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The Embiidina of Eastern Asia, Part I

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The embiid fauna of eastern Asia is rich and varied. Besides the Cretaceous amber fossil, *Burmitembia venosa* Cockerell, the extant fauna comprises eight families, of which four will be treated or proposed in Part II. Definition of some of the families is strengthened by inclusion of species occurring west of Myanmar. This, and future contributions on this fauna, almost entirely will be based on thousands of specimens the author collected and reared during several expeditions. Unfortunately, at present, research time and limited publication space permit only a résumé of this vast collection.

The richest part of eastern Asia's embiid fauna occurs in Thailand, but it diminishes southward into Indonesia. Strangely, the Philippines and New Guinea have only monotonously similar species of the widespread Indoaustralian genus *Aposthonia* Krauss, mostly treated in Part II. Because females are wingless and cannot fly, islands never connected to mainland lack embiids except for the few species inadvertently transported by man. Also, there are a few "weed" species randomly spread by man.

It is tantalizing to consider what additional taxa must occur in as yet unvisited places, such as the mountains of northern Myanmar, Laos, Vietnam, southwestern China, and other remote areas. However, author's advanced age and increasingly restrictive collecting permit requirements limit further exploration.

Key to Embiid Families of Eastern Asia (Adult Males)
(Asterisk (*) indicates treatment will be in Part II)

1 Myanmar amber fossil . . . . . *Burmitembiidae
Extant species 2
2 Wings with anterior media vein forked 3
– Media vein not forked 7
3 Distal segment of left cercus not fused to the basal segment 4
– Distal segment at least partly fused to the basal segment 6
4 Minute species (body length less than 10 mm). Inner base of left hemitergite (10 L) fused to medial sclerite (MS) which is extensively extended forward as a triangular point beneath ninth tergite. (9) . . . . . *Teratembiidae
Larger species (body length 10-18 mm). Base of tenth tergite (10) more or less straight, not greatly extended forward beneath ninth tergite 5
5 Hemitergites (10 L and 10 R) broadly separated, intervening cleft largely filled with a large sclerite (MS) . . . . . *New Family
– Hemitergites not broadly separated . . . . . Embiidae
6 Antennal segments without usually long, wavy setae. Wings maculated with irregular white areas . . . . . *Embonychidae

– Antennal segments with unusually long, wavy setae. Wings without irregular white areas . . . . . *New Family
7 Unusually small species (body length 5 mm). Left cercus with distal segment fused to apex of basal segment . . . . . *New Family
– Larger species (body length 10-18 mm). Left cercus with distal segment not fused to the basal segment. . . . . Oligotomidae

Embiomorpha, new infraorder
Embiidae Burmeister, 1836

Distribution.— African and Indian regions. Many genera from other regions, particularly Neotropical, that were once and currently placed in this family, will be assigned to other families.

Diagnosis.— Adult males monochromatic brown, alate or apterous, robust, body length averaging 12 mm. Cranium longer than broad, eyes small. In most species the mandibles are elongate, parallel-sided, with distal teeth usually curled ventrad, subapical teeth usually obscured by the dorsals. Antennal setae short. Wing vein MA always forked. Hind basitarsi short, with one or two medial papillae. Terminalia hemitergites narrowly spaced; medial sclerite (MS) inconspicuous. A flap-like projection (MF) partly extends over epiproct. Cerci two-segmented, basal segment often globose, always echinulated, at times bilobed.

Only the genus *Oedembia* has been found in NE Myanmar. Otherwise, this is a large genus with many closely related species, one of which, *O. dobhali* from southern India, was erroneously placed by the author in a subgenus, *Parembia*, of *Embia* (Ross 1950). The author has chosen the most distinctive new species of *Oedembia* from India as the best type species of the new genus.

Oedembia Ross, gen. nov.
Type species: *Oedembia dilatamenta*, Ross, sp. nov., present designation.

Distribution.— India, Nepal, Pakistan, and Myanmar.

Diagnosis.— Males with basic characters of Embiidae, but the submentum is swollen (the basis of the generic name). The lobe of the basal segment of the left cercus is unusually large, triangular, with a dorsal, horizontal fold. The right tergal process (10 RP) is very long, sharp, folded forward beneath caudal margin of 10 R. Both paraprocts and the hypandrium lobe are short, sclerotic. Hind basitarsus short with two very large papillae.

Females: Without noteworthy characters, except the two basitarsal papillae.

Remarks.— For the present, the above generic description will augment the description of the type species. The genus is most closely related to *Parembia* Davis, 1939, treated in error by the author as a subgenus of *Embia* Ross, 1950. The author now considers *Oedembia* a distinct genus because of its swollen submentum, more elongate left tergal process, shorter hypandrium process, much shorter left paraproct and longer, acute right tergal process. A transverse dorsal fold on the basal segment of the left cercus lobe is also absent in *Parembia*. There are also other distinctions.

Oedembia dilatamenta Ross, sp. nov.
Figure 1.

Holotype.— Male, on slide, CAS. India: 4 mi W Kochagaon, 75 m elev., Assam. Matured in culture 22-IV-1963 (E.S. Ross).

Description.— Large, body length 14 mm, alate. Characters are described for the genus. Head broad, quadrate; broader than long; submentum dark, transversely rugose, broad at base,

becoming narrowed and elevated anteriorly. Body length 14 mm; forewing length 10 mm, breadth 2 mm.

FEMALE: Without significant characters.

PARATYPES.— Many topotypic males (CAS), to be deposited in major entomological collections.

ADDITIONAL RECORDS (CAS).— Assam: numerous specimens from near Shillong, 1000 m elev.; Assam: Meleng Forest Reserve, 100 m elev. (males from this locality are smaller with a paler prothorax); Bengal: Badantan Forest Reserve, near Darjeeling, 1000 ft. elev.; Bengal: Ging, near Darjeeling, 4500 ft. elev.; Bangladesh: Ichamati Forest Reserve, 20 mi E of Chittagong; Nepal: 10 mi SW of Sopiyang, 1800 m elev. The above lots, and many more stocked in alcohol vials, indicate that this is a widespread species requiring future analysis. An apparently new species was collected in Myanmar. It is possible that *Oedembia* will be multispecific and prolific, as evidenced by the author's very extensive collection of specimens preserved in alcohol. The geographic range of these species may have increased as a result of colonial traffic.

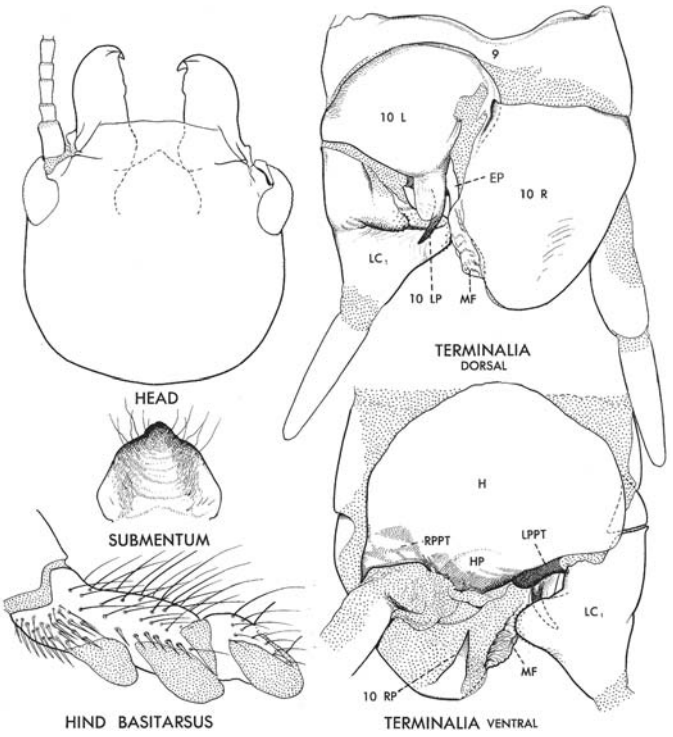

FIGURE 1. Important characters of holotype of *Oedembia dilatamenta* Ross. E.S.R (see page 599 for abbreviations).

***Oedembia burmana* Ross, sp. nov.**

Figure 2.

HOLOTYPE.— Male, on slide, CAS. Myanmar: 18 mi. SE of Mandalay, 400 ft. elev., matured in culture 29-XII-1978 (E.S. Ross).

DESCRIPTION.—Smaller than the larger, almost black *O. dilatamenta* with a paler prothorax. Submentum flatter; wings with less conspicuously white cross-veins; left tergal process not as abruptly broadened at base; basal segment of left cercus with transverse fold less prominent. Body length 12mm.

Oligotomorpha, new infraorder
Oligotomidae Enderlein, 1909

DISTRIBUTION.— Mediterranean, Middle East, Indian region, Southeastern Asia, and Australia.

DIAGNOSIS.— Males apterous or alate. Wings with MA unforked. Hind basitarsus with one or two papillae. Terminalia with medial flap (MF) separated from right hemitergite (10R) by an exten-

sive membranous area which then projects caudad as though it is a process of the right hemitergite, but actually it appears to be MF rotated caudad. Basal segment of left cercus inwardly lobed or unlobed, never echinulated. Females without distinctive characters.

Key to Genera of Southeastern Asian Oligotomidae (males)

1 Base of left cercus completely encircled by the basipodite (LCB) which projects mesad as a lobe . . . . . *Oligotoma*
– Base of left cercus with only an outer flange, which never completely encircles the cercus base and never is lobed 2
2 Basal segment of left cercus globular . . . . . *Bulbosembia*
– Basal segment of left cercus slender, never bulbous 3
3 Base of each mandible with a dorsal, thumb-like lobe . . . . . *Lobosembia*
– Mandibles without dorsal lobes 4
4 Size large, body length averaging 14 mm; often strongly bicolorous, basically blackish brown except for usually bright orange prothorax and bases of forelegs. Antennae usually distally white, setae usually longer than the bearing segment; Hind basitarsi usually with two ventral papillae. Terminalia with 10 LP usually broad, aedeagus usually sclerotic and broadened caudad . . . . . *Eosembia*
– Size medium, body length 5–10 mm. Body and legs brown throughout, prothorax only slightly paler. Antennae never white-tipped, medium brown throughout. Hind basitarsi never with two papillae. Terminalia with 10 LP slender, aedeagus not conspicuous . . . . . *Aposthonia*

***Eosembia* Ross, gen. nov.**

TYPE SPECIES: *Eosembia nepalica*, Ross, sp. nov., present designation.

NAME BASIS.— *Eos* Greek = dawn, in reference to occurrence in lands of the "rising sun".

DISTRIBUTION.— Northeastern India and southeastern Asia.

