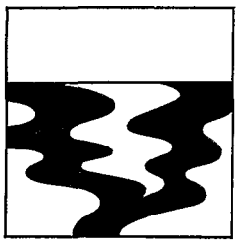

The Leptophlebiidae : Atalophlebiinae of New Caledonia (Ephemeroptera)

Part III. — Systematics

William L. PETERS and Janice G. PETERS *

ABSTRACT

The third in a series on the Leptophlebiidae (Ephemeroptera) of New Caledonia, this paper treats two new genera, Notachalcus *n.g. and* Ounia *n.g., with a description of species. Both genera are described from nymphs and adults.*

KEY WORDS : Ephemeroptera — Systematics — New Caledonia.

RÉSUMÉ

Le troisième d'une série sur des Leptophlebiidae (Ephemeroptera) de Nouvelle-Calédonie, ce travail traite deux genres nouveaux, Notachalcus *n.g. et* Ounia *n.g., avec une description des espèces. Ces deux genres ont été décrits à partir des stades nymphaux et adultes.*

MOTS CLÉS : Éphéméroptères — Systématique — Nouvelle-Calédonie.

INTRODUCTION

This paper is the third 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) lists all localities, methods, and acknowledgments. Part II (PETERS and PETERS, 1980) gives a portion of the systematics. It is noted that Peters (1980) divided the Leptophlebiidae into two subfamilies and hence the change in the title of this series.

All field work for this paper was supported by the National Geographic Society, Washington, D.C., and all laboratory research and writing of this paper was supported by a research program (FLAX 79009) of the Scientific and Educational Administration/Cooperative Research, United States Department of Agriculture.

Notachalcus, new genus

(Fig. 1-5, 14-16, 31, 33-34, 41-42, 45, 47-52, 59-64, 71)

IMAGO. Length of ♂: body, 6.5-7.6 mm; fore wings, 6.7-8.0 mm. Length of ♀: body, 6.5-8.0 mm; fore wings, 7.5-9.9 mm. Eyes of ♂ meet of meson of head, 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 4 times as great as maximum width of an eye. Wings (Fig. 1-5): maximum width of fore wings a little more than 1/3 (♀) to less than 1/2 (♂) maximum length of fore wings; vein Rs of fore wings forked less than 1/5 (♀) to less than 1/4 (♂) of distance

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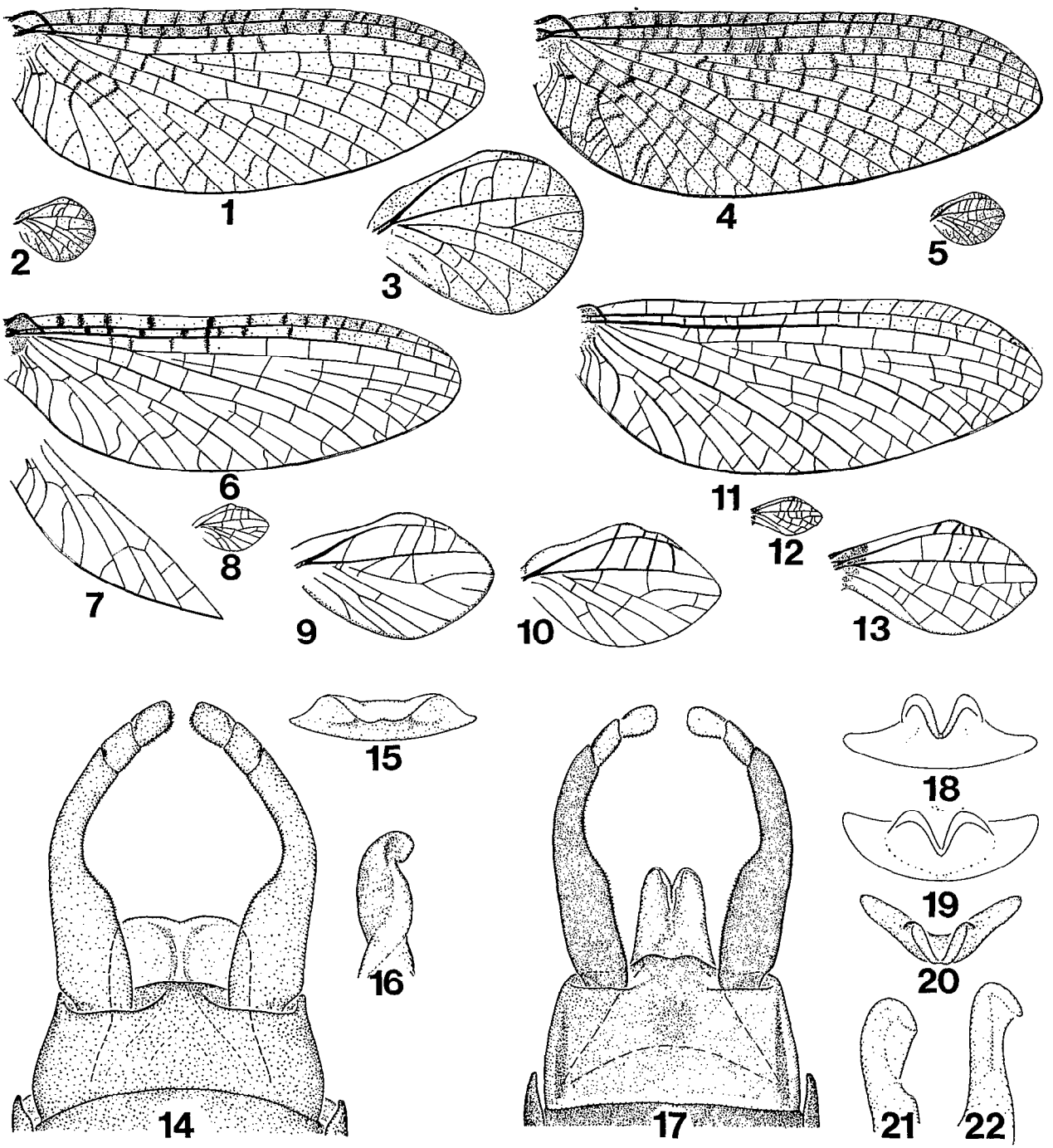

