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TWO NEW SPECIES OF *AESHNA* IN THE *PUNCTATA* GROUP FROM SOUTHEASTERN BRAZIL (ANISOPTERA: AESHNIDAE)

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Based on material from the states of Rio de Janeiro and Minas Gerais, *A. serrana* sp. n. (holotype ♂: Serra do Subaio, Teresópolis, Rio de Janeiro State) and *A. itatiaia* sp. n. (holotype ♂: Brejo da Lapa, Itamonte, Minas Gerais State) are described and illustrated. The type material is to be deposited in the Museu Nacional and in the Instituto de Biologia, UFRJ, Rio de Janeiro. Morphological features of the 2 new spp. are compared in a table and SE Brazilian members of the *punctata* group (that includes also *A. decessus*, *A. eduardoi* and *A. punctata*) are keyed.

INTRODUCTION

The group *punctata*, as defined by MACHADO (1984), belongs to the subgenus *Aeshna* (*Hesperaeschna*) and is composed of three species: *A. punctata* Martin, 1908, *A. decessus* Calvert, 1953 and *A. eduardoi* Machado, 1984 (MACHADO, 1985a). These species are recorded only from southern and southeastern Brazil, and are characterised by "the peculiar shape of the male superior appendages, whose apex forms a sharp spine directed ventrally and caudally in prolongation of the superior carina, thus presenting an appearance comparable to the beak, or to the claw of a bird". Good descriptions of the type material of these three species are available: CALVERT (1953, 1956) - *A. decessus*; MACHADO (1985a, 1985b) - *A. eduardoi* and *A. punctata*, respectively.

The first described species of the group was *A. punctata*, based on material from Brazil and Mexico (MARTIN, 1908), without designation of a holotype. CALVERT (1956), in his revisionary study of the neotropical aeshnas and allies, added only newly registered specimens from southern and southeastern Brazil. Specimens of type series were not examined. MACHADO (1985b), after studying the type material of *A. punc-*

tata, detected that the five specimens of the Martin's original description were not conspecific. Thus, he considered the two females of this series, both from Mexico, as *A. jalapensis* Williamson, 1908, and excluded *A. punctata* from the faunistic list of that country. In relation to the three males, he detected that the two of R. Martin's collection (Muséum National d'Histoire Naturelle, Paris), from Espírito Santo State, Brazil, are conspecific. One of these was designated as the lectotype of *A. punctata*, and was carefully described in his paper. In relation to the other male deposited in the E. De Selys's collection (Institut Royal de Sciences Naturelles, Brussels), from Brazil, probably from the collections made by Paul Borchgrave in Rio de Janeiro State (CALVERT, 1956), due to remarkable differences in the form of cerci, Machado considered that it may not be conspecific with those specimens of Martin's collection.

Aeshna decessus was the second described species of the group. CALVERT (1953) used for the original description only a male specimen from Itatiaia, Rio de Janeiro State. In his revision (CALVERT, 1956), he did not include any additional information about the species. Until this moment we have no information about other specimens.

After the above cited study redescribing *A. punctata*, MACHADO (1985a) described *A. eduardoi*, the third species of the group, from Minas Gerais State. The latter is very distinct from the type material of the two formerly described species. Material of this species was identified earlier by SANTOS (1966a) as *A. punctata*.

Studying material of this group collected in Rio de Janeiro State and adjacent regions deposited in the collections of UFRJ, the authors detected two groups of specimens. Surprisingly, neither of them are in accordance with the descriptions of the type specimens of the three species commented on above, being considered as representatives of two new species. Correlate material of one of them was identified and treated earlier by SANTOS (1966b; 1970) as belonging to *A. punctata*.

METHODOLOGY

The morphological descriptions, measurements and illustrations were made with the aid of a stereoscopic microscope equipped with a camera lucida. Some measurements were taken using an electronic digital caliper. The terminology for wing venation and abdominal colour pattern follows FRASER (1957) and WALKER (1912), respectively. All specimens studied are deposited at the Departamento de Zoologia, Instituto de Biologia (DZRJ) and Departamento de Entomologia, Museu Nacional (MNRJ), UFRJ, Rio de Janeiro, Brazil.

AESHNA SERRANA SP. NOV.

Figures 1-6, 13

M a t e r i a l. – BRAZIL, Rio de Janeiro State, Holotype ♂: Teresópolis, Serra do Subaio (in the dam area of the Clube Sayonara, alt. ca 1100 m), 30/31-III-1996, A.L. Carvalho & Lab. Entomologia UFRJ leg. – Paratype ♂: Itatiaia, Maringá, Vale do Córrego das Cruzes, 23-II/03-III-2001, N. Ferreira Jr & C.M. Souza leg.; to be deposited at MNRJ (holotype) and DZRJ (paratype), UFRJ, Rio de Janeiro.

E t y m o l o g y. – Named from the Latin "*serrana*", from a mountainous region.

