

Alan W. Vining
June 1993

Acta Biol., Venez., 14 (1) (57-78)
Noviembre 1992

CABALLITOS DEL DIABLO (ODONATA) DE LAS SIERRAS DE TAPIRAPECO Y UNTURAN, EN EL EXTREMO SUR DE VENEZUELA

DRAGONFLIES (ODONATA) FROM THE SIERRAS OF TAPIRAPECO AND UNTURAN, IN THE EXTREME SOUTH OF VENEZUELA

Jürg DeMarmels

Instituto de Zoología Agrícola, Facultad de Agronomía, Universidad Central de Venezuela, Apartado 4579, Maracay 2101-A, Venezuela.

Palabras claves: Odonata, Amazonas, Tapirapeco, Unturán, Venezuela.

SUMMARY

During an expedition carried out in February and March 1989 about 300 dragonflies, including some larvae, were collected. They represent 12 families, 46 genera and 80 species. *Dimeragrion unturanense* sp. n., *Lestes debellardi* sp. n. and *Leptobasis yanomami* sp. n. are new to science, while a further five species are first Venezuelan records. *Allopodagrion* Förster is re-established in its original full generic rank. The hitherto unknown larvae of seven species are described and illustrated. Only about 50% of the species found had been recorded previously from the neighbouring region of Mt. Neblina. The material studied, including the holotypes of the new species, are deposited in the collection of the Museo del Instituto de Zoología Agrícola (MIZA), Facultad de Agronomía, Universidad Central de Venezuela, Maracay.

RESUMEN

Durante la expedición llevada a cabo en Febrero-Marzo de 1989 a la Serranía de Tapirapeco, se capturaron cerca de 300 "caballitos del diablo", incluyendo adultos y larvas. Ellas representan 12 familias, 46 géneros y 80 especies. *Dimeragrion unturanense*, *Lestes debellardi* y *Leptobasis yanomami* son nuevas especies para la ciencia, mientras que otras cinco especies representan nuevos registros para Venezuela. *Allopodagrion* Förster es reestablecido en su completo y original rango genérico. Las larvas previamente desconocidas de siete especies se describen e ilustran. Sólo cerca del 50% de las especies encontradas han sido registradas previamente para la región vecina del Cerro La Neblina. El material estudiado, incluyendo los holotipos y paratipos de las especies nuevas, se encuentran depositados en la Colección del Museo de Zoología Agrícola (MIZA), Facultad de Agronomía, Universidad Central de Venezuela, Maracay.

INTRODUCTION

Only recently, and thanks to the effort of the "Fundación para el Desarrollo de las Ciencias Físicas, Matemáticas y Naturales" (FUDECI), Caracas, it became for the first time possible to explore the dragonfly fauna of Venezuela's southern most mountain ridges on or close to the Brazilian border. In 1984 and 1985 a long-term expedition to Mt. Neblina yielded close to 30 new dragonfly species and a similar number of first records (DE-MARMELS, 1989a, b). At the beginning of 1989 I was invited to participate in an expedition to the Sierra de Tapirapecó and neighbouring mountains

and river systems. The region explored lies East of Mt. Neblina and is one of Venezuela's so-called "last frontiers". It includes, besides of the Sierra de Tapirapecó proper, the more northern Sierra de Unturán, as well as some lowland sites along the Río Siapa and the Río Mavaca (Map. 1). The former drains to the Amazon while the Mavaca belongs in the Orinoco drainage system. The study area lies on the Guayana shield, within the territory of the Yanomami Indians. The whole region is completely covered by a closed canopy of virgin rain forest interrupted only by the meandering rivers.

The present paper includes all adults and larvae collected chiefly by Mr. A. Chacón, staff member of our Institute, and myself, between 14 February and 6 March 1989. This period falls within the dry season which ends in April. In spite of some raining during our stay, many dragonfly species appear not to be on the wing in this time of the year. Some could be recorded in their larval stage only and most of the species seen as adults were rather uncommon. The total of specimens collected and examined is about 300. 12 families, 46 genera and 80 species are represented. Three species are new to science and a further five are first Venezuelan records. Some species, especially of the genus *Argia* Rambur, could not be identified. All specimens, including the holotypes of the new species, are deposited in the collection of the Museo del Instituto de Zoología Agrícola (MIZA), Facultad de Agronomía, Universidad Central de Venezuela, Maracay.

COLLECTING SITES

1. Base Camp and surroundings, on the upper Río Mavaca, left bank, 160 m elevation, 02°02'10"N, 65°06'50"W, 14 Feb, 22 Feb, 1-6 Mar 1989
2. Unturán (Western Sierra de Unturán), 900-1000 m elevation, 01°25'N, 65°18'W, 15-18 Feb 1989
3. Tamacuari (Sierra de Tapirapécó), 1300 m elevation, 01°13'00"N, 64°41'30"W, 19-21 Feb 1989
4. Siapa 1 (upper Río Siapa) 495 m elevation, 01°42'50"N, 64°33'40"W, 26-28 Feb 1989
5. Siapa 2 (upper Río Siapa), 500 m elevation, 01°43'10"N, 64°31'50"W, 23-25 Feb 1989

LIST OF SPECIES

The arrangement of the families tries to put more closely related groups together, while genera and species follow alphabetically. Synonyms are omitted when not necessary for an unambiguous identification. All measurements are given in millimeters.

Zygoptera

Calopterygidae

Hetaerina caja dominula Selys, 1853

Material (3♂ 1♀).— 1♂, Río Mavaca, S of Base Camp; 1♂, 1♀, Siapa 2.

Remarks.— As usual, this species was found along broader water courses. While moderately common along a 10 m broad river in the forest, it was exceedingly numerous on the Mavaca and Siapa rivers, which might be up to 50 m wide. *H. c. dominula* was absent from smaller creeks in the forest where it was replaced by the following two species.

Hetaerina laesa Hagen in Selys, 1853

Material. 5♂, 5♀, Base Camp.

Remarks.— Many more were seen along small sand-bottomed creeks in the forest. Some could be observed away from water on sun-hit bushes.

Hetaerina moribunda Selys, 1853

Material. 5♂, 1♀, Base Camp.

Remark.— This species shows similar habitat preferences as *H. laesa*.

Iridictyon trebbau Racenis, 1968

Figures 1-6 (larva)

Material (19♂, 4♀; 3larvae).— 15♂, 4♀, Unturán; 4♂, Tamacuari; 1♂, ultimate instar larva. 2♀, penultimate instar larvae, Unturán.

Larva.— Occiput concave, occipital lobes with a dorsal tubercle; antennae as in Fig. 2, first segment twice the length of the head between anterior margin of clypeus and middle of occipital border. Labium as in Fig. 3. Hind border of pronotum broadly rounded, somewhat prominent in front of the mesostigmata; no spines or tubercles present. Wing sheaths reaching to end of abdominal segment 4. Lateral margin of abdominal segments 9 and 10 serrate, segment 10 with a blunt dorsomedian spine which surpasses hind margin of this segment (Fig. 1). Male gonapophyses not reaching and of segment 9 (Fig. 4). Female gonapophyses (penultimate instar) shorter than segment 10; valves with several irregular rows of denticles. Caudal gills of the full-grown larva lost, those of the penultimate instar as shown in Figs. 5-6.

Measurements (ultimate instar).— Total length (excl. caudal gills) 21.3; first antennal segment 1.8; hind femur 7.8; hind tibia 10.0; maximum width of posterior wing sheaths 1.8.

Remarks.— The adult females do not show the usual dark and white wing bars, but have pale smoky wings. In one specimen a weak indication

of a brown transverse stripe is discernible.- The larvae clung to submerged roots under the overhanging bank of the creek. So far undescribed, the larvae are associated with *I. trebbau* by supposition. At both collecting sites this was the only Calopterygid present. The larva of *Hetaerina medinae* Racenis, a common pantepuyan species which -to my surprise- was not found in the region, differs in many ways from that of *I. trebbau* (pers. observation). The broad wing sheaths and outer anal field in the latter provide further evidence for the correct identification. The small size of the full grown larva is noteworthy. The genus is endemic in the mountains of the Guayana shield ("pantepuyan", see Mayr & Phelps, 1967).

Polythoridae

Chalcopteryx scintillans McLachlan, 1870

Figure 7 (larva)

Material. 8♂, 3♀; 1♀ larva (ultimate instar exuviae), Unturán.

Larva.- Uniformly brown and hardly distinguishable in its general appearance from larvae of *Chalcothore montgomeryi* (Racenis) described by DeMarmels (1988). The caudal gills, presumably those structures of most diagnostic value, are, however, lost. Labium narrower than in *Ch. montgomeryi*; ovipositor surpassing end of segment 10 by one third of its length (less than one third in *Ch. montgomeryi*). Wing sheaths reaching end of segment 6 (end of segment 5 in *Ch. montgomeryi*). The latter two characters are usually subject to a high degree of variability. The figures of the larva of *Chalcopteryx rutilans* (Rambur) in SANTOS & COSTA (1987) are too generalized as to allow any comparison with *Ch. scintillans*.

Measurements. Total length (excl. caudal gills) 8.6; hind femur 2.6; hind tibia 3.0.

Megapodagrionidae

Dimeragrion unturanense sp. n.

Figures 8-10

Male (holotype). Venezuela, Amazonas State, Sierra de Unturán, 950 m, 01°25'N, 65°18'W, 15-18 Feb 1989, J. DEMARMELS leg. Material (5♂, 1♀, including holotype and paratypes). 1♂, paratype, same dates as holotype, 4♂, paratypes, Tamacuari.

Male (holotype). Labium dark brown, face brilliant black, a white transverse band across anteclypeus and base of labrum; occiput and top of

head black, a rufous streak between each lateral ocellus and corresponding antenna; frons angulate. Prothorax dorsally brassy black, its hind margin convexly rounded; pterothorax dark brown to black with metallic blue or green reflections; mesepisternum and mesepimeron densely covered with bluish pruinescence; some pruinosity also along sutures and ventrally. Legs dark brown to black. Wings slightly smoky, pterostigma dark brown. 23 (25) postnodal cross-veins (px) in fore wings 19 (20) in hind wings. 2 cubito-anal cross-veins (Cux) in three wings, 3 in left fore wing. 2 antenodal cells in discoidal field in all but in left fore wing (3). R⁴ originating very little before subnodus, IR₃ at first px. R₃ branching after px 6 in fore wings, at px 6 in hind wings; IR₂ originating at px 11 in fore wings, in hind wings at or after px 9. Abdomen dark brown to black; segments 3-6 with a brown basal ring; segments 1,2 and 9 with blue pruinescence dorsally. Superior anal appendages slightly shorter than segment 10 and triangularly pointed in lateral view (Fig. 8) in dorsal view tips convergent (Fig. 9). Penis similar to *D. mesembrinum* DeMarmels (DEMARMELS, 1989b: Figs. 4-5).

Measurements. Total length (excl. anal appendages) 38.0; abdomen (excl. anal app.) 30.5; anal appendages 0.8; hind wing 35.2; pterostigma (costal side, front wing) 1.0; radial side 2.0.

The paratype males do not differ substantially from the holotype: 3-4 antenodal cells in the discoidal field; minor variations in the branching of IR² and R³; R⁴ often originating slightly more proximally. Measurements. Total length (excl. appendages) 40.5-43.5.

