

Fossil *Macaca nemestrina* (LINNAEUS, 1766)
from Java, Indonesia

MITSURU AIMI
Kyoto University

ABSTRACT. This is a description of the fossil macaque specimen registered as G. M. B. K 102 at the Geological Museum in Bandung. It is consisted of a left half maxilla and a mandible. The fossils are assigned to *Macaca nemestrina* (L., 1766) being a large macaque with long mandibular symphysis, big canines and marked lateral flares in molars. They were unearthed from Sangiran, near Surakarta, Central Java, Indonesia. The horizon is unknown. It is, however, most likely to be the Kabuh Formation, Middle Pleistocene, based on the colouration and matrix of the specimen. This is the first valid record of *Macaca nemestrina* (L., 1766) from Java, where now the species is absent.

INTRODUCTION

In the course of examining the collection of the Geological Museum in Bandung (G. M. B.), I found two species of fossil macaques which were unearthed from Sangiran, near Surakarta, Central Java, Indonesia. Of these, the larger is assigned to *Macaca nemestrina* (L., 1766), and the smaller to *M. fascicularis* (RAFFLES, 1821). This report will concentrate to describe the fossil specimen of *M. nemestrina*. This is the first record of *M. nemestrina* from Java, where the species is now absent. It is, however, present in the adjacent areas of Java such as Sumatra, Kalimantan (Borneo) and the continental southeast Asia.

Macaca nemestrina (LINNAEUS, 1766)

Referred specimens: G. M. B. K 102, left maxilla and mandible, the left maxilla with I¹–M³, the mandible with full dentition, lacking the ascending rami.

Horizon and locality: Unknown (probably Kabuh Formation, Middle Pleistocene); Sangiran, near Surakarta, Central Java, Indonesia.

Diagnosis: A large *Macaca*. Mandible with long symphysis and strong superior transverse torus. Canines large. Upper molars with marked lateral flares on both buccal and lingual surfaces. M³ not much reduced in size. Lower molars with developed lateral flares on buccal surfaces. P₃ large. P₄ with long axis on the same line as the molar row axis. Anterior surface of I₁ perpendicular to the occlusal plane.

DESCRIPTION

MAXILLA (Fig. 1, Table 1)

Surface of the maxillary bones is eroded too severely to describe precisely. Thin zygomatic process starts at the distal end of the M² and extends postero-externally. The teeth are well preserved except incisors and canine. Diastemata are present between I² and C', and between C' and P³. Canine developed. There is no clear groove on its mesial surface because of dam-