MALE (holotype and variation of paratype inside parentheses). – H e a d (Fig. 1).

– Labrum, clypeus and frons ground colour orange to yellowish-brown, covered with blue hues, concentrated laterally. Clypeo-labral suture dark. Fronto-clypeal suture black (brown), enlarged into triangular spot toward eyes. Base of mandible black (brown). Dorsal surface of frons with black T spot with stem 1.41 (1.34) mm wide and parallel sided, bordered laterally by narrow yellow stripe 0.28 / 0.25 (0.3 / 0.27) mm wide. Vertex and occiput greenish-brown. Eyes dark brown with blue hues in life. Black stripe embracing limits of vertex, ocelli, bases of antennae, eyes and occiput. Rear of eyes and labium orange brown.

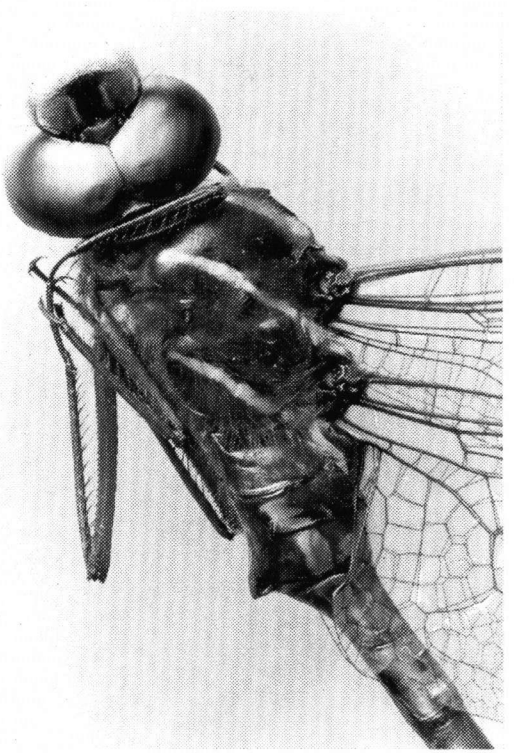


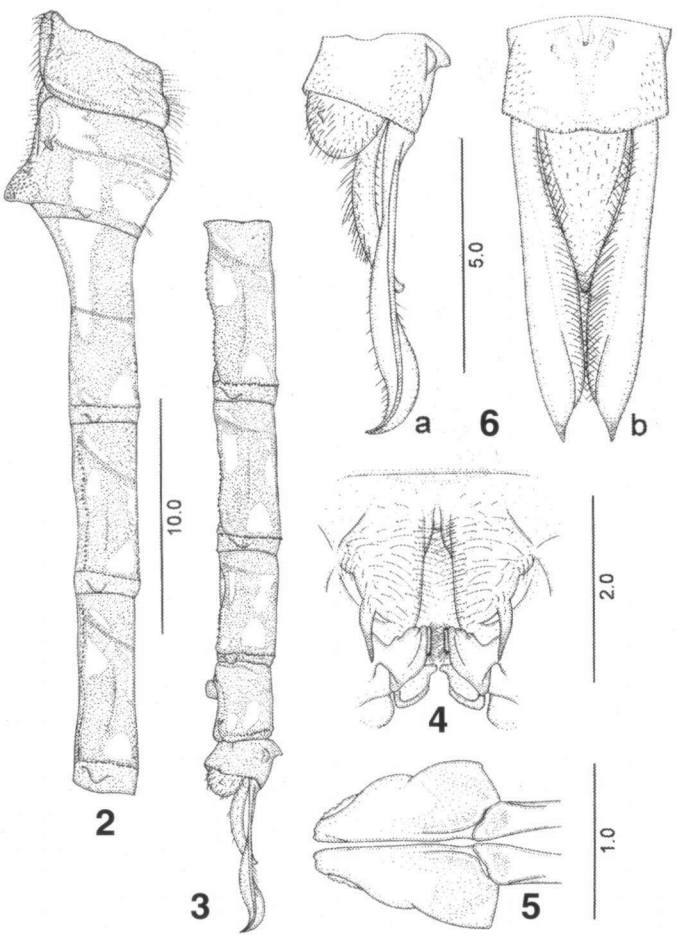
Fig. 1. *Aeshna serrana* sp. nov., male holotype: head, dorsal view, and thorax, lateral view.

T h o r a x (Fig. 1). – Ground colour reddish-brown with darker areas adjacent to meso- and metepimeral stripes. Antehumeral, mesepimeral and metepimeral stripes blue turning into cream colour below, very narrow. Antehumeral stripe with upper end rounded 2.94 (3.5) mm long, maximum width 1.19 (1.25) mm at mid-length; 1.59 (2.25) mm distant from carina of antealar sinus. Mesepimeral stripe slightly convex 8.0 (8.4) mm long and 0.83 (0.75) mm wide. Metepimeral stripe nearly straight 5.9 (6.35) mm long and 0.73 (0.78) mm wide. Femora and tibiae reddish-brown, darker apically; tarsi dark brown; all spines of legs black. Wings yellowish (uncoloured); venation reddish-brown tinged, except on anal triangle area and apical portion, in both wings, which are brown or black; pterostigma brown, darker dorsally, with parallel sides; membranula black, whitish anteriorly.

