PROCEEDINGS

OF THE

Hawaiian Entomological Society

VOLUME V

1921-1923
HONOLULU, T. H.

V5
1921-23
Insect

PROCEEDINGS OF THE HAWAIIAN ENTOMOLOGICAL SOCIETY

INDEX TO VOLUME V

INDEX TO AUTHORS, EXHIBITORS AND PERSONS MENTIONED IN PAPERS OR DISCUSSIONS.

(Page references to papers are in black-faced type.)

INSECT INDEX BY ORDERS

* Indicates genera, species, etc., new to science

HYMENOPTERA

COLEOPTERA

DIPTERA

LEPIDOPTERA

HEMIPTERA-HOMOPTERA

HEMIPTERA-HETEROPTERA

ORTHOPTERA

NEUROPTERA AND ODONATA

LOWER ORDERS

(Isoptera, Corrodentia, Thysanoptera, etc.)

MISCELLANEOUS (NON-HEXAPODA)

GENERAL INDEX

PLANT INDEX

ERRATA IN VOLUME V.

Proceedings Hawaiian Entomological Society

The following errors have been discovered, and should be corrected in the text:

Page 8, line 12, for "4" read "40".
" 14, line 20, for "Perkin's" read "Perkins' ".
" 106, line 32 of Table, for "(3) 177; (4) 302; (5) 409" read "(3) 177, 302, 409".
" 112, line 35, for "(5)" read "(6)".
" 116, lines 31 and 32 for "(Kookolau)" read "(Kokolau)".
" 123, line 3 from bottom, for "*Coelophoria*" read "*Coelophora*".
" 140, line 12 from bottom, for "10 males" read "10 females".
" 146, add to footnote "type of *molokaiensis*".
" 194, line 4, for "*quinquemaculata*" read "*quinquefasciata*".
" 225, line 28, for "*Tabinia*" read "*Tambinia*".
" 272, line 27, for "*Spingolabis*" read "*Sphingolabis*".
" 292, line 6, for "*Ophthalomomyia*" read "*Ophthalmomyia*".
" 300, line 10, for "*orbiculatus* Gyll." read "*orbiculus* (Gyll.)".
" 408, line 14, for "twice as long as wide" read "twice as wide as long".
" 426, line 30, for "*Choctospila*" read "*Chaetospila*".
" 485, delete line 23, "*Hypergonatopus* sp."
" 485, delete line 37, "*Pachyneuron siphonophorae*".
" 485, delete line 42, "*Aphycus alberti*".
" 485, delete line 43, "*Aphycus claviger*".

VOL. V, NO. 1 OCTOBER, 1922

PROCEEDINGS

OF THE

HAWAIIAN ENTOMOLOGICAL SOCIETY

FOR THE YEAR 1921

HONOLULU, HAWAII

PRICE 75 CENTS

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All correspondence should be addressed to the Secretary, Hawaiian Entomological Society, Honolulu, Hawaii, from whom copies of the Proceedings may be purchased.

Volume I of the Proceedings, for 1905-07 (in five numbers), contains 210 pages, 4 plates, and 5 text figures.

Volume II, 1908-12 (in five numbers), contains 311 pages, 7 plates, 5 cuts and 1 portrait.

Volume III, 1913-1917 (in five numbers), contains 500 pages, 8 plates and 6 cuts.

Volume IV, 1918-1920 (in three numbers), contains 610 pages, 10 plates and 25 cuts.

Price per volume, $2.00. Price of any single number of Volume I-III, 50 cents. Price of any single number of Volume IV, 75 cents.

PROCEEDINGS

OF THE

Hawaiian Entomological Society

Vol. V, No. 1. For the Year 1921. October, 1922.

JANUARY 6th, 1921.

The 184th meeting of the Hawaiian Entomological Society was held in the entomological laboratory of the experiment station of the Hawaiian Sugar Planters' Association, President Timberlake presiding. Other members present: Messrs. Giffard, Ehrhorn, Muir, Osborn and Whitney, and Dr. L. O. Kunkel, visitor.

In the absence of the Secretary, Mr. Osborn was appointed Secretary pro tem.

The minutes of previous meeting were read and approved with corrections.

The Executive Committee reported the selection of Mr. Muir as Librarian, Mr. Timberlake, Custodian of Collections, and Mr. Swezey, Editor for 1921.

The resignation of the Secretary, Mr. Fullaway, was received, he being absent on foreign insect work. Mr. Willard was elected to fill the vacancy for the balance of the year.

PAPERS READ.

"Observations on Xylocopa and Lithurgus (Hymenoptera)."

BY W. M. GIFFARD.

"Synonomy of the Carpenter Bee, Xylocopa varipuncta (Hymenoptera)."

BY P. H. TIMBERLAKE.

NOTES AND EXHIBITIONS.

Mr. Muir exhibited some specimens of weevils that had been determined by Dr. Marshall of the British Museum, from specimens sent him by Mr. Swezey, and read Dr. Marshall's letter in regard to them. The species were as follows:

Stenommatus musae, recently described by Dr. Marshall from the specimens sent by Mr. Swezey, collected by him in banana corms at Kaimuki and thought to be an immigrant, but according to Dr. Marshall, not necessarily to be considered as an introduced species.

Stenotrupis sp., a small Cossonid which has been found a few times in sugar cane on Oahu. It is not represented in the British Museum, and is probably undescribed.

Lithurgus albofimbriatus Sich. (*Megachilidae*) and *Xylocopa varipuncta*.—Mr. Giffard exhibited portions of a tree-trunk fence post, collected at Waimea, Oahu, December 27, 1920, showing channels and cocoons constructed by *Lithurgus*, and *Xylocopa;* also a cut section of the same post about 2½ feet long and 8 inches in diameter from which, in 7 days, 19 males and 25 females of *Lithurgus* and 22 males and 27 females of *Xylocopa* issued. Also were exhibited slide mounts of mouth parts and genital organs of both sexes of *Lithurgus*.

Alphitobius piceus.—Mr. Giffard exhibited a number of these Tenebrionid beetles taken from the above sections of fence post.

New Miscogasterid.—Mr. Timberlake exhibited a single specimen of a parasite reared by Mr. Swezey from flower heads of *Dubautia* collected on Mt. Kaala, Oahu, September 26, 1920. A large number of *Tephritis dubautiae* Bryan were reared from these flower heads, but there was only one specimen of the parasite, which is a new species of the Miscogasteridae, and is also a representative of an undescribed genus. As no other insects were reared from the material, the host of the parasite is probably the *Tephritis* that issued so abundantly. So far as known, no other Miscogasterid has been reared in these islands (except the common introduced *Tomocera*), although the family is one of the few groups of the Chalcidoidea represented in the endemic fauna. The species are rather numerous and fall into several genera, but specimens are infrequently met with, and the accumulation of material becomes a slow process. Mr. Timberlake also exhibited another specimen strictly congeneric with Mr. Swezey's, which he collected from a *Raillardia* tree on Haleakala, Maui, at an elevation of about 5800 feet, July 22, 1919. The association of this unnamed genus with Compositae is therefore more assured, and this is easily explained if the species are really parasitic in *Tephritis,* as species of the latter breed in the flower heads of both *Dubautia* and *Raillardia.*

Insects on Chinese cabbage.—Mr. Whitney exhibited three species of insects intercepted in quarantine, on Chinese cabbage from San Francisco.

Syrphidae: *Melanostoma stegnum* (Say) and *Syrphus* sp.

Anthomyiidae: *Phorbia fusciceps* (Zett.), commonly known as the seed-corn maggot.

FEBRUARY 3, 1921.

The 185th meeting of the Hawaiian Entomological Society was held at the experiment station of the H. S. P. A., with Mr. Timberlake presiding. Other members present were Messrs. Crawford, Ehrhorn, Giffard, Muir, Osborn, Swezey, Whitney, and Willard. Mr. T. L. Bissell and Dr. L. O. Kunkel were visitors.

The minutes of the previous meeting were approved as read and corrected.

Mr. Swezey gave an interesting report on his attendance of the meetings of the American Association for the Advancement of Science, American Association of Economic Entomologists, and Entomological Society of America, held at Chicago University, December 27 to 31, 1920.

Mr. T. L. Bissell was nominated for active membership in the Society.

NOTES AND EXHIBITIONS.

Mitrastethus bituberculatus (Fabr.).—Mr. Swezey exhibited a specimen of this weevil, identified by Dr. Marshall of the British Museum, who stated that it was a New Zealand species. A letter from Commander J. J. Walker, President of the Entomological Society of London, states that he has found this insect very commonly in several localities in the North and South islands of New Zealand. Also, that it appears to be practically confined to the native and imported conifers, occurring under the bark and in the decaying wood of old logs, and not in the living tree. It is the weevil from rotten wood, mentioned on pages 374 and 382 of Proceedings Haw. Ent. Soc., III, No. 5, 1918.

Metamasius ritchiei Marshall.—Mr. Ehrhorn exhibited a specimen of this pineapple weevil, which came from Jamaica. He stated that it does extensive damage to the fruits, stems, and the roots of pineapple plants, and that a living larva of this species had been found in some pineapple plants that were imported into Honolulu from Mexico.

Gitonides perspicax Knab.—Mr. Timberlake exhibited four specimens of this Drosophilid, reared from a mealy bug on sugar cane at Halifax, Queensland, by Mr. Muir in March and April, 1920. The species is apparently widely distributed, as Knab records it from Manila, Philippine Islands, and Pusa, India, as well as from Honolulu. Mr. Muir states that it occurs in Java.

Itoplectis immigrans Timb.—Mr. Timberlake called to attention that Dr. Perkins, in a recent letter to the Experiment Station, states that this "is the species which I referred to in the Fauna as commonplace—no doubt without justification, but at the same time the only species of the subfamily I had specially studied were the fine '*Rhyssa*' group and other conspicuous tropical things, and I must have been thinking of these at the time. Of this *Itoplectis,* I took a female with much broken wings in 1901 in Honolulu. This differs from several later caught ones (1904) in having only the small apical segment black and the propodeum reddish, but it is clearly the same species. It is even possible it may have become darker since its introduction."

In another letter, Dr. Perkins mentioned that he had once seen this species in large numbers, and curious enough all his specimens except one were from Oahu.

Mr. Timberlake remarked that the species must have become much rarer in recent years on Oahu, as it has not been found recently, although much collecting of Hymenoptera has been done by Fullaway, Bridwell, Williams, and others. He also remarked that it is possible that some of the introduced Hymenoptera do become darker after being in the Islands for a period of years, and this is possibly the case also in *Cremastus hymeniae* Viereck., some specimens of which have considerable black on the thorax. But it is rather unsafe to generalize on the subject as the insects may vary to the same extent in their native habitat.

MARCH 3, 1921.

The 186th meeting of the Hawaiian Entomological Society was held at the H. S. P. A. Experiment Station, with President Timberlake presiding. Other members present were Messrs. Bissell, Ehrhorn, Giffard, Muir, Osborn, Swezey, and Willard.

Minutes of the previous meeting were read and approved.

Mr. T. L. Bissell was elected to active membership in the Society.

PAPERS READ.

"Insects Attacking Ferns in the Hawaiian Islands."

BY O. H. SWEZEY.

"Insect Collecting in Zero Weather in Illinois."

BY O. H. SWEZEY.

NOTES AND EXHIBITIONS.

Dermestes vulpinus damaging lead lining of acid-tank.—Mr. Timberlake exhibited specimens and the work of this Dermestid. These were brought in by Mr. C. C. James, manager of the Pacific Guano and Fertilizer Company. The damage was done by the larvae, which bored their way between the wooden work beneath the tank and the lead lining, in preparation of their pupal chambers. In many instances they had gnawed grooves in the lead, and had in a few cases perforated the lining so that the tank had to be relined.

Insects from figs of Ficus retusa at Hongkong, China.—Mr. Timberlake exhibited 22 species of chalcid-flies, all reared from figs of *Ficus retusa* collected by Mr. Fullaway at Hongkong in January, 1921. These are divided into several distinct groups: First, a species of Agaonidae, the true caprifier of the figs; second, a group of 6 species, representing 5 genera, which probably are all inquiline and forming galls of their own inside the figs. These do not fall at all well in any of the subfamilies or tribes recognized by Ashmead, but numbers of the group probably were included by him under the Idarninae, although the more correct position apparently would be a new subfamily of the Callimomidae; third, 5 species of Idarninae, representing 3 genera; fourth, 3 species of the genus *Ormyrus*; fifth, 7 species of *Decatoma*.

* *Undetermined Cricket from Honolulu.*—Mr. Timberlake exhibited specimens of a small peculiar cricket found in rubbish in old boxes stored in a shed at Kaimuki. This species has been collected before, by Mr. Terry at Kekaha, Kauai (May, 1906), and about Honolulu, by Messrs. Ehrhorn and Swezey.

** *New Ichneumonid.*—Mr. Swezey exhibited specimens of an Ichneumonid recently collected by him in a weedy lot at Kaimuki, which is apparently a new immigrant here, not previously recorded.

Nesotocus giffardi.—Mr. Swezey reported having seen borings of this beetle in branches of a *Cheirodendron* tree on a ridge above Hauula. This is the farthest record for this weevil, and now makes its range extend throughout the whole Koolau mountains of Oahu.

Ptinus villiger Reit.—Mr. Swezey exhibited a specimen of this beetle of the family Ptinidae, which was taken with three others from a box of butterflies at Rockford, Illinois. It is a museum pest which he had not seen before, and one which museum collections in the Hawaiian Islands are not troubled with.

Kelisia paludum Kirk.—Mr. Muir exhibited a specimen of

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* *Cycloptiloides americanus* (Sauss.), as determined later by Morgan Hebard. [Ed.]

** *Casinaria infesta* (Cress.), as determined later by R. A. Cushman. [Ed.]

this insect from Jamaica, and remarked that this extends the distribution of this Hawaiian species to the Atlantic.

Machilis heteropus.—Mr. Muir exhibited a specimen of *Machilis heteropus,* with drawings showing the likeness between the first maxillae, palpus, mandibles, and antennae.

APRIL 7th, 1921.

The 187th meeting of the Hawaiian Entomological Society was held at the experiment station of the Hawaiian Sugar Planters' Association, with Mr. Timberlake in the chair. Other members present were Messrs. Bissell, Crawford, Ehrhorn, Muir, Osborn, Swezey, and Willard. Visitors present were Messrs. Geo. C. Roeding, a prominent fruit grower from Fresno, California; H. L. Lyon, L. O. Kunkel, and E. L. Caum of the Hawaiian sugar planters experiment station, and Q. C. Chock of the Territorial Board of Agriculture and Forestry.

Minutes of the previous meeting were read and approved.

Mr. Swezey reported that the Hawaiian Sugar Planters' Association had donated an additional $300 to the Society to help defray printing expenses.

Upon motion of Mr. Crawford, it was voted that the secretary, upon receipt of the donation, write a letter to the Trustees of the H. S. P. A., expressing the appreciation and thanks of the Society.

Upon motion of Mr. Muir, it was voted to suspend the regular program to enable Mr. Geo. C. Roeding to talk on fig insects.

Mr. Roeding outlined the life history of the *Blastophaga,* gave an account of its introduction into California, and related interesting experiences and anecdotes connected with his trip to Smyrna, undertaken to investigate the habits of *Blastophaga,* and the methods of caprification employed there by the natives.

JUNE 2d, 1921.

The 188th meeting of the Society was held in the entomological laboratory of the Experiment Station, H. S. P. A., with President Timberlake presiding. Other members present:

Messrs. Ehrhorn, Muir, Fullaway, Bissell, Osborn, Swezey, Crawford, and Wilder.

Minutes of previous meeting were read and approved.

PAPER READ.

"A New Hawaiian Delphacid (Homoptera)."

BY F. MUIR.

NOTES AND EXHIBITIONS.

Ischiogonus sp.—Mr. Muir exhibited specimens of this parasite of the Australian fern weevil (*Syagrius fulvitarsis*), sent by Mr. Pemberton from New South Wales, Australia. Cocoons of the parasite arrived on May 21, and since then 4 females and 30 males have issued. Most of them have been liberated on Mt. Tantalus, where there are Sadleria ferns infested with the weevil.

Mitrastethus bituberculatus and *Dryophthorus distinguendus*.—Mr. Ehrhorn exhibited these two weevils obtained from the wood of propagating boxes. The former is a New Zealand beetle and was found in the sound wood; the latter was in the rotted wood.

Vanessa callirhoea.—Mr. Swezey exhibited a set of wings of this butterfly sent him by Mr. Charles E. Hempel from Funchal, Madiera Islands. They have markings more nearly like *Vanessa tammeamea* than has any other species. Each species is similarly confined to an isolated group of islands, which are separated by many thousand miles.

Platyedra gossypiella.—Mr. Swezey exhibited a specimen of the pink boll-worm moth reared from the seed capsule of *Hibiscus youngianus* collected by Mr. McEldowney, April 1, 1921, on the ridge at Waimalu, Oahu.

Vanessa tammeamea.—Mr. Swezey stated that Mr. Caum reported to him the finding of 6 chrysalids of this butterfly attached to the leaves of the awa (*Piper methysticum*) in Pukoo Valley, Molokai, February 15, 1921. Butterflies issued from 5 of the chrysalids, and a *Chalcis obscurata* from the remaining one. This is the first record of this as a host for this parasite.

Frontina archippivora.—Mr. Swezey reported rearing this

Tachinid fly from a chrysalis of *Lycaena boetica* in Kaimuki, March 19, 1921. It is the first record of this fly from this host. The maggot issued from the butterfly chrysalis March 11, and the adult fly emerged from puparium March 19.

Aloha ipomoeae.—Mr. Swezey reported that Dr. Lyon had handed him specimens of this leafhopper taken at light in his office at the Experiment Station, March 12, 1921.

Hieroxestes omoscopa Meyrick.—Mr. Swezey stated that in a letter from Mr. Meyrick, this name is given for the Tineid moth described as *Opogona apicalis* by Swezey in Bull. 6, Exp. Station, H. S. P. A., p. 17, pl. III, figs. 4, 5, 1909.

Amaranth Jassid.—Mr. Swezey reported taking this immigrant Jassid on amaranth at Lahaina, Maui, May 20, 1921. This is the first record of its capture on any other island but Oahu, where it was first taken by Mr. Ehrhorn in October, 1918, on *Amarantus spinosus* near his office on the waterfront in Honolulu.

Oxacis collaris.—Mr. Swezey reported this beetle as coming abundantly to lights at the waiting station at Pawaa Junction, Honolulu. Sixty-five of them were counted running on the wooden walls near an electric light in a sheltered place, and sixteen were counted similarly near another light.

Eupatorium macrophylla. — Mr. Swezey reported having found some clumps of this foreign weed growing up at the head of one of the valleys at Maunalua at the dry end of the island of Oahu, April 17, 1921. Some of them were in flower. This is the pest that has become so widely spread on the island of Maui, and is overrunning some of the cattle ranches on the upper slopes of Haleakala. It is called "paumakani" by the Hawaiians. This patch of this weed was reported to the Territorial Forester, who has taken measures towards having the patch eradicated.

Simplicia robustalis.—Mr. Swezey reported rearing this moth from caterpillars which were quite abundant feeding on the dead leaves of chayote vine at Kilauea, Kauai, May 4, 1921. The first record of this immigrant moth on that island.

Telenomus.—Mr. Timberlake exhibited two females of a probably introduced species of *Telenomus*, apparently not hitherto recorded. The specimens were taken on windows, the first May 10, 1916, at Kaimuki, the other by Mr. Ehrhorn in Manoa Valley, March 29, 1921. It is easily distinguished from the rest of the Hawaiian species by its brown color.

Eulophus.—Mr. Timberlake exhibited specimens of an introduced species of this genus, reared by Mr. Swezey from the lantana leaf-miner collected at Makaha, Oahu, March 27, 1921. The species may be recognized by the extremely coarse reticulation of the scutellum, and by the entirely pale legs, in which characters it differs from all other Hawaiian Eulophidae.

Hunterellus hookeri Howard in India.—Mr. Timberlake exhibited a series of females of this Encyrtid collected by Messrs. Fullaway and Ballard from a dog at Coimbatore, South India, on February 20, 1921. Mr. Fullaway observed that the parasites, when disturbed, did not fly or jump away more than a couple of inches, and directly returned to rest on the dog, much in the same manner that the horn-fly returns to its host after being disturbed. This Encyrtid is known to be parasitic in dog ticks of the genus *Rhipicephalus* and has been found previously in Texas, California, Mexico and Portuguese East Africa.

Ox warble.—Mr. Swezey reported observing the ox warble (*Hypoderma lineata*) on imported cattle at Kilauea and Lihue, Kauai, May 4, 1921. As many as half a dozen of the warbles were observed in the back of one cow.

Draeculacephala mollipes.—Mr. Osborn exhibited specimens of this Jassid collected on small plant sugar cane at Ewa Plantation, Oahu, June 1, 1921. Fifteen indivdiuals were noticed on the cane in about two hours' search. No immature stages were observed.

Mr. Ehrhorn exhibited a collection of economic insects from Porto Rico.

Clytus annularis Fab.—Mr. Fullaway exhibited specimens of this Cerambycid beetle, received from Brother Matthias Newell of Hilo, with the information that it has established itself at Hilo, and can be readily obtained in dry bamboo. This beetle was taken in Honolulu as early as 1905. As but a single example was found on that occasion, in an insectary at the Experiment Station, H. S. P. A., where some sake tubs were stored, it was believed to have come from the Orient in the tubs. Brother Matthias states, however, that he collected the first specimen taken in the islands many years ago, the specimen having been given to Dr. Perkins. The species has a wide distribution in the Orient, being recorded from India, Assam, Burmah, Siam, China, Japan, Malacca, Java, Timor, Molucca, Aru, New Guinea and Port Jackson, Australia. As far as can be ascertained, this is the first published record of its presence in Hawaii.

Micromus vinaceus.—Brother Matthias Newell of Hilo states in a letter to Mr. Fullaway that this introduced Australian lace-wing fly, which was liberated in Hilo in 1920, has become established and is active on plants infested with aphids.

Insects Collected at Waimea, Hawaii.—Mr. Fullaway furnished a list of insects collected or observed at Waimea, Hawaii, in May, 1921, with notes on particular species, as follows:

COLEOPTERA.

Diachus auratus on rose-bushes.
Pantomorus fulleri.
Gonocephalum seriatum.
Monocrepidius exsul.
Coelophora inaequalis.
Cryptolaemus montrouzieri.
Scymnus notescens.
Hister bimaculatus under cow-dung. Other Histers not present.
Philonthus scybalarius.
Lispenodes hawaiiensis.
Aphodius lividus.

HEMIPTERA.

Oechalia grisea.
Nysius sp.
Siphanta acuta.

LEPIDOPTERA.

Anosia erippus.
Herse cingulata.
Vanessa atalanta.
Vanessa cardui.
on *Cirsium lanceolatum* so-called Scotch thistle.
Eriopygodes euclidias.
Cirphis unipuncta.
Agrotis ypsilon.
Agrotis dislocata.
Agrotis crinigera.
Spodoptera mauritia.
Plusia chalcites.
Lycaena blackburni.
Pontia rapae.
Omiodes accepta.
Hymenia recurvalis.
Amorbia emigratella.

NEUROPTERA.

Anomalochrysa sp.
Chrysopa microphya.

HYMENOPTERA.

Apis mellifica.
Polistes sp.
Sceliphron caementarium.
Crabro sp.
Odynerus sp.
Chalcis obscurata.
Echthromorpha fuscator.
Ichneumon koebelei.

Ichneumon purpuripennis.
Bassus laetatorius.
Angitia hawaiiensis.
Pheidole megacephala.
Trichogramma sp.

DIPTERA.

Psychoda sp.
Eristalis tenax.
Xanthogramma grandicornis.
Allograpta obliqua.
Frontina archippivora.
Chrysomyia dux.
Sarcophaga pallinervis.
Stomorhina pleuralis.
Lyperosia irritans.
Musca domestica.

SIPHONAPTERA.

Saxcopsylla gallinacea.

JULY 7th, 1921.

The 189th meeting of the Society was held in the usual place, President Timberlake presiding. Other members present: Messrs. Bissell, Crawford, Ehrhorn, Fullaway, Grinnell, Muir, Swezey and Wilder, and Dr. Kunhi Kannan of Bangalore, India, visitor.

In the absence of the secretary, Mr. Swezey was appointed secretary pro tem.

Minutes of the previous meeting were read and approved, with a few corrections.

NOTES AND EXHIBITIONS.

Amblyteles purpuripennis.—Mr. Fullaway reported that specimens of this Ichneumon forwarded to the U. S. National Museum for determination, have been identified with *purpuripennis* (Cresson), a California species, by Mr. Cushman. This is one of the species introduced by Mr. Koebele about twenty-five years ago, probably at the same time that *koebelei* was introduced.

Buprestid larva.—Mr. Ehrhorn reported finding Buprestid larvae in bamboo, imported from Japan, at a Japanese store, the bamboo being so much eaten as to be readily crushed.

Pleistodontes froggatti.—Mr. Muir reported the establishment of this fig wasp on the Moreton Bay fig tree at Emma Square. A large number of the insects were liberated on the tree in February, and just recently a crop of figs has matured on the tree for the first time in its history, and when the fallen figs were examined they were found to have the exit holes where the insects had issued.

Nitidulid beetles in pineapples.—Mr. Crawford called attention to the problem that the pineapple companies have with this beetle in the canneries. Great numbers of the beetles come in with the pineapples from the fields, and have become a nuisance by getting into the open cans of pineapples before they are sealed up. It is reported that the finding of these in cans on being opened in the States has given rise to stories of young cockroaches being found in Hawaiian canned pineapples. The canneries are greatly concerned in preventing the beetles from getting into the cans. Mr. Fullaway reported having advised the companies in regard to methods of preventing the production of these beetles where they have increased so greatly on account of the pineapple refuse from the canneries which has been hauled to the fields for use as fertilizer. Liming of refuse piles has been tried to prevent the breeding of the beetles in this refuse.

Lantana insects.—There was a general discussion of the work of the introduced lantana insects and the effect that they have had on checking the lantana, and comparisons were made of the present conditions of the lantana with its much greater abundance at the time these insects were introduced from Mexico in 1902. The discussion was introduced by Dr. Kunhi Kannan of Bangalore, India, who stated that lantana had become established some time ago in India and that it is now spread throughout the country. He has been on an extended tour of Europe and the United States, having spent a year in study for the Doctor's degree at Leland Stanford University, and now on returning home was desirous of taking with him some of the lantana insects to try establishing them in India. He particularly wished to try the Agromyzid fly whose maggot feeds in the berries.

Sternochaetus mangiferae.—Mr. Swezey exhibited three pupae of the mango weevil taken from a seed of a mango on which thirty-one egg-punctures were counted on the surface of the fruit when it ripened and fell from the tree June 6. He stated that egg-punctures had been observed numerous on many of the mangoes, but on examination of the seeds usually not more than two weevils were found to have developed in each seed. In three instances only had he found as many as three weevils per seed. He was unable to account for the failure of so large a proportion of the weevil eggs. Mr. Wilder commenting on the prevalence of the mango weevil this season, stated that in his progagation work he had a germination of but 4 per cent of the seeds.

Nesoprosopis anomala.—Specimens of this rare native bee were exhibited by Mr. Swezey, who reported the finding of a nest in a borer hole in the dead trunk of a *Pipturus* tree on Tantalus, June 19, 1921. There were 8 pupae in a series of cells in a single row. From these, 3 females and 5 males appeared a few days later. In the tin box where the pupae had been kept there was a strong odor somewhat resembling citronella. A female and 2 males of the same bee were caught at flowers of *Straussia* very near to where the nest was found.

Nesoprosopis unica.—Mr. Swezey reported finding a nest of this bee in the pith cavity of a dead *Pipturus* twig on Tantalus, June 19, 1921. From this nest one male bee issued, while the other 4 larvae in the nest each had a larva of *Eupelmus* feeding on it. These matured July 5 to 7. They were 1 male and 3 females, coming near to Dr. Perkin's species *euprepes.*

Dictyophorodelphax mirabilis.—Mr. Swezey reported collecting one male specimen of this strange leafhopper on *Euphorbia* at Wahiawa, June 3, 1921. Also two nymphs which were parasitized by a Dryinid. It is the first time that he has found specimens of this leafhopper that were parasitized. This is a new locality record, and extends the known range of the species.

Apomecyna pertigera.—This beetle was exhibited by Mr. Swezey, who reported having reared 66 of them from a length of eight feet of a gourd vine (*Sicana odorifera*) growing on a fence at the Vineyard St. Nursery, May 10, 1921. The vine had made an extensive growth on the fence, and was very badly infested by larvae of this beetle. There must have been thousands of them. The beetle has been known to attack melon and cucumber vines, but not to such an extent as in the present instance. Other insects breeding from the same eight-foot piece of vine as above, while in a decaying condition were:

30 *Achritochaeta pulvinata*, 2 Oscinids, 1 *Araecocerus fasciculatus*, 1 small Anthribid with long antennae (*Lawsonia* sp.), 5 *Opogona aurisquamosa*, 1 *Opogona purpuriella* (it is not certain about this species, but the specimen was found dead on the table near the breeding jar containing the material, and as the cover had been off accidentally several times, it could have come from this. This is the first record of this moth from Oahu, it being previously known only on Hawaii), 5 *Ereunetis minuscula*, 1 *Pyroderces rileyi*, 3 *Cremastus hymeniae*, 1 banded-winged *Apanteles*. The two latter were parasitic on one or more of the Tineids.

Cirrospilus sp.—Mr. Timberlake exhibited specimens of a previously unrecorded parasite evidently belonging to this genus. It was reared by Mr. Swezey from the lantana leaf-miner collected at Lihue, Kauai, May 6, 1921, and at Spreckles-ville, Maui, May 18, 1921. Mr. Swezey believes that he reared the same parasite on Oahu some years ago, but the specimens have been misplaced. It is easily distinguished from all the rest of the Hawaiian Eulophidae by its bright yellow color and greenish black markings, and is unquestionably an introduced species.

Tenebrionidae.—Mr. Timberlake exhibited a specimen of *Ammophorus insularis* Boh. found beneath a wooden box on bare ground at Kaimuki, June 8, 1921, only a few rods from the locality where it was rediscovered about a year previously; also a single specimen of an undetermined Tenebrionid quite distinct from all others in the local collections. This was taken in Honolulu, June 23, 1919, but the details of capture were not remembered.

Megachile fullawayi.—Mr. Timberlake exhibited a female specimen of this bee collected on a *Gaillardia* flower at Kaimuki, June 5, 1921.

Megachile timberlakei.—Mr. Timberlake exhibited a nest and specimen of this bee collected by Mr. Ehrhorn in a crevice about his house at Kahala, June 26, 1921. The nest was made out of the leaves and colored bracts of the *Bougainvillea*.

Oecanthus sp.—Mr. Ehrhorn reported having secured from a Japanese passenger on a steamer, specimens of singing crickets being used as pets.

Dichocrocis punctiferalis Gn.—Mr. Ehrhorn exhibited 7 Pyralid moths of this species, reared from pupae found on five-leaved pine in conservatory of the Japanese steamer "Tenyo Maru" while in port June 8, 1921. This was on the return trip of the steamer from San Francisco. Infestation must have occurred while the steamer was at some Oriental port, the moth having a range all the way from Japan to India and to Australia. The moths issued four days after the pupae were collected on the steamer, and well illustrates how insects infesting plants on steamers could mature while the steamer was in port and come ashore. Probably a number of our introduced pests have arrived here in just this way. Some specimens of a Xylorictid moth (*Ptochoryctis tsugensis* Kear.) were reared from the same material as the above.

AUGUST 4th, 1921.

The 190th meeting of the Hawaiian Entomological Society was held at the usual place, with President Timberlake in the chair. Other members present were Messrs. Bissell, Fullaway, Muir, Osborn, Whitney, Wilder, and Willard. Dr. Kunhi Kannan of Bangalore, India, was a visitor.

Minutes of the previous meeting were read and approved.

PAPERS READ.

"Description of a Cuckoo-Wasp from the Hawaiian Islands (Hymenoptera)."

BY S. A. ROHWER,

Bureau of Entomology, United States Department of Agriculture, Washington, D. C.

"Conditions of Entomological Work in India."

BY DR. K. KUNHI KANNAN,

Government Entomologist, Bangalore, India.

NOTES AND EXHIBITIONS.

Ptinus brunneus Dufts.—Mr. Timberlake exhibited a specimen of this beetle collected in Honolulu November, 1909, by Mr. D. B. Langford. This is an imported species that has never been recorded from the Islands.

Uscana semifumipennis, in Texas and India.—Mr. Timberlake reported on identifying this common Bruchid parasite from Brownsville, Texas, from the eggs of *Mylabris sallaei,* in the material collected by Mr. Bridwell and brought to Honolulu by Mr. Willard. Mr. Fullaway also obtained the same species in India, the specimens having been given to him by Mr. Subramaniam. These were reared from eggs of *Mylabris chinensis* in stored cajanus at Bangalore, July 8, 1920.

Megachile timberlakei.—Mr. Timberlake reported on another nest of this bee collected by Mr. Ehrhorn at Kahala on July 10. The nest was built inside the frame of a door lock, and was made of Bougainvillea leaves and colored bracts, the female using the keyhole as the natural entrance and exit. On about July 31 to August 3, four females and eight males issued from the nest.

Correction of records of Plagithmysine beetles.—Mr. Timberlake called attention to the following lapses in recent numbers of the Proceedings.

In the Proceedings, vol. 3, p. 384, 1918, Mr. Bridwell recorded a *Plagithmysus acuminatus,* taken in Wailupe Valley, Oahu, on *Sapindus.* This name is a clerical error for *P. cuneatus* Sharp. In vol. 4, p. 50, a *Clytarlus vestitus* was recorded from Olinda, Maui, by Fullaway and Giffard. This is another clerical error, and the species in question is *Neoclytarlus modestus* (Sharp).

SEPTEMBER 1st, 1921.

The 191st meeting of the Hawaiian Entomological Society was held at the experiment station of the H. S. P. A., with President Timberlake presiding. Other members present were Messrs. Bissell, Fullaway, Ehrhorn, Giffard, Grinnell, Muir, Whitney, and Willard. Dr. Kunhi Kannan and A. H. Soon were visitors.

The minutes of the last meeting were read and approved as corrected.

Mr. Albert H. Soon was nominated for membership by Mr. Grinnell.

It was brought to the attention of the society that Mr.

Albert Koebele, an honorary member of the society, was having considerable trouble in getting proper recognition from American consuls in Europe in his attempt to return from Europe to the United States. Mr. Fullaway moved that a committee be appointed to formulate resolutions which would draw the attention of those in authority to the great value of Mr. Koebele's services to the United States, especially in Hawaii and on the Pacific Coast; and to ask that special consideration be given him in his request for passports. This motion, after being amended by Mr. Muir to the effect that the committee consist of Mr. Fullaway, Mr. Swezey, and Mr. Giffard, was passed.

NOTES AND EXHIBITIONS.

Mr. Timberlake exhibited a cockroach,* which is apparently new to the Islands. Found by him in his house at Kaimuki.

Mr. Giffard exhibited a small representative collection of Kauai insects, principally Coleoptera, collected in April, 1920, by J. A. Kusche. Among these are species of *Lucanidae, Plagithmysus, Clytarlus, Rhyncogonus,* etc., from the mountain regions back of Waimea and Makaweli.

The following notes on "Insect Observations on the Island of Hawaii," were given by Mr. Ehrhorn.

On July 25, on the Volcano road six miles from Hilo, *Pseudococcus montanus* was found very abundant on Ieie vine. *Pseudococcus straussiae* was found plentiful on *Straussia* and showed some parasitism. *Pseudococcus bromeliae* was found on twigs of *Straussia* covered over with soil by the ant *Pheidole megacephala,* as well as on Hilo grass roots and roots of large sedge. A mantis egg mass was also found in this locality.

August 2, at the Parker ranch, the following observations were made: At Waiki, Olinda bugs, or Fuller's rose beetle, were found very abundant in the orchard, where they seemed to be especially fond of the leaves of plum trees. The woolly-aphis was observed on the apple trees, and was no doubt introduced when the trees were imported. At an altitude of 4750

* *Supella supellectilium* (Serv.), as determined later by Morgan Hebard. [Ed.]

feet, a large ant lion, *Formicaleo wilsoni* McLach. was caught. These were plentiful flying about over pasture lands. At the old Purdy place, *Odonaspis ruthae* Kotinsky, were feeding on the roots of Manienie grass. At the new dairy, altitude 3200 feet, Olinda bugs were attacking and seriously damaging the foliage of a native tree, *Sophora chrysophylla.* It is claimed that many of these trees are killed by this defoliation. At an altitude of 3000 feet, *Heliothrips hemorrhoidalis* was damaging the young leaves of Eucalyptus trees. This species is quite abundant in the forest areas of the various islands, and has probably been here many years.

On August 4, with Mr. Swezey, in cane field at Olaa (above Mountain View), were observed many nymphs of *Cyrtorhinus mundulus,* which was introduced last year by Mr. Muir, and which has spread considerably since liberation.

August 6, Mr. Swezey found Hilo grass at Kapapala ranch badly infested with *Trionymus insularis.* The Tahiti coconut weevil *Diocalandra taitensis* (Guer.), previously reported by Mr. Swezey from the Kona section, was also found. These were in the husk near base of nut. The nuts were from the coast at Punaluu.

On August 9, indications of the work of the Tahiti coconut weevil were found at Puuiki and near the shore at Kalapana. The trees were so high that no weevils were found. The cane borer was found in the heart of a coconut tree, the stump of which had rotted.

It was noted that the Mediterranean fruit fly was not serious at Wainaku, there being good amounts of strawberry guavas, coffee, and other small fruits there.

At the Hilo Hotel a number of the Australian lacewings were captured, and Mr. Swezey collected a number of the new green grasshopper, which is very abundant about the lights on the hotel lanai. No males were observed, although some young were seen on plants in the garden.

OCTOBER 6th, 1921.

The 192d meeting of the Hawaiian Entomological Society was held in the usual place, with President Timberlake in the chair. Other members present were Messrs. Bissell, Bryan, Ehrhorn, Fullaway, Giffard, Illingworth, Muir, Swezey, Soon, and Willard.

The minutes of the last meeting were read and approved.

Mr. Albert H. Soon was elected to active membership in the society.

The committee appointed to draft a resolution showing the entomological services of Mr. Albert Koebele to this country, submitted the following resolution, together with a memorandum of Mr. Koebele's services.

Upon motion by Mr. Muir, it was unanimously voted to accept the committee's report, and that after the resolution had been signed by the president and secretary, that it be forwarded to Mr. E. K. Taylor of Alameda, California, who is Mr. Koebele's attorney.

Resolution of Appreciation of the Entomological Services of Mr. Albert Koebele.

Whereas, it has come to the notice of the Hawaiian Entomological Society that Mr. Albert Koebele, septuagenarian entomologist, former employe of the U. S. Department of Agriculture, and agent in co-operation with the California State Board of Horticulture, also Superintendent of Entomology for the Board of Agriculture and Forestry under the Republic of Hawaii and later consulting entomologist for the Territory of Hawaii and an honorary member of this society since its organization in 1904, also a naturalized American citizen since 1880, has been and is still detained against his will in Germany, whither he went previous to the outbreak of the War to secure special treatment for tropical fever and a disease of the eyes, and at the same time to collect beneficial insects for the Territory of Hawaii; and

Whereas, It is believed that Mr. Koebele merits special consideration from the Government of the United States of America through its representatives because of the invaluable services he has rendered to the country in saving threatened agricultural industries in California and Hawaii by his energy and skill in entomological field research work and particularly in discovering and introducing the natural enemies of certain insects which were at that time destroying the principal crops of these countries; and were causing incalculable losses to agriculture; therefore, be it

Resolved, that the following memorandum of the conspicuously important services of Mr. Koebele be placed on record with this testimonial of the society's high appreciation of his merit and belief in the worthiness of his claim on the interest of the Government in his desire to return to the land of his adoption and to his home in the State of California.

MEMORANDUM OF KOEBELE'S SERVICES TO AMERICAN AGRICULTURE.

1888-9. As agent for the U. S. Department of Agriculture and for the State of California. Introduced the Vedalia ladybird from Australia and saved the citrus industry in California, which was threatened by the cottony cushion scale. This single exploit saved the orange growers, it is estimated, twenty million dollars.

1890-93. In the same capacity. Visited Australia, New Zealand and the Fiji Islands twice and secured many beneficial insects, principally ladybird beetles which were introduced into California to prey on scale pests.

1893-1910. Traveled in different countries in the interest of the Republic and later the Territory of Hawaii as Superintendent of the Division of Entomology, Board of Agriculture and Forestry and consulting entomologist, collecting beneficial insects to be introduced into the islands for the purpose of destroying injurious insects, thus relieving agricultural and horticultural industries of the severe losses so occasioned. In these years he visited Ceylon, Australia, Fiji, China, Japan, Mexico and Europe. His great work—discovering and introducing the natural enemies of the sugar cane leaf hopper—in co-operation with Dr. R. C. L. Perkins, earned him lasting fame in the Territory of Hawaii, and saved an industry now worth fifty million dollars yearly.

In 1910 Koebele was relieved from active duty and retained as Consulting Entomologist, on account of ill-health brought on by fever contracted during his exploration and research work in fever-infested regions of the tropics.

The following detailed account of Koebele's work was published in 1911 by Dr. L. O. Howard, Chief Entomologist of the United States Department of Agriculture. (Bul. 91, U. S. Bureau of Entomology. July 29, 1911.)

"The Australian Ladybird (Novius Cardinalis Muls.) in United States."

"But all previous experiments of this nature were completely overshadowed by the remarkable success of the importation of *Vedalia* (*Novius*) *cardinalis* Muls., a coccinellid beetle, or ladybird, from Australia into California in 1889. The orange and lemon groves of California had for some years been threatened with extinction by the injurious work of the fluted or cottony cushion scale (*Icerya purchasi* Mask.), a large scale insect which the careful investigations of Professor Riley and his force of entomologists at the United States Department of Agriculture had shown to have been originally imported, by accident, from Australia or from New Zealand, where it had originally been described by the New Zealand coccidologist, the late W. M. Maskell. The Division of Entomology had been for several years engaged in an active campaign against this insect, and had discovered washes which could be applied at a comparatively slight expense and which would destroy the scale insect. It had also in the course of its investigations discovered the applicability of hydrocyanic acid gas under tents as a method of fumigating orchards and destroying the scale. The growers, however, had become so thoroughly disheartened by the ravages of the insect that they were no longer in a frame of mind to use even the cheap insecticide washes, and many of them were destroying their groves. In the meantime, through some correspondence in the search for the original home of the scale insect, Professor Riley had discovered that while the species occurred in parts of Australia it was not injurious in those regions. In New Zealand it also occurred, but was abundant and injurious. He, therefore, argued that the insect was probably introduced from Australia into New Zealand, and that its abundance in the latter country and its relative scarcity in Australia were due to the fact that in its native home it was held in subjection by some parasite or natural enemy, and that in the introduction into New Zealand the scale insect had been brought in alone. The same thing, he argued, had occurred in the case of the introduction into the United States. He therefore, in his annual report for 1886, recommended that an effort be made to study the natural enemies of the scale in Australia and to introduce them into California; and the same year the leading fruit growers of California in convention assembled petitioned Congress to make appropriations for the Department of Agriculture to undertake this work. In February, 1887, the Department of Agriculture received specimens of an Australian parasite of *Icerya* from the late Frazier S. Crawford, of Adelaide, South Australia. It was a dipterous insect known as *Lestophonus iceryae* Will., and for some time it was considered, both by Professor Riley and his correspondents and agents, that the importation of this particular parasite offered the best chances for good results.

Neither the recommendations of Professor Riley nor of the then commissioner of agriculture, Hon. Norman J. Colman, nor the petitions of the California horticulturists gained the needed congressional appropriations, and, since there appeared at that time annually in the bills appropriating to the entomological service of the Department of Agriculture a clause preventing travel in foreign parts, it became necessary to gain the fund for the expense of the trip to Australia from some other source. A movement was started in California to raise these funds by private subscription, but it was never carried through. In an address given by Professor Riley before the California State Board of Horticulture at Riverside, Cal., in 1887, he repeated his recommendations. During the summer of 1887 he was absent in Europe, and the senior author, who was at that time the first assistant entomologist of the department, by correspondence secured from Mr. Crawford numerous specimens of *Icerya* infested by the *Lestophonus* above mentioned. During the winter of 1887-88 preparations were being made for an exhibit of the United States at the Melbourne Exposition, to be held during 1888, and Professor Riley, after interviewing the Secretary of State, who had charge of the funds appropriated for the Exposition, was enabled to send an assistant, Mr. Albert Koebele, to Australia at the expense of this fund. This result was hastened, and Mr. Koebele's subsequent labors were aided by the fact that the Commissioner-General of the United States to the Exposition was a California man, Mr. Frank McCoppin, and his recommendation, joined to that of Professor Riley, decided the Secretary of State in favor of the movement. In order to partially compensate the Exposition authorities for this expenditure, another assistant in the Division of Entomology, Professor F. M. Webster was sent out to make a special report to the commission on the agricultural features of the Exposition. Mr. Koebele, who sailed from San Francisco August 25, 1888, was thoroughly familiar with all the phases of the investigation of the cottony cushion scale, and had for some time been stationed in California working for the Department of Agriculture. His salary was continued by the department and his expenses only were paid by the Melbourne Exposition fund. He made several shipments of the *Lestophonus* parasite to the station of the Division of Entomology of the Department of Agriculture at Los Angeles, where, under the charge of Mr. D. W. Coquillett, a tent had been erected over a tree abundantly infested with the scale insect; but it was soon found that the *Lestophonus* was not an effective parasite.

On October 15, Mr. Koebele found the famous ladybird (Vedalia) *Novius cardinalis* in North Adelaide, and at once came to the conclusion that this insect would prove effective if introduced into the United States. His first shipments were small, but others continued from that date until January, 1889, when he sailed for New Zealand and made further investigations. Carrying with him large supplies of *Vedalia cardinalis*, the effective ladybird enemy, he arrived in San Francisco on March 18, and on March 20, they were liberated under the tent at Los Angeles, where previous specimens which had survived the voyage by mail had also been placed.

The ladybird larvae attacked the first scale insect they met upon being liberated from the packing cages. Twenty-eight specimens had been received on November 30 by Mr. Coquillett, 44 on December 29, 57 on January 24, and on April 12 the sending out of colonies was begun, so rapid had been the breeding of the specimens received alive from Australia. By

June 12 nearly 11,000 specimens had been sent out to 208 different orchardists, and in nearly every case the colonizing of the insect proved successful. In the original orchard practically all of the scale insects were killed before August, 1889, and, in his annual report for that year, submitted December 31, Professor Riley reported that the cottony cushion scale was practically no longer a factor to be considered in the cultivation of oranges and lemons in California. The following season this statement was fully justified, and since that time the cottony cushion scale, or white scale, or fluted scale, as it is called, has no longer been a factor in California horticulture. Rarely it begins to increase in numbers at some given point, but the Australian ladybirds are always kept breeding at the headquarters of the State Board of Horticulture at Sacramento, and such outbreaks are speedily reduced. In fact, it has been difficult for the State horticultural authorities to keep a sufficient supply of scale insect food alive for the continued breeding of the ladybirds."

* * * *

Other Introductions by Koebele Into California

"Mr. Koebele took a second trip to Australia, New Zealand, and the Fiji Islands while still an agent of the Department of Agriculture, but at the expense of the California State Board of Horticulture, and in 1893 he resigned from the United States Department of Agriculture and was employed by the State Board of Horticulture of California for still another trip to Australia and other Pacific Islands. He sent home a large number of beneficial insects, nearly all of them, however, coccinellids. Several of these species were established in California, and are still living in different parts of the State. The overwhelming success of the importation of *Novius cardinalis* was not repeated, but one of the insects brought over at that time, namely, the ladybird beetle *Rhizobius ventralis* Er., an enemy of the so-called black scale (*Saissetia oleae* Bern.), was colonized in various parts of California, and in districts where the climatic conditions proved favorable its work was very satisfactory, notably in the olive plantations of Mr. Elwood Cooper, near Santa Barbara. Hundreds of thousands of the beetles were distributed in California and in some localities kept the black scale in check. Away from the moist coast regions, however, they proved to be less effective."

* * * *

"A similar lepidopterous insect, *Thalpochares cocciphaga* Meyrick, was brought over from Australia in the summer of 1892 by Koebele and left by him at Haywards, Calif., but the species evidently died out."

The Hawaiian Work.

"In 1893 Koebele resigned from the service of the State of California and entered the employment of the then newly established Hawaiian Republic, for the purpose of traveling in different countries and collecting beneficial insects to be introduced into Hawaii for the purpose of destroying injurious insects. Before leaving California he had introduced a very capable ladybird, *Cryptolaemus montrouzieri* Muls., which feeds upon mealy bugs of the genus *Pseudococcus*. This insect flourished, especially in Southern California, and on arrival in Hawaii he found that coffee plants and certain other trees were on the point of being totally destroyed by the allied scale insect known as *Pulvinaria psidii* Mask. He at once introduced this same *Cryptolaemus,* which is an Australian insect, with the result that the *Pulvinaria* was speedily reduced to a condition of harmlessness.

It may be incidentally stated that within the past year efforts have been made by the Bureau of Entomology to send the *Cryptolaemus* to Malaga, Spain, for the purpose of feeding upon a *Dactylopius*. The first attempt was unsuccessful, and the results of the last attempt have not yet been learned.

Another importation of Koebele's into Hawaii was the ladybird *Coelophora inaequalis* from Ceylon, Australia, and China, which was successful in destroying plant lice upon sugar cane and other crops. Writing in 1896, Mr. R. C. L. Perkins stated that Koebele had already introduced eight other species which had become naturalized and were reported as doing good work against certain scale insects. Among other things he introduced *Chalcis obscurata* Walk. from China and Japan, which multiplied enormously at the expense of an injurious lepidopterous larva (*Omiodes blackburni* Butl.), which had severely attacked banana and palm trees.

Koebele's travels from 1894 to 1896 were through Australia, China, Ceylon, and Japan. In 1899 he left for Australia and the Fiji Islands, and sent many ladybirds and parasites to Hawaii, especially to attack the scale *Ceroplastes rubens* Mask. The Hawaiian Sugar Planters' Association, an organization which was responsible for Koebele's appointment, subsequently employed Mr. R. C. L. Perkins, Mr. G. W. Kirkaldy, Mr. F. W. Terry, Mr. O. H. Swezey, and Mr. F. Muir. By the close of 1902, sugar planters were especially anxious concerning the damage of an injurious leafhopper on the sugar cane, *Perkinsiella saccharicida* Kirk. This insect had been accidentally introduced from Australia about 1897, had increased rapidly, and by 1902 had become a serious pest. Koebele had made an effort to introduce parasites of leafhoppers from the United States into Hawaii, with unsatisfactory results and consequently in the spring of 1904 Koebele and Perkins visited Australia and collected all possible parasites of different leafhoppers. Altogether they succeeded in finding more than one hundred species. Of these the following hymenopterous parasites are said to have become acclimated in Hawaii: *Anagrus* (two species), *Paranagrus optabilis* Perk. and *P. perforator* Perk. and *Ootetrastichus beatus* Perk. These species are all parasitic upon the eggs of the leafhopper. By the end of 1906 observation upon a certain plantation indicated the destruction of 86.3 per cent of the eggs by these parasites. In addition to these egg parasites certain Dryinid parasites of hatched leafhoppers have apparently become established, namely, *Haplogonatopus vitiensis* Perk. *Pseudogonatopus* (two species), and *Echthrodelphax fairchildii* Perk. Three predatory beetles, namely, *Verania frenata* Erichs., *V. lineola* Fab., and *Callineda testudinaria* Muls., were also distributed in large numbers.

The practical results of these importations seem to have been excellent. There seems to be no doubt that the parasites have been the controlling factor in the reduction of the leafhoppers.

The good work in Hawaii is still continuing. Koebele is now on a visit to Europe to import the possible parasites of the horn fly (*Haematobia serrata* Rob.-Desv.), Muir is trying to find an enemy to a sugar-cane borer (*Rhabdocnemis obscurus* Boisd.), and other similar work is under way."

PAPERS READ.

"Notes on Immigrant Coleoptera."

BY D. T. FULLAWAY.

"Notes and Observations on Parandra puncticeps Sharp. (Coleoptera)."

BY W. M. GIFFARD.

Mr. Swezey read a paper entitled, "Notes on the Isopod Known as *Geoligia perkinsi*, Dollfus." By Chas. Chilton, Professor of Zoology, Canterbury College, New Zealand.

NOTES AND EXHIBITIONS.

Supella supellectilium.—This cockroach, exhibited by Mr. Timberlake, was first captured by him about April or May, 1921, and sent to Mr. Morgan Hebard of Philadelphia for determination. Mr. Hebard states that it is a cosmopolitan species previously unknown in Hawaii.

Parandra puncticeps Sharp.—Mr. Giffard exhibited thirty-eight adult specimens, and a number of preserved larvae and pupae of this beetle, which were collected at twenty-nine miles, Olaa, Hawaii, at an elevation of 3800 feet.

Dirhinus giffardii.—Mr. Fullaway exhibited a specimen of this parasite collected on a manure pile at Waialae in September, 1921. He stated that this parasite, introduced as a parasite of the Mediterranean Fruit Fly, is undoubtedly established here, and is probably a general parasite of Diptera.

Dermestid larva.—Mr. Fullaway exhibited a living Dermestid larva feeding on a pinned insect specimen. Mr. Giffard stated that he had noticed holes made by these larvae through the sides of cardboard insect boxes, in which the supply of naphthalene had become low, but that a good supply of napthalene was sufficient to prevent their entry.

Caccodes debilis.—Mr. Swezey reported having collected a specimen of this Malacodermid beetle from *Euphorbia* in Iao Valley, Maui, July 8, 1920. This is the first record of this insect anywhere except on Oahu. It was collected in houses by Blackburn. Perkins collected it outside as well. Mr. Swezey has collected two specimens at the experiment station of the H. S. P. A. (one on a vine), and one at Kaimuki, all of which were collected in 1911.

Oxydema fusiforme Woll.—Mr. Swezey called attention to Dr. Marshall's paper on Samoan Curculionids in the last issue of Proc. Haw. Ent. Soc., vol. IV, where, on page 596, the weevil described as *Pseudolus hospes* by Perkins in the Fauna Hawaiiensis, is determined as *Oxydema fusiforme* Woll., originally described from Ceylon, but known also from Seychelles, Rodriguez and Marquesas, and now from Upolu Island, Samoa.

Micromus vinaceus.—Mr. Swezey exhibited a specimen of this Australian Hemerobiid, collected by him in Manoa Valley at the cane plots of the experiment station, H. S. P. A., at the back part of the valley, August 9, 1921. This is the first specimen to be recovered on the island of Oahu since their liberation in large numbers in 1919 and 1920. He reported also, finding all stages of this Hemerobiid on aphis-infested okra in the garden of the Hilo Hotel, Hilo, Hawaii, July 25, 1921. Brother Matthias Newell had previously observed this insect established in Hilo.

Platyedra gossypiella.—Mr. Swezey reported breeding three specimens of this moth from the flower buds of *Hibiscus youngianus,* found growing along the Volcano Road about six miles south of Hilo, Hawaii, July 25, 1921. Quite a large proportion of the buds on the plants were attacked by the larvae. A female *Pristomerus hawaiiensis* was bred from one larva of the lot. He reported also finding this same plant with flower buds attacked by larvae of *P. gossypiella* in Waimea Canyon, Kauai, September 4, 1921. It thus seems that this plant is one of the common hosts of the pink boll-worm.

Parandra puncticeps.—Mr. Swezey exhibited a chip from a standing dead koa tree at Halemanu, Kauai, showing the egg in situ of this Prionid beetle. The tree from which this was taken was a large dead trunk from which the bark had loosened, but not yet fallen away. Fourteen beetles were found beneath the bark of this and other similar trees nearby. The females had been ovipositing directly into the solid wood, making an excavation, about 4 mm. deep and slanting downward, into which the egg was placed. The egg is white, cylindrical with rounded ends, 3 mm. long and 1 mm. in diameter. The opening of the egg cavity is blocked by the torn-apart fibers of wood. Many of these were to be seen on the surface of the tree trunks, after it had been discovered how to recognize them. These were placed at an elevation of from near the ground to six feet high. It was not learned whether oviposition took place at a higher elevation up the trunk than one could see conveniently; but it is likely that it did.

Casinaria infesta.—Mr. Swezey reported rearing this Ichneumonid from a larva of *Phlyctaenia ommatias* collected in the Alakai Swamp, Kauai, 4000 feet, August 22, 1921; and from a larva of *Phlyctaenia argoscelis* collected at Kokee, Kauai, 3500 feet, August 18, 1921. This immigrant Ichneumonid was first noticed at Kaimuki in February and March of this year when it was abundant in a weed lot, where many caterpillars were abundant, especially *Hymenia recurvalis*, but the host was not determined at that time.

Dolichurus stantoni.—Mr. Swezey reported collecting a few specimens of this Philippine roach parasite in the forest at Kokee, Kauai, August, 1921. They were abundant, being noticed along all trails of the vicinity.

Amaranth Jassid.—Mr. Swezey reported collecting this little Jassid on amaranth weeds growing at Nawiliwili, Lihue, and Waimea, Kauai, September 9, 7, and 3, respectively. It is the first record of this immigrant Jassid on Kauai, and it is quite abundant in the places mentioned.

Microbracon pembertoni.—Mr. Swezey reported rearing this Braconid from lantana berries, collected at Nawiliwili, Kauai, September 9, 1921. Its host is probably *Crocidosema lantana* or *Platyptilia pussilidactyla,* as the larvae of both these moths were present in the material collected. This is the first record of this Braconid from Kauai.

Leucostoma atra.—Mr. Swezey reported a recent determination of this little Tachinid fly by Dr. Aldrich, from specimens sent a short time ago. It is a common American insect, and is the fly parasitic on *Corizus hyalinus*, as mentioned in Proc. Haw. Ent. Soc., IV, p. 467, 1921. Dr. Aldrich, in his letter, stated that there were no published records as to the host of this fly, but that there was a manuscript note of its having been reared from *Reduviolus ferus*. Mr. Swezey further reported catching two specimens of it at Kokee, Kauai, 3500 feet, in August, 1921, which is the first record of its occurrence on that island.

Labidura icterica Serv.—Mr. Swezey reported the capture of a specimen of this earwig at Grove Farm, Kauai, September 9, 1921. This immigrant earwig was first recorded in the Fauna Hawaiiensis (II, Pt. VI, p. 690, 1910) by Perkins, as occurring at Honolulu and in the country. The present instance is apparently the first record of its occurrence on Kauai.*

Mylabris sallaei.—Mr. Swezey reported finding this weevil very abundant in pods of *Acacia farnesiana* and algaroba at Mana and Waimea, Kauai, August 17, and September 3, 1921. As many as a dozen exit holes were frequently to be found in one pod of *A. farnesiana*. This is the first record of this insect on Kauai.

Mylabris pruininus.—Mr. Swezey reported collecting this weevil in the garden at the Hilo Hotel, July 25, 1921; and at Kokee, Kauai, 3500 feet, August, 1921; and in Waimea Canyon, Kauai, September 4, 1921. These are the first records of this insect on each of these islands.

Diocalandra taitensis.—Mr. Swezey reported finding this coconut weevil in coconuts from Mr. Monsarrat's beach place at Punaluu, Hawaii, August 5, 1921. The adult beetles were found beneath the bracts at the base of mature coconuts, and larvae were found feeding within the shuck. Dried gum on the surface of the shuck indicated where there were larvae inside. The nuts themselves were not injured. This indicates the probability of this pest having been brought to Hawaii in coconuts from the South Seas at some time.

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* This insect has recently been recorded from Kauai as *L. riparia* (Pallas) by Morgan Hebard. Bishop Museum, Occasional Papers, vol. vii, No. 14, p. 314, 1922. [Ed.]

NOVEMBER 3d, 1921.

The 193d meeting of the Hawaiian Entomological Society was held at the experiment station of the H. S. P. A., President Timberlake presiding. Other members attending were Messrs. Bissell, Bryan, Crawford, Ehrhorn, Fullaway, Giffard, Illingworth, Muir, Soon, Swezey, Whitney and Willard.

The minutes of the last meeting were approved as read.

A communication from Mr. E. K. Taylor of Alameda, Cal., was read, in which he stated that favorable action had been taken by the State Department at Washington in the matter of issuing passports which would enable Mr. Albert Koebele to return immediately to the United States.

PAPER READ.

"An Interesting New Derbid Genus (Homoptera)."

BY F. MUIR.

NOTES AND EXHIBITIONS.

Stigmaeus floridanus.—Mr. Ehrhorn exhibited a pineapple sucker showing this mite, commonly called the Florida pineapple mite, and stated that a fortnight ago a severe outbreak of it was reported in the Moanalua section of Oahu. It was thought at that time to be new to the islands, but after investigation, it was found that in 1908 Mr. Van Dine reported it on pineapple plants in the grounds of the U. S. Experiment Station, and that the record had been either forgotten or overlooked.

Mr. Ehrhorn exhibited also three earwigs found feeding on woolly aphis at Waiki, Parker Ranch, Hawaii. He stated that woolly aphis, feeding on apple trees there, had been destroyed by some enemy, and took some of the twigs with the aphis in a tin can to his office. Upon opening the can, he found the aphis had been destroyed and found the three earwigs on the galls of the apple twig. The earwigs were presented to the Hawaiian Entomological Society.

Zorapteron on Kauai.—Mr. Swezey exhibited a slide mount of a minute insect, which he had collected in a rotten log at Kokee, Kauai, August 20, 1921. Mr. Muir had cleared and mounted it, and endeavored to determine it. It appeared to be a peculiar form of Orthoptera.* As Mr. Morgan Hebard has recently been revising the Hawaiian Orthoptera, the remainder of the specimens of this insect collected at the same time, have been sent to him for study.

Tenodera sinensis.—Mr. Swezey reported that Mr. Meinecke, of the Territorial Normal School, had reported to him of the occurrence of this preying mantis at Hilea, Kau, Hawaii, in 1920. This is believed to be the first record of its occurrence in that section of Hawaii.

Arrhenophagus chionaspidis Aurivillius. — Mr. Timberlake exhibited specimens of this parasite reared from the males of *Phenacaspis eugeniae*, collected at Kohala, Oahu, October 23, 1921, by Mr. Ehrhorn. This species, although it has never been collected here before, has been in the islands probably for many years, as Mr. Ehrhorn has observed exit holes of a parasite in the male scales of *Phenacaspis* at various times since arriving in Honolulu in 1909.

Euscepes batatae.—Mr. Swezey stated that some pieces of dead Japanese morning glory vine, containing larvae, which were brought in by Mr. Ehrhorn, produced ten adults of the sweet potato weevil and three adults of *Oxydema fusiforme.*

Pseudococcus swezeyi Ehrhorn.—Mr. Whitney reported that this scale insect had been found on *Dianella odorata* by O. H. Swezey at Kokee, Kauai, August 19, 1921; and on the Ilima plant by Mr. Ehrhorn at Waikapu Gulch, Wailuku, Maui, October 12, 1921. These are the first records of this species from these two islands. He stated that it was first described by Ehrhorn from specimens collected between folded leaves of *Acacia koa* from Mt. Tantalus, Oahu, by Swezey, December 5, 1915.

Pseudococcus maritimus Ehrhorn, on various garden crops.

Pseudococcus comstocki Kuwana, on apple and pear.

Mr. Whitney reported that specimens of these scales had been sent from Nelson, New Zealand, by Mr. R. J. Tillyard, and that this is the first record of their occurrence there. He

* This insect proved to be a representative of the Order Zoraptera, and this is the first record of any such occurring here. [Ed.]

stated also that the determinations had been verified by Ferris.

Rhipicephalus sanguineus.--Mr. Fullaway reported that this dog tick had been very abundant about Honolulu during the past summer, and that there were apparently two species. Specimens were sent to Mr. G. W. F. Nuttall, who determined them to be all one species. Mr. Fullaway stated that this is the first time the dog ticks from Hawaii have been definitely determined by an authority.

Formicaleo wilsoni McLachl. — Mr. Bryan exhibited six specimens of this ant lion collected by W. H. Meinecke at Puukamaoa, Kau, Hawaii, September 2, 1921, 1950 feet elevation. He stated that they were comparatively common but hard to catch. They were previously collected by Swezey in 1919 near Kawaihae, Hawaii (Proc. Haw. Ent. Soc., v. IV, p. 338); Giffard, five specimens at Kau, Hawaii, December, 1911 (v. II, p. 228); and by Ehrhorn, Perkins and others in Kau. Also seen by Swezey just below Pahala Mill, Kau, 1905 (v. II, p. 228).

Xystrocera globosa Oliver.—Mr. Bryan exhibited a female specimen of this borer, caught by Robert Plunkett in the Kamehameha School grounds November 3, 1921. A discussion of its habit of attacking only injured or dying parts of the monkey pod tree followed.

North American Syrphidae.—Mr. Bryan read a list of a representative collection of North American *Syrphidae* which has been received by the Bishop Museum from W. M. Davidson of Vienna, Virginia. They were collected both in the East, and southern and central California.

Prosbole hirsuta, a fossil Homopteron.—Mr. Muir showed Handlirsch's figure of the upper Permain fossil *Prosbole hirsuta* and specimens of *Homoptera* of the family *Tropiduchidae*, pointing out the similarity both in the venation and in the heteropterus condition of the tegmen of many species belonging to the family *Tropiduchidae*. In *Prosbole* the anal furrow is behind the cubitus, as it is in *Homoptera*, whereas in *Hemiptera* Comstock and Needham consider that it is before the cubitus; there is no sign of the median furrow which is present in so many *Heteroptera*. These points are all in favor of its being a

Homopteron. On the same plate of Handlirsch's work is the restoration of *Eugereon*, which Mr. Muir called attention to, and stated that if the restoration be correct, the mouth parts are on a totally different system to *Hemiptera* and it can have nothing to do with that order, a conclusion also drawn from the wing venation.

NOVEMBER 16th, 1921.

A special meeting was held at the Bishop Museum for the purpose of viewing a large and very interesting collection of Australian insects, which were collected and exhibited by Mr. J. F. Illingworth. Of special interest was the large number of specimens representing many different species of insects attacking sugar cane. Many species were represented by large numbers of specimens, and Mr. Illingworth very kindly offered to supply members of the society with any of these in which they were interested.

The meeting was well attended by both members and visitors, the following being present members: Messrs. Bissell, Bryan, Carter, Crawford, Ehrhorn, Fullaway, Giffard, Holmes, Illingworth, Muir, Swezey, Soon, Timberlake, and Willard. Visitors: Professor Herbert E. Gregory, Director of the Bishop Museum, Dr. Stanley C. Ball, of the museum staff, Mr. A. F. Judd, a trustee of the museum, and Mr. Q. C. Chock, of the Board of Agriculture and Forestry.

DECEMBER 1st, 1921.

The 194th meeting of the Hawaiian Entomological Society was held at 2:30 p. m. in the usual place. Members present, besides President Timberlake, who presided, were Messrs. Bissell, Bryan, Ehrhorn, Fullaway, Giffard, Illingworth, Muir, Rosa, Soon, Swezey, Whitney, Wilder, and Willard. Mr. E. W. Rust from California, who was returning from South Africa, where he has been collecting parasites of scale insects, was a visitor.

Minutes of the previous regular meeting were read and approved, as well as those of the special meeting held November 16.

Report of the treasurer showed a balance on hand December 1, 1921, of $252.05.

Officers were elected as follows for the year 1922:

President	H. T. Osborn
Vice-President	D. T. Fullaway
Secretary-Treasurer	H. F. Willard
Additional Members of Executive Committee	W. M. Giffard D. L. Crawford

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ANNUAL PRESIDENTIAL ADDRESS.

"Observations on the Phenomena of Heredity in the Ladybeetle, Coelophora inaequalis Fabricius."

BY P. H. TIMBERLAKE.

PAPERS READ.

"New and Little Known Hawaiian Delphacidae (Homoptera)."

BY F. MUIR.

"Tables of Distribution and Food-Plants of Hawaiian Delphacidae (Homoptera)."

BY WALTER M. GIFFARD.

"A Study of the Lucanid Coleoptera of the Hawaiian Islands."

BY EDWIN C. VAN DYKE,
University of California.

"A New species of Rhyncogonus from the Hawaiian Islands (Coleoptera-Rhynchophora)."

BY E. C. VAN DYKE.

"Descriptions of New Genera and Species of Hawaiian Encyrtidae (Hymenoptera), III."

BY P. H. TIMBERLAKE.

"Descriptive and Biological Notes on Blepyrus insularis Cameron (Hymenoptera)."

BY P. H. TIMBERLAKE.

NOTES AND EXHIBITIONS.

Anthomyia vicariens Schiner.—Mr. Whitney exhibited specimens of this fly collected October 2, 1921, by Mr. Ehrhorn in his chicken yard in Manoa Valley. They were referred to Dr. Aldrich of the U. S. National Museum, who states that they belong to this Australian species.

Goniodes stylifer.—Mr. Swezey exhibited one specimen of this turkey louse, collected from a turkey by Dr. H. L. Lyon. The only previous record was by Van Dine, collected on Molokai in 1908.

Lariophagus texanus Crawford. — Mr. Willard exhibited specimens of this Pteromalid, which were reared from *Mylabris sallaei* in pods of *Acacia farnesiana,* collected at Ninth avenue, Kaimuki, and near the Wailupe wireless station at Waialae. He stated that this parasite, which was introduced into Hawaii from Brownsville, Texas, by the Federal Bureau of Entomology, was liberated in these two localities on the 6th and 19th of October, 1921. From pods collected at these two places in the latter part of November, 1921, eight males and forty-eight females were reared, showing that it had established itself in a very short time.

Immigrant Records for 1921.

BY THE EDITOR.

In this list of immigrant insects, those marked with an asterisk were first observed in 1921. The others have been known to be present for from a few to several years, but either unrecorded or their identity not known. Determinations of these are now recorded for the first time. For details of records, etc., refer to the pages given.

	Page
**Stenommatus musae* Marshall (Col.)	2
Stenotrupis sp. (Col.)	2
Mitrastethus bituberculatus (Fabr.) (Col.)	3
Cycloptiloides americanus (Sauss.) (Orth.)	6
**Casinaria infesta* (Cress.) (Hymen.)	6
**Telenomus* sp. (Hymen.)	9
**Eulophus* sp. (Hymen.)	10
Clytus annularis Fab. (Col.)	10
Amblyteles purpuripennis (Cress.) (Hymen.)	12
**Cirrospilus* sp. (Hymen.)	15

PAPERS PRESENTED DURING 1921.

A Study of the Lucanid Coleoptera of the Hawaiian Islands.

BY EDWIN C. VAN DYKE,
University of California, Berkeley, Cal.
(Presented by title by W. M. Giffard at the meeting of December 1, 1921.)

In the year 1871, the first specimens of Hawaiian Lucanidae were secured by Mr. Harper Pease, from the "Mountains of Kanoi," and sent to the British Museum, where they were studied by Charles O. Waterhouse [1] and a new genus, *Apterocyclus*, with one species, *honoluluensis*, established for their reception. By the time the "Fauna Hawaiiensis" was published, a few more specimens had been secured, chiefly by Mr. Perkins. These were studied by Dr. David Sharp [2] and, as several were found to differ considerably in structure from the species described and figured by Waterhouse, were described as new. This brought the number of known forms from the islands up to seven, where it has remained ever since. Within the last few years, however, a fairly large number of specimens has been collected, especially through the field work of Mr. J. August Kusche, who captured, in 1919, considerably over a hundred specimens in the uplands of the island of Kauai and of Mr. H. T. Osborn, who found about a dozen, at Puu Ka Pele, Kauai, the same year. A portion of the specimens collected by Mr. Kusche came to me through the courtesy of Mr. Preston Clark, of Boston. The remainder were secured by Mr. W. M. Giffard and the Bishop Museum, both of Honolulu. Mr. Osborn's specimens went to the collection of the Hawaiian Sugar Planters' Association.

As a result of an examination of my specimens, I soon found that our ideas with regard to the group needed revision. Mr. Giffard, who had been studying the specimens in the islands, came to the same conclusion and later on, finding that I had been devoting some time to their study, wrote to me and

[1] Trans. Entom. Soc. London, 1871, p. 315.
[2] Fauna Hawaiiensis, Vol. III, Pt. V, Coleoptera, pp. 403-405.

requested that I complete the work already begun. At the same time, he offered to have all of the specimens in Hawaiian collections shipped to me and generously placed all of his notes, dissections, and drawings at my disposal. All of this material is now before me as a result of this kind offer and of the assistance of Mr. Swezey, who shipped much of it.

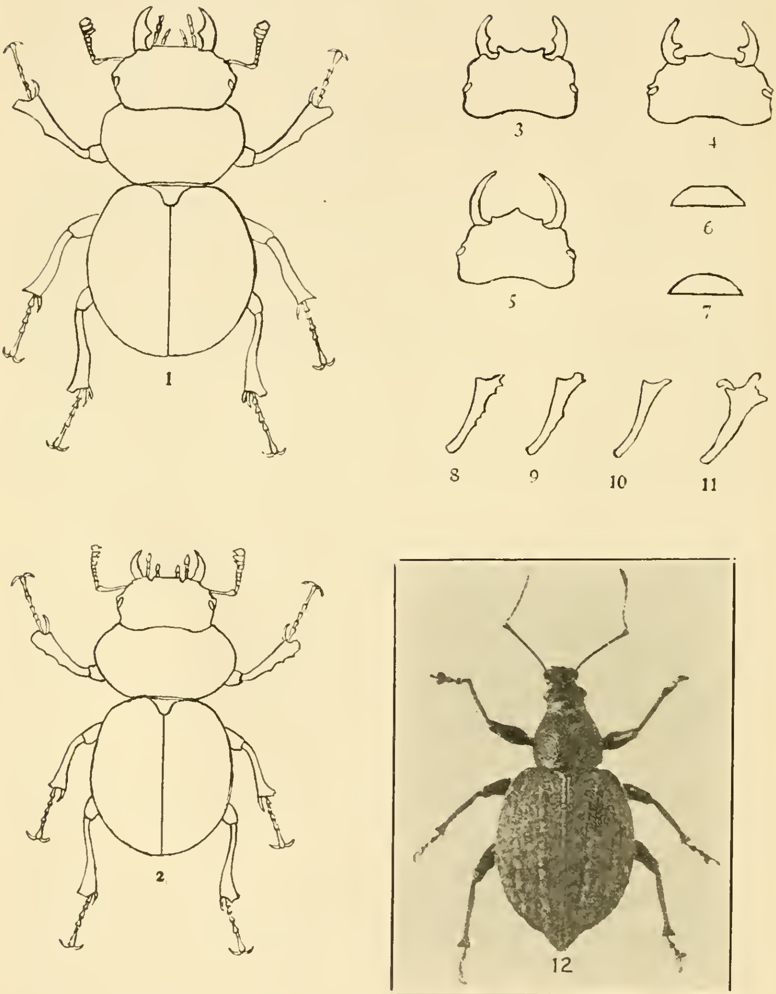
The genus *Apterocyclus* is peculiar in that it is wingless and without a labrum. It was stated by Waterhouse to be somewhat related to the Chilian genus *Sclerostomus*, but by Sharp supposed to be closer to the genus *Dorcus*, and to this latter view I agree. In fact, all specimens seen appear superficially like very degenerate and chubby species of *Dorcus*. Among the individuals of the genus there is also a very great amount of variation. I have had the opportunity to study one hundred and thirty-six specimens and as a result of this, supplemented by a careful examination of the dissections and drawings of the genitalia of numerous divergent forms, made by Mr. Giffard, have come to the conclusion that there is but one species, *honoluluensis*, and that all other so-called species are but variants of this. It seems to me that we have here a case of a species of *Dorcus* or of a closely related genus having become established at a very ancient time on what is now the island of Kauai, and of having undergone subsequent to that time a great degree of modification, chiefly along lines of degeneration. The species having once lost its stable status, soon acquired a great deal of plasticity which has been retained to the present date. The degeneration is shown in such ways as the absolute loss of wings and the resulting reduction of the entire afterbody, particularly evident in the shortening of the metathorax, as is clearly to be seen beneath in the very short metasternum, and the shortening and rounding of the elytra, a character that is always to be noted in species which have been long without wings; the loss of the labrum; and the shrinking of the integument, particularly noticeable in the elytra of the males. The species has undoubtedly developed its subterranean habits [3] with the resulting enlargement of legs,

[3] Mr. Kusche told me that he found practically all of his specimens in old rotting stumps or at the base of the same, and that sometimes they were some distance below the surface.

though there has been no appreciable reduction or other modification of the fore tarsi, as is so often found in fossorial Lamellicornia. The males show the usual Lucanid tendency to vary as regards the mandibles, the head, and prothorax; and the species as a whole, the tendency of lignivorous insects in general to vary greatly as to size. The largest males are fully 21 mm. in length from clypeus to apex of elytra and 11 mm. in greatest breadth, while the smallest specimen seen is hardly 12 mm. in length and 6 mm. in breadth.

The structures which I have found to be the most important from the standpoint of variability and useful as indices for my work, are the mandibles, the clypeus, the submentum (the mentum of earlier authors), the sides of the head, the fore tibia, and the scutellum, and to a lesser degree the middle and hind tibia. In no two specimens from the large number under observation, could I find all of the characters absolutely the same, though in the majority a certain proportion of the characters were alike. As regards the mandibles, there were found four main types: the first, the generalized and usual form with a moderately developed and acute tooth at about the middle, such as is shown in Plate I, fig. 1; second, a form with the tooth much more elongated and blunt at the tip and also projecting somewhat upwards as well as inwards, fig. 4; third, a form with greatly elongated, almost straight, and toothless mandibles, fig. 5; and fourth, a much reduced simple type of mandible with at most only a slight enlargement where the tooth should be, fig. 2. The first three forms are only found in the males and the last is restricted to the females. The clypeus shows that it may vary in three distinctive ways: have a transverse anterior margin, fig. 1; a pronounced bi-emarginate anterior margin, fig. 3; or be somewhat triangular with the middle much produced, fig. 5. The sides of the head are almost straight and parallel in a few, with the canthus not prominent and not impinging upon the anterior portion of the eye, fig. 3; somewhat rounded and with a well developed, more or less tuberculous canthus that decidedly overlaps the anterior margin of the eye, fig. 1; and quite oblique and converging anteriorly, with but a moderate development of the canthus, though with the same slightly im-

Plate I.



Apterocyclus and Rhyncogonus.

pinging upon the eye, fig. 5. The anterior tibia may have the outer margin multidentate, fig. 8; may be somewhat simple in outline, fig. 10; or have the apex decidedly tripalmate, fig. 11. Composite types may also be found as in fig. 9. The scutellum is normally moderately prolonged and evenly rounded at the apex as shown in figs. 1 and 2, but in a few it is much shortened, greatly elongated and with parallel sides, or quite triangular and acute at the apex. The middle and posterior tibia may be simple and untoothed as with the majority, or provided with an acute tooth at about the middle as was no doubt the ancestral condition. Other characters are also variable, but they are of less value for purposes of differentiation. The male genitalia have been carefully studied by Mr. Giffard. I have critically examined the mounted dissections which he made from various forms, together with his drawings, and can find no differentiating characters of moment, though there were noted minor modifications. These latter, I believe, are mainly due to the changes which have been produced in the parts by mounting rather than to any material difference in the structures themselves. The male genitalia do, however, show distinctive generic characters. Plate II, which is made from one of Mr. Giffard's careful drawings, will give a good idea of the distinctive features, and enable anyone who wishes to contrast them with those found in other genera of the Lucanidae.

Studying the specimens themselves in regard to the struc-

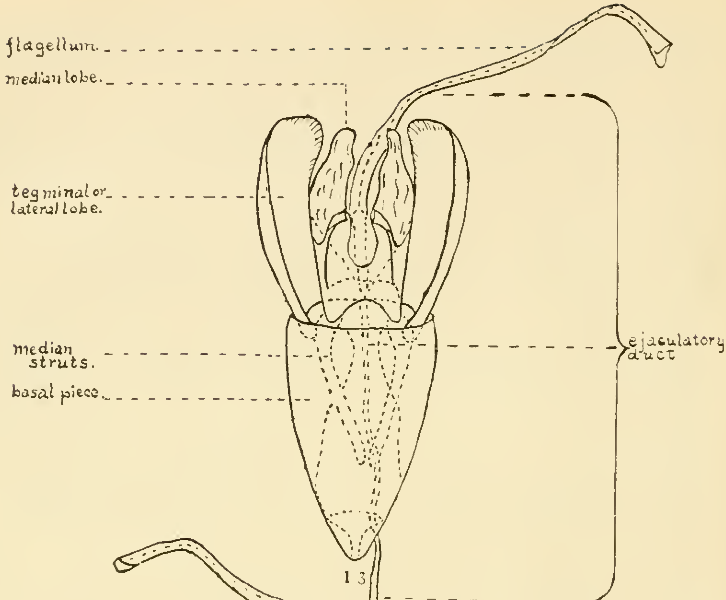
EXPLANATION OF PLATE I.

Fig. 1, Male of Apterocyclus honoluluensis Waterhouse (typical form).
Fig. 2, Female of Apterocyclus honoluluensis Waterhouse (typical form).
Fig. 3, Head of Apterocyclus honoluluensis var. waterhousei Sharp (typical).
Fig. 4, Head of Apterocyclus honoluluensis Waterhouse (atypical form).
Fig. 5, Head of Apterocyclus honoluluensis var. palmatus n. var.
Fig. 6, Submentum, trapezoidal form.
Fig. 7, Submentum, simple or arcuate form.
Fig. 8, Fore tibia, the multidentate form.
Fig. 9, Fore tibia, a composite form.
Fig. 10, Fore tibia, a simple or reduced form.
Fig. 11, Fore tibia, the tripalmate form.
Fig. 12, Rhyncogonus alternatus n. sp.

tures indicated above, I found that they could readily be put into four main assemblies or groups. Three of these would include only males and the fourth only females. The three male types are sufficiently distinctive to be listed as varieties. The female type is fairly constant, the males less so, some being intermediates between two or more of the dominant types.

The members of the first group, I would in general characterize as being quite large and robust and with sides somewhat parallel; the head with moderately well developed and toothed mandibles, the clypeus bi-emarginate in front, and with the sides almost parallel and with the canthus but moderately developed and not or but slightly impinging upon the eye, fig. 3; a prothorax, large and with sides almost straight; the fore tibia large and multidentate on the outer margin; the middle and hind tibia each with a well developed and acute tooth near the middle, the scutellum of the normal type, fig. 1; and the submentum of the trapezoidal type, fig. 6. Two of the specimens before me are of this type, both collected by Mr. Kusche near the Waialae river, Kauai, and now belonging to Mr. Giffard. *Apterocyclus waterhousei* Sharp would also belong here. The elytra in this last are spinous at the sutural apex and the anterior margin of the clypeus somewhat truncate according to the illustration, but these are divergent and individual characters and of less value than are the characters which associate it with the others. The individuals of this group I would consider as most generalized and closest to the ancestral stock. The large size, more parallel form, smooth mahogany colored surface, and many toothed anterior tibiae, show that they have departed the least from their progenitors. The possession of wings and labrum and the general development which wings would require would make them almost typical species of *Dorcus*.

The second group, I would consider as including the specimens approximating the type of the genus, *Apterocyclus honoluluensis* Water., or like the one outlined in fig. 1. These would in general have moderately developed and toothed mandibles, the clypeus with a truncate or straight anterior margin, the head with the sides somewhat rounded though slightly angulated because of the development of the canthus, which always impinges upon the eyes, a submentum with the anterior margin arcuate, fig. 7, a scutellum of the usual form, anterior tibia with only a single tooth at the middle, fig. 1, or even without, fig. 10, and middle and posterior in general without the lateral tooth. The beetles included here are the dominant forms. They are very dark, almost black, and in general quite opaque throughout, only a few showing on the head and prothorax the smoothness and mahogany color which is so characteristic of the females and of the members of the first group. These I would consider as having become most specialized along lines of degeneration. Among the members in this assembly will be seen the greatest amount of minor variations and signs of unstableness. The specimens as a whole show a great degree of reduction and simplification of structure as well as peculiar modifications and they vary also greatly in size, many of the less developed being much distorted and asymmetrical. The mandibles may be large or small, have a large tooth, fig. 4, or one much reduced but never absent, though the usual is with one of moderate size, fig. 1. In a few specimens the tooth is short and very broad at base, and in a number there is an additional but very small denticle not far from the apex of the mandible. The clypeus though generally straight along its anterior margin, may in some of the larger individuals show a bi-emarginate margin though never to such a marked degree as seen in group one, or a tendency toward the triangular shape so characteristic of the following group. In one or two of the more extreme phases, the margin is retracted and emarginate and in several almost evenly arcuate. The submentum is trapezoidal in a few of the larger specimens, though in the majority, simply arcuate, fig. 7. The sides of the head are, as a rule, as shown in fig. 1, though there is a great degree of variability as to the details of the outline, especially as to the prominence of the canthus and its relationship to the eye. The scutellum is generally normal, fig. 1, but in a few, great instability is shown by its assuming unusual shapes, as when the lobe becomes greatly elongated or quite triangular. The fore tibiae are, as indicated, in general quite simple as to the shaft but often variable as regards the apex. In the middle and hind tibiae, the shaft is usually



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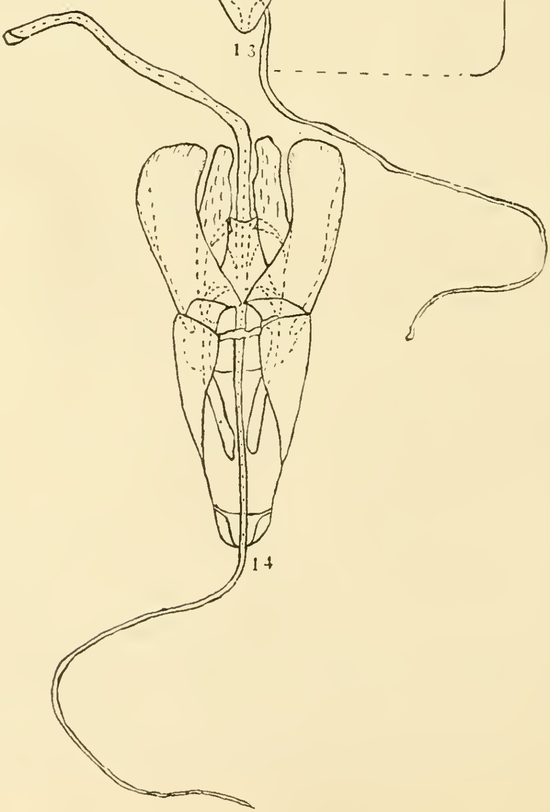

14

Male genitalia of Apterocyclus.

simple, though often definitely toothed. Most of the specimens seen came from an altitude of from three thousand to over four thousand feet, as from Kokee and Puu Ka Pele, on the island of Kauai, and were collected during May or June. I believe that from this group will develop the dominant and perhaps stable type of the future if the species persists. At present, however, there is great instability. Among the described forms I would assign to this group besides *Apterocyclus honoluluensis* Water., previously mentioned, *A. munroi* Sharp, *A. adpropinquans* Sharp, *A. varians* Sharp, and *A. deceptor* Sharp, so-called species which are but slightly different, each in its own way, from the bulk of this group. If I were to name other new forms, basing them upon the same degrees of modification, noted for the above, I would need to designate at least fifty new forms, for, as I have previously stated, hardly any two specimens have the same structures modified in the same way and to the same degree.

The third group will include a number of individuals which are primarily characterized by being quite large, robust, and decidedly opaque. They have much elongated and untoothed mandibles, fig. 5, a triangular clypeus, and fore tibiae very robust and markedly tripalmate at the apex, fig. 11. In one specimen, the submentum is arcuate anteriorly, in the others, trapezoidal. In all other regards, they resemble the members of group two and show the same degree of variability as regards character. Five specimens of this phase are now before me, one belonging to the Bishop Museum, one to Mr. Giffard, and three to me, all collected by Mr. Kusche at an altitude of four thousand feet on the island of Kauai. This very distinct phase, I consider worthy of a name so will call it the variety *palmatus* n. var. and designate one of my specimens as the type, the other specimens as paratypes. It is a

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EXPLANATION OF PLATE II.

Fig. 13. Male genitalia of Apterocyclus honoluluensis Water., upper side.
Fig. 14. Male genitalia of Apterocyclus honoluluensis Water., under side.

Figs. 13 and 14 are copied from drawings made by Mr. W. M. Giffard, and the parts are named according to the nomenclature of Sharp and Muir.

form which has become extremely modified along peculiar lines and seems to indicate that it is being adapted to a subterranean life. The long, almost straight, and porrect mandibles and heavy, fossorial anterior tibiae are such as one usually finds in insects leading a burrowing life.

The fourth group includes only females. Those which I have seen are of rather small size, averaging 18 mm. in length from clypeus to apex of elytra, are somewhat shining and of a rich mahogany color, have short and simple or untoothed mandibles, the clypeus with a straight anterior margin or merest indication of being bi-emarginate, a submentum that is more or less trapezoidal, and anterior tibiae that are always well developed apically and have a few lateral denticles, fig. 2. In two of the specimens under observation, the middle and posterior tibiae have a small tooth near the middle, but in the remainder the tibiae are simple. These females are also very hairy beneath, body as well as legs, and this degree of pilosity is never approached by any of the males. Seven specimens have been examined, one belonging to the Bishop Museum, one to the collection of the Hawaiian Sugar Planters' Association, one to Mr. Giffard, and four to me. The second specimen mentioned was captured by Mr. H. T. Osborn at Kokee, Kauai, June 11, 1919, and in company with eleven males of group two. The others were found by Mr. Kusche at an altitude of four thousand feet on Kauai, and in company with specimens of group three and a large series belonging to group two. The only other female that I know of is the one described as *Apterocyclus feminalis* Sharp which, according to the description and figure is not appreciably different from those seen by me.

Thus to sum up, I would state that, according to my judgment, there is but one species of the family Lucanidae in the Hawaiian Islands, *Apterocyclus honoluluensis* Waterhouse. The female of this, separately described as *Apterocyclus feminalis* Sharp, is readily separated from any of the males, by good characters, and is also fairly stable. The males, on the other hand, are markedly unstable and polymorphic, though as far as known examples show, they appear to be specialized in general in three ways: first, towards a retention of many of the primitive characteristics as is shown by members of the first group, which might be designated by the name *waterhousei* Sharp and listed as a phase or variety of the species *honoluluensis* Water.; second, along lines of degeneration and simplification of structure, including all members of my second group, and to be designated as the typical form; and third, along lines of great modification as regards the mandibles and anterior tibiae, a result, I think, of becoming more adapted to a subterranean mode of life, producing a phase which I would designate as the phase or variety *palmatus* n. var.

For the opportunity to study this most interesting group of beetles I must thank the following good friends: Mr. W. M. Giffard, Mr. Preston Clark, and Mr. O. H. Swezey. Mr. Giffard in particular aided me in every way that was possible.

A New Species of Rhyncogonus (Rhynchophorous Coleoptera), from the Island of Kauai, Hawaiian Islands.

BY EDWIN C. VAN DYKE,

University of California, Berkeley, Cal.

(Presented by title by W. M. Giffard at the meeting of December 1, 1921.)

Rhyncogonus alternatus n. sp.

Robust, very convex, blackish-brown, the tibiae and tarsi somewhat reddish; head with rostrum slightly longer than diameter across the eyes and coarsely, somewhat strigosely punctured above, the punctures of the front more rounded, and finer posteriorly, the surface sparsely clothed with light-brown hair, denser in the supraorbital region, the antennae with the first and second joints of the funiculus of about equal length; the prothorax broader than long, with sides almost parallel in basal half and slightly rounded and convergent anteriorly, the disc coarsely, cribrately, and irregularly punctured, with a smooth median longitudinal line, the surface sparsely pilose, like the head but with a tuft of lighter colored hair near the posterior angles; the elytra somewhat longer than broad and twice as broad as prothorax, very convex, even in the male, and with the carinate margin only evident near the humeri, the disc with rows of large and well-impressed punctures, the intervals flat except every fourth which is a bit convex and more elevated, the surface densely clothed with moderately long reddish-brown pile which is inclined to be collected into tufts and somewhat vittately arranged, the vittae on the more elevated intervals being especially prominent. Beneath, the body is coarsely closely punctured and sparsely finely pubescent. Male, length, 10 mm., breadth, 5 mm.; female, length, 12 mm., breadth, 6 mm. Plate I, fig. 12.

This species is evidently somewhat related to *Rhyncogonus depressus* Sharp. and *Rhyncogonous vittatus* Sharp, differing primarily from both by being very convex, also by the color of the pile and its arrangement. In *depressus*, the pile is uniformly arranged and closely appressed; in *vittatus*, arranged in series of somewhat regular vittae; while in *alternatus*, it is not only somewhat longer and coarser, but darker, and inclined to be so dispersed that the covering of every fourth interval is more prominent. In drawing up this description, I have examined twenty-eight mounted specimens from my collection, and previously had seen several times that number, all collected near a swamp, at an altitude of about four thousand feet, on the island of Kauai, during June, 1919, by Mr. J. August Kusche.

Type male and allotype female in my collection, also several others designated as paratypes, a pair of which will be deposited in the Bishop Museum, Honolulu, and the California Academy of Sciences, San Francisco.

Identity of the Hawaiian Carpenter Bee of the Genus Xylocopa (Hymenoptera).

BY P. H. TIMBERLAKE.

(Presented at the meeting of January 6, 1921.)

The Hawaiian carpenter bee has been established in the Islands for many years, and was first collected by Blackburn. F. Smith (Journ. Linn. Soc. London, 14, p. 684, 1879), and W. F. Kirby (Entom. Mo. Mag., 17, p. 86, 1880) both identified the species as *Xylocopa aeneipennis* (De Geer), which is now commonly synonymized with *X. brasilianorum* (Linn.). This identification has been followed by most later writers, including Perkins (Fauna Hawaiiensis, I, p. 113, 1899) and Maidl (Ann. k. k. Naturh. Hofmus., 26, p. 307, 1912).

In 1899, Alfken (Entom. Nachr., 25, pp. 317, 318) pointed out the differences between our insect and *brasilianorum* and identified it with *X. chloroptera* Lep. from China and the East Indies, but later retracted this determination, using the name *brasilianorum* in 1903 (Zool. Jahrb., 19, p. 576).

Our insect, however, is strictly identical with a species common in Southwestern United States, which was described as *X. varipuncta* by Patton in 1879 (Canad. Entom., 11, p. 60).* Females from Whittier, California, and Hawaiian specimens agree exactly even in the minutest details of puncturation. It is likely, therefore, that the species was introduced from California instead of from South America, as formerly supposed. Maidl also records (l. c., p. 264) a female *brasilianorum* from Japan, and it would be interesting to know whether this is also *varipuncta*.

Proc. Haw. Ent. Soc., V, No. 1, October, 1922.

* Since this note was presented, Dr. T. D. A. Cockerell has examined Hawaiian specimens and pronounces them to be exactly *varipuncta*, which he considers to be distinct from *brasilianorum*. Mr. S. A. Rohwer has also kindly compared specimens with others in the U. S. National Museum from Arizona, and finds them to be identical.

Observations on Xylocopa and Lithurgus (Hymenoptera).

BY W. M. GIFFARD.

(Presented at meeting of January 6, 1921.)

On December 22, Mr. Muir and I were at Waialua and observed the males of *Lithurgus albofimbriatus* swarming around the exit holes of *Xylocopa varipuncta* in part of an old tree-trunk, which had been utilized as a fence-post. It was quite evident that the males were waiting for the emergence of females. At the time no *Xylocopa* were noticed in the immediate neighborhood. Five days later, December 27, I again visited the place for the special purpose of cutting away a portion of the fence-post for further study and examination. The swarming of *Lithurgus* males, previously noticed, had entirely ceased. In a wait of one hour only two solitary specimens on the wing were seen in the immediate neighborhood (one male and one female), but *Xylocopa* were flying around the post, entering and emerging from their burrows in numbers.

Bringing the cut sections to Honolulu and bagging them for better observation, emergence of both *Lithurgus* and *Xlyocopa* began on the day following in large numbers, so that at the expiration of seven days nineteen males and twenty-three females of *Lithurgus* and twenty-two males and twenty-seven females of *Xylocopa* had emerged from two sections of post, measuring in all 2½ feet by 8 inches in diameter. (Note.—A large proportion of the *Lithurgus* and some of the *Xylocopa* were found to be attacked by large swarms of Acari. These had massed themselves in swarms to the propodeum and anterior segments of the abdomen.)

Upon opening the sections for further observation, the channels of both *Lithurgus* and *Xylocopa* were plainly seen, together with many old cocoons of the former and others containing pupae. The larvae of *Lithurgus* were not observed, nor were the pupae of *Xylocopa* seen. It is safe to say that quite a few more *Lithurgus* would have emerged had the splitting of the sections of the post been further postponed. There remained in the channels two males and one female, and one partly grown larva of *Xylocopa.*

In addition to the above Aculeates, the sections of post contained large swarms of *Pheidole megacephala,* which had taken possession of the old channels of the *Lithurgus.* It was observed by Muir and Timberlake at the time the sections were split that *Lithurgus* apparently filled up the most of its old channels by the frass taken from those newly constructed, this frass even tightly packing up the interior of the old cocoons.

From beneath the bark and in some of the channels were swarms of the Tenebrionid beetle (*Alphitobius piceus*); also one example of *Oxydema fusiforme,* also a number of small Roaches, one Centipede, and the larva of an Elaterid beetle.

Insect Collecting in Zero Weather in Illinois.

BY O. H. SWEZEY.

(Presented at meeting of March 3, 1921.)

The week before Christmas, December, 1920, I spent at a farm house near Rockford, Ill. It was hardly a favorable time for collecting insects, as for a part of the time the temperature dropped as low as zero. However, a few interesting captures were made, which are now exhibited.

In a cavity in the center of a block of wood, recently brought in from the forest, was found a colony of the large black wood ant, *Camponotus pennsylvanicus* (Deg.), of which a series of specimens was secured. Among these ants some queer brown insects were noticed, and sixteen of them were collected. These proved to be a species of Staphylinid beetle, *Xenodusa cava* (Lec.), which is an inquiline in ants' nests. I had never before seen any of these insects. The ants feed the beetles and their larvae, and they in turn lick the clusters of hairs on the sides of some of the adbominal segments of the beetles. An account of this is given in Wheeler's Ant Book.

In another cavity, which was an old channel of some wood borer, opening out to the exterior, was a mud nest of some wasp, containing several cells in a mass. From this mud nest, four pretty, white-marked Ichneumonids * issued the latter part of February; also 143 small *Tetrastichus* issued during the middle of the same month. The latter were determined as *Tetrastichus johnsoni* Ashmead, by Mr. Timberlake.† One wasp, *Ceropales fraterna* Smith, issued March 3. From what has been previously observed of this wasp, it may have been a parasite on the wasp which was the builder of the nest. If so, the true builder of the nest was not learned, for the total emergences are given above. On examination of the eight cells of the nest, one cell contained the cocoon of the *Ceropales fraterna;* four cells contained the cocoons of the Ichneumonids; two cells contained cocoons of the Ichneumonid from which

* *Mesostenus discoidalis* Cresson, as determined later by R. A. Cushman.

† Identification confirmed by Mr. A. B. Gahan by comparison with types in the U. S. National Museum.

the *Tetrastichus johnsoni* had issued, thus proving the host of this parasite; the remaining cell contained a cocoon of the Ichneumonid with a dried-up larva.

It was not possible to determine the host of this Ichneumonid. But it must have been either the *Ceropales fraterna*, or if this wasp was a parasite on some other wasp (possibly an *Agenia*) that may have built the nest, the Ichneumonid might have been a parasite on the *Agenia*.

In similar blocks of wood were found many larvae of two or three Longicorn beetles, and possibly of Buprestids as well. None were collected, nor were any adults found, or remains of any adult beetles that might be a help to the identification of the larvae. Beneath the bark where beetle larvae had been working, three cocoons were collected, from which one Braconid‡ issued. It probably was a parasite on some one of the beetle larvae.

‡ *Atanycolus* sp., as determined later by S. A. Rohwer.

Insects Attacking Ferns in the Hawaiian Islands.

BY O. H. SWEZEY.

(Presented at the meeting of March 3, 1921.)

In a recent paper by Dr. Charles T. Brues on "The Selection of Food-plants by Insects, With Special Reference to Lepidopterous Larvae,"* he says, "The term phytophagous with reference to insects is commonly employed in a considerably restricted and rather inaccurate sense, including only those species that feed upon the higher plants, meaning by these the ferns and flowering plants. Only an extremely small, almost negligible, proportion subsist upon ferns, so that from a practical standpoint, we would include only those feeding upon the Spermatophytes."

It is to be presumed that Dr. Brues has in mind conditions of his region, the Eastern United States, when he says an almost negligible proportion of insects subsist upon ferns. Here in the Hawaiian Islands a considerable number of insects subsist exclusively upon ferns, besides quite a number of others which are more or less associated with them.

During the seventeen years that the writer has been engaged in economic entomology in the Hawaiian Islands, the study of the habits, host-plants, life histories, parasitic relations, etc., of the endemic insects have received considerable attention as well as have the introduced insects which were of economic importance. In becoming familiar with the endemic insect fauna of the Hawaiian Islands, one soon learns that the different species are largely attached to particular trees or plants, and conversely that each species of tree or plant has its own peculiar insect fauna—one or more species of insects which feed upon it exclusively. Following out this phase of the insect relations to the plants, much attention has been given to the study of the insect faunas of some of the more important native trees which seemed to have a larger insect fauna than many of the other species.

Along these lines, the native ferns in the Hawaiian Islands have come in for their share of similar consideration. The

Proc. Haw. Ent. Soc., V, No. 1, October, 1922.

* American Naturalist, LIV:313, 1920.

Hawaiian Islands are rather rich in ferns, from very small moss-like species to large tree-ferns, about 130 species in all, and there is found to be quite an extensive insect fauna peculiar to these ferns. Perhaps not every species of fern is attacked by insects, but there are quite a number which have one or more species of insects peculiar to them. Information on these insects accumulates slowly, and is as yet far from complete, but the following are known at present:

Lepidoptera.

Eriopygodes euclidias (Meyrick). [Caradrinidae.]

This moth is very abundant in the forests where ferns abound. Its caterpillar is the cutworm type, though it remains on its food-plant in daytime instead of hiding under rubbish or in the soil. They feed on many kinds of ferns, and apparently only on ferns. The caterpillar varies from nearly plain green to almost black.

Scotorythra rara (Butler). [Selidosemidae.]

Caterpillars of this moth are very polyphagous, mostly feeding on trees, but they have also been found feeding on ferns. They occur on all the islands of the group.

Batrachedra sophroniella Walsingham. [Hyponomeutidae.]

The larvae of this moth feed on the sporangia of *Aspidium cyatheoides*, protected by a web. When there are no more sporangia, they feed on the undersurface of the frond, eating away the parenchyma and leaving the upper epidermis which then shows as dead spots. Pupation takes place within a cocoon alongside of the midrib of a pinna. This moth is known on Oahu, Maui, and Hawaii. I have taken it at Pauoa, Mt. Tantalus, Pacific Heights Ridge, Hillebrand's Glen, Halawa, and Waiawa on Oahu; Keanae, Maui; Waimea, Hawaii.

Batrachedra lomentella Walsingham. [Hyponomeutidae.]

This species has similar habits, but the identity of the fern to which it is attached cannot be stated with certainty. The moth is known on Oahu and Hawaii. I reared it from unidentified ferns in Hakalau Gulch, Hawaii; and Palolo, Oahu.

Batrachedra bedelliella Walsingham. [Hyponomeutidae.]

The larvae of this tiny moth feed among the sporangia of the birdnest fern, *Asplenium nidus.* I have reared them from Palolo, Oahu, and Hakalau, Hawaii. They no doubt occur on all the islands where this fern does. In the Fauna Hawaiiensis the species is recorded from Maui and Molokai. I have found larvae feeding among the sporangia of *Elaphoglossum reticulatum* in Palolo Valley, Oahu, which I failed to rear. It may be the same species, and yet it might be still another species of the same genus.

Batrachedra syrraphella Walsingham. [Hyponomeutidae.]

The larvae of this species feed on the sporangia of *Dryopteris parasitica.* They hide within a white silken tunnel produced wherever they are feeding. I have reared it from Palolo Valley and from Waianae, Oahu; and have collected it besides at Niu, Wailupe, Kaumuahona, Hillebrand's Glen, Waiahole and Kaala, Oahu. In the Fauna Hawaiiensis it is also recorded from Kona and Kilauea, Hawaii.

Batrachedra sp.

I found fronds of *Pteris irregularis* on Mt. Tantalus, Oahu, very much mined by a small larva which was taken to be of a species of *Batrachedra*, but no adults were reared to prove their identity.

Batrachedra spp.

There are four other native species of this genus whose habits are not known, but it is likely that they may be found to be attached to some of the ferns.

At several places in the mountains of Oahu, *Polypodium spectrum* fronds have been found mined by a lepidopterous larva larger than the preceding. None have been reared, however, so that the species of moth is yet unknown.

Euhyposmocoma ekaha (Swezey). [Hyponomeutidae.]

The larvae of this moth feed singly on the underside of the fronds of *Asplenium nidus.* They eat off the parenchyma, leaving the upper epidermis which shows as dead patches. While feeding, the larva is protected by a covering of silk and frass, making a sort of covered way connected with a burrow in the midrib where the larva stays when not feeding. This covered way is shifted as the eaten-off area enlarges in size. This moth occurs wherever this species of fern is found in the numerous mountain valleys of Oahu, but has not yet been found on the other islands.

Euhyposmocoma trivitella Swezey. [Hyponomeutidae.]

The larvae of this moth are miners in the simple sterile fronds of *Elaphoglossum reticulatum,* and have been found only on the east side of the mountains of Kauai.

Hyposmocoma spp.

Several undetermined species of these tiny moths are associated with ferns. The larvae live in cases, and several kinds of these cases have been found on fern fronds or in dead, decaying frond-stalks of tree-ferns. Possibly they are not particularly attached to the ferns as host-plants. This remains to be determined.

Coleoptera.

Heteramphus filicum Perkins. [Cossonidae.]

This weevil is found in rotting tree-fern trunks or stumps on Oahu. As yet it is not known to have any other habitat, and is considered a fern insect.

Heteramphus wollastoni Sharp.

Heteramphus foveatus Sharp.

These two closely related species are also occasionally found in similar situations as *filicum* on Oahu, but their usual food-plant is *Astelia veratroides.*

Heteramphus swezeyi Perkins. [Cossonidae.]

The larvae of this species are miners in the sterile fronds of *Elaphoglossum reticulatum, micradenium, gorgonum* and *squamosum.* They pupate and develop to the adult beetle within the mine. The species has been observed chiefly in Palolo Valley, Oahu, but has been taken also at Punaluu towards the opposite end of the same mountain range, and its mines have been observed at Wahiawa about the middle of the range; hence, it apparently occurs throughout the range. It has not yet been found on the other Islands.

Oodemas brunneum Perkins. [Cossonidae.]

This weevil occurs in dead frond-stalks of *Pteris* on Molokai.

Oodemas aenescens Bohman. [Cossonidae.]

This species occurs in dead frond-stalks of *Cibotium* spp.

on Oahu and Lanai. It is not confined to ferns, however, for it also occurs in dead branches of many kinds of trees and shrubs.

Pentarthrum prolixum Sharp. [Cossonidae.]

This elongate weevil is found, often abundantly, in the dead frond-stalks of two or three species of *Cibotium*, tree-ferns. It does not occur on anything else. It is common on all the Islands.

Dryophthorus pusillus Sharp. [Cossonidae.]

This weevil occurs on Oahu, and inhabits decaying tree-ferns, *Cibotium* spp.

Dryophthorus modestus Sharp. [Cossonidae.]

This species occurs on Oahu, Maui, and Hawaii, and is rarely found in similar places to the preceding.

Dryophthorus insignis Sharp. [Cossonidae.]

This species occurs on all the Islands and is more often found on tree-ferns, inhabiting the dead frond-stalks. The species of the genus *Dryophthorus* usually feed in rotten wood, and it is likely that some of the other species may also be found in decaying fern-stems.

Pseudolus longulus (Boh.). [Cossonidae.]

The larvae of this weevil feed in the dead frond-stalks of *Cibotium chamissoi*. They also feed in dead bamboo and other dead or rotten wood. It occurs on all the Islands.

Proterhinus longulus Sharp. [Proterhinidae.]

This representative of the endemic family Proterhinidae is found on tree-ferns (*Cibotium chamissoi, C. menziesii*). The larvae feed in the dead frond-stalks. The species occurs only in the forests of Oahu.

Proterhinus pteridis Perkins. [Proterhinidae.]

This species occurs on Molokai, in the leaf-stalks of a species of *Pteris*.

Proterhinus sharpi Perkins. [Proterhinidae.]

This species occurs on Haleakala, Maui, on a non-arboreal fern. A number of other species of *Proterhinus* are commonly swept from ferns, and it is likely that they will be found to be attached to them when their habits are fully studied.

Holcobius hawaiiensis Perkins. [Ptinidae.]

This beetle has been taken at base of tree-ferns.

Nesapterus monticola (Sharp). [Nitidulidae.]

I found two specimens of this beetle in the dead frond-stalk of *Cibotium menziesii* in Palolo Valley. Otherwise the habits of the species are not known.

Diptera.

Drosophila sp. [Drosophilidae.]

An undescribed species of this genus has been reared from living frond-stalks of *Sadleria cyatheoides* at Niu, Oahu, and at Kilauea, Hawaii. The larvae are found in the very young fronds. They are very elongate, and tunnel up and down in the stem. There is hardly a frond to be found on any plant of this fern that has not several of these tunnels, but the fern does not seem to be seriously injured by them.

Agromyza sp. [Agromyzidae.]

An undescribed species of this genus is a miner in the fronds of *Marattia douglassi*. The mines are often very abundant, but very few adults have been reared. It occurs on Oahu, and possibly on the other Islands wherever the fern occurs.

Homoptera.

Oliarus kaonohi Kirkaldy and **O. montivagus** Kirkaldy of the Cixiidae have been reared from nymphs occurring in decaying frond bases and in the fibrous matter of tree-fern stems, and in the dead frond-stalks. It is likely that several of the other species of this genus are also attached to ferns, for many of them are taken by sweeping on ferns. It is probable that the near-related *Iolania perkinsi* Kirkaldy may be found to breed similarly, for the adults are commonly collected from ferns.

Ilburnia ipomoeicola Kirkaldy. [Delphacidae.]

This small leafhopper is associated with *Sadleria cyatheoides*. It oviposits very abundantly in the young tender frond-stalks. It has been reported on *Cibotium*, and also occurs on a few other plants. It is known on Kauai, Oahu, and Hawaii.

Ilburnia amamau Muir. [Delphacidae.]

This species occurs on *Sadleria cyatheoides* on Haleakala, Maui.

Ilburnia nephrolepidis (Kirkaldy). [Delphacidae.]

This species occurs on *Nephrolepis exaltata*. It has been collected at Maunawili, Oahu; Iao Valley, Maui; Ookala and Kilauea, Hawaii.

Nesorestias filicicola Kirkaldy. [Delphacidae.]

Has been collected from *Elaphoglossum gorgonum*, and possibly other ferns. Palolo, Pacific Heights and Tantalus, Oahu.

Nesorestias nimbata (Kirkaldy). [Delphacidae.]

Has been collected on *Phegopteris* sp. and may occur on other ferns. Collected at Kaumuahona, Waiawa, Waiahole and Punaluu, Oahu.

Nothorestias badia Muir. [Delphacidae.]

Collected on undetermined ferns at Kuliouou, Oahu.

Nothorestias swezeyi Muir. [Delphacidae.]

Collected on *Aspidium* sp. at Makaha, Oahu, 1500 feet elevation.

There are likely other species of Delphacidae yet to be discovered that are attached to some of the different ferns.

