

PROCEEDINGS
OF THE
Hawaiian Entomological Society

Vol. III. No. 2. JAN. 1914-APRIL 1915. JUNE 1915.

JANUARY 8TH, 1914.

The one hundred-first regular meeting of the Society was held in the usual place, President Swezey in the chair. Other members present: Messrs. Bridwell, Ehrhorn, Osborn, Pember-ton, and Warren.

Minutes of the previous meeting read and approved.

The president read a letter recently received from Mr. Muir, who is now in Formosa engaged in the search of parasites on the *Anomala* beetle. An interesting account was given of his work there.

On motion it was decided that the Library of the Society be assembled and retained at the Board of Agriculture and For-estry.

ENTOMOLOGICAL NOTES.

Mr. Ehrhorn reported the finding of a colony of the ter-mite *Coptotermes* sp. in the Douglass fir timber supporting the band stand in the Capitol grounds. The timbers had been large-ly destroyed by them. Several of the timbers contained a cone about 18 inches long and 8 inches in diameter, composed of a composite material manufactured by the termites from the wood. One of these cones was being kept to secure adults if possible from the nymphs which were now present. Some timbers were sound while others had been completely destroyed. The same band stand had been repaired five years previously when it had been similarly affected, apparently by the same inset tho its identity was not made known at that time. In the present re-building of the stand creosoted timbers have been used. This termite is the same species that Mr. Swezey reported at the pre-vious meeting as doing considerable damage in the floor timbers of the Kamehameha Chapel, and the work of which had not pre-

viously been noted as distinct from the other two species known here.

A general discussion of termites followed.

Mr. Ehrhorn reported successfully combatting the cypress roach (*Eleutheroda dytiscoides*) by means of roast paste spread on bread and protected from the weather by a pasteboard covering, placed in the trees frequented by the roaches. Mr. Bridwell mentioned finding this roach feeding on ripening mangoes and papayas; and Mr. Swezey reported it feeding upon oranges on the tree and on the outer covering of the pods of the glue bush (*Acacia farnesiana*).

A Note on "Technomyrmex Albipes".

BY O. H. SWEZEY.

Recently in looking over some unarranged material, I came across specimens of this ant collected at several widely separated localities in Hawaii. At Laupahoehoe, Hawaii, May 11, 1911, I found a nest of them in the stem of a dead frond of a tree fern, growing in a gulch. At Kilauea, Kauai, July 14, 1911, but with no circumstances of collection. At Hauula, Oahu, August 9, 1913, taken on leaves of a mountain apple tree in a gulch. The only other records of capture of this ant in Hawaii are by Mr. Ehrhorn at Maunawili, Oahu, April 13, 1912, (recorded on page 237 of Vol. II, Proceedings of the Hawaiian Entomological Society) and at Mr. Gartley's, Nuuanu Valley, August, 1913. Apparently the species has been established for several years and widely spread already. My specimens were taken incidentally, no special attention being given to ants at the time.

FEBRUARY 5TH, 1914.

The one hundred-second regular meeting of the Society was held in the Library of the Board of Agriculture and Forestry, President Swezey in the chair. Other members present: Messrs. Bridwell, Ehrhorn, Illingworth, Osborn and Pemberton, and Mr. M. Ishida from Formosa, visitor.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL NOTES.

Mr. Pemberton exhibited a microscope slide showing stridulating organ of the ant, *Pheidole megacephala*. It is an oval striated area on the anterior portion of the third dorsal segment of the abdomen, which is rubbed by hairs on the second segment of the petiole when the abdomen is raised and lowered quickly. The stridulation is not audible in the worker and only with difficulty in the female.

Mr. Bridwell exhibited a nest of *Trypoxylon bicolor*, and a box of North American Trypoxylonidae.

A Note on "*Nesotocus giffardi*" Perkins.

BY OTTO H. SWEZEY.

Seven males and six females of this large endemic Curculionid were taken by Mr. Montague Cooke from a *Cheirodendron* tree along the Castle Trail on the side of Kaumuahona not far above the Rest House, at 7 a. m., January 4th, 1914. More specimens were present but escaped being captured.

Very few specimens of this species have previously been obtained. I collected a single male in flight on the top of Kaumuahona, July 12th, 1908. There is but one specimen in the Bishop Museum, collected by Dr. Perkins on Tantalus.

The species is described by Dr. Perkins in Fauna Hawaiiensis, III, Part VI, p. 654, 1910, the male only being known.

Three other species of this endemic genus are known: one on Kauai, one on Maui and one on Maui and Hawaii. Dr. Perkins says that all of them live in the wood of the *Cheirodendron* tree.

MARCH 5TH, 1914.

The one hundred-third regular meeting of the Society was held in the Library of the Board of Agriculture and Forestry, President Swezey in the chair. Other members present: Messrs. Bridwell, Ehrhorn, Illingworth, Osborn, Pemberton and Warren.

Minutes of previous meeting read and approved.

The Secretary reported that the publications belonging to the Society had been assembled in the entomologist's office at

the Board of Agriculture, where they are now available for the use of the members.

The Secretary also proposed the preparation of a list of the periodicals pertaining to entomology in the various libraries of Honolulu, for publication in the Proceedings. Mr. Swezey agreed to become responsible for obtaining a list of those at the Bishop Museum, Mr. Illingworth from the College of Hawaii, Mr. Warren from the Sugar Planters' Experiment Station, Mr. Bridwell from the Board of Agriculture and the Society, and Mr. Fullaway (absent) presumably would supply a list from the Hawaii Agricultural Experiment Station.

ENTOMOLOGICAL NOTES.

Mr. Bridwell exhibited three species of Carabidae collected on Mt. Kaala among the bases of the leaves of the silver sword (*Astelia*) and in dry stipes of a tree fern (*Cibotium*). He also exhibited a series of North American Carabidae and gave notes on their habits and upon the variations of some of the species.

Mr. Swezey reported the finding of cocoons of the introduced *Pompilus* in an old cane stool in one of the fields of Honolulu Plantation.

Mr. Osborn reported finding an adult *Ceratitis capitata* upon the summit of Mt. Konahuanui (3000 ft.) on February 22nd. Mr. Pemberton expressed his opinion that it had not bred there but had probably been carried there by the wind from the windward side of the mountain range. Mr. Ehrhorn expressed his belief in the great importance of the air currents in the distribution of insects in these Islands, and described the effect of air currents in carrying insects up onto the snowfields of the Sierra Nevada Mountains. Mr. Bridwell recalled the habits of the Carabid beetle of the genus *Nebria*, which lives at the edge of the snowfields and feeds on the air-borne insects.

Mr. Swezey exhibited specimens and presented the following note:

Notes on "*Orneodes objurgatella*" Walsm.

BY OTTO H. SWEZEY.

On Feb. 8th, 1914, I collected a handful of fruits from a tree of *Plectronia odorata* in Palolo Valley. Since that time, 46 moths of *Orneodes objurgatella* have emerged from these fruits. This is a rather rare moth, Lord Walsingham having

had but two specimens when he described the species. These were collected by Dr. Perkins in the Waianae Mountains. Later, Dr. Perkins reported the species having been bred in numbers, probably from drupes of *Plectronia*. I once reared a small specimen from flower buds of *Plectronia* in the same locality from which I have now reared so many from the fruits of the same tree.

Only two species of this genus have been found in the Islands, the other species being on Kauai and described from a single specimen.

APRIL 2ND, 1914.

The one hundred-fourth regular meeting of the Society was held in the library of the Board of Agriculture and Forestry, President Swezey in the chair. Other members present: Messrs. Back, Bridwell, Ehrhorn, Fullaway, Illingworth, Osborn, Pemberton and Warren; and Mr. Henry Tryon, Government Entomologist of Queensland, visitor.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL NOTES.

Mr. Ehrhorn read a letter from Mr. E. E. Green, reporting that the common injurious *Lepidosaphes* on Croton, previously determined as *L. lasianthi*, is properly identified as *L. auriculata* Green. (T. Linn. Soc. London, 12, p. 205, 1907.)

Mr. Ehrhorn further reported a curious find in quarantine inspection, being a shipment of pieces of wood containing large Cerambycid larvae, sent by a Japanese physician for a cure for consumption.

Mr. Tryon related the introduction of a Cerambycid from Australia to Cape Colony in Eucalyptus timber.

Mr. Fullaway called attention to a discussion by Dudgeon on the value of fungus disease of insects in the control of pests. A general discussion of insect diseases and their economic utilization followed, participated in by nearly all of those present.

Mr. Tryon discussed the prickly pear pest in Queensland, and gave a brief account of his mission in the study of the diseases and insect enemies of cactus. He and Dr. Johnston were just now on their return from a round-the-world expedition sent out by the Queensland Government for this purpose.

MAY 7TH, 1914.

The one hundred-fifth regular meeting of the Society was held at the library of the Board of Agriculture and Forestry, President Swezey in the chair. Other members present: Messrs. Back, Bridwell, Ehrhorn, Fullaway, Illingworth, Osborn and Pemberton.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL NOTES.

Mr. Pemberton exhibited the introduced *Zelus reynardii* and a lady-beetle (*Rhizobius ventralis*) on which he had found it feeding. He reported having seen the first instar larvae of this bug feeding on thrips and red spiders. Mr. Bridwell reported having seen this bug very abundant in the Imperial Valley of California, and commonly feeding on lady-beetles.

Mr. Ehrhorn reported seeing a Pentatomid bug feeding on the live-oak caterpillar in California.

Mr. Illingworth remarked on the habit of the common centipede in brooding over her eggs. A general discussion of the habits of centipedes and scorpions followed.

Mr. Ehrhorn exhibited a yam from Manila, taken in quarantine inspection, infested with *Aspidiotus bartii*, a scale previously reported from West Indies and Central America.

Mr. Ehrhorn called attention to the description of *Euthrips hawaiiensis* Morgan, from material collected on cotton by Mr. Fullaway. (Proc. U. S. Nat. Mus. 46, 3, 1913.)

Mr. Fullaway reported finding an undetermined species of *Chirothrips* on daikon in Honolulu.

Prof. Illingworth gave some observations on recent damage by onion thrips. Dr. Back reported the killing out of about ten acres of onions by this thrips at Kailua on the windward side of Oahu.

Mr. Bridwell exhibited a frond of *Asplenium kaulfussii* infested by aphids, determined by Mr. Fullaway as *Idiopteris nephrolepidis* Davis, described from specimens from a greenhouse in Chicago.

Mr. Fullaway discussed the attacks of *Gelechia gossypiella* on the cultivated Hibiscus.

Notes on "Crocidosema marcidellum" (Walsm.) [Tortricidae].

BY OTTO H. SWEZEY.

This species was described by Lord Walsingham from a single female collected by Perkins in the Waianae Mountains in 1892, and provisionally placed in the genus *Adenoneura*—the absence of the male making it impossible to determine the genus with certainty. I have recently reared a series of 34 specimens, and find that the species belongs in the genus *Crocidosema*, the male having the characters distinguishing that genus. There is some variation in intensity of markings in my series, but many of them exactly match the figure given by Walsingham in the *Fauna Hawaiiensis*.

My series of specimens were all reared from larvae in fruits of the native Hibiscus (*H. arnottianus*) collected from a tree along the Manoa Cliffs Trail of Mt. Tantalus, March 15th, 1914. It was the first time that I ever found fruits on a tree of the native Hibiscus, and I noticed that they were much eaten, so took along about two dozen of them (about all that I could conveniently obtain) to rear the moth from the numerous larvae infesting them. My 34 specimens emerged April 3rd to the 16th.

Mr. J. F. Rock told me once that he had found the fruits of this Hibiscus and other related trees in the mountains of Hawaii badly eaten by insects. I have no doubt but what they were the larvae of this moth.

The eggs of the moth are laid on the outside of the enclosing calyx. On hatching the young larva eats through this, and feeds for a time between it and the fruit, finally eating inside of the fruit and destroying all of the seeds. In the lot of fruits that I collected there were but three seeds remaining uninjured when the larvae had finished with them.

The young larvae have the head and cervical shield black. The full-grown larva is about 12mm. in length, dirty whitish or yellowish with a rosy tinge; head very pale testaceous, eyes black, a black streak behind eyes and above this the posterior margin of the head is black; cervical shield concolorous, two submedian blackish spots at posterior margin; spiracles circular, black margined; surface of body minutely roughened except circular areas at base of setae.

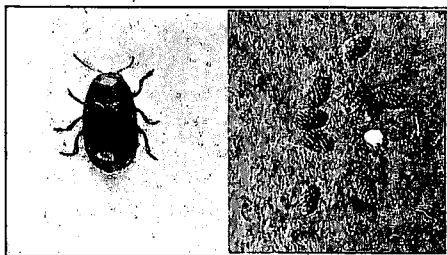
The pupa is about 7mm. in length; yellowish brown; wing-

sheaths and posterior leg-sheaths extend to apex of 4th abdominal segment, antenna-sheaths a little shorter; two transverse rows of small backwardly-directed spines on dorsum of abdominal segments 2-7, those of the anterior row the larger, one row on segments 8 and 9; cremaster blunt, with two lateral and two dorsal spines.

**Notes on the Oviposition of "Diachus auratus"
(Chrysomelidae).**

BY OTTO H. SWEZEY.

The presence of this little Chrysomelid in the Hawaiian Islands was first discovered by me in May of last year and reported at the June meeting of the Entomological Society. In July, I found it at Kaimuki, Waialae, and in Manoa Valley, always in the flower heads of *Leucaena glauca*. Recently (April 26) it was found on koa in the south end of the Waianae Mountains by Mr. Bridwell and myself. They could be swept quite abundantly from some small trees. I found them on the



Diachus auratus. Adult and eggs, x 6. One of the eggs has the excrementitious case partially removed, showing the white oval egg within.

leaves, but did not find any in the flowers, tho they undoubtedly could have been with sufficient search.

I brought home a female alive, supplying her with koa leaves on which she fed at the edges as well as on the surface in small spots. On the following day I found that she had laid six eggs. These were cylindric-oval, .7mm. long and .4mm. thick, resembling pellets of excrement. They varied in color from greenish to yellow and brown, the surface being covered

with lamellate projections spirally arranged. Breaking an egg, I found that the egg itself is white and smooth, enclosed by this outer rough crust, which mystified me somewhat until a few days later I happened to observe the female in the act of supplying an egg with this outer covering. She had already extruded the egg and was holding it between the hind tarsi while she deposited a covering of excrement on it from the anus. This was done bit by bit as she slowly revolved the egg from right to left, the whole process occupying about an hour. When entirely covered the egg was dropped. The excrement appeared like freshly chewed-up leaf material of which the beetle had been feeding only a short time before. In the course of a week, 30 eggs were produced.

JUNE 4TH, 1914.

The one hundred-sixth regular meeting of the Society was held at the library of the Board of Agriculture and Forestry, President Swezey in the chair. Other members present: Messrs. Back, Bryan, Ehrhorn, Osborn, Pemberton and Warren.

Minutes of previous meeting read and approved.

Owing to the inability of Mr. Bridwell to continue as Secretary and Treasurer of the Society, on account of his absence from Honolulu, Mr. Pemberton was elected to fill the office for the balance of the year.

On motion, it was decided to change the meeting place of the Society to the Sugar Planters' Experiment Station.

ENTOMOLOGICAL PROGRAM.

Mr. Ehrhorn exhibited a Syrphid fly which had become impaled on a sharp thorn in a rosebush, the thorn piercing the fly on the dorsum of the thorax between the wings. He suggested the probability of its having become caught as a result of its own exertions or by the wind.

Mr. Swezey announced having bred a species of *Ephedrus* from the rose aphid, the parasite not having been previously recorded here.

Mr. Ehrhorn exhibited a coconut containing within the stem-end a quantity of minute, active, hair-like worms.

Mr. Ehrhorn also exhibited a portion of a spineless cactus

(imported from California and now growing at the Waialae Dairy), which was so heavily infested with the scale, *Diaspis echinocacti*, as to be almost entirely covered. He reported this scale to be very abundant in spots on the plants and in some cases completely absent from adjoining plants. The scale was well parasitized by a species of *Aphelinus*, the parasite attacking both male and female scales. Mr. Ehrhorn estimated that 75% of the scales were parasitized.

Mr. Ehrhorn further exhibited a thread-like worm, three inches long when alive, which had been working in pine seedlings from Maui.

Mr. Swezey reported the capture of a number of winged termites at night as they were swarming at lights on Hotel and Nuuanu streets. As they differed from the two well-known termites, he considered that they were the winged forms of the *Coptotermes* sp. which had been found so abundantly working in a fallen flag pole and in the bandstand at the Capitol grounds early in the present year. No winged individuals had been found in those colonies.

Mr. Swezey also reported that the female Chrysomelid, *Diachus auratus* whose egg-laying habits were reported on by him at the previous meeting, had now laid 164 eggs in the period of over two months which she had been in captivity. Dr. Van Dyke, who had determined the species, reports it as common thruout the United States.

Mr. Pemberton mentioned the rearing of four specimens of *Opius humilis* from about 2,000 fruits of *Bumelia* sp., heavily infested with fruitfly larvae.

Dr. Back showed that so far this represented but a small percentage of larvae parasitized, as about 3,000 adult fruitflies issued from this same lot of fruit.

New Hawaiian Microlepidoptera.

BY OTTO H. SWEZEY.

The following five species have recently been named by Mr. August Buseck from specimens that I sent him for determination and description if new.*

Platyptilia lantana. This is the plume moth in the flower clusters and fruit of lantana. It was introduced from Mexico by Mr. Koebele about twelve years ago.

* Published in *Insecutor Inscitiae Mentruus*, II, pp. 103-107, 1914.

Petrochroa swezeyi. A tiny moth that comes to lights at Kaimuki, and which I have also reared from small larval cases on the lava rocks in that region. It represents a new genus in the Family Cygnodiidae.

Petrochroa dimorpha. This also comes to light abundantly. I have reared it from larvae amongst dead leaves, also in dead grass.

Batrachedra cuniculator. A leaf-miner in sedges in the swamps of Kewalo.

Acrolepia nothoestri. A leaf-miner in *Nothoestrum longifolium*, a native tree occurring in the mountains.

List of Additions to the Lepidopterous Fauna of Hawaii Since the Publication of the Fauna Hawaiiensis.

BY OTTO H. SWEZEY.

In the Fauna Hawaiiensis were described or listed 310 species of Macrolepidoptera and 441 species of Microlepidoptera, a total of 751 species. I find that 65 species can now be added to this number, some of which are newly described endemic species; some introduced species that were not previously described; and others introduced species previously known elsewhere.

For convenience of reference I present this list which gives place of description of the new species and reference to records of the introduced species.

ENDEMIC SPECIES.

Family CARADRINIDAE:

Cirphis dasuta Hampson. Cat. Noct. British Museum, V, p. 493, 1905.

Agrotis coniotis Hampson. Cat. Noct. British Museum, IV, p. 426, 1903.

Euxoa (Agrotis) eremioides Meyrick. E. M. M., XXXVI, p. 257, 1900. (Laysan Id.)

Euxoa (Agrotis) procellaris Meyrick. E. M. M., XXXVI, p. 258, 1900. (Laysan Id.)

Euxoa diplosticta Hampson. Ann. Mag. Nat. Hist., 8th ser., IV, p. 368, 1909.

Family PLUSIADAE:

- Hyphenodes leptoxantha* Meyrick. E. M. M., XL, p. 130, 1904.
- Nesamiptis newelli* Swezey. Proc. Haw. Ent. Soc., II, 5, p. 270, 1913.
- Nesamiptis laysanensis* Sw. Proc. Haw. Ent. Soc., III, 1, p. 18, 1914. (Laysan Id.)
- Plusia giffardi* Sw. Proc. Haw. Ent. Soc., II, 5, p. 270, 1913.

Family HYDRIOMENIDAE:

- Hydriomena giffardi* Sw. Proc. Haw. Ent. Soc., II, 5, p. 271, 1913.
- Hydriomena roseata* Sw. Proc. Haw. Ent. Soc., II, 5, p. 271, 1913.

Family PHYCITIDAE:

- Genophantis leahi* Sw. Proc. Haw. Ent. Soc., II, 3, p. 103, 1910.

