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TWO NEW SPECIES OF *SANTOSIA* COSTA & SANTOS, 1992 WITH A DESCRIPTION OF FIVE NEW CORDULIID LARVAE (ANISOPTERA: CORDULIIDAE)

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S. machadoi sp.n. (holotype ♂: Parque Nacional da Serra da Bocaina, São Paulo, Brazil; 25-II-1977) and *S. newtoni* sp.n. (holotype ♂: Brejo da Lapa, Itatiaia, Rio de Janeiro, Brazil; 19-II-1974) are described and illustrated along with their exuviae. The exuviae of *Aeschnosoma marizae* Santos, *Neocordulia androgynis* (Sel.) and *N. setifera* (Hag.) are also described and illustrated for the first time. The known *Santosia* spp. and the neotropical corduliid larvae are keyed.

INTRODUCTION

COSTA & SANTOS (1992) described the genus *Santosia* based on a single male from Nova Friburgo, Rio de Janeiro, Brazil. It is well known that the Corduliidae is sparsely represented in the neotropical region, with 36 species, as well as sparsely represented in collections. Thus, the neotropical species have not been well studied. In the last fifteen years DE MARMELS (1983, 1989, 1991), COSTA & SANTOS (1992) and MACHADO & COSTA (1995) have increased our knowledge of the discovered species. Biological data are also quite scarce. Of these 36 species, 9 are now known in their larval stages.

On 13-I-1953, on Planalto de Itatiaia at 2400 m, Santos and his group collected specimens identified as "Corduliidae genero?". In 19-II-1974, Santos collected from Itatiaia, Brejo da Lapa at 2200 m altitude, a male corduliid larva. This specimen was raised in the laboratory by Santos. All of the specimens were recognized as a new species and are described here.

On 25-II-1977, Santos & Costa collected on Serra da Bocaina, São Paulo at an altitude of 1800 m in a small stream originating from a waterfall, a corduliid larva.

This specimen was fed and kept alive in the laboratory for 3 days by Santos. Near a waterfall, 6 adulte male specimens were collected on the same day. These specimens have now been determined as belonging to a second undescribed species of *Santosia*.

On 22-XI-1979 Santos and his group collected from the Rio Mambucaba at approximately 1000 m, near Parque Nacional da Serra da Bocaina headquarters, RJ, 3 corduliid larvae, raised and identified by Santos as *Neocordulia setifera*.

On 24/25-X-1980 and 5-II-1981 Santos and his group collected from Goias in a small creek with approximately 2.00 m width and little sparse marginal vegetation, larvae of *Aeschnosoma*, identified by us as *A. marizae*. These larvae were identified as *Aeschnosoma* according to the characters cited by GEIJSKES (1970) and determination of the species *A. marizae* was by elimination of the other known larvae described by him (*A. forcipula* and *A. auripennis*) and supported by adults collected at the same site and date.

DESCRIPTIONS OF NEW SPECIES

SANTOSIA MACHADOI SP. NOV.

Figures 1-3, 7

M a t e r i a l. – **Holotype** ♂: BRAZIL, São Paulo, Parque Nacional da Serra da Bocaina, alt. 1800 m, 25-II-1977, N.D.Santos & J.M.Costa leg.; – 5 **paratypes** with date as the holotype, and 2 paratypes from the same place and collector, dated 18-II-1977. Deposited in the Museu Nacional, Rio de Janeiro, Brazil.

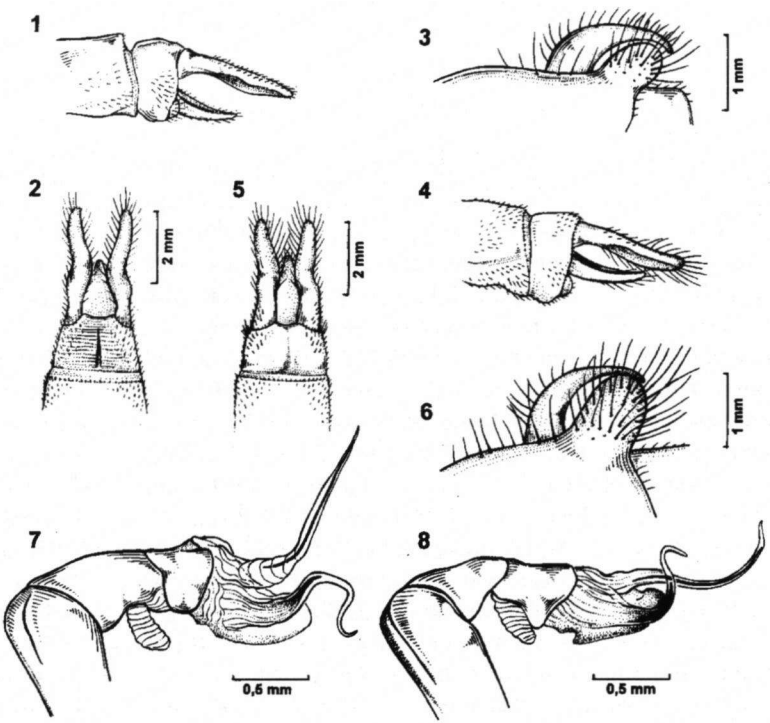
E t y m o l o g y. – We dedicate this species to Professor Dr Angelo Barbosa Monteiro M a c h a d o in recognition of his relevant contributions to odonatology in Brazil.

MALE (**holotype**). – H e a d. – Vertex dark brown with metallic green luster; frons ferrugineous with metallic green reflections and reddish at the base; top of frons with 2 tubercles, separated by a short deep central furrow; postclypeus and anteclypeus brown with slight gloss; labrum and labium light brown; occipital triangle large; head, except the eyes, with a golden pilosity, light in labial area.