FIG. 1-22. — **Imago.** FIG. 1-13, fore wing, hind wing, and hind wing enlarged: 1-5, *Notachalcus corbassoni* (1-3, ♂; 4-5, ♀); 6-9, *Ounia loisoni*, ♂ (7, variation in fork of vein MP); 10, *O. inclavis*, ♂; 11-13, *O. hyalina*, ♂. FIG. 14-22, genitalia of ♂: 14-16, *Notachalcus corbassoni*; 17-22, *Ounia loisoni*. (Detail: 14, 17, ventral view; 15, 18-20, distal view of penes; 16, 21-22, lateral view of penes, venter on right)

from base to margin; vein MA forked less than 1/2 of distance from base to margin, fork asymmetrical, distal portion of vein MA sagged posteriorly; vein MP_2 attached at base to veins MP_1 and CuA with a cross vein (Fig. 1) to vein MP forked (Fig. 4), attachment of vein MP_2 to MP_1 less than 1/3 of distance from base to margin, base of vein MP_2 nearer to vein MP_1 to nearer to vein CuA; base of vein ICu_1 attached to vein CuP, a cross vein attached between CuA and near base of vein ICu_1, remainder of Cu-A area as in Fig. 1, 4; cross veins numerous. Costal margin of hind wings rounded (Fig. 2-3, 5); apex of wings broad and rounded, cross veins few. Legs: ratios of segments in ♂ fire legs, 0.64:1.00 (2.50 mm):0.04:0.40:0.32:0.20:0.16. Claws of a pair dissimilar, one apically hooked (Fig. 31), other obtuse, pad-like. Male genitalia (Fig. 14-16): segment 2 of forceps a little shorter to equal length of 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 less than 1/3 maximum width, apex of styliger plate shallowly cleft to smooth; penes fused except indented apically; penes broad except broader at base, apex of each penis lobe blunt, rounded to truncated. Female with a small genital extension on posterior margin of sternum 7 (Fig. 41-42). Ninth sternum of ♀ shallowly cleft apically (Fig. 45). Terminal filament a little longer than cerci.

MATURE NYMPH. Head prognathous. Antennae 2 times maximum length of head. Mouthparts (Fig. 47-52): dorsal hair on labrum as in Fig. 47; submedian and anterior areas of hair ventrally; anteromedian emargination with 5 broad-based denticles (Fig. 48). Clypeus as in Fig. 47. Left mandible as in Fig. 50. Lingua of hypopharynx with well developed lateral processes, paired submedian internal longitudinal row of a long hair on dorsum, apex of submedian lobes with a rack-like process (Fig. 49), anterior margin of lingua deeply cleft; superlingua as in Fig. 49, 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 a little longer than 1/2 length of segment 2, triangular; hair on maxillae as in Fig. 51. Labium as in Fig. 52; segment 2 of palpi equal to length of segment 1; segment 3 of palpi a little longer than 1/2 length of segment 2, triangular, narrow ; paraglossae ventral to glossae. Short hair on entire body. Legs (Fig. 59-62): maximum width of tibiae 1 1/2 times maximum width of tarsi, tibiae in cross section triangular; outer margin of femora indented along apical half so tibiae can draw partially into femora (Fig. 59); apex of claws hooked and narrow, denticles on claws progressively larger apically. Gills (Fig. 63): gills on segments 1-7 alike; dorsal and ventral portions of lamellae broad, lanceolate (Fig. 63); main trunk of tracheae along median line of lamellae, few tracheal branches on either side of trunk; main trunk of tracheae hevily pigmented, branches not pigmented, lamellae heavily pigmented. Posterolateral spines on abdominal segments 2-9, spines progressively larger posteriorly, apex of spines on segments 8 and 9 bifurcated as in Fig. 64. Terminal filament a little longer than cerci.

ETYMOLOGY. notos, Gr., meaning south; chalkos, Gr., M., meaning copper. Masculine.

TYPE SPECIES. *Notachalcus corbassoni*, new species.

DISCUSSION. *Notachalcus* can be distinguished from all genera of the Leptophlebiidae by the following combination of characters. In the imagos: (1) length of vein Sc of the hind wings is 2/3 maximum length of hind wings (Fig. 2-3, 5); (2) apex of hind wings is broad and rounded (Fig. 2-3, 5); (3) claws of a pair are dissimilar with one apically hooked and the other obtuse, pad-like (Fig. 31); (4) female possesses a small genital extension on posterior margin of sternum 7 (Fig. 41-42); and (5) penes of the ♂ genitalia are fused except indented apically and are broad except broader at base (Fig. 14). In the nymph: (1) segment 3 of the labial palpi is shorter and narrower than segment 2 (Fig. 52); (2) width of labrum is greater than width of clypeus and lateral margins of labrum are extremely angular (Fig. 47); (3) outer margin of basal 1/2 of left mandible is smoothly curved, while apical 1/2 is straight (Fig. 50); (4) dorsal and ventral portions of abdominal gills 1-7 are broad and lanceolate (Fig. 63); and (5) posterolateral spines occur on abdominal segments 2-9 and apex of spines on segments 8 and 9 is bifurcated (Fig. 64).

Notachalcus appears to be most closely related to *Ounia* and *Arachnocolus* from New Zealand, but can be distinguished from then by the following combination of characters. In the imagos: (1) apex of hind wings is broad and rounded (Fig. 2-3, 5); (2) penes of the ♂ genitalia are fused except indented apically and are broad except broader at base (Fig. 14); (3) female possesses a small genital extension on posterior margin of sternum 7 (Fig. 41-42); and (4) claws of a pair are dissimilar with one apically hooked and the other obtuse, pad-like (Fig. 31). In the nymph: (1) width of labrum is greater than width of clypeus and lateral margins of labrum are extremely angular (Fig. 47); (2) dorsal and ventral portions of abdominal gills 1-7 are broad and lanceolate (Fig. 63); and (3) posterolateral spines occur on abdominal segments 2-9 and apex of spines on segments 8 and 9 is bifurcated (Fig. 64).

