THE

PITHECAHTHROPUS LAYERS ON JAVA

GEOLOGICAL AND TALEONTOLOGICAL

RESULTS OF THE TRINIL EXPEDITION (1907 AND; 1908)

EXECUTED WITH THE SUPPORT OF

ACADEMIC.'JUBILEE FOUNDATION OF THE CITY OF BERLIN AND THE

ROYAL BAVARIAN ACADEMY OF SCIENCES

PUBLISHED BY

M. LENORE SELENKA MUNICH

AND

PROF MAX BLANCKENHORN BERLIN-

WITH THE COOPERATION OF NUMEROUS PROFESSIONALS

WITH 32 TABLES

AND NUMEROUS TEXT ILLUSTRATIONS

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EMPLOYEE:

Prof. Dr. Max Blanckenhorn, Berlin; Dr. Emil Carthaus, Berlin;

Prof. Dr. Dieck, Berlin;

C. M. Dozy, mining engineer, Haag; Prof. Dr. Joh. Felix, Leipzig;

Dr. E. Hennig, D. East Africa;

Prof. Dr. 0. Jäckel, Greifswald;

Dr. W. Janensch, D. East Africa;

Mrs. H. Martin-Icke, Leiden;

Prof. Dr. Karl Martin, Leiden:

Fritz Oppenoorth, mining engineer, Sumatra; Prof. Dr. Hans Pohlig, Bonn;

Dr. Hans Reck, Berlin;

Dr. Julius Schuster, Munich;

Dr. Hans v. Staff, Berlin;

Dr. Fritz Stremme, Berlin;

Prof. Dr. Walkhoff, Munich.

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IN MEMORY OF EMIL SELENKA

DEDICATED

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Selenka-Trinu expedition

Plate I.

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Fig. 1. Site of the Pithecanthropus (marked with a white cross) on the left bank of Solo.

In the background pit II of the Selenka-Trinil expedition. The raised dump was filled up by the latter in 1907. On the right is the boat that carries our workers

Fig. 2. The same place when the water level is low

The two different PÜhecanthropus finds are marked here by two rectangular white signals, namely a poster on the low post close to the open shed (skull) and a paper on the floor in front of the shed (femur). (The signal on the high pole on the right for the new work is irrelevant.) In the foreground the dump of pit I on the right bank of the river Wilhelm Engelmann's publishing house in Leipzig.

Introduction of

M. Lenore Selenka.

I.

The first impetus for the plan to start investigations at the Pitkecanthropus site dates back to 1899. At that time, my husband, Prof. Emil Selenka, went to see Prof. Dubois with me and toured the Pitliecanthropus - ^> i \ xcke. The intense interest they aroused in us, the lively wish that the investigations should be continued and the regret that Mr. Dubois could not make such a continuation probable either from his side or from that of the Dutch government, prompted me even then in the presence of Mr. Dubois on the suggestion that we might consider the continuation ourselves

should take.

Even if the special developmental tasks my husband set himself, and

which filled the last decade of his life and would probably not have allowed him to take up this plan, his interest in the follow-up of those traces of the hitherto most important link in the history of human development remained lively.

In the autumn of 1902, at the beginning of which I lost my husband, I made the decision to take up the investigation in Java on my own. This happened occasionally when I was present in Holland and after I had received a lively welcome and direct encouragement from Mr Dubois. Mr.Dubois also provided me with some orientation sketches and information and sent me one of his former overseers, a retired Dutch sergeant who had worked for him on the site for years 1

).

I would like to express my sincere thanks to Mr Dubois for this kind support of my plans.

At the same time, I obtained the approval of Prof. Treub, who was then in Holland, director of the botanical garden in Buitenzorg and scientific advisor to the government there, to my project and his assurance that he would support the company with his endorsement.

-

1) This man was provisionally engaged by me at that time, but unfortunately died the following year. Later I took another Dutch ex-sergeant named de Winter, who had also worked on the site and whom I found with the help of the Dutch colonial ministry, out to Java.

Selenka-Trinu expedition.

3,

Since the years 1903 and 1904 were largely determined by obligations against my husband's academic legacy, I was not able to begin preparing the company until 1905. In the meantime I had initiated related links and information in Java and Holland on the broadest possible basis. It was originally my intention to carry out this undertaking from my own resources and independently of any corporation, only on the basis of the prospect of concession from the Indian and Dutch authorities.

In the autumn of 1905 I obtained official permission from the Dutch Colonial Ministry to carry out the investigations on Java, and through its mediation my request for permission to work and for permission to export the found objects to the Governor General of India was supported . This request was fully granted in January 1906.

In the autumn of 1905 the Royal Prussian Academy of Sciences and the Academic Jubilee Foundation of the City of Berlin also approached my company with suggestions for support. The negotiations on this dragged on until late autumn 1906. At that time, the Academic Jubilee Foundation of the City of Berlin signed a contract with me, according to which they contributed the sum of 14,000 marks to the excavations and in which it was planned to add another 14,000 marks if this was to carry out the work there according to the plan would be required. According to this plan, the excavations in the actual bone layers (after completion of the necessary preparatory work) should be carried out for at least 3 months. Since the excavations, which were also extended to double the allotted time, actually required far more than three times the first installment in costs \*), the foundation approved the second installment at a later date2 ).

Incidentally, it can only be ascribed to the extraordinary relief granted by the Indian government to the company that the costs of implementation did not have to be much higher. The granting of free labor in such large numbers and the position of the relatively high-paid European supervisors alone represent a significant part of the costs that would otherwise have been necessary.

For making the entire company possible, thanks primarily to the generous courtesy of the Dutch and Indian governments, namely:

To His Excellency the Colonial Minister, Mr. D. Fock,

who gave me the official grant of all powers, insofar as they were subject to the Dutch home government, and advocated granting the rest to the Indian government;

To His Excellency the Governor General van Nederlandsch-Indie I. B. van Hedtsz,

who gave me the permission to dig on the Dutch-Indian soil, in addition 25 freelancers (whose number was later tripled) and commanded 2 active military men to supervise them and especially the personal and unrestricted disposal of all natural knowledge brought to light by the expedition -

Scientific finds 3

)

granted;

1) I paid the additional costs myself.

2) This also included a certain sum for the later publications, which, however, could not cover the costs of the same.

3) I had to commit myself not to take any finds of any archaeological character out of the country.

to Mr. D. Fr. M. van Rees, Algemeene Secretaris van Nederlandsch-Indie,

for his helpful promotion of all interests relating to the expedition before and during its entire duration; then

the now deceased Prof. Dr. M. Treub, Directeur van het Departement van Landbouw in Nederlandsch-Indie, then director of the botanical garden in Buitenzorg,

for his advice and support given to me in the years of preparation for the expedition

support and ongoing promotion of the company.

In second place, I owe thanks to the Board of Trustees of the Academic Jubilee

Foundation of the city of Berlin for the extensive support of the expedition and the possibility of a broader base of the same and the Königl. Prussian Academy of Sciences for recommending my company at that point.

The two-year working period of 1908 owes its funding to the Königl Bavarian Academy of Sciences and the Directory of the Bavarian State Paleontological Collection, to whom I would also like to express my thanks.

I would also like to thank all those interested in the scientific and other results of the expedition to the following sponsors of the company:

On Java:

In Batavia:

Mr ue Voogd, Overste van Genie zu Batavia,

who selected the 2 Dutch sergeants to supervise the work in Trinil and who, through the excellent choice of these people as well as through his constant, willing support and helpfulness throughout the course of the expedition, earned an outstanding contribution to their success;

Mr. Koningk Knyp, boss van Mynwesen (mining),

who in the most generous way provided us with all the necessary machines, dump trucks, decauville rails, as well as pumps, drills and digging tools and had them transported free of charge for us to the workplace;

Mr. Styprian Lucius, Head of Spoorwesen (Railway Administration),

generously granted free transport on all railways for all incoming and outgoing shipments for the entire duration of the expedition, furthermore free travel for all persons affiliated with the expedition 1

);

Mr. Stieltje, Chef van Posteryen (postal administration),

to whom we owed the provision of two free mail runners between Ngawi and Trinil, a perk which, since we were not connected to the post office, saved us great costs and difficulties.

In Madiun:

the resident Mr. Boissevain,

who sent the workers' columns to Trinil and consistently proved to be the patron of the expedition;

1) This is all the more highly valued as in striking contrast to the fact that here the Dutch-Indian government even granted free freight for the scientific collections that originated in their soil and that were transferred to foreign countries, when the same collections were transported to the German ones Museums to which they were to be sent had to pay the full freight rate for the transport from Bremen to Berlin (almost 400 marks) despite multiple requests from academically authorized parties for exemption or reduction of the costs. (!)a \*

the assistant resident Mr. Heckmf.yer in Ngawi,

who, as Trinil's closest senior official, watched over the fate of the work and has proven himself to be the most benevolent patron;

the commander of Ngawi Mr. Bloeme,

the immediate superior of my military supervisor, who made the work much easier with a lot of help and favors.

I also owe a lot of thanks

Mr. L. A. Bakhuis, the former Major in the Dutch-Indian Army, now Beferendaris

at the Ministry of the Colonies in The Hague,

for the helpful and kind advice and mediation that he gave me for years in all official steps in matters of the expedition.

I do not want to omit to express my heartfelt thanks to my following advisors and helpers in the preparation of the expedition:

In Holland:

Prof. A. Hubrecht in Utrecht,

Prof. Nieuwenhuis in Leiden,

Prof. Martin in Leiden,

Mr. Adrian de Stoop, director of Dordrechtschen Petroleum Maatschappy, and his

kick in the Tschepu petroleum station, near Trinil; also in Germany:

Prof. Eberhard Fraas in Stuttgart, Prof. Otto Jaeckel (now Greifswald), Prof. Conrad Oebbecke in Munich, and the writer Wilhelm Bölsche

j

Dr. Max Rothmann (doctor) \ in Berlin.

Dr. Hans Friedenthal

The great courtesy of the North German Loyd, who is responsible for all

The members of the expedition granted considerable reductions in the passage and also allowed 20 cbm of free freight for the goods of the expedition. We made use of the latter advantage mainly on the outward journey, while on the return journey we had to use other routes several times to avoid reloading due to the fragility of the finds.

For the summer of 1906 I had prepared a pre-expedition to Java with a geological expert (and already occupied ship berths), which, however, had to be abandoned due to initially overlooked statutory difficulties with regard to the academic contribution to the foundation that emerged at the last moment .

I therefore asked Prof. Wilhelm Volz, whom I asked for an orientation visit to Trinil when he left for Sumatra in 1905 and with whom I had agreed to meet there for 1906, to carry out this preliminary examination alone, and asked him about this the workers already promised to me for this working period, as well as the terrain plans and information that I have already procured. At my request, the governor had the two soldiers

Meyboom and Bai r already commanded on the spot in June 1906 and so, when Prof. Volz arrived in Trinil, they were already there with 25 workers to deal with the arrangements agreed with me

J

This first sent to me by letter from Java, then by Mr. Volz I.

accept the creation of test pits and carry out the excavations and profile uncoverings necessary for his preliminary investigation. Prof. Volz undertook this preliminary examination in two short visits to Trinil and gave me a short written report on it. It was agreed that if after his departure from Java the workers were allowed to stay in Trinil to continue the work, for which he promised to seek permission from the governmental authorities, he should notify me of this by telegram according to a specially worked out code, because I would then be responsible for the necessary wanted to take care of geological supervision. In the meantime, Herr Volz reported to me that the work would be stopped as soon as he left and that the workers would be sent home, and that work would not be allowed until my own arrival in Java and "everything would have to rest".

and had prepared to withdraw.

It was not until January 1907 that I found out through a bill for house holdings I received from Java.

rented the sergeants that they would continue the digging with the workers until October (when the start of the mining period) and that they had been assigned to this task for an unlimited period from the start. Work was therefore carried out in Trinil from mid-June to mid-October in 1906, with three large trenches being carried out and further individual shafts being started. By and large, the order I issued and conveyed by Herr Volz was followed, "never to go down to the exact color and type of bone layer"; In isolated cases, bone material, mainly in somewhat higher elevations, has already been touched and stored, which is recorded in our collections with special figures from 1906, so that the subsequent control of the work at that time could be carried out sufficiently.

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II.

News that was repeated orally in Europe afterwards prompted me to send a geologist out for the late summer months of 1906, which I intend to do if the work begun can be continued

In November 1906 the geologist Dr. Johannes Elbert from Münster for the geological work and the Dutch mine engineer Fritz Oppenoorth for the technical management of the Trinil work. The latter took up the Heise on January 1, 1907, in order to start the preparatory work as early as the subsidence of the Begen monsoon would allow. At the beginning of February he arrived in Trinil and on his arrival found the sergeants and desires workers in Ngawi at his disposal. But he was not allowed to take the latter with him to Trinil as the house had to be built in accordance with regulations (with Freikulis)

).

At this point I have to meet this reliable, talented and capable man (who at that

1) Mr. Volz published the results of his geological observations made during that preliminary investigation in a brochure in the winter of 1906. I only became aware of the appearance of this publication shortly before I left for Java.

2) Oppenoorth's own work report below provides information on the execution of this introductory and all other technical work.

)

performed his job as a volunteer for the first 4 months without any pecuniary remuneration), to express the most unreserved praise for his selfless, tireless zeal and excellent work. He deserves great credit for the success of the excavation work, which is so successful despite very special difficulties and obstacles.

Unfortunately, Oppenoorth was unable to continue his work in Trinil until the end of the excavation period, as severe typhoid fever threw him on the sick bed in mid-August. After he had been fed by me for 3 weeks in his primitive trinile dwelling at his request in order not to be far from his beloved workplace, he had to be transferred to Ngawi.

Not without heartfelt gratitude can I remember the generous behavior of the assistant-resident, Mr. Heckmeyer, who took the patient into his own home so as not to leave him to the military hospital. He gave him the most loving care for a full 4 months until a stage of convalescence made his return to Europe possible.

Dr. Elbert went to Oppenoorth for two months and at the same time I started to leave the country. He arrived at the Triniler work site in mid-March, found the preparatory work led by Oppenoorth already in full swing and the living and working rooms set up.

Dr. Elbert's activity in Trinil was limited to just under 3 months, since in mid-May, due to minor differences with Mr. Oppenoorth, he demanded that Mr. Oppenoorth be dismissed from me as a condition for the continuation of his contractually agreed work for 11 months. I could not possibly accept such a condition for more than one reason. At one point, Mr. Oppenoorth's involvement at that stage of the work seemed absolutely essential. Dr. Elbert himself, with whose knowledge and consent Oppenoorth was employed, had to confirm the excellence of his work. But then it would have been an unforgivable mistake, without the very best reasons, to dismiss the only Dutchman who was employed by this work on Dutch-Indian soil and with such extensive Dutch support. Under these circumstances, Dr. Elbert left the expedition in mid-June.

After his departure, a geologist who happened to be in Java at the time, Dr. Deninger from Freiburg, working for the expedition in Trinil, but from their association already at the end

June resigned.

In mid-July, Dr. Emil Carthaus, then based in Tosari on Java, for the geological

and palaeontological work in Trinil I did 1

Since Dr. Elbert on his departure from Trinil, contrary to his obligation and promise

All the records and mappings made in the service of the expedition were taken along and not a single one of the necessary bases for the continuation of the work afterwards. had left its own results, its short working period remained for the purposes and Dr. Carthaus was obliged to do all the investigations

the expedition as good as inconclusive 2

to undertake all over again. (I also refer to his report below.)

)

Dr. Carthaus stayed with the expedition from the end of July 1907 until the end of the working period of that year; H. until the rainy season came and the most important bone layer, which was only about 20 cm above the depth of the river, came under water.

lj Iwarmed with Dr Carthaus, who was known to me from earlier publications, and had already contacted us in writing during the years of preparation for the expedition.

2) Dr. Elbert has secured the observations and records made in his involvement, the priority of which has been secured for him and their own publication in the entire Trinilwerk was expressly agreed upon leaving 'already in the summer of 1907 in Java in lectures and journals and further used here in brochures, etc.

).

Volcanic chain that runs through Java in its entire length 1

- the Tengger - one of the most characteristic volcanic formations on earth forms 2

When Mr. Oppenoorth fell ill towards the end of August, Dr. Carthaus also oversees the technical work as well as the sorting, preparation and recovery of the finds. I am Dr. Carthaus is very grateful for the great zeal and interest with which he has taken on the work that is in the middle of the process and made so difficult by the lack of the basics and brought it to a close. In the course of our collaboration, I was often astonished how this gentleman, who had lived in the tropics for so long, had accepted nothing at all of the slowness and nonchalance that one encountered so often in long-term tropical settlers, but rather the vivacity of the Had preserved spirit and initiative that have benefited the work greatly. I don't want to allow myself to judge the value of his work here, since she can speak for herself in this work.

As an additional assistant, I hired Mr. Charles Boissevain, nephew of the chief government official of the Madiun residence, as secretary and bookkeeper. I want to give the young man the best possible appreciation for his loyalty to his duty in fulfilling the many tasks into which he knew how to work his way quickly. He also checked the found notes with the greatest conscientiousness and kept the lost property book.

III.

The island of Java is divided into 13 residences; each one of them has a resident over him who is endowed with extensive powers. The individual residencies break up again into districts, which, one might say, are governed by assistant residences; for this second rank also represents an authoritarian power in its area, and even the controllers subordinate to it, to which the smaller localities are subordinate, still have independent jurisdiction.

The Madiun residence, to which Trinil belongs, is located in the very heart of Java - in the so-called Middenjava. Their area encloses two large volcanoes (the Lawu and Wilis), members of the

).

The Madiun residence has long been known to the Javanese population as a place where bones were found. Many names in the vicinity of Trinil still point to this fact, such as Batu-Gadja (the elephant stone), as the cliffs are called a few minutes upstream from Trinil. (See Fig. 2 in Carthaus, Geologie von Java, p. 20.)

The vernacular calls these remains butangbuta (bones of giants) and keeps the tradition alive that violent fights between gigantic demons once took place on these places. It is called u. a. that the head of such a giant lay at Surabaja and the feet at the western end of the island, while his body parts are scattered over the middle of the country. The Chinese settlers in the country, who are the only agents of trade in every fairly sizeable village, have known these sites since ancient times and used them for medicinal purposes

1) Cf. the geological overview map of Java on plate V. - For further topographical information I refer to the treatise by Dr. Carthaus.

2) See the illustration on Plate IX.

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and in one of their eastern representatives

Fig. L.

Sundanese, father and child. (Reproduction from the collection of Mr. Ing.Link, Hilversum.)

used because here, as in China itself, the powder made from crushed fossil bones is used as a miracle-working medicine. <In any case, it would always be practical for the discovery of fossil sites if one wanted to investigate the sites that have been handed down among the Chinese.)

In a less superstitious way, however, the Madiun bones were already being looked at around the middle of the last century by a Javanese gentleman named Raden-Saleh, who for scientific purposes brought together an impressive collection of fossil bones, which are now in the Geological Museum of Suffering is located. This man, highly developed for his time and environment, who also excelled as a painter, a scion of an old, elegant Javanese regent family with Arab admixtures, appears to be a belated descendant of the former heyday of Javanese cultural development, as it was under the influences of a millennium , more spiritual than political invasions from India into Java unfolded. One after the other, sometimes side by side, the waves of Brahmanism, Buddhism and Islam flooded the island and left their mark on the population, religious architecture, law, literature and science, blending with the original cultural heritage of the Malay islanders has created a characteristically self-contained cultural structure. Even today, Java's handicrafts are of a strictly individualized

ized, sharply outlined, distinguished peculiarity that is unparalleled in the world. On the other hand, there is the tremendous boom in architecture and sculpture, of which the largest and most elaborate Buddhist monuments in the world still bear witness in this country, whose population today knows almost nothing about the technology of stone construction, and occasionally Regarding the images that appear in his rice fields as having fallen from heaven, they are quickly forgotten - just like the historical consciousness among the people

seems dead and has its monuments only in the dramas and epics of national literature.

It is only a century and a half ago since the last of the powerful empires in which that cultural period of Java found its highest political expression, the Muslim empire of Mataram in Middenjava - which, like the more western Hindu empire of Modjapahit, once had its sphere of power far beyond Java's borders in the Indian archipelago and as far as the Malay Peninsula - fell into two parts under contact with the Dutch, which then survived for almost a century in a kind of pseudo-life.

..

The last meager remains of past splendor vegetate., M •

i

Sundanese woman (good type). (Reprod. From the sammi. Des uorm ing. Li \*\*, u.iversum.)

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to this day as the only so-called "independent"

Fig. 4.

Entrance to the kraton or palace. iKeprod. from "Sunny Worlds" Ton E. and L. Selenka. Kreideis Verlag, Wiesbaden.)

Selenka-Trinil expedition.

Introduction.

IX

Areas of Java, the Empire of Surakarta and the Sultanate of Djokjakarta, the latter in close proximity to Madiun.

In these districts, currently grouped under the name of the "Vorstenlande", the population still bears the most clearly

Stamp of the mixture of blood between the established Malay tribe and the Aryan immigrants. The type of Javanese proper - as the population of Middenjava, especially the foothills, as well as Madiun and Kediri, in a broader sense also all of Eastern Java, is called - differs sharply from that of the coastal inhabitants and from the Sundanese, who are particularly represented in the western Javanese. The physique is slimmer and slimmer, the color of the face lighter, especially in the posh

Great. The formation of the face is more noble than the Malay, and is often of an Aquiline type. In the costume, too, there is a difference in the tastier simplicity, the seriousness of the colors and the strict style of the arrangement of folds in the drapery, as in the characteristic binding of the headscarf.

The Javanese stands out in front of the Sunda

ness even in the lower classes

greater formality of nature, as well as even more

more marked devotion in front of the traditionally superior and the Europeans. Also in the language, which, by the way, differs from ordinary Malay and not without it even from the Malays Fig. 3.

If anything else is understood, there is an extraordinary awkwardness and strict constraint; here, as in the ancient Indian languages, there is still a differentiation of the use of words for the meaning of higher to lower and vice versa.

Only in the foothills and in Middenjava can one still observe the custom, which is embarrassing for Europeans, that oncoming merrymakers or wagon drivers jump off in sight of the approaching European or even a tall Javanese and crouch down on the side of the road with their faces turned away until the Spectator is over. In Trinil, the messengers, suppliers, and even the chiefs of my person usually only approached in low

Javanese nobleman. (Keprod. With the permission of the Koninkl. Institut voor Nederl. Indie.)

chewing position; a defense against such use is misunderstood by the people and felt to be offensive.

At the two courts of Surakarta and Djokjakarta, the stiff ceremonial of the past brilliant times still prevails in almost unchanged form. It doesn't matter that both potentates are not much more than prisoners in their many kilometers of palace districts - the so-called kratons - and never without permission and only in the company of the Dutch resident

Fig. 5.

Court grower \ on Djokjakaita (Serimpi).

are allowed to leave this district, which is sweetened for them by outwardly meticulous honors from the Dutch administration, as well as by very respectable annual payments. Within their district, however, they are unrestricted autocrats and the court of several thousands, as well as the vast Kraton population and, in a broader sense, the population of the entire area of ​​the foothills, live in direct dependence on "the nail of the universe," like one of the hundred titles of the Emperor of Surakarta is.

How strictly the Dutch are able to maintain the appearance of the old conditions from the beginning of their political conquest in Java was brought to mind by a process that I was aware of on the way to Trinil in the hotel des 4 hours away by train Surakarta watched. On the side of the porch of the house I saw a procession of six Javanese, who are known as court servants, passing by from the kitchen. Two forerunners, then two, who carried a steaming silver soup bowl on raised hands and two rear ones, which held the characteristic gilded "pajung" (state umbrella) of imperial dignity stretched over it, which was also displayed at every departure of the prince, even over the The roof of the closed body is supported. Every day at 12 o'clock the "tribute" of the Dutch government is paid as an honorary

testimony delivered to the imperial court.

To illustrate the curious flowers that make up this Asian mix

table pompes with European aspirations, here is another rehearsal. At a ceremonial reception of the Emperor of Surakarta, to which all the high-ranking Dutch officials of the place were invited along with their ladies, a whole column of barefoot servants in gold-braided liveries, who crept up in the usual, half-crawling posture,

magnificent crystal goblets with beautifully chased heavy gold lids are presented. The habitues of the place thanked them negatively by bowing their heads, but I - a newcomer and half languished in the sultry

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In terms of originality, it leaves nothing to be desired when I was allowed to attend the rehearsal of a serim dance in the inner palace in Surakarta for the purpose of phonographic recordings of the imperial orchestra (Gamelang), when the ruler present ceremoniously two farewell

-

grabbed and -

found the chalice empty.

tropical night air

The column of servants went out to the other side of the hall with their tantalus cups and came back after a few minutes, the goblets now filled with ice-cream lemonades, but without gold lids, which one should obviously admire beforehand, undisturbed by the sensual enjoyment of the refreshment drink.

Gravely

pulled,

rather it crept

had monstrous giant cucumbers handed over. This dance is only performed by very young princesses of imperial blood and offers a spectacle of exquisite exotic grace and bizarre. The recordings, which I had to make crouching on the floor in front of the crouching musicians, were made quite difficult by the fact that I was not allowed to turn my back on the potentate enthroned in the background of the hall at any price, which was (Dutch- discher) Chief Ceremony Master had impressed very emphatically!

Incidentally, among the younger generation of these strange courts one now encounters an up-and-coming trend, some representatives of it speak Dutch or even French, and the mixture of their traditional, artistic and elegant customs with Western manners produces very attractive results.

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Very recently the spirit of Reformation has begun to stir in Java as well, which, it seems, traces back to the Russo-Japanese war, seems to gradually bring the whole Eastern world, which has been rigid for so long, into more or less noticeable vibrations . Quietly pulsing there is a striving through the Javanese people to become more conscious of themselves again, less instinctively to regard the things around them as given. The old heroic national literature, breathed deeply by the Hindu spirit, after having been kept alive for centuries only by the popular wayang stage, is being revived for study. The ancient sacred Kawis J

are brought out and made the basis of popular reform efforts. This is not the place to pursue this interesting Renaissance movement on Malay soil any further. I want to end this excursus into ethnological field, which is perhaps a bit forbidden here, with a strange prophecy, which I was told as coming from a secret Kawi manuscript of the 3rd century AD and which I am passing on without responsibility. It goes something like this: “There will come a time when people will walk on iron strings! And at that time, the people of Java are different

To be subjugated to the people. And then there will come a time when people will go up in the air. And at that time the people of Java will become free again! "

The religion of the population of Java is present throughout (if we disregard the Chinese colonies, which only make up a large number in the coastal places and exclusively comprise traders and craftsmen, and the diminishing number of Hindustan merchants and peddlers, here called "Kling") Islam, which is expressed in noisy festivals on the high Muslim holidays, but otherwise lets "Allah be a good man" and never grows to the fanaticism that often forms the soul of insurrectionary outbreaks on Sumatra and other islands of the archipelago .

In addition, the Javanese brain teems with a myriad of genuinely native ghosts and demons, who give his strongly developed imagination the necessary nourishment.

This lively imagination, together with great passion in an externally measured nature, a sensitivity that can be called almost sensitive, and a naive, violent feelings of honor, one has to bear heavily in the treatment of Javanese. The administrative officials exercising jurisdiction - as I have often observed - also put these character elements into the scales with great understanding, as is generally the case today (it used to be different) the thorough understanding and skillful handling of the Malay national character and the inherited customs aroused admiration on the part of the Dutch. Also only in Malay

1) The Kawi is a combination of Sanskrit and Old Javanese language elements and now only literary language. b \*

The rampage that occurs in the archipelago and Malacca falls under this aspect. Even now one finds the ominous large wooden fork planted at the entrance of every larger patch, with which the man, seized by sudden frenzy, who was still responsible for peaceful work a few minutes before, is caught in his wild, dead straight, pernicious course of every oncoming, in order to be in silent custody Brought to consciousness, but not handed over to punishment. Likewise, the so-called "latah," a peculiar sporadic insanity, which only occurs in Malays, is probably connected with this extremely excitable disposition. It is mostly related to some kind of shock or strong emotional movement and manifests itself in the fact that the exciting object, for example a snake or a dog, is cramped for days, sometimes for weeks.

In the case of the servants, thrown together from different areas of Java, which the housekeeping in Trinil required and which was difficult enough to keep together - for our primitive housekeeping in deserted places was with the spoiled terms especially the "Jongen" taken from the coast as "Bimbu" (wilderness) decried - have I made or studied all kinds of studies on the Javanese psyche. be able to renew previous experiences in it.

The large number of these servants in European terms is explained by the box-like limitation of their services. The water carrier will not cut grass, the messenger will not do house service, etc. There were always some parasitic appendages to take with you in order to get people in our remote area; especially since the important post of Kokki (cook) could usually not be filled without an officially recognized "accompanying phenomenon" and unfortunately, given the ephemeral nature of the latter, it was subject to frequent changes. The Javans, as Mohammedans, are polygamists, but on average they make little use of it or at least more in the form of succession, a divorce still costs a few guilders less than a marriage.

Unfortunately, I could not make use of the rich material on psychological observation that the convict workers assigned to me would have offered, because the consideration of the criminal relationship forbade any closer examination of the people or any involvement with them outside of working hours.

U.iHscr the / "Sl r.rNKA-Expodition. '^ -'

Location-plan on the excavation poles

at Trinil (1900)

Fig. 6.

Building land

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l'undollo des PithecaiUhropus

The Madiun area is the hottest area on the island in terms of climate. It has the honorary title "Hell of Java" in Dutch vernacular. In Trinil the thermometer moved on average in the cooler summer months (between 92-95 ° Fahrenheit = 34 ° C.). In September and October, when the heat rises, we often had 100 ° F. (== 38 ° C.) and more.

Trinil has not been an actual town for a long time and until recently was not even listed on the government maps of Java: it now consists of only 3-4 poor huts.

The next somewhat larger settlement is Soko, where besides Malay there was only one European family (of Mr. Lukas). Because of the kindness of this gentleman, we have been able to enjoy the advantages of a daily supply of fresh bread, milk and ice cream.

About 15 km away is the next more respectable place, namely Ngawi, the seat of an assistant resident and a controller, as well as a small garrison. Before we began our work, the way from the great highway on which Ngawi is to Trinil was completely impassable for cars; In view of our company, the courteous government officials made it more or less drivable for narrow-gauge cars, but every downpour and other coincidences often caused unpleasant interruptions to our connection.

The nearest train station to Trinil, about 18 km away, on the line crossing the island from east to west, which was only completed a few years ago, is Paron and the distance from here is 9 hours to Surabaja and 24 hours to Batavia. (There are no night trips.)

The Pithecanthropus funesial (see Fig. 1 on plate I) is on the left bank of Solo at a sharp corner of the river; a flat plate-like projection pushes itself into the river bed,

On the side of the Solo River opposite the site of the Pithecanthropits Resie, on the edge of the steeply sloping, approximately 50 m high river slope, Dubois left a low memorial stone on which the letters PAE [Pithecanthropus erectus) are carved and an arrow pointing to the on the other bank indicates the point at which the find was made. (The number of meters given as the distance is not entirely correct.) Dr. At my request, Carthaus made a trigonometric fixation of the site and marked the location precisely. The Solo River makes a north-facing loop that breaks up into many smaller turns, the base of which narrows to only 500 m south of Trinil 2

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Plate I gives two views of the site taken in August 1907. The raised heaps of the ledge are later embankments, originating from the overburden of the hinterland that we removed. The specific location of the femur is on plate I, Fig. 1 in front of the open hut with a lying white cross, in plate I, Fig. 2 by a white paper lying on the floor, that of the skull in the latter figure by a poster low pillar next to the open shed. The two posts were made by us according to the statements made by the person employed under Dubois

1) This little card comes from a survey of the river area of ​​the upper Bengawau carried out by the Indian government in 1900 and was sent to me by Mr. Dubois.

2) See also the orientation map on panel VI.

which originally rose only a little above the lowest water level (see Fig. 6) 1).

the workers of Dubois found the skull and about 1 year later the femur of Pithecanthropus about 15 m away, and in the following years 2 teeth a short distance away.

At this point

Holländers de Winter, whom I took with me - and who himself dug up the Pithecanthropus Femar and when he found the skull (by his colleague, also a Dutch sergeant)

-

When he left Java, Dubois had planted three small casuarina trees near the memorial stone; We found these shot up to an impressive height (see Fig. 7 above). They were the only tree representatives on the otherwise completely bare river plateau, on which we built our houses with full view of the workplace.

The space for these houses with the outbuildings was rather limited, as it was approached to the north by the Dussois Pit, to the south, by a rather deep gorge.

fixed. The distance between the designated points is about 15 m. A third view of the site is given here under FIG. It is taken a little upstream from Trinil.

been waiting

Fig. 7.

Dubois memorial stones on the left bank of the Solo, on the right the Kasuariuenbaurae, which he gave.

was bordered. So we could only build the sergeant's house some distance from our apartment, as well as the rather large workers' house.

To the south of our home rose the regular, truncated cone of the volcano? Lawu, which we only saw in the clear early morning hours and shortly before sunset stand out sharply against the sky. We were therefore unable to take a good photograph from here of this volcano, which is closest to our place of work, which seems to be so closely related to the bone deposits in Trinil, because there is too little light at those hours. Even the faint outline of the Wilis volcano was sometimes visible to the northeast in particularly favorable weather conditions. The low one ran between them as a blue haze line

The Pandan range of hills, the so-called Kendeng Mountains, which only reach a height of approx. 150m. The surrounding area was pretty bare. Rice was not cultivated in the area, there were only a few tobacco fields, some of which we found at very low prices in late summer

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bought in order to examine new excavation terrain. The only larger tree population was, a few kilometers away, one of those characteristic Djati forests, whose species of tree, with its extraordinary hardness of wood, provides the material for the most important wooden implements and tools and which, despite the dense stand, provide little shade because the very large leaves in grow too far apart.

In the immediate vicinity there was only sparse bush on the river banks. In a sense, this was a favorable circumstance, since even from this sparse population we had to chop off the bushes that towered over the edge of the plateau towards autumn, because they offered the poisonous snakes, which increased in size and brazenly at the first signs of the time, which became ever more brazen of the

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Fig. 8.

View of the Pitlieeaittliropiis-FimUsteWe as seen upstream from Trinil. Left the embankments of our üruhe II. In the background the expedition houses and the front part of Gruhe I.

Area are numerous, welcome hiding spots from which they could easily reach our veranda, their favorite sleeping place, at night. These beptiles were always in the spaces between our braided double walls. At noon we were often frightened by the frightened squeaking of the frogs at which they were eating at the same time as ours. Chasing away would only have been possible if our house had been demolished.

In addition, the great lack of animals in the whole area was striking. We saw no noteworthy representatives there, neither of smaller mammals nor of birds. Only around noon did we sometimes enjoy the sight of a slumbering crocodile, which made itself comfortable on the banks that were exposed in the dry season.

In our immediate vicinity there was almost no food available; We could rarely even get rice. The only thing that we could get on the spot in favorable cases were fish, in which the river is very rich. But this also depended on the good XVI

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Will of the fishermen who came together from a fairly wide area at regular intervals at the favorable river corner of Trinil, where they poisoned the river according to the Malay fishing method and then caught the stunned fish partly with small nets, partly with poles.

A picture of this painting process is shown in Fig. 9. Striking enough the carelessness with which the people moved in the river, in spite of the not uncommon occurrence of crocodiles. So with our purchases of food, we were entirely dependent on deliveries from Ngawi

reliant. There was a market there every five days, but almost everything was sold out by the time the sun rose. In order to be there in time, we had to send a prau (clumsy Malay river barge) with four men downriver to Ngawi the evening before, where they arrived early in the morning. With the supplies they acquired there, they hit because the journey home was

Fig. 9.

Fishing in the Solo River near Trinil. (The happy shouting on this occasion is probably sufficient protection against crocodiles. L

went up, did not return to Trinil until after midnight. The kind wife of the assistant resident of Ngawi, Ms. Heck.meyeu, to whom I owe the warmest thanks in every respect, as well as her husband, has been very helpful to us with these difficult supply relationships. It is not too much to say that the unwavering willingness to help of this high-minded and kind-hearted man, often associated with great sacrifices of time and effort, and the rare understanding and interest that he showed in the scientific goals of the excavations, played a large part in the the implementation of the Trinil work. Mr. Heckmeyer is also initially closed

We owe the fact that the number of 25 detainees initially approved by the government was doubled in the second month and finally increased to 75. It goes without saying that that increase in the number of workers has been a major influence on the outcome of our labor.

The government workers, who are also called chain boys there, because as convicts on the marches they are usually tied to one another with chains or, like ours, with ropes, were for the most part real Javanese from the residences of Central Java, and also from the Sundanese from the coastal areas Maduresen, from the neighboring island of Madura to the northeast. The latter made our most capable workers. They are considered to be the most spirited elements of the Malay population

Fig. 10. The criminal workers.

Java's approach, but at the same time as addicted to trading and idiosyncratic. They usually included the few murderers who were in our otherwise very tame column of criminals, and these were not the most clumsy for all work that required a little more intelligence. Most of the others were serving sentences for minor theft, jealousy and similar offenses.

The rules for treating people were very precisely regulated. Beatings were strictly forbidden, and government officials immediately investigated any complaints made by workers. It was also strictly forbidden to let the workers transport heavy loads over long distances, and therefore we only had pieces of machinery or rails moved by people between nearby locations as an exception and with special permission.

According to the official requirement, I had to build a sleeping house for the workers

about 10 minutes away from our apartments. This workers' house had to come along

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be surrounded by a strong barbed wire fence to prevent the convicts from running away at night. Nevertheless, it happened a few times. Especially since the lazy Javanese found the stay in the prison in Ngawi at times more tempting than the arduous mine work.

The people slept on bamboo beds, 4 or 6 together, all in a common room. Twice, in accordance with the increased number of workers, we had to add additional extensions to our prison house.

The mandurs (Malay guards) assigned to them were not convicts, but mostly residents of the village of Ngawi. Among them were some very intelligent people who after a short time proved to be very skilled and reliable in treating the bones still stuck in the ground and in quickly recognizing such pieces in the surrounding earth.

We also had some extremely skilled individuals among the workers themselves, whom we were able to train in preparation work, gluing and sorting of the finds. We met some of the people with real interest in the work; in any case, the ambition to have made a good find was evident in most of them.

Fig. 11.

The sergeant's house.

The convict costume consisted of short, brown-yellow jackets and trousers (the former were usually taken off at work) and a roof-shaped, coarsely braided grass hoof (as opposed to the traditional sarong costume in the country).

Fig. 10 gives a picture of our column of workers as they come up from the bank at the end of their work in order to bring their equipment into the shed. The two men in the foreground with hats in hand are the manduras.

The mood of the people was, on the average, by no means sullen, which I could observe especially during the daily bath. For every evening, when the troop of workers who worked in the other side of the pit, made multiple trips across the river on the flat Prau, the people romped about in the shallow yellow water with happy shouts, but more Asian

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Correspondingly, never took the loud forms as would be the case with similar amusements in Europe.

The workers' meals were given twice a week by the Chinese "Ahemer," d. H. the delivery counterpart of the military authorities, drove on a cart to Trinil, where we always had to check the rations, weighed exactly for each head, with the greatest accuracy, so that fraud on the part of the Chinese would be prevented.

The ration per capita was: 0.75 kg rice, 0.15 kg salt, 0.02 kg Javanese sugar, 0.2 kg fresh meat, 0.25 kg fresh or 0.1 kg dried fish, 0.25 kg fresh Vegetables and spanish pepper; often eggs instead of meat. Four of the people did the cooking themselves.

The Indian government provided me with two active Dutch military men to supervise the workers, one with the rank of sergeant major, named Meyboom, a Dutchman by birth, the other a sergeant named Bauer, a German.

For the period of 18 months for which they were available to me (instead of the 15 months originally granted to me), in addition to their regular military pay, these people received a total of 3 guilders daily from the government, so that the daily Salary payment amounted to 8 guilders. I emphasize this point in order to properly emphasize the generous support that the Indian government has given the work.

The sergeants kept their own household in their little house, which was divided into two parts, where the Njai (Javanese housekeeper) they carried with them did the same for each of them.

Fig. 11 shows the sergeant's apartment, an idyll in which the new citizen of the world born in Trinil, whose arrival we celebrated with the only available bottle of champagne, is not missing. (I understand that Sergeant Bauer recently brought the mother of this Trinil offspring home by marriage.)

For the excellent choice of these two people, whose efficiency, reliability, zeal and intelligence I would like to express well-deserved praise at this point, I am particularly indebted to the Commander-in-Chief of the Javanese genius, Colonel deVoogd. In the one and a half year training course for the Trinil Workers, they have trained themselves to be highly valued assistants for such tasks that require responsibility and skill.

The supervision of the workers was rather strict. The doors of her apartment were locked at night; two police officers kept watch; this guard was again checked by the village patrol. Such patrols can be found in all Javanese villages. After breakfast, the workers were brought to our apartment at 6 o'clock in the morning under the guidance of their mandates, where the two European overseers and Mr. Oppenoorth then checked whether everyone was present; then the sick were examined and helped if possible; if we could not treat them, they were sent back to Ngawi. When the inspection was over, the equipment was fetched from the Gudang and each overseer went with his group to the pits; one group of workers was put on a prau in two sections on the other bank. From 11 am to 1 am they rested and ate lunch. The work was then continued until 5 o'clock, the equipment was salvaged, and the evening bath in the river followed, whereupon the prison laborers were counted again. Then they were locked up again.

Around the middle of working hours, at the beginning of August, we gave our workers' corps a customary »slamatan«, a kind of obligatory festival of happiness that is essential to the success of any job in Javanese terms. Our convicts and coolies got an afternoon off and were treated in a solenner manner on the grassy areas behind our apartments with two goats roasted in toto and unmeasured quantities of rice. This was enough to get the poor guys in

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bright cheers. Unfortunately I had to deny them the joy of "tandakken" they had asked for. H. that they were allowed to enjoy the dance of some Malay country dancers; This process is very well mannered and respectful, especially since, according to Malay custom, women and men never dance together. But in the last moment I was held back from this encore by a wink from above. The people compensated for this by riding on painted hobby horses, an ancient pastime that they performed with much ceremony and dignity. One of the mandurs then gave a solemn address to the "Nonja besar derri Trinil" (great mistress of Trinil), as I was called in the area, in which he said that they enjoyed working for us and were happy, if a lot and really big (!) bones came out of the earth. The Kapala Kampongs (village heads) and their followers from all the villages in the vicinity had gathered for this festival, so that a very impressive gathering was gathered.

The workers were very receptive to a small gift, mostly tobacco. Such gifts were given when a worker had brought out a fine fossil without damaging it, or when, as was initially the case, a great deal of ground had been processed. Fundamentally, however, monetary gifts or bonuses were never given for the raising of a fossil, so as not to mislead people in any way into frauds, which, of course, were ruled out both by the nature of the finds and that of our workers' material as well as by the incessant strict control.

Besides the government workers, we employed 25-30 recruited coolies for most of the time, so that we worked with an average of 100 men; our sergeants, however, in some respects preferred the work of the penal laborers to that of the free coolies.

V.

The reports and treatises of my employees provide information on the division and implementation of the actual excavation work, the geological investigations and the findings. I limit myself to a few general information.

The goal and the guiding thought that had determined me to begin these investigations was to determine the age of the Pithecanthropus layers more precisely by clarifying the geological conditions in general, as well as the overall picture of the fauna accompanying the Pithecanthropus remains, as well as possible Finding further remnants or related forms through which the still open question of the special position of this important intermediate form in the line of development of the human family tree could be further promoted.

In addition, the finding of early human remains and traces should be investigated, as far as the scope of the expedition somehow allowed.

The fact that, apart from the specific developmental results, the excavation of a rich vertebrate fauna was to be expected in this program, which in addition to its importance for the elucidation of age, also promised special scientific and materially valuable results, was to be assumed based on previous experience and had a decisive effect on them Participation of the academic anniversary foundation in my company.

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Since it was established and confirmed by our preliminary investigation in 1906 that the Trinile soil itself was still very rich in fossils, also the fact that the individual remains of Pitheeanthropus were found in fairly close proximity to one another, the expectation that more would be found If parts of the same individual did not appear too bold, the exploitation of the immediate vicinity of that site was placed at the center of the overall work. We therefore begin our excavations on both banks of the Solo River, following on from the sites excavated at the time of the Dubois. We began first with attacking the right bank of the river and with Expansion of the trenches created in 1906 (Pit I). The water conditions as well as the lower number of our workers at the beginning made it possible for us to open the actual Pithecanthropus SteWe on the left bank only towards the end of May (pit II cf. plate I). From then on there was continuous work on both banks until the end of the expedition. This conclusion only took place with the again somewhat abnormally early onset of the rainy season in the last days of October 1907 and the associated complete underwater stepping of the bone beds.

After the direct excavation and recovery work was completed, about 10 days were used to pack and send the last found objects, to clean and repair the borrowed machines, rails, bulk trucks and tools and to transport the latter material back to Ngawi, so that the final conclusion the expedition took place around mid-November 1

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The work in Trinil itself was always the focus of the task according to the goals set for the expedition. In the second half of the 1907 working period, however, smaller detachments of workers with the necessary supervision were sent to investigate and prospecting work in the near and far area of ​​Trinil. Longer examinations were also carried out in the pandan chain (the low ridge south of Trinil) and in the adjacent volcanoes Lawu and Wilis. Work on a larger scale at a great distance from Trinil could not be carried out with the workers granted by the government, since they were not allowed to be employed at any significant distance from Trinil, while other workers were allowed to be employed in larger ones

Number could not be obtained at the relevant locations. All investigations further away from Trinil therefore had to be carried out with smaller troops of recruited coolies.

During such a small expedition to the wider area of ​​Trinil, the fossil human tooth was also found, that of the Berlin Anthropological Society in the February 1910 meeting

was presented for discussion and to Prof. Walkhoff and

).

The place where the tooth was found at the edge of the small Sondebach, a tributary of the Bengawan, is 3.5 km from Trinil.

In its upper course, the Sondebach washes the bones of Alas-tua, in which fossils corresponding to the Trinil fauna are found. Individual bone finds have also been made in the vicinity of the mouth.

Fig. 12 is a photograph of the reference; this itself is specifically designated by the crouching figure (Meyboom).

1) For all other details, I refer to the reports of my two technical employees Oppenoorth and Dozy, as well as Dr. Carthaus.

2) Blanckenhorn, model of a fossil human tooth from the SELENKA-Trinil expedition on Java. Magazine f. Ethnology, Berlin 1910, issue 2, p. 337.

3) Cf. the relevant special treatises towards the end of this work.

by Prof. Blanckenhorn2

Prof. Dieck examined and described in more detail 3

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It goes without saying that both in 1907 and in the second year of work we carried out extensive searches for other human finds in the vicinity of the site, but unfortunately without any result.

We sent the finds to Germany with the German-Australian Shipping Line, as the only line that could transport the boxes without reloading in Singapore. Although we had been granted free shipping for 20 cbm on the North German Lloyd and the discount granted on the Australian line was considerably lower, we preferred not to subject the contents of the crates, which were easily endangered by impact, to double loading. The boxes were transported to Surabuja and embarked there on the customary ox wagon to the next train station.

Fig. 12.

The place where the human tooth was found in the Sondö Valley. (Photograph by Dozy.)

We sent the first shipment, consisting of 17 large boxes, at the end of August, and two more shipments in September and November. The total shipment for 1907 consisted of 43 large boxes.

The collections have become the property of the Berlin Palaeontological Museum.

At the end of the work, the expedition houses were placed under the care of the assistant resident of Ngawi and, despite their light construction and the heavy rain monsoon in winter, remained sufficiently well-maintained to serve as apartments for the next year's working period, in 1908.

Before leaving Java, I asked His Excellency the Governor of the Dutch East Indies for permission to continue the excavations in the following year, if the means could be found. Before I left I received the grant on the condition that the Work would be started by August 1908 at the latest.

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In spring 1908, at the suggestion of Dr. Schlosser, the curator of the Munich State Palaeontological Collection, the management of this museum is close to the plan to financially support the continuation of the Trinil work, which I am granted by my previous license. For the new working period, I got the Dutch mine engineer Mr. Charles Maria Dozy, a friend of my previous Dutch colleague Oppenoorth, approved by the Munich museum directorate and inaugurated all the details of the work by Oppenoorth himself.

Mr. Dozy went to Java at the beginning of July 1908 and started the excavations there again with the help of the 25 workers already sent to the site by the Indian government. As a result of more favorable weather conditions than had prevailed in the previous year, these were continued until mid-December 1909 with again very rich findings. This year, too, my representative was given 25 freelancers (at the very end even 50) over and above the original number; the same benefits were also granted to the company this year in terms of transport, procurement of machines, pumps, etc.

The successor to Mr. van Rees at that time, General Secretary Mr. Van der Oorth, as well as the I. Secretary Mr. Hulshoff Pol, and we also have the current assistant resident of Ngawi Mr. Mulder and the commanding officer Thank you Mr. Landshoek for your willing support.

Mr. Dozy got rid of his difficult and responsible task with extraordinary skill and great loyalty to his duties, which is all the more commendable as he took on this task immediately after graduating from the Dordrecht technical college. Based on the work of the previous year and the aids still available from it, in the short five months of his work in Trinil he has created a very respectable and excellently organized collection and provided a series of profiles and records that complement the work of the previous year. I give unreserved recognition to the capable young man in my name and in the name of the Directory of the Munich State Paleontological Collection.

The findings of the two-year working period have passed into the possession of the Royal Bavarian State Geological-Paleontological Collection, whose board of directors has kindly allowed them to be used for joint processing with the Berlin collection; it therefore forms the basis of the specialist work in this work.

The excavations on Java took a total of 18 months according to what has been said:

in 1906 from mid-June to mid-October,

»» 1907 »February 1st to November 13th,

»» 1908 »August 1 to mid-December.

From this time eleven months were devoted to research into the actual bone layers, while approx. 7 months (including the period from 1906) were taken up by the extensive preparatory work.

An average of 8 to 12 meters of mostly hard upper layers had to be lifted off before the bone layers were reached. The total earthmoving carried out in the 3 working periods is around 10,000 cubic meters.

Introduction.

XXIV

M Lenore Selenka, -

The riddle of Pühecanthropus has not yet been finally solved. The Trinil expedition did not produce any new evidence of direct membership or non-membership in the human family tree. On the other hand, the question of the age of the strata of his finds, which is significant for his position on the history of human development, has been clarified in one most important point.

It does not matter whether one or the other of the narrower views on age represented in this work - or published in some other way, but gained on the basis of a connection with the expedition - (after all, even with the inclusion of Dubois' view, they only diverge within half of a relatively short geological time period), that much is certain now: The decisive layers of the find are geologically younger than was previously largely assumed. So you are too young to be able to recover a form that was still directly active in the human developmental trunk at that time, that is, a form that actually preceded the incarnation at that time.

For it can be described as a generally prevailing assumption of today's research that man in no way came into being on or even after the transition from the tertiary to the diluvium, which is now more or less just a matter of. It is one of the results of the Trinil expedition that it was able to prove, with great probability, traces of real people on Java as local and contemporaries of Pühecanthropus.

If, therefore, one wants to see a direct human ancestry in Pühecanthropus at a certain stage of development and not rather regard it as the offspring of a developmental branch branched off laterally from the same trunk in the early Tertiary, one must logically assume that the geological form Pühecanthropus was already early existed in the tertiary and then, after somehow and at some point man emerged from it, it persisted alongside the higher form developed from it as an old residual form and without further lateral specialization into the Diluvium.

It can be countered whether such a long persistence of the form overtaken by development and no longer specializing is probable. We do have examples of other species of mammals that have survived from the Middle Tertiary to the present day with almost no transformation. But whether such an analogy could also be applied to the most complicated case of a being as highly developed as Pühecanthropus is another question!

In itself, however, the question would be justified and the finding of a single individual of Pühecanthropus in the old Diluvial or even the most recent Tertiary should not justify us to draw the time limit downwards so narrowly for him that he is therefore out of the direct tribal human line would have to be switched off for reasons of time. With the age determination of the Trinile strata, the question - which would have been simplified by the result of a decidedly tertiary age of the same - is no longer resolved. In addition to the geological aspects, the morphological aspects will have to come to the fore again, and this indisputably requires further discoveries and, in order to obtain them, further systematic research.

In Pühecanthropus, whether we see him in the direct line of the tribe or on a side branch of the human tribe, we still have the closest relative of the human being, whom we have known up to now, so close that the boundary line to the genuine, lowest human being becomes according to some eminent researchers, it is now almost beginning to blur.

It therefore remains one of the most burning tasks of anthropological development research to fathom its secret further.

Introduction. XXV

It is at least probable that the soil of Java, which can be called classical in this sense, can hold the key to it - and perhaps to some other new information about the earliest epochs of the human race - and the incarnation - in its bosom.

It would probably only be a question of sufficient time, means and perseverance to wrest rich developmental and anthropological treasures from it, especially if one also draws the absolutely tertiary terrestrial stratification more into the investigations.

But the stubborn coincidence just a few meters from the floe, where our expedition made the last shovel stab, could easily give us the same Pithecanthropus individual, previously known to be all too problematic, who conjured up this flood of hypotheses - and in all probability near the place where he was found only disintegrated into its parts - giving an arm or jawbone, which would be so incomparably important for the evolutionary decision.

A complete search of this entire deposit, which has now been approximately determined by our expedition and is not excessively extensive, would not be too great a sacrifice for such a chance.

Having tackled the big problem at this auspicious point with an almost intuitive grip will remain the permanent and lasting merit of Eugen Dubois. The Trinil expedition only wanted and could be a continuation on this foundation. Perhaps one of her most valuable results is that she has restarted research that has been dormant for almost 20 years.

To my delight, I can express my reasonable expectation that the Dutch-Indian government, stimulated by the results of this expedition, will soon start the commencement and continuation of the investigations on Java.

In conclusion, I take the opportunity to express my sincere thanks to all of the gentlemen who worked on this work; but especially to my co-editor, Professor Dr. Max BLANCKENHORN-Berlin, for his tireless and self-sacrificing work in creating this work.

Seleuka Trinil Expedition

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Work report on the excavations.

I. part. The works of 1907 to August from

Mine engineer F. Oppenoorth.

With panel II, Figures 1–3, panel III and 12 text illustrations.

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On January 1, 1907, I embarked in Genoa and, after a short stay in Batavia, reached Trinil towards the end of January.

Since Trinil itself only consists of a few Malaysian huts and therefore offered no accommodation, I first had to quarter in Ngawi, from where I immediately started the construction of the necessary buildings.

The location of the expedition houses was determined by the local conditions. We chose an approx. 100 m wide plateau protruding into a river corner and bordered by two brook gorges, which allowed a free overview of the two nearest turns of the Solo River, which is strongly curved here, and of the site of the Pithecanthropits remains. On the edge of this plateau was the memorial stone 1 erected by Dubois

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From here we were able to keep an eye on the two main points where our excavations were to begin.

I found the column of 25 forced laborers assigned to the SELEXKA expedition together with 2 European overseers (sergeants) already available when we arrived in Ngawi, but I was not allowed to transfer them to Trinil before the house for them was completed and with the obligatory barbed wire fence (as an interim prison) was set up.

I therefore had to build this house and a temporary apartment for myself with recruited freelancers (coolies).

We paid these people 30 cents a day (about half a mark), which is a lot for this area. Even so, the workforce was hard to come by. Almost all the men were busy with the work on the paddle fields (rice fields), and this explains why the preparatory work took up a lot of time. The procurement of building material also cost us a lot of effort. Any material other than bamboo was very difficult to come by, despite being very close to the Djati forests. These forests are under government supervision and the timber sales are leased. There are only a few places where there is a store of wood where you can buy it. In addition, you have to have a permit to transport wood.

1) See Fig. C on p. XII and Fig. 7 on p. XIV of the expedition report of Prof. Selenka.

F. Oppenoorth, work report on the excavations.

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which is only valid for a few days. Transporting timber without such a permit will result in a prison sentence. So it was much more convenient, faster and cheaper for us to use bamboo, a material that every Javane possesses in sufficient quantities. This giant grass, which grows in clusters of 10 to 100 stalks and is up to 30 m high, gives the Javanese everything that belongs to building a house. He also uses it to build his bridges and make his household appliances from them, and the young root shoots, preserved in vinegar, make an excellent treat. There are different types of bamboo:

1. Bamboo peton, which is as thick as a strong pine tree. We couldn't get this variety in Trinil.

2. Bamboo ori, about 10 cm in diameter, which we used as supports and beams.

3. Bamboo-Alus (fine bamboo) in the thickness of 3 to 5 cm. This was split into 8 parts, the outer bark removed and

braided together. Such

Wattle was used too

House walls, also for carrying baskets, mats, etc.

For roofing was

Alang-Alang taken, an approx. 1 m

tall grass that is about 20 cm

thickly on top of each other and

excellent protection against the heat

and the tropical rain. At

This grass wasn't catching either

to get only several hundred

Roof tiles were to be found; we

then have a few thousand themselves

burned. For this purpose a small, round oven used that is about

2 m in diameter and with

Wood waste was heated. That such

Bricks, on bamboo rafters

placed, definitely not against tropical

rain give a completely protective roof, we have learned several times. Later these tile roofs were also covered with Alang-Alang.

We had to build 8 buildings in all: 1 dwelling house, 1 laboratory, 1 storage room, 1 kitchen house with servants 'apartment and bathroom, 1 stable and carriage room, 1 house for the sergeants, 1 very large workers' house, 1 shed for equipment and machines.

Fig. 13 is a view of one of our cottages, built on the model of the native dwellings, only slightly higher and more comfortable. It contained our laboratory and the dissecting room. At the back left is the gudang (storage room) for the bones, in which our darkroom was also set up.

Fig. 14 shows the house under construction. One is busy with making the roof, i. H. to lay the rafters on it. The floor consisted of tamped clay with sand and after a few days it became quite hard. The house contained 6 rooms and was 6 m high. It took a lot of effort to get bamboo that was both long and strong

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Fig. 13.

Our laboratory and dissecting room (on the left the trees planted by Dobois).

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F. Oppenoorth.

was enough. Walls, doors, and shutters were all made of bamboo wickerwork; Of course we didn't have glass windows. Fig. 15 gives a view of the finished house. The vertical bamboos were coated with tar to protect them from the white ants and planted about 2 m / 2 m deep into the earth. We were here quite high and on dry sandy ground, so that the houses did not have to stand on stilts, as is the custom in Java.

Fig. 16 provides an overall picture of our eight houses, taken from the river bank, with the exception of the workers' house, which was further away. The river is just visible below to the right. In the foreground under the Dubois memorial is the fountain, on the right a narrow footpath leads to pit I. In the background is the Kendeng hill range.

One of our first jobs was, of course, to provide drinking water, an extremely difficult thing with the sudden gathering of such a large number of drinking water

poor places. We were able to get the river water mostly from a fountain, but since we usually have to bathe in it, we always have to give the water in the dry season, as was the case when we were about

definitely not to drink. All sorts of sick people have to fetch water, filter it and cook very well. The wells no longer have abundant water 100 in number, our residence in Trinil

took. There were too many people for the well, and as a result we were not able to get any drinking or ground water several times in the beginning. So we had to try to drill a new well ourselves, which happened in the gorge south of the memorial stone. We were given a small drill rig from the Dutch-Indian Mining System, similar to the one used in Banka for drilling tin ore. At a depth of about 6 m we found pretty good water. To a

Fig. 14.

The house under construction.

To get a sufficient amount, we dug a hole about 1 m in diameter at this point, which was lined with bamboo wickerwork at the bottom.

We strictly forbade the workers to fetch water here; they got their own well, which was drilled near their place of work and their home.

At the beginning of March 1907 we had come to the point where apartments were ready for myself and 25 workers. Later an apartment had to be built for the two overseers near the river bank. Now it was also possible to bring the tools and machine material necessary for the excavations to Trinil. Some of this material was already stored in Ngawi and was sent in a grobak (transport cart, pulled by oxen) to Soko, the very small village located at first in Trinil. The last stretch of car from there was not passable during the rainy season. The heavy downpours made the ground softened, so that everything from Soko to Trinil had to be carried 4 km. During our stay, the ground and the path became a little harder, so that we could later drive a car, but it is several times happens that the car couldn't go any further and we had to ask the villagers to help us. It was always done willingly.

That has more trouble for us

Transport of large pieces of material

made, such as pumps, drills and

the Decauvillebahn material. Also

these could go to Soko by car

to be brought. When the water

was high enough, they were turned into a

Prau (small boat) loaded and such

the Soko River (tributary of the Solo)

promoted down to Trinil. However, this was not always possible because the small tributaries do not carry water at all times. The rather heavy Decauville wagons were then pulled to Trinil by about 10 workers. The wagons often sank into the wet clay right up to the axles, and it took many hours to get to work. Rail sections from un-

2 people could carry about 5 m in length. The pumps (the well-known diaphragm pumps) also made little effort because they could be completely dismantled.

The excavation work began at a point which we knew from the previous summer's excavations that there were fossil bones, namely on the right bank of the Solo, at the gorge north of the memorial stone.

As already reported elsewhere, in 1906 from the beginning of July to mid-October 20 men had worked ahead and the following digs had been made

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1. On the right bank of the river about 60 m south of the memorial stone, directly on the river, there was a hole of such dimensions that two men could work in it. It was deepened to 2 m below the lowest water level. It was impossible to go deeper because of the strong water pressure. The drilled layer, a black, crumbly clay containing Melania, continued a little further down. The bone layer

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Fig. 16.

Our houses seen from the river. In the background, the Kendeug train is indicated softly.

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7-8 m. This hole was in three

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stone, where pit I was later dug. The length of the pit was 27 m, the width at the top 4 m, (at the bottom about 11 m the greatest depth

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Fig. 15. Our house.

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Work report on the excavations.

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was not found here.

2. North of the memorial

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F- Oppenoorth.

Divisions dug and only the northern one down to the bone layer. This was the piece that was started and some bones were found in it, so a subsequent part was started. Fortunately, the latter was not completed to the bone layer, so that we could dissect the bones ourselves next year. Among the fossils found in 1906 was a fairly well-preserved skull of a Felis species, several bones from Cervus, Bos, and Stegodon, including a Stegodon skull that is said to have been about 80 cm high, but unfortunately fell apart completely.

3. On the left bank of Solo, directly on the river, about 50 m south of the last Dubois excavation. The breadth was about two meters and the depth was about four feet below the lowest water level. Some bones were also found here as early as 1906.

4. On the left bank of Solo, dug into the river wall, a few hundred meters north of the

Dussois excavations. The depth was 1 l / - m below the lowest water level. It was 2

found black clay and a 0.35 m thick layer of bone with some stegodon bones.

Since some of the pits were right here on the river bank and the embankments that had been left could not withstand, these pits were flooded with mud in the winter of 1906-07, and therefore for

Initially useless for observation purposes.

In March 1907 I began to cover the terrain with about 12 men and lay the Decauville railway. For the time being, the rest of the workers were still occupied with the extension to the workers' house, which we had to build as quickly as possible to accommodate the 25 workers promised to me by the government.

Because of the exceptionally high flood level, which we also had to struggle with now, in the spring of 1907, and the continuous heavy rainfall, mining had to be limited to the upper layers for the first month and a half. Nonetheless, the work site was once under water as a result of a heavy rain banjer (sudden enormous influx of water from the mountains after heavy rain squalls, which often causes large floods. ”Early in May we found we came to work early one morning The ditch several meters deep was completely submerged. Fortunately the D-amm had held out and the water level dropped again the next afternoon so we could start working with the pumps. Our government-supplied pumps would not have been sufficient But a short time beforehand we had removed from the one day ride But even during the entire duration of the east monsoon, the water conditions caused us the greatest difficulties. The inflow of groundwater was always so strong that we were only able to keep the pits sufficiently water-free by keeping all the pumps in constant action even in the driest months, mostly dew and night. (The pumps had a capacity of 1500 liters per minute.) The pumping could only be done by very strong workers who worked in two groups and had to be relieved every half hour Convicts could not be conducted enough control. The night pumper had to announce their vigilance by singing to the night watch on the residential bank.

The following photographs show how colossal the water level in the Solo River is:

Photograph 17 was taken on February 20th, in the middle of the rainy season; it is still densely the maximum level, but on the days on which this was noticeable, it rained so

strong or the lighting was so poor that it was impossible to take a picture. The seemingly small island in the middle of the river is the dump of Dubois' work. To the right you can see the steep walls of the old excavations. The flat contour line in the background is the valley terrace of the river.

Work report on the excavations. XXXI

Photograph 18 shows the

River on June 4th, so at the beginning

the low water level. The

earlier island now appears as

Peninsula; on their northeastern

Page is started Pit II. Of the

Solo has become considerably narrower; large sandbanks emerge at every bend. At the front left is the large heap of pit I; At the top left the Kendeng hills can still be seen. The barges belong to a fishing fleet.

Photograph 19 gives a picture of the lowest water level we experienced in Trinil; It was on August 29th. In the foreground are the three heaps of mine. The island of Fig. 17 protrudes entirely from the river; to the right of it you can see the whole of pit II. In the background, where a guard is standing in the water, is an experimental trench from 1906, which is now being enlarged a little. The river is now largely inaccessible.

At the beginning of April the house for the new 25 forced laborers was ready, and dismantling could now be carried out on a large scale.

Immediately next to the former Dubois excavation sites on the right bank, we began to enlarge the previous year's digs (I). In order to be able to dig the surface layer more quickly, a Decauville railway was laid after the river bank and the dead material was thrown onto a dump on the river. This saved a lot of time and effort, otherwise all loose ground would have had to be carried away with small carrying baskets, whereby it should be noted that the Javanese workers always take it for a walk, lose half the contents of the basket on the way and so on a lot of material

Fig. 18

soio-fiow. Water level on June 4, 1907

River course.

has to be taken away twice.

At the end of April, when the water- L '

stood a little lower,

Fig. 17.

Solo River. Water level on February 20, 1907.

XXXII

F. Oppenoorth.

Digging was also started on the left bank of the Solo, where the bone layer was partially washed away and a beautiful skull of Bos could be seen protruding.

We called this pit, the one started later, with pit II

Place up to which the DuBOis excavations the hinterland of the one near the river's edge

Pithecantkro2n (s-F \ mdste \\ e had removed.

The floor plan of pit I on plate II, Fig. 1 gives a detailed overview of the outline and

the dimensions of the pit. First the long south-eastern middle section (cf. ABCT) in Plate II, Fig. 1) is dug

then the left part (BEFG) and the southern tip (CH1K). Later are still in the north

about 50 m added (LMNA). '

The transverse solid lines relate to Profde I-II shown in FIGS. 2 and 3

Pit I.

The greatest length of pit I was 5.2 m, the width at the top 11 in, at the bottom 9 m, the depth 7 to 9 m. The whole surface about 350 square meters.

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The pits were dug up in layers so that as many workers as possible could work at the same time without running the risk of an accident due to landslides or that too much land would be in vain if it turned out that the fossil record was declining or ceasing entirely. The Decauville Railway, on which the material was continued, was halfway up.

In mid-April all the pumps were set up so that we could empty the hole from the previous year and remove the washed-in mud. About a month later we encountered the first layer of leaves and were able to collect leaf prints. Also were

Fig. 19.

Solo fluli. Lowest water level on August 29, 1907.

A few fossil bones had already been found in the upper layers of the sand, admittedly very isolated: they mainly belonged to Bos and Stegodon. Our "very first find was already at the beginning of April", but not exactly of the kind we were looking for, namely the complete skeleton of a recent Kerabau (buffalo) or large, gray Javanese tie! We used it for comparison purposes.

The illustrations on plate III give a clear picture of the progress of work in the

Pit I.

Fig. 1 shows the pit taken on April 1st, facing north. A bamboo bridge has been placed in the middle so that the bottom could be moved to Halde I. The first terrace is already finished and provided with rails. The second terrace has been tackled; the bottom is loosened with hoes, shoveled into the carrying baskets with patjols (small shovels) and these onto the next

raised terrace.

Every worker has his own special job: one chops, the second fills the baskets, and

the third brings them up. Those workers who drive the car also have to fill it from the baskets. This specialization of work seemed to us the most expedient. The

Selenka-Trinu expedition.

Selenka-Trinil expedition

Profile

Wilhelm Engelmann published in Leipzig.

Fig. 4

Pit I in 1908 i. Measure 1: 600 (according to Dozy)

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Plate IL

Sdenka-Trinü expedition.

Plate III.

Wilhelm Engelmann's publishing house in Leipzig.

Selenka-Trinu expedition.

Plate IV.

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Work report on the excavations.

XXXIII

strongest people were used for the hard work; The two wagon drivers were also among the best workers, because driving through, changing and turning on the turntables required a great deal of skill; in the beginning, the wagons continually derailed.

Fig. 2, panel III shows us the status of the work on June 3rd, that is 2> / 4 months later. Levels 1-5 have already been dug up. Terrace I and II have been completely removed, while the track is laid on the third. Only a narrow strip remains of the fourth level, and a few pieces of the fifth, because it was easier to bring the baskets up.

The bridge in the middle of the pit has been removed and a new one has been built in the south. The terrace height was 1 m. We therefore now had a transport track 2 m lower than in Fig. 1, which made the work of bringing up the ikats (baskets) much easier. A cut was made in the wall opposite the bridge in order to have a short connection with Halde II.

On the right side you can see a side piece being tackled. In the south, terraces 1 and 2 will be further excavated and a connection with the river will be created in the middle. To the left, where the overseer stands, another side piece of the pit is also made into terraces

excavated. The sixth terrace has also been almost completely removed.

Figure 3, panel III is taken 14 days later. The bone layer is now and is being reached

only edited by two people. The supervisor, Sergeant Bauer, is giving instructions from above to a worker who has dug up a bone. The pumps can be seen in the background on the right. In this pit, too, the various layers can be clearly seen. The black spots on the left wall of the pit are pitches.

Fig. 4, panel III gives a view of the pit from the end of August; all terraces have been dismantled, a new part is being worked on in the north. In order to drive away the reason now, a new transport route had to be laid. We also tried to use one of our horses for this transport work.

Small bamboo sticks are rammed into the right wall as a sign of the square division that was carried out in both pits. They were driven into the hanging wall of the bone layer. The pump line can still be seen in the back right; the visible bamboo frame was used to drill a deep water hole and at the same time to try to see whether the lying surface of the black ilfefam'a clay layer could be reached. Unfortunately, we did not succeed in this.

In the second half of May the water level in the Solo River had become so low that we could also go to work on the left bank of the Solo:

Fig. 20 shows the beginning of the installation of pit II, north of the dump of the Dussois work, which is visible in the foreground. On the right, where the worker stands, we have found the buffalo skull mentioned above. In this pit there is a bank visible in the Solo River, which was now above water and immediately yielded a lot of bones and teeth that were unfortunately not well preserved.

At the beginning of June the owner of Madiun gave us 25 workers for a second time, so that, apart from the coolies we had recruited, we could now work with 75 men. After the workers' house had been enlarged accordingly, work on pit II could be carried out on a larger scale. (In pit I, the number of workers had to remain fairly constant due to the gradual extraction system.)

The steep river bank in pit II, inland from the Dussois excavations, was removed, an easier job than in pit I, but it was dependent on the water level.

A track was laid along the pit. It was 34.5 m long, 4-5 m wide; the

Depth was about 2 m below the track. The highest steep face was eight to nine meters high. Of the

Selenka-Trinil expedition.

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XXXIV

The soil was black, fat clay with numerous limestone concretions, which gave so much that two terraces were laid out to be on the safe side to absorb the ground. But it was most comfortable to work without additional terraces, i. H. just tumble down the bottom of the car.

Both pits I and II yielded a large number of fossils, among which were very fine specimens, so that the main work was ultimately only directed towards the exploitation of these two pits.

The dismantling technique was as follows:

The uppermost layers were blasted with powder with extreme caution, and only after we had established that the vibration did not cause any damage to the deeper-lying bones.

layers brought with it 1

Then the following layers, mostly several meters thick, were up

).

detached to the bone layer with hooks.

When the bone layer was reached - which was clearly visible from the rather sharp separation of the various layers - then work was continued in such a way that the layer was scraped off with the patjol (pickaxe) until one came across bones. Usually this was shown by a peculiar unpleasant tone

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Fig. 20.

Grulie II in the complex. At the beginning of June.

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the scratching over the tuff gave. Now the patjol was put aside and the chopping began with small chisels and scraping knives, a job that often took several hours. Some large skulls were even worked on for several days before they were completely exposed from the shift.

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F. Oppenoorth,

The bone layer actually consisted of three layers that became increasingly coarse-grained from top to bottom. The upper layer was fine blue tuff with harder clay nodules, the lower layer was coarse-grained and harder with lava

bombs and bulbs of pumice.

As a result of the greater resistance of the fossil bones to the surrounding area

softer volcanic tuff they could mostly be removed without much damage. The hard clay marl bulbs and lava bombs that lay here and there in the layer, especially next to the fossils, caused great difficulty. These pieces of rock then had to be dug up first, and further bones were repeatedly found, so that sometimes one

whole bone complex was to be detached together.

1) Incidentally, most of the bones were already stored in a broken state; Some could also be found to have broken safely before they fossilized. In the skull of a young Stegodon No. 203 (cf. Janensch, Die Proboscidier-Skull der Trinil-Expeditions-Sammlung. Pp. 152 and 161, Plate XXI) one of the 30-40 cm long tusks had broken off and turned sideways cemented to the skull with tuff. In many other bones, too, tuff was observed between old fracture surfaces.

Work report on the excavations.

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Of course, we have also tried to screen the bones. We had already selected strong sieve material of various hole sizes in Europe and brought them with us, with the intention of possibly sieving the entire main bone layer. However, this soon proved to be an impossibility, as the small lapillic grains immediately settled in the mesh and not a single piece of fossil or bone splinter was found with this method. By the way, we performed for the important bone layers at all For the Javanese Ar-

it was a real pleasure

sitting quietly on the floor in

inexhaustible patience a find

chisel pieces; for this ar-

The Javanese showed themselves to be

neatly sent. Some of

them we could do the most difficult

Entrust work; she over-

took out the fossil

lien when the other workers

encountered such. This division of labor

took place in the following way:

A worker hit a bone

so he immediately stopped digging

and called one of the taxidermists

and this then always at the

European workplaces present

overseer. The latter then gave

the worker concerned one

Note on which the current

Number, the pit, shift, that

Square, the date and, in the case of elongated pieces, the direction was noted. With this piece of paper the bone was later converted into Chinese - to hold the fragments together

The paper was wrapped up, placed in a basket, and brought to my apartment for further preparation.

The same number as on the slip of paper was noted on a map of the pit that was given to the overseer every morning, so that when I wrote it in the diary I could fill in exactly where and in what shift the fossil in question had been. Both pits were divided into square meters, which were marked lengthways with numbers and widths with letters. The overseers were not allowed to throw away a single piece, even if it seemed to have absolutely no value.

All of the material was brought to preparation at the end of each half day's work.

Further preparation consisted of washing, brushing and gluing the broken pieces together. Then each fossil was numbered, inscribed, and kept in the gudang. Especially

Fig. 21.

Gudang with fossil pieces in plaster. Photograph by Dozy.

1, Prohoscidier lower jaw, 2 and 3, turtles, 4, skull of Bns, 5 and 6, tusks of Stegodou.

XXXVI

F. Oppenoorth,

Valuable or easily fragile pieces were plastered in. In the beginning this was done with open plaster of paris, which, however, was very difficult to obtain in sufficient quantities. Later (1908) the pieces were treated with plastered cloths brought from Germany.

Fig. 21 shows a number of such plastered finds stored in the Gudang.

On some days, especially in midsummer, when both pits were working on a broader basis in the bone layer, the finds piled up - there were occasionally 50 or more pieces on a day - that their screening and registration, which, because of the exact con - The trolling of the square numbers could not be postponed until late in the evening, which is unusual for tropical work.

in situ; all around it is excavated; as each filled such a small drainage channel was made. On the right are the chisel and hammer, those for the upper one

Work was needed. (As already mentioned, the finer work was done with very small chisels and scratching knives.)

Most of the bones were heavily silicified and gave us little trouble. Extraordinary work has been done on the remains of a giant stegodon (see Figures 23 and 24). These were found in the upper layers of pit II, in a light gray tone, about 5 m above the bone layer. They consisted of a skull with an upper jaw and tusks (2.10 m long, sloped at the tips), thighs (a good 1 m long), pelvis and ribs, while about 5 m away from them

as well as vertebrae, two ribs and a femoral head (cf. FIG. 23). Some hippopotamus molars were also found there. Unfortunately, all of these were

Bones are very badly preserved because they were not silicified, like the lower lying ones.

In Fig. 24 the other part of this proboscidial find can be seen, the head with the tusks, the thighs and the pelvis. Sergeant-Major Meyboom is still doing the dissection; behind him (5 m lower) is the track; to the left are some baskets with fallen pieces wrapped in Chinese paper; next to it lies the canvas that has been stretched over the bones. The clay was quite damp. So that the drying of bones in the sun does not proceed too quickly

1) See skull no.218 Crocodilus ossifrayus in Janensch, Die Reptilienreste, p. 66, panel XIII.

2) The groundwater contained a good deal of sulfuric iron oxide in solution and initially attacked the workers' feet severely. Also, they couldn't see the bones very well because the water turned milky. A small canal was made in the middle or on the side of the pit for drainage, which leads to the swamp, ie. H. a hole about 1 m in diameter (see also panel IV).

3) See Janensch, Die Proboscidier-Skull p. 157, Large Lower Jaw No. 823. Text Figure 3 and Plate XXIV, Fig. 1.

22 shows a crocodile skull 1

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Hole yourself immediately with milky water 2

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Fig. 22.

Crocodile head, still rooted in the ground, lying in the groundwater, photograph by Oppenoorth.

associated lower jaw 3

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we stretched a protective roof over it; at night we covered them with straw to protect them from moisture. For several weeks they were soaked in glue water (for some a diluted glass of water was used, which proved to be better) until they had attained sufficient hardness for transport; however, they suffered a lot on the way to Berlin.

The stegodont material is one of the most beautiful that has ever been found. This occurred in almost all layers, including on the surface in the arable soil.

Fig. 23.

Jaw, rib and femoral head of a stegodon. Photograph by Oppexüoktii.

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Fig. 24. Skull and tusks (2.10 m long) of a Steijodon.

Photograph by Heckmetkh.

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Antlers 22 skulls 5 jaws with large teeth 5 extremities (fragments) 10 vertebrae 4 pelvis 1 parts of turtles. 6th

Work report on the excavations.

XXXVII

In addition to bones, many plant prints and pieces of fossil wood have been collected. The preparation of the same was extremely difficult due to the fragility of the material. Usually the plant remains were varnished when they were dry; plaster casts were also often made.

The distribution of the bones over the pits was very irregular. Altogether a good 2000 bones were found in 1907, of which about 1225 in pit I and 700 in pit II. The rest of the bones come from various other sites. The many smaller pieces, such as teeth, smaller fragments, etc., are not included in this count.

To give an approximate overview of how the bones were distributed, I pick out a certain part of pit I [HIK 2737), which gave about 60 bones,

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Tapping

pit

larger bones, skulls, vertebrae, pelvis, extremities of stegodon, bos, deer, crocodile and most deer antlers.

pit

Bones from deer, pig etc. and many teeth, including one primate tooth. (See treatise Stremme.)

II gave more smaller ones

XXXVIII E. Carthaus,

In pit I a total of about 2500 cbm has been excavated and about 350 square meters of bone layer exposed; on average, 3.5 bones were found per square meter.

In pit II approx. 2200 cubic meters were excavated and around 260 square meters of bone layer exposed.

So pit II averaged about 2.7 bones per square meter.

According to this, in 1907 a total of 4700 cubic meters of ground and about 610 square meters of bone layer were offset

been exposed.

On average, 1.5 cbm of material was moved per man per day until we got into the

Bone layer came. Here, of course, it is no longer possible to give a specific number, because all work there was focused only on the extraction of fossils.

Of the 75 forced laborers that we finally had available, a number always left for ancillary work, namely

for the kitchen

for carrying drinking water. ,

daily sickness average

House building, repairs, carpentry work. pump

Cleaning and dissecting the fossils.

4 men 2 »

1>

. 3 »4». 2 »

A total of 16 men a day.

Minor repairs to the houses were constantly necessary. After strong winds and downpours, the roofs in particular often required repairs.

To send the bones to Germany, we mostly had to make the boxes ourselves. Because of the lack of wood in the area around Trinil, this was associated with not minor difficulties. We obtained the main box material from shipping companies in Surabaja. Even here, in order to take account of the proportions of the bones, it was often necessary to bring in carpentry work.

We used the savanna grass Alang-Alang and coarse Chinese blotting paper as packaging material in the boxes.

Part II. The work from August to November 1907 by

Dr. E. Carthaus.

To supplement the previous work report by Mr. Oppenoorth, who unfortunately had to give up his work as the technical director of the expedition in August due to typhus illness and so could not carry out the excavation work to the end, I would like to conclude here some information about the since the beginning of August 1907 from continued work on me.

In pit I on the right bank of the Solo River, further smaller sections of terrain in the shape of rectangles were attacked as bulges of the same roof on the sides and west

.

XXXIX

and various interesting finds were made in the main bone layer within this, about which the find register provides more detailed information. In addition, from then on the work in this pit was mainly aimed at uncovering the lahar conglomerate layer under the main bone layer as much as possible and examining it for its organic inclusions. If only very few finds of bone remnants and conchyllium shells were made during this laborious work, due to the more firmly established connection of the volcanic material to be excavated, it has nevertheless led to a better understanding of the character of this lahar conglomerate, so that one becomes aware of the species and the way it was created. In spite of the dry season, this work was made very difficult by the large amount of penetrating groundwater. Admittedly, this was not to be expected otherwise near the Solo River and at the mouth of a side valley (with a trickle of water). This excessive flow of water, which could not be managed even with a larger pump, unfortunately also made it impossible to reach the clay layer below the Lahar conglomerate down to the bottom with a test shaft built on a somewhat broader base (to avoid carving) to cross. In any case, it was over 3 meters thick at the point in question.

In pit II on the left bank of the Solo River, the sections that had been cut under Oppenoorth's direction were dug to the bottom of the bone layer; In addition, a small section of terrain was tackled as a northern continuation of the pit and also excavated to the bottom of the main bone layer.

Much work has been done to uncover the rather complicated strata profile on the river bank to the north of the last-mentioned pit to a distance of over 400 m. There

were at the point where the two fault lines 1 and some bone fragments were also found.

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lie, quite extensive excavations are necessary,

Work report on the excavations.

Furthermore, about 1 km above pit II on the left bank of the river near the, below the

Name Batu gadja 2

Search shafts sunk a few meters deep in order to get to know the sequence of layers below and above the main bone layer, which is not very thick there. Finally, a wider test shaft was dug about 3 km north of Trinil under the village of Säkä, also for the purpose of getting to know the stratification better here at some distance from the Solo River. Unfortunately, this shaft could only be driven 7-8 m deep because of the ever increasing penetration of the groundwater. On top of that, the Begenzeit (western monsoon) began to have an obstructive effect.

As the amount of water in the Solo River increased as a result and one had to reckon with flooding that might set in quickly, we were forced towards the end of October to give up the work in the two pits on the river bank and to build the pit tracks, including the turntables and dogs ( Wagons) from these so that they would not be carried away or buried under mud and debris in the event of a flood.

1) See ideal profile I on panel VI.

2) See the map on panel VI and Fig. 2 on p. 20 of my geological treatise.

)

known barre consisting of coarse conglomerate in the Solo River two

XL

C. M. Dozy,

I. part. The work in 19081)

by mining engineer C. M. Dozy.

With panel II, Fig. 4, panel IV and 1 text illustration.

On July 1, 1908, I left Genoa on a steamer from Norddeutscher Lloyd, which company had again granted a substantial reduction on the ticket and expedition luggage. On July 26th I reached Batavia, where I immediately registered for an audience with the governor-general.

Fig. 25. Drilling for examining the underlying layers. PhotOgr. By Dozy.

Se. Your Excellency assured me that he would support the investigations in every way possible. From the management of the state railways as well as

from the management of the netherlands-ind. Railroad company I received free tickets for myself and free freight for all goods on the expedition, and the postal administration also granted various facilities. She gave 2 mail runners for the daily service between Ngawi and Trinil.

After I arrived in Ngawi on August 1st, work could start immediately. My first visit to Trinil showed me. that the expedition houses were not preserved in such a way that they could be used immediately and that the excavation sites had also suffered greatly from the floods of the rainy season. So the first job consisted of making the houses and especially those intended for the prison laborers habitable again, which was done with the help of Freikulis. The working material that I received from the Genius Department was still in Ngawi from the previous year and was transported to Trinil by the 50 prison laborers who had been sent to my disposal by the resident from Madiun to Ngawi. It consisted of the Decauvillebahn (movable field railway with associated bulk wagons), devices and pumps. From the then deputy assistant

I received two small boats for residents, as the work was taking place on both sides of the river, as well as other conceivable help; the latter also applies from

Military commanders.

On August 12th all this preparatory work was over and the pits were back in one

Brought to the state that further excavations were possible, which began on the 13th. In pit I, the section marked a on the pit plan, panel II, Fig. 4, was attacked first

1) See Selenka, Introduction, p. XXIII.

Work report on the excavations.

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and at the same time also one in pit II. The work schedule was as follows: in pit I, 17 workers were busy loosening the earth, 6 in order to throw the loosened earth with small woven baskets, which are made by the prisoners in Ngawi, into the dump trucks and to push them to the river, where they were emptied by tipping over. The supervision was carried out in the first place by the European sergeant major Meyboom, who also had a Javanese overseer under him. In pit II there were 16 workers for the actual basic move and 6 for the transport under the supervision of a mandur and the European sergeant Bauer.

In the beginning the work went rather quickly as the bottom was not hard and no fossils were found in the upper layers. The basic offset was 50 to 60 cubic meters a day. Soon, however, we came across the blue-gray layer of ash in pit I, which contained a great number of leaf impressions and fossil wood. These were lifted off as well as possible, but the work was very difficult as the pieces mostly fell apart.

Now bones have also been found. As soon as such a case occurred, the piece was brought upstairs with the addition of a note and precise details of the place of discovery and layer (following the classification of the previous year) and cleaned and labeled here under my personal supervision. At first I did the leg work all by myself, later I brought in a Javanese worker who did the work very carefully. The water level was measured every day and the position of the main bone layer in both pits was determined by leveling. I also repeatedly took profiles in the excavations.

When working in the main bone layer, the number of workers was limited, as the greatest care had to be taken here. The other half of the workers that had become free now began with a new piece, which is indicated with b on the card, Plate II, Fig. 4. The same thing happened in pit II.

After the new pieces in both pits, which I marked b, had been removed, further pieces (e) were tackled. An interesting observation was made here, namely the complete wedge-out of the main bone layer, as I have also stated in a profile of pit II not printed here. At this point of the river there was no further work to the east and the land to the south was private property.

So all the work was now concentrated on the right bank. A short time later I found the western end of the main bone layer in pit Ie. It still had to be determined how far the shift went north and south, and for this I turn to the chief of mining, who immediately and willingly provided me with powerful drilling equipment. With it 2 holes were made, one north and one south of the pits. The bores were driven into the conglomerate tuff layer (g of my profile, panel X) without the main bone layer being encountered above it, so that the expansion limits of this layer in a horizontal direction were established.

In pit I the whole work was now concentrated on a fairly large piece (d of Fig. 4, Plate II). This was excavated in 3 parts.

Meanwhile, in mid-November, the Begenzeit2 was

by water. Night and day had to be pumped. Once the Solo River rose in

1) Cf. my "Remarks on the Stratigraphy of the Sediments in the Trinil Area" and the profiles on panel X.

2) The year 1908 was more favorable in terms of water conditions than the abnormal year 1907 because the rainy season began later. (S.)

Selenka-Trinil expedition. I.

)

started and encountered the first difficult

XLII

C. M. Dozy, work report on the excavations.

5 hours 5 m, so that the entire pit was under water (cf. Plate IV, Fig. 4). But since I wanted to work until at least the beginning of December, I asked the resident of Madiun to send me another 25 workers. My request was not only granted immediately, but the new workers came to Trinil in four days. This made it possible to work until December 15th despite the heavy rain. Pieces a, b and c had put 800 cbm in pit I and 950 cbm in pit II. The last piece d in pit I was 1600 cbm.

The first shipment was sent to Munich in October; there were 7 boxes with the first finds and a lot of plant material. In the last few weeks the rest of the material was packed up. That still filled 13 boxes.

During the time of the excavations, I repeatedly carried out geological investigations in the area. In several places I had profiles dug in order to get a clear picture of the stratigraphic conditions. Among other sites, I also visited the point at Sonde, where the human tooth had been found a year earlier, and took profiles there. At Alastuwa on the upper Kali probe I collected bones. At Banjer Bangi on the Solo Right Bank, I was able to determine the lack of an equivalent of the bone layer.

After finishing my work at Trinil, I went on an excursion to the Pandan Mountains, east of Trinil. With the help of the resident of Madiun I got a mandur and 6 Javans, with which I visited the well-known sites from Tjaruban, first Kedung Brubus, where Prof. Dubois had carried out excavations, then at Gunung Butak, where a very nice profile was made the osseous layers, which have their highest point above the sea, are clear; Finally I examined the area near Kebon Durum. Bones and layer samples were collected everywhere.

Since the task set for the expedition for 1908 was thus solved, I left Ngawi at the beginning of January and embarked for Europe in Batavia a few weeks later.

Note d. Ed. (S.) You might notice that there are several repetitions in the various work reports. I deliberately wanted to change and correct the reports I received from my two Dutch employees, both from distant foreign countries and independently of one another, in German.

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On the geology of Java, especially the excavation area of Oost-Indie by W. van Gelder, 1910, with the publisher's permission

J. B. Wolters, Groningen. - The one on the same in

Place names recorded in Dutch spelling are in the

present works, and so also on the special card, panel VI,

consistently in a corresponding to the German pronunciation

Transcription reproduced. So instead of oe (in Madioen) im

Always follow u, instead of ui eu, instead of ou au, instead of eu ö, instead

u ü, written instead of z s etc. The best way to express the short e in the German spelling is with an apostrophe, i.e. Kelut and Semeru should be better written K'lut and S'meru. Instead of wadas (Javanese synonymous with hard marl limestone) it is better to write padas, since wadas is a dialectical distortion. On the other hand, Watoe (= stone) will have to be written in German Batu, so Batu kras instead of Watoekaras (= solid stone) and Batu gadja instead of Watoegadjah (= elephant stone).

2) See Verbeek and Fennema, Geologische Beschryving van Java en Madura, p. 329. Selenka-Trinil-Expedition.

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Volcanic mantle

B; ~: ^

Diluvium and Alluvium

Fig. 1.

Another area around Trinil in central Java with the upper course of the Bengawan or Kali Solo and the Lawu volcano, geologically depicted according to the geological map of Java by Dr. K. Verbeek and Fenneha. (Side cards, bottom left: The vicinity of Trinil.)

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Panel V).

2

E. Carthaus,

Volcano past to today's level of Kediri-Djombang, which to the east, respectively. North-east with today's Java Sea in connection.

Based on the results of geological research so far, it is difficult to decide whether the gulf, or the strait, was last connected to the ocean at the point of today's Madiun plain to the west or east. One might assume that the 5 to 6 m thick, soft, lime-free sandstone on Gunong Butak of the Pandan Mountains, 'which contains remains of bones from diluvial or perhaps pliocene mammals and plunges at most 3 to 4 ° to the south, all in one Freshwater lake or a large mire on the edge of the Madiun plain and later lifted to said height. In this case the Madiun plain would have to be raised at its eastern edge and cut off from the sea very late. In my opinion, however, the sandstone formation is a "lahar" formation, created by sand or. Streams of ash from volcanoes. Because, as Verbeek also says, the limit of the Quaternary formation on the Pandan lies, like almost everywhere on Java, at a height of well over 100 m above sea level.

The main railway line, which runs through Java from west to east, and on which one can probably assume that for its exit from the Madiun-Solo plain into the lower lying coastal regions, both to the east in the direction of Surabaja and to the south-west in the direction of Jogjakarta the lowest-lying terrain sections on the edge of this plain were selected, the exit to the east found in the saddle between the volcanoes Pandan and Wilis between the stations Tjaruban and Wilangan in a railway cut in which the track is 120.20 m highest. The terrain on the southern side of the incision is 123.20 m above sea level, and on the northern side 121.85 m. On the other hand, the exit is from the level of

Madiun-Solo to the coastal region in the southwest in the direction of Jogjakarta at a maximum height of 157 m

According to this one should assume that the Madiun plain had longest had a connection with the ocean on the east side, through the saddle between Pandan and Wilis. One must not forget, however, that both the eastern and the southwestern exit in the area of ​​still very young, energetic volcanic activity, there from the fire mountains Wilis and Lawu and here from the volcanoes Merapi and Lawu

went out, lie.

The Madiun Plain is supported by a relatively narrow, flat strip of land

Gendingan-Walikukun in direct connection with the level of Solo. The Lawu volcano lies between the two levels. But there can hardly be any doubt that at the time when both of these plains were still forming gullies or a strait of the sea, the connecting road between them was wider; for the geological conditions on the north side of the Lawu reveal clearly enough that here the terrain has been considerably raised in a not so distant time and that the Lawu has formed thick deposits on its north side.

Dr. E. Carthaus, Berlin.

With plates V-IX and 2 text illustrations.

The place Trinil forms a small hamlet ("duku" or tithe shank) in the administrative district

Ngawi of the residency Madiun in Central Java (see the enclosed overview map of Java 1 Trinil itself is, as a look at the geo-

Logical special cards (Fig. 1) shows, not far from the northern edge of a fairly large and only partly flat hilly plain, which here in this country is known as the "Plain of Madiun". It takes up the space of a gulf that was still present in the Pliocene period, resp. a strait. Starting from today's south coast of Java in the south of the current residence of Jogjakarta, this road ran between two tertiary islands, namely that of today's western Zuider (South) Mountains and that of Nanggulang2), then through the current plain of Surakarta with the Solo- River and in the south of the elongated tertiary island of the Kendeng Mountains. At last she moved on at the southern foot of the little pandan

1) This map is from the Nederlandsch School Atlas In the south and south-east, the Madiun plain is bounded by a rather steep mountain range that rises to over 1000 m. The same is built up from very old andesites and andesite tuffs, some of which must have been deposited under the sea, as well as from andesite breccias and intermediate, mostly bituminous limes and clays of only a small extent. Verbeek and Fennema have on the. geological map of Java and also in the explanatory texts on this, this entire formation is referred to as Breccia days (J /,) and counted as part of the Miocan, without the solid andesites and

1) According to Veruf.ek, .Taarboek van het Mynwezen in Nederlandsch Indie, 1908, p. 783 IT., 376 m above sea level.

2) After the management of the "Nederlandsch Indische Spoorwegmatschappy" gave me a friendly report, while I received the first-mentioned information through the friendly mediation of the General Management of the State Railways.

above sea level near the Klatten 2 station

).

On the geology of Java, especially the excavation area.

3

Andesite tuff to be highlighted by special colors. In any case, andesitic rock types play the main role in the mountainous terrain in the south of the Madiun plain, and clayey and calcareous sediments take a back seat. Verbeek in his "Geologische Beschryving van Java en Madura" describes these ancient Tertiary andesites as andesites with the character of diorites and diabases. A few years ago, when I first saw the andesite rocks on the road from Slahun to Tegal-Ombo uncovered in numerous profiles for the first time, I was surprised at the similarity of various tuffs of those andesites with some Devonian shell stones of the Rhenish-Westphalian slate mountains, especially in terms of their overall habit and the inclusions of the numerous fossils (corals and shell remains). The ore deposits in the area of ​​this ancient andesite with their zinc, lead, copper and iron ores, as they have recently been discovered at Slahun, Pulong and Kasihan near Tegal-Ombo, are very similar

those who are known in connection with diabases in Nassau and Westphalia.

The above-mentioned old andesites with their tuffs that are still formed under the sea and the interposed calcareous and clayey sedimentary rocks form the relatively oldest type of mountain in today's Madiun plain. [On the VERBEEK map, a section of which is reproduced above (Fig. 1), these andesitic tuffs are placed under the oldest tertiary formations]. It can be assumed that the two volcanoes Lawu and Wilis, which with their extensive base, the Madiun plain in the west, resp. Limit the east to islands formed from andesites with submarine tuffs (tuff

breccias). For this speaks z. B. the occurrence of tuff breccias at the northern foot of the Lawu 1)

and in the west of the Pandan at Miono and Ngindjaan 2

these tuff breccias to be completely covered by the colossal ejecta of this volcano. I would like to believe that Wilis and Lawu, but especially the first-named Feuerberg, have developed very active volcanic activity since the earlier Miocene period; for around their foot there are actually enormous amounts of volcanic ejecta piled up, both in the form of ashes, lapilli and bombs, as well as in that of so-called lahar currents. In the tertiary strata of the Kendeng Mountains there is also massive amounts of volcanic material, which probably only comes from Lawu, Wilis or Pandan. It should be noted that as a result of the fact already mentioned by Younghuhn that winds coming from the southeast prevail in the high mountain region of Java,

Ashes and pumice stones had to be deposited most abundantly on the northwest side of the volcanoes. The fire mountain Lawu today has a height of 3265 m and the Wilis (in its highest peak, the Dorowati) one of 2556 m, but it should be noted that this volcano, built on a very extensive basis, as can be assumed for various reasons, must have suffered a gigantic collapse, so that its original height can be regarded as at least equal to that of the Lawu.

Furthermore, the Madiun plain is bounded in the northeast by the small, only 906 m high volcano Pandan, respectively through the low mountain saddle already mentioned above between it

Fire Mountains and the Wilis 3

Kendeng or chain mountains existing from miocene and pliocene ages.

low mountain range, which in its oldest, steeper dipping layers from the to the older

).

The northern edge of the Madiun plain is formed by the tertiary layers of It is a long,

1) From Verbeek a. a. 0. p. 243 mentioned.

2) Verbeek p. 226 f.

3) Unfortunately I was not able to know the geological conditions of the Pandan by my own experience

to learn; I therefore stick to what was said about it by R. Verbeek, Geologische Beschryving van Java en Madura, p. 219, and Jaarboekvanhet Mynwezen, Jaarg. 1908, p.783ff.

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Shine on the western side of the Wilis

4th

E. Carthaus,

Miocan is said to be built on the breccia level, but in its younger, less and less steeply sloping layers, it is composed of sandy marls, as well as sometimes calcareous sandstones, conglomerates and marl limestone, some of which arose from andesite tuff.

The Madiun Plain has very little dip from south to north. The village of Slahun is 150 m in its southernmost part, the town of Ponorogo, about 15 km further north.

place, 100 m, the city of Madiun, located pretty much in the middle of the plain, 65 m andNgawi 1, only 46 m above sea level.

Coming from the Surakarta plain at Gendingan, the Solo River enters the Madiun plain in a south-westerly or west-south-westerly direction and then flows with strong meanders, especially at the place Trinil (see map Fig ), with a main direction from west to east, on the southern edge of the Kendeng Mountains to the town of Ngawi. Here he breaks through this mountain range with a sharp bend in a northerly direction. The fact that the breakthrough took place at this point is probably due to the fact that the Bengawan Madiun or Madiun river, which takes its water partly from the Wilis and Lawu, partly from the plain and the southern border mountains discussed above, and in its lower course near Ngawi there is a fairly large amount of water, near this small town, coming from the south, it almost meets the Kendeng Mountains at a right angle2

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Taking into account the fact that the upper, more calcareous, young tertiary strata of the Kendeng Mountains south of the edge of the same push themselves at very small angles of incidence (8 ° -15 °) under the Quaternary of the Madiun plain and that all of the above-mentioned tertiary strata, finally the breccia floor, in an elevation up to perhaps 300, certainly over 164 m on the Pandan

one can probably assume that the Miocan and Pliocene layers mentioned run through the subsoil over the entire Madiun plain. On the southern edge of the plateau of Madiun, as well as that of Solo [Surakarta], the breccia level seems to have risen fairly quickly, so that here on what was once a fairly steep coast with later, not particularly great uplift of the old seabed, the middle Miocene and pliocene layers at the edge are less could emerge. Of course, there can also be a fault.

The marine layers, which are, in all probability, under the whole plain

from Madiun, show on the northern edge, in the Kendeng Mountains, an even greater

angle, the older you are. On the Pandan, north of the Butak Mountains, are the layers of the breccia

floors after Verbeek4 almost upside down. This elevation (in the axis of the Kendeng and Pandan)

Gebirges) seems to have progressed steadily from the Miocene period to the Quaternary period.

In the area of ​​the plain itself, I saw young tertiary layers only on their north and north-west

border from the Sonde site on the Solo River to near Trinil 6

their storage in different places despite their short geological age, manifold disturbances

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suffered.

Before I say anything about this, however, I would first like to describe the deposits,

which make up the floor of the Madiun plain:

1) See Fig. 1.

2) As can clearly be seen, this breakthrough must have occurred under strong water pressure or by strong flowing water.

3) Verbeek, Jaarboek van het Mynwezen, 1908, p. 783 ff.

4) Jaarboek van het Mynwezen, 1908, p. 784.

5) Cf. the special map on panel VI.

6) See the fault at Padas Malang, Figure 1 on Plate VII.

stanchions 6

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on the northern edge

Again, they have in

On the geology of Java, especially the excavation area.

5

By and large, the upper layers of the earth, which cover the floor of this plain, consist of ashes and other, sometimes very finely divided volcanic material. In a fairly wide -

These deposits are covered by one width, usually only y

Over 2 m thick layer of a peculiar tough, black-blue clay, which on the island of Java, especially in the low, more flat terrain, often forms the arable soil. In view of the fact that with the great average warmth of the tropics, extensive humus formation is possible only in water-covered or swampy territories, I would like to assume that those blue-black clays make up the dam mud of former swampy primeval forest or of marshes, as they are yes encountered in such a large extent everywhere in the Malay archipelago in the lowlands. Most often this blue-black dam soil has formed on the seabed, as already shown by the shell remains of brackish water and sea conchylia it contains. In this case we are dealing with swamp or coastal forests once located in brackish water, those towards the sea

- Numerous limestone concretions are found in many places in this blue-black clay. Verbeek sees them as calcium deposits in the trunk of various tree species (often also in the form of phosphoric acid lime). Only here I would not agree with Verbeek when he primarily thinks of the teak or Djatti tree (Tectona grandis L. f.); because this tree is definitely not a fan of swampy soil and grows best on dry, lime and magnesia-rich soil. It is never found in the swampy beach area; in addition, as I have occasionally shown in another treatise, this tree is a forest tree that was only introduced to Java in Hindu times. On the other hand, I believe that the calcareous concretions, which are also, e.g. B. just near Trinil, in the uppermost layers of the just mentioned deposits of volcanic ash (where the latter forms the actual dam earth), from Tectona grandis, and perhaps from their usual companions Butea frondosa Rxb., And Schleichern trijuga Wlld. because the remains of former Djatti forests can often still be found on this soil and the limestone concretions may have formed long after the volcanic material was deposited. In my opinion that the blue-black clays originated on the swampy jungle floor, the fact that they are completely absent on the heads of the dune-like elevations near Trinil, on the other hand, there are often smaller, rubble-like accumulations of volcanic bombs (hornblende upd also Augitandesite) will. I think that there may be river gravel from the first formation of the Solo River or volcanic bombs that were only slightly moved by the water, between which the finer, more or less weathered volcanic material was washed away and carried away into the swampy terrain. The fact that there are so few land and freshwater conchylia in the blue-black dam soil, although the plastic material is unthinkable, suggests that we are more concerned with swamp formations in these peculiar clay deposits than have to do with formations in stagnant water. You can spend hours searching in vain for land conchylies in swampy primeval forests on lime-poor soil, whereas you can do so in almost every pond and pond, as well as in large ones

"Rawahs" (large water-filled swamps), everywhere on shells of freshwater conchylia.

As a very limited, most likely fluvial formation at Trinil I see the up to several meters thick, quickly wedging insignificant deposits of

1) A noteworthy treatise by Dr. Mohr, published in the annals of the botanical garden in Buitenzorg, confirms my statement with a detailed explanation of the circumstances.

often passed into the zone of the rhizophore forests 1

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m, but here and there itself

II I

brown clay sandstone or sandy clay, which are in 2 or 3 places above the light gray ash deposits or have deposited in depressions of them.

As for the deposits in the Madiun plain below the blue-black clay, we must see two different facies in them, perhaps beginning with the white-gray volcanic ash layer just mentioned. One of them has to be in a "Rawah", i.e. H. formed a swamp lake, which at least temporarily, as a result of breakthroughs of the water through the crumbly volcanic ash material that partially forms its edge, was traversed by more strongly flowing water. (There are many such Rawahs on Java.)