Female (paratype). Labium pale; pale transverse band across face also including mandibles and genae. Prothorax as in male. Pterothorax brown with coppery reflections and yellowish stripes along humeral and lateral sutures. Wings smoky, pterostigma brown. 24(25) px in fore wings, 21(22) in hind wings. Only 2 antenodal cells in the discoidal field; 2-3 cux. R₃ originating after px 7 in three wings, after px 8 in left fore wing; IR₂ branching at px 12 (10) in fore wings, at px 9(11) in hind wings. R₄ originating more proximally from subnodus than in the holotype. Abdomen brown; cerci two times the length of segment 10 (Fig. 10).

Measurements. Total length (excl. anal appendages) 31.5; abdomen (excl. app.) 25.0.

Remarks. Male *D. unturanense* differ from male *D. mesembrinum*, *D. percubitale* Calvert and

D. secundum Needham in having shorter, triangularly pointed superior anal appendages (lateral view) with the basal dorsal tubercle higher than tergal surface of segment 10. Tips of inferior appendages strongly curved upwards and slightly cephalad. The female of *D. secundum* is unknown, but probably differs from *D. unturanense* in color pattern of head and in having only one cux. Female *D. unturanense* have the dorsobasal tubercle of the cerci slightly better developed female *D. percubitale* and *D. mesembrinum*. The latter has only one cux in all wings. At both localities *D. unturanense* was taken along small creeks in the forest together with *Iridictyon trebbai* and (larvae of) *Neocordulia biancoi* Racenis (see below).

Megapodagrion megalopus (SELYS, 1862)

Figures 11-12

Material. 7♂, 1♀, Base Camp.

Remarks. All specimens were taken in the forest, far from water, flying close to the ground or sitting on sticks or stemlets of low growing plants. The larval habitat is unknown, but might not be lotic.

Megapodagrion Selys sensu stricto is monotypic. Those species included in *Allopodagrion* Förster, currently considered a subgenus of the former, differ in many important features from *M. megalopus*. Therefore I think that full generic rank for *Allopodagrion*, as originally assigned to by Förster (1910), is clearly justified. The strongest argument for doing so is given by penis morphology: The penis of *Megapodagrion* is les-tine (Fig. 11-12), while that of *Allopodagrion* is typically megapodagrionine (Figs. 13-14) with two conspicuous cornua as have, for example, *Dimeragrion* Calvert, *Heteragrion* Selys, *Oxystigma* Williamson, *Philogenia* Selys and *Sciotropis* Racenis. Petiolation of wings ceases far distad from cux in *Megapodagrion*, but very close to, or even proximally of cux in *Allopodagrion*. *Megapodagrion* has two supplementary sectors between IR₂ and R₃, and two more between R₃ and IR₃ while *Allopodagrion* has only one in each space. The fore wings are shorter than the hind wings in *Megapodagrion* but equal or longer in *Allopodagrion*. Adult *Megapodagrion* are mottled with brown, the two apical abdominal segments are in the male densely covered with white pruinescence. Adult *Allopodagrion* are black with blue patches on the mesepisterna, which might be covered by blue pruinescence, tip of abdomen has no pruinescence. The larval habitat of *Megapodagrion* is

unknown, but adults are found in lowland rain forest away from running water flying close to the ground. All species of *Allopodagrion* are instead breeding in small mountain creeks in partly open or closed forest and do not abandon the water courses. It seems, therefore, that besides of the long legs, *Allopodagrion* does not share more characters with *Megapodagrion* than with *Philogenia* or with any other of the compared genera.

Oxystigma williamsoni Geijskes. 1976

Material. 3♂, 5♀, Base Camp

Rimanellidae

Rimanella arcana Needham, 1933

Material. 3♂, 1♀, Unturán

Remarks. An additional female was observed at the same place, perhaps ovipositing into some roots hanging over the creek. The water here was flowing rapidly over a steep rocky bottom.

Lestidae

Lestes debellardi sp. n.

Figures 15-19

Male (holotype). Venezuela, Amazonas State, upper Rio Mavaca, 160 m, 02°02'10" N, 65°06'-50"W, 1-6 Mar 1989, J. DeMarmels leg.

Material (3♂, including holotype and paratypes). 1♂, paratype, km 85 road El Dorado - Santa Elena de Uairén, Bolívar, 1-3 Nov 1982, E. Rubio & T. Borrego leg.; 1♂, paratype, km 33 (same road), 22 May 1985, F. Fernández leg.

Male (holotype). Labium and rear of head pale, labrum and mandibles sky blue, top of head black with a metallic green luster. Compound eyes (in life) blue above, yellow green below. Pronotum laterally blue, dorsally predominantly brown. Mesepisternum brassy black (brown along median carina), with a strongly obscured green stripe along humeral suture, this stripe less than half as broad as dark portion of mesepisternum. Thorax laterally sky blue, pectoral color pattern as in Fig. 15. Coxae blue, femora brown with a black external line; tibiae pale blue externally, creamy internally with black longitudinal line. Wings hyaline, venation black, pterostigma dark brown. Three wings with 13 px, left hind wing 14. R₃ branching between third and fourth px (fore wings), between second and third (hind wings). Abdomen dorsally brassy black, segments 1-4 and 8 laterally sky blue; segments 3-7 with basal ring of same color, otherwise brown laterally. Segment 9 black with a characteristic pruines-

cent white basal mark on top; segment 10 black. Anal appendages black, the superiors without internal basal spine; inferiors about half as long as superiors, in their apical portion with a brush of stiff yellow hairs (Figs. 16-17).

Measurements. Total length (excl. anal appendages) 46.6; abdomen (excl. app.) 37.0; anal appendages 1.4; hind wing 24.5.

The paratypes are similar to the holotype, but with their color less well preserved. Fore wings with 12-15 px, hind wings with 12-14. R₁ branching slightly before to considerably after fourth px. Size similar, the male from km 33 somewhat smaller (total length 44). Penis of this male illustrated in Figs. 18 and 19.

Female. Unknown

Remarks. *Lestes debellardi* is similar to *L. pictus* Hagen in Selys and *L. falcifer* Sjöstedt. The latter two have, however, differently shaped inferior appendages and a diverging color pattern. The holotype was taken in the forest, away from water, together with some *L. falcifer*. I dedicate this species to Dr. Eugenio de Bellard Pietri, Caracas, the organizer of the expedition, who allowed me to take part in it.

Lestes falcifer Sjöstedt, 1918

Material (4♂). 2♂, Siapa 2; 2♂, Base Camp

Remarks. All specimens were caught in the forest, away from water. At Siapa 2 *L. falcifer* was flying together with *Gynacantha gracilis* (Burmeister) in a hollow among vines and bushes. The presence of these species, incl. oviposition of the latter, indicate that the hollow will be filled with water during rain season.

Perissolestes sp.

Remarks. One male was observed at Unturán. It was hanging from a twig in a dark corner of the creek, but could not be secured.

Protoneuridae

Epipleoneura lamina Williamson, 1915

Figures 20-22

Material. 6♂, 11♀, Base Camp.

Remarks. One pair was taken in tandem at a 10 m broad river in the forest. The other specimens, many of them subtenerals, were found away from water sitting on sun-hit bushes in the forest. The species is new to Venezuela.

Neoneura denticulata Williamson, 1917

Figure 22a

Material. 1♀, Base Camp (Río Mavaca).

Remarks. This female corresponds well with a male from Patacame Island (Orinoco), in the MIZA collection. FRASER (1946) gives a brief description of the female, but no figure of the prothoracic hind lobe. Therefore the identification of the Mavaca female remains somewhat doubtful.

Neoneura desana Machado, 1989

Figures 23-24

Material. 6♂, 1♀, upper Río Mavaca (S of Base Camp).

Female. So far undescribed. Head brown with black markings (Fig. 23); rear of head chiefly black with four brown spots in the vicinity of foramen, and a broad pale margin along compound eyes. Pronotum brown with black markings on anterior and posterior lobes; shape of posterior lobe as in Fig. 24. Color pattern of pterothorax similar to *N. luzmarina* DeMarmels (DEMARMELS, 1989a: Fig. 76). Legs pale except for outer side of femora and tarsi which are dark brown. Wings hyaline, pterostigma yellow. Venational characters as in male. Abdomen brown, segment 1 with a brown laterobasal spot; segments 2-6 with a dark brown transverse band close to distal end of tergum and with an additional dark spot laterally at the ventral distal angle; segments 8 and 9 with an incomplete black longitudinal line laterally parallel to ventral carina of tergite; segment 9 with three dark spots dorsally. Ovipositor (not including styli) reaching to distal end of segment 10.

Measurements. Total length 28.0; hind wing 16.5.

Remarks. The female was taken in tandem with a male. Many more specimens were seen flying under overhanging trees along the river bank. Tandems were ovipositing there into masses of small floating sticks. This is the first Venezuelan record of this species.

Neoneura fulvicollis Selys, 1886

Material. 1♂, upper Río Mavaca (S Base Camp).

Remark. A few additional specimens were observed, together with *N. desana*.

Neoneura gaida Racenis, 1953

Material. 1♂, upper Río Mavaca (S of Base Camp).

Remarks. Numerous additional specimens, including tandems, were observed. They were flying and ovipositing together with *N. desana*, but the distribution of *N. gaida* along the river seemed less uniform.

Neoneura myrthea Williamson, 1917

Material. 2♂, Siapa 2.

Remarks. Males were sitting on a sun-hit log, which was partly floating in the water.

Psaironeura machadoi DeMarmels, 1989

Material. 1 ♀, Base Camp.

Remarks. The only specimen seen. It was caught at a small sandy creek in the forest. In the absence of a male the specific identity of this female must remain somewhat doubtful.

Coenagrionidae

Acanthagrion apicale Selys, 1876

Figures 25-29 (larva)

Material. 3 ♂, 1 ♀ (reared, with exuviae), Base Camp.

Larva. Occipital lobes bulging, but not angled, beset with spines; occipital border deeply excavated. Labium (Fig. 25) reaching to beyond first pair of coxae. Antennae seven-jointed (Fig. 26). Hind border of pronotum with lateral angles produced, but not pointed. Wing sheaths reaching to base of segment 5 (Fig. 27). Tibiae and tarsi with scattered soft hairs. Adomen dark with a pale longitudinal dorsomedian line; posterior angles of segments 4-8 strongly marked off and beset with spinules; ovipositor slightly surpassing end of segment 10, valves beset with about four large spines and a few very small ones, in a single row (Fig. 28). Lateral and central caudal gills of same length, sharply pointed (Fig. 29).

Measurements. Total length (excl. gills) 10.5; caudal gills 7.0; hind femur 2.5.

Remarks. The larva of *A. apicale* comes closest to that of *A. luteum* Racenis described by Geijskes (1941) sub "*A. ascendens* Calvert", but specimens were not compared directly. The larva was found in a small stagnant pool in close vicinity of a sandy creek, in the forest. The pool was filled with leaf litter, had a sandy ground and clear water. A larva of *Fylgia amazonica lychnitina* DeMarmels was found in the same pool (see below).

Acanthagrion chacoense Calvert, 1909

Figure 30

Material (2 ♂, 1 ♀), Base Camp. 1 ♂, 1 ♀ (in tandem), upper Río Mavaca (S of Base Camp).

Remarks. The male from Base Camp was flying over a small stagnant pool in the large clearing of the camp, in the neighbourhood of the river. The tandem was caught over low bank vegetation on the Mavaca. This is the second record of the species from Venezuela.

The female was described by Calvert (1961), but the mesepisternal fossae are not mentioned.

These appear as hardly noticeable shallow impressions at the median end of the furrow, which separates mesostigmal laminae from mesepisterna (Fig. 30).

Acanthagrion indefensum Willimson, 1916

Material. 3 ♂, Siapa 2.