Family PYRAUSTIDAE:

- Omiodes meyricki* Sw. Bull. Ent., Exp. Sta. H. S. P. A., 5, p. 24, 1907.
- Omiodes musicola* Sw. Proc. Haw. Ent. Soc., II, 2, p. 40, 1909.
- Omiodes maia* Sw. Proc. Haw. Ent. Soc., II, 2, p. 74, 1909.
- Omiodes anastreptoides* Sw. Proc. Haw. Ent. Soc., II, 5, p. 272, 1913.
- Omiodes fullawayi* Sw. Proc. Haw. Ent. Soc., II, 5, p. 272, 1913.
- Omiodes laysanensis* Sw. Proc. Haw. Ent. Soc., III, 1, p. 19, 1914. (Laysan Id.)
- Nacoleia scotaea* Hamp. A. M. N. H., (8), IX, p. 442, 1912.
- Nacoleia hemiombra* Hamp. A. M. N. H., (8), IX, p. 442, 1912.
- Hymenia exodias* Meyrick. E. M. M., XL, p. 130, 1904.
- Pyrausta thermantoidis* Sw. Proc. Haw. Ent. Soc., II, 5, p. 273, 1913.
- Mestolobes sicaria* Meyr. E. M. M., XL, p. 131, 1904.

Scoparia gymnopis Meyr. E. M. M., XI, p. 131, 1904.

Scoparia isophaea Meyr. E. M. M., XI, p. 132, 1904.

Scoparia lycopodiae Sw. Proc. Haw. Ent. Soc., II, 3, p. 104, 1910.

Scoparia nectaroides Sw. Proc. Haw. Ent. Soc., II, 5, p. 273, 1913.

Family GELECHIADAE:

Aristotelia gigantea Sw. Proc. Haw. Ent. Soc., II, 5, p. 274, 1913.

Thyrocopa sapindiella Sw. Proc. Haw. Ent. Soc., II, 5, p. 274, 1913.

Family TORTICIDAE:

Archips fuscocinereus Sw. Proc. Haw. Ent. Soc., II, 5, p. 275, 1913.

Archips sublichenoides Sw. Proc. Haw. Ent. Soc., II, 5, p. 276, 1913.

Tortrix semicinerana Sw. Proc. Haw. Ent. Soc., II, 5, p. 276, 1913.

Capua cassia Sw. Proc. Haw. Ent. Soc., II, 4, p. 183, 1913.

Capua santalata Sw. Proc. Haw. Ent. Soc., II, 5, p. 276, 1913.

Family HYPONOMEUTIDAE:

Euhyposmocoma akaha (Sw.). Proc. Haw. Ent. Soc., II, 3, p. 105, 1910.

Euhyposmocoma trivitella Sw. Proc. Haw. Ent. Soc., II, 5, p. 278, 1913.

Family CYGNODIIDAE:

Petrochroa swezeyi Busck. Insecutor Inscitiae Menstruus, II, p. 105, 1914.

Petrochroa dimorpha Busck. Insecutor Inscitiae Menstruus, II, p. 105, 1914.

Family TINEIDAE:

Gracilaria mabaella Sw. Proc. Haw. Ent. Soc., II, 3, p. 89, 1910.

Gracilaria hauicola Sw. Proc. Haw. Ent. Soc., II, 3, p. 106, 1910.

- Gracilaria dubautiella* Sw. Proc. Haw. Ent. Soc., II, 5, p. 278, 1913.
Gracilaria hibiscella Sw. Proc. Haw. Ent. Soc., II, 5, p. 279, 1913.
Bedellia oplismeniella Sw. Proc. Haw. Ent. Soc., II, 4, p. 184, 1913.
Bedellia boehmeriella Sw. Proc. Haw. Ent. Soc., II, 4, p. 185, 1913.
Acrolepia nothocestri Busck. Insector Inscitiae Menstruus, II, p. 106, 1914.

INTRODUCED SPECIES.

Family LYCAENIDAE:

- Thecla agra* Hewitson. Purposely introduced about 1902.
Thecla echion L. Purposely introduced about 1902.

Family PIERIDAE:

- Pontia (Pieris) rapae* L. Meyrick, E. M. M., XL, p. 132, 1904.

Family CARADRINIDAE:

- Caradrina reclusa* Walk. Swezey, Proc. Haw. Ent. Soc., II, 1, p. 3, 1908.

Family PLUSIADAE:

- Adrapsa manifestalis* (Walk.). Swezey, Proc. Haw. Ent. Soc., II, 3, p. 133, 1910.

Family PHYCITIDAE:

- Cryptoblabes aliena* Sw. Bull. Ent. Exp. Sta. H. S. P. A., 6, p. 24, 1909.
Myelois ceratoniae Z. Swezey, Proc. Haw. Ent. Soc., II, 3, p. 135, 1910.
Ephestia kuhniella Z. Swezey, Proc. Haw. Ent. Soc., III, 1, p. 12, 1914.

Family GALLERIADAE:

- Corcyra cephalonica* Stn. Swezey, Proc. Haw. Ent. Soc., II, 5, p. 212, 1913.

Family PTEROPHORIDAE:

Platyptilia lantana Busck. Insecutor Inscitiae Menstruus, II, p. 103, 1914. Purposely introduced about 1902.

Family GELECHIADAE:

Sitotroga cerealella (Oliv.). Van Dine, An. Rep. Hawaii Exp. Sta. for 1907, p. 43, 1908.

Family HYPONOMEUTIDAE:

Batrachedra rileyi Walsm. Bull. Ent., Exp. Sta. H. S. P. A., 6, p. 22, 1909.

Batrachedra cuniculator Busck. Insecutor Inscitiae Menstruus, II, p. 106, 1914.

Family TORTRICIDAE:

Crocidosema lantana Busck. Proc. Wash. Ent. Soc., XII, 3, p. 132, 1910. Purposely introduced about 1902.

Amorbia emigratella Busck. Proc. Wash. Ent. Soc., XI, p. 201, 1909.

Family TINEIDAE:

Opogona apicalis Sw. Bull. Ent., Exp. Sta. H. S. P. A., 6, p. 17, 1909.

Opogona purpuriella Sw. Proc. Haw. Ent. Soc., II, 5, p. 280, 1913.

Ereunetis penicillata Sw. Bull. Ent., Exp. Sta. H. S. P. A., 6, p. 13, 1909.

Cremastobombycia lantanella Busck. Proc. Wash. Ent. Soc., XII, 3, p. 133, 1910. Purposely introduced about 1902.

Cyane terpsichorella Busck. Proc. Wash. Ent. Soc., 3, p. 134, 1910.

JULY 2ND, 1914.

The one hundred-seventh regular meeting of the Society was held in the library of the Board of Agriculture and Forestry, President Swezey in the chair. Other members present: Messrs. Back, Ehrhorn, Illingworth, Osborn, Pemberton and Warren; and Mr. Veitch, who was on his way to take a position

as Entomologist for the Colonial Sugar Refining Co. in Fiji, as visitor.

Minutes of previous meeting read and approved.

On motion of Mr. Ehrhorn it was voted to change the hour of meeting from 3:30 P. M. to 2:30 P. M.

ENTOMOLOGICAL PROGRAM.

Mr. Ehrhorn exhibited a female Mediterranean fruitfly, the ovipositor of which had become stuck in a small *Chrysophyllum* fruit during oviposition and had died in this position, the juice of the fruit being very gummy. Dr. Back stated that he had also observed this often in the same fruit.

Prof. Illingworth reported that in some experiments in spraying squashes with Sodium Arsenite they were not free from the attack of the melon fly.

Mr. Ehrhorn stated that he had observed *Pseudococcus filamentosus* so prevalent on the orange trees in Judge Cooper's orchard in Manoa Valley that practically every terminal bud was badly dwarfed and curled thru the infestation of this mealy-bug.

Mr. Swezey exhibited a vial containing flea eggs and newly hatched larvae. The eggs had been taken from a man's hat which had been lain on by a dog in the home of a Japanese in Palolo Valley, June 28. Many of the eggs had hatched by July 2.

Mr. Swezey reported that a total of 247 eggs had been laid by the Chrysomelid beetle, *Diachus auratus*, mentioned by him at the previous meeting. The beetle had lived two months after being captured, laying from one to five eggs daily, and once as high as 15 on two successive days.

Mr. Swezey exhibited two specimens of *Isosoma orchidearum* bred from an orchid of the genus *Cattleya* from Dr. Lyons' orchid house. This is the first record of this insect in Honolulu, tho, now that the work of the insect is known, Mr. Ehrhorn stated that orchids showing similar infestation were known several years ago in the orchid house at the Moanalua Gardens, but no insects were found in connection with them at the time.

Mr. Swezey also exhibited specimens of an Orthalid fly, possibly of the genus *Paragorgopsis*, which were reared from maggots found in a coconut that had sprouted. They were found when the coconut was sawed in half for the purpose of making

orchid baskets. The maggots were feeding on the partially decayed meat of the sprouting coconut. They were bluish in color and of the general form of fruitfly maggots. The habits of the fly had not previously been known, the specimens had been taken now and then on windows by several of the entomologists in Honolulu. The first specimen was secured by Mr. Terry in 1904 at the entomological laboratory of the Board of Agriculture and Forestry.

Mr. Swezey further exhibited a single specimen of a Chrysidid which was recently caught by Mr. Potter in his studio on the second floor of the chemical laboratory at the Experiment Station of the Sugar Planters' Association. This is the first record of a Chrysidid caught in the Hawaiian Islands, and must be a recent introduction.

Prof. Illingworth exhibited two specimens of the Reduviid bug, *Triatoma rubrofasciata*, captured in Honolulu.

Some Hyperparasites of White Grubs.

BY OTTO H. SWEZEY.

In May, 1914, 56 cocoons of *Elis sexcincta* were received from Mr. George N. Wolcott. He had collected these at Urbana, Illinois, while collecting cocoons of *Tiphia* to send to Porto Rico. Not desiring to make use of the *Elis* cocoons, he forwarded them to the Experiment Station, where we expected to experiment with this species as a parasite on the grubs of *Anomala* and *Adoretus*. There were not many emergences from the lot and they were mostly males; only one female emerged. She lived for several weeks but failed to parasitize any of the grubs that were supplied her in the cage.

From this lot of cocoons one male and one female Mutilid emerged, and one Bombyliid. Careful examination showed that with each of them they had been parasitic on the *Elis*, and thus were hyperparasites of some white grub—presumably some species of *Lachnosterna*.

The Bombyliid was *Anthrax fulvohirta* Wied. I have not seen any reference in literature to its host relationships. In Dr. Forbes' 24th Illinois Report, 1908, on page 160, a Bombyliid (*Exoprosopa fascipennis* Say) is mentioned as a parasite on *Tiphia*, and is thus also a hyperparasite on white grubs. On page 161 of the same Report, another Bombyliid (*Sparnopolius fulvus* Wied.) is mentioned as a direct parasite on white grubs.

The Mutilids above were of different species, according to the best available literature on this family—the male being *Mutilla castor* Blake, and the female *Mutilla ferrugata* Fabr. From the fact of breeding them both from the same lot of *Elis* cocoons, collected in the same field, and that each was described only on the one sex, I am inclined to the opinion that these are the sexes of one and the same species. Further observations by those working on white grubs and their parasites in Illinois would be of much importance. I have not previously seen any reference to a Mutilid being parasitic on a Scoliid.

Dragonflies and Their Food

BY ALFRED WARREN.

During the latter part of 1913 and the first part of 1914 the writer carried on some research work* for the purpose of obtaining definite data on the range of food of the local dragonflies, particularly of the two common lowland species, *Anax junius* Drury and *Pantala flavescens* Fabr. The following is a brief summary of these investigations. The food habits of the above species of dragonfly were studied in both the nymphal and adult stages. With the nymph, examination of the contents of the alimentary canal was the chief method employed to ascertain what the dragonfly lives on during this period of its life; while with the adult, two methods were employed, viz., examination of the contents of the alimentary canal and field observation. In the pursuit of these investigations, it was aimed to cover as much territory around Honolulu as time and circumstances would permit, so as to include as many as possible of the varied conditions under which the dragonflies find their food on the lowlands.

EXAMINATION OF THE CONTENTS OF THE ALIMENTARY CANAL OF NYMPHS.

In this connection 335 nymphs, 41 *Anax* and 294 *Pantala* were dissected for the purpose of examining the alimentary canal. Out of the 41 specimens of *Anax*, 6 were found to have

* This work was carried on in connection with a course in entomology at the College of Hawaii in partial fulfillment of the requirements for the degree of M. S.

the digestive tract entirely empty; and of the 294 *Pantala*, 76 had in their alimentary canal no traces of animal remains, being either entirely empty or containing some mud, gravel or algae. There were then left in all 253 specimens whose digestive tract contained some kind of animal remains.

The following list gives the different kinds of animal life preyed on by dragonfly nymphs as represented in the contents of the digestive tract of the 253 *Anax* and *Pantala* nymphs dissected. The figures in the table represent units, or the number of times a certain species or group appeared in the series of dissections; that is, each distinctive species or group of animal, as classified in the table, whether found in large or small quantities in the contents of a single digestive tract, is given the value of one unit.

TABLE SHOWING THE FINDINGS IN THE CONTENTS OF THE ALIMENTARY CANAL OF 253 NYMPHS.

COLEOPTERA

Dytiscidae, the smallest of the three sps..... 16

DIPTERA

Chironomidae

Chironomus hawaiiensis, larvae167
Chironomus hawaiiensis, adults 4
 Chironomid larva, undetermined 1 172

Culicidae

Mosquito larvae and pupae 12
 Mosquito adult 1 13

Dolichopodidae 1

Adult fly, undetermined 1 187

HEMIPTERA

Myodochidae

Merragata hebroides White 1

Gerridae

Microvelia vagans White 2 3

HYMENOPTERA		
<i>Myrmicidae</i>		
<i>Pheidole megacephala</i> Fabr.	2	
Ants, undetermined	11	13
<hr/>		
ODONATA		
<i>Libellulidae</i>		
<i>Pantala flavescens</i> Fabr., nymphs		6
CRUSTACEA		
<i>Cypris</i>	108	
Shrimps	3	111
<hr/>		
MOLLUSCA		
Spiral shells		14
PROTOZOA		
<i>Euglena</i>		30
ANNULATA		
<i>Nereis</i>		1
AMPHIBIANS		
Tadpoles		8
FISH		
Top Minnow (?)		1
Total.....		390

LAND INSECTS AS FOOD FOR NYMPHS.

It has been suggested that, since the Hawaiian streams and other bodies of fresh water contain so very few kinds of aquatic insects, and since the yellow and blue dragonflies are so numerous in many localities, the nymphs must obtain some part of their food from other sources than from the purely aquatic creatures. This outside food is thought to be derived from the occasional accidental dropping into the water of aerial insects; or, during freshets when extensive areas of vegetation are suddenly inundated, from the large numbers of insects that drown and are swept into the main water channels.

In order to find out if the nymphs really do feed on aerial forms if given a chance, a series of experiments was carried on by feeding the nymphs, both *Anax* and *Pantala*, in confinement

only such forms of insects that were aerial or at least in that stage at the time they were used in the experiments. In these tests only half-grown or larger nymphs were taken. No other food than land insects was given them and these in most cases were dropped in the feeding jars alive. Some of the nymphs were carried through in this way for one or two moults, or until they finally emerged. In some cases this feeding period was carried on for from two to five weeks. All the different species of insects fed were readily eaten, except most of the ants, especially those strong in formic acid, and some aphids.

Beside adult insects, caterpillars, maggots and grubs of various kinds, also other small creatures, such as spiders, land Crustaceans (shrimps and sowbugs), millipedes, earthworms, and nematodes were fed to the nymphs. All these were eagerly snatched at and eaten up.

Often when no other food was available, small bits of fresh beef seemed to be relished.

That dragonfly nymphs do feed on land insects under natural conditions is borne out by the findings in the contents of the alimentary canal of the 253 nymphs dissected, as listed above. Out of this number, 20 nymphs were found to contain aerial forms, thus representing 7.9 per cent. of the number dissected; or, if this number is expressed in units, to conform with the tabulated statement, then the land insects consumed by these nymphs constitute 7.9 per cent. of their food.

FIELD OBSERVATION AND EXAMINATION OF THE CONTENTS OF THE ALIMENTARY CANAL OF ADULTS.

In this series of dissections 218 *Pantala* and 24 *Anax* (excluding those whose alimentary canal was found empty) were taken. To these figures may be added a number of dragonflies that were caught with the victim still more or less intact in their mouth parts. As the mouth parts are really part of the digestive tract, the insects thus found will be included in the list of those found in the alimentary canal proper.

As there seems to be a slight difference in the food habits between the *Pantala* and *Anax*, as indicated by the observations so far made, the findings of the two species will therefore be given under separate tables, as follows:

TABLE SHOWING THE FINDINGS IN THE CONTENTS OF THE ALI-
MENTARY CANAL AND MOUTH PARTS OF 24 ADULT ANAX.

COLEOPTERA

Scarabaeidae

<i>Psammодиус</i> sps.	6	
Undetermined sp.	1	
Undetermined beetle	1	8

DIPTERA

<i>Culicidae</i>	3	
Undetermined flies	4	7

HEMIPTERA

Fulgoridae

<i>Siphanta acuta</i> Walk.		1
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HYMENOPTERA

Apidae

<i>Apis mellifica</i> Linn.	11	
<i>Formicina</i>	5	16

LEPIDOPTERA

Caradrinidae

<i>Cirphis unipuncta</i> (Haw.)	1	
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Pyraustidae

<i>Hymenia fascialis</i> (Cram.)	1	
Undetermined forms	9	11

ODONATA

Agrionidae

<i>Agrion</i> sp.	1	
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Libellulidae

<i>Pantala flavescens</i> Fabr.	1	2
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MISCELLANEOUS

Mite		1
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Total.....		46
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TABLE SHOWING THE FINDINGS IN THE CONTENTS OF THE ALIMENTARY CANAL AND MOUTH PARTS OF 218 ADULT PANTALA.

COLEOPTERA

*Bostrichidae**Rhizopertha pusilla* Fabr. 1*Scarabaeidae**Psammodyus* sps. 22

Undetermined sps. 2

Staphylinidae 31

Undetermined beetles 28 84

DIPTERA

*Chironomidae**Chironomus hawaiiensis* Gr. 1

Undetermined sps. 5

*Culicidae**Culex fatigans* Wied. 1*Stegomyia scutellaris* Walk. 1

Not determinable 3

Drosophilidae 3

Undetermined flies 140 154

HEMIPTERA

Aphidae 24*Corisidae**Corixa blackburni* White 4*Fulgoridae**Perkinsiella saccharicida* Kirk. 4

Undetermined sp. 1

*Jassidae**Draeculacephala mollipes* Say 3*Nesophrosyne perkinsi* Kirk. 3*Lygaeidae* 2*Tingitidae**Teleonemia lantanae* Dist. 4 45

HYMENOPTERA		
<i>Apina</i> (not honey bee)	1	
<i>Braconidae</i>		
<i>Chelonus blackburni</i> Cam.	1	
<i>Formicina</i>		
<i>Myrmicidae</i>		
<i>Pheidole megacephala</i> Fabr.	6	
Undetermined Ants	11	
<i>Mymaridae</i>		
<i>Paranagrus optabilis</i> Perk. (?)	1	
Other Hymenopterous Parasites	3	23
<hr/>		
LEPIDOPTERA		
<i>Tineidae</i>		
<i>Cremastobombycia lantanella</i> Busck. (?).....	5	
Undetermined forms	72	77
<hr/>		
ODONATA		
<i>Agrionidae</i>		
<i>Agrion</i> sp.		1
CORRODENTIA		
<i>Psocidae</i>		8
THYSANOPTERA		
<i>Thripidae</i>		9
MISCELLANEOUS		
Mite		1
Spiders		2
<hr/>		
Total.....		404

SUMMARY.

The data obtained on the food habits of the two species of dragonfly during this research work and recorded above are by no means exhaustive or final, but they should be considered merely as a beginning of a study which has heretofore received little attention. However, as far as these data show we may gain some idea of the food habits of this group of insects and something of their economic importance to the rest of the insect fauna under Hawaiian conditions. The following is a summary list of the species or genera that have been found to contribute

to the food of the two species of dragonfly in both the nymphal and adult stages.

NUMBER OF SPECIES OR GENERA IDENTIFIED.

COLEOPTERA

Dytiscid sp. (the smallest of the three local sps.)
Rhizopertha pusilla Fabr.
Psammodyus sps.