DISCUSSION.— Only a few species have been described to date but, as a result of author's collecting, at least twenty five more await description. This contribution is limited to species occurring east of India with the exception of the new species, *Eosembia nepalica*, from lowlands of Nepal. It is selected as the type of the genus because it is so distinct that it should never be regarded as a congener of any species of the related, large, widespread genus *Aposthonia* Krauss. In some cases it is difficult to establish a sharp division between the two genera. Noteworthy *Eosembia* characters include in many of its species white distal antennal segments and two papillae on the hind basitarsi. Most males also have conspicuous sclerotization of the ejaculatory duct. In this character, and many others, there is inconsistency within the genus but none of these have a second hind basitarsal papilla.

Unlike smaller species of *Aposthonia*, those of *Eosembia* spin conspicuous galleries on the surface of tree trunks or road banks. In at least one species, freshly-spun silk has a violaceous sheen which later becomes white. Eggs are laid in a single-layered cluster covered with pulverized bark or feces. Broods are highly gregarious, develop in unison.

The largest concentration of *Eosembia* species occurs in evergreen forests of Assam (about 20 new species) and in Bangladesh (five new species). These, and previously-described species from India, will be treated in author's forthcoming general coverage of Embiidina of the Indian region.

During almost year-long travels in India (1961–62), the author encountered no *Eosembia* south of the Ganges, or in the damp evergreen forests of SW India. Perhaps species were unable to cross the central drier life zones of the subcontinent.

Diagnosis.— Males large. In all but one east-of-India species (*spatha*), the thorax and forelegs are bright orange, other body parts are brownish black. West of Myanmar all species are entirely brownish black. Cranium small, slender, sides often caudally convergent. Eyes medium to small. Antennae very long, usually 28-segmented; distal segments abruptly white in some species and most segments bear very long, wavy, erect setae, as in the unrelated genus *Ptilocerembia*. Mandibles oligotomoid; submentum sclerotic but rather small, its sides and anterior margins strongly inflexed. Wings relatively large, darkly pigmented with violaceous luster; hyaline stripes very narrow, sharply defined; wing veins relatively well sclerotized, venation oligotomoid. Hind basitarsi elongate, plantar setae dense; a second papilla usually is small, acute, at times reduced to a minute, flat, circular spot, or very rarely it is absent. Abdominal terminalia basically oligotomoid with following features: Left tergal process (10 LP) usually slender, rather straight but in a few other species it is broad, spatulate, strongly depressed at its base, then curved upward distad; never distally divided into subprocesses. Hypandrium process (HP) often trough-like, occasionally twisted leftward exposing its surface to dorsal view. Ejaculatory duct (GON) usually extensively sclerotized, often a single filament extending its full length within HP; at times flattened and flared caudad, forming a flange between apices of 10 LP and HP. Left paraproct (LPPT) often extensively membranous on inner-basal side, but always with a sclerotic apical hook directed outward which sometimes is large and bulbous. Left cercus-basipodite (LCB) is a large, sclerotic flange fused to outer basal rim of the left cercus without trace of an inner lobe or ring. Basal segment of left cercus slender, varying from a simple cylindrical form to distally-expanded and lobed; other cercus segments normal, always sclerotized.

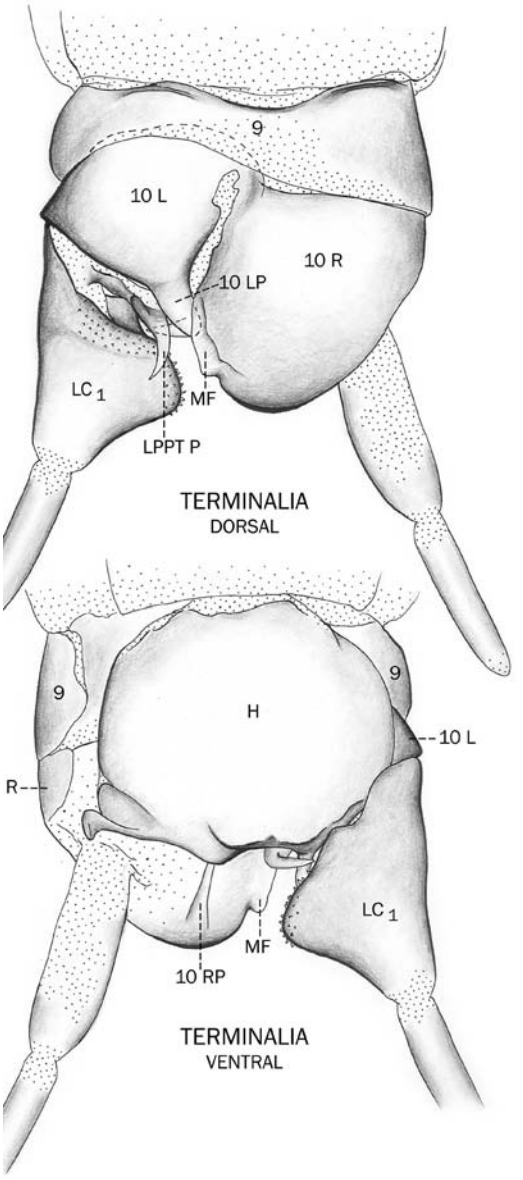

Figure 2. Important characters of holotype of *Oedembia burmana* Ross. J.C. (see page 599 for abbreviations).

Females: Large, robust, richly pigmented. Often with distal antennal segments abruptly white. In some species the prothorax and certain leg segments are bright orange, but entirely dark in others. Intersegmental areas of thorax, coxae, and trochanters often whitish. Hind basitarsi often with two ventral papillae.

Component species.— More than twenty-five species are known to author. Most are new but

not all will be described at this time. Certain previously-described species of "*Oligotoma*" will be assigned to the genus. Three species-groups are composed, as follows:

Nepalica Group

Eosembia nepalica Ross, sp. nov. described below.
Eosembia gravelyi (Kapur and Kripalani), comb. nov.
Oligotoma gravelyi Kapur and Kripalani, 1957:127. TYPE: Zool. Survey of India, Calcutta. Type locality, Kalimpong, Darjeeling District, India, comb. nov.
Eosembia montana (Kapur and Kripalani), comb. nov.
Oligotoma montana Kapur and Kripalani, 1957:129. TYPE: Zool. Survey of India, Calcutta. Type locality, Pashok, Darjeeling District, India.
Eosembia michaeli (McLachlan), comb. nov.
Oligotoma michaeli McLachlan, 1877:383. TYPE: British Museum (Natural History). Male type was collected in a London orchid house. Source of the orchid was probably NE India or Myanmar. To date no complete specimen has been found. Kapur and Kripalani's specimen (1957:124) cannot conclusively be identified as *michaeli* due to incompleteness of their specimen.

Eosembia nepalica Ross, sp. nov.

Figure 3.

HOLOTYPE.— Male, on slide, CAS. NEPAL: 2 miles E of Lamidanda, 1660 m, matured in culture (E.S.Ross).

DESCRIPTION.— Appearance: Large, slender, alate; blackish brown throughout, including antennal apices; all membranes dark. Color details (in alcohol): Cranium glossy black, lacking pattern, golden brown ventrally. Eyes lavender, with narrow, golden borders. Antennae 20-segmented; basally dark brown, blending distad to lighter brown, then tan to apex. Mandibles dark mahogany brown with piceous margins; submentum black, other mouthparts dark brown. Prothorax and its legs very dark mahogany brown with dark lavender membranes; pterothorax and its legs mahogany brown with intersegmental membranes dark creamy white tinged with purple. Wings similar in color to thorax; sclerotic areas of terminalia blackish brown except for the clear amber left process and the clouded amber apex of right process (10 RP or MF?) membranes of hypandrium lobe pinkish white; cerci very dark mahogany brown, extreme apices golden brown. Dimension (on slide): Body length 12.0; forewing length 7.5 mm, breadth 2.0 mm.

Important anatomical characters: As figured. They are: the caudally sclerotic and vaulted left hemitergite (10 L); the long, very slender, clear amber narrowly-based left process (10 LP); the basely-broad right process (10 RP or MF?) which is sclerotized half way up its inner side; the black sclerotization of the ejaculatory duct (GON); the very slender, scarcely lobed basal segment of left cercus.

ALLOTYPE.— Female, in alcohol, (CAS) from holotype's culture.

DESCRIPTION.— Appearance: Large, robust; dark brown except for white-tipped antennae, golden prothorax, and bases of forelegs. Color details: Cranium dark mahogany brown, blending to golden brown at extreme base and ventrally; eyes black; antennae dark brown to segment 17, segment 18 grayish white, segments 19 to 23 white. Submentum chestnut brown, other ventral mouthparts yellowish brown; palpi blending distad to medium brown. Cervical and prothoracic sclerites clear amber ventrally, dorsally more orange; membranes purplish, forelegs concolorous with pronotum except for mahogany brown tibiae and entire tarsi. Meso and metathoracic sclerites and legs dark, glossy chocolate brown except for tan trochanters and tibial bases. Abdominal sclerites similar with all membranes purplish white; sterna medium brown except for darker sides of

sterna 8 and the entire 9, cerci concolorous with abdominal terga. Body length 17 mm. Without noteworthy anatomical characters except for the minute subapical second hind basitarsal papilla.

Paratypes and allotypes.— Hundreds of adults from the type cultures; to be distributed in major entomological museums.

Other specimens examined.— A large cultured series from stock collected 10 mi NW of Hitaura, at 400 m in the Rapti Valley, Nepal.

Discussion.— This, one of the most western of known species of *Eosembia*, is readily distinguished by its very narrow, pale, left tergal process; broader right "process"; the larger sclerotization of ejaculatory duct; and narrower, more definite hook of left paraproct.

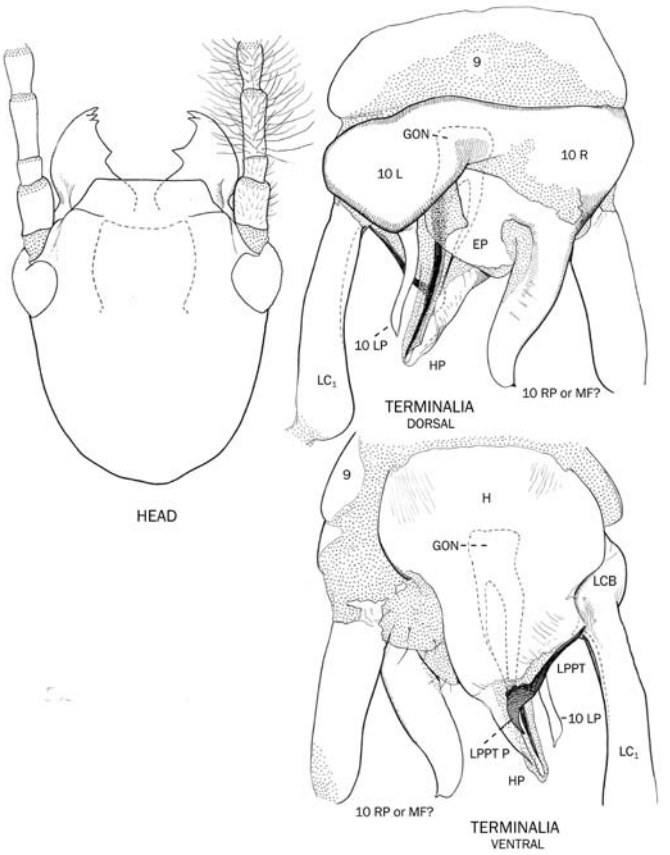

Figure 3. Important characters of holotype of *Eosembia nepalica* Ross. E.S.R. (see page 599 for abbreviations).