Remarks. Few males were observed flying over low bank vegetation. This is the second record for Venezuela and the first the Amazonas Federal Territory.

Aeolagrion flammeum (Selys, 1876)

Material. 4 ♂, 2 ♀, Base Camp.

Remarks. Several were collected around sun-hit bushes in the forest, but others frequented a large shady rainwater pool.

Aeolagrion neblinae DeMarmels, 1989

Material. (3 ♂, 1 ♀). 1 ♂, Tamacuari; 2 ♂, 1 ♀, Unturán.

Remarks. The male from Tamacuari was flying over a patch of large terricolous Bromeliads on an open slope, while the specimens from Unturán were caught in the forest, not far from a small creek.

Argia infumata Selys, 1865

Material. 1 ♂, Base Camp.

Remark. A few more males were seen in the vicinity of small creeks in the forest, where they posed on sun-hit leaves.

Argia insipida Hagen in Selys, 1865

Material. 1 ♂, 1 ♀ (in tandem), Siapa 2.

Remarks. Numerous tandems were observed, all flying upstream. A few single males settled on a floating log. The populations south of the Orinoco differ from the northern form in having much broader black (brown in female) humeral stripes. These are about half as broad as the mesepimeron. The pale markings between the post-ocular spots are also much reduced or entirely wanting in the southern form.

Argia mollusca Fraser, 1946

Material. 2 ♂, Base Camp.

Remark. New to Venezuela.

Argia sp.

Remark. 12 specimens representing four additional species have been collected, but they could not be identified at present.

Leptobasis yanomami sp.n.

Figures 31-35

Male (holotype). Venezuela, Amazonas Federal Territory, upper Río Mavaca, 160 m, 02°02'10"N, 65°06'50"W, 14 Feb - 6 Mar 1989, J. DeMarmels leg.

Material. 2♂, 1♀, including holotype and paratypes; all with same data.

Male (holotype). Labium pale; labrum dark green; top of head black, a small rounded blue postocular spot on each side; a rufous transverse band across head between postocular spots and rear of head, which is pale. Antennae dark brown. Compound eyes in life dark green above, vivid grass green below. Anterior lobe of pronotum rufous laterally, blue dorsally in the middle; median lobe rufous above, bright blue laterally; posterior lobe brown, its hind margin trilobate with the middle lobe about as broad as both lateral lobes taken together. Each mesepisternum with a rounded tubercle behind mesostigmal laminae, close to median carina. Color of pterothorax strongly rufous with vivid blue stripes as follows: a complete antehumeral stripe closely paralleling humeral suture, a somewhat broader stripe over proximal half of metepisternum and lower angle of mesinfraepisternum, an ill-defined stripe along distal margin of metepimeron; the latter otherwise creamy to bluish white. Legs pale, dark brown tibial spines shorter than intervening spaces. Wings hyaline, venation dark brown; pterostigma rufous, shorter than underlying cell and with the four sides about equal in length. Anal vein branching from wing margin as far after *cux* as this latter is long. Three antenodal cells in the discoidal field (two in right fore wing) 11 px in fore wings, 10 in hind wings. R_3 rising from or after fifth px; IR_2 from eighth or ninth px in fore wings. In hind wings R_3 branching after the fourth px; IR_2 as in fore wings. Abdomen chiefly brown dorsally, darker at tips of segments 3-6. Segments 1-3 laterally blue, segments 7-10 entirely rufous and laterally slightly expanded. Anal appendages rufous, shaped as in Figs. 31 and 32.

Measurements. Total length (incl. appendages) 36.5; abdomen 30.5; hind wing 17.5.

The male paratype resembles the holotype, but has 12 px in the fore wings. R_3 rises from the sixth px in the fore wings, from the fifth in the hind wings. Penis as illustrated in Figs. 33 and 34.

Female (paratype). Top of head and labrum rufous, otherwise as male. Hind lobe of pronotum trilobate, but considerably different from male (Fig. 35). Wings similar to male paratype. Eighth abdominal segment with ventral spine; ovipositor slightly surpassing end of segment 10.

Measurements. Total length 38.0; abdomen 31.5; hind wing 19.0.

Remarks. *Leptobasis yanomami* comes closest to *L. mammilaris* Calvert, but differs from it in the shape of the male anal appendages and the female prothoracic hind lobe. The latter is illustrated for *L. mammilaris* in Fig. 36. The female attributed to *L. mammilaris* by Calvert (1909) is doubtless not that species. All specimens were taken in the forest on sun-hit bushes, away from water. The specific name chosen refers to the Indian tribe of the "Yanomami" which settles in this South Venezuelan region.

Metaleptobasis brysonima Williamson, 1915

Material. 1♂, Base Camp.

Remark. The specimen was collected at a small creek in the forest.

Metaleptobasis fernandezi Racenis, 1955

Figures 37-40

Material. (6♂, 1♀). 4♂, 1♀, Base Camp; 2♂, Siapa 2.

Remarks. *Metaleptobasis* Calvert is a difficult genus, chiefly because the amplitude of intraspecific variability of most species is unknown. *M. fernandezi* was described from a single female (Racenis, 1955). The prothoracic hind lobe of the present female (Fig. 37) corresponds well with the holotype and with the figure given by Geijskes (1932, sub *manicaria* see Racenis, 1955). The mesothoracic horns are reduced to mere tubercles. The thoracic middorsal stripe is slightly broader in the female from Base Camp than in the type. With some doubts I am referring also the sixmales to *fernandezi*. The male of this species has not so far been described. The present specimens are exceedingly similar to *M. mauritia* Williamson, but differ from that species (only 1♂ compared: Valencia, Trinidad, 7 Apr 1965, T. W. Donnelly leg.) in the superior anal appendages: In *mauritia* they are slightly narrower and less sharply angled internally in the apical third; the tip is clearly marked off from the internal margin, and is reddish (Figs. 41-42). In *fernandezi* the superior appendages are slightly broader and more angled internally in the apical third; the transition between internal margin and tip is smooth, the tip dark brown (Figs. 38-39). The hind border of the pronotum has a metallic green spot in the middle in male *mauritia*, which is absent in *fernandezi*. The mesothoracic horns are similarly shaped in both species (males) (Figs. 40, 43).

Female *mauritia* have a differently shaped prothoracic hind lobe (Fig. 44) and developed mesothoracic horns (Fig. 45). The specimens from Ba-

se Camp were collected together with *M. brysonima*, but the two males from Siapa 2 were taken in a (then) dry hollow in the forest.

Metaleptobasis manicaria Williamson, 1915

Figure 46

Material. 1 ♂, Siapa 2.

Remark. The prothoracic hind lobe of a female from the delta of the Orinoco is illustrated (Fig. 46).

Pseudostigmatidae

Mecistogaster linearis (Fabricius, 1777)

Material. 2 ♀, Base Camp.

Mecistogaster lucretia (Drury, 1773)

Material. 1 ♂, Unturán; 1 ♀, Base Camp.

Microstigma rotundatum Selys. 1860

Material. 2 ♂, Base Camp.

Remarks. One of the males was holding a territory in a small clearing. It consisted of a recently fallen tree with a twirled stem, which held about twenty phytotelmata with varying water content over almost its whole length. Some leaf detritus and mosquito larvae were observed in some of these water bodies, but no larvae of *Microstigma* Rambur or of any other Zygoptera was detected (but see below under *Triacanthagyna dentata* and *Libellula herculea*).

Anisoptera

Aeshnidae

Aeshna cornigera planaltica Calvert, 1952

Figures 47-48 (larva)

Material. 1 ♂ (reared from last instar larva). Tamacuari.

Larva. This single specimen is the only one known to me of the pantepuyan form of *planaltica*. It differs from a typical Brazilian *planaltica* (♂, ultimate instar exuviae, Rio Grande do Sul, sep 1985) kindly furnished to me by Prof. Dr. A.B.M. Machado, Belo Horizonte, as well as from ordinary North Venezuelan *cornigera cornigera* described by DeMarmels (1982): In the Tamacuari specimen, the prementum surpasses posteriorly the middle coxae (Fig. 47), while in the Brazilian example it ends already between the middle coxae. The male lamina at the base of the epiproct is close to half as long as the latter, and sharply pointed in the Tamacuari larva (Fig. 48); this lamina is obviously shorter than half the epiproct and more bluntly tipped in *cornigera cornigera*.

Measurements (Tamacuari). Total length 34.5; maximum width of head across compound eyes 8.0; hind femur 6.0; hind tibia 6.7.

Remarks. The single larva was found in a small mountain creek in the forest together with many larvae of *Neocordulia biancoi* (see below). Unfortunately, the adult male escaped after having been kept alive for maturation during two days.

Castoraeschna tepuica DeMarmels, 1989

Material. 1 ♂ (reared from last instar larva); 1 ♂, additional last instar exuviae; Unturán.

Remarks. Several additional larvae, some in the last instar, were found in an about 1 m broad black water creek in the forest, where they clung to roots under the overhanging bank. The bottom of the creek is stony with no sand and but little detritus. The male larva was described by DeMarmels (1990). Female larvae are still unknown. A single ultimate instar larva of this sex was also caught at Unturán, but was lost just before emergence of the adult. Therefore, any information about the length of the gonapophyses can not be given. However, the larva was very similar in overall appearance to male specimens. Adults were not observed.

Gynacantha auricularis Martin, 1909

Material (5 ♂, 1 ♀). 4 ♂, 1 ♀, Base Camp; 1 ♂, Siapa 2

Remarks. During the day specimens were sitting on thin stems of bushes in the forest. When disturbed they flew to other bushes some ten meters away. At about 06 40 h p.m. they fly through open spaces to feed, but disappear again at about 07 h p.m. The female was collected in the afternoon when ovipositing into the base of a small tree in a dry hollow. This hollow will doubtless be filled with water in the rainy season. The male from Siapa 2 was found entangled in a mist net.

Gynacantha bifida Rambur, 1842

Material. 3 ♂, 1 ♀, Siapa 2

Remarks. These and some additional specimens were flying across a large deforested area on the left bank of the river, also between half past six and seven, in the evening.

Gynacantha gracilis (Burmeister, 1839)

Material (6 ♂, 1 ♀). 3 ♂, Base Camp; 3 ♂, 1 ♀, Siapa 2

Remarks. The species was common and behaved like *G. auricularis*. Several females were seen ovipositing into roots of small bushes in dry hollows, but never in nearby water filled pools.

Gynacantha nervosa Rambur, 1842

Material. 1♂, Siapa 2.; 1♀, Base Camp.

Gynacantha sp. near *tibiata* Karsch. 1891

Material. 1♀, Base Camp.

Remarks. The female was taken when ovipositing into the roots of a bush in a dry hollow. Its specific identity is not clear beyond any doubt. Some characters observed are: Second and third femur reddish, becoming black in the apical fourth. Second and third tibia brown black, with anexternal yellow streak which becomes dark brown towards tip. All tarsi black. Pterostigma pale brown. Anal appendages basally black, remainder lost.

Neuraeschna harpya Martin, 1909

Material. 1♂, 3♀, Base Camp.

Remarks. On 14 February I observed numerous specimens circling through the clearing of the Base Camp. At later dates the species became rather sporadic. Flight activity begun at about 6 30 h p.m. and the green thoracic stripes of *Neuraeschna* could then still be made out from some distance. Later, increasing darkness would prevent one from distinguish this genus from simultaneously flying *Gynacantha*'s. During day time I never saw any *Neuraeschna* in the jungle. This is the first record of the species from Venezuela.

