

SHORT COMMUNICATIONS

**AESHNA (HESPERAESCHNA) PAULOI SPEC. NOV.
FROM MOUNTAIN STREAMS IN BRAZIL
(ANISOPTERA: AESHNIDAE)**

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The new sp. is described and illustrated from 12 ♂ and 12 ♀, collected in Minas Gerais and Paraná (holotype ♂, allotype ♀; Serra do Cipó, alt. 1300-1400 m, Santana do Riacho, State of Minas Gerais, IV-1983 (deposited in the author's collection). It shares with *A. (H.) cornigera planaltica* and *A. (H.) huarupi* the presence of deep excavations on the anterior margin of the epimeral stripes but, unlike these spp., its antehumeral stripe is very small. *A. (H.) pauloi* sp.n. fly over stony mountain streams where their larvae can be found.

INTRODUCTION

The subgenus *Hesperaeschna* contains 15 species; all from the neotropical region except for *Aeshna (H.) californica*. In the 38 years that have elapsed since the publication of CALVERT's classic monograph (1956), only two *Hesperaeschna* species have been described, *Aeshna (Hesperaeschna) eduardoi* Machado, 1984 from Minas Gerais, Brazil (MACHADO, 1985) and *A. (H.) nubigena* DE MARMELS, 1989 from Cerro de la Neblina, Venezuela. Here we describe another species, based on material collected mostly in the mountain region of the Serra do Cipó, near Belo Horizonte, where their larvae have been found in stony streams.

This beautiful species is dedicated to my companion of odonatological excursions, my son, Paulo.

AESHNA (HESPERAESCHNA) PAULOI SPEC. NOV.

Figures 1-7

Material. — BRAZIL, Minas Gerais, Santana do Riacho (Serra do Cipó, alt. 1300-1400 m):

holotype ♂, **allotype** ♀, IV-1983, A., P.A. & E. Machado leg.; – 1 ♂, 10-III-1956, A. Machado leg.; – 2 ♀, IV-1982, 1 ♂, 2-II-1988, A., P.A. & E. Machado leg.; – 2 ♂, XI-1988, Y.L.R. Leite, L.P. Costa & P.A. Machado leg.; – 2 ♂, 19-IV-1987, P.A., E. Machado & A. Braz leg.; – 1 ♀, VII-1986 (emerged from larva collected V-1986), 1 ♂, 14-VIII-1985 (emerged from larva collected IV-1985), 1 ♀, 15-IX-1985 (emerged from larva collected VIII-1985), A., P.A. & E. Machado leg.; – Belo Horizonte 1 ♀, X-1962; 1 ♀, 17-X-1963, U.G. de Castro leg.; – Varginha, 1 ♂, X-1952, 1 ♀, XII-1952, J. Marcelino leg.; – Retiro das Pedras, 1 ♀, V-1990, M.J. Ferolla leg.; – Ouro Preto, 2 ♀, XII-1985 (emerged from larvae collected XI-1985), M.G. Sad leg.; – 1 ♂, 1 ♀, [exact locality unknown], Paraná – Ponta Grossa, 1 ♂, XI-1939, 1 ♂, II-1952, F. Justos Jr leg.

Total: 12 ♂ and 12 ♀. Holotype, allotype and 20 paratypes in the author's collection. One male paratype in the collection of the Department of Zoology, Federal University of Minas Gerais and another in the Department of Zoology, Federal University of Paraná.

MALE. – [Color description based on living specimen. (Fig. 1). Color notation according to KORNERUP & WANSCHER, 1967].

Head. – Labium bluish white (22A2) with apex of median lobe black. Labrum bluish white (22A2), distal margin narrowly edged with black. Anteclypeus, clypeus and vertical surface of frons pastel blue (22A4). A dark line on the fronto-clypeal suture and a transverse black band 0.5-0.7 mm wide, occupying the upper third or fourth of the anterior (vertical) surface of frons, continuous with the head of the black T spot (Fig. 2). Dorsal surface of frons sky blue (22A5). Black T spot (Fig. 2) with a stem which is 0.6-0.8 mm wide at mid length, constricted anteriorly, bordered laterally by a narrow yellowish white (1A2) stripe 0.2-0.3 mm wide. A black transverse basal stripe embracing the vertex, the ocelli and the bases of the antennae, connected with the fronto-clypeal black line along the eye margin of the frons (Fig. 2). Vertex yellowish green (30A6) with an anterior black spot about the same width of the stem of the frontal T spot (Fig. 2). Occiput bluish white (22A2). Eye pastel blue (22A4) with two dorsal bands greyish magenta (13E5) and a yellowish white (1A2) line at its anterior rim.