If one takes a look at profile 2 on panel VI, as it is on part of the southern wall of the excavation site [pit I] on the right bank of the Solo River [Bengawan Solo] near Trinil, one becomes aware of the over Layers lying on the main bone layer, rapidly wedging and bent within their boundary surfaces, there can hardly be any doubt that such irregular stratification could only take place in sometimes strongly flowing water within a land lake.

In plains with rivers, which are located in the vicinity of such volcanoes, which throw out enormous amounts of ash and lead "lahar currents 1)" to valleys, it is certainly not uncommon, especially in a rainy climate like that of Java, that by damming up the enormous amount of loose volcanic ash material which the lahar currents bring to the plain, inland lakes or rawahs are formed. The edge of the same then suffers, especially at the time of very abundant atmospheric precipitation and when the volcanoes in question deliver less ash for a time, occasionally breakthroughs, so that the water in such an inland lake must start moving more or less sideways .

The south of the plain of Kediri2 provides a very instructive picture in this regard

was once connected to the Madiun plain to the west of it as a bay or strait and is only separated from it by accumulations of volcanic material at the foot of the Wilis. That southern part of the Kediri plain must have, as Verbeek aptly points out, "was still under water at a relatively young age, ie it must have formed a land lake". This is shown by the almost horizontal, Quaternary deposits on the border towards the Tertiary Mountains. Verbeek rightly seeks the cause of this in the volcanic activity of K'lut 3

closed off the plain and temporarily prevented the drainage of water (through the Ngrowa or Brantas River), which naturally flooded the southern part of the plain4) «. Today only the Rawah Bening and the large swamp north of Tjampur Darat remain of this sea, which, according to Verbeek, is constantly decreasing in size, as it was a few decades ago

should have been much bigger. Also in the south of the plain of Kediri, in the volcanic quarternary and younger layers of ash and lahar, there are undoubtedly buried a number of bones of mammals, birds, etc., which have recently been caused by eruptions of the K'lut, connected with the lahar phenomenon who died. Unfortunately, at the time I didn't have the right drilling material to get through

1) So-called mud streams, heavily laden with volcanic ash, pumice and bombs.

2) Cf. the map of Java, panel V.

3) The K'lut and the Wilis show a lot in common in their whole structure. The same is true of

their volcanic activity, which is still very active today at the K'lut mountain of fire and gives a fairly true picture of the former activity of the Wilis. See Figure 1 on panel VIII.

4) Verbeek, Geologische Beschryving van Java en Madura, p. 169.

6th

E. Carthaus,

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who, as he says, “extended his products to the foot of the Wilis at Kediri, thereby

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Which

On the geology of Java, especially the excavation area.

7th

drilling a number of boreholes in the vicinity of Trinil to get a reasonably correct idea of ​​the extent of the former Rawah there. About that in 1908 by Dozy

attempted drilling see his short report!

I believe so much, however, of the geological profiles as they appear here and there on the bank

of the Solo River to the north and northeast of Trinil 1

soon after the formation of the main bone layer on the northern side of the conglomerate ridge, which perhaps continues on the right side of the river, no more deposits formed under water, but that here - apart from the lowest clayey tufa layer immediately above the main bone layer - only ledges of volcanic material (ash, pumice, bombs) on dry land. To the north of that conglomerate ridge lie volcanic tuffs 2 over the main bone layer

said back's own deposited layers 3. What is particularly noticeable is the much more abundant one

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Occurrence of pumice stones, from pea to head size, in the former deposits. The fact that the light pumice appears colorfully distributed from top to bottom, now lying under and now over much heavier compact volcanic bombs, shows that the deposits on the north side of the conglomerate ridge are probably never settled by running water were4 ).

I believe that I can only explain the receding of the pumice pieces in the middle and upper Trinil layers south of said ridge a by the fact that they disintegrated more during and after their fall into the water of the former Rawah of Trinil and their parts, with at times stronger movement of the water were separated from each other. It is not uncommon to find cracked and half-cut pieces of pumice in these layers deposited under water.

As I said, I was unable to determine how far the Rawah had previously reached south.

But I want to mention here that in a test shaft, which, about 3 km away in the south

west of Trinil, it was submerged to a depth of about 8 m, only sandstone-like volcanic

Tuffs poor in pumice stone were encountered. For paleontological finds only those come

Quaternary deposits formed under water, the actual trinile layers, into account, although it is

It is by no means excluded that fossil bone remains may also be found in volcanic land deposits

find here and there. So I occasionally came across my investigation of the previous year

Chaussee, which leads 5 from Maospati to Magetan 6, on a layer of leaves in one of vul-))

Kanian ash and bombs existing tuff deposits.

As for the actual trinile layers, in which the two main pits I II for

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of a habit that is visibly different from the one on the south side of the

At the time of the Selenka expedition they were excavated 7

1) See profile 1 on panel VI.

2) Layer 14 of profile 1.

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so under the already mentioned several times

3) For example in the large pit IL excavated by the Selenka expedition

4) We are obviously not dealing with Lahar conglomerates (see below!) In the deposits lying above the main bone layer.

5) In the west resp. Southwest of the city of Madiun.

6) At the south-eastern foot of the Lawu.

7) Pit II on the left bank of the river is, so to speak, a continuation or expansion of those excavations under Prof. Dubois, in which the remains of the much-discussed Pithecanthropus erectus Dub. were found (see the map on panel VI).

offer to be able to see that already

8th

E. Carthaus,

a greenish-gray, more or less firmly cemented tuff. For now

whitish gray volcanic tuffs 1

During the excavations, for the sake of better understanding for our European overseers, we called it Lahar sandstone (cf. 12 in profile 2). The sand-like granules that make up the Lahar sandstone consist of ash-like, volcanic material in which only isolated quartz granules have separated. The green color is caused by 2 chlorite-like particles

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caused, which fill the entire lahar tuff and probably arose from the decomposition of the augite or the hornblende of andesites. Andesites and their tuffs, apart from a little extensive basalt deposit at the foot of the Lawu in the Residence Solo (Surakarta), form the igneous rock from which - like most of the still active and extinct volcanoes of Java and the Malay archipelago - both the Lawu as well as Wilis and Pandan have built up. The lahar tuff (12) is several meters thick in places. As can be seen from profile 2, it is sometimes represented by a yellow, clayey tuff (11 a) which, however, only got the yellow to yellow-brown color through decomposition of the chlorite-like material where the tuff was very fine-grained. Under the lahar tuff (12) lie mighty banks of gray, sandstone-like tuff (10-11), interspersed in many places with streaks of a bluish-black clay that quickly become wedged out again, which run extremely irregularly and varying in number between these banks. To differentiate paleontologically different horizons according to the organic inclusions or constant pitches in these sandstone-like tufa layers, as Dr. Elbert did not do.

The last-mentioned tuff layers are underlain by a tufa layer that appears striped white in vertical section, which is present everywhere in the outcrops made at Trinil, but whose thickness is probably no greater than 1 m at any point. This tuff was very hard in places.

Below is the main bone layer (8), but in numerous places, namely at the excavation site on the right bank of the Solo River (break I), a thin, very bituminous clay layer (9) intervenes between this and the striped tufa layer. I want to call this bituminous clay layer the main plant layer because when it was uncovered it must have shown itself to be extraordinarily rich in plant prints. The broad conclusions that Dr. Elbert has drawn from these extremely poorly preserved plant remains, 1) In profile 2 of pit I, layer 13a, "white, sandstone-like tuff with rubble layers", and 13, "light gray, sandstone-like tuff", is designated. At Pit I on the right bank of the river, this white-gray TufT composed of volcanic ash is no more than 2.50 m thick; but towards the south it becomes considerably more powerful, as can be seen in various profiles on the Solo River.

2) I suspect glauconite less among the green-colored granules of the Lahar sandstone because of the poverty of the andesites in potash.

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Selenka-Trinil expedition.

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Marines Pliocene

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Gray Tuff with Tonsohmitzen 3)

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Coral bank

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Yellow clay tuff \*)

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Terrestre or freshwater formations

lA marine layers

Profile lines 1—3 and A—

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Locations of K = corals,

S = sea urchins, Fo = foraminifera, Mo = marine mollusks, Pi = Pithecantfiropus, Mz = human tooth

Special map of the Trinil area and probe on the Solo River

Ideal profile I of the quaternary and tertiary strata mining

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\_\_a\_ £ o i layer of rubble

Volcanic mud tuff »Lahar sandstone

111 1 1 sandy clay

13 \* '' '' • • - • \*

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Light sandstone-like tuff

Blues

White T

Verlag von Wilhe

nken Solo-Ufer near Trinil according to Dr. K. Carthaus)

Z IC3 Jerüillagen 4 »

Gray sandy tuff

Bone layer1) Leaf layer2) White-striped, sandstone-like tuff 15 16 17

^ ---?> • - ^ »^ .-- ^ - ^ r

White tuff conglomerate jumbled layers of blue-black clay

8th

1) with wood scraps, cervids, stegodons, pithecanthropus, etc .; at pit III with rolls and strongly rounded bone fragments. 2) blue-black clay, merging into tuff with remains of plants.

:!) Fresh water conchylia.

4) local formations in profile 2.

• elmann in Leipzig.

Richest freshwater collusc location I.

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Profile 2.

Piece of wall in Pit I on the Solo right bank

Plate VI

SSO.

Sdm ^ THnUrB ^ Ü

H.hl "

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& on the left Solo bank near Trinil; according to Dr. E.

Cart house;

NNW.

sso.

Gray tuff with ToniChmitzon 'I

Gray sandy TulT

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«SäÜS ^

"--layers

Profile lines 1-3 and Ä-C

Locations of K = corals,

S = sea urchins, Fo = foramimleren Mo = sea mollusks, Pi = PuAe camthropus, Mz = human tooth

Yellow lonigcr TulT ")

Volcanic mud tulT »Lahar sandstone c

Light sandstone tipcr TulT

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Special map of the Trinil area and probe on the Solo River

1) with Holzreslen, Cerviden, Steeodon, Pitlucmthropm etc .; at pit III roll with G "e" and Hstaark "ahb •" ,, "l.l, - u.

Ideal profile I of the Quaternary and Tollarians

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by WiUiel »

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in Leipzig,

>) blue-black tone,

3) fresh water conchylia.

4) local formations in profile 2.

Richest freshwater mollusc lake

plumb knuehoniragmenlon.

merging into TulT with plant remains.

Profile 2.

Piece of wall in Pit I on the Solo right bank

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Plate 17

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Säenka-Tnnü-ExpeiJ:

Fig. 1.

L Solo shore no, -Phot. from Cartha

/ V-A

Rejection of men’s concerns about Padas Mala:

the bspecial card on plate VI.

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Fig. 2.

<^ Verlag von Wilhelm Engeimann in Li

J

Pit I on the right bank of the Solo River Aufan »

thicker tuff

jLL Tuffsan / lsteii

- \* brown tuff lx light tuff

X>, clay (volcanic)

, clayey tuff x clay

JL tuff sandstone JL solid clay

X tone (volcanic)

X X, as well as /--./// contain ^ »arine conchylic residues

On the left side of the profile, the transition from XX to step vi is in part a gradual one

ff — Ä = main bone shank

L - Lahar conglomerate

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Selenka-Trinil expedition.

Plate VII

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Fig.1. Rejection of the marine layers at PadasMalangamLinkenSolo-Banks north of Trinile at point 3 of the special map on plate VI. (Photo by Carthaus)

Fig. 2. Pit I on the right bank of the Solo River in early August 1907. (Photo von Carthaus)

Wilhelm Engelmann's publishing house in Leipzig.

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On the geology of Java, especially the excavation area.

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nicely developed than that - judging from the leaf impressions collected earlier - the already

excavated sites must have been the case 1

That the plants, of which so numerous remains are in said layer2).

found, did not grow in place, results on the one hand from the complete lack of roots, which, as far as trees are concerned, would have penetrated the deeper layers, on the other hand from the lack of humus in the sandstone-like layers above the main bone layer Tuffs. As far as I could still see from the various larger pieces pulled out of the heap, the remains of leaves of various plant species got into the places where they were enclosed in clay and tuff, either through water or - what is probably just as likely - through Wind carried here from the near shore. Since the individual leaves are largely parallel to each other with their surfaces and are irregularly separated by tuffy intermediate means, rain of ash must have fallen while they were carried to their place of discovery by wind or water, or they are covered by ash which of gently flowing water

was continued.

After the material available to me, I cannot understand how Dr. Elbert3 both)

as extremely poor preservation was able to indicate not only a number of genera and even species, but also to classify the plant remains of the trinuclear layers in two different plant zones, from which plant prints are to be found in 5 horizons at different heights. It would have to be that he collected about the ones he had collected for the Selenka expedition

Pieces in addition, would have a particularly rich collection 4

But Dr. Elbert did not have any further evidence at that time when he said in a public lecture he had already given in Batavia: According to the plant remains he found in the tri-layers of the lowlands of Madiun, some of the plant types that cool to the lower limit of today's are to be found and indicated the upper one of today's moderate vegetation zone; from which, therefore, a temporal decrease in temperature for the time of deposition of the trineal layers deposited over the main bone layer results. Anyone who has seriously dealt with systematic botany and especially with the study of tropical flora knows that without having flowers or fruits at the same time, it is only possible with a few, precisely characteristic leaves [such as cinnamomum, melastoma, etc.], according to them, without further ado, plant families, let alone species, can be determined with certainty. Although I have occasionally on my travels through the entire Malay archipelago, for a period of more than ten years, kept an eye on the study of flora and am not entirely unexperienced in the field of phytopalaeontology, I would not draw such conclusions dared to draw, as Dr. Elbert. During my wanderings I noticed the fact that the leaves of the same species often vary greatly in shape and sometimes even in their veins, depending on the age of the individual trees, the climatic and soil conditions, and yes , even of the season. Such a variation of the sheet, not just in size,

1) In the second year of the expedition, however, Mr. Dozy brought in a considerable number of well-preserved plant remains, with the help of which the precise knowledge of the Trinil flora was promoted.

2) Remnants of wood were also found in the main bone layer and in the hanging gray sandstone-like tuffs in random positions and distribution.

3) Dr. Elbert, About the age of the Kendeng layers with the Pithecanthropus erectus Dübois, New Yearbook for \* Mineralogy, Geology and Paleontology, Supplement-Vol. XXV, pp. 648-662, Stuttgart 1908.

4) Dr. Schuster has recently prepared a large number of leaf prints from pieces that I had excavated from the dump, and was then able to identify a number of plant species by careful comparison.

Selenka Triml Expedition.

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E. Carthaus,

but also in the form, namely between the obovate and elliptical, respectively. lanceolate, I have, depending on the season, especially with some Papilionaceae, such as z. B. Uraria lagopoidcs D. C. and Desmodium gyroides D. C. observed.

I do not believe that, least of all in the fossilized state and with such preservation of the leaves as is the case with the plant prints of Trinil, one can only look at the shape of the leaves, for example. B. Malay Quercus species as such can definitely represent. Dr. Valeton, who has been studying the tree flora of Java for twenty years and who has written a fundamental, comprehensive work on it, explained to me that he was unable to determine a Malay Quercus shape from a single leaf. Unless the cups of the cupuliferous fruit are also available, I would like to put it in doubt that, in the case of an acorn-like Malay fruit in the fossilized state, with less good preservation, it is possible to definitely represent it as belonging to Quercus 1He stayed in India for a short time and made the above assertion that he had learned little of the Malay flora. When he (1. c. S-659 and 660) asserts that Eugenia "is a deciduous tree strongly reminiscent of the Japanese gonifer Gingko biloba", I still have some doubts about his knowledge of the Indian flora. Dr. At the time, Valeton pointed out to Mr. Elbert that the genus Syxygium, separated from Eugenia, resembles gingko biloba in its nerve structure (but only in this one). But anyone who knows the Malay Eugenia and Syxygium arias to some extent will be amazed at ELBERT's assertion about the genus Eugenia. Syxygium jambolanum Roscb. {Eugenia jambolana Lam.) Is found mainly in the deeper region on calcareous soil and provides the Djamblang or Djuet fruits, which the natives like to eat. Even more than Quercus, of which I saw stately trees in the Zuidergebirge (Sumber Düren coffee plantation) not yet 700 m above sea level, Castanea would speak for a decidedly lower average temperature than that of today's lowlands (lower vegetation zone). Only Mr. Valeton told me that he had not seen a single leaf of Castanea under the Trinil plant prints. And now Dr. Elbert even a conspicuous preponderance of the genera Quercus and Castanea, both according to species as the number of individuals! He also speaks of Engelhardtien, which on Java can only be found in the higher mountains !! But who, I ask, can recognize an Engelhardtia as such from a remnant of a leaf alone (from today's standpoint of science)! Dilleniaceae leaves can

I have also looked in vain for a real justification.

I am giving the scientific opinion of Dr. Valeton (chief of the herbarium

in Buitenzorg) about the plant remains in Trinil:

»Report on the vegetable fossils of the SELENKA expedition.

I. Leaf prints. These of course allow a very varied or even no interpretation at all. A relatively large number of the impressions show a great similarity under one another, these are obovate-elongated, entire-edged, pinnate-veined leaflets of various types

1) By the way, I never saw an acorn-like fruit among the plant remains of Trinil.

2) I saw the most and most beautiful trees in Dillenza, resp. Wormia, on Java in the deeper region of Bantam, where they seem to be found in enormous quantities in silicified form.

can be identified with some probability as belonging to this family2

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In addition, Dr. Elbert, at least back then when

but not, without seeing the hairs, dipterocarp leaves. In short, in my opinion Elbert was in no way entitled to draw such far-reaching conclusions at that lecture in Batavia. The same is true of his sharp division of the Kendeng strata into lower, middle, and upper Diluvium, according to theirs

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Lauraceae. Derris elliptica 1 occurs.

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is a liana that grows in the light forest from the beach to the mountains

On the geology of Java, especially the excavation area. 11

Size. I do not know of any plant whose leaves are more similar to them than the leaflets of Denis elliptica. Only this species has the peculiarity that on the same plant individual leaves are elliptical, others obovate-elongated. But I didn't find any prints that match the elliptical shape. By the way, there are of course a host of other types of plants with the same leaves, e.g. B. Myrsine species, Zrora species,

There are also several prints that are reminiscent of the leaves of Ficus species, especially Ficus retusa and Ficus infectoria, with a peculiarly irregular, alternating thick and thinner leaf nerve.

A single leaf nerve with a well-preserved, wavy, serrated leaf margin and a typical basal nerve is very similar to Mallotus moluccensis. In so far as there can be any concern in such an uncertain question of probability, it seems to me that the imprint belongs to Mallotus moluccensis. Finally there is a single remnant of fruit, which is cemented together with a silicified trunk and is extraordinarily similar to a Schima fruit. This is all I was able to find about the leaf prints. These provisions say nothing about the level of the sea and the climatic conditions in which the plants lived.

The Ficus Arlen as well as Mallotus moluccensis and Derris elliptica live in the open forest from the beach up to 1500 m. Schima maronkae only lives in the mountains of West Java (up to Wilis),but there is in Sumatra a species of Sckima, Schima Wallichii, which goes down to the beach

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II. Detritus masses. The soft pieces contain a tremendous mass of leaves and twig fragments, some of which are piled in layers, and mostly humified. Only a relatively few leaf blades are well preserved, but a very large number of central and lateral nerves can be clearly seen. These, mixed with compressed twig fragments and bits of bark, give the impression that one is mainly one

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which could provide information about family or even genus.

Through thin sections that Dr. Mohr was kind enough to have it made for me

very little information could be obtained. The cell structure of the fragments seems to have been almost completely lost, only individual cork lamellas still have a clear structure. Individual cross-sections showed a clear dicotyl type due to the arrangement of the parts.

Treatment with potassium hydroxide and Schultze's maceration agent to break down the fragments into their elements were unsuccessful because there are almost no elements left. Most of the pieces completely dissolved in Schultze's maceration agent. Only when boiled with 10% potassium hydroxide solution and subsequently treated with nitric acid could some bits be lightened in this way

1) With various leaf prints from Trinil, in which Dr. I suspected Valeton Derris elliptica myself

Incidentally, more thought of the two Papilionaceae mentioned (Uraria lagopoides D. C. and Desmodium gyroides D. C,)

which are still found at Trinil today.

2) Particularly with regard to this Sckima-Fiucht, one might assume that the climate of Trinil

At the time of the deposition of the plant layer it was still more humid than it is today, like that of West Sumatra, Banka and Biliton today.

2 \*

Undoubtedly there are quite a lot of prints from non-dicotyledon plants (grasses or equisetes?), But all only in very small fragments, without even a single characteristic part (knot, leaf tip or fruit),

made of blades of grass 2

)

compound mass in front of you.

12th

E. Carthaus,

and become swollen so that they formed small hollow cylinders which looked most like depleted miniature fern trunks.

A further investigation in this direction could probably shed some light on the nature of the fragments.

Buitenzorg, January 1908. signed Dr. Valeton. "

It is with great pleasure that I welcome the fact that a botanist, Dr. Schuster, has taken the trouble to remove the plant remains from Trinil as detritus

to examine more closely macro and microscopic 1

).

At first I believed that in Trinil I was only

1) Dr. Incidentally, Schuster used a much more extensive material as a basis for these investigations, namely that carefully collected by Dozy in 1908 (after previous instructions on the type of conservation to be used by Prof. Rothpletz-Munich).

Regarding the conclusions that Dr. Schuster draws from his investigations into the Trinil flora, of course I cannot agree with him. I am referring to its publication in the meeting reports of the Kgl. Bavarian Academy of Sciences, mathematical-scientific class, year 1909, Abh. 17, in which he is often based on the results of my work reported here without mentioning it. Schuster says u. a. that the Trinil flora indicates a colder climate than that which prevails at the excavation site today, namely that flora according to him (see p. 22) "corresponds to an evergreen mixed primeval forest of the temperate zone, as it is today in one

Altitude of 600-1,200 m, namely at the upper limit of this temperate region, occurs «. Assuming now that the ScHUSTER species determinations are correct, I would like to note that several of the specific species occur only in the warm lowlands. As such, with reference to the almost fundamental work by Koorders and Valeton, Bydrags tot de kennis van de boomsoorten van Java, whose information I have found very reliable on my numerous botanical excursions, I only name the following species:

Dehasia squarrosa Miq. et inches. (See Koorders and Valeton, Vol. X.)

Cryptocarya ferrea Bl. Does not exceed 500 m above sea level (Koorders and Valeton, Vol. X, p. 217).Garcinia dulcis short. On Java it only grows at less than 500 m above sea level (Koorders and Valeton, Vol. IX, p. 360).

HopeafagifoliaMiq. Only below 500m above sea level on Java (KoordersundValeton, Bd.V, p.125). Vatica lancaefolia Miq., Grows in the Malay archipelago only in the humid lowlands.

Feronia elephantum Corea, thrives best in the coastal lowlands of Java. The same applies

Saraca minor Miq.

I saw Memecylon niyrsinoides Bl. Only in the easternmost Java and here alone at less than 200 m above sea level

(Koorders and Valeton, Vol. V, p. 213).

Gordiasuaveolens Bl. Growing wild on Javanese in the lowlands up to 500m above sea level (Koordersund

Vol. VII, p. 69). The same applies to Fagraea littoralis Bl.

Since the mentioned plant species can only be found in the warm lowlands, in my opinion there are only two possibilities with regard to the Trinil flora:

Either individual leaves of those two excavated plant species which today only grow in the mountains (namely Viburnum coriaecum Bl.> Which on Java is not below 1400 m, and Castaneopsis Curtisii, which is only found on Borneo at 250-300 m altitude) are through the mud-tuff stream, by running water or by the wind at that time in the area of ​​Trinil, or the two types of plants - which I, as I am most inclined to assume - once vegetated at lower sea level in the area of ​​Trinil than there the climate was much more rainy. In order to show with two examples belonging here how much a larger amount of rain allows some plant species to descend to lower sea heights, I refer to the already mentioned Schima species (which on Java only at about 1000 m altitude, on the other hand to Banka and Sumatra occurs in the lowlands) alone. on Mitrephora Maingayi Hook, fil., which grows on the island of Banka in the warm lowlands, whereas the Mitrephora obtusa, identical or very closely related, can only be found on Java at 800-1200 m asl. The Castaneopsis species and many other forest trees come in that are rich in atmospheric precipitation

West Java already at a much lower altitude than in East Java, which is far poorer in it.

So I believe, in agreement with Valeton, to be able to say that none of its types indicate that the Trinil flora was grown in a colder climate than is found around Trinil today

On the geology of Java, especially the excavation area.

13th

had to look at this plant detritus with a magnifying glass that it was mainly granule remains; And all the more so since most of the bone remains that were excavated near Trinil belong to Gervids and Bovids, i.e. predominantly grass-eating herbivores. In accordance with my assumption that we are dealing with a Rawah - i.e. a swamp lake formation - as a sales point for the Trinil plantations, Dr. Schuster can also detect remains of Gyperaceae.

One more argument against Dr. Elbert, I would like to assert the temporarily cooler temperature assumed by Elbert: Of the freshwater conchylia, which were found in the pitches below, above and between the layers of plants and which show the same faunistic character down below the main bone layer, the larger Melania forms are special but am-

,

pullaria ampullacea Linn., today never found in the cooler zone, where oaks, chestnuts and angels grow.

I have the few species of freshwater conchylia [Unio sp. and Melania sp.), which to me as from the time of Dr. Elbert origin, were shown, if only because the sites were not named, completely ignored and only those bowls that were made by myself

or, at my instigation, were pulled out of the pitches and the main bone layer, sent to Prof. Martin in Leiden, who is well known as a specialist in Quaternary and recent freshwater conchylies. In the geological-paleontological institute there, Martin's assistant at the time, Miss Icke, now Prof. Martin, had the goodness to specifically close the bowls as follows

determine:

Bulimas citrinus Brug.

Melania testudinaria v. d. Bush.

»

»

»

»

verrucosa Hind. granum v. d. Bush. infracostata Mousson. Sarrinieri bread.

Paludina javanica v. d. Bush. Ampullaria ampullacea Linn.

This is now in its entirety a fauna as it can still be found today in the swamps and little agitated freshwater pools of the deeper, hot zone of the island of Java. "All eight species," writes Prof. Martin, "are still alive, only one variety deviates a little from the recent representative. In the pitches of the trinile layers below and immediately above the bone layer there was also a small helix shape, next to Bulimus citrinus Brug. thus the only land snail species that has been found. Prof. Martin himself recently examined the freshwater bivalves [Unio and Corbicula) sent to Leiden and put together some of the notes below.Under the said white-striped tuff, respectively. the main layer of vegetation that lies beneath it is the main bone layer, in which, in front of the excavation site of the SELENKA expedition on the left bank of the river (pit II), on panel I,

is. But the climate there will have been much richer in rain at the time the trinile layers were deposited, and the fact that I believe I can detect pathological changes in various animal bones which might indicate arthritis deformans is indicative of this as has been stated in the case of quite a number of cave bear bones,

J) See above p. 8,

I return to the description of the trinile layers 1

).

14th

E. Carthaus,

Figure 1 with the point marked x the remains of Pithecanthropus were found at that time I have called this layer the main bone layer because it was mainly the collected bone fragments that were found, although the latter is not missing in the layers overlying it and in the conglomerate layers below it. In the illustration, panel VII, FIG. 2, one can see the main bone layer and the conglomerate lying below it on the bottom of the pit at the point indicated in the corner of the picture. The main bone layer, which has a thickness of 0.4 m to almost 1 m, appears deep blue-gray when moist and freshly opened, and when dry, light blue-gray to dark gray. It also consists of volcanic material, ash, very small and slightly larger lapilli, some of which show the transition to the pumice structure, and pieces of pumice stone.

Here and there, rounded pieces of dense, well-crystallized andesite and andesite lava, probably up to a hundredweight, were found. It is difficult to decide whether they fell as volcanic bombs into the main bone layer during its formation, or whether they were carried here in a lahar stream. The fact that these rounded pieces show various forms of andesite, and that both hornblende and augitandesite can be found underneath, should indicate that they come from a stream of lahar, which is also evident from an explanation below.

The volcanic material of the main bone layer was generally shown by silica, in various places also by iron pebbles and iron oxide hydrate compounds. Iron pebbles in small crystals, rarely reaching the size of a pea, are relatively abundant in this layer; the latter appears to be impregnated in nests. Since rhombic iron sulphide or marcasite also seems to have formed in many cases, presumably as a result of its easy decomposition into sulphurous and sulfuric acid and iron oxide resp. Hydrate compounds, some of the pieces of wood enclosed in this layer and lying around in a tangle, charred to a remarkable degree. But this is only the case where there is a lot of pebbles. Especially the abundant occurrence of pebbles and the confused mess of the up to 1 or 3 m long trunk resp. Pieces of branches in the layer seem to indicate to me that the formation of the main bone layer did not take place in the midst of a continuously strong flowing water, but in the bay of a river with a steeper gradient, but most likely in a Rawah, with water flowing through more rapidly ( in the case of breakthroughs in the accumulating tuff). It is only in stagnant water that pebbles can form in the vicinity of rotting plants and the pebbles must have formed in the main bone layer very soon.

But it is easily possible that the sulfur of the iron sulphide was contained in the lahar material, from which in my opinion the main bone layer was built, as volcanic sulfur. I imagine that this lahar material got through a very wide river into a Rawah near Trinil, which was created when the lahar material accumulated at a drainage point of that river after a colossal eruption of the Wilis volcano. In order to explain this, I would like to go into the lahar currents of Java in more detail in the following, after I only mentioned briefly to complete the description that under the main bone layer (8) a volcanic conglomerate (6), which is in places firmly cemented together, with isolated Andesite blocks up to a size of half a cubic meter, but mostly less than the size of a fist.The word "Lahar" is as well known among the natives of the island of Java, in the western province of the island, Bantam, as in central Java (Madiun, Surakarta) and the easternmost part of Java, the province of Besuki. Unfortunately one still has in our time, so in 1901 and even

On the geology of Java, especially the excavation area. 15th

in 1909, had an unpleasant opportunity on Java to get to know this terrible, devastating lahar phenomenon.

To the east or east-south-east of Wilis and separated from it only by the southern part of the Kediri plain, the above-mentioned Kelut or K'lut fire mountain, only 1731 m high, with its grotesque, sharp-pointed contours (cf.

According to Verbeek (description by Java en Madura p. 166 f.) The summit of this volcano has collapsed and now shows 3 craters, of which the largest and probably the oldest is only preserved in its eastern part. After its curvature, Verbeek assumes a former crater with a radius of 2.5 km. To the left and right of this edge, near the summit, lie two

smaller craters. Of these, the western one is still active today and includes a lake with a surface area of ​​0.79 square kilometers, while the rim surrounding it, which rises 200-300 m above the level of the crater lake, has a radius of 640 m. On the west side, this edge sinks to a height of a few meters above said water level.

In the case of eruptions, which, according to the natives' belief, recur every 30 years in the area and the last of which took place in 1901, 1875 and 1864, Verbeek says that the water of the volcanic lake is either ejected with or it collapses (with weaker eruptions) the crater wall at its lowest point. With such an emptying of the crater lake, combined with a rain of ash (and usually also thunderstorm discharges over the summit), then, usually following the next given natural watercourse, enormous masses of water with terrible force flow on the steep mountain slope to the valley, enormous amounts of ash, Carrying sand, volcanic bombs and other igneous rocks.

Various people, from the town of Blitar, about 25 km away from the crater lake of the K'lut, as well as from the plantations at the southern and western foot of the Fire Mountain, described to me the resulting noise (in 1901) as similar to a gigantic one in the immediate vicinity of the stream, and so terrifying that even the domestic animals were scared to death and completely beside themselves. Maybe 3

Roaring until the water flowing down from the mountain reached the town. Fortunately the Lahar Current already flowed here in such a broad bed that only the lower part of the town was inundated by the Lahar Current. In contrast, in 1875 the water of the Lahar2 is said to have been the whole

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For hours the residents of Blitar heard a terrible one

Some of the city flooded several meters high3

With the first terrible outbreak of the Lahar Current, however, the devastation is long

not over. Because afterwards all the small watercourses on the slopes of the fire mountain, which flow to the bed of the lahar (they are partly formed only after the eruption), lead to this still amazing amounts of ash and other volcanic material. As the river bed is no longer able to absorb the latter, the water overflows and stagnates, which can be fatal for the residents. In 1905 I saw a long bridge at Blitar, the piers of which only protruded from the lahar bed iy-2 m, during a few years

2

1) The eruption of 1874 is denied by all older Europeans and natives who lived and lived around the K'lut. There should only be one breakthrough in the crater wall at that low point. 2) The Javanese use the word Lahar to refer not only to the mud or, better said, sand stream itself,

but also the bed through which it ran.

3) Figure 2 on panel VIII shows a portion of the Lahar Current from 1901 near Blitar,

while photograph 1 gives a picture of a landscape near the volcanic mountain lake shortly after the ash rain of 1901.

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16

E. Carthaus,

near the hamlet of Nglumpang, [belonging to the Desa Talun]. Verbeek 3

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I was told "that the bed extends through the mass of the vomused to walk high over it'1

K'lut the coming lahar sand annually by a good 1 m. Today people in Blitar live in constant fear that the next eruption of the Fire Mountain will destroy the whole town.

In all of this, one must reckon with the torrential tropical rains which come down so frequently in that area and which so very soon carry a large part of the loose volcanic material lying on the volcanic slopes into the watercourses. - If I take into account all the circumstances and facts observed at the K'lut, Wilis and S'meru today, then I can only imagine that the main bone layer of Trinil is the later product of an extraordinarily large lahar flow that emerged from a former western crater des Wilis came and, with its first powerful eruption, those conglomerate masses, which lay under the main bone layer, extended into the area

worn by Trinil. Although the Solo River in its upper course above Trinil does not yet absorb a tributary that extends to the foot of the Wilis or near it, the structure of the Wilis volcano, which in contrast to that of the Lawu, that of the K. 'lut so much looks like that to look for the exit point of the lahar flows from Trinil on it.

As Junghuhn discovered, the Wilis volcano is indeed a gigantic volcanic ruin. It covers a larger area with its foot than the Lawu volcano. Since the angles at which its lower parts, not affected by the collapse, rise from the plains of Kediri and Madiun, are much the same as those of the Lawu, which reaches nearly 10,000 feet, the assumption is not so very daring that the Wilis, which now still has heights of over 7,500 feet at the edges of its collapsed, wide crater, was once also about 10,000 feet before a series of enormous volcanic catastrophes its present

Condition has brought about.

Historical information about eruptions of the Wilis is not available. But has all appearances

According to, the activity of a small crater on the west side of the Wilis, in which the volcanic mountain lake "Ngebel" lies, has not yet come to an end. As the administrator of the coffee-processing plant in the southern part of the crater, Mr. Roeland, informed me, the north-western part of Lake Ngebel, especially during the months of April, May and June, i.e. at the turn of the wet and dry season, often over 1 km clearly audible, dull thunderous, thunderous noise noticeable. This can be found in the hamlet of Pudjuk, about 2 km after

SSE from the southern outflow of the Talaga 2

settles. There is also a sulfur fountain at the Glugo hamlet (Desa Gondowito), 3km to the southeast. Furthermore, about 4y2 km away from it, one finds carbonic acid springs

or that, as Junghuhn thinks, a single colossal original crater, which filled its entire summit, collapsed.

1) This bridge should no longer protrude from the lahar at all.

2) The natives name such mountain lakes with the name Tälaga; a highly Javanese word, probably borrowed from Sanskrit, which seems to me to have some affinity with the Greek ToiXaoca. Such geographical designations (names), which reveal an Indo-European root, are not infrequently encountered in Java.

3) Geological description van Java cn Madura, p. 246 u. 247.

)

Ngebel a spring with hot water, the sulfur

also mentions a warm well west of Ngebel deep at the foot of the Wilis Mountains, called Umbul, whose water is rather rich in carbonic acid and contains hydrogen sulfide. The whole configuration of the upper part of the Wilis seems to indicate that this fire mountain was formerly either a double volcano, the two collapsed craters of which would probably fall into an axis running from WNW to ESE,

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Selenka-Trinu expedition.

Plate VIII.

Fig. 1. View of part of the K'lut volcano after the last eruption. vegetation through the ashes moistened by the rain.

Fig. 2. A lahar stream from the K'lut volcano.

(Both pictures after photographs by 0. Kurkdjian, Surabaja)

Wilhelm Engelmann's publishing house in Leipzig.

Destruction of the forest

A detailed description of the craters 1

On the geology of Java, especially the excavation area.

17th

On the ruins of this gigantic original main crater, new craters would have formed, the walls of which also collapsed. Verbeek gives of the 4 old ones to the eastLooking at the upper part of the Wilis from the village of Pudak in the Ngebel region, the thought that the Wilis used to be a double volcano whose eastern crater has probably collapsed comes to mind. The base of this latter consists of older andesite rocks and andesite tuffs, as well as that of the western former main crater, which is now to be discussed, in the western debris field of which the small volcano Ngebel (made of Hornblende andesite) with its lake later built up. Judging by its preserved edges, the latter main crater must now have had a diameter of more than one geographical mile. It was this giant crater which, as a result of the most magnificent eruptions, allowed its lahar material to reach the Trinil area. Given the importance of the question of whether the animals at Trinil, the remains of which we dug up, perished in running water or in a mud-tuff stream, I have to go into these circumstances in detail here.

The Telaga Ngebel crater takes up very little space in this large crater. A large part of the walls of the latter is still preserved; only the western rim of the crater is wide open. The northern crater wall is largely formed by the 1553 m high Manjutan; the southern and eastern walls but by a long ridge. The latter begins in the south of the old crater with the better, continues east to Batur-soko, and from here gradually merging in a more northerly direction, it stretches over the Djeding summit to Patak benteng, and then, an im assuming the entire north-northeast direction to end in the mountain ridge called Kemangang. Although the old pintuck crater now appears to be wide open to the west, considering the current orographic conditions, I do not consider it to be ruled out that the enormous lahar flow, which supplied the material of the main bone layer of Trinil and the conglomerates underneath it as far as Trinil, erupted through the gap in the north-northeast wall of the large crater, which lies between the eastern foothills of the Manjutan and the north of the Kemangan and is still traversed by a brook coming from the inside of the old crater. If so, then has

the aforementioned huge lahar flow turned first to NNE, then to NNW and then to NW.

On the road leading from the town of Madiun in a south-easterly direction to the village of Dungus, I later found this colossal broad lahar flow, which there in its main direction already faces the area of ​​Trinil. From a geological point of view, this huge lahar flow strikes me as most remarkable.

Behind Paal2 5 on the road to Dungus you can see it on both sides)

suddenly there are huge, more or less rounded andesite blocks. This phenomenon had already struck the Europeans and the more intelligent natives there, since otherwise such mighty boulders are completely absent at this distance from the Wilis, with the exception of a stretch at the northern foot of it, and so I heard about it from the gentleman who was familiar with the area at the eastern foot of the Wilis van Berenstyn in Madiun. During a joint inspection on the spot, I found that these block

1) Verbeek, Geologische Beschryving van Java en Madura, Vol. I, p. 167 u. 168.

2) One Java Paal is 1507 m; this distance is usually indicated by a numbered post on the main roads.

to which I refer here.

Anyone from an elevated point near the approximately 15 km southeast of the crater lake

Selenka-Trinil expedition.

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18th

E. Carthaus,

—2 m wide strips of terrain occur, which

large accumulations in a l 1

pointing in a south-easterly direction to the northern edge of the giant crater discussed above in the area of ​​the small Ngebel volcano. A small avenge, the Kali Maron, which falls a little north of Madiun into the already mentioned Madiun river, runs through this Rlock field in a valley that is not very deep. While its lower slope and the vengeance bed consists mainly of finer volcanic material, ash and sand, the upper valley slope appears to be composed of a peculiar, also thoroughly volcanic conglomerate. In this, ash and lapilli form the more or less solid bark material, otherwise it consists of mostly rounded, but never sharp-edged, rather rubble-like pieces of andesite (different in crystallization, structure and composition). From head size to content of several cubic meters, the andesite pieces are jumbled together. It struck me immediately that the largest of these cloisters are predominantly at the highest points on the deposition road of the mud-tuff stream; as if they had pushed themselves over the smaller ones as a result of side pressure. Such pressure on the side must have arisen from the damming of the river. In this way, enormous accumulations of large andesite blocks were formed, which at various points make up hill-tops protruding to the northwest or west. These acquire an appearance somewhat reminiscent of terminal moraines of glaciers as soon as the ash cementing the conglomerate and the lapillaries are weathered and washed away by rain. You can watch the mandas very nicely, and then in a south-easterly direction from Madiun via Kanigoro to Sumbul. About 200 m behind the village of Rantengan, the path leads up a hill head reminiscent of terminal moraines. Here it is a stretch on both sides as if it were sown with mighty boulders. The conglomerate, which has not yet been weathered, appears on the road itself at individual points. All these hill-tops protruding to the northwest and west in the terrain are fairly flat towards the slopes of the Wilis; sometimes even sloping gently in this direction at first (damming)./ ^

An extremely interesting phenomenon, which I was able to observe in many places in the Rlockfelde, which extends towards the Wilis, gave me the idea that one is dealing with a very huge one, from the former giant crater in the wider area of ​​the Telaga-Ngebel. going lahar currents must have to do and that the said hill tops were most likely caused by the damming of the lahar currents loaded with particularly large blocks in the relevant places:

On very many andesite blocks you can see, for the most part, parallel friction furrows and scratches, more or less similar to glacier cuts; and mostly only on one, but sometimes also on several sides of the boulder at the same time. At the same time, very many of the latter have adopted a sloping structure, thus losing the usual massive volcanic rocks. Strangely enough, however, this schisty structure very often does not go through the whole block, but is limited to a more or less thick zone on its outside. It should be noted here that it is precisely the andesite blocks, which have been scratched and appear to have slabs on their surface, a noticeable tendency to break into numerous irregular, polygonal or rounded pieces. This circumstance seems to indicate to me that the skirts were carried away by the mud tuff stream, still glowing, and so in this, due to thrust and pressure, they could partly assume a schisty structure, but partly due to different temperature and tension in their soon

fast, soon slower movement in which streams were more or less cracked. In general

a gradient of about 1:20 2

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On the geology of Java, especially the excavation area.

19th

mine show only the larger blocks with sharp incisions, while this is missing in smaller, more rubble-like pieces or runs in slightly flatter grooves.

Taken together, these observations led me to the conclusion that all the large, small, and even the smallest pieces of rock must have been carried at least 10-15 km to their present-day sites by a lahar flow, which is enormous beyond all familiar terms; namely through a stream which originated from the mentioned old giant crater with a diameter of 8 km on the west side of the Wilis and in its lower course (where it is lost among younger volcanic ejecta) points straight to the area of ​​Trinil-Ngawi. There it dammed up in front of the marine deposits of the Kendeng Mountains at its southern foot and reached its end.

Let us assume that the water level of the lake, which I once considered the filling of the interior

think quite well that through strongly flowing water, filled through and through with a pulp of ash, in which countless volcanic bombs are driven, such '

mighty boulders were dragged from the said Wilis crater to the city of Madiun. Meanwhile from here to Trinil there is still a good 25 km in a straight direction; on this stretch, when that colossal lahar flow streamed down to the valley, there could have been no noticeable gradient. And yet the conglomerate from Trinil, which lies under the main bone layer, must have come from Wilis in a lahar stream. This transport can therefore only have taken place in an extensive, somewhat deeper river bed.

If larger masses of rubble and boulders are carried away quite far into the plains by broad and deep rivers which come from the mountains into the plains, then this would result in such a large amount of andesite blocks being carried over as they are in the conglomerate Occurring at Trinil, would not have been possible without a mud tuff stream. In one of these, the material carried often had to jam. With the violent breakthrough, as a result of the simultaneous accumulation of water, individual larger boulders could very well be swept away a considerable distance into the plain. Because this process was repeated in different places, the few large andesite blocks that were found in the conglomerate near Trinil could even be carried over the plain by the mud tuff stream. We also see this phenomenon in the lahar currents of the K'lut.Unfortunately, the gigantic lahar flow discussed here is completely hidden from view over the entire space between the above-mentioned village of Bantengan (not far from Madiun) and the banks of the Solo River near Trinil, as it is several meters thick of younger volcanic ash and lapilli layers , here and there probably also clay smiting, is covered. There is, however, some evidence that my assumption discussed above is correct.

1) Such extensive crater lakes can still be found on various islands of the archipelago today. I just want to remind you of the wonderfully beautiful lake of Manindju (on Sumatra's west coast), which is located in the crater of the Danau volcano and is 16.6 km long and 8 km wide. The surface of the volcanic lake is 459 m above sea level. Perhaps the large Tengger crater in East Java, which is so popular with tourists, inside of which the Bromo and other small volcanoes rise (see Plate IX), was once filled with such a crater lake and flowed to the north.

2) The city of Madiun is in a straight line about 15 km from the southern edge of that giant volcano and is about 65 m above sea level.

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was roughly on the same level as that of the

would like to assume that giant crater 1

Today's much smaller mountain lake of Ngebel, namely at about 800 m, then you can

20th

E. Carthaus,

Also the fact that in the conglomerate of Trinil lying under the main bone layer the lighter pumice stone is mixed between the specifically much heavier solid andesite pieces (rolls, bombs), that it does not occur in layers or mainly in its upper parts, suggests that a mud-tuff stream, not a river carrying only water and some detritus, which carried the material of the conglomerate from Wilis to Trinile. The fact that water was also active at the same time shows less the rare occurrence of wood and bone remains in this conglomerate than the occurrence of freshwater conchylia, which has been observed once or twice.

One could also put forward the hypothesis that all of the volcanic material thrown out by the Wilis fell in the form of a rain of ash and bombs into a Bawah swamp near Trinil, so that the conglomerate would then have formed underwater here. On the other hand, strong ones seem to me

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<ilNl \* ^ «l

Fig. 2.

Stepping out of the Lahar conglomerate in the Solo River when the water level was low in September 1907 at Batu gadja, 16 minutes north above Trinil.

There are concerns: If it were the case, then the pumice stone, because it floats in the water, would on the whole be higher than the much heavier volcanic bombs. Formal pumice layers would probably have formed. Also between the conglomerates there would have to be clay pits with numerous conchylic bowls from time to time. The surface of the whole layer of conglomerate would be even and not form hills; at most a few powerful bombs would protrude from the surface. In fact (see profile 1) the surface of the conglomerate, which by the way also varies greatly in thickness, rises to such small conglomerates

1) The shells of freshwater conchylia are not to be found in the higher lying soft conglomerates north of the conglomerate ridge a (profile 1 on panel VI), nor are there any remains of wood. Remnants of bone seem to be completely absent there.

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^ '• Si ^^ fejGP

f + ej ^ \*\*\*\*

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On the geology of Java, especially the excavation area.

21st

Hills, which corresponds very well with the conglomerate resp. Block mounds') of the large mud-tuff stream that is exposed in the southeast of the city of Madiun with its surface. I attach to this the observation that just before the conglomerate uplifts directly on the river near Trinil various larger andesite blocks were found, some of which had to be removed when the profiles were uncovered.

Since the mud-tuff stream at Trinil, which has supplied the conglomerate under the main bone layer, is covered in its lower course by younger deposits of several meters in thickness, nothing can be said about its width, nor about any ramifications of it.

I want to mention here that Junghuhn2

for more than half a century has drawn attention to the lahar currents at the northern foot of the Wilis, between the current railway stations (the post office at that time) Tjaruban and Wilangan (located in the saddle between Wilis and Pandan), although, in my opinion, he was the scratching of the large andesite blocks did not correctly interpret.Verbeek and Fennema do not mention the strange phenomenon described here in their geological description of Java.

So in the Trinil conglomerate discussed here we have before us the products of the first eruption of enormous mud tuff streams from the aforementioned pintuck crater on the western Wilis, which is probably filled with an extensive lake.

The overlying main bone layer, on the other hand, was formed from loose volcanic material, mainly ash and lapilli, which in the further course of the eruption reached the deposition site, near Trinil, either through the same bed as the mud-tuff stream before, or another as a result of Dams caused by 3

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A real discordance of the layers overlaying or underlaying the conglomerate layers (6 of our ideal profile), as previously described by Prof. Dubois et al. a. assumed does not exist according to my observations. I can only imagine that this erroneous view arose from the above-mentioned local swelling of the conglomerate layer to form small mounds (as in a of profile 1), between which the main bone layer and the layers overlying it then settle in more or less horizontal positions. Where such hillocks are not present, however, the conglomerate layer is pushed in completely concordantly between the main bone layer above it and the freshwater deposit of black-blue clay (5 in profile 1) below it.

As for the latter, it is possible that it is locally very thick, contains gypsum here and there, and passes over into the marine formations to be discussed below through clay marl and clay sandstone.

The freshwater nature of these clays (5 and 7) is clearly marked by individual bests of freshwater conchylia.

1) A small conglomerate mound evidently also constitutes the "Batu gadja", i.e. Elephant stones, known abruptly from the Solo River, represent block conglomerate rocks, which are located a few hundred meters upstream from Trinil and are characterized by larger andesite inclusions from the average conglomerate (see Fig. 2 on p. 20).

2) Young chicken, Java, its shape, plant cover and internal structure, translated by J. K. Haßkarl, 2nd edition, Leipzig 1857, p. 377.

3) With regard to this almost fine-grained ejecta material, which was only taken later from the mountain slope and fed to the lahar stream through smaller watercourses, I would like to remind you of what was said in the discussion of the lahar phenomena of the K'lut volcano,

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the father of the geology of Java, before

22nd

E. Carthaus,

Let us now turn to the banks of the Bengawan Solo in the north of Trinil. There, a few hundred meters upstream, the middle part of our ideal profile 1 was partly exposed, partly it was made more visible by a rather superficial cut. As you can see in the profile, this is a stretch of the mountain range with its layered structure disturbed. The main bone layer, which is mostly only thin here, can be seen as the guiding horizon further north, which consists of exactly the same volcanic material as at the excavation sites (pits I and II) near Trinil. Here, too, she is not poor in bone debris, as u. a. has also shown in a prospect carried out at the instigation of Prof. Volz (see profile 1). For the terrain of profile 1 at this prospect it should be noted that there is also in a higher position (than layer 15) "conglomerate" instead of the middle and higher trinil layers otherwise formed under water. In contrast to the latter, these brittle conglomerates and tuffs (14-15) are formed on solid land without water cover.

I believe, as I said, that the main bone layer (8) to the north of the conglomerate ridge o can also be seen as a good guide horizon, although here there is a blue-black clay layer (7) up to almost 1 m thick between it and the lower conglomerate layer (6 ) inserts. On the whole it is not exactly easy to get a correct picture of the stratification in the north of the conglomerate hill a with the stratification fault of the mountain range to be followed for a short distance.

Below the lower conglomerate you can see at one point on the right bank of the river, not far

below the mentioned Batu gadja (Fig. 2 on p. 20), again the blue-black tone (5) lie 1

a hundred meters further upstream, where the strata begin to dip flat to the south (below 8-15 °), this clay (5) reappears under the conglomerate. But here, where it comes into much more contact with the atmospheric air, it has completely bleached and turned gray to white-gray due to the destruction of the coloring organic matter.Now clayey sandstones and sandy clays (4) follow in concordant storage beneath the clay to the north, probably consisting mainly of volcanic material (tuff), in which petrefacts seem to be completely absent.

Further to the north, these flat layers, which are certainly 20 m thick, are underlain by white and gray, as well as yellowish clay and clay marl (1), the latter of which contains unrecognizable shell remains here and there. A sting of a sea urchin found in it, as well as the remains of the bivalve veins, which can certainly not be identified, reveal the marine origin of this layer clearly enough.

Below this is a solid layer of limestone (2) over 2 m thick, but wedging in places, with fragments of coral and the best of marine mollusks. More recognizable marine fossils contain the said marls with the coral layer lying between them on the left bank of the river, the

1) The sound is only visible here when the water level of the river is very low in a small mountain saddle. 2} Just in the sharp bend the river makes here, and a little further upstream.

I also seem to have no doubt that the

nearby hamlet Pongkol opposite 2

Clay marl (1) in the north of the hamlet of Padas malang, which occur on the right and left bank of the river and also here under- and overlay the coral bank, are of the same age as the ones just discussed. Especially on the left bank near Padas malang, the clay marl, if one can call it that here in the unweathered condition, is extraordinarily rich in fossils. Where the river bed is covered by water at the edge of the river bed at normal water level, it succeeded

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Some

On the geology of Java, especially the excavation area.

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In a short time, when the latter was very low, he was able to collect a large number of mollusks with a few workers that were so beautifully preserved (at least while they were being excavated) that one could have believed that they were dealing with recent sea shells. This youthful post-tertiary impression was reinforced for me by the extraordinary resemblance of the individual forms to those of my collections near the Javanese coast and on various islands in the Malay archipelago of the memory of living sea conchylia known to me, which of course in Trinil Comparison were no longer available. The material in which these beautiful mollusc remains are embedded is, in my opinion, mainly of volcanic origin. The chlorite-like granules contained in the same in such abundance are probably due to decomposing augites or horn bladders. In most places the unweathered layer appears bluish-gray due to organic matter, but sometimes more greenish in color due to the said green granules. It seems to me that the gray and yellowish clay marls that can be seen above and below the coral layer in the previously mentioned areas have emerged from this material through weathering above the level of the river.

A glance at photograph 1 on panel VII shows that these apparently quite young strata have suffered disturbances. The strata that dips to the right, eastern side of the profile represent an irregular alternation of sandstones, clay sandstones, marls and clays in the case of less severe weathering, the already mentioned sequence of layers of clays and clayey sandstones, which lies above the coral layer in the north of Trinil (4 in profile 1) and mediates the transition from the freshwater layers to the marine layers. The deepest layer I in the picture, a solid gray tone, includes shells of very small marine molluscs throughout, which perhaps represent so-called miserable forms, arose during the gradual

Closure of the Madiun Gulf from the ocean. In addition, the lack of fossils in the higher strata is not surprising, if one considers that their formation falls at the time when the Madiun plain was closed off by the sea and the sea cover was either a freshwater lake or a lake. Bawah swamps made way or disappeared completely or in places due to drying out. In the latter case, small deposits of salt could easily have formed in addition to plaster of paris; and that really seems to have been the case, because a few kilometers northeast of Trinil there is a hamlet which is called Banju-asin, i.e. H. Salt water or salt wells, and there is also said to be a brine spring at Glaman.Older layers than the previously discussed, conchylic clay resp. I have not been able to observe limestone marl in the area from Trinil to the Kendeng Mountains. I therefore conclude here the description of the profile of the trinile layers.

It only remains for me to mention that both at the probe and opposite the hamlet of Pongkol on the left bank of the river above the clay marl, which is 2-3 m thick overlying the coral layer, I have a loose layer consisting only of andesite pebbles (up to the size of a fist) found about whose age, however, I am uncertain. I have drawn the ideal profile of the strata of Trinil on this one, but I believe that the stratum represents a fairly recent formation of the riverbanks, formed during floods. Opposite Pongkol there was an almost 1 m long fragment of an elephant resp. Stegodont tusk.

With regard to the fossils contained in the marine strata in the vicinity of Trinil, I myself was unable to identify the numerous different species, since I lack the necessary literature on Java as well as all comparative material. Prof. Martin

in Leiden had the kindness to send him a collection of those at Sonde and at

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E. Carthaus,

To have Padas malang determined by Prof. Martin from the clay marl and the remains of conchylia excavated under the coral layer in my presence. The result of this investigation, at least as far as the gastropods are concerned, is available as a special treatise appended to this work, to which I hereby refer.

To explain this, I would like to say that the small village of Sonde, as can also be seen on the map of the area around Trinil (panel VI), is located approximately one geographical mile west of Padas (= Wadas) malang. At that place there is a clay marl similar to that of Padas malang on the right bank of the Solo River. In earlier years (VERBEEK collection) a great number of mollusc remains were collected from it, among which Prof. Martin alone could identify 123 gastropod species. Among these are, as Martin says, 67 species still alive today, i. i. plenty of 54 ^ ", of which 15 species are only represented in extinct varieties. Martin now also finds the more recent finds, as he already discussed in more detail in 1908 \*), to confirm his earlier conclusion that the layers of the probe and padas malang are not older than Pliocene, but he leaves it open whether they are older or younger Pliocene

belong. Elbert regards the above-mentioned strata in Sonde as the lower Pliocene, while upper-pliocene tuffs and conglomerate breccias are said to occur in the lying area of ​​the Kendeng strata. Elbert's determination of age seems to me incorrect; I fully agree with what Prof. Martin says to justify his claim that the layers of probe discussed are relatively young. If you yourself have seen the remains of the conchylia of Padas malang, how they were pulled out of the earth or the marl with such wonderfully preserved colors and even the shine of the shells, then you can hardly imagine that they were further back Ancient Pliocene times were embedded in their place of discovery. If I did not allow myself to be guided by the very precise species determinations carried out in Leiden, I would still consider them to be younger than Pliocene even today.

On this occasion I would like to repeat again emphatically what Martin has already emphasized in support of his assertion about the low age of the probe layers, namely that the marine conchylic fauna of the tropics is still far too incompletely known to easily recognize still young species or varieties to be able to represent it as extinct, provided that there is no identical one that is still alive

it is mostly a matter of minute differences and series of variations.

In doing so, Professor Martin says that he used the concept of species narrowly in all determinations. Regarding the remains of the bivalve veins found near Padas malang on the left bank of the river

What caught the eye was the fact that most of the bowls were still completely or almost completely closed at their place of discovery or only slightly pushed apart to the side. This is seldom the case with bivalve shells of the kind usually found on the beach, not even with the shells of dead mussels found in the sea itself. Rather, this is only found in those who are pulled out of the water with their living inhabitants at the same time or who are still alive in the sea1) Martin, K., The age of the layers of Sonde "and Trinil on Java. Koninklijke Akademie van Wetenschappen te Amsterdam, 1908, p. 7-16.

2) Following on from this, I would like to mention that my old teacher, Prof. F. von Sandberger, perhaps among a larger collection of sea and brackish water conchylia that I had collected during my first stay in Dutch India in 1888 and 1889 discovered a dozen new species, which, however, have not yet been described.

2 species has become known so far).

When determining such semi-fossil shells, it is impossible "to use every single recently described species for (direct) comparison," where

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quickly buried under a thick layer of clay or sand so that the shell-dweller is unable to work his way out of it. Now that the material in which the shell remains are

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the whole marine fauna, of which we have the remains at Padas malang before us, have destroyed with one blow. The fact that volcanic forces played their part in the immediate vicinity is also shown by the multiple stratification disturbances within the Quaternary deposits, for example at Padas malang (see photograph 1 on panel VII) and at Gendingan, 5-6 km north

the Walikukun Railway Station.

Martin (1. c. P. 13) also emphasizes that the marine Pliocene clay marls, which are the oldest

Depicting sediments of the profile I designed, including those of Padas malang, must have formed in shallow water in the immediate vicinity of the land and that they ended up in the immediate vicinity of a river mouth. I can only agree with that. But when Martin adds that this river was probably only the Solo river, I would like to raise reservations about it.

Not only in my opinion based on geological and orographic conditions, but also in accordance with old Javanese tradition, the Bengawan solo used to have a different course. The one large loop of the river in the north, respectively. Northwest of Trinil, in the northwesternmost part of which is the mollusc site of Padas malang, did not exist before. The landowner Lucas, an Englishman who is well acquainted with the country and its people, tells me the further course of the old river in the north, resp. Northeast of Trinil on request in a letter as follows:> From the Glaman salt spring it runs nearly parallel with existing river through the Kendeng-hills along Kali Gede, Gounong Rambet and joins the (present) Solo river below Ngawi (Kali Kankoung at Sogoro Ouroung ) ... I imagine this change in course of the river can hardly be called prehistoric. The native legends ascribe it to the same period as that of a dynasty, that was settled at Djojorojo on the Lawou but whether such a dynasty ever existed except in the mystic sagas of the Wayang I do'nt know, at all events, it seems to have taken place since Java was inhabited by semi civilized people, otherwise tradition would make no mention of the change1). "

On the whole, it seems to me that the Solo River, emerging from the above-mentioned narrow passage between the plains of Solo (Surakarta) and that of Madiun, flowed closer to the foot of the Lawu, in a much straighter course than now he looks for his way in strange turns through the piled up ash material of the Wilis and Lawu to his outflow gate from the plain of Madiun near Ngawi.

I would like to believe that it was only streams descending from the very close Kendeng Hills to which the occurrence of fluvial mollusc forms in the clay marls of Padas malang and Sonde can be ascribed. It should be remembered that corals can also be found in the clam-rich clay marls of Padas malang and that these are directly overlaid by a coral bank. Corals, however, avoid the proximity of large estuaries. Also, the earthy, sandy material in which the mollusc fauna of Padas malang is buried on the left bank of the river bears no resemblance to river mud at high water levels, so that the sudden destruction of the marine fauna of Padas malang is hardly brought about by massive, rapid alluvial water can be. What

1) Wayang is an old national Javanese shadow play, which dates back to Hindu times, with partially moving figures, based on stereotypical texts, mostly still borrowed from the Kawi language. - The dynasty mentioned by Mr. Lucas, if I am not mistaken (on one or two seats), actually existed in the 13th or 14th century AD on the Lawu.seems to me almost entirely volcanic, I would like to assume that volcanic events be it in the form of ash rain, lahar currents or tidal waves laden with sand and ash as a result

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from earth resp. Seaquake

Selenka-Trinil expedition.

4th

26 E. Carthaus,

In addition to the primarily volcanic material of the above-mentioned deposit, however, I also think that volcanic events probably caused the sudden destruction of the marine fauna of Padas malang, is the fact that the coral bank between the layers mentioned appears to be shaken up ; just like the one opposite the hamlet of Pongkol and the one a little further down the river above Trinil, so that large coherent coral stocks cannot be found in it.

The organic inclusions of the coral bank itself seemed to me, which determines the species -

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How careful one generally has to be in determining the age of layers solely on the basis of the foraminifera such as z. In the Malay archipelago, for example, num- mulites have been identified, where recent species such as Nummulites Niasi have been found from the num- mulites that were previously regarded as exclusively tertiary.

Clays and clayey sandstones lie above the petrefact-rich clay marls just discussed. It is not surprising if there are no fossils in them, for they were deposited at a time when the Madiun plain was closed off from the ocean and more and more sweetened, which inevitably caused the marine fauna to perish relatively quickly.

In the blue clay layer, under which the main bone layer underlying mud tuff

Conglomerates, melania, paludines and best of anvpullaria have already been found, proof that there are;

at the time this layer was formed at Trinil there were already accumulations of fresh water.

In the conglomerate itself, which, as I have said, already reveals that there is no formation of a river by the colorful mixture of its lighter and heavier components, the best of freshwater conchylia were found, albeit rarely and only at the upper and lower interfaces. At Trinil, however, these were only found in those places (pit I on the right bank of the river) where the conglomerate takes on a more clayey, crumbly texture, turns into an almost black color and

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The main bone layer, on the other hand, is characterized by intact animal bones that lack traces of abrasion on stones in running water. But they can be transported quite a long way in a muddy tuff stream, and indeed all the material that makes up the main bone layer corresponds to such an assumption.

1) Cf. the later treatise by J. Felix: "The fossil anthozoa from the vicinity of Trinil."

2) The foraminifera and sea urchins are from Dr. v. Staff, Berlin, specifically checked.

3) Often the conglomerate appears through more or less extensive decomposition of the iron silicate (Augit

or hornblende) of the andesites greenish or reddish in color. In other places it takes on a more light color due to the strong prominence of whitish pumice and lapillis.

meets, according to a cursory investigation, to be the same or very similar to the recent ones1). Between the coral fragments there are spondylus and ostrea, but also other lamellar branchiate and gastropod shells; also have colonies of Clypeastriden with their shells, respectively. the fragments of which, the coral bank in some places so filled that it forms a true clypeastrid breccia here. In other places, on closer inspection, one finds the layer enormously rich in tiny foraminifera 2 that externally resemble nummulites

large andesite inclusions are almost completely absent 3

Speaking of the assumption communicated, it is now that in the conglomerate layer there were probably remains of bones, but almost exclusively only fragments of such. At their ends, they do not show the typical unrolling of bone fragments, as one usually sees in river beds.

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Noteworthy and for mine above

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On the geology of Java, especially the excavation area.

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An assessor who involuntarily became competent in the matter, Mr. Berkhout, administrator on a coffee plantation on the K'lut, who got into such a lahar sand flow during the last eruption of the aforementioned volcano and was driven a considerable distance away from it, told me, that he had not suffered any hard knocks from the rocks in the lukewarm sand pulp. As far as he was still conscious, it seemed to him that he had drifted downstream in a very thick paste.As already said above, these lahar sand flows are not to be confused with the lahar conglomerate flows. The former only appear some time after the main eruption and the emptying of the crater lakes and persist for days, weeks, even months. They obtain their sandy ash material through many small side runs from a larger part of the ash field on the volcanic slope. This also explains why they are so rich in bone fragments in a certain part of their course where they just have the opportunity to break away. Junghuhn (Java p. 707 ff.) Very vividly describes the nature and the devastation of these mud tuff streams (also p. 493 ff.), Which of course show the various stages of the

Have consistency and often smell of sulfur. I only quote the following passage:

“The great navigable river of Kediri, Kali Brantas, which, because it flows in a semicircle around the foot of the mountain, absorbs all the streams that flow down from the K'lut, swelled that same night, from the 16th to the 17th May, so immensely and rolled away with it such an enormous amount of uprooted or broken tree trunks together with dead buffalo, wild bulls (Bantengs), monkeys, turtles, crocodiles, that the great bridge over Kediri, the largest on the island of Java, rolled under the force of all these masses, which the raging current drove against them, soon succumbed and was completely destroyed. A multitude of fish either floated dead on the surface of the water or were stunned enough to be grasped with the hands. The water was completely black from the added mud, lukewarm and stank

for hydrogen sulfide gas.

The river from Kediri began at Modjokerto (Djapan, in the possession of Surabaja)

up to then covered a curved course of nearly fifteen geographical miles, although the straight line distance between the two places is only eight miles, not swelling until the following afternoon, and reached its highest level at seven o'clock in the evening, at which time the current was extraordinary was raging. The water was black as pale ink, and yielded 25% fine, fat heel, which evaporated as a very fine vul-

Kanische ash, which was mixed with pumice stones. In a delta arm of the same, the Kali Gempol, on the border of Surabaja and Pasuruan, in the night of the 17th to the 18th, besides other wild animals, a tiger and eight human corpses also drove down.

One should remember, therefore, that according to the young chicken, the water of the Kali Brantas, after having covered almost 15 geographical miles from the K'lut, was black as pale ink and contained 25% of a fine fat heel which turned out to be a very fine one volcanic ash mixed with pumice stones. Wouldn't it be possible to find an explanation for the formation of the bluish-black pitches and tone smits in it? If I nevertheless looked at them above for a paragraph in a swamp lake, a Bawah, it was because so many intact freshwater conchylic shells and numerous impressions of whole leaves lie in these clays.

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E. Carthaus,

I believe that the extensive descriptions of the young fowl are well suited to explain the abundant occurrence of animal bones and pieces of wood in the main bone layer of Trinil. The layers above the main bone layer, probably even beyond the so-called lahar sandstone, must also be regarded as lahar formations, perhaps with the exception of the clay smiths in between. If you consider that the giant crater of the Wilis had a diameter of about 8 km and assumes that it contained a crater lake which was somewhat corresponding to its gigantic dimensions, then one can easily imagine that when it suddenly emptied through eruptions, mud tuff flows had to arise, of the extent and weight of which we can hardly get a correct idea. I would even like to believe that the Wilis lahar streams were still very broad at Trinil and that enormous masses of lahar may still be found in the subsurface beyond this place.

The irregular wedging and swelling of the layers at Trinil can be explained as follows: Lahar currents coming from the Wilis poured into a Rawah, a swamp lake, the northern edge of which was close to today's Trinil. This edge, formed by lahar material, occasionally suffered breakthroughs, so that at times stronger currents had to develop in the interior of the swamp. In the same way, torrents that came from the nearby solid land in the north can have had a transformative influence on the trinile layers deposited and deposited here. At one point in fraction I, a former vortex was even clearly shown in the layer structure. One could think of deposits in an ordinary river bed at a point where it makes a sharp bend. If, however, one were dealing with a real river, real quartz sand and real river pebbles would have been found somewhere at the rather extensive excavation sites. But even for quartz sand, apart from the current bed of the Bengawan Solo (Solo River), I have looked in vain in the whole area around Trinil.Incidentally, the shells of freshwater molluscs found in the main bone layer also indicate stagnant or at least predominantly stagnant water, as it is, of course, also found in smaller pools on river banks. Umo species, of which numerous shells have been found, appear in some species at river banks where the water moves very slowly due to damming. The same is true, though to a lesser extent, of smaller species of Melania. In the Malay archipelago, I have only ever found paludines and ampoule arias in completely still water, in pools, swamps and on rice fields that have been under water for a long time.

The bones of the main bone layer reveal two remarkable phenomena: First, there are no traces of prolonged transport on them; second, there are no connected skeletons. So it is hardly to be assumed that whole, still connected carcasses with the Lahar-

1) The same applies to the bone remnants, which were found occasionally in the deposits above the main bone layer.

currents have been carried into the main bone layer1

Draw the conclusion that the lahar current, which carried the material to the main bone layer, carried with it more or less decayed animal corpses, which disintegrated due to the low friction in it, or only isolated, partially connected skeletal parts. After that, a number of days, weeks or even months must have passed after the animals in question were killed by the first violent eruption before they entered the lahar stream

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On the geology of Java, especially the excavation area.

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got into it. So long after the main eruption and the emptying of the crater lake, the lake flows much more calmly and gently, and because the water in it is still filled through and through with ash, lapilli and pumice in a colorful mixture, i.e. with on average very soft rock material is, the bones, even if they are carried along a long distance by such a pulpy stream, do not suffer any noticeable abrasion, but splintering only occurs when they happen to get between larger pieces of solid andesite. In a river with only water and solid debris, on the other hand, further transport of the bones without abrasion is only possible under very special circumstances and only for a small part of the bones, if larger quantities of them get into the river

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As to the degree of fossilization, the same in the animal bones lying in the main bone layer, as well as the wood remains, is different, and this not because of the different geological ages of the bones, but rather because of the different nature of the organic remains enveloping lahar material. Even more than the mechanical, the chemical nature of the same plays a major role here.

First of all, it should be emphasized that freshly fallen volcanic ashes, like me, both on

Sumatra 2

)

as well as Java 3

)

observed or chemically demonstrated that a considerable

1) Unfortunately, a catastrophe that occurred in East Java in the last days of August 1909 not far from the eastern foot of the mighty S'meru volcano and in which over half a thousand people lost their lives provided a great illustration of what I said about lahar streams. In this case it is not a laharsl current, which originated in a crater lake that was suddenly emptied by an eruption, but a huge mud-tuff current, which in the case of an enormous rainfall (up to 350 mm in one day) in the upper one Region of the aforementioned mountain of fire, which continuously spewed ash, lapilli, pumice and volcanic bombs, was formed by damming this ejecta material in a river or lahar bed. The force of the mud-tuff flow must have been terrible beyond description when the dam formed by that damming broke through. Entire villages and all of their inhabitants were washed away and most of them were immediately buried under the mud tuff. Solid stone bridges were also torn away, railroad tracks dragged along long distances through the river, and not on the slopes of the mountains, but where a fertile plain spreads out at the eastern foot of the S'meru.If one now thinks that in that devastating lahar stream, with the help of all the small water channels flowing towards it, volcanic material from a fairly large area had accumulated on the hillside, it becomes understandable that with this stream many pieces of wood and animal bones, namely deer antlers, were carried away apart from those bones that come from the animals and people who died in it. I emphasize this because a disproportionate amount of deer antlers were found between the remains of the bones of Trinil. In the higher mountain regions, as in Java in general, between the stunted wood and the savannah grass, where they remain undisturbed, there are extremely numerous deer. As with us, these shed their antlers every year when the monsoons change. At the lower ends of most of the antlers found near Trinil one can now clearly see that they had already been thrown from their bearers when they were dragged to their place of discovery with the mud tuff stream. The antlers are not thrown off on the water, but mostly in the forest and in the undergrowth (as one can also read in Riesenthal and in other books on hunting and forest zoology), so that the antlers found at Trinil are only caused by lahar currents or by running water alone from wooded terrain or from the savannah to their place of discovery. I think less of a transport by water alone because it shows no traces of unwinding. I would like to mention here that the fact that a complete animal skeleton (and not even of aquatic animals) was ever found in Trinil, but only bits and pieces jumbled together or only bone fragments, leads me to believe that the animals, which have made a contribution to the bone finds of Trinil before they resp. the remains of which leached at their place of discovery, had long since died and the bond between the individual parts of the skeleton was either completely broken or at least loosened so that they reached their place of discovery separately from one another. Certainly crocodiles, of which many, but it should be noted, skeletal parts (especially teeth) were excavated, may have previously dismembered this or that skeleton from which bones were excavated.

2) On the double or triple volcano Tandikat-Kantjeh-Singalang in 1889. 3) On Bromo in different years.

30th

E. Carthaus,

Lent amount of easily soluble silica or silicic acid compounds that dissolve in the water coming from the atmosphere, mostly probably containing carbonic acid. This explains the started silification of individual wood and bone residues in the main bone layer. In addition, one could observe how the fossilization was already more advanced in these areas, where small pebble crystals appeared in large numbers. This can be explained with regard to the easy decomposition, especially of rhombic pebbles (marcasite), and the resulting formation of sulphurous or sulfuric acid. In other parts of the main bone layer, most often where it shows lighter colors and is poorer in very finely divided ash material, the bones, but especially the wood, appear much less fossilized or changed, so that they appeared to me as young as pieces of wood my collection, the Roman bridges and Roman pile resp. From boardwalks - In the parts of the main bone layer that are so rich in pebbles, the more or less extensive charring is to be regarded quite decidedly as a sulfuric acid char which can be brought about in a very short time with concentrated sulfuric acid. Likewise, the remains of bones were undoubtedly fossilized much more quickly than without them by the action, albeit of rather dilute sulphurous or sulfuric acid. Even the young chicken noticed in a report on the lahar currents of the K'lut that the water contained in them was acidic. Sulphurous or sulfuric acid seems to be found very frequently in such streams, which, as Junghuhn relates (p. 710), occasionally caused European newspapers to write after the eruption of the Kawah Idjen in 1817: “The forests were wide and wide Doused with sulfuric acid, which corroded and destroyed everything «.If one also takes into account the fact that fossilization proceeds extremely quickly, especially in humid tropical regions, then one must admit that in our case the higher or lower degree of the same is absolutely no measure of the greater age of wood and wood Gives off bone remnants. It is precisely the least fossilized of these best that are much more likely to be used as a measure of their real age. I saw remains of wood from an undoubtedly Chinese junk which had been excavated in the alluvium of Surabaja, in which the charring was astonishingly advanced.

In this connection I would like to note that of the few bone fragments which were found here and there in the layers overlying the main bone layer, most of them appeared much more weathered and exhausted - at the same time they also showed a much greater tendency to disintegrate in the air - than those in the main layer found. It is easy to explain that the leaching was more advanced in those bone fragments. But it is also understandable that the bones found in the main bone layer are heavier and heavily impregnated with mineral substances; for the conglomerates with the underlying clays form a watertight horizon, so that the water impregnated with mineral salts had to act much longer and more strongly on the organic residues enclosed therein.

I would also like to emphasize that in view of the enormous activity which the fire mountain Wilis must have developed in the often mentioned giant crater in its west, and after all that we have about the extent and thickness of such mud-tuff streams, which of relatively small ones Craters or crater lakes go out, know that the lahar formations at Trinil (with a maximum thickness of not yet 25 m) have arisen all together in a relatively short time. The flora and fauna of these layers of

On the geology of Java, especially the excavation area. 31

up to the blue-black tone underlying the conglomerate, one and the same geological

logical age 1

The paleontological examination of the bones was carried out from the other side. Only some

I would like to allow myself some remarks. No human bones were found at Trinil himself while I was there; but one of our capable European overseers, Sergeant-Major Meyboom, found that when he went to look for bone-bearing deposits in the

lying fairly exposed on the surface, a human molar, or rather the crown of it. This is discussed in

in one of the following parts of this work.

With regard to the stegodonts, which are relatively common in the main bone layer, the fact deserves

It should be mentioned that also from the upper Trinil layers, even above the Lahar sandstone, very large, remarkably little broken bones of the same species (S. ganesa) as that of the main bone layer were excavated: also proof of the fact that they remained the same the fauna during the deposition of the various layers of trinile. The same applies to the remains of Rhinoceros sp.

The Artiodactyla go, I assume, in exactly the same way through all Trinil strata up to the Lahar sandstone. As far as I can remember, no bones at all other than pachyderma were found above it.

The Cervid clan from this zodiac is particularly represented by the remains of numerous individuals. Among them, it seems to me that one form in particular is very common that is quite close to the Russa

which occurs today in so many large Malay islands up to the Moluccas 3 What struck me from a hunter's point of view is the relatively strongly curved shape of the antlers, which reminds me of the shape of the dwarf reindeer from the German Diluvium [Cervus Guettardi). This peculiarity proves that the bearers of these antlers could not have stayed in a jungle similar to today's Malay. Otherwise they would soon have become entangled with their antlers in the lianas, which are so numerous and colorfully intertwined in the latter. This strengthened my initial opinion that in the peculiar plant detritus which is found so en masse over the main bone layer,

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neighboring Kendeng Mountains, in a river valley near probe 2),

it should actually contain grass residues 4

in Trinil's case they could only have lived on savannahs or desert grass fields5.

There were also some very nice abnormalities under the antlers. Now these usually become dense precisely through damage to the newly formed antlers

1) Nothing indicates that a tree flora ever vegetated on the floor of the Trinil strata in the Quaternary period; the conchylic fauna buried in the clay smiths contains only short-lived types.

2) At M%. the map on panel VI. See also Dozy's later report on the find.

3) This Russa deer does not reach the same size on all Malay islands. Particularly large specimens used to occur on Java, where, in addition to the usual six-enders, sometimes eight-enders are also found. In any case, it is very daring in the Malay archipelago to speak of different species of deer in terms of the variety of antler shapes.

4) The apparently relative rarity of grass remains among the existing fossil plant material could perhaps be explained by the assumption that it was less the water than the wind that piled up the remains of the leaves. Because you can often see the wind blowing tree leaves with you, but only rarely blowing leaves off the grass growing close to the ground.

5) Passed with Imperatum and Saccharum species, called "Alang-alang" and "Glagah" by the Javanese.

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The numerous cervids as well as bovids

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with maybe island-like

32

E. Carthaus,

Branches or trees formed, which could easily happen with those strongly curved antlers. The fact that there are so many shed antlers in the bone layer clearly shows, as already noted, that this was not formed in still water, but that the antlers already shed by the animals were brought about by lahars, since the cervids almost only shed their antlers in the woods and not near the water.

Allow me to return briefly to the particularly important question of the age of the Pithecanthropits strata of Trinil.

My view, obtained from the geological conditions described, is that the whole complex of layers from which the collected bone remains are taken down to the bluish-black tone under the much-discussed conglomerate

is young. The result of the palaeontological investigations of the fossil freshwater and land conchylic fauna by Mr. and Mrs. Martin and of the flora by Schuster agrees with this. As far as the vertebrates are concerned, I do not allow myself to make my own judgment and refer to the following detailed descriptions by Hennig, Jäckel, whose content is still unknown to me.

Jannensch, Pohlig and Stremme.

If only I judge by the whole look and habit of the trinile layers

After all that I have seen of post-tertiary strata in India and Europe, I would be inclined not to regard them even as the oldest diluvium, which is more likely to be the marine marl clays of Padas malang with their extremely fresh-looking, could be attributed to sea and brackish water conchylic shells that are well preserved in color and luster. I believe that many of the mollusc species collected in Sonde and Padas malang will be recognized as not extinct, but still living species, once one gets to know the conchylic fauna of the Malay islands better and more completely.

Since the Pithecanthropus strata appeared to me to be quite young from the start for various reasons, I immediately began to search for traces of human activity in their earth or Look for tuff masses. I also believe that I have noticed traces of human processing on various pieces of bone and ivory, which will be discussed briefly in another section of this book.

I would like to point out one more circumstance here, that the island of Java was already more than 1000 years ago under the influence of a relatively high-ranking culture, which originated from the Aryan Hindus. The beautiful island must have been densely populated in its central part, in which Trinil is also located, in the 8th and 9th centuries, otherwise the giant buildings of Borobudur and those of the temple groups of Prambanan, Tjandi-Sewu etc. cannot come about. Since, as we know, the Hindu princes were very great lovers of hunting, one might not be mistaken in assuming that far more mammal species have died in Java since the Diluvial Age than in our Nordic homeland. The Javanese legend also knows various animals that one searches in vain among those living there today - B. a dwarf ox that is said to have had reddish horns. These circumstances make it understandable if the mollusc fauna has remained pretty much the same on Java since the Diluvial Age, but not the vertebrate fauna.In conclusion, I would like to say that there is no doubt that there are still completely unknown mammals on the islands of the Malay archipelago and even on the island of Java. So

On the geology of Java, especially the excavation area.

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A few years ago in Java I was made aware of a wild dog species by local hunters, the short-legged Kikke dog, which is still unknown to zoologists. I also read in an article ') by the assistant at the zoological institute of the Department of Agriculture in Buitenzorg, Mr. P. A. Ouwens, that he had found a species of anoa on the island of Gelebes which did not match Anoa depressicomis. Ouwens adds an exact description of both male and female specimens captured alive. - I myself have repeatedly heard brown hunters tell of mammals on Sumatra as well as other Malay islands, which probably do not all belong to the realm of fable, but are still completely unknown in scientific circles.

1) Bataviaasch Nieuwsblad of May 17, 1910 (sheet II).

Selenka-Trinil expedition.

II

Remarks on the stratigraphy of the sediments in the Trinil area

from

C. M. Dozy. With panel X.

The marine sediments that emerge north of Padas malang (see the map on panel VI) are composed of sandy and clayey marls with limestone banks. They have (cf. panel X, profile C) an incline of 6 ° -8 ° to the south, forming smaller and larger saddles. A single fracture crevice can be seen in the northern part of the river meander (at 3 of the above map). A very distinct saddle comes to light to the east. (Compare the photograph, Panel VII, Fig. 1).

From north to south, these sediments, as far as one can observe here, consist of sandy marl (a in profile C, panel X) with very little fossilization. This is followed by a marl b (approx. 16 m) very rich in fossils of the genera: Pleurotoma, Oliva, Marginella, Turricula, Nassa, Murex, Natica, etc.

Then comes a coral bank c (thickness about 11 m), with a lot of echinoids (clypeastrids and spatangids), and foraminifera and finally a little calcareous marl d, which is 16 m thick. These sediments are mostly discordantly overlaid on the surface of the terrain by Quaternary river debris (layer t in profile G).

From Padas malang upstream, to the south, one sees layer d concordantly overlaid by a brown-red conglomerate tuff layer e. It is a mass of fine grains of andesitic material with coarser pieces embedded in it. Everything is badly weathered and clayey; by oxidation of the iron oxide the mass is colored brown. At the top, this layer merges into a blue clay layer f without a sharp border, the hanging wall of which still shows a clear inclination of 6 ° to S. This tone f is followed by the most powerful of all sediments: a conglomerate tuff g, very similar to c. but finer-grained and less weathered; the thickness was calculated to be 50-60 m. This sediment is from Padas malang to Pilang and from Batu1

Batu Gadja and Trinil can still be found in this conglomerate tuff a black layer of clay 2

Its dip is initially 6 ° where it is still above the water level, but then it continues horizontally, so that it can be followed towards S. when the water level is low.

1) According to the Dutch spelling Watoe Gadja.

2) One cf. also layer 7 in Carthaus1 ideal profile 1. (Die Red.)

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It is a 1

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m thick layer, which separates crookedly from hanging and lying.

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Gadja to Trinil observed on the two banks of the river. Between

C. M. Dozy, Remarks on the Stratigraphy of the Sediments in the Trinil Area

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Very close to the river bay, across from Trinil, the brown lapilli and tuff layers characteristic of the pits (profiles A and B) encroach on the conglomerate tufa without being properly. it could be determined how this is done. In the pits, however, it was possible to observe how the conglomerate tuff is overlaid by the other layers. In both pits the main layer of bone was found directly on the conglomerate tuff; only here and there is a very hard conglomerate layer (h in profile A and B) between the tuff and bone layers, consisting exclusively of coarser rolls or a black clay layer [i in profile A). To the east of pit II, where work was carried out for a short time in a small pit III (see the map on panel VI and Carthaus' ideal profile 1 there), only the hard conglomerate layer 1 was found, at least on the conglomerate tuff 2, the real one)); The main bone layer is missing here or is not typically developed. Later the end of the

Main bone layer found in pit II at its eastern end, where it affects 3 wedged fossils, the conglomerate tuff (9 or 6) contains almost no fossil bone remains. In the hard conglomerate layer (h in profile A, or 8? In Carthaus' profile 1 near pit III), a lot of bone fragments were found, among other things. a. a shark tooth, fragments of stegodon teeth, etc., but most of the bones were found in the main bone layer k. In the latter, the bone fragments are not very rounded in contrast to those from pit III, probably because the layer material is less hard. The main bone layer contains not only bones but also molluscs. Both in the black clay layer i under the main bone layer k and in this there were many specimens of melania and tjnio.

As stated above, one end of the main bone layer was found in Pit II. In the north of pit I, I could observe that the layer wedged out (see my profile A). The main bone layer is therefore a very local sediment, the boundary of which has been precisely determined several times. The absence of the layer was confirmed by drilling to the north and south of the pits. The slight inclination it shows at its ends is caused by original sedimentation on an inclined plane. Otherwise, the layer is horizontal, as was determined by leveling.

The distance between the two points (to the north of pit I and to the east of II) where the

Layer wedges is 200 m. The layer complex that follows the main bone layer,

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changes very strongly [l s in profiles A u. B). Sometimes there are thin layers of clay that will soon appear

wedges stored in the tuffs. In the lower tuff layers n in pit I (layer g of pit II near Carthaus) there are deposits of plant material which often form entire layers. The upper layers are colored brown by oxidation of the iron and also contain calcareous concretions. At least I did not observe any real tectonic disturbances within the range of the freshwater strata4

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In my opinion, the formation of all these layers, including the main bone layer, should have happened something like this. The conglomerate tufa deposits e and g, which cover the marine sediments everywhere, had been exposed to erosive influences for a long time, so that many unevenness had formed in the terrain surface. In these shallow basins, the bones which had been deposited nearby on the surface were washed together. The transport was usually little, so that the bones were hardly rounded; this is how the main bone layer was formed

1) In Carthaus' ideal profile as 8? = denotes the bone layer in question. (Publisher's Note.)

2) At Carthaus shift 6.

3) See also layer 8 in Carthaus' ideal profile.

4) The shift interruptions in Carthaus' ideal profile (at??) Are probably not actual faults.

(Publisher's Note.)

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What the

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C. M. Dozy, Comments on the Stratigraphy of the Sediments in the Trinil Area.

The water often remained for a long time in the basins that were connected to the original solo, so that a layer of clay was deposited first. The presence of mollusks shows that the river was already flowing through the plain at that time, probably with little gradient and greater width.

Vegetation developed in the swamps; the dying plant material spread on the ground and formed the mentioned plant layers. Clay was deposited where nothing disturbed the calm in the swamps. Sometimes when colossal rains fell on the slopes of the Lawu and Willis volcanoes, large amounts of loose tuff and lapilli that lay there were dragged along and deposited in the plain at the foot of the mountains, devastating and covering everything. The same is still happening now with the volcanoes on Java (this year a very similar catastrophe near Lumodjong, volcano S'meru) Skeletal parts of animals lying on the ground were dragged along and stored between the tuff. This is how the tuff layers overlying the main bone layer can be thought of.

If we now look at the bone sites east and west of Trinil, the following should first be noted: West of Trinil, where the Kali probe empties into the Solo River, there is a good profile opposite. It shows the pliocene marine mollusc marl (layer b in profile C, plate X or layer 1 in Carthaus 'ideal profile) overlaid by a 1 m thick conglomerate layer') made up of coarser rolls. Immediately on top of this lie gray and brown layers of ash in which one finds bones everywhere in the surrounding area, as with Banjer Bangi, to the same extent as in the upper Trinil layers. Most of the time, the light ashes are washed away and the bones then rest on pillars. In any case, the difference compared to the trinile main bone layer is considerable.To the east of Trinil the osseous layers are found in a band about 6 to 8 m wide on the southern slopes of the Pandan Mountains. Here, too, there are gray and brown, fairly fine-grained ash layers with clay deposits that rest on the marine sediments. The latter are different from those at Trinil and also show a greater inclination of up to 15 °. The highest point is reached by the tuff layers at 400 m above sea level in Gunung Butah, a small hill that is surrounded on all sides by the marine sediments and has strong bones. The inclination is about 10 °, but quickly flattens out towards S. so that the layers in the plane are horizontal again. Everywhere these layers coincide with the upper Trinil layers, which in my opinion are equivalent here as well as with Sonde. A certain equivalent of the main bone layer is missing.

The creation will probably be the same as with Trinil. Strong rain flows carried the tuffs, which lay loosely on the slopes of the mountains, and were originally an Aeolian sediment, to a greater or lesser extent and deposited them partly on the slopes, partly in the plain. The inclination of up to 10 °, which the layers now show (but only those on the mountain slopes), need just as little as the height above the sea to indicate a later uplift and thus to a higher age.

1) Cf. Carthaus, panel VI, layer 3 at the left (northern) end of profile 1. (Editor's note.

Selenka-Trinil expedition.

Plate X.

Conglomerate tuff

Hard conglomerate tuff, preferably andesite rubble

black clay main bone - very hard

blue-gray lapilli, bone-bearing

Profile C on the left bank of Solo near Padas Malang (according to Dozy) scale 1: 4500

Padas Malang

«WM

Blue-gray light-gray coral bank Lime-poor, ebrown conglome- superficial,

marl

Marl with mollusks

Marines Pliocene

sandy marl, conglomerate tufa

rattuff

loose, brown ash layers and river debris

low in fossils

°

Ion, blue

Profile A of pit I in the direction N-S (according to Dozy) Scale 1: 300

Complex of blue-p brown ash with yellow sandy

clayey ash and lapilli with lime concretions

ü Burned ashes

gray ash layers clayey deposits, with embedded clay- thin iron oxide-

ash

layers u. Clay gall. Lots of plant remains

layers

o red lapilli, bone-bearing (only in profile A)

with a lot of melania (only in profile B)

layer of solidified ash

Wilhelm Engelmann's publishing house in Leipzig.

Profile B of pit I in N-S direction (see panel II, Fig. 4 and the map on panel VI)

Scale 1:

300

The fossil anthozoa from the vicinity of Trinil von

Prof. Johannes Felix, Leipzig.

(Preliminary communication.)

The palaeontological material collected by the Selenka expedition also includes an extremely large number of corals, which were given to me for investigation. They come from different and, it seems, different ages of found layers. The investigation of these is by no means completed. The following provisions and notifications are therefore still incomplete and some of them are of a provisional nature. At the urgent request of the editor of this work, I am only adding them to the already completed treatises of the other collaborators.

The majority of the corals I have come from four sites, which are marked as follows on the labels: I. Coral bank of Duku Penkai. II. Penkai, NW corner? Kali Bogeno, marl. III. Padas malang. IV. Bangun W. Sonde, marl ?, Lower Pliocene. I also have a coral from the following two locations: "Between Duku Trinil and Duku Penkai, right bank" (Favia affmis E. H.) and "Glaman bei Trinil" [Septastraea n. Sp.).

I found the following forms at the mentioned locations:

Astraeopora sp

Alveopora daedalea Blov. (Forsk. Sp.)

»Verrilliana Dana Balanophyllia sp

Caryophyllia cf. clavus Sgacchi. . .

. .

Mediterranean Sea. Atlantic. Plio

Cyphastraea cf. microphthalma E. H. (Lam. Sp. »Äff. Serailia Forsk

»N. Sp. (aff. ocellina)

Diploria n. Sp

Euphyllia fimbriata Bedot. (Spengl. Sp.). . Favia n. Sp

Fungia sp

Oalaxea ape. Quoyi E. H. sp

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I. Duku Penkai Coral Bank. Indian Austral-Asian.

Other occurrences

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cän d. Mediterranean area.

Dead Sea

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Pacific

ocean

Mediterranean Sea

»''

38

Johannes Felix,

Goniaraea anomala Rss Goniastraca faims Klz. (Forsk. Sp.)

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pcctinata Klz. (Ehrbrg. Sp.) Retiformis E. N. (Lam. Sp.) ....Madreporq div. Sp Macandrina arabiea Klz

»N. Sp Metastraea n. Sp

Mussa corymbosa Dana (Forsk. Sp.) Orbicella tabidata Martin

»N. Sp? Pachyscris sp

Pocillopora informis Dana ........ Porites arenosa E. H. (Esp. Sp.)

»

...

»Leptoria n. Sp

“Cf. irregularis Vaugh. (Verr. Sp.)

»Maldivensis prima Bern

»Cf. Sinensis octava Bern

...

+ + +

Prionastraea vasta Klz. var. superficialis Klz. “Robusta Dana

Siderastraea maldivensis Gaud »n. Sp

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Symphyllia acuta Quelch

»Cf. sinuosa E. H. (Quoy et Gaim. Sp.)

+ +

Red Sea

Indian Ocean

[Paint.- Asian. Mediterranean Sea

Pacific

Other occurrences

Younger tertiary from Java.

Miocan from Java.

There are approx. 40 species of which 22, even if at the moment partially with cf., could be specifically determined. The table above gives the following overview with regard to other occurrences of the same:

Live only in the Red Sea: Alveopora daedalaea, Goniastraca favus, Goniasfraea peetmata, Maendrina arabiea, Prionastraea vasta var. Superficialis.

Live only in the Indian Ocean: Prionastraea robusta, Siderastraea maldivensis.

Only live in the Australian-Asiatic Mediterranean: Euphyllia ßmbriata, Porites cf. sinensis octava, Symphyllia cf. sinuosa, Symphyllia acuta.

Live only in the Pacific Ocean: Alveopora Verrilliana, Porites cf. irrcyidaris, Pocillopora informis.

In the Red Sea and the Pacific lives: Mussa corymbosa,

Live in the Red Sea, Indian Ocean and Pacific: Porites arenosa, Goniastraca retiformix. Lives in the Indian Ocean and Pacific: Cyphastraea cf. microphthalma.

There is also one species, Orbicella tabidata, in the Miocene of Java, and another. Goniaraea

anomala, there in even younger, probably piiocene strata. Finally, one species, Caryophyllia cf. clavus, occurs in the Mediterranean, Atlantic and Mediterranean Pliocene. It may, however, be noted here that the specimen in question is to be regarded at least as a probably new variety of the species mentioned. Furthermore, of the 40 or so species, at least 9 are new, and the last two mentioned are extinct from the Javanese tertiary. Of course, it is not ruled out that one or the other species will later be discovered on closer investigation of the Australian-Asiatic Mediterranean. According to our current knowledge, of those 40 species

approx. lb% still alive.

Goniaraea anomala Flx. (Rss. Sp.) Hydnophorella exesa Pall

Isis n. Sp

Maclrepora sp

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Red Sea

+

Indian Austral. -Asian. Ocean Mediterranean

+

+

+ +

Pacific

+

Other occurrences

Younger Tertiary of Java.

Aphrastraea deformis E. H. (Lam. Sp. Coelastraea tcnnis Verr. .... Euphyllia n. Sp.... •

Flabellum sp Fungia sp

Galaxea sp

Ilydnophora grandis Gard. Madrepora sp

Macandrina sp Poeillopora favosa Ehrbrg. Seriatopora cf.lineata L

Siderastraea n. Sp

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The fossil anthozoa from the Trinil area. 39

II. Penkai, NW corner ?, Kali Bogeno, Marl, Lower Pliocene.

Orbicella acropora Gard. (Edw. Sp.). Porites cf. irregularis Vaugh. (Verr. Sp. Siderastraea maldivensis Gard.... Stylophora digitala E. H. (Pall. Sp.)...

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If we disregard the madrepora, which does not allow a reliable determination, there remain 7 species, of which 2 or almost 29 ^ are probably extinct (Goniaraea anomala and Isis n. Sp.). The remaining 5 are all found in the Indian Ocean, the Australian-Asian Mediterranean and the Pacific. Only one of these latter (Stylophora digitala) also in the Red Sea.

The number of species of this fauna is very small, but its composition seems to indicate a somewhat older age of the layer that encloses it than that of the coral layer referred to under I. "Coral bank of Duku Penkai". As is well known, after the Miocan, the Egyptian-Arab Miocan Sea was constricted against the Mediterranean Basin and its remains broke south to the Indian Ocean. One must therefore expect a greater diversity of the fauna in the Red Sea and the Indo-Pacific region in the older Pliocene than in the later Pliocene or Quaternary, in the course of which the number of common forms of the two areas naturally increases gradually as they migrate over and over had to.

III. Padas malang. Dead Sea

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Indian Ocean

+

Austral .-- Asiatic. Mediterranean Sea

Pacific

+

Of the 7 specifically determined species, 2 are new, resp. probably extinct. In terms of those still alive, relationships with the Indo-Pacific region somewhat outweigh those with the Red Sea fauna. Before the fungia and flabellum have been specifically determined, I do not want to make any assumptions about the age of the found layer. It is noteworthy, however, that so few species of this and the two references discussed above are common; it is probably just the Fungia sp., a Madrepora and the new species of Siderastraea. Besides the anthozoa there was also a mille-pora.40

Johannes Felix, The fossil anthozoa from the area around Trinü.

Aheopora cf. polyacantha Rss

Cylicia cuticulata Klz

Deltoeyathus n. Sp

Goniaraea cf. micrantha Flx. (Rss. Sp.) Madrcpora sp

Montipora monasteriata Forsk. . . Porites cf. irregularis Vaugh. (Verr. Sp.) Pocillopora informis Dana

-

Stephanocoenia intersepta E. H. (Esp. Sp. Symphyllia acuta Quelch

Ehrbrg Seriatopora hystrix Dana

favosa

IV. Rangoon W, probe, marl ?, Lower Pliocene. Indian Austral-Asian.

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Red Sea

+

ocean

Mediterranean Sea

Pacific

+ +

Other occurrences

Younger tertiary from Java.

Younger tertiary from Java.

If we ignore the madrepora, which does not allow a definite specific determination, the fauna of Rangoon consists of 11 species, one of which is new. Of the remaining 10, 3 are in the Red Sea, while the other 7 are in the Indo-Pacific region, 2 of which are known only to be fossils in what is probably early tertiary layers of Java, one living from the Banda Sea and 4 from the Pacific. The fauna therefore has a predominantly Pacific habitus, with which the age indication "Unter-Pliocän" found on the labels is in accordance with what was said under II above.

As far as one can draw conclusions about the age of the coral-bearing strata from previous investigations, it appears that part of the latter is to be assigned to the Upper Pliocene, another part to the Lower Pliocene. The Indo-Pacific character predominates in all faunas, but the younger the strata, the greater the percentage of species that can be found in the Red Sea today.

Some neogene sea urchins from Java from

H. v. Staff and H. Reck.

(Material from the Selenka expedition in 1907.)

The fossil echinids we have from the Trinil area in Java come from a typical sea urchin marl limestone, which apart from countless specimens from predominantly flat-shelled sea urchins

also a significant amount of large flat foraminifera1

a horizontally and vertically widespread characteristic face. In spite of the low level of solidification of the marl, which in itself indicates that it is quite young, it is usually very difficult to remove perfect specimens of the sea urchins; the thicker forms in particular always show a poor state of preservation, due to their pronounced thin skin. The latter may well have contributed to the fact that the first detailed, well-illustrated description of the tertiary echinoderms of Java by J. A. Herklots (Leiden 1854) established all species with one exception as new. It was not until K. Martin's revision (1880) that it was possible to establish that "not only a large number, but by far the majority" of the species described belong to the recent fauna. Therefore, there are numerous redefinitions in Martin, which are based on the species names established by the zoological side.

With the small number of species such as specimens available to us, in conjunction with the state of preservation already described, which, however, gives the sea urchins a somewhat "fossil" character from the outside, we would not have been able to take an independent position on this question if we had not the kindness of the management of the Zoological Museum in Berlin would have made their rich and extremely well-ordered comparative material available. An examination of the fossil material by the Berlin geological institute revealed surprisingly little echoes of specifically palaeogenic or miocene forms, while individual species that occur both recently and young tertiary showed good agreement with the corresponding forms of our material. A more precise determination of the horizon was impossible for us after what has been said.

All species are irregular, and the specimens fall considerably short of the maximum size of the respective type, as Martin emphasizes in individual cases (cf. L. c. P. 77).

We follow M. Meissner's compilation (Bronns Kl. And 0. 1904) as far as possible in the system.

1) Unfortunately, the poor state of preservation of the foraminifera did not allow us, as we had initially hoped, to add anything new to the investigations carried out by Martin on foraminifera from corresponding rocks.

Selenka-Trinil expedition.

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contains. These marls apparently belong

42 H. v. Staff and H. Reck,

Laganidae A. Ag.

Laganum Meusch.

With Agassiz and Pepper we only summarize the forms with 5 genital pores under this name, and leave the name Peronella the type with 4 genital pores.Laganum depressum Lesson.

Laganum multiforme Martin. Peronella decagonalis Ag. Scutella decagona Herkl. Laganum tenuatum Hkl. Laganum rotundum Herkl. Laganum angulosum Herkl.

The range of variation of the specimens available to us is quite considerable, but remains within the framework of the recent forms; therefore we do not consider Martin's new species name necessary and believe that we can base our view on Martin's own words; corresponding to the name multiforme, he too initially admits the variability and, as differences, is able to counter

Laganum depressum to give the following reasons:

1. The larger tubercles of the shell.

2. A deeper circumpetal depression.

3. The lower degree of the ambular cral furrows. 4. The weaker development of the peristomal star. 5. The smaller size.

6. The coincidence of the longest diameter with the plane of symmetry (longitudinal axis) in the varieties with an elliptical anus.

From points 3 and 4, Martin himself states: "The same may be the case in certain varieties of Laganum depr." - Point 6 touches something strange, since Martin states at the beginning of his description (1. cp 76): "The greatest diameter is in a line with the anterior extremities of the anterior pair of ambulacra. «We believe that this question takes care of itself in view of the great variability of the external form, also emphasized by Martin. —Points 1—4 are already so completely connected by transitions in our somewhat scanty material, and also vary so considerably with the more recent forms that we believe we are not allowed to attach any importance to them. - Likewise, point 5 is perhaps not species-separating.

It is therefore between Laganum depressum (Typ. Rec.) And Lag. Multiforme Mart. no separate species separation to be carried out: at most one can set up a series of forms, the extreme representatives of which, however, should not be mutations that differ in time but rather simultaneous variations.

What Peronella decagonalis Mart. (non Ag!), we see in Herklot's illustration (1. c. T. I, 6), as in Martin's text (1. c. p. 98) no reason for a separation.

Incidentally, how far the species concept of the Lag. Depr. is measured, results u. a. from the consent of E. v. Mahtens on the inclusion of the Lag. Tonganense Quoy u. Gaimard as a mere variety of the Lag. Depr., In spite of the fact that he too particularly emphasizes its considerable difference in height and size.

Some neogene sea urchins from Java.

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Peronella Gray emend. Pepper.

In contrast to the previous type, which seems to be extremely common, we have only one single, albeit well-preserved, specimen.

Peronella decagonum Lesson (Ag.) Var.

The present specimen differs from Lag. Depressum, apart from the already mentioned characteristic smaller number of genital pores, mainly by the more strongly arched middle part and the somewhat more plastic interpetal bulges. The petals are comparatively short so that the distance to the edge is wide, which is particularly noticeable for the area adjoining the rear pair. There is no tendency to widen in the line of the anterior pair of ambulacrals; the anus is very close to the edge, the peristomal star is well formed; its five rays have much finer tubercles than the rest of the surface.

E. v. Märtens mentions a Laganum decagonum with five genital pores, which seems to be less elongated. We cannot say anything about the relationship between this form and our specimen, especially since a definitive decision has not yet been made on the question of the generic meaning of the number of genital pores.

Clypeastridae Ag. (Clypeastrinae Gregory).

Clypeaster Lm.

From the zoological point of view, only 5 recent species have recently been distinguished from this genus [Cl. clypeus Död., Gl. exeelsior Död., Cl. japonieus Död., Cl. rarispinus Meij., Cl. rosaceus L.). The wide distribution and the littoral-sublittoral area of ​​life suggest from the outset that there must be a very considerable range of variation in these few species. Even if it is generally in the style of palaeontological-stratigraphic investigations to define the concept of species as narrowly as possible, we do not consider ourselves justified here to go further than the zoologists, since we are dealing exclusively with still living or sub-recent forms .

