OCCASIONAL PAPERS

OF THE

CALIFORNIA ACADEMY OF SCIENCES

No. 140, 54 pages, 16 figures. March 21, 1984

A Classification of the Embiidina of Mexico with descriptions of new taxa

By

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SAN FRANCISCO

PUBLISHED BY THE ACADEMY

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US ISSN 0068-5461

The California Academy of Sciences
Golden Gate Park
San Francisco, California 94118

Printed in the United States of America

SIERRA PACIFIC PRESS
A division of Sierra Graphics & Typography
1722 J Street, Ste 19 • Sacramento, CA 95814 • (916) 444 9133

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ABSTRACT

All supraspecific categories of Embiidina occurring in Mexico are treated. *Drepanembia,* a new subgenus of *Neorhagadochir* is proposed and its type species redescribed from a topotype. The new genera *Brachypterembia, Conicercembia,* and *Pachylembia* of the Embiidae, and included new species, are described. Family Anisembiidae is divided into two subfamilies, one of which (Chelicercinae) is new. Genus *Mesembia* is subdivided into five species-groups and two of its species are newly described. *Bulbocerca,* originally a subgenus of *Anisembia,* is treated as a genus and one of its new species is described. *Anisembia* is newly recorded from Mexico. *Anisembia schwarzi* Ross is a junior synonym of *Mesembia venosa* (Banks). *Chelicerca* is subdivided into five species-groups and three of its many new species are named. *Dactylocerca* is divided into two species-groups and two new species are named. The new genus *Pelorembia* and its type species are described. The family Teratembiidae is discussed, its Mexican species listed, and a new species of *Oligembia* and two new species of *Diradius* are described. Mexican species of the non-endemic family Oligotomidae are discussed.

A Classification of the Embiidina of Mexico with descriptions of new taxa

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Introduction

As a result of eight fieldtrips to Mexico conducted over a forty-five year period, I have accumulated a very large collection of Mexican Embiidina. This collection comprises about one hundred species, most of which are new. It was my intention to treat this interesting fauna in a single, comprehensive volume, and portions of the manuscript were completed but set aside as I made excursions to develop a world view of the order. Because of recent interest in the order by Mexican specialists, I have decided to publish a classification of the Mexican embiids at this time. Basic information on the anatomy and biology of the order will be published in other contributions.

As is to be expected in such a highly diversified biological setting, Mexico has an exceptionally rich and interesting embiid fauna. The bulk of the species belong to the widespread, Neotropical family Anisembiidae—especially its major genus *Chelicerca* Ross, which tends to proliferate in semi-arid habitats. Mexico also represents the northern extremity of range in the New World for the family Embiidae. Surprisingly, three new genera of the family were discovered and these appear to prefer pine-oak zones in the Sierra Madre Occidental. The nearly pantropical family Teratembiidae occurs throughout Mexico, and the largely Asian family Oligotomidae is represented by four introduced "weed" species.

In certain sections of the Mexican fauna, e.g., the subgenus *Drepanembia* of *Neorhagadochir*, and the *lobatus* group of *Diradius*, the interpretation of species and/or races will require very careful analysis based on extensive field sampling. Whenever possible, large series of adults should be cultured, not only to serve as adequate study material, but also to make possible a distribution of paratypes to appropriate collection centers. In this contribution the designation paratype almost always is limited to adult males reared from the same culture as the holotype. Such paratypes have almost the same significance as the holotype. In view of the extreme sexual dimorphism of females in the Embiidina, female paratypes are designated parallotypes.

The illustrations in this contribution were drafted by me from cleared specimens mounted on microscope slides (Ross, 1943). The images are not drawn to scale. Thickness of line and shading reflect degree of sclerotization. Membranous or fleshy areas are stippled. Except for echinulations (peg-like setae), vestiture is omitted.

Explanation of symbols: 9 = ninth abdominal tergite; 10 L and 10 R = 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.

Institutional symbols: CAS = California Academy of Sciences, San Francisco (the writer's collection); USNM = U.S. National Museum of Natural History, Washington, D.C.; IBUNAM = Instituto de Biologia, UNAM, Mexico, D.F.; BMNH = British Museum (Natural History).

Acknowledgments

Portions of this work were supported by National Science Foundation grants. I wish to thank Mr. Kendrick W. Miller for helping to defray the costs of publishing this contribution.

Key to Families and Genera of Mexican Embiidina

1. All instars of both sexes with two ventral papillae (sole-bladders) on hind basitarsus 2
— All instars of both sexes with only one ventral papilla (the distal) on hind basitarsus 7
2. Adult females, pale tan with conspicuous dorsal maculation on head and body. A parthenogenetic, introduced species recorded in Mexico only from NW Baja California ..... ***Haploembia solieri***
— Adult females, usually blackish, integument unpatterned, occasionally with whitish intersegmental thoracic membranes. Bisexual, endemic family widespread in southern Mexico (Embiidae) 3
3. Terminalia of adult males with a large, sickle-shaped left hemitergite process (10 LP) arcing toward base of left cercus. Basal segment of left cercus at least partially sclerotized 4
— Left process (10LP) minute, straight, spine-like, scarcely discernable. Basal segment of left cercus almost entirely unsclerotized (fig. 5) ..... ***Pachylembia***
4. Basal segment of left cercus of adult males broadened only at extreme base, lacking a conate, inner-apical lobe 5
— Basal segment only slightly broadened at base, inner-apex with a prominent, conate lobe (fig. 4) ..... ***Conicercembia***
5. Extreme inner-base of basal segment of left cercus of adult male bearing minute echinulations (peg-setae) *(Neorhagadochir)* 6
— Basal segment of left cercus lacking echinulations (fig. 3) ..... ***Brachypterembia***
6. Adult males relatively small, pale. Known only from northern lowlands of Guatemala. Left tergal process (10 LP) shorter than hemitergite (10 L). Basal segment of left cercus not abruptly constricted and flexible in distal two-thirds (fig. 1) ..... Subgenus **Neorhagadochir**
— Adult males large, usually blackish; at times partially orange. Occur throughout southern Mexico extending south into Costa Rica. Left tergal process (10 LP) at least twice the length of hemitergite (10L). Distal portion of basal segment of left cercus abruptly narrowed and flexible (fig. 2) ..... Subgenus **Drepanembia**
7. Mandibles of adult males without apical dentation (incisor cusps) (Anisembiidae) 8
— Mandibles of adult males apically dentate (3 teeth on left mandible, 2 on right) 13

8. Adult males with right process (10 RP) simple, lacking an apical talon or hook. Base of right cercus weakly sclerotized, circular (Anisembiinae) .. 9
— Apex of 10 RP with a talon, or hook-like subprocess. Base of right cercus irregularly flared and sclerotized (Chelicercinae) 11
9. Adult males with tenth tergite not cleft to base. Left mandible with a medial flange between apical tooth and proxadental cusp 10
— Tenth tergite cleft to basal margin. Left mandible without medial flange (evenly, inwardly arcuated behind apical tooth; figs. 6 and 7) .... ***Mesembia***
10. Northeastern Mexico, and northward. Cranium of adult male small. Mandibles short, delicate with an acute flange on inner arc of left mandible (fig. 8) ..... ***Anisembia texana***
— Baja California and shores of Golfo de California. Cranium of adult males massive, elongate-oval. Mandibles large, elongate; medial flange of left mandible broad, obtuse (fig. 9) ..... ***Bulbocerca***
11. Cranium massive, circular in form; eyes and antennae small, nymphoform. Mandibles stout, behind the non-dentate apices formed almost as in nymphs and females. Body form nymphoid, always apterous. Known only from Chilpancingo region of Guerrero (fig. 14) ..... ***Pelorembia***
— Head normal, longer than broad, caudally-tapered; eyes small to large. Mandibles delicate, thin, with at most only a thin flange behind apices. Body form slender, usually small, length averaging 8–9 mm; apterous or alate. Widespread range 12
12. Composite left cercus long, finger-like; often smoothly, inwardly arcuated. Inner-apical side of right hemitergite (10 R) semicircular with "talon" appearing as a rudimentary point on right extremity of caudal arc. Hypandrium process (HP) very large, complex, usually extensively sclerotized on dorso-apical surface. Known only from western Mexican plateau (from Jalisco as far north as Utah and SW California) (fig. 12) ..... ***Dactylocerca***
— Left cercus two-segmented, or composite (one-segmented); if composite, not exceptionally arcuated or elongated. Inner-apical side of right hemitergite (10 R) straight or angulate, or an incomplete arc bearing a slender talon-like process. Hypandrium process (HP) small to large but never extensively sclerotized on dorso-apical surface. Widespread from Mexico to Argentina (figs. 10–12) ..... ***Chelicerca***
13. Adult males with wing vein MA (R4+5) forked. Left cercus basipodite (LCB) with one or more inner lobes, the uppermost of which is usually minutely forked or sharply pointed at apex. Base of medial sclerite (MS) extended at least halfway beneath 9th tergite 14
— Wing vein MA simple. LCB at most with a single, short, blunt lobe, this never forked. MS only slightly extended beneath 9th tergite (Oligotomidae, part) ..... ***Oligotoma***
14. Right hemitergite (10 R) shorter than broad, right side tapered; line of fusion with medial sclerite (MS) evident. Left cercus-basipodite (LCB) with only one inner lobe (fig. 15) ..... ***Oligembia***
— 10 R as long as broad; right side long, straight; fusion line of MS and 10 R completely obsolete. LCB with at least two inner lobes (fig. 16) ... ***Diradius***

Family EMBIIDAE

Genus *Neorhagadochir* Ross

Neorhagadochir Ross, 1944, p. 418.

Type species.—*Neorhagadochir inflata* Ross, 1944, by original designation.

Distribution.—Southern Mexico southward to Costa Rica.

Diagnosis.—*Males:* Highly diverse in appearance. Most are large (body length averaging 13.0 mm); alate, brachypterous, or apterous; typically blackish except for a white band behind prothorax and yellowish sub-basal antennal segments. However, one species has the head contrastingly gold, another is entirely yellow-tan. Cranium broad with convergent sides. Eyes usually rather small. Antennae with as many as 30 segments; basal segments usually golden, blending to dark brown beyond IV, apical segments dark. Mandibles short, broad, without prominent proxadental cusp; apical teeth large, well spaced. Submentum large, sclerotic, shield-like; sides and apex strongly inflexed, apical angles often produced. Wings variable in size; in some species they are entirely lacking or abbreviated, in others present or absent within a single population. Venation embioid (MA branched) with a few white cross-veins, costal margin brown. Hind basitarsus with two ventral papillae. Abdominal terminalia with tenth tergite broadly cleft to basal margin, membranous area partially extended across base of left hemitergite. Left hemitergite (10 L) small, caudal margin not produced; process (10 LP) usually very large, sickle-shaped, parallel-sided until its acute apical taper, inner side thickened, often bearing a tiny rudimentary subprocess at outer base. Right hemitergite (10 R) triangulate with inner margin weak; tapered as a process (10 RP) which curves ventrad and terminates without distinctive talon structure. Medial flap (MF) slanted meso-basad, weakly to strongly sclerotized. Epiproct (EP) sclerite at times broad, but often poorly defined. Ninth sternite (H) large, complete; its process (HP) moderately produced, broad, apex truncate and simple. Left paraproct (LPPT) large, well sclerotized, never fused to side of H or HP; caudal margin echinulate, especially toward left corner where it develops as a rounded nodule. Basal segment of left cercus short, flared and sclerotic toward base; inner side of base produced mesad as a beak-like, micro-echinulate lobe; distal portion of cercus usually tubular with weak mesal sclerotization which causes twisting and flexibility. Basal segment of right cercus extensively membranous, especially at outer base; distal segments of both cerci elongate, evenly sclerotized.

Females: Usually blackish-brown throughout except for distinctive white pattern due to white fat bodies visible through membranous areas, as follows: two broad, white areas between thoracic segments, epipleurae of metathorax and

abdominal segments I-VII (in some species tergites IV-VI are pale almost to center line); membranous areas otherwise dark lavender. Basal antennal segments and basal sclerites of mouthparts and gula usually amber-yellow.

Discussion.—Due to limited past collections, this genus was unfortunately based on the atypical type species, *inflata* Ross, of which only the holotype is known. Recently collected series now indicate that widespread populations related to *Embia salvini* McLachlan are more representative of the generic concept.

The most important generic character is the cone-shaped basal segment of the male's left cercus which has an extremely basal, echinulate inner lobe. Opposite this is a micro-echinulate caudal fold of the left paraproct. The cercus lobe and this fold probably work together to provide a copulatory grip.

Component species.—These form two groups, here treated as subgenera. The first, *Neorhagadochir* s. str., with males characterized by small size, greatly enlarged eyes, short left tergal process, broad epiproct sclerite and the extremely short basal segment of the left cercus. To date, only the following species is known.

Neorhagadochir (Neorhagadochir) inflata Ross, 1944, p. 419 (Fig. 1).

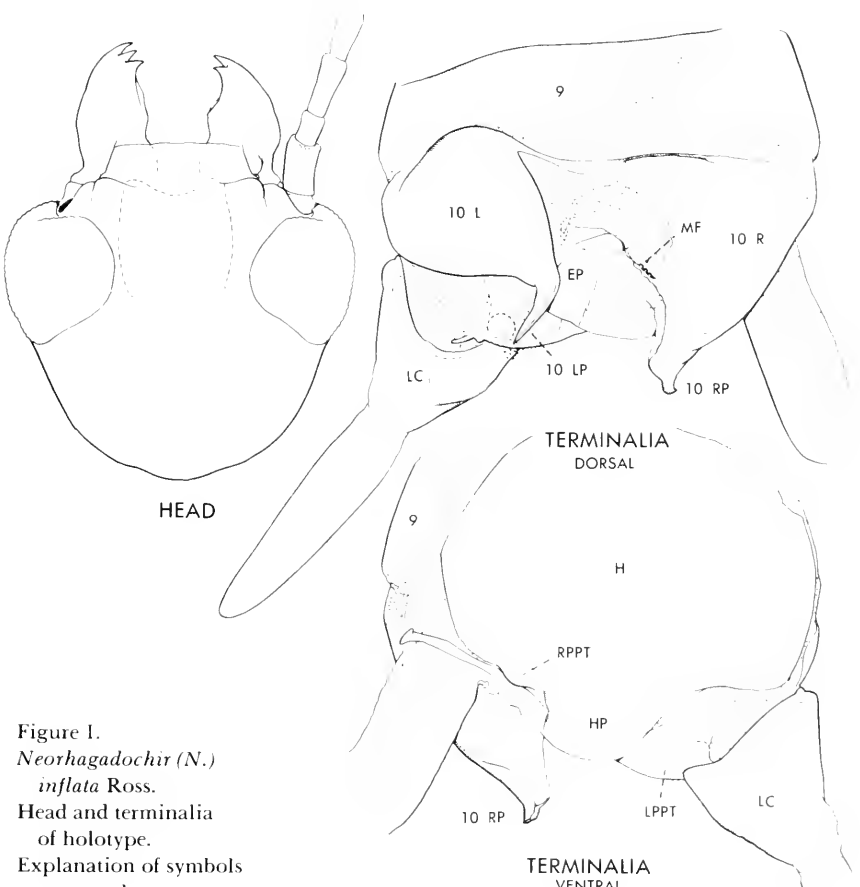

Figure 1.
Neorhagadochir (N.) inflata Ross.
Head and terminalia of holotype.
Explanation of symbols on page 1.

Holotype.—Male, on slide, USNM. Guatemala; Cayuga V-15 (Wm. Schaus). The type locality is a small village on the railroad in the lower Montagua Valley not far SW of Puerto Barrios. Apparently, the type was collected at light for its collector specialized in moths. Also, the specimen has the appearance of nocturnal species.

The second and more common group of species is assigned to the following new subgenus.

Subgenus ***Drepanembia*** Ross, new

Type species.— *Embia salvini* McLachlan, 1877, by present designation.

Distribution.—Southern Mexico to Costa Rica.

Diagnosis.—Adult males large, body length averaging 12 mm, head with small eyes. Left tergal process (10 LP) greatly elongated, sickle-shaped, arising from tapered mesal side of left hemitergite (10 L). Medial flap (MF) more sclerotic than in *inflata*. Epiproct sclerite (EP) narrower. Basal segment of left cercus much more elongate, consisting of two portions—a broad, sclerotic base and an abruptly-narrowed cylindrical apex which is flexible due to extensive desclerotization.

Component species.—To date, only the type species is named; however, careful study of my extensive, cultured series from many Mexican and Central American localities will undoubtedly result in descriptions of several new species.

Neorhagadochir (Drepanembia) salvini (McLachlan) (Figure 2)

Embia salvini McLachlan, 1877, p. 380,—Enderlein, 1912, p. 51.
Embia (Olyntha) salvini McLachlan, Hagen, 1885, p. 198.
Olyntha salvini (McLachlan) Krauss, 1911, p. 31.
Embolyntha salvini (McLachlan) Davis, 1940, p. 349.
Neorhagadochir salvini (McLachlan) Ross, 1944, p. 419.—Mariño and Marquez, 1982, p. 100.

Holotype.—Male, British Museum (Natural History), BMNH, from Guatemala: "Chinuatta," 4100 ft (Salvin). The type locality is undoubtedly Chinaulta, a suburb of Guatemala City.

The present illustration is based on a topotypic male (CAS) collected by the author. In addition, I have collected and reared extensive series of *salvini* and closely related new species and races from many localities in southern Mexico, and Central America as far south as Puntarenas, Costa Rica. In many populations, the males are apterous and, in one of these occurring under stones in Nicaragua, they are very slender and pale in color suggesting a subterranean confinement of activities.

Biology.—There is no typical habitat for the subgenus. In highland regions, colonies are found in bark crevices and are often conspicuous. They may also occur in road bank crevices and among matted leaves on the ground in pine-oak forests.

In more arid regions, stone cover is utilized and galleries may deeply extend into soil crevices. In cultures, the various species thrive and appear to be immune to disease epidemics. Such culture vigor is probably a manifestation of a field vigor which explains the extensive and abundant occurrence of the subgenus.