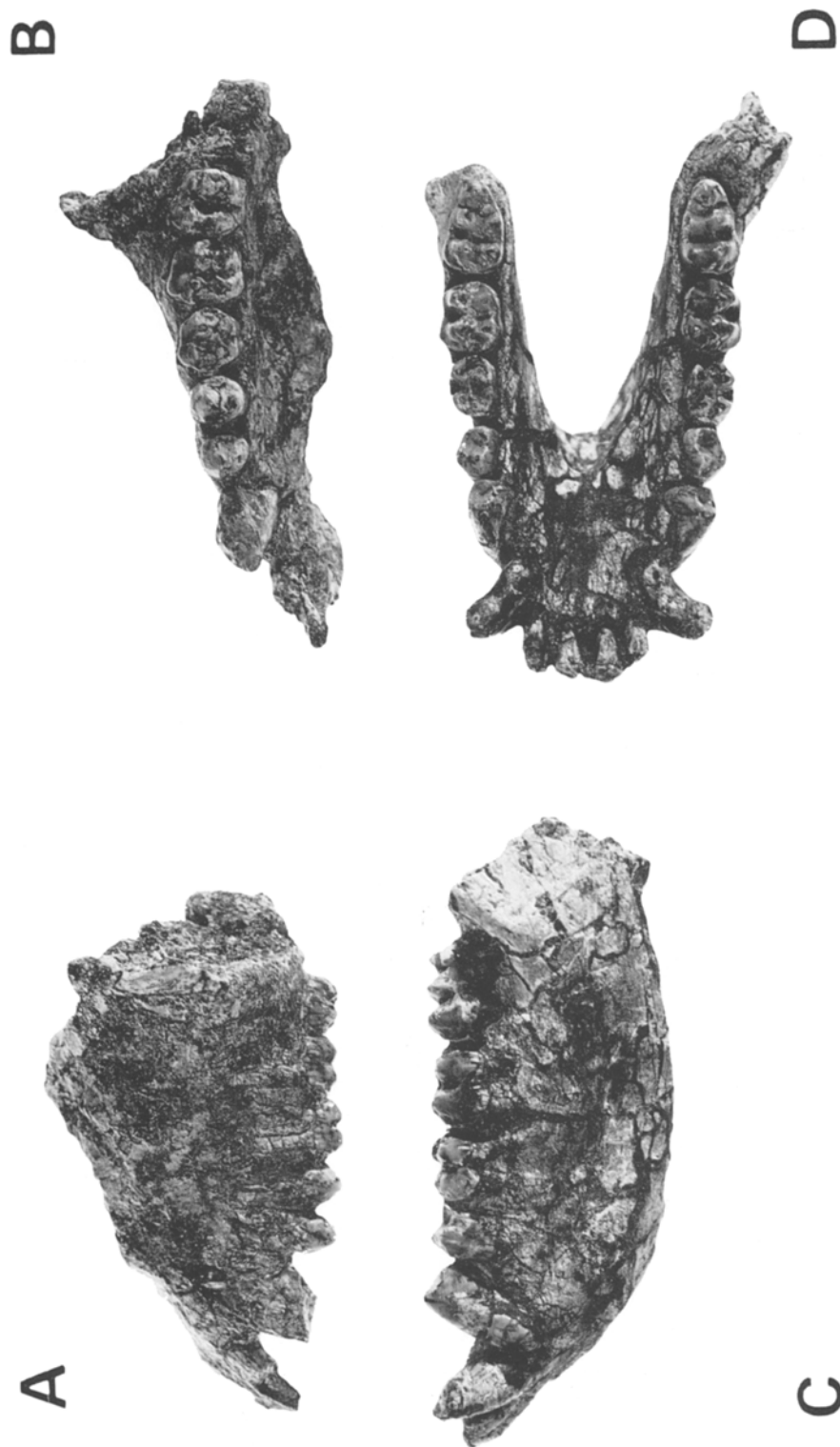


Fig. 1. Maxilla and mandible of G. M. B. K. 102. Left maxilla with I-M³: A, lateral view; B, occlusal view. Mandible with full dentition: C, left lateral view; D, occlusal view. Natural size.

age. In the premolars, the lingual cusp (protocone) is lower and smaller than the buccal one (paracone). The anterior fovea is smaller than the posterior one. The P^3 is bicuspid and slightly worn but the apex of each cusp is still covered by enamel. The P^4 is worn down so that the dentine appears at the apex of the lingual cusp, the protocone. A small but distinct third cusp (hypocone) is present distally to the protocone. The molars are bilophodont and bucco-lingually flared. They do not have interconulus. They possess both anterior and posterior foveae. The buccal cusps are higher than the lingual ones in M^1 and M^2 . In M^3 , however, the four cusps are of nearly equal height. The M^1 is worn but the exposed dentinal spaces are not confluent with each other. This is the smallest molar. The M^2 is slightly worn to expose dentine only at the apices of the four cusps and is the largest molar. The M^3 is faintly worn without distoconulus and not much reduced in size compared to the M^2 .

MANDIBLE (Fig. 1, Table 1)

In profile, the basal margin is convex. The mandibular body is deepest (26.6 mm) below the M_2 . The anterior border of the ascending ramus meets the mandibular body below the M_3 . The symphysis is fairly long reaching back to the distal end of the P_4 . The superior mandibular torus is well developed to overhang at the symphyseal region (Fig. 2). A mental foramen is situated under the P_4 on the lower third of the body. There is a deeply demarcated fossa, trigonum retromolare, bucco-distally to the M_3 .

The dental arcade is U-shaped. The anterior surface of the I_1 is perpendicular to the occlusal plane. The canine is large. The P_3 is unicuspid and sectorial. It is developed and not much worn. The anterior fovea has a distinct groove from the apex of the cusp downward antero-lingually to the neck. Two ridges run distally from the apex of the cusp and meet each other forming the distal fossa. The P_4 is molarized to show bilophodonty. The long axis of this tooth does not rotate buccally but is on the same line as the molar row axis. It is worn so that the dentine appears at the apices of the three cusps, i.e., the protoconid, the metaconid and the entoconid, but the dentinal spaces are separated from each other. The molars exhibit bilophodonty. They possess both anterior and posterior foveae. Their lingual cusps are higher than the buccal ones. Their buccal surfaces are flared buccally when viewed from above, while the lingual surfaces are almost vertical. The M_1 is heavily worn so that the dentinal spaces of the protoconid and the metaconid are confluent. A similar condition characterizes the hypoconid and the entoconid. On the M_2 , which is slightly worn, the dentine appears only at the apex of each cusp. There is a small but distinct tubercle, tuberculum intermedium, between the metaconid and the entoconid. In the M_3 , tuberculum sextum is located distally to the entoconid. It is faintly worn to expose the dentine at the apices of the protoconid and the metaconid in the right row but not in the left row.