Thorax (Fig. 1). – Prothorax black, anterior and posterior lobes bordered with light yellow (4A5). Pterothorax olive brown. Antehumeral stripe on the lower half or less of the mesepisternum yellowish green (25A7), small (1.2-1.5 mm long, 0.4-0.6 mm wide), rectangular or narrowed at its lower extremity (60%). It was not observed in two nonacetone specimens, a situation that could be due to postmortem artefacts. Lateral thoracic stripes (Fig. 1) yellowish green (30A6) with their lower extremities greenish yellow (1A8), both reaching the upper margin of their sclerites. The stripes are constricted by the presence of deep excavations at their anterior margins, the mesepimeral stripe (Fig. 3) containing 2 (58.3%), 3 (25%) or 4 (16.6%) excavations and the metepimeral (Fig. 4), 1 (58.3%) or 2 (41.6%) excavations. Projecting from the posterior margin of the metepimeral stripe at its upper half there is a small digitation (detached from it in 2 specimens).

In 50% of the individuals there is also a very narrow pale stripe (maximum



Fig. 1. *Aeshna (Hesperaeschna) pauloi* sp.n., living paratype.

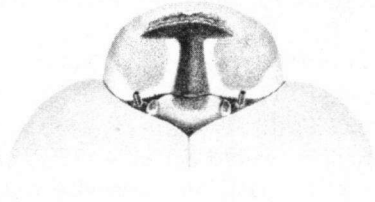


Fig. 2. *Aeshna (H.) pauloi* sp.n., frons in dorsal and slightly anterior view.

width 0.5-0.6 mm) along the anterior part of the metepisternum starting at the transverse suture below the metastigma and either reaching the upper part of the sclerite, or merging with the mesepimeral stripe. This stripe may be complete (17%), incomplete (33%) or totally absent (50%). A black area is always present at the upper part of the metepimeron behind the metepimeral stripe and surrounding the lower parts of

the mesepimeral and metepimeral stripes (Fig. 1). Other less constant and usually round or oblong dark spots occur in front of the upper part of the humeral and second lateral sutures, inside the excavations of the epimeral stripes, and at the mid third of the metepimeron, anteriorly. Legs black, external surface of femora reddish brown (8E5) internal surface of first femur with an elongated yellowish green (30A6) area occupying its proximal 3/4 and extending into the coxa. Wings in matured specimens hyaline, venation black except for the costa, nodus, subnodus, the cubito-anal crossveins and all the crossveins anterior to MA on the basal half of the wings which are yellow. Pterostigma yellowish brown (5D7) above

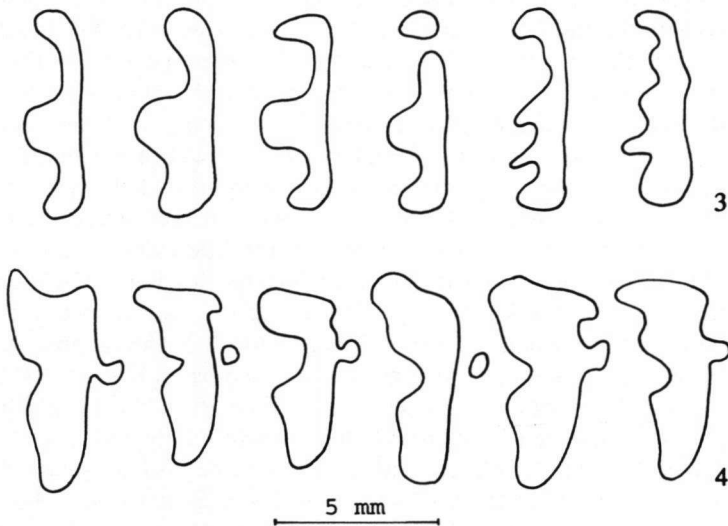


Fig. 3-4. *Aeshna (H.) pauloi* sp.n., different shapes of stripes in the type series: (3) mesepimeral stripes; - (4) metepimeral stripes.