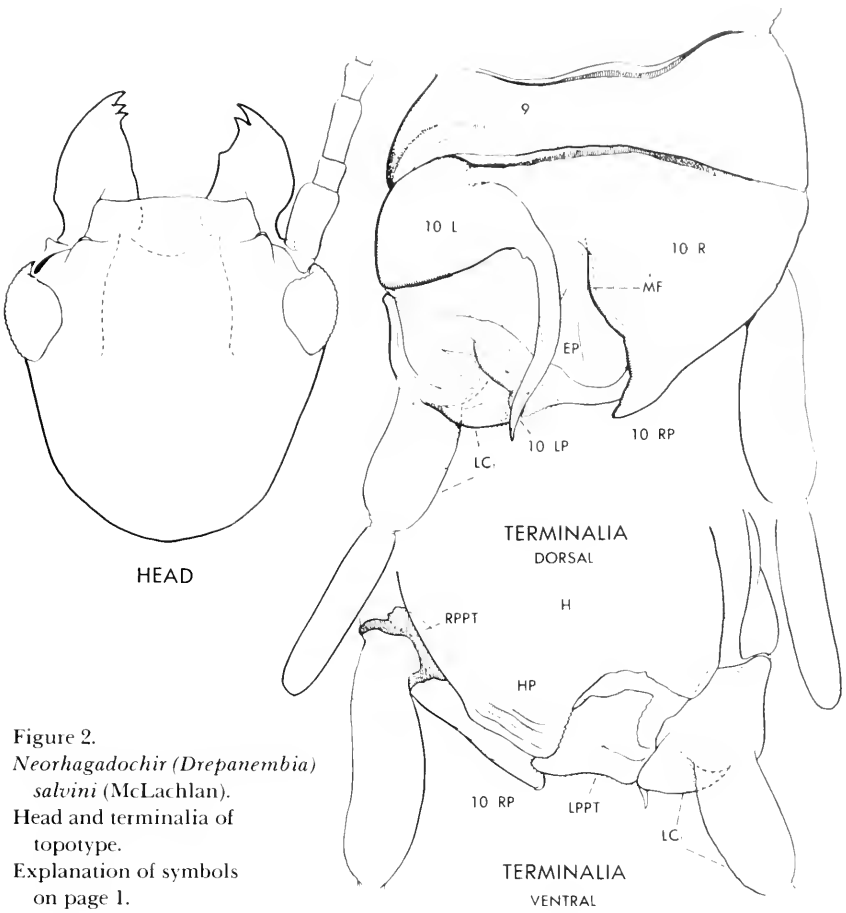

Figure 2.
Neorhagadochir (Drepanembia) salvini (McLachlan).
Head and terminalia of topotype.
Explanation of symbols on page 1.

Genus ***Brachypterembia*** Ross, new

Type species.—*Brachypterembia moreliensis* Ross, new species, by present designation.

Distribution.—Mexico: Pine-oak zone of mountains SE of Morelia, Michoacán; altitude 8000 ft.

Diagnosis.—*Males* moderately large (body length averaging 13 mm), elongate, short-winged; uniformly blackish, without pale band between pro- and mesothorax, membranous areas very dark lavender, or purple. Head and mandibles similar to those of *Neorhagadochir* but with submentum less sclerotic and with a weak anterior margin. Costal and apical wing margins dark brown, radial blood sinus (RBS) borders pink; white cross-veins confined to RBS–Rs interval. Hind basitarsi with two ventral papillae. Tenth abdominal terminalia broadly cleft to basal margin; left hemitergite (10 L) very small, caudal margin transverse; its process (10 LP) long, evenly-tapered, sickle-shaped, arising from inner margin of 10 L; right hemitergite (10 R) large, equilaterally-triangulate; its process (10 RP) a short sclerotic hook curved latero-ventrad and lacking a prominent sublobe.

Medial flap (MF) a long, slender, sclerotic process angled baso-mesad at 45°. Epiproct (EP) rather small, largely membranous; sclerite small, narrow. Ninth sternite (H) extensive, convex; its lobe (HP) very short, broad, apical margin pale amber. Right paraproct (RPPT) with a relatively large sclerite partially fused to side of HP and arced around ventral base of cercus. Left paraproct (LPPT) sclerite large, heavily sclerotized, fused to side of HP, its caudal margin aligned with that of HP; fleshy portion obsolete, lacking lobes or micro-echinulation. Basal segment of left cercus very short, robust, moderately sclerotized on all surfaces; inner base gradually broadened but not lobed, broadest point bearing a few minute, short setae and thus not actually echinulate; dorsal base extended basad as a sclerotized flange covering a portion of the membranous interval between the cercus base and the left hemitergite. Other cercus segments normal.

Females: Without noteworthy generic characters. Generally chestnut-brown with cream, pale, medial areas on anterior portions of meso- and metascuta of thorax and cream epipleural membranes forming lateral margins of thorax and abdomen. Head golden-brown; pronotum yellow, mottled with brown. All legs with pale tibiofemoral joints; hind basitarsi with two ventral papillae.

Discussion.—Because potential habitats are widespread in Mexico, it may be expected that this genus will comprise several species. If all are similar to *moreliensis,* males of the genus can be recognized by their uniformly blackish coloration, abbreviated wings and the terminalia characters—primarily the short, globose, unlobed basal segment of the left cercus which apparently lacks echinulation on its inner side.

Brachypterembia moreliensis Ross, new species
(Figure 3)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Michoacán: Parc Nacionál José Maria Morelos, 14 miles SE Morelia; 8000 ft elev., matured in culture 23 March 1977 (E.S. Ross).

Description.—Appearance: Moderately large, slender; wings short, less than half normal length, extending only to mid-abdomen; body and all appendages black or dark brown, dorsum of abdomen paler in less sclerotic areas; membranous areas various shades of dark lavender, or purple. Color details (in alcohol): cranium dorsally and laterally dull jet-black, devoid of pattern, surface finely sculptured; gular area golden-brown. Eyes pale purple. Antennae uniformly blackish-brown except for pale, purplish joint-membranes; 25 segments in complete antenna. Mouthparts similar in coloration to antennae (in variant specimens the submentum is golden-brown instead of blackish). Sclerotic portions of thorax blackish except for lighter sterna. Sterna of pterothorax golden-brown on anterior areas. All thoracic membranes dark lavender, blending to pale purple ventrally. Legs blackish-brown except for whitish femoro-tibial joints and largely golden tarsi of mid and hind legs. Wings largely concolorous with thorax except for narrow whitish, hyaline stripes and one or two cross veins between RBS and Rs. Abdomen various shades of medium brown with pale purplish membranous areas except for largely black terminalia which have pale purplish membranes and tan unsclerotized portions of cerci; apices of tenth tergal processes translucent

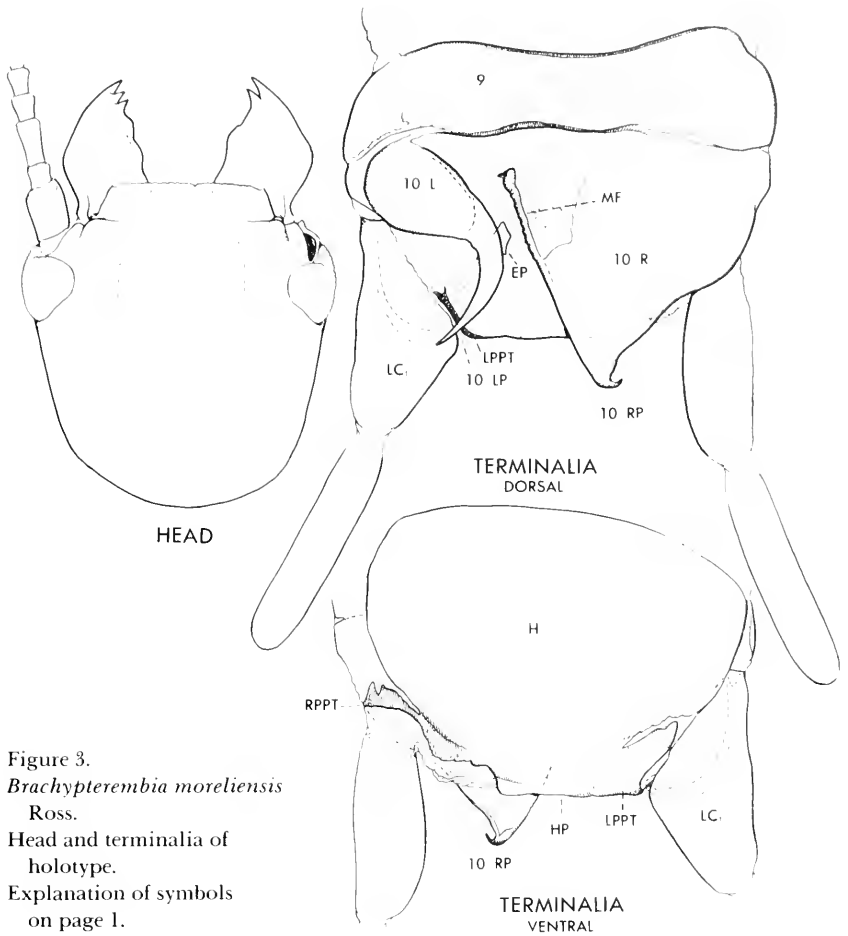

Figure 3.
Brachypterembia moreliensis Ross.
Head and terminalia of holotype.
Explanation of symbols on page 1.

mahogany-brown. Dimensions (on slide): body length 12.5 mm; forewing length 4.1 mm, breadth 0.75 mm.

Important anatomical characters: As described in the generic diagnosis, and figured.

Allotype.—Adult female with holotype data and disposition.

Description.—Appearance: Large, robust, generally chestnut-brown dorsally with cream-white dorso-pleural margins of almost entire length of thorax and abdomen. Color details (in alcohol): cranium golden-amber, dorsally clouded with medium brown. Eyes pale, gray-lavender. Antennae uniformly blackish-brown with purple membranes, 22-segmented (complete). Mouthparts various shades of dark amber, submentum and mandibles clear amber. Pronotum pale yellow, clouded with tan; anterior margin subcutaneously white; pleural membranes dark lavender; ventral sclerites golden-brown, cervical membranes whitish; posterior pronotal plate dark purple-brown except for subcutaneously-pale, transparent medial area. Meso- and metathorax mahogany-brown, subcutaneously paler medially with pronounced white dorso-lateral margins due to white fat bodies visible through transparent derm. Legs dark brown except for white

femoro-tibial joints (knee spots) and largely-tan fore tibiae and mid and hind tarsi. Abdomen dorsally mahogany-brown with white dorso-pleural margins due to internal fat bodies; ventrally shades of tan except for darker brown areas of paragenital sternites, the eighth with a broad pale tan membranous medial region. Basal segments of cerci medium brown with extensive cream-white areas due to fat body tissue within, apical segments dark brown with extremities pale tan. Body length (in alcohol): 16.5 mm.

Important anatomical characters: The robust form, hind tarsi with two ventral papillae, the contrasting pigment distribution of the eighth abdominal sternite.

Paratypes and parallotypes.—Numerous specimens reared from type culture which matured at various dates during March and April, 1977. These are deposited in major entomological collections, including IBUNAM.

Biology.—The type locality is in the pine-oak zone of the Sierra Madre Occidental at 8,000 feet elevation. Colonies are encountered on coarse bark of oak trees and, occasionally, pines. They are especially associated with loose bark of recently-cut fence posts which provide excellent under-bark retreats for the insects. On the encounter date, 3 November 1976, each colony contained a single adult female associated with her eggs or young nymphs (not exceeding 3rd instar). Galleries radiated from crevice retreats into lichens which appear to be the principal food. Such galleries were covered with pulverized bark or fecal material. By 1 February 1977, some of the nymphs attained the penultimate instar, the males exhibiting peculiar, upcurled wing pads. Most males matured during March and April. The brood of each female developed in unison. The various broods could be maintained in a mixed, single culture.

Laboratory cultures gradually died out during April 1967 due to heavy *Diplocystis* infestations.

Genus ***Conicercembia*** Ross, new

Type species.—*Conicercembia tepicensis* Ross, new species, by present designation.

Distribution.—Mexico: Oak zone in mountains of SE of Tepic, Nayarit, altitude 4000 ft.

Diagnosis.—*Males,* moderately large (body length averaging 13 mm), similar in appearance to those of *Neorhagadochir* Ross; alate, wings slightly shortened; uniformly blackish except for a broad cream-white band between pro- and mesothorax and a lesser pale interval between head and pronotum; membranous areas otherwise purplish. Head and mandibles similar to *Neorhagadochir* but the anterior margin of the submentum is not inflexed. Wings with costal and apical margins narrowly white, RBS borders pink; white cross-veins present between C and apex of RBS, Rs and MA, and between MP and CU; venation embioid. Hind basitarsi with two ventral papillae. Tenth abdominal tergite broadly cleft to basal margin; caudal margin of left hemitergite (10 L) obtusely angulate, left process (10 LP) sickle-shaped, rather large, gradually tapered to a sharp point; right hemitergite (10 R) extensively produced caudad, tapered to form a process (10 RP) which terminates in a prominent sclerotic talon subtended by an equally prominent membranous lobe. Medial flap (MF) a sclerotic arm projected basad, aligned with central body axis (i.e., not strongly angled mesad), its apex expanded and sclerotic.

Epiproct (EP) large, fleshy; its sclerite broad, granular, weakly margined, positioned directly beneath 10 RP. Ninth sternite (H) extensive, well sclerotized; apex produced as an upturned, rounded process (HP) which is pale in color and transparent. Right paraproct (RPPT) with sclerotic base weak, fused to side of H. Left paraproct (LPPT) with a strongly sclerotized, transverse base fused to side of H and a more extensive membranous, fleshy portion which lacks lobes or microechinulation along its caudal margin. Basal segment of left cercus elongate, heavily sclerotized in entire basal two-thirds, inner base slightly lobed but lacking echinulation; inner surface somewhat concave, thence abruptly produced inwardly as a prominent, sclerotic, acutely-pointed cone which lacks echinulation; extreme apex of segment membranous. Basal segment of right cercus weakly sclerotized except narrowly along inner side. Apical segments of both cerci equal, elongate, weakly sclerotized.

Females: without noteworthy generic characters.

Discussion.—Although only the type species is presently known, it is likely that several related new species will be discovered as the extensive oak zones of NW Mexico are surveyed by a specialist.

The primary generic character is the peculiar left cercus. Its conate, subapical, inner lobe is found in no other species and it is suspected that it is not homologous to the lobe found in this position in most Embiidae, Anisembiidae, and other families. It seems to be a secondary lobe for it completely lacks echinulation. The homology of the normal inner lobe apparently is the slight inner-basal swelling of the left cercus. This would conform with the condition found in all other North American relatives.

The other generic characters are less pronounced. In order of importance they are: (1) the fleshy unlobed non-echinulate caudal margin of the left paraproct; (2) the greatly prolonged right tergal process with the terminal talon subtended by an extensive membranous lobe, and; (3) the peculiar form of the left tergal process.

Conicercembia tepicensis Ross, new species
(Figure 4)

Holotype.—Male, on slide, deposited in California Academy of Sciences, San Francisco.

Type data.—Mexico; Nayarit. El Ocotillo, 3 mi NW of Chapalilla, Hwy. 15, 4000 ft elev., matured in culture 26-IV-1977 (E.S. Ross).

Description.—Appearance: Moderately large, similar to males of *Neorhagadochir;* wings shortened, extending only to base of abdominal segment VIII; blackish throughout except for cream-white neck and broader similar band between pro- and mesothorax, membranous areas otherwise reddish-purple. Color details (in alcohol): Cranium dull jet-black, devoid of pattern, surface finely sculptured; gular area very narrowly brownish. Eyes pink. Antennae uniformly blackish except for pink joint-membranes; 26 segments in complete antenna. Clypeo-labral membranes pale pink; sclerotized portions of mouthparts dark mahogany-brown except for dark amber distal portions of mandibles; submentum well sclerotized with lateral margins weakly inflexed, apical margin not inflexed. Cervical membrane dorsally pale with cream-white fat bodies visible within, ven-

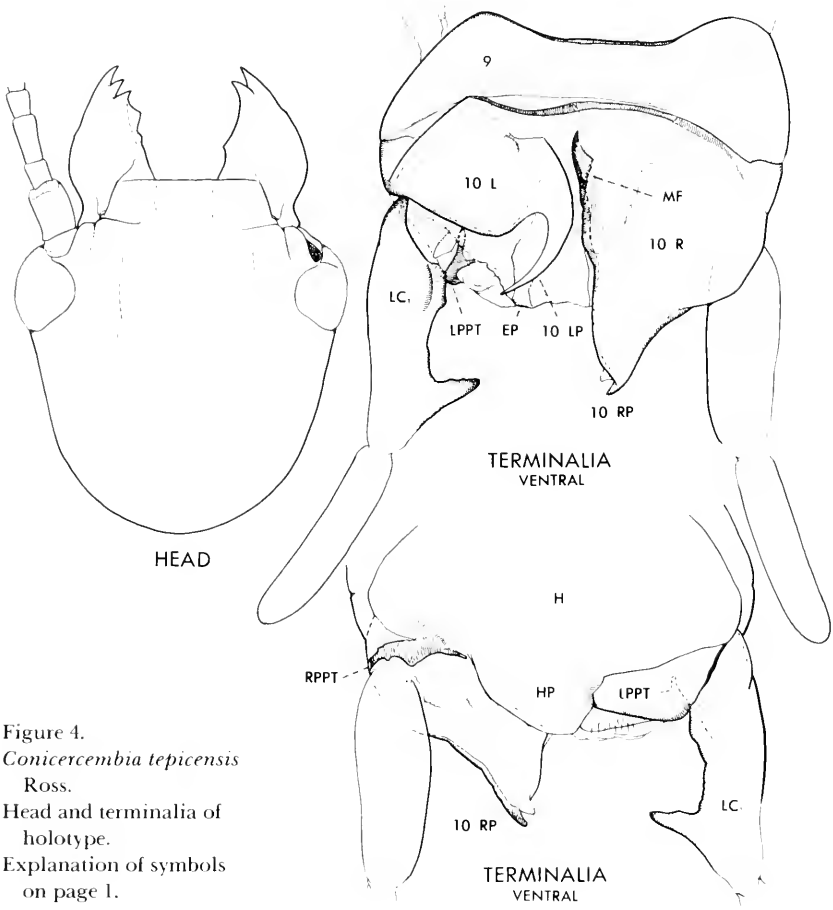

Figure 4.
Conicercembia tepicensis Ross.
Head and terminalia of holotype.
Explanation of symbols on page 1.

tral membrane tinged with pink. Prothoracic sclerites and forelegs blackish except for reddish-purple membranous areas. Membranous area between pro- and mesothorax brilliant cream-white due to fat body within, this pale band sharply delimited. Pterothoracic sclerites various shades of dark brown to black with purple membranes; femora without prominently-pale apices. Wings with stripes black and violaceous in luster, radius borders pink. Abdominal segments I through VIII largely purple due to weak sclerotization; terminal segments blackish with pale pink membranes, apices of tergal processes dark amber. Dimensions (on slide): body length 13.5 mm; forewing length 6.0 mm, breadth 1.75 mm.

Important anatomical characters: As figured and described for the genus.

Allotype.—Adult female with holotype data and disposition.

Description.—Coloration distinctive. Head, meso- and metathorax and dorsum of abdomen dark mahogany-brown; prothorax pale gold, pale membranous areas between thoracic segments forming two distinct transverse bands; pale pleurae and sides of tergites of abdomen forming broad, longitudinal stripes down sides. Forelegs pale yellow, mid-legs golden-brown, hind legs largely mahogany-brown. Hind basitarsi with two ventral papillae. Body length: 16.5 mm.

Paratypes and parallotypes.—Toptypic series distributed in major entomological museums, including IBUNAM.

Biology.—The type locality is in an oak zone with scattered pines at 4000 ft. elevation in the mountains about 30 miles SE of Tepic. Colonies are encountered in crevices of the coarse bark of oak trees. They are most likely to be found in stumps and branch bases left by wood cutters. Especially favored are recently installed oak fence posts with bark still attached. The splits and loose bark provides excellent means of avoiding predators and adverse climatic conditions. Each colony consists of a crevice refuge and foraging galleries among lichens used as food. On the encounter date, 5 November 1976, each colony was occupied by a single adult female and her brood of first and second instar nymphs. Some females had only eggs. These nymphs began maturing during late April 1977 and by mid-June females were laying eggs. These were laid in loose clusters around the resting place of each parent female.

