

FOUR NEW SPECIES OF *PHILOGENIA* DAMSELFLIES FROM
ECUADOR AND COLOMBIA (ZYGOPTERA:
MEGAPODAGRIONIDAE)*

S.W. DUNKLE

Department of Entomology and Nematology, University of Florida,
Gainesville, Florida 32611, United States

Received and Accepted September 17, 1985

P. minteri sp. n. (holotype ♂; Fla St. Coll. Arthropods (FSCA), Gainesville, Florida, USA) is described from 15 ♂ 8 ♀ collected at Limoncocha and Lago Agrio, Napo Province, Ecuador. *P. macuma* sp. n. (holotype ♂; FSCA) is described from Macuma, Santiago Zamora Province, Ecuador. *P. sucra* sp. n. (holotype ♂; United States National Museum, Washinton D.C.) is described from 2 ♂ collected near Sucre, Caqueta Intendencia, Colombia. *P. ebona* sp. n. (holotype ♂; FSCA) is described from near Quibdo, Choco Department, Colombia.

INTRODUCTION

CALVERT (1924) monographed 17 species of the exclusively Neotropical genus *Philogenia*. WESTFALL & CUMMING (1956) added *P. zeteki* and *P. leonora*, and RACENIS (1959) described *P. ferox*. Thus 20 species of *Philogenia* are known, to which the following 4 are added.

PHILOGENIA MINTERI SPEC. NOV.

Figures 1-4

Material. — **Holotype** male: Ecuador, Napo Province, Limoncocha (0.24S, 76.36W) 19 February 1972, leg. D.L. Pearson. Deposited in Florida State Collection of Arthropods (FSCA), Gainesville. **First female** (allotype): same data but collected 24 January 1972, deposited FSCA. — **Paratypes**, all from the above locality: 1 ♂, 18 November 1980, leg. M.J. Westfall, Jr. FSCA; 1 ♂, 5 July 1971, leg. D.L. Pearson, D.R. Paulson Collection (DRP); 1 ♂, 15 February 1972, leg. D.L. Pearson, DRP; 1 ♀, 19 February 1972, leg. D.L. Pearson, DRP; 1 ♂ 1 ♀, 1 March 1972, leg. D.L. Pearson,

* Florida Agricultural Experiment Station Journal Series, number 6708.

DRP; 1 ♂, 23 July 1977, leg. D.R. Paulson, DRP; 1 ♀, 16 August 1972, leg. E.W. Stiles, DRP; 1 ♂, 23 August 1980, leg. S.W. Dunkle, S.W. Dunkle Collection (SWD); 1 ♂ 1 ♀, 28 August 1980, leg. S.W. Dunkle, SWD; 1 ♂, 22 August 1978, leg. K.W. Knopf, K.W. Knopf Collection (KWK); 1 ♂, 23 August 1978, leg. K.W. Knopf, KWK; 1 ♂, 28 August 1978, leg. K.W. Knopf, KWK; 1 ♂, 23 August 1980, leg. K.W. Knopf, KWK; 1 ♂, 24 August 1980, leg. K.W. Knopf, KWK, 2 ♂ 1 ♀, 28 August 1980, leg. K.W. Knopf, KWK; 1 ♀, 29 August 1980, leg. K.W. Knopf, KWK. — Paratype: Ecuador, Napo Province, small stream at town of Lago Agrio, 1 ♀, 18 August 1980, leg. K.W. Knopf, KWK.

Etymology. — This species is named in honor of MINTER J. WESTFALL, Jr, who has contributed so much to our knowledge of Neotropical Odonata, on the occasion of his 70th birthday.

Diagnosis. — Males easily identified by enlarged, deformed-looking tips of paraprocts. Females have lateral projections from hind lobe of prothorax as in *silvarum* Ris, but in lateral view of the prothorax have a less convex anterior lobe and more convex posterior lobe, and in dorsal view more separated bulges on the middle lobe.

Description. — Holotype described below, differences in male paratypes in parentheses.

Head: Labrum, lateral surface of mandible, and adjacent gena pale blue (pale green in life). Antennae, clypeus, frons, and occiput dark brown; vertex mottled with paler brown (clypeus and basal 2 antennal segments pale in juveniles). Rear of head and labium tan. (Eyes in life dark brown above, medium brown below).

