

The Immature Stages of Hawaiian Cerambycidae,
with a Key to Larvae

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The cerambycid fauna of Hawaii is of unusual interest in that it includes one large endemic group, namely the Plagithmysi of the tribe Clytini. This group consists of the genera *Plagithmysus*, *Callithmysus*, *Nesithmysus*, *Aeschrithmysus* and *Neoclytarlus* (= *Clytarlus*). The genera *Callithmysus* and *Clytarlus* of Sharp have been regarded by Aurivillius (1912) as synonymous with *Plagithmysus*. I strongly favour this course and consider that the so-called generic characteristics of *Aeschrithmysus* and *Nesithmysus* as defined by Perkins have been considerably weakened as a result of the subsequent description of additional species which have become connecting forms; particularly this concerns the degree of enlargement of the hind femora.

The plagithmysine group may be distinguished on adult characters from other genera of the Clytini by the absence of transverse folding of the wings (which, therefore, project beyond the abdomen), the strongly attenuated elytra, and the presence of stridulatory organs on two or, sometimes, three different parts of the body. Another character, namely the presence of pronotal carinae or tubercles, is present also in the genera *Neoclytus*, *Euryscelis* and *Rhopalopachus*.

There has been much controversy and conjecture concerning the possible origin of this unique group of cerambycids. The West Indian genus *Euryscelis* would appear most closely to resemble the plagithmysine group in possessing strongly enlarged hind femora and a carinate pronotum. The wings, however, are normal and folding. Hence it seems feasible that the ancestral stock of the plagithmysine group most probably originated from Central or South America rather than from the Indo-Pacific region whence many of the native plants are presumed to have come. All these species are very closely inter-related and would appear to have arisen from a single introduction. A study of the larval stages has not, unfortunately, revealed any indications as to the probable origin of these cerambycids.

That this group has been remarkably successful is evident from the large number of described species. This high degree of speciation may probably be attributed to the ready availability of a wide variety of hosts and to the lack of competition from other lignicolous insects. It has been the experience of Dr. Swezey that almost every plagythmysine species is associated with a single host. It is indeed most unusual that species which are predominantly dead-wood feeders should prove to be so discriminating, for, generally speaking, species which infest rotting wood are markedly polyphagous (see also Duffy, 1953, p. 35).

The generic larval characteristics of this group, as might be expected, are even less distinct, so much so that it has not been possible to separate the larvae generically. Hence they have been dealt with species by species under the group Plagithmysiides. Plagithmysine pupae may apparently be distinguished from those of other Clytini by the presence of at least one large tubercle (usually 2 or 4) on the pronotum and by the position of the mid-femora which extend posteriorly between the wings and elytra, thus separating them. In addition to the plagithmysine group there are two other endemic genera, namely *Parandra* and *Megopsis*, both of which are represented by a single species. The genus *Oopsis* is also represented by a single indigenous species.

Another unusual feature of the Hawaiian cerambycid fauna is the comparatively recent and successful establishment of several imported or introduced species (mainly of West Indian or American origin) representative of the Cerambycinae and Lamiinae. These species have also been included in the keys as they are as frequently, if not more frequently, encountered than are the endemic plagithmysine species.

This study has only been made possible as a result of years of patient and painstaking field work on the part of Dr. O. H. Swezey, who has succeeded in collecting and rearing the majority of the Hawaiian Cerambycidae. Biological information concerning the endemic species has not been discussed or summarized in this paper as this aspect has already been dealt with adequately by Swezey, Bridwell and others in various "PROCEEDINGS" of the Hawaiian Entomological Society.

In conclusion I wish to express my thanks and appreciation to E. C. Zimmerman for suggesting that I should undertake this work and to Dr. W. H. Anderson, Dr. E. A. Chapin, and Dr. O. H. Swezey for enabling me to borrow the material for study.

Family Characters of Cerambycid Larvae

Form elongate, usually subcylindrical, occasionally cylindrical or strongly depressed. Cuticle thin, often rather leathery, especially on pronotum; never deeply pigmented or extensively sclerotised, usually greyish or milky white or pale testaceous; pubescent, especially on lateral regions.

Head extensible, usually deeply invaginated into prothorax; occiput large, occipital foramen very large, ventral and often divided into two portions by the tentorial bridge. Ventral surface with a broad transverse bridge formed completely or mainly by the large hypostoma, the front margin of which is never strongly curved or retracted. Clypeus distinct, membranous, usually glabrous. Mandibles short, cutting edge either oblique or gouge-like; never with molar part or prostheda. Antennae usually strongly retractile; second segment usually bearing a tapering hyaline process; generally three-, but sometimes apparently only two-segmented; basal membrane often large and conspicuous. Maxillae protracted but compact; maxillary stipes movable only in one plane; maxillary articulating area distinct, generally fleshy. Labial palpi distinct, conical.

Prothorax large, with a wide collar; mesothorax, metathorax and abdomen narrower; never with hypopleural sclerites; always with a rectangular sclerotised, dorsal plate which is generally more or less glabrous posteriorly but sometimes pubescent or asperate.

Abdomen extended; dorsally, and usually ventrally, bearing fleshy ambulatory ampullae on first six or seven segments; ninth segment often with a sclerotised plate or process or with rigid urogomphi. Anal region nearly always trilobate, exerted.

Legs often vestigial or absent; if present, then widely separated. Never more than four-segmented (excluding unguiculus).

Spiracles annular, bilabiate, with respiratory opening narrow; lips membranous, clothed with setigerous tubercles; peritreme often with marginal chambers.

Note: When larvae are being critically examined it is advisable to remove them from the spirit and place them on a piece of dry filter paper. By absorbing the excess fluid, this makes minute structures such as pleural discs, asperities, setae and ocelli more conspicuous as often they are indiscernible when the larva is wet.

Key to Subfamilies of Cerambycid Larvae

1. Legs absent or vestigial and mandible with an oblique cutting edge (fig. 24). Head distinctly oblong, with sides parallel or converging posteriorly (fig. 24). Maxillae rigid, only movable from stipes; cardo, maxillary articulating area and submentum fused. Pleural tubercle often bearing a sclerotised pit at each extremity (fig. 25). Occipital foramen undivided (fig. 24)..... **Lamiinae, p. 140**
- Legs usually present and well developed but if absent or vestigial, then mandible with a gouge-shaped cutting-edge (fig. 12). Head transverse to subquadrate, with sides diverging posteriorly (figs. 1-7). Maxillae movable; cardo, maxillary articulating area and submentum distinct. Pleural tubercle without sclerotised pits. Occipital foramen divided by tentorial bridge..... **2**
2. Mandible with an oblique cutting-edge (fig. 1). Front margin of frons with the lower boundary usually projecting over the clypeus and the upper boundary dentate or carinate but if not then pronotum asperate posteriorly. Clypeus wide (fig. 1), filling space between dorsal articulations of mandibles. Maxillae with palpi and lobes in same plane as cardo; lobe slender, subcylindrical and densely setose on inner margin (fig. 3). Ninth abdominal segment long, extended. Legs present, well-developed and at least as long as maxillary palpi; unguiculus stout and straight. Six epistomal setae present. Antenna with or without a sclerotised, setose third segment. Prothoracic coxae almost meeting medially. Pronotum sometimes asperate (fig. 4). Dorsal ampullae with two very distinct transverse impressions. Pleural discs present or absent..... **3**
- Mandible with a gouge-like cutting-edge (fig. 14). Front margin of frons with the lower boundary never projecting over clypeus and upper boundary never dentate or carinate (fig. 14). Clypeus narrow, not filling space between dorsal articulations of mandibles (fig. 14). Maxillae with palpi and lobes curved upward against ventral surface of mandibles; lobes broad and flat, with inner margin glabrous or almost so (fig. 23). Ninth abdominal segment never long and extended. Legs smaller, seldom as long as maxillary palp and sometimes absent; unguiculus slender, usually flagelliform. Four epistomal setae present. Antennae always with a strongly sclerotised, setose, third segment (figs. 18, 19). Prothoracic coxae widely separated. Pronotum never asperate. Dorsal ampullae with posterior transverse impression generally indistinct. Pleural discs present. Palpifer and/or first palpal segment often with a dorso-external process. **Cerambycinae, p. 138**

3. Posterior area of pronotum (fig. 4) and the ampullae asperate. Front margin of frons with lower boundary never projecting over clypeus (fig. 1). Postcondylar carina and subfossal process absent. Pleural discs absent. Antenna always with a strongly sclerotised, setose, third segment (fig. 2). Spiracles with marginal chambers large and extending well beyond outer margin of peritreme (fig. 5).
**Parandrinae** (*Parandra puncticeps* Sharp), p. 141
 Posterior area of pronotum and the ampullae without asperities. Front margin of frons with lower boundary projecting over clypeus (fig. 7). Postcondylar carina and subfossal process present (fig. 7). Pleural discs present. Antenna sometimes without a strongly sclerotised, setose, third segment. Spiracles with marginal chambers, if present, very small and not extending beyond outer margin of peritreme.....**Prioninae** (*Megopis reflexa* [Karsch]), p. 141

Key to Genera and Species of Hawaiian Cerambycid Larvae Cerambycinae.