Genus ***Pachylembia*** Ross, new

Type species.—Pachylembia chapalae Ross, new species, by present designation.

Distribution.—Mexico: Pine-oak zone of Jalisco and Guerrero.

Diagnosis.—Males: Medium to large (body length averaging 10 mm), robust, apterous; uniformly black except for one or two narrow white bands between thoracic segments; all appendages entirely dark except cerci which are irregularly paler on unsclerotized surfaces. Cranium oval, eyes small; antennal segments nymphoid, setae short; mandibles as in *Neorhagadochir;* submentum large, sclerotic, all margins well defined. Body nymphoid; abdomen of one species *(taxcoensis)* higher than broad. Hind basitarsi with two ventral papillae and dense plantar setae. Tenth abdominal tergite broadly cleft meso-basally; left hemitergite (10 L) somewhat quadrate and projected meso-caudally, surface densely setose (the setae at times slanted latero-basad); process (10 LP) very small, finely tapered (almost hair-like); right hemitergite (10 R) large, densely setose in *chapalae;* process (10 RP) simple, short, especially broad in *chapalae.* Medial flap (MF) a simple, short arm. Epiproct sclerite (EP) very broad, angled toward right. Ninth sternite (H) evenly sclerotized, convex, not extended as a pronounced process (HP). Left paraproct (LPPT) with sclerite narrow, touching but not fused to margin of HP, fleshy portion extensive and evenly microspiculate. Right paraproct obsolete. Basal segment of left cercus partially or entirely unsclerotized but with a very narrow, basal, sclerotic rim, the inner-dorsal portion of which is produced as a small submembranous lobe (flap-like in *taxcoensis*), the surface of which has few, if any echinulations.

Females: General appearance and coloration almost identical to males. Hind basitarsi with two papillae.

Discussion.—This genus at present comprises three new species. Although the head and body characters are very similar to those of *Neorhagadochir,* certain features of the male terminalia are found in no other species of the order. These include: the almost obsolete left tergal process; the very dense, basad-slanted, coarse setae on the hemitergites; the dorso-basal, at times flap-like, lobe of the basal segment of the left cercus which is almost non-echinulate.

It is possible that the setae of the hemitergites aid the copulatory grip and thus reduce the need for a well-developed left tergal process.

As the Sierra Madre between Lake Chapala and Taxco is thoroughly surveyed, additional species of *Pachylembia* should be discovered.

Biology.—The known species are terrestrial but occur in distinct habitats. *Chapalae* occurs under stones in crevices of "black cotton" soil in semi-arid plateau zones—pasture land with thickets of scrub vegetation, cacti and *Agave*. A related species, *unicincta,* was found webbing matted oak leaves in a pine forest zone a short distance south of the habitat of *chapalae. Taxcoensis* colonies were found in similar habitats near Taxco, Guerrero, but also under stones in pasture land to the west of Iguala. All species appear to have a single generation of adults per year.

Pachylembia taxcoensis Ross, new species
(Figure 5)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Guerrero: 5 km E Taxco, matured 20-X-1976 (E.S. Ross).

Description.—Appearance: Medium sized, robust, apterous; darkly melanized except for a distinct white band between each thoracic segment; bases of antennae and cerci pale. Color details (in alcohol): Cranium dorsally jet-black, luster dull, lacking pattern; ventrally mahogany-brown. Eyes dark lavender, reddish-brown marginally. Basal antennal segments various shades of tan, antennae grading to light mahogany including apex (22 segments, complete). Mandibles amber with piceous apical dentation; submentum blackish-brown. Prothoracic and cervical sclerites blackish-brown. Prothoracic and cervical sclerites blackish-brown; membranes dark purple, almost as dark as sclerites; pronotal surface dull, alutaceous. Posterior pronotal plate clear; its subdermal fat body and that beneath adjacent intersegmental membranes, forming an abrupt, white, intersegmental band. Mesothoracic sclerites, including its posterior plate, dark mahogany-brown; membranes almost as dark as sclerites. Metathorax similar but with anterior edge of scutum clear, revealing internal white fat, and thus forming a second white thoracic band. Legs concolorous with thorax except for pale "knee joints" of mid and hind legs. Abdomen rust-red with purple membranes; tenth hemitergites and hypandrium shades of brown and tan with piceous margins, membranes pale; basal segments of cerci pink-white at bases blending to light rust-red distad, distal segments tan with extreme apices pale. Body length (on slide): 10.5 mm.

Important anatomical characters.—Cranium circular in outline; submentum sclerotic, quadrate, anterior angles slightly projected. Terminalia laterally compressed, height almost equal to width due to great convexity of ninth sternite (H). Tenth tergite broadly cleft to basal margin, cleft broadest at base. Left hemitergite (10 L) as broad as long, densely setose—the setae slanted basolaterad; caudal margin sclerotic, inflexed, caudally extended; process (10 LP) very small, narrow, finely tapered—almost setaform. Right hemitergite (10 R) large, inner margin weak, densely setose caudo-laterally—the setae directed caudad; caudal angle abruptly narrowed to form a blunt, amber-colored process (10 RP). Medial flap (MF) weak, sinuous. Epiproct sclerite (EP) very broad. Ninth sternite (H) very

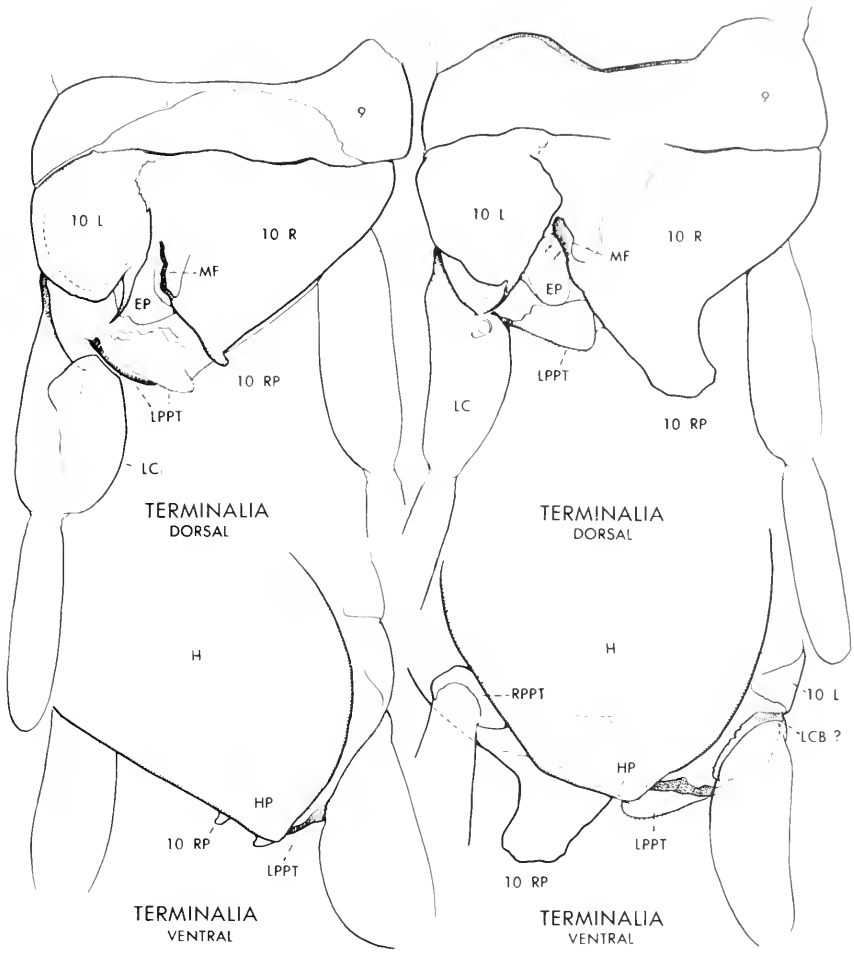

Figure 5, left. *Pachylembia taxcoensis* Ross. Terminalia of holotype. Figure 5, right. *Pachylembia chapalae* Ross. Terminalia of holotype. Explanation of symbols on page 1.

large, strongly convex; caudally broadly tapered toward left to form a very short, acute process (HP). Left paraproct (LPPT) narrowly sclerotized, not fused to HP; caudal margin a membranous, micro-echinulate fold. Basal segment of left cercus globose, largely desclerotized except for narrow basal rim; lobe a triangular, non-echinulate, dorso-basal flap, folded toward left. Other cercus segments normal except for extensive desclerotization of right basal segment.

Allotype.—Female, in alcohol, with holotype data and disposition.

Description.—Appearance: Dark mahogany brown throughout with conspicuous bands between thoracic segments. Color details: Cranium dark piceous (darkest portion of insect), dorsal pattern obscure. Antennal scape dark mahogany; flagellar segments, including apicals, uniformly dark brown (16-segmented, complete). Prothoracic and cervical sclerites mahogany-brown, all membranes lavender; posterior pronotal plate transparent amber, white fat bodies beneath and adjacent forming a broad, white intersegmental band. Mesothoracic sclerites

reddish-mahogany, membranes lavender. Metathorax similar except for transparent amber prescutum and clear anterior margin of its scutum both of which reveal white fat bodies and form a second white thoracic band. Legs mahogany except for pale "knee joints" of mid and hind legs. Abdominal sclerites reddish-mahogany with pale lavender membranes; abdominal apex darker; cerci brown. Body length 12.5 mm.

Paratypes and parallotypes.—Numerous topotypic adults deposited in major entomological collections, including IBUNAM.

Other studied specimens.—A large, cultured series, from Guerrero: 7 mi W Teloloapan, 5000 ft. elev. (E.S. Ross).

Discussion.—This species is readily recognized by the male's peculiar left cercus—the basal segment with a non-echinulate, dorso-basal flap instead of a lobe. The circular cranium and the lateral compression of the male terminalia are also distinctive features.

Biology.—The type locality is a steep slope of oak woodland within sight of the town of Taxco. Colonies are abundant between layers of dead oak leaves on the ground. The maturity of adults peaked during the month of July and August but fewer adult males appeared in cultures during March, June, October and November.

The Teloloapan site is hilly pasture land where colonies were very abundant under and between stones on an open, SW slope. A new species of *Chelicerca* was found under the same stones. In cultures most adults matured during October.

Pachylembia chapalae Ross, new species
(Figure 5, right)

Holotype.—Male on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Michoacan: 4 miles NW of Sahuayo, 5600 ft elev., matured in culture 6-XI-76, under stones near walls at edge of *Agave* field (E.S. Ross).

Description.—Appearance: Apterous, moderately large (body length averaging 13 mm); uniformly blackish-brown except for a narrow, dorsal, white band between each thoracic segment, membranous areas otherwise dark lavender. Color details (in alcohol): Cranium dorsally very dark mahogany-brown, dull, devoid of pattern; becoming dark chestnut-brown ventrally. Eyes small, nymphoid; reddish-brown. Antennae chestnut-brown, becoming slightly darker basad and paler distad; 27-segmented (complete). Clypeo-labral membranes whitish; mouthparts various shades of dark to medium mahogany-brown. All sclerotic portions of thorax and legs blackish mahogany-brown, bases of fore and mid tibiae blending to golden-brown; posterior pronotal plate and adjacent spiracular lobes pure-white due to fat body color within; posterior mesonotal plate as dark as the scutae; anterior margin of metascutum transparent and revealing pure-white fat body within; all thoracic and cervical membranes otherwise dark lavender, thus appearing concolorous with sclerites to the unaided eye. Basal abdominal segments concolorous with thorax but subterminal segments become paler and more purplish due to reduced sclerotization; sclerotic portions of segments IX and X very dark mahogany, apices of processes becoming golden-brown, membranous areas purplish-white; basal half of basal segment of left cercus purplish-cream, distal

half purplish-brown; basal segment of right cercus purplish-brown with sockets of trichobothria pale; distal segments of cerci mahogany blending to tan at extreme apices. Body length 14.0 mm.

Important anatomical characters: Head, eyes and antennae nymphoid; the sclerotic, shield-like submentum; mandibles large, flat, with large well-separated apical dentation. Tergites of abdominal segments VI–IX with strong baso-lateral apodemes, becoming increasingly large toward abdominal apex. Tenth tergite broadly cleft (broadest basally), basal margin of cleft very thin and interrupted medially. Left hemitergite (10 L) quadrate, caudal margin projected and rounded mesally; surface with large, dense setae angled caudo-laterad; left process (10 LP) very small, almost hair-like. Right hemitergite (10 R) broad, transverse; mesal surface densely setose; broadly tapered caudad to form a broad, spatulate process (10 RP) which is apically truncate and lacks subprocesses; sub-basal surface of process longitudinally depressed. Medial flap (MF) of right hemitergite short, caudal margin sinuous and sclerotic. Epiproct (EP) short, surface almost entirely sclerotized. Ninth sternite (H) extensive, vaulted, evenly sclerotized; not developed caudad as a process (HP), margin in its position inflexed. Left paraproct (LPPT) a fleshy, membranous lobe, evenly microspiculate dorsally; ventrally bearing a narrow, irregularly-margined sclerite extending diagonally and then dorsad across inner base of left cercus. Right paraproct (RPPT) a weakly sclerotized ring encircling base of right cercus ventrally, not fused to side of ninth sternite (this might prove to be part of the right cercus-basipodite). Basal segment of left cercus extensively desclerotized basad except for a very narrow, sclerotic basal ring (LCB?); produced dorsad at extreme mid-base as a twisted, finger-like small, submembranous lobe which lacks echinulations. All other cercus segments normal.

Allotype.—Female, in alcohol, with holotype data and disposition.

Description.—Appearance: Similar to male but larger, more robust but with dark areas lighter brown (not appearing black); white bands between thoracic segments broader. Color details (in alcohol): Cranium dark mahogany-brown clouded by paler areas, dorso-basal maculation faint. Eyes dark lavender, same tone as cranium. Antennae uniformly brown except basal segments are yellow-brown. Prothoracic sclerites concolorous with cranium, adjacent membranes dark purple; postnotal plate translucent medium brown, its anterior membranous arc brilliant white due to fat body within; spiracular lobes likewise white; membranous area between pro- and mesothorax otherwise cream-white, forming a broad band. Meso- and metathorax otherwise concolorous with pronotum except for a broad white intersegmental band. Legs uniformly mahogany-brown except for paler hind tibial bases. Abdominal sclerites dark mahogany with pleural membranes purple, dorsal and ventral membranes purple-white. Cerci translucent brown with concolorous membranes. Body length 15.5 mm.

Paratypes and parallotypes.—Topotypic adults, reared from type culture, deposited in major entomological museums, including IBUNAM. The paratype series also includes a lot reared from females with the following data. Jalisco: El Molino, 5000 ft, near west end of Lago Chapala.

Additional records: Jalisco: 5 mi W Jiquilpan, matured 26-X-78 (E.S. Ross), 1 male; and Jalisco: 5 mi W Jacona, matured 6+24-X-78, 3 males.

Biology.—All culture stocks were collected under stones in pasture land with dense thickets of shrubs, cacti and *Agave*. Eggs of one female began hatching late

in December. This brood matured between 15 June and 20 July the next year and produced first instar nymphs later in July. These were half grown by late September.

During copulation, the male terminalia was centered beneath the vulva and both cerci projected freely. Apparently, the left cercus is not important as a clasper, the union being secured by the pressure of the hemitergal setae and the concavity of the right hemitergite which is a socket for reception of the sclerotic caudal margin of the left hemitergite.

Pachylembia unicincta Ross, new species

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Jalisco: 5 mi S Mazamitla, 5800 ft elev., matured I-1979 (E.S. Ross).

Description.—Appearance: Moderately large (body length 13.0 mm), apterous; blackish except for cinnamon-brown on head and whitish band between meso- and metanotum of thorax. Color details (in alcohol): Cranium basically cinnamon-brown with piceous clouding, especially between dorsal pattern; ventrally golden-brown; anterior tentorial pit area translucent amber. Preclypeal sclerites yellow. Antennal segment I tan, other segments gray-black with pink membranes; apical three segments becoming lighter gray; 21 segments in complete antenna. Sclerotic areas of mouthparts gray-black; mandibles piceous with amber apices; submentum piceous with anterior angles amber. Sclerotic areas of body and legs various shades from gray-black to jet-black (pronotum darkest); all membranous areas dark purple (appearing concolorous with sclerites to unaided eye); anterior area of mesonotum dark purple, that of metanotum narrowly white with some dark purple clouding. Cleft of tenth abdominal tergite white, bases of cerci largely tan. Body length (in alcohol) 13.0 mm.

Important anatomical characters.—Almost identical to *chapalae*, differing as follows: caudal and mesal margin of left hemitergite more heavily sclerotized and inflexed. Left tergal process smaller, more strongly curved leftward and almost entirely obscured beneath overhanging caudal margin of hemitergite. Meso-basal side of lobe of left cercus slightly sclerotized, that of *chapalae* unsclerotized.

Allotype.—Female, in alcohol, with holotype data and disposition.

Description.—Appearance: Coloration similar to males. Cranium basically red-mahogany with distinct dark mahogany pattern. Eyes concolorous with cranium. Antennae yellow-tan in basal third blending to mahogany distad, apical segments not distinctly pale. All dorsal body sclerites, and legs blackish-brown; all membranes very dark purple, almost as dark as sclerites; membranous zone across anterior margin of metanotum translucent and exposing pure-white fat body which forms an abruptly-defined, transverse, white band with irregular margins. Ventral sclerites and membranes paler than dorsals except for portions of sternites VIII and IX. Cerci, including joints, mahogany-brown. Body length: 16 mm.

Paratypes and parallotypes.—Numerous topotypic adults deposited in major entomological museums, including IBUNAM.

Discussion.—Although anatomically similar, *unicincta* is readily distinguished from *chapalae* due to the presence of only one white thoracic band instead of two. Minor terminalia differences are cited in the above description.

Biology.—The type culture was secured in south-facing open glades in pine-oak forest where the species uses interstices of dead oak leaves on the ground as protection for its galleries and as food. The peak maturation of adults occurred during the month of August. Colonies were very rare and each was occupied by a single female and her brood.

Family **ANISEMBIIDAE** Davis

Anisembiidae Davis, 1940b, p. 535.—Ross, 1940b, p. 642; 1944, p. 434; 1970, p. 169.
Mesembiinae Ross, 1940b, p. 643 (Type genus: *Mesembia* Ross; 1944, p. 435 (as syn. of Anisembiidae).
Anisembiinae Ross, 1940b, p. 649 (Type genus: *Anisembia* Krauss); 1944 (as an invalid concept).

Type genus.—*Anisembia* Krauss, 1911, by original designation.

Distribution.—Confined to Neotropical region except for limited extension into United States. Occurs in a wide range of environments from tropical rain forest to desert, sea level to high altitude.

In spite of great systematic diversity, adult males of all species have the following characters in common: Apices of mandibles non-dentate (some species may have medial points and flanges and great molar development). Submentum, at least in all Mexican species, weakly sclerotized; margins not inflexed. Often apterous, but when winged, MA never branched. Hind basitarsi always lacking a medial (second) ventral papilla. Abdominal terminalia simple to complex; left cercus often with segments fused, basal segment usually inwardly lobed toward apex and always bearing echinulations.