Thorax: Prothorax mostly dark brown, tan dorsolaterally (all tan dorsally in well preserved paratypes). Rear edge of posterior lobe with evenly convex slightly raised rim. Mesepisternum medium brown with dark brown mid-dorsal carina, carinae surrounding antealar sinuses, and narrow stripe along humeral suture. A narrow tan stripe next to mid-dorsal carina (may be postmortem change, absent in some paratypes). Mesepimeron, metepisternum, and metepimeron tan with a diffuse dark brown stripe on each. Synthoracic katepisterna dark brown. Under-surface of metepimeron, inter-alar area, and metapleural suture tan with white pruinosity. Legs tan with dark brown carinae and setae (distal femora and proximal tibiae dull blue in well preserved paratypes).

Wing veins and pterostigmata dark brown, tips barely brown. Forewing postnodal crossveins 28-26 (22-28), hindwing postnodals 25-24 (19-26). M2 arises near 8th (7-8) postnodal in forewing, 7th (6-8) in hindwing. Pterostigma with 5-6 (4-7) crossveins posterior to it.

Abdomen: Dark brown with yellow white markings, including a narrow lateral stripe on segments 1-3, and laterobasal spots on 4-8 which are connected ventrally. Segments 9-10 white pruinose dorsally. Cerci in side view bent down 90 deg. at half length, slightly expanded but truncate at tips (Figs 1-2), the medial flange projecting anteriorly more than lateral flange. Paraprocts triangular in side view, nearly as long as cerci, with a deep oblique groove separating tip from basal 3/4. Tip flat dorsally, slightly concave posterodorsolaterally, the surfaces of these 2 planes roughened and meeting in a straight line in dorsomedial view. Proximo-

dorsal margin of paraproct flared posterolaterally, producing a flange visible in lateral but not dorsal view. Penis and hamules as in other *Philogenia* spp.

Measurements (in mm): total length 50 (43-49), abdomen 40 (35-40), hindwing 33 (27-33).

Female. — Allotype described below, differences in female paratypes in parentheses.

Color pattern like male except abdominal segment 9 white, but not pruinose, dorsally. White area separated into 2 spots by a mid-dorsal brown line in allotype and 2 paratypes. Hind lobe of prothorax with bluntly to sharply pointed lateral projection (Figs 3-4) which is bent anteriorly in some paratypes, more so in the one from Lago Agrio. Ovipositor beyond segment 8 about as long as segments 8+9, and projecting a little beyond the paraprocts. Cerci pointed, triangular in outline, and about as long as segment 10. Styli subequal to slightly longer than cerci. Bluntly triangular epiproct in dorsal view projects about 1/4 length of cerci beyond segment 10, the dorsal surface either concave or convex.

Forewing postnodal crossveins 28-26 (23-30), hindwing postnodals 26-25 (23-27). Remainder of venation also like male except M2 arises at postnodal 9 in forewing of 2 paratypes.

Measurements (in mm): total length 44 (41.5-44), abdomen 34 (33-34), hindwing 34 (31-33).

Comparison with female *silvarum*: Identical except for structure of prothorax. In side view the anterior lobe of *minteri* is less convex, the posterior lobe more convex (Fig. 3). In dorsal view the median area between anterior lobe and dorsolateral bulges of middle lobe wider and less v-shaped in *minteri* (compare Figs 4 & 6). The above comparison is based on an examination of 3 of the same female *silvarum* listed by CALVERT (1924). The female epiproct, which CALVERT (1924) implied was characteristic only of *silvarum*, is present in all female *Philogenia* spp. I have seen.

Remarks. — While no pairs of *minteri* have been collected in copulation, I believe the females described above are this species because only this *Philogenia* spp. has been found at Limoncocha by several odonatologists. *P. minteri* has been collected in January, February, March, July, August, and November, and thus probably has an all year flight season in its habitat of relatively uniform climate. Like other *Philogenia* spp., *minteri* perches on vertical stems near the ground with its wings spread, where it is almost invisible in the shady forest undergrowth except for the pale terminal abdominal segments. The lack of teeth on the ovipositor indicates that female *Philogenia* spp. oviposit in soil or another soft substrate.

