

THE LEPTOPHLEBIIDAE OF NEW CALEDONIA (EPHEMEROPTERA)

PART II. — SYSTEMATICS

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ABSTRACT

This is the second in a series of papers on the Leptophlebiidae (Ephemeroptera) of New Caledonia. Five new genera are established. Celiphlebia n.g., Poya n.g., Tindea n.g., and Peloracantha n.g. are based on nymphs and adults associated by rearing. Coula n.g. is established from adults only.

RÉSUMÉ

LES LEPTOPHLEBIIDAE (EPHEMEROPTERA) DE NOUVELLE CALÉDONIE. II^e PARTIE - SYSTÉMATIQUE

Ce travail est le deuxième d'une série sur des Leptophlebiidae (Ephemeroptera) de Nouvelle Calédonie. Il traite de cinq genres nouveaux, dont quatre — Celiphlebia n.g., Poya n.g., Tindea n.g., et Peloracantha n.g. — ont été décrits à partir de stades nymphaux et adultes; les relations entre ces stades ont été mis en évidence par des élevages. Coula n.g. a été décrit seulement à partir des adultes.

INTRODUCTION

This paper is the second in a series on the systematics, phylogeny, biogeography, and ecology of the Leptophlebiidae of New Caledonia. Part I of this series (PETERS, PETERS and EDMUNDS, 1978) gives all localities, methods, and acknowledgments.

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Celiphlebia, new genus

(Fig. 1, 5-7, 23, 27, 34-35, 46, 51-52, 61-64, 77-83, 95-98, 109-110, 115-123)

IMAGO. Length of ♂: body, 5.2-6.6 mm; fore wings, 6.0-7.0 mm. Length of ♀: body, 4.9-9.0 mm; fore wings, 7.7-9.6 mm. Eyes of ♂ meet on meson of

head (Fig. 23), dorsally upper portion circular-shaped, lower portion of eyes 3/4 length of upper portion; eyes of ♀ separated on meson of head by a length 3 times as great as maximum width of an eye. Wings (Fig. 5-7): maximum width of fore wings a little less than 1/3 maximum length of fore wings; vein Rs of fore wings forked less than 1/4 of distance from base to margin; vein MA forked more than 1/2 of distance from base to margin, fork symmetrical, distal portion of vein MA sagged posteriorly; vein MP₂ attached at base to veins MP₁ and CuA with a cross vein (Fig. 5), attachment of vein MP₂ to MP₁ 1/3 of distance from base to margin, base of vein MP₂ nearer to vein MP₁ to curved nearer to vein CuA; vein ICu₁ attached to veins CuA and CuP with a cross vein, remainder of Cu-A area as in Fig. 5; cross veins few. Costal margin of hind wings convex (Fig. 6-7) with concavity located about 1/2 distance from base; apex of wings acute, rounded; cross veins few. Legs: ratios of segments in ♂ fore legs, 0.67-0.80: 1.00 (2.30-2.80 mm): 0.04: 0.28-0.36: 0.26-0.32: 0.20-0.22: 0.08-0.13. Claws of a pair dissimilar, one apically hooked (Fig. 27),

other obtuse, pad-like, with an apical knob. Male genitalia (Fig. 34-35): segment 2 of forceps a little shorter in length than segment 3, segment 2 of forceps $1/6$ length of segment 1, apex of segment 3 blunt; base of forceps broad, its inner margin forming an angular bend near middle of forceps; length of styliger plate along median line a little longer than $1/3$ maximum width, apex of styliger plate shallowly cleft; penes fused except for apical $1/5$, apical cleft U-shaped (Fig. 34), penes broad except broader near base, apex of each penis lobe knobbed, each penis lobe with a semicircular row of subapical spines, apex of spines pointed towards apex of penis lobes (Fig. 34). Margin of sternum 7 of ♀ a little rounded with very small medial extension (Fig. 51-52). Ninth sternum of ♀ shallowly cleft apically (Fig. 46). Terminal filament a little longer than cerci.

MATURE NYMPH. Head prognathous. Antennae 2 times maximum length of head. Mouthparts (Fig. 77-83, 95-98): dorsal hair on labrum as in Fig. 77, 81; anterosubmedian and anterior areas of hair ventrally; anterior margin with 5 large, blunt, broad-based denticles (frequently indistinct). Clypeus as in Fig. 77, 81. Left mandible as in Fig. 78, 82. Lingua of hypopharynx with well developed lateral processes, paired submedian row of long hair on internal dorsal surface, apex of submedian lobes with short spines and a rack-like process (Fig. 96, 98), anterior margin deeply cleft; superlingua as in Fig. 96, 98, with a row of hair along anterior margin, lateral margins blunt to rounded. Segment 2 of maxillary palpi a little longer to $1 \frac{1}{4}$ length of segment 1; segment 3 of palpi a little shorter than $1/2$ length to $3/4$ length of segment 2, triangular; a V-shaped ridge near the ventral, inner anterolateral margin of maxillae; hair on maxillae as in Fig. 95, 97. Labium as in Fig. 80, 83; segment 2 of palpi equal to length of segment 1; segment 3 of palpi a little longer than $1/3$ length of segment 2, triangular; paraglossae ventral to glossae. A row of long hair on dorsal mid-line of abdomen and thorax; row forks near anterior half of pronotum and rows continue along inner margin of eyes; a row of fine hair on dorsum of basal segments of all 3 caudal filaments (Fig. 1). Legs (Fig. 115-122): maximum width of tibiae 2 times larger than maximum width of tarsi, tibiae in cross section triangular (Fig. 116, 120); outer margin of femora indented near apex so tibiae can draw partially into femora (Fig. 115); apex of claws hooked and narrow, denticles on claws progressively larger apically (Fig. 118) to claws with a basal group of 2 small denticles and an apical row of about 22 subequal-sized denticles (Fig. 122). Gills (Fig. 109-110): gills on segments 1-7 alike; dorsal and ventral portions of lamellae plate-like, apex of each portion acute, inner margins of

each portion rounded (Fig. 110) to straight (Fig. 109); dorsal portion with main trunk nearer outer margin of lamella, tracheae on inner side of main trunk branched and well pigmented, tracheae on outer side of main trunk absent to weakly developed; ventral portion with main trunk near median line of lamella, tracheae on both sides of main trunk branched, lightly pigmented to well pigmented. Posterolateral spines on abdominal segments 3 to 5-9, spines progressively larger posteriorly. Terminal filament longer than cerci.

Etymology. kelis, Gr., meaning spot; phlebos, Gr., f., meaning vein. Feminine.

TYPE SPECIES. *Celiphlebia caledonae* new species.

DISCUSSION. *Celiphlebia* can be distinguished from all genera of the Leptophlebiidae by the following combination of characters. In the imagos: (1) the Cu-A area of the fore wings possesses 2 long intercalaries; ICu_1 is strongly bowed (Fig. 5); (2) length of vein Sc of the hind wings is $3/4$ maximum length of hind wings (Fig. 6-7); (3) penes of ♂ genitalia are fused except for apical $1/5$; apex of each penis lobe is knobbed and has a semicircular row of subapical spines (Fig. 34); (4) claws of a pair are dissimilar; one is apically hooked while other is obtuse, pad-like and with an apical knob (Fig. 27); and (5) ninth sternum of ♀ is shallowly cleft apically (Fig. 46). In the nymphs: (1) anterior margin of lingua of hypopharynx is deeply cleft; apex of submedian lobes of lingua each possesses a rack-like process (Fig. 96, 98); (2) outer margin of mandibles is strongly curved at right angles and a few scattered hairs to a tuft of hair occur near angle of outer margin (Fig. 79, 82); (3) abdominal gills occur on segments 1-7 and are double, plate-like and oblong (Fig. 1, 109-110); (4) a row of long hair occurs on dorsal mid-line of abdomen and thorax; row forks near anterior half of pronotum and rows continue along inner margin of eyes; a row of fine hair occurs on dorsum of basal segments of all 3 caudal filaments (Fig. 1); and (5) shape of labrum is as in Fig. 77, 81.

Celiphlebia appears to be most closely related to *Poya* and can be distinguished from it by the following combinations of characters. In the imagos: (1) length of vein Sc of the hind wings is $3/4$ maximum length of hind wings (Fig. 6-7); (2) eyes of ♂ meet on meson of head (Fig. 23); (3) margin of sternum 7 of ♀ is a little rounded with a very small medial extension (Fig. 51-52); and (4) dark brown clouds surround all cross veins in fore wings of ♂, a large dark brown cloud occurs near bulla and fork of vein MA in fore wings (Fig. 5). In the nymphs: (1) outer margin of mandibles is smoothly curved and obtuse (Fig. 79, 82); (2) abdominal gills occur

on segments 1-7 and are plate-like and oblong (Fig. 1, 109-110); (3) anterior margin of labrum does not have a median emargination (Fig. 77-78, 81); and (4) no median spines occur on abdominal terga 1-9 (Fig. 1).

KEY TO THE SPECIES OF *Celiphlebia*, NEW GENUS

NYMPHS

1. Inner margin of abdominal gills rounded (Fig. 110); thoracic ganglia not pigmented; tibiae with a dorsal row of short spines running parallel to dorsal row of hair (Fig. 119-120)..... *C. starmuehlneri*
 — Inner margin of abdominal gills straight (Fig. 109); thoracic ganglia pigmented; tibiae without row of short spines running parallel to dorsal row of hair (Fig. 115-116) *C. caledonae*

***Celiphlebia caledonae*, new species**

(Fig. 1, 5-7, 23, 27, 34-35, 46, 51-52, 61-64, 77-80, 95-96, 109, 115-118)

MALE IMAGO (in alcohol). Length: body, 5.2-6.6 mm; fore wings, 6.0-7.0 mm. Upper portion of eyes reddish-brown, lower portion brownish-black. Head dark brown, margins darker. Antennae brown, flagellum pale with darker annulations. Basal half of ocelli black, apical half brownish-white to white. Thorax: brown, carinae darker, sutures lighter; pleural areas dorsal to base of legs and near anterior base of fore and hind wings back; margins of pronotum black. Coxae of all legs dark blackish-brown; apex of all femora darker brown, and a dark brown, wide, transverse band near middle of prothoracic femora; apex of tibiae and first tarsal segments of prothoracic legs washed with darker brown, tarsi of prothoracic legs light brown, tarsi of mesothoracic and metathoracic legs washed with brown; remainder of legs light yellowish-brown. Wings (Fig. 5-7): longitudinal veins of fore wings dark brown, longitudinal veins of hind wings lighter; cross veins of fore wings dark brown, cross veins in anterior half of hind wings lighter brown, cross veins in posterior half of hind wings hyaline; membrane of fore and hind wings hyaline, except apical 1/3 of cells C and Sc of fore wings whitish translucent; dark brown clouds surround all cross veins in fore wings, a large dark brown cloud near bulla and fork of vein MA in fore wings. Abdomen: segments 1-7 yellowish-brown to light reddish-brown; margins of tergum 1 washed with darker brown, terga 2-9 with a darker brown color pattern as in Fig. 61-62, 63-64, pattern on median of terga 2 to 3-5 indistinct; spiracles on terga 3-6 dark brown, a pale brown spiracular mark sometimes present on tergum 2, remainder of spiracles and tracheae pale;

sterna 1-6 with lighter, paired, submedian marks. Genitalia (Fig. 34-35): pale yellowish-brown, forceps paler. Caudal filaments brown, paler annulations at articulations.

FEMALE IMAGO (in alcohol). Length: body, 4.9-9.0 mm; fore wings, 7.7-9.6 mm. Eyes black. Head dark brown, areas around ocelli and carinae darker. Antennae dark brown, flagellum paler. Basal half of ocelli blackish-brown, apical half white. Color and marks of thorax as ♂ imago, except pronotum extensively washed with darker brown, general color darker. Color and marks of legs as in ♂ imago, except general color darker. Wings: color and marks as in ♂ imago, except membrane of fore and hind wings darker reddish-brown, clouds surrounding cross veins sometimes small or absent, and cloud surrounding fork of MA sometimes reduced to only a slight indication of color. Abdomen: dark brown; tergum 1 uniformly washed with darker brown, terga 2-9 as in ♂ imago except general color darker; sterna 1-7 to 9 with lighter, paired, submedian marks. Caudal filaments: color and marks as in ♂ imago.

MATURE NYMPH (in alcohol). Head: dorsum yellowish-brown, venter pale; carinae of dorsum washed with darker brown; a black transverse band between eyes. Thorax: nota yellowish-brown, sterna paler; darker brown notal marks as in ♂ and ♀ imagos (Fig. 1); ganglia blackish-brown. Legs (Fig. 115): yellowish-brown; apex of femora darker brown, dorsal surface of femora with a large, median, darker brown macula; claws with single row of denticles, denticles progressively larger apically (Fig. 118). Abdomen: terga yellowish-brown, darker brown tergal marks as in ♂ and ♀ imagos; sterna pale, sterna washed with darker brown and with pale, submedian, paired marks as in ♂ and ♀ imagos in last instar only; ganglion on sternum 7 blackish-brown. Gills (Fig. 109): membrane gray; tracheae black, branches on inner margin heavily pigmented, branches on outer margin lightly pigmented, more distinct on ventral portion; outer margin of lamellae straight. Well developed posterolateral spines on abdominal segments 3 to 5-9. Caudal filaments brown.