DIPTERA

Chironomus hawaiiensis Grims., larvae, pupae, and adult.
Culex fatigans Wied., larvae and adults.
Stegomyia scutellaris Walk., larvae and adults.
Liancalus sp.

HEMIPTERA

Corixa blackburni White
Draeculacephala mollipes (Say)
Merragata hebroides White
Microvelia vagans White
Nesophrosyne perkinsi Kirk.
Oliarus tarai Kirk.*
Perkinsiella saccharicida Kirk.
Siphanta acuta Walk.
Teleonemia lantanae Dist.

HYMENOPTERA

Apis mellifica Linn.
Chelonus blackburni Cam.
*Muscidifurax vorax**
Paranagrus optabilis Perk. (?)
Pheidole megacephala Fabr.

LEPIDOPTERA

Agrotis dislocata Walk.*
Cirphis unipuncta (Haworth)
Hymenia fascialis (Cram.)

ODONATA

Agrion sps.
Pantala flavescens Fabr., nymphs and adults.

* Added since writing the original article.

* Added later.

LIFE HISTORY OF "PANTALA FLAVESCENS" FABR.

As far as could be learned the life history of none of the local dragonflies had been worked out. As the dragonfly is in evidence all the year round in Hawaii, it will be of interest to have some idea as to the length of development from egg to adult. A brief review of the results of some rearing experiments with the *Pantala* will therefore be given. There are three distinct stages in the life of the dragonfly,—the egg; the nymph, or growing period; and the adult, or mature stage.

Egg.—The eggs are whitish (later on they become quite yellow), subspherical bodies, about one-fifth mm. by one-third mm. in size. They are laid singly or a few at a time by the female as she flies close over a body of water striking the tip of her abdomen down on the surface. The eggs of this species are laid anywhere in the open where water flows or accumulates—from a small mud-puddle in the street to a large stream or pond.

The eggs for the purpose of carrying out the breeding experiments were secured by catching female dragonflies in the act of ovipositing, and collecting in a glass those eggs which were extruded from the bursa copulatrix in large masses. The number of eggs thus obtained varied from 50 to several hundred. In one case 816 were collected in this way from a single female, most of which proved to be fertile. Each batch was placed separately in a small Petri dish filled with water where the eggs hatched in from 5 to 7 days.

Nymph.—The newly hatched nymph is about two-third mm. long. Its first activity is to moult almost immediately after hatching, increasing its length by a fraction of a millimeter, when it is ready to start out on its life-long hunt for food,—food which is in all cases animal life. In these rearing experiments it was soon found that, on account of their strong cannibalistic character, the nymphs had to be placed in separate vessels. As an illustration of their cannibalism the following incident may be given: Seventy (69 *Pantala* and one *Anax*) nymphs of various sizes were placed in a small rearing tank and provided with no outside food, except a small top minnow. One week later there were left 7 *Pantala*, the one *Anax*, and the little fish, so that 62 nymphs were eaten by their fellows.

Four nymphs were successfully reared to maturity. The following gives in tabular form the life history of the four dragonflies from egg to adult:

TABLE SHOWING THE LIFE HISTORY OF FOUR SPECIMENS
 "PANTALA FLAVESCENS" FABR.

Egg or Instar	Average Length in mm. for the First Three	No. 1	No. 2	No. 3	No. 4	Average
		Days	Days	Days	Days	Days
Egg .....	..	5	5	5	7	5½
1st	%	—½*	—½*	—½*	—½*	—½*
2nd	1	4	5	4	3	4
3rd	1½	3	5	7	3	4½
4th	2½	2	8	6	2	4½
5th	4	3	8	6	3	5
6th	5	2	5	5	4	4
7th	6	3	6	5	5	4¾
8th	8	2	5	6	6	4¾
9th	10	5	4	9	5	5¾
10th	13	4	9	9	8	7½
11th	18	8	13	14	27	11¾†
12th	24	19	30	30	..	26½†
Total No. of days for growth of nym.		55	98	101	66	80
		Female	Female	Male	Male	

From the above table it will be seen that the nymphs moult ten or eleven times; and that the length of time of incubation and especially the total nymphal period vary considerably in the different individuals. It will also be noted that the time of the last two or three instars gradually lengthens, the last, of course, being the longest, averaging (for the four) more than one-third of the life of the nymph. This long period is due to the great change that takes place during the last stadium,—a change from the nymphal water-inhabiting form, breathing chiefly by means of tracheal gills, to the adult form, breathing altogether by means of tracheae. We may say this period corresponds to the pupal stage of those insects possessing a complete metamorphosis. During this time many of the organs are greatly changed; and some are even completely reconstructed, such as the respiratory organs, labrum, wings, compound eyes, gizzard, etc.

In the above experiments the nymphal period varied from 55 to 101 days. It is doubtful if the nymphs complete their growth in nature in so short a time as No. 1 did in the above experiment, except in very rare cases, as their food supply is not always close at hand; and the amount of food, modified doubtless by climatic conditions, largely determines the rate of growth

* Less than ½ hr.

† For 3.

of the nymphs. In the above table nymphs Nos. 1 and 4 were fed daily with large amounts of food; while Nos. 2 and 3 were fed less often and in smaller quantities. The difference is brought out in that Nos. 1 and 4 completed their growth in about two months, while Nos. 2 and 3 required over three months for their development.

Other experiments conducted along this line proved still more strikingly the relation of food to growth. Two nymphs, hatching on the same day, were placed in separate vessels. One was fed liberally with mosquito larvae, and the other was given five or six mosquito larvae every four or five days. In nineteen days the former moulted seven times, and was well along the eighth instar when the latter cast its third moult, and at this stage was no larger than the other at its fourth instar.

The ability to fast for long periods of time also plays a great part in the length of nymphal life. Some experiments were carried on to see how long nymphs could go without food. The longest fasting periods, obtained in these experiments, were from 14 to 16 days. Under natural conditions, however, there is no doubt but that they can keep alive without food for much longer periods. Some species of dragonfly nymphs have been kept without food in confinement for a month and more. Specimens of *Aeschna cyanea* and *Agrion puella* fasted for 30 and 33 days respectively ("Entomologist", 33:211), and at the end of that time were still active and apparently not at all affected by the long fast.

From the above statements we may safely conclude then that the nymphal period varies from two to six or more months.

Adult.—No attempt was made to see how long the imago lives, as the very active nature of the dragonfly and the manner in which it procures its food would not permit of any successful feeding in confinement. It is reasonable to suppose, however, that its life does not extend over a great many weeks, if we can draw any inference from the very advanced stage of development of the ovaries in the later stages of the female nymphs, although this is no definite proof, and experiments on the life of the adult dragonfly would be of very great interest. In dissecting nearly full-grown female nymphs, it was found that the ovaries were full size, and the ovarian tubes practically as long and plump as those of the adult, but no signs of any egg constructions could be detected.

AUGUST 6TH, 1914.

The one hundred-eighth regular meeting of the Society was held in the entomological laboratory of the Sugar Planters' Experiment Station, President Swezey in the chair. Other members present: Messrs. Ehrhorn, Illingworth, Osborn, Pember-ton and Wilder.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL PROGRAM.

Mr. Ehrhorn stated that he had found *Hister bimaculatus* very abundant at the Waialae Dairy, hundreds occurring in small areas in manure piles. A number of cockroaches that were perfectly white were also found buried in the manure. Prof. Illingworth stated that this lack of coloring was due to their having very recently molted.

Mr. Wilder exhibited quite a number of water-striders of the genus *Halobates*, which he had captured in October, 1913, skipping over the surface of the ocean between the Island of Kahoolawe and the coast of Maui. This is the only record of the capture of any of this genus of bugs by any of the members of the Society.

Prof. Illingworth reported having observed a large number of larvae of the Syrphid fly, *Volucella obesa*, feeding within a decayed papaya trunk.

Mr. Swezey exhibited a small weevil which was caught on an orchid by Dr. Lyon. It was of a species not hitherto known here, probably near related to *Acythopeus nigerimus*, an orchid weevil that has been quite injurious in some orchid houses in Honolulu of recent years, tho much smaller than the latter.

Mr. Swezey spoke of having visited a canyon back of Hau-ula on the windward side of Oahu where he had never collected before, and exhibited a moth, *Hyposmocoma* sp. and a bug, *Acanthia* sp., which were probably new species. The moth was at rest on the surface of a rock and the bug was taken from the surface of the stream.

Mr. Ehrhorn reported that from two pounds of coffee gathered at random in Kona, Hawaii, 100 pupae of *Ceratitis capitata* were secured, and that from these pupae 90 specimens of *Opius humilis* were bred. He considered this very gratifying, inasmuch as only three females of the parasite were liberated in the district from which the coffee was taken, and only about

a year had elapsed since the females were liberated. Mr. Ehrhorn also stated that he had observed *Opius humilis* ovipositing in fruitfly maggots in fruit, not only on the tree, but after it had fallen to the ground. He expressed the opinion that fruitfly larvae may be killed by the heat of the sun, when in certain fruits, after the fruit has fallen to the ground. He had found that all of the maggots in a mango, which was lying in the direct sunlight and which was much heated, were dead.

Prof. Illingworth spoke of the great importance, in parasite breeding, of confining the parasites for a sufficient length of time to assure mating before liberation; basing his arguments upon practical experience gained in the breeding and liberation of Tachinids in Fiji.

SEPTEMBER 3RD, 1914.

The one hundred-ninth regular meeting of the Society was held in the usual place, President Swezey in the chair. Other members present: Messrs. Back, Ehrhorn, Illingworth, Osborn and Pemberton.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL PROGRAM.

Mr. Swezey exhibited a specimen of the mango weevil (*Cryptorhynchus mangiferae*) taken by Mr. C. M. Cooke at Lihue, Kauai, this being the first record of the presence of this beetle on that Island.

Mr. Swezey also exhibited two species of earwigs found in a box of apples from California; a small beetle found in a basket of plums from California; and an ant, determined by Mr. Ehrhorn as *Brachymyrmex* sp., taken by Dr. Lyon in his orchid house. All of these were of species not hitherto recorded in the Hawaiian Islands.

Prof. Illingworth, in reporting results of spraying experiments against the melon fly, stated that a spray-formula used elsewhere, composed of sodium arsenite, glucose, sodium borate, and borax used in certain proportions, was found to be injurious to young plants attacked by the melon fly. The spray solution when properly combined proved a good substance for retaining its original liquid condition. It showed no decided tendency however of attracting the adult flies.

Dr. Back stated that an important factor to consider in the control of the melon fly by spraying, is the lateness at which sexual maturity is reached; mating not taking place until at least three weeks after issuance from the pupa, and oviposition not commencing until about a month after issuance. He also stated that one great difficulty in the effective elimination of this fly in an infested region is the longevity of the adults, many then being alive at the Fruitfly Insectary which were nearly seven months old.

Mr. Ehrhorn announced the recovery of two females and six males of the Australian fruitfly Braconid (*Diachasma tryoni*) from infested coffee secured from Kona, Hawaii. This is the first record of the success of the introduction of this species, which has resulted from the liberation of only four females in Kona in June, 1913.

OCTOBER 8TH, 1914.

The postponed one hundred-tenth regular meeting of the Society was held in the usual place, President Swezey in the chair. Other members present: Messrs. Ehrhorn, Illingworth, Osborn and Pemberton.

Minutes of previous meeting read, corrected and approved.

The Editor reported the issuance of the first number of the third volume of the "Proceedings of the Hawaiian Entomological Society".

ENTOMOLOGICAL PROGRAM.

Mr. Ehrhorn stated that he had ascertained since the last meeting of the Society, that the samples of infested coffee from which he had bred *Diachasma tryoni*, as reported at that meeting, were secured at Kaualoa, a point about six miles from the place where the original parasites were liberated last June.

Prof. Illingworth stated that he had recently seen the ant, *Pheidole megacephala*, excavate into three inches of soil and kill pupae of *Sphinx convolvuli*; and that he had also observed the same ant follow and kill the burrowing cockroach, *Nauphoeta bivittata*, and another roach, *Leucophoea surinamensis*, as they burrowed in moist soil.

Prof. Illingworth exhibited a living, active Dermestid larva

and 15 molted skins of this larva, all of which had been cast between May 2, 1913, and Oct. 1, 1914. The larva was apparently full-grown in May, 1913, when observations began, and was confined during the entire period between two watch glasses, and having nothing for food but dried insects. He also exhibited a bottle of cayenne pepper badly infested with the beetle, *Catorama mexicana*. He also stated that he had found the beetle, *Tribolium ferrugineum*, feeding upon the paste in newly-bound books at the College of Hawaii.

Prof. Illingworth further stated that he had observed the nymphs of three species of cockroaches to be compressed laterally when first hatched, but that the dorso-ventral flattening takes place in a short time, the lateral compression being due to the position of the young nymphs while crowded together in the egg-mass before hatching.

Mr. Ehrhorn stated that he had noticed the fire ant, *Solenopsis geminata*, apparently not as abundant as formerly. Mr. Swezey said that he had noticed them as prevalent as usual at his home in Kaimuki.

Mr. Ehrhorn exhibited several living specimens of the wasp, *Polistes aurifer*, which were parasitized by Stylopids. In one case there were as many as three Stylopids between the abdominal segments of one wasp. These wasps were taken by Mr. Ehrhorn and Mr. Swezey from nests on the under side of palm leaves at the grounds of the Sugar Planters' Experiment Station; five of the parasitized wasps were taken from one nest, an unusual proportion of the wasps being parasitized.

Mr. Swezey exhibited a specimen of *Coniocompsa vesiculigera* (End.), this being the first record of any member of the family Coniopterygidae in the Hawaiian Islands.

Mr. Swezey also exhibited a portion of corrugated paper taken from a packing box under his house, in the folds of which were several cells of a nest of a wasp resembling *Trypoxylon bicolor* but somewhat smaller. Some of the cells contained cocoons of the wasp, other cells contained very small spiders. The nest was accidentally found by observing the wasp going to it with spiders. The wasp is an undetermined species not hitherto recorded in the Hawaiian Islands.

Prof. Illingworth exhibited some books and old papers which had been attacked by the termite, *Calotermes marginipennis*. The books were ruined, there being large cavities and galleries that had been eaten out by the termites.

A Leaf-Mining Cranefly in Hawaii.

BY OTTO H. SWEZEY.

Dicranomyia foliocuniculator n. sp.

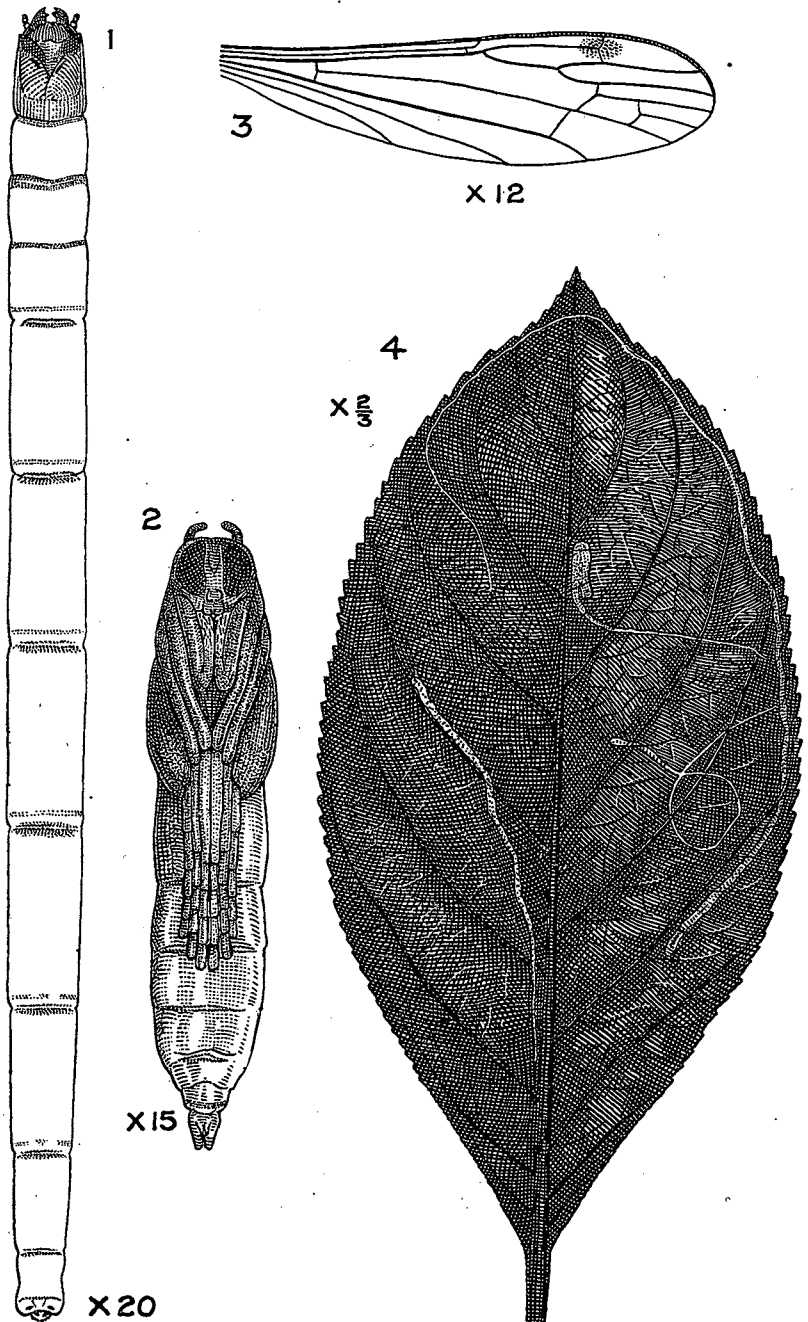
Head, antennae and mouth parts dark fuscous; thorax and abdomen fuscous above, ochraceous below, abdomen sometimes greenish below; halteres fuscous, the stem paler; wings fuscous-hyaline, not spotted except a spot of more intense fuscous at the termination of the first longitudinal vein; auxiliary vein for the last three-fifths running very close to the first longitudinal vein, terminating a little before the origin of the second longitudinal vein, connected with first longitudinal a little before termination; venation as shown in Fig.; legs slender, fuscous, femora paler towards base, coxae and trochanters ochraceous. Length of body, 4mm.; wing, 5mm.

HABITAT. Larvae mining the leaves of *Cyrtandra paludosa* and other species of *Cyrtandra*, in the mountains at Punaluu, on the windward side of Oahu. No adults collected. I first discovered the mines of this insect in the leaves of *Cyrtandra* bushes growing along the Punaluu Trail, June 11, 1911, and reared a few specimens. Later, on the following dates, I again collected mined leaves and reared a few more specimens: August 10, 1913; September 13, 1914. The adults proved to be different from any hitherto described species in Hawaii.

MINE. The mine is long and slender, more or less sinuous and wandering about the leaf, often following the margin, gradually widening as the larva increases in size. There may be as many as a dozen mines in one leaf.

LARVA. The full-grown larva is 10-11mm., elongate, slender, cylindrical, gradually tapering posteriorly, without setae, footless, anterior and posterior margins of segments (except 3 or 4 anterior and 2 posterior ones) minutely roughened on dorsal and ventral surface to assist in locomotion. Whitish, transparent so that the alimentary canal and tracheal system are plainly seen, the latter having two longitudinal tracheae connecting with two black spiracles above the anus. Head with brownish mouth-parts, mandibles working horizontally, the whole head retracting into the following segment which in turn retracts into the next. Segments 1-3 of moderate length, 4-10 elongate, remaining segments short.

PUPA. The pupa is formed within the mine, the larva



Dicranomyia foliocuniculator. Fig. 1, larva; fig. 2, pupa; fig. 3, wing venation; fig. 4, leaf of *Cyrtaudra* showing mines.

sometimes receding somewhat from the terminal end of the mine before pupating. Some were found with the anterior end projecting thru a break in the dead epidermis of the leaf. 6-7mm. long, slender, nearly cylindrical; pale greenish, head, wing-sheaths and leg-sheaths dark fuscous to nearly black just before the emergence of the fly. Thorax with two yellowish brown dorsal horns, the respiratory processes, projecting forward with the tips curved ventrally. Leg-sheaths of equal length, extending along ventral side to the apex of the fourth abdominal segment; wing-sheaths placed laterally, extending to apex of second abdominal segment; margins of abdominal segments minutely roughened as in the larva, which enables the pupa to force itself half way out of the mine before the emergence of the fly; apex of abdomen slightly bifid.