Clypeaster rosaceus Linne.

Eehinanthus humilis Leske. Clypeaster humilis Mart. (non Ag.)Eehinanthus profundus d'Argh et Haime. Clypeaster latus Herkl.

(For other synonyms see Fourtau, Bull. Inst. Egyptien, 1904, p. 420.

The specimens available to us show the same enormous range of variation or the same two extreme types as the recent representatives. These extremes can be briefly described for our specimens in the following way. One is thin-edged, rounded pentagonal, evenly arched in the shape of a shield, petals flat, no circumpetal groove. The other with a thick bulge at the edge, a clear circumpetal furrow, raised petals and a more elongated outline.

Thus the range of variation of this form seems to extend in a similar direction as with Laganum depressum, from which it is now also distinguished in fragments by the bulbous form of the petals, the strongly concave underside and the marginality of the anus. After all, is between

the extreme forms of Clypeaster rosacus show an even more considerable difference, 6 \*

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H. v. Staff and H. Reck,

than between the terminal links of the series of forms of Laganum depressum. Accordingly, it could be justified to separate the extremes of Clypeaster rosaceus as varieties, although of course our material should not be rich enough to make a definitive separation, possibly even as a species. It is therefore with the necessary reservation that we fix the following variety.

Clypeaster rosaceus var. Nov. crassüimbata.

Under this name we include the types with a thick bulge mentioned above.

together. Their persistence for a considerable period of time speaks more for the existence of a true variety than of local breeds or even mutations.

Cassidulidae Ag. Spec. ind.

A fragment seems u. a. refer to this family through the very pronounced floscelle. The petals are very long and narrow. The inner rows of pores are remarkably close together and are only separated by a high, narrow rib. The state of preservation of the stone core does not allow the unpaired peristome plates of the interradia to be clearly seen, while the pit-shaped, recessed ambulacral phyllodium should be recognizable.

Of course, this finding does not allow any reliable assignment to a specific genus, if one could also think of Echinolampas.

Location: Padas malang, left bank.

Spatangidae Gray. Prymnadelinae Gregory. Schizaster Ag.

The thinness of this genus with considerable body volume causes the consistently poor preservation of the specimens available to us. Even where, as an exception, the sculpture of the bowl and the petals has been preserved, the overall picture has become indistinct due to the strong depression.

Schizaster cf. canaliferus (Lm.).

A relatively well-preserved specimen before us shows so clear agreement with sight. canal. that we would not express the slightest doubt as to its belonging to this species, if the anal end did not obscure the longitudinal profile by its compression. After all, it could be a little lower than the typical representatives; but even this difference, if it really does exist, could only be insignificant and therefore at most lead to the separation of a variety or mutation.

Schizaster cf. Philippii (Gray).

The assignment of other stone cores and shell specimens that we have in large numbers to this species is much less certain. The sub-central position of the vertex, as well as the smaller indentation of the anterior, unpaired ambulacrum clearly distinguishes it from the previous type. What the poor state of preservation, which reveals no detail, allows to see and combine, points more to sight. Philippii as on sight. ventricosus Gray, the Martin (1. c. p. 80) Herklots Seh. sub-rhomboülalis. According to the very bad figures of Herklot (1. c. Plate V, Fig. 4), however, is for

we cannot judge this question.

Some neogene sea urchins from Java.

Prymnodesminae Gregory.

Breynia Desor.

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Since this genus only contains the one species Br. Australasiae established by Leach, the only relevant question for our investigation was whether the genus characters could be proven with sufficient certainty. Despite the fact that the specimen was only present in fragments, this could be ascertained with sufficient certainty, whereby the shape, number and position as well as the position of the large, recessed spiny warts could be used as a guide. The suggestion of a circumpetal fasciole seemed to us to exclude the genus Echiriocardiiun Gray, while against Lovenia Ag. and Sarsella Pomell spoke the arrangement of the paired ambulacras.Breynia australasiae Gray. Breynia magna Martin (Hkl.). Eupatagus magnus Herkl.

Despite the poor state of preservation, the marginal secondary tubercles of the upper side were clearly visible, so that we cannot agree with Martin's concerns about the assignment to the recent form, especially since the marginal curvature differs slightly (cf. ), which our specimen does not share, should not be species-separating.

By finally asking Prof. Blanckenhorn, who is responsible for processing the material])

entrusted to express our most binding thanks, we enclose a list of the most important literature:

1. Herklots, Fossiles de Java. IV. Echinodermes. Leiden 1854.

2nd v. Martens, On East Asian Echinoderms. Arch. F. Natural history XXXI-XXXIII. 1865-1867.

3. Martin, Revision of the fossil Echini from the Tertiary strata of Java. Notes from the Leyden Museum.

Vol. II. 18S0.

4. Pfeffer, The Clypeastrids of the Hamburg Museum. Ratio natural Hamburg-Altona 1881.

5. Pepper, East African echinids, etc. Year of scientific research. Hamburg. XIII. 1896.

1) Unless otherwise noted in the text, Duku Penkai (left bank?) Should be mentioned as the site.

The fossil gastropods

Mrs. H. Martin-Icke, Leiden. \* »

The following investigations are by no means finished, they rather represent the result of a preliminary examination, with a number of species still remaining undetermined. Although the complete processing of the material would enrich our faunistic knowledge, no general aspects are to be expected which could not be derived from this preliminary investigation.

Those identifiable species, for which only the genus has been established, I have referred to below as spec, spec. 1, 2, etc., in the sense that in the lists for the various locations the same number also indicates the occurrence of the same species. Among these species there are undoubtedly those that belong to the fauna of today, and also presumably some already known from the tropical Tertiary and finally a number of new forms.

The reason why the recently described and extinct species have not all been identified is that up to now I have only been able to compare the fossils from Java in Leiden and the recent gastropods in the Museum of Natural History there. Above all, the comparison with the collection of the British Museum is still pending; but the time available was by no means sufficient to work through the extensive material. For the same reason, I could not tackle the processing of the lamella branch at all.

Hclix spec. (1)

Actaeon flammcits Gmel. var.

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Conus vimincus Reeve Conus ngawianus Mart

Conus socialis Mart.

Conus (indeterminable) (1 and r)

Atys naucum Linn. (1) .

Atys cylindrica Hebl. Atys spec. 1 (r)

Bulla, ampulla Linn. (1) Terebra spec. 1

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Terebra spec. 3

Terebra spec. 4 (r)

Conus sulcalus IIwass. var. Conus sinensis Sow

Conus longurionis Krin.

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Mart

Pleurotoma [Drülia] bataviana Mart. (1) Oliva [Strephona] rufula Duolos

Oliva (indeterminable) (1)

Ancillaria Jiaighuluü Mart

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A. Gastropods from the marine layers. I. Padas malang.

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Pleurotoma [Surcula] tjibaliimgensis Mart. (1) Pleurotoma (s. Str.) Gendinganensis Mart. . . . Pleurotoma (s. Str.) Earinuta gray. var. Woodwwrdi

alive probe '

Ancillaria ampla Gmel + Marginella (Cryptospira) quinqueplicata Lam. var.

alive;

Probe"

minor Mart. (1)

Marginella {Volutella) dactylus Lam. (1 and r) Yetus spec. 1 (1 u, i)

Voluta {Aulica) scapha Gmel. (1)

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Current bus spec. I2

Current bus spec. 2

Power bus (indeterminable)

Rostellaria (s. Str.) Pourisii Petit®) (1) Rostellaria spec. 4th

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Miter (Chrysamc) aurantia Gmel. (1) Mitra [Gancilla) flammea Quoy (1)

Mitra spec. 1 (1)

Turricula (Vulpecula) bataviana Mart. (1) . Turrieula [Vulpecula] Jonkeri Mart. (1) . Turricula {Vulpecula) plicaria Linn. (1) . Turricula spec. 1 (1)

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Turricula (indeterminable) (1) Fusus spec. 1

Tritonidea sondeiana Mart. 1

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+ Turritella cingidifera Sow. (1)

+ Melania (s. Str.) Sondeiana Mart.

+ Melania (Sermyla) tomatella Lea.

+ Solarium (see street) perspectivum Linn (!).

+ Solarium (see str.) Maximum Phil. (1). .+ {Xenophora hut) calcidifera Reeve.

+ ++ + + + + +

Nitric Woodivardianus MART.

Hindrer tambacana MART

Still, [Niotha) Kieneri Desk. ssp. Still ..... + {Hinia) Verbeek MART. (1)

Still, Spec. 1

Still, Spec. 2

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Columbella (s. Str.) Bandongensis MART. (1 u. R).

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Columbella (s. Str.) Fidgurans Lain. (1). . Columbrlla {Strombina) gracillima MART. . Murex (s. Str.) Verbeek MART. (1)

{Polytropa purple) bantamcnsis MART. (1) Triton [Ranularia) pseudopyrum MART. (1) Ranclla (s. Str.} Subgranosa Beck (1) Ranclla (s. Str.) Noble Reeve (1)

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Ranclla {Apollo) bitubercularis Lain. (1). Ranclla (unbestimmbar) (1)

{Phalium metal) ball Reeve. ssp. (R) Cass {Phalium) herklotsi MART

Cass (unbestimmbar) (R)

The barrel (s. Str.) Xonatum Green (1) of the barrel (s. Str.) Costate Desk barrel Spec. 1 (1)

Cask Spec. 2 (1)

Cask Spec. 3 (1)

Tub (unbestimmbar) (1 u. R) Pirula (unbestimmbar) (1)

Shells (s. Str.) Cylinder Born (1) Web {Luponia) unusual Linn. (1) Web {Luponia) sondeiana MART. Shells {Ocellaria) Eros LINN

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H. Martin Icke, Die fossilen Gastropoden.

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Terebellum punetatum Chemn. (]) .... Cerithium (s. Str.) Tubercidatum Linn. ssp. Cerithium {Greyhound) karangense MART. (1) Cerithiuni Spec. 1 (1)

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(1). . .

spec calliostoma

+ Fissurella {Subemarginida) spec.6.

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Hurricane {old) ticaonica Reeve (1) Turbo spec. 1. (1)

A top spec. 1 (1)

A top (unbestimmbar) (1)

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Xenophora Spec. (1)

spec narica

Natica (s. Str.) Xebra Lain. (1)

Natica (s. Str.) Morochiensis Grael. (1) Conomitra (s. Str.) Red Bom

Natica (s. Str.) The yolk Linn. (1)

Natica (s. Str.) Gendinganensis MART. . Natica {Neverita) large, Phil. (1). . . Natica {Polinices) breast Lain. (1). . Natica {Polinices) pourisiana Recluz. Natica {Polinices) jukesii Reeve (1 \*.. Natica {Mamilla) nielanostoma Grael. 5 Sigaretus (s. Str.) Planulatus Recluz (R). . Sigaretus Spec. 1 (R)

Nerita {Theliostyla) chamaelon Linn. (1 u. R) {Neritina tenant) polished with LINN. (P

Nerita (unbestimmbar) (1)

Hurricane {old) sondeianus MART. (1)

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Strombits (s. Str.) Fennemai MART. (1). .

Strombus (s. Str.) Isabella Lain. (1 u. R). Strombus [canaria) toothed Linn. ssp. (1)

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Ptychopotamides (?) Jonkers MART. (1) Vermetus javanus MART. (1)

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Distomus {Monilca) callifera Lain. (1)

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+ Scutus Aroid Reeve

1) Twice a day Schlußwindung only listen war dieser Art bekannt.

2) Nabe verwandt mit STR. dilalatus Strains. (Swainsoni Reeve).

3) Spiralskulptur stark entwickelt als bei den Fossilien By sonde.

4) Nahe verwandt mit R. minifera passages rights Lippe zeigt aber die außen deutliche Leisten und besitzt zwei,

durch eine tiefe Einbuchtung geschiedene Dornen.

5) Spiralskulptur nur schwach angedeutet.

6) Am next verwandt mit Submarginula intermediate Reeve.

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J (1).

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2. Martin Icke,

The list bedeutet ein der obigen 1 hinter dem Namen, dass die betreffende Art am linken ein R, dass sie am only give rights Flussufer found wurde. Dieselben Arten liegen aber vielfach außerdem noch ohne eine derartige Bezeichnung, nur mit der allgemeinen Angabe »Padas Malang", vor, so dass die Hinzufügung of 1 or R keineswegs bedeutet, dass die genannte Spezies ausschlieBlich links or right found sel. Einen Unterschied zwischen links und rechts Ufer kann ich nicht Fest- stellen. Objekte, welche nur nach der Gattung zu bestimmen, aber wegen nicht weiter zu ungenügender Erhaltung verwerten sind, wurden zur Vervollständigung des faunistischen Gesamtbildes dennoch eingetreten gefügt. In der ersten Column bedeutet ein -Ī, dass die Art noch in der heutigen Science vorkommt: In der zweiten gibt ein -f an, dass sie ist auch in the probe found.

The list contains 104 bestimmbare Arten; 79 von diesen sind mit bereits bekannten identifiziert; 25 blieben unbestimmt; befinden sich unter den identifizierten Spezies rezente 53 und 26 ausgestorben. Angenommen, dass die unbestimmt gebliebenen 25 Arten Science samtlich der heutigen fehlten, so wiirden 53 rezenten Fossilien only 51 ausgestorben gegenüberstehen; Spezies wurden dann noch lebenden that 51% ausmacht. Gewonnene Prozentsatz Vorlaufiger Prüfung ist aus aber dieser bei nur zu niedrig eingangs genannten Griinden gewiB; diirfte schwerlich niedriger der wirklich sein als der fur probe

Dazu kommt, dass von den Arten on this Fundorte nicht weniger als auch von probe 58 bekannt sind. Mithin kann ein wesentlicher Altersunterschied zwischen den Schichten von Padas Malang und denjenigen By probe, welche als K. Martin Pliocän betrachtet, nicht bestehen. Es handelt sich auch wieder um eine küstennahe Bildung in untiefem Wasser; einzelne Melanien und sind eingeschwemmt helix.berechnete (54 #) i).

Tomatina [Sao) spec. Bulla ampulla Linn. Bulla (unbestimmbar). Terebra spec. 1. Terebra spec. 2. Terebra spec. 5.

Conus sinensis Sow. Conus soeialis Mart. Cone (unbestimmbar).

II. Probe.

Marginella (Gryptospira) quinqueplicata Lam. var. minor Mart.

Voluta (unbestimmbar). Fusus spec. 1.

Phos Woodwardianus Mart. Nassa (Hinia) Verbeeki Mart. Nassa spec. 3.

Columbella (Strombina) graciliima Mart.

Cassis (unbestimmbar).

Dolium (s. Str.) Ladoum Desh.

Pirula (unbestimmbar).

Strombus (unbestimmbar).

Mclania [Tarcbia) madiunensis Mart. Solarium (s. Str.) Maximum Ppil. Xenoplwra (Tugurium) calculifcra Reeve. Natica (s. Str.) Xebra Lam.

Natica (s. Str.) Vitcllus Linn.

Natica (Polinices) po / risiana Recluz. Natica (unbestimmbar).

Ncrifa (Thcliostgla) chamaeleon Linn.

Gibbula {Minolia) spec.

Triton (Ranidaria] pseudopyrum Mart. Plcurotoma (s. Str.) Gendingc / enfantsis Maut. Panella (s. Str.) Nobilis Reeve.

Pleurotoma (s. Str.) Sondeiana Mart. Plcurotoma (s. Str.) Carinata Gray. var.

Woodivardi Mart.

Pleurotoma (Drillia) flavidula Lam. var.

Panella (unbestimmbar).

Cassis (Semicassis) pile. Reeve var. Cassis (Semicassis) Ilcrliolsi Mart.

Die meisten Arten der obigen Liste waren bereits aus den Schichten von Sonde bekannt. Neu sind für diesen Fundort nur Tomatina (Sao) spec, Bulla, ampulla Linn., Terebra spec. 1, 2 u. 5, Fusus spec. 1, Nassa spec. 3, Dolium (s. Str.) Ladoum Desh., Pirula spec. and Gibbula (Minolia) spec. Die beidenbestimmtenArtengehörenderheutigenFaunaan. DieAnzahldervonSondebekanntenSpezies beläuft sich nun im Ganzen auf 137; hiervon sind 7 noch nicht bestimmt und 2 bislang nur in un- genügender Erhaltung vorhanden. Die neu hinzugekommenen Formen liefern keine neuen Gesichtspunkte für die Charakterisierung der Ablagerung.

1) K. Martin, Das Alter der Schichten von Sonde "und Trinil auf Java. Kon. Akad. V. VVet. Amsterdam; Versl. Meded., 1908, p. 0.

Terebra spec. 1

Cone (unbestimmbar) (1)

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Pleuroloma gendinganensis Mart. . Pleurotoma (s. Str.) Carinata Gray. var.

Woodward Mart

Oliva sondeiana Mart

Oliva [Strephonä] rufula Duclos Marginella (Cryptospira] quinqueplicata

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Strombus spec. 1

Strombus (unbestimmbar) (1) Terebellum punctatum Chemn. (1)

(1) Columbella (Strombina) graeillima Mart.

Murex (s. P.) Verbeeki Mart

Triton [Ranularia] pseudopyrum Mart. j

'++

Natiea (Polinices) mamilla Lam. 1)

(1). .

Linn reticulated person. J)

(1)

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+ + Natiea [Polinices] poioisiana Recluz + + - Natiea (unbestimmbar)

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(1).

Ranella (s. Str.) Subgranosa Beck Ranella (unbestimmbar)

Cassis (unbestimmbar)

Neritina [Clithon] brevispina Lam.1

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+ + Xenophora [Tugurium) Dunkeri Mart. + + - (Steinkerne) (1)

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Conus socialis Mart.

Olive trieineta Mart.

Oliva [Strephonä] rufula Duclos. Natiea [Polinices] mamilla Lam.

Natiea [Polinices] poioisiana Recluz. Natiea [Mamilla] melanostoma Gmel. Sigaretus spec. 1.

Trochus [Lamprostoma] maeulatus Lam.

lebend Sonde '

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Padas malang

+ Dolium (s. Str.) Ladoum Desh

Strombus (Canarium) gendinganensisMkRT

Lebend Probe "

Die fossilen Gastropoden.

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Padas malang

III. Duku Penkai.

+ + Xenophora {Tugurium) calculifera Reeve + + +

+ + - Natiea (s. Str.) Xebra Lam

+ + + + + +

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+ + Natiea (s. Str.) Vitellus Linn

—— + + Natiea (s. Str.) Gendinganensis Mart. . .

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Trochus [Teetus] triserialis Lam.1

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——— —— Trochus (unbestimmbar) (1)

Die obige Liste, in welcher ein beigefügtes 1 ein Vorkommen am linken Solo-Ufer bedeutet, enthält 35 bestimmt unterschiedene Arten neben 8 unbestimmbaren. There are about 35 species of common species, 32 of which are found in Sonde or in Padas malang or in the Fundorten zugleich vor, und zwar 31 in Sonde, 23 in Padas malang and 22 gleichzeitig in Beiden Orten. Dies beweist, daß die Schichten von Duku Penkai denen von Sonde und Padas malang äquivalent sind.

Bei Vernachlässigung derjenigen Arten, für welche das Vorkommen bei Duku Penkai nicht ganz zweifellos feststeht, gelangt man dennoch zu demselben Resultate.

Die 3 Arten, welche bis jetzt weder von Sonde, noch von Padas malang bekannt waren, sind: Potamides spec, Xenophora (Tugurium) Dunkeri Mart. and Trochus (Teetus) triserialis Lam.

IV. Rangoon, west of Sonde.

Von den obigen 8 Arten kommen die ersten 6 in Sonde, die 7. in Padas malang vor, während der rezente Trochus nur von Rangun bekannt ist. Von den Fossilien gehören 5 der heutigen Fauna an.

1) Fundort nicht ganz sicher. Nach Angabe der Etikette »nach aller Wahrscheinlichkeit Duku Penkai«.Selenka-Trinil expedition,

7th

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Lam. var. minor Mart

Turricula gendinganensis Mart. 1 )

+ + + Melania [Sermyla] tornatella Bea. ——

Hindsia gendinganensis Mart Hindsia tambacana Mart

Nassa (s. Str.) Coronata Brug. var. Nassa [Hinia) Verbeeki Mart

Nassa (Eionc) thersites Brug Columbella (s.str.) Bandongensis Mart. 1

Melania (indeterminable)

+ Solarium (indeterminable) (1)

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(1). .

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Potamides spec.

+ + + VermetusjavanusMart

Melania (Tarebia) madiunensis Mart.

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+ +++

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(1)

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H. Martin-Icke,

Insofar as the small amount of material permits any judgment, the fossils again seem to originate from a layer which is equivalent to that of the probe.

It thus emerges that the marine deposits of Padas malang, Sonde, Duku Penkai and Rangun show no age difference whatsoever on the basis of the above investigations and that they must all belong to the Pliocene.

B. Gastropods from the civilian species of Trinil. More detailed information on the location.

Helix rotaioria v. d. Bush l

Limnaeus rubiginosus Michel

Planorbis tondanensis Quoy et Gaim. em. Mousson Pliysa spec

Melania (Pachycliilus) testudinaria v. d. Bush var.

Clay bench over the main bone layer, pit II. Clay layer over the main bone layer, pit II. Clay layer over the main bone layer, pit II. Clay layer over the main bone layer, pit II. Deeper bone layers.

Lowest part of the bone layers.

Layers of bone from the pit on the right bank.

Position under the bone layer, trench, south of the memorial stone.

)

Mclania (Striatella) tubereulata Müller .... clay layer over the main bone layer, pit II.

Melania (Tlotia) granutn v. d. bush

Melania (Plotia) savinicri bread.

Melania (Tarebia) verrucosa Hinds.

Melania spec

Bitliynia truncata Eyd. and sow.

Paludina javaniea v. d. bush

Ampullaria (Paehylabra) seutata Mouss.

Tuff layer under the conglomerate layer.

Clay layer over the main bone layer, pit II.

Lowest part of the bone layers.

Tuff under conglomerate layers.

Deeper layers of bone.

Position under the bone layer, trench, south of the memorial stone. Position under the bone layer, trench, south of the memorial stone. Layers of bone from the pit on the right bank.

Deeper layers of bone.

Tuff under conglomerate layers.

Lowest part of the bone layers.

Layers of bone from the pit on the right bank.

Layer of clay over the main bone layer, pit IL

Tuff layer under the conglomerate layer.

Lowest part of the bone layers.

Clay layer over the main bone layer, pit 11. Bone layers from the pit on the right bank.

Deeper layers of bone.

Clay layer over the main bone layer, pit II.

About the names in the above list, note the following:

Pl / i / sa and Isidora are known to be very difficult to distinguish from fossil records; But Isidora is one

so that you can expect PIn / sa rather than Isidora on Java. Besides

predominantly African genus 2

the species seems to me to be a very good match for Phijsa, and that's why I've listed it here.

),

Ampullaria (Paehylabra) seutata Mouss. is only represented by lids, but these are extremely characteristic, so that the determination is probably safe despite the lack of the bowl.

Because of the importance of these layers, I have the fossils with details of all of them

1) Identical to specimens that Elbekt collected on the Kali Soko, tributary of the Solo. 2 Mahtini and Chemnitz, Vol. I, Dept. 17. p. 70.

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The fossil gastropods.

51

Data are given that were even available about their place of discovery, but I am unable to evaluate them precisely. Therefore a number of species occur in multiple repeats.

It can be assumed, however, that all of these fossils are essentially of the same age. I used to identify 3 other species from the bone layers, namely bullmus

citrinus Brug., Melania (Melanoides) infracostata Mouss. and Ampullaria (Pachylabra) ampullacea Linn. j),

so that we have 16 different species at our disposal for characterizing the layers concerned, one of which is Physa and one Melania. The 14 specific species are all represented alive.

Although it is in and of itself unsafe to make a percentage calculation for so few species and the two unnamed species, as explained above, could very well belong to today's fauna, assuming the opposite would still result in a minimum value of 87.5 \_% "more recent forms

1) Branca, Preliminary Report, etc. Meeting. d. kgl. Pruss. Akad. D. Knowledge 1908, XII, March 5, p. 270. 2) a.a.0.S.1 and 11receive. K. Martin calculated for the Quaternary of Celebes 88\_ ^ 2

Do not ascribe standing deposits any older than diluvial age.

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So I can do the in

7 \*

Notes on the freshwater bivalve from the Pithecanthropus strata of Trinil

Prof. K. Martin.

The numerous remains of TJnio all belong to the two species, which were mine earlier

were mentioned, but could not be determined due to a lack of comparative material 1

One of these has since been from Dubois as TT trinilensis Dubois introduced into science2

).

Dubois did not describe the species and only depicted the inside of the right flap, but it is nevertheless certain that the larger TJnio, which is more than 11 cm in length and is in many bowls, partly in excellent condition, is that of belongs to him established species. Dubois gave the fossilization a new name "temporarily" because he did not succeed in finding the species alive on Java and therefore considered it "not unlikely" that it was extinct. Of course, this requires further confirmation; I cannot say anything about it myself, since the East Indian unions are remarkably poorly represented in the Leiden collection.

The second species, also in very good condition, agrees with ü. productus mousses.

Almost without exception with the form which the author called var. normalis. From recent bowls that El'bert collected in the Kali Soko, a right tributary of the Solo, and brought to Leiden for comparison, I can recognize the species in question do not distinguish.

match 3

Elbert has already mentioned petrification as the 77th 'productus from the Kendeng strata 4

),

that I can only confirm its determination5

Most specimens of this species keep within the dimensions given by Mousson

sions: length 72, height 33, thickness 21 mm; only in exceptional cases were the bowls 37 mm high and about 80 mm long. One of the largest individuals has, at the rear, in the middle of the bowl height, individual weak, vertically positioned wrinkles that intersect the growth lines at an obtuse angle; with a second

1) Branca, Preliminary Report, etc. Meeting. d. kgl. Pruss. Akad. D. Wissensch., 1908, XII, 6 March, p. 270.

2) Dubois, The geological age of the Kendeng and Trinil fauna. Tydschr. Con. Ned. Aardr. Geno script., 2nd series. XXV, 1908, Afl. 6, p. 1249, Pl. 39, Fig. 6.

3) Mousson, Die Land- und Freshwater-Mollusken von Java, p. 93, Tab. 17, Fig. 3-5.

4) About the age of the Kendeng layers, etc. Neues Jahrb., Beilageband XXV, 1908; also Centralbl. f. Min., 1909, No. 17, p. 517.

6] Not to be confused with the North American style, U. productus Conrad, Martini u. Chemnitz, Konchylien-Kabinett, IX, 2, p. 66, Tab. 16, Fig. 2.

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so-

K. Martin, Notes on the Freshwater Bivalves from the Pithecanthropus Layers of Trinil.

53

such a sculpture is barely indicated. Very exceptionally, individual short, thread-like ridges develop behind, above the rounded keel, which are irregular or almost horizontal and give the impression of dotted lines. Finally, the vertebrae may show faint wrinkles or warts, which especially in a small individual, which is the var. Fragilis Mouss. corresponds. This form, which is also represented among the recent material of the Kali Soko (cf. Elbert), is nothing at all other than the youth stage of the former.

TJ. productus mousses. looks very similar in form to U. orientalis Lea and is cited by Reeve as a synonym with the latter 1); but U. orientalis has yellow radial stripes behind and its occurrence on Java becomes a. a. 0. presented as doubtful. That's why I prefer the name

productus.

The corbicula is a fairly small species, which is distinguished by the height of the shell, the distended and protruding vertebrae, and the distinctly three-sided outline. Species of a similar shape are, without being common, widespread in Asia. These include C. crassida Mousson from western Asia, C. erosa Prime from Cambodia, C. Lydigiana Prime from Siam, and C. Sandai Rein from Japan. The latter 2 seems most closely related of all of these

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to be, as far as this can be judged from illustrations and descriptions of the species mentioned, of which I have only two copies of C. Sandai for comparison The fossil is only smaller and has more closely set concentric ribs than the recent Japanese species. Whether it still occurs in today's fauna, I am not able to decide with the tools at my disposal.Both Carthaus and Elbert collected these Corbicula. I infer from the information on its labels that it occurs downstream of Sonde, in the lying area of ​​the Kendeng strata, and at Padas malang. From the latter place there are only individual, but well-preserved and certainly identical shells.

1) Reeve, Vol. XVI, Unio, Tab. 91, spec. 491.

2) Martini and Chemnitz, Konchylien-Kabinelt, Vol. IX, Section 3, p. 193, Tab. 38, Fig. 11 u. 12th

The fish scraps from

Dr. Edw. Hennig. With panel XI.

A. Selachia.

Fern. Carcharidae.

A dozen small, well-preserved shark's teeth (cf. Plate XI, Fig. 1 - turns out to be to 5)

Carcharias due to the simple three-sided shape (without secondary teeth), the finely serrated edges, the gentle curvature of the back and flattening of the front, as well as the generally small; albeit naturally changing inclination towards the outside. Some of the slimmer teeth are likely to belong to the lower jaw; they are also serrated to the tip. This results in after

the classification of Müller and Henle as a sub-genus Prionodon.

In Carcharias (Prionodon) gangeticus Müll.-Henle we plan a live Indian shark

us who go up into the rivers. The occurrence of Selachierzähnen at our site 1 is therefore nothing remarkable in itself.

Dubois2

Fossil finds, but fails to state which features are decisive for him. The species does not occur alive in Java.

gives teeth of a new species of Prionodon Dijki from the locality Ngembak, which differs from

)

even has this same Prionodon gangeticus in the "sandstone of Trinil" among his

Martin 3

living carch. Henlei Val. By a slight curve on the inner edge of the teeth and from the carch.

)

japonicus Schleg. is distinguished by the fact that "its teeth are somewhat slimmer and have a base that is more elongated towards the outside." Also from Ngembak come two as Carcharias (prion.) Jarnicus Mart. designated teeth, which are characterized by their size, slim shape and extremely fine marginal notches that can only be seen under a magnifying glass.

1) Four pieces are marked 1, F k. 87, one the number 197, the remaining seven are labeled illegibly (either 47 or 4L ??).

2) Tijdschrift van het koninglijk Nederlandsch Aardrijkskundig Genootschap, 2nd series, Deel XXIV, No. 3, Mededeelingen, May 15, 1907, p. 455.

3) Contribution e.g. Geol. East Asia a. Australia, 1st series, vol. 3: "Tiefbohrungen auf Java", p. 28, plate II. Figs. 21-23. Leiden 1883-87.

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Has

Edw. Hennig, The fish scraps.

55

As far as the teeth before me are concerned, they differ very considerably from the Pr. Javanicus, judging by the illustrations; What distinguishes them from the illustrations by Pr. Dijki is the outer edge, which is not sharply angled but concave, and the fact that the serrations on the base leg are weaker than stronger than halfway up the tooth. But the same is the case with one of the teeth described by Martin (op. Cit., Fig. 22), and I have to agree with this author if he can "see no species difference with regard to the behavior of the recent Prionodon species" . After looking at a series of Carchias teeth belonging to the Berlin Zoological Museum, I go even further and can also see the differences mentioned by Carch. Henlei andjaponicus not recognized as a basis for specific delimitation. The tooth molds change inside

half of the shark teeth are so extraordinarily strong that it seems pointless to me to determine anything about their affiliation on the sparse finding of isolated teeth. A specimen of Carcharias gangeticus, which I used for comparison, combined almost all of the species mentioned here

peaceful in its once dangerous brook!

I feel compelled to use it when identifying the teeth as Prionodon sp. to let go.

At Padas malang a larger (cf. Plate XI, Fig. 6) and a smaller vortex of the carcharide type have been found in the "marl".

Fern. Pristidae.

The brooks are represented by the bostral sting \*) of a sawfish (plate XI, Fig. 7), which at first glance does not show either its selachier or fish character. Such finds are not uncommon and have been known since the Middle Eocene. You might notice anything that has happened so far

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generally known of these animals, the occurrence there in river deposits; but has Pappenheim

in a communication important for the knowledge of the Pristids 3

live strictly marine, but (perhaps only temporarily) also go into the estuaries and1) Not Rostral Tooth! (see above Jaekel: Zeitschr. d. deutsch, geol. Ges. 1890, p. 91 and Hilgendorff: Sitz.-Ber. Ges. naturf. Freunde Berlin 1888, pp. 109-110).

2) S. Stromer von Reichenbach, contribution. Geol. U. Pal. of Austria-Hungary 1905, vol. XVIII, p. 55.

3) Seat. Ges. Naturf. Friends of Berlin 1905, No. 3, p. 99.

4) v. Martens was the first to show that there is a livelier exchange between land and aquatic animals in the tropical regions, and P. Pelseneer (L'origine des animaux d'eau douce. Brussels 1906) deepened this law to the effect that the amounts of precipitation in the regions concerned The following should also be taken into account: When there is a lot of rain, the sea water will also experience a certain amount of sweetening and, on the other hand, the humidity of the air in the tropics will contribute to the fact that the way from land to fresh water into the sea and vice versa encounters less steep transitions. According to him, the maximum of the exchange lies in the Malay island world. Our Prionodon and Pristis findings from Java, Carcharias gangeticus in India and the PETER's observation cited by Pappenheim about the occurrence of sawfish far into the Sambesi make a small contribution to this. The climbing fish to be mentioned below, which have also been found fossil, form a counterpart with their ability to remain out of water for a longer period of time. I can therefore only agree with Dübois' opinion that at the time of the Trinil deposits exactly the same climatic conditions prevailed as today.

even go quite far up here «4

(or subfossil) evidence of this habit and also (as far as I am informed), because so far Pristis finds have only been made in Europe, North Africa (Egypt) and America.

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)

pointed out that 'the animals don't

Our piece remains interesting as the first fossil record

5G

Edw. Henriig,

What is unusual about the specimen (which, by the way, comes from the right side of the "saw") is a not inconsiderable curvature towards the bottom. At least I did not perceive anything of the kind in living forms, but I did notice an alluvial Pristis antiquorum from the Birket el-Qerun, which corresponds in everything to our piece, only considerably surpasses it in size. However, an identification cannot be made because the rostral spines on the individual are not constant in their formation and cannot be used for determination. Incidentally, Pristis antiquorum is the only living species that does not exist in the East Indies. According to Günther (Vol. VIII), Pr. Zijsron Bleek and cuspidatus Latham are restricted to the East Indies, while Pr. Perrotteti Müll.-Henle is in all tropical seas

citing Smith-Woodward reports that Pr. cuspidatus lacks the characteristic groove on the posterior margin of the rostral spine, so this species is also eliminated and the choice remains between Pr. Zysron, Perrotteti and pectinatus; because

there is no reason to assume a new species 2

).

and Pr. pectinatus Lath. spread. Is it true what Dames]

)

A smoothing and deepening of the upper side at the tip is likely due to wear and tear 3

to be explained. The rear edge is not straight, as in the majority of the cases I know, but slightly curved inwards. The length is 7 cm, so it indicates an animal of not inconsiderable dimensions and thus, if one keeps the possibilities of movement of such shapes in mind, also

to a correspondingly large current.

B. Teleostomata.

Fern. Siluridae.

Among a large number of loose fish bones and bone fragments from the "clay banks above the main bone layer, Pit II Trinil", the presence of silurids is immediately revealed by the characteristic serrated pelvic fin spines, which are easily mistaken for the lower jaw by the unfamiliar. I count 13 pieces in varying condition and size. The longest of them (No. 991) measures 9 cm and so suggests shapes of very considerable dimensions. Most of the silurids that I have examined in Java had fin spines

3 to 4 cm in length4).

These are also fossilized.

A systematic differentiation according to the serration of the edges and the sculpture in general should prove to be possible, but this question has not yet been approached from the zoological point of view, so that the literature offers no reference points. The material of a single collection will hardly provide a sufficient basis for this. So I have to limit myself to hints, especially since the fossil material z. T. is strongly unrolled and the finer details appear blurred. In the majority of cases, only the teeth on the inside are clearly pronounced1) Silz.-Ber. Ges. Naturf. Friends June 19, 1888, p. 108, footnote.

2) Where it leads when new types are set up in the usual generous manner in response to incomplete fossil remains, was shown by the complete saw by Propristis SchweinfurUii Dames (New Year 1907,!.) Described by E. Fraas in its various components represented three different subgovernments (Pro-, Anibly- and F.opristis!

3) On the use of the saw and the widespread exaggerated ideas about it see Paitenheim 1. c.

4) But there are also considerably larger forms among living forms. So the geol. Univ.-Institut zu Berlin a comparative piece 14 cm in length, whose affiliation and occurrence is unfortunately not known.

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The fish scraps. 57

of the slightly curved spine1); the number of teeth and thus the spaces between them change many times, but not within the same piece. The sculpture is not exactly straight longitudinally. A fragment that is already striking due to its black color is different (cf. Plate XI, Fig. 8): the very clear surface shows an increasing dissolution of the longitudinal back into small nodules from the inside out, the outermost row of which is the teeth of the Form the outer edge.

Each fin spine is traversed by a channel in the longitudinal direction. Although the right and left fin spines are about equal, I cannot address two as a pair. The 13 pieces must therefore correspond to as many individuals. Storage is therefore obviously not a primary one.

It is noticeable that all the fin spines are detached from their connection with the shoulder girdle. Anyone who has tried "to artificially bring about such a solution knows that this does not require a small amount of effort, yes, that it is almost impossible without parts of the extremely ingenious and

),

disturbs and thereby the isolation be caused. One specimen appears to be slightly charred at the upper end and was lying together with what appeared to be a scorched bone, probably an interoperculum. The multiple volcanic phenomena of Java, however, mean that there is no lack of informal explanations for this either.

In addition, a large number of other bones can be related, partly with certainty, partly only presumably, to silurids. So we certainly have a natural deposit of fish bones in front of us. First and foremost, granular roof bones are to be mentioned here, which betray their nature through the peculiar, functionally unknown skull openings of the catfish. Such a cranial opening is located in the superior occipitale (cf. Plate XI, Fig. 9a and b) and on the median suture of the frontals. The former is available in three copies, the latter in one complete pair and one pair preserved in fragments. In the whole habitus they are followed by a number of further pieces, among which two left orbitosphenoidea and two left parietals can be recognized by their outlines. This already results in a more or less complete picture of the skullcap and thus the possibility of generic determination (cf. Plate XI, Fig. 10).

The shape of the Frontalia clearly points to Günthers4

homalopterae, group A: Clariinae, d. H. to the two genera Ciarias and Heterobranchus

The zoologists only differentiate between these two forms in that the dorsal fin, which is uniformly developed in Ciarias, is divided in Heterobranchus and the rear half is developed as an adipose fin, a feature that is of course unusable for the paleontologist.

1) On the inside the teeth are always facing backwards, on the outside facing forward.

2) 0. In the Morphologi Jahrbuch XXIV, 2 (Engelmann, Leipzig 1896), Thilo made some nice considerations about the mechanism of such joints.

3) E.g. the engineer Herrmann reported about the Indians of Bolivia.

4) Manual of Ichthyology. Translated from the English by v. Hayek, Vienna 1886, p. 401.

5) G. A. Boulenger sees himself in "A revision of the African Silurid Fishes of the Subfamily Clariinae" (Proc. Zool.

Soc. London 1907/08 Dec. 10, p. 1062-1097) forced to make tabula rasa: "to take up their study as if they had never \* been classified before." He arrives at the following further structured> Synopsis of the Genera:

down 5

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Selenka-Trinil-Expeditioii.

8th

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to break. The natives of some areas use it

complicated locking joint 2

Sting sometimes used as weapons and tools 3Such tools could be thrown together here, but it is by no means compulsory, rather the joint part of the shoulder girdle can also be destroyed in the flow or through the decomposition process.

for which they are splendidly suited. The assumption

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Subfamily of the Siluridae

58

Edw. Hennig,

The occipital must help us further: Lydekker 1

Heterobranchus is characterized by a "more developed supra-occipital process". That is confirmed

-

Unfortunately, the rear end of two of the three pieces at hand has now broken off; the third, which, by the way, bears the designation »Pit II, Layer 17« as a special location information, leaves no doubt as to whether it belongs to the genus Ciarias, but at the same time differs from the other two in its larger dimensions, smoother surface and one fine grooves on the edges that radiate outwards on all sides. It is true in everything with the supraoccipital

a Ciarias magus of the Berlin Zoological Museum 2

Of course, such an identification cannot be made binding for the skeletal parts that enable it; but Dubois also cites Ciarias magus of Trinil in the communications mentioned.

For the other two pieces and the rest of the head bones belonging to them, the definition of Ciarias can only be guessed at, but with some probability. Because Heterobranchus is in the Asian group of forms only through a living species H. tapeinopterus and a tertiary (from the Sivalik Hills) H. palaeindicus Lyd. represented, Ciarias is by far the more richly shaped genus. In H. palaeindicus the breakthrough opening of the supra-occipital lies behind its widest point, H. tapeinopterus was not available to me for comparison. With Ciarias Falconeri Lyd. there is no similarity from the Unterpliozaen of the Sivalik Hills, other fossil Clarias species (apart from the Gl. magus, which is still widespread in the Indian archipelago and mainland) are not described. Among the species that are still alive, there are several at least very close ones, some of which occur on Java itself:

In Ciarias Teysmanni and Dussumieri, the occipital appeared to be relatively somewhat wider; in the former, the frontal opening is also further forward. In the specimens of Ciarias batrachus that I saw, the occipital tapered less towards the front than on the fossil material.

A. Dorsal fin simple, consisting entirely of articulated rays:

a) Eyes with free rim, pectoral and ventral fins well developed.

Ropes of the head protected by bone shields 1. Ciarias Gron. Sides of the head bare, only the postorbital plate present 2. AUabenchdys Blgr.

b) Eyes without a free rim, sides of the head bare.

Postorbital present, pectorals well developed, ventrals small. ... 3. Clariallahcs Blgr.

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at least for the Indo-Asiatic forms. The African Clarias species have as a rule in juvenile forms, all these differences seem to me to be less well developed - a pointed occipitale superius, which brings about a certain approximation of heterobranchus here. In the Asian relatives, the gently rounded rear edge of this bone protrudes only a little and thus enables easy separation.

> absent, pectorals and ventrals very small

4. Gymnallabcs Blgr. 5. Clta »inallabcs Blgr.

6. Heterobranchus Geoffr. 7. Dinotoptci-us Blgr. "

»»

,

“Rudimentary or absent, ventrals absent.

B. divided dorsal fin, the rear part designed as an adipose fin. Sides of the head protected by bony shields, felt fin large and from

Bone carriers (elongated neural spines) supported

Sides of the head bare, only post-orbitals present, adipose fin small. .

Since, according to what has been said, our Javanese forms have a fairly coherent head armor, 2, 8, 4, 5 and 7 are ruled out for our consideration, and likewise only Ciarias and Heierobnmchus remain.

1) Palaeont. Ind. Ser. X »Ind. tert. and post. tert. Vert. «Vol. III, Part 8, p. 248.

2) I owe Dr. Pappenheim the friendly and supportive introduction to the zoological collection and some valuable tips.

has already pointed out that

)

match. In the absence of any other comparison

The fish scraps. 59

With Eq. fuscus, I couldn't tell the difference. But even the above are not sufficient to give this species, which as far as I know only occurs in China, a preference with regard to the destination. The zoologist differentiates the species according to their teeth and other characteristics that cannot be used here, and ignores the shape of the individual bones with Becht, because it fluctuates within the species, even in the course of individual development.It would therefore be presumptuous to determine the earlier range of a still living species based on such remains or even to want to establish new species. I am referring to Martin's heartfelt words 1 »You should finally stop ... determining things that are not

Whether the bone reproduced in Plate XI, Fig. 11 belongs to another species of catfish, such as Pimelochus, and whether it represents a gill cover (preoperculum), I was unable to determine, since it is not complete; The shape and longitudinal grooves seem to indicate this. There is a second, even worse preserved copy.

I also depict a small ossicle (Plate XI, Fig. 12) which is conspicuous because of its peculiar attachment head. I couldn't find anything like it anywhere. But I am inclined to assume that it would like to be a Badius branchiostegus, that is, a part of the gill apparatus, and that of a Silurid.

A bone is represented several times (cf. Plate XI, Fig. 13), which can only belong to the roof of a teleost animal, but for which I found no analogue among the Silurids. Here Dubois' statement about his findings of Anabas scandens (the climbing fish) and Ophiocephalus put me on the right track. Unfortunately, the scales of these closely related fish are spread over the entire roof of the skull, so comparisons are only possible with skeletons, in which zoological collections are naturally less rich. At least I think I can say with certainty that the bone in question represents the frontal part of an ophiocephalus. Only this genus shows such large forms as are evidently present in the best. Strangely enough, only the left frontalia (plate XI, Fig. 13) have survived, namely two and a half large ones (length approx. 6 cm) and one smaller one (4 cm), as well as an unrecognizable fragment. The four Frontalia must have belonged to four different individuals. As the only other best belonging here - at the same time as a welcome one

): Can determine mortals! "

Confirmation of our destiny -

is recognizable by its outlines, its marginal sculpture and its curvature and also indicates the considerable size of the fish. Species cannot be determined.

Non determinanda.

Eight well-preserved vertebrae are difficult to interpret; six probably belong together (Plate XI, Fig. 15). Two more should represent another genus (Plate XI, Fig. 16 a and b).

According to Martin's quoted words, I must leave all other bone parts undefined; It would only be due to a lucky coincidence if one were to be able to recognize one or the other when looking through all the skeletons of living forms; a methodological determination is in any case excluded. Teeth are - with the exception of a truncated cone, shown on plate XI, Fig. 17 a and b - not below it.

1) Pal. Results of deep drilling on Java (preface).

there is a single left gill cover (Plate XI, Fig.

14),

of the

8th\*

Non determinanda:

8 vertebrae, 1 tooth a. a. m.

:

60

Edw. Hennig, The fish scraps.

Summary.

The list of available pieces shows that the lion's share of the fish fauna of Trinil goes to the Silurids:

Selachia

Teleostomata

Carcharidae:

12 teeth of Prionodon sp.

2 vertebrae.

Pristidae

1 rostral spine.

Siluridae:

13 pectoral fin spines of different individuals.

3 superior occipitalia of two types \ 2 right, 2 left frontalia

2 Orbitosphenoidea

2 parietals

2 gill covers of Pimelodus? 1 radius branchiostegus?

Ciarias sp.

4 frontalia 1 operculum

Ophioeephalus sp.

Explanation for panel XI. Figs. 1-5. Teeth of Prionodon sp. Side view.

Carcbarid-type vertebrae. Side view, diagonally from below. Rostral spine of Pristris sp., From the right side of the saw. Spines from the right pectoral fin of a Silurid.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9. Supraoccipital of Ciarias sp. a from above, b from below. Fig. 10. Reconstruction of the cranial roof of Ciarias sp.

Fig. IL Perhaps the preoperculum of? Pimelodus sp.

Probably the radius branchiostegus of a Silurid. Left frontal of Ophioeephalus sp.

Left gill cover of Ophioeephalus sp.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 15-

Figures 17 a and b. Conical tooth, from side (b) and from above (a), indefinite.

. Indefinite fish vertebrae.

All figures are drawn in natural size, the originals are in the Kgl. Geological-Palaeontological Institute and Museum in Berlin.The reptile remains (excluding turtles)

Dr. W. Janensch. With panels XII and XIII.

A. Crocodilia. Gavialis bengawanicus Dubois.

Skull without a snout no.680 from Trinil. (Panel XII, Fig. 1.)

The present skull lacks the snout, the lower border of the left orbit, and basal parts.

The roof of the skull is laterally bounded by parallel edges that converge only slightly towards the front. The hind edge bends in the middle to form a short, pointed, flat protrusion to the rear and is directed a little forwards on both sides, around the backward and outward runners of the roof of the skull belonging to the Squamosa limit inside.

The roof of the skull rises moderately steeply and evenly towards the eye sockets. The sculpture is relatively small. Behind the upper perforations and between them, the surface of the bone is almost smooth. To the front there are pitted depressions that take on a long, furrow-like character towards the eye sockets. At the front in the depression between the eye sockets the sculpture has almost disappeared again. A few, rough, wide holes lie along the side edges of the roof of the skull, especially in the outer rear corners.

The upper temple holes have a decidedly egg-shaped contour and are positioned with their longitudinal axis obliquely outwards and forwards. There is a slight angular bulge in the direction of the eye sockets. The rear edge runs parallel to that of the roof of the skull, i.e. slightly outwards towards the front. The bridge between the upper temple holes is wide and flat. The inner, steep wall is high at the back and too low at the front. The lower temple hole, the border of which is only completely preserved on the right side, has the shape of a right-angled triangle, the right angle of which lies in front and below. Above the back corner protrudes a ledge that was originally apparently longer. Below the latter, the opening extends further back than above. The bridge between the lower temple opening and the orbital is almost vertical and is only very slightly directed forwards and downwards.

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W. Janensch,

Dimensions of the skulls of Oavialis bengawanicus and Oavialis gangeticus (in centimeters). (The following bold digits in this table and the following represent ratios.)

Total length from the tip of the snout to the rear end of the quadrata in the median plane .....

Greatest width of the skull

Distance of the outer corners of the quadrata from each other Width of the roof of the skull across the centers

of the upper temple holes

Distance of the outer corners of the Squamosa from each other Distance of the front edge of the eye holes from the

Tip of the snout in the median plane

Inner distance between the eye holes. . Largest diameter of the eye holes

Largest width perpendicular to the previous one

Distance of the eye holes from the upper temples

holes

Largest diameter of the upper temple holes. Largest width perpendicular to the previous one

Largest diameter of the lower temple holes Largest width of the lower temple holes vertical

to the upper edge

Distance between the upper temple holes. . . Width of the bridges between the upper and lower

Temple hole

Length of the articular surface of the quadrata

Width of the condyle

Height of the condyle

Distance of the condyle from the line connecting the

posterior corners of the quadrata

Width of the basioccipital

Distance of the upper edge of the foramen magnum from the

Skull roof

Distance of the lower surface of the basioccipital from the

Skull roof

Lowest height of the occipital surface

right

19.0 100

Left

right

76.5 287

27.6 103 26.7 100

Left

right left 61.7 295

21.6 103

20.9 100

15.6 74.7 17.0 81.5

44.6 21.2 6.6 31.6

. .

14.5 76.3 15.4 81.1

6.9 36.3 approx. 4.5 23.7

2.5 13.2

20.1 75.3 21.4 80.2

54 203 8.9 33.4

6.6 24.7 6.5 24.4 6.4 24.0 6.4 24.0

2.7 10.1

...

..

4.5 23.7 3.7 19.5 4.0 21.1

Oavialis bengaivanicus Berlin

Gavialis gangeticus Gavialis gangeticus Zoological MuseumBerlin Zoological MuseumLeiden

2.5 13.2

2.5 13.2

4.2 15.7

2.4 9.00

1.6 8.42

1.9 9.1 19 9.1

4.8 25.3 7.7 28.9 3.6 19.0 6.3 23.6 7.2 27.0

5.4 25.8 5.0 23.9

2.6 12.4 6.0 28.7 5.2 24.9 5.3 25.4

3.4 16.3 1.8

5.4 25.8 4.9 23.4

2.6 12.4 5.9 28.4 5.1 24.4 5.3 25.4

3.3 15.8 8.6

7.6 28.5 6.4 24.0 6.9 25.9

2.6 9.74 2.6 9.74 3.4 17.9 3.3 17.4 5.2 19.5 5.3 19.9

4.5 16.9 3.6 13.5

1.5 5.62 7.0 26.3

4.8 18.0

13.1 49.2

4.0 21.1 4.0 21.1 5.6 21.0 5.6 21.0

3.5 16.7 3.3

2.8

1.1 6.1

3.7

3.6 17.2 15.8

13.4

5.3 29.2

17.7Of the eye holes, the right one, except for a part of the lacrymal, has been preserved in its entire border, while the lower and front edge of the left is missing. The outline of the eye opening is regularly circular, the upper and lower edges sharp-edged, the latter slightly jagged, the former smooth, only becoming somewhat jagged towards the front.

The occipital surface abuts against the roof of the skull along a slightly projecting edge at an angle which markedly exceeds 90 °. The condyle is regularly rounded and barely shows a median furrow. The foramen magnum has a broad oval outline.

The posterior end of the quadrata protrudes relatively little - only 4 mm - over the condyle.

If the lower jaw of a gavial, described below, belongs to the same species as the skull, it could be inferred from its shape that the rostrum is long and thin, and that it broadens strongly at its front edge.

2.6 13.71 2.0 10.51

0.4 2.11 5.7 30.0

3.0 15.8

8.3 43.2

10.0 47.9

4.8 23.0 4.8 23.0

4.0 15.0

dicus Lyd. 3

)

posed.

The reptile remains (excluding turtles).

63

the gavial there as G. bengawaniciis n. sp. He says: »Gavialis bengawanicus n. Sp. is hardly different from the live Siamese G. gangeticus than by the somewhat smaller number of teeth and the somewhat shorter beak. The shortening only affects the maxillary and the corresponding part of the lower jaw. The tooth formula is ff (in the species ff to ff, which live in the Ganges and Indus). Also stand

the two foremost teeth, the left and right halves of the lower jaw, a little further apart. "

It is very likely that Dubois' form and the remains of the Selenka expedition belong to the same species. The snout is not present on the present example, so that its length cannot be taken into account as a point of comparison. Therefore

but the number of teeth in the lower jaw described below agrees with Dubois' statement. The gavial of Trinil is in fact quite close to the living Indian species. In addition to the deviations mentioned by Dubois, I can point out a few other differences that

insofar as they relate to proportions, their degree can be seen in the attached table. For comparison I had a somewhat larger skull of the Indian gavial from the Zoological Museum in Berlin and a slightly larger copy from the Zoological Collection in Leiden2

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In the Javanese species the distance between the eye sockets is somewhat larger, the edge, as can be seen in spite of its incomplete preservation, is not so strongly jagged and bulged towards the front; furthermore, the depression between them is also somewhat deeper. The upper temporal openings are smaller, especially in the direction perpendicular to the largest diameter. It has to do with the fact that in the living species its outline is more three-sided and the outer side of the triangle is longer. The posterior wall of the upper temporal holes, like the parallel part of the posterior edge of the roof of the skull in G. bengawanicus, runs slightly forward and outward, while both in

G. gangeticus go a little back and outside. The distance between the upper temple holes is much greater in the former. But in this point the skull of the great skeleton of Leiden surpasses the kind of Trinil. So this ratio does not seem to be constant. But it would still be possible to determine with richer material whether size and age play a role. The lower temple holes are considerably smaller in the fossil form, both in length and in width. The opening extends further back below the process protruding from behind than above, while in G. gangeticus the reverse is the case. The condyle is somewhat smaller. The distance between the lower surface of the basioccipital and the roof of the skull is somewhat smaller. The quadrata protrude less from the condyle. In general, the pit sculpture is less developed, especially between

the eye sockets.

What has been said for the living Indian gavial also applies to those of Falconer and

Lydekker specified fossil remains of the same species from the Sivaliks, whose species match is beyond doubt.

Of the other forms described from the Sivaliks, the piece is first used for comparison, which Lydekker reserved with the species G.In his latest review of the fauna of Trinil, Dubois l

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1) The geological age of the Kendeng or Trinil fauna. Aardrijkskundig Genootschap, 2nd Ser., Dl. XXV, 1908.

2) Please allow me to thank curator Prof. Dr. Tornier and Dr. van Oort, who graciously made the rich materials on crocodile skulls in the zoological collections in Berlin, or Leiden, available for comparative investigations, to express my sincere thanks.

3) Indian tertiary and port-tertiary Vertebrates PI. XXXI, Fig. 3.

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W. Janensch.

It differs significantly from our skull of 67. bengawanicus in that the edges of the skullcap are not approximately parallel, but rather converge strongly towards the front, that the lower temple openings are much shorter, and that the eye holes are not round, but elongated and widen draw angled around the front corners of the skull. The latter peculiarity is much less recognizable in the illustration of the view from above than in the original itself.

An exact comparison with Lydekker's Gaviaüs curvirostris') is not possible, since only parts of the snout up to and including the orbital region are preserved, the posterior parts of the skull are missing. The species is distinguished by the shortness and upward curvature of the snout, as well as the lack of a widening at the front end. If the lower jaw of Trinil, treated below, belongs to the skull of the same place described here, we would have to assume a large deviation from 67th curvirostris with regard to the established points.

From .67. leptodus falc. Cantley depicts Lydekker (op. Cit., Plate XXXII, Fig. 4) a piece of the rostrum of the skull, which is distinguished by the smallness of the teeth. For a direct comparison with the trinile skull there is again no possibility of comparison because of the differences in the traditional parts. If the lower jaw and skull of Trinil belong together, the smallness of the teeth would be a very different character.

The parts on which Lydekker (op. Cit. P. 227) founded his gigantic, new kind of 67. pachyrhynckws are exclusively those of the rostrum and therefore cannot be used here for comparison. Also from Rhamphosuchus crassiäens Falc. Cantl. only incomparable parts of the skull located in front of the middle of the eye holes are known.

Lower jaw No. 1219 from Trinil. Plate XII, Fig. 2 and 3.)

Of the two mandibular branches separated along the symphysis suture, the left one is completely preserved, while the right one lacks the anterior tip and the articular.

The widening of the snout is also very gradual up to the beginning of the symphysis, but then the proximal sections turn away from each other at a large angle.

The teeth are approximately half as many. Their number, or that of the alveoli, is 22 on the right and 23 on the left. A second tooth, which is abnormally located in the first alveolus together with the foremost one, is not included. The tooth that is more present on the left mandible is rather the last.

The outer opening is narrow and ends very pointedly at the front and rounded at the back.

The outer sculpture is not significantly developed. It consists on the symphysis part in elongated, flowing furrows. Some flat, wide pits then appear behind the outer opening.

A comparison of the lower jaw of Trinil with the living Indian gavial reveals the following differences: In the latter, the widening of the second tooth is more pronounced, the snout is more clearly separated at its beginning because the individual branches widen less at the proximal end of the symphysis the teeth in this area are closer to the outer edge, the contour of the branches rises more suddenly and higher before the breakout, the breakouts are longer, the number of teeth is fewer, 22-23, compared with 25-26.

1) a. a. 0. Plate XXXI, Figs. 1 and 2.

Total length in the median plane

Length of the symphysis

Width of the mandible branches perpendicular to the median plane

on the 2nd tooth

between 5th and 6th tooth in the middle of the symphysis at the beginning of the symphysis

Width of the mandible branches under the middle of the outer opening

Height of the mandible: on the 2nd tooth

? 4.2 5.4 2.12.7 2.7 3.4 5.2 6.6 2.5 3.2 5.0 6.4 9.8 12 4.8 6.1

87 100

48.5 56 together

7.5 8.6 4.7 5.4 5.7 6.1

70.1 100

40.6 58 together

2.5 3.6 5.0 7.1 2.5 3.6

3.1 4.4

3.6 5.13.9 5.6 8.4 12.0 3.8 5.4

between 5th and 6th tooth

in the middle of the symphysis

at the beginning of the symphysis

across the middle of the outer opening 7.4 9.4

2.4 3.1 2.3 2.9 2.7 3.4 3.7 4.7

3.0 3.4

2.7 3.1 2.9 3.3 3.2 3.7 3.7 4.3

7.1 8.2 7.7 8.9 5.2 6.0 2.3 2.6

1.7 2.4 2.0 2.9

2.2 3.1

2.8 4.0 5.2 7.4 5.5 7.8 3.8 5.4 1.5 2.1

Greatest height of the mandible perpendicular to the upper edge. Length of the outer opening

Width of the outer opening

7.2 9.2

7.2 9.2

5.9 7.5 5.3 6.2 1.7 2.2 2.4 2.8

:

The reptile remains (excluding turtles).

65

Table of the dimensions of the lower jaws of Gavialis bengawanicus and Gavialis gangeticas. Qavialis bengawanicus Gavialis gangeticus Qavialis gangeticus

right-

Berlin

78.5 100

45 57 together

? 7.2 9.2 3.6 4.6

2.7 3.4

12.5 14 2.7 3.4 2.9 3.3

2.3 3.3

2.8 4.0 5.2 7.4 5.6 8.0 3.7 5.3 1.5 2.1

7.4 9.4 6.1 7.8 1.8 2.3

7.7 8.9

It should also be pointed out that the rostrum in 67th gangeticus, as can be seen from the ratios in the table, is significantly slimmer in the Leiden skull than in the larger Berliner, a difference that can be attributed to the age difference and before warns that from the great breadth of very large specimens in direct proportions to infer a corresponding body length.

The above list of differences shows that we cannot ascribe the lower gavial of Trinil to the living Indian species.

As has already been mentioned in the description of the Trinil gavial skull given above, Dubois establishes the new species G. bengaivanicus for the Pitkecanthropus layers. Even though I cannot determine the shortening of the beak, which he stated, which should also be noticeable in the lower jaw, in the present lower jaw, I believe, on the basis of the matching number of teeth, of which he gives 23, to assume may that it is the same species.

The larger distance between the two foremost teeth in the Javanese form according to Dubois cannot be seen in the completely preserved left lower jaw branch. Among the extinct gavials of the Sivaliks, G. hysudricus is found in Lybekker's treatise (Indian tertiary and posttert. Vertebr.) Only with a questionable front end of the lower jaw.

PI. XXXIX, Fig. 4), which deviates completely from our trinile lower jaw due to the lack of any enlargement on the 2nd tooth.

The curvature of the rostrum, characteristic of G. curvirostris, which Lydekker found in the skull, must naturally also have belonged to the lower jaw. Such is not even indicated in the specimen from Trinil.

The lower jaw of 67th leptodus differs completely through the flatter cross-section and the

much smaller and more closely spaced teeth. Selenka-Trinil expedition.

9

Zoological Museum Berlin Zoological Museum Leiden

left right left right left

66

W. Janensch,

Total length from the tip of the snout to the rear corners of the quadrata

Distance from the tip of the snout to the apex of the condyle. Greatest width of the skull

Width of the skull at the large 9th or 10th tooth

Smallest width of the skull behind the 9th resp. 10th tooth

Largest width of the foremost snout section at the 3rd or 4th tooth. Smallest width of the skull behind the 4th or 5th tooth

right

469 100 441 94 226 48 157 33.5

approx. 145 30.9 103 21.9

83 18 299 64

Left

right

474 100 approx. 442 93 239 50

11 2.3 4697 4391

Left

Distance of the front edge of the eye holes from the tip of the snout Inner distance between the eye holes

Largest diameter of the eye holes

Largest width of the eye holes perpendicular to the previous one

Diameter of the lower temple holes perpendicular to the anterior margin. Width of the lower temple holes perpendicular to the lower edge

Distance between the upper temple holes

Width of the basioccipital

Distance of the upper edge of the foramen magnum from the roof of the skull.

. .

. .

. .

. .

. .

. .

166 35.0 159 39.5 108 228 93 196 295 62 42 8.9

Distance of the upper edge of the choan opening from the roof of the skull. Lowest height of the occipital surface

Distance of the outer posterior corners of the pterygoid from one another

.

.

.

20 4.3 43 9.2 37 7.9 98 20.9

52 11.1

151 32

Length of the maxillary suture

Length of the palatal suture

Length of the pterygoid suture.

Total length of the palatina

Width of the two palatina at their rear end taken together Length of the palatal perforations

Width of the palatal perforationsDistance between the front end of the palatal perforations and the tip of the snout. . . .

89 19.0 104 22.2 144 30.7

92 19.6 81 17.1 105 22.4 110 23.2 144 30.7 140 29.5

79 167 110 23.2 136 2S, 7

. .

,

65 13.9 60 12.7

64 13.5

The lower jaw or parts of the huge G. pachyrhinus Lydekker have not been described.

Rhamphosuchus erassidens is entirely different from the curve of the snout, the splenialia that reach far forward, and the lack of widening of the front end of the snout.

After all, G. bengawanicus seems to me to be closer to G. gangeticus than to the other gavials of the Sivaliks, as far as these are sufficiently known to be compared.

Crocodilus ossifragus Dubois.

Skull No. 218 from Trinil. (Plate XIII, Fig. 1-3.)

The present, excellently preserved skull of Trinil is completely preserved except for very few small, broken-out parts and the majority of the teeth, the smallest of which are broken off but mostly fell out.

Dimensions of the skull of Crocodilus

Orocodilus ossifragus from Trinil

Pal. Museum Berlin

Crocodilus palustris

Natural history cabinet Stuttgart

48 10.2

60 12.8 62 13.2 62 13.1 59 12.4 408.5 429.0139.1 449.6 27 5.8 30 6.4 34 34

30 6.4 28 6.0 21 5.7 29 6.1

126 26.6

54 11.5 57 120 57 120

approx. 146 30.8

65 13.9

145 30.9 147 31.0

44 9.4 CO 12.7

113 24.1 107 22.8 128 27.0

127 26.8 45 9.5

206 43

43 9.2

228 49

40 8.5 48 10.1 203 43

27 5.8

29 6.1

.

ossifragus, palustris and porosus.

by Java Zool. Mas. Zool. Mus. Property d. Prof. Martin Zool. Mus.

from Borneo Zool. Museum Berlin

v. Ceram

Zool. Mus. To suffer

545 100 506 93 326 60 169 31.0 156 28.6 116 21.3

96 17.6

from Borneo Zool. Museum Berlin

from Borneo Zool. Leiden Museum

right left 735 100

662 89 417 57 236 32.1 225 30.6 172 23.6 145 19.7 452 61

76 10.3

84 11.4 80 10.9

Suffering suffering

83 100 218 100 8299 21197 31 37.4 89 41

To suffer

right

321 100

30595 145 45

Left

To suffer

418 100 39 594 203 49 105 25.1 100 23.9

75 18.4 58 14.2

right

499 100

472 95 238 48

Left

right

550 100

Left

17 20.5 20 24.1 14 16.9 12 14.5

49 22.5 48 22.0 34 15.6 27 12.4

77 24.0 75 24.3 53 16.5 44 13.7

20 6.2

47 147 47 14.7?

35 10.9 35 10.9 23 7.2 23 7.2 22 6.9 23 7.2 103.1

131

128 approx. 90 76 322

2 ", 2 25.6 18.0 15.2 64

511 93 303 55 162 29.5 147 26.7 117 21.3

91 16.6 345 63

46 8.4

68 12.4 70 12.7

33.6136.3 18 21.7 34 15.6 14 16.7 26 11.9

67.2178.2 3 3.6 14 6.7 8 9.6 9 4.1

44 8.8 6 112.2 6 112.2 43 8.6 43 8.6 32 6.4 32 6.4 27 5.4 25 5.0

about 11 2.20

43 7.8 47 8.5 57 7.6 58 7.8 35 6.4 36 6.5 51 6.9 50 6.8 29 5.3 32 5.8 45 6.1 48 6.5

The reptile remains (excluding turtles).

67

Grocodilus por-> sus

.

66 13.2

84 15.3 83 15.1 173 31.5

135 18.4 130 17.7 227 30.4

135 18.7

51 10.2

40 8.0 122 24.4

24 3.3 77 10.5 64 8.7

183 24.9

88 12.0 86 11.7

239 32.3

101 18.4 98 17.8 137 18.6 136 18.5 134 24.4 136 24.7 159 21.6 167 22.7 146 26.6 146 26.6 176 23.9 172 23.4

62 12.4 59 11.8 162 32.4

71 12.9 73 13.3 193 35.1

106 21.2 102 20.4 146 29.2

70 140 168 33.6

85 17.0

110 22.0 110 22.0 42 8.4 42 8.4 255 51.0

38 7.6

The muzzle is long and quite broad, the outer contour of the large ninth tooth widens out sharply, while the constriction cuts deeply behind the fourth tooth; the nasal area separated by this is broadly rounded, with the greatest width just before the constriction. Under the front edge of the eye holes there is again a small, flat widening, followed by a very insignificant indentation, from which the outer edges of the jugalia, diverging relatively little from one another, to the widest part of the skull immediately in front of the articular surface lead there.

The actual roof of the skull makes a three-sided impression, since the edges, which are especially bulging towards the back, converge strongly towards one another; between them the skullcap is sunk slightly concave.

The eye holes end in a rectangular manner at the back, but at an obtuse angle towards the front. The lower temple holes show an equilateral triangular outline. The upper temple holes have a very short oval shape with a longitudinal axis pointing backwards. The one on the left is a little smaller

and narrower than the right one. The outer nasal opening is almost exactly circular, from behind 9 \*

99 19.8 110 22.0 142 28.4

<

•

approx. 15 2.7 63 11.5 42 7.6 133 24.2

88 16.0

133 24.1 132 24.0 174 23.7 173 23.5

49 8.9 4.6 8.4 60 8.2 60 8.2 267 49 269 49 337 40 342 4748 8.7 79 10.8

68

W. Janensch,

The front ends of the nasals protrude a long way as a uniform, thin bone lamella. In front of the nostril are the round holes corresponding to the foremost large lower jaw teeth

11-12 mm in diameter.

The foramen magnum is low oval.

On the palate side it is noteworthy that the premaxillary-maxillary suture behind the

fourth tooth comes down from above at the constriction of the snout, bends sharply backwards on each side and then runs a distance approximately perpendicular to the middle. The palatina are narrow and flat, they widen only slightly towards their rear end. The upwardly rising walls of the palatina are set off against the palate surface by a rounded edge and converge somewhat towards each other upwards. The posterior suture of the palatina against the pterygoid has short projections in the center and outside, rearwardly directed, of fairly equal length, which give the suture a wavy character. The short suture that delimits the front end of the transversa against the maxillary, that is, which lies between the row of teeth and the palatal opening, is characterized by a strongly pronounced pin of the maxillary protruding backwards. In connection with the narrowness of the palatina, the palatal perforations are quite wide, the

widest point is approximately in the middle of its length. The openings end in a rounded shape at the front, and more pointedly rounded at the back.

The number of teeth is 18 on each side, it being assumed that all of the empty alveoli originally also had teeth. The fourth and ninth teeth are particularly well developed.

The pits, which correspond to the apparently very strong first lower jaw teeth, are very wide and deep and, as already noted above, pierce the upper bone wall in the form of round openings.

The sculpture of the surface of the skull is entirely legitimate. The foremost snout section is, however, relatively smooth. The following section, up to about half the distance from the eye holes, is sculpted in a very pitted shape. A rounded cusp is noticeable above the large ninth teeth, probably due to their deeply reaching alveoli. The rear half of the skull surface between the nose and eyes shows weaker, longitudinally furrowed sculpture, especially in the central areas. The entire rear part of the skull between the eyes, under these and the lower temple holes, as well as the roof of the skull is in turn covered with deep, mostly rounded pits.

The upper edge of the actual roof of the skull is thickened, is bulged out towards the rear end and has a finely wrinkled surface. The equally thickened, finely wrinkled upper hands of the eye holes continue over the front end of the latter, as it were, as superficial bulges that curve inward and, together with the upper eye rims, enclose a lyre-like field.

The length of the pre-orbital bulge, measured from the anterior end of the orbit, is about 3 ½ cm on the right and 5 cm on the left.

Comparison and species identification.

Of the living species of the genus Crocodilus, comparisons with the skull of Tiinil are primarily C.porosus and ('.palustris

Let us first use C. porosus for comparison. It was my kind of one

The reptile remains (excluding turtles). 69

A large number of skulls are available, namely those from the zoological museums in Berlin and in Leiden, as well as a copy from the possession of Prof. Dr. Martin, who kindly entrusted the same thing to me for investigation. I have measured a number of them and compiled them in the table. When choosing the point of view, it was important to place skulls of different sizes next to each other. Since the width of the snout is subject to considerable fluctuations in C. porosus, measurements between 40 and 60 cm in length were as varied as possible. Only the most important dimensions have been taken from some of the Leiden specimens.

The comparison of the given ratios, which are related to the length of the skull, shows how the width dimensions in particular vary. If we only consider the three skulls of 499, 545 and 550 mm in length, we see that the ratio for the largest skull width between 48 and 60, the width for the large ninth tooth between 26.2 and 31.0, the largest Width of the foremost snout section between 18.0 and 21.3, the smallest width behind the fourth tooth between 15.2 and 17.6.The observation of the ascending row of skulls of different sizes also gives a picture of the shifts in the proportions as they arise with increasing body size. It can be seen that the width of the skull is very small in the earliest youth and increases with age, whereas the eye sockets are initially much larger and are much closer to one another. In addition, there are a few other youthful features: the upper temple holes are narrow, flat and separated from each other, the palatina are not inflated towards the top, a peculiarity that later becomes very apparent. Obviously, as a result of this lack of inflation of the palatina, the palatal perforations are not yet narrowed at the back, but rather have a round ending. To this extent, a change in shape that progresses with age also asserts itself in the dentition; as the very slim figure in youth becomes thicker and plump. Furthermore, there is usually a decrease in the number of maxillary teeth. This is because it is 19 in youth and 18 in age. This decrease is due to the fact that as the first large lower tooth grows, the cavity in the premaxillary becomes wider and wider, first cutting the alveolus of the second upper tooth and finally cutting it completely displaces or prevents the formation of replacement teeth.

In the following I have compiled the skulls I examined from the Zoological Museum in Leiden and two from the Berlin Zoological Museum (labeled B) according to the number of teeth and sorted them by size. Each skull is only identified by the number of centimeters that the distance between the tip of the snout and the condyle measures.

It own in the upper jaw

19 teeth

82

83 211 383 395 497

on one side 19 on the other 18 teeth

394 435 - - - - -

18 teeth

407 439 461 472 B 505 508 511 B 662

599 ——

70

W. Janensch,

From this compilation it should be clear that the upper jaw always has 19 teeth in youth, that the second tooth usually disappears in the case of medium size, but can still be preserved in some individuals.

In the lower jaws, I have never found any deviation from the number 15.

A comparison of our Trinil specimen with similarly sized skulls of C. porosus results in the following. The outline of the facial part is very similar in the case of broad-snouted pieces of C. porosus, only the constricted foremost part of the snout is not so short, but rather more rounded. The widening on the ninth tooth is not quite as strong even in the largest C. porosus measured. The lateral contours of the posterior skull diverge more and more in the latter type. Furthermore, the inner distance of the eye holes from one another is apparently noticeably smaller for the same size. The side edges of the actual skull roof diverge less to the rear. The distance between the upper edge of the choan opening and the roof of the skull is significantly smaller. The difference in the design of the palatina is very remarkable. As already mentioned, in C. porosus these swell upwards and become too blistered and thus create an air container for the nasal passage at the same point where the well-known conspicuous bone vesicles are located in the qavial. Also in the

On the palate surface, the palatina are slightly arched throughout, and they also widen towards the rear. On the other hand, in the skull of Trinil there is no distension of the palatine, which is flat in front, narrower and much less widened towards the rear. In connection with these differences in the palatina there are deviations in the shape of the palatal perforations. Due to the strong expansion and widening of the palatina towards the rear, the rear end of the perforations is narrowed to a narrow gap, while in our crocodile these end with a collar, the latter also lacking the strong protrusions of the palatina at its rear, outer corners. The suture between the premaxilla and maxilla differs in C. porosus in that the nipples advance in the median line, creating a w-shaped line. The sculpture is quite similar in both; in particular, the longitudinally furrowed areas in the rear half of the face are designed to be completely identical. The lateral edges of the roof of the skull are similarly bulged, but in the case of the Trinil skull to a greater extent backwards. In contrast to this, the pitted sculpture also extends in a strip between the upper temple holes, whereas this is not the case with C. porosus. The ridge-shaped, rough-This species extends significantly further forward.

From C. palustris I was welcomed by the great kindness of Prof. Dr. Fraas, the

I would like to express my sincere thanks for this, a skull from Trichoor in East India from the Kgl. Leave the natural history cabinet to Stuttgart for precise measurement and comparison. It is very favorable that this skull is almost the same size as that of Trinil.

The shape of the skull of C. palustris differs due to the slightly larger width of the snout and the less deeply cutting constrictions in the fourth and fifth tooth and between 11th and 12th or 12th and 13th tooth, due to the more pronounced and curved sides of the muzzle and the noticeably more convex facial profile.

The premaxillo-maxillary suture is straight, i.e. not drawn backwards as in the Trinil skull. While the shape of the breakthroughs is quite similar, the rear seam of the palatine differs due to its rounded shape. The one occupied by the basioccipital

The part between the foramen magnum and the choan opening is considerably more developed vertically, which is expressed in the table in the dimensions of the distance between the upper edge of the choan opening and the skull. In connection with this greater expansion of the basioccipital

The reptile remains (excluding turtles).

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region, the whole space between the Jugalia and the Pterygoids is considerably more extensive. The roof of the skull only has margins that diverge slightly backwards, the eye and upper temple holes are closer together, the depression between the former is deeper. The quadrata protrude further beyond the posterior ends of the squamosa. The areas on the upper side of the Javanese skull, which are covered with weaker, furrowed sculpture, are sculptured to a greater extent and more pitted in C. palustris; the side edges of the roof of the skull and the upper edges of the eye holes are not thickened, the roughness in front of these is less compact, but more pitted and moreover curved longer and flatter. The teeth, which are nineteen on each side as a result of the preservation of the second, are plump and thicker, which is particularly noticeable in the largest, fourth and tenth.

If we try to determine which of the two living species the Trinil crocodile is closest to, the following comparison would result. It resembles C. palustris more and differs from C. porosus in terms of the outline of the entire skull and the reshaping of the palatine and palatal perforations, while it comes closer to C. porosus and differs from C. palustris by the Design of the profile, the curvature of the lateral edges of the skull, the surface sculpture, the premaxillo-maxillary suture, the shape of the teeth and the ratio of the squamosum to the square. With regard to the divergence of the lateral margins it differs from both living species, the same applies to the lower height development of the basioccipital part, the amount of which differs even more in C. palustris than in C. porosus. According to the investigations given above in G. porosus on the influence of age on the number of teeth, I am not able to make a very great difference in the number of teeth

To attach weight. If the lower jaw of a Trinil crocodile, described below, belongs to the same species as the skull, which can be regarded as probable based on its shape, then there would again be a not unimportant similarity to C. palustris in this point.

In assessing all the differences, I think I have to decide in favor of the view that our Trinil crocodile is about the same distance from C. palustris and C. porosus, and that a direct genetic intermediate position is not likely.

Since Gray (Transact. Of the Zoolog. Soc. London Vol. VI, p. 141) points out that a variety of this species occurs on Ceylon with a narrower nose and longer and narrower premaxils, it is very possible that there are representatives that show even more resemblance to that of Trinil in the skull than the one from Stuttgart from East India.

In his latest publication on the fauna of Trinil (The geological age of the Kendeng or Trinil fauna. Tidschr. Vh Kon. Nederl. Aardrijksk. Gen. 2. Ser. XXV 1908) Dubois introduces the new species C. ossifragus for a crocodile which is said to be equally close to the Indian C. palustris in the Ceylon variety and the C. sivalensis from the Sivaliks. Dubois says of the important nature of the premaxillary: “Our fossil Javanese species moved away from itC. sivalensis and approached C. palustris due to the shorter length of the premaxilla, the greater roughness in front of the eye sockets. «According to this, C. ossifragus Dubois has premaxillae that are shorter than that of C. sivalensis and probably longer than that of C. palustris . The latter would be true of the findings on our trinile skull. On the other hand, the statement that the premaxilla should be shorter than in C. sivalensis would not apply if we were to say that from Lyüekker (Indian tertiary and posttertiary Vertebrates III, PI. XXVIII, Fig. La, and PI. XXIX, Fig. 2a ) Use the illustrated example for comparison, because the premaxillae are significantly shorter in this case. The mentioned »roughness before the

Our example also has eye sockets, as stated above.

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W. Janensch,

According to Dubois, its species differs from C. sivalmsis and C. palustris "in the more significant widening of the 9th tooth and the non-round shape of the dimples on the upper surface of the skull". The muzzle of the Berlin skull, as explained above, is somewhat inferior in width to the Stuttgart palustris skull, but the reverse case may very well also occur, especially when compared to specimens of the slimmer variety of Ceylon. If Dubois' statement of the non-round shape of the dimples on the upper surface of the skull were to refer to the places of the furrow-like sculpture mentioned in our Trinil skull, then that would fit this. However, this only applies to certain parts of the skull.

Even if the diagnosis of his C. ossifragus given by Dubois up to now is by no means exhaustive, I believe, in spite of the discrepancies mentioned, I should still assume that our Berlin skull can also be assigned to this species.

But I think I have to emphasize again that the Trinil crocodile has very remarkable echoes of the living C. porosus.

The Sivalik species C. sivalensis differs from the Javanese in the shorter length of the premaxilla, the lack of sculptural strips in front of the eye openings and the shortness of the maxillary medial suture. I do not dare to decide whether they are as close to one another as the trinile form is to the living, since the deviations with regard to their genetic-systematic value are too difficult to assess against one another. Obviously further removed from C. ossifragus, however, is the second type of sivalik, C. palaeindicus, whose strongly convex profile, larger circumference of the upper temporal openings and greater width of the palatina differ greatly.

Lower jaw no.1766 from Trinil.

The anterior, tooth-bearing sections of two associated mandibles of a small individual lie in front of them; on the right the foremost tip is missing up to about half the length of the symphysis. In the area of ​​the symphysis the mandibles are flattened at the top. Between the 7th and 8th tooth

on the right is the width 15 mm, the height about 19 mm. The cross-section here is roughly triangular, but with a strongly curved outside. Towards the front, the height decreases, it is almost 17 mm immediately behind the symphysis, it is largest on the 11th tooth, namely 31 mm, behind it its amount decreases and then soon increases again. The width remains approximately from the 7th tooth on

15 mm roughly the same.

The symphysis extends to the middle of the 4th tooth socket, its length cannot be determined precisely.

since the anterior margins of the alveolus of the 1st tooth are not completely preserved on the left mandible either. Judging by the angle which the mandibles form against one another, the muzzle must have been quite wide.

Only a few of the teeth have survived. The first and fourth alveoli are particularly large.

The length from the front end to the middle of the 11th tooth is approximately 14 '/ 2 cm. The preserved part of the right mandible extends approximately to the 16th tooth.

The sculpture on the outside of the mandible branches consists of scattered, elongated pits that in places flow into furrows or billets.

The estimate of the greatest length of the skull, to which the present mandibular branches belonged, results in the amount of 39 cm, if one considers the position of the 11th tooth with the distance of the pit from the 11th mandibular tooth on the skull described above Crocodilus ossifragus

Length of the body without the condyle. Length of the body with the condyle. Width of the condyle

Height of the condyle

Total height of the vortex

The reptile remains (excluding turtles).7.3

compares. Almost the same number, namely 40 cm, resulted from a Crocodilus porosics skull from the Zoological Museum in Berlin.

Whether the branches of the lower jaw belong to C. ossifragus Dubois cannot be determined with certainty, but considering the outline of the anterior end of the snout it can be considered probable.

The shortness of the symphysis is very different from C. porosus. Even in the very youthful skulls of the latter type of the Zoological Museum at Leiden, 82 and 89 mm in length, the symphysis extends behind the fourth tooth, and in all larger pieces that I was able to examine, to the middle or the rear edge of the fifth Tooth socket, while, as already indicated, with the

Trinil mandibles only go up to the middle of the 4th tooth, which gives the front end a completely different character.

On the other hand, there is great correspondence with the lower jaw of the Stuttgart skull of C. palustris, in which the symphysis is almost the same length and the entire outline of the anterior section is designed quite similarly.

Trinil vertebra # 1707.

Trinil vertebra # 1707 is from a large individual. Half of the left transverse process is missing. The shape of the well-preserved right shows that it was not ribbed. The vortex must therefore be one of the last presacral.

The dimensions are as follows:

82 mm 108 »70» 57 »183» Total width of the vertebra (the left transverse process is thought to be supplemented) approx. 350 »

The vertebra at hand is likely to come from Crocodilus ossifragus Dubois, not Gavialis bengawanicus Dubois. The comparison of the skeletons of Crocodilusporosus and Gavialisgangcticus of the Leiden zoological collection showed that the spinous process in the former protrudes relatively much higher over the prezygapophyses than in the gavial. With regard to this feature, the present vertebra shows more resemblance to those of C. porosus and should therefore be assigned to the representative of the genus Crocodilus in Trinil. Dubois' statement that C. ossifragus should reach very large dimensions would also be correct.

B. Lacertilia.

Varanus.

Two single vertebrae of Trinil come from a member of the genus Varanus. An exact determination and comparison cannot be provided because of the inadequate material, all the less so since the living forms have not yet been adequately processed osteologically.

Selenka-Trinil expedition.

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W. Janenscb, The Reptile Remnants (excluding Turtles).

0. Ophidia.

It is in front of the small snake vertebra No. 365 from Trinil.

Unfortunately, since the systematically very important spinous process is incomplete, a more precise determination is not possible. It is likely that the vertebra came from a representative of the Colubrids in a broader sense.

Blackboard explanation.

Plate XII. Fig. 1. Skull of Gavialis bengawanicus Dubois No. 680 by Trinil. 0.54 d. nat. Size

Fig. 2. Lower jaw of Gavialis bengaivanicus Dubois No. 1219 from Trinil. 2 nat. Size / 9

Fig. 3. the same. 5

/ ai

nat. Size

Plate XIII. Fig. 1. Skull of Crocodilus ossifragns Dubois No. 218 from Trinil. View from above. approx. J Fig. 2. same. View from below, approx. 73 nat. Size

Fig. 3. the same. View from the side, approx. 1/3 nat. Size

/ 3

nat. Size

The fossil turtle remains of Trinil from

Prof. Dr. O. Jaekel.

With panels XIV and XV.

The turtles or testudines, which are a subclass of my new class of Paratheria1)

are represented in the Trinil material by a number of complete shell halves and various individual bone parts. Most of them originate from the main bone layer, the yellow carapace of Chitra No. 10 from its 1st layer of clay. Some parts, freshly preserved in brown, were found in the clay banks above the main bone layer, and some yellow pieces were also found in layer 3.

The remains that are present belong to the two orders of Trionychia and Cryptodira and, among the latter, to the large family of Testudinidae. I owe special thanks to Mr. F. Siebenrock in Vienna for her systematic determination.

Ord. Cryptodira (Cope) Boulenger.

Fern. Testudinidae Boul.

»Nuchal plate without rib-like extensions; Pectoral shields connected to the marginalia2). "

Subfam. Emydinae.

“The scalp is smooth at the top, or it breaks up into little shields at the back; Square open at the back; more or less clearly developed webbed feet; webbing is always present, at least in rudimentary form; Metacarpal elongated; Claws long and curved. "A. Neural plates hexagonal, the short sides anterior.

I. The plastron is connected to the back shell by a fixed seam, i.e. immobile. Alveolar surface of the upper jaw wide, 1 or 2 central edges available.

a. Axillary and inguinal processes are very long, the former extend to the first rib, the latter are inserted between the 5th and 6th costal rib.

1) 0. Jaekel, About the Paratheria, a new class of tetrapods. (Zool. Num. 1910.)

2) Siebenrock, synopsis of the recent turtles with consideration of the species that became extinct in historical times. (Zool. Jahrb. Suppl. X, p. 450.)

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0. Jaekel,

Gene. Batagur Gray.

The 4th vertebral no longer than the 3rd; it covers 3 neuralia; Entoplastron located in front of the humero-pectoral suture; Alveolar surface of the upper jaw very broad, 2 central edges present; Choanen located behind the eyes; Scalp divided into small fields above and behind; Tail very short.

We only know one species of this genus, which is native to back India and the Sunda Islands,

Affiliation of the existing Emydinid armor to Batagur ensured.

Batagur Siebenrocki n. Sp.

If we start with our large armor pieces of the carapace and plastron with the description of the

The following armor pieces are available in the new way:

1. An almost complete carapace (No. 1026), plate XIV, Fig. La from above and Fig. Lb from below in V5 nat. Size pictured. Its dimensions are as follows:

Length 53 cm.

Width 41 cm.

Height of the bulge 21.5 cm.

The upper side (Fig. La) is curved fairly uniformly flat oval, so that only a weak depression accompanies the tree, especially on the sides. The center is hardly noticeably curved in the longitudinal axis. The inside (Fig. 1b) shows the anterior and posterior inflection of the sternal bridge, which is typical of Batagur and related genera, so that deep "sternal alkali" arise. Best of the vertebrae are recognizable in the center line, especially in the upper part of the best of the vertebrae of the Säcral region. On both figures, Fig.la and lb, the front end is directed downwards. The thickness of the armor is about 10 mm in the pelvic area and 16 mm at the sternal bridge.

B. baska Gray, on which the diagnosis of the genus is based. From the von Siebenrock: 1

Of course, only a few of these features can be found in our fossil skeleton parts. The border lines of the horn shields, which are otherwise visible from the furrows in the shell of fossil forms, have been rubbed off on our specimens, so that the specific shape of the fourth vertebral is unfortunately not recognizable. Since nothing was found of the skull either, the determination is based only on the general shape of the shell, in that the position of the entoplaston in front of the humero-pectoral suture can also be found in other Emydinid genera. Nevertheless, even after Mr. Siebenrock's judgment, the

at Gray and the one kept in the Berlin Museum of Natural History, unfortunately not skeletonized,

B. baska 1

When comparing specimens from B. baska, the proportions and general shape of the carapace hardly differ from those of the living species, which seem to be subject to considerable fluctuations. With almost the same absolute size, however, the curvature of the fossil armor seems to be higher and larger than that of the recent ones.

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Plastron (No. 1026) shown from the inside, the front end of which is also pointing downwards in the illustration.

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2. That on Plate XIV, Fig. 2, in a similar size ratio (approx. / 13th

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1) The diagnosis of B. baska Gray in Siebenrock is: »Back shell moderately depressed, in boys with vertebral disease), in adults uncut, smooth. Nuchal long and broad. Plastron large convex, trimmed at the front, cut off at an angle at the back; The central suture is never more than half the length of the humeral suture. Snout elongated to a point and turned upwards; the jaw edges serrated; the looseness of the mandibular symphysis is almost the same as the transverse diameter of the eye socket. 4 claws on the front feet «.

)

The fossil turtle remains of Trinil.

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Seams and borders of horn plates are unfortunately just as difficult to recognize on its outer lower surface as on the previously discussed carapace. The dimensions of this plastron are in its current state Fig. 2:

Length 47 cm.

Largest width 33 cm. . Height of the bulge 8 cm.

3. A second plastron (No. 1548) and a second carapace (No. 1058), both from the main bone layer, are present in a badly shattered condition. The size of these non-measurable parts appears to be approximately the same as that of the tank described above.4. An incompletely preserved right margin 3, which is 6 cm wide at the front and 8 cm at the rear edge and shows the course of some weakly sunk border lines of the horn shields on the upper side.

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5. Two pelvic halves belonging together, their right panel XIV, Fig. 4 in 3

na-t- Gr. from the nat. Size is shown. The process turned to the right in FIG. 4 is the ilium, which is widened in the shape of a spoon at the top, the process directed downwards in the table is the ischium, and that turned up to the left is the pubis. The latter two are widened inward and fused together at the median line. 3 shows this medial union and the large round gap which is thereby formed between the ischial pubis and the joint socket, viewed from below. The latter is visible in FIG. 4 in the middle of the object with the border lines of the three elements of the basin that meet here. In Fig. 3 the socket is on the left, above and below it one notices on the left side the anterior and posterior wings of the enlarged ilium. In the preservation with the gray, somewhat corroded surface, these basin pieces fit exactly to the previously mentioned armor pieces. This also applies to their dimensions; its height of about 12 cm fits into the interior of the tank, the largest of which is exterior

Height above was given as 21.5 cm.

Batagur signatus n. Sp.

right outside and its left panel XIV, Fig. 3 from below in i

Two fragments of the armor rim are plate XV, Fig. 5 and 6 in 2 and 3 nat. Size pictured. / 5/8

6 shows a nuchale, on the surface of which the border furrows of the horny plates are very sharply dug. The plate is complete in itself and has the following dimensions: width 42 mm; Length in the center line 36 mm. Its greatest thickness is 10 mm, but only 2.2 mm at the medial posterior margin. The other piece shown in Fig. 5 is a left margin 3, it is 35 mm long in the vertical longitudinal axis of the animal 24 in the figure and in a transverse extent from the inner edge to the right-angled protruding band edge of the carapace, at the one above in the figure Front edge thickened up to 21 mm. The two pieces most likely belonged to the same individual. The size of this carapace can therefore be estimated at 18 cm in length and around 14 cm in width. It would be an interesting, but not entirely easy, task to reconstruct its structure from the course of the furrows in the horn-shell. but unfortunately this is not possible for me without a wealth of comparative material. It should only be noted that a medial horn shield on the nuchale is missing or very reduced; the two middle band shields meet closely at the front, but leave a triangular gap at the back, which perhaps still carried a rudimentary center shield. The first Epicostal shields still reach up to the side corners of the Nuchale. On Marginale 3 (Plate XV, Fig. 5) the border of two ribbon shields runs in the middle parallel to the front and rear edges, and the side edge of the second epicostal shield runs

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0- Jaekel,

at a distance of about 8 mm from the inner edge of the margin, roughly parallel. This, as well as the indicated size of the carapace, 18:14 cm, seems to characterize the species for the time being. Their name is based on the sharp expression of the Hornschild furrows.

The following remnants are likely to be placed at Batagur, but cannot be reliably determined in the absence of the necessary reference material:

Of the so-called primary shoulder girdle there is a right scapula with the anterior process, which I regard as an acromion and not as a praecoracoid, and both coracoid. Both form the joint surface for the humerus, but are only connected to it by ligaments, not synostotically. The scapula (Plate XV, Fig. 10) with its upper stalk and its anterior process consists of two slender, rotating, almost straight-line braces that meet at right angles at the joint. The coracoid connected medially backwards and downwards (Plate XIV, Fig. 8) is thin under the thickened part of the joint and round in cross-section and spreads out distally in a leaf-like manner.

Also a forearm bone, radius (Plate XV, Fig. 9) in% natural size. should belong here. It is 8 cm long and shows the same state of preservation as the bones of to be described later

Chitra minor.

Ord. Trionychia.

Fern. Trionychidae.

Due to their grooved surface sculpture, the detachment or lack of the marginalia, the protruding rib ends of the disc and the peculiar dissolution of the plastron into rod-shaped elements with sculptured central plates, fragments of the armor of Trionychids are easily recognizable as such. The more precise definition of the individual genres, however, presents greater difficulties and I am particularly indebted to Mr. Siebenrock for letting me point out the rare oneReferred to genus Chitra, of which no skeleton specimen was available for comparison. The description and illustration of the Trionychid plasters that Siebenrock published was very valuable to me. He also received a skeleton from the Brussels museum by Chitra, of which he had at least depicted parts of the plastron.

This has made it possible to determine the greater part of our remains and to compare them with the remains of Trionyx itself. Of the latter genus, however, there are only a few remains.

Gene. Trionyx Geoffr.

Trionyx trinilensis n. Sp.

An interclavicle (entosternum) and a left clavicle (episternum) appear to be part of the genus

Trionyx in the strict sense of the word. They are on Plate XV, Figs. 12 and 13 in 2

Size shown. Fig. 13, the medial interclavicle, is directed with the anterior tip downward. The clavicle Fig. 12 is to be oriented in such a way that the thin process on the left lies against the anterior margin of the interclavicle and leaves only its central part exposed, while the thicker, flat portion on the right was directed forwards next to the line of symmetry. In the bones there are no special sculptural plates in the ossification center, as can be found in various species of the genus Trionyx, Cyclanorbis and Cycloderma. The angle of the interclavicle is rather obtuse, in contrast to that of Chitra

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The fossil turtle remains of Trinil. 79

(Plate XV, Fig. 14), where it is pointed. The anterior process of the clavicle (episternum) is remarkably long, similar to that of Trionyx cartilaginus. However, an identity of ours with this species is impossible, since in the latter the interclavicle is provided with a sculptured central field, and our interclavicle, which obviously belongs to the clavicle, shows a smooth surface. According to this there seems to be a new species, which, of course, can only be characterized provisionally by the smooth surface and broad form of the interclavicle and the length of the anterior process of the clavicle. Both pieces were found together in the clay banks above the main bone layer. I will rename the form as Trionyx trinilensis n. Sp.

Gene. Chitra Gray.

The genus Chitra differs from the other Trionychids according to the latest system by F. Siebenrock primarily in that his xiphiplastra have a triangular extension at the front edge of their medial commission, which is not six to eight, but only three-pointed as in Pelochelys and that the lateral processes of the hyo- and hypoplastra, which are otherwise at most two-pointed, have three to four teeth here. In addition, the interclavicle (entoplastron) is acute-angled and, in the only living species, has very long legs. In the back armor (carapace) the 8 neuralia form a closed row; the last carapaceous costal plates are connected medially by a suture. The other characteristics given by Siebenrock (Synopsis of the recent turtles, p. 608) are not relevant for our remains. According to this, the following skeletal parts should belong to Chitra.

1. A large carapace, shown in Plate XV, Fig. 1 with the front end down. It is 64 cm long in the middle line, its greatest width on the third costal pair is 55.5 cm, the height

its arch 14 cm. Figure 1 on plate XV is thus roughly on 2

Neuralia is not completely preserved, but it can be seen that it extends uninterrupted to the front edge of the last Costalia; the latter are also connected by a medial suture.

2. A partially preserved Carapace No. 199, namely its rear section with the last five right and the last four left Costalien.

The following pieces are included in the Chitra plastron:

3. A large right xiphiplastron, Plate XV, Fig. 2 in y4 nat. Size shown and positioned so that its front edge is on the left and its medial edge is on top. The triangular appendage above is, as I said, characteristic of Chitra. This piece fits the size of the carapace listed under 1 so that it can be assumed that it belongs to the same animal, at least the same species, as the two large carapaces. It is 22 cm long and 14 cm wide at the front.

A right Xiphiplastron plate XV, Fig. 3 is considerably smaller than the previous one; it should have been about 17 cm long and 11 cm wide and differs not insignificantly from the previous one, so that it can still be assigned to the genus Chitra, but not the same species. On the other hand, a left hypoplastron, Plate XIV, Fig. 4, should be assigned to the same individual as the piece just mentioned. It's on the back edge -in all shape and size proportions exactly to the last-mentioned xiphiplastron of the other half of the body. Its front (in FIG. 4 upper) edge is broken off, as is its medial edge (on the left in the figure) injured.

in Fig. 4

the

Lower edges

- about 18 cm wide and fits

/ 13

reduced. The series of

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0. Jaekel,

The entoplastron (the interclavicle) shown in Plate XV, Fig. 14, with its acute-angled shape and long, narrow thighs, goes well with Chitra, and with its size and preservation it goes well with the large back armor mentioned as No. 1-2. The length of the legs is 21 cm, the width of the rear bracket 26 cm. Fig. 14 shows the slightly concave inner surface.

A fragment, Plate XV, Fig. 11 (in r>

belonged to the same species. It also matches the aforementioned Entoplastron well in size.

A comparison of the two Xiphiplastra, Plate XV, Figs. 2 and 3, shows that there are two different types of Chitra, which can also be distinguished by their size and their state of preservation.

Chitra Selenkae n. Sp.

Chitra Selenkae n. Sp. may be called the larger species, to which I ascribe the carapace, Plate XV, Fig. 1, the xiphiplastron, Fig. 2, the interclavicle, Fig. 14, the fragment in question, Fig. 11. Only the Xiphiplastra come into consideration for comparison with the following species, since other elements of both species are not present.

The xiphiplastron, Fig. 2, is inflected at the outer edge (the lower one of the figure) and shaped in its whole outline, especially the sculptured surface, much more whitened and complex than that of the following kind. Its dimensions are given above; it is about a third larger than that of the following species, but its sculpture is finer.

Chitra minor n. Sp.

From the above-mentioned xiphiplastron Fig. 2, that shown in Fig. 3 differs considerably in many details and also in size. It is only about two thirds the size of the previous one, but shows a thoroughly senile sculpture that, despite its smaller size, is even stronger than that of

Chitra Selenkae, so that it cannot be ascribed to a youth form of the aforementioned. The outer edge is consistently convex, the front inner angle is right-angled, the inner edge almost straight with very small bulges, while these are very considerable in Chitra Selenkae. The cones also show considerable differences throughout. Thus those directed outwards in the middle at the front edge are truncated almost in a straight line, while they are strongly represented in Ch. Selenkae and a medial one protrudes sharply, which in our species is entirely absent.

Apparently that belongs to the same species and probably to the same individual

Systematically unspecified remnant of a Trionychid.

An incomplete anterior cervical vertebra (Plate XIV, Fig. 5) could belong to the smaller species Chitra minor, as well as a few fragments of another vertebra, but a more precise determination is not possible without very rich reference material. In all likelihood it would also be hardly worthwhile, since it would hardly reveal to us any other species of fauna than those already mentioned.

/ 13

nat. Size shown) should be a clavicle lEpiplastron:

which have the characteristic features of the genus ('hitra in the form

left hypoplastron plate XV, Fig.

its outer projections on the right in the figure can be recognized. The shape of the lower rear margin differs not insignificantly from that of the living Cliitra indica. The inflection of the inner edge is considerably deeper and wider, so that there can be no doubt as to the specific independence of this form from the living species.

4,

Fig. 5.

Cervical vertebrae of Trionychids from the front in 4

Plate XV.

The fossil turtle remains of Trinil.

81

The faunistic character of the turtles described here corresponds completely to the Hindi and Sunda Island Province. The forms form different species than the living ones, even if they are evidently close to them.

For the important help given to me by the curator Dr. F. Siebenrock in Vienna for the comparative use of living forms, I am very grateful to him. Since I was no longer able to check the individual pieces and where they were found after the manuscript had been written, Herr Privatdozent Dr. Stremme was kind enough to do this job for me in Berlin. For this, too, I would like to thank him most sincerely.Explanation for panel XIV.

Figs. 1-4. Batagur Siebenrocki n. Sp.

la carapace from above, lb from inside in 1

nat. Size.

2 plastron from the inside in 3/13 nat. Size. At 1 and 2 the front end is directed downwards.

Fig. 1. Carapace of Chitra Selenkae n. Sp. with the front edge down in 2 / i3 nat. Size.

Fig. 2. Right xiphiplastron from Chitra Selenkae in i

Fig. 3. Right xiphiplastron of Chitra minor n. Sp. in 2 nat. Size. / 9

Fig. 4. Left hypoplastron of Chitra minor n. Sp. in 1/4 nat. Size.

Fig. 5 and 6. Fragments from the armor rim of Batagur signatus n. Sp. 5 in 2

Figures 7 and 8 Coracoid in Figure 4

Fig. 9. Radius in 3 / g nat. Size.

Fig. 10. Scapulars in 4 / ii nat size.

Fig. 11. Clavicle (epiplastron) of Chitra Selenkae n. Sp. in 5/13 nat. Size.

Fig. 12. Interclavicula (Entoplastron) 1 of rw TMmsis n sp in s / nat size

or 5 / i4

Fig. 13. Left clavicle (episternum)

Fig. 14. Interclavicula (Entoplastron) of Chitra Selenkae n. Sp. in 2

Selenka-Trinil expedition.

11

/ 10

nat. Size. \

> from Batagur?

\

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/ 5

/ 5

3 and 4 two halves of the pelvis that belong together.

3 left half from below in i / nat. Size; 4 right from the right outside in 3, 'g nat. Size. 3

(The process at 4 turned to the right is the ilium, the left downward is the ischium, and the left upward is the pubis.)

>

/ 5

nat. Size.

/ i

nat. Size.

nat. Size.

/ 5,

6 (nuchale) in 3 / g nat. Size.

The mammals with the exception of the Proboscidians of

H. Stremme, Berlin.

With plates XVI-XX and 10 text illustrations.

Introduction.

The director of the Berlin Geological-Paleontological Institute, my esteemed teacher, Privy Councilor Prof. Dr. I owe Branca, and the leader of the Trinil expedition, Prof. Selenka, the order to process the mammal remains (with the exception of the proboscidians) from the Kendeng strata. In spring 1909 I was also able to inspect some of the Trinil finds collected during the previous year in Munich and in autumn 1909, thanks to the kind support of Prof. Bothpletz and Prof. Schlosser, I received a number of skeletal parts that did not exist in Berlin sent to all the magnificent skull of Bhinozeros (in a plaster cast).

During the processing, the focus was specifically on two questions: what is the relationship between the fossil and the recent Javanese fauna, and how does it relate to the fossil Indian? To answer the latter, apart from the literature, I had only a few plaster casts of a few shapes at my disposal, so that I was not always able to decide with certainty about the relationship between fossil Javanese and fossil continental species. On the other hand, thanks to the gracious cooperation of the director, Prof. Dr. Brauer, of Dr. Little and especially thanks to the never tired, excellent support of the curator, Prof. Matschie, to deal with the relationships to the recent fauna in much more detail by comparing them with the rich treasures of the Berlin Zoological Museum. I owe my thanks to my colleague Kronecker for taking the excellent photographs.