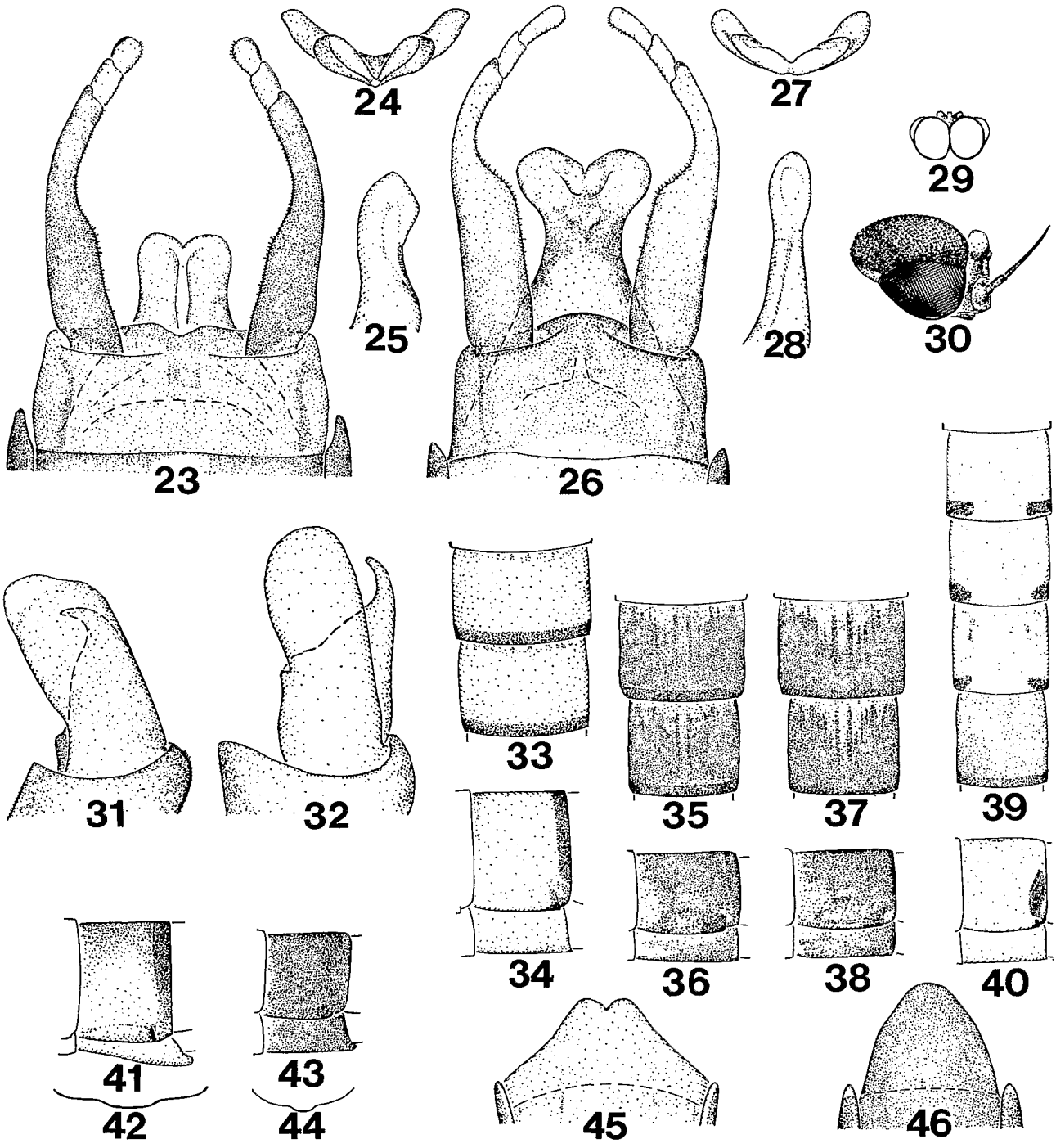

FIG. 23-46. — **Imago.** FIG. 23-28, genitalia of ♂: 23-25, *Ounia inclavis*; 26-28, *O. hyalina*. FIG. 29-30, eye of ♂ of *O. loisoni*. FIG. 31-32, fore claw of ♂: 31, *Notachalcus corbassoni*; 32, *Ounia loisoni*. FIG. 33-40, abdominal color pattern of ♂: 33-34, *N. corbassoni*; 35-36, *O. loisoni*; 37-38, *O. inclavis*; 39-40, *O. hyalina*. (Detail: 23, 26, ventral view; 24, 27, distal view of penes; 25, 28, lateral view of penes, venter on right; 29, dorsal outline; 33, 35, 37, terga 5-6; 39, terga 4-7; 34, 36, 38, 40, abdominal segment 5, lateral). FIG. 41-44, abdominal segment 7 (lateral view) and outline of sternum 7 of ♀: 41-42, *Notachalcus corbassoni*; 43-44, *Ounia loisoni*. FIG. 45-46, 9th sternum of ♀: 45, *N. corbassoni*; 46, *O. loisoni*

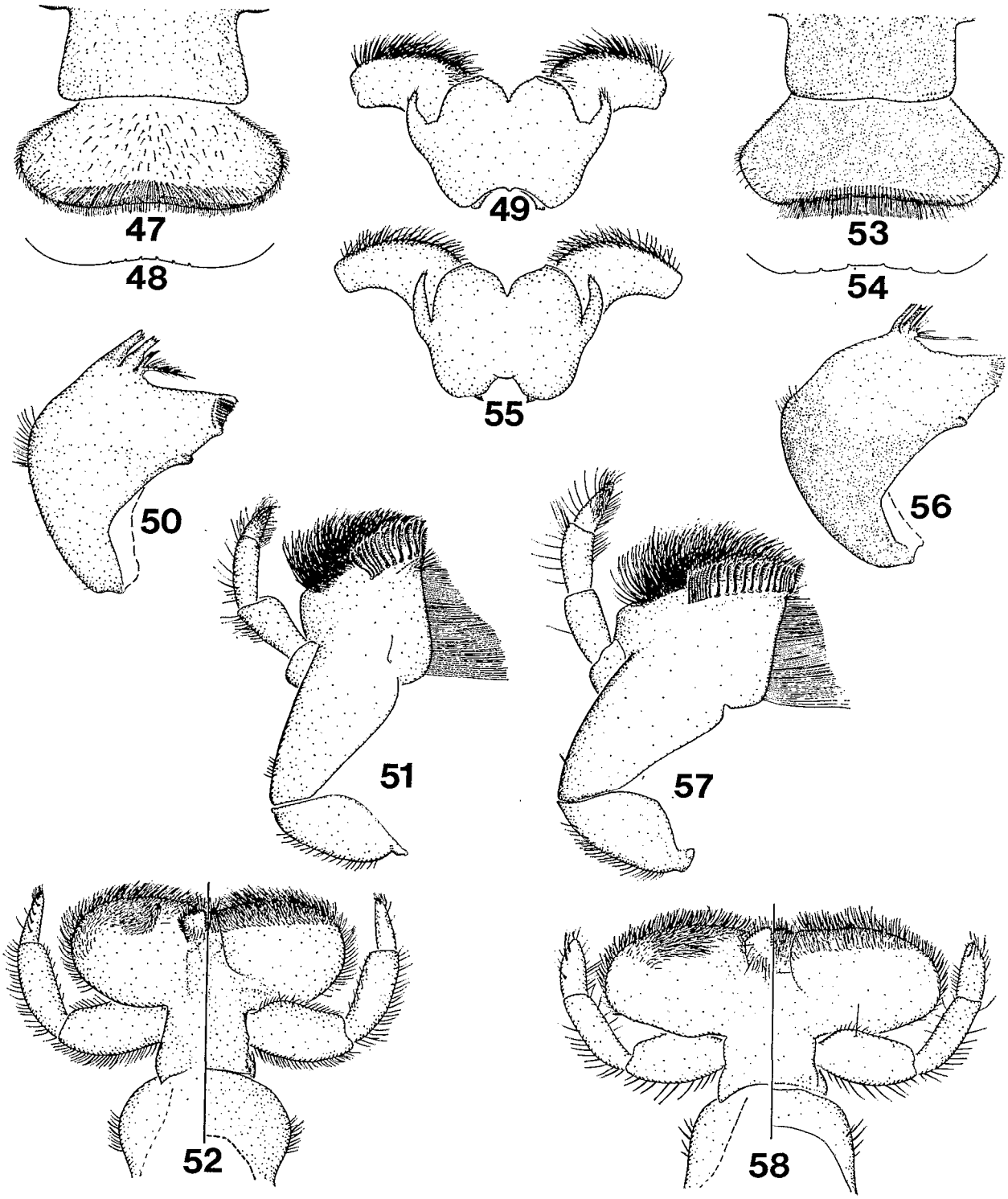

FIG. 47-58. — **Mouthparts of mature nymph:** 47-52, *Notachalcus corbassoni*; 53-58, *Ounia loisoni*. 47, 53, clypeus and labrum; 48, 54, outline of margin of labrum; 49, 55, hypopharynx; 50, 56, left mandible; 51, 57, ventral view of right maxilla; 52, 58, labium (venter on right, dorsum on left)