Venation (left / right). – Antenodals in forewing (FW) 18 / 18 (17 / 17); in hindwing (HW) 11 / 11 (13 / 13). Second reinforced antenodal 5th in four wings (5th or 6th). Postnodals in FW before pterostigma 15 / 14 (15 / 13); HW 18 / 16 (15 / 15). Triangles with 5 cells in four wings (5 or 6). Supratriangles with 5 / 4 (3 / 4) cells in FW; 3 / 3 in HW. Anal triangles with 3 cells. Anal loop with 9 / 10 (11 / 10) cells, with 1 / 2 (2 / 2) central cells. Cubito-anal crossveins 4 / 4 in FW; 4 / 3 (4 / 4) in HW. Number of rows of

cells between fork of IR3 at level of distal end of pterostigma 4 in four wings. Number of cells between point of origin of IR3 fork and Rspl 4 / 3 (4 / 4) in FW; 3 / 4 (4 / 4) in HW. Two rows of cells between M1 and M2 begin under pterostigma in four wings. Maximum number of cells between M4 and M4spl 3-4? / 3 (4 / 3) in FW; 4 / 3-4? (4 / 4) in HW. Maximum number of cells between Cu1 and Cu2 1 in FW; 2 in HW.

A b d o m e n (Figs 2, 3). – Ground colour reddish-brown; carinae black. Pale spots on all segments (Figs 2, 3) disposed as follows (paratype in bad condition of colour preservation, not described): AD absent on all segments. A pair of spots named AMD



Figs 2-6. *Aeshna serrana* sp. nov. (Figs 2, 3, 6 male holotype; – 4, 5: male paratype): (2) abdomen, segments 1-5, lateral view; – (3) abdomen, segments 6-10 and anal appendages, lateral view; – (4) anterior lamina and hamular processes, ventral view; – (5) fourth segment of penis, dorsal view; – (6) anal appendages: (a) lateral view, (b) dorsal view.

dorsally on segment 2, just anterior to lateral carina, apparently not present in the species treated by WALKER (1912). MD on 2-8, connected to each other on 2; PMD poorly defined, probably present on 3-8, connected with MD. PD on 1-9, connected to each other on 1 and 2 and with MD on 2. AL on 2-7, being doubtful on 6; AL of segment 2 reaching auricles. ML on 2-8, connected with AL on 2. PL on 1, 2, 8 and 9. Pale spots AMD, PD, AL, ML, PL and MD on 2 blue; MD on 3-8 and PMD yellowish. Intersegmental membranes reddish-brown, without defined pale spots. Sternites brown.

Abdominal segment 1 with mid-ventral, very low tubercle, represented by area bearing around 40 (25) spinules directed posteriorly adjacent to transversal fold. Auricles each with two distal teeth, curved inward. Genital lobe developed ventrally, not extending beyond posterior limit of tergum 2 in lateral and ventral views, covered with spinules, projected ventrally about 1.02 (1.08) mm; angle between its posterior margin and ventral margin of segment 3 in lateral view about 140°. Anterior laminae broad; length of bottom of cleft between pair, as visible in ventral view, larger than length of mesal anterior area; spines of anterior laminae curved, distinctly shorter than length of bottom of cleft. Mesal margins of hamular processes subparallel in their anterior half, diverging caudad, producing crevice between pair about 90° in ventral view. Penis not examined (paratype illustrated in Fig. 5). Dorsum of segment 10 with mid-dorsal blunt tooth and, on each side of it, two blunt carinae. Cerci slender, distinctly longer than abdominal segments 9+10, similar in length to exposed tergum of segment 4 measured dorsally; narrow at base, widening progressively to attain maximum width 1.23 (1.2) mm at distal two-thirds, narrowing progressively toward apex; superior carina extends for more than distal half of cerci, increasing in height on distal third to form very distinct arch in lateral view, and with 15 (11-13) poorly developed shallow crenulations at its margin; inner margin curved; outer margin straight almost to apex, where the two margins and the down-curved prolongation of arch converge to form sharp-pointed apical spine; apices parallel in dorsal view; apex of cerci more acute than dorsal spine of segment 10 in lateral view. Epiproct curved upward, distinctly longer than half of cerci.