1 Tijdschrift van het Koninklijk Nederlandscb Aardrijkskundig Genootschap, 2nd Ser., Dl. XXV, 1908, Afl. (i.

During the processing, a work by Eugen Dursois 1 appeared in the autumn of 1908

on "the geological age of the Kendeng or Trinil fauna", in which Dur.ois for the first time gave a more precise description of almost all the mammals of the Kendeng strata that he worked on. The fossils were given the new name that Dubois believed was appropriate and were briefly, but often aptly, characterized. I had to deal with this work primarily. So skeptical

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H. Stremme, The Mammals Except for the Proboscidians.

83

At first I faced the rules of mammals at Dubois, but in the long run I had to agree with his views in almost all cases.

First I will let the description of the individual animal forms follow and then give a summarizing overview of the fauna.

Rodentia.

Hystrix sp. (Plate XVI, Fig. 5.)

Only one molar of rodents is present, which turns out to be a right upper second molar of a small hystrix-kvt and thus testifies to the presence of this group of animals, which is also native to Java today, at the time of the Pithecanthropus. The broken, severely chewed tooth at the bottom is 0.49 cm wide and 0.51 cm long. Dubois also mentions the remains of porcupines from his collection in one of his earlier communications, without giving any details about them in his last publication.Carnivora. Canidae.

Mececyon trinilensis n.g. n. sp. (Plate XVI, Fig. 1 and 2.)

Description.

From a dog there is a weathered fragment of a left lower jaw branch, which is composed of two parts glued together. A fracture goes through the bite tooth and cuts off its third tip, then runs obliquely forward through the jaw. The coronary process and the angular process have broken off with the condyle. The front part has broken off vertically behind the canine. You can see into the alveolus of the canine. M2 and P3 are glued on, M3 is missing. P3 sat very high. P4 is absent; you can see its alveolus, which is probably enlarged by crumbling. The anterior crest of the coronary process is remarkably changed by crumbling: it is in two

Branches are divided, the stronger of which is conspicuously slightly inclined forward and breaks off at the height of the jaw, while only the weaker runs backwards in the usual manner. The weathering of the iron pebbles or the dissolving effect of the sulfuric acid formed here is probably a factor in itself. In part due to the unusually strong tapering of the lower jaw and its unusually narrow, slender shape; but since its thickening still clearly stands out in the places characteristic of the dogs, the sulfuric acid cannot have removed too much from it.

Certainly the lower jaw itself was unusually slender and unusually high in relation to the height of the teeth. The teeth are also noticeably slender and narrow in relation to their length. The row of teeth is long and strongly curved outwards. M3 was there, but tiny; There is a small gap between P4 and P3, a larger one between P3 and P2, P4 closely related to Mt. P2 and P3 are bilobed, the latter like P4 closed at the back by a strong basal band; P4 three-pointed, the third point small but clearly raised from the basal ligament. The bite tooth is three-pointed; the inner hump (metaconid) was broken off, but was certainly present,

ll \*

M.

84 H. Stremme,

even if it was only tiny. The talon is less wide than the outer hump (protoconid) and only single-pointed. A long, basal band-like structure has emerged from the second (inner) point, and the space between the two points is particularly elongated. M2 is small and three-pointed and not much about i

as long as the fang.

The dimensions of the jaw and teeth are compiled in the following tables.

Height of the mandibular branch thickness »»

from me

2.39 1.02

from me

2.64 0.94

rm3

from M3

2.79 0.81

Pm, c

length

0.35 0.80 2.09 1.11 0.95 0.91 (0.51) (1.41) 0.23 0.39 0.75 0.44 0.35 0.31 0.40 ( 0.78)

Relationship and naming.

(e.g.

The dimensions of the teeth (in cm) are taken on the alveoli on the lingual side, with only the ridge and length of the crown of the fang.

/ 5

wider. The row of teeth is 6.24 and 6.77 cm by 1.38 and 0.95 cm, respectively

between Pm-j and Pm3

1.85 0.95

at the front edge at the rear edge at the rear edge

7.62 cm

3

M3 M2 M, Pmi Pm2

Length of the row of teeth from Pn ^ -

Length of the crown of M! 2.14 cm

Width of the outer hump of Mj 0.84 cm, width of the talon of Mi 0.70 cm

On Java live from wild canids Cuon javanicus, the red wolf, and the Tenggerhund. The fossil form described above is not related to Cuon. Its lower jaw is shorter and thicker; the third molar is missing, and sometimes the first premolar as well. The other teeth are packed closely together, so the whole row of teeth is shorter, but the individual teeth are wider. While z. R. with Cuon javanicus (according to a measurement made by Dr. Janensch in Leiden) the row of teeth from the second premolar to the second molar (in some red wolves the whole row of teeth) measures 5.45 cm, spanning the ends of these two teeth Trinil pine 6.60 cm. For two Siberian red wolves, the length and ridge of the fang were 2.10 and 2.00 cm and 0.90 and 0.92 cm, respectively; the tooth

is also the same length at J.

shorter than that of the fossil Javanese dog. The talon of the fang is similar, although it is wider in relation to the protoconid than that of the Trinil jaw, but shows the inner tip as a long ridge.

The Javanese wild dog, Canis familiaris var. Tenggerana Kohlbrugge, was owned by Dr. Janensch kindly compared with the Trinil copy. Found that the Engger Dog's lower jaw does not taper forward. The distance between the two anterior premolars was greater. From the middle of the fang there was a strong indentation of the upper one1) Studer, The prehistoric dogs in their relationship to the dog breeds currently alive. Treatise Switzerland, paleont. Ges., 1901, p. 112.

Jaw margin that the Trinil jaw lacks. According to Studer 1

turns. Its teeth show no closer resemblance to those of the fossil. Rhyme dingo is that

)

the Tenggerhund is close to the dingo

Real dingo

tfZ.G. . . 6859. . .

au Wed in front

2.24

on Wed behind

2.05 2.37 2.36

The mammals with the exception of the proboscidians.

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Talon of the fang wider and two-pointed. The dimensions of the dingo jaw are also different, as the table below shows. I was able to measure the lower jaws of a real dingo and two specimens from the zoological garden in the Berlin zoological museum.

Length of the row of teeth Pm4 -M3

7.41 7.46 7.80

Height of the lower jaw

Mi (crown) length width

1.93 0.82 2.12 0.95 1.99 0.89

In the real dingo, if the length of the row of teeth is shorter, the fang is shorter but wider; also the lower jaw is lower than that of the Trinil dog.

Of other Malay and Indian canids, the Sumatran Battaker dog has smaller, thicker jaws, thicker teeth, shorter row of teeth. The jackals of Sumatra, Siam and Bengal have a shorter row of teeth, much thicker, narrower teeth and a clumsier jaw, more points on both molars. The wolves, not just the Indian Canis

pattipes Sykes, but the representatives of the Wolf group in general, have a longer row of teeth, thicker teeth, wider, stronger lower jaws and two points on the broad talon of the fang. The lower jaws of the fox are more similar to those of the jackals, but are usually even smaller. Even the largest of the foxes have lower jaws, even if the row of teeth is longer.

I looked through hundreds of domestic dogs in the Zoological Museum without finding a shape to which I could have attached the Trinil dog. In general, the following characteristics apply to them: relatively heavier jaw, thicker teeth, wider talon of the fang.

In the Siwalik layers, canids come to Lydekker 1

Canis Cantteyi Evil and Canis sp. ape. Canis aureus. The latter, a jackal-like shape, comes as

the jackals, not for comparison. The Caniscurvipalatus had Evil as a relative

designated by Vulpes bengalensis Shaw. But Lydekker shows that in the "number of his

zahnung «closer with the real dogs, in the construction of the teeth with the foxes and, z. B. in the form

of the lower jaw, coincides with Otocyon. It is a small shape with a low jaw and a short one

Row of teeth in which the premolars are tightly packed. At the fang, the talon is as wide as that

great tip. Canis Cautleyi, which, according to Rose, is similar to the Indian wolfe Canis pallipes Sykes

also considered by Lydekker as a relative of the wolves, whose fang is fully that of the wolves.

come equals. No canids have been described from the Pleistocene sites of India,

on the other hand Koken2 and Schlosser3 announce fossil canid teeth from China, albeit so sparse))

Remains that a comparison with the Trinil pine is not possible.

Other fossil canids cannot be compared: Amphicyon: M too thick,

P too small; Pseudamphieyon: teeth too heavy and clumsy, also set completely differently and with a different formation of the teeth; Cephalogals: characterized by strong basal bands; Simocyon: number of teeth reduced; Cynodictis and those closely related in the dentition (Plesiocyon, Pachycynodon, Cynodon, Amphicynodon, Temnocyon): teeth that are too pointed, the P mostly also single-pointed, jaws low; Galecynus: fang tips too low.

1) Lydekker, Tert. a. Posttert. Vertebr. II, p. 76 ff.

2) Koken, About fossil mammals from China. Paleontol. Abh. III, p. 71.

3) Locksmith, The Fossil Mammals of China. Dep. K. Bavarian Akad. Wiss. XXII, 1, p. 25 and 26th

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before: Canis curvipalatus Böse,

86

H. Stremme,

So at the moment I can only keep the Trinil dog in isolation. Even if the noticeably high and slender shape of the lower jaw is not to be used for diagnostic purposes due to the etching by the sulfuric acid, the slender, slightly pointed shape of the teeth in connection with their full number with a wider extension of the row of teeth is a cuon-like formation Ripped tooth salons have such peculiar characteristics that it seems necessary to me to establish a new genre. I propose the name Mececijon v trinüensis n. G. n. sp. in front. In the Dubois collection is a canide)

not represented.

Felidae.

Feliopsis palaeojavanica n.g. n. sp. (Panel XVI, Fig. 3 and 4; Panel XVII, Fig. 1.)

A large felid the size of a tiger is represented by fragments of a skull (No. 5), which reveal important peculiarities. There are: the forehead with the adjacent bones; the right upper jaw with the two large premolars, the alveoli of M and P, those in the alveoli

t

stuck fractions of C, I3, I2 and the fused alveolus of I,; a fragment of the left upper jaw with remnants of the two large molars. The cranial sutures are barely visible, the teeth are badly worn - so we have an old animal in front of us.

The forehead is arched on the whole, slightly sunk in the middle. The point of contact with the nasals is hollowed out. The transition into the side wall of the eye socket is barely noticeable, without interruption by a sharp edge. The post-orbit corners are broken off. From them gently curving, narrow crists along the cranial axis extend to the sagittal ridge with which they soon unite. Even behind the postorbital processes, the broad forehead merges into the orbital wall without a sharp step.

The tooth formula is 31 1C3P IM in the upper jaw. The outer incisor was wider than the two inner ones, all three standing close together. The canine was more long than it was wide, the first premolar small, its alveolus is rounded and present on both sides. The second premolar is bilobed and has a weak anterior and posterior basal band. The rather low fang has three points and a large talon; two small points lie next to each other in front and the third, largest, behind the outer front point. The front inner tip has been chewed off, the outer tip broken off, but the remnants of a small spike can still be seen in front of it.

The great talon of the fang is high and long and slender; its cutting edge forms an angle slightly smaller than 90 ° with that of the outer hump. The only molar stands laterally inside behind the fang and is positioned transversely. The existing right intermaxillary is pierced by a large incisive foramen.

Tooth formula, formation and position of the teeth reveal a relative or member of the genus Felis. The arched forehead, only slightly recessed in the middle, has a panther-or tiger-like shape, which, compared with the lion, is characterized by a more flattened or strongly recessed forehead.

I first compared the fossil skull with three skulls of Java tigers, two males and one female. The two males are similar to each other and can be called Felis sondaica Fitz after a friendly message from Prof. Matsc.hie. That deviates from them

1 Mccc from edftT / Xtis slim.

M.

which even exceeds that of No. 2695 Q in width. 19RO

the width of the forehead is number 5 on the fossil

The ratio of the length of the row of teeth (I - 2})

No. 19659 tf

12.08 5.33

6.70

2.26. The transition from the forehead to the

Fossil No. 5

i right.

l left. .

0.48

0.84

1.36 1.05 - -

2.52 1.72 0.65 2.15 0.89 - 1.70 - -

2.41

»C3 No. 2693»

»$ No.19639»

»<3 old, Hsinganfu

-

1.42 2.95 2.12 »» »2.14 0.78 3.15 1.95 0.65 1.12 ||||

.

Ji

J2 J3 C P2 P3 P4 M,

Length Width Length Width Length Width Length Width Length Width Length Width Length Width |

0.46 0.95 1.11 1.32 3.16 2.32 0.63 0.60 2.17 0.86 2.91 1.69 0.54 0.82 1

The mammals with the exception of the proboscidians.

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Females not insignificantly. On the one hand, naturally in size, as can be seen from the following figures. (Length and width were measured by projecting onto a plane.)

9 «96 = -iar.? Iff" »w width 18.67 cm

Length 3 "1 '," 42 cm =

(^ f 2693: "f i» 46

Width 21.55 cm

cm

.

After all, the proportions can be described as consistent. But behind the postorbital processes, the forehead of the female is even absolutely wider with 5.50 cm than that of the male with 5.32 and 5.36 cm. The angle between the cutting edge of the paracon and the metacon is on the right for both men, the cutting edge of the metacon (talon) is fairly horizontal. In the female, on the other hand, the talon is slightly raised, the angle a bit more acute. Prof. Matschie is inclined to regard the female not as being from Felis sondaica, but from a geographical variety.

Compared to these three tigers, the skull of the fossil form is characterized by a foreheadSidewall of the orbit strongly graduated. After all, both differences are not alien to all tigers. An old male who Filchner found in 1904 near Hsinganfu, Prov. Shinsi in China, has shot, shows

R4-ft = \

(1 '

Sidewall of the eye socket. In contrast, in all tigers the incisive foramen seems to be smaller and less sharply delineated than in the fossil form.

Rez.Q No. 2695 right - 0.45 1.01 1.00 1.30 2.51 1.81 only left existing 1.90 0.73 3.00 1.63 0.41 1.15 |

1087 = 1.83, for the recent ones: Q \_ ^ \_

1.96 or

1.86 a slightly graded transition from this to the J

0.45 0.77 1.39 2.66 1.85 0.36

1

0.50 1.02 1.06

0.49 0.75 1.39 2.73 1.62 0.58

- 0.43 0.92 1.05 1.28 2.90 2.03 0.41 0.71 2.06 0.79 3.22 1.81 0.58 1.13

0.47 0.82 1.4.3 0.58 2.61 1.78 0.51

\_ • - -

1.12 1.31 2.94 2.06 0.88 0.55 2.18 0.84 3.37 1.75 0.52 1.04 [|

0.35 1.12 1.60 2.60 1> 92 0.48

But in a particularly remarkable way the ratio of the length of the canine to the length of the fang (on the alveoli) in the four recent forms is different from that of the

3 16 = 2 51

2 95 öW =

1.08; with the recent Q - ~ ^ fossil. With the latter it is -—-- =

0.84; for No. 2693 <j <

°, 93;

2.90 for No. 19659 '=

Tiger, Persia ....>, Amur

Lion, German East Africa ». Central Africa. .

of the corner zaline

1.86 2.52 2.68 2.60 2.59 2.90 1.72

of the fang

2.79 0.67 3.17 0.78 3.56 0.75 3.18 0.82 3.38 0.73 3.65 0.79 2.34 0.74

Panther, Siam

», China .... 1.68 2.58 0.65

" , Cameroon

», Togo Leopard, Africa

...

. . .

2.26 2.58 0.87 1.06 1.87 0.57 0.51 1.12 0.45

0.90; by the Chinese tiger

=

0.87; d. H. in the fossil form is the canine

length

H. Stremme.

2.94 '

0.0 I.

These measurements show that the fang of the large fossil specimen is shorter than even that of the small recent female and that the canine is larger than normal in the tiger. But the most important of all these differences is the relationship between the length of the fang and that of the canine.

and couldn't find once that the fang was shorter than the canine. I give from the abundance of

ÖjLjU

longer than the fang, with the four recent ones, as in general with the tiger, conversely the fang is longer than the canine. In addition, the crown of the fang is also lower than that of the tiger. I have given the dimensions of the teeth and their ratios below.

tooth. I then measured numerous specimens of the genus Felis 1

Measurements the following again.

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length

of the canine I of the bite tooth

It can be seen from this compilation that in the larger cats the canine tooth is generally longer in relation to the fang than in the small cats, in which the length of the canine tooth is only about half that of the fang tooth. In the deviant behavior, the Trinil cat seems to face all recent ones. Here it is more reminiscent of Machaerodus, from which it otherwise deviates in the tooth formula, felis-like formation of the fang, larger relative rides of the canine.

A peculiarity of the fang on the Trinil skull is also worth mentioning: the long, slender extension of the talon, which ends quite pointedly, is less common among the more recent forms in the large ones (it is generally shorter and blunt in the tigers), on the other hand more common with the small forms. Rhyme panther, leopard, lynx, in the wildcat it is similarly trained.

Among the other teeth, M, less wide in the fossil specimen, P3 in relation to P4 wider than in the tiger.

Lydekker2 describes from the Siwalik layers

Falc. et Cautley, F. brachygnathiis Lyd., F. äff. pardiis, F. äff. lynx, F. subhimalayana Bronn and Felis? sp. The latter is a small form of which only an upper canine has become known. The relatives of the lynx and panther are only represented by the lower jaw. The same is true of F. brachygnatha, and only of the other two forms are larger parts of the skull and jaw known. F. subhimalayana Bronn has been described by Baker and Durand in an Indian journal inaccessible to me; the description of which is repeated by Lydekker. It is a small form that the Felis bengalensis Kerr. should not be dissimilar. There is nothing about the teeth

More details can be found in the short description. The great Felis cristata is. after Lydekker from

1 inter alia all 28 tiger and 113 lion skulls in the zoological museum. 2 Lydekker, Ind. Tert. and Posttert. Vertebr. 11. p. 320 ff.

Oz, Bolivia

Lynx ...

Wild catDomestic cat 0.47 Felis spelaea, Gaylenreuth

)

Remains of six Felis species, F. cristata

1.40 2.19 0.64

0.92 0.51 3.21 4.00 0.80

The mammals with the exception of the proboscidians.

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Tiger quite different and is closer to lion, even more to jaguar. This shape has a strikingly narrow forehead. I was able to measure the lengths of the canine tooth and the fang tooth on a plaster cast. They were 2.50 and 3.05 cm. F. cristata is therefore certainly not identical or related to the Trinil form.

Of the Siwalikfelids Aeluropsis and Aelurogale only the lower jaws are described. Machaerodus sivalensis has the longer, slimmer Machaerodus serrated tooth and unusually small P3. In Cynaelurus, the inner cusp of the fang is rudimentary.

No cat is known from the Narbada fauna. Only recent forms have been found in the Karnul Caves, namely Felis tigris, pardus, ehaus and rubiginosa, to which the present cat is not related.

The remains of the feuds described by Koken (1. c.) And Schlosser (1. c.) From China are insufficient for a comparison with the ones in question.

Dubois writes about the feuds of the Kendeng layers:

“There are three types of Felis. Two of these were about the same height

those of the tiger and the lion, the third species resembled a strong Felis minuta. None of these can be identified with living species - nor do I find any closer connections to the fossil species described. Strangely enough, the tiger, which is now so common on Java, Sumatra and the mainland, is not even represented by a closely related species. Incidentally, its very particular current distribution points to later immigration. "

The two large forms are called Felis oxygnatha n. Sp. and Felis trinilensis n. sp. and mainly described by them for the parts of the snout and the lower jaw. Only what was said by F.trinilensis

"There was a small pm2 in the upper jaw, the pm3 and pm4 were shorter and more simply built than in the tiger." Of these three features, two apply: the presence of P2 and the shortening of P4. But, as Professor Dubois kindly wrote to me, the fang of this species is longer than the canine.

Dinictis and Hoplophoneus are distinguished from other feuds by a slender tear

tooth which is also longer than the canine, nimravus and pogonodon due to the absence of the anterior ones;

Outside tip off.

So I cannot relate the fossil form described above to any of the known genera

put and therefore propose the name Feliopsis palaeojavanica n. g. n. sp. in front. Even if the size of the canine is reminiscent of Machaerodus, the shape of the molars is more felis-like, so that Feliopsis belongs to the subfamily of the Felinae.

Ungulata.

Perissodactyla. Rhinoceridae.

Rhinoceros sivasondaicus Dub. (Panel XVII, Fig. 8; Panel XVIII, Fig. 1 and 2.)

describes two Bhinozeros forms from his collection, a more common one between

Dubois 1

Rhinoceros sivalensis and the recent Rh. Sondaicus and called Rh. Sivasondaicus, and a second form, Rh. Kendengindicus, which is closely related to the living Indian rhinoceros. In the

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1) Dubois, The Geological Age, etc. a. a. 0. p. 1258 u. 1259. Selenka-Trinil Expedition.

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12th

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H. Stremme,

The Berlin collection only contains a slightly broken \* front premolar and a few extremity bones from a rhinoceros. In contrast, the Munich collection contains a beautiful, almost complete skull, two lower and one upper molars, which allow a very detailed description.

The slender skull, its long snout and nose show the relationship to the Indian rhinos of today. The occiput rises somewhat forward from the condyles; only one nasal horn was present. Processus postglenoideus and processus posttympanicus are closely intertwined. So it belongs to the subgenus Rhinoceros s. str., who lives today on Java (Rh. sondaicus) and in India (Rh. linicornis); It differs from Dicerorhimis sumatrensis in all the aforementioned peculiarities. As in Rh. Sondaicus, the molars lack the grista, which in Rh. Imicomis separates a medifossette. The forehead indentation, which is so clearly protruding in profile, is also long and flat as in

that one, not as deep and rising strongly backwards as with this one. The skull is strikingly similar to that of Rh. Sondaicus in every respect. The dimensions also show this close relationship.90

In the following table, following that of Toula 1

reproduced distances and for comparison place the Rh. sondaicus and sumatrensis reported by Toula next to them.

The numbers correspond to those chosen by Toula.

1. Greatest measured length (occipital joint head-tip of the nose)

2. Largest width of the nasal bones

3. »\*> '" »» Frontal Bones .. .. • 6. Removal of the parietal ridges

8. Width of the occipital ridge at the border of the vertex.

9. Width of the occiput above the ear opening

10. Removal of the outer margins of the occipital condyles. .

11. (Distance of the tip of the nose from the level of the occipital

12. Ikammes over the frontal tuberosity

14. Greatest width of the occiput below ..........

15. Width of the occipital opening

17. Height of the occipital opening

18. Removal of the upper edge of the occipital opening to the

Ilinterhauptskamme

19. Removal of the occipital ridge from the tip of the nose,

laterally

20. Removal of the occipital joint head to the front

Orbital rim

21. Removal of the anterior orbital edge to the nasal

cave edge:

22. From the rim of the nasal cavity to the tip of the nasal bones.

24. From the ilin joint head to the molars

28. From the occipital ridge to the anterior edge of the eye. . ,

33. Width of the furrow between mastoid u. Proc. postglenoidalis

34. Removal of the tip of the proc. postglen. to the rear edge

of the occipital joint head

42.Distance from the palatine margin to the lower margin of the

main hole

11.0-14.25 13.0-18.3

8.95-11.35 (49.2)

16.8-19.7 4.05-5.6 4.6 -6.0

9.7-13.1 44.5-50.7 27.0-30.6

9.9 -11.8

4.15-17.1 16.8-22.6 26.0-29.3

0.2 - 1.1

8.1 -12.2 23.7 - 27 s

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1) Toula, the rhinoceros from Hundsheim. Fig.k. k. geol. Reiclisamt XIX. t. 1902, p. 11 and Table overview.

Rhin. siva- sondaicus adult

59.8 9.5 19.6 3.5 13.7 17.3 13.4

50.7

27.1 4.8 4.4

14.14

51.2

38.3

10.8 15.2 24.5 32.1

0.0

13.4

28.3

Rhinoceros sondaicus

Dicerorhinus sumatrensis

)

determined proportions the measured

old man

59.0 8.7 18.4 7.0 14.2 20.2 13.0

56.0

27.1 4.55

14.9

55.4

39.0

11.7 16.0 23.0 34.0

0.0

15.5

approx.152.9

young female

58.5 9.5 17.1

6.85 14.2

19.9 13.4

50.0

25.6 4.8

48.5

38.5

11.3 14.8 25.0 31.0

0.0

30.5

!

Limit values ​​of 1 1 viduen

48.8 -55.9 6.2 -11.0 13.0 -15.5 3.1 -9.9

Indi-

The mammals with the exception of the proboscidians.

Ql

The dimensions show agreement with in almost all points. Rhinoceros sondaicus. This is evident from a comparison with those of the smaller Sumatra form. Dicerorhinus sumatrensis has a slightly shorter skull than the three Javanese, a narrower forehead; the outer edges of the occipital cusps are less distant, while the occipital opening is narrower to wider but higher: d. H. the articular cusps are smaller. It also has a narrower occiput, the occiput lower (18); the distance from the occipital joint head to the anterior orbital margin is considerably shorter; the distances from the tip of the nose to the level of the hind head ridge, from the occipital joint head to the molars, from the occipital ridge to the anterior edge of the eye, from the posterior edge of the occiput joint head to the tip of the proc. post-glenoidalis and from the palatine margin to the lower margin of the occipital opening are also smaller. In 12 of 21 dimensions Dicerorhinus sumatrensis shows lower values, and in all of them the difference between the fossil and the two Java skulls is small.

In terms of the width of the nasal bones, the width of the occipital ridge, the occipital opening, the distances between the anterior orbital and nasal cavity rims and from here to the tip of the nose, there are similarities between the three Javanese and Sumatran skulls, i.e. in 5 of 21 dimensions. The removal of the parietal ridges is very small in the fossil rhinoceros. Even with the recent Javanese, they are occasionally closer together than the information in the table suggests. A moderately large, not yet fully grown, female skull in the Berlin Zoo showed the same narrowness at this point.

Another deviation of the fossil from the modern Javanese rhinoceros concerns the width of the occiput above the ear opening, which is smaller in the fossil than in both modern ones. However, the strong deviations among the skulls of Rhinoceros sumatrensis that Toula observed make such a deviation possible also among the Java rhinos. The Sumatran rhinoceros has a furrow up to 1 cm wide between the mastoid and the postglenoid process, which the recent Javanese lacks. Here, too, as mentioned above, shows the fossil correspondence with the recent Javanese.If the general shape of the skull shows only differences from the recent one, which can lie within the individual range of variation, there are still deviations in the dentition that make the creation of a new species appear justified.

The teeth are moderately chewed, the spur has already lost its tip in almost all of them and is flatly rounded. The rear pit (post fossette) has long been isolated. As mentioned above, the anterior pit shows no division by crista or counterspur; it is conspicuously rounded and small. The outer wall is indented and has a strong parastyle, the premolars a second, weaker rib.

A comparison with the molar teeth of Rhinoceros sondaicus revealed in an old specimen with the same crown height as in a younger individual a more elongated, weakly indented anterior pit and a sharper spur that was divided in individual teeth. The same differences are found in those of Toula. (P. 20) and Falconer (Fauna ant. Siv. Plate 75) shown teeth of Rhinoceros sondaicus, furthermore also those of Dicerorhinus sumatrensis, even with the strongest chewing, which shape corresponds more closely to Rhinoceros sondaicus in the formation of the molars - is true than in the formation of the other parts of the skull. Another difference between the fossil and modern Javanese rhinos is the size of the anterior premolars. Namely the first preholar, which was found in all recent Java and Sumatran rhinos, the Toula, Guvier, Falconer and others. a. and which I saw in the Berlin Museum, a stunted and already not

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92

H. Stremme,

A tooth that was chewed off too old is still relatively impressive in the chewed row of teeth of the fossil rhinoceros and shows two distinct pits. The only molar in the Berlin Trinil collection is also a right first premolar, while only the inke remains on the skull. This single tooth is less chewed than that of the entire row of teeth on the skull. The following table provides information about the dimensions of the molars compared to those of Rhinoceros javanicus and sumatrensis, in which I compare the dimensions of the fossil Javanese with those of

three Rhinoceros sondaicus (one specimen from the Berlin Museum, the other two after Cuvier 1)),

Fossil Javanese Nasr

Hörn, Munich. . . i 2.11 2.76 0.76

Rh. Sondaicus (Berl. Mus.). 1.78 1.65 1.08 »> (according to Cuvier) 2.10 2.00j 1.05» »>> missing

»Unicornis» »2.60 2.50 1.02

»Sumatrensis (Berl. Mus.) 1.70 1.94 0.88> sivalensis (after Baker

2.80 4.03 0.69 3.56 5.22 0.69 3.78 5.05 0.75 3.92 5.60 0.70 4.50 5.63

j

|

Width 14 width hl width H width width 3 width M ^ JM J 3 ea i-9

1

width

1.97 2.41 0.83

0.80 5.22 4.86 1.07 \_\_\_

0.78 5.054.75 1.06 0.94 5.00 4.70 1.06 0.86 4.70 4.80 0.98 0.76 6.50 6.20 1.05 0.71 4, 94 4.86 1.01

0.61 7.55 8.30 0.91

;),

a Rhinoceros sumatrensis (from the Berlin Museum)

from a Rhinoceros unicornis (after Cuvier 1

and a Rhinoceros sivalensis (after Baker and Durand2

Pmj Pm2 Pm3 Pm4 Mj M2 M3

®1 «0> 899Oo ©

Length Em length tu length length tu length, g> length bo ÄS length aSpaaB |

2.65 3.40 0.78 3.65 4.71 0.77 3.63 5.13 0.71 4.00 5.35 0.75 4.40 5.61! 3.50 3.90 0.90 4.20 4.90 0.86 4.40 5.30 0.83 5.00 5.30 0.94 5.30 5.60; 3.00 4.00 0.75 3.70 5.20 0.71 4.30 5.70 0.75 4.60 5.70! 0.81 5.00 5.80 4.00 4.40 0.90 4.60 5.30 0.87 4.20 6.90 0.61 4.70 7.10 0.66 5.10 6.70 2 .60 2.80 0.93 3.70 4.65 0.79 3.83 5.17 0.74 3.93 6.10 0.64 4.19 5.92

3.50 5.90 0.59 4.50 8.00 0.56 4.90 8.30 0.59 4.40 8.10 0.54 4.95 8.10

i

We see from the table above that P4 has the same dimensions in all three forms. The width (at the alveoli) of this P4 is related to that of the preceding premolars

with Rhinoceros sivasondaicus like 1 1.03 (P3): 0.80 (P2) • 0.48 (PO,

and Durand). . .

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»»

> »

sondaicus »10.93i: 0.66»: 0.32,

accordingly the lengths

in Rhinoceros sivasondaicus like 1: 0.97 (P.

8th)

2)

»»

»»

sondaicus »1 1.00»

sumatrensis »

or. "

1 0.92 »1 0.91» 1 0.90 »

0.79 »

0.70 0.54 »

0.74 (P.

0.73 »

: 0.41. -

: 0.37 »

: 0.54 (PO,

: 0.49,

»

5>

v

))

have put together.

or." 1: 0.95 »0.79»: 0.43 »-

»» 1 0.86 »0.70» sumatrensis »1: 0.97. : 0.68>: 0.44>

This comparison gives greater values ​​for the fossil Javanese compared to the recent one.

In a comparison with the molars of the fossil Asian rhinoceros, the following are to be excluded:

Rh. Palaeindicus Falc. et Cantl. 3 Rh. Habereri Castle. 4 Rh.Brancoi Castle. 4 the one only weak),),),1) Cuvier, Recherches sur les Ossemens fossiles. 4th ed. III, p. 74.

2) Communicated in Falconer's Palaeontological Memoirs. I, p. 169.

3) Falconer and Cantley, Fauna antiqua sivalensis, VII,, Pl. 73-75; Lydekker, Ind. Tert. and Posttert. Vertebr.,

I, p. 4, plate IV, Fig. 4.

4) Schlosser, Die fossil Säugetiere Chinas, 1903, p. 58 ff.

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The mammals with the exception of the proboscidians.

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have indented outer wall without parastyle. Rh. Platyrhinus Falc. l

and Rh. namadicus Falc. 1 have three fossets, not two like the Trinil rhinoceros. Bulged outer wall, parastyle and

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to enable. What is known of them shows the type of Rh. Sondaicus and Dicerorhinus su- matrensis. Rh. Sivalensis shows the tooth structure of the fossil Java rhinoceros. Falconer has shown two skulls from the bottom. The enamel figures of the moderately severely chewed molars agree perfectly with those of Rh. Sivasondaicus. The front pit is rounded and small. Crista and counterspur are absent. There is no evidence of a division of the spur, as indicated by the last premolar in Falconer's illustration (Plate 75, Fig. 7) of Rh. Sondaicus.

cover. The anterior premolar is missing from both skulls. Lydekker 5

There are individual teeth of Rh. sivalensis expressly states that the dentition is so close to the living Javanese that one must take it to be the descendant of that. In terms of the nature of the skull, it stands between the living Indian and Javanese. He does not give skull measurements. Such are published in Falconer's Palaeontological Memoirs I, p. 159 after Baker and Durand.

Baker and Durand regarded this form, which they called Rh. Indicus fossilis, and which corresponds in size closely to the recent Indian rhinoceros, merely as a fossil remnant of the Rh. Unicomis, without paying attention to the great difference in dentition, to which Lydekker rightly indicates. In the proportions of the skull dimensions, Rh. Sivalensis also differs somewhat from Rh. Unicomis. The recent one has a higher occiput, while the width of both is roughly the same. For comparison, I have taken the plaster cast of the fossil Javanese skull that Baker and Durand give of the skull of Rh. Sivalensis. I have reproduced them in the table below and added Cuvier's information about the Indian and two Javanese rhinos.

Judging by the proportions, the fossil Javanese with the fossil Indian and the recent Javanese rhinoceros almost coincide in the height of the occiput, while, as already mentioned, that of the Indian is higher. Rh. Sivalensis is narrowest in the width of the lower parts of the skull, while Rh. Unicomis comes closer to the Javanese. The length of the row of teeth is exactly the same in relation to the width of the forehead in the fossil, is greater in Rh. Unicomis and smaller in the Javanese. In general the deviations in the proportions of all five forms are no greater than those observed by Toula in eleven specimens of the Rh. Sumatrensis. In any case, they show the close association of these species in the skull structure. I could only compare the skull of the Rh. Sivalensis with that of the fossil Javanese in illustrations. I could not find any significant difference in shape between them.

In tooth structure, Rh. Unicomis differs significantly from Rh. Sivalensis due to greater complications in the enamel folds. I refer here to Lydekker's excellent remarks. The numbers in Table II also show great differences. Baker and Durand give the dimensions of five rows of maxillary teeth, which for Rh. Sivalensis are considerably larger, in accordance with its larger body size

1) Fauna antiquasiv., VII, Pl. 72 u. 75; Lydekker a. a. 0. p. 11 u. 14. 2) Fauna a. s. Plate 73-75.

3) Lydekker, a. a. 0. P. 18.

4) Koken, Fossil Mammals of China, p. 24.

5) Lydekker, a. a. 0. p. 29.

Rh.iravaddicus Lyd. 3

Both of the latter are too little known to be compared with the entire row of teeth of the Rh

Rh. sivalensis Falc have only two fossettes. 2

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of a detailed description

and Rh. sinensis Kok. 4th

Of the

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H. Stremme.

have given absolute values. The widths of the premolars are related to one another, the

of P4 = 1 set, like

the lengths according to how

..

a) 1; 0.96: 0.74 - b) 1: 0.85: 0.67: 0.43 c) 1: 0.86: 0.63 -

a) 1: 0.90: 0.71 - b) 1: 0.82: 0.58: 0.41 c) 1: 0.80: 0.70 -In these ratios, Rh. Sivalensis fits in well with those of the recent and fossil Javanese rhinoceros, perhaps more closely with the former than the latter. It is only in the form of the enameled figures that Rh. Sivalensis seems to be closer to the fossil Javanese than to the recent.

sivasondai- cus

19.4 27 11.3 19.4 25.2 24 8

;

13.4 4.8 4.4 8.6

28.3 36.8

38.3 44.9 9.5 17.4 15.2 23.8

Ratios: 2: 1

6: 3 2.20 2.56

2: 3 2.39 2.71 2:10 3.14

6: 4. . 1.28 1.27 6:10 2.88

14:13 1.60 1.36 12:11. 1.35 1.22

unicornis

n- CuviER) l ":

1. Height of the occiput from the lower edge of the foramen magnum to the top of the ridge

2. Greatest width of the occiput.

3. Smallest thickness of the skull at the temples

4. Width of the frontal bones on the postorbital processes

5. Distance from the front edge of the eye socket to the ear opening. 6. Length of the row of teeth

7. Width at the occipital cusps

8. Width of the foramen magnum

9. Height of the foramen magnum

10. Distance between the inner margins of the glenoid fossae. 11. Distance from the posterior palatine margin to the lower margin

of the occipital opening

12.Distance from the right occipital condyle to the anterior

edge of the eye socket

13. Greatest width of the nasal bones

14. Height from the highest point of the nasal arch to the roof of the mouth

19.6 21.8 29.4 30.3 y 11.8 13.5 17.2 19.7 29.2 29.0 24.8 (21.5; i. 14.5 13.2

5.75 3.8 4.3 4.2 4.9 6.7 4.0 4.5 7.3 9.0 9.5 9.0

\* 32.9 30.5

39.0 38.5 8.7 9.5

1.2 1.09 1.50 1.39 -

2.20 2.10

2.44 2.48 2.25

3.65 3.38 3.08 3.36 -

1.18 1.26

and a broken upper premolar. The former seem to have almost the same chewing and crown height as the rhinoceros of Trinil. M3 has much sharper figures than the corresponding molar

the latter; M2 is more similar, only has a sharper spur.

1) Only six teeth.

2) Lydekker, a. a. 0. U, p. 40, plate X, Fig. 1 and 2.

Rh.kahiuliensis Lyd. 2)

is with two whole upper molars (M3 and M2)

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RMnoceros Rhinoccros Rhinoccros Rh.sondaicus

1.39 1.32

sivalensis skull Oceiput

25.9 22.3 34.1 26.6 12.6

25.4

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I.

2.

32.5

32.4 27.5 19.5 14.0 13.0

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28.0 30.5 12.5 23.0 28.2

1.19 1.42 3.05 2.61

-

(after Cuvier)

The mammals with the exception of the proboscidians.

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best matches the Trinil rhinoceros. Based on the material available to me, I cannot decide whether the relationship between the two is such that the rhinoceros of Trinil, as Dubois thinks, mediates between Rh. Sondaicus and Rh. Sivalensis. In any case, it differs from Rh. Sondaicus in the relative size of the premolars and in the formation of the molars, so that the separation of the fossil from the recent Javanese rhinoceros is justified. Since it is not attached to Rh. Indicus (unicornis), like Dubois' Rh. Kendengindicus, but to Rh. Sondaicus, it is Rh. Sivasondaicus Dub. to call.

The two lower molars, a right and a left, were both broken. In the blueprint they agree with those of Rh. Sondaicus, but no more detailed investigations can be made with them.

The Berlin collection contains other skeletal parts: a broken atlas, two humums (including a youthful one), a radius, two femora and two worn metatarsals. (For comparison I had a mounted skeleton of the Javanese rhinoceros from the collection of the Berlin Zoological Museum.) The best preserved of these bones is the left femur No. 219. It is a strong, relatively slender bone, the one with the femur of Rh. sondaicus, as far as I could see this, agrees well. Cuvier ') describes the thigh of Rhin. sondaicus: »Le femur a son troisieme trochanter place au milieu de son cote external, large, recourbe en avant, ne remontant pas de sa pointe vers le grand trochanter, lequel ne donne non plus aucune pointe pour venir a sa rencontre. L'echancrure entre deux n'est donc pas close en dehors; mais du reste hurry est also grande que dans l'unicorne. La tete inferieure est plus elargie en arriere. «These properties also distinguish the femur of Rh. Sivasondaicus from that of the mainland Indian Rh. Unicornis. The relatively well-preserved radius is also slender and shows the characteristic shapes of that of Rh. Sondaicus. One humerus is heavily coated with iron gravel and tuff and broken in places, the other from a young individual. The remaining bones are all badly preserved.

I measured the femur # 219 and the radius # 46 and the numbers in the followingalthough the Cuviers seem more precise to me.

• The proportions of the femur initially show the considerable deviation in proportions

of the Rh. unicornis from those of the three much more similar animals. The femur of the former is comparatively slimmer than that of the three others, of which Rh. Sondaicus is widest above and below, and Rh. Sumatrensis is narrowest. Only in the relatively larger upper latitude do the numbers of the recent deviate from those of the fossil Javanese rhinoceros, while in all other proportions there is good agreement between the two. In the dimensional formation of the distal end, there is agreement between all four types. On the other hand, the proximal end of Rh. Unicornis is thicker than that of the other three, which also agree here. Also under the ratios of the radius, Rh. Sivasondaicus and sondaicus show the closest relationships to one another among the four species. Rh. Unicornis has the widest radius at the top, Rh. Sumatrensis the narrowest, the other two are in the middle.

1) Cuvier, Recherches sur les Ossemens fossiles, 1825, II, 1, p. 36. 2) Toula, a.a.0.S. 46 and 58.

3) Cuvier, op. a. 0. p. 40 and 41.

Of all these fossil forms, Dubois is right, Rh. Sivalensis is absolutely true

reported by a Rh. sumatrensis and that of Cuvier3

communicated by Rh. sondaicus and Rh. unicornis. I kept the names of Toulas,

Table with the from Toula2

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96

H. Stremme,

The measurement of the limb bones unequivocally shows the close relationship between Rh. Sivasondaicus and Rh. Sondaicus.

Femur

radius

Rhinoceros

cus

Rhinoceros

(Cuvier) Rhinoceros sumatrensis (TOULA) Rhinoceros unicornis (Cuvier)

Rhinoceros

cus

Rhinoceros sondaicus

Rhinoceros sumatrensis (Toula) Rhinoceros unicornis (Cuvier)

sivasondai-

sivasondai-

sondaicus

(Cuivier)

;

45.8 47.5 43.3 57.5 2nd largest width at the top .... 19.8 20.6 16.4 21.8

1. Greatest length

2. Largest width at the top. 3. Greatest thickness on top.

.

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34.3 35.8 30.5 38.0 9.85 10.6 8.3 12.5

3. Greatest thickness of the joint.

4. Width above the trochanter

5. Smallest width

6. Thickness in the same place. .

7. Largest width at the bottom .... 8. Largest thickness at the bottom (inside)

.

9. Greatest thickness at the bottom (outside).

Ratios: 1: 2. . 1: 7. . 8: 9. . 8: 7. . 2: 3. .

- 5.43 5.4

1

2.31 1.83

3.2 3.11

1.22 1.29

1.17 1.11

2.41 2.35 2.33 2.02

8.2 8.8 7.35 10.8

—— ——

11.9

8.5 4. Greatest width, middle. . . 4.8 4.0 —— ——

5. Greatest thickness, middle.

Ratios: 1: 2 2: 3

Artiodactyla. Suidae.

Sus brachygnathus Dub. (Panel XVI, Fig. 8 -11; Panel XVII, Fig. 2-7.)

. . 3.7 3.0

6.3 5.8

- 6.0 4.4

14.3 15.3 12.4 17.0 16.7 17.0 14.45 20.0

..

..

3.47 3.37 3.67 3.04

- 1.81 1.53

13.7 13.2

11.1 15.6

2.64 3.44 3.49 4.41 1.30 1.28 1.16 1.18

From the pig there are: 1 part of the skull with parts of the two rows of maxillary teeth; 2 rows of maxillary milk teeth; 8 lower jaw parts, e.g. Sometimes with the almost complete rows of teeth, but always without incisors; several isolated canines and molars; 1 cervical vertebra; a number of broken limb bones, namely parts of the humerus, radius, femur, tibia and metatarsal bones.

In addition, I was able to compare from the Munich collection: an upper jaw from an adult male that extends from the anterior incisor to the first molar, a lower jaw fragment with the last two molars, two lower jaw parts from young individuals with deciduous teeth, several lower canines and incisors and a tibia.

Dubois shares about the pigs of the Kendeng fauna with 1): The two wild boar species of the Kendeng fauna belong to the Cclebensis verrucosus group, as is shown by name in the shape of the cross section of the lower canine teeth, which after Nathusius and Nehring are the most important Makes character for grouping the pigs. It is now again apt to how the shape of the last mandibular molar made the one species, Sus bravhygnathus n. Sp. already very similar to today's Celebes pigs

the other, Sus macrognathus n. sp., corresponds to Sus verrucosus living on Java. But the latter has in the relatively more significant strength and shape of the lower canine, as well as in the humped one

1) Tijdschr. 1908, p. 1263.

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The mammals with the exception of the proboscidians.

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Swelling of the lower jaw still peculiarities in itself that are reminiscent of Sus celebensis. These fossil species are thus somewhat closer to each other than the current species mentioned, and there are also transitions between the former. Of the living species, however, Nehring already suspected the earlier existence of a common stem form. It is also important that the most common living Javanese and Sumatran wild boar species close to the Papuan pig, Sus vittatus, are not represented among the Kendeng fauna. This species seems to have immigrated from the Australian region only later.The lower jaw from the Kendeng strata, ascribed by Martin to the Siwalian Sus hysudricus, undoubtedly belongs to Sus brachygnathus. As is well known, several species from the Siwalik strata are grouped under Sus hysudricus; one of these may have been closer to our Sus brachygnathus, but was certainly not identical with him. "

These two species are also represented among the pork remains available to me for investigation. The majority belong to the smaller species, which Dubois called Sus brachygnathus. Parts of the skull are too sparse to be linked to a comparative discussion

could. But the canines, which are so important for the division of pigs, are abundant; let them begin the description and comparison.

Two upper canines from a young male and one lower canine from an adult female were examined. In addition, the upper left canine of an adult male and several lower jaw teeth of males came from the Munich collection.

It is well known that in the genus Sus, according to the cross-section of the lower canines of the male, two groups can be distinguished, those of the Susverrucosus and the Suscrofa. "While the enamel back side of the tooth is inclined and considerably wider than the outside, in the case of Sus verrucosus it lags behind the latter in extent and is positioned transversely to the longitudinal axis of the skull 1)." The comparison of the male lower jaw teeth showed the typical formation of the Verrucosus-Cmim.

Three subgroups can be distinguished among the recent representatives of the Verrucosus group: those of the actual Sus verrucosus from Java, the Sus celebensis from Celebes and the Sus barbatus from Borneo. Stehlin is of the opinion that the lower canines of these three species are insignificantly different. But at least I was able to determine some differences in the teeth of the Verrucosus and Celebensis pigs at the Berlin Zoological Museum. While in Suscelebensis (see also Fig. Stehlin) the lingual to the labial side of the cross-section is 1.89 cm: 1.92 cm, Sus verrucosus shows 1.72 cm: 1.45 cm. The fossil Javanese species follows the recent one with 1.71 cm: 1.56 cm

Javanese Sus verrucosus. The teeth of the recent Javanese representative of the Scrofa group, Sus Milleri Jent., A relative of Sus vittatus from Sumatra, are smoother than those of Sus brachygnathus, not rubbed and lingually weakly or not at all due to their different position and length at the back .

According to Stehlin, the formation of the lower female canine, of which the Berlin collection contains a specimen stuck in the lower jaw, is more important for distinguishing between Sus celebensis and Sus verrucosus. He is short-crowned; the crown has been lowered to 0.93 cm in height by chewing. The root protrudes high from the alveolus; it is long, but not wide, evenly formed (without a bulge) and flattened at the back. Stehlin 2

Sus celebensis as very compressed and apparently not at all prepared for supplies, 'because the lower one

1) Stehlin, On the history of the suidene dentition. Dep. Swiss palaeontol. Ges., 1899, XXVI, p. 229.

2) Stehlin, a. a. 0. p. 260 and 261st Selenka-Trinil Expedition.

13th

)

describes the mandibular canine of

98

groups. Also Sus Oi Miller 1

),

While z. B. Jentink 2 in the lower jaw row Pj -) 3

of the Sus celebensis 8.5 cm, in the third

1) Miller, Notes on Malayan Pigs. Proc. U.S. Nat. Mus., XXX, p. 737.

2 Jentink, Sus Studies in the Leyden Museum. Notes from the Leyden Museum, 1905. XXVI, p. 194.

M.

H. Stremme,

The enamel line is already at the level of the alveolar margin and the root is already closed, although the talon of M3 is only just beginning to come into use. The fuseless rear facet is deepened in the known manner in the shape of a channel and since the outer enamel edge protrudes more backwards than the inner one, the exceptional case occurs here that the outer facet has a greater width than the inner facet. About the corresponding canine tooth of Sus verrucosus Q, Stehlin writes: “The crowns of a skull in the Basel collection are barely one and a half centimeters long; the enamel-free root part of the teeth already extends over the alveolar margin, although the M3 only began to break through the gums. They are also compressed and considerably weaker than those of the much smaller Sus celebensis. The overhang is minimal. ”The difference between the Can.inf.vonSuscelebensis§ andSusverrucosusQ would therefore be that the crown of the former is lower than that of the latter. Here the fossil form again follows the Sus verrucosus. The outer facet of the crown is related to the inner facet as 0.97 cm: 0.90 cm, i.e. H. the relationship corresponds to that indicated by Stehlin from Sus celebensis, which I also found in Sus verrucosus Q. Here the ratio of outside to inside was 0.90: 0.83 at 1.34 cm crown height. A corresponding copy of Sus celebensis was not available to me. In Sus barbatus the Canini are inf. 2 set up for supplies to Stehlin. Since the canine of the fossil mandible was firmly seated in the alveolus, I could not determine how it behaved.The male maxillary canines lack the groove on the back of the Scrofa-Vittatus-Milleri canines. In contrast, their enamel covering is richly fluted like that of the Verrucosus Sehweine. Their curvature is somewhat more pronounced than that of the Verrucosus teeth that I examined, and it corresponds completely to that of Sus celebensis.

If I may conclude from the few recent pieces that I can compare after Stehlins and my investigation, then there is at least a little more correspondence between the fossil pig and Sus verrucosus in the formation of the canines. In contrast, the last mandibular molar is developed like that of Sus celebensis and differs from that of Sus verrucosus. The last molar inf. consists of 3 as with the former, not as with the latter of 4 humps

the smallest form from the. Barbatus group, from Sumatra, has three rows of humps, while the larger Barbatus pigs from Borneo, Sus barbatus S. Müll, and Sus Gargantua Miller, have a talon behind the three rows of humps, which is smaller than the 4th row of humps Sus verrucosus. In Sus celebensis, Oi and brachygnathus, M3 is shorter than the three premolars, only a little longer in a very old fossil specimen (No. 310). The two front molars of the fossil Q No. 169 are slightly longer than the last molar,

but shorter for the old animal No. 310.

The anterior lower premolar stands, as is often the case in the Verrucosus area, close behind the

Canine tooth, not even chewed on the old animal.

In the rest of the formation of the molars and premolars I was able to distinguish between the

compared forms cannot be found.

The entire row of lower jaw teeth in the fossil pig is in the middle inwards.

bent. Here it also agrees with Sus celebensis and Sus Oi, while Sus verrucosus deviates outwards by stretching straight or slightly bending.

The length of the dentition of the fossil pig differs from that of the other forms.

Lower jaw

169 Q exp., Right 310 was valid, left. .

1818 young, left 246 right. . . 246 left ....

-

upper jaw

578 young, left 578 young, right

.

1.36 1.25 1.85 1.66 3.01 1.84

- 1.33 1.27 1.84 1.70 1.78

——

1.66 1.22 2.15 1.56

1.95 1.50 3.77 1.85

1.39 1.05 1.79 1.37 3.65 1.58 1.44 1.03 1.83 1.37 4.05 1.75

-

1.25 1.44 1.79 1.77

1.32 1.42 1.85 1.66 3.81 2.02

1.23 0.95 1.54 1.33 2.57 1.42

1.14 1.27 1.62 1.64 2.38 1.67

r. Lower jaw 1841

1. Munich .... Reviewer:

12727 cJ exp., Right

upper jaw

12673 Q, right. .

1.20 0.62 1.37 0.84 11.71 1.65 1.33 0.64 0.55 1.11 0.40 1.18 0.53 1.28 0.81

127270 (5, right lower jaw

A4276 5 upper jaw

A4276 (5 old, right lower jaw

1.95 2.22 0.82 0.37 1.20

0.54 1.23 0.71 1.23 1.31

A1509 (5, right upper jaw

A1509 3, right

8.95 1.34 1.16

-

-

0.89 0.44 1.05 0.66 1.10 0.80 1.21 0.89

1.69

1.33

2.65 1.49

2.47 1.73

old, right

0.63 0.39 0.77 0.39 0.99 0.54

..

0.91

1.19 0.61 1.27 0.81 1.05 (0.45) 1.29 A58) 1.12 (0.47) 1.27 (0.57j

0.91 1.22

..

.

.

-

Sus brachygnathus from Trinil.

Sus macrognathus from Kedung brubus. Sus macrognathus

by Trinil.

Sus verrucosus from the zool. garden

(Java import).

Sus celebensis from Minahassa.

Sus celebensis from Saputan, Mina-hassa.

Lower jaw

12673 2 young, right 11.18 1.08 0.75 0.74 0.38

——

..

.

-

-

8.42

0.39 0.63 0.89 0.38 1.08 0.60 1.23 0.92 1.25 1.39

2.04

1

——

1.02

0.73

.1

£ 3

length

width

.

The mammals with the exception of the proboscidians.

Molars of the lower jaw measured 2.5 cm and the third molar of the upper jaw 2.4 cm, the corresponding figures for the fossil form are 9.89; 9.31 and 3.08, respectively; 3.14; 3.17 and 3.01, respectively; 3.20. The latter therefore has not insignificantly longer teeth than the former. In contrast, the teeth of Sus verrucosus are considerably larger than those of the fossil: 11.18 and 11.71 cm for the row of teeth; 3.65; 4.05 for the last lower molar and 3.81 for the last upper molar. The tooth row ratios: M3 are 3.4 for Sus celebensis (according to Jentink's measurements), 3.28 or 3.47 (according to my information below), for Sus brackygnathus 3.23 and 2.97 and for Sus verrucosus 3, 04 or 2.89. They show that Sus brachygnathus stands in the proportionate length of the mandibular molars between the two recent forms, of which Sus verrucosus has the relatively longer ones.

The table below gives the dimensions for the teeth. The numbers in brackets are from pieces that had lost their enamel.

1TM C P4 P3 P2 Pt Mi M2 M3CD CD CD CD CD CD CD CD 1 CS

No. «bDMbn tu60bo 1

a

Hl m Hl

a'S "3a a" S '3: C3 1-: C3

i-5 Hl P3 Hl «Hl m Hl |

1.03 0.46 1.18 0.63 1.25 0.79 1.27 1.00 1.85 1.34 3.08 1.53 ———

9.89 0.93 0.63 0.70

9.31 0.92 0.70 0.70 0.45 0.91 0.46 1.10 1.10 0.71

1.18 1.65

1.38 1.02 1.95 1.47

1.31 (0.80) 1.78 (1.19 3.17, 1.43)

-

3.14 1.60 ——

0.69 0.54 0.90 0.69 0.95 1.08

1

|

1

\

0.93 0.49 0.98 0.75 0.95

?

1.18 1.21 1.68 1.54

The length-width proportions of the third molars show a remarkable difference. For the fossil pig they are lower jaw Q 2 or 1.96, upper jaw cf 1.64; for Sus verrucosus lower jaw § 2.30; qF 2.30; Upper jaw c? 1.89; for Sus celebensis lower jaw ^ 1.88 or 1.78: upper jaw tf 1.42 or 1.43. For the fossil form, these numbers result in relatively narrower third molars than Sus

celebensis and relatively broader than Sus verrucosus. The fossil stands between the two recent ones. The 13 \*

1.27 (0.78) 1.70 (1.17)

(1.38)

i i

j

1

)

>

99

100

H. Stremme,

Measurements of length and width of the other teeth of the Kendeng pig hardly differ, taken in absolute terms, from those of Sus verrucosus. Thus the elongation of the last molar is the main difference in the latter from the fossil form in relation to the dentition. The other teeth of Sus celebensis are also shorter than those of the fossil, with the same width.

What remains to be compared is the barbatus group, the forms of which I give the following figures

after Miller 1

)

reproduce:

Sus barbatus (5 Borneo. »» »».

Sus Ol (J Sumatra

Sus gargantua <3 Borneo

13.7 4.70 2.10 13.4 4.50 2.00 12.2 3.38 1.84 14.0 4.70 2.10

2.24 2.25 1.84 2.24

1.58 1.54 1.49 1.60

..

P -M 2

length Width

3 Inf.

Length Width

Lower jaw

upper jaw

M3 M3 P2 3 3

Sus barbatus and Sus gargantua show great agreement. Their teeth are about 4 cm longer than those of the Kendeng pig. In those, the ratio of the row of teeth to the last molar is inf. the same as this one. In contrast, the length-to-width ratio of the last mandibular molar is the same as that of Sus verrucosus, that is, it is just as long and narrow, although its talon is not exactly as large as that of Sus verrucosus. The last upper molar shows the same conditions as that of the Kendeng pig, so it is relatively wider than in Sus verrucosus. Sus Oi is close to Sus celebensis in all three proportions, only the relative length of the last mandibular molar (to the row of teeth) is even shorter than this. Its teeth are only 2.5 cm longer than those of the Kendeng pig.

On the only fragment of the skull of the fossil form, only the anterior and upper band of the orbit, parts of the eye socket and the cheeks, and also the associated rows of molars are preserved. Judging by the canines of these last, the fragment comes from a male; the replacement dentition was complete, but the third molar was only beginning to appear. So the animal was not yet fully grown. The preserved parts show remarkable differences from the Celebensis and Fem <eoms skulls. The cheeks are flat, the eye socket is only slightly deep, the eyebrows are broad and round. The former is found in the Hegel in young animals. But I saw the noticeably shallow depth of the eye socket and the rounded, not sharp-edged formation of the eye-bow in very young pigs with deciduous teeth in a similar way, if hardly so peculiar, but in no case in pigs of the same age. However, I have only compared pigs of the same age from the Äe / 'o / a group, not with those of the Verrucosus group

can. However, there were younger animals from the latter.

There were several pieces of pine from boys in the collection. On a lower jaw are those

Deciduous teeth have already fallen out and two premolars and the canine are about to erupt. This stage corresponds to that of a 10-month-old domestic pig. In another gap in the lower jaw, the last deciduous molar is still present and the second molar begins to come through. The corresponding domestic pig was around 7 months old.

As from the quotations of the Arbeil given above. from Dubois, also consider Martin2)

1, i Miller, op. a. 0. p. 756.

2} Mahtin, Collection of the Geological Museum in Leiden, 1,4, p. 60.

-M length width i. M3

3.70 2.35 2.91 3.70 2.40 2.97 3.10 2.10 3.61 3.70 2.30 2.98

M Sup.M length: width

relationship

The mammals with the exception of the proboscidians.

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pork remains from the Kendeng fauna have already been described as Sus hysudricus. Its dimensions completely match those of the present one.Indeed, from the Indian forms, Sus hysudricus Falc comes. the Sus. brachygnathus near. In particular the lower jaw depicted by Lydekker in Indian Tertiary and Posttertiary Vertebrata III, Plate VIII, Fig. 3, resembles that of Sus brachygnathus. The curvature of the row of teeth is the same as in Sus brachygnathus and the Cßfe & ewsis pigs. In terms of dimensions, Sus hysudricus, Plate VIII, Fig. 3, exceeds the Brachygnathite pig, but the formation of the lower M3 is almost identical in both. The ratio of the length of the whole tooth to the width of the anterior row of cusps is 2.01 (: 1) or 1.96 in S. brachygnathus and 1.92 in S. hysudricus, Fig. 3. Fig. 2 of the same table hardly belongs to the same species of animal. It should also represent a part of the right branch of the lower jaw, but you can already see from the two rear molars that the curve of the row of teeth is different

was. M3 is also shorter and thicker than that of Fig. 3: - ^ ^ - = - ~ -

°

.

Falconer's, too

Width 1

specimens of Sus hysudricus depicted in Fauna antiqua sivalensis, Plate 71, Fig. 5-11

may, as has been repeatedly pointed out since Stehlin, distribute themselves into different forms and also do not correspond to those depicted by Lydekker. The teeth of FIG. 8 are larger than those of FIGS. 6 and 10. M3 of FIG. 8 has a talon which is absent from the corresponding one of FIG. At

it is -j5 - ^ - = 2.08; in Fig. 10 1.95. Judging from the pictures, M3, Fig. 8, is almost one

Centimeters longer than M3, Fig. 10. M3, Fig. 3, with Lydekker also does not have the talon, but is apparently longer than M3, Fig. 10, with Falconer. According to Stehlin \*) there is the group to which Sus hysudricus Falc. heard, not firmly. The only canine tooth pictured is that of a female upper jaw in Fig. 9 at Falconer's, from which the group characters cannot be taken. Accordingly, under Sus hysu-

dricus Falc. and Lyd. probably 4 types combined. Also Sus hyotherioides Schlosser2

also close to the Sus brachygnathus, though less than Lydekker's Sus hysudricus. The teeth are

Extremities.

I give the dimensions of the measurable limb remains in the following table. For comparison, I add the dimensions of some corresponding extremities of Sus celebensis and barbatus, which I was able to compare in the Zoological Institute of the Agricultural University (Samml. Nehring). Sus verrucosus extremities were not available to me.

The ratios show that the dimensions of the distal end of the humerus, the proximal and distal end of the Badius, the III, IV, V metacarpals and the distal end of the tibia are in good agreement between the fossil pig and Sus celebensis. In contrast, the difference between the II metatarsal and the III metatarsal is considerable. Both are wider in Sus celebensis than in the fossil ones. In the case of the II metacarpal, this difference may indicate the greater reduction in this bone in the fossil form. In the case of the III metatarsal, it is explained by the youth of the fossil specimen. The figures for the extremities also show that the fossil form is larger than Sus celebensis.

1) About the history of the suiden bite. Dep. Swiss palaeontol. Ges., 1899, XXVI, p. 73 u. 265.

2) Schlosser, The fossil singing animals of China, etc. Dep. Bavarian. Akad. D. Wiss., II. Kl., XXII. Vol., 1st abbot, p. 92.

even longer than the Sivalik form, M »of the lower jaw e.g. but also wider - ^ - ^ - = - ~ - = 1.85. & 6:

Width 20 However, according to Schlosser, the shape should have distant relationships with the Scrofa-Vittatus-Grwppe.

'

)

stands

102

No.

<J 1737; 1220; 1571; 1370;

prox. Radius dist. Radius MetacaTp. II metacarp. III metacarp. IV metacarp. V left right left left prox. right dist. right

Metatars. III left

Q 181; ?; 627; 1668; 1602 Sus celcbcnsis $ • • •

—— ———— —— 2.40 1.55 2.65 2.05 4.24 0.72 81 1.20 a) 2.75 2.47

right right right

3.41 3.20 2.41 1.48 2.84 1.88 4.19 0.80 5.56 1.10 1.17 1.11 0.84 1.15 a) 2.37 2.25 5, 23 1.30

dist.

dist. Tihia

right

Width Depth Width Depth Width 1

h) left

Depth length width length! Width Width Depth Width Depth Width Depth Length Width

a) 3.21 2.65

3.73 3.32

1

H. Stremme,

The difference was roughly that the female of the fossil matched the male of the recent pig in size.

... (

1393; 384 (young) y bj 3.19 2.66 J6.13

»» Q

Sus barbatus S [

Proportions

{

In the pigs there are quite remarkable differences in the formation of the distal end of the radius, as the attached figure shows. Here too, the Scrofa pigs can be separated from the Yerrucosus pigs. The radius of the Scrofa-Gmppe is wider and in relation to the width less thick than that of the Verrucosus-Gmppe. This is consistently shown by the radii of Sus brachygnathus (B.),ÄBD

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• •

S. broke.

S. celeb.

S. barb.

\_\_

2.95 2.63 2.06 1.40 2.29 1.55

Left

-

-

-

4.87 4.93 | 11

1.12

[1.07 11.12 0.99

1.55

1.63 1.47

1.29

1.511 1.47

5.89 5.10

1 0.68

| Sl 1 u, 1

4.98

5.24 5.00

Fig. 1.

The distal ends of the left radii of Sus vittalus (J.), Sus brachygnathus (B), Sus barbatus (C, with attached ulna) and the right radius of Sus celebeiisis (D, with attached ulna). -'3 nat. Size

Sus celebensis (D.) and barbatus (C.) in comparison with that of Sus rittatus (A). Sus scrofa agrees very closely with the latter. It is not only in this relationship that there are differences in the two groups, there are also differences in the formation and course of the pits and edges; in particular the curvature of the central main ridge is different in Sus vittalus than in Sus brachygnathus. In the figures, the sections formed from their upper beginning behave in the former as 1.14: 0.94, in the latter as 0.85: 0.95. The original pieces show this shift of the center line very clearly,

but it cannot be measured here. In Sus brachygnathus, the middle bar goes straight down at first, then bends inward in a long curved line, and then runs diagonally downwards close to the side edge. With Sus rittatus it does not go straight down from its starting point, but

Left

Left

:

9.22 1.90 1.90 1.88

\_ \_\_\_ 1 |

-

1

|

6.38 1.25 1.30 1.30 1.23

1

1 0.73 1.05 4.02 4.85 1

The mammals with the exception of the proboscidians.

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immediately diagonally inwards (which can be seen better on the original than on the illustration), then makes a short, weak bend to the side and pulls diagonally downwards over half the bone width. The from the upper part of the center bar z. The partially enclosed pit is deeper and more evenly oval in Sus braehygnathus, whereas in Sus vittatus it is flatter and irregular. In addition, the upper outer edge of Sus braehygnathus is stronger and more swings than that of Sus vittatus. The differences between the two pig radii are so great that when I determined the Brachygnathus radin, I first doubted whether it belonged to Sus. Only the comparison with that of Sus barbatus and especially of Sus celebensis gave the proof. That of Sus celebensis, of which I could only compare a right Badius, is extraordinarily similar to that of Sus braehygnathus, although this cannot be seen from the illustration. The Badia of Dicotyles and Babirussa, which also showed considerable differences from that of Sus braehygnathus, were compared.

Designation.

The comparisons of the little Kendeng pig with the recent ones have shown that it is a Verrucosus pig. In terms of size, it is somewhat larger than the Celebensis pig, and can be compared with it in terms of the formation of the molar teeth, both in the rows of teeth and again in individual teeth. On the other hand, in the formation of the canines it seems to be closer to the larger, more recent Sus verrucosus of Java, from which it differs in the curvature of the molar row and in the formation of the last mandibular molar. In the proportions of the teeth it stands between sus verrucosus and sus celebensis. The size of the second metacarpal also does not correspond to the Sus celebensis. The depth of the eye socket and the formation of the edge of the eye socket were equally different from those of Sus celebensis and Sus verrucosus in the only fragment of the skull, which, however, does not belong to a fully grown animal. The shape can be called a new species after so many differences and for it the name Sus braehygnathus Dub. to choose.

Sus macrognathus Dub. (Plate XVI, Fig. 12 and 13.)

There are also some pieces of the second larger pig species of the Kendeng fauna, which Dubois describes as Sus macrognathus. There are first and second mandibular molars from the Berlin collection and a second and third mandibular molar and a poorly preserved tibia from the Munich collection. The two molars in the Berlin collection do not come from Trinil, but from Kedoeng Broeboes. They are not well preserved. Their dimensions as well as those of the two well-preserved Munich molars are given in the table. These figures show that the larger Kendeng form has a longer and wider Mx and M2 than Sus braehygnathus and verrucosus. M2 of Sus barbatus is longer and wider at 2.40: 1.74. Likewise that of Sus Oi with 2.20: 1.60. The third molar is as long as that of Sus verrucosus, but wider. The ratio is 2, i.e. the same as for Sus braehygnathus, although this form seems to have had a small talon in addition to the three rows of cusps, which Sus braehygnathus lacks. Otherwise the teeth are formed in the same way as those of the Feminom pigs. But the remains are too small to allow an attempt to be made to establish kinship relationships of this form, especially also in the direction indicated by Dubois. In the proportion of the third mandibular molar, however, the deviation from Sus verrucosus indicated by Dubois in the direction of Sus celebensis is actually present, so that the designation of the pieces by Dubois' name is justified.The tibia was almost twice as long as that of the Sus braehygnathus.

104 H. Stremme.

Hippopotamidae.

Hippopotamus sp.

(Panel XVI, Fig. 6 and 7; Panel XIX, Fig. 6; Panel XX, Fig. 6.)

Dubois mentions that in his collection of Trinil there are no hippopotamus remains. From the other sites he describes parts of the skull of a new species, which he calls Hexaprotodon sivajavicits and which is equidistant from the Narbada species Hexaprotodon namadicus and palaeindieus, but adjoins Hexaprotodon sivalensis. In the Berlin collection there are four z. Partly broken maxillary molars (cf. Plate XVI, Fig. 6 and 7), which probably belonged to an individual. There are Mt and M2 on the right and left with completely coincident chewing. M2 on the right is completely preserved, mainly the front part of M2 on the left. The chewing figures of this front part of the two teeth are mirror images of the same: the enamel runs around the entire tooth part without interruption, so the two front cusps are already united; A melting island has remained in the middle. On the back half of the right tooth, both cusps are still separated. The anterior molars are more chewed and broken, and individual pieces are missing. Here the two humps of both halves have long been united, the front melt island is tiny.

These teeth differ from the corresponding ones of the western Tetraprotodon kviexv because of the richer, almost delicate folds of the enamel. In the original I could compare it with: Tetraprotodon Pentlandi, madagascarensis and amphibius from West and East Africa. Hippopotamus A pcdaeindicus

)

F. u. C. from the Pleistocene of the Narbada valley, on the other hand, seems to have had similar, less clumsy enamel forms of the fauna antiqua sivalensis, according to the illustrations on plates 57 and 62. Hexaprotodon sivalensis and namadicus are more like the western ones with regard to the formation of the enamel

Types of tetraprotodon similar.

In the table below I have put together some dimensions for comparison:

Javanese form

Hippopotamus palaeindieus (after plaster cast). Tetraprotodon madagascarensis

4.81 4.78 4.37 4.25 3.25 3.55 4.27 4.21 4.17 5.28 5.32 4.45 5.42 4.70

3.77 3.66 3.95 3.78 2.84 2.95 3.68 3.25 3.43 4.45 4.56 3.80 4.52 4.10

3.88 3.82

3.27 3.48

1: 0.78 1: 0.76 1: 0.90 1: 0.89

»Amphibius

Hexaprodoton sivalensis (after Lydekker).

1: 0.87 1: 0.86 1: 0.82 1: 0.86 1: 0.83

1: 0.83

1 0.77 1: 0.79 1: 0.71 1: 0.88

> »Aberrant forms

.

M2 right Mi right M2 left Ratio M2: M] length width length width length width length width

The numbers I measured are taken at the bottom of the crown. Here are in

1) Falconer had called this shape the Tetraprotodon. Lydekker (Ind. Tert. Posttert. Vertebr., 111. Plate VI, Fig. 2) found a lower jaw with 6 incisors and thereupon Falconer's distinction between the genus

Hippopotamus into Hcxa- and Tetraprotodon.

2; Lydekker, et al. a. 0., Siwalik and Narbada Bunodont Suidae, p. 5.

generally the teeth almost square. Lydekker 2

neten) has taken measurements of the hexaprotodon teeth. Also with Tcira-

)

does not indicate where he (converted by me in cm-

:

The mammals with the exception of the proboscidians.

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protodon greater differences in the ratio of length to width. So I measured according to the illustration

Hippopotamus palaeindicus (Falconer, Plate 62, Fig. 11, i / nat. Gr.) For M 2.49: 1.91; for M 1.97: 1.75 224

and in the Javanese form also according to the illustration for M2 5.31: 4.39; for M, 4.31: 37.7. In any case, even a comparison of the dimensions does not give any reliable indication of the relationship between the Javanese and any of the other forms.

I refrain from naming the species because I cannot decide whether it is the same shape that Dubois has already named.

Of the other skeletal parts of the hippopotamus, two right astragali (cf. Plate XIX, Fig. 6) should be mentioned, both of which are not found in Trinil but in Kedoeng Broeboes. I received one of them from the Munich collection. The strongly arched tarsal joint and the convex joint surface for the calcaneus revealed them as the ankle bones of a cloven-hoofed. They differ from that of the buffalo, which is roughly the same size, in their shorter length, greater width and the oblique position of the bulls. The distal joint roller is not, as in the case of the Bovids, separated by a uniform recess running from front to back into two approximately equal-sized bulbs, but divided into two unequal, recessed joint sections by a somewhat crooked comb. This hippopotamus ankle bone lacks the sharp marking of all parts of the -Bo ^ V / m ankle bone, it is considerably softer in shape).

Attachment. In Plate XX, Fig. 6, a tooth is shown which is possibly an incisor of the hippopotamus. - The rather corroded tooth is 6.4 cm long, its front part is provided with a uniform enamel cap that is thickened like a button at the front. The melting cap has been chipped off in front. The massive tooth is very thickened towards the bottom, and at the bottom it seems to be somewhat broken. On the whole it is not completely straight, but rather slightly curved. The cross-section is round.

Of the incisors of the tetraprotodon, the upper jaw teeth are more curved and provided with an enamel band, the larger lower jaw teeth are much larger and thicker than this small one, the smaller ones also have an enamel cap that does not protrude as a button-like thickening. It is pulled far back on the underside of the teeth. The melting cap is pointed at the front. However, the tip is repelled. Even on the small mandibular incisives of older specimens, the cap is completely worn off. The enamel-free part of the hippojjotamus incisiyen is not thickened in the shape of a club, like that of the tooth in question, but increases considerably more evenly and is grooved; somewhat similar in the bend. It grows back from persistent pulp. The pulp is pointed towards the front like a hollow cone. The impression of such a point can also be seen at the rear end of the fossil tooth. Comparative material from He.raprotodon was not available to me, nor were there any milk incisives from Tetraprotodon. The incisors of the Tetraprotodon are therefore not like the fossil ones. I leave it open whether he really belongs here. A milk incisor from Stegodon, which I had also thought of, can be obtained from Dr. Janensch and Professor Pohlig hardly be.

1) JD Tscherski (Scientific results of the Janaland and New Siberia Expedition. Memoires ac. Imp. Sciences Petersbourg, VII, Bd. 40, No. 1, p. 167, 1892) asked about the formation of the ankle bones in other cloven-hoofed animals. noteworthy discussions given.

Selenka-Trinil expedition. 14th

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H. Stremme,

Cervidae.

Cervulus kendengensis n. Sp. (Plate XX, Fig. 2.)

From a muntjac deer there is a strong left antler pole, No. 411, the rear end of which is broken off at the tip. As the remains of the frontal bone still sit on the rose bush, it has been completely preserved. It is short, thick and strong and has an almost circular hole on the outside almost halfway up, the surroundings of which are partly covered. This hole is probably the result of an injury. The floor is now filled with stuck iron gravel. The cross-section of the rose bush, which is extended from front to back, shows a sharp front and a flattened rear. The rose is smooth and thin, not raised and puckered or pearled, deeper on the inside than on the outside. The two rungs (one is in doubt whether one should speak of a pole and an eyebrow or of two rungs of a dichotomously forked pole, since both appear to be almost equally long and equally strong as a result of the breaking off of the tip of the rear rung) are long and almost straight, namely the front or eye ridge that is directed forward and a little inward, towards the skull axis The rear or main rung is slightly curved, and the ab-

broken, slightly inwardly turned tip seems to have had only a slight bend. The rear rung is only slightly stronger than the front rung. Both rungs are provided with long, smooth grooves and diverge at an angle of almost 45 °. Between the two, as between the human fingers, there is a weaker one. Evenly formed bridge pulled up on both sides, the upper part of which is hollowed out from above.

The straight front rung measures 10.7 cm to the rose. Above the rose, the rod in front of the fork has a longitudinal diameter of 3.26 and a transverse diameter of 2.09 cm, and below the rose 2.52 and 1.8 cm, respectively. The bridge between the two rungs measures 3.61 cm up to the rose on the inside and 3.16 cm on the outside. The height of the rose bush on the back from the rose to the frontal bone is 3.36 cm.

This pole is quite different from those of the living muntjaks. I was able to compare five antlers from the zoological museum of the recent Javanese kidang. They are very different from one another. But all of them have a longer rose stem that lacks the round hole on the outside. (If, however, the hole in the fossilized antlers is due to an injury, then the shortness of the rose stem is possibly also caused by this. The rose is pearled and pearled and strongly bent up in all of them. (In comparison with the other deer, the rose could probably also once smooth and thin.) The ridge of the eye is always more curved and mostly shorter, often downright tiny compared to the strong rod. This too is mostly more curved, namely the tip, which is, however, broken off in the fossil rod The bar is always considerably wider and thicker than the rung. The bridge between the bar and the rung is always lower, not so raised on the sides, and not as regular as on the fossil bar.Just as or even stronger than the antlers of the Javanese muntjak are those of the other Sunda forms and of the continental, Indian, Tibetan, Chinese, and also that of Formosa from the rod of the fossil Javanese. I was able to use four antlers from Borneo, two from Saigon, one each from Colombo and Formosa, three each from your zoological garden and three known origins for comparison, so a total of 19. I was always with them when I heard of the rose disregard, which may be abnormally developed under the fossil, the rose pearled, the front rung

The mammals with the exception of the proboscidians.

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smaller and more curved, the rear rung considerably wider and stronger than the front rung, the connecting bridge between the two, especially lower on the sides, and its central cavity mostly divided in the middle by a raised ridge. Among the deviations of the fossil rods from the modern ones, it seems to me that the following are of essential importance: The front rung is considerably higher, straighter and stronger than in the modern ones; the rear shoot is weaker in relation to it, and probably also shorter, and also less curved; the more evenly formed connector is higher.

Fossil members of the genus Cervulus have been described by Lydekker as Cervulus muntjac teeth from the Karnul caves in India. Cervulus? dicranocerus Kaup von Eppelsheim is to be put to Dicrocerus according to its antlers. Rütimeyer already draws attention to this. However, Lydekker still requires proof of the matching dentition. Is it the same with Cervulus? australis Serres from the lower Pliocene of Montpellier. However, Boyd Dawkins judges the Kaupschen antlers of Cervulus dicranocerus: "In these the fork of the antler is further removed from the burr than in the Dicrocerus elegans, and is so far therefore more diffentiated".

Dicrocerus differs from Cervulus in terms of antlers in a similar way to the fossil Javanese muntjac. In this old genus, the two rungs are more evenly formed and not so strongly curved. A very similar form of the connecting bridge also occurs here. A smaller rod from Steinheim's Dicrocerus furcatus Hensel in the Berlin Museum shows a considerable resemblance to the fossil Javanese: the front rung is straight, the not much thicker rear rung slightly curved, the connecting piece is similarly raised on the sides and hollowed out in the middle. In this piece, too, the rose is only slightly raised, but the boseneck stick is significantly longer. But this small rod and the numerous large ones in the Berlin Museum and the large number of published illustrations also reveal another considerable difference from the fossil one: the two rungs are pretty much the same length, with the Java specimen the back rung is if an attempt is made to supplement the missing point, still considerably longer than the front rung, probably several centimeters. Furthermore, in Dicrocerus the hind shoot is mostly irregularly curved, often also forwards, but hardly inwards, as is usually the case with Cervulus, at least the Javanese. This inward curvature is present in the fossil Javanese, albeit weakly. The angle between the two rungs

is the same with the recent and the fossil. The cross-section of the rose bush is extremely variable.

-

The shape of the fossil Javanese rod is halfway between that of Dicrocerus and Cervulus. In view of the great variability of the antlers of Dicrocerus and Cervulus it seems impractical to express this middle position by a new gender designation only after the one incompletely preserved rod, which seems to have been injured during the life of the animal. At least it is necessary to make the differentiation clear by means of a new species name. The attribution to one of the two genera is difficult, however, since the rod differs equally from those of both, all the more difficult than the attribution to Dicrocerus would have to lead to the establishment of the pliocene age of the fauna. In view of this only remnant that seems to me to be too daring. Besides, I believe among the similar

the difference in size of the rungs and the slight curvature of the rearOf other fossil Muntjak deer, the American Cosonjx, according to Cope, would have rods similar to those of Dicrocerus, but Matthew places Cosoryx = Merycodus among the Antilocapridae. Palaeomeryx sivalensis was only known through teeth.

I.

approx. 24 ribs (perhaps partly also from the other small cloven-hoofed animals), over 60 tarsal and tarsal bones,

10 rows of upper jaw and 24 lower jaw teeth (partly complete), numerous individual teeth, also some deciduous molars.

All of these parts are broken quite badly, e.g. T. also rubbed off. Since in some cases this condition does not make it possible to distinguish whether the bones come from females or young animals, I have combined these two categories. In addition to a few rows of teeth, part of the antlers, which are surprisingly large in number, is best preserved.

1) a. a. 0. S. 12G0.

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H. Stremme,

To have to recognize shoots, both of which make the overall habitus of the Stande docli into a cervulus-like one. I therefore call the muntjac of the Kendengschichten Cervidus kendengensis.

Dubois also has Cervuhis Staugen in his collection and writes about it 1): “Some horns of Cervidus may well belong to a pliocene form, although they are very similar to those of the living species; it is well known that these horns vary greatly. "

Other parts of the skeleton of muntjacs could not be found, namely unfortunately no teeth, which are smoother and more rounded in the muntjak than in the Axis.

Cervus (Axis) Lydekkeri Märt.

(Panel XVII, Fig. 15-17; Panel XVIII, Fig. 3 and 4; Panel XIX, Fig. 1 n. 2; Panel XX, Fig. 3-5.) Syn .: Cervus Mrioeerus Dub. a. a. 0. p. 1259.

A very rich material is available from this small Trinil deer. If I disregard a few fragments that are difficult to determine, I can sort the bulk of the material by gender and z. Partly list according to age with the following numbers.

cf Numerous skull parts, including 12 skull capsules; especially the forehead with the rose bushes and the antlers. Around 500 individual antler poles with rose attached, including over 200 discarded ones.

29 cervical vertebrae, including 5 atlas

4 Epistropheus

14 thoracic vertebrae

27 lumbar vertebrae

? 1 caudal vertebra fragment

12 shoulder blades 10 humerus

11 radius and ulna

9 metacarpals 4 pelvic parts 4 femur

9 tibia

6 metatarsals

O and young.

5 cervical vertebrae, including no atlas

1 Epistropheus

8 thoracic vertebrae + 3 from young animals

8 lumbar vertebrae + 2 from young animals

9 shoulder blades

8 humerus

9 radius and ulna 8 metacarpals

11 pelvic parts 6 femur

12 tibia

10 metatarsals

The mammals with the exception of the proboscidians.

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Antler.

The little Trinil deer was one of the deer whose antlers usually have no more than 6 ends. Of these groups Rusa, Axis, Capreolus, Elaphurus, the i? Wsa group is widespread in the Sunda Archipelago today. But the fossils differ considerably from the antlers of the ü ^ s-a-deer: the pole bends away from the rose, in Rusa pretty straight outwards, in the fossil ones inwards. In addition, the fork rung is turned outwards in Rusa and inwards in the fossil ones. These features show that we have before us a representative of the Jxj'.s deer, which are now restricted to the Indian suburbs. Capreolus is distinguished by the short, straight pole, Elaphurus by the absence of the rungs and the division of the pole into two rungs, of which the front part divides again.

Several species of the recent J.m-stag have been described, the Lydekker 1

summarizes. For comparison, I had two antlers from the Indian Ocean and two from Ludwigsburg near Stuttgart from the Zoological Museum. I couldn't use a few more from the Berlin Zoo, they were short and bulky and only resembled Axis in their basic form. The two front Indian antlers, like the Ludwigsburgs, matched the ^ t.n-'s antlers depicted by Lydekker.

The fossil one differs significantly from this recent form. First of all, the rods of the fossil axis are shorter due to its smaller body size. For the front Indian specimens I measured 68.1 and 71.5 cm from the Böse, for the Ludwigsburgs 56.8 and 58.7 cm, for the specimens from the Zoological Garden 51.6 and 48.7 cm; the longest of the Javanese measured 58.2 cm, the shortest 28 cm, most of the others about 50 cm. The strongest of the Javanese poles, which was thicker than the recent ones, broke off at 55 cm. Perhaps this has also reached 70 cm. In addition, the lyre-like curvature of the fossil antlers is stronger than that of the more recent. Especially in her youth she was remarkably strong. The two poles are often quite close to each other, and also hang noticeably low. With age, the strength of the curvature is sometimes somewhat lost, and the degree of sagging often seems to be slight; the antlers then come closer to that of the recent Am deer. Perhaps similar differences can be noticed in this in the different age stages. Lydekker has had an Am antler plaque for 6 consecutive yearspictured. But it turned out so badly that you can't see anything right. Even with the most stretched specimens of the fossil form, there is another difference to the recent ones: the fork rung is constantly less close to the rod than is the case with Axis axis; the angle between the rod and the fork rung is therefore less acute, almost a right one. Also, as Dubois points out, it is shorter and not at the same time turned backwards as in Axis axis.

The abundance of antler material makes it possible to study the various developments and changes better than was previously possible with a fossil deer. A very young philistine is shown in Plate XVII, Fig. 17. The illustrations on Plates XVIII-XX show sizes and

presumably partly age groups with clear differences or deflection inwards.

Among the numerous bars, there are striking differences in the thickness, length, and curvature of the bar, as well as the two rungs. The end of the rod is often flamed, often straight; the rungs are often short, often long, curved or straight. The granulation of the antlers is very different: sometimes it is smooth, sometimes it is extremely rough. The evil one is at times strongly curled up, at times

weak, in individual pieces also bent up on the inside. 1) Lydekker, Deer of All Lands, p. 179.

)

to Cervus axis Erxl.

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H. Stremme,

The cross-section of the various poles looks very different: above the rungs of the eye it is often circular, but often more oval; below the fork rungs oblong, but of different thicknesses with the same width.

The malformations are numerous: especially outgrowths up to the length of a small rung. A young animal's weak rod is wound in a helical shape. The rungs of the eyes are kinked on a larger, otherwise well-grown antler; the buckling must have occurred while the rod was still covered by the bast (Plate XX, Fig. 4). A second, tiny, stunted pole sits on another man's hive; the larger rod has an oblong, not circular circumference above the rungs of the eye; here there must have been a break in the Bosenstock and possibly the lower bar and a second bar must have grown out of the break point of this physiological center of regeneration (Plate XX, Fig. 5).

The large number of ejector poles is striking: over 2

It is estimated that there are no less well-preserved specimens among these than among those still sitting on the Bosenstocke. The majority of the broken ejector poles seem to have been freshly broken, while the old fractures should predominate in the case of the broken others. However, it is hardly possible to make a sure judgment here. The rods have become friable in the process of fossilization and, in contrast to the extremely tough ones of living animals, are so brittle that they constantly broke when measuring and comparing. There is not a rod that does not have multiple breaks. Often, even with the crumbly texture, you cannot decide whether the curd is fresh or old.

The distribution of the rods in the individual layers was such that of the numbered 400 pieces come from the main bone layer and only 25 from all other layers.

Skull.

The skulls usually still have pieces of antler, or rather, parts of the skull are often still attached to the pieces of antler. The bare canes are present on one specimen, the animal had just dropped. The skulls are all badly shattered, so that I could only take a few measurements; in most of the males it was possible to measure the distance between the foramina supraorbitalia on the frontal bones, the length of the parietal bone, and the width of the occiput. For comparison, I have placed the same size of two recent J. M. deer from the Berlin Zoological Garden (9909, 9910) and one from Ludwigsburg (9497) next to it.

1. Distance between the foramina supraorbitalia. . 2. Average length of the parietal

3. Occipital width

6 c5 6 <3 c5 6 d 6 <3 6 6 6 6 393 1421 302 N / A: tli) 471 Hill »Avg. Average: .42 0910 9909 9497

4.26 4.34 4.13 3.91 4.17 5.28 4.96 5.35 5.20 4.88 4.96 5.02 4.72 4.93 4.90 4.89 6, 39 5.93 6.26 6.20

6.01 6.87 7.17 7.14 7.53 7.17 6.79

7.08 8.96 8.87 8.45 8.76

The ratio of the occipital width to the parietal length on the one hand and to the distance between the frontal bone foramina on the other hand is 1.44 and 1.70 for the fossils, 1.41 and 1.69 for the more recent ones. So we have a good match here.Teeth.

I could not separate the teeth of the fossil axis from those of the more recent ones by characteristic features. The differences in the dentition dos axis from those of the other deer forms

/ 5

of all existing, about 220 pieces.

Upper jaw 262!

l left

(Left ,.

i x. -i

Ana tooth rows 478

Row of teeth 766;

1 right

right 5.85 0.76 0.77

0.75 0.81 0.89 0.68 0.96 0.70 0.99 1.30 0.76 1.13 1.41 0.80 1 1.65 0.98 0.66 0.64 0.98 0.65 0.95 1.24 0.76 1.12 1.36 0.82 1 0.75 0.84 0.89 0.72 1.04 0.69 0.91 1.18 0.77 1 , 15 1.36 0.84

0.77 0.84 0.91 0.76 0.97 0.78 0.92 1.19 0.77 1.15 1.35 0.85

0.62 0.79 0.78 0.61 0.91 0.67 0.90 1.20 0.75 1.08 1.21 0.89

Tooth rubbing \* 20,.

i left

Row of teeth 755; right row of teeth 1274; right

No. 1148 right 6.69

1: 1.19: 1.58 1: 1.08: 1.71 1: 1.14: 1.80 1: 1.14: 1.67 1: 1.18: 1.69 1: 1.18: 1.68 1: 1.07: 1.65 1: 1.14: 1.68 1: 1.13: 1.62 -

1: 1.12: 1.46

1: 1.16: 1.64

"162

»1650

"1410

"522

»1180

"756

“319 left

7 »» 1411 »without no.»

No. 997

0.50 0.26 1.93 0.78 0.45 1.75

0.54 0.28 1.93 0.72 38 1.89

0.50 0.29 1.72 0.74 0.40 1.85

0.53 0.29 1.77 0.75 0.44 1.71 ———

- - - - 0.810.45 1.79 - - - - 0.76 0.43 '1.77 7.01 0.57 2.04 2.04 0.75 0.41 1.82

At the alveoli.

0.77 0.52 1.48 1.02 0.69 0.79 0.53 1.49 0.94 0.76 0.87 0.62 1.42 1.00 0.68 0.77 0, 50 1.56 1.03 0.68 0.88 0.59 1.49 1.07 0.72 0.92 0.60 1.53 1.19 0.81 082 0.55 1.49 1.01 0.78 0.79 0.56 1.41 1.06 0.74 0.86 0.57 1.50 - 0.73 0.92 0.61 1.51 1.13 0.74 0.92 0 , 60 1.53 1.07 0.73

1.47 1.08 0.80 1.35 1.750.77 2.30 1.24 1.07 0.78 1.37 1.69 0.82 2.06 1.47 1.140.79 1.44 1, 67 0.77 2.17 1.51 l, 22'o, 86 1.42 1.74 0.87 2.00 1.48 1.26 0.83 1.52 1.80 0.80 2.24 1, 47 1,280.91 1.41 1,960.88 2.22 1.29 1.15 0.87 1.33 1.70 | 0.85 2.00 1.43 1.20 0.80 1.50 1,720.80 2.15

- 1.20: 0.85 1.41 1,810.86 2.10 1.52 1,270.82 1.54 1,650.80 2.06 1.47 1.24 5.81 1.53 1.76 0.82 2.15

6.42 »6.40

,

6.87

U CD

CDU bD B

: d d 4N

M2

1-1 cq width M width hl P2 width 3 M width 3 width Hl width 3

RIGHT 5.95 0.77 0.76

0.81 0.86 0.86

1.351.40 0.97 1.451.48 0.98 1.29 1.45 0.89 1.19 1.36 0.88 1.31 1.40 0.93 1.30 1.36 0.95 1, 36 1.39 0.98 1.15 1.23 0.94

i1

6.09 0.80 0.78 5.97 0.80 0.82

-7 i -u rnn (right 5.93 0.73 0.71

a

SS length SD

P '3

Length bD

a "S

Length bD

a 'cd

Length bD B

Length bD length C \* CD

M.

:

1: 1.20: 1.36 1: 1.21: 1.39 1: 1.21: 1.32 1: 1.14: 1.20 1: 1.18: 1.38 1: 1.26: 1 , 42 1: 1.25: 1.48 1: 1.20: 1.28 1: 1.19

————

P3

®1

Wed

Ms ratio of

The mammals with the exception of the proboscidians.

111

has Rütimeyer1

The jaw teeth are broad and strongly developed, and the enamel, especially on the inside, is remarkably rough. There are small accessory columns on the molars. The row of premolars is considerably shorter than that of the molars. In addition to 10 rows of teeth, there are numerous individual teeth.

)

so well marked that it is unnecessary to go into it here. The upper

icä

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Wed

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Mon

Upper jaw.

pi

o CD

1 0.77 0.95 0.81 0.65 1.12 0.58 0.99 1.35 0.73 1.19 1.47 1 0.77 0.99 0.78 0.72 1.08 0.66 1.04 1.37 0.76 1.26 1.47 1 0.69 0.91 0.76 0.70 0.97 0.72 0.98 1.30 0.75 1.19 1 , 39

CD

P-2

<x>

CD

© CD length of

———— ——— 0.61 0.78 0.86 0.58 0.95 0.61 0.87 1.28 0.69 1.04 1.40 0.74

Not all of the numerous branches of the lower jaw could be measured, as some were chewed down to the root, others were defective, and in still others the iron pebbles between the teeth could not be dissected away. The mandibular teeth are also very rough, and the molars, especially the accessory columns, are well developed. The row of premolars is even shorter relative to that of the molars in the lower jaw than in the upper jaw. The last molar is very high.

Fig. 2.

TJnterki sferast

the row of teeth

CD <D length g>

CD CD length fco

length

m width 1-3 PO width Mi 2 3

bD

length

P3 P2

<D a> 2 length bD

Lower jaw.

Pi Mi M2

M3 CD CD

Ratio of length

: c3 ica PO width

ä width

U

Width> -3

: <3> -,: MM:

0.73 0.37 1.97 »- - - - 0.84 0.44 1.91

»-

6.48 049 0.22 2.21 0.71 0.41 1.72 - - - - 0.71 0.48 1.47

CD CD length fcD

M width

0.8ö'o, 58 1.44 1.08 0.7311.48 1.29 0.78 1.65 1,700.72 2.36

In the proportions of both the upper and lower teeth, strong deviations are noticeable, as is the rule with teeth.

1) Rütimeyer, Contributions to a natural history of the deer. II. Abh.Schweizer Paläontol.Ges., 1883, VIII, p.23.

Left row of maxillary teeth with roots from the labial side. Cerrus Lydekkcri Marx. -, '3 nat. Size

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H. Stremme,

Extremities.

The extremities, like the vertebrae, were so numerous that I could put together two skeletons, a male and a female. All parts are compared with the corresponding of a female skeleton of Axis axis and show the complete correspondence with them in all forms.I have measured all measurable limb parts and compiled the measurements in the following table. On the whole, they show a good agreement. The depth of the distal end of the humerus originating from a young animal is the same as that of the adult animal, but is more backward in width. The opposite is true for the proximal end of the radius.

<5 humerus.

d Femur, distal end 1391 1

6 young Q

6th

394 »» N / A

1383 r 573 r 61 1 proximal end 573 r

»»

distal »» »

2.73 2.67 1 (5 tibia

166 r 22.30

»

6 young proximal

»

»

6th

1334 proximal end »

r 16.16 -

»»

3.91

2.66 2.06 1.29 2.73 2.10 1.30 2.56 2.12 1.21

Front extremity

No. side length width depth

Veili. B: T

Rear extremity

No. side length width depth

Verli. B: T

. . . 580 r distal end 1615 r

16.28

3.65 5.12 0.71

3.46 4.82 0.72!

3.34 4.59 0.72

> J>

»»

1796 r 1003 r

- 3.03 2.61 1.16 »» 1382 1

—— 2.98 2.48 1.20 9 »» 1337 r

- ——— 3.01 2.63 1.16 young

»

»

,

»» 1099r »» 1302r »» 1926r

2.72 1.49 1.80 2.86 1.51 1.93 2.98 1.55 1.87 2.71 1.50 1.80 2.82

609 r 18.83

O

6 Met acarpus

»» 55 -

^

»> 1380 r 1

distal »1334 r

9

992 proximal end »

»> 456

»> 54

1336 12.60 proximal end 1336

2.61 1.44 1.80

»»

2.57 1.40 1.86

»> 474

1

2.41 1.43

1.68

1174 1336 205 1764 55 proximal end 1764

»» Distal »» »

i>

distal »

»

1.58

. .

.

»1764> 55> 541

-

12.20

2.43 1.24 1.95

61 1 497 r 1478 1

- ——— 2,821,471.87 9 168 r 19.10

- ———

573 r 61

281> 330

1

1

-

——— 4.09

1668 - -

o.N.

Metatarsus ....

Table I.

3.12 4.02 0.74 - ———

proximal end

2.68 2.51 1.08 »» 1781 1

——— - distal »1813 r

——— - »» 1676 1

>

- ———

14.16 14.45

-

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-

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-

-

proximal end »» distal »» »» »16741 1 1 1

- 3.98 3.43 1.16

2.58 2.47 1.04

3>

—— 2.87 1.58 1.81 »» 166 r

1.80 2.61 1.68 1.53 2.53 1.69 1.47 2.38 1.66 1.41 2.81 1.32 2.16

»> 314

2.36 1.72 1.36

1.55

1598 -

- ———

12.95

»770 - -

distal »»

1540 r

2.24 1.35 1.66 2.01 1.21 1.66

12.95 -

1503 ———

———

2.19 1.56 1.41

-

2.16 1.65 »1.81

o.N.

2.32

1.44 2.44 1.37 1.77 - 2.30 1.38 1.64

2.00 1.47 1.36 - 2.02 1.49 1.36 - 2.11; i, 3o 1.63

»»

»

-

2.34 1.68 1.39

2.46 1.84 1.34

——

2.18 2.28 0.95 - 2.24 2.36 0.94 2.39 1.45 1.65

-

2.69 1.36 1.99 5 1540 r 15.38

——

2.61 1.70 1.53 proximal end% \* 1.88 2.11 0.88

- 2.20 1.45 1.52>> 1811 1 - 1.76 1.87 0.94 ——— -

»

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1

1

2. (12 1.15

2.01 1.24 1.66

- 2.37 1.82 1.30 -

-

-

-

2.35

1.87

1.25

1.76

Moschus mosckiferus No. 56 1

Moschus mosckiferus No. 56 1

Cermlus muntjac $ 1

No. 9031 r

Ilusa hippelaphus var. Moluccensis

20.8

19.2

24.6

24.7

22.7

23.1 3.06: 2.20 1.39

Gervulus muntjac <$ \

Busa porcinus r

Axis axis Q 1 ....

Cervus elaphus Ol .. No. 434 1

Dama darna Q No. 1786 1 Capreolus capreolus No. 1784

6th

...

2.05

1.85 Axis axis 1 Q ....

No. 203

Odocoilus gymnotis <3 No. 21346 r 16.7

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The mammals with the exception of the proboscidians.

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Table II. Radius; proxim. The End

Tibia; distal end

Length Width Depth

13.35 2.04: 1.19 12.17 2.20: 1.20

Relation

1.71 1.82

Length I.

Width: Depth Rat.

2.50: 1.69 1.47 2.30: 1.77 1.30 2.73: 1.63 1.67 3.77: 2.64 1.43 2.81: 2.18 1.29

1.75 1.76 1.69 1.80

Cervus elaphus Q 1. No. 434 1

31.0 4.23: 3.27

34.6 4.61: 3.47

21.6 3.11: 2.51

22.2 2.45: 1.84 1.33

2.85: 1.59 1.79 Odocoilus gymnotis <3 No. 21346 r 22.6 2.65: 1.90 1.39 Pudua pudu Q r 7.64 1.36: 0.97 1.40 Pudua pudu Q 1 12.95 1.77: 1.22 1.45

»» (Humilis) No. 14242 r

7.94 1.75: 0.98 1.77 »(humilis) No. 14242 1 13.6 1.76: 1.31 1.34

In Table II I have the dimensions of the radius and tibia of all measurable deer skeletons from

compiled from the Zoological Museum. From the recent Axis deer I could only measure the extremities of a female. A comparison of the dimensions reproduced here with those of Axis Lydeklceri shows the agreement of this with Axis axis. In the ratio of width: depth, Cervicitis muntjac (f 1 (a specimen from North Borneo) and also Cervus capreolus 1784 1 agree with Axis Lydekkeri. But while the ratio of length: width of the radius in Axis Lydekkeri tf 4.9, at Axis Lydekkeri Q is 4.8 and Axis axis Q is also 4.8, Cervulus muntjac 5.5 and Cervus capreolus 6.4.Thus, with the help of the extremities, it is proven that the small Trinil -Hirsch belongs to the Axis deer It should also be mentioned that two distal ends of the tibia of Palaeomeryx furcatus have the same dimensions as those of Axis Lydekkeri

adults other than Alces and Rangifer 1

)

matched well: = 'or'

= 1.29 and 1.23, respectively.

Height of Axis Lydekkeri.A comparison of the dimensions of the fossil axis with those of the recent shows that it is an exceptionally small axis shape. In terms of body height, it is about J 4 behind the front Indian ones as well as those planted to Ludwigsburg and the specimens in the Berlin Zoological Garden.

Material cannot decide.

Designation.

had described a fragile half of the antler of a small deer from the Javanese bone tuff collection of Radhen Saleh, which he had not given a definite location

1) Tscherski (Wissenschaft !. Ergebn. D. Janaland-Exped., 1892, p. 199 ff.) Made careful investigations into the extremities of this and other large deer.

2) K. Martin, Fossil Mammal Remains from Java and Japan. Collection d. geol. Reichsmuseums Leiden, 1886, IV, p. 63.Selenka-Trinil-Expedition. 15th

^

/

Perhaps it comes from Axis minor Hodgs. from the Himalayas closer in size to what I lack of

K. Martin 2

)

Rusa porcinus 1

14.5 3.28: 1.60

16.3 3.40: 1.83

23.7 4.79: 2.74

26.2 5.15: 2.92

14.8 3.00: 1.77

15.8 2.45: 1.33

17.6 2.73: 1.58 1.72

16.4 2.43: 1.45 1.67 1 23.9 2.61: 2.06 1.26 15.1 2.29: 1.41 1.62

Dama dama £ No. 1786 r Capreolus capreolus No. 1784 1

1.29 1.30 1.24

...

.

..

61 25.2

2.62: 2.14 1.23

114

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Cervus Lydekkeri called. Apparently it is not a right half of the antler, as Martin writes, but a left one, from which all three ends have broken off. The pole is unusually small, measuring only 15.3 cm from the rose to the upper edge of the smaller fork branch. Nevertheless, the remains of the ends make a relatively strong impression. The poles of similar size I examined belonged to young animals and showed a weaker development of the ends than that shown by Martin. The fork branch is also wider on the bar than the ones I examined. Even if Martin's specimen corresponds in general form to the antlers of the deer described above, I was inclined, on account of the differences mentioned, to refer to Dubois's drawing Axis liriocerus, which is unequivocally given to the same deer species as the Rerliner Belong to antlers. But Prof. Dubois kindly informed me that Martin's manner was identical to his. The older MartinscIic drawing for the Trinil deer should therefore be chosen.

Distribution of the fossil axis.

India. From the Karnul caves, i.e. from Pleistocene sites, Lydekker1

)

some teeth

from Cervus axis Erxl. described which originate from a larger deer than the Javanese and

show the presence of the recent Indian species in the Pleistocene. From the Pliocene of the Siwaliks

Lydekker2 writes four species of deer, of which C. sivalensis, known for its teeth, parts of the skull,

)

Antlers to put to Rucervus. The other three, C. latidens, triplidens and simplicidens, are arranged according to teeth. C. latidens is a gigantic form with primitive tooth features and an unusually strong column on the inside of the tooth between the two crescent moons, which is not as developed in almost all other deer; only C. giganteus from the Rhenish Diluvium still has a similarly strong accessory column. That of the .4.TMs deer is small and weak. Also

C. triplidens has a strong column, so it cannot have been an axis, although Trouessart3

plidens under Axis. Finally, the teeth of C. simplicidens, according to Lydekker's first reconciliation, were similar in general form to those of Rucervus Duvaucellii, but different from them in details. Later Lydekker recognized C. simplicidens as an axis fovm and the recent

C. axis Erxl. put close.

Europe. Axis was also common in Europe during the Pliocene period. Royd Dawkins 4

)

represents C. Perrieri, Etucrianun, suttonensis and cylindroceros of the mostly Upper Pliocene deer from central France, Italy and England to the .dxis group. He leaves these four species over from the ten that Croizet and Jobert, Pomel, Rravard, and himself established earlier. Lydekker5 also holds this alone

four species upright. G. Perrieri has up to four ends on each rod; (Called Deperet 6)

C. Perrieri then more correct than Elaphus); in C. cylindroceros the ridge does not sit directly on the rose, but a few centimeters higher on the stem; C. suttonensis has a short straight rod. These species are therefore not to be placed on Axis. In contrast, C. Etueriarvm could be more of an axis. The illustration by Royd Dawkins shows that the bar on the fork rung moves backwards (?)1) Lydekker, Indian Tertiary and Post. Vertebr., IV, p. 46.