Anisembiids are well represented in Mexico and require very careful research based on large, cultured series. The many undescribed species in Mexico and Central America may be assigned to two very distinct subfamilies. Additional subfamilies occurring in South America will be proposed in future works.

Subfamily **Anisembiinae**

Anisembiinae Ross, 1940b, p. 643 (Type genus: *Anisembia* Krauss, 1911); 1944, p. 434.
Mesembiinae Ross, 1940b, p. 643 (Type genus: *Mesembia* Ross, 1940a); 1944, p. 435 (as synonym of Anisembiinae).

Genera assigned to this subfamily, which ranges deep into South America, form a cohesive group but one which should not be based on the segmentation of the left cercus of the male. Both two-segmented and one-segmented cerci may occur within a genus, as well as in both of the subfamilies occurring in Mexico.

The wings of adult males have strong wing veins and conspicuous cross-veins. The terminalia are relatively weakly sclerotized, simple and primitive. All terminalia processes, including that of the hypandrium, are simple. The base of the right cercus is circular, and weakly sclerotized. The paraprocts are rather symmetrical and only partially fused to the sides of the hypandrium process. The sides of the apex of the ejaculatory duct are not sclerotized. The most generalized anisembiines occur in South America, some species having symmetrical cerci—the left never lobed or echinulate.

Mesembia, the largest and most generalized of the three Anisembiine genera occurring in Mexico, is redefined as follows:

Genus *Mesembia* Ross

Mesembia Ross, 1940a, p. 12.—Davis, 1940b, p. 532.—Ross, 1940b, p. 643; 1944, p. 437.

Type species.—*Oligotoma hospes* Myers, 1928, by original designation.

Distribution.—Portions of Mexico, Central America, and the West Indies.

Diagnosis.—*Males:* Small to medium sized, body length 8-13 mm; always alate; generally unicolorous tan to black, antennae white-tipped in some species. Head elongate-oval; eyes medium sized; mandibles short, narrow-basad, outer sides usually arcuate; inner-apical margin of left mandible with flange very low, never abruptly angulate; submentum weak, quadrate. Wings with radial blood sinus (RBS) not merging apically with costa; veins Rs + MA and Rs sclerotized, longitudinal veins otherwise usually reduced to rows of setae; cross-venation usually weak, several present anterior to Rs, one each between Rs-MA and Ma-MP (the last two may be faint or absent). Tenth abdominal tergite incompletely to completely cleft to basal margin; inner margin of left hemitergite not sclerotized to base (as in *Anisembia*) but the left process (10 LP) is usually longitudinally carinate at inner basal side and the process itself is variable in form from straight to upward, inwardly or outwardly curved; usually tapered to a point. Right process (10 RP) variable from a weak, rounded lobe to a sclerotic, prolonged, apically-truncate process. Epiproct (EP) varying from broad to narrowly elongate. Ejaculatory duct never sclerotized. Ninth sternite (H) and lobe (HP) weak. Left and right paraprocts vestigial. Left cercus usually two-segmented, rarely one-segmented; basal segment varying from short, with an obtusely angulate inner-medial lobe, to elongate, tubular with a small, abruptly defined, inner-apical lobe. Females without noteworthy generic characters.

Discussion.—*Mesembia* is at this time subdivided into five species-groups, some of which may be sufficiently differentiated to eventually be treated as subgenera, or genera. *Anisembia* and *Bulbocerca*, although closely related to *Mesembia*, represent more specialized divergences. *Anisembia*, occurring in NE Mexico, is distinguished by the acutely angulate, inner-apical flange of the left mandible; almost obsolete cross-venation of the wings; the all-margin-sclerotization of the left hemitergite; and the narrow, elongate, sclerotic left paraproct. *Bulbocerca* is distinguished by its northwesterly, desert occurrence; usually apterous males; large, oval head with elongate mandibles; the unsclerotized inner margin of left hemitergite; and the short left tergal process.

1. The *HOSPES* Group

Large species with basal segment of left cercus gradually lobed mesally. Medial cleft not extended to base of tergite. Epiproct broad, caudally expanded. Inner base of left process carinate. Represented only by *Mesembia hospes* (Myers) of Cuba.

2. The *VENOSA* Group

Smaller species with basal segment of left cercus abruptly lobed distally. Tenth tergal cleft and left process as in *Mesembia hospes*. Epiproct sclerite narrow, entirely fused to inner side of tergite. Represented only by *Mesembia venosa* (Banks) of Cuba (= *Anisembia [Anisembia] schwarzi* Ross of Cuba, new synonym).

3. The *CHAMULAE* Group

Small to large sized species, 6-13 mm in length with left cercus abruptly lobed distally. Medial cleft extended to base of tergite. Epiproct sclerite broad, distally expanded. Inner base of left process sclerotized and carinate, surface longitudinally strigose; apex rounded, curved leftward and ventrad.

This is a large group with nine new Mexican species in my collection (CAS) and two others from northern Guatemala. A common species occurring in the highlands of Chiapas is named at this time.

Mesembia chamulae Ross, new species
(Figure 6)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Chiapas: Parje Voites, Mun. Zinacantan, 4500 ft elev., matured in culture IV-1977 (E.S. Ross).

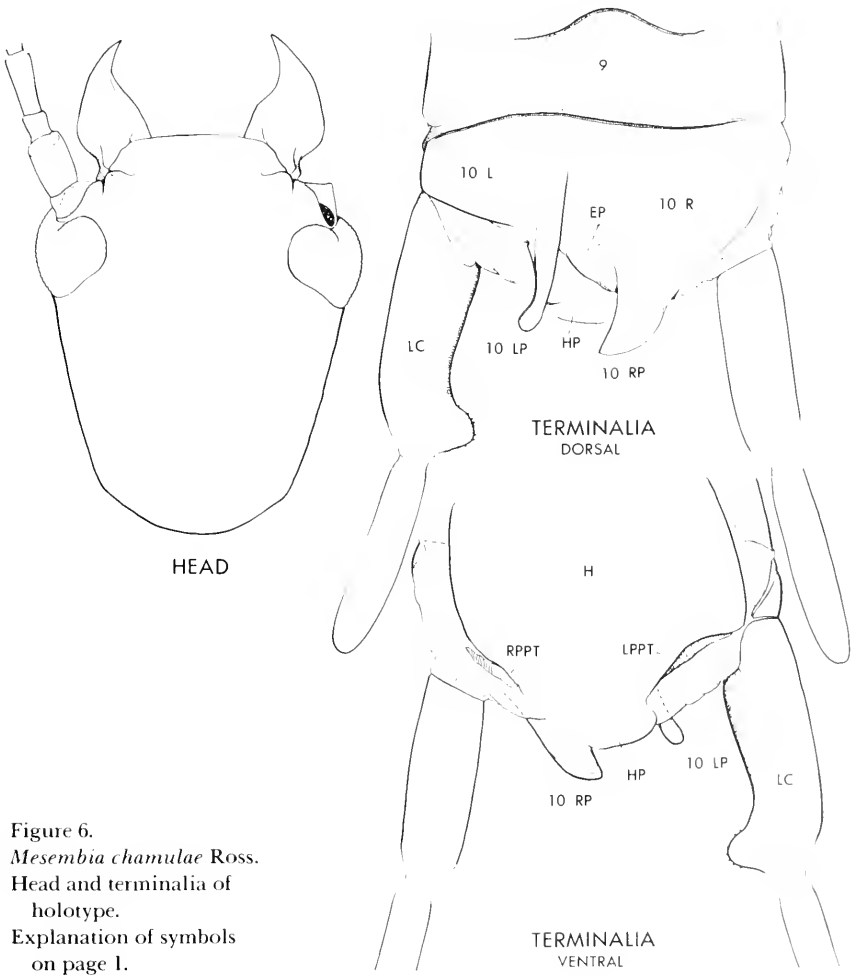

Figure 6.
Mesembia chamulae Ross.
Head and terminalia of holotype.
Explanation of symbols on page 1.

Description.—Appearance: Large, alata; uniformly dark mahogany-brown except for largely pale pterothoracic scuta. Color details (in alcohol): Cranium dark mahogany with irregular paler pattern; eyes and clypeal membranes dark lavender; basal segment of antenna dark mahogany, flagellar segments (20 in all) medium brown except distal segment which is tan; mouthparts concolorous with cranium. Prothoracic and cervical sclerites dark mahogany, all associated membranes very dark lavender. Pterothoracic scuta appearing pale tan due to whitish muscles visible subdermally, promontories and some surfaces tinged with dark mahogany; pleurites and sternites dark mahogany with dark lavender membranes. Legs various shades of mahogany, anterior basitarsus dark lavender in membranous areas. Wings with pigment stripes mid-brown, hyaline stripes abruptly margined; longitudinal veins well sclerotized except at apices; cross-veins white when crossing hyaline stripes. Abdomen largely mottled mahogany with purple-white membranes; terminalia dark mahogany with very dark lavender membranes, including joints of cerci. Dimensions (on slide): Body length: 12.0 mm; forewing length 8.0 mm, breadth 2.0 mm.

Important anatomical characters: As figured. Of specific importance is the elongate cranium, the shape of the tergal processes and that of the basal segment of the left cercus.

Allotype.—Female, in alcohol, with holotype data and disposition (from same culture).

Description.—Appearance: Large; very dark, almost entirely black with lavender membranes. Color details: Cranium basically red-mahogany with dark mahogany pattern; antennal segments uniformly dark mahogany. All sclerotic portions of body and appendages dark mahogany except for slightly paler pronotum and mid-anterior portions of meso- and metathoracic scuta and sterna; membranes mostly dark lavender with some paler thoracic areas. Body length: 18 mm.

Paratypes and parallotypes.—Numerous topotypic adults deposited in major entomological museums, including IBUNAM.

Other specimens studied.—All Chiapas in vicinity of San Cristóbal de las Casas, as follows: Rancho Nuevo, in SCC; 7 mi E of S.C.C.; 14 mi E of S.C.C.; Cave, 5 mi S of S.C.C.; and Nachig. All localities between 7000 ft and 7500 ft elev.

Biology.—This species inhabits the pine-oak woodlands characteristic of the region and colonies are found in trail and road banks, around bases of tree trunks, on sheltered surfaces of pine logs, etc. In the yard of Rancho Nuevo ("Harvard Ranch") in San Cristóbal de las Casas, colonies extensively web the bark and branch nodes of shade trees. Adults matured in culture during almost every month of the year, with a peak maturity between January and April.

Discussion.—*Chamulae* is the largest and one of the most darkly pigmented species of *Mesembia*. It also occurs at the highest known altitude of the genus. In spite of this, there are no strong anatomical characters distinguishing it from the many other species of its group. A combination of minor characters (size, coloration, and geographic occurrence) serve, however, to distinguish these species. Such details will be made known when a species treatment of *Mesembia* is undertaken.

4. The *HAITIANA* Group

Medium sized species with basal segment of left cercus very abruptly and distally lobed. Medial cleft extended to base of tergite. Epiproct sclerite broad,

distally expanded. Inner base of left process sclerotic with a parallel carina on hemitergite; apex of process very narrow, turned mesad at almost 90°. Includes only one known species from Haiti, *Mesembia haitiana* Ross, 1940b, p. 646; 1944, p. 440.

5. The *CATEMACOA* Group

Medium sized species with distal segment of left cercus broadly fused with basal segment which is distally lobed on inner side. Medial cleft extended to base of tergite; its membrane basally broad, extended leftward partially across base of left hemitergite. Epiproct sclerite broad, distally expanded, almost entirely separated from right hemitergite by a membranous line. Left tergal process variable in form, simple; right process almost parallel-sided, apex diagonally truncate. Includes a new species from eastern Guatemala and the following:

Mesembia catemacoa Ross, new species
(Figure 7)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Vera Cruz: 2 km E of Catemaco, 350 m, matured in culture 25-VIII-80 (E.S. Ross). On bark of trees along shore of lake.

Description.—Appearance: Moderately large, winged; blackish-brown throughout with only slightly paler membranes. Color details (in alcohol): Cranium dark mahogany-brown, devoid of pattern, paler around anterior tentorial pits and ventrally; surface evenly alutaceous. Eyes very dark lavender, almost as dark as cranium; narrowly rimmed with pale tan. Antennal segments uniformly dark brown, apicals only slightly paler. Palpi dark brown, other mouth parts golden-brown. Body sclerites and legs various tones of dark mahogany-brown, sternites chestnut-brown with darker sutures; all membranes dark purple, not much paler than sclerites. Wings dark brown with very narrow hyaline stripes and white cross-veins, luster metallic-lavender. Dimensions (on slide): Body length 10.0 mm; forewing length 6.4 mm, breadth 1.7 mm.

Important anatomical characters.—As figured. Cranium exceptionally narrow and elongate, eyes rather small. Mandibles acutely narrowed apically, flange of left mandible not produced; submentum weak. Antennal segments stout, 22-segmented. Tenth tergite cleft to basal margin; processes (10 LP and 10 RP) similar in form but 10 LP is shorter with extreme apex translucent, both strongly striate. Segments of both cerci very stout; fused apical segment of left cercus very large, broadly attached to basal segment.

Allotype.—Female, in alcohol, with holotype data and disposition (from type culture).

Description.—Appearance: Rather large, blackish-brown with pale band between meso- and metathorax, pronotum largely pale, mid and hind coxae white, antennal apices white. Color details: Cranium chestnut-brown clouded with dark brown. Antennal segments dark brown (including membranes) except for 5 white apical segments, 21 in all. Pronotum anteriorly chestnut-brown, grading caudad to cream-white. Posterior pronotal plate, adjacent sclerites and mesonotum dark mahogany-brown; posterior mesonotal plate clear yellow-white; adjacent membranes white, thus creating a pale intersegmental band. Metanotum

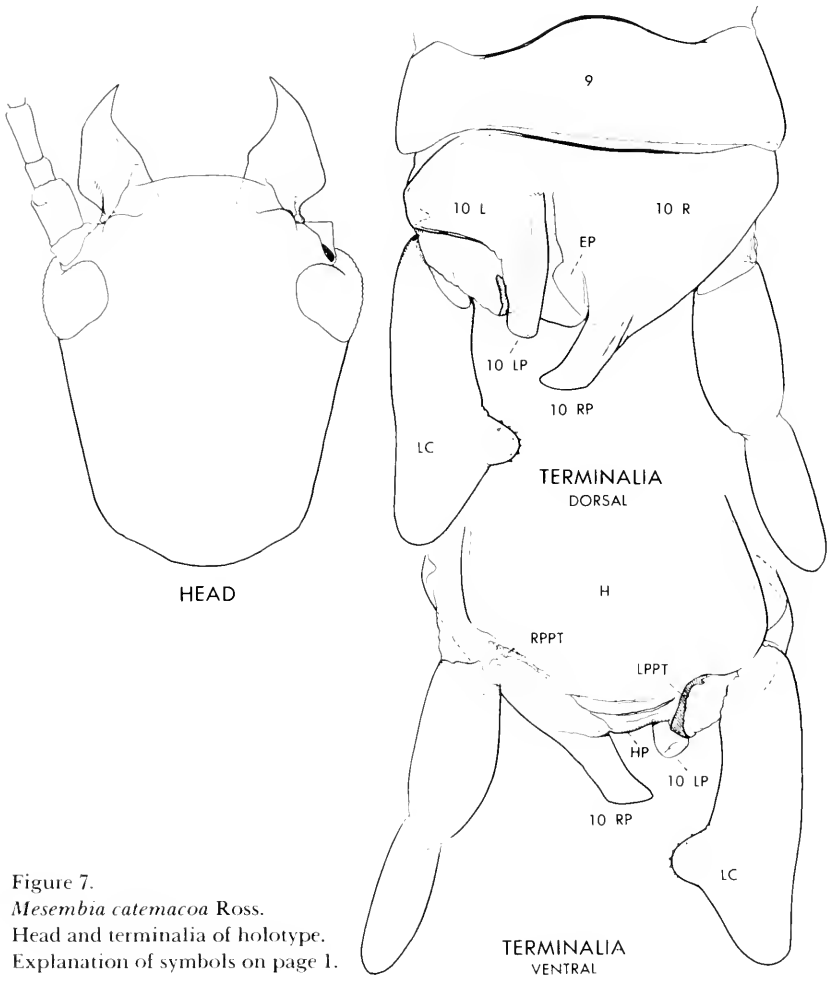

Figure 7.
Mesembia catemacoa Ross.
Head and terminalia of holotype.
Explanation of symbols on page 1.

dark mahogany-brown. Legs concolorous with dark thoracic sclerites except for largely cream-white mid and hind coxae. Abdomen almost as dark as thorax except for darker perigenital sternites and cerci. Body length 12.0 mm.

Paratypes and parallotypes.—Hundreds of topotypic adults reared in type culture, matured between September, 1980 and March, 1981—mostly during the month of January. Deposited in CAS, USNM, IBUNAM and other appropriate collection centers.

Remarks.—To date, no additional species of this group have been discovered in Mexico, but inasmuch as a closely related new species occurs in eastern Guatemala, related species must occur in intervening regions.

Additonal record.—Chiapas: 5 mi NE Huixtla, 225 m, male matured 11-XI-1980 (E.S. Ross).

Genus ***Bulbocerca*** Ross, new status

Anisembia (Bulbocerca) Ross, 1940b, p. 654; 1944, p. 148.

Type species.—*Anisembia sini* Chamberlin, 1923, by original designation.

Distribution.—Mexico: Islands and shores of Golfo de California and mountainous interior of Baja California.

Diagnosis.—*Males:* Medium to small sized, length averaging 9 mm; apterous or alate; pale tan to black, or multicolored. Cranium exceptionally large, elongate-oval. Eyes small, nymphoid. Antennae rather short, segments increasing in length distad, unicolorous; mandibles large, elongate, outer sides extensively straight before apical curvature; inner-apical arcuation of left mandible appearing to have a slight rudiment of a subapical tooth; submentum broader than long. Thorax with or without slight developement of wing pads; fully alate in two species. Hind basitarsi short, globose. Tenth abdominal tergite not cleft to base, cleft arcuated toward left, its margins not elevated or sclerotic. Left hemitergite (10 L) sclerotic on basal and caudal margins only; its process (10 LP) short, blunt or truncate; right process (10 RP) fairly prolonged, truncate or feebly tapered. Epiproct sclerite (EP) broader than long. Ninth sternite (H) large, weakly but evenly sclerotized; its process (HP) broad, extensive, irregularly truncate apically. Paraprocts (LPPT and RPPT) large, almost symmetrical, but occasionally obscure due to desclerotization. Basal segment of left cercus largely cylindrical with inner side flattened and sclerotic, then abruptly expanded as a bulbous, densely microechinulate nodule; apical segment short, rounded, broadly fused to basal segment. Basal segment of right cercus elongate, apical segment rather short.

Females: Without significant generic characters.

Discussion.—The discovery of five new species closely related to *sini* strengthens my conclusion that *Bulbocerca* is a valid genus. It seems to be confined to the arid coastal zones of Sonora and the peninsula of Baja California. Thus its range is well separated from that of *Anisembia* and *Mesembia* by Mexico's central plateau. Consistent differences in many anatomical characters provide a basis for generic separation from *Anisembia* and *Mesembia* and other related genera. Alone, none of these characters would seem to be of generic importance, but in aggregate they are conclusive.