Staurophlebia reticulata (Burmeister, 1839)

Material. 3♂, Base Camp.

Remarks. Several additional specimens were observed flying to and fro along the margin of the clearing or at the river side. The species is active from the morning to the evening, but usually disappears before the first *Gynacantha* makes its appearance.

Triacanthagyna dentata (Geijskes, 1943)

Figures 49-50 (adult); 51-57 (larva)

Material. 2♀ (reared, with their exuviae), Base Camp.

Female. The two females correspond fairly well with the description of the male type given by Geijskes (1943). In one female the triangles in left fore and right hind wing have two proximal longitudinal veins each. In the other female the costa, subcosta and pterostigma of the left fore wing are completely unpigmented (white). Ovipositor short; central prong of threepronged ventral process on abdominal segment 10 more than twice the length of lateral pronges. Anal appendages dark brown, as long as segments 8, 9 and 10 together (Figs. 49-50).

Measurements. Total length (excl. appendages) 59-66; abdomen (excl. app.) 44-50; anal appen-

dages 7-8; hind wing 49-50.5; pterostigma (costal side, front wing) 4.4-4.8; same (hind wing) 3.3-4.0.

Larva. Brown, without definite pattern of longitudinal lines on abdominal dorsum. A dark area under lateral angle of prothoracic hind lobe and a rounded dark spot above middle coxa, on the mesepimeron. Antennae seven-jointed; occipital lobes not bulging laterally, with their outer margins converging towards occiput, the latter slightly concave (Fig. 51). Labium (Fig. 52) reaching backwards to middle coxae; two long palpal setae close to base of movable hook, and a third one slightly more proximally (Fig. 53). In one specimen the left lateral palp lacks the proximal seta. Hind border of pronotum gently rounded, the lateral angles produced into a pointed triangle. First projection of prothoracic supracoxal process spine-shaped, the second triangularly pointed (Fig. 54). Femora with two dark cross-bands and dark tip; dark cross-bands of tibiae largely fused and pale areas reduced to one or two ill-defined spots. Wing sheaths not reaching to end of segment 4, each with two dark comma-shaped dashes in the central area. Abdomen with lateral spines on segments 5-9, but those of segment 5 extremely small (Fig. 55). All anal appendages of about the same length and as long as segments 9+10 together; epiproct truncated (Fig. 56); gonapophyses reaching backwards slightly into segment 10 (Fig. 57).

Measurements. Total length 38.0; greatest width of head across compound eyes 8.0; hind femur 6.2; hind tibia 6.7.

Remarks. This is the first record of *T. dentata* from Venezuela. Adults were not seen, but in numerous phytotelmata held by a fallen tree (see under *Microstigma rotundatum*) about a dozen larvae of early instars were found, together with also small larvae of *Libellula herculea* Karsch. Only the two females could be brought to emergence.

Santos (1973) describes the larva of *T. caribbea* Williamson, and Carvalho (1988) that of *T. ditzeri* Williamson. From both, *T. dentata* larvae might be separated on the basis of the reduced number and peculiar disposition of the palpal setae.

Comphidae

Aphylla Selys, 1854

Material. 1♀, Base Camp.

Remarks. Dr. J. Belle Velp (The Netherlands) has identified the single specimen as "*Aphylla* near *molossus*, new species?" This female was flying over the leaf litter close to the forest floor, in a sunny clearing.

Archaeogomphus nanus Needham, 1944

Material. 1 ♂, Siapa 2.

Remarks. The teneral specimen was captured close to the river bank, on its maiden flight, but the exuviae could not be found.

Phyllogomphoides major Belle, 1984

Material. 2 ♂, upper Rio Mavaca (S of Base Camp).

Remarks. The species was common also on the Siapa. Other Gomphids were also seen, but none could be secured.

Corduliidae

Neocordulia biancoi Racenis, 1970

Material. 5 ultimate instar larvae. Tamacuari.

Remarks. Larvae, mostly of advanced instars, were common in the forest creek at the Tamacuari. Numerous larvae, albeit of younger instars, were found also at Unturán. Many were brought down to the Base Camp alive, but died soon afterwards. Adults were not seen.

Libellulidae

Anatya guttata (Erichson, 1848)

Figures 58-60

Material. 7 ♂, 5 ♀, Base Camp.

Remarks. The species was common in the forest. Copulae were also observed. Males with long anal appendages ("guttata") and others with short ones ("normalis" Calvert) (Figs. 58-59) thrived side by side and I consider them forms of the same species. No other difference can be detected in the males, and none in the females. An intermediate male from Táchira State is illustrated in Fig. 60.

Diastatops pullata (Burmeister, 1839)

Material. 1 ♂, Siapa 1.

Elasmothemis cannacioides (Calvert, 1906)

Material. 1 ♂, Río Mavaca (S of Base Camp).

Remarks. Many more specimens were seen flying around dead branches of trees which had fallen into the water, also on the Río Siapa. The males are of the southern phenotype as described by DeMarmels (1989a).

Elga leptostyla Ris. 1911

Material. 2 ♂, Base Camp.

Remark. Typical for small creeks in the forest where the males use to sit on sticks in the sun.

Erythemis haematogastra (Burmeister, 1839)

Material. 1 ♂, Base Camp.

Remark. A few additional males were seen over rainwater pools in the large clearing between the Camp and the river.

Erythrodiplax amazonica Sjöstedt, 1918

Figures 61-64 (larva)

Material. 1 ♂, 1 ♀ (reared from ultimate instar larvae), Tamacuari.

Larva. Uniformly brown, hairy, with spiny tibiae (Fig. 61). Eyes bulging; occipital margin slightly concave; antennae short (Fig. 62). Labium reaching backwards to behind first coxae; labial palp without crenations; 11 palpal setae with some additional small setae near base; 18 mental setae (Fig. 63). Femora with two dark cross-bands; tibiae, specially third pair, beset with long spiniform hairs. Wing sheaths surpassing fifth abdominal segment, with long hairs along dorsal keel. Abdomen hairy, but lacking lateral or dorsal spines. Anal pyramid as in Fig. 64.

Measurements. Total length 14.0; greatest width of head 4.5-4.7; hind femur 4.7; hind tibia 6.0-6.2.

Remarks. While searching for frogs in large terrestrial bromeliads. Dr. Helmut Mägdefrau from the Bayrische Staatssammlung, Munich (Germany), found the two ultimate instar larvae, each in a separate specimen of bromeliad. Both adults emerged about a week later and stayed alive for two days. Adult male and female look similar, with a pale yellow middorsal stripe along the carina of the black brown mesepisterna, and with an orange abdomen.

Measurements. Total length (incl. anal appendages) 32.5 (♀ 34.5); hind wing 27.0 (♀ 25.5).

Erythrodiplax angustipennis Borrer, 1942

Material. 1 ♀, Base Camp.

Erythrodiplax fusca (Rambur, 1842)

Material. 1 ♂, Base Camp.

Remark. Several more were observed at the rain water pools in the clearing. A pioneer species.

Erythrodiplax umbrata (Linnaeus, 1758)

Material. 1 ♂, Base Camp.

Erythrodiplax unimaculata (de Geer, 1773)

Material. 2 ♂, Base Camp.

Remark. Taken together with preceeding species at rain water pools.

Fylgia amazonica lychnitina DeMarmels, 1989

Figures 65-70 (larva)

Material. 5♂, 2♀ (adults), 1♂ larva (ultimate instar), Base Camp.

Larva. Small, dark, with some yellow spots on the pterothorax. Head much broader than long, with almost straight occipital margin (Fig. 65). Antennae as illustrated (Fig. 66); segment 6 the longest, dark basally; apical segment spindle-shaped with pointed tip. Hinge of labium reaching second coxae. Labium as in Figs. 67-68. Hind margin of pronotum laterally somewhat protruding, and spinous. Legs moderately long, femora with two dark rings. Wing sheaths reaching to end of abdominal segment 5. Abdominal with dorsal hooks on segments 3-9 and with long lateral spines on segments 8 and 9 (Fig. 69). Anal pyramid as in Fig. 70.

Measurements. Total length (excl. lateral spines) 9.5; maximum width of head across compound eyes 3.0; hind femur 3.0; hind tibia 3.6.

Remarks. The larva was found between leaf litter in the pool described under *Acanthagrion apicale* (see above) Here, adult males as well as an ovipositing female were observed. The larva when disturbed feigns death. The unique specimen found was reared to emergence, but died during transformation. Therefore it can be associated with *Fylgia kirby* only by supposition. However, small size and peculiar features practically exclude any other genus.

Libellula herculea Karsch, 1889

Material. 1♀, reared from antepenultimate instar larva, Base Camp.

Remarks. The larva was found together with many more of the same species, and with larvae of *Triacanthagyna dentata* in several phytotelmata held by a fallen tree (see above under *Microstigma rotundatum* for habitat description). An adult male had established its territory around the log and a second male was seen there as well, but none was taken.

It is interesting to note that North of the Orinoco, in the Coastal Cordillera. *L. herculea* breeds in quiet portions of rocky quebradas (mountain creeks), but also in water-filled crevices of rocks which may be overflowed periodically by the quebrada after rainfall. *L. herculea* is the only Venezuelan dragonfly with a definite courtship display, which seems identical to that of *Libellula (Belonia) croceipennis* Selys, described by Williams (1977). Oviposition behavior is also identical.

Macrothemis delia Ris, 1913

Material. 1♀, Base Camp.

Macrothemis hemichlora (Burmeister, 1839)

Material. 1♂, 3♀, Siapa 1.

Micrathyria hippolyte Ris, 1911

Material. (1♂, 2♀). 1♂, 1♀, Base Camp; 1♀, Siapa 2.

Remark. All specimens were taken in the forest, away from water, on sun-hit bushes.

Micrathyria laevigata Calvert, 1909

Material. 2♂, Siapa 2.

→ The specimens correspond well with the figures and diagnosis given by Santos. (Remark) (1954).

Micrathyria pseudeximia Westfall, 1962

Material. 2♂, Base Camp.

Misagria parana Kirby, 1889

Material. 1♂, Base Camp.

Nephepeltia phryne (Perty, 1834)

Material. 2♂, Base Camp.

Remarks. There is no trace of a yellow antehumeral spot and the pale abdominal markings are considerably smaller than in specimens from North of the Orinoco. Several males were flying at stagnant back waters in the clearing.

Oligoclada abbreviata (Rambur, 1842)

syn. *Oligoclada raineyi* Ris, 1919 (Geijskes, 1984)

Material. 1♂, Siapa 2.

Oligoclada walkeri Geijskes, 1931

Material. 1♂, Base Camp (Rio Mavaca)

Orthemis aequilibris Calvert, 1909

Material. 2♂, Base Camp.

Orthemis schmidtii Buccholz, 1950

Material. 5♂, 2♀, Base Camp.

Remarks. A female was seen ovipositing into a rain water puddle, on the path between camp and river bank, but males were also common at other stagnant back waters in the clearing.

Orthemis sp.

Material. 1♀, Base Camp.

Remark. The specimen could belong in *O. anthracina* DeMarmels or *O. attenuata* (Erichson), but without the corresponding male its identity is difficult to establish.

Perithemis thais Kirby 1889

Material. 1♂, Base Camp.

Tramea calverti Muttkowski, 1910

Material. 1♂, 1♀, Base Camp.

Uracis infumata (Rambur, 1842)

Material. 5♂, 1♀, Base Camp.

Remarks. Wing tips broadly black in four males, brown after the pterostigma in the female and hyaline except for the extreme outer margin, in the fifth male. All specimens were collected in the forest, sitting on sticks.