2j Lydekker, Indian Tertiary and Post. Vert., I, p. (54-70, Cat. Foss. Mamm. Brit. Mus., 1885, p. 104.

3) Trouessart, Catal. Mamm., Supplem. Ii) ü4, p. GiHj.

4) Boyd Dawkins, Conlributions to the History of the Dcer of tlie European Miocene and Pliocene slrata.

Quarterly Journ. Gcol. Soc. London 1878, p. 402-420.

5) Lydekker, Cat. Foss. Mamm. Brit. Mus., 1885, p. 106.

6] Deperet, Nouv. eludes sur les Ruminants plioc. et quat. d'Auvergne. Bull. Soc. G6ol. France, 1883/4, p, 282.

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C. tri-

1) Deperet, a. a. 0., Plate VI, Fig. 5.

The mammals with the exception of the proboscidians.

U5

bow is. The curvature of the Deperet 1 is even more pronounced

This is where C. Etueriarum differs from C. Lydekkeri, whose rod only rarely shows a slight curve at this point. In C. Etueriarum, the fork rung is also directed forward, not inward, as in Axis Ltjdekkeri. Deperet did not consider C. Etueriarum to be an axis at all, but rather a smaller breed of Elaphus issiodorensis or at least a form closely related to it. Deperet states that the difference between C. Etueriarum and issiodorensis is that the former has a round rod, only slightly triangular at the eyebrow, and the latter a triangular, strongly flattened rod. Another rather considerable difference that Deperet did not

The fact that C. Etueriarum always has only three, C. issiodorensis, on the other hand, has up to four ends on each pole. According to the illustrations, the latter must also have a rod that is much less curved than the former. On the other hand, Deperet (pp. 260 and 262) designates two species as Axis, of which C. bor- bonicus, although the strong curvature of the rod of Axis, even of Axis Lydekkeri, has a higher attachment of the eyebrow, while C. pardinensis, by Boyd Dawkins closer to C. Perrieri, has a slightly curved straight rod, as actually shown by C. Perrieri, which has four ends on each side. As far as the illustration and description allow a judgment, it seems to me that C. Etueriarum and possibly C. borbonicus belong to Axis, but none of the others.

Attachment.

Thanks to the kind courtesy of Mr. Prof. Dr. Rothpletz and Prof. Dr. Schlosser in Munich I can reproduce two pictures of a complete skull by Axis Lydekkeri with completely preserved antlers on Plate XVIII, Fig. 3-4, which is in the Munich collection. The front view of the skull shows very nicely the strong curvature of the rods, first inward, then outward; the side view, how low, even bent below the horizontal, the antlers are, and how strongly the upper part is erect.

Cervus sp.

From a larger species of deer, some antler debris and other skeletal parts, e.g. B. an astragalus, which do not allow a more detailed determination. They don't come from Trinil, but from Kedoeng Broeboesher. A recent looking cervical vertebra of Trinil is also of a larger species. The Rusa forms described by Dubois, which are significantly larger than the Axis, are not represented in the Berlin collection by certain pieces.

Oavicornia, Antilopinae (Zittel).

Fam. Giraffidae. Unterfam. Boselaphinae (Knottnerus Meyer).

Duboisia n. G. Kroesenii Dub.

(Panel XVII, Figs. 12-14; Panel XIX, Figs. 3–5; Panel XX, Fig. 1.)

Skull.

According to the presence of horn nuclei and selenodontic dentition, a Cavicornier has the beautiful skull (No. 1512) of an adult animal. The left side of the skull is

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the illustrated copy.

15 \*

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H. Stremme,

well preserved. Mainly only the nasal bone and zygomatic arch are missing. The right side, on the other hand, is more smashed and dented; the nucleus, the premaxilla, the premolar and the first molar are also missing from it. There is a fracture in the front part of the skull that has pushed the upper jaw inwards and to the right.

The dentition is brachyodontic in front, hypselodontic behind; the horn cone begins immediately behind the eyebrow: the parietal bones are long and straight, the front bones bent: all these characteristics allow the antelope to be recognized.

The skull is moderately slender in shape. The strongest, strongly tubercular forehead bulges that begin above the anterior orbital margins with a high, broad elevation are most striking. The two bulges are not united at the front, but separated by a strong indentation, in the middle of which the sharply marked forehead seam runs. They diverge backwards and maintain quite a considerable height. They accompany the upper arch of the eye at some distance and leave a strong cavity free between them and the arch. The left bead is followed by the only remaining horn cone, which has a broad, flattened shape. The broad forehead bulge extends back over its front surface and finally runs on the upper horn core. The horn core is also slightly indented on both sides. The horn core first turns flat and obliquely outwards, then rises and bends forward and inward at the top. Its back is convex. Between the long forehead bulges, the long browbones are rough and somewhat concave. The frontal suture is clearly marked by a row of tubercles. The long parietal bones are flattened at the topand also sculpted. From the horn cones, two ledges extend backwards in an arch on each side. The axially located one is broad, rough and irregular. It runs to the middle of the parietal bones and reaches this about 1.5 cm in front of the drop of the occiput. The corresponding one on the other side meets here with the one, and a faint row of tubercles forms the continuation of the two united. The second outer ridge is thinner, but more sharply marked, and runs in an arc to the occiput, whose strongly developed, lateral ridges it meets. The parietal bones slope outward from these second ridges and are slightly convex. The occiput, which is bordered by wide side ridges, drops off steeply, is even somewhat concave. Its vertical center line is marked by a strong comb that is thickened like a button at the top. At a distance of about 1 cm

two weaker side ridges run parallel to him. The condyles are everted, the basioccipital is characterized by a sharply incised, narrow channel that begins at the foramen magnum and runs over the base phenoid and ends at the pterygoids. At this channel an isolated occipital base could be determined as belonging to the antelope and separated from that of the same size of the axis deer, which has a flat, wide channel, the center of which is adorned with a narrow bar.

The bullae protrude strongly and protrude downward over the occipital base.

The skull axis is naturally kinked. The palate shows a narrow, oval foramen at the level of the first and second molars, behind which there is a second, smaller one at some distance. At the front it is deepened in the midline, towards which the two maxillary bones drop obliquely. The lacrimal bone is stepped off at the lower edge and is not deepened, but rather flatly arched, the ethmoidal gap is narrow and long. A tear pit is missing, just below the teardrop bone

the upper jaw is hollowed out shallowly. A strong supraorbital foramen is present below the start of the forehead bulge. The seams have for the most part disappeared, only a little can be seen clearly; so the animal was fully grown.

The same formation of the frontal and parietal bones shows a second skull fragment, in which the right horn core is preserved, the left one broken off. The heavy sculpting is also the same.

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This skull is a little wider than the one described above, the horn core a little longer and stronger. Three isolated horn kernels come from smaller individuals.

In comparing this fossil antelope with the recent one, the identification table provided by Knottnerus-Meyer in his treatise "On the tearbone of the ungulate") with regard to the formation of the tearbone and ethmoid gap served me well. The family of the Oiraffidae is characterized in the version of Knottnerus-Meyer by Lacrymalia, which are characterized by a step-like heel on the lower edge, which narrows it strongly in the front part. In this family, Knottnerus-Meyer differentiates between two subgroups: there are tear pits or there are no tear pits. The first group includes the subfamily of the Tetracerotinae, which is characterized by small and narrow ethmoidal gaps. The second group includes three subfamilies: the Antilocaprinae (with large triangular ethmoidal gaps; the Bosclaphinae (with very narrow and long ethmoidal gaps) and the Giraffinae family (with large, almost round ethmoidal gaps). In the subfamily the Boselaphinac is to be found after the formation of the lacrimal bone and the ethmoid gap, the fossil Javanese antelope.

The other families of the antelopes or, since the giraffes are not traditionally counted among them, the actual families of the antelopes are to be classified according to Knottnerus-Meyer with regard to the lacrimal bone and the ethmoid gap as follows: 1. Reduncidae: Lacrymal oblong-rectangular, tear pits missing, large ones Ethmoid gaps present. 2. Cephalopkidae: Lacrymale similar to that of the Giraffidae, tear pits present, ethmoid gaps missing. 3. Nemorrhaedidae: Lacrymale

longer than the lower, tear pits and ethmoidal gaps present. 4. Neso-

large, upper edge 1

tragidae: Lacrymale mostly higher than long and of irregular square shape, tear pits and ethmoidal gaps always present. 5. Gacellldae: lacrymales in the facial part longer than high; Lacrimal pit absent or present, ethmoid gap present. 6. Panthalopidae: Lacrymales not large, wider from the orbit, narrower in front below, tear pits and ethmoid gaps missing. 7. Saigidae: Lacrymale large, front edge is exposed in the upper half, tear pits small, ethmoid gaps are absent. 8. Antilopidae: Lacrymale trapezoidal, tear pits present, ethmoid gaps absent. 9. Lithocraniidae: Lacrymale large, as high as long, tear pits and ethmoid gaps present. 10. Bubalidae: Lacrymale large, elongated, continuously narrowing from the orbital margin, only remaining the same width in the foremost quarter; There are tear pits and ethmoid gaps. 11. Hippo-tragidae: Lacrymale narrow and long, evenly wide; Tear pits are absent; There are ethmoid gaps. 12. Orycidae: Lacrymales progressively wider towards the front, tear pits absent, ethmoid gaps present. 13. Tragelaphidae: Lacrymal trapezoidal, extensive, tear pits absent, ethmoidal gaps present. 14. Taurogradiae: lacrymales high on the orbital margin, very large; There are tear pits and ethmoid gaps. 15. Rupicapridae: Lacrymale oblong-rectangular, regular. There are no tear pits, ethmoid gaps present or absent.

On the fossil skull, lacrymal and ethmoidal gaps are easy to recognize, the distinction from the other antelope groups and the assignment to the Boselaphinae are easy to make. But there are also numerous common properties that connect Boselaphus and the fossil Javanese form. Boselaphus shows the same strong crest development of the occiput; in him, too, the condyli are everted. The basioccipital has the same strong and long central groove. The sculpting

on the forehead and parietal bones is very similar, as is the (albeit significantly weaker) curvature

1) Knottnerus-Meyer, About the tearbone of ungulates. Archives for Natural History 73, 1907, I, pp. 1–151. I thank Prof. Matschie for pointing out this work.

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Fossil Javanese form (1 skull)

Boselaphus tragocamelus <3 average: 5 skulls longest skull, No. 35

Tetraceros <5

25.5 10.0 2.55

41.4 15.0 2.70 43.9 15.5 2.83

19.8 8.5 2.33

13.56 1.88 11.6 10.3 1.13 2.20

——————

6.95 3.67

11.40 3.63 11.60 3.78

5.76 3.44

:

the horn cone. But these properties are in the Javanese form z. Sometimes more pronounced, and in a way that gives it a significantly different appearance. The horn cones (Fig. 3) are flatter and more triangular, the angular extension of the forehead bulge is considerably stronger; in Boselaphus they are more rounded, the edge weak and short and without indentations on either side. While in Boselaphus the horn cones are only weakly curved, first slightly backwards and outwards, then inwards (the horns themselves are usually stronger), they are so in the fossil anti-

Fig. 3.

Sections through the kernels of .1 Duboisia, B Boselaiilius, C Tetraceros. Front up. nat. Size

lope in a far greater degree. In her, they project noticeably far to the side, perhaps beyond the greatest breadth of the skull (it cannot be determined precisely because the posterior edge of the eye and the zygomatic arch are missing). In Boselaphus the forehead bulge is only strongly developed in front, so that here it is similar to the anterior horn cones which in Tetraceros usually, but not always, break through the skin and are covered with horns. This forehead bulge weakens considerably towards the horn cones; the groove between it and the orbital rim is shallower. In contrast, the lateral ridges of the parietal bones in Boselaphus are usually much more pronounced than in the fossil form. In the latter, a sharp edge runs from the lateral main ridges onto the zygomatic arch, which seems to be absent in this one. There is another difference in the dimensions of the skulls of both antelopes. Of the

Skull of the full-blown Javanese form is about 1

not in the same proportion; but has a shorter face than the Indian one. The horn cones are relatively longer with her. The table below provides information about the numerical proportions of the skulls. Longitude and latitude were obtained by projection onto a plane. I took the largest at the rear orbital margin as the width. As usual, I measured the length of the face from the anterior orbital margin to the anterior end of the premaxilla, the length of the horny cones from their base, and the circumference just above it.

Length o width of the skull

Length to width

/ 3

Ratio of circumference ratio ratio of length to ratio of length of horn to length of skull

Visible length of the left cone to the circumference length to the constant length of the skull to the face horn (lower of the horn length of the 1st left length to the length of the endo cone) cone horn cone teeth row of teeth

24.50

9.42

1.72 13.5

2.10 6.5

12.0 1.13 3.25

5.3 1.26 3.05

We see from the ratios in this table that the Javanese skull is relatively wider and shorter than that of Boselaphus. The skull of Tetraceros is relatively broader and shorter, and its face even shorter. The ratio of the length of the skull to the row of teeth, that of the Boselaphinensmaller, both shorter and narrower, but

Boselaphus tragocamelus

Length of skull ....

Width of the skull ....

D ratio Jf f width

No. 3

15.7 cm 7.4

2.12

2 258J

16.7 37.7 7.8 13.6

2.14 2.77

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39.0 41.3 42.8 14.7 15.5 15.5

2.65 2.69 2.76

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is the same, shows a longer dentition in Tetraceros. In relation to the length of the skull in Tetraceros the horn cone is almost as long as in Boselaphus, while the fossil form has a longer cone; it is slimmer in Tetraceros than in both Boselaphines.

Below I give the length and width dimensions of the skulls of all Boselaphus SchMel measured by me, including two animals only a few days old (No. 3 and 2). The comparison shows that the skull of Boselaphus grows two and a half times in length and only two times in width. The brain part is also relatively stronger in newborns than in adult animals.

Since the females in Boselaphus are unhorned and show no skull sculpture, the skull of the Javanese form, which is certainly closely related, will come from a male.

Because of the numerous fractures, only a few other measurements could be taken on the fossil skull. The above are also somewhat imprecise as a result. I have listed the other measurable quantities in a table below.

No. 1512

1. Forehead width at the anterior orbital margin .... 6.21 2. Forehead width at the posterior orbital margin .... 9.93 3. Distance from the beginning of the frontal bone to the upper

Occipital margin (midline) 15.9 4.Distance from the posterior approach of the horn

kernes to the middle of the upper occipital margin 5.90 5. Width of the occiput between the ear

9.93 6. Removal of the two outer condyles .... 5.04

7. Perpendicular from the back of the head to the

upper margin of the foramen magnum. . . 3.83 8. perpendicular to the lower edge of the for. like. 5.87

9. Distance from the anterior margin of the 1st premaxilla

to the rear edge of M3 14.80

Ratios: 2: 1. . . . 1.60 3: 1 .... 2.55 3: 4 .... 2.70 3: 5 .... 1.60 9: 1 .... 2.38

No. 2585

35 22TS5

10.06 9.95 14.65 14.96

22.6 21.8

9.33 8.92

2583 l

8.21 11.30 12.51 14.78

20.6 23.5

9.24 9.83

2: 5 ....

-

1 1.31

No. 869 a. 1514

Boselaphus tragocamelus

Tetraceros without no.

4.96 7.68

11.30

5.01

5.52 3.16

2.10 3.96

11.90

1.54 2.27 2.25 2.04 2.40 1.38

The range of variation among the Boselaphus SchMeln is not inconsiderable. In the two proportions that concern the occiput, the dimensions of the fossil Javanese form stand outside those of the Boselaphus SchMe \. These say that the occiput of the Javanese antelope is wider

9.36-14.29

-

6 50:

-

20.8

9.51

5.19 7.21

8.19 7.80 7.76 7.97

5.75 5.63 5.48 5.78 8.26 8.82 8.32 8.80

26.1 25.2 22.7 26.0

1.46 1.50 1.52 1.33 2.24 2.20 2.50 2.07 2.41 2.44 2.10 2.38 2.00 1.93 1.86 2.13 2. 60 2.54 2.75 2.30 1.30 1.32 1.20 1.34

-

-

-

-

-

-

-

4.81 7.96

23.9

1.52 2.22 2.18 1.92 2.55

10.84 11.31 11.32 10.45 11.02

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H. Stremme.

was than at Boselaplnis. Furthermore, the section behind the horn core approaches in the fossil is shorter. Tetraceros in all proportions definitely follows Boselaphvs and, like this, deviates from the fossil form.

Teeth.

As for the comparison of the skulls, the work of Knottnerus-Meyer is an easily usable one

FROM

Fig. 4.

A maxillary, B mandibular grater with roots from the labial side, lhthoisia Krocscnii Diai. 2.3 nat. Size

The dentition is similar to that of the bovids, but the molars are less high, though hypelodontic. The cement is also missing. The molars are characterized by their basal pillars, which are particularly well developed in the upper jaw. In the existing lower jaws they are weaker, but still clearly pronounced in Mj. The teeth are either smooth or not very rough (Fig. 4). The chewing surface of the maxillary molars shows small islands and only one larger spur on the posterior margin of the second mark. The ribs are strongly developed on the outside of the upper molars, as well as on the inside of the lower molars. - The teeth also agree almost in every detail with those of Boselaplnis, as described by Schlosser and as I saw them on the recent Nilgau skulls in the Berlin museum. One difference lies in the structural strength of the enamel, which in Boselaphus is usually considerable, in the fossil form it is either weak or absent. I saw another difference in the formation of the lower premolars: the last one shows one more enamel fold on the outside of the fossil form, so it is distinguished by an even more complicated backdrop than that of Boselaplnis compared to that of Bos. It is also wider and more angular at the back. This latter also applies to the penultimate premolar. The closure of the teeth, especially in the lower jaws, is narrower than that of Boselaphus, but this may be due to the origin of the Boselaphus SchsLdei from the zoological garden. Tetraceros has a deer-toothed set of teeth that is the closure of the lower jawalso narrower in this small form than in Boselaphux.

Below are the numbers for each tooth. On the reproduction of the dimensions of

I renounce the Boselapkus teeth; the animals from the zoological garden all had teeth, not one specimen had good dentition.

An entire lower jaw is absent; a barely chewed last lower molar has a crown height of 2.56 cm.

I Schlosser, The Fossil Mammals of China. Abh. II. Kl. Kgl. Bavarian. Akad. D. Wissensch., 1903, XXII. 1. S 161.

Overview, we used Schlosser's 1

Odontography of the recent antelopes a very valuable compilation, which promotes and facilitates the identification of the teeth.

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Upper jaw No. 1512 1 »1512r

0.81 0.91 0.90 1.11 0.61 1.18 1.09 1.45 —————

1.24

1.40 1.43 1.23 1.46 1.55 1.40 1.45 1.60 1.33 1.51 1.50 1.44 1.46 1.69 1.24

1.01 2.03 0.93

Lower jaw No. 1051 1

1.01 0.67

0.92 0.66 ——

0.99 0.94 1.28 0.94 1.30

1.09 0.78

»

»

. "

524 1

550 1 1101 r

0.91 1.03 0.70 1.15 ——————

\* »». »».

1.17 0.98 1.43 1.10 0.89 1.34

1.06 2.02

1312 1 1212 "1 1916 1

552 1 418 r 881 r

1165 r

1.00 0.95 2.02 0.98 1.18 1.03 1.31 1.07 2.02 1.04

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——

——

——

- - - - 1.22

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Pi E2 F3 Mi M2 M3

Length Width Length Width Length Width Length Width Length Width Length Width

0.88 0.60

1.01 1.12 1.06

1.32 1.41 1.31 1.46 1.30 1.52 1.50

0.95 0.70 ————

————————

- - 0.97 0.68 1.06 0.75 ————

1.42 0.96 2.02 0.92 1.28 0.89 1.57 0.98 - - 1.22 0.85 1.29 0.91 2.00 0.93

1.19 0.90 1.35 0.94 2.01 0.93

————

0.98 0.67 1.04 0.72

Spine.

There is an atlas from the spine and probably a fourth lumbar vertebra. The severely broken atlas differs from that of the male Axis deer, which is roughly the same size, above all in the higher, more rounded shape of the joint socket, which fits on the occipital condyles of the skull.

I received a completely preserved atlas of the antelope from the Munich collection (see Fig. 5). This enabled a detailed comparison with that of Axis. The vortex itself is something with Axis

FROM

Fig. 5.

Atlas A from Jhihoisia, B from Cervus Lydelclceri. 2 / s nat. Size

shorter than that of the antelope, the upper arch shorter than the vertebral body and only slightly rounded at the back; in this case, conversely, the upper arch is longer than the vertebral body and is deep and pointed. The wings of the Axis are strongly extended backwards and almost horizontal, in the antelope they run obliquely downwards and are less powerful. The vertebral body of Axis has a rather strong lower process which is elongated somewhat backwards beyond the vertebral body. In the antelope, this extension is a shorter, slightly thickened ridge at the back. These differences should suffice to characterize the two vertebrae as belonging to two quite different forms.

The shape of the atlas vertebra of Ditboisia also corresponds to that of the Nilgau. But the ratio of the total length to the front height is greater with this one with 2.2 than with those with 1.8 or 1.71, i.e. H. the atlas is relatively lower at the Nilgau.

Selenka-Trinil expeditioli. 16

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The lumbar vertebra, which is also broken, can be distinguished from the corresponding one of the J.m deer by its somewhat clumsier shape.

Extremities.

There are only meager fragments of the extremities; apart from a calcaneus and several phalanges, probably to be made here, not a piece was unbroken. I had to read these bones out of the more numerous, almost equal sizes, on the axis. They differed from these in their sturdier and clumsier construction, some parts also in special peculiarities which are difficult to describe; sometimes humps, sometimes gaps, were formed or arranged differently. A comparison with the corresponding parts of the skeleton of an almost adult female Nilgau showed the agreement with this in almost all details. Here are some numbers for each part.

No.

486

638 1602 1792

description

left humerus, distal end. > Radius, proximal end.

wide length

5.95 5.55

5.66 2.85

4.26 2.65

relationship

1.07 1.99 1.61 0.72

1002 312 1341

. .

. .

right metacarpus, proximal end 568 »Femur, distal end. . .

7.15 9.94 ———

»» >> ... left tibia, proximal end .... right tibia, distal end .... left metatarsus, proximal end

7.66 7.92 0.97 4.91 3.72 1.32 3.67 4.26 0.86 ———180 »» »».

Javanese form

Width to length ratio

3.85 3.67 1.05 3.29 1.76 1.87 2.29 1.55 1.48 4.10 5.54 0.74 4.01 5.26 0.76 4.85 4, 73 1.03 3.14 2.62 1.20 2.46 2.66 0.92 2.05 2.19 0.94

Boselaphus tragocamclus Q

Ratio of the widths of both forms

0.65 0.58 0.68 0.57 0.56 0.63 0. (54 0.67 0.57

The deviations in the ratios of the extremities of Boselaphus and the fossil antelope are so small that they cannot be taken into account. According to the ratios in the last row, the badius, the femora and the smaller metatarsus are smaller, that is, probably female, perhaps also z. Partly from juvenile animals, the remaining bones from larger ones, probably males. The differences in size can be seen so clearly that they did not need to be presented in figures.

Judging by these extremity measurements, the fossil form was a little over half as high as Boselaphus; d. H. at the withers the female measured about 70 cm, the male about 80 cm, compared to about 120 cm for Boselaphus Q and about 135 cm for Boselaphus q \*.

Designation.

The above comparisons of the fossil antelope with the recent one show that the former is close to the Indian Nilgau. But the relationship is not so close that it could be regarded as a kind of Boselaphus. The skulls are completely different in appearance. The stronger, flatter and more outwardly directed horn cone and its more pronounced curvature, the thicker, more even forehead bulge and the more even, deeper supraorbital groove - these striking features suggest significantly more different animal types when viewed than when studying the details more closely shows. There are also deviations: the relatively shorter face of the fossil antelope, the wider occiput, the shorter skull section behind the

The mammals with the exception of the proboscidians.

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Horn nuclei, the slight development or lack of roughness on the tooth enamel, the other formation of the lower premolars, the higher atlas.

As Prof. Dubois informed me during his tour of the Berlin collection, the

standing described form with its Tetraceros Kroesenii1

it was called Boselaphus. The entire Berlin skull of this shape enables the decision to be made in favor of the closer relationship with Boselaphus, although it cannot be denied that in fact some features correspond more to Tetraceros, as I pointed out above. But the systematic position of the new form is not such that it occupies an intermediate position between the two modern antelopes.

)

Tear pits fairly deep, sharp tear pit absent, below the

Tetraceros quadricomis New form

Boselapkus tragocamelus

There are no tear pits, and below the tear bones there is often a pit in the upper jaw.

Parietalia forming a plate that extends to the forehead ridges with strong lateral ridges.

Horn cone terminating with the edge of the skull; slightly curved; slightly triangular, strongly

younger.

Forehead bulge hornless, more developed in front than behind, not very curved, forms a clear supraorbital groove; Frontalia flat in front of the forehead bulge.

Occiput with strong, lateral ridge formation, articular cusps everted.

Basioccipital with a strong median groove that passes over to the base phenoid.

Bullae tympanicae ending at the level of the basioccipital.

Teeth very rough. Maxillary molars with (rarely without;

Basal pillar.

Posterior molars above and below

hypselodont.

Mandible premolars smooth on the outside, indented in some specimens, rounded and narrow behind.

Lumpy depression of the lacrimal bone

Maxillary bone.

Parietalia forming a plate that extends up to

reaches to the forehead bulges, with weak lateral ridges.

Horn cones probably bent out over the edge of the skull; strongly curved; triangular with leading edge, strongly tapering.

Forehead bulge evenly developed, straight, forms a strong supraorbital groove; Frontalia flat in front of the forehead bulge.

Occiput with strong, lateral ridge formation, articular cusps everted.

Basioccipital with a strong median groove that passes over to the base phenoid.

Bullae tympanicae protruding over the basi- occipital.

Teeth smooth or not very rough.

Maxillary molars without or with maxillary molars with strong ba

weak basal pillar. saline pillars.

Posterior molars above and below Posterior molars above and belowset off at the edges.

Parietals rounded, without crests on the sides.

Horn cones moved towards the middle of the skull, remaining about 1 cm from the edge of the skull on each side; slightly curved; rounded with lateral edge, tapering less.

Forehead bulge often carrying horns, only hinted at between the horns on each side, first curved inwards, then outwards, does not form a supraorbital groove; Frontalia in front of the forehead bulge, sometimes bulging, sometimes flat.

Occiput with weak lateral ridges, articular cusps not protruding.

Basioccipital with a weak central groove.

Bullae tympanicae protruding strongly over the basi- occipital.

brachyodont.

Mandibular premolars folded on the outside, angular and broad behind.

hypselodont.

Mandibular premolars folded on the outside, angular and broad behind.

Teeth smooth or not very rough.

In the table above I have tried to compare the peculiarities of the three forms with one another. The systematically so important development of the lacrimal bone and the ethmoid

1) Tijdschrift van het Koninklijk Nederlandsch aardrijkskundig Genootschap, 1908, p. 1260.

identical. In his earlier publications

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H. Stremme,

Kicke speaks for the relationship with Boselaphus. A series of Tetraceros - Boselaphus - new forms could be constructed in the formation of the forehead bulge and the lorn cones. The formation of the tooth enamel and the mandibular premolars corresponds to that of Tetraceros, not Boselaphus. In all other traits, Boselaphus is closer than Tetraceros.

B. namadicus Rüt is one of the fossil forms of Boselaphus. from the Altpleistocän of the Narbadatal closely to B. tragocamelus. The presence of Boselaphus is also attested from the Pliocene of the Siwaliks of Pendschab by teeth of a species the size of the recent one below.

The numerous comparisons above show such an abundance of differences between Boselaphus and the Javanese form that I believe I may propose a new generic name for them. In honor of Prof. Eugen Dubois, the discoverer of the Pithecanthropus, I name it Duboisia Kroesenii Dub. n. g.

In the system of ungulates, which is based on the tearbone examinations by Knottnerus-Meyer, it is the second genus next to Boselaphus in the subfamily of the Boselaphinae, which belongs to the Giraffidae family.

Bovidae.

1 )

There is a wealth of material from one species of Rüffel: three skulls, a horn cone, eight rows of lower jaw teeth, numerous loose upper and lower teeth, vertebrae, ribs, shoulder blades, pelvis, extremity bones, so that a skeleton can be almost completely assembled.

Skull.

Of the three skulls, one (without a number) is quite well preserved. Its horn cones are almost complete; only in the part of the face are shattered areas, especially on the underside. Of the other two skulls, one (no. 29) has been preserved in a similar way to that of Bibos and that of the deer: the half of the face is missing from the orbit. The antelope skull has also suffered a fracture at the front edge of the orbit. This break-off part is the same weakest part of the skull, the rupture of which causes the frequent pug headedness in the embryo. The third skull (no. 165) is badly eaten away (probably by sulfuric acid) and even more smashed than skull 29.

The following description is mainly based on the well-preserved skull. This has a relatively slender part of the face, from which the forehead rises sharply to a high arch. Above the nasal bones, there is a short, rounded crista on the forehead, which is accompanied by two shallow furrows. The crista quickly widens and flattens backwards; the furrows diverge, become flatter and disappear. From the height of the bulge, after a short approach, mighty horned cones extend sideways in slight curves. The horn cones are only slightly bent downwards; at their ends they stand up and slightly protrude above the forehead plane. Almost from the base they are slightly curved backwards. Each of the horn cones is almost 90 cm long. One can probably assume that the horns measured from one horn tip over the forehead to the other of both living animals, a considerable length. The horn cones

1) According to Trouessart, Catalogus Mammalium, Supplementband 1904. P. 743, the designation lh <ffrh <s has priority over Biibalus.palaeokerabau Dub.

(Panel XVIII, Fig. 5 and 6; Panel XIX, Fig. 8; Panel XX, Fig. 7-9, 12-14.)

Buffelus

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have a wingspan of over 1.50 m. Each of the tenons is three-sided; the top is flat, the front forms a more or less sharply pronounced right angle with it and falls steeply downwards. The underside adjoins them in a rounded approach, which runs in a gentle convex arc to the rear edge of the upper side. The front is much shorter than the top and bottom. The forehead is strongly tuberculated between the horn cones. Right at the rear edge of the horn cone it falls almost vertically downwards, so that the parietal bones form an almost upright plate. They are separated from the low but wide occiput by a strong crest. The temporal fossae are extraordinarily high and deeply incised. The occipital articular cusps protrude only slightly backwards over the paroccipital processes; these are strong and moderately curved inward. The cuneiform bones rise sharply at the base of the skull. The choanas are quite far back and are divided by the vomer, which is extended to the rear. Otherwise not much has been preserved from the underside. The rims of the eyes are moderately bulging, accompanied by an arch on their upper side; the zygomatic arches, strong and sharp in front

cut, weakened backwards.

Almost every step of the way this description fits the Kerabau, the living Sunda buffalo, which Cuvier believes to be wild on the islands, whereas Schlegel only wanted to see feral domestic buffalo in the free buffalo. The same steep slope of the parietal bones, the same shape of the horn cones, the same tuberculation of the forehead are inherent in fossils in the Kerabau. Both are in contrast to the American. In this case, the height of the skull is in the parietal bones, which curve down slightly from there. Its horn cones are less flat on the top, at least near the base,

above

front

back

below

Fig. 6.

Cross section through the left horn cone of Buffelus palaeoUerabau Düb. close to the base. ] / 2 nat »Gr.

more convex, their underside somewhat concave.

They are less curved backwards and possibly twisted a little so that their tip points downwards. His forehead is smooth.

The fossil buffalo seems to be differentiated from the recent Sunda buffalo: by a longer facial part in relation to the brain part, by a more pronounced forehead; by their crista and furrows, which I did not observe in Kerabau, but found in Ami; through narrower pre-maxillae, which could lead to expect a wider mouth of the recent one. I also haven't seen a Kerabau of the same size so far. At least it is possible that a larger material from the recent Kerabau than that available to me, namely from the wild Kerabau, blurs these differences.

The table below gives a compilation of the dimensions of Kerabau, Ami, the fossil Indian (B. platyceros and palaeindicus) and the fossil Javanese. In terms of measurements, I have followed those given by Lydekker \*) and converted his own into centimeters. However, I was only able to take part of its measurements on the Javanese skull, e.g. Partly because his

1) Lydekker, Indian Tertiary and Posttertiary Vertebrata, I, p. 136.

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H. Stremme,

Designation does not always show clearly where its dimensions are taken. I've added some figures to compare with Kerabau and Arni.

I will go into more detail below on the relationships between the Indian buffalo.

I. Distance between foramen magnum and occipital ridge

II. Distance between the occipital ridge and the vertex

\

7.5 7.7 9.4 10.6

14.8 11 11.2 11.4

20.1 20.5 25.4 285 23.6:

38.6 44.6 53.0 50.8 19.5 17.6 21.5 25.4

11.7 11.5 13.0 15.7

9.6 9.7 17.7 19.0 17.8 4.7 4.1 6.1 6.35 6.1 6.5 6.0 7.1 7.6 7.4 6 5.8 6.3 6.6

9.4 11.4 13.4 16.5 11.4

21.0 24.0 25.4 30.5 14.3 11.2 12.7 15.5 20.9 21.6 25.4 27.9 12.1 8.3 13.2 18.5

7.3 6.0 6.3 7.1

8.7 9.0 12.9 17.8 12.7 34.8 24.0 43.0 47.0 42.0 10.1 11.2

19.5 20.3

25.4 27.3

46.1 55.2

23.5 26.5

24.7 31.5

III. Width of skull at the upper edge of the orbit.

IV. Distance between orbital ridge and nasal i

top

V. Width of occiput

VI. Distance between the outer angles of the occipital condyles

VII. Length of the temporal fossa. .

VIII. Distance between the base of the horn and the orbit.IX. Longitudinal diameter of the orbit

X. Cross-thru knife of the orbit

XI. Removal of the supraorbital foramina ...

XII. Distance between the orbital crest and a line connecting the centers of the orbits Distance of the outer paroccipital processes.

Zygomatic arch width

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|

''

j |

j |

j

| i

I;

"

.,

I.

,

||

XIII. XIV. XV.

XVIII. XIX. XX. XXI.

XXII.

XXIII.

XXIV.

Longitudinal diameter of the horn core base on the right. XVI. Transverse diameter of the horn core base on the right. XVII. Width of the parietal bones between the fossae

temporal

Circumference of the horn core base ....... Width of the premaxilla

Smallest forehead width below the horny nucleus Distance from foramen magnum to

Point of contact between nasals and Frontalis Distance from the left occipital condyle to the anterior margin of the left premaxilla. Distance from the occipital ridge to the anterior

edge of the orbit

Distance from the anterior edge of the orbit to the

Anterior margin of the premaxilla

10.9

22.7

Buffelus palaeokerabau

Buffelus Buffelus Buffelus arni

\

BllffduS

0. N.

10.0

17.5 21.4

46.7 20.1

12.5 11.9 5.2 6.5

6 10.9

25.0 17.9 24.0 14.1 10.5

10.6 44.9 11.2 22.9

27.7

55.6

26.7

31.6

29

7.5

18.6

platyceros Berlin Lidekkeks mdicus \* a

In the table shows the relationship -> .. “. the predominance of the facial skull over the brain 5 will b

skull of the fossil Javanese buffalo opposite the Kerabau. Although in the Ami the cranial skull is elongated backwards due to the moderate curve of the parietals, the ratios for the facial and cerebral parts are only the same as in the Trinil buffalo; H. that facial skull looks shorter

XXII

than that of this one. The ratio TM == results in a wider snout for the measured one

Kerabau than with his fossil relative and the measured Arni,

There is also agreement between Arut \ Kerabau and in other numerical ratios

m • M »•« i o • HI (forehead width at the eyes) I iinil-Buffcl. So in

XVII (width of the skull at the parietal bones)

Trinil Buffalo 2, Kerabau 2.31. Arni 2.27

sondaicus palae-

, '

•

I.

2.8, Arni 2.72.

Good. Buffalo.

Judging by the proportions, the correspondence between the two Arni is on the whole correct.

Buff'elus palaeindieus shows more agreement with Kerabau again.

Teeth and lower jaw.

IV (occiput — tip of the nose)

I (height of the supraoccipital)

IV (occiput — tip of the nose)

III (forehead width at the eyes)

IV (occiput — tip of the nose) V (occiput width)

4.67

2.18

2.31

1.08

-

-

-

-

IX (length

X (height

V (width of the occiput)

the 0rbita

I (height of the supraoccipital) XIV (zygomatic arch width)

I (height of the supraoccipital) IV (occiput - tip of the nose)

XIV (zygomatic arch width) V (occipital width)

XIV (zygomatic arch width)

V (occipital width) XVII (parietal bone width)

2.01 2.47 2.60

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X (total length) and 1.97, B. palaeindieus 1.6, B. platyceros 1.85. ^ "

Trinil-Buffalo 2.43, Kerabau 2.36, Further ratios are calculated below.

> •••

Trinil buffalo

Kerabau

5.14

1.91

1.98

1.08

Arni

5.79 5.63

2.17 2.08

2.53 2.36

1.03 1.12

2.28 2.28

2.81 2.70

2.06 2.08

0.81 0.85

1.95 1.66

B. pal.

4.80

1.78

2

1.15

2.40

2.62

1.82

0.91

1.43

B. plat.

2.40

1.94

0.84

-

-

-

2.78

1.84

0.93

1.90 1.70 2.26

“The difficulties with which the representation of a fossil fauna has to struggle solely according to the characters of the teeth accumulate in the group of bovids that is now to be performed in such a way that, despite all the effort, the results obtained are viewed with only a certain degree of dissatisfaction. «This is how coking 1 begins

Bovid teeth, words, the justification of which I had the opportunity to fully appreciate while working through the abundant bovid tooth material from Trinil. Judging by the skulls, two groups of bovids are represented in the Berlin collection, Buffelus and Bibos. The beautiful buffalo skull, No. 29, still has five right and four left molars in the upper jaws and a branch of the lower jaw with five molars and the alveolus of the sixth. The well-preserved molars of the upper jaw show restless, irregular formation of the enamel folds, well-developed but not too strong accessory columns and are longer than wide. The enamel is rough. Numerous individual teeth appear from them because of their plump, more powerful structure, thicker, likewise rough enamel, almost square outline, and particularly deep, strong development of the accessory columns

to be different. According to the distinguishing features that Bütimeyer2 and Koken on molars)1) Koken, About fossil mammals from China. Palaeontol. Abh., III, p. 63. 2) Rütimeyer, Natural History of the Cattle I p. 100 and 101.

)

in his work "About fossil mammals from China" the chapter about the

XX (front width)

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H. Stremme,

of Bibos and Buffalo, these clumsier and more square teeth could belong to Bibos. But it was not possible for me to convincingly represent these two differences of the more square or more elongated structure, which seem to be so easy to determine numerically, by measuring them. The square teeth were all badly chewed. But how the chewing affects the outline of the tooth, I could see from a last left molar over 6 cm long. I measured a length of 3.10 cm at the top, a width of 2.07 cm in front and 2.04 cm in the back. I measured 3.5 cm deeper, respectively, 3.02, 2.80 and 2.85 cm. So while the upper part was very elongated, the lower part was almost square. I have measured numerous of the wide, square individual teeth and have sometimes obtained even sharper expressions of equilateralism, but received such a confusing number of transitions that I could not arrive at a reliable result.

The same applies to the other molars.

The dimensions of the rows of teeth are:

P2 length width

P3

length

Width width

Mj M2

M3 length width

Buffclus, skull without no. R 1.77 2.05 0.86 1.78 2.25 0.78 ———

1296 1

2.12 2.33 0.91 2.58 2.70 0.92

2.45 2.48 1 3.08 2.48 1.24 3.18 2.48 1.28 2.91 2.23 0.86 2.48 2.18 1.14 3.04 2.13 1.42 2.13 2.26 0.94 2.65 2.11 1.25 2.92 2.04 1.44

, 1

1.75 2.34 0.75

1.60 2.14 0.75 1.84 1.99 0.92 1.74 2.14 0.81 »» Q r. . . . 1.63 1.71 0.95 1.56 1.91 0.81 Bibos (3 rec. R 1.59 1.78 0.90 1.79 1.85 0.97

»Rec. r (J

....

length Width

length

Length Width

length Width

length Width

length Width

Of the lower jaws (Plate XVIII, Fig. 5 - there are two almost complete ones, which have a good lower 6)

allow for divorce in all of their characters. The lower jaw of Buffelus is longer and slimmer, less thick, higher on the teeth, the ascending branch wider but relatively lower than that of Bibos. The coronet process is much wider in the former than in the latter and apparently more curved backwards and sideways outwards. The gap between premolars and incisors is relatively shorter in Buffclus, its crest more curved inward, while in Bibos it is more gentle.

The following measurements illustrate some of the differences between the two mandibles. •

10.

Width of the condyle

Distance between the condyle and the posterior end of the symphysis level behind the last molar

“Before the first premolar

Lowest height in the gap

Width of the corolla

Length of the row of teeth

Distance between the alveoli of Fi and J: 1 thickness behind M3

Buffclus No. 23 Bibos No. 1518

42.9 35.5 8.7 7.5 5.5 3.85 3.2 2.65 4.5 3.2

16.6 14.0 13.7 11.0 3.05 3.1

2.4 2.1 5.8 4.95

2.58 2.53 3.12 3.23 3.70 4.36

1.

2.

3.

4th

5.

6th

7th

8th.

9. »before P,

Ratios: 1: 6. 1: 7 ..

6: 5. .

length Width

2.67 2.55 1.04 2.70 2.65 1.06 3.05 2.61 1.16

2.47 2.62 0.94 2.65 2.64 1 3.01 2.63 1.15 —— ———

4: 3: 2. 2: 8.

1.45: 2.83 242

L83 1.47

.

. 1.72: 2.72. 2.85

2.29 8: 1) .. 1.27

:

3: 9

..

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The comparisons show, as further differences, an initially weaker, then greater swelling of the height of the lower jaw of Bibos and a relatively more even increase in Buffelus. Furthermore, the lower jaw of Bibos at the teeth is more inflated in relation to the height than that of Buffelus. In the former, the thickness increases more strongly in the spaces Pn ^ -M3.

That these differences in the lower jaws are definitely generic, not sexual, I was able to establish from a comparison between recent representatives of both genera, who, according to the chewing figures, must have been of the same age.

While it was not difficult to differentiate between Buffelus and Bibos according to the lower jaws, the teeth could not be separated from one another so well. At first glance, the teeth of the two lower jaws appeared just as different as the upper jaw teeth (cf. Plate XX, Figs. 14 and 15). The buffalo teeth had extraordinarily restless enamel figures and elongated shape, the Banteng teeth were simpler and wider in cross-section. But the Banteng jaw came from an old animal, the buffalo jaw from a much younger one. With age, the lower jaw teeth also change extraordinarily. A 6cm long last molar measurement at the top, 4.08cm length, 1.48 front, 1.61 middle,0.82 cm rear width. 3.2 cm lower, on the other hand: 3.97, or 1.82, or 1.90 or 0.98 cm. A 6.2 cm long M2 above 3.28, 1.37 and 1.45 cm; 3.5 cm lower, 2.79, or 1.82, or 1.83 cm. But even if the measurements of the individual teeth, at least of the last two molars, failed, so that all the numerous measurements of the large number of individual teeth were in vain, differences in the length of the teeth could be determined in the two jaws which at least enabled the determination of the numerous lower jaw fragments. The length of the individual teeth was distributed in different ways over the total length of the row of teeth. I measured the inside of the alveoli (as good as the iron pebbles between the teeth would allow) for

Tooth row M3 M2 Mj P3 P2 Pi

the buffalo number 23. . . 16.6 3.90 2.89 2.50 2.22 1.90 1.70 Ratios 6.62 1.56 1.15 1 0.89 0.76 0.68 den ßanteng No. 1518. . 14.0 3.90 2.46 1.95 1.90 1.78 1.35 Ratios 7.17 2 1.26 i-i 0.97 0.91 0.69

For a recent buffalo and a recent Banteng, I measured in the same way: row of teeth 'm3 M2 Mi P3 P2 Pi

Buffalo No. 8046 .... 15.61 3.86 Ratios 6.45 1.60 Banteng No. 8024. . . 13.79 3.78 Ratios 6.93 1.90

3.08 2.42 1.97 1.75 1.62 1.27 1 0.81 0.72 0.67 2.56 1.98 1.99 1.89 1.23 1.29 1 1 0. 96 0.62

Here the relationship of the tooth lengths to one another and to the row of teeth is very similar to that of the fossil ones: in the buffalo on the whole a greater decrease in Mt forward and a weaker increase in the back, in the Banteng a weaker decrease in the front and a stronger increase in the back. Only Pi has the same ratio of the two-thirds length of Mj for all of them.

The dimensions of the remaining fossil lower jaw rows are (the length on the lingual

Side taken):

Selenka Triuil Expedition. 17th

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H. Stremme,

Buffelus No. 23 r. . . .

16.60 1.69 0.93 1.81 2.07 1.22 1.69 2.2!) 1.45 1.58 2.62 1.72 1.52 2.93 1.76 1.66 3.90 1.83 2. 13 14.85 1.48 1.00 1.48 1.75 1.21 1.45 1.82 1.55 1.17 2.43 1.67 1.45 2.65 1.78 1.49 3.97 1.88 2.10

Bibos No. 745 1 »No. 423 r

.

.

14.48 1.33 0.97 1.37 1.99 1.20 1.66 1.99 1.40 1.42 2.27 1.74 1.31 2.59 1.76 1.47 4.08 ————

—————— ——— ~ r

1.75 2.33 1.91 2.23 2.02 2.39 1.99 2.20 1.89 2.18

Buffelus No. 250 No. 590 I No. 273 1

4.27 | 3.00 2.03 1.48 3.25 2.01 1.H2 4.83 2.70 1.92 1.40 2.95 1.99 1.48 4.40 2.56 1.94 1.32 2.90 1.93] 1.50 4.1.1

No. 1032 r

1 -

1

1.97 1.26 1.56 2.00 1.35 1.48 2.54 1.90 1.34 2.82 1.89 1.57

No.

Buffelus554. . , 250. . . 895 .., 1032 ..,

590 ..

273 ..

Bibosliö ...

- 272 (abnormal)

Zalin series M, Mo M, Po

j

Tooth-

rub a B

length

Length OD

a a • S

I ^ nge BS

- \* a

length

fcß length length g>

Hi

Width Hl n Width 3 pa Width Hl «Width J P3 Width Hl H Width j

17.05 4.43 6.57 1.66

2.93 2.66 2.39 2.26 1.58

14.85 6.80 15.89 7.35

1.10 1 0.89 0.85 0.59 4.25 2.81 2.49 2.30 1.87

1.71 1.13 1 0.92 0.75

3.32 3.03 2.65 2.42 1.93

1.10 1 0.85 0.80 0.64 4.15 2.95 2.63

1.58 1.12 1

4.87 3.33 2.93

1.66 1.13 1

4.30 3.21 2.58

1.61 1.30 1

4.20 2.69 2.15 2.15 1.79 1.57 1.95 1.25 1 1 0.83 0.73 4.26 2.58 2.19 2.11 2.10 1.95 1.95 1.18 1 0.97 0.96 0.88

As extraordinarily strong as the individual values, taken in absolute terms, differ (e.g. M3 of the buffalo by 0.7 cm!), Quite constant differences in the proportions can be found between Mt and M3 and Mt and P3: M3 is twice as high in Bibos long and P3 just as long as Mj. In the Buffelus the length of the M is about l2 of that of the M and P is ± shorter than M ,.

3/3 t 3 Vio

I have put the width measurements together with the labially measured lengths in the following table. Almost all of the teeth were covered more or less thickly with cement, so the width measurements taken in the area of ​​the alveoli are naturally uncertain. The cementless tips

measuring, however, was useless because of the changeability of the long teeth.

Lower jaw.

P3 P2 Pi M, M2 M3

No. 272 ​​is strangely abnormally formed under the branches of the mandible. The dimensions of the teeth and its thickness on the rear molars prove this piece to be a Bibos Kieter. Of the prernolars, the two anterior ones have fallen out of the alveoli. The third premolar and the first molar are also moved high out of the alveoli before they are embedded in the Trinil sand. M2 and M, have been chewed off at an angle, the inner wall of the latter is more severely smashed by the anterior wall of the former than is often seen in the other jaws. The jaw tapers noticeably on and in front of the premolars. Behind the 3rd molar, the jaw is 6.67 cm high and 2.97 cm thick, in front of the 1st molarcorresponding to 4.96 or 2.51 cm, in front of the 1st premolar 2.81 or 1.83 cm. in the gap 2.19 and 1.41 cm; while the corresponding numbers for the complete B&O pine, No. 1518, 7.5 and

- Thickness accordingly - ~ or - ±

.

It is likely that this abnormal behavior of the library

2 1 1 69

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3.1 cm in height and thickness behind the last molar, 5.33 and 2.65 cm in front of the 1st molar, 3.85 and 2.1 cm in front of the 1st premolar and 2.65 and 1.83 respectively cm in the gap. Behave in height

rearmost and foremost measurement to each other via No. 272 ​​like

- ~ -

at No. 1518 like

~ -

and in the

jaw is due to a healed fracture in the area in front of the 2nd molar.

A right lower jaw piece, no. 985, comes from a large buffalo that has just grown up. It shows the five front molars in z. Some of them in excellent condition and especially the premolars

in the beginning of the chewing. The inner wall of the premolars is more slit by two deep folds, one at the front and one at the back, and that of the two molars is also more creased than is the case in older animals. The second molar can be seen in its entire height, but somewhat fragmented at the lower end. But the roots were only just beginning to form. I was able to measure a height of this tooth of 6.66 cm (see Plate XVIII, Fig. 5).

A number of incisors, cheek teeth and germinal teeth complete the dental material of bovids. The lack of related comparative material makes the attempt to assign the first two tooth categories seem risky. A third premolar of a bibos was clearly distinguishable from my buffelus. The latter, at the beginning of the digestion, would result in the more complicated enamel figure shown in the lower jaw No. 985, while in Bibos the double fold in front and behind would be missing.

Whirl.

Bovid vertebrae from all regions except the tail are present in large numbers. I was also able to determine clear differences between them with regard to the design of individual parts, but due to the lack of suitable reference material, I could not determine their meaning in more detail. In particular, there was a lack of recent iftos skeletal parts, while from the Kerabau I only had a sub-recent skeleton of a weak buffalo cow with its still very young calf.

Under the vertebrae, large thoracic vertebrae are characterized by a strong, almost massive formation of the transverse processes. A great, well-preserved Epistropheus differs vividly from others, so it may be described in more detail.

In Pl. XX, Fig. 12 and 13 I give illustrations of both forms of training. The thicker and heavier of the two is present several times. Its spinous process begins in front with a high, rounded, broad edge that slopes over the opening of the tooth process. The spinous process then bends gently convexly upward and widens into a powerful bumpy plate. In front of the rear edge of the vertebra, it slopes steeply backwards and is divided on the vertical rear by a sharp and high median edge. The postzygapophyses discharge far back, as does the mighty thick and wide, straight transverse process. The anterior joint also wraps around the underside of the spoon-like dens, but is lower on the underside than on the right and left and flattened on the lower edge. The hollowed back of the vertebral body is wider than it is high, its lower edge protrudes only slightly backwards. The differences between the second Epistropheus, of which only one copy is available, are striking. The spinous process begins with a raised, thick tip and rises rather steeply upwards with a concave curve, higher than the previous one. He's upstairs with a fat one

Buttons, not provided with a plate. This button extends to the back of the whole 17 \*

,

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H. Stremme,

Vertebra, then the spinous process falls steeply, but sloping slightly forward. The postzygapophyses are much shorter than in the previous one and a little more curved, the transverse processes also shorter and weaker. The deeply hollowed back of the vertebral body is higher than it is wide and its lower edge is strongly and spur-like extended backwards. The anterior articular surface stretches evenly around the three sides of the spoon-like opened dens; the lower edge is not cut straight off as in the previous one, but rounded. This Epistropheus is taller and slimmer than the very massive and broad one described above. Despite these big differences, both are stirringFig. 7.

Atlas vortex of two different bovids.

A 0/3 nat. Gr.) Of Huffelus palaeokerabau; D ('/ a nat. Gr.) Probably from Bibos.

Vortex from Bovids. For Stegodon and E / ephas they are u. a. relatively too long; those of Rhinoceros and Hippopotamus are much broader and less high, and their anterior joint is not extended to the lower surface, the dens. Both vertebrae are close to that of Bos without being identical with him. The spinous process of Bos has the sharp leading edge of the second, but rises less steeply and high than this one. The postzygapohyses load backwards similarly to those of the first. The transverse processes are weaker than in the first, but also differ from those of the second in that they are more strongly bent inwards at the back. The back of the vertebral body is relatively somewhat wider than in the second, but the spur-like elongated lower edge is similar. The anterior articular surface, on the other hand, is again similar to that of the first. The one described in the first place seems so

by Pomel1

Buffalo.

Figure of Biboswivbeln has become known.

)

same pictured of Buffelus antiquus. I then speak it as that of whether but the second belongs to Bibos, I am unable to decide, as neither do I

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Ten atlas vertebrae are available in various sizes, the larger ones (Fig. 7 A) characterized by strong, rearwardly elongated wings, as I did not find in a few smaller ones (Fig. 7 B) and a specimen of the Bos taurus. But I tried in vain to determine constant differences between these forms of training by taking measurements. The vertebrae, which correspond to Bos, one of which is well directed at the occiput of the Bibos-damaged victim to be described later, probably belong to this genus, the first cervical vertebrae according to Bütimeyer2

to match. The long-winged one agrees with that described by Pomel (op.

Extremities.

Limb parts are present in large numbers, but mostly badly shattered. I believe I have found some differences among the Badia, which may correspond to the differences between the genera or species. The proximal end of the joint of the Badius in Buffelus, as could be seen in the subrecent buffalo cow, is quite sharp and regularly indented front and back. The indentation is produced from behind by the ulna; the front is a little weaker. The difference in Bos is noteworthy: the large posterior indentation caused by the ulna is deeper in the latter and more extended towards the body axis, and the free axially located side of the Badius joint is therefore relatively shorter than in Bos.

Among the 15 Badius parts, two smaller ones differ from the others. One of them, # 706, is completely but badly eaten away by decomposed iron gravel. At this is the distal end

FROM

Fig. 8.

Proximal ends of two right bovid radii.

A from Buffelus palaeolierabati (No. 291); B perhaps from Bibos (No. 1742). l

connected to the shaft without any noticeable seam, so the animal was an adult. A longer and thicker Badius, whose shape belongs to Buffelus, turns out to be young compared to Buffelus, since the distal joint is not yet grown. The second, smaller Badius part, no. 1742, is extremely well preserved and shows a bone so well developed that it must have come from an adult animal. It is the proximal end (Fig. 8B) with the beautifully preserved joint, which is strikingly different from that of the Buffelus. First of all, its front lacks the indentation from the buffalo, it is

1) Geologique de l'Algörie. Pomel, Bubalns antiquus. 1893. Plate II, Fig. 5, 6. 2) Rütimeyer, Experiment on a natural history of the cattle, II, p. 87.

fe

na "t- Gr-

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with those of Bos 6)

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H. Stremme.

here, on the contrary, slightly bulging. From this protrusion towards the body axis, the edge of the joint is trimmed straight up to the center line of the joint and from here runs in an arch to the rear, which also lacks the strong indentation at the point of contact with the ulna. The part of the joint facing away from the body axis is characterized by a blunt tip located on the outside and directed outwards, while in Buffelus it is less sharply marked, located almost in the middle of this joint section and only slightly directed outwards. The following table also shows numerical differences between these two radii and those of the Buffelus, a ratio of width and depth that corresponds to that of the young Buffelus.No.

Buffela, r 291.

»R1195.

»R647.

»R105

»1 18291)

width depth

depth

. r 1092 r 1464

> 1749

»1382

»1 1625

10.43 5.41

1.96

1,657

»Young 1 1510

10.41 5.50 - 10.68 5.51 11.07 5.68

1.98

1.98

1.97 - 1.98

.

»1 7462). Bovide r 706. .

.

.

- 10.71 5.30 2.02

- 9.39 4.28 2.24

28.3 7.98 3.91 2.03 3.55

- 8.62 4.25 2.03

»R 1742

.

.

.

.

.

.

.

-

.

34.7 10.96

35.3 10.97

34.5 11.03

30.7 10.26

30.4 8.91 -

5.67 1.93 3.17 5.59 1.97 3.22 5.64 1.96 3.13 5.43 1.91 2.98 4.77 1.87 3.42

length

length

Pro: the end

Width width

- 10.55 5.45 1.96

-

-

11.06 5.68 ——

I cannot decide whether the smaller ones that differ from the buffalo radii belong to Bibos or another bovid because of the lack of comparative material.

FROM

Fig. 9.

The proximal melacarpus joints of two different bovids.

.1 (No. <I1) from Buffelus palucokei-abau, B (No. 1655) probably from Bibos. -'z nat. Size

Similar differences in size and training were found in other parts of the extremities. In three large proximal metacarpus joints, for example, the joint surface is

1) Weathered, with a soft surface.

2) Conspicuously poorly preserved, perhaps even younger than 1510.

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coarse, divided into two approximately equal parts, corresponding to those of the subrecent buffalo cow; in the small one, corresponding to those of Bos tauras and primigenius, into a larger outer and a smaller inner section. The following table shows the comparative figures.

No. and page

Buffehis 91 r. . . . 7181 .... 1741r ... recent Q r. "1. . . .

Bos primigenius. . .

outer

Bibos? 1655 r. »325 1

6.99 4.19 7.28 4.50 7.42 4.71 6.89 3.95 8.21 5.02

1.67 2.90 1.62 3.12 1.57 3.05 1.74 2.86 1.64 3.38

... Bos taurus 1583 1. .

.

Metacarpus.

ProKimales end

Part of the prox. Articular surface

width depth

width

Depth outer inner

8.11 4.54 1.79 3.92 8.25 4.71 1.75 3.75 8.19 4.69 1.74 3.86 5.82 3.38 1.72 2.37 5, 85 3.60 1.62 2.70

3.77 1.04 4.01 0.94 3.96 0.97 2.56 0.93 2.79 0.97 3.35 0.87 3.71 0.84 3.54 0.86 3. 63 0.79 4.08 0.83

Again, the lack of comparative material does not permit a decision.

Naming and relationship.

describes of bovids Leptobos Groeneveldtii n. sp., Leptobos dependicornus n. sp. (possibly

Dubois 1

licher way Q to previous), Bibos palaeosondaicus n. sp., Bibos protocavifrons n. sp. and Bubalus palaeokerabau n. sp. About the latter it says: 'I used to take the Kendeng buffalo to be Bubalus palaeindieus. The fossil Javanese species, however, has neither the elongated shape of the skull of the Narbada species nor the almost straight stretching and transverse direction and the almost square cross-section of their horned cones. The shape of the skull is as short as that of the living Javanese species, and the frontal surface of the horn cones is flat, with a sharp lower edge and a sharp upper edge; and in that they are also delimited by a very blunt edge, the cross section of the horn cone can become triangular almost semicircular. In the shape of the cone, the Kendeng buffalo is a little closer

)

the Siamese B. platyceros and differs from the living Kerabau species; Incidentally, the skulls of the two Javanese species are very similar; the living one probably derives from the fossil species, such as the name Bubalus palaeokerabau n. sp. should indicate. "

Having said this, there can be no doubt that the one I described above

Buffalo is identical to Dubois' Bubalus palaeokerabau. Since TROüEssart 2 is the older, the buffalo should be called Buffelus palaeokerabau Düb.

)

the name Buffelus

Buffelus palaeokerabau is undoubtedly very close to Kerabau, as I explained above. I have also stated above the differences between the two, which justify a new species name. Both of the Ami and Bubalus palaeindicus are distinguished by the steep slope of the rear skull, while the two mainland buffaloes have an outstretched, arched rear skull.

Bütimeyer 3

)

explained B. palaeindicus so closely related to the American, “that the justification of a

1) loc. Cit., P. 1261 ff.

2) Trouessart, Gatal. Mamm.

3) Rütimeyer, Tertiary Rinder und Antilopen, p. 141.

136 H. Stremme,

special name for the fossil form is likely to be questioned «. But Lydekker 1

numerous deviations of the fossil from the recent buffalo: larger size, different shape of the infracristal part of the occipital surface, narrower temporal fossae; Orbit, nasal bones, nasal cavity, last molar, the degree of inclination of the basicranial axis to the level of the palate, the posterior extension of the palatine bones are different. Even if all these differences are only small, in Lydekker's view they are completely sufficient to allow the two forms to be artificially distinguished. Lydekker considers B. palaeindicus to be the direct ancestor of the Ami. B. prdaeindicus occurs in the old diluvial deposits of the Narbada valley, but also (some smaller specimens) in the older, upper pliocene of the Siwaliks near Bubhor.Dubois is inclined to regard B. palaeoheräbau in a similar way as the progenitor of the Kerabau, and I believe I can agree with him on this.

The horned cones of Bubalus platyeeros Lydekker are indeed, as Dubois thinks, similar to those of B. paleieokerabau, not only in their cross-section, but also in their curvature and horizontal extension. However, in the absence of the necessary comparative material, I cannot determine whether this similarity is limited to the horn cones or whether it goes further.

)

describes another from Falconer's collection to be connected to the American

Rütimeyer 2

Buffalo as B. sivalensis. The shape comes from the Siwalian hills, so it is also older than B. palaeindicus. In her, the horn cones are not horizontal, as in the latter, and in the American they are usually downwards, but inclined upwards at an angle. The back of the head seems to be that of the Ami. Rütimeyer's and Lydekker's descriptions appeared at the same time, so that neither author could refer to the other. In the Catalog of Foss. Mamm. in the Brit. Mus. II, p. 29, Lydekker Rütimeyers combines B. sivalensis with his B. platyeeros. According to the descriptions and illustrations given by both authors, one would have thought the two forms to be different. The Bubalus occipitalis, acuticornis and antilopinus mentioned by Lydekker there are relatives of the dwarf buffalo, Anoa, and are now placed in the genus Anod. In any case, the genus Buffelus was already present in the Indian Upper Pliocene.

It is not necessary to go into more detail about the African ruffle with their short, strongly curved horn formation. The fossil Buffelus antiquus Pomel from North Africa resembles the American with its long horned cones and the elongated occiput and, like this one, differs in these points from the Javanese described here.

The discovery of the fossil B. palaeokeräbau makes Cuvier's view that the wild Kerabau of the Sunda Islands are not feral domestic buffalo, but rather form an original part of the island fauna, to be correct.

Bibos palaeosondaicus Dub.

(Panel XVIII, Fig. 7 and <S; Panel XIX, Fig. 7, 9-11; Panel XX. Fig. 10 and 11.)

While Dubois, besides Buffelus, describes Leptobos and Bibos as members of the Kendeng fauna, the Berlin collection contains, apart from the skeletal parts of bovid remains already described in the individual chapters of Buffelus, only a skull without a snout and several horn cones belonging to Bibos are to be asked. There is nothing that can be determined with certainty about Leptobos.

1) Lydekker, Ind. Tert. and Posttert. Vertebr., I, p. 138. 2) Rütimeyer, loc. a. 0., p. 139.

)

found right

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The moderately preserved upper part of the skull of the Bibos extends to the upper level of the eyebrows; the upper half of the right horn core is missing.

The mighty forehead is slightly curved in the middle and protruding on the sides. In relation to the frontal bones, the parietal bones are much shorter than z. B. the American buffalo and the Kerabau. Similar to the latter, they are curved downwards, but the interparietal is adorned with a strong median knot that extends forward to the forehead and forms the upper crest of the occiput to the rear. The strong horn cones, the base of which sits shoulder-like on the forehead,

rejuvenate fairly quickly and evenly. They are slightly bent backwards and curved upwards and are in no part in the same plane as the forehead. Their cross-section is oval, the broad front is somewhat flattened. Its base is provided with strong tubercles that reach down to the forehead, but are not connected from both sides.

The occiput is especially curved inwards at the top and provided with sharp ridges; the condyles bulging. The underside of the skull is poorly preserved. - The other horn kernels are z. Sometimes thicker than those sitting on the skull.

Bison, to which genus Martin initially put the fossil Bibos horn kernels from Java, is characterized by a broader forehead, which is bulging in the middle and sloping slightly towards the sides to the horn cones, which are initially in a plane with the forehead. Further up, the horn cones bend forward. Bison also has a knot between the horn cones, but this is wider and lower than that of Bibos.

This sparse Bibos-Ma.tena \, to which the lower jaw, already described in Buffelus, is added, does not permit an in-depth comparison with the more recent B ^ os forms, especially since the main part, the part of the skull, is quite poorly preserved. What you see of it approaches the corresponding parts of the Banteng, Bibos sondaicus, while the mainland Gaur differs by a high bulge between the horned cones.above

I was able to sell several skulls of tame Bantengs from the Zoological Museum

use the same. The Banteng is what Müller and Schlegel 1 already point out and how also from)

Bütimeyer2 is highlighted, extremely variable in the skull structure. First are the gender)

differences significant; Of the differences that can be used here, mention should be made of the formation of the horn cones, which in the adult female are thinner and smaller, directed strongly backwards, less curved, but with the tips inward. Compared to this, the skull of the fossil Banteng belongs to a bull, and since no seam can be seen any more and the tuberculosis is severe, an old one. But the differences in males are also considerable. Sometimes the parietal bone is missing, sometimes the horn cones are almost straight and obliquely directed upwards and backwards, sometimes they are strongly curved. The Banteng skulls of the Zoological Museum differ by name from the fossils by their wider and lower rear skull. Bütimeyer's illustration also shows considerable

1) Müller and Schlegel, Verhandelingen over de Naturlijke Geschiedenis der Nederlandsche overzeesche Besitt, 1839-1844, p. 197

2) Rütimeyer, attempt at a natural history of the cattle, II, p. 77.

Selenka-Trinil expedition. 18th

Cross section through a left horn core of Bibos palaeosondaicus Ddb. '/ •; nat- G> r-

back

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H. Stremme,

There are some differences: the rear skull is also wider and lower, the horns more curved, first downwards, then upwards.

In terms of dimensions, the following differences can be noted between the fossil and recent skulls nos. 98, 99, 100, 8026 and 8027. Nos. 98-100 come from Borneo; No. 8026 belonged to a full-grown Banteng from the Berlin Zoological Garden, the vertex knot was only faintly indicated, its strong horn core less curved, almost straight; No. 8027 cannot be determined from its origin.

1. Front width below the horn cone

2. Narrowest part of the parietal bones

3. Largest occipital width

4. Height of the upper occiput

5. Distance from the center of the forehead to the upper edge of the foramen magnum

No. 1031, foss. I.

22.2 9.5 20.5 11.4 20.5

No. 6020 No. S027 No. 98 No. 99 No. 100

18.7 19.15 19.0 19.6 19

The proportions are 1: 3 1.08 or 0.92 or 0.93 or 0.96 or 1.01 or 1 1: 2 2.36 »2.23» 1.95 »1.79 1.94 »2.04 1: 4 1.94» 2.08 »1.89» 2.25 »2.45 \* 2.48 3: 4 1.79» 2.26 »2.08» 2, 35 9 2.43> 2.48 4: 2 1.2 »1.07» 1.03 »0.79 0.79» ​​0.82 5: 2 2.16 »-» 1.94 »1.75 »1.84» 1.94

3 says that the back of the head is narrowest in relation to the forehead at

The proportion 1:

the fossil form. 1: 2, that the parietal bone narrowing is greatest in the fossil form, but also varies greatly in the more recent. 3: 4 that the supraoccipital is highest relative to the occipital width in the fossil Bibos. 1: 4, that with the latter the height of the supraoccipital in relation to the forehead width remains within the fluctuation limits of the recent Bibos. 5: 2, that the longitudinal diameter of the skull in relation to the parietal bones is greater in the fossil than in the recent Bibos. 4: 2, that the height of the occiput in relation to the parietal bone narrowing is more considerable in the fossil than in all modern ones. I.e. all proportions show the narrower and narrower back of the fossil bibos compared to the more recent.

I have already spoken in the corresponding chapters of Buffelus about the teeth, lower jaw, vertebrae and limb parts that are to be placed with Bibos with certainty or more or less likely.

Designation.

Leptobos-Arl to this Urbanteng. But it is very strange that there should be a form alongside these

I a. a. 0. p. 1262.

writes about Bibos: »Next to this Leptobos there are several forms of Bibos

Dunois 1

most of which, more or less closely, attach themselves to the living Banteng. I describe this as Bibos palaeosondaicus n. Sp. together. Others mediate the transition from ours

)

8.4 9.8 20.4 21.0 9.0 10.1 19.0

10.6 10.1 9.3 19.8 19.4 19.0

8.44 7.97 7.65

18.5 18.6 18.1,

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finds, which by its very high frontal bulge between the horns and the hollow frontal area is deceptively similar to the living Gaur: Bibos protocarifrons n. sp. Apparently we have before us the development of the i? \* Os forms from the Leptobos form, which is still somewhat reminiscent of antelopes, a development which the ingenious Rütimeyer had already suspected. One circumstance that is particularly striking here - and something similar must also strike us in other forms of the Kendeng fauna - is that the various stages of development occur at the same time and next to one another. This indicates more of a leap than of a gradual development. «The Bibos fovm described by me above is without doubt similar to that of Dubois as Bibos palaeosondaicus n. Sp. designated identically. With this renaming, Dubois followed the custom of giving fossil forms that are similar to the recent ones with a new name. In the same way, RüTiiMEYER xcalled a Bibos remnant from Narbada as Bibos pcdaeogaurus. He writes about it: “Under this title I mention a skull piece from the British Museum in Nerbudda, without any particular description. It consists only of the maxillary zone, but with excellently preserved dentition, of a skull that I would safely call Bibos gaurus if I did not consider the custom generally useful to designate fossils with a special name. Still, I don't

I would have given up a name if it had not been found in Falconer's manuscripts, admittedly without proof that it was dedicated to this fossil. The fossil also leads the Gaur up to at least some part of the postpliocene epoch. "

Bibos also occurs fossil on the Indian mainland, but in a form that

must be described as the more specialized compared to the Banteng. “In all respects the Gaur appears as an heir and successor to the Banting. He begins his morphological career within the range of forms of this species; but he leads her beyond measure

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according to Rütimeyer's explanations 2

)

that the male Banting reached. "

Lydekker mentions nothing of Bibos in his list of the fossil bovids of India 3

In contrast, he notes in the Catalog of Fossil Mamm. in the Brit. Mus. II, p. 23, with reference to Rütimeyer's description of the skull part: "The specimen is perhaps insufficient for specific determination," but retains the species name. The presence of Bibos in the Pleistocene of China has been established by Koken and Schlosser; since only teeth are known from there, they were made by Koken and Schlosser

as Bibos sp. designated.

One of the skulls in the Berlin Museum shows a feature that distinguishes it from those of the Bibos.

daicus seems to be consistently separated: it has a relatively narrower and higher rear skull, a peculiarity that seems to me suitable to allow it to be artificially separated from Bibos sondaicus. So it seems to me that Dubois' determination, if I may judge from this one skull, is not only justified according to the custom of the older palaeontologists, but can actually be justified by a characteristic difference. There is a difference, as it is in Buffelus palaeindicus in relation to the Ami and in Buffelus palaeokerabau in relation to the Kerabau

can be found

- unmistakable kinship. at all

1) Tertiary cattle, p. 154.

2) Rütimeyer, attempt at a natural history of the cattle, II, p. 95. 3) Lydekker, Ind. Tert. and posted. Vertebr., I, p. 92.

18 \*

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H. Stremme,

Primates.

Simiae.

Cercopithecidae,

Macacus sp. (Plate XVII, Figs. 9-11.)

A slightly chewed molar (No. 23) with a damaged crown and also not completely preserved root is a right third lower molar of a cercopithecid. It is a five-humped molar with a low anterior talon. The humps opposite in pairs are clearly yoked. The yokes are directed slightly backwards. The third hump is not arranged exactly in the middle, but moved slightly outwards. Between the two rows of yokes on the one hand, the second row of yokes and the last hump on the other hand, there is a plaster. The outside of the rather high crown is divided into three parts by two deep incisions, while the inside is smooth. The greatest width (0.65 cm) shows the front pair of cusps, the middle pair of cusps is 0.56 cm, the last cusp is 0.45 cm wide. The length of the tooth is 0.90 cm. The root is completely fused in its upper part, the lower part has broken off.

In addition to the five-humped molars of the monkeys, the tooth was also compared with those of the procyonids and viverrids. However similar it was by name to those of some paradoxes, especially Arctogalidia, relatively considerable differences could be determined from these in the formation or the lack of the cusps, the talon, the yokes, the roots, with the characteristics of the last Lower molars of cercopithecids matched.

As for the Cercopithecids still present on Java today, the third lower molar differs from Semnopithecus in that the indentations between the cusps extend deeper on its inside and thus cut the crown more strongly. The yokes are also straightened and the last hump is more in the middle. The corresponding molar of Trachypithecus maurus also lacks the anterior talon and the plaster. Lophopithecus mitratus has a little plaster, but no talon. In the East Indian Semnopithecus leucoprymnus is theTalon similar to the fossil, but with fewer plasters. Semnopithecus schistaecus from

Kashmir and Semnopithecus enteüus are according to Lydekkers 1

Position of the yokes and the last hump. Of the fossil Semnopithecus avten, Semnopithecus palae-inclicus ^) of the Siwalik hills is larger, the rear hump is more in the middle. At Semnopithecus

pentelici from Pikermi, the yokes are more strongly developed.

Of the Maeacus species, M3 from Nemestriuus nemestrinus has a small side hump

laterally on the inside in front of the last hump: also the fossil deviation from this form, the

1) Lydekker, Indian Tertiary and Posttertiary Vertebrata IV, S.o.

2) Deninker, About a monkey jaw from the Kendeng layers of Java. Centralbl. Min., 1910, pp. 1-3. According to the supplement volume by Trouessart, Catal. Mamm., P. 17, the species described by Deninger would not do Inuus [Iimuus), but Nemestrinus nemestrinus L. ». saradana Den. to be called.

as courage. describes saradana from the Kcndeng layers of Saradan on Java, shows this

Deninoer 2

Side humps. In Deninger's table, however, Joei's three recent nemestrines of the side humps are listed as missing. In no case did I miss it in the Berlin copies. Also C> / no-

)

)

Pictures different by the straight

1

Foss. Maeacus sp. No. 23

0.56 0.45

1.42: 1.23: 0.90 1.33: 1.19: 1 0.83 1.32: 1.13: 0.87 1.45: 1.34: 0.80 1.50: 1 , 42: 0.91 1.50: 1.31: 0.80 1.71: 1.43: 1 0.78

Zati cynomolgus »»

»» »» »»

>

»

Q Sumatra Q Sumatra Q Sumatra (5 Sumatra Q Borneo. Q Borneo. Q Borneo. (5 Borneo. (3 Borneo.

1.39: 1.62: 1.69:

1.16: 0.82 1.42: 0.93 1.48: 0.81

Nemestrinus nemestrinus <3 Borneo »(3 Borneo

1.26: 1.12: 1 0.98 1.56: 1.37: 1.06 1.63: 1.40: 1 1.18

Carnivora;

n. sp.

»-

(5 Sumatra

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pithecns maurus from Celebes has a small inner hump. In contrast, M3 of the second Java macaque, Cynomolgus fascicularis, is much closer to the fossil one. The small side hump is not present here, the talon never seems to be missing. The yoke and plaster formation are the same. In the table below I have compared the widths of the fossil tooth with those of some cynomolgus from Sumatra and Borneo. Javanese material was not available to me. The recent specimens are usually a bit smaller and narrower. There are considerable deviations among the ratios, but in no case is the same ratio found as in the fossil one. As far as I could examine the molars of Cynomolgus, their roots were not as deeply fused as the fossil ones. In the five-humped lower molars of Hylobates, which are broader and rounder in themselves, I saw a similarly deep intergrowth of the root.

.

.. 0.65

0.56 0.50 0.42

Front middle rear row of humps humps row humps

0.58 0.50 0.43 0.52 0.48 0.36 0.60 0.57 0.40 0.56 0.49 0.38

.0.60 0.50 0.35 0.56 0.50 0.43 0.65 0.57 0.40 0.56 0.49 0.33

0.63 0.56 0.50 0.80 0.70 0.51 0.85 0.73 0.52

Ratios

overall length

The fossil Maeacus sivalensis is only known from pieces of the upper jaw. So if the similarity of the fossil Javanese tooth with the corresponding one of Cynomolgus fascicularis is considerable, it is still relatively broader than this and has an overgrown root, and is therefore in any case not identical with it. In view of the all too small remnant, I refrain from naming the species.

Overview of the fossil mammal fauna of the Kendeng strata.

Dubois collection.

Rodentia: Hystrix sp. 1

JSdentata: Manis palaeojavanica Dub.

Berlin and Munich collection. Hystrix sp.

)

Felis oxygnatha Dub. Felis trinilensis Dub. Felis microgale Dub. Hyaena bathygnatha Dub. Lutra palaeoleptonyx Dub.

-

Mececyon trinilensis n.g.

-

1) Hystrix and Maeacus or Semnopithecus are mentioned in earlier work by Dubois.

Feliopsis palaeojavanica n.g. n. sp.

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Ungulata: Stcgodon Ganesa var. Javanicus Dub.

Elephas hysudrindicus Dub. Rhinoceros sivasondaicus Dub. Rhinoceros kendengindicus Dub. Tapirus pandanicus Dub.

Sus brachygnathus Dub.

Sus macrognathus Dub.

Hippopotamus (Hexaprotodou) sirajara-

nicns dub. Cervulus sp.

Cervus (Axis) liriocerus Dub.

Cervus (Rusa) kendengensis Dub. Cervus [Rusa) palaeomendjangan Dub. Tetraccros Kroesenii Dub.

Leptobos Oroeneveldtii Dub. Leplobos depcndicornis Dub. Ift & os palaeosondaicus Dub. Bibos protocavifrons Dub. Bubalus palaeokerabau Dub.Primates: Macacus or SetnnopitJtccusJ;

Pithecanthropus erectus Dub.

Stegodon Airawana Mabt.

[Stegodon cf. trigonocephalus Mart.] [Elephas sp. similar to antiquus Falc] Rhinoceros sivasondaicus Dub.

ä <s brachygnathus Dub. iSfos macrognathus Dub. Hippopotamus sp.

Cervulus kendengensis n. Sp. Cervus [Axis) Li / dekkeri Mart. [Cenm sp.]

Duboisia Kroesenii Dub. n. g.

Z? / & O.s palaeosondaicus Dub.

Buffelus palaeokerabau Dub.

Macacus sp.

[Macacus [Nemestrinus) nemestrinus L.

courage. saradana Den. 1

General considerations about the mammalian fauna of Trinil, their age and how the bone bed was formed.

A comparative compilation of the mammals described by Dubois with those described by me, which latter I still have the Macacus nemestrinus mut described by Deninger. saradana shows the greater richness of the Dubois collection compared to the Berlin and Munich collections. Dubois identified no less than 19 genera with 27 species, while Dr. Janensch and I could only describe 14 genera with 17 species, including the species of Dkninger. Dubois has more genera: Monis, Hgaeua, Lutra, Tapirus, Leptobos (two species), Pithecanthropus; less: Mececyon, Feliopsis. More species: in addition to the aforementioned three species of Felis, a second species of Rhinoceros, a third species of Cervus and a second species of Bibos; less: the second type of stegodon that Dr. Janensch has determined.

As for the ratio of the fossil fauna I have listed to the recent Javanese, the remains of Hgstrix, Sus macrognathus, Cervus sp. and Macacus too insignificant to compare. Of the others, Mecccgou trinilensis is not known as a recent form from Java or anywhere else; Feliopsis palaeojavanica of tiger size differs from the recent Javanese, Indian and Siberian tigers and cannot be identified with any known genus of Felidae. According to the genus, Stegodon became extinct, Elephas of Java disappeared. The rhinoceros differs in dentition from Rhinoceros sondaicus and tends to Rhinoceros sivalensis, but is with

1, Hystrix and Macacus or Semnopitliccua are mentioned in earlier work by Dubois

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Closely related to Rhinocerossondaicuss. Susbrachygnathus still belongs to the Java-living Verrucosus group, but is not identical to any of the living species of this group. Hippopotamus is extinct as a genus in India; It could not be decided whether it was a hexaprotodon or a tetraprotodon. Cervidus kendengensis moves away in the antlers of Cervidus muntjac in the direction of ancient forms. According to the subgenus, Cervus (Axis) Lydekkeri has disappeared from the Sunda Archipelago, relatives still live on the Indian mainland. An antelope no longer lives on Java today, the fossil Duboisia is most closely related to Boselaphus, but also deviates considerably from it and occupies a special position. Bibos palaeosondaicus is closely related to the Banteng, but not identical. Buffelus palaeokerabau also differs from the recent Kerabau,

is to him as Buffelus palaeindicus is to Arni, d. H. probably was his ancestor.

Thus we see here a fauna which differs considerably from the present day and which does not contain any species in common with it; not one of the easily identifiable species is identical to one of today. Of these, Rhinoceros, Bibos and Buffelus still have close relatives in today's fauna, probably direct descendants. Cervidus kendengensis and Sus brachygnathus could also have been the ancestors of the living. The rest of the types that are characteristic of the Kendeng fauna are extinct on Java, as a family even the three proto-

boscidier, hippopotamus and the antelope.

If we now go through these forms in relation to the fossil forms, it was to Mececyon

and Feliopsis no closer fossil relatives can be found. Stegodon Airawana Mart. is closest related to Janensch with Stegodon ganesa and Stegodon insignis, which occur in the Indian Pliocene and Pleistocene. [Stegodon cf. trigonocephalus and Elephas cf. antiquus are both not from Trinil and only represented by a shattered molar each. According to Janensch, Stegodon trigonocephalus is also related to Stegodoninsignisundganesa. According to Janensch, the elephant tooth shows more oxodonts than Elephas indicus and is more reminiscent of Elephas antiquus. (The representative of E. antiquus in India, according to Leith Adams, Elephas namadicus Falc from the Altpleistocän of the Narbadatal, is expressly described by Janensch as different.) Rhinoceros sivasondaicus is close to Rhinoceros sivalenis. Sus hysudricus from the Indian Pliocene and Sus hyotherioides from the Chinese Pliocene seem to be related to Sus brachygnathus. The remains of hippopotamus are too small to be able to decide whether it is Dubois' hexaprotodon or tetraprototon. Hippopotamus palaeindicus from the Pleistocene of the Narbadatal is similar in the folding of the enamel of the molars. The pliocene Hexaprotodon species of India are in this respect more similar to the recent African Tetraprotodon. Cervidus kendengensis moves away from the miocene Dicroceros and the miocene and pliocene Cervidus in the direction of Cervulus muntjac. The Axis-Kivsch belongs to an ancient group that is already known from the Pliocene of India and Europe. In China, Axis with Cervus leptodus Koken is first mentioned from the Pleistocene. The antelope Duboisia is close to Boselaphus, a form that already occurs in the Indian Pliocene. Bibos is first mentioned in India and China from Pleistocene camps; the fossil Bibos and Buffelus relate to Banteng and Kerabau as Buffelus palaeindicus from the Pliocene and Pleistocene of India relate to the Arni.As for the others only according to their genus according to certain forms, Macacus and Hystrix are already present in the Pliocene of Siwalik. About the remains of Cervus sp. no determination of affiliation can be made. In the following, I repeat my attempt to put the individual forms together with their relatives in a similar way that Schlosser used so exemplary in his work on the fossil mammals of China. (Of the abbreviations mean: Kam. = Karnul caves, Nb. = Narbadatal, Siw. = Siwalik.

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Trinil

Hystrix sp.

Mecreyon trinilensis n.g. n. sp. Fcliopsispa'aeojavanica n.g. n. sp. Stegodon Airawana Mart.

Rhinoceros sivasondaicus Dub. Sus brachggnafhus Dub.

Sus macrognathus Dub. Hippopotamus sp.

Gerrulus kendengensis n. Sp. Cervus (Axis) Lydekkeri Mart.

Duboisia Kroesenii Dub. Bibos palaeosondaicus Dub. Bitffeins palaeokerabau Dub.

Macacus sp.

In addition, from other found

Pliocene

Related species Pleistocene

Now on Jaya

Hystrix Java +

+ +

Rhinoceros sondaicus Java Verrucosus group

5

+

Cervulus muntjac Z. +

+ Zftios sondaicus Java

Buffelus sondaicus Java

? Macacus cynomolgus Java

+ +?

Siw.

Elephas similar to antiquus Falc. • Elephas hysudricus Falc.

Cervus sp. V

Nb.

Elephas antiquus Europa Elephas hysudricus Nb.

?

Hystrix Siw.

Hystrix came. —— ——

Stegodon ganesa and insignis Stegodon ganesa and insignis'

Siw.

Rhinoceros sivalcnsis Siw. iSms hysudricus Lyd. Siw. & <s hyofhrriodes Schl. China

? ?

Nb.

Dicrocerus Miocene Europe

Cervus (Axis) simplicidens Lyd. Cervus axis Erxl. Came.

Siw. Boselaphus sp. Siw.

-

? Buffelus platyceros Lyd. Siw.

»

Boselaphus uamadicusB-VT.l ^ b. Bibos sp. China;? Nb. Buffelus palaeindicus Nb.

-

palaeindicus Siw. ——

locations:

Stegodon cf. trigonocephalus Mart. Stegodon ganesa and insignis Stegodon ganesa and insignis

The fauna of Trinil, as it appears after Prof. Selenka's excavations, is in any case one that contains a considerable number of extinct forms. But I can no more find a compelling reason for ascribing a Pleasant age to her, any more than one which absolutely required the Old Pleistocene Age. Important key fossils are the stegodonts, which are related to Stegodon insignis. According to Schlosser, Stegodon insignis is characteristic of the Upper Plioean fauna as However, Stegodon insignia also occurs in the Narbacla fauna of the Altpleistocorn. An important key fossil would possibly be Elephas, whose tooth fragment Janensch places as close as possible to the elephas antiquus. The piece is not from Trinil; neither does Duboish have any elephas- ses from Trinil in his large collection. Dubois himself is not inclined to think of the differences in the age of the sites in this peculiar absence; Dubois named the elephant as Elephas hymdrmdims n. Sp. designates and places it by name, after comparing the skulls, close to Elephas hysudrieus from the Siwalik layers of the Pendschab and the sub-Himalayan mountains and from the Altpleistocän of the Narbadatal. With regard to the number of yokes, this is closer to E. antiquus than to recent E. indicus. Lydekker places F .. hysudricus according to its yoke shape] between E. mnaidriensis and E. antiquus. However, it was precisely the small number of yokes on the Javanese tooth fragment that prompted Janensch to bring it closer to E.aniiqwus. Janensch fails to identify the species because of the lack of material. E. nan / adicits: is expressly excluded; its molars »differ due to the lack of clearly loxodontic enamel shape and due to the

greater wrinkling of the enamel ". Unfortunately uichl compared with E. hysudricus aal Janensch.

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-

?

? Hippopotamus palaeindicus

Nb.

Cervulus muntjac Z. Kam.

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Taken as a whole, the Narbada fauna, which is considered to be Altpleistocän, has a certain similarity

with that of Trinil. Locksmith 1 position.

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gives a summary in his work on the mammals of China

Ursus namadicus Falc.

Mus sp.

Euelephas namadicus Falc. Euelephas hysudricus Falc. Loxodon planifrons Falc. Stegodon insignis Falc. Stegodon ganesa Falc. # Equus namadicus Falc. Hippopotamus namadicus Falc.

Hippopotamus palaeindicus Falc. Sus sp.

Cervus sp. Aristotelis Cuv. Boselaphus namadicus Rüt. : ti: Bos namadicus Falc.

Leptobos Fraxeri Rüt.

? Bibos palaeogaurus Rüt. Buffelus palaeindicus Falc. : {+ifr.

Under 16 (or 17) forms there are at least the five with 4 £ that have close relatives in the Trinil fauna. These five in particular all appear in Pliocene! Likewise Hippopo tamus.

The Pleistocene fauna of the Karnul Caves, which mainly contains recent Indian forms, switches off for a comparison. It lacks the stegodon and hippopotamus. Likewise the older Pleistocene fauna of China.

The European Oberpliocänfaunen of Auvergne, Roussillon, Montpellier and Val d'Arno contain, according to Schlosser's compilation: Cynopithecines, Canis, Vidpes, ürsus, Machairodus, Felis, Viverra, Mustela, Hyaena, Hystrix, Castor, Lepus, Mastodon, Elephas, Hipparion, Equus, Tapirus, Rhino- ceros, Hippopotamus, Sus, Bos, Leptobos, Gazella, Palaeoryx, Palaeoreas, Cervids of the genera Elaphus,

Capreolus, Axis, Polycladus. Rovids, antelopes, axis, hippopotamus are also represented here. The rest of the composition of the European Upper Pliocene fauna is also very close to the Kendeng fauna.

The Unterpliocänen Hipparion-F'atmen from the Siwalik, China, Maragha, Pikermi are through Hipparion, Dinotherium, Mastodon, Aceratherium, Machairodus, especially the Indian still through Anthracotherium and relatives, Sivatherium and relatives and the like. a. excellent, i.e. forms that are alien to the Kendeng fauna.

According to these comparisons it cannot be denied that there is a certain probability

speaks for the Upper Pliocene age of the Kendeng fauna 2

There are no steppe forms in the Trinil fauna. It is considered a fauna of all its types

forest and z. T. water-loving animals characterized. Of water-loving animals, the deer, rovids, proboscidians, the hippopotamus, the pigs and the rhinoceros should be mentioned by name. I also counted the deer here. Even in our temperate climate, the deer are said to show a great fondness for water, especially for wallowing puddles, as I was assured by hunters. With the deer of the tropics this is even more the case. One should find the dropping poles of the deer particularly often in such Suhlstätten. Perhaps in this consideration we have a possibility of preventing the mass accumulation of bone fragments in the main bone

1) locksmith, a. a. 0. p. 195.

2) I have dealt with the age question in more detail in an excerpt from this work: The mammalian fauna of the Pithecanthropus layers (Centralbl. Min. 1910).

Selenka-Trinil expedition. 19th

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layer to explain. The deer bones are also common here, and among these primarily the rods.

There are a total of 527 poles and broken poles where the rose is still present. Of these, 230 have been dropped, 179 left and 51 right. Of the 297 not discarded, 164 left and 133 right. The vast majority of these rods are found in the main bone layer. Of 425 numbered, 400 are from this one and only 25 from all the others combined.

Most of the ejection rods are in good condition, they show fewer old breaks, i.e. breaks that did not arise after embedding, than those that were not discarded. Traces of transport and unwinding can be seen on them as little as on the great majority of all bones. Privy Councilor Branca 1 already pointed out this lack of unwinding phenomena, as well as the lack of entire skeletons

which is supposed to be alluvial, could have brought together such an abundance of well-preserved dropping poles, is inexplicable to me.

It seems even more inexplicable to me that just such an extraordinarily large number of sticks, including those that have not been thrown off, are said to have been washed up by the mud flow

After the poles not thrown off

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attentive. That a stream of mud flowing to Volz, Elbert u. a. the cause

while other remains of them are much more sparse 2

Judging by the fact that there are remains of at least 164 males, while after the extremities and vertebrae at most 12 can be counted. Also a maximum of 12 females are to be counted according to the skeletal parts. Relatively more numerous than extremities are the males' skulls, which are completely absent from the female. It doesn't make sense to me that a stream of mud could separate so strangely. An explanation for this striking predominance of the antlers is possible. Antlers and horns are those parts of the ungulates that are spurned by predators of all kinds and are not eaten with them. It is therefore natural to look for the remains of predator meals in the rods that have not been discarded, which are often marked by old cracks. Predatory remains are present in Mececyon, Feliopsis, and the crocodiles. The remains of the latter, especially individual teeth, are much more common than those of the former. The presence of crocodiles also explains the accumulation of bones in a water deposit rather than just felids and canids. The latter do not tend to drag their prey to the water. This conception of the accumulation of bones in the main bone layer as a residue of predatory meals, especially crocodiles, also explains that almost all bones are shattered and show sharp fracture surfaces with no trace of unwinding. You are from the robberyanimals have been smashed. That predators have bitten into the bones seems to me to be evident from two holes on either side of a buffalo metatarsus. Both are old because of the trinilian sand that penetrated them. They are almost exactly opposite one another; one has penetrated deep, the other has only caused a weak shattering.

Other observations are likely to attribute the accumulation of bone in the main bone layer to the same cause. During the preparation of the antelope skull, I saw that it was not only filled with the volcanic ash material. In one of the eye sockets there were small lime pebbles at the bottom. T. were cemented to the bone with lime. Other cranial openings

1) Branca, preliminary report on the results of the Trinil expedition of the Acad. Jubilee Foundation. Meetings d. Kgl. Prussia. Akad. D. Wissensch., 1908, p. 270.

2) It has been assured me in the most definite manner by Professor Selenka. that almost no part of the collection that was carried out under their direction has not been brought to Berlin. Without this insurance, of course, my above statistics would be worthless.

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has in its last publication a similar view of the deposition of the main

1) Dubois, op. a. 0. p. 1241.

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were covered with yellow riverine, over which a solid layer of ash was spread. Lime pebbles and river clay are also found frequently in other hollow bones of Trinil. Lime gravel and river clay are deposits of slowly flowing water.

The state of preservation of the deer antlers as well as the other bones is strikingly different. Some are well preserved, brittle, but still show the finest tuberculosis without any damage. On others again nothing can be seen of tubercles; they have turned yellow and crumbly. The sulfuric acid formed during the weathering of iron gravel cannot always have caused this attrition. Often the crumbly bones are still covered by the same undecomposed ash sand that is stuck to the well-preserved ones. It is possible that the crumbly bones, before they were embedded in sediment, lay longer in the water than the well-preserved ones, which must have been poorly flowing because no sapropel was formed. At least the test for organic matter was in vain. In running water, bones are permanently destroyed if they are not protected by sediment cover.

Some of the ejector bars are provided with sharp fragments of the cane that are still attached to the evil one. The director of the Berlin Zoological Garden, Prof. Dr. Heck, agreed with me, interpreted these as poles that, not yet completely ready to be thrown, were forcibly separated from the bosom. This separation can be done when sweeping trees or wallowing, which is what all deer, especially the tropical ones, tend to do. As an avid hunter, Dr. Perch from the Kgl. Geological State Institute announced that deer dropping poles are also often found in the Suhl places in Germany.

All these observations can be combined into the following picture. Too weakly flowing water with little sedimentation, whose material z. Some of them consisted of volcanic ash, the forest animals came to drink and wallow. Crocodiles and possibly other robbers seized some of the animals and left z. B. only a few bones left of the deer apart from the antlers. Naturally, this view can only apply to the main bone layer.

Dubois 1

Bone layer said: »From the nature of the deposit it is quite natural that the animals perished in volcanic eruptions, of a similar kind, but probably even more powerful, as they often took place in Java in historical times. The eruptions, to which we owe the fossil bones indirectly, will have been repeated at times, even if they all belonged to the same geological period. ' In the richest places of discovery, as in Trinil, Kedungbrubus, and Bangle, most of the bones are found in a layer of lapillus, which rests on a gray-black, calcareous and, when dry, very crumbly claystone containing freshwater mollusks (mainly melanias and unions). Such a layer of clay, which must have been deposited in very calmly flowing water, reached a thickness of about 35 m at Kedungbrubus, while I found it only an average of 1 m thick at Trinil. The lapillic layer marks the beginning of a volcanic eruption, and it is precisely in those quiet places (where under normal circumstances the clay sank) that the animal corpses had to be washed up. This is how the “main bone layer” was formed at Trinil. When volcanic activity subsides or after most animals havehad come, the animal remains in the tuffs had to become rarer. This explains the relative poverty of the upper classes in Trinil. The animal corpses fell apart in those quiet places through putrefaction, but much more had to be torn into pieces by

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the crocodiles who graze on living and dead animals in abundance at just such places. The bones were separated from each other and broken many times. By throwing it back and forth and hitting the prey against the ground, these terrible building animals try to partially crush it and tear it to pieces with the help of their forefeet. Human-sized animals can then be devoured with bones. It is well known that the force with which crocodiles can bite is also very great. As has been found experimentally, this can be almost 13 times the body weight of the crocodile, i.e. thousands of kilograms. Such a force is sufficient to cause the broken bones that we perceive at Trinil and other localities. In some cases I found impressions of the teeth of these beptiles in less compact pieces of bone. By the way, crocodile teeth are one of the most common Trinilian fossils.

The fact that hundreds of antlers of one and the same deer species [Gervus liriocerus) were found at Trinil can be explained simply by the fact that whole buds of this J..xis-like deer perished at the same time and were washed up in that quiet spot. It was precisely the horns, which were not clad with meat, that the crocodiles mostly left untouched, the other bones were almost always broken, just as they are actually found.

Special attention should be paid to one circumstance here, namely that some horns that have been dropped are also found. This can be explained by the fact that those quiet river spots were also used as watering places. Such discarded deer horns are also common in European clay deposits. "

I came to the above-mentioned view of the deposition of the main bone layer independently of Dubois and before the publication of his last work. Mine also differs from Dubois on important points, namely the way in which the evidence is presented is different. In any case, I believe that in trying to draw conclusions about their deposition from the distribution of the bones one must arrive at a view similar to that expressed by Dubois and myself.

Table explanations.

Plate XVI.

Fig. 1. Left mandibular branch of Meceeyon frinilaisis n. G. n. sp. Outside. »2.» " " " " """" View from above. »3. Right upper jaw of Feliopsis palaeojavaniea n. G. n. sp. Outside.

4.> »» »» »\*» »View from below.

5. Right upper second molar of Hystrix sp. Enlarged 2 times.

6. Right first maxillary molar of Ilippopoiamus sp.

»7.» second »» »»

8. Left front and upper jaw of Sus braehygnathus Dub. Adult male. Side view.

»>» >> »

• 10. The two posterior deciduous molars and the first true molar of Sus braehygnathus Dub.

- 11. Maxillary canine of Sus braehygnathus Dub. Young male.

»12. Left lower jaw piece with the two posterior molars of Sus macrognathus Dub. From above.

9.

»» »» View from below.

»13.» »» »» »

»» »

»»

Inside.

The originals for Figs. 1-7, 10 and 11 are in the Geological-Palaeontological Institute in Berlin, those for Figs. 8, 9, 12 and 13 in the Munich Institute. All figures except Fig. 5 in natural greetings.

4th

»

»» »

nat. Size »» »» Bibos palaeosondaicus Düb. V2 natural size

" " " " " " " From above. • /;> nat.Gr.

Third premolar, first and second molar of a bovid, presumably from Bibos palacosondaieus Dub. Nat. Size

»

4. (J lower tooth of & <s brachygnathus Dub. Inner side.

5. »» »•» »Front.

6. Skull fragment (left eye socket and cheek) from Sus brachygnathus Dub. Young male. 7. Upper jaw belonging to this skull. From underneath.

8th.

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Plate XVII.

Fig. 1. Skull of Feliopsis palaeojavanica n. G. n. sp. From above.

»2. Right lower jaw branch of an adult female of Sus brachygnathus Dub. From above.

»3.>»> »» \* »,,

Outside.

Left first upper premolar (No. 97) of Rhinoceros sirasondaicus Düb. Occlusal surface.

Right last mandibular molar (No. 23) of Macacus sp. Labial side. 3 times enlarged

»9.

»10. »»> »» »». “Lingual side. Enlarged 3 times »11.» »» »» »» »Occlusal surface. 3 times magn.»12.

»13.

> 14.

»15.

»

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Five upper jaw teeth from Duboisia Kroesenii Dub.

Three maxillary milk molars and the first true molar from Duboisia Kroesenii Düb. Five lower molars from Duboisia Kroesenii Dub.

Row of maxillary teeth from Cervus Lydekkeri Mart.

16. Row of lower teeth »» »

17. First piece of antler from a young Cervus Lydekkeri Mart. Philistine.

The originals for Figs. 1-3 and 6-17 are in the Berlin Institute, for Figs. 4 and 5 in the Munich Institute. All figures, except 9-11, in natural size.

Plate XVIII.

Fig. 1. Skull of Rhinoceros sivasondaicus Dub. Bottom. i 4 nat. Size »2.» »•» »» Left side.

»3. Skull of Cervus Lydekkeri Mart. From above. Downsized.

»4. »>>» »Left side.

»5 and 6 lower jaws of Buffelus palaeokerabau Dub. at different ages. 1 / o nat. Size »7. Lower jaw of Bibos palacosondaieus Dub. V2 na-t- Gr.

»8. Last upper molar probably from Bibos palacosondaieus Düb. Nat. Size

The originals for Figs. 1-4 are kept in the Munich Institute, those for Figs. 5-7 in the Berlin Institute. Fig. 1— are made from photographs by W. Kronecker.

Plate XIX.

Fig. 1 and 2. Antlers from Cervus Lydekkeri Mart. 1 i nat. Size /

1 3. Skull of Duboisia Kroesenii Dub. From behind. 2 nat. Size /: i

> 4. \* »» »» »5.» »» »» 6. Astragalus of Hippopotamus sp.

> 7. Astragalus of a Bovid {Bibos?;.

From above. - /: y nat.Gr.

'From the left. 2

Nat. Size Nat. Size

j3

nat. Size

8. Right lower jaw branch (outside) of Buffelus palaeokerabau Düb. l 9.

10/11

All originals are in the Berlin Museum. Fig. 1-5 after photographs by W. Kronecker.

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H. Stremme, The Mammals Except for the Proboscidians.

Plate XX.

Fig. 1. Skull of Duhoisia Kroesmii Dub. Underside, nat. Size -fa

2. 3. 4. 5

Left antler rod vou Cervulus kmdengensis n. Sp. Nat. Size

Antlers (# 886) from Cerrus Lydekkeri Mart. Young specimen. '/ 3 na ^ Gr.

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»» »

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- 11.

»12 and 13.

»14th row of teeth of the left lower jaw from Buffelü's palacokerabau Dub. Nat. Size »15. > »Right»> Bibos palaeosondaicus Dub. Nat. Size

All originals are in the Berlin Museum. Figs. 1. 3–5 and 7–11 are made from photographs by E. Kronecker.

Left antler pole from Crrvus Lydekkeri Mart. with an eyebrow bent over. i

Right antler pole from Crrvus Lydekkeri Mart. with a small second pole on the same rose bush. 1/4 na \* - Gr.

Incisor? See appendix on hippopotamus. Nat. Size

Skull of Buffelüs palaenkerabau Dub. From underneath. l / - nat. Size

" " " " From above. \* / "n & t- Gr.

6th

7th

8. »9.»

From behind. \* / 7 nat- Gr.

»>» »

10. Skull of Bi ^ os palaeosondaicus Dub. From behind. 1.4 nat. Size

,

/ i

nat. Size

The Proboscidier Skulls of the Trinü Expedition Collection of

Dr. W. Janensch ..

With plates XXI-XXV and 17 text illustrations. (Genus Stegodon.)

Introductory remarks.

In the following presentation of the stegodonts, the description of the dentition is accompanied in great detail by detailed measurements recorded in tables. I started from the consideration that the proboscidians cannot be proceeded thoroughly enough in the treatment of the teeth. The extremely high degree of specialization of the dentition was, as is often the case in similar cases in the animal kingdom, accompanied by a considerable breadth of individual variability. That one must be reckoned with is evident from the fact, which can often be ascertained, that in the same individual corresponding teeth show great differences on the right and left. Multiple examples of this can also be found in the following descriptions. It is well known that the delimitation of the individual species of the Proboscidier genera, which is mainly based on the dentition, is often associated with great difficulties and also gives the authors considerable leeway to the subjective judgment of the authors. Therefore, in the interest of the progress of the system, it seems absolutely desirable to give the description of the dentition so thoroughly and impartially that every reader can make as complete a judgment as possible about the range of variation and reliability of the species identification. As extensive as the present material is, it leaves many questions unanswered, some of which are important for identifying the species. It was therefore the endeavor to design the following presentation of the material from the Selenka expedition in such a way that it can also be used with benefit as factual material for any later investigations of other collections of Javanese stegodons.The investigation of the stegodonts, as well as the animals, was greatly encouraged and clarified by visiting the museums in Leiden and London. My most sincere thanks go to the Academic Jubilee Foundation of the City of Berlin, which granted me the means for a trip to Leiden and London. I also have my deepest thanks to Prof. Dr. Martin for the kind courtesy with which he gave me the valuable stegodontic material from the paleontological collection on Leiden for examination and me through

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multiple advice supported. I also owe my sincere thanks to Dr. A. Smith-Woodward and Dr. Bather, who kindly made the treasures of the British Museum available to me.