Biology.—Typically, *Bulbocerca* colonies are found under and between stones especially in the thin shade of desert trees and shrubs growing along arroyos. By using subterranean retreats, the insects can withstand some of the greatest aridity and heat found in North America. In addition to rocky habitats, one species was found in a sandy zone where it used dry cattle droppings as cover and food. It is probable that only one generation develops per year.

Component species.—Besides the type species *sini* (Chamberlin) from Loreto, Baja California, and San Carlos Bay, Sonora (new record), six new species are in my collection (CAS). Three of these are from the peninsula of Baja California, one is from a northern island in Golfo de California, and another from Kino Bay on the mainland of Sonora. These species are well defined anatomically as well as in size and coloration. When this portion of Mexico is thoroughly searched, it may be expected that many more species and races will be discovered. Speciation may have been stimulated by limited gene pool exchange due to male apterism and by population size reduction during periodic drought. The only known alate species

were collected under stones at the edge of Laguna Seca Chapala, a rather elevated locality in north-central Baja California, and at Napolo, a canyon draining into the gulf opposite Isla Santa Catalina. At this time, one new species is described and figured to represent the generic characters.

Bulbocerca fulva Ross, new species
(Figure 8)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Baja California: Comondu, 21-VII-1938 (E.S. Ross).

Description.—Appearance: Small, apterous; head rather large; uniformly pale amber with darker amber cranium. Body length 9.0 mm. Anatomical characters: As figured.

Allotype.—*Female,* in alcohol, with holotype data and disposition.

Description.—Appearance: Similar in appearance to male, but larger.

Paratypes.—Several males with type data and disposition.

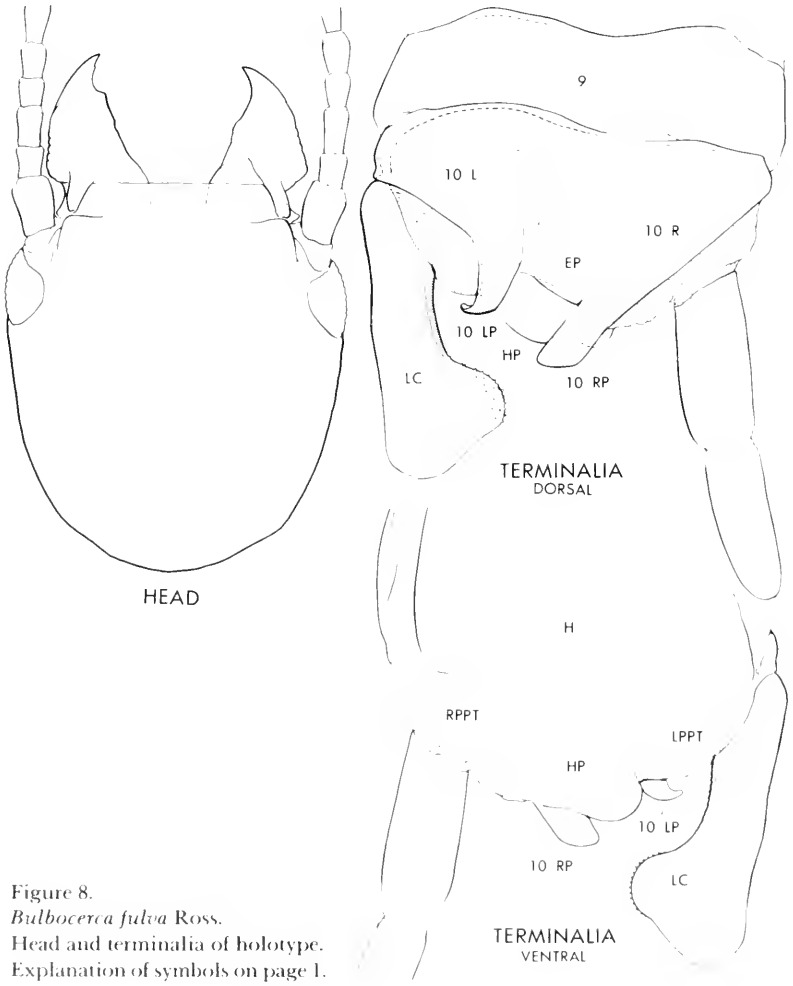

Figure 8.
Bulbocerca fulva Ross.
Head and terminalia of holotype.
Explanation of symbols on page 1.

Other specimens examined.—A series of both sexes reared in a culture from Baja California: 3 miles S of Canipole, Sierra Giganta; males matured 2 October 1941 (E.S. Ross).

Discussion.—Fulva differs from *sini* (Chamberlin) in its smaller size and uniformly pale amber coloration. *Sini* is blackish-brown with whitish thoracic intersegmental bands and an orange cranium. *Fulva* and *sini* will be more fully treated when the other species of the genus are described and compared.

Biology.—The types were collected under stones at the edge of cultivated fields (next to native scrub) at the bottom of the basaltic gorge of Comondú. Conditions were extremely dry and the embiids in underground retreats were attracted to the surface by wetting the ground with water from a nearby irrigation ditch. The Canipole colonies were found under stones beneath thorny acacias at the edge of a stony wash draining toward the head of Bahia Concepción, Golfo de California.

Genus *Anisembia* Krauss

Anisembia Krauss, 1911, p. 74.—Enderlein, 1912, p. 109 (in error as a synonym of *Oligotoma* Westwood and *Haploembia* Verhoeff).—Chamberlin, 1923, p. 346.—Davis, 1940b, p. 531.—Ross, 1940b, p. 649; 1944, p. 445, 1984, p. 84.

Type species.—Embia texana Melander, 1902, by original designation.

Distribution.—United States: South-central states, especially eastern Texas southward at least to Victoria, Mexico.

Diagnosis.—Males: Rather small, averaging 8 mm in length; apterous or alate (at times in same colony). Dark brown with head, prothorax, and profemora golden; white between pro- and mesothorax. Head oval; eyes small; antennae uniformly dark brown; mandibles short, outer margins continuously arcuate; inner-apical arcuation of left mandible with an acute medial flange, inner arcuation of right mandible smooth; submentum broader than long, weakly sclerotized. Wings, when present, relatively short, darkly pigmented; RBS slanted toward costal margin but not merging with it; all veins behind RBS indicated only by lines of setae and well-defined pigment stripes; cross-veins almost entirely obsolete behind RBS; apterism in some males manifested by short wing pads or a complete absence of any trace of pads. Tenth abdominal tergite incompletely cleft. Left hemitergite (10 L) rather large with all margins dark, sclerotic; inner margin not elevated, straight, continued caudad as the straight inner margin of left tergal process (10 LP) which is weakly sclerotized on its outer apex, and slightly curved mesad. Right hemitergite (10 R) large, its basal margin well defined; outer margin weak, evenly slanted and continuous with outer side of process (10 RP) which is not pronounced or apically-truncate. Epiproct sclerite (EP) broad, curved ventrolaterad beneath right hemitergite. Ninth sternite (H) large, quadrate, evenly sclerotized; its process (HP) short, rounded, weak. Left paraproct sclerite (LPPT) narrow, arcuate, basally fused to H; right paraproct represented by small, rudimentary sclerites (RPPT) next to H. Basal segment of left cercus cylindrical with a conate, sparsely echinulate, inner-apical lobe; apical segment a short setose lobe fused to basal segment; line of fusion membranous. Right cercus normal but with apical segment short and concolorous with basal segment.

Females: With coloration paralleling that of males. Lateral, arcuate areas of eighth sternite very dark; intervening area clear membrane. Ninth sternite darkly

pigmented except for large, clear, equilaterally-triangulate baso-medial area. Segments of cerci concolorous, exceptionally short.

Discussion.—Anisembia is very closely related to other anisembiine genera of North America, especially *Mesembia.* Principal distinctions of males are the non-ridged, straight, composite inner margin of the left hemitergite and process, the narrow form of the left paraproct sclerite, the acutely flanged left mandible, and the reduced wing venation. In spite of similar left cerci of males, *Mesembia catemacoa* is not closely related to *texana.*

Component species.—The genus is limited at this time to the one species *texana* (Melander), 1902. *Oligotoma venosa* Banks, 1924, described from Santa Clara, Cuba, assigned by the writer (1944) to *Anisembia* is now removed to *Mesembia* Ross because of the ridged inner margin of its left hemitergite; prolonged, truncate right tergal process; narrow, closely appressed epiproct sclerite; broadly sclerotized left paraproct; and the stronger wing venation with prominent crossveins. The former subgenus, *Bulbocerca* Ross, is now regarded as a distinct genus.

Anisembia texana (Melander)
(Figure 9)

Embia texana Melander, 1902, p. 19.
Anisembia texana (Melander) Krauss, 1911, p. 74.—Chamberlin, 1923, p. 345.—Davis, 1940b, p. 532.—Ross, 1984, p. 84.
Oligotoma texana (Melander), Enderlein, 1912, pp. 92, 109.
Anisembia (Anisembia) texana (Melander), Ross, 1940b, p. 650; 1944, p. 445.

Holotype.—Male, nymph, MCZ. Austin, Texas (A.L. Melander).

Mexican records.—Nuevo Leon: 20 mi W of Linares (on Hwy. 60), under stones in canyon (E.S. Ross), alate and apterous males matured in culture during April, 1947. Tamaulipas: 19 and 28 mi S Ciudad Victoria (on Hwy. 85), males matured in culture during November, 1949.

General distribution.—In the United States, *texana* ranges throughout eastern Texas northward into the Wichita Mts. of SW Oklahoma and eastward into Arkansas and western Mississippi. In humid, forested environments it colonizes tree bark; in arid zones it occurs under stones. Alate males are most frequent in wetter regions. Some arid localities have only apterous males.

Subfamily ***Chelicercinae*** Ross, new

Type genus.—Chelicerca Ross, by present designation.

Distribution.—SW U.S.A., throughout Mexico, southward to central Argentina.

Diagnosis.—Wings, when present, usually narrow; lacking cross-veins. Male terminalia usually well sclerotized. Left tergal process (10 LP) broad, complex, left side often twisted downward. Apex of right tergite rounded, slightly produced (10 RP); usually with a talon-like process (probably of medial flap derivation) arising on inner margin and arcing across apex of process. Epiproct (EP) a diagonal fold in cleft, often sclerotic, occasionally spinous. Hypandrium process (HP) broad, complex, its apical rim usually reflexed dorsally; caudal margin with lobes and/or microspiculation. Apex of ejaculatory duct bordered by a pair of sclerotic "rods"

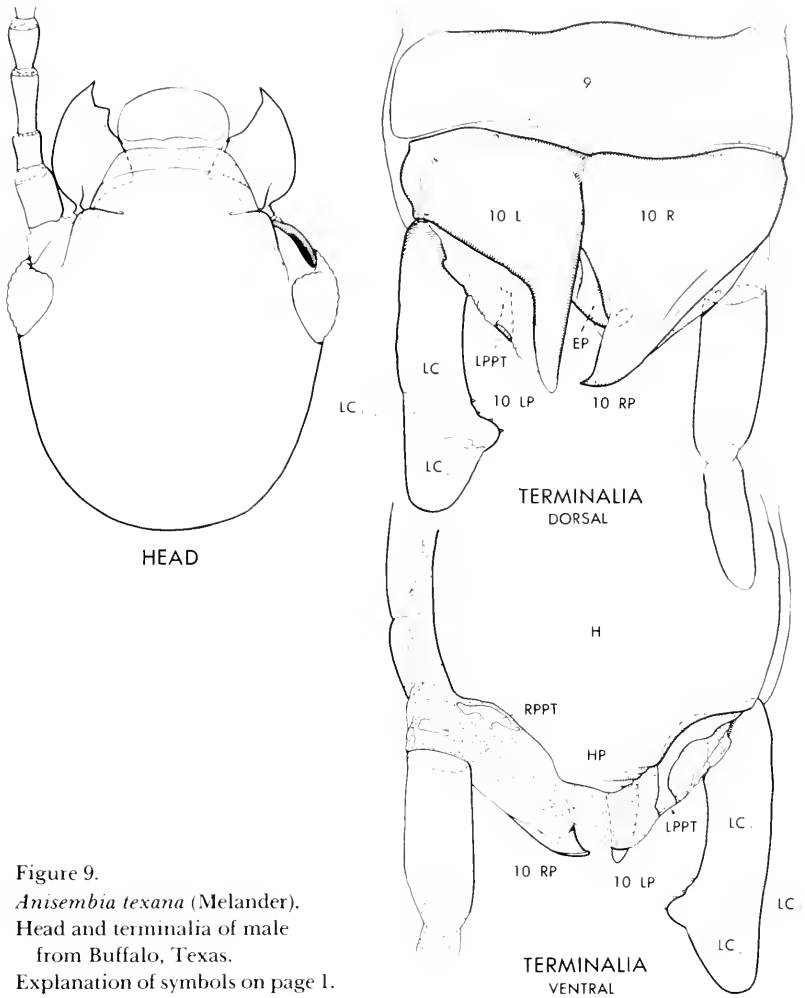

Figure 9.
Anisembia texana (Melander).
Head and terminalia of male from Buffalo, Texas.
Explanation of symbols on page 1.

(gonapophyses = GON). Portion of left paraproct (LPPT) isolated as a sclerotic plate at inner base of left cercus, its other portion, and right paraproct (RPPT), fused to sides of HP (it is possible that portions of the complex apex of HP are of paraproct derivation). Segments of left cercus usually fused; basal segment echinulate, often lobed. Base of right cercus sclerotic, irregular. Females without apparent subfamily characters.

Discussion.—This highly diversified subfamily probably is composed of many genera. For the present, the numerous Mexican species (mostly new) will be assigned to the following three genera.

Genus *Chelicerca* Ross

Anisembia (Chelicerca) Ross, 1940b, p. 656
Chelicerca Ross, 1944, p. 448 (generic status).
Chelicerca (Protochelicerca) Ross, 1944, p. 449 (Type species: *C. dampfi* Ross, 1944). New sysnonymy.
Schizembia Ross, 1944, p. 440 (Type species: *S. granids* Ross, 1944). New synonymy.

Type species.—Anisembia (Chelicerca) davisi Ross, 1940b, by original designation.

Distribution.—Mexico southward into northern Argentina and southern Peru.

Diagnosis.—Males: Generally small, body length averaging 8-9 mm; apterous or alate. Usually darkly pigmented, often with reddish prothorax. Head small, caudally tapered; mandibles acutely pointed; submentum small, quadrate, weakly sclerotized. Wings, if present, narrow; RBS often slanted into costal margin before wing apex; cross-veins poorly developed, or absent. Abdominal terminalia highly diverse; tenth tergite cleft to basal margin. Left process (10 LP) usually broad to apex, slanted or twisted downward on left side, often carinate, notched, or with small subprocesses on apical margin. Right hemitergite (10 R) often deeply emarginated on inner side; typically with a slender "talon" arcing toward right. Epiproct (EP) varying from a clear membranous condition to darkly sclerotic with recumbent spines. Apex of ejaculatory duct usually bordered by dark sclerotic gonapophyses (GON). Hypandrium lobe (HP) very broad, often apically complex with one or more smaller lobes usually bearing minute echinulations. Left paraproct (LPPT) a large, sclerotic plate usually completely detached from adjacent structures; right paraproct fused to HP or obsolete. Basal segment of left cercus elongate, always echinulate, usually abruptly lobed; in many species the apical segment is partially to completely fused or "absorbed" into basal segment. Basal segment of right cercus with at least outer edge of basal rim sclerotic, usually entirely so with an irregularly ventral flange; apical segment always distinctly articulated. Females without good generic characters but usually recognizable by rather multicolored, banded pattern on body segments.

Discussion.—Chelicerca is perhaps the most diversified genus of the order. It appears to have attained its greatest development in arid and semi-arid Neotropical regions—particularly in Mexico. Species of the genus, and of its close relative, *Dactylocerca,* have adapted to marginal environments of the order from cold extremes in central Utah and the southern Rocky Mountains, and altitudes above 12,000 feet in the Ecuadorian Andes, to arid extremes in the loma zones of the rainless Pacific shores of Peru.

Since my 1944 treatment, I have collected at least seventy-five new species of *Chelicerca* throughout the range of the genus. These may be assigned to several species-groups, the most extreme of which eventually may be considered subgenera, or genera. The following is a synopsis of the species-groups occurring in Mexico.

1. The *dampfi* Group

Males small, wings large. Mandibles short, apices sharp; inner arc of left mandible without flange. Eyes large. Terminalia without isolated sclerite in cleft. Left process (10 LP) without apical hook. Talon of right process (10 RP) very short. Epiproct not sclerotized. Caudal margin of hypandrium process (HP)

membranous, without lobes, right side microechinulate. Left cercus with apical segment distinct, i.e., not fused to basal segment.

Represented only by *Chelicerca dampfi* Ross *(Chelicerca (Protochelicerca) dampfi* Ross, 1944, p. 450, figs. 83, 85, 86. Type locality: Chiapas: Finca Esperanza). I have cultured numerous adults of this species from stock obtained near the type locality — about 19 mi NE of Huixtla, on the road to Jacote. Colonies occur on shaded rocks and stumps in tropical forest.

2. The *davisi* Group

Males small to medium sized, winged. Mandibles short, apices sharp; inner arc of left mandible without flange. Eyes small to large. Terminalia without isolated sclerite in cleft. 10 LP without apical hook. Talon of 10 RP large, evenly arcuated. Left angle of HP projected, surface smooth; right corner rounded, echinulate. Segments of left cercus fused.

Represented in Mexico by the following named species. Many new species in my collection (CAS) await description.

(1) *Chelicerca davisi* (Ross) Figure 10 *(Anisembia [Chelicerca] davisi* Ross, 1940b, p. 656, figs. 26-28; 1944, p. 456, assigned to *Chelicerca.* Type locality:

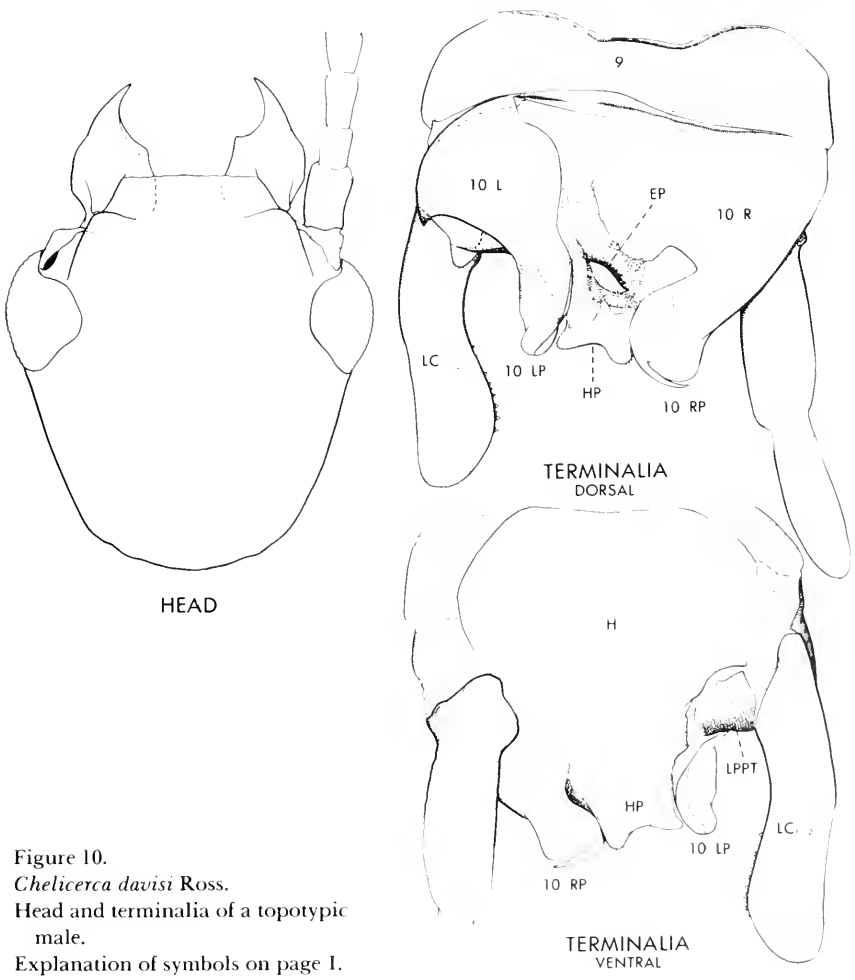

Figure 10.
Chelicerca davisi Ross.
Head and terminalia of a topotypic male.
Explanation of symbols on page 1.