1. Dorsal ampullae microscopically spiculate and dull. Ocellar lenses indiscernible. Length up to 44 mm.(**Oemini**) *Xystrocera globosa* (Olivier) p. 142
 Dorsal ampullae not spiculate; usually shining but if dull then microscopically granulate or reticulate. Ocellar lenses distinct (fig. 12). Length up to 30 mm. 2
2. Proeusternum with sculpturation similar to that on posterior part of pronotum (figs. 9, 11). Legs well developed, longer than maxillary palpi. Ampullae microscopically granulate**Callidiopini** 3
 Proeusternum without sculpturation as on pronotum. Legs not well-developed, much shorter than maxillary palpi.....**Clytini** 4
3. Front margin of prosternum with a row of about 30 small elongate, brownish tubercles (fig. 9); proeusternum dull, milky white and finely granulate. Abdominal segments 4-7 quadrate to transverse; ampullae scarcely protuberant.
**Curtomerus pilicornis** (Fabricius), p. 146
 Front margin of proeusternum without a row of tubercles; proeusternum shining, longitudinally striate (fig. 11). Abdominal segments 4-7 strongly elongate; ampullae strongly bilobed.....**Ceresium unicolor** (Fabricius), p. 146
4. Three pairs of ocelli present in a row, laterad and ventrad of antenna (fig. 12). Genae broadly ferruginous (fig. 12).....**Cyllene crinicornis** (Chevrolat), p. 148
 Only one pair of ocelli present (fig. 14) 5
5. Postnotal fold of prothorax, mesonotum and metanotum shining and very finely rugose. Ocellus situated laterad of antenna and not surrounded either posteriorly or ventrally by sclerotisation of gena. Mouthframe feebly sclerotised, testaceous. Ampullae vermiculately rugose anteriorly and smooth and shining posteriorly and with a distinct median transverse impression. Genae with long, fine, curved setae. Usually in *Bambusa*.....**Chlorophorus annularis** (Fabricius), p. 149
 Postnotal fold of prothorax, mesonotum and metanotum dull, microscopically granulate. Ocellus situated ventrad of antenna and at least partly surrounded by ferruginous sclerotisation of gena (fig. 14). Mouthframe strongly sclerotised, ferruginous (fig. 14). Ampullae entirely and evenly dull and microscopically granulate (except *Aeschriihmysus*); without a median, transverse impression
**Plagithmysine** group, p. 149

Plagithmysine group.

In the following key certain species could not be separated satisfactorily and other species could only be separated on characters likely to vary intraspecifically. In several cases a species was represented only by one or two larvae in rather poor condition, hence until longer series become available for study, this key must be regarded as provisional.

17. Third segment of maxillary palp distinctly longer than second segment. Spiracles narrowly oval 18
 Third segment of maxillary palp not longer than second..... 20
18. Median reticulate area of prosternum with distinct reddish setae.....
 *Neoclytarlus nodifer* (Sharp) 19
 Median reticulate area of prosternum with pale golden setae.....
19. Second antennal segment about one and one-half times as long as basal width. Inner angle of maxillary lobe very strongly rounded (fig. 23).....
 *Neoclytarlus filipes* (Sharp)
 Second antennal segment about twice as long as basal width. Inner angle of maxillary lobe acutely angular (fig. 22)
 *Plagithmysus cristatus* (Sharp), and *Neoclytarlus dodonaeae* Swezey
20. Third antennal segment about three times as long as basal width..... 21
 Third antennal segment about twice as long as basal width.....
 *Nesithmysus bridwelli* Perkins
21. Sclerotization of gena beneath and posterior to ocellus distinctly ferruginous and as darkly pigmented as mouthframe (fig. 14).....*Plagithmysus muiri* Perkins p. 150
 Sclerotization of gena beneath and posterior to ocellus narrow, indistinct, testaceous and not as darkly pigmented as mouthframe.....*Neoclytarlus lookii* Swezey

Lamiinae

1. Posterior half of pronotum velvety asperate. Gena with a conspicuous transverse furrow immediately in front of ocellus. Hypostoma bearing 2-6 setae on each side of gular region (fig. 24). Epipleurum strongly protuberant on segments 6-8 only. Pleural tubercle with a pair of distinct sclerotised pits (fig. 25). Ninth segment without a caudal process or spine.....
 (*Acanthocinini*) *Lagocheirus obsoletus* Thomson, p. 154
- Posterior half of pronotum not asperate. Gena without a transverse furrow in front of ocellus. Hypostoma with only one seta on each side of gular region. Epipleurum strongly protuberant on segments 1-8 (figs. 28, 29). Pleural tubercle with only a single sclerotised pit. Ninth segment usually with a minute caudal process or spine (figs. 28, 29)..... 2
2. Head with setiferous pores on frons longitudinally impressed; sides parallel, and abruptly constricted behind middle. Hypostoma with anterior part steeply sloping down to front margin, which is in a lower plane than that of hind margin. Antenna with third segment three times as long as broad, as long as second segment. Hypostoma not granulate. Length up to 36 mm.....
 (*Mesosini*) *Coptops aedificator* (Fabricius), p. 155
- Head with setiferous pores on frons not longitudinally impressed; sides strongly converging posteriorly, broadly and feebly constricted behind middle. Hypostoma flat, with front margin in same plane as hind margin. Antenna if three-segmented, then third segment at most slightly longer than broad. Hypostoma microscopically granulate. Length up to 21 mm..... 3
3. Antenna 3-segmented, the second segment with a subquadrate, sclerotised third segment and a conical, hyaline supplementary process (fig. 27). Sides of head roundly divergent for anterior half, broadly constricted for posterior half. Hypostomal sutures incurved posteriorly..... (*Niphonini*) 4
 Antenna two-segmented, the second segment bearing a conical hyaline process only. Sides of head parallel for anterior half, not constricted for posterior half. Hypostomal sutures straight..... (*Ptericoptini*) 5
4. Posterior part of ninth abdominal tergite with several long pale setae and a minute, blunt, median spine of a diameter scarcely exceeding that of the basal part of the setae..... *Pterolophia camura* Newman, p. 156
 Posterior part of ninth abdominal tergite with a few long pale setae only.....
 *Prosoplus bankii* (Fabricius), p. 156
5. Ninth abdominal tergite with a small median, tubular, sclerotised process near hind margin (fig. 28)..... *Oopsis nutator* (Fabricius) p. 157
 Ninth abdominal tergite with a small, transverse, oval, sclerotised plate (bearing a minute spine) near hind margin (fig. 29)..... *Sybra alternans* Wiedemann, p. 158

1. Parandrinae.

Parandrini

Parandra puncticeps Sharp

Mature larva (figs. 1-5): Length up to 38 mm.; breadth (at prothorax) 8.2 mm. Form cylindrical, rather slender, gradually tapering posteriorly to ninth segment. *Head* (fig. 1) slightly depressed, slightly transverse (maximum head-width 6 mm.), sides feebly rounded. Temples with a shallow constriction behind middle; genae bearing a few, fine setae. Front margin of frons roundly declivous, straight; a transverse row of numerous fine, short setae present behind epistomal setae. *Antenna* (fig. 2) long, fleshy, scarcely retractile; segment 3 bearing a dome-shaped supplementary segment. *Mandible* robust, wedge-shaped, pitchy, shining; apex strongly and acutely pointed and directed downward; bearing several short setae on outer face near base; molar area flattened into a striate, trapezoidal plate. *Clypeus* trapezoidal, leathery, as wide at base as epistoma. *Labrum* elongate, cordate, feebly sclerotised and fringed with a few fine setae. *Maxilla* (fig. 3) with shape and setae as figured; lobe elongate, cylindrical, sparsely setose. *Prothorax* with posterior area of pronotum (fig. 4) and median area of eusternum asperate; eusternum distinctly separated from presternum. *Abdomen* with dorsal ampullae present on segments 1-7; each ampulla abruptly and strongly protuberant and finely and sparsely asperate. *Pleural tubercle* oblong, strongly protuberant, setose; *epipleura* slightly protuberant on last three segments. *Anal lobes* compact, each with an oval, rugose area. *Legs* slender, rather long; *unguiculus* slender, strongly imbricately spinose for apical half. *Spiracles* of mesothorax broadly oval but not protruding into prothorax; abdominal spiracles with peritreme broadly oval and thick but feebly sclerotised; posterior margin with a row of at least 20 marginal chambers which are largest at middle (fig. 5).

Pupa (fig. 6): Length 21 mm.; breadth 8 mm. *Head* strongly bent beneath prothorax; rounded, glabrous, with two small conical tubercles placed medially on front and vertex respectively. *Antennae* thick, submoniliform, short, extending to just beyond mid-coxae. *Labrum* triangular, glabrous. *Pronotum* transverse, with numerous short spines, especially around front and lateral margins. *Mesonotum* glabrous; *metanotum* with a few short spines extending in an oblique row on each side of scutellar groove; *scutellum* protuberant, fleshy, glabrous. *Elytra* and wings extending as far as fourth abdominal segment. *Abdomen* with tergites one to seven and pleura bearing numerous short, rather stout, ferruginous spines (each with a fine basal seta). *Eighth tergite* glabrous. *Ninth tergite* with widely-separated, divergent urogomphi which are very stout, depressed and spinose and truncate apically. *Sternites* glabrous. *Legs* with hind femora extending to third abdominal segment and hind tibiae almost at right-angles to longitudinal axis of body. *Functional spiracles* present on first six abdominal segments, the seventh pair being closed and nonfunctional; peritreme narrowly oval, thick and scarcely raised above general level of cuticle; posterior margin with a row of about 8 subcontiguous chambers.