REMARKS

The referred specimen, G. M. B. K 102 is composed of maxilla and mandible. The maxillary tooth row is well preserved without any disorder in the position of the postcanine teeth. To the contrary, the mandible is deformed slightly in the course of fossilization to bear gaps between the M_1 and M_2 , and between the M_2 and M_3 . So there is discrepancy between the maxillary and mandibular tooth rows when they contact each other. After reconstruction of the mandible, the maxillary tooth row occludes neatly with the mandibular tooth row. The wearing stage of the crown is same in the matching upper and lower teeth. The colouration

Table 1. Tooth dimensions¹⁾ of the referred specimen G. M. B. K 102. (in mm.)

		C		P3		P4	
		M-D ²⁾	B-L ³⁾	M-D	B-L	M-D	B-L
Maxillary teeth	Left	10.2+	7.7	5.9	6.6	6.3	7.8
Mandibular teeth		M-D	B-L	M-D	B-L	M-D	B-L
	Right	9.6	6.9	10.4	5.2	7.3	5.6
	Left	9.7	6.8	10.8	4.9	7.0	5.6

1) Dimensions were selected after SWINDLER (1976); 2) mesio-distal length; 3) bucco-lingual breadth; 4) anterior breadth; 5) posterior breadth; 6) trigonid breadth; 7) talonid breadth; 8) hypoconulid breadth.

(continued)

and matrix attached to them are identical in both the maxilla and mandible. Accordingly it is most likely that these maxilla and mandible belong to the same individual, though there is no information about them whether they were found in association or not.

The specimen, G. M. B. K 102, was originally assigned to *Macaca* sp. indet. It is clear, however, that this specimen belongs to male *Macaca nemestrina*, because this is a large macaque with big canines, long mandibular symphysis, vertically implanted first lower incisors and marked lateral flares in molars.

The label attached to G. M. B. K 102 gives its locality as Sangiran. No information about its horizon was included. The colour of the specimen is not brown but black and white. It is filled with calcareous matrix. Accordingly, it is most likely that it was unearthed from the Kabuh Formation, the Middle Pleistocene in age, rather than from the Pucangan Formation or from the Notopuro Formation of the Sangiran dome.

There are several reports on fossil macaques from Java. They are: STREMMER (1911) on *Macacus* (= *Macaca*) sp., KOENIGSWALD (1933) on *Macacus* (= *Macaca*) sp., KOENIGSWALD (1940) on *Macaca irus* (= *M. fascicularis*), *Macaca* sp. I and *Macaca* sp. II, BADOUX (1959) on *Macacus* (= *Macaca*) sp. indet., and HOOIJER (1962, 1964) on *Macaca fascicularis*.

Regarding *M. nemestrina*, however, there have never been any records except DENINGER's (1910) of its existence on Java. DENINGER (1910) described a macaque fossil, *Inuus nemestrinus* L. mut. *saradana*. STREMMER (1911), MARTIN (1919), ES (1931) and SZALAY and DELSON (1979) followed DENINGER's designation. KOENIGSWALD (1933), however, cited it just as *Macacus* (= *Macaca*) sp., and afterwards he (1940) assigned it to *Macaca irus* (= *M. fascicularis*). The specimen is a left mandible of a male macaque with the symphyseal part and P₃-M₃. DENINGER himself mentions that this specimen differs from the recent *nemestrina* in its smaller canines and small symphyseal part. In addition, this specimen bears some other characteristics. The occlusal view of the specimen in the text clearly shows that the M₃ rotates buccally and the size of P₄ is relatively small. The table gives small figures in general for the dimensions of the specimen as *Macaca nemestrina*. The length of P₃-M₃, for example, measures only 35 mm.