T h o r a x. – Prothorax light brown. Synthorax light brown with greenish reflections and golden pilosity. Legs brown; femur II and III with short spines, serrate; second pair of tibiae with keels; wings hyaline, yellowish; distal end of anal area angulate; triangle of forewing crossed but that of hindwing not crossed; supratriangle on fore- and hindwings not crossed; subtriangle of forewing with 3 cells and of hindwing 1 cell; triangle of forewing coinciding with the 3rd antenodal vein and in hindwing at arculus origin, between the first and second antenodal veins; sectors of arculus of forewings and hindwings diverging at origin; one cell between distal end of anal loop and hind margin of wing; basilar space on fore- and hindwings free; 1 cubito-anal cross vein (Cu-a) on all wings, except 2 on some specimens; M_3 and M_4 not undulate; discoidal field of forewing parallel sided,

slightly narrowed at the distal end, with 2 rows of cells in the median region and with 3 rows of cells at level of the nodus, passing to 2 rows and finishing with 3 rows of cells; MSPL with 5 cells on all wings; RSPL with 9 cells on forewings and 7 cells on hindwings; anal area beginning with 1 cell, totaling 18 cells until distal end of anal loop; anal triangle with 2 cells; proximal side of anal triangle less of half of costal side, the basal cell with more than 2/3 of triangle; membranule dark brown, light on the proximal side; arculus between the 1st and 2nd antenodals on all wings but proximal to the 2nd on some specimens; 8 antenodals on forewings and 5 on hindwings; 7 postnodals on forewings and 9 on hindwings (10 postnodals on some specimens); anal loop elongate, not truncate, with 2 rows of cells at the anal base and 4 at distal end, totaling 16 cells; distal end of anal loop at level of middle fork of M; 1 accessory bridge on all wings; IR_2 beginning at distal end of pterostigma on all wings.

A b d o m e n. – Dark brown with metallic luster on segments 1-3; in dorsal view slightly swollen at segments 1-2; segments 7-10 cylindrical. Superior appendages



Figures 1-3 and 7: *Santosia machadoi* sp.n.: (1) terminal appendages, lateral view; – (2) terminal appendages, dorsal view; – (3) genitalia of 2nd abdominal segment; – (7) penis. – Figures 4-6 and 8: *Santosia newtoni* sp.n.: (4) terminal appendages, lateral view; – (5) terminal appendages, dorsal view; – (6) genitalia of 2nd abdominal segment; – (8) penis.

with the proximal (carinated) part about as long as the distal (non-carinated) part, with a large ventro-lateral concave at midlength (Figs 1, 2); inferior appendages about as long as the proximal (carinated) part. Genitalia of 2nd segment (Fig. 3) with small anterior lamina, not visible laterally; hamules strongly incurved, exceeding the genital lobe end, equidistant; genital lobe rounded forming an angle, of approximately 60° at its base; auricles small, rounded; penis as in Figure 7.

Measurements (in mm). – Total length (including appendages) 55; abdomen 40; forewing length 35; forewing width (at level of nodus) 13; hindwing length 35; hindwing width (at level of nodus) 15; superior appendage length 3; inferior appendage length 1.5; pterostigma length 2.

FEMALE unknown.

SANTOSIA NEWTONI SP. NOV.

Figures 4-6, 8

Material. – **Holotype** ♂: BRAZIL, Rio de Janeiro, Itatiaia, Brejo da Lapa, alt. 2200 m, 19-II-1974, N.D.Santos leg. Adult emergence in the laboratory. – **Paratypes**: 1 ♂, Planalto do Itatiaia (Represa a 2400 m), 13-I-1953, N.D.Santos, J.P.Machado, A.L.Castro and L.Travassos leg.; 1 ♂, Teresópolis, Lago do Saldanha, 14-III-1966, N.D.Santos leg. Holotype and paratype deposited in the Museu Nacional do Rio de Janeiro, Brazil.

Etymology. – We dedicate this species "in memoriam" to Professor Dr Newton Dias dos Santos in recognition of the rich odonatological collection of the Museu Nacional started by him.

MALE (**holotype**). – Head. – Vertex light brown with metallic blue luster; frons ferrugineous with metallic blue; top of frons with 2 tubercles, separated by a deep, central furrow; postclypeus and anteclypeus with metallic luster; labrum and labium light brown; occipital triangle large; head, except the eyes, with a golden pilosity.

Thorax. – Prothorax yellowish brown. Synthorax yellowish brown with blue metallic reflections and white pilosity. Legs brown; femur II and III with short spines, serrate; second pair of tibiae with keels. Wings hyaline; distal end of anal area angulated; triangle of forewing crossed but that of hindwing not crossed; supratriangle on fore- and hindwings not crossed; subtriangle of forewing with 3 cells and of hindwing free; sectors of arculus of forewings and hindwings diverging at origin; one cell between distal end of anal loop and hind margin of wing; basilar space on fore- and hindwings free; 1-2 cubital-anal cross vein (Cu-a) on forewings, 2 on hindwings; M_3 and M_4 not undulate; discoidal field of forewing parallel sided, slightly narrowed at the distal end, with 2 rows of cells in the median region and with 3 rows of cells at level of the nodus, passing to 2 rows and finishing with 3 rows of cells; MSPL with 5 cells on all wings; RSPL with 9 cells on the forewing and 7 cells on the hindwing; anal area beginning with one cell, totaling 18 cells until distal end of anal loop; anal triangle with 2 cells; proximal side of anal triangle less than half of costal side, the basal cell with more than 2/3 of triangle; membranule dark brown, light on the proximal side; arculus between the 1st and 2nd antenodals on all wings; 7 antenodals on left forewing and 8 on right wing; 5 antenodals on hindwings; 7 postnodals on forewings and 8 on hindwings; anal loop elongate, not

truncate, with 2 rows of cells on the anal base and 3 at distal end, totaling 16 cells; distal end of anal loop at level of middle fork of M; 1 accessory bridge on all wings; IR_2 beginning at distal end of pterostigma on all wings.

A b d o m e n. – Dark brown with metallic luster on segments 1-3; in dorsal view slightly swollen at segments 1-2; segments 7-10 cilindrical. Superior appendages (Figs 4, 5) as *S. machadoi* but with a small ventral-lateral concavity at midlength; inferior appendages (Figs 4, 5) distinctly longer than the proximal (carinated) part; frons with bluish reflections and synthorax with bluish and greenish reflections. Genitalia of 2nd segment (Fig. 6) with small anterior lamina not visible laterally; hamules incurved and equidistant; genital lobe rounded, forming an angle, of approximately 60° at its base (Fig. 6); auricles small, rounded; penis as in Figure 8.

M e a s u r e m e n t s (in mm). – Total length (including appendages) 57; abdomen 40; forewing length 35; forewing width (at level of nodus) 13; hindwing length 34; hindwing width (at level of nodus) 15; superior appendage length 2.8; inferior appendage length 1.8; pterostigma length 2.