Material studied: 2 larvae, 1 pupa, 1 imago, Kumuweia, Kauai, June 25, 1932, ex *Pipturus albidus* (O. H. Swezey); 2 larvae, Kipahula, Maui, August 21, 1929, ex *Acacia koa* (O. H. Swezey).

Biology. See Giffard (1922).

2. Prioninae

Callipogonini

Megopsis (Aegosoma) reflexa (Karsch)

Mature larva (figs. 7-8). Length up to 75 mm.; breadth (at prothorax) 13 mm. Form subcylindrical, very robust, gradually tapering posteriorly to ninth segment. *Head* (fig. 7) moderately depressed, slightly transverse (maximum head-width 8.8 mm.). *Genae* very strongly shouldered, rugose, sparsely setose, darkly pigmented. *Mouthframe* strongly sclerotised, rugose, narrowly pitchy. *Frons* ferruginous anteriorly, becoming testaceous

posteriorly. Front margin of frons comprising a narrow, pitchy, sclerotised, obliquely sloping ridge; upper boundary straight, narrowly carinate and bidentate medially; lower boundary straight, not protruding over clypeus. Postcondylar carina sharply raised. Subfossal process obtusely conical. Antenna three-segmented; second segment barrel-shaped, obliquely truncate apically and bearing a minute sensory organ (supplementary segment ?) and a conical apical segment (fig. 8). Mandible very robust, pitchy, shining with outer face rugose, longitudinally sulcate and bearing about six stout setae. Labrum semicircular, coriaceous and fringed with numerous stout setae. Three distinct ocelli present in a straight row laterad and ventrad of antenna; pigmented spots indistinct, enclosed posteriorly by the strongly sclerotised gena. Gula extremely short; sutures diverging to meet anterior portion of occipital foramen. *Prothorax* transverse, sparsely setose, testaceous; delimited laterally by a pair of grooves; median cleavage line complete but indistinct; faintly transversely rugose and glabrous. Eusternum distinctly separated from presternum by a V-shaped suture. Sternum rugose, glabrous. *Mesonotum* and *metanotum* feebly rugose, glabrous. *Abdomen* with dorsal and ventral ampullae on segments 1-7. Pleural discs distinct only on segments 1-3; each radially striate with a shallow pore. Segments 8 and 9 feebly rugose, the latter large, strongly elongate, with only a few fine scattered setae. Segment 10 trilobed, each lobe strongly protuberant, ovoid and bearing a few fine setae. *Legs* rather short (about as long as maxillary palpus), testaceous and sparsely setose; unguiculus robust, spine-like, not imbricately spinose. Spiracles of mesothorax broadly oval; mesothoracic pair minute; abdominal spiracles with peritreme broadly oval, thick and slightly raised above general level of cuticle.

Material studied: 2 larvae, Kahana, Oahu, February 2, 1929, ex *Pelea*, (O. H. Swezey).

3. Cerambycinae

Oemini

Xystrocera globosa (Olivier)

Mature larva. Length up to 44 mm.; maximum breadth (at prothorax) 7.1 mm. *Head* trapezoidal with maximum head-width 4.9 mm. Genae strongly shouldered. Temples narrowly ferruginous ventrad of antennae and bearing numerous short bristly setae. Sclerotization of mouthframe ferruginous and narrowly interrupted beneath antennae. Antenna with segment 2 about one and one-half times as long as basal width; supplementary process conical, about one-fourth length of segment 3. Mandibles short, broad, entirely pitchy. Labrum transversely oval, with anterior margin very densely fringed with short pale setae. Ocelli indiscernible, probably absent. Hypostoma with front margin broadly and very strongly sclerotised and very faintly transversely striate; sutures distinct, slightly incurved. Gula slightly raised; sutures concave, distinct. Maxillary palpi with segment 3 not longer than segment 2; dorso-external process of palpifer distinctly attenuated. Labial palpi with segment 2 shorter than segment 1. *Prothorax* transverse, slightly wider posteriorly, with numerous very short pale setae and interspersed glabrous spots on lateral regions; pronotum with median cleavage line distinctly impressed; anteriorly testaceous, shining; median area rather coarsely punctate and bearing short setae; posteriorly finely and closely longitudinally striate. Prosternum with a pair of triangular, shining, slightly rugose areas. *Abdomen* with ampullae dull, reticulate, rugose and microscopically spiculate; strongly bilobed, especially those on posterior segments. Pleura microscopically pubescent with a few longer setae. *Legs* distinctly 4-segmented, pale.

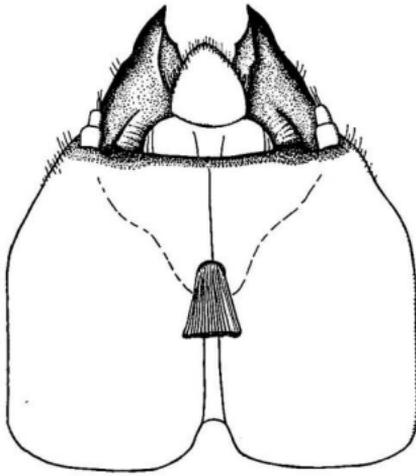
Fig. 1. *Parandra puncticeps* Sharp. Mature larva. Head (dorsal aspect).

Fig. 2. *Parandra puncticeps* Sharp. Mature larva. Apical part of antenna.

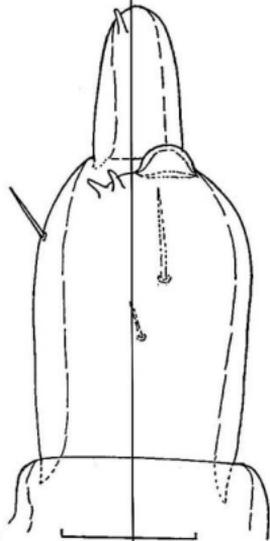
Fig. 3. *Parandra puncticeps* Sharp. Mature larva. Apical part of maxilla (ventral aspect).

Fig. 4. *Parandra puncticeps* Sharp. Mature larva. Pronotum.

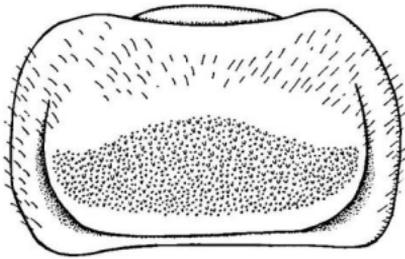
Fig. 5. *Parandra puncticeps* Sharp. Mature larva. Peritreme of abdominal spiracle.



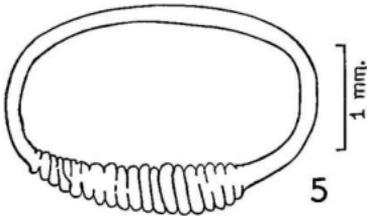
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1 mm.



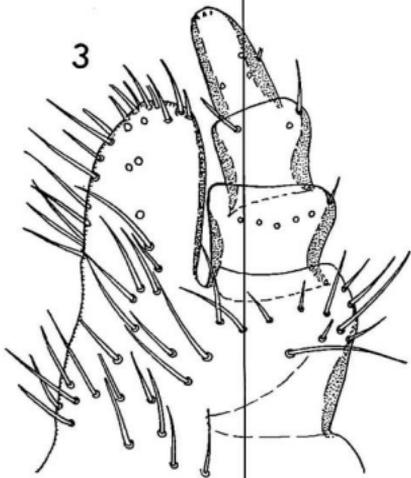
2
0.25 mm.



4
2 mm.



5
1 mm.



3
0.25 mm.

Pupa. No pupae of this species are available. Gardner (1927) gives the following description: "Antennae long, recurved near the 7th abdominal segment, the apical joint reaching to near the head in the male. Pronotum with a number of soft erect papillae, each papilla with a short cephalad seta. Abdominal tergites 1 to 6 without papillae or setae; 7th tergite with a posterior group of papillae similar to those on the pronotum but smaller; 8th tergite with a slight median posterior projection and with a few papillae."

Material studied: 1 larva, Honolulu, June 11, 1945, ex "monkeypod" tree.

Host plants. *Acacia catechu*, *A. modesta*, *Acrocarpus fraxinifolius*, *Albizzia lebbek*, *A. lucida*, *A. moluccana*, *A. odoratissima*, *A. procera*, *A. stipulata*, *Bauhinia acuminata*, *Bombax malabaricum*, *Grewia tiliaefolia*, *Xylia dolabriformis* (Beeson, 1941).