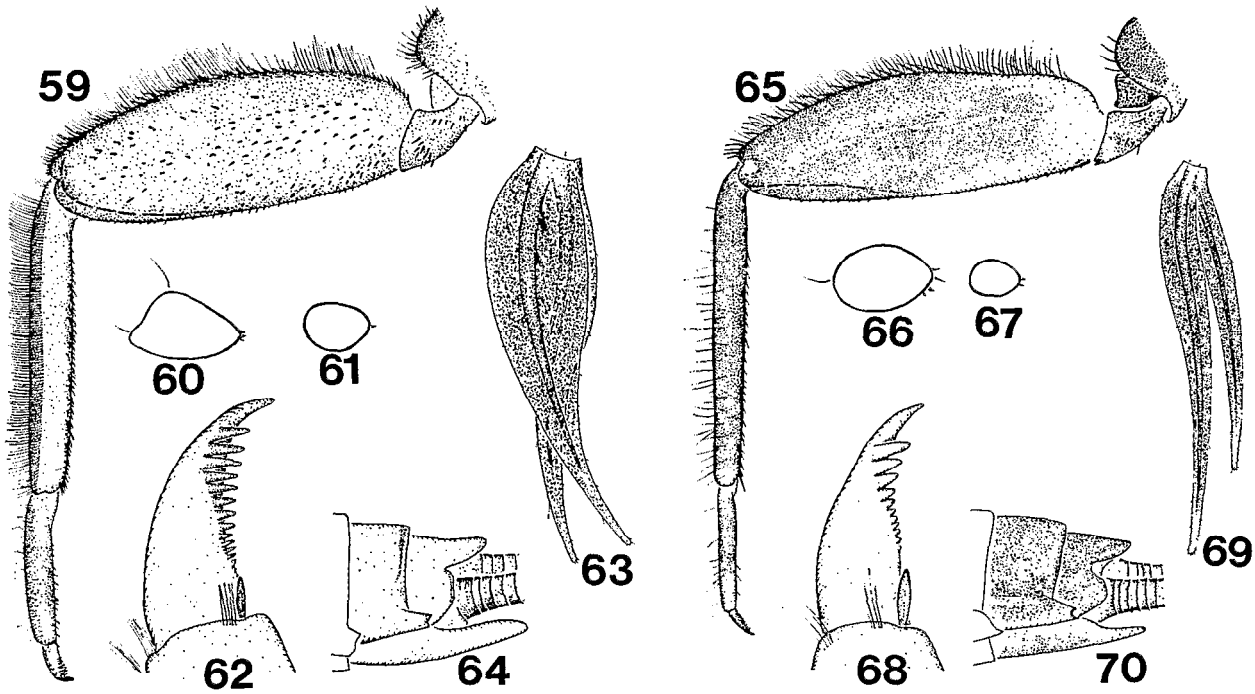

FIG. 59-70. — **Leg, gill, abdomen of mature nymph**: 59-64, *Notachalcus corbassoni*; 65-70, *Ounia loisoni*. 59, 65, fore leg; 60-61, 66-67, cross sections of tibia and tarsus; 62, 68, fore claw; 63, 69, gill 4; 64, 70, lateral view of abdominal segments 9-10

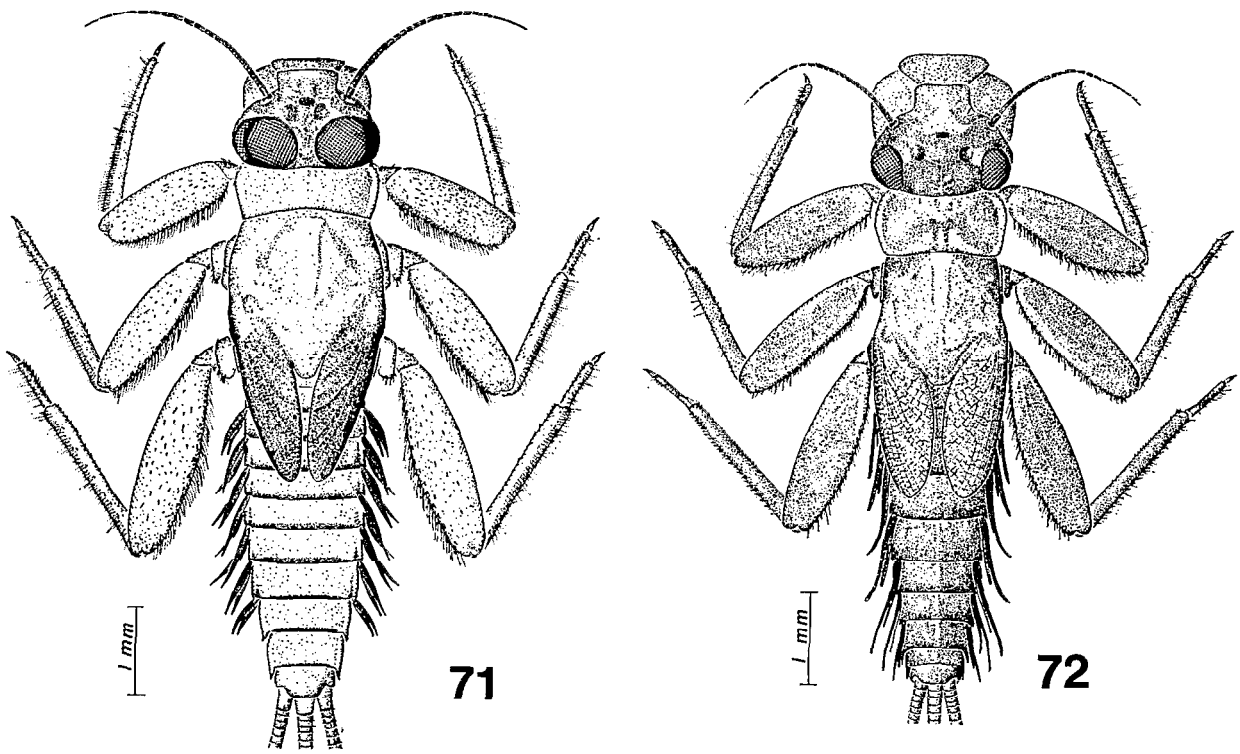

Fig. 71-72, **mature nymph**: 71, *Notachalcus corbassoni*, ♂; 72, *Ounia loisoni*, ♀