SPECIMENS. Holotype ♂ imago, No. N35; allotype ♀ imago, No. N35; paratypes: 36 nymphs, 1 ♂, 1 ♀, No. N13; 73 nymphs, 2 ♂, 2 ♀, 3 ♀ subimagos, No. N14; 177 nymphs, 1 ♂, 3 ♂ subimagos, 2 ♀ subimagos, No. N15; 1 ♂, No. N16; 8 nymphs, No. N17; 3 nymphs, No. N18; 83 nymphs, 2 ♂, 6 ♀, 2 ♂ subimagos, 7 ♀ subimagos, No. N19; 2 nymphs, No. N20; 3 nymphs, No. N21; 1 nymph, No. N23; 3 nymphs, 7 ♂, 2 ♀, No. N25; 11 nymphs, 1 ♂ subimago, 2 ♀ subimagos, No. N26; 327 nymphs, 6 ♂, 6 ♀, 4 ♂ subimagos, 4 ♀ subimagos, No. N27; 58 nymphs, 2 ♂, 3 ♀, No. N28; 132 nymphs, 5 ♀, 1 ♂ subimago, 2 ♀ subimagos, No. N34; 264 nymphs, 37 ♂, 41 ♀, 21 ♂ subimagos, 30 ♀ subimagos, No. N35; 323 nymphs, 12 ♂, 8 ♀, 4 ♂ subimagos,

4 ♀ subimagos, No. N37; 1 ♂, No. N41; 183 nymphs, 49 ♂, 37 ♀, 18 ♂ subimagos, 22 ♀ subimagos, No. N42; 26 nymphs, No. N43; 4 nymphs, No. N46; 4 nymphs, 1 ♂, No. N47; 6 nymphs, No. N50; 54 nymphs, 17 ♂, 8 ♀, 23 ♂ subimagos, 17 ♀ subimagos, No. N51; 9 nymphs, 1 ♂ subimago, No. N52; 41 nymphs, 5 ♂, 1 ♀, 2 ♀ subimagos, No. N53; 65 nymphs, 18 ♂, 28 ♀, 8 ♂ subimagos, 7 ♀ subimagos, No. N54; 66 nymphs, 3 ♂, 3 ♀, 1 ♀ subimago, No. N55; 23 nymphs, No. FNK4; 3 nymphs, No. FNK5; 2 nymphs, No. FNK9; 28 nymphs, No. FNK 10, 11, 13; 73 nymphs, No. FNK18-20; 18 nymphs, No. FNK22; 31 nymphs, No. FNK23-24; 15 nymphs, No. FNK25-26; 13 nymphs, No. FNK30; 37 nymphs, No. FNK31-32; 3 nymphs, No. FNK37; 42 nymphs, No. FNK42; 11 nymphs, No. FNK53; 3 nymphs, No. FNK56; 42 nymphs, No. FNK57; 4 nymphs, No. FNK59; 51 nymphs, No. FNK62; 1 nymph, No. FNK63; 7 nymphs, No. FNK64; 2 nymphs, No. FNK66; 40 nymphs, No. FNK67; 29 nymphs, No. FNK68; 3 nymphs, No. FNK71; 8 nymphs, No. FNK72; 26 nymphs, No. FNK74; 75 nymphs, No. FNK79; 3 nymphs, No. FNK80; 14 nymphs, No. FNK81; 1 nymph, No. FNK82; 6 nymphs, No. FNK84; 13 nymphs, No. FNK85; 28 nymphs, No. FNK86; 7 nymphs, No. FNK88-89; 3 nymphs, No. FNK93; 51 nymphs, No. FNK94; 8 nymphs, No. FNK95; 32 nymphs, No. FNK98; 31 nymphs, No. FNK100; 9 nymphs, No. FNK102; 6 nymphs, No. FNK103; 6 nymphs, No. FNK105; 22 nymphs, No. FNK107; 35 nymphs, No. FNK111; 9 nymphs, No. FNK120; 49 nymphs, No. FNK121; 5 nymphs, No. FNK124; 11 nymphs, No. J1; 2 ♂, No. C1. All types are in alcohol, except 2 ♂ of locality No. C1 are pinned. Association of the nymphs and adults is by rearing. All types are deposited in the following collections: holotype, allotype, 1305 nymphal paratypes, 57 ♂ paratypes, 30 ♂ subimaginal paratypes, 53 ♀ paratypes, and 39 ♀ subimaginal paratypes at FAMU; 1304 nymphal paratypes, 57 ♂ paratypes, 31 ♂ subimaginal paratypes, 54 ♀ paratypes, and 40 ♀ subimaginal paratypes at UU; 67 nymphal paratypes, 13 ♂ paratypes, 6 ♂ subimaginal paratypes, 11 ♀ paratypes, and 6 ♀ subimaginal paratypes at BPBM, O.R.S.T.O.M., CTFT, and NMNH; 2 ♂ paratypes (locality No. C1) at British Museum (Natural History).

As *C. caledonae* is the most common species of mayfly in New Caledonia, it is also the most variable throughout the island. The most noticeable variation is the color of the adult wings. Under normal lighting conditions the membrane of the wings appears hyaline, but under dark field microscope or any dark background the membrane of specimens is hyaline, while the membrane of others is whitish, translucent. This difference is even apparent under field conditions. The variation is most extreme at localities No. N37 and N42 in the ♂ imagos. A few ♂ intergrades are in the series from both localities. The intergrades range from light whitish, translucent to a mottled hyaline and whitish, translucent. The variation of the ♀ wings is not as extreme at localities N37 and N42. No other differences occur between the two types, except the general color is lighter in specimens with whitish, translucent wings. The nymphs of the two types are indistinguishable.

Such variation occurs among specimens from various other localities, but with less extremes. Most specimens have wings which are hyaline or mottled. More field study is needed to determine if the color differences in the wings are due to age of the imago, or a true variation.

Imagos and nymphs from some localities are generally lighter in color, and the abdominal color pattern is indistinct. Such variation is most extreme from locality No. N14.

In populations from the Rivière Bleue region, many individuals are smaller and darker. Imagos of these darker forms sometimes have a dark median, longitudinal dash on the femora of the mesothoracic and metathoracic legs. The pattern on the abdominal terga of adults and nymphs is more extensive on the darker forms (Fig. 63-64) than on specimens from the type locality (Fig. 61-62).

Among nymphs from various localities the abdominal gills are lighter and the tracheation is indistinct. Further, the relative gill width increases with size, so that gills of young nymphs are narrow while gills of the largest of mature female nymphs approach the width of gills of *C. starmuehneri*. Among other nymphs the thoracic ganglia and the ganglion on abdominal sternite 7 are lightly pigmented to not pigmented.

Etymology. Species is named for New Caledonia.

DISCUSSION. *Celiphlebia caledonae* can be distinguished from *C. starmuehneri* by the following characters. In the nymphs: (1) the inner margin of abdominal gills is straight (Fig. 109); (2) thoracic ganglia are pigmented; (3) there is no row of short spines running parallel to the dorsal row of long hair on the tibiae (Fig. 115-116); (4) claws possess a single row of denticles; denticles are progressively larger apically (Fig. 118); and (5) the general body color is yellowish-brown with distinct blackish-brown marks as in Fig. 1.

BIOLOGY. *Celiphlebia caledonae* is the most common species of mayfly throughout New Caledonia and is found in most streams and rivers with sufficient water flow. Nymphs were found in streams with water temperatures of 16.5 °C-24 °C and at about sea level to 458 m. The species was most abundant in streams with water temperatures of 18 °C-20 °C, but was common throughout the entire temperature range.

Nymphs emerged to subimagos in early evening and subimagos were collected in abundance at light traps. The subimagos molted to imagos in early morning and swarming occurred in full sunlight between 1030 hrs and 1600 hrs, most frequently between 1030 and 1300 hrs. Males swarmed in companies of 5-15 over bushes or low-hanging

brush in or along the sides of streams. Males swarmed in the typical up-and-down or pendular pattern 0.5-3 m above the marker vegetation.

Descriptions are based on preserved specimens. Color and marks of live material are more intense, giving in nature the impression of a reddish mayfly with black spotted wings.

Celiphlebia starmuehlneri, new species

(Fig. 81-83, 97-98, 110, 119-123)

MALE IMAGO. Unknown.

FEMALE IMAGO. Unknown.

MATURE NYMPH (in alcohol). Length of body: ♂, 5.1-5.9 mm; ♀, 5.6-8.0 mm. Head: light brown; a black, transverse band between eyes of ♀, band faded on ♂. Thorax: light brown, sterna paler; lateral margins of dorsum washed with darker brown; mesonotum with a large, pale, posteromedian macula. Legs: yellowish-brown; apex of femora darker brown, dorsal surface of femora with a large, median, darker brown macula; tibiae with an inner row of short spines parallel to and next to dorsal row of long hair (Fig. 119-120); claws with a basal group of 2 denticles and an apical row of about 22 subequal-sized denticles (Fig. 122). Abdomen: light brown; terga 4 and 5 with a large, median pale macula (Fig. 123), posterior margins of terga 2-8 washed with brown. Gills (Fig. 110): membrane gray; tracheae black, branches on both sides of main trunk pigmented; outer margins of lamellae rounded. Well developed posterolateral spines on abdominal segments 5-9. Caudal filaments light brown.

SPECIMENS. Holotype ♂ nymph, No. FNK84; paratypes: 2 nymphs, No. FNK62; 8 nymphs, No. FNK66; 20 nymphs, No. FNK67; 21 nymphs, No. FNK80; 12 nymphs, No. FNK82; 8 nymphs, No. FNK84; 1 nymph, No. FNK87; 15 nymphs, No. FNK88-89; 6 nymphs, No. FNK105. All types are in alcohol. All types are deposited in the following collections: holotype, and 27 nymphal paratypes at FAMU; 26 nymphal paratypes at UU; 10 nymphal paratypes at BPBM, O.R.S.-T.O.M., CTFT, and NMNH.

The abdominal gills of a few specimens have the apices rounded, but not all gills on any one specimen. The tergal color pattern of the ♀ is indistinct and faded in a few specimens, particularly the maculae on abdominal terga 4 and 5. The size and extent of the macula on the femora varies among specimens. Younger nymphs of *C. starmuehlneri* are more strikingly marked than mature nymphs, with dark brown marks around margins of prothorax and on mesonotum, with a dark streak along area of fusion between wing pads and thorax, and with distinct dark brown bands on posterior margins of terga 2-8.

ETYMOLOGY. Species is named for Prof. Dr. F. Starmühlner, who collected all the types.

DISCUSSION. *Celiphlebia starmuehlneri* can be distinguished from *C. caledoniae* by the following characters. In the nymphs: (1) the inner margin of abdominal gills is rounded (Fig. 110); (2) thoracic ganglia are not pigmented; (3) a dorsal row of short spines runs parallel to dorsal row of long hair on tibiae (Fig. 119-120); (4) claws possess a basal group of 2 denticles and an apical row of about 22 subequal-sized denticles (Fig. 122); (5) the general body color is almost uniformly light brown, except for darker margins on thorax and abdominal terga and pale maculae on posteromedian area of mesonotum and abdominal terga 4 and 5 (Fig. 123).

BIOLOGY. *Celiphlebia starmuehlneri* has been collected on both the East Coast and the West Coast at lower elevations (altitude 2-85 m) by Prof. Starmühlner. Nymphs were found in streams with water temperatures of 18.4 °C-23.7 °C; however, most nymphs were collected at 18.5 °C-20.0 °C. All nymphs were collected from August 12 to September 16 and most were mature. As the 1972 collecting trip did not obtain any specimens, *C. starmuehlneri* may emerge in early spring.

Poya, new genus

(Fig. 2, 8-10, 24, 28, 36-37, 47, 53-54, 65-69, 84-87, 99-100, 107, 111-112, 124-130)

IMAGO. Length of ♂: body, 5.2-6.5 mm; fore wings, 6.8-7.5 mm. Length of ♀ subimago: body, 6.5-8.5 mm; fore wings, 9.0-11.0 mm. Eyes of ♂ separated on meson of head by a length equal to maximum width of median ocellus, dorsally upper portion circular shaped, lower portion of eyes 3/4 length of upper portion (Fig. 24); eyes of ♀ subimago separated on meson of head by a length 3 times as great as maximum width of an eye. Wings (Fig. 8-10): maximum width of fore wings a little more than 1/3 maximum length of fore wings; vein Rs of fore wings forked a little less than 1/4 of distance from base to margin; vein MA forked more than 1/2 of distance from base to margin, fork symmetrical, distal portion of vein MA sagged posteriorly; vein MP₂ attached at base to veins MP₁ and CuA with a cross vein (Fig. 8), attachment of vein MP₂ to MP₁ less than 1/3 of distance from base to margin, base of vein MP₂ equidistant between veins MP₁ and CuA; vein ICu₁ attached to veins CuA and CuP with a cross vein, remainder of Cu-A area as in Fig. 8; cross veins numerous. Costal margin of hind wings convex (Fig. 9-10) with concavity located about 1/2 distance from base; apex of wings acute, rounded; cross veins few. Legs: ratios

of segments in ♂ fore legs, 0.67: 1.00 (2.60 mm): 0.04: 0.38: 0.33: 0.28: 0.11. Claws of a pair dissimilar, one apically hooked (Fig. 28), other obtuse, pad-like, with a subapical knob. Male genitalia (Fig. 36-37): segment 2 of forceps equal in length to segment 3, segment 2 of forceps 1/8 length of segment 1, apex of segment 3 blunt; base of forceps broad, its inner margin forming an angular bend near middle of forceps; length of styliger plate along median line 1/2 maximum width, apex of styliger plate shallowly cleft; penes fused except for apically 1/5, penes broad except broader near base, apex of each penis lobe acute, each penis lobe with a semicircular row of subapical spines, apex of spines pointed towards apex of penis lobes. Posterior margin of sternum 7 of ♀ subimago a little rounded with an extremely small genital extension extended to anterior margin of abdominal segment 8 (Fig. 53-54). Ninth sternum of ♀ subimago shallowly cleft apically (Fig. 47). Terminal filament a little longer than cerci.