Biology. The following account has been abstracted from that of Beeson (1941): "The larval tunnels run in the inner bark mainly but also groove the sapwood superficially. In trees with thick bark a heavy infestation reduces more than half the thickness of the bark to dust so that the bark readily separates from the wood. The prepupal tunnel is made at a right angle or an obtuse angle to the surface of the sapwood and then turns downwards or upwards to terminate in a pupal chamber parallel to the long axis of the log. This chamber is lined throughout with a fine deposit of calcium carbonate, very thin so that the inequalities and minor projections on its walls are hardly concealed; the lining is white with some yellowish discoloration especially at the lower end where the larval exuviae rest. The upper end is closed by a thin, smooth, ellipsoidal dome of calcium carbonate about $\frac{1}{4}$ th. of an inch high and $\frac{7}{16}$ th. of an inch wide. The calcium carbonate is produced in two of the four Malpighian tubules. The pupal period lasts about three weeks."

"The digestive juice of the larvae contains amylase, saccharase and maltase but does not contain cellulase and consequently it does not digest cellulose. There are no mycetocytes in any part of the body. The principal food supply is from other carbohydrates and soluble sugars in the sapwood. The heartwood of *Albizzia lebbek* contains only small traces of starch and sugar and this fact explains why the larval tunnels do not penetrate the heartwood."

"Emergence occurs in every month of the year but mainly in May, June and in September. The larval life is variable and in some individuals may be prolonged for two years, while other individuals of the same brood may develop in less than a year."

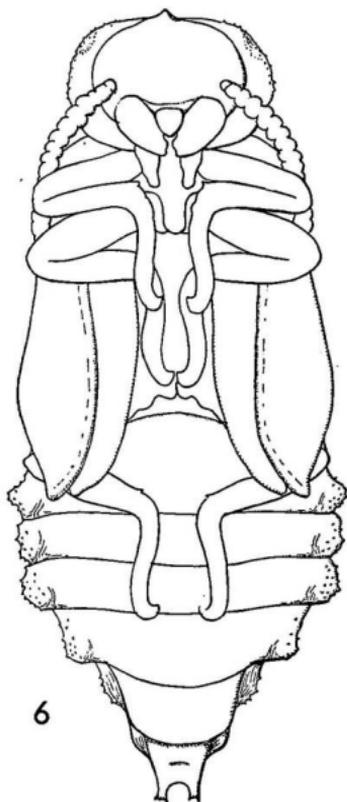
Fig. 6. *Parandra puncticeps* Sharp. Male pupa (ventral aspect).

Fig. 7. *Megopis (Aegosoma) reflexa* (Karsch). Mature larva. Head (dorsal aspect).

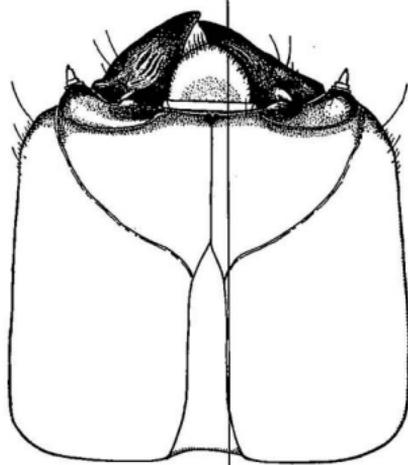
Fig. 8. *Megopis (Aegosoma) reflexa* (Karsch). Mature larva. Apical part of antenna.

Fig. 9. *Curtomerus pilicornis* (F.). Mature larva. Left half of prosternum.

Fig. 10. *Curtomerus pilicornis* (F.) Pupa. Head and pronotum.

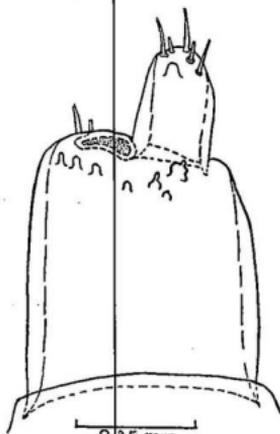


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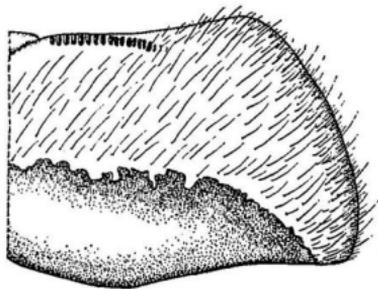
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1 mm.



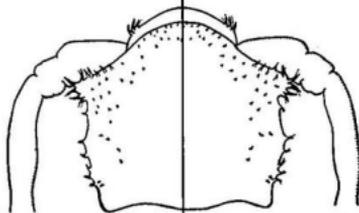
8

0.25 mm.



9

1 mm.



10

2 mm.

Economic importance. In India, Ceylon, Malaya and Egypt this species is a pest of shade and ornamental trees, particularly *Albizzia* sp. The less resistant trees may be killed in one season by a heavy infestation.

Callidiopini

Larvae of this genus are remarkable in having the surface of the proeusternum sculptured in the same way as the posterior half of the pronotum.

Curtomerus pilicornis (Fabricius) (= *Cylindera flava* [Fabricius])

Mature larva (fig. 9). Length up to 16 mm.; maximum breadth (at prothorax) 4.2 mm. *Head* transverse, with sides diverging posteriorly. Genae with numerous long, pale, slightly curved setae. Front margin narrowly pitchy. Labrum transversely oval. Ocelli absent. Hypostoma with front margin narrowly ferruginous; sutures indistinct; some long, fine setae present on each side of gula, which is distinctly raised. Maxillary and labial palpi with apical segment longer than penultimate. *Prothorax* with posterior half of pronotum dull, milky white and finely granulate; front margin of prosternum (fig. 9) with a row (interrupted medially) of about 30 small, elongate, brownish tubercles; proeusternum dull, milky white and finely granulate. *Abdomen* with ampullae granulate and glabrous. *Legs* small, slightly longer than segment 3 of maxillary palpi.

Pupa (fig. 10). Length 8-11 mm.; maximum breadth 3.1 mm. *Head* with vertex, which is visible from above, bearing a group of spines immediately above each antenna. Eyes strongly convex, with a row of spines along ventral margin. *Pronotum* with a pair of prominent spinose, lateral tubercles near front margin. *Abdomen* with spines on tergites 1-6 mostly directed anteriorly. Tergite 7 with numerous scattered short spines. Tergite 8 with about 6 short spines. *Legs* with femora strongly clavate; hind femora extending as far as abdominal segment 5. *Functional spiracles* present on segments 1-5 but vestigial pairs present on segments 6 and 7; peritreme broadly oval and moderately thick.

Material studied: 8 larvae, 1 pupa, 1 imago, Honolulu, May, 1928, ex *Acacia decurrens* (O. H. Swezey); 9 larvae, 3 imagos, Niu Valley, Oahu, September 30, 1928, ex "guava" (O. H. Swezey).

Host plants. *Acacia decurrens*, *A. farnesiana*, *Eucalyptus*, *Datura*, *Pimenta officinalis*.

Ceresium unicolor (Fabricius) (= *simplex* Gyllenhal)

Mature larva (fig. 11). Length 25 mm.; breadth 4.1 mm. Genae strongly sclerotised and ferruginous behind antennae, with only a few short bristly setae. Front margin of frons narrowly ferruginous. One oval ocellus present laterad and ventrad of antenna. *Prothorax* with posterior half of pronotum shining, longitudinally striate. Front margin of prosternum without tubercles; proeusternum (fig. 11) shining and longitudinally striate as on pronotum. *Abdomen* with ampullae very strongly protuberant both dorsally and ventrally on segments 1-6; segments 4-7 strongly elongate. *Legs* appreciably longer than segment 3 of maxillary palpi.

Fig. 11. *Ceresium unicolor* (F.) Mature larva. Left half of prosternum.

Fig. 12. *Cyllene crinicornis* (Chevrolat). Mature larva. Head (lateral aspect).

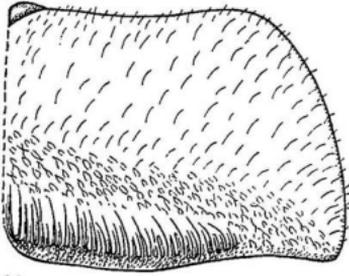
Fig. 13. *Chlorophorus annularis* (F.) Male pupa. Seventh and eighth abdominal tergites.

Fig. 14. *Plagithmysus muiri* Perkins. Mature larva. Head (lateral aspect).

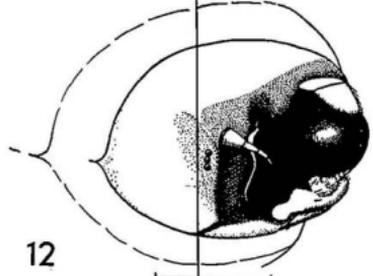
Fig. 15. *Plagithmysus muiri* Perkins. Male pupa (dorsal aspect).

Fig. 16. *Plagithmysus blackburni* (Sharp). Mature larva. Hypostoma.

Fig. 17. *Plagithmysus newelli* Sharp. Mature larva. Hypostoma.