and brown (5F8) below, membranule brown (5F8). In a teneral specimen that emerged in the laboratory the wings show a yellowish tinge more evident in the central 2/4 of the wing anterior to MA.

Venation. — Antenodals in forewing (FW) 16 (42%), 15 (33%), 17 (13%), 14 (8%), 19 (4%); in hindwing (HW) 9 (42%), 10 (33%), 11 (21%), 12 (4%). Postnodals in FW 12 (45%), 11 (21%), 10 (17%), 13 (17%); in HW 13 (50%), 14 (21%), 12 (17%), 15 (8%), 11 (4%). Triangles with 5 (71%), 4 (25%) or 3 (4%) cells in FW and 4 (92%) or 5 (8%) cells in HW. Supratrangles with 2 (46%), 3 (42%), 1 (8%) or no (4%) crossveins in FW and 2 (71%), 1 (21%) or 3 (8%) crossveins in HW. Anal triangle with 3 (83%) or 4 (17%) cells. Anal loop with 9 (37.5%), 8 (25%), 10 (21%), 11 (12.5%) or 12 (4%) cells. Cubito-anal crossveins in FW 6 (67%), 7 (25%), 5 (8%) in HW 5 (62%), 6 (30%) or 4 (8%). Number of cells between the fork of IR3 at the level of the distal end of the pterostigma 3 (93%) or 4 (7%) in FW and 3 (80%) or 4 (20%) in HW. Second reinforced antenodal in FW 5th (87%), 6th (8%) or 7th (5%) in HW 5th (74%), 4th (8%), 6th (9%) or 7th (9%).

A b d o m e n (Fig. 1). — Pale spots disposed as follows (nomenclature according to WALKER, 1912): AD very small, present in segments 2-5,8. MD fused with each other except on 8; connected with PD on 2, with ML on 3-6,8, with PMD on 7-8; absent from 9-10. PMD (CALVERT, 1956) fused with each other and with MD forming a large transverse rectangular spot on 6-7, smaller on 5-8. PD fused with each other on 1 and 2 where it is also fused with ML + PL and connected to MD by a short line. AL fused with ML on 1, extending from the anterior to the transverse carina on 2-8, absent from 9-10. ML fused with AL on 1, with PL and PD on 2, with MD on 3,6, connected with PL on 7-8, absent from 9-10. PL fused with AL and ML on 1, with PD on 2, with ML on 7-8, with PD on 9 forming an isolated rectangular spot on 3-6. Abdominal colors (Fig. 1): ground color of dorsum of segments 1, 2, 8 reddish brown (8E5), 3-7 reddish brown becoming dark brown (8F5) distally, 9 dark brown with two rounded areas reddish brown, 10 brownish yellow, darker anteriorly. Lateral abdominal areas black. Pale tergal spots colored as follows: Dorsal spots greyish green (29C5) except for MD and PD on 2 which are sky blue (22A5) and the lower parts of PD on 8-9 which are pastel blue (22A4). Lateral spots yellowish green (30A1) on 1, sky blue (22A5) on 2 and on AL of 3, greyish green (29C6) on 3 (ML and PL), and 4-6, greyish green above and pastel blue (22A4) below on 7-9, yellowish brown on 10. In another paratype, the colors of which have been noted *in vivo*, there is some pastel blue tinge also in the lateral spots of 4-6 and PL of 3. Ventrally inflexed surface of tergite 1 greenish yellow (1A8), of tergites 2-9 sky blue (22A5) distally black on 3-8. Sternite 1 brown, 3-8 black, 9 (behind the genital valve) and 10, greenish yellow. Hamule base pastel blue (22A4). Superior appendages reddish brown, inferior appendage yellowish brown with the borders dark brown.