Notachalcus corbassoni, new species

(Fig. 1-5, 14-16, 31, 33-34, 41-42, 45, 47-52, 59-64, 71)

MALE IMAGO (in alcohol). Upper portion of eyes light reddish-brown, lower portion black. Head copper-brown, carinae dark brown. Antennae copper, flagellum paler. Basal 1/3 of ocelli dark brown, middle 1/3 copper, apical 1/3 white. Thorax light copper-brown, pronotum paler, mesonotum darker; carinae darker, sutures paler; lateral margins of pronotum, pleural areas at anterior base of fore wings, and areas dorsal to base of legs dark brown. Legs light yellowish-brown, apex of femora darker. Wings (Fig. 1-3): longitudinal and cross veins of fore and hind wings light brown, except cross veins of fore wings darker and surrounded with narrow, darker copper clouds, clouds largest near bulla and faded near posterior edge of wings; membrane of fore and hind wings hyaline light yellowish-brown, except cells C and Sc of fore wings translucent yellowish-brown, more translucent in apical 1/3 of cells C and Sc, membrane of apical 1/5 of hind wings darker copper. Abdomen (Fig. 33-34): light yellowish-brown, segments 1-8 translucent; a dark brown, narrow, transverse band on posterior margin of terga 1-9 ; an indistinct dark brown, narrow, transverse band on anterior margin of terga 1-8; spiracles dark brown, tracheae hyaline, light copper. Genitalia (Fig. 14): light yellowish-brown, small darker markings at forceps segments 2 and 3. Caudal filaments copper, annulations at articulations darker, faded near apex.

FEMALE IMAGO (in alcohol). Eyes black. Head copper, heavily washed with dark brown. Antennae copper, flagellum paler. Basal half of ocelli dark brown, apical half whitish-brown. Color and markings of thorax and legs as in ♂ imago. Wings (Fig. 4-5): color and markings as in ♂ imago, except membrane of fore and hind wings darker, translucent copper. Abdomen: color and markings as in ♂ imago, except terga darker and anterior, transverse band on terga more distinct and wider, tracheae lightly pigmented with dark brown. Caudal filaments as in ♂ imago.

MATURE NYMPH (in alcohol). Head: copper, washed with dark brown. Thorax: copper, color and markings as in ♂ and ♀ imagos. Legs: yellowish-brown, coxae and apex of femora darker. Abdomen (Fig. 71): color and markings as in ♂ and ♀ imagos. Gills (Fig. 63): membrane dark grayish-black; main trunk of tracheae darker. Caudal filaments copper.

SPECIMENS. Holotype ♂ imago, No. N42; allotype ♀ imago, No. N42; paratypes: 10 nymphs, No. N13; 18 nymphs, No. N14; 73 nymphs, No. N15; 1 nymph, No. N16; 1 ♀ imago, 5 ♂ subimagos, 53 nymphs, No. N17; 2 nymphs, No. N18; 12 nymphs, No. N19; 9 nymphs, No. N20; 1 ♂ imago, 47 nymphs, No. N21; 16 nymphs, No. N22; 5 nymphs, No. N23; 1 ♀ imago, 21 nymphs, No. N25; 2 ♀ subimagos, 33 nymphs, No. N27; 9 nymphs, No. N28; 7 nymphs, No. N34; 1 ♂ imago, 3 ♀ imagos, 3 ♂ subimagos, 97 nymphs, No. N35; 1 ♂ subimago, 68 nymphs, No. N37; 1 ♀ imago, No. N39; 10 ♂ imagos, 5 ♀ imagos, 2 ♂ subimagos, 1 ♀ subimago, 129 nymphs, No. N42; 1 ♂ imago, 1 ♀ imago, 4 nymphs, No. N43; 2 ♂ imagos, 1 ♀ imago, 1 ♂ subimago, 33 nymphs, No. N46; 2 ♀ imagos, 106 nymphs, No. N47; 5 nymphs, No. N50; 1 ♂ imago, 2 nymphs, No. N51; 1 nymph, No. N52; 1 ♂ imago, 1 ♀ imago, 16 nymphs, No. N53; 5 ♂ imagos, 4 ♀ imagos, 2 ♂ subimagos, 1 ♀ subimago, 34 nymphs, No. N54; 5 nymphs, No. N55; 1 nymph, No. FNK4; 4 nymphs, No. FNK18-20; 1 nymph, No. FNK22; 1 nymph, No. FNK25-26; 1 nymph, No. FNK31-32; 2 nymphs, No. FNK30; 2 nymphs, No. FNK37; 1 nymph, No. FNK39; 57 nymphs, No. FNK42; 5 nymphs, No. FNK56; 11 nymphs, No. FNK59; 18 nymphs, No. FNK64; 1 nymph, No. FNK67; 2 nymphs, No. FNK79; 3 nymphs, No. FNK80; 1 nymph, No. FNK82; 2 nymphs, No. FNK83; 21 nymphs, No. FNK85; 3 nymphs, No. FNK86; 1 nymph, No. FNK88-89; 8 nymphs, No. FNK93; 2 nymphs, No. FNK95; 5 nymphs, No. FNK100; 1 nymph, No. FNK102; 18 nymphs, No. FNK104; 4 nymphs, No. FNK105; 7 nymphs, No. FNK107, 9 nymphs, No. FNK111; 1 nymph, No. FNK120; 16 nymphs, No. FNK121; 7 nymphs, No. FNK124; 7 nymphs, No. J12. All types are in alcohol. Association of the nymph and adults is by rearing. All types are deposited in the following collections: holotype, allotype, 5 ♂ paratypes, 4 ♀ paratypes, 3 ♂ subimaginal paratypes, 2 ♀ subimaginal paratypes, and 315 nymphal paratypes at FAMU; 5 ♂ paratypes, 4 ♀ paratypes, 3 ♂ subimaginal paratypes, 2 ♀ subimaginal paratypes, and 315 nymphal paratypes at UU; 3 paratypes, 3 ♀ paratypes, 2 ♂ subimaginal paratypes, and 100 nymphal paratypes at BPBM, O.R.S.T.O.M., CTFT and NMNH.