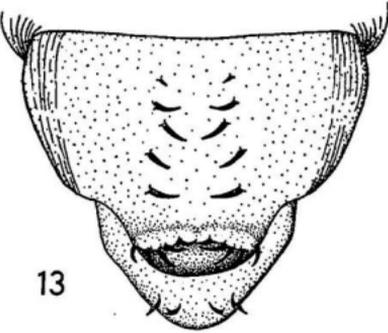


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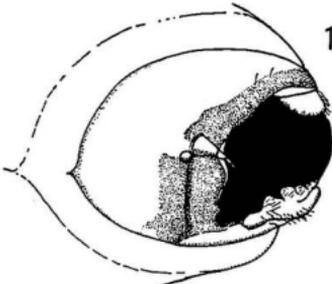
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1 mm.

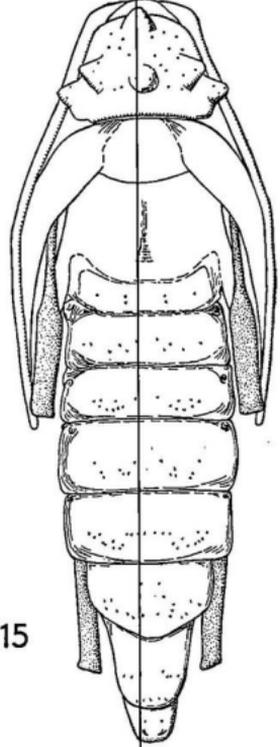


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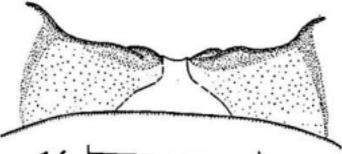
2 mm.



14

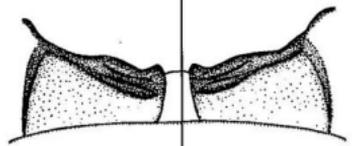


15



16

1 mm.



17

1 mm.

Material studied: 1 larva, Waimano, Oahu, November 20, 1927, ex *Acacia koa* (O. H. Swezey); 5 larvae, 1 imago, Honolulu, November 27, 1927, ex "croton" (O. H. Swezey).

Host plants. *Pipturus*, *Acacia*.

Clytini

Cyllene crinicornis (Chevrolat)

Mature larva (fig. 12). Length up to 25 mm.; maximum breadth (at prothorax) 6.7 mm. *Head* with maximum head-width 4.1 mm. Genae gradually narrowed up to mouth-frame, smooth, faintly striate and bearing a few pale setae; temples narrowly ferruginous behind ocelli and not as darkly pigmented as front margin of frons. Sclerotisation of mouthframe ferruginous, not interrupted beneath antennae (fig. 12). Antennae with segment 2 at least twice as long as broad; segment 3 three times as long as basal width and about two-thirds as long as segment 2; supplementary process conical, less than one-fourth length of segment 3. Mandibles broad, entirely pitchy; longitudinal impression absent. Labrum transversely oval, fleshy, with long pale setae. Three ocelli present in a row laterad and ventrad of antenna; lens small, convex; pigmented spot indistinct. Hypostoma with front margin broadly ferruginous and strongly transversely rugose; sutures ferruginous, curved. Gula distinctly raised; sutures concave, distinct. Maxillae with lobe entirely glabrous on inner margin; maxillary palpi with segment 3 short, about as long as segment 2; dorso-external process of palpifer much shorter than segment 3 of palpi. Labial palpi with segment 1 much broader than and as long as segment 2. *Prothorax* with long, fine, pale, silky setae on lateral regions; pronotum with similar setae and orange-testaceous anteriorly; posteriorly milky white, and longitudinally striate; median cleavage line faintly impressed. *Abdomen* with ampullae dull, milky white, extremely finely reticulate; median longitudinal furrow broad and shallow. Pleural discs wrinkled, reticulate and rather indistinct. *Legs* distinctly 3-segmented but shorter than maxillary palpi.

Pupa. Length up to 21 mm.; maximum breadth 5.8 mm. *Head* with vertex visible from above, smooth; front transversely striate medially, glabrous; posterior region of temples with a small group of long fine setae. Labrum triangular, glabrous. *Pronotum* slightly transverse, with sides strongly diverging posteriorly and hind angles abruptly right-angled; scattered papillate spinules present especially on anterior region and along sides; disc with a median conical tubercle. *Mesonotum* transversely striate, glabrous. *Metanotum* with a few minute papillae on each side of scutellar groove which is broad, shallow and transversely striate. *Elytra* and wings extending to abdominal segment 4. *Abdomen* with tergites 1-6 each with a transverse band of scattered short spines (each with a basal seta). Tergite 7 elongate, tapering posteriorly with hind margin rounded; bearing a transverse row of 5-6 large spines (which are curved anteriorly) near posterior margin, anterior to which are 2 or 3 pairs of inwardly-curved spines. Tergite 8 transverse, with posterior margin broadly rounded and bearing 4 inwardly curved spines. Segment 9 retracted into segment 8. Sternites glabrous except for a few minute setae around lateral regions. Pleura scarcely protuberant, longitudinally rugose, glabrous. *Legs* with hind-femora extending as far as abdominal segment 5 and lying parallel to longitudinal axis of body. *Functional spiracles* present on abdominal segments 1-5, those on segments 6-8 vestigial; peritreme rather narrowly oval and raised well above general level of cuticle.

Material studied: 7 larvae, 2 pupae, 1 imago, Molokai, February 15, 1928, ex *Prosopis* (O. H. Swezey).

Host plants. *Acacia confusa*, *A. arabica*, *Sapindus*, *Prosopis chilensis*, *Poinciana regia*, *Haematoxylon campechianum*, *Leucaena glauca*, *Albizia lebbek*, *Fraxinus*.

Chlorophorus annularis (Fabricius)

Mature larva. Rather similar to that of *Cyllene crinicollis* (Chevrolat) from which it may be distinguished as follows: Form more slender; length up to 23 mm.; maximum breadth (at prothorax) 4 mm. Head with sclerotisation of mouthframe interrupted beneath antenna by a narrow gap. Genae feebly sclerotised and testaceous. Hypostoma with front margin narrowly pale testaceous; sutures pale testaceous. One pair of ocelli present. Antenna with supplementary process elongate, nearly half as long as segment 3. Maxillary palpi with segment 3 slightly longer than segment 2. Legs minute, shorter than apical segment of maxillary palpi.

Pupa (fig. 13). Similar to that of *Cyllene crinicollis* (Chevrolat) from which it differs as follows: Pronotum devoid of sublateral papillate spinules. Abdominal tergite 7 with spines smaller and arranged as figured (fig. 13).

Material studied: 15 larvae, 2 imagos, Guam, September 20, ex green *Bambusa* stem (Gomez); 1 larva, Honolulu, May 14, 1929, ex *Bambusa*, (O. H. Swezey); 8 larvae, 1 pupa [no data].

Host plants. *Bambusa*, *Dendrocalamus strictus*, *Shorea robusta*, *Tectona grandis*, *Sinocalamus* and *Spondias* spp. (Duffy, 1953).

Biology. Oviposition occurs on cut bamboo which has already lost a certain amount of sap. The first-instar larvae bore into the tissues of the walls of the bamboo, making irregular excavations which are packed with powdery wooden particles and frass. The galleries are not delimited by the nodes. The mature larva excavates a cell in the wood in which it pupates. Adults emerge from May to September but principally in June (Duffy, 1953).

Parasites. Hymenoptera. *Eurytoma xylotrichi* Ferrière, *Doryctes bi-striatus* Kieffer, *D. brevipetiolus* Kieffer, *D. picticeps* Kieffer, *D. strioliger* Kieffer, *D. tristriatus* Kieffer, *Duportia cincticornis* Kieffer, *Paraglypta tubigera* Kieffer, *Promiscolus sequestriatus* Kieffer, *Scleroderma domestica* Latr. (Duffy, 1953).

Economic importance. Owing to its particular type of habitat, development is often considerably retarded with the result that emergence often occurs after the bamboo has been utilized in the construction of furniture, etc. In India the bamboo structure of thatched roofs and field telegraph posts are frequently extensively attacked by this species. (Duffy, 1953).

Plagithmysine group.

Plagithmysine larvae appear to possess all the major characteristics of the tribe Clytini and so far as the Hawaiian cerambycid fauna is concerned, appear to be closely related to the genus *Chlorophorus* from which they differ as follows: Head with mouthframe strongly sclerotised, ferruginous; ocellus at least partly surrounded by the ferruginous sclerotization of genae. Postnotal fold, mesonotum and metanotum dull, microscopically granulate. Abdomen with ampullae entirely and evenly dull and microscopically granulate (except *Aeschrithmysus*) and without a median transverse impression.