Nesophryne filicicola Kirkaldy. [Tetigoniidae.]

Nesophryne microlepiae Kirkaldy.

These two species were recorded from *Microlepia strigosa*, Kalihiwai, Kauai.

Idiopterus nephrolepidis Davis. [Aphididae.]

This aphidid is often found on *Elaphoglossum reticulatum* and some other native ferns, and by some is considered a native insect.

Orthoptera.

Paratrigonidium filicum Perkins. [Trigonididae.]

This small cricket was found by Perkins at Olaa, Hawaii (two thousand feet), "in dense forest, frequenting a tall soft fern, which covers the ground beneath the trees."

Paratrigonidium viridescens Perkins. [Trigonididae.]

This cricket was found in the same locality as the preceding species, but it "lives among a beautiful creeping fern, which clothes the tree-trunks in wet forests."

Banza spp. [Locustidae.]

Adults and young of several species are often found on ferns.

PREDATORS.

Several species of native Carabidae are always to be found in dead or hollow frond-stalks and decaying tree-fern stems, where they are in search of prey. An occasional predacious bug, and earwigs are also found in these places, as well as the peculiar crickets *Prognathogryllus* and allies.

None of the native insects occurring on ferns in the Hawaiian Islands are particularly injurious to the ferns which they infest. There are parasites working on them, which largely accounts for their control. There is no telling, however, but what they might prove serious pests, if by any chance some of them became introduced into other countries, just as the Australian fern-weevil has done in Hawaii.

Besides the endemic insects, a few others are sometimes found on ferns in the forests of Hawaii; as, for example, the wax scale (*Ceroplastes rubens Maskell*) on *Elaphoglossum reticulatum* and other ferns, and some of the other introduced scales on different ferns, but none of them are of any consequence.

Syagrius fulvitarsis Pascoe. [Molytinae.]

This is known as the Australian fern weevil,* which first appeared in fern-houses in Honolulu, and then a little later (about 1904) became established in the open and spread to a considerable extent in the mountains in the immediate vicinity of Honolulu, practically exterminating one of the most abundant ferns (*Sadleria cyatheoides*) and a species of *Asplenium,* but not harming the tree-ferns (*Cibotium* spp.) nor other ferns. The chief injury is done by the feeding of the larvae in the frond-stalks, killing them prematurely, and eventually causing

* *Ischiogonus syagrii* Fullaway, a parasite on the fern weevil, was discovered in Australia by C. E. Pemberton in April, 1921, and introduced to Hawaii. It became established quickly, but it yet remains to be demonstrated whether it will become as effective here as in Australia in controlling the pest.

the death of the whole plant. In 1909, it was found to have become established in a fern-house in Hilo on the Island of Hawaii. Attempts were made to eradicate it there, but later on it was found generally spread throughout the town, and by 1920 had extended its spread to some distance outside. A considerable colony was found at a distance of twenty-nine miles and at an elevation of nearly four thousand feet, near the volcano Kilauea, where there are extensive tree-fern forests, in places chiefly composed of *Sadleria,* which were thus threatened with destruction as they had been in the mountains near Honolulu. Strenuous measures were employed by the Territorial Board of Agriculture to eradicate the weevil in that place, with as good success as has ever been attained in the destruction of an insect pest that has once become thoroughly established.

Description of a Cuckoo-wasp from the Hawaiian Islands (Hymenoptera).

BY S. A. ROHWER.
Bureau of Entomology, Washington, D. C.
(Presented at the meeting of August 4, 1921.)

So far only one species of Chrysididae has been recorded from the Hawaiian Islands, and it seems to be undescribed. It has, however, been known to the entomologists of the Islands only since June, 1914, when a specimen was taken by Mr. Potter and formed the basis of a short note presented by Swezey to the Hawaiian Entomological Society (see Proc. Haw. Ent. Soc., Vol. 3, No. 2, 1915, p. 71). Since then the species has become more abundant, and in Proceedings of the Hawaiian Entomological Society (Vol. 3, No. 3, Sept., 1916, p. 142) Mant exhibited a number of specimens. The species has never been identified, but it has been assumed that it was introduced. In 1917 (Proc. Haw. Ent. Soc., Vol. 3, p. 288), Bridwell records having found adults of this Chrysidid in nests of *Sceliphron* at Diamond Head, Oahu. To accompany a letter dated June 4, 1921, P. H. Timberlake sent six specimens of this wasp to the United States National Museum for identification and referred to them as follows:

"I also send six specimens of a Chrysidid which was first taken here in 1914, and is now fairly common in Oahu. It has not been taken on the other Islands, although Mr. Swezey saw one on Kauai last summer, but was unable to catch it. It is known to parasitize the common *Sceliphron caementarium*."

It is unfortunate that there are no records which would indicate the native home of this species. At first thought one would think that it had been introduced with its host, but this cannot be the case because there is no Chrysidid of the subgenus *Pentachrysis* known from the native home of *Sceliphron caementarium*. Certain species of Chrysidids * are known to

* Besides those mentioned by Dalla Torre (Catalogue Hymenopterorum vol. 6, 1892) and Kohl (Ann. Naturh. Hofmus. Wien, bd. 32, 1918, p. 167) the following may be added: *Chrysis* (*Hexachrysis*) *durga* Bingham on *Sceliphron intrudens* Smith and *Chrysis* (*Trichrysis*) *tridens* Lepeletier on *Sceliphron caementarium* (Drury).

parasitize species of *Sceliphron,* and as the genus *Sceliphron* is known to occur in all zoological regions and the habits of many of the species are similar, it is fair to assume that if a Chrysidid parasitic on any species of this cosmopolitan genus was introduced into Hawaii it would easily adapt itself to the common species of the Islands.

I have compared the specimens before me with the descriptions of all the species assigned to the subgenus *Pentachrysis,* and am unable to find any description with which they will agree. The new species seems to be closely allied to the African *inops* Gribodo, but the transfrontal carina is much more deeply emarginate than it is in that species.

Chrysis (Pentachrysis) extraniens new species.

Female. Length 9.5 mm. Clypeus shining, with sparse distinct punctures, the apical margin with a deep, broad angulate emargination; frontal basin closely and rather finely punctured; at the sides the punctures are somewhat confluent and the surface is striato-punctate; across the top of the frontal depression there is a low nearly straight transverse ridge and above this a stronger, more complete ridge which is angulately emarginate medianly, and when seen from above appears as a deeply emarginate transfrontal carina; the area between these two carinae polished, impunctate; two irregular, raised lines extending dorsad of the frontal carina and enclosing the anterior ocellus in a large horse-hoof-shaped area; frons above carina and vertex with large, close punctures which are even closer in the postocellar area; posterior orbits with large punctures, the carina strong (less so dorsally) and extending to about the middle of the eye; malar space granular, its length subequal with the width of mandible at base (or length of pedicellum); antenna stout, the third joint subequal in length with four plus five, pronotum with its median length subequal with the medium length of the scutellum, the dorsal and anterior surfaces with large rather close punctures, the two surfaces not sharply separated, dorsally with a median longitudinal depression; pronotum longer laterally, the lateral and dorsal surfaces separated by a sharp carina, sides shining but with large punctures dorsally; scutum shining, with large punctures which are more widely separated than those of the pronotum; notauli straight, well-defined and foveolate; scutellum, postscutellum and middle area of propodeum forming a continuous surface which is covered with large, close (somewhat more widely separated on scutellum) punctures; lateral-dorsal area of propodeum granular basally and punctured apically; upper part of mesepisternum with large, close punctures; sides of propodeum striate; tergites shining, with rather large, well-defined punctures which are separated by a distance at least equal to their diameter; second and third tergites with an indistinct raised line medianly; the third tergite gently concave dorsally, the subapical pits well defined, eight on each side of median ridge; apical margin of tergite with five triangular teeth of uniform size, the distance between the lateral teeth slightly greater than the distance between an intermediate and median tooth; seen from the side the ventral margin of the third tergite is straight.

Greenish-blue, with a bluish reflection on third tergite, a copperish reflection on sides of second tergite, and a dark purplish spot around ocelli and one covering the median area of the scutum; antenna beyond third joint black; legs entirely green; wings brownish-hyaline; venation black; head, thorax and legs with sparse gray hair.

Paratype females have the blue color of the body more pronounced than in the type and might be called blue-green. The subapical pits may be reduced to fourteen.

Male. Length 6 mm. Agrees well with the above characterization of the female, but the end of the third tergite is more pointed and the apical teeth are lower and more obtuse.

Type-locality.—Honolulu, Oahu, Hawaii.

Allotype-locality.—Black Point, Oahu.

Described from five females and one male collected by P. H. Timberlake. The type female was collected on the laboratory window August 15, 1916. The allotype male was collected September 10, 1916. Three paratype females were collected at Honolulu on May 15, 1918, May 15, 1920, and June 22, 1919. The other female is labeled "Ex Sceliphron cells," "Diamond Head, Oahu, May, 1919."

Type, Allotype and *Paratypes.*—Cat. No. 24,645, U. S. Nat. Mus.

Conditions of Entomological Work in India.

BY K. KUNHI KANNAN,
Government Entomologist, Bangalore, India.

(Presented at the meeting of August 4, 1921.)

The development of Economic Entomology as a branch of Scientific Agriculture is so largely due to the United States, that in countries where its importance was recognized only later there has been a pronounced tendency to adopt methods and results obtained in the States without reference to their suitability to local conditions. India is no exception to the rule. The importance of the investigation of crop pests was recognized only late in the eighties of the last century, but the duty was left in the hands of men who were engaged in Museum work and who were, therefore, not able to investigate the pests reported to them. It was inevitable, therefore, that recommendations were made based on results obtained in the States, and that several of them proved useless. It was not till 1901 when the Department of Agriculture was reorganized and an Agricultural Research Institute established in Pusa, that a full-time officer for the study of pests was appointed. Since then the work has rapidly developed. Two of the Provinces have entomologists of their own, and there is in all the Provinces a staff of subordinate officers. In Mysore, one of the native States, an entomologist was appointed as early as 1908. The Entomological staff in India is still unequal to the immense task before it, but in the next few years a more rapid increase in the staff is likely to take place.

Entomological work in India is largely determined by the local conditions, and these are different from those of most other countries. India is a land of peasant proprietors. The average size of holdings is only four acres against sixty or eighty in the United States, and the yield from an acre represents on an average only what an American farmer would willingly spend in spraying alone. Any costly remedies such as those employed in the States are, therefore, entirely out of question except in regard to crops like coffee and tea, in which the yield per acre is sufficiently high. The consequence is that the entomologist has to devise methods which are within the very small means of the Indian farmer, and spraying, as a general proposition, cannot be considered at all. Such remedies are being devised, with the increasing recognition on the part of Indian entomologists of the profound difference in Indian conditions from those of most Western Countries. Provided the remedy satisfies the requirements indicated above, the Indian farmer can, as a rule, be easily persuaded to adopt them. Indeed, he himself has not been slow to devise certain ingenious remedies. The insecticidal property of mercury was long known to him, and it was not before it was proved by me * that any entomologist thought of the value of the metal in that connection. So, too, in regard to the storage of pulses he has hit upon devices which stood the test of scientific investigation. The simple method of putting a layer of sand on top of stored pulses, which I have suggested as an effective means of safeguarding them from the Bruchids, was derived from a study of the local methods of storing them.

Fumigation, as a method, is inapplicable to conditions in India, where each farmer stores his own pulses for the year, and where villages are so far apart and have such crude facilities of transport that distribution of the chemical could not be done on any large scale. Nor could the farmer be entrusted with so dangerous a chemical. The different method required of storing pulses in India is an illustration of the lines the entomologist has to proceed in India. The remedies that are now being devised take into account this fundamental fact. In my own State several remedies have been devised which are of a very simple character. The treatment of *Nymphula defunctalis*, an amphibious caterpillar pest of rice, with kerosening the water in the fields, was proved simple and popular. Another serious caterpillar pest which devastates many dry crops of the state is being controlled by the handpicking of the moths, which are conspicuous objects in the bare field, and easily caught and killed by the children of the village. More examples need not be given to show how very different are the lines in which entomological work has to be carried on in

* It has recently come to our notice that in a "Treatise on the Culture of the Pineapple," by William Speechly, published in London in 1821, on pages 321-329, is an account of a method of using quicksilver for the destruction of scale insects on pineapple. [Ed.]

India. If in all work relating to the control of pests in India, regard be had to the attenuated and fragmentary character of the holdings of the farmer and his very small means, often hardly adequate to bare livelihood, there can be no doubt that the diffusion of knowledge of Economic Entomology will be as quick and widespread as in the States.

Notes on Immigrant Coleoptera.

BY D. T. FULLAWAY.

(Presented at the meeting of October 6, 1921.)

It is gratifying to be able to refer by name to a number of beetles which have rested in our insect cabinets for some time unidentified. The determinations which follow have been secured through the kindness of Mr. G. E. Bryant, of the Imperial Bureau of Entomology, to whom examples of the different species were referred for identification. The citation of previous references to the species is made as an additional means of recognition. In several cases the present reference is the first that has been made to the occurrence of the species in Hawaii. Immediately following the list of determinations is an extended list of species which have been known in Hawaii for some time without published notice. The bibliographical references furnished have been gained from Gemminger & Harold's Catalogue of the Coleoptera, Junk's Catalogue of the Coleoptera, Leng's Catalogue of North American Coleoptera and other miscellaneous sources of information, as indicated.

These additions to our knowledge of the local Coleoptera have resulted from a brief study of the literature and collections of the Board of Agriculture and Forestry and the Hawaiian Sugar Planters' Experiment Station.

RECENT DETERMINATIONS.

ANTHRIBIDAE.

? **Lawsonia** sp.*

vide F. H. 1 (6), p. CXXIV; Pr. H. E. S. 3, p. 273.

First record, April 6, 1916.

Earliest specimen collected by D. B. Langford in May, 1910.

Locality: Honolulu (Oahu).

* Specimens referred by Mr. Bryant to Dr. Karl Jordan, a specialist upon this group of beetles, have been recently identified as a new species belonging to the genus *Exillis*, and will shortly be described and published.

Lamiidae.

Sybra alternans Wied.

vide Pr. H. E. S. 3, p. 388; 4, pp. 39, 82.

First record, July 6, 1917.

Collected: Honolulu (Oahu).

S. alternans credited to Eschscholtz *in litt.* (cf. Lacord. Gen. Col. IX, p. 616, 1872) in G. & H. (X, 3104).

No reference to Wied. Locality, Malacca. Bridwell (supra, p. 82) recognized the species in material collected by Williams in the Philippine Islands.

Oedemeridae.

Ananca ? sinensis Gemm.

vide F. H. 1 (6), p. CXXVI.

Earliest specimen collected by Swezey at Puako, Hawaii, May 12, 1905. A second specimen captured by Swezey on steamer at Hilo, Hawaii, May 24, 1915, and another taken by Ehrhorn on wharf in Honolulu, June 6, 1911.

Ananca sinensis Gemm. Coleop. Heft. VI, 1870; *chinensis* Bohem. Res. Eugen. 1858, p. 111 (G. & H. VII, p. 2169).

Locality: Hong Kong.

Anthicidae.

Anthicus floralis L.

Not previously recorded.

Earliest specimen collected by Giffard, December 1, 1907.

Locality: Honolulu (Oahu).

Anthicus floralis L. Fauna Suec. 1761, p. 228; Syst. Nat. ed. 12, p. 681. (G. & H. VII, 2095.)

This catalogue gives a lengthy synonomy and the following distribution: Lombardia, Gallia, Anglia, Italia, Germania, Chili, Am. bor. Junk (Anthicidae, p. 47) adds Erythrea and Leng (p. 163) considers it cosmopolitan.

Xylophilidae.

Xylophilus sp.

Not previously recorded.

Earliest specimen collected by Swezey, October 17, 1905, on mulberry in Honolulu.

The species has also been taken by Swezey on Hawaii, at Hilo, October 26, 1908, and on Kauai at Lihue, March 31, 1912.

TENEBRIONIDAE.

Platydema subfascia Walker.

vide Pr. H. E. S. 3, p. 14.

Earliest specimen collected by Giffard on Tantalus Mt., back of Honolulu (Oahu), December 26, 1904. This species has also been taken by Terry at Kealia, Kauai, October 21, 1905, and by Swezey on Maui, in Iao Valley, July 29, 1906.

First record, September 4, 1913.

Platydema subfascia Walker Ann. Mag. Nat. Hist. (3) II, 1858, p. 284. (Junk's Cat. Col. Tenebrionidae, p. 377.)

Localities: India, Sunda Islands, S. China, etc.

Blapstinus ? dilatatus Lec.

vide Pr. H. E. S. 3, p. 373.

Earliest specimen collected by Swezey at Waipahu, Oahu, August. 25, 1904. The species has also been taken by Swezey on Hawaii, at Kawaihae, September 5, 1919. First record, March 1, 1917.

Blapstinus dilatatus Lec. Ann. Lyc. N. H. N. Y. V, 1851, p. 146. Cas. Mon., p. 430, t. 4, f. 1. (Junk's Cat. Col. Tenebrionidae III, p. 298.)

Localities: Arizona and Southern California. Cited, also, by Leng (p. 231).

Conibius sp. nr. brunnipes Champ.

Not previously recorded.

Earliest specimen collected by Ehrhorn, August 16, 1917.

Locality: Honolulu (Oahu). ?

Conibius brunnipes Champ. Biol. Centr. Amer. Col. IV, I, 1885, pp. 183, 530, t. 6, f. 12. (Junk's Cat. Col. Tenebrionidae, II, p. 302.)

Locality: Central America. Leng (p. 231) gives locality "Mex. (U. S. ?)"

DERMESTIDAE.

Telopes undulata Motsch.

Not previously recorded.

Earliest specimen collected by Terry, December, 1908.

Locality: Honolulu (Oahu).

Telopes (*Acthriostoma*) *undulata* Motsch. Etud. Ent. 1858, p. 47, t. 1, f. 10. (G. & H., III, IV, p. 917.)

Locality: India Or. Listed also by Junk (Dermestidae, p. 60.)

THROSCIDAE.

Trixagus sp.

vide Pr. H. E. S. 3, p. 289.

First record, October 5, 1916.

Locality: Honolulu (Oahu).

STAPHYLINIDAE.

Osorius rufipes Motsch.

Not previously recorded.

Earliest specimen collected at Olaa, Hawaii (collector's name not given), in April, 1918. The species has also been taken by Fullaway on Oahu, in Honolulu, September 9, 1919.

Osorius rufipes Motsch. Bull. Mosc. 1857, IV, p. 508. (G. & H., I, II, p. 642.)

Locality: India Or.

Lithocharis ochracea Er.

Not previously recorded.

Specimens without date label.

Collected: Honolulu (Oahu).

L. ochracea credited to Gravenhorst in G. & H. (I, II, p. 622) and Leng's Cat. Col. N. A. (p. 103).

Localities: (G. & H.) Taite, Chili, Germania; (Leng) Mich. Eur. & N. A. Fla.

DYTISCIDAE.

Hydrovatus confertus Sharp.

Not previously recorded.

Earliest specimen collected by Terry in Honolulu (Oahu), June 12, 1904. The species has also been taken by Swezey on Hawaii at Olaa, April 19, 1920.

Hydrovatus confertus Sharp, Tr. Dublin Soc. (2) II, p. 329, 1882.

Locality: Siam.

CARABIDAE.

Bembidium sp.

Not previously recorded.

Earliest specimen collected at Honolulu (Oahu). Labeled "Kewalo." By Swezey, July 24, 1913.

The species has also been taken by Swezey on Maui, at Waihee, July 11, 1920.

Perigona nigriceps Dej.

Not previously recorded.

Earliest specimen collected at Honolulu (Oahu). Labeled Pond's Dairy, Kapahulu, ex cattle ordure. By Terry and Swezey, May 15, 1907.

P. nigriceps Dejean Spéc. gén. des Coleop. V, 1831, p. 44 (Leng, p. 64).

Localities given: Southern California, Africa, Asia.

HYDROPHILIDAE.

Cercyon sp.

Not previously recorded.

Earliest specimens collected at Honolulu (Oahu), by Swezey? April, 1910.

TROGOSITIDAE.

Lophacateres pusillus Klug.

Not previously recorded.

Earliest specimens collected by Swezey at Honolulu (Oahu), October 2, 1914, in rice-hulls.

Lophacateres pusillus Klug. Jahrbücher der Insectenkunde, Berlin, 1834, p. 159 (Leng, p. 194).

Localities given: Siam, S. C., Texas.

CLERIDAE.

Thaneroclerus buqueti Lef.

Not previously recorded.

Earliest specimen collected by Swezey at Lihue (Kauai), September 11, 1907.

The species has also been taken by Swezey at Honolulu (Oahu), August 18, 1913, ex rotten board on ground, September 7 and 27, 1914, at light.

Thaneroclerus buqueti Lefebvre. Ann. Fr. 1835, p. 582, t. 16, f. 4. Westw. Introd. I, 1839. (G. & H., V-VII, p. 1739.)

Locality: India Or.

Marshall says: "An introduced insect, being known at present only from India and Ceylon."

ADDITIONAL SPECIES NOT HITHERTO CREDITED TO HAWAII.

Curculionidae.

Imaliodes pusillus Karsch.

Earliest specimens secured in October, 1906, from seeds of *Saraca indica.* Also reared from seeds of *Castanospermum australe.*

Locality: Honolulu (Oahu).

Imaliodes pusillus Karsch. B. E. Z. XXV, p. 10, pl. 1, fig. 15.

Locality: Marshall Islands.

Tenebrionidae.

Gnathocerus maxillosus Fabr.

Earliest specimen collected by Terry, October 19, 1906.

Locality: Honolulu (Oahu).

Gnathocerus maxillosus Fabr. Syst. El. 1, 1801, p. 155.

Localities: America, Madeira, Canary Islands, S. France. (Junk, Tenebrionidae III, p. 392.)

Dermestidae.

Anthrenus thoracicus Melsh.

Earliest specimen collected by Langford July 7, 1909. *vide* An. Rep. U. S. Exp. Sta. 1904.

Locality: Honolulu (Oahu)?

Anthrenus thoracicus Melsh. Pr. Phila. Acad. Nat. Sci. II, 1844, p. 117.

Locality: Middle and Southern States of the U. S. distinct from *A. scrophulariae* (Blatchley. Col. Indiana, p. 597).

Coccinellidae.

Stethorus vagans Blackburn.

Earliest specimen collected by Austin, August 20, 1904.

Locality: Oahu.

Stethorus vagans Blackburn Tr. R. Soc. S. Australia, XV, p. 248.

Locality: Australia.

Pullus sp.

Earliest specimen collected by Terry at Lihue, Kauai, April, 1905.

This species has also been taken by Swezey on Oahu, at Honolulu, September 13, 1905, and on Hawaii, at Honokaa, August 11, 1915.

LATHRIDIIDAE.

Coninomus constrictus Gyll.

Earliest specimen collected by Swezey in Honolulu, March 11, 1921, on Lantana flowers.

Coninomus (*Latridius*) *constrictus* Hummel Ess. Ent. IV, 1824, p. 13. Gyll. Ins. Spec. IV, 1827, p. 138. Cosmopolitan (G. & H., III, IV, p. 896).

CUCUJIDAE.

Silvanus planatus Germ.

Earliest specimen collected by Terry at Aeia, Oahu, April 2, 1906.

Silvanus planatus Germ. Ins. Spec. Nov. 1824, p. 466.

Locality: Am. Bor. (G. & H. III-IV, p. 879). Possibly female of *bidentatus*. (Blatchley, Col. Ind., p. 562.)

Silvanus bidentatus Fab.

Earliest specimen collected by Swezey in Honolulu, April 11, 1917.

Silvanus bidentatus Fab. Syst. El. I, p. 317 (G. & H. III-IV, p. 879).

Locality: Europe.

STAPHYLINIDAE.

Aleochara puberula Klug.

Earliest specimen collected by Swezey at Waialae, Oahu, July 11, 1913.

Aleochara puberula Klug. Ins. Madag., p. 139.

Locality: Madagascar, Madeira, Gallia. "A true cosmopolitan *Aleochara* of the subg. *Xenochara*, first described from Madagascar, although occurring almost everywhere" (Fenyes in litt.).

Gibbium psylloides (Czemp.).

Earliest specimen collected by Swezey in Honolulu, April 21, 1909.

Gibbium psylloides (Czemp.) Dissertation inauguralis Vienna, 1778, p. 51; *scotias* Fabr. Spec. Ins. 1781, p. 74. Cosmopolitan. Introduced into the U. S. A. (Leng, p. 240).

Note on the Isopod Known as Geoligia Perkinsi Dollfus (Crust.).

BY CHAS. CHILTON,
Professor of Biology, Canterbury College, New Zealand.

(Presented at the meeting of October 6, 1921.)

In the Fauna Hawaiiensis, Vol. 2, p. 525, Monsieur A. Dollfus described, under the name of *Geoligia perkinsi*, a terrestrial Isopod which had been collected at several localities in the islands of Hawaii and Kauai at heights varying from two to four thousand feet above sea level. The genus *Geoligia*, to which he referred the species, had been established by him in the year 1893* for a species found at a height of 1200 metres in the forests at Cumbre de Valencia, Venezuela. He defined the new genus as follows:

"Coxopodites (épimères des auteurs) non distincts. Le reste comme dans le genre *Ligia*. Espèces terrestres."

The new species from Hawaii, which is described in some detail, gave Dollfus an opportunity to revise the characters of the genus, and he points out that the line of separation between the epimera and the segments exists on the segments posterior to the first, but is scarcely distinct. To the generic characters, however, he adds that the branches of the uropods are articulated. Consequently, he redefined the genus as follows:

"Coxopodites (épimères) non ou très-peu distincts. Appendices des uropodes articulés. Le reste, et notamment les parties buccales, comme dans le genre *Ligia*. Espèces terrestres."

The species *Geoligia perkinsi* is described at some length, and it is stated that the pleo-telson has the posterior margin provided with five blunt teeth similar to that of *Ligia exotica* Roux.

Some years ago some terrestrial Isopoda were sent to me from Honolulu and Puuloa in the Hawaiian Islands by the late G. W. Kirkaldy as *Geoligia perkinsi*. On examination, however, they proved definitely to be examples of *Ligia exotica*

* Voyage de M. E. Simon au Venezuela; Isopodes terrestres, Ann. Soc. Entomol. de France, vol. LXII, p. 343.

Roux, a species which is stated by Miss Richardson [†] to occur at "Honolulu, Hawaii." I have dealt fully with this species in my report on the Isopoda from the shore of Chilka Lake, India (Memoirs Indian Museum, Vol. V, p. 462), and in it have pointed out that in the male the epimera are completely united with the segments in all segments, the junction being indicated only by a faint line, but that in the adult females a suture is fairly distinct on segments 2, 3 and 4, and that there appears to be much variation in the distinctness of the epimera in different species of *Ligia*. It is clear, therefore, that this character alone is not sufficient for the establishment of the genus *Geoligia*, as has been admitted by Dollfus himself in the revised diagnosis. There remains, therefore, only the articulations of the branches of the uropods. This character is, as Dollfus states, very remarkable, and I have beeen anxious, therefore, to get specimens showing it. These I have so far failed to obtain. While in Honolulu, in 1920, I collected some specimens of *Ligia* on the edge of a fresh-water swamp at Honolulu, but these proved to be *Ligia exotica*. From the Bishop Museum, by the kindness of Mr. O. H. Swezey, I got also some specimens labeled "S. E. Koolau Mts., Oahu," collected by J. C. Bridwell. These also proved to be undoubtedly *Ligia exotica*, having the branches of the uropods non-articulated. The height at which these specimens at Koolau mountains were obtained is not stated. Subsequently, Mr. Swezey has sent me other specimens from two places at Waialae, one at a sand bank on the edge of a spring near the seashore, and the other at the edge of a fresh-water lagoon near the seashore. All of these prove to be *Ligia exotica*.

From the great resemblance of *Geoligia perkinsi* in most characters to *Ligia exotica*, and from the fact that I have been unable to obtain any specimens from the Hawaiian Islands with the rami of the uropods articulated, I am inclined to believe that there must be some mistake about this character. In the list of localities and specimens from which *Geoligia perkinsi* were obtained, M. Dollfus mentions only one male with a complete uropod, and Mr. Swezey tells me that there are

† Monograph of Isopods of North America, p. 676.

at present no specimens of *Geoligia perkinsi* in the Bishop Museum with uropoda attached.

If this character is based on a single specimen, as appears to be the case, it seems probable that the articulation of the branch of the uropods was either abnormal or perhaps that the appearance was caused by the very slender rami having been bent at certain points. This is easily possible, and has actually occurred in at least two of my specimens, giving an appearance somewhat like articulations. Dollfus, however, definitely states that the exopod is three-jointed and the endopod six-jointed, and this is shown in his figure. The shape of the terminal segment is, as he says, similar to that of *Ligia exotica*, and the other drawings of the head, antennae, lower lip and mandibles, maxillae and maxillipeds correspond precisely with those of *Ligia exotica*. *Ligia exotica* is primarily a species of the seashore, but it is known to occur on the edges of fresh-water streams and lagoons at considerable distances from the shore, and there seems to be no reason why it may not reach as high as the localities given for *Geoligia perkinsi*. To test the truth of my suggestion that *Geoligia perkinsi* is the same as *Ligia exotica*, I wish, of course, to get specimens from the same localities as those given for *Geoligia perkinsi*, and I shall be greatly obliged to any naturalist who can assist me in doing so. The specimens at present at my disposal are not sufficient to show to what height *Ligia exotica* extends, but it certainly does live in the Hawaiian Islands on the edge of fresh-water springs and lagoons, as shown by the specimens that I have mentioned above, and presumably those from the S. E. Koolau mountains must have been obtained at some considerable height above the sea level.

The tube labeled "*Geoligia perkinsi*, Puuloa," ‡ which was sent to me by the late G. W. Kirkaldy in 1908, contains seven specimens of which two still have the uropoda complete. These are non-articulate, and the specimens are undoubtedly *Ligia exotica*, quite similar to the other specimens from on and near the seashore.

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‡ The place where these specimens were collected is near the mouth of the channel from Pearl Harbor, Oahu.

In the type species of the genus, *Geoligia simoni* from Venezuela, only the outer branch of the uropod was present, and it is non-articulate. The articulation of the branches of the uropods in *G. perkinsi,* if it really occurs, would, as far as I know, be the only instance in the family and should be supported by stronger evidence than that at present existing, for this appears to be based on a single specimen in which the uropods had possibly been injured.

Addenda: From the facts given above I was quite convinced that *Geoligia perkinsi* Dollfus was identical with *Ligia exotica* Roux, but for complete confirmation of this conclusion it was necessary to prove that *L. exotica* extends to heights above sea level comparable to those recorded for *Geoligia perkinsi.* Through the kindness of Mr. O. H. Swezey this proof is now supplied. I have just received two specimens collected by him at the base of leaves of *Astelia* plants at "Summit Camp," Kauai, at an altitude of 2000 feet. These two specimens are quite the same as those found near the seashore and are certainly *Ligia exotica.* The uropoda are detached from the body, but fortunately two complete uropoda are in the tube and these have the branches uniarticulate and agreeing closely with the description I have given for the Lake Chilka specimens of *Ligia exotica.* Mr. Swezey has also sent me two other specimens from Kauai collected by Mr. J. A. Kusche at an altitude of 4000 feet. These prove to be also *Ligia exotica,* fortunately having two uropods present with the uniarticulate branches usual in that and other species and showing no sign of the articulation described for *Geoligia perkinsi.* These specimens show that *Ligia exotica* occurs as a terrestrial species in the Hawaiian Islands up to an altitude of 4000 feet and confirm my conclusion that *Geoligia perkinsi* is the same species and that the articulation of the branches of the uropods described by Dollfus was based on a damaged specimen. Moreover, this is not the only case where a species of *Ligia* commonly found on or near the seashore extends to considerable altitudes, for in Lord Howe Island *Ligia australiensis,* which is common on the seashore in the eastern parts of Australia, occurs in fresh waters up to a height of 700 feet. Similarly in the Juan Fernandez Islands the shore amphipod *Orchestia chiliensis* is also found at altitudes of 1500 feet; in the Hawaiian Islands *Orchestia platensis* is found from the seashore up to very considerable heights, and numerous other examples of the same kind could be given.

(Dr. Charles Chilton, Canterbury College. June 20, 1922.)

A New Hawaiian Delphacid (Homoptera).

(Presented at the meeting of June 2, 1921.)

BY F. MUIR.

Nothorestias swezeyi sp. n. Figures 1 and 2.

Male. Brachypterous; length, 2.4 mm.; tegmen, 1 mm. Vertex very slightly wider than long, apex round, projecting beyond eyes, base slightly in front of middle of eyes; length of frons twice the width, median carina forking a little beyond the middle; antennae reaching slightly beyond base of clypeus, second segment 1.8 times the length of first. Tegmina short, reaching to posterior margin of third abdominal segment, coriaceous.

Opening of pygofer about as long as wide, round, ventral margin produced into a short, stout, pointed process; anal emargination large, anal angles rounded; armature of diaphragm forming a rounded projection reaching nearly to orifice of diaphragm, shagreen. Anal segment large, anal spines large, bases far apart, curved, diverging, their bases swollen. Genital styles flat, outer margin concave on apical half, convex on basal half, inner margin slightly sinuous, apex truncate, corners slightly produced, outer one more so than inner. Aedeagus flattened

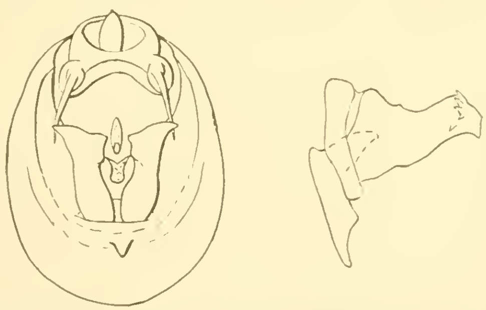


Fig. 1 and 2. Pygofer, full view, and aedeagus, lateral view, left side view, left side of *Nothorestias swezeyi*.

laterally, deep at base, orifice at apex which is slightly turned ventrad, five or six small spines forming a circle near orifice.

Dark brown or nearly black; antennae, legs and dorsal part of apex of abdomen light. Tegmina dark brown, a black mark at apex of clavus.

Female. Brachypterous; length 2.6 mm.; tegmen 1 mm.

Similar in color to male, but the legs are darker.

Described from two males and one female from Makaha, Oahu, 1500 feet elevation, off *Aspidium* sp. (Swezey, March 27, 1921). Type deposited in the H. S. P. A. Collection, No. 1001.

This species comes nearer to *Nesorestias filicicola* Kirk. than it does to *Nothorestias badia* Muir, showing that the condition of the median frontal carina is not a good phylogenetic character.

An Interesting New Derbid Genus (Homoptera).

BY F. MUIR.

(Presented at the meeting of November 3, 1921.)

Anomaladerbe gen. nov.

Tegmina large, broad, surface undulating. Media forking from radius after the basal median sector (M4). Media with three sectors of four, if the small vein at apex be counted. Clavus not distinctly open, but claval vein extending some distance beyond and in intimate connection with cubitus. The second branch of cubitus (Cu 1a) bent and touching Cu 1 for a short distance; Cu 1 also bent and nearly touching M4, which in turn is bent towards M3. The apices of Sc and R thickened considerably. Hind wing half the length of tegmen, anal area well developed with distinct anal veins, margin of anal area corrugated to form stridulating organ. Head produced dorsally, in lateral view conical, flattened laterally. Vertex nearly upright, pointed at apex, excavate; face linear, lateral carinae meeting together from base to near apex; clypeus with two short lateral carinae at base, no median carina; eyes subreniform; antennae large, slightly longer than face, flat, thin with a slightly thickened margin; no subantennal process. Pronotum very short, upright in middle fitting into base of vertex, no shoulder keels. Mesonotum rounded, wider than long, lateral carinae very faint, but each carina produced in middle into a rounded knob.

This genus holds an anomalous position. By the length of the wing it approaches the Zoraidinae, but the presence of a well developed anal area and anal veins prevents it from being placed in the subfamily. In this respect it is like *Symidia* Muir. The clavus is not distinctly open, and so it should be placed in the Cenchreini, but the bending of the cubitus and M4, and the formation of false cross-veins parallel to the margin places it in the Otiocerini. In that tribe it comes next to *Platocera,* but is distinguished from it by the short wings, enlarged apices of subcosta and radius, the greatly elongated head, the two small knobs on the mesonotum and the incom-

Anomaladerbe pembertoni sp. n. Figures 1, 2, 3.

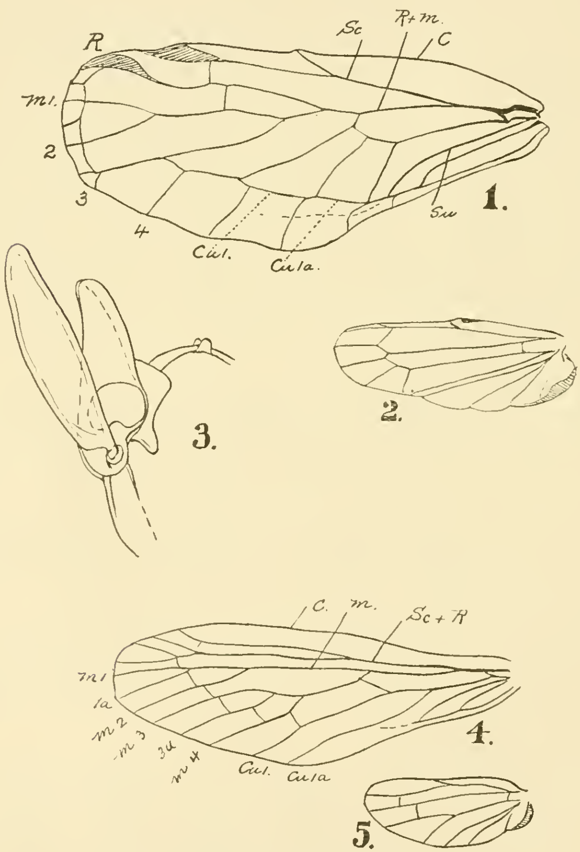
Female. Length, 2.8 mm.; tegmen, 7 mm. Pregenital plate broader than long, hind margin broadly angularly produced from the sides to the middle, the apex of production curved slightly dorsad. Anal segment broader than long, apex broader than base, truncately sinuate. Yellowish; legs lighter; antennae, head and base of mesothorax tinged with red; basal abdominal tergites red. Tegmina and wings slightly opaque, veins yellow, basally tinged with red; a slight infuscation along the veins in apical half of tegmina.

Proc. Haw. Ent. Soc., V, No. 1, October, 1922.

plete opening of the clavus and the arrangement of the cubitus.

Described from one female from Lami, Viti Levu, Fiji (*C. E. Pemberton,* 1920). Type in H. S. P. Experiment Station collection No. 1002.

The tegmen and wing of *Symidia flava* Muir is figured for the first time. It holds the same position in the Cenchreini as *Anomaladerbe* does in the Otiocerini (figures 4, 5).



EXPLANATION OF FIGURES.

1. Tegmen of *Anomaladerbe pembertoni.*
2. Wing of *Anomaladerbe pembertoni.*
3. Lateral view of head and pronotum of *Anomaladerbe pembertoni.*
4. Tegmen of *Symidia flava.*
5. Wing of *Symidia flava.*

New and Little Known Hawaiian Delphacidae (Homoptera).

BY F. MUIR.

(Presented at the meeting of December 1, 1921.)

The present paper deals chiefly with Delphacidae from the island of Kauai collected by Mr. O. H. Swezey, and a few by Mr. J. A. Kusche. They are of interest, because much less collecting has been done on that island than on the others, and we were unable to state whether the few species known from there indicated a natural paucity or only the limited amount of collecting.

The present collection was over a wide enough area to give us some better idea, and the fact that all the known Kauai species except three, as well as nine species described as new, were taken indicate that it is fairly representative. It consists of nineteen species in all, the Leialoha group with ten, the Aloha group with eight, and one *Kelisia*. An equal amount of collecting in Oahu, Maui or Hawaii would have produced a much larger number of the Aloha group. I think we are justified in considering Kauai as poor in Delphacidae and having a higher proportion of the Leialoha group than the rest of the archipelago.

Mr. Swezey's collections were made at the following elevations: Alakai swamp, 4000 feet; Nualolo, 3000; Kalalau, Kumuwela, Kokee, Halemanu, and Kauaikinana, 3500 feet.

Types deposited in the H. S. P. Experiment Station Collection.

Leialoha Kirk.

The present collection contains some long series of species of this genus, the study of which has decided me to consider as species forms I have described as subspecies. The amount of evolution that has taken place in the Leialoha group is not near so great as in the Aloha group, and the differentiation of the male genitalia has not proceeded so far. We must not, therefore, expect the same amount of specific difference in these organs in the former as in the latter.

Leialoha lehuae Kirk.

Two male specimens from Kokee, Kauai, and one from Alakai swamp (*Swezey*, August, 1921).

Leialoha oceanides (Kirk.). Figure 1.

Aloha oceanides Kirk. Faun. Haw. II, 6, p. 580.

One male specimen that I identify as this species taken on Waialeale Trail, Kauai, elevation four thousand to five thousand feet (*J. A. Kusche,* May, 1920). One male Kalalau, Kauai, off *Osmanthus,* and one female from Alakai swamp (*Swezey,* August, 1921). The aedeagus is thin, cylindrical, very slightly curved, the apex produced into a curved spine; slightly basad of apex. There is a long, curved spine, and still more basad is another much shorter and slightly curved.

Leialoha suttoniae sp. n. Figure 2, 2a.

Male. Macropterous; length, 2.3 mm.; tegmen, 3 mm. Length of vertex equal to width, slightly broadest near apex, apex rounded or bluntly conical, base about middle of eyes. Length of face 1.6 times the width, widest in middle, sides slightly curved, two distinct median carinae. Antennae reaching to base of clypeus, first joint annulate, second three times the length of first.

Opening of pygofer subdiamond shape, wider than long, margins entire, anal emargination large, anal angles large, considerably produced and truncate at apex, surrounding about three-fourths of anal segment. Aedeagus long, cylindrical, thin, slightly curved, apex bent at right angle to form a crook which is fairly straight to near tip, which is curved and acute, with some minute teeth along it; slightly basad of the crook is a small spine.

Vertex and nota black or dark brown, clypeus lighter brown, face, genae, antennae, lateral portions of pronotum, tegulae and legs yellow or very light brown; abdomen dark brown with yellow pleura. Tegmina hyaline, a dark fuscous mark from base to apex over median and cubital area, including the apical radial cells, veins same color as membrane, tubercles small, numerous. Wings fuscous, veins dark.

Female. Macropterous; length, 2.7 mm.; tegmen, 3.5 mm. Similar to males but lighter in color, some specimens being reddish yellow, the fuscous on tegmen very faint and the veins reddish.

Described from five males and thirteen females from Kalalau, Kauai, off *Suttonia sandwicensis* (*Swezey,* August 20, 1921). There are also four males and two females from Nualolo, Kauai, off the same plant, which are all lighter in color with red veins, a dark spot at apex of clavus, and the hind femora and apex of tibiae black or dark fuscous. These specimens are not included in the type material. The nymphs vary in color, becoming darker as they increase in size, the larger ones having the thorax and wing pads brown or mottled with brown. This species comes near to *L. kauaiensis.* Type No. 1049.

Leialoha scaevolae sp. n. Figure 3.

Male. Macropterous; length, 2.6 mm.; tegmen, 3 mm. Vertex slightly longer than broad, broadest at apex which is rounded or broadly conical. Length of frons nearly twice the width, broadest in middle, sides slightly curved, two distinct median carinae. Antennae reaching slightly beyond base of clypeus, first segment annuliform, second nearly four times the length of first.

Shape of pygofer similar to *L. suttoniae,* but the anal angle not so broadly truncate, more angular; genital styles slightly more acute at apex than in *L. suttoniae.* Aedeagus somewhat similar, but the apex more rounded and the crook at apex thinner, more curved and without teeth, the small subapical spine slightly curved.

Vertex, median portion of pronotum, the mesonotum, dorsum of abdomen and the pygofer dark brown; face, clypeus, antennae, legs, lateral portions of pronotum and ventral surface of thorax and abdomen yellow. Tegmina hyaline, milky white, a small black mark at apex of clavus, the apical cells and the apical margin slightly fuscous, veins and tubercles same color as membrane, tubercles very minute. Wings hyaline, milky white, veins slightly fuscous.

Female. Macropterous; length, 3 mm.; tegmen, 3.6 mm.

Similar to male, but slightly lighter in color; the ovipositor dark brown. Many of the females are uniformly yellow or with a slight infuscation on thorax; the ovipositor is always darker.

Described from thirteen males and thirteen females from Kumuwela, Kauai, off *Scaevola chamissoniana* (*Swezey,* August 28, 1921). There are also two females from Kalalau, Kauai, one off *Osmanthus* and the other off *Coprosma,* neither of which do I consider as food plants. Type No. 1050.

Leialoha kauaiensis Muir.

Two males and one female from Alakai swamp off Ohia lehua; one male from Kalalau off *Suttonia;* one male and two nymphs from Nualolo off Ohia lehua; one male and two females from Kokee off Ohia lehua. The one on *Suttonia* is evidently accidental, Ohia lehua being the food plant.

Nesodryas (Nesothoë) hula (Kirk.). Figure 4.

Six males and two females from Kokee off *Sideroxylon* (*Swezey,* August 28, 1921); six males and five females from Kalalau off *Osmanthus sandwicensis* (*Swezey,* August 20, 1921); one male from Nualolo off *Phyllostegia*, and one female off *Pelea* and two females off *Suttonia*.

These all conform to the original description. The aedeagus has the crook at the apex at about 45°, with its apex expanded and curved.

Nesodryas (Nesothoë) seminigrofrons sp. n. Figure 5.

Male. Macropterous; length, 2.8 mm.; tegmen, 2.9 mm. Vertex distinctly broader than long, apex slightly rounded, produced beyond eyes but slightly, same width as base, base anterior to middle of eyes. Length of face 1.8 times the width, sides slightly curved, median carina slightly obscure at base. Antennae reaching to base of clypeus, first segment as wide as long, second three times the length of first.

Anal angle of pygofer rounded, slightly produced. Genital styles the typical subsickle-shape. Aedeagus tubular, thin, slightly curved and recurved, apex produced into a long, acute process and from its base, on margin of orifice, a T-shape process arises, the cross-piece at apex curved, crescent shape.

Face except apical third, genae except apical half, clypeus and thorax dark brown or nearly black, pronotum with a series of light dots along lateral carinae to behind lateral angles, vertex and frons with light dots, three pairs of dots on face slightly raised and showing signs of forming transverse bands, apical portions of face and genae creamy white; legs light with fuscous marks; first segment of antennae dark, second segment light. Tegmina hyaline slightly stramineous, slightly fuscous at base, an irregular curved fuscous mark from middle of clavus to near base of costa extending irregularly along radial cell to apical, median and cubital cells, a small dark mark at apex of clavus; veins same color as membrane except the apical veins which are dark; tubercles minute, mostly same color as veins, but some on the darker veins of corium are light. Wings hyaline, slightly fuscous, veins dark.

Female. Macropterous; length, 3.3 mm.; tegmen, 3 mm. Similar in color to male.

This species comes next to *N. perkinsi* (Kirk.), the aedeagus of which I figure (Figure 6) for comparison; the apex of the T-piece is much smaller, and the spine at apex shorter and more obtuse.

Described from one male and one female from Kumuwela off *Campylotheca* (*Swezey*, August 28, 1921). Type No. 1052.

Nesodryas (Nesothoë) alboguttata sp. n. Figure 7.

Male. Macropterous; length, 2.2 mm.; tegmen, 2.6 mm. Length of vertex subequal to width, apex broader than base, slightly rounded, base behind middle of eyes; length of face 1.7 times the width, one distinct median carina. Antennae reaching to base of the clypeus, first segment wider than long, second segment more than four times the length of first.

Anal angle of pygofer very slightly produced. Aedeagus thin, cylindrical, apex narrowly rounded with the crook about 45° to stem and slightly expanded at apex, a small spine slightly below apex. Genital styles of the normal subcylindrical shape, characteristic of the genus.

Vertex brown mottled with lighter brown; face brown with three semi-transverse marks and a few small light spots on side, clypeus darker brown. Antennae light brown. Pronotum light brown in middle, darker on sides with small light marks; mesonotum dark brown; legs brown, lighter on hind tibiae. Tegmina hyaline, milky white with brown markings as follows: Extreme base, a broad V-shape mark from costa near base to near apex of clavus and back to costa before stigma, a broad mark from hind margin beyond clavus to apex of radius, the apical veins fuscous, tubercles small, white, bearing white hairs. Wings hyaline, milky white with darker veins.

Described from one male from Kokee off *Antidesma* (*Swezey*, August 19, 1921). This species I consider near to *N. gulicki*, but is distinguishable by tubercles being white instead of brown, the apex of aedeagus is rounded instead of acute, and the shape of the crook is somewhat different. Type No. 1051.

Nesodryas (Nesothoë) semialba sp. n. Figure 8.

Male. Macropterous; length, 2.6 mm.; tegmen, 3.0 mm. Length of vertex subequal to width, apex subequal to base, base about middle of eyes; length of face 1.7 times the width, sides slightly curved, median carina distinct, the lateral carinae curved inward and meet together before the apex of face.

The genitalia are near to those of *N. alboguttata*, but the crook of the aedeagus stouter, the apex broadened out on the inner corner; there is no small spine on the side.

Head and thorax dark brown or black, first segment of antennae brown, second yellow, legs brown, hind tarsi and apex of tibiae lighter. Basal half of tegmina similar to *N. alboguttata* in color, extreme base dark brown, then a narrow light mark, then a broad V-shape mark reaching from costa to hind margin at apex of clavus; the apical half of tegmina milky white; veins same color as membrane, apical veins and apical margin slightly fuscous, tubercles small, same color as veins or slightly darker on apical veins. Wings hyaline, slightly fuscous with darker veins.

Described from one male from Kalalau off *Osmanthus sandwicensis* (*Swezey*, August 20, 1921), and one female from Alakai Swamp (Swezey, August 22, 1921). This species comes next to *N. alboguttata*. Type No. 1057.

Nesodryas (Nesothoë) dodonaeae Muir.

Three males and nine females, and a nymph from Kokee off *Dodonaea;* one male from Kalalau off *Suttonia;* one male and five females from Halemanu off *Alphitonia* (*Swezey,* August 31, 1921).

One male from Kaholuamano, Kauai, elevation four thousand feet (*J. A. Kusche,* April, 1920).

Aloha swezeyi Muir.

A series of four males and eight females; six from Kumuwela off *Campylotheca;* one from Kokee; four from Nualolo off *Campylotheca;* one from Kauaikinana off *Lipochaeta.* The former figure of the aedeagus * was incorrect, so a more correct one is given herewith (Figure 9).

Ilburnia ipomoeicola (Kirk.).

A long series of both sexes and young off *Lythrum, Polygonum, Pipturus* and *Rumex* from Kokee (*Swezey,* August, 1921).

Ilburnia koae-phyllodii (Muir.).

Three males and one female from Halemanu, and one male and one female from Kumuwela off *Acacia koa* (*Swezey,* August, 1921).

Ilburnia rubescens (Kirk.).

A series from Kaholuamano and Waialae falls, four thousand feet elevation (*Kusche,* April, 1920).

Ilburnia kuschei sp. n. Figure 10.

Male. Brachypterous; length, 2.5 mm.; tegmen, 1.7 mm. Length of vertex about equal to the width at base, apex considerably narrower than base, projecting in front of eyes, straight with median carina of face projecting, base about middle of eyes. Length of face 2.6 times the width, sides very slightly curved, widest on apical half, median carina simple, but the base thickened with an obscure appearance of a fork. Antennae reaching to near middle of clypeus, second segment 2.2 times the length of first. Tegmina reaching to apex of sixth abdominal tergite.

Opening of pygofer a little longer than wide, margins entire, round, anal emargination wide, shallow, anal angles slightly produced, diaphragm fairly long, dorsal margin rounded with a slight indentation in middle, armature standing out as a rounded projection in the middle. Anal segment moderate size, anal spines flattened laterally, median size, broad at base, near together. Genital styles not reaching to anal segment, apex truncate, corners rounded, slightly narrowed in middle, basal angle large, rounded, forming half the inner margin. Aedeagus thin,

* Pro. Haw. Ent. Soc., III, 3 (1916). Plate 2, fig. 21.

subcylindrical, curved slightly dorsad, broadest at base where it is produced on dorsal aspect, a few minute spines about middle.

Ochraceous, black or dark brown between carinae of face, vertex and nota, front and middle coxae dark, some scattered fuscous marks on abdomen. Tegmina hyaline, slightly ochraceous, a dark mark at apex of clavus, veins slightly fuscous in middle, tubercles minute, sparse, bearing black macrotrichia.

Female. Brachypterous; length, 3 mm.; tegmen, 1.9 mm. Lighter in color than the male, the black between carinae of head and thorax much reduced.

Described from two males and two females from near Waialae falls, Kauai, four thousand feet elevation (*J. A. Kusche*, April, 1920). There are also three females and three nymphs, not included in the type series from Kokee, off *Cyrtandra* (*Swezey*, August, 1921), which I consider to belong to this species. This species I place near *I. boehmeriae*. Type No. 1056.

Ilburnia campylothecae sp. n. Figure 11.

Male. Brachypterous; length, 2.1 mm.; tegmen, 1.3 mm. Length of vertex 1.2 times the width, apex projecting beyond eyes, rounded, base about middle, or slightly in front of middle, of eyes; length of face 2.4 times the width, sides slightly curved, median carinae obscurely furcate at base. Antennae reaching slightly beyond base of clypeus, second segment twice the length of the first. Tegmina reaching to posterior margin of seventh abdominal tergite.

Opening of pygofer a little longer than wide, round, margins entire, anal emargination wide, shallow, anal angle rounded, not produced; dorsal margin of diaphragm produced in the middle, the armature running down to the orifice and studded with minute spines. Anal segment on same plan as in *Aloha ipomoeae*, the anal spines large, in full view, strongly diverging to apex, wide at base. Genital styles reaching to anal segment, truncate and broad at apex, inner angle produced, narrowed in middle, anal angle large and quadrate. Aedeagus cylindrical, apex acute, orifice on ventral aspect at apex, five or six spines along ventral aspect, a few on right side and a few on left. Black between carinae of head and pronotum, carinae and antennae light brown or yellow, mesonotum black with the hind apex yellow, coxae black, legs sordid yellow, the femora with a faint longitudinal fuscous mark. Abdomen dark, yellow at base with small light marks on pleura and in the middle on apical tergites, anal segment sordid yellow. Tegmina hyaline, light sordid yellow with a large subtriangular fuscous mark in middle, the base of the triangle is slightly concave and extends along the nodal line from apex of costal cell to apex of clavus, the apex is near base, one side running parallel with Sc + R and the other across to near apex of clavus; veins same color as membrane, tubercles very sparse, minute and bearing black macrotrichia.

Female. Brachypterous; length, 2.2 mm.; tegmen, 1.5 mm. Similar in structure and color to male, but the mark on tegmina greatly reduced.

Described from two males and one female from Kumuwela from which the holotype and allotype are selected, and two males from Nualolo, which have the mark on tegmina reduced and faint (*Swezey*, August, 1921), off *Campylotheca*. Type No. 1055.

Ilburnia naenae sp. n. Figure 12.

Male. Brachypterous; length, 2.4 mm.; tegmen, 1.8 mm. Length of vertex 1.7 times the width, apex rounded, projecting slightly in front of eyes, base considerably behind the middle of eyes; length of face 2.2 times the width, widest in middle, sides slightly curved, median carina simple or slightly thickened at base, but not furcate. Antennae reaching to near middle of clypeus, second segment double the length of first. Tegmina reaching to base of pygofer.

Opening of pygofer slightly longer than wide, margins entire, rounded, anal emargination large, anal angle not produced. Dorsal margin of diaphragm U-shape with a median armature projecting in middle and continuing to near orifice, the armature with a row of very fine spines on each side. Anal segment medium size, spines flattened laterally, bases well apart. In some specimens the anal spines are more acute than in the one figured. Genital styles reaching to anal segment, flat, apex truncate with the apical corners produced, the inner one more so than the outer, outer margin slightly concave, inner margin concave on apical half, convex on basal half, basal angle obscure. Aedeagus subtubular, slightly flattened laterally, slightly curved, a large, broad-based, flattened spine arises about the middle of the ventral aspect slightly on the right side, the base extending about one-third the length; on the left side there is a small spine and a couple of minute ones on apical dorsal and apical ventral aspect, orifice at apex on ventral aspect.

Prothorax and mesothorax, head between carinae, front and middle coxae black or dark brown. Antennae, carinae of head, legs and hind coxae yellow, abdomen black or dark brown with base and small marks at side, along posterior margin of segments and the anal segment, yellow. Tegmina hyaline with a brown mark at apex of costal cell and another at apex of clavus with a very slight infuscation stretching between them; veins same color as membrane, tubercles sparse, minute, same color as veins, bearing black macrotrichia.

Female. Brachypterous; length, 3.1 mm.; tegmen, 2.4 mm. In color somewhat lighter than male, the carinae of thorax light.

Described from nine males and seven females from Alakai swamp (*Swezey*, August, 1921), off *Dubautia* sp. The native name of the various species of this plant, as well as of some of the larger *Raillardiae*, is "naenae."

There is considerable variation in color from the darker to the lighter forms in both sexes, in some the dark mark on tegmen is distinct and runs basad along Sc + R. This species I place near *I. geranii*. The aedeagus recalls that of *Nesorestias nimbata*. Type No. 1054.

Ilburnia viridis sp. n. Figures 13, 13a.

Male. Brachypterous; length, 2.1 mm.; tegmen, 1.5 mm. Length of vertex subequal to width, base slightly behind the middle of eyes, apex rounded, produced slightly in front of eyes, carinae obscure; length of frons 1.8 times the width, widest slightly on apical third, median carina obscure. Antennae reaching near to middle of clypeus, second joint double the length of first. Tegmina reaching to base of pygofer.

Pygofer considerably wider than long, ventral margin shallowly and roundly emarginate and thickened; lateral margins round, entire; anal emargination moderate, enclosing slightly more than half the circumference of anal tube, anal angles rounded, not prominent. Diaphragm fairly long, dorsal margin biconcave, the middle produced into a point, the armature forming a thin plate from dorsal margin to orifice, which in lateral view has three or four irregular serrations. Anal segment moderately large, anal spines moderately large, broad, flattened laterally. Genital styles narrow, long, reaching to anal segment, diverging, inner margin sinuate, outer margin concave in middle, apex truncate, basal angle moderately developed. Aedeagus long, slender, subcylindrical, the apical half straight, basal half slightly curved upward, a row of small teeth along the ventral aspect of apical half or two-thirds, and three or four on dorsal aspect in middle, a few small teeth on left side near apex; orifice on left side at apex.

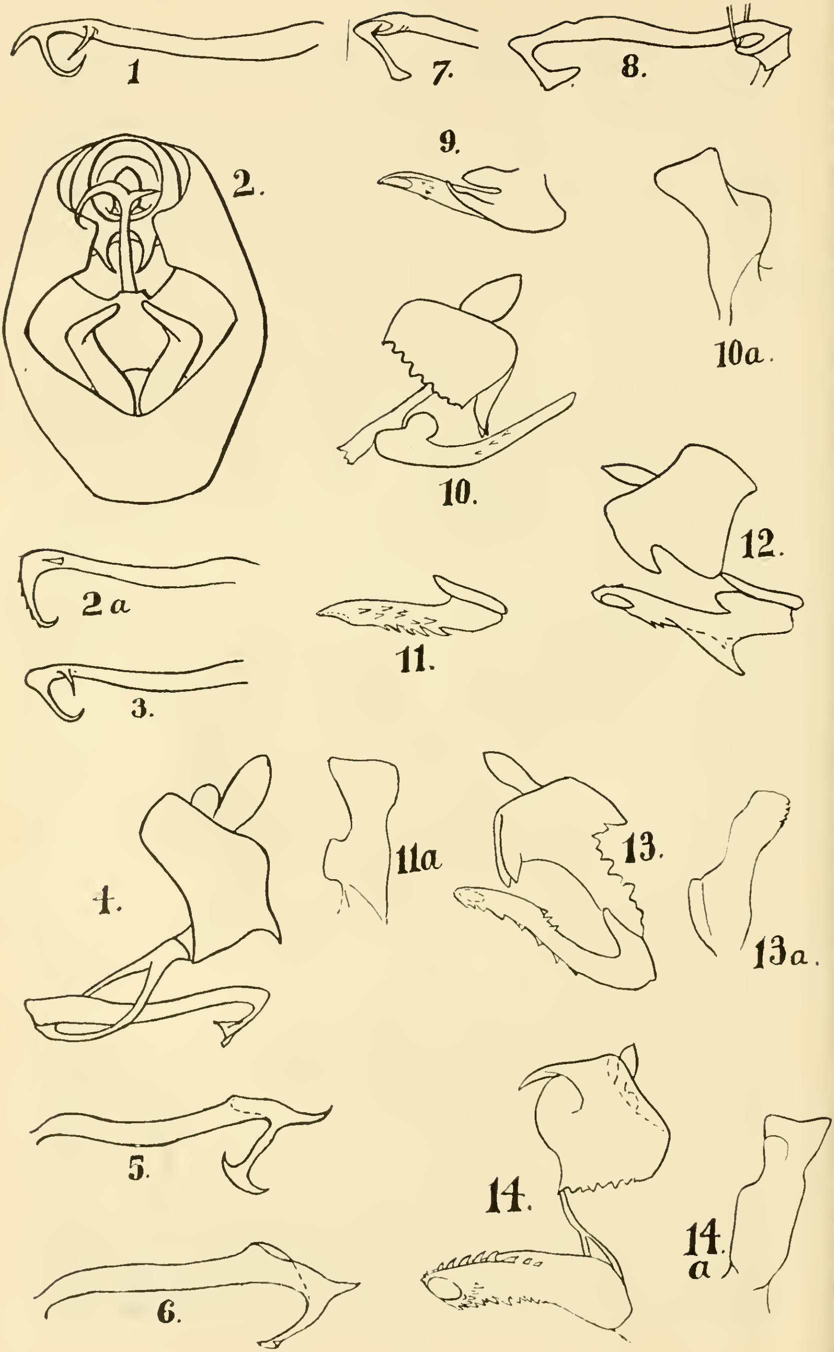
Light green, legs and pygofer slightly lighter in color, arista of antenna and spines on legs dark brown. Tegmina hyaline tinged with green, veins light green.

Female. Brachypterous; length, 2.4 mm.; tegmen, 1.8 mm. Similar in color to male. Ovipositor light brown or fuscous.

Described from two males and thirteen females from Nualolo, off *Phyllostegia* (*Swezey*, September, 1921). This species I place near to *I. boehmeriae*, but it is quite distinct. Type No. 1053.

Ilburnia pilo sp. n. Figures 14, 14a.

Male. Brachypterous; length, 2.1 mm.; tegmen, 1.4 mm. Vertex longer than broad, projecting somewhat beyond eyes, apex broader than base, slightly rounded, base considerably behind middle of eyes; length of frons twice the width, broadest in middle, sides slightly arcuate. An-



Male genitalia of Delphacidae.

tennae reaching to near middle of clypeus, length of second segment nearly twice the first. Tegmina reaching to base of pygofer.

Opening of pygofer longer than broad, margins entire, ventral margin very slightly emarginate; anal emargination large, anal angle angular but not produced; diaphragm fairly long, dorsal margin broadly U-shape, armature forming a broad ridge from dorsal margin to orifice, but not greatly produced, surface slightly shagreen. Anal segment large, spines large, wide apart, their bases greatly enlarged in lateral view, similar to the spines in *Aloha ipomoeicola.* Genital styles reaching to dorsal margin of diaphragm, apex truncate, basal angle not greatly produced, slightly narrowed in middle. Aedeagus subtubular, slightly flattened laterally, very slightly curved; in the dorsal aspect of the apical half there is a row of about ten teeth, on the ventral apical half a row of about two irregular teeth, with a few on the right side.

Dark brown or nearly black, carinae of head and thorax lighter, antennae lighter, legs lighter, coxae and femora fuscous; abdomen dark, with posterior margin light. Tegmina hyaline, slightly fuscous except apical cells and base of clavus, the veins in fuscous area darker, tubercles minute, bearing black macrotrichia.

Female. Brachypterous; length, 2.7 mm.; tegmen, 1.7 mm. Similar in color to the male. Tegmina reaching to base of eighth abdominal tergite.

Macropterous; length, 2.7 mm.; tegmen, 2.6 mm. Similar in color to the brachypterous form; the tegmina hyaline with brown veins and no fuscous mark.

PLATE III.

LIST OF FIGURES.

Described from twenty-two males, twenty females, and a number of nymphs from Haleakala, 5800 feet elevation, off *Coprosma ernodeoides* (*Timberlake*, July, 1919), the native name of all the species of this genus being "pilo."

This species is near *I. coprosmicola* of Hawaii, but differs distinctly in the genitalia. In *I. coprosmicola* the pygofer is more excavate on the ventral margin and the genital styles more exposed, longer, apex oblique and reaching to the anal segment; the armature of diaphragm is much larger, and projects as a thin flange; the aedeagus is more slender, and the spines not so stout. Type No. 1058.

I. ahinahina n. n.

Ilburnia pulla Muir Pro. Haw. Ent. Soc. IV, p. 98 (1919), pre-occupied by *I. rubescens* var. *pulla* (Muir). Pro. Haw. Ent. Soc. III, p. 186 (1916).

Kelisia swezeyi Kirk.

A small series from Halemanu off *Eragrostis* (*Swezey*, August, 1921).

The Distribution and Island Endemism of Hawaiian Delphacidae (Homoptera) with Additional Lists of Their Food Plants.

BY WALTER M. GIFFARD.

(Presented at the meeting of December 1, 1921.)

In presenting the following tables as a guide and check list to such as may be interested in this group of our endemic leaf-hoppers, the compiler wishes to digress somewhat from the introductory remarks which such tables might ordinarily occasion. Because our endemic leaf-hoppers, like some others elsewhere, do not particularly affect agricultural interests, and therefore are of no special economic importance, some may wonder why so much interest is taken in their biology and morphology by our local entomologists. There are several reasons for this. First, because of several very injurious species of hoppers, not so very far from our gates, which as yet have not reached Hawaii; and, second, because the sugar cane leaf-hopper (*Perkinsiella saccharicida*), which cost this Territory losses of many millions of dollars in 1903, 1904 and subsequent years, is, as it were, the foundation-stone of economic entomology in Hawaii. Not only was this Delphacid responsible for large money losses, but it was also the cause for organizing in 1903 of a large staff of entomologists for biological research and field work in the Territory, and the building up of such organizations as the Experimental Station of the Hawaiian Sugar Planters' Association and the Territorial Board of Agriculture and Forestry and its Plant Quarantine and Inspection Department. It is therefore not surprising that the many families and groups of leaf-hoppers distributed through both continents are of more than passing interest to some of our systematic as well as economic workers. The systematic study of these families or groups, whether local or foreign, is quite necessary because, with Hawaii as the "Cross Roads of the Pacific" and in almost daily steamship communication with many tropical or sub-tropical regions, there is always the possibility that one or more of several known species of hoppers or other injurious insects may be accidentally introduced. In this connection, as an instance, it might here be recorded that in 1913 Mr. J. C. Bridwell, while in Nigeria, West Africa, collected there among other material for study in Honolulu, a small Delphacid, allied to our own sugar cane leaf-hopper, which Mr. Muir later described as *Megamelus flavolineatus*. During the past year Mr. Muir has received collections of leaf-hoppers from Porto Rico (where insects of some sort are carrying mosaic disease in sugar cane) and among these he found this West African species of which Mr. Wolcott, the entomologist in Porto Rico, remarks: "The identification of *M. flavolineatus* was especially fortunate, as this is a cane insect which may become a serious pest." The fact, therefore, that these insects convey many plant diseases also makes their study necessary for economic work. Knowledge acquired purely from scientific studies sooner or later is the foundation of applied practices, as is well instanced in the "Fauna Hawaiiensis," without which we never could have handled our local entomological problems with the same degree of certainty.

The present tables summarize our knowledge of the distribution of the endemic Delphacidae in our islands and further adds to the lists of their food plants as previously published.* As is to be expected, the species having *all* or many long-winged forms have a wider distribution than those having only a few or *no* long-winged forms. The comparative paucity of *Alohini* on Kauai and comparative richness of *Leialohini* is of interest and may indicate that that island was separated from the others before the arrival of Delphacidae in the Archipelago. The distribution shows the value of segregation in species formation, which fact is also shown by the lists of food plants. Those species living on two or more plants show much greater variability than those confined to a single plant. When we consider the topography of the islands, the isolated distribution of many plants and the fact that so many species are represented only by short-winged forms or by only an occasional long-winged form, we can see how isolation can take place even on the same island.

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* Proc. Haw. Ent. Soc. III, No. 4, May, 1917, p. 339 et seq.

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(4) *op. cit.* 1917, Vol. III, Part 4.
(5) *op. cit.* 1918, Vol. III, Part 5.
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* The references include only such papers as give descriptions, notes, and observations.

TABLE I.

Island Distribution of Hawaiian Delphacidae *

ALOHINI	Macropterous Form		Brachypterous Form		Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Bibliography†
	Male	Female	Male	Female							
Leialoha											
naniicola (Kirk)	X	X				X				X	(1) p. 580; (3) p. 172
lehuae (Kirk)	X	X			X	X		X			(1) p. 581; (3) p. 172; (8) p. 91
oahuensis Muir	X	X				X		X			(3) 173; (4) 300
hawaiiensis Muir	X	X								X	(3) 173; (4) 300; (5) 409
mauiensis Muir	X	X							X		(6) 87; (7) 509
lanaiensis Muir	X	X						X			(4) 299
kauaiensis Muir	X	X			X						(3) 173; (8) 93
suttoniae Muir	X	X			X						(8) 92
scaevolae Muir	X	X			X						(8) 93
ohiae (Kirk)	X	X			X	X				X	(1) 581; (3) 174
oceanides (Kirk)	X	X			X						(1) 580 (Aloha); (3) 174; (8) 92
pacifica (Kirk)		X			?		?				(1) 581
Nesodryas											
freycinetiae Kirk	X	X				X					(1) 596; (3) 175
giffardi Kirk	X	X				X					(1) 597; (3) 175
elaeocarpi Kirk	X	X				X					(1) 596; (3) 175
eugeniae Kirk	X	X				X		X			(1) 597; (3) 175; (4) 301
antidesmae Muir	X	X				X					(4) 300
dodonaeae Muir	X	X			X						(3) 176; (8) 95
Nesodryas (Nesothoë)											
fletus (Kirk)	X	X						X	X		(1) 592; (3) 176; (4) 302; (6) 87
dryope Kirk	X	X			X	X				X	(1) 597; (3) 176; (4) 301; (5) 409
haa Muir	X	X								X	(7) 509
munroi Muir	X	X						X		X	(4) 303; (6) 87
gulicki Muir	X	X				X				X	(3) 177; (4) 301; (6) 87
alboguttata Muir	X				X						(8) 94
semialba Muir	X	X			X						(8) 95
terryi (Kirk)	X	X				X					(1) 594; (4) 301
bobeae (Kirk)	X	X				X					(1) 593; (3) 177
piilani (Kirk)	X	X					X	X			(1) 594; (3) 178; (4) 301
maculata Muir	X	X						X		X	(3) 177; (4) 302; (5) 409
perkinsi (Kirk)	X	X				X					(1) 593; (3) 178
seminigrofrons Muir	X	X			X						(8) 94
hula (Kirk)	X	X			X						(1) 592; (3) 178; (8) 93
laka (Kirk)	X	X							X		(1) 594; (3) 178; (6) 87

*Islands showing ? mark opposite three species are included in the summaries and tables of island endemism.

†See page 105 for list of references.

TABLE I—Continued.

ALOHINI	Macropterous Form		Brachypterous Form		Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Bibliography
	Male	Female	Male	Female							
Nesodryas (Nesothoë)—contd.											
pluvialis .... (Kirk)		X			X						(1) 595; (3) 178
silvestris .... (Kirk)		X						X			(1) 595; (3) 178
frigidula .... (Kirk)		X								X	(1) 593; (3) 178
Aloha											
ipomoeae .... Kirk		X	X	X	X	X	X	X	X	X	(1) 581; (3) 178; (6) 88
myoporicola .... Kirk			X	X				X		X	(1) 581; (3) 179; (4) 303; (5) 410; (7) 510
plectranthi .... Muir			X	X		X					(3) 179
kirkaldyi .... Muir			X	X		X					(3) 180
swezeyi .... Muir		X	X	X	X	X				X	(3) 180; (4) 303; (5) 410; (8) 96
flavocollaris .... Muir			X	X		X					(3) 181
dubautiae .... (Kirk)			X	X		X					(1) 583 (Nesopleias); (3) 182
artemisiae .... (Kirk)			X	X		X					(2a) 118 (Nesopleias); (3) 182
campylothecae .... Muir			X	X		X					(3) 183; (4) 303
Nesorestias											
filicicola .... Kirk			X	X		X					(1) 583
nimbata .... (Kirk)			X	X		X					(1) 582
Nothorestias											
badia .... Muir			X			X					(4) 304
swezeyi .... Muir			X	X		X					(8) 87
Dictyophorodelphax											
mirabilis .... Swezey			X	X		X					(2) 104; (3) 184; (4) 279
swezeyi .... Bridwell			X	X		X					(5) 386
praedicta .... Bridwell			X	X					X		(6) 72
Ilburnia											
koae .... (Kirk)	X	X	X	X	?	X				X	(1) 583; (2) 161, 208 fig.; (3) 185; (5) 410
rubescens .... (Kirk)	X	X			X	X			X	X	(1) 584; (2) 202; (5) 411; (6) 90; (8) 96
rubescens var. pulla . (Muir)	X	X				X				X	(3) 186; (5) 411
koae-phylodii ...... (Muir)	X	X			X	?					(3) 186; (8) 96
pilo .... Muir		X	X	X					X		(8) 99
coprosmicola .... Muir			X	X						X	(6) 103; (7) 516
pseudo-rubescens ... (Muir)	X	X							X	X	(3) 186; (5) 411; (6) 88
swezeyi .... (Muir)			X			X					(3) 187
anceps .... (Muir)			X	X						X	(3) 187; (5) 411
nephelias .... (Kirk)			X	X				X			(1) 588; (3) 197; (4) 308
nigriceps .... (Muir)			X	X				X			(4) 308
cyrtandricola .... (Muir)			X	X						X	(5) 406, 412
dubautiae .... Muir			X	X					X		(7) 510
pele .... (Kirk)	X	X								X	(1) 585; (3) 188; (4) 304
raillardicola .... Muir			X	X					X		(6) 102

TABLE I—Continued.

ALOHINI	Macropterous Form		Brachypterous Form		Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Bibliography
	Male	Female	Male	Female							
Ilburnia—continued											
nesopele Muir			X	X					X		(7) 511
oahuensis (Muir)			X	X		X					(3) 188
stenogynicola Muir			X	X					X		(6) 94
campylothecae Muir			X	X	X						(8) 97
mamake Muir			X	X					X		(6) 101
cyrtandrae (Muir)			X						X		(3) 189
timberlakei (Muir)			X			X					(4) 304
phyllostegiae (Muir)		X	X	X						X	(5) 405, 412
kokolau Muir			X	X					X		(6) 95
neocyrtandrae Muir			X	X					X		(6) 100
gouldiae (Kirk)			X	X		X					(1) 586; (3) 189
nephrolepidis (Kirk)			X	X		X				X	(1) 586; (2) 203; (3) 189
blackburni (Muir)	X	X	X	X		X			X	X	(3) 189; (4) 308; (5) 411; (6) 108; (7) 514
curvata Muir			X						X		(6) 96
aku Muir			X	X						X	(7) 513
perkinsi (Muir)			X						X		(3) 190
nesogunnerae (Muir)			X	X				X			(4) 305
gunnerae Muir)			X	X		X					(4) 305
disjuncta Muir)			X	X				X			(4) 306
amamau Muir			X	X					X		(7) 512
painiu Muir			X	X					X		(6) 102
neowailupensis Muir			X	X		X					(3) 191 (N. wailupensis); (6) 108
lobeliae (Muir)			X	X		X					(3) 212; (4) 306; (6) 108; (7) 520
waikamoiensis Muir			X	X					X		(6) 97; (7) 514
wailupensis (Muir)			X	X		X					(3) 181 (Aloha)
boehmeriae Muir			X	X		X					(7) 514
viridis Muir			X	X	X						(8) 99
kuschei Muir			X	X	X						(8) 96
pipturi (Kirk)			X	X		X	X				(1) 584; (1) 202; (3) 191
chambersi (Kirk)			X	X						X	(1) 590; (1) 202; (3) 192; (7) 515
osborni (Muir)			X	X					X		(3) 192; (6) 99
acuta Muir			X	X					X		(6) 96
geranii Muir			X	X					X		(7) 515
naenae Muir			X	X	X						(8) 98
cyathodis (Kirk)			X	X						X	(1) 589; (3) 192; (6) 91
var. fullawayi (Muir)			X	X			X				(3) 192; (6) 91
var. lanaiensis (Muir)			X	X				X	X		(4) 309; (6) 92
var. nigrinervis Muir			X	X					X		(6) 92
var. ceke Muir			X	X					X		(6) 92
incommoda (Muir)			X	X		X					(3) 193
ahinahina Muir			X						X		(6) 98 (pulla); (8)
mauiensis Muir			X	X					X		(6) 99
sulcata Muir			X	X					X		(7) 516
leahi (Kirk)	X	X	X	X	X	X					Ent. 1904 p. 176 (Megamelus) (2) 202; (3) 193

TABLE I—Continued.

ALOHINI		Macropterous Form		Brachypterous Form		Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Bibliography
		Male	Female	Male	Female							
Ilburnia—continued												
monticola	(Kirk)			X	X					X		(1) 591; (3) 197; (6) 90
raillardiae	(Kirk)		X	X	X						X	(1) 590; (2) 203; (3) 194; (4) 309; (7) 516
coprosmae	Muir			X	X					X		(6) 93
neoraillardiae	Muir			X	X						X	(7) 517
ipomoeicola	(Kirk)	X	X	X	X	X	X				X	(1) 586; (2) 202; (3) 194; (5) 412; (7) 517; (8) 96
longipes	Muir			X	X					X		(6) 93
halia	(Kirk)			X	X		X					(1) 584; (2) 202; (3) 194
giffardi	(Muir)			X	X		X					(3) 194
montis-tantalus	(Muir)			X	X		X					(3) 195
sharpi	(Muir)			X	X		X					(3) 195
asteliae	(Muir)			X	X		X					(4) 307
koebelei	(Muir)			X			X					(4) 308
gigantea	Muir			X			X					(7) 517
rocki	(Muir)			X	X		X					(3) 196
haleakala	(Kirk)				X					X		(1) 587; (3) 197
argyroxiphii	(Kirk)			X	X					X		(1) 590; (2) 203; (3) 197; (6) 89.
procellaris	(Kirk)			X	X			X				(1) 588; (3) 197
umbratica	(Kirk)	?	?	?	?						X	(1) 585
hamadryas	(Kirk)		X				X					(1) 587
palustris	(Kirk)			X				X				(1) 589; (2) 202
nubigena	(Kirk)			X				X				(1) 589
imbricola	(Kirk)			X						X		(1) 590
sola	(Muir)			X			X					(4) 307
hamata	(Muir)			X	X				X			(4) 309
tetramolopii	Muir			X	X					X		(6) 88
bridwelli	Muir			X	X					X		(6) 90
olympica	Muir			X	X		X					(7) 520
ulehihi	Muir			X	X						X	(6) 104
DELPHACINI												
Kelisia												
sporobolicola	Kirk		X	X	X	X	X			X	X	(1) 578; (4) 310; (6) 86; (7) 509
var. immaculata	Muir			X	X						X	(7) 509
swezeyi	Kirk		X	X	X	X	X					(1) 578; (4) 310; (7) 509; (8) 102
eragrosticola	Muir		X	X	X					X		(6) 85
emoloa	Muir			X	X		X					(4) 311
‡paludum	Kirk			X	X		X					(1) 579; (4) 310
Perkinsiella												
‡saccharicida	Kirk	X	X	X	X	X	X	X	X	X	X	
Peregrinus												
‡maidis	(Ashm.)	X	X	X	X	X	X	X	X	X	X	

‡Introduced species.

TABLE I—Continued.

Summary of Genera and Species Described from all Islands

Genera	Species
Leialoha	12
Nesodryas	6
Nesodryas (Nesothoë)	18
Aloha	9
Nesorestias	2
Nothorestias	2
Dictyophorodelphax	3
Ilburnia	87
†Kelisia	6
*Perkinsiella	1
*Peregrinus	1
Total	147

*Recent introduction.

†One species (K. paludum) cosmopolitan.

TABLE II.

Total Species on Each Island

Genera	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii
Leialoha	7	4	1	3	1	3
Nesodryas	1	5	0	1	0	0
Nesodryas (Nesothoë)	6	5	1	5	2	6
Aloha	2	8	1	2	1	3
Nesorestias	0	2	0	0	0	0
Nothorestias	0	2	0	0	0	0
Dictyophorodelphax	0	2	0	0	1	0
Ilburnia	9	30	5	6	35	19
Kelisia	2	4	0	0	2	2
Perkinsiella	1	1	1	1	1	1
Peregrinus	1	1	1	1	1	1
	29	64	10	19	44	35

TABLE III.

Single Island Endemism*

Islands	Leialoha	Alohae	Delphacini	Tota
Kauai	10	4	0	14
Oahu	6	33	2	41
Molokai	0	3	0	3
Lanai	2	5	0	7
Maui	2	31	1	34
Hawaii	3	13	1	17
	23	89	4	116

*The tables of Island Endemism include **Kelisia paludum,** a cosmopolitan species, but not the recent introductions, **Perkinsiella saccharicida** and **Peregrinus maidis.**

TABLE III—Continued.

Species Included in Single Island Endemism

Genera	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Total
Leialoha	4	0	0	1	1	1	7
Nesodryas	1	4	0	0	0	0	5
Nesodryas (Nesothoë)	5	3	0	1	1	2	12
Aloha	0	6	0	0	0	0	6
Nesorestias	0	2	0	0	0	0	2
Nothorestias	0	2	0	0	0	0	2
Dictyophorodelphax	0	2	0	0	1	0	3
Ilburnia	4	20	3	5	30	13	75
Kelisia	0	2	0	0	1	1	4
	14	41	3	7	34	17	116

Species Included in Two Island Endemism

	Leialoha	Nesodryas	Nesodryas (Nesothoë)	Aloha	Ilburnia	Kelisia	Totals
Kauai + Oahu	0	0	0	0	2	1	3
Kauai + Molokai	1	0	0	0	0	0	1
Oahu + Molokai	0	0	0	0	1	0	1
Oahu + Lanai	1	1	0	0	0	0	2
Oahu + Hawaii	1	0	1	0	2	0	4
Molokai + Lanai	0	0	1	0	0	0	1
Molokai + Maui	0	0	0	0	1	0	1
Lanai + Maui	0	0	1	0	1	0	2
Lanai + Hawaii	0	0	2	1	0	0	3
Maui + Hawaii	0	0	0	1	0	0	1
	3	1	5	2	7	1	19

Species Included in Three Island Endemism

	Leialoha	Aloha	Ilburnia	Total
Kauai + Oahu + Lanai	1	0	0	1
Kauai + Oahu + Hawaii	2	1	2	5
Oahu + Maui + Hawaii	0	0	1	1
	3	1	3	7

Species Included in Four Island Endemism

	Ilburnia	Kelisia	Total
Kauai + Oahu + Maui + Hawaii	1	1	2

Species Included in Six Island Endemism

	Aloha
Kauai + Oahu + Molokai + Lanai + Maui + Hawaii	1

TABLE IV.

*ADDITIONS TO REFERENCE LIST OF HAWAIIAN DELPHACIDAE WITH THEIR FOOD PLANTS.†

Leialoha.

L. oahuensis Muir. *Metrosideros polymorpha* (4) long series, Munro, December, 1916.

L. mauiensis Muir. *Coprosma montana* (6) series both sexes and young, Giffard and Fullaway, May, 1918.

L. lanaiensis Muir. *Metrosideros polymorpha* (4) Munro, November, 1916.

L. kauaiensis Muir. *Metrosideros polymorpha* (3) Swezey, February; (8) Swezey, August, 1921.

L. hawaiiensis Muir. *Metrosideros collina polymorpha* (4) long series, with young, January, 1917.

L. suttoniae Muir. *Suttonia sandwicensis* (8) series both sexes, Swezey, August, 1921.

L. scaevolae Muir. *Scaevola chamissoniana* (8) long series, both sexes, August, 1921.

Nesodryas.

N. giffardi Kirk. *Cyrtandra* sp. (4) *Rollandia grandiflora* (4) Giffard, October, 1917.

N. fletus (Kirk.). *Antidesma platyphyllum* (6) one female, May, 1918, Giffard and Fullaway.

N. gulicki Muir. *Euphorbia* sp. (6) series, Giffard and Muir, December, 1918; *Metrosideros collina polymorpha* var. *glaberrima* (6) large series both sexes, August, 1918, Giffard.

N. perkinsi (Kirk.). *Metrosideros polymorpha* var. (4) small series, Giffard and Fullaway, November, 1916.

N. munroi Muir. *Dodonaea viscosa* var. *spathulata* (6) long series both sexes and young, Giffard, July, 1918.

N. piilani (Kirk.). *Osmanthus sandwicensis* (6) Munro, December, 1916.

N. haa Muir. *Antidesma platyphyllum* (7) large series both sexes, August, 1918; January, September, 1919, Giffard.

N. laka (Kirk.). *Sida* sp. (5) small series both sexes and young, Bridwell, August, 1918.

N. hula (Kirk.). *Sideroxylon* sp. (8) series both sexes, Swezey, August, 1921; *Osmanthus* sp. (8) series both sexes, Swezey, August, 1921.

N. seminigrofrons Muir. *Campylotheca* sp. (8) one female, one male, Swezey, August, 1921.

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* Continued from Proc. Haw. Ent. Soc. III, 4, 1917, p. 339 et seq.

† (*3*) refers to Proc. Haw. Ent. Soc. 1916, III, 3; (*4*) op. cit. 1917, III, 4; (*5*) op. cit. 1918, III, 5; (*6*) op. cit. 1919, IV, 1; (7) op. cit. 1921, IV, 3; (*8*) op. cit. 1922, V, 1.

N. alboguttata Muir. *Antidesma* sp. (8) one male, Swezey, August, 1921.

N. semialba Muir. *Osmanthus* sp. (8) one female, one male, Swezey, August, 1921.

N. dodonaeae Muir. *Dodonaea* sp. (8) three males, nine females; *Alphitonia* sp. (8) one male, five females, Swezey, August, 1921.

Aloha.

A. ipomoeae Kirk. *Ipomoea pentaphylla* (6) series both sexes, Giffard and Fullaway, May, 1918.

A. swezeyi Muir. *Cheirodendron gaudichaudii* (5) long series both sexes and nymphs, Giffard, August, 1917; long series both sexes and nymphs off *Bidens pilosa* (5) Giffard, August, 1917; *Campylotheca* sp. (8) series both sexes, Swezey, August, 1921.

Nothorestias.

N. swezeyi Muir. *Aspidium* sp. (8) Swezey, March, 1921.

Dictyophorodelphax.

D. swezeyi Brid. *Euphorbia celastroides* (5) small series, May, 1917; large series both sexes and young, February, 1918, Bridwell and Swezey.

D. praedicta Brid. *Euphorbia hookeri integrifolia* (6) large series both sexes and young, August-September, 1918, Bridwell.

Ilburnia.

I. phyllostegiae (Muir). *Phyllostegia racemosa* (5) long series both sexes and young, Giffard, August, 1917.

I. cyrtandricola (Muir). *Cyrtandra* sp. (5) long series both sexes and young, Giffard, August, 1917.

I. anceps (Muir). *Freycinetia arnotti* (5) four females and four males, Giffard, August, 1917.

I. monticola (Kirk.). *Coprosma montana* (6) long series and young, Bridwell, August, 1918.

I. tetramolopii Muir. *Tetramolopium humile* (6) long series and young, Bridwell, August, 1918.

I. bridwelli Muir. *Argyroxiphium virescens* (6) small series and young, Bridwell, August, 1918.

I. longipes Muir. *Cyrtandra mauiensis* (6) small series both sexes, Giffard and Fullaway, May, 1918.

I. coprosmae Muir. *Coprosma montana* (6) long series both sexes, Giffard and Fullaway, May, 1918.

I. stenogynicola Muir. *Stenogyne kamehamehae* (6) series both sexes, Giffard and Fullaway, May, 1918.

I. kokolau Muir. *Campylotheca* sp. (6) one male, two females, Bridwell, August, 1918.

I. dubautiae Muir. *Dubautia plantaginea* (7) Timberlake, July, 1919.

I. nesopele Muir. *Astelia veratroides* (7) series both sexes, Timberlake, July, 1919.

I. amamau Muir. *Sadleria* sp. (7) very large series both sexes, and young, Timberlake, July, 1919.

I. aku Muir. *Cyanea tritomantha* (7) series both sexes, Giffard, January, 1919.

I. boehmeriae Muir. *Boehmeria* sp. (7) small series and young, Swezey, August, 1919.

I. geranii Muir. *Geranium arboreum* (7) large series both sexes and young, Timberlake, July, 1919.

I. sulcata Muir. *Cyrtandra* sp. (7) small series both sexes and young, Timberlake, July, 1919.

I. blackburni (Muir). *Charpentiera obovata* (5) series both sexes and young, Giffard, August, 1917; *Strongylodon lucidum* (5) series both sexes, Giffard, August, 1917; *Touchardia latifolia* (5) small series both sexes and young (dark form), Giffard, August, 1917; *Cyanea hammatiflora* (6) small series both sexes, Rock, August, 1918; *Clermontia coerulea* (7) series both sexes, Timberlake, August, 1919; *Urera sandwicensis* (7) series both sexes and young, Giffard, August, 1918.

I. neoraillardiae Muir. *Lipochaeta subcordata* (7) very large series both sexes and young, Giffard.

I. gigantea Muir. *Pritchardia* sp. (7) one male only, Swezey, August, 1920.

I. olympica Muir. *Lobelia* sp. (7) small series both sexes, Swezey, August, 1920.

I. chambersi (Kirk.). *Raillardia ciliolata* (7) small series, Giffard, July, 1919.

I. cyathodis var. *lanaiensis* (Muir). *Cyathodes* sp. (6) small series, Bridwell, August, 1918.

I. cyathodis var. *nigrinervis* Muir. *Cyathodes* sp. (6) long series, Bridwell, August, 1918.

I. cyathodis subsp. *ecke* Muir. *Argyroxiphium* sp. (6) long series, Rock, August, 1918.

I. curvata Muir. *Cyrtandra* sp. (6) one female only, Giffard and Fullaway, May, 1918.

I. acuta Muir. *Cyrtandra mauiensis* (6) small series both sexes, Bridwell, August, 1918.

I. waikamoiensis Muir. *Cyanea aculeatiflora* (6) small series and young, Rock, August, 1918; *Cyanea* sp. (7) series both sexes and young, Timberlake, July, 1919.

I. ahinahina Muir. *Argyroxiphium* sp. (6) (8) one male only, Rock, August, 1918.

I. mauiensis Muir. *Campylotheca mauiensis* (6) very long series both sexes and young, Giffard and Fullaway, May, 1918.

I. neocyrtandrae Muir. *Gunnera petaloidea* (6) long series, Rock, August, 1918.

I. mamake Muir. *Pipturus* sp. (6) long series and young, Rock, August, 1918.

I. raillardiicola Muir. *Raillardia menziesii* and *R. platyphylla* (6) long series and young, Bridwell and Swezey, August, 1918.

I. raillardiae (Kirk.). *Raillardia scabra* and *R. ciliolata* (7) long series and young, Giffard, July, 1918.

I. painiu Muir. *Astelia veratroides* (6) small series both sexes, Bridwell, August, 1918.

I. coprosmicola Muir. *Coprosma ernodioides* (6) long series both sexes and young, Giffard, August, 1918.

I. uhehihi Muir. *Smilax sandwicensis* (6) three females and three males, Giffard, August, 1918.

I. nephrolepidis (Kirk.). *Nephrolepis exaltata*,* January, August, 1918, January, August, 1919, series both sexes and young, Giffard.

I. ipomoeicola (Kirk.). *Gouldia elongata*, *Antidesma* sp., and *Cyrtandra* sp. (5) small series with young in instances, Giffard, August, 1917 (probably accidental captures); *Strongylodon lucidum* (5) long series both sexes and young, Giffard, August, 1917; *Mucuna gigantea* (7) series both sexes and young, Giffard, August, 1918; *Polygonum* sp., *Pipturus* sp., and *Rumex* sp. (8) long series both sexes and young, Swezey, August, 1921.

I. lobeliae (Muir). *Kadua glomerata* (6) small series both sexes, Timberlake, September, 1918.

I. viridis Muir. *Phyllostegia* sp. (8) small series both sexes, Swezey, August, 1921.

I. naenae Muir. *Dubautia* sp. (8) series both sexes, Swezey, August, 1921.

I campylothecae Muir. *Campylotheca* sp. (8) small series both sexes, Swezey, August, 1921.

I. kuschei Muir. *Cyrtandra* sp. (8) three females and young, Swezey, August, 1921.

I. koae-phyllodii (Muir). *Acacia koa* (8) small series, Swezey, August, 1921.

I. pilo Muir. *Coprosma ernodioides* (8) very large series both sexes and young, Timberlake, July, 1919.

Kelisia.

K. sporobolicola Kirk. *Eragrostis atropioides* (6) long series, Bridwell, August, 1918; *Eragrostis* sp. (7) one female, one

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* The full series were taken two or three at a time on several occasions on several large plants growing in the "*Algae steam crack*" on the larva flow, within a few hundred yards of the active crater. The heat near steam vents in the crack prevented close collecting. This so-called algae steam crack was since covered by the flow of 1920.

male, Swezey, September, 1920; series, Timberlake, July, 1919.

K. eragrosticola Muir. *Eragrostis variabilis* (6) long series both sexes and young, Giffard and Fullaway, May, 1918.

K. swezeyi Kirk. *Eragrostis* sp. (7) small series, Swezey, September, 1920; *Eragrostis* sp. (8) small series, Swezey, August, 1921.

K. sporobolicola immaculata Muir. *Deschampsia australis* (7) long series both sexes and young, August, September, 1919, Timberlake, Giffard; *Vincentia angustifolia* (7) series both sexes and young (dark var.), Giffard, September, 1919.

Perkinsiella.

* *P. saccharicida* Kirk. (Sugar cane leaf hopper.) Widely distributed on sugar cane since 1902.

Peregrinus.

**P. maidis* (Ashm.). (Corn leaf hopper.) Widely distributed on Indian corn or maize since about 1880.

TABLE V.

ADDITIONS TO ALPHABETICAL LIST ** OF KNOWN HAWAIIAN FOOD-PLANTS † AND OF THE DELPHACIDAE ATTACHED THERETO.

Alphitonia excelsa Reiss. (Kauila). *Nesodryas dodonaeae* Muir.

Antidesma sp. (Hame). *Nesodryas alboguttata* Muir.

Antidesma platyphyllum Mann (Hame or Haa). *Nesodryas fletus* (Kirk.); *Nesodryas haa* Muir.

Argyroxiphium virescens Hbd. (Ahinahina). *Ilburnia bridwelli* Muir.

Argyroxiphium sp. (Ahinahina). *I. cyathodis* subsp. *eeke.* Muir; *I. ahinahina* Muir.

Astelia veratroides Gaud. (Painiu). *I. painiu* Muir.

Bidens pilosa L. *Aloha swezeyi* Muir.

Boehmeria stipularis Wedd. (Akolea). *I boehmeriae* Muir.

Campylotheca mauiensis Hbd. (Kookolau). *I. mauiensis* Muir.

Campylotheca sp. (Kookolau). *I. kokolau* Muir; *Nesodryas seminigrofrons* Muir; *I. campylothecae* Muir.

Charpentiera obovata Gaud. (Papala). *I. blackburni* (Muir).

Cheirodendron gaudichaudii (D. C.) Seem. (Olapa or Kauilamahu) *Aloha swezeyi* Muir.

Clermontia coerulea Hbd. (Haha). *I. blackburni* (Muir).

Coprosma ernodioides Gray (Kukainene) (gen. Pilo). *I. coprosmicola* Muir; *I. pilo* Muir.

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* Accidentally introduced.

** Continued from Proc. Haw. Ent. Soc. III, 4, 1917, p. 345 et seq.

† Specific and native names after Hilbd. Flora Haw. Is. 1888; Rock, Indig. trees of Haw. 1913; Rock, Bot. Bull. No. 2, Bd. Ag. and For. 1913.

Coprosma montana Hbd. (Pilo). *Leialoha lehuae mauiensis* Muir; *I. coprosmae* Muir; *I. monticola* Muir.

Cyanea aculeatiflora Rock (Haha). *I. waikamoiensis* Muir.

Cyanea hammatiflora Rock (Haha). *I. blackburni* (Muir).

Cyanea tritomantha Gray (Aku). *I. aku* Muir.

Cyathodes tameiameiae Cham. (Pukeawe or Maieli). *I. cyathodis* var. *fullawayi* Muir; var. *lanaiensis* Muir; var. *nigrinervis* Muir.

Cyrtandra mauiensis Rock *I. longipes* Muir; *I. acuta* Muir.

Cyrtandra sp. *I. cyrtandricola* Muir; *I. sulcata* Muir; *I. curvata* Muir; *I. kuschei* Muir.

Deschampsia australis Nees. *Kelisia sporobolicola* var. *immaculata* Muir.

Dodonaea viscosa L. var. *spathulata* Sm. (Aalii or Kumakani). *Nesodryas munroi* Muir.

Dodonaea sp. (Aalii). *Nesodryas dodonaeae* Muir.

Dubautia plantaginea Gaud. (Naenae). *I. dubautiae* Muir.

Dubautia sp. (Naenae). *I. naenae* Muir.

Eragrostis variabilis Gaud. (Emoloa or Kalamalo). *Kelisia eragrosticola* Muir.

Eragrostis atropioides Hbd. (Emoloa). *Kelisia sporobolicola* Kirk.

Eragrostis sp. (Emoloa). *K. sporobolicola* Kirk; *K. swezeyi* Kirk.

Euphorbia hookeri integrifolia Hbd. (Akoko). *Dictyophorodelphax praedicta* Brid.

Euphorbia celastroides Boiss. (Akoko). *D. swezeyi* Brid.

Euphorbia sp. (Akoko). *Nesodryas gulicki* Muir.

Freycinetia arnotti Gaud. (Ie-ie). *I. anceps* (Muir).

Geranium arboreum Gray (Nohuanu). *I. geranii* Muir.

Gunnera petaloidea Gaud. (Apeape). *I. neocyrtandrae* Muir.

Ipomoea pentaphylla Jacq. (Kuahulu). *Aloha ipomoeae* Kirk.

Kadua glomerata Hook & Arn. (Pilo? or Au?) *I. lobeliae* Muir.

Lipochaeta subcordata Gray (Nehe). *I. neoraillardiae* Muir.

Lobelia sp. *I. olympica* Muir.

Metrosideros polymorpha Gaud. vars. (Ohia lehua). *L. lehuae mauiensis* Muir; *L. lehuae lanaiensis* Muir; *L. lehuae kauaiensis* Muir; *L. lehuae oahuensis* Muir; *Nesodryas perkinsi* (Kirk.).

Mucuna gigantea D. C. (Kaeëë). *I. ipomoeicola* (Kirk.).

Nephrolepis exaltata Schott. (Okupukupu, Nianian or Pamoho). *I. nephrolepedis* (Kirk.).

Osmanthus sandwicensis (Gray) Knobl. (Pua or Ulupua). *Nesodryas piilani* (Kirk.); *Nesodryas hula* (Kirk.); *Nesodryas semialba* Muir.

Pelea sp. (Alani). *Nesodryas hula* (Kirk.) (one specimen only).

Phyllostegia sp. (Ulihi). *I. viridis* Muir; *N. hula* (Kirk.) (one specimen only).

Phyllostegia racemosa Benth. (Kiponapona). *I. phyllostegiae* Muir.

Pipturus albidus Gray (Mamake). *I. mamake* Muir; *I. ipomoeicola* (Kirk.).

Polygonum sp. (Kamole). *I. ipomoeicola* (Kirk).

Pritchardia sp. (Loulu and Hawane). *I. gigantea* Muir.

Raillardia ciliolata D. C. (Kupaua?). *I. chambersi* (Kirk.); *I. raillardiae* (Kirk.).
Raillardia menziesii Gray (Kupaua?). *I. raillardiicola* Muir.
Raillardia platyphylla Gray (Kupaua?). *I. raillardiicola* Muir.
Raillardia scabra D. C. (Kupaua). *I. raillardiae* (Kirk.).
Rumex sp. (Pawale or Uhauhako). *I. ipomoeicola* (Kirk.).
Sadleria sp. (Amaumau). *I. amamau* Muir.
Saccharum officinarum L. (Ko) Sugar Cane. *Perkinsiella saccharicida* Kirk.
Scaevola chamissoniana Gaud. (Naupaka). *Leialoha scaevolae* Muir.
Sesbania tomentosa Hook & Arn. (Ohai). *Aloha ipomoeae* (Kirk.).
Sida sp. (Ilima). *Nesodryas laka* (Kirk.).
Sideroxylon sp. (Alaa, Aulu or Kaulu). *Nesodryas hula* (Kirk.).
Smilax sandwicensis Kth. (Uhi, Ulehihi & Pioi). *I ulehihi* Muir.
Stenogyne kamehamehae Waw. (Puaainaka, Maohiohi or Mohihi). *I stenogynicola* Muir.
Strongylodon lucidum Seem. (Nukuiwi or Kaiwi). *I. blackburni* (Muir); *I. ipomoeicola* (Kirk.).
Suttonia sp. (Kolea). *N. hula* (Kirk.) (two specimens only); *N. dodonaeae* Muir (one specimen only).
Suttonia sandwicensis (A. D. C.) Mez. (Kolea laulii). *Leialoha suttoniae* Muir.
Tetramolopium humile Hbd. *I. tetramolopii* Muir.
Touchardia latifolia Gaud. (Oloná). *I. blackburni* (Muir).
Urera sandvicensis Wedd. (Opuhe). *I. blackburni* (Muir).
Vincentia angustifolia Gaud. *Kelisia sporobolicola immaculata* Muir.
Zea mays L. (Maize or Indian Corn). *Peregrinus maidis* (Ashm.).

Notes and Observations on Parandra Puncticeps Sharp (Coleoptera).

BY W. M. GIFFARD.

(Presented at the meeting of October 6, 1921.)

In July, 1921, the writer found in the dense, inside forest above the "twenty-nine mile" region in Olaa, Hawaii, at approximately 3800 feet elevation, a particularly rotted stump of *Suttonia*, which had been attacked by this Cerambycid. Due to its decayed condition and the absence of all bark, adult beetles were not seen, but a large number of the larvae and pupae were taken. The most part of these were preserved in alcohol for future study, but a number of the pupae were kept alive to be reared, and were later placed in a glass jar filled with the dry but rotted tree loam from the stump. By the end of August, eighteen adults (nine males and nine females) had been reared from these pupae. In order to make a partial test of the longevity of the adult beetle, the last six specimens reared were kept under observation for four weeks, and later killed. This period could have been extended, as the beetles continued to exhibit considerable activity when emerging from the soil after dark. Their tendency during the night was to fight and mutilate each other, however, and it was deemed necessary to either kill them or have them ruined for specimens. During the period of observation, it was noticed that the beetles appeared above the coarse loam in the jar only after dark, and retired from one to two inches below immediately at or before dawn. During their activity at night, efforts were repeatedly made to keep them under closer observation, using for this purpose the ordinary 40-watt electric lamp in ordinary household use. On every occasion, however, within three minutes of their exposure to light, the whole six specimens had "dug in" and would not reappear until after the jar had again been placed in the dark. Because of these nocturnal tendencies it was not possible to observe whether copulation took place during the period of their captivity. Most probably not, due to the unnatural conditions of their close confinement and to the exceptional activity previously referred to.

A series of fifty-three specimens of this indigenous Cerambycid (including the eighteen examples reared above) collected on the Islands of Hawaii, Kauai, and Oahu, at elevations from 1500 to 4000 feet, have been studied and the genital organs dissected out by the writer from three males and one female from Kauai, two males and one female from Hawaii, and one male from Oahu. Although these dissections may, for the present, be considered as a preliminary study, still, so far as can be seen at this time, the variations noticed by comparison of the genitalia of the examples from each of the islands named, present nothing of real specific value. The same may be said more positively of the body characters. Although the mandibles and the lateral margins of the thorax are extremely variable in male examples from each island, there are intermediate forms which connect these extremes. This is quite noticeable both as to structure and sculpture in the eighteen reared specimens from Hawaii previously referred to. The smaller series taken "in situ" on Oahu and Kauai present the same tendencies. The representative collections of this Cerambycid have heretofore been very sparse in individual specimens, and in consequence many of the variations noticed from time to time have led some to suspect the possibility of more than the one species described. Examination and study of a series like the present one, however, tends to lessen any such suspicion unless some other important but constant character than is yet known can be found by further study of larger series from all the islands in the archipelago.

The males of this beetle are easily separated from the females by the difference in structure of the mandibles and in the shape of the fifth abdominal ventral segment, which in the male is well rounded, while in the female it is flattened. Among fourteen specimens recently collected on Kauai by Mr. O. H. Swezey was found a small but starved example, the mandibles of which indicated the female sex, while the fifth ventral segment of the abdomen was that of a male. Upon dissection of the genitalia it was found to be a male, as suspected. This tends to show that in this variable species the use of the ventral segment, when separating the sexes, is perhaps more reliable than the mandibles.

While collecting the Kauai specimens above referred to, Mr. Swezey informs me that he observed the eggs of *Parandra puncticeps* inserted into the hard outer surface of the wood of a koa trunk, where the bark had loosened from the tree but had not yet fallen away, there being space enough beneath the bark for the female to perform the process of oviposition. He brought samples of these eggs "in situ" to Honolulu. This is believed to be the first record of finding the eggs of this interesting Cerambycid.

ANNUAL ADDRESS

Observations on the Phenomena of Heredity in the Ladybeetle, Coelophora Inaequalis (Fabricius).

BY P. H. TIMBERLAKE.

(Presented at the meeting of December 1, 1921.)

It has long been known that certain species of ladybeetles of the family Coccinellidae exhibit marked colorational dimorphism or even polymorphism. Among North American species *Adalia bipunctata* (Linnaeus) and *Olla abdominalis* (Say) are known to have a predominantly black phase besides the much more abundant paler form. Mr. A. F. Burgess appears to have been the first American entomologist to make observations on the phases of Coccinellidae, and in some breeding experiments that he conducted with *Adalia bipunctata* found that the black and normal phases, when mated together, produced both phases again not only in the first, but in the second generation.*

In experiments carried on at Whittier, California, in 1912, and again in 1915 at Salt Lake City, Utah (using beetles, however, from Brownsville, Texas, collected by Mr. M. M. High), I found a similar set of phenomena in regard to the heredity of the black and normal phases of *Olla abdominalis*. Throughout the experiments a perfect segregation of the phases was obtained, but there were no other evidences of Mendelian inheritance in respect to the dominance of one phase over the other, or in the sequence and proportions of the phases when interbred. It even seemed next to impossible to get pure stock of the black phase by breeding, for when this phase was mated together for two or more successive generations, the offspring was quite as apt to belong to the normal as to the black phase.

In 1912, I had the opportunity of experimenting with an Oriental Coccinellid *Cheilomenes sex-maculata* (Fabricius), which was brought by Mr. R. S. Woglum from India to the United States. Of this species I received originally eight females and one male which were all of the normal *sex-maculata* phase. As soon as they began to lay eggs the females

Proc. Haw. Ent. Soc., V, No. 1, October, 1922.

* U. S. Dept. Agric. Bur. Ent. Bull. 17, pp. 59, 60, 1898.

were isolated, and the offspring of each were thus kept under observation. Much to my surprise one of the females produced offspring of three types, the normal phase like the parent, a red phase with only the inner margin of the elytra black, and a black phase with a red cross-band behind the humeral angle of the elytra. I experimented with these forms as much as the time at my disposal and the ill-effect of inbreeding would permit, but could discover no evidence of Mendelian inheritance except in the perfect segregation of the phases. A complete set of data obtained from these experiments with *Cheilomenes* was submitted to a well-known student of Mendelian inheritance, Dr. John Detlefsen of the University of Illinois, and he was unwilling to venture any explanation of the phenomena presented, although loath to admit that the inheritance was not amenable to Mendelian laws.

Having seen from my own experiments and from those of other workers, including Mr. A. F. Burgess, Professor R. A. Johnson, and Miss Miriam Palmer, that while the inheritance of ladybeetles is often segregative, its phenomena are not otherwise easily amenable to Mendelian interpretations, I was surprised and delighted to find a case of simple Mendelian inheritance in the Australian ladybeetle, *Coelophora inaequalis* (Fabricius). This inheritance was coupled, moreover, with an example of a segregative but apparently non-Mendelian inheritance in an illuminating manner.

Coelophora inaequalis, so well known to Hawaiian entomologists, was an early introduction of Albert Koebele's into these islands from Australia. As found here it exhibits a remarkable uniformity of markings, and shows no trace of the range of variation credited to it elsewhere † and, in fact, it represents the normal and most abundant of the three phases

† The geographical range of this species is reported to extend from Japan and the Philippines through the East Indian Islands to New Caledonia and Queensland, but I am convinced that the Philippine form really represents a similar but quite distinct species from the Australian. The fact that there are two species confused under this name only partially explains the reputed variability of *inaequalis*, as I have reason to believe that both have a similar range of variation, and that similar color phases are common to both.

that I shall discuss later. It is bright red in color, with heavy black markings on the elytra and with the pronotum mostly black except on the anterior margin (Figure 1).

In July, 1919, Dr. F. X. Williams, on returning to Honolulu from Queensland, brought back a few beetles of *Coelophora inac-*

Fig. 1. Normal phase of *Coelophora inaequalis.*

qualis, which furnished the original stock of beetles with which I experimented during the greater part of the following year. In this stock was included two forms, and a third soon appeared in breeding, which to the uninitiated eye appeared to repre-

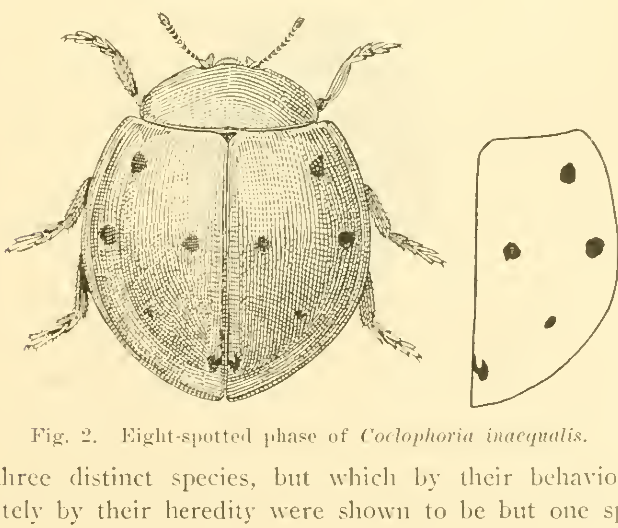

Fig. 2. Eight-spotted phase of *Coelophoria inaequalis.*

sent three distinct species, but which by their behavior and ultimately by their heredity were shown to be but one species.

Besides the normal phase of *inaequalis* there was a paler red form with four round black dots arranged in an oblique-sided quadrangle on each elytron, a common dot on the elytra near their apex, and usually two similar dots near the middle of the pronotum. This form, represented in Figure 2, may be called the nine-spotted phase from the nine dots on the elytra. The dots vary a little in size, but there has been observed no tendency whatever for this form to intergrade with the normal phase.