This is apparently a very remarkable habit for a crane-fly, as I have been unable to find any mention of such habits in literature. The larvae of those species that have been studied feed at the roots of plants, beneath dead bark, in rotten logs and other decaying vegetation, etc., some are aquatic, and others live on leaves like caterpillars. There are numerous species of *Dicranomyia* in the mountains of the Hawaiian Islands, many of which are yet undescribed, and the habits of the larvae are mostly unknown. It may be that other species may be found to have this leaf-mining habit when their habits are studied.

NOVEMBER 5TH, 1914.

The one hundred-eleventh regular meeting was held in the usual place, President Swezey in the chair. Other members present: Messrs. Giffard, Ehrhorn, Fullaway, Illingworth, Kuhns, Osborn, Pemberton and Potter; and Mr. C. F. Mant, visitor.

Minutes of previous meeting read and approved.

Mr. Swezey proposed the name of Mr. C. F. Mant for active membership in the Society.

ENTOMOLOGICAL PROGRAM.

Mr. Ehrhorn read from the October, 1914, number of Science, a paper by Fernando Sanford of Stanford University, giving results of the use of Cyanide of Potassium injected into

holes bored in the trunks of trees as a remedy for scales and other sap-feeding insects.

Mr. Osborn in reporting on the present distribution of the Jassid, *Draeculacephala mollipes*, gave the following points on Oahu at which he had collected it on rice: Waipio, March 12, 1914; Honouliuli, April 26, 1914; Waiahole, July 9, 1914; Punaluu, August 9, 1914.

Mr. Osborn reported that on October 10, and for a week or more thereafter, he had observed at Waikiki Beach large numbers of the small fly *Scatella hawaiiensis* var. *sexnotata*. They had not previously attracted any attention.

Mr. Fullaway briefly summarized and mentioned certain interesting features of a recent paper by Professor V. L. Kellogg of Stanford University on the "Ectoparasites of Mammals." (American Naturalist, May, 1914.)

Prof. Illingworth stated that at present he could find no evidences of the activity of the palm leafroller (*Omiodes blackburni*), that on the trees previously infested by it none of the stages of the insect were to be found at the present time. Mr. Swezey expressed his opinion that this was remarkable for when he had previously made some studies on this pest he could find one or more stages of them present on the trees at all times, tho at certain seasons they were scarcer than at others.

Mr. Swezey exhibited adult specimens of *Trynoxylon* sp. which were reared from the nest in corrugated paper that he had exhibited at the previous meeting.

Mr. Swezey also exhibited male and female specimens of a species of *Tiphia* recently introduced from Japan by Mr. Muir, to attack the grubs of the beetle, *Anomala orientalis*.

Investigation of Spread of Fruitfly Parasites in Kona, Hawaii.

BY W. M. GIFFARD.

Investigations as to distribution of *Opius humilis* and *Dia-chasma tryoni* throughout the coffee fields in South and North Kona, either one or both of these having been collected by W. M. Giffard and Dr. E. A. Back in the following fields over a distance of twenty-six miles between October 28th and 31st both inclusive, viz.:

(In all these fields Dr. Back gathered samples of ripe ber-

ries and either saw or took parasites, whilst Giffard confined his work to collecting adult specimens on the wing or by sweeping. In all instances only a small number of parasites were taken, many of those captured having been liberated.)

SOUTH KONA.

No. 1. Oct. 31, 1914. At Kalahiki, one and one-half miles south from Hookena Church on main road. Field scarce of berries. Caught nine specimens (*Diachasma tryoni*, all ♂♂). Parasites plentiful.

No. 2. Oct. 31, 1914. At Hookena, opposite church on main road. Berries plentiful in this field. Saw many parasites. Caught six specimens (*Diachasma*, 4 ♂♂, 2 ♀♀).

Special. Oct. 28, 1914. At Honaunau, opposite Honaunau store on main road. In this field in which berries were plentiful six specimens of both species (2 *Opius* ♂♂ and 4 *Diachasma* ♂♂) were taken by W. M. Giffard, being the first taken during the period of investigation whilst Dr. Back was gathering berries from a field one mile mauka of the store where the original *Diachasmas* were liberated in June, 1913. Large numbers of parasites seen in this makai field by W. M. Giffard.

No. 3. Oct. 29, 1914. At Honaunau, one-half mile mauka Honaunau store. On this day Dr. Back took seven specimens while collecting berries (4 *Opius* 2 ♂♂, 2 ♀♀ and 3 *Diachasma* ♂♂).

No. 4. Oct. 29, 1914. One-half way between Honaunau and Kahaloa in coffee field opposite new Bishop Estate road junction with main road. Caught 5 specimens (4 *Opius* and 1 *Diachasma*, all ♂♂).

No. 5. Oct. 29, 1914. At Kahaloa near Michado store. Berries and parasites plentiful. Caught 10 specimens (all *Opius*, 2 ♀♀ and 8 ♂♂).

No. 6. Oct. 29, 1914. At Kealakekua, opposite Capt. Cook coffee mill. Berries fairly plentiful with many parasites. Caught 7 specimens (5 *Opius*, 4 ♂♂, 1 ♀ and 2 *Diachasma*, 1 ♂, 1 ♀).

No. 7. Oct. 28, 1914. On makai road to Napoopoo on land of Kahaloa. In field opposite school house. Berries not plentiful. Took 2 specimens (*Opius*, both ♀♀).

No. 8. Oct. 28, 1914. On same road in field opposite

papaia grove. Berries not plentiful. Took 2 *Opius* ♂♂ and 1 *Diachasma* ♂.

No. 9. Oct. 28, 1914. On same road one-fourth mile nearer Paris ranch house. Took 1 specimen *Opius*, ♂. Berries not plentiful. *N. B.*—Parasites evidently scarcer in fields along lower Kealakekua or Napoopoo road than mauka, as fewer were seen.

NORTH KONA.

No. 10. Oct. 30, 1914. At Kainaliu opposite Hiwashta grocery store about two miles north from Miss Paris', took 3 parasites (all *Opius*, 2 ♀♀, 1 ♂). Saw numbers of parasites. Coffee berries plentiful.

No. 11. Oct. 30, 1914. At Honalu about four miles north from Miss Paris'. Took two parasites (both *Opius*, 1 ♂, 1 ♀). Saw a few others but berries not plentiful.

No. 12. Oct. 30, 1914. At Keauhou about three-fourths mile south of Kailua road junction. Took 6 parasites (all *Opius*, 5 ♂♂, 1 ♀). Saw numbers. Coffee berries plentiful.

No. 13. Oct. 30, 1914. At Kahaluu (Bishop Estate land) in Oka's coffee field, about two miles south of Halalooa. Took 12 parasites (all *Opius*, 11 ♂♂, 1 ♀). Saw large numbers. Berries not very plentiful.

No. 14. Oct. 30, 1914. Lanihau, in field opposite store of Nakahara, about three miles north of Holualooa postoffice. Took 5 specimens (all *Opius*, ♂♂). Both berries and parasites plentiful.

No. 15. Oct. 30, 1914. At Holualooa, in field of Hyashihara, where a second tent containing *Opius humilis* were liberated, I took 1 *Opius*, ♀, and a small *Braconid* sp. The same conditions prevailed in this field as in that of Kimura.

No. 16. Oct. 30, 1914. At Holualooa, in fields of Kimura, where a tent containing original *Opius humilis* parasites were liberated. In field makai of Yokoyama store on main road I saw no *Opius* at all but Dr. Back says he saw two. Coffee berries were scarce, crop having been picked. On same land mauka of road I took 1 specimen (*Opius*, ♀), but there was likewise a scarcity of berries.

No. 17. Oct. 30, 1914. At Kalalooa, about 2½ or 3 miles north from third junction of road to Kailua beyond Honokohau. Took 12 specimens (6 *Opius*, 2 ♂♂, 4 ♀♀, and 6 *Diachasma*,

3 ♂♂; 3 ♀♀). Coffee in this small field was wild, overgrown and uncultivated, with berries only fairly plentiful. Saw many parasites.

NORTH KONA		SOUTH KONA	
From Kealakekua to and beyond Honokohau; 15 miles		From Kealakekua to and beyond Hookena; 12 miles	
<i>Opius</i>	<i>Diachasma</i>	<i>Opius</i>	<i>Diachasma</i>
3	6	2	9
2	....	4	6
6	....	4	4
12	....	10	3
5	....	5	1
1	....	2	2
1	....	2	1
6	....	1	....
—	—	—	—
36	6	30	26

New Species of Hawaiian Moths.

BY OTTO H. SWEZEY.

Epagoge urerana n. sp.

Antennae 3/5, brown. Palpi pale brown, terminal segment very short, not projecting in front of head. Head and thorax chocolate brown. Front wings chocolate brown, with numerous short dark fuscous strigulae; a whitish ochreous band across wing at 1/3, bent outwardly nearly to a right angle at middle; a similar somewhat indistinct band at 2/3, and a subterminal band from 7/8 of costa to tornus; in the female the dorsal half of wing beyond basal third is ochreous; cilia brownish; expanse 12-13mm. Hind wings and cilia very pale brownish. Abdomen light brown. Legs ochreous, fore and mid femora and tibiae brownish above, tarsi barred with brown.

HAB. Mt. Tantalus, Oahu, April 5, 1914. Four specimens reared from larvae boring in twigs of *Urera sandwicensis*, near growing tip of new shoots.

LARVA. Full-grown larva about 12mm.; pale greenish, head pale testaceous, eyes black, lateral margin of head with a black line beginning a little back of eyes; cervical shield fuscotestaceous, tubercles distinctly slightly infuscated, those of line

ii wider apart than those of line *i*; spiracles circular, dark margined; skin minutely roughened; anal comb of five stiff bristles.

PUPA. About 7mm.; pale yellowish brown; wing-sheaths and posterior leg-sheaths extend to the apex of 4th abdominal segment; antenna-sheaths shorter; segments 3-7 with two transverse rows of very fine backwardly directed spines, one row on segments 2, 8 and 9; cremaster curved ventrally, with several hooked bristles; spiracles slightly raised. Pupa enclosed in cocoon made by rolled-over edge of dead leaf.

Semnoprepia fuscopurpurea n.sp.

Antennae and palpi fuscous. Head and thorax purplish fuscous. Forewings uniformly purplish fuscous, cilia light fuscous; expanse 21mm. Hindwings and cilia pale greyish. Abdomen light fuscous. Legs light fuscous, hind ones paler.

HAB. One male collected on Mt. Olympus, Oahu, January 30, 1913.

Semnoprepia ferruginea n.sp.

Antennae fuscous, basal joint ferruginous. Palpi ochreous, paler on their inner sides, terminal joint hardly as long as median. Head and thorax ferruginous. Forewings uniformly ferruginous with no markings, cilia ochreous and ferruginous mixed; expanse 25-26mm. Hindwings greyish ochreous, cilia ochreous. Both wings fuscous in disk below. Abdomen uniformly ochreous. Legs ochreous, fore and mid-femora and tibiae with a ferruginous tinge; hind tibiae with long ochreous hairs dorsally.

HAB. Mt. Olympus, Oahu, January 11, 1914. A male and female bred from pupae collected in dead branches of a Cheirodendron tree.

PUPA. 12mm.; pale reddish brown; antenna-sheaths, wing-sheaths and posterior leg-sheaths extend to near the apex of 5th abdominal segment; segments 4, 5 and 6 movable; cremaster blunt, with 6 or 8 hooked bristles.

Gracilaria ureraella n.sp.

Antennae $1\frac{1}{4}$, ochreous, fuscous on apical fourth. Palpi white, sometimes somewhat fuscous externally. Head and thorax white, sometimes ochreous. Front wings ochreous, an oblique whitish streak from $\frac{1}{4}$ of costa to near middle of wing, connected with dorsum by two wide oblique whitish streaks, another outwardly oblique narrow

whitish streak at $\frac{3}{4}$ of costa not meeting a large whitish extension from tornus, a small whitish costal spot just before apex; all of these whitish streaks more or less bordered by fuscous, sometimes the whitish markings are pure white and sometimes they are ochreous concolorous with the other ochreous portions of the wing; cilia whitish ochreous, slightly fuscous at tips and a dark fuscous line at base; expanse 7-9mm. Hind wings greyish fuscous, cilia paler. Abdomen greyish fuscous. Legs ochreous, fuscous above and tarsi barred with fuscous.

HAB. Mt. Tantalus, Oahu, March 15, 1914; 13 specimens reared from mines in leaves of *Urera sandwicensis*; and again March 16, 1915, 20 more specimens reared from mined leaves of the same tree.

LARVA. Full-grown larva about 6mm.; slender, segment 2 much enlarged, head mostly retracted into it; pale greenish head strongly bilobed, testaceous with brown sutures, eyes black; cervical shield slightly testaceous and roughened on the disk; a similarly roughened area on ventral side between the legs, black lengthwise in middle; abdominal prolegs on segments 7-9.

PUPA. Pupa slender, 4mm., pale greenish; wing-sheaths extend to apex of 5th abdominal segment, free beyond 4th segment; posterior leg-sheaths extend to apex of abdomen; antenna-sheaths extend to apex of abdomen and curve up over the back to about middle of abdomen; cremaster rounded, unarmed.

MINE. The mine at first is a small roundish blotch becoming irregular as it becomes larger from the eating of the larva within. The larva emerges to spin its whitish cocoon on the surface of the leaf.

The moths emerged from the cocoons in about ten days.

PARASITES. From the lot of mined leaves collected March 15, 1914, 19 specimens of a new species of *Sierola* emerged; and from the lot collected March 16, 1915, two specimens of *Omphale metallicus* emerged, also 9 specimens of an undetermined Chalcid. Nearly as many parasites as there were moths.

Gracilaria urerana n.sp.

Antennae $1\frac{1}{2}$, fuscous, paler at the apex. Palpi whitish, terminal segment fuscous externally. Head dull ochreous. Thorax pale brownish ochreous. Front wings brownish fuscous, apical fourth pale lemon yellow; three narrow white streaks extending inwards from the dorsum about equally spaced, wider at base, tapering to apex which is

bent outwards, the third one of these meets a white line outwardly oblique from $2/3$ of costa; some pale bluish scales preceded by a black spot at apex of wing. Cilia on apical fourth of costa alternating four white and four fuscous spots, terminal cilia fuscous, yellowish at base. Expanse of wings 9-11mm. Hind wings and cilia light fuscous. Abdomen greyish fuscous. Legs ochreous, fore and mid tibiae fuscous above, tarsi barred with fuscous.

HAB. Mt. Tantalus, Oahu, March 16, 1915. Eight specimens reared from mines in the leaves of *Urera sandwicensis*, at the same time and from the same lot of leaves as the preceding.

MINE. The mine is very slender where it starts from an egg placed on the under side of the leaf, it gradually widens as the larva grows, becomes serpentine and towards the last enlarges to a blotch. The larva emerges to spin its whitish cocoon on the surface of the leaf. The moths emerged from the cocoons in about ten days.

Philodoria pipturicola n.sp.

Antennae dark fuscous. Palpi whitish, median joint slightly fuscous externally. Head and thorax slaty fuscous. Forewings with basal portion fuscous to about one-third of costa and to two-thirds of dorsum, beyond this orange; a white line on costa from near base to about two-thirds, where it bends inward and extends a little farther to join a transverse white band at the end of the cell, this band widest in the middle where it has mostly pale-blue scales; an oblique white spot near middle of cell, sometimes reaching dorsum; cilia fuscous with two white spots in costal cilia, one of them at the end of transverse white band, the other smaller and a little nearer the apex; a large pale-bluish patch in apical cilia; expanse 6-7mm. Hindwings and cilia dark fuscous. Abdomen dark fuscous, it and thorax as well whitish below. Legs fuscous, whitish below.

HAB. Punaluu, Oahu, September 13, 1914; 10 specimens bred from mines in the leaves of *Pipturus*.

LARVA. 7mm.; pale yellowish; head with a dark brown or blackish spot in each lobe, deeply bilobed and mostly retracted into segment 2, which is wider than the rest, other segments gradually tapering backwards; distinct constrictions between segments; cervical shield somewhat roughened, two pale brownish longitudinal streaks; thoracic legs feeble; abdominal prolegs on segments 7-9.

PUPA. 3mm.; very pale brownish, abdomen yellowish;

wing-sheaths pointed, extending to 5th abdominal segment; posterior leg-sheaths extend to apex of abdomen; antenna-sheaths extend beyond apex of abdomen and curve over dorsally and forward about two segments.

MINE. At first serpentine, later a blotch. The larva emerges to spin a light brownish cocoon on some convenient surface.

Petrochroa trifasciata n.sp.

Antennae black, ringed with white. Palpi fuscous and white mixed. Head and thorax dark greyish fuscous. Forewings black, greyish fuscous at base; three white transverse bars at one-fourth, one-half and three-fourths respectively; a few white scales at termen; a small orange patch following and contiguous to the first white bar; a large orange patch occupying most of the space between second and third white bars; cilia greyish fuscous, black at base on apex and termen. Hindwings and cilia greyish fuscous, the cilia a little paler. Abdomen dark greyish fuscous. Legs black, spotted with white. Expanse 6mm.

HAB. Laupahoehoe, Hawaii, May 11, 1911. One female bred from a case found on rocks at the top of the sea-cliff.

LARVAL CASE. 3mm. long, oval, of white silk covered with minute particles of sand and dirt.

DECEMBER 10TH, 1914.

The postponed one hundred-twelfth regular and tenth annual meeting of the Society was held in the usual place, President Swezey in the chair. Other members present: Messrs. Back, Ehrhorn, Illingworth, Kuhns, Muir, Osborn, Pemberton and Potter; and Mr. Poole, visitor.

Minutes of previous meeting read and approved.

Mr. C. F. Mant was elected to active membership in the Society.

Treasurer's annual report rendered and accepted.

As the Treasurer's report showed a deficit, Mr. Muir moved that a committee be appointed to consider means of improving the financial condition of the Society. The motion carried and the President appointed Messrs. Giffard, Muir and Fullaway on the committee.

ENTOMOLOGICAL PROGRAM.

Mr. Ehrhorn stated that from some egg-clusters of the mantid, *Paratenodera sinensis*, which were sent him from Hawaii several months ago, he had succeeded in rearing an adult female, from which he had already secured one egg-cluster. In growing to maturity the nymph had been fed on a succession of insects composed of plant lice, fruit flies, melon flies, bees and grasshoppers respectively. He stated that the adult showed from repeated experiments, an instinctive tendency to avoid a bee's sting when capturing and holding it.

Mr. Swezey exhibited a specimen of the Megachilid, *Lithurgus albofimbriatus*, taken by him on Coconut Island in Kaneohe Bay, Oahu, November 15, 1914; where he had found it in its nest in a hole excavated in the pithy base of a dead date-palm leaf. It was the first observation of the nesting habits of this bee in the Hawaiian Islands, tho an occasional specimen has been taken during the past ten or twelve years. In the nest no cut leaves are used as *Megachile palmarum* does, but a mass of pollen is simply stored up on which the egg is laid quite similar to the large carpenter bee, *Xylocopa brazilianorum*. Mr. Swezey also exhibited a specimen of *Lithurgus albofimbriatus* taken from a nest in a dead tree at Suva, Fiji, July, 1912. The species was originally described from Tahiti.

Mr. Swezey stated that he had taken 5 more specimens of the Coniopterigid, *Coniocompsa vesiculigera*, since the capture of the first one mentioned at a recent meeting of the Society. They were attracted to lights at his house in Kaimuki. Mr. Pemberton stated that he had recently found them quite numerous about his lamp in Manoa in the evenings.

Insects from French Frigate Shoals.

BY OTTO H. SWEZEY.

The following insects were found on a collection of plants made by Dr. Wm. Kerr, surgeon of the U.S.S. "Rainbow", at French Frigate Shoals, October, 1914. The plants were collected on a sand island which had an elevation of about seven feet. They were collected just before departing from the island to return to Honolulu, and were still in fairly fresh condition when received a few days later:

- (1) Ant, *Monomorium destructor* (Jerd.). A few dead

specimens found on the glandular stem of *Boerhaavia diffusa*.

(2) Noctuid Moth. Two small larvae found on *Boerhaavia*. Were kept alive to try rearing the moth.