Biology.— The type colonies were found on the surface of road banks in a sal forest. Colonies were conspicuous white patches spun on soft granitic surfaces. Each labyrinth had a retreat leading into a rock crevice. Old silk is highly elastic and white, fresh silk is temporarily purple. In the same locality colonies also were found on and between planks of a small road culvert. Only females and third instar nymphs were found at the time of encounter in late November, 1961.

The Rapti Valley locality is much lower in altitude and largely forested with sal. Pines absent. Most galleries were found on tree trunks in deep shade, but most lacked embiids. Apparently they had been disturbed by some insectivore. Numerous tiny plokiophilid bugs were present. Only a few second or third instar embiid nymphs were present November 24, 1961, as well as a few egg masses. These were laid on bark surfaces in flat layers imbedded in a matrix of masticated bark or feces. Mature males appeared in cultures June to September, 1962.

Myanmara Group

Eosembia myanmara Ross, sp. nov.

Figures 4–5.

Holotype.— Male, on slide, CAS. Myanmar: Myamyo, 3530 ft elev. On bark of trees in the park. Matured in culture 23-I-79 (E.S. Ross).

FIGURE 4. Live adult male of *Eosembia myanmara* Ross. E.S.R

DESCRIPTION.— Very large, body length 20 mm, alate; purplish black except, in some variants, for golden posterior half of cranium. Color details (alive): Cranium golden behind eyes and ventrally, except for a faint brown pattern; anterior portion and clypeus piceous brown with ecdysial suture unusually clear. Eyes dark lavender. Antennal segments 1 and 2 piceous, all others grayish black to apex (28-segmented). Preclypeal and labral membranes lavender white, the former with two light brown sclerites; labrum piceous; mandibles glossy black; palpi dark brown; submentum sclerotic, orange tinged with piceous. Cervical sclerites yellow, some portion piceous brown; membranes purplish white. Pronotum basically yellow but margined, especially caudally with purplish dark brown. Pterothorax and its membranes various shades of purplish brown, except for scutae which basically are grayish cream. Legs mottled purplish brown without pale coxae. Abdomen concolorous with pterothorax except for the largely piceous brown terminalia and glossy black processes, apex of 10LP lavender white, process of LPPT and apex of 10RP or MF? translucent reddish amber. Dimensions (on slide): body length 20 mm; forewing length 10.5mm, breadth 3.5 mm.

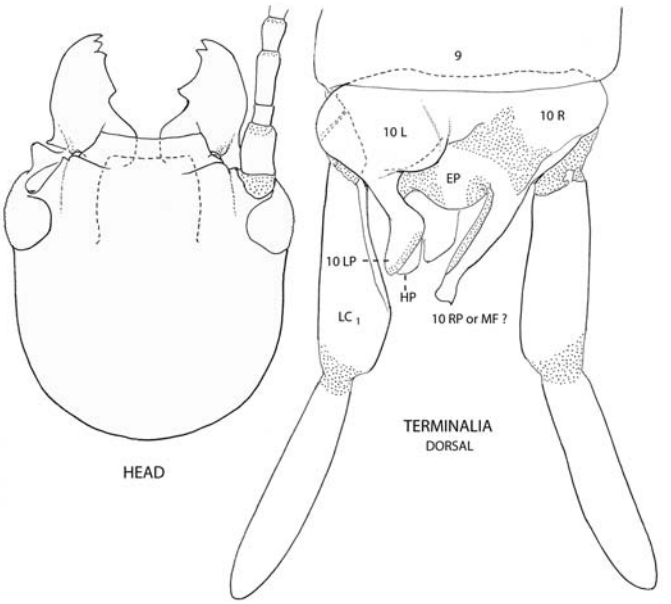

FIGURE 5. Important characters of holotype of *Eosembia myanmara* Ross. E.S.R. (see page 599 for abbreviations).

Important anatomical structures: Cranium elongate, parallel-sided. Antennae 30-segmented, setae long, apicals not white. Hind basitarsi with a large, subapical papilla. Left hemitergite with a very dark brown, inflexed, caudal margin; its process constricted, then broadened, outwardly-slant-

ed, thick and pale-edged; right hemitergite mostly membranous; epiproct, caudal margin and "process" (10 RP or MF?) very dark brown. HP tapered caudad; ejaculatory sclerite very thin. Paraproct process dark, but blunt. Basal segment of left cercus gradually expanded, but not lobed.

Allotype.— Female in alcohol (CAS) reared in holotype's culture.

Description.— Very large, body length 28 mm. Cranium mostly golden brown, frons and clypeus rugose, grading to piceous; antennae entirely dark brown except for five white distal segments. Prothorax golden with grayish white membranes; forelegs dark brown except for golden apices of femora. First acrotergite medium brown; all other body sclerites dark brown, with all intervening membranous areas white except those of thorax which are a little darker. All legs dark brown except for golden tibial "knee-joints", hind basitarsi with two, prominent papillae. Cerci entirely medium brown.

Discussion.— This species is very common on tree trunks around the town's big artificial lake in the park. The clean silk galleries are large and conspicuous, but author didn't find any during his very short visit into an adjacent patch of native forest. Because of extensive past colonial traffic, the species may have been introduced from elsewhere. Author reared a large number of paratypes in several cultures. These will be distributed in major museums.

Auripecta Group

***Eosembia auripecta* Ross, sp. nov.**

Figures 6–7.

Holotype.— Male, on slide, CAS. Thailand: 13 mi SE Lee (Li), 500 m, matured in culture 7-IV-1963 (E.S. Ross).

Name basis.— The golden pterothorax of males.

Holotype.— Male very large, alate; blackish brown, most of thorax and forelegs bright orange; antennae white-tipped. Color details (in alcohol): Cranium blackish brown dorsally, lacking pattern, ventral surface clear amber. Eyes dark lavender, narrowly rimmed with gold. Antennae 30-segmented, almost as dark as cranium except for two distal white segments tinged with tan. Mouthparts concolorous with cranium but submentum is partially dark amber. Cervical and prothoracic sclerites bright gold; all membranes dark creamy white but not strongly contrasting with sclerites. Foretarsi and tibiae concolorous with cranium, forelegs otherwise bright gold, paler than pronotum. Pleura and sterna of mesothorax golden to chestnut brown, poststernum brown; comparable sclerites of metathorax largely mahogany brown; mesothoracic tarsi and tibiae dark mahogany brown, legs otherwise chestnut brown; hind legs dark mahogany brown with membranes and tarsal papilla lavender white. Wings very dark brown with bright, violaceous iridescence, hyaline stripes very narrow, sharply defined; bordering lines of RBS bright rusty red. Abdominal sclerites, including most of terminalia and cerci, blackish brown; left tergal process (10 LP) becoming bright straw yellow distad, narrowly rimmed with reddish amber; membranes of hypandrium lobe (HP) pinkish white. Dimensions (on slide): body length 16.5 mm, forewing length 9.0 mm, breadth 2.2 mm.

Important anatomical characters: As figured and as follows: The broad, spatulate left tergal process (10 LP) with a sharp obtuse outer-apical angle; the acuminate, slender, hooked apex of the right process (10 RP or MF?); the slender, distally-flared, sclerotic ejaculatory duct (GO); the broad-based, caudally-arcuated, left paraproct's hook (LPPT P); and the long, slender, slightly lobed basal segment of the left cercus.

Allotype.— Female, in alcohol, CAS, from holotype's culture.

Description.— Large, robust; blackish brown except for the following: golden prothorax,

creamy white band between meso and metathorax, largely orange fore and mid legs, and white-tipped antennae. Color details: Cranium dark chocolate brown with mahogany ecdysial suture and caudally suffused gular area which is amber yellow; preclypeal membrane whitish. Eyes almost concolorous with cranium. Antennae 28-segmented, uniformly dark chocolate brown except for six white distal segments. Cervical and prothoracic sclerites including acrotergite (but not the poststernum) orange; associated membranes grayish cream; forelegs concolorous with pronotum except for dark mahogany brown basitarsi. Meso and metathoracic sclerites very dark mahogany brown except for clear, yellowish acrotergite and prescutum which, in combination with creamy white internal fat, creates a pale band between the thoracic somites; mid legs entirely orange, hind legs entirely dark mahogany brown except for a golden femorotibial joint. Abdomen and cerci concolorous with metathoracic scutum, dorso-pleural and intersegmental membranes contrastingly white; sternites and paraprocts golden brown except for dark areas of sterna 8 and 9. Body length 22 mm. Without noteworthy anatomical characters except for the conspicuous, medial hind basitarsal papilla; and the microsetose first valvifer with lateral sclerotization.

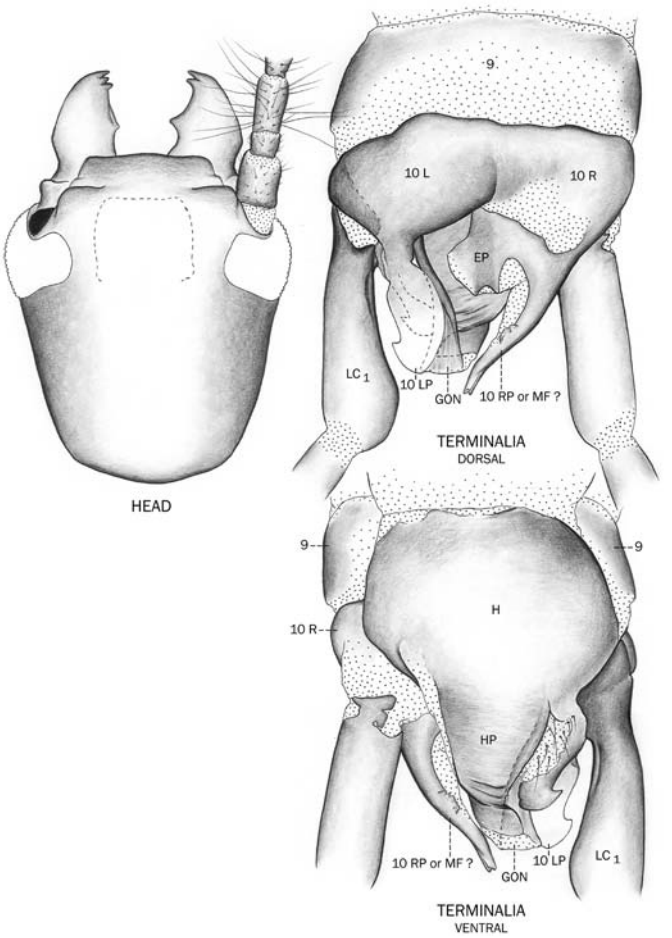

FIGURE 6. Important characters of holotype of *Eosembia auripecta* Ross. J.C. (see page 599 for abbreviations).