The third form was solidly black with only the anterior corners of the pronotum red, and I shall refer to it as the black phase (Fig. 3). It was the rarest from at first, although later obtained in number. It apparently was not included among the original lot of beetles which came from the Herbert River, Queensland, but two specimens were reared in the first generation from the stock supply of beetles, and thus of unknown parentage.

My first experiments were directed towards finding out the behavior of the nine-spotted and normal phases towards each other in heredity. Consequently, on August 26, three nine-spotted females were isolated in vials, and a record kept sep-

Fig. 3. Black phase of *Coelophora inaequalis*.

arately for each beetle of the number and character of the offspring which were reared to maturity. These beetles were from the stock supply, and had mated repeatedly and indiscriminately after the manner of Coccinellidae. The number of offspring reared in these and later experiments may appear trivially small, but this is due to the exacting nature of their voracious appetite and the time and care that has to be bestowed upon each larva to bring it to maturity.

Heredity of the Nine-spotted Phase.

The offspring obtained from the three nine-spotted females were as follows:

Female	Offspring reared
No. 1. Male parentage composite	4 nine-spotted and 15 normal
No. 2. Male parentage composite	9 nine-spotted and 15 normal
No. 3. Male parentage composite	20 nine-spotted and 20 normal
Totals	33 nine-spotted and 50 normal

The breeding together of the nine-spotted offspring gave the following results in the next generation:

Pair	Parent of female	Parent of male	Offspring reared
No. 6	No. 1	No. 3	10 nine-spotted and 6 normal
No. 7	No. 3	No. 2	16 nine-spotted and 3 normal
No. 9	No. 1	No. 2	6 nine-spotted and 1 normal
No. 10	No. 2	No. 3	10 nine-spotted and 2 normal
	Totals		42 12

The nine-spotted offspring of the second generation were again mated together, and gave these results:

Pair	Parent of female	Parent of male	Offspring reared
No. 12	No. 7	No. 6	13 nine-spotted and 0 normal
No. 18	No. 6	No. 10	12 nine-spotted and 5 normal
	Totals		25 nine-spotted and 5 normal

The results of similar matings for the succeeding generation were as follows:

Pair	Parent of female	Parent of male	Offspring reared
No. 21	No. 12	No. 18	0 nine-spotted and 2 normal
No. 27	No. 18	No. 12	8 nine-spotted and 5 normal
	Totals		8 nine-spotted and 7 normal

It thus appears that into the fourth generation the nine-spotted phase, when bred in a direct line, still produced normal offspring, and, in fact, produced a larger proportion of normal beetles in the fourth than in the third generation. This, however, may have been at least partly due to the smaller number of offspring of the fourth generation reared to maturity. It is possible, but we will not say how probable, if the breeding of this phase in a direct line had been continued longer, that ultimately the production of a practically pure race would have been reached.

Heredity of the Normal Phase.

No attempt was made to breed the normal phase in the direct line, as we already know that this phase was introduced into the Hawaiian Islands years ago, and that it has bred true to itself here since that time. The heredity of beetles of the normal phase derived from the nine-spotted form, however, may be considered.

Pair No. 8 of normal beetles were reared from the nine-spotted females No. 1 and 2, the character of whose offspring we have already seen. From this pair were reared eleven normal offspring.

Both beetles of the normal pair No. 24 were reared from the nine-spotted pair No. 18, and hence the parentage had been nine-spotted for three preceding generations in the female line, and at least for two generations in the male line of descent. From this pair seven normal beetles were reared.

Although these experiments are not extensive enough to be conclusive they seem to indicate that the normal phase is more stable than the nine-spotted phase. Presumably, however, the production of the nine-spotted phase from such parentage is possible, and at least occasionally takes place, although more rarely than the production of the normal phase from nine-spotted parentage.

Heredity of the Normal Crossed With the Nine-spotted Phase.

One mating was made to determine whether either the normal or nine-spotted phase were dominant over the other in heredity. Pair No. 31 consisted of a female of the nine-spotted phase reared from pair No. 12 and a normal male of Hawaiian stock. From the account already given of the heredity of the nine-spotted phase it is apparent that pair No. 12 were the nearest approach to a pure race of their kind achieved during the course of the experiments, as their offspring, thirteen in number, were all nine-spotted, and we already know that the Hawaiian beetles are at least presumptively of pure normal stock. The offspring of this interesting pair were seven nine-spotted and eight normal beetles.

There is thus no evidence to show that either the normal or the nine-spotted phase is dominant over the other in heredity, and the results of the various matings are not easily interpreted according to Mendelian laws. It is apparent, however, that the normal phase is considerably more stable than the nine-spotted form, as would be naturally expected from its much greater abundance. That the nine-spotted phase is able to maintain itself when it is both less stable and much less numerous than the normal phase is quite likely due to some other factor of heredity intervening which has not been considered as yet. Otherwise, it would seem inevitable that the nine-spotted phase would be finally swamped and eliminated.

Heredity of the Black Phase.

The black phase was not represented in the original lot of beetles that reached Honolulu alive, but two specimens appeared about September 1st in the first generation of offspring emerging in the jar in which the mixed lot of nine-spotted and normal beetles were kept. These were left in the breeding jar for a few days after reaching sexual maturity, and mated indiscriminately with each other and the other beetles. On September 12 one of the black beetles was removed and isolated in a vial as female No. 5, and for a mate was given a normal male of Hawaiian stock. But the fact that this female had mated previously with both the black and nine-spotted phases was apparent from the character of its offspring, as 3 black, 3 nine-spotted, and 16 normal beetles were reared from its eggs. Subsequently the offspring of female No. 5 were bred through five generations, and the black phase was found to be recessive to both the normal and nine-spotted forms and recurring in alternate generations in true Mendelian proportions.

Heredity of the Black Crossed With the Nine-spotted Phase.

In considering these breeding experiments in detail let us first take up the results of the crosses of the black with the nine-spotted phase. Pairs No. 16 and 17 consisted of black females reared from female No. 5 mated with nine-spotted males reared respectively from the nine-spotted pairs Nos. 6 and 9. From female No. 16, 6 nine-spotted beetles, and from female No. 17, 19 beetles of the same form were reared without either normal or black offspring. The reciprocal cross No. 35 had similar ancestry, the female having been reared from the nine-spotted pair No. 27, the black male from the F_2 generation of female No. 17. This crossing gave twenty-three nine-spotted beetles.‡ We see, therefore, that the nine-spotted phase is dominant over the black.

If the cross of black and nine-spotted forms is truly Mendelian in inheritance, as indicated by the dominance of the nine-spotted form over the black, the mating together of the nine-spotted offspring of this cross should produce in the following generation both nine-spotted and black forms in the proportion of 3 to 1. Consequently, three matings were made of the offspring of pairs No. 16 and 17, numbered respectively 19, 20, and 22. The results are conveniently given in tabular form.

Pair No.	Female from	Male from	Phase of parents	Character of offspring
19	No. 17	No. 17	Nine-spotted	15 nine-spotted, 5 black
20	No. 17	No. 17	Nine-spotted	3 nine-spotted, 2 black
22	No. 17	No. 17	Nine-spotted	4 nine-spotted, 1 black
	Totals			22 nine-spotted, 8 black

We see, therefore, that the black phase reappeared in F_2 generation approximately in the correct Mendelian proportion.

‡ Towards the end of this breeding experiment one normal and one black beetle issued from two lots of larvae reared to maturity, but there is considerable probability that these had gotten mixed in by mistake. If large numbers of larvae are handled at the same time, a small percentage of mixture of the different lots must be expected to occur occasionally, even if great care is taken to prevent this mishap.

The assumption follows that the nine-spotted and black phases behave as a simple allelomorphic pair.

Heredity of the Black Crossed With the Normal Phase.

The inheritance of the black crossed with the normal phase was next studied. A black female reared from pair No. 19 was mated with a normal male of Hawaiian stock as pair No. 33. From this mating nineteen normal beetles were reared and no black offspring, thus showing that the normal phase is dominant over the black. A reciprocal cross No. 34 was also made, using a normal female reared from pair No. 27 (parents and grandparents for three generations being nine-spotted) and a black male from pair No. 20. This mating produced twenty-six normal offspring, and thus also showed complete dominance of the normal phase.

The normal offspring of these two crosses were next mated together and the following results were obtained:

Pair No.	Female from	Male from	Phase of parents	Character of offspring
38	No. 33	No. 34	Normal	22 normal, 7 black
39	No. 33	No. 34	Normal	36 normal, 9 black
	Totals			58 normal, 16 black

We thus find an approximate Mendelian proportion of the black offspring to the more numerous normal beetles, and the conclusion is forced upon us that the black and normal phases form a simple allelomorphic pair quite the same as the black and nine-spotted phase. It would seem better, however, to consider the normal and nine-spotted phases taken together as forming one unit of the allelomorphic pair, and the black phase as the other unit.

The Heterozygous Normal Phase.

In the F_2 generation of crosses between the black and normal phases about three-fourths of the offspring are normal, of which one-fourth should be pure normal and one-half heterozygous or carrying both the black and normal factors of inheritance. During the course of my experiments I discovered that the heterozygous normal beetles differ slightly in coloration from the homozygous normals, and that they could be distinguished without fail. The homozygous beetles have the black of the pronotum extending out at the base clear to the lateral margins, whereas in the heterozygous beetles the pronotum is pale at the sides, and the femora and underparts of the thorax are paler (Fig. 4). Pair No. 42 of these normal

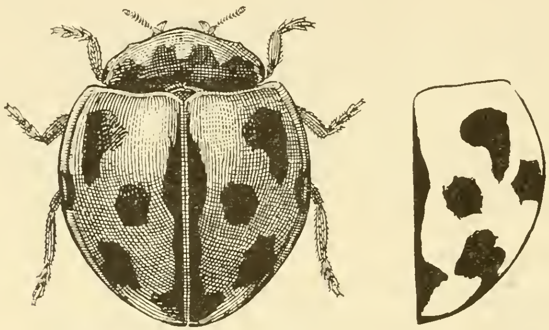

Fig. 4. Heterozygous normal phase of *Coelophora inaequalis*.

but heterozygous beetles selected from the offspring of pairs No. 38 and 39 produced 60 offspring of the F_3 generation; of these 47 were normal and 13 belonged to the black phase. On the other hand, no difference was detected between the homozygous nine-spotted beetles and those of the same phase which are heterozygous for black.

Heredity of Heterozygous Normal and Nine-spotted Beetles in Crosses.

If normal and nine-spotted beetles which are heterozygous for black are mated together we would expect to find segregation of all three phases in the offspring, and that the normal and nine-spotted taken together, outnumber the black offspring about 3 to 1. We would also expect the nine-spotted and normal phases to be produced in about equal numbers, or possibly with a preponderance in favor of the normal as the more stable phase. A cross of this kind was actually made, and we consequently are able to consider the outcome as expressed in the character of the offspring.

The female of pair No. 37 was a heterozygous nine-spotted beetle raised from pair No. 35 (nine-spotted X black), and the male a heterozygous normal beetle from pair No. 34 (normal X black). A total of 59 beetles were raised from this pair, of which 14 were normal, 28 nine-spotted, and 17 black. The blacks were produced, therefore, in true Mendelian proportion, but there was an unexpected preponderance of the nine-spotted over the normal.

If the ancestry of pair No. 37 be examined, the nine-spotted phase will be found greatly in the ascendency, the direct female line of descent having been nine-spotted for five preceding generations, and the direct male line also nine-spotted for the first four generations. This, perhaps, is the true explanation of the predominance of the nine-spotted phase in the offspring of this pair.

Nine-spotted Phase More Stable When Crossed With the Black.

But, on the other hand, when the nine-spotted phase is crossed with the black, as in pairs Nos. 16, 17 and 35, and in pairs Nos. 19, 20, and 22 of the F_2 generation, the nine-spotted phase is evidently stabilized, as from these pairs as many as seventy nine-spotted offspring were reared without the appearance of the normal phase except in one instance which may have been due to a mixture of lots. In crosses between heterozygous, and presumably homozygous nine-spotted beetles, a large percentage of the offspring were nine spotted. The data on these crosses may be conveniently tabulated:

Pair No.	Female from		Male from		Character of parents	Character of offspring	
15	No. 10	9-spotted	No. 5	black X normal	9-spotted	7 9-spotted	4 normal
23	No. 17	black X 9-spotted	No. 18	black X 9-spotted	9-spotted	14 9-spotted	1 normal
26	No. 18	9-spotted	No. 16	black X 9-spotted	9-spotted	2 9-spotted	0 normal
28	No. 12	9-spotted	No. 16	black X 9-spotted	9-spotted	19 9-spotted	6 normal
29	No. 15	9-spotted	No. 17	black X 9-spotted	9-spotted	14 9-spotted	4 normal
36	No. 22	9-spotted	No. 23	9-spotted	9-spotted	19 9-spotted	4 normal
	Totals					75 9-spotted	19 normal

There is some evidence, therefore, that the nine-spotted phase is given greater stability when crossed with the black, and this may be the explanation of the preponderance of the nine-spotted phase in the offspring of pair No. 37. We have also already seen that in crosses between the nine-spotted and the normal phase there is a distinct tendency for the former to be gradually eliminated, as it is less stable than the normal. If it is true that the nine-spotted phase is constantly stabilized by crosses with the black, the one tendency counteracts the other, and the nine-spotted phase is thus able to maintain itself under natural conditions.

Heredity of Heterozygous Beetles Crossed With Black.

In crosses where one parent is recessive and the other heterozygous, the offspring should be produced in the ratio of one recessive to every dominant. Two crosses of this nature were made and produced results given here in tabular form:

Pair No.	Female from	Male from	Character of parents	Character of offspring	
40	No. 35	No. 20	Heterozygous 9-spotted female X black male	33 black	35 9-spotted
41	No. 34	No. 20	Heterozygous normal female X black male	26 black	29 normal

We thus observe that the expected proportion of the phases was nearly perfectly attained in the offspring.

Heredity of the Black Phase Crossed With Black.

As the last link in the chain of evidence to prove that the black phase is a simple Mendelian recessive, the cross was made of black with black, using a female reared from pair No. 38, and a male from pair No. 39. From this union (pair No. 43) were reared a total of sixty-two beetles, all of which were black like the parents, showing that the black phase breeds true to itself as a recessive should.

Conclusions.

From the data now presented to you it is evident that the black phase of *Coelophora inaequalis* is a Mendelian recessive to the dominant normal and nine-spotted phases, that it breeds true to itself, and when crossed with either of the dominant forms is produced in Mendelian proportions in alternate generations.

The relationship of the normal and nine-spotted phases is difficult of Mendelian interpretation, although they are perfectly segregative in inheritance. On the whole the evidence in this species and in other species of Coccinellidae with corresponding forms, would indicate that the inheritance of these forms is not Mendelian and that the laws governing its manifestations are not yet discovered or understood. Taken together, however, the normal and nine-spotted phases form one unit of the allelomorphic pair of which the black phase is the other unit.

Descriptions of New Genera and Species of Hawaiian Encyrtidae (Hymenoptera), III.

BY P. H. TIMBERLAKE.

(Presented at the meeting of December 1, 1921.)

The present paper completes the consideration of Hawaiian Encyrtidae so far accumulated, except the endemic species of *Anagyrus*. The genera here treated all belong to the Mirini and the new species are apparently endemic. The types have been deposited in the collection of the Hawaiian Entomological Society.

Coelopencyrtus Timberlake.

The discovery of a fourth species of this interesting genus seems to indicate that our knowledge of its extent is far from complete. Of the described species three have been reared from *Odynerus nigripennis* (Holmgren) and only one from all the other species of *Odynerus*, although Dr. Perkins has recorded one or two probably undescribed species from the larvae of *Odynerus montanus* Smith and *O. oahuensis* Dalla Torre.* The preponderance of material reared from *nigripennis* is probably due to the fact that th nests of this species are much more frequently found than those of any other species of *Odynerus*, which are perhaps just as frequently parasitized.

The females of *Coelopencyrtus* are not easily distinguished as a rule, whereas the males show good characters in the structure of the head and antennae. The following table of the species may be found useful, although no characters have been discovered which will distinguish the females of *odyneri* and *swezeyi* in all cases. The distinctions given for these two species apply only to specimens from Oahu, as specimens of *swezeyi* from Hawaii have the characters given for *odyneri*, except that the eyes are considerably more sparsely pubescent than in specimens of either species from Oahu.

FEMALES.

1. Head not greatly wider than long, if at all; the frontovertex nearly thrice as long as wide; the eyes distinctly pubescent............ 2

* Fauna Hawaiiensis, Introduction, Vol. I, part 6, p. xcvii, 1913.

Head considerably wider than long; the frontovertex much wider or about twice as long as wide; the eyes bare..............*orbi* Timb.

2. Head about as long as wide; the clypeal margin produced medially; middle tibiae yellowish brown, except towards the base......... 3

Head somewhat wider than long, the clypeal margin roundingly arcuate, not distinctly produced medially; middle tibiae wholly blackish; frontovertex narrowest in front of the anterior ocellus. *mauiensis* n. sp.

3. Clypeal margin abruptly produced medially into a broadly rounded process; frontovertex narrowest at a point about halfway between the anterior and posterior ocelli, and strongly bluish in color. *odyneri* Timb.

Clypeal process less abruptly produced and somewhat subangulate at apex; frontovertex narrowest at the anterior ocellus and with a more or less greenish luster........................*swezeyi* Timb.

MALES.

1. Frontovertex either distinctly longer than wide or considerably produced in front of the eyes.................................... 3

Frontovertex no longer than wide and only slightly produced in front of the eyes... 2

2. Frontovertex a little wider than long, the frons weakly protuberant; pedicel of antennae with a basal conical process above. *orbi* Timb.

Frontovertex as long as wide, the frons rather strongly protuberant; pedicel expanded on dorsal side at apex so that it is twice as wide at apex as at base........................*mauiensis* n. sp.

3. Anterior ocellus on a line with the anterior margin of eyes in dorsal view of head; pedicel no wider than long; the first funicle joint with a lamelliform process above at base...........*odyneri* Timb.

Anterior ocellus in front of a line connecting the anterior corners of the eyes in dorsal view of head; pedicel considerably wider than long; the first funicle joint patelliform, produced above as a thin plate and as a short ramus on the outer side; the second funicle joint produced into a short ramus on the outer side. *swezeyi* Timb.

Coelopencyrtus sp.

A single female reared from the mud cell of *Odynerus oahuensis* Dalla Torre, collected at Makua, Oahu, in 1900 by Messrs. Koebele and Perkins, seems to represent a new species, but in the absence of the male it would be inadvisable to formally name and describe it. In the above table of species it would run to *odyneri*, except that the frontovertex is proportionately wider, being hardly over twice as long as wide. The head is somewhat thinner fronto-occipitally than in *odyneri*, a little wider than long, and the eyes appear to be somewhat more densely pubescent. The coloration agrees very well with *odyneri*.

Coelopencyrtus mauiensis n. sp. Figures 1-3.

Female. Similar to *odyneri*, but the head is somewhat thicker fronto-occipitally, and a little wider than long, with the clypeal margin subtruncate and rounding towards the sides, the medial process practically absent; frontovertex narrower, being narrowest at a point a little in front of the anterior ocellus, the inner orbits of the eyes, therefore, somewhat diverging posteriorly throughout a greater part of their length; ocelli in an equilateral triangle with the anterior ocellus somewhat behind the center of the frontovertex. (In specimens of *odyneri* of about the same size as the types of *mauiensis* the frontovertex is noticeably wider and the ocellar triangle is larger but still equilateral as the anterior ocellus is placed farther forward either at or before the center of the frontovertex, whereas in much larger specimens of *odyneri* the ocellar triangle is noticeably still more acute.) In other structural details and in sculpture and vestiture practically as in *odyneri*.

Coloration also about the same, except in regard to the legs and wings; the former are nearly wholly blackish, with the front and hind tarsi brownish, the middle tarsi and tibial spur brownish yellow, the middle tibiae also more or less brownish yellow, narrowly at apex on the under side; wings hyaline, with the smoky stain found in *odyneri* fainter,

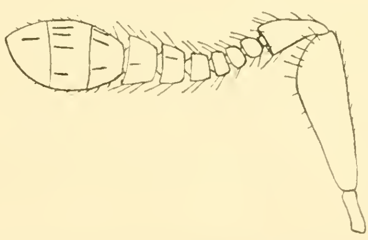

Fig. 1. *Coelopencyrtus mauiensis.* Antenna of female.

except across the disc opposite the apical third of the venation and abruptly terminating in a straight line parallel with the speculum and somewhat more basal, the base of the wing being perfectly clear except for a short, smoky streak near the posterior margin.

Length of body, (0.91 to) 1.21; length of head, 0.419; width of head, 0.466; width of vertex at posterior ocelli, 0.117; width of mesoscutum, 0.417; length of forewing, 1.00; width of forewing, 0.440 mm.

Male. Similar to *odyneri* in general characters, but the head is only twice as thick dorsally as at the oral margin, less distinctly longer than wide, and more rounded in frontal view but not so distinctly so as in *orbi;* frontovertex as long as wide and only slightly produced in front of the eyes with the frons nevertheless rather strongly protuberant; ocelli in a right-angled triangle, the anterior ocellus placed just behind a line connecting the anterior corners of the eyes, the posterior pair situated about one-half more than their own diameter from the occipital margin. Scape as wide as in *odyneri* and shaped nearly as in *swezeyi* and *orbi,* with the dorsal margin even more deeply concave and the ventral margin evenly and strongly convex, the inner margin near the base provided with a minute nipple-like process; pedicel comparatively large, flattened

Fig. 2. *Coelopencyrtus mauiensis.* Antenna of male, lateral view.

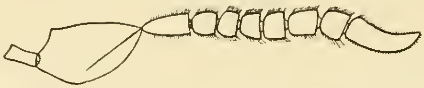

Fig. 3. *Coelopencyrtus mauiensis.* Antenna of male, dorsal view.

and produced above at apex so that in lateral view it is much wider at apex than at base and wider than either the scape or club; first and fifth funicle joints subequal in length and somewhat longer than the other joints, the second and third shortest; in lateral view of the funicle, all the joints more or less transverse, the first joint much wider at apex than at base and a little wider than the three following joints, but somewhat narrower than the fifth, the sixth distinctly smaller than the fifth, but appearing somewhat thicker in dorsal view; club somewhat shorter than the last three funicle joints combined, distinctly wider than the funicle and strongly obliquely inclined as in *odyneri.*

Face above antennae with a median carina, which reaches upward almost to the middle of the eyes; whole face above antennae shagreened or without smooth and polished areas found in the males of the other three species, being finely reticulate on the upper part between the eyes and rugulose-reticulate below, more roughly in the lower part of the scrobal impression or just above the strong transverse protuberance below and partly between the antennal sockets, considerably more smoothly in the deepest parts of the scrobal impressions opposite the upper half of the median carina; area of differentiated sculpture on either side of face between the antennal sockets and the eyes is very finely lineolate-reticulate and sharply defined below from the rugulose area of the middle of the face, but intergrading above next to the eyes with the reticulations of the upper part of the face, this area also much smaller than in *odyneri* or *swezeyi* and leaving a much wider median interspace; frontovertex duller or with the reticulations more rugulose than in *odyneri.*

Sculpture otherwise not differing materially from *odyneri*, and similar to the female.

The suberect pubescence on frontovertex and upper part of face rather dense and long, or about as in *odyneri;* the tuft of fine pubescence on the pedicel confined to the apex on the dorso-anterior margin; the short, erect pubescence of eyes rather dense as in *odyneri.*

Coloration as in the female except that the antennae are somewhat more brownish.

Length of body, (1.09 to) 1.19; length of head, 0.487; width of head, 0.471; width of vertex at posterior ocelli, 0.223; width of mesoscutum, 0.450; length of forewing, 0.992; width of forewing, 0.447 mm.

Described from 76 females, 7 males (holotype, allotype and paratypes), reared July 22, 1920, from a larva of *Odynerus nigripennis* (Holmgren), collected on the ditch trail near Keanae, Maui (O. H. Swezey).

Nesencyrtus kaalae (Ashmead). Figures 4, 5.

This species seems to have been unusually common in the fall of 1919 and following winter, as large series were reared at that time from the larvae or pupae of *Nesoprosopis fuscipennis* (Smith) and a small species which was probably *N. koae* Perkins, collected in the mountains back of Honolulu by Messrs. Bridwell and Williams.

From a pupa of what was probably *Nesoprosopis koae,* col-

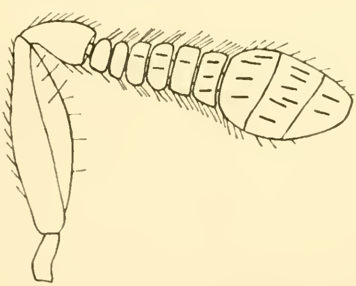

Fig. 4. *Nesencyrtus kaalae.* Antenna of female.

lected by Mr. J. C. Bridwell in a rotten stump at the base of the Thurston trail, Nuuanu Valley, Oahu, on October 19, 1919, 1 male and 17 females issued on November 1-2, and 5 living females were also taken in the debris of the same stump.

From three larvae of *Nesoprosopis* collected in a living condition by Mr. Bridwell from the same stump, and later exposed by me to the parasites, there issued from the first, after it had pupated, 60 males and 25 females on November 15-16; from the second 1 male and 17 females on November 15-16; and

Fig. 5. *Nesencyrtus kaalae.* Antenna of male.

from the third 1 male and 45 females about November 24. Presumably, these were already parasitized when exposed to the parasites from October 25 to November 7. The parasitized pupa above noted was so closely packed with the pupation cells of the parasite that even the front femora were utilized.

From a parasitized larva of *Nesoprosopis fuscipennis* collected by Dr. F. X. Williams December 14, 1919, on the Manoa Cliff trail, Oahu, there issued 62 females on December 26.

From the larva of a small *Nesoprosopis* sp. possibly *N. koae* Perkins, collected by Dr. Williams, January 4, 1920, on the waterfalls ridge, Manoa Valley, Oahu, at about 1600 feet elevation, and which did not show parasitism when found, there issued 16 males and 10 males on January 27-29.

The Oahu males, which had not been seen previously, proved to be identical with the males from Kilauea, Hawaii, described in these Proceedings, Vol. 4, p. 223. The Kilauea females, however, have the head somewhat thinner fronto-occipitally and the frontovertex proportionately wider or about one-half longer again than wide instead of about twice as long as wide as in the Oahu specimens. The frontovertex is also deeper blue, but the coloration does not differ materially otherwise.

Nesencyrtus sp.

One female collected at a steam crack near Kilauea, Hawaii, 3800 feet elevation, September 6, 1919 (W. M. Giffard), is apparently a new species, but it would be inadvisable to name it at this time as the males in this genus show better distinguishing characters than the females. It differs from Kilauea specimens of *kaalae* in having a slightly different shaped head and longer ovipositor and paler legs. The apex of the front and hind tibiae, the middle tibiae, and all the tarsi except the apical joint are brownish yellow, whereas only the tarsi and apical half of the middle tibiae are pale in *kaalae*.

Nesencyrtus sexramosus n. sp. Figure 6.

Male. Head somewhat thinner fronto-occipitally and of different shape than in the male of *kaalae;* as seen from above it is very strongly transverse or about three times wider than long, the anterior margin almost straight, the sides rounded, the occipital margin concave; as seen from the side it is only slightly thicker fronto-occipitally above than at the oral margin, the occipital margin appearing convex and the face concave above the antennal sockets; as seen from in front it is slightly wider than long and has roughly the shape of a keystone, being well rounded above, and with the sides converging from about the middle of the eyes nearly in a straight line to the broad oral margin; occiput somewhat concave; eyes small, very broadly ovate, only slightly longer than wide; frontovertex about a half wider again than long, its anterior

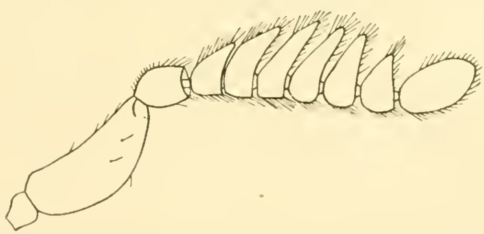

Fig. 6. *Nesencyrtus sexramosus.* Antenna of male.

margin not produced in front of the eyes; ocelli considerably smaller than in *kaalae* and arranged in an obtuse-angled triangle, the anterior ocellus about its own diameter from the anterior margin of the frons, the posterior pair about one-half their own diameter from the eye margins and three times as far from the occipital margin; cheeks longer than wide and somewhat longer than the eyes; face broad, convex below the antennal sockets and rather deeply concave above them to form a large scrobal impression.

Antennae inserted far apart a short distance from the oral margin, of similar structure as in *kaalae*, but the scape is not twisted and in side view is rather strongly concave above and convex on the ventral margin, and as seen from above considerably thickened at base; pedicel a little longer than wide, not produced on inner side as in *kaalae;* funicle joints all ramose on the inner side, the branches of the two middle joints longest, those of the first and sixth joints shortest, the sixth joint being similar to the fifth joint of *kaalae;* club a little longer and narrower than in *kaalae.*

Scrobal impression finely lineolate-reticulate and somewhat more coarsely and evidently sculptured than the frontovertex, the fine lines more or less concentric around a pair of small triangular more deeply impressed smooth areas placed on either side of the short median carina on lower half of the impression, this carina not expanding above as in *kaalae.*

In other characters of form, sculpture and pubescence not materially different from *kaalae.*

General color moderately shiny black, the face below antennae and the frontovertex bluish black, the axillae and scutellum slightly bluish, the scrobal impression and mesoscutum with a dark greenish luster; antennae blackish, the scape and pedicel shining, the flagellum dull and more brownish; legs black with a luster like that of the body, but all the tarsi and the spur of the middle tibiae brownish yellow, with the apical joint of the tarsi more or less infuscated; wings hyaline, the veins dark brown.

Length of body, 1.13; length of head, 0.438; width of head, 0.483; thickness of head, 0.221; width of vertex at posterior ocelli, 0.228; width of mesoscutum, 0.438; length of forewing, 1.11; width of forewing, 0.499 mm.

Described from one male (holotype) collected in the Kau desert, near Kilauea, Hawaii, at 3800 feet elevation, September 13, 1919 (W. M. Giffard).

Hypergonatopus n. g.

Female. Head subhemispherical, with the face moderately inflexed; eyes rather large and the frontovertex moderately to strongly narrow, ranging from about two and one-half to six times longer than wide, the vertex with a distinct small fovea in each posterior corner; the ocelli arranged in a more or less acute-angled triangle, the posterior pair close to the eye-margin and more or less removed from the occipital margin; face with a broadly ovate or subcircular shallow scrobal impression, divided longitudinally by the broad, low protuberance between the antennae. Antennae inserted far apart close to the clypeal margin; the sockets more than twice their own length apart; scape slender, reaching considerably beyond the scrobal impression; pedicel obconical, about as long as the first three funicle joints combined; flagellum moderately clavate, the funicle joints short, mostly about as long as wide or a little transverse and increasing gradually in thickness distad; club three-jointed, rather large, about as long as the funicle and obliquely truncate at apex. Mandibles narrow at apex with three more or less unequal acute teeth, the inner tooth smallest and the middle longest, sometimes con-

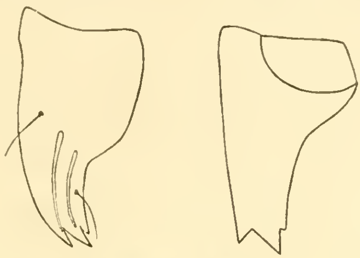

Fig. 7. *Hypergonatopus hawaiiensis.* Mandible of female, interior and dorso-anterior views.

siderably longer than the other two; base of mandible broad and expanded nearly in the same plane with apex. Palpi short, the maxillary pair four-jointed, the two middle joints about as long as thick, the basal joint one and one-half to two times as long, the apical joint about three times as long; labial pair with three nearly equal joints, each about as long as thick.

Thorax of about the usual size and robustness, the mesoscutum strongly transverse, twice or more wider than long; axillae short and transverse, meeting or nearly meeting at their inner tips; scutellum longer than wide, rounded at apex, and more or less longer than the scutum; propodeum short and declivous, but lengthening towards the sides, the spiracles minute and circular. Abdomen ovate, depressed or often more or less deeply sunken in behind the first tergite, nearly as wide at base as the thorax and about one-half to two-thirds as long; ovipositor not protruded and enclosed to the apex of the abdomen by the ventrites.

Legs normal, the middle tibiae enlarging towards apex, the middle tarsi stout at base but tapering towards apex, the spur as long as the first tarsal joint. Wings either of the hemipterous type or fully developed; in either case the marginal vein is elongate or usually about three or four times as long as the rather short stigmal vein, the postmarginal somewhat shorter than the stigmal or sometimes a little longer in the hemipterous wing.

Sculpture throughout is excessively fine or microscopic, the fronto-vertex having extremely fine, shallow, thimble-like punctures; the face and cheeks much smoother or hardly perceptibly shagreened under high magnification; the mesoscutum with very fine scale-like reticulations, the axillae and scutellum with similar sculpture but nevertheless duller, although not opaque; the mesopleura anteriorly with very fine reticulate shagreening, but becoming much smoother on the posterior half; the abdomen entirely smooth and polished.

Pubescence of head unusually sparse, the eyes being perfectly glabrous, but the frontovertex has an orbital row on each side of a few fine setae set in minute pin-punctures, and there is a row of very fine setae on each side of the face at the outer margin of the scrobal impression, each row encircling the antennal sockets and ascending on each side of the facial prominence to about opposite the upper end of the sockets; mesonotum including scutellum with more or less numerous reclinate setae of normal structure, which are scarcely seriately arranged; abdomen with a row of fine setae on each side of the basal tergite and rather sparsely pubescent on the sides towards the apex; legs and antennae with the usual amount of pubescence; pubescence of the body dark-colored throughout, and not conspicuous.

Coloration of body usually bluish-black, with more or less purple luster on the head and abdomen; the mesoscutum and often the frontovertex, metallic green; wings typically more or less deeply infuscated at extreme base and on the apical two-thirds, but the cloud becomes gradually fainter towards the apex, and is interrupted by a hyaline area at the end of the stigmal vein and by another area on the opposite margin of the disc.

Male. Differs from the female mostly in the structure of the head and antennae. The head is much thinner fronto-occipitally, the eyes considerably smaller, the frontovertex much broader or hardly longer than wide; the face with a similar scrobal impression which reaches upward between the eyes. Antennae inserted just below a line connecting the lower corners of the eyes; the scape rather short but reaching beyond the scrobal impression; pedicel not over twice as long as thick at apex and much shorter than the first funicle joint; flagellum slender and cylindrical, clothed with long, scattered, semi-erect setae; the funicle joints all much longer than thick, the club elongate and about equal to the last two funicle joints combined. Sculpture, pubescence and coloration of the same type as in the female, but the wing pattern is much fainter, although usually apparent.

Genotype: *Echthrogonatopus hawaiiensis* Perkins.

This genus is closely allied to *Echthrogonatopus* Perkins, which in turn is similar to *Epiencyrtus* Ashmead, but *Echthrogonatopus* as represented by its genotype, *E. exitiosus* Perkins, has no foveae on the vertex, the eyes are slightly pubescent, the mandibles with the teeth nearly equal, the scutellum densely and opaquely sculptured, the mesoscutum with appressed, rather dense whitish pubescence, the middle tibiae less enlarged at apex, and the middle tarsi less thickened at base, the wings wholly hyaline, the disc ciliated throughout, the basal area being but little more sparsely pubescent, the speculum narrow and reaching from the stigmal vein obliquely nearly to the opposite margin. In the male the scrobal impression is deeper and less rounded above, the antennae somewhat shorter, the pedicel longer, stouter and equal to the first funicle joint in length, the head much more coarsely sculptured.

To *Hypergonatopus* belong two species, hithertofore placed in *Echthrogonatopus*, viz. *E. hawaiiensis* Perkins and *Microterys molokaiensis* Ashmead. I am greatly indebted to Dr. James Waterston of the British Museum for carefully comparing specimens of *hawaiiensis* from the Hilo district of Hawaii with Oahu specimens, and for furnishing copious notes drawn up from the type of *molokaiensis*. It is hardly necessary to add that his assistance has greatly facilitated my work on the genus, which otherwise could not have been carried out as fully. Much more recently Dr. Perkins has returned the female type of *hawaiiensis* to the Islands, and I have thus had opportunity to study it personally.

The following synoptic tables may help in distinguishing the species.

FEMALES.

1. Head unusually thick; the wings truncated at apex of the stigmal vein and reaching only to the middle of the abdomen; legs yellow 6
   Head moderately thick; the wings fully developed; legs mostly blackish 2
2. Wings comparatively broad, about 2.6 to 2.7 times longer than wide; frontovertex about two and one-half times longer than wide 3
   Wings very narrow or about 2.9 times longer than wide; frontovertex about thrice as long as wide, marginal vein about thrice as long as the stigmal; apex of middle tibiae and middle tarsi brownish yellow, knee-joint of middle legs, apex of front and hind tibiae and corresponding tarsi brownish or sometimes somewhat yellowish .... *hawaiiensis* (Perkins)
3. Legs distinctly brownish, somewhat paler towards the tips of the tibiae and on the tarsi, the apical third of middle tibiae and the middle tarsi yellowish 5
   Legs almost wholly blackish, except middle tarsi and tibial spur; the apex of middle tibiae only slightly yellowish 4
4. Facial ridge between antennae not completely dividing the scrobal impression; scutellum abruptly declivous at apex, its disc more densely pubescent; marginal vein typically about twice as long as the stigmal vein, the latter nearly straight and not greatly enlarged at apex .... *vulcanus* n. sp.

Facial ridge between antennae extending the whole length of the scrobal impression; scutellum more uniformly convex and gradually declivous at apex, its disc more sparsely pubescent and bare at the sides; marginal vein about three and a half times as long as the stigmal, the latter enlarged towards apex and curved towards costal margin .... *oahuensis* n. sp.

5. Wings with faint brownish markings, the discal setae in the basal area weak and colorless, excepting a row next to the submarginal vein; marginal vein about two and one-third times as long as the stigmal .... *brunneipes* n. sp.

6. First funicle joint somewhat longer than wide and subequal to either of the last two funicle joints in length; metallic luster of body brilliant, the antennae and legs wholly yellow........ *flavipes* n. sp.

First funicle joint hardly longer than wide and distinctly shorter than the fifth or sixth funicle joint; metallic luster of body comparatively weak; antennae dark brown or fuscous, the scape somewhat yellowish except at base, the last two funicle joints dusky yellow; legs yellow, with the hind tibiae fuscous except at base and apex .... *hemipterus* n. sp.

MALES.

1. Antennal scape and legs largely black; scutellum duller than the mesoscutum 2

Antennal scape and legs, including coxae yellow; mesoscutum and scutellum metallic green with a brassy luster......... *flavipes* n. sp.

2. Wings about 2.5 to 2.6 times longer than wide.................... 3

Wings narrower, about 2.7 to 2.9 times than wide; with faint markings and without a differentiated clear spot beyond apex of the stigmal vein; fifth funicle joint about 1.35 to 1.4 times longer than the first joint, the club hardly or not at all wider than the funicle and slightly longer than the first two funicle joints combined. *hawaiiensis* (Perkins)

3. Wings without a differentiated clear spot beyond apex of the stigmal vein 4

Wings with a clear spot beyond apex of venation set with weaker hyaline setae; marginal vein about four times as long as the stigmal; fifth funicle joint about 1.5 times longer than the first, the club very slightly longer than the first two funicle joints combined.* *molokaiensis* (Ashmead)

4. Wing pattern distinct, the area just beneath the marginal and stigmal veins deeply stained; medial setae of the basal area of disc strong and pigmented; fifth funicle joint about 1.33 times as long as the first, the club about one-fifteenth longer than the first two funicle joints combined............................ *vulcanus* n. sp.

Wing pattern faint and indistinct, except in a small area just be-

* These characters are based on Dr. Waterston's examination of the

neath the marginal and stigmal veins; medial setae of the basal area of disc weak and hyaline; fifth funicle joint about 1.55 times as long as the first, the club about one-ninth longer than the first two funicle joints combined......................*brunneipes* n. sp.

Hypergonatopus hawaiiensis (Perkins). Figures 7-10.

Echthrogonatopus hawaiiensis Perkins, 1912, Haw. Sugar Planters' Exp. Stat., Ent. Bull. 11, p. 17.

Female. Head nearly hemispherical in shape, as seen from above almost perfectly semi-circular in outline; as seen from in front the cheeks arcuately converge so that the greatest width is about opposite the middle of the eyes; as seen from the side the outline is subtriangular, with the dorsal side moderately rounded and slightly shorter than the facial side, the greatest thickness fronto-occipitally being opposite the lower corners of the eyes; occiput only slightly concave; eyes of moderate size, broadly and slightly obliquely ovate, widest anteriorly and just contiguous with the occipital margin behind; frontovertex about three times longer than wide, slightly widening at the posterior ocelli; the ocelli arranged in an acute-angled triangle, the distance between the posterior type of *molokaiensis*.
pair about a fourth less than the distance from either to the anterior ocellus, the posterior pair about their own diameter from the eye-margin and nearly twice as far from the occipital margin; cheeks about as long as the width of the eyes; face with a rather large, nearly circular shallow scrobal impression reaching from the oral margin almost to the eyes, arcuately emarginated below by the mouth, and divided longitudinally by the broad low protuberance between the antennae, which usually reaches the upper margin of the impression.

Antennal scape moderately long, slender, and slightly widened at the middle, the ventral margin gently arcuate; pedicel as long as the first three funicle joints combined; first funicle joint a little longer than wide and somewhat longer than any of the three following joints, which are

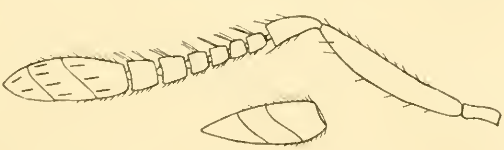

Fig. 8. *Hypergonatopus hawaiiensis*. Antenna of female, with insert of club showing usual shape of the latter.

subequal in length but increase slightly in thickness distad, so that the fourth is a little wider than long; last two funicle joints distinctly longer than those just preceding, but only slightly longer than the first, the sixth barely wider than long; club much wider at base than the preceding joints, and about equal to the last five funicle joints combined.

Thorax moderately convex above; the pronotum weakly arcuate, its posterior margin subangulated medially; mesoscutum about twice as wide as long; axillae twice as wide as long and acutely meeting medially; disc of scutellum rather convex, the sides and apex strongly elevated and declivous; propodeum sloping backward, very short medially, and moder-

Fig. 9. *Hypergonatopus hawaiiensis.* Forewing of female.

ately long at the sides. Abdomen about one-half as long as the thorax, moderately convex below, and concave above behind the first tergite.

Wings long and narrow, about 2.9 times longer than wide; marginal vein elongate and about three times as long as the stigmal, the latter short and triangularly enlarged towards apex, the postmarginal rapidly tapering and somewhat shorter than the stigmal; speculum narrow and passing into the bare area at the middle of the disc nearly opposite to the end of the submarginal vein; this partly bare basal area with a short row of setae at the posterior margin of the disc, connecting with a group of scattered setae just below the submarginal vein; rest of the disc densely setose, but the setae become finer and hyaline in two areas, one just beyond the apex of the stigmal vein, the other on the opposite side of the disc.

Frontovertex with very fine, shallow, thimble-like puncturation which is slightly coarser and more evident than in *flavipes* or *hemipterus,* this sculpture becoming very delicate or hardly perceptible on the face, and absent on the cheeks, which are smooth and polished; frontovertex also with a row of fine pin-punctures along each orbit; mesonotum with fine, scaly reticulations, the mesoscutum being highly polished, the axillae and scutellum considerably duller, the reticulations on the scutellum becoming finer and at last obliterated towards the apex; both the scutum and scutellum with rather numerous fine, scattered pin-punctures which become somewhat thicker on the apical part of the scutellum; anterior part of mesopleura very delicately rugulosely reticulate, the posterior half becoming smoother; propleura and prepectal plates with delicate reticulations somewhat coarser than the sculpture of the mesoscutum; abdomen smooth and highly polished.

Pubescence as described under the genus, the setae on the mesoscutum and scutellum moderately numerous, or considerably thicker than in *flavipes,* the basal tergite of abdomen with a row of only about four setae on each side.

General color bluish-black, the vertex, postorbital region, mesoscutum, lateral and apical margin of scutellum either metallic green or with a strong greenish luster; basal tergite of abdomen metallic greenish with a brassy and purple luster, the venter usually with a more or less evident brassy luster; other parts of the body with a purple luster, which is sometimes brilliant especially on the cheeks and posterior half of the mesopleura, but the axillae and scutellum considerably duller than the rest of the thorax; antennae and legs dark fuscous, the scape and femora nearly black, the apex of front and hind tibiae and corresponding tarsi somewhat brownish, the apical fourth of middle tibiae and the middle tarsi brownish yellow, middle trochanters and a narrow annulus near the base of the middle femora pale yellowish; wings with a small fuscous cloud at extreme base, and a transverse cloud beneath marginal vein extending to the opposite margin, medially produced towards the apex where it expands in the middle of the apical half of the disc, and gradually disappears towards the margins; the cloud being delimited by a clear area at the end of the stigmal vein and by another on the opposite side of the disc, the latter area somewhat fusiform in shape, extending parallel with the margin and basally produced into the transverse cloud beneath the marginal vein.

Length of body, (1.06 to 1.37) 1.33; length of head, 0.462; width of head, 0.487; thickness of head, 0.287; width of vertex at anterior ocellus, 0.120; width of mesoscutum, 0.478; length of forewing, 1.18; width of forewing, 0.407 mm.

Male. Head much thinner fronto-occipitally than in the female, the occiput more deeply concave; as seen from the side it is thickest above the middle, the facial outline meeting the plane of the frontovertex in an angle of somewhat more than 90 degrees; eyes much smaller, somewhat less broadly oval but otherwise about as in the female; frontovertex about a fourth longer than wide, the ocelli arranged in a nearly equi-

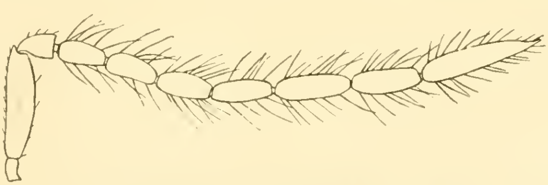

Fig. 10. *Hypergonatopus hawaiiensis.* Antenna of male.

lateral triangle, the anterior ocellus placed a little in front of the middle of the frontovertex; the posterior pair about one-half of their own diameter from the eye-margin, and nearly twice as far from the occipital margin; cheeks nearly twice as long as wide and nearly as long as the eyes; scrobal impression of face subcircular, somewhat longer than wide, reaching upward between the eyes, and divided in its lower two-thirds by the longitudinal low prominence between the antennal sockets. Antennae inserted just below the line connecting the anterior corners of the eyes, and rather close together, the sockets just touching the ocular line and placed about their own length apart; scape much shorter than in the female and slightly expanded beneath, its length including radicle joint about equal to the pedicel and first two funicle joints combined, yet reaching well beyond the scrobal impression; pedicel about twice as long as thick and two-thirds as long as the first funicle joint; first three funicle joints about three times as long as thick, the following joints somewhat longer, the fifth a little longer than either the fourth or sixth; club slender, tapering to acute apex, about one-ninth longer than the first two funicle joints combined. Thorax and abdomen practically as in the female; the wings a little shorter and wider, about 2.7 to 2.75 times longer than wide, the discal setae about the same, except that there is no area of weaker, hyaline setae at the apex of the venation or on the opposite side of disc. Thimble-like punctures of frontovertex much coarser than in the female, being rather prominent but shallow; sculpture and pubescence otherwise very similar to that of female. Coloration agreeing closely with female, except that the wing-pattern is considerably reduced and much fainter, the extension of the cloud medially often being extremely faint.

Length of body, (0.83 to) 1.06; length of head, 0.370; width of head, 0.412; thickness of head, 0.119; width of vertex, 0.167; width of mesoscutum, 0.372; length of forewing, 1.10; width of forewing, 0.422 mm.

Redescribed from the following specimens all reared from Dryinid cocoons on sugar-cane collected by Mr. Swezey: 5 females, 1 male, Mountain View, Hawaii, August 26-30, 1916; 4 females, Papaikou, Hawaii, October 23, 1908; 3 females, 1 male, Hilo Sugar Company, near Hilo, Hawaii, February 27, 1919; 1 male, Waiakea, Hawaii, July 2, 1913; and 1 female, 1 male, Waiakea, Hawaii, April 13, 1916. The host of this series presumably is *Echthrodelphax fairchildii* Perkins, although there is a possibility that some of the specimens may have come from the cocoons of *Haplogonatopus vitiensis* Perkins.

The type of *hawaiiensis*, a female reared from the cocoon of *Pseudogonatopus perkinsi* (Ashmead), collected by Dr. Perkins in the mountains back of Honolulu, differs slightly from Hawaiian specimens as follows:

Head appears to the eye somewhat thicker fronto-occipitally, but there is hardly any difference by actual measurement; the frontovertex is slightly narrower, with the ocelli in a more acutely angled triangle, the distance between the posterior pair being slightly more than half the distance between either and the anterior ocellus; the facial prominence slightly more arched from end to end, and not quite reaching to the upper margin of the facial impression; eyes just barely separated from the occipital margin; pedicel slightly longer than the first three funicle joints combined, the first funicle joint about a half longer again than the second; wings 2.92 times longer than wide, the marginal vein slightly over three times as long as the stigmal, pubescence of the mesoscutum and scutellum slightly sparser; coloration the same, except that the apex of the middle femora and the tips of the front and hind tibiae and corresponding tarsi are paler and more yellowish.

Length of body, 1.15; length of head, 0.408; width of head, 0.434; thickness of head, 0.264; width of vertex at anterior ocellus, 0.166; width of mesoscutum, 0.401; length of forewing, 0.990; width of forewing, 0.339 mm.

Dr. James Waterston also kindly compared a male from Oahu furnished by Dr. Perkins (a reared specimen from Tantalus, 1906, and presumably from the type series) with a male from Mountain View, Hawaii, and found the wing pattern slightly more distinct, the basal cloud being more extensive and the disc beyond the venation more deeply tinted medially; the marginal vein proportionately shorter; the club somewhat wider than the funicle and slightly longer than the first two funicle joints combined, the fifth funicle joint about 1.4 times as long as the first joint. This male, according to Dr. Waterston, was only about 0.95 mm. long, the forewing 0.86 mm. long and 0.30 mm. wide.

Hypergonatopus molokaiensis (Ashmead).

Microterys molokaiensis Ashmead, 1901, Fauna Hawaiiensis, 1, p. 322.

This species was described from a single male specimen taken in the mountains of Molokai at three thousand feet, by Dr. Perkins, in June, 1893.

Dr. Waterston's notes on this specimen are as follows:

"Wings hyaline, with the following clouding: veins brown; at the base of the wing a light brown triangular patch occupying the basal one-third of the submarginal cell and sloping to a point on the hind margin opposite the middle of the submarginal vein. It occupies the distal two-thirds of the oblique 'hairless line.' There is the usual clear space distally, parallel to the hind margin, extending in this case to a little beyond half. Beyond the level of the radial knob there is a faint small median cloud connected indistinctly with that behind the marginal.

Dimensions (of wing): Length, 1.15 mm; breadth, 0.44 mm.

Submarginal: marginal: radius: postmarginal:: 170: 60: 15: 15.

Chaetotaxy: On the marginal about ten bristles with twenty-five behind, the latter bristles much closer set than in *hawaiiensis*. Clear space beyond radius larger, with twenty to thirty hyaline bristles.

PROPORTIONS OF ANTENNAL JOINTS (FUNICLE AND CLUB).

	1	2	3	4	5	6	Club
Length	30	34	36	38	45	39	68
Breadth	15	15	16	16	17	17	20"

Hypergonatopus vulcanus n. sp.

Female. Similar to *hawaiiensis* but the eyes are slightly smaller and very narrowly separated behind from the occipital margin, their inner orbits more parallel; frontovertex wider or about two and one-half times longer than wide; ocelli arranged in a nearly equilateral triangle, the distance between the posterior pair hardly less than the distance from either to the anterior ocellus; scrobal impression of face slightly deeper; antennae similar, but the first funicle joint is proportionately a little longer, the sixth funicle joint more abruptly wider than the preceding joint; wings shorter and wider or about 2.6 to 2.7 times longer than wide, the marginal vein shorter or only slightly more than twice as long as the stigmal, the latter proportionately longer, nearly straight and more nearly of the same thickness throughout, the postmarginal also proportionately longer. Sculpture hardly distinguishably different from *hawaiiensis*, but apparently a little coarser.

Coloration as in *hawaiiensis*, but with somewhat weaker metallic luster, legs somewhat darker, the pale annulus at base of middle femora hardly apparent, the middle tibiae almost wholly dark, or only slightly brown or yellowish at extreme apex. Wings with a small, somewhat semi-circular darker cloud just beneath the marginal and stigmal veins, the pattern otherwise similar.

Length of body, (0.94 to) 1.05; length of head, 0.358; width of head, 0.407; thickness of head, 0.233; width of vertex at anterior ocellus, 0.120; width of mesoscutum, 0.370; length of forewing, 0.933; width of forewing, 0.356 mm.

Male. Similar to the male of *hawaiiensis*, differing principally in the shorter, wider wings, which are about 2.5 times longer than wide; the club somewhat wider than the funicle and proportionately shorter, or only about one-fifteenth longer again than the first two funicle joints combined. Coloration similar with differences as noted in case of the female, the wings, however, more deeply stained, a small spot beneath the marginal and stigmal veins being very deeply pigmented.

Length of body, 0.91; width of vertex, 0.162; width of mesoscutum, 0.353; length of forewing, 0.943; width of forewing, 0.379 mm. The head is slightly shrunken so that other measurements are not possible.

Described from four females, two males (holotype, allotype, and paratypes) reared from a Dryinid cocoon, probably of *Pseudogonatopus perkinsi* (Ashmead), Kilauea, Hawaii, February 8, 1917 (F. Muir), and from the following paratypes:

One female collected at twenty-nine miles, Kilauea, Hawaii, January, 1917 (Giffard and Muir), with length of body, 1.22 mm. and marginal vein about 2.9 times longer than the stigmal.

One female collected at an old steam crack, four thousand feet, Kilauea, Hawaii, September 8, 1919 (W. M. Giffard), body 1.11 mm. long and marginal vein slightly less than three times longer than the stigmal.

One female dissected from a Dryinid cocoon, probably of *Pseudogonatopus perkinsi*, which in turn was reared from parasitized nymphs of *Ilburnia coprosmicola* Muir, collected on *Coprosma ernodioides* at twenty-seven miles, near Kilauea, Hawaii, July 30, 1918 (W. M. Giffard), has the body 1.19 mm. long and the marginal vein only slightly longer than the stigmal, the apex of scutellum, sides of propodeum and base of abdomen with a brilliant purple luster.

This series of *Hypergonatopus* from the Kilauea region, Hawaii, shows a remarkable degree of variation in the proportions of the marginal and stigmal veins, but as I cannot discover any other tangible differences between the extremes, it seems reasonable to suppose that they all belong to one species. The holotype shows an intermediate condition.

Hypergonatopus oahuensis n. sp.

Female. Very similar to *vulcanus* and differing in the same way that it does from *hawaiiensis*, but the facial prominence between the antennae extends the whole length of the scrobal impression, the head is thicker fronto-occipitally, the scutellum more uniformly convex, with the declivity at apex distinctly more gradual. Sculpture similar, but the reticulation of the scutellum is coarser and distinctly enlarging towards the sides, a condition which holds in a lesser degree for *vulcanus;* pubescence considerably sparser on the scutellum, the sides of which are entirely bare, and the median longitudinal rows of setae are made up of only about five or six bristles.

Similar to *vulcanus* in coloration, or bluish black with a green luster on frontovertex, mesoscutum, apex of scutellum and on the basal tergite of abdomen in some aspects; other parts of the body with a bluish luster which is weak except on the abdomen; antennae black and becoming slightly brownish on the flagellum; legs black, with front and hind tarsi brownish, the apex of middle tibiae and the middle tarsi brownish yellow.

Wings very similar to *vulcanus*, but the marginal vein is 3.5 times longer than the stigmal, the latter enlarged towards apex and curved towards the costal margin.

Length of body, 1.18; length of head, 0.398; width of head, 0.426;

thickness of head, 0.273; width of vertex at anterior ocellus, 0.120; width of mesoscutum, 0.393; length of forewing, 1.12; width of forewing, 0.422 mm.

Described from one female (holotype), collected on Mt. Kaala, Oahu, between 2500 and 3000 feet elevation, July 22, 1917 (Timberlake).

Hypergonatopus brunneipes n. sp.

Female. Very close to *vulcanus*, but having the head somewhat broader and slightly thinner fronto-occipitally; thorax more robust and wider, the scutellum wider across the base; sculpture of the mesonotum somewhat coarser, and the pubescence of the mesoscutum very much sparser; setae in the hyaline area near base of forewing greatly reduced in size and hyaline; marginal vein about 2.7 times longer than the stigmal, the latter enlarged at apex and curved towards the costal margin.

Coloration similar to *vulcanus*, the head with a rather weak bluish and purple luster on the frontovertex; the mesoscutum and apex of scutellum metallic green, the abdomen above and side of propodeum with a strong purple luster, changing to greenish in some aspects on the basal tergite, the venter with a greenish luster; mesopleura dark brown, shining but hardly metallic; antennae and legs dark brown, with apex and base of front tibiae, apex of middle femora, apical half of hind tibiae, and front and hind tarsi pale brown, the trochanters, annulus at base of femora, apical third of tibiae and the tarsi of middle legs yellowish. In one specimen (paratype) the pleura and legs are much paler brown. Wing markings similar to *vulcanus*, but much fainter.

Length of body (1.01 to 1.16), 1.14; length of head, 0.386; width of head, 0.473; thickness of head, 0.249; width of vertex at anterior ocellus, 0.120; width of mesoscutum, 0.412; length of forewing, 1.06; width of forewing, 0.403 mm. The head is slightly shrunken, but the measurements are believed to be tolerably accurate.

Male. Very similar to the male of *vulcanus*, but differing in the same way as the female in regard to the sculpture, pubescence and wing characters. Coloration similar to that of the female but the upper part of the face and the frons with a greenish luster, the lower part of the face, the cheeks and vertex with a purple luster, and the pleura, antennae and legs are rather pale brown. Wings almost hyaline, excepting a small spot beneath the marginal vein.

Length of body, 0.98; width of vertex, 0.174; width of mesoscutum, 0.396; length of forewing, 1.05; width of forewing, 0.417 mm. The head is so much shrunken that other measurements are not possible.

Described from three females, one male (holotype, allotype, and paratype), reared from a Dryinid cocoon, probably of *Pseudogonatopus perkinsi* (Ashmead), reared in turn from *Ilburnia koae* (Kirkaldy), Kilauea, Hawaii, January, 1915 (F. Muir).

Hypergonatopus flavipes n. sp.

Female. Head large and unusually thick fronto-occipitally, forming somewhat more than a hemisphere and distinctly wider than the thorax; dorsal surface very strongly and uniformly convex, the anterior outline forming a considerably larger arc than a semicircle; as seen from in front the outline is perfectly rounded above, but the cheeks converge slightly in a curve to the broad and truncate oral margin; as seen from the side the anterior outline is well rounded except that the face is slightly flattened at the scrobes; occiput only slightly concave; eyes very large and broadly oval, widest anteriorly and touching the occipital margin behind; frontovertex about six times longer than the least width, very narrow anteriorly and gradually widening behind so that the width is about one-half greater at the occipital margin; ocelli very minute and arranged in a very acute-angled triangle, the anterior ocellus at the center of the frontovertex, the posterior pair touching the eye-margin and far removed from the occipital margin; cheeks a little more than one-half as long as the eyes and very broad above; face only slightly inflexed, the scrobes in the form of a shallow, very broadly ovate impression about as wide as long and divided below by a broad, low ridge between the antennae, the impression of about the same size and depth as in *hawaiiensis*, but less circular.

Antennal scape slender, curved, slightly wider at the middle, the ventral margin arcuate; pedicel as long as the first two funicle joints combined; first funicle joint somewhat longer than wide and about equal to either of the last two joints in length, but considerably narrower; next two joints about as wide as long, the fourth somewhat shorter and slightly wider than long, the last two joints distinctly longer than those preceding, the fifth about as wide as long, the sixth slightly wider than long; club missing except part of the basal joint, but presumably about as in *hemipterus*.

Thorax rather depressed above, the pronotum transverse, with its posterior margin only slightly arcuate; mesoscutum short and strongly transverse or about two and one-half times wider than long; axillae not greatly wider than long, and slightly separated medially; scutellum distinctly longer than wide, rather acute at apex, the disc depressed, the lateral margins and apex well elevated and declivous. Abdomen hardly longer than one-half of the thorax, the first tergite prominent, the following tergites deeply sunken in and telescoped within the first segment.

Wings of the hemipterous type or truncated at apex of the stigmal vein, the apical margin rounded, marginal vein between four and five times longer than thick and about thrice as long as the stigmal, the postmarginal slightly shorter than the stigmal vein; area of disc beneath the submarginal vein with about six or seven scattered, very minute hyaline setae; area beneath the marginal vein densely setose, the speculum distinct.

Frontovertex with excessively minute and delicate thimble-like sculpture appearing smooth under low magnification, and with a row of sparse, minute, setiferous punctures at the orbits; mesoscutum polished and with very fine, scale-like reticulations, the axillae and scutellum slightly duller with similar reticulations, those of the scutellum somewhat coarser; mesonotum also with a few, extremely minute, scattered setiferous pin-punctures, those of the scutellum slightly larger and rather more numerous, and distributed sparsely over the disc from base to apex; mesopleura microscopically rugulose anteriorly, but becoming smooth on the posterior half, prepectal plates finely reticulate; propodeum smooth and polished, and with a median carina; abdomen smooth and highly polished.

Pubescence of the head about as in *hawaiiensis;* collar of pronotum with a row of fine setae somewhat coarser than those of the head, mesoscutum with sparse scattered setae like those of pronotum, the scutellum with slightly coarser, more numerous setae; sides and apex of abdomen with a few fine setae, the basal tergite with a row of about six fine setae on each side near the middle.

Head blue-black with a purple luster; mesoscutum bright metallic green, the axillae and scutellum duller green; pronotum, pleura and propodeum with a strong purple luster; basal tergite of abdomen bright metallic green, the remainder of abdomen brilliant metallic purple; antennae and legs entirely yellow, the coxae and base of femora paler, the general color approximating yellow ocher of Ridgway; apical fourth of wing beneath marginal vein and small area at extreme base fuscous, the marginal and stigmal veins dark brown, but submarginal except basal part nearly hyaline; pubescence of body dark and inconspicuous.

Length of body, 1.18; length of head, 0.476; width of head, 0.490; thickness of head, 0.332; least width of frontovertex, 0.073; width of mesoscutum, 0.424; length of forewing, 0.552; width of forewing, 0.216 mm.

Male. Differs from the female principally in the shape of the head, which is much thinner fronto-occipitally with the face distinctly inflexed; as seen from above the outline of the head is semicircular; as seen from in front the cheeks arcuately converge more strongly than in the female; as seen from the side the dorsal part is well rounded, but the face from the lower third of the eyes to just above the clypeal margin is strongly flattened and forms an obtuse angle with the plane of frontovertex; eyes hardly more than one-half as large as in the female, broadly oval and widest near the middle; frontovertex with parallel sides and about a half longer again than wide; ocelli large, arranged in a nearly equilateral triangle, the posterior pair only slightly farther apart than the distance from either one to the anterior ocellus, about one-half their diameter from the eye-margin and about one and one-half times their diameter from the occipital margin; cheeks longer than wide and slightly longer than the width of the eyes; face comparatively larger than in the female, the upper part surrounding the antennal sockets distinctly flattened and also continuous with the scrobal impression, which is semicircular and reaches upward between the eyes. Antennae inserted close together on a level with the lower corners of the eyes, the sockets less than own length apart; scape somewhat shorter and straighter than in the female, but otherwise similar, the rest of antennae missing. Wings evidently not abbreviated as in the female, but they have been much mutilated by psocids, the apical half of each missing, but enough remains to show a fuscous cloud beneath the marginal vein, bounded by the speculum towards the base of the wing. Sculpture of the frontovertex more distinct than in the female, the reticulation of the mesoscutum somewhat coarser and distinctly enlarging along its anterior margin especially medially, the reticulation of scutellum about like that of the scutum. Pubescence as in the female, except that the fine setae on the lower part of the face are more scattered and arranged transversely near the clypeal margin. In other structural characters and in coloration agreeing closely with the female.

Length of body, 1.06; length of head, 0.391; width of head, 0.431; thickness of head, 0.231; width of frontovertex, 0.172; width of mesoscutum, 0.403 mm.

Described from three females, one male (holotype, allotype, and paratypes) reared from a Dryinid cocoon, presumably of *Pseudogonatopus perkinsi* (Ashmead), collected at Halawa, Oahu, September 12, 1909 (O. H. Swezey).

Hypergonatopus hemipterus n. sp. Figure 11.

Female. Structurally nearly identical with *flavipes*, but the scape is a little narrower and widest just beyond the middle; the first funicle joint hardly longer than wide and distinctly shorter than either the fifth or sixth joint, the second to fourth joints subequal with the fourth, only a trifle shorter, the last two funicle joints as in *flavipes;* club considerably wider than the last funicle joint and as long as the five preceding joints combined, its apical joint obliquely truncate beneath. Wings

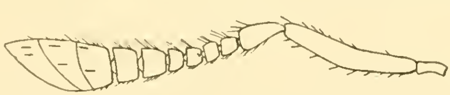

Fig. 11. *Hypergonatopus hemipterus.* Antenna of female.

abbreviated in the same manner, but more squarely truncate at apex; marginal vein shorter and stouter, but over three times longer than the stigmal, the postmarginal stout and a little longer than the stigmal. Sculpture and pubescence nearly the same as in *flavipes*, although the mesonotum is slightly more coarsely reticulate.

Coloration similar, but the metallic luster is much weaker and the antennae and hind tibiae are much darker; head shining black, with a very weak bluish luster, except the cheeks and postorbital region which have a rather strong purplish and dark green luster, mesosnotum metallic green, the axillae and scutellum not much duller than the mesoscutum; pronotum and pleura darker than in *flavipes*, the purple luster on the latter rather strong, propodeum shining, metallic brownish as in *flavipes*; abdomen the same as in *flavipes* except that the metallic luster is greatly diminished; antennae dark brown or fuscous, the scape except at base suffused with yellowish, and the last two funicle joints dusky yellow; legs yellow as in *flavipes*, but the hind tibiae are fuscous except at base and apex; wing markings as in *flavipes*.

Length of body, 1.11; length of head, 0.426; width of head, 0.419; thickness of head, 0.273; least width of frontovertex, 0.064; width of mesoscutum, 0.351; length of forewing, 0.469; width of forewing, 0.191 mm.

Described from two females (holotype and paratype), collected along the trail on Kaumuohona, Oahu, January 7 and September 9, 1917 (Timberlake).

Aulonops n. g.

Closely allied to *Hypergonatopus* and differing chiefly in the shape of the head, and particularly of the face. Outline of the head as seen from above semi-circular, as seen from the side triangular with the dorsal and facial sides about equal, their planes meeting in a somewhat acute angle, the dorsal outline moderately convex and the facial side concave; as seen from in front, the head is considerably wider than long, the dorsal surface strongly rounded from side to side, the cheeks from a short distance below the eyes converging sharply to the broad and emarginate oral margin; occiput rather deeply concave; eyes moderately

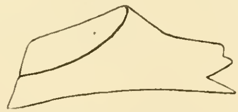

Fig. 12. *Aulonops bifasciata*. Mandible of female, anterior view.

large, broadest anteriorly and almost touching the occipital margin behind; frontovertex about thrice as long as wide, and with a small fovea at each posterior corner; cheeks rather short and strongly narrowing towards the mouth.

Face considerably inflexed and with a deep transverse scrobal impression suggestive of the conditions found in *Chrysoplatycerus*, but here the angle between the face and the frons is well rounded off, and the angle between the anterior and posterior face of the impression is obtuse; as seen in frontal view of head the outline of the impression is nearly square except that the anterior corner of the square is strongly truncated by the mouth; posterior face of the impression is furthermore concave from side to side and has two narrow, shallow, longitudinal furrows near the middle to receive the scapes at rest; anterior face of the impression is much smaller and composed for the most part of the broad, slightly convex space between the antennal sockets. Mandibles similar, but the two inner teeth are very short and subequal, and taken together they are deeply divided from the long, acute ventral tooth.

Scutellum distinctly longer than in *Hypergonatopus* and more pointed at apex. Middle tarsi nearly of the same thickness from base to apex. Abdomen of the same size and shape, but the ovipositor issues from near the base of the venter. Sculpture of the same type as in *Hypergonatopus*, but the reticulations of the mesoscutum are very faint, and the scutellum is nearly smooth and not duller than the scutum. In other respects similar to species of *Hypergonatopus*.

Genotype: *Aulonops bifasciata* n. sp.

Aulonops bifasciata n. sp. Figures 12-14.

Female. Frontovertex narrowest in front of the ocelli and slightly widening towards the occipital margin; ocelli in an acute-angled triangle, the distance between the posterior pair about a third less than the distance from either to the anterior ocellus, the posterior pair about one-half their own diameter from the eye-margin and somewhat more than twice as far from the occipital margin. Scape slender, reaching beyond the scrobal impression, thickest at the middle, the ventral margin slightly arcuate; pedicel nearly three times as long as thick at apex and fully equal to the first three funicle joints combined; flagellum gradually increasing in thickness distad; funicle joints all wider than long, the first four nearly equal in length, the first one but slightly wider than long,

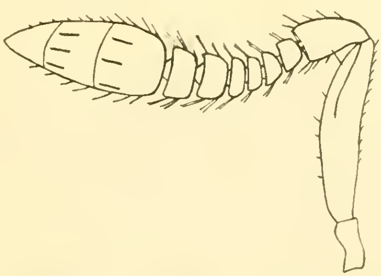

Fig. 13. *Aulonops bifasciata.* Antenna of female.

the fourth about twice as wide as long, last two funicle joints about twice longer than those preceding, each about one-half wider again than long; club rather elongate oval in shape, somewhat obliquely truncate and acute at apex, and about equal in length to the funicle and one-half of the pedicel combined.

Mesoscutum strongly transverse or nearly two and one-half times wider than long, its posterior margin straight; axillae about two and one-half times as wide as long, their inner tips very acute and nearly meeting; scutellum about one-half longer again than the scutum, rather strongly convex and declivous at the sides and apex. Forewing about 2.54 times longer than wide; the marginal vein elongate or about four times as long as the stigmal, the latter rather short and capitate at apex, the postmarginal about one-half as long as the stigmal; setae of the disc arranged nearly as in *Hypergonatopus hawaiiensis*, except that there is a short, bare area extending entirely across the disc beneath the apical part of the submarginal vein.

Frontovertex with microscopic, shallow, thimble-like puncturation and with a row of fine pin-punctures at the margin of the eyes; face and lower part of the cheeks very finely and delicately reticulate, the cheeks becoming smooth and polished next to the eyes; mesoscutum microscopically reticulate and moderately shiny; the scutellum medially at base with a similar sculpture, which gradually becomes effaced towards the sides and apex, the disc also with a few scattered minute pin-punctures; mesopleura with very fine longitudinal lineolations on the anterior and ventral part, becoming smooth and polished posteriorly; abdomen entirely smooth and polished.

Pubescence, sparse, dark-colored and inconspicuous, the eyes glabrous, the mesoscutum and disc of scutellum with very fine scattered setae; the abdomen with a few very fine setae at the sides and apex.

Head and body shining, bluish black with a blue or purplish luster, the cheeks next to the eyes, the mesopleura, propodeum and abdomen with a brilliant purple luster; face metallic greenish, the frontovertex and mesoscutum with a slight greenish luster in some aspects, but bluish in others; antennae and legs dark fuscous or blackish, the front and hind tarsi, apex of middle femora and tibiae brownish, the middle tarsi,

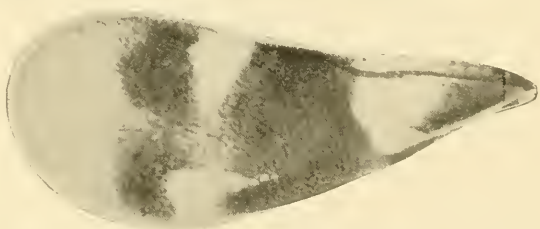

Fig. 14. *Aulonops bifasciata.* Forewing of female.

except the apical joint and the tibial spur, brownish yellow. Wings with a dark brown cloud except on the apical fourth, the cloud broken by three clear hyaline spots, a large triangular spot beneath the submarginal vein, an acutely angular spot suspended from the costal margin at apex of the stigmal vein, and a somewhat quadrate spot opposite which is narrowly extended basad on its inner side; the space between these two clear areas about as wide as one-third of the disc and less deeply pigmented, as is also the case with the middle portion of the clouded area just distad.

Length of body, 1.09; length of head, 0.375; width of head, 0.466;

thickness of head, 0.259; width of vertex at anterior ocellus, 0.118; width of mesoscutum, 0.429; length of forewing, 1.09; width of forewing, 0.427 mm.

Described from one female (holotype), collected in the Waianae Mountains between Kolekole Pass and Mt. Kaala, Oahu, March 9, 1911 (D. T. Fullaway).

Euchalcerinys n. g.

Female. Head moderately thick fronto-occipitally, the face strongly inflexed; as seen from above more strongly rounded on the sides than anteriorly; as seen from the side thickest considerably above the middle, the dorsal outline well rounded and somewhat shorter than the facial side; as seen from in front the outline is well rounded above, and slightly convergent on the sides towards the mouth, occiput moderately concave, its dorsal margin not strongly acute; eyes of medium size and nearly circular in outline, posteriorly just reaching to the occipital margin; frontovertex about three times as long as wide and without foveae at the posterior corners; ocelli arranged in an equilateral triangle, the posterior pair at the eye margins, and about thrice their own diameter from the occipital margin; cheeks about as long as the diameter of the eyes, and without a genal suture; face with a shallow, semi-oval scrobal impression extending upward between the lower borders of the eyes and divided inferiorly by the facial prominence between the antennal sockets, which is short, not greatly longer than wide, and convex below.

Antennae inserted a moderate distance apart, rather close to the oral margin, the distance between the sockets about a third greater than the distance from either to the oral margin and about one-half the distance from either to the nearest point of the eye; scape slender, and rather

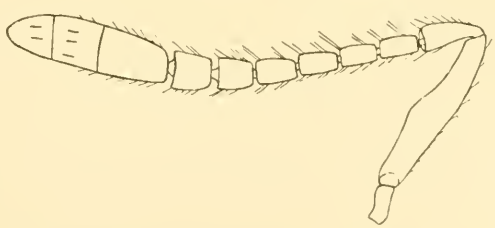

Fig. 15. *Euchalcerinys apicicornis.* Antenna of female.

long, reaching about to the plane of the frontovertex, and somewhat thicker at the middle; pedicel obconical, three times as long as thick at apex or nearly as long as the first two funicle joints combined; flagellum moderately clavate, the funicle joints all longer than wide, but distinctly increasing in thickness distad, the sixth joint about one-half wider again than the first; club three-jointed, large, oval, bluntly rounded at apex, somewhat wider than the last funicle joint and as long as the four preceding joints combined.

Mandibles rather narrow at apex with three acute teeth, of which the two ventral are subequal and not deeply divided from each other, the inner or dorsal tooth considerably smaller; base of mandible moderately wide and expanded nearly in the same plane as the apex. Palpi short, the maxillary pair three-jointed, with the apical joint tapering and equal

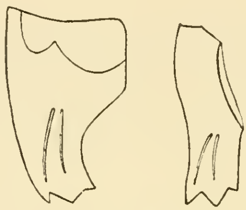

Fig. 16. *Euchalcerinys apicicornis.* Mandible of female, dorso-anterior and anterior views.

to the other two joints combined; labial palpi with three very short, equal joints, the two basal joints thickest at their union, the apical joint narrower and tapering.

Thorax of normal structure and robustness, the notum strongly convex; mesoscutum twice as wide as long, its posterior margin nearly straight, or only slightly produced medially; axillae over twice as wide as long, their inner tips very acute and meeting; scutellum about as long as the mesoscutum, or as long as its own width at the base, the disc strongly convex, the apex bluntly rounded; propodeum extremely short medially, but moderately long at the sides. Abdomen as wide as the thorax and nearly as long, triangular-ovate in shape and acute at apex; the basal tergite very prominent, longitudinally convex, and almost one-half as long as the whole abdomen; following tergites deeply sunken in and, excepting the apical one, mostly withdrawn beneath the first tergite; ovipositor barely exserted and not enclosed by the ventrites except basally.

Legs slender and rather longer than usual, the middle tarsi not much thickened at base and only slightly tapering, the spur of the middle tibiae slender and about two-thirds as long as the first tarsal joint. Wings large and broad, the venation much shorter than one-half the length of the disc; the submarginal vein close to the margin so that the costal cell is unusually narrow, marginal vein not much longer than wide and considerably shorter than the moderately long stigmal vein, the postmarginal vein very short and spur-like; speculum reaching nearly across the disc and widening below; disc beyond the speculum densely, uniformly pubescent, the setae in the basal area considerably sparser and larger, but becoming shorter and transparent towards the posterior margin.

Face, cheeks, most of pleura, the scutellum and abdomen smooth, the abdomen being highly polished; frontovertex with microscopic, very shallow thimble-like puncturation, appearing smooth and shining under low magnification; mesoscutum very finely reticulate, the anterior end of the mesopleura very delicately lineolate.

Pubescence rather sparse and inconspicuously colored; the frontovertex with only a few fine setae, the eyes with rather sparse, very short, erect setae; mesonotum with sparse, subseriately arranged setae which are longer on the scutellum, the apex of the scutellum with a pair of still longer bristles; sides of propodeum and abdomen more thickly pubescent than other parts of the body.

Male. Head but little, if any, thinner than in the female; as seen from above, strongly rounded anteriorly, with the frons slightly protuberant and the occipital margin concave; as seen from the side, thickest just above the lower corners of the eyes, the dorsal side rather weakly rounded and much shorter than the facial side, the latter nearly straight except that the facial ridge between antennae is visible as a protuberance below; as seen from in front it is well rounded above, with the vertex slightly protuberant, but the cheeks converge below nearly straight to the moderately wide and somewhat emarginate oral margin; eyes somewhat smaller than in the female, nearly round with the posterior margin somewhat oblate; frontovertex about one-half longer again than wide; ocelli large, arranged in a little less than a right-angled triangle, the posterior pair slightly the farthest apart, about half their own diameter from the eye margin and twice as far from the occipital margin, the anterior ocellus placed at the middle of the frontovertex; cheeks nearly as long as the width of the eyes, the genal suture fine but distinct; face

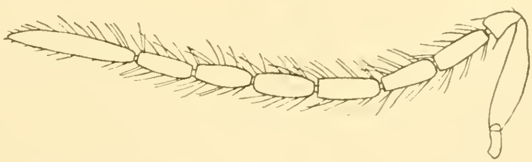

Fig. 17. *Euchalcerinys apicicornis.* Antenna of male.

with a rather deep, oval, longitudinal scrobal impression, extending from the oral margin well upward between the eyes or the whole length of the face, nearly twice as long as wide, and divided on the lower half by a well elevated ridge between the antennae, which is slightly convex from end to end as seen from the side.

Antennae inserted rather close together far from the oral margin, the upper ends of the sockets about touching the ocular line, the distance between the sockets nearly equal to the distance from either to the nearest point of the eye, and about one-fourth less than the distance from the lower end of the sockets to the oral margin; scape moderately long, reaching well beyond the scrobal impression, rather stout and fusiform in shape; pedicel somewhat longer than thick at apex and about equal to one-half of the first funicle joint; flagellum elongate, cylindrical, rather densely clothed with long semi-erect hairs, which decrease in length on the club gradually towards the apex; funicle joints all about three times longer than thick, the club no thicker than the funicle, one-third as long and tapering to the acute apex.

Thorax, legs, and wings similar to the female, the abdomen much shorter, a little wider than long, rounded at apex, and about one-half as long as the thorax, the first tergite prominent, the following tergites, except the apical one, almost entirely concealed beneath the first, but not deeply sunken in.

Frontovertex with distinct but fine, thimble-like puncturation much more evident than in the female; face, except in the depths of the scrobal impression, and the inner margin of the cheeks very finely and mostly transversely lineolate; mesoscutum much more coarsely reticulate than in the female, the reticulations large anteriorly and gradually becoming much finer towards the posterior margin; shagreening of the mesopleura rather more evident and extensive than in the female; sculpture otherwise nearly as in the female.

Pubescence of head distinctly less sparse than in the female, there being fine setae scattered over the frontovertex, on the sides of the face and on the lower parts of the cheeks, and the setae of the mesoscutum are arranged much more distinctly in rows.

Genotype: *Euchalcerinys apicicornis* n. sp.

This genus is similar to both *Chalcerinys* and *Helegonatopus* of Perkins, but in each of those genera the head is thicker and the antennae are slenderer and inserted a little higher on the face. *Chalcerinys* besides has a much stronger, denser sculpture, a distinct genal suture, and the apical margin of the basal tergite distinctly emarginate; its male has the ridge between antennal sockets very prominent and extending towards the oral margin as a sublaminate rostriform crest; the scape very stout, moderately long, of equal width throughout, and somewhat spirally twisted, the pedicel short and flattened; the funicle joints all flattened, unequal in size but all longer than wide, the first joint largest, it being both wider and longer than the following joints. *Helegonatopus* also is much more sculptured than *Euchalcerinys*, the scutellum being opaque and densely shagreened, the genal suture distinct, the maxillary palpi four-jointed, the marginal vein about twice as long as thick and subequal to the stigmal; while the male has the scape rather short and flattened, very wide at base and strongly narrowed to the apex; the pedicel short, the flagellum slender, elongate cylindrical, clothed with long hairs as in *Euchalcerinys*, but the funicle has only five joints decreasing in length distad, the morphological sixth joint having become fused with the club; the latter is as long as the last two funicle joints combined and shows a faint indication of a suture at its middle.

Euchalcerinys apicicornis n. sp. Figures 15-17.

Female. General color metallic bluish black; the face, cheeks, scutellum, pleura, and abdomen, except the basal tergite, with a purple luster; frontovertex slightly greenish, the mesoscutum more evidently metallic greenish in some aspects, but in others bluish black, the luster in direct dorsal view iridescent; apex of scutellum and basal tergite of abdomen metallic green with a brilliant variable luster, chiefly golden or brassy and purple; antennae dark brown, the base of the scape and radicle joint paler brown, the club pale brownish yellow; legs including coxae yellow, the hind tibiae slightly brownish on the basal half, the apex of last joint of the tarsi dark brownish; wings very faintly and uniformly tinted with fuscous or almost hyaline, the veins pale yellowish; mandibles and protruded part of ovipositor brown.

Length of body, 0.98; length of head, 0.391; width of head, 0.412; thickness of head, 0.214; width of vertex at posterior ocelli, 0.113; width of mesoscutum, 0.382; length of forewing, 1.20; width of forewing, 0.499; length of protruded part of ovipositor, 0.045 mm.

Male. General color metallic bluish black, but the face, inner half of the cheeks, frontovertex, mesoscutum, apex of scutellum and basal tergite of abdomen metallic green, the luster of these parts much less variable than in the female, the frontovertex dullest; outer half of the cheeks and disc of scutellum with a brilliant purple luster, the pleura and remainder of the abdomen with a weaker luster; antennae dark brown, the base of the scape and apex of the pedicel pale brown; legs colored as in the female, but the hind tibiae, except at base and apex, more distinctly brownish, and the first three joints of the hind tarsi are slightly brownish; other parts as in the female.

Length of body, 0.84; length of head, 0.329; width of head, 0.353; thickness of head, 0.207; width of vertex at posterior ocelli, 0.141; width of mesoscutum, 0.346; length of forewing, 1.09; width of forewing, 0.447 mm.

Described from one female (holotype) collected at Waiahole, Oahu, March 28, 1915 (O. H. Swezey); one male (allotype) collected at Kalihiuka, Oahu, April 27, 1919 (J. C. Bridwell); and one male (paratype) collected on the Manoa Cliffs trail, Oahu, September 1, 1918 (Timberlake), the latter specimen with the head missing.

Anabrolepis extranea Timberlake.

A second specimen of this interesting species was taken by

Dr. F. X. Williams on *Metrosideros* in the upper part of Manoa Valley, Oahu, on July 25, 1920. It has a pair of long, filiform bristles at apex of the scutellum, which were broken off in the type.

A specimen of *Anabrolepis* recently received from Dr. R. J. Tillyard, who reared it from *Aphelinus mali* material on apple from the United States (the real host was probably one of the Diaspinae), is close to *A. zetterstedtii* (Westwood). It differs from *extranea* in having the last two funicle joints yellowish; the pubescence of the mesoscutum somewhat sparser and blackish (in *extranea* the pubescence of the mesoscutum is neither so sparse nor dark-colored as indicated in the original description, but pale brownish and moderately abundant); the wings distinctly wider in proportion to the length, the pattern of the same type but differing slightly in detail, the apical dark area being longer than wide, the subapical clear spot on anterior margin strongly narrowed inwardly or subtriangular in shape, with only its inner apex provided with dark-colored setae, the setae of the marginal vein dense, coarse and tapering, and apparently none of them spear-shaped.

A. zetterstedtii, according to Mercet (Fauna Iberica, Himen., Fam. Encirtidos, p. 678, 1921), is similar to the above specimen from North America, but the pubescence of the pronotum and mesoscutum is white, and the antennae seem to be somewhat slenderer, with the last two funicle joints slightly longer than thick.

Quaylea whittieri (Girault).

Quaylea aliena Timberlake, Proc. Haw. Ent. Soc. 4, p. 216, 1919.

There seems to be no reasonable doubt that *aliena* is a synonym of *whittieri*, as the receipt of a large series from California discloses numerous specimens that cannot be distinguished from *aliena*. The differences pointed out in the description of *aliena* seem to be correlated, for the most part, with the smaller size of the types compared with the larger California specimens which I then had at my disposal, which were reared mostly from *Scutellista*.

This species has become one of considerable importance in California, as it has greatly increased since the introduction of *Aphycus lounsburyi* Howard, and now parasitizes a large percentage of this *Aphycus* in certain localities.

An account of the introduction of *Quaylea* into California is given by Alexander Craw in his Horticultural Quarantine Report for the months of December, 1900 to April, 1901 (Eighth Biennial Report, State Board Horticulture, California, for 1901-2, pp. 196, 197, 1902). Craw calls the species *Hemencyrtus crawii*, a manuscript name given by Ashmead. I have seen one of the original specimens at Sacramento, Cal., determined by Craw as *Hemencyrtus crawii*, so that there is not any doubt about the identity of *crawii* and *Quaylea whittieri*.

I have also recently received a few specimens of this species from Dr. R. J. Tillyard, which were reared from *Saissetia oleae* at Sydney, New South Wales, by Mr. Luke Gallard.

Notes on the Identity and Habits of Blepyrus insularis Cameron (Hymenoptera, Chalcidoidea).

BY P. H. TIMBERLAKE.

(Presented at the meeting of December 1, 1921.)

The Encyrtid chalcid-fly described by Cameron under the name of *Encyrtus insularis* has been a puzzle to everyone who has attempted to identify the insect from the description alone, and it has consequently been described several times and referred to several incorrect genera.

For assistance in working out the synonymy of this parasite, I am much indebted to Dr. James Waterston of the Imperial Bureau of Entomology, who compared Hawaiian specimens with the type of *insularis* in the British Museum, and to Dr. R. C. L. Perkins for transmitting an old specimen which had been collected by Blackburn and retained by him as identical with the one sent to Cameron and described as *insularis*. This specimen, which is perfectly preserved, bears the No. 87. The actual type in the British Museum has fared worse, as Dr. Waterston reports that the antennae and abdomen have been lost. In regard to the comparison, Dr. Waterston writes as follows: "I have compared them (i. e., the Hawaiian specimens forwarded under the name of *Blepyrus mexicanus*) with the torso of Cameron's type of *Encyrtus insularis*, and so far as I can see the two are identical."

Dr. Perkins in the Introduction to the Fauna Hawaiiensis (Vol. 1, Part 6, p. cvi, 1913) synonymized *Blepyrus marsdeni* Howard with *insularis*, but having failed to state his grounds for doing so, his action was not accepted by me in my former papers on Hawaiian Encyrtidae. It now appears that this synonymy was based on the Blackburn specimen mentioned above, and was of course correct.

Generic Characters of Blepyrus Howard.

Female. Form short, compact; head thin, menisciform, somewhat wider than the thorax; eyes very large, vertical, continuous with the occipital margin above, finely, rather densely, and shortly pubescent; frontovertex moderately wide, or about one-fourth as wide as the head, abruptly widened behind the ocelli; the latter arranged in a large, nearly equilateral triangle, the posterior pair close to the eye margins, and about their own diameter from the occipital margin; cheeks short, or about one-fifth the length of the eyes; face with a semi-oval scrobal impression reaching upward between the eyes, the depths of the scrobes in the form of shallow grooves converging from the antennal sockets, but not meeting

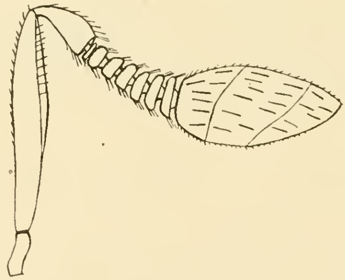

Fig. 1. *Blepyrus insularis.* Antenna of female.

above, the facial prominence between the antennae broad and low.

Antennae inserted rather far apart close to the clypeal margin, short and strongly clavate; scape slender, cylindrical, reaching nearly to the middle of the eyes and distinctly beyond the scrobal impression, pedicel a little longer than the first three funicle joints combined, the apical stalk connecting with the funicle very strongly capitate at its apex, forming a distinct but false ring-joint; funicle joints all short and transverse, the sixth over twice as wide as long; club very large, irregularly oval, about as long as the pedicel and funicle combined, and much wider than the last funicle joint.

Mandibles narrow at apex, very unequally tridentate, the middle tooth much the longest, the inner tooth inserted much farther toward the base than the outer or ventral tooth; the base of the mandible rather wide and expanded in a plane at right angles with the plane of the apex. Palpi short, the maxillary pair with four joints, the two middle joints stoutest and only a little longer than thick, the basal joint nearly twice as long, and the apical joint about three times as long; labial pair with three joints, the middle joint hardly longer than wide, the apical joint about three times as long as thick, the basal joint a little shorter; labrum rather prominent, its apical margin transverse and ciliated with a row of fine hairs.

Thorax very robust and of great depth dorso-ventrally, the mesonotum strongly convex; pronotum almost vertical, the collar very short; mesoscutum about twice as wide as long, its posterior margin trisinuate, the median lobe of the sinuosity much the widest and overlapping, when in normal position, the inner angles of the axillae; the latter, therefore, often appearing slightly separated but actually meeting; scutellum slightly longer than the mesoscutum, rather acute at apex, the disc somewhat depressed towards the base, more rounded towards the sides and apex, which are moderately elevated and abruptly declivous at the margins; propodeum short and nearly of equal length at the sides and middle.

Wings of moderate size, the disc beyond the speculum densely ciliated; the costal cell nearly as densely ciliated; the basal part of disc more sparsely ciliated with longer setae, the row of setae guarding the proximal margin of the speculum much longer than the others; marginal fringe short throughout. Marginal vein between two and three times as long as thick; the stigmal rather long, or about thrice as long as the marginal, nearly straight but with the apex curved slightly towards the costal margin; postmarginal vein nearly a half longer than the stigmal.

Legs of about normal length and structure; middle tibiae somewhat enlarged at apex and with a row of about nine peg-shaped spines on the outer, apical margin, the spur stout and nearly as long as the first tarsal joint; middle tarsi rather stout and tapering to apex, the basal joint about equal to the next three joints combined, the plantar surface of the first four joints provided with numerous peg-shaped spines similar to those on the tarsi of *Eupelmus;* hind tibiae with two short unequal apical spurs; hind tarsi somewhat longer and slenderer than the middle pair, and without the conical spines on the plantar surface.

Abdomen a little shorter than the thorax, triquetrous in shape, the apex bluntly rounded, the dorsal surface, when not distorted, much depressed and only slightly hollowed behind the first tergite, the venter moderately compressed, the ovipositor entirely enclosed by the ventrites; cerci or vibrissal plates situated on each side of the dorsum just before the middle, the vibrissae reaching nearly to the apex of the abdomen.

Frontovertex with shallow, more or less confluent, thimble-like punctures of considerable size, but nevertheless much smaller than the diameter of the ocelli; the scrobal impression of face smoothish, but with fine transverse lineolations; mesoscutum extremely finely reticulate and with numerous seriately arranged setiferous punctures; axillae and scutellum more opaque, being microscopically rugulose and with punctures like those of the scutum, the scutellum, however, becoming smoother and reticulate at apex; abdomen highly polished and with fine scale-like reticulations.

Pubescence on head and thorax rather thick, but not conspicuous because of its non-contrasting color, short and nearly erect on the fronto-vertex, larger, coarser, denser and more decumbent on the mesonotum, the apical part of scutellum becoming nearly bare, but with a pair of longer bristles at apical margin; abdomen nearly bare, but with a sparse fringe of moderately long, fine hair at the sides just below the lateral margins of the dorsum.

Blepyrus at present contains only a single species, as Ashmead's *phenacocci* is a typical species of *Chalcaspis* and must be cited in the future as *Chalcaspis phenacocci* (Ashmead). The genus evidently belongs to the Ectromatine group of genera notwithstanding the tridentate mandibles, as its relationship to *Pauridia, Acnasius, Chalcaspis, Zarhopalus,* etc., is apparent. Considered as a Mirine it is placed fairly well in Ashmead's tables, but *Coccophoctonus,* a synonym of *Blepyrus,* seems to be more accurately placed.

The following bibliography of *Blepyrus insularis* does not contain all the references to the species, but it is intended to include references to all new names and new combinations. The synonymy of *mexicanus, marsdeni, texanus,* and *dactylopii* was established through examinations of the types in the U. S. National Museum in 1917.

Blepyrus insularis (Cameron). Figures 1, 2.

Encyrtus insularis Cameron, Mem. Manchester Lit. & Phil. Soc. (3) 10, 1886, p. 243, female (not male). Honolulu, Oahu.

Blepyrus mexicanus Howard, Proc. U. S. Nat. Mus. 21, 1898, p. 234, female (excluding male). Monterey, Mexico.

Blepyrus marsdeni Howard, l. c., p. 234, female. Honolulu, Oahu.

Blepyrus texanus Howard, l. c., p. 235, female. Brownsville, Texas.

Coccophoctonus dactylopii Ashmead, Proc. U. S. Nat. Mus. 22, 1900, p. 375, female (not male). Honolulu, Oahu (not Australia).

Bothriothorax insularis Ashmead, Fauna Hawaiiensis, 1, Part 3, 1901, p. 321, female (not male). Hawaiian Islands.

Blepyrus insularis Perkins, Fauna Hawaiiensis, 1, Part 6, 1913, p. cvi. Hawaiian Islands.

Blepyrus mexicanus Timberlake, Proc. Haw. Ent. Soc. 3, 1918, p. 403. Mexico, Texas, Hawaiian Islands.

Blepyrus mexicanus Timberlake, Proc. Haw. Ent. Soc. 4, 1919, p. 186. Mexico, Texas, Hawaiian Islands, Manila, Philippines, Java.

Bothriencyrtus insularis Timberlake, Proc. Haw. Ent. Soc. 4, 1919, p. 213. Hawaiian Islands.

The female of *insularis* should be easily recognized from the preceding generic description and from other characters given by Cameron, Howard and Ashmead, but the male has remained undescribed up to the present time. Cameron considered his specimen to be a male, but his description applies only to the female sex. Howard's supposed male of *Blepyrus mexicanus* clearly belongs to another genus, probably a new one allied to *Anagyrus,* and Ashmead's supposed males of *Coccophoctonus dactylopii* are merely small females.

The true male of *insularis* is very similar to the female in general appearance, and without close scrutiny might be mistaken for that sex; it differs, however, rather remarkably in the structure of the antennae, as the funicle is three-jointed and the club is correspondingly enlarged.

Male. Head somewhat smaller than in the female, less menisciform and thicker fronto-occipitally; eyes smaller and considerably wider in proportion to their length; frontovertex proportionately wider or somewhat less than one-third the total width of head, and less widened behind the ocelli, the latter arranged nearly in a right-angled triangle, the posterior pair less than half their own diameter from the occipital margin; face and cheeks nearly as in the female.

Antennae inserted close to the clypeal margin; scape much shorter

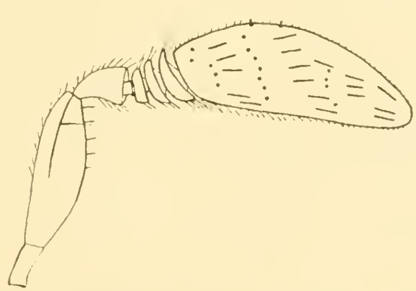

Fig. 2. *Blepyrus insularis.* Antenna of male.

and stouter than in the female, slightly widened in the middle, about one-half as long as the rest of the antennae and reaching only to the upper margin of the scrobal impression of the face; pedicel short and stout, about a half longer than its apical thickness, but longer than the first two funicle joints combined, the false ring-joint seen in the female absent or greatly reduced; funicle with only three transverse joints, the third very short or over thrice as wide as long; club very large, solid, elongate oval in shape, its dorsal outline convex, but the ventral side straight, widest at the middle, where it is about one-third wider than the last funicle joint, and in length equal to about twice the pedicel and funicle combined.

Abdomen smaller than in the female, hardly more than one-half as long as the thorax, more acute at the apex, and usually strongly depressed above and beneath.

Other structural characters closely approximating those of the female sex, except that the frontovertex is much more opaque with finer, closer thimble-like punctures.

Coloration similar but not metallic, and with less yellow on antennae and legs, the head, thorax, and abdomen being black and only moderately shiny; antennae and legs fuscous to blackish, the apex of the front tibiae, apical half of middle tibiae, and front and middle tarsi brownish yellow, the hind tibiae slightly yellowish, the hind tarsi yellow beneath, and more or less fuscous above; wings hyaline and not distinctly stained with yellowish as in the female.

Length, (0.82 to) 1.23; length of head, 0.497; width of head, 0.544; width of frontovertex, 0.172; width of mesoscutum, 0.535; length of antenna, 0.613; length of forewing, 1.09; width of forewing, 0.487 mm.

Characters taken from a large series of females and six males reared from *Pseudococcus virgatus* (Cockerell), or associated with this host, Honolulu and vicinity, Oahu, and five females from Manila and Los Banos, Philippines (George Compere, Fullaway, and H. E. Woodworth). The males were captured on September 11 and 13, 1916, on vines of the velvet bean, heavily infested with *Pseudococcus virgatus*, and on which the females of *insularis* were very abundant.

This parasite is presumably distributed throughout the lowlands of the Hawaiian Islands, although recorded specifically only from Oahu hithertofore. It has been stated that it was taken by Blackburn, however, on several of the Islands, and I have seen females from Olowalu and Wailuku, Maui.

Life History.

Blepyrus insularis is parasitic only in *Pseudococcus virgatus* (Cockerell) so far as known. Females that were supplied with *Pseudococcus longispinus* (Targioni) oviposited rather freely, but no offspring were reared, the eggs or newly hatched larvae presumably having been killed by the physiological reactions of the hosts. In another experiment a female was supplied with *Pseudococcus krauhniae* (Kuwana), but in this case the mealybugs were wholly ignored by the parasite.

This parasite seems always to choose first-stage larvae for oviposition, and preferably those that have recently hatched, and examines them first with her antennae. Having satisfied herself that the larva is suitable, the female turns quickly about and protrudes the ovipositor backward beneath the victim, which is punctured usually through the venter. During the process the apical part of the abdomen is extended backward and downward in a cone-shaped body. The ovipositor when protruded is slender, naked, or without external sheaths, and curved upward. The female usually places her hind tarsi on the host during oviposition, evidently partly for purposes of orientation and partly to hold it in place. The whole process of oviposition requires only about one or two seconds for completion.

Development is evidently slow, as the host itself must grow to considerable size before it is finally killed and consumed by the parasite. A female that was supplied with newly hatched *virgatus* on February 12 was observed to oviposit after a few minutes, and oviposition probably continued for several days, as on February 22 the parasite was found dead. Offspring from this reproduction began to issue on March 15 and continued to issue up to April 5, indicating a minimum length of the life-cycle of thirty-two days and a maximum of about forty-five days. The rather great range in time required is probably due to differences in the rate of the preliminary development of the host. In warmer summer weather the rate of development ought to be considerably quickened. As compared with *Pauridia peregrina* Timberlake, which has similar habits, the life-cycle is approximately the same. A female *Pauridia,* which was supplied with larvae of *Pseudococcus krauhniae* for about twenty-seven hours on January 28 and 29, oviposited freely and produced offspring which issued between February 28 and March 11, inclusive, thus indicating a minimum life-cycle of thirty-one days and a maximum of forty-three days.

Types in the Collection of the Hawaiian Entomological Society.

The custodian of the type collection of this society submits the following list of the types belonging to the society or in its care on December 31, 1921. The condition of the specimens is considered good unless otherwise stated.

Diptera.

Dicranomyia swezeyi Alexander.....	Holotype and allotype, both badly broken
Dicranomyia stygipennis Alexander..	Five paratypes, one badly broken
Dicranomyia foliocuniculator Swezey.	Holotype and ten paratypes
Tephritis swezeyi Bryan............	Holotype
Tephritis dubautiae Bryan.........	Holotype and allotype

Lepidoptera.

Euxoa wikstroemiae Swezey	Holotype and one paratype
Euxoa kerri Swezey	Holotype and one paratype
Phytometra violacea Swezey	Holotype
Omiodes giffardi Swezey	Holotype
Celerio perkinsi Swezey............	Holotype
Mestolobes chrysomolybdoides Swezey.	Holotype and one paratype
Mestolobes quadrifasciata Swezey....	Holotype and three paratypes
Capua tetraplasandra Swezey	Holotype and one paratype
Capua reynoldsiana Swezey	Holotype and five paratypes
Semnoprepia pittospori Swezey......	Holotype and two paratypes
Semnoprepia coprosmae Swezey	Holotype and six paratypes
Gracilaria neraudicola Swezey	Holotype and five paratypes
Opostega callosa Swezey	Holotype and one paratype
Opostega serpentina Swezey	Holotype and one paratype
Opostega filiforma Swezey	Holotype
Opostega peleana Swezey	Holotype

Homoptera.

Trioza ohiacola Crawford...........	Holotype
Trioza hawaiiensis Crawford........	Holotype
Trioza lanaiensis Crawford	Holotype
Trioza pullata Crawford............	Holotype
Kuwayama nigricapita Crawford....	Holotype
Kuwayama minuta Crawford	Holotype
Kuwayama gracilis Crawford.......	Holotype
Heraheva hyalina Crawford	Holotype
Heraheva giffardi Crawford	Holotype
Megatrioza palmicola Crawford.....	Holotype

Cerotrioza bivittata Crawford ...... Holotype
Dictyophorodelphax praedicta Bridwell .... Holotype, allotype, and eight paratypes

Coleoptera.

Nesithmysus bridwelli Perkins ...... Holotype and one paratype
Nesithmysus forbesii Perkins .... Holotype
Nesithmysus haasii Perkins......... Holotype
Plagithmysus platydesmae Perkins .. Holotype
Plagithmysus swezeyi Perkins....... Holotype
Clytarlus indecens Perkins.......... Holotype and three paratypes
Neoclytarlus euphorbiae Bridwell.... Holotype, allotype, and four paratypes.
Xyletobius timberlakei Perkins...... Holotype and one paratype
Sericotrogus bryani Swezey......... Holotype
Stenommatus musae Marshall....... Four paratypes
Proterhinus swezeyi Perkins........ Holotype
Proterhinus impressiscutis Perkins... Holotype
Proterhinus bridwelli Perkins .... Holotype
Proterhinus euphorbiae Perkins ..... Holotype and four paratypes
Proterhinus euops Perkins .... Holotype and eight paratypes
Proterhinus asteliae Perkins .... Holotype and eleven paratypes
Proterhinus abnormis Perkins....... Holotype and eight paratypes
Proterhinus phyllobius Perkins...... Holotype and seven paratypes
Proterhinus fuscicolor Perkins ...... Holotype and six paratypes

Hymenoptera.

Odynerus litoralis Giffard .... Holotype and allotype
Odynerus monas var. *aeneus* Giffard. Holotype
Odynerus kauensis Giffard.......... Holotype
Odynerus perkinsi Giffard .... Holotype and allotype
Odynerus koolauensis Giffard .... Holotype and allotype
Melanocrabro discrepans Giffard .... Holotype
Megachile timberlakei Cockerell..... Two paratypes
Itoplectis immigrans Timberlake .... Holotype, allotype, and two paratypes
Opius lantanae Bridwell............ Holotype and allotype
Microbracon pembertoni Bridwell .... Holotype and allotype
Microbracon terryi Bridwell......... Holotype and allotype
Microbracon swezeyi Bridwell....... Holotype and allotype
Hormiopterus vagrans Bridwell..... Holotype, allotype, and two paratypes
Silaon rohweri Bridwell............ Holotype and allotype
Scleroderma immigrans Bridwell .... Holotype
Sclerodermus semnoprepiae Bridwell. Holotype, allotype, and one paratype
Sclerodermus chilonellae Bridwell ... Holotype and allotype
Sclerodermus muiri Bridwell........ Holotype

Sclerodermus tantalus Bridwell	Holotype
Sclerodermus manoa Bridwell	Holotype
Sierola distincta Fullaway	Ten paratypes
Sierola armata Fullaway	Two paratypes
Sierola volcanica Fullaway	One paratype
Sierola acuta Fullaway	Two paratypes
Sierola notabilis Fullaway	Two paratypes
Sierola sima Fullaway	One paratype
Sierola spicata Fullaway	Three paratypes
Sierola giffardi Fullaway	One paratype
Sierola muiri Fullaway	One paratype
Sierola bicolor Fullaway	One paratype
Sierola aristoteliae Fullaway	One paratype
Sierola levis Fullaway	One paratype
Sierola peleana Fullaway	One paratype
Sierola usitata Fullaway	Two paratypes
Sierola koa Fullaway	One paratype
Sierola pilosa Fullaway	One paratype
Sierola megalognatha Fullaway	One paratype
Sierola tantalea Fullaway	One paratype
Sierola compacta Fullaway	One paratype
Sierola longicaudata Fullaway	One paratype
Sierola laticeps Fullaway	Five paratypes
Sierola timberlakei Fullaway	Two paratypes
Sierola pulchra Fullaway	Seven paratypes
Sierola pubescens Fullaway	Three paratypes
Sierola seminigra Fullaway	One paratype
Sierola fuscipes Fullaway	Two paratypes
Sierola callida Fullaway	One paratype
Sierola brunneipes Fullaway	One paratype
Sierola arida Fullaway	One paratype
Sierola brunnea Fullaway	One paratype
Sierola hirsuta Fullaway	Three paratypes
Sierola koolauensis Fullaway	One paratype
Sierola capuana Fullaway	One paratype
Sierola lugens Fullaway	One paratype
Sierola gracilariae Fullaway	One paratype
Sierola kaduana Fullaway	One paratype
Sierola cryptophlebiae Fullaway	One paratype
Sierola polita Fullaway	One paratype
Sierola opogonae Fullaway	One paratype
Sierola batrachedrae Fullaway	Two paratypes
Sierola puuwaawaa Fullaway	One paratype
Sierola amica Fullaway	One paratype
Sierola adumbrata Fullaway	One paratype
Sierola nemorensis Fullaway	One paratype
Sierola bridwelli Fullaway	One paratype

Sierola philodoriae Fullaway	One paratype
Sierola planiceps Fullaway	One paratype
Sierola hirticeps Fullaway	One paratype
Sierola nitens Fullaway	One paratype
Sierola brunneiventris Fullaway	One paratype
Sierola perottetiae Fullaway	One paratype
Anagyrus nigricornis Timberlake	Holotype, allotype, and ten paratypes
Anagyrus swezeyi Timberlake	Holotype, allotype, and fifteen paratypes
Anagyrus antoninae Timberlake	Holotype, allotype, and ten paratypes
Xanthoencyrtus apterus Timberlake	Holotype, allotype, and two paratypes
Xanthoencyrtus semiflavus Timberlake	Holotype
Xanthoencyrtus sanguineus Timberlake	Holotype, allotype, and six paratypes
Xanthoencyrtus laysanensis Timberlake	Holotype and allotype
Xanthoencyrtus bridwelli Timberlake	Holotype, allotype, and six paratypes
Xanthoencyrtus semiluteus Timberlake	Holotype, allotype, and three paratypes
Xanthoencyrtus fullawayi Timberlake	Holotype
Pauridia peregrina Timberlake	Holotype, allotype and eleven paratypes
Coelopencyrtus odyneri Timberlake	Holotype, allotype, and fourteen paratypes
Coelopencyrtus swezeyi Timberlake	Holotype, allotype, and fourteen paratypes
Coelopencyrtus orbi Timberlake	Holotype, allotype, and fourteen paratypes
Quaylea aliena Timberlake	Holotype, allotype, and two paratypes
Aphycomorpha araucariae Timberlake	Holotype, allotype, and six paratypes
Anicetus annulatus Timberlake	Holotype, allotype, and two paratypes
Plagiomerus hospes Timberlake	Holotype and two paratypes
Anabrolepis extranea Timberlake	Holotype
Xesmatia flavipes Timberlake	Holotype and one paratype
Encyrtus barbatus Timberlake	Holotype, allotype, and three paratypes

P. H. TIMBERLAKE, Custodian.

CONTENTS OF VOL. V, NO. 1.

VOL. V. NO. 2 SEPTEMBER, 1923

PROCEEDINGS

OF THE

HAWAIIAN ENTOMOLOGICAL SOCIETY

FOR THE YEAR 1922

HONOLULU, HAWAII
PRICE 75 CENTS

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All correspondence should be addressed to the Secretary, Hawaiian Entomological Society, Honolulu, Hawaii, from whom copies of the Proceedings may be purchased.

Volume I of the Proceedings, for 1905-07 (in five numbers), contains 210 pages, 4 plates, and 5 text figures.

Volume II, 1908-12 (in five numbers), contains 311 pages, 7 plates, 5 cuts, and 1 portrait.

Volume III, 1913-1917 (in five numbers), contains 500 pages, 8 plates, and 6 cuts.

Volume IV, 1918-1920 (in three numbers), contains 610 pages, 10 plates, and 25 cuts.

Volume V, No. 1, 1922, contains 177 pages, 3 plates, and 25 cuts.

Price per volume, $2. Price of any single number of Volume I-III, 50 cents. Price of any single number of Volume IV and V, 75 cents.

PROCEEDINGS

OF THE

Hawaiian Entomological Society

Vol. V, No. 2. For the Year 1922. September, 1923

JANUARY 5, 1922.

The 195th meeting of the Hawaiian Entomological Society was held at the experiment station of the Hawaiian Sugar Planters' Association. Members present, besides Vice-President Fullaway, who presided, were Messrs. Bissell, Bryan, Ehrhorn, Giffard, Illingworth, Muir, Rosa, Swezey, Soon, Timberlake, Wilder, and Willard.

Minutes of the previous meeting were read and approved.

The Secretary reported that the Executive Committee had made the following appointments: Curator of Insects and Librarian, Mr. P. H. Timberlake; Editor of the Proceedings, Mr. O. H. Swezey.

PAPER READ.

"The Leaf-Miners of Pipturus (Lepidoptera)."

BY O. H. SWEZEY.

NOTES AND EXHIBITIONS.

Exhibition of a large collection of insects from Kokee, Kauai, August, 1921, by O. H. Swezey.

Fossil Insects.—Mr. Muir exhibited a pamphlet, entitled "Mesozoic Insects of Queensland," by Dr. R. J. Tillyard. He called attention particularly to the excellence of the photographs, in which the veins and even the hairs on the insect wings were easily discernible.