(3) Plume moth, *Trichoptilus oxydactylus* (Walk.). Several larvae on *Boerhaavia*.

(4) Tineid moth, *Ereunetis* sp. A small larva in dead stem of grass, *Monerma repens*.

(5) Scolytid beetle, *Xyleborus* sp. ? A minute specimen in the same dead grass as No. 4.

(6) Mealybug, *Pseudococcus virgatus*. On *Portulaca oleacea*.

(7) Plant louse, *Aphis gossypii* Glover. On *Portulaca*.

The following officers were elected for 1915:

President.....	E. M. Ehrhorn
Vice-President.....	J. F. Illingworth
Secretary-Treasurer.....	H. T. Osborn

ANNUAL ADDRESS

A Preliminary List of the Hymenopterous Parasites of Lepidoptera in Hawaii.

BY OTTO H. SWEZEY.

While collecting and rearing larvae in my life-history studies of Hawaiian Lepidoptera during the past ten years, I have secured a good many records and notes on their parasites. Often when I have collected a batch of caterpillars in the mountains and brought them in for rearing, I would get no adult moths, but all specimens yielded parasites instead. I have thought it advisable to publish the list of parasites and any observations on their habits that I have thus far obtained. I have embodied also parasite records of other observers: Dr. R. C. L. Perkins, D. T. Fullaway, W. M. Giffard, E. M. Ehrhorn, F. W. Terry, and H. O. Marsh.

The parasites of cosmopolitan and introduced Lepidoptera are included with the others. Most of the parasites treated of

are native, but there are quite a number that have been purposely introduced. There are also a few that, tho originally described from here, are not to be considered as endemic, for they are also now known elsewhere. There are a few also that have made their appearance here the past few years thru the channels of commerce, at least not purposely introduced. Some of these have not yet been determined.

Other factors are also active in keeping the Lepidoptera in check, but it is very certain that the Hymenopterous parasites play an important part, and are largely responsible for the scarcity of many of the native species of moths in the mountains of the Hawaiian Islands. As proof of their scarcity one has but to spend a day collecting moths or caterpillars in the mountains.

Another indication of the scarcity of many species is found in the Fauna Hawaiiensis. With all the thoro collecting by Dr. Perkins, of the 310 species of Macrolepidoptera listed or described in the Fauna, 44 species or 14% were described from single specimens; and 36 species or 11% were described from but two specimens. Of the 441 Microlepidoptera, 106 species or 24% were described from a single specimen; and 71 species or 16% from but two specimens. Taken as a whole, 20% of all the species were described from single specimens, and 14% from but two specimens. If the introduced species were subtracted from the total number, and these percentages taken only on the native species they would be still higher.

Of course there are some species of moths that are known to be common or abundant in the mountains, so much so that sometimes their caterpillars are found defoliating the particular trees or shrubs on which they customarily feed. This may be due to the fact that usually the relationship between insect parasites and their hosts is such that there is a variable ratio in numbers between parasite and host, depending often on some conditions which are more favorable or more detrimental to one or to the other, the host or the parasite, sometimes the one being most affected and sometimes the other. Oftentimes, as with certain leaf-miners, from the appearance of the leaves on the trees it would seem that the moth should be numerous; but when the mined leaves are collected to rear the moths it is found that they had mostly been parasitized.

There are yet many parasites whose hosts and habits are unknown. The recording of all observations to date will fur-

nish a basis for further research in this line. The systematic arrangement used in the Fauna has been followed. It is to be regretted that a number of species have not been specifically determined, and those that are new species are yet undescribed. The greater number of these records of rearing of parasites are from the island of Oahu, and chiefly from Honolulu and the mountain ridges near Honolulu.

Family BETHYLIDAE.

Sierola molokaiensis Ashm.—Reared from the sugar cane bud-moth, *Ercunetis flavistriata* Walsm. In one lot of cocoons collected, it was found that one-third of the larvae had been parasitized. The female *Sierola* stings the host larva and deposits one to several eggs on it, which soon hatch. In one instance 9 larvae were found on one host caterpillar. The larvae obtain their growth in a few days, feeding externally on the host; they then make their cocoons close together, often connected and without distinct form. Probably the habits of other species are similar, tho I have not had definite observations on any of them.

Sierola dichroma Perk.—Reared from a larva of *Nacoleia scotaea* Hamps.

Sierola flavocollaris Ashm. and *Sierola* sp.—Reared from *Aristotelia elegantior* Walsm., a Gelechiid occurring in the fruits of *Gouldia coriacea*.

Sierola n.sp.—Reared abundantly from mines of *Gracilaria ureraella*, a leaf-miner in *Urera sandwicensis*.

Sierola sp.—I have reared undetermined specimens of several species of *Sierola* from *Archips capucinus* (Walsm.), *Capua cassia* Sw., *Epagoge infaustana* Walsm., *Batrachedra* n.sp. on *Elaphoglossum*, *Philodoria splendida* Walsm. and *Gracilaria mabaella* Sw.

Scleroderma sp.—Reared from cocoons found in dead wood near the dried remains of larvae of *Hyposmocoma chilonella* Walsm., which is a dead-wood feeder. I presume that the larvae feed externally on their host the same as those of *Sierola* do, tho I have not actually seen them. The cocoons are similar to those of *Sierola*.

Parasierola sp.—Reared from *Gelechia gossypiella* (Sandrs.) by Mr. Fullaway.

Cephalonomia sp.—Reared from *Ephestia elutella* Hb. (Ehrhorn).

Family CHALCIDIDAE.

Chalcis obscurata Walk.—This parasite was introduced from Japan by Mr. Koebele in 1895, to prey upon the palm leaf-roller (*Nacoleia blackburni* Butl.) and the sugar cane leaf-roller (*Nacoleia accepta* Butl.). Besides these hosts it attacks quite a number of moths. I have reared it from *Plusia chalcites* Esp., *Simplicia robustalis* Guen., *Phlyctaenia despecta* (Butl.), *P. nigrescens* (Butl.), *P. stellata* (Butl.), *Archips postvittanus* (Walk.), *Amorbia emigratella* Busck., *Crociosema plebiana* Zell., *Cryptophlebia illepidia* (Butl.), and *Ereunetis simulans* (Butl.); and it has been reared from *Nacoleia monogona* Meyr. by Fullaway. The Tortricid *Amorbia emigratella* has of late years been its favorite host. The adult parasite stings and oviposits in the pupa of its host, where the parasite grows to maturity. It gnaws its way out at maturity. It is found to vary greatly in size, according to the size of its host. The species of *Nacoleia* and *Plusia* furnish food enough for a normal-sized adult, but such small hosts as *Phlyctaenia despecta* and *Crociosema plebiana* furnish hardly enough food, and the parasites emerging from pupae of these species are often very small. There is never more than one parasite per host pupa. It is occasionally reared from the puparium of a Tachinid (*Chaetogaedia monticola* Big.) in the pupa of *Plusia*. This may be called an accidental hyperparasitism.*

Chalcis polynesiensis Cam.—Reared from pupa of *Homoeosoma humeralis* (Butl.). Probably parasitic on other Phycitids such as flour moths, as it has been collected under circumstances which would lead one to infer this.

Hockeria sp.—This is an accidentally introduced parasite which has become abundant of late years. I have reared it from pupae of *Ephestia elutella* Hb. and *Corcyra cephalonica* Stn., cereal moths; *Pyralis mauritialis* Boisd., the Pyralid feeding in old *Polistes* nests; and *Stoerberhinus testaceous* Butl., a Gelechiid whose larva feeds in dead grass and other decaying vegetation. Mr. Fullaway has reared it from *Gelechia gossypiella* (Sandrs.), the pink cotton boll-worm.

* Recently this chalcid has been bred from *Gelechia gossypiella* by Mr. August Busck. [Ed.]

Family ENCYRTIDAE.

Eupelmus dysombrias Perk.—Reared from *Phlyctaenia omatias* Meyr. by Fullaway.

Eupelmus spp.—I have reared three undetermined species of this genus from pupae of three different hosts respectively: *Aristotelia elegantior* Walsm., *Aristotelia mendax* Walsm., *Aristotelia* n.sp. in galls on *Gouldia*, *Heterocrossa subumbrata* Walsm., *Batrachedra sophroniella* Walsm., *Semnoprepia* sp. There is a large number of native species of this genus. Among them different species have hosts among several different orders, and there is no doubt but what several more species will be found to parasitize Lepidoptera when their habits are studied.

Family EULOPHIDAE.

Omphale metallicus Ashm.—Reared from *Aristotelia* n.sp., a leaf-miner in *Kadua*; *Heterocrossa subumbrata* Walsm.; *Heterocrossa inscripta* Walsm.; *Heterocrossa* sp. in fruit of *Suttonia*; *Gracilaria epibathra* Walsm., leaf-miner in *Dubautia*; *Gracilaria mabaella* Sw., leaf-miner in *Maba*; *Gracilaria marginestrigata* Walsm., the leaf-miner in *Sida*; *Cryptophlebia vulpes* Walsm. in koa pods (Terry); *Bedelia orchilella* Walsm., the sweet potato leaf-miner (Fullaway); *Hyposmocoma liturata* Walsm. (Fullaway). The larva of this parasite feeds singly, externally on the host larva and pupates by the remains of the latter. It and other species of the genus kill an enormous number of leaf-miners and other Micros. I have reared a number of close-related parasites from leaf-miners and other Micro larvae.

Omphale sp.—Reared from the larval case of *Hyposmocoma liturata* Walsm.

Melittobia hawaiiensis Perk.—This minute insect is normally a parasite on Aculeate Hymenoptera, having been found parasitizing *Sceliphron caementarium* (Drury), *Pison hospes* Smith, *Megachile palmarum* P., and *Odynerus nigripennis* (Holm.). I have also found it breeding on the larvae of the sugar cane bud-moth, *Ereunetis flavistriata* Walsm. In a lot of 50 cocoons of this moth collected in cane at the Experiment Station, H. S. P. A., 12% were parasitized by this insect. At another time, of 27 cocoons there was a parasitization of 77%. The eggs are laid externally on the host larva after it has made its cocoon. They soon hatch, and become full-grown in about

a week. I have found as high as 45 per host. (In some Hymenoptera I have found several hundred per host. Once I reared 338 from one larva of *Megachile palmarum*.) Pupation takes place where the larvae have fed, and where they have been numerous the pupae lie in a mass. The pupal stage is about two weeks.

Family TRICHOGRAMMIDÆ.

Pentarthron flavum Perk.—This tiny egg-parasite I have reared from eggs of *Vanessa tammeamea* Esch., *Deilephila lineata* Fab., *Nacoleia accepta* (Butl.), *Nacoleia blackburni* (Butl.), *Nacoleia meyricki* (Sw.), *Archips postvittanus* (Walk.) and *Amorbia emigratella* Busck. From one to several parasites develop in a single egg of the host, depending on the size of the egg. From *Nacoleia* eggs I have had usually about three per egg, while from the larger egg of *Vanessa tammeamea*, 24 emerged. This is a very beneficial parasite. It often destroys a large proportion of the eggs of *Nacoleia blackburni* and *Archips postvittanus*, and recently *Amorbia emigratella*—many egg-masses of the latter being found entirely parasitized. It has a very short life-cycle. I bred a generation in 10 days.

The eggs of *Bactra straminea* are also parasitized, and Mr. Fullaway has bred it from eggs of *Heliothis obsoleta* Fab.

Pentarthron semifumatum Perk.—Reared from eggs of *Herse cingulata* Fab. (Fullaway). I have reared it from the egg of *Deilephila lineata*. One one occasion I reared 7 of this species and 7 of *P. flavum* from one egg of the latter.

Family ICHNEUMONIDÆ.

Ichneumon koebelei Sw.—This parasite was introduced from America by Mr. Koebele about 15 years ago. It parasitizes *Cirphis unipuncta* (Haw.), the army-worm, *Agrotis ypsilon* Rott., the black cutworm, and probably other related caterpillars, but does not accomplish much good, as it does not appear to be very prolific. The parasite stings an egg into the caterpillar, where the egg hatches and the larva grows while the caterpillar is obtaining its growth. The host is not killed till it enters the ground to pupate. The parasite finally transforms to the adult within the host pupa, without spinning a definite cocoon—merely spinning a little silk on the inside of the empty pupa case of the host. The adult finally emerges by breaking an irregular hole at the anterior end of the pupa case.

Echthromorpha fuscator (Fab.)—This large Ichneumonid has a large number of hosts. I have reared it from the following: *Vanessa tammeamea* Esch., *Lycaena boetica* Linn., *Plusia chalcites* Esp., *Nacoleia accepta* (Butl.), *Nacoleia blackburni* (Butl.), *Archips postvittanus* (Walk.), *Amorbia emigratella* Busek., *Euhyposmocoma trivitella* Sw.; and Dr. Perkins records it from *Vanessa cardui* (L.). *Vanessa tammeamea* is its special favorite. One can hardly collect a chrysalis of this butterfly that has not been parasitized. In my experience I have collected but two which yielded butterflies instead of parasites. Dr. Lyon tells me that Mrs. Lyon once collected a large number of the chrysalids in the forests of windward Maui, and obtained very few butterflies from them, the parasites emerging instead. The female oviposits in the host pupa. The chrysalis of *Vanessa tammeamea* hanging fully exposed is easily found by it. The pupae of *Plusia* are stung thru the thin cocoon. The pupae of leaf-rollers hidden by folded leaves are parasitized by stinging thru the leaf. Pupation takes place within the chrysalis, no regular cocoon being made, only a little silk being spun onto the inner wall of the empty chrysalis. The adult parasite emerges by gnawing a roundish lateral hole near the anterior end of the chrysalis.

Pimpla hawaiiensis Cam.—Altho described from the Hawaiian Islands, Dr. Perkins is of the opinion that this parasite was introduced from Mexico. It parasitizes pupae similarly to *Echthromorpha*. I have reared it from *Cryptoblabes aliena* Sw., *Euhyposmocoma ekaha* Sw., *Nacoleia accepta* (Butl.), *Nacoleia blackburni* (Butl.), *Amorbia emigratella* Busek, *Archips postvittanus* (Walk.), *Cryptophlebia illepidia* (Butl.); and Dr. Perkins has reared it from *Ethmia colonella* Walsm. also. Other hosts are *Gelechia gossypiella* reared by Fullaway, and *Hyposmocoma liturata* Walsm.

Enicospilus dispilus Perk.—I have reared this from *Eriopygodes euclidias* (Meyr.), so also has Mr. Fullaway. It very likely parasitizes the caterpillars of related species as well.

Enicospilus spp.—Reported by Dr. Perkins to parasitize *Agrotis* sp., *Scotorythra* sp., and Pyralids. The females of this genus oviposit in the caterpillars. The larva lives within, feeding and growing, not killing the caterpillar until it has hidden under moss, bark, or in rotten wood, or in the ground to pupate. The full-grown parasite larva issues from the host caterpillar and spins a dense brown cocoon in which it completes its trans-

formations. There are quite a number of species of this genus here, and when their habits are fully studied they will probably be found to be parasitic on similar caterpillars to the above.

Athyreodon debilis P.—I have reared from *Phlyctaenia iocrossa*.

Athyreodon sp.—Dr. Perkins records it from a species of *Phlyctaenia*.

Atrometus tarsatus Ashm.—I have reared from *Hyposmoma trimaculata*.

Atrometrus sp.—I have reared from *Aristotelia* n. sp. in galls on *Gouldia*. The parasite transformed to maturity within the pupa of its host similarly to *Echthromorpha*.

Cremastus hymeniae Vier.—This undoubtedly is an introduced species, for it was not known till 1910. It appeared on the lowlands about Honolulu, but has now spread to the mountains as well, and all over the Island of Oahu. Its first noticeable host was *Hymenia recurvalis* Fab., whose life-history was being investigated by Mr. H. O. Marsh in 1910. Other hosts from which I have reared it are: *Genophantis leahi* Sw., *Phlyctania platyleuca* Meyr., *Phlyctaenia calcophanes* Meyr., *Phlyctaenia campylothea* Sw., *Thyrocopa* sp., *Cryptophlebia illepida* (Butl.), *Capua santalata* Sw., *Batrachedra cuniculator* Busck, *Petrochroa dimorpha* Busck, and *Bactra straminea*.

Limnerium polynesiense Cam.—This must be an introduction, for its only known host here is the diamond-back cabbage moth (*Plutella maculipennis* Curt.), which it parasitizes very extensively.

Limnerium blackburni Cam.—This species has a very large number of hosts. I have reared it from the following: *Nesamiptis obsoleta* (Butl.), *Scotorythra* sp., *Nacoleia accepta* (Butl.), *Nacoleia asaphombra* (Meyr.), *Nacoleia anastrepta* (Meyr.), *Nacoleia blackburni* (Butl.), *Nacoleia localis* (Butl.), *Nacoleia monogona* (Meyr.), *Phlyctaenia endopyra* Meyr., *Phlyctaenia platyleuca* Meyr., *Phlyctaenia campylothea* Sw., *Pyrausta constricta* (Butl.), *Pyrausta dryadopa* Meyr., *Mecyna aurora* (Butl.), *Scoparia* sp., *Platyptilia rhynchophora* Meyr., *Homocosoma humeralis* (Butl.), *Genophantis iodora* Meyr., *Phthorimaea operculella* (Zell.), *Mapsidius auspicata* Walsm., *Batrachedra* sp., *Archips capucinus* (Walsm.), *Tortrix metallurgica* Walsm., *Tortrix thoracina* Walsm., and *Epagoge infaustana* Walsm. In addition to these, it was reared from *Phlyctaenia stellata* (Butl.) by Dr. Perkins, from *Phlyctaenia*

despecta (Butl.) by Perkins and Fullaway, and from *Nacoleia continuatalis* (Wall.) by Fullaway. The larvae live singly in the host larvae. The latter spins up for pupation but fails to pupate, as about that time it has been nearly consumed by the parasite within, which soon breaks out of the remains of the host, finishes eating it except the skin, and makes its cylindrical cocoon within the cocoon made by the host. The adult emerges therefrom in about ten days. The habits of the related genera: *Cremastus*, *Pristomerus*, are similar to this.

Pristomerus hawaiiensis Ashm.—Reared from *Nacoleia accepta* (Butl.), *Phlyctaenia chytropa* Meyr. and *Heterocrossa* sp. in *Olea* seeds. Mr. Fullaway has reared it from *Omphisa anasamosalis* Guen. and *Gelechia gossypiella*. I have seen the males of this species in swarms in the air like one often sees gnats.

Lathrostizus insularis Ashm.—Breeds in the larvae of *Plochia interpunctella* Hub., *Ephestia elutella* Hub., and probably other flour moths. The adult parasite emerges from the pupa of the host.

Family BRACONIDAE.

Chelonus blackburni Cam.—This species has quite a number of hosts: *Hymenia recurvalis* Fab., *Lineodes ochrea* Walsm., *Homoeosoma humeralis* (Butl.), *Phthorimaea operculella* (Zell.), *Batrachedra cuniculator* Busck., *Phlyctaenia despecta* (bred by Perkins), *Gelechia gossypiella* (bred by Perkins and Fullaway), *Petrochroa dimorpha* Busck (Perkins). The larva of this parasite lives singly in the host larva. It emerges from it after the latter has made its cocoon for pupation, and makes its own white oblong cylindrical cocoon within that of its host. I do not know whether oviposition takes place the same with this species as with *Chelonus texanus* as reported by W. D. Pierce and T. E. Holloway in *Journal of Economic Entomology*, Vol. 5, pp. 426-428, 1912. According to their observations *C. texanus* oviposits in the egg of the host, but does not prevent the hatching of the egg. The host larva grows with the parasite in it, and later is killed, and the parasite larva emerges and makes its cocoon as our species does.

Phanerotoma hawaiiensis Ashm.—Reared from *Stoeberhinus testaceus* Butl. Its white oblong cylindrical cocoon was within the cocoon of the host. It probably parasitizes other related *Micros*.

Phanerotoma sp.—Two or three specimens were reared from *Myelois ceratoniae* Zell., infesting the pods of *Acacia farnesiana*.