Uracis ovipositrix Calvert, 1919

Material. 4♂, ¹¹♀, Base Camp.

Remark. Extremely common in the forest and along the forested margin of a broad back water of the Mavaca.

Uracis siemensii Kirby, 1897

Material. 4♂, ²♀, Base Camp.

Remarks. All specimens have hyaline wings. This species behaves quite differently from its congeners. The males hold territories at small water holes in the forest, close to the creek. They rarely settle, but spend considerable intervals hovering close to the water surface. A female was laying eggs stabbing its ovipositor into the humid bank some thirty centimeters above water. The movement of the hovering female is somewhat reminiscent of ovipositing *Cordulegaster* Leach.

ZOOGEOGRAPHICAL ASPECTS

Surprisingly, about half of the species found had not been recorded in 1984/85 during a year-round expedition to neighbouring Mt. Neblina, in the West (DeMarmels, 1989a,b). *Dimeragrion mesembrinum*, an endemic species from Mt. Ne-

blina, is replaced by *D. unturanense* sp.n. in the Sierras of Tapirapecó and Unturán. This is a clear hint to the endemic potential of these eastern mountains. On the other hand, *Aeolagrion neblinae*, described from Mt. Neblina, was recorded from Tapirapecó and Unturán as well. A further five taxa are clearly pantepuyan (Mayr & Phelps, 1967). These are *Iridictyon trebbau*, *Rimanella arcana*, *Aeshna cornigera planaltica*, *Castoraeschna tepuica* and *Neocordulia biancoi*. Most lowland forms are Amazonian or of wide distribution. The range of a few species, such as *Neuraeschna harpya*, are insufficiently known.

Acknowledgements

I am indebted to Dr. Francisco Carrillo B., Dr. Eugenio de Bellard P., Mr. Pedro Pérez R. and Lic. Ramiro Royero, all from the "Fundación para el Desarrollo de las Ciencias Físicas, Matemáticas y Naturales" (FUDECI), Caracas, for their efforts in organizing the expedition and for making my participation possible. Dr. Jan Belle, Velp (The Netherlands) and Prof. Dr. Angelo B. M. Machado, Belo Horizonte (Brazil) kindly checked the identification of some species and/or made specimens available for direct comparison.

REFERENCES

CALVERT, P.P.

1909— Contributions to a knowledge of the Odonata of the Neotropical Region, exclusive of Mexico and Central America. *Annals of the Carnegie Museum* 6 (1): 73-280.

CALVERT, P.P.

1961— Adult Odonata of the Catherwood Peruvian-Amazon Expedition. *Proceedings of the Academy of Natural Sciences*, Philadelphia, 113 (1): 1-20.

CARVALHO, A.

1988— Descrição da larva de *Triacanthagyna ditzleri* Williamson, 1923 (Odonata, Aeshnidae, Gynacanthini). *Revista Brasileira de Entomologia*, 32 (2): 223-226.

DEMARMELS, J.

1988— Generic characters of *Chalcothore* DeMarmels, 1985, with notes on the male of *C. montgomeryi* (Racenis, 1968) and a description of the larva (Zygoptera: Polythoridae). *Odonatologica*, 17 (4): 379-384.

DEMARMELS, J.

1989a.— Odonata or dragonflies from Cerro de la Neblina and the adjacent lowland between the Río Baría, the Casiquiare and the Río Negro (Venezuela). I. Adults. *Boletín de la Academia de las Ciencias Físicas, Matemáticas y Naturales*, Caracas, 25: 11-78, 89-91.

DEMARMELS, J.

1989b.— Odonata or dragonflies from Cerro de la Neblina and the adjacent lowland between the Río Baría, the Casiquiare and the Río Negro (Venezuela). II. Additions to the adults. *Boletín de la Academia de las Ciencias Físicas, Matemáticas y Naturales*, Caracas, 25: 81-87.

DEMARMELS, J.

1990— Nine new Anisoptera larvae from Venezuela (Gomphidae, Aeshnidae, Corduliidae, Libellulidae). *Odontologica*, 19 (1): 1-15.

FÖSTER, F.

1910— Beiträge zu den Gattungen und Arten der Libellen II. *Wiener Entomologische Zeitung*, 29: 51-56.

FRASER, F. C.

1946— Notes on Amazonian Odonata in the Leeds Museum. *Transactions of the Royal Entomological Society*, London, 96 (2): 11-46.

GEIJSKES, D. C.

1932— The dragonfly-fauna of Trinidad in the British West Indies (Odonata). *Zoologische Mededeelingen*, 14: 232-262.

GEIJSKES, D. C.

1941— Notes on Odonata of Surinam II. Six mostly new zygopterous nymphs from the coastland waters. *Annals Entomological Society of America*, 34: 719-734.

GEIJSKES, D. C.

- 1943— Notes on Odonata of Surinam III. The genus *Coryphaeschna*, with descriptions of a new species and the nymph of *C. virens* *Entomological News*, 54 (3): 61-72.

GEIJSKES, D. C.

- 1934— ¿What is *Oligoclada abbreviata* (Rambur, 1842)? (Odonata: Libellulidae). *Zoologische Mededeelingen*, 58 (12): 175-185.

MAYR, E. & PHELPS, W. H.

- 1967— The origin of the Bird fauna of the South Venezuelan Highlands. *Bulletin of the American Museum of Natural History*, 136: 273-327.

RACENIS, J.

- 1955— El género *Metaleptobasis* (Odonata: Coenagrionidae) en Venezuela. *Boletín del Museo de Ciencias Naturales*, Caracas, 1 (1): 3-20.

SANTOS, N. D.

- 1954— Revisão de *Micrathyria didyma* (Selys, 1857) e suas correlatas (Libellulidae, Odonata). *Arquivos do Museu Nacional*, 42: 491-506.

SANTOS, N. D.

- 1973— Contribuição ao conhecimento da fauna da Guanabara e arredores. 81- Descrição da ninfa de *Triacanthagyna caribbea* Williamson, 1923 (Odonata: Aeshnidae). *Atas da Sociedade de Biologia do Rio de Janeiro*, 16 (2/3): 53-54.

SANTOS, N. D. & COSTA, J. M.

- 1987— Descrição da ninfa de *Chalcopteryx rutilans* (Rambur, 1842) Selys, 1853 (Odonata: Polythoridae). *Atas da Sociedade de Biologia do Rio de Janeiro*, 27. 1-4.

WILLIAMS, C. E.

- 1977— Courtship display in *Belonia croceipennis* (Selys), with notes on copulation and oviposition (Anisoptera: Libellulidae). *Odonatologica*, 6: 283-287.

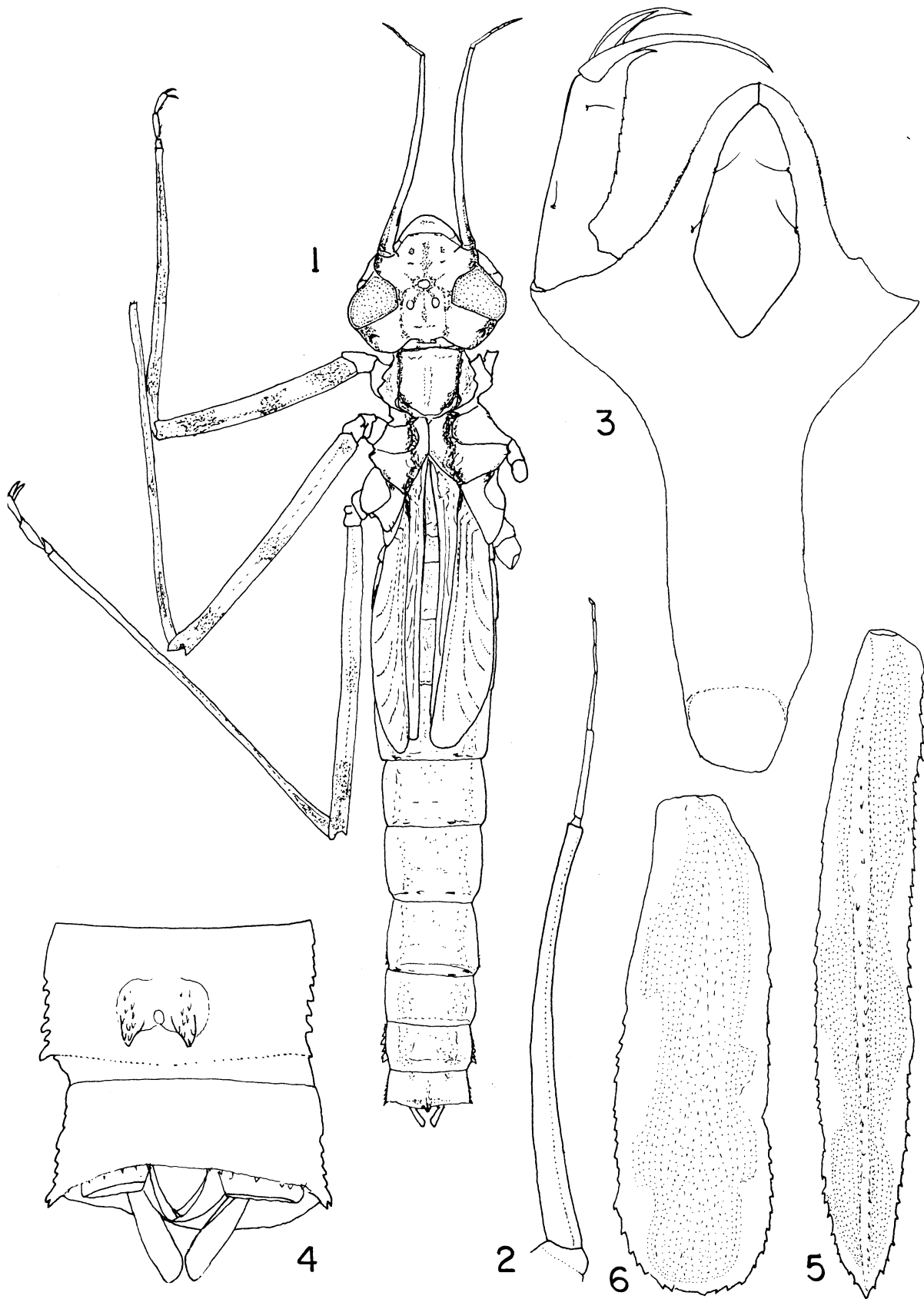


Plate I: Figures 1-6. *Iridictyon trebbau*, larva. (1) male larva, ultimate instar, dorsal view; (2) right antenna; (3) labium, dorsal view; (4) abdominal segments 9 (with gonapophyses) and 10, ventral view (all same specimen); (5) female larva (♀ ante?) penultimate instar, detached lateral gill; (6) median gill, left lateral view (same specimen).