These larvae constitute so homologous a group that individual descriptions would be for the greater part repetitive. The few character-

istics whereby they may be distinguished from each other are evident in the key. For the sake of completion, however, a detailed description is given of the larva and pupa of a typical plagithmysine species as follows:

Plagithmysus muiri Perkins

Mature larva (fig. 14). Length up to 25 mm.; maximum breadth (at prothorax) 5.5 mm. *Head* with maximum head-width 3.7 mm. Genae gradually narrowed up to mouth-frame, smooth, faintly and sparsely striate and bearing numerous short, bristly, reddish setae; sclerotisation beneath and posterior to ocellus ferruginous, as dark as mouthframe and not completely enclosing ocellus (fig. 14); temples testaceous behind ocelli. Sclerotisation of mouthframe broadly ferruginous, not interrupted beneath antennae. Antennae with segment 3 about 3 times as long as basal width. Mandibles broad, entirely pithy with longitudinal impression absent. Labrum transversely oval, fleshy and fringed with rather long pale setae. One pair of ocelli present immediately ventrad and laterad of antenna; lens rather large, oval, protuberant; pigmented spot distinct. Hypostoma with front margin rather broadly ferruginous and very feebly bilobed; sutures ferruginous, incurved; gula feebly raised, with sutures concave, rather indistinct. Maxillae with lobe entirely glabrous on inner margin; maxillary palp with segment 3 not longer than segment 2. Labial palpi with segment 1 much broader than and longer than segment 2. *Prothorax* with lateral regions micro-pubescent and bearing numerous short pale setae; pronotum bearing numerous rather long pale setae along anterior and lateral margins; anterior half shining, orange-testaceous; posteriorly dull, testaceous, longitudinally and irregularly striate and entirely micro-granulate; median cleavage line distinctly impressed. Abdomen with ampullae dull, milky white, extremely finely granulate; median longitudinal furrow broad and shallow. Pleural discs slightly wrinkled, reticulate and indistinct. *Legs* 3-segmented, minute, not longer than apical segment of maxillary palpi. *Spiracles* with peritreme rather narrowly oval and testaceous.

Pupa (fig. 15). Length up to 21 mm.; maximum breadth 6 mm. *Head* with vertex visible from above; vertex, front and genae smooth, glabrous; labrum triangular, thick and glabrous. *Pronotum* quadrate with acutely-pointed and slightly upturned lateral tubercles; disc with 4 strongly protuberant, conical tubercles and scattered spinules as figured. *Mesonotum* and *metanotum* smooth and glabrous; scutellar groove shallow and faintly transversely striate. *Elytra* and wings extending laterally to abdominal segment 4. *Abdomen* with tergites 1-6 partly micro-spiculate and each bearing a transverse irregular group of short stout, ferruginous spines (each with a subapical seta and tuberculate basally). Tergite 7 elongate, tapering posteriorly and hind margin strongly rounded; bearing a transverse row of rather stout spines near hind margin, anterior to which is a similar group of slightly smaller spines. Tergite 8 subquadrate bearing medially one or two pairs of strongly incurved spines. Tergite 9 fleshy, protuberant. Sternites glabrous. Pleura scarcely protuberant, longitudinally rugose, glabrous. *Legs* with mid-femora lying laterally to body and extending posteriorly between elytra and wings, thus separating them; hind-femora extending as far as abdominal segment 7 and lying parallel to longitudinal axis of body. *Functional spiracles* present on segments 1-6, those on segments 7 and 8 vestigial; peritreme rather broadly oval and thick, testaceous and slightly raised above level of cuticle.

Fig. 18. *Plagithmysus giffardi* Perkins. Mature larva. Apical part of antenna.

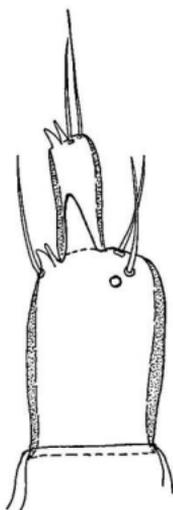
Fig. 19. *Plagithmysus kuhnsi* Perkins. Mature larva. Apical part of antenna.

Fig. 20. *Neoclytarlus longipes* (Sharp). Mature larva. Apical part of antenna.

Fig. 21. *Callithmysus koebeleii* Perkins. Mature larva. Apical part of antenna.

Fig. 22. *Plagithmysus cristatus* (Sharp). Mature larva. Apical part of maxilla (ventral aspect).

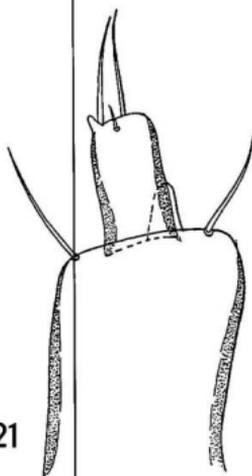
Fig. 23. *Neoclytarlus filipes* (Sharp). Mature larva. Apical part of maxilla (ventral aspect).



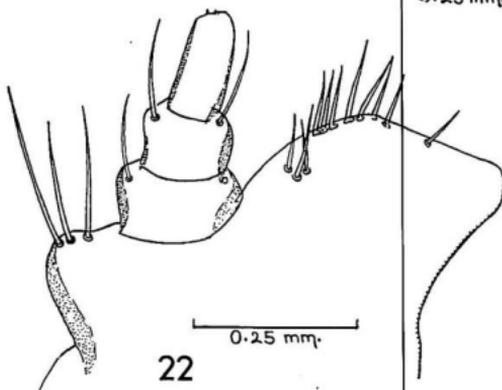
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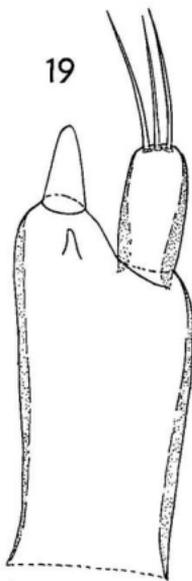
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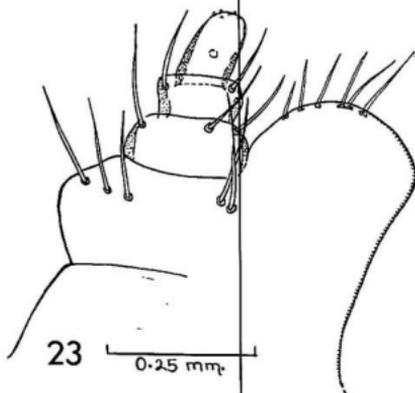
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22



19



23

Material studied:

Plagithmysus muii Perkins, 3 larvae, 1 pupa, 2 imagos, Oahu, November 13, 1934, ex *Sideroxylon* (O. H. Swezey).

P. newelli Sharp, 1 larva, Maui, March 5, 1947, ex *Nicotiana glauca* (K. L. Maehler).

P. giffardi Perkins, 1 larva, 1 imago, Kilauea, Hawaii, October 14, 1929, (O. H. Swezey).

P. solitarius Sharp, 5 larvae, 1 imago, Oahu, January 26, 1930, ex *Elaeocarpus* (O. H. Swezey); 3 larvae, Mohiaka Valley, Oahu, September 11, 1932 ex *Metrosideros* (O. H. Swezey).

P. varians Sharp, 2 larvae, 1 imago, Kilauea, Hawaii, July 4, 1934, ex *Acacia koa* (O. H. Swezey); 4 larvae, 1 pupa, 1 imago, Nauhi, Hawaii, October 2, 1931, ex *Acacia koa* (O. H. Swezey).

P. blackburni (Sharp), 6 larvae, 2 pupae, 1 imago, Mt. Hualalai, Hawaii, July 31, 1929, ex *Sophora* (F.X.W.).

P. cristatus (Sharp), 10 larvae, 1 imago, Kalauao, Oahu, March 1, 1931, ex *Acacia koa* (O. H. Swezey).

P. bishopi Sharp, 1 larva, 1 imago, Kilauea, Hawaii, May 4, 1930, ex *Pelea* (O. H. Swezey).

P. lamarckianus Sharp, 4 larvae, Kohala Mts., Hawaii, October 4, 1929, ex *Pipturus* (O. H. Swezey).

P. arachnipes Sharp, 5 larvae, 1 imago, Halemanu, Kauai, July 6, 1932, ex *Acacia koa* (O. H. Swezey).

P. bilineatus Sharp, 5 larvae, 1 pupa, 2 imagos, Kilauea, Hawaii, July 19, 1934, (O. H. Swezey).

P. sharpianus Perkins, 1 larva, 1 imago, Kumuweia, Kauai, March 10, 1928, ex *Pipturus* (O. H. Swezey).

P. kuhnsi Perkins, 3 larvae, 1 imago, Waianae Mts, Oahu, October 14, 1928, ex *Pipturus* (O. H. Swezey).

Neoclytarlus dodonaeae Swezey, 1 larva, Kilauea, Hawaii, August 25, 1945, ex *Dodonaea*.

N. lookii Swezey, 6 larvae, 2 pupae, 2 imagos, Pohakuloa, Hawaii, September, 1951, ex stems of *Chenopodium oahuense*.

N. nodifer (Sharp), 6 larvae, 2 pupae, 2 imagos, Kawaihae Uka, Hawaii, February 11, 1952, ex branches and twigs of *Acacia koaia*.

N. filipes (Sharp), 3 larvae, 1 imago, North Kona, Hawaii, September 1, 1929.

N. indecens (Perkins), 10 larvae, 1 imago, Mt. Kaala, Oahu, July 11, 1929, ex *Smilax* (O. H. Swezey).

N. longipes (Sharp), 20 larvae, 1 pupa, 4 imagos, Halemanu, Kauai, June 12, 1932, ex *Alphitonia* (O. H. Swezey).

Fig. 24. *Lagocheirus obsoletus* Thomson. Mature larva. Head (ventral aspect).