Structural characters. — Auricles with 2-3 black distal teeth. Abdominal segment 1 (Fig. 5) with a mid-ventral tubercle bearing many spinules. Structures of the genital fossa as in Figure 5. Spine of the anterior lamina (length 0.55-0.75 mm) reaching almost to the level of the hind margin of the hamular process. In profile its apex does not project ventrally to the margin of the genital fossa.

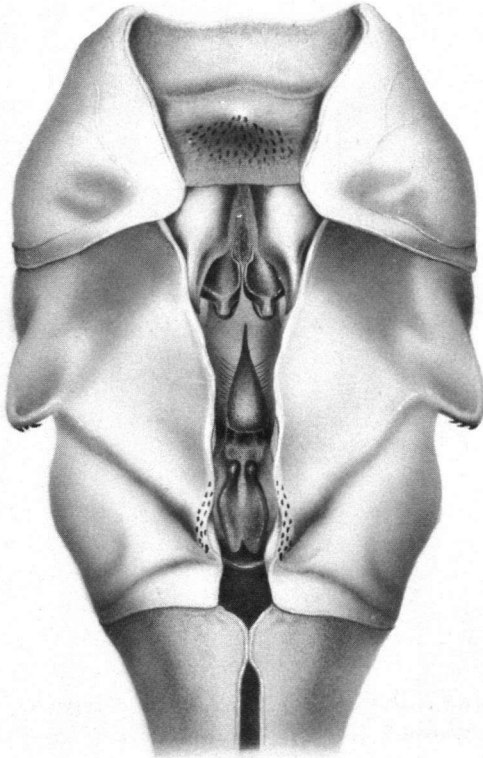


Fig. 5. *Aeshna (H.) pauloi* sp.n., holotype ♂: abdominal segments 1-2, ventral view.

Genital lobe low, with 40-50 denticles, the area occupied by them not widening anteriorly. Dorsum of abdominal segment 10 with a mid-dorsal tooth (Figs 6-7). Anal appendages shaped as in figures 6-7, the superiors slightly longer than abdominal segments 9-10.

Measurements (mm). — Holotype, with size ranges of 11 paratypes (in parenthesis): total length, including appendages 74.0 (63.0-73.5), — abdomen, without appendages 50.3 (45.5-52.0), — superior appendages 5.9 (5.7-6.0), — hindwing 47.3 (45.0-49.0), — pterostigma of FW 2.9 (2.5-3.2), — of HW 2.4 (2.2-2.7).

FEMALE. — [Color description based on acetonized specimens]

Head. — Differs from that of the male as follows: labium and labrum yellow (3A8). Anteclypeus, clypeus and vertical surface of frons greyish yellow (2B5)

turning into light yellow (3A4) laterally. Transverse black band on the upper part of the anterior (vertical) surface of frons 0.3-0.6 mm. Dorsal surface of frons as in the male, except for the color which is bluish grey (23D2) in most specimens and pale blue (23A3) in one paratype. As observed in a color picture of a living specimen the eye of the female differs from that of the male in being predominantly yellow rather than blue.

Thorax. — Differs from that of the male as follows: antehumeral stripe smaller (1.0-1.2 mm long; 0.2-0.3 mm wide) absent in 42% of the specimens

all of which had well defined color patterns (two specimens acetone); the absence, therefore, not being due to postmortem artefacts. Lateral stripes greyish yellow (2B4), less variable than those of the males, the mesepimeral containing 2 (100%) and the metepimeral 1 (70%) or 2 (30%) excavations at their anterior margins. The wings of 4 teneral specimens that emerged in the laboratory had a distinct yellow tinge on the cubito-anal space and on the area anterior to MA extending up to the level of the bifurcation of IR3, more intense on the nodal region. In the mature specimens the yellow becomes very faint. In one specimen, it was restricted to the nodal region and the wing base.