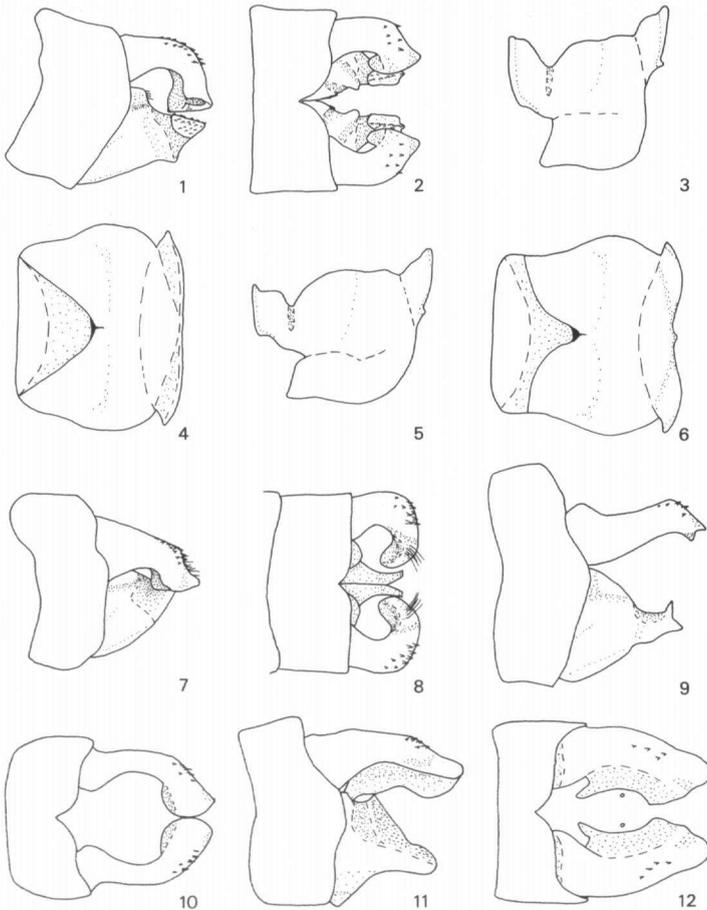
PHILOGENIA MACUMA SPEC. NOV.

Figures 7-8

Material. — Holotype male: Ecuador, Santiago Zamora Province, Macuma (2.09S, 77.42W) on forest trail at 867 m, 2 February 1972, leg. D.L. Pearson. Deposited in Florida State Collection of Arthropods, Gainesville.

Etymology. — Named for collection locality of holotype.

Diagnosis. — Male identified by combination of cerci bent sharply down-



Figs 1-12. Structures of *Philogenia* spp., drawn at 50X, in left lateral and dorsal views. — Figs 3-6: female prothorax, — other Figs: male abdominal segment 10 and appendages: (1-2) *P. minteri* sp. n., holotype male; — (3-4) *P. minteri*, allotype female; — (5-6) *P. silvarum*, from Campamiento, Peru; — (7-8) *P. macuma* sp. n., holotype male (tips of paraprocts partly concealed in 7); — (9-10) *P. sucra* sp. n., holotype male, specimen slightly compressed vertically (paraprocts not shown in 10); — (11-12) *P. ebona* sp. n., holotype male, proximo-dorsal tooth of medial flange concealed (paraprocts not shown in 12 except that the o indicates the position of the tip of the dorsal tooth of the paraproct).

ward and truncate at tips, with tapered and pointed paraprocts. Female unknown.

Description of male. — Identical to *P. minteri* except for abdominal appendages. Forewing postnodal crossveins 29-28, hindwing postnodals 23-26. M2

arises near 8th postnodal in forewing, 7th in hindwing. Pterostigma has 5-6 crossveins posterior to it.

Cerci as in *minteri* but more forcipate, thus appearing less bent in lateral view (Figs 7-8). Paraprocts in lateral view 3/4 as long as cerci, lacking oblique lateral groove of *minteri*, but with a shelf probably homologous to proximal side of groove of *minteri*. Paraprocts slightly divergent with truncate, slightly up-curved, chisel-like tips, not expanded at tips as in *minteri*. Dorsolateral edges of paraprocts flared posterolaterally, producing flanges visible between bases of cerci in dorsal view (Fig. 8). Hamules and penis as in other *Philogenia* spp.

Measurements (in mm): total length 47, abdomen 38, hindwing 32.5.

PHILOGENIA SUCRA SPEC. NOV.