MATURE NYMPH. Head prognathous. Antennae a little longer than maximum length of head. Mouthparts (Fig. 84-87, 99-100): labrum greatly expanded laterally; dorsal hair on labrum as in Fig. 84; submedian, anterior, and lateral areas of hair ventrally, hair shorter on anterior area; antero-median emargination with 5 wide broad-based denticles (Fig. 85). Clypeus as in Fig. 84. Left mandible as in Fig. 86. Lingua of hypopharynx with well developed lateral processes, paired submedian longitudinal row of long hair on internal dorsal surface, apex of submedian lobes with a rack-like process (Fig. 100), anterior margin of lingua deeply cleft; superlingua as in Fig. 100, with a row of hair along anterior margin, lateral margins blunt. Segment 2 of maxillary palpi a little longer in length than segment 1; segment 3 of palpi 3/4 length of segment 2, triangular; a V-shaped ridge near the ventral, inner anterolateral margin of maxillae; hair on maxillae as in Fig. 99. Labium as in Fig. 87; segment 2 of palpi a little shorter than length of segment 1; segment 3 of palpi 1/2 length of segment 2, triangular; paraglossae ventral to glossae. Thorax with very small tubercles; a dorsal median ridge on entire length of abdomen, ridge well developed and produced into a small, median, posterior spine on terga 1-9 (Fig. 2, 107, 128-130); a row of long hair on dorsal mid-line of abdomen and thorax, row forks near anterior half of pronotum and rows continue along inner margin of eyes; a row of fine hair on dorsum of basal segments of all 3 caudal filaments (Fig. 2). Legs (Fig. 124-127): maximum width of tibiae a little larger than maximum width of tarsi, tibiae in cross section triangular (Fig. 125); outer margin

of femora indented near apex so tibiae can draw partially into femora (Fig. 124); apex of claws hooked and narrow, denticles on claws progressively larger apically, except basal denticles smaller and more slender (Fig. 127). Gills (Fig. 111-112): gills on segments 1-7 alike, dorsal and ventral portions of lamellae plate-like; dorsal portion terminated in 2 long, slender filaments, outer filament longer; ventral portion terminated in 1 long, slender filament, inner apical area deeply cleft; main trunk of tracheae along median line of lamellae, tracheae branched only on inner margin, main trunk and tracheae of dorsal portion pigmented, main trunk of ventral portion pigmented, tracheae not pigmented. Posterolateral spines on abdominal segments 5 or 6-9, spines progressively larger posteriorly, apex of posterolateral spines on segment 9 blunt (Fig. 130). Terminal filament a little longer than cerci.

Etymology. Poya, based on the locality Poya. Feminine.

TYPE SPECIES. *Poya brunnea*, new species.

DISCUSSION. *Poya* can be distinguished from all genera of the Leptophlebiidae by the following combination of characters. In the imagos: (1) the Cu-A area of the fore wings possesses 2 long intercalaries; $1Cu_1$ is strongly bowed (Fig. 8); (2) length of vein Sc of the hind wings is 2/3 maximum length of hind wings (Fig. 9-10); (3) each penis lobe of ♂ genitalia possesses a semicircular row of subapical spines; apex of spines are pointed towards apex of penis lobes (Fig. 36-37); (4) claws of a pair are dissimilar; one is apically hooked while other is obtuse, pad-like with a subapical knob (Fig. 28); and (5) margin of sternum 7 of ♀ subimago is a little rounded with an extremely small genital extension extended to anterior margin of abdominal segment 8 (Fig. 53-54). In the nymphs: (1) anterior margin of lingua of hypopharynx is deeply cleft; apex of submedian lobes of lingua each possesses a rack-like process (Fig. 100); (2) labrum is greatly expanded laterally (Fig. 84); (3) outer margin of mandibles is strongly curved at right angles (Fig. 86); (4) abdominal gills 1-7 are double and plate-like; dorsal portion is terminated in 2 long, slender filaments and ventral portion is terminated in 1 long, slender filament (Fig. 111-112); and (5) dorsum of abdomen has a median ridge developed into small posterior spine on terga 1-9 (Fig. 107); a paired row of long hair occurs along inner margin of eyes, submedian line of thorax, and a single row of long hair occurs along mid-line of abdomen and basal half of caudal filaments (Fig. 2).

Poya appears to be most closely related to *Celiphlebia* and can be distinguished from it by the following combinations of characters. In the imagos:

(1) length of vein Sc of the hind wings is $2/3$ maximum length of hind wings (Fig. 9-10); (2) eyes of ♂ are separated on meson of head by a length equal to maximum width of median ocellus (Fig. 24), and (3) no dark clouds occur near bulla or fork of vein MA in fore wings (Fig. 8). In the nymphs: (1) outer margin of mandibles is strongly curved at right angles (Fig. 86); (2) abdominal gills occur on segments 1-7 and are plate-like; dorsal portion is terminated in 2 long, slender filaments and ventral portion is terminated in 1 long, slender filament (Fig. 111-112); (3) anterior margin of labrum has a well developed median emargination (Fig. 84); and (4) a small, median, posterior spine occurs on terga 1-9 (Fig. 107).

Poya brunnea, new species

(Fig. 2, 8-10, 24, 28, 36-37, 47, 53-54, 65-69, 84-87, 99-100, 107, 111-112, 124-130)

MALE IMAGO (in alcohol). Upper portion of eyes reddish-brown, lower portion grayish-black. Head dark brown, carinae black. Antennae light reddish-brown. Basal half of ocelli black, apical half whitish. Thorax brown, carinae darker, sutures paler; pronotum uniformly washed with black; carinae around and between base of mesothoracic and metathoracic legs black; carinae around and between base of prothoracic legs and anterior base of fore wings black. Coxae of all legs washed with black, trochanters and femora of prothoracic legs dark reddish-brown, remainder of prothoracic legs and trochanters of mesothoracic and metathoracic legs pale brown washed with reddish-brown, apex of tibiae of prothoracic legs a little darker red; remainder of legs pale yellowish-brown. Wings (Fig. 8-10): longitudinal veins of fore wings pale yellowish-brown to hyaline except posterior fourth of C, Sc, R_1 and R_s light brown, cross veins in cells C, Sc, R_1 and anterior of remainder of wing reddish-brown, faded along posterior margins; longitudinal and cross veins of hind wings hyaline, except narrow dark reddish-brown clouds surround cross veins along costal margin and in anterior half of fore wings, apical $1/3$ of cells C and Sc of fore wings translucent pale brown, membrane of fore and hind wings brown at base. Abdomen: reddish-brown; terga 1-9 washed lightly with darker blackish-brown, faded, irregular on terga 6-9 (Fig. 65-67); a black, oblique bar-like mark near posterolateral corners of terga 2-7, those on tergum 7 faded; faded, black, sublateral, longitudinal bars on terga 2-9; a paler, median, longitudinal band on terga 1-9; black, narrow, transverse band on posterior margin of terga 1-10; a black, median macula near posterior margin of terga 5-9, those on terga 5 and 9 faded;

spiracles black on terga 2-7, remainder of spiracles and tracheae hyaline; pale submedian oblique marks on sterna 2-9 as in Fig. 69. Genitalia (Fig. 36-37): brown. Caudal filaments brown.

FEMALE IMAGO. Unknown.

FEMALE SUBIMAGO (in alcohol). Eyes black. Head brown, washed lightly with black, a black W-shaped mark on vertex. Antennae brown. Basal half of ocelli black, apical half white. Color and marks of thorax and legs as in ♂ imago, except darker brown. Wings: marks as in ♂ imago, membrane translucent light grayish-brown. Abdomen: color and marks similar to ♂ imago, except darker and more distinct (Fig. 68). Caudal filaments pale.

MATURE NYMPH (in alcohol). Head: dorsum brown, venter pale; a blackish-brown mark extended between eyes and including ocelli; area around base of antennae washed with blackish-brown. Thorax: dorsum brown, venter pale; carinae of dorsum blackish-brown; ganglia washed lightly with black. Legs: pale. Abdomen: terga brown, sterna pale; color and marks of terga similar to ♂ imago and ♀ subimago (Fig. 2, 128-129); ganglion on sternum 7 washed lightly in black. Gills (Fig. 111-112): membrane gray, darker near middle; tracheae black, branches on outer half less pigmented. Caudal filaments light brown.

SPECIMENS. Holotype ♂ imago, No. N42; paratypes: 7 nymphs, No. N14; 8 nymphs, No. N15; 9 nymphs, 1 ♂ subimago, 2 ♀ subimagos, No. N17; 14 nymphs, No. N21; 11 nymphs, 1 ♂, No. N23; 1 nymph, No. N 34; 1 nymph, No. N35; 5 nymphs, 4 ♂ subimagos, 2 ♀ subimagos, No. N37; 23 nymphs, 2 ♂ subimagos, 3 ♂, No. N42; 9 nymphs, No. N46; 4 nymphs, No. N47; 21 nymphs, 1 ♂ subimago, No. N50; 5 nymphs, No. N53; 1 nymph, No. N54; 11 nymphs, No. FNK25-26; 20 nymphs, No. FNK29; 2 nymphs, No. FNK56; 1 nymph, No. FNK79; 28 nymphs, No. FNK85; 3 nymphs, No. FNK86; 1 nymph, No. FNK93; 4 nymphs, No. FNK104; 1 nymph, No. FNK124. All types are in alcohol. Association of the nymphs and adults is by rearing. All types are deposited in the following collections: holotype, 54 nymphal paratypes, 1 ♂ paratype, 2 ♂ subimaginal paratypes, and 2 ♀ subimaginal paratypes at FAMU; 55 nymphal paratypes, 2 ♂ paratypes, 2 ♂ subimaginal paratypes and 2 ♀ subimaginal paratypes at UU; 20 nymphal paratypes and 1 ♂ subimaginal paratype at BPBM, O.R.S.T.O.M., CTFT, and NMNH.

The color patterns on specimens are variable within anyone locality and between localities (Fig. 2, 65-67, 128-129). The tergal color pattern on ♂ imagos, ♀ subimagos, and nymphs ranges from distinct to extremely faded; generally, the pattern is more distinct in specimens from the southern half of the island. The oblique mark on the posterolateral corners of terga 2-7 is reduced to a small macula in some specimens (Fig. 67). The shape of the ventral portion of the gill lamellae of nymphs

can vary within individuals (Fig. 111-112) and the ganglion on sternum 7 may be faded on some specimens. Young nymphs are marked in much the same way as is *Celiphlebia caledoniae* and are easily confused with that species (Fig. 128), but the color pattern in *Poya brunnea* becomes darker, redder, and more extensive as nymphs mature (Fig. 129).

Etymology. brunneus, ML., meaning brown.

BIOLOGY. *Poya brunnea* appears to be distributed throughout New Caledonia. Nymphs were found in streams with water temperatures of 15.2 °C-22.1 °C and at about 76-458 m elevation. Many specimens were collected through the entire water temperature and altitudinal ranges, and a large collection was made at locality No. FNK85 with a water temperature of 22.1 °C.

Nymphs were collected on the underside of rocks in the fastest portions of rivers. All imagos and subimagos were collected at light trap, and no swarming was observed.