Supella supellectilium (Serv.).—Mr. Bryan exhibited a specimen of this recently introduced Australian roach, which was captured January 3, 1922, in the cottage of Colonel Clark at the Kamehameha Boys' School, Honolulu, by Miss Clark.

Plagithmysus munroi (a correction). — Mr. Swezey called attention to Nos. 5 and 6 in Dr. Perkins' paper on Plagithmysides (Proc. Haw. Ent. Soc., IV, 996, 1921), and to the fact that the name of the species had been omitted in the manuscript. A surmised determination as *P. munroi* was supplied in a footnote. Recently the specimens were returned by Dr. Perkins, and these, Nos. 5 and 6, were found to be labeled *P. concolor*, hence, this is the name to be supplied for notes 5 and 6 in the paper.

FEBRUARY 2, 1922.

The 196th meeting of the Hawaiian Entomological Society was held at the experiment station of the Hawaiian Sugar Planters' Association, and was presided over by Vice-President D. T. Fullaway. Other members present were Messrs. Bissell, Bryan, Ehrhorn, Giffard, Illingworth, Muir, Rosa, Soon, Swezey, Timberlake, and Willard. Mr. W. H. Cowdry was a visitor.

The minutes of the previous meeting were read and approved.

PAPERS.

"The Erythrina Twig-Borer (Terastia meticulosalis) in Hawaii (Pyralidae, Lepidoptera)."

BY O. H. SWEZEY.

"Notes on Diptera Occurring in Hawaii."

BY J. F. ILLINGWORTH.

"Description of Two Flies Attacking Lantana (Diptera)."

BY DR. J. M. ALDRICH.

(Presented by Mr. Swezey.)

* **"Preliminary Notes on Pseudoscorpions."**

BY E. H. BRYAN, JR.

ENTOMOLOGICAL NOTES.

Synthesiomyia brasiliana.—Mr. Illingworth exhibited speci-

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* Withdrawn from publication. [Ed.]

mens of this fly, and masses of its pupa cases. He called attention to its peculiar habit of pupation, consisting of forming its puparia among the hair on the carcass of its host, so near together that, after their emergence, the holes resemble honeycomb.

Scymnus sp.—Mr. Timberlake reported the discovery of a new Coccinellid, which has been confused in collections with the so-called *Rhyzobius ventralis*, which it resembles in size and coloration. This species agrees in many respects with the Australian species *Scymnus varipes* (Blackburn), but is apparently distinct. It is almost unquestionably one of the species introduced by Koebele years ago from Australia, and may have been confused at the time of introduction with the so-called *ventralis*. The specimens exhibited were all taken in the mountains back of Honolulu from Pacific Heights and Konahuanui to Kuliouou. The earliest collected specimen seen was taken January 1, 1905, on Tantalus, by Mr. Giffard.

Lindorus sp.—Mr. Timberlake called attention to the fact that the Coccinellid, passing under the name of *Rhyzobius ventralis* in both California and the Hawaiian Islands, is evidently not the species described by Erichson. Both it and the true *ventralis* belong to the genus *Lindorus*.

Sinoxylon conigerum.—Mr. Fullaway exhibited specimens of this beetle, which is doing damage to lead cables on the islands of Maui and Hawaii.

Epagoge infaustana.—Mr. Swezey exhibited a series of this Tortricid moth, reared from larvae on *Pipturus*, collected in Makaleha Valley, January 8, 1922. Dr. Perkins collected this moth abundantly on Kauai, Maui, Molokai, and Hawaii, but not on Oahu. Mr. Swezey had previously reared a few specimens from larvae boring in the tips of twigs of *Pipturus* on Tantalus. One tree was found in Makaleha Valley on which were hundreds of the larvae. They were feeding on the leaves, skeletonizing them, and hiding in webbed-together leaves at the tip, or a bit of the turned-over edge. They pupated in similar places. A score or so of leaves with larvae were collected, and from these twenty-two moths issued January 19 to 28, and two of the parasite, *Cremastus hymeniae*. This adds another to the large number of hosts of this parasite.

Lantana Flies.—Mr. Swezey exhibited paratypes of two flies as recently returned to him by Dr. Aldrich. One of the flies is the lantana stem gall-fly, *Eutreta xanthochaeta* n. sp., the other the lantana seed fly, *Agromyza lantanae* Froggatt.

Kelisia paludum.—Mr. Swezey exhibited this little Delphacid, collected by him at Honaunau, Hawaii, August 13, 1919. Quite a series were collected at the time from a low sedge in a brackish place at about sea-level. The specimens had recently been determined by Mr. Muir. It is the first record on any other of the Hawaiian Islands except Oahu and Laysan.

Azya luteipes.—Mr. Swezey reported observing this lady beetle very abundant on a hau tree at the sea coast south of the Magnetic Station at Sisal, Oahu, January 29, 1922. A score or more could be seen at one time resting on the under side of the leaves of an isolated tree. He had never seen so many of this lady beetle before.

Chrysopa sp.—The immigrant lace-wing fly, which has been known the past two years on Oahu, was reported by Mr. Swezey as being very numerous on wiliwili trees on the Ewa coral plain south of Sisal. Their cocoons were most abundant, being found on the leaves, and also in the opened pods, many of which were hanging on the tree. Two to six of the cocoons were found together in some of the pods. A few larvae were also seen, and an adult has issued from the cocoons brought in, which proves the identity of the insect. *Pseudococcus virgatus* was present and had probably been the food of the insect.

North American Trypetidae.—Mr. Bryan exhibited specimens from this family with the following note: In order to have authentic specimens of *Eutreta sparsa* Wied. to compare with our lantana gall-fly, several mainland entomologists were appealed to. A series of ten specimens were received at the Bishop Museum from Dr. C. W. Johnson, Dr. W. E. Britton, and the United States National Museum, the specimens having been collected in Massachusetts, Connecticut, White Mountains, North Carolina, and California.

Dr. Johnson forwarded also a collection of typical eastern Trypetidae, with notes as follows: "*Eutreta sparsa* Wied. infests *Solidago*, forming swellings on the new shoots near the ground. The galls are figured in Thompson's 'Illustrated Catalogue of American Insect Galls,' p. 55, pl. 10, fig. 315. I enclose a California specimen. The western examples seem to differ somewhat from the eastern, and I sometimes wonder if they are really the same. *Eutreta diana* O. S. form galls on *Artemesia*. In the allied genus *Eurosta*, two closely related species will form very different galls or attack two species of plants. *Eurosta solidaginis* (Fitch) forms a large, globose gall on the stalks of *Solidago*, far above the ground. *Eurosta reticulata* Snow makes an elongate gall at the base of new growth. *Eurosta comma* (Wied.) makes a peanut-like gall on the roots of *Solidago rugosa*. *Eurosta elsa* makes about the same shaped galls on the roots of *Solidago juncea*, according to Daecke, Ent. News, v. XXI, p. 341, pl. 10, 1910."

In addition to specimens of these species, Dr. Johnson forwarded to the Museum specimens of *Straussia longipennis* (Wied.); *Acidia fratria* (Loew); *Oedaspis atra* Loew; *Rhagoletis pomonella* (Walsh), the apple maggot; *Aciura insecta* (Loew); *Icterica seriata* (Loew); *Tephritis albiceps* Loew; *Euaresta bella* (Loew); and *Trypeta palposa* Loew.

Mr. W. H. Cowdry, a visitor, made a few remarks. He stated that, although he had not attended an entomological meeting for fifty years, he was one of the first members of the Entomological Society of Canada. He had been to North China collecting botanical specimens, and found that the lack of forests there made the number of species of insects very small.

MARCH 2, 1922.

The 197th meeting of the Hawaiian Entomological Society was held at the experiment station of the Hawaiian Sugar Planters' Association, with Vice-President Fullaway presiding. Other members present were Messrs. Bissell, Bryan, Giffard, Illingworth, Muir, Rosa, Swezey, Timberlake, Wilder, and Willard.

The minutes of the previous meeting were read and approved.

PAPERS.

* "Some of the Early References to Hawaiian Entomology."

BY J. F. ILLINGWORTH.

EXHIBITS.

Stomatoceras hakonense Ashmead.—Mr. Timberlake exhibited two females of this species, which were collected by Mr. Whitney in a log from Japan during the course of his quarantine work. The specimens had apparently crawled into crevices of the log to hibernate, and their discovery after the log reached Honolulu is another illustration of the many ways that insects may be widely distributed by commerce.

Eutreta sparsa and *Eutreta xanthochaeta*.—Mr. Muir exhibited mounted genitalia showing the distinctive characters of these two flies.

Plagithmysus perkinsi Sharp.—Larvae of this beetle taken in *Myoporum sandwicense* in the region of the volcano in August, 1920, were brought to Honolulu in the wood and kept until February, 1922, when three specimens emerged, which were exhibited by Mr. Giffard. One was a perfect specimen, and another partially so, portions of the elytra having been eaten by the ant, *Pheidole megacephala*. The third specimen was quite eaten by ants, excepting one elytra and part of one hind leg.

Cane-borer caught by English sparrow.—Mr. Swezey reported having observed an English sparrow fly up and catch something on the wing, and take it to the ground to eat it. He succeeded in frightening away the sparrow and secured the remains of its feast, which proved to be an adult cane-borer beetle. Score another for the sparrow!

Heliothis obsoleta.—Mr. Swezey exhibited two moths reared from caterpillars found feeding on the blossoms of *Sida cordifolia* at Kaimuki, January 31, 1922. Ten of the caterpillars were found, but eight of them yielded parasites instead of moths, giving 80 per cent parasitization. Twenty-seven of the parasites, a Tachinid fly (*Frontina archippivora*), issued February 16-23. The moths issued February 24 and 28.

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* Withdrawn from publication.

The caterpillars of this moth are known as the cotton boll worm and corn ear worm in the Southern States; but in Hawaii they have not been recorded as injurious to these plants. Mr. Swezey reported that he tried the above caterpillars on green sweet corn and the corn was voraciously eaten by them. It is not understood why corn in the field has not been reported attacked by these caterpillars. The fact that they are so highly parasitized as above, indicates that they are sufficiently controlled by the Tachinids. No doubt the eggs are also somewhat attacked by *Pentarthron flavum*.

Gitonides perspicax Knab and *Titanochaeta ichneumon* Knab. —Mr. Swezey mentioned for record that these two flies had been described by Knab in Ins. Insc. Menstruus in 1914 from specimens sent him by Swezey. These had escaped being entered in Hawaiian literature.

Monopis meliorella (Walk.) and *Crypsithyris enixa* Meyrick. —Mr. Swezey exhibited these two moths which he had had determined by Mr. Meyrick, from specimens sent him recently. They had been collected in Kaimuki by Timberlake and Swezey, and are immigrants of which this is the first record.

Megastigmus sp.—Mr. Fullaway reported the capture, February 13, 1922, on the window of the laboratory at Government Nursery of a species of *Megastigmus*. Some of the species of this genus of Chalcid flies are seed-eating in the larval state.

Introduced Staphylinid.—Mr. Fullaway reported also the recovery on February 12, 1922, at Moanalua Dairy of the Staphylinid, *Creophilus erythrocephalus*, introduced by Mr. Illingworth from Australia in September, 1921, and since multiplied and distributed in the Territory.

Recently determined Coleoptera.—Mr. Fullaway also reported receiving the following identifications of introduced Coleoptera from Mr. G. E. Bryant of the British Museum.

Carabidae.

Bembidium sp.

Perigona nigriceps (Dej.).

Hydrophilidae.

Cercyon sp.

Trogositidae.

Lophocateres pusillus (Klug).

Cleridae.

Thaneroclerus buqueti (Lefèvre).

APRIL 6, 1922.

The 198th meeting of the Hawaiian Entomological Society was held at the usual place, and was presided over by Vice-President Fullaway. Other members present were Messrs. Bissell, Bryan, Ehrhorn, Giffard, Illingworth, Muir, Rosa, Soon, Swezey, Timberlake, and Willard. Mr. N. H. Cowdry was a visitor.

The minutes of the previous meeting were read and approved.

PAPERS.

"The Insect Fauna of Hen Manure."

BY J. F. ILLINGWORTH.

"On the Classification of the Fulgoroidea (Homoptera)."

BY F. MUIR.

NOTES AND EXHIBITIONS.

Diocalandra taitensis.—Mr. Bissell exhibited the pupal chamber and channels of a beetle, which were made in the husk of a dry coconut, and were evidently the work of *D. taitensis.* He stated that this coconut had been found at the home of Mr. Charles H. Bellina on Waialae Bay, April 2, 1922. This beetle has been previously found in the Hawaiian Islands only on the island of Hawaii, and this record would indicate that it is now on the island of Oahu.

Allograpta obliqua.—Mr. Swezey reported finding this new immigrant Syrphid fly abundant in the Hamakua district of Hawaii in March, 1922. Specimens were secured in several places: Honokaa; on hibiscus at the manager's house at Paauhau; and along roads where there was guava and lantana, 500 to 1000 feet elevation at Ookala.

Xiphidiopsis lita.—Mr. Swezey reported seeing four specimens of this new Locustid in the clubhouse at Olaa, March 13, 1922. This indicates that it is becoming numerous outside of Hilo, where it has been known for three years, Olaa being about eight miles from Hilo. He also reported that Matthias Newell had told him of finding a male at light in Hilo. This is the first time the male has been observed, although the females have been seen by scores at lights at the Hilo Hotel.

Anisolabis eteronoma.—Mr. Swezey reported finding this large earwig common in cane fields on Hawaii in March, 1922. It was usually under trash, but was also found in the soil while digging for wire worms. They were found at Hilo Sugar Company, Laupahoehoe, and Honokaa. At the latter place they were also found in a rotten log above the cane fields at an elevation of about 2000 feet.

Exillis lepidus.—This Anthribid was found very abundant in dead Kukui twigs at Kaimuki by Mr. Swezey, March 15, 1922. The larvae were feeding in the pith of the dead twigs. A few pupae were found, and one had matured already, thus demonstrating what the insect was.

Araecerus fasciculatus.—Mr. Swezey reported on the dissection of eggs from a female of this beetle, and that they agreed with the description given of them by Mr. R. T. Cotton in Journal of Agricultural Research, XX, No. 8, p. 607, 1921. They were different from the description given by Mr. Swezey in Proc. Haw. Ent. Soc., IV, No. 3, p. 452, 1921. This latter description was from eggs that Mr. Swezey had found, and surmised them to be those of *A. fasciculatus* from the circumstances of finding, and the fact that there was no other known species of beetle to which they could be referred. Now it is certainly known that the aforementioned eggs belong to something else, and just what, remains to be discovered.

Lasioderma serricorne.—The cigarette beetle was reported by Mr. Swezey as having been reared from a larva feeding in the pulp of a dried litchi nut handed to him by Dr. Lyon.

Agromyza lantanae.—Mr. Swezey reported results of germination of lantana seeds that had been infested with maggots of this Agromyzid. From 100 infested seeds, retained until after emergence of flies, and then planted December 20, 1921, between

February 18 and April 5, 1922, eighty-two seedling plants were obtained.

As a check, 100 non-infested seeds were similarly planted, and ninety-five seedlings were secured. This is a further demonstration of the fact that the Agromyzid does not thoroughly destroy the embryos of the lantana seeds.

Note on fumigation with carbon bisulphid.—Mr. Ehrhorn exhibited a dry limb of *Paulownia imperialis* from Japan, which was imported for use as floats for fish-nets. Upon its arrival, this limb contained a nest of ants, and was fumigated with carbon bisulphid. He called particular attention to the fact that the hollow center of the limb, used by the ants as a nest, had a very small entrance hole at one end, through which the carbon bisulphid fumes successfully penetrated and killed all of the ants during an exposure of forty-eight hours.

*An undetermined fly.**—Mr. Illingworth reported the finding of a new fly at Kaimuki. He noticed them flying in a group like Syrphid flies, but he had not yet established their identity.

MAY 4, 1922.

The 199th meeting of the Hawaiian Entomological Society was held at the experiment station of the Hawaiian Sugar Planters' Association, with Vice-President Fullaway in the chair. Other members present were Messrs. Bissell, Crawford, Bryan, Ehrhorn, Giffard, Illingworth, Swezey, Timberlake, Rosa, Willard, and Williams.

The minutes of the previous meeting were read and approved.

Mr. Swezey reported the receipt from the printers, of the new indexes for Vols. I and IV of the Proceedings.

PAPERS.

"Halobates in Hawaii (Hemiptera)."

BY E. H. BRYAN, JR.

NOTES AND EXHIBITIONS.

Tinea pelionella.—Mr. Swezey exhibited a specimen of this

* Later determined by Dr. Aldrich as *Limnophora arcuata* Stein. [Ed.]

Tineid reared from a larval case on an old woolen cap, April 7, 1922. Several of the cases were found, four of them containing larvae. Moths reared from these April 27 to May 1, 1922. This moth was recorded in the Fauna Hawaiiensis, but collections here contain no specimens. The present specimen belongs to this species.

Carabid new to Hawaii.—Mr. Timberlake exhibited a small Carabid beetle captured by Mr. Muir at Puuloa, Oahu, April 10, 1922, on the ground among sugar-cane. It is an immigrant not heretofore seen here.

Glyptocolastes bruchivorus.—Mr. Bissell exhibited specimens of this Bracconid, reared from *Mylabris sallaci* in *Acacia farnesiana*, collected on Ewa coral plain, April 21, 1922. This is the first recovery of this Bruchid parasite, since its introduction from Texas in the summer of 1921.

Nut grass borers.—Mr. Williams mentioned two borers in nut grass (*Cyperus rotundus*), taken in the Philippines. One of the borers is the larva of a Tortricid moth, determined by Mr. Swezey as belonging to the genus *Bactra*. The other is the larva of a small beetle, apparently related to the "bill bugs" in the United States. Both species of larvae bore in the stems and the corm, but are not an effective check on the nut grass in the Philippines.

Scutigera straba (Wood). The Hawaiian house centipede.—Mr. Bryan gave the following synonymy and note on this centipede:

Cermatia straba Wood, Jour. Acad. Nat. Sci. Phila., (2), V, p. 11, 1862.

Scutigera straba Silvestri, Fauna Hawaiiensis, III, p. 323, 1904.

A specimen was captured in the Bishop Bank, April 29, and presented to the Bishop Museum by Mr. Garvie, teller. It fits the description of this, the only *Scutigera* recorded from Hawaii, a translation of the description of which follows:

"Ferruginous Cermatia (Scutigera); single median line; head broad, densely, minutely punctated, and appendages sparsely pilose; broad and long longitudinal depressions in the middle and on both sides (of the head), the one curved, before the eyes, the other transverse, indistinct, between the eyes; the scuti roughened with small spines and minute, close punctures, scarcely scaly, posterior edge emarginate, with the margins strongly elevated, spiny and crenulate; the legs ferruginous, first joint of the metatarsus equal in length to the following seven."

It is closely allied to *Scutigera forceps* Raf., the mainland house centipede, recorded in U. S. Dept. Agr. Circ. 48.

JUNE 3, 1922.

The 200th meeting of the Hawaiian Entomological Society was called to order at 2:30 p. m. by Vice-President Fullaway, at the usual place. In the absence of the Secretary, Mr. Timberlake was appointed by the Chair to act as Secretary pro tempore. Other members present were Messrs. Bryan, Crawford, Ehrhorn, Giffard, Illingworth, and Rosa.

The minutes of the previous meeting were read and approved.

PAPERS.

"New or Little-Known Crane-Flies from the Hawaiian Islands."

BY CHARLES P. ALEXANDER.

(Presented by Mr. Bryan.)

NOTES AND EXHIBITIONS.

Dolichopodidae.—Mr. Timberlake exhibited a small collection of local Dolichopodidae. Eight species are apparently of immigrant origin and of these, three belong to *Psilopus* (*patellifer* Thoms., *pachygyna* Macq., and *pallidicornis* Grimsh.), and one each to *Hydrophorus, Medeterus, Asyndetus, Dolichopus,* and *Hypocharassus.* The recently described *Dolichopus exsul* Aldrich (Proc. U. S. Nat. Mus. 61, Art. 25, p. 15, May, 1922) is very abundant in favorable places in the mountains such as Pauoa flats, on Tantalus, and also has been taken in Honolulu. It is widely distributed throughout the Islands and has been collected on Kauai, Oahu, Maui, Molokai, and Hawaii. Of the endemic species about twelve were shown, none of which agrees with those described by Grimshaw.

Nesopimpla naranyae.—Mr. Timberlake called attention to a recent paper by Cushman (Proc. U. S. Nat. Mus. 61, Art. 21, p. 9, May, 1922) in which *Itoplectis immigrans* Timb. is synonymized with *Nesopimpla naranyae* Ashmead, which was described from Japan in 1906. The parasite may possibly be one of those introduced by Koebele in 1896, from Japan, and was first collected on Oahu by Dr. Perkins in 1901.

Syagrius fulvitarsis.—Mr. Fullaway reported the discovery of the fern weevil on Maui by Mr. C. S. Judd, Territorial Forester, on May 22, 1922. It was found on the Amaumau fern on the lower side of Nahiku ditch between Makapipi and Hanawi streams for a distance 300 feet along the ditch, and also in one spot at Kapaula near the Nahiku camp. Later, the infestation was found to extend about a mile between the Government road and the ditch, and to points above the ditch.

A discussion followed concerning the probable means of inter-island dispersion of the fern weevil, with the general agreement that it must have been carried by travelers to Hilo from Honolulu, and probably from Hilo to Maui in potted ferns, fern leis, etc.

JULY 6, 1922.

The 201st meeting of the Hawaiian Entomological Society was held at the experiment station of the Hawaiian Sugar Planters' Association. Owing to the absence of the president and vice-president, Mr. Swezey was chosen as chairman. Other members present were Messrs. Bissell, Bryan, Ehrhorn, Illingworth, Rosa, Timberlake, Wilder, and Willard. Mr. R. Ewart was a visitor.

The minutes of the previous meeting were read and approved.

PAPERS.

"Notes on Diptera."

BY E. H. BRYAN, JR.

Mr. Bryan presented also the following paper, "Undescribed Species of Australasian and Oriental Crane-Flies," by Charles P. Alexander.

NOTES AND EXHIBITIONS.

Xanthoencyrtus fullawayi.—Mr. Timberlake reported the discovery of this parasite of *Pseudococcus calceolariae* Maskell, on Oahu, two females having recently appeared in a collection of the host made in upper Manoa Valley in June, 1922, by Swezey and Fullaway. This species has formerly been known only on Hawaii.

Trypoxylon philippinensis.—Mr. Swezey reported that he had recently received the identification of this wasp from specimens sent to Mr. S. A. Rohwer of the United States National Museum. This *Trypoxylon* was first collected in Honolulu by Dr. H. L. Lyon, December 6, 1913. It is first recorded in Proc. Haw. Ent. Soc., III, p. 66, 1915, where Mr. Swezey reports having found its nest in folds of corrugated paper in a packing-box at Kaimuki, October, 1914. Specimens reared from this nest are reported on page 90 of the same publication. On page 458 is mention of a nest in glass pipette in chemical laboratory which was of this wasp. It was first reported in Hilo, Hawaii, by Swezey in September, 1918, recorded in Proc. Haw Ent. Soc., IV, No. 1, p. 75, 1919. On page 458 of the same volume Mr. Williams reported the finding specimens of the same *Trypoxylon* in the Experiment Station, H. S. P. A. collection, that were collected in the Philippines (Williams) and Hongkong (Terry).

Sisyrophyta gomphias.—Mr. Swezey exhibited a specimen of this moth reared from a caterpillar collected by Mr. Ehrhorn on a *Pisonia* tree on Mount Tantalus, April 30. He stated also that he had reared two moths from pupae found in soil at the base of a *Bobea* tree in the forest above the cane fields at Kukaiau, Hawaii, May 30, 1922. The food plant of this species had not previously been known. Apparently it is not confined to one tree.

Micromus vinaceus.—Mr. Swezey reported the recovery of this introduced Australian Hemerobiid at Paauilo, Hawaii, May 29, 1922; Niulii, Hawaii, June 6, 1922; Pololu Valley, Hawaii, June 8, 1922; and Opaeula, Oahu, April 10, 1921. Mr. Bryan has collected it recently on the Na Pali coast of Kauai.

Polycaon stoutii.—Mr. Swezey exhibited a specimen of this large Bostrychid beetle sent in by Mr. William Searby, May 22. It had issued from an oak table. Another beetle had issued from this table a short time previously and had been destroyed. This is a California beetle which attacks live oak, maul oak, eucalyptus, and almond. It has not been taken previously in Hawaii.

Chaetospila elegans.—Mr. Swezey reported finding this parasite in a small package of sorghum seed infested with *Calendra oryzae* at his house in Kaimuki. The package was what was left from planting and had been undisturbed for about six weeks. When examined October 28, it was found to be badly infested with the weevils, many adults being present. Sixteen adults of the parasite were secured; also a brachypterous Anthocorid bug not seen before.

Holcobius glabricollis.—Mr. Swezey exhibited this Anobiid and reported that fourteen beetles had issued from branches of dead koa tree brought in by Mr. Williams from the Manoa cliffs trail, Tantalus, August 29, 1920. In the Fauna Hawaiiensis, this beetle is recorded as scarce, a very few specimens having been taken on Haleakala, Maui, by Mr. Blackburn, and on Oahu by Dr. Perkins. In both instances on koa trees. Possibly it is attached to this tree.

Chrysomyia dux Esch. in Australia.—Mr. Bryan exhibited a male specimen of this Muscid fly, which was captured at Port Hacking near Sydney, November 4, 1914, by Musgrave; and which was loaned to the Bishop Museum for examination by the Australian Museum at Sydney.

Holocompsa fulva Burm.—Mr. Bryan exhibited another specimen of this little roach, which was captured in Hilo on dry moss by Mr. Matthias Newell. Mr. Illingworth stated that Mr. Newell had observed this roach as common about Hilo for a number of years.

Diocalandra taitensis Guer.—Mr. Bissell exhibited a specimen of this coconut weevil which was bred from the base of a dry coconut leaf from the grove of Mr. Charles H. Bellina at Kuliouou, Oahu. This leaf was collected the latter part of April, 1922, and the beetle emerged during June, being the first specimen collected on Oahu.

Culex sp.—Mr. Ehrhorn called attention to specimens of a mosquito which he collected at Kahala. He reported that this species does not make any sound when attacking at night, whereas *Culex quinquemaculata* does make a sound; and inquired if any member of the society had made the same observations.

Importation of birds.—Mr. Ehrhorn reported that the Board of Agriculture and Forestry had permitted the landing of six peewees for liberation on the Parker Ranch on Hawaii. He stated that these birds included in their diet certain soft snails in which the liver fluke passes part of its life cycle.

SEPTEMBER 7, 1922.

The 202d meeting of the Society was held in the usual place, with Vice-President Fullaway presiding. Other members present Messrs. Bissell, Crawford, Giffard, Rosa, Swezey, Timberlake, and Wilder. In the absence of the Secretary, Mr. Swezey was appointed secretary pro tem.

Minutes of the previous meeting were read and approved.

PAPERS.

* **"A Study of the Male Genitalia of the Hawaiian Cixiidae (Homoptera). Part I. Iolania Kirkaldy."**

BY WALTER M. GIFFARD.

NOTES AND EXHIBITIONS.

Exillis lepidus Jordan.—Mr. Fullaway reported that he had recently received a letter from Dr. K. Jordan giving this as the name for this immigrant Anthribid beetle. It had recently been described in The Entomologist, Vol. LV, p. 152, 1922. It is the insect mentioned as "A New Anthribid" on page 273, Vol. III of Proc. Haw. Ent. Soc., 1917; and as "*Lawsonia* sp.," Proc. Haw. Ent. Soc., V, pp. 38 and 75, 1922.

Pheidole megacephala.—Mr. Crawford reported the apparent scarcity of this ant during the past eight months in Manoa Valley. It has been replaced by the tiny yellow ant, *Plagiolepis*

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* Withdrawn for publication elsewhere. [Ed.]

exigua. But lately *Pheidole* has again become prevalent, and Mr. Crawford wondered if the present greater abundance of the house-fly was connected with the previous scarcity of the ant, as the latter is known to have some control of the house-fly maggots. Mr. Giffard also had noticed the prevalence of one or another of these ants at various times. Mr. Timberlake mentioned similar observances, and that at one time when he was living on Lunalilo Street, the guinea ant was the most prevalent. Mr. Fullaway reported the presence in great abundance of the yellow ant on mealy-bug material used in breeding lady-beetles, but that it caused no interference or injury, it merely living on sweets—the honeydew in connection with the mealy-bugs.

Synonymy of the Fuller's Rose Beetle.—Mr. Muir, at present in England, sent the following note on the synonymy of this beetle: In Bull. Soc. Ent., France, 1922, No. 8, p. 100, Hustache points out that our Fuller's rose beetle (*Aramigus fulleri* Horn) is the same as *Pantomorus godmani* (Crotch). Both Mr. Chapman and Dr. Marshall have examined Crotch's type and agree with Hustache. Our species must, therefore, be known in future as *Pantomorus godmani* (Crotch). The following synonymy and distribution is given by Hustache:

Pantomorus godmani (Crotch).

Asynonychus godmani Crotch, Proc. Zool. Soc. Lond., 1867, pp. 388, 389, pl. 23, fig. 9.
Aramigus fulleri Horn, Proc. Am. Phil. Soc., XV, p. 94, 1876.
Pantomorus olindae Perkins, Fauna Hawaiiensis, 1, p. 130, 1900.
Pantomorus fulleri Champion, Biol. Cent. Amer., IV, 3, p. 333, pl. 15, fig. 19, 1911.
Naupactus ovulum Iek. in litt.
? *Naupactus subvittatus* Fairm. and Germ., Col. Chili, II, p. 7, 1861.

Distribution: California, Mexico, Brazil, Chili, Azores, Portugal, Sicily, and Hawaiian Islands. It is considered of American origin, and was evidently introduced into the other regions named.

Mr. Fullaway called to attention that this synonymy is given by Champion in the Entomologist's Monthly Magazine, (3) VIII, p. 161, 1922.

Perkinsiella saccharicida and *P. insignis.*—Mr. Muir sent this note on these leafhoppers, from examination of material in the British Museum: In looking through unworked material at the British Museum, I found three specimens of *Perkinsiella* Kirk. Two of the specimens are *P. saccharicida* Kirk., one from Merebank, Natal (C. P. V. D. Merwe, I-2-18), and the other from Mauritius (J. E. M. Brown). The third specimen is *P. insignis* (Dist.) from Accra, Gold Coast (J. W. Scott Macfie, November, 1920). It is possible that *P. saccharicida* has been taken to Mauritius and Natal with sugar-cane. As no damage due to this insect has ever been reported from those regions, we must presume that parasites keep it in check.

Allograpta obliqua (Say).—Mr. Giffard reported that in July and August he captured a large series of both sexes of this Syrphid fly flying over the flowers of Sweet Alyssum at twenty-nine miles, Olaa, near Kilauea, Hawaii. This fly was recorded on February 5, 1920, by Timberlake (Proc. Haw. Ent. Soc., IV, 3, p. 456, 1921) as a new immigrant on Oahu. In October, 1920, Swezey also reported it from Kauai. It has not yet been reported from other islands than the above. Other Syrphids taken at the same time at or near Kilauea were: *Volucella obesa* Fab., *Eristalis tenax* L., *E. punctulatus* Macq., and *Xanthogramma grandicorne* Macq. *E. tenax* was very abundant everywhere in the neighborhood, but the others were only seen occasionally.

Scotorythra hyparcha Meyr.—Mr. Giffard remarked on the overabundance of this nocturnal moth at lights in the Kilauea region for the past four or five months. The verandahs and porches of the Volcano House and residences in the neighborhood have been overrun by this moth, possibly 90 per cent of the number seen nightly being males. At the hotel, the nightly flight was so annoying to guests that the servants were called upon to use the vacuum cleaner to sweep the ceilings and walls free of these pests. During twelve years and frequent visits he had never seen such an invasion of that or any other species of moth as occurred this summer.

Kelisia paludum.—Mr. Giffard reported the collecting of a large series of both sexes and nymphs of this Delphacid on a patch of *Juncus* sp. near the beach at Naapoopoo, Kealakekua,

S. Kona, Hawaii, August 1, 1922. The male genitalia agree perfectly with the Oahu form, but the coloration of this Kona form is much darker than those from Oahu, and is nearer in color to the Fijian form described by Muir. Mr. Swezey reported having collected this same Delphacid in August, 1919, on a small swamp sedge at Honaunau, which is only a few miles further south than where Mr. Giffard's specimens were collected.

Mediterranean fruit-fly.—Mr. Wilder exhibited some small green apples grown on a tree near the Territorial prison at Kalihi, which he suspected were infested with the Mediterranean fruit-fly. So far nothing but Drosophilids had been bred from them. Mr. Crawford mentioned that there appeared recently in a California horticultural journal the report that larvae and pupae of the Mediterranean fruit-fly had been found in a package containing avocadoes, but marked "groceries," that had been received at Los Angeles through the mail from Honolulu. This was followed by a general discussion on fruit-flies and the methods of quarantine against them prevalent in California.

Pink Boll-worm.—Mr. Fullaway stated that what was apparently this pest had been reported by Simmonds in Fiji.

Zoraptera sp.—Mr. Fullaway reported collecting this remarkable insect at Kokee, Kauai, where Mr. Swezey first discovered it last year. He secured what he took to be a winged form of it.

Pontia rapae.—Mr. Swezey reported seeing one or more cabbage butterflies flying on board the steamship "Wilhelmina," September 4 and 5, being the last two days of the voyage of the steamer from San Francisco to Honolulu. A butterfly was seen on four different occasions, but it could not be determined whether there were that many different individuals or if it was the same individual observed that many times. As there were crates of cabbages on the deck of the steamer, it is inferred that the butterflies seen had issued from chrysalids that were among the cabbage leaves. This demonstrates how some of the immigrant insects could have arrived, and it is very probable that the Syrphid fly, *Allograpta obliqua*, came in just this way, as its larvae feed on plant lice, and cabbages are often infested with them.

OCTOBER 5, 1922.

The 203d meeting of the Hawaiian Entomological Society was held at the experiment station of the Hawaiian Sugar Planters' Association. Vice-President D. T. Fullaway occupied the chair. Other members in attendance were Messrs. Bryan, Crawford, Ehrhorn, Illingworth, Rosa, Swezey, Timberlake, and Willard.

The minutes of the previous meeting were read and approved.

It was with deep regret that the members learned of the death, on August 27, 1922, of Dr. David Sharp, of London, England, who was an honorary member of this society.

Upon motion of Mr. Swezey, it was unanimously voted to appoint Mr. Giffard as a committee to draft proper resolutions on the death of Dr. Sharp.

PAPERS.

"Insects from the Summit of Mauna Kea."

BY E. H. BRYAN, JR.

"Review of Dr. Heinrich Karny's Der Insektenkorper und seine Terminologie."

BY E. H. BRYAN, JR.

NOTES AND EXHIBITIONS.

Diptera. — Dr. Illingworth gave further notes on Diptera, explaining corrections by Dr. Aldrich and Major Patton in the determinations of several species of Diptera mentioned in a paper, entitled "Notes on Diptera Occurring in the Hawaiian Islands," and which has been previously recorded in these Proceedings.

Diocalandra taitensis (Guern.)—Mr. Ehrhorn reported the occurrence of this coconut weevil at Lahaina on the island of Maui. This information came from Mr. George Compere, who found this insect in a coconut sent from Lahaina to San Francisco by mail. Mr. Compere found many holes like shot-holes in the husk, and cutting into the husk, found larvae, pupae, and adults, a sample of which he sent to Mr. Ehrhorn.

Rhinoceros beetle from Guatemala.—Mr. Swezey exhibited a monstrous horned beetle handed him by Mr. William Weinrich, who had collected it on a tree in Guatemala in August of this year.

Oligota sp.—Mr. Swezey exhibited a tiny Staphylinid beetle probably of this genus, which he had found feeding on the sugar-cane leaf-mite and its eggs in the cane fields of Oahu Sugar Company, and also at the Sugar Planters' Experiment Station grounds. The larvae were also found feeding on the mites. This is apparently the first record of this immigrant beetle in the Islands. A similar beetle occurs feeding on red spiders in California. It may turn out that this is the same species. The mite that they were feeding on here is *Tetranychus exsiccator,* the cane leaf-mite occurring in Java. Apparently this has never been recorded in Hawaii, though it has been known for a long time that mites were occasionally found on cane-leaves.

Ereunetis flavistriata.—Mr. Swezey mentioned that, while in San Francisco in August at the Plant Inspector's office, he inquired about the *Hyposmocoma* sp., which had been reported as occurring on coconuts from Honolulu, as per printed reports in the California Monthly Bulletin. A more recent identification had been made by Mr. Busck as *Ereunetis* sp. On being shown a specimen of the moth concerned, Mr. Swezey was able to identify the species as *Ereunetis flavistriata*, the sugar-cane bud-moth, whose larvae are found also on banana bunches, pine-apples, and various other plants, chiefly feeding on the dead tissues.

Heterospilus prosopidis.—Mr. Swezey reported rearing this Braconid quite plentifully from *Bruchus chinensis* in pigeon peas at Kaimuki, September 16, 17, 1922. The peas had become infested by the bruchids while still on the bushes. Males predominated in those reared, there being nine males and three females.

Pediculoides ventricosus.—Dr. Illingworth stated that kerosene was very helpful in relieving the irritation caused by the bites of this mite on the bodies of human beings.

Pseudaphycus sp.—Mr. Fullaway exhibited specimens of this Encyrtid, introduced from Mexico in April and May, 1922. It is a primary parasite of *Pseudococcus nipae* and has already become established here.

Anagyrus antoninae.—Mr. Timberlake exhibited a small series of this species from Japan, consisting of two specimens from Nagasaki collected by Mr. T. Ishii, and three specimens collected by Mr. C. P. Clausen, California State Insectary, No. 1261a.

Magachile.—Mr. Timberlake exhibited specimens of *Megachile fullawayi* and *M. timberlakei* collected at Kaimuki, September, 1922, at flowers of *Cosmos.*

Pleistodontes imperialis.—Mr. Timberlake reported that this fig-wasp, caprifier of *Ficus rubiginosa*, has become established from specimens liberated in January, 1922. A few specimens of the wasp were reared from a fig collected by Dr. H. L. Lyon on July 16 from a tree at the Federal Experiment Station grounds in Honolulu.

NOVEMBER 2, 1922.

The 204th meeting of the Hawaiian Entomological Society was held at the usual place, and was presided over by Vice-President D. T. Fullaway. Nine other members were present, as follows: Messrs. Bissell, Bryan, Ehrhorn, Giffard, Illingworth, Rosa, Swezey, Timberlake, and Willard.

The minutes of the 203d meeting were read and approved.

Mr. Giffard, chairman of the committee on finances, reported that the Hawaiian Sugar Planters' Association had voted to donate to the society the sum of $300 to meet the deficiency in the cost of printing the Proceedings for the year 1921.

Upon motion of Mr. Giffard, it was unanimously voted that the Secretary write the Hawaiian Sugar Planters' Association, conveying to them the thanks and appreciation of the society for their continued support.

In response to a request from Mr. Giffard (appointed at previous meeting), Mr. Crawford was appointed to assist him in drafting a resolution on the death of Dr. David Sharp. This committee submitted the following resolution:

"The Hawaiian Entomological Society feels with deep regret the loss it has sustained in the passing of a distinguished honorary member, Dr. David Sharp. But much greater, however, is the loss to Entomological Science which has been so much advanced by the devoted work of this great man. To the loved ones who survive Dr. Sharp, this Society extends its sincerest sympathy and Aloha."

Upon motion of Mr. Swezey, it was unanimously voted that this resolution be adopted and a copy sent to the bereaved widow.

Mr. Fullaway stated that Mr. Muir had informed him by letter that he would later on write up an obituary of Dr. Sharp.

PAPERS.

"Records of Introduced Beneficial Insects."

BY O. H. SWEZEY.

"A List, With Notes, of Insects Found at Waimea, Hawaii, in June, 1922."

BY J. F. ILLINGWORTH.

"House-Flies."

BY J. F. ILLINGWORTH.

NOTES AND EXHIBITIONS.

Pheidole megacephala Fabricius. — Mr. Giffard observed a swarm of queens and males of this ant in flight over his premises on Keeaumoku Street about 6:30 in the morning of one day in October. He stated that the swarm was about four feet wide and forty to fifty feet long. Mr. Ehrhorn stated that he had observed smaller swarms of these ants on several occasions, and that they usually swarmed after a rain-storm.

Anicetus annulatus.—Mr. Timberlake exhibited one specimen of this species reared by Mr. H. Compere from *Coccus hesperidum* on *Aralia*, taken in quarantine at San Francisco from the steamship "Taiyo Maru." Also two females from *Coccus hesperidum* collected at Sacramento, California, in 1912; a small series collected by Mr. Muir at Chin San, Macao, China, in December, 1906; and a few from China reared by Mr. Koebele under his number 1225. The species was described in 1919 from specimens collected on Oahu and Kauai.

Labels.—Mr. Bryan called attention to the method of making insect and locality labels by photographing sheets of paper upon which the desired information had been typewritten. He stated that he had found this method very satisfactory, where the number of labels desired was too small to pay for printing.

Micromus vinaceus.—Mr. Swezey exhibited cocoons of this introduced Hemerobiid, situated between ribs at base of papaia leaf, and reported that they were found there quite abundantly at the United States Experiment Station grounds.

Agrotis neurogramma Meyr.—Mr. Swezey exhibited a specimen of this Noctuid moth collected at light by Mr. Giffard at Kilauea, Hawaii, in August, 1922. This is only the second specimen of this moth that has been collected, so far as known. It was described in the Fauna Hawaiiensis on a single specimen collected at Kilauea by Dr. Perkins in August (the year not recorded in the Fauna, though it was probably 1895) and apparently none have been collected since until now.

Pantomorus godmani.—Mr. Swezey reported on the abundance of the eggs of this beetle in koa pods hanging on the trees on Sugar Loaf Mountain, October 29, 1922. Of fifty-five pods examined, forty-five had from one to seven batches of the eggs inside. There was a total of 103 batches. The pods had many perforations made by the larvae of the Tortricid which destroys most of the koa seeds. Apparently the beetles had oviposited inside the pods by inserting the ovipositor into the holes, as the egg-batches were always near these openings and in the place where a koa seed had been eaten.

Cylas formicarius.—Mr. Ehrhorn exhibited photographs of a basket of sweet potatoes, imported from Shanghai, China, and of cut-open individual potatoes, showing a very severe infestation by this sweet potato weevil. Sweet potatoes are imported as food from the Orient by the Chinese, but importations are less than they were six or eight years ago.

Urosigalphus bruchi Cwfd.—Mr. Bissell exhibited specimens of this Bruchid parasite, and reported that eleven individuals had been reared from Bruchidae in algaroba pods collected between September 21 and October 25, 1922. This parasite was introduced from Texas in July, 1921, and this is the first record of its recovery since its liberation at that time.

DECEMBER 7, 1922.

The 205th meeting of the Hawaiian Entomological Society was held at the experiment station of the Hawaiian Sugar Planters' Association, with Vice-President D. T. Fullaway presiding. Other members present were Messrs. Bissell, Bryan, Crawford, Ehrhorn, Giffard, Illingworth, Rosa, and Willard. Messrs. Syuti Issiki and Tadashi Okumi, Japanese entomologists from Formosa, were visitors.

The minutes of the previous meeting were read and accepted.

The treasurer's report, showing a cash balance on hand of $78.50, was accepted subject to the approval of Mr. Crawford, who was appointed auditor.

Officers were elected as follows for the year 1923:

President	F. Muir
Vice-President	O. H. Swezey
Secretary-Treasurer	H. F. Willard
Additional members of Executive Committee	D. L. Crawford W. M. Giffard

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* ANNUAL PRESIDENTIAL ADDRESS.

"Notes on the Mealy-Bugs of Economic Importance in Hawaii."

BY D. T. FULLAWAY.

PAPERS.

"Descriptions of Two New Mexican Species of Encyrtidae Introduced into Hawaii (Hymenoptera)."

BY P. H. TIMBERLAKE.

†"Review of the Hawaiian Genera Dyscritomyia and Prosthetochaeta, With Description of New Species (Diptera)."

BY E. H. BRYAN, JR.

* In the continued absence of the president, H. T. Osborn, throughout the year (being on parasite exploration in Mexico), the vice-president, D. T. Fullaway, occupied the chair for the year and also presented the Annual Address. [Ed.]

† Withdrawn from publication. [Ed.]

"New Records, Identifications, and Synonymy of Diptera in Hawaii."

BY E. H. BRYAN, JR.

"Insects Attracted to Carrion in Hawaii."

BY J. F. ILLINGWORTH.

* "A Study of the Male Genitalia of the Hawaiian Cixiidae (Homoptera). Part II. Oliarus Stal."

BY W. M. GIFFARD.

NOTES AND EXHIBITIONS.

A new fly.—Mr. Fullaway exhibited a small fly, not previously known to occur in the Islands. It was taken on a windowpane of the quarantine room at the Government Nursery, and is supposed to have come into the room with cow manure. The fly has a pair of caudal hooks, is black with a white transverse band on the abdomen, and has white halteres. It appears to be close to the species of *Milichia* (Agromyzidae) represented here.

Coccus elongatus.—Mr. Ehrhorn exhibited a limb of a Cosmos tree heavily infested with this scale, which had been killed by a white fungus. He called attention to the varieties of fungi attacking Coccidae and other Homoptera here and on the mainland and stated that this limb showed an exceptional attack of fungus on *C. elongatus.*

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* Withdrawn from publication. [Ed.]

PAPERS PRESENTED DURING 1922.

On the Classification of the Fulgoroidea (Homoptera).

BY F. MUIR.

(Presented at the meeting of April 6, 1922.)

INTRODUCTION.

Stål has been justly styled the Father of Hemipterology, and the fourth volume of his Hemiptera Africana (1866) is still the foundation of the classification of Homoptera. Although the number of genera has increased greatly since then, yet the characters he employed in his classification of the fulgorids hold good for most cases today. The trouble has been that workers have disregarded his characters and placed genera in families where they should not be, and so they have broken down the family characters.

A contemporary of Stål's, F. X. Fieber, also laid us under a deep debt by his work. Although he based his work mainly on European species, it holds good today. In many ways he was more modern than Stål, especially in his specific work. His recognition of the value of the male genitalia for specific distinction placed the Delphacidae of Europe in a condition that no other method could have done. If we follow his lead and extend his work it will be to the advantage of Homopterology.

Another worker to whom we owe a debt of gratitude for the elucidation of the relationship of the families of Auchenorhynchous Homoptera is H. J. Hansen. His work[1] has shown the morphological distinctions between the different groups and has placed these divisions on a safe foundation. That I do not agree with him, in regarding the fulgorids as consisting of a single family, in no way implies that I do not appreciate or recognize his good work. His paper should be in the hands of every student of Homoptera.

Melichar has compiled monographs of seven of the families

Proc. Haw. Ent. Soc., V, No. 2, September, 1923.

[1] Entomologisk Tidskrift XI (1890), pp. 19-76, Pls. I, II. Partly translated by Kirkaldy, The Entomologist, April, 1900, p. 116, et seq. I have not used all of Hansen's characters and must refer the reader to his work.

of Fulgoroidea, viz., Flatidae,[1] Acanaloniidae,[1] Ricaniidae,[2] Tropiduchidae,[3] Dictyopharidae,[4] Issidae,[5] and Lophopidae.[6] By so doing he has placed all Homopterists under obligation. Workers may wish at times that he had been more critical in his treatment of some groups and had used more fundamental characters for his subfamilies and tribes, but this in no way detracts from our obligations to him for his great industry.

Kirkaldy died before he had matured his views. Had he lived I feel sure he would have eventually produced a classification worthy of his labors.

Many workers have added to the number of genera and species during the last decade, but in most cases their contributions to the broader aspects of classification of the fulgorids have not been great, and in some cases their work has been inimical through their having placed many genera into wrong families.

The present paper is but an incomplete resumé of what is at present known on the subject of the families of the fulgorids. If it enables younger workers to recognize them, work upon their better characterization and to arrange more adequately the genera which compose them, then it will have served its purpose. I also hope that it will convince workers that the divisions are distinct enough to be recognized as families. This latter has a practical as well as a theoretical bearing, for workers are often more careful to place their genera into the right family than they are to place them into the right subfamily. It would also have the advantage of enabling the Recorder to segregate the genera into families in the "Zoological Record" instead of lumping them all together.

I have also used some of the information that I have accumulated on the male genitalia. The characters found in these organs are without doubt the most valuable aids to specific work. Not only do they show the specific differences, but they

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[1] Ann. des K. K. natur Hofmus Vienna (1902).

[2] t. c. XIII (1898).

[3] Verh. Natur. Verin. Brun (1914).

[4] Abh. K. K. zool. bot. Ges. Wien VII (1912).

[5] t. c. (1906).

[6] Ann. Mus. Nat. Hist. Hung. XIII (1915).

indicate the specific relationship better than any other characters. They are also of value for generic purposes and, so far as I have observed, are of use in the separation of families. By the study of these organs I believe that we shall eventually have a much better idea of the relationship of the families than we have at present.

The female genitalia may have equally good characters, but my knowledge of these at present is too limited to allow me to generalize upon them. I hope to be able to do so at a later date. The only generalization I can make at present is the distinction between complete and incomplete ovipositors.

Among the Fulgoroidea some of the chief characters used for generic purposes are the shape of the head and thorax and the number and arrangement of the carinae upon them. These characters, I believe, are liable to independent origin in different species, and so some of our genera may have a polyphyletic origin. Some of the families as they now stand are also likely to have a polyphyletic origin. The further study of the male genitalia is likely to show this, and will lay the foundation upon which a more natural grouping of both species and genera is likely to be erected.

The Order Hemiptera.

The Order Hemiptera or Rhynchota forms a large, homogeneous, and monophyletic group of insects characterized by the shape, position, development, and function of the mouth organs. Although there exists some difference of opinion as to the minor details of the homologies of the head and mouth parts, the fact has been established by embryological studies that they are built upon a normal, mandibular type, and that the alteration takes place during the development of the embryo. It has also been shown that the mouth parts arise in a similar manner in both the Homoptera and Heteroptera.

The mandibles form long, thin setae; the maxillae during their development divide into two parts, one forming a long, thin seta and the other amalgamates with the head capsule; the labium is long and narrow, with its lateral edges curved upward, and meet together on the middle dorsal line, thus forming a split tube in which the setae rest. In the embryo the labium arises as paired processes, which later on amalgamate; the evidence indicates that it represents the entire labium and not the palpi only. In many adult Heteroptera there are four divisions, which, by their position, are evidently homologous to the submentum, mentum, and ligula, the latter consisting of two segments which are probably the subgalea and the amalgamated paraglossa and lacinia. In *Belostoma* there is a pair of small, simple processes on the subgalea which are considered by some to represent the palpi. From the base of the mandibles a sulcus has sunk into the head running toward the antennae, and the head capsule has grown over the base of the mouth parts. This obscures the homologies. Although the order is very large and the head undergoes great changes in the various groups, yet the shape, arrangement, and function of the mouth organs remain more constant than in any other of the larger orders of insects.

By the character of the mouth organs the Hemiptera are distinctly separated from all other insects. The Thysanoptera come nearest to them, but they are so distinct that they can have no direct phylogenetic connection, only an indirect one, through a remote common ancestor from which both may have evolved along somewhat similar but distinct lines. The Psocidae possess a semi-free maxillary rod, which may be the starting point of the maxillary seta, but they can only be related through a very distant common ancestor. The similarity between the wings of Psocidae and Psyllidae is due to convergence or parallel development, and has no phylogenetic significance. If the Mallophaga have any relationship to the Anoplura, then the latter can have no relationship with Hemiptera. The sucking mouth of the Anoplura appears to be built on a very different plan from that of the Hemiptera, and the Siphunculata most certainly are very different. I consider that the Hemiptera are the most isolated of all the large orders and their origin is obscure.

That such highly specialized mouth organs, with their special line of development going back into the embryo, could have originated independently in two or more different groups, is highly improbable, so we must, therefore, consider the Hemiptera to form a monophyletic order, very ancient and very isolated. That they are ancient is demonstrated by the fact that in the Trias of Australia the divisions of Cicadidae, Cercopidae, Cicadellidae, and Fulgoroidea were well established; and one of the oldest fossil insects, *Prosbole* of the Permian, can be placed in the existing family Tropiduchidae.

During the course of insect evolution a number of attempts have been made to produce a piercing and sucking mouth. For perfection of mechanism none surpasses, nor even equals, that of the Hemiptera. This may account for the constancy of type through such a long period of time and in such a large group. With the exception of the Thysanoptera and Anoplura, where the mouth parts are much more generalized, the Hemiptera is the only order of ametabolus insects with a complete piercing and sucking mouth, and the only order in which such a type of mouth arises in the embryo.

There are a number of types of venation within the order, but I know of no one character, or group of characters, by which all can be separated from all other orders.

The Two Suborders.

The two suborders, the Heteroptera and the Homoptera, are divided mainly on the shape of the head and the position of the labium. In the Heteroptera there is a well-developed gula, which is very long in some groups; the head projects forward and the proboscis is bent at its base and lies under the head when at rest. In most of the Heteroptera there are four segments to the labium, but in some the mentum and submentum are fused, thus making only three segments. In the Homoptera the gula is absent or represented only by a small membrane; the head is deflexed and inflexed so that the base of the labium is in intimate connection with the prosternum; the submentum is membraneous, and in many forms the mentum is reduced. The labium, when at rest, projects backward between the legs, more or less in line with the head, and is not bent at a sharp angle to it.

Of the two suborders the head of the Heteroptera appears to me to represent the more generalized type. Whether the primitive Hemiptera had its mouth organs deflexed beneath its head or standing straight out, it is difficult to judge. The highly developed mouth organs of the Heteroptera of today are not the primitive type of the order. This was evidently a more generalized type from which both suborders evolved, the Heteroptera retaining certain of the more primitive characters.

The distinction between the two suborders generally given in text-books, of the "beak" arising from the front or back of the head, is incorrect. The "beak" arises from the same place in both suborders, but in one the gula is large and the head straight out, while in the other the gula is small or absent and the head turned under.

My objection to considering these two suborders as distinct orders is that, by so doing, we divide a monophyletic group and make the same distinction between them as we do between them and Coleoptera and other orders. The characters of the tegmina, upon which the two suborders are generally based, and upon which they are named, do not hold good, for some of the Homoptera are heteropterous and some of the Heteroptera are homopterous. If we use the venation to separate the two suborders, then we must be logical and divide the Homoptera into several orders.[1]

The Two Groups of the Homoptera.

The line of evolution of the head that has divided the Homoptera from the Heteroptera has continued within the Homoptera and divided them into two groups, the Auchenorhynchi and the Sternorhynchi. In the former, the labium, while being intimately related to the prosternum, is still in close relationship with the head capsule. In the latter, a portion of the head capsule, along with the clypeus, labium and tentorial structure, is more or less detached from the head capsule; the labium is in more intimate contact with the prosternum, and an invagination at the base of the labium penetrates the thorax and forms a setal chamber or crumena, wherein the setae lie coiled when at rest. In the Aphiidae and Psyllidae the relationship of these parts can be plainly seen, but in the Coccidae and some Aleurodidae the head is greatly reduced and the true relationship is lost or very obscure.

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[1] Dr. E. Bergroth informs me that the Heteropterous family Peloridiidae has no gular region, and that the labium is not bent at the base. This is a very interesting fact and I would like to examine one of these rare insects.

That the Homopterous head has departed further from the primitive type than the Heteropterous, or is more highly specialized, is the conclusion I have arrived at after a fairly extensive study; and that the Sternorhynchi have specialized along this line further than the Auchenorhynchi is a conclusion that appears to follow as a natural sequence.

The Sternorhynchi.

It is beyond the scope of this paper to enter into a discussion of the four families, or superfamilies, forming this group. That they are highly specialized in habit and structure, and that the latter is often specialization by reduction, soon becomes evident to the student. The one or two jointed tarsi, the reduction of venation, the simplification of the genitalia, and the reduction of head and thorax are all characters in question. To a certain extent these reductions of organs coincide with reduction of size and a sedentary habit. From my present knowledge I am convinced that these simplifications are specialization by reduction and not primitive conditions. It should be realized that ideas on this point are of importance, as they influence the whole conception of the evolution of the order.

The Psyllidae, as we know them today, are too highly specialized to form the ancestor of the other three families. This ancestor must either have been a much more generalized psyllid or a generalized aphid. The Coccidae are the extreme specialization of the group.

The four families, or superfamilies, that compose this group have been treated as suborders, and there is a tendency even to consider them as orders. When we examine the characters that are used to separate them it is found that they are very slender and not of sufficient weight to justify us in so doing.

MacGillivray[1] divides the order into three suborders, viz., Heteroptera, Homoptera, and Gularostria. He restricts the term Homoptera to the Auchenorhynchi, and the Sternorhynchi he terms Gularostria. The former he defines as follows:

"b. Antennae minute and inconspicuous, setiform or awl-shape; tarsi with three segments; prothorax large and conspicuous .... Homoptera."

[1] MacGillivray, 1921. The Coccidae, p. 4.

The only one of these characters that will stand is the three-jointed tarsi. The antennae are never minute or setiform, and in many species the first and second segments are large, very conspicuous, and in some cases of peculiar shape. The arista or flagellum is thin, in some cases distinctly jointed, in others indistinctly or not jointed. The prothorax is sometimes small and not at all conspicuous.

Orders and suborders founded upon such trivial characters cannot take the same status as orders such as Coleoptera, Diptera, or Hymenoptera. It is, therefore, to be regretted that they are given ordinal or subordinal rank.

Some writers have derived the Psyllidae from a Psocid-like ancestor, and so, naturally, we must consider all the other Homoptera and Heteroptera as derived from the Psyllidae. In my opinion this is a reverse of the true order.

Auchenorhynchi.

This group is divided into two superfamilies, the Cicadoidea and the Fulgoroidea, upon a number of important characters. The small family Tettigometridae is of great interest, as it has a number of characters belonging to both groups.

Three ocelli are found in one family of the Cicadoidea, the Cicadidae, and also in the majority of one family of the Fulgoroidea, the Cixiidae. The latter fact is often lost sight of by systematists and phylogenists when discussing the Homoptera.

In the Cicadoidea the antennae have only a few sense-organs situated on the flagellum; in the Fulgoroidea they are numerous and generally of a complex nature, and mostly situated upon the second segment.

In the Fulgoroidea the middle coxae are articulated considerably apart and have considerable range of movement; this is similar to the condition of the front legs of most insects and of all the legs in such primitive insects as *Machilis*. In the Cicadoidea the middle coxae are much nearer together and their movements very limited, which we must consider as a specialization. In the Cicadoidea the hind coxae are mobile; in the Cicadidae and Cercopidae they are small and do not reach the lateral margins of the thorax, whereas in the Membracidae and Cicadellidae they are wide and reach the lateral margins of the thorax. In the Fulgoroidea the hind coxae are immobile and their exterior part is coalesced with the metathorax.

In all the Cicadoidea, with the exception of the Cicadellidae, and in all the Sternorhynchi, one finds a wonderful arrangement of the alimentary tract whereby the posterior portion of the mid-gut is brought into intimate contact with part of the crop. This allows certain of the more fluid contents of the crop to pass through the walls of the crop and mid-gut by osmosis, the more solid portion passing through the intestine and undergoing digestion. The fact that the Membracidae possess a filter or colum and the Cicadellidae do not, although they are otherwise so closely related, is difficult to account for. The simplest way would be to consider that they have lost it since parting from the main stem. But we have no evidence at present that they have, so we must give this distinction weight when considering phylogeny. The Fulgoroidea and the Heteroptera possess no sign of a filter.

In the Cicadoidea and in the Delphacidae and in part of the Cixiidae the ovipositor is complete, the anterior and middle pair of processes (the latter amalgamated into one in whole or in part) are fastened together by a tongue and groove so that they work as a single organ. In the remainder of the Fulgoroidea and the Sternorhynchi the ovipositor is greatly reduced or incomplete, the anterior and middle pair are not co-ordinated, and often the three pairs are rudimentary or are entirely absent. The complete ovipositor is the primitive type among the Homoptera. The incomplete ovipositor often has secondary adaptations for cutting into plants for depositing their eggs.

The male genitalia are much more complex and difficult to understand. Our present knowledge stands as follows:

The genitalia of the sexes are homologous in so far that they arise from similar processes situated in the same position on the abdomen. Their relationship is as tabulated below, where g 1 is the anterior, g 2 the median, and g 3 the posterior processes or gonapophyses.

	Female	Male
g 1.	Guides of ovipositor	Genital plates, often amalgamated to pygofer
g 2.	True ovipositor	Aedeagus
g 3.	Ovipositor sheaths	Genital styles

The pygofer of the male is formed of the ninth tergite, together with the coxites (or endopodites) of the eighth sternite, except in the Cicadidae. In the Cercopidae, Membracidae, and Cicadellidae the anterior processes (g 1) are often free, broad plates (the genital plates of systematists). These are sometimes joined together for most of their length and amalgamated to the pygofer, but they are distinctly present in some form. In the genus *Tettigometra* g 1 are well developed and distinct as in the families above mentioned. In all other Fulgoroidea they are generally indistinguishable, having been completely incorporated into the pygofer, or they form comparatively small processes on the pygofer. In the Cicadidae the coxites and eighth sternite form a large plate, the hypandrium, below the pygofer, and the pygofer is membraneous along the median ventral surface. The genital styles (g 3) are well developed and articulate in all the families with the exception of the Cicadidae, where they are rudimentary and fixed on the sides of the pygofer. They are large and complex in some Fulgoroidea. The aedeagus in its simplest form appears to consist of a swollen basal portion, the periandrium, and a more distal portion, the penis, which is generally tubular. But this organ is the most polymorphic of all the genitalia, and in the fulgorids forms good distinctions between some of the families. In some male fulgorids the eighth abdominal sternite is distinct and free from the pygofer, in others it is closely attached to the pygofer and in still other species it is amalgamated to the pygofer and not recognizable as a separate sclerite.

The Families of the Fulgoroidea.

Although I fully recognize the value of Hansen's work, yet I am compelled to differ from his conclusion that the thousand and odd genera of the Fulgoroidea form but a single family. The external characters that separate these genera into groups are much more distinct than many ofttimes used in other orders for the erection of families, and in most cases these characters are supported by good distinctions in the male genitalia.

In discussing the venation of the Fulgoroidea, Metcalf[1] remarks: "While the wing venation of most of the insects that

[1] Ann. Ent. Soc. America, VI, 3 (1913), p. 343.

have been studied extensively so far can be reduced to a more or less uniform type for the family, in the Fulgoridae no such typical form can be given." The same might be said of any group if some fourteen families were thrown into one, and is, in itself, a sufficient reason to indicate that we are dealing with a number of families.

The classification of the Homoptera is founded upon other characters than wing venation, but a type of venation can be recognized as pertaining to most of the families. If we were to make a classification upon venation alone, without any knowledge of the rest of the insect, as we are forced to do with fossil Homoptera, it would be very different from our present one. The Sternorhynchi would have no connection with the Auchenorhynchi; the Psyllidae would be placed next the Psocidae if not with them; some of the Flatidae would be placed among the Cicadoidea because the claval veins do not form a Y; such forms as *Tessitus insignis* Walker would also be placed with them, perhaps to form a distinct family; the Tropiduchidae, as we know it now, would form several families not closely related; the Derbidae would be considered as several families and some placed with the Cixiidae; the Delphacidae would be treated as Cixiidae, and most of the other families would be changed considerably. Pterologists might maintain that such a classification would represent the natural order of things better than the present one made by entomologists. It demonstrates the great care necessary when basing conclusions upon a few fossil wings, for similar deceptions as the Psyllidae and Psocidae may have existed in the past, and we have no means of recognizing their existence.

But as fossils are the only direct evidence of the time sequence of evolution we must take every advantage of them, and for this reason a closer study of the venation in each family must be made. Except in three families of the Fulgoroidea, I have not sufficient knowledge to make a close comparative study of the venation, but there are several points which require discussing before such a task can be undertaken with any satisfaction.

The two chief points are the status of the costa and the anal veins. Unfortunately, Metcalf[1] only traced the tracheae of the

[1] Ann. Ent. Soc. Amer., VI, 3 (1913), pp. 341-352.

fore-wings down to the alar bridge in three cases. In two of them, *Amphiscepa bivittata* and *Thionia simplex,* the costal trachea is shown arising from the bridge; in the third case, *Scolops,* it arises from the subcosta. In all the genera that I have examined so far the trachea agrees with *Scolops* and arises from the subcosta. In these latter cases the question arises as to whether this trachea is homologous with the costa. Tillyard[1] has shown that the Dipteron, *Comptosia* sp., has a distinct costa arising from the alar trunk and a humeral arising from the subcosta. He has also shown good reasons for regarding the humeral and Sc′ as homologous. If Metcalf had not shown that in two cases this trachea arises from the alar trunk, I should not hesitate to consider the costa as absent and the humeral (or Sc′) as present in all the fulgorids. While I shall use the term costa for this vein, I leave its true homology an open question whose solution will influence our conception of the primitive type of venation of the group.

By calling this vein the costa we are faced by the fact that, in a large proportion of the fulgorids, the costa vein and costa margin do not coincide, but the vein lies considerably within the membrane, leaving a precostal cell or *costal area.* This is a condition recognized in no other order of insects. In certain genera, such as *Xiphidium, Conocephalus,* and some *Blattidae,* there is a trachea arising from the subcosta, which appears homologous to the vein under discussion, but Comstock refrains from calling it a costa.

The second point is the supposed movement of A1 to Cu. This has been discussed by Tillyard,[2] and I consider that his contention, that Cu does have more than two branches, is more logical than the contrary. Metcalf[3] remarks that the Cu and first anal "are united for a short distance from the body trachea and cubitus is usually two-branched," but he gives no evidence to show that a branch of A moves over to Cu, but accepts it from Comstock and Needham.

The cubital system of the Homoptera, and also of the Corrodentia, is identical with that found in neuropteroid insects such

1 Tillyard, 1919, Pro. Linn. Soc., New South Wales, p. 548, fig. 50.

2 t. c., p. 570.

3 Metcalf, Ann. Ent. Soc. Amer., VI (3), pp. 341-351 (1913).

as *Sisyra flavicornis*, *Polystaechotes punctatus*, *Chauliodes pecticornis*, *Hemerobius humuli*, and *Sialis infumata*, to name but a few. There is neither evidence of, nor necessity for, the crossing over of M to the Cu system. I have stated[1] that in the Delphacidae the suture was formed by the fourth cubital and first anal. This is incorrect, as it is formed solely by the posterior branch of the cubitus, as in all Homoptera, the first and second anal forming the Y veins of the clavus. In some fulgorids, i. e., some Fulgoridae, the third anal is present.

The absence of a distinct, free R1 in the adult tegmen is characteristic of most of the living Auchenorhynchous Homoptera, but it is found in the Mesozoic Cicadid *Mesogereon* Tillyard. The R1 trachea has been found in the early nymphal stages of Cicadidae and Membracidae, and it is probable that it will be found in the early nymphal stages of some of the Cixiidae.

The amalgamation of the bases of M and Cu appears to be characteristic of all recent Cercopidae and so cannot represent a primitive type, even in those forms in which Sc is normal. The venation of the Cicadellidae and Membracidae is too specialized to represent a primitive condition, and so is that of the Sternorhynchi.

I consider that the most normal and primitive type of venation of recent Homoptera is to be found among the Cixiidae. Here we find Sc, R, M, and Cu all arising from the basal cell and M with four normal branches. The genus *Andes* Stål has a venation of this type. The tegmina are steeply tectiform, the ovipositor is complete, and there is a median ocellus. But it has a typical fulgorid head.

In most Fulgoroidea the Y vein is present, but in some it is not; in the Cicadoidea it is never distinctly present. When not present in fulgorids they can be distinguished from Cicadoidea by the two claval veins passing out of the end of the clavus and not entering the hind margin before the apex of clavus, as they do in most Cicadoidea.

The interesting Mesozoic fossil genus *Ipswicia* Tillyard has a Y vein, but otherwise it might be placed among some of the existing Cercopidae. I consider that it is closely related to the

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[1] Muir, Pro. Haw. Ent. Soc., II (1913), p. 269, Pl. 6, figs. 1, 2.

Tettigometridae, and it cannot be considered as more primitive than some existing fulgorids. Handlirsch placed *Prosbole hirsuta* Koken in the Palaeohemiptera. Tillyard considered that it is not on the direct line of descent of the Heteroptera, but on a side line, nearly allied to *Dunstania* Tillyard, which he considered as in the direct line. In *Prosbole* the Sc and R are amalgamated to slightly before the node, a condition common in the Homoptera, but, so far as I know, not found in the Heteroptera. There is no sign of a median furrow, and the anal furrow is behind the cubitus in the normal homopterous position, whereas in the Heteroptera it is normally before the cubitus. As we have only the venation to judge by, I should place *Prosbole* among the Homoptera in the Tropiduchidae. The heteropterous condition found in *Prosbole* occurs in several genera of the Tropiduchidae, especially among the Tambiniini.

Fossil Homoptera are not very numerous, but the few we know, especially the Mesozoic, are of great interest. They demonstrate beyond any doubt the great antiquity of the order. In the Mesozoic Homoptera of Australia we find the two great superfamilies of the Auchenorhynchi completely established. The Cercopidae, Ciccadellidae, and Cicadidae are completely differentiated, and the Fulgoroidea are also represented. This indicates that we must go back far beyond that period for the origin of the order, or believe that evolution proceeded at a very much greater rate before than after the Trias.

The following table is not considered final, as further study in some of the families may change my views; and in the process of time, and with accumulated knowledge, some of them are sure to be divided. Neither is the table completely satisfactory, as the division between one or two of the families may not prove to be complete. Such a case is that between those Cixiidae without a median ocellus and with lateral carinae on the clypeus, and the Dictyopharidae. But the student soon becomes familiar with the facies of these insects and recognizes them at once.

TABLES OF THE FAMILIES OF THE FULGOROIDEA.

1. (2) Antennal flagellum segmented. No mobile spur on hind tibiae. Lateral ocelli not outside the lateral carinae of frons; lorae plainly visible in full view forming a continuous curve with clypeus .... *Tettigometridae*

2. (1) Antennal flagellum not segmented. Lateral ocelli outside the lateral carinae of frons, generally beneath the eyes; lorae not visible in full view or forming an angle with clypeus.

3. (4) Hind tibiae with a mobile spur at apex. Tegmina without a costal area .... *Delphacidae*

4. (3) Hind tibiae without a mobile spur.

5. (6) Three ocelli present........................ *Cixiidae* in part

6. (5) Two or no ocelli.

7. (8) Posterior angle of mesonotum restricted off by a groove or fine line. Costal area present or absent........... *Tropiduchidae*

8. (7) Posterior angle of mesonotum not restricted off by a groove or fine line.

9. (10) Anal area of wings reticulate. Lateral carinae of frons continued on to clypeus. No costal area, or only a very narrow one without cross-veins. Clavus open, the Cu 2 (Claval suture) and claval veins continuing to apical or hind margin and often branched .... *Fulgoridae*

10. (9) Anal area of wings not reticulate or, if so, then lateral carnae of frons not continued on to the clypeus.

11. (12) Face transverse or nearly as long as wide, lateral edges angular. Anal area of wings sometimes reticulate, in which case no lateral carinae on clypeus. With or without costal area. Clavus often roundly closed; claval veins reaching apex of clavus. the suture (Cu 2) and claval veins continuing to the apical or hind margin, and sometimes branched...... *Eurybrachidae*

12. (11) Lateral edges of face not angular or, if so, then face distinctly longer than wide.

13. (26) Tegmina without a costal area, or only a small one without transverse veins.

14. (19) Claval vein not entering apex of a closed clavus, but joining the commissure or suture before apex, or the clavus is open.

15. (16) Apical segment of labium short or very short (*Venata* an exception) .... *Derbidae*

16. (15) Apical segment of labium much longer than wide, sometimes very long.

17. (18) Sides of clypeus acute or with carinae. Apart from the lateral edges, frons generally with two or three carinae. *Dictyopharidae*

18. (17) Apart from the lateral edges, the frons with not more than one (median) carina. Sides of clypeus rounded, without carinae. *Cixiidae* in part

19. (14) Claval vein entering apex of clavus.

20\. (21) Base of abdomen with one or more appendages bearing three hemispheroidal depressions .... *Achilixiidae*

21\. (20) Base of abdomen without lateral appendages.

22\. (23) Tegmina when at rest nearly horizontal or but slightly tectiform. Hind margin beyond clavus generally expanded, and when at rest overlap............................*Achilidae*

23\. (22) Tegmina when at rest steeply tectiform; hind margin beyond clavus not expanded, and do not overlap when at rest.

24\. (25) Tegmen large, tectiform. Hind edge of pronotum slightly roundly emarginate; mesonotum large, long. No spines on hind tibiae. *Acanaloniidae*

25\. (24) Tegmina generally smaller. Head as wide, or nearly as wide, as the thorax. Posterior edge of pronotum straight, rarely slightly concave; mesonotum short. Hind tibiae with spines. Tegmina often coriaceous or subcoriaceous...................*Issidae*

26\. (13) Tegmina with a distinct costal area with transverse veins.

27\. (30) Clavus not granulate.

28\. (29) Head wider than pronotum, seldom a little narrower, sides of clypeus often without carinae. Pronotum without carinae or with an obscure median carina; mesonotum very large; front legs simple...................................*Ricaniidae*

29\. (28) Head narrower than pronotum. Sides of clypeus with carinae. Pronotum with carinae. Front legs expanded.....*Lophopidae.*

30\. (27) Clavus granulate. Apex of clavus sometimes blunt and closed, sometimes open. Claval veins separate or joined together at apex .... *Flatidae*

I. Tettigometridae.

Tettigometridae Germar (1821), Magaz, Entom.; type **Tettigometra** Latreille (1804), Hist. Nat. Ins., 12, p. 312.

From the viewpoint of morphology and the relationship of the various fulgorids this family is the most interesting and important, although it is one of the smallest. Its synthetic characters make it hard to say whether it should be placed in the Cicadoidea or the Fulgoroidea, or whether it should be placed in a group by itself. For systematic purposes I have kept it in the Fulgoroidea because the majority of its characters indicate that to be its correct position.

Its cicadoidean characters are as follows: The arista of the antenna is segmented; the shape of the head is typically cicadoidean, the frons reaches from eye to eye without any lateral carinae dividing off a small area around the eyes (a continuation of the genae) on which both the lateral ocelli and the antennae are situated; the lateral ocelli are present on the frons; the antennae are situated nearer together than the eyes and not distinctly beneath them; the lorae are plainly visible in full view and form a curve with the clypeal region; the middle coxae allow of very little movement in a transverse direction and, in some species, the male genitalia have the genital plates (g 1) well developed and free.

The fulgoroidean characters are as follows: The second segment of the antenna is large and bears large and comparatively complex sense-organs; tegulae are present and well developed; the posterior coxae are fixed; the spiracles are on the lateral areas of the abdomen; the empodium is free for the greater portion of its length, and its apex is not deeply emarginate; the tegmina have a Y claval vein.

The tegmina are small, convex, coriaceous and have a resemblance to the tegmen of Cercopidae. The subcosta and radius are joined to beyond the middle, the claval veins form a Y, and there are irregular cross-veins in the apical area.

In *Hilda breviceps* (fig. 2) the genital plates (g 1) are amalgamated to the pygofer, but are recognizable; the periandrium is semibulbous, large, and in contact with the base of the anal segment, which is very short; the penis is short and tubular, the apodeme of the penis is large. In *Tettigometra* sp. (fig. 1) the genital plates are large and free; the periandrium forms a large ring which touches the base of the anal segment; the penis is long, angular in middle, and has a large membraneous "sac" at apex; the anal segment is large.

With the exception of the female external genitalia, which are abortive, and the venation, all the characters of this family are primitive. Whether it represents the direct line of evolution from the precicadoidean type to the fulgoroidean, or whether it only represents an offshoot from the lower stem, it is difficult to say. But its cicadellian characters and the fact that the Cicadellidae have no intestinal filter, support the idea that the primitive cicadellian type was the starting point of the splitting of the group into two, and that the Cicadellidae are the more direct descendants from the primitive type, but do not now contain all the primitive characters, and are highly specialized in certain directions.

It is interesting to note that the two types of male genitalia found in the Cixiidae are represented in the Tettigometridae by generalized forms, and so may go back beyond the Cixiidae.

II. Cixiidae.

Cixoides Spinola (1839), Soc. Ent. Fra., VIII, p. 202; type **Cixius** Latreille (1804), Hist. Nat. Crus. Ins., XII, p. 310.

This family contains from ninety to one hundred genera. Except in a limited manner in faunistic works, it has not been revised since 1866, when Stål tabulated thirteen genera. From a point of view of morphology and phylogeny it is of great interest, as from it, according to my views, the other families of the Fulgoroidea, with the exception of Tettigometridae, have most likely evolved.

The chief characteristic of most of the Cixiidae, but not all, is the presence of a third ocellus. Apart from this, the absence of certain characters separates them from other families. The tegmina have no costal area, or only a small one at the base, and then it has no transverse veins. The claval vein runs into the hind margin of the clavus or, in a few cases, into the suture near the apex; the clavus is closed. There is no mobile spur on the hind tibia. The apical segment of labium is distinctly longer than wide, generally of considerable length. When no median ocellus is present the clypeus is often destitute of lateral carinae. The frons never has more than three carinae, viz., the median and lateral.

At present I divide the family into two subfamilies, one of which can be divided into two tribes.

1. (4) Clavus not granulate................................*Cixiinae*
2. (3) No subantennal process and antennae not sunk into pits...*Cixiini*
3. (2) Subantennal process present or antennae sunk into pits. *Bothriocerini*
4. (1) Clavus granulate ....*Meenoplinae*

In many of the genera of the Cixiini the ovipositor is complete; in these cases the abdomen is generally considerably flattened laterally, the tegmina steeply or fairly tectiform, the pygofer longer than wide, with a depression down the middle in which the ovipositor rests, and the hind tibia seldom has spines. In the other genera the ovipositor is incomplete and often considerably reduced, the abdomen is not flattened laterally but often flattened horizontally; the pygofer is flat, broader than long and covered with wax glands; the tegmina very slightly tectiform, and the hind tibiae often have spines.

In the normal type of aedeagus of the Cixiinae the periandrium is tubular, membraneous or chitinous, and often bears spines or other processes; the penis is often complex and large (figs. 7 and 8), or it is greatly reduced and difficult to separate as a distinct part of the aedeagus (fig. 25). There is a tubular apodeme from the base of the penis, passing through the periandrium and connected with the apodemes of the genital styles. The ejaculatory duct passes through this apodeme and opens on the penis. In the genus *Mnemosyne* Stål the periandrium and apodeme of penis are amalgamated into one and form a strong, chitinous mass, with, in some species, a small membrane at apex to represent the penis (fig. 3). The genus *Kinnara* (fig. 4) is the exception to this type.

In the Meenoplinae (fig. 6) and in the genus *Kinnara* (fig. 4) the periandrium is large, more or less funnel-shape, and the penis is drawn into it, the base of the penis often projecting through and beyond the base of the periandrium. The penis is sometimes also funnel-shape.

The Delphacidae, Derbidae, Tropiduchidae, and Achilixiidae have the aedeagus as in the Cixiinae, or modifications of it, while the other nine families have the aedeagus on the Meenoplinae type.

The fact that the Tettigometridae contain representatives of the two types of genitalia in generalized conditions indicates that the two subfamilies may have arisen among the precixiids, and should be regarded as distinct families.

Unfortunately for systematists we cannot use the absence or presence of spines on the hind tibiae, or the complete or incomplete ovipositor, to divide the Cixiini, as there are too many intermediate stages.

The family will be greatly enlarged by a slight amount of collecting in the tropics.

III. Delphacidae.

Delphacoides Spinola, Ann. Soc. Ent. Fr., VIII, p. 329 (1839); type **Delphax** Fabricius (1798), Ent. Syst. Suppl., p. 500.

This family has been neglected by most collectors, especially in the tropics, but at present it contains over ninety genera. It is recognizable from all other fulgorids by the presence of a movable spur on the apex of the hind tibia. It has been divided into two subfamilies and three tribes.

1. (2) Posterior tibial spur subulate, with cross-section either circular or angular, apex acuminate, without teeth on sides.....*Asiracinae*
2. (1) Posterior tibial spur cultrate, subcultrate or thin, with or without teeth on the hind margin.........................*Delphacinae*
3. (4) The tibial spur cultrate, solid, both surfaces convex, distinct teeth along the hind margin..................................*Alohini*
4. (3) Tibial spur thin, or if solid, then with the inner surface concave.
5. (6) Spur cultrate, solid but with inner surface concave, no teeth on hind margin ....*Tropidocephalini*
6. (5) Spur thin or foliaceous, sometimes tectiform, with or without teeth along the hind margin...........................*Delphacini*

The female is furnished with a well-developed, complete ovipositor, and the eggs are laid in the tissues of the food plant. The base of the ovipositor is situated considerably anterior of the middle of the abdomen, and the pygofer is long and narrow, with a groove along the middle for the reception of the ovipositor. This makes the more posterior abdominal sternites more or less V-shape. The male has a well-developed pygofer, one pair of genital styles and an aedeagus consisting of a single tube which in some forms (Delphacinae) is simple (fig. 9) and in others (Asiracinae) complex, with a distinct penis and large periandrium (fig. 10). In most species there is no evidence of the anterior gonapophyses (g 1), but in others these are quite evident. The venation is of a simple form, very uniform, and similar to that of many Cixiidae. In many species brachypterous forms are known.

IV. Tropiduchidae.

Tropiduchidae Stal (1866), Hem. Afr., IV, p. 130; type **Tropiduchus** Stal (1854), Afr. Vet. Ak. Forh., p. 248.

This family was monographed by Melichar in 1914, at which date he recognized sixty-nine genera. Since then several new ones have been added.

With few exceptions the claval vein reaches to the apex of the clavus, which is acutely closed. In a few cases it joins the suture near its apex, and in a few it joins the claval margin near the apex. In many genera there is a distinct costal area with cross-veins; in others the costal area is entirely missing. The genus *Alcestis* is of interest on account of its peculiar venation. What Melichar considers the subcosta I consider to be the costa, so that in some species there is a very small costal area; Sc and R are joined for some distance at their bases, and Sc gives out branched veins which reach the costal margin.

Melichar uses the presence of a suture that divides the posterior angle of the mesothorax from the disc as the distinguishing character of the family. If the forms it brings together can be retained in one family, then it is of great service and relieves systematists of considerable trouble.

We know little about the genitalia at present. The ovipositor appears always to be of the incomplete form. The aedeagus shows considerable variation in the different groups. In *Ommatissus loufouensis* Muir (fig. 11) the periandrium forms a small ring with two long, slender processes; the penis is long, slender, tubular and slightly sinuate; the genital styles are separate. In *Tabinia formosa* (fig. 27) the genital styles are connected together at their base, the periandrium is like a semitube on the dorsal aspect of the penis (an epiandrium), and the penis is tubular. In *Vanua poyeri* Muir (fig. 20) the genital styles are amalgamated together and form a single, asymmetrical organ; the periandrium is a long, slender, chitinous tube, and the penis is complex and large. There is a large apodeme connecting the base of the periandrium with the apodemes of the genital style. It is possible that what I term the periandrium in this genus is, in reality, the penis, and that the periandrium is absent. It recalls the type found in Derbidae, but it is curved in an opposite direction and there is an apodeme. It is necessary to do considerable more work in this family before we can follow the connection of the groups of genera. It is highly probable that it will be divided into two or more families.

The following is a slight modification of Melichar's table. I treat the groups as representing two subfamilies and seven tribes.

1. (4) Costal area present with cross-veins.............*Tropiduchinae*
2. (3) Antennae very short, globose....................*Tropiduchini*
3. (2) Antennae longer, double as long as the width of the eye. *Catulliini*
4. (1) Costal area absent or very small and without cross-veins. *Tambiniinae*
5. (6) Costal area absent or very short; subcosta with many branches, some furcate, reaching costal margin.............*Alcestisini*
6. (5) Subcosta without furcate branches reaching to costal margin.
7. (12) Tegmina not leathery.
8. (9) Cross-veins absent ....*Tripetimorphini*
9. (8) Cross-veins present.
10. (11) Cross-veins distad of the middle of tegmin..........*Tambiniini*
11. (10) Cross-veins basad of middle of tegmen, apical area longer than corium ....*Paricanini*
12. (7) Tegmina leathery, reaching but little beyond apex of abdomen. *Hiraciini*

I consider that the Upper Permian fossil *Prosbole* can be placed within this family. It is very similar in venation to the living insect *Neommatissus* Muir, and to *Trobolophya* Mel. I cannot consider it in any way ancestral to the Heteroptera. It has no median furrow, and the posterior furrow (suture) is behind the cubitus and not between it and the media.

V. DERBIDAE.

Derboides Spinola, Ann. Soc. Ent. Fra., VIII (1839), p. 205; type **Derbe** Fabricius (1803), Syst. Rhyng., p. 80.

This family contains about ninety genera. Every collection of any extent received from the tropics contains new species and genera, and when the tropics of Africa and America are explored for these insects the number of species will soon be doubled.

The eggs are unknown, but they must be laid in rotten wood, or under bark, for that is where the nymphs are found. In some genera the ovipositor is absent or represented by mere rudiments; in others the gonapophyses are fairly well developed, but never coadapted or developed for cutting, so that the eggs are most likely all laid on the surface.

The family is recognized by the very short joint of the labium, except in a very few cases, together with the absence of other characters. The male genitalia are also quite distinctive. There is great diversity of form within the family; the head in several genera is more bizarre than in any other family of fulgorids, and the tegmina and wings run from quite normal cixiid-like forms to long, narrow tegmina and wings reduced to mere stumps and used as stridulating organs. There is no costal area except in a few forms, and then it is at the base and has no cross-veins. Many species have the claval area granulate.

I divide the family into two subfamilies and six tribes.

1. (4) Tegmina long and narrow. Wings very small or not more than half the length of the tegmina, narrow, the costal and posterior margins subparallel or converging to a pointed apex, the cubital and claval areas greatly reduced, with the claval veins missing or reduced, the posterior basal area large, corrugated and used as a stridulating organ. . . . . *Zoraidinae*

2. (3) Eyes in front not reaching to base of clypeus, subcostal cell long, sometimes very narrow. . . . . *Zoraidini*

3. (2) Eyes in front, reaching to the base of the clypeus; subcostal cell very short or absent; female genital styles abortive. . *Sikaianini*

4. (1) Tegmina not long and narrow; wings nearly always more than half the length of tegmina, the anal area large and the cubital and anal veins normally developed. . . . . *Derbinae*

5. (10) Claval cell closed or only narrowly open for a short distance, the extended claval vein not joining cubitus and not forming part of a contiguous series of submarginal cross-veins; cubitus generally proceeding straight to hind margin.

6. (7) Cubitus apparently with four or more veins, reaching to the hind margin . . . . *Derbini*

7. (6) Cubitus with less than four veins reaching to the hind margin.

8. (9) Cubitus simple or furcate, reaching the hind margin direct, not running into the basal median sector. . . . . *Cenchreini*

9. (8) Cubitus connected with the basal median sector, forming an angular or quadrate cell; sometimes with a cross-vein near the base of the basal median sector, forming a triangular cell; tegmina broad . . . . *Rhotanini*

10. (5) Clavus open, the cubital veins bent and touching and, together with the extended claval, forming part of the submarginal row of apical cross-veins. . . . . *Otiocerini*

The Cenchreini are the most generalized tribe, and such genera as *Vekunta* approach the Cixiidae very closely. In the genus *Symidia* we have an approach toward the Zoraidinae and in the genus *Phaciocephalus* toward the *Otiocerini*.

So far no fossil forms have been recognized. The present distribution is over the entire tropics in forest country, with a few straying into temperate regions. The Zoraidinae and the Rhotanini are only known from the Eastern Hemisphere, while the two genera *Derbe* and *Mysidia* are confined to the Western Hemisphere.

The aedeagus is quite typical of the family and can be recognized from all other fulgorids. The pygofer and anal segment are normal; the latter is often large and produced into one or two spines at the apex; the former is generally produced into the middle of the ventral margin. The genital styles vary in size and shape, their apodemes are fairly large and free from all connection (except muscular) with the aedeagus, and thus differ from most other fulgorids. The aedeagus is long, subtubular, slender, and curved upward, with a complex structure at the apex; the base is in contact with the base of the anal segment and has a large surface connection with the body membrane. The curved basal section I am inclined to regard as the periandrium (fig. 28, pa.) and the apical section as the penis. Under this interpretation there is no apodeme of the penis, but only a small, strong apodeme on the base of the periandrium for the attachment of muscles. This type of genitalia, with slight modification among the Zoraidini, is found all through the family. The genus *Venata* Distant has this type of genitalia and must be included in the family.

VI. Achilixiidae.

Type **Achilixius** Muir. Philippine Jour. Sci., 22 (5) (1923), p. 483.

This family is easily recognized by the two processes on each side of the base of the abdomen, the anterior larger than the posterior. The larger bears two hemispheroidal depressions and the smaller bears one. There is a somewhat similar appendage at the base of the abdomen in the genera *Benna* and *Bennaria* of the Cixiidae. The posterior margins of the tegmina beyond the clavus are not produced and do not overlap when at rest, the tegmina being considerably tectiform. The male genitalia are very different from those of other families, but the nature of the aedeagus places it in the Cixiine group, although otherwise it might be placed near the Achilidae in the Meenopline group.

The male pygofer is normal, with a transverse bar across the middle to which the base of the aedeagus is attached (fig. 5, t. b.); the aedeagus shows no sign of division into periandrium and penis, but is cultrate, the ventral margin being double and curved, the dorsal margin straight and single. The ovipositor is incomplete.

The family is erected for a single genus containing four species. I hesitated before erecting the family, but as the genus cannot be placed in any recognized family without doing violence to the family characters it is best placed by itself.[1]

VII. Dictyopharidae.

Dictiophoroides Spinola (1839), Ann. Soc. Ent. Fra., VIII, pp. 202, 283; type **Dictyophara** Germar, Silb. Revue Ent., I, p. 175 (1833).

This family was monographed by Melichar in 1912, at which time he recognized seventy-six genera. He divided it into five groups, which I shall consider as two subfamilies with five tribes.

1. (6) A distinct suture dividing clavus from corium; tegulae and ocelli present .... *Dictyopharinae*
2. (3) No cross-veins in the clavus .... *Dictyopharini*
3. (2) Clavus with a cross-vein between first claval and suture.
4. (5) Tegmina with narrow costal area .... *Dichopterini*
5. (4) Tegmina without costal area .... *Cladyphini*
6. (1) No suture dividing the clavus from corium .... *Orgerinae*
7. (8) Tegmina entirely or almost covering the abdomen .... *Lyncliini*
8. (7) Tegmina very short, not nearly covering the abdomen ... *Orgeriini*

Melichar called his Group IV Bursini, although he placed the genus *Bursinia* Costa in his Group V, Orgerini. The above classification is likely to be modified with further study.

The tegmen has no costal area, or a very narrow one without transverse veins; the claval vein does not reach the apex of clavus. Besides the lateral margins the frons generally has two

[1] The writer has received from Dr. F. X. Williams specimens from Ecuador, representing two species of an undescribed genus which goes into this family. There is only one rounded process bearing three depressions.

or three median longitudinal carina. The family is closely connected with the Fulgoridae. At present it contains a number of aberrant forms which make it difficult to define. It is also difficult to separate from those Cixiidae without a median ocellus.

The periandrium is large, often funnel-shape, membraneous or semi-membraneous, and often has the apical margin divided into lobes (fig. 29). The penis is a short tube or ring with two long processes (fig. 18, 29 a) very similar to the type found in the Fulgoridae (fig. 16).

VIII. Fulgoridae.

Fulgorellae Latreille (1807). Ger. Crust. Ins., VII, p. 163; type **Fulgora** Linn., Syst. Nat. (1767), I, p. 703.

Kirkaldy[1] considered that the type of the genus *Fulgora* is *europaea* Linn. and, therefore, should be used in place of *Dictyophara* Germ. For *Fulgora* auctt. (type *Laternaria* Linn.) he used *Laternaria* Linn., which agrees with Stål. The question appears to stand upon whether Sulzer's fixation of the type in 1776 be valid. Van Duzee does not follow Kirkaldy, and as I am not in a position to follow the history of this name I shall place myself with the majority and not make the alteration.

The family stands with about one hundred or more generic names. It needs a modern revision, as nothing has been done to it since Stål's time except in local faunistic works where a number of genera have been described. It contains the largest and most showy species of the superfamily, and so has attracted more attention from collectors than any of the others. In some species the head is greatly elongated and enlarged, and has been stated by some to be luminous. The controversy on this subject is old, but an explanation may be found in Kershaw's discovery that the prolongation of the head is filled by a diverticulum from the crop. The head at times may be filled with bacteria from the stomach and be in the same condition as the silkworm larva when attacked by luminous bacteria.

The reticulation of the anal area of the hind-wings appears to be a constant character of this family, and cross-veins are numerous on the tegmina, which are comparatively narrow. The costal area is absent or forms but a narrow area without trans-

[1] Haw. Sug. Planters' Exp. Sta. Ent. Bull., XII, p. 11, 1913.

verse veins. The Sc is free to the basal cell in some genera, the bases of R and M are generally joined together for a short distance. The clavus is open, the suture (Cu2) continues as an independent vein and is often branched and enters the apical margin. The first and second claval veins form a Y and often continues as a free, branched vein to the apical margin; the third claval (An3) is sometimes present as a free vein in the apical portion of the clavus.

The lateral margins of the frons are generally straight, or if they are angular then the frons is longer than wide.

The female ovipositor is incomplete and is often abortive. The eggs are laid on the surface, in some cases in double rows, and covered with wax. The aedeagus is very similar to that found in the Dictyopharidae. The periandrium is large, funnel-shape, and membraneous, the penis short and produced into two slender processes (fig. 16). The penis is sometimes greatly reduced.

IX. Eurybrachidae.

Eurybrachydida Stal (1866), Hem. Afr., IV, p. 129; type **Eurybrachys** Guer. (1834) Voy. Belang. Ind. Orient, p. 475.

This small family of some two dozen genera is a fairly difficult one to place. In certain characters it approaches the Fulgoridae, in others the Achilidae.

The female has an incomplete ovipositor. The male genitalia are complex and at present not fully understood. In *Gelastopsis insignis* Kirk. (fig. 24) the male pygofer is simple and the genital styles large but normal. The aedeagus is unique, so far as my knowledge extends; it forms a short tube flattened horizontally, on each side arises a large, strong spine-like process, dorsally and ventrally there is a semi-membraneous flap. In *Olonia picca* Kirk. (fig. 12) there is a large plate attached to the ventral margin of the pygofer produced posteriorly into two curved spines; this may represent a development of g 1. The genital styles are large and complex; the aedeagus is peculiar and consists of a membraneous area in which the genital opening is situated, with three pairs of sclerites, the basal pair being the largest, triangular and projecting as two large, broad spines; internally there is a membraneous tube to which the apodeme is attached (fig. 12 b). The genitalia require much further study before we can place the family with any certainty.

The frons is broad, generally broader than long, and the lateral margins angular. In some genera there is a costal area with cross-veins, in others it is absent. The claval vein runs to the apex of the clavus, which is generally roundly closed; the vein proceeds beyond the clavus and ends in the hind margin and is sometimes branched. The third claval vein (An3) is sometimes present as a free vein in the apical half of the clavus; Cu2 or claval suture continues beyond the clavus, branches and terminates in the apical margin. The anal area of the hind-wing is reticulate in a few species.

X. Achilidae.

Achilida Stal (1866), Hem. Afr., IV, p. 130; type **Achilus** Kirby (1818), Trans. Linn. Soc., Lond., XII, 475.

This is a very homogeneous family of about sixty genera. The chief characteristics of the family are the claval vein reaching the apex of clavus, which is closed; the hind margin produced beyond the apex of clavus; the tegmina, when at rest, very slightly tectiform or nearly horizontal, and the areas beyond the clavus overlapping. In only a few genera is there any sign of a costal area, and then there are no cross-veins.

The female has an incomplete ovipositor. In the male the pygofer is considerably flattened horizontally, there is generally a pair of processes on the medio-ventral margin; the genital styles are large and complex; the aedeagus in *Eurynomeus granulatus* (fig. 23) consists of a periandrium which is produced into three pair of processes, and a penis which is a small tube with two long, flat processes (fig. 23 a). In a large Philippine Achilid at present undetermined (fig. 26) the periandrium and penis are fairly normal, but the apodeme forms a long, semi-chitinous tube, the nature of which I do not understand. A great deal more work must be done upon the family before its correct position in the superfamily can be demonstrated. Certain points place it near the Eurybrachidae and Fulgoridae, but there are others which separate it very decidedly.

XI. Acanaloniidae.

Acanonides Amyot and Serville (1843), Hemip., pp. LVIII, 520; type **Acanalonia** Spinola, Ann. Soc. Ent. Fra., VIII (1839), p. 447.

This small family, which contains only five or six genera, was monographed by Melichar in 1902. It comes very close to some of the Issidae by which it appears to be separated by the absence of spines on the hind tibiae.

The head is about as wide as the thorax and the clypeus lacks lateral carinae. The posterior margin of the pronotum is straight or but slightly concave, the pronotal carinae absent or obscure; the mesonotum is large. The tegmina are steeply tectiform. This family differs from the Flatidae by having no costal area, or if there be one then it is obscure and has no transverse veins.

The ovipositor is incomplete. The aedeagus is complex, the penis and periandrium appear to be amalgamated into a complex tube with appendages (figs. 30, 31), a condition found in some Issidae.

XII. Issidae.

Issites Spinola (1839), Ann. Soc. Ent. Fr., VIII, p. 204; type **Issus** Fabricius (1803), Syst. Rhyng., p. 99.

This is a difficult family to characterize. With the exception of a few cases the head is as wide as the thorax, or wider. The hind margin of the pronotum is straight or but slightly concave or convex; the mesonotum is short, not more than twice the length of the pronotum, with a transverse carina across it parallel to the hind margin of the pronotum, which divides it into two parts; the anterior portion is covered by the pronotum and is generally of a different sculpturing to the posterior portion. This character is also found in some Dictyopharidae and Lophopidae.

The tegmen is without a costal area, or if one be present then it is small, obscure, and without cross-veins. The tegmen is often very short or very narrow and the venation obscured. The legs are generally thick and the hind basitarsus short and thick.

The ovipositor is incomplete. The male genitalia are considerably diverse, even in the few species that I have examined.

In *Hemisphaerius moluccanus* Kirk. (fig. 33) the periandrium is large and semi-membraneous; the penis forms a fairly large tube produced into two processes with a median process in the middle. This aedeagus is like the type found in the Ricaniidae. In *Danepteryx* sp. (fig. 21) the periandrium forms a small tube which fits tightly around the large, semi-cylindrical, curved penis. In *Gelastissus histrionicus* Kirk. (fig. 35) the periandrium is a short, wide tube with the dorsal edge curved over at its apex; the penis is smaller and has two large, curved spines at the apex. In *Aphelonema vespertina* Kirk. (fig. 34) the periandrium is large and membraneous, while the penis is thin and curved. These few examples show the diversity to be found in the family, and indicate the necessity for a great amount of work before we shall be able to understand the relationship of the genera included within it.

Melichar monographed the family in 1906, when he recognized ninety-five genera; since then several new ones have been added. The following division of the family is based on Melichar's work.

1. (2) Tegmina short and only reaching slightly beyond the base of the abdomen, or exceedingly narrow, parchment-like, thick or opaque, seldom hyaline; wings absent or rudimentary....... *Caliscelinae*
2. (1) Tegmina entirely covering the abdomen or the greater portion of it.
3. (4) Clavus and corium not separated by a suture. Tegmina generally convex, thick, and the venation obscure......... *Hemisphaerinae*
4. (3) Clavus separated from corium by a suture................ *Issinae*
5. (6) Wings absent or rudimentary, not folded.......... *Hysteropterini*
6. (5) Wings present, entire.
7. (8) Wings with margins entire.............................. *Issini*
8. (7) Wings with a deep cleft in the apical margin, the anal area very large .... *Thioniini*

The genus *Augila* Stål would come into the Issini. It might be as well to make a separate tribe, or even subfamily of it. *Danepteryx* Uhler and *Gamergomorphus* Melichar would go into the Caliscelinae near to *Alleloplasis* Waterh. It might be more natural to consider the Caliscelinae as a tribe of the Issinae.

XIII. Lophopidae.

Lophopida Stal (1866), Hem. Afr., IV, p. 130; type **Lophops** Spinola (1839), Ann. Soc. Ent. Fra., VIII, p. 387.

This small and homogeneous family was monographed by Melichar in 1915, and twenty-seven genera were then recognized. The head is narrower than the thorax and there is a tendency for the middle portion of the frons to be produced; the front legs are flattened and expanded in most cases; the hind margin of pronotum is truncate; the clypeus is keeled laterally; the hind basitarsus is short and generally swollen; there is a distinct costal area with cross-veins.

I do not follow Melichar's tribes, as the characters he uses do not hold true, and he has placed some of his genera into the wrong tribes, according to his own characters.

The ovipositor is incomplete. The aedeagus has a large periandrium (figs. 15, 17, 19), often considerably complex; the penis forms a short tube with a pair of processes, often of a complex nature. It is a specialization upon the *Dictyophara* type near to the Ricaniidae.

XIV. Ricaniidae.

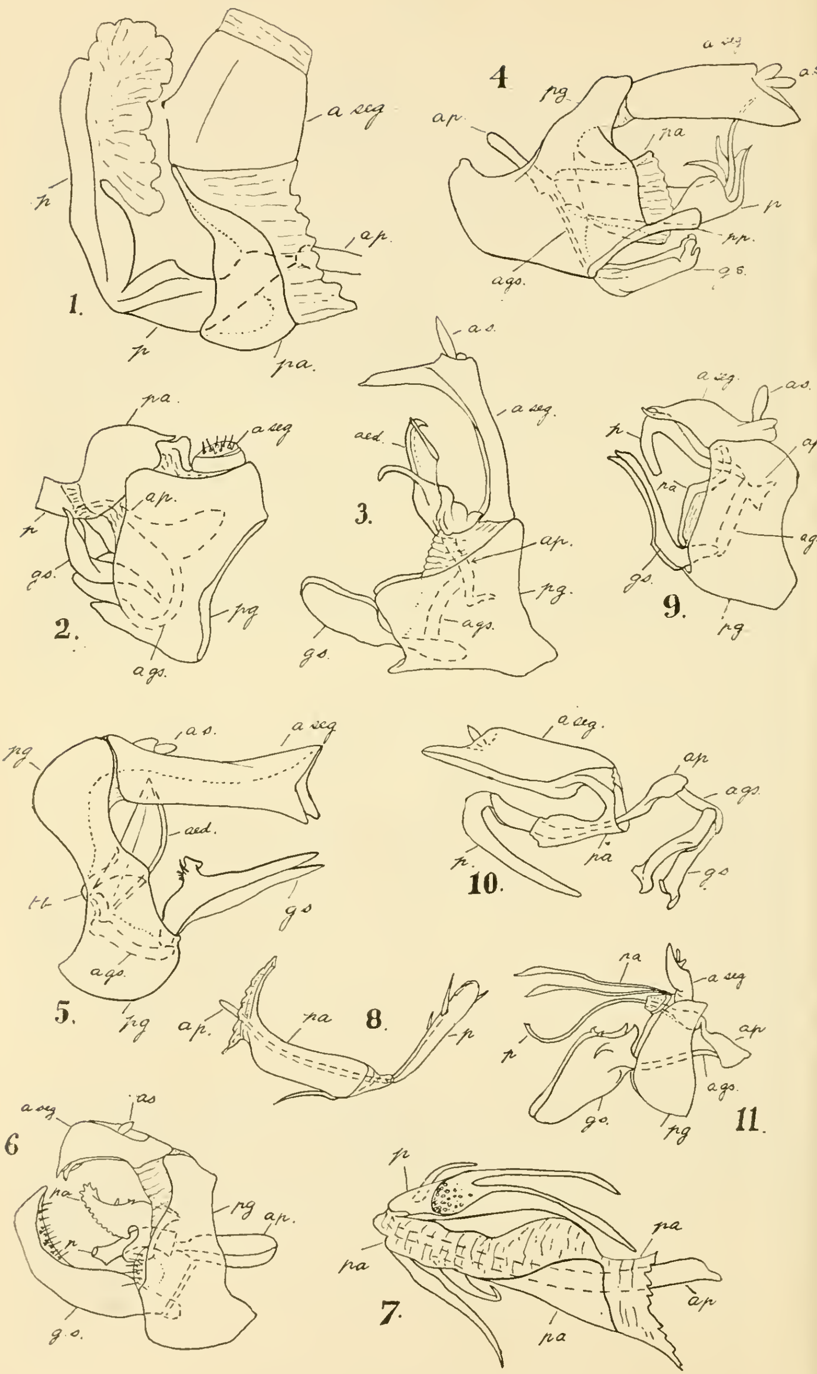
Ricaniida Stal, Hem. Afr., IV, p. 219 (1866); type **Ricania** Germ. Mag. Ent., III, p. 221 (1818).

Head wide, in a few cases narrower than the pronotum. Pronotum slightly roundly emarginate on hind margin; mesonotum very large. Tegmina large, steeply tectiform when at rest, a costal area with transverse veins always present, which is quite distinct even when narrow; clavus not granulate, apex closed, pointed, claval vein reaching apex, the costal veins joining before the middle or shortly beyond the middle. Posterior tibiae with spines; hind basitarsi short.

In 1898, when Melichar monographed the family, he recognized thirty-one genera. A few more have been added since. He divided the family into two groups.

1. (2) Frons wider than long, or as wide as long; the sides of clypeus without carinae .... *Ricaniini*
2. (1) Frons distinctly longer than wide or as wide as long; in the latter case the clypeus has lateral carinae.................. *Nogodini*

I believe a better classification can be made on the venation,



Male Genitalia of Fulgoroidea.

but my present knowledge of the family is too limited to allow me to carry out such a scheme.

In the few genera which I have examined the male genitalia are all built on the same type. The periandrium (figs. 13, 22) forms a large and comparatively simple tube; the penis forms a more or less short tube or ring from which arises a pair of processes more or less narrow and with ample apices; within the penis there is a small process which is sometimes trilobed, and on which the gonopore appears to be situated, and which may represent the true penis.

Most species of this family are comparatively large and often gaily colored, and so they have been given more attention by collectors than the more obscure fulgorids. The family is a very homogeneous one.

XV. Flatidae.

Flatoides Spinola, Ann. Soc. Ent. Fr., VIII, pp. 204, 387 (1839); type **Flata** Fabricius, Ent. Syst. Suppl., 511, 517 (1798).

Head generally narrower than thorax. Pronotum with the posterior margin generally roundly emarginate, in some case subangularly and in a few cases straight; mesonotum fairly

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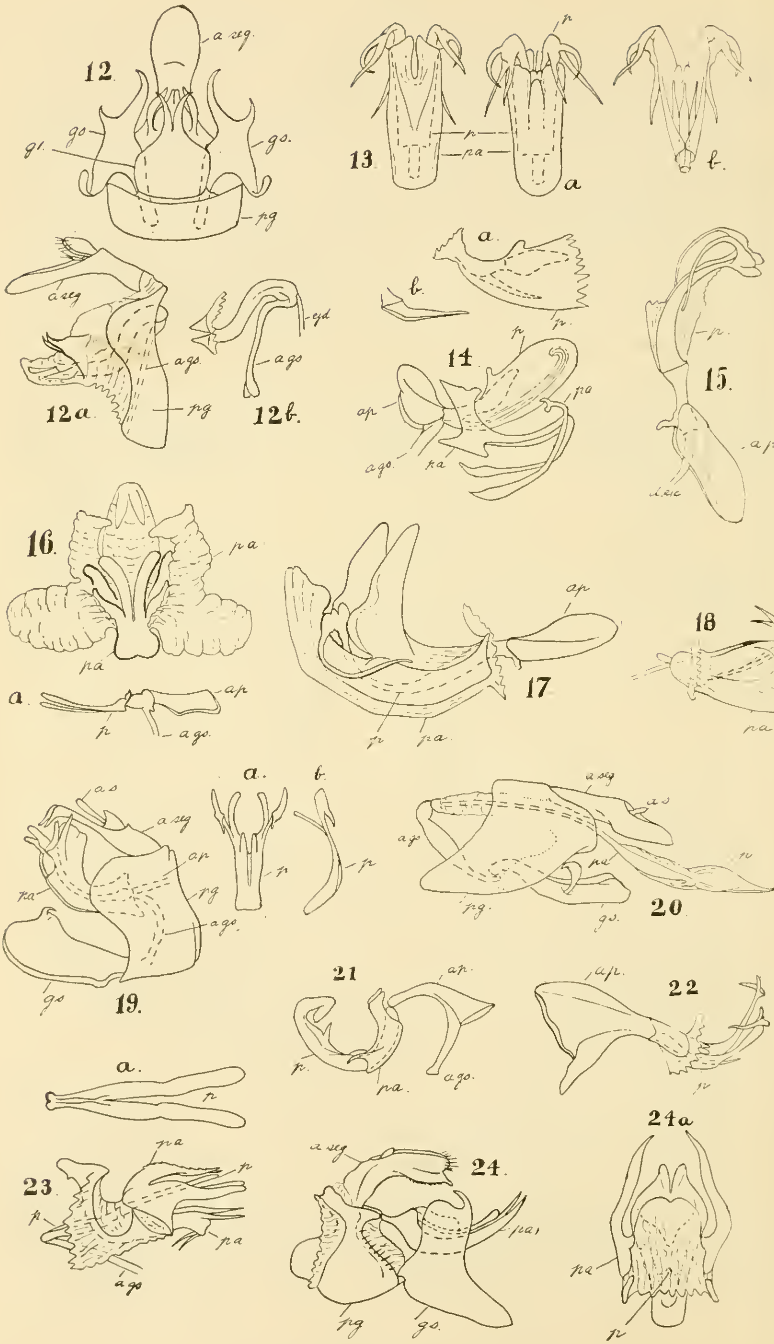
PLATE IV.

1. *Tettigometra* sp. (Tettigometridae). Right side view of aedeagus and anal segment.
2. *Hilda breviceps* (Tettigometridae). Right side view of male genitalia.
3. *Mnemosyne efferatus* (Cixiidae). Right side view of male genitalia.
4. *Kinnara maculata* (Cixiidae). Left side view of male genitalia.
5. *Achilixius singularis* (Achilixiidae). Left side view of male genitalia.
6. *Phaeonura froggatti* (Cixiidae). Right side view of male genitalia.
7. *Borysthenes fasciolatus* (Cixiidae). Right side view of aedeagus.
8. *Myndus caligineus* (Cixiidae). Left side view of aedeagus.
9. *Stenocranus seminigrifrons* (Delphacidae). Right side view of male genitalia.
10. *Ugyops kellersi* (Delphacidae). Right side view of anal segment, aedeagus and genital styles.
11. *Ommatissus loufouensis* (Tropiduchidae). Right side view of male genitalia.

Lettering on figures: *aed*, aedeagus; *ags*, apodeme of genital styles; *ap*, apodeme of penis; *as*, anal style; *a seg*, anal segment; *ejd*, ejaculatory duct; *g*[1], anterior gonopophyses; *p*, penis; *pa*, periandrium; *pg*, pygofer.



Male Genitalia of Fulgoroidea.

large. Tegmina large, in a few genera narrow, with a distinct costal area with cross-veins; the clavus granulate, often open and the claval veins separate, or the claval veins joined near apex.

The family was monographed in 1902 by Melichar, who included the Acanaloniidae. By excluding these we have a homogeneous group of about eighty to ninety genera which can be divided into two subfamilies of strikingly different facies.