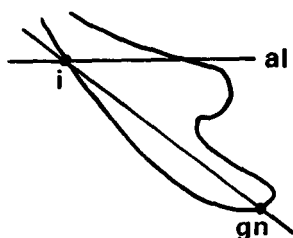


Fig. 2. Median section through the symphysis of G. M. B. K 102; mandible oriented in the alveolar plane. al: alveolar line; i-gn: incision-gnathion line. Natural size.

Table 1. (continued)

M1			M2			M3			
M-D	AntB ⁴⁾	PostB ⁵⁾	M-D	AntB	PostB	M-D	AntB	PostB	
8.4	8.4	7.9	9.0	10.3	9.3	8.8	9.9	8.7	
M-D	TriB ⁶⁾	TalB ⁷⁾	M-D	TriB	TalB	M-D	TriB	TalB	Hypoconulid ⁸⁾
8.6	7.4	7.4	10.0	10.2	8.8	12.6	9.0	7.7	5.0
8.4	—	7.8	10.1	9.9	9.1	12.6	9.2	7.9	4.8

All these are the characteristics of *Macaca fascicularis*, not of *M. nemestrina*. Accordingly it is most likely that this specimen belongs to *M. fascicularis*, as already mentioned by KOENIGSWALD (1940) and HOOIJER (1962).

The discovery of the *nemestrina* specimens described above is thus the first positive record that this species existed on Java and provides concrete evidence for the extinction of *Macaca nemestrina* from Java which was suggested by FOODEN (1975).

Acknowledgements. I would like to express my sincere thanks to H. M. S. HARTONO and DARWIN KADAR, Geological Research and Development Centre, Bandung, Indonesia, who allowed me to examine the specimens under their care. My thanks extend also to AKIYOSHI EHARA, Primate Research Institute, Kyoto University, for reading the manuscript and to KENNETH G. MCKENZIE, Riverina C. A. E., Australia, for correcting my English expression. The photographs of the specimens were prepared by MINORU KINOSHITA, Primate Research Institute, Kyoto University. This study was partially supported by the Japan International Cooperation Agency and the Toyota Foundation.

REFERENCES

- BADOUX, D. M., 1959. Fossil mammals from two fissure deposits at Punung (Java). Thesis, Univ. Utrecht, Kemink en Zoon N. V., Utrecht.
- DENINGER, K., 1910. Ueber einen Affenkiefer aus den Kendengschichten von Java. *Centralbl. f. Mineralogie*, 1910, pp. 1–3.
- ES, L. J. C. VAN, 1931. *The Age of Pithecanthropus*. Martinus Nijhoff, the Hague.
- FOODEN, J., 1975. Taxonomy and evolution of liontail and pigtail macaques (Primates: Cercopithecidae). *Fieldiana, Zool.*, 67: 1–169.
- HOOIJER, D. A., 1962. Quaternary langurs and macaques from the Malay Archipelago. *Zool. Verh. Rijksmus. Nat. Hist. Leiden*, 55: 1–64.
- , 1964. New records of mammals from the Middle Pleistocene of Sangiran, Central Java. *Zool. Med. Rijksmus. Nat. Hist. Leiden*, 40: 73–88.
- KOENIGSWALD, G. H. R. VON, 1933. Beitrag zur Kenntnis der fossilen Wirbeltiere Javas. *Wet. Med. Dienst Mijnb. Ned. Indië*, 28: 1–127, pls. I–XXVIII.
- , 1940. Neue Pithecanthropus-Funde 1936–1938. *Wet. Med. Dienst Mijnb. Ned. Indië*, 28: 1–205, pls. I–XIV.
- MARTIN, K., 1919. *Unsere palaeozoologische Kenntnis von Java*. E. J. Brill, Leiden.
- STREMMER, H., 1911. Die Säugetiere mit Ausnahme der Proboscidiier. In: *Die Pithecanthropus-Schichten auf Java*, L. SELENKA & M. BLANCKENHORN (eds.), Engelmann, Leipzig, pp. 82–150, pls. 16–20.
- SWINDLER, D. R., 1976. *Dentition of Living Primates*. Academic Press, London.
- SZALAY, F. S. & E. DELSON, 1979. *Evolutionary History of the Primates*. Academic Press, New York.

—Received December 9, 1980; Accepted January 7, 1981

Author's Name and Address: MITSURU AIMI, Primate Research Institute, Kyoto University, Inuyama, Aichi, 484 Japan.