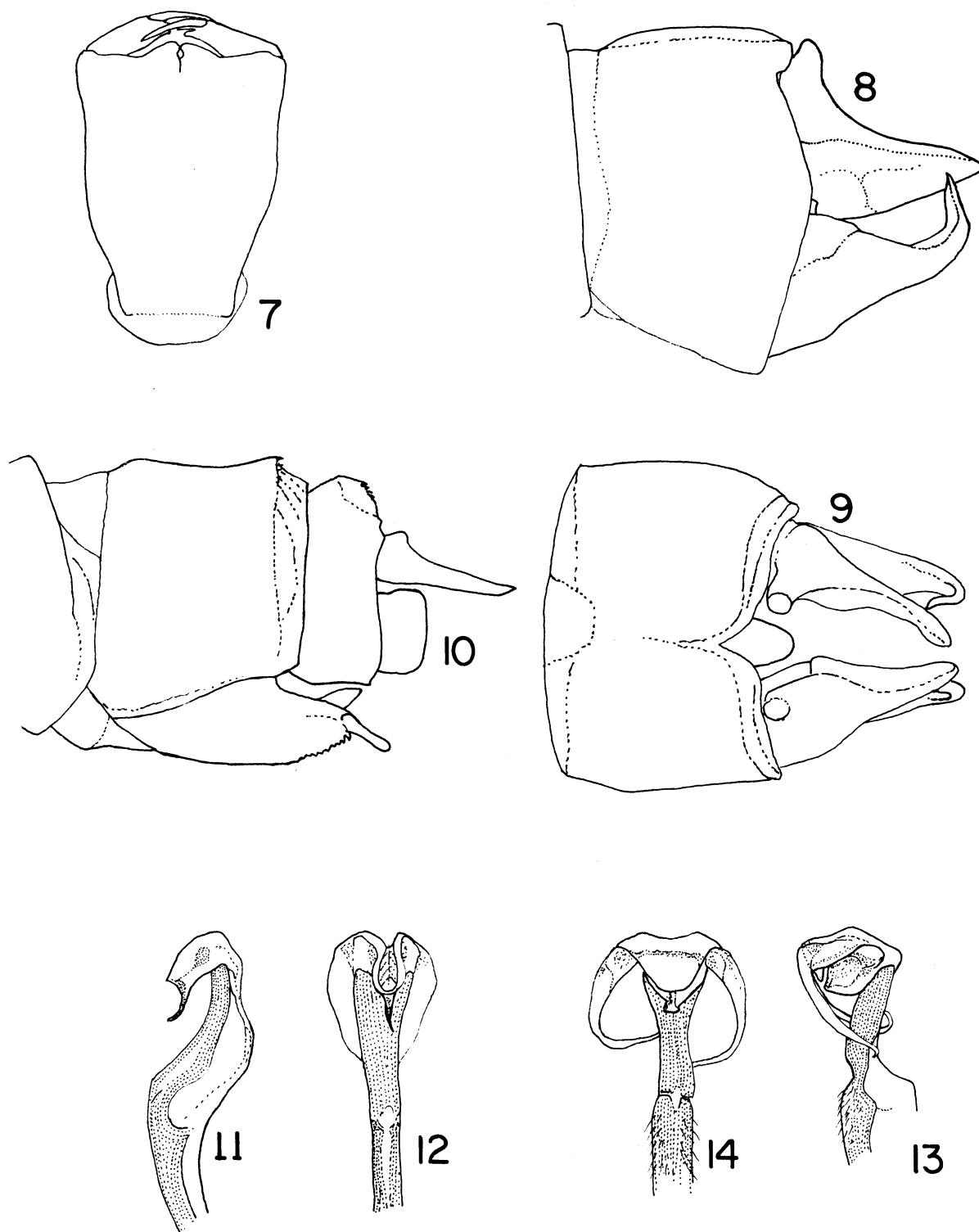


Plate II: Figure 7. *Chalcopteryx scintillans*, female ultimate instar exuviae, labium, ventral view. Figures 8-10. *Dimeragrion unturanense* sp.n. (8) holotype male, abdominal segment 10 with anal appendages, left lateral view; (9) same, dorsal view; (10) female, paratype, tip of abdomen, left lateral view. Figures 11-12. *Megapodagrion megalopus*, male. (11) penis, right lateral view; (12) same, ventral view. Figures 13-14. *Allopodagrion oscillans* (Venezuela, Táchira, Betania). male. (13) penis, right lateral view; (14) same, ventral view.

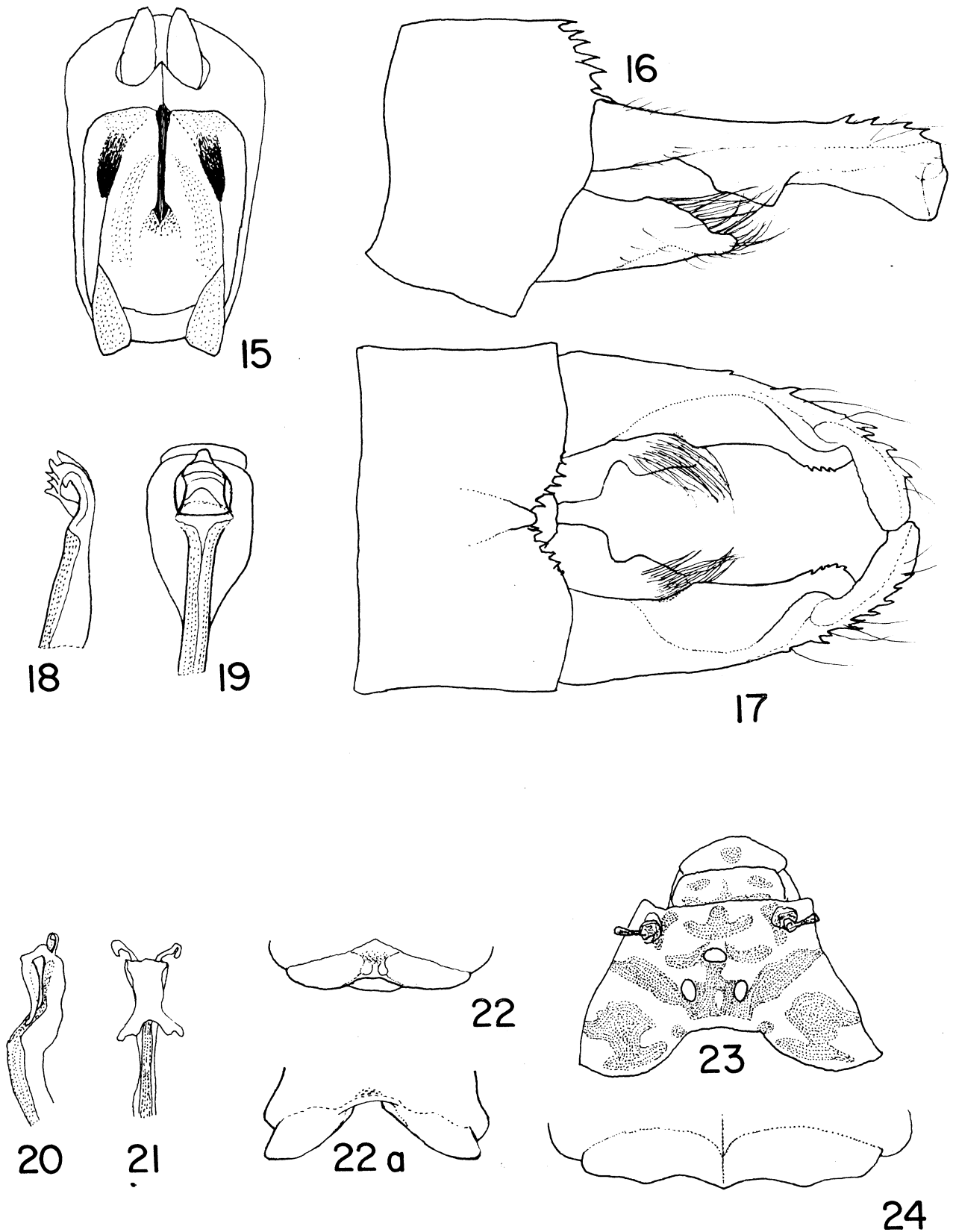


Plate III: Figures 15-19. *Lestes debellardi* sp.n. (15) holotype male, pectoral color pattern, ventral view; (16) segment 10 with anal appendages, same specimen, left lateral view; (17) same, dorsal view; (18) penis of paratype, right lateral view; (19) same, ventral view. Figures 20-22. *Epipleoneura lamina*. (20) penis, right lateral view. (21) same, ventral view; (22) hind margin of pronotum of female taken in tandem, dorsal view. Figure 22a. *Neoneura denticulata* (?). hind margin of pronotum (female), dorsal view. Figures 23-24. *Neoneura desana*, female taken in tandem. (23) color pattern of head, dorsal view; (24) hind margin of pronotum, dorsal view

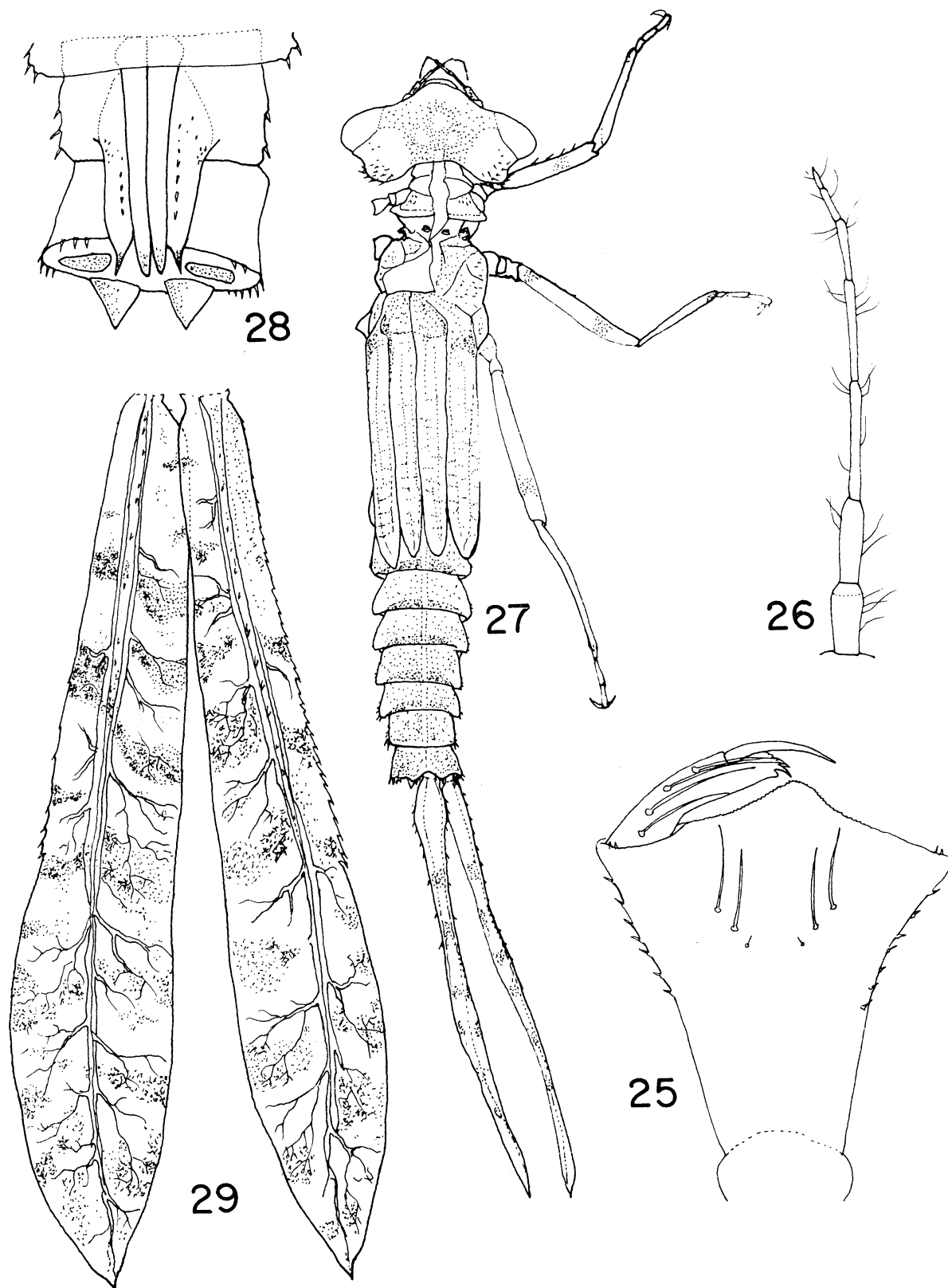


Plate IV: Figures 25-29. *Acanthagrion apicale*, female ultimate instar exuviae. (25) labium, dorsal view; (26) left antenna; (27) exuviae (left lateral gill lost), dorsal view; (28) tip of abdomen with gonapophyses, ventral view; (29) median gill (at left) and right lateral gill, right lateral view. Figure 30. *Acanthagrion chacoense*, female mesostigmal laminae and mesepisternal fossae, dorsal view.