Skull.

The present material on stegodon skulls includes one adolescent and four fully or almost fully grown. The youthful skull No. 203 is the only well-preserved one and should therefore be placed in front of the others in the description. Of the four adults, the large one, marked no. 304, whose well-preserved dentition will be described below and to which the lower jaw no. 823 obviously belongs, has decayed to such an extent that it has to be eliminated for the representation. The other three large skulls have been poorly preserved in that the entire part of the face has always been lost, so that they are of little value for comparison. One of them (No. 225) is so badly suppressed that it is not worth describing him. In addition to these entire skulls, there are tooth-bearing fragments of a juvenile and a half-adult, the dentition of which is described below. A fragment (No. 256) will be discussed in particular because it forms a not unimportant addition to the youthful skull due to the complete preservation of the upper forehead contour.

•

a) Adolescent skull No. 203. (Plate XXI, Figs. 1 and 2.)

The preservation is generally good. The left tusk alveolus, the zygomic arches, the right condyle and the adjacent part of the right ear region are missing, while the left is crushed; Furthermore, parts of the apex to the right and left of the center and the edge where the forehead and apex meet have been lost.

The forehead is flat and very high. Its height, counted from the upper edge of the nostril, is 20 cm, as much as the smallest width, which is about half the height. It should also be taken into account that the median projection protruding from above into the nostril is not retained and is therefore not included in the amount of the forehead height. The forehead widens slowly and evenly from its narrowest point upwards.

The nostril is broadly kidney-shaped and relatively high. Its length is about 127 mm with an inner height of about 54 mm, whereby the median upper projection, which has not been preserved, is not taken into account.

The interalveolar groove is wide; since it has no sharp edges, certain and unambiguous dimensions cannot be given. It is remarkable that the right tusk attached to the skull, with a weak curvature concave towards the median, has grown with its tip beyond the center to the left. If the left tusk, which was also present but no longer had any connection with the skull, had had the same position as the right, they would have to have crossed.

The entire side surfaces of the skull, counted from the alveolar margin of the maxilla to the upper margin, are flat and very high in relation to the width. The greatest height from the lowest point of the maxillary edge - on the left deciduous molar M - to the highest point of the upper edge of the

2

The temporal pit is 40 cm. The actual temple pit in particular contributes to this height development

at, she measures from the she; downwardly limiting crista to its upper edge about as much as

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in width. The front edge of the temporal pit describes an evenly curved arc. The distance between the outer walls of the maxilla about the middle of the Mmt (first deciduous molars) is 16.5 cm, towards the front this amount decreases.

The surface of the palate is flat between the Mm, it only lowers towards the inner alveolar margin

down a little, creating the character of a hollow with a level floor. Between the Mm2, on the other hand, the palatal surface is also concave in the middle. While the Mm2 are set somewhat forward, the Mmj are parallel to one another. The smallest distance between the latter is 5.7 cm, the former 4.5 cm. In front of the rows of teeth, the lower surfaces of the anterior sections of the maxillae sink strongly downwards; here they show a sharply cut groove in the midline.The Ghoanen opening has the outline of a high isosceles triangle 7 cm high and about 4 cm wide. The not yet fully developed Mmt lie against the thin side walls of the choanic opening in a position that is too convergent upwards. As a result of the loss of the bone lamellae covering them, they are exposed with their crowns.

The infraorbital foramen has a highly oval lumen and expands to a large extent towards the rear.

The apex is, as far as can be judged by the best received from it, sunk somewhat in the middle. The two pits for the ligamentum nuchae, separated by a central wall, are narrow and fairly deep.

b) Fragment of a youthful skull No. 256 by Trinil. (Text figure 1.)

The skull fragment shows the crown and forehead region very well preserved. The smallest width of the forehead is 18 cm, which indicates an even smaller individual than the one previously described

Fig. L.

View of the forehead area of ​​the youthful skull No. 256. '/ e nat. Size

youthful skull closes. The apex shows a shallow depression. The ligament pits are shallower than those of the small skull. It is important to precisely determine the top of the profile of the forehead crown edge. This forms a line that is sunk too wide towards the middle.

c) Large skull no.1656 by Trinil. (Text figure 2.)

The face and forehead are missing. The rear view of the skull has been shown in order to show in what way and to what extent the lower edge of the apex, essentially formed by the parietals, extends to the sides. It's about to

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notice that this lower margin has not even been preserved to the end on both sides. Also to be seen is the strong expression of the elongated furrow underlying them.

The area of ​​the neck ligament is badly bruised. Likewise, the part between the back of the head and the palate has been crushed, mainly in a lateral direction. It seems

Fig. 2.

Rear view of the large skull No. L666. 'i nai Ör.

the distance between the lower edge of the foramen magnum and the palate, which is now about 33 cm, has not been significantly changed.

The easily measurable distance between the outer surface of the left zygomfortic and the median plane is 31 cm.

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d) Large skull no.1876 by Trinil.

The entire face, forehead, and large parts of the vertex are missing, while the occipital condyles and adjacent parts of the supra-occipital have been preserved.

The distance between the outer edges of the condyles is 17 cm, the length of the right 9.4 cm, its width 5.6 cm. The foramen magnum is approximately 7.4 cm wide. The distance between the lower edge of the foramen magnum and the palatal surface is 32 ^ 2 cm. The pit for the neck band is very deep.

The three-sided choan opening has a width of 9.4 cm and a height of 9.6 cm. So both measures are almost the same amount.

Due to the strongly convergent position of the remaining posterior sections of the Mm3, the surface of the palate widens significantly backwards. It is also sunk in a clearly concave shape.

Comparison of the Trinil stegodon skull with other stegodon skulls.

Of the skulls of Trinil, almost only the young can be used for comparison, since the large ones are too imperfectly preserved.

In determining the species we have to consider primarily the skull on which Martin (Foss. Mammalian) based his species St. trigonocephalus. A comparison is greatly facilitated by the fact that the age, judged by the state of the dentition, is exactly the same in both. It emerges first of all that the dimensions of St. trigonocephalus, as the teeth show throughout, are more considerable than those of the trinile skull. But also all of them

• The form relationships are very different.

The forehead is shaped quite differently; in the shape of Trinil it has the same height and

Width, while on the Leiden skull of St. trigonocephalus I measured the smallest width 33 1/2 cm, the height 24 1/2 cm, i.e. a ratio of around 3: 2, but it must also be taken into account that the amount of height expansion as a result, the median protrusion reaching down into the nostril from above is also measured.

In the trinile stegodon, the upper forehead contour shows a medium depression, in the case of St. trigonocephalus it runs in a convex curvature. Not much would have changed in this design if the somewhat worn upper ligaments of the temporal pits were completely preserved. Like the forehead, the nasal opening in St. trigonocephalus is also lower; the inter-alveolar groove is narrower. The side view also offers a completely different picture. The temporal pit is much lower in Martin's species, the above ending of the lateral surface of the skull is atit is acute-angled in contrast to the rounded shape of the Triniler Stegodon. If the upper edge of the temporal fossa were completely preserved, the last-mentioned character would certainly be more pronounced than less pronounced on the Leiden skull.

The above-mentioned differences between the skulls of the same age of St. trigonocephalus and the stegodon of Trinil are so far-reaching and important that they cannot be explained by individual variability or by the difference in sex - which the latter are only slight at an early age as it is mainly related to the strong development of the tusks of the males. Rather, a kind of separation seems to be absolutely necessary.

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Of the stegodons of the Sivaliks, the first is Stegodon bombifrons Falc. u. Cantl. completely different in the cranial structure in that the forehead is strongly arched and strongly constricted from the temporal surfaces. The nostril is also significantly lower.

From St. insignis Falc. u. Cantl. three juvenile skulls were depicted by Falconer (F.A. S. PI. 18, Fig. 1, 2. and 3). In the smallest of them, Fig. 1, the forehead is heavily weathered and thus probably lowered. The specimen shown as Fig. 2 is slightly smaller than our adolescent skulls from Trinil and has a particularly well-preserved forehead area and is therefore particularly suitable for comparison. His forehead is now significantly wider at its narrowest point than it is high, in contrast to the Trinile skull, where it is approximately equally extended in both directions. Furthermore, in that specimen of St. insignis the nostril is noticeably lower and narrower. The same deviations that are hereby identified as Fig. 2 by Falconer

shown skull, also apply to the piece of Fig. 3, which exceeds the size of the Javanese skull. The differences are very obvious, as a comparison of the illustration given in this treatise with those of the Falconers shows at first glance. There is therefore no doubt about a diversity of species. Incidentally, in the adult skulls of St. insignis the forehead is still significantly lower than in youth, so the deviation is even more significant.

Opposite St. insignis the large skull of St. ganesa (F.A. S. PI. XXI) has a significantly higher forehead. However, it is still considerably lower than that of our specimen from Trinil and, in addition, it has a very different character due to the upward narrowing. A species belonging to St. g'enesa cannot therefore be assumed as long as it has not been proven that the size of the Trinil Stegodon approximates the shape of the skull of the Indian species. The available skull material shows no signs of this.

Dubois (Trinil fauna) understands the stegodon of the Pithecanthropus strata as a variety of St. ganesa, which he calls var. Javanicus, and which is said to differ from the Indian species little more than by its smaller size. According to him, only older skulls should deviate from the Ganesa fovm in that the frontal and occipital parts are flattened against each other and are more or less sharply separated from each other. As shown above, the described juvenile Stegodon skull of Trinil also differs not insignificantly from St. ganesa, so that, in my opinion, while taking into account the difference in dentition, a specific separation appears more appropriate than the separation of a variety.

Dubois now also counts the two skulls described by Martin as St. trigonocephabus among his variety St. ganesa. He thinks that if these are well preserved, they would not have the strange triangular shape and that is why Martin’s name should be taken away.

The examination of the little Leiden skull shows me that the upper edge of the temporal fossa has been somewhat repelled. There, if completely preserved, the shape of the skull would appear even more triangular than it does now. Incidentally, even if the MARTiNian name were less distinctive than it really is, it would not be possible to replace it with Dubois' designation for reasons of priority. Now the species of Trinil is, as I believe I can show, not at all identical with St. trigonocepfialus; rather, especially in the structure of the skull, it is so different that the partingA special species appears justified, which Martin already established on the basis of molars with the name St. Airaivana. The question that then arises again, whether the form of Trinil in the sense of Dubois as a variety Airmvanayon St. ganesa or as an independent species, I believed, as already said above, to have to decide in the latter sense,

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Lower jaw.

a) Large lower jaw No. 823 from Trinil. (Plate XXIV, Fig. 1 and text figure 3.)

The almost completely preserved lower jaw apparently belongs to the large crumbled skull. The size, preservation, chewing and degree of use of the molars are so consistent that there can hardly be any doubt that they belong together.

Fig. 3.

Side view of the right branch of the large lower jaw No. 823. '/ s nat. Size

The left joint condyle has not been preserved; the ligament on the right and smaller parts of its base have been lost.

Dimensions of the lower jaw.

a = large lower jaw No. 823; b = lower jaw no. 1238/9; r == right, 1 = left.

c = lower jaw no.845.

Length of the single branch

Thickness of the branch just below the anterior end of the

foremost tooth

Thickness of the branch under the front edge of the crown fort

sentence (largest width)

Smallest width of the branch next to the symphysis. . . Height of the branch at the front end of the foremost tooth

Length of the symphysis including the bostrum .... Inner distance of the branches below the front end

of the foremost tooth

Inner distance between the upper ends of the corolla processes

from each other

Inner distance of the branches from each other directly below

half of the condyle height of the corolla process

1

77 78.5 7.9 7.5

18.4 18.4 - 14.5 approx. 16 -

8.1 7.4 23.5 23.5 13.5 14

12 14

9.1

47

44.5 31

6.0 15

10

5.1 approx. 14

6.8

18.5 -

6.4 18.5 12.5

9 10 (?)

9.6

7.5 10.5

9.5

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When viewed from above to the front, the outer outline shows outer contours of the mandible branches that converge at an acute angle. The side view shows that the lower contour of the branches represents an elongated flat arch. The alveolar margin rises in a smooth curve.

The front edges are drawn out both high up and long down to a well-developed rostrum. The inner walls of the mandible branches run parallel from the front to about the middle of the alveolus. Then they widen extremely strongly up to the area of ​​the front edge of the corolla process, in which they are at the same time much lower. At this broad point on the branches, the molars are fully turned inwards, thus leaving a broad outer zone of the surface free.

The symphysis groove is flat. The profile of the symphysis rises steeply on the posterior side in an even curve, while it slopes more flatly towards the front.

The anterior margin of the coronet rises above the alveolar margin approximately at a right angle. The entire height of the coronet process, counting from the lower contour of the mandibular weight,

the height of the mandible itself below the anterior margin of the former. In the upward direction, the coronary processes diverge noticeably.

The outline and shape of the condyles cannot be determined due to insufficient preservation.

The opening of the tooth canal is narrow and pointed downwards.

The superficial protuberance at the posterior end of the alveoli is elongated in outline.

On each branch there are three outer mental foramina about halfway up on either side

very similar position. The middle foramen is a little higher than the two lateral ones. Internal mental foramina are absent.

Comparison of the Trinil mandibles with each other and with other Stegodon mandibles.

The three lower jaws described already provide clues for the determination of constant and variable properties. The thickness of the lower jaw branches was found to fluctuate, which is significantly less in the small one, No. 1238/39, than in the other two larger lower jaws. The height of the branches at the anterior end of the alveolar margin is much greater in the large lower jaw than in the small second, and even more important than in the third. In addition, the alveolar rim of the first is much more curved upwardly concave than in the small specimen. The very different shape of the symphysis profile is particularly remarkable. The latter properties seem to me to be related to one another in a certain way. The height of the mandibular anterior margins is certainly related to the course of the alveolar margins, which in the high jaw curve upward in an arched line, in the lower jaw, on the other hand, in a straight direction, the lower contour of the branch more parallel.The great diversity of the symphyseal profiles is also somewhat understandable if one imagines that the connecting bone bridge in the large lower jaw experiences a strengthening upwards in the direction of its strong height development. A very simply inclined upper surface of the symphysis, like that of the small jaw, would then be transformed into the steep one of the large one.

The constant and therefore characteristic properties of the lower jaw, to judge by the present material, are the shape of the outline, which narrows strongly and fairly straight forward, when viewed from above, the elongated, very flat, arched lower contour of the mandible branches and the very low height the same exist in the region of the anterior margin of the corolla process.

is over 2 l

/ 3

The two mandible branches listed in the found book belong together and have been put together. The coronet process and the condyle are missing on both sides. The last molar on the left branch has been exposed up to its rear end and for this purpose the bone covering overlying its rear half has been removed.

The lateral contours of the assembled lower jaw run towards each other at an acute angle.

The lower contour of the mandible branches shows a very slightly curved curve. The alveolar margin runs almost straight, as the branches increase in height relatively little towards the front. Below the front edge of the corolla process, the branches are very low, at the same time of moderate width, in any case narrower than in the large one described above

Lower jaw.

A rostrum is not developed at all,

rather, the front edge of the broad and flat symphysis groove is turned forward like a spout. The profile of the symphysis has roughly the shape of an elongated oval, which is drawn out obliquely upwards and forwards, the side of which, facing upwards and backwards, is completely flat and only slightly curved.

Fig. 4.

View of the lower jaw No. 1238/39 from above. l / a nat. Size

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b) Small lower jaw No. 1238/39 from Trinil. (Text figures 4 and 5.)

c) Lower jaw no.845 from Trinil.

The lower jaw No. 845 is the most incompletely preserved; the branches are missing the posterior parts along with the coronet and condyle.

The outer outline of the lower jaw is extremely acute-angled with a fairly straight outer contour. The lower contour of the branches is very flat curved. The branches rise fairly high after the anterior end of the alveolar. At the point where the anterior margin of the crown processes is assumed, the lower jaw branches are low and very wide.

There is no rostrum, whether it was present in a very weak development, but it broke off later, remains uncertain.

The symphysis profile is somewhat similar to the shape of a right triangle, the hypotenuse of which is very slightly curved upwards and backwards.

If we compare the Trinil mandibles with those of other well-known stegodonts, there is initially a very good match with the jaw branches of St Airawana shown by Martin

Fig. 5.

View of the left branch of the same lower jaw. 7g nat. Size

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(Neue Stegod. Plate I, Fig. 1 and 2). The position in which Martin depicted the two mandibles, which are not connected, should at least come very close to the truth. But even if the angle of the two branches of the lower jaw were to be chosen a little differently, the very great similarity would remain with regard to the outline, which also narrows towards the front. The very weakly curved lower contour of the mandibles and their very low height in the area of ​​the front edge of the coronet process are added as further matching properties.

The shape of the lower jaw thus only confirms the determination of the Stegodon of Trinil, based mainly on the dentition, as the MARTiNSche species.

On the other hand, it cannot be overlooked that the lower jaw of St. Airaicana bears great resemblance to some of the Sivaliks depicted by Falconer. This applies with regard to the lower, flat curved contour for the lower jaw of the St. insignis of the fauna antiqua Sivalenis, plate 20A, Fig. 3, with regard to the outline for plate 18, Fig. 4. Also with the lower jaw of St. ganesa (FAS Plate 24 A, Fig. 3a, and Plate 20 A, Fig. 1) there is great agreement on both points mentioned.Incisors.

a) Incisors of the large crumbled skull No. 305. (Figures 6—8.)

In the large skull, the two incisors are present. Mr.PreparatorBorchert succeeded with his usual skill and care in assembling one of them from the countless fragments. Its total length is 2.42 m, measured on the convex side. At the proximal end only a thin wall encloses the pulp, so that it is probable that this part was still in the alveolus. The circumference of the tooth at the lower end is 42 cm, the diameter 13.4 cm.

Fig. 6.

Incisor dos large disintegrated skull no; iu5. > / i- nat- Gr.

As the figure shows, the curvature is moderately strong. A rotation is only weakly pronounced, so that the curvature almost falls into one plane.

According to its external appearance, the tooth can be described as moderately slender. The distal end is very tapered, but the tapering was not originally caused by wear and tear.

The distal end of the other, unassembled tusk ends completely blunt in the conspicuous opposite.

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b) The tusk no. 466 differs from the large one described by a slightly larger curvature. The circumference and diameter at the base are 27.5 and 8.05 cm, and the length of the convex side is 143 cm.

c) Of the tusks of the little skull no. 203, the left one could not be attached because there is no connection. The right incisor located in the alveolus (Plate XXI, Figs. 1 and 2) is exposed to an extent of about 29 cm as a result of its partial breakage. The thickness in front of the end of the alveoli is 33 mm. The curvature is weak. The front end is trimmed slightly at an angle.

At the tip there is an enamel cap, distinguished by its hardness, gloss and dark color, the proximal border of which is very irregular and at one point extends over 3 cm from the tip.

d) Apart from a number of more or less complete sections of tusks of Trinil of various strengths, there are two well-preserved specimens without a precise location. Of these, No. 1658, at 166 cm in length, 30 cm in circumference and 8 cm in diameter, has a slight curvature lying in one plane.

Fig. 7.

Incisor no. 1660. View of the greatest curvature. Vi- 'nat- & r-

Fig. 8.

Same. View perpendicular to the greatest curvature. '/ i2 nat. Size

e) The other tusk, No. 1660 (text fig. 7 and 8), 176 cm long, 31 cm rear circumference

and 9.2 cm largest in diameter, it is rather strongly curved, but at the same time very strong

turned out of the plane.

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Molars.

The enamel formation of the molars of Stegodon Airawana. (Figures 9-11.)

A close look at the molar enamel shows that it consists of two different layers, an inner and an outer. The inner one is thinner and finely wrinkled. On top of this lies the outer one, covering it like a jacket, usually of greater thickness and not in actual folds. Only the surface shows fine furrows that run from bottom to top on the front and side walls of the yokes. Both enamel layers usually differ from one another due to their different coloring, in that the inner one is lighter than the outer one. On the accompanying boards, the inner layer is highlighted with a light tone.

Also of importance is the fact that the inner layer offers much greater resistance to wear than the outer one.

By chewing, perhaps with the help of dissolving nutrient and salivary juices, the cement is removed far below the level of the actual abrasion surface, so that more or less deep valleys are created between the yokes. On the walls of these valleys, the outer layer of enamel is exposed to damaging mechanical and chemical influences. Consequently

Fig. 9.

Cross section through two chewed yokes.

Fig. 10.

Cross-section through three defrosted yokes with step formation.

Fig. 11.

Beginning of the deposition of the outer enamel layer.

Inner layer of protection

Outer layer of insulation

'7-7

\ L {- ~ \ Dentin

cement

s = step in the enamel

The three figures are schematic and in 1/2 nat. Size

Here, the enamel is removed from the entire exposed surface in such a way that it always appears smooth. Only the cross-sections of the inner ones lie in the abrasion surface of the tooth crownwrinkled enamel layer, as the dentin because of its WT

becomes. The outer layer of enamel does not reach the level of abrasion, but you can see it penetrating the folds of the light inner layer on the sides of the yokes.

The formation of wrinkles is only perceptible in the abrasion plane at the level of the yokes, but not on the yoke sides.

The outer layer of enamel is removed from the front and rear sides of the yokes over a large area up to the level of the cement surface in the yoke valleys. At this level, the ablation surface of the enamel cuts at an angle against the undamaged lower parts of the enamel surface that are still stuck in the cement. If the remaining cement is then removed further, e.g. B. by

Weathering, the boundary between the erosion surface and the still intact enamel surface clearly emerges as a step or step, which is made even clearer by the fact that the surface above the step is smooth as a result of wear, while the parts below it still show the original superficial creasing or wrinkling.

Cross breaks through yokes show how the outer layer of enamel becomes too thin downwards. Often the inner layer ragl with the tips of the mammils from the mantle of the outer

the authenticity of the chewing process

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Location out. When viewed with a magnifying glass, the transverse breaks also show quite clearly a certain difference in the structure of the two layers, in that the outer one shows slightly downward-pointing fibers, while the inner one makes a more compact impression. The differences were far less noticeable on two thin sections, especially since the difference in color disappears when the sections are very thin. In the figures, the boundary between the two layers is shown schematically as a sharp line, which it is not in reality.

Some yokes that have not yet been fully developed provide information about the way in which the enamel is formed. A small tooth fragment, apparently the talon of a deciduous molar, consists entirely of the inner layer. As a result, the surface shows the wrinkles running upwards from below. The yokes of another deciduous molar show a further stage. With them, the deposition of the outer layer has started. However, this only covers the upper parts of the yokes in a thin layer, it runs downwards and leaves a zone of the inner fold layer uncovered on the lower edge of the yoke flanks. The formation of the outer layer therefore begins at the top. The schematic text fig. 11 is intended to illustrate the stage just described.

The step formation on the enamel is at Sl. Airaivana to a moderate degree, but much more pronounced in St. trigonocephalus, probably due to the greater thickness of the outer enamel layer in this species. I have not found any notable formation of steps in the stegodonts of the Sivaliks.

Description of the molars. Upper Mm2 (milk molar).

a) Mm2 of adolescent skull no.203 by Trinil. (Plate XXII, Fig. 1.)

The second deciduous molar on both sides of the young skull is preserved in almost the same way.

The chewing has progressed so far that the front edge of both teeth has already disappeared

is. As a result, the yoke formula does not have to be specified in full. To an only incompletely

holding the front yoke are followed by four more. By analogy with the full-

constantly preserved mm, the yokes are numbered from 1 to 5. Whether there was a front talon is 2

fail to determine the same is true of a rear. The chewing has for the most part already made the enamel walls of the individual yokes disappear, only the last two yokes of the left tooth are still almost completely surrounded by an enamel edge, within which the dentin is strongly hollowed out. Since the width of the last yoke is a little larger than the previous one, it is possible that a back talon was present but was completely lost by the chewing.

The chewing surface slopes down on both sides towards the outside. The two teeth are clearly convergent towards the front.

The outline of the teeth can no longer be determined, since apart from the entire front edge on both sides the front half of the outer band has disappeared as a result of the chewing. But the still existing rear section of the outer edge of the left tooth seems to indicate by its course that originally there was a narrowing of the tooth crown towards the front, as shown in such a striking way by the complete Mm2 described below.The crown protrudes far beyond the root, especially on the inside. But in the heavily worn condition, a certain absorption of the latter is to be expected.

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Table I.

Dimensions of the upper molars Mm2 in millimeters.

a = Mm-, of the adolescent skull (No. 203): greatest length = 48 + (right) 48+ (left), b = Mm2 of the isolated maxillary (No. 1408): greatest length = 54 (right).

1st yoke 2nd yoke 3rd yoke 4th yoke 5th yoke Rear talon r1r1r1r1r1r1

Largest yoke length (in the lower part of the a40 (

Crown) 1 b34-31-34-39

Upper yoke length (= distance between vertices a f

points of the outermost nipple tips) 1 to approx. 28-20 — approx. 24-29

Yoke width

. .1

b 5—11 —5-9 - (8-) 10- 9 - 9 —7—10—

Distances of the mammalian tips from a (

those of the following yoke .... 1 yoke height

b 9-9 b

a

bapprox. 1.2-1.6 -approx.1.4-1.3

—7—9—

20 - 18 -

-1.3 - about 1.5 - 4.1 about 3.6 -

-4.7 -

2.1 - approx. 2.1 -

Largest yoke length:

upper yoke length. . I.

Largest yoke length:

Largest yoke length: yoke height .... b

(medium) yoke width

a

-

a

4.0 3.4-4.3

b

The yokes are perpendicular to the inner edge in their longitudinal direction. The remnants of the melted walls run fairly straight. But it is questionable whether the roofs of the yokes were just as straight.

Traces of cement are only noticeable on the inner, basal margin of the tooth crowns. The enamel is thin and finely puckered.

Due to the well advanced chewing, the melted walls of the individual yokes take on the shape of an elongated rectangle, the character of which is only indistinct in the last yoke due to the rounded rear contour.

b) Mm2 of right maxillary No. 1408 from Trinil. (Plate XXII, Fig. 2.)

The tooth is completely preserved. The outline is very irregular. From the back to the front it narrows very sharply as far as the region of the second yoke, only to suddenly widen again, especially towards the outer side. The side edges of the crown therefore show an indentation in front of the center, which is stronger on the outside than on the inside. Front and

The ends of the lines are evenly rounded, with the rear edge tapering a little inwards and backwards.

One could vary how the yoke formula is to be given. The first two yokes are idly chewed off and form a coherent mass, separated only by a slightly deep furrow, which could be viewed as the first yoke together with the front talon if one did not get a talon that would be significantly longer than the first yoke ». As a result, these two links will be referred to as the first and second yokes. With this procedure we get five yokes and one very strong

developed rear talon, which comes close to a real yoke in importance. The formula would therefore be 5 X-

414040 —41 — about 37—

—32—25— about 9 about 11 10 10 10 about 11 10

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While the first yoke is chewed to about half its height, the third yoke is only ground down until the dentine appears for the first time, and the fourth yoke is only ground down at the highest mammillary tips. The chewing surface slopes down a little towards the outside.

Cement is only poorly developed, it covers the flanks of the posterior yokes in a thin layer and also only partially covers the sides and the posterior wall of the crown. There is only a very small amount of cement between the first yokes.

The rearmost yokes are slightly bent forward; the front ones give no information about this point, since the chewing has already removed too much from them.

The side surfaces of the yokes are almost vertical on the inside, but much more sloping on the outside.

The course of the first two yokes is irregular. The foremost forms a flat, forward-convex arc. On the inside it is only the width of a mammilla, but on the outside it widens to a good double. In the middle of its length there is one

Constriction. A strongly developed indentation of the enamel wall is present approximately in 1 away from the outside.

The course of the second yoke is characterized by a sharp kink, which divides it in a ratio of 2: 1, in such a way that the short section is located on the inside.

The third, fourth and fifth yoke are divided into two sections by an interruption in the middle, which form a very obtuse angle with each other in the last two yokes, while the third shows more the suggestion of an S-shaped curvature. The rear talon also has a very obtuse-angled kink.The third yoke ends in a row of eight main mammilles, while the last two and the rear talon make the nine of them particularly prominent. The tips of the mammils of the fourth and fifth yoke form a very flat curve when viewed from the front. From the posterior wall of the posterior talon, a few very flat, wart-like elevations emerge at a height of 2/3, which represent the rudiments of other mammils. From the middle of the last yoke a mammilla emerges backwards and comes close to one protruding from the talon.

The melted figures of the first two yokes, which are more strongly chewed, are complicated and at the same time strongly folded due to the strong structure of the yokes. Due to the higher position of the abrasion surface, the thickness of the enamel walls is greater than that of the tooth of the adolescent skull described above. The entire tooth crown is provided all around on its sides with narrow grooves that run upwards and are filled with cement.

Upper Mm ,,

a) Upper Mnij of the youthful skull no.203 from Trinil. (Plate XXII, Fig. 1.)

The adolescent skull of Trinil shows the completely preserved Mm, behind the Mm2. The right one is exactly the same as the left one.

The teeth are of a decidedly rectangular shape; they widen gradually and evenly towards the rear; the front end is slightly bevelled towards the inside, while the rear end is strongly rounded. Both teeth are parallel to each other, pointing straight forward.

There are seven yokes as well as a front and a rear talon. The chewing extends up to the fifth yoke, which in the left tooth only just struck in its highest nipples

/ i

the total length

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is, while the majority of them are already clearly cheeked in on the right and a contiguous narrow abrasive surface has already formed.

The chewing attacks the yokes more in the middle than on the sides, which, however, causes a very slight concavity. In the longitudinal direction of the tooth, the chewing surfaces of the individual yokes together form a very slightly convex surface. The teeth themselves sit on the palatal plane in such a way that the ridges of the yokes of the right slope slightly to the right, those of the left slightly to the left. The chewing surfaces are inclined in the same way.

Largest yoke length (on the basis of the tooth crown

f

1st yoke,

r1r1 r1r1r1Ir1

44 43 46z 45z 48z 48z 50z 50z 51z 51

--- 43 - 45 47 48 48 47 43

33 33 36 331 35 35 38 37 3534333227

1 Upper yoke length (distance den

-

Vertices of the outermost mammalian tips)

Yoke width. .

18th

———--— 33 —33 38 -; 39 40 37 33 25

Distances of the mammary tips from those of the following yoke \

Yoke height

!

—————-—— 17 22 24 25 27 27 28 27 21

Largest yoke length:

length I 1.3

1.4 1.4 1.3 1.4 1.4 1.4 1.3 1.4 1.5 1.61.5 1.6 ——

- --—— -

Largest yoke length:

Yoke height. .

-

Table No. 2.

Dimensions of the upper mm, in millimeters.

Mnij of the youthful skull (No. 203): length = 101 (right), 101 (left). b = Mnii of the isolated maxillary (No. 1408): length = 90 (right).

Upper yoke

Greatest yoke length; (middle) yoke

width I 3.2

1.2 1.2 about 3.4 about 3.4 about 3.6 about 3.6 3.4

J

j

3-83-511-1411-1414 14 approx. 14 approx. 14 approx. 14 approx. 1415 14 1414 ———— —-——-——

|

f

(

front talon

2nd yoke

3rd yoke

4th yoke

5th yoke 6th yoke 7th yoke \

rear talon

approx 7 11-16 12 12 -

14 14 14 14 13 13 13 13 - -

approx. 5

———————— 13 14 14 13 12 12 10

28 29282828——

3.5

3.3 3.8

3.2

3.6

1.8 -

1.4 1.2

1.3 1.3

3.7 3.8 - - - - -

2.0

z means that cement is included.

1.9

| 1.8

1,

Cement is abundant. Between the first three yokes it has almost completely disappeared due to the wear and tear of the tooth; to the left of the fifth, to the right of the sixth yoke, it has been preserved in its original thickness and surrounds the last yokes and the back talon in such a way that only the tips of the nipples remain free. The boundaries of the individual yokes are also marked in the cement mantle, as far as this is still intact, by sharp grooves. In thinner

Layer of cement also covers the lower portions of the sides of the yokes, as well as the entire basal margin of the tooth crown.

The yokes are generally straight and perpendicular to the longitudinal axis; only the second yoke describes a very flat arc convex to the front. The anterior talon, which hugs the outer two-thirds of the anterior wall of the first yoke very closely, also describes a slightly forward convex arc. The rear talon is hidden in the cement so that its course cannot be seen. . The excellent mammary tips reveal a slight kink.| 3.9

4.7

- 14.0

- 4.0 1.8

4.3

1.8 1.91.7 1.8 - -

--—— 1.7 1.6

12 12 11 9 4

still strongly angled to the previous Mm2. Hints of cement.

He still shows no trace of chewing and only

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As far as the cement mantle shows, the yokes are inclined a little forward: the inclination of the front yokes seems to be noticeably greater than that of the rear.

The sides of the yokes slope very steeply towards the base of the crown. The base of the tooth crown lacks a bulging widening.

The first three yokes are narrowed into two sections that are almost identical to one another

disassembled, next to it the yokes are thickened slightly bulbous towards the front and back.

Structure is weak; fine notches indicate the boundaries of the individual mammils and constrict the chewing figure in a fairly even manner. The thickness of the enamel is small.

The number of mammals on the yokes that have not yet been chewed or only very weakly chewed, where it can be determined alone, is about ten, but often two or three of these are less than the others in length and are completely covered by cement when the yokes have not yet been chewed. while the others protrude from it with their tips. When viewed from the front, the ends of the mammilla lie in an only very slightly curved curve.

The front talon is well structured; it is divided into two longer lateral sections, which include a central short one, but are still clearly separated from this in the present stage of chewing. The shape of the posterior talon cannot be determined, as it is almost entirely covered with cement. Those of the mammilles which are outstanding from this point alone are considerably finer than those of the other yokes.

b) Mmj of Right Maxillary No. 1408 from Trinil. (Plate XXIII, Figs. 1-3.)

The right maxillary of a very youthful animal, already mentioned above, bears a completely preserved Mm ^ behind the Mm2

The number of yokes is seven, in full agreement with the previously described Mmt, and there is also a front and a rear talon.

The outline of the whole tooth is by and large rectangular, it narrows somewhat towards the front because the anterior yokes become somewhat shorter, and the last yoke is noticeably shortened in comparison with the penultimate one.

The yokes are generally perpendicular to the longitudinal direction, on the inner side the third to sixth yokes are slightly bent forward. The second yoke runs in a very flat arc that is convex to the front. The first yoke is irregular in shape, with a short row of nipples extending backwards and outwards at an angle to the yoke axis.

The front talon rests against the first yoke, namely its outer half, in a very flat arc. It is thicker on the outside than on the inside. The posterior talon forms an almost straight line of mammillae, which likewise become thick on the outer side.

All yokes are inclined forward, the last only very weak, the front stronger. The sides of the yokes are very steep, the inner ones almost vertical.

The first five yokes are clearly divided into two by a constriction.

The latter is a little lingual from the middle on the first three yokes, exactly in the middle on the fourth yoke and a little buccally from the middle on the sixth. The constrictions of the third to fifth yoke lie in a straight line, the central axis of the tooth in the middle of the fourth yoke

The other

Distances of the mammary tips from those of the next yoke!

Yoke height

Largest yoke length: Upper yoke

8 913 1315 1615 1616 16

16 15-17 16-18 16-18 17 1

15-18 14-17 17 16-18 17 18 17 17 16

28 - 31

1.5 1.6 1.4 1.4 1.3 1.4 1.4 1.5

length

Largest yoke length:

width

Largest yoke length:

(middle) yoke

j

i

[

i

3.9

4.2

3.6

3.4

3.7

3.5

3.6 3.6 -

.

3.9

Yoke height

1.7

z means that cement is included.

..

1.9

(

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crosses at a small angle and in the extension of which on the sixth and seventh yoke, more and more towards the buccal side, still show hints of constrictions.

The number of main mummies on all yokes is 8-9.

Furrows of the same character as those which border the individual mammils on the flanks of the yokes are also found on the sides of the yokes and give them a wrinkled appearance. But here they are limited to their lower surfaces and are more strongly developed on the rear yokes than on the front. The anterior wall of the anterior talon and the first yoke, insofar as it is not covered by this, lacks the furrow, the more pronounced this is on the back of the posterior talon.Upper M ,.

a) Upper Mr of the youthful skull No. 203 by Trinil.

The youthful skull has the first true molar behind the mn ^ on each side. The preservation is complete with the exception of a few broken mammary tips. The teeth are not yet fully developed, as the last yokes show, they are also not yet indented into the surface of the palate, but are still at an almost right angle to it. With their rear ends the two teeth converge strongly against each other.

The still existing rear part of the arched bone roof covering the undeveloped tooth was removed in the right M1? in which the last yokes are better preserved than in the left, lifted off.

Table No. 3.

Dimensions of the upper Mx in millimeters.

a = Mt of the youthful skull (No. 203): length = 127 (right). b = Mxof the skull fragment (number 47): length = 125 (right).

Largest yoke length (at the base of the crown) i Upper yoke length (distance between the

Vertices of the outermost mammalian tips)>

Yoke width 1

)

front

15 15 33

58 58 57 57 58 59 - 43 - -62 -65z666658z57z

f

51 54 54 54 55 56

back talon 1st yoke 2nd yoke 3rd yoke 4th yoke 5th yoke 6th yoke 7th yoke Tal.n

r1r1r1r1r1r1 1r1

33 40 40 42 40

41 38

- 32.40) 34

12-15 13

- 1.8 (1.5 1.2

3.8 3.9 3.7 4.3 4.4

1) The yoke width of the last yoke of the youthful skull is not measured, as these are not yet fully developed.

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Since both teeth are completely identical, it is sufficient to only describe the right one below.

The crown widens evenly and gradually from front to back. The front end is limited obliquely, as a result of the formation of a short talon on its outer side, whereby the outer crown edge is lengthened compared to the inner one.

The number of yokes is 7, plus a rear talon, which comes close to a real yoke in size and is quite independent, but is considerably narrower and lower than such and can therefore only be referred to as a talon. As already mentioned, there is also a short front talon. The tooth formula is therefore- X 7 X-

As is obvious from its position on the skull, there is no trace of chewing.

There is only a thin layer of cement on the front wall of the first yoke.

act.

Examination of the tooth crown shows that the last yoke is obviously not yet completely finished. In its lower part it has not attained the thickness of the front one, it is much stronger and deeper furrowed. The ends of the mammils, on the other hand, are already thicker and at the same time lean forward significantly. These properties also apply to a lesser extent to the preceding sixth yoke and probably also to the rear talon.

In addition, all yokes are bent forward, and the front to a greater extent than the rear.

The position of the sides of the yokes is very steep on the outside, a little less on the inside.

In their course the yokes are by and large almost exactly perpendicular to the lateral edges of the crown.

The first two yokes have a constriction approximately in the middle of their longitudinal extension. In the third yoke this is shifted inwards, but then gradually moves more and more to the other side in the following yokes and is located buccally from the center in the last two. The third yoke is somewhat kinked at the point of the constriction. The number of main mothers is 7-8, plus a few less prominent mothers.

The front talon represents a mammary side of about half the length of a yoke and lies in front of the outer half of the front wall of the first yoke. The outermost mammilla on the inside is the highest; from that point on the tips of the adjacent mammils descend and rise again a little on the outer side.

The posterior talon is distinguished by two particularly large nipples, which include a third, narrower one, and which are separated from a lower inner row of nipples by a constriction and from a single outer nipple by an interruption.

Buccal next to the last two yokes are accessory mammils of different heights on both teeth, the pointed, slender shape of which seems to indicate that they were not quite finished in their development.

In the second to fifth yokes, the ends of the mammils lie on a line that is very flat from the outside to the center, rises a little steeper from the inside and reaches its highest point at a more or less large distance buccally from the center line of the tooth crown. The mammary ends of the first yoke are approximately at the same height, those of the last two yokes rise continuously fromoutside to inside.

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b) Upper Mj of the skull fragment No. 47 by Trinil. (Plate XXII, Fig. 3.)

The fragment of a skull bears on both sides the heavily chewed-on muscles, the front yokes of which have already disappeared. In addition, the foremost part of the left tooth has broken off, while on the right the front two-thirds of the outer edge has split off in a narrow zone.

The width of the crowns is considerably larger than that of the upper M of the youthful t

Skull.

The best-preserved outline of the left tooth diminishes an increase in crown width

to perceive behind.

Both teeth converge forward in a hardly noticeable manner.

The full number of yokes cannot be determined. The right tooth shows seven yokes, learn one

rear talon. Since the melting walls of the first of the existing yokes have been completely lost due to the chewing, the limits of the same can only be estimated by comparison with the following. There is then a space in front of the penultimate existing yoke which is too wide for one yoke alone, so that at least originally there must have been a front talon in front of it.

The chewing has already attacked all yokes, only the low rear talon is still intact on both sides. The melt walls between the second and third yoke are only preserved on both sides on the inside to a short extent.

The chewing surfaces drop significantly towards the outside.

Cement is still to be found in the depths of the valleys between the last three yokes, furthermore on the rear half of the outside of the crown base, and in abundance on its rear side.

The position or inclination of the yokes cannot be determined because of the high degree of chewing, just as little as the inclination of their side surfaces.

The extensive chewing of the front yokes up to and including the fourth led to the formation of the outline of a decidedly elongated rectangle. The fifth shows a structure in that it has a constriction somewhat buccally from the middle and a second one lingually, which is better developed on the right tooth than on the left. The penultimate yoke shows the same structure as the previous yoke in the right tooth, whereas in the left it is constricted several times. The last yoke does not allow a dichotomy to stand out.

«While the course of the yokes up to and including the fifth is almost straight. and indeed perpendicular to the lateral edges of the crown, the penultimate yoke, especially in the left tooth, is curved forward in its inner half. The last yoke is a little slanted and bent too weakly towards the rear. The posterior talon is only narrow, short and low, and reveals four main mammillae.

The wrinkling of the enamel is quite fine in the anterior, heavily chewed yokes, but simpler in the last, little chewed yokes.

The enamel layer itself is noticeably thicker than that of the last deciduous molars.

Lingual from the last yoke, at the same time moved a little forwards in the right tooth, stands a blunt, isolated mammilla, a similar one also stands on the inner edge in front of the penultimate yoke of the left tooth.

The very short and narrow rear talon ends on the right in four mammilles, while the left? only two of them protrude from your cement, separated by a wide gap.

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c) Fragment of a questionable upper Mj No. 288 from Trinil.

According to its dimensions, the front end of the tooth can be assigned to a Mt and, since the existing inner edge, which extends over three yokes, does not reveal any curvature, it is probably to an upper left. There is a front talon, the first yoke almost completely, the second mostly and the third about half. The missing parts of the three first yokes are those on the outside.

The length of the first yoke is estimated to be about 51 mm, which is the same as that of the Mj of the youthful skull. The front talon is longer than this and extends almost to the inner edge. The outer mammilla standing on this side is separated from the rest of the very evenly high ones by a deep gap. On the outer side, the talon is much wider, as a result of which the front end experiences a strong bevel.

The structure of the three yokes is very similar to that of the left Mt of the small skull, only the course of the first yoke is straight. The position of the constrictions of the yokes, on the other hand, is exactly the same.Upper M2.

a) Upper M2 of Trinil's skull fragment No. 47. (Text figure 12.)

The already mentioned fragment of the skull carries the M2 behind the Mt on each side.

While the right M2 is completely preserved, the left one is missing the last two yokes. The teeth stand

Fig. 12.

Side view of the right upper M-; of the skull shrinkage no. 47. V2 nat- Gr.

at an angle to the M and the palatal surface and run obliquely upwards, t

converge against each other. The last four to five yokes were undoubtedly still from the bone

roof originally covered.

The outline is hardly wider towards the rear. The front end is slightly oblique

to the front outside, while the rear end is symmetrically trimmed in a uniform, flat curve. Every tooth is very noticeably curved in its median plane.

There are nine yokes on the right tooth and an insignificant front and back

terer talon.

The first yoke was chewed to a very insignificant extent.

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Distances of the Mammil-j lens tips from those of the next yoke>

a b

a

21-26 22-26 20-24 22 19-23 19-22 22 23 24 24-25 24 25 23 - 22-24 24-26

Yoke height j

b

j1

Table No. 4.

Dimensions of the upper M2 in millimeters.

a = upper M2 of fragment no.47: length = 191 (right).

b = upper woman of the large skull No. 304: length = 180 (right), 196 (left).

-——— Largest yoke-like (other aca. 33 ca.31ca.69 70 71z 70 75z 74 74 74 74 - 78 78 -76 66 c.41

front talon

rear talon

1st yoke 2nd yoke 3rd yoke 4th yoke 5th yoke 6th yoke 7th yoke 8th yoke 9th yoke r1r1r1r1r1r1r1r1r1r1r1

Base of the crown). . 1 b 80 - 82 84 - Upper yoke length (Ab-j

was the top aca.20 21 approx. 39 —— approx. 44 approx. 48 48 51 49 49 points of the outermost! b

Mammal tips). J

89 z

a approx. 11 approx. 10 16-25 16-21 22 b

21 19-22 19-22 20 21 about 21 about 22

20 - 202 121 21 2222 - around 26

Largest yoke length: Upper (aca.1.7 approx.1.5 approx.1.8 —— approx.1.6 approx.1.6 1.5 yoke length.... \ B

Largest yoke length: (middle a approx. 3.0 approx. 3.1 approx 3.4 approx 3.7 3.2 lere) yoke width. . 1 b

Largest yoke length: yoke a about 1.8 1.9 1.7 height 1b

3.3 3.6 4.0

1.7

3.7

1.7

3.7 3.5 approx. 3.5 - 4.1 4.0 4.0

- about 3.4

38 3741 41-43

- 48

z means that cement is included.

It should be noted here that the outer mammillary tips of the anterior yokes show a kind of corrosion.

The cement pavement is finished on the first four yokes. It encloses them in the form of thick, bulging plates, which are separated from one another by sharply cut furrows. The tips of the mammillae are also covered with cement on the first two yokes, and although they protrude somewhat on the two following yokes, it almost seems as if a thin layer of cement has peeled off afterwards. The sides of the yokes are also largely covered with cement, and where this is missing, it has probably fallen off afterwards. From the fifth yoke onwards, the cement pavement becomes smaller, the valleys between two adjacent yokes are no longer completely filled and become wider and wider towards the rear. The ninth yoke has almost no cement left.

The yokes are inclined a little forward, and the rear to a greater extent than the front.

The sides of the yokes are quite steep on the outer side, and noticeably more slanted on the inner side.

The width of the yokes changes slightly (see the table). The second yoke is particularly thick, the following ones are narrower, but later the yokes move further apart so that if the cement covering were fully formed they would again have a greater width.

The height of the yokes is quite considerable.

The second and third yokes on the right tooth are buccally bent forward from the center in a very flat shape, at least this concerns the cement board. All remaining yokes have

straight course.

90 z 92 z

52-47—32- 66—57—

\_ ~~

22-19 20

1.5 1.5 1.5 -1.6 -1.5 -1.5 -1.4 -c.1.3- 1.4 -

84 89

48 -52

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In the first yoke, two mammilles are strongly advanced and have already chewed on because of their position.

On the second and fifth yokes in the cement mantle there is a somewhat median indentation of the cement; on the third yoke of the right tooth there is such a notch lingually near the center. A clear notch also shows the seventh yoke on the right buccal next to the middle.

The number of main mummies is seven to eight on the yokes, the tips of which are bared by cement.The anterior talon lies in front of the outer half of the anterior wall of the first yoke and is low and very narrow. It is completely bare of cement. The two outermost mammils facing outwards are the thickest and tallest.

The posterior talon, which is also entirely free of cement, represents a series of very low and thin mammils, the middle of which are the weakest.

The vertical folds of the flanks of the exposed yokes are slight. On the other hand, a very fine, wave-like, horizontal fold emerges strongly on the lateral base surfaces of the crown and the lower part of the yokes and also extends somewhat on the flanks of the yokes into the valleys.

b) Upper M2 of the large crumbled skull No. 304 from Trinil. (Plate XXV, Fig. 1.)

Corresponding to the dimensions of the large disintegrated skull, the two M2 are also relatively large. Its front end has disappeared through chewing. In the case of individual yokes, the side walls have completely or partially chipped off, and the cement on the crown base has also apparently peeled off. Eight yokes are still preserved on the right tooth, eight on the left and the remainder of a ninth or a very strongly developed anterior talon. It cannot be determined whether there were originally nine yokes, as on the above M2, or more. There is also no clarity about the formation of rear talons, as the cement is thickly on the rear end of the crown. On the left tooth an isolated tip of the mammary protrudes from the cement behind the last yoke, which perhaps indicates a low talon hidden in the latter. The tooth crown widens too much backwards and ends with more evenly

Rounding.

The chewing on the last yoke only affected the mammilla tips. The chewing area

is clearly convex in the longitudinal direction, it has also dug deepest between the median line and the outer edge. Incidentally, chewing is a little more advanced on the right tooth than on the left.

Little remains of the cement.

The original height of the yokes can no longer be determined because of the chewing. A slight forward inclination can be seen in the rearmost yokes. The sides of the yokes are very steep, almost vertical; the latter are therefore only slightly shortened towards the top.

The course of the anterior yokes is fairly straight and directed approximately perpendicular to the lateral edges of the crown. Only the last three yokes are curved slightly backwards. As a result of the high degree of chewing, the anterior melted figures have a rectangular outline

middle ones are wider in the middle than at the ends.

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Only the rear, less heavily chewed yokes can give a picture of the structure of the yoke backs; it is moderately strong in these. A median constriction is fairly clearly pronounced on the penultimate yoke of the left tooth. It is also found on the third and fourth from last yoke of the right tooth, but here accompanied by a further constriction

each side.

The number of equal head mummies is quite large and is short at the last

Yokes nine to ten. The enamel is thinly developed; this also applies to the outer layer, a step formation is consequently only weakly indicated. The curling of the inner, hard enamel layer is fine and even when the chewing has progressed somewhat.

Upper M3.

a) Upper M3 of Trinil's large crumbled skull No. 304. (Text figures 13 and 14.)

The upper M3 of the large skull are completely preserved. The rear sections were still under bone cover, but the right tooth was exposed to such an extent that the last yokes were accessible at least from the side. There is still no sign of chewing. The formation of the enamel is complete, but the cement is only fully developed on the front yokes and completely envelops them except for the outer mammils on the inner side, where they protrude from it. The furrows, which indicate the boundaries of the yokes in the cement, become deeper and wider towards the rear, and from the fourth yoke onwards the main nipples always protrude from it.

The front end is plump and straight in the left tooth, and slightly obliquely truncated in the right tooth. The type and degree of tapering of the rear end cannot be determined.

Fig. 13.

Front view of the foremost yoke of the upper M of the large crumbled skull No. 304. '/ •! nat. SizeFig. 14.

Rear view of a yoke of the upper degree of the great

The curvature in the vertical is, as the right tooth shows, even and moderately strong.

The position of the yokes is almost vertical, the sides are steep. The profile of the yokes is evenly rounded, with the front yokes sloping slightly lower towards the inside.

A median furrow can be seen on the second to fourth yokes of both teeth in the cement mantle, and on the left also on the first yoke. Such a notch is also found in the rear yokes, which are less covered with cement. T. indicated

Crumbled skull No. 304. '

. • \_ •

nat. Size

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X75

The course of the yokes is fairly straight on the right tooth, whereas on the left a slight s-shaped curvature from the third to the sixth yoke is remarkable. The following yokes are still completely or almost completely covered by bones, so that their shape cannot be determined.

The number of main mummies in the first four yokes cannot be identified due to the development of cement. It is noticeable that the slightly protruding tips of the outermost mammils on the inner side show a curiously holey and rough, steeply set grinding surface, similar to the above-described upper M2 of the skull fragment. There can be no question of chewing or abrasion by mechanical transport, the latter not because the teeth were found to be firmly attached to the skull. It is probable that some kind of corrosion of the perhaps not yet finished superficial enamel coating was effective during its development, perhaps with the help of pressure when it was pushed forward against the surrounding bone cover.

The number of main mummies is for the 5th to 10th Right yoke 6, 8, 8, 7, 8 and 7, for the 5th and 6th yoke 9 and 7 on the left. The 11th yoke and the low talon are almost only visible from the side. The total number of yokes in the right tooth is 11, plus a rear talon and a front talon indicated by a mammary tip protruding from the cement, which can also be recognized in the same way on the left tooth.

b) Upper left M3 # 174, probably from the Trinil area. (Plate XXV, Fig. 2.)

An isolated upper M3, found to be the left on the remaining outer ascending surface of the maxillary, was bought from a native chief near Trinil. It is generally yellow in color and still shows remnants of the yellowish weathered tuff from which it originated. Up to the fifth yoke the tooth crown increases in width, from there it narrows first gradually and then more strongly and finally tapers towards the back. The front end, on the other hand, is wide and almost straight.

The curvature of the tooth crown in the median plane is considerable.

The number of yokes is twelve, plus a front and a rear talon. The chewing is still very little. On the first yoke the dentine core is exposed only in the middle of the mammilla tips, on the second yoke these are just ground, while the other yokes are evidently not yet attacked by the abrasion. The following yokes up to and including the eighth point show a striking, straight truncation of the nipple tips, but in no case the chewing could have reached that far; rather, there must have been another cause, perhaps a corrosion phenomenon similar to that before was mentioned in the upper M3 of skull No. 304.

Cement is abundantly developed. Between the first two yokes it is evidently removed to a certain extent by chewing. In the following yokes, the valleys between the yokes are completely filled, the yoke boundaries are marked by slightly cut furrows between the cement beads. From the fifth yoke on, the furrows gradually get deeper and deeper, so that it appears as if the cement formation in the back half of the tooth has not yet been completed.

The fact that the tips of the main mammillae protrude continuously from the coat of cement enveloping the flanks of the yokes, and that the sides of the same are completely free of it, may be due to subsequent superficial weathering of the cement mass.

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Largest yoke length (at the base of the crown)

Upper yoke length (distance between the vertices

|

\

[

a b a b c d e a68

- about 57 24-26 -

- 68 - about 57 26 -

the outermost mammoth tips).

Yoke width ')

. .

- about 50 24 "

Distances between the tips of the mammoths and those of the next yoke

\ b a b a b a b c d e a b

- 22-25 - 59 59

19th

27 28 27 23-25 ​​- 23-24

Largest yoke length:

Largest yoke length:

Largest yoke length:

upper yoke length ...

(medium) yoke width.

Yoke height

-

1.4 -

-

-

.

table

Dimensions of the top

a = upper M3 of large skull No. 304. b = upper left Ma No. 174:

c = upper M3 of skull no.1650:

d - upper M3 of skull No. 1875:

e = upper M3 of skull no.225:

2nd yoke 3rd yoke 4th yoke r1r1r1r1r1

a 87z 90z 96z 97z 94 - - 95 b -approx. 68 77 -82 -85 -86 e

d

e 86

front talon

1st yoke

- 7-14

-

19-20-19-20

The yokes are high in the anterior part of the crown and then become lower and lower towards the rear in an even manner; they are furthermore clearly inclined towards the front, the foremost to a somewhat greater extent than the rear.

The side surfaces of the yokes are very steep on both sides, and to a fairly similar extent. The tips of the mammoths lie in a flat, evenly curved arc.

The first two yokes are fairly straight. In the third, a few mummies have advanced in the middle. From the fourth yoke on, a weakly lingual pre-bend of the mammilla rows is always noticeable lingually from the midline, which is repeated up to the penultimate yoke.

The front talon is narrow, thicker on the outside and a little higher than on the

1) Measured on the outside of the base. The upper widths of the yokes including cement are significantly larger, because they lie on a larger radius because of the strong curvature.

56 55

1.5z 1.6z 1.6z 1.6z

about 1.6

4.0z -3.8 -

4.3

4.3

about 1.5

54

4.5 -

1.6 -1.6

z means that cement

-

54 1.4 1.5

4.4

86

68

76z 79z 68z 76z 64z 71z 61z 64z

——

26th

- - 23-24

- 23-37 - 24-17 -

-

19-21

-

17-21

- -

- - - -

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No. 5.

M3 in millimeters.

Length = 256, greatest width on the left. Length = 171 (right), 143 (left). Length = 200 (right), 176 (left). Length = 193 (right), 180 (left).

5th yoke 6th yoke 7th yoke 8th yoke 9th yoke 10th yoke 11th yoke 12th yoke r1r1r1r1r1r1r1r1r1

\_\_\_ \_ \_\_\_\_\_\_\_ 93 86

—————————

86 85 85 83 77 69 60 44 32

87 85 85

85z 85 85z

———

87z 84z 81z 82z

82 81 79 75 70 71 62 62 about 45 49 81z 84z 77z 80z 69z 73z - - - -

- - ————————— 67 69 67 70 63 62

- - - 60 - 61 - - 47 - - -

about 59 58 about 56 40 about 30 about 17

-

- - —20-22 22-23 —20-22—17-19 —16-18 - - -

21 20 14

——

19 19 19 19 19 19 19 19 19 19 19 about 18 19 about 13 13

21 22 22

19th

19th

26 25-29 27 30 27-30 26-30

———

19 19 21 21 22 21 20 about 20 about 21

23-31

23-24

20-22 ———— ——— —————— -

———————— 56 55 50 47 45 44 39

1.3 1.4 —————————

31

approx. 1.9

4.5

—— 4,6z 4,3

z

4.0z 3.9 -

3.9

2.

3.9z

3.9z zzz5: 3.5z 3.8 3.4 3.6 approx 3.2 approx.

——— 3.2z -

about 1.5

4.1

1.5

4.3

1.4 1.4 1.4 1.5 1.5 approx. 1.5

\_

4.0 3.7 3.7 3.8 3.2 3.1

4.6 4.5 4.5 4.3 4.3 4.2 4.0 3.7 3.7 approximately 3.4 3.3 approximately 3.5 3.8

———————

1.5 1.6 1.7 1.6 1.5 1.4 1.1 1.0

is also measured.

inner; it is almost the length of the first yoke. A mammilla located approximately in the middle, the tallest and thickest, lies directly against the front wall of the foremost yoke.

As a result of the strong cement development, it cannot be determined whether there is a clear indentation and constriction of the yokes.

Up to the tenth yoke seven to nine protruding main mummies can be counted, on the eleventh yoke there are six, on the twelfth yoke five and on the rear talon three. The shortening of the yokes towards the rear end is fairly uniform, so that the separation and designation of the thirteenth yoke as the rear talon is arbitrary.

From the ninth to the twelfth yoke, the base of the crown, especially on the inside, is somewhat bulky.

The side surface of the crown base and the lower sections of the yoke sides have very fine, wavy crimps on the enamel surface.

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Back talon

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c) Upper M3 of Trinil's No. 1656 skull.

The eight back yokes and the back talon on the right tooth, and the yokes and talon on the left 6Y2. On the right the lateral ends of the front yokes are missing.

The left tooth tapers fairly evenly towards the back, the right tooth has the inner side curved and the outer straight. Inside, a low basal bulge is not very developed.

The chewing is irregular in the last three yokes in that it is considerably more advanced on the outside than inside, while in the previous yokes the chewing surface is flat and fairly evenly concave. The chewing surfaces dip noticeably towards the level of the palate on both sides.What is remarkable is the relatively large number of yokes with roughly the same amount of chewing, which can be seen on the right in the five in front. The yokes form clearly pronounced arches open to the rear; the curve of the third to last yoke is weaker, the last two yokes are slightly s-shaped.

The fused figures end at the front yokes, as far as these are at least preserved, on the outside rectangular, but on the inside pointed.

The foremost yoke of the right tooth is relatively well structured by three indentations in the front edge of the enamel. The following yokes, on the other hand, have a simple shape of the abrasion figures. The curling of the enamel is uniform.

d) Upper M3 of Trinil's 1876 skull.

There are the last eight yokes of the right tooth, the front of which the outer half is missing, and a remnant of the ninth, of the left seven yokes, the front of which is outside e.g. T. has broken off, and a small remnant of an eighth. The rear ends of the teeth are encased in a thick cement coat, in which a rear talon is probably still hidden in the right one, and perhaps likewise in the left.

The crowns taper fairly evenly towards the back. They converge very strongly towards one another and in the second yoke of the right tooth - not counting the foremost remnant of the ninth - they are already approaching one another to a distance of 5 cm. The chewing surfaces are deeply hollowed out, especially on the outside. The maximum of the chewing is particularly far out in the case of the right tooth, where consequently the outer parts of the anterior yokes have already been lost, while the inner ends have been little worn and protrude high and pointed. The lesser chewing on the inside can perhaps be explained by the fact that

significant convergence of teeth whose inner edges are outside the area of ​​the grinding chewing

surfaces remain with the chewing movement. The pre-bending of the heavily worn yokes is less. Only the last yokes are not affected by the chewing. The chewing surface that has been preserved is therefore quite short, it encompasses the yoke on the right, and it can be seen from the position on the palate and the position of the root holes at the front end of the tooth that not much of the original chewing surface can be missing.

The structure of the yokes is small. The small enamel folds are relatively deeply folded, especially on the anterior enamel margins of the anterior yokes, which makes the enamel appear rather thick.

Accordingly, the very. asymmetrical chewing of the right tooth, the enamel bulges end here pointedly on the inside and broad on the outside. In the left tooth this difference in the ends is the same

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only slightly pronounced in the second yoke, while the first yoke is broad on the inside, the third ends pointed on both sides.

The third from last yoke shows six main mammils on either side, the penultimate of the right tooth has five.

e) Upper M3 of Trinil's No. 225 skull. (Plate XXIV, Fig. 2.)

The last two molars of the large skull No. 225 are in good condition, of which the right has the last nine yokes, the remainder of the last tenth and the posterior talon, and the left apart from the latter six yokes and parts of the two preceding ones. Both teeth rejuvenate evenly towards the rear, with the right tooth at the back being narrower than the left.

The chewing surfaces are strongly convex in the longitudinal direction, particularly strongly curved in the anterior yokes, in addition they are hollowed out transversely to them, deepest in the anterior yokes somewhat lingually next to the center. The chewing is more advanced on the left tooth than on the right.

Cement still covers the base of the tooth crown, the depths of the posterior valleys, and completely envelops the posterior talons.

The structure of the enamel of the yokes is moderate. On the right, the three front enamel girdles are divided into two somewhat unequal sections by a front and rear constriction. On the left tooth, the second and third to last yoke are divided roughly in the middle, which is less pronounced on the right with the corresponding yokes.

The main mammill number, which can only be determined from the last yokes that are still slightly chewed, is six on the right of the last two yokes and seven on the left.

All yokes, with the exception of the last three, are very slightly convex forwardbent.

The enamel belts of the front, heavily chewed yokes are designed quite differently in the two teeth. On the right end they are pointed on the outside, rectangular on the inside, on the left on the third and fourth from the last they are pointed on both sides, on the fifth from last both sides are rectangular, on the sixth from last they are pointed on the inside, and on the outside apparently at right angles - however, the lateral enamel wall has broken off here.

The enamel is of moderate thickness, the folds are moderately fine and even. The rear talons are very low and, as already mentioned, still completely encased in cement.

Lower M2,

a) M2 of the large lower jaw No. 823 from Trinil. (Plate XXII, Fig. 4.)

The front end of both teeth has disappeared due to chewing. In addition, the first yokes of the left tooth are missing some broken pieces. The last six yokes and the posterior enamel wall of the preceding one are present on both sides. In the following description, since no tooth in the material under investigation provides information about the complete yoke formula, they will be referred to in the order from the beginning as first to seventh, as they are present on the incomplete tooth in question. In the table, the names of the yokes are x + 1 to x + 7, where x corresponds to the number of missing. A short rear talon has been developed on the left, while the few insignificant mummies on the right in its place can hardly be described as such.

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The lateral curvature of the crowns is clear. Its base widens noticeably in the area of ​​the last yokes, which is reinforced a little by the thin cement covering that is only preserved at the back.

The chewing affected all the yokes, even in the last one it has already exposed the dentine core.

Largest yoke length (at the base of the tooth crown)

Upper yoke length (distance between the vertices of the outermost mammalian tips)

about 68 about 36

71 approx. 43

Yoke width

Largest yoke length: width)

——

approx. 15-19 approx. 19 approx. 13 15

Table No. 6.

Dimensions of the lower M2 in millimeters.

a = teeth of the large lower jaw No. 823: length = 16 (right and left). b = teeth of the lower jaw No. 1238/39: length = 81 (right), 87 (left).

(middle yoke

3.9

x-f- 1st yokex + 2nd yokex-f3th yokex + 4th yokex + 5th yoke 6th yoke r1r111r11

79-82 80 83 82 87z 87z 89z 74 75

x + 7. yoke

rear talon r1

- 19th

16-23

4.0

16-23

4.2

20-23 - 24 22-23 approx. 24 approx. 24 approx. 16-19 approx. 18 - approx. 9

20 - 3.6 3.9 j approx 3.7 approx 3.7

- - | 3.7 3.8 approx. 4.0 approx. 3.7 - - z means that cement is also measured.

The surface of the chewing is flat concave in the longitudinal extension of the tooth, while it is inclined towards the outside on the front yokes, which is related to the more pronounced chewing. On the left tooth, the chewing surface is lingually deepest from the median line. This phenomenon is clearly pronounced on the front yokes.

There is only a small amount of cement left. It fills the depth of the last two Jochtal valleys and is also found as a thin coating, as far as it has not crumbled off, on the sides and the rear wall of the crown base.

The original height of the yokes can no longer be determined at the degree of chewing. The same applies to the front yokes with regard to any inclination. In the case of the rear, it is the cement that prevents anything from being established. Pie sides of the yokes are steep on the outside and sloping on the inside.

The width of the yokes is rather small at the front, whereas the width of the rear yokes is much larger (see table).

The last four yokes are almost straight and almost perpendicular to the side edges of the crown. The first cluster together with their ample outer halves, somewhat converging against each other. Since the outer sections maintain the vertical direction towards the outer edge, a kink occurs lingually from the center, which can be clearly seen in the second and third yokes.

With advanced chewing, as on the front yokes, the melting figures are wider in the middle than at the ends, which is due to the fact that at the level of the chewing surface the yoke is thickest in the middle. By digging the abrasion deeper in the middle, as with the left tooth, the character of the enamel figure is then reinforced.

| 20th

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lg; [

A constriction in the middle is clearly marked on the fourth and fifth yokes and was probably originally also present on the third. But they don't show the last two yokes.The number of main mummies on the penultimate yoke is nine on the left. The last yoke is longer on the left than on the right. The left rear talon consists of four mammilles, on the right there is only one larger and two very insignificant, low ones. Accessory, solitary, low nipples are found on both teeth on the outside above the base between the fifth and sixth yoke, also in a tiny size between the fourth and fifth, further outside next to the last yoke, a larger one on the right and two very tiny ones on the left .

The enamel is rather thin when the chewing is advanced, but thicker at the beginning, because the outer enamel layer is then even more abundant. In the case of the last, wider yokes, the outer layer of enamel is thicker and, as a result, there is only weak banding.

b) Lower M2 of the lower jaw No. 1238/39 by Trinil.

Only the back three yokes are present on both sides, of which the third from the last is only incomplete; everything else has gone through wear and tear. The chewing is of course very advanced. The chewing surface is weakly hollowed out transversely to the longitudinal extension. The outer edge has been preserved the highest, especially on the right tooth. Cement is only available to a very small extent at the outer end of the Jochtal valleys.

The third to last yoke seems to have been slightly curved, according to the posterior enamel wall, which is alone. The penultimate yoke describes an arch open to the rear, as does the last. The latter is shortened on the outside of the right tooth. The talons negotiated on both sides widen towards the inside.

The inner layer of enamel is thin and fine and evenly crinkled. Lingual from the talons there are two low mammilles on the left that have not yet reached the chewing area, on the right one large and high one.

Lower molar. (Plate XXIU, Fig. 4.)

The present fragment of a lower right molar, probably found to the northwest of Trinil, comprises four complete yokes and also a fifth anterior one, which lacks the anterior enamel wall. Despite the shortness of the piece, the sideways curvature is quite noticeable. The chewing is far advanced in the anterior yokes; in the last it has already exposed the dentin core of the mammilla to a considerable extent.

In the profile view, the chewing surface is slightly curved in the outer half, it sinks deeper towards the inside and then rises steeply on the inside. The cement is deeply worked out on the front yokes.

The yokes are all curved or, perhaps more correctly expressed, kinked. The ridge of the rearmost yoke is, to be sure, fairly straight, but the exposed rear wall bends too much forwards towards the base, so that with more chewing the curvature of the yoke would become more pronounced. Towards the outside, as it were, the yokes cluster somewhat against one another. The structure of the two rear yokes is moderate, with a central notch

following:

Greatest length width

Greatest length:

1st yoke

-

2nd yoke

73 17-21 3.84

3rd yoke

72 17-21 3.79

4th yoke

72 17-21 3.79

o. yoke

72

-

medium width

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well educated. The latter is also faintly indicated in the preceding third yoke, but in this case the enamel belt is otherwise very straight and unbroken. This character is even more pronounced in the second and the rear enamel wall of the first yoke, where strikingly straight lines have emerged. The enamel is tight and evenly puckered. The last yokes show only a small amount of gradation in the enamel.

The largest yoke length is smaller than with all other M3s, if you disregard the last yoke that becomes shorter and shorter towards the rear. The fact that this piece cannot belong to the rear section of an M3 is evident from the approximately equal length of the yokes. It can therefore only be an M2 or maybe even Mj. The dimensions are the

The present tooth is remarkable due to the great similarity of the kinked course of the yokes with that of the original teeth of the Stegodon Airawana at Martin (New Stegodonts). There is also agreement as to the structure and folds of the enamel. On the other hand, it cannot be doubted that the tooth belongs to the same species as those found at Trinil himself, since it adjoins the M2 of the large lower jaw No. 823 in all essential points.Lower M3,

a) Lower M3 of the large lower jaw No. 823 from Trinil. (Plate XXV, Fig. 3 and text figures 15 and 16.)

The lower jaw, which probably belongs to the large decayed skull No. 304, has the last molars in complete preservation on each side, which are exposed by favorable fractures through the posterior parts of the jaw branches.

The teeth are strongly curved and twisted. The curvature is strongest at about 1/3 of the entire length and is a little more sudden on the left tooth than on the right. The rear end is pointed by a clearly contrasting bevel on the outer side.

The yoke number is 13, and there are also front and rear talons.

The chewing has only ground the mammilla tips of the first two yokes without exposing the dentin core.

Cement completely envelops the front yokes, unless the chewing has removed it. The yoke boundaries are indicated by strongly pronounced furrows, which towards the rear, corresponding to the less and less advanced stage of cement excretion, are getting deeper and wider

will. The four rear yokes are still completely devoid of cement.

The tooth crown has a very slight basal bulge on the outside in the area of ​​the last yokes

on which a few low, clumsy and dull mummies sit.

The yokes are strongly inclined forward. The front ones are pretty high, the back ones will

on the other hand, they gradually get lower and lower and take on a roof-like shape in the side view.

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The side surfaces of the yokes are steep, on the outside in the front part of the crown a little more inclined.

The mammilla tips lie on a very flat arch, which is somewhat asymmetrical in that it slopes more deeply outwards than inwards.

The course of the yoke ridges is fairly straight, but the yokes, especially the rear ones, bend clearly forward at the bottom with their middle, so that if the chewing is severe, the enameled figures would bend forward in an arched manner. In the middle yokes, approximately from the fifth to the tenth, a central notch is formed in the yoke crowns.

Fig. 15. Fig. 16.

View of the lower right dimension of the large lower jaw No. 823. '/ s nat. Size Anterior view of a yoke of the lower right molar of the lower large jaw No. 823.

1/2 nat. Size

The number of main mummies should be given as six to eight; on the right the twelfth yoke has five, the thirteenth three and the rear talon one mammilla, while the left tooth has four or five on the last yoke and five mammilles are present on the talon.

The front talon is short and narrow and turned on the outside.

The rear yokes, which are not yet covered by cement, have a peculiarly bumpy, rough surface with vertical furrows on their front and rear walls. The base of the tooth crown is covered with longitudinal, fine, undulating wrinkles, particularly noticeable on the inside.

b) Lower M3 of the lower jaw No. 1238/39 by Trinil.

In addition to the rearmost ends of the M2, the lower jaw No. 1238/39 also bears the last molars. The right one is missing some yokes behind; the left one is completely preserved, but in order to be able to be examined in its entire length, its rear part had to be freed from the bone covering lying on it. The teeth are stained brown in many places by iron, they give the impression that they were superficially attacked by weathering. The enamel is also noticeably rough on the anterior yokes and its contours are rather unclear and washed out.

The tooth tapers evenly towards the back. The outer side of the left tooth crown is covered by bones in the area of ​​the last yokes, so that the outline cannot be precisely determined. The crown of the tooth is strongly curved and at the same time strongly rotated, in a sense it screws itself out of the jaw from the back to the front.

The number of yokes is 13, plus a front and a rear talon.

The chewing exposed the dentine core in the first three yokes, while on the fourth only the tips of the mammilla were abraded.

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:

Largest yoke length, upper yoke length

.

Largest yoke length: (medium) yoke width

b d a e

approx. 3.9

- 3.8 4.1 4.2 4.3 4.1 approx. 4.3 - -

Largest yoke length:

Yoke height.

. . .

- 1.5

z means that cement

|

b {e a {c

t

1

about 3.24.0z about 4.7z 4.2z '4.1z 4.2z 4.0z 4;

4.3- -

Table dimensions of the lower M3

a = lower M3 of the large skull no.823:

b = lower M3 of the small lower jaw No. 1238/39: c = right lower M3 No. 26:

d = lower left M3 of lower jaw No. 845:

2nd yoke 3rd yoke 4th yoke 5th yoke r1r1r1r1r1r1

a —ca38 76z 76z 83z 82z 89z 86z 91 - 90 -

Front talon

1st yoke

Largest yoke length (at the base of the b about 39 - 64 65 76 77 77 80 82 82 82 80)

Crown)

Upper yoke length (distance between the vertices of the outermost mammule

Distances of the mammillary tips from those of the next yoke. .

( 1

{

c 83 - 81 - d

a25—43 49 approx. 45 58— b 4746

-

————

approx. 46

a approx. 9 approx. 12 19 approx. 16 18-22 18-22 19-23 17-26 19-24 17-26 19-23 18-23

c.

b about 10 about 10 17 16 18 18 19 about 18 d

a——

18-26

17-23 16-20 17-23 -

a 1,8z 1 b

i c

1.7z approx.1.8z

\_\_\_\_

f

- -20-18-25 18 19

-

-

60 -

1.9 -

1.8 1.7 about 1.8 -

-

a-2

-

The somewhat hollowed-out chewing surfaces are not inclined towards one another to any great extent.

The cement clothing is plentiful. Apart from the foremost yokes, where cement has disappeared through wear and tear, and the last yokes, where the formation of it was apparently not yet finished, the yokes are enveloped down to the outermost tips of the mammilla. Only the side surfaces of the yokes, especially on the inner side, protrude largely from the cement. It is, however, to be expected that the weathering eroded the cement covering of the surface and perhaps z. T. removed. The boundaries of the individual yokes are characterized by shallow furrows.

The yokes are clearly inclined forward. On the outside, the side surfaces are steep, on the inside a little more inclined.

The mammilla tips lie on a very flat arch.

The course of the yokes is fairly straight, but not entirely perpendicular to the longitudinal axis, rather the outer end is pushed a little forward towards the buccal. The first yoke of the left tooth is curved into a flat arch open to the front.

The first yoke is on. both teeth divided by indentations from the front and back into two sections not very different in size. The subsequent yokes leave a remarkable one

91

91 91 91

92 89 90 87

86 76

-

-

approx. 60

2434 22

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-

-

-

57 61 55 - 48 47 - 47

55 58 50 approx. 54

The Proboscidier Skulls from the Trinil Expedition Collection.

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No. 7.

in millimeters.

Length = 304 (right), 303 (left). Length = 215 -f- (right), approx. 266 (left). Length = 241 +.

Length = 174 +.

6th yoke 7th yoke 8th yoke 9th yoke 10th yoke 11th yoke 12th yoke 13th yoke r1r1r1r1r1r1r1r1r1

- - - 72 - 76 74

- - - 67z about 53z

-

78 ———————————

77

-

77

76 47 - - 49 - - - -

- - -

58

48 46

44 ————————. 35 —29 —19 ———

19-24 19-22 21-27 20-25 22-27 22-26 23-26 22-25 23-26 22-24 19-23 21 19 21 16 16-19

-

——

-22 22 -19-16

19-23 - 19-24 18-22 21-25 19-23 21-25 19-25 20-24 23 22-25 20 22-24 20-23 - - - - 18-2315-21 18-2318-20 —20-22 —18-22 - 22-21 —19-22 - - - - 18 —19 —21 —21-25—23-26—19-24—16-21 ————— 61 - 61 61 58 59 56 59 56 61 53 60 52 51 47 48 31 45

\_\_——

-

56 - 54 - 54 - -

58-58

1.6 - 1.6 1.5 1.7 - 1.7 1.6 1.7 about 1.6 1.6 - 2.1 1.7 about 2.2 about 1.7 - 1, 8th

1.8 - - 2.1 2.3 - about 2.8 -

4.2 - 3.8 4.0 3.7 3.8 3.6 4.0 3.6 3.7 3.6 3.9 3.5 3.6 Ccl.OjO tJ.ö - -

———

————— - -

\_\_

3.5 3.7

approx.

3.8

1.5 - 1.5 1.5 1.6 1.6 1.6 1.5 1.5 1.4 1.4 1.4 1.3 1.5 approx. 1.1 1.2 ——

Not recognizing the structure of the crown. The main mass of the anterior talon lies buccally from the center. The chewing has removed the entire height of the posterior enamel wall in places, so that the dentin cores of the anterior talon and the first yoke are fused together.

The number of main mummies seems mostly to be about seven, at the rear end the number decreases, at the rear talon there seem to be only three to four.

As already mentioned, the enamel of the front yokes, which have already been used, is also somewhat weathered, so that the degree of wrinkling can no longer be clearly recognized.

c) Lower M3 # 26 from Trinil.

The present right third molar comprises ten yokes and the posterior talon, while the foremost yokes have broken off. The weathering has severely attacked the dark brown cement and completely removed it in places. The chewing has only sharpened the tips of the mammils of the first two yokes, namely in an inclined plane that descends deeper on the outside and here

on the foremost yokes has already exposed the dentin cores of the outer mammillae. Selenka-Trinil expedition. 24

——---- ——

1.3 1.3 1.4 1.4 1.3 approx

is also measured.81

67 75 about 53 about 58

70 32 45

about 40

- - - - - -

approx. 42

-

20th

- ———

Back talon

186

W. Janensch,

The tooth is strongly and evenly curved and at the same time clearly rotated, the base also describes a weak, upwardly concave curvature. The rear part of the crown is quite narrow and quite high in relation to it.

Cement is still abundant and originally apparently also covered the tips of the nipples and the entire flanks of the tooth crown.

On the outer side, the base of the crown is slightly thickened.

The yokes are all clearly inclined forward, they are crooked in the sense that the inner end is advanced.

The sides of the yokes are very steep on the inside, almost vertical, on the outside a little more inclined.

The number of mammilles is six to seven on the foremost yokes, four on the penultimate and its predecessors, and three on the last. The rear talon consists only of a single, very low mammilla.

The base of the crown and the lowermost portions of the sides of the yokes are superficially curled in the longitudinal direction.

The tips of the mammils are arranged in fairly straight rows.

d) Lower M3 of lower jaw No. 845 from Trinil.

The lower jaw No. 845 bears the incompletely preserved left last molar. In front only the dentin core of the crown base is left, while behind four heavily chewed yokes and the rear talon are preserved.

The tooth tapers backwards. The melted figures are strongly curved, and indeed asymmetrically in such a way that the outer wing of the arch bends significantly more backwards. The figures end in a rectangular manner towards the inside, while they taper towards the outside.

The structure of the melt figures is insignificant. The enamel is moderately thick.

The dentine core of the posterior talon has not yet been exposed by chewing. There are four mammilles to be seen on him. In addition, there are a few very slight warts on the back wall.

e) Lower M3 No. 1254 from Trinil.

The fragment of a left branch of the lower jaw, which is described as questionable from Gendingau, bears the larger fragment of a tooth, which owing to its tapering towards the rear, should be regarded as the third molar. The weathering has already attacked the outstanding parts of the enamel, and parts of the cement coating have broken out. Sections of the crown are missing in front and behind.

The almost flat chewing surface, which descends more deeply on the outer side, has grinded the sixth of the existing yokes, while in the first three the dentin core is exposed in a contiguous zone.

Cement completely covers the last two yokes and also the crown base, at least on the outside, in its rear section. The boundaries between the individual yokes are

Barely noticeable in the cement as shallow depressions.

A basal bead is not developed on the existing tooth section.

The yokes lean forward and are in the same position as that of the mandibular molars

Make something diagonal by advancing a little with its inner end. The sides of the yokes are steep.

7th

1) In this formula, X means the talon.

The Proboscidier Skulls from the Trinil Expedition Collection.

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The structure of the yokes is even and insignificant.

The chewed yoke has three symmetrically located constrictions protruding from the front and rear, the next one having four slight constrictions. The wear and tear of the outer layer of enamel has caused a weak step formation between the front yokes. A median notch in the crown can be seen on the fifth and sixth of the existing yokes.

The base of the crown shows the fine longitudinal grooves in fairly regularity.

Since the position of the yokes cannot be determined due to the lack of the front and rear ends and their dimensions cannot be classified in the table, the few numbers are given here: length of the second to sixth yoke 80, 81, 83, 84 e.g. .83 z mm, width of the second to fourth yoke 20-21, 20-21, 20-21. The ratios of yoke length to (average) yoke width are accordingly 3.9, 4.0, 4.0 for the second to fourth yokes.

Summary of the dentition of Stegodon Airawana Martin and comparison with other species.

There are no indications that the teeth described above do not belong to a single species, but rather come from several species. The teeth of the same rank show only minor or similar deviations from one another, as experience has shown within a proboscidial species, such a slight fluctuation in the number of yokes in the third molars, or as can even be observed in the right and left teeth of a single individual, so the difference in the curvature of the lower molars, in the formation of the talons and the type of chewing. The essential characteristics of the teeth of different ranks adjoin the preceding or succeeding one in such a way that there is no crack at any point which would have to be explained by species diversity.A compilation of the main characters of the dentition on the basis of the available material should follow here. In addition, it should be emphasized at the same time that when processing further materials, limitations or extensions of the characteristics can arise later, quite apart from the fact that the anterior upper premolars and all anterior lower molars up to and including the anterior real molars are not at all , and the lower second molars are only represented in the posterior sections in the collection of the Selenka expedition.

The yoke formula is, as far as known so far: Mm? 5 X X X M X? X X 9X XU — 12X X13X

Dubois recently states (Trinil-Fauna, p. 1256) that the number of yokes of the last lower molars in the Trinil stegodon goes up to at least 14, but it cannot be seen from his information whether he is counting the talons.

A strong constriction of the anterior part of the crown seems to be characteristic of the Mm2. The character of the yokes of the upper deciduous molars is more roof-like than wall-like. The same can be said for the first upper real molars. The second and third upper molars have a more wall-like design of the yokes. In general, the yokes are positioned noticeably forward. The outside and inside of the yokes are steep. The last upper and lower molars narrow strongly towards the rear. A basal widening of the crown base is sometimes weak.

The second, maybe halfway

24 \*

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W. Janensch,

With strong and even chewing, the yokes show a forward convex curvature. The structure of the yokes is moderate. There is often a median notch in the yoke crests, as well as often on the side. However, the enamel figures are usually simply or slightly indented. An outer and an inner enamel layer can be distinguished. The inner hard enamel layer is thin and fine and evenly puckered. The outer, soft enamel layer is of moderate thickness, so the formation of steps that occurs with chewing is not very noticeable. (Compare with the section given above on the formation of enamel at Stegodon

Airawana.)

Table No. 8 gives the ratios of the yokes of St. Airawana's molars derived from the

Individual tables are compiled. In each line of a heading, the smallest and largest amount of the relevant ratios of a tooth are entered. The numbers of the first and last yoke are not taken into account, since their size is often influenced by their position at the ends, and taking them into account would then disturb the picture. For the same reason, the yokes behind the eighth yoke in the upper M3 and the yokes behind the tenth yoke in the lower M3 are not taken into account, in which the ratios are taken into account by the backward

adjusting taper of the tooth crown can be influenced.

Table No. 8.

Compilation of the ratios of the yokes of the molars.

Largest yoke length:

upper yoke length.

Largest yoke length: (medium) yoke width. •

Largest yoke length:

Yoke height

. .

. . I.

1.4-1.6 1.7-1.9 1.5-1.7 1.3-1.4

Upper Mm2 Upper Mnii Upper Mi Upper M2 Upper M3

1.3-1.6 1.3-1.6 1.3-1.5 1.5-1.6 1.3-1.4

. 1.2-1.4 1.4 - approx. 1.6

Lower Mon

-

Lower M3

1.5-1.7 1.7-1.8 18

4.0 3.2-3.8 3.5-3.7 3.2-3.7 3.8-4.0z 3.6-4.2 3.6-4.3

3.4-4.3 3.8-4.3 3.7-3.9 approx. 3.4-4.1 3.7-4.4 3.9-4.0 e.g.

3.9 z-4.6 z

- 1.8-1.9 1.7 1.7 1.6

4.1-4.3

The table shows that the ratio of the greatest to the upper yoke length, which expresses the narrowing of the yokes upwards, or the steepness of their sides, and also the ratio of yoke length to yoke width, is different due to the number of teeth moved within the same limits. The ratio of yoke length to yoke height, on the other hand, evidently shifts a little from front to back in favor of the latter. This fact means a certain increase in specialization in the posterior and later molar teeth.

The tusks, which are certainly from Trinil, show slight to moderately strong curvature, which falls entirely or "almost entirely in one plane, with only a slight degree of rotation. They generally show the same character, so that we can safely use them, including the skulls that are not present belonging to Stegodon Airawana.

On the other hand, we cannot simply attribute the tooth of unknown origin, which is distinguished by its strong twisting out, to the species mentioned, since it is possible that it originates from another f'roboscidier species. We cannot therefore extend the diagnosis of the Stegodon Airawana to include the character peculiar to this tusk.The Proboscidier Skulls from the Trinil Expedition Collection.

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To compare the dentition of the Trinil stegodonts, the species already listed by Martin von Java are to be used. This is called (Neue Stegod. S. 3) Stegodon Cliftii Falc. et Cantl., St. Airatvana Mart., St. bombifrons Falc. et Cantl. var. and St. trigonocephalns Mart. First of all, the two Javanese species St. Airatvana and trigonoceplialus established by Martin will be considered. The basis for comparing these forms is provided by the

Martin's treatises as well as his own personal investigations of the Javanese material on suffering, supported by the gracious approach of this scholar.

The species Stegodon Airatvana was founded on two mandibular branches that belong together and each bear a tooth. Since the width of the latter increases towards the rear, apart from the last yoke and the adjoining talon, it cannot be M3, but only one of the preceding molars. The dimensions and above all the large number of yokes make it appear most likely that the second true molars are present.

Martin specifies the characteristic features of St. Airawana: shallow longitudinal gaps in the tooth crowns, three-sided abrasion figures, thin and finely crinkled enamel, relatively slender and narrow yokes, insignificant cement cladding and V-shaped inclined chewing surfaces.

Martin suspects that part of a lower molar belongs to the same species, which he had earlier (Foss. Mammals. Plate VI, Fig. 1) with reservations drawn to St. trigonocephalus. This change of view seems to me to be entirely justified, since the delicacy of the enamel, the poor structure of the yokes and the lack of well-developed step formation speak for St. Airawana. I also believe with certainty that the short fragment of a lower molar that Martin (Foss. Mammals. Plate III, Fig. 2, p. 51) from St. Cliftii expected to have to be moved to St. Airawana. In the thinness of the enamel, the fineness and evenness of its folds, in the slightly curved course of the enamel shape and its widening towards the inside, there is a very great similarity or agreement with the Martian species; the ratio of yoke length to yoke width in the right type tooth of St. Airawana is 3.7: 4.2, so it is exactly the same as that of the large lower M2 of Trinil. The

Species identity does not seem to be in doubt in view of the extensive agreement. The dentition of the Stegodon trigonocephalus Mart. differs from that of St. Airawana in some points noticeably, if both species are close. From the remains known so far, the dimensions of St. trigonocephalus have generally been more considerable. Martin (Neue Stegod. P. 102) gives the median column of the tooth crown, roof-shaped shape of the yokes, fine puckering of the enamel, a relatively high number of yokes, as characteristic features of the latter type,

9\_l\_4\_i\_7 for which the rather incomplete formula Mm -

? + (9 10)? (10-IIP -f

could be set up, kinking of the not yet chewed yokes along the gap, appearance of a laterally deep indentation of the enamel belt with half-worn yokes and possibly outward to further, less deep indentations, frequent forward curvature of the yokes, tendency to assume a rhombic cross-section, which disappears with stronger chewing, rather abundant development of the cement.

Of these features, I emphasize the more pronounced structure of the yokes as differing from St. Airatvana and particularly important.

The lateral folds of the enamel of the yokes are particularly evident in the case of heavy chewing. Significant for this are the molars shown in Martin Plate I, Fig. 1 (Vorweltl. Probosc.) And Plate IV, Fig. 2 (Foss. Mammals), which show an irregularity of the enamel figures, as I do in St. Airatvana have not found.

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M——

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W. Janensch,

On the basis of my own investigations, the following remarks should also be made: In St. trigonocephalus the outer, easily wearable enamel layer is thicker than in St. Airawana. In connection with this, when the yokes are abraded, the enamel is stepped much more pronounced than in the other species. This character can be seen particularly clearly in the tooth depicted by Martin (Vorweltl. Probosc.) Plate I, Fig. 1, also Plate IV, Fig. 2 (Foss. Mammals.) And the lower last molar in Neue Stegod. Plate III, Figs. 5, 6 show this peculiarity well. The width of the yokes in St. trigonocephalus is somewhat larger in the large, probably last upper molar (Vorweltl. Probosc. Plate I, Fig. 1), in which the ratio of yoke length to yoke width is 3.3: 3.5. On the other hand, in the right Mmx of the Leiden type skull, the amounts for the ratio of the greatest yoke length to the upper yoke length and of yoke length to yoke width are within the values ​​determined for the last deciduous molars of St. Airawana. The outline of the second deciduous molar of the Leiden skull is designed differently. It is namely regularly elliptical,thus lacks the characteristic indentation that can be found at St. Airawana. As a result, in the Mm2 the course of the anterior yokes is much more irregular in the latter species. In the case of the lower molar of St. trigonocephalus, plates III, Figs. 6 in Neue Stegod., Which, judging by its gradual tapering towards the rear, should represent an M3, the rear, broadly truncated ending, which stands in stark contrast to the much more pronounced tapering at St. Airaioana. An external, it seems, constant difference is finally the larger size of the teeth of St. trigonocephalus.

A very certain proof that the large cited trigonocephalus molars belong to Martin's type skull, which incidentally seems to me quite likely, has not yet been produced and, given the incompleteness of the material known up to now, cannot be produced. In any case, St. Airawana differs significantly from both. The question then arises whether there are one or two other fossils on Java besides this species. Until the latter is proven, it is best to let the best in question, insofar as they cannot be placed at St. Airawana, together at St. trigonocephalus. Certainly, one will not always be able to tell apart tooth fragments of both types.

Incidentally, I also seem to be considering whether the teeth that Martin referred to as St. bombifrons might not belong to St. trigonocephalus or St. Airawana. In Plate V, Fig. 2 in fossil. Mammal, the fragments shown seem to me to belong to one of the Javanese species because of the height of the yokes.

The two tooth fragments of the upper molars (Neue Wirbelt. XII, Fig. 1 and Neue Stegod. Plate III, Fig. 7), which Martin connects to St. bombifrons or describes as a variety thereof, are very difficult to determine according to their species. first because of the extremely thick cement coat, then because of the lack of strong chewing and characteristic abrasion figures and finally because of the apparently abnormally exaggerated curvature of the crown in the longitudinal direction.

If we compare the Triniler Stegodon with the species of the Siwalik, we can immediately eliminate St. Cliftii and bombifrons. Apart from the much greater thickness of the enamel, the number of holes in the molars is so much smaller that it cannot be attributed to one of these types. According to Lydekker (Catal.) The number of yokes of the M3 increases to a maximum of eight at St. (liflii, and a maximum of nine for St. bombifrons.

The difference in the yoke formula compared to St. insüfnis is much smaller. According to Lydekker

the yoke number of the upper Mm is 5-G, the upper Mm, 7, the M, -M 7-8, 7-8 and 9-11, the 23rd

lower M-, 9-13. Beyond these numbers, those of St. Airawana of Trinil go beyond the top

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M2 with 9 and with the upper M3 with 11-12. According to Dubois, as already mentioned, the number of yokes of the lower M3 increases to 14.

Even if the differences in the maximum number of yokes do not differ widely, it is nevertheless noteworthy that the minimum number of trinil last molars does not go nearly as far down. It should be noted, however, that the molar material of the Siwaliks and the present one of Trinil cannot be compared with one another, and that furthermore the possibility is not excluded that in the former several teeth are difficult to distinguish or not at all distinguishable Species may be included.

The question of whether St. insignis and ganesa are different species, which Dubois assumes, or whether the former represents the female and the latter the male sex of a species, which Lydekker considers possible, has not yet been finally decided. The latter author is unable to distinguish the molars of both types, so that he was prompted to list all molars under the one name St. insignis in the catalog of the British Museum. Nevertheless, it is of interest that the large type skull from St. ganesa shows M3 with only ten yokes, and that according to Lydekker's statement another specimen has ten or eleven yokes.

The personal inspection of the Siwalik material in the London museum showed me that the molars designated as St. insignis, among which there should also be numerous, which would be part of St. ganesa, if this can be maintained as an independent species , but show a significantly different character than that of the Triniler Stegodon. The difference is based primarily on the fact that the fused layers are thicker and a separation into an inner, resistant layer and an outer, less stable layer cannot be recognized. Namely, nothing is perceptible of a step formation caused by wear. Furthermore, the pleating is coarser in St insignis, the structure of the yokes is generally somewhat weaker, and the melting figures are simpler. The yokes of the true molars, namely the lower M3, are generally somewhat more roof-shaped and their outside and inside are less steep.The differences listed suggest that the molars of the St insignis are a little more original than those of St Airawana.

From the comparison of the molars of St insignis and those of Stegodon of Trinil I can only draw the conclusion that the two cannot be identical. Given that the molars of St insignis and St ganesa are indistinguishable, I am convinced that the trinile form cannot be assigned to the latter species, even as a variety which Dubois has recently advocated (Trinil fauna).

The comparison of the incisors of St Airawana with those of St ganesa, which appears important in view of Dubois' determination of the Trinile species as a mere variety of St ganesa, shows that the degree of twisting out of a plane is much more important in the Siwalik's Stegodon than with the teeth that are certainly part of St. Airawana.

That of E. Naumann (Foss. Eleph.) Originally as St. trigonocephalus Mart. The deciduous molar of Mindanao described but later separated from this species by Becht and renamed as St Mindanensis has such high wall-shaped lamellas that its species identity with the stegodon of Trinil is out of the question. The great height of the yoke lamellae even suggests the question whether this species might not turn out to be a little highly specialized elephas with more complete knowledge.

The insignificant finds of Stegodon teeth, which were made known in Japan and China by Naumann and Brams, or Owen, Koken and Schlosser, can no more be identified than those of the Siwaliks with those of Trinil.

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W. Janensch,

A summary of the Trinil stegodons.

The Stegodon of Trinil represented in the collection of the SELENKA expedition is St. Airawana Martin.

The skull structure of St. Airawana differs considerably from St. trigonocephalus Mart. from. The character of the molars is also somewhat different.

Of the stegodonts of the Siwaliks stands St. insignis Falc. et Cantl. , together with St.ganesaFalc.etCantl., inderZahnungSt.Airawanaamnext. However, there are certain deviations that make the Indian style appear a little more original. In terms of skull structure, St. Airawana also differs from St. insignis and St. ganesa, while the lower jaws are similar.

The deviations of St. Airawana from St. insignis and ganesa are so great that it cannot be regarded as a variety of one of these species.

Stegodon sp. (cf. Airawana Martin). Lower M3 No. 1252 from Gendinjan.

The present tooth is badly weathered. In addition to a narrow back talon, there are the last five yokes and two more half yokes in front of them. The weather has already had a strong effect and has particularly eroded the cement.

The wide, truncated shape of the rear end is characteristic of the outer contour.

The chewing has only affected the foremost yokes to a minor extent.

The yokes are curved a little forward convexly. The outsides are proportionate

not very steep, and the front ones are relatively slightly inclined forward.

Regarding the structure, it should be noted that the penultimate yoke is divided into two parts, and that an

the last two about six main mummies can be recognized.

In view of the broadly trimmed shape of the rear end of the steeply sloping side surfaces

of the yokes and the steep position of the yokes, I do not want the present tooth without reservation

to St. Airawana. St. trigonocephalus is approaching.

It does not seem impossible to me that it belongs to a form which

Table of dimensions in millimeters.

Upper yoke length (distance of the vertices of the outermost distance of the mammillary tips from those of the following yoke

approx 48 43 41 41 26 ——

Stegodon cf. trigonocephalus Martin. (Plate XXV, Fig. 4.)

It is the rearmost section of a tooth that has four yokes and extends through its

lateral curvature and the narrowing to the rear as the right lower M <. :

The tooth from the Pandang gives the impression of having been exposed to the action of dissolving agents to a high degree. The cement has almost completely disappeared and ha!

5th last 4th last 3rd last 2nd last Last Back Yoke Yoke Yoke Yoke Yoke Talon

-

-

89 83 75 63

3 (1

22 20 20

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are only preserved in small quantities in the deep crevices between the individual joebs, and most abundantly between the last two yokes. The dentine substance exposed by the chewing along the center line of the yokes is deeply hollowed out. Even the enamel is evidently affected, especially on the sides of the yokes. It remains to be seen whether the superficial etching of the tooth occurred during the animal's life as a result of the action of saliva or plant sap from food, or after death under the influence of weathering.A basal bulge is very pronounced and also strongly developed on the inner convex side. The yokes are wide, the outer and inner side surfaces converge strongly upwards, so that the purchase surface of the three front yokes is relatively short. The appearance of the step formation on the front and rear flanks of the yokes is very striking. These initially rise fairly straight from below, but then suddenly bend over at a sharp edge and thus cause the yokes to taper very suddenly. The edge sharpens in places to almost 90 °. The flanks above the edges are hollowed out concavely, as it were. The step formation is sharply pronounced on both flanks of the two front yokes and on the front wall of the third, but is completely absent on the rear wall of the third and on the flanks of the last yoke.

There are wide gaps between the first two yokes that narrow sharply. These fissures were undoubtedly originally filled with cement, which was only subsequently removed by weathering.

The width of the yokes in relation to their length is considerable, as can be seen from the following summary.

Third to last yoke Penultimate yoke Last yoke. Back talon

Greatest length

89 84 78 64

Width')

approx. 30 28 25 approx. 16

Greatest length:

approx. 3.0 3.0 3.1 approx. 4.0

width

The width of the yokes is therefore about 1

the strong development of the basal bulge influences the ratio in favor of length.

The talon and the last yoke are straight. The penultimate yoke is slightly convex forwardly curved, the third from last also, only to a greater extent. The yokes are set in accordance with the lateral curvature of the entire tooth crown so that they converge towards one another on the inner side.

The number of main mummies cannot be determined on the yokes because of the chewing. On the talon one can distinguish a lower outer, a higher inner and an even higher main mammilla accompanied by two sidelobes.

The present tooth shows a character that is quite different from that of St. Airawana. The formation of steps is much more developed, evidently as a result of the greater thickness of the enamel, the yokes are wider, a relation which is less clearly expressed numerically when comparing length and width because of the very pronounced basal bulge of the crown; the rear end of the crown is broadly trimmed and not pointed. On the other hand, the strong step formation of the enamel is a characteristic of the molars of St. trigonoeephalus Mart., In addition, the strong truncation of the rear end is very pronounced in one of the last lower molars illustrated by Martin (Neue Stegod. Plate III, Fig. 5).

1) Measured the distances between the centers of the valleys delimiting the yokes approximately in the median line of the crown. Selenva-Trinil expedition. 25th

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their length, it should still be noted that

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W. Janensch,

That the latter is to be understood as M3 seems to me to be beyond doubt because of the clear, albeit slight, decrease in length of the yokes towards the rear. However, he does not have a strongly developed basal bulge of the crown. For this reason, and in view of the fact that the determination of a single tooth fragment must generally always remain uncertain, I only place the tooth of Gendinjan at St. trigonocephahis with some reservation.

Genus Elephas.

Elephas sp. Molar No. 1253 by Gendinjan (?). (Plate XXIII, Fig. 5 and text figure 17.)

The fragment of a molar, the location of which Gendinjan is questionably given, comprises seven lamellae preserved in their entire height, the last of which the posterior enamel wall is largely missing; there is also the rear wall of an eighth in front of the front of the foremost lamella. The present molar section does not show any lateral curvature. The individual slats

Fig. 17.

Side view of the molar of Elephas sp. No. 1253 by Gendinjan (?). '/ a nat. Size

are extraordinarily high and narrow. The height of the four posterior ones not yet affected by chewing is 198-205 mm; the largest found

lying in height, 77 mm. Towards the top there is a very gradual, slight narrowing so that

The chewing surface obtained only in a short extension is indicated slightly convex, both in the longitudinal direction and across it; one could deduce from this that there is an upper molar, which would also be supported by the lack of lateral curvature of the tooth crown.The chewing figures show that the enamel is quite thick. The last of the chewed-on lamellae shows five small, ring-shaped enamel figures, the penultimate four larger, irregularly round, the third-last three elongated figures, of which the middle, the longest, bulges very roughly to the front and back.

The front of the posterior enamel wall of the anterior, only half-preserved lamella exposed by the fracture shows, in addition to a fold that does not penetrate deeply, a central bulge extending backwards from top to bottom, through which a loxodontic shape of the chewing figure as the chewing progresses would have been conditional. A second posterior transverse break through the tooth lays in the same

Width, roughly i

/ i

average slat width around 2

The thickness of the lamellas is small, 15-16 mm.

Free the inner surface of an enamel wall, but the loxodontic character is not pronounced here. I cannot give a definite identification of the species on the basis of the only incomplete and only weakly chewed molar. The unmistakably existing suggestion of the loxodontic type would speak against the assignment to the living Elephas indicus, but it does

E. antiquus Falc. recall. The extremely hypselodontic character would also be reminiscent of the latter type. The molars of K. namadicus Falc. et Cantl. differ due to the lack of clearly

embossed loxodontic enamel shape and the stronger pleating of the enamel.

Our molar would most likely be reminiscent of E. antigutes, but as already said,

in the case of the imperfection of the material, the question of species identification can be left open.

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Height is approximately 66 mm.

The Proboscidier Skulls from the Trinil Expedition Collection.

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Blackboard explanation.

Plate XXI. Fig. 1. Adolescent skull of Stegodon Airaivana Martin No. 203 by Trinil. Side view. i / nat. Size 3

Fig. 2. The same. Front view. Vs nat. Size

Plate XXII. Fig. 1. Upper Mm2 and Upper Mm, from Stegodon Airawana Martin; Juvenile Skull No. 203 by Trinil. Nat. Size

Fig. 2. Upper right Mm2 of Stegodon Airaivana MknTm; isolated maxillary No. 1408 from Trinil. Nat. Size Fig. 3. Upper Mt of Stegodon Airawana Martin; Skull fragment No. 47 from Trinil. Nat. Size

4 lower right M2 of Stegodon Airawana Martin; Large skull no.823 by Trinil. Nat. Size

Plate XXIII. Fig. 1. Upper right Mmj of Stegodon Airawana Martin; isolated maxillary from Trinil. View from the top. Nat. SizePlate XXIV.

Plate XXV.