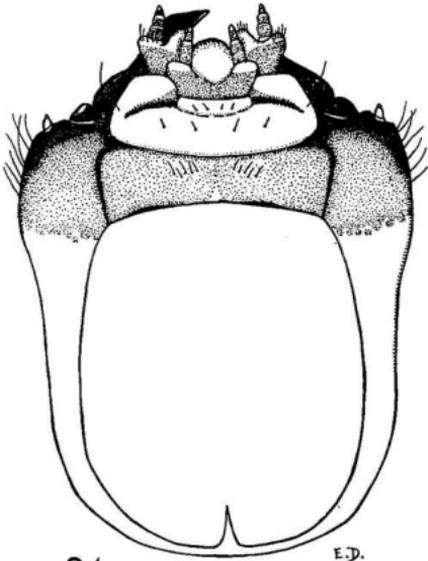
Fig. 25. *Lagocheirus obsoletus* Thomson. Mature larva. Spiracle and pleural tubercle of abdominal segment.

Fig. 26. *Coptops aedificator* (F.). Mature larva. Peritreme of abdominal spiracle.

Fig. 27. *Pterolophia camura* Newman. Mature larva. Apical part of antenna.

Fig. 28. *Oopsis nutator* (F.). Mature larva. Ninth tergite.

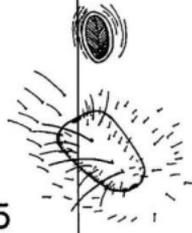
Fig. 29. *Sybra alternans* Wiedemann. Mature larva. Ninth tergite.



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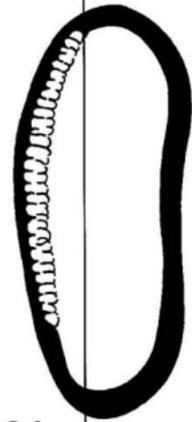
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25

1 mm.



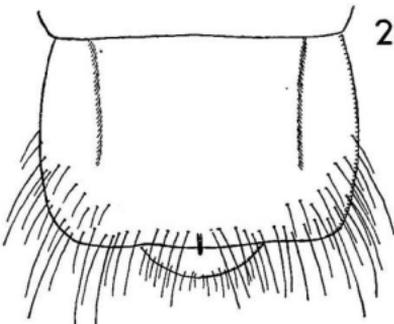
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0.1 mm.



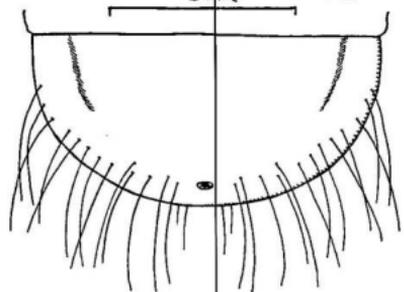
27

0.25 mm.



28

1 mm.



29

Nesithmysus bridwelli Perkins, 2 larvae, Waianae Mts., Oahu, November 14, 1937 (O. H. Swezey); 3 larvae, July 23, 1929, ex *Pelea* (O. H. Swezey).

N. haasii Perkins, 1 larva, Kahana, Oahu, February, 1931 (O. H. Swezey).

Callithmysus microgaster (Sharp), 1 larva, 2 pupae, 1 imago, no locality, ex *Bobeia* (O. H. Swezey); 1 larva, Kahuku, Hawaii, February 15, 1928.

C. koebelei Perkins, 1 larva, Tantalus, Oahu, January 2, 1928, ex *Pipturus* (O. H. Swezey).

4. Lamiinae

Acanthocinini

Lagocheirus obsoletus Thomson

Mature larva (figs. 24-25). Length up to 34 mm.; maximum breadth 6.5 mm. **Head** (fig. 24) strongly depressed with sides slightly constricted just before middle (maximum head-width 3.1 mm.) and slightly converging posteriorly; antennal foramen open behind; mouthframe ferruginous, very strongly and rather broadly sclerotised; frons with 8 setiferous pores and numerous minute setae. Genae strongly shouldered and protuberant, strongly sclerotised, pitchy and rugose. One pair of ocelli present; lens ferruginous; pigmented spot indistinct. Hypostoma flat, smooth, ferruginous; sutures pitchy and slightly curved; gular region with a pale cleavage line on each side of which is a rugose area bearing 4-6 setae. Antenna 2-segmented, segment 2 bearing a conical hyaline process. Maxillae strongly sclerotised with palpi 3-segmented; segment 3 about two-thirds length of segment 2. **Prothorax** with antero-lateral regions with numerous long ferruginous setae; posterior half of pronotum asperate, with small, scattered, lenticular glabrous areas. **Abdomen** with ampullae with a single transverse impression, a conspicuous pair of lateral furrows and a broad, rather deep longitudinal furrow; non-tuberculate, dull, velvety spiculate. Segment 9 without a caudal spine. Epipleurum protuberant on last 3 segments only. Pleural tubercle (fig. 25) broadly oval, with a pair of sclerotised pits and at least 10 setae. Anus trilobate. **Legs** absent. **Spiracles** with peritreme round, thick, testaceous.

Pupa. Length 21 mm.; breadth 9.5 mm. **Head** with vertex visible from above and deeply excavate between antennae; bearing a few short spines (each with a basal seta) behind base of each antenna; front with groups of 2-4 spines near base of each antenna, half-way between and at inner margin of each eye and at base of clypeus. Antennae extending as far as abdominal segment 5 where (in the female only?) they are strongly recurved and directed anteriorly to terminate alongside mid-coxae. Eyes feebly convex, glabrous. Mandibles each with a spine near middle of outer face. Labrum slightly transverse, with front margin strongly rounded and glabrous or almost so. **Pronotum** strongly transverse, with sides bearing a pair of stout tubercles; numerous short spines are present especially along front margin. **Mesonotum** smooth, with about 6 small spines; scutellum depressed, glabrous. **Metanotum** smooth, with about 4-6 spines on each side of scutellar groove which is shallow. Elytra each with a conspicuous spine near base. Elytra and wings extending as far as abdominal segment 4. **Abdomen** with tergites 1-6 with anterior half with a median oval, tuberculate, spinose protuberance and posterior half with a transverse row (interrupted medially) of short spines. Seventh tergite bearing numerous, much stouter incurved spines. Tergite 8 with similar spines; tergite 9 very short, truncate apically and bearing a pair of large, incurved spines (urogomphi?). Sternites glabrous. Pleura rather strongly protuberant, rugose. **Legs** with fore- and mid-femora clavate, each femur with a row of spines near apex; mid- and hind-femora each with a long tuberculate process near base²; hind-femora extending to abdominal segment 4; hind-tibiae with a row of

² Similar tuberculate processes are present apparently in all species of Acanthocinini (see Duffy, 1953).

spines; all tibiae more or less at right-angles to longitudinal axis of body. *Functional spiracles* present on abdominal segments 1-6, where they are placed laterally; peritreme rather narrowly oval, moderately thick and slightly raised above general level of cuticle.

Material studied: 8 larvae, 3 pupae, 1 imago, Honolulu, August 22, 1951, ex dead branches of breadfruit tree; 1 larva, 1 pupa, 1 imago, Niu Valley, Oahu, October 30, 1928, ex "kukui" log (O. H. Swezey); 3 larvae, 1 pupa, 1 imago, no data.

Host plants: *Plumeria rubra*, *Hibiscus*, Allamanda vine, *Araucaria*, *Euphorbia multiformis*, *Pseudopanax*, "kukui," Ceara rubber.

Biology. According to Bridwell (1920) this cerambycid attacks unhealthy or injured stems of *Euphorbia multiformis*. After destroying the main stem and branches while the plant is living, it then pupates therein.

Mesosini

Coptops aedificator (Fabricius)

Mature larva (fig. 26). Length up to 36 mm.; maximum breadth (at prothorax) 7.5 mm. *Head* moderately depressed, slightly elongate, widest at middle and abruptly and strongly constricted near posterior third; frontal sutures distinct for entire length; antennal foramen open behind; mouthframe strongly and broadly sclerotised. Frons entirely ferruginous with 8 setiferous pores which are feebly longitudinally impressed; 6 epistomal setae present. One pair of ocelli present; ocellar lens round, feebly convex; pigmented spot rather indistinct. Hypostoma ferruginous, with front margin more darkly so; an abrupt, widely-curved ridge across middle; one pair of distinct setiferous pores present; sutures distinct, pitchy and slightly incurved. Gular region with a pale median cleavage line. Antenna with segment 2 only slightly transverse; segment 3 cylindrical, three times as long as broad, as long as segment 2; supplementary process shorter than segment 3. Maxilla with palpal segment 3 acutely conical, as long as segment 2. Labial palpi with segment 2 cylindrical, about half length of segment 1. Mentum not distinct from submentum. *Prothorax* with pronotum very faintly striate and glabrous. *Abdomen* with each dorsal ampulla with a single transverse, curved furrow and two transverse rows of glabrous tubercles, anterior to which are a few irregularly arranged ones; the two rows are interrupted by the median longitudinal furrow. Ventral ampullae with two rows of tubercles. Segment 9 with a small erect spine (which is not inserted on a sclerotised plate) on middle of posterior margin. Epipleurum protuberant on all segments. Pleural tubercle small, with the ventral sclerotised pit rather large and very distinct. *Legs* absent. *Spiracles* (fig. 26) with about twenty-four marginal chambers.