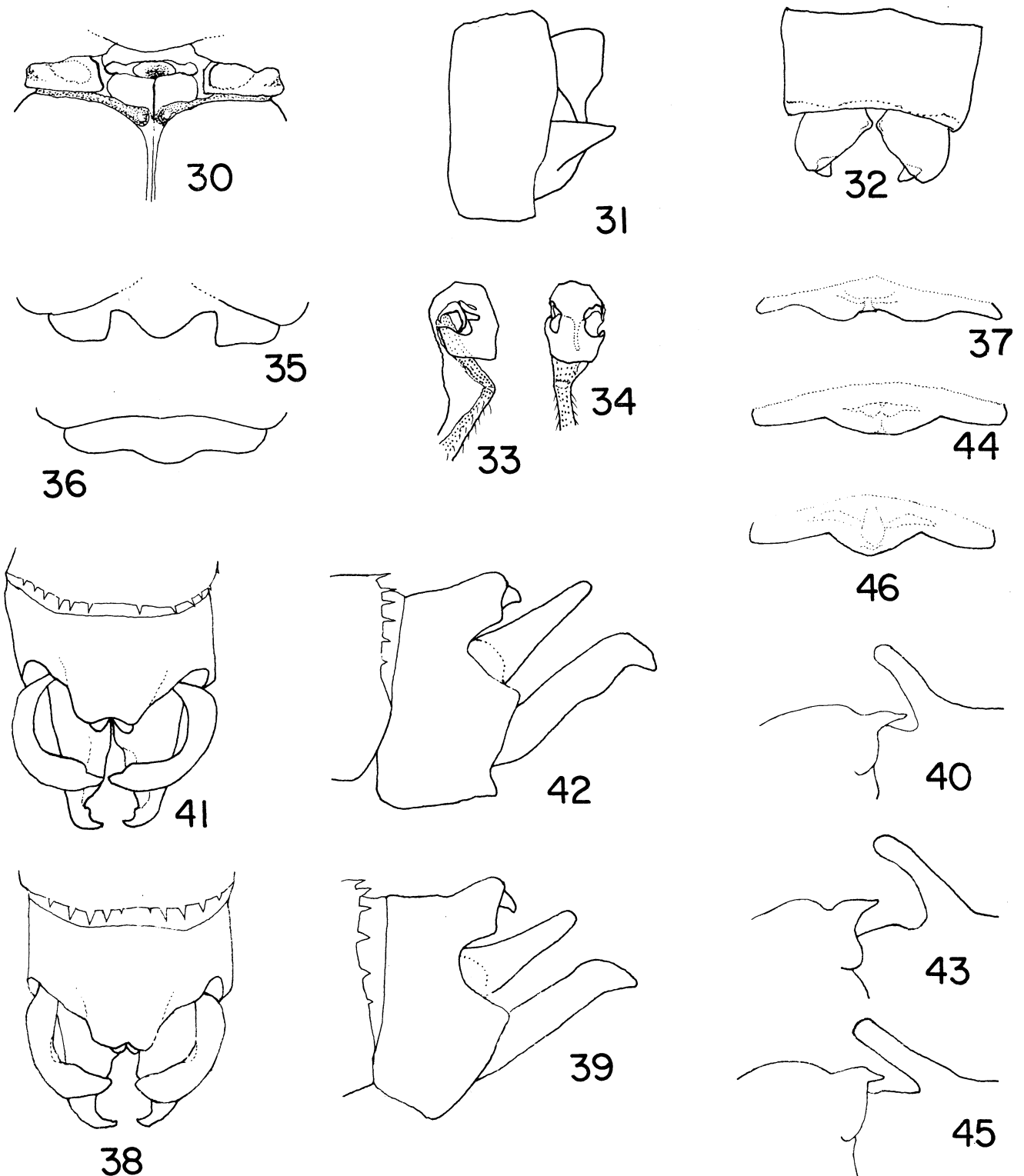


Plate V: Figures 31-35. *Leptobasis yanomami* sp.n. (31) abdominal segment 10 with anal appendages, holotype male, left lateral view; (32) same, dorsal view; (33) penis, paratype, left lateral view; (34) same, ventral view; (35) hind margin of pronotum, paratype female, dorsal view. Figure 36. *Leptobasis mammilaris*, female (Venezuela, Bolívar, Canaima), hind margin of pronotum, dorsal view. Figures 37-40. *Metaleptobasis fernandezi*. (37) female, hind margin of pronotum, dorsal view; (38) male, abdominal segment 10 with anal appendages, dorsal view; (39) same, left lateral view; (40) male, left mesothoracic horn, left lateral view. Figures 41-45. *Metaleptobasis mauritia* (41) male (Trinidad, Valencia), abdominal segment 10 with anal appendages, dorsal view; (42) same, left lateral view; (43) left mesothoracic horn, left lateral view; (44) female (Venezuela, Amazonas, San Juan de Manapiare), hind margin of pronotum, dorsal view; (45) left mesothoracic horn, left lateral view, same specimen. Figure 46. *Metaleptobasis mannicaria*, female (Venezuela, Delta Amacuro, Jotacuay), hind margin of pronotum, dorsal view.

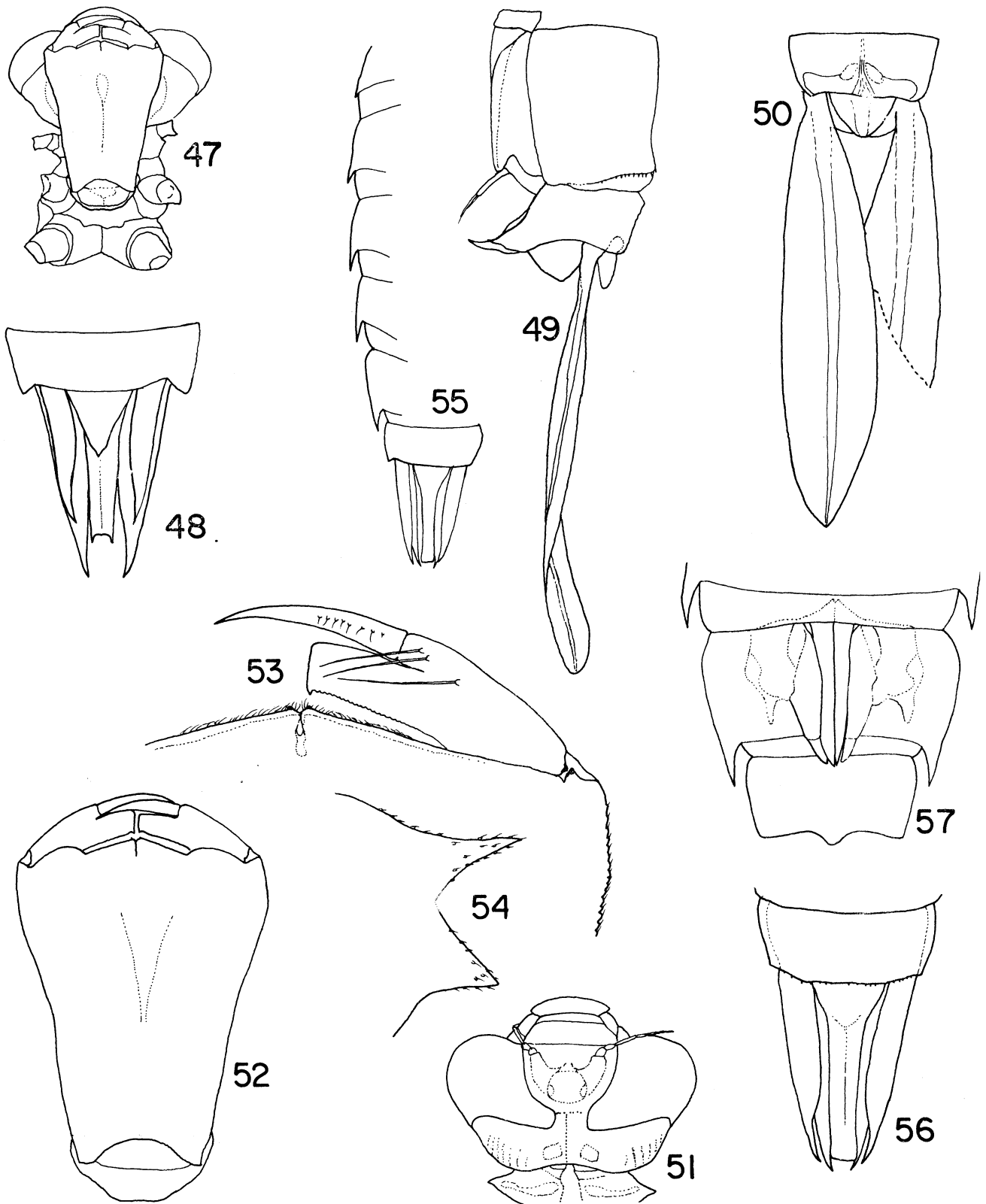


Plate VI: Figures 47-48. *Aeshna c. planaltica*, male ultimate instar exuviae, (47) labium, ventral view; (48) anal pyramid, dorsal view. Figures 49-57. *Triacanthagyna dentata*, female. (49) tip of abdomen (adult) with anal appendages, left lateral view; (50) same, dorsal view; (51) head (ultimate instar exuviae), dorsal view; (52) labium, ventral view; (53) apical portion of labium with right palp, dorsal view; (54) right prothoracic supracoxal process, dorsal view; (55) part of abdomen showing left lateral spines, dorsal view; (56) anal pyramid, dorsal view; (57) abdominal segment 9 with gonapophyses, ventral view.