Fig. 2. The same. View from the inside. Nat. Size

Fig. 3. The same. View from the outside. Nat. Size

Fig. 4. Lower right M2 (?) From Stegodon Airawana Martin, probably northwest of Trinil. Nat. Size Fig. 5. Molar of Elephas sp. Nat. Size

Fig. 1. Large lower jaw of Stegodon Airawana Martin; No. 823 by Trinil. 1/4 nat. Size Fig. 2. Upper M3 of Stegodon Airawana Martin; Skull No. 225 from Trinil. Nat. Size

Fig. 1. Upper M2 of Stegodon Airawana Martin; Skull No. 304 from Trinil. Nat. Size

Fig. 2. Upper left M3 of Stegodon Airaivana Martin; No. 174 of Trinil. Nat. Size

Fig. 3. Lower right M3 of Stegodon Airaivana Martin; Large lower jaw No. 823 from Trinil. Nat. Size Fig. 4. Lower right M3 of Stegodon cf. trigonocephalns Martin; from Pandang. Nat. Size

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On the osteology of Stegodon from

Prof. Hans Pohlig, Bonn.

With panels XXVI and XXVII and 6 text figures.

As with most of the other extinct mammals, even of very important ones, almost nothing has been known of Stegodon about the rest of the skeletal structure, while there is already an abundant literature on cranology and dentition. It was therefore of particularly great value that the excavations at Trinil brought to light such an extensive material of proboscidial bones, and above all that it was decided to first of all give the stegodon bones excavated under Prof. Selexka's direction a comprehensive and detailed treatment.

This monograph actually remedies a long-existing practical need, especially that of the paleontologist who has so far looked in vain in the specialist literature, even among the works on the osteology of the recent fauna, for sufficient comparative material. Most of it is still found in the old fundamental books by Cuvier 1 and de Blainville 2.

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educated, but that too is all too poor for the purposes of palaeontological comparison. About osteology

There is little more of Mastodon than what old Warren3

in somewhat mediocre presentations

from an Italian masfodoji; from

of the "Ohio Animal" and also Sismonda4

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)

fossil elephants are only the good, admittedly only very few figures worth mentioning, the

Leith Adams has supplied 5 of the British species; because his illustrations of the Maltese bones 6 come

because of the abnormalities of these insular Mediterranean dwarf races, little consideration for comparative purposes.

Therefore, for the comparison, I was largely dependent on the extensive and extremely rich osteological material that I have been working on in most European and several exotic museums since 1880, and its publication while there was still time Withholding the indispensable public funds has been made impossible. This comparative material is still available through the kind mediation of Prof. Matschie and Dr. Stremme around

1) G. Cuvier, Recherches sur les ossements fossiles, Paris 1836.

2) Ducrotay de Blainville, Osteographie des mammiferes. Paris 1839-1864.

3) J. C. Warren, Mastodon giganteus. Boston 1852.

4) E. Sismonda, Osteografia di un mastodonte. My. R. Acad. Torino 2., XII., 1862. 5) A. Leith-Adams, British fossil elephants. Paleontographical Society, London.

6) A. Leith-Adams, in Transactions Zoological Society, vol. IX, London.

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valuable recent addition from the zoological and palaeontological departments of the Berlin Royal Museum of Natural History.

All of the bones described and depicted below are undoubtedly of the form or breed of Martin's Stegodon Airawana.

I. Vertebrae and thorax.

1. Cervicale. Of the cervical vertebrae, the atlas is represented in the Berlin collection by only one half on the right (plate I, Fig. 1), which also lacks the transverse process. Nevertheless, the essential features of the bone are well preserved: the contours of the proximal and distal articular surfaces, the vertebral foramen and the arterial foramina. as well as the upper and lower arch.

Dimensions: total height of the atlas 15y cm; Length 9 cm; Spinal foramen 8] X (possibly) 8 cm; occipi- 2/2

valley articular area 10x6 cm, distal (half) 9X7 cm; Lateral arterial hole 3 cm, upper diameter 4 cm.

Comparison: From mastodons, good and reliable comparison material is mostly from M. giganticwidely distributed in the collections to whom Warren's illustrations of the atlas (1. c. pl. XXI,

Figures 1 - generally correspond well; so also the mastodon atlas of the Berlin museum, whose 4)

Vertebral foramen 9y X7 measures 3 cm, with 21 X 31 cm total dimension of the vertebra, for height X width - 2/4

Also in Berlin are I. cervicals of M. Andium, the largest of which has a foramen of 12 x 9 cm; Blainville depicted such a bone from M. Humboldti (?), as well as from M. angustideus.

This atlas of Stegodon is distinguished from that of the Ohio mastodon by 1. narrower occipital, but wider axial articulation surfaces; 2. flatter shape of the upper arch, which is strongly arched in this mastodon; 3. larger lateral arterial foramina.

From the fossil elephants of Europe, E. meridionalis comes into consideration first, which is very close to the Stegodon and forms the transition between the latter and Elepkas. Most of the pliocene proboscidial bones in Italy undoubtedly belong to this species, because they are much more abundant than the Mastodon arvemensis and E. [antiquus) Nesti, which occur in the same layers, and whose bones are partly recognizable by their enormous dimensions, and are the least common .

The largest I. Cervical (pictured by Blainville) from E. meridionalis at Florence has a foramen of 12 × 9 cm, being more than 40 cm wide and 20 cm high; the large arterial foramen, 4 cm in diameter, is more like that of Stegodon, as is the greater divergence of the internal margins at the occipital joint, which is somewhat narrower than usual in Elephas, but already considerably wider (up to 8 cm at 13 cm high) than in Stegodon; the flat shape of the upper arch is common to the latter and most other elephants, the shape of the axial half of the articular surface even more approximates the square shape than in the case of Stegodon, being broader at the top.

Elephas antiquus typus, the largest land mammal known to date, has produced even bigger bones than even Mastodon longirostris, the skeletal remains of which (Mannheim!) Were for the most part erroneously ascribed to Binotherium; the atlas of the large Taubach skeleton at Jena, for example, is more than 52 cm wide, and that is not yet the maximum of both species. The foramen in this case measures 125 X 9 cm and appears narrow for the gigantic dimension of the vertebra.

What is most striking here is the considerable width of the occipital articular surfaces, with very little divergent internal margins, which is characteristic of all elephants, as a result of the enormous increase in weight of the dentition and thus of the entire cranium. The transverse processes give way

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their largest (upper) surface in the elephants is less from the horizontal than in the older Proboscidians, in which they are partially almost vertical: the 4 arterial foramina are on average narrower in the former, the upper arch not only appears flat as in Stegodon, but sometimes even strongly sunk (in E. africanus, for example), in contrast to the often tapering curvature in Mastodon. In Q and otherwise with weak tusks (recent species), the two halves of the proximal and distal articular surfaces are far apart; the vertebral foramen of the Leipzig E. africanus measures, for example, 96 X (above and below) 72 cm.

A peculiarity that Stegodon has in common with some recent elephants (cf. the figure of E. africanus in Blainville) is the continuation of the lateral arterial foramen also distally, in a channel-shaped groove that leads to the vertebral foramen.

The Axis (Epistropheus) by Stegodon is represented in the Berlin collection by 4 copies, of which only the bow is available. The best is shown from the side on Plate XXVI, Fig. 2 and here in Figure 1 from the front.

Fig. L. Fig. 2.

Axis of Slcgodon from Trinil, proximal view. 3 nat. Size Arches of III - VI. Cervicale of Steyoilon from Trinil, l'orsal view. '/ s nat. Size \

The thin ridges that bordered the external foramina on the outside of the transverse process are missing; otherwise the piece is intact (No.1955). The foramen vertebral appears here to be more triangular, on another axis (No. 1447 of the museum) its contour is closer to the square in the front view.

Dimensions: Maximum height of the bone 22 cm, width 17 cm; distal articular surface of the body

(HeightXwidth) 10 »/ 2X122cm; heightXwidthof the vertebral foramens5X & lcm length of the body,: '/ / i;Bottom 12 '/., Cm, top 9 cm.

Comparison: In the case of mastodons (M. giganteus, M. arvernensis, M. hngi / rostris) the greater width is

of the arch on Epistropheus in general, as is the large diameter of the vertebral

foramens; the latter measures on a M. giganteus in Berlin 7x2 X 71 cm above a small M. arvernensis / «>

On the osteology of Stegodon.

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to Florence 6 ^ 2 X6 cm. On the other hand, in the profile of the arch, Stegodon is more similar to the proportions prevailing in Mastodon.

In elephants, the latter almost always show a much smaller inclination of the upper arch contour downwards forwards (exceptions occur only in the ancient E. africanus); the whole spinous process appears higher and slimmer than in mastodon. The shape and size of the vertebral foramen are very variable, even in the same species, owing to the same cause as in the 'Cervical I; in the largest E. meridionalis at Florence and Bologna (almost 30 cm high) the large foramina measure 75 X 70 and 90 X 75 cm, - the latter is still not too significant given the gigantic dimensions of the bone. E. antiqims already reached an axial height of about 35 cm in the large Taubach skeleton at Jena, more than the colossal 2nd cervical of the Mastodon longirostris from Eppelsheim at Darmstadt, which is wrongly determined as Dinotherium.

The articular surfaces of the elephants are directed somewhat more upwards, corresponding to the position of the spinous process which is more strongly inclined to the front.

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are (No. 1111).

Nonetheless, these remains are very indicative, for the comparisons show that the cervical

vortex series in Stegodon is relatively longer than in elephants and in this respect corresponds more to the proportions of Mastodon. This also extends to the arches and bodies of Epistropheus and Atlas - less so of Cervical VII. On the other hand, the stegodon and mastodon arches are somewhat narrower, especially at the front, that is, on the whole, more compact. The total length of the 4 arches shown above is 13 cm median, with a slightly larger Elephas indicus in Berlin only 10 cm; the 4 corresponding bodies of the colossal Taubach skeleton from E. antiquus to Jena measure together median: ventrally 26 cm, dorsally 21 cm, which is little, given the colossal dimensions (e.g. 22 cm maximum body width, distal, without processus transversi, on cervical III .). Of the (broken) sheets No. III-VI, only one side has survived, which has a (maximum) total length of 30 cm.

It follows from this that Stegodon (and Mastodon) had a less extremely short and stocky neck than Elephas, which in turn is in causal nexus with the weight proportions of the dentition and cranology; by name. For the same reason, the normal head position in Elephas seems a bit higher,

to have become more exalted.

Cervical V. Is from Stegodon zu Berlin, except in the illustrated arch of text figure 2, in

an almost completely complete copy is available, which is represented on plate I by FIG. Dimensions. Maximum width 21 cm, arch width at the joint 13 cm, body height proximal 11 cm, distal 14 cm, width in front 7 1/2 cm. Vertebral foramen 8X5 cm (for width X height); Arterial

foramen 3y2 cm. Blainville has shown a good middle cervical of the mammoth.

Cervical VI. Is reproduced in a very complete representative (No. 1110 zu Berlin) on plate I, Fig. 4, also in the proximal view, there are also several damaged vertebrae: No. 2000 of the collection without the larger part of the body, No. 96 without bow and an almost complete, but heavily worn, smaller copy (without no.) Dimensions of no. 1110: width of the bow on the body 15 cm; Vertebral foramen 8 X & li cm! Arterial foramen 4x3 cm. The former is at number 1110

more triangular, semicircular on the smaller specimens.

The lower wing-shaped extensions of the processus transversi, which in Mastodon are very long, lateral

are stretched and wide, have broken off and been lost. In Elephas these are extensions

Gervicale III

IV. These are only reliably represented in Berlin by arches, which are shown here in Figure 2 with those of Cervical V and VI, which undoubtedly belong together

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shorter and directed downwards, the spinous process, on the other hand, is longer, the vertebral foramen smaller, the contour of the anterior view more elongated in the vertical sense, the body more rounded. On the cervicals V. and VI measured by me in Mainz and Darmstadt. of the mammoth, as in that depicted by Blainville, the arches are also relatively broader, up to 22 cm at 14 X 15 cm at V. front body dimension; with Stegodon the body is broader in front below than above on V., conversely on VI .; in Elephas these two proportions are opposite to those in Stegodon.Cervical VII is in the very well preserved No. 857 on Plate XXVI, Fig. 5, lateral from the right

and FIG. 5a is shown distally from behind; the latter view shows the body and arch joints

the articulation surfaces for the anterior halves of the head of the first ribs. The vortex is a bit asymmetrical,

which is not uncommon among the proboscidians in the vertebral series. Dimensions: maximum height

2iy cm, width 26 cm; Vertebral foramen 9 1/2 x 7 cm; Body 13 x 12 cm (for width x height). This 2nd

So vortex comes from a relatively large individual.

Comparison: in Elephas the spinous process is longer, this measures in a somewhat smaller one

E. indicus zu Berlin, for example, 12 cm (above the vertebral foramen); the latter is closer to the

same individual it measures 9y2 X53A cm>

on a cervical VII of the mammoth 36 cm wide (in '

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x

more similar to that of dorsal I, and the position of the articular surfaces for the rib tubercle is more like that of the latter, while in Stegodon it is close to the articular facet of the head of the rib. 2. Dorsal. Dorsal I from Stegodon is available in two very good copies in Berlin,

No. 349 and 701, the latter of which is shown on plate XXVI, FIG. 6, laterally and No. 349 in FIG. 7 proximally; Both of them lack the epiphysis of the spinous process, No. 701 is somewhat asymmetrical. Dimensions of no.349: maximum total height (without spinosus epiphysis) 37 cm, width 27 cm, 153 each at the proximal arch joint and at the front of the hip joint

/ 4

the Petersburg Mining Academy) is the same dimension only 10y X 2

cm. Here the processus trans-

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versi much stronger than with Stegodon, the whole shape of the vertebra thereby appears more depressed and

(Width x Height); Vertebral foramen 7 1 4 x 7 cm (height x width); Spinosus height above the foramen (without /

Epiphysis) 21 by 2 cm.

When compared, the lower height of the spinosus in the elephant falls over

so more than in these the spinosi of the preceding cervicale are relatively longer. The withers sinks less steeply from the dorsal I towards the neck than in the stegodon and mastodon. The behavior of the Spinosi is also conditioned by the greater or lesser weight of the dentition and the whole cranium. A dorsal I of E. indicus zu Berlin with a total width of 22 1/2 cm has a spinosus of only 15 cm high, a gigantic mammoth dorsal I in Leith Adams of 34 cm maximum width, on the other hand, 28 cm.

Furthermore, in Elephas the median section of the vertebral body is more decidedly tapered upwards in a wedge shape, similar to that of the cervicals, which is connected with the changed posture of the neck discussed above; the distal arch joint is also steeper upwards, the transversi are directed more downwards. - The largest known proboscidier dorsal I again belongs to the colossal Taubacher skeleton of E. antiquus from Jena and has a maximum width of 4½ cm.

In polydiscodon the foramen is sometimes extremely high, as in the figure of Blainville by E. indkus.

Dorsal II from Stegodon zu Berlin (No. 224) comes from a very strong, sure q? Animal and corresponds to the maximum proportions of the subgenus; the piece is very well preserved, only the epiphyses of the spinosus and the transversi are missing. Dimensions: maximum height hex width of the vertebra 46x-9cm. the body 10 '/ 2 x 12 cm, the foramen 7x9 cm; Height of the spinosus 28 ',., Cm. - A smaller one

cm; Body in front 10x9 cm

/ 2

In the profile view, the transversi of Stegodon are directed more decisively forwards, the costal joints are lower, the distal arch joint is directed more downwards, the center is not tapered upwards in a wedge shape, the proximal spinosus does not protrude at an angle below, as in E. indicus and E. antiquus; in the latter, the angulus formed by the spinosus and body articular surface is not insignificantly smaller, the extremely long spinosus is less erect and more inclined backwards; the latter is very long in Stegodon (no. 1445), up to 8 cm.

Dorsal III, from a smaller stegodon (No. 412), is shown on Plate XXVI, Fig. 9, laterally and, Fig. 9a, proximally; nothing is missing but the spinosus epiphysis. Without this the vertebra is 45 cm high, 23 ^ cm wide; the body is 9 cm high and 10 x 4 cm wide, the spinosus above the foramen still 32 cm high. - That the proportions of the foramen on the dorsal III and subsequent can be reversed from what was shown above for the preceding is shown by this bone with its high foramen (7 X 674 cm for height x width) and the corresponding one of a small but fully grown Indian elephant in Berlin with a low foramen (4 x 5 cm for width x height). The large dorsal III of Mastodon, depicted by Sigmonda, otherwise very similar to Stegodon, has longer, less thick and more downwardly turned transverses; the spinosus, including the epiphysis, is 42 cm high.Otherwise it is also noteworthy about this stegodon dorsal that the proximal arch-joint surfaces are already quite narrow and the transversi are distinctly curved forward; the spinosus is little thickened at the upper end; it is narrow and straight in profile as in Elephas, so it does not have the shape bent backwards as in the figure of Blainville's Mastodon angustidens.

On a dorsal III from Elephas to Darmstadt, 30 cm wide, the spinosus (46 cm high without the epiphysis) has a considerably less erect position than on Stegodon.

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Vertebra (No. 1445), on which the transverse epiphyses are preserved (maximum width 28 cm), is shown in Plate I, Fig. 8a.

In Elephas the transversi are longer, without the inclination upwards present in Stegodon; a smaller, undoubtedly Q E. antiquus from Rome (near Bonn) has a maximum height of 55 cm and a maximum width of possibly 32 cm. Furthermore, here, as in the case of genetically

logically younger elephants, mostly higher on the preceding vertebrae,

the dimension is 8 x? 74 cm for height x width. The same applies to these

Spinosus higher, in E. antiquus very substantial, almost 40 cm above the

Foramen, somewhat stronger (q?) Animal compared to 28l.

cm (albeit without an epiphysis) in Stegodon of one

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Dorsal IV is there in three very good representatives from Stegodon, from

which a smaller one (No. 223, without spinosus epiphysis) is depicted on plate XXVI, Fig. 11, distal, the largest (No. 1444) on plate XXVI, Fig. 10, proximal and here in the \* text figure laterally .

The smaller of this dorsal has a very narrow foramen of only 574X5 cm; it is on both

Selenka-Trinil expedition.

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Fig. 3.

Dorsal IV of Stigoion from Trinil, profile view. i / o n ^ t. Size

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only a little higher than hreit. The larger one is not quite symmetrical and somewhat damaged on the right transverse versus the other.

Dimensions of No. 1444: maximum vertebra height 61 cm, spinosus height 44 cm, body height

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Spinosus is only a few centimeters more.

A third (no doubt Q) dorsal IV of Stegodon, the smallest (No. 159), is abnormally wide ^ S '/ o cm,

at only 44 cm maximum height of the vertebra) and accordingly also has an abnormally wide one

12 cm, foramen height cm; Spinosus, diameter at the top, 9l cm. 6y4 / i

This dorsal is usually the highest in the elephants and therefore probably also in the Stegodon, although the preceding and the following give it very little in terms of spinosus height. The latter reaches quite adventurous dimensions in the case of the giants of the clan, for example on the large Taubach skeleton of E. antiquus zu Jena about 60 cm without the (missing; epiphysis, while the total height, because of the steeply inclined position of the

cm, at only 4y2 cm high).

Foramen proportions are mostly the opposite of those of Elephas, whose foramen is wider than it is high

Foramen (63

A comparative consideration also shows that here, as in Dorsal III, in the same sense the

3 (4/4

X 3y cm in a small E. indicus in Berlin). The body of Elephas is slightly narrower and 2

/ 4

higher, so the distal lip joint does not reach all the way up to the same, as in Stegodon; the transversi are less thick in the latter, but the spinosus is more compact. The spinosus tends to be highest in Mastodon on dorsal III, in the tucks of the genus up to 58 cm (including the epiphysis), i.e. about 10 cm less than in the tucks of Elephas on dorsal IV.

Dorsal V of the Trinil stegodon is shown in Plate XXVI, Fig. 12, proximally and Fig. 12a laterally. Only the spinous epiphysis is absent, as usual; the foramen is somewhat asymmetrical. Dimensions:

maximum height Xwidth of the vertebra 48 24 cm, the body in front 91 x91 'x / 2 /

5y2 X6 '/ 4 cm; Spinosus length 36 cm.

The shape of the bone agrees well with that of Elephas; only are with the latter

The genus the transversi are more massive, the distal bipolar joint does not reach up that high, and the spinous axis already forms a smaller angle with the joint surfaces of the body. On the large Taubach skeleton of E. antiquus zu Jena, this vortex is almost 40 cm wide, and proportionally high and massive! In such colossi the foramen is quite disproportionately narrow.

On dorsal VI of the Triml stegodon (Plate XXVI, Figs. 13, 13a), apart from the epiphysis, a small part of the end of the spine is missing (No. 321, Berlin). The maximum width of the vertebra is 22 cm, the body is only a little wider at the front than 1 x 91 cm high).

(9/2 /

The comparison of this bone from Mastodon, Stegodon and Elephas, especially thetypical species E. antiquus and mammoth shows above all that the first two have relatively shorter, weaker and more steeply erect spinous processes; Warren has marked this well in a figure from Mastodon giganteus (1st c.). On the Stegodon the spinosus is no longer upright, but still considerably smaller, as can be seen from the proportions despite its defect. On the dorsal VI of the great Taubacher E. antiquus zu Jena, the spinosus, at 33 cm maximum vertebral width, without the (missing) epiphysis, is 55 cm, in total over 60 cm long, only about 5 cm less than the longest (that of the Dorsal IV); and such a vortex from the mammoth from the Lippe (near Berlin) measures 29 cm maximum width, almost 47 cm spinosus length - - the foramen is only 6 1/2 cm wide and 7 cm high. A not much smaller Dorsal VII in Darmstadt is very similar: the transversi are noticeably higher on both vertebrae than in Stegodon, corresponding to the high, rounded shape of the foramen.

In the case of the stegodon and mastodon, and particularly in the latter, 1. the transverses are thinner and longer, 2. the postural joints are situated higher, especially in front, 3. the foramen is wider, and

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4. the transversi bent forward more decisively. From all this it can be seen that Dorsal VI marks the vertebral peculiarity of the two main groups more sharply than the preceding vertebrae, in particular the stronger and more evenly high structure of the dorsal crest of the bones of Elephas. In the large Taubacher E. anüquus zu Jena, Dorsal "VII still has a spinosus length of 46 cm without the epiphysis (i.e. a total of about 50 cm), with a maximum vertebral width of less than 30 cm;

genius to Darmstadt these dimensions are 37 cm (40 cm) and 27y2 cm.

From Dorsal IX (Plate XXVI, Fig. 14) the Tr'mil-Stegodon in Berlin has nothing but useful

a spinosus, which is well preserved and remarkable because of its short length of only 25cm. In addition, the following dorsal X shares a special peculiarity with a spinous perforation, at a point which on other proboscidial vertebrae, namely anterior dorsals, is probably at most characterized by a very deep and wide fossa on the anterior spinous surface.

This spinous process is already very thin and swells at the upper end to an epiphysis still 3 by 2 cm wide; the abnormal spinous foramen is 4 cm long.

The dorsal crest of Stegodon extends, as in the case of Mastodon, steeply behind the last cervical vertebra and almost suddenly to a considerable height, and already sinks significantly at dorsal VI, down to the very small dimensions at dorsal X; in Elephas, on the other hand, the last cervicals already have considerable spinosi, the crista develops in the anterior dorsals to the greatest height among all proboscidians and is maintained even higher at a greater distal distance than in the genealogically older relatives, and remains further down to the last dorsals of very respectable training, as shown in the following.

From the dorsal X of the stegodon (Plate XXVI, Fig. 15, 15a) the one described above is visible

pegs that belong together individually (No. 175 zu Berlin) are in very good condition, only the ends of the

left transversus and spinosus; the latter is dorsal in the same place as the preceding

of the animal, an abnormal perforation, which is only 2 \* / 2 cm high, corresponding to the still small

larger dimensions of the whole process. The maximum width x height of the body in front is 10 x 8 3

of the foramen 63 / X43 cm. Another dorsal X (No. 244 in Berlin) is somewhat larger. 4/4

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cm,

Comparative measurements show that the spinosus on dorsal X in Elephas in particular is considerably higher and stronger; The body and foramen are not yet so broad here; the transversi, on the other hand, are already decidedly bent backwards, while at the stegodon they are still directed forward.

Dorsal XVII of Stegodon is shown in Plates XXVI, Figs. 25, 25a (No. 321 in Berlin) and is complete with the exception of the left transversus and a small part of the spinosus epiphysis. The whole bone was 28 cm high and about 22 cm wide; the very broad foramen measures 6x3y2 cm, the spinosus 18 cm, the front body is 10 cm high and 11 cm wide; the arch is 11 cm long at the joints. This vertebra belonged to a strong cf animal.

In Elephas the spinosus is higher and far more powerful than in Mastodon and Stegodon, and the foramen is considerably higher; Furthermore, in Elephas the transversi are much longer, and in Stegodon there is no hint of the strong backward turn of their distal arch-joint parts. With Elephas, this bend gradually develops in the series from dorsal VI to XVI and already reaches a high degree in the latter.At Berlin only two of the other stegodon vertebrae are poorly preserved

Dorsals XIX and XX present, the former (No. 195) plate XXVI, Fig. 26, the other (No. 230) in Fig. 27 from the front; in both the foramen is lower and broader than in Elephas, the spina is weaker; at the anterior arch joints are those found in Elephas and Mastodon

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The transverses are not developed, they are considerably higher on the posterior ones and are more curved upwards. The dorsal XIX (Fig. 26) is of a smaller animal, strongly rolled and somewhat asymmetrical; in Stegodon it is the foremost in the vertebral series, which has a rearward rotation of the transversi.

The turning of these transverse processes in Elephas more backwards, in the entire vertebral series behind DorsalV, is evidently associated with a stronger development of the longissimus dorsi in the causal nexus, which in turn was caused by the increasing weight of the dentition and the entire cranium.

In Elephas the crista rises again to a considerable height at dorsal XX, in E. antiquus the spinosus height reaches almost 30 cm without epipbyse, with the entire vertebra remaining 43 cm high.

3. Lumbar: Lumbar I from Stegodon is represented in three copies in Berlin, the largest of which (No. 1448) is reproduced on Plate XXVI, Figs. 28, 28a; the second, smaller one (without number) is more complete and very well preserved, but lacks the body epiphyses and therefore undoubtedly has one

belongs to a youthful individual; of the third one (without a number) only the bow is present. In the profile of Elephas the spinosus is much wider, almost evenly wide to the tip; the distal arch joint reaches further back, the transversus lies much lower there and is less decidedly turned upwards. In front the arch joint extends considerably higher than in Stegodon's.

The lumbar region I of the large Taubacher E. antiquus is (without the spinosus epiphysis) almost 40 cm high.

Lumbal II from Stegodon (no. 280 zu Berlin) is from a strong q \* animal and is not entirely symmetrical; it is reproduced in Plates XXVI, Figs. 16, 16a. The proximal body is already wider than it is high, 12 y2 (rear 14) x 10 cm, whereas in Elephas it is still approximately circular. The foramen measures 8x4 cm, it is lower than on the mastodon and laterally merges into a canal at the rear which is considerably higher than on the mastodon.

In the profile view, the transversi are also turned more upwards than with Elephas. The arc length on the large Taubacher E. antiquus is almost 20 cm, on this maximum specimen of Stegodon 14y2 cm.

Another lumbar II from Stegodon zu Berlin (No. 127) is without an arch and is even only 8 cm anterior height and 12 ^ cm wide, and the foramen is no less than 9 cm wide.

Lumbar III in Berlin (without no.) Is shown on plate XXVI in Figs. 17, 17a and is very well preserved.

It is 23 cm wide; the body measures 12 3 (rear 14 1 x 8 cm, the foramen 8y X 3y2 cm, the arch / ->)

/ 4 2

is 8 by 2 cm long, against more than double that of the large Taubacher E. antiquus.

On Elephas the spinosus is still higher here, on Mastodon the foramen is lower: on the former, furthermore, the transversi are not bent backwards, as in Stegodon.

2. Sacral and caudal vertebrae of Stegodon are not available in Berlin, but the sacrum of the continental Stegodon is known, of which Blainyille requested a picture.

The sacra of the individual elephant species have not insignificant differences; in E. antiquus, for example, up to six vertebrae are also fused together with all the transversi, which does not occur in any recent species.

From the thorax of the stegodon only a few almost complete costae and several l'iagmente of such are available at Berlin; the best of these is shown on Plate XXVI in Figs. 18-21.

The Xth rib on the left side (No. 238, Fig. 18) is the longest of the existing, it measures a little over 100 cm in the curve; almost nothing is missing except the epipbyse. The previous IX. maintains

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to be the longest on the Proboscidians, but little more than IX. On the large Taubacher E. antiquus, Costa IV already has a curve length of 140 cm.

In addition, there is only one complete rib to Berlin, an IX. or X. from a smaller animal, it does not measure 100 cm in the curve. A preceding one (with tubercle) from a larger animal is not complete, but still has the epiphysis; likewise the next preceding, very similar one, only about half of which has been preserved (No. 192 on Berlin) and comes from the other side.Two partially preserved Costae V, on which the tubercle is further removed from the head, are shown in Plate XXVI, Fig. 21 (No. 84); FIG. 21 shows a fragment of Costa III in Berlin (without the epiphysis). The previous one has an epiphyseal width of 16 cm on the large Taubacher E. antiquus, with a circumference of 42 cm

Furthermore, two upper ends of posterior ribs are shown on plate I in FIGS. 20 (no. 352) and 19 (no. 819).

Nothing at all has survived from the stegodon sternum in Berlin; the manubrium on the large Taubacher E. antiquus measures almost 60 cm from one I. Sternalcosta to the other; on the SchMiDT mammoth skeleton in Petersburg the following Sternebral is 33 cm long and very similar to a Bonn specimen. On the Turin mastodon, the measure is 27 cm.

II. Shoulder girdle and carpal extremities.

1. Scapula. - A whole series of more or less defective Stegodon blades is available in Berlin, the two most complete of which are on Plate XXVI in Fig. 22 (No. 226) and Plate XXVII, Fig. 1, la, lb (No. 247) are shown; the former is 64 cm in length, but very damaged in front and behind and without most of the spine. The other specimen is from a stronger, undoubtedly (f fully grown animal and only up to 55 cm in length, but the spine is largely left over cm; the Scapularest (No. 1842) of an even larger individual is 27 cm thick, thus offering the extreme dimensions of Stegodon; of Elephas it is almost 35 cm.

Another pair of scapular remnants from Berlin (nos. 407 and 1238) provide a slightly different basal view from that given in Plate XXVII, Fig. 1b, in that the articular surface protrudes externally instead of internally, as does the whole bone here does not have the external bevel like # 247.

Comparison: If the parts that are most essential for the comparison are inadequately preserved, there are few handling for the latter. In Mastodon, especially in the basal view of the articular surface, the basal spina does not appear as inclined forward as in Stegodon (especially No. 1238) and Elephas; in the colossi of the latter genus the powerful development of the spine is striking, as in a scapula of E. antiquus zu Gotha. The two peculiarities touched upon stand in causal nexus with the stronger development of the carpal extremities in the two last-named groups, owing to the increasing weight of the dentition and cranium.

The shape of the articular surface, as shown above by Stegodon, differs even within the same species and is therefore generally of no importance; only in the giants of Elephas is their enormous width in relation to length, for example 16y X 28] / 2 cm (after the

Curve) on the great Taubacher E. antiquus, 161

The shovel is bent more outward on Elephas, behind the joint, the tubercle in front of the latter

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X25 cm measured in a straight line. The basal margin of the

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mostly longer. The rest of the shape and direction of the basal margin varies greatly from person to person; just compare the figures of E. indicus and E. africanus in Blainville and Leith Adams!

- This bone from Stegodon is also only in Berlin more

defective copies available, the best of which is reproduced on plate XXVII in Fig. 2, 2a (without no.), an even less complete (no. 811) in Fig. 7, 7a. The head part of the former is missing, it is up to 58 cm long, the minimum circumference is 28 cm, the width there at least 8 cm, further down on the external condyle 17 cm, the height on the latter 22 cm, at the internus 12 cm. The distal joint is 15V2 cm wide (at No. 811), 8y2 cm at the gapitulum and 13 cm long at the trochlea, straight.

If one compares these parts with those of Mastodon and Elephas, it is shown that their individual forms differ in manifold ways, both in the contour and height of the condyles and in the formation of the distal articular surface. The whole bone in Elephas is slimmer than in Mastodon, but above all it has considerably stronger torsion, especially in the recent species: the direction line of the tubercles forms (in the basal view) with the foreground of the radiocubitus joint a very acute angle, in Mastodon stand these lines are almost perpendicular. The above-mentioned bending of the scapular basal margin in Elephas is related to this.

On the large Taubacher E. antiquus, the humerus, without the (missing) tubercles, is still 132 cm long, i.e. originally about 140 cm.3rd radius. - A well-preserved spoke from Stegodon zu Berlin (No. 1756), only missing the distal epiphysis, is shown on plate XXVII in Figs. 4, 4a, 4b. The piece is still 55 cm long; Width and circumference are a minimum of 5 cm and 14 cm, proximal 12 and 27 cm (at 6 cm thickness), distal 13 and 36 cm. The body is as good as not bent at all, less even than in E. indicus, which otherwise has the lowest degree of all proboscidians in this respect. A more important difference is the strong torsion; it is stronger in Mastodon, where the longitudinal direction of the carpal articular surface is almost perpen- dicular to that of the proximal; both are almost parallel in E. indicus, in E. africanus and E. meridionalis somewhat closer to the ratio of Stegodon. The form and direction of the proximal articulation facet still offer various differences, which, however, may be of a more individual nature.

2. Humerus.

or less

At the large Taubacher E. antiquus the distal end of the radius 231 measures 66 cm circumference (to Munich).

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cm at

- This bone is perfectly preserved in No. 49 from Stegodon in Berlin

Plate XXVII shown in Figs. 3, 3a, 3b, 3c. The maximum height is 64 cm, the width at the proximal joint 16 cm, in the middle 7 and distal 10y2 cm; the minimum circumference is 22 cm. the carpale maximum 33 cm. The olecranon is of remarkable length; on this the articulation facet has a more decided internal curvature above than in Elephas, it is also further angled forward, the cutout for the radius appears less deep.

Like all other long bones, the ulna in Stegodon and Elephas is slimmer and more graceful than in Mastodon; a cubitus of M. giganteus in Berlin that is just as long as No. 49 is 8 cm

4. Ulna.

and up

Width and 26 cm minimal circumference; its olecranon joint measures 13 x 141 /, x 18

cm of minimal circumference.

- Stegodon are only present in the Selenka collection 1 Semilunare Munich, 2 Triquetra (Plate XXVI, Fig. 11, IIa to Munich) and 2 Hamata to Munich), of which the

11 x12 »2 X161

cm for Stegodon No. 49.

On the large Taubacher E. antiquus, the ulna (in Munich) measures 111 cm in length, 15 cm less

Width at 48,

5. Carpus. From

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cm, against

to

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larger is shown on Plate XXVII, Fig. 9; the metacarpus is only represented by metacarpal III without the distal epiphysis (in Munich) (Plate XXVII, Fig. 13, 13a, 13b), the largest of the phalanges has been preserved (Plate XXVI, Fig. 24 in Berlin) .

Of some comparative interest among these bones only the metacarpal III. The proximal joint facets individually have very different shapes, also different angular inclinations to one another; But what seems to be essential in Stegodon and is also characteristic of the only small (defective) Metacarpal III in Florence, which certainly belongs to Mastodon, is the steeper direction of the articular surfaces upwards and backwards, whereby the proximal rear end of the bone is more pointed than with Elephas. This, together with a relatively larger distal width of the bone, indicates that here traces of the old plantigrade gait are more clearly discernible than in Elephas; in spite of the increase in the heaviness on the carpus under the increasing dentition and cranial weight in the latter genus.

On the large Taubacher E. antiquus, Metacarpal III (in Stuttgart, zoological cabinet) is 25 cm long; in the case of the colossi among the elephants, the entire shape of the forefoot bones is naturally more compact.

III. Pelvic girdle and tarsal extremities.

1. Innominatum. - In Berlin there are two very good Stegodon basins, of which the smaller, more complete one is shown here in text fig. 4 is shown (No. 142); the larger one (No. 1687, fig. 5) has a somewhat defective ilium; Admittedly, the strange shape of the latter at No. 142, especially in the sacral region, gives the impression that the original preservation had been artificially helped by a not entirely knowledgeable hand. But I have not been able to discover any trace of such tuition from the original.

As the bone is shown here, the maximum distance from the spina ischii to the anterior ilii is even slightly larger (73 cm) than to the posterior ilii (72 cm), measured in a straight line, the maximum width of the ilium in the cristal direction 67 cm; The posterior spine lies 56 cm above the acetabular margin. At No. 1687 the diameter of the acetabulum is 14 cm, the foramen oval 19 X 10 cm, the length of the symphysis 36 cm.A third, even larger Innominatum from Stegodon zu Berlin (No. 306?) Measures a maximum of about 100 cm in a straight line; it has a pan of 17 cm, a foramen of 24 cm of maximum diameter, and has belonged to an undoubtedly maximal individual.

Comparison: In Mastodon and Stegodon the pelvis is wider than in Elephas, due to the external extension of the anterior spine; on the other hand, the symphysis is also longer, due to the tapering of the spina ischii, so that the part around the foramen has a rhombic contour compared to the almost rectangular shape of Elephas; for in this case the free bone edge also borders the symphysial edge at approximately right angles, but in the mastodon and stegodon it is blunt.

All of this shows that in Elephas the basal edge of the innominatum, measured in a straight line, is not insignificantly shorter than the maximum distance from the spina ischii to the upper part of the crista, while in Stegodon this ratio is rather the opposite of the above - 73: 72 cm, on the other hand with an E. indicus in Berlin of about the same size 67: 80 cm.

On the ilium the shape of the anterior spine is more specifically variable; it is duller in the Stegodon and Mammut (Darmstadt), sharper in the other elephants and Mastodon giganteus. In contrast, the shape and position of the posterior spine in our stegodon is quite peculiar: the crista, as well

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the internal edge of the ilium is relatively very slightly curved, the spina posterior superior is sharper and higher above the acetabular edge (56 cm at no. 142) than is the case with a proboscidian, the inferior is hardly indicated.

The symphysis part is therefore considerably longer in the Stegodon and Mastodon than in Etephas; the symphysial sac measures 30 cm on the E. indicus mentioned, 36 cm on the approximately equal size Stegodon, No. 1687, and 42 cm on a slightly larger Mastodon giganteus in Berlin (17 cm acetabular diameter). Accordingly, the foramen in Elephas is also smaller, 13 x 7 cm in the case mentioned, compared to 19 x 10 (!) Cm in the Stegodon and 22 x 12 cm in the Mastodon (in E. meridionalis and E. (anti-

Fig. 4.

Kechtc half of the basin of a stegodon from Trinil, Externansichi

nat. Size

quus) Namadiae at the same time wider); while the maximum acetabular diameter is conversely somewhat larger, 15 cm compared to 14 cm in the case of Stegodon (17 cm on the colossal specimen No. 306).

A number of differences, apart from sexual and otherwise individual, are of lesser importance; but the essentials emphasized are numerous enough, and in all of these Stegodon joins Mastodon and not Elephas, as is also the case in the more essential peculiarities of the vertical series and the other skeletal parts described above . Especially for the hip region of the general build of ele-

phas it turns out that it developed more narrowly and higher than that of its ancestors. In the large Taubacher F. anUquus, the ilium alone has a straight maximum diameter of 107 cm, from the anterior to the posterior spine.

2. Femur. - This bone from Stegodon is very well preserved in Berlin in the large 'undoubtedly with the above-mentioned Innominatum No. 306 individually belonging) No. 307; this is on plate XXVII in Fig. 8, 8a and here in text fig. 6 reproduced.

Only the trochanteric epiphysis is missing on this femur. There are also the distal end of a small femur and minor fragments. Dimensions at No. 307: Maximum height 110 cm.

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distal width 25 cm, do. Circumference 76 cm; minimum width 14 cm, do. Circumference 38 cm; Ball diameter 15 cm, do. Circumference 51 cm; distal articulation surface: width in front 10 cm, do. back 21 cm, external length 21 cm, do. internal 25 cm (measured in a straight line).

The aforementioned smaller femur has an abnormally large, minimal condyle distance of 5 cm.

Fig. 5. Fig. 6.

Left (defective) half of the pelvis of Stegodon from Trinil, view of the Baaal. '/ «Nat. Size Left femur of Stegodon from Trinil, front view,

'/ s

nat. Size

Comparison: The fact that the long bones of Mastodon are thick and plump, those of Elephas are more slender, could not be overlooked even by older observers such as Warren without attempting to explain this difference. Above is shown on the carpal extremity,

that Stegodon is more like Elephas in its more graceful structure; and the same is true for femur and

Selenka-Trinil expedition.

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Tibia, as can be seen here and in the following from the dimensions: E. iridieus zu Berlin, cited several times above, has on its femur, 100 cm long: 10 ^ cm wide and 30 cm minimal circumference, which corresponds to the aforementioned proportion of Stegodon No. 307 corresponds approximately; the only 90 cm long Q Cambridge femur of Mastodon giganteus has a minimum circumference of 32 '/ 2 cm, the not much larger Berliner even 37 cm. In particular, the entire length of the Mastorfon femoral body is considerably wider and more compressed.In a second very important point, on the other hand, Stegodon, as in the above with the structure of its tarsal extremity, also in that of the femur, does not attach itself to Elephas but to Mastodon: in the almost complete absence of the torsion of the bone body, which is strongly developed in Elephas . The posterior boundary plane of the condyles in Mastodon is almost parallel to the anterior of the proximal femoral margin; Both planes, on the other hand, form a considerable acute angle in Elephas (up to about 40 °); with Stegodon this angle is only 15 °, so the proportion is considerably closer to that of Mastodon than that of Elephas.

Numerous other points of difference are either only individual or at most specific in character; thus the different length of the collum, the different position and shape of the trochanters, the greater or lesser curvature of the body outwards and backwards, the more or less developed form of its internal and external excess and its rounding either, or sharpening. Above all, the design of the distal articulation is extremely variable. The fused fossa and union of the two condyles, which is most common in mammoths, but also occurs in mastodons (angustirfens), is not observed in stegodons; has not been described.

The femur on the large Taubacher E. antiquus was more than 160 cm long; the next largest are all about 150 cm long, they are: Mastodon longirostris at Darmstadt (wrongly determined there as Dinotherium), E. meridionalis in Florence, E. trogontherii in London (wrongly determined as E. meridionalis type, cf. Leith Adams 1. cp 222) and Budapest, the latter probably belonging to E. (primigenius) tro- gontherü l

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3. Tibia. - There are three copies of Stegodon in Berlin; the best (no. 144) is shown on plate XXVII in Figs. 5, 5a, 5b, 5c, a second (no. 251) in Figs. 6, 6a (a third is without no.). No. 144 is 51 cm high, the width is 16> / cm maximum, 8 cm minimum and 141 cm distal, as is the circumference

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52 cm, 24 cm and 43 cm, the thickness 13y2 cm, 7 cm and 12 \* / 2 cm; on the condyle externus is the bone

12 '/ 2 cm thick.

The shin is under the long proboscidial bones because of its short, stocky shape

by far the best preserved and therefore most common among the fully represented fossils in collections. Comparative investigations of this large material show above all that the tibia of Stegodon and Elephas, like the other long bones, is more graceful than that of Mastodon, whose tibial body is broader and more voluminous, and, like the femur, has a shape compressed from behind forwards; the Berlin giganteus has on the tibia, 55 cm high, at least 10 cm wide and 26 cm circumference, but only 6 1 / cm thick; also the ends are

1) Elephas trogontherii has recently been safely proven by Mahiic Pavlow 1009 also from Russia (Taraspol) and is congruent with its synonym »Elephas Wüsti \*; what they themselves to / •. '. trogontherii are thick-plate molars from the typical mammoth.

2

more voluminous, the distal is 16 cm wide, the proximal 20 cm, with a circumference of 58 cm. But seem

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in the point among the elephants there may be accidental exceptions to this bone; At least this is the case with a Florentine tibia, allegedly from the Massimo near Arezzo (and then undoubtedly E. antiqious, Quaternary), which without such a location would have to be definitely assigned to Mastodon (avemensis); also because of the tarsal tapering of the bone characteristic of Mastodon (compared to Stegodon and Elephas) ​​in the profile view of the bone.

The other parts of the tibia are individually very variable in their design, which can hardly be used for the determination of specific, let alone generic, differential features; this applies in particular to the condyles including the eminentia, as well as to the tarsal articulation surfaces.

is labeled, but the dimensions are more like E. (antiquus) Nestii.

The fibula of Stegodon does not exist in Berlin.

4. Tarsus. - This is represented by Stegodon in the Selenka collection only by a slightly rolled talus, which is shown on plate XXVII in Figs. 12, 12a; there is nothing of the metatarsus or phalanges.

IV. Results of a general nature.The more essential result of the treatment of the present shiny material, the first specific description and representation of the Stegodon skeleton, useful for the practical purposes of the paleontologist, is given above. At this point it is superfluous to summarize the more general results of a zoological and comparative anatomical nature, which can be inferred from these detailed investigations and which also justify geological conclusions:

Stegodon follows mastodon completely in most of the chief osteological peculiarities; Both had in common: the low posture of the head, the less compact shape of the neck, the steeper ascent of the spinal crista from the neck and from stooping and also its less extreme height, especially towards the lumbar region. - All of this, along with a few subordinate points established above, are characteristics that are related to the relatively low weight of the skull, especially the dentition of the mastodon and stegodon.

Second, there are common characteristics that can be viewed as ancient points in the statics and mechanics of bone structure. 1. The remarkable width of the basin compared to the proportions of Elephas; 2. the less steep position of the feet, less distant from the plantigrade type, and 3. the minimal torsion or rotation of the long bones. With Mastodon the gait was turned somewhat inwards than outwards, with Stegodon a slight outward turn begins, which in Elephas develops very decisively outwards

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The tibia of the large Taubacher E. awtiquus is approximately 90 cm high,

at least not too great a measure in comparison with the other, especially carpal long bones of this skeleton - only very little larger than on the largest Florentine skeleton, that of E. meridionalis there

This gradual change is evidently due to the same cause as the following characteristic, which connects Stegodon and Elephas: to the great migrations beginning towards the end of the tertiary period, to the stronger development of locomotion of the animals; the elephants can and could, according to their extremities, "reach out" more effectively than the genealogically older proboscidians.

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Has.

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From the osteological point of view, only one essential peculiarity of the Stegodon and Elephas is in common: the graded shape of the long bones, in contrast to the even more plump limb structure of Mastodon. The latter is one of the reasons why I consider Mastodongiganteus (as well as Mylodon) to be strictly tertiary; the mode of conservation is irrelevant, there are also animal remains of the Jurassic with all the peculiarities of the conservation mode characteristic of the Tertiary, where the conditions are the same. The climatic fluctuations, which were initially perceptible towards the end of the tertiary period, also produced more perceptible changes in the seasons and thus the beginning of accelerated shifts in the animal world over large areas, and a peculiar formation of their locomotive organs.

Mastodon also spread over the whole earth, but the method of spreading was extremely slow and lasted for eons; this is evident from the locally restricted extent of the species. It was different with Elephas; Even the genealogically and geologically older species, the still very Stegodon-like E. meridionalis and E. antiqims, spread from Asia, where the former was in the Hysudriae race and the latter in the Namadiae class, all the way to Europe; the Trogontheria elephant also conquered America, where it penetrated into the tropics in the E. Columbi variety; and likewise the typical mammoth was circumpolar, which, although not quite as far as the tropics, spread considerably more boreally than all previous ones.

As a result of the increased activity of movement, the bone structure of the proboscidial extremities had to be less plump, the muscles more sinewy, the body more gaunt; and yet it has been found that the upper dimensional extremes among the elephants are not only not inferior to those of Mastodon, but even surpass them. It is precisely because of the less favorable nutritional conditions that the enormous elephant tendency developed, and through the latter in turn the greatest size of the cranium and, furthermore, of the whole body among all proboscidians in Elephas; similar to how, due to the glacial, geological situation, the Cervids, Ovids and Caprids attained the most handsome body sizes under the mighty growth of their forehead decorations 1].

However, the above description teaches that stegodon also osteologically, as in the dentition, represents a whole connection between mastodon and elephas. Whilst all the essential features of the bone structure are otherwise quite similar to Mastodon, in the less clumsy shape of the extremity bones it corresponds to Elephas. However, it is precisely this characteristic that is decisive for drawing conclusions about the way of life of animals and the geological conditions which determine such. While Mastodon succumbed, Stegodon apparently still outlived the Scanic, primeval glacial phase, it initiated the worldwide migrations of this clan along with the oldest elephants. This result of a comparative anatomical examination is in agreement with the geological result from the storage in the Trinil strata, which, according to its whole fauna, corresponds to our norfolkium 2

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1) See H. Pohlig, Theory of Descent with Consideration for Geological History. Stuttgart, F. Lehmann. 1909. 2) Cf. H. Pohlig, Eiszeit und Urgeschichte. P. 43. Leipzig, Quelle & Meyer. 2nd Edition. 1910.

or the oldest interglacial can best be parallelized.

Fig. »» »» »» »» »»

Right half of the atlas (seen from the right). Axis, lateral view.

Cervical V, frontal view.

Cervical VI, frontal view.

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15.15a. Dorsal X, lateral and frontal.

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2.

3.

4th

5, 5a.

6, 7.

8, 8a. Dorsal II, lateral and frontal. 9, 9 a. Dorsal III, lateral and frontal.

Cervical VII, from the side and from behind. 2 Dorsal I, lateral and frontal.

»21.

»22.

»23.

»24.

»25.25 a. »26.

Costa V, fragment.

Defective scapula No. 226, lateral. Hamatum, distal view.

Carpale phalange, frontal. Dorsal XVII, lateral and frontal. Dorsal XIX.

Dorsal XX.

10, 11. 2 Dorsal IV, distal and frontal. 12.12 a. Dorsal V, resp. lateral and frontal. 13.13a. Dorsal VI, lateral and frontal.

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»28.28 a. Lumbar I, lateral and frontal.

»14. Dorsal IX (Spinosus), frontal.

On the osteology of Stegodon, 213

Dinner clarification.

Plate XXVI.

All the figures refer to the skeleton of Stegodon from Trinil and are in full-size. The originals are in the Royal Museum of Natural History in Berlin.

16, 16 a. Lumbar II, lateral and frontal.

> 17.17a. Lumbar III, lateral and frontal.

“18th Costa X, left.

19 (No. 819), 20 (No. 352). Fragment of posterior ribs.

Plate XXVII.

All figures from the Stegodon from Trinil; Fig. 1-8 in 1/6 of the natural size (originals from Berlin); Fig. 9-13 in about 1/3 the natural size (originals from Munich).

Fig. 1, la, Ib. Scapula No. 247, frontal, lateral and basal.

»2, 2 a. Humerus, frontal and lateral.

> 3, 3a, 3b, 3c. Ulna, lateral, frontal, proximal and

basal.

“4, 4a, 4b, 4c. Radius, lateral, frontal, proximal and

basal.

»5, 5a, 5b, 5c. Tibia No. 144, frontal, lateral, basal

and proximal.

Figures 6, 6a.

Tibia, basal and proximal. Humerus No. 811, frontal and basal. Femur # 307, internal and basal. Hamatum, frontal.

Trapezoid, frontal and internal. Triquetrum, frontal and proximal. Talus, proximal and distal.

7, 7 a. 8, 8 a. 9.

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»13, 13a, 13b. Metacarpal III, frontal, lateral and

10, 10a. 11, IIa. 12, 12a.

proximal.

The probe's tooth (a fossil human tooth from Java).

A. Odontological and comparative studies of

Prof. Dr. Walkhoff, Munich.

With panel XXVIII.

Among the discoveries made by Prof. Selenka during her excavations on Java in the vicinity of Trinil, where the Pithecanthropus erectus was found, the human tooth found at the probe must be described as of great interest. This tooth shows so many peculiarities that it seems worthy of a particularly detailed description. Thanks to the kindness of Ms. Selenka, I received the tooth for a detailed odontological examination, the results of which I present in the following.

The probe's tooth already has a peculiar history in its assessment. When it was brought to Europe, Mrs. Selenka showed it to the discoverer of Pitkecanihropus, Prof. Dubois. The latter soon explained the tooth, although he had only seen it for a few minutes

as a »very recent and white-looking human lower jaw

Notice printed on it 1

molar with trinil-like sand adhered to its rootless lower surface, although it was not found at Trinil ". "This sand cannot have been brought by nature to the tooth, which looks very different from the thousand teeth from that layer!" Ms. Selenka objected to this statement by Dubois as soon as she was informed of the relevant publication (only by chance several months after it)

The fact that a quite credible European had found the tooth in a place several kilometers from Trinil spoke against a forgery by glued-on sand from Trinil. The detailed under-

The search soon revealed that Dussois's assumption was unsubstantiated.

The present tooth (Plate XXVIII, Figs. 1-4) is undoubtedly a lower left molar.

The roots are completely absent. The tooth consists mainly of an exquisitely preserved enamel cap. Inside the melting cap there is a peculiar mass which will be discussed later. The five cusps of the chewing surface are all very well defined, but the tips of the outer cusps are apparently abraded by the act of chewing (Plate XXVIII, Fig. 6).

1) Journal d. Kgl. low]. Ges. F. Erdk., 2nd Ser., XXV, AH. 6, 1908.

2) The fossil teeth of Trinil. Tijdschr. v. left Con. Nederl. Aardrijkskundig Genootschap, 2 «ser. , XXVI. On. 3, 1909.

2 appearances) experienced, protested immediately).

Walkhoff, Odontological and Comparative Studies on the Tooth from Sonde \

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Only the anterior inner cusp is completely preserved; the rear inner cusp has also suffered severe mechanical wear. The former has a very strong main bead from the tub. ant. internal, originating in its course, is accompanied by two lateral furrows which give rise to small secondary ridges. The anterior outer cusp shows the usur apart from the dentine cone belonging to it. In the other cusps, too, the smaller enamel cusps were largely lost due to the act of chewing.

On the occlusal surface, the molar has the typical cross shape of a human lower molar. Since the four main cusps are approximately the same size, the chewing surface would appear square, if the fifth posterior cusp were not positioned like a wedge between the second outer and second inner cusps and in this way a stronger, even rounding of the distal ones Surface of the molar. This fifth cusp deviates considerably from its normal position in modern humans, where it is mostly more buccal, although it must be admitted that the position of the fifth cusp still occurs exactly in the direction of the longitudinal axis of the molar. In the chimpanzee and often in the gibbon, on the other hand, this position of the fifth cusp is usually present. The main furrows are sharply cut, but generally show the normal course. There is little anterior fovea.

The buccal surface shows a foramen coecum molare, otherwise the individual cusps are sharply separated by furrows on the side surfaces.

Both the mesial as well as the distal side of the present molar have so-called interstitial friction surfaces (Plate XXVIII, Figs. 2 and 3), usures which arise from the low mobility of the teeth, because they rub against each other when chewing can. The mesial friction surface is particularly pronounced. Experience has shown that such interstitial friction surfaces occur with older, tightly fitting teeth. The adult individual to whom this tooth undoubtedly belonged must therefore also have had a closed row of teeth. - As far as the proportions are concerned, we have quite considerable dimensions to establish.

The mesiodistal diameter is a good 13 mm, the buccolingual 11 mm. Even if the lower edge is poorly preserved, the height of the crown can still be estimated at at least 7.5 mm. Certainly the general shape and cusp position of the tooth is reminiscent of the lower first molars of Krapina, and the size is also quite the same (below, 1.13.40, r 12.40 crown width; 1 12.40, r 10 , 80 crown thickness; 1 7.50-9.00, r 6.50-7.50 mm crown height according to Kramberger for not

needed molars).

The mostly strongly increased enamel folds of the Krapina teeth compared to today's teeth

is not immediately evident in this tooth due to the wear and tear of the cusps, but the inner anterior cusp shows an indication of this. On the whole, however, the general shape of the tooth (apart from the position of the fifth cusp) does not deviate in particular from a modern, very well-developed molar. According to its entire habitus, the tooth from Sonde is a typical human molar and in all probability a first. It cannot be a wisdom tooth because the tooth also shows an interstitial friction surface distally and as a second molar it should be difficult to address because the size speaks against it.The tooth has apparently suffered injuries in the form of fractures after its discovery 1).

1) Editor's note. With regard to these injuries, Mr. Carthaus explains the following: I really don't know anymore whether a piece of it had chipped off when the tooth was handed over to me and was then stuck on again. I do not attach the slightest importance to it, since on the one hand I know from experience that teeth are exposed to long wind and weather, especially in the tropics. Get cracks once they get some time

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A break goes straight through the fifth cusp. Another fracture goes between the two inner cusps, first in the direction of the very weak posterior fovea and then between the second and third outer cusps. I was able to detect these fractures especially through the X-ray (Plate XXVIII, Fig. 5). When the tooth was handed over to me, the individual pieces were apparently not glued together very carefully with an organic glue, in particular the crack gaped through the cross of the rear cusp. These cracks also penetrated through the mass lying inside the melting cap and were later filled with a glue-like mass between the individual sections.

The enamel cap of the tooth apparently still has a fairly solid structure. In any case, this is an extremely important fact when determining the geological age. Comparative tests with regard to the hardness of the enamel did not reveal any significant differences with today's human teeth.

The mass inside the enamel cap, on the other hand, is noticeably soft, which could be scratched with the greatest of ease and no longer gives the impression of dentin on the outside. The whole of the lower part of the original dentin with the root has completely disappeared, and only in the enamel cap, but also no longer in all parts of it, is a remnant which has in any case been subject to significant changes. It usually has a light to dark gray, sometimes also brownish appearance, and fits the enamel cap very precisely (Plate XXVIII, Figs. 8, 9, 10). Small gaps are only to be found at the edge after the tooth neck, which evidently result from the fact that the contents in these places later fell out when the tooth was found and its fragmentation took place. You can clearly see two layers, one

peripheral and one central (Plate XXVIII, Fig. 7). The former mostly consists of sharply delimited, approximately cube-shaped structures which, when viewed from above, show an approximately square surface, especially on the more straight side walls of the enamel cap, while they are trapezoidal in shape at the rounded angles which the sides form with one another . This shape can be seen particularly beautifully at the mesiobuccal angle, because here a cubic mass has completely fallen out (Plate XXVIII, Fig. 7 at a). While one cube is always lined up in a row in the peripheral layer, the sections in the central layer are much more irregular and have a very different shape, corresponding to the narrowed spatial relationships. All of these sections are evidently the result of later drying out of the mass; however, they lie tightly against one another without any space and without the slightest binding agent. However, a mass of glue was clearly visible in the joints of the identified artificial enamel fractures. The glue used to glue the fragments together was of course not reflected in the x-ray, but this shows the artificial gaps in the enamel cap all the more clearly (Plate XXVIII, Fig. 5). Would

If the contents of the melting cap, for example in the form of sand, are artificially joined together from individual pieces by an organic binding agent, then small gaps or variations in the density of the rock would undoubtedly be detected by the X-ray image.

For the question of how the present condition inside the enamel cap was brought about, whether artificial or natural, the fact that

be kept dry, on the other hand the shape of the tooth has not been changed in the least. The injuries can also have occurred in Europe on one of the occasions when the tooth was examined by various specialists and, among other things, was once an impression was taken. Frau Selenka explains that she has never seen the tooth broken, except for Herr Walkhoff when he demonstrated the double fracture. She remembers, however, that the tooth was given to her in Trinil with the remark that he should handle it very carefully because a piece of it had already broken off or could easily break off.Odontological and comparative studies on the tooth from probe \

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in places (so on the fifth cusp) the inside of the enamel wall is exposed. Such a thorough local removal of the dentin could be done mechanically with the help of a good dental fracturing machine, but it would still be possible to microscopically prove that a mechanical cavity had occurred even in incident light. Even at high magnification nothing of this is noticeable here. A removal of the dentin could therefore only have taken place chemically, but there is no method by which one can artificially detach the dentin chemically from the enamel without attacking it as well.

It is possible to use agents that act very quickly on the organic matter of a dentin, e.g. B. by boiling sulfuric acid, destroy the dentin and thus isolate the enamel cap of a tooth. But of course this then also shows a matt surface, as it is caused by any acid action on the enamel tissue. The present change of the tooth without Nature can bring about the slightest destruction of the enamel cap only by means of the weathering process, in that only the organic substance of the dentin was attacked, as a result of which the calcium salts contained in the dentin lost their connection with one another, disintegrated into powder and then separated from the dentine This process of the sole but complete dissolution of the organic matter of the dentin must have been immensely slow if, as is actually the case with the present object, the enamel is nevertheless so complete and well preserved the shiny surface of our tooth is so beautifully preserved that at first glance one might mistake it for a recent tooth. This is probably why Dubois fell into this error. The fact that so far not a single human tooth from the Diluvial Age has been found, which shows the loosening and destruction of the dentin by the natural process even approximately in the same way as the tooth from the probe, speaks for the tremendous duration of the changes in its dentin. Only the extremely small amount of the organic enamel substance and an extremely slow process of destruction of the organic substance with the simultaneous absence of chemical influences on the inorganic tooth substances can be attributed to the fact that the enamel cap in this object

is preserved full of beauty. How otherwise human teeth tend to decay when exposed to natural influences. B. the teeth of Krapina. Although the dentin is nowhere dissolved in these teeth and there are no nearly isolated enamel caps, the enamel is already in a certain dissolution process because the enamel caps are extremely brittle.

According to these explanations, the question of an artificial intervention in the present tooth and the objection made by Dubois \*) that simply trinile-like sand could be glued to the rootless lower surface of a recent molar, for mechanical and general chemical reasons, should also be settled if it were not refuted by the later microscopic findings and the special chemical analysis of the tooth contents.

Another question to be touched upon here: is the probe tooth fossilized or not? An authority like Schlosser considers the tooth to be really fossil, which Dubois in turn “seems a little too daring”. According to Dubois, the tooth should "look white and be a very recent human mandibular molar". To be sure, the tooth shows a whitish color than is usually the case with fossilized teeth, but if one considers what a pronounced fossil coloring is based on, then one has to admit that this tooth need not show the fossil coloring to a marked extent,

1) Tijdschrift van Het Kon. Nederlandsch Aardrijskundig Genootschap, 2nd Ser., Dl. XXVI, 1909, Afl. 3. pp. 398-401.

Selenka-Trinil expedition.

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because the coloring substances: iron, manganese etc. can only be infiltrated into the interior of the teeth in the organic matter or in cavities, which are either vitia primae formationis or arise from the later natural destruction of the organic matter. For the most part, the characteristic, turquoise color of a fossil tooth that is usually present is due to the absorption of those coloring substances that later penetrate into the dentin. The enamel allows the color to shine through, but is itself much less discolored than the dentin. Since the organic substance contained in it is far less, the tooth enamel always has a far less color due to the infiltrated substances. In our special case the enamel, which is the main mass of the tooth residue, is still perfectly preserved and still of a hardness which does not indicate even the slightest chemical decomposition of its inorganic mass.Since the natural processes which led to the complete dissolution of the dentin, at least in the whole root, could of course also act on the enamel, but here neither a loss of substance nor any loss of density can be ascertained, so the conclusion is that we do in the tooth of probe have to do with an excellently well-formed enamel tissue that has been consolidated from the start on the best possible basis. This, very poor in organic matter, allowed a coloring, which is mostly peculiar to fossil teeth, only to a very small extent. Furthermore, if the specific coloring substances that later come in from outside happen not to be present at the relevant deposit, the coloring in the mostly characteristic way can of course not occur even if the dentin is still present. It is therefore

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Of course, it cannot be ruled out that fossil teeth of different origins can also show a greater or lesser degree of fossil coloring, even e.g. B. if they are geologically of the same age, because of course it only depends on the amount of coloring substances that happen to occur at the respective deposit. It should be expressly emphasized that the tooth of Sonde is not, as Dubois says, white, but has a bluish coloration, which a recent tooth does not have. Dirois explains the tooth simply "only as subfossil and from a geologically recent time". He did not find such a tooth "in Trinil or other Javanese sites of older vertebrate remains and considers it very different from the many thousands of teeth that he found in these places." However, if one takes into account that the tooth brought by Mrs. Selenka, albeit in the vicinity of Trinil, at least 3 kilometers away, was found in another place, which was obviously not its original deposit, and one also takes into account that of As I said above, how the fossil coloring comes about especially on teeth, one cannot simply claim that a tooth is subfossil or even quite recent if one judges this only by the color and because it is found in the vicinity of others that show a much stronger coloring.

In order to further remove any doubts about the authenticity of the tooth and the mass in the enamel cap, I isolated the fragments again. In hot water, the organic binder was dissolved upon exposure to the former for quite a long time. Exactly according to the fractures previously determined by the radiograph, the tooth crown disintegrated into the three parts mentioned above. No filling compound adhered to the fifth hump. The other two large fragments showed the filling compound on the surfaces that had now come to light with such a precise tape connection to the inner wall of the enamel cap that even the greatest doubters would have to admit a natural formation when looking at this surface. Even in the finest protrusions which the dentin makes into the enamel cusps, the mass of the enamel wall lies hard, and despite the prolonged treatment with very hot water, the former remained firmly attached to the enamel (Plate XXVIII, Figs. 8-10). Finally looking at the

Odontological and comparative studies on the tooth by probe. '219

Fracture surfaces that even two differently colored masses are in the melting cap. One looks light gray with a greenish tinge, the other, much smaller in quantity, looks deep dark brown. Both lie hard against each other, especially at the melting point, completely filling the space, but are sharply separated from each other. At individual points one can clearly see that the mass is structurally positioned in accordance with the course of the dentinal tubules and is thus a pseudomorphosis. 10 especially shows this.

The results of my investigations, which I have cited so far, prove, on the average, the opposite of Dubois' views on the morphological and geological behavior of the probe-tooth and initially show that it is fossil and unadulterated.

The nature of the contents of the melting cap is particularly important for further assessment. Since the tooth is unique and the amount of material present was small, I did not dare to sacrifice any of the contents of the enamel cap for a microscopic thin section examination, especially since something had already been used for an analysis by Prof. Oebbecke, Munich was. That normal dentin analogous to normal enamel was not simply present, I could easily see from the softness of the mass and from the top view microphotographs which were made of the fracture surfaces. So there must have been a pseudomorphosis, which I initially assumed had occurred completely, although Prof. Oebbecke had demonstrated a delicate organic framework in his analysis. So I took one like a locksmithcomplete new formation of rock mass on the part of nature in place of the dentine. Prof. Dieck 1, who then carried out another microscopic examination at Ms. Selenka's instigation, but then directly demonstrated by thin sections of the filling compound that the dentin structure with its canals is preserved both in the dark and in the chalky weathered layer, and I refer to his work in this work in this regard. With this DiECK investigation, the last remnants of the Dubois see objections to the authenticity of the tooth from Sonde also fall.

Palaeontologically, I consider the tooth of Probe for a piece of very old age. His age

the Dubois depicts with full roots. Acids and the like evidently had no effect on either, nor any strong mechanical forces, but solely the simple process of weathering the organic matter. This weathering process is evidently much stronger in the probe tooth than in the Pithecanthropus. The tooth of the latter shows, by its very nature, that the tropical climate does not at all need to allow the weathering process of a primate tooth to proceed faster than it is generally known to us. It must be remembered that the probe tooth was found only a few kilometers from Trinil. More specific tropical effects cannot be considered with the tooth of probe compared to those of Trinil. As far as I know, never before has a human tooth been found in which the enamel cap was preserved in full beauty through the natural weathering process, but the dentin was metamorphosed in this way. I remember the numerous teeth of Krapina and Spy in which the dentin is still present; Even the old diluvial lower jaw of Heidelberg was brought to light with all its crowns and roots. In complete contrast to Dubois, I believe, for the reasons given above, to conclude that this tooth represents the oldest human document

1) For more details, see the article below: "Microscopic examination of the probe-tooth".

2) Note d. Ed. It would of course be highly desirable, rather necessary, that the dentin of the Pithcecmthropus teeth should also be made available for analysis. S.

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is perhaps much taller than Pithecanthropus erectus2 tooth

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has become known to this day. With regard to the preservation of its constituent parts, the tooth from Sonde can only really be compared with a few "human-like teeth from the floor ore of the Swabian Alb". The excellent work by Branca on this subject reports "two completely unused molars" of the lower jaw, which consist only of an enamel cap and, according to Branca, could therefore initially be referred to as germ teeth (Plate II, Figs. 1 and 4 of BRANCA's work ). There is no evidence of dentin on either of them. Branca says quite correctly that the molar depicted on Plate II, Fig. 4 can only be an apparent germ tooth because it has the lateral polished surfaces. But the other lower molar (Plate II, Fig. 1), which in terms of size is pretty much the same as the tooth of the probe, certainly had a very large amount of dentin, and at least a larger part of the root was also formed in it . Because the dentine becomes evolutionary

always formed before the enamel. In these tertiary teeth, too, the dentin probably lost its coherence as a result of the gradual destruction of the basic organic substance; the purely inorganic matter became friable and crumbled, so that in the end only the enamel caps remained. Just as no one will declare these teeth from the flooring ore to be recent, just as little is the case for the tooth from the probe, which moreover worked for the chewing act for a long time and therefore had a fully developed root. [It should be noted here that the design of the chewing surface of the tooth from Sonde cannot be confused with the molar tooth of Pithecantliropus, nor with the teeth from the floor ore, nor with Drjopithecus. The probe tooth is a typical human tooth, which, considering its old age, indicates a great constancy of the shape of the first human molar]

Thanks to the kindness of Prof. Dr. Koken in Tübingen, I was able to directly compare the two above-mentioned floor polish teeth from the Swabian Alb with the tooth from Sonde. It was found with these objects that the blue coloration was by no means as strong as on teeth, which z. B. come directly from the Trinil deposit. A fossil pig tooth found there, which z. B. Dubois recognized as such, shows an extremely dark color. It is not just an enamel cap, it contains a hard dentin in which the dark coloring substances are stored. The latter shine through the enamel darkly. The two human-like teeth of the stone ore, which only consist of the enamel cap, do not even come close to the deep dark color of trinile teeth. With regard to their coloring they are far more similar to the tooth of Sonde, and in particular the tooth depicted by Branca in his work on plate II, Fig. 1 is not much darker in color than the latter. The tooth shown in Plate II, Fig. 4 has a deeper color in some places, but otherwise the tooth is also much more similar in color to the tooth from the probe than purely fossil teeth from the Trinil deposit. Both teeth from the floor ore now clearly have the dark turquoise color of the enamel cap only at individual points, either where z. For example, some dark rock is still embedded in the enamel cap, or - and special attention is to be drawn to this - in those depressions on the inner side of the enamel cap into which the dentin cusps protruded. These spots are usually the least calcified in humans. The enamel usually shows numerous anomalies of the structure here, as I have also convinced myself of the teeth of the anthropomorphs, and the darker coloration in these places can be explained by the possibility of a greater absorption of coloring substances in the enamel tissue itself. The two mentioned teeth from the floor ore are therefore a good comparison object with the tooth from Sonde, not only in their external behavior, in that the dentin is completely destroyed by an extremely long process of weathering without the enamel being chemically attacked. Rather, a comparison should also be madeOdontological and comparative studies on the tooth by probe.

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with regard to the geological time periods for those objects cannot be simply dismissed out of hand. In any case, the quality of the tooth from Sonde cannot be compared with teeth which come from graves of the younger Stone Age or Bronze Age and of which only enamel caps are occasionally found. I myself have recently seen quite a number of such enamel caps coming from old barrows in the Lüneburg Heath. They were extremely crumbly, even with careful handling they would disintegrate and were quite dull.

The above-mentioned floor polish teeth, on the other hand, have evidently been in motion and thus literally polished bright at the dentine enamel line. The enamel caps of the Stone Age and Bronze Age just mentioned would have long been destroyed by such mechanical force that the artificial polishing of the inner enamel surface visibly brought about. On the other hand, the probe tooth would certainly have withstood such an impact with regard to its enamel cap. The fact that the very soft metamorphosed dentin inside the enamel cap was not lost makes the conclusion seem justified that the tooth has not been in motion in the river bed for a long time. The opinion of Dr. Carthaus has a lot to say about the Sonde tooth occasionally being carried away by a flood from a higher lying creek deposit by a tropical rain, and it is, as Prof. Blanckenhorn \*) emphasized with Becht, that the upper course should be very much to be desired of the Sonde brook and the older deposits of the southern Kendeng slopes are still subjected to the most thorough research for further traces of fossil humans2 If one can argue about the exact geological age of the tooth, it stands

In any case, the fact that the tooth as the first fossil remnant of man in Asia is, in its entirety, a testimony to the existence of man in a very distant period of time, which, if one considers the similarity of the condition of the tooth of Sonde with the teeth of the Bohner ore applies, could possibly even be placed in the tertiary.

Explanation for panel XXVIII.

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4th

5. X-ray of the probe tooth in its first artificial composition. 6. Occlusal surface of the probe tooth. Photograph. Enlargement approx. li / a times.

7th Sond6 tooth photographed from the root at approx. 41/2 times magnification. At a, a large piece of metamorphosed dentin fell out.

8-10. The fracture surfaces of the parts of the probe tooth, which are present after the glue has been dissolved, photographed in a striking light, greatly enlarged. s enamel, d dentine. The dark spots in the dentin are the later deposited masses, which partly follow the direction of the dentinal tubules, partly as in e in FIG. 10.

1) Blanckenhobn, model of a fossil human tooth from the SELENKA-Trinil expedition on Java. Magazine f. Ethnology, volume 2, p. 354, Berlin 1910.

2) Note d. Ed. The Selenka expedition carried out this research at the end of the first and the two-year working period to the extent that their work program permitted, but this was not possible to the extent that the subject would require. S.

Probe tooth; Occlusal surface.

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medial surface. distal surface. buccal surface.

Fig. 1-4 in natural size according to drawings.

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B. Microscopic examination of the probe tooth of

Prof. Dr. Dieck, Berlin.

With 9 illustrations on plate XXIX.

The probe tooth, the crown of a lower left first molar, shows abrasion on the occlusal surface as well as on the medial and distal crown surface. So the tooth was in contact with both its front and rear neighbors. The latter is likely to have existed for years. The moderate abrasion of the chewing surface in connection with the whole rest of the appearance of the enamel suggests that the carrier of the tooth may be an adult, but in any case a relatively young individual.

On Plate XXIX, Figures 1-3 show the enamel cap from the occlusal surface, from below with its contents and in the X-ray. The five-humped type, as shown in the occlusal surface, in connection with the grinding on the posterior surface, makes it certain that it is the first molar.

The contents of the enamel cap are the metamorphosed remnants of the original natural dentin. The entire root part of the tooth has gradually decayed through weathering, apparently having undergone the same metamorphosis.The pseudodentine (for the sake of brevity the converted dentine residue in the enamel cap is so called) is still close to the inner wall of the enamel in many places, but it can be

peel off easily.

Macroscopically, there is no longer any resemblance to normal dentin, while enamel

with its transparency and surface gloss has an almost unchanged appearance.

The internal cohesion and the hardness of the pseudodentine are extremely low. A fine drill, which is used to cut off a small piece for microscopic examination

used found little more resistance than in chalk.

The lack of internal cohesion leaves the organic substance in them destroyed

close the original form and the severe failure of the hydrochloric acid sample suggests a subsequent increase in the carbonate of lime content. The latter, however, is not a necessary conclusion, because it would be understandable that the hydrochloric acid sample shows a stronger development of carbonic acid than with normal dentin, even if the dentin content of calcium carbonate remains unchanged, if the organic substance is destroyed by the weathering processes or is so changed that the Lime salts have lost their previous firm bond to it.

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Dieck, microscopic examination of the probe tooth.

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According to an analysis by Berzelius, normal dentin dried at 120 ° has the following composition

Organic matter 28.0 Phosphoric acid lime with fluorine calcium 64.3 Carbonate acid lime 5.3 Phosphoric acid magnesia 1.0 Soda with a little table salt 1.4

Since it was of interest to obtain a quantitative analysis of the metamorphosed dentin in the enamel cap despite the small amount of test material, Prof. Dr. Marckwald, Berlin, kindly accepted to have a microanalytical test carried out in his laboratory. However, it was only possible to determine the content of calcium carbonate and organic matter.

I have the original report from Prof. Dr. Follow Marckwald on the investigation:

“According to Dr. Carthaus' qualitative analysis of the mass showed that it essentially consisted of calcium phosphate and calcium carbonate in addition to organic matter. The carbonate content should now be determined using the microbalance. The experiments described below were carried out by my assistant, Dr. Keetman been executed.

The first thing to do was to check the usefulness of the method for determining the calcium carbonate content of pure calcium carbonate (double spar). For this purpose, the calcium carbonate was calcined and the weight loss determined using the microbalance. The accuracy of the method gives the following numbers:

I. 3.61 mg calcium carbonate lost 1.64 mg CO2; from this it would be calculated that 3.72 mg of carbonate were present.

II. 3.50 mg CaCO3 lost 1.57 mg CO2, from which it would be calculated that 3.59 mg carbonate was present.

The method gives the carbonate content to an accuracy of about %%.

The prerequisite for the method was that nothing other than carbonic acid would evaporate during the glow. Calcium phosphate is not volatile, but the organic components burn. In order to be able to use the method nonetheless, an attempt had to be made to quantitatively convert the lime formed by annealing back into carbonate and thus to determine its amount through the increase in weight. As shown in preliminary tests with calcium carbonate, this was achieved by treating the residue on ignition with ammonium carbonate.

3.61 mg CaCO3 yielded 1.97 mg CaO, which during regeneration yielded 3.61 mg CaCO3. So the method was useful.

The investigation of the dentine was now started. There were two for this

Samples available. One was made of coarse little bits, the other of powder. The analyzes showed agreement within the limits of observation errors. The results are given in the following table:

I II III

Loss on ignition

0.127 ms 0.193 »0.372»

Organic matter

12.7% 14.2 »11.0»

Calcium carbonate

7.5% 9.5 »7.7.

Weight of substance applied

0.793 m | 1.05 »2.58»

Weight gain due to aroma carbonate

0.026 ms 0.044 ».0.088,

Found as a percentage of dentine

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Dieck.

It follows that the metamorphosed dentin contains around%% calcium carbonate and around 13% organic matter. Whether the remainder of around 79 ^ consists exclusively of calcium phosphate cannot be determined by the microanalytical examination. "The investigation has shown that the metamorphosed dentin has lost 15% of organic matter compared to normal dentin, and an increase of?% Of carbonate of lime.

The pseudo-dentin has a dark, pitch-gray, on the weathered surface a whitish-gray, chalky appearance, but layers of the lighter substance penetrate into the depths of the darker. The microscopic examination reveals the dentin structure perfectly, as well

in the dark as well as in the chalky weathered layer. A difference could, however, be established insofar as the structure in the darker masses was purer, more original than in the lighter layers, which were evidently more exposed to weathering, even though they are still there

had received unmistakably.

The investigation was carried out on fine scrap pieces and on a carefully prepared section

executed.

The microphotograms Fig. 4 and 5 show the dentin structure in the longitudinal view and in the transverse

Sections of the tubules with oil immersion and 900x magnification. In the dark-looking layers, the metamorphosed dentin is interspersed with red-brown spots, which are likely to result from an iron compound (Fig. 6 and 7). The iron sample was positive both macrochemically and microchemically. These spots have a predominantly oblong shape and their longitudinal axis is transverse to the dentinal tubules. At a sufficiently high magnification it can be seen that the peripheral brightening of the spots consists of delicate yellow-brown lines (Fig. 8). This shows that the iron compound has been deposited outside the dentinal tubules in place of the earlier basic substance; the fine yellow-brown lines mentioned correspond to the course of the earlier basic substance fibrils, perpendicular to the dentinal tubules.

The dentinal tubules themselves often show a dark filling, soon over longer distances, often also within a tubule with interruptions. Since this dark brown content of the tubules was in many places the core of the red-brown spots described, the interpretation suggests that the iron compound first penetrated the dentinal tubules and only then led to the imbibation of the environment.

Figure 9 is a comparative photograph of normal recent dentin.

In any case, the investigation has shown that the contents of the enamel cap are the remainder of the original, albeit metamorphosed, dentine.

From Dr. Carthaus has already taken the view that carbonated water had an effect on the dentin and that after gradual leaching of the organic matter a new deposit of carbonate of lime took place. This view finds some support in the results of the investigation by Prof. Marckwald. Small residues of organic matter could be detected even when the examined material was dissolved under the microscope.

The fact that the enamel has remained intact should speak against the assumption that the shrinkage of the root of the probe tooth could have come about after a previous decalcification with water containing sulfuric acid. You can also safely recognize the acid effect and at least let the surface gloss be missing.

The behavior of the enamel towards sulfuric acid is interesting. In hot 50 # acid one can remove a tooth by decalcifying the dentin and destroying the organic base

Selenka-Trinil expedition.

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Fig. 1-8 1 2 3 4 5 6 7

Explanation for panel XXIX.

Human tooth from probe \ occlusal surface (natural size). Underside (nat. Size). X-ray image (nat. Size).

Microscopic examination of the probe tooth.

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Substance, of the dentin cartilage, isolate the entire enamel cap; only the gloss of the enamel is lost. In dilute sulfuric acid, on the other hand, the enamel is attacked much more intensely and decalcified after a relatively short time.

It can be completely ruled out that, in the case of the probe tooth, after a complete loss of dentine, a new substance foreign to the tooth would have subsequently filled the cavity of the enamel cap.

I have to leave the more competent judgment of the geologist and chemist to the more competent judgments of the periods of time to be spent for the present metamorphosis of the dentine and how high the age of the probe tooth is to be estimated.

Dentin material in the>> »»

Longitudinal section at 900x magnification

Cross-section at 900x magnificationLongitudinal section with brown precipitates in 280x magnification.

»» »» »» »530x»

> »» »» »Even more enlarged dentin of a recent human tooth, comparison image in 530x magnification.

C. Brief report on the location of the probe tooth 1

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C. M. Dozy. With a text illustration.

The distance of the tooth find place from Trinil is about 3.5 km (about 1 hour). The terrain at the site is slightly hilly and covered with Djatti forest. Marls come to the surface there

The place where the human tooth was found in the Sonde Valley (the place where Mr. Meyuoum [right) sits] according to a photograph by Dozy.

and limes. The Sonde stream is not deeply cut, but the walls are quite steep. The distance from the mouth of the brook to the main river Solo is about 1000 m. From bones

1) Note d. Ed. S. Since the tooth was found at the very end of the first working period, an immediate closer examination of the place of discovery was no longer possible before the onset of the rainy season. In the second year of the expedition [1906, Mr Dozy, on my behalf, still had an exact record of the place of discovery together with the finder of the tooth. Major Meyboom, made, profiles also taken there and, as far as the circumstances allowed, searched the surrounding area.

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C. M. Dozy, Find Report Regarding the Probe Tooth.

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Only a few jaw fragments from Bos are found in the river bed at the site, but none in the hanging pendants of the bank. The stream has no steep gradient and was almost completely dry at the time of the find; Some water still streamed between the rolls, but not much; In the rainy season it can, like all streams, carry a lot of water, so that the dragging of bones cannot be ruled out. It is also all marl and here and there solid limestone that come to light, whereas the well-known bone-bearing ashes and tuffs are missing. So the tooth is safely carried along by the water. The stream comes from the south side of the Kendeng Hills and flows past Alas tua (= Alt Alas), where the ash and tuff layers also occur. This is about 2000 m further north than the location. The bones that were sparsely found in the river bed of the Sonde brook were probably washed away from these tuffs near Alastuwa and dragged along.

I can only say good things about the trustworthiness of the finder, Sergeant Major Meyboom. It is out of the question that this thoroughly honorable and trustworthy man, chosen with special care by the Indian military administration for the expedition, would be capable of forgery, quite apart from the technical impossibility. He found the tooth himself quite accidentally when he was walking down the river bed from Alastuwa. He immediately picked up the tooth and brought it to Trinil, where he gave it to Dr. Carthaus handed over.

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D. Geological and mineralogical remarks on the discovery of the probe tooth from

Dr. E. Carthaus, Berlin.

Even if I did not get to know the actual place of discovery of the probe tooth myself through personal observation, but only the lowest part of the small valley through which the probe brook flows, I would like after everything that I learned about it and I have seen and observed during my long stay on Java, assume it is very likely that the human tooth from the Kali probe will be caused by high water or a flood, as they return so very often with the enormous amount of rainfall on the island , was dragged from a higher deposit to its place of discovery. I consider these higher fluvial sediments to be partly older than the main bone layer of Trinil, in which the remains of Pithecanthropus were found. During the later Pliocene period, when the plain of Madiun and on its western edge the immediate vicinity of today's Trinil was still covered by the sea, the current Kendeng Mountains, on the southern edge of which the Sonde-Bach (Kali Sonde) the Solo- River hurries, even as a comparatively broad one

Promontory. The chain of hills forming this mountain range is composed of a core of volcanic breccias, overlaid by sandy marls, clays and calcareous sandstones, which Verbeek and Fennema classify as part of the Miocan. More calcareous sediments, marl and limestone, which Verbeek calls Pliocene, lean against these layers. All of the deposits mentioned contain a lot of volcanic material enclosed in themselves; likewise the stream deposits.Apart from what has been said, I would like to consider some of the fluvial formations up to more than 100 m above the adjacent plain of Madiun to be older than the main bone layer of Trinil, also because of the partly older appearance of the bone fragments found in them. It would also be at least possible that a fragment of an anthropomorphic (?) Lower jaw, which Prof. Selenka saw at the time and that was because of him, was found earlier by Prof. Dubois at a distance of approx. 50 km (?) West of Trinil its quality, which indicates the beginning of a chin formation, appeared almost even more interesting and important than the actual Pahcanthropas Slücke, originally from such older strata from the western foothills of the Kendeng Mountains 1

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If the crown of the probe tooth has retained an apparently fresh, shiny appearance in its enamel, this does not in any way indicate that the tooth is very old. I only need palaeontologists on teeth that are geologically very old, such as teeth. B. the fish and dinosaur teeth of the Triassic to remember. In these teeth it is evident, especially when they are embedded in marl and lime

1) It would be very much to be hoped that this important piece of scientific assessment would be made accessible and that the two teeth, which Dubois counted as Pithecanthropus, would be examined chemically and microscopically and compared with the probe tooth.

E. Carthaus, Geological and Mineralogical Remarks on the Find of the Sondö Tooth.

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were closed, in most cases even the luster was still excellent, and the same is the case with the scales of the ganoids or meltfish, which often lie together with them and are covered by a mass that is genetically and chemically similar to tooth enamel.

In my opinion, the decomposition of the dentin and the largely crumbling of the same is very remarkable in the probe-tooth. I would like to assume that the dentin was first decomposed by carbonated water on its outer edge, with the formation of relayite, i.e. i. a compound of calcium phosphate with calcium carbonate, that this was partially leached with increasing carbonic acid content by further penetrating carbonated water and that then, after cracks and gaps had appeared between the enamel and the dentin, as well as in the latter itself, a crumbling or crumbling of the Dentin is done. Similar chemical reactions can also be observed on a large scale in nature, namely in the contact zone of phosphorite deposits with limestone. In this, the Staffelit formations may mostly be overlooked, since in Germany, as far as I know, they were only observed at Staffel, near Limburg, and at Brilon in Westphalia1

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Since, as Prof. Dieck also mentioned in his discussion, normal dentine (according to Berzelius) with a content of 64.3 ^ calcium phosphate already contains 5.3 ^ calcium carbonate, the analysis carried out with the kind help of Prof. Marckwald with but the microbalance was only able to determine a content of around%% calcium carbonate in the metamorphosed dentin of the probe tooth (although it must also be taken into account that the organic substance in this dentin has decreased from 28% to V%) the relayit formation in the latter is not far advanced, but as one can see with a strong magnifying glass, but even better with the aid of the binocular microscope, and as can be seen above all from Prof. Dieck's beautiful examinations Decomposition in the dentine remnants of the probe tooth is of a different degree, so that, despite the average low carbonate content, it can here and there have progressed so far that egg ne leaching of staffelite substance by carbonated water (perhaps with the formation of bicarbonate or biphosphate) could take place quite easily. - The fact that Prof. Dieck emphasized that the converted dentine "offered little more resistance to a fine drill than chalk" deserves attention. The easelite occurring in nature is inherently harder; but since the pseudodentine forms a homogeneous mass (even when greatly enlarged) in its most decomposed parts, there will hardly be a mechanical connection (mixture) of calcium carbonate with phosphate, rather a chemical one, and one would then have to do with a similar association of very small easelite particles, as in the case of soft chalk there is one of loosely joined together tiny lime particles which have largely retained their earlier organic form.In order to be able to draw any conclusions about the age of the same as a find from the decomposition and the partial absence of the dentin on the probe-tooth, in my opinion the following factors or facts should be taken into account: calcium triphosphate or fluorapatite, at least like him According to its chemical composition, in which dentin is present, it is extremely difficult to dissolve in ordinary water, so that it is hardly soluble

1) From such a contact zone near Brilon I received pieces of rock with fossils from the Devonian Stringocephalic Limestone from the deceased Bergmeister Hüser, which were converted into relayite or phosphorite with a strong clay and iron content, so that the reverse chemical process also takes place in nature . According to von Dechen, fist-sized pieces of Devonian lime were also converted into phosphorite in one of the deeper layers of the earth in the Balver Cave.

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E. Carthaus, Geological and Mineralogical Remarks on the Finding of the Sond6 Tooth.

can be talked about. Even carbonated water can only noticeably attack the dentin after a very long period of action, provided the gas acts only in a small amount and not under pressure of more than one atmosphere, but not the enamel at all, so to speak. That is why the animal teeth enclosed in limestone are usually so well preserved, even with a high geological age. It seems to be different if humic acids act on the dentin for a longer period of time; but there are still too few precise studies on this. If the dentin on a tooth has deteriorated far advanced by one of the humic acids, the enamel of the same may appear to have been attacked and has lost its shine. Where there is such an action of humic acids, I believe that if the teeth are exposed to dry air for a long time, a more or less extensive blue coloration will often occur; for since these organic acids usually also contain iron in dissolved form, in contact with the phosphates of the enamel and dentin on their surface or in the resulting cracks, iron phosphate in the form of vivianite is easily formed. Since double-carbonized iron is very easily precipitated from its carbonic acid solution, the said iron phosphate formation will only rarely show itself during the prolonged action of carbonated water on any tooth, and the gloss of the tooth enamel will be fairly preserved. The decomposition or chemical transformations discussed seem to proceed relatively quickly when teeth lying in the ground are exposed to the effects of dilute sulfuric acid. This is likely to have been the case with most teeth that have lost all or part of their dentin when lying under the floor for a long time. Where animals or plants decompose, because there is almost no lack of iron compounds in nature, sulfur iron is easily formed, and because this, especially in its rhombic crystallization form, the marcasite, tends to decompose very easily, it also becomes easy Sulphurous and sulfuric acid (dissolved in water) and at the same time also form a solution of sulfuric iron. In teeth which have been more or less altered by this mineral acid, the blue color mentioned should always be observed, and at the same time the enamel

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has been omitted here for the reason given. - Long-term action of any humic acid seems to me to be completely excluded with the probe teeth, because in the area of ​​the Kali probe there are absolutely no muds or accumulations of stagnant water, rather the whole terrain appears with Djatti- (teak- ) Existed in trees that love dry limestone soil and simply do not arise where the soil remains permanently moist.

From a geological or chemical point of view, there is in any case the possibility that the probe-tooth has to be of right age. In order to be able to determine this more precisely, for which unfortunately the type of occurrence at the place of discovery does not give any reliable evidence, as Walkhoff "has successfully shown, only comparisons with other teeth remain, in which the dentin has disappeared or is considerably reduced due to prolonged lying in the earth Above all, one would have to try to get even more precise data on the duration of the weathering of teeth on the tropical forest floor, namely on one which, like that on Central Java, takes about half of the year under the influence of one absolutely dry and the same time under that of a rainy monsoon.have lost all or part of its luster, but this is not the case with the probe teeth. I would also like to conclude from the impregnation of the tooth in individual places with only a very small percentage of iron oxide hydrate (brown iron stone) that this is most likely only a long-term effect of carbonated water. The formation of Vivianite

Traces of possibly human activity

in the trinil layers of

Dr. E. Carthaus.

With plate XXX.

Since the Trinil strata seemed to me geologically very young, as I already discussed in my treatise: "On the Geology of Java, etc." p. 32, I have been aware of any deposits there from the very beginning of my activity in Trinil traces of human activity to be discovered 1).

and nondescript bone fragments received no special attention; but I found some of the preserved pieces which, in my opinion, may well have been altered by human hands.

This subheading includes three larger fragments of tusks from Stegodon or Euelephas, one of which (Plate XXX, Fig. 1 and 2) is almost 23 cm long, 8 cm wide and 3.5 cm thick. As can be seen in FIG. 4, this piece fits almost exactly to a second (FIG. 3), which has a length of 20 cm at 7.5 cm greatest width and 5 cm greatest thickness. In my opinion, the nature of the fracture surfaces clearly shows that the ivory was still fresh or in good condition when these pieces were blasted off the tusk. Strange circumstances would have to have come together in order for such splinters to arise naturally, and a Berlin ivory turner, to whom I showed the pieces, was of the same opinion. If the latter had been blown out of the tusk of a stegodon by violently hitting a hard stone in a river bed with a strong current, one would with some probability expect traces of jerking and rolling on the fragments

can. Therefore, I would rather like a job by very clumsy human hands

1) I still take the opportunity to point out an error on the part of Prof. Dubois. In one of his publications (The geological age of the Kendeng or Trinilfauna, p. 1251, 1908) he puts it as though I, too, have ever spoken of potsherds or even "cooking pots" found in the Kendeng strata have been. At the time, Dr. Elbert (Natuurkundig Tijdschrift voor Nederlandsch-Indie, Deel 67, 3 and 4, p. 125, Weltevreden 1907. - About prehistoric finds from the Kendeng strata of East Java. Correspondence sheet of the German Society for Anthropology, Ethnology a . Urgeschichte, XXXIX, p. 126, 1908) on such finds, as well as on that of a bronze ball, found together with the remains of the skull of a Stegodon (l). These finds were completely independent of me from the named gentleman and were not made at Trinil, but at the Pandan volcano. By the way, Dr. Elbert has long since corrected their age determination. (Correspondence sheet of the German Society for Anthropology, XL, 5, p. 33 May 1909.)

Unfortunately, before my time there was the little one that was brought to light for days

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E Carthaus, '

and see in the splinter with an almost elliptical outline (Fig. 1 and 2) the rough shape of an ax-hand mallet or wedge-like instrument, also for the reason that the flat piece of ivory, which is quite sharp and pointed at one end, has a certain , although not showing extensive smoothing on the inside. A piece of ivory shaped in this way would be excellently suited for opening various edible fruits native to Java, which have a very hard, fibrous or leather-like skin, such as For example, those of individual palm trees and the so popular durian (Durio ZibetJnmisJ, which the natives even today sometimes open with wedges of hard wood. Possibly the above-mentioned second piece would have to be regarded as a fallen residue during the production of the last discussed one, and the same applies also of the third piece (not shown), which is 6 cm in width and 3 cm in thickness and is only 15 cm long. If these pieces had not been chipped off by very strong blows from tusks, the ivory would be near the places where they were struck Probably still show cracks. Unfortunately, I cannot give any more precise details about the location of these ivory pieces, since they were found under Elbert before the time I came to Trinil and not specified, but according to the sergeants they come from Pit II from the part of the main bone layer which was fairly close to conglomerate hill a (see Plate VI, profile 1).Among the bone fragments kept by Mr. Oppenoorth as rubbish, I found the following particularly noteworthy:

1. An awl-shaped, somewhat curved piece of bone (Plate XXX, Fig. 6), 9 cm long with two still quite sharp edges at the current end. The same is perhaps made by splintering off a long bone. Greatest width 1 cm, greatest thickness 0.6 cm. The outermost tip has broken off. The remainder of the tip, which is slightly tapered towards the rest of the tip, appears to be noticeably smoothed on the fracture side and this surface could have been produced by scraping or grinding.

2. A 14 cm long, dagger-like pointed, slightly curved piece of a young buffalo horn 2.5 cm in width and 2 cm in thickness (Fig. 5). A rounded edge runs along its concave side, while a fairly shallow groove runs over the central part of the broad, convex side. Although this fragment does not show any clear scraping or sanding surfaces, its shape on the whole is striking to me because it is ideally suited for use as a dagger or stabbing weapon.

3. A small fragment of bone 4.7 cm long and 0.7 cm wide (Fig. 7), flattened at one end and pointed at the other thick end. The sharp edge, which runs backwards at the tip, is bounded by two flat surfaces, the larger of which on the long convex side of the piece seems to have been created by grinding.

4. Fig. 8. A 6.5 cm long, flat, saber-shaped bent bone fragment, which towards the lower end has a width of about 1 cm. It could be cropped on the convex side of the tip or it could be scraped off in an irregular manner.

5. Fig. 9. A piece of bone two inches long, the shape of which I would like to call that of a distorted sphenoid. Greatest width 1.8 cm, greatest height 1.2 cm. This small bone could be scraped or ground smoothly at both ends in a raw manner, so that (as in FIG. 6) sharp, cutting end edges are produced.

To give the reader their own judgment about these doubtful bone artifacts and their

The most important of these are photographed to enable the way in which they were created

compiled on a table (XXX) so that, in the event of later excavations and investigations of the pit

1) For the production of the photographs I speak to Dr. Kronecker would like to express my deepest thanks.

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and the pictures on

Traces of possibly human activity in the Trinil layers.

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canthropus layers would still provide unquestionable evidence of the presence and activity of man at the time and at the places where they were deposited, these first uncertain traces discovered by me can be used.

The discussed finds seem to me to be worth considering, especially in connection with an education that could possibly be understood as a fireplace, which we discovered shortly before my departure.

From the outset, I had advised the two European overseers to pay close attention to any thin layers that might appear in the main bone layer or at its boundary, which might indicate wood ash from a former fireplace. It seemed particularly appropriate to pay close attention to this in pit II near the conglomerate ridge a

because this had to (according to my earlier statements) at the time of education

(see Plate VI, Profile I)

the main bone layer on the band of the Bawah, in which the latter was deposited, protruded as a headland. A few days before the end of the work an ash-like, peculiarly loose, horizontal tufa layer of about j

clearly stood out from the surrounding tufa mass. The overseers they showed me believed they could see nothing more than an old fireplace, a view that I would like to agree with. Treated with dilute hydrochloric acid, a sample of the ash-like mass roared up, and the volcanic tuff residue, which was not attacked by the weak acid, showed itself to be strikingly red in color due to iron oxide, while otherwise, as far as I have seen, this coloration was when the tuff material was treated with dilute hydrochloric acid does not emerge. It is a well-known fact that if iron compounds are contained in the floor of a fireplace (as can be found in almost every pale yellow clay and especially in volcanic ejecta), red iron oxide compounds are formed (botburn) of the soil). Likewise, the coating of the tuff particles of the examined sample with carbonate of lime must be described as striking, because otherwise the main bone layer is extremely poor. However, it did not succeed in detecting potassium in the hydrochloric acid solution by adding platinum chloride. I believe that this can easily be explained by the fact that the extremely porous, sandy or gravelly tuff mass of the main bone layer has been exposed to leaching for a long time. It is known that potash salts are extremely easily removed from the soil by water, unless they are made insoluble in it by humus or humic acids or that this alkali is bound to silicates. But in the given case this could not be the cause.At first sight it might seem surprising that at the time of the deposition of the Trinil strata on Java people are said to have lived who were familiar with the use of fire; However, one must not forget that on this island, on which the earth fire is still smoking today from more than a quarter of a hundred volcanoes and which (like the Lamongan) often throw out glowing lavas, the wood of the jungle could very easily catch fire, and that in this way the native inhabitants of the island could more easily get hold of the heavenly gift of fire than anywhere else. (Such jungle fires as a result of volcanic eruptions occur, as Junghuhn variously emphasizes in his work, even when the crater in question enclosed a maar from which streams of lahar flowed.)

For this reason, I would not attach any particular scientific value to the pieces of charcoal, which were dug up here and there from the main bone layer and which clearly reveal themselves as charcoal formed by fire, if they were not exactly

found in larger numbers near the alleged fireplace. One could do this Selenka-Trinil expedition. 30th

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/ 3

m diameter revealed, which is very

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E. Carthaus, traces of possibly human activity in the Trinil strata.

Small pieces of charcoal also refer to natural charring, favored by the sulfuric acid sometimes abundantly contained in the water of the lahar streams, think only that, apart from the whole physical nature of the charcoal, its shape also speaks against it, especially in the case of two larger, thick pieces which are in the direction of the Wood fiber briefly broken off and appear rounded. Such a design of charcoal is likely to arise, if not by a rather complicated artificial processing of the wood, only by charring a larger piece of wood in the fire, this cracking across the wood fiber and thus allowing pieces of the existing shape to arise. There

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However, charring by fire from a volcano cannot be ruled out. But why were such pieces found in large numbers mainly near the presumed fireplace and otherwise only rarely?

that also various long bones of buffalo and other animals,

At first I believed 1

all of which were sharply broken off in almost the same place, as in Fig. 9 on plate XXX, in the vicinity of their articular surfaces, and were colored dark gray to black around the fracture point, were artificially charred, for the purpose of partially heating them up Mark easier to win; However, a chemical investigation taught me that the darkening of the bone mass was caused by iron sulphide, since this carbon but no carbon could be detected. In spite of this, this dark zone, which appears in several pieces and which gradually merges into a gray-blue to whitish one towards the distal end of the bones (see Plate XXX, Fig. 10), seems very strange: because I cannot imagine that all the fragments of the drills discolored in the manner described are said to have happened to lie in the Bawah of Trinil in such a way that they could only absorb sulfur iron at the edge of their fracture surfaces.

Figs. 1-4.

Explanation for panel XXX.

Fragments of Stegodon's tusks.

Fig. 1 u. 2. Elliptical piece with a sharp edge (at S.), can be used to open large hard-shelled ones

Fruit or as a hand ax. Fig. 1 from the inner or broken side, Fig. 2 from the cutting edge. 1/2 nat. Size

> 3. Dagger-like piece, with two semicircular (artificial?) Large notches on the side, lies well in the hand as a thrust weapon. 1/2 nat. Size

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»4 shows the original connection between the two pieces. V3 natural size Double-pointed dagger-like fragment of a young bovid horn. Nat. Size

»5.

> G — 9. Four small fragments of bone, sharp-edged. Nat. Size (Fig. 6 is very sharp at the front on the left

angular like a knife blade and without injury. The small angled notch at X is neither on the original nor on the drawing and was only created afterwards with the collotype process.)

10. Metatarsus of a buffalo, broken across, light gray in the vicinity of the joint end, dark colored at the break. Figs. 1-5 and 7-10 are made from photographs by W. Kronecker, Fig. G from a drawing.

1) Cf. Brancas preliminary report on the results of the Trinil expedition of the Academic Jubilee Foundation of the City of Berlin. Meeting report d. Kgl. prussia. Akad. D. Science, XII. S. 5. Berlin 1908.The flora of the Trinil layers of

Julius Schuster.

With plates XXXI and XXXII and 8 text illustrations.

Whereas in Europe the cultivation of that branch of botany, which takes on the task of unraveling the last section of the history of the plants living today, based on the fossil finds of the more recent geological formations of this part of the world, opened up unimagined insights into the climatic conditions to which those plants were adapted, the palaeobotanical documents for the tropical regions are so far only sparse and hardly sufficient to get to know from them even an approximate basic features of the development of those distant flora. In general, this also applies to the island kingdom known as the Malay or more correctly Indo-Australian archipelago 1

The best explored island of Java, the piece of earth where an important phase in human history took place, to which the discovery of the Pithecantkropus erectus is evidence. Ms. Selenka has therefore earned special merit when she also had a rich material of the enclosed fossil flora collected during her excavations at the Pithecanthroptis-FimdsteWe near Trinil. As will be explained in more detail here, this not only provides important clues for the age problem of the Pithecant kropus, as well as the climatic and other conditions of the entire layer complex in question, but also provides direct insights into the development history of the recent vegetation cover of the Indo-Australian archipelago.

The fossil flora of Trinil, about the occurrence of which the information in the geological section of this work processed by Carthaus can be compared, already has two sides, if

also not very detailed, editing found. Once on the part of the geologist Elbert 2

but almost only provided genus determinations and believed to be able to differentiate between two plant zones: a lower plant layer allegedly corresponding to the temperate region, in which the Pithecantkropus was found, consisting of different Ficus species, Proteacees, Dipterocarpens, Dillenia, Michelia, Magnolia, Eugenia jambolana (this quite common) and Eugenia deeipiens, furthermore an upper vegetation zone equivalent to the cool region, which is characterized by the striking predominance of Quercus and Castanea, furthermore Laurus and Litsea, Dysoxylon, Engelhardtia, Cornus and Benthamia, as well as Ericaceae and Myrtaceae. Elbert distinguishes two different levels according to the two growing zones,

1) See my remarks at the end of this work.

2) About the age of the Kendeng strata with Pithecantkropus erectus Dub. New. Year f. Min. Etc., Stuttgart, Vol. XXV, supplement, 1908, p. 648.