1. (2) Body considerably compressed laterally, the tegmina steeply tectiform, the apical portion of the costal margins and the apical margins meeting together, or approaching very closely when at rest .... *Flatinae*

2. (1) Body not compressed laterally or only slightly so; tegmina horizontal or only slightly tectiform, the apical portion of costal margins not meeting together beneath the abdomen. .*Flatoidinae*

In the few genera in which I have examined the male genitalia they appear to be very uniform. The periandrium forms a short tube or ring and from each side a long, narrow appendage arises which generally has the apex enlarged or complex. The penis forms a large tube, often funnel-shape and flattened

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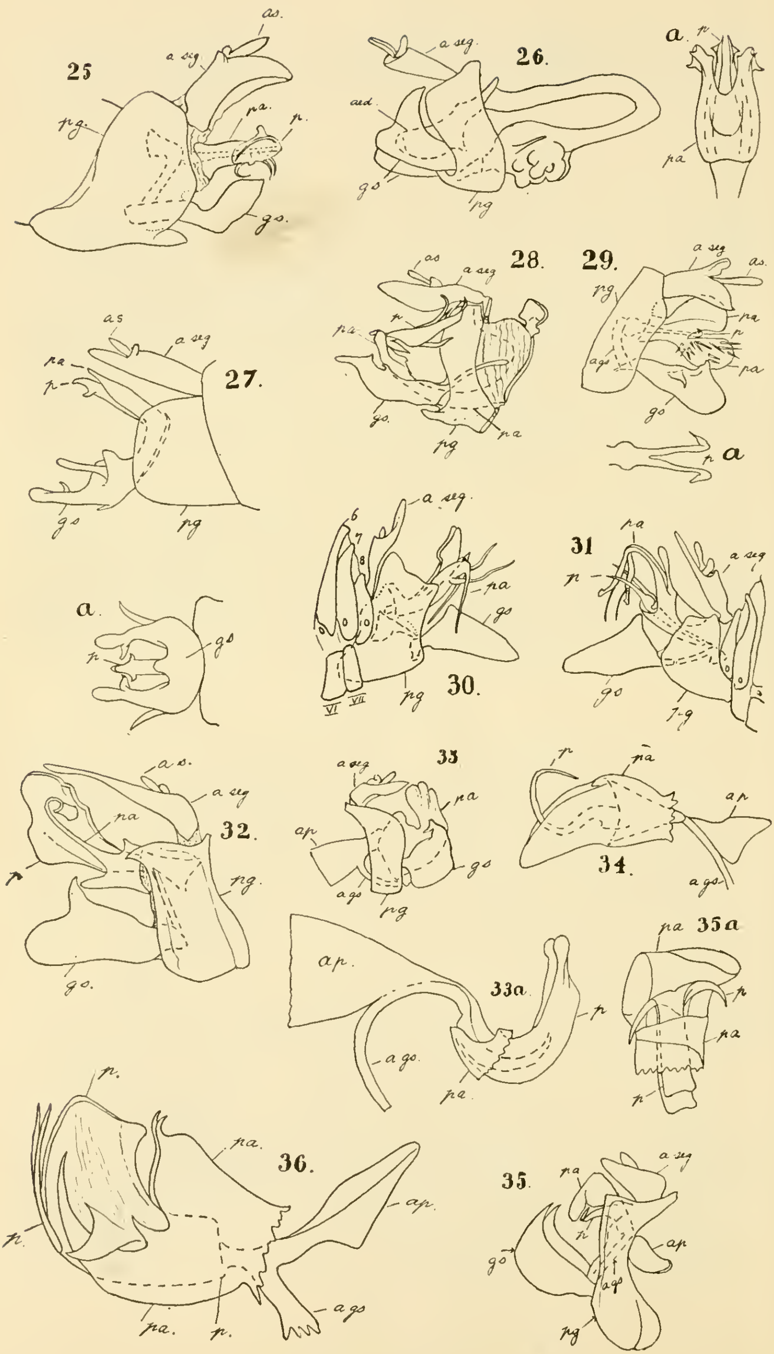
PLATE V.

12. *Olonia picea* (Eurybrachidae). Ventral view male genitalia; *a*, right side view male genitalia with styles and g¹ cut away; *b*, aedeagus.
13. *Pochazа fuscata* (Ricaniidae). Ventral view of aedeagus; *a*, dorsal view of aedeagus; *b*, dorsal view of penis.
14. *Neomelicharia guttulata* (Flatidae). Left side view of aedeagus; *a*. basal portion of penis; *b*, process bearing gonopore.
15. *Pyrella aberrans* (Lophopidae). Right side view of penis.
16. *Aphana* sp. (Fulgoridae). Ventral view of periandrium; *a*. lateral view of penis.
17. *Pyrella aberrans* (Lophopidae). Right side view of aedeagus.
18. *Dictyophara nerides* (Dictyopharidae). Left side view of aedeagus.
19. *Virgilia nigropicta* (Lophopidae). Right side view of male genitalia; *a*, dorsal view; *b*, lateral view of penis.
20. *Vanua poyeri* (Tropiduchidae). Left side view of male genitalia.
21. *Danepteryx* sp. (Issidae). Right side view of aedeagus.
22. *Mindura obscurus* (Ricaniidae). Left side view of penis.
23. *Eurynomeus granulatus* (Achilidae). Left side view of aedeagus; *a*, dorsal view of penis.
24. *Gelastopsis insignis* (Eurybrachidae). Left side view of genitalia; *a*, dorsal view of aedeagus.



Male Genitalia of Fulgoroidea.

laterally, the apical margin being cleft for some distance; on each side of the penis there is often a depression into which the process of the periandrium fits when at rest. Within the penis at its base there is a process on which the gonopore appears to be situated (figs. 14, 32). In the Flatoidinae the periandrium is large, forming a short, thick funnel, and the processes are shorter; the penis is also shorter and wider (fig. 36). The ovipositor is always incomplete.

Phylogeny.

The classification of animals started early in the history of mankind, most likely with the dawn of speech. It was started for convenience and was empirical, and has continued down the ages on the same lines. With the dawn of biological science it was continued scientifically, and a natural order of arrangement became evident. Since Darwin made evolution a living force with biologists the natural arrangement, or natural order, has become predominant, in some cases even to the detriment of utility.

The living species of animals represent the terminal twigs of the tree of insect life of which we examine but the surface.

PLATE VI.

25. *Myndus musivus* (Cixiidae). Left side view of male genitalia.
26. gen. sp. ? (Achilidae). Right side view of male genitalia; *a*, dorsal view of aedeagus.
27. *Tambinia formosa* (Tropiduchidae). Right side view of male genitalia; *a*, ventral view of same.
28. *Phaciocephalus* sp. (Derbidae). Right side view of male genitalia.
29. *Dictyophara europeae* (Dictyopharidae). Left side view of male genitalia; *a*, dorsal view of penis.
30. *Acanalonia* sp. (Acanaloniidae). Left side view of male genitalia.
31. *Amphiscepa bivittata* (Acanaloniidae). Right side view of male genitalia.
32. *Siphanta acuta* (Flatidae). Right side view of male genitalia.
33. *Hemisphaerius moluccanus* (Issidae). Left side view male genitalia; *a*, left side view of penis.
34. *Aphelonema vespertina* (Issidae). Right side view of aedeagus.
35. *Gelastissus histrionicus* (Issidae). Right side view of male genitalia; *a*, ventral view of aedeagus.
36. *Urantes* sp. (Flatidae). Right side view of aedeagus.

What lies below that surface—the branches, limbs, and trunk—we can only speculate about, using for our guides the arrangements of the terminal twigs and such little evidence as is given us by paleontology. Such speculation we term phylogeny, and its existence entirely depends upon our belief in evolution; the form it takes is moulded by the nature of that belief.

To the phylogenist the cut and dried dichotomous characters, which are such a boon to systematists, are often of little value. On the other hand, those organs showing a graduate series, which are anathema to the systematist, are generally the phylogenist's best friends. It is upon these lines that the following speculations proceed.

The Hemiptera existed before the Heteroptera or Homoptera, and were characterized by the nature and function of the mouth parts. They were more generalized that either of these suborders are today, but they approached nearer to the former. The head would have possessed a gula region, and the beak may have been carried out straight. When not in use this position would be inconvenient, and it was possibly to avoid this that the main dichotomy came about. In the Heteroptera the gula region persisted and even became greatly developed and the beak bent at its base so that it packed away under the head and thorax. In the Homoptera the gula was reduced and the head became inflexed so that the beak when at rest lay straight out beneath the thorax without a bend at its base, thus the base of the labium was brought into intimate relationship with the prosternum. This turning under of the head led to a flattening and widening of the head capsule, especially the more apical portions such as the genae and lorae. This line of evolution of the head was carried to its greatest extent in the Cicadoidea, more especially in the specialized Cicadellidae. The Tettigometridae of the Fulgoroidea retains this type of head, but it is modified slightly along the fulgorid lines. It is possible that in the Fulgoroidea the vertex lengthened and curved downward. In this case the lateral carinae of the frons would represent the ridge above the antennae in the Cicadoidea.

After the departure of the Fulgoroidea from the main stem, or perhaps even before that, there arose the peculiar arrangement of the intestine whereby the "filter" or "colum" was

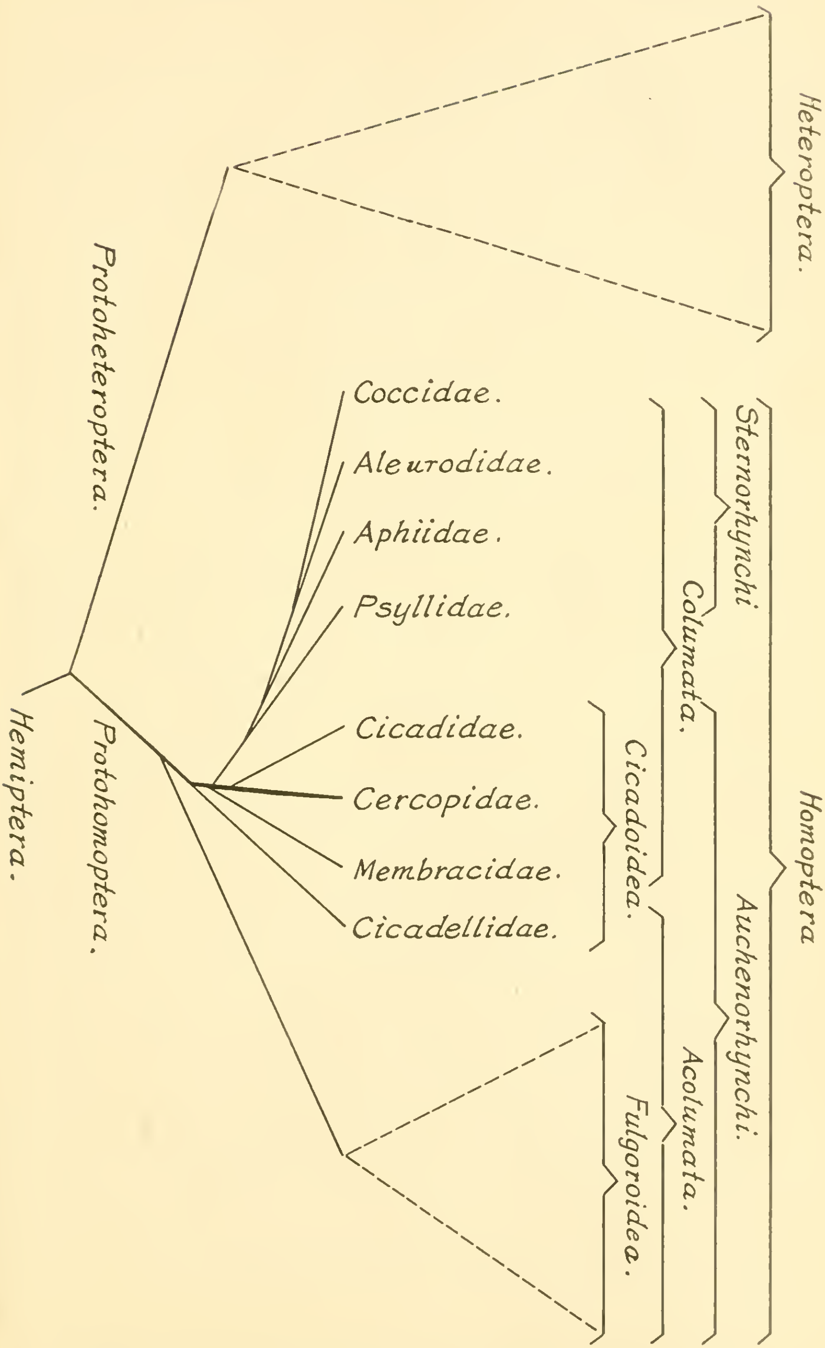


Diagram 1, showing the morphological affinity of the Homoptera.

formed. This must have been on a side branch and it gave rise to the Cicadidae, Cercopidae, and Membracidae, as well as to the Sternorhynchi. The latter followed certain lines of evolution of their own, such as specialization by reduction, the formation of a setal chamber or crumena and the detachment of part of the head capsule from the rest of the head. This reduction may be due to their decrease in size together with their sedentary habits. The formation of the setal chamber may be for a mechanical perfection for controlling the long setae when in use, as well as for a place of protection when at rest. This line of evolution of the Sternorhynchi culminates in the Coccidae, which are in general the smallest and most sedentary of the group.

The venation of the early Hemiptera approached Comstock's theoretical wing very closely, and a somewhat similar type of venation is found in the more generalized of each of the larger groups. The tendency for the bases of the four chief systems to amalgamate one with another is traced through all the groups, especially with the reduction of the width of the wings. This is carried to its greatest extent among the Sternorhynchi and is possibly a result of reduction of size and disuse.

According to my interpretation of the evolution of the Fulgoroidea, the Tettigometridae represent the *modified descendants* of the most primitive fulgorids. They descended from a form having small hind coxae, as in Cercopidae, and not from a form having the present membracid-cicadellid type. The Cixiidae represent a branch from the early stem which have retained certain primitive characters, such as the three ocelli, a simple venation and the complete ovipositor. At an early period the Cixiidae divided into two groups, Cixiinae and the Meenoplini.[1] From the former the Delphacidae arose by the acquisition of a mobile spur on the hind tibia; they carried over and retained the complete ovipositor and the more generalized male genitalia. The modification of the venation in the family is by reduction. The Tropiduchidae evidently came from a Cixiinae stock and have undergone considerable evolution within the family (if all the genera contained in it represent a monophyletic group).

[1] It is possible that this dichotomy goes back to a pre-cixiidae form, and that they should be regarded as distinct families.

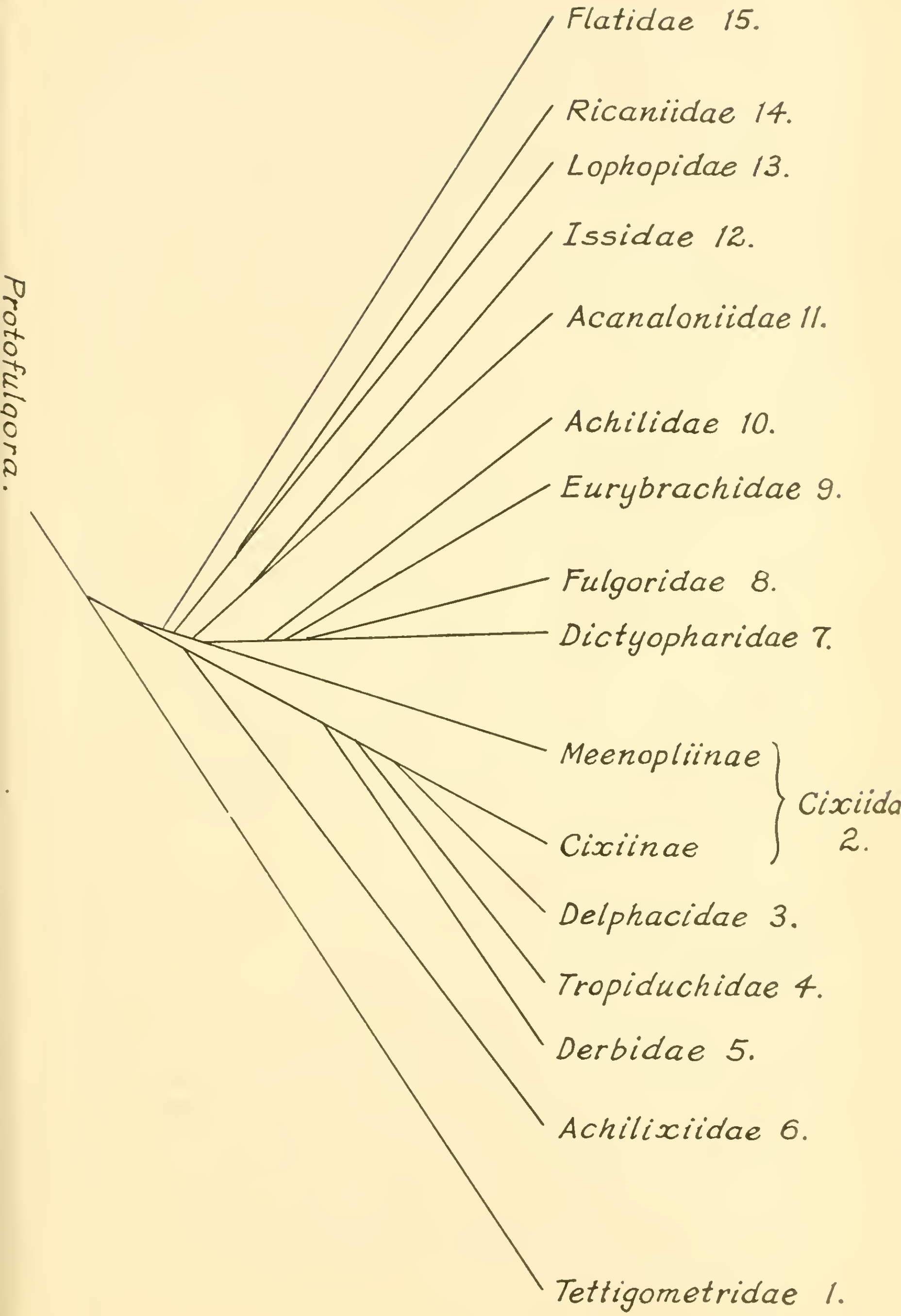


Diagram 2, showing the morphological affinity of the families of the Fulgoroidea.

Platygenesis has taken place in one group and stenogenesis in another. The aedeagus has undergone considerable evolution within the family, but, so far as present knowledge enables us to judge, it is of the Cixiinae type. The generalized Derbidae approach so closely to the Cixiidae that some genera have been shifted from one to another, but they possess distinct male genitalia. The Achilixiidae belong to the Cixiinae group, but they are difficult to place as they have some synthetic characters. The other nine families arose from the Meenoplinae stock or from genera having their type of genitalia. Our knowledge is too slight to allow us to speculate on their relationship with any hope of being correct. The Dictyopharidae and Fulgoridae are closely allied. The Eurybrachidae show some affinities to the Fulgoridae, and so do the Achilidae. The other five families may have arisen from the generalized Dictyopharidae or from a more direct Meenoplinae stem. The Issidae and Acanaloniidae are closely allied, but the possibility of the Issidae being a composite group must not be overlooked. The Lophopidae and the Ricaniidae have affinities, and the Flatidae come close to them. With the exception of the Issidae, one of whose characteristics is a reduction and thickening of the tegmina, the last five families show considerable platygenesis, the last three often having a wide costal area containing cross-veins; the Tropiduchidae in part share this characteristic, and other families show it to some extent. Stenogenesis also appears in several families quite independently, so that neither of these characters can be used for the grouping of the families.

It is to paleontology that we must look for information to fill in our time elements so as to round out our speculations in phylogeny. So far the evidence fits in with the above conclusions. The Tropiduchidae, Cixiidae, and Tettigometridae (if the latter are allied to *Ipswichia*) are found in Mesozoic times or earlier, along with Cercopidae, Cicadidae, and Cicadellidae; whereas Fulgoridae, Flatidae, Ricaniidae and, perhaps, the Derbidae have only been found in much more recent formations.

While paleontology gives us some positive data as to the presence of certain forms at certain periods, yet the geological record is not nearly complete enough to allow us to accept negative evidence as indicating that other forms did not exist at those periods. We must use other evidence to support such a proposition. We cannot expect to find much evidence of Coccidae in the geological records, but we can reason from their high specialization that they appeared later than the more generalized Sternorhynchi.

When considering the problems of phylogeny the possibilities and probability of parallel and convergent evolution must be constantly borne in mind. In every large group of animals there is evidence of such, and it is the first work of the phylogenist to decide where this has taken place. For this reason we must not base our conclusions upon one structure alone. But we must base our conclusions upon evidence, even if it be inconvenient. If evidence can be shown that the "filter" was once present in the Cicadellidae and has since been lost, then our task would be simplified; the Membracidae would then come off the same base and the Cercopidae would represent the more direct line. This is indicated by the thickened line in the diagram. But until such evidence can be produced we must take things as we find them and arrange our diagram accordingly.

In drawing up diagrams Nos. 1 and 2 (Plates VII and VIII) I have tried to take the above remarks into consideration. They do not indicate the time element, but simply try to express my conceptions of the morphological affinity of the families dealt with. As such they are liable to alterations and repairs, as they give way beneath the weight of accumulated knowledge.

New or Little-Known Crane-Flies from the Hawaiian Islands (Tipulidae, Diptera).

BY CHARLES P. ALEXANDER, AMHERST, MASS.

(Presented by Mr. Bryan at the meeting of June 3, 1922.)

The following records are based on a collection of Tipulidae kindly sent to me by Dr. James F. Illingworth. The types and uniques are preserved in the collection of the Bishop Museum, Honolulu. The chief papers dealing with the Tipulidae of the Islands are the following:

Grimshaw, Percy. Fauna Hawaiiensis, vol. III, pp. 6-10; 1901.

Alexander, Charles P. Notes on the Crane-Flies of the Hawaiian Islands. Annals Ent. Soc. Amer., vol. XII, pp. 25-30; 1919.

It now appears that the species of *Limnobia*, *Styringomyia*, and *Trimicra* are more widely distributed than was believed at the time of their original characterization in 1901. The numerous species of *Dicranomyia*, on the other hand, all seem to be endemic. The same is true of the single species of *Gonomyia* known from the Islands.

Limnobia perkinsi Grimshaw.

The following localities are represented:

Oahu: Honolulu, October, 1919 (E. H. Bryan, Jr.).

Fiji: Rewa, March, 1906 (F. Muir).

The species is now known from other Pacific Islands as Samoa and Tahiti. In previous papers, the writer had considered this species as being more properly referable to *Libnotes*. Following the definition of the latter genus as diagnosed by Mr. F. W. Edwards, the present species is to be retained in *Limnobia*.

Dicranomyia stygipennis Alexander.

(*D. brunnea* Grimshaw, preoccupied.)

The following records are available:

Oahu: Kolekole, Waianae, February 29, 1920 (E. H. Bryan, Jr.); Pauoa V., June 17, 1917 (J. C. Bridwell);

Moanalua V., altitude 1200 feet, April 9, 1922 (E. H. Bryan, Jr.).

Maui: altitude 2000 feet, March 19, 1919 (J. A. Kusche).

Kauai: altitude 4000 feet, April 23, 1919 (J. A. Kusche); Kokee, January, 1919 (J. A. Kusche).

The synonymy of *D. brunnea* with *stygipennis* is established by a comparison of paratypes of the two. Grimshaw described the wings as being "hyaline," which is certainly not the case. The present species appears to be the most abundant Tipulid in the Islands.

Dicranomyia grimshawi Alexander.

(*D. apicalis* Grimshaw, preoccupied.)

The following localities are represented:

Oahu: Cooke Trail, April 5, 1919 (O. H. Swezey).

Kauai: altitude 4000 feet, April 23, 1919 (J. A. Kusche); Kokee, March 30, 1919 (J. A. Kusche).

Dicranomyia hawaiiensis Grimshaw.

The following locality is added:

Hawaii: Honaunau, June, 1919 (J. G. Stokes).

Dicranomyia kauaiensis Grimshaw.

This very rare crane-fly is represented by material from near the type-station.

Kauai: Summit Camp, September 2, 1920 (O. H. Swezey).

Dicranomyia foliocuniculator Swezey.

Three specimens from the following stations:

Oahu: Cooke Trail, April 5, 1919 (O. H. Swezey); Moanalua V., altitude 1200 feet, April 9, 1922 (E. H. Bryan, Jr.).

Dicranomyia nigropolita sp. n.

General coloration shiny black; anterior part of vertex and a conspicuous ventral area on thoracic pleura silvery white pubescent; wings faintly infuscated, the stigma conspicuous, dark brown; cell *first M2* open by the atrophy of *m*.

Male. Length about 3 mm.; wing, 4.6 mm.

Female. Length about 4 mm.; wing, 4.8 mm.

Rostrum and palpi brownish black. Antennae black, the basal flagellar segments subglobular. Head black, the narrow vertex silvery white anteriorly.

Pronotum obscure yellow, blackened medially. Mesonotum shiny black; in some cases the humeral region of the praescutum obscure yellow; lateral margins of the praescutum very narrowly yellowish. Pleura brownish black, shiny, with a conspicuous, ventral, obscure yellow area that is densely covered with a microscopic appressed pubescence that appears like a bloom when viewed obliquely from above; this area extends from behind the fore coxa to dorsal of the mid-coxa. Halteres pale brown, the base of the stem and the knobs yellow. Legs with the fore coxae obscure yellow; mid-coxae yellow, the base extensively infuscated; posterior coxae with the outer face infuscated; trochanters obscure yellow; remainder of the legs black. Wings with a faint brownish tinge; stigma conspicuous, oval, dark brown; veins dark brown. Venation: *Sc* short, *Sc1* ending just before the origin of *Rs*, *Sc2* apparently atrophied; cell *first M2* open by atrophy of *m*; basal deflection of *Cu1* close before the fork of *M*.

Abdomen black, the ventral lobes of the hypopygium brownish yellow.

Habitat.—Hawaiian Islands.

Holotype, male, Kaumuahona, Oahu, November 23, 1919 (E. H. Bryan, Jr.).

Allotype, female, Southeast Koolau Mountains, Oahu, February 11, 1917 (J. C. Bridwell).

Paratypes, female, Wahiawa, Oahu, October 31, 1920 (O. H. Swezey); male, Waihee, Maui, September 4, 1919 (E. H. Bryan, Jr.).

This handsome little fly is readily told by the shiny black coloration and the open cell *first M2*.

Styringomyia didyma Grimshaw.

The following records are available in this material:

Oahu: Central Y. M. C. A., Honolulu, February 16, 1922 (William A. Meinecke); one pair, taken in copula.

Hawaii: Honaunau, August 13, 1919 (O. H. Swezey).

Trimicra pilipes (Fabricius).

Mr. F. W. Edwards believes that most, if not all, of the rather numerous described species of the genus are synonyms or varieties of the common *T. pilipes*. There can be no doubt but that the total number of valid species is much less than has generally been supposed. The Hawaiian records have been listed hitherto as *T. lateralis* Grimshaw. The following observations are available:

Kauai: Kaholuamano, April, 1920 (J. A. Kusche).

Hawaii: Honaunau, June, 1919 (J. G. Stokes).

Undescribed Species of Australasian and Oriental Crane-Flies (Tipulidae, Diptera).

BY CHARLES P. ALEXANDER, AMHERST, MASS.

(Presented by Mr. Bryan at the meeting of July 6, 1922.)

The species herein described as new are from Southeastern China, Papua, and Eastern Australia and were collected by Messrs. Kershaw and Muir, and the late Messrs. R. Helms and F. W. Terry. They were included in the collections of the Bernice P. Bishop Museum and were kindly submitted to me for determination by my friend, Dr. James F. Illingworth, to whom I am indebted for many kind favors.

Genus Gynoplistia Westwood.

Gynoplistia nigrithorax, sp. n.

General coloration black; head reddish; antennae with ten branched segments; wings with a very heavy brown pattern.

Female? Wing, 11 mm.

Rostrum obscure reddish; mouth-parts dark; palpi dark red, paler at the incisures. Antennae reddish, the pectinations dark brown; seventeen-segmented, the formula being 2+2+8+5, the longest pectination (on flagellar segments five and six) about three times the segment; pectination of flagellar segment ten shorter than the segment. Head shiny red.

Pronotum velvety black. Mesonotum subshiny, black throughout; pseudo-sutural foveae very large, oval in outline. Pleura velvety black. Halteres black, the extreme base obscure reddish. Legs with the coxae and trochanters black, the femora abruptly orange with the tips narrowly infuscated, broadest on the posterior femora, almost obliterated on the fore femora; tibiae orange, the fore tibiae slightly infuscated, the extreme bases and the broader apices darkened; tarsi black. Wings with a faint yellowish tinge, the base and cell *C* more strongly flavous; a very heavy brown pattern, appearing as two broad crossbands, the first broadest, extending from arculus to beyond the level of the origin of *Rs*, interrupted in cell *R* proximad of *Rs* and not including cell *second C* except the base; basal two-fifths of cell *second A* flavous; the second band occupies the level of the cord, is of nearly equal width throughout and completely traverses the wing; wing-apex darkened, restricting the ground-color to a very narrow and ill-defined area across the apical cells; veins dark brown, brighter in the yellow areas. Venation: Cell *M1* longer than its petiole; cell *first M2* arcuated at its proximal end; basal deflection of *Cu1* about one-third its length beyond the fork of *M*.

Abdomen broken.

Hab.—Papua.

Holotype, female ?, Laloki, New Guinea, November, 1910 (*F. Muir*).

Type in the Hawaiian Sugar Planters' Experiment Station.

Gynoplistia fumipennis, sp. n.

General coloration black, the thoracic pleura dusted with grey; legs black; wings suffused with dark brown; abdomen orange, the terminal two segments and the ovipositor black.

Female. Length, 12.5 mm.; wing, 10.5 mm.

Rostrum and palpi black. Antennae black, the flagellum badly twisted in the unique type so the number of segments cannot be accurately determined. Head shiny black.

Thorax shiny black, the pleura with an appressed microscopic grey pubescence that appears like a bloom. Halteres brownish black. Legs with the coxae black, dusted with grey; remainder of the legs black. Wings with a dark brown suffusion, almost uniform over the entire surface, the costal region only being a little darker, pale longitudinal streaks in cells *R, M, Cu1, first A, second A*, and along vein *M;* veins dark brown. Venation: *r* near tip of *R1;* petiole of cell *M1* very short, about one-half longer than *m;* basal deflection of *Cu1* just beyond midlength of cell *first M2*.

Abdomen bright orange, segments eight and nine shiny black. Ovipositor black, the valves elongate.

Hab.—New South Wales.

Holotype, female, Blue Mountains, December, 1912.

Type in the Bishop Museum.

Gynoplistia helmsi, sp. n.

General coloration greenish black; abdomen violaceous, the third and genital segments reddish; legs black, the femoral bases broadly reddish; wings subhyaline, heavily banded with brown; antennae with not more than seventeen segments, the basal seven flagellar segments pectinate.

Female. Length, 8.8 mm.; wing, 8.2 mm.

Rostrum greenish black; palpi black. Antennae with sixteen or seventeen segments, the formula being 2+2+5+7 (or 8), black. Head greenish black.

Mesonotum greenish black, shiny. Pleura black, dusted with whitish. Halteres yellow. Legs with the coxae black, dusted with white; trochanters black; femora black with the basal half or less reddish, the tips somewhat clavate; remainder of the legs black; posterior legs lost. Wings subhyaline, the base yellowish; cell *C* light brown, *Sc* dark brown; a heavy brown pattern distributed as follows: bases of cells *R* and *M*, continued into cells *Cu* and *first A*; a large, quadrate area at origin of *Rs*, barely reaching *M*; a crossband extending from the stigma across the wing along the cord, leaving a pale spot in cell *first M2;* wing-tip rather narrowly dark brown, including the distal two-fifths of cells *R2, R3*, and *R5;* all of *M1* and the extreme tip of *second M2;* a brown cloud beyond mid-length of cell *second A;* veins brown, yellow at the base of the wing. Venation: Cell *second R1* very small, triangular; cell *M1* about as long as its petiole; basal deflection of *Cu1* at about one-third the length of cell *first M2*.

Abdomen violaceous, the third segment reddish. Ovipositor elongate, orange, the tips darkened.

Hab.—New South Wales.

Holotype, female, Blackheath, January, 1904 (*R. Helms*).

Type in the Bishop Museum.

This species is dedicated to the memory of the collector.

Genus Eriocera Macquart.

Eriocera praelata, sp. n.

Male. Length, 24 mm.; wing, 24 mm.

By Edwards' Key to the Old World species of *Eriocera*, the present species runs down to *E. mesopyrrha* (Wiedemann), from which it differs as follows:

Size very large, one of the largest species of the genus known. Antennal scape dark brown, the flagellum obscure yellow, the terminal segments darker. Head dark brown, the vertical tubercle small, conical. Mesonotal praescutum rich reddish brown, the remainder of the mesonotum darker; scutellum conspicuously protuberant. Pleura brown. Legs with the fore and middle femora reddish brown, the tips narrowly infuscated; posterior femora dark brown, the bases brighter. Wings rich brown with a broad but diffuse yellowish crossband, this lying mostly proximad of the cord; base of anal cells similarly brightened; distal third of costal region dark brown; the yellow discal band includes the bases of cells *R3* and *first M2;* veins pale brown. Venation: *Rs* spurred at origin; *r* about one and one-half times its length beyond the fork of *Rs; M2* shorter than the petiole of cell *M1;* vein *second A* strongly sinuous, bent strongly toward vein *first A* at the tip so the large cell *second A* is narrower at the margin than is cell *Cu*. Abdomen rich reddish brown, segments one and five to nine brownish-black, the caudal margins of tergites two to four narrowly darkened; basal half of tergite two shiny; hypopygium black.

Hab.—China.

Holotype, male, Macao (*F. Muir*).

Type in the Hawaiian Sugar Planters' Experiment Station.

Eriocera muiri, sp. n.

General coloration black; wings brown, cells *C* and *Sc* yellow; a very broad yellow crossband before the cord; abdomen black, the basal halves of the tergites scoriaceous.

Male. Length, 14 mm.; wing, 14.5 mm.

Rostrum and palpi dark brown. Antennae dark brown, the terminal flagellar segments broken, the basal flagellar segments a little paler than the scape. Head dark brown.

Mesonotum dark brown, with three almost concolorous smooth stripes; scutellum and postnotum shiny dark brown, the scutellum projecting. Pleura shiny dark brown. Halteres rather short, dark brown, paler basally. Legs dark brown. Wings brown; cells *C* and *Sc* yellow; wing-apex broadly darker brown; a very broad yellow crossband, lying almost wholly proximad of the cord; veins dark brown, those in the yellowish areas paler. Venation: *r* on *R2* about one and one-third times its length beyond the fork of *Rs;* cell *M1* present; vein *second A* sinuous, cell *second A* at wing-margin a little narrower than cell *Cu;* cell *second A* large.

Abdominal tergites bicolorous, the base of each segment scoriaceous, liliaceous brown, the apical half velvety black; hypopygium dark; sternites more uniformly brown.

Hab.—China.

Holotype, male, Macao (*F. Muir*).

Type in the Hawaiian Sugar Planters' Experiment Station.

This interesting *Eriocera* is named in honor of the collector, Mr. Frederick Muir. By Edwards' Key, this species runs out at couplet seventy-one by the combination of scoriaceous crossbands on the abdominal tergites and the presence of five posterior cells.

Eriocera obliqua, sp. n.

Female. Length, 15-16 mm.; wing, 14-14.5 mm.

Allied to *E. nepalensis* (Westwood), from which it differs as follows:

Wings with the base not at all brightened; the white band before the cord broadest in cells *R* and *M*, narrowed at the ends. Venation: *r* very oblique as in this group of species, inserted at or before the fork of *R2+3*. Ovipositor with the base black, only the valves dark horn-colored.

Hab.—China.

Holotype, female, Macao (*F. Muir*).

Paratopotypes, two females.

Type in the Hawaiian Sugar Planters' Experiment Station.

The general appearance of this fly is more like *E. hilpa*

Walker and allies (*hilpoides* Alexander, *davidi* Alexander, etc.), from all of which it is readily told by the position and course of *r*.

Eriocera terryi, sp. n.

Male. Length, 12.8 mm.; wing, 11.5 mm.

Female. Length, 15 mm.; wing, 12.4 mm.

Related to *E. geminata* Alexander (Japan), differing as follows:

Antennae of the male longer, with long and conspicuous setae. Thoracic stripes black, almost concolorous with the interspaces. Legs brownish-black throughout. Wings with the discal pale band larger, oblique in position and pale yellow in color, only a little paler than the paired spots in cell *R;* the discal band extends from cell *Sc1* across cells *second R1*, *R*, and *M*, barely attaining cell *Cu;* a pale area in the center of cell *Cu1*. Venation: *r* approximately its own length beyond the fork of *R2+3* and twice its length from the tip of *R1;* fork of vein *Cu* forming a greater angle; basal deflection of *Cu1* at or before midlength of cell *Cu1*. Ovipositor and genital segment fiery orange.

Hab.—China.

Holotype, male, Hongkong, 1908 (*F. W. Terry*).

Allotopotype, female, in copula with the type.

Type in the Hawaiian Sugar Planters' Experiment Station.

This interesting species is named in memory of the collector, the late Mr. F. W. Terry. By Edwards' Key, it runs out at *E. hilpa* Walker, to which group of species it should be referred.

Eriocera submorosa, sp. n.

General coloration black; vertical tubercle deep red; wings brown; cell *M1* lacking; abdominal tergites with alternate opaque and shiny cross-bands.

Male. Length about 12.5 mm.; wing, 12.2 mm.

Rostrum and palpi dark brown. Antennae with the scape brown, the flagellum black; antennae, if bent backward extending beyond the base of the abdomen. Head black, the region of the vertical tubercle deep red with a small, circular black spot.

Pronotum dark brown medially, paler laterally. Mesonotum velvety black. Pleura brownish black. Halteres dark brownish black. Legs brownish black throughout. Wings strongly tinged with brown, somewhat darker at the base and in the costal region; veins dark brown. Venation: *Sc1* ending beyond the fork of *R2+3; r* on *R2* about two and one-half times its length beyond the fork and on *R1* nearly four times its length from the tip; cell *M1* lacking; cell *first M2* rectangular; basal deflection of *Cu1* before midlength of cell *first M2*; *Cu2* about one-half the length of the basal deflection of *Cu1*.

Basal abdominal tergite velvety black; segments three to seven more dilated and with the basal two-thirds of each segment shiny, glabrous, somewhat glaucous; hypopygium black; sternites deep reddish brown.

Hab.—China.

Holotype, male, How-lik Mountains, 1907 (*Kershaw*).

Type in the Hawaiian Sugar Planters' Experiment Station.

Genus Pselliophora Osten Sacken.

Pselliophora kershawi, sp. n.

General coloration orange; wings yellow, the apex dark brown; wing-base variegated with paler brown; eighth sternite of male hypopygium not projecting.

Male. Length, 19 mm.; wing, 15.5 mm.

Female. Length, 25 mm.; wing, 19 mm.

Rostrum reddish; palpi reddish brown. Antennae orange, the terminal segments darker; all flabellations black; pectination of first flagellar segment in the male stout, orange; antennae of female orange, the terminal three segments minute. Head orange.

Thorax entirely orange, immaculate. Halteres orange, the knobs a little darker. Legs with the coxae and trochanters concolorous with the thorax; femora obscure orange, the posterior femora with the tips conspicuously infuscated; tibiae orange, the posterior tibiae with a broad but diffuse pale annulus at base; metatarsi brownish orange, the terminal segments brown. Wings yellow, the apex beyond the cord dark brown, this including the distal half of the stigma; the yellow base is extensively suffused by paler brown, including a very broad, oblique crossband, broadest in cells *R* and *M*, narrower in cells *Cu* and *first A*; cell *second A* and the caudal margin of *first A* entirely dark; the yellow ground-color appears as a broad, conspicuous band completely traversing the wing before the cord and a narrow longitudinal area in the bases of cells *Cu* and *first A*, on either side of vein *first A*, continued across cell *first A* to the margin near the tip of vein *second A*. In the male the brown basal pattern is somewhat less intense, especially in cells *R* and *M*, and the base of cell *second A* is yellow. Venation: Cell *M1* barely sessile; *m-cu* long.

Abdomen orange; caudal margin of ninth tergite of male and the ovipositor of the female black. Male hypopygium with the ninth tergite having an oval median notch, the lateral lobes obliquely truncated, with the caudal face tumid, heavily blackened, the surface microscopically roughened. Ninth sternite with two flattened mesal plates, each terminating in an acute spine directed dorsad, the caudal margin of the plates lying side by side, the ventral mesal angle produced caudad into a chitinized rod which is directed ventrad, the apex feebly bilobed. Eighth sternite not produced.

Hab.—China.

Holotype, male, How-lik Mountains, 1907 (*Kershaw*).

Allotopotype, female.

Type in the Hawaiian Sugar Planters' Experiment Station.

This interesting species of *Pselliophora* is dedicated to the collector.

Genus Habromastix Skuse.

Habromastix heroni similior, subsp. n.

Male. Length, 15 mm.; wing, 18 mm.; antenna, 19 mm.

Female. Length, 21 mm.; wing, 17 mm.; antenna, 6.5 mm.

Generally similar to *H. heroni* Alex. (Dorrigo, New South Wales), differing in the wing-pattern, as follows:

Pale ante-stigmal area in costal cell small or lacking; the distal pale area in cell *M* completely traverses the cell from vein *M* to *Cu* (in *heroni* confined to the vicinity of vein *Cu*); center of cell *first M2* usually pale. Venation: *Rs* shorter; cell *M1* short-petiolate, sometimes sessile.

Hab.—New South Wales.

Holotype, male, Sydney, March, 1910 (*R. Helms*).

Allotopotype, female, April 10, 1909 (*R. Helms*).

Paratopotypes, two males, April 15-20, 1909.

Type in the Bishop Museum.

Other Malayan, Oriental, and Australasian Crane-Flies.*

In addition to the foregoing new species of Tipulidae described by Professor Alexander, the following species from the same collections were determined by him. Specimens in the Bishop Museum.

Australia, Helms Collection.

Gynoplistia melanopyga Sch., Sydney, N. S. W.
Gynoplistia bella (Wh.), Sydney, N. S. W.
Ptilogyna ramicornis (Wh.), Centennial Park.
Leptotarsus scutellaris Skuse, Blackheath, N. S. W.
Pseudolimnophila indecora Al., Perth, W. Aust.

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* List furnished by E. H. Bryan, Jr.

Macromastix constricta Skuse, Sydney, N. S. W.
Macromastix costalis (Swed.), Sydney, N. S. W.
Ischnotoma serricornis (Macq.), Sydney, N. S. W.
Ischnotoma rubroabdominalis (Macq.), Millthorpe, N. S. W.
Discobola australis (Skuse), Ourimbah, N. S. W.
Trimicra hirtipes (Wh.), Sydney, N. S. W., Perth, W. Aust.
Plusiomyia gracilis (Wh.), Sydney, N. S. W.
Gnophomyia fascipennis (Thom.), Sydney, N. S. W.
Dolichopeza cinerea Macq., Sydney, N. S. W.
Dolichopeza longifurca Skuse, Sydney, N. S. W.
Dicranomyia sp., Sydney, N. S. W.

Malayan and Oriental.

(Collected by F. Muir, except where otherwise noted.)

Eriocera chrysomela Edw., Lo fou Mountains (100-1000 feet), China.
Eriocera nepalensis West., Lo fou Shan (100-1000 feet), China.
Eriocera basillaris Wd., Java.
Eriocera paenulata End., Sandaglaija, Java.
Eriocera perennis O. S., Los Banos, Philippine Islands (Williams).
Ctenacroscelis sp. (locality not given).
Trentepohlia (*Mongoma*) sp., Amboina material, S. S. Tjibodus.
Conosia irrorata (Wd.), Kowloon (Terry).
Pselliophora gaudens (Walker) Makassar (S. W. Celebes).
Pselliophora tripudians Bezzi, Los Banos, Philippine Islands (Williams).
Pselliophora sp., Macao Island, China.
Tipulodina sp., Macao Island, China.
Nephrotoma sp., Macao Island, China.
Nephrotoma sp., Amboina.

Other papers by Charles P. Alexander on the Crane-flies of these regions are:

1917. Two New Crane-flies from the Philippine Islands, Insecutor Inscitiae Menstruus, V, pp. 6-8.

1918. New Species of Tipuline Crane-flies from Eastern Asia. Journal New York Ent. Soc., XXVI, pp. 66-75.

1922. New or little-known Tipulidae (Diptera). Australasian Species.

VIII. Ann. & Mag. of Nat. Hist. (9), IX, pp. 145-160.
IX. Ann. & Mag. of Nat. Hist (9), IX, pp. 297-315.
X. Ann. & Mag. of Nat. Hist. (9), IX, pp. 505-524.

1922. Undescribed Crane-flies (Tanyderidae and Tipulidae) in the South Australian Museum, No. 2.

Records of the South Australian Museum, II, No. 2, pp. 223-270.

Descriptions of Lantana Gall-Fly and Lantana Seed-Fly (Diptera).

BY DR. J. M. ALDRICH,
U. S. NATIONAL MUSEUM.

(Presented at the meeting of February 2, 1922.)

LANTANA GALL-FLY.

Eutreta xanthochaeta new species.

Male. Very similar to *Eutreta sparsa* Wd., except that the bristles of the head and thorax are all pale yellow in color. Head brownish yellow, the front with numerous flattened whitish hairs, of which a row in front of the ocellar triangle are turned backward; a very distinct black spot on the orbit at the level of the first antennal joint; face with two large round black spots; antennae yellow, including the arista. Palpi yellow, the hairs at the tip blackish.

Thorax brownish yellow. Mesonotum covered with flattened, pale yellow hairs; pleura of the same color, with a darker stripe just above the sternopleura; metanotum black, opaque. Abdomen reddish yellow at base, especially on the sides, the first segment elongated, second and third with a transverse dark spot, the fourth mostly black. Hypopygium small, reddish. The hairs of the abdomen are black where the ground color is black. Legs yellow, the femora slightly infuscated, especially on the lower edges; the front femora with an irregular double row of short, yellow bristles above, and on the lower outer side a row of four or five longer yellow bristles which begin at the middle.

Wings broad, but not circular in outline, deep brownish in color, sprinkled with numerous small, whitish dots; the costal edge is white throughout, but very narrowly so, with an undulating border where it joins the darker color. This pale border becomes wider and more uniform beyond the tip of the second vein and ends a short distance beyond the fourth vein; from this point around the hind border of the wing there are about twelve somewhat equally spaced white dots of which the first three or four rest on the margin.

Female. Ovipositor broad at base, about as long as the two preceding segments varying in color from reddish brown to black. Darker specimens show two dark spots close together below the eye, the lower one joining the edge of the mouth and also a median spot at the edge of the mouth.

Length of male, 5.1 mm.; of female, including ovipositor, 6 mm.

Described from twelve specimens of both sexes bred from Lantana in the Hawaiian Islands.

Type. Male, Cat. No. 25,203, U. S. Nat. Mus., Honolulu, March 18, 1918, O. H. Swezey, Collector. Paratype specimens will be deposited in the collection of the Experiment Station of the Hawaiian Sugar Planters' Association and in the Bernice Pauahi Bishop Museum, Honolulu.

Although this species is an importation from Mexico, there are no specimens in the National Museum from any part of the American Continent which have pale bristles. Hendel in Abhandlungen und Berichte des Konigl. Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden, Band XIV (1912), p. 54, published June 15, 1914, has given a synopsis of the South American forms belonging to this genus, none of which agrees with the present species.

Lantana Seed-Fly.

Agromyza lantanae* Froggatt.

A minute shining black species, with black halteres, the male having very strong up-curved vibrissae.

Male. Front one-third the head width; orbits very narrow, slightly shining, with four bristles; ocellar triangle shining, a little elongated. Antennae black, small, inserted below the middle of the eyes, a very distinct prominence between them. Facial orbits very narrow, hardly visible; the cheek about one-sixth the eye-height, slightly wider anteriorly where it is a little produced and bears on each side a large bristle or, more correctly, a pencil of hairs which are glued together. This pencil is quite slender at the base and consequently much less tapering than in *curvipalpis* Zett., *coniceps* Malloch and *affinis* Malloch. Palpi small, black. Mesonotum with two pairs of dorso-centrals, the small hairs covering the surface extending almost to the scutellum; the latter has four large bristles. Pleura shining black. Halteres black, calypters brown with blackish margin bearing a dense row of short black hairs. Abdomen shining black without any blue or green reflection, not highly polished. Legs entirely black.

Wings subhyaline, narrow at the apex, but widening rapidly toward the base and with a well-developed nearly square anal angle. The anterior cross-vein is barely beyond the tip of the first vein and at about two-

* This name was first used by Froggatt in a paper on the Lantana Fly in the Agricultural Gazette of New South Wales, XXX, pp. 665-668, 1919, with the impression that the insect had been previously described under that name. Froggatt gave a very brief description of the fly, not intended as a technical description, and entirely inadequate to distinguish the species. Hence, the advisability of the present description, although the name *lantanae* must be accredited to Froggatt.

thirds of the length of the discal cell. The hind cross-vein a little longer than the preceding section of the fourth vein, about two-thirds as long as the last section of the fifth vein. The costa extends to the fourth vein.

Female. Oral margin only a little produced with a single small vibrissa on each side. Ovipositor short, shining black with numerous hairs, the apical ones as long as any of the abdomen.

Length, 1.5 mm. in both sexes.

Described from thirty-three specimens of both sexes bred from seeds of lantana in the Hawaiian Islands by O. H. Swezey.

I identified this species a few months ago as *Agromyza affinis* Malloch, a species which was described from a single female taken in the vicinity of Washington, D. C. Mr. Malloch doubtfully associates with this female two males from Key West, Fla. I have recently succeeded in identifying the true male of *affinis* from approximately the latitude of Washington. I find that it differs from the male of *lantanae* in having the cluster or pencil of vibrissal hairs much more thickened at the base; that is, apparently part of these hairs are short so they only increase the size of the cluster at the base. I am still unable to see any satisfactory characters for separating the two species in the female sex, but since lantana does not grow at Washington, *affinis* must have an entirely different larval habit, which would tend to confirm their distinctness. Mr. J. C. Bridwell has submitted a series of twelve specimens of an *Agromyza* which he bred from *Lantana camara* at Brownsville, Tex., in April and May, 1921. The specimens are badly denuded, but I do not doubt that they are the same species.

Four specimens sent by Dr. J. F. Illingworth from Gordonvale, North Queensland, where they were bred from lantana, are also the same species. I also include here the two males from Key West, Fla., mentioned by Malloch in connection with his description of *affinis*.

Notes on Diptera Occurring in Hawaii.

BY J. F. ILLINGWORTH.

(Presented at the meeting of February 2, 1922.)

Comparatively little has been published on Hawaiian Diptera. The rather extensive investigations of Terry, while doing much to aid local entomologists in a knowledge of many species, was unfortunately cut short by his untimely death; hence, few of his data were ever published.

In this paper it is my desire to submit accumulated information on two of our commonest flies, and also add a few remarks on several other species listed in the Fauna Hawaiiensis, but not known in collections here. Most of the matter dealing with terminology has come through the kindly assistance of Dr. J. M. Aldrich, of the United States National Museum, Dr. Guy A. K. Marshall, of the British Museum, and Major W. S. Patton, of Edinburgh University, the latter having visited the principal type collections of Europe during the summer.

Synthesiomyia nudiseta (Van de Wulp), det. by Patton.

Cyrtoneura nudiseta Wulp, Argentine Republic.
Synthesiomyia brasiliana B. & B., Brazil.

This American species is evidently a rather recent arrival in the islands. Terry did a lot of breeding work on it in 1910, and though I first collected it in Fiji (June, 1913), I found it abundant here as soon as I began breeding carrion flies, early in 1914. At that time this species went under the common name of the red-tailed Sarcophagid, as designated by Bridwell,[1] who had done some breeding work with the species, and discovered that the larvae made cocoons in sand. My Fiji specimens were determined by Aldrich as *S. brasiliana* B. & B. and, I believe, Bridwell, too, so determined it, for he used this name in his paper,[2] presented before the Medical Society here.

Proc. Haw. Ent. Soc., V, No. 2, September, 1923.

[1] Bridwell, J. C., Proc. Haw. Ent. Soc., vol. 3, p. 15 (September 4, 1913), 1914.

[2] Bridwell, J. C., Trans. Med. Soc. Hawaii, for 1916-17, pp. 27-32, 1918. (See, also, Rev. Appl. Ent. Ser. B., vol. 6, pp. 163-4, 1918.)

I found this species very localized in Australia, apparently occurring only around Brisbane. After my return to Honolulu, I sent specimens to Patton, who found that this was Van der Wulp's species *nudiseta,* originally described from Argentine Republic, in 1883.[3] He placed it in Macquart's genus *Cyrtoneura,*[4] which was characterized by having the antennal bristle thickly feathered. However, in 1893, Brauer and Bergenstam, securing specimens from Brazil, named the species *brasiliana* and were compelled to create the new genus *Synthesiomyia*[5] for it. Other localities on record for it are Florida and Georgia.[6] [7]

At a previous meeting I called attention to the very peculiar manner in which the maggots congregate so compactly side by side, that a cross-section of the mass of hair and dirt from the carcass, in which they are imbedded, gives the appearance of old honeycomb.

In breeding out these flies on a dead rat, I found that the maggots were considerably slower in getting started than either those of *Sarcophaga fuscicauda* Bött. or *Chrysomyia megacephala* (Fab.); being more closely associated, when ready to pupate, with the larvae of *Ophyra nigra* Wied. These two latter species both have smooth shiny maggots, but those of *S. nudiseta* have conspicuous black caudal spiracles, whereas those of *O. nigra* are brown in color, making them easy to separate.

Chrysomyia megacephala (Fabr.), det. by Patton.

Musca megacephala Fabr. Ent. Syst., vol. IV, p. 317, 1792.
Musca dux Eschscholtz, Entomographien, 1822, p. 114.
Lucilia dux Wiedemann, Auss. Zweifl., vol. II, p. 399, 1828.
Lucilia flaviceps Macquart, Dip. Exot., 3d Sup., p. 302.
Musca remur Walker.

This oriental species was probably an early introduction into

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[3] Wulp, F. M. Van der, Amerikanische Diptera; Tijdschr. Ent., vol. 26, p. 42. Also noted, Zool. Record, 1883, Ins., p. 248.

[4] Macquart, M. J., Suit a Buffon, vol. 2, p. 13, 1835. Description of the genus *Cyrtoneura* (*Curtoneura*).

[5] Brauer, Friedrich and Bergenstam, J. E. von, Zweifl. d. Kaiserl. Mus., vol. 6, pp. 96, 110, et seq., 1893.

[6] Hough, G. de N., Biol. Bull., vol. 1, p. 29, figs.

[7] Johnson, C. W., Proc. Acad. Nat. Sci. Philadelphia, p. 335, 1895. Johnson, C. W., Bull. American Mus. Nat. Hist., vol. XXXII, p. 76, 1913.

the Islands. Hence, here, as well as elsewhere, it has gone under a variety of names. Van Dine got it determined in the United States National Museum, in 1907, as *Calliphora dux* (Esch.), and, in 1909, Terry determined it as *Lucilia dux* (Esch.). Early in 1916, Swezey sent specimens to the United States National Museum, and these were determined by Knab as *Chrysomyia dux* (Esch.). Now, Patton has compared our specimens with the type and cleared up the synonymy. In his letter of September 10, 1922, he says: "I went to Kiel and found that the whole of Fabricius' collection of Diptera was destroyed, only pins left. Fortunately his type of *megacephala* was not completely gone and I was able to recognize it. At the back of the label were the words 'Ex. Ind. Or.' This finally disposes of this species. The type came from India and not from West Africa. *Ch. flaviceps* Macq. is the same species, as is also *Musca dux* Esch."

The distribution of this species is extremely wide, extending from India, probably its native home, to Hawaii. Muir collected it in China, Borneo, and Java, and Fullaway took specimens in Guam. Eschscholtz's type locality. It is also found in New Hebrides and Australia. I saw a male specimen taken near Sydney, in the Australian Museum, and a male has just been forwarded in a collection from New Hebrides.

It breeds in all kinds of animal matter, and has been recorded repeatedly as a sheep-maggot fly in Hawaii. The adults are particularly fond of sweets, and are frequently found in swarms in fields of corn affected by leaf-hoppers, where they feed upon the honey dew.

Lucilia caesar Linn.

This widespread carrion species probably does not occur in Hawaii. The basis for including it in our fauna has been Howard's record [8] of three specimens collected by Henshaw, on the island of Hawaii. No one has collected *caesar* here subsequently, so I asked Dr. Aldrich to try to locate these specimens in the United States National Museum collection and clear the matter up. May 20, 1922, he wrote: "I find no Hawaiian specimens under this species in the collection, but there are three specimens collected by Henshaw, April 16, 1900, correctly placed under *Lucilia sericata*. Inasmuch as Howard did not mention the latter species, I think there is little doubt that his reference was a misidentification which has been corrected since then."

Ophyra leucostoma (Wied.).

This is another European species probably incorrectly referred to our fauna. The single record is the female specimen from the Waianae Mountains, Oahu, in the Henshaw Collection, recorded by Howard.[8] Dr. Aldrich wrote that he looked through the material under *Ophyra leucostoma*, but found none from Hawaii. He says, "Our Anthomyid material has been sorted over repeatedly and I presume the specimen has been transferred to another species."

I wrote Dr. Marshall, of the British Museum, November 15, 1922, as follows:

"Going over Diptera, we found a number of records in the Fauna Hawaiiensis which are probably errors; hence, to clear these up may we ask you to see if the following specimens can be located, and if they stand under these names.

"*Leucostoma analis* Meigen ?, Fauna Hawaiiensis, vol. 3, p. 20.

"*Calliphora azurea* Fln., Fauna Hawaiiensis, vol. 3, p. 27.

"*Ophyra aenescens* Wied., Fauna Hawaiiensis, vol. 3, p. 30.

"*Phora* sp., Fauna Hawaiiensis, vol. 3, p. 76.

"(We are sending you specimens of *Aphiochaeta scalaris* to compare with this headless specimen.)

"*Rhinia testacea* Desv., Fauna Hawaiiensis, vol. 3, p. 83.

"*Homalomyia femorata* Loew, Fauna Hawaiiensis, vol. 3, p. 84.

"*Sapromyza* sp., Fauna Hawaiiensis, vol. 3, p. 85."

In reply, December 16, 1922, Dr. Marshall wrote:

"With regard to the Diptera in the 'Fauna Hawaiiensis,' mentioned in your letter, all of these are in the British Museum under the names you give, with the exception of the *Phora*, which appears to have been lost. I, therefore, am unable to compare your specimens of *Aphiochaeta scalaris* with it.

"Major Austin informs me, however, that the fact that these insects have been incorporated in the collection under these names is no guarantee that the names are correct, as Grimshaw's identifications have not been checked. He thinks the

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[8] Howard, L. O., Proc. Ent. Soc., Washington, vol. IV, p. 490, 1901.

specimen labeled *Leucostoma analis* Mg. is probably not that species, but is very closely allied to it."

Major Patton, remarking recently on Grimshaw's record of *Calliphora azurea*, suggests, though he had not seen the specimen, that it is almost certainly *Chrysomyia megacephala*.

Insect Fauna of Hen Manure.

BY J. F. ILLINGWORTH.

(Presented at the meeting of April 6, 1922.)

During 1916 the writer, while making some studies of the stick-tight flea (*Echidnophaga gallinacea* Westw.) upon poultry, became interested in the swarms of insects which were observed in and about the manure that had been removed from the hen-houses. In this instance, the droppings had been collected and stored in old kerosene tins, preparatory to placing on the garden. These stood in the open, so had collected considerable moisture from rains, etc., and in a few tins the contents had even become saturated. Yet conditions appeared to be ideal for the development of insects, for even these supersaturated contents were a writhing mass of larvae of various Diptera, etc., together with the various forms of predators and parasites that had gathered around to prey upon them.

Since all exact information of the breeding habits of insects is valuable for reference, the writer thought it well to record all of the organisms that came under these observations. Naturally with the Hawaiian fauna, the great majority of dung-feeding insects are Diptera. Twelve species of flies were bred out from this material. Of the natural enemies of these—predators and parasites—I was able to note fully twenty species.

Diptera Reared; Given in the Order of Abundance.

1. *Sarcophaga fuscicauda* Böttcher.—This species I found also in North Queensland, where it proved exceedingly troublesome about human habitations, breeding upon any available food or excrement. Its association with man in the tropics is almost as close as that of the house-fly, *Musca domestica* Linn., though it is more of an outdoor species, living primarily about camps, etc. Like the house-fly, too, this species is quick to follow along the lines of commerce, the indications being that it came to Hawaii either from Australia or from other Pacific countries to the west, during rather recent times. The earliest specimens in collections here bear date of 1905. Dr. R. R.

Parker identified this species for Mr. Timberlake early in 1919. I sent a lot of Sarcophagids from North Queensland to Parker, February 9, 1918, and he also found this species among them.

Even in the semi-liquid manure, the larvae appeared perfectly happy; yet, when full fed, they died if they were unable to migrate to a fairly dry situation.

2. *Musca domestica* Linn., the house-fly.

3. *Stomoxys calcitrans* Linn., the stable-fly.

4. *Ophyra nigra* Wied.—These shining black Anthomyids also appear to be closely associated with man in the tropics, for they are widely distributed. They are very abundant in Queensland, principally as carrion feeders; and are regarded as one of the sheep blow-flies.

The larvae have a characteristic smooth, shiny appearance, and the caudal spiracles are particularly small and brown in color. Unlike the house-fly and stable-fly, the larvae of this species were found to pupate right in the excessively moist manure, from which they were able to emerge successfully.

Mr. Frederick Knab of the United States Museum determined specimens for Mr. Swezey, early in 1916; and also determined a lot which I sent from the College of Hawaii about the same time. Later (March 22, 1918) Dr. Aldrich found that specimens, which were bred and collected in North Queensland, also belonged to this species. Described from China, and being widely distributed in the Orient, introduction to Hawaii was evidently through shipping. The earliest reference to the species here is probably that in the Fauna Hawaiiensis, where two females taken during 1893 and 1894 are placed in the genus *Hydrotaca* Desv. The earliest specimens that we find in collections here are dated Hawaii, February 28, 1905, taken by Terry.

5. *Fannia pusio* Wied.—The larvae of this smaller, omnivorous Anthomyid also swarmed in the semi-liquid manure; yet, like the Sarcophagid, I found that it was necessary for them to get a fairly dry place to pupate, in order to emerge successfully.

6. *Milichiella lacteipennis* Loew.—This tiny Agromyzid occurred in great swarms, with three other undetermined species, about the tins of manure. All three species were later bred out from the mass.

7. An undetermined Mycetophilid (No. 20) also bred out in considerable numbers. This is the tiny fly that is so troublesome, coming into houses to the lights, especially when one is reading in the evening. Their small size permits them to pass through ordinary mosquito screens.

8. *Lucilia sericata* Meig.—I was surprised to have this carrion-fly breed out, even in small numbers, from the hen manure; for knowing the habits of this species I naturally assumed that the numerous individuals swarmed about the manure-tins only to feed. This common English blow-fly has gradually extended its range round the world. It probably got to Hawaii some time about 1900, the first specimens in collections here being dated 1904, by Terry.

9. *Euxesta annonae* Fabr.—This well known Ortalid bred out of the manure in limited numbers. Though I frequently saw the adults sitting about on the surface while the mass was fermenting, I was not able to identify any of their young. The earliest Hawaiian record, that I have been able to locate, of this species, is in the Fauna Hawaiiensis, a female specimen taken in the Honolulu mountains, 1900.

Natural Enemies of Diptera Found in the Manure.

Predators were abundant all the time that the dipterous larvae were developing in the manure; on the other hand, parasites were little in evidence (due to their small size), yet they finally emerged in considerable numbers from the pupae of the flies.

Two species of earwigs were common during the earlier stages, *Euborellia annulipes* (Luc.) and *Spingolabis hawaiiensis* (Borm.). A few of a third, a small species, *Labia pilicornis* (Motsch.), were also captured.

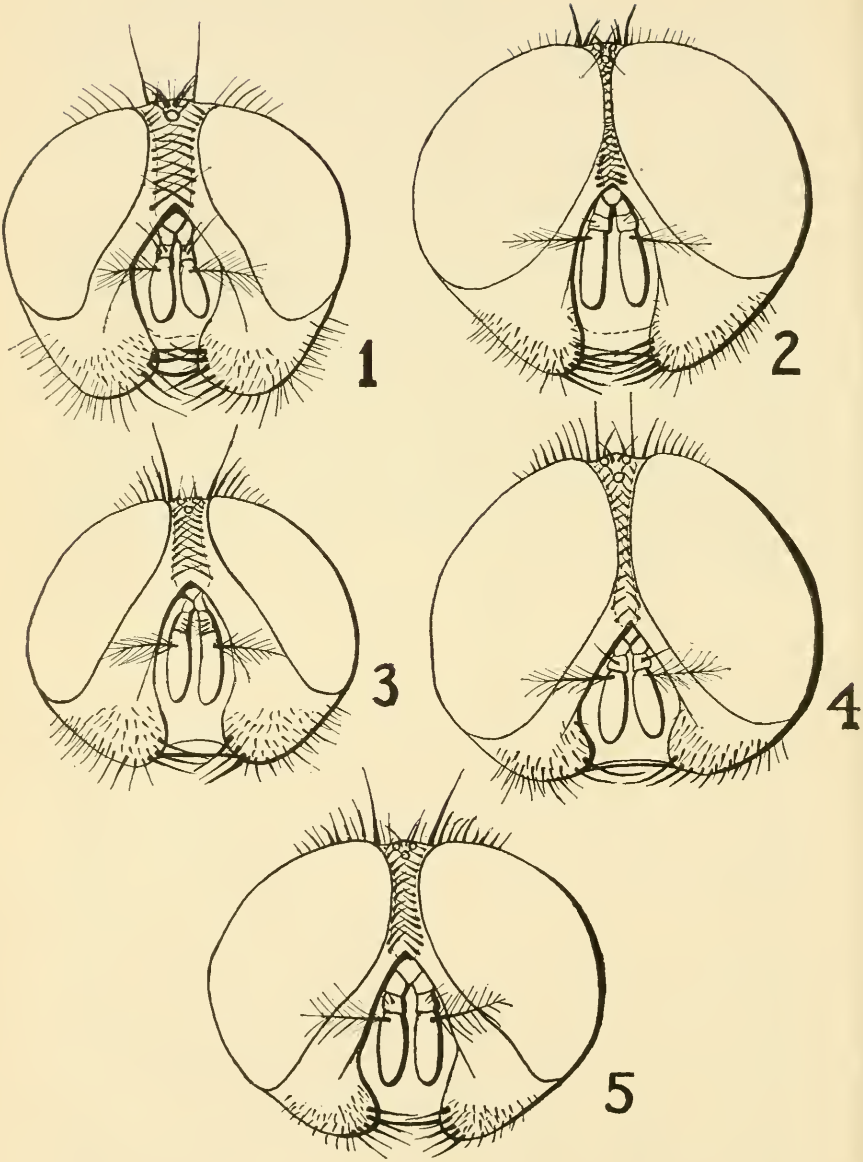
The common Hydrophilid, *Dactylospermum abdominale* (Fabr.), was active, and I also secured specimens of *Cryptopleurum minutum* Fabr. and another small undetermined species.

Four species of Staphylinids were abundant during the earlier part of the work, *Philonthus longicornis* Steph., which Mr. A. M. Lea of the South Australian Museum informs me is the correct name for our *P. scybalarius*, which is a synonym; *Philonthus discoideus* Grav.; a species of *Tachyporus;* and a small *Oxytelus* sp.

Ants swarmed over the surface of the manure and burrowed in where they found the mass dry enough, seeking both the eggs and the larvae of the flies. *Pheidole megacephala* Fabr. proved most useful in this work, attacking even the full grown maggots; *Ponera perkinsi* Forel was also in evidence.

Mites gave considerable distress to the flies when they began to emerge, their bodies being frequently so covered with these predators that they could scarcely move about.

At least seven species of hymenopterous parasites were secured, as they emerged from the various dipterous pupae. The large Cynipid, *Eucoila impatiens* Say, apparently came only from the puparia of the Sarcophagid; Spalangiids were very abundant, at least four species being present; *Spalangia cameroni* Perk., *S. philippinensis* Full., *S. simplex* Perk., and one that is apparently new. Of the remaining, there were two species of *Diapria* and a few *Pachycrepoideus dubius* Ashm. The determinations of these Hymenoptera were kindly supplied by Mr. Fullaway and Mr. Timberlake; they are all fairly recent introductions.



House Flies.

House-Flies.

BY J. F. ILLINGWORTH.

(Presented at the meeting of November 2, 1922.)

Attempting to straighten out the terminology of our Muscoid flies, particularly those records of specimens not recognized in collections here, some interesting observations have come to my notice. Apparently the common house-fly, *Musca domestica* Linn. of Europe, North America, etc., does not occur here, at least not in its typical form. Collecting thousands of flies, during the past decade, has failed to disclose a single specimen.

I have on exhibition typical *domestica* from San Francisco and Mojave Desert, Cal.; Ithaca, N. Y.; and Sydney, Australia. It is to be noted that, in comparison with these, where the eyes of the males are well separated, most of the Hawaiian specimens have the eyes, in that sex, almost contiguous, with some variations.

There is a record of *Musca flavinervis* Thomson in the Fauna Hawaiiensis, which has troubled me, since no specimens have been recognized in collections here. During the voyage of the

PLATE IX.

FACE VIEW OF MALE HOUSE-FLIES.
(Semi-diagrammatic, Camera Lucida sketches.)

EXOTICS.

Fig. 1. Typical *Musca domestica* Linn., from Mojave Desert, Cal., 1916, Illingworth collector.

Fig. 2. Typical *Musca flavinervis* Thomson, from Cape Town, South Africa, Bridwell collector.

HAWAIIAN VARIETIES.

Fig. 3. Nearest approach to *Musca domestica* of all the flies taken. Oahu, January 2, 1914, Illingworth collector.

Fig. 4. Nearest approach to *Musca flavinervis* of all the flies taken. Puna, Hawaii, March 13, 1922, Swezey collector.

Fig. 5. An intermediate form which is representative of the Hawaiian house-flies. University of Hawaii Farm, October 17, 1922. Illingworth collector.

Eugenia, 1851-3, the specimens which Thomson described were collected on Ross Island, on the coast of China (?), and he further stated that a variety was taken at Honolulu. I have typical specimens, which I take to be this species, from Cape Town, collected by Bridwell, and it is very interesting to note that the common house-flies of Hawaii compare more closely with these than with specimens of the true *domestica.* It will further be seen that there is some variation in the width of the space between the eyes of the males in the Hawaiian flies, just as one might expect. Hawaii, being the "melting pot of the Pacific," flies coming from the East and from the West, along the lines of commerce, have met and mingled here, with the result that our variety of the common house-fly is not typical of either species, but rather a hybrid.

The Little House-Fly.

Fannia canicularis Linn. is another species which was recorded from Hawaii,[1] two specimens having been sent from that island to Dr. Howard in 1901. Yet no further specimens had been placed in collections here. During my recent visit to the large island (June, 1922) I found that this was the most abundant species, literally swarming in the hotel where I stopped in Waimea. Hence, it would appear that we overlook the commonest things in our collecting, by taking too much for granted.

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[1] Proc. Ent. Soc. Wash., IV, p. 490, 1901.

A List With Notes of the Insects Found on the Parker Ranch, June, 1922.

BY J. F. ILLINGWORTH.

(Presented at the meeting of November 2, 1922.)

Those marked with an asterisk (*) were not collected.

DIPTERA.

* *Psychoda* sp., abundant on manure piles.
Tipulids—several species collected on grass and under shrubbery. These were sent to Alexander for determination.
* *Culex quinquefasciata* Say, troublesome at night.
Chironomid, ex shrubbery.
Mycetophilid, abundant on cowdung.
Neoexaireta spinigera (Wied.), on shrubbery.
Sciapus pachygyna Macq., on shrubbery.
Eristalis punctulatus Macq., on flowers.
Eristalis tenax (Linn.), on flowers.
* *Xanthogramma grandicornis* (Macq.), on flowers.
Allograpta obliqua Say, on flowers.
Aphiochaeta scalaris Loew, bred abundantly from cutworm material.
Frontina archippivora Williston, abundant on cutworms.
Chaetogaedia monticola Bigot, abundant on cutworms.
Sarcophaga pallinervis Thoms., abundant on cowdung.
* *Stomorhina pleuralis* (Thoms.), ex grass.
Musca flavinervis Thoms. (?) (*domestica*), abundant in houses.
* *Stomoxys calcitrans* (Linn.), on cattle.
Haematobia irritans (Linn.), on cattle.
Lucilia sericata Wied., on shrubbery.
Chrysomyia albiceps Wied., on shrubbery.
Chrysomyia megacephala Fabr., on shrubbery.
Calliphora latifrons Hough, on shrubbery.
Hydrotaea houghi Malloch, on shrubbery.
Ophyra nigra Wied., on shrubbery.
Ophyra aenescens Wied., on shrubbery.
Fannia canicularis (Linn.), abundant in house.
Drosophila xanthosoma Grim. (?), on shrubbery.
Rhodesiella elegantula Becker, on shrubbery.
Rhodesiella tarsalis Adams, on shrubbery.
Dacus cucurbitae Coq., on shrubbery.
* *Ceratitis capitata* Wied., on peaches.
Atherigona excisa Wied. (*Acritochaeta pulvinata* Grim.), on shrubbery.
Hylemyia cilicrura Rondani (*Phorbia fusiceps* Zett.), on shrubbery.
Nine undetermined Anthomyids, etc., ex grass and shrubbery.

Orthoptera.

Pycnocelus surinamensis (Linn.), under stones.
Cutilia soror (Brunn.), under stones.
Blatella germanica (Linn.), in house.
Euborellia annulipes (Luc.), under stones.

Hemiptera.

Oechalia griseus (Burm.), ex shrubbery.
Reduviolus blackburni (White), ex shrubbery.
Reduviolus capsiformis (Germ.), ex shrubbery.
Hyalopeplus pellucidus (Stäl), ex shrubbery.
Nysius delectus White, ex shrubbery.
Nysius sp., ex shrubbery.
Siphanta acuta Walker, ex shrubbery.
Jassids, three species, ex shrubbery.
Aphis maidis Fitch, ex corn.
Psocus, two species, ex corn.

Neuroptera.

Nesomicromus vagus Perk., ex shrubbery.

Hymenoptera.

Amblyteles koebelei (Swezey), ex cutworms.
Amblyteles purpuripennis (Cresson), ex cutworms.
Echthromorpha fuscator (Fabr.), ex cutworms.
Diplazon laetatorius (Fabr.), ex shrubbery.
Chalcis obscurata Walk., ex shrubbery.
Eucoila impatiens Say, ex diptera larvae in dung.
Aphaereta muscae Ashm., ex diptera larvae in dung.
* *Sceliphron caementarium* (Drury), on shrubbery.
* *Apis mellifera* Linn., on flowers.
Pheidole megacephala Fab., ex insects.
Crabro polynesialis Cam., ex shrubbery.
Odynerus heterochromus Perk., ex shrubbery.

Lepidoptera.

Cirphis unipuncta (Haw.), ex growing corn.
Agrotis ypsilon Rott., ex growing corn.
Agrotis crinigera (Butl.), ex growing corn.
Lycophotia margaritosa (Haw.), ex growing corn.
* *Vanessa cardui* Linn., on thistle.
* *Lycaena boetica* Linn., on growing beans.
* *Anosia crippus* Cram., on milkweed.
* *Pontia rapae* (Linn.), on cabbage, nasturtiums, etc.

Coleoptera.

* *Aphodius lividus* Oliv., ex cowdung.
Gonocephalum seriatum Boisd., under stones.
Monocrepidius exsul Sharp, ex growing corn.
Philonthus longicornis Steph., ex dung.
Rhyzobius ventralis Erichs., ex shrubbery.
Coelophora inequalis (Fabr.), ex shrubbery.
* *Cryptolaemus montrouzieri* Muls., ex shrubbery.
* *Hister bimaculatus* Linn., under cowdung.
Anthicus floralis G., ex grass sweepings.
Diachus auratus (Fabr.), ex flowers.
Nitidulid, ex *Ricinus* seed.
Nitidulid, ex grass.
Pantomorus godmani (Crotch), ex growing corn.

Insects Attracted to Carrion in Hawaii.

BY J. F. ILLINGWORTH.

(Presented at the meeting of December 7, 1922.)

Recently while carrying on experiments, with dead rats as bait, I was interested in the variety of insects attracted. Naturally the first to appear were the blow-flies, *Sarcophaga barbata* Thoms., *S. dux* Thoms., *Chrysomyia megacephala* (Fabr.), *Ch. albiceps* Wied., and *Lucilia sericata* (Meigen). Other flies breeding in carrion, usually coming after decay sets in, were *Ophyra nigra* Wied., *Fannia pusio* Wied., *Synthesiomyia nudiseta* van der Wulp, and these were accompanied by a considerable variety of insects, apparently attracted by the odor of decay, as follows: *Eristalis aeneus* (Scopoli), *E. punctulatus* Macq., *Dacus cucurbitae* Coq., *Atherigona excisa* Wied., *Musca domestica* Linn., *Euxesta annonae* Fabr., *Brachydeutera argentata* (Walker), the wasp, *Pachodynerus simplicornis* Sauss., and the beetles *Clytus crinicornis* Chevr., and *Melanoxanthus melanocephalus* Thunb. Finally, when the carcass was pretty well decomposed, it was visited by the predaceous Staphylinid beetle, *Creophilus maxillosus* L., the young of which feed upon the larvae and pupae of the flies, and the skin beetles, *Dermestes vulpinus* Fabr., *D. cadaverinus* Fabr., *Attagenus plebeius* Sharp, and *Necrobia rufipes* Fabr.

I was interested to observe the predaceous habit of the larvae of *Chrysomyia albiceps*. After the carcass was almost eaten, the spiny larvae of this fly were frequently observed around the edges on the surface of the soil, with their hooks inserted into the bodies of the larger maggots of the Sarcophagids, etc. This observation led me to a little experiment. I placed fifty of these predaceous larvae in a jar of soil, with 100 larvae of the large Sarcophagid, *S. barbata*. On emergence, I found forty-eight of the *Ch. albiceps* came through in good condition—the other two dying in the puparium—while only fifty-nine of the Sarcophagids came through, three others dying in the puparium; hence, showing clearly that 38 per cent had fallen a prey to the larvae of the smaller, predaceous species. Since *Ch. albiceps* is a rather

Proc. Haw. Ent. Soc., V, No. 2, September, 1923.

recent introduction into these islands, from Australia, it may have an important bearing upon our other carrion feeders, especially the Diptera. It is worthy of note that *Lucilia sericata* is already noticeably scare here, while both *Ch. albiceps* and *Ch. megacephala* have become exceedingly abundant.

While in Honopu, Napali, Kauai, last June, Mr. Bryan collected a very similar fauna from a dead goat in the advance stages of decay, with the addition of the predaceous Histerid beetle, *Saprinus lugens* Erich., the other Clerid, *Necrobia ruficollis* Fabr. and some earwigs.

Halobates in Hawaii (Hemiptera).

BY E. H. BRYAN, JR.

(Presented at the meeting of May 4, 1922.)

The only insects to defy the terrors of Neptune living about Hawaii, or, with a few exceptions, to be found anywhere in the world, belong to the genus *Halobates*. These pelagic Heteroptera belong to the family Hydrometridae or water striders, and are characterized by a pubescent oval body; triangular head; four-jointed antennae; short, stout front legs; long, slender middle and hind-legs, which are inserted at the sides of the posterior end of the thorax; a very small abdomen, and an entire absence of wings.

Of the fifteen or more species of *Halobates* known, eleven are carefully described and figured in an excellent monograph by F. Buchanan White, in the Report of the Voyage of H. M. S. Challenger, Zoology, Vol. VII, pt. 19, pp. 1-82, with three plates. Using this, Dr. Illingworth and I were able to determine the identity of the specimens in the Bishop Museum collection.

Halobates wüllerstorffi Frauenfeld was brought back from Palmyra in July, 1913, as recorded by Mr. Swezey (Proc. Haw. Ent. Soc., III, p. 16, 1913). This species is common to the North and South Atlantic, Indian, and Western Pacific Oceans, but was apparently unknown previously from the East Pacific.

Halobates sericeus Eschscholtz is the common species captured at Waikiki, especially after Kona storms. It has been recorded by Osborn and Pemberton in these proceedings, Vols. III and IV. It has also been taken by Dr. C. M. Cooke, Jr., at Malaekahana, near Kahuku, Oahu, October 31, 1915; by G. P. Wilder at sea between Maui and Kahoolawe, October, 1913; and by Mr. Greenly and others at Waikiki beach, 1914 to date. F. B. White records that, next to *H. wüllerstorffi*, it is the most abundant species, but almost confined to the North Pacific Ocean. The bulk of the Challenger specimens were from stations "from Japan to Honolulu."

Dr. Sharp (Cambridge Natural History, Insects, Pt. II) states that when the sea is calm they skip rapidly over its surface, but disappear when it becomes agitated. The whole life-cycle may be passed through far away from land. They are strong divers and shelter themselves from rough sea by keeping well below the surface. They are gregarious.

Notes on Diptera.

BY E. H. BRYAN, JR.

(Presented at the meeting of July 6, 1922.)

Trypanea.

Entomologists in Hawaii have for some time questioned the correctness of using *Tephritis* as the genus of the three species of Trypetidae, *crassipes, cratericola,* and *dubautiae,* with the large fuscous spot near the apex of the wing and the radiating fuscous bands. A short time ago I sent specimens of these three species and of *T. swezeyi* to Dr. Aldrich, for his opinion, and received the following reply: "The three species which you were in doubt about undoubtedly go in *Trypanea*, or as originally spelled and preferred by Bezzi, *Trupanea.* The amended spelling is on the authority of Hendel, which is about as good as anything could be in this family; and I prefer the corrected form, as undoubtedly the Greek 'u' should be represented in English by 'y' as in the word 'psyche.' *Tephritis swezeyi* is placed in the correct genus, as you thought. I should mention that *Trypanea* covers the same group as *Urella* in the sense of Loew's Monograph."

These species, *crassipes* (Thomson), *cratericola* Grimshaw, and *dubautiae* Bryan, are therefore to be referred to *Trypanea* Schrank (Briefe Donaumoor, p. 147, 1795). This genus is characterized by a slender body, scutellum with two bristles, and pattern of the wing, star-shaped and limited to the apex, with the rest of the wing immaculate or only spotted fuscous (in contrast to the non-radiating, reticulate pattern of *Tephritis,* covering nearly the whole wing). These two genera are well characterized and figured in Bezzi, Indian Trypaneids (fruit-flies) in the collection of the Indian Museum, Calcutta, Memoirs of the Indian Museum, Vol. III, pp. 162, 166, Pl. X, 1913.

Dolichopus exsul Aldrich.

Dr. Aldrich identified a series of Dolichopodidae, previously known as *Dolichopus* sp., which I sent him, as this species, which he recently described in Proc. U. S. Nat. Museum, Vol. 61, Art. 25, p. 15, 1922. This new species was mentioned by

Mr. Timberlake at the last meeting. Dr. Aldrich said, in a recent letter: "I was greatly interested in this species, because it was the only one known of the genus, large as it is, which occurs in a tropical climate. There are at least 350 species, and I think near 400, known in this genus now." What seems to me equally interesting is that the Oriental Collection of Mr. Muir contains a single specimen of what appears to be the same species from Tokyo, Japan, May, 1913.

Limnophora arcuata Stein.

The recently captured species of Anthomyid "hovering fly," with the four prominent black spots on the gray abdomen, reported on by Mr. Illingworth recently,* was identified by Dr. Aldrich as *Limnophora arcuata* Stein (Berlin Ent. Zeitsch., Vol. 42, p. 201), described from Georgia and Louisiana. It has since been found rather widely over the United States, in Porto Rico, St. Thomas, and Brazil. In 1920, Malloch (Trans. American Ent. Soc., Vol. 46, p. 145) made it the type of a new genus, *Eulimnophora*. Dr. Aldrich says, "The characters mentioned seem rather slight, and I have postponed changing the name of the species until I can get a more comprehensive view of the genera allied to this so as to see how many there should really be." This species is now known from Mount Olympus, Palolo Valley, Kaimuki, and Moanalua Valley, Oahu, and Kalalau, Kauai.

Pygophora lobata Stein.

A specimen of Anthomyid collected by Fullaway in Guam (No. 1259) was sent to Dr. Aldrich, and was identified by Malloch as *Pygophora lobata* Stein.

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* Reported at the April 6, 1922, meeting. See page 188 preceding.

Insects from the Summit of Mauna Kea.

BY E. H. BRYAN, JR.

(Presented at the meeting of October 5, 1922.)

Several reports have been made on the insect life at higher elevations on Mauna Loa. On September 7, 1916, William H. Meinecke exhibited specimens collected by him in Mokuaweoweo crater (Proc. Haw. Ent. Soc., III, p. 285). December 14, 1916, William A. Bryan exhibited a similar series, which he had captured on the summit the previous August (id., III, p. 295).

As long ago as 1897, Dr. H. B. Guppy, writing in the *Pacific Commercial Advertiser* on "The Summit of Mauna Loa" (see review in *Nature*, Vol. LVII, p. 21, November 4, 1897), speaks of the insect life on the summit as follows:

"Curiously enough, insects of various descriptions are common on the summit. One species of butterfly common at the coast is not at all infrequent. The butterflies were more often to be found dead than alive, and those flying about were in a half-drowsy condition and easily caught. There were flies of different kinds, the house-fly and the blue-bottle fly proving a great nuisance. Besides these there were moths, bees, gnats, and an occasional dead dragon-fly; while bugs and other insects were collected as they fed upon the bodies of dead butterflies. These insects were more common when the wind was southerly, and no doubt they had been brought up to this absolutely sterile region by the wind. Evidently most if not all of the butterflies and moths soon die, and probably the other insects, too. The whole matter is, however, very suggestive, and shows how readily insects (even the parasitic bug) may find their way into the upper air currents."

Mr. William H. Meinecke ascended to the summit of Mauna Kea, July 25, 1922, where he secured specimens of the following species: Lepidoptera: *Pontia rapae* (Linn.), the cabbage butterfly; Diptera: *Chaetogaedia monticola* Bigot, and *Frontina archippivora* Williston; Hymenoptera: *Amblyteles koebelei* (Swezey), *Echthromorpha fusco-orbitalis* Cam., *Bassus laetatorius* (Fabr.), and *Limnerium blackburni* Cam.

Concerning these he says: "Several dead cabbage butterflies were observed. Other insects, principally flies and ichneumons dead on the snow, the larger ones causing the formation of deep holes in the snow. Several flies and wasps were alive when captured." He thinks there is little doubt that all these insects were carried to the higher altitudes by the wind, and that between the lower temperature and the lower air pressure few are able to survive for any length of time.

Review of Dr. Heinrich Karny's "Der Insektenkorper und seine Terminologie."

BY E. H. BRYAN, JR.

(Presented at the meeting of October 5, 1922.)

Dr. Heinrich Karny states, in his introduction, that his object in writing "Der Insektenkorper und seine Terminologie" was to provide a simple handbook and glossary of insect morphology for persons using his tables for the determination of indigenous insects. He has done more than that.

To the student familiar with German he has given a compact, simple, little introduction to the morphology and classification of insects, such as one would find in the chapter on insects in a good text-book of Zoology. To this he has added a comprehensive glossary of 475 entomological terms, both Latin and German, with their explanations in German.

The value to the average American student of science, however, is of a different nature. Rarely do you find a young entomologist or zoologist who is also a good student of languages. And rarer still is the text-book or dictionary of a foreign language which gives the student much material help on scientific terms. That is one of the reasons for the misunderstandings between the English-speaking and foreign systematists. They either dislike or are unable correctly to translate each other's descriptions and remarks.

Dr. Karny's greater contribution, as I see it, lies in his having provided an elementary text-book of scientific German for the student studying entomology.

New Records, Identifications, and Synonymy of Diptera Found in Hawaii.

BY E. H. BRYAN, JR.

(Presented at the meeting of December 7, 1922.)

During the course of my work on Hawaiian flies, names have come to light which have been apparently omitted from local literature. Some of these determinations were made by Mr. F. W. Terry, of specimens in his collection. Some were identified for Dr. Illingworth by the late Mr. Frederick Knab, and others, recently, by Dr. Aldrich. A few of the synonyms were suggested by Major W. S. Patton, of Edinburgh.

New Records.

Calliphora latifrons Hough. [Muscidae.]

Identified by Aldrich; specimens collected by Illingworth, near Waimea, Hawaii, June, 1922.

Conicera atra (Meigen). [Phoridae.]

Identified by Knab; specimens bred by Illingworth, "ex rotten potatoes," Oahu, March, 1916.

Hydrotaea houghi Malloch. [Anthomyidae.]

Identified by Malloch; specimens collected by Illingworth, near Waimea, Hawaii, June 19, 1922; a single specimen (Swezey), Kilauea, Hawaii, February 24, 1919.

Milichia sp. [Agromyzidae.]

Det. by Knab; specimens bred "ex barley seed," by Illingworth, March, 1915.

Rhodesiella elegantula (Becker). [Chloropidae.]

Specimens collected by Illingworth, near Waimea, Hawaii, June 18, 1922. Identified by Aldrich, who says: "(*Meroscinis* of Becker, Monog. Ann. Mus. Nat. Hung., IX, 1911, p. 89.) Known from Formosa, Java. Bezzi, in Journ. N. Y. Ent. Soc., XXVII, 1919, 174, has explained that *Meroscinis* is a syn. of *Rhodesiella* Adams."

Rhodesiella tarsalis Adams. [Chloropidae.]

Specimens collected by Illingworth, near Waimea, Hawaii, June 18, 1922. Identified by Aldrich, who notes: "(*Meroscinis scutellata* de Meijere.) A widespread Oriental and African species."

Sapromyza sp. [Sapromyzidae.]

Det. by Aldrich; specimen collected by Illingworth, near Waimea, Hawaii, June 14, 1922.

Recent Identifications and Synonymy.

Aedes aegypti (Linn.) [Culicidae.]

Our common day mosquito. (= *Aedes calopus* (Meigen), *Stegomyia fasciata* (Fabr.) etc.).

Aphiochaeta scalaris (Loew). [Phoridae.]

Identification by Knab of specimens bred by Illingworth "ex dead roach," April 7, 1913. Recently identified again by Dr. Aldrich. The common, large, brownish Phorid, locally known as "*Phora* sp.," the one I bred in 1920 from dead land shells (Proc. Haw. Ent. Soc., IV, p. 489).

Atherigona excisa (Wied.). [Anthomyidae.]

(= *Acritochaeta pulvinata* Grimshaw.) Synonymy by Malloch.

Drosophila repleta Wollaston. [Drosophilidae.]

Specimens bred "ex rotten potato," March, 1916, by Illingworth, were so determined by Knab, who noted: "= *carinata* Grim." The descriptions do not agree. Also recorded by Sturtevant from Hawaii (Carnegie Pub., 301, 1921, p. 101).

Gitona perspicax (Knab). [Drosophilidae.]

Sturtevant (Carnegie Pub., 301, 1921, pp. 54, 55) says that he does not consider *Gitonides* Knab distinct from *Gitona* Meigen.

Hylemyia cilicrura Rondani. [Anthomyidae.]

(= *Phorbia fusciceps* Zett.), which was determined from Hawaii by Knab, bred ex beets, by Illingworth, 1916. Synonymy by Aldrich; specimens collected by Illingworth, near Waimea, Hawaii, June 18, 1922.

Leptocera ferruginata Stenhammar. [Borboridae.]

(= *Borborus* sp. in local collections.) Identified by Knab; specimens collected by Illingworth, Oahu, June, 1914. Very common about refuse and manure.

Milichiella lacteipennis (Loew). [Agromyzidae.]

(= *Ophthalomomyia lacteipennis* Loew.) Synonymy by Knab. The very abundant little shiny black dung-fly, with the very shiny hyaline wings.

Puliciphora sp. [Phoridae.]

The Phorid with the wingless females. Det. by Knab; specimens bred by Illingworth, "ex dead roach," January, 1916.

Synthesiomyia nudiseta van der Wulp. [Muscidae.]

(= *S. brasiliana* B. & B.; "the red-tailed Sarcophagid," etc.) Synonymy suggested by Major Patton; bred extensively ex dead rat by Illingworth. The maggots pupate together in the fur, forming a honeycomb-like mass.

The Leaf-Miners of Pipturus (Lepidoptera).

BY O. H. SWEZEY.

(Presented at the meeting of January 5, 1922.)

The mamake tree, *Pipturus albidus,* is endemic to the Hawaiian Islands. It occurs in the forests of all the large islands of the group, and is one of the trees which supports a considerable insect fauna, as shown by a paper on the subject in Proceedings Hawaiian Entomological Society, II, p. 153, 1912. At that time the leaf-miners attacking this tree were not so well known as now, but one species being mentioned, and, as it turns out now, was incorrectly determined.

Now that the leaf-miners of Pipturus have been more thoroughly studied, it is found that there are several species, some of which closely resemble one another, but occur in different localities or on different islands, illustrating the production of species by geographic isolation.

These leaf-miners all belong to the Lepidopterous family Tineidae. At present six species are recognized, and no doubt others will be found by further collecting in regions where no particular attention has been given to these insects.

Philodoria micropetala Walsm.

Fauna Hawaiiensis, I, p. 719, Pl. XXV, fig. 22, 1907.

This species was described from a single specimen collected at Halemanu, Kauai. I collected specimens of it on *Pipturus* trees at Kokee (which is near Halemanu), on August 23, 1921. The trees had mined leaves, and I consider that the mines belonged to this moth. It is found that the specimens agree with the figure and Walsingham's description of *micropetala.* That being the case, all of my previous references in Proceedings Hawaiian Entomological Society to this species occurring on Oahu as a leaf-miner in *Pipturus* are in error, as the Oahu species is not the same as these Kauai specimens. I determined specimens from *Pipturus* on Oahu by comparison with the figure of *micropetala,* and as they nearly agreed, and as there were no other near related species known at the time, I felt that probably there might be variation enough to account for the difference between my specimens and the figure.

In Proc. Haw. Ent. Soc., II, p. 222, 1913, I stated that *micropetala* (the species which was mistaken for it) occurred on all the Islands. The leaf mines that had been found in *Pipturus* up to that time, I had taken to be all of the same species of moth. Since then I have discovered several other species in different places by rearing them from the mines in the leaves.

Philodoria floscula Walsm.

Fauna Hawaiiensis, I, p. 718, Pl. XXV, fig. 21, 1907.

This species was described from Hilo and Olaa, Hawaii. I have collected it on *Pipturus* at Mountain View, Hawaii, March 31, 1906.

Philodoria pipturicola Swezey.

Proceedings Hawaiian Entomological Society, III, p. 96, 1915.

This species was reared from mined leaves collected from *Pipturus* in the forest above Punaluu, Oahu, September 13, 1914, and above Wailuku, Maui, December 9, 1922.

Philodoria pipturiella n. sp.

Antennae brownish; palpi white inwardly, externally brownish at apical portion of median and terminal joints; head and thorax grayish brown. Fore-wings bronzy brown, costal margin narrowly white to about two-thirds, where a white spot projects inward, pointing obliquely outward; sometimes the white on costa extends only half-way to this spot; a large nearly circular white spot in middle of wing at about one-third the fold which traverses its center; a large white spot at tornus, an orange spot opposite it on costa, narrowly separated from it by a metallic blue patch which widens apically; beyond the blue patch a large orange patch occupies the remaining apical portion of the wing except a small apical black spot followed by metallic blue in the apical cilia; cilia otherwise brownish, with two white spots in the costal cilia above the orange patch. Expanse of wings 5-6 mm. Hind-wings brownish as in fore-wings, cilia paler brown. Abdomen bronzy brown, whitish beneath. Legs pale brownish, whitish beneath.

Holotype in collection of Hawaiian Entomological Society. Paratypes in author's collection, and the collections of the Bishop Museum and Experiment Station of the Hawaiian Sugar Planters' Association.

Hab.—Oahu: practically the whole island wherever *Pipturus* grows. I have reared it many times from mines in *Pipturus* leaves collected at various places in the S. E. Koolau Mountains: Palolo, Kaumuahona, Tantalus, and Pacific Heights, and also from Mount Kaala and Makaleha, in the Waianae Range. The large leaves of *Pipturus* often contain great numbers of the mines, even up to a hundred, but usually the larvae in most of them die or are parasitized so that but few of them reach their full growth and spin cocoons. The cocoons are made on the under side of the leaf alongside a prominent vein, white and not very conspicuous.

Any mention that I have previously made to *micropetala* in the Proceedings of the Hawaiian Entomological Society pertains to this species.

Philodoria pipturiana n. sp.

Antennae pale fuscous, apical portion white. Palpi whitish, streaked with fuscous externally. Head sordid whitish. Thorax dark fuscous, white beneath. Fore-wings dark fuscous to nearly black, with several white markings: a white costal bar outwardly oblique from about middle of costa extends about half-way across wing; another oblique white bar at two-thirds of costa, which recurves to the costa, terminating in a few white scales in the costal cilia; just beyond this is a curved transverse white bar nearly interrupted in the middle, its costal end terminating with a few white scales in the costal cilia (not present in the paratype); a longitudinal white streak on basal third of fold, followed by a large oval white spot about middle of fold; a large oval white spot on dorsum about at end of fold; cilia fuscous except for the white scales previously noted in costal cilia and a few white scales at base of apical cilia. Expanse of wings 8-9 mm. Hind-wings and cilia dark fuscous. Abdomen fuscous. Legs pale fuscous, tarsi white spotted.

Described from two specimens collected on *Pipturus* tree which had leaves containing leaf-miners, on the Upper Hamakua Ditch Trail, Kohala Mountains, Hawaii, July 31, 1921. In color this species resembles *nigrella* from Kilauea and forest above Hilo, Hawaii, but the white markings are distinctly different. The habits of *nigrella* are not known.

Holotype in the collection of the Hawaiian Entomological Society; paratype in collection of the Hawaiian Sugar Planters' Association.

Gracilaria neraudicola Swezey.

Proceedings Hawaiian Entomological Society, IV, p. 385, 1920.

Reared from leaf mines in *Neraudia melastomaefolia* (a tree near related to *Pipturus*), at Punaluu, Oahu, June 11, 1916, and Waiahole, Oahu, August 13, 1916. Reared from leaf mines in *Pipturus* at Pahoa, Hawaii, September 20, 1918; in the jungle along Volcano Road south of Hilo, Hawaii, July 25, 1921; and at 2000 feet elevation on Judd Trail, Kona, Hawaii, August 14, 1919.

Correction.

My record in Proc. Haw. Ent. Soc., II, p. 222, 1913, of breeding *Philodoria basalis* Walsm. from leaf mines in *Pipturus* leaves in Kohala Mountains, Hawaii, is an error. There is a mistake about it somewhere, for since that time I have ascertained that *basalis* is the leaf-miner in *Metrosideros* or ohia lehua, on Hawaii and Maui.

TABLE OF PIPTURUS LEAF-MINERS.

1. (8) More or less orange at apex of fore-wing.
2. (7) White spot on fold usually not reaching dorsal margin.
3. (4) Apical half of fore-wing with ground color orange. .*P. pipturicola*
4. (3) Much less orange at apex of fore-wing.
5. (6) White spot on fold nearly circular................*P. pipturiella*
6. (5) White spot on fold semi-circular................*P. micropetala*
7. (2) White spot on fold, narrow, extending to dorsal margin. *P. floscula*
8. (1) Fore-wing not orange on apical portion.
9. (10) Three outwardly oblique white spots extending inward from dorsum of fore-wing.........................*G. neraudicola*
10. (9) Oval white spot on dorsum near end of fold......*P. pipturiana*

The Erythrina Twig-Borer (Terastia meticulosalis) in Hawaii (Pyralidae, Lepidoptera).

BY O. H. SWEZEY.

(Presented at the meeting of February 2, 1922.)

Terastia meticulosalis Guené, Delt. & Pyr., p. 212, 1854.
Terastia subjectalis Led., Wien. ent. Mon., p. 480, 1863.
Megaphysa quadratalis Walker, Cat., XXXIV, p. 1527.
Megastes coeligenalis Hulst, Trans. Am. Ent. Soc., XIII, 156, 1886.
Terastia meticulosalis, Hampson, Fauna of British India, Moths, IV, p. 381, 1896.

What appears to be this Pyralid moth, I have reared from pupae found in pods of the wiliwili tree (*Erythrina monosperma*). Three of these pupae were found in pods on a tree in Makaleha Valley, Oahu, January 8, 1922. The larvae had eaten the immature seeds and pupated within a cocoon partially within the remains of the skin of the seed. There were quite a good many pods on the tree which had matured and were hanging opened with the seeds exposed. Other pods were found in which the seeds had been eaten, besides the three which contained pupae. This is the first time that the wiliwili pods or seeds have been found eaten in this way, and the first record of this moth for the Hawaiian Islands.

Hampson, in Fauna of British India, Moths, IV, 381, 1896, gives a description and figure, and the distribution as: St. Domingo; Honduras; Ceylon; Java; Philippines. He states that the "larva bores in young stems of *Erythrina*."

Fletcher, in Some South Indian Insects, p. 439, 1914, gives the distribution in South India as Bellary, Madras, and Coimbatore. He says the larva "bores into terminal shoots and unripe seed-pods of *Erythrina* of various species."

In Proceedings of the Second Entomological Meeting at Pusa, India, 1917, I find it stated that "it is sometimes a serious pest, especially of *Erythrina Indica*, the larva boring in the young shoots so that all the new growth may be killed back."

Dyar, in Journal of the New York Ent. Soc., IX, 21, 1901, describes the larva from *Erythrina herbacea* in southern Florida, and says: "The larva is an internal feeder, boring in the younger stems which it completely hollows out, killing them. When the plant is in early flower, the young flower heads are often killed and webbed up into a foul mass by this larva. Spins a large webby cocoon in the ground."

Hulst's description of *coeligenalis* does not exactly agree with the description of *meticulosalis* given by Hampson. My specimens do not quite agree with these, nor with the figure given by Hampson. Where a species has been described under four different names, it must have some variation. Hence, I think that my specimens, the three of which show quite a bit of variation in color, come near enough to be considered this species. However, I shall endeavor to have it verified, either at the United States National Museum or by someone in India.

It seems strange that no one should have noticed the work of this moth on this side of the island, and that this first record should come from a valley so far removed from the more densely settled portions, where we should expect a new immigrant to be first noticed.

On January 29, I made considerable search for evidence of this moth on wiliwili trees on the Ewa coral plain south of Sisal. In that region there are a good many of the trees, many of them being very large. Just at this time there are many ripe pods hanging on the trees with the seeds exposed. Seach among these finally revealed the presence of remains of eaten seeds containing the cocoons of a moth. Examination of the empty chrysalids showed them to belong to the Phycitid moth *Myelois ceratoniae,* and gives us a new addition to the food plants of this moth. Six such seeds were found, but in all cases the moths had already issued. Search will be made in other localities as opportunities present.

Apparently the insect has been here a long time, but has not increased abundantly and has thus escaped notice. It no doubt arrived some time in the past, when seeds of *Erythrina Indica* or some other species were imported.

Records of Introduction of Beneficial Insects into the Hawaiian Islands.

BY O. H. SWEZEY.

(Presented at the meeting of November 2, 1922.)

Apparently the first beneficial insect purposely introduced into Hawaii was the lady beetle (*Novius cardinalis*), which is an enemy of the cottony cushion scale (*Icerya purchasi*). This was introduced from Australia in 1890 (probably via California) by Mr. Albert Koebele, who was engaged at that time in introducing beneficial insects into California to attack their orchard pests.

Since that time, there have been many species of beneficial insects successfully introduced into Hawaii, from various parts of the world, and by several institutions here. Mr. Koebele was engaged for this work in 1893. Between that time and 1904 many valuable lady beetles were introduced, also parasites of scale insects. In 1904 the Experiment Station of the Hawaiian Sugar Planters' Association began introducing parasites for the sugar-cane leafhopper, and has continued the work of introducing beneficial insects for one insect pest or another ever since. The Territorial Board of Agriculture and Forestry has also been active in this line of work; the United States Experiment Station and the Honolulu office of the United States Bureau of Entomology have also had a share in this important work.

The records of these introductions are very scattered, and in some cases very obscure, possibly entirely lacking in many cases. Herewith an attempt is made to put together for convenient reference the records of all successful introductions, so far as they could be found. They are grouped according to the various purposes for which they were introduced. The date of introduction is given, so far as known, the country from which introduced, and the particular pest on which it preys.

Lady Beetles Preying on Scale Insects, Mealy-Bugs, Etc.

1890. *Novius cardinalis* Muls. From Australia via California. On cottony cushion scale.

? [1] *Novius koebelei*. From Australia via California. On cottony cushion scale.

1894. *Cryptolaemus montrouzieri* Muls. From Australia via California. ? On mealy-bugs.

1894. [2] *Rhizobius ventralis* Erich. From Australia via California. On mealy-bugs.

? [1] *Cryptogonus orbiculatus* Gyll. Japan. On mealy-bugs.

1895, 1906, 1914. *Nephus* sp. near *bipunctatus* Kugel. Japan, South China, Philippines. On mealy-bugs.

1894. *Orcus chalybaeus* (Boisd.). Australia. Diaspine scales,

1894. *Serangium maculigerum* Blkb. Australia. Diaspine scales.

? *Lindorus lophanthae* Blaisd. California. Diaspine scales.

1895. *Chilocorus circumdatus* Schon. South China. Diaspine scales.

1895. *Sticholotis punctatus* Crotch. China, Japan. Diaspine scales.

1895. [3] *Pentilia nigra* Weise. China, Japan. Diaspine scales.

1908. *Azya luteipes* Muls. Mexico. Lecaniinae.

1908. *Hyperaspis jocosa* (Muls.). Mexico. *Orthezia*.

1922. *Curinus coeruleus* Muls. Mexico. *Pseudococcus nipae*.

1922. *Hyperaspis silvestrii* Weise. Mexico. *Pseudococcus nipae*.

1922. *Nephus* sp. Mexico. *Pseudococcus bromeliae*.

1922. *Diomus* sp. Mexico. Mealy-bugs.

1922. *Diomus* sp. (four-lined). Mexico. Mealy-bugs.

Coccid Parasites.

1894. ? *Aspidiotiphagus citrinus* Craw. China, Japan. On diaspine scales.

1905. *Scutellista cyanea* Motsch. California. *Saissetia nigra*.

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[1] Abundant in 1897, but later disappeared.

[2] The lady beetle introduced under this name, and for a long time considered as such, has recently been shown by Mr. Timberlake to be a species of *Lindorus*.

[3] Recorded as introduced, but this name is used by Koebele incorrectly, and the species supposedly introduced, although established, is as yet undetermined.

1908. [4] *Comperiella bifasciata* How. Japan. Diaspine scales.
1915. *Leptomastidea abnormis* (Gir.). Sicily via California. *Pseudococcus kraunhiae.*
1922. *Pseudaphycus utilis* Timb. Mexico. *Pseudococcus nipae.*
1922. *Coelaspidia osborni* Timb. Mexico. *Pseudococcus calceolariae.*

It is probable that many of the other parasites established in the Hawaiian Islands on introduced Coccids are some of those that were purposely introduced, but on account of their identity not being known at the time of introduction definite records are lacking.

Lady Beetles Preying on Plant Lice.

1893. [5] *Coccinella californica* Mann. California. (Disappeared after 1896.)
1894. *Coelophora inaequalis* (Fab.). Australia, Ceylon, China.
1894. *Platyomus lividigaster* Muls. Australia.
1894. *Diomus notescens* (Blkb.). Australia.
1895. *Coelophora pupillata* (Schon.). Hongkong.
Before 1894. [6] *Callineda conformis* (Boisd.). Australia. (Disappeared after 1906.)
1895. *Synonyche grandis* Thun. China, Japan. (Disappeared after 1896.)
1895. *Verania discolor* Fab. Hongkong. (Disappeared after 1896.)
1895. *Coelophora biplagiata* Swartz. Hongkong. (Disappeared after 1896.)
Scymnus, several undetermined species introduced; details of introduction not known.

Other Enemies of Plant Lice.

Syrphid flies and Chrysopa flies were reported established by Koebele in 1897. It is not known which species, nor where from, nor when introduced.

1904. *Chrysopa* sp. Australia.
1907. *Trioxys* sp.? California. Parasite on orange Aphis.
1919. *Micromus vinaceus* Gerst. Queensland.

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[4] Doubtfully established.

[5] Again introduced in 1905, but failed.

[6] Again introduced in 1904, but failed.

Enemies of the Sugar-Cane Leafhopper.

1904. *Paranagrus optabilis* Perkins. Queensland. Egg-parasite.
1904. *Paranagrus perforator* Perkins. Queensland. Egg-parasite.
1904. *Anagrus frequens* Perkins. Queensland. Egg-parasite.
1905. *Ootetrastichus beatus* Perkins. Fiji. Egg-parasite.
1906. *Haplogonatopus vitiensis* Perkins. Fiji. Parasite on nymph.
1907. *Pseudogonatopus hospes* Perkins. China. Parasite on adult.
1916. *Ootetrastichus formosanus* Timb. Formosa. Egg-parasite.
1920. *Cyrtorhinus mundulus* (Bredd.). Queensland and Fiji. Predacious on eggs.

Bruchid Parasites.

1910. *Uscana semifumipennis* Gir. Texas. Egg-parasite.
1910. *Heterospilus prosopidis* Vier. Texas. Parasite on larva.
1921. *Lariophagus texanus* Cwfd. Texas. Parasite on larva.
1921. *Urosigalphus bruchi* Cwfd. Texas. Parasite on larva.
1921. *Glyptocolastes bruchivorus* Cwfd. Texas. Parasite on larva.
1921. *Horismenus* sp. Texas. Parasite on larva.

Fruit-Fly Parasites.

1913. *Opius humilis* Silv. South Africa. On larva of *Ceratitis capitata.*
1913. *Diachasma tryoni* Cam. Australia. On larva of *Ceratitis capitata.*
1914. *Diachasma fullawayi* Silv. Africa. On larva of *Ceratitis capitata.*
1914. *Tetrastichus giffardianus* Silv. West Africa. On larva of *Ceratitis capitata.*
1913. *Dirhinus giffardii* Silv. West Africa. On pupa of *Ceratitis capitata.*
1913. [7] *Galesus silvestrii* Kieffer. West Africa. On pupa of *Ceratitis capitata.*
1916. *Opius fletcheri* Silv. India. On larva of *Bactrocera cucurbitae.*

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[7] Doubtfully established.

OTHER ENEMIES OF DIPTERA.

1906. *Eucoila impatiens* Say. Arizona. On larva of *Sarcophaga*.
1909. [7] *Bathymetis* sp. Germany. On puparium of horn-fly.
1909. *Hister bimaculatus* L. Germany. Predacious on maggots.
1913. *Muscidifurax raptor* Gir. & Sand. South Africa. Parasite on puparia.
1914. *Pachycrepoideus dubius* Ashm. Philippines. Parasite on puparia.
1914. *Spalangia philippinensis* Ful. Philippines. Parasite on puparia.
1914. *Spalangia* sp. Africa. Parasite on puparia.
1921. *Creophilus erythrocephalus* Fab. Australia. Predacious on maggots.

PARASITES OF LEAF-ROLLERS AND ARMY WORMS.

1895. *Microbracon omiodivorum* (Terry). Japan. On larva of leaf-rollers.
1895. *Chalcis obscurata* Walker. Japan. On pupa of leaf-rollers, etc.
? *Amblyteles koebelei* (Sw.). California. Army-worm parasite.
? *Amblyteles purpuripennis* (Cress.). California. Army-worm parasite.
? *Frontina archippivora* Will. North America. Army-worm parasite.

MISCELLANEOUS.