FEMALE unknown.

SPECIES KEY TO *SANTOSIA*

1. Abdominal segments 7-10 flattened; superior appendages as long as segments 9+10; frons and synthorax with only bluish reflections ..... ***marshalli***
– Abdominal segments 7-10 cylindrical; superior appendages slightly longer than segments 9+10; frons and / or synthorax with greenish reflections 2
2. Superior appendages with the proximal (carinated) part about as long as the distal (non-carinated) one, with a large ventral-lateral concave at midlength; inferior appendages about as long as the proximal (carinated) part; frons and synthorax with greenish reflections ..... ***machadoi* sp. n.**
– Superior appendages as *S. machadoi* but with a small ventrolateral concavity at midlength; inferior appendages distinctly longer than the proximal (carinated) part; frons with bluish reflections and synthorax with bluish and greenish reflections ..... ***newtoni* sp. n.**

DESCRIPTIONS OF LARVAE

AESCHNOSOMA MARIZAE SANTOS, 1981
Figures 9-16

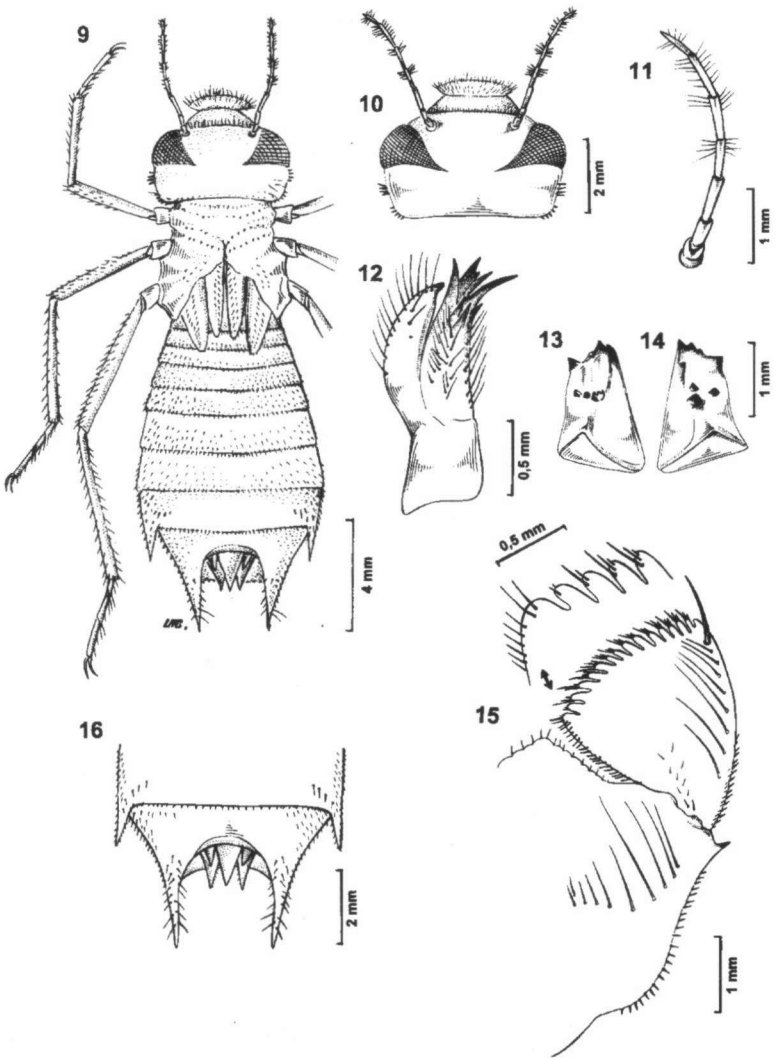
M a t e r i a l. – BRAZIL, Goiás, Brasília, Distrito Federal, Reserva Ecológica (IBGE), Pomar, 2 ♂, 24-X-1980; 1 ♂, 25-X-1980; 5 ♂, 5-II-1981, N.D.Santos, L.F.Reys Netto & H.Mesquita leg.

General coloration light brown.

H e a d. – Small, wider than long, widest across the eyes (Figs 9, 10), these small and rounded at the outer margin, but acutely pointed forward the middle. Between the bases of antennae a sharp ridge, armed forward with more than 25 long setae (Fig. 9) arranged in one group only. Occiput rounded, posterior margin straight; at the hind corners on each side a process with five short claw-like setae and, nearer to the eyes, another row of such setae (Fig. 10). Antennae (Fig. 11) seven-jointed, scapus slightly shorter than pedicellus, the following joints of flagellum of about

equal length, the 6th joint is the longest.

Mouth parts. – Labrum simple (Fig. 10), rectangular, fringed with long hairs. Right mandible (Fig. 14) with 5 teeth on distal end and 3 teeth on inner face. Left mandible (Fig. 13) with 4 teeth on distal end and with 3 teeth on inner face, the biggest one with 3 "kernels" at the upper side. Left and right maxillae (Fig. 12)



Figures 9-16. *Aeschnosoma marizae*, larva: (9) general aspect, dorsal view; – (10) head; – (11) antennae; – (12) maxillae; – (13) left mandible; – (14) right mandible; – (15) labium; – (16) abdominal segments 8-10.

with 7 large teeth on top of inner lobe (lacinia) followed by a row of 9 larger spines and some long hairs; outer lobe (galea) pointed at the end, outer side beset with many long bristle-like hairs. Labium with prementum rectangular (Fig. 15), inner side with 10 setae each side, the 4th marginal setae the longest; side margins of prementum each with more 20 short claw-like spines from base to 2/3 of its length; at each distal end, just under base of lateral lobe, there is a small triangular tooth. Median lobe of prementum high and prominent, the steep sides beset with low crenulations along the margins and intermittent small spines, of which there are 2 on top. Lateral lobe broad triangular, 8 long setae along inner side of lateral margin and on its outer margin there is one row of small spines; a relatively short movable hook and on the outer margin 14 crenulations about twice as high as wide; on top of each one 2-3 spines. Inner margins with a number of long flat setae (about 20). At base of lobe there are 10 short setae.

T h o r a x. – Finely fringed with a row of short spine-like hairs at long upper and lateral margins of pro-, meso- and metathorax. Wingpads parallel, with rows of short setae over the many veins, tips reaching backward to base of abdomen segment 3. Legs long. Femur and tibiae with short triangular spines, these more numerous on hind tibia than on middle and fore tibia; tarsus on the underside of the three joints a double row of simple setae. Claws long and simple.