Venation. — Antenodals in FW 16 (35%), 15 (25%), 17 (20%), 13 (15%), 14 (15%); in HW 10 (40%), 9 (30%), 11 (25%), 12 (5%). Postnodals in FW 11 (57%), 12 (19%), 10 (12%), 13 (6%) or 14 (6%); in HW 12 (45%), 13 (20%), 11 (15%), 9 (5%), 10 (5%), 14 (5%) or 16 (5%). Triangles with 5 (80%) or 4 (20%) cells in FW and 4 (75%) or 5 (25%) cells in HW. Supratrangles with 3 (50%), 2 (35%), 1 (10%) or 4 (5%) crossveins in FW and 2 (80%), 1 (15%) or 3 (5%) crossveins in HW. Anal loop with 9 (45%), 10 (20%), 11 (15%), 8 (10%) or 12 (10%) cells. Cubito-anal crossveins in FW 6 (45%), 7 (35%) or 5 (20%), in HW 5 (60%) or 6 (40%). Number of cells between the fork of IR3 at the level of the distal end of the pterostigma in FW 3 (93%) or 4 (7%), in HW 3 (84%), or 4 (16%). Second reinforced antenodal in FW 5th (100%) in HW 5th (90%) or 6th (10%).

Abdomen. — Arrangement of the pale spots as in the male, except for the following: on segment 2, MD absent and PD not fused with each other; on segment 8, PMD absent and MD small and not fused. Colors: ground color light brown (6D8) dorsally, dark brown (6F7) laterally. Ventrally inflexed surface of tergites 2-8 pale green on their anterior 3/4 or 2/3. Pale tergal spots pale green

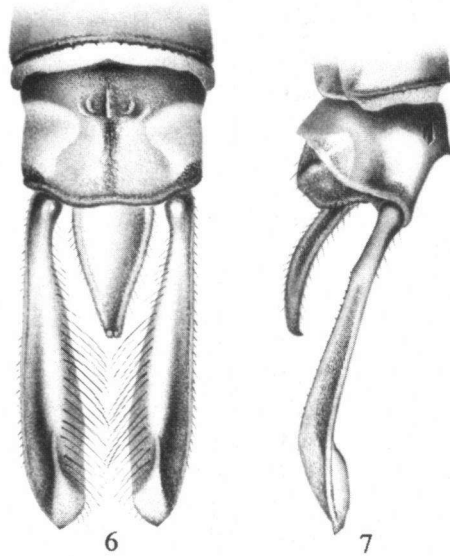


Fig. 6-7. *Aeshna (Il.) pauloi* sp.n., holotype ♂, appendages: (6) dorsal view; — (7) right lateral view.

(26A3) with irregular yellowish areas. Appendages reddish brown (8E5).

Structural characters. — Abdominal segment I with a mid-ventral tubercle bearing many spinules. Ovipositor projecting caudally beyond the level of the hind edge of the tergum of 9. Anal appendages much longer than 9+10, shorter than 8+9, with maximum width of 1.0-1.1 mm at mid length, the outer margin straight almost to the apex, the inner margin convex throughout, longitudinal carina distinct only at base, apex rounded.

Measurements (mm). — Allotype, with size ranges of 11 paratypes (in parenthesis): Total length, including appendages 76.0 (68.5-77.0); — abdomen, without appendages 52.5 (46.0-52.5); — appendages 6.2 (5.0-5.8); — hindwing 53.0 (47.0-53.0); — pterostigma of FW 3.5 (3.1-4.1); — of HW 3.0 (2.6-3.1).

DISCUSSION

Aeshna pauloi keys out to *A. marchali* in CALVERT (1956). However, it differs from *A. marchali* mainly by its considerably larger size, by the absence of an inferior subbasal tooth on the male superior appendages and by the presence, in both sexes, of deep excavations on the anterior margins of the epimeral stripes. A slight excavation on these margins can be observed in *A. joanisi*, *A. manni*, *A. psilus* (CALVERT, 1956) and *A. nubigena* (DE MARMELS, 1989). However, deep excavations comparable to those of *A. pauloi* occur only in *A. cornigera planaltica* and *A. haarupi* (CALVERT, 1956), the latter containing two mesepimeral and one metepimeral excavation as in *A. pauloi*. These two species, however, can be readily separated from *A. pauloi* by the presence of a large pale antehumeral stripe.