Tindea, new genus

(Fig. 3, 11-15, 25-26, 29, 38-41, 48, 55-56, 70-72, 88-91, 101-102, 106, 113, 131-134)

IMAGO. Length of ♂: body, 8.0-10.0 mm; fore wings, 8.4-9.5 mm. Length of ♀: body, 8.0-10.5 mm; fore wings, 9.5-11.0 mm. Eyes of ♂ meet on meson of head, dorsally upper portion circular-shaped, lower portion of eyes 3/4 length of upper portion (Fig. 25-26); eyes of ♀ separated on meson of head by a length 3 times as great as maximum width of an eye. Wings (Fig. 11-15): maximum width of fore wings a little more than 1/3 maximum length; vein Rs of fore wings forked a little less than 1/4 of distance from base to margin; vein MA forked more than 1/2 of distance from base to margin, fork symmetrical, distal portion of vein MA sagged posteriorly; vein MP₂ attached at base to veins MP₁ and CuA with a cross vein (Fig. 11), attachment of vein MP₂ to MP₁ less than 1/3 of distance from base to margin, base of vein MP₂ curved towards vein CuA; vein ICu₁ attached to veins CuA and CuP with a cross vein, remainder of Cu-A area as in Fig. 11; cross veins numerous; some cross veins in apical 1/3 of cells C anastomosed (Fig. 11, 14-15), anastomosis weakly developed in some specimens (Fig. 15). Costal margin of hind wings convex (Fig. 12-13), with concavity located 1/2 distance from base; apex of wings acute, rounded; cross veins few. Legs: ratio of segments in ♂ fore legs, 0.75: 1.00 (2.80 mm): 0.03: 0.32: 0.28: 0.18: 0.10. Claws of a pair dissimilar, one apically hooked (Fig. 29), other obtuse, pad-like. Male genitalia (Fig. 38-41): segment 2 of forceps a little longer in

length than segment 3, segment 2 of forceps 1/8 length of segment 1, apex of segment 3 rounded; base of forceps broad, its inner margin forming an angular bend near middle of forceps; length of styliger plate along median line a little less than 1/2 maximum width, apex of styliger plate shallowly cleft; penes fused except for apical 1/5, penes broad except broader near base, apex of each penis lobe rounded, each penis lobe with a semicircular row of subapical spines, apex of spines pointed towards apex of penis lobes. Female with an ovipositor or egg guide extended to anterior 1/3 of segment 8 (Fig. 57-58). Ninth sternum of ♀ very shallowly cleft apically (Fig. 48). Terminal filament a little longer than cerci.

MATURE NYMPH. Head prognathous. Antennae a little longer than maximum length of head. Mouthparts (Fig. 88-91, 101-102): labrum greatly expanded laterally; dorsal hair on labrum as in Fig. 88; submedian and anterior areas of hair ventrally; anteromedian margin with 5 wide broad-based denticles frequently indistinct (Fig. 89). Clypeus as in Fig. 88. Left mandible as in Fig. 90. Lingua of hypopharynx with well developed lateral processes, paired submedian longitudinal row of long hair on internal dorsal surface, apex of submedian lobes with a rack-like process (Fig. 102), anterior margin of lingua deeply cleft; superlingua as in Fig. 102, with a row of hair along anterior margin, lateral margins blunt. Segment 2 of maxillary palpi equal to length of segment 1; segment 3 of palpi 3/4 length of segment 2, triangular; a V-shaped ridge near the ventral, inner anterolateral margin of maxillae; hair on maxillae as in Fig. 101. Labium as in Fig. 91; segment 2 of palpi 3/4 length of segment 1; segment 3 of palpi 3/4 length of segment 2, triangular; paraglossae ventral to glossae. A row of long hair on dorsal mid-line of abdomen and thorax; row forks near anterior half of pronotum and continues onto vertex of head; a row of fine hair on dorsum of basal segments of all 3 caudal filaments (Fig. 3). Legs (Fig. 131-134): maximum width of tibiae a little larger than maximum width of tarsi, tibiae in cross section triangular (Fig. 132); outer margin of femora indented near apex so tibiae can draw partially into femora (Fig. 131); apex of claws hooked and narrow, denticles on claws progressively larger apically, except basal denticles smaller and more slender and spaced apart from remaining denticles (Fig. 134). Gills (Fig. 113): gills on segments 1-7 alike; dorsal and ventral portions of lamellae plate-like, each portion terminated in 1 long, slender, median filament, inner apical area of dorsal plate-like portion moderately cleft at base of filament and rounded (Fig. 113); main trunk of tracheae near outer margin of dorsal portion and near middle

of ventral portion, tracheae on both sides of main trunk branched, except less so on outer margin of dorsal portion; main trunk and tracheae pigmented. Posterolateral spines on abdominal segments 2 or 3-9, spines progressively larger posteriorly, apex of posterolateral spines on segment 9 blunt. Terminal filament a little longer than cerci.

Etymology. *Tindea*, based on the locality Tindéa. Feminine.

TYPE SPECIES. *Tindea cochereaui*, new species.

DISCUSSION. *Tindea* can be distinguished from all genera of the Leptophlebiidae by the following combination of characters. In the imagos: (1) the Cu-A area of the fore wings possesses 2 long straight intercalaries (Fig. 11); (2) length of vein Sc of the hind wings is a little more than 3/4 maximum length of hind wings (Fig. 12-13); (3) each penis lobe of ♂ genitalia possesses a semicircular row of subapical spines; apex of spines are pointed towards apex of penis lobes (Fig. 38-40); (4) claws of a pair are dissimilar; one is apically hooked while other is obtuse, pad-like (Fig. 30); and (5) ♀ possesses an ovipositor or egg guide which is extended to anterior 1/3 of abdominal segment 8 (Fig. 57-58). In the nymphs: (1) anterior margin of lingua of hypopharynx is deeply cleft; apex of submedian lobes of lingua each possesses a rack-like process (Fig. 102); (2) labrum is greatly expanded laterally (Fig. 88); (3) outer margin of mandibles is strongly curved at right angles and a tuft of hair occurs near angle of outer margin (Fig. 90); (4) abdominal gills 1-7 are plate-like and each portion is terminated in 1 long, slender, median filament (Fig. 113); and (5) a row of long hair occurs on vertex of head, dorsal mid-line of thorax and abdomen, and base of caudal filaments (Fig. 3).

Tindea appears to be most closely related to *Lepegenia*. As *Lepegenia* is known only from the nymph, *Tindea* is distinguished from it only on nymphal characters: (1) abdominal gills 1-7 are doubled, plate-like, and each portion is terminated in 1 long, slender, median filament (Fig. 113); (2) abdominal gills 1-7 are similar in shape and are not modified to form a suction cup (Fig. 3); (3) outer margin of mandibles is strongly curved at right angles and a tuft of hair occurs near angle of outer margin (Fig. 90); and (4) anteromedian margin of labrum possesses 5 broad-based denticles (Fig. 88), denticles often indistinct.

Tindea cochereaui, new species

(Fig. 3, 11-15, 25-26, 29, 38-41, 48, 55-56, 70-72, 88-91, 101-102, 106, 113, 131-134)

MALE IMAGO (in alcohol). Upper portion of eyes

reddish-brown, lower portion grayish-black (Fig. 25-26). Head light brown, washed heavily with black. Antennae brown, flagellum paler. Basal half of ocelli black, apical half yellowish-brown. Thorax light brown, carinae darker, sutures paler; pronotum uniformly washed with dark brown; dark brown oblique areas on mesothoracic and metathoracic pleurae between base of legs and wings; thoracic ganglia black. Coxae and trochanters of all legs and femora of prothoracic legs yellowish-brown, washed with brown; prothoracic femora light brown with apex and base darker and redder; apex of prothoracic tibiae brown; remainder of legs pale. Wings (Fig. 11-15): longitudinal and cross veins of fore and hind wings pale brown; membrane of fore and hind wings hyaline, except apical 1/3 of cells C and Sc of fore wings translucent, a narrow V-shaped dark brown band across base of fore wings as in Fig. 11, and membrane at base of hind wings dark brown as in Fig. 12-13. Abdomen: light brown; margins of tergum 1 darker brown; anterior 1/3 of terga 2-6 transparent, terga 2-9 with a narrow, dark brown, transverse line near posterior margin, line faded on terga 7-9 (Fig. 70); a dark brown L-shaped mark near posterolateral corners of terga 2-8 (Fig. 71), mark faded on terga 7 and 8; terga 7-10 opaque; darker light reddish-brown marks on terga 7-9 as in Fig. 70; a dark brown, median mark on terga 7-9 as in Fig. 70, mark faded on terga 6 and 7; spiracles and tracheae hyaline; sterna entirely light brown; abdominal ganglia 6 and 7 black. Genitalia (Fig. 38-41): pale. Caudal filaments pale, darker brown annulations at articulations, annulations darker near middle, paler near apex.

FEMALE IMAGO (in alcohol). Eyes gray. Head light brown, posterior to lateral ocelli large dark brown maculae. Antennae light brown, flagellum paler. Basal half of ocelli black, apical half white. Color and marks of thorax and legs as in ♂ imago, except general color a little darker. Wings: longitudinal veins of fore and hind wings and cross veins of hind wings light brown, cross veins of fore wings dark brown; membrane of fore and hind wings transparent except apical 1/3 of cells C and Sc of fore wings translucent, a narrow V-shaped brown band across base of fore wings, membrane at base of hind wings dark brown. Abdomen: color and marks as in ♂ imago, except general color darker; abdomen entirely opaque; reddish-brown anterior and submedian marks on terga 2-9 as in Fig. 72, marks faded on terga 7-9; ovipositor pale. Caudal filaments pale, darker brown annulations at articulations, annulations darker near middle, paler near apex.

MATURE NYMPH (in alcohol). Head: dorsum dark brown, venter pale. Thorax: dorsum dark brown,

venter pale, ganglia black. Legs: dorsum brown, except a wide, darker brown transverse band near apex of femora, area on either side of band lighter than remainder of femora (Fig. 131), apex of tarsi dark brown; venter pale, except darker brown near apex of prothoracic femora. Abdomen (Fig. 3): terga brown, posterior margin of terga 1-9 with a narrow, darker brown, transverse band; a L-shaped mark near posterolateral corners of terga 2-7; paired, submedian, pale maculae sometimes present on terga 4-6, those on tergum 5 larger; lateral margins of terga 8-9 pale; median and lateral areas of terga 9-10 pale; sterna pale, ganglion on sternum 7 black. Gills (Fig. 113): membrane gray, darker near middle; tracheae black, branches on ventral portion of lamellae less pigmented. Caudal filaments dark brown.

SPECIMENS. Holotype ♂ imago, No. N50; allotype ♀ imago, No. N50; paratypes: 1 nymph, No. N12; 3 nymphs, No. N13, 72 nymphs, 2 ♀, 3 ♀ subimagos, No. N22; 8 nymphs, No. N23; 29 nymphs, 1 ♀, No. N25; 21 nymphs, No. N27; 127 nymphs, 6 ♂, 4 ♂ subimagos, 4 ♀ subimagos, No. N50; 186 nymphs, 4 ♂, 14 ♂ subimagos, 4 ♀, 27 ♀ subimagos, No. N51; 32 nymphs, No. N52; 10 nymphs, 5 ♂, 7 ♂ subimagos, 3 ♀, 2 ♀ subimagos, No. N53; 4 nymphs, No. N55; 9 nymphs, No. FNK9; 6 nymphs, No. FNK15; 3 nymphs, No. FNK23-24; 26 nymphs, No. FNK25-26; 13 nymphs, No. FNK31-32; 20 nymphs, No. FNK75. All types are in alcohol. Association of the nymphs and adults is by rearing. All types are deposited in the following collections: holotype, allotype, 223 nymphal paratypes, 4 ♂ paratypes, 6 ♂ subimaginal paratypes, 3 ♀ paratypes, and 10 ♀ subimaginal paratypes at FAMU; 222 nymphal paratypes, 4 ♂ paratypes, 6 ♂ subimaginal paratypes, 4 ♀ paratypes, and 10 ♀ subimaginal paratypes at UU; 50 nymphal paratypes, 2 ♂ paratypes, 3 ♂ subimaginal paratypes, 1 ♀ paratype, and 1 ♀ subimaginal paratypes at BPBM; 25 nymphal paratypes, 2 ♂ paratypes, 3 ♂ subimaginal paratypes, 1 ♀ paratype, and 4 ♀ subimaginal paratypes at O.R.S.T.O.M.; 25 nymphal paratypes, 2 ♂ paratypes, 2 ♂ subimaginal paratypes, 1 ♀ paratype, and 4 ♀ subimaginal paratypes at CTFE; 25 nymphal paratypes, 1 ♂ paratype, 3 ♂ subimaginal paratypes, 1 ♀ paratype, 4 ♀ subimaginal paratypes at NMNH.

The abdominal color pattern on the ♀ is variable among the types. The dark brown anterior and submedian marks on terga 2-9 are faded and almost absent in several specimens from several localities. The abdominal color pattern on the nymphs is variable among the types. The paired, submedian, pale maculae on terga 4-6 often extend to terga 8, and the maculae can be enlarged to longitudinal bars. There is also variation in degree of anastomosis of the apical area of cell C of the fore wings (Fig. 11, 14-15). In 89 imagos and subimagos examined, 69 showed anastomosis of at least some of the cross veins in both wings (Fig. 14) while 11 showed only a few « Y-shaped » cross veins in both wings (Fig. 15). In the remaining 9 adults, anastomosis occurred in one wing and the « Y-shaped » condition in the other.

Figures 38-41 are included to show some of the variation in the genitalia of the ♂ imagos from one locality (N50). As is also true of other genera with this genitalia type, a part of the variation is natural in the population and part comes from distortion when the penes are mounted on microscope slides.

Etymology. Species is named for Dr. Paul Cochereau, Centre O.R.S.T.O.M., Nouméa.

BIOLOGY. *Tindea cochereaui* appears to be confined from the Rivière Nondoué on the West Coast south to the entire Southern Region at higher altitudes and is most abundant in our collections from the Southern Region. Nymphs were found in streams with water temperatures of 16.5 °C-23 °C and at about 31-183 m elevation; however, the species was most abundant in streams with water temperatures of 19 °C-19.5 °C at about 135-183 m elevation.

Nymphs were collected on the underside of rocks in the fastest portions of rivers. Subimagos only were collected at light trap and no imagos were observed swarming. Subimagos molted to imagos in late afternoon of the next day.