30 \*

),

and for that

),

the very

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Julius Schuster,

Family art

Fungi.

Polyporaceae Polyporaceae spec. (P. 246, Fig. 8;

General distribution of the species Hühe in m

——

Dicotyledones. Fagaeeae

Moraceae

»»

»

»

»» »

»

Loranthaceae »

>

Castanopsis {Castanea) CurtisiiKiNG (Plate XXXI, Malay Peninsula, Borneo Fig. 27-32)

300

50-1000

150-450 and higher

50-1000 20-1400

50-1200 -

10-1000 10-1500

0-2250 -

600-1200 600-1200

150-1500 - - -

900 -

100-150 and higher

150-240 and higher

150-300 and higher

10-500 and higher

30-1200

Streblus asper Lour.

Artocarpus rigida Bl.

Artoearpus cf. altissima J. J. Smith

^ C2 «MMfecas L. (Plate XXXI, Fig. 7-8) Ficus retusa L.

East India to Siam, Sumatra, Philippines, Moluccas

Malay Peninsula, Sumatra, Borneo Sumatra

East India to Java, Philippines

Eastern Himalayas to Formosa, Sumatra, Borneo, Celebes, Philippines, New Guinea, New Caledonia

Ficus infcctoria Roxb. (Plate XXXI, Fig. 9-10) Khassi Mountains to New Guinea var. Wightiana King Ceylon to Japan

Ficus callosa Willd. (Plate XXXI, Fig. 1-4 and East India to Celebes, Timor p. 246, Fig. 5-6)

Ficus variegata Bl. (Plate XXXI, Fig. 11-12) East Indies to China, Celebes, Moluccas

Loranthus longiflorus Desv.

Loranilius elasticus Desv. (Plate XXXI, Figs. 5-6) Loranthus pulverulentus Wall.

Himalayas to Australia

East India to Malay Peninsula Himalaya to Malay Peninsula

Hamamelidaceae Altingia (Liquidambar) excelsa Noronha (Taf. Eastern Himalaya to Yunnan, Sumatra XXXI, Fig. 13-14)

Euphorbiaceae>

>

»

Anonaceae »

»

»

>

»

>

>

Lauraceae

Fhceggea obovata M. Arg. Cleistanthus myrianthus Kurz

Himalayas to China and Australia, Africa Malay Peninsula to New Guinea Malay Peninsula to Java

Aporosa fruticosa M. Arg.

Mallotus moluccanus M. Arg. (Plate XXXI, East India, Java to New GuineaFig. 15-16)

Uvaria zeylanica L. Malabar, Travancore, Ceylon Uvaria Lamponga Scheff. (Plate XXXII, Sumatra

Fig. 44-47)

Uvaria purpurea Bl. Malay Peninsula to Hong Kong and to

the philippines

Melodorum manubriatuin (Wall.) Hook. f. et Malay Peninsula and Philippines

Thoms.

Ellipeia cuncifolia Hook. f. et Thoms.

Unona discolor Vahl Polyalthia laterißora King

Mitrcphora Maingayi Hook. f. et Thoms.

Malay Peninsula, Borneo

East India to China, Borneo, Celebes Malay Peninsula, Sumatra, Celebes

Malay Peninsula, Java, Borneo Kma- 150-900 balu)

Tetranthera alnoides Miq. (P. 244, Fig. 1; P. 246, Himalaya (1200 m) to China (introduced in Mauritius 900-1500 Fig. 2-4; Plate XXXII, Fig. 29-31))

Occurrence of the species in the area or Java closest to where the fossils were found

Java; Pandan volcano 400-900 m Java; only in the western part

Java; in the western and central part

Java; Pandan 500 m, Lawu-Kukusan volcano 1200-1400 m

Java; Madiun, Mahoeng Mountains 750 m

Java; in a mixed primeval forest consisting of 400 species

Notes on the fossil species,

their occurrence and their relative abundance

Fungal mycelium, parasitic in the vessels of a piece of trunk of Cassia alataL that has been converted into wood opal. (see this)

Notes on the recent species

Java; Pandan 400-900; not more than 1500 m main leaf layer, once Java; Trinil 100-150m

Java; missing in central Java (not below 600 m)

Java; Pandan 400-900 m Java

Java

Java

Java; Trinil, 100-150 m

Java

Java; in a wide variety of (wet and dry) locations

Java; at an altitude of 1500 m

especially in humid and cool climates, preferably with Altingia, large tree

Epiphyte

Tree with a columnar trunk, forms the begion of the rasamala trees

shrub

tree

also a pine evergreen 30 m high tree

often, as well as any small tree

The flora of the Trinil layers.

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Main leaf layer, often a charred tree with the habitus of oak, fruit cup (cupula) once

Main leaf layer, multiple

“A charred male inflorescence

Main leaf layer, multiple

evergreen sapling of the mixed jungle (soil moist)

evergreen tree

large tree of the mixed primeval forest

large evergreen tree

small deciduous tree

»

> wood sticks

Land form of mountain forests

once

several times, including a kie-size tree

multiple>

once

multiple "

once

multiple

»

selholz, the latter also in the main

»

bone layer main leaf layer, multiple

lich charcoals

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Julius Schuster.

Family art

Height in m

until 1800

-

-

-

500 -

20-500 -

1300-1500

20-500 120-1200

900-1350 300-900

300-450 and higher

-

Lauraeeae

> »» »

Dilleniaceae

Guttiferae>

»

Dipterocarpeae »

Sterculiaceae Rutaceae

Meliaceae

»

Papilionaceae

»

»

»

General distribution of the species

Tetranthera salicifolia Roxb. (Plate XXXII, Malay Peninsula, Figs. 32-33)

CylicodapknefuseaBh. (Plate XXXII, Fig. 27-26) CyUcodaphneeuneataBh. (T! A.i.XXXl \, Fig. 25-26)

Dehaasia squarrosa Miq. et inches. Cryptocarya ferrea Bl. Var. Oblongifolia (Bl.)

Meisn.

Tctracera sarmentosa (L.) Willd. var. lifting

carpa (DC.) Hook. f. et Thoms. Garcinia dulcis short

Garcinia Grahami Pierre Mesua ferrea Choisy

Hopca fagifolia Miq. VaticalancaefoliaMiq. (Plate XXXII, Figs. 34-37)

Reveesia Walliehii R. Br. (P. 246, Fig. 7) Feronia elephantum Corea (Plate XXXII,

Fig. 38-43)

Aglaia palembanica (Miq.) C. DC. (Plate XXXII, Figs. 23-24)

Aglaia odorata Lour. (Plate XXXII, Figs. 21-22)

Cassia alata L. (Plate XXXI, Figs. 17-18; p. 246, Fig. 8)

Saraca minor Miq. (Plate XXXII, Figs. 19-20)

Sumatra

Sumatra, Borneo

Java (endemic)

Malay Peninsula and Java

East India to Siam, Sumatra, Celebes

Andaman, Celebes, Moluccas, Timor Borneo

Himalaya to Siam

Malay Peninsula, Sumatra, Bangka Himalaya to Malay Peninsula, Khassi Mountains, India, East Himalaya

West Himalayas, Ceylon, Middle East

Malay Peninsula, Sumatra, Borneo, Philippines

East India to China, Philippines, Amboina

Fig. 3-18) Guinea

Melastomaceae Memecylon floribundum p. (Plate XXXII, Java (previously thought to be endemic!), Also 25-900

&

Araliaceae

Borraginaceae Loganiaceae

Apocyneae Caprifoliaceae

Motiocotyledones. Cyperaceae

Indefinite

Origin.

Copal (of amber-like texture)

Fig. 48-50) Philippines

Memecylon myrsinoides Bl. (Plate XXXII, Malay Peninsula, Java 200-450

Fig. 51-52)

Polyscias pinnala forest. (Plate XXXI,

Fig. 19-20)

Cordia aff. suaveolens Bl.

East Indies, New Guinea, New Caledonia, 600-1100 Celebes, Philippines - Australian Ele-

ment!

Fagraea litoralis Bl. (Plate XXXI, Fig. 23-24; East India, Java, Celebes, Moluccas Plate XXXII, Fig. 53)Willughbya apicidata Miq. (Plate XXXI, Sumatra Figs. 21-22)

Vibumum coriaceum p. (Plate XXXI, Figs. 25-26)

Cyperus spec.

temperate Himalayas to central China (Sze 1200-2700 ch'uan), Sumatra, Java

\* ——

———

East India to Timor, Brazil, Cuba, 360 Haiti, Martinique, in the tropics cosmopolitan and higher political

Himalaya to Siam, Ceylon, Malacca, Su- 150-700 Matra

Indigofera tineioriaL. (Plate XXXII. Fig. 1 - East India to Japan (fatherland unknown) - 2)

Deguelia [Derris] elliptica Benth. (Plate XXXII, Malay Peninsula to Siam and New 50

and higher

Java (endemic)

5-500 10-700

-

Occurrence of the species in which the fossil site was found. Comments on the fossil species, the areas closest to it or Java, their occurrence and their relative frequency

Notes on the recent species

Java Java

Java

Java

Java extinct on Java

Just overgrown on Java -

Java

Java; Trinil 100-300 m

Java; Pandan 400-900 m

Java

Java

Java; Pandan 400-900 m

Java Java

Java; Madiun 1400-2000 m; Kendil 1500 to 1600 m; Kukusan volcano 1200-2600 m

»

»

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»» »

»»

»»

multiple

once several times

»

once several times

small tree

small tree of mixed primeval

forest

evergreen 12 m high tree

small tree in moist soil, tall tree in very moist primeval forests

cultivated many times

10 m high tree

Bush of moist soils wood-like perennial of mountain forests

12 m high tree of moist soil

Climbing shrub

tree-like shrub

»> Deciduous

tree-like shrub

leaf-shedding sapling evergreen climbing shrub (sub-

epiphyte!) rubber cliana

Character plant of the higher, constantly humid mountain region; small tree

-

-

similarly different Cyperus species, e.g. B. Frequently in the main bone and main Oyperus dilutus, Trinil 100-150 leaf layer, as well as in the very hard one

Clay and ash layer

- From the clay banks above the main bone layer - contains neither free

succinic acid still bound

The flora of the Trinil layers.

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—— Main leaf layer, several times

——> once

»»

Silica, main bone layer fruit, main bone layer, once

Main leaf layer, once

" multiple

»Once, also opal wood from the topmost layer of red ash

Main leaf layer, once

" multiple

“Often, one too

Sleeve

Main leaf layer, multiple

»»

“Once, including lignite in the main bone layer

Silica, main leaf layer Main leaf layer, multiple

»

once

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Julius Schuster,

by placing the lower plant layer with Pithecanthropus in the complex he called the lower Kendeng layers and counted as the old Diluvium, while he added the upper plant layer to his middle Kendeng layers and also assigned it to the old Diluvium.

The plant fossils from the SELENKA expedition were also examined

Valeton, head of the herbarium in Buitenzorg. This compares the sheet prints 1

the leaves of Derris elliptica, as well as those of Fieus species, namely Ficus retasa and Ficus infeetoria, as well as Mallotus moluccanus, without saying anything definite about the sea level and the climatic conditions under which these plants lived. Valeton was only able to provide little explanation about the numerous plant remains present as detritus at Trinil.

I myself had a richer material for examination than Elbert and Valeton. In addition to all the plant material that had been brought together by the SELENKA expedition in 1906/07, which was carried out with the support of the academic jubilee foundation of the city of Berlin, I also had the collections of the SELENKA expedition in 1908 supported by the Munich Academy, all of them four large boxes with so numerous and well-preserved plant remains that a monograph of the entire material appeared to be a worthwhile task. Dealing with such an extensive workload was, however, associated with considerable difficulties; on the one hand, the corresponding fossil flora are practically unknown; on the other hand, there is no comprehensive presentation of the recent flora of the Indo-Australian archipelago, so that one has to rely on the numerous special works and monographs belonging to the great systematic period of the first half of the from the last century and are not suitable for the determination of fossil leaf remains, since with the highly schematic character of these drawings, one leaf is usually the same as the other. Extensive preparatory work was therefore necessary on the hand of the rich herbarium treasures of the Berlin Botanical Museum in order to systematically study the woody plants of the Indo-Australian archipelago, which far exceed 1000, and to compare them with the fossil material. An important addition was the Bijksherbarium of Leiden, which contained the Malay flora in particular, and after its visit the last doubts about individual species could be resolved.A more detailed explanation of the individual determinations of the fossil flora of Trinil can be dispensed with here, since this could only be done on the basis of numerous tables and the systematic and botanical discussions would fall somewhat out of the scope of the present work; both will

in a shear form (see pp. 236-239).

The first result of this compilation is that all 52 fossil plants

still live today. This result is absolutely certain, since not only the species could be identified with the recent ones in such a way that the latter can be placed directly on the fossil leaf prints and convinced of the complete agreement, but also certain varieties of individual species, which today are characterized by a different geographical Spread are excellent, could in the fossil

1) A fruit residue similar to the genus ScJrima, mentioned by Valeton, was not available to me.

2) A preliminary communication already appeared under the title »A contribution to the Piiheoaiühropus-FTBige \* in the session. d. Kgl. bayer. Akad., Math.-phys. Kl. 1909, 17th fig. There is no reference to literature or sources; but I would like to emphasize here later that the geological facts communicated there are primarily the detailed observations of Dr. E. Cartiiaus are the basis.

anyway in my forthcoming monographic work 2

about the Trinil flora. The illustrations on the two tables (XXXI and XXXII) may offer some examples, where the fossil species are each time shown together next to the recent one to be compared with them, in three-fold reduction. First of all, the results are presented below in tabular form for a better overview.

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some with

The flora of the Trinil layers.

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Evidence of material; an extinct species or variety is completely absent. Compared with the recent leaves, the fossil leaves almost give the impression that they were embedded in the tuff just yesterday or recently. Admittedly, a glance at the current geographical distribution of the species immediately shows that we are not dealing with a very recent deposit.

Of the 52 species that allowed species identification, 21 are no longer alive on Java today.

Of these 21 species, one belongs to the group of plants that now go from East India to New Guinea, the Araliacee Polysoms pinnata (cf. Plate XXXI, Figs. 19 and 20), which are partly used as a hedge plant, partly as a 2— 3 m high tree is mainly found in New Guinea and New Caledonia, so it is to be regarded as an Australian element, but also occurs in the Philippines and Celebes, as well as on the Indian mainland. How beautifully the occurrence of the fossil plant mediates between the known sites of the recent ones, and it would not be wonderful if it were still possible to prove Polyscias pinnata alive in Java, yes it is even possible that the at 1100 m on the Bahun Polyscias javanica K. et V. growing on the Idjen plateau in East Java is the same species.

Two of the species not known to live in Java today reach their eastern border in the Philippines; Here, too, the fossil occurrence near Trinil is an important link between today's distribution on the Malay Peninsula and the Philippines, where one of the two species, the Anonacee Melodorum manubriatum, is only known to be alive, while the other little-known species, the Meliacee Aglaia palembanica (cf. panel XXXII, Figs. 23 and 24), a 10 m high tree, is still found alive on Bangka, Sumatra and Borneo, although its main distribution is to be found today on the Malay Peninsula (Perak, Penang).

Two species are now only found on the mainland and the island of Borneo: first of all, Castanopsis (Castanea) Curtisii (see Plate XXXI, Fig. 27-32), whose leathery, slightly dorsiventral and entire-edged leaves with a short trickle tip are the relatively more common ones Plant fossils belong to Trinil. Which species occur more frequently in the trinile strata is of course difficult to determine on the basis of the material collected, since only a few pieces of each species were available for investigation and especially because the aim was to collect as many species as possible without looking at the frequency to take the best of each individual into consideration; the figures given in the table about the amount of occurrence are only relative and it should not be concluded from the single occurrence of a species that it actually occurred in isolation. Castanopsis Curtisii, which was discovered by Curtis in Penang (Malay Archipelago) at an altitude of 300 m and later brought back from Borneo by Beccari, is a tree with the habitus of oaks, which therefore claims a special interest because the Castanopsis Avten, their Today three are still found alive in Java, character plants of the so-called cool begion, where the fruit cups of the chestnuts together with acorns lie around in large numbers on the ground. You can find chestnuts already at 700 and 300 m, but they find the most favorable living conditions in the shady, always moist and evergreen primeval forests of the cool Begion, consisting of around 200 to 400 tree species, on fertile and humus-rich, always moist soil. Only on the upper band of the moderate Begion do the chestnut trees in Java stand out more because of the number of individuals, so thatone has to address them, given the appropriate accompanying plants, as an unquestionable indicator of a moderate climate, which can be considered certain for the species Castanopsis Curtisii. Hence the determination of the fossil species is of particular importance, and I am in the pleasant position of that

Visibility of the marginal kinking of the second-order nerves and other features. Selenka-Trinilixpedition. 31

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Julius Schuster,

sufficiently marked leaves by the reliable determination of a charred fruit stand with the adhering scaly fruit pike (cupula), the microscopic-anatomical examination of which proved to belong to Castanopsis. It should be emphasized here, however, that the finding of Castanopsis alone does not justify the assumption of a temperate climate corresponding to the temperate zone.

The second species known only from the mainland (Perak, 300 m) and Borneo is the Anonacee

Ellipeiacuneifolia; unfortunately there are more precise information about the height of this species and numerous other plants 1)

not before, to which the gaps in the given table are also due. In the Indo-Australian archipelago, not even the systematic description and sighting of the individual living species can be called satisfactory, and more detailed phytogeographical studies have only recently begun; Koorders and Valeton have made excellent contributions to palaeontology and the biontology of Javanese wood species through their work »Boomsoorten op Java«, which is still in the process of being published.

Of the wood species that now only grow alive on Sumatra and Borneo, the Lauracee Cylicodaphne cuneata (cf. Plate XXXII, Figs. 25 and 26) should be mentioned. Limited to Borneo only

is Gareinia Grahami, an evergreen tree belonging to the Guttiferae.

The number of species now known only to live in Sumatra is greater, among them

especially the beautiful leaves of the Anonacee TJvaria Lamponga (Plate XXXII, Fig. 44-47) have been found several times at Trinil; the lauraceae are represented here by Cylicodaplme fusca (panel XXXII, Figs. 27 and 28), the apocynees by Willughbya apiculata (panel XXXI, Figs. 21 and 22), a rubber cliana which is of interest because lianas or climbing plants are in the fossil flora of Trinil is otherwise almost entirely absent. Only the Loganiacee Fagraea litoralw (Plate XXXI, Fig. 23 and 24, XXXII, Fig. 52 and 53) can be cited here, an evergreen Sube-Piphitic climbing shrub which actually does not quite deserve its species name, as it is up to 700 m2

)

ascends.

In this context, one of the most common Trinil fossils must not be forgotten,

which also belonged to a climbing shrub, the Papilionacee Degelia (Derris) elliptica (Plate XXXII. Fig. 3-18). The pinnacles of this species, which are widespread from the Malay Archipelago to Siam and New Guinea, are very variable and show all possible shapes between ovoid and narrow-wedge-shaped, but are always easily recognizable by their characteristic base and veins; The Myrsine-kvizn (e.g. Myrsine semlserrata), which are similar on superficial examination, and all Lauraceae are completely different due to the strongly protruding anastomosing nerves, just as in the apparently similar Ixora (e.g. Ixora timoaensis) the nerves are narrower and as in Myrsine curved. Other Papilionaceae, such as Uraria lagopoides and Desmodium gyroides, are by no means considered: the former has broad-oval leaves, the latter hardly has any closer resemblance on closer inspection. Here, too, I am able to support the determination, which has been sufficiently secured on the basis of the remains of the leaves, by finding a well-preserved case belonging only to this species (Plate XXXII, Figs. 17 and 18), see above

that here too the slightest doubt can no longer arise.

1) In the table above, only those figures are used that are guaranteed by reliable collectors and reliable sources; Quite apart from the height indications of cultivated specimens z. B. Feronia dephantum and Oarcima dulcis in the warm lowlands or Altmgia excelsa in gardens at 300 m, as one can just as little draw climatological conclusions from them as from the occurrence of the sweet chestnut with ripening fruits in the

harsh climate of the Isar valley near Munich.

2) At Simpolan (Rahun) according to Koorders and Valeton "Boomsoorten" IX. 1903, p. 83.The flora of the Trinil layers.

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So there are only three lianas to be recorded, the rest are trees and bushes, so that the conclusion is justified that the plants of Trinil belonged to an open jungle, almost free of lianas, and that goes well with that of Carthaus Grund Hunting experience emphasized the fact that the strongly curved deer antlers found in so many places at Trinil refer to animals that would not have been able to move easily with them in the liana-intertwined jungle of the tropics. The food of these cervids has also been preserved; it is probably to be found in the plant detritus so common with Trinil, which Carthaus and Valeton noticed, and after microscopic examination I can confirm the suspicion of the former that we are dealing here with remains of cyperacea; since fimbristylis, which is characterized by the presence of secretory cells and jagged parenchymal cells, can be ruled out, the remains of a Cyperus species are present, of which are on the edge in Java

of those shallow standing waters, the so-called Rawahs, find numerous species; a particular

The 9 species that are now only found on the Indian mainland are of particular interest. Among these is primarily a small tree from the Guttiferae family, Mesua ferrea, which thrives on moist soil and whose anthers are used as drugs because of their violet-like odor. This tree, which is no longer found in the wild in Java today, but is often planted near temples, since its beautiful large flowers are often offered as offerings, is a characteristic plant of the evergreen forests of the humid zone of the fore and aft India, where it is is to be found in an altitude region of 1300-1500 m, ie an altitude corresponding to the temperate zone of Java (650-1500 m). The small lanceolate leaves with the very prominent central nerve are found several times by Trinil.

Equally important is the discovery of Reveesia Wallichii, a Sterculiacee whose wooden body (text figure 7 on p. 246) is characteristic enough to enable a reliable determination. The silicified wood, according to which the determination was carried out, should be particularly emphasized because it comes from the main bone layer, i.e. it belongs to the flora that is directly associated with Pithecanthropus. Nowadays Reveesia Wallichii is a characteristic plant of high Asia; it grows z. B. on the Eastern Himalayas and the Khassi Mountains at an altitude of 900-1300 m, thus also speaks for the climatic conditions of the temperate zone and in this respect fully follows the conclusions resulting from the findings of the main leaf layer.

According to Elbert, the flora that occurs together with Pithecanthropus should correspond to the temperate zone through the appearance of Magnolia and Myrtaceae, such as Eugenia jambolana and decipiens, while the main leaf layer, through the predominance of genera such as Quercus, Engelhardtia, Cornus and Ericaceae, reveal the character of the cool zone . I have made the greatest effort to find the genera indicated by Elbert in the material available to me, but in vain with the exception of Ficus. I can assert with certainty that leading plants of the cool region (1500-2500 m), such as Engelhardtia, Cornus, and also Ericaceous, do not occur fossilized in Trinil and that the flora of the actual Pithecanthivpus layer has no different character from that of the main leafy layer.

1) In these, Oyperus fragments were by far the most common; In addition, they contained numerous scraps of leaves from deciduous trees, among which those from Ficus could be detected microscopically.

31 \*

The type can of course be traced to the chaff-like remains

these sedge-grasses, which covered the banks of a Rawah, served as food for the herbivores found in Trinil in such great numbers.

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do not specify, but there is little doubt that

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Julius Schuster,

In addition to Reveesia Wallichii, a well-preserved, orange-like fruit from the main bone layer is to be mentioned, which is characterized by the numerous seeds distributed over the pulp, which now in the tropics are often cultivated in the coastal region and then partly wilded again Rutacee Feronia elephantum ( Plate XXXII, Figs. 38-43). In the wild state it still grows in the West Himalayas, in the Middle East (Coromandel coast) and Ceylon at an average of 700-900 m, of the small obovate leaves, however, nothing fossil has been preserved, but on the fruit there were even remains of the coarse outer shell (epicarp) with the schizogenic oil gaps well preserved and accessible for examination. Common to the main leaf layer are Polysoms pinnata (brown coal wood) and Polyaltlaa lateriflora (pebble wood); of the former, the characteristic fig-like leaf is found in the main plant layer, of the latter likewise leaves and identical pebbles. The sedge remains of Cyperus are not only common in the main bone and leaf layer; rather, they are not missing in the hard layer of clay and ash in between.Numerous pieces of charcoal were also collected in this as well as in the main layer of leaves. I received five of these for examination (text fig. 1), all of which belong to the same species of wood, namely the Lauracee Tetrarithera alnoides, whose small alder-like leaves (Plate XXXII, Fig. 29 to 31) from the main layer of leaves were

Fig. 1.

l'rolien from Triniler charcoal, somewhat reduced in size; the two middle pieces originally went together.

be part of a branch charred in hot ashes or glowing lava as well as a human hearth. They represent large, lumpy, cylindrical, bone-like looking pieces, which on their edges and surfaces show on the one hand the radial course of the wood fibers and on the other hand the traces of transport by being clearly unrolled. The only thing that seems certain to me is that the charcoals in question were not caused by lightning strikes. For one day not all cells would be preserved so regularly and then such fossil charcoals, as they are available to me from the Upper Miocene and Diluvium, are never so large and form charred, leaf-like peeling longitudinal

1) About the spontaneous occurrence see the card in A. Engler, About the geographical distribution of the Rutaceen, Abh. K. Preuss. Akad. 1896, Map III, bottom right.

2] Cf. also the remarks by Cauthaus in the section of this work Traces of possibly human activity in the Trinil layers, p. 2113.

lie. The charcoal residues 2

To be mentioned briefly, because at the time it was assumed in the daily newspapers that these could originate from a prehistoric man who lived with Pithecantl tropus, which is partly in the textbooks, e. B. that of Kayser has passed over. In my opinion, however, these pieces of charcoal, which apparently slowly burned up or smoldered, are there

4 'they all still have the marrow crown (text fig. 2 -

contained inside without the cells of the same being crushed, as is the case with the wood of the charcoal piles, but of little decisive value for the question of whether they served as fire for the Pithecanthropus or a hypothetical prehistoric man. Because they can

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are here therefore

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chipping of the secondary wood body; The wood of the Trinil charcoal is also not a tall tree, but a more shrub-like occurrence. It is easy to understand that, in contrast to the bones and common woods found in Trinil, the pieces of charcoal are unrolled, since charcoals can easily be rounded off at the edges and flattened each other through mechanical contact.

Much more important is the fossil laurel in the other relationship Tetrantkeraalnoideshati their home in the Himalayas and grows there at 900-1200 m, also in Assam. In Java it is only known at an altitude of 1500 m; So here is again a typical example of a plant from the trinile layers adapted to the temperate zone. A related species with willow-like leaves, Tetrantkera salicifolia (Plate XXXII, Figs. 33 and 34), also lives up to 1800 m, which today only lives on the Indian mainland (Manipor). In general, the Lauraceae are so numerous in the fossil flora of Trinil with 6 species, including Tetrantkera alnoides relatively most frequently, that this plant association with pike can be described as the beginning of the laurel family; there are u. a. Cryptocarya ferrea in the variety known as oblongifolia, which grows at 500 m on the Malay Peninsula and Java, and also the Dekaasia squarrosa, native to Java, must also be mentioned.

Of other plants endemic to Java, only Gordia suaveolens, a deciduous tree belonging to the Borraginaceae, rising up to 500 m, to which a wooden body is most likely to be mentioned. The Melastomacee Memecylon floribundum (Plate XXXII, Fig. 48 and 49), which goes up to 900 m, which was previously considered endemic, was found in the Philippines (leg. Cuming. No. 2322).

Two species that are to be regarded as leading plants are of particular interest. One is Elingia or Liquidambar excelsa (Plate XXXI, Figs. 13 and 14), the Rasamela tree, whose dead straight columnar trunk splits into branches only 30 m above the ground and with its spherical canopy towers over all the trees, which is why the young chicken prince Called primeval forests. This tree, whose undivided trunk would still tower over a beech top, does not go deeper than 600 m and no higher than 1200 m in its original location. At the same time, it gives us the height limit for the forest flora embedded in the Trinil layers, which we have to look for at around 1200 m. Another species that is important for the physiognomic character of the vegetation, Viburnum coriaceum (Plate XXXI, Figs. 25 and 26), a small tree-shaped snowball, does not go below 1200 m. It is indicative of the higher, constantly humid mountain region and rises on the Javanese mountains of fire to 2300 m; its real home is the temperate Himalayas.Based in particular on Elingia excelsa, Viburnum coriaceum, Tetrantkera alnoides and salicifolia, Mesua ferrea, Reveesia Wallichii, Feronia elephantum, Castanopsis Curtisii, the conclusion is that the conditions analogous to the fossil vegetation of Trinil are now close to the upper limit of the temperate Vegetation zone (650-1500 m) and the sea level for the Trinil flora is to be set at approx. 1200 m. It is well known that about 50 years ago the ingenious young hen, rightly called the Humboldt Javas, transformed the vegetation of this island into hot (0-650 m), temperate (650-1500 m), cool (1500-2500 m) and cold (2500-3300 m) region, and in fact this quarter-division, which gradually rises from the beaches of the tropics to the peaks of the volcanoes, is so accurate that it is still fully valid today. These regions could also be called fig, laurel, oak and heather regions, depending on the type of vegetation that is most prominent in terms of species and individuals, and in short, the fossil flora of the Trinile corresponds to the region of the laurel trees.

Does the remaining fossil vegetation of Trinil speak for the allocation to young fowl's tempered zone? First of all it should be emphasized that specific plants of the sea beach, furthermore

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g 2 and 3. i

Fig. G.

Fig. 6.

Radial lengthways through a trinile charcoal (Teiranihera alnoides Mi >>); Fig.: I shows a part of the well preserved marrow crown, Fig. 2

,. . “Wood with adjoining pith, in addition to this in Fig. 4 the recent comparative object. - Fig. 5 "on 6. Wood and pith (horizontal section from

\\ ii ii,., Fig. 5 recent, Fig. 6 fossil. - Fig. 7. Cross-section of the fossil radiator from Rtveesia WaUUhii R. llu. (The dark transverse zones

... Drm i »i of the fossilization (1) Fig. B. Radial Laiigasohliff through a trunk of Cassia alata L transformed into wood opal

,., i dark hyphae of a fungal mycelium (Polyporaceai spee.) filled, to the left of it the bolt fibers and the transversely running rake rays.

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Fig. F>

7 lUUroal, Fig. 2-4 255iual. Fig.

rr

) 5 times enlarged

i.

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tropical palm trees are completely absent in the Trinil flora and almost all 54 species up to the one at approx. 650 m

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That in the temperate zone there are still numerous species of

the lower limit 1

The first zone of the hot lowlands is self-evident, given the transition character of this zone between the tropical heat of the lowlands and the cool temperature of the oak-covered mountain region large leaf areas reveal the peculiarities of the tropical flora. But among them, too, Ficus indica (panel XXXI, Figs. 7 and 8) and Ficus callosa (panel XXXI, Figs. 1-4) rise up to 1000 m, Ficus retusa in the Eastern Himalayas up to 1200 m, Ficus variegata (panel XXXI, 11 and 12) up to 1500 m; Ficus infectoria (Plate XXXI, Figs. 9 and 10) occurs in the Khassi Mountains at 1200 m, and here in a formation exactly corresponding to the trinile form with strongly protruding nerves, which Miquel previously described as a special species of Ficus submonticola, and also which now exclusively on the Indian mainland z. B. the var. Wightiana occurring in the Nilgherigebirge can be found on the hair or rather down to the finest nerve in Trinil fossil. The other plants behave in the same way. So I believe that the entirety of the Trinil flora excludes a hot tropical climate, but fits in well with the vegetation characteristic of the temperate zone.

The conditions necessary for the cervids are found here in an excellent way, an open forest area free of lianas as possible; It is characteristic of the temperate zone with its less dense foliage that the lianas are decreasing here.

Against the number of plants listed above, some of which are often collected and therefore precisely known in terms of their geographical distribution, the few freshwater conchylia found under, above and between the layers of plants do not constitute an overly weighty argument against the moderate levels resulting from the flora Temperature. It should be mentioned once that the

Martin specified Paludina javanica after young chicken still occurs today in the swamp lakes or Rawahs of the temperate region; Furthermore, it would be possible that the temperature of the lakes during the pluvial period was higher than the air temperature and that this caused the apparent contradiction between the freshwater mollusks and the terrestrial flora.In relation to the climatic conclusions drawn on the basis of the plant material, Dubois has already made the objection with regard to Elbert's botanical findings that the remains of the plants that speak for a cooler climate were washed down from the higher mountain areas through smaller watercourses after the main eruption of the volcano. On the other hand, it must be said that the totality of the Trinil flora, as can be asserted on the basis of exact determinations, is thoroughly uniform

Has character; If Dubois' flood hypothesis were correct, one would find real representatives of the tropical flora next to those of the cool region and the cold summit flora scattered in a colorful tangle, such as tropical palms next to heather, figs next to myrtaceae, coastal plants next to Engelhardtien etc. the plant deposits at Trinil not from the main eruption, because with this not so many whole and well-preserved leaves would have reached Trinil, but a later, weaker eruption, which in itself makes it very improbable that

1) Only three plants are known to me not above 500 m up to now: öareinia dulcis, Hopea fagifoHa and Cryplocarya ferrea .. Carthaus uses these (see his critical remarks in this work p. 12 footn.) Among other less serious arguments, in order to assume a much more rainy climate for the Trinil flora like me, but in contrast to me a tropical climate. Apart from the fact that I cannot imagine how no temperature drop would occur in a "much rainier climate", according to Carthaus' argument one would have to do much more

expect purely tropical species. See also my remarks on p. 250, etc.

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Plants from the higher regions were carried away in large quantities. The discovery of a pebble from Reveesia WaUichii proves to me that the leaves, which I refer to as indicators of a moderate climate, were not carried away by the wind to the area of ​​Trinil 'at the time

now only grows on the Indian mainland and exclusively at an altitude of 900-1350 m. If one compares the fossil flora of Trinil with that which is now to be found in this place in the northern plain of Madiun, one can see a considerable difference in the vegetation deoke. After the collections of living plants made by Elbert in 1907, which are now in the Rijksherbarium

Ailments are kept alive from the fossilized families near Trinil 1

Urticaceae:

Artocarpus integrifolia L. f.

Cudrania javanensis Trecul. Trema virgata Bl.

Ficus gibbosa Bl.

Ficus benjamina L. Streblus asper Lour,

Loranthaceae

Loranthus longiflorus Desv.

JEivphorbiaceae

Antidesma Burda's Spr.

Bridelia stipularis Bl. Bridelia tomentosa Bl.

Qlochidium glaucum Bl. Macaranga Tanarius M. Arg. Phyllanthus reticulatus Poir.

Anonaceae:

Anona reticulata L.

Lauraceae

Uvaria purpurea Bl.

Cinnamomum zeylanicum L.

Sterculiaceae Helicteres Isora L.

Melochia indica A. Gray. Kleinhovia hospita L.

liutaceae

Evodia spec.

l \* apilionaceae

Dichrostachys cinerea W. et A.

Albizzia stipulata Boiv. Atylozia subrhombea Miq.

Papilionaceae

Bauhinia divaricata L.

Bauhinia malabarica Roxb. Cassia alata L.

Cassia fistida L.

Cassia florida Vahl.

Cassia mimosoides L.

Clitoria ternatea L.

Crotolaria semperflorens Vent.

Desmodium Cephalotes Wall. Desmodium gangeticum DC. Flemingia involucrata Benth. Flcmingia lineata Roxb. Flemingia strobilifera R. Br. Leucaena glauea Benth. Pachyrrhizus angulatus Rich. Mexoneurum frutescens Desf. Sesbania grandiflora Poir. Teramnus labialis Spr. Uraria crinita Dksv.

Araliaceae:

Polyscias nodosa ski m.

1) Of course, this list does not claim to be exhaustive, but the plant-geographical cooperatives in the archipelago are still so little known that every contribution based on reliable determinations deserves consideration.

Boraginaceae

Ehretia buxifolia Roxb. var. micro-

phyUa Lam. Apocyneae:

Alstoiiin costatu R. Br. Alstonia viliosa Bl. Plumiera acutifolia Poir.

Cyperaceae

Cyperus dilutus Vahl.

Fimbristylis globulosa Kunth.

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Of this recent flora in the vicinity of Trinil, of which a palm, Calamus spec., The Aracee Pothos longifolius Presl and the fern Polypodium Phygmatodes are mentioned, there are only four species whose names are blocked in the above list, fossil at Trinil. All species that indicate a temperate climate are completely absent today in the Trinil plain, such as Castanopsis, Altingia, all Lauraceae except Cinuamum xeylanicicm, Viburnum coriaceum etc. The latter can still be found alive in the Trinil area, but only for the time being at 1200 m (Kukusan volcano, Kali Djeploh). But here, too, one would look in vain for a plant cooperative corresponding to the fossil flora.Such is only to be found on the Indian mainland, namely in Assam on the eastern border of India, in the Khassi Mountains at an altitude of 750-1200 m. There, in the temperate region, there is a plant community consisting of very moisture-loving species such as Streblus asper, Ficus callosa and variegata, Altingia excelsa, Mesita ferrea, Hopea fagifolia, Aglaia odorata (panel XXXII, Fig. 21 and 22), Saraea minor (panel XXXII , FIGS. 19 and 20) and Viburum coriaceum; furthermore species that have their original home in the temperate Himalayas and also require a fairly humid, temperate climate, such as Ficus retusa and infectoria, Loranthus longiflorus and

pulverulentus, Flueggea obovata, Tetranthera alnoides and salicifolia, Vatica lancaefolia (Plate XXXII, Figs. 34-37), Reveesia Wattichii, Feronia elephantum. A few species, such as Polyalthia lateriflora, of course, also occur in dry locations, but these are very adaptable in general and therefore not useful for climatic conclusions. From this it should be evident that a comparative consideration of the climatic conditions of the Khassi Mountains on the one hand and the temperate zone on Java on the other hand allows the climate to be assumed for the Pithecanthrojjus period to be determined with reasonable certainty. The fossil trinile flora definitely calls for a more humid climate than is now the case in central Java, where the forests are already transitions from the flora of western Java, which require greater moisture, to the more xerophilic woody formation of eastern Java. As is well known, the Khassi Mountains, which rise steeply from the Silhet plain, have an average rainfall of 11626 mm at Cherrapungi, which with an altitude of 1250 m corresponds to the elevation assumed for the fossil trinile flora, and even if this colossal amount of rain comes through here the peculiar plateau-like situation is conditioned, we can assume a similar amount of rain for the fossil trinile flora; because also the eastern Himalayas, in which, in my opinion, the original home of the main mass of fossil flora is to be found, has amounts of precipitation that can be compared with that of Cherrapungi on the south side of the Khassi Mountains. Assam and Tenasserim, which still house a plant cooperative that corresponds to the fossil fuel, also have large amounts of rain: Assam has 239 cm mean rainfall per year, Tenasserim even more than 400.

As far as the temperature conditions are concerned, some temperature averages for Southeast Asia are listed first: Toba on the inland plateau of North Sumatra has an average annual temperature of 20.9 ° at an altitude of 1150 m and Tosari on Java at 1777 m has an average annual temperature of 15.9 °. In the Madiun plain, where Trinil lies, the present temperature averages 24-28 degrees. From numerous temperature means for Southeast Asia, the amount for the mean temperature decrease has now been found to be 0.59 ° per 100 m. If one sets the height limit of the Trinilflora, which can be assumed on the basis of the flora, to 1200 m, one obtains an average temperature decrease of 7.08 ° for the Pithecanthropus period, and the other known temperature conditions of southeast Asia also speak under the above conditions that rely on the vegetation, for an average 6 ° lower

Temperature than today for the time when the Pithecanthropus lived. This number is certainly not too high

Selenka-Trinil expedition.

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taken, since, as was shown in the discussion of the vegetation conditions, the upper limit of the temperate zone must be claimed for the fossil flora. After young chicken, the temperature of the temperate growing zone is between 18 and 22 °. The rain is stronger here and almost every afternoon violent thunderstorms unload on the slopes of the mountains. Wind-driven masses of mist move between the trunks and the humidity in the atmosphere is greater. The leaves often have tips that allow the leaf surface to drain more quickly, such as Castanopsis Curtisii, Artocarpus rigida, Ficus infectoria, indica and retusa, Altingia excelsa, Hopea fagifolia, Fagraea litoralis and the like. a. Large leaves are rare, almost only in Ficus eallosa (Plate XXXI, Fig. 1-4) and Polyscias pinnata. In this temperate region in particular, there is a wealth of different types of woody plants, it is the open, evergreen mixed jungle of the temperate zone, one of those jungle wilderness that are now more and more being cleared and of which the old young chicken writes wistfully: In mine The image of the forests remained fresh, the eternally green there, the thousand blossoms that never cease to smell there. . . .The number of woody plants of the second or moderate altitude belt is estimated at about 250 species, so that about the fifth part of the living species of Trinil is known to be fossilized and the twentieth part of the approximately 1000 species of Java's forest flora in general. It goes without saying that this had to be the primary basis for the treatment of the fossil herbarium of Trinil, where every stroke of the hammer revealed a new image of the flora that is now withdrawn in the rugged mountains; Just as in scientific zoopalaeontology Cuvier first had to know exactly the tapir itself in order to determine a paleotherium and see in which way it deviated from the tapir, so in paleobotany the knowledge of the recent plants is the only basis for an exact determination. Only on such a basis is it possible to approach such difficult problems as those presented by the climate of a past earth period.

In the above I believe to have proven the existence of a thermal depression, which one has to imagine in the form of a pluvial time, for Java. Such a period of increased precipitation, which is naturally of the greatest importance for biological discussions, also has the northern one

How is the thermal depression or cope with the Pithecanthropus Ze'ti to be explained?

A diluvial firn boundary depression of 500-600 m corresponds in the tropics to a mean temperature decrease of 3-4 °; Since, as explained above, a temperature decrease of 6 ° is to be assumed for the Pithecanthropus strata, the firnline depression in lava would have been 800 m, and this number agrees fairly well with the diluvial snow line in Central Africa, the 900-1000 m lower. Now, however, the glacier border in Africa is 4500-000 m, in Java, on the other hand, 3000-3100 m, and from this it again follows that the diluvial snow line in Trinil is on average 800 m lower than it is today. These facts lead to the most important and controversial question of the geological age of Pithccanthropus.

1) Cf. Blanckenhorn, News on the Geology of Palestine and the Egyptian Nile Valley. Magazine d. German geol. Society, 1910.

and was included by Volz on the basis of geographical considerations

South America and all of Africa 1

also adopted for Southeast Asia. The fossil flora described here provides paleontological evidence for the existence of such a pluvial period; Viburnum coriaceum, a small tree-like snowball with oval, elongated leaves narrowed at the front, which should not be confused with the very similar Viburnum sundaicum, which is sufficiently different due to the always short, pointed teeth of the leaf edge, should be regarded as the key fossil for this.

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It was shown above that the original home of the Trinil flora, which is now scattered over the mainland and the Indo-Australian island kingdom, is to be found in the temperate Himalayas; So it must have started its migration eastwards from here. Since the fossil flora of Trinil does not contain plants whose seeds and fruits are dispersed by the ocean waves, such as If, for example, the Pangium Treubii described by Raciborski from the Miocene of Java, spread by birds, but at most in the seeds of Garcinia dulcis, which are wrapped in an aril-like pulp, then the spread of such a rich tree flora on the Indo-Australian archipelago is not possible explain differently than by former land connections, because it is not possible that so many tropical forest trees survive the migration over such important stretches of sea; such cases are always rare exceptions. The question will therefore be which land connections are necessary to explain this spread, and at what time did these land connections exist.

The number of those species that go today from the eastern Himalayas to New Guinea or Australia is not small; it comprises 14 of the 54 fossil species that, according to their recent distribution, between which the fossil deposits on Java mediate in the most beautiful way, a land connection of the Asian continent with the three large Sunda Islands, with Celebes, the Moluccas, Timor, New Guinea and Australia require so that during this time western plants and animals could reach Australia unhindered via Timor.

If we now take a look at the geology of the Indo-Australian archipelago, we find that according to the stratigraphic, oceanographic and zoological researches, among which those of the Sarasin brothers are to be mentioned, extensive land connections existed during the height of the Pliocene period which enabled both plants and animals to penetrate from mainland India to Australia and vice versa. At that time the invasion of the plants must have taken place from the Himalayas, because already towards the end of the Pliocene period the bridges collapsed in the order from west to east and set narrower limits to the spread of the western elements. There is no doubt that this great plant invasion from the Himalayas took place in the Young Pliocene, because the Himalayas did not emerge until the Pliocene, and the Miocene flora, which was made known from the Sunda Islands through the work of Goeppert, Heer, Geyler and Bagiborski 1 ), are completely different from the flora found at Trinil; they do not contain a species that is closely related to a Trinil species. Now it is a well-known fact that in the early Pliocene period a severe thermal depression occurred, which caused great shifts in the plant world. Volz's view that the higher Pliocene was a drought has no paleontological justification and can hardly be sustained. A pluvial period began not only with the Diluvium (according to our common division of the Quaternary), but a deterioration in the climate became noticeable on the earth as early as the Upper Pliocene, which was reflected in the composition of the flora of tropical, heat-loving relic species and newly immigrated cold-loving montane Species becomes known, so that such a young Pliocene flora represents a peculiar mixture of flora, as one would look for it today in vain; on Central European soil z. B. grew near Frankfurt a. M. (clarifier) ​​mountain pines (varnish montana foss.) And palms (Pseudonyssa palmiformis).How about that in the tropics? It would of course be of the greatest importance, especially for the determination of the age of the Trinil flora and the Pithecanthropus, to compare Asian Pliocene flora

1) There is also a berry-like fruit that Verbeek collected in the tin soaps Bankas and Warburg called Monodorospcrmum bancanum. This unique specimen exhibited in the Botanical Museum Berlin is undoubtedly an anonacea fruit; however, it does not belong to the exclusively African genus Monodora.

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can. For Java the Pliocene flora of Gunung Kendeng should be mentioned here, which Crie carefully subdivided

is looking for.

According to him, the little flora consists of:

Glumaceae:

Palmae: Artocarpeae: Lauraceae: Dipterocarpeae: Mhamnaceae: Sapotaceae:

Poacites cyperoides Crie.

Poacites arundinacea Crie. Palmacites flabellata Crie. Artocarpidium Martinianum Crie.

Actinodaphne Martiniana Crie. Phyllites dipterocarpoides Crie. Rhamnus ventilagoides Crie. Sapotacites Delprati Crie.

As you can see, this flora does not contain a genus that is also found fossil in Trinil. It consists of species, some of which are very close to recent ones without fully agreeing with them; so Artocarpidium Martinianum undoubtedly stands for the recent Ficus leucantatoma Poir. closest to Java, Actinodaphne Martiniana to the Javanese A. proeera Nees. A comparison of this flora with the Trinil flora is not conclusive because it is not known whether the flora described by Crie is old or young Pliocene; In general, the determination of the age is not certain, and I suspect that the leaf impressions are to be placed in the Miocene like those described by Goeppert.

Nathorst's beautiful investigations into the fossil flora of Mogi in Japan, which Nordenskjöld discovered not far from Nagasaki, are therefore of great importance. In this flora it is very noticeable that there are no tropical forms and that the plants indicate a cooler climate than currently prevails in southern Japan; According to the composition of the flora, the climate corresponds to that of the high-lying parts of Japan today. With the flora of Mogi, Nathorst thus provided evidence that the influence of a thermal depression made its way to the southern tip of the Japanese island kingdom. Do we now have to relocate this flora to the later Pliocene or perhaps to the beginning of the Diluvial Age? According to the extremely careful determinations of Nathorst are of the

51 species of the fossil flora of Mogi 20 new species, from which every paleontologist inferred from such a high number of extinct species a Young Pliocene age, a higher age is excluded by the 31 species identical to living montane plants of Japan. Accordingly, the percentage of recent species for a young flora of tropical Asia can be calculated to be about 60 ^. If one now considers that the plants as a whole are not as sensitive to climatic fluctuations as the animals, and that in fossil fauna up to 90% more recent forms are assumed for the Pliocene, the Pliocene age determination of the flora of Mogi can be considered certain At the same time it proves to us another important fact, namely that in the tropics in the Pliocene period not only the now living flora dominated, but also a considerable number of now extinct species existed alongside such species That there was no advance in flora development in the Pliocene period in the tropics either, such as the fact that all of today's flora dates from the Young Pliocene. The proposition that the Pliocene is the birthplace of today's vegetation also applies to the tropics.

If we now compare the 51 species of the Mogiflora with the 54 of the Trinil flora, it has already been emphasized several times that the latter certainly has neither an extinct species, nor an extinct variety, nor any other modification that cannot be fully identified with a recent one. From this I believe I have to draw the safe conclusion that the Trinil flora is of diluvial age, belonging to the quarter-war period.

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This result, which is also supported by Martin's treatment of the freshwater mollusc remains, contrasts sharply with Dubois' view of the numerous vertebrate remains, especially the bones of large mammals. As is well known, Dubois concludes today that the deposition was at a Young Pliocene due to the large number of new animal species in the fauna of Trinil. The apparently high evidential value of this mammal fauna is considerably reduced by the fact that in Asia there is no completely reliable diluvial mammal fauna known, i.e. not really known which species of ancient animal genera still lived in the old diluvian of those countries and which were already extinct in the Young Pliocene. So it will not be possible to draw exact conclusions for age determination from the bones of mammals alone, and the microfauna that would be more suitable for this is underdeveloped. From the zoopalaeontological point of view, it cannot be denied that the trinile fauna has an ancient character due to the relatively large number of extinct species, namely the remains of Stegodon, the ancestor of the elephant with tusks in the upper jaw. It is true that the species Stegodon insignis, recognized as a key fossil for the younger Pliocene fauna of Asia, is just as little represented in Trinil as Stegodon Clifti and bombifrons from theyounger pliocene fauna of China.

The thermal depression derived from the plants above can of course be derived from the mammalian

not opening up the animal world, even if a certain Nordic character cannot be denied. But the fact that ancient forms were able to survive longer on Java than on the mainland is not difficult to explain. The investigations in the zoological area by the Sarasin brothers and in the botanical area by v. Wettstein have shown that when a species penetrates from one area into the other, a corresponding change in shape occurs.

It was pointed out above that the development center for the Trinil flora is to be found in the Himalayan region; That this can also be assumed for the animal world is shown by the pliocene deposits of the Siwaliks, with whose fauna that of Trinil has certain similarities. When, towards the end of the Pliocene period, a general climate deterioration occurred from the Himalayas, a large plant and animal invasion to the east apparently took place and animals and plants were able to penetrate from the Indian mainland to Australia on the land bridges that still existed at that time, and of course they migrated more sensitive species of the tropical region earlier than those adapted to the temperate and cooler zone, so that this great shift will have taken place in several, at least three stages, as the current geographical distribution of the trinil plants shows; but these immigrations are of no further relevance to the question of interest here. The flora will have changed little during this shift during the Pliocene land period, since in the Pliocene the majority of the types now alive were already present and partly mixed with the relics of the Miocene, partly fought the struggle for existence. The plant world had already reached the height of development compared to the animal world; the animal world, on the other hand, had not yet advanced to the point where it has recently changed in shape, and so a shape a will transform itself into a kind a1 on its migration across the three great Sunda Islands, Celebes, the Philippines, Moluccas, Timor, New Guinea and Australia; a2, a3. . . an have transformed so that there is a seamless transition between a and an from east to west. Now, however, in the Pliocene period, the corresponding land bridges collapsed in the reverse order to the advances to the east.

standing isolation from west to east caused the emergence of new species and endemisms a "'

a3 ', a2', a, ', while the archetypes a gradually died out. The transition links a, a2, etc. must have been preserved for the longest time on the island that had the longest connection with the continent, and that is Java; one likes now with the Sarasins the incursion of the Java Bridge into the old diluvial

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Delayed or not, it seems certain that at the time of Pithecanthropus Java was still connected with the mainland, as the small number of species of the Trinil flora endemic to Java, which amounts to only two, should prove. Even the ten plants that now only grow on the continent speak for a land connection with the Indian mainland and a look at the fauna actually shows the equally interesting and rare phenomenon that it contains the different stages of development at the same time and side by side: it is sufficient to Stegodon to remember, the intermediate form between Mastodon and Elephas, of Tetracems Kroesenii Dubois, an extremely strange transitional form of an antelope species, of Dubois' Bibos palaeosondaicus, the development of a Bibos form already suspected by Rütimeyer from the Leptobos fovm, which is still somewhat reminiscent of the antelope, and the possibility cannot be denied for the time being that Pitheeanthropus also represents such a transitional form, i.e. really a missing link. Further investigations may reveal Pitheeanthropus to be a human form that may not deserve a special gender name, but here in the extreme south-east of Asia the chances of discovering a transitional form between apes and humans are greatest.

The age limit for the Pithecanthropus layer, whose unity is also determined by the geological,

and zoopalaeontological facts have been proven, has recently been put by most researchers, especially the employees of this SELENKA-Trinil work, between the young Plioeän and the old diluvial. Thus, after a diluvial age has emerged on the basis of the floristic conditions, it would not be particularly necessary to prove that it belongs to the old diluvium; In particular, the ancient character of the animal world is important here, which in itself rules out a transfer to the middle diluvium, as Volz assumed on the basis of volcanic geological considerations. But also the flora would speak against such an assumption of a middle diluvial age due to the large number of species no longer occurring in Java today. The tectonic aspects that were asserted when determining the age of the Pitheeanthropus cannot be decisive either; just like undisturbed tertiary, there can also be disturbed quaternary. Even less is the degree of fossilization of the bones a determining factor; The remains of wood in particular show that, in addition to silicified trunks, there are also numerous lignite timbers that appear as young as the posts of the Roman bridges that have been transformed into lignite. However, this should be subject to the decision of the geologistQuestions are not dealt with in more detail, just as little is the formation of the Trinil layers.

As far as this last point is concerned, it should only be emphasized that, on the basis of the paleontological facts, I am unable to agree with the fluvial character of the deposit, which Dubois emphasized mainly. That there is no autochthonous deposit is sufficiently proven by the irregularly distributed wooden bodies and the confusedly scattered leaf remains. There is only one plausible explanation for the fact that the wood, like the bones, still show no traces of transport and that well-preserved leaves with base and tip are common, and that is that the leaves passed through after a large volcanic eruption small watercourses were fed into a calmly flowing mud stream (so-called Laharstrom) and deposited by this in a swamp lake ^ so-called Rawah) near today's Trinil. The abundant education speaks for this

Pebbles of sulfur near the lignite woods, as can only be done in stagnant waters. This view agrees entirely with the formation of the trinile layers, which Garthaus developed in detail, while the conception of them as fluvial sediment seems very simple, but cannot explain all the peculiarities of this deposit.

According to the above, the Pitheeanthropus is to be relocated to the old diluvium, namely into the great pluvial period that occurred towards the end of the Pliocene period and also in the old diluvium

The fossil flora of the white tuff from lasers 3 Castanopsis Curtisii King;

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Quercus lamellosa Hook. f. Ficus eallosa Willd .;

et Thoms .;

The flora of the Trinil layers.

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Because the flora does not contain any extinct species like they did in the Upper Pliocene period

still lasted 1

According to the flora of Mogi with about 20-30 ^ ", the Pithecanthropus period can hardly be relocated to the beginning of that great pluvial period. Furthermore, since the plant species embedded in the main leaf layer above require the same climatic conditions Just as the remains found in the main bone layer with Pitheanthropus, i.e. a further cooling or increase in precipitation upwards cannot be determined due to Palabotanic facts, I would actually like to assume that at the time of Pitheanthropus the peak of the large pluvial period had been reached; in Europe this would correspond to the Mind Ice Age and this would bring Pithecanthropus close to Homo heidelbergensis, which, according to Blanckenhorn's large overview table (aa 0.), is best placed in the transition phase between the third last glacial period and the penultimate interglacial period .

In conclusion, it is permitted to briefly cite one more proof for the view presented here. There is no shortage of deposits with fossil plants on Sumatra, Java and Celebes, but some of them have not yet been palaeontologically exploited and some have not yet been investigated. The geological-mineralogical Rijksmuseum in Leiden has a larger collection of these, which the director of this institute, Prof. K. Martin, sent me to Munich for closer examination, for which I would like to express my most sincerely at this point. Unfortunately, the volcanic material is not very favorable for the preservation of fossil plants, and therefore exact determinations are very tedious and only worthwhile if numerous samples are available from one location.

In this respect, the sheet impressions collected by the engineer van Heuckelum from the white Quaternary tuffs of lasers in the Binangun administrative district in the Rembang residence are of outstanding interest. These white horizontal calcareous substances, which are underlaid by lime marl and sometimes contain unrolled pebbles, form in the vicinity of lasers

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70 to 80 m high plateau and are without a doubt quaternary deposits 2

at Trinil the plants are embedded as mud flows and now hardly rise up to 100 m along the north coast of Rembang; so they have nothing to do with the igneous masses of the ancient Andesite. But even the latter do not reach great heights: the Gunung Lasern east of Lasern 807 m and the highest point, the Gunung Pandan on the border of Madiun 900 m, a height to which various plants of the temperate zone, such as z. B. Viburnum eoriaceum do not descend.1) Cf. in particular the more recent statements by Blanckenhorn a. a. 0., 1910, with "comparative overview table of the most important deposits and processes of the Pliocene and Diluvial Periods of Egypt, Syria and Europe".

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3) See Julius Schuster, De Tage geologique de Pithecanthrope et de la period pluviale a Java. Compt. Rend. Acad. Paris, T. 151, p. 779-781, 1910.

2) See Verbeek et Fennema, Description göologique de Java et Madoura, T. I, p. 251, 1896 and Map B. VII. The elevation of these deposits up to 80 m is perhaps a further argument for my view that the included and with the fossil flora homologous by Trinil belongs to the peak of the pluvial period equivalent to the Minde Ice Age (cf. also Blanckenhorn, The climate of the Quaternary period in Syria-Palestine and Egypt in "Postglacial climatic changes", Stockholm 1910, p. 426 sub 4).

These tuffs have like

revealed the following types:

Flueggea obovata M. Arg. Mallotus moluccanus M. Arg.

Uvaria purpurea Bl.;

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;

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Julius Schuster,

Unona discolor Vahl

Dehaasia squarrosa million et inches .; Tetracera sarmentosa (L.) Willu. var.

hebecarpa (DC.) Hook f. et Thoms.

Indigofera tinctoria L.

Deguelia (-Derris) elliptica Bekth .:

Vibumum coriaceum Bl.

;

;

As can be seen, all of this dozen species, with the exception of Quercus lamellosa, are identical with the flora of Trinil, so that a flora equivalent to that of the Pithccanthropus layers is now present from a quaternary layer. Quercus lamellosa, an oak up to 40 m high, which has not yet been found near Trinil fossil, only grows on the mainland today, namely in the temperate region of Sikkim at an altitude of 1500 to 2400 m, thus just reaching the upper limit of the temperate region. For the fossil deposits, depending on the local conditions in the vicinity of lasers, washing down cannot be considered. After the unanimous find at Trinil, I would almost like to regard Vibumum coriaceum as a key fossil of the Old Quaternary Pluvial Period on Java, and it is probably no coincidence that this snowball and the oak mentioned above are found in the damp and cloudy climate of Szechuan1

Find distribution and both occur in the temperate Himalayas. I consider Quercus lamellosa to be

Another characteristic plant of the pluvial period of the Indo-Australian archipelago, which is responsible for a thermal

Depression of that time speaks. That other oak species (Koord-ers2 names 7) still in the)

growing in the lowest region of Java is no argument against my theory, for which I see a new support in the fossil flora of lasers.

After the collections by Elbert, the following plants can now be found at an altitude of 400 to 900 m on the Pandan:

Vitis discolor, Calosanthes indica, Pangium edule, Capparis micrantha, Chloranthus offwinalis, Argyreia capitata, Alangium sp , Amoora spec, Cedrela spec, Eugenia Jambolana, Jambosa spec, Eugenia spec div., Corymbis veratrifolia, Ixora spec, Psychotria aurantiaca, Evodia glabra, Homalittm tomentosum. Helicteres hirsuta, Melocliia indica, Greivia celtidifolia, Pterospermum Blumeanum, Schoutenia orata, Celtis

Wightii, Conocephalus suaveolens, Ficus fistidosa, F. fidva, F. gibbosa, F. hispida, F. parietalis, Piptitrus asper, Streblas asper, Villebrunea integrifolia, Callicarpa longifolia, Clerodendron Blumeanum, C. scrralum.

Much work will still be needed to wrest the riddle of the Sphinx of the Indo-Australian archipelago; In the present humble article I believe I have shown that Pithecanthropus erectus lived in the old diluvium and that during the great pluvial period.

1) Leaves completely matching the shape of the Himalayas are in the Berlin Herbarium (leg. Von Rosthohn.)

2) Plant-geographical overview of the Fagaceae of Java, K. Akad. Van Wetensch. Amsterdam. Pp. 488 to 497, 1909.

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in central China the northern border of their

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Figs. 1-4.

Table explanations.

Plate XXXI.

Ficus callosa Willd. 3 shows a leaf shape with a rounded base from the Buitenzorg Botanical Garden; Fig. 4 narrowed leaf base after an original copy from the Willdenow Herbarium.

Loranthus elastieus Desv. 6 according to material from Tenasserim.

Ficus indica L. Fig. 8 Leaf from East India.

Ficus infcctoria Roxb. Fig. 10 Upper side of sheet according to material from the Khassi mountains, 1200 m (= Ficus monfi-cola Miq.).

Firns rariegata p. Fig. 12 Upper side of a leaf from Pandan, Java, Madiun residence, 400-900 m, leg.

Elbert.

Altingia (IAquidcmibwr) excelsa Noronha. 14 after a leaf collected from Blume on Java. Mallotus moluccanus garbage. Arg. (Var. Genuinus Muell. Arg.). Fig. 16 Upper side of a sheet from the Buiten

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5-6. 7-8. 9-10.

11-12,

13-14. 15-16

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3-18. Deguelia (Derris) elliptica Benth. Different variations of the very polymorphic leaflets together with different recent comparison material (Java, Siam, Ceram-Land, Neu-Hannover). 18 leather-like sleeve with sharp edges on both sides, after a plant that Zollinger had collected on Java.

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19-20.

21-22. »• 23-24. > 25-26. »27-28. »29-31.

> 32-33. »34-37. »38-43.

Selenka-Trinil expedition.

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Plate XXXII.

Figs. 1-2. Indigofera tinctoria L. Fig. 2 Small side leaflets from East India.

The flora of the Trinil layers.

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caring garden.

Cassia alata L. Fig. 18 Upper side of one of the two terminal leaflets from East India.

17--18

19-20

21-22

23--24

25-26

27--32 Gastanopsis (Castanea) Curtisii King. Fig. 28 top and Fig. 30 bottom according to material from Borneo,

Polyscias pinnata forest. Fig. 20 a lower sheet (upper side) from Nusa, Neumecklenburg. WillughbyaapiculataMiq. Fig. 22 after a copy collected by a giant on Sumatra.

Fagraea litoralis p. Fig. 24 a lower leaf with a rounded, edged tip after material from Engler Viburnum coriaceum p. Fig. 26 after leaves from Java by Koorders.

SaracaminorMiq. Fig. 20 based on material from Siam, Bangkok.

Aglaia odorata Lour. Fig. 22 Leaf from Hainan, leg. Henry.

Aglaia palembanica (Miq.) C. DC. Fig. 24 Leaf from Borneo, leg. Korthals.

Cylicodaphne cuneata BL Fig. 26 Upper side of leaf of a specimen from Sumatra.

Cylicodaphne fusca p. Fig. 28 after a plant from Sumatra, leg. Forbes, upper side of the leaf.

Tetranthera alnoides Miq. Fig. 31 after a copy collected by Koorders in the province of Madiun, Java.

Tetranthera salieifolia Roxb. Fig. 33 Sheet from the Calcutta Botanical Garden.

Vatica lancaefolia Bl. Fig. 35 Upper side of a plant from the Chittagong Mountains, East India.

Feronia elephantum Corea. 38 and 39 show the fossil fruit from the side and inside; Fig. 42 a

Longitudinal section through the recent fruit based on alcohol material collected by Count Solms zu Buitenzorg; 43 shows the same younger stage, in order to show the originally pentarchal arrangement of the ovules later randomly distributed over the pulp; Fig. 40 a piece of the surface sculpture of the peel of the fossil and Fig. 41 of the recent fruit.

44-47. Ucaria Lamponga Scheff. 45 upper side of a sheet from the Buitenzorger Hortus; 46 and 47 the same piece from two sides.

48 ^ -50. Mcmecylon floribundum p. Fig. 49 after a plant collected by Zollinger on Java. 51-52. Memecylon myrsinoides p. Fig. 51 Bjatt from Java, leg. Zollinger.

53. Fagraea litoralis p. See also Plate XXXI, Figs. 23-24.

All figures are reproduced by photographic means after the originals drawn in natural size by Gertrud Bartusch, reduced by 3.

General considerations on the scientific

Results of the Selenka-Trinil expedition from

Prof. M. Blanckenhorn, Berlin. Editor's Closing.

The SELENKA-Trinil expedition and the current publication of its scientific results in this work could perhaps appear to some distant people as a kind of unfair competition to the meritorious discoverer of the Pithecanthropus erectus, insofar as that of Prof. Dubois himself in his earlier excavations Java, material brought together at the beginning of the nineties is still not fully processed and published in detail. On the other hand, it should be emphasized that, as Prof. Selenka said in her introductory expedition report, the approach was taken from the beginning in agreement with Mr. Dubois himself and with the Dutch Colonial Ministry. In the autumn of 1905 she also said - with approval

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of the aforementioned ministry, to which the DuBOis collections and publications are subject, Mr Dubois is expressly entitled to a three-year lead time for each publication. Dubois, who at the time stated that his own work on the Trinil fauna would be completed within a year as positively certain, declared himself quite satisfied. But even later, when Dubois asked for an extension of this publication deadline, Ms. Selenka in particular complied with this wish to a large extent and, shortly before this work went to print, was ready to make further concessions. But since on the other hand between the Kgl. Prussian Academy of Sciences, Ms. Selenka and the publishing house of Wilhelm Engelmann in Leipzig had concluded a certain publishing contract, further postponement of the publication for an indefinite period would have invalidated this favorable contract and the entire publication would have been questioned. As a result, the Prussian Academy, as the representative of the Berlin Jubilee Foundation, finally had to decide to incorporate or to include in his later work the last, too far-reaching wishes of Dubois (who had already begun processing all the material collected by the SELENKA expedition simply intended to be attached) in order to preserve the independent character of the planned publication in accordance with the contract made with the publisher ').1) It would be easy, using the correspondence and files available to me, to go into more detail about these various negotiations, in which I myself, at least since 1909, took part, and to go into detail about what has been said above prove, but that would lead too far and also not correspond to the purely scientific purpose of this work.

M. Blanckenhorn, General Considerations on the Scientific Results of the Selenka-Trinil Expedition. 259

Before the conclusion of this substantial work, I should now be allowed to take a brief, clear review of the most important scientific results presented in it, insofar as they are of general interest.

As its leader has already explained, the SELENKA-Trinil expedition had essentially five goals in mind:

Searching for and collecting any other remains of Pithecanthropus or other anthropomorphic forms,

also of traces of man,

also of the remains of the fossil fauna and flora of the various strata, promotion of knowledge of the geology of the Trinil area, in particular the way the Pithecanthropus strata formed.

Determine the relative age of the latter.

1.

2. 3. 4.

5.

Ad 1.

Regarding point 2, however, I can first refer to the works by Walkhoff, Dieck and Carthaus, which are reproduced in this work, which refer to an interesting fossil human tooth found by the expedition at Sonde, but about its relative age Unfortunately, its occurrence as creek rubble on the surface does not give any definite information from a geological point of view. Before that, I myself had already taken the opportunity to present and discuss the latter at a meeting of the Berlin Anthropological Society

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Carthaus discusses some bone fragments from the Pithecanthropus layer that may have been used as tools by humans or human-like beings. We have shown the most important of these on Plate XXX in order to enable the readers themselves to form their own judgment about these dubious artifacts. My own opinion of these things

but moved into the realm of possibility if not probability.

Ad 3. The result of the SELENKA expedition is significant with regard to the advancement of our knowledge of the fossil fauna and flora of the strata affected by the excavations, both the deeper marine and the mighty freshwater formations. Of the rich collection of marine fossils, only the foraminifera and bivalve veins remain unprocessed; the former because, after examination by Messrs. Staff and high bar didn't seem to offer anything new, the latter,

1) Blanckenhorn, model of a fossil human tooth from the SELENKA-Trinil expedition on Java. Magazine f. Ethnology, booklet 2, p. 337. Berlin 1910. This lecture was given before the DiECK research was carried out, that is to say without any precise knowledge of the metamorphosis of the dentin.

2) Branca, preliminary report on the results of the Trinil expedition of the Academic Jubilee Foundation of the City of Berlin. Meeting report d. Kgl. Prussia. Akad. D. Wissensch., XII, p. 264. Berlin 1908.

33 \*

Only with regard to the first of these five goals did the SELENKA-Trinil-Expedition unfortunately remain unsuccessful, but apparently only because there were no such at the excavated places, for which the expedition cannot of course be blamed.

as far as I saw them, just like Branca's 2

and almost all of the experts in prehistory and geology that I and Ms. Selenka asked about them, saying that their shape could well be used by humans, but that they could just as easily be traced back to other, purely natural processes. The local coexistence of humans with the Pithecanthropus on Java is therefore not yet incontestably proven by these finds, however

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260 M. ßlanckenhorn,

because Mr. and Mrs. Prof. Martin in Leiden, the recognized best experts on the tertiary and recent conchylic fauna of the Sunda Islands, before their new trip to Java im. The spring of 1910 no longer found the time for this lengthy investigation. For the purpose of determining the age of the marine layers, the revision of the rich gastropod material collected at several sites by Ms. Martin-Icke and the provisional restoration of the corals by Prof. Felix, Leipzig, was sufficient. A detailed rewriting of these corals (over 60 different species, of which at least 11 are new, i.e. still unknown), Mr. Felix has planned for a later time.The extraordinarily versatile material of organic residues of the fluviolacustren Pühecantkrojms-Schichien was thoroughly reworked. The fossil plant remains, which in the course of the second year of the expedition by Mr. Dozy (carefully collected, preserved and sent (to Munich) according to the instructions of Prof. Rothpletz-Munich, were found in a special Rotan scientist and phytopalaeontologist, Dr. Schuster, a suitable reworker; his Rericht, included in this work as the last treatise, brings in some respects an interesting resume of his comparative studies, while a special monograph with many tables is to be published later (with the support of the Munich Academy of Sciences).

Professor Martin, the gastropods Ms. Martin-Icke, the fish Dr. Hennig, Rerlin, the crocodilians Dr. Janensch, Rerlin, the turtles Prof. Jaekel, Greifswald, the mammals with the exception of the proboscidians Dr. Stremme. Rerlin, the headboards of the latter Dr. Janensch, the skeleton of Stegodon Herr Prof. Pohlig, Ronn, made detailed studies and reported more or less in detail. The paper by Prof. Dubois, published in 1908: "The Geological Age of the Kendeng or Trinil Fauna", in which for the first time the conchylia and vertebrates he himself collected are listed and named

has been taken into account in all of the above-mentioned treatises in our work (with the exception of the sea turtle work), the new species of Dubois, although they are only briefly characterized in his work and do not appear as far as possible, adopted and their knowledge further promoted. How many new species of fossil fauna have also been added may be compared in detail.

For the first time the skeleton of Stegodon has been compiled and described in detail in almost all of its parts by the most qualified specialist.

Ad 4. ​​The diligent and conscientious geologist of the expedition, Dr. Carthaus, made many new interesting observations and put them together in a longer report. The head of the last phase of the excavation, Engineer Dozy, also accurately measured a number of geological profiles, some of which are shown in Plate X.

As is well known, there are several views about the way in which the bone layer leading to the Pitheccmthropus remains and the complex that surrounds it came about:

Dubois describes (admittedly only in his last publication mentioned above in 1908) the bone-leading tuffs as lluviatile formation. In the then multi-armed Rengawan, whose quiet spots also served as drinking troughs, the corpses of the animals that had perished in volcanic eruptions (primarily of the Wilis, then also of the Lawu) were herded together and the carcass parts were then torn apart by the crocodiles and the bones broken. It was only during this formation that the lying layers in the north were erected.

General considerations on the scientific results of the Selenka-Trinil expedition.

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According to Martin, the layers would be repositioned several times by the current, sifted through the grain and their material on the bones within the layers would be washed out and locally enriched. The skeletal remains are now on a secondary deposit.

Volz, who by the way was only about 2 days in Trinil, regards the tuffs as mud flows of the double volcano Lawu-Kukusan and their bones as not being washed together by the river, but being embedded directly in the uncoated mud.

According to Elbert 1

so also the area of ​​Trinil, at the time of its publication (without the knowledge and permission of the expedition leader) was relatively minor given the shortness of its presence, the actual Kendeng layers are genuinely fluvial. Only locally it seems to be little or no fluviatil relocated tuff masses.

In his geological presentation, which introduces the individual scientific treatises of this work, Carthaus goes into detail on all the individual layers of the profiles and shows, with reference to the current processes in volcanic areas of Java, in a credible way how the various formations originated can- According to this, complicated processes are sometimes the basis.),

its experiences and observations regarding the geology of Java, and

For Carthaus, the mighty, irregularly thick conglomerate breccia, which lies above the marine layers but still under the actual bone layer, emerged from a huge mud-tuff stream ("lahar") from a former, now gone, giant crater on the western Wilis, filled with an extensive lake. That is why he refers to it directly as a "Lahar conglomerate". (Perhaps the more correct expression would be "lahar breccia".) The main layer of bone above, on the other hand, arose, according to Carthaus, from occasional later eruptions of loose volcanic material from ash and lapilli with simultaneous washing away of lahar material in a bay of a river with a steeper gradient, but most likely in a »Rawah« or large marsh with alternately stagnant and (when the damming tuff masses break through) more strongly flowing water. The large quadrupeds whose bones are unrelated but unrolled2

find themselves embedded were not brought directly to their current deposit. Rather, they were initially (partly in herds) in the eruptions with accidents in the volcanic mud or drowned in water basins, buried for a while until they decay, but afterwards the crumbling skeletal parts were occasionally washed out by torrential tropical rain and transported over a short distance and in the deeper collection or storage basins or troughs of the local uneven lahar surface. The following above the bone layer

Deposits are an alternation of tuffs made of lapilli masses that were fed to the Rawahs through small watercourses, of ash that fell on the spot in the water, and freshwater clay deposits in calm parts of the basin, in which layers of leaves that were washed in could also be preserved.

According to his earlier written reports, Branca3)

and finally Schuster4 essentially adopted and reproduced. Also find on Dozy)

we have them again with a few minor modifications.

1) About the age of the Kendeng strata with pithccanthropus. New. Year f. Min., Beil., Vol. XXV, pp. 648-662, 1908.

2) I would just like to say that I could consistently notice very clear traces of repulsion and unwinding on all corners and edges of the smaller bone splinters I examined (? From the Pitheeanthropus layer).

3) a. a. 0. 1908.

4) A contribution to the Pitltecanthropus question. Meeting report d. Kgl. Bayer. Akad. D. Science Math.-natural Class 17. Munich 1909.

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Conditions

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M. Blanckenhorn,

Among the employees at the SELENKA Trinil plant, only Dr. Strengthen the view of Dubois more. Because of the conspicuous, almost massive accumulation of well-preserved deer antlers (without associated skeletal remains), he considers the bone layer to be the primary deposit and thinks of weakly flowing water, which the deer used as a watering place and allegedly also for wallowing. He believes that it is at such drinking troughs or watering places that the deer get rid of their mature antlers (while according to Carthaus, p the trees they rub and bump against). In addition, according to Stremme, the predators, especially the so common crocodiles, contributed extraordinarily to the enrichment of the antlers and bovid horns on these bank spots by causing the water-loving deer, buffalo, pigs, as well as the antelopes, etc., to drink and drink again and again Wallows returned, surprised, torn and devoured with the antlers and horns left behind.

So Dubois, Martin, Carthaus and Stremme agree, in contrast to Volz (who, as already indicated above, had insufficient time and opportunity to make observations on the spot and could not replace this deficiency later by checking paleontological material) that the main bone layer is not a stream of mud, but a fluvial, lacustre or fluviolacustre formation. The main difference is that Dubois and Stremme assume that the bones and antlers are accumulated on primary, Martin, Carthaus, Schuster, and I myself mainly on secondary storage, the latter, of course, excluding heavy transport.Another question concerns the climate under which the Kendeng strata emerged. The question of climatic conditions can be answered less reliably by geologists and zoologists than by botanists, if only relatively minor changes are involved, and that should be

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Elbert 1

layers to be able to differentiate between several plant horizons. The lowest plant layer lying directly above the main bone layer contains a flora (Ficus species) such as occurs today at the lower limit of the cool and the upper limit of the temperate vegetation zone of Java, with a temperature 6-8 ° lower was at Trinil's than today's. At the time of the formation of the deeper Pithecanthropiis layer itself (in the lying layer of this plant layer) the temperature could have been 3 to 6 ° lower than the present one. In the higher plant layers, which Elbert observed in his "middle Kendengschichten", plants are said to predominate. B. Quercus,

Castanea, Engelhardtia, Cornus and Benthamia belong to the cooler vegetation zone of Java, at sea heights of 1500-2500 m. According to E., the floristic findings lead to the fact that there was a thermal depression at that time, which corresponds to a current altitude difference of approx. 1100 m. Accordingly, one would have to look for the so-called glacier boundary in Java at 3000-3100 m.

1) About the age of the Kendeng strata with Pitheeamthropus ereetus Dubois. New year b. F. Min., Side dish. Vol XXV, p.648. Stuttgart 1908.

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From

of the tropics.

which can be found in other areas of the globe in the geo-

here in the area

all researchers agree on this

phenomena or desert phenomena,

has demonstrated logical past, there is no evidence of this in the Kendeng layers of Java. It can only be a matter of differences in the amount of precipitation and in temperature.

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the first geologist of the SELENKA expedition, believes in the lower and middle Kendeng

Glacial-

General considerations on the scientific results of the Selenka-Trinil expedition.

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It would of course be extremely interesting if one could really prove completely different climatic conditions for those times, which would make a comparison with the proven climatic changes of the Pliocene-Diluvial period at other places on earth even easier. But with such far-reaching conclusions, a little more caution and care is required in the utilization

Dubois, Valeton and Carthaus are quite opposed to this. Valeton, the head of the Buitenzorg Herbarium, who had received a provisional, incomplete shipment from Mrs. Selenka from the first half of the working year 1907, explained that the reliable identification of the species of the poorly preserved leaf prints about the sea level was obtained afterwards and climatic conditions, in which the plants lived, say nothing. Dubois rejects any thought of a cool climate and a parallel phenomenon of the Ice Age. Carthaus is of the same opinion as Valeton as far as temperature is concerned, but the nature of the flora as well as the fauna leads him to believe that the climate at the time of the deposition of the Trinil layers was much more rainy.

Schuster was in the fortunate position of being able to examine a richer material of better preserved plant remains than any of his predecessors. On the basis of these studies, he initially denies the possibility of a separation of several different plant layers or plant zones, as claimed by Elbert. But otherwise he comes to very similar conclusions as E. According to him, the uniform Trinil flora corresponds to an evergreen mixed primeval forest of the temperate zone, as it is today at an altitude of 600-1200 m, namely at the upper limit of this temperate begion occurs. He describes the region, which corresponds to the fossil flora of Trinil, as that of the laurel family. Viburnum coriaceum is his main form. The temperature averaged 6 ° lower than today. The fossil trinil flora is reminiscent of the Florader Khassian Mountains in Assam, one of the rainiest areas in the world with annual rainfall of 11.5 m. The climate difference compared to today is therefore at Sch. not only in lowering the temperature, but above all in greater humidity.

So all three authors Elbert, Carthaus and Schuster agree that it isa period of heavy precipitation or pluvial periods 2

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Ad 5. With this, however, a first clue is already given for the determination of the age of the relevant strata, and thus we enter into the discussion of the last and most important point on which the Selenka expedition wanted to further our knowledge, the age question of the Kendeng strata .

Well characterized pluvial periods are known only from relatively recent times, namely from Upper Pliocene and Diluvian. They correspond in time to the European-American glacial periods. I

myself recently in two places 3

that the great actual pluvial time (in the narrower sense) of the Mediterranean countries, especially North Africa

1) As a result of his early departure from the Selenka expedition, Elbert could not yet have an overview of the entire floristic findings, at least not at the time of the publication discussed (1908).

2) Volz (Neues Jahrb. F. Min., Festband 1907, p. 267) also takes this opinion.

3) News on the geology of Palestine and the Egyptian Nile Valley. (Zeitschi-, d. Deutschen geol. Ges., 1910.) - The climate of the Quaternary period in Syria, Palestine and Egypt (in the work published by the executive committee of the 11th international geological congress in Stockholm: The changes in the climate since the maximum the last ice age. p. 425. Stockholm 1910)

provided data is necessary when it was first Elbert 1

Recognition of the results of a revision and confirmation from another party.

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provided evidence based on long-term studies,

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has applied, and require these examinations

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and the Middle East (and also presumably the glacial ages of Australia, New Zealand and Tasmania) coincide with the first half of the long, multi-part ice age of northern Europe - the Alps and North America or - if one assumes four sub-ice ages with Penck-Brückner - with the two first, the Günz and Mindel Ice Age. In my opinion, the first or Günz Ice Age is 1

)

Simultaneously with the immigration of Nordic forms into the Mediterranean, the IV. Mediterranean stage Suess' or Siciliano, the older blanket or plateau gravel and probably also the uppermost layers of the Arno valley with Elephas meridionalis, which were previously considered to be the Upper Pliocene type. The second or Mindel Ice Age of the younger gravel, which marks the climax of the pluvial, corresponds, together with the long interglacial period that followed, to the previous Old Diluvium 2

If the boundary between Pliocene and Diluvian or between Tertiary and Quaternary is retained in the old, unfortunately still popular, conception, the large, on the whole, fairly uniform pluvial formation will be torn into two equal pieces, a pliocene or tertiary and a diluvial or quaternary. How I a. a. 0., but without a doubt it has enough for itself to raise the very important moment of the onset of such an extremely drastic change in climate spread over the whole earth to the formation limit, instead of an ice age to the Pliocene, the rest to the Diluvian

deliver.

At Trinil in Java we have the marine strata that most geologists use

and paleontologists in particular Mr. and Mrs. Martin, Felix etc., on the basis of the fauna, a genuinely Pliocene and only Dubois a Miocene age is ascribed, a powerful complex of freshwater layers, formed essentially from volcanic material, the uniformity of which is generally derived from all descriptions and Profiles. Very similar conditions can be observed in the Egyptian Nile Valley, below a marine Pliocene formation (with Ostrea cncidlata and Pecte benedictus) on top

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(sometimes over a base of breccias) approx. 50-70 m of fluvial gravel, conglomerates, rubble banks, gravel, gravel, limestone and marl with conchylia, the z. T. are extinct (Melanopsiden and Viviparen), z. T. still live. This entire upper complex corresponds to the large cope period, which later followed at the time of the middle Diluvium or the (penultimate) Bite Ice Age, again a weak Begen period, a small cope. For the Egyptian-Syrian cope too, only a considerable increase in precipitation, but no decrease in temperature, has been proven with full certainty.

In Java everything speaks for the fact that the Kendeng or Trinil layer complex

if the actual large (no longer the small middle diluvial) 2 represents the cope. Within )of this complex, however, the bony Pithecanthropus layer is not so very far from the base of the same above the marine true Pliocene, i.e. H. about in the middle or even better in the lower half. If the volcanic Trinil strata now cover the whole great pluvial, i.e. H. represent the first two ice ages and are relatively evenly distributed over this whole time, then, in my opinion, the Pithecanthropus layer would still have to be temporal

1) Compare a. a. 0. my »Comparative overview table of the most important processes and deposits of the Pliocene and Diluvial periods in Egypt, Syria and Europe«. (Journal of the German Geol. Ges., Plate X, 1910.

2) The effects of the third, central diluvial or crack ice age, which follows the unusually long intermediate period of the MR interglacial, can still be demonstrated in the southern Mediterranean region and North Africa, but not nearly as pronounced as the previous large or actual one Pluvial. In these subtropics, you could therefore also call them a small pluvial. For the fourth, Oberdiluviale or Wünn-Glacial (time of the low terrace gravel), on the other hand, there was no noticeable climatic difference compared to today in the countries I examined.

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General considerations on the scientific results of the Selenka-Trinil expedition.

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its first half or middle, d. H. the first or Günz Ice Age or the one following this

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That would be the period about its affiliation, whether to the Pliocene or

To be interglacial isochronous 1

There is still a difference of opinion on the Diluvium in Europe, the transition period from the Pliocene to the Diluvium, the previous Upper Pliocene with Elephas meridionalis. This border question between Pliocene and Diluvium would first have to be decided and settled definitively and uniformly in Europe before it can be answered for Java. In any case, I myself am inclined to use the entire first larger half of the pluvial, i.e. H. the Günz Ice Age including the G.-M. To assign interglacial as Diluvium I or older Unterdiluvium to the Diluvial period, in that I consistently summarize under the latter all formations that correspond to the four ice ages or interglacial periods in between. Depending on whether one likes to use the older conception to designate the equivalents of the beginning of the great glacial period as Upper Pliocene or, with me, as Diluvium, depending on whether the Pithecanthivpus strata is of tertiary or quaternary age.

Since, as I said, the formation boundary between Pliocene and Diluvian fluctuates in general among the various authors in Europe and the term Pliocene itself is not sharply defined, one should not be surprised if in one that is so remote from Europe and deviates in terms of climatic development Like Java, one stratum is now called pliocene, now also determined by others as diluvial, while a third group of authors leaves the question undecided. Dubois and Verbeek belonged to the first group, Martin, Martin-Icke, Volz, Elbert, Carthaus, Schuster, Pohlig to the second group, and Stremme to the third. Among the second group, Volz even considers the middle diluvial age to be the most probable, a view which, however, can hardly count on long-term applause; the others are unanimous for alto or subdiluvium.

The ways in which the authors mentioned arrive at their age specifications are very different and have nothing in common with mine.

Above all, K. and H. Martin drew their conclusions from the numerical ratio of the recent to the extinct forms in the marine and freshwater conchylic fauna, which Carthaus also emphasizes. Dubois emphasizes, however, that the calculations suitable for Europe must not be valid for the tropical regions, here rather, where the main factor for the change in the species during the Tertiary period, the temperature decrease from the Eocene to the Ice Age, was (allegedly) missing or less was effective, a far higher percentage of recent species must be found in the Indian Tertiary. Carthaus emphasizes the strikingly fresh appearance of the marine pliocenconchylia that occur in the lying bone layer, which are pleasantly colored and shiny.

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hold present and could be mistaken for recent at first sight.

Dubois, Stremme and Pohlig rely primarily on the fossil mammal fauna of the Trinil strata. With the exception of the extinct Stegodon, Leptobos and the three new genera of Stremme: Mececyon, Feliopsis and Duboisia, the genera are very recent, but of the 27 well-identifiable species, according to Stremme, not one is identical to a current one. Then the end seemed to be1) Incidentally, I am happy to admit that this conclusion, obtained from a purely stratigraphic point of view, regarding the special classification of the Pifhccanthropus strata within the pluvial, is on a somewhat weak footing, that the affiliation of the last to the first half of this great period is only a hypothesis, and Finally, it is also conceivable that the possible deposits from the first moist third of the pluvial are destroyed again and continued and so the largest part of the layer complex at Trinil can only be assigned to the relatively moist upper third of the pluvial. Then the bone layer could possibly correspond to the climax of this climatically differentiated period, just as the Carthaus thinks it can deduce from the fossil flora for geological reasons and Schuster believe. It would then be about the extremely moist and cold Mindel Ice Age, the actual old diluvium in the sense of most geologists.

Selenka-Trinil expedition. 34

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probably justified on early Pliocene age. If Dames, Uhlig and Frech previously pointed out the correspondence with the old Quaternary Narbadda fauna of India, Dubois believes that the latter can be placed in the Pliocene with equal justification, but there are many arguments against this, including that for sure proven occurrence of human artifacts therein 1

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Pohlig is of the opinion that the trinile strata, according to their mammalian fauna, can best be paralleled with the Norfolkian or older interglacial. It should be noted, however, that Pohlig only recognizes 3 glacial periods at all and it is not clear whether his first interglacial corresponds to the G.-M.- or the M.-R. interglacial in the Penck-Brückner sense2

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In his evidence, Volz goes into the entire geological history of the Sunda Islands. The tuffs and mud flows in question emerged from the Lawu-Kukusan double volcano, which belong to the type of the younger pyroxene-andesite volcanoes. The Kukusan started its eruptions in the old diluvium, the Lawu even later. The main activity of the latter, however, is diluvial when young. Dubois considers it unproven that the pyroxene-andesite volcanoes did not begin their activity as early as the Pliocene period; According to Verbeek, such eruptions had already taken place on Java in the Miocan.

on the Indian Ocean 4

rand rose up as Horst the “Malay plaice” of the Sunda Islands, consisting of folded and erect layers. The strain caused uneven vertical movements ("torsion") and shattering through longitudinal and transverse jumps. In the fragmentation zone ("at the edge of torsion") and the

Crisp boilers built up mighty volcanoes in groups5

Volcanic activity occurs in the beginning of the Diluvian and (as can be seen from the behavior of the central diluvial river terraces of the plain) towards the end of the Central Diluvian. In this last period the southern Indomalayan mainland was finally broken up into islands, which were already at the turn

of the tertiary, and indeed it went from to W

diluviums hears the gradually more and more restricted possibility of further immigration

1) See Koken, Referat in Neues Jahrb., I, p. 117, 1909.

2) Earlier ("Eiszeit und Urgeschichte des Menschen" 1907, p. 88) Pohlig had taken the view "that the volcanic tuff layers of Java with the remains of Stegodon and the boundary forms between humans and apes are of Saxon age" H. belonged to its middle and strongest glaciation period.

3) Jungpliocänes dry climate in Sumatra and the land connection with the Asian continent. Gaea, 45th year, 7/8, p. 385, 1909.

4) Just like in the Mediterranean region and Europe (cf. my comparative overview table of the most important processes of the Pliocene period in Egypt, Syria and Europe in the magazine of the German geol. Ges., Plate V, 1910), where the invasion of the Red Sea , the temporary connection of the waters of the Indian Ocean and the Mediterranean Sea, transpression of the IV. Mediterranean stage, collapse of the South Aegean Sea and Gulf of Corinth, intensive folding of the Alps, uplift of Scandinavia and Great Britain and many volcanic eruptions, e.g. in Arabia, Syria, on the Cyclades. in the Algerian Atlas and in France, fall in exactly the same extremely turbulent period at the beginning of the Ice Age, so that these many upheavals on the earth's surface can at least be seen as locally reinforcing, if not sufficient causes of the Ice Age or Pluvial Age.> ir geology of Sumatra. Observations and studies. Geol. U. paleontol. Treatise published v. Coking. N. F. Vol. VI, 2, i ^ i. The geomorphological position of Sumatra. Geographer. Magazine 1909.

6) Cf. also Elbert in Neu. Year f. Min., Supplement, Vol. XXV, p. 653, 1908.

6)

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The Malagasy-Indian-Australian continent sank. On its exterior

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as a result of intensive uplift, broad land associations between

For the Pliocene period, Volz 3 thinks

the Malay Archipelago and the Asian mainland under a dry climate and considerable invasion of flora and fauna both from Asia, especially the Himalayan region, and from Australia. At the turn from the Tertiary to the Pleistocene, great tectonic movements occurred

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The biggest break-ins and the strongest

6 continued).

With the end of the middle

General considerations on the scientific results of the Selenka-Trinil expedition.

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of land animals and plants from the outside to Java, "because the connecting bridges have now collapsed.

Thus Volz comes to the conclusion that the Pitkecanthropus camp is by no means older than diluvial, but neither is it younger than young diluvial. Elbert, Carthaus and Schuster agree with this demonstration and add a few points to it.

Schuster emphasizes that the fossil trinile flora is composed of species and varieties that still exist today and concludes with full certainty that they are no older than ancient

could be diluvial. But if he earlier 1

the Sunda Strait between Sumatra and Java had already collapsed in the Old Diluvium, this is mine

Know a daring, not yet proven assumption 2

have that at the time of Pitkecanthropus the climax of the pluvial period (which according to my classification would correspond to the Mindel Ice Age of Europe) had already been reached. He is thus in complete contrast to Elbert (op. Cit. P. 660), according to whose information, however, those plant layers (3-1) appear only considerably above the bone layer which correspond to the cool vegetation zone of Java, while the plant layers from the vicinity of Bone layer itself (5 and 4) are initially supposed to represent the temperate vegetation zone with only 3–6 ° lower temperature than today.

The fact that, according to Schuster's investigations, the fossil flora of the Trinil layers corresponds to the present world is diametrically opposed to the striking difference in the fossil mammal fauna, which, according to Dussois and STREMME, deviates from today's world with all its species. From an evolutionary point of view, this is a very remarkable fact that one and the same stratum can unite such enormous opposites and deserves to be particularly emphasized as one of the most interesting results of the investigations following the Selenka expedition. I myself am not aware of such a blatant, typical case. In this way one also understands the different views regarding the age of the strata of those authors who believe they can rely on one or the other group of organisms.

In my opinion, as in that of most geologists, neither the land

in its percentage relationship to the present world, for various reasons, which I cannot go into here, the correct standard for

Assessment of the absolute age of a layer, even if it also takes into account the respective climatic conditions,

-

a ratio of at least 87.5% of recent forms, which is particularly suitable for the beginning of the Diluvium.

Having said all that, we come back to my above conclusion that a very early or very late pliocene age; H. the turn of the tertiary and quaternary, about the

1) Schuster, A contribution to the Pithecanthropus-Fruge, pp. 15, 16 u. 29th Munich 1910.

2) Elbert a. a. 0. p. 654 gives e.g. B. only admit that Java was separated from Sumatra in the young diluvian. - Carthaus told me that the separation still lives on in the Javanese tradition and that in a court chronicle the year 1000 AD is referred to as the time of definitive breakup.

3) One cf. in addition u. a. Branca's critical statement about the importance of vertebrate material for the question of age on p. 59 of his latest, recently published, highly interesting and noteworthy publication: The state of our knowledge of fossil humans, Leipzig 1910.

still plant the land-dwelling mammals 3

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)cited as further evidence of this age that the Java Bridge

Reflect rural contexts and other living conditions more faithfully. As key fossils, I agree with K. Martin - the water-dwelling mollusks should definitely be preferred. But if one takes the findings from these within the Pithecanthropus stratum to Bäte, then the result is

the examinations of Mrs. H. Martin-Icke 4

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4) See H. Martin-Icke, Die fossil Gastropoden, p. 51.

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In particular, Schuster believes it has been proven

34 \*

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The middle of the great pliocene-underdiluvial or better (according to my name) old -diluvial pluvial period (in the narrower sense) is that time which best corresponds to all conditions. If we take the concept of time a little further, then it is certainly the great pluvial time to which the age determinations of the unconditional majority of authors can be combined.

Basically it can only be a question of which section of the long pluvial is most relevant, whether the first third (the so-called Upper Pliocene Günz Ice Age), the middle (the first short interglacial) or the last Third (the Mindel Ice Age).

If we dub the ape-man Pithecanthropus erectus. If placed in the first or G-M interglacial, it would still be a whole ice age, namely the M ice age, the climax of the pluvial in the narrower sense, older than the oldest known skeletal remains of the actual

People, the Homo Heidelbergensis Schot 1

denotes the beginning of the following M-B interglacial period, whereas Homo Neanderthalensis or

primigenius in Chelleen and Mousteria dominated the further or last R-W interglacial 2

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1) If we, however, lend our ear to Schuster's discussions about the flora of the Trinil layers, the Pithceantliropus layers in the upper half, the upper third or the climax of the pluvial, i.e. in the Mindel Ice Age, these remained Deposits still separated by half an ice age from those that enclose the lower jaw from Heidelberg. - This, in the actual or earlier sense, subdiluvial age of

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Layer would also best fit the view of the geologist Carthaus. 2) See my table a. a. 0.

G =

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The latter, dug at the base of the sands of wall,

Pressure from Breitkopf. \ Harte! in Leipzig.

Misprint correction.

In the introduction, page VI, note 2, line 2 from below, you can read: when he leaves instead of "when he leaves".

At the bottom of page 157, a note from the editor belonging to the end of the first paragraph, line 6, should be added: “In addition, these pieces were actually found quite close to each other during the excavations (cf. Oppenoorth's work report, p and Fig. 11). "

As a result of an oversight, the statement on Tables XII, XIII and XXIII on pages 74 and 195 left the note that the original photographs of the figures depicted were taken by Mr. W. Kronecker.

Plate XII reads Gavialis bengawanicus instead of “Crocodilus bengawanicus”.

In the explanation of panel XXV on page 195 below and on panel XXV itself it must read: All figures 1—4 in y2 nat. Size instead of “nat. Size".

Selenka-Trinü-Expedition,

Fig. 16

Fig. 7

Fig. 13

Fig. 2

Fig. 14

Praemax-. Fig. 10

Fig. 6

Figure 9a

Fig. 17 a

Fig. IS

Fig. 17 b

Fig. 5

Fig. 4

I.

Fig. 3

Fig. 1

Fig. 11

Figures 1-17. Fish scraps

Wilhelm Engelmann's publishing house in Leipzig.

Fig. 8

Fig. 12

Plate X.I

Selenka-Trinil expedition.

Fig. 3 V21 nat. Size

Figs. 1-3. Crocodilus bengawanicus Dub.

Wilhelm Engelmann's publishing house in Leipzig.

Fig. 1 0.54 nat. Size

Plate XII

Sdenka-Trinü expedition.

Figs. 1-3. Oroeodilus ossifragus Dub. (All figures in \* / iü nat. Gr. Verlag by Wilhelm Engelmann in Leipzig.

Plate XIII.

Selenka-Trinil expedition 7i.

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Fig. La Vs nat. Size

l2Ä

Fig. 1 b Vs nat. Size

Figs. 1-4. Batagur Siebenrocki jacket. - n. Sp.

Fig. 5.

Fig. 4 Vs nat. Size

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Fig. O Vs nat. Size

Cervical vertebrae of Trionychids

Wilhelm Engelmann's publishing house in Leipzig.

Plate XIV.

Selenka-Trinil expedition.

Plate XV.

Fig. 5 V5 nat. Size

Fig. 7 Vio nat. Size

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Fig. 11

\* / nat.Gr. 5

Fig. 12 \* /. nat. Size

Fig. 10 Vu nat. Size

Fig. 2 V4 nat. Size

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Fig. 4 V4 nat. Size

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Fig. 14 / s nat. Size

Figs. 1-14. Trinil fossil turtle remains

Wilhelm Engelmann's publishing house in Leipzig.

Selenka-Trinil expedition.

Figure 1-13. The mammals with the exception of the Proboscidier - Verlag by Wilhelm Engelmann in Leipzig.

Plate XVI,

selenka-Trinü expedition.

Fig. 1- 17. The mammals with the exception of the Proboscidier - Verlag by Wilhelm Engelmann in T.ein?

Plate XVII.

Selenka-Trinu expedition.

Plate XVIII.

Fig

1/2 nat. Size

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Figures 1-8. The mammals with the exception of the Proboscidier - Verlag by Wilhelm Engelmann in Leipzig.

Fig. 6

Selenka-Trinü-Expedition> i

Figures 1-11. The mammals irl

would take the Proboscidier publishing house from Wilhelm Engelmann in Leipzig.

Fig. 8 V »nat. Size

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r «$ gm

Plate XIX.

Selenlca-Trinu expedition.

Figures 1-11. The mammals with the exception of the Proboscidier - Verlag by Wilhelm Engelmann in Leipzig.

Fig. 8

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Plate XIX.

Selenka-Trinity expedition

Figures 1-15. The mammals with the exception of c

) boscidier - Wilhelm Engelmann's publishing house in Leipzig

Plate XX.

Selenka-Trinik expedition.

Fig. 1-15. The mammals with the exception of the Prohoscidier publishing house by Wilhelm Engelmann in Leipzig.

Plate XX.

Selenlca-Trinu expedition.

Plate XXI.

Fig. 1 2. Stegodon Airawana Mart. (Va nat. Gr .;

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Selenka-Trinu expedition.

Plate XXII.

Figs. 1-4.

Stegodon Airawana. (All figures in natural size. '

Fig. 4 Lower M.

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Wilhelm Engelmann's publishing house in Leipzig.

Fig. 3 Upper Mm,

Selenka-Trinil expedition.

Plate XXIII.

Fig. L Lower right Mn ^

Fig. 3 Lower right mnii

Fig. 5

Fig. 1-4 of Stegodon Airaivana Mart .; Figure 5 of Elephas sp.

Fig. 4 Lower right st.

(All figures in natural size.

Wilhelm Engelmann's publishing house in Leipzig.

Selenka-Trinu expedition.

Plate XXIV.

Fig. 1 V4 nat. Size

Fig. 2

Upper M, nat. Size 3

Figures 1 and 2. Stegodon Airawana Mart. Wilhelm Engelmann's publishing house in Leipzig.

Selenka-Trinil expedition.

Plate XXV.

Fig. 2 Upper left M3

Upper M.

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Figs. 1-3. Stegodon Airmvana Mart. Fig. 4. St. cf. trigonoeephalus Mart. (All figures in natural size;

Wilhelm Engelmann's publishing house in Leipzig.

Fig. 4 lower right st,

Selenka-Trinil expedition.

Fig. 9

Fig. 28

Fig. 10

Fig. 17 a

Fig. 16

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Fig. 27

Fig. 2

Figure 9a

Figure 28a

Figure 16a

Fig. 3

Fig. 4

Figure 5a

Fig. 17

Fig. 19

Fig <26 Fig 1-27. To the skeleton of

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Publisher by Wilhel:

Fig. 20

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nat. Size)

felmann in Leipzig.

Plate XXVI.

Selenka-Trinu expedition.

Figure 16a

Fig. 17

Fig. 27

Fi 2 Fig. 26 S-

Fig. 1-27. To the skeleton of ßegodon. (All figures in Italian size) Verlag von Wilhelm Enge i mann fa Leipzig

Plate XXVI.

Selenka-Trinil-Ezpedition

Fig. 7 a Fig. 8 Ve nat. Size

Figures 1-13. To the skeleton of Stegodon. Fig.

Verlag von Wilheh

Fig. 3a V «nat. (ir.

8 in Vß nat. Gr., Fig. 9-13 in approx. 1/3 nat. Size

ingelmann in Leipzig.

Fig. 4 Ve nat. Size

Fig. 4a Va nat. Size

Fig. 5a Vg nat. Size

Fig. 6a Vg nat. Size

Fig. 4b Vg nat. Size

Fig. 4 c Vs nat. Size

Fig. 6 V «nat. Size

Plate XXVII.

Fig. 13 a 0.35 nat. Size

Sdenka-Trinil expedition,

Tafd XXVII.

Figure 1-13. To the skeleton of Stegodon. Fig. 1-8 in i / o nat. Gr., Fig. 9-13 in approx. '/ A TM' Gr.

Wilhelm Engelmann's publishing house in Leipzig.

Fig. 13a 0.35 nat. Size

Selenka-Trinu expedition.

Plate XXVIII.

Fig.l

Fig. 7

Fig. 9

Fig. 2

Fig. 4

Fig. 3

Fig. 5

Fig. 6

Figures 1-10.

Human tooth from probe.

Wilhelm Engelmann's publishing house in Leipzig.

Selenka-Trinü expedition,

ztyy xxzx.

Fig. 6 Enlarged 280 times.

Figs. 1-8. Human tooth from probe \

Fig. 9.

Recent dentin

Fig. 1 nat. Size

Fig. 2 nat. Size

Fig. 3 nat. Size

Fig. I enlarged 900 times.

Fig. 5, enlarged 900 times.

'VMnRß

Fig. 7 enlarged 530 times

Wilhelm Engelmann's publishing house in Leipzig.

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Fig. 9 530 times enlarged.

Fig. 8

Selenka-Trinil expedition.

Fig. 8 nat. Size

Fig. 7 nat. Size

Fig. 9 nat. Size

Fig. 10 1/2 nat. Size

Fig. 1 1/2 nat. Size

Fig. 2 V2 nat. Size

Fig. 3 V2 nat. Size

Fig. 4 V3 nat. Size

Wilhelm Engelmann's publishing house in Leipzig.

Selenka-Trinil expedition.

Plate XXXI.

Wilhelm Engelmann's publishing house in Leipzig.

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Selenka-Trinil expedition.

Plate XXXII.

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Wilhelm Engelmann's publishing house in Leipzig.

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