Measurements (in mm). – Total length (incl. anal appendages) 83.50 (84.00); maximum width of head 10.78 (10.73); anterior end of stem of T spot 1.43 (1.28); posterior end of stem of T spot 1.38 (1.21); maximum width of antehumeral stripe 1.10 (1.28); superior end of mesepimeral stripe 0.37 (0.54); inferior end of mesepimeral stripe 0.68 (0.69); superior end of metepimeral stripe 0.70 (0.90); inferior end of metepimeral stripe 0.34 (0.57); length of HW 50.90 (50.70); maximum width of HW 15.90 (15.80); length of pterostigma of left FW 3.13 (3.62); total length of abdomen (without anal appendages) 58.50 (57.40); height of ventral tubercle of abdominal segment 1 0.29 (0.41); ventral projection of genital lobe 1.00 (1.20); length of the spines of the anterior lamina 0.61 (0.65); maximum width of abdominal segment 2 7.06 (4.95); minimum width of abdominal segment 3 2.35 (2.14); width of distal end of abdominal segment 4 4.78 (4.33); width of distal end of abdominal segment 9 4.05 (4.07); length of cerci 5.75 (6.14); length of epiproct 3.46 (3.32).

FEMALE and LARVA unknown.

AESHNA ITATIAIA SP. NOV.

Figures 7-12, 14

Material. – BRAZIL, Minas Gerais State, Holotype ♂: Itamonte, Brejo da Lapa (alt. ca 2200 m),

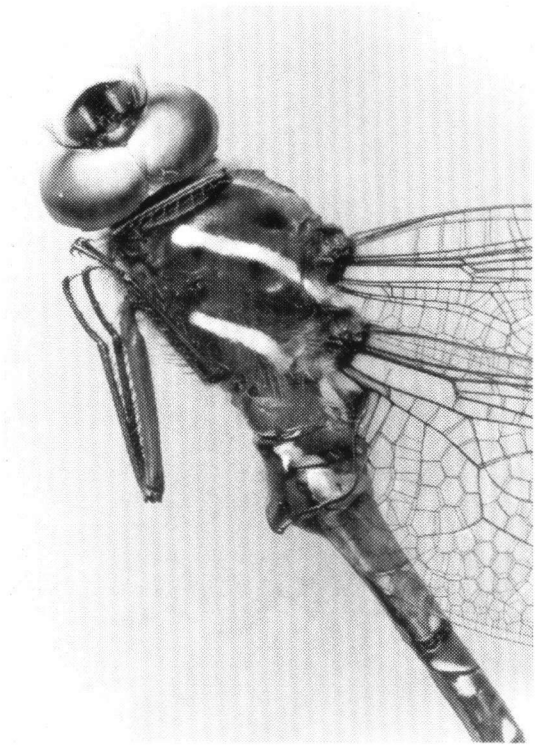


Fig. 7. *Aeshna itatiaia* sp. nov., male holotype: head, dorsal view, and thorax, lateral view.

1-X-1993, A.L. Carvalho leg. – Paratypes: Itamonte, Brejo da Lapa, 1-X-1993, A.L. Carvalho leg. 2 ♂; – Itamonte (near Serra Negra) (alt. ca 2000 m), 2-X-1993, A.L. Carvalho leg. 1 ♂; – Itamonte, Fazenda Cabeceira do Aiuruoca, 18-X-1997, A.L. Carvalho & Lab. Entomologia, UFRJ leg. 6 ♂; – Itamonte, Travessia Itatiaia-Visconde de Mauá, 10/13-IX-1998, A.L. Carvalho & Lab. Entomologia, UFRJ leg. 4 ♂, 1 ♀; – Itamonte, Brejo da Lapa, 30-IX-1999, A.L. Carvalho leg. 1 ♂ (genitalia examined); – Itamonte, Fazenda Cabeceira do Aiuruoca, 8-IX-2000, Lab. Entomologia, UFRJ leg. 1 ♂ (without head); – Itamonte, Brejo da Lapa, 12-X-2001, Lab. Entomologia, UFRJ leg. 1 ♂; – Itamonte, Fazenda Cabeceira do Aiuruoca, 13-X-2001, Lab. Entomologia, UFRJ leg. 3 ♂; – Rio de Janeiro State, Parque Nacional da Serra da Bocaina (col. 7), 2-V-1980, N.D. Santos, L.F. Neto & H. Mesquita leg. 1 ♂, 1 ♀. – To be deposited at MNRJ (holotype and 2 paratypes: 1 ♂ / 1 ♀) and DZRJ (20 paratypes: 19 ♂ / 1 ♀), UFRJ, Rio de Janeiro.

Etymology. – The species epithet, "*itatiaia*", refers to the type-locality. It is a latinized word from the Tupi-Guarani (a Brazilian indigenous language) that means pointed rocks.