Peloracantha, new genus

(Fig. 4, 16-19, 30, 42-43, 49, 57-58, 73-74, 92-94, 103-105, 108, 114, 135-138)

IMAGO. Description based on ♂ and ♀ subimagos and ♀ imago. Length of ♂ subimago: body, 11.0-13.2 mm; fore wings, 14.3-15.7 mm. Length of ♀: body, 13.5-17.5 mm; fore wings, 16.2-21.0 mm. Eyes of ♂ separated on meson of head by a length equal to maximum width of a median ocellus, dorsally upper portion circular-shaped, lower portion of eyes 3/4 length of upper portion; eyes of ♀ separated on meson of head by a length 3 times as great as maximum width of an eye. Fore wings (Fig. 16, 19): maximum width of wings a little more than 1/3 (♂) to a little less than 1/2 (♀) maximum length of wings; vein Rs of ♂ forked less than 1/3 of distance from base to margin, vein Rs of ♀ forked less than 1/4 of distance from base to margin; vein MA forked 1/2 distance from base to margin, fork symmetrical, distal portion of vein MA usually sagged posteriorly; vein MP₂ attached at base to veins MP₁ and CuA with a cross vein (Fig. 16, 19), attachment of vein MP₂ to MP₁ less than 1/3 of distance from base to margin, base of vein MP₂ equidistant between veins MP₁ and CuA to nearer to vein CuA than MP₁; base of vein ICu₁ attached to veins CuA and CuP with a cross vein, remainder of CuA area as in Fig. 16, 19; cross veins numerous, more numerous in ♀ than in ♂. Costal margin of hind wings convex (Fig. 17-18), with concavity located 1/2 distance from base; apex of wings acute,

rounded; cross veins few. Legs: ratios of segments in ♂ fore legs, 0.71: 1.00 (4.90 mm): 0.02: 0.12: 0.10: 0.08: 0.08. Claws of a pair dissimilar, one apically hooked (Fig. 30), other obtuse, pad-like, with an apical knob. Male genitalia (Fig. 42-43): segment 2 of forceps a little longer in length than segment 3, segment 2 of forceps 1/6 length of segment 1, apex of segment 3 rounded; base of forceps broad, its inner margin forms an angular bend near middle of forceps; length of styliger plate along median line 1/3 maximum width, apex of styliger plate with paired, large, submedian protuberances as in Fig. 42-43; penes fused except for apical 1/7, penes broad except broader at base, apex of each penis lobe rounded, each penis lobe with a semicircular row of subapical spines, apex of spines pointed towards apex of penis lobes. Female with an ovipositor or egg guide on posterior margin of sternum 7 extended to anterior 1/3 of segment 8 (Fig. 57-58). Ninth sternum of ♀ shallowly cleft apically (Fig. 49). Terminal filament a little longer than cerci.

MATURE NYMPH. Head prognathous. Antennae 3/4 maximum length of head. Mouthparts (Fig. 92-94, 103-105): labrum greatly expanded laterally and bowed (Fig. 92); dorsal hair on labrum as in Fig. 92; median and anterior areas of hair ventrally. Clypeus as in Fig. 92. Left mandible as in Fig. 93. Lingua of hypopharynx with well developed lateral processes, paired submedian longitudinal row of long hair on internal dorsal surface, apex of submedian lobes with internal submarginal rack-like processes, anterior margin deeply cleft; superlingua as in Fig. 104 with a row of hair along anterior margin, lateral margins acute. Segment 2 of maxillary palpi subequal in length to segment 1; segment 3 of palpi 1/2 length of segment 2, triangular; a V-shaped ridge near the ventral, inner anterolateral margin of maxillae; hair on maxillae as in Fig. 103. Labium as in Fig. 94; segment 2 of palpi equal to length of segment 1; segment 3 of palpi 1/2 length of segment 2, triangular; paraglossae ventral to glossae. Short hair on entire body, hair longer on vertex of head and thoracic nota; a keel-shaped median spine on posterior margin of metathoracic notum and a larger keel-shaped median spine on abdominal terga 1-9, base of each spine covers entire median line of each tergum (Fig. 4, 108), spines progressively larger posteriorly. Legs (Fig. 135-138); maximum width of tibiae a little larger than maximum width of tarsi (Fig. 136-137), tibiae in cross section triangular (Fig. 136); outer margin of femora indented near apex so tibiae can draw partially into femora (Fig. 135); apex of claws hooked and blunt; 3 large denticles near middle of claws, apical denticle smaller; posterior to 3 large denticles a row of small subequal denticles; 1-3 small

denticles and several hairs near apex of claws (Fig. 138). Gills (Fig. 114): gills on segments 1-7 alike, gills 6 and 7 smaller; dorsal and ventral portions of lamellae plate-like, ventral portion smaller, apex of each portion blunt and rounded; main trunk of tracheae nearer outer margin of dorsal portion and along median line of ventral portion, tracheae on both sides of main trunk branched, main trunk lightly pigmented, tracheal branches not pigmented. Posterolateral spines on abdominal segments 7-9, spines progressively larger posteriorly, all spines blunt. Terminal filament a little longer than cerci.

Etymology. peloros, Gr., meaning monster; akantha, Gr., f., meaning spine. Feminine.

TYPE SPECIES. *Peloracantha titan*, new species.

DISCUSSION. *Peloracantha* can be distinguished from all genera of the Leptophlebiidae by the following combination of characters. In the imagos: (1) the Cu-A area of the fore wings possesses 2 long straight intercalaries (Fig. 16, 19); (2) length of vein Sc of the hind wings is 9/10 maximum length of hind wings (Fig. 17-18); (3) each penis lobe of ♂ genitalia possesses a semicircular row of subapical spines, apex of spines are pointed towards apex of penis lobes (Fig. 42); (4) claws of a pair are dissimilar; one is apically hooked while other is obtuse, pad-like, and with an apical knob (Fig. 30); and (5) apex of styliger plate of ♂ genitalia possess paired, submedian protuberances (Fig. 42-43). In the nymphs: (1) anterior margin of lingua of hypopharynx is deeply cleft; apex of submedian lobes of lingua each possesses an internal submarginal rack-like process (Fig. 104); (2) labrum is greatly expanded laterally and bowed (Fig. 92, 105); (3) outer margin of mandibles is strongly curved at right angles and a tuft and a row of hair occur near angle of outer margin (Fig. 93); (4) abdominal gills 1-7 are double, plate-like and rounded (Fig. 114); and (5) a large, keel-shaped median spine occurs on metathorax and abdominal terga 1-9 (Fig. 4, 108).

Peloracantha appears to be most closely related to *Lepeorus* and can be distinguished from it by the following combination of characters. In the imagos: (1) apex of penis lobes of ♂ genitalia is rounded and without appendages (Fig. 42) (appendages and sclerotization between inner apical margins of lobes of the penes are evident in subimagos of *Lepeorus*); (2) a small posteromedian protuberance occurs near margin of abdominal terga 1-9, most prominent on 6 or 7-9 (Fig. 57, 73-74); (3) cross veins are abundant in the fore wings between ICuA and CuP (Fig. 16, 19); (4) claws of a pair are dissimilar; one is apically hooked while other is obtuse, pad-like and with an apical knob (Fig. 30);

and (5) costal brace of fore wings of ♀ lacks pigmentation of cells C and Sc. In the nymphs: (1) abdominal gills are plate-like with lamellae doubled (Fig. 114); (2) a large, keel-shaped, median spine occurs on metathorax and abdominal terga 1-9 (Fig. 4, 108); (3) labrum is greatly expanded laterally and bowed (Fig. 92, 105); (4) posterolateral spines occur on abdominal segments 7-9; and (5) entire ventral surface of glossae and paraglossae of labium is covered with fine hair as in Fig. 94.

As *Peloracantha titan* is one of the largest Leptophlebiidae known, very early instar nymphs are often collected. These early instars possess several characters not common to later instar nymphs. Paired, submedian, small tubercles occur on the vertex of the head and a row of paired submedian small tubercles occur on the pronotum and mesonotum. The abdominal gills are lanceolate with the apices acute.

Peloracantha titan, new species

(Fig. 4, 16-19, 30, 42-43, 49, 57-58, 73-74, 92-94, 103-105, 108, 114, 135-138)

MALE IMAGO. Unknown.

MALE SUBIMAGO (in alcohol). Upper portion of eyes reddish-brown, lower portion blackish-brown. Head and antennae pale brown. Basal half of ocelli black, apical half white. Thorax pale brown, carinae darker, sutures paler; a blackish-brown, longitudinal bar on pleurae dorsal to base of legs. Legs light brown, apex of tibiae and tarsal segments darker, a darker longitudinal macula on dorsal surface of prothoracic femora. Wings (Fig. 16-18): longitudinal and cross veins of fore and hind wings light yellowish-brown, except cross veins in cells C, Sc, and R_1 darker; membrane of fore and hind wings light brown, translucent, except membrane of cells C, Sc, and R_1 of fore wings darker; irregular darker brown clouds surround cross veins of cells C, Sc, and R_1 of fore wings, membrane around bulla of fore wings darker brown. Abdomen: light yellowish-brown; a blackish-brown, narrow, transverse band on the posterior margin of terga 1-8, band narrower on lateral margins (Fig. 73-74); a small blackish-brown, median, longitudinal, dash mark on posterior margin of terga 1-9 just in front of small, median, spine-like nub on terga 1-9; posterolateral areas of terga 1-9 washed lightly with blackish-brown, faded on terga 7-9; a blackish-brown, sublateral, dash mark on terga 1-7; spiracles hyaline to spirales on terga 1-4 with a small black macula; tracheae hyaline. Genitalia (Fig. 42-43): light yellowish-brown, reddish-brown annulations at articulations of forceps segments 2 and 3. Caudal

filaments light yellowish-brown, darker brown annulations at articulations.

FEMALE IMAGO (in alcohol). Eyes black. Head pale brown, a dark brown transverse band between anterior base of eyes and curved posteriorly to vertex. Antennae pale brown. Basal half of ocelli black, apical half white. Color and marks of thorax and legs as in ♂ subimago. Wings: color and marks as in ♂ subimago, except veins darker; membrane of fore and hind wings hyaline, except membrane of cells C, Sc, and R_1 brown, translucent, and membrane of costal brace hyaline. Abdomen: color and marks as in ♂ subimago, except color and marks lighter; ovipositor light yellowish-brown. Caudal filaments pale yellowish-brown, darker annulations at articulations.

MATURE NYMPH (in alcohol). Head: dorsum brown, venter pale. Thorax: dorsum brown, venter pale; color marks as in ♂ subimago and ♀ imago. Legs: dorsum brown, venter pale, apex of claw dark brown; a light brown dorsal macula near apex of femora. Abdomen: terga brown, sterna pale; color marks on terga similar to those of ♂ subimago and ♀ imago. Gills (Fig. 114): membrane blackish-gray; main trunk of tracheae darker. Caudal filaments brown.

SPECIMENS. Holotype ♂ mature nymph, No. N50; allotype ♀ imago, No. N50; paratypes: 12 nymphs, No. N22; 3 nymphs, No. N23; 2 nymphs, No. N26; 1 nymph, No. N27; 1 ♂ subimago, No. N37; 42 nymphs, 1 ♂ subimago, 5 ♀ subimagos, No. N50; 2 nymphs, No. N52; 20 nymphs, 1 ♂ subimago, No. N53; 2 nymphs, No. FNK31-32. All types are in alcohol. Association of the nymphs and ♂ subimago is by the abdominal spines and color pattern on specimens from the same locality. Association of the nymphs and ♀ imago is by rearing. All types are deposited in the following collections: holotype, allotype, 28 nymphal paratypes, 1 ♂ subimaginal paratype, and 1 ♀ subimaginal paratype at FAMU; 28 nymphal paratypes, 1 ♂ subimaginal paratype, and 1 ♀ subimaginal paratype at UU; 7 nymphal paratypes, and 1 ♀ subimaginal paratype at BPBM; 7 nymphal paratypes, 1 ♂ subimaginal paratype and 1 ♀ subimaginal paratype at O.R.S.T.O.M.; 7 nymphal paratypes and 1 ♀ subimaginal paratype at CTFT; and 7 nymphal paratypes at NMNH.

The submedian protuberances on the styliger plate of the ♂ subimago from locality N37 (Fig. 43) are more acute than on specimens from the type locality (Fig. 42). There is also some variation in the intensity of color and marks on the abdominal terga.

Etymology. Titan, Gr., meaning son or daughter of Uranus and Gaea, symbolic of brute force and large size.

BIOLOGY. *Peloracantha titan* was collected from the Southern Region and Mt. Aoupinié near Ponérihouen on the East Coast. Nymphs were found in streams with water temperatures of 18 °C-

20.5 °C and at about 137-458 m elevation. Most nymphs were collected at about 19 °C.

Nymphs were collected under large flat rocks to slab rocks in the fastest portions of the rivers. When on handscreens, the nymphs moved quickly and laterally off the handscreens. No imagos were seen swarming, but one ♂ and 2 ♀ subimagos came to light trap after dark. The ♂ subimago from locality No. N37 was collected in an emergence trap located over large boulders (ca. 50 cm to 2 m diameter). All other specimens were reared from nymphs. Only one ♀ subimago molted to the imago; all remaining subimagos died.