Adults of *Notachalcus corbassoni* are variable throughout New Caledonia. The apex of the styliger plate of the ♂ imago is shallowly cleft to not cleft. This cleft is most pronounced on specimens from the Yaté area, but can be variable among specimens from any one locality. The apex of the penes lobes of the ♂ imago is rounded to truncated. Most specimens have rounded lobes, but occasional specimens from various lovalities have truncated lobes. The base of vein MP_2 of the fore wings is nearer to vein MP_1 to nearer to vein CuA. The position of the base of vein MP_2 is variable among specimens from each locality.

The size range of both the ♂ and ♀ is considerable. Specimens from the Eastern Coast are generally smaller. The general color of both the ♂ and ♀ is darker among specimens from various localities.

ETYMOLOGY. The species is named in honor of Mr. M. CORBASSON, Director, Centre Technique Forestier Tropical, Nouméa.

BIOLOGY. *Notachalcus corbassoni* appears to be abundant throughout New Caledonia. Nymphs were found in streams with water temperatures of 16.5-24 °C and at about 31-458 m elevation. Most nymphs were collected at temperatures of 18-19 °C.

Nymphs were collected on the bottom surface of small to large rocks in the fastest portions of the rivers. Often nymphs were found under large leaves, especially in areas of slab rock. When disturbed, nymphs moved quickly.

Nymphs emerged in the morning and subimagos apparently molted to imagos the following morning. Swarming occurred in full sunlight in mid-morning (09.30 hrs) as small companies of males joined in pendular swarms 0.5-3 m above the surface of the stream or above vegetation in or near the stream. Individual female imagos were seen ovipositing throughout the afternoon.

With its overall copper coloration and morning swarms, *N. corbassoni* is a conspicuous species species which cannot be confused with any other in New Caledonia.

Ounia, new genus

(Fig. 6-13, 17-30, 32, 35-40, 43-44, 46, 53-58, 65-70, 72)

IMAGO. Length of ♂: body, 4.5-7.0 mm; fore wings, 5.3-7.8 mm. Length of ♀: body, 5.2-5.9 mm; fore wings, 6.0-6.5 mm. Eyes of ♂ meet on vertex of head to separated on meson of head by a distance equal to maximum width of a lateral ocellus, dorsally upper portion circular-shaped, lower portion of eyes 3/4 length of upper portion (Fig. 29-30); eyes of ♀ separated on meson of head by a length 4 times as great as maximum width of an eye. Wings (Fig. 6-13): maximum width of fore wings 1/3 to a little more than 1/3 maximum length of fore wings; vein Rs of fore wings forked less than 1/4 to 1/4 of distance from base to margin; vein MA forked about 1/2 of distance from base to margin, fork symmetrical, distal portion of vein MA sagged posteriorly; vein MP_2 attached at base to veins MP_1 and CuA with a cross vein (Fig. 7, 11), to vein MP forked (Fig. 6), to vein MP_2 appears forked from vein CuA, attachment of vein MP_2 to MP_1 a little less than 1/3 to 1/3 of distance from base to margin, base of vein MP_2 when attached by cross veins nearer to vein MP_1 than to vein CuA; vein ICu_1 attached to veins CuA and CuP with a cross vein, remainder of Cu-A area as in Fig. 6-7, 11; cross veins numerous. Costal projection of hind wings well developed, rounded, apex located 1/2 distance from base (Fig. 8-10, 12-13), apex curved over to not curved over; apex of wings acute, rounded; cross veins few. Legs: ratios of segments in ♂ fore legs, 0.70:1.00 (2.2 mm):0.02:0.36: 0.32:0.19:0.13. Claws of a pair dissimilar, one apically hooked (Fig. 32), other obtuse, pad-like. Male genitalia (Fig. 17-28): segment 2 of forceps equal to a little longer in length than segment 3, segment 2 of forceps 1/5 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 less than 1/2 to 1/2 maximum width, apex of styliger plate shallowly cleft as in Fig. 17, 23, to entire as in Fig. 26; penes fused except at apex, broad, flattened, each penis lobe area concave ventrally (Fig. 17, 23, 26), except for median ridge and lateral edges. Female with a small genital extension on posterior margin of sternum 7 (Fig. 43-44). Ninth sternum of ♀ entire (Fig. 46). Terminal filament a little longer than cerci.

MATURE NYMPH. Head prognathous. Antennae 1 1/2 times maximum length of head. Mouthparts (Fig. 53-58): labrum moderately enlarged laterally; dorsal hair on labrum as in Fig. 53; submedian to anterior areas of hair ventrally; anteromedian emargination with 5 large, broad-based denticles (Fig. 54). Clypeus as in Fig. 53. Left mandible as in Fig. 56. Lingua of hypopharynx with well developed lateral processes, paired submedian internal longitudinal row of long hair, apex of submedian lobes with rack-like process, anterior margin of lingua deeply cleft; superlingua as in Fig. 55, with a row of hair along anterior margin, lateral margins blunt. Segment 2 of maxillary palpi a little shorter than 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. 57. Labium as in Fig. 58; segment 2 of palpi equal to length of segment 1; segment 3 of palpi a little longer than 1/2 length of segment 2, triangular, broad; paraglossae ventral to glossae. Sparse, short, fine hair on anterolateral corners of pronotum. Legs (Fig. 65-68): maximum width of tibiae 2 times maximum width of tarsi, tibiae oval in cross section (Fig. 60-61), outer margin of femora indented so tibiae can draw partially into femora (Fig. 65); apex of claws hooked and narrow, denticles on claws progressively larger apically (Fig. 68). Gills (Fig. 69): gills on segments 1-7 alike; gills deeply forked and 2 portions of lamellae overlap on dorsal surface of gills, each portion long, smoothly

tapered to apex; main trunk of tracheae forked near base of gills and each branch along median line of each portion of lamellae; main trunk darkly pigmented, both portions of lamellae translucent, blackish, granular. Posterolateral spines on abdominal segments 2-9, spines progressively larger posteriorly, apex of posterolateral spines on segment 9 indented and gives appearance of double spines (Fig. 70). Terminal filament a little longer than cerci.

ETYMOLOGY. Ounia, based on the name Tribu d'Ounia. Feminine.

TYPE SPECIES. *Ounia loisoni*, new species.

DISCUSSION. *Ounia* can be distinguished from all genera of the Leptophlebiidae by the following combination of characters. In the imagos: (1) length of vein Sc of the hind wings is 2/3 maximum length of hind wings (Fig. 8-10, 12-13); (2) apex of hind wings is acute and rounded (Fig. 8-10, 12-13); (3) claws of a pair are dissimilar with one apically hooked and the other obtuse, pad-like (Fig. 32); (4) female possesses a small genital extension on posterior margin of sternum 7 (Fig. 43-44); and (5) penes of the ♂ genitalia are fused except at apex and each penis lobe is concave ventrally (Fig. 17-27). In the nymph: (1) segment 3 of labial palpi is shorter than but equal in width to segment 2 (Fig. 58); (2) width of labrum is greater than width of clypeus and lateral margins of labrum are extremely angular (Fig. 53); (3) outer margin of basal 1/2 of mandibles is smoothly curved while apical 1/2 is relatively straight, except for bulge below incisors (Fig. 56); (4) abdominal gills 1-7 are deeply forked and each portion is long and smoothly tapered to apex (Fig. 69); and (5) posterolateral spines occur on abdominal segments 2-9, and apex of spines on segment 9 is bifurcated (Fig. 70).