A b d o m e n. – Longer than wide, slightly wider on segment 7 (Fig. 9). Dorsal – lateral side of abdominal segments 1-7 provided with many short spines; no dorsal hooks; transversal carina on segments 1-8 with short spines; segment 10 very short (Figs 9, 10); lateral spines present on segments 8-9 (Figs 9, 16); lateral spine on segment 8 about as long as middorsal length of segment 9+10; lateral spine on segment 9 distinctly longer than middorsal of segment 9+10. Appendages short, triangular, pointed; cerci distinctly shorter than the paraprocts and these as long as the epiproct (Fig. 16).

M e a s u r e m e n t s (in mm). – Total length 17.3; maximum width of head across the eyes 4.5; maximum width of abdomen (segm. 7) 6.0; length abdomen + appendages 12.0; length lateral spines on abdomen segment 8 1.0; length lateral spines on abdomen segment 9 2.0; antennae: scapus 0.1; pedicellus 0.1; flagellum 3.2; femur I 3.3; femur II 3.7; femur III 4.6: tibia I 2.6; tibia II 4.0; tibia III 5.3; tarsus I 2.0; tarsus II 2.2; tarsus III 2.6.

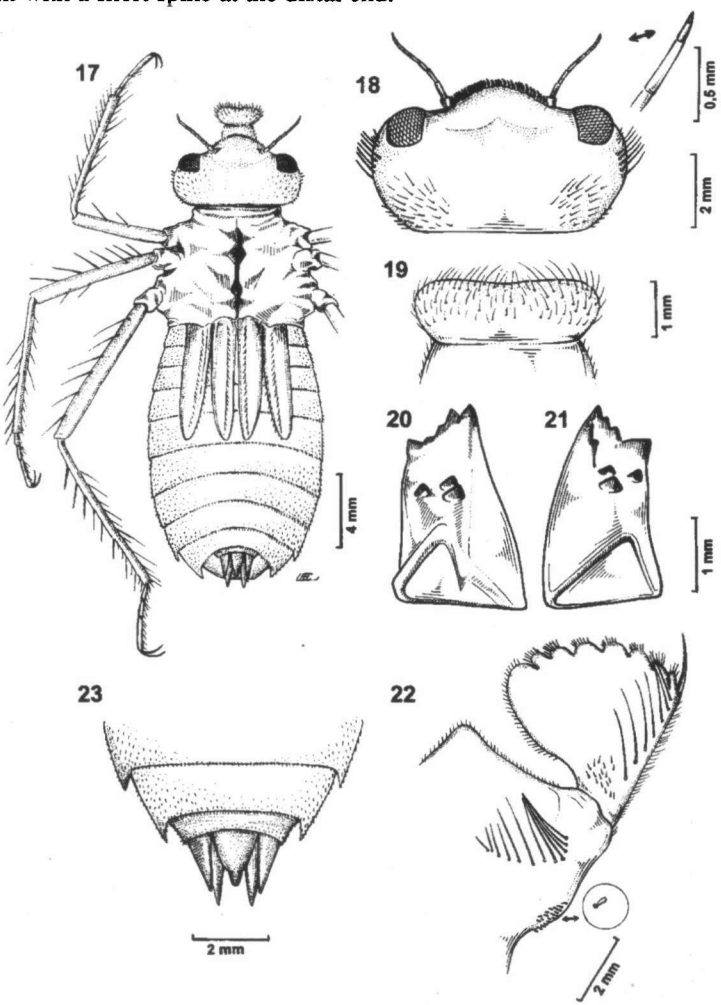
REMARKS. – This description was based on young specimens.

NEOCORDULIA ANDROGYNIS (SELYS, 1875)
Figures 17-23

M a t e r i a l. – BRAZIL, Minas Gerais, Serra do Cipó, 1♂ (raised in laboratory), 1-XI-1983, A. Brás leg., emerged on 14-XI-1983, identified by A.B.M. Machado; – Rio de Janeiro, Parque Nacional da Serra da Bocaina, rio Mambucaba, 2 ♂, 22-XI-1979, N.D.Santos, L.F.Reys Netto & S.M.Pereira leg. (nº 1388); same place, 1♂, 2-IV-1980, same leg. (nº 344); same place, 1 ♂, 22-XI-1979, same leg. (nº 1552); Goiás, Brasília, 1♂, 10-II-1981, N.D.Santos, L.F.Reys Netto & H.Mesquita leg. (nº 635); Mato Grosso, Chapada dos Guimarães, 1♂, 14-VII-1983, L.F.Reys Netto leg. (nº 273).

General coloration dark brown.

H e a d. – Small, wider than long, widest across the eyes (Figs 17, 18), these small and rounded at the outer margin, but slightly pointed inward. Between the bases of antennae a sharp ridge, armed with more than 25 short flat forward directed setae. Occiput rounded, rear slightly concave; at the hind corners on each side there are more than 20 long setae and nearer the eyes there are many setae (Fig. 18). Antennae seven-jointed, scapus as long as the pedicellus, the first joint of flagellum is the longer, the following joint of flagellum of about equal length; the last joint with a short spine at the distal end.



Figures 17-23. *Neocordulia androgynis*, larva: (17) general aspect, dorsal view; – (18) head; – (19) labrum; – (20) left mandible; – (21) right mandible; – (22) labium; – (23) abdominal segments 8-10.

Mouth parts. – Labrum simple (Fig.18), rectangular, fringed with long hairs. Right mandible (Fig. 21): distal end with 5 teeth and inside with 3 pointed teeth. Left mandible (Fig. 20) with 4 teeth at distal end and 3 teeth on inner side. Maxillae absent. Labium with prementum rectangular (Fig. 22), inner side with 12 setae on each side, the 7th marginal setae the longest; side margins of prementum each with more than 15 short flat setae from base to 3/4 of its length. Median lobe of prementum high and prominent, the steep sides beset with low crenulations along the margins and intermittent small spines, but larger than in *A. marizae*. There are 15 small spines on median side between the margin of prementum and the base of setae. Lateral lobe broad triangular, 7 long setae along inner side of lateral margin; a relatively short movable hook and on the outer margin 7 crenulations as high as wide; on top of each one 6-8 spines. Inner margin with a number of spine-like setae (about 20). At base of lobe there are 18 short setae.