1904. *Aphanomerus pusillus* Perk. Queensland. Egg-parasite of *Siphanta acuta*.
1909. *Blastophaga psenes* (Linn.). California. Caprifier of edible fig.
1910. *Ceromasia sphenophori* Vill. New Guinea. Parasite of larva of *Rhabdocnemis obscura*.
1916. *Paranagrus osborni* Ful. Philippines. Egg-parasite of corn leafhopper.
1916. *Scolia manilae* Ashm. Philippines. Parasite of larva of *Anomala* and *Adoretus*.

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[7] Doubtfully established.

1917. *Dolichurus stantoni* Ashm. Philippines. Parasite on nymph of roach.

1921. *Ischiogonus syagrii* Ful. Australia. Parasite of larva of Australian fern weevil.

1921. *Pleistodontes froggatti* Mayr. Australia. Caprifier of *Ficus macrophylla.*

1922. *Pleistodontes imperialis* Saund. Australia. Caprifier of *Ficus rubiginosa.*

1922. *Notogonidea luzonensis* Rohwer. Philippines. Parasite of field cricket.

? *Stethorus vagans* Blackburn. Predacious on leaf-mites.

LANTANA INSECTS.

1902. *Agromyza lantanae* Frogg. Mexico. Larvae in seeds.

1902. *Thecla echion* Linn. Mexico. Larvae on flowers.

1902. *Thecla agra* Hew. Mexico. Larvae on flowers.

1902. *Crocidosema lantana* Busck. Mexico. Larvae in flower clusters.

1902. *Platyptilia pusillidactyla* Walk. Mexico. Larvae in flower clusters.

1902. *Cremastobombycia lantanella* Busck. Mexico. Leaf-miner.

1902. *Teleonemia lantanae* Distant. Mexico. Leaf-bug.

1902. *Eutreta xanthochaeta* Aldrich. Mexico. Stem gall-fly.

ANNUAL ADDRESS.

Notes on the Mealy-Bugs of Economic Importance in Hawaii.

BY DAVID T. FULLAWAY.

(Presented at the meeting of December 7, 1922.)

These notes have resulted from a study of our common dactylopiine species[1] made preparatory to handling the material collected by H. T. Osborn in Mexico, which, during the past few months, has been chiefly mealy-bug enemies. Mr. Osborn's investigations in this field began primarily with the definite purpose of introducing and acclimatizing the coccinellid beetle *Hyperaspis silvestrii*, observed by Koebele and Silvestri to be an important enemy of *Pseudococcus nipae* in Mexico. The pursuit of this object led him gradually to widen the scope of his work, with the result that we have received from him numerous and sizable shipments of four species of coccinellid beetles, in addition to *Hyperaspis silvestrii*, and five or six internal parasites of mealy-bug species existing here. While the extent of Mr. Osborn's achievement in Mexico could scarcely be anticipated, the results amply justify a belief which I have held for some years; namely, that, in view of the comparative scarcity of some of the species existing here which are attacked by internal parasites, it should be possible to ameliorate present conditions with regard to other species unchecked by internal parasites, by seeking out such enemies as exist and introducing them here. I believe all of the economically important mealy-bug species found here have been brought to the islands in the course of time with plants. In some cases, one or other of their enemies have been brought with them, or have since been purposely introduced. Undoubtedly the present situation with regard to mealy-bug infestations represents a great improvement over the

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[1] According to list following. *Eriococcus araucariae* and species of *Asterolecanium* omitted from consideration, as *Eriococcus* and allies and *Asterolecanium* and allies are now viewed as separate subfamilies. The affinities of *Phyllococcus* also being in question, that genus has not been included in the present discussion either.

conditions prevailing, say twenty or twenty-five years ago, and much of this improvement is due to the excellent work done by the numerous species of coccinellid beetles introduced by Koebele from the Orient and Australia. But with regard to most of the species, and particularly those infesting crop plants, the present situation is far from being satisfactory, and a remedy should be sought in the way I have indicated. Mr. Osborn's work in Mexico furnishes an example of what can be done.

In carrying out an idea of this sort, a primary concern is to learn the center of distribution of the noxious species, and to that end all the data bearing on this point should be collected and carefully considered. Unfortunately, in some cases, the available data is valueless for the purpose mentioned. In that contingency, the only recourse is to investigate one zoological region after another until a fruitful one is found. In other cases, however, the way is clearly marked.

The point is here made that conversely to the proposition above stated, the presence of several or numerous parasites of a noxious species in any definite region is *prima facie* evidence on the origin or center of distribution of the species. Such evidence is now available for three of our species, and Mr. Timberlake has pointed out the weight of evidence with regard to two others.

Another important consideration in an undertaking of this kind is ability to recognize any particular species in hand. The main purpose of my study was to familiarize myself with the different species, so that the material sent in could be handled with safety and utilized to the greatest advantage. After gaining a thorough knowledge of the species, it was easy to formulate the keys here given to the subfamily, genera, and species under consideration, which may be useful to others working on this group of insects. Thanks to the careful and painstaking work of Ferris, Morrison, and others, who have pointed out the greater dependability of morphological characters, the distinction of mealy-bug species now rests upon much surer ground than formerly. With regard to the keys just mentioned, I will say that I have tried, in the case of species, to combine morphological characters in a table with the more obvious distinguishing marks or traits. I have also sought to indicate my views as to the relationships of the different genera and species. And where I could facilitate access to species in nature or in the literature by giving data or references I have done so. A few drawings are furnished to illustrate obscure points in the descriptions.

According to the latest classifications of the Coccidae, the subfamilies Monophlebinae, Ortheziinae, Eriococcinae, Dactylopiinae, Asterolecaniinae, Coccinae, and Diaspinae include all the Hawaiian species, and the following key will indicate the distinction of the species under consideration.

KEY TO SUBFAMILIES.

1. Body covered by a firm waxy scale separable from the insect and made up in part of larval exuviae; legs lacking; posterior end of the abdomen pygidiform .... *Diaspinae*
   Not so 2
2. With two or more pairs of abdominal spiracles, anal ring placed dorsally some distance before the body apex and not at the end of a cleft 3
   Without abdominal spiracles, anal ring placed at or close to the body apex, or if dorsally, at the anterior end of a cleft in the body... 4
3. With not more than two pairs of abdominal spiracles, anal ring without setae .... *Monophlebinae*
   With seven pairs of abdominal spiracles, anal ring with setae. *Ortheziinae*
4. Body usually with the posterior extremity cleft, anal opening at the anterior end of this cleft and covered by a pair of triangular plates; these characters more or less obscured in the species that are covered with wax.............................. *Coccinae*
   Posterior extremity of body not cleft, sometimes more or less indented, but never with plates over anal opening................. 5
5. Body margin with a row of eight-shaped gland pores; legs wanting; antennae very much reduced, minute.............. *Asterolecaniinae*
   Not so 6
6. Dorsal ostioles present.............................. *Dactylopiinae*
   Dorsal ostioles absent.............................. *Eriococcinae*

The group Dactylopiinae as delimited for the purposes of this paper comprises the following species, listed under their respective genera according to the author's conception of their affiliation. The synonymy is also indicated.

Genus Antonina Signoret.

bambusae (Mask.).

vide Morrison, Pr. U. S. N. M., 60, p. 55 (1922); Green, Coccidae of Ceylon, Pt. V (1922).

Sphaerococcus bambusae Mask. N. Z. Trans., XXV, p. 237 (1892).

Chaetococcus bambusae (Mask.) Ckll. Rev. Mus. Paul., III, p. 501 (1898).

Kermicus bambusae (Mask.) Ckll. Entomologist, XXXII, p. 93 (1899).

crawi Ckll.

Psyche IX, p. 71 (1900); Kuwana, Pr. Cal. Ac. Sci. 3, III, p. 57 (1902); Ehrhorn Pr. H. E. S., III, p. 236.

indica Green.

Mem. Dep. Ag. India, II, 2, p. 27 (1908) Fig.

Antonina boutelouae auct. *vide* Ehrhorn, Pr. H. E. S., III, p. 282.

Genus Geococcus Green.

radicum Green.

Ent. Mo. Mag., XXXVIII, p. 262 (1902).

Ripersiella rhizophilla Fullaway & Kotinsky (*sine* descr.) Ent. News, XXI, p. 49 (1910); Fullaway, Pr. H. E. S., II, p. 108.

Genus Ferrisia *Novum.*

virgata (Ckll.).

Dactylopius virgatus Ckll. Entomologist, XXVI, p. 178 (1893).

Pseudococcus virgatus (Ckll.). Kirkaldy, F. H., III (2), p. 103 (1902).

Genus Trionymus Berg.

sacchari (Ckll.).

Dactylopius sacchari Ckll. Jn. Trin. Nat. Club, II, p. 195 (1895).

Pseudococcus sacchari (Ckll.). Ehrhorn Pr. H. E. S., III, p. 1 (1913).

Pseudococcus calceolariae auct. Ehrhorn loc. cit.

calceolariae (Mask.).

Dactylopius calceolariae Mask. N. Z. Trans. XI, p. 218 (1878).

Pseudococcus calceolariae (Mask.). Kirkaldy F. H., III (2), p. 103.

Pseudococcus sacchari auct. *vide* Ehrhorn loc. cit.

Pseudococcus saccharifolii auct. Ferris in litt.

lounsburyi (Brain).

Pseudococcus lounsburyi Brain An. Ent. Soc. Am., V, p. 179 (1912), Figs.

insularis Ehrhorn.

Pr. H. E. S., III, p. 244 (1915).

Genus Pseudococcus Westwood.

nipæ (Mask.).

Dactylopius nipae Mask. Tr. & Pr., N. Z. Inst., 1892, XXV, p. 232 (1893), Figs.

filamentosus (Ckll.).

Dactylopius filamentosus Ckll. Entomologist, XXVI, p. 268 (1893).
Pseudococcus vastator (Mask.) Kirkaldy F. H., III (2), p. 103 (1902).

kraunhiae (Kuwana).

Dactylopius kraunhiae Kuw. Pr. Cal. Ac. Sci. (3), III, p. 55 (1902), Figs.
Pseudococcus citri auct.

longispinus (Targ.).

Dactylopius longispinus Targ. Cat., p. 32 (1869).
Pseudococcus adonidum (Linn.). Kirkaldy F. H., III (2), p. 103 (1902).

brevipes (Ckll.).

Dactylopius brevipes Ckll. Entomologist, XXVI, p. 267 (1893).
Pseudococcus bromeliae auct. *vide* Science n. s., LV, 1422, March 31, 1922, and LVI, 1446, September 15, 1922.

Genus Tylococcus Newst.

giffardi Ehrhorn.

Pr. H. E. S., III, p. 243 (1915).

Genus Ripersia Sign.

palmarum Ehrhorn.

Pr. H. E. S., III, p. 245 (1915).

KEY TO GENERA.

1. Abdomen of the adult female posteriorly invaginated, the anal ring at the inner end of this invagination.................. *Antonina*
   Not so 2
2. Anal lobes very prominent, chitinous, with a stout sabertooth-like spine at extremity of each lobe and two pairs of chitinous hooks on the dorsum, one pair on the head and the other immediately cephalad of the anal ring............................ *Geococcus*
   Not so 3
3. Anal cerarii with two cerarian spines.......................... 4
   Anal cerarii with more than two cerarian spines.................. 6
4. With tubular wax pores in clusters about margins of segments, particularly at caudal end.......................... *Ferrisia* n. g.
   Not so 5

5. With circular wax pores numerous and closely crowded in derm of caudal segments, numerous dorsal setae, few pairs of cerarii and these on the distal segment or segments of abdomen, body usually elongate .... *Trionymus*
With circular wax pores less numerous and closely crowded in derm of caudal segments, fewer dorsal setae, many pairs of cerarii, usually seventeen to nineteen, distributed on the abdominal, thoracic, and cephalic segments, body usually of oval form. *Pseudococcus*

6. Antennae eight-segmented, body with marginal tumescences. *Tylococcus*
Antennae six-segmented, body without marginal tumescences *Ripersia*

Genus Antonina Signoret.

Pseudococcine forms without legs in the adult female; with the antennae in the adult female reduced to mere stubs; without recognizable cerarii; with the posterior end of the body more or less invaginated, this invagination forming a tube at the inner end of which is the anal ring. Spiracles very large and conspicuous. Circular, multilocular pores present on the dorsum.

Type of the genus *Antonina purpurea* Sign.

Three species of this genus are commonly found in Hawaii, two on bamboos grown for ornamental purposes, and one on the common lawn and pasture grass *Cynodon dactylon*. They are of no great significance economically.

The species may be distinguished by use of the following key:

1. Entire derm heavily chitinized; large; 8 mm. long.......... *bambusae*
Less heavily chitinized, the derm thick only on posterior abdominal segments; smaller 2
2. Abdominal spines fairly stout; body oval (on bamboo)......... *crawi*
Abdominal spines very slender; body rotund (on Bermuda grass). . *indica*

Morrison (Pr. U. S. N. M., 60, p. 56) describes and figures *bambusae*, and it is on the basis of his comparisons (p. 58) that the species is included in *Antonina*. Green gives excellent figures of *indica* and *bambusae* and describes the latter in considerable detail in Part V of the Coccidae of Ceylon.

Genus Geococcus Green.

Pseudococcine form with the antennae set very close together at the front of the head; six-segmented, the terminal segment large; legs present. Body terminating in a pair of prominent anal lobes with a stout sabertooth-like spine at the extremity of each lobe. Derm with trilocular pores. Anal ring setiferous.

Type of the genus *Geococcus radicum* Green.

A monotypical genus described from Ceylon and, according to Green (loc. cit.), not known elsewhere except in Hawaii. Mr. Ehrhorn, however, has called my attention to the similarity of Kuwana's *Ripersia oryzae* (Bul. Imp. Cent. Ag. Exp. Sta., 1, p. 186, 1907), described from Japanese material collected on the roots of rice and other plants, and in Ent. Mo. Mag., LIX, p. 18, January, 1923, the species is said to occur in the West Indies. The species is fairly common in Hawaii, in a more or less complete pulverulent white waxy sac on the roots of plants (koa, mango, nut-grass, etc.), but of no great significance economically. A good figure and description of the insect is furnished in a paper by the author published in Proc. Haw. Ent. Soc., II, p. 108. Green, in his recently published Pt. V of the Coccidae of Ceylon, also gives excellent figures and redescribes the insect in much detail. No mention, however, has heretofore been made of the chitinized strip of the derm at the margin of the penultimate segment extending inward obliquely and bearing two prominent setae. It is quite plain in stained specimens. Green's figures also fail to show the accessory spines in the adult, although present in the nymph. It is possible that the Hawaiian forms so far observed have all been immature.

Genus Ferrisia *Novum.*

Characterized for the reception of the species hitherto passing under the name of *Pseudococcus virgatus*. A pseudococcine form without a tooth or denticle on the face of the tarsal claw and with eight-segmented antennae, but differing from typical species of *Pseudococcus* by having only a single pair of cerarii, situated on the anal lobes, and by the possession of numerous peculiar wax ducts, which are unusually large and have their mouths surrounded by a small chitinized area bearing one to four small setae.

Type of the genus *Pseudococcus virgatus* (Ckll.).

This is a tropical species with a wide distribution. The facts with regard to this so far elicited have warranted Timberlake's stating that it points to Oriental origin. The species is treated by Ferris in an article on Mealy-Bugs in Jn. Econ. Ent., XII, p. 297, where the fact in regard to its aberrancy is plainly stated. Ferris describes the morphological characteristics and figures the important distinguishing characters. Morrison in his paper on the Philippine Non-diaspine Coccidae (Phil. Jn. Sci., 17, 2, 1920) and Green in his Coccidae of Ceylon, Pt. V, also figure the essential characters of this species. The latter author gives a rather poor illustration of the insect as it appears in nature.

Genus Trionymus Berg.

Pseudococcine forms with circular wax pores numerous and closely crowded, particularly in the derm of caudal segments; with numerous dorsal setae and few cerarii. Tarsal claw without a denticle and antennae of adult female seven or eight-segmented.

Type of the genus *Trionymus perrisii* (Sign.).

Four species referable to this genus are commonly found in Hawaii, two on sugar-cane, the other two on lilies and Bermuda grass respectively. The species commonly known as the Pink Mealy-Bug, formerly referred to as *Pseudococcus calceolariae* and now believed to be Cockerell's *P. sacchari,* is always present behind the leaf-sheath on sugar-cane, and usually the infestation is extensive. It is a pest of considerable economic importance. The legs, antennae, and certain morphological characters have been figured by Morrison (Phil. Jn. Sci., 17, 2, 1920). The species, formerly misidentified as *P. sacchari* and *P. saccharifolii* but now believed to be Maskell's *calceolariae,* has not heretofore been fully characterized or figured. A brief diagnosis follows, illustrated by drawings:

Trionymus calceolariae (Maskell).

In life.—Concealed beneath the sheathing bases of the leaves of its host, surrounded by masses of wax. It appears slenderer and less rotund than either of the other two species of mealy-bugs occurring in the same situation, and the body color is grayish rather than pinkish, as in those species. The filaments of wax from the penultimate and anal lobes are heavy; and there are also four or five finer filaments cephalad of these on either side. The dorsal covering is mealy and rather light. Oviparous, the ovisac loose and fluffy. Color when heated in KOH lilac, a rose tint being meanwhile imparted to the liquid. The species is less prevalent than either of the other two, presumably on account of an extensive parasitism.

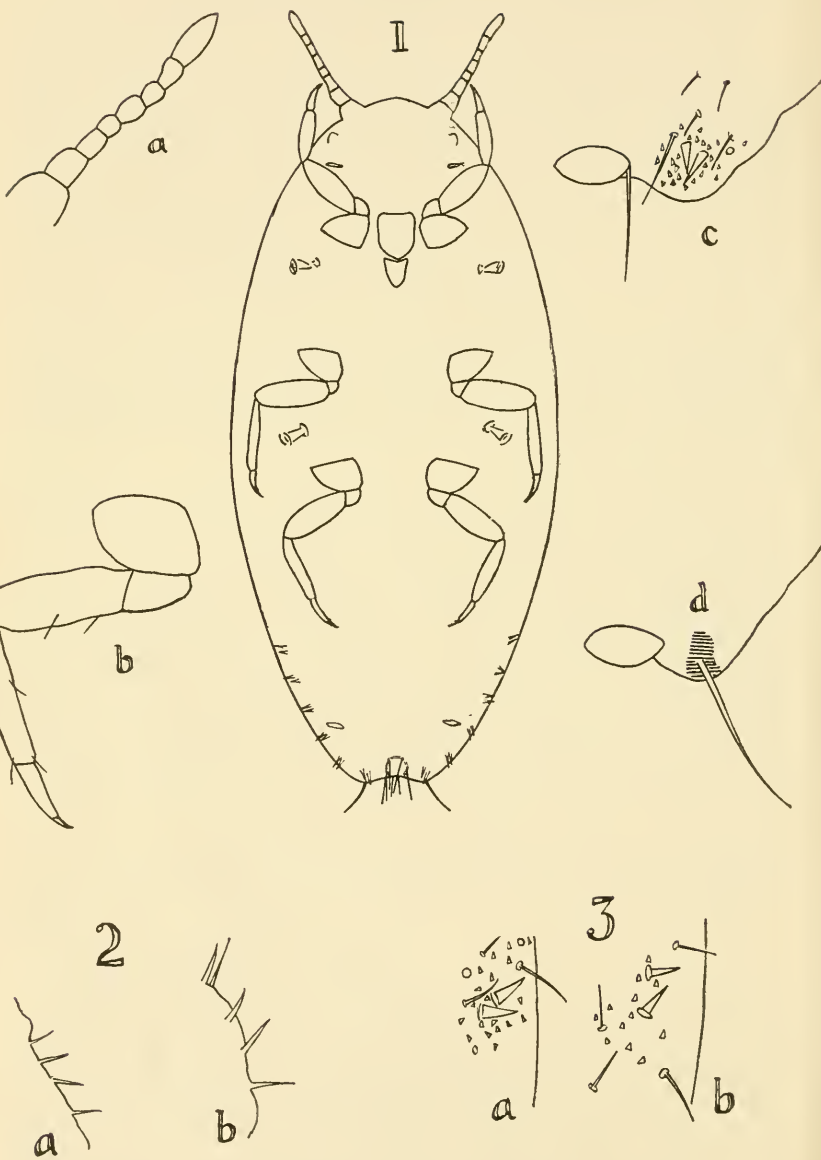
Morphological characteristics.—About twice as long as wide, legs and antennae well developed; i. e., fairly long and thick. Antennae seven or eight segmented, apical segment the longest, one and two stout, second next to apical segment in length and considerably longer than first, though scarcely more than half as wide; third shorter and narrower; fifth, sixth, and seventh (or fifth and sixth in seven-segmented specimens) subequal, fourth smaller. Anal lobes and anal ring fairly well developed. Six pairs of cerarii at the caudal end of body, only the anal lobe pair well developed, the others decreasing in size as they progress toward anterior end of body, and all without chitinizations, but with triangular pores grouped about them fairly closely and accompanied by auxiliary setae. A triangular chitinization (weakly developed in some specimens) on the ventral side of the anal lobe. Anal lobe setae long and fairly stout, somewhat longer and stouter than the anal ring setae. Derm with many triangular pores, small tubular ducts without raised rim about the mouth, and large numbers of multilocular pores, particularly at caudal end of body. Dorsal body setae fairly numerous, particularly so on the head.

Authentication. Authenticated by Ferris, who has examined specimens sent to Green by Maskell himself.

The species heretofore passing under the name of *Pseudococcus lounsburyi* is a pest on lily bulbs, and affects to some extent the growing plants. It would be of considerable importance economically if lilies were more extensively cultivated here than they are. Brain's description and figures of the insect (loc. cit.) are ample. I have, however, figured the anal lobe cerarii of this and the grass-infesting species, *insularis*, to illustrate morphological distinctions referred to in the following key.

KEY TO SPECIES OF TRIONYMUS.

1. Form short oval, width, considerably more than half the length (on sugar-cane and rice) .... *sacchari*
   Slenderer, width hardly more than half the length 2
2. With six pairs of cerarii on the six posterior abdominal segments (on sugar-cane) .... *calceolariae*
   With only one or two pairs of cerarii on the ultimate or ultimate and penultimate segments 3
3. With two pairs of cerarii and numerous wax pores (about twenty-five) closely grouped around cerarian spines on anal lobe (on lilies). *lounsburyi*
   With only one pair of cerarii, the anal lobe pair, wax pores around the cerarian spines fewer, not more than twelve, and less closely placed (on Bermuda grass) .... *insularis*



Trionymus calceolariae.

Genus Pseudococcus Westwood.

Pseudococcine forms with triangular wax pores in the derm predominating over those of the circular type; with many cerarii, usually seventeen to nineteen pairs, distributed among the abdominal, thoracic, and cephalic segments. Tarsal claw without a denticle and antennae of adult female seven or eight segmented.

Type of the genus *Pseudococcus longispinus* (Targ.).

As limited above, the genus comprises but five species in Hawaii, all of which are agricultural or horticultural pests of considerable economic importance and are consequently treated *in extenso*.

The species may be distinguished by use of the following key:

1. Derm with dorsal rows of spines, besides the marginal cerarian spines, the latter toward the middle of the body tending to become widely separated 2

   Derm without dorsal rows of spines 3

2. Cerarian spines short and stout, the three pairs of the marginal series in front of the anal lobe pair widely separated.

   Usually occurring individually; ovoviviparous, therefore never developing an ovisac; dorsal secretion in rows of small granular masses, lateral filaments subequal, cylindrical; derm dark red, becoming purple madder when boiled in KOH; wide range of host plants, but commonly found on guava, avocado, palms, Ficus carica, Ficus bengalensis, Sterculia urens, Asparagus spp., mulberry .... *nipae*

   Cerarian spines longer and more slender, the pairs immediately in front of the anal lobe pair close together.

   Usually occurring in clusters, under cover of densely matted yellowish white wax; the species is oviparous and this covering is the ovisac; eggs purplish; integument shining black, becoming violet carmine when boiled in KOH; secretion heavy,

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Fig. 1. *Trionymus calceolariae* (Mask.) a, antennae; b, leg; c, anal lobe showing cerarii, triangular pores, and auxiliary setae; d, anal lobe, ventral side, showing triangular chitinization.

Fig. 2. *Antonina spp.* abdominal spines; a, *indica*; b, *crawi*.

Fig. 3. *Trionymus spp.* Anal lobe cerarii, triangular wax pores, and auxiliary setae; a, *lounsburyi*; b, *insularis*.

lateral filaments so wide they appear coextensive around margin of body, which is elevated from its base by cushion of waxy filaments, dorsal secretion appearing as four heavy double knob-like masses on each side and some finer filaments extending laterally behind these. Wide range of host plants, but commonly found on citrus, leguminous plants, cotton, hibiscus, Clerodendron squamatum .... *filamentosus*

3. Cerarii without auxiliary setae, except in the last two abdominal pairs; eighteen pairs of cerarii, each with two spines, filiform at apex, those of the anal lobe cerarii longest, with scattered pores and two or three auxiliary setae, ventral surface of anal lobe with a prominent narrow chitinized streak extending inward obliquely from the base of the large seta, the latter about a third to a half longer than the anal ring setae.

   In life dull brownish yellow, dorsal secretion of wax light, giving body a grayish tinge, a dark median longitudinal streak often apparent; color when boiled in KOH carmine; marginal filaments short and approximately equal in length, those from anal lobe a little longer; oviparous, egg sac formed posteriorly and somewhat spherical in shape, eggs yellow. Wide range of host plants, but commonly found on mango, crotons, pomegranate, Ficus bengalensis (aerial roots), Calathea...*kraunhiae*

   Cerarii with auxiliary setae................................. 4

4. Anal lobe and penultimate cerarii strongly chitinized, seventeen pairs of cerarii, the first three or four pairs with three or four conical spines, the remainder with two, these increasing in size gradually toward posterior end of body, penultimate pair and anal lobe pair much larger, the latter being extremely stout, all accompanied with numerous pores which are concentrated into a crowded circular area about spines in the case of anal lobe and penultimate cerarii. Ventral side of anal lobes with a large triangular chitinized area, apex directed forward, a narrow thickening along median edge. Anal lobe setae shorter and more slender than anal ring setae.

   In life dull yellowish brown, form long oval, dorsal secretion of wax light with some short filaments, giving body a farinose to grayish tinge; marginal filaments unusually long, lateral filaments half body width, those from anal lobes as long as body, penultimate pair stouter and only half as long; body elevated from its base by cushion of waxy filaments, but ovoviviparous, therefore no egg sac formed; color when boiled in KOH becoming purple lake. Wide range of host plants and particularly in glass-houses on maiden-hair fern, ornamental species of Asparagus, etc.................. *longispinus*

   Anal lobe cerarii weakly chitinized at most, penultimate pair not chitinized, seventeen pairs of cerarii, all with numerous pores, first three, the penultimate and the three or four pairs anterior to the penultimate pair usually with three or four spines, those of the anal lobe the largest, no chitinized areas about any of the cerarii, although chitinization is faintly indicated about anal lobe cerarii. Ventral side of anal lobes with quite large chitinized area extending in from the base of the anal lobe setae; anal lobe and anal ring setae nearly equal, one and one-half times diameter anal ring.

In life salmon pink, form oval to short oval, fairly convex, dorsal secretion of wax fairly abundant, hiding the color of the derm; marginal filaments not very long (less than one-fourth width of body) and more or less uniform in length excepting the filaments from the anal lobes and those immediately anterior to them, which grade posteriorly from the length above stated to nearly the full length of the body in the case of those of the anal lobes. Beneath this pair are two short plate-like filaments and some fluffy wax, occasionally a drop of honey-dew. The species is negatively phototropic. It is ovoviviparous, therefore no egg sac is produced. Always present on pineapples, sugar-cane, and bananas, and often found on other plants, particularly on sisal, soursop, and on the roots of cannas, nut-grass, etc. *brevipes*

Pseudococcus brevipes (Cockerell).

I have accepted Professor Cockerell's suggestion to use the above name for the common species on pineapples, bananas, etc., which has apparently now become widely distributed with the transference of plants from one region to another in the interest of agricultural development. Secretive in habit, it could be overlooked without fault of anyone on plants in transit from one country to another, and this habit has probably aided its dissemination.

The species appears to be partial to bromeliaceous and allied plants, and, in view of the discovery of several internal parasites of it in Central and South America, I consider it indigenous in the tropical portion of the American continent. It does not seem to flourish outside the tropics.

The species (under the name *bromeliae*) is treated by Ferris in a paper entitled "Observations on Some Mealy-Bugs" in Jn. Econ. Ent., XII, p. 296, and a figure given of the distinguishing morphological characters. Ferris established the identity of our species by including it with specimens from Florida and the West Indies, which Cockerell has stated are identical with *brevipes*. Morrison (loc. cit.) and Green (Pt. V, Coccidae of Ceylon) also figure the morphological characteristics of the species (under the name *bromeliae*).

Ehrhorn considers that Kuwana's *ananassae* is probably the same species.

Pseudococcus nipae (Mask.).

This is another species believed to belong to the tropics of the American continent, although now widely spread through the transference of ornamental plants from one region to another. The belief just mentioned is based on the presence of numerous enemies of this species in Mexico, some of which appear to be rather strict. As already stated, the species is a serious agricultural and horticultural pest, and the Hawaiian Government has recently introduced three species of coccinellid beetles and three internal parasites (two encyrtids and one scelionid) to secure a measure of relief from its attacks on fruit trees and ornamental plants.

The species is treated by Ferris in a publication on "The California Species of Mealy-Bugs" in the Stanford University series, p. 49, and a figure given of the penultimate and anal lobe cerarii and the ventral side of the anal lobe showing the peculiar character of the chitinization and grouping of pores.

Pseudococcus filamentosus (Cockerell).

This is another tropical species now widely distributed, probably on citrus stocks or scions, as it affects citrus very generally and has proved a great hindrance to citrus culture in Hawaii, causing malformation of the terminal growth. According to Koebele it gained entrance to Hawaii about 1891, from Japan. It also affects leguminous plants generally, and in Cairo, Egypt, caused serious injury to leguminous shade-trees in 1909. At that time it was the subject of much study and investigation, which was afterward reported upon in a paper by F. C. Willcocks, entomologist to the Khedevial Agricultural Society, published in the Bull. Ent. Res., I, p. 121. The species was considered as new and was so described by Newstead and Willcocks under the name *Dactylopius perniciosus*, but Kränzlin, in 1913, in describing a similar infestation at Dar-es-Salaam (see Rev. Appl. Ent., II, p. 146), refers the Egyptian and the Tanganyika insect, rightly I believe, to *filamentosus*.

Newstead and Willcocks (loc. cit.), Robinson (Phil. Jn. Sci., XII D, p. 8), and Ferris (Coccidae of Lower California, Stanford U. Pubs. Biol. Ser., I, 2, p. 83) have all described or figured structural details of this species. The account of the first-mentioned authors is particularly full and complete. In this account the authors make the statement: "Small parasitic Hymenoptera belonging to the family Chalcididae appear to play a very important role in the natural control of this pest. Three members of this family have been reared from the mealy-bug." This parasitism of the species in Africa by Chalcids has been confirmed by E. W. Rust, field entomologist of the California State Department of Agriculture, who reared parasites from it in South Africa. The presence of parasites of this species on the African continent and their absence elsewhere leads me to believe that the species is indigenous to that continent. The introduction of these parasites at Hawaii would be a valuable service, and if their establishment could be secured, they would undoubtedly help materially in the control of *P. filamentosus*, which now rests entirely on the work of the polyphagous predators, *Cryptolaemus montrouzieri*, *Scymnus bipunctatus*, and *Gitonides perspicax*.

Morrison (loc. cit.) also figures the leg, antennae, and certain morphological features of this species, and the present author in Bul. 18, Hawaii Experiment Station, illustrates its appearance in nature.

Pseudococcus kraunhiae Kuwana.

The distinction between *Pseudococcus kraunhiae* and *Pseudococcus citri* is made on the basis of very slight differences. Ferris, however, believes the species can be discriminated in California, and the morphological characteristics of the Hawaiian form, as judged by his standards, point to its identity with the former species rather than the latter. Timberlake brings additional evidence to bear on the question by claiming a biological dissimilarity between the Hawaiian mealy-bug and what passes for *citri* in California. He says: "Whatever species ours is, it it constantly parasitized by the encyrtid *Pauridia peregrina*, while the species in California which goes under the name of *citri* is apparently not receptive to this parasite." Possibly both species are present in Hawaii as well, but this contingency has never been satisfactorily demonstrated. If, as held by some, *kraunhiae* and *citri* are synonymous, the Hawaiian insect represents a very widely spread and polyphagous species. On the other hand, the distribution of typical *kraunhiae* is very limited, it being confined to Japan and California outside of Hawaii. Once it was recorded from quarantined plants in New Jersey, but the record lacks confirmation. The Hawaiian insect is heavily parasitized by *Leptomastidea abnormis* as well as by *Pauridia peregrina* and is the prey also of other polyphagous mealy-bug enemies. It is, therefore, of much less significance as an agricultural and horticultural pest than some of the other mentioned species, although occasionally a heavy infestation will be observed.

Ferris has described the morphological characteristics of both species in his paper on "The California Species of Mealy-Bugs" (loc. cit.), and figures the distinguishing characters. A good illustration of *P. citri* as it appears in nature, which might well pass for *P. kraunhiae* also, is found in connection with Sanders' paper on "The Identity and Synonymy of Some of Our Soft Scale Insects" in Jn. Econ. Ent., II, p. 428.

Pseudococcus longispinus (Targ.).

This is another tropical or subtropical species of wide distribution and with a wide range of host plants. It is particularly a greenhouse pest, flourishing most luxuriantly in a warm, still, moist atmosphere. Ferris treats this species in his paper on "The California Species of Mealy-Bugs" (loc. cit.), describing the morphological characteristics and giving figures of the important characters. Sanders, in a paper on "The Identity and Synonymy of Some of Our Soft-Scale Insects" (loc. cit.), gives an excellent illustration of this mealy-bug as seen in nature. Green also describes and figures the species in Pt. V of the Coccidae of Ceylon.

Genus Tylococcus Newst.

Pseudococcine forms without a tooth or denticle on the face of the tarsal claw and with eight-segmented antennae, well developed anal ring bearing six long stout setae, and marginal tumescences corresponding to the cerarii, each of which consists of a triangular or scutiform chitinization beset with a number of stout spines, auxiliary setae, and triangular wax pores, the caudal pair the largest and provided each with a very long seta. Derm with numerous triangular pores, a few circular pores, and setae in rows and patches.

Type of the genus *Tylococcus madagascariensis* Newst.

Only one species referable to this genus is found in Hawaii, viz., *T. giffardi* Ehrhorn. It infests species of *Pandanus*, but without very serious consequences. The species is included because *Pandanus odoratissimus*, which grows wild in Hawaii, is the source of the lahala woven fabrics. Several other forms are cultivated as ornamental plants. The type species is illustrated by Newstead in the original publication, but the figure showing the outline of the body is believed to exaggerate the degree of marginal tumescence.

Genus Ripersa Sign.

Pseudococcine forms with six-segmented antennae in the adult female, without a tooth or denticle on the face of the tarsal claw, with marginal cerarii bearing two or more spines, at least on the caudal segments, and with anal ring bearing six setae. The derm with numerous triangular pores and some circular ones.

Type of the genus *Ripersia corynephori* Sign.

This genus has only one accredited species in Hawaii, viz., *Ripersia palmarum* Ehrhorn. It infests a variety of palms, including the so-called traveler's palm (Ravenalla), but without very serious consequences. It is mentioned here because it is commonly encountered on ornamental palms, where it is difficult to extirpate.

Descriptions of Two New Species of Encyrtidae From Mexico Reared from Mealy-Bugs (Hym., Chalcidoidea).

BY P. H. TIMBERLAKE.

(Presented by title by Mr. Fullaway at meeting of December 7, 1922.)

The following species of Encyrtidae were discovered by Mr. H. T. Osborn in the State of Vera Cruz, Mexico, in the course of his explorations for natural enemies of mealy-bugs to introduce into the Hawaiian Islands. Of these *Pseudaphycus utilis* has become established at Honolulu, but *Coelaspidia osborni* has not been recovered as yet, although liberated in large numbers. The types are in the collection of the Hawaiian Sugar Planters' Experiment Station, and paratypes will be distributed to various museums.

Pseudaphycus utilis n. sp. Figs. 1-4.

This species has a different habitus from all other species of *Pseudaphycus* known to me, but I think that it is properly placed in this genus. It is easily distinguished from all the described species of the genus and of the closely allied genera *Acerophagus* and *Bothriocraera* by its comparatively large size, entirely hyaline wings, and the bright yellow coloration with blackish pubescence on the mesonotum. In my table of the species of *Pseudaphycus* (Proc. U. S. Nat. Mus., Vol. 50, p. 570, 1916) it runs to *graminicola*, but differs in having the face and cheeks of normal length, the coloration bright yellow, the pubescence of the mesonotum dark instead of whitish, the abdomen much shorter or hardly longer than wide, the ovipositor more briefly protruded, the wings considerably wider, etc. The species is a parasite of *Pseudococcus nipae* (Maskell) and has become established at Honolulu from material collected at Orizaba, Mexico, by Mr. Osborn in the spring of 1922.

Female. General form robust, the thorax being almost as thick dorso-ventrally as wide; head rather thick fronto-occipitally, the outline in dorsal view broadly elliptical with the occipital margin slightly and broadly emarginate at the middle, the surface strongly convex from side to side; as seen from the side the outline is triangular with the facial side about a fourth longer than the dorsal side, the angulation well rounded off; as seen from in front it is slightly wider than long, the dorsal part strongly rounded in outline, the cheeks strongly converging below toward the mouth; occiput only slightly concave, its dorsal margin acute; eyes large, broadly oval, a little broader below and not quite reaching to the occipital margin, the width of each somewhat more than a third of the total width of head; frontovertex slightly more than twice as long as wide, its sides parallel; ocelli either in an equilateral triangle or with distance between the posterior pair slightly less than the other two sides of the triangle, the anterior ocellus placed slightly behind the center of the frontovertex, the posterior pair about one-fourth their own diameter from the eyes and about twice their diameter from the occipital margin; cheeks somewhat shorter than the greatest width of eyes; the face a little longer than the cheeks, the scrobal impression moderately deep and nearly semi-circular, the scrobes proper in the form of converging lines not meeting above.

Antennae inserted far apart close to the clypeal margin; scape slender, slightly flattened but not expanded, reaching well beyond the scrobal impression of face; pedicel long and slender or about equal to the first three funicle joints and one-half of the fourth joint combined, or a little more than one-third as long as the scape proper; funicle joints gradually increasing in size distad, all somewhat wider than long, the fifth not quite twice as wide as the first; club large, oval, a little longer than the funicle, well rounded and slightly obliquely truncate at apex.

Mandibles with the two outer or ventral teeth distinct, the middle one longer and more acute, but the inner or dorsal tooth nearly rectangular. Maxillary palpi four-jointed, the joints not greatly unequal in length, the first one shortest, the apical one longest, and the third one stoutest; labial palpi indistinctly three-jointed with the middle joint very short and perhaps not always differentiated.

Thorax moderately convex above, the collar of pronotum of about the normal structure found in *Aphycus* and allies; mesoscutum twice as wide as long, without traces of parapsidal lines; axillae rather large, twice as wide as long, and meeting rather broadly at their inner tips; scutellum somewhat longer than its basal width, acute at apex, the disk strongly depressed, the lateral margins abruptly declivous and well elevated; propodeum very short medially, but longer at the sides, depressed anteriorly, but strongly declivous on posterior half, especially at the sides.

Wings reaching well beyond apex of the abdomen and moderately wide; submarginal vein with about twelve well developed setae; the marginal vein punctiform, the postmarginal somewhat longer than the marginal, but indistinct and with one moderately large seta; stigmal vein moderately long, enlarged at apex, but not slender at base as in *P. angelicus* (Howard); disk of wing uniformly pubescent, even in the basal area, the setae being considerably coarser and not so dense as in *angelicus*, the costal cell with four rows of fine setae in its basal half and with one to three rows in different parts of the apical half, the setae near apex of the cell becoming much larger; speculum very narrow next to the stigmal vein, but widening below, where it is separated by one row of setae from the hairless streak along the posterior margin, but connecting therewith by means of an arm directed toward the base of the wing. Legs rather long, especially the middle pair; middle tibiae strongly enlarged at apex; the middle tarsi stout at base and tapering toward apex, the first joint nearly as long as the four following joints combined; tibial spur stout and as long as the first joint of the tarsus.

Abdomen hardly longer than wide and much shorter than the thorax, its apex broadly rounded, the dorsum depressed and slightly concave; ovipositor briefly protruded, the exserted part about one-fifth as long as the abdomen, or about equal to the basal joint of the hind tarsi.

Sculpture throughout extremely fine and alutaceous; under high magnification the surface of the head and notum appears finely reticulate, the reticulations of the frontovertex being rather finer than the facets of the compound eyes, those of the mesonotum considerably finer still and more transverse; frontovertex also with a few larger but very shallow pin-punctures not ordinarily perceptible, the mesonotum slightly shiny and with minute setiferous punctures; basal tergites of abdomen also with extremely fine reticulations.

Head without conspicuous pubescence, the eyes practically bare, the frontovertex with fine short hairs which are not easily seen and arranged mostly along the orbits, the occipital margin of the vertex, however, with a row of about six coarser black setae; notum of the thorax, including scutellum, with rather numerous, seriately arranged, blackish setae; tegulae with an oblique row of similar setae.

General color nearly uniformly yellow, but of different shades due to post-mortem changes, varying from light cadmium to cadmium yellow or nearly orange (Ridgway), the coloration in life being bright yellow; the lower part of the face, the cheeks, underparts of thorax, and the legs somewhat paler yellow; antennae concolorous with the upper part of face, the funicle joints often considerably darker or even slightly dusky, the club contrastingly very pale yellowish or nearly white; tibiae and tarsi slightly more brownish than the base of the legs, the tip of the last joint of the tarsi dusky; a spot on the pronotum just above the neck, the narrow obliquely placed metanotal sclerite on each side of the scutellum and the center of the abdomen above more or less extensively behind the first tergite are often more or less infuscated, varying from brownish to blackish, but any or all of these marks may be faint or absent; a narrow, transverse blackish band on propodeum just tangent to the apex of the scutellum seems always to be present, but is often interrupted at the middle; the vibrissal or cercal plates of abdomen also black, and a minute dot beside each of the ocelli usually present, due apparently to pigment transfusing from the ocelli after death, as the position of dots in respect to the ocelli varies greatly; ovipositor yellow, but usually a little darker than the abdomen, the extreme apex often dusky to blackish; mandibles brown at apex; wings entirely hyaline, the veins very pale or nearly colorless.

Length of body, (0.907 to) 1.48; length of head, 0.514; width of head, 0.554; thickness of head fronto-occipitally, 0.309; width of vertex at posterior ocelli, 0.191; length of antenna, 0.804; width of mesoscutum, 0.577; length of fore-wing, 1.37; width of fore-wing, 0.582; length of protruded part of ovipositor, 0.129 mm.

Male. Very similar to the female in structure and coloration; eyes somewhat smaller, the ocelli larger, the frontovertex proportionately a little broader; scrobes proper of the face considerably wider, curved, and practically meeting above; antennae of the same general structure, but the scape is a little wider and with a distinct broad emargination on dorsal margin just beyond the middle, the club solid, much slenderer, and much more obliquely truncate from below upward; abdomen smaller or not over one-half as long as the thorax, the venter with a median fold. General color paler yellow than in the female, or about empire yellow (Ridgway), the dorsum of the thorax, however, more or less cadmium yellow, the underparts of thorax, coxae, and femora nearly Martius yellow (Ridgway); black markings on the metanotum, propodeum, and abdomen much more prominent than is usual in the female, the abdominal mark being triangular in shape and pale in the center.

Length of body, (1.08 to) 1.44; length of head, 0.455; width of head, 0.474; thickness of head fronto-occipitally, 0.266; width of vertex at posterior ocelli, 0.172; length of antenna, 0.683; width of mesoscutum, 0.530; length of fore-wing, 1.21; width of fore-wing, 0.533 mm.

Described from the following material reared from *Pseudococcus nipae* (Maskell) from the State of Vera Cruz, Mexico (H. T. Osborn): 68 females, 11 males (holotype, allotype male, paratypes), Orizaba, April and May, 1922; 8 females, 1 male (paratypes), Rio Blanco, collected in April and issuing up to May 8, 1922; 1 female (paratype), Nogales, April 7, 1922; 4 females (paratypes), El Potrero, July and August, 1922.

Type No. 1099, Hawaiian Sugar Planters' Experiment Station.

Coelaspidia new genus.

Similar in some respects to both *Chrysoplatycerus* Ashmead and *Zarhopalus* Ashmead, but differing in many details. The female differs from either of these genera in being apterous, the thorax increasing in width behind the tegulae, the pronotum very large, the mesoscutum relatively small, the scutellum longitudinally grooved on the disk, the abdomen very large with the dorsum very strongly convex at least in life. From *Zarhopalus* the female differs further in having a broad dorsal margin or fold to the scape, the flagellum much more massive, with reduction in size of the pedicel and enlargement of the club, the scutellum with an apical fascicle of hairs, etc. From *Chrysoplatycerus* it differs further in having the flagellum massively clavate, with a solid club, instead of being laminately expanded, the mandibles obscurely tridentate, the apical fascicle of hairs on the scutellum much smaller, consisting of one transverse row of setae, etc.

The males of *Chrysoplatycerus*, *Zarhopalus*, and *Coelaspidia* are very much alike, and in the absence of females might easily be considered to belong together in one genus. The habitus of all is exactly alike, and, as the best distinguishing characters are rather recondite, I offer the following table as an aid to their recognition:

1. Mandibles narrow at apex, with an acute median tooth and an angulation on each side, producing an obscurely tridendate condition; flagellum circular in cross-section, sensoria present, but not producing a rugose effect, the first funicle joint and pedicel, not greatly unequal; marginal vein no longer than thick............. 2

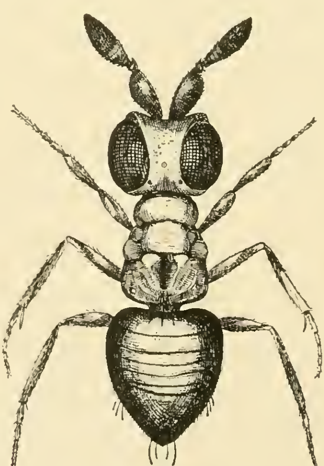
   Mandibles narrow at apex and plainly bidendate, with the inner tooth much longer than the other; flagellum oval in cross-section, densely covered with short linear sensoria, producing a marked rugose effect, the pedicel much smaller than the first funicle joint; wings very broad, strongly triangular in shape, the marginal vein about two or three times as long as thick. .*Chrysoplatycerus* Ashmead

2. Scape, excluding radicle, a little longer than the pedicel and first two funicle joints combined, and only slightly widened beneath; wings rather broad and triangular in shape, the submarginal vein not thickened apically ....*Zarhopalus* Ashmead

   Scape, excluding radicle, no longer than the pedicel and first two funicle joints combined; distinctly, although not greatly, expanded beneath and concave on the outer surface; wings of about normal breadth and not at all triangular in shape, the submarginal vein slightly, but distinctly, thickened in the distal third of its course. *Coelaspidia* new genus

Female. As compared with *Chrysoplatycerus* the head is thicker fronto-occipitally, the eyes much smaller so that the frontovertex becomes considerably wider, or about a third of the total width of the head; occiput deeply concave above, the occipital margin acutely, but not very sharply, angled; scrobal impression very deep and semi-circular, as in *Chrysoplatycerus*. Antennae similar as to the scape, but the flagellum is not laminate, it being much shorter, compressed and massively clavate, the cross-section of any part being oval, the joints all closely packed together; pedicel subtriquetrous and fully one-half as long as the funicle; the latter six-jointed, each joint much broader than long, the first much the smallest, it being considerably narrower than the apex of the pedicel, the following joints becoming successively much broader, but hardly increasing in length; club solid, somewhat greater in length and bulk than the funicle, but only slightly wider than the preceding joint, suboval in shape, the apex obliquely and roundingly subtruncate beneath. Mandibles very slender, obscurely tridentate at apex, there being a prominent, very acute median tooth flanked on both sides by a much smaller tooth, the inner or dorsal one forming nearly a right angle with the inner margin of the mandible. Palpi short, maxillary pair four-jointed, apical joint about as long as the basal three combined, acute and with long hairs at apex, the second longest of the other three joints; labial pair three-jointed, the basal joint longest and over twice as long as the second, which is shortest; apical joint blunt at apex, with shorter hairs than on maxillary palpi.

Thorax moderately robust and convex above, increasing in width behind the tegulae; pronotum large, anteriorly conical, the collar as long as the mesoscutum, its posterior margin only slightly arcuate; mesoscutum short and transverse, about twice as wide as long, its anterior corners foveate; axillae well developed, not greatly wider than long, their inner tips acute and meeting medially or nearly so, their outer sides abruptly declivous; scutellum as long as the mesoscutum, five-sided, the apex being rather broadly truncate, the sides abruptly declivous and forming a sharp margin with the disk, the latter distinctly, although not deeply, concave except at apex, and sloping backward; propodeum large, sloping obliquely backward, hardly longer at the sides than at the middle, the spiracles small and almost circular.



Coelaspidia osborni.

Wings rudimentary, reaching only to the anterior margin of the propodeum. Legs of the normal length and structure, the middle tarsi tapering toward the apex, the first joint nearly as long as the following joints combined; spur of middle tibiae a little shorter than the first joint of the tarsus; hind tibiae with two short unequal apical spurs; hind tarsi slender, the first joint about equal to the last three joints combined.

Abdomen unusually large, or fully as long as the head and thorax combined, and much wider, convex above and beneath, with the apical part of the dorsum behind the vibrissal plates often, but not always, shrunken in after death; first tergite about twice as long as the second, which, with the following, except the last, decrease successively in length, the apical one being nearly as long as the three preceding combined; vibrissal plates or cerci situated at one-fourth the length of the abdomen from the apex; ovipositor entirely enclosed and concealed by the ventrites and without protruding sheaths.

Frontovertex very finely lineolate; pronotum and mesonotum and first tergite of abdomen finely reticulate; other parts of the body mostly smooth. Vestiture throughout very fine and sparse, being most abundant and conspicuous on the collar of the pronotum and on the mesoscutum; apex of the scutellum with a small, short fasicle of hairs consisting of about twelve fine black setae arranged in a transverse row close together, the outer pair of setae very short, the middle setae longest.

Male. With fully developed wings and very similar to the male of *Chrysoplatycerus*. Head considerably thicker fronto-occipitally, the occiput very deeply concave; as seen from above, well rounded on the sides, transverse anteriorly between the eyes and deeply emarginate at the occipital margin; in side view the dorsal and facial sides of the triangular outline are about equal. Antennae agreeing closely, the scape short, very slender in dorsal view, but compressed and somewhat expanded below, concave on the outer surface, pedicel about as long as thick at apex, and not much smaller than the first funicle joint; flagellum stoutly cylindrical, the funicle not tapering distad, each joint about as long as thick and nearly circular in cross-section, club solid and as long as the two and one-half preceding joints combined; entire funicle densely clothed with extremely fine short hairs, the club more sparsely pubescent; sensoria of the flagellum inconspicuous and not producing a rugose effect as in *Chrysoplatycerus*. Mouth parts as in the female.

Notum of the thorax very convex from side to side; the collar of pronotum very narrow and strongly arcuate; axillae very acute and meeting at their inner tips under the overlapping margin of the mesoscutum; scutellum rounded at apex. Fore-wings moderately wide, not triangular in shape, as in *Chrysoplatycerus;* marginal cilia short, the discal pubescence moderately dense and covering entire membrane, excepting the rather wide speculum; venation as in *Chrysoplatycerus*, except that the marginal vein is no longer than thick, the submarginal slightly thickened in the distal third of its course, and not thickened toward the base. Abdomen and legs showing no distinctive differences from *Chrysoplatycerus.* Sculpture, vestiture, and type of coloration of the same character, excepting that the eyes are densely pubescent.

Genotype: *Coelaspidia osborni* n. sp.

Coelaspidia osborni n. sp. Figs. 5-9 and text figure.

Female. Head, as seen from above, strongly rounded on the sides, deeply concave at occipital margins, truncate and slightly concave in front; in side view, increasing in thickness fronto-occipitally from above downward to a point opposite the lower ends of the eyes; in frontal view, slightly wider than long, the outline well rounded on the sides and below and considerably flattened dorsally; eyes of medium size, broadly oval, and a little wider on the anterior half, well separated above from the occipital margin; frontovertex a little over twice as long as wide and increasing slightly in width anteriorly; the frontal ledge between the eyes and the scrobal impression not transversely grooved, as in *Chrysoplatycerus splendens* (Howard); ocelli minute and arranged in slightly less than a right-angled triangle, the posterior pair placed a little more than their own diameter from the margin of the eyes and remote from the occipital border; scrobal impression broadly transversely oval, the prominence between the antennae nearly as broad as long.

Antennae inserted far apart, rather close to the clypeal margin; scape projecting for about two-thirds of its length beyond the scrobal impression; excluding the radicle, it is somewhat less than twice as long as wide, obliquely truncate at base on the dorsal side and broadly rounded at apex; its dorsal margin folded in an acute angle with the inner surface, thus forming a flat dorsal surface which increases in width toward the apex and forming a groove beneath on the outer side for the reception of the following joints; pedicel as long as thick and not cupped at apex; joints of flagellum closely joined into an elongate oval mass: the funicle somewhat smaller than the club, its first joint about one-third as wide as the sixth, with the intervening joints becoming gradually wider; club slightly wider than the funicle and somewhat acute at apex.

Frontovertex microscopically and transversely lineolate, the lines showing only a slight tendency to form reticulations, and with very minute, shallow, sparsely scattered pin-punctures; scrobal impression highly polished, the facial prominence between the antennae rather rugulosely and very finely shagreened; pronotum, mesoscutum, axillae, and scutellum finely reticulate, the pronotum being subrugulose and the scutellum smooth and becoming considerably polished toward the apex; pleura, propodeum, and abdomen smooth and polished, the first tergite nevertheless being finely reticulate.

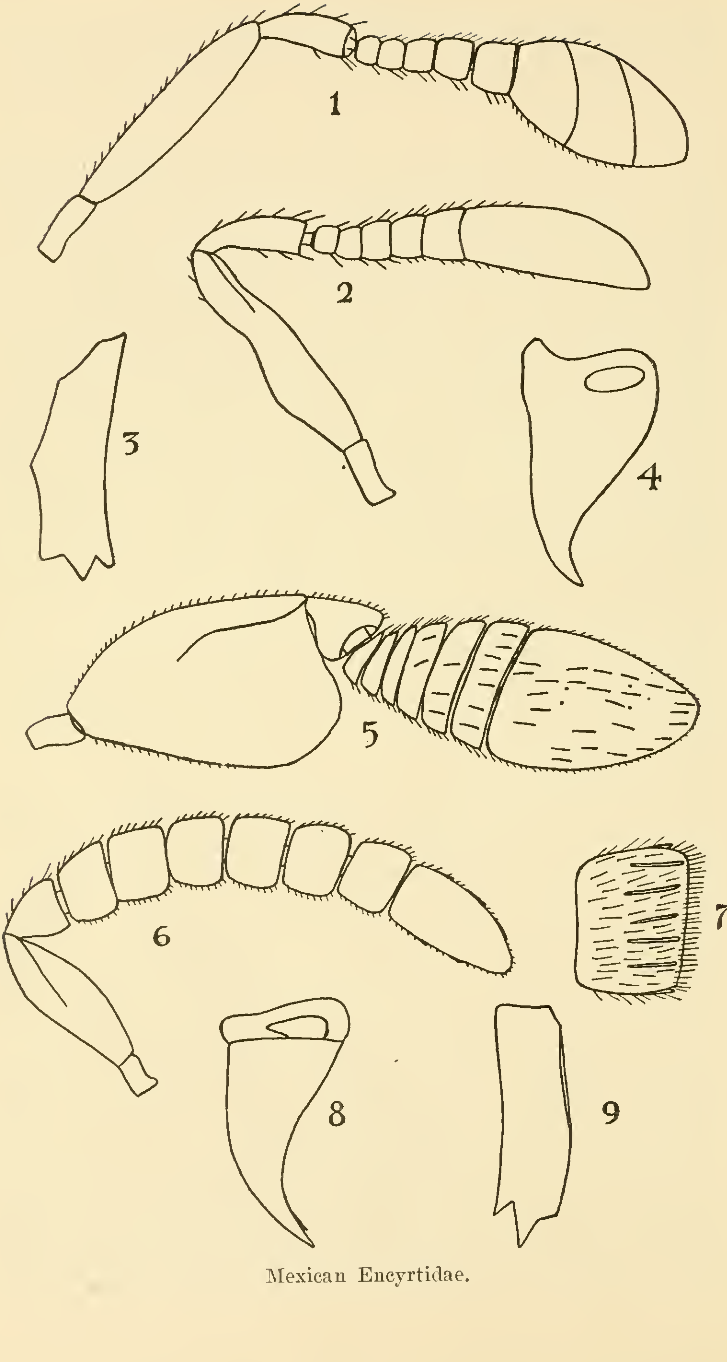
Eyes bare; frontovertex with very short, fine setae, which are well scattered, quite inconspicuous, and inclined forward; facial prominence with fine whitish setae; pronotum with rather numerous fine reclinate setae, which are whitish in color; mesoscutum, axillae, and scutellum with similar, but sparser, pubescence, which becomes progressively sparser and less conspicuous posteriorly; abdomen nearly bare, although the tergites bear some very sparse, short setae, and the venter a few much longer hairs, especially at apex.

General color dark metallic green with a bronzy luster; the mesopleura, tegulae, the fovea at each corner of the scutum, the posterior margin of the basal tergite, and a connecting median longitudinal band on the same segment, which tapers forward, dark purple; a median longitudinal purplish band also usually present on the mesoscutum; rest of the first and the second tergite bright metallic green, the following tergites greenish with a purple luster, the venter darker or more or less blackish; facial prominence, lower part of the cheeks, sides of the notum between the scutellum and base of the wings and propodeum more or less brownish with a green luster, or occasionally in a few of the paratypes the whole head and notum are more or less brownish with a metallic luster, thus producing a marked bronzy effect; antennae black, the scape and pedicel paler except on the ventral margin of the former (in slide mounts appearing distinctly brown), the dorsal expansion of both scape and pedicel with a bright green luster; mandibles brown; legs brownish yellow, all the coxae, the apex of middle tibiae, and the middle tarsi, except apical joint, paler yellow, all the femora on apical half and the tibiae on basal half infuscated and somewhat metallic greenish.

Length of body, (0.59 to) 1.64; length of head, 0.452; width of head, 0.490; thickness of head fronto-occipitally, 0.287; width of vertex at posterior ocelli, 0.169; length of antennae, 0.676; width of mesoscutum, 0.377; width of propodeum, 0.452; length of abdomen, 0.860; width of abdomen, 0.664 mm.

Male. Head hardly wider than long, the cheeks somewhat converging toward the broadly rounded oral margin; eyes of medium size, about a fourth longer than wide, broadly rounded anteriorly; frontovertex about as long as wide, and widening both in front and behind on account of the curvature of the eye-margins; ocelli large, arranged in a right-angled triangle, the anterior ocellus just behind the center of the frontovertex, the posterior pair almost touching the occipital margin and placed a little more than their own diameter from the eyes; cheeks as long as the width of the eyes; face concave, the antennal prominnce not much elevated, somewhat longer than wide, and just above the antennal sockets changing into a very narrow rounded carina-like ridge, which ascends medially to the angulation between the face and frons; on each side of this ridge lie the shallow scrobes, which are parallel in the upper third of their course and diverge below toward the antennal sockets.

Frontovertex subrugulosely, transversely reticulate and with numerous fine scattered pin-punctures; face much smoother, being finely scaly-reticulate, the scrobes smooth and polished; cheeks exterior to the genal suture longitudinally reticulate; mesonotum finely, transversely reticulate and with very fine punctures; the scutum subrugulose, but not so rough as the



Mexican Encyrtidae.

frontovertex; the axillae and scutellum smoother, the latter being considerably polished at apex; propleura, prepectal plates, and metapleura very finely scaly-reticulate, but nevertheless smoothish and shining; the reticulations on the metapleura much less apparent; mesopleura smooth and polished; abdomen comparatively coarsely, transversely reticulate, especially on the basal tergite, with the reticulations formed by fine raised lines, each reticulation generally over twice as wide as long.

Lower part of face, the cheeks, frontovertex, eyes, and mesonotum rather densely covered with fine, short, dark-colored setae, which are reclinate on the notum, erect and somewhat shorter on the eyes, suberect on the frontovertex, and inclined forward on the face and cheeks; scutellum with a pair of fine and considerably longer setae on each side of apex; pubescence of abdomen rather sparse and longer than that of the thorax, but not in any way conspicuous or distinctive.

General color dark metallic green, the face brilliant green, with the upper part of the antennal prominence above the socket dark purple; mesopleura also somewhat purplish; abdomen nearly black with a purplish and greenish luster; antennae black; legs metallic blackish with trochanters, base of all the femora, knee joints, tip of hind tibiae, apical third of front and middle tibiae and all the tarsi except apical joint brownish yellow, this color of the middle tibiae and tarsi being somewhat paler, and the hind tarsi dusky above; mandibles brown; the palpi yellowish white; wings hyaline, with dusky yellowish veins.

Length of body, (0.655 to) 1.07; length of head, 0.384; width of head, 0.419; thickness of head fronto-occipitally, 0.252; width of vertex at anterior ocellus, 0.209; length of antenna, 0.659; width of mesoscutum, 0.421; length of fore-wing, 0.912; width of fore-wing, 0.426 mm.

Described from 153 females, 59 males (holotype, allotype male, and paratypes) reared from *Pseudococcus calceolariae* (Maskell) on sugar-cane collected at El Potrero, Vera Cruz, Mexico, in May, June, and July, 1922, by H. T. Osborn, and in part bred in Honolulu from the same host and also from *Pseudococcus sacchari* (Cockerell) and *Pseudococcus kraunhiae* (Kuwana).

Type No. 1100, Hawaiian Sugar Planters' Experiment Station.

EXPLANATION OF PLATE XI.

Figs. 1–4, *Pseudaphycus utilis.*
1, Female antenna.
2, Male antenna.
3, 4, Frontal and dorsal view of mandible of female.

Figs. 5–9, *Coelaspidia osborni.*
5, Female antenna.
6, Male antenna.
7, Sixth funicle joint of male antenna greatly enlarged.
8, 9, Dorsal and frontal view of mandible of female.

OBITUARY.

Dr. David Sharp, M. D., F. R. S., etc.

To our society the death of Dr. David Sharp is an irretrievable loss. The work and time which he devoted to the entomology of our Islands and the influence he exercised upon others working on our insect fauna placed him in a unique position. His death removes the second of the three men to whom we owe most of our knowledge of our insects.

Sharp was born at Towcaster, Northamptonshire, England, in 1840, but his parents moved to Stony Stratford, where he spent the first ten or eleven years of his life, and afterward to London. In 1853 he entered St. John's Foundation School, where he remained until he left to enter his father's business. At this time Herbert Spencer was living with his family, and it is evident that the writings and personality of this eminent philosopher influenced Sharp's mind and perhaps gave it that keen and logical quality which characterized his whole life and works.

Finding commercial life uncongenial he decided to study medicine. He first attended St. Bartholomew's Hospital, London, and afterward studied at Edinburgh University, where he graduated in 1866 with the degrees M. B. and C. M. After acting as assistant to his family's doctor in London he moved to Thornhill, Scotland, in 1867, where he was appointed to the Crichton Institute at Dumfries. In 1884 he moved to Southampton, England, and later to Dartford, Kent. In 1890 he was appointed curator of the insect collection of the University Museum of Zoology, Cambridge, where he remained until 1909, when he retired to Brockenhurst, in the south of England, for the rest of his life. He died August 27, 1922, shortly before his eighty-second birthday.

Sharp was interested in insects when a boy and collected Lepidoptera before he left school. He must have turned his attention to Coleoptera shortly before 1861; his note book of captures begins on April 16 of that year. His first publication was in 1865 and is a short paper on British species of Agathidium. In 1869 he published "A Revision of the British Species of Homalota," which showed his great ability for systematic work. He retained his love for the Staphylinidae all through life and described Bate's collection from the Amazon. the collection for the Biologia Centrali Americana, collections from Japan and other smaller collections. His biggest single work was "On Aquatic Carnivorous Coleoptera or Dytiscidae" (1882), and it is of interest as he carried out a synthetic system of nomenclature on lines laid down in his pamphlet, "The Object and Method of Zoological Nomenclature" (1873). The work by which he is most generally known to entomologists is his "Insecta" in the Cambridge Natural History, one of the most readable and lucid textbooks on entomology.

But zoologists will always remember him for the time and labor he devoted to the Zoological Record. He acted as recorder of insects from 1885, and as editor of the work as well as recorder of insects from 1892 until a few weeks before his death. To many men this work alone would have been a life's work, and one wonders how he found time for so much besides. He had great powers of concentration, never wasted time, and he could turn from one subject to another without loss of time picking up the threads of his work. In zoological matters his judgment was sound, and he never allowed himself to be carried away by the various controversial subjects that have divided biologists during the last sixty years. While he appreciated the good in many of the theories brought forward, his keen mind could always see their limitations.

Sharp was deeply interested in island life and it is this aspect of his work which is of greatest interest to the members of this Society. He wrote a number of papers on the Coleoptera of New Zealand and started the late Major Broun on his entomological career. He wrote many papers on Japanese Coleoptera, and in 1888 was appointed a member of the committee to examine the fauna and flora of the West Indies. His friendship with the Rev. Thomas Blackburn brought him into personal relation with the Hawaiian Islands.

When this friendship began I am not able to find out, but in his note book we find that he was exchanging specimens with Blackburn in August 9, 1865. From 1876 to 1882 the Rev. Thomas Blackburn resided in Honolulu as chaplain to the bishop and senior priest of the cathedral, and although his duties allowed him very little time for collecting, yet he managed to get a number of our interesting insects. In those days traveling about the Islands was vastly more difficult than at present. There was no Mountain Trail Club to cut trails through the forests, and a climb to the back of Tantalus and back was a hard day's work.

From 1877 to 1897 Sharp and Blackburn published a number of separate papers on the Coleoptera, and in 1885 they published a joint Memoir, bringing all the information together. Other specialists worked at other orders collected by Blackburn. This work demonstrated the unique quality of the fauna of the Islands and led to a desire for a more extended investigation. Owing to the advocacy of Prof. Alfred Newton and Dr. Sharp, the British Association for the Advancement of Science appointed a committee in the year 1890 "to report on the present state of our knowledge of the Sandwich Islands, and to take steps to investigate ascertained deficiencies in the fauna, with powers to co-operate with the committee appointed for the purpose by the Royal Society, and to avail themselves of such assistance as may be offered by the Hawaiian Government or the trustees of the museum at Honolulu." The two committees worked together for twenty-two years when the work was closed. During these years Sharp acted as secretary and also as editor to the three volumes of the Fauna Hawaiiensis and worked on important sections of the Coleoptera.

His sound judgment was shown in selecting Dr. R. C. L. Perkins as field naturalist, and to the labors of these two, and, in a lesser degree, to the other specialists who worked on the different groups of insects, we owe the Fauna Hawaiiensis. In no other group of islands in the tropics have the insects been worked out so completely. Through this work we have been able to realize fully the unique endemism of the fauna, to recognize the later emigrants from the native insects, and to see evolution "in being" in a more simple form than in any other part of the globe. It has also enabled us to carry on a line of economic work with an understanding that would have been impossible without it, and which has resulted in a saving of many millions of dollars to the agriculture of the Islands. This work in turn has been a huge experiment on the death factors of insects and has added a distinct chapter to our understanding of Natural Selection.

All scientific work if truthfully carried out eventually finds its place in the sum of human activities, but few entomologists working along purely scientific lines have lived to see their work bear such practical results as have Sharp, Blackburn, and Perkins, the three founders of Hawaiian entomology.

The number of Sharp's writings is over 250, and it has only been possible to list those dealing with the Hawaiian Islands.

Works on Hawaiian Entomology by Dr. David Sharp.

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1878. Descriptions of some new species and a new genus of Rhyncophorous Coleoptera from the Hawaiian Islands. Trans. Ent. Soc. Lond., pp. 15-26.

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1878. On some Longicorn Coleoptera from the Hawaiian Islands. Trans. Ent. Soc. Lond., pp. 201-210.

1879. On some Coleoptera from the Hawaiian Islands. Trans. Ent. Soc. Lond., pp. 77-105.

1880. On some Coleoptera from the Hawaiian Islands. Trans. Ent. Soc. Lond., pp. 37-54.

1881. On some Coleoptera from the Hawaiian Islands. Trans. Ent. Soc. Lond., pp. 507-534.

1884. On some genera of the sub-family Anchomenini (Platynini Horn), from the Hawaiian Islands. Ent. Mo. Mag., XX, pp. 217-219.

1885. Notes on the genus *Plagithmysus* Motsch. C. R. Soc. Ent. Belg., p. LXXIV-VI.

1885. Memoirs on the Coleoptera of the Hawaiian Islands. Trans. R. Dublin Soc. (2), III, pp. 119-300, pls. IV, V, by Blackburn and Sharp.

1896. On *Plagithmysus:* a Hawaiian genus of Longicorn Coleoptera. Ent. Mo. Mag., XXXII, pp. 237-240, 241-245, 271-274.

1897. On *Plagithmysus:* a Hawaiian genus of Longicorn Coleoptera—Supplement. Ent. Mo. Mag., XXXIII, p. 12.

1919. Studies in Rhynchophora V. The genus Rhyncogonus. Proc. Haw. Ent. Soc., IV, pp. 77-82.

FAUNA HAWAIIENSIS.

Editor of the three volumes and writer of the following parts:

1900. Coleoptera Phytophaga, II, pp. 91-116.

1903. Coleoptera Caraboidea, III, pp. 175-292.

1908. Coleoptera III, pp. 367-579. Sharp and Scott.

1910. Coleoptera III, pp. 645-650. Sharp and Perkins.

1913. Preface, XI-XIII.

F. M.

Immigrant Records for 1922.

BY THE EDITOR.

This is a list of the immigrant insects recorded for the first time in 1922. Many of them have been known for some time, but have remained undetermined or unrecorded, and are now recorded with recent determinations. Those marked with an asterisk were observed or collected for the first time during the year. For details of records, etc., refer to the pages given.

	Page
* *Terastia meticulosalis* Guen. (Lep.)	180, 297
Scymnus sp. (Col.)	181
Monopis meliorella (Walk.) (Lep.)	185
Crypsithyris enixa Meyr. (Lep.)	185
* *Megastigmus* sp. (Hym.)	185
Exillis lepidus Jordan (Col.)	187, 194
* *Limnophora arcuata* Stein (Dipt.)	188, 286
* Carabid (Col.)	189
Hydrophorus sp. (Dipt.)	190
Medeterus sp. (Dipt.)	190
Asyndetus sp. (Dipt.)	190
Hypocharassus sp. (Dipt.)	190
Dolichopus exsul Ald. (Dipt.)	190, 285
Trypoxylon philippinensis Ashm. (Hym.)	192
Polycaon stoutii Lec. (Col.)	192
* *Oligota* sp. (Col.)	199
* Agromyzid (Dipt.)	204
Spalangia sp. (Hym.)	273
* *Calliphora latifrons* Hough (Dipt.)	277, 290
Conicera atra (Meigen) (Dipt.)	290
Hydrotaea houghi Mall. (Dipt.)	277, 290
Milichia sp. (Dipt.)	290
* *Rhodesiella elegantula* (Becker) (Dipt.)	277, 290
* *Rhodesiella tarsalis* Adams (Dipt.)	277, 291
* *Sapromyza* sp. (Dipt.)	291
Aphiochaeta scalaris (Loew) (Dipt.)	277, 291
Leptocera ferruginata Stenh. (Dipt.)	292
Puliciphora sp. (Dipt.)	292

CONTENTS OF VOL. V, NO. 2.

VOL. V. NO. 3 DECEMBER, 1924

PROCEEDINGS

OF THE

HAWAIIAN ENTOMOLOGICAL SOCIETY

FOR THE YEAR 1923

HONOLULU, HAWAII
PRICE 75 CENTS

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All correspondence should be addressed to the Secretary, Hawaiian Entomological Society, Honolulu, Hawaii, from whom copies of the Proceedings may be purchased.

Volume I of the Proceedings, for 1905-07 (in five numbers) contains 210 pages, 4 plates, and 5 text figures.

Volume II, 1908-12 (in five numbers), contains 311 pages, 7 plates, 5 cuts, and 1 portrait.

Volume III, 1913-17 (in five numbers), contains 500 pages, 8 plates, and 6 cuts.

Volume IV, 1918-20 (in three numbers), contains 610 pages, 10 plates, and 25 cuts.

Volume V, No. 1, 1922, contains 177 pages, 3 plates, and 25 cuts.

Volume V, No. 2, 1923, contains 162 pages, 8 plates, and 1 cut.

Price per volume, $2. Price of any single number of Volume I-III, 50 cents. Price of any single number of Volume IV and V, 75 cents.

PROCEEDINGS

OF THE

Hawaiian Entomological Society

Vol. V, No. 3. For the Year 1923. December, 1924

JANUARY 4, 1923.

The 206th meeting of the Hawaiian Entomological Society was held at the usual place. Besides Vice-President Swezey, who presided, there were present the following members: Messrs. Bryan, Crawford, Ehrhorn, Fullaway, Giffard, Illingworth, Rosa, Whitney, and Willard. Mr. S. Issiki was a visitor.

The minutes of the last meeting were read and approved.

The Executive Committee reported the followng appointments:

P. H. Timberlake, Librarian and Custodian of Insects.

O. H. Swezey, Editor of the Proceedings for 1923.

Upon motion of Mr. Bryan, it was voted that the editor be authorized to accept or reject any paper presented for publication; and that all papers be typewritten and submitted in duplicate.

NOTES AND EXHIBITIONS.

Maruca testulalis Geyer.—Mr. Swezey exhibited a specimen of this Pyralid moth reared from a larva found in pod of garden peas December 9, 1922. Two of the larvae were found in a mess of green pea pods obtained from the Metropolitan Meat Market. Two larvae of *Lycaena boetica* were found in the same batch of pods. Both kinds of larvae were feeding on the green peas. One moth issued December 23, and one butterfly December 28. This Pyralid moth has not previously been noted here, though it has undoubtedly been present for some time. It is a moth which is widespread in India where, according to literature on Indian insect pests, it is a minor pest of pulses, occurring also in *Dolichos lab-lab*, green gram, red gram, mung, moth tur, and probably wild Leguminosae.

Blabophanes crocicapitella (Clems.).—Mr. Swezey exhibited this Tineid moth reared from dead rat material. A large number of the moths had issued from a tin of soil containing the remains of a dead rat with which Mr. Illingworth was experimenting.

Setomorpha insectella Fab.—Mr. Swezey reported rearing this moth abundantly from larvae feeding in alfalfa meal, and also from the remains of a bale of alfalfa hay which had become partially decayed, Kaimuki, December 10, 1922. This is new data on the habits of this Tineid moth.

Bruchids in Koa seeds.—Mr. Swezey reported the breeding of *Bruchus limbatus* and *B. prulninus* from koa seeds, and stated that, so far as he knew, this was the first record of Bruchids from koa seeds, and that *B. limbatus* was more abundant than *prulninus*. He had collected pods from trees on Sugar Loaf Hill, to examine for injury to the seeds by Tortricid larvae. The examination of 120 pods collected from a height of twenty feet and having a possibility of 1285 seeds, contained 598 good seeds, or 45 per cent (a greater proportion of good seeds than usual); 545 seeds had been eaten by Tortricid larvae, or 42 per cent; 69 seeds, or 5 per cent, were attacked by Bruchids.

Bruchus sallaei on Maui.—Mr. Swezey reported having reared 26 of this Bruchid from 5 pods of *Acacia farnesiana* collected in a gulch of the Honokawai section of Pioneer Mill Co., several miles north of Lahaina, December 5, 1922. Many eggs were on the pods at time of collecting, and the Bruchids issued December 11 to 31. Four parasites, *Heterospilus prosopidis*, also issued. Apparently, this is the first record of the occurrence of this Bruchid on the Island of Maui. It is abundant there, as shown by the pods collected, and the other pods on the bushes of the locality.

Plochionus timidus Hald.—A specimen of this Carabid beetle and its larvae were exhibited by Mr. Swezey. Three of the beetles were collected by him on a *Pandanus* tree at Paia, Maui, December 8, 1922. There were Tineid larvae among the debris of dead leaves. It is probable that the beetle and its larvae were feeding upon these. This is the first record of this species in the Islands. It occurs throughout the United States, and is closely related to *Plochionus pallens* which has been collected in houses in Kaimuki by Timberlake and Swezey.

Pleistodontes imperialis Saund.—Mr. Swezey reported this fig-wasp now very well established. The large tree of *Ficus rubiginosa* on the old Tantalus road above Makiki Heights, in December, produced a very large crop of fruit (a twig containing a dozen fruits being exhibited) due to the presence of the fig-wasp. An indication of the abundance of the insect is shown by the examination of one fruit which contained 85 (61 females and 24 males) of the fig-wasps, already matured, but had not issued from the galls where they developed. The fruit also contained 155 good seeds.

Mapsidius quadridentata Walsm.—Mr. Swezey exhibited a specimen of this moth, which issued from a cocoon found by him on a leaf at 2000 feet elevation, Wailuku, Maui, December 9, 1922. The position where the cocoon was found indicated that the larva had fed on *Charpentiera* leaves just as do the other species of this genus. It was described originally from a single specimen from Lanai.

Supella supellectilium (Serv.).—A specimen of this roach was exhibited by Mr. Swezey, who had taken it in the Pioneer Hotel, Lahaina, Maui, December 5, 1922. It is the first record of the occurrence of this roach on Maui. It was first collected by Timberlake in Kaimuki about May, 1921.

Cyrtorhinus mundulus (Bredd.).—Mr. Swezey reported finding this bug established in a leafhopper-infested field at Lahaina, Maui, December 5, 1922. As no colony of the bug was placed on Maui when it was introduced from Australia two years ago, it has reached Lahaina by its own efforts, probably from Ewa Plantation, where it was very abundant during the early summer of 1922. It is a considerable distance (seventy miles or more) for a small insect to make its way over seas, and indicates their ability to do it in some way or other.

Carpophilus sp. in Macadamia Nut.—Mr. Fullaway reported an infestation of macadamia nuts by Nitidulid larvae which proved, on rearing the larvae to adults, to be a species of *Carpophilus*. The nuts were not perfect, and it is probable that the beetles were attracted by the rancidity of the meat.

FEBRUARY 1, 1923.

The 207th meeting of the Hawaiian Entomological Society was convened at the usual place at 2:30 p. m. Vice-President Swezey presided. Other members present were Messrs. Bissell, Bryan, Ehrhorn, Fullaway, Giffard, Rosa, and Willard.

The minutes of the previous meeting were read and approved.

NOTES AND EXHIBITIONS.

Rhodesiella elegantula Becker.—Mr. Bryan exhibited three specimens of this Chloropid fly, which were captured by Mr. Swezey in Palolo Valley, December 24, 1922. The species is shiny black, with a long triangular scutellum, the thorax and scutellum being covered with light yellow-brown hairs. The legs are yellow-brown, and the last tarsal joint darker. Specimens have been captured near Waimea, Hawaii. This is the first record for Oahu.

A Weevil Near Scyphophorus acupunctatus Gyll.—Mr. Bissell exhibited one specimen of a weevil, very closely resembling this sisal borer, which was collected in Honolulu, June 1, 1922. This specimen may have been brought in with pods of *Acacia farnesiana* from Ewa coral plain near an old sisal plantation. One specimen of this weevil was collected by Mr. Muir at the H. S. P. A. Experiment Station in December, 1918.

An Anthribid New to Hawaii.—Mr. Bissell exhibited one specimen of an Anthribid, previously unrecorded in Hawaii, which was collected on a window at the Vida Villa Hotel, Honolulu, January, 1923.

Winged Form of Zorotypus swezeyi Caud.—Mr. Fullaway exhibited a specimen of the winged form of *Zorotypus swezeyi*

(Order Zoraptera) collected at Kokee, Kauai, in a rotten log during July, 1922.

Lysiphlebus sp. from California.—Mr. Fullaway exhibited a specimen of a California species of *Lysiphlebus*, parasitizing the cotton aphis, *Aphis gossypii*, the bean aphis, *Aphis medicaginis*, and the wild coffee aphis, *Toxoptera aurantiae*. This parasite has been sent in numbers by Mr. Timberlake from Whittier, California, for colonization here.

Cyrtorhinus mundulus (Bredd.).—Mr. Swezey reported collecting this introduced bug on *Sporobolus* grass on the beach near Barber's Point, Oahu, January 7, 1923. On the grass was the leafhopper *Kelisia sporobolicola*, and presumably the bug was feeding on the eggs of the leafhopper. This is the first observance in Hawaii of this bug living on or being associated with other leafhoppers than the cane leafhopper. It was observed two miles from a cane field of Ewa Plantation.

Enicospilus dispilus Perk.—A specimen of this *Ophionid* was exhibited by Mr. Swezey, collected by him at Wailuku, Maui, 2000 feet, December 9, 1922. Apparently, it is the first record of it from that island.

Calotelcia elegans Perk.—Mr. Swezey exhibited a female of this beautiful Scelionid collected by him in a cane field at Lahaina, Maui, December 5, 1922. The type was collected at the Experiment Station H. S. P. A., Honolulu, in 1905, by Dr. Perkins, who considered it an immigrant. Apparently, this is the first record of it from Maui.

Casinaria infesta (Cress.).—Mr. Swezey exhibited a specimen of this Ophionid reared from *Phlyctaenia stellata*. Several caterpillars were collected on *Pipturus* on the Manoa Cliff trail on Mt. Tantalus, January 10, 1923. Only two of the caterpillars lived to spin up, and from each of these one of this parasite issued fourteen days later. This is an additional host for this parasite, and indicates its spread to the mountains. It is an immigrant that was first observed in Kaimuki in February, 1921.

Protoparce quinquemaculata blackburni (Butl.).—Mr. Swezey exhibited three fine specimens of this Sphingid moth which he had reared from caterpillars collected on *Nicotiana glauca* at Sprecklesville, Maui, December 8, 1922. The caterpillars had obtained their growth and entered the soil for pupation on December 13, 14, and 16, respectively. The moths issued just forty-one days later in each instance, i. e., January 23, 24, and 26, respectively. Although this moth has been known for a long time, having been collected by Blackburn, yet the caterpillars are rarely met with, *Nicotiana glauca* apparently being its favorite food plant, although it was reported as occurring on cultivated tobacco, when this was being grown at Kona, Hawaii, a few years ago. Hitherto, the only specimen of the moth in any collection in the Territory has been a single one in the H. S. P. A. collection, reared by Mr. Swezey from a caterpillar collected on *Nicotiana glauca* at Kahului, Maui, October 10, 1919. From the present lot of specimens, he intends distributing one each to the Bishop Museum and the Board of Agriculture and Forestry.

MARCH 1, 1923.

The 208th meeting of the Hawaiian Entomological Society was held at the usual place, with President Muir in the chair. Other members present were Messrs. Bissell, Bryan, Crawford, Fullaway, Giffard, Illingworth, Rosa, Swezey, and Willard.

The minutes of the previous meeting were read and approved.

PAPERS.

"Hawaiian Trypetidae."

BY E. H. BRYAN, JR.

"Notes on Coccinelidae."

BY D. T. FULLAWAY.

"The Small Banana Weevil."

BY J. F. ILLINGWORTH.

"Whence the Termites of Hawaii?"

BY THOMAS E. SNYDER.

Entomologist, Bureau of Entomology, United States Department of Agriculture.

NOTES AND EXHIBITIONS.

Hippobosca equina Linn. in New Hebrides.—Mr. Bryan exhibited two specimens of this horse louse-fly which were among a small collection of flies received at the Bishop Museum from Mr. E. Robertson, Tanna Island, New Hebrides. It is sometimes called the "winged horse tick" of Europe, and has also been recorded by Loew from North America, according to Aldrich's Catalogue.

Rhodesiella tarsalis Adams.—Mr. Bryan noted that the series of specimens in the H. S. P. A. collection marked "Rhopalomeiidae, Rhinotora?" from Tantalus, Oahu, 6-19-21 (Swezey), Grove Farm, Kauai, 3-2-17, Honolulu, VII-1-16 (Ehrhorn), "observed on leaves infested with *Pseudococcus nipae*," and on window 4-23-14 (Swezey), belong to this species, as does also a single specimen of this fly collected by Giffard on the window at his home January, 1923.

Phormia regina Meigen.—Mr. Bryan stated that this fly had been recorded from Hawaii by Dr. L. O. Howard (Proc. Ent. Soc., Washington, IV, p. 490, July, 1901), but that its occurrence here was questioned by local entomologists. In reply to his inquiry concerning this fly, Dr. Aldrich wrote as follows January 19, 1923:

"On looking at our collection I found three female specimens, two collected by H. W. Henshaw in 1900, on the volcano Kilauea; and one from Hilo, Hawaii, collected by William H. Ashmead, July 6, 1901. The last I am sending you, together with a male and female from the United States."

Lonchoptera sp.—Mr. Bryan stated that a single specimen in the collection of the Bishop Museum, collected by Mr. Giffard at Twenty-nine Miles, Olaa, Hawaii, August, 1922, was determined as belonging to the family *Longchopteridae* by its striking and characteristic antennae and wing venation (Williston, N. A. Diptera, p. 240). This family of flies contains but a single genus, *Lonchoptera*. No specimens of this family have hitherto been reported from Hawaii.

Diocalandra taitensis (Guer.).—Mr. Swezey exhibited a piece cut from a leaf stem of coconut palm, showing the characteristic exit holes and borings of the Tahiti coconut weevil. He had obtained this from a leaf which had fallen from a thirty-foot high palm tree on Kinau street, Honolulu, February

9, 1923. This is further evidence of the general distribution of this weevil, though it is so scarce as to be difficult to find.

Pyralis manihotalis Guen.—Mr. Swezey exhibited a specimen of this Pyralid moth collected at light by Mr. Ehrhorn, February 9, 1923, in Manoa. This is the first specimen of this moth collected for a long time. Dr. Perkins collected one specimen in Honolulu over twenty years ago, and Blackburn had collected it in his time. No specimens are in any collections in Honolulu. Its habits are not known here. It is a species ranging from South America, Australia, Malay Archipeligo, South Asia, and Africa.

Maruca testulalis Geyer.—Mr. Swezey stated that, since reporting this Pyralid moth at the February meeting, he had come across a specimen of it among some insects at the Bishop Museum, collected on Tantalus last August by Professor Mosely from Ohio, who was visiting the Islands last summer. That specimen will be the first capture of this immigrant moth here.

Pleistodontes froggatti Mayr.—Mr. Swezey reported having obtained a total of 211, or 178 females and 33 males of this fig-wasp from a single fig picked from the Moreton Bay fig tree in Emma Square, Honolulu, February 9, 1923. The tree was bearing an immense crop of fruit, many of which had already fallen to the ground, each fruit showing numerous exit holes where the fig-wasps had issued. The insects had issued before the fruits had fallen from the tree.

Pleistodontes imperialis Saund.—Mr. Swezey reported that this fig-wasp was established on a Ficus tree at Dr. Dean's home, Manoa. Examination of a fruit from this tree which Dr. Dean had handed to Dr. Lyon disclosed the presence in it of a considerable number of the fig-wasps. As none of the insects had been distributed in that vicinity, they must have reached there of themselves from the tree on Makiki Heights, where they had recently been found abundantly established. The distance might be about a mile in an air line.

Fijian Butterflies.—Mr. Swezey exhibited a collection of butterflies lately received from Hubert W. Simmonds, Government Entomologist at Suva, Fiji. It composed fourteen species as follows, representing half or more of the species recorded from the Fiji Islands:

Tirumala neptunia (Feld.).
Xiparia helcita (Boisd.).
Salpinx macleayi (Felder).
Deragena proserpina Butler.
Calliploea adyte Boisd.
Doleschalia bisaltide Cram.
Hypolimnas bolina Linn.
With color variations of the female.
Papilio schmeltzi Her.-Sch.
Xois sesara Hew.
Terias hecabe L. (?)
Nacaduba vitiensis (Butl.).
Jamides woodfordi Butl.
Undetermined *Lycaenid.*
Undetermined *Hesperid.*

APRIL 5, 1923.

The 209th meeting of the Hawaiian Entomological Society was held at the Experiment Station of the Hawaiian Sugar Planters' Association, President Muir presiding. Other members present were Messrs. Bissell, Bryan, Crawford, Ehrhorn, Illingworth, Swezey, Timberlake, and Willard.

The minutes of the previous meeting were read and approved.

PAPER.

"Stability of Specific Names." *

BY F. MUIR.

NOTES AND EXHIBITIONS.

Evaza javanensis Meij.—Mr. Bryan stated that this small black and brown Stratiomyid fly, hitherto known as *Acanthina* sp., was given this identification by Mr. Brunetti at the British Museum. Mr. Brunetti also stated that our "*Sargus* sp." is the same as that mentioned in the Fauna Hawaiiensis under that name, that it belongs to the genus *Cephalochrysa* Kert., probably an undescribed species, and that he will describe it soon.

A mango pest in Rapa, Austral Islands.—Mr. Bryan exhibited a small series of Microlepidoptera, which were among

* For publication elsewhere. [Ed.]

a large collection of insects from the Austral Islands recently brought to the Bishop Museum by Mrs. A. M. Stokes. They bore the label, "November 26, 1921, Rapa, Ahurei. From larvae on mango blossoms. Entire crop destroyed."

Pyralis manihotalis Guen. — Mr. Swezey reported having secured a specimen of this moth at his house in Kaimuki, and that among insects collected at Pawaa Junction by Mr. Issiki, entomologist from Formosa, were two of this moth.

New Immigrant Bruchid.—Mr. Swezey exhibited a Bruchid which he had recently collected in a patch of cow peas at the United States Experiment Station, Honolulu, which is apparently different from the Bruchids at present known here. Whatever species it is has not yet been determined.

Pheidole megacephala Fab.—Mr. Illingworth stated that on April 3, 1923, he had found this omnivorous ant destroying the parasitic wasps, *Scolia manilae* Ashm. Sweet potato blossoms on the banks of reservoir No. 6, in the Oahu Sugar Company's plantation, were simply alive with these ants. They were probably driven out of the soil by the recent heavy rains, and were certainly improving their opportunity by waylaying every Scolia wasp that visited these flowers. Many of the wasps were observed overpowered by the ants, and in various stages of being dismembered. It must be stated, however, that conditions at the time were very exceptional and probably do not occur more than a few days out of the year. At any rate, he stated, this was the first time that he had observed the ants attacking Scolia in such numbers. It is a well-recognized fact that the ants are more troublesome during the wet season, coming into houses, getting into bee-hives, etc., hence, they will probably let the wasps alone as soon as the soil becomes sufficiently dry for them to return to it.

Pycnoscelus surinamensis (Linn.)—Mr. Illingworth gave the following note on this roach: In my search for early references to Hawaiian entomology, I found that Eschscholtz, who was here in 1816, described a roach, *Blatta punctata*, in his Entomographien, p. 86, published in 1822. I recently wrote Mr. Morgan Hebard, requesting information as to which of our present species this name referred. In his reply of January 16, 1923, he states:

"**Blatta punctata** Eschscholtz, described in 1822 from the Hawaiian Islands, is a synonym of **Pycnoscelus surinamensis (Linnaeus)**, as has been indicated by Kirby in his catalogue of 1904. This record was overlooked in my recent study of Hawaiian Orthoptera, where I noted only the first record for the islands as **surinamensis.**"

Elytroteinus subtruncatus (Fairm.).—Note by J. F. Illingworth. An interesting new habit for this weevil is recorded in the New Zealand Journal of Agriculture (Vol. XXVI, p. 34, January, 1923.), where it is called "the Fiji Lemon Weevil." Lemons from Cook Islands were found to be infested by the larvae of this species; the adults being determined by Dr. G. A. K. Marshall of the British Museum. The attack on the fruit was at the base of the stalk, the larvae boring into the pulp, where pupation took place. Recently this species was recorded from Honolulu by Swezey (Proc. Haw. Ent. Soc., Vol. IV, pp. 82-83), who found it infesting the roots of white ginger. Dr. Marshall identified the Hawaiian material as *Pteroporus subtruncatus* Frm. (See idem. p. 361); but afterwards proposed (Bull. Ent. Res., London, Vol. IX, p. 278) *Elytroteinus* n. n. for *Pteroporus* Frm. of which the only species is *Elytroteinus subtruncatus.* The indications are that this is a dangerous introduction, and it behooves entomologists to be on the lookout for infestations of other crops. Such a general feeder might even decide to levy a heavy toll upon our pineapple industry.

Pheidole megacephala Fab.—Mr. Willard exhibited a vial of the dead bodies of this ant, which he had found very abundant on the trail into Waianae Valley on March 19, 1923. It is estimated about 200 piles, ranging in size up to three inches in diameter and to three-quarters of an inch deep, were observed in the trail. Mr. Illingworth and Mr. Swezey stated that they had seen similar piles of these ants in irrigation ditches in sugar-cane fields, and that the dead ants had apparently been removed from the nests after being drowned.

Coelophora inaequalis Fab.—Mr. Timberlake reported that specimens of the nine-spotted form of this ladybeetle had been seen in Honolulu on several occasions during the past six months. This and the black form were liberated in considerable numbers in the Punahou district and Manoa Valley during the fall of 1919 and the following winter.

MAY 3, 1923.

The 210th meeting of the Society was held at the usual place and was attended by the following members: President Muir, who presided, and Messrs. Bissell, Bryan, Illingworth, Rosa, Swezey, Timberlake, and Willard.

The minutes of the previous meeting were read and approved.

NOTES AND EXHIBITIONS.

Euplectrus platyhypenae How.—Mr. Swezey exhibited all stages of this army-worm parasite which he was rearing on a large scale in the insectary, from material received from H. T. Osborn, collected at El Potrero, Vera Cruz, Mexico. The parasite lays eggs in clusters of two to fifty on the backs of caterpillars. The eggs hatch in three days; the larvae finish their growth in four days; and the adults appear in about a week, so that the period from oviposition to adult is about two weeks. Oviposition occurs on the two army-worms, *Cirphis unipuncta* and *Spodoptera mauritia*, and on the garden cutworm *Lycophotia margaritosa*. Probably any such kind of larvae that are available would be made use of.

Maruca testulalis Geyer.—Mr. Swezey exhibited a specimen of this moth reared from a caterpillar found in a lima bean pod, where it was feeding on the seeds. It was found April 11, apparently full grown, for it spun up the next day, and pupated April 13, the cocoon being thin enough so that the pupa was readily seen. The adult issued ten days later on April 23. This is the same moth first reported by Mr. Swezey at the January meeting, reared from pea pods.

Pseudopheliminus sp. — Mr. Timberlake exhibited a few specimens of an Eulophine recently discovered on Oahu. One male was collected by Mr. Swezey at Waialae, November 26, 1922, and two males and one female were reared from *Gracilaria marginestrigata* Walsm. on *Sida*, collected at the Peninsula on March 11, 1923. The female has a small, round, black spot beneath the stigmal vein, and the male has three-branched antennae.

Berecyntus sp. — Mr. Timberlake exhibited many living females of a new species of *Berecyntus* reared April 24, from an *Agrotis* larva (species not determined), collected February 23, 1923, at Pasadena, California. The species is evidently polyembronic, the females ovipositing in the eggs of the host. Eggs of *Spodoptera mauritia* Boisd. and of *Plusia chalcitis* Esp. when placed with the females were not noticed, but eggs of *Agrotis ypsilon* Rott. immediately caused great excitement among the parasites and were oviposited in freely. Sometimes two or even three females were seen ovipositing in the same egg.

Bruchobius sp.—Mr. Timberlake exhibited specimens of a Pteromalid provisionally determined as a new species of *Bruchobius,* which has not been recorded from the Islands. One female was taken on the laboratory window September 13, 1916, and recently large numbers have been issuing from pigeon peas infested by *Bruchus quadrimaculatus* Fab. and *Bruchus chinensis* Linn. (O. H. Swezey, collector). Two specimens of the same parasite from Bangalore, India, were also shown, which had been bred from *Bruchus.*

Coptotermes intrudens Oshima.—Mr. Bryan reported that a considerable flight of these termites was noticed about the business district of Honolulu on April 1, 2, and 3, 1923. Also that Dr. Illingworth had noticed them swarming about lights in the Honolulu Public Library on April 26, 1923.

Mr. Muir exhibited specimens of *Odynerus nigripennis* (Holmg.), *Echthromorpha maculipennis* Holmg., *Oodemas aenescens* Boh., *Scymnus kinbergi* Boh., *Sarcophagus dux* Thoms., and *Sarcophagus barbata* Thoms., which he had taken to Europe at Mr. Timberlake's suggestion to compare with types at Stockholm. Both Dr. A. Roman and Mr. Muir had compared these insects with the types, and concluded they were rightly determined. They will be placed in the collection of the Society.

JUNE 7, 1923.

The 211th meeting of the Hawaiian Entomological Society was convened at the usual place at 2:30 p. m., with President Muir in the chair. Other members present were Messrs. Bissell, Bryan, Crawford, Fullaway, Swezey, Timberlake, and Willard.

The minutes of the previous meeting were read and approved.

PAPERS.

"A New Hawaiian Rhyncogonus."

BY R. C. L. PERKINS
(Presented by O. H. Swezey.)

"The Bishop Museum Collection of Psyllidae."

BY D. L. CRAWFORD.

NOTES AND EXHIBITIONS.

Cutworm enemies.—Mr. Fullaway reported that the following cutworm enemies, the Carabid beetle, *Calosoma semilaeva* and the Chalcid fly *Euplectrus platyhypenae*, were being distributed at the Waikii station of the Parker Ranch.

Coccinella sp. — Mr. Timberlake exhibited a specimen of *Coccinella* taken by Mr. Swezey, June 1, 1923, in Field 39, Oahu Sugar Co., Oahu. It is close to *Coccinella 11-punctata* Linn. and might easily pass for that species, but differs specifically in the male genitalia.

Pseudophelininus sp. — Mr. Timberlake reported that the species recorded at the last meeting from Oahu has since been taken on Kauai by Mr. Swezey. One female having been reared from *Gracilaria hauicola* collected at Hanalei on May 16.

Maruca testulalis Geyer.—Mr. Swezey reported finding on May 29, the larvae of the Indian pea moth quite abundant in the flowers of *Sesbania grandiflora*, growing at the Pineapple Experiment Station grounds on the next ridge beyond Alewa Heights. The larvae were feeding in the large flowers in the region of the staminal column, and at the base of the flower, both in the fresh flowers and in withered flowers. There were green pods on the trees but no larvae were found in them.

Orthomecyna mesochasma Meyr.—Mr. Swezey exhibited a specimen of this Pyraustid moth, and reported having reared it from a whitish larva found among the roots of a stool of sugar-cane at the Lihue Plantation on Kauai, May, 1923. The larva was apparently full grown and did not do any more eating, so it was not determined as to its feeding habits. The native genus *Orthomecyna* has fourteen species whose habits are entirely unknown. This is the first time that a larva of any species has been discovered. The species *mesochasma* is very abundant on Kauai and often comes to light in large numbers.

Draeculacephala mollipes Say.—Mr. Swezey reported the capture of this large green Jassid in a garden at Kilauea, Kauai, May 11, 1923. It has been collected on Kauai on only one other occasion, when Mr. Bryan collected it at Nualolo beach on Naio, in June, 1922.

Cyrtorhinus mundulus (Bredd.).—Mr. Swezey reported having found in May that this bug was spread through all the sugar plantations of the Island of Kauai, wherever any leaf-hoppers were to be found. A colony was liberated at Kekaha in August, 1921, and this spread has taken place since then.

Flight of Termites.—Mr. Willard reported having observed the flight of great numbers of termites, probably *Coptotermes intrudens,* on the evening of May 10, 1923, on Beretania and Young streets near the McKinley High School. The flight occurred after a warm, sultry day, beginning soon after dark and ending about 9:30 p. m. At 10 p. m. none of the insects were seen flying about lights.

JULY 5, 1923.

The 212th meeting of the Hawaiian Entomological Society was held at the usual place, President Muir presiding. Other members present were Messrs. Bissell, Bryan, Rosa, Swezey, Timberlake, and Willard. Mr. R. Ewart was a visitor.

The minutes of the previous meeting were read and approved.

NOTES AND EXHIBITIONS.

Mr. Bryan exhibited a large collection of insects, spiders, etc., which he had collected on a recent trip to Nihoa and Necker Islands and French Frigate Shoals.

Horismenus sp.—Mr. Willard reported the recovery of this parasite from *Mylabris sallaei* in pods of *Acacia farnesiana*, collected on the Waianae road just beyond Ewa Plantation, June 16, 1923. He stated that this parasite was the last to become established in the field, of the four Bruchid parasites, which were introduced from Texas in 1921 by the Federal Bureau of Entomology.

Limnophora arcuata Stein.—Mr. Swezey reported having reared this Anthomyid fly from puparia collected in cow dung in Mr. Eric Knudsen's pasture, Koloa, 700 feet, Kauai, May 14, 1923. When collected, the puparia were taken for those of the horn-fly, but this Anthomyid issued instead. Examination of the puparia shows that they are quite different from horn-fly puparia. From two of the fifteen puparia collected, there issued two specimens of *Spalangia cameroni*. Specimens of the fly were also collected at the Lihue Hotel.

Notogonidea luzonensis Rohw. — Mr. Swezey exhibited a specimen of this Philippine cricket wasp collected July 4 in his garden at Kaimuki. This indicates that it is becoming more widely spread since the first recovery last March.

Maruca testulalis Geyer.—A specimen of the Indian pea moth was exhibited by Mr. Swezey, collected by him among pigeon peas in his garden, July 4, 1923. Probably the larvae of the moth were feeding in the pigeon pea pods, but none were found.

Polytus mellerborgi (Boh.).—Mr. Swezey reported collecting this weevil on banana plants on Kauai, both in the garden at Lihue Hotel, and on bananas growing wild along the streams back in the mountains at headwaters of Wailua River.

Tiny Carabid from Cane Stools.—A specimen of this minute Carabid was exhibited by Mr. Swezey. He had collected it among cane roots at Grove Farm, Lihue, Kauai, May 18, 1923. He reported also having collected a few at the same place last year, but had not reported it at the time. It is the same beetle first found in a cane stool at Puuloa, Oahu, in 1922 and reported at the time.

SEPTEMBER 6, 1923.

The 213th meeting of the Society was held at 2:30 p. m. at the H. S. P. A. Experiment Station, President Muir in the chair. Other members present: Messrs. Bissell, Fullaway, Timberlake. Whitney, and Willard.

Owing to the absence from Honolulu of a number of members, no meeting was held in August. The minutes of the 212th meeting, held in July, were read and approved.

The Secretary reported that the Proceedings for the year 1922 were mailed on September 4, 1923.

The Secretary read a communication from The Academy of Natural Sciences of Philadelphia setting forth the financial status of the *Zoological Record*, and stating that the Zoological Society of London was suffering an annual loss of £1100 on its publication. The letter stated that unless all but £500 of this annual loss could be covered by zoologists and zoological societies throughout the world, it would be necessary to discontinue the publication of the Record, and this society was asked for assistance.

Upon motion by Mr. Fullaway, this communication was referred to the Executive Committee for action.

NOTES AND EXHIBITIONS.

Antonina indica Green.—Mr. Fullaway reported finding the larvae of *Antonina indica* on the roots of pineapple at Moanalua, Oahu, August 21, 1923.

Xenophyes cascus.—Mr. Muir exhibited a nymph of *Xenophyes cascus* Bergroth from New Zealand. The insect belongs to the small family Peloridiidae and they are of interest because they have their head deflexed and inflexed in a manner similar to Homoptera. Without disection it is impossible to state if there be a gula or not, but from the appearance of the labium it would appear that there is not. If this be the case then it may be necessary to place the family in a suborder by itself.

A Bruchid new to Hawaii.—Mr. Bissell exhibited several specimens of a Bruchid new to Hawaii and determined by him as *Bruchus amicus* Horn, and stated that several specimens had been forwarded to the Federal Bureau of Entomology, Washington, D. C., for verification of his determination. The first specimen was obtained by Mr. Bissell at the U. S. entomological laboratory, January 18, 1923, where it was bred from pods of *Prosopis juliflora* collected in Honolulu. One specimen of this same species was collected by Mr. Swezey at the U. S. Experiment Station and reported in the meeting of the society on April 5, as a new immigrant Bruchid. Mr. Bissell stated that it has since been bred very numerously from both green and ripe pods of *P. juliflora*, which had been collected at various places, Wailupe wireless station and a point two miles beyond Waipahu on the Ewa road.

OCTOBER 4, 1923.

The 214th meeting was held at 2:30 p. m. at the usual place, President Muir presiding. Other members present: Messrs. Bryan, Crawford, Fullaway, Giffard, Timberlake, and Willard.

The minutes of the previous meeting were read and approved.

The Secretary reported that the Executive Committee had considered the request for financial assistance for publication of the Zoological Record. The Committee recommended that no funds of the Society be used for this purpose, since it is necessary to obtain outside assistance each year to pay for its own publications. The great value of the Zoological Record to systematic workers in all branches of Zoology was recognized by the Committee, and it was their opinion that voluntary subscriptions from the members of the Society might be secured for this purpose.

Upon motion by Mr. Giffard, it was voted that the report of the Executive Committee be accepted, and that the Treasurer systematically canvass the members and friends of the Society and raise at least $25 to forward to the Zoological Record.

NOTES AND EXHIBITIONS.

Ethmia colonella Walsm.—Mr. Bryan stated that Dr. C. M. Cooke, Jr., had reported a Kou tree, *Cordia subcordata* Lam., near his beach house at Malaekahana, near Laie, Oahu, almost defoliated by a small, green caterpillar. He exhibited a series of this moth which was captured about the tree by Dr. S. C. Ball, although no caterpillars were seen at the time.

Xiphidiopsis lita Heb.—A female specimen of this Tettigoniidae was taken by Mr. Fullaway in Honolulu, September 11, 1923. Hitherto it has been known only from the town of Hilo, and vicinity, Hawaii, where it appeared first in 1919.

Nysius delectus White.—Mr. Giffard exhibited a large number of these insects, which had been taken at large by Mr. Irwin Spalding on the ridge near Green Peak, overlooking Nanakuli Valley, on the Waianae Range, Oahu. Mr. Spalding reported that, in the latter part of September, 1923, while tramping along the thickly vegetated ridge on its windward crest during heavy wind and showers, he noticed that the fronds of tree ferns, mokehana, and other vegetation, when disturbed, caused enormous flights of these heteropterous insects, so much so, that their contact with the face and clothing became annoying. These facts caused Mr. Spalding to investigate, and he reported that certain of the vegetation, more particularly the ferns, contained large masses of these insects which, in spots, had assembled in millions. As an example he claims that on a single frond of tree fern he and his companions observed an assemblage of these insects over one inch thick by three inches long and two inches wide, from which he captured a handful of *Nysius* of which this exhibit forms a part. Mr. Spalding further stated that this unusual flight continued for half a mile on the ridge and that the insects appeared to be quite undisturbed by the wind and rain, but flew in myriads just as soon as the bushes were disturbed. No cause for the unusually large numbers was advanced by Mr. Spalding and no perceptible damage to the vegetation was observed by him. Mr. Fullaway reported a similar occurrence at Waikii, Parker Ranch, on corn, thickly congregated but not bunched in layers. Mr. Bryan had observed a number on *Chenopodium* bushes on Necker Island, all bunched up in several layers.

Chalcid Flies.—Mr. Timberlake exhibited the following species, giving new records:

Xesmatia flavipes Timb., one female on **Sapindus,** Kilauea, Hawaii, August 5, 1919 (Swezey).

Pauridia peregrina Timb., one female on Koa, Kilohana, Kauai, September 1, 1920 (Swezey).

Anicetus annulatus Timb., one female, Kaiwiki, Hawaii, September 22, 1918 (Swezey).

Adelencyrtus odonaspidis Full., series, all females, Honaunau, Hawaii, August 13, 1919 (Swezey).

Microterys flavus Howard, one female, Kaumuohona, Oahu, January 17, 1917 (Bridwell).

Hypergonatopus n. sp., one female, southeast Koolau Mountains, Oahu, February 4, 1917 (Bridwell).

Zeteticontus sp., one female, Honolulu, 1906 (Perkins), taken in garden.

Paranacryptus lacteipennis (Cameron). Three females taken in Honolulu, November, 1907 (Terry); October 19, 1915 (Swezey); and September 29, 1923 (Timberlake). These are apparently all the specimens of this species in the local collections. The species was described as an **Epitranus,** but agrees fairly well with **Paranacryptus.**

Tanager Expedition.—Mr. Bryan reported on the recent expedition to Nihoa, Necker, and French Frigate Shoals, exhibiting several maps of the islands and a number of photographs. He also gave an outline of the insects and plant life observed on each.

NOVEMBER 1, 1923.

The 215th regular meeting of the Society was held in the usual place, President Muir in the chair. Other members present: Messrs. Bryan, Crawford, Ehrhorn, Fullaway, Giffard, Pemberton, Rosa, Swezey, and Timberlake.

The minutes of the previous meeting were read and approved.

Mr. Muir reported that in accordance with the motion of the previous meeting to canvass the members of this Society for subscription in relief of the distressed financial condition of the publishers of the Zoological Record, a total of $30 had been subscribed. The Society approved the forwarding of this fund direct to the Zoological Society of London.

PAPERS.

Mr. Bryan read a paper entitled, "Scenopinus in Hawaii."

Mr. Timberlake presented a discussion on a paper by him on the "Hymenoptera of Nihoa, Necker and French Frigate Islands, collected by Mr. E. H. Bryan of the Tanager Expedition." The collection was exhibited. This paper has been withdrawn for publication elsewhere.

"Further Notes on Chrysomyia Megacephala."

BY J. F. ILLINGWORTH.

(Presented by E. H. Bryan, Jr.)

Mr. Swezey presented a paper under the title: "Notes on Economic Insects in America Samoa." He particularly discussed the insect fauna of the coconut palm, sugar cane, papaia, taro, banana, and cucumber.

"New Fulgorids from the West Indies."

BY F. MUIR.

NOTES AND EXHIBITIONS.

Mr. Ehrhorn exhibited a large photo of members in assembly of the 1923 meeting of the Pan-Pacific Scientific Conference in Sydney, Australia.

Zatropis tortricidis Cwfd.—Mr. Timberlake exhibited specimens of this Pteromalid which has been collected from Oahu, Kauai, Maui and Hawaii, and a paratype female from Northeast, Pennsylvania, loaned for comparison by the U. S. National Museum. The species was first taken in Honolulu in January and December, 1902, by Dr. Perkins, who reared it from *Gracilaria marginistrigata*. It has also been reared from *Cremastobombycia lantanella* and from lantana berries, so that it is probably parasitic on *Agromyza lantanae*.

Pheidole megacephala (Fab.)—Mr. Crawford discussed the swarming of this ant on a potted palm at the University of Hawaii. He stated that the ants came from beneath a cement floor and were driven out through the leaking of a water pipe, and that there were from ten to twenty thousand massed on the leaves of the palm, carrying the eggs and immature stages with them.

Saissetia nigra (Nietn.)—Mr. Fullaway reported finding the black scale on pineapples at Moanalua. Mr. Timberlake stated that he had also seen it on nut-grass.

Scolia manilae Ashm.—Mr. Fullaway reported seeing this Philippine wasp numerous in pineapple fields at Moanalua.

Samoan Lepidoptera.—Mr. Swezey exhibited a collection of over 100 specimens of Lepidoptera collected in Samoa prior to 1914 by Julius Henniger. Mr. Swezey secured this collection while in Samoa in September, 1923. They will be deposited in the Bishop Museum, through the request of Mr. Henniger. Mr. Swezey stated that most of the moths in the collection are species described from India.