Coula, new genus

(Fig. 20-22, 31-33, 44-45, 50, 59-60, 75-76)

IMAGO. Length of ♂: body, 5.2-7.3 mm; fore wings, 7.1-7.3 mm. Length of ♀: body, 6.2 mm; fore wings, 7.0 mm. Eyes of ♂ separated on meson of head by a length equal to maximum width of a lateral ocellus, dorsally upper portion circular-shaped, lower portion of eyes 1/2 length of upper portion; eyes of ♀ separated on meson of head by a length 5 times as great as maximum width of an eye. Wings (Fig. 20-22): maximum width of fore wings a little more than 1/3 maximum length of fore wings; vein Rs of fore wings forked 1/4 distance from base to margin; vein MA forked a little less than 1/2 of distance from base to margin, fork symmetrical; vein MP₂ attached at base to veins MP₁ and CuA with a cross vein (Fig. 20), attachment of vein MP₂ to vein MP₁ 1/3 of distance from base to margin, base of vein MP₂ equidistant from veins MP₁ and CuA to nearer to vein MP₁; vein ICu₁ attached to veins CuA and CuP with a cross vein, remainder of Cu-A area as in Fig. 20; cross veins numerous. Costal margin of hind wings convex (Fig. 21-22) with concavity located about 1/2 distance from base; apex of wings acute, rounded; cross veins few. Legs: ratios of segments in ♂ fore legs, 0.68: 1.00 (2.5 mm): 0.04: 0.40: 0.32: 0.20: 0.12. Prothoracic claws of a pair dissimilar, one apically hooked (Fig. 31), other obtuse, pad-like with a small subapical spine (Fig. 31); mesothoracic and metathoracic claws of a pair similar, both apically hooked with an opposing hook (Fig. 32-33) (see discussion). Male genitalia (Fig. 44-45): segment 2 of forceps a little shorter in length than segment 3, segment 2 of forceps 1/10 length of segment 1, apex of segment 3 rounded; base of forceps broad, its inner margin forming an angular bend past middle of forceps; length of styliger plate along median line a little more than 1/2 maximum width, apex of styliger plate with a well developed, median protuberance and shallowly cleft at apex (Fig. 44);

penes fused, except at apex, broader at base and apex, apex of each penis lobe acute, lateral margins of penes curved dorsally as in Fig. 45, each penis lobe with a row of subapical spines, apex of spines pointed towards apex of penis lobes (Fig. 44-45). Female with a well developed ovipositor or egg guide extended to the middle of abdominal segment 8 (Fig. 59-60). Ninth sternum of ♀ entire apically (Fig. 50). Terminal filament a little longer than cerci.

MATURE NYMPH. Unknown.

Etymology. *Coula*, based on the name Tribu de Coula. Feminine.

TYPE SPECIES. *Coula fasciata*, new species.

DISCUSSION. *Coula* can be distinguished from all genera of the Leptophlebiidae by the following combination of characters. In the imagos: (1) the Cu-A area of the fore wings possesses 2 long straight intercalaries (Fig. 20); (2) length of vein Sc of hind wings is 2/3 maximum length of hind wings (Fig. 21-22); (3) each penis lobe of ♂ genitalia possesses a semicircular row of subapical spines; apex of spines are pointed towards apex of penis lobes (Fig. 44-45); (4) prothoracic claws of a pair are dissimilar; one is apically hooked while other is obtuse, pad-like with a small subapical spine; mesothoracic and metathoracic claws of a pair are similar and both are apically hooked with an opposing hook (Fig. 31-33); and (5) costal margin of hind wings is convex (Fig. 21-22).

Coula appears to be most closely related to *Celiphlebia* and closely related genera and can be distinguished from them by the following combination of characters. In the imagos: (1) prothoracic claws of a pair are dissimilar; one is apically hooked while other is obtuse, pad-like with a small subapical spine; mesothoracic and metathoracic claws of a pair are similar and both are apically hooked with an opposing hook (Fig. 31-33); (2) ninth sternum of ♀ is entire apically (Fig. 50); (3) ♀ possesses a well developed ovipositor or egg guide which in lateral aspect is broad and apically blunt (Fig. 59-60); and (4) cross veins are absent in basal 1/3 of cell C of the fore wings (Fig. 20).

Some variation occurs among the claws of the ♂ and ♀ imagos. While the condition in the fore claws is generally as illustrated (Fig. 31), the fore claws of some specimens have only a single hooked claw, apparently indicating that the pad-like half of the claw is easily lost. In the mesothoracic and metathoracic legs, the claws of a pair are always similar, but may vary from a strong recurvature (Fig. 32) to a greatly reduced recurvature, and in one case a small opposing hook at the inner apex of the recurvature (Fig. 33).

Coula fasciata, new species

(Fig. 20-22, 31-33, 44-45, 50, 59-60, 75-76)

MALE IMAGO (in alcohol). Upper portion of eyes red, lower portion brownish-black. Head pale yellowish-brown. Antennae pale yellowish-brown, flagellum paler. Basal 1/3 of ocelli dark brown, apical 2/3 pale yellowish-brown. Thorax pale yellowish-brown, sterna paler; lateral margins of pronotum and carinae at base of fore and hind wings black. Legs pale yellowish-brown, prothoracic femora reddish-brown, apical third of mesothoracic and metathoracic femora yellowish-brown with basal third of segments pale yellowish-brown, apex of prothoracic tibiae and first tarsal segment light brown, apex of tarsal segments a little darker. Wings (Fig. 20-22): longitudinal veins of fore and hind wings pale yellowish-brown except basal tenth of vein C dark blackish-brown, basal section of other longitudinal veins reddish-brown in area of band or macula only, cross veins of fore and hind wings hyaline; membrane of fore and hind wings hyaline pale yellowish-brown, except apical 1/3 of cells C and Sc of fore wings translucent; a wide, transverse, dark yellowish-brown band near base of fore wings (Fig. 20); a large, transverse, dark yellowish-brown macula near base of hind wings and extended to middle of cell C. Abdomen: pale yellowish-brown, translucent, except terga 3-5 hyaline (Fig. 75-76); posterolateral corners of terga 2-7 lined with black, line faded on tergum 2; terga 3-7 with sublateral black lines as in Fig. 76; spiracles and tracheae hyaline. Genitalia (Fig. 44-45): pale

yellowish-brown. Caudal filaments broken off and missing.

FEMALE IMAGO (in alcohol). Eyes black. Head pale yellowish-brown. Antennae pale yellowish-brown, flagellum paler. Basal half of ocelli light brown, apical half pale yellowish-brown. Color and marks of thorax and legs as in ♂ imago. Wings: color and marks as in ♂ imago, except membrane of fore and hind wings darker. Abdomen: color and marks as in ♂ imago, except terga 3-7 with a sublateral, black, transverse line that fuses to anterior, sublateral line as in Fig. 59. Female ovipositor or egg guide pale yellowish-brown. Caudal filaments pale yellowish-brown.

MATURE NYMPH. Unknown.

SPECIMENS. Holotype ♂ imago, No. N42; allotype ♀ imago, No. N42; paratype: 1 ♂ imago, No. N25. All types are in alcohol. All types are deposited in the following collections: holotype and allotype at FAMU; 1 ♂ paratype at UU.

Etymology. fascia, L., meaning band.

BIOLOGY. *Coula fasciata* has been collected only on the East Coast and in the Southern Region. Adults were collected near streams with water temperatures of 19 °C-20.5 °C and at about 76-153 m elevation. The ♂ imago from locality No. N25 was swarming 2 m above a dirt road along the stream.

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le 20 juillet 1979.

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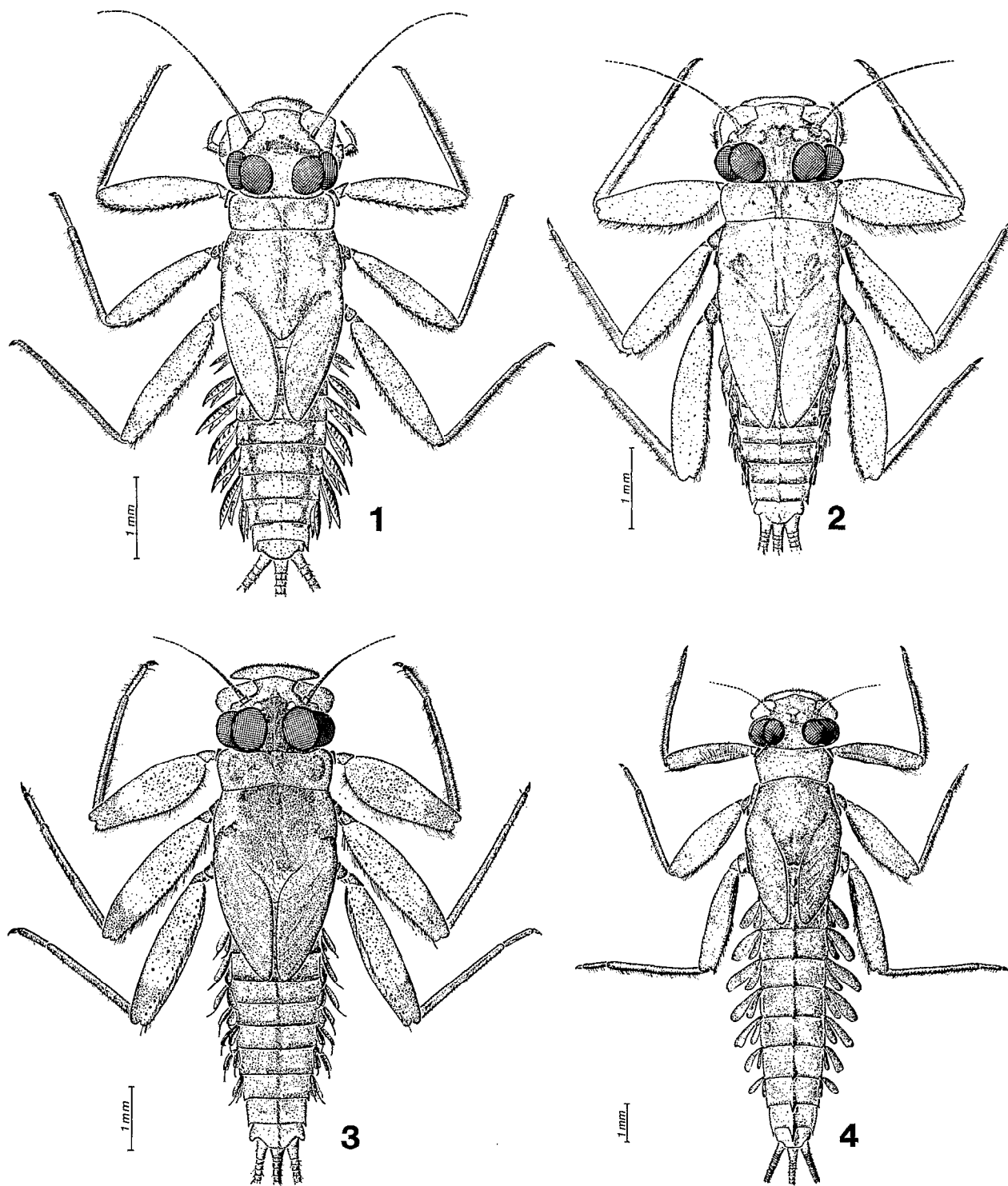


Fig. 1-4. — Mature male nymph: 1, *Celiphlebia caledonae*; 2, *Poya brunnea*; 3, *Tindea cochereaui*; 4, *Peloracantha titan*.