T h o r a x. – Prothorax rectangular, smaller than rear margin of head, and there is one small tubercle on each lateral side; meso- and metathorax without spines. Wingpads parallel, with rows of short setae over the many veins, tips reaching backward to bases of abdomen segment 5. Legs long. Femur and tibiae with long spines; these more numerous on hind tibia than on middle and fore tibia; tarsus on the underside of the three joints a double row of simple setae. Claws long and simple.

A b d o m e n. – Longer than wide, slightly widest on segment 5 (Fig. 17). Dorso--lateral side of abdominal segments 1-10 without setae; no dorsal hooks; transverse carina on segments 1-10 with short spines; segment 10 very short (Fig. 23) and concentrated on the dorso-distal end of segment 9; lateral spines present on segments 8-9 (Fig. 23), these very short. Appendages short triangular, pointed; epiproct triangular with distal end truncated, distinctly shorter than the cerci and these slightly shorter than the paraprocts (Fig. 23).

M e a s u r e m e n t s (in mm). – Total length 23.0; maximum width of head across the eyes 6.0; maximum width of abdomen (segm. 5) 9.0; length abdomen + appendages 14.0; length lateral spines on abdomen segment 8 0.5; length lateral spines on abdomen segment 9 0.5; antennae: scapus 0.1; pedicellus 0.3; flagellum 2.0; femur I 4.0; femur II 6.0; femur III 8.0: tibia I 6.0; tibia II 7.0; tibia III 8.0; tarsus I 3.0; tarsus II 3.0; tarsus III 3.4.

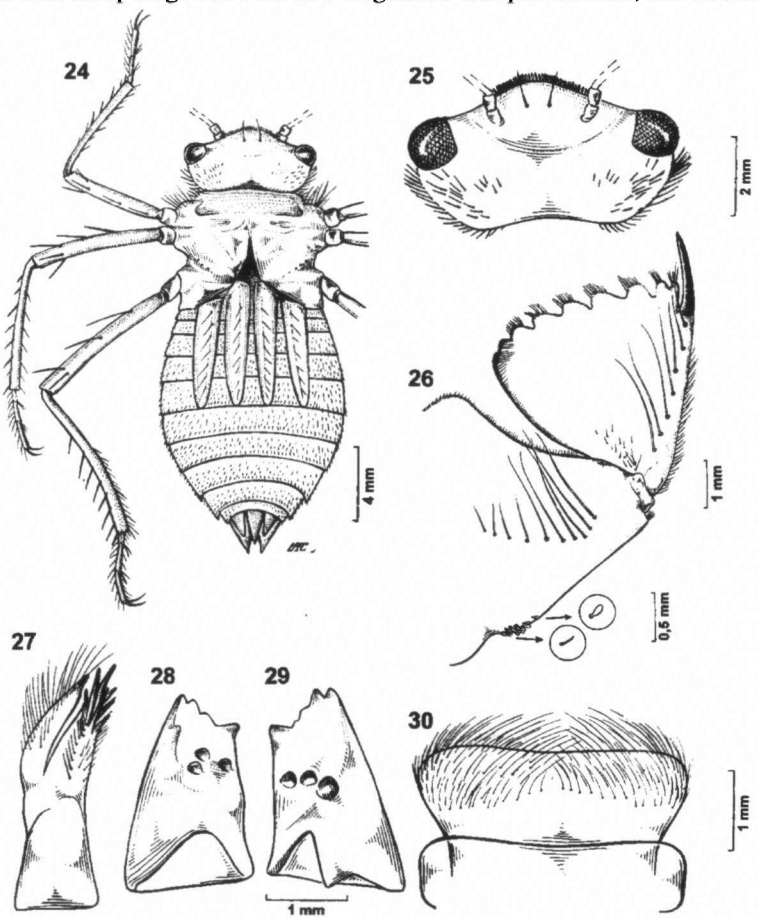
NEOCORDULIA SETIFERA (HAGEN *in* SELYS, 1871)
Figures 24-30

M a t e r i a l. – BRAZIL, Rio de Janeiro, Sede do Parque Nacional da Serra da Bocaina, alt. 1000 m, 3 ♂ exuviae, 22-XI-1979, Rio Mambucaba, 1 ♂ exuviae, 27-XI-1979, 1 ♂ exuviae, 28-XI-1979, 1 ♂ exuviae, 18-IV-1982 and 1 ♂ exuviae, 7-XI-1982, N.D.Santos, J.M.Costa, S.M.Pereira & L.F.Reys Netto leg.; 1 ♂ larva and 2 ♂ exuviae, 22-XI-1969, N.D.Santos & L.F.Reys Netto leg.; 7 ♂ larvae and 1 ♂ exuviae, 25-II-1977, N.D.Santos leg.; 16 ♂ larvae, 21-IV-1978, L.F.Reys Netto & Jorge leg.; 1 ♂ larva, 27-IV-1978, L.F.Reys Netto & Jorge leg. (nº 258); 10 ♂ larvae and 5 ♂ exuviae, 29-X-1977, N.D.Santos leg.; 28 ♂ larvae, 1-V-1980, N.D.Santos & L.F.Reys Netto leg.; 1 ♂ larva, 30-X-1979, N.D.Santos leg.; 1 ♂ larva, 2-V-1980, N.D.Santos leg. (nº 262); Cachoeira de Macacu, Sítio Veloso,

1 ♂ larva, 14-XI-1981, L.F.Reys Netto, Regina & Valéria leg.; 1 ♂ larva, 18-IV-1982, N.D.Santos leg.; Rio Macacu (rio de 2ª ordem), 1 ♂ larva, IV-1995, T.C.Santos, leg.; Rio São Joaquim (rio de 1ª ordem) 1 ♂ larva, V-1995, T.C.Santos & J.M.Costa leg.; 4 ♂ larvae, VI-1995, T.C.Santos leg.; 3 ♂ larvae, IX-1995, T.C.Santos leg.; Rio Souza (rio de 3ª ordem) 1 ♂ larva, VI-1995, T.C.Santos & J.M.Costa leg.; 1 ♂ larva, X-1995, T.C.Santos leg.; Mato Grosso, Chapada dos Guimarães, 17 ♂ larvae, 14-VII-1983, L.F.Reys Netto leg.; 4 ♂ larvae, 16-VII-1983, L.F.Reys Netto leg.; 1 ♂ larva, X-1983, N.D.Santos leg. (nº 270).