MALE (holotype and variation of male paratypes inside parentheses, n = 5). – Head (Fig. 7). – Labrum yellowish-ochraceous. Clypeus and frons greenish-yellow. Clypeo-labral suture black. Fronto-clypeal suture black, enlarged into triangular spot toward eyes. Base of mandible black. Dorsal surface of frons laterally grey (greenish-blue to grey) with black T spot with stem 1.22 (1.06-1.16) mm wide and parallel sided, bordered laterally by a narrow greenish yellow stripe 0.23 / 0.24 (0.23-0.29) mm wide. Vertex black with a median dorsal spot greenish yellow. Occiput black with a median yellow stripe. Eyes dark brown with green hues. Black stripe embracing limits of vertex, ocelli, bases of antennae, eyes and occiput. Rear of eyes black. Labium (ochraceous to) orange brown.

Thorax (Fig. 7). – Ground colour brown. Antehumeral, mesepimeral and metepimeral stripes greenish-yellow. Antehumeral stripe fusiform 2.81 (1.91-3.25) mm long, maximum width 0.56 (0.44-0.81) mm at mid-length; 1.31 (1.19-1.31) mm distant from carina of antealar sinus. Mesepimeral stripe nearly straight 7.60 (6.69-7.90) mm long and 0.65 (0.60-0.75) mm wide. Metepimeral stripe nearly straight, abruptly enlarged

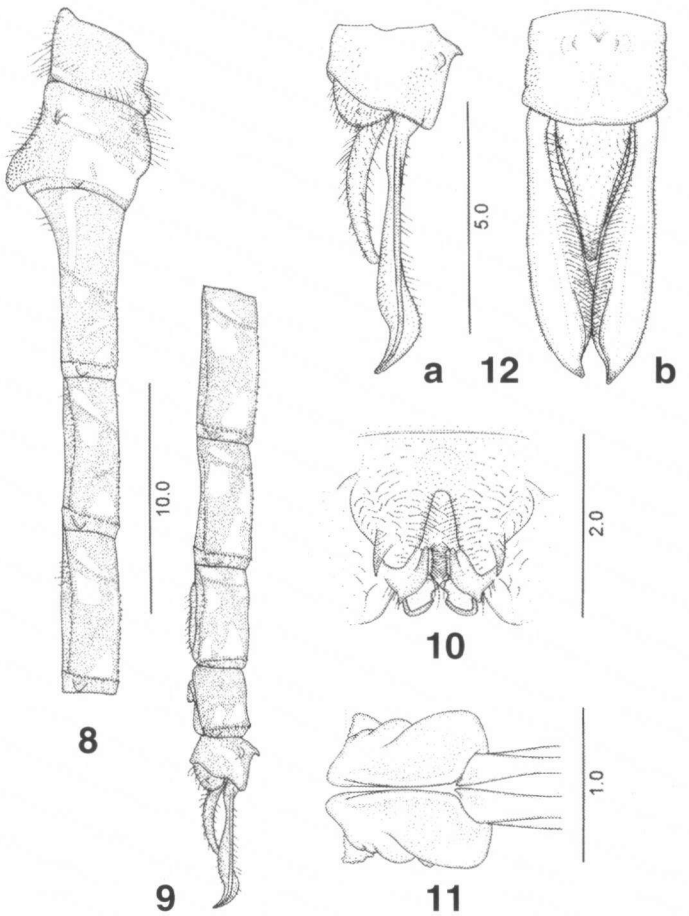
above and directed forward, turning into bluish colour in this region, 5.30 (4.40-5.72) mm long and 0.83 (0.55-0.82) mm wide. Femora brown, black apically; tibiae black, with a brown longitudinal stripe dorsally; tarsi and all spines of legs black. Wings yellowish (uncolored to yellowish); venation dark-brown or black, except for Costa, yellow dorsally and from nodus to apex ventrally; pterostigma brown, darker dorsally, with parallel sides; membranula whitish in proximal half, black in distal half.

Venation (left / right). – Antenodals in FW 16 / 15 (14-16 / 15-17); in HW 10 / 11 (9-11 / 9-11). Second reinforced antenodal 5th in four wings (5th or 6th). Postnodals in FW before pterostigma 13 / 14 (11-13 / 12-14); HW 17 / 12 (13-15 / 12-15). Triangles in FW with 6 / 5 (4-5 / 4-5) cells; HW 5 / 4 (4 / 4). Supratriangles with 3 / 4 (3-4 / 3-4) in FW; 3 / 3 (3-4 / 3-4) in HW. Anal triangles with 3 cells. Anal loop with 9 / 9 (9-10 / 9-11) cells, with 1 /1 (1-2 / 1-2) central cells in both wings. Cubito-anal crossveins 4 / 5 (4 / 4) in FW; 3 / 3 (3 / 3-4) in HW. Number of rows of cells between fork of IR3 at level of distal end of pterostigma 4 in four wings (3-4 / 3-4). Number of cells between point of origin of IR3 fork and Rspl 4 in four wings (3-4). Two rows of cells between M1 and M2 begin under pterostigma in four wings. Maximum number of cells between M4 and M4spl 3 /3 (3-4 / 3-4) in FW; 4 / 4 (3-4 / 3-4) in HW. Maximum number of cells between Cu1 and Cu2 1 in FW; 2 in HW.