Vera Cruz: El Fortín). I have cultured this species form lots collected near the type locality and Lago Catemaco, Vera Cruz.

(2) *Chelicerca heymonsi* (Enderlein) *(Oligotoma heymonsi* Enderlein, 1912, p. 114, figs. 74-76; Ross, 1944, p. 454, assigned to *Chelicerca.* Type locality: Oaxaca [?]: Sierra Mixteca). I have studied the holotype and compared it with specimens collected near Nochixtlan, Oaxaca.

(3) *Chelicerca chamelaensis* Mariño and Márquez *(Chelicerca [C.] chamelaensis* Mariño and Márquez, 1982, p. 102, figs. 1-5. Type locality: Jalisco: Chamela). This is one of many related new species occurring in western Mexico, the study of which will be very difficult.

3. The *NODULOSA* Group

Males similar to those of the *davisi* group but generally larger and with the finger-like lobe, or nodule, of the right apical corner of HP densely echinulated (rather than smooth) on a rounded apex.

Represented by the following named species and several closely related new species from the Vera Cruz and Chiapas regions.

Chelicerca nodulosa Ross *(Chelicerca nodulosa* Ross, 1944, p. 451, figs. 84, 87, 88. Type locality: Vera Cruz: Isla). I have cultured several lots of this species from the states of Vera Cruz and Chiapas. Among the difficult-to-define new species, one was collected on Cerro Huitepec, near San Cristobal de las Casas at 8500 feet elevation.

4. The *JALISCOA* Group

Males small, apterous or alate. Mandibles small, short; left with an obtuse flange on inner curvature. 10 LP very broad, flat; extreme apex with a small but distinct hook. Talon of 10 RP abruptly angulate instead of evenly curved. Cleft with a detached sclerite opposite epiproct (EP) which is weakly sclerotized. HP small; left angle broadly rounded, smooth; left angle semicircular, echinulate. Left cercus segments fused.

Three new species have been collected on the central plateau, one of which is described at this time.

Chelicerca jaliscoa Ross, new species
(Figure 11)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Jalisco: 5 mi W Jiquilpan, matured in culture 1-III-1979 (E.S. Ross).

Description.—Appearance: Small, apterous, slender; head and terminalia black, prothorax golden, remainder of specimen shades of mahogany-brown. Color details (in alcohol): Cranium glossy black, lacking pattern but suffused at margins with mahogany. Eyes lavender-gray, paler than cranium. Basal antennal segment dark mahogany; other segments medium brown, somewhat darker distad. Cervical and pronotal sclerites and posterior pronotal plate golden-yellow, associated membranous areas whitish tinged with pink. Other thoracic sclerites and legs mahogany except for posterior margin of mesonotum and fore coxae which are golden; membranous areas pale brick-red. Abdominal sclerites mottled maho-

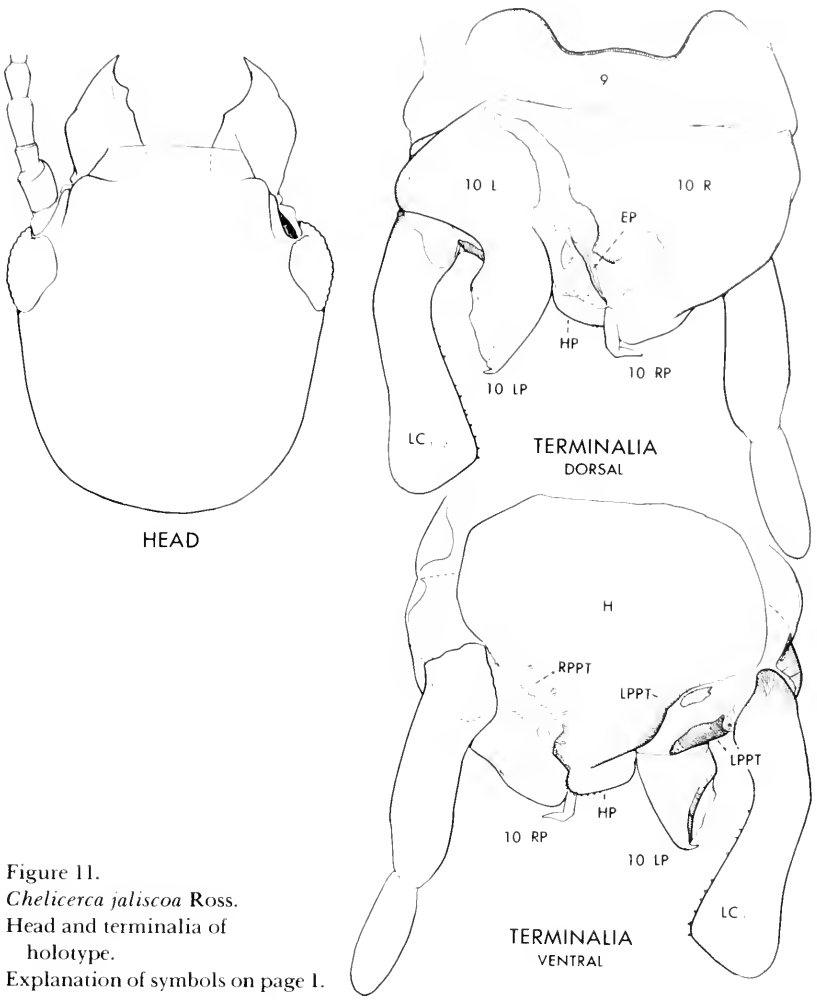

Figure 11.
Chelicerca jaliscoa Ross.
Head and terminalia of holotype.
Explanation of symbols on page 1.

gany, membranes yellow-tan; terminalia sclerites glossy dark mahogany, membranous areas pink-white. Body length (on slide): 5.75 mm.

Important structural features.—Cranium oval, eyes small, antennae 17-segmented. Mandibles small, short, left mandible with an obtusely angulate medial flange. Left tergal process (10 LP) exceptionally broad, flat except for a narrow downward fold at extreme caudo-lateral apex; inner apex with a small but prominent hook. Talon of right process extended beyond apex of 10 RP, abruptly angled to right at 90°. Medial cleft with an isolated sclerite. Epiproct (EP) fold elongate, well sclerotized. Hypandrium process (HP) rather small, short, thick, without processes; echinulate only on a rounded caudo-ventral nodule on right side. Left cercus straight on inner side, echinulate along distal two-thirds of this surface.

Allotype.—Female (in alcohol), with type data and disposition (from type culture).

Description.—Appearance: Small, slender; golden-brown with prothorax and intersegmental area between meso- and metathorax paler. Color details: Golden-brown with faint rust pattern, eyes dark lavender. Antennae yellow-tan, distal segment (the 19th) darker. Cervical and prothoracic sclerites pale yellow, adjacent membranes whitish. Other thoracic sclerites rust-brown; membranous areas, especially between segments, whitish due to color of internal tissues. All leg segments rust-brown. Abdominal sclerites darker rust-brown with pink-white membranes; cerci golden-brown. Body length: 9 mm.

Paratypes and parallotypes.—A series of topotypic, cultured adults, most of which matured during April and June. Deposited in CAS, USNM and IBUNAM.

Biology.—Stock for the type culture was collected during the rainy season under stones in pasture land with mixed cactus and thorny scrub.

5. The *maxima* Group

Males large, alate. Mandibles sharply pointed, left mandible without obtuse or acute flanges. Tergal cleft without isolated sclerite. 10 LP short, abruptly twisted laterad; apex with a down-directed hook on upper edge. 10 RP rather narrow; talon arising high on inner side, evenly curved, crossing half of process-width. Epiproct sclerite (EP) weak, granulate. HP prominent, broad, up-curved; apical rim sclerotic, non-echinulate with a single, acute, medial spine slanted leftward. Left cercus with lobe bulbous, densely echinulate; apical segment well defined but broadly fused to basal.

The following two new species are known:

Chelicerca maxima Ross, new species
(Figure 12, left)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Guerrero: 3 mi S of Acahuizotla (old route of Hwy. 95), matured in culture 20-IV-1947 (E.S. Ross).

Description.—Appearance: Very large, alate; mahogany-brown except for lemon-yellow prothoracic and cervical sclerites, surrounding membranous areas cream-white. Color details (in alcohol): Cranium dark mahogany, golden-brown around foramen magnum and tentorial pits. Eyes blackish-lavender, narrowly rimmed with golden-brown. Antennae uniformly mahogany-brown. Prothoracic and cervical sclerites lemon-yellow bordered with piceous, all adjacent membranes cream-white. Pterothorax and abdomen various shades of mahogany-brown, legs likewise, except for largely golden fore-coxae. Dimensions (on slide): Body length 12.5 mm; forewing length 7.1 mm, breadth 2.0 mm.

Important structural features: Antennae 25-segmented; segments very stout, keg-shaped. Mandibles small, short, apices sharp; medial flange of left mandible unlobed. Basal margins of 8th and 9th abdominal terga with very broad apodemes. Left tergal process (10 LP) broad, short; abruptly twisted leftward and downward; dorso-caudal angle bearing a sharp spine. Right process (10 RP) relatively narrow, smooth, translucent-amber; its talon arising high on inner margin, abruptly curved to right, extending only to mid-line of process. Medial cleft of 10 lacking isolated sclerite. Epiproct (EP) margin folded, granular, not heavily sclerotized. Hypandrium process (HP) upturned, sclerotic; its caudal rim smooth,

except for a small spine slanted leftward; this margin is narrow, not extended dorsally. Left cercus with segments broadly fused, evenly sclerotized; lobe somewhat bulbous, densely echinulate. Basal segment of right cercus expanded distad, evenly sclerotized; basal rim sclerotic, irregular.

Allotype.—Female (in alcohol) with type data and disposition.

Description.—Uniformly dark mahogany-brown. Antennae light brown at base becoming dark brown distad. Intersegmental areas of thorax pale. Mid and hind legs with extreme apices of femora and basal fourth of tibiae cream-white. Body length: 13.0 mm (length measurement is approximate due to shriveling—the specimen died in the culture).

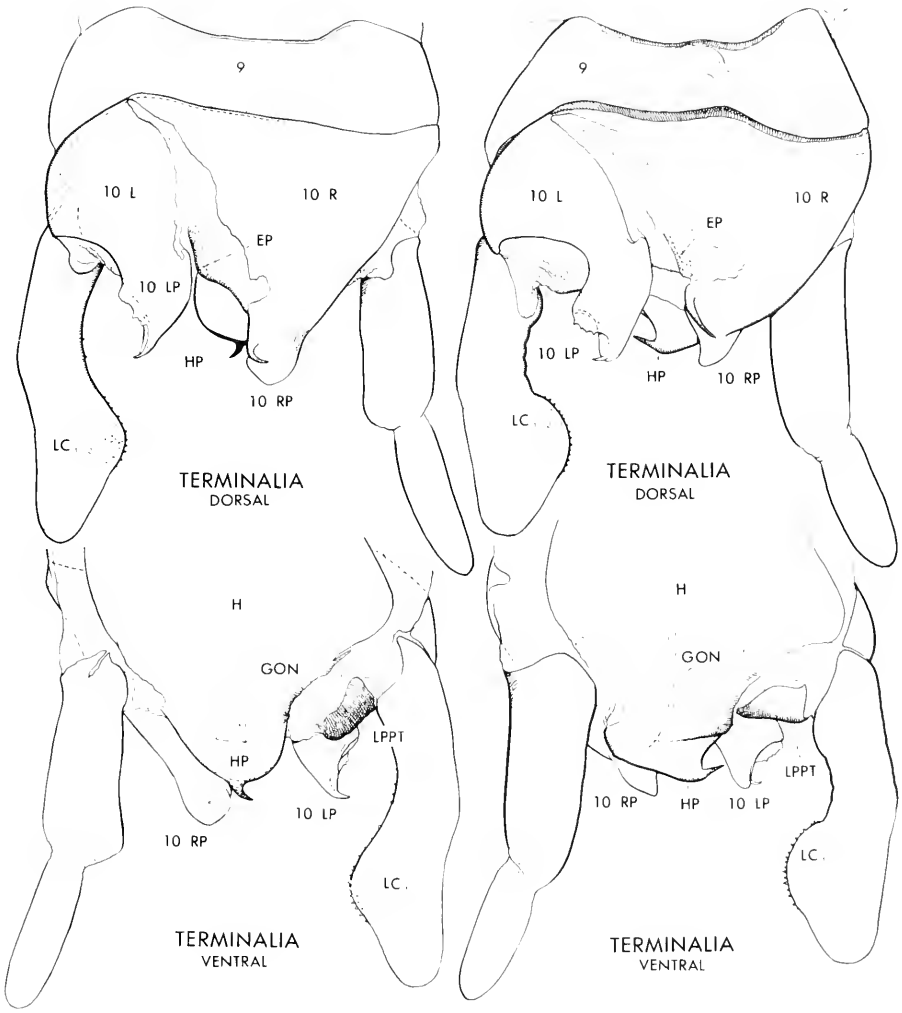

Figure 12, left. *Chelicerca maxima* Ross. Terminalia of holotype. Figure 12, right. *Chelicerca spinosa* Ross. Terminalia of holotype. Explanation of symbols on page 1.

Paratypes.—Four adult males from type colony, matured in culture during late April and May, 1947. Deposited in CAS and IBUNAM.

Biology.—I collected a single female (the allotype) alive on bark of a high, dead stump in evergreen tropical forest in a canyon. Second instar nymphs appeared in the culture by mid November, 1946 and matured during April and May the next year. The culture died because it produced only males.

Relationship.—Discussed in the treatment of the following new species.

Chelicerca spinosa Ross, new species
(Figure 12, right)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Chiapas: 5 mi SW Motozintla, 1900 m (at crest of pass), matured in culture 15-XII-1980 (E.S. Ross).

Description.—Appearance: Moderately large, alate; mostly blackish-brown with pale yellow areas on posterior portions of all thoracic segments, femora—especially of hind legs—pale golden-brown; abdomen uniformly dark. Color details (in alcohol): Cranium uniformly blackish brown, area around tentorial pits dark amber; eyes dark lavender, slightly paler than cranium; basal half of antennae golden-brown becoming dark brown in distal half, 22-segmented (complete); basal portions of mouth parts medium brown, distal portions darker. Pronotum mahogany-brown anteriorly, becoming cream-white in caudal third — the color of the intersegmental membranes; cervical and ventral sclerites of prothorax shades of mahogany-brown. Pterothorax largely dark mahogany-brown; posterior third of epimera and pre-episternum and dorsal membranes, contrastingly cream-white. Coxae, trochanters and femora of all legs varied tones of cream-white and yellow-brown, apices of all femora becoming light brown; tibiae and tarsi of all legs dark mahogany. Abdomen, including terminalia, dark mahogany; membranes dark purple, almost as dark as sclerites. Dimensions (on slide): Body length 10.0 mm; forewing length 6.1 mm, breadth 1.3 mm.

Important structural features: As figured. Of special importance, in comparison with *maxima:* The longer talon of the right tergal process (10 RP); the weaker sclerotization of the epiproct fold (EP); the very large, leftward-recurved spine on the caudal margin of the hypandrium process (HP) and the larger, more broadly rounded, echinulate lobe of the left cercus.

Allotype.—Female (in alcohol) with type data and disposition.

Description.—Generally blackish-brown with slightly paler prothorax and whitish antennae. Cranium dull black, finely alutaceous, lacking pattern, becoming mahogany in clypeal area. Eyes purple-black, almost as dark as cranium. Basal antennal segment dark straw-yellow; all other segments (20 in all) blending distad from pale yellow to gray-white, membranes white. Mouthparts mahogany-brown. Cervical sclerites dark amber. Prothoracic sclerites shades of mahogany, membranous areas pink-gray except for a white area at anterior pronotal margin due to fat body within. Posterior pronotal plate mahogany, blending to golden-brown anteriorly and then white due to color of subcutaneous tissue. Remainder of thorax shades of blackish-brown and mahogany except for small, white, subcutaneous areas beneath posterior mesonotal plate and a similar white spot at each posterior corner of metanotum. Legs concolorous with thorax except for chestnut-

brown foretarsi and gray trochanters and femoral bases of hind legs. Abdomen blackish-brown except for a narrow, white, subcutaneous streak at lateral caudal margin of tergites I through VI. Cerci shades of mahogany. Body length 8.5 (somewhat shrivelled due to death in culture).

Paratypes.—None.

Biology.—Galleries of the type specimens were found in dense epiphytes on a limb of a large, cloud forest tree on the crest of the divide between Jacote and Huixtla. If the tree had not been recently felled, the habitat would have been inaccessable. It is anticipated that this species and relatives also occur in nearby Guatemala. A species of the *nodulosa* group was encountered in the same habitat.

6. The *WHEELERI* Group

Adult males highly variable in size and appearance, black to pale amber, apterous or alate. Cranium often elongate; mandibles usually enlarged with an acute or obtuse flange on inner side of left mandible. Cleft of terminalia lacking an isolated sclerite. 10 LP very broad, flat, not twisted latero-ventrad; inner corner with a prominent, acute point. 10 RP very narrow; talon large, evenly arcuated, as long or longer than width of process (one new species has a thin flange projecting mesad from base of a laterally-directed, scarcely-arcuated talon). Epiproct (EP) a simple, granular fold, not sclerotized. HP sclerotic, upturned; margins smooth, never echinulate, with a prominent medial process on caudal rim; the rim extends dorsally over a portion of HP. Segments of left cercus fused; lobe globose, echinulate.

This appears to be the largest species-group of *Chelicerca* but only one of the twelve species in my collection (CAS) has been described. All of these species are from semi-arid habitats south of Mexico, D.F. The only named species is:

Chelicerca wheeleri (Melander) *(Olyntha wheeleri* Melander, 1902, p. 17, fig. 1. Type locality: Morelos: Cuernavaca; Ross, 1944, p. 452, figs. 89-91 as new combination).

This large black species is common under stones in the Cuernavaca region. Apterous or alate males may occur in the same locality.

Genus *Dactylocerca* Ross

Anisembia (Dactylocerca) Ross, 1940b, p. 659.
Chelicerca (Dactylocerca) Ross, 1944, p. 454; 1957, p. 52.
Dactylocerca Ross, 1984, p. 85.