Microdus hawaiiicola Ashm.—I have reared it from *Thyrocopa sapindiella* Sw., *Stoeberhinus testaceus* Butl., *Batrachedra rileyi* Walsm., *Ereunetis flavistriata* Walsm., and *Gelechia gossypiella*; and Dr. Perkins reared it from *Ereunetis simulans* (Butl.), and *Hyposmocoma* sp. The larva of this species emerges from its host when the latter has spun its cocoon to pupate, finishes eating the caterpillar, then makes its own white oblong cylindrical cocoon within the cocoon of the host. The adult emerges in about two weeks.

Apanteles sp.—A species that first appeared in Honolulu in 1910, and has now become abundant. I have reared it only from *Opogona aurisquamosa* (Butl.), but it probably attacks other *Micros* whose larvae feed in decaying vegetation on the ground. Mr. Fullaway has also reared it from the same host as above. I have not ascertained the feeding habits of the larva of this parasite, but probably there is but one per host. Its white oblong cylindrical cocoon is made in the cocoon of the host.

Protapanteles hawaiiensis Ashm.—I have reared this only from cocoons in the larval cases of *Oecia maculata* Walsm., which it often parasitizes quite heavily. Of 33 larval cases collected at one time, 70% contained parasite cocoons. There is one parasite per host.

Bracon omiodivorum (Terry).—This was introduced from Japan by Mr. Koebele probably in 1895, to parasitize the plam leaf-roller and the cane leaf-roller, *Nacoleia blackburni* and *N. accepta*. I have also reared it from *Hymenia recurvalis*, and once from either *Archips postvittanus* or *Amorbia emigratella*. It mostly attacks the cane leaf-roller, however. Often as high as 75% of the caterpillars in a bad outbreak of the cane leaf-roller will be found parasitized by this Braconid. It is the most important parasite on this pest. The parasite stings the caterpillar so that it is paralyzed and remains so. The eggs are laid on the exterior of the caterpillar, from 1 to 3, tho 6-8 are about the usual number. The eggs hatch in a day or two, and the young larvae feed externally on the caterpillar, growing rapidly and becoming full-grown in about 3-4 days. The cocoons are flattish and made on the leaf near the dried remains of the caterpillar, more or less connected or in a mass. The

adults emerge in about a week. The life-cycle thus being very short—about 14 days.

Bracon sp.—I reared six of this parasite from cocoons of *Batrachedra cuniculator* Busck, a leaf-miner in sedges in the Kewalo swamps of Honolulu, in May, 1914. It was not previously observed here. Its larva feeds externally, one per host, and makes its cocoon in the mine of the latter.

Habrobracon hebetor (Say).—This is the abundant parasite on the meal and flour moths, *Plodia interpunctella* and *Ephestia elutella*. It is often to be found in large numbers in the feed warehouses in Honolulu. From 1 to 8 eggs are laid externally on the host caterpillar; they hatch in about a day, and the larvae get their growth in three days, spin cocoons and the adults emerge in about a week, so that the whole life-cycle occupies but two weeks. The shortness of the life-cycle allows for such frequent generations it is often very effective in controlling the flour moths.

Bracon sp. ?—I have reared an undetermined Braconid from the sedge stem-borer *Bactra straminea* (Butl.).

Bracon sp.—Reared from *Gelechia gossypiella* by Mr. Fullaway.

JANUARY 7TH, 1915.

The one hundred-thirteenth regular meeting of the Society was held in the usual place, President Ehrhorn in the chair. Other members present: Messrs. Fullaway, Illingworth, Kuhns, Mant, Muir, Osborn, and Swezey.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL PROGRAM.

Mr. Swezey reported having found a wasp, *Polistes aurifer*, with a nest but recently started, on the under side of a stone lying on top of the ground at Diamond Head, January 1st. It being the earliest date at which he had observed these wasps beginning their nests. Mr. Ehrhorn stated that he had noticed a nest at the Outrigger Club about three weeks previously.

Mr. Osborn exhibited 28 specimens of *Halobates* sp. which were collected on the beach at Waikiki, Dec. 19, 1914. Large numbers of these bugs, mostly adults, were blown ashore during

a three days' "Kona" storm. The species was apparently the same as collected by Mr. G. P. Wilder from the surface of the sea between Maui and Kahoolawe, October, 1913, and by Mr. C. M. Cooke from the surface of the sea near Palmyra, July, 1913. There is no previous record of its capture on the shores of Oahu.

Mr. Swezey exhibited an insect box made from a cigar box lined with parafin instead of cork, and certain advantages of this method of lining insect boxes were pointed out and discussed by himself and Mr. Muir. Cheapness of material and ease of preparation were factors in its favor. Mr. Muir stated that he had learned that this method was being used at the British Museum.

Hawaiian Species of *Laboulbenia* and Their Hosts.

BY OTTO H. SWEZEY.

The few species of *Laboulbenia* here listed with their hosts are taken from Prof. Roland Thaxter's "Contribution Toward a Monograph of the Laboulbeniaceae, Part II", Memoirs of the American Academy of Arts and Sciences, Vol. XIII, No. VI, 1908.

The hosts are all species of Hawaiian Carabidae. Of the 34 species listed, 5 occur on Kauai, 7 on Oahu, 11 on Maui, 6 on Molokai, 2 on Lanai, and 3 on Hawaii.

Laboulbenia hawaiiensis Thaxter:

Atelothrus erro (Blkb.) Maui.

Atelothrus gracilis Shp. Maui.

Mauna frigida (Blkb.) Maui.

Colpodiscus lucipetens (Blkb.) Maui, Hawaii.

Colpocaccus tantalus (Blkb.) Oahu.

" *hawaiiensis* Shp. Hawaii.

" *lanaiensis* Shp. Lanai, Molokai, Maui.

" *posticatus* Shp. Kauai.

Mesothriscus musical (Blkb.) Oahu.

" *tricolor* Shp. Maui, Molokai.

" *alternans* Shp. Kauai.

- Mecyclothorax pusillus* Shp. Maui.
 " *ovipennis* Shp. Maui.
 " *montivagus* (Blkb.) Maui.

Bembidium. Numerous undetermined specimens.

Laboulbenia disenochi Thaxter:

- Disenochus fractus* Shp. Maui.
 " *aterrimus* Shp. Kauai.
 " *sulcipennis* Shp. Kauai.
Anchonymus agonoides Shp. Maui.
Brosconymus optatus Shp. Oahu.

Laboulbenia sphyri Thaxter:

- Metromenus caliginosus* (Blkb.) Oahu.
 " *epicurus* (Blkb.) Oahu.
 " *latifrons* Shp. Molokai.

Laboulbenia cauliculata Thaxter:

- Colpocaccus lanaiensis* Shp. Lanai, Maui, Molokai.
 " *marginatus* Shp. Kauai.
Atelothrus depressus Shp. Lanai.
 " *constrictus* Shp. Molokai.
Mesothriscus hawaiiensis Shp. Hawaii.
 " *alternans* Shp. Kauai.
 " *musicola* (Blkb.) Oahu.
Metromenus fraudator Shp. Molokai.
 and other undetermined specimens.

Laboulbenia cauliculata var. *prolixa* Th.:

- Mesothriscus tricolor* Shp. Maui, Molokai.
 " *collaris* Shp. Molokai.
Metromenus aequalis Shp. Oahu.

Laboulbenia cauliculata var. *spectabili* Th.:

- Metromenus caliginosus* (Blkb.) Oahu.
 " *mutabilis* (Blkb.) Oahu.
 " *latifrons* Shp. Molokai.

FEBRUARY 4TH, 1915.

The one hundred-fourteenth regular meeting of the Society was held in the usual place, President Ehrhorn in the chair. Other members present: Messrs. Giffard, Fullaway, Illingworth, Osborn and Swezey.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL PROGRAM.

Mr. Osborn exhibited a series of 2 females and 3 males of *Nesophrosyne nimbicola* Kirk. These were collected by Prof. W. A. Bryan on the Island of Lanai at an elevation of 3400 feet. The male of the species appears not to have been described or collected before.

Mr. Osborn also exhibited specimens of the fly *Scatella hawaiiensis* Grim., collected at Waiamao, Oahu, about 1200 feet, on the wet stones about a waterfall, January 17, 1915. Mr. Swezey called attention to the fact that the common form of this species, named var. *seanotata* by Terry, had apparently not been published.

Mr. Swezey exhibited a specimen of *Tenebroides nana* Melsh., collected by him in his house at Kaimuki. It has not been previously recorded here.

Mr. Swezey also exhibited a moth reared from a caterpillar on *Boerhaavia*, collected by Dr. Wm. Kerr of the U.S.S. Rainbow at French Frigate Shoals in October, 1914. The moth had but recently emerged and appears to be a new species of the *Agrotis* group.

Dr. Illingworth exhibited specimens of insects mounted on celluloid points and cards. A general discussion on insect pins and methods of mounting followed.

Use of Cockroaches in Medicine.

BY J. F. ILLINGWORTH.

In reviewing the literature on the uses of insects in the manufacture of various substances, I came across the following interesting note in Merck's 1907 Index, of the use of cockroaches in medicine:

"Blatta.

(Cockroach) *Periplaneta orientalis*.

Constituents: Blattaric acid; antihydropin; fetid, fatty oil; *uses*: *Internal*, in dropsy, Bright's disease, whooping-cough, etc.—*External*, as oily decoction for warts, ulcers, boils, etc. *Doses*: 10-15 grains in dropsy, as powder, or pills; or 4 fluid drams decoction."

I have noticed that our wingless, shiny species (*Polyzosteria soror* Brunn.) emits a distinct pungent odor when disturbed, which closely resembles that of the common Pentatomid bugs—the odor that we have often noticed on berries in the States when these bugs have sucked them. Very likely these roaches, also, have medicinal properties which may be of value when they are properly investigated.

MARCH 4TH, 1915.

The one hundred-fifteenth regular meeting of the Society was held in the usual place, President Ehrhorn in the chair. Other members present: Messrs. Fullaway, Illingworth, Kuhns, Osborn and Swezey.

Minutes of previous meeting read and approved.

ENTOMOLOGICAL PROGRAM.

Dr. Illingworth reported on some observations made in a poultry yard on the ant *Pheidole megacephala*, which in great numbers were destroying the eggs of the hen flea, *Xestopsylla gallinacea*. They were also getting the flea larvae and an occasional adult; in several instances they were observed picking fleas which had been killed by creosote from the combs of the hens. He also mentioned the destruction by ants of the larvae of the monkeypod borer, *Xystrocera globosa*, which he was attempting to rear.

Mr. Ehrhorn related some observations he made several years ago on Molokai which indicated that ants were a large factor in controlling "ox warble", *Hypoderma lineata* Villers. The work of this fly is only occasionally observed on Molokai and the large numbers of ants on the cattle ranges destroy the larvae as they emerge and fall to the ground to pupate.

Mr. Muir exhibited a large series of the Delphacid *Aloha lehuuae*, from various localities in the Hawaiian Islands, showing color variations from light to dark. The color varies according to locality. The species occurs on "Ohia" trees and there is another species known as *A. ohiae* which appears to grade into *lehuuae*, but so far only females have been collected and it is still uncertain whether it should be considered a distinct species or not. Mr. Muir expressed his opinion that *A. lehuuae* was close to the original type of Delphacid which first became established on these Islands.

Mr. Fullaway exhibited a parasite reared from spider eggs collected by Messrs. Muir and Giffard at Kilauea, Hawaii. It is, a species of *Baeus*, probably new. Dr. Perkins described a species of *Baeus* but its habits were not known.

Mr. Fullaway also exhibited a male Diapriid of the genus *Platymischoides*, collected by Mr. Swezey.

Mr. Swezey exhibited a collection of insects made February 14, at Puu Kapele, at an elevation of 3500 feet on the west side of the Waimea Canyon, Kauai. Some of them of special interest, and some of them were new species. He also exhibited four larvae of the Lucanid *Apteroöcyclus*, the only genus of native Lamellicorns. These grubs were found by Mr. Meinecke under rotten logs a little higher up than Puu Kapele, on the same day. They were said to be very numerous there. It is probably near the region where the few specimens of these beetles were previously collected.

APRIL 1st, 1915.

The one hundred-sixteenth regular meeting of the Society was held in the usual place, President Ehrhorn in the chair. Other members present: Messrs. Fullaway, Illingworth, Muir, Osborn, Pemberton and Swezey.

Minutes of previous meeting read and approved.

Mr. Muir, chairman of the Finance Committee, reported that the Trustees of the Hawaiian Sugar Planters' Association had appropriated the sum of \$100.00 per year to aid the Society in the publication of the "Proceedings".

Description of an Interesting New Crabro from Kauai.

BY WALTER M. GIFFARD.

(Presented by F. Muir.)

Melanocrabro discrepans sp. n.

MALE. Black; second segment of abdomen with a yellowish white dorsal fascia near its base, widest towards the sides; fourth segment with a yellowish white spot on the side, sometimes very small or entirely wanting; fifth segment with entire fascia at base; sixth with lateral spot. Front legs pale, especially on the anterior surface, tibia not flattened. Clypeus slightly produced in front, subangular in middle and covered with silvery pubescence. Mandibles black, the underside regularly fringed with yellowish hairs. Antennae with apex of sixth joint prominently and strongly produced ventrally. Head and thorax dull, rugosely sculptured and covered with long white hair. First joint front tarsus subterete, slightly flattened beneath; about as long as the four distal joints together. Abdomen with basal segment extremely finely punctured, sparsely clothed with short, inconspicuous hairs; second to fifth closely and finely punctured, the short hairs becoming more numerous posteriorly; sixth and seventh more coarsely punctured, the latter emarginate at apex, hairs much longer, projecting beyond hind margin, those on the underside also long and projecting beyond the hind margin like a fringe. Beneath, the second segment is somewhat shiny, finely punctate, slightly convex and sparsely clothed with fine hairs, the following segments dull and strongly depressed.

HAB. Forests and mountain slopes of Kauai, 4,000 feet elevation.

Described from 2 taken at Kaholuamano, September, 1909 (Giffard), and 1 at Waialeale, June, 1913 (Hardy). Types in author's collection.

OBS. This comes near to *curtipes* but is easily distinguished from it by the first front tarsus not being flattened, and the hind tibiae flattened anteriorly, causing the posterior half to be somewhat carinate dorsally; the second abdominal sternite

slightly but distinctly convex; more prominent antennal tooth; the mesonotal sculpture less dense.

The interest attached to this species lies in its *Hylocrabro* affinities. Dr. R. C. L. Perkins, in a letter to me about this insect, remarks that it "connects *Hylocrabro* still more closely with *Melanocrabro* and I should not wonder if its female is not what I call *Hylocrabro*."

New and Little-Known Derbidae.

BY F. MUIR.

The species described in this paper were collected by the writer during 1913-14, or were presented to him by entomologists in Formosa during his visit there. The addition of 17 species to the Java list indicates the richness of that island, especially when we consider that the writer only had three days collecting in suitable localities, and that nearly all his specimens were taken at Bendoredjo during one morning's collecting. Formosa and Philippines will also prove to be very rich. The family already has some eighty genera and nearly four hundred species, and when the South and Central American, as well as the Indo-Malayan areas, are more closely worked this number will be easily doubled. They are forest insects, all the nymphs as far as is at present known, living in rotten trees.

The measurements are from the apex of head to anus, and from base to apex of one tegmen.

VEKUNTA Dist.

(1) *pseudobadia* sp. n.

♂ This differs from the Bornean species *badia* in the spot on costa being smaller and having no darker spot in center of it, also in the genitalia as follows: Apex of anal segment truncate or slightly emarginate instead of pointed; styles narrower, ventral edge entire, dorsal edge produced into wide angular process in middle, apex blunt, turned inward; whereas in *badia* they are broader, the dorsal edge straight and the apex with small, sharp, inwardly turned apex.

Length 2.5mm.; tegmen 4mm.

Hab. Bendoredjo, Java; on palms (Muir, March).

(2) *lineata* Melichar.

♂ Ventral and lateral edges of pygophor straight; anal segment long, anus in basal third where segment slightly widens, then gradually narrows to point, the apical third turned ventrally and cleft from apex to angle of head; styles long, narrow, apical third turned upward, apex pointed, basal two-thirds subparallel sided, dorsal margin slightly incrassate, a small quadrate process on inner surface near base.

Hab. Mount Maquilang, Luzon (Muir, February).

(3) *malloti* Mats.

V. malloti Matsumura 1914, Ann. Mus. Nat. Hung. XIII, 288.

V. okadae Muir 1914, Pro. Haw. Ent. Soc. III, 1, p. 45.

LAMENIA Stal.

Thyrocephalus Kirkaldy 1906. H. S. P. A. Bull. I, p. 429.

Dr. Melichar in describing *L. flavescens* (Philip. Jour. Sci. 1914, IX, D. 2, p. 179) has placed this genus in the *Achilinae*. To this I cannot agree, as this genus has the characteristics of the family (or subfamily); should it be upheld then some fifteen or sixteen genera of the *Cenchrea* group will also have to be moved to *Achilinae*. The two following species have the characteristic subantennal plate as long as, or a little longer than, the antenna.

(1) *javanica* sp. n.

♂ Stramineous, fuscous over keels of face, clypeus, labium, tibiae, margin of tegulae, tergites of abdomen and genitalia, a dark round spot on propleura; tegmina stramineous, opaque with waxy secretion, fuscous over clavus, along hind and costal margins and an acutely angular mark on margin between subcosta and media; wings opaquely white with waxy secretion, veins brown.

Ventral edge of pygophor straight, lateral edges rotundate; anal segment large, much longer than broad, basal portion subparallel sided, then gradually narrowed to pointed apex which is turned ventrally, anus about a third from base; styles reaching to end of anal segment, narrow, semispatulate, the dorsal edge nearly entire, curving slightly upward and broadly dilatate, the ventral edge roundly produced beyond the middle and narrowly dilatate, apex pointed and turned inward, a small round knob on inner side near base from which rises a small sharp spine.

♀ Last abdominal sternite longer than broad, posterior edge steeply curved from sides near base to middle; anal segment ovate, anus near base.

Length 2.5mm.; tegmen 3.5mm.

Hab. Buitenzorg, Java (Muir, May).

(2) *albipennis* sp. n.

♂ Stramineous, fuscous on keels of face, tibiae, especially apices of hind pair, and dorsum of abdomen; tegmina white, opaque with waxy secretion, slightly infuscate along hind margin, especially from end of clavus to cubitus, three fuscous marks on border, one at apex of first median sector, one at apex of radia and the third at apex of subcosta; wings opaquely white with waxy secretion, veins white.

Ventral edge of pygophor straight, lateral edges slightly sinuous; anal segment large, sides subparallel, slightly narrowed before apex, apex truncate, anus one-third from base; styles reaching to end of anal segment, dorsal edge nearly straight, subparallel to ventral edge for basal two-thirds, then ventral edge narrowing to sharp apex which is turned inward, a rounded keel runs from base to apex on outer surface, a small round process on inner side on basal half.

Length 3.3mm.; tegmen 5mm.

Hab. Bendoredjo, Java, on palms (Muir, March).

PYRRHONEURA Kirk.

(1) *javana* sp. n.

♂ Vertex and face in profile slightly more rounded than in type species. Vertex, base of face, dorsum of thorax and all abdomen and genitalia dark reddish brown, apex of face, antennae, clypeus, ventral surface of thorax and legs yellow; tegmina reddish fuscous, veins darker except costa and apical veins which are lighter red, a dark spot on cross-vein at base of fourth median sector; wings fuscous, veins dark.

Ventral edge of pygophor straight, lateral edges subangularly produced in middle; anal segment much longer than broad, broadest at base, gradually narrowing to apex which is rounded, anus at apex; styles reaching to end of anal segment, narrow, dorsal edge almost entire, ventral edge gradually produced to about a third from apex, then narrowing to the rounded apex which is turned upward and inward, on inner surface a small plate runs from base to about middle where it is rounded off.

♀ Hind border of tegmina bearing light mark along clavus and between cubital veins. Last abdominal sternite broader than long, hind margin subangularly produced from sides near base to middle,

the sides of production being very shallowly excavate, the disk of angularly produced portion slightly depressed.

Length 2mm.; tegmen 4.5mm.

Hab. Bendoredjo, Java (Muir, March).

TEMPORA Mats.

Tempora Matsumura 1914, Ann. Mus. Hung. XII, p. 290.

This genus is placed by its author next to *Vekunta*, but the neururation of tegmina show that it belongs to the *Otiocerus* group; it comes next to *Pyrrhoneura* Kirk., from which it differs only in having the lateral keels of face approximate or touching near their bases, a character found in *P. rubida*. It will be difficult to keep these two genera apart.