A b d o m e n (Figs 8-12). – Ground colour varying from brown basally and dark-brown apically; carinae black. Pale spots on all segments, disposed as follows: AD absent on all segments. AMD (see description of *A. serrana*) dorsally on segment 2. MD on 2-8 (+ 10?) [absent on 3 in specimens from Rio Aiuruoca], connected to each other on 2; PMD on 5-7 [absent on 5 and 6 in specimens from Parque Nacional da Serra da Bocaina], connected with MD. PD on 1-9 (+ 10?), connected to each other on 2 (+ 10?) and with MD on 2 (+ 10?) [PD and PMD connected on 7 in specimens from Brejo da Lapa]. AL on 2-8; AL of segment 2 reaching auricles. ML on 2-8 (+ 10?), connected with AL on 2. PL on 1, 2, 8 and 9 (+ 10?) [absent in 8 in specimens from Brejo da Lapa]. Pale spots on segs 1-2 bluish, with exception for the AMD pair, yellowish; remaining segments pale spots yellowish, with exception for PD and PL which are bluish. Intersegmental membranes dark-brown, with transversal yellow spots in odd number, varying from 5 to 11. Sternites dark-brown or black.

Abdominal segment 1 with mid-ventral, very low tubercle, represented by conic area bearing around 50 (30-60) spinules directed posteriorly adjacent to transversal fold. Auricles each with two distal teeth, curved inward. Genital lobe developed ventrally and posteriorly, passing level of posterior limit of tergum 2 in lateral and ventral views, covered with spinules, projected ventrally 0.74 (0.86-1.42) mm; angle between its posterior margin and ventral margin of segment 3 in lateral view about 105° (90°-120°). Anterior laminae broad; a large yellow spot in each side; length of bottom of cleft between pair, as visible in ventral view, smaller than length of mesal anterior area; spines of anterior laminae curved, similar in length to bottom of cleft. Mesal margins of hamular processes subparallel in their anterior half, diverging caudad, producing crevice between pair about 100° in ventral view. Penis not examined (a paratype illustrated in Fig. 11).

Dorsum of seg. 10 with mid-dorsal blunt tooth and, on each side of it, two blunt carinae. Cerci slender, slightly longer than abdominal segments 9+10, distinctly shorter in length than exposed tergum of segment 4 measured dorsally; narrow at base, widening progressively to attain maximum width 1.20 (1.15-1.50) mm at distal three-fourths, narrowing abruptly toward apex; superior carina extends for more than distal half of cerci, increasing in height on distal third to form very distinct arch in lateral view, and with 6-7 (5-7) poorly developed shallow crenulations on its margin; inner and outer margins curved, where two margins and down-curved prolongation of arch converge to form bluntly-pointed apical spine; apices slightly convergent in dorsal view; apex of



Figs 8-12. *Aeshna itatiaia* sp. nov. (Figs 8, 9, 12: male holotype; – 10, 11: male paratype): (8) abdomen, segments 1-5, lateral view; – (9) abdomen, segments 6-10 and anal appendages, lateral view; – (10) anterior lamina and hamular processes, ventral view; – (11) fourth segment of penis, dorsal view; – (12) anal appendages: (a) lateral view, (b) dorsal view.

cerci blunter than dorsal spine of segment 10 in lateral view. Epiproct curved upward, distinctly longer than half of cerci.

Measurements (in mm). – Total length (incl. anal appendages) 71.62 (66.56-72.55); maximum width of head 9.50 (9.33-10.17); anterior end of stem of T spot 0.91 (0.96-1.22); posterior end of stem of T spot 0.94 (1.00-1.19); maximum width of antehumeral stripe 0.56 (0.44-0.81); superior end of mesepimeral stripe 0.94 (0.69-0.97); inferior end of mesepimeral stripe 1.10 (1.00-1.25); superior end of metepimeral stripe 0.91 (0.72-2.00); inferior end of metepimeral stripe 0.62 (0.56-0.78); length of HW 43.11 (39.16-44.43); maximum width of HW 13.12 (12.51-13.91); length of pterostigma of left FW 2.88 (2.59-3.16); total length of abdomen (without anal appendages) 48.67 (45.10-49.79); height of ventral tubercle of abdominal segment 1 0.30 (0.12-0.36); ventral projection of genital lobe: 0.74 (0.86-1.12); length of spines of anterior lamina 0.66 (0.62-0.65); maximum width of abdominal segment 2 6.05 (4.95-6.90); minimum width of abdominal segment 3 1.82 (1.62-1.95); width of distal end of abdominal segment 4 4.05 (3.62-4.57); width of distal end of abdominal segment 9 3.15 (3.50-3.80); length of cerci 5.11 (4.75-5.28); length of epiproct 2.93 (2.54-3.14).