Type species.—*Anisembia (Dactylocerca) rubra* Ross, 1940b, by original designation.

Distribution.—Southwestern United States and Mexico at least as far south as Jalisco.

Diagnosis.—*Males:* Small, always alate; jet-black with prothorax and subterminal abdominal segments reddish or yellowish. Head and mandibles small. Wings small, narrow; RBS angled into costal margin before wing apex. Terminalia exceptionally large—much larger than head; right hemitergite (10 R) broadly-rounded caudally, not bearing a definite process, or talon—the latter represented only as a small notch or hook on right caudal arc. Epiproct (EP) complex, heavily sclerotized, in some species bearing recumbent spicules slanted

basad. Hypandrium process (HP) expanded and arcuated caudally, its dorsal surface sclerotized, its membranous areas at times coarsely spiculate. Left cercus without trace of a terminal segment, greatly elongated, tubular in shape, strongly arcuated or almost straight. Females small, slender; uniformly reddish or tan in color.

Discussion.—Dactylocerca exhibits the greatest anatomical complexity on the *Chelicerca* line. *Rubra* (Ross) is the most north-ranging, most cold-enduring species of the order and it occurs over a wide area from southern Utah and New Mexico to northern Baja California without apparent subspeciation. The genus is best represented on the central highlands of Mexico well into the state of Jalisco. A new species also occurs at sea level near San Carlos Bay, Sonora. To date, the writer has collected about twelve new species, two of which are described below.

Dactylocerca appears to be derived from the *davisi* group of *Chelicerca*. Some species of these genera could almost be assigned to either, but the bulk of *Dactylocerca* are clearly generically distinct—especially on the basis of the greatly enlarged, complex hypandrium process.

Species of the genus appear to compose two species-groups, as follows:

1. THE *RUBRA* GROUP

Characterized by a cluster of recumbent spicules on dorso-caudal rim of the epiproct (EP), an absence of dorso-basal spicules on the upper left corner of the hypandrium process (HP) and a northwesterly occurrence.

The following species are named: *Dactylocerca rubra* (Ross), *Anisembia (Dactylocerca) rubra* Ross, 1940b, p. 659; 1957, p. 52; 1984, p. 86. Type locality: Baja California: Playa Rosarito.

Although widespread in SW United States, the Mexican range of *rubra* appears to be limited to NW Baja California.

A second species, *Dactylocerca ashworthi* Ross (1984, p. 86), occurs in the mountains of northern Sonora and extends into comparable habitats of southeastern Arizona. The writer has collected at least two new species of the *rubra* group in other regions of Sonora.

2. THE *MULTISPICULATA* GROUP

In this group, the rim of the epiproct is simply sclerotic and lacks recumbent spicules. This deficiency appears to be offset by an extraordinary development of spiculate surfaces on the right, dorso-caudal portion of the hypandrium process. Species of the group are known only from Mexico's central highlands from Durango to Jalisco. These species exhibit interesting clines of increasing complexity.

Dactylocerca multispiculata Ross, new species
(Figure 13, left)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Jalisco: 20 mi W Jiquilpan, matured VIII-1948 in culture C-14 (E.S. Ross).

Description.—Similar to *flavicollis*, including most color details except that the prothorax and other non-sclerotic areas are reddish instead of golden. Dimensions (on slide): body length 7.0 mm; forewing length 4.0 mm, breadth 0.9 mm.

Important anatomical characters: Cranium and mandibles as in *flavicollis*. Terminalia broad, complex; hypandrium process (HP) exceptionally large with a large, densely spiculate area on upper left side, apex broadly and evenly rounded, right side with a small but distinct echinulate nodule.

Allotype.—Female (in alcohol) from type culture. Almost identical to females of *flavicollis*.

Paratypes and parallotypes.—30 adult males and 16 adult females from type culture and a male from 5 mi S of Jiquilpan. Deposited in CAS, UNAM, and IBUNAM.

Discussion.—At present, *multispiculata* appears to be very distinct, but I have collected several related new species which will require very close comparison and more detailed descriptions.

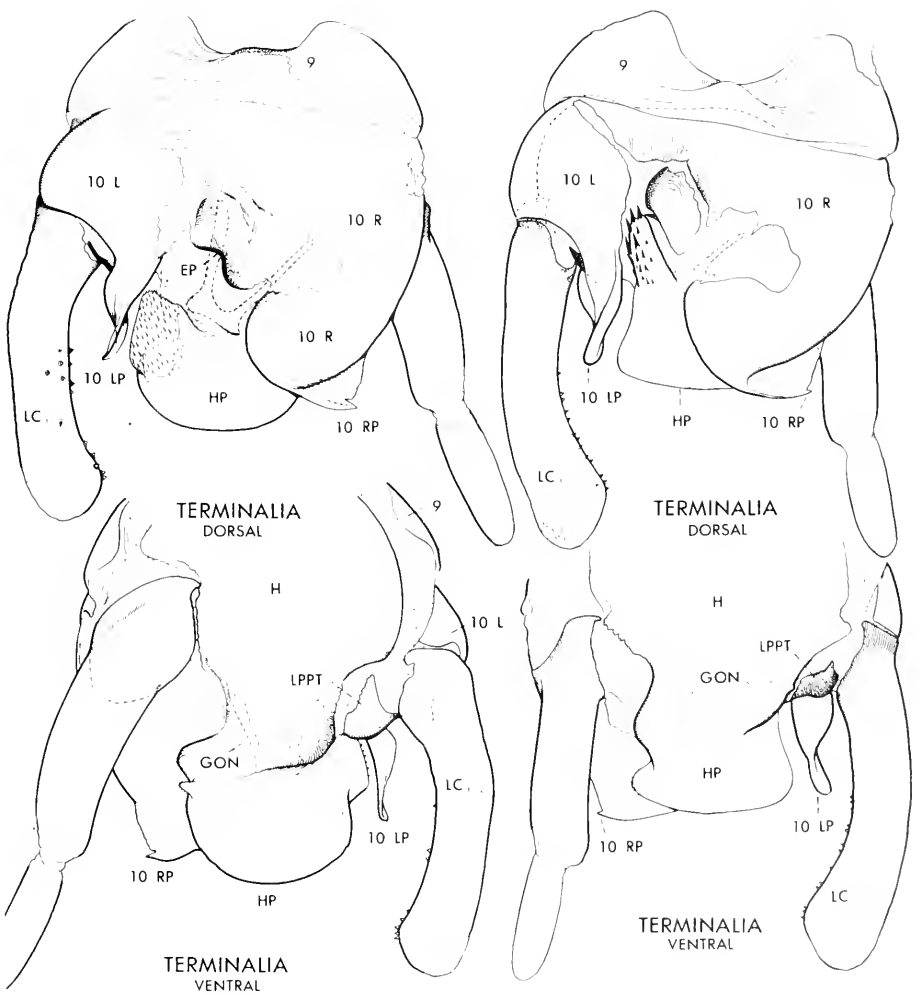

Figure 13, left. *Dactylocerca multispiculata* Ross. Terminalia of holotype. Figure 13, right. *Dactylocerca flavicollis* Ross. Terminalia of holotype. Explanation of symbols on page 1.

Biology.—Small colonies are encountered under stones in cactus-thornbush habitats used as pasture. Adults matured in the culture during October and November.

Dactylocerca flavicollis Ross, new species
(Figure 13, right)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Zacatecas: 4 mi N Fresnillo (Hwy. 45), 2350 m elev., matured in culture 19-VIII-1960 (E.S. Ross).

Description.—Appearance: Small, alate, head and terminalia dark mahogany-brown, remainder of body lighter mahogany except for golden prothorax. Color details (in alcohol): Cranium shiny, dark mahogany; surface finely alutaceous, without pattern. Eyes purple, paler than cranium. Antennal segments uniformly mahogany, 17 segments (complete). Prothoracic sclerites clear golden-yellow, membranous areas pink. Pterothoracic and abdominal sclerites and legs varied shades of mahogany; membranous areas cream-white. Terminalia sclerites glossy, dark mahogany, darker in more sclerotic areas; membranous areas gray-white. Dimensions (on slide): body length 6.5 mm, forewing length 3.25 mm, breadth 0.8 mm.

Important anatomical characters: Cranium oval; eyes small, interstices of facets clear; left mandible with a large, acute medial flange. Left process of terminalia (10 LP) stout, twisted; apex rounded. Right hemitergite (10 R) very large with a large detached portion above epiproct fold; deeply excised; caudal margin broadly arcuated and inflexed separating a thin, translucent, amber flange which bears a minute point (10 RP) on extreme outer right corner. Hypandrium process (HP) very large, complex; developed as a thumb-shaped, sclerotic, coarsely-spiculate dorsal process slanting baso-laterad in front of ejaculatory duct opening; remainder of process a thin, pale, smooth-margined flange which is lobed and micro-echinulate on right corner. Left cercus rather straight, slender, lacking mesal lobe, echinulate along almost entire inner side.

Allotype.—Female, in alcohol, with type data and disposition.

Description.—Appearance: Small, slender. Generally yellow-tan, head and abdominal apex darker. Color details: Cranium golden with faint, granular, rufous mottling. Eyes black. Antennae (17-segmented) and mouthparts yellowish. Thorax translucent straw-yellow; legs similar except for more reddish tibiae and tarsi; membranous areas concolorous with sclerites. Abdomen basically concolorous with thorax but with rufous mottling increasing caudad; perigenital sternites light brown. Body length 8.0 mm.

Paratypes and parallotypes.—Numerous cultured adult males and females from type locality. Deposited in CAS, USNM, IBUNAM, and other appropriate collection centers.

Additional series.—Hundreds of specimens reared from a culture obtained in Zacatecas: 12 mi SE Zacatecas (Hwy. 49), about 8000 ft elev. (E.S. Ross).

Discussion.—*Flavicollis* is immediately distinguished by the sclerotic, coarsely spiculated, corner of the hypandrium process, which is narrowly projected toward the base of the left tergal process. This represents the extremity of

the trend of such spiculation to concentrate, enlarge, and extend on the surface of a process. The paper-thin, squared, apical extension of HP is also distinctive.

Biology.—Colonies of the species occur under stones in cactus-thornbush habitats used as pasture. Adult males appeared in the type culture between September and June with peak numbers during April. In the Zacatecas culture, males matured every month of the year but mostly during June.

Genus ***Pelorembia*** Ross, new

Type species.—*Pelorembia tumidiceps* Ross, new species, by present designation.

Distribution.—Southern Mexico.

Diagnosis.—*Males:* Very large, body length averaging 17 mm, nymphoform, apterous. Blackish-brown except for largely orange thorax and legs. Head massive, as broad as long, almost circular, heavily sclerotized; eyes small, nymphoid; mandibles short, stout, coarsely dentate basad of the non-dentate apices; antennae small, short-segmented, dark to apex. Legs stout, as in nymphs and females. Tenth tergite narrowly cleft to base. Left process (10 LP) short, lateral margins carinate, intervening trough arcuately strigose; apical margin lobed on left corner. Right process (10 RP) bearing a small outer-apical hook subtended by a blunt lobe. Epiproct (EP) obsolete, represented only as a membranous fold. Ninth sternite (H) and its lobe (HP) evenly, strongly sclerotized; the latter caudally attenuated to form a thumb-like medial lobe on a non-echinulate margin. Gonapophyses (GON) prominent. Left paraproct (LPPT) sclerotic, detached; right paraproct very rudimentary. Cerci stout, both two-segmented; basal segment of left cercus thick with a finely and densely echinulate, globose, subapical lobe. Females superficially resembling males except for head form and terminalia.

Discussion.—The strange body and head characters of the male may be attributed to a high degree of neoteny. The atypical (non-anisembiid) condition of the mandibles must reflect a partial retention of the nymphal mandibular condition. In spite of the simplicity of the terminalia, the affinities of the genus appear to be with the *wheeleri* group of *Chelicera.*

To date, only the type species is known.

Pelorembia tumidiceps Ross, new species
(Figure 14)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Guerrero: 3 mi E of Chilpancingo, November 1946 (E.S. Ross).

Description.—Characters of the genus, as figured. Head length (from clypeal margin) 2.5 mm, breadth 2.5 mm; body length 16.5 mm.

Allotype.—Female, in alcohol, with holotype data and disposition.

Paratypes and parallotypes.—Numerous topotypic males and females deposited in several major museums, including IBUNAM.

Discussion.—No other species even remotely resembling *tumidiceps* has been found and thus its identification is simple. Colonies of the species are found in dry bark crevices of small palmettos (6 to 8 feet high) in the semi-arid life zone of

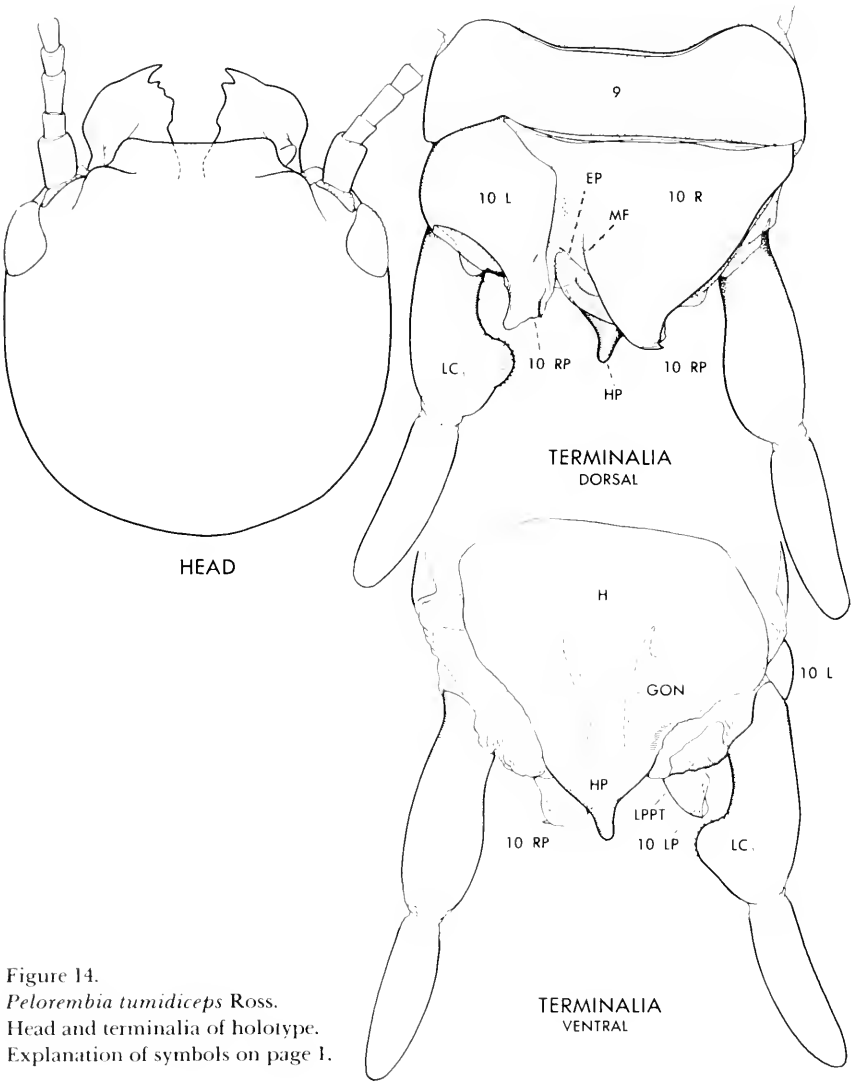

Figure 14.
Pelorembia tumidiceps Ross.
Head and terminalia of holotype.
Explanation of symbols on page 1.

Guerrero characterized by an abundance of a white-blossomed species of tree morning glory. Colonies are also present as patches of silk associated with a crevice retreat on bark of trees in dense thickets of second growth. Apparently, the species does not utilize cover of numerous stones in the environment, as does a new species of *Chelicerca* occurring in the locality.

Family **Teratembiidae**

Krauss (1911) based this family on his poorly described *Teratembia geniculata* Krauss (1911) from Tucumán, Argentina. This species' identity remained uncertain until I collected topotypic specimens and established the nature and validity of the taxa (1952). It was evident that Teratembiidae had priority over the more recently proposed Oligembiidae Davis (1940).

The family is well represented in the Neotropical and Afrotropical regions and, to a much lesser extent, tropical Asia. Two genera and numerous species occur in Mexico.

All species of the family are relatively small (maximum body length of males about 8 mm). Adult males of Mexican species are always winged and the anterior branch of the media (MA) is always forked. The mandibles are always apically dentate and the submentum is sclerotic with all margins inflexed. In all species, the hind basitarsus lacks a second (submedial) ventral papilla. The left and right hemitergites (10 L and 10 R) are fused to an exceptionally large medial sclerite (MS) which is extensively produced forward beneath the ninth tergite (9). The epiproct (EP) and right process (10 RP) are completely separated from the right hemitergite (10 R) by a transverse, membranous suture. The left paraproct (LPPT) is large, fused to the side of the hypandrium process (HP), and often extended caudal to serve as ventral support of the ejaculatory duct. The left cercus-basipodite (LCB) is completely fused to the base of the left cercus and bears one or more small mesal lobes, the dorsal of which is minutely bifurcated at extreme apex. The basal segment of the left cercus (LC1) never is echinulated on its inner surface. The base of the right cercus is ventrally extended basad (this may be the fused right cercus-basipodite) and its inner surface may be sclerotized and apically lobed. Except for relatively small size, somber coloration, and lack of a second hind basitarsal papilla, females have no distinct family characters.

Teratembiids usually colonize bark crevices but they may also occur under stones in arid habitats. Males of pale species are attracted to lights on warm, humid nights.

Genus *Oligembia* Davis

Oligembia Davis, 1939, p. 217.—Ross, 1940b, p. 636; 1944, p. 459; 1952, p. 226.

Adult males of *Oligembia* are distinguished from those of *Diradius,* the other teratembiid genus occurring in Mexico, by the following characters of the abdominal terminalia: Lines of fusion of 10 L, 10 R, and MS still evident as shallow, indistinct grooves (such lines are entirely absent in *Diradius*), 10 R with outer side short, tapered laterad (in *Diradius,* this margin is long, at least as long as outer margin of 10 L, and not tapered). The apex of 10 LP does not have an extensive, talon-like, inner process well separated from a flange-like outer portion. LCB has only a single inner process terminated by minute bifurcation. *Diradius* has a blunt lobe beneath such a process and may have a tiny, finger-like process on the inner side of the basal segment of the left cercus. The inner side of the basal segment of the right cercus is relatively simple. That of *Diradius* may be sclerotic, excised and bear one or more apical lobes.

Most of the many Mexican species of *Oligembia* in my (CAS) collection are new and await close study and description. To date, only *armata* Ross (1944, p. 474, type locality: Port of Spain, Trinidad) has been reported from Mexico (Terr. Quintana Roo, Ross, 1944). Careful study, based on adequate series, may prove this to be a distinct species.

Oligembia melanura Ross (1944, p. 460, type locality: New Braunfels, Texas) has been collected in the mountains southwest of Linares, and several closely related new species occur—especially on Mexico's central plateau. More distinc-

tive additional species have also been collected. To provide generic representation in this contribution, the following species is described at this time.