PARATYPES AND PARALLOTYPES.— Hundreds of adults reared in the type cultures to be distributed in major entomological museums.

OTHER SPECIMENS EXAMINED.— Large series reared from cultures stocked from the following Thailand localities: Chiang Mai's Doi Suthep; 10 mi N of Saraburi; Yan Hee Dam; Khao-Yai National Park; Banpe (13 mi SE of Rayong); hills 20 mi SE of Chantaburi; and Prachuap. It is possible that close study will show that several races or species are involved in these extensive series. Males of populations differ from that of the type in having the distal four antennal segments white as well as in other coloration characters.

DISCUSSION.— Closely related new species or races have been collected in Laos, Vietnam, and peninsular Thailand. It is probable that a difficult complex of *E. auripecta* relatives occurs throughout southeastern Asia, including *Oligotoma hainanensis* Lu from Hainan Island, China. For the

FIGURE 7. Live adult female of *Eosembia auripecta* Ross. E.S.R.

present, until related species are described, *E. auripecta* can be recognized by its terminalia characters and coloration of both sexes. Unrelated species, such as *E. aequicercata* (described below), have similar size and coloration.

BIOLOGY.— *Eosembia auripecta* principally colonizes bark of trees and logs in evergreen tropical forests, or in secondary growth; labyrinths of the highly gregarious broods may cover extensive bark surfaces. The silk isn't sprinkled with pulverized bark or feces, as in *Ptiloceremba* and some other genera, colonies of which may occur in the same habitats. In seasonally-dry forest with deciduous hardwoods, *E. auripecta* may gain security in bark crevices, as well as near the bases of saplings and stones. During author's field encounters (mid-July), mating had recently occurred; adult males apparently had been present a few weeks earlier but had since died. Adult females were present with their egg masses and early instar young. The following year adults began maturing in cultures as early as February, but peak maturity period was in April through June.

Eosembia laotica Ross, sp. nov.

Figure 8.

HOLOTYPE.— Male, on slide, CAS. LAOS: 30 km SE of Pakse, matured in culture II-1971 (E.S. Ross).

DESCRIPTION.— Appearance very large, body length 16 mm; light brown, fore body and its legs tan. Cranium narrowly convergent caudad; eyes large protruded,

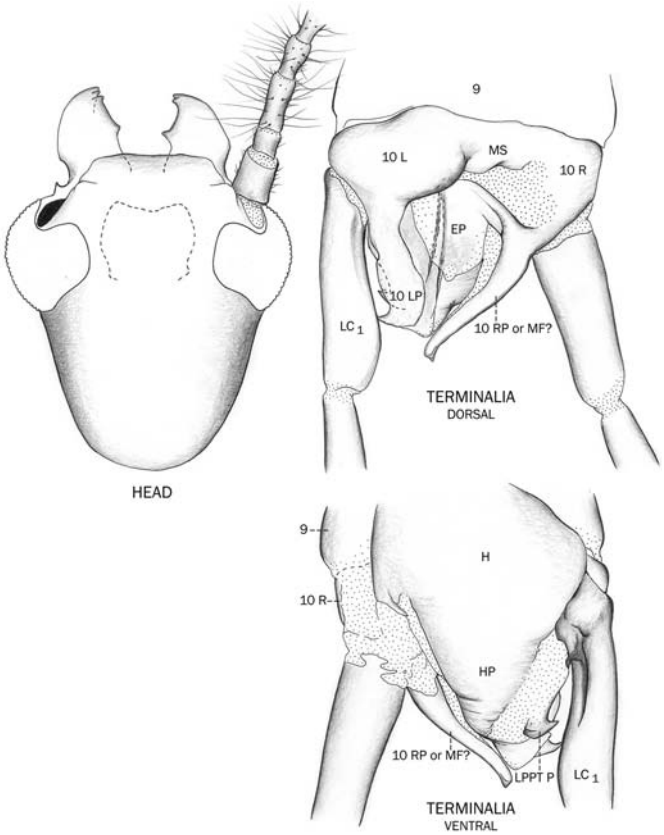

FIGURE 8. Important characters of holotype of *Eosembia laotica* Ross. J.C. (see page 599 for abbreviations).

interspace equal to an eye-width. Antennae 31-segmented, distal five white; setae long. Hind basitarsi densely setose, a second papilla not evident. Left tergal process of terminalia rather broad but narrower than that of *E. auripecta*, an otherwise similar species.

FEMALES: without significant features.

PARATYPES AND PARALLOTYPES.— Numerous topotypes reared from colonies on bark of very large trees; to be deposited in major museums.

DISCUSSION.— *Laotica* is very similar to *E. auripecta* of Thailand but differs in cranial and eye form, fewer white distal antennal segments, narrower 10 LP, and less vivid coloration. Specimens from 16 km S of Tha Teng, Bolovens Plateau, Laos, I-16-1961 (R.E. Leech) are almost identical to *E. auripecta*.

***Eosembia malaya* Ross, sp. nov.**
Figures 9–10.

HOLOTYPE: Male, on slide, CAS. MALAYA: Jor Camp, matured in culture 23-VII-1963 (E.S. Ross).

DESCRIPTION.— HOLOTYPE: Male, Cranium very dark brown anteriorly, blending caudad to yellow brown; sides straight, convergent caudad. Antennae 32-segmented, uniformly light brown except for thin-walled, abruptly-white, smaller, five distals; setae long, wavy. Mandibles dark mahogany, deeply excised, proxadental cusp of right mandible especially large, acute. Submentum sclerotic, dark mahogany; pronotum light yellow, pleura and sterna light brown, surrounding membranous areas pale yellow. All legs light brown. Abdominal terga and sterna light brown, membranous areas pale tan. Hind basitarsi with a medial

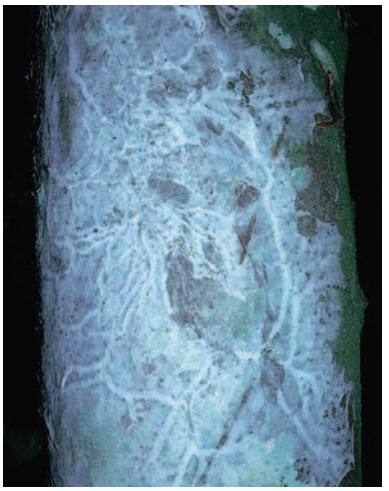

FIGURE 9. Galleries of *Eosembia malaya* Ross. E.S.R.

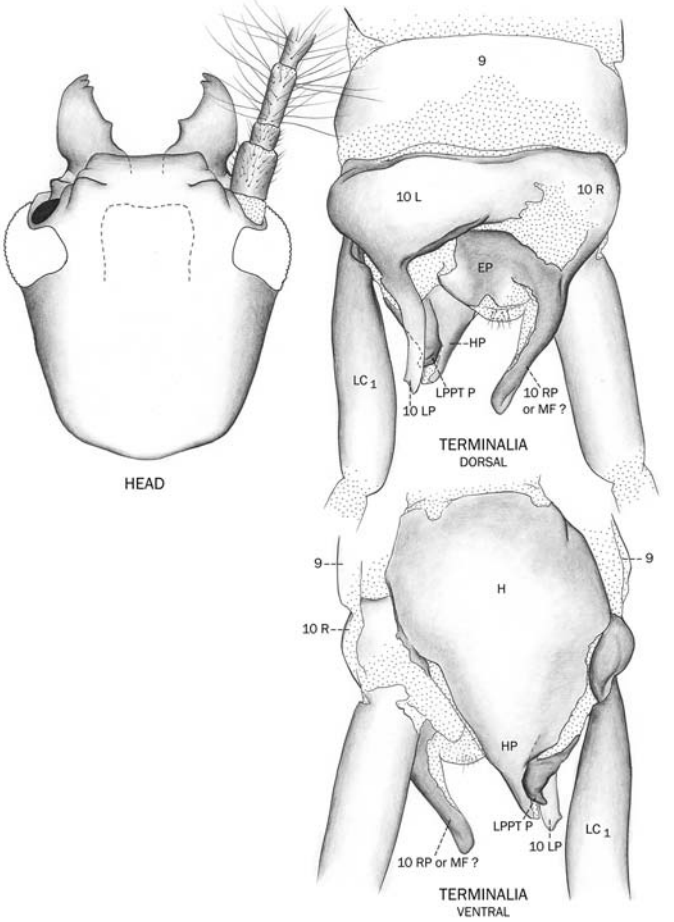

FIGURE 10. Important characters of holotype of *Eosembia malaya* Ross. J.C. (see page 599 for abbreviations).

papilla. Sclerotic surfaces of terminalia glossy medium brown, membranous surfaces white; cerci uniformly medium brown, joints grayish white. Structure of processes as figured. Dimensions (on slide): body length 17 mm; forewing length 11 mm, breadth 3 mm.

ALLOTYPE: Female, golden with faint cranial pattern; mouthparts pale tan. Antennae 24-segmented, distal segments white. Body almost entirely pale yellow. Pronotum and abdominal surfaces clouded with light brown. All legs pale yellow. Abdominal pleura creamy white; cerci entirely very pale yellow. Hind basitarsi with a medial papilla. Body length 18 mm.

PARATYPES AND PARALLOTYPES.— Numerous specimens from holotype's culture; CAS to be deposited in major museums.

DISCUSSION.— This species is unique in its extensively pale yellow coloration. Large colonies were present on several large tree trunks in a semi-cleared, once-forested area.

Thoracica Group

***Eosembia thoracica* (Davis), comb. nov.**
Figure 11.

Oligotoma thoracica Davis, 1940b:370. Cotypes: Three males, Museo Storia Nat. Genoa. Data: Burma, "Carin Chebã".

LECTOTYPE.— Present designation. One of the above cotypes was transferred to CAS. These cotypes were the basis for *Oligotoma collaris* Navás, 1927: 388, which Navás had misidentified as *Haploembia collaris* Navás 1923:14, of the Congo. On this basis Navás transferred *collaris* to the genus *Oligotoma*. Davis, 1940b, recognizing this error, justifiably proposed a new name for the Burmese males. Author has studied all specimens involved in these actions and concluded that *Oligotoma collaris* Navás, 1923, represents a valid species of the African genus *Dihybocercus* Enderlein (Embiidae).

The Lectotype, now designated, selected by author from one of the Burmese Cotypes, is treated, as follows: Lectotype, (present designation.) –Alate male, on slide, deposited in Museo Civico di Storia Naturale, Genoa. Type labels.— "Carin Chebã 900-1100 m. L. Fea. VI. 88," "*Oligotoma collaris* Nav. P Navás S. J. det." (green paper, Navás' hand), "*Oligotoma thoracica* Davis cotype" (Davis' hand).