Figures 9-10

Material. — **Holotype** male: Colombia, Caqueta Intendencia, near Sucre (1.47N, 75.39W) at km 35 (road unknown), 24 January 1969, leg. W.D. Duckworth and R.E. Dietz. Deposited in United States National Museum (USNM), Washington D.C. — **Paratype** male: Same data except collected at km 21, deposited USNM.

Etymology. — Named for the town of Sucre, near the type locality.

Diagnosis. — Male distinguished by shape of abdominal appendages, the cerci forcipate, the paraprocts bifid. In addition, few other *Philogenia* spp. lack black mesepimeral and metepimeral stripes. Female unknown.

Description of male. — Holotype described below, differences in paratype in parentheses.

Head: Labrum, lateral surface of mandible, and adjacent gena pale blue. Flagellum of antennae, clypeus, frons, and occiput dark brown, vertex medium brown. Basal 2 segments of antennae, rear of head, and labium tan.

Thorax: Mostly medium brown with black mid-dorsal carina, carinae of alary sinus, dorsal carinae, and upper end of humeral suture. Sides of prothorax, mesokatepisternum, and mesepimeron below level of metaspiracle, black, and metepisternum with a black stripe. Thus each side of thorax appears brown with a black stripe which is narrow near base of hindwing, but which widens downward and forward to the head, and is interrupted just anterior to metaspiracle. Underside of thorax tan, lightly white pruinose. Posterior lobe of prothorax with an evenly convex narrow rim. Legs tan with darker brown carinae and setae.

Wings veins and pterostigmata dark brown, membrane barely brown at tips. Forewing postnodal crossveins 24-26 (22-23), hindwing postnodals 22 (21-20). M2 arises near 6th postnodal in forewing, 6th (7-5) in hindwing. Pterostigma has 4 (5) crossveins posterior to it. Arculus lies distal to 2nd antenodal crossvein at distance equal to upper limb of arculus.

Abdomen: Brown with yellow white markings, including a narrow lateral stripe on segments 1-3, and laterobasal spots on 4-8 which are connected

ventrally. Segments 9-10 white pruinose dorsally. Cerci in dorsal view forcipate, with distal third bent medially and downward, widened and rounded at tip (Figs 9-10), the medioanterior surface distal to bend flattened in vertical plane. In ventrolateral view tip truncate as in *mazuma*, and distoposterior edge projects downward in a fingernail-like flange (the latter can be seen in Fig. 9). Paraprocts in lateral view as long as cerci, wide at base, becoming narrow in distal half, with a large dorsal subapical tooth, appearing bifid. In ventral view tip of paraproct ends in a lateroposterior point (lower tooth of Fig. 9). Dorsolateral edge of basal half of paraproct appears undulate in both lateral and posterior views. Hamules and penis as in other *Philogenia* spp.

Measurements (in mm): total length 51 (53), abdomen 41 (43), hindwing 32.5 (34).

PHILOGENIA EBONA SPEC. NOV.

Figures 11-12

Material. — **Holotype** male: Colombia, Choco Department, 11 km east of the reten (military reserve) at Quibdo (5.42N, 76.40W) on the road to Bogotá at km 205, 21 January 1972, leg. Woodruff W. Benson. Deposited in the Florida State Collection of Arthropods, Gainesville. The original label states "11 km E of Reten at Quibdo, Col, km post 205", from which the above location was deduced by D.R. Paulson. This locality is on the Pacific slope.

Etymology. — This species is named for its predominantly ebony-black coloration.

Diagnosis. — Male abdominal appendages distinctive, each cercus with 2 large tooth-like angles projecting anteriorly, each paraproct with a large triangular dorsal tooth. Synthoracic coloration also distinctive, mostly black with a large oval brown spot on the anterior 2/3 of each mesepisternum.

Description of male. — Head: Labrum, lateral surface of mandible, adjacent gena, and clypeus tan (probably pale green or blue in life). Frons, vertex, and occiput black with a narrow brown stripe from each lateral ocellus to nearest antennal base. Antennae dark brown, rear of head tan, labium black.