Ounia appears to be most closely related to *Notachalcus* and *Arachnocolus* from New Zealand, but can be distinguished from them by the following combination of characters. In the imagos: (1) apex of hind wings is acute and rounded (Fig. 8-10, 12-13); (2) penes of the ♂ genitalia are fused except at apex and each penis lobe is concave ventrally (Fig. 17-27); (3) claws of a pair are dissimilar with one apically hooked and the other obtuse, pad-like (Fig. 32); and (4) female possesses a small genital extension on posterior margin of sternum 7 (Fig. 46). In the nymph: (1) width of labrum is greater than width of clypeus and lateral margins of labrum are extremely angular (Fig. 53); (2) abdominal gills 1-7 are deeply forked and each portion is long and smoothly tapered to apex (Fig. 69); and (3) posterolateral spines occur on abdominal segments 2-9, and apex of spines on segment 9 is bifurcated (Fig. 70).

KEY TO THE SPECIES OF *Ounia*, NEW GENUS

MALE IMAGOS

1. Cross veins in cells C, Sc, and R_1 of fore wings surrounded with narrow, dark brown clouds (Fig. 6); eyes meet on vertex of head (Fig. 29-30)..... *O. loisoni*
— Cross veins in cells C, Sc, and R_1 of fore wings not surrounded by dark clouds (Fig. 11); eyes separated on meson of head by a distance 1 1/2 times width of median ocellus to equal maximum width of a lateral ocellus.. 2
2. Abdominal segments 1-7 dark brown (Fig. 37-38); vein MP of hind wing forked (Fig. 10); penes gently narrowed apically (Fig. 23)..... *O. inclavis*
— Abdominal segments 1-7 hyaline, light brown (Fig. 39-40); vein MP of hind wing straight (Fig. 12-13); penes constricted past mid-length and flared apically (Fig. 26).. *O. hyalina*

Ounia loisoni, new species

(Fig. 6-9, 17-22, 32, 35-36, 43-44, 46, 53-58, 65-70, 72)

MALE IMAGO (in alcohol). Length: body, 5.4-6.5 mm; fore wings, 5.8-6.1 mm. Upper portion of eyes red-brown, lower portion black (Fig. 30). Head dark brown, carinae darker, sutures paler. Antennae dark brown, flagellum paler. Basal half of ocelli black, apical half brownish-white. Thorax dark brown, carinae darker, sutures paler, carinae of pleurae and pronotum washed heavily with black. Legs brown, except prothoracic tarsi paler, entire legs except prothoracic tarsi and tarsal segment 4 and claws of mesothoracic and metathoracic legs heavily washed with darker brown. Wings (Fig. 6-9): longitudinal veins and cross veins of fore and hind wings brown; membrane of fore and hind wings hyaline, except base of fore and hind wings light brown, cross veins in cells C, Sc, and R_1 of fore wings surrounded with narrow, darker brown clouds, clouds wider near base of wings (Fig. 6), apical 1/3 of cells C and Sc of fore wings translucent, whitish. Abdomen: brown, heavily washed with darker brown, posterior margin of terga 1-10 darker; terga 2-8 with a narrow, pale, median, longitudinal line extended entire length of each tergum (Fig. 35), lateral to pale line, paired narrow, dark brown, longitudinal lines extended entire length of each tergum; spiracles dark blackish-brown, tracheae washed heavily with dark brown; sterna 1-9 washed with darker brown as in Fig. 36, posterolateral margins of sterna 2-7 darker, sterna 2-7 with a small, pale, anteromedian bar and paired, small, pale, anterosubmedian oblique bars. Genitalia (Fig. 17-22): forceps dark brown, except apical segments progressively paler; penes pale. Caudal filaments brown, darker brown annulations at articulations, alternate annulations darker in basal 2/3 of caudal filaments.

FEMALE IMAGO (in alcohol). Length: body, 5.2-

5.9 mm; fore wings, 6.0-6.5 mm. Eyes black. Head dark brown, carinae darker, sutures paler. Antennae dark brown, flagellum lighter. Thorax: color and marks as in ♂ imago. Legs: color and marks as in ♂ imago, except apex of prothoracic tibiae pale. Wings: longitudinal veins and cross veins of fore and hind wings dark brown; membrane of fore and hind wings hyaline light brown, except base of fore and hind wings darker brown; cross veins in fore wings surrounded with narrow, dark brown clouds, clouds more extensive in anterior portion of wings and nearly fuse near bulla, apical 1/3 of cells C and Sc of fore wings translucent. Abdomen: color and marks as in ♂ imago, except dark color more extensive. Caudal filaments brown, darker brown, narrow annulations at articulations in basal 1/2 of caudal filaments.

MATURE NYMPH (in alcohol). Head: brown, venter lighter, dorsum washed heavily with darker brown between eyes and ocelli as in Fig. 72. Thorax: brown, venter lighter, lateral areas of mesonotum and areas around fore wing pads washed heavily with darker blackish-brown, mesoscutum darker brown, lateral margins of pronotum darker brown, a dark brown median mark on pronotum as in Fig. 72, mesofurcasternum and mesobasisternum heavily washed with dark brown. Legs (Fig. 65): brown, uniformly washed with darker brown, except ventral surface of femora pale, tarsi reddish-brown. Abdomen: color and marks as in ♂ and ♀ imagos, except posterosublateral margins of sterna 1-8 darker brown. Gills (Fig. 69): membrane blackish, granular; tracheae black. Caudal filaments brown.

SPECIMENS. Holotype ♂ imago, No. N42; allotype ♀ imago, No. N42; paratypes: 5 nymphs, No. N25; 2 nymphs, No. N27; 1 ♂, 1 ♂ subimago, No. N35; 1 nymph, 3 ♂ subimagos, No. N37; 5 nymphs, 15 ♂, 5 ♀, 8 ♂ subimagos, 5 ♀ subimagos, No. N42; 19 nymphs, 2 ♀, 1 ♂ subimago, 2 ♀ subimagos, No. N50; 9 nymphs, No. N52; 8 nymphs, 1 ♂, 2 ♀, 1 ♀ subimago, No. N53; 2 nymphs, 1 ♂, No. N54; 6 nymphs, No. FNK29; 4 nymphs, No. FNK85; 3 nymphs, No. FNK120. All types are in alcohol. Association of the nymphs and adults is by rearing. All types are deposited in the following collections: holotype, allotype, 17 nymphal paratypes, 5 ♂ paratypes, 3 ♂ subimaginal paratypes, 2♀ paratypes, and 2 ♀ subimaginal paratypes at FAMU; 16 nymphal paratypes, 5 ♂ paratypes, 3 ♂ subimaginal paratypes, 3 ♀ paratypes and 2 ♀ subimaginal paratypes at UU; 7 nymphal paratypes, 2 ♂ paratypes, 1 ♂ subimaginal paratype, 1 ♀ paratype, and 1 ♀ subimaginal paratype at BPBM, O.R.S.T.O.M., CTFT and NMNH.