LOCALITY INTERPRETATION.— This locality appears to be in the Thandaung Reserved Forest, Karen Hills, Toungoo Distr. S. Myanmar, 19°04′N, 96°41′E; 9010-1100 N. Snelling (1988 *Ent News* 99:12) reported that this locality is at 24°59′N, 96°52′E, a mountainous area about 105 km NW of Bhano, Kachin State, Burma.

CONDITION OF LECTOTYPE.— Originally carded, wings spread; head, mid-legs, and terminalia were mounted in balsam by Davis, 1939. Entire specimen has since been combined by author on one slide in balsam. Condition good with all appendages complete except distal antennal segments.

DESCRIPTION.— Very large, broad-winged; antennae exceptionally long, hirsute; body shining blackish brown except for an orange prothorax including its coxae, trochanters, and femora. Cranium piceous black lacking pattern, gular surface golden brown. Antennae concolorous with cranium, becoming slightly more brownish distad, distal segments never white. Submentum and other mouthparts golden blending to reddish brown. Prothorax, including first spinasternum, orange; forecoxae, trochanters, and femora golden brown (possibly orange in life); tibiae dark brown, tarsi piceous. Remainder of thorax piceous brown, shining, sclerotized areas with a violaceous luster; midcoxae, trochanters, tibiae, and tarsi medium brown, femora golden brown; hind legs entirely

dark brown. Abdomen entirely dark brown with faint violaceous luster. Dimensions (on slide): body length 19.5 mm; forewing length 10.25 mm, breadth 2.4 mm.

Important anatomical characters: Cranium narrow, oval, sides convergent behind eyes, caudal margin narrowly rounded; surface between eyes foveate and transversely rugose. Eyes small, globose. Antennae exceptionally long; basal segments stout, flagellars elongate; setae very long, erect, wavy. Mandibles short, oligotomoid. Submentum quadrate, sclerotization average; sides broadly arcuate, anterior angles rounded, apical margin shallowly emarginated. Wings with oligotomoid venation; "granular" borders of RA dark purple: pigment bands very dark, broad; hyaline stripes narrow, sharply defined; veins MA, MP, and CuA, represented only by rows of setae; cross-veins present between C and RA and RA and RP. Hind basitarsus elongate; plantar setae uniform in size and located along entire outer ventral surface, large setae irregular and sparse on inner surface; a second smaller papilla is present subapically. Terminalia with left hemitergite vaulted, its outer, inner, and caudal margins heavily sclerotized; process (10 LP) short broad, parallel-sided, apex obliquely-truncate, outer margin thin, pale amber. Right hemitergite largely membranous, sclerotic along outer margin only; process (10 RP or MF?) greatly elongated, extensively membranous on inner, apex with a small outer hook. Hypandrium process (HP) narrowly sclerotized, its margin and apex membranous, densely microspiculate (the spiculations not sharp, but disc-like); an internal, slender, rod-like sclerite parallels the narrow sclerotization of HP and probably sheaths the aedeagus. Left paraproct produced caudad as a slender sclerite bearing a large, outwardly-directed hook. Basal segment of left cercus greatly elongated, slightly constricted medially then expanded at inner apes; inner margin sclerotic, outer margin medially submembranous; outer ventral flange (LCB?) extensive, notched into side of hypandrium. Basal segments of right cercus evenly sclerotized and cylindrical.

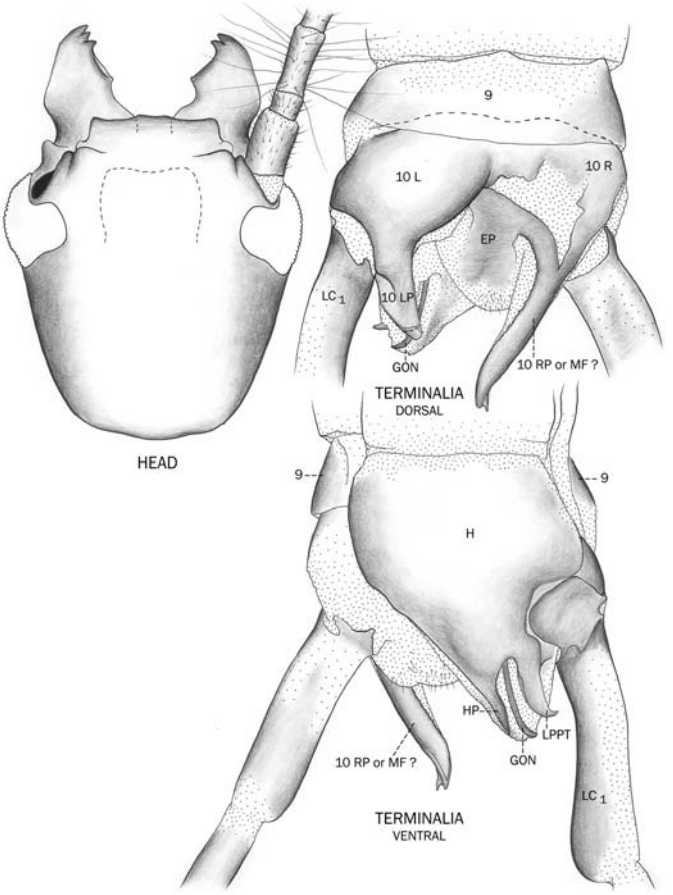

FIGURE 11. Important characters of lectotype of *Eosembia thoracica* (Davis). J.C. (see page 599 for abbreviations).

REMARKS.— A second "Cotype", Genoa museum, is of little value, because its terminalia are extensively damaged. In other characters, including color, it agrees with the lectotype. Author found a third specimen in the Navás Collection in Zaragoza, Spain. *Thoracica* is not closely relat-

ed to any other known species of its genus. Additional collecting in Myanmar will probably yield related species.

In 1979, author encountered a large colony of embiids on a tree trunk in western Shan State, Myanmar, at Sintai, 1000 ft, 30 mi E of Meiktila. Cultures produced hundreds of specimens (CAS).

The specimens appear to represent *E. thoracica*, differing only in minor terminalia structures, such as the shorter, broader of outwardly-slanted 10 LP. The cultures also provide an opportunity to briefly describe coloration of the very large females (body length 24 mm), as follows:

Antennae brown, except five whitish tan distal segments; prothorax, its legs, cervical sclerites, and first spinasternum yellowish. Remainder of thorax, cerci, and all body sclerites very dark brown; most intersclerotital membranes white, lateral membranous areas of thorax lavender, including joint membranes.

Aequicercata Group

***Eosembia aequicercata* Ross, sp. nov.**
Figure 12.

Holotype.— Male, on slide (CAS). Thailand: 13 mi SE of Lee (Li), 600 m, matured in culture 5-IV-1963 (E.S. Ross).

Name basis.— Reference to the almost equal left and right cerci of males.

Description.— Appearance very large, alate, blackish brown except for bright yellow prothorax. Antennal apices tan, never white. Color details (in alcohol): Cranium glossy blackish brown, lacking pattern; gula and margins of occipital foramen amber yellow. Eyes dark purple but paler than cranium. Antennae 25-segmented, the basal one brownish mahogany, segment 2 lighter, 3-5 pale yellow, others blending to blackish brown, extreme apex blending to tan. Cervical and prothoracic sclerites golden; poststernum blending to brown; membranes basically creamy white tinged with pink. Forelegs mahogany brown, trochanters and coxae golden. Pterothorax and its legs dark mahogany brown with dark purple membranes. Abdomen matching the color of pterothorax except for more blackish cerci and terminalia. Apex of left process dark amber. Dimensions (on slide): body length 16.5 mm; forewing length 9.0 mm, breadth 2.2 mm.

Important anatomical characters: As figured. Antennal segments rather short; setae shorter than segment-width, not erect or wavy. Cranium convex, elongate-oval; eyes small, located forward. Mid hind basitarsal papilla very close to the distal one. Left tergal process (10 LP) long, narrow, gradually arced leftward, evenly tapered to apex. Right process (10 RP or MF?) parallel-sided except for an abruptly tapered apex. Ejaculatory duct lacking sclerotization. Left paraproct (LPPT) a broad plate fused at base to hypandrium (H), bearing a small, barb-like apical point directed leftward. Basal segment of left cercus constricted, sclerotic at base, gradually expanded distad but not abruptly lobed, almost equal in form to basal segment of right cercus; distal segments of cerci exceptionally stout, almost as thick as basal segments.

Allotype.— Female, in alcohol, CAS. From holotype's culture.

Description.— Very large, robust; blackish brown except for orange prothorax and basal segments of forelegs and white-tipped antennae. Color details: Cranium blackish, lacking pattern, becoming golden ventrally. Antennae mostly concolorous with cranium, sub-basal segments 2 to 5 chestnut brown, distal segments 24 to 27 white. Cervical and prothoracic sclerites bright orange (including most of poststernum), surrounding membranes pinkish cream. Meso and metathoracic sclerites varied shades of dark mahogany brown; surrounding membranes dark purple, those between somites not forming a pale band. Forelegs concolorous with prothorax except for

mahogany brown tibiae and tarsi; mid and hind legs concolorous with respective thoracic somites except for yellowish femorotibial joint. Abdominal coloration similar to that of meso and metathorax; sclerotic areas of sternites 8 and 9 not much darker than others. Body length 19 mm.

Important anatomical characters: Mid hind basitarsal papilla, almost as large as the distal, are located just distad of midsegment. First valvifer weakly sclerotized and laterally setose, but not medially; aperture of accessory gland without special surrounding structure.

Paratypes and paralllotypes.— Hundreds of adults reared in the type culture; will be distributed in major entomological museums.

Discussion.— *Eosembia. aequicercata* is most closely related to *E. varians* (Navás) of SW China, including Hong Kong. Principal differences are in coloration, mandibular form, and the more slender tergal processes of *E. aequicercata*. Two other new species, from Vietnam and northern Thailand, have more slender males but have in common an absence of sclerotization of the ejaculatory duct. These four species form a distinct species-group characterized by the last mentioned character.