SWEZEYIA Kirk.

(1) *vandergootii* sp. n.

♂ Antennae slightly smaller than in *lyricen* Kirk., otherwise typical.

Stramineous, a dark mark over sides of face in front of eyes, and from behind eyes over sides of thorax down middle to tip of tegmina; tips of labium and tarsi slightly infuscate. Tegmina hyaline slightly opaque with waxy secretion, veins yellowish except where fuscous mark passes down tegmina through clavus, over base of cubitus and along median, mark darkest at base of third median sector; wings hyaline, slightly opaque with secretion, veins reddish.

Ventral edge of pygophor straight, lateral edges slightly curved, anal segment about twice as long as broad, subparallel sided, apex slightly rounded, tip turned down, dorsal surface sloping from middle to sides, anus at apex; styles reaching beyond anal segment, slender, slightly broadened and curved upward at apical half, apex bluntly pointed and curved inward.

Length 2.3mm.; tegmen 3.2mm.

Hab. Bendoredjo, Java, on palm trees (Muir, March).

I name this little insect after Mr. P. van der Goot, to whose help in entomological matters while in Java I am greatly indebted.

NESOKAHA Muir.

(1) *philippina* sp. n.

♂ In profile vertex and face rounded, no angle where they meet;

antennae slightly more ovate than in *N. piroensis*. Light yellow, eyes brown, light brown over keels of face; tegmina light yellow, slightly opaque with waxy secretion, veins yellow, a black spot at apex between third and fourth median sectors, a small dark mark at end of subcosta; wings very light yellow, opaque with waxy secretion, veins yellow.

Ventral edge of pygophor straight, lateral edges angularly produced in middle; anal segment longer than broad, slightly narrower at apex than base, apex slightly emarginate (a little spine at each corner), anus at apex; styles narrow, reaching to end of anal segment, curved slightly upward on apical portion, apex pointed, ventral edge entire, dorsal edge having a small angular projection near base and a minute spine in middle.

♀ Last abdominal sternite wider than long, hind margin angularly produced from sides to middle, the apical portion turned upward; in lateral view sternite concave at base and convex in middle.

Length 2mm.; tegmen 4mm.

Hab. Mount Maquiling, Luzon. (Muir, February.)

(2) *lineata* sp. n.

♀ Light yellow, eyes brown, keels of face brownish. Tegmina hyaline slightly opaque with waxy secretion, veins white except costa, subcosta and apical veins which are yellowish, a black line on basal portion of costa through subcostal cell to radial cross vein, continued very faintly to basal portion of fourth median sector, another black line from base of claval margin to apex of first median sector, a round black spot in middle of fourth median sector; wings opaquely white with waxy secretion, veins white.

Last abdominal sternite broader than long, hind margin angularly produced from sides to middle, apex turned dorsad.

Length 2.4mm.; tegmen 4.2mm.

Hab. Los Banos, Luzon. (Muir, February.)

DEVADANDA Distant.

(1) *leafmanii* sp. n.

♂ Face produced in front as in *pectinata*; first joint of antennae small, second joint bilobed, a smaller, rounded, basal part which bears the arista and scattered small "scales" and a long cylindrical portion bearing long "scales". Dirty yellow, face hyaline above eyes, brownish below, darker around eyes and along edge of hyaline area, two dark marks on apex of face, dark across base and apex of clypeus, along medio-lateral portion of thorax, over ventral surface of thorax, coxae,

base of femora, abdomen and genitalia. Tegmina hyaline, slightly opaque with waxy secretion, veins yellow on basal half, reddish brown on apical half, apical veins and transcostal veins red, fuscous along costal, apical and hind margins, subcostal and radial veins darker, a dark mark at base of fourth median sector, two small marks in clavus and one in median cell; wings hyaline, opaque with waxy secretion, veins basally yellow apically fuscous.

Ventral edge of pygophor straight, lateral edge slightly curved; anal segment long, dorsal surface angular, sloping from middle to sides, apex rotundate, anus at apex; styles long and narrow, apices rounded and turned inward, ventral edge gradually produced into a short wide angle about middle, dorsal edge produced into a small rounded process near base and a small spine about middle.

♀ Second joint of antennae globose, covered with short sense organs as in *Kaha*; posterior margin of last sternite angular, apex turned upward into base of styles. Body lighter colored than male.

Length 2.5mm.; tegmen 4mm.

Hab. Buitenzorg, on palms. (Muir, May.)

I name this species after Mr. F. Leefman, to whose guidance I owe some very pleasant collecting trips.

(2) *perplexa* Muir.

From Buitenzorg, Java, on palm trees, both sexes in numbers. (Muir, May.)

♀ Antennae small, globous, with elevated sense organs and small "scales", last abdominal sternite as in *leefmanii*.

(3) *extrema* (Muir).

Kaha extrema Muir, 1913 H. S. P. A. Ent. Bull. XII, 52.

This species was described from a single specimen with damaged antennae. I can now recognize that it should be placed with the above species. All three differ from the description of the generic type in the form of antennae, but I think there is some mistake, as *pectinata* is described as having antennae different from any Derbid yet known. I submitted specimens of one of the above species to Mr. Distant, who considers it distinct from *Devadanda*, but I shall await the opportunity to examine the type before I erect a new genus.

EOSACCHARISSA Kirk.

(1) *ouwensii* sp. n.

♂ Yellow; eyes brown, vertex and basal portion of face whitish, fuscous mark across apical portion of face. Tegmina white, opaque with waxy secretion, veins yellow spreading into cells, five black hair-lines across costal and apical radial cell more or less bordered with yellow, a small black dot in first medio-apical cell, another in fifth, a light yellow mark across clavus and over cubitus, the upper portion of cubitus and the median cross-vein bordered with fuscous.

Ventral edge of pygophor produced in middle into acutely angular process, lateral edges into sharply pointed angle in middle; anal segment much longer than broad, slightly broader at base than apex, apex truncate, anus at apex, from the ventral surface near apex arises a minute pointed process curved backward; styles reaching to end of anal segment, narrow, curved upward, apex rounded and turned inward, ventral edge produced into small angular process near base, dorsal edge near base produced into rotundate process with a fine spine on top.

♀ Last abdominal sternite longer than broad, hind edge produced acutely angularly in middle.

Length 2.5mm.; tegmen 3.8mm.

Hab. Buitenzorg, Java, on palm trees. (Muir, May.)

I have named this little insect after Major Ouwens of the Zoological Museum, Buitenzorg.

LEPTALEOCERA Muir.

The following species differs from the type in having the head in profile ovally produced, the junction of vertex and face being at the apex of the extension; the lateral edges of the pronotum are curved forward; the antennae flat but not quite so large proportionally. Until I have examined the type of *Nicerca* and *Interamma* I am dubious as to the validity of this and certain allied genera.

(1) *coccinella* sp. n.

♂ Bright scarlet, antennae fuscous along edges, clypeus and coxae yellowish.

Ventral edge of pygophor produced in middle into small plate longer than broad, slightly narrowing to apex which is formed by two arcs touching in middle, lateral edge of pygophor rounded; anal segment boat-like, longer than broad, narrowing to apex which is subtruncate, sides turned upward, anus situate in concavity of dorsal surface near

base; styles long, narrow, curved slightly upward, apex round, ventral edge slightly sinuous, dorsal edge complex, a small process with rounded apex arising from middle.

♀ Yellow, inclining to scarlet, a dark scarlet mark through middle of face to eyes, antennae brown; tegmina white, opaque with waxy secretion, veins yellow, reddish along costa, yellowish over clavus, along hind margin, apical portion of cubital cell and more or less over apical cells, scarlet mark near base of media, on cubitus and over median cells to apex; wings hyaline opaque with waxy secretion, reddish yellow veins.

Last abdominal sternite a little wider than long, rotundately produced from sides to middle; anal segment large, boatshape, bluntly rounded at apex, anus in middle.

Length 2.5mm.; tegmen 4.5mm.

Hab. Bendorodjo, Java, on palm tree. (Muir, March.)

In spite of the difference in color I feel sure that these are the sexes of the same species; more mature females may be scarlet like the male.

EPOTIOCERUS Mats.

(1) *flexuosus* (Uhler).

Otiocerus flexuosus Uhler, 1896, Pro. Nat. Mus. U. S. A., p. 283; Matsumura, 1904, 1000 Ins. Japan, II, p. 61., Pl. XXI, fig. 13.

Nicerta flexuosa Muir 1914, Pro. Haw. Ent. Soc., VIII, 1, p. 48.

Epotiocerus flexuosus Matsumura 1914, Ann. Mus. Nat. Hung., p. 300.

The validity of this genus cannot be judged without comparison with the type of *Nicerta*.

♂ Ventral edge of pygophor produced into a small trapezoidal plate, longer than broad, base slightly broader than apex, each corner of apex produced into a small spine; lateral edges entire, slightly curved; anal segment slightly longer than broad, sides turned upward boatshape, apex slightly emarginate, anus in middle; styles longer than anal segment, ventral edge slightly sinuate, curved upward towards apex, dorsal edge deeply sinuate, pointed apex turned inward, a keel runs from apex to base on outer surface.

♀ Posterior edge of last abdominal sternite steeply and rotundately produced to middle, the produced portion longer than the basal portion, middle slightly "tipped".

Specimens from Formosa differ slightly in genitalia from

Japanese specimens, but without fresh material for comparison they cannot be separated.

MEGATROPIS Muir.

Mesotiocerus Matsumura 1914, Ann. Mus. Nat. Hung. p. 301.

(1) *formosana* (Mats.)

♂ Ventral edge of pygophor straight, lateral edges slightly curved; anal segment medium size, basal half tubular, distal half semi-tubular, apex forming small downward turned lobe, anus in middle within the tubular portion; styles projecting slightly beyond anal segment, edges subparallel, curved slightly upward towards apex where slightly sinuate, apex rounded.

♀ Last abdominal sternite as broad as long, hind margin angularly produced from sides to middle.

(2) *interruptolineata* Melichar.

Three specimens from Los Banos, Luzon, 1 ♂ and 2 ♀. In the male the antenna has a projection from base of second joint somewhat similar to *obliquefasciata* Mel. which the female does not possess.

♂ Ventral and lateral edges of pygophor straight; anal segment fairly large, basal half tubular, distal half subtubular, apex rounded, anus in middle within tubular portion; styles projecting slightly beyond anal segment, edges very slightly sinuate, slightly increasing in width from base to middle then gradually narrowing to blunt inward-turned point.

♀ Last abdominal sternite broader than long, steeply and roundly produced from sides to middle; anal segment as in ♂ but basal tubular portion shorter.

MYSIDIOIDES Mats.

Mysidioides Matsumura 1904, 1000 Ins. Japan, II, p. 60.
Neocyclometopum Muir 1913. H. S. P. A. Ent. Bull. XII, p. 61.

(1) *jacobsoni* (Mel.)

Neocyclometopum jacobsoni Melichar Notes Leyden Mus. XXXVI, p. 102.

Two male specimens from Bendoredjo, Java, on palms, (Muir, March), which appear to be this species, the tegmina very slightly infusate along margins.

Ventral edge of pygophor straight, two small, pointed processes arising from middle, their apices diverging, lateral edges of pygophor drawn out into sharp point in middle; anal segment large, subparallel sided, apex emarginate (each corner drawn out to a point); styles reaching beyond anal segment, dorsal edge curved slightly upward, ventral edge deeply emarginate on basal half, apical half gradually narrowing to apex which forms a small, inwardly turned point.

(2) *sapporensis* (Mats.)

Two ♀ specimens from Arisan, Formosa (Maki, July), and one ♂ from Japan (Okada, on bamboo); until a male from Formosa has been examined there will be some uncertainty as to the right identification.

♂ Ventral edge of pygophor straight, from between styles arises a small triangular plate, the apex produced into two divergingly curved sharp spines; lateral edges straight with a small sharp spine about middle; anal segment broad at base gradually narrowing to downward turned apex, which is deeply emarginate (apex forming two spines); styles reaching beyond anal segment, subparallel sided to beyond middle, where it widens out on ventral edge then narrows to the inwardly turned blunt apex, a small rounded process arises about middle on inner side of ventral edge.

♀ Last abdominal sternite broader than long, posterior edge very slightly and angularly produced from sides to middle.

(3) *infuscata* sp. n.

♀ Stramineous with castaneous markings on sides of clypeus, inner sides of antennae, between keels of pronotum and scutellum; dark brown at posterior portion of scutellum and over abdomen, legs with faint bands. Tegmina yellowish with yellow veins and irregular dark brown markings as follows: spot at base, two small bands across middle and small spot near apex of costal cell, at base of radial through median and over second cubital cells, spots at bases of sectors, over most of apical cells, especially along apical veins, spots at base and through middle of cubital cell and in clavus.

Last abdominal sternite large, shield-shape, posterior margin steeply and rotundately produced from near the sides; anal segment small, rotundate, anus in middle.

Length 4.2mm.; tegmen 8.4mm.

Hab. Arisan, Formosa. (M. Maki, July.)

No angle at junction of vertex and face, keels of face contiguous at base.

(4) *maculata* sp. n.

♂ Fuscous yellow, dark on face, antennae, ventral surface of thorax and over abdomen. Tegmina dirty white, opaque with waxy secretion, veins light yellow, black mark on hind margin at end of clavus, in some specimens forming small V, and infuscate spot in clavus, over radial cross-vein, end of subcosta and more or less over all apical cells; wings dirty white with yellowish veins.

Ventral edge of pygophor straight with a small rotundate projection in middle, from the middle inner surface arises a pair of flattened divergingly curved spines bluntly pointed at apex, lateral edges slightly curved; anal segment large, sides subparallel, anus in middle, beyond anus segment curved ventrally, apex broad, roundly excavate, (each corner produced into a point); styles large, reaching beyond anal segment, dorsal edge straight, ventral edge sinuous, produced in middle half, apex pointed and turned inward, from inner surface near base arises a small round-pointed process.

♀ Markings on tegmina much smaller and fainter. Last abdominal sternite wider than long, median three-fifths roundly produced.

Length 3.5mm.; tegmen 7mm.

Hab. Arisan, Formosa. (M. Maki, July.)

The male has no angle at junction of vertex and face and the keels of face are contiguous at base; the female has the vertex slightly flattened, slightly angular at junction with face and the keels of face not contiguous till a little beyond base.

PLATOCERA Muir.

(1) *albipennis* sp. n.

♂ Antennae as in *nigrifrons* but not quite so flattened, sense organs equally distributed over its surface.

Head and body stramineous to light castaneous, darker over face, edges of antennae, lateral portions of pro and mesonotum and sides of abdomen. Tegmina and wings white, opaque with waxy secretion, veins light yellow.

Ventral edge of pygophor slightly and evenly convex, between the styles a bifurcate process, the apices pointed and divergingly curved with a small projection below apices on outer sides, lateral edges straight, a small angular projection from inner surface near middle; anal segment large, base broad tapering to pointed apex, anus about middle; styles large, broadest on distal half, curved slightly upward,

apices rounded, ventral edge produced into a small angular point about third from apex, a little below this a small process with round apex arises from inner surface.

♀ Posterior edge of last abdominal sternite slightly rounded.

Length 4.8mm.; tegmen 9mm.

Hab. Arisan, Formosa. (M. Maki, July.)

SIKAIANA Dist.

(1) *makii* sp. n.

Wings half as long as tegmina, anal area forming stridulating organ.

♂ Stramineous, eyes brown, fuscous on antennae, apices of tibiae and sides of abdomen; tegmina white, opaque with waxy secretion, veins yellowish, a black mark across tegmina, widest over base of second and middle of first median sectors, eight small red dots on costa, at second and third red dot a black mark through costal cell, two small black spots near base, another in clavus, another at end of clavus, from apex of costa to base of third median sectors a larger black mark, black marks on hind margin near apex of median sectors; wings white, opaque with waxy secretions, a black mark in middle of hind margin.

No medio-ventral process on pygophor, lateral edges roundly produced on sides of anal segment; anal segment longer than broad, apex round, dorsal surface convex, ventral concave, anus near apex on ventral side, anal style large, subcordate, concavo-convex, looking as if apical portion of segment; styles shorter than anal segment, broad at base narrowing to apex which is turned in and ends in a minute fine spine with another slightly before apex, dorsal edge nearly entire, ventral edge roundly produced on basal half.

♀ Anal segment very short, anal style large, subcordate.

Length 2mm.; tegmen 5.5mm.

Hab. Arisan, Formosa. (M. Maki, June.)

ZEUGMA West.

(1) *monticola* Kirk.

Several specimens from Bendoredjo, Java, on palm trees. (Muir, March.)

In the description of the genitalia of this species the apex of anal segment is described as "angularly emarginate". This would be more correctly described as being cleft nearly down to anus, so that the apex is formed of two long ensate processes. The lateral angular projection of the pygophor has a suture

across the lower portion, cutting off a small triangular portion: It is very probable that this is the same as *vittata* Westwood.

(2) *javana* sp. n.

♂ Vertex and face narrower than in *vittata*, but not so narrow as in *makii*; a faint keel dividing vertex from face. Tegmina broader than in *vittata*, being produced on hind margin beyond clavus, a character shared by *makii*.

Stramineous or light brown, dark brown or black between keels of vertex, face and clypeus, and along outer sides of keels, dark mark down first and second coxae, two longitudinal marks on femora, the tarsi and tips of tibiae fuscous, six dark marks down scutellum, abdominal segments lightest on posterior edges; tegmina light stramineous, veins yellow bordered with fuscous, fuscous over radial cell and gradate cross-veins, a round black spot at base of cubitus.

Ventral edge of pygophor slightly angularly produced in middle, lateral edges forming a broad angular plate, the ventral edge of which is toothed near apex; anal segment quadrate, longer than broad, anus about middle, a small ridge across base, apex forming a flattened surface; styles longer than anal segment, lanceolate, the apices turned upward.

♀ Last abdominal sternite broader than long, posterior edge produced angularly towards middle, the apex turned upward, a slight longitudinal depression near lateral edges.

Length 4mm.; tegmen 9mm.

Hab. Bendoredjo, Java, on palm trees. (Muir, March.)

PROUTISTA Kirk.

It is to be regretted that several Homopterists actively engaged in describing Derbidae refuse to recognize this genus. Bierman* showed the validity of Buckton's genus *Assamia* and Kirkaldy recognized it also, *Proutista* being the new name he proposed, as Buckton's was preoccupied.

(1) *pseudomoesta* sp. n.

This species differs from *moesta* in having the face, antennae, middle of thorax, lateral keels and apex of scutellum and pleura of thorax yellowish; the dark markings on tegmina slightly reduced.

♂ Ventral edge of pygophor produced into small point in middle, anal segment shorter, straight, apex rounded and not turned ventrad; styles long, narrow, edges subparallel except at base where inner edge

* Notes from Lyden Mus. XXXIII (1910), p. 35.

broadens out, apex sharply pointed turned inward and upward, from inner surface near base arises a quadrate process about twice as long as broad.

♀ Anal segment cylindrical, as long as broad, apex of abdomen (genital area) cylindrically produced.

Length 2.5mm.; tegmen 6mm.

Hab. Bendoredjo, Java, on palms; Pasoeroean, Java, on sugar-cane (Muir); Buitenzorg, Java, on palm (Leefmans).

In collecting I passed over this species for *moesta* and it was only by chance that I secured a series.

(2) *dolosa* sp. n.

♂ This species differs from *pseudomoesta* by its darker thorax and by the markings on tegmina and wings being still more reduced, in radial cell it only forms three bands, one near base, one over cross-vein and one at apex; on hind margin the markings form a series of fine dot at apices of veins; wings hyaline, veins dark, fuscous mark on apex.

♀ Anal segment cylindrical, much shorter than broad, apex of abdomen (genital area) flattened, sunk between two small lateral plates. In the shape of genital area this is nearer to *moesta* than to *pseudomoesta*.

Length 2.5mm.; tegmen 6mm.

Hab. Bendoredjo, Java, on palms; Pasoeroean, Java, on sugar-cane (Muir, March).

P. fenestrata (Bier.) is intermediate between these two species.

PARAPROUTISTA Muir.