Thorax: Mostly black. Prothorax with a pair of round brown dorsolateral spots on anterior lobe, its posterior lobe straight-edged posteriorly and with small tooth-like angles laterally. Lower 2/3 of mesepisternum covered by large oval orange brown spot. Lateral synthoracic sutures with narrow tan stripes. Under-surface of metepimera tan, lightly white pruinose, with a pair of large diffuse black spots. Forelegs black with anterior and medial surfaces of femora tan. Middle and hind legs tan with black lateral and medial surfaces of femora, medial surface of tibiae, and tarsi.

Wing veins and pterostigmata dark brown, tips barely brown. Forewing postnodal crossveins 31, hindwing postnodals 30-27. M2 arises near 9th postnodal in forewings, between 8-9 in hindwings. Arculus just distal to 2nd antenodal crossveins.

Abdomen: Black with small round basolateral pale spots on segments 4-7.

Segments 9-10 slightly pruinose laterally but not dorsally (pruinosity possibly dissolved by grease). Cerci in dorsal view slightly incurved with slightly notched outline on medial side near tip (Fig. 12). Cerci concave on both lateral and medial edges in lateral view (Fig. 11). In mediiodorsal view, medial edge projects far ventrally in sagittal plane, and has an upturned tooth-like pointed proximo-dorsal angle which nearly touches shaft of cercus. Visible in dorsal view, and partly in lateral view, on medial flange is another long blunt tooth-like proximo-ventral projection. Paraprocts nearly as long as cerci, in ventral view parallel-sided with bluntly pointed laterodistal angles. Distal halves of paraprocts flattened in ventrolateral to dorsomedial plane, thus planes of the 2 paraprocts lie perpendicular to each other. Mediiodorsal edge of paraproct knife-edged, forming a large dorsal triangular tooth-like angle at about half paraproct length. This tooth lies in the sagittal plane and is prominent in lateral view. Dorsolateral surface of tooth and knife-edge posterior to it finely reticulate-roughened.

Measurements (in mm): total length 43, abdomen 34, hindwing 29.

DISCUSSION

As CALVERT (1924) has pointed out, *Philogenia* spp. are remarkably similar in coloration and structure, except that they are equally remarkably diverse in the shape of the male abdominal appendages. The new species, like other *Philogenia* spp., are best identified by comparing the male abdominal appendages or female prothorax with available figures, although CALVERT (1924) presented keys based mostly on those structures. In those keys, male *macuma* and male *minteri* do not key out properly to any species. Male *sucra* key to *cristalina* Calvert, and male *ebona* key to *augusti* Calvert. Female *minteri* key to *silvarum*, not a closely related species based on the shape of the male abdominal appendages.

Philogenia macuma perhaps evolved from an ancestor like *berenice* Hagen, which has the least complex male abdominal appendages in the genus, by bending the distal half of the cerci downward. *P. minteri* could have been derived from *macuma* by bending the cerci further downward and expanding the tips of the paraprocts.

P. sucra could have evolved from *berenice* by developing a dorsal tooth on each paraproct. The male abdominal appendages of *cristalina* are also similar to those of *sucra*, but have smaller, more proximal teeth on the paraprocts. *P. sucra* may also be related to *polyxena* Calvert and *cassandra* Hagen, because these three species lack mesepimeral and metepimeral black stripes.

P. ebona, like many other *Philogenia* spp., has an enlarged medial flange on each cercus. *P. ebona* could have evolved from *augusti* by enlarging the proximal teeth on the medial flange of the cerci, blunting the paraprocts and enlarging the dorsal tooth on them, and expanding the black thoracic coloration.

ACKNOWLEDGEMENTS

The loan of specimens by KENNETH W. KNOFF, OLIVER S. FLINT, MICHAEL L. MAY, and DENNIS R. PAULSON is very greatly appreciated, and I thank ROSSER W. GARRISON for suggesting numerous beneficial changes in the manuscript.

REFERENCES

- CALVERT, P.P., 1924. The generic characters and the species of *Philogenia* Selys (Odonata: Agrionidae). *Trans. Am. ent. Soc.* 50: 1-56.
- RACENIS, J., 1959. Notas taxonomicas sobre la familia Megapodagrionidae (Odonata: Zygoptera) con la sinopsis de la especies Venezolanas. *Acta biol. venez.* 2: 335-367.
- WESTFALL, M.J. & R.B. CUMMING, 1956. Two new species of *Philogenia* from the Panama Canal Zone (Odonata: Coenagriidae). *Bull. Fla. St. Mus.* 1: 241-252.