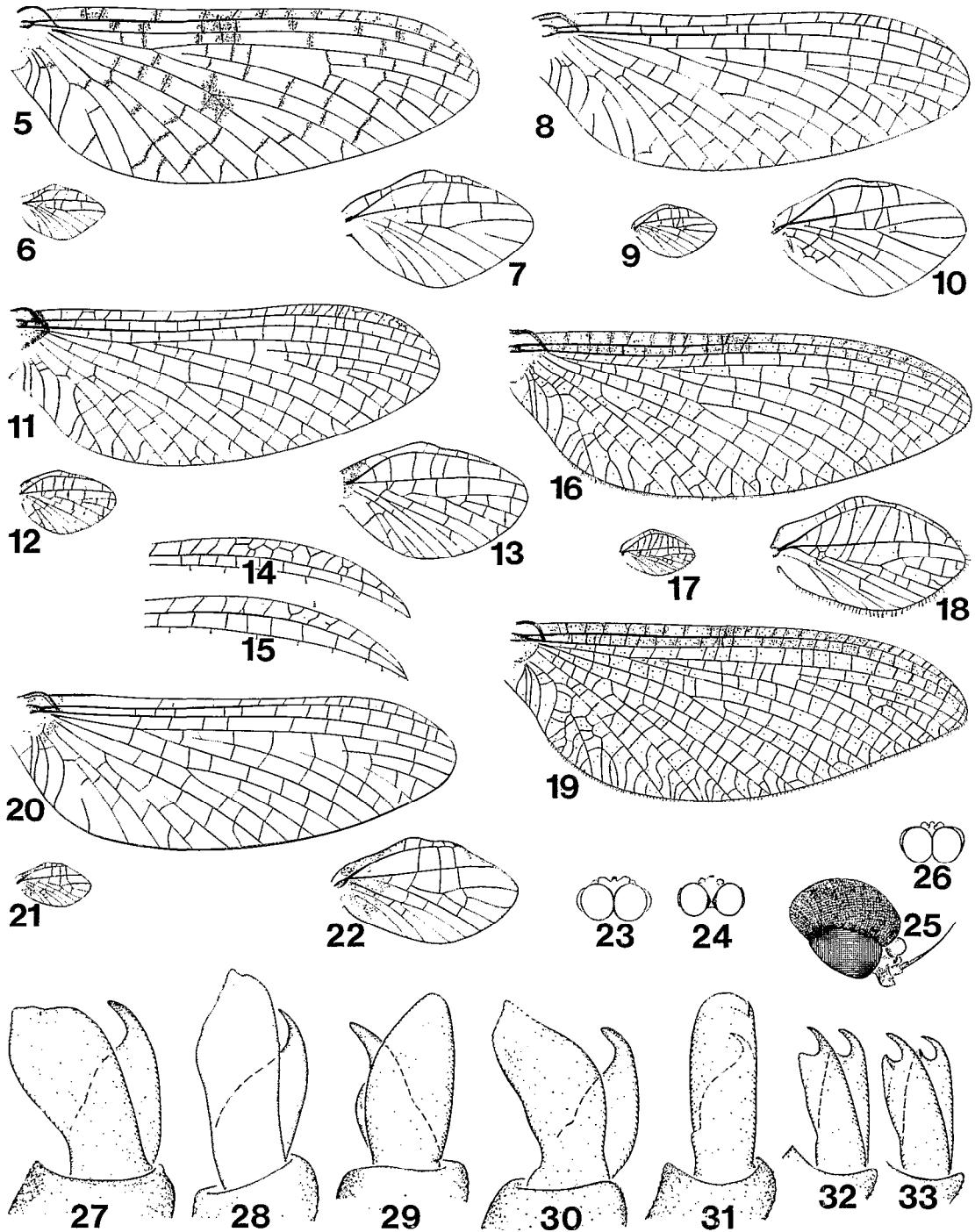


Fig. 5-22. — Fore wing, hind wing and enlargement of hind wing of imago (or subimago): 5-7, *Celiphlebia caledonae*, ♂; 8-10, *Poya brunnea*, ♂; 11-15, *Tindea cochereaui* (11-13, ♂; 14-15, detail of stigmatic area in fore wing of ♀); 16-19, *Peloracantha titan* (subimagos: 16-18, ♂; 19, ♀); 20-22, *Coula fasciata*, ♂.

Fig. 23-26. — Eyes of ♂ imago, dorsal and lateral views: 23, *Celiphlebia caledonae*; 24, *Poya brunnea*; 25-26, *Tindea cochereaui*.

Fig. 27-30. — Fore claw of imago or subimago: 27, *Celiphlebia caledonae*; 28, *Poya brunnea*; 29, *Tindea cochereaui*; 30, *Peloracantha titan*; 31, *Coula fasciata*.

Fig. 32-33. — Claw of metathoracic leg of *C. fasciata*.

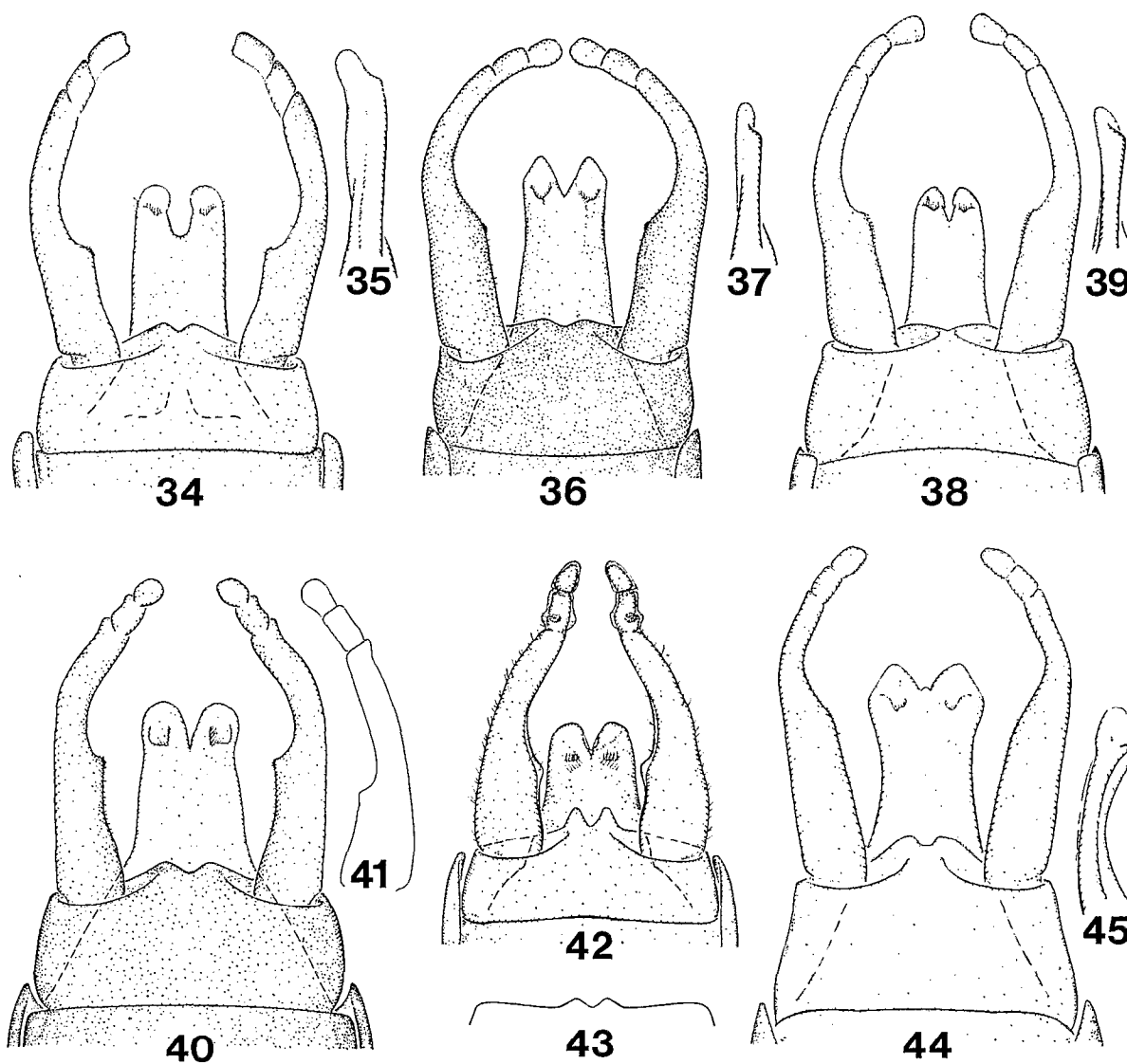


Fig. 34-45. — Genitalia of ♂ imago (or subimago): 34-35, *Celiphlebia caledonae*; 36-37, *Poya brunnea*; 38-41, *Tindea cochereaui*; 42-43, *Peloraecantha titan* (subimago); 44-45, *Coula fasciata*. Full figures of genitalia are ventral views. Details figures: lateral view of apex of penis lobe, venter on right (35, 37, 39, 45); variation in shape of forceps (41); variation in posterior margin of styliger plate (43).

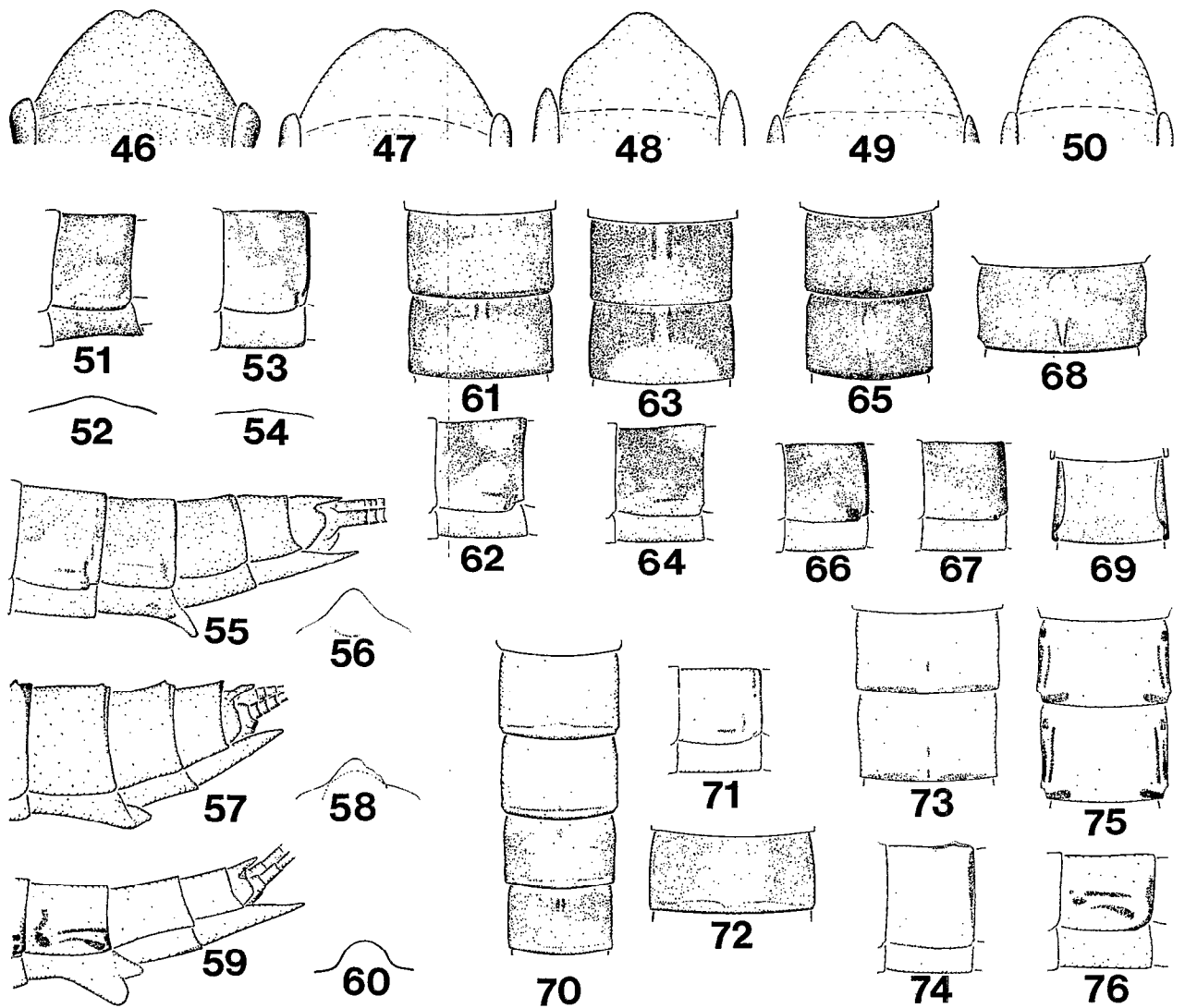


Fig. 46-60. — ♀ imago (or subimago): 46, 51-52, *Celiphlebia caledonae*; 47, 53-54, *Poya brunnea* (subimago); 48, 55-56, *Tindea cochereaui*; 49, 57-58, *Peloracantha tilan*; 50, 59-60, *Coula fasciata*. Ventral view of ninth sternum (46-50); lateral view of abdominal segment 7 (51, 53), 6-10 (55), 7-10 (57, 59); ventral view of margin of sternum 7 (52, 54, 56, 58, 60).

Fig. 61-76. — Abdominal color patterns of imago (or subimago): 61-64, *Celiphlebia caledonae*; 65-69, *Poya brunnea*; 70-72, *Tindea cochereaui*; 73-74, *Peloracantha tilan* (subimago); 75-76, *Coula fasciata*. Figures are dorsal views of terga 5-6 and lateral views of segment 6 of ♂, except for: tergum 5 of ♀ subimago (68); sternum 6 of ♂ (69); terga 5-8 of ♂ (70); tergum 5 of ♀ imago (72).