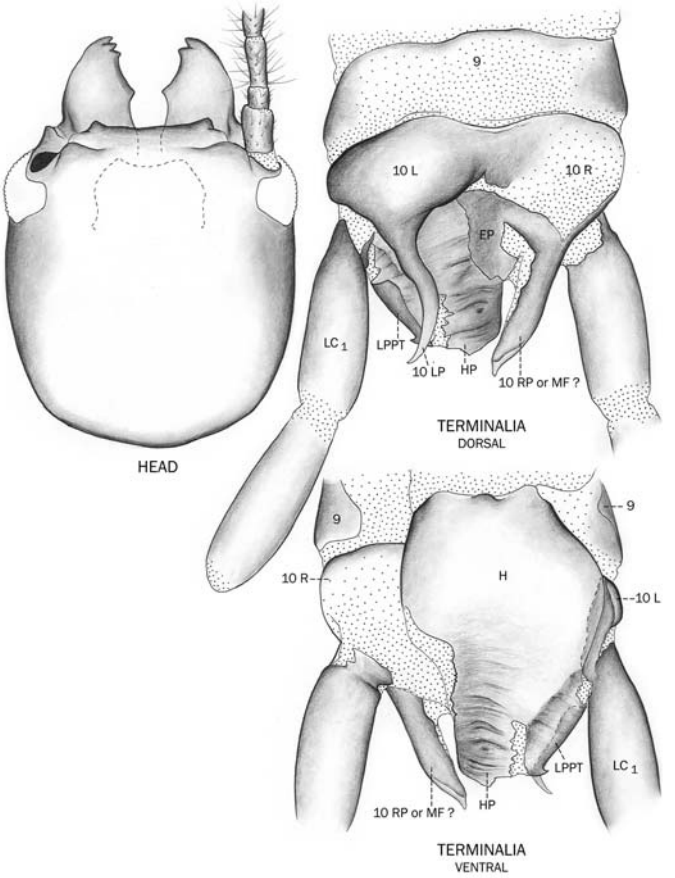

Figure 12. Important characters of holotype of *Eosembia aequicercata* Ross. J.C. (see page 599 for abbreviations).

Biology.— The type locality is a rocky ridge in low hills covered with open hardwood forest subject to seasonal drought and fires. Stock for cultures comprising only adult females and egg masses was collected 19-VII-1962 soon after first rains of the wet season. Colonies occur in dry bark crevices, on the sides of stones, and on bases of small saplings. *Auripecta* occurs in the same habitats but its females are distinguished, among other characters, by their yellowish or orange midlegs and a pale meso-metathoracic intersomital band.

Progeny began maturing during February of 1963 and continued through May with peak maturation during April. This periodicity was repeated in 1964 broods.

Eosembia varians (Navás), comb. nov.

Oligotoma varians Navás, 1922:32. Davis 1940b:376.
Aposthonia varians (Ross), 1978:3.

Holotype.— Alate male, on slide, Mus. Nat. d' Hist. Nat. Paris.

Description.— Males large, body length 14 mm; alate, entirely black. Cranium, and all sclerotic portions of body and appendages black; all antennal segments black, distally becoming tan but never white; setae not long and wavy. Mandibles and submentum reddish mahogany. All abdominal portions, including terminalia, mahogany; 10 LP broad, tapered and arcuated caudad; cerci dark tan, the left expanded but not abruptly lobed. Second papilla of basitarsi not evident, except as a small, flat, less-sclerotic spot.

Female Hong Kong specimen: Large, bicolorous. Cranium very dark brown, alutaceus. Antennal segments almost black, five distals small, white. Prothorax orange, slightly mottled with tan; forecoxae, trochanters, and femora orange. Foretibiae medium brown, fore-tarsi, metathorax, and abdomen concolorous with cranium; membranous portions of thorax lavender. Cerci dark brown. Body length average 16 mm.

Discussion.— This is a widespread, endemic species in SW China, closely related to *O. aequicercata* but differing in minor details, such as antennal coloration. Conspecific males have been collected in several localities, as reported in author's 1978 paper. The largest population was encountered on deforested heights (now grasslands) of Tai Mo Shan, above New Territories, Hong Kong. Cultured specimens served as a basis for the above redescriptions.

Spatha Group

Eosembia spatha Ross, sp. nov.

Figure 13.

Holotype.— Male, on slide, CAS. Myanmar: Taung-gyi (Taunggy), 4712 ft elev., matured in culture 20-III-1979 (E.S. Ross).

Name basis.— Gr. *spathe* = broad sword, refers to broad left tergal process.

Description.— Moderately large, body length 12 mm, alate; entirely black, including antennal apices. Color details (alive): Cranium jet black, surface alutaceous, but glossy. Eyes purplish black. Antennae entirely black, excepting slightly paler distal segments, membranes rusty red. Preclypeal and labral membranes rusty red; all sclerotized portions of mouthparts glossy black, membranes pinkish. All thoracic sclerites and legs glossy jet black, associated membranes pink with a dark, rusty red, subcutaneous tinge. Wing bands smoky black, hyaline stripes narrow, sharply defined; costal and radial borders bright rusty red. Abdominal terga 1 to 9 dark brown, membranes similar to those of thorax. Terminalia sclerites glossy jet black except for left tergal process (10 LP) and

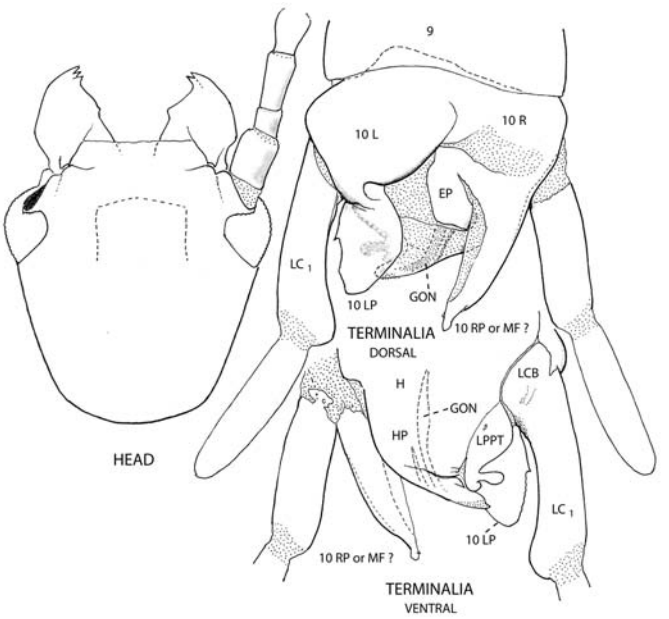

Figure 13. Important characters of holotype of *Eosembia spatha* Ross. E.S.R. (see page 599 for abbreviations).

left paraproct process (LPPT-P) which are translucent mahogany brown; cerci mostly blackish with dark purple membranes.

Anatomical characters: Antennal setae very long, gradually shorter distad. Hind basitarsi with a small, almost terminal papilla. Left process of terminalia very broad, scoop-like, inner side evenly arcuate, outer side straight with a small, acute basal projection; hypandrium lobe (HP) sclerotic, short, broadly arcuated toward right and dorsad; left paraproct not fused to HP, sclerotic and bearing a prominent, thumb-like lobe adeagus sclerite arcuated basad beneath HP. Basal segment of left cercus incurved but not lobed.

Discussion.— This is a very distinctive species that might later be assigned to a separate new genus. Only a few males (CAS) were reared from stock collected in bark of small trees in front of the district headquarters building. Time didn't permit more extensive collecting.

Aposthonia Krauss

Figure 14.

Aposthonia Krauss, 1911: 48.— Enderlein, 1912:100 (as syn. of *Oligotoma* Westwood).— Davis, 1936:233; 1940b:363 (as syn. of *Oligotoma*).— Ross, 1956b:316 (as valid genus); 1963:135.
Oligotoma (*Aposthonia*) Krauss, Ross, 1955:2.

Type species.— *Aposthonia vosseleri* Krauss, 1911: 48 (= *Oligotoma borneënsis* Hagen), original designation.

Distribution.— Tropical Asia, north to southern Japan; Indonesia, Melanesia, and throughout Australia. A few species spread by man to Oceania, New Caledonia, Madagascar, and east African coasts. Absent in Afrotropical region and the Americas.

Diagnosis.— Males: Very small to moderately large, body (length 5–17 mm); apterous or alate; coloration diverse, never with antennal apices white, or body and legs brightly pigmented as in many *Eosembia*. Hind basitarsi never with more than one papilla. Terminalia basically as in *Eosembia* but never with prominent internal phallic sclerotization. Distinguished from *Oligotoma* by absence of mesal lobing of the left cercus-basipodite and simplicity of the left paraproct process. Females

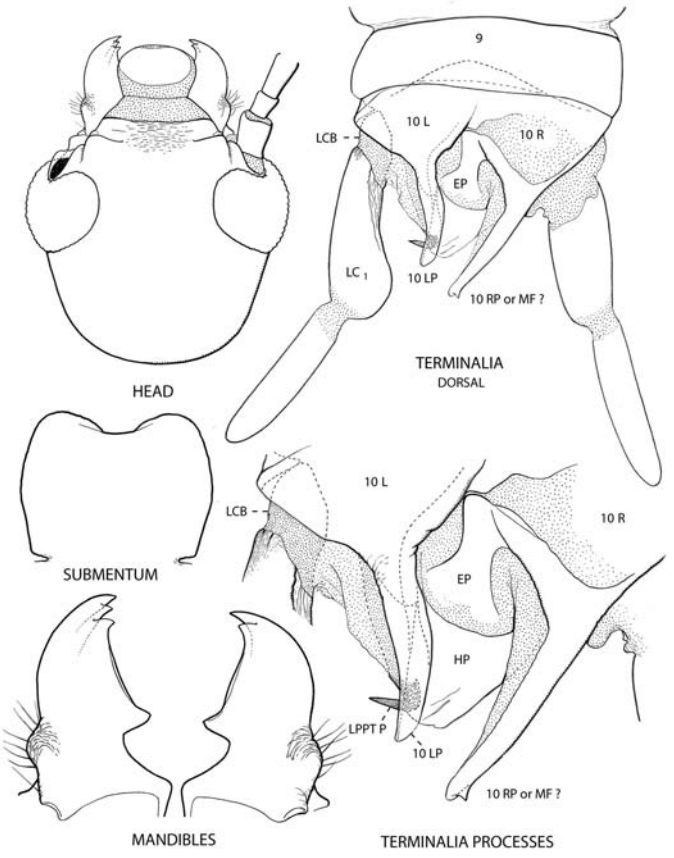

Figure 14. Important characters of holotype of *Aposthonia borneënsis* (Hagen). E.S.R. (see page 599 for abbreviations).

readily separated from those of *Eosembia* by absence of white apical segments of the antennae and lack of a second hind basitarsal papilla.

Discussion.— There has been hesitation to accept *Aposthonia* as a valid genus. However, a survey of the many known and new species in author's collection reveals a wide range of species-groups, some of which eventually may prove to represent distinct genera or subgenera. It is author's regrettable practice to use *Aposthonia* as a "catch-all" for oligotomoid species-groups insufficiently distinct to be treated as genera.

Potentially *Aposthonia* is the largest genus of the order, often with monotonously-similar species distinguished by combinations of minor differences in size, coloration, and not, as a rule, by striking male terminalia characters. Only the type genus will be treated at this time. Many of the scores of other species will be covered in Part II of this study, as well as in future publications.

Oligotoma Latreille

India has many endemic species of this important genus, three of which have widely dispersed in commerce. Because their adult males are attracted to lights, they are most frequently collected. One other species *Oligotoma greeniana* Enderlein, has spread less widely. "Weed species" are frequently collected within the regional scope of this paper but only the two described below are endemic in Myanmar.