Xiphidiopsis lita Heb.—Mr. Swezey exhibited a specimen of this Tettigoniid collected at light at the University of Hawaii, October 20, 1923. It is the second record of this species from the Island of Oahu, the insect being known previously for the past four years at Hilo and vicinity on the Island of Hawaii. Mr. Bryan stated that he had also collected one at Kalihi. To date the male has not been seen.

Notogonidea luzonensis Rohw.—Mr. Swezey reported that he had collected the Philippine cricket-wasp at the following places: In house, Manoa Valley, October 9; in Y. M. C. A. Cafeteria, October 12; in cane field at Laie, October 16; Oahu Sugar Co., Field 53, October 17. Two of these recently introduced wasps were also seen on the ridge at Kuliouou, October 14, but not captured. This indicates a very wide natural spread from the original point of liberation at the H. S. P. A. Experiment Station grounds in March, 1922. Mr. Fullaway stated that he had also seen it in the pineapple fields at Moanalua recently.

Tineola biselliella (Hum.).—Mr. Swezey exhibited specimens of this clothes-moth and stated that they were reared by Mr.

Giffard from larvae found on a woolen hat at his bungalow at Twenty-nine Miles, Olaa, Hawaii. This is commonly known as the webbing clothes-moth. It has previously been recorded in Honolulu by Dr. Illingworth feeding in brushes at the University of Hawaii (Proc. Haw. Ent. Soc., III, p. 274, 1917). Mr. Timberlake showed a parasite *Apanteles hawaiiensis* which he stated Mr. Giffard had reared from a cocoon of this moth, at the same locality.

Epigramorpha fidilis.—Mr. Swezey exhibited and discussed a snail which he had found crawling about in a package of cane sent from Wailuku, Maui, packed in moss. The moss was secured in Wailuku and was originally from E. O. Hall & Son, Honolulu, who probably imported it from the States for packing material. The snail, according to Dr. Cooke, of the Bishop Museum, occurs in Oregon, Washington and British Columbia, but is not known to be established in Hawaii. It is probably *Epigramorpha fidilis.*

Japanese earthquake.—Mr. Bryan read a letter from Dr. J. F. Illingworth, dated October 24, 1923, written from Japan, describing the losses of his entomological equipment and collections owing to the recent earthquake and fire in Japan.

Australian ants.—Mr. Bryan exhibited some Australian ants received at the Bishop Museum from Prof. Dr. Yngre Sjostedt of the Naturhistoriska Riksmuseets, Stockholm. One hundred and four species are represented by 113 specimens, thirty-seven of which are cotypes.

Tanager Expedition.—Mr. Bryan exhibited a collection of insects and photos taken by him while on the Tanager Expedition to Johnson and Wake Islands in July and August, 1923, and gave some interesting facts relative to the vegetation, topography and insect fauna of the islands.

DECEMBER 6, 1923.

The 216th meeting of the Hawaiian Entomological Society was held at the H. S. P. A. Experiment Station, President Muir presiding. Other members present: Messrs. Bissell, Bryan, Crawford, Ehrhorn, Fullaway, Giffard, Pemberton, Rosa, Swezey, Timberlake, Wilder, and Willard.

The Treasurer reported a balance on hand December 1, 1923, of $118.59.

The following officers were elected for the year 1924:

President, O. H. Swezey; Vice-President, H. F. Willard; Secretary-Treasurer, D. T. Fullaway.

Additional members of the Executive Committee, D. L. Crawford and W. M. Giffard.

PRESIDENTIAL ADDRESS.

"Homoplasmy or Convergent Development of Evolution."

BY F. MUIR.

PAPERS.

"Records of the Introduced and Immigrant Chalcid-flies of the Hawaiian Islands (Hym.)."

BY P. H. TIMBERLAKE.

"Descriptions of New Chalcid-flies from Hawaii and Mexico (Hym.)."

BY P. H. TIMBERLAKE.

"Notes on Hawaiian Aphidae With Records of Food Plants (Homoptera)."

BY P. H. TIMBERLAKE.

NOTES AND EXHIBITIONS.

Atropos divinatoria Müll. — Mr. Timberlake exhibited two vials of insect material, one of which had been heavily attacked by this Psocid. The other which showed very little attack, contained many of the Psocid egg parasite, *Alaptus globosicornis* Gir.

Musca vicini Macquart. (=*Musca flavinervis* Thomson).— Mr. Bryan submitted the following note on this muscid: Major W. S. Patton in the Philippine Journal of Science, Vol. 23, No. 4, pp. 311, 326, 328, 1923, records the synonymy and relationship of this fly. This is the Oriental house-fly with the narrow fronted male, figured and discussed by Dr. Illingworth in these Proceedings, Vol. V, p. 275, 1923. Our typical house-flies have characters intermediate between this species and *M. domestica* Linn. Mr. Bryan stated also that the collection of Muscidae from Java, Amboina and Borneo, discussed by Major Patton (id. 323), was collected by Mr. F. Muir, and that the type of *Musca illingworthi* when returned, will be deposited in the collection of the Hawaiian Sugar Planters' Experiment Station, with a paratype in the Bishop Museum.

Scenopinus fenestralis Linn.—Mr. Bryan stated that the "new fly" recorded by Mr. Fullaway (Proc. Haw. Ent. Soc., Vol. V, p. 204, 1923), which resembled *Milichia* (Agromyzidae) has since proved to be an undersized male of *Scenopinus fenestralis* Linn. The males have a transverse white band on the abdomen.

Scholastes bimaculatus Hendel. (Ortalidae).—Mr. Wilder exhibited a series of specimens of this coconut fly, which had been bred by Mr. Bryan from coconuts furnished him from Mr. Wilder's place in Honolulu. He stated that the maggots of this fly were white when young and a deep blue when full fed. It was described from Fiji and Samoa about 1878, and is closely allied to species which occur throughout Southeast Asia and Oceania.

Oestrus ovis Linn.—Mr. Fullaway reported the finding of a large number of this sheep head maggot in the head sinus of a goat, which was killed by Mr. Albert Horner in Tauhau Valley on Kauai, during November, 1923.

Oliarus eggs.—Mr. Swezey reported the finding of a batch of eggs on the surface of a bracket fungus collected from a koa log on Mt. Ohulehule, October 28, 1923, which, on hatching, turned out to be *Oliarus*. Apparently it is the first record of the finding of eggs *of Oliarus* in Hawaii. There were about a dozen of the oval white eggs loosely enclosed beneath what had the appearance of a small bit of lichen. The inner edge of this was composed of white, waxy material usually found at the apex of the abdomen of the female *Oliarus;* the outside was greenish as if covered by a minute growth of lichen.

Tinea pellionella Linn.—Mr. Swezey exhibited a portion of a saddle cloth of coarse hair, which Mr. Giffard had found infested by this species of clothes moth at his barn on Keeaumoku street, Honolulu. Hundreds of the larval cases were present, and a score or more of moths had issued in the two weeks the material had been under observation.

Staphylinid attacking fruit-fly larvae.—Mr. Bissell exhibited a specimen of a *Staphylinid* beetle, which was collected by E. A. Back and C. E. Pemberton in 1913, and reported by them as attacking the larvae of the Mediterranean fruit-fly in Manoa Valley, Honolulu. He stated that it was different from any species he could find in Hawaiian collections; but that it resembled superficially *Leurocorynus cephalotes* in the Bishop Museum collection, and that possibly it was of the same genus. Also that it was near to *Phyrocephalys coelestis* from Australia.

Pyralid caterpillar on celery.—Mr. Fullaway reported taking a *Pyralid* caterpillar on celery which had been imported into Honolulu from California.

PAPERS PRESENTED DURING 1923.

Hawaiian Trypetidae (Diptera).

BY E. H. BRYAN, JR.

(Presented at the meeting of March 1, 1923.)

I have received two letters from Prof. Dr. M. Bezzi, in reply to a box of Hawaiian fruit and gall-flies, and a request for his opinion on their nomenclature. He states that "*Chaetodacus cucurbitae* and *Ceratitis capitata* are the usual forms." . . . but thinks that *crassipes*, *cratericola*, and *dubautiae* should be retained in *Tephritis*, although he admits that they are "very like *Trypanea*, in having a star-shaped terminal spot, which is, however, combined with a net-like pattern continued to the base of the wing." He goes on to say that "these species seem to form a group peculiar to the Islands, only the unknown *limpidapex* being a more typical *Tephritis*."

At the July 6 meeting of the Society, last year, on the authority of Dr. Aldrich, I referred these three species to the genus *Trypanea*. In view of Dr. Bezzi's familiarity with the group, it might be wise to leave them in the genus *Tephritis*, but in order to distinguish them from the typical *Tephritis*, to place them in a sub-genus *Trypanoidea*, *Tephritis crassipes* (Thomson) being typical of the sub-genus. *T. swezeyi* and *T. limpidapex* would not belong in this sub-genus.

Scenopinus in Hawaii (Diptera).

BY E. H. BRYAN, JR.

(Presented at the meeting of November 1, 1923.)

It has been known for some time that there were two introduced species of *Scenopinus* in Hawaii. One has infuscated wings, black halteres, and dark legs with yellow tarsi; and the other, nearly clear wings, reddish-brown legs, and the halteres with conspicuous white knobs.

Grimshaw (Fauna Hawaiiensis, Vol. III, p. 11, 1901), records *Scenopinus niger* "Mg." (which should be "(De Geer)") as collected in "Hotel, Honolulu." Just recently I found a reference by Brunetti (Fauna British India, Diptera Brachycera I, p. 312, 1920) that *Scenopinus fenestralis* (Linn.) occurred in Hawaii.

Lundbeck (Diptera Danica, pt. 2, p. 159, 1908) gives descriptions and a key separating these species and I find that our specimens fit these two species very nicely. They may be separated by the following key:

Wings strongly infuscated; eyes separated in both sexes; legs blackish, tarsi yellow; halteres dark....................... *S. niger* (De Geer).

Wings not strongly infuscated; eyes of male contiguous; legs ferrugineous; halteres with white knobs................. *S. fenestralis* (Linn.).

These flies may be easily recognized. They are jet black, with a flattened abdomen, the seven segments of which bear transverse depressions. They are quite bare of bristles, even the arista of the small, three-jointed antennae being lacking. They are most frequently seen on windows, but are also occasionally found elsewhere, as on Ewa Coral Plain. The larvae are elongate, cylindrical, of about twenty segments. They are thought to be carnivorous, living upon the larvae of small moths, fleas, etc. They are associated with certain groups of plants, as the Umbelliferae, and on *Syringa, Rosa* and *Carpinus*.

The Bishop Museum Collection of Psyllidae (Homoptera).

BY D. L. CRAWFORD.

(Presented at the meeting of June 7, 1923.)

Several hundred specimens of Hawaiian Psyllidae in the Bishop Museum were recently assembled by E. H. Bryan and examined by the writer. Twelve species were found to be represented in this collection, as follows:

Trioza iolani Kirkaldy.
Trioza ohiacola Crawford.
Trioza hawaiiensis Crawford.
Hevaheva perkinsi Kirkaldy.
Hevaheva giffardi Crawford.
Hevaheva silvestris Kirkaldy.
Hevaheva monticola Kirkaldy.
Kuwayama minuta Crawford
Kuwayama nigricapita Crawford.
Kuwayama gracilis Crawford.
Cerotrioza bivittata Crawford.
Megatrioza palmicola Crawford.

The following observations may be of interest. Maui and Kauai are both represented in this collection, whereas in published records of Psyllidae neither of these islands has figured much.

Trioza iolani occurs on Maui, judging from the presence of one specimen of this species from Iao Valley, on Ohia lehua.

Trioza ohiacola is a more widely distributed species, occurring on most if not all the islands and forming galls on leaves of Ohia lehua, as does *Trioza iolani* also. This is a variable species and seems to merge into *T. iolani.* Specimens, some very typical of the species and some not very typical, appear in the collection as from Kilauea, Glenwood, Kaiwiki and South Kona (all on Island of Hawaii); Iao Valley, Maui; and a number of upland points on Oahu.

Kuwayama gracilis is represented from several points on Oahu and several specimens collected on Maui (Iao Valley and Kailua) appear to belong to this species, but show a strong tendency to revert to *Trioza* in having genal cones. This genus is distinguished from *Trioza* by the absence of genal cones, the paired projections on the front of the head. The fact that several species from widely separated regions have been referred to this genus and the further fact that each of these species appears to be more closely related to certain *Trioza* species in the same region than to other *Kuwayama* species elsewhere, would seem to indicate that the absence of genal cones is a characteristic derived independently in different localities as parallel evolutional development.

The Maui specimens of *K. gracilis* and one specimen from Oahu appear to belong to this species without much doubt, except that the genal cones are not wholly wanting. Whether these particular specimens really represent another species or not is left for further study to determine.

Kuwayama minuta is represented by a considerable number of specimens from Kauai (Summit Camp).

The other species in the collection present nothing of notable interest.

Notes on Coccinellidae.

BY D. T. FULLAWAY.

(Presented at the meeting of March 1, 1923.)

Curinus coeruleus (Muls.).
Mulsant Spec., p. 472.

Description of Immature Stages.

Egg. Deposited in clusters of from one to two dozen eggs. Individual eggs cylindrical, tapering at the ends, exceeding 1 mm. in length, pearly white, smooth, although microscopically sculptured, micropylar end roughened by the presence of numerous minute granular papillae in a circular area about the opening, attached by an adhesive fluid at opposite end, but seldom erect, usually procumbent.

Larva. Eight mm. long, 3 mm. wide at middle, tapering to both ends, moderately convex, integument finely reticuately rugose; head small, roughly rectangular, a little longer than wide (dorsal view), fairly smooth, black, with a few scattered pale hairs; ocelli three on either side of the head, near antero-lateral angle, directly behind antennae, which are short and three-segmented; the maxillary palpi are considerably larger and three-segmented also; the labial palpi two-segmented. Prothorax much larger than head, roughly triangular in outline (dorsal view), creamy white, the cervical shield brownish, bisected by a median longitudinal white vitta, each half with a black border except for a short distance on posterior margin and with two black spinous tubercles bearing many black spinous hairs situated midway on outer lateral margin; many black spinous hairs on the flat plates. Mesothorax, metathorax and ten abdominal segments transverse, mesonotum and metanotum with four, abdominal tergites, except the last two, with six longitudinal rows of large black spinous tubercles bearing black spinous hairs. These are disposed with reference to individual nota as follows: On the mesonotum two outer (pleural) and two inner (lateral) tubercles on either side, the former widely separate, the latter close together and with a brown spot bordered with black at the base on the inner side; metanotum with two outer (pleural) and one inner (lateral) tubercle, the large oval basal spot entirely black; abdominal tergites with one pleural, one lateral and one dorsal tubercle on either side. There is a conspicuous submarginal crease or depression on either side between the lines of lateral and pleural tubercles. There are also scattered black spinous hairs medially on the mesothorax and metathorax, and laterally on the abdominal segments, a median single and lateral double row of small black depressed tubercles on the abdominal tergites, and spiracular openings in the intersegmental folds at the anterior margins of the first six abdominal segments, between dorsal and lateral tubercles, and on pronotum at base of anterior of the two pleural tubercles on inner side. Color dusky, except an interrupted median longitudinal white vitta (already noted on pronotum), a white U-shaped area embracing the median section of the fourth and posterior margin of the third abdominal segment (to and including the bases of the two lateral tubercles) and the corresponding tubercles on the first and second abdominal segments; a white spot at the base of the corresponding pleural tubercles on the posterior side, as well as at the base of the posterior of the two pleural tubercles on the metathorax on the posterior side, and a median section of the pleural and lateral tubercles on first abdominal segment, lateral tubercle on second abdominal segment and dorsal tubercle on fourth abdominal segment, also as above indicated for prothorax and head. Penultimate segment with many light and dark hairs on posterior margin. Last segment retracted, appearing on the ventral side of body as a flat foot, the organ of attachment in pupation. Venter lighter, legs stout, transverse rows of depressed tubercles on the abdominal sternites.

Pupa. Formed within the shed larval skin, which is rent lengthwise from the anterior margin of the cervical shield to the posterior margin of the fifth abdominal tergite and an opening formed by the receding margins, the pupa lying in the hollow. Length, 5 mm.; width, 3.5 mm., depth, 2 mm. Viewed from above, roughly triangular in outline, the dorsal surface moderately convex. Head retracted beneath the pronotum and closely appressed to the body, not visible on dorsum; roughly triangular in outline, quite narrow at the clypeus although the sides are parallel for half their length. Pronotum deeply emarginate medially on the anterior margin for the reception of the head, lateral margins rounded, only the very posterior part visible from above, the posterior margin slightly curved outwardly. Mesonotum and metanotum transverse, the obtusely angled base of the wing covers joining them laterally, nine segments visible in the dorsal view of abdomen, which is roughly triangular in outline, all the segments transverse. The color of the body ranges from creamy white to reddish brown with dusky markings. Head mostly dusky, pronotum with two broad dusky vittae of reddish-brown ground color, mesonotum with an obtusely angulate narrow transverse black vitta behind anterior margin and two widely separated black spots in front of posterior margin on reddish brown ground, metanotum nearly black, a reddish brown oval area medially near anterior margin. Wing covers blackish along posterior lateral margin, otherwise reddish brown to dusky and yellowish brown, first abdominal tergite black with reddish brown anterior margin and with two pairs of papillae, the lateral ones situated close to the lateral margins, considerably elevated and conical, the median ones more tuberculate, a dusky to black transverse chitinization on each of the following segments to and including the eighth; ninth and tenth segments very small, the latter retracted and with a forked tail for the attachment of the body. Legs and maxillary palpi very conspicuous ventrally. Wing covers reaching posteriorly as far as the posterior margin of the fifth abdominal segment.

Figured in Biennial Report, Hawaiian Board of Agriculture and Forestry, 1921-22, Plate XI (opposite p. 64).

Egg stage	9 Days.
Larval stage	28 Days.
Pupal stage	7 Days.

Hyperaspis silvestrii Weise.
Boll. Portici v. 3, p. 205, 1908.

Description of Immature Stages.

Egg. Laid singly beneath the adult female of *Pseudococcus nipae*. Color, pale lemon yellow, elliptico-cylindrical, .5 mm. long, surface rugulose.

Larva. Young larva olive green, pale and sordid, .75 mm. long, head capsule thinly chitinized, dusky and shining, three ocelli on either side black, a black spot posteriorly on either side of the median line on pro, meso and metathoracic nota. Body clothed with pale hairs. Legs stout. Full grown larva 5 mm. long, 2 mm. wide, elongate oval, flatly convex, color pale clay yellow, darker medially, covered dorsally with white, waxy secretion. Secretes a sulphur yellow fluid from the dorsum when this is disturbed. Head small, transverse, labelliform, retractile, thinly chitinized and bearing fine hairs, ocelli two on each side, black, immediately behind the short, papillate antennae, which are two-jointed and setaceous at apex. Maxillary palpi four jointed. Labial palpi disc-like. Legs fairly stout. Prothorax transversely oval, narrower than the mesothorax or the metathorax. Abdominal segments transverse, narrowing slightly in a posterior direction from the metathorax. A longitudinal row of setigerous turbercles is present on the lateral margins, another within the margin of the metathorax and the first eight abdominal segments, three transverse rows of fine hairs on the pronotum, two on mesonotum and metanotum and a line along the lateral margins of each, a transverse row of hairs on the anterior margin of the first eight abdominal segments, ninth abdominal segment with the hind margin curved, a line of hairs along the caudal margin and a few scattered hairs on the notum, ventral surface nearly naked, the foot on the venter of ninth segment.

Pupa. Completely covered with a mass of white, waxy secretion. When denuded of this, the color appears the same as that of larva. Very convex dorsally, flat ventrally, short oval, 3.5 mm. long, 2.75 mm. wide, dorsally very hairy, head withdrawn to the venter and somewhat imbedded, the nota reaching nearly half the length of body, wing cases extending to the posterior margin of the fourth abdominal segment, last abdominal segment recurved onto the venter and bearing the foot or organ of attachment.

Figured in Biennial Report, Hawaiian Board Agriculture and Forestry, 1921-22, Plate XI (opposite p. 64).

Egg stage	7 Days.
Larval stage	27 Days.
Pupal stage	13 Days.

The Small Banana Weevil (Coleoptera).

BY J. F. ILLINGWORTH.

(Presented at the meeting of March 1, 1923.)

Polytus mellerborgi (Boheman).

Sitophilus mellerborgii Boh., Schoenherr, Genera et Species Curculionidum, vol. 4, p. 976, 1837. Hab., Java.

Calandra remota Sharp, Memoirs on the Coleoptera of the Hawaiian Islands. Sci. Trans. Roy. Dublin Soc., vol. 3 (Ser. 2), p. 254, 1885. Hab., Oahu. (?) Immigrant.

Polytus n. gen. for **mellerborgi** Boh., Faust, J., Curculionidae von Birma. Ann. Mus. Genova, Ser. 2, vol. XIV (XXXIV) 1894. Hab., Rangoon.

I first took specimens of this small weevil in Fiji, 1913, commonly in stems of growing banana, closely associated with the ordinary banana borer, *Cosmopolites sordidus* (Germ.). In fact, so closely were they associated with the larger weevil that for a time I considered them starved specimens of *sordidus*.

Returning to Hawaii, I sent specimens with other material to both the U. S. National Museum and to the British Museum for identification. Mr. Schwarz of the former institution determined them as *Calandra remota* Sharp. Just recently, in going over this material, I discovered that the specimens returned from the British Museum labeled "*Polytus mellerborgi* Boh." were the same species.

Looking up the original description of *mellerborgi*, it was evident that *Calandra remota* must be a synonym for this small banana borer. I wrote Dr. Guy Marshall of the British Museum for further confirmation, stating that we have exotic specimens in Honolulu collections from Borneo, Java, Amboina, Malay Peninsula, China and Fiji. In his reply of December 16, 1922, he states *Calandra remota* Sharp, is undoubtedly a synonym of *Polytus mellerborgi* (Boh.), which is widely distributed throughout tropical Asia.

I was interested in reviewing the literature to find that Faust says, "Einem Zwerg von *Cosmopolites sordidus*," which describes it perfectly, for it is an exact miniature of the larger weevil borer.

Additional References.

Sasscer, E. R., Important foreign insect pests collected on imported nursery stock in 1915, Journ. Econ. Ent., vol. 9, p. 218, 1916.

Banana plants from the Philippines riddled by *Cosmopolites sordidus*, were reported to be also infested with *Calandra remota* Sharp. In the abstract of this report (see Rev. Appl. Ent. (Ser. A) vol. 4, p. 199) the reviewer has substituted *Polytes mellerborgi* Boh., placing *Calandra remota* Sharp in parentheses.

Notes on this species, under the name *Calandra remota* have appeared in the Proceedings of the Hawaiian Entomological Society as follows:

Vol. 1, p. 113, Giffard took 20 specimens from decaying banana stems on Tantalus.

Vol. 3, p. 269, Giffard took a specimen in beating "ieie" vines.

Vol. 3, p. 388, Bridwell found the larvae feeding in the base of banana stems.

Vol. 4, p. 76, Bridwell reported that specimens collected by Muir in China, Malay Peninsula, Java, Borneo and Amboina belonged to this species.

Vol. 4, p. 464, Swezey found nine specimens in the decaying corm of a banana plant at Kaimuki, and again (p. 472) he took 65 of these weevils from beneath the dried-up leaf sheaths of one banana plant at the same place. These had apparently matured from larvae that had developed in the corm below the surface.

Further Notes on Chrysomyia Megacephala (Fabr.) (Diptera).

BY J. F. ILLINGWORTH.

(Presented by E. H. Bryan, Jr., at the meeting of November 1, 1923.)

I wish to add the following notes on the distribution of this species. In Yokohama during July, 1923, I took four males in a fly-trap, in a sweet shop. Yet, during extensive collecting in this region, in June and July, I got no other specimens, even on exposed carrion; a fact which indicates that this species is rare in this latitude. Collecting in Hokkaido failed to reveal a single specimen, though Dr. Matsumura's extensive collection in the Imperial University at Sapporo contained numerous material, both males and female, from the Ladrone Islands, and a male taken at Baguio, Luzon, P. I., by Prof. C. F. Baker.

In Kyoto I took a single male of this species in a fish market, October 1, 1923. I also found this fly in a collection from India, determined by Brunetti, at the Shimazer Seisachio Specimen Department.

Thus these records extend the range recorded in my original notes on this species (Proc. Haw. Ent. Soc. V. pp. 266-7, 1923), and indicate that Yokohama is the northern limit of this semi-tropical fly.

Proc. Haw. Ent. Soc., V, No. 3, December, 1924.

A New Hawaiian Rhyncogonus (Coleoptera, Rhyncophora).

BY DR. R. C. L. PERKINS.

(Presented by O. H. Swezey at the meeting of June 7, 1923.)

Rhyncogonous saltus n. sp.

Nearly black, though reddish in parts, the funicle joints of the antennae and the tarsi evidently rufescent.

Head basally with distinct punctures, in front of these strigose to about the line of the antennal insertions, sparsely clothed with pale yellowish setae; the eyes quite strongly convex; the first and second funicle joints of the antennae subequal, the first not three times as long as its greatest width, the third much shorter than these, the club longer than the three preceding joints together.

Pronotum very densely, subrugosely punctured, such small spaces as are left between the punctures shining; a very narrow smooth median line, which in some aspects appears like a fine carina, extends practically the whole length of the pronotum. The general clothing of this part is very sparse, but towards the sides it forms a dense band which is more or less interrupted or at least thinner towards the middle.

Elytra narrow, about three times as long as the pronotum, and one and a half times as long as broad, clothed with pale decumbent setae (which do not form a pattern, being generally distributed) and with very sparse erect ones, which are chiefly noticeable on the apical and on the lateral parts; the coarse serial punctures are ill-defined or irregular in outline and between them are scattered minute turbercles or surface granulations; there are also some vague inequalities of the surface which are more or less transverse in direction, but, as happens in other species, there may be individual peculiarities. There is no distinct, sharp edge or carina marking off the pseudepipleural portion of the elytra, and this portion is well clothed in general, no distinct maculations being formed by the setae, though they are less numerous on the lower part. On the apical part of the femora the appressed setae become conspicuously dense, in the case of the front and middle legs on both the outer and inner surfaces, but only on the outer surface of the hind femora. The large basal portion of the abdominal ventral surface is mostly smooth and shining, with copious and distinct punctures; the subtriangular apical segment is very feebly sculptured but conspicuously pubescent, the two small preceding segments being comparatively bare.

Female. Length 8 mm.; width of elytra about 3.5 mm.

This obscure species is placed near *R. extraneus*, *simplex* and *vestitus*, and bears considerable superficial resemblance to narrow and depauperated examples of *simplex*. Apart from numerous other distinctions, the value of which is in some cases uncertain owing to the variability of the latter species, while the one above described is at present known only from a single specimen, the ventral abdominal segments afford a good character which is probably quite constant. In *simplex* female the penultimate (exposed) ventral segment is conspicuously hairy, like the apical one, in *saltus* it is nearly bare, like preceding and very unlike the following segment in clothing.

Hab.—Oahu, Waianae Mts., where a single specimen was collected May 9, 1920, by Mr. O. H. Swezey, near the Kolekole Pass, on the native Composite, *Campylotheca menziesii.*

Whence the Termites of Hawaii?

BY THOMAS E. SNYDER.
Entomologist, Bureau of Entomology,
U. S. Department of Agriculture.

(Presented by O. H. Swezey at the meeting of March 1, 1923.)

On a recent visit to the Museum of Camparative Zoology, Cambridge, Mass., through the kindness of Mr. Nathan Banks, I was able to examine a small collection of termites from Hawaii. Among this material were large-sized soldiers of a species of *Neotermes* which may be *Neotermes connexus* var. *major* Sny. I recently described this variety from dealated adults collected at Kaiwiki. The label in the vial of the material from the Museum of Comparative Zoology was merely "Hawaiian Islands."

Very few termites are known from Hawaii; but five species have been described, four being in the more primitive family Kalotermitidae and one being in the intermediate family Rhinotermitidae; no species in the more highly specialized family Termitidae are known from Hawaii. A list of the species of termites of Hawaii showing family relationship and occurrence follows:

Family Kalotermitidae.
Neotermes connexus Snyder......................All Islands
Neotermes connexus var. *major* Snyder......Hawaii, Kaiwiki
Kalotermes immigrans Snyder...............Oahu, Honolulu
Cryptotermes piceatus Snyder................Oahu, Honolulu

Family Rhinotermitidae.
Coptotermes intrudens Oshima..............Oahu, Honolulu

It would be interesting to know whether these termites are native to Hawaii or not. Students of the fauna of Hawaii claim that there is only one native species of termite, namely the mountain form, *Neotermes connexus* Snyder, formerly supposed to be *"Calotermes" castaneus* Burmeister of the United States and the West Indies. *Neotermes connexus* Sny. is a true forest insect, confining itself to the mountain forests, but occurs on all the islands. It is sometimes injurious to living forest trees but does not cause any extensive dying of trees. *Kalotermes immigrans* Snyder, believed to have been *Kalotermes marginipennis* Latr. of North and Central America and the West Indies, is believed to have been introduced. This species occurs in dead trees and other timbers on the lowlands. Nevertheless it is known to have been present in Hawaii since 1883, which is also the first record of *Neotermes connexus*. *Cryptotermes piceatus* Snyder, believed to have been *Cryptotermes brevis* Walker, has been known to occur in Hawaii only since 1904, and with *Coptotermes intrudens* Oshima, known to occur in Hawaii only since 1913, is responsible for the greater part of the destruction of the woodwork of buildings, furniture and other timber in Honolulu. Both of these termites are supposed to have been introduced into Hawaii and are confined principally to Honolulu, although spreading rapidly.

The species in the family Kalotermitidae occurring in Hawaii are related to species occurring in the United States and the West Indies, whereas *Coptotermes intrudens* is related to a species of *Coptotermes*, namely *formosanus* Shiraki, of Japan and Formosa. It may be that some of these species have been introduced into Hawaii and have since developed into distinct species. However, *Neotermes connexus* and *Neotermes connexus*, var. *major* seem to be native species and I should not be surprised if *Kalotermes immigrans* were also native. A single specimen, possibly a variety of this species, collected at Waikiki is lighter colored, longer, with longer, wider head, and has the pronotum relatively shorter in proportion to its width; the wings are also longer; membrane of wing rugose between median and subcosta. Of course it may be that it has been introduced and it is splitting up into varieties. Another species collected on Hawaii, at Hilo in July, 1900, by H. W. Henshaw, is apparently new. More material is needed to definitely determine whether these are varieties or distinct species.

Recently Claude Fuller has described a species of *Cryptotermes* from Durban, South Africa, which is very close if not identical with *Cryptotermes brevis* Walker of Southern Florida and the West Indies. Fuller named this species *pseudobrevis*. It was confined to one carpenter shop in one locality. Such species of termites living in dry, sound wood may easily become cosmopolitan through commerce. Strict enforcement of quarantine laws will prevent much of such distribution.

Recent systematic work on termites is giving us concise records on distribtuion. *Reticulitermes flavipes* Kol. is found to occur only in the eastern portion of the United States. *Leucotermes tenuis* Hagen of America includes three other distinct species. *Neotermes castaneus* Burmeister is a definite species of restricted distribution.

May I not make a plea for a more thorough survey of the distribution of termites in Hawaii and the collection of specimens of soldiers with winged forms, if possible! Such specimens can be placed in alcohol and sent to the United States National Museum. Such a survey may enable us to better determine the status and relationship of Hawaiian termites.

A description of the soldier of *Neotermes major* Snyder is appended.

Neotermes major Snyder.

Soldier.—Head light castaneous-brown, darker anteriorly, broad, but longer than broad, fairly flat, but slightly arched, area of epicranial suture slopes to anterior and is slightly depressed, head with scattered long and short hairs. Width of gula at front nearly three times width at center.

Eye spot purplish, elongate (2 mm. long) slanting.

Labrum yellow-brown, broader than long, rounded and with long hairs at apex.

Mandibles black (reddish brown at base), fairly stout, slenderer and incurved at tips; left mandible with two sharp, pointed teeth at middle and a basal molar; right mandible with one sharp, pointed tooth at middle and basal molar.

Antennae light castaneous-brown, 16 segments, pubescent; third segment elongate, clavate, nearly as long as fourth and fifth segments together.

Pronotum yellow-brown, darker rim at anterior margin, broader than head, deeply roundedly concave at anterior margin, corners high anteriorly, sides roundedly narrowed to posterior margin, latter is slightly emarginate; with scattered long hairs.

Legs with tibiae swollen.

Abdomen yellow-brown, with long hairs.

Measurements: Length of entire soldier, 10.5+ (?) mm.; length of head with mandibles, 4.9-5.20 mm.; length of head without mandibles (to anterior), 3.30 mm.; length of left mandible, 1.70 mm.; length of pronotum, 1.70 mm.; length of hind tibia, 1.80-1.90 mm. (aver. 1.85); width of head, 2.5-2.7 mm.; width of pronotum, 2.8 mm.

Described from three soldiers in the Museum of Comparative Zoology, Cambridge, Mass., in a vial with label "Hawaiian Islands." This soldier is believed from its size, etc., to be the same species as *Neotermes connexus*, var. *major* Snyder, described from dealated adults from Kaiwiki, Hawaii. If so, it is a valid species, not a variety; if not, it is a new species. Two of these specimens from which the description was made are in the Museum of Comparative Zoology, Cambridge, Mass., the other is in the U. S. National Museum, Washington, D. C.

Notes on Insect Pests in Samoa.

BY O. H. SWEZEY.

(Presented at the meeting of November 1, 1923.)

While in Samoa four weeks during September, 1923, every opportunity was taken to make observations on insect pests of economic importance there.

Apparently the most destructive pests are those of the coconut and banana, and they appear to be such as have comparatively recently arrived there from elsewhere, probably from other Islands of the South Pacific.

The worst pest on sugar cane is the borer, the same kind that we have in Hawaii. As cane is grown in Samoa only for thatching the native houses, the damage done by the borer is not taken so seriously as if it were a commercial crop.

Insects on Sugar Cane.

Perkinsiella vitiensis Kirk.

This leafhopper was usually to be found in patches of sugar cane, though not abundant enough to be injurious. In fact, the insects themselves were rather so scarce as to be difficult to find, but their presence was known by the discoloration of the midrib of the leaves where eggs had been deposited. Very few eggs were found anywhere, and I failed to find any that were parasitized. However, a few of the little round exit holes were found which indicate where the egg-parasite *Ootetrastichus* had issued. This was very likely the same species (*Ootetrastichus beatus* Perkins) that occurs in Fiji. The adult parasite oviposits in eggs of the leafhopper. In developing, the parasite larva consumes the leafhopper egg in which it has hatched, it then eats the other two to seven eggs of the same cluster of leafhopper eggs. Having obtained its growth the larva transforms to the pupa and adult in a small cavity in the leaf tissue, and gnaws the tiny round exit hole to make its escape when fully matured. This egg-parasite was introduced from Fiji to Hawaii in 1905 where it rendered valuable assistance in checking the cane leafhopper (*Perkinsiella saccharicida* Kirk.)

occurring there. A single specimen of the egg-parasite was collected in a cane patch on the island of Tau of the Manu'a group, which proves to be the Fijian species mentioned.

Rhabdocnemis obscura (Boisd.).

The cane borer was generally present and quite injurious. In some places worse than others, sometimes scarce and hard to find in cane patches. Often it was easier to find in coconut trees, where its larvae were in the bases of old leafstalks, usually the stubs where leaves had been cut off.

A colony of the New Guinea Tachinid fly parasitic on the larvae of this borer was sent to the Naval Station, Pago Pago, in 1918. I learned that the flies had been liberated in a cane patch at a Samoan village on Pago Pago harbor. As I was not able to find any of the parasites anywhere that I looked, it must have failed to become established. If it had succeeded in establishing, it could have spread quite generally by this time. Other colonies of this parasite have recently been sent in further attempts to establish it there.

Elytroteinus subtruncatus (Fairm.).

A beetle which has been known as the ginger weevil, was found in cane along with the cane-borer in a cane patch on the side of the mountain above Fagasa village. Quite a number of larvae were found, mostly in broken off canes lying on the ground and already somewhat bored by larvae of *Rhabdocnemis obscura*. A few pupae were found which were saved till they matured to the adult beetles. The identity of the species was verified by Dr. G. A. K. Marshall of the Imperial Bureau of Entomology.

Longicorn beetle.

A few larvae of a Longicorn beetle were found in dead canes on the ground in the same cane patch at Fagasa. These were not reared, so their identity is not known. They were probably some dead-wood borer, and not a particular cane insect, probably only attacking dead canes.

Melanitis leda Linn.

On two occasions the larva of this butterfly was found feeding on cane leaves. One of them was reared, thus proving its identity. It is a green caterpillar, probably a special cane insect, though not numerous enough to be considered a pest. I do not know if it feeds on other plants than cane. It occurs in Fiji, and quite widely distributed in the South Pacific.

Cosmopteryx dulcivora Meyr.

The larva of some small species of moth was found boring in the midribs of cane leaves, fairly common, but not specially injurious. I failed to rear any adults, but it is likely to be the species here given which occurs in Fiji with similar habits.

Mealy bugs: Pseudococcus sacchari and **P. calceolariae.**

Both of these species of mealy bugs are found, the former more common than the latter. Both feed on the cane stalk at the nodes, inside of the leaf sheaths. No parasites were found associated with these, nor ladybeetles feeding on them.

Aleyrodes bergii (Sign.).

In several different places colonies of an Aleyrodid were found on cane. They were usually on the underside of the leaf and near the base, and in quite dense clusters of a few hundred insects and occupying a space of two to three inches along the leaf. They were not numerous enough to cause any significant injury. This species also occurs in Fiji.

Diaspine scale.

In the cane patch at Fagasa, a few stalks of cane were found having a scale on them near the joints. Not numerous enough for injury. The species has not been determined.

Coconut Insects.

Oryctes rhinoceros Linn.

The rhinoceros beetle seems to be considered the most important of all insects that affect the coconut in Samoa. The injury is done by the large adult bettles feeding and burrowing in the growing crown of the coconut tree, where they may cause such injury as to result in the death of the tree, or they may only mutilate the undeveloped leaves so that they cannot become fully developed and of proper service to the tree, or it may be that the undeveloped fruiting clusters are so much injured as to prevent the bearing of nuts. The appearance of the newer mutilated leaves serves to indicate when and where the beetle is prevalent. The larvae or grubs are not injurious but feed in dead and rotting stumps and logs.

Searching out these grubs and destroying them is the chief control measure being practiced. It seems to be quite effective when persistently and thoroughly carried out. One day per week is designated as "beetle day," on which the natives are required to make special search for these grubs. Many thousands of them are thus found by chopping up old logs and stumps. Their eggs are also found in this way, and a few of the beetles themselves, all of which are destroyed. Much benefit is derived in this way, but the work would be greatly facilitated if the coconut groves were kept free of the native jungle of brush and vines that has such a tendency of rapidly choking up the space beneath the coconut trees. On account of this undergrowth there is great difficulty in finding the breeding places of the beetles and many will escape detection and thus enough grubs go through to maturity to keep the beetle continuously going.

Rhabdocnemis obscura (Boisd.).

The sugar-cane borer is found quite commonly in coconut trees. The beetles may be found behind the bases of the leaves where they can readily hide among the fibrous matter, but the grubs were usually found in the bases of the leafstalks, and mostly in those that had been cut off, leaving a stub remaining on the tree. These cut-off ends provide a place where the adult beetles could conveniently lay their eggs, which accounts for the grubs being more often found in such positions. On account of this habit of feeding in these places, this weevil is not of important injury to the coconut trees.

Diocalandra taitensis (Guer.).

The Tahiti coconut weevil was found quite abundantly in places. It is much smaller than the sugar-cane borer. Its larvae feed in the edges of the lower part of the leaf stalk, and as it is the older leaves that are most often attacked, they are not significantly injurious to the trees. They, too, are likely to be more abundant in stubs of cut-off leaves.

Promecotheca reichii Baly.

This is a Hispid beetle whose larvae are leaf-miners in the leaflets of coconut. The egg is laid on the surface of the leaf, and the young larva, on hatching, bores into the leaf and feeds on the inner green part of the leaf, and producing a dead spot on the leaf where the green matter has been eaten away. The larva transforms to a pupa and eventually to the adult beetle within the mine in the leaf. This was not observed to be abundant enough to be particularly injurious.

Leaf Caterpillar.

Everywhere the coconut leaves showed evidences of the feeding of some insect which ate off the surface in small spots, leaving one epidermis of the leaf and giving the appearance of numerous small dead spots on the leaflets. No insects were found actually doing this eating, but it was considered as being the work of caterpillars of some small moth which was out of season at the time I was there. I thought at the time that the appearance of the leaves was different from that caused by the little moth, *Levuana iridescens,* which injures coconut leaves so badly in Fiji.

Graeffea minor Br.

Stick insects were found feeding somewhat on coconut leaves in a few places. In feeding they consume the whole substance of the leaf, so that the leaflets have ragged edges, or may even be eaten down to the midrib. A larger species, *Graeffea cocophaga* (Newp.), is also said to feed on coconut leaves, but I failed to find any of these. The damage by these insects did not seem to amount to much.

Chrysomphalus rossi (Mask.).

This scale insect was found frequently on coconuts, occurring on or beneath the scales at the base of the nuts, also on other parts of the tree. It did not seem to be particularly injurious.

Scholastes bimaculatus Hendel.

This fly appears to be attached to the coconut, but perhaps not as a pest, as it apparently breeds in decaying nuts. The fly is usually seen on fallen nuts lying under the trees. What I considered their eggs were found by thousands beneath the scales at the base of immature coconuts lying on the ground, that had fallen off accidentally by the wind, or had been partially eaten by the flying fox, which damages the young nuts on the trees a good deal. I also found very numerous small pink maggots feeding in the decaying husk of similar nuts lying on the ground, which I took to be the maggots of this fly. However, these conclusions are not to be given too much importance. Further observations are necessary to fully learn the life history and habits of the fly and its exact relations to coconuts.

Termites.

A species of termite that is very abundant in the forests of Samoa, builds large, black, rough-surfaced nests on the trunks of trees from one to ten feet or more from the ground. They feed in the trunks, also build narrow covered runs about on the surface of the tree trunk, often extending to a considerable elevation in the tree. Beneath these runs the termites feed on the bark.

Coconut trunks frequently bear these termite nests. A favorite position for the nest being at one of the numerous notches that have been cut into the trunks by the natives to facilitate climbing the trees for the nuts. Besides providing a place for the entrance of termites to the trunk, these notches also present opportunities for decay to set in which diminishes the productivity of the tree and shortens its life. This phase of it is probably more detrimental than the injury by the termites, and it seems to me that this practice of notching the trees should be discouraged.

Banana Pests.

Cosmopolites sordidus (Germ.).

The banana weevil was found in a number of places. Perhaps it has only lately become established and not yet generally spread. The larva of this beetle is a fat, white, legless grub which bores in the corm and base of banana stems. The adult is a black snout-beetle and may be found in the same places and beneath the dried leaf bases at the base of banana stems. This pest is very destructive to bananas where it occurs in Fiji, Queensland, Java and probably most of the groups of islands between there and Samoa. Where numerous in the base of banana stems these are weakened and may easily fall over, or the plant prevented from normal growth and fruiting, and the young suckers may be entirely killed. This pest has become very serious in Fiji and it is very difficult to devise satisfactory methods of control. It is likely to increase to that condition in Samoa.

Nacoleia octasema Meyrick.

The banana scab moth is generally prevalent. The caterpillars of this moth feed among the flowers and the green bananas on the bunch. Where they feed on the surface of the young growing bananas it does not always prevent their growing to normal size, but the surface where eaten assumes a scabby appearance which is detrimental to the sale of the fruit. The bunches, too, are unattractive where littered up with the black frass from the caterpillars.

This pest occurs from Java to Queensland, Solomon Islands, and to Fiji and Samoa, and no doubt it occurs at all intervening islands. I think that it has not been previously reported in Samoa, and may be of somewhat recent introduction there. In Java, dusting with pyrethrum powder is said to be effective in controlling the pest. The pyrethrum is mixed one part to three parts of sifted wood ashes or lime, and dusted into the opening flower cluster or among the small growing bananas by means of a syringe-like duster.

Papaia Fruit-fly.

Dacus xanthodes Broun.

This fruit-fly was reared from immature fruits of papaia at Amauli towards the east end of Tutuila. I did not find it generally attacking papaias, but it is not confined to papaia as it has been reared from guavas and granadillas. Fruit-fly maggots were found in alligator pear, and in several kinds of native fruits in the forest, but none of these were reared, so we do not know if they were this species or other species of fruit-flies.

Taro Insects.

Chaerocampa celerio (Linn.).

The larvae of this medium-sized hawkmoth were occasionally found feeding on the leaves of taro, not numerous enough to be considered injurious, however. It occurs from India to Java, Borneo, Australia, and Fiji. The large, green caterpillars with a horn at the tail end may be readily picked off and killed when noticed.

Megamelus proserpina Kirk.

This is a small leafhopper found on the underside of the leaves, and often quite numerous though not specially injurious. It occurs in Fiji, Java, the Philippines and probably intervening regions.

Several other kinds of leafhoppers were collected on taro leaves, but were not considered as particularly attached to taro the same as *M. proserpina* is.

Aphidid.

An undetermined plant louse was also found on the leaves of taro, but not causing serious infestations.

Insects of Cucurbits.

Glyphodes indica Saund.

The larvae of this widely spread leaf-roller moth were occasionally found on cucumber vines, but in no case were they numerous enough to be considered a pest.

Aulocophora fabricii ?.

A leaf-beetle probably of this species was quite abundant on squash and pumpkin vines.

As nearly all of the insects above mentioned do not occur in the Hawaiian Islands, and as some of them are serious pests where they are, we may consider ourselves fortunate if they can be kept from reaching our islands.

Of the ten insects on sugar-cane mentioned, only three are at present infesting cane in Hawaii, the borer and the two mealybugs. Some of the others, although not serious pests on cane in Samoa, might possibly become pests if they reach Hawaii, the same as the leafhopper from Australia became such a bad pest, whereas it was not a bad one in Australia.

The most of the coconut insects are not present in Hawaii either. The leaf-roller that we do have, however, causes the leaves to look more dilapidated than they do in Samoa with several kinds of insects feeding on them. Our one pest on coconut leaves is too much, we surely do not want any more.

The banana borer and the banana scab moth would ruin the banana industry in Hawaii if they should gain access here, and there is no telling what the papaia fruit-fly might do here, as it has been reported bred from pineapples from Fiji, though not fully substantiated.

As Samoa is the closest tropical neighbor from which steamers are coming regularly, it is the most likely place from which some of the already widely distributed tropical insect pests could accidentally reach Hawaii, and makes it urgent that a constant lookout be maintained to prevent as long as possible any more such pests arriving here.

Descriptions of New Chalcid-Flies from Hawaii and Mexico (Hymenoptera).

BY P. H. TIMBERLAKE.

(Presented at the meeting of December 6, 1923.)

The types of the Hawaiian species described in this paper are deposited in the collection of the Hawaiian Entomological Society, and those of the two Mexican species of Encyrtidae are in the collections of the Hawaiian Sugar Planters' Experiment Station.

ENCYRTIDAE.

Acerophagus debilis n. sp. Fig. 1.

This species is most like *notativentris* (Girault) among previously described species, and differs in the position and arrangement of the ocelli, in the much more clavate antennae, and by lacking a fuscous mark on the abdomen of the male.

Female. Head of the same general shape as in other North American

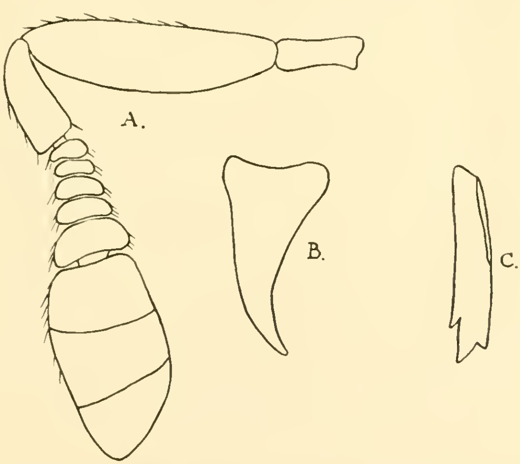

Fig. 1. *Acerophagus debilis.* A. Antenna of female. B and C. Mandible in dorsal and frontal views.

species of the genus, but rather thicker fronto-occipitally than in most species; in dorsal view fully rounded on the sides and in front; in side view thickest opposite the anterior ends of the eyes, the planes of the frons and face meeting in slightly more than a right angle, the face somewhat shorter than the frontovertex; as seen from in front, distinctly wider than long, but not greatly so, the sides of the head rounded, the oral margin rather broad and subtruncate. Frontovertex about twice as long as wide, the orbits parallel; ocelli in a right-angled triangle, the anterior ocellus placed at the posterior third of the frontovertex, the posterior pair about their own diameter from the occipital margin and much closer to the eye margin; eyes rather smaller than in *notativentris*, somewhat less than twice as long as wide, widest near the anterior end; cheeks distinctly shorter than the width of the eyes; face with a rather shallow, semi-oval scrobal impression, the sides of the impression sloping; the bottom largely filled by the prominence between the antennae, which is about one-half longer than wide and reaches upward to the ocular line; the scrobes proper occupy the rather narrow space between the sides of the impression and the prominence, and converge and unite above in a curve. Antennae (Fig. 1a), inserted as usual close to the oral margin and far apart, more strongly clavate than in other species; scape rather wide, pedicel almost as long as the funicle and considerably narrower at apex than the scape; funicle joints all transverse and increasing in width, the fifth joint about twice as long and twice as wide as the first; club broadly oval, somewhat obliquely truncate at apex and as long as the funicle and two-thirds of the pedicel combined. Mandibles (Fig. 1b and c) of the usual type, with the outer tooth far basad, and the middle tooth considerably larger than the inner tooth.

Thorax and abdomen normal for the genus, the ovipositor sheaths protruded for a distance about equal to one-fourth of the length of the abdomen, or to the length of the middle tibial spur. Wings narrow, the disk finely, densely pubescent, but the setae in the basal area distinctly coarser and sparser; speculum narrow and only slightly widening as it approaches the posterior margin which it does not quite reach; stigmal vein narrow at base and gradually enlarging towards the apex, about twice as long as the marginal and postmarginal veins combined.

Sculpture throughout very finely alutaceous, the frontovertex not perceptibly more granular than the rest of the body; both it and the mesonotum with very minute, scattered setiferous punctures. Pubescence on the head very short and inconspicuous, the setae on the frontovertex nevertheless rather numerous and retrorse; eyes rather densely pubescent, the setae very short and erect; pubescence of mesonotum moderately thick and rather dark colored, quite uniform in distribution on the scutum, axillae, and scutellum.

Color of head, thorax, and abdomen about capucine yellow (Ridgway), the face and underparts of the thorax slightly paler with the scape, club and legs nearly unicolorous; remainder of antennae somewhat dusky; apex of ovipositor sheaths blackish; wings hyaline, the veins very pale brownish.

Length of body (0.436 to) 0.721; length of head, 0.235; width of head, 0.275; thickness of head fronto-occipitally, 0.151; width of frontovertex, 0.099; length of antenna, 0.339; width of mesoscutum, 0.240; length of fore-wing, 0.587; width of fore-wing, 0.226; length of exserted part of ovipositor, 0.073 mm.

Male. Similar to the female, but the frontovertex is proportionately wider, or not quite twice as long as wide, the anterior ocellus placed only a little behind the center; antennae slenderer, the club solid; the abdomen smaller, strongly depressed, ovate, and about two-thirds as long as the thorax.

Coloration paler, the vertex, notum of thorax and abdomen light orange-yellow (Ridgway), the frons shading into paler yellow anteriorly; the face, underparts of thorax and the legs pale yellowish; antennae pale yellowish, but with the fifth funicle joint and base of the club fuscous and the remainder of the club yellowish white.

Length of body (0.396 to) 0.533; length of head, 0.203; width of head, 0.214; thickness of head fronto-occipitally, 0.113; width of frontovertex, 0.085; length of antenna, 0.290; width of mesoscutum, 0.203; length of fore-wing, 0.521; width of fore-wing, 0.212 mm.

Described from 3 females (holotype and paratypes) reared from *Pseudococcus brevipes* Ckll. (*bromeliae* of authors) on pineapple, Amatlan, Vera Cruz, Mexico, May 20, 1922; 1 male (allotype) from the same host on *Tillandsia*, El Potrero, Vera Cruz, July, 1922; and 1 male (paratype) reared November 1, 1922, from the same host from Cuernavaca, Morelos, Mexico, all collected by H. T. Osborn.

Type No. 1142, Hawaiian Sugar Planters' Experiment Station.

Synaspidia new genus.

This genus appears to be closely allied to the *Blepyrus*, *Aenasius*, *Archinus*, and *Zaomma* group of genera. It differs from *Blepyrus*, *Euryrhopalus* and close allies in having the head non-menisciform and without large punctures; from *Archinus* it differs in having the post-marginal vein well developed and longer than the stigmal, the ovipositor not protruded, the cheeks not unusually short, etc. From *Zaomma* it differs in having the eyes smaller, the frontovertex only moderately narrowed, the facial impression not horseshoe-shaped, the club less strongly enlarged, the pedicel not very short, the antennae unicolorous, etc. On the whole, it seems to agree most closely with *Zaomma* which, unfortunately, is known to me only by description.* It agrees with *Zaomma* in having the face inflexed,

* I have since examined the type of *Zaomma argentipes*, which unfortunately has been badly mutilated, the head being in fragments on a slide. *Zaomma* has the thorax strongly convex above, the axillae rather well separated and slightly elevated above the scutellum; the latter is

with the frons prominent, the antennae strongly clavate, the marginal vein very short, the post-marginal and stigmal veins both long. The axillae and scutellum are closely fused in *Synaspidia* as in *Chalcaspis* and *Metaphaenodiscus*, but both of those genera have the head menisciform.

Female. Head much wider than long, thick fronto-occipitally with the face strongly inflexed and the frons prominent; in side view, appearing distinctly triangular, with the planes of the face and frontovertex about equal in length and meeting in a right angle; eyes large, very broadly oval, largely dorsal and latero-dorsal in position; frontovertex narrow or about four times as long as its narrowest part, the ocelli in an acute angle; face with a large scrobal impression which is subtriangular above; cheeks rather short or about one-half as long as the width of the eyes. Antennae inserted rather far apart close to the oral margin; scape slender, slightly widened at the middle, and reaching a little beyond the scrobal impression; pedicel of about normal length and shape, and rather longer than one-half of the funicle; flagellum short and strongly clavate, the funicle six-jointed and rapidly increasing in width distad, the first joint nearly twice as wide as long, the sixth about thrice as wide as long; club broadly oval, about one-half longer again than wide, rather longer and much wider than the funicle, three-jointed with the apical joint obliquely truncate beneath. Mandibles slender in frontal view, expanding at apex and with three acute teeth, of which the middle one is much the largest; base of mandible expanded in a plane at right angles with the apex. Palpi short, the maxillary pair four-jointed, the labial pair three-jointed.

General form of body short and robust, the thorax about one-third longer again than wide, pronotum largely concealed by the head, the collar not very strongly arcuate; mesoscutum nearly thrice as wide as long, its posterior margin slightly sinuate on each side of the middle; axillae but little wider than long, not especially acute at the inner angle and rather widely separated medially; they are also closely fused to the scutellum, the separating suture being only weakly indicated; the consolidated scutellum and axillae as a whole is about as long as wide at the base, and the apex is well rounded. Abdomen at base as wide as the thorax and somewhat shorter, subtriangular in dorsal view with the apex subtruncate; the dorsum rather deeply concave, the venter subvomeriform; vibrissal plates situated near the middle of the lateral margins; ovipositor wholly enclosed by the ventrites and the sheaths not appreciably protruded.

Legs short and normal in structure; middle tarsi with the usual tapering form and considerably stouter than the hind pair. Wings small and

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pulvinate, longer than wide, the apex rather broadly rounded, the sides and apex high and declivous. The marginal vein is about three times longer than wide; the stigmal short, slender, curved upward, a little over one-half the marginal; the postmarginal shorter than the stigmal, being short and triangular.

not reaching much beyond the apex of abdomen; the disk moderately densely pubescent, the speculum very distinct, the basal area with sparser, somewhat coarser but more hyaline setae, the costal cell pubescent except next to the vein; marginal fringe very short but dense; submarginal vein reaching to the middle of the costal margin, almost straight and somewhat thickened near its apex; marginal vein quadrate-punctiform; the stigmal rather long, straight and with a slender, short spur at apex; postmarginal vein somewhat longer than the stigmal, the angle between these two veins acute; costal cell of hind wings moderately wide and extending to the hooklets.

Head and thorax with a very finely reticulate, moderately lustrous surface, the face more lustrous and with a considerably coarser reticulation; frontovertex with fine pin-punctures. Pubescence of head and body short, fine, appressed, dark-colored and inconspicuous; setae of the mesoscutum seriately arranged, those on the axillae and scutellum sparser yet rather numerous. Coloration metallic.

Male. Very similar to the female, but the antennae are only eight-jointed, the funicle with five joints, and the club solid.

Type of the genus: *Synaspidia pretiosa* n. sp.

Synaspidia pretiosa n. sp. Figs. 2 and 3.

Female. Head with the whole dorsal surface sloping forward and downward nearly at right angles with the longitudinal axis of the thorax; as seen in frontodorsal view, it is strongly rounded on the sides, subtruncate in front, the occipital margin broadly roundly emarginate; as seen from in front, distinctly wider than long, strongly rounded on the sides, with the cheeks gibbously convergent towards the rather small mouth. Occiput rather deeply concave, its dorsal margin very acute; eyes large, hardly a third longer than wide, their outline strongly rounded except at the inner orbits, their posterior margin contiguous to the occiput; frontovertex narrowest at the anterior ocellus, slightly widening anteriorly and more abruptly widened at the posterior ocelli; ocellar triangle moderately acute, the distance between the posterior pair of ocelli equal to about three-fourths of the distance between either and the anterior ocellus; the posterior pair contiguous to the eyes and removed about one-half their own diameter from the occipital margin. Scrobal impression large and occupying nearly the whole face, but rather shallow, indefinitely bounded on the sides, but definitely limited above by the angle between frons and face; the prominence between the antennae low and weakly convex, oval in outline and about twice as long as wide; the scrobes proper in the form of linear grooves on each side of the prominence, but uniting above and forming the bottom of the whole impression in its dorsal half. Antennae and mandibles as in figure 2; maxillary palpi short, thickest at apex of the second joint, the first two joints nearly equal in length, the second about one-half longer than thick, the third distinctly smaller than the second, although hardly shorter on its outer margin, the fourth joint cylindrical and tapering in apical half, about as long as the first two joints combined; labial palpi very short, the middle joint transverse, the apical joint somewhat the longest, conical, and hardly more than twice as long as thick.

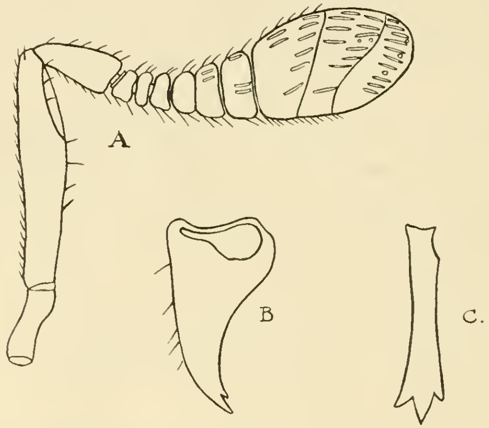

Fig. 2. *Synaspidia pretiosa.* A. Antenna of female. B and C. Mandible in dorsal and frontal views.

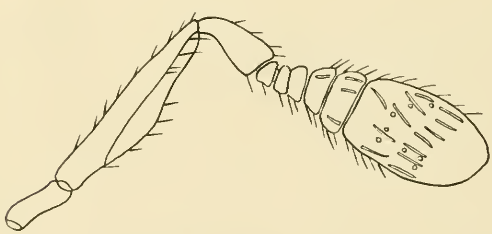

Fig. 3. *Synaspidia pretiosa.* Antenna of male.

Thorax moderately convex above, distinctly wider than the depth dorso-ventrally; the axillae and scutellum very strongly depressed and lying in one plane, the apex of the scutellum very briefly elevated, yet abruptly declivous at the margin, the latter very finely acutely rimmed, just inside of which is a delicate submarginal furrow. Propodeum short and very transverse, considerably longer at the sides and there declivous, the basal margin finely carinate; on both sides of the middle this basal carina branches, the branch on each side curving backward and outward towards but not reaching the posterior margin halfway between the foramen of the petiole and the lateral corner; just inside of the spiracles on each side another fine carina runs straight backward to the edge of the declivous portion of the propodeum, where it branches, the inner branch connecting with the submedian carina, the outer branch extending towards the posterior lateral corner of the propodeum, still another branch is given off anteriorly and runs forward to the spiracle; spiracles rather large, oval and contiguous to the basal margin of the propodeum.

Reticulation of head and thorax very fine and delicate, but somewhat coarser and more evident on the face; frontovertex with two longitudinal rows of pin-punctures on either side of the median line, and an orbital row of much finer punctures on each side; mesonotum with numerous seriately arranged, minute setigerous punctures similar to the orbital punctures of the head, and becoming sparser on the axillae and scutellum; prepectal plates as coarsely reticulate as the face; mesopleura with an extremely fine reticulate shagreening; propodeum except for the carinae described above is mostly smooth; reticulation of the abdomen rather coarser and more evident than that of the face and with the lines mostly transverse, especially on the basal tergite.

Eyes with an extremely short sparse pubescence, not apparent except under high magnification; pubescence of head and body short, recumbent and dark-colored, antrorse on the frontovertex and retrorse as usual on the thorax, that of the axillae and scutellum becoming sparser and the apex of the scutellum with two considerably longer setae; sides of the propodeum behind the spiracles with a very fine whitish pubescence, which, however, is not conspicuous; pubescence along the sides and at the apex of abdomen sparse, but somewhat longer than that of the thorax.

General color moderately lustrous black; head with a rather weak bluish-green luster, the face more lustrous and greenish; mesoscutum usually somewhat bluish, but sometimes like the axillae and scutellum, which are darker and more aeneous; lateral posterior corners of the propodeum with a rather bright bluish luster; abdomen mostly like the scutellum, but the apical tergite has a brighter and greenish luster; antennae and legs concolorous with the body, but less lustrous, the tarsi mostly yellowish, with the last three joints of the hind pair, the last joint and the spines on the plantar surface of the middle pair fuscous, the front pair more or less dusky yellow, the spur of the middle tibiae yellow; wings hyaline, the disk with a very faint indefinite fuscous cloud beneath the stigmal vein, the veins brownish.

Length of body (1.16 to) 1.32; length of head, 0.497; width of head, 0.601; thickness of head fronto-occipitally, 0.325; width of vertex at anterior ocellus, 0.085; length of antenna, 0.662; width of mesoscutum, 0.561; length of fore-wing, 1.027; width of fore-wing, 0.502 mm.

Male. Very much like the female in most respects and the following differences appear to be the most important: Vertex widening a little more at and behind the posterior ocelli, somewhat protuberant and rather more dully shagreened; ocelli slightly larger and in a less acute triangle;

eyes considerably more densely and conspicuously pubescent; antennae (Fig. 3) with the flagellum proportionately shorter, the funicle only five-jointed, the club solid, but in general shape agreeing with the female; the scape with a narrow ventral exfoliation from the apex to a little more than three-fourths of the length excluding the radicle, this exfoliation in the female being much smaller and not reaching to the middle; abdomen somewhat wider than long, rounded at apex and hardly more than one-half as long as the thorax, therefore, considerably smaller, more depressed than in the female, and with the venter not at all vomeriform.

Length of body (0.825 to) 1.15; length of head, 0.441; width of head, 0.507; thickness of head fronto-occipitally, 0.261; width of vertex at anterior ocellus, 0.094; length of antenna, 0.542; width of mesoscutum, 0.499; length of fore-wing, 0.905; width of fore-wing, 0.457 mm.

Described from 13 females, 8 males, reared from *Pseudococcus brevipes* Ckll. (*bromeliae* of authors) collected in Mexico by Mr. Osborn, as follows: 1 female (holotype) reared August 10, 1922, from its host on *Tillandsia,* El Potrero, Vera Cruz; 12 females, 3 males (paratypes), reared from mealybugs on *Tillandsia* and other Bromeliaceous plants, El Potrero, on July 31, and during August, 1922; 2 males (allotype and paratype) with the same data, but collected in March, 1923; 3 males (paratypes) from mealybugs on a Bromeliaceous plant, Rio Seco, Vera Cruz, March 15, 1923.

Type No. 1143, Hawaiian Sugar Planters' Experiment Station.

Zeteticontus perkinsi n. sp. Fig. 4.

Female. Head moderately thick fronto-occipitally with the face slightly inflexed; in dorsal view appearing semi-circular with the occipital outline broadly and roundly emarginate; in side view appearing thickest fronto-occipitally at the anterior ends of the eyes, the planes of the face and frons meeting in an angle of distinctly more than 90 degrees; in frontal view appearing as wide as long and nearly circular in outline with the broad oral margin truncate. Occiput moderately deeply concave; eyes of medium size, broadly oval, about one-third longer again than wide, posteriorly contiguous with the occipital margin, the inner orbits somewhat diverging anteriorly; frontovertex occupying about a third of the total width of the head, and about one-third longer than its own width at the anterior ocellus; ocelli rather large, disposed in what is slightly more than a right-angled triangle, the posterior pair somewhat less than their own diameter from the occipital margin, and not more than one-half as far from the margin of the eyes. Cheeks in side view of head rather wider than long and distinctly shorter than the width of the eyes, the genal suture very obscure; facial impression subcircular, extending for about one-half of its length above the ocular line, the prominence between antennae convex, about twice as long as wide and reaching somewhat above the middle of the facial impression; the scrobes proper broadly united above, the sloping walls of the facial impression extending far laterad of them (in *planiscutellum* the facial impression is distinctly triangular, rather shallow and strictly co-extensive with the scrobes proper, and the antennal prominence is about as wide as long); antennal sockets situated rather far apart near the oral margin, the distance between them somewhat less than the distance from either to the nearest part of the eyes, and slightly more than twice as great as the distance from either to the oral margin.

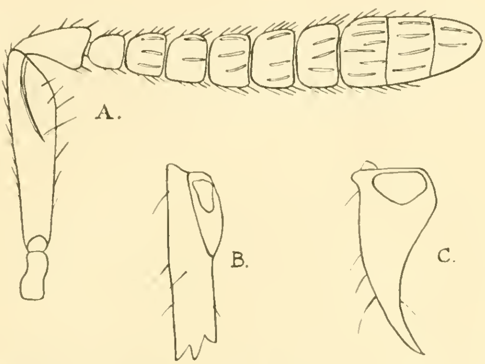

Fig. 4. *Zeteticontus perkinsi.* A. Antenna of female. B and C. Mandible in frontal and dorsal views.

Antennae moderately short and distinctly clavate (Fig. 4a); scape slightly expanded beneath and widest at about one-half way between the middle and apex; pedicel equal in length to the first two funicle joints combined, wider at apex than the following joint and slightly narrower than the second funicle joint; first funicle joint much the smallest, about as wide as long, the following joints increasing in width and slightly in length, the next two not much wider than long, the sixth about one-half wider again than long and nearly twice as wide as the first; club oval, a little tapering to the rounded apex, somewhat longer than the three preceding joints combined, its three joints nearly equal in length, the basal one broadest; flagellum except the first funicle joint provided with rather numerous but not at all crowded linear sensoria, the whole flagellum also with very numerous short reclinate setae, and similar, somewhat longer setae occur also on the scape and pedicel. Mandibles (Fig. 4b and c) and palpi as in other species of the genus; the two outer teeth of mandibles equal, both rather shorter than in *planiscutellum*, and the inner tooth placed considerably closer to the apex than in that species, the mandible, therefore, more similar to *abilis* as figured by Silvestri.

Thorax nearly twice as long as wide, moderately convex and not quite so thick dorso-ventrally as wide; pronotum strongly arcuate; mesoscutum much longer medially than at the sides and somewhat less than twice as wide as long, its posterior margin nearly transverse or only slightly produced medially; axillae over twice as wide as long and very acute medially, their inner tips slightly separated or covered by the mesoscutum; scutellum nearly as long as the scutum, the greatest width about equal to the length, the width decreasing from near the base to the rounded apex, the sides low yet abruptly declivous, the disk moderately convex; propodeum extremely short in the middle, but strongly lengthening and becoming declivous towards the sides.

Abdomen a little shorter than the thorax, triangular in outline, with the basal angles rounded and strongly depressed with the dorsum a little sunken in; vibrissal plates situated on the lateral margin a little before the middle; ovipositor sheaths barely protruded, the spicula (in the unique type) lies free from the sheaths and curves downward and a little forward from the point where it issues a short distance from the apex of the venter.

Legs rather short, the middle tarsi considerably stouter than the hind tarsi, but not distinctly tapering towards apex, the basal joint about equal to the spur of the middle tibiae and about equal to the following three joints combined. Wings as in *abilis,* as figured by Silvestri except in the following particulars: Marginal vein fully twice as long as wide, the stigmal practically equal to the marginal in length and much more expanded at apex and constricted at base than in *abilis,* the post-marginal about one-half as long as the marginal; the row of about seven coarse setae guarding the proximal side of the speculum extends more than three-fourths of the distance towards the opposite margin; the second row of finer setae situated just proximad extends for the same distance as the first row and parallel with it, and there is another row of setae lying beneath and parallel with the submarginal vein; the discal pubescence beyond the speculum is moderately dense and fine, and the marginal fringe is extremely short, but dense.

Head with very fine reticulations transversely arranged between the anterior corners of the eyes and just above the facial impression arranged in lines conforming to the rounded margin of the impression, and in this manner extending downward and forward on the face towards the cheeks; the dorsal and anterior orbits of the eyes with a row of pin-punctures, which become gradually smaller and obscurer anteriorly; frontovertex provided also with two other curved rows of pin-punctures, beginning close to the orbital row on each side near the anterior part of the frons and curving backward to join together in a loop behind the anterior ocellus. Mesoscutum with equally fine scaly reticulations producing a somewhat rougher effect than on the head and with numerous seriately arranged minute setiferous punctures; axillae appearing smoothish, yet with an extremely fine reticulation, the scutellum smooth and highly polished; propodeum smooth except for a small longitudinally shagreened median area, and provided with a distinct median carina, the posterior margin also carinate, pleura distinctly reticulate throughout except on the metapleura; abdomen apparently smooth throughout.

Frontovertex with mostly antrorse short setae arising from the pin-punctures, the lower face and cheeks with similar finer setae; eyes with numerous but not dense short erect setae; posterior margin of pronotum with a row of setae about like those on the scutum; the seriately arranged setae of the scutum rather coarser and longer than those on the fronto-vertex, the transverse row on posterior margin containing about fourteen, and the median longitudinal rows about six or seven setae; scutellum with about thirteen pairs of setae on the basal two-thirds, which strongly increase in size from the base towards the apex; the latter evidently provided with another pair of setae, which are broken off in the type, although their position is indicated by punctures; propodeum with a small tuft of fine short setae on the lateral margins; abdomen with fine setae along the sides and more numerous setae at apex.

General color aeneous black; the head, except most of the face, with a rather weak dark bluish-green luster, the pronotum and mesoscutum with a similar somewhat more greenish luster; facial impression, axillae, scutellum, and abdomen much more lustrous and with green, brassy, and dark purplish reflections; tegulae and underparts of thorax shining piceous with a metallic luster only on the pro- and metapleura. Scape dark brown, the pedicel and flagellum blackish. Legs shining piceous, with the tips of the front and middle femora somewhat paler or brownish; trochanters, apical third of front tibiae, middle tibiae except about basal third and the tarsi, except apical joint of hind pair and apex of last joint of the other pairs, brownish yellow. Wings entirely hyaline, the veins brownish yellow, with the marginal vein a little darker. Pubescence of body wholly dark colored.

Length of body, 1.36; length of head, 0.417; width of head, 0.443; thickness of head fronto-occipitally, 0.259; width of vertex at anterior ocellus, 0.160; length of antenna, 0.742; width of mesoscutum, 0.429; length of fore-wing, 1.183; width of fore-wing, 0.523 mm.

Described from one female (holotype), collected in Honolulu in 1906 by Dr. Perkins. The following note by Dr. Perkins is attached to the specimen: "*In horto meo.* Not previously seen by me." The species has not been taken since, and there is, therefore, some doubt that it has become established in the Islands.

Aphelinidae.

Aphelinus maidis n. sp. Fig. 5.

Female. Head of the usual shape, wider than the thorax, as seen from above nearly three times as wide as thick fronto-occipitally, as seen from in front much wider than long; frontovertex only a little longer than wide and somewhat narrowing forward; ocelli in an obtuse angle, the posterior pair about their own diameter from the occipital margin and somewhat more distant from the margins of the eyes; facial impression moderately deep, with sloping sides, the bottom occupied by the triangularly shaped, barely convex prominence, which reaches from the antennal sockets nearly to the dorsal end of the impression. Antennae (Fig. 5) inserted moderately far apart close to the oral margin; scape about four times or a little more as long as wide; pedicel about one and two-thirds times longer than the first two funicle joints combined; the latter equal, and about one-half wider than long; third funicle joint over twice as large as the preceding joint, somewhat wider than long and about one-fourth as long as the club; club narrowly oval, as long as the pedicel and funicle combined and two and one-third times longer than its own width. Mandibles with an acute outer tooth and a broad inner truncation, the ventral or outer edge provided also with a strong tooth-like spine or lobe halfway between the base and apex. Maxillary palpi two-jointed, the basal joint hardly longer than thick, the apical joint about thrice as long; labial palpi two-jointed, both joints about twice as long as thick, the apical joint a little shorter and slenderer. Thorax and abdomen practically as in related species, such as *mali, nigritus,* etc. Wings fully developed and with seven oblique rows of coarser setae proximad of the speculum, the basal fourth of the disk bare.

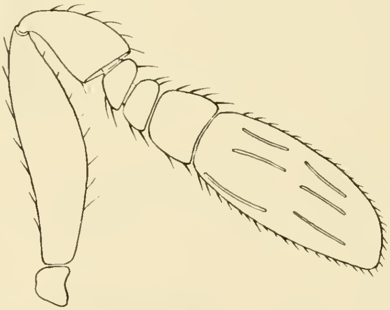

Fig. 5. *Aphelinus maidis.* Antenna of female.

Head very finely, delicately shagreened with reticulations and moderately shiny, the frontovertex with numerous fine shallow setiferous pin-punctures; thorax and abdomen moderately shiny, or about as in *nigritus,* and rather less shiny than in *mali;* the thorax with extremely fine uniform reticulations, the abdomen apparently smooth. In the pubescence of the head and body there appears to be not much difference between this and related species, but the vertex has two pairs of setae, which are considerably coarser than the other setae of the frontovertex; one of these four setae is placed behind each one of the posterior ocelli, and each of the other pair is placed at the posterior corner of the vertex close to the occipital margin.

General color black, but the head and abdomen may be more or less fuscous brown, the base of abdomen more or less distinctly yellowish, although in many cabinet specimens appearing wholly dark. Mandibles pale brown; antennae dusky yellow; legs pale yellow, the front femora on dorsal side and front tibiae except at apex slightly brownish; middle coxae at base, hind coxae, middle and hind tibiae fuscous to blackish, the apical half of the middle femora more dilutely fuscous; tarsi, especially beneath, more brownish-yellow than the other paler parts of the legs, and the apex of the apical joint fuscous. Wings hyaline, but faintly tinged with fuscous, especially beneath the marginal and stigmal veins; the veins yellowish.

Length of body (0.554 to 0.990), 0.903; length of head, 0.276; width of head, 0.386; thickness of head fronto-occipitally, 0.191; width of vertex at posterior ocelli, 0.151; length of antenna, 0.363; width of mesoscutum, 0.358; length of fore-wing, 0.858; width of fore-wing, 0.396 mm.

Male. Very similar to the female and distinguished with difficulty in case of dry specimens, but averaging considerably smaller in size and with the wings often a little clearer.

Length of body, 0.533 to 0.811 mm.

Described from the following material: 32 females, 22 males (holotype, allotype male, and paratypes), reared from *Aphis maidis* Fitch, in Honolulu, December, 1919, to February, 1920 (Timberlake); 1 female (paratype) reared from *Aphis maidis* on grass, Ewa Plantation, Oahu, May 19, 1922 (Timberlake); 2 females, 1 male (paratypes), from same host on corn, Manoa Valley, Oahu, April 10-11, 1923 (Timberlake); 2 females, 2 males (paratypes), collected on sugar-cane, Mountain View, Hawaii, January 21, 1918 (Timberlake); 8 females, 6 males (paratypes), reared from *Aphis sacchari* Zehntner on sugar-cane, Honolulu, August 18-25, and September 13, 1916 (Timberlake); 1 male (paratype) from the same host on sugar-cane, Ewa Plantation, Oahu, August 3, 1918 (Timberlake); 1 female (paratype) collected in Honolulu, March 21, 1917 (Timberlake); 1 male (paratype) reared from *Aphis sacchari*, Hawaii Mill Co., Hilo, Hawaii, September 16, 1913 (Swezey); 1 female (paratype) collected at Waikea, Hawaii, October 2, 1913 (Swezey); 1 female (paratype) collected at Waialua, Oahu, January 8, 1923 (Swezey); 1 male (paratype) reared from *Aphis* sp. on *Scirpus maritimus* L., Honolulu, January 7, 1913

(Swezey) and 2 males (paratypes) collected in Honolulu in 1906 (Dr. Perkins).

Aphelinus maidis comes closest to A. *nigritus* and *lapisligni* Howard, and is distinguished by the characters given in the following table. In Kurdumoff's table of the European species it runs to *varipes* (Förster) and to *hordei* Kurdumoff, but does not agree with either, as both the middle and hind tibiae are black.

Aphelinus gossypii n. sp. Fig. 6.

Female. Head shaped exactly as in *maidis* as far as can be determined in more or less shriveled specimens; antennae (Fig. 6) inserted in the usual position; the scape not quite four times longer than wide, excluding the radicle joint; pedicel almost twice as long as the first two funicle joints combined; first funicle joint about twice as long as wide, the second distinctly longer than the first and about one-third wider than

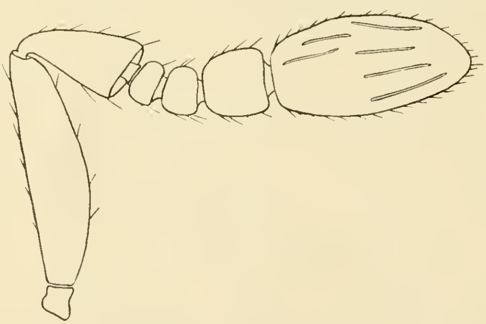

Fig. 6. *Aphelinus gossypii.* Antenna of female.

long, the third about as long as the first two combined, only slightly wider than long and a little less than one-third as long as the club; club rather broadly oval, one-half as wide as long, as long as the funicle and two-thirds of the pedicel combined, and provided with about six slender linear sensoria. Mandibles nearly as in *maidis;* maxillary palpi also the same, the labial pair with one joint about five times as long as thick; the terminal joint of both palpi in this species and also in *maidis* bears a slender, long, spine-like appendage, which may be a true but much attenuated segment, but which is regarded as a seta in the preceding computation of the joints. Thorax and abdomen practically as in *maidis;* wings fully developed, the speculum limited basad by a single row of coarser setae and by about two to five additional setae in the angle between this row and the marginal vein.

Sculpture about the same as in *maidis*, except that the setiferous punctures of the frontovertex are less numerous and less distinct; the pubescence the same, but sparser on the frons.

Color of the head and body shiny black, the base of the abdomen more or less distinctly yellow, the extreme tip of the abdomen and the ovipositor sheaths also yellowish. Mandibles pale brown; scape, and sometimes the pedicel, pale brown or dilutely fuscous, the rest of antenna dusky yellow. Legs, including coxae, blackish; apex of front femora, front tibiae except for a more or less distinct infuscation on the basal half, front tarsi, middle trochanters, apex of middle tibiae with spur and tarsi and hind tarsi except basal joint brownish yellow; hind trochanters and hind femora clear pale yellow. Wings almost hyaline, the veins yellowish.

Length of body (0.598 to) 0.914; length of head, 0.351; width of head, 0.443; thickness of head fronto-occipitally, 0.165; width of vertex at posterior ocelli, 0.174*; length of antenna, 0.434; width of mesoscutum, 0.396; length of fore-wing, 0.903; width of fore-wing, 0.405 mm.

Male. Very similar to the female, but smaller and with the antennae slenderer, the club being hardly wider than the funicle and more pointed at apex than in the female.

Length of body (0.452 to), 0.747; length of head, 0.295; width of head, 0.358; thickness of head fronto-occipitally, 0.160; width of vertex at posterior ocelli, 0.153; length of antenna, 0.403; width of mesoscutum, 0.302; length of fore-wing, 0.754; width of fore-wing, 0.349 mm.

Described from 25 females, 9 males (holotype and paratypes) reared from *Aphis gossypii* Glover collected in Honolulu in May, 1919, and in March, 1923; also 1 female (paratype) associated with this *Aphis* on Hibiscus in Honolulu, April 12, 1918 (Timberlake); 1 male (allotype), labelled "on bean *Aphis*," presumably *Aphis medicaginis* Koch, collected in Honolulu, November 22, 1904 (Swezey); and 1 male (paratype) collected at Kilauea, Hawaii, in July, 1906 (Dr. Perkins).

This species of *Aphelinus* is very similar to *A. mali* (Haldeman), but is readily distinguished by the characters given in the following table of species.

Aphelinus semiflavus Howard.

Three females reared February 29, 1916, from *Toxoptera aurantii* (Fonscolombe) collected on the Manoa Cliff trail on Tantalus, Oahu, and one female reared March 30, 1918, from

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* Head somewhat shriveled, so that the measurements are necessarily more or less inaccurate.

Aulacorthum circumflexum (Buckton), also from Tantalus, agree very well with North American specimens from Clemson College, South Carolina and Los Angeles, California. The wings of these specimens are clearer hyaline than in the North American specimens, the scape and pedicel are paler and in the female from *A. circumflexum* the wings are small and narrow, but agree in this respect with all males that I have seen from the United States, and also with one female from Los Angeles. In both of these females with small wings the abdomen is considerably blackened except at the base.

TABLE OF CERTAIN SPECIES OF APHELINUS MOSTLY HAWAIIAN AND NORTH AMERICAN

The following table has been prepared to show the relationship of the two species described in the preceding pages, and to aid in the identification of these and other species. One Australian species is also included.

1. Body partly black or brown, or wholly dark 2
   Body wholly yellow except ocelli and eyes; wings with four basal rows of setae and a fifth row widely separated from the others; legs and antennae yellow .... *automatus* Girault

2. Speculum of fore-wing bounded basad by several rows of setae 5
   Speculum bounded basad by one and one-half rows of setae or by one row and several more or less scattered setae just beneath the marginal vein 3

3. Abdomen yellowish on basal segment; scape narrower 4
   Abdomen wholly black or fuscous; legs brownish, the hind femora pale yellow, hind tarsi whitish, with the basal joint brown; scape short and rather wide, about one-third as wide as long, hardly longer and a little wider than the club .... *niger* Girault

4. Frontovertex smooth and with very minute and inconspicuous punctures; scape blackish, about four times longer than wide, but hardly narrower than the club; pedicel about one-third longer than the third funicle joint; funicle and club clear yellow, the third funicle joint slightly longer than wide; hind tarsi not black at the base; ovipositor sheaths dusky except at apex. .*mali* (Haldeman)
   Frontovertex with more evident pin-punctures beset with longer bristles than in *mali;* scape pale fuscous, about four times longer than wide, but considerably narrower than the club; pedicel nearly twice as long as the third funicle joint; funicle dusky, the club purer yellow, the third funicle joint slightly wider than long; hind tarsi yellowish with the basal joint and apex of the

last joint dark brown or blackish; ovipositor apparently shorter and more tenuous than in *mali*, the sheaths shorter and wholly yellow .... *gossypii* n. sp.

5. Wings large and comparatively wide, the disk beyond the speculum finely and densely pubescent, the marginal fringe comparatively short and often inconspicuous 6
   Wings comparatively small and narrow, the stigmal vein reaching far beyond the middle of the costal margin, the disk beyond the speculum with coarser, sparser setae, the marginal fringe, comparatively long and conspicuous; abdomen except the lateral margins usually wholly yellow; the male with elongate antenna, the third funicle joint not much shorter than the long, slender club .... *semiflavus* Howard

6. Head wholly black 7
   Face yellow, but the frontovertex brown or blackish.............. ....*abdominalis* (Dalman) and allies

7. Front and middle legs not wholly clear yellow 8
   Legs wholly clear yellow, except the hind coxae and tibiae; abdomen not yellow at base; scape not over three times as long as wide; wings clear, hyaline................................*nigritus* Howard

8. Middle and hind coxae and tibiae brown or blackish, the hind femora clear yellow, remainder of legs yellowish although the front femora and tibiae may be more or less dusky; abdomen sometimes but not usually distinctly yellowish at the base in dry specimens; antennae much as in *nigritus* but the scape is about four times longer than wide; wings with a faint cloudiness on the disk mostly beyond the speculum ....*maidis* n. sp.
   Legs brown or blackish including the hind femora, but the tips of the tibiae, the tarsi, and all of the front tibiae more or less distinctly yellow; antennae about as in *maidis;* wings with a faint but distinct smoky cloud on the disk, deepest below the marginal vein ....*lapisligni* Howard

Aphytis Howard.

In 1908, Dr. Howard suggested that it would be desirable to segregate the aphis-feeding species of *Aphelinus* into a new genus, but he never carried out his suggestion for the reason, I believe, that he was not entirely sure of the characters of the type species of the genus. Since that time Kurdumoff has given a synopsis of the European species of *Aphelinus*, and has shown clearly that the genotype, *A. abdominalis* (Dalman) is an aphis-feeding species. It is, nevertheless, still desirable to divide *Aphelinus,* but now it is apparent that coccid-feeding species are the ones to be segregated. Two generic names are available for this group of species: *Prosaphelinus* De Gregorio, 1915, about which there is no doubt, and *Aphytis* Howard, 1900, which by the original description was said to differ from *Aphelinus* in having one less funicle joint. Mercet has already pointed out that *Aphytis chilensis* Howard in all probability is closely allied to his *Aphelinus longiclavae,* and therefore similar also to *A. capitis* Rust. I believe it is safe to conclude that *Aphytis chilensis* really has three funicle joints, with the first one very small and overlooked by Dr. Howard, and I therefore adopt this name for the group of the old genus *Aphelinus* containing the coccid-feeding species.*

The two genera *Aphelinus* and *Aphytis* as here recognized have much in common but most of the species differ considerably in habitus. *Aphelinus,* at least typically, has a broad head and the body tapering behind it to the apex of the abdomen, but the essential generic difference lies in the ovipositor. This in *Aphelinus* is comparatively tenuous and is enclosed entirely by the ventrites so that in oviposition it is protruded backward in a more or less horizontal position. In *Aphytis* the head, thorax and abdomen do not differ greatly in width, and the ovipositor is comparatively strong and entirely free, so that in oviposition it descends almost perpendicularly from near the base of the abdomen.

Two Hawaiian species belong to *Aphytis* as here recognized, viz: *Aphytis diaspidis* (Howard) and *A. limonus* (Rust).

Trichogrammatidae.

Megaphragma new genus.

Female. Head apparently very thin fronto-occipitally, the frontovertex somewhat wider than one-third of the whole head, the eyes large, the cheeks rather short, the sides of the head and the cheeks gibbously convergent on the mouth. Ocelli apparently absent. Antennae (Fig. 7a) inserted very high on the face between the eyes, apparently rather nearer

* Subsequent examination of the type of *Aphytis chilensis* in the National Museum does not lead me to change the above statement. Only two funicle joints are actually visible in the unique type, but the antennae are so folded beneath the head that an unobstructed view of the base of the funicle can not be obtained.

to the occipital margin than to the mouth, and six jointed; scape subfusiform-compressed, but not very wide, including the radicle about as long as the eyes; pedicel large and pyriform, contracted at apex, much thicker than the scape or the following two joints; funicle composed of one minute ring-joint which is twice as wide as long; club as long as the rest of the antenna, three-jointed, strongly fusiform in shape, the basal joint about twice as long as wide at the base but increasing in width toward the apex; middle joint about twice as long and thrice as wide as the preceding joint and widest just beyond the middle; apical joint very strongly conical, nearly as long as the preceding joint, and provided with conspicuous longitudinal chitinous ridges running the whole length and some of them strongly projecting at apex. Mandibles with two strong acute teeth at apex. Maxillary palpi apparently one-jointed but rather elongate and tapering; labial palpi not seen.

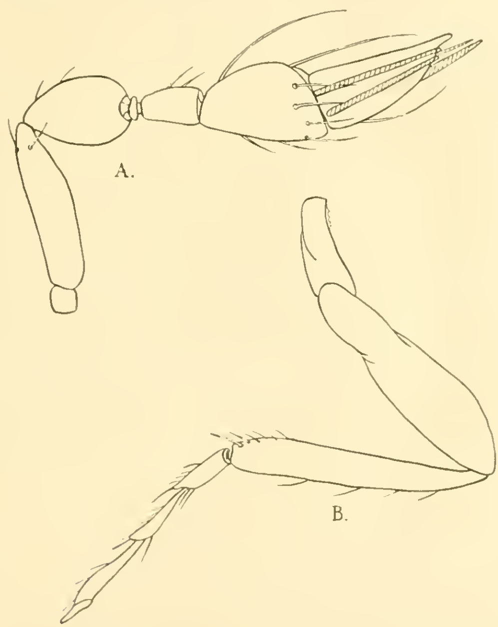

Fig. 7. *Megaphragma mymaripenne.* A. Antenna of female. B. Hind leg of female.

Thorax scarcely as long as wide; pronotum not visible from above; the parapsidal furrows strongly developed, the middle lobe of the mesoscutum about as long as wide; scutellum about twice as wide as long, and very broadly rounded at apex. Abdomen broadly sessile, very slightly narrower than the thorax and slightly longer, the apex rather narrowly rounded; phragma of the mesothorax has but slightly converging sides and it reaches almost to the apex of the abdomen; ovipositor not protruded, and internally it reaches almost to the base of the abdomen; thorax and abdomen together form an oval mass nearly twice as long as wide.

Legs (Fig. 7b) of moderate length, the femora rather stout but compressed, the front tibiae also considerably enlarged; middle and hind tibiae and all the tarsi cylindrical and slender, the tarsi rather long although only three-jointed.

Wings resembling a typical Mymarid wing in shape, being linear, about seven times longer than wide, and having an exceedingly long marginal fringe; venation reaching about to the middle of the costal margin, the submarginal and marginal veins about equal in length, the stigmal vein short and stubby, the postmarginal vein absent; costal cell extremely narrow; disk of wing on the apical half with a row of few fine, short setae; hind wing extremely narrow, yet rounded at apex.

Male. Not known.

Type of the genus: *Megaphragma mymaripenne* n. sp.

Megaphragma differs from all other Trichogrammatidae known to me except *Hydrophylax* Matheson and Crosby in having the wings linear and very long-fringed. *Hydrophylax,* however, has the thorax and abdomen combined about four times as long as wide, the legs considerably longer and slenderer, the antennae eight-jointed with two well-developed funicle joints besides an annellus, and with a comparatively small three-jointed club. In Girault's classification *Megaphragma* falls in the tribe *Lathromerini* but differs from all the included genera with six-jointed antennae in having the wings very narrow and long-fringed.

Megaphragma mymaripenne n. sp. Fig. 7.

Antennae as in Fig. 7a, the middle joint of the club with two large setae and several smaller ones, the apical joint with one moderately long seta and with at least two of the chitinous sensoria projecting at apex.

Disk of wing with about five or six very minute setae in an irregular median longitudinal row on the apical half beyond the venation; disk narrowest opposite the apical part of the marginal vein, somewhat widening proximad and about twice as wide on apical half as at the narrowest point, the apex well rounded. Marginal vein with two fine, rather short setae at its base, and on the disk near the opposite margin just proximad of the constricted part is a somewhat longer seta. Marginal fringe beginning on the posterior margin opposite the stigmal vein and consisting of about twenty-six setae, the first one opposite the stigmal vein being a little smaller than the discal seta just preceding it which is mentioned above; the following setae rapidly increasing in length, those at and on both sides of the apex about one-half as long as the wing itself, those on the anterior margin gradually and slightly decreasing in length basad and abruptly terminating at a point slightly more than midway between the apex of the wing and the stigmal vein; the remainder of the costal margin to the stigmal vein provided with a fringe of exceedingly minute short setae about five in number and visible only under high magnification.

Hind wing exceedingly narrow but triangularly widened at the hooklets, and slightly widened again at the apex which is rounded; no discal setae present; marginal fringe composed of twelve setae beginning on the posterior margin just beyond the hooklets and abruptly terminating on the anterior margin at the apex of the wing, only two of the setae being situated on the anterior side of the apex; the setae also rapidly increase in length towards the apex, where they are only slightly shorter than those of the fore-wing.

Tarsi of front legs distinctly longer than the front tibiae; tarsi of middle and hind legs (Fig. 7b) slightly shorter than the corresponding tibiae.

No definite surface sculpture observable under high magnification.

Head and thorax rather pale yellow, the eyes black; antennae and legs pale yellowish; occiput of head and the abdomen brown; wings hyaline, but the hind pair are rather distinctly infuscated at and near the hooklets.

Length of body, 0.252; length of antenna, 0.162; length of fore-wing, 0.229; greatest width of fore-wing, 0.031; greatest length of marginal fringe of fore-wing, 0.135; width of thorax, 0.118; length of thorax and abdomen combined, 0.195 mm.

Described from two females (holotype and paratype) mounted on a slide with fragments of about three other females which were accidentally crushed during preparation. These specimens were collected by Mr. C. E. Pemberton late in January, 1920, on the leaves of a forest tree at Mountain View, Hawaii, where they were associated with Thysanoptera. Mr. Pemberton had a suspicion at the time that the *Megaphragma* were parasitic on the thrips. This species is presumably an immigrant in the Hawaiian Islands, but of this there is, of course, no direct proof at present.

Aphelinoidea xenos n. sp. Fig. 8.

Female. Structurally similar to *A. semifuscipennis* Girault, but the basal joint of the club shows no transverse groove or suture on the ventral side near the middle, the apical margin of the joint is more nearly straight on both sides, or only gently arcuate, whereas it is deeply angularly emarginate on the outer surface in *semifuscipennis;* the fore-wing narrower with fewer or about twenty discal hair lines at widest part of the disk, *semifuscipennis* having about twenty-five to twenty-eight lines, the disk, therefore, distinctly more sparsely pubescent; the marginal fringe distinctly longer and practically equal to one-fifth of the greatest width of the disk, but in *semifuscipennis* equal to about one-seventh of the width of the disk.

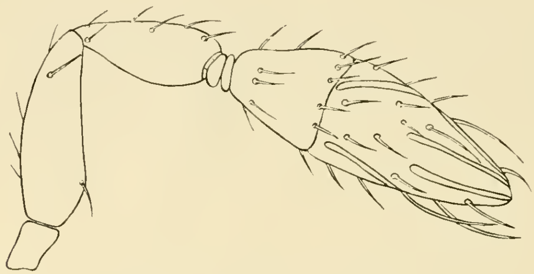

Fig. 8. *Aphelinoidea xenos.* Antenna of female.

General color much paler than in *semifuscipennis* or yellowish brown instead of piceous. Dry specimens are brown, with most of the head, the dorsum of the thorax and sometimes apex of the abdomen above paler and more or less yellowish, and with the lower half of the occiput, the cheeks, lower part of the face, the sternum, pleura, and most of the abdomen fuscous brown. In balsam mounts the coloration is dusky yellow, with the lower half of the occiput, the cheeks, oral margin of face, sternum, pleura, and transverse bands on the abdomen appearing rather dilutely fuscous, these darker parts being not very conspicuous nor sharply bounded except on the occiput, the bands on the abdomen sometimes confined to the basal half or two-thirds; rest of the face, apex, and part of the venter of abdomen purer brighter yellow, the frontovertex orange yellow; eyes and ocelli bright carmine; antennae clear yellow; legs dusky with the tips of the tibiae and the tarsi paler and more yellowish.

Wings hyaline, but with basal part beneath the venation clouded with fuscous, the apical margin of the cloud extending slightly obliquely distad from the apex of the stigmal vein towards the opposite margin and into the pubescent area of the disk; the cloud also with a darker triangular area beneath the apex of the marginal vein, the apex of the triangle touching the vein; just proximad is a slightly clearer area, somewhat similar in shape, but smaller and with the base of the triangle against the vein, sometimes this clearer area is more diffused and extends along the vein towards the base of the wing; hind-wings with a short slightly clouded area beneath the apical half of the venation; marginal vein of both fore and hind-wings distinctly more infuscated than the rest of the venation.

The following measurements are given in a column parallel with similar measurements of *semifuscipennis:*

	xenos	*semifuscipennis*
Length of body to apex of ovipositor (0.471 to)	0.635 mm.	0.537 mm.
Length of antenna	0.234 mm.	0.224 mm.
Length of scape	0.081 mm.	0.079 mm.
Length of pedicel	0.049 mm.	0.045 mm.
Length of club	0.103 mm.	0.098 mm.
Length of basal club joint	0.037 mm.	0.035 mm.
Length of pedicel and flagellum	0.153 mm.	0.145 mm.
Length of fore-wing	0.475 mm.	0.499 mm.
Width of fore-wing	0.191 mm.	0.215 mm.
Length of marginal fringe of fore-wing	0.040 mm.	0.037 mm.

Male. Very similar to the female, but with the antennae slenderer, the two joints of the club practically equal in length, the wings narrower, with the discal pubescence somewhat sparser and the marginal fringe distinctly longer or nearly one-third as long as the greatest width of the disk.

Coloration as in the female, except that the fuscous bands on the abdomen are confined entirely to the basal half or a little more than half of abdomen, the fuscous cloud at base of wings somewhat paler.

Length of body, (0.417 to) 0.608; length of antenna, 0.222; length of scape, including radicle, 0.083; length of pedicel, 0.048; length of club, 0.081; length of basal joint of club, 0.041; length of pedicel and flagellum combined, 0.138; length of fore-wing, 0.478; greatest width of fore-wing, 0.163; length of marginal fringe of fore-wing, 0.051 mm.

Described from 21 females, 20 males (holotype, allotype, male and paratypes) mounted on slides and reared by Mr. Swezey from the eggs of *Sogata paludum* (Kirkaldy) collected at Kewalo in Honolulu on August 18, 1913, and on May 4, 1914; and 14 specimens (paratypes) of undetermined sex, mounted on cards and reared with the preceding specimens.

Records of the Introduced and Immigrant Chalcid-Flies of the Hawaiian Islands (Hymenoptera).

BY P. H. TIMBERLAKE.

(Presented at the meeting of December 6, 1923.)

The purpose of this paper is to provide a list of all known adventive Chalcid-flies found in the Hawaiian Islands, together with records of their distribution on the different Islands and dates of their introduction or first capture. Although host records are not a primary concern of this article, yet many of these records are given incidentally or for the purpose of designating more definitely certain undescribed species.

Records of 144 species are here brought together. Of these at least twenty-four species have been purposely introduced, in three instances subsequently to the first capture of the species, which at the time had not been recognized to occur in the Islands. A considerable number of other Chalcid-flies have been introduced at various times, but records only of those that have been recovered or found established are given here.

In point of time of the first capture or introduction twenty-six species have records extending back before 1902 and seven of these were collected by Blackburn during his residence in the Islands between 1876 and 1882.

During the twelve-year period between 1902 and 1913, inclusive, seventy-three species were first found or introduced so far as information is obtainable at this time; during the last ten years, 1914 to 1923, inclusive, forty-five additional species have been introduced or discovered for the first time. Although the record of first capture in the Islands of any particular species may be several to many years subsequent to its first establishment here, yet it is perhaps significant that a considerably smaller proportion of species were discovered during the last decade than during the preceding twelve-year period, the exact proportion being 4.5 species per year as compared with 6.08 species per year for the preceding period. Possibly the greater proportion for the 1902-1913 period is due to the fact that some of the species had been established for many years and were finally brought to light because of the greatly increased activity along entomological lines that was inaugurated at about that time, but on the other hand the quarantine established in 1902 has doubtlessly prevented many species from gaining an entrance into the Islands and presumably has been increasingly efficient in this respect.

In the preparation of this paper I have received considerable help from Mr. A. B. Gahan, of the U. S. National Museum, who has generously compared specimens with types and supplied records of specimens in the National Museum. These records are designated by (U. S. Nat. Mus.) in the list.

Agaonidae.

1. *Blastophaga psenes (Linnaeus).

Introduced in 1909 from California and its distribution is limited to a few trees in the Moanalua Gardens near Honolulu.

2. *Pleistodontes froggatti Mayr.

Introduced in 1921 from Sydney and recovered in June of the same year. It is now well established in Honolulu and at Waimea, Hawaii.

3. *Pleistodontes imperialis Saunders.

Introduced in 1922 from Sydney and recovered in July of the same year. Its present distribution is limited to a few trees in and near Honolulu.

Callimomidae.

4. Podagrion beneficium Girault.

One specimen is labelled (by inadvertence?) as taken in November, 1922, at Palolo, Oahu (Illingworth) but I have a suspicion that the record is erroneous and that the specimen is actually from Queensland.

5. Megastigmus sp.

One specimen was taken by Fullaway on a window in Honolulu, February 13, 1922, and the species is very likely not established.

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* Purposely introduced insects are starred throughout the list.

Chalcididae.

6. ***Brachymeria obscurata** (Walker).

Introduced by Koebele from Japan about 1895 and now common on Kauai, Oahu, Maui and Hawaii.

7. **Brachymeria polynesialis** (Cameron).

Taken by Blackburn in Honolulu and recorded by Ashmead also from Hilo, Hawaii. The species is now rarely found, and I have taken only two specimens, one in Honolulu and another at Honaunau, Kona, Hawaii. Mr. Swezey also found it at Hamakuapoko, Maui, in January, 1910.

8. **Stomatoceras pertorvum** Girault.

First taken in Honolulu by Dr. Perkins in 1900. It is now very common and widely distributed as it was collected at Puunene, Maui, in October, 1904 (Swezey), and at Lihue, Kauai, in September, 1907 (Swezey).

9. **Paranacryptus lacteipennis** (Cameron).

Taken by Blackburn on Oahu and now very rare. There is one female in the National Museum collected by Ashmead, July 6, 1901, at Hilo, Hawaii. It was described by Cameron in 1883 as *Epitranus lacteipennis*.

10. ***Dirhinus giffardii** Silvestri.

Introduced in 1913 from West Africa, and recovered at Waialae, Oahu, in September, 1921 (Fullaway).

Eurytomidae.

11. **Eurytoma orchidiarum** (Westwood).

This species was found breeding on *Cattleya* orchids in Honolulu in June, 1914, by Dr. Lyon.

12. **Eurytoma** sp. parasitic on Braconidae.

Recorded by Dr. Perkins as first taken in 1903, but a series collected by him in December, 1903, at Bates Street, Honolulu, belongs to the following species. The earliest records verified by me are as follows: Reared from *Microbracon omiodivorus*

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* Purposely introduced insects are starred throughout the list.

(Terry) at Naalehu, Hawaii, December, 1905 (Swezey); collected in Honolulu, April, 1907 (Swezey); reared from *Dinocampus coccinellae* (Shrank) at Puunene, Maui, June, 1909 (Terry), and collected at Waipouli, Kauai, March, 1917 (Swezey). It was recorded by Dr. Perkins also as a parasite of *Apanteles*.

13. **Eurytoma** sp. parasitic on Trypetidae.

Reared from *Tephritis crassipes* Thomson in December, 1903, at Bates Street, Honolulu (Perkins); collected at Huehue and in South Kona, Hawaii, in August, 1919 (Swezey), and at Olokele Canyon, Kauai, in September, 1920 (Swezey). It has been reared by Mr. Swezey on Oahu also from *Tephritis swezeyi* Bryan.

14. **Harmolita swezeyi** Phillips and Poos.

This species is phytophagus on Bermuda grass (*Cynodon dactylon* [*L.*] Pers.). The earliest records that I have been able to verify are as follows: Collected at Puako, Hawaii, May, 1905 (Swezey); at Honolulu in June, 1905 (Swezey); at Kealia, Kauai, May, 1906 (Terry) and at Iao Valley, Maui, August, 1908 (Swezey). Dr. Perkins thought that there might be two species of *Harmolita* in the Islands but I have been able to distinguish only one.

Pteromalidae.

15. **Mormoniella brevicornis** Ashmead.

This species was reared by Terry from Muscoid puparia in Honolulu in December, 1907, and again in April, 1910. It was reared by him from *Chrysomyia dux* (Esch.), *Lucilia sericata* (Meig.), *Sacrophaga dux* Thomson and *Sarcophaga barbata* Thomson.

16. ***Muscidifurax raptor** Girault and Sanders.

Reared from *Sarcophaga* puparia collected at Waialae, Oahu, in May, 1907 (Swezey), and from the same host in Honolulu by Terry in August, 1907, and January, 1911. Reintroduced from South Africa in 1913 by Silvestri.

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* Purposely introduced insects are starred throughout the list.

17. **Zatropis tortricidis** Crawford.

Reared from *Gracilaria marginestrigata* Wlsm. in Honolulu, January and December, 1902 (Perkins); taken in the Alakai Swamp, Kauai, September, 1917 (C. N. Forbes); reared from lantana berries collected at Wailuku and Sprecklesville, Maui, May, 1921 (Swezey); collected at Honokaa, Hawaii (2500 feet), May 28, 1922 (F. X. Williams). It has been reared also from the lantana leaf-miner (*Cremastobombycia lantanella* Busck), and is commonly reared from lantana berries so that it is probably parasitic on *Agromyza lantanae* Froggatt.

18. **Aplastomorpha calandrae** (Howard).

Reared from corn infested with *Calendra oryzae* (Linn.), collected in Honolulu, January, 1910 (Swezey), taken in a cornhouse at Hamakuapoko, Maui, January 29, 1910 (Swezey), and reared from *Calendra oryzae* in rat poison, Honokaa, Hawaii, October, 1922 (Pemberton). It was first recorded apparently by Bridwell in 1918 under the name of *Pteromalus calandrae* Howard (Proc. Haw. Ent. Soc., 3, p. 488) and as here determined includes the undetermined Pteromalid mentioned by him. It is now a common parasite in stored products and has been reared in Honolulu from *Mylabris quadrimaculatus* (Fab.), *M. chinensis* (Linn.) and *M. phaseoli* (Gyll.). It has been found by Bridwell also breeding in the open and was reared by him from *Mylabris pruininus* (Horn) and was also taken on Wailupe Ridge, Oahu, May 6, 1917 (Bridwell). In February, 1924, Mr. Ehrhorn found it in his office under conditions indicating that it was breeding on *Catorama mexicana* Chev.

19. **Lariophagus distinguendus** (Förster).

This species was collected at Pahala, Hawaii, May 21, 1915 (Swezey), and on a window in Honolulu, January 22, 1916 (Swezey). During 1916 about half a dozen specimens were taken on windows at the Sugar Planters' Experiment Station and one was taken by Mr. Ehrhorn at his home in Manoa Valley. It has been reared from *Calendra oryzae* (Linn.) infesting rat poison at Honokaa, Hawaii, October, 1922 (Pemberton).

20. **Lariophagus** sp.

An unidentified species of this genus was taken at Honolulu in a shipment of rice from Japan, September 17, 1909 (Lewis). A note attached to the specimens (four females) states that they were found flying around a larva of *Tenebroides mauritanicus* (Linn.). One male taken by Mr. Swezey at Paia, Maui, August 24, 1908, apparently belongs to the same species.

21. ***Lariophagus texanus** Crawford.

Introduced from Brownsville, Texas, in 1921, by Bridwell and Willard and reported by Willard later in the same year to have been recovered on Oahu. It is parasitic on *Mylabris sallaei* (Sharp) and doubtlessly on other species of *Mylabris*.

22. **Eupteromalus** sp.

This species was reared by Mr. Swezey from Dryinid cocoons, apparently one to each cocoon, probably of *Haplogonatopus vitiensis* Perkins and possibly also of *Echthrodelphax fairchildii* Perkins, on *Sogata paludum* (Kirkaldy), and also from cocoons of the spider Cryptine, *Arachnoleter swezeyi* Cushman, collected at Kewalo, Oahu, May 4, 1914; also reared by Mr. Swezey from *Gracilaria marginestrigata* Wlsm., mining *Xanthium* at Nawiliwili, Kauai, September, 1921.

23. **Bruchobius** sp.

One female was collected on a window of the Sugar Planters' Experiment Station, September 13, 1916 (Timberlake), and in April and May, 1923, it was reared in large numbers from pigeon peas infested with *Mylabris quadrimaculatus* (Fab.) and *M. chinensis* (Linn.), collected by Mr. Swezey. A small series was also brought back from India by Mr. Fullaway, these specimens having been reared from *Mylabris* larvae at Bangalore in February, 1921, by Subermanian. Mr. Gahan, to whom specimens were submitted, writes me that it is known to him also from the Philippines.

24. **Habrocytus** sp.

Reared from lantana leaf-miner *Cremastobombycia lantanella* (Busck) collected at Lihue, Kauai, May 6, 1921 (Swezey), and

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* Purposely introduced insects are starred throughout the list.

from the same host collected at Sprecklesville, Maui, May 18, 1921 (Swezey).

25. **Pteromalid** undetermined.

A single female collected in Olokele Canyon, Kauai, by Mr. Swezey, September 5, 1920, shows considerable affinity with both *Bruchobius* and *Zatropis* but at present remains unplaced. It is a comparatively robust species, with a lenticular head, the vertex being strongly declivous behind the ocelli.

26. **Pteromalus fuscitarsis** Ashmead.

Described from a single specimen taken on Lanai by Dr. Perkins in January, 1894, and not recognized by me. As there are no other species of Pteromalidae present in the Islands that can be considered endemic, I believe this species must also be an immigrant.

27. ***Pachycrepoideus dubius** Ashmead.

Two females were reared from puparia of the cane-borer Tachinid (*Ceromasia sphenorphori* Vill.) collected in Honolulu, April 10, 1911 (Swezey) and one female was obtained from a puparium of a *Drosophila* sp. in rotting pineapple collected in Honolulu, October, 1907 (Terry). Reintroduced by Fullaway in 1914 from the Philippines.

28. **Pachyneuron allograptae** Ashmead.

Reared by Mr. Terry in April, 1904, from the puparia of *Simosyrphus grandicornis* (Macq.), collected on the plantation of the Oahu Sugar Company. More recently a series was reared from sorghum heads collected in Honolulu, July, 1920 (Timberlake), the host presumably being a Syrphid, as the material was infested with *Aphis maidis* Fitch.

Previously recorded as *P. syrphi* (Ashmead), 1881, but that name is preoccupied by *P. syrphi* (Ratzeburg), 1848, which is the same as *P. flavipes* (Förster) according to Kurdumoff. *P. allograptae* Ashmead, 1887, is the next oldest available name for this common North American species.

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* Purposely introduced insects are starred throughout the list.

29. **Pachyneuron siphonophorae** (Ashmead).

Reared from *Ephedrus incompletus* Provancher in an *Aulacorthum* sp. on rose-bushes, Honolulu, April and May, 1914 (Swezey), and from the same host at Wailuku, Maui, in June, 1916 (Swezey). Reared also from *Diaeretus chenopodiaphidis* (Ashmead) in *Myzus persicae* (Sulzer) on cabbage, Palolo Valley, Oahu, in August, 1917 (Timberlake).

30. **Pachyneuron** sp.