Material studied: 4 larvae, 2 imagos, Liverpool, Lancashire, August, 1948, ex *Azelia* imported from East Africa (M. G. de C. Fraser), in the collection of the British Museum (Nat. Hist.).

Host plants: *Acacia arabica*, *Acacia* sp., *Acrocarpus fraxinifolius*, *Aegle marmelos*, *Albizia lebbek*, *Bauhinia purpurea*, *B. retusa*, *B. vahlii*, *B. variegata*, *Bombax malabaricum*, *Buchanania latifolia*, *Butea frondosa*, *Coffea arabica*, *Careya arborea*, *Cassia siamea*, *Cudrania javanensis*, *Dalbergia paniculata*, *Excoecaria agallocha*, *Ficus glomerata*, *F. religiosa*, *F. sp.*, *Garuga pinnata*, *Hevea brasiliensis*, *Holoptelea integrifolia*, *Lannea grandis*, *Manihot glaziovii*, *Millettia auriculata*, *Mucuna imbricata*, *Pavetta indica*, *Pongamia glabra*, *Pterocarpus marsupium*,

Pueraria tuberosa, *Semecarpus anacardium*, *Shorea robusta*, *Spatholobus roxburghii*, *Terminalia bellerica*, *T. tomentosa*, *Wrightia tinctoria* (Beeson & Bhatia, 1939). Fraser (1949) records this species from *Afzelia* sp. and the present writer has recently received a specimen from *Artocarpus* sp.

Biology. According to Beeson and Bhatia (1939) larvae of this species feed either subcortically or actually in the inner bark, and the damage they do to the sapwood is only superficial, for even the pupal cells are constructed almost entirely in the bark. Fraser (1949) confirms this, although he noticed that three larvae under observation had burrowed deeply into the sapwood to pupate; but this change of habit, as he points out, was probably occasioned by the excessive drying-out of the wooden block. The emergence hole is circular, but usually somewhat ragged (owing to the thinness of the bark?). Emergence occurs more or less throughout the year, although the main period in India is in June. The life-cycle normally lasts a year.

Parasites. Hymenoptera: *Scleroderma immigrans* Bridwell.

Niphonini

Prosoplus bankii (Fabricius)

Mature larva. Length 21 mm.; breadth (at prothorax) 4.5 mm. *Head* moderately depressed, elongate, with sides slightly diverging to middle, then strongly converging posteriorly and abruptly constricted at posterior third; frontal sutures indistinct; antennal foramen open behind. Frons smooth, testaceous, with 8 setiferous pores near front margin; 6 epistomal setae present. One pair of ocelli present; lens rather strongly protuberant; pigmented spot indistinct. Hypostoma ferruginous (front margin more darkly so), slightly convex; one pair of distinct setiferous pores present; sutures distinct, slightly incurved. Gular region with a pale median ventral cleavage line. Antenna 3-segmented, the second segment bearing a minute conical, hyaline supplementary segment; segment 3 subquadrate. Maxilla with segment 3 of palp about as long as segment 2. Labial palpi with segment 3 about two-thirds as long as segment 2. *Prothorax* with pronotum very faintly striate and glabrous. *Abdomen* with each dorsal ampulla with a single transverse furrow and two transverse rows of glabrous, moniliform tubercles, anterior to which are a few irregularly arranged ones; these rows not interrupted by median furrow. Ventral ampullae with two rows of tubercles. Segment 9 without a terminal spine (with a few fine setae only). Epipleurum protuberant on all segments. Pleural tubercle small, with only the ventral sclerotised pit distinct. *Legs* absent. *Spiracles* with peritreme broadly oval.

Material studied: 8 larvae, 1 imago, Molokai, November 2, 1928, ex "pigeon pea" stem, (O. H. Swezey).

Host plants: "pigeon pea," *Euphorbia*, *Crotalaria*, *Prosopis*, *Capparis*, *Erythrina*, *Citrus*.

Pterolophia camura Newman

Mature larva (fig 27). Length up to 21 mm.; maximum breadth (at prothorax) 4.2 mm. *Head* rather strongly depressed, elongate, with sides slightly diverging to middle then strongly and broadly constricted posteriorly; frontal sutures indistinct; antennal foramen open behind. Frons smooth, broadly castaneous and with 8-10 long setae near front margin; 6 epistomal setae present. One pair of ocelli present, lens oval, protuberant, with pigmented spot distinct. Hypostoma micro-granulate, with front

margin very narrowly ferruginous; one pair of distinct setiferous pores present; sutures distinct, slightly incurved. Gular region with a pale median cleavage line. Antenna (fig. 27) with segment 2 short, transverse; segment 3 slightly longer than broad and bearing an apical appendage; supplementary process conical, nearly as long as segment 3. Maxillary palpi with segment 3 almost as long as 2. *Prothorax* with pronotum pale testaceous anteriorly and with a fringe of setae across front margin and several long setae laterally; posteriorly smooth and shining. *Abdomen* with each dorsal ampulla with a single transverse furrow and 2 transverse rows of oval, glabrous tubercles surrounded medially and sublaterally by additional tubercles; narrowly but deeply interrupted by the median furrow. Ninth segment with several very long ferruginous setae and with a minute median spine near hind margin. Anal lobes with shorter setae. *Spiracles* with peritreme subcircular, thick.

Pupa. Length up to 14 mm.; maximum breadth 4.5 mm. *Head* with vertex visible from above, smooth, broadly excavated between antennal tubercles and with a pair of setae at base of each of them; front smooth, with about 5 setae around each eye; clypeus with a transverse row of 6 setae; labrum with numerous long setae on each mandible. Antennae short, extending as far as apices of elytra. *Pronotum* slightly transverse, widest posteriorly; disc with a few minute scattered setae. *Mesonotum* with an oblique row of setae on each side of middle. *Metanotum* with scattered short setae on each side of scutellar groove which is broad and shallow. *Elytra* and wings extending to abdominal segment 4. *Abdomen* entirely microscopically granulate; tergites 1-6 each with 2 transverse rows of scattered, short stout spines (each with a basal seta); tergite 7 elongate, tapering posteriorly and with numerous similar scattered setae; tergite 8 short, transverse, with a row of short spines on hind margin. Segment 9 retracted into segment 8. Sternites each with 2 or 3 lateral setae. *Legs* with hind femora extending nearly as far as segment 4; femora with a few fine scattered setae; tarsi glabrous. *Functional spiracles* with peritreme narrowly oval.

Material studied: 3 larvae, 2 pupae, 1 imago, Honolulu, June 6, 1951, ex dead avocado branch.

Ptericoptini

Opsis nutator (Fabricius)

Mature larva (fig. 28). Length 17 mm.; maximum breadth (at prothorax) 3.1 mm. *Head* rather strongly depressed, elongate, with sides converging behind middle (maximum head-width 1.4 mm.); frontal sutures indistinct; antennal foramen open behind. Frons smooth, with 8 setiferous pores; 6 epistomal setae present. One pair of ocelli present; ocellar lens thick, oval, convex; pigmented spot indistinct. Hypostoma slightly convex, granulate; one pair of setiferous pores present; sutures distinct, ferruginous, slightly curved and converging posteriorly. Gular region with a pale median cleavage line. Antenna 2-segmented, segment 2 bearing a hyaline, dome-shaped process. Maxilla with segment 3 of palp about as long as segment 2. *Prothorax* with antero-lateral regions bearing numerous long, fine, silky setae; posterior part of pronotum shining, faintly longitudinally rugose. Eusternum separated from sternellum by a transverse impression. *Meso- and metanotum* dull, microscopically granulate. *Abdomen* with dorsal ampullae slightly bilobed, comprising a pair of oval areas of subcontiguous, moniliform tubercles, a transverse impression and a broad, longitudinal, median furrow. Ventral ampullae with 2 transverse rows of tubercles. Segment 9 with a pair of dorso-lateral, curved impressions and a minute tubular, strongly sclerotised process (fig. 28); setae pale yellowish white. Epipleurum protuberant on all segments. Pleural tubercle small, with only the ventral sclerotised pit distinct. *Legs* absent. *Spiracles* with peritreme round, thin, testaceous.

Material studied: 4 larvae, 2 imagos, Oahu, Manoa Valley, December 28, 1931, ex *Pipturus* (O. H. Swezey).

Host plants. *Pipturus*.

Sybra alternans Wiedemann

Mature larva (fig. 29). Very similar to that of *Oopsis nutator* (Fabricius) from which it differs as follows: Length 12 mm.; breadth (at prothorax) 2.9 mm. *Meso-* and *metanotum* slightly shining, smooth. *Abdomen* with ampullae not bilobed. Tergite 9 (fig. 29) with caudal process bearing a minute transverse, oval sclerotised plate; setae pale ferruginous.

Material studied. 1 larva, 1 imago, Honolulu, January 3, 1952, ex branch of *Hibiscus*.

Host plants. *Hibiscus*, *Ficus*, *Cordia*, etc.; polyphagous. Also found in the pseudo bulbs of orchids (*Dendrobium* and *Cattleya* spp.).

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