FEMALE (n = 2). – Head and Thorax. – Similar to male, differs as follows: T spot with stem 1.28, 1.15 mm wide, bordered laterally by narrow stripe of 0.23 / 0.20, 0.21 / 0.21 mm wide. Eyes dark-brown with green or blue hues. Antehumeral stripe 1.35, 2.24 mm long, maximum width 0.36, 0.53 mm at mid-length; 3.34, 2.64 mm distant from carina of antealar sinus. Mesepimeral stripe 6.53, 6.75 mm long and 0.63, 0.58 mm wide. Metepimeral stripe 5.62, 5.72 mm long and 0.69, 0.60 mm wide.

Venation (left / right). – Antenodals in FW 16 / 16, 15 / 15; in HW 11 / 11, 10 / 11. Second reinforced antenodal 5th on four wings. Postnodals on FW before pterostigma 13 / 12, 11 / 13; HW 14 / 16, 15 / 15. Triangles with 4 cells and supratriangles with 3 cells on four wings. Anal loop with 9 / 9, 10 / 10 cells, with 1 central cell on four wings. Cubito-anal crossveins 4 / 4, 5 / 4 on FW; 3 on HW. Number of rows of cells between fork of IR3 at level of distal end of pterostigma 3 / 4, 3 / 3 on FW; 3 / 4, 3 / 3-4 on HW. Number of cells between point of origin of IR3 fork and Rspl 4 / 3-4, 3 / 4 on FW; 4 / 4, 4 / 3 on HW. Two rows of cells between M1 and M2 begin under pterostigma on four wings. Maximum number of cells between M4 and M4spl 3 / 3, 4 / 4 on FW; 4 on HW. Maximum number of cells between Cu1 and Cu2 1 on FW; 2 on HW.

Abdomen. – Similar to male, differs as follows: AL absent on 8. ML connected with PD and PL on 8. PL absent on 9. Presence of large pale spot on 10 on each side. Pale spots on segments 3-10 greenish-yellow. Abdominal segment 1 with mid-ventral, very low tubercle, represented by conic area bearing about 38, 54 spinules directed posteriorly. Ovipositor projecting posteriorly beyond level of hind edge of tergum 9 (ventral), genital valves reaching exactly to that level. Dentigerous plate with about 100 spinules, divided in two lobes. Cerci foliaceous, slender, slightly shorter than abdominal segments 9+10, somewhat convex; widening progressively to attain maximum width 0.93, 1.26 mm at distal three-fourths, narrowed gradually to rounded tip, thicker in relation to rest of cercus. Epiproct as long as paraprocts, in a form of a equilateral triangle in dorsal view.

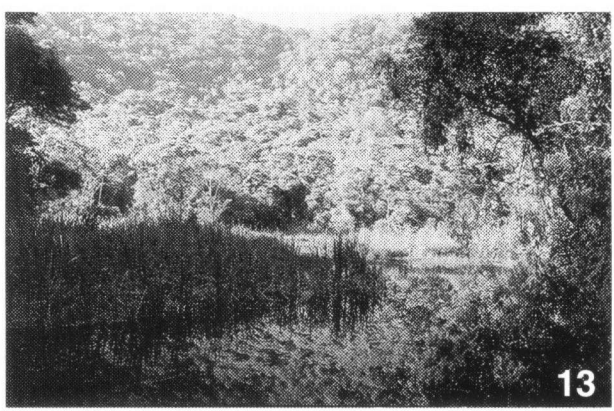
Measurements (in mm). – Total length (incl. anal appendages) 70.57, 67.94; maximum width of head 10.00, 10.10; anterior end of stem of T spot 1.10, 1.10; posterior end of stem of T spot 1.16, 1.14; maximum width of antehumeral stripe 0.36, 0.53; superior end of mesepimeral stripe 0.58, 0.68; inferior end of mesepimeral stripe 1.02, 0.91; superior end of metepimeral stripe 1.04, 1.34; inferior end of metepimeral stripe 0.60, 0.54; length of HW 46.70, 43.70; maximum width of HW 14.25, 13.86; length of pterostigma

of left FW 3.94, 3.26; total length of abdomen (without anal appendages) 47.12, 45.68; height of ventral tubercle of abdominal segment 1 0.29, 0.23; maximum width of abdominal segment 2 6.52, 6.32; minimum width of abdominal segment 3 2.48, 2.28; width of distal end of abdominal segment 4 3.48, 3.76; width of distal end of abdominal segment 9 3.61, 3.31.

Ultimate instar larvae described as *A. punctata* by SANTOS (1966b).