At the time of erecting this genus I had doubts as to the value of its chief characteristic, the furcation of the third median sector. Experience has shown its constancy; of its utility there can be no doubt for the facies of the species of this and some allied genera are so similar that any good distinction is an advantage. Whether it should be considered as generic or subgeneric is a matter of personal opinion. In *albicosta*, *pseudoalbicosta* and *brunnia* the keels of face do not meet till below eyes or thereabout and are not so closely contiguous.

(1) *albicosta* sp. n.

♂ Dark stramineous or light brown, clypeus and abdomen red slightly fuscous, veins red, some eight or nine small white spots in

costal cell connected together by the white or yellowish white costa, small white spot on apical border with fuscous spot in middle.

Pygophor very short, ventral edge straight, lateral edges angularly produced, the lower edge of angle slightly sinuous and longer than upper edge; anal segment about twice as long as wide, sides subparallel, apex rounded, lateral edges about middle produced into a small downward-turned angular process, anus about middle; styles in ventral view sublanceolate, apex forming blunt, hollow cone, the apical edge being rounder, below and inside of this apical cone dorsal edge complex forming a long inwardly pointed process and a smaller outwardly turned curved spine.

♀ Anal segment exceedingly short, forming ring in apical portion of the ovate genital area.

Length 2.7mm.; tegmen 7mm.

Hab. Bendoredjo, Java, on palms. (Muir, March.)

This species is very like *coccineo-venosa*, but the genitalia is quite distinct.

(2) *brunnia* sp. n.

♂ Light brown, darker over apex of clypeus, labium and apical edge of genital styles, yellowish over keels and apex of scutellum; tegmina fuscous brown with lighter mottlings over posterior half, veins dark brown with lighter marks, lighter markings through costal and apical portion of subcostal cells and at apices of radia and media; wings light brown, veins dark.

Pygophor very short, ventral edge subangularly produced in middle, lateral edges slightly and roundly produced; anal segment little longer than broad, apex broadly rounded, anus in apical half; in ventro-lateral view styles ovate, dorsal edge produced into a subquadrate process, depressed in middle and bent inward, a little distad of this a small blunt angular process turned inward.

Length 4mm.; tegmen 9.5mm.

Hab. Macassar, Celebes, on palms. (Muir, May.)

This has the tegmina more uniformly colored than *cera-mensis* and the genitalia is distinct.

(3) *pseudoalbicosta* sp. n.

♂ Light brown, apex of clypeus and abdomen darker, antennae, legs and keels of thorax lighter, tegmina very like *albicosta*, veins not such a bright red, whitish spots along costa not so pronounced and confined more to distal half.

Pygophor very short, ventral edge slightly curved in middle, lateral edges angularly produced, anal segment little longer than broad, anus

before middle, beyond anus segment curved downward, slightly narrowed to truncate apex; styles broader than long, in latero-ventral view sublanceolate, apex turned inward, dorsal edge incrassate, the margin turned inward and produced into a complex process, differing considerably from that of *albicosta*.

♀ Anal segment exceedingly short set between two angular plates, ventral border of genital area sinuate and elevated.

Length 3mm.; tegmen 8mm.

Hab. Urai, Formosa. (Muir, August.)

Besides the slight difference in color this species is differentiated from *albicosta* by genital structures.

(4) *sauterii* sp. n.

♂ Stramineous tinged with green, a small black dot on each side of the third abdominal tergite another at each corner of last sternite and on anal segment above anus; tegmina hyaline, opaque with waxy secretion, veins yellow tinged with red along costa and subcosta, slightly fuscous over radial and median basal cells and on veins, especially cross veins and in apical radial cells, faint spot at end of veins on hind margin.

Pygophor very short, anal segment longer than broad, sides subparallel to anus where there is a slight constriction, rounded beyond anus with a small median lip-like process in middle; styles subquadrate, base much narrower than apex, apical margin as long as dorsal margin, both entire and slightly rounded, a deep depression near base of ventral edge, a small, broad outwardly turned spine about middle.

♀ Apex of abdomen (genital area) flattened, triangular; anal segment very short, below anus two downward and inward curved pointed processes, near basal line of genital area two rounded knobs.

Length 4mm.; tegmen 9mm.

Hab. Arisan, Formosa. (M. Maki, June; Muir, August.)

This species is near *variegata*, especially in shape of *genitalia*. I have named it after Mr. H. Sauter, whose work in Formosa has added so much to our knowledge of the zoology of that interesting island.

ZORAIDA Kirk.

One of the chief characters of this genus is the narrow face formed by the contiguous lateral keels, which are continuations of the lateral keels of the vertex. Several allied genera have been erected having wider faces, with a carina or a fine groove down the middle. The nymphs of all the narrow-faced Derbiidae, including *Zoraida*, have broad faces. In the nymph of *Z.*

insolicola the face is as broad as long, the lateral edges arcuate, two pair of carinae, one lateral and one medio-lateral. At the last ecdysis the face is invaginated down the median line, the lateral keels coming together and more or less coalescing. If the head of an adult *Zoraida* be boiled in caustic potash the face will open out, showing, during the process, characters attributed to certain genera. From observations made on several species it appears probable that some of these genera are only imperfectly developed specimens of *Zoraida*.

(1) *cydista* Dist.

One ♀ specimen from Bendoredjo, Java, which agrees with specimens from Papua and Amboina. (Muir, March, on palm tree.)

PEGGIOPSIS Muir.

The two following species have the bulging eyes very slightly emarginate on lower margin, and the long, flat antennae of the type; the clypeus not so large proportionately as is general in *Zoraida*.

(1) *nigrovenosa* sp. n.

♂ Stramineous, white with waxy secretion over pronotum, eyes brown, fuscous on antennae, tarsi and abdomen; tegmina and wings hyaline, veins dark brown or black, ends of four in apex of tegmina colorless with a small black dot where color ends.

Ventral edge of pygophor produced into small lanceolate process in middle, lateral edges angular beside anal segment; anal segment spatulate with wide and short base, anus about middle; styles longer than anal segment, narrow, tip narrowed to a rounded apex and turned upward, ventral edge produced into small blunt angle before middle, dorsal edge with small round process near apex.

Length 2.5mm.; tegmen 8mm.

Hab. Bendoredjo, Java, on palms. (Muir, March.)

(2) *javana* Mel.

♂ Ventral edge of pygophor produced into small spatulate process, lateral edges subangularly produced; anal segment much longer than broad, slightly widened beyond middle then gradually narrowed to rounded apex which is turned down slightly and "lipped", anus in middle, dorsal surface of basal half sloping to sides, a small projection in middle half way to anus; styles not reaching to end of anal seg-

ment, very similar to *nigrovenosa* but more curved, the apices blunter and turned inward nearly at right angles.

Bendaredjo, Java, on palms. (Muir, March.)

These two species are very close, but the color of the neurathion and the shape of genitalia, especially the anal segment, distinctly separates them. My five specimens of *javana* are males, the species was described from a single female.

DECORA Dammerman.

Dichotropis Muir 1913, H. S. P. A. Ent. Bull. XII, p. 83.

(1) *pavo* Bireman.

♂ Edges of pygophor entire; anal segment as long as width of base, narrowing to truncate apex, anal style projecting beyond apex of segment; styles subovate, apex somewhat truncate, on dorsal edge from near base arises a small spine with apex bent outward.

DECORA Dammerman.

(1) *pavo* Bierman.

♂ Edges of pygophor entire; anal segment as long as width of base, narrowing to truncate apex, anal style projecting beyond apex of segment; styles subovate, apex somewhat truncate, on dorsal edge from near base arises a small spine with apex bent outward.

One ♂ specimen from Bendoredjo on palm tree, which conforms very closely to Bierman's description. *Dichotropis* only differs from this in the degree of development of keels of face and slight difference in width of vertex, character not sufficient to justify its retention.

MECYNORHYNCHUS Muir.

(1) *kershawi* Muir.

Four specimens from Mount Maquiling. (Muir, February.)

The single ♂ specimen of *kershawi* on which the genus was founded was taken in Borneo.

♂ Pygophor very short, ventral edge straight, lateral edges slightly arcuate; anal segment very short; styles longer than broad, gradually widened to apex which is broad and rounded, ventral edge entire dorsal edge in middle produced into a long curved spine.

♀ Last abdominal sternite very short and broad, posterior edge straight except in middle where it is produced into a minute angle.

(2) *hyalinus* sp. n.

♂ Light yellow, darker on keels of face and vertex and over mesonotum and dorsum of abdomen. Tegmina hyaline, slightly opaque with waxy secretion, veins yellow, a black mark in middle of costal cell and one on hind margin at apex of cubitus, slightly fuscous over radial cross-vein.

Pygophor exceedingly short, ventral and lateral edges straight; anal segment very short, anal style projecting beyond apex; styles acinacicate, apex truncate, reaching to anal segment, from dorsal edge near apex a small spine with small knob on apex.

Length 1.6mm.; tegmen 3.5mm.

Hab. Bendoredjo, Java, on palm tree. (Muir, March.)

(3) *stramineus* Muir.

One ♂ specimen from Buitenzorg, Java, off palm tree, which I cannot separate from the Formosan species.

(4) *obscurus* sp. n.

♂ Yellow, fuscous over face and vertex, apex of clypeus, apex of labium, femora and apices of tibiae, blood red mark on middle of first and second tibiae, dorsum of abdomen and genitalia brown, anal style brown. Tegmina hyaline, slightly fuscous and opaque with waxy secretion, veins very light yellow or white, costa darker yellow, slightly infuscate over basal half of subcosta, and bases of median sectors, wings hyaline, veins white. The basal portion of subcosta raised considerably.

Pygophor very short, anal segment longer than wide, anal style projecting beyond apex from under side; styles longer than wide, widest near apex, apex rotundate, dorsal edge roundly produced near base and drawn out into a sharp spine about middle, the spine curved at apex.

Length 1.4mm.; tegmen 3.5mm.

Hab. Buitenzorg, Java, on palm tree. (Muir, May.)

(5) *fuscus* sp. n.

♂ Yellow, fuscous over dorsal surface of head and thorax, abdomen and genitalia fuscous, pleura tinged with red. Tegmina fuscous, veins dark except in costal cell and apical margin where they are yellow, basal portion of costal cell nearly hyaline; wings fuscous with dark veins; both tegmina and wings with slight waxy secretion.

Pygophor very short, edges straight; anal segment short, anal style projecting beyond apex; styles subquadrate, base narrower than

apex, apex slightly rounded, spine on dorsal edge curved, with small knob at apex. This genitalia comes near to *hyalinus*.

Length 1.5mm.; tegmen 3.5mm.

Hab. Buitenzorg, Java, on palm tree. (Muir.)

LEVU Kirkaldy.

The presence of a well-developed shoulder keel on the pronotum distinguishes this genus from *Rhotana*; there is a slight difference in neuration of tegmina and in general shape. The genus is not recognized by some Homopterists, but the distinction is useful even if only considered as of subgeneric value.

(1) *toroensis* (Mats.).

Rhotana toroensis Matsumura.

(2) *hopponis* (Mats.).

Rhotana hopponis Matsumura.

(3) *matsumurae* sp. n.

♂ Yellowish red, apical portion of abdomen darker red, legs light yellow. Tegmina, vitreous, veins yellowish, at apex of clavus a brown or fuscous mark from hind margin to first median sector, brownish at base of second median sector and over apical cross-veins, four small black dots on basal half of subcosta; wings hyaline, veins white.

Pygophor laterally compressed, ventral edge not produced, lateral edges broadly anularly produced in middle; anal segment small, little longer than broad, anus at apex, anal style spatulate, longer than broad, projecting beyond end of segment; styles longer than broad, slightly narrowed at base, apex rounded, a small curved blunt pointed spine on inner surface near base.

♀ Last sternite of abdomen broader than long, hind margin in middle produced into angular process which turns up between base of styles; anal segment exceedingly short, anal styles small, narrowly spatulate.

Length 2.5mm.; tegmen 4mm.

Hab. Arisan, Formosa. (Maki, July; Muir, August.)

(4) *quadramaculata* sp. n.

♂ Light yellow, slightly tinged with red on face, tegmina hyaline slightly opaque with waxy secretion, veins yellow, a yellowish band bordered with fuscous from the hind margin apical of clavus to

costa, broadest over media then narrowing to costa, fuscous yellow over apical portion of subcosta and radia and over apical cross-veins, a row of four black spots on cross-veins between median sectors; wings hyaline, opaque with waxy secretion, veins white or light yellow.

Pygophor laterally compressed, ventral edge not produced, lateral edges slightly and very broadly angularly produced in middle; styles considerably longer than broad, narrowest at base, apex narrowly rounded, from middle of inner surface arises a small, outwardly curved, blunt pointed spine, a small rounded process arises near base.

♀ Last abdominal sternite broader than long, hind margin angularly produced from sides to middle.

Length 2.5mm.; tegmen 4.5mm.

Hab. Arisan, Formosa. (M. Maki, July.)

(5) *lucida* sp. n.

♀ This species differs from the type of the genus in having the basal half of the costa arcuate and the costal cell very broad, especially the basal half.

Light yellow, front and middle femora streaked with red. Tegmina yellowish and dull in middle, brown and glittering around borders, three glittering spots at apex, one hyaline and two black; veins in median portion white with fuscous marks, in other parts of tegmina yellowish, wings white with white veins.

Length 2.5mm.; tegmen 4mm.

Hab. Poespoe, East Java. (Muir, April.)

Notes on Hawaiian Roaches.

BY J. F. ILLINGWORTH.

Leucophaea surinamensis Fab.

On May 21st, 1914, I collected 10 pairs of this burrowing roach from the loose soil, under stones, on the College Farm. I placed these in a large jar with a quantity of the soil in which I had found them. They were fed on various substances, but I found that they took kindly to bread and the inner part of banana skins; refusing meat, butter, insect remains, etc.

June 1st, I found many young had been born—it has been noted that this is one of our four viviparous species. During

that summer the birth-rate was enormous, so that the soil was literally swarming with young of various stages. Early in September, I found most of the adults were dead, and all of them covered with mites. Since these mites did not appear to attack the nymphs, I removed all of the old roaches from the jar, at once, and wet down the soil. The activity of the young roaches in scrambling thru the soil may account for their freedom from attack.

March 15, 1915, the first adult emerged; a second one appeared on March 28th, and another today—April 1st, being 10 months a nymph. Since these roaches lived in their native soil and were continually supplied with food and drink, we get some notion of the length of their period of development under rather favorable conditions.

Rhyparobia maderae (Fab.).

Nine adult specimens, received from Hilo, Hawaii, on Nov. 14, 1914, thru the kindness of Bro. Matthias Newell and Mr. Ehrhorn, have given me the opportunity to make observations on this, our largest roach.

These insects came over in a box, packed in moss; and I have kept them in this same material, transferring them to a glass jar with a cover of wire screen. A small quantity of water was sprinkled on the moss and they were supplied with bits of bread. They were evidently very hungry, for they began eating at once and sipping up the water.

A VIVIPAROUS SPECIES.

The day following their arrival I discovered young in the moss. These were separated out into another jar with some of the moss; and found to be 32 in number. They have much the appearance of the ordinary sowbug, in form and color.

This makes the fourth viviparous species for our Hawaiian fauna. This habit of bearing living young appears to be rather uncommon among roaches in general, being confined to tropical species. The first case mentioned in the literature* was a South American form (*Panchlora viridis*).

* *Insect Life*, Vol. III, p. 443, 1891.

STRIDULATION.

This species produces a very noticeable stridulation, whenever disturbed. By holding the insect between the fingers, we are able to observe that the sound is produced by rubbing the caudal border of the pronotum over the mesonotum. The stridulation can be made by working these parts together with the fingers.

DISAGREEABLE ODOR.

None of our roaches are more disagreeable to handle. While most roaches emit a liquid fecal matter, when disturbed, I have never found a species before that compares with this for the unpleasant odor.

Rhyparobia maderae feeds extensively upon insect remains. This is especially true with the nymphs, which eat up their own cast skins as fast as they shed them. I have not found them eating each other, but they soon clean up the remains of any soft-bodied insects that I place in the jars; a large dragon-fly will be eaten over-night.

The period of development of this species is evidently somewhat longer than that of *L. surinamensis*; nymphs at 4 months are less than one-fourth the size of the adults.

Phyllodromia hospes Perk.

HAB. Under stones, rubbish, etc.; out of doors, also in houses.

The females of this species are wingless. I found them in great numbers on the Waialae beach, beyond Diamond Head, among camp refuse. They were associated with *Nauphoeta bivittata*, *Phyllodromia hieroglyphica* and *Eleutheroda dytiscoides*. One specimen of *Rhyparobia maderae* nymph, was also found in this place. Several of the females were found with the oothecae still attached to them. On May 4th, 1914, one of these reproducing females and a male were placed in a jar in the laboratory where observations were made on the reproductive habits as indicated below:

1914.			
May	14th	1st ootheca	Hatched Aug. 30th. 108 days. Ootheca very dry.
"	20th	2nd	"
"	23rd	3rd	"
"	28th	4th	"
June	1st	5th	"
"	8th	6th	"
"	16th	7th	"
"	24th	8th	"
"	30th	9th	"
July	3rd	10th	"
"	6th	11th	"
"	10th	12th	"
"	12th	13th	"
"	15th	14th	Male died.
"	17th	15th	"
"	19th	16th	"
"	22nd	17th	"
"	25th	18th	"
Aug.	1st	19th	"
"	6th	20th	"
"	13th	21st	"
"	17th	22nd	"
"	23rd	23rd	"
"	28th	24th	"
Sept.	2nd	25th	"
"	7th	26th	"
"	15th	27th	Hatched Oct. 20th, time 35 days. 20 young.
"	20th	28th	Hatched Oct. 26th, time 36 days. 20 young.
"	25th	29th	Dried up. Open vials.
"	30th	30th	" " " "
Oct.	8th	31st	" " " "
"	14th	32nd	" " " "
"	20th	33rd	Hatched Dec. 4th, time 45 days. 18 young.
"	28th	34th	Hatched Dec. 10th, time 43 days. 20 young.
Nov.	14th	35th	Dried up—cotton plugs in vials.
"	21st	36th	Dried up—cotton plugs in vials.
Dec.	1st	37th	½ size. Dried up—cotton plugs in vials.
"	10th	38th	½ size. Dried up—cotton plugs in vials.
1915			
Apr.	12th		No more oothecas produced.

The egg cases were at first kept in open vials, after removing them from the jar, but the eggs dried out too much, so that many of them did not emerge at all. Later, in order to determine how long she could produce fertile eggs, after the death of the male, I placed each ootheca in a corked vial on the day that it was laid, and left these in the table drawer. Those that I treated in this way—the 27th, 28th, 33rd, and 34th cases—

hatched without undue drying, in an average of about six weeks. Evidently she is able to produce fertile eggs several months after mating and, quite possibly, as long as her egg-laying period lasts.

At the present writing (April 1) this female appears to be well-fed and contented tho she has produced no more egg-cases.

Bees Destructive to Hardwood.

BY J. F. ILLINGWORTH.

Xylocopa aeneipennis de Geer, *Lithurgus albofimbriatus* Sich.

These two species were found recently, working in a large block of Koa (*Acacia koa* Gray), which had been stored for some time, with other lumber under a building. The principal damage was to the sap-wood, but in several places the burrows extended into the hardest portions of the seasoned heart-wood.

The first species made its entrance thru the ends of the block, following pretty much the grain. Opening up the inside, the nest was found to be a series of longitudinal, tubular burrows, placed side by side; each individual burrow being about 3 to 6 inches in length, and the several chambers were connected by side openings. Young in all stages were found, but only one specimen in each tube. The lower end of the chambers containing the larvae was stored with a pollen-mass, similar to ordinary bee-bread; and each slender white larva rested with its head in this. In several of the tubes partial wooden partitions had been formed across, near the end, from chewed wood-pulp. The small chambers thus set off were about three-fourths of an inch in length, and in one case several of these had been formed one above another; their use is not evident, since the pupae usually lie exposed in the cavities in which they have developed.

Another block of wood was found later that showed perfectly the partitions, in which case they were entire, enclosing full-grown larvae, one above another, in series of threes.

The burrows of the small species were much more irregular, cutting in every direction. In many places they opened into the chambers of the large species; and they probably lived harmoniously together, for apparently they used the same exit.

No specimens of *Lithurgus* were found in the nest, but the appearance would indicate that it had been recently abandoned. In the ends of many of the burrows were the fresh cocoons of the emerged bees, and in some places the dry bee-bread still remained.