General coloration dark brown.

H e a d. – Small, wider than long, widest across the eyes (Figs 24, 25), these small and rounded at the outer margin, but slightly pointed inward. Between the bases of antennae a sharp ridge, armed with more than 33 short flat forward setae. On the hind sharp ridge there are two long setae. Occiput rounded, rear concave; at



Figures 24-30. *Neocordulia setifera* larva: (24) general aspect, dorsal view; – (25) head; – (26) labium; – (27) maxillae; – (28) right mandible; – (29) left mandible; – (30) labrum.

the hind corners on each side a process with more than 6 short setae and nearer the eyes another rows of long setae (Fig. 25). Antennae absent.

Mouth parts. – Labrum simple (Fig. 30), rectangular, fringed with long hairs. Mandible right (Fig. 28): distal end with 5 teeth and inside with 3 short teeth all of the same size. Left mandible (Fig. 29) with 3 large teeth and 2 very short at distal end; inside with one large tooth and 2 short teeth. Maxillae (Fig. 27) with 7 large teeth on top of inner lobe (lacinia) followed by a row of 10 larger spines and some long hair; outer lobe (galea) pointed at the end, outer side beset with many long bristle-like hairs. Labium with prementum rectangular (Fig. 26), inner side with 10-11 setae, the 6th marginal setae the longest; side margins of prementum each with more than 15 short flattened setae to 3/4 of its length; at each distal end, just under base of lateral lobe, there are 3 short spines. Median lobe of prementum high and prominent, the steep sides beset without crenulations, but with short spines along the margin. Lateral lobe broad triangular, 7 long setae along inner side of lateral margin and one row of small spines on its border; a relatively short movable hook and on the outer margin with 7 crenulations (that proximal at movable hook, bifurcate) as high as wide; on top of each one 10-15 spines. Inner margin with many spine-like setae (about 60). At base of lobe there are 18 short setae.

T h o r a x. – Prothorax rectangular, as long as the hind side of head, its outer border armed with many long setae and there is a tubercle on each lateral side; meso- and metathorax with some long setae. Wingpads parallel, with rows of large setae over the many veins, tips reaching backward to bases of abdomen segment 5. Legs long. Femur with long spines, the last femur with 4 spines. Tibiae with long spines, the last tibiae with 7 spines; tarsus on the underside of the three joints a double row of simple setae. Claws long and simple.

A b d o m e n. – Longer than wide, slightly wider on segments 5-6 (Fig. 24). Dorso-lateral side of abdominal segments 1-6 provided with long setae intercalated with the other very small setae; no dorsal hooks; transversal carina on segments 1--10 with short spines; segment 10 very short (Fig. 24) and concentrated on the dorso-distal end of segment 9; lateral spines are present on segments 8-9 (Fig. 24), these are short, but reaching the base of the next segment. Appendages short triangular, pointed; epiproct triangular, pointed at the distal end, distinctly bigger than the cerci and shorter than the paraprocts (Fig. 24).

M e a s u r e m e n t s (in mm). – Total length 21.6; maximum width of head across the eyes 6.7; maximum width of abdomen (segm. 5+6) 9.0; length abdomen + appendages 14.0; length lateral spines on abdomen segment 8 0.2; length lateral spines on abdomen segment 9 0.3; antennae: scapus 0.4; pedicellus 0.3; flagellum absent; femur I 5.0; femur II 6.4; femur III 8.0; tibia I 5.8; tibia II 7.0; tibia III 8.0; tarsus I 3.0; tarsus II 3.0; tarsus III 3.6.

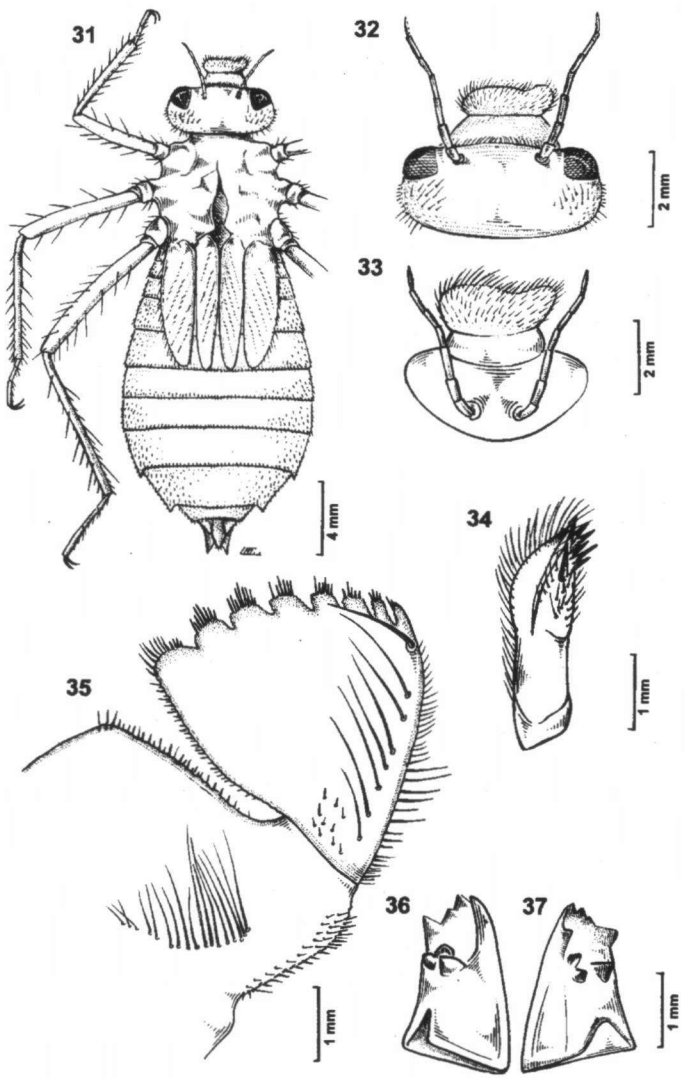
SANTOSIA MACHADOI SP. NOV.