The east Asian "weed species" of *Oligotoma* are: *O. humbertiana* (Saussure), males characterized by a conspicuous spine near the outer apex of 10 RP or MF?; *O. saundersii* (Westwood), males with a horizontal sickle-shaped ventral process of LLPT and a broad 10 LP; and *O. greeniana* Enderlein with a broad-based, apically-twisted, tapered 10 LP. Of course, there are many other characters peculiar to these species. The Myanmar endemic new species are as follows:

Oligotoma burmana Ross, sp. nov.

Figure 15.

Holotype.— Male, on slide CAS. Myanmar: Kalaw, Shan State, 4292 ft elev., matured in culture 29-I-1979 (E.S. Ross).

Description.— Very dark brown throughout, including all antennal segments; mandibles reddish dark brown. Alate, venation oligotomoid. Legs unicolorous dark brown except for yellowish extreme bases of hind tibiae, hind basitarsus without a second papilla. Terminalia basically oligotomoid; 10 LP rather short, broad, apex golden, rounded partly cleft and projected into inner side of the LCB process; hypandrium process (HP) short, dark brown dorsally and ventrally, sclerotic, apex rounded; left paraproct (LPPT) fused to hypandrium (H), its caudal edge sclerotic, narrowly and evenly arcuated; left cercus-basipodite (LCB) large, dorsally lobed, with a ventral sclerotic, thumb like, subventral lobe projected mesad; basal segment of left cercus unlobed, its outer side membranous. Body length 10 mm; forewing length 0.6 mm breadth 1.3 mm.

Allotype.— Female from holotype's culture. Paratypes and parallotypes. Numerous specimens from holotype's culture, CAS, to be distributed in major institutions.

Other specimens.— Author collected another series 18 mi SE of Mandalay, 400 ft elev. (a much lower altitude than that of the type series, 4292 ft elev., in a pine forest). In view of the altitudinal differences and minor terminalia details, the series may represent a distinct species.

***Oligotoma ubicki* Ross, sp. nov.**
Figure 15.

Holotype.— Male, on slide, CAS. Myanmar: Magway Division, Showe Settaw Wildlife Reservation, el. 137 m, in deciduous forest, at night, 29-IX-2003 (D. Ubick).

Description.— Light brown, alate; body length 8 mm; forewing length 6 mm, breadth 1.3 mm. With general characteristics of *O. burmana* but smaller and paler. Terminalia with its base and right side sclerotic and dark piceous, outer side less sclerotic and pale; beneath the base is a peculiar, interior thumb-like lobe; left cercus lobe (LCB) broadened distad, covering a pale module . Hypandrium (HP) lobe dark, short, rounded. Left paraproct (LPPT) amber-colored with large sharp spines projected left and right.

Female.— No specimen.

Discussion.— This specimen was probably collected at a light. Its terminalia characters are very distinctive. It is named after its collector.

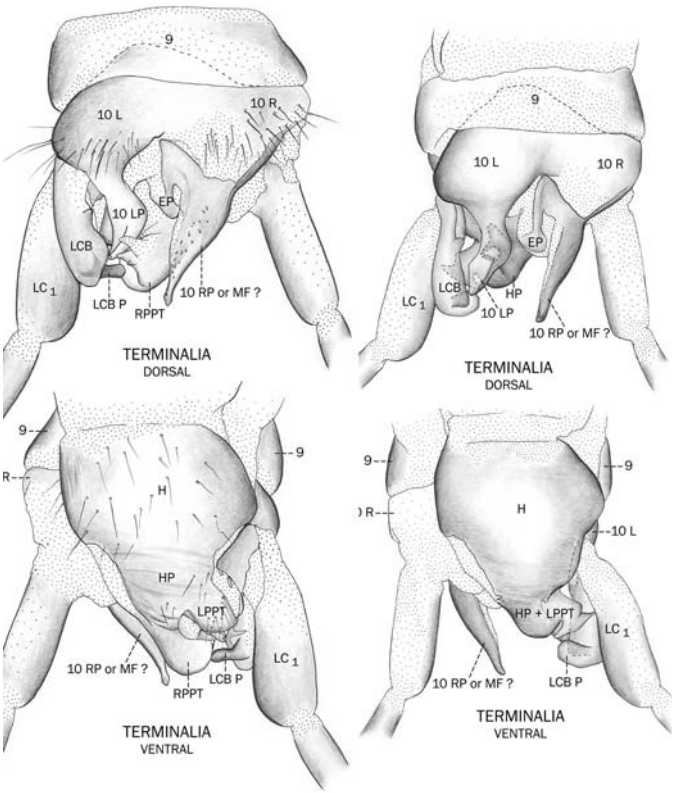

Figure 15. Important characters of holotypes of *Oligotoma burmana* Ross (left) and *Oligotoma ubicki* Ross (right). Both J.C. (see page 599 for abbreviations).

Bulbosembia Ross, gen. nov.

Type species: *Bulbosembia thailandica* Ross, sp. nov., present designation.

Distribution.— Southeastern Asia.

Diagnosis.— Males small, body length about 8 mm. Always alate; uniformly pale tan to dark brown. Cranium varying from elongate-oval to broadly circular; eyes moderately large to very large, inflated. Antennae 15-segmented almost unicolorous, segments elongate, setae not especially long. Mandibles thin, usually short; submentum shield-like, moderately sclerotized, at times exceptionally small and narrow. Wings oligotomoid; MA forked at mid-wing. Hind basitarsi elongate, lacking a medial papilla. Terminalia basically oligotomoid with the following special characters: Left hermitergite (10 L) not lobed on dorsocaudal margin. Left process (10 LP) very short, but stout, twisted on edge; apex with a dorsally-rounded flange and a small, ventral, acute spur. Hypandrium process (HP) rounded apically, not turned upward or channeled at apex. Ejaculatory duct (ED) bordered internally by two filament-like sclerites which diverge basad. Left paraproct (LPPT) rudimentary, fused to side of HP; apex lacking a hook or "talon". Cerci two-segmented, left cercus-basipodite (LCB) represented only as a flange on outer base of cercus. Basal segment of left cercus very broad or bulbous apically, forming a rounded inner lobe; its inner-basal surface con-

cave or channeled dorsally to serve as a recess for 10 LP when the cercus is pulled inward. Females without noteworthy generic characters. Uniformly tan to dark brown.

Discussion.— This distinct genus is most closely related to *Aposthonia* Krauss, but differs from this genus and all other oligotomids in the peculiar bulbous basal segment of the left cercus, which strongly resembles that of many species of *Embia* Latreille, but of course lacks echinulation. It differs in the other important characters mentioned above. The ejaculatory duct is unique in that it is bordered by a symmetrical, diverging pair of long, slender filaments. Such genital sclerotization, although present in some species, isn't as distinctly and symmetrically divided as in *Bulbosembia*.

Biology.— Colonies are located in bark crevices and under flakes of trees in damp tropical forests. They are scattered, difficult to find.

Component species.— In addition to the type species, described below, author has collected four additional species: one in Singapore's Bukit Timah forest reserve, two in hanging moss of cloud forest high in Malayan mountains (e.g., Gunong Batu Brinchang), and one from the 10,000 ft level on Mt Kinabalu, Sabah (Borneo).

***Bulbosembia thailandica* Ross, sp. nov.**

Figure 16.

Holotype.— Male, on slide, CAS. Thailand: waterfall, 20 mi SE of Chantaburi, 75 m, matured in culture 28-II-1963 (E.S. Ross).

Description.— Appearance: Small, slender; alate; medium brown with head darker brown. Color details (in alcohol): Cranium dark chocolate brown with very faint, pale maculation. Eyes blackish. Antennal segment 1 dark chestnut brown, 2 to 4 yellowish brown, 5 to 14 (the distal) medium brown. Mandibles dark amber; submentum also dark amber, clouded with dark brown basally. Prothorax and its legs dark brown; pterothorax basically creamy tan dorsally, brown laterally and ventrally. Mid and hind legs medium brown with pale trochanters. Pigmented bands of wings light brown; hyaline stripes narrow, sharply defined. Abdomen and its terminalia various shades of medium brown, membranous apex of hypandrium lobe whitish; apex

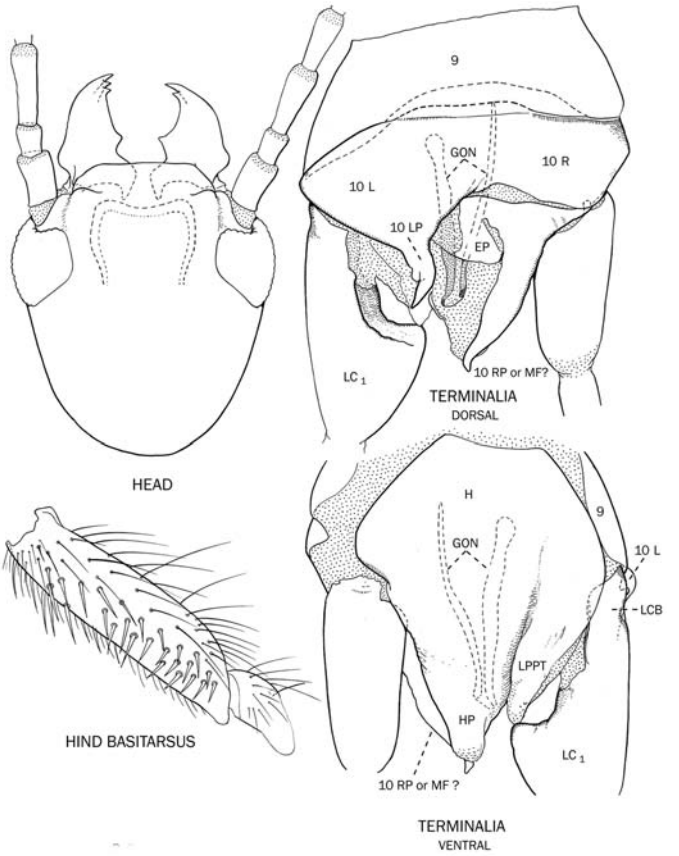

Figure 16. Important characters of holotype of *Bulbosembia thailandica* Ross. E.S.R. (see page 599 for abbreviations).

of left paraproct and ejaculatory duct filaments very dark brown, the latter visible through hypandrium's integument; apices of tergal processes golden amber. Dimensions (on slide): body length 6.5 mm; forewing length 4.5 mm, breadth 1.4 mm.

Important anatomical characters: As figured. Additional details will be treated when related species are described.

Allotype.— Female, in alcohol, CAS, from holotype's culture.