The presence of dark areas on the pterothorax of *A. pauloi* deserves further consideration. Black areas surrounding the lower extremities of the epimeral stripes can be observed in *A. pauloi*, *A. marchali*, *A. californica* (CALVERT, 1956) and *A. punctata* (MACHADO, 1985). However, *A. pauloi* is unique in the subgenus by the presence, in most specimens, of a series of round or oblong pleural dark spots, a feature so far observed only in the subgenus *Marmaraeschna*. Indeed, in some specimens in which the lateral stripes have partially faded, due to postmortem changes, the color pattern of the pterothorax resembles somewhat that of a *Marmaraeschna*.

ECOLOGY AND CONSERVATION

Although never very abundant, *A. pauloi* have been consistently observed in the mountain region of Serra do Cipó during the last 38 years. SOARES et al. (1989) give a general description of the region. Situated about 100 km north of Belo Horizonte, the Serra is part of Espinhaço mountain range, with altitudes that reach up to 1800 m. It has a great number of limpid streams that form small waterfalls and pools running mainly through floristically very rich altitudinal

meadows. The following aeshnids can be seen flying over these streams and their pools: *Aeshna (Hesperaeschna) pauloi*, *Castoraeschna longfieldae*, *C. colorata*, *C. januaria* and occasionally *A. (H.) punctata*. However, *A. (H.) pauloi* is restricted to stony streams and pools, where its larvae can be found, whereas the castoraeschnas seem to prefer those with soft muddy bottom, rich in aquatic vegetation.

A. pauloi is a mountain species. In the region of the Serra do Cipó, it has so far been found on the wing at altitudes of 1300-1400 m, often even higher up. However, it has never been found at the base of the Serra (alt. 850 m), in spite of the fact that the area also contains stony streams, similar in appearance to those found at higher altitudes.

From the standpoint of its conservation status, *Aeshna pauloi* does not seem to be under threat. At least in the region of the Serra do Cipó, there is little anthropogenic pressure upon the mountain streams where it lives, and the species is protected in two parks, the Serra do Cipó National Park, and the Itacolomi State Park, near Ouro Preto. Besides this, the fact that it has been found in Ponta Grossa, Paraná, 850 km from its main area of occurrence in the vicinity of Belo Horizonte, indicates that the geographic distribution of the species is quite large.

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REFERENCES

- CALVERT, P.P., 1956. The neotropical species of the "subgenus *Aeshna*" sensu selysii 1883 (Odonata). *Mem. Am. ent. Soc.* 15: V + 251 pp., 47 pls excl.
- DE MARMELS, J., 1989. Odonata or dragonflies from Cerro de la Neblina and the adjacent low land between the Rio Baria, the Casiquiare and the Rio Negro (Venezuela). II. Additions to the adults. *Boln Acad. Cien. fisic., mat. natur.* 25: 81-87.
- KONERUP, A. & J.H. WANSCHER, 1967. *Methuen handbook of color*. Mèthuen, London.
- MACHADO, A.B.M., 1984. Estudo sobre as aeshnas do grupo *punctata* com observações sobre os tipos de *A. punctata* Martin, 1908 (Odonata-Aeshnidae). *Resum XI Congr. brasil. Zool.*, Belém, p. 161.
- MACHADO, A.B.M., 1985. Notes on the types of *Aeshna punctata* Martin, 1908 (Odonata Aeshnidae). *Revta brasil. Zool.* 2(6): 327-332.
- MACHADO, A.B.M., 1985. Description of *Aeshna (Hesperaeschna) eduardoi* Machado, 1984, from the mountains of Minas Gerais, Brazil (Anisoptera: Aeshnidae). *Odonatologica* 14(1): 45-56.
- SOARES, D., A.B.M. MACHADO, P.I.S. BRAGA & F.M. COSTA-SANTOS, 1992. *Serra de Cipó*. Empresa das Artes, São Paulo.
- WALKER, E.M., 1912. The North American dragonflies of the genus *Aeshna*. *Univ. Toronto Stud. (Biol.)* 11: 1-213, pls 1-28 excl.