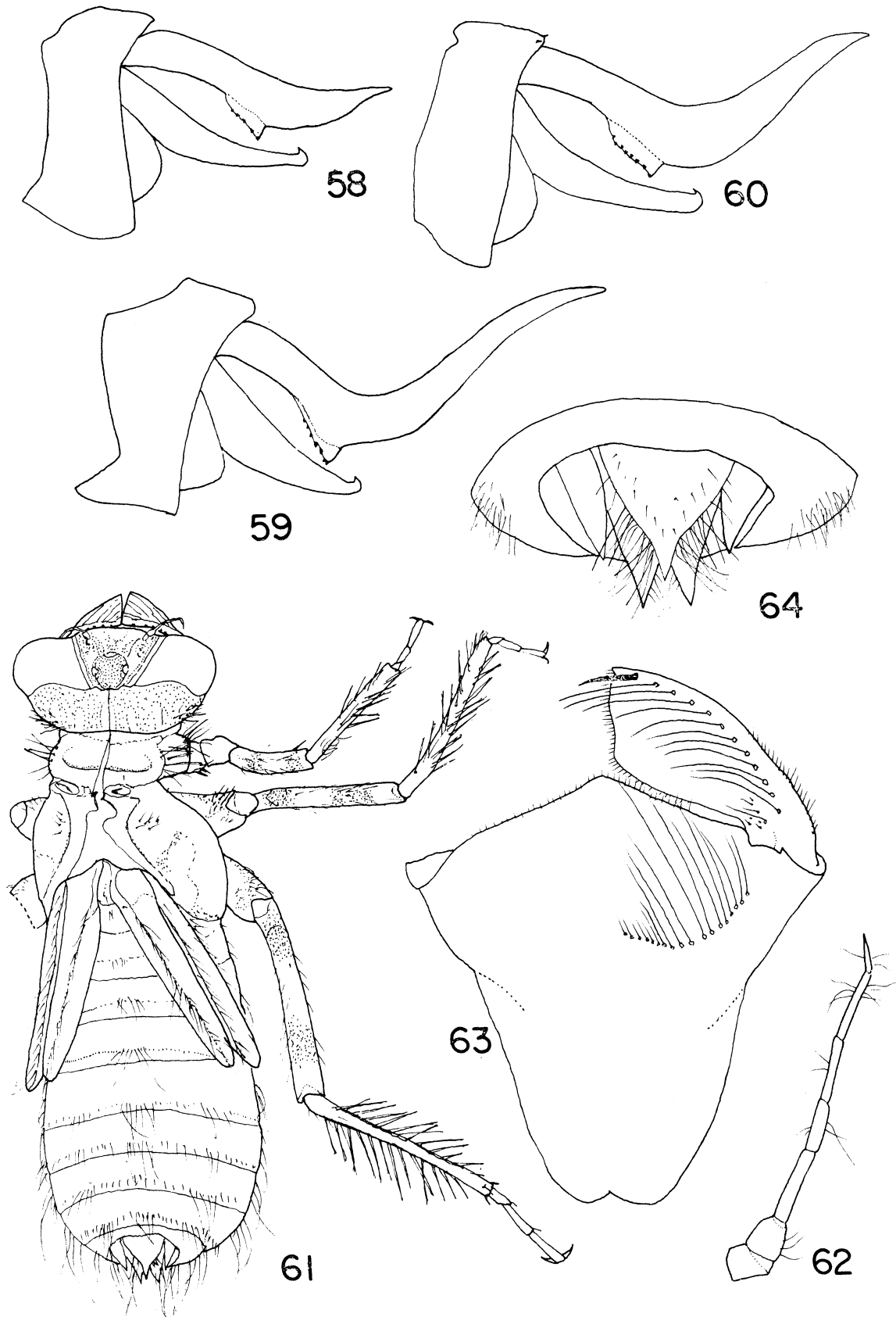


Plate VII: Figures. 58-60. *Anatyia guttata*, male anal appendages, left lateral view. (58) "normalis" form; (59) "guttata" form (both Base Camp); (60) intermediate specimen (Venezuela, Táchira, La Fria). Figures 61-64. *Erythrodiplax amazonica*, male ultimate instar exuviae (61), exuviae, dorsal view; (62) left antenna; (63) labium with right palp, dorsal view; (64) anal pyramid, dorsal view.

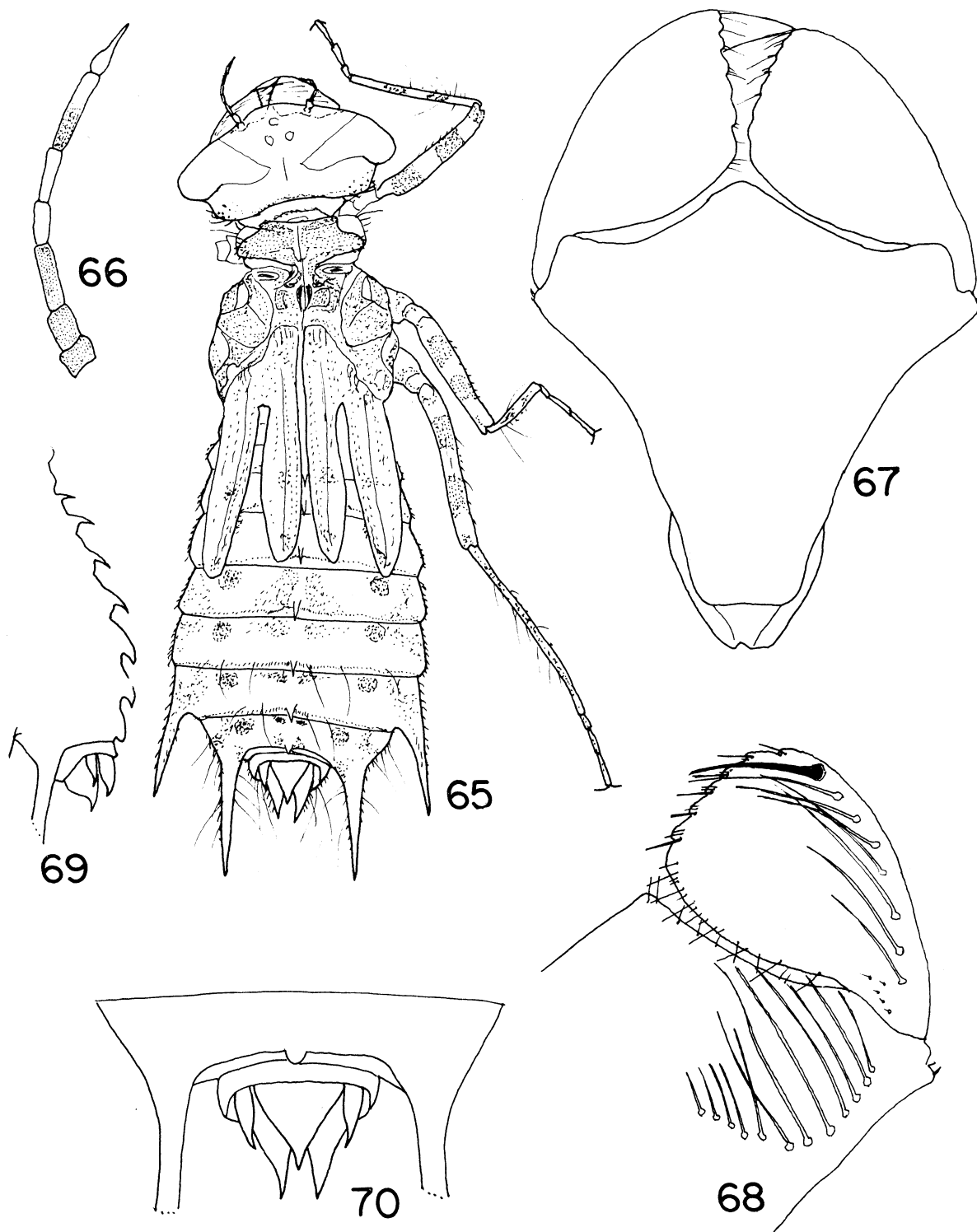


Plate VIII: Figures 65-70. *Fylgia amazonica lychnitina*, male ultimate instar larva. (65) larva, dorsal view; (66) left antenna; (67) labium, ventral view; (68) apical portion of labium with right palp, dorsal view; (69) skyline of abdomen, left lateral view; (70) anal pyramid, dorsal view.

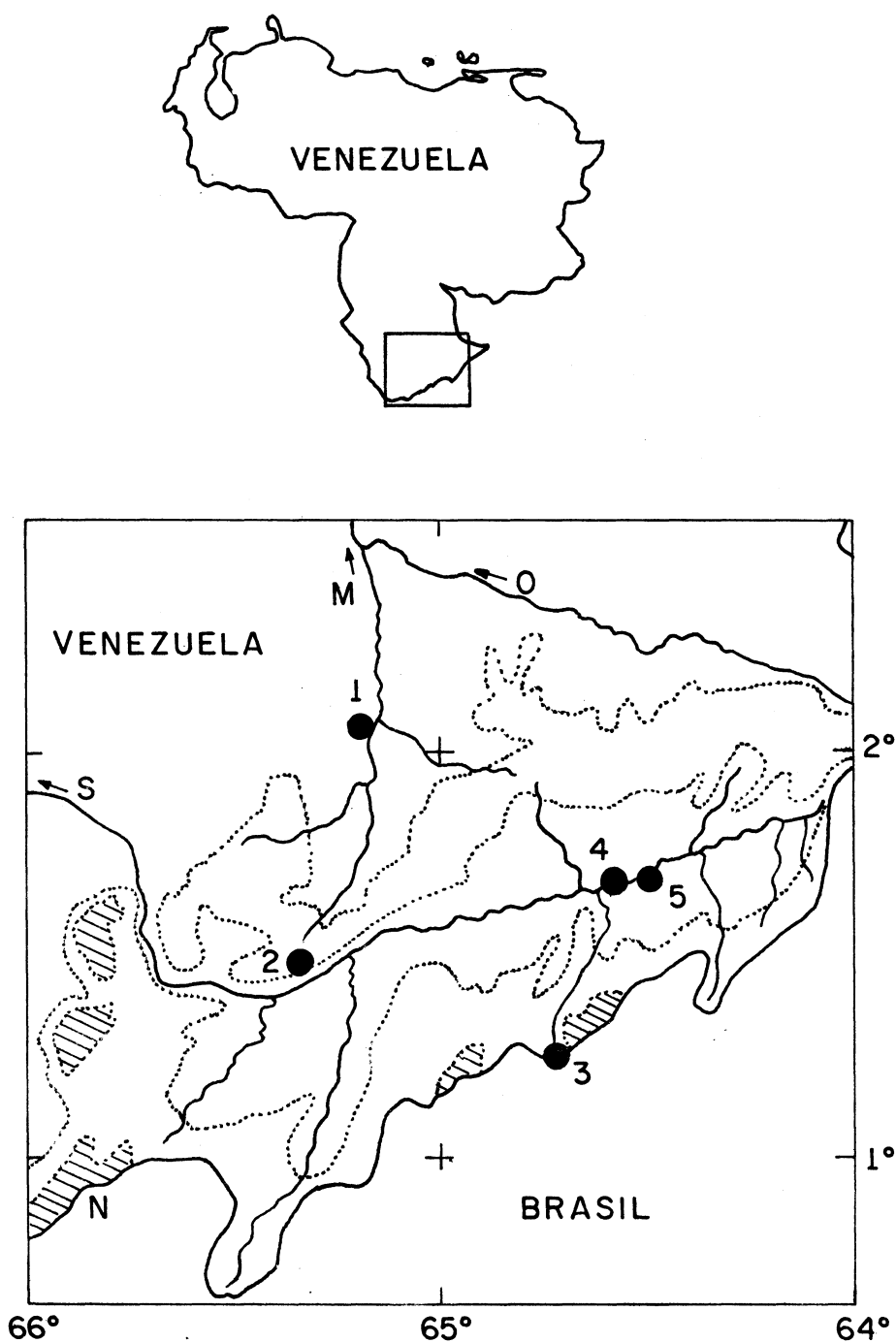


Plate IX: Map 1. Venezuela. Extreme South, on the Brazilian border. (1) Base Camp; (2) Unturán; (3) Tamacuari; (4) Siapa 1; (5) Siapa 2; (M) Río Mavaca; (N) Mt. Neblina; (O) Orinoco; (S) Río Siapa. (dotted line: Mountain ridges with elevations between 500 and 1000 m; hatched areas: 1000 to more than 2000 m).