Occasional adult specimens of *O. loisoni* are generally lighter in color, especially the abdomen. Lighter specimens were collected from many localities.

ETYMOLOGY. Species is named in honor of the late Dr. Guy LOISON, former Program Director (Health), South Pacific Commission, Nouméa.

DISCUSSION. *Ounia loisoni* can be distinguished from the remaining species of *Ounia* by the following characters in the imagos: (1) cross veins in cells C, Sc, and R_1 of fore wings are surrounded with narrow, darker brown clouds (Fig. 6), (2) eyes of ♂ meet on vertex of head, and (3) terga 2-7 are brown and washed heavily with darker brown (Fig. 35).

BIOLOGY. *Ounia loisoni* occurs throughout New Caledonia and is found in small streams to medium-sized rivers. Nymphs were found in streams with water temperatures of 18-23 °C and at about 76-458 m. The species was most abundant in streams with water temperatures of 18-19.5 °C.

Nymphs occur under medium-sized rocks in the fastest portion of the stream. Subimagos were collected at light traps, but swarming was never seen.

Ounia inclavis, new species

(Fig. 10, 23-25, 37-38)

MALE IMAGO (in alcohol). Length: body, 4.5 mm; fore wings, 5.3 mm. Upper portion of eyes reddish-brown, lower portion black. Antennae dark brown, flagellum paler. Head blackish-brown, carinae darker. Basal half of ocelli blackish-brown, apical half brownish-white. Thorax dark brown, pleurae paler; carinae blackish-brown, especially on pleurae; margins and carinae of pronotum washed heavily with blackish-brown. Mesothoracic and metathoracic legs dark brown, except tarsal segment 4 and claws paler; prothoracic legs broken off and missing. Wings (Fig. 10): longitudinal veins of fore and hind wings dark brown, faded in Cu-A area of fore wings and posterior half of hind wings; cross veins of fore and hind wings brown, faded in posterior half of fore and hind wings; membrane of fore and hind wings hyaline, except base of fore and hind wings brown, apical 1/3 of cells C and Sc of fore wings translucent. Abdomen: brown, terga 1-10 washed with darker brown, posterior margin of terga 1-10 with a narrow, darker brown, transverse band; terga 8-10 washed uniformly with dark brown, terga 1-7 with a narrow pale, median, longitudinal line extended entire length of each tergum, lateral to pale line paired narrow darker brown, submedian longitudinal lines extended entire length of each tergum; lateral margins of terga 1-7 with darker and paler areas as in Fig. 37-38; spiracles dark

blackish-brown, tracheae hyaline; sterna 1 and 8-9 uniformly washed lightly with dark brown, posterolateral margins of sterna 2-7 washed lightly with darker brown. Genitalia (Fig. 23-25): dark brown, except forceps segments 2 and 3 paler. Caudal filaments broken off and missing.

FEMALE IMAGO. Unknown.

MATURE NYMPH. Unknown.

SPECIMENS. Holotype ♂ imago, No. N50. Holotype is in alcohol and deposited in the FAMU collection.

ETYMOLOGY. in-, L., meaning without; clavis, L., meaning bar.

DISCUSSION. *Ounia inclavis* can be distinguished from the remaining species of *Ounia* in the ♂ imago by the following characters: (1) cross veins in cells C, Sc, and R_1 of fore wings are not surrounded with darker clouds, (2) eyes are separated on meson of head by a distance equal to 11/2 times maximum width of the median ocellus, and (3) terga 2-7 are brown and washed heavily with darker brown (Fig. 37).

BIOLOGY. *Ounia inclavis* has been collected only from locality No. N50. At this locality the water temperature was 19.5 °C and the altitude 153 m.

Ounia hyalina, new species

(Fig. 11-13, 26-28, 39-40)

MALE IMAGO (in alcohol). Length: body, 7.0 mm; fore wings, 7.8 mm. Upper portion of eyes reddish-brown, lower portion brownish-black. Head brown, carinae heavily washed with darker brown. Antennae brown, flagellum paler. Basal half of ocelli brownish-black, apical half brownish-white. Thorax brown, carinae darker, sutures paler; carinae of pleurae washed with brownish-black, especially between base of wings and base of legs. Coxae of legs brown, remainder of legs pale, except apex of femora with dark brown wide transverse band and apex of tibiae with a dark brown narrow transverse band. Wings (Fig. 11-13): longitudinal veins and cross veins of fore and hind wings pale, cross veins faded in posterior half of fore and hind wings; membrane of fore and hind wings hyaline, except apical 1/3 of cells C and Sc of fore wings translucent whitish and base of fore and hind wings dark brown. Abdomen: segments 1-7 hyaline, light brown, segments 8-10 dark brown; terga 1-7 with posterolateral margins blackish-brown, terga 8-10 with a blackish-brown, posterior, transverse band; spiracles blackish-brown, tracheae hyaline; posterior half of sternum 7 washed lightly with darker brown, sternum 8 with a blackish-brown, posterior, transverse band (Fig. 39-40). Genitalia (Fig. 26-28): dark brown, apical half of penes and apical 1/3 of forceps paler. Caudal filaments pale.

FEMALE IMAGO. Unknown.

MATURE NYMPH. Unknown.

SPECIMENS. Holotype ♂ imago, No. N50. Holotype is in alcohol and deposited in the FAMU collection.

ETYMOLOGY. hyalinus, L., meaning transparent.

DISCUSSION. *Ounia hyalina* can be distinguished from the remaining species of *Ounia* on the ♂ imago by the following characters: (1) cross veins in cells C, Sc, and R_1 of fore wings are not surrounded with darker clouds; (2) eyes are separated on meson of head by a distance equal to maximum width of a lateral ocellus, and (3) terga 2-7 are hyaline, light brown (Fig. 39).

BIOLOGY. *Ounia hyalina* has been collected only from locality No. N50. At this locality the was temperature was 19.5 °C and the altitude 153 m.

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APPENDIX

All figures in this paper were prepared from specimens collected at the type localities except the following: *Notachalcus corbassoni*, FIG. 1-5, 15-16, 31, 33-34, 62 from N54; *Ounia loisoni*, FIG. 65 from N25, FIG. 72 from N50.