Description.— Slender, pale golden without contrasting pigmentation on portions of body or its appendages. Cranium bright gold anteriorly, with faint rusty tinge which also defines a basal maculation. Eyes black. Antennae 16-segmented, basally pale straw yellow, blending distad to yellowish tan. Prothoracic sclerites and legs yellowish tan mottled with rust. Remainder of insect pale yellowish tan with transparent sclerites appearing darker due to subcutaneous rusty gold tissue within; perigenital sternites not contrasting in pigmentation; cerci concolorous with abdomen. Without important anatomical characters. Body length 7.0 mm.

Paratypes and parallotypes.— Numerous topotypic adults reared in the holotype's culture to be deposited in major entomological museums.

Discussion.— The type culture was stocked from small, inconspicuous colonies in crevices and flakes of tree bark in wet evergreen forest thinned for planting coffee. Colonies of *Ptilocerembia* Friederichs and *Eosembia* Ross were common in the same locality.

Lobosembia Ross, gen. nov.

Type species: *Lobosembia mandibulata* Ross, sp. nov., present designation.

Name basis.— Greek *lobos* in reference to an unusual dorsal lobe on each mandible of males.

Distribution.— Northern Thailand: Mixed tropical forest. Probably also ranges into Laos, eastern Myanmar, and southwestern China.

Diagnosis.— Males: Large, body length averaging 15 mm; robust; alate; blackish except for a white band between pro and mesothorax, antennae entirely dark. Cranium broad, almost quadrate; clypeal margin sclerotic and inflexed, unicolorous. Eyes relatively small. Antennae 27-segmented; setae short, inconspicuous; apical segments not abruptly pale or white. Mandibles broad-based, then arcuated around labrum with an unusually elongate incisor lobe; the very short, dorsobasal carina usually conspicuously projected forward and outward as a lobe; submentum darkly sclerotized, inflexed sides project forward beyond anterior margin as incurved, knob-like lobes, anterior margin not otherwise inflexed. Wing venation oligotomoid, RS+MA forked at mid-length of wing; hyaline stripes very narrow, sharply defined; wing shape exceptionally broad; vannal area large, its basal edge narrowly folded beneath. Hind basitarsus elongate, without trace of a second papilla; plantar setae very dense, uniform in size and shape. Abdominal terminalia basically oligotomoid, with following unusual features: Left hemitergite (10 L) short, caudal margin not lobed, its process (10 LP) unusually small, straight, tapered caudad; hypandrium process (HP) arising broadly from a narrow hypandrium (H), is very long and somewhat twisted, its apex lying partially beneath inner lobe of basal segment of left cercus which it equals in length; apical third somewhat flared and dorsally sclerotized. Ejaculatory duct without trace of sclerotization. Left paraproct (LPPT) fused to HP. Left cercus-basipodite (LCB) represented only as a sclerotic flange fused to outer basal edge of left cercus, which is slender basally, then broadly expanded dorso-mesad as an angulate lobe which inserts into a mesodorsal depression on the inner apex of the left paraproct.

Females: Large, robust, length averaging 17 mm; mostly chestnut brown anteriorly, abdomen and legs dark chocolate brown, thoracic intersegments creamy white; mid and hind coxae, trochanters, and tibial bases also creamy white; antennae and cerci entirely dark. Hind basitarsi with only one ventral papilla.

Discussion.— The lobed mandibles and that of the submentum and the composite left paraproct (HP+LPPT) especially distinguish this genus. The hypandrium lobe, and gallery formation distinguishes this genus from all others in the family, but it is probably most closely related to *Aposthonia* Krauss. Author also collected a possible second new species in northwestern Thailand, males of which have reduced mandibular lobes. The biological features described for the one species may be characteristic of all others in the genus.

***Lobosembia mandibulata* Ross, sp. nov.**
Figures 17–19.

Holotype.— Male, on slide, CAS. Thailand: East slope of Doi Suthep, near Chiang Mai, 560 m; matured in culture 15-IV-1963 (E.S. Ross).

Description.— Large, robust, broad-winged; blackish except for a white membranous intersomital band between pro- and mesothorax. Color details (in alcohol): Cranium dark chocolate brown, faintly clouded with mahogany brown between eyes and around anterior apophysial pits. Eyes gray. Antennae 27-segmented, segments 1 and 2 mahogany brown, all others medium brown blending to tan distad. Mandibles dark amber with dorso-basal lobes chocolate brown; submentum and palpi concolorous with cranium. Prothoracic sclerites and legs dark chocolate brown, lighter than cranium, poststernum golden brown; prothoracic membranes tinged brownish purple. Pterothoracic sclerites and membranes as in prothorax. Mid and hind legs similar to prothoracic legs in color except for yellowish brown tibial bases, coxae, and trochanters. Wings dark brown with very narrow hyaline stripes, whole surface with iridescent violet luster. Abdominal coloration similar to that of thorax except for darker terminalia which have the epiproct sclerite and its left process amber yellow; membranes white on inner side of right process and around aperture of ejaculatory duct, other membranes purplish; distal segments of cerci mahogany brown. Dimensions (on slide): body length 16.0 mm; forewing length 8.5 mm, breadth 2.5 mm.

Important anatomical characters.— As figured and noted in generic Diagnosis.

Allotype.— Female, in alcohol, CAS. From holotype's culture.

Description.— Large, robust; mostly chestnut brown anteriorly with white membranous band between each thoracic somite; abdomen and legs dark chocolate brown. Color details: Crani-

Figure 17. Adult female of *Lobosembia mandibulata* Ross, sp. nov. From 11 km NW of Fang, near Chiang Dao (cave), Chiang Mai Prov., Thailand. Matured in culture II-1980 (E.S. Ross). E.S.R.

um basically dull, dark chocolate brown, blending to dull golden brown in a broad transverse arc between eyes, and ventrally. Eyes grayish black. Antennae 27-segmented; segments 1 and 2 chestnut brown, 3 and 4 yellowish tan, others becoming dark brown to apex. Prothoracic sclerites clouded, dark chestnut brown, membranes purple. Forelegs dark chocolate brown with femorotibial joint creamy white. Acrotergites and associated lobes and membranes creamy white resulting in a two-banded appearance. Meso and meta-thoracic scuta "granular", chestnut brown; pleurities and most of sternites chocolate brown; basisterna largely yellowish brown; mid and hind legs chocolate brown except for creamy white coxae, trocanters, and femorotibial joints. Basal abdominal tergites at first concolorous with metathoracic scutum, others becoming very dark chocolate brown caudad; sternites 1 and 2 creamy white, others dark chestnut brown, but with sclerotic portions of paragenital sternites dark chocolate brown; abdominal membranes purple. Cerci chocolate brown with purple membranes. Body length 18 mm. Without anatomical characters for species definition.

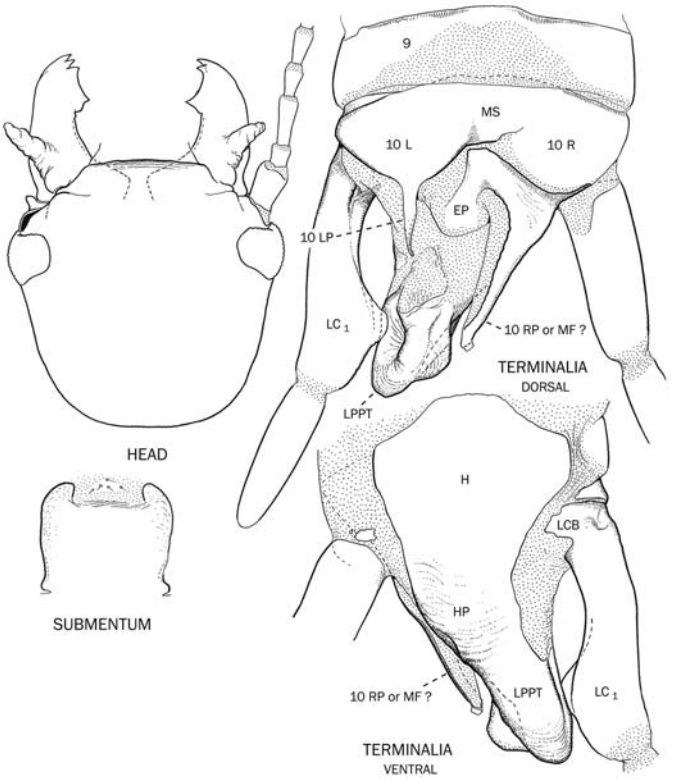

FIGURE 18. Important characters of holotype of *Lobosembia mandibulata* Ross. E.S.R. (see page 599 for abbreviations).

PARATYPES AND PARALLOTYPES.— Series of topotypic adults reared in holotype's culture; to be deposited in CAS, USNM, BMNH, and other major museums.

BIOLOGY.— Colonies are most often spun on the bark surfaces of slender trees in open hardwood forest on sunny ridges at about the 560-meter level of the lower slopes of mountains, such as Thailand's Doi Suthep. Such forests have a grass under story and are subject to seasonal drought and fires. Colonies have a peculiar formation; each is composed of a single long gallery of clean silk without lateral branches. When first encountered during the wet season of mid-July, each colony contained only a single female and her egg mass, which was about 10 mm in diameter, and contained a single layer of about fifty eggs embedded in a matrix of mas-

FIGURE 19. Large colony of *Lobosembia mandibulata* Ross, sp. nov. On a tree trunk 11 km NW of Fang, near Chiang Dao (cave), Chiang Mai Prov., Thailand. XI-1978 (E.S. Ross). Silk galleries produced by brood of a single parent female. Note silk is not covered with pulverized bark or feces. E.S.R.

ticated bark fragments or fecal pellets. The entire layer was covered with a sheet of silk. No adult males were encountered in the field, although some of the females were almost mature. Broods of field-collected females and eggs matured between mid April and early June the following year. Attempts to rear another cycle in the laboratory failed. The colonies might possibly have a much different appearance as the broods develop if they had remained together. No prior-season remnants of large labyrinths were found; author suspects that nymphs disperse and that each individual matures in a separate gallery.

Additional records.— All Thailand; collected by E.S. Ross. Numerous topotypic cultured specimens from various locations on E slope of Doi Suthep (above Chiang Mai); 400–600 m in elevation. Most males matured during April. Large cultured series from Samaung, 23 mi S of Chiang Mai, 900 m, on limbs of a freshly cut tree. Some males have much shorter mandibular lobes, but their terminalia are typical. Large cultured series from 11 km NW of Fang, Chiang Dao (cave), Chiang Mai Prov., colonies on tree trunks, adults matured XI-1978.

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Explanation of Symbols

9 = ninth abdominal tergite; 10L and 10R = hemitergites of tenth segment, 10 LP and 10 RP = processes of these hemitergites; MS = medial sclerite of 10; EP = epiproct (segment 11); H = hypandrium (sternite 9); HP = process of H; LPPT and RPPT = left and right paraprocts; LCB and RCB = left and right cercus-basipodites; LC 1+2 = composite left cercus; GON = gonopophysis (?) –internal sclerotic "rods" bordering the apex of the ejaculatory duct; LPPT-P = process of left paraproct.

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