Figures 31-37

M a t e r i a l. – BRAZIL, São Paulo, Parque Nacional da Serra da Bocaina, alt. 1800 m, 1 ♂ (raised in laboratory), 25-II-1977, N.D.Santos & J.M.Costa leg.

General coloration dark brown.

H e a d. – Small, wider than long, widest across the eyes (Figs 31, 32), these small and rounded at the outer margin, but slightly pointed inward. Between the bases of antennae a sharp ridge, armed with many setae. Occiput rounded, rear straight; at the hind corners on each side there are 10 long setae and nearer the eyes there are many small setae (Fig. 32). Antennae seven-jointed, scapus slightly shorter



Figures 31-37. *Santosia machadoi*, larvae: (31) general aspect, dorsal view; – (32) head; – (33) labrum; – (34) maxillae; – (35) labium; – (36) left mandible; – (37) right mandible.

than pedicellus, the 3rd joint is the largest and the 4th the smallest (Figs 32, 33).

Mouth parts. – Labrum asymmetric (Figs 32, 33) with right side forming a round lobe, fringed with long hairs. Mandible (Figs 37, 38): distal end with 5 teeth and inside with 2 very short teeth and one bigger pointed one. Maxillae with 7 large teeth on top of inner lobe (lacinia) followed by a row of 10-12 larger spines and some long hairs; outer lobe (galea) pointed at the end, outer side beset with many long bristle-like hairs. Labium with prementum rectangular (Fig. 35), inner side with 17 setae each side, the 8th marginal setae the longest; side margins of prementum each armed with 2 or 3 rows of short spines from base to its distal end; at each distal end, just under base of lateral lobe there are many such spines. Median lobe of prementum high and prominent, the steep sides beset with low crenulations along the margins and intermittent small spines, of which there are 3 larger on top. Lateral lobe broad triangular; 7 long setae along inner side of lateral margin and one row of long spine-like setae; a relatively short movable hook and on the outer margin 7 low crenulations, each provided with 2-8 spine-like setae. Inner margin with a number of short setae (about 25). At base of lobe there are 10 short setae.

T h o r a x. – Prothorax rectangular, smaller than hind side of head. Meso- and metathorax with short spine-like setae along the upper and side margin. Wingpads parallel, with rows of short setae over the many veins, tips reaching backward to bases of abdomen segment 5. Legs short. Femora and tibiae with long spines intercalated with short spines; tarsus on the underside of the three joints a double row of simple setae. Claws long and simple (Fig. 31).

A b d o m e n. – Longer than wide, slightly wider in segments 7-8-9. Dorso--lateral side of abdominal segments 1-9 provided with a number of small strong claw-like setae; no dorsal hooks; transverse carina on segments 1-9 with short spines; segment 10 very short and concentrated on the dorso-distal end of segment 9; short lateral spines are present on segments 8-9. Appendages short triangular, pointed; epiproct distinctly longer than cerci and slightly shorter than paraprocts (Fig. 31).

M e a s u r e m e n t s (in mm). – Total length 23.4; maximum width of head across the eyes 5.0; maximum width of abdomen (segm. 5-6-7) 9.6; length abdomen + appendages 16.0; length lateral spines on abdomen segment 8 0.4; length lateral spines on abdomen segment 9 0.4; antennae: scapus 0.4; pedicellus 0.6; flagellum 3.0; femur I 4.0; femur II 6.0; femur III 7.4: tibia I 4.6; tibia II 6.0; tibia III 6.4; tarsus I 2; tarsus II 2; tarsus III 3.8.

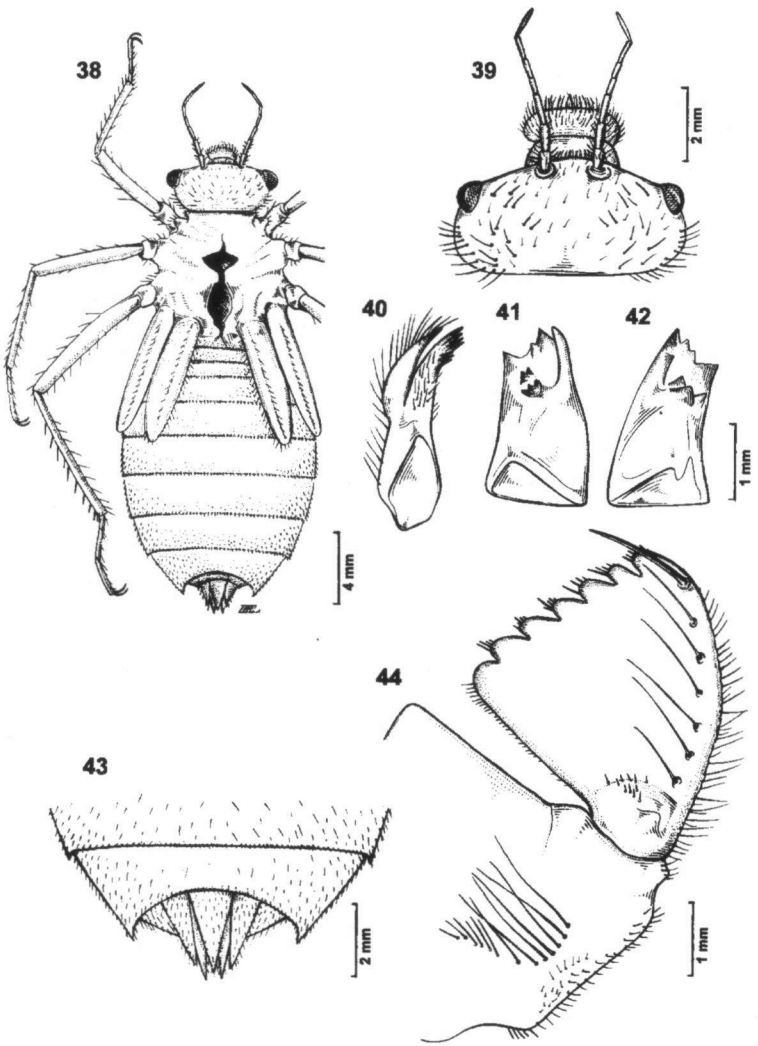
SANTOSIA NEWTONI SP. NOV.
Figures 38-44

M a t e r i a l. – BRAZIL, Rio de Janeiro, Itatiaia, Brejo da Lapa, alt. 2200 m, 1 ♂ (raised in laboratory), 19-II-1974, N.D.Santos leg.