Three females were reared from puparia of *Leucopis nigricornis* Egger collected on sugar-cane in Honolulu in August and September, 1919 (Osborn and Timberlake). Recorded by me in 1920 as *P. anthomyiae* Howard in Proc. Haw. Ent. Soc., 4, p. 330, but it is very distinct from the common *Leucopis* parasite of the United States, which I believe is correctly identified as *anthomyiae*. The local species has practically no neck on the propodeum, and has the petiole of the abdomen smooth and polished and with a distinct prong on each side at about the middle. I have the same species also from California, where it was reared from several species of Coccidae.

Miscogasteridae.

31. **Tomocera californica** Howard.

This species was an early immigrant to the Islands and was collected by Blackburn. It was described by Cameron under the name of *Moranila testaceiceps,* and has been found on Oahu, Maui, Molokai, Lanai and Hawaii.

32. ***Tomocera ceroplastis** Perkins.

Found by Dr. Perkins on Tantalus, Oahu, and described as a parasite of *Ceroplastes rubens* Maskell in 1906. I have reared what is apparently this species from *Asterolecanium pustulans* (Cockerell) at Honolulu. The species seems to me rather doubtfully distinct from *californica*. According to Dr. Perkins it was introduced by Koebele from China.

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* Purposely introduced insects are starred throughout the list.

33. ***Scutellista cyanea** Motschulsky.

Introduced by Craw in 1905 from California and now a common parasite of *Saissetia nigra* (Nietner) and *S. hemisphaerica* (Targ.). Although there seem to be no specimens in collections except from Honolulu and vicinity I think it must be widely distributed in the Islands.

Spalangiidae.

34. **Spalangia cameroni** Perkins.

Found by Blackburn and recorded by Cameron in 1881 as *S. hirta* Haliday. It has been taken on Kauai, Oahu, Maui, Molokai and Hawaii and parasitizes a variety of Diptera including *Stomoxys*, *Lyperosia*, *Sarcophaga*, *Limnophora* and *Dacus*.

35. ***Spalangia philippinensis** Fullaway.

Introduced by Fullaway in 1914 from the Philippines. It was reared in 1916 by Dr. Illingworth in Palolo Valley, Oahu, from various dipterous puparia in hen manure, and in September, 1919, by Willard from *Dacus cucurbitae* Coquillett in Honolulu.

36. **Spalangia** sp.

Reared by Mr. Swezey from horn-fly puparia (*Lyperosia irritans* Linn.) collected at Waialae, Oahu, March 15, 1910, and by Dr. Illingworth in 1916 together with the preceding species. This species may have been purposely introduced, as several other species of *Spalangia* are known to have been brought here, of which we have no exact record, or which have not been recovered.

The other two Hawaiian species of *Spalangia*, *S. lanaiensis* Ashmead and *S. simplex* Perkins seem to be endemic species.

37. **Choetospila elegans** Westwood.

First taken by Mr. Bridwell in Honolulu in 1913, and found by him at Haiku, Maui, in September, 1918; collected from a store window at Mountain View, Hawaii, October 19, 1917

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* Purposely introduced insects are starred throughout the list.

(Timberlake). It has been reared from *Calendra oryzae* (Linn.) and from various Bruchids (Mylabridae).

38. **Spalangiid.**

This species belongs to what is apparently a new genus near *Cerocephala* Westwood. I have seen only five specimens, all taken in Honolulu, most of them probably at or near the Sugar Planters' Experiment Station. One was taken by Dr. Perkins in April, 1908, two by Mr. Swezey in 1915 and 1916, and two by myself in 1917 and 1921.

Eupelmidae.

39. **Anastatus koebelei** Ashmead.

This species was collected as early as 1892 at Kona, Hawaii, by Dr. Perkins, and described in 1901. In 1906, Perkins recorded it from Oahu as a parasite in the eggs of a Locustid, by which was meant the species now known as *Elimaea punctifera* (Walker). It is probably common on the other Islands, but I have seen no specimens except from Oahu, and one specimen from Iao Valley, Maui, taken by Mr. Bryan in 1919. The male of this species has not been found.

40. **Solindenia picticornis** Cameron.

Collected by Blackburn and now widely distributed throughout the Islands but not known elsewhere. It is certainly an immigrant through commerce, however, as it is remarkably different from the endemic Eupelmids. It is parasitic in the egg-capsules of a Blattid, *Allacta similis* (Saussure) and perhaps of others of the smaller Blattids, as indicated by Dr. Perkins in 1913 (Introduction, Fauna Haw. vol. 1, pt. 6, p. cvi). The male has been reared but is as yet undescribed.

41. **Charitopodinus swezeyi** (Crawford).

The first notice of this species was by Swezey in 1914, who recorded it as a *Eupelmus* sp. parasitic on *Harmolita* in Bermuda grass at Kaimuki. In 1918, Bridwell recorded it also as a parasite of Mylabridae, of *Chelonus blackburni* Cameron and of the Cryptine parasitic in the egg-cocoons of spiders, which has since been described by Cushman as *Arachnoleter swezeyi*. It was taken as early as June, 1905, on Oahu and in

1906 on Kauai. It has been taken by Mr. Muir also at Macao, China. The male remains unknown.

42. **Eupelmella subaptera** (Ashmead).

Described under *Eupelminus* by Ashmead in 1901 from the Waianae Mountains, Oahu. This species is rather rarely taken in the mountains of Oahu, and I presume that it is adventive because it is an isolated form.

43. **Eupelmus** sp.

One female taken by Mr. Swezey in the South Waianae Mountains, Oahu, on November 9, 1919, differs so remarkably from other Hawaiian *Eupelmus* that I believe that it is also adventive. The sculpture is remarkably smooth and polished and the scape is bright yellow.

Encyrtidae.

44. **Xanthoencyrtus fullawayi** Timberlake.

This species was recorded by Fullaway in 1913 as the supposed male of *Pseudococcobius terryi*, but as no separate data were given its first appearance in the Islands is unknown. It was collected on Hawaii in 1916 by Mr. Swezey and in 1922 a large series was reared from *Trionymus calceolariae* (Maskell) collected on sugar-cane in Manoa Valley by Messrs. Swezey, Fullaway and Quan Chock. As many as fifteen parasites sometimes issue from a single mealy-bug. The male has not been found.

45. **Anagyrus nigricornis** Timberlake.

This species was taken on Oahu in March 1910 (Swezey), on Kauai, in 1915 (Swezey), on Maui in 1918 (Swezey), and on Hawaii in 1919 (Swezey, Giffard).

46. **Anagyrus antoninae** Timberlake.

First discovered in Honolulu in 1919 (Timberlake) and not yet found elsewhere in the Islands excepting one specimen taken by Mr. Swezey on Lanihuli, Oahu, in September, 1919. It is known also from Japan.

47. **Anagyrus swezeyi** Timberlake.

First recorded in 1913 by Fullaway and taken on Oahu as early as August 24, 1910, by Swezey; taken at Lihue, Kauai, May 23, 1918 (Timberlake), at Lupe Ditch, Maui, in June, 1918 (Giffard and Fullaway), at Napoopoo, Hawaii, August 10, 1919 (Timberlake), and on Sand Island, Midway, in April, 1923 (Fullaway). It is essentially a grass-inhabiting species and seems to be confined strictly to the lowlands.

48. ***Leptomastidea abnormis** (Girault).

Introduced from California in the winter of 1915-1916 by Ehrhorn and Fullaway. It is not known to have become established except at Honolulu and vicinity.

49. **Pauridia peregrina** Timberlake.

First recorded by Fullaway in 1913 but taken as early as 1906 by Dr. Perkins in Honolulu. It was taken on Maui in June, 1918 (Giffard and Fullaway), at Kilohana, Kauai, September 1, 1920 (Swezey), and on Eastern Island, Midway, in April, 1923 (Fullaway). It is also known from China, Luzon, Fiji, California and South Africa.

50. **Blepyrus insularis** (Cameron).

Taken on several of the Islands by Blackburn and known to me from Oahu, Maui and Hawaii.

51. **Encyrtus infelix** (Embleton).

Recorded by Ashmead in 1901 as *Encyrtus fuscus* from Hawaii and Lanai, and known to me also from Oahu and Maui. This species is widely distributed both in the lowlands and in the native forests.

52. **Encyrtus barbatus** Timberlake.

Recorded first in 1919 but taken as early as March, 1905, in Honolulu by Mr. Craw. Besides having been collected in a few localities on Oahu this species was taken by Mr. Swezey at Napoopoo, Hawaii, on August 10, 1919. It seems to be confined to the lowlands. It is known to me also from the fol-

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* Purposely introduced insects are starred throughout the list.

lowing foreign localities besides those listed in 1919: Nagasaki, Japan (T. Ishii); Los Baños, Luzon (Woodworth) and San Marino, California (H. Compere).

53. **Homalotylus flaminius** (Dalman).

This species is represented by a single specimen collected by Koebele in Oahu and recorded by me in 1919.

54. **Quaylea whittieri** (Girault).

Taken as early as September, 1905, by Kotinsky in Honolulu; collected at Kona, Hawaii, by Pemberton in December, 1915, and at Kilauea, Hawaii, by Swezey in June, 1917. It was described by me in 1919 as *Q. aliena* and later merged with *whittieri*.

55. **Zeteticontus perkinsi** Timberlake.

Described elsewhere in this number from a specimen collected by Dr. Perkins in Honolulu in 1906; it has not been taken since.

56. **Microterys kotinskyi** (Fullaway).

First recorded in 1906 by Kotinsky as probably *M. flavus* (Howard) and again by Perkins in 1910 under the latter name. The species is now very common and widely distributed in the Islands and I have seen specimens from Kauai, Oahu, Maui and Hawaii.

57. **Microterys flavus** (Howard).

Of this species I have seen only three specimens, a pair collected on Hawaii by Koebele and one female taken by Mr. Bridwell on Kaumuohona, Oahu, on June 17, 1917.

58. **Aphycus alberti** Howard.

This parasite has been taken a few times in Honolulu and the first record goes back to October, 1914 (Swezey).

59. **Aphycus claviger** Timberlake.

Represented by only two specimens collected on Lanihuli, Oahu, September 3, 1916 (Timberlake). The female is similar to the preceding species but has a little wider scape, and the abdomen is largely fuscous instead of wholly yellow as in *alberti*. The male is hardly distinguishable.

60. **Pseudococcobius terryi** (Fullaway).

As recorded by Fullaway in 1913 this species was first found by Terry on Maui in June, 1909. It is now known to be widely distributed on Hawaii, Maui, Oahu and Kauai. In July, 1919, I took an apterous female among *Eragrostis* in a very windy place on the side of Iao Valley, Maui. According to a recent letter received from Mercet the generic name *Aphycus* should be used for the group of species represented by *terryi*, but I will not make the change until he has published his conclusion.

61. **Aphycomorpha araucariae** Timberlake.

This parasite of *Eriococcus araucariae* Maskell has been taken only in or near Honolulu and the earliest record goes back to July, 1906 (Kotinsky).

62. ***Pseudaphycus utilis** Timberlake.

Introduced in 1922 from Orizaba, Mexico, and now well established and very effective on *Pseudococcus nipae* on Oahu. It has been distributed also to some of the other Islands.

63. **Xesmatia flavipes** Timberlake.

First recorded and described in 1920 from two specimens taken in widely separated localities in the mountains of Oahu in December, 1918, and June, 1919. More recently I have seen a specimen collected by Mr. Swezey at Kilauea, Hawaii, on August 5, 1919.

64. **Euchalcerinys apicicornis** Timberlake.

First collected by Mr. Swezey on March 28, 1915, and so far it has been taken only in the Koolau Mountains on Oahu. Like the preceding species it is a presumable immigrant.

65. **Aphidencyrtus schizoneurae** (Ashmead).

Recorded by Dr. Perkins in 1910 from Oahu and collected as early as June, 1905, in Honolulu (Swezey). Found at

* Purposely introduced insects are starred throughout the list.

Wailuku, Maui, June 18, 1916 (Swezey); at Mountain View, Hawaii, January 21, 1918 (Timberlake), and at Grove Farm, Kauai, in May, 1918 (Timberlake).

66. **Helegonatopus pseudophanes** Perkins.

Recorded in 1910 by Dr. Perkins from Oahu and collected by Terry at Waipahu in May, 1907; taken at Kekaha, Kauai, April 12, 1913 (Swezey); at Hakalau, Hawaii, March 6, 1915 (Swezey) and at Puunene, Maui, December 18, 1917 (Swezey).

67. **Saronotum americanum** Perkins.

Apparently first recorded by both Mr. Swezey and the writer in 1919, but taken as early as November 29, 1912, at Ewa Plantation, Oahu (Swezey); reared from Dryinid cocoons from Hilo, Hawaii, in September and October, 1913 (Swezey); taken at Olowalu, Maui, on December 20, 1917 (Swezey).

68. **Adelencyrtus odonaspidis** Fullaway.

First recorded by Dr. Perkins in 1913 from Honolulu as *Amicroterys* sp. and described by Fullaway in the same year, but taken as early as December 1, 1907, by Swezey at Wailuku; collected at Honaunau, Hawaii, August 13, 1917 (Swezey and Timberlake), and at Waikapu, Maui, March 23, 1924 (Swezey).

69. **Plagiomerus hospes** Timberlake.

So far this species has been collected only in the Koolau Mountains, Oahu, having been taken first by Mr. Giffard at Nuuanu Pali, October 19, 1919, and more recently by Mr. Swezey at Kalihi, Opaeula and Waimalu.

70. **Anabrolepis extranea** Timberlake.

This species has been taken up to the present time only in the Koolau Mountains of Oahu as follows: One female on Tantalus, October 26, 1919 (Giffard); another at the head of Manoa Valley, July 25, 1920 (Dr. Williams); a third on Waialae ridge (1500 feet), November 26, 1922 (Swezey); and another at Waikane on sandalwood, April 13, 1924 (Swezey).

71. **Anicetus annulatus** Timberlake.

First recorded in 1913 by Mr. Fullaway as *Cerapterocerus* sp. and taken by him in Honolulu, April 25, 1912; collected on

Puu Kapele, Kauai, February 14, 1915 (Swezey), and at Kaiwiki, Hawaii, September 22, 1918 (Swezey). The species is known to me also from Sacramento, California, and Chin San, Macao, China.

72. *Comperiella bifasciata Howard.

Recorded by Mr. Fullaway in 1913 as *Cerapterocerus* sp. and reared as early as August, 1905, by Kotinsky from *Aspidiotus* on *Bombax ceiba* Linn. in Honolulu. It was reintroduced in 1908 presumably from China and has been taken apparently only once in recent years, Mr. Fullaway having informed me that he collected a specimen in 1916. The species is common in Japan.

73. Arrhenophagus albipes Girault.

Incorrectly recorded by the writer in 1922 as *A. chionaspidis* from specimens taken near Honolulu in October, 1921, by Mr. Ehrhorn. It has since been found commonly in Honolulu and was taken at Kahuku, Oahu, November 8, 1923, by Mr. Pemberton. It was described in 1915 from Hongkong, China, and recorded by Girault also from Gifu and Jamsui, Japan.

Aphelinidae.

74. Aneristus ceroplastae Howard.

This species was recorded by Fullaway in 1913 and by the writer in 1918 as *Prococcophagus orientalis* (Howard). Mr. Gahan of the U. S. National Museum more recently has compared the types of *ceroplastae* and *orientalis* and has pronounced them to be the same. The species was collected in Honolulu and at Waianae, Oahu, by Dr. Perkins in 1902; on October 10, 1905, it was collected at Hana, Maui (Swezey); in 1913 it was recorded from Kona, Hawaii, by Fullaway, evidently from specimens then recently taken; and on February 14, 1915, it was taken on Puu Kapele, Kauai (Swezey).

75. Coccophagus sp.

Recorded by Ashmead in 1901 as *Coccophagus lecanii*, but appearing to me to be distinct from that common North Ameri-

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* Purposely introduced insects are starred throughout the list.

can species. I have examined specimens collected by Dr. Perkins in Honolulu, and two specimens collected on Hawaii by Koebele (his Nos. 1117 and 1560). Although formerly common, the species has become extremely reduced in numbers in recent years, probably because of competition with the preceding species, and the only recent specimen that I have seen is a male, that apparently belongs here, reared by Mr. Swezey from *Eucalymnatus tessellatus* (Sign.), collected on Puu Kapele, Kauai, February 14, 1915.

A *Coccophagus* sp. was recorded in 1893 by Mr. W. G. Wait in the Planters' Monthly, vol. 12, p. 562, from North Kona, Hawaii, as parasitic on *Pulvinaria* and *Lecanium* on coffee. It was called by the manuscript name, *Coccophagus hawaiiensis* Howard, and its identity with the species incorrectly called *lecanii* by Ashmead has been established recently by examination of specimens (two females, with the date, October 24, 1893) in the National Museum.

76. **Coccophagus ochraceus** Howard.

An insect was recorded by Ashmead in 1901 from Kilauea, Hawaii, under this name, but the identification, like several others of Ashmead's, is open to grave doubt. *Ochraceus* has recently become well known to me from California and South Africa, and I have seen nothing similar to it from the Hawaiian Islands.

77. **Centrodora xiphidii** (Perkins).

Described by Dr. Perkins in 1906, but recorded by Swezey in 1905 from Honolulu and Makiki, Oahu; Lahaina, Maui and Koloa, Kauai. It was collected also at Hilo, Hawaii, on October 2, 1913 (Swezey). I have seen no specimens collected earlier than 1905.

78. **Prospaltella koebelei** Howard.

Described by Dr. Howard in 1908 from "Hawaii," his specimens having been reared by Koebele from *Morganella longispina* (Morgan). I have not seen this species.

79. **Prospaltella** sp.

A small black species with a pale yellow scutellum has been collected on Oahu several times, and is presumably the species recorded by Fullaway in 1913 as *Coccophagus lecanii* from *Aspidiotus rapax* Comst. One female was taken by Dr. Perkins in Honolulu in December, 1908, and I have taken two specimens on Tantalus and Mt. Kaala. In March, 1924, it was reared by Mr. Swezey from *Aspidiotus cydoniae* Comst. on sugar-cane collected at the Experiment Station grounds in Honolulu. In the National Museum I found one female reared by Koebele from an *Aspidiotus* sp. on ohia tree at Olaa, Hawaii (No. 1561), and unfortunately without any date.

80. **Prospaltella** sp.

A wholly orange-yellow species with yellow antennae and legs and hyaline wings, which have a moderately long marginal fringe, was collected by Mr. Swezey from grass on Pearl Harbor Peninsula, Oahu, July 4, 1919.

81. **Encarsia versicolor** Girault.

In 1907, Kotinsky recorded an *Encarsia* sp., which was reared from *Aleyrodes sonchi* Kotinsky, presumably in Honolulu. This record very likely was inclusive of both this and the following species, as both had been reared at that time by Mr. Swezey from this host. Of *versicolor* I have seen a number of specimens reared from *Aleyrodes sonchi* and *Aleyrodes vaporariorum* Westwood, in Honolulu, the oldest specimens having been taken by Mr. Swezey in the Kalihi district on January 27, 1906. In the National Museum I also found specimens reared by Koebele from *Aleyrodes* on lantana as early as February, 1899, at Kona, Hawaii. I have a large series of this species reared in California from several species of Aleyrodidae, and a few specimens from New Haven, Connecticut, out of *Aleyrodes vaporariorum* collected by Mr. B. H. Walden. The species was described from the latter host from Urbana, Illinois.

82. **Encarsia** sp.

This is a bright yellow species with the wings wholly hyaline, the disk of the wing rather broad, without a bare area beyond the stigmal vein, and with the marginal fringe less than one-half of the width of the disk. I have examined specimens of this species reared from *Aleyrodes sonchi*, *A. vaporariorum* and

A. hibisci Kotinsky. It was taken in Honolulu, May 27, 1907 (Swezey), in Kona, Hawaii, in December, 1915 (Pemberton), and in Hilo, January, 1918 (Timberlake). In the National Museum there are some much older specimens reared by Koebele from an *Alcyrodes* on coffee at Olaa, Hawaii, in December, 1898.

83. **Aspidiotiphagus citrinus** (Craw).

Recorded by Dr. Howard in 1898 from Honolulu, but the record probably pertains to the following species, at least in part. Reared by G. Compere in Honolulu as early as January, 1899, from *Chrysomphalus rossi* (Mask.) on *Araucaria* (U. S. Nat. Mus.); taken in Kona, Hawaii (5000 feet), by Koebele, host and date not given, Koebele's Nos. 1526, 1527 (U. S. Nat. Mus.); reared from *Aspidiotus perniciosus* Comst. and *A. hederae* (Vall.) from Makaweli, Kauai, date not given, Koebele's Nos. 1135, 1136, and 1137 (U. S. Nat. Mus.). *Citrinus* at the present time seems to be considerably less abundant in Honolulu than the following species.

84. **Aspidiotiphagus agilior** Berlese.

According to a paper by Mr. A. B. Gahan, of which I have seen a manuscript copy, this species is apparently distinct from *citrinus*. *Agilior* has not been recorded from these Islands heretofore—at least under its present name—although Dr. Howard's record of *citrinus*, in 1898, was presumably at least inclusive of this species. It was reared by Koebele in Honolulu in August and October, 1896, from *Parlatoria zizyphi* (Lucas) and *Fiorinia fioriniae* (Targ.) (U. S. Nat. Mus.); from *Lepidosaphes beckii* (Newm.) on orange in Kona, Hawaii, in April, 1898, and at Makaweli, Kauai, in May, 1898 (U. S. Nat. Mus.).

A species of *Aspidiotiphagus* was introduced by Koebele about 1894 from China and Japan, but whether it was this or the preceding species, or both, is unknown.

85. **Aphelinus maidis** Timberlake.

Probably both this and the following species were included by Fullaway in 1913 in his record of *Aphelinus mali*, as both were present in collections at that time. *Maidis* was collected in Honolulu in 1906 by Dr. Perkins, and a mummified cane aphis (*Aphis sacchari* Zehntner) is preserved in the collection of the Sugar Planters' Station, collected at Lahaina, Maui, September 27, 1905 (Swezey), which was without doubt parasitized by this species, this aphid being commonly attacked by it; it was reared from the cane aphis at Hilo, Hawaii, September 16, 1913 (Swezey); and on May 22, 1918, the writer found the corn aphis (*Aphis maidis* Fitch) parasitized by this species at Grove Farm, Kauai.

86. **Aphelinus gossypii** Timberlake.

The oldest specimen of this species that I have seen was taken in Honolulu on November 22, 1904, by Mr. Swezey, and the species was taken also at Kilauea, Hawaii, by Mr. Perkins in July, 1906.

87. **Aphelinus semiflavus** Howard.

Of this species, I have reared three specimens from material collected on Tantalus, Oahu. From *Toxoptera aurantii* (Fonscolombe), I obtained two females on February 29, 1916, and one female on March 30, 1908, from *Aulacorthum circumflexum* (Buckton).

88. **Aphytis diaspidis** (Howard).

Recorded by Kotinsky in 1905 as *Aphelinus fuscipennis* from Mokuleia, Oahu, and in 1913 by Fullaway as *Aphelinus diaspidis*, but taken in Honolulu by Koebele as early as January, 1899 (U. S. Nat. Mus.). I have seen specimens only from Honolulu.

89. **Aphytis limonus** (Rust).

The *Aphelinus* species incidentally recorded by Girault in 1913 from Honolulu proves to be this species, together with a few specimens of *diaspidis*. These specimens were reared by Koebele, March 10, 1899, from an *Aspidiotus* on oleander in Honolulu (U. S. Nat. Mus.). This species was also reared in Honolulu by Mr. George Compere in January, 1899, from three different species of diaspine scales. *Limonus* was described by Rust in 1915 from specimens collected by Mr. Ehrhorn in 1911. It is a common species in Honolulu, but I have not seen it from any other locality.

90. **Marietta** sp.

First recorded by Fullaway in 1913 from Honolulu, but collected considerably before that time by Dr. Perkins. The earliest specimens that I have seen were taken by Mr. Swezey at Kaimuki, on March 8, 1913; others were taken at Kahuku, Oahu, July 18, 1919, and at Waikapu, Maui, on March 23, 1924, also by Mr. Swezey. It is now a common species on Oahu and occurs in a fully winged and apterous condition. In habits it is a secondary parasite of *Trionymus* and *Antonina* on grasses.

91. ***Marietta carnesi** (Howard).

In 1907, Mr. Kotinsky reported on the introduction of a *Perissopterus* sp. from China, which was reared from *Lepidosaphes* and liberated in Honolulu in the summer of 1906. In 1913, Mr. Fullaway recorded a *Perissopterus* which he had reared from a *Lepidosaphes* sp. at the Federal Experiment Station. The identity of the species concerned in these records is not certain, as I have seen no specimens, but there are grounds for believing that it was *carnesi* Howard. At any rate, I captured a female of this species on February 10, 1924, in Makiki, Oahu, on *Schinus* infested with *Saissetia nigra* (Nietn.), and later reared a few more specimens from material collected at the time. *Carnesi* has been known previously as a secondary parasite of Diaspine scales. It is readily distinguished from the preceding species by the very slender scape, which is no wider than the pedicel.

92. **Eretmocerus corni** Haldeman.

This species was determined by Dr. Perkins for Kotinsky, who recorded it from Honolulu in 1907 as a parasite of *Aleyrodes hibisci* Kotinsky. I have reared this species from the same host collected at Hilo, Hawaii, in January, 1918.

93. **Archenomus perkinsi** (Fullaway).

Described by Fullaway in 1913 from Honolulu, under the genus *Pteroptrichoides* from specimens collected by Kotinsky on August 24, 1906. It apparently has never been found elsewhere in the Islands.

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* Purposely introduced insects are starred throughout the list.

94. **Pseudopteroptrix imitatrix** Fullaway.

First recorded by Fullaway in 1913 as *Pteroptrichoides* sp. as a parasite of *Howardia biclavis* (Comst.) and still known only from Honolulu.

Signiphoridae.

95. **Signiphora aspidioti** Ashmead.

This species was recorded from Honolulu in 1913 by Mr. Girault as *S. coquilletti* and was reared from several species of *Aspidiotus* in Honolulu by Koebele as early as January and March, 1899 (U. S. Nat. Mus.). There are also specimens in the National Museum reared by Koebele from *Aspidiotus* sp. on ohia at Olaa, Hawaii.

96. **Signiphora** sp.

This is apparently the species recorded by Fullaway and by Muir in 1913 as *Thysanus* sp. from *Aspidiotus* species in Honolulu. It was reared from a *Parlatoria* on avocado at Kaimuki, June 3, 1913 (Swezey), and also reared by me apparently from *Coccus longulus* (Dougl.), although some diaspine scale may have been included in the material. It is distinguished from the following species by having a well-developed discal bristle on the fore-wing and by having the antennal club proportionately shorter and wider.

97. **Signiphora thoreauini** Girault.

One female was collected by Mr. Swezey on May 19, 1917, at Niulii, Hawaii. This specimen has the antennal club considerably longer and narrower than in Californian specimens of this species, but in almost all other respects it agrees very closely.

Tetracampidae.

98. **Astichus cyaneus** Ashmead.

This species apparently requires a new generic name, as it certainly is not a true *Astichus* and belongs to a different group from that assigned to it by Ashmead. It was described in 1901 from a specimen taken on Lanai in January, 1894. It was taken on Oahu by Perkins, and much earlier by Blackburn; found also on Maui in 1918, and on Kauai in 1921 by Swezey. It is a rather rare species occurring in the native forests, and I believe it must be adventive because of its isolated position in respect to the native fauna.

Eulophidae, Entedoninae.

99. **Secodella metallica** (Ashmead).

Described as *Omphale metallicus* in 1901 from specimens taken on Hawaii, Molokai, Oahu, and Kauai. It was taken on Mt. Kaala, Oahu, by Dr. Perkins as early as December, 1892 (U. S. Nat. Mus.). It has been taken also on Maui. Like the preceding species, it has usually been considered endemic, but I believe it has all the earmarks of an immigrant species, it being an isolated species without congeners in the Islands, and occurring at all elevations on many different hosts.

100. **Achrysocharis fullawayi** (Crawford).

Described in 1913 from Honolulu as *Derostenus fullowayi* (sic) and apparently first taken by Fullaway about 1910. It has been reared from *Agromyza pusilla* Meig. collected at Paauhau, Hawaii, January 17, 1918 (Timberlake), and from *Cremastobombycia lantanella* Busck collected at Lihue, Kauai and Ulupalakua and Sprecklesville, Maui, in May, 1921 (Swezey). It has been reared also from *Gracilaria marginestrigata* Wlsm., *Gracilaria hibiscella* Swezey and *Philodoria pipturiella* Swezey.

101. **Achrysocharis** sp.

This species, which has not been previously distinguished from *fullawayi*, was reared by Dr. Perkins as early as January, 1902, in Honolulu, from *Gracilaria marginestrigata* Wlsm. Two females were reared from the same host at Kaimuki, March 8, 1908 (Swezey), and two females were taken at Kekaha, Kauai, in August, 1913 (Osborn). It seems to have become very largely if not wholly replaced by the preceding species, as all the specimens of *Achrysocharis* obtained in recent years belong to *fullawayi*. It is distinguished from *fullawayi* by the considerably coarser reticulation and by the brighter, more brassy green color with purple on the scutellum.

102. **Chrysocharis parksi** Crawford.

Recorded by Crawford in 1913 as *Chrysocharis* sp. from specimens collected in Honolulu by Fullaway. It was reared from *Agromyza pusilla* Meig. at Kaimuki, June 24-27, 1906 (Swezey), and collected at Pahala, Hawaii, as early as May 6, 1905 (Swezey). In September, 1918, Mr. Bridwell reared it from *Agromyza pusilla* at Haiku, Maui.

103. **Pleurotropis** sp.

This species was reared from the cocoons of *Microbracon omiodivorus* (Terry) in April, 1917, at Honolulu (Bridwell and Timberlake), and has not been recorded heretofore from the Islands.

104. **Entedonine** sp.

This species, which is parasitic in the cocoons of the spider Cryptine, *Arachnoleter swezeyi* Cushman, was taken by Mr. Terry at Waipahu, Oahu, in May, 1907, and at Honolulu in June of the same year. It is now widely distributed on Oahu, but apparently has not been found on the other Islands. It is recorded here for the first time.

105. ***Horismenus** sp.

Introduced by Bridwell and Willard from Brownsville, Texas, in 1921, and recovered by Mr. Willard on Oahu, in 1923.

Tetrastichinae.

106. **Melittobia hawaiiensis** Perkins.

Described in 1907 from Honolulu, and the earliest specimen that I have seen was taken by Dr. Perkins on a window at Waikiki, Oahu, in 1903 or 1904.† Mr. Swezey has discovered its work in *Sceliphron* cocoons, also at Kilauea, Kauai, and in July, 1920, obtained specimens from *Odynerus nigripennis* Holm. collected at Keanae, Maui. Taken also in *Sceliphron* nest at Kealakekua, Hawaii (3500 feet), August 20, 1919 (Swezey and Timberlake).

107. **Melittobia peles** Perkins.

Described as a variety of the preceding species by Dr. Per-

* Purposely introduced insects are starred throughout the list.

† The label is obscure, with the final figure rewritten so that it is not evident whether 1903 or 1904 was intended.

kins, who says that it is probably a distinct species. With this I fully agree, as there are good structural characters to separate it in both sexes. Dr. Perkins' unique specimen was collected at Kilauea, Hawaii, in July, 1906. Two females were collected on Mt. Olympus, Oahu, by Swezey, on April 2, 1911, and in July, 1918, I obtained a large series, including males from a larva of *Odynerus nigripennis* collected at Nuuanu Pali, Oahu.

108. **Tetrastichine** near **Melittobia.**

This is the parasite of *Ereunetis flavistriata* Wlsm. recorded by Mr. Swezey in 1909 from Honolulu (Exp. Sta. H. S. P. A., Ent. Bull., 6, p. 29). It resembles *Melittobia* in many ways, but is smaller, more metallic, and the funicle has only two joints. The male, moreover, closely resembles the female. Reared by Mr. Swezey from an *Ereunetis* larva on coconut at Grove Farm, Kauai, September 13, 1907, and taken by him in Honolulu, January 20, 1908. It seems to be a common parasite of *Ereunetis* in Honolulu, and probably is more widely distributed than the records show.

109. ***Ootetrastichus beatus** Perkins.

Introduced from Fiji in 1905 and now well distributed throughout the sugar-cane districts of the Islands.

110. ***Ootetrastichus formosanus** Timberlake.

Introduced from Formosa in 1916 and now distributed to the same extent as *O. beatus*.

111. **Tetrastichus hagenowii** (Ratzeburg).

Recorded by Ashmead in 1901 from Hawaii and Lanai, and probably one of the earliest immigrants of this group of insects, but not taken by Blackburn so far as I am aware. It presumably occurs on all the larger Islands, although I have seen specimens only from Kauai, Oahu, Maui, and Hawaii.

112. ***Tetrastichus giffardianus** Silvestri.

Introduced by Fullaway from West Africa in 1914. The following records of specimens taken in general collecting will be of interest: Collected on Konahuanui, Kaumuohona, and at Pauoa

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* Purposely introduced insects are starred throughout the list.

Flats, Oahu, in June, 1917 (Bridwell), taken in Iao Valley, Maui, on September 5, 1919 (Bryan).

113. **Tetrastichus** sp.

Collected at Makiki, Oahu, January 25, 1907 (Swezey), and now rather common in Honolulu. Most of my specimens were taken on store windows, although the species also occurs in the open. It is distinguished from other Hawaiian species by the median scutal groove, the dark femora and yellow scape and pedicel.

114. **Tetrastichus** sp.

Of this species I have seen only one specimen, collected by me from a store window at Kaimuki, Oahu, on January 5, 1918. It is somewhat similar to *hagenowii*, but is much more depressed, more metallic, and with a smoother sculpture. It seems to be closely allied to *T. metallifer* Masi.

115. **Tetrastichus** sp.

Taken by Dr. Perkins at Kilauea, Hawaii, in June, 1906, and there is a note attached to the specimen to the effect that it was apparently associated with *Eurytoma* or a Pteromalid parasitic on Diptera, and that the species is widely distributed, as he had taken it on Tantalus, Oahu. Mr. Giffard has also reared this species at Kilauea from *Tephritis* puparia in *Raillardia* flowerheads, April, 22, 1920. Among Hawaiian species it is most similar to the third species recorded above (No. 113), but it has the propodeum much shorter, the oral margin yellow, the scape and pedicel dark, and the femora yellow at base and apex.

Elachertinae.

116. **Elachertus advena** Timberlake.

This species will be described elsewhere in the near future. First recorded by me in 1919 as *Elachertus* sp. from specimens reared by Professor Crawford in Honolulu from *Hypothenemus*, but taken as early as June 10, 1917, on Tantalus by Mr. Bridwell. Taken at Waikee, Maui, September 4, 1919 (Bryan), and a good series, including males, was taken by Mr. Fullaway on Sand and Eastern Islands, Midway, in April, 1923.

117. **Elachertus** sp.

A small series of this species, which has not been recorded heretofore, was reared by Mr. Giffard on July 9, 1906, from an unknown host collected in Moanalua Valley, Oahu.

118. **Elachertine.**

Recorded by me in 1919 as a *Rhopalotus* sp., but now placed in a different group. One female was swept from grass and weeds near Lihue, Kauai, May 23, 1918 (Timberlake); four females were collected by Mr. Swezey at Honaunau, Hawaii, August 13, 1919; and one female was taken by Mr. Fullaway in Honolulu on December 4, 1920.

119. **Cirrospilus** sp.

Reared from *Cremastobombycia lantanella* Busck at Lihue, Kauai, May 6, 1921, and from the same host at Sprecklesville, Maui, May 18, 1921 (Swezey); reared from *Gracilaria marginestrigata* Wlsm. at Kaimuki, Oahu, in April, 1922 (Timberlake).

EULOPHINAE.

120. **Diaulinus** sp.

Recorded by Crawford in 1913 from Honolulu, but reared as early as November 30, 1906, by Mr. Swezey at Kaimuki, Oahu, from *Gracilaria marginestrigata* Wlsm.; reared by Mr. Bridwell in September, 1918, from *Agromyza pusilla* Meig. at Haiku, Maui.

121. **Notanisomorphomyia** sp.

This is the species recorded by me in 1922 as *Eulophus* sp. One female was taken in Honolulu, May 28, 1917, probably by Mr. Swezey; it was reared from *Cremastobombycia lantanella* Busck, collected by Mr. Swezey at Lihue, Kauai, May 6, 1921, at Ulupalakua, Maui, on May 17, 1921, and at Huehue, Hawaii, on July 27, 1921. This species has been reared also from *Gracilaria marginestrigata* Wlsm., *Gracilaria neraudicola* Sw., *Euhyposmocoma trivitella* Sw., *Bedellia orchilella* Wlsm., etc. Although it has been reared and collected in considerable numbers, no males have yet been found.

122. **Pseudopheliminus** sp.

This species was first taken by Mr. Swezey, who collected a male on Waialae Ridge, Oahu, November 26, 1922; it was reared from *Gracilaria hauicola* Swezey collected at Hanalei, Kauai, on March 16, 1923 (Swezey); one female was taken on Nihoa by Mr. Bryan on June 14, 1923, and one at Wailuku, Maui, by Mr. Swezey on December 9, 1922. I have reared it also from *Gracilaria marginestrigata* collected at Pearl Harbor Peninsula, Oahu, in March, 1923, and at Kaimuki in January and February, 1924.

Trichogrammatidae.

123. **Brachistella lutea** (Fullaway).

Described by Fullaway in 1914 as *Jassidophthora lutea* from specimens reared from the eggs of *Draeculacephala mollipes* (Say) at Honolulu apparently early in 1913, as Mr. Muir exhibited specimens at the meeting of the Entomological Society on February 6, 1913; it was reared also from the eggs of *Conocephalus saltator* (Saussure) collected in Honolulu by Mr. Swezey in January, 1913, and taken at Ewa, Oahu, by Mr. Swezey on August 13, 1921.

124. **Oligosita hilaris** (Perkins).

Described by Dr. Perkins in 1910 as *Westwoodella hilaris* and taken by him in Honolulu as early as January, 1904. I have seen only a few specimens including the type, all of which were collected by Dr. Perkins.

125. **Oligosita caerulocephala** (Fullaway).

Described by Fullaway in 1914 as *Westwoodella caerulocephala* from specimens taken at the same time and under the same circumstances as the types of *Brachistella lutea*, but it was reared by Mr. Swezey also in 1912 from Cicadellid eggs in sedge at Honolulu.

126. **Ittys** sp.

Reared by me from the eggs of *Nesophrosyne maritima* Kirkaldy in *Dodonaea* leaves collected at Makua, Oahu, July 16, 1916.

127. **Aphelinoidea xenos** Timberlake.

Reared by Mr. Swezey from the eggs of *Sogata paludum* (Kirkaldy) collected at Kewalo in Honolulu on August 18, 1913, and May, 4, 1914.

128. ***Uscana semifumipennis** Girault.

Introduced in 1910 from Texas and first reported to be established at Honolulu by Fullaway at the meeting of the Entomological Society held February 1, 1921; found at Kona, Hawaii, in July, 1912, by Fullaway. It has not been reported from the other Islands, but doubtlessly occurs also on Maui and Kauai.

129. **Ufens** sp.

This parasite of the eggs of *Elimaea punctifera* (Walker) and *Holochlora japonica* Brunner was first recorded by Dr. Perkins in 1910. All the specimens that I have seen were taken in or near Honolulu except one or two specimens taken by Mr. Swezey at Barber's Point, Oahu, on December 23, 1923.

130. **Trichogramma semifumatum** (Perkins).

Described by Dr. Perkins in 1910 as *Pentarthron semifumatum* from Honolulu and Kilauea, Hawaii, but collected as early as June, 1906, at the latter locality; reared from undetermined Noctuid eggs on lichens on a dead tree, Haleakala, Maui (6000 feet), in July, 1919 (Timberlake). Not known from Kauai, but presumably occurring there.

131. **Trichogramma minutum** Riley.

Described by Dr. Perkins in 1910 as *Pentarthron flavum* from Honolulu and renamed *T. perkinsi* by Girault. Recorded as *T. pretiosa* in 1907 by Mr. Swezey, who reared specimens from the eggs of *Omiodes meyricki* Swezey collected at Honomu, Hawaii, on March 21, 1907, and who also took specimens in Honolulu a few days later. Some poor specimens with unexpanded wings reared by Mr. Swezey from the eggs of *Anomalochrysa* at Kilauea, Hawaii, on September 28, 1913, apparently belong to this species. It is commonly found also in the eggs of *Amorbia, Lycaena, Herse, Vanessa,* etc. The earliest specimens

* Purposely introduced insects are starred throughout the list.

seen were reared by Koebele in Honolulu in the summer of 1900 from the eggs of *Omiodes blackburni* (Butler) (U. S. Nat. Mus.).

132. **Megaphragma mymaripenne** Timberlake.

A few specimens of this remarkably minute species were taken by Mr. Pemberton, who found them associated with a thrips in the forest at Mountain View, Hawaii, late in January, 1920.

MYMARIDAE.

133. **Alaptus immaturus** Perkins.

Recorded by Dr. Perkins in 1910 from Oahu and reared as early as January 6, 1905, by Mr. Terry at Oahu Sugar Company. There seems to be no doubt that it was unintentionally introduced from Queensland at the time that the leafhopper egg parasites were being established. It was taken at Hilo, Hawaii, on March 8, 1913, by Mr. Swezey.

134. **Alaptus globosicornis** Girault.

Recorded by Girault from Honolulu on a single specimen taken August 3, 1900, and the variety *hawaiiensis* was based by him on this specimen. Specimens that I have seen reared from the eggs of the common wingless Psocid that infests insect collections (*Atropos divinatoria*) are uniformly greyish, with the abdomen paler. In life they are decidedly blackish in color, with the abdomen much more dilutely pigmented and appearing translucent dusky whitish, especially in the male. This coloration agrees reasonably well with the original description of *globosicornis*. The *Alaptus* recorded by Mr. Swezey from Psocid eggs in the nests of *Megachile* from Koko Head, Oahu, I believe must be this species, as I have reared specimens under the same conditions. The male has the second funicle joint distinctly smaller than the joint on either side. One male was taken by Mr. Osborn at Hakalau Plantation, Hawaii, in May, 1914.

135. **Alaptus** sp.

One female taken by Mr. Osborn at Hakalau Plantation with the male of *globosicornis* recorded above and two males taken by Mr. Swezey on a window in Honolulu, November 28, 1915, belong to a species heretofore unrecorded from the Islands.

The female differs from *immaturus* in its more dusky color and much shorter antennae and from *globosicornis* in its more yellowish color and in having the funicle joints much less moniliform. The fore-wings in both sexes have a median discal row of six to eight strong setae on the apical half.

136. **Leimacis peregrina** Perkins.

Described in 1910 from specimens taken in Honolulu. I have not seen this species.

137. **Gonatocerus mexicanus** Perkins.

Recorded by Mr. Swezey in 1916 from specimens reared from the eggs of *Draeculacephala mollipes* (Say) collected at Kapiolani Park, Honolulu, on August 26 and 27, 1915; one female was taken by Mr. Swezey on sugar-cane in Honolulu on October 14, 1914.

138. **Gonatocerine.**

One female taken by Mr. Swezey on a window in Honolulu on November 28, 1915, has the antennae very long, slender and ten-jointed. The fore-wing is clavate, with a long fringe only at the apex and with about three irregular rows of discal setae on one surface and two submarginal rows on the other surface, each row being composed of about six setae and confined to the broadened apical part of the wing. The specimen is only 0.24 mm. long and has the antennae, legs, and wings considerably longer than the body. Another specimen was taken by me in the entomological laboratory of the Sugar Planters' Station on March 25, 1924.

139. ***Anagrus frequens** Perkins.

Introduced in 1904 from Queensland and now common and widely distributed in the Islands. It attacks the eggs of other Delphacids besides *Perkinsiella*, and has been reared from the eggs of *Peregrinus maidis* (Ashm.), *Sogata paludum* (Kirk.), *Kelisia sporobolicola* Kirk., and *Liburnia leahi* (Kirk.). This species has been synonymized with *A. armatus* (Ashmead) by Mr. Girault, and perhaps correctly so, although I prefer to use the name *frequens* at present.

* Purposely introduced insects are starred throughout the list.

140. **Anagrus** sp.

Recorded by Fullaway in 1917 from specimens reared from the eggs of *Peregrinus maidis* on corn in Honolulu in the summer of 1916. This species is black, with the base of the abdomen yellow, and the wings are very broad as compared with *frequens*.

141. ***Paranagrus optabilis** Perkins.

Introduced in 1904 from Queensland and widely distributed in cane fields throughout the Islands, although now much less common since the introduction of *Cyrtorhinus mundulus* (Breddin).

142. ***Paranagrus perforator** Perkins.

Introduced in 1904 with the preceding species, but lost sight of in recent years. The only specimens that I have seen were reared from the eggs of *Aloha impomoeae* Kirkaldy collected by Mr. Swezey in Makiki Valley, Oahu, on March 2, 1906.

143. ***Paranagrus osborni** Fullaway.

Introduced in 1916 from Los Baños, Luzon, Philippine Islands, as a parasite of *Peregrinus maidis* (Ashm.). It is probably well established, although difficult to distinguish from *optabilis*.

144. **Polynema reduvioli** Perkins.

It was reared by Mr. Swezey on August 20, 1905, from the eggs of *Reduviolus capsiformis* (Germ.) in Honolulu; found by Mr. Terry at Kilauea, Koloa and Makaweli, Kauai, in November and December, 1905; recorded by Dr. Perkins in 1910, also from Hawaii; collected by Mr. Fullaway in April, 1923, on Sand and Eastern Islands, Midway, and on Ocean Island. I presume that the Mymarid, recorded by Fullaway in 1914 from Laysan, is this same species.

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* Purposely introduced insects are starred throughout the list.

Notes on Hawaiian Aphidae, With a List of Food Plants (Homoptera).

BY P. H. TIMBERLAKE.

(Presented at the meeting of December 6, 1923.)

The number of aphid species occurring in Hawaii is not great, but some of them are of considerable economic importance, among which should be mentioned *Aphis sacchari, A. maidis, A. gossypii,* and *A. medicaginis.* Some, such as *Macrosiphum solanifolii,* which are important pests elsewhere, confine themselves almost exclusively to weeds and are, therefore, negligible here in an economic sense. The thirty-seven species now known from the Islands are apparently all introduced, and there is no absolute certainty that there was any aphid fauna at all in the Islands before the establishment of commercial relations with the outside world in the early part of the nineteenth century.

The purpose of these notes is primarily ecological, or to provide a working list of the species, together with their food plants. I have, therefore, not attempted to describe any of the species which are apparently new, but in the case of species of uncertain identity I have found it desirable to place on record a few simple characters by which they may be distinguished from their congeners present in the Islands. The classification employed is mainly that of Mr. A. C. Baker (U. S. Dept. Agric. Bull. No. 826, 1920), but with some modifications where Mr. Baker's treatment seems somewhat too rigid. My thanks are due to Mr. Baker for the identification of several species.

Subfamily Aphiinae.

Tribe Lachnini.

1. **Lachnus tujafilinus** (Del Guercio).

This species has been discovered recently by Mr. Ehrhorn, who found apterous colonies on *Thuya occidentalis* L. in Manoa Valley, Oahu, at the last of January and during February, 1924. On account of the peculiar marking of the apterous form of this species, I believe that there is no doubt about the identification.

Proc. Haw. Ent. Soc., V, No. 3, December, 1924.

Tribe Callipterini.

2. **Myzocallis kahawaluokalani** Kirkaldy.
Kirkaldy, 1907, Proc. Haw. Ent. Soc. 1, p. 101.

This species has not been found since Kirkaldy's description was published in 1907, and is unknown to me. It was described from specimens taken on the crepe myrtle, *Lagerstroemia indica* L., and was reported by Kirkaldy to occur on other shrubs in Honolulu, the identity of which was not made known.

Tribe Aphini.

3. **Anuraphis helichrysi** (Koch).
Aphis myosotidis Fullaway, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 42.

This is the common species on *Erechtites,* and is sometimes found on *Gnaphalium purpureum* L. Both of these plants are introduced weeds, and the aphid, therefore, has no economic interest. It is known to occur on Oahu, Kauai, and Maui.

4. **Aphis sacchari** Zehntner.

This species is common throughout the Islands on sugar-cane (*Saccharum officinarum* L.) and sometimes occurs in large infestations, but is generally a pest of minor importance due to its control by predaceous enemies. Mr. Fullaway found a colony on sorghum (*Andropogon sorghum* Brot.) in Honolulu in August, 1916, but its occurrence on this plant is evidently rare.

5. **Aphis maidis** Fitch.

This is a very common species on corn (*Zea mays* L.), various varieties of sorghum, Sudan and Tunis grass (*Andropogon sorghum* Brot.), wonder forage grass (*Andropogon* sp.), pearl millet (*Pennisetum glaucum* (L.) R. Br.), and Guatemala grass (*Tripsacum laxum* Nash.). It has been found in the Islands also on the following non-cultivated plants and weeds: Club rush (*Scirpus maritimus* L.), Job's tears (*Coix lacryma-jobi* L.), goose grass (*Eleusine indica* Gaertn.), fox tail grasses (*Chaetochloa lutescens* (Weigel) Stuntz and *C. verticillata* (L.) Scribn.), crab grasses (*Syntherisma pruriens* (Trin.) Arthur and *S. sanguinalis* (L.) Dulac), and barnyard grass (*Echinochloa crusgalli* (L.) Beauv.).

The economic importance of this pest is greatly increased by its transmission of mosaic disease from its normal hosts to sugar-cane. This phase of its activity has been investigated by Dr. Kunkel, and many of the above records of food plants are due to his work. Although the corn aphis does not establish colonies on sugar-cane in the Hawaiian Islands, immigrants undoubtedly settle on the cane plants and are able to live long enough to transmit disease. Forced but unsuccessful migrations to cane also take place when infested grasses are weeded out in the cane fields.

6. **Aphis middletonii** Thomas.

This is a root-inhabiting species on various Compositae and has been found in Honolulu on cultivated *Coreopsis* and China aster (*Callistephus chinensis* (L.) Nees).

7. **Aphis gossypii** Glover.

The cotton aphis, which, according to Van der Goot, is the *Aphis malvae* Walker of European authors, is one of our commonest and most destructive species. Its food plants are very numerous, and the list given herewith might be greatly increased by careful collecting. Among cultivated plants, it has been found in the Islands on cotton (*Gossypium barbadense* L.), *Cucumis*, taro (*Colocasia antiquorum* var. *esculenta* Schott), *Caladium bicolor* Vent., Hibiscus (*Hibiscus rosa-sinensis* L. and hybrids), *Clerodendron* sp., egg plant (*Solanum melongena* L.), pink and white shower (*Cassia nodosa* Ham.)., periwinkle (*Vinca rosea* L.), avocado (*Persea gratissima* Gaertn.), Ageratum (*Ageratum houstonianum* Mill.), hybrid of *Plumieria rubra* L., sunflower (*Helianthus annuus* L.), marigold (*Tagetes erecta* L.), Mexican creeper (*Antigonon leptopus* H. and B.), Zinnia (*Zinnia elegans* Jacq.), Ixora (*Ixora macrothyrsa* Theijsm. and Binn.), and hollyhock (*Althaea rosea* Cav.).

It also occurs in more or less abundance on the following weeds: *Bidens pilosa* L., *Cuphea hyssopifolia* H. B. and Kunth., *Waltheria americana* L., *Cassia bicapsularis* L., *Solanum nodiflorum* Jacq., *Malvastrum coromandelinum* (L.) Garke, *Malva parviflora* L., *Ipomoea pentaphylla* Jacq., *Desmodium uncinatum* D C., *Crotalaria incana* L., *Erechtites*, *Stachytarpheta dichotoma*

Vahl., *Euphorbia pilulifera* L., *Euphorbia* sp., *Sida cordifolia* L., and *Sida rhombifolia* L.

It was also found on a native Mucuna vine (*Mucuna* sp. near *urens* (L.) Medic.) on the Ditch Trail near Keanae, Maui, in July, 1920 (Swezey).

8. **Aphis** sp.

A bright orange-yellow species of *Aphis*, very similar to *Aphis gossypii* in structure, has been observed on *Waltheria americana* L. on the island of Oahu. Even the alate form has the abdomen bright yellow. The species is distinguished from *gossypii* by the coloration and by the different proportions of the antennal segments in the alate viviparous form.

9. **Aphis medicaginis** Koch.

Aphis papaveris Silvestri, 1909, Bol. Quind. Soc. Agr. Ital. 14, p. 344.

Aphis gossypii Fullaway, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 39 (in part).

Aphis medicaginis Higgins, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 54.

The first record of this pest under its correct name was by Higgins, in 1910. It was confused by Fullaway with *Aphis gossypii,* but is easily distinguished by the shiny black color and reticulate derm of the apterous females.

It has been found on the following cultivated plants: Various beans (*Phaseolus* spp.), Cowpea (*Vigna cylindrica* (L.) Merrill), pigeon pea (*Cajanus cajan* (L.) Millsp.), hyacinth bean (*Dolichos lablab* L.), and the night-blooming Cereus (*Cereus triangularis* (L.) Haw.). It is especially destructive to cowpeas.

It also occurs on the following weeds: *Portulaca oleracea* L., *Medicago denticulata* Willd., *Indigofera suffruticosa* Mill., *Euphorbia pilulifera* L., *Datura stramonium* L., *Tribulus cistoides* L., and *Acacia farnesiana* (L.) Willd. It was found on *Tribulus* on the outlying islands by the members of the Tanager Expedition in 1923.

10. **Aphis** sp.

A heretofore unrecorded and as yet unidentified species of *Aphis* was taken February 25, 1917, in large numbers on *Cam-*

pylotheca macrocarpa (Gray) Hbd. on the Manoa Cliff trail on Mt. Tantalus, Oahu.

It is distinguished from other species occurring here except *Aphis bambusae* and the following species on *Scirpus* by having secondary sensoria on the third to fifth antennal joints and from *bambusae* by the greenish-yellow color of the apterous phase which lacks a white waxy secretion and by the longer cornicles which are about as long as in *Aphis medicaginis.*

11. **Aphis** sp.

A yellow species on *Scirpus maritimus* L. was taken by Mr. Swezey in April, 1913, at Kewalo, in Honolulu. In many ways it is close to the preceding species on *Campylotheca,* but the antennae of this species are longer and wholly yellow, whereas the last four joints are black in the other species.

12. **Aphis swezeyi** Fullaway.

This species recorded by Fullaway on *Gnaphalium* sp. has not been collected since.

13. **Aphis bambusae** Fullaway.

> *Melanaphis bambusae* Van der Goot, 1916, Zur Kenntniss der Blattläuse Javas, p. 61.

This species was found by Fullaway on a bamboo which was believed to be a species of *Phyllostachys.* It has been wrongly accredited to Kirkaldy by Van der Goot, and more recently by Baker.

14. **Brevicoryne brassicae** (Linnaeus).

The cabbage Aphis occurs here rather sparingly on cabbage (*Brassica oleracea* L.) and kale (*Brassica* sp.), and is sometimes found on *Capparis sandwichiana* D C.

15. **Toxoptera aurantii** (Fonscolombe).

This species is found commonly in the mountains of Oahu, generally at an elevation of 1500 to 2000 feet on various species of endemic trees and shrubs of which the following have been noted, although the list is by no means complete: *Scaevola chamissoniana* Gaud., *Pittosporum glabrum* Hook. and Arn., *Hibiscus arnottianus* Gray, *Pelea* sp., and *Straussia* sp.

It also occurs on the following cultivated or escaped shrubs and trees: Coffee (*Coffea arabica* L.) and mango (*Mangifera indica* L). The record on mango is based on a small colony found at Kaimuki, May 24, 1920, which is the only time that the species has been discovered in the coastal lowlands, to the writer's knowledge, except that a single-winged migrant was taken by Fullaway in October, 1922, on *Ixora macrothyrsa* Theijsm. and Binn. It has never been seen on Citrus in the Islands, probably because of its rarity in the lowlands, where most of the Citrus trees are grown.

16. **Vesiculaphis caricis** (Fullaway).

Toxoptera caricis Fullaway, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 32.

Vesiculaphis caricis Del Guercio, 1911, Redia, 7, p. 464.

This peculiar aphid was discovered by Fullaway on a sedge (*Carex* sp.) in the mountains back of Honolulu.

17. **Yamataphis oryzae** Matsumura.

Matsumura, 1917, Jour. Coll. Agr. Tohuku Univ. 7, p. 412.

A single alate female was taken by me while riding on a street-car between Kaimuki and Moilili, in Honolulu on March 24, 1924. This specimen agrees very well with Matsumura's description, and I believe the identification is certain, notwithstanding the limited material on which it is based. The species was discovered by Matsumura at Sapporo, Japan, on the roots of rice (*Oryza sativa* L.).

18. **Myzaphis** sp.

The apterous phase of this species is sometimes common on cultivated rose-bushes in Honolulu, and was first noticed in 1916, but the alate form was not discovered until March, 1923. In Theobald's table of rose aphids (Bull. Ent. Research, 6, p. 112, 1915) it runs to *neorosarum* Theobald, a new name for *rosarum* Buckton (not Kaltenbach), but it is apparently not that species. According to Buckton, *neorosarum* has black marks on the abdomen in the alate phase which is not true of the Honolulu species, and the capitate hairs of the body are more nearly as in *rosarum* (Kaltenbach) as figured by Theobald.

19. **Capitophorus braggii** (Gillette).

This species was discovered on artichoke (*Cynara scolymus* L.) April 12, 1923, by Mr. Swezey, in the Manoa Valley, Oahu.

20. **Amphorophora lactucae** (Kaltenbach).

This species was first noticed by the writer in Honolulu in November, 1922, and has since been found widely distributed on Oahu. It is now very common on *Sonchus oleraceus* L., and seems to have replaced *Macrosiphum solanifolii* on this food plant.

21. **Myzus citricidus** Kirkaldy.

This species recorded and described by Kirkaldy in 1907 (Proc. Haw. Ent. Soc. 1, p. 100) occurs abundantly on the tender growth of various species of Citrus on Oahu, and probably on most of the other Islands.

22. **Myzus** sp.

A small species apparently belonging to the genus *Myzus* was taken by Mr. Fullaway on bamboo, in Honolulu, on two occasions in the winter of 1917-1918. The material preserved is not sufficient for the identification of the species, but indicates that it is different from all other aphids known to occur here.

23. **Myzus persicae** (Sulzer).

The common peach aphis of the United States and Europe has so far been found in Hawaii only on cabbage (*Brassica oleracea* L.), kale (*Brassica* sp.), papaya (*Carica papaya* L.), and *Datura stramonium* L.

24. **Aulacorthum** sp.

This green *Aulacorthum* has the cornicles with about three to five rows of coarse irregular reticulations at the apex, the third antennal joint with about fifteen to nineteen sensoria in a row, the fourth joint with five or six sensoria, while the apterous phase has only about six sensoria in a row on the basal half of the third antennal joint. It is very close to *A. rosaefolium* (Theobald), but distinct in having much fewer sensoria on the third antennal joint of the apterous females. It apparently differs from any species of aphid so far recorded from rose-bushes.

This species infests cultivated rose-bushes (*Rosa,* hybrids) and largely replaces *Macrosiphum rosae* in the lowlands of the Islands. I have found it on roses in Honolulu and on Tantalus, Oahu, and at Wailuku, Maui, and also collected it on rose-bushes at Whittier, California, in 1912.

25. **Aulacorthum circumflexum** (Buckton).

Circumflexum was discovered by Mr. Fullaway on poha (*Physalis peruviana* L.) on Tantalus, Oahu, and I have since taken it on one of the native shrubby violets (*Viola* sp.) in the Punaluu Mountains, Oahu, and on *Phyllostegia grandiflora* Benth. on Mt. Kaala, Oahu, at about 3000 feet. It has also been taken on pansies (*Viola tricolor* L.) in Honolulu by Mr. Fullaway.

Van der Goot makes this species the type of his genus *Neomyzus,* but it seems to me to agree in every respect with *Aulacorthum,* as the apterous females examined by me have one or two small sensoria on the third antennal joint.

26. **Aulacorthum** sp.

In 1918, Mr. Fullaway collected, on an unidentified composite on Maui, a green *Aulacorthum* without dark markings, which agrees almost exactly with *circumflexum* in structural details and in the color of the legs, cornicles and antennae. In March, 1920, he took what is apparently the same species on ferns at Kilauea, Hawaii.

27. **Aulacorthum** sp.

A small colony consisting entirely of apterous females was collected on a fern (*Polypodium* sp.) in the native forest on the Pauoa trail, Tantalus, Oahu, in February, 1916. The species is green, with the cornicles, antennae, excepting the first two joints and base of the third joint, the apex of the tibiae and the tarsi blackish. The frontal tubercles appear to be somewhat shorter than is usual for the genus, but they are gibbous on the inner side, the third antennal joint bears one or two sensoria near the base, and the cornicles are slightly tapering and transversely imbricated and imperfectly reticulated at apex. The identification of the species must rest until the alate form is discovered.

28. **Macrosiphoniella sanborni** (Gillette).

This aphid occurs on florists' Chrysanthemum (*Chrysanthemum hortorum*) in Honolulu, and was first recorded by Fullaway in 1910.

29. **Macrosiphum rosae** (Linnaeus).

The common rose aphid was recorded by Fullaway from Honolulu, Oahu, and from Mana and Puuopelu, Hawaii (2000 to 3500 feet). I have found but one specimen of it in Honolulu, but have seen it abundant on cultivated roses at Mountain View and Kilauea, Hawaii.

30. **Macrosiphum solanifolii** (Ashmead).

Macrosiphum trifolii Fullaway, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 23 (not Pergande, 1904).

For the determination of this species I am indebted to Mr. A. C. Baker, with whom I agree after comparing Hawaiian specimens with a long series collected in Texas, Utah, and California, on potato, rose, alfalfa, *Sonchus*, *Lactuca scariola* L., *Malva parviflora* L., *Citrus*, *Erodium cicutarium* L'Herit., and cultivated strawberry. I believe that *Macrosiphum creelii* Davis, described from specimens taken on alfalfa, is a synonym.

This species was formerly abundant in the lowlands on *Sonchus oleraceus* L., but I have been unable to find it during the last two years. On one occasion I discovered a small but vigorous colony on *Portulaca oleracea* L., and in January and February, 1920, I found small colonies on corn (*Zea mays* L.) in Manoa Valley, located mostly on the basal part of the stalk and on the lower leaves of vigorously growing plants.

31. **Neotoxoptera violae** (Pergande).

A species, believed by Fullaway to be the one described by Pergande, was taken by him on Tantalus, Oahu, on cultivated violets (*Viola odorata* L.). It has not been found since.

32. **Idiopterus nephrolepidis** Davis.

Macrosiphum kirkaldyi Fullaway, 1910, Ann. Rep. Haw. Agric. Exp. Sta. for 1909, p. 22, figs. 1-2.

Fullawayella kirkaldyi Del Guercio, 1911, Redia, 7, p. 462.

Nephrolepidis is a common species in the mountains back of Honolulu on *Acrostichum reticulatum* Kaulf., *Polypodium lin-*

care Thunb. and doubtlessly several other species of ferns, and has been taken on ferns at Kilauea, Hawaii, by Fullaway.

The genus *Fullawayella* has been misunderstood by Baker, who wrongly uses it to replace *Neotoxoptera* Theobald and *Micromyzus* Van der Goot. Essig has also stated that *nephrolepidis*, without doubt, is a native of the Hawaiian Islands, and that it has been introduced from there into the United States. There is, however, no local evidence that *nephrolepidis* is endemic to the Islands, and I believe that it has been introduced here as likewise in the United States on imported plants.

33. **Pentalonia nigronervosa** Coquerel.

Nigronervosa is a not uncommon species on banana of various kinds (*Musa* spp.) in Honolulu, and presumably occurs throughout the Islands in the lowlands. It was also found by Mr. Fullaway in June, 1922, on ferns in Honolulu.

Subfamily Eriosomatinae.

34. **Eriosoma lanigerum** Hausmann.

Fullaway has recorded the woolly aphis from apple trees (*Pyrus malus* L.) at Waikii, Hawaii (4500 feet), and more recently Mr. Ehrhorn reported on finding the species at the same locality (Proc. Haw. Ent. Soc. 5, p. 18, 1922).

Subfamily Hormaphinae.

35. **Cerataphis lataniae** (Boisduval).

This species occurs on the loulu palm (*Pritchardia* sp.) in Honolulu, and one or two trees at the College of Hawaii have been continuously infested for several years. It has been found by Dr. Lyon also on greenhouse orchids at the Moanalua gardens near Honolulu.

36. **Thoracaphis ficus** Baker.

Baker, 1920, U. S. Dept. Agric. Bull. No. 826, pl. 16, figs. Q, R.

Fullaway (Proc. Haw. Ent. Soc. 4, p. 471, 1921) has recorded the occurrence of this species on *Ficus* in Honolulu, under the name of *Thoracaphis fici* Van der Goot, which is apparently a manuscript name. It occurs frequently on the banyan tree (*Ficus Benghalensis* L.) about Honolulu.

37. Undescribed Aphid on **Araucaria.**

An undescribed and peculiar aphid was reported by the writer as occurring on the Norfolk Island pine (*Araucaria excelsa* R. Br.) in 1916 (Proc. Haw. Ent. Soc. 3, p. 267). It belongs to a new genus, apparently of the subfamily Hormaphinae, and can hardly be confused with any other Hawaiian species.

New and Little Known Fulgorids from the West Indies (Homoptera).

BY F. MUIR.

(Presented at the meeting of November 1, 1923.)

From time to time Mr. G. N. Wolcott has forwarded to the writer fulgorids from Porto Rico and other West Indian Islands; some of these he named at the time of their reception, others he placed on one side for future study. Among the latter the following appear to be undescribed, or needing some comment. A study of the male genitalia of the species reported as common to various West Indian Islands and the mainland is very desirable, and is likely to show a higher endemism than has hitherto been evident.

CIXIIDAE.

Cubana tortriciformis sp. nov.

Female. Length, 5 mm.; tegmen, 8 mm.

The base of the vertex not quite so angularly emarginate as in the type. Brown, the carinae of head and thorax lighter brown or yellow, legs light brown, abdomen light brown, slightly infuscate. Tegmen light brown or stramineous, with lighter and darker markings; the darker brown markings are, one from base of costa over first claval vein, a large, irregular V-shape mark with its apex near Mf, and one arm touching the mark over the first claval vein and the other reaching the middle of costa; a small mark across costal cell slightly more distad, a fainter one at base of stigma and continued in a curve to apex of clavus, another subparallel to last starting distad of stigma, where it is broadest, a broader dark mark over apical Sc and R reaching to M, a thin line slightly apical to that; at apex between M3 and 4 a black round mark. The veins dark in dark area and lighter in light area; the middle of the subapical cells semi-hyaline, wings slightly fuscous and opaque, veins brown.

One female from Mameyes P. R., 3000 feet elevation, Acc. No. 29-1924 (G. N. Wolcott).

This is the third species to be placed in this genus, the other two being from Cuba. The genus is near to *Cotylepceps*, but can be recognized from it by the longitudinal median carina on vertex.

Type in the National Museum, Washington.

Derbidae.

Cedusa wolcotti sp. nov. Plate XII, Figs. 1, a.

Male. Length, 2 mm.; tegmen, 3.3 mm.

Vertex slightly longer than in type species, a faint carina dividing it from frons; lateral margins of frons straight, subparallel sided or frons slightly broader at apex than at base, a faint median frontal carina; sub-antennal plate large, typical; shoulder keels distinct, but small. Tegmina slightly narrower than type species, apex more rounded, venation with one apical M (M 1c) missing, apical cells shorter.

The anal angle of pygofer produced into a long, narrow process, lateral margins ventrad of process concave; anal segment long, narrow, anus slightly basad of middle, broadest at base gradually narrowed to truncate apex, the apex has the appearance of being cleft in middle and afterwards joined together, in some specimens there is a little hole through the middle near apex; genital styles large, broad, the apex broadly rounded with a small process on outer margin near base, and a broad longitudinal median ridge from base to the inner margin near apex, inner margin slightly convex, entire; the apex of the left style is cleft nearly across and produced into a small spine, the right style being entire at apex and without spine.

Stramineous, slightly darker over apical portion of mesonotum. Tegmina hyaline, slightly opaquely white; clavus, apical cells and Cu area slightly fuscous, a black mark at apex of Cu, smaller one at apices of apical cells; veins same color as membrane. Wings opaquely white, M and A veins brown, others white.

Female. Similar to male. The pregenital plate (seventh sternite) produced from side to middle, sides of produced portion sinuous, apex rounded.

Described from twenty-three males and five females from Yauco, Porto Rico (*G. N. Wolcott*, August 24, 1923; Acc. No. 236), feeding on a palm. Type No. 1135, in Hawaiian Sugar Planters' Experiment Station collection; paratypes in U. S. National Museum, Washington, and G. N. Wolcott's collection.

Dysimia gen. nov.

Sc+R+M forming a common stalk on the basal fifth, Sc+R fork a little basad of the middle and level with M fork; Sc cell fairly long and narrow; M with seven apical veins, pectinate or subpectinate, the first or basal sector furcate near base, the second furcate near apex, the third and fourth arising near together at apical cross-veins; the Cu with three veins entering hind margin, Cu fork slightly before apex of clavus, Cu1 forked near apex; clavus closed, claval veins forking on basal third, entering commissure near apex of clavus. Hind-wing more than half the length of tegmen, anal area well developed with anal veins.

Vertex small, triangular, lateral carinae large, meeting together at apex. Base of frons narrow with lateral carinae touching, gradually widening to apex, lateral carinae large, curved under the antennae, but do not form a subantennal process. Clypeus shorter than frons, rounded. In profile vertex and frons forming a curve. Pronotum angularly emarginate posteriorly, very short in middle, no shoulder carinae or only a very slight indication of any; mesonotum broader than long, without carinae. Antennae shorter than frons, first segment wider than long, length of second segment about twice the width, apex slightly larger than base. Female genital style small, but complete. Hind tibiae with two or three small spines, which are missing in some specimens.

This genus stands between *Symedia* and *Mysidia*, but, as it has only three Cu veins reaching the hind margin, and the sectors of M are not incorporated into the Cu, it must be placed in the Cenchreini. It differs from *Symedia* in having no shoulder keels, the Cu with three branches instead of two, the basal M sector two-branched instead of three, and the second M sector two instead of one branch; wings are also proportionately much larger. In *Dawnaria* Dist. the M is not pectinate and in *Phenice* Cu has two branches, the first M sector two, and the others are simple.

Type *D. maculata*.

Dysimia maculata sp. nov. Plate XII, Figs. 2, a.

Male. Length, 1.5 mm.; tegmen, 3.6 mm.

Stramineous; genae in front of eyes, the middle of mesonotum and basal portion of abdominal tergites fuscous, fuscous over lateral portions of pronotum, a small dark mark on tegulae sometimes forming a distinct spot. Tegmina hyaline, slightly opaque with waxy secretion and very slightly fuscous, especially over apical cross-veins and in apical cells, veins stramineous with fuscous marks; four black spots on tegmen, the largest on Cula, a smaller one at base of Cu1, another in costal cell at base of Sc+R fork and a very small one on M basad of first sector. Wings hyaline, veins stramineous with fuscous markings, a round black spot between Cu and A.

Anal segment small, anus near base, lateral edges curved ventrad. Inner margins of genital styles slightly concave on basal half and convex on apical half, outer margin produced angularly in middle, the apex of the angle produced into a thin, curved process.

Female. Length, 1.9 mm.; tegmen, 4 mm.

In color similar to male, the fuscous on tegmen a little darker, and the abdominal tergites lighter. Hind margin of pregenital plate turbinate or angular with curved sides, reaching nearly to apex of styles.

Described from thirty-five males and twelve females, feeding on two species of *Inga*: *I. vera* and *I. laurina* (*G. N. Wolcott,* August, 1922, Acc. No. 279-23).

Type in H. S. P. A. Experiment Station collection, Honolulu, No. 1136; paratypes in U. S. National Museum, Washington, and G. N. Wolcott's collection.

Dictyopharidae.

Parahydriena gen. nov.

Sc+R fork and M fork at cross-veins, M4 appearing as arising from cross-vein, Cu fork considerably basad of these, about one-third from apex of clavus, M1 and 2 fork at apical cross-veins, M with five apical veins, 1, 2, 3, 4, 4 a; a single line of apical cross-veins; claval fork about one-third from base, apex entering commissure near apex, no cross-veins in clavus; Sc+R+M making a short stalk at base. Apical half of vertex in the middle raised into a deep keel which in profile is subangular; frons long, narrow, base half the width of apex, basal third subparallel sided beyond which widening with sides slightly arcuate, widest before apex; lateral margins keeled, two median longitudinal carinae which meet together at apex; clypeus tricarinate. Pronotum short in middle with a median carina, wider at sides with a single, curved carina behind eyes; mesonotum tricarinate, carinae straight, laterals slightly diverging posteriorly, posterior angle divided off by a slight depression, but not by a suture or line. Front legs simple, not expanded, front tibiae and femora subequal in length, without spines; hind tibiae with three spines on apical half.

This genus approaches *Hydriena* Melichar in having two medio-frontal carinae, but the shape and nature of the elevated portion of the vertex appear to differ, and the front legs are not exceptionally long.

Type *P. hyalina*.

Parahydriena hyalina sp. nov. Plate XII, Figs. 3, a, b, c.

Female. Length, 4.2 mm.; tegmen, 5.7 mm.

Yellow or light stramineous; carinae of head, sides of clypeus, lateral portion of cephalic projection and sides of head below it dark, also dark over carinae of thorax, a thin line in middle of lateral portions of pronotum, a dark mark over coxae and pleura of thorax; the apical half of abdominal tergites and fifth, sixth, and seventh sternites dark. Tegmina and wings clear hyaline, veins light brown.

Anal segment longer than broad, in outline basal half slightly concave, apical half slightly convex, apex slightly arcuately emarginate; anus in apical half. Posterior genital styles laterally flattened, triangular, excavate in middle, apex with a number of spines curved inward; median and anterior styles covered by posterior styles.

One female specimen from Lares, Porto Rico (*G. N. Wolcott,* June 14, 1921, Acc. No. 130, 1921).

Type in U. S. National Museum, Washington.

Issidae.

Colpoptera brunneus sp. nov. Plate XII, Figs. 4, a, b, c, d.

Male. Length, 3.7 mm.; tegmen, 4.6 mm.

Dark brown, lighter over genae, lighter spots in middle of frons, over carinae of head and thorax, legs lighter. Tegmina dark brown, light brown over costal area and cell, and a few small, light marks in clavus; veins same color as membrane except apical veins which are light, a light mark at stigma and at apex of clavus. Wings fuscous, slightly lighter at base, veins dark. The tegmina are generally covered with a light powdery secretion.

In lateral view lateral margins of pygofer straight or slightly concave, anal angle rounded, not produced. Anal segment fairly large, anus in middle, apex rounded. Genital styles large, subtriangular, two ridges running across apical half, outer margin irregularly sinuate. Periandrium forming a tube, deeply and narrowly emarginate, or cleft, on ventro-apical margin, with a long, thin process arising from the bottom of the emargination (Figs. 4, a), and from each side of the emargination arises a bifurcate, spine-like process; the penis is large, membraneous or but slightly chitinized, with a pair of curved spines about middle of ventral aspect.

Female. Similar in size and color to the male. The tegmina of this species has the costal vein leaving the costal margin one-fourth from the base and forming a narrow costal area without cross-veins; the Sc and R simple, and forming a short stalk; M bifurcate about middle, M3+4 joining R for a short distance; Cu forking near apex. In the hind wings there is an emargination at the apex of Cu, as well as one in middle of anal area; no granules on the clavus. Vertex much wider than long, truncate at apex, slightly concave at base. Basal margin of pronotum widely angularly emarginate, lateral carinae following hind margin of eyes.

Described from three males and two females from Utuado, P. R. (*G. N. Wolcott,* November, 1921, Acc. No. 475), one male and two females (type locality), one male from Toa Alta (*G. N. Wolcott,* April 21, 1921, Acc. No. 105, 1921), and one male from Cicales, P. R. (*G. N. Wolcott*, March 24, 1920, Acc. No. 65, 1921).

Type in H. S. P. A. Experiment Station, Honolulu; paratypes in U. S. National Museum, Washington, and G. N. Wolcott's collection.

Colpoptera maculifrons sp. nov.

Male. Length, 3.8 mm.; tegmen, 5.4 mm.

Light brown; slightly darker at base on lateral portion of frons, a series of seven or eight lighter spots curving from the outer angles of base to near apex in the darker portion of frons; pronotum slightly mottled with darker marks; mesonotum considerably darker. Tegmina light brown, slightly darker in middle, veins same color as membrane except in middle, where the Sc, R, M, and Cu from one-third from base to near nodal line are dark brown or black. Wings brown with darker veins.

Anal segment long, narrow, anus at base where it is broadest, gradually narrowing to acute apex. Genital styles somewhat similar to former species, but the apex (corresponding to x in Fig. 4) is produced into a spine with its apex bifurcate and pick-shape.

Vertex considerably wider than long, apex very slightly arcuate, base slightly, roundly emarginate. In this species there is a very slight sign of transverse veins in the costal area.

Described from one male from Rio Piedras, P. R. (*R. T. Cotton*, 2, 10, 1917).

Type in U. S. National Museum, Washington.

The genus *Colpoptera* Burmeister is difficult to place; it has been placed in the Issidae, Ricaniidae, and Flatidae by different workers. The absence of any sign of granules on the clavus should exclude it from the Flatidae, and the male genitalia are not typical of that family. The absence of a distinct costal area with distinct cross-veins should also exclude it from the Ricaniidae, and the eyes nearly touch the tegulae. If it should be placed in the Ricaniidae it would come near to *Bladina*, in which the costal area is obscure. Personally, the writer prefers to place it in the Issidae until such time as the morphology of that family has been more thoroughly worked, and it should go into the Thioniini.

Acanaloniidae.

Acanalonia brevifrons sp. nov. Plate XII, Figs. 5, a, b.

Female. Length, 6.9 mm.; tegmen, 8.6 mm.

Vertex wider than the length in middle, apex widely angular or subangular; frons much wider than long. No costal area; Sc and R arising from the same spot on basal cell, Mf near base, fork of M3+4 very near to Mf, Cu without a fork. Anal segment sublanceolate, anus in middle; posterior genital styles large, triangular, the apex swollen and roughened, but not bearing teeth.

Green; slightly brownish over vertex, more so on legs; costa light; apical margin from the apex of Sc to apex of clavus reddish brown with small light marks, slightly reddish along second claval and hind margin. Wings slightly greenish with green veins, slightly brownish over anal area.

Described from one male from Pt. Cangrojos P. R. (*G. N. Wolcott*, June 24, 1920, Acc. No. 234).

Type in U. S. National Museum, Washington.

In Melichar's latest classification of this family* this species would come into *Amphiscepa* Germar. But Van Duzee has pointed out that the type of this genus is an Issid and it is not available for Acanaloniidae. If Melichar's genus is maintained, then a new name must be given it.

Flatidae.

Tetraceratium gen. nov.

This genus is near to *Neocerus* Mel., but it is easily recognized by the deep angular emargination of the base of the frons, and a corresponding emargination of the anterior margin of the pronotum.

The cells of the costal area and the apical cells form a continuous margin from the base of the costa to the apex of the clavus; Sc, R, M, and Cu arising from basal cell, the forks of R, M, and Cu about equal distance from base; M branching out and its apical cells occupying the greater portion of apical margin; the branches of Cu pressed together at apex of clavus; claval veins forking near apex and entering commissure. The apex of vertex and base of frons deeply angularly emarginate, the vertex excavate, its base hidden by the pronotum; the width at base of frons, from tip to tip of the horns, double the width at apex, sides slightly sinuous, no carinae on frons, the edges slightly raised; clypeal suture obscure, clypeus without carinae. Basal segment of antennae as broad as long, second segment about twice as long as broad; eyes round without

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* Wytsmann's Genera Insectorum, fascicule 182 (1923), p. 4.

antennal sinus, ocelli distinct. Pronotum excavate in middle, anteriorly produced into two processes corresponding closely to the two at apex of vertex, a small, raised process behind eyes, base of pronotum widely angularly emarginate; mesonotum about as long as wide, without carinae, hind tibiae with one spine near apex.

According to Melichar's latest arrangement of the Flatidae, this genus would form a new subtribe of the Nephesini. His subtribe Crytoflatini should be the typical subtribe, as it contains *Nephesa* Amy. Serv.

Type *T. wolcotti*.

Tetraceratium wolcotti sp. n. Plate XII, Figs. 6, a.

Female. Length, 7 mm.; tegmen, 8 mm.

Stramineous slightly tinged with green, in life probably green; veins of tegmen greenish; wings hyaline, opaquely white with waxy secretion, veins white.

Anal segment large, flat, thin, in outline oval, anus near apex; posterior styles of ovipositor small, longer than wide, apex slightly pointed; anterior styles triangular, small; posterior margin of pregenital plate slightly angular.

One female from Haina, Santo Domingo, R. D. (*G. N. Wolcott*, 1920, No. 31).

Type in U. S. National Museum, Washington.

Ormenis Stal.

In his recent work, Melichar has divided the old genus *Ormenis* into several genera. This would be good if his characters were more definite. In his table of the Cryptoflatini it is fairly difficult to follow certain characters; as an instance, the one or two transverse lines formed by the apical and subapical cross-veins are not always easy to recognize, especially the subapical line, which is often irregular, and the cross-veins indistinct. In the present paper the writer has retained the old generic conception and added remarks as to where they appear to come in Melichar's new classification. He believes that a better system for both the Ricaniidae and Flatidae could be arrived at if more advantage was taken of the venation of tegmina.

Ormenis quadripunctata (Fabr.).

There are six specimens from Porto Rico which agree with the descriptions of this species. There is no subapical transverse line.

Ormenis infuscata (Stal).

There are two specimens from Vega Baja, P. R. (*R. T. Cotton*, 8, 4, 16, Acc. No. 518-16), which the writer considers to be this species, judging by descriptions. The subapical transverse line could be considered as present, as it is fairly well developed, the cross-veins being fairly regular. If we consider this as a line, then it would be an undescribed genus near to *Acrophaea* Mel. The frons is wider than long, and there are two spines on the hind tibiae.

Ormenis marginata (Brunnich).

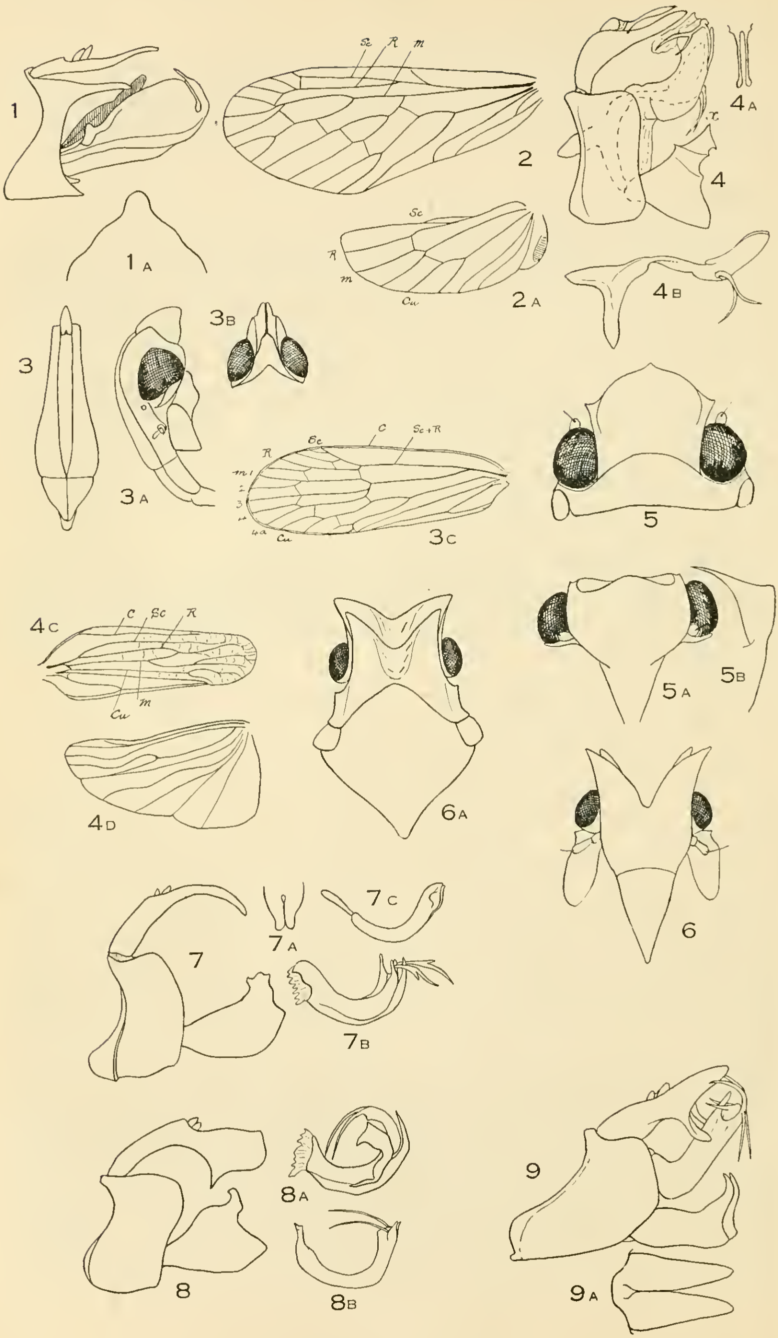
This is made by Melichar into a monotypic genus *Petrusina* in which there are two transverse lines in apical area, but in the specimens from Porto Rico the cross-veins are somewhat irregular and obscure.

Ormenis pseudomarginata sp. n. Plate XII, Figs. 7, a, b, c.

Male. Length, 2.7 mm.; tegmen, 4 mm.

Frons broader than long (1.3 to 1), median carina distinct on basal half, absent from apical half, lateral carinae only indicated at base, lateral margins carinate; no carinae on clypeus; vertex very short, mostly covered by pronotum; width of head equal to, or wider than, width of thorax, no carinae on mesonotum or only a slight indication at the base of median carina. Hind tibia with only one spine. Costal area distinct with transverse veins, and slightly granulate. Sc very strong, simple to apex; R arising from M near its base and forking about one-third from base of tegmen; Mf level with Rf, Cuf slightly basad of former two; granulations over the base of R and M obscure their junction. Nodal line slightly arcuate and formed by some irregular cross-veins and a slight depressed line across tegmen from node to apex of clavus; apical line fairly even and distinct; claval vein forking near apex, clavus strongly granulate.

Pronotum and mesonotum black or very dark fuscous brown, frons lighter brown, shading out to nearly yellow on sides, clypeus light fuscous; genae, antennae and eyes yellow; front and middle legs yellow, hind legs light brown, yellowish over apical half of tibiae and tarsi. Abdomen, pygofer and styles dark brown. Tegmina black or very dark fuscous brown, a white line along costal margin, narrowest at base where it only



West Indian Fulgorids.

covers about one-third of the width of costal area, broadening to apex where it covers the whole costal area; veins slightly lighter along nodal line. Wings fuscous with dark veins.

The periandrium is tubular with a pair of chitinous, bifurcate spines at apex; the penis is tubular with a chitinous rim at apex, but no process. The apex of anal segment is cleft for some little distance. The details of the genitalia are best understood by the figures.

Described from one male from Porto Rico (*R. T. Cotton*, January, 1917, Acc. No. 127-17), and one male from Lares P. R. (*J. More*, December, 1920, Acc. No. 150-20).

Type in H. S. P. A. Experiment Station, Honolulu, T. H., No. 1140; paratype in U. S. National Museum, Washington.

In Melichar's latest table this would run down to *Petrusina* Mel.

Petrusa pygmaea (Fabr.). Plate XII, Figs. 8, a, b.

The specimens the writer has before him from Porto Rico run down to *Petrusa* Stal in Melichar's latest table, and agree with his specific description in his monograph; they also agree with Stal's original specific description. Stal states that this genus has two transverse lines in the apical area of the tegmina,

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PLATE XII.

1. *Cedusa wolcotti*, lateral view male genitalia; *a*, female pregenital plate (seventh abdominal sternite).
2. *Dysimia maculata*, left tegmen; *a*, left wing.
3. *Parahydriena hyalina*, front view frons and clypeus; *a*, lateral view head and pronotum; *b*, dorsal view head; *c*, left tegmen.
4. *Colpoptera brunneus*, lateral view male genitalia; *a*, emargination at apex of periandrium with median process; *b*, lateral view penis and apodeme; *c*, right tegmen; *d*, left wing.
5. *Acanalonia brevifrons*, dorsal view head and pronotum; *a*, front view frons and clypeus; *b*, profile vertex and frons.
6. *Tetraceratium wolcotti*, front view head; *a*, dorsal view head, pronotum and mesonotum.
7. *Ormenis pseudomarginata*, lateral view male genitalia without aedeagus; *a*, apex of anal segment; *b*, lateral view periandrium; *c*, lateral view penis.
8. *Petrusa pygmaea*, lateral view male genitalia without aedeagus; *a*, lateral view periandrium; *b*, lateral view penis.
9. *Flatoides brunneus*, lateral view male genitalia; *a*, ventral view genital styles.

whereas Melichar places it in the group with only one. The specimens have a distinct regular apical line, but only a very slight subapical line. The male genitalia are figured, and it is hoped that those having access to the type, or who have topotypes, will compare them and publish the results.

Flatoides brunneus sp. n. Plate XII, Figs. 9, a.

Male. Length, 3.5 mm.; tegmen, 4 mm.

In size, venation and general build this species is near to F. *punctata* (Walk.), but the vertex is slightly shorter and its apex a little more obtuse. The hind tibiae have three spines, one on basal and two on apical half. The costal area is wide at base and gradually narrows to apex, Sc arises from basal cell, R+M form a small stalk at base, Cu arises from basal cell, but becomes crowded out by M towards the apex of clavus; claval veins furcate near apex, enters the apex or the commissure near apex, clavus closed.

Dark brown; slightly darker over base of frons and mesonotum. Tegmina light brown, veins same color as membrane; wings very light brown with darker veins. A few very small dark specks on costal area and on corium.

The anal segment large with anus in middle, basal half tubular, slightly constricted at anus, apical half flattened horizontally with the apical margins slightly apical of anus produced into a large process on each side, with a smaller one arising between them from the ventral middle line of anal segment, apex in dorsal view rounded with a slight emargination in middle. Genital styles in ventral view subtriangular, longer than broad, touching on middle line of basal half; in lateral view the outer apical angle produced into a broad, curved spine with acute apex. Periandrium tubular with two pairs of spines at the ventral apical margin, one pair curved dorsad and the other pointing basad. The penis tubular on basal half and then bifurcate with two spines at apex.

Haina, Santo Domingo, R. D. (*G. N. Wolcott*, 1920), one male.

Type in U. S. National Museum, Washington.

The specimen of *F. punctata*, with which it has been compared, is from Florida, and was identified by Van Duzee. It appears to agree with descriptions of that species, but Melichar places it in *Cyarda*. If Van Duzee's and the author's identification be correct, then Melichar is wrong. The genitalia of *brunneus* and *punctata* are very close to one another and differ considerably from those of *Uxantes*. The three spines on the hind tibiae places this in the subgenus *Atracodes* Mel., but the number of these spines do not give a natural grouping.

PRESIDENTIAL ADDRESS.

Homoplasmy or Convergent Development in Evolution.

BY F. MUIR.

(Presented at the meeting of December 6, 1923.)

This meeting brings to an end the nineteenth year of our society, during which time we have held 216 meetings, thus only twelve meetings have been missed. This is a very good record for so small a society. The observations, captures, records, and descriptions, published in the twenty publications of nearly 2000 pages issued by our society, rank next to the Fauna Hawaiiensis in importance as contributions towards the knowledge of our insect fauna, and in regards to habits, life histories, and food plants, they are the chief storehouse of our knowledge. If our society had not been in existence during these nineteen years, few of these observations would have been placed on permanent record, and the loss to our science would have been great. The complete indices made for each of the four volumes so far completed have made the miscellaneous information scattered through our Proceedings easily accessible to future workers. Our small membership makes it impossible for us to publish our Proceedings upon the subscriptions and sales of our Proceedings, and the trustees of the Hawaiian Sugar Planters' Association have come to our assistance in a very generous manner. We all fully appreciate this help and trust that the good cause that they assist eventually comes back to them through the economic work which is made more possible with every increase in our knowledge of the fauna of the Islands. In no other group of tropical islands is the insect fauna so well known, the endemic insects so distinctly recognized from the later introductions, or the records of the later natural and artificial insect immigrants so fully observed and recorded, and in no other such group of islands has such knowledge been used to better advantage in the control of such insects as affect our economic plants.

To those of us who have been carrying on economic work along the lines of biological control, the following extract from a letter of the great French naturalist, Philibert Commerson, written 150 years ago from Mauritius, is of deep interest, for not only did he foresee the possible economic use that could be made of introducing birds and other animals into Mauritius, but he also clearly recognized the principle of the balance of nature or the struggle for existence.

> "It is a misfortune that we have not here any of those birds which destroy insect life. It is only this island that affords the spectacle of great forests without a single woodpecker. That is the great enemy of white ants, other ants, large and small caterpillars. What a service one would render the colony if one could but introduce robins, flycatchers, magpies, shrikes . . . and other insectivorous birds which never touch grain.
>
> "Small hawks, owls, etc., could be imported to keep check on the multiplication of the smaller grain-eating birds; as well as snakes of a non-poisonous kind to destroy the rats. It would even be useful to bring frogs to purify the fresh-water pools, etc., of the swarming multitude of gnat-larvae which abound in them." *

This is a remarkable passage, and opens up a lot of interesting reflections as to where Commerson would have ended had he not died a comparatively young man, a martyr to his zeal for scientific research.

But it is not upon these subjects, interesting as they are, that I wish to speak today, but upon the very different one of:

Homoplasmy** or Convergent Development in Evolution.

This subject has formed the theme of many works, but I shall not touch upon its historic or bibliographic side, but I shall simply bring before your notice a few examples to show its universality in the animal world and suggest some of its bearings upon evolution.

In both the Protozoa and the Metazoa we find the same fundamental types of symmetry, i. e., radial, bilateral, spiral, leiotropic, dexiotropic, and modifications of these.† There are

* Life of Philibert Commerson, Pasfield Oliver (1909).

** Webster defines this word as: Resemblance between different plants and animals, in external shape, in general habits, or in particular organs, which is not due to descent from a common ancestor, but to similar surrounding circumstances.

† Kofoid, Nature, August 13, 1923, p. 253.

good reasons to believe that the Porifera or sponges (Parazoa) had a different origin from the Metazoa, the former from the Choanoflagellata and the latter from the Ciliata. Thus, it follows that multicellular animal organisms, with their attendant sexual method of reproduction, and the formation of ova and spermatozoa, has arisen at least twice independently of one another. The production of multicellular organisms was the most momentous step in animal evolution, and the fact that it occurred more than once in the animal world is of supreme significance.

In each great phylum illustrations of homoplasmy, or convergent or parallel development, can be found. The simplicity of the organization of Protozoa is not favorable to the recognition of such development, but students of those organisms could cite good examples.

Stephenson's * paper on Indian Oligochaeta is of great value from our standpoint, as he shows how parallel and convergent development has gone on in a number of genera, and he gives convincing evidence for polyphyly in some of them. I have contended for this in certain genera of Homoptera. This important paper should be consulted by all interested in this subject.

Many cases of homoplasmy could be cited from the Mollusca, but I will confine myself to those cases in which branchiae or gills are replaced by a lung or lung cavity. The animals included in the order Pulmonata all have a pulmonary sac. They are placed in two sub-orders, and are considered by many as having two distinct origins—the Basommatophora, originating from the Opisthobranchiata, sub-order Tectibranchiata, and the Stylommatophora from the sub-order Nudibranchiata. Most of the Prosobranchiata possess branchiae, but some possess pulmonary sacs; of the latter, some families (Cyclophoridae, Cyclostomatidae, Aciculidae) are placed in the sub-order Monotocardia, while others Helicinidae, Hydrocenidae, Proserpinidae are placed in the sub-order Diotocardia. Here we have four groups in which the branchiae have been replaced by lung cavities all having independent origin. Even if we disagree with the above

* Pro. Zoo. Soc. Lond. 1921, pp. 103-142.

classification, we have to admit two origins, viz.: Operculata and Pulmonata, and then within each of these we have to admit convergence of characters upon which the above classification is based. Thus, if we consider the genera of Prosobranchiata, which have pulmonary sacs as forming a monophylogenetic group, we have to admit that they have acquired the one or two auricles independently. The reduction of the shell has taken place independently within the Pulmonata and the Opisthobranchiata, and in each case is accompanied by, and may be the direct result of, the reflected epipodia, which gives protection to the visceral mass.

In another class of Mollusca, the Cephalopoda, we find a very complex eye which, in certain important points, parallels the eye of mammals.

As example of homoplasmy among Crustacea, I cite the Monstrillidae, belonging to the order Copepoda and the Rhizocephala, belonging to the order Cirripedia. Here we have some of the most extraordinary cases of metamorphoses, due to parasitism, in the animal kingdom, and certain of the most remarkable features being paralleled in these two orders. Parasitism has taken place in many of the large groups of animals and has led to reduction of organs and simplification of organism, and numerous cases of homoplasmy can be found among them. Hermaphroditism is found in the Cirripedia, Isopoda, and Epicarida, and have been derived independently from dioecious ancestors. This condition has arisen sporadically in many groups of animals.

Among insects many instances could be cited. The Honorable N. C. Rothschild, in his presidential address to the Entomological Society of London in 1917, pointed out the marvelous cases of homoplasmy among insect ectoparasites. In these we find the development of ctenidia, the form flattened horizontally, the legs situated far apart and spreading, the claws often of peculiar form, their femora with pseudojoints, all in insects so far apart as Diptera, Coleoptera, Heteroptera, and Hemimeridae (Orthoptera sens lat.). His concluding remarks are interesting:

"From the various examples of resemblance I have mentioned, it is evident that the medium in which a species exists, exercises a most power-ful influence on its evolution. If that is the case of Epizoic insects, we are not far wrong in assuming that the similarities, often slight in themselves, which sympatric insects (i. e., insects living in the same district) exhibit, are due in the first instance to similarity in the surrounding primary conditions of life." *

Among the Hymenoptera we have some most extraordinary examples of homoplasmy in wasps which inhabit figs. The true fig-wasps, or Agaonides, are wonderfully constructed for the life they lead, especially the male, which never leaves the fig, and passes its life among the forest of fig flowers; it is wingless, or nearly so, flattened horizontally, in many cases the middle legs are reduced or rudimentary, and the mandibles are large for gnawing open the galls containing the females; in fact, their whole morphology has been modified to adapt the insect to its activities within the fig. Other fig-inhabiting wasps belonging to quite different groups of genera, not taking any part in the polinization of the flowers, have males modified along similar lines. A thorough study of the fig-inhabiting wasps, their relationship and homoplasmy, would well repay a number of years' close study. If any of the figs bearing open fruit have gall wasps attached to them, their study should be included, as they should throw light upon the origin of the relationship of insect to fruit.

Wheeler, discussing certain ants, remarks:

"We have here some very interesting cases of convergence, or parallel development, since the underground habit has caused the workers, which rarely or never leave their burrows, to lose their deep pigmentation and become yellow or light brown and to become nearly or quite blind."

Among the Arthropods we find many that breathe by tracheae, i. e., Prototracheata, Myriapoda, Insecta, Arachnida, and perhaps even Isopoda. If the tubes in Isopoda are really tracheae, then these organs had at least two distinct origins, and even leaving these out of account it is highly probable that among the four other groups tracheae arose at least twice independently. Gills have arisen quite independently in many groups, and several times in a single class, such as insects, and even more than once in the same order.

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* Pro. Ent. Soc. Lond. for 1916. September, 1917, cxli, clvi, and figs.

Among the Amphibia the Apoda, or limbless Amphibia, give an example of homoplasmy. Writing of these, Gadow remarks that:

"About forty species are known, these have been placed in seventeen genera, mostly on comparatively slight grounds, and several of these genera are probably unnatural, the distinctive characters having undoubtedly been developed independently in various countries." **

Among the lizards we find five families without limbs which have evidently lost them quite independently of one another. The burrowing snakes have a number of characters in common, but they have more than one origin.

According to many authorities, the birds are not descendants of the Dinosaurs, in spite of the many characters common to both. However striking these characters are, "they are instances of convergent analogies, the upright walk, which has been assumed and improved upon independently by members of both Theropoda and Orthopoda, has produced the same, or nearly the same modifications in them as in birds." *

Among the mammals we find the Metatheria or Marsupials and the Eutheria developing along independent lines, but reaching a number of very similar results. As an example, I quote the Marsupial mole (*Notoryctes*) and the Eutherian mole (*Talpa*) and its allies.

The Cetacea or whales, the Sirenia and the Carnivora Pinnipedia have traveled along the same lines of development independently, and the fossil reptile *Ichthyosaurus* has also traveled along the same lines, which is similar to the normal form of fishes, and apparently is the best adapted to life in the water. In these cases there are innumerable characters in morphology and anatomy which had to be modified to convert these land, or at most amphibious, animals into complete or nearly complete aquatic animals. Some birds have also taken to aquatic life and have been independently modified along lines to fit them for that element. Many insects belonging to different families have also been modified along lines adapting them for a life in the water.

** Camb. Nat. Hist. VIII, Amphibia and Reptiles, p. 89 (1901).

* Gadow, Camb. Nat. Hist. VIII, p. 416 (1901).

Flight, or the power of moving through the air for some considerable distance, has been acquired by animals in different classes, such as fishes, lizards, birds, and mammals. In the case of birds and bats, although the details differ, yet the conversion of the front limbs into organs of flight have been paralleled.

Nearly all the examples cited above are functional homoplasmy, or adaptations of certain organs for certain uses, and it is of great interest to note that the great majority of the most conspicuous cases of homoplasmy are of that nature, for it shows very forcibly the direct or indirect influence of the environment upon the organism.

But there are innumerable cases of homoplasmy in which it is difficult to connect any functional use. Such are well known to any systematist who has worked at a large group and has attempted to draw conclusions as to their relationship. Every entomologist could cite innumerable examples, so I will only refer to a few of those which I find in the group which I have paid most attention to, and recently published upon, namely, the fulgorid Homoptera.

In fulgorids we find a vein in the fore-wing, which is generally considered as the costa. In many forms, including what I consider to be the most primitive, we find this vein coincident with the costal margin, but in others it is some distance from the margin and thus forms a precostal cell or "costal area" which is often crossed by a number of veins. This condition has arisen at least twice among the fulgorids and most likely several times. The amalgamation of the basal portion of the veins has taken place many times quite independently, even within a single family; the commonest is the amalgamation of the subcosta and radius, but the radius and media have also amalgamated together; and also the subcosta, radius, and media. The clavus is normally closed, but in more than one family (i. e., Derbidae, Flatidae, and Fulgoridae) it is found to be open in some genera. Among the Flatidae there are some genera in which the claval veins do not form a fork, a condition peculiar to the Cicadoidea. The arrangements of the branching of the veins and the conditions of the cross-veins are paralleled many times in the superfamily. The reduction of wings in the superfamily has taken place many times quite independently. Another character used in classifying these insects is the condition of the carinae on the frons, whether there be one simple carina, or if it be forked, or if there be two. These conditions are found quite independent of one another in different families and in groups in the same family. The condition of the antennae is also used in some families, and here again there is no phylogenetic connection between those having large, flattened antennae, as they are found in more than one group of a single family (i. e., Delphacidae). In the Derbidae we find the sub-antennal process and shoulder keels developing quite independently, and the latter forming a large antennal chamber in widely separated genera. It may be objected that the present classification of these families is not "natural," and hence the apparent homoplasmy, but in whatever sequence or order these genera may be placed, cases of homoplasmy will be found.

This condition is not peculiar to the fulgorids, but is found in every group of insects of moderate size which one studies. Timberlake, in discussing a single family of Hymenoptera, the Encyrtidae, remarks:

> "The bewildering plasticity of the group whereby the same character may have been developed independently in different genera (as, for instance, the fascicle of hairs at the apex of the scutellum in *Encyrtus*, *Cheiloneurus*, and *Chrysoplatycerus*.)" *

These few cases of homoplasmy, out of vast numbers which could be cited, have not been brought to your notice out of idle curiosity, but because I believe that they are important evidence in the one great problem which should be at the back of all zoological studies, viz., evolution.

Although I appreciate and admire the vast amount of experimental zoology that has been done within recent time, yet, when it is all considered, it does not give direct or indirect evidence enough to base a belief in evolution upon. This belief is based upon nature's own experiments, upon our studies of development, comparative morphology and anatomy of living and fossil animals, upon the geographic distribution in past and present time, and the time sequence as shown by fossils. Most of this information is the direct result of systematic zoology. If all

* Timberlake, Proc. Ent. Soc. Wash. 25 (3), p. 58 (1923).

this evidence was wiped out, the evidence founded upon experimental zoology would not prevent William Jennings Bryan from expunging the teaching of evolution from American schools. Yet we are constantly being told that systematic work is only worthy of inferior intellects, and that great intellects turn their attention to genes or tropisms, or other superior subjects.

The fact that animals have adapted themselves so wonderfully to their environment, independently arriving at similar resuts on more than one occasion, would make one believe that Lowell's famous lines:

> ''Some flossifers think that a fakkilty's granted the minnit its proved to be thoroughly wanted.''

contain more truth than sarcasm.

Everyone who studies the subject must admit that adaptation runs through the whole animal kingdom, and most will admit the frequency of homoplasmy. Nearly every zoologist who believes in evolution will also admit that the environment, in its widest sense, has been the great "potter's thumb," moulding the organisms in form and habit. The great rift comes when biologists begin to discuss the manner in which this moulding has taken place. This has divided them into two great camps, one following Weismann and the other Lamarck.

Weismann contended that the germ plasm passed from generation to generation continuously, without a break, absolutely uninfluenced by the body cells or soma. Thus, any influence which the environment might have upon the soma could not be impressed upon the germ plasm. As the soma arises from the germ plasm at each generation, it follows that the only means by which heritable variation can arise is by an alteration of the germ plasm. While Weismann considered that the environment might produce modifications of the germ plasm similar to that produced on the soma (parallel modification) many of his followers do not admit this, but maintain that the germ plasm cannot be influenced by the environment either directly or indirectly. According to this extreme school, all variation arises through the mixing and sorting out of the genes during the mating of the sperm and egg. In this kaleidoscopic shifting of the genes, or particles of the chromosomes, the chances of the combinations of characters that are necessary arising in the necessary consecutive order, without any inimical combinations, are so enormous that one's faith falters, and one turns to seek a solution which requires a smaller draft upon our credulity. That similar sequences should have occurred two, three, or more times quite independently is still harder to believe. This has been aptly called the "lucky throw of the Mendelian dice," but the dice are not six-sided, but very many-sided, and many sides bear death upon their face, and others bear indifference, and among the remainder only certain sequences are allowable, and the banker is Death and Oblivion.

But even to those whose faith is greater than mine there are other obstacles. While there is a large amount of negative evidence to support Weismann, there is also some positive evidence which is against him. That the continuity of the germ plasm is not so universal as he thought, is evident from work such as Gatenby's on the formation of new egg cells during sexual maturity in frogs. Kammerer's work cannot be ignored by his opponents, and the work of Guyer and Smith on the eyes of rabbits is a strong point against him. The more recent work of Garrett and Harrison on melanism among British moths is of great interest, for here we find that melanism caused by certain metal salts is inherited, and follows the Mendelian law.*

Turning to the other school of thought, we find few today who hold the crude views of a past generation. Early in the development of animal life a mechanism must have been developed to guard against individual mutilations becoming incorporated into the race, otherwise we should have nothing but maimed and helpless races of animals.

Fortunately, we have a few leaders who can see the virtues and vices of both of these extreme schools of thought, and who are combining the best in each into a more workable theory. In the study of the development of the phylum, as well as the individual, the great task is to discover the mechanism by which similar cells develop into totally different organs, having vastly

* Melanism in the Lepidoptera and its Possible Induction, Nature, August, 1923, p. 240. See, also, Nature, September 16, 1922, p. 380.

different functions and shapes. This cannot be due to the chromosomes and genes, for all the cells are equally endowed, but it must be due to forces external to these chromosomes, by which some of the latent capacities of growth are suppressed, while others are encouraged. Some light is being thrown upon this most interesting problem by recent discoveries in cell activities and harmones, and in the harmonic relationship of various parts of an organism. This most important and fascinating subject is but in its infancy, but already it appears to have thrown some little light upon Lamarckian factors and the inheritance of acquired characters. The post-pituitary harmone is responsible for the change of color in the skin of the frog which is of a protective nature, and, if we accept Kammerer's experiments, individuals born of parents that have lived in dark or light surroundings are correspondingly light or dark, which most likely is caused by the influence of the harmones on the germ plasm. Guyer and Smith's experiments on the eyes of rabbits may also be due to similar influences. Along this line of thought we may eventually find the mechanism by which we can understand, to some extent, the effect of use and disuse upon the organism. But we must co-ordinate the studies of form, function and development, or morphology, physiology and embryology.

This subject also has direct bearing upon the subject of this address, viz., Homoplasmy, for if environment in its widest meaning can affect certain organs or characters in one animal it is likely to do so in many others. The reduction of eyes in cave-dwelling animals may then be due to the absence of stimuli and not to "chance throws of the Mendelian dice"; and if we admit the possibility or probability of this, then the reduction of organs in parasitic animals may also be due to the absence of stimuli. And then it is not a long step to the production of similar characters in different animals living under similar conditions. That they do develop such is common knowledge. The question at present at issue is whether this is due to harmonic relationship between the animal and its environment or to "chance throws of the Mendelian dice."

Immigrant Records for 1923.

BY THE EDITOR.

The following immigrant insects are recorded for the first time, in this publication. Some have been known or collected previously, but remained undetermined or unrecorded. Those marked with an asterisk (*) were observed or collected for the first time during the year, and hence considered as rather recent arrivals. Those marked (**) were observed for the first time early in 1924, and are included here as they are listed in a paper that was finished in the latter year. For details of records, etc., refer to the pages given.

	Page
* *Maruca testulalis* Geyer (Lep.)	341, 348, 352, 354, 356
* *Plochionus timidus* Hald. (Col.)	342
* *Rhodesiella elegantula* Becker (Dipt.)	344
* Anthribid (Col.)	344
Rhodesiella tarsalis Adams (Dipt.)	347
Lonchoptera sp. (Dipt.)	347
Erasa javanensis Meij. (Dipt.)	349
* *Bruchus amicus* Horn (Col.)	350, 357, 358
Pseudopheliminus sp. (Hym.)	352, 354, 445
Bruchobius sp. (Hym.)	353, 423
* *Coccinella* sp. (Col.)	354
Hypergonatopus sp. (Hym.)	360
Zeteticontus perkinsi Timb. (Hym.)	360, 402, 430
Aphelinus maidis Timb. (Hym.)	405, 436
Aphelinus gossypii Timb. (Hym.)	408, 437
Aphelinus semiflavus Howard (Hym.)	409, 437
Megaphragma mymaripenne Timb. (Hym.)	414, 447
Aphelinoidea xenos Timb. (Hym.)	415, 446
Harmolita swezeyi Phillips and Poos (Hym.)	421
Zatropis tortricidis Crawf. (Hym.)	361, 422
Lariophagus distinguendus (Först.) (Hym.)	422
Lariophagus sp. (Hym.)	423
Eupteromalus sp. (Hym.)	423
Habrocytus sp. (Hym.)	423
Pteromalid, undetermined (Hym.)	424
Pachyneuron siphonophorae (Ashm.) (Hym.)	425
Pachyneuron sp. (Hym.)	425
Spalangia sp. (Hym.)	426
Spalangiid (Hym.)	427
Eupelmus sp. (Hym.)	428
Aphycus alberti How. (Hym.)	430
Aphycus claviger Timb. (Hym.)	430

END OF VOLUME V.

CONTENTS OF VOL. V, NO. 3.