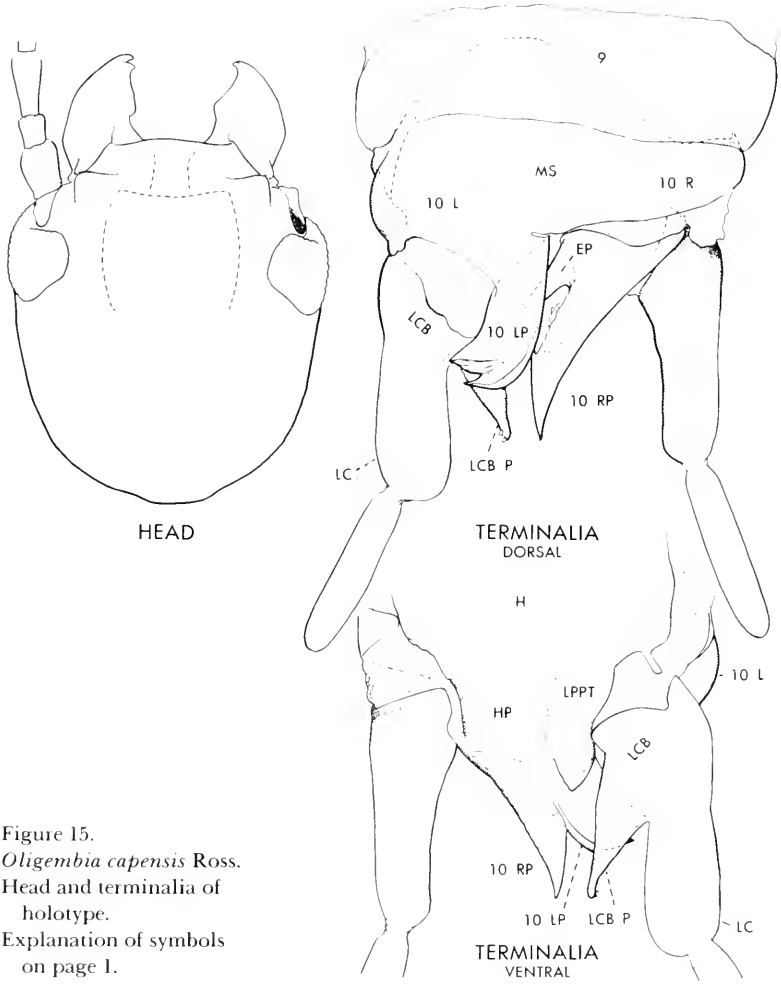

Figure 15.
Oligembia capensis Ross.
Head and terminalia of holotype.
Explanation of symbols on page 1.

Oligembia capensis Ross, new species
(Figure 15)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Baja California: 3 mi S. Colonia Plutarco Elias Calles (S of Todos Santos), Cape Region. Matured in culture 25-XII-77 (E.S. Ross).

Description.—Appearance: Small, alate, generally dark brown with darker head. Color details (in alcohol): Cranium dark chestnut-brown with faint darker pattern, clypeus blending to dark amber. Eyes dark lavender (darker than cranium) with tan margins. Antennal segments yellow-amber, membranes white. Mandibles yellow-amber bordered with dark amber; palpi tan; submentum translucent gold. Body and legs golden-brown tinged with rust-brown (pronotum more

extensively so); abdominal terminalia dark due to extensive rust-brown tinge, cerci slightly paler. Body length 5.9 mm; forewing length 3.75 mm, breadth 1.0 mm. Cranium as figured. Terminalia with forward projection of medial sclerite (MS) extending only half length of ninth tergite (9), apex rounded. Left tergal process (10 LP) with apex dorsally furrowed, as figured. Process of left cercus-basipodite (LCB) large, surface rugose; apex bifurcated. Additional details as figured.

Paratypes.—Twelve adult males from type colony deposited in CAS, USNM, and IBUNAM.

Discussion.—*Capensis* is related to *melanura* but has a broader cranium with larger eyes; a distinctly shaped, shorter extension of the medial sclerite (in *melanura* this is longer and acutely angulate); and the process of the left cercus-basipodite is rugose, less tapered and apically bifurcated.

Biology.—The type locality is uninhabited cactus-thorn scrub just behind marine sand dunes. Small colonies of the species, each occupied by a single female and her brood, were found in bark crevices and flakes of "palo San Juan," *Forchammeria watsonii* (Capparidaceae). Such a tree species should provide a favorable habitat for embiids in a desert area because its dense, non-deciduous foliage shades bark surfaces during the high temperatures of the dry season. At the time of encounter, November 24, 1977, only adult females and about twenty nymphs were collected and cultured. Many of these eventually died but thirteen adult males matured between late December, 1977 and May, 1978.

This, the first teratembiid collected in Baja California, is probably a relict of a biota derived from an ancient land connection with the mainland of Mexico.

Genus *Diradius* Friederichs

Diradius Friederichs, 1934, p. 419. Davis, 1940, p. 528.—Ross, 1944, p. 493; 1984, p. 90.
Oligembia (Dilobocerca) Ross, 1944, p. 476 (Type species: *Oligembia (Dilobocerca) lobata* Ross, 1944, p. 477); 1984, p. 90 (as syn. of *Diradius*).

Type species.—*Diradius pusillus* Friederichs, by original designation.

Distribution.—Southeastern U.S.A. to northern Argentina and western Africa (four new species). Species are widespread in Mexico except, apparently, in arid habitats.

The identity of *Diradius* long remained unsettled due to deficiencies in the original description and figures of the holotype (the only known specimens). This difficulty was compounded by destruction of this specimen during World War II. Recently, however, I collected nearly topotypic specimens (near Itajai, Santa Catarina, Brazil) and determined that *Diradius* is congeneric with *Dilobocerca* Ross.

Diradius, as discussed under the above treatment of *Oligembia*, is most readily distinguished by the great length of the outer side of the right hemitergite (10 R) and the complete absence of fusion lines between 10 L, 10 R and the medial sclerite (MS). Combined with these distinctions is the usual presence of a lobe beneath the "claw"-bearing lobe of the left cercus-basipodite.

Most Mexican species of *Diradius* belong to the *lobatus* group and most are undescribed. A proper exposition of such species will require very carful study based on adequate, cultured series. The named Mexican species of *Diradius* are

listed below. Except for *lobatus,* all species names are newly combined with *Diradius* at this time.

1. *lobatus* (Ross), 1944, p. 477. Type locality: Brownsville, Texas; also occurs in northeastern Mexico.
2. *jalapae* (Ross), 1944, p. 480. Type locality: Rio Santiago, Jalapa, Vera Cruz.
3. *chiapae* (Ross), 1944, p. 481. Type locality: Vergel, Chiapas.
4. *emarginatus* (Ross), 1944, p. 483. Type locality: Loma Bonita, Oaxaca.
5. *pacificus* (Ross), 1940b, p. 640. Type locality; Magdalena I., Islas Tres Marias.
6. *uxpanapaensis* (Mariño and Márquez), 1982, p. 105. Type locality: San Cristóbal de las Casas, Chiapas.

For representation in this contribution, the following closely related new species are described.

Diradius diversilobus Ross, new species
(Figure 16, left)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; San Luis Potosi: Tamazunchale, XI-1946 (E.S. Ross).

Description.—Appearance: Small, alate; very pale tan with contrastingly darker head and terminalia. Color details (in alcohol): Cranium clouded, golden-brown, internal organs visible through transparent derm. Eyes lavender-black. Basal three antennal segments pale tan, other segments very pale tan with whitish intersegmental membranes. Thoracic sclerites and legs pale, translucent tan; pronotum slightly darker, tinged with rust-brown. Wings with vein bands pale tan, scarcely darker than hyaline stripes. Abdomen concolorous with thorax except for transparent-amber terminalia sclerites bordered with red-amber; basal cercus segments tinged with rust-brown, inner margins sclerotic and piceous; distal segments whitish. Dimensions (on slide): Body length: 6.5 mm; forewing length 4.8 mm, breadth 1.25 mm.

Important structural features: As figured. Of special importance is the complex inner face of the composite left cercus. The furcate dorsal process of LCB is subtended by a sclerotic, apically-rounded sub-process. Caudad of these processes, a slender, elongate, apically-rounded process arises at a slightly higher plane and appears to be a process of LC, rather than LCB. The basal segment of the right cercus is exceptionally sclerotic on its inner face and bears two prominent distal lobes.

Allotype.—Female from type culture. Color (in alcohol): Closely parallels that of male but the cranium is yellow-amber. Body length: 7.0 mm.

Paratypes and parallotypes.—139 adult males and 114 adult females all from type culture, matured on various dates in early 1947. Deposited in CAS, USNM, IBUNAM and other museums.

Discussion.—Diversilobus is closely related to the following new species and appears also to be related to *uxpanapaensis* in view of the "pequeño proceso digitiforme" on the basal segment of the left cercus. However, the structure of the left tergal process (10 LP), as illustrated by the authors, appears to be entirely distinct. It is assumed that this is not due to twisting during slide preparation.

It should be noted that when the basal segment of the cercus angles inward (perhaps the position during copulation) the cleft between the apical elements of 10 LP fits between the finger-like process and the bifurcate process.

Biology.—The type colony was found in bark of a rotting tree.

Diradius pallidus Ross, new species
(Figure 16, right)

Holotype.—Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data.—Mexico; Tamaulipas: 60 mi S of Ciudad Victoria, 17-XI-1948 (E.S. Ross).

Description.—Appearance: Small, alate; body and appendages whitish, cranium contrasting yellow-amber. Color details (in alcohol): Cranium yellow-amber, brain and muscles clearly visible through transparent derm; frons becom-

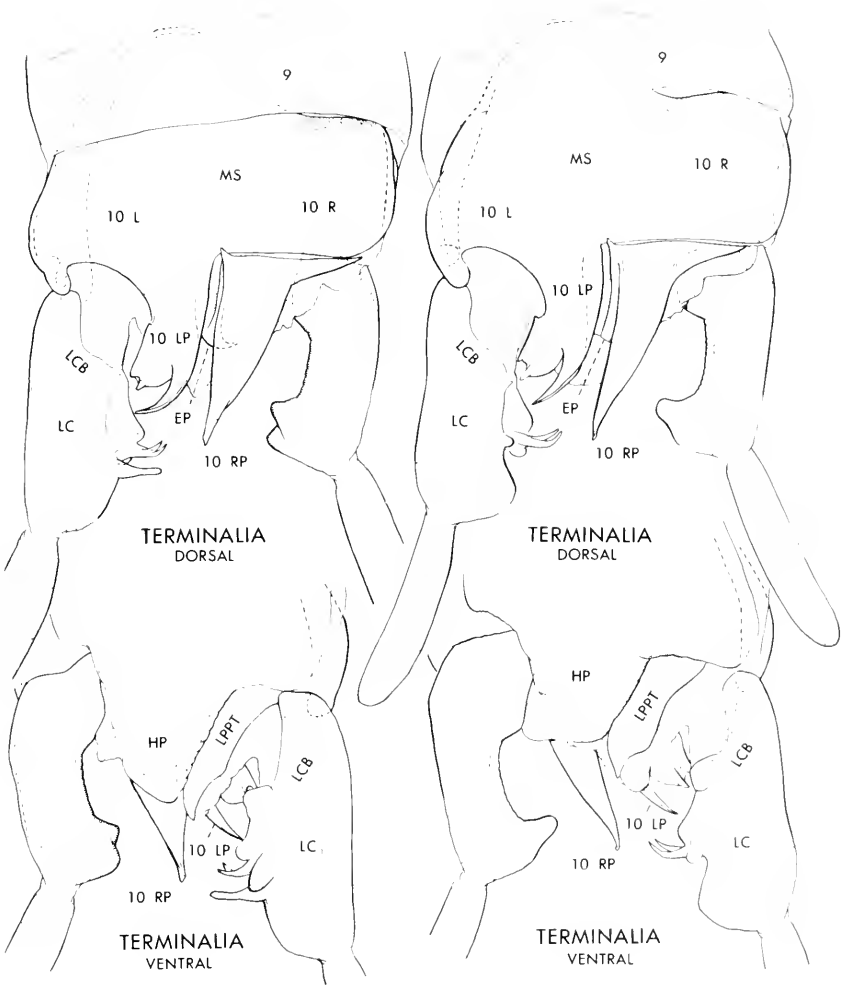

Figure 16, left. *Diradius diversilobus* Ross. Terminalia of holotype. Figure 16, right. *Diradius pallidus* Ross. Terminalia of holotype. Explanation of symbols on page 1.

ing dark amber. Eyes dark lavender. Mandibles and submentum amber, margins piceous; other mouth parts whitish. Antennae with two basal segments pale yellow, other segments whitish. Body and legs appearing to be white due to white internal organs visible through transparent integument. Wings with vein bands almost as pale as hyaline stripes, appearing white in repose over abdomen. Terminalia sclerites very pale amber, margined with dark amber; cerci white except for piceous inner margins of basal segments. Dimensions (on slide): Body length 6.2 mm; forewing length 3.5 mm, breadth 0.8 mm.

Important structural features: As figured. Of special importance is the small lobe dorso-caudad of the furcate inner process of the left cercus-basipodite (LCB) and the pronounced but simple inner-apical lobe of the right basal segment of the cercus.

Allotype.—Female in alcohol from type culture. Color: Closely parallels that of male but with all body sclerites pale tan and the cranium light brown. Body length: 7.5 mm.

Paratypes and parallotypes.—247 adult males and 169 adult females, all from type culture, matured on various dates throughout the year. Same distribution as *diversilobus.*

Discussion.—Pallidus is closely related to *diversilobus* as evidenced by the process of the basal segment of the left cercus dorso-caudad of the furcate inner process of LCB. It is readily distinguished, however, by the small size of this process (elongate, slender, finger-like in *diversilobus*), the single distal lobe of the right cercus (double in *diversilobus*) and the smaller lobe beneath the furcate process of LCB.

Biology.—The type colonies were found near ground level under bark of stumps in low, tropical jungle with numerous terrestrial bromeliads.

Family OLIGOTOMIDAE

Some of the most frequently collected Mexican embiids belong to the Old World family Oligotomidae. Adult males of three introduced species of *Oligotoma*, commonly attracted to lights, are readily recognized by the following combination of characters: Mandibles apically dentate; submentum sclerotic with lateral and anterior margins inflexed. Wings with MA unbranched. Hind basitarsus with only one ventral papilla. Basic appearance of terminalia similar to that of Teratembiidae but with important distinctions. In addition to three species of *Oligotoma*, parthenogenetic *Haploembia solieri*, introduced from the Mediterranean region into California, has extended its range into northwestern Mexico. The following is an annotated list of Mexican Oligotomidae:

(1) *Oligotoma saundersii* (Westwood)

From its center of endemicity in northern India, this species has dispersed in human commerce to many warm regions of the world. It has been collected in scattered localities in Mexico, particularly in eastern and southern regions. It is likely to steadily extend its range.

Males are easily recognized by the horizontal, sickle-shape process beneath the hypandrium lobe.

(2) *Oligotoma nigra* (Hagen)

This species, ranging from northern India westward to Egypt, was introduced into California many years ago, perhaps in date palm cuttings. It has spread southward into northwestern Mexico and may be expected to extend its range into other regions of Mexico. It prefers arid habitats.

Males are recognized by the hook-like process of the left cercus-basipodite which is directed ventrad, rather than horizontal, as in *saundersii*.

(3) *Oligotoma humbertiana* (Saussure)

Also native to India, *humbertiana* has been spread by man throughout tropical Asia. The writer suspects that the species was transported on Manila Galleons to Mexico's west coast where it is now a very widespread, common species. It is steadily increasing its range into other regions of Mexico.

Males are readily recognized by the minute, outer-apical process on the right tergal process of the tenth abdominal segment.

(4) *Haploembia solieri* (Rambur)

The genus *Haploembia* is endemic in the Mediterranean region. The parthenogenetic form of *solieri* was apparently introduced into California in commerce during the Spanish colonial period. From California, *solieri* has spread into northern Baja California as well as into Arizona, Texas, and other regions. It is thus likely that it will eventually be found in other northern Mexican regions.

Literature Cited

Chamberlin, J.C. 1923. A revision of the genus *Anisembia* with description of a new species from the Gulf of California. Proc. Calif. Acad. Sci. (4) 12:341-351, figs.

Banks, N. 1924. Descriptions of new neuropteroid insects. Bull. Mus. Comp. Zool. 65:421-455, 4 pl.

Davis, C. 1939. Taxonomic notes on the Order Embioptera. II, A new Neotropical genus of Embioptera. Proc. Linn. Soc. N.S.W. 64:217-222, 21 figs.

———. 1940a. Taxonomic notes on the Order Embioptera. XVII, A new Neotropical genus previously confused with *Embia* Latreille. l.c. 65:344-352, 41 figs.

———. 1940b. Taxonomic notes on the Order Embioptera. XIX, Genera not previously discussed. l.c. 65:525-532, 23 figs.

———. 1940c. Family classification of the Order Embioptera. Ann. Entomol. Soc. Amer. 33:677-682.

Denis, R. 1949. Ordre des Embioptères, Chapter in Grassé, Traité de Zoologie. Masson et Cie, Paris. 9:723-744, figs. 366-380.

Enderlein, G. 1912. Embiidinen. Coll. Zool. Selys-Longchamps. 3:1-121, ill.

Friederichs, K. 1934. Das Gemeinschaftsleben der Embiiden und Näheres zur Kenntnis der Arten. Arch. Naturg. (n. ser.) 3:405-444, 18 figs.

Hagen, H.A. 1885. Monograph of the Embiidina. Can. Entomol. 17:141-155, 171-178, 190-199, 206-229.

Krauss, H.A. 1911. Monographie der Embien. Zoologica (Stuttgart). 23:1-78, ill.

McLachlan, R. 1877. On the nymph-stage of the Embiidae, with notes on the habits of the family. J. Linn. Soc. London (Zool.). 13:373-384.

Mariño, E. and C. Márquez. 1982. Embiopteros de Mexico. 1. Descripción de tres nuevas especies y algunos nuevos registros. An. Inst. Biol. Univ. Autónoma Nac. Méx. 52 (ser. Zool.): 99-113, figs.

Melander, A.L. 1902. Two new Embiidae. Biol. Bull. 3:16-26, figs.

Myers, J.G. 1928. The first known embiophile, and a new Cuban embiid. Bull. Brooklyn Entomol. Soc. 23:87-90, 1 fig.

Ross, E.S. 1940a. A new genus of Embioptera from the West Indies. Pan-Pacific Entomol. 16:12.

———. 1940b. A revision of the Embioptera of North America. Ann. Entomol. Soc. Amer. 33:629-676, ill.

———. 1943. Métodos de recolocción, crianza y estudio de los Embiópteros (Ins. Embioptera) Rev. Entomol. 14:441-446.

———. 1944. A revision of the Embioptera of the New World. Proc. U.S. Natl. Mus. 94:401-504, ill.

———. 1952. The identity of *Teratembia geniculata* Krauss and a new status for the family Teratembiidae (Embioptera). Wasmann J. Biol. 10:225-234, figs.

———. 1957. The Embioptera of California. Bull. Calif. Insect Surv. 6:51-57, ill.

———. 1970. Biosystematics of the Embioptera. Annual Rev. Entomol. 15:157-172.

———. 1984. A synopsis of the Embiidina of the United States. Proc. Entomol. Soc. Wash. 86(1):82-93.

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