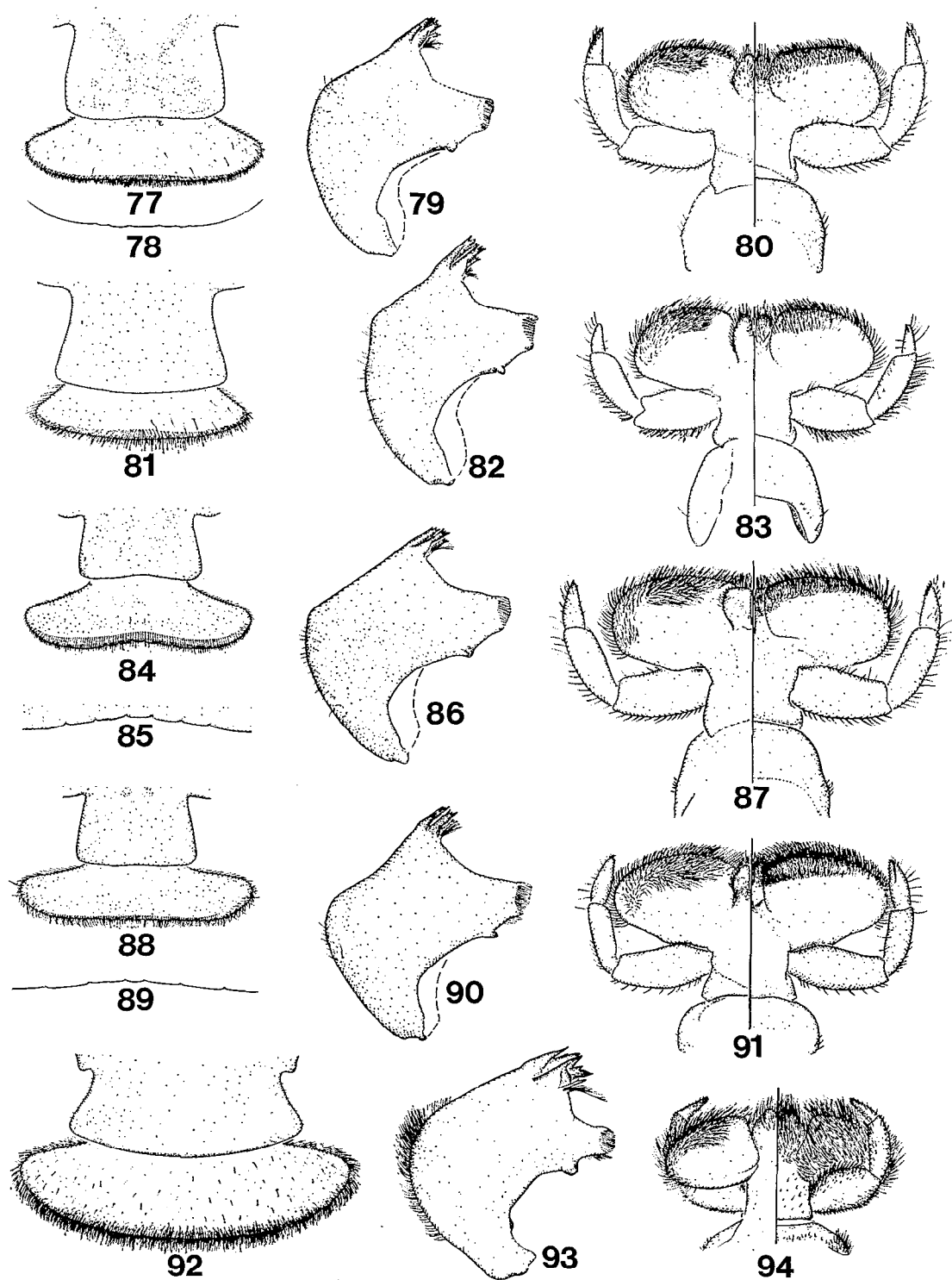


Fig. 77-94. — Clypeus and labrum (with detail of anteromedian emargination of labrum), left mandible, and labium of nymph: 77-80, *Celiphlebia caledonae*; 81-83, *C. starmuehneri*; 84-87, *Poya brunnea*; 88-91, *Tindea cochereaui*; 92-94, *Peloracantha titan*. Fig. 84, 88 reduced to .75 in proportion to other mouthparts; 85, 89 enlarged 2 X. Ventral surface on right side of figures of labium, dorsal surface on left.

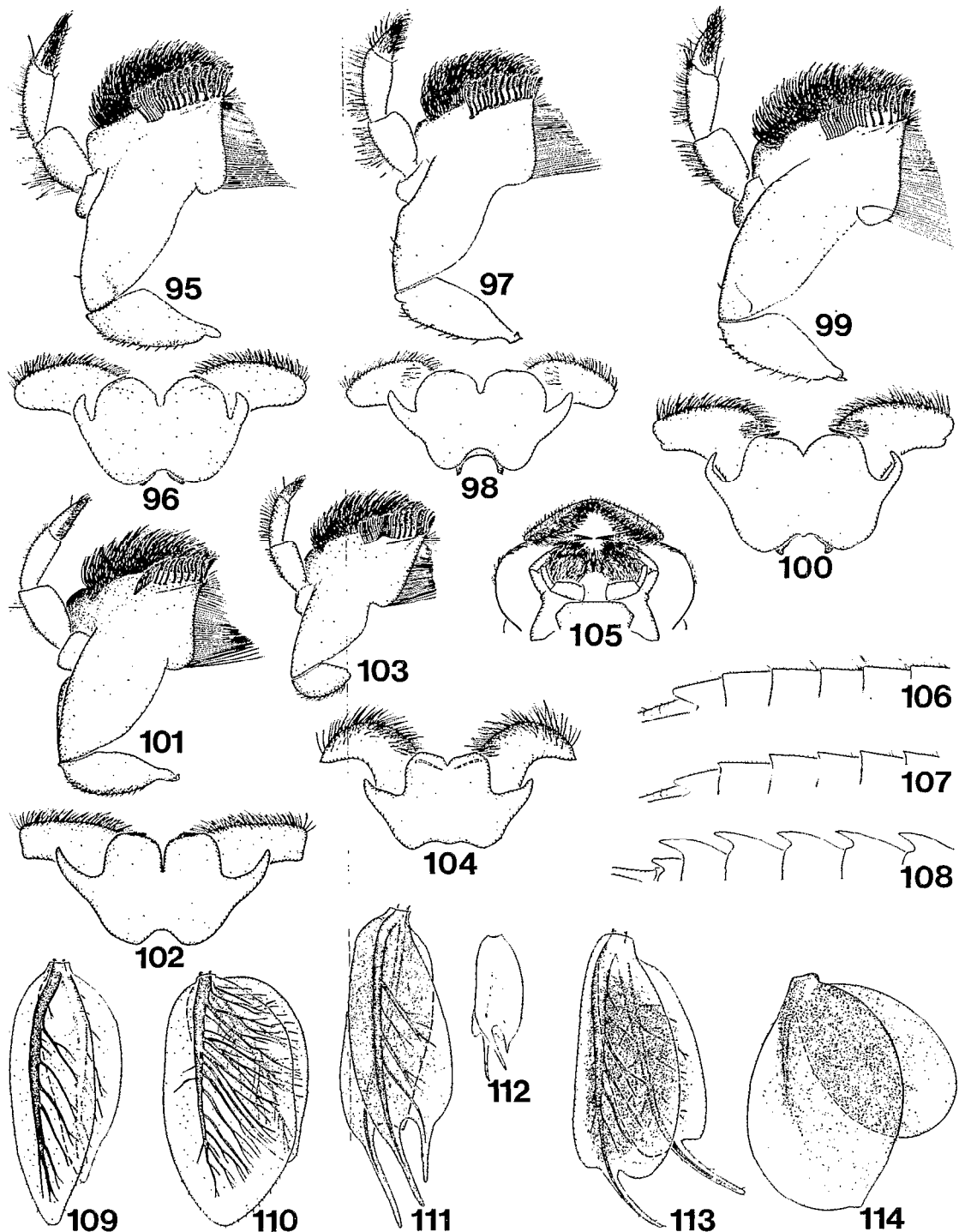


Fig. 95-104. - Ventral view of right maxilla and hypopharynx of nymph: 95-96, *Celiphlebia caledonae*; 97-98, *C. starmuehlneri*; 99-100, *Poga brunnea*; 101-102, *Tinidea cochereaui*; 103-104, *Peloracantha titan*.

Fig. 105. - Ventral view of head capsule of nymph of *Peloracantha titan*.

Fig. 106-108. - Lateral view of dorsum of abdominal terga 5-10 of nymph: 106, *Tinidea cochereaui*; 107, *Poga brunnea*; 108, *Peloracantha titan*.

Fig. 109-114. - Gill 4 of nymph: 109, *Celiphlebia caledonae*; 110, *C. starmuehlneri*; 111-112, *Poga brunnea*; 113, *Tinidea cochereaui*; 114, *Peloracantha titan*.

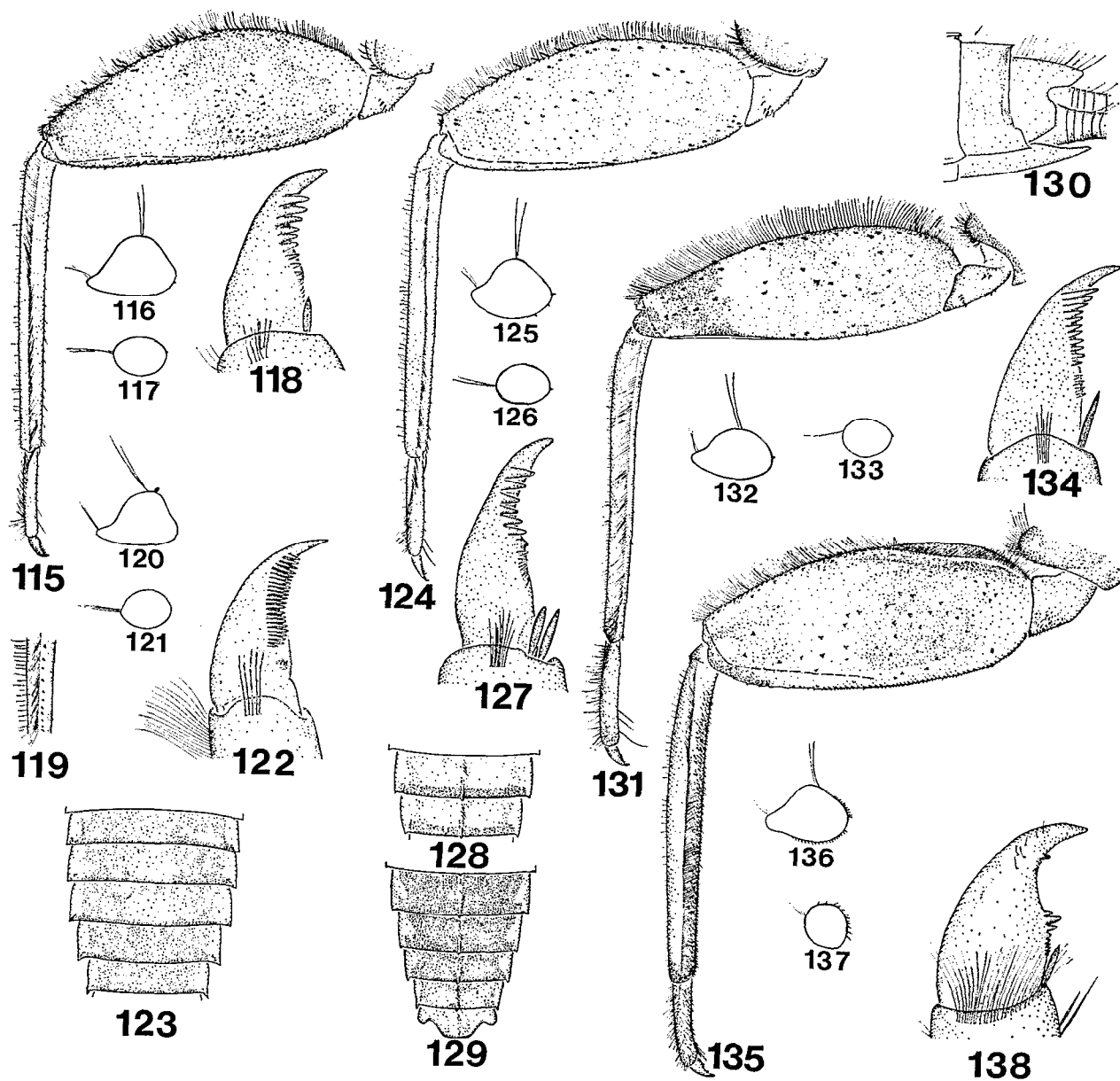


Fig. 115-138. — Nymph: 115-118, *Celiphlebia caledonae*; 119-123, *C. starmuehneri*; 124-130, *Poya brunnea*; 131-134, *Tindea cochereauai*; 135-138, *Peloracantha tilan*. Figures show fore leg, cross sections of tibia and tarsus, and fore claw, except for: section of tibia (119); abdominal terga 3-7 (123), terga 6-7 (128), terga 6-10 (129); and lateral view of abdominal segments 9-10 (130).

APPENDIX

Localities from which Figures were prepared

Species	Locality Number	Figure Number
<i>Celiphlebia caledonae</i>	N19	27
	N25	23
	N34	116-117
	N35	5-7, 34-35, 46, 51-52, 61-62, 77-80, 95-96, 115, 118
	N37	1, 109
	N51	63-64
<i>C. starmuehlneri</i>	FNK67	122
	FNK88-89	81-83, 97-98, 110, 119, 120-121, 123
<i>Poya brunnea</i>	N15	128
	N17	47, 53-54, 68
	N21	2, 125-126, 130
	N22	24, 37, 67
	N42	8-10, 28, 36, 65-66, 69, 84-87, 99-100, 124, 127
	N47	107, 111-112, 129
<i>Tindea cochereaui</i>	N22	14, 48, 55-56, 72
	N50	11-13, 25-26, 29, 38, 40-41, 70-71, 88-91, 101-102
	N51	15, 39, 132-134
	N52	3, 106, 113, 131
<i>Peloracantha titan</i>	N37	43
	N50	4, 16-19, 30, 42, 49, 57-58, 73-74, 92-94, 103-105, 108, 114, 135, 138
	N53	136-137
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