In general very similar to the larva of *S. machadoi*. The first and second joints of antennae are slightly larger.

M o u t h p a r t s. – Labrum simple (Fig. 39), rectangular, fringed with long

hairs. Right mandible (Fig. 42) with 5 teeth at distal and larger than in *S. machadoi*; inside with 3 teeth of the same size (2 smaller and one larger in *S. machadoi*). Left mandible (Fig. 41) with 4 teeth at distal end and inside with 3 teeth, the biggest one with 3 "kernels" at the upper side. Maxillae (Fig. 40) as in *S. machadoi*. Labium (Fig. 44) very similar to *S. machadoi*, but prementum distinctly larger, inner side with 13 setae each side, the 7 marginal setae the longest. Lateral lobe with 6 long setae along inner side of lateral margin on the outer side with 7 low crenulations. At



Figures 38-44. *Santosia newtoni*, larva: (38) general aspect, dorsal view; – (39) head; – (40) maxillae; – (41) left mandible; – (42) right mandible; – (43) abdominal segments 8-10; – (44) labium.

base of lobe there are 12 short setae.

T h o r a x and a b d o m e n. – As in *S. machadoi*. Appendages short, triangular and pointed; epiproct and cerci about the same size and slightly shorter than the paraprocts (Fig. 43).

M e a s u r e m e n t s (in mm). – Total length 23.0; maximum width of head across the eyes 5.5; maximum width of abdomen (segm. 5-6-7) 9.8; length abdomen + appendages 14.0; length lateral spines on abdomen segment 8 0.2; length lateral spines on abdomen segment 9 0.4; antennae: scapus 0.4; pedicellus 0.6; flagellum 3.0; femur I 4.0; femur II 5.0; femur III 7.0: tibia I 4.6; tibia II 6.0; tibia III 6.4; tarsus I 2.2; tarsus II 2.6; tarsus III 4.0.

LARVAL KEY TO CORDULIINAE KNOWN FROM NEOTROPICAL REGION

1 Abdomen with dorsal hooks 2
– Abdomen without dorsal hooks 3
2 Dorsal hooks on segments 6-9; lateral spines present on segments 8-9; 10-11 mental setae ..... ***Navicordulia nitens***
– Dorsal hooks on segments 3-9; lateral spines present on segments 5-9; 7 mental setae on each side ..... ***Rialla villosa***
3 Lateral spine on abdominal segment 9 longer than the median dorsal length of segment 9+10 4
– Lateral spine on abdominal segment 9 shorter than the median dorsal length of segment 9+10 6
4 Lateral spine on abdominal segment 9 about 4-5 times as long as the median dorsal length of segments 9+10; lateral lobe of prementum with 7 setae ..... ***Aeschnosoma forcipula***
– Lateral spine on abdominal segment 9 at maximum 3 times as long as the median dorsal length of segment 9+10; lateral lobe of prementum with 8 setae 5
5 Lateral spine on abdominal segment 9 three times longer than the middorsal length of this segment; three short setae at base of lateral lobe; 9 crenulations on the distal margin of lateral lobe. ..... ***Aeschnosoma auripennis***
– Lateral spine on abdominal segment 9 distinctly longer than the middorsal length of segments 9+10; ten short setae at base of lateral lobe; 15 crenulations on the distal margin of lateral lobe ..... ***Aeschnosoma marizae***
6 Antennae long, projected over the anterior region of head, reaching the base of lateral lobes 7
– Antennae short, not projected over the anterior region of head 8
7 Thirteen mental setae; lateral lobe with 6 setae; epiproct and cerci about the same length and slightly shorter than the paraprocts ..... ***Santosia newtoni***
– Seventeen mental setae; lateral lobe with 7 setae; epiproct distinctly longer than cerci and slightly shorter than the paraprocts ..... ***Santosia machadoi***
8 Lateral spines on abdominal segment 8 and 9 very short, not reaching the base of the next segment respectively; epiproct with distal end truncate, distinctly shorter than the cerci and these slightly shorter than the paraprocts ..... ***Neocordulia androgynis***
– Lateral spines on abdominal segments 8 and 9 short but reaching the base of the next segment respectively; epiproct with distal end pointed, distinctly longer than the cerci and shorter than the paraprocts ..... ***Neocordulia setifera***

DISCUSSION

Eight corduliid genera have been recorded in the Neotropical region: *Aeschnosoma* Selys, 1870; *Navicordulia* Machado & Costa, 1995; *Paracordulia* Martin, 1906; *Rialla* Navás, 1915; *Santosia* Costa & Santos, 1992; *Gomphomacromia* Brauer,

1864; *Lauromacromia* Geijskes, 1970 and *Neocordulia* Selys, 1882. With the discovery of two new species, the number of species is now 36 and the number of known corduliid larvae is now 9 for the Neotropical region. DE MARMELS (1983) has also described two probable new species of *Paracordulia*, based on two females not considered in this work.

For over 45 years (from 1940 to 1985), in different locations in the State of Rio de Janeiro, Dr Newton Dias dos Santos collected and identified 240 species, dozens of genera and many specimens identified only to family. Now, returning to continue Santos' work on the Rio de Janeiro State fauna, we have found species in the material still unknown to science.

The *Santosia newtoni* larva was collected from limpid waters on upper Itatiaia (Minas Gerais side) at 2200 m (Brejo da Lapa) where the winter temperature falls below 0° C. The limpid water which flows through these plateaus, when dammed, forms small marshy areas with abundant aquatic vegetation (*Potamogeton)* and with a rich fauna of aeshnid and coenagrionid (*Oxyagrion simile*) larvae, of Trichoptera, Ephemeroptera as well as a great abundance of Amphipoda (*Hyalella*). The 2 new species described in this work are very close to *Santosia marshalli*, although separated by characteristics presented in the key. From the observations analyzed and some taken from Santos' notes, we conclude that *Santosia* occurs over an altitudinal distribution at 800 to 2400 m.

From Santos' notes, we have obtained the following data on the *N. setifera* larvae: "the specimens were collected between 4:00 and 5:30 p.m.; the river had water quite transparent, slow-moving, sandy bottomed banks, and a depth of approximately 50 cm. at collection site". In 1995-1996, T.C. Santos and J.M. Costa collected 12 male *Neocordulia setifera* larvae from a mountain stream at 200 m altitude.

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