NOTES ON BIOLOGY

The two specimens used for the description of *A. serrana* sp. nov. were collected in two different localities of Rio de Janeiro State. The environment where the specimen from Teresópolis was collected is an artificial dam of a mountain stream (ritron) at about 1100 m, whose margins are covered by *Typha* sp. and Cyperaceae species (Fig. 13). The region is densely forested, so that this dam is a kind of clearing. The associated fauna of Odonata is very rich due to the presence of both lotic and lentic, umbrophylous and open country species. The other Aeshnidae recorded from this place are: *Aeshna cornigera planaltica* Calvert, *Castoraeschna castor* Brauer, *Coryphaeschna adnexa* Hagen, *C. perrensi* McLachlan, and *Limnetron debile* Karsch. The specimen from Itatiaia was collected while it was patrolling a small open country passage of a stream on a slope, very near forested areas. In this same place specimens of *C. castor* were also collected.



Figs 13-14. View of the collecting sites of: (13) *Aeshna serrana* sp. nov., Serra do Subaio, Teresópolis, Rio de Janeiro State, Brazil, in January, 1995; – (14) *Aeshna itatiaia* sp. nov., Brejo da Lapa, Itamonte, Minas Gerais State, Brazil, in September, 1996.

Most of the studied specimens of *A. itatiaia* sp. nov. were collected in the area of the

plateau of Itatiaia in Minas Gerais State, near the limits between the states of Rio de Janeiro and São Paulo, especially at streams and springs in natural open country areas (Fig. 14). This region was previously described by SANTOS (1966b; 1970) in notes concerning *A. punctata*, which now may be attributed to *A. itatiaia* sp. nov. Few but abundant species of Odonata occur in these brooks and pools of cold waters, densely covered by macrophytes. In the areas of "montane scrubby" and "grassy campos" located above of 2000 m (EITEN, 1992) this species prevails, along with *Aeshna* (*Hesperaeschna*) *braziliensis* von Ellenrieder & Costa, these being the commonest species of dragonflies. In the areas below 1500 m, in forested areas, *A. itatiaia* sp. nov. also occurs, but other Aeshnidae like *A. cornigera planaltica* and *L. debile*, and especially some Libellulidae, are the commonest dragonflies.

DISCUSSION

We agree with MACHADO's (1984; 1985b) concept of the "*punctata* group", including some similar species of *Aeshna* (*Hesperaeschna*) from southern and southeastern Brazil. Notwithstanding, its main diagnostic feature seems to be not exclusive (the peculiar shape of male cerci, whose apex forms a kind of spine directed ventrally and caudally in prolongation of the superior carina; Figs 6 and 12). This feature is more or less accentuated in members of the genus from other regions, as in *A. rileyi* Calvert (Africa) and *A. joannisi* Martin (northern South America), and probably in species of other genera too, as in *Oplonaeschna armata* (Hagen) (North America). So, for the precise definition of this group more characters should be evaluated and considered. Although very distinct from all known species of the "*punctata* group", it is possible that the newly described *A. condor* De Marmels (De MARMELS, 2001) from the Venezuelan Andes, which has cerci very similar to *A. punctata*, can belong to this group, as suggested by that author.

Nonetheless, for the purposes of the present discussion, we took into account only the five species described from southeastern Brazil, viz. *A. decessus*, *A. eduardoi*, *A. itatiaia* sp. nov., *A. serrana* sp. nov., and *A. punctata*, that are unquestionably very similar morphologically. Aiming at the precise separation of the five cited species, the more distinctive characters were organized in a comparative table (Tab. I), and, among them, the more evident ones were used to compose the key presented in the next section.

Aeshna serrana sp. nov. seems to be very close to *A. decessus*, notably the venation colour reddish, and tibiae as bright as the femora (as shown in Fig. 1). Besides, both are equivalent in length, being the two largest species of the group. In the beginning of this study, we considered the possibility that the pair of specimens studied could be attributed to *A. decessus*. Only the holotype of *A. decessus* is known and seems to be a very damaged specimen. The absence of the pair of spines of the anterior lamina, the

* Material of this species was treated in the literature as *A. peralta* Ris (e.g. SANTOS, 1966c, 1970) or *A. variegata* Fabricius (e.g. CARVALHO & NESSIMIAN. 1998).

Table I

Morphological comparison among the species of the *punctata* group of *Aeshna (Hesperaeschna)* occurring in southeastern Brazil, based on the descriptions of the types (males) – [Measurements in mm]

Characters	*A. punctata* (MACHADO, 1985b)	*A. decessus* (CALVERT, 1956)	*A. eduardoi* (MACHADO, 1985a)	*A. serrana* sp. n.	*A. itatiaia* sp. n.
Total length	–	78.0	70.0 - 72.0	83.5 / 84.0	66.6 - 72.6
Width of metepimeral stripe in relation to mesepimeral stripe	similar	?	wider	similar	similar
Colour of tibiae	brown	reddish	dark (brown to black?)	reddish-brown	black and brown
Length of left hind wing	49.5	51.0	44.1 - 47.3	50.9 / 50.7	39.2 - 44.4
Colour of longitudinal veins bases	black	reddish-yellow	black	reddish-brown	dark brown or black
Colour of costal vein between nodus and pterostigma on its ventral side	?	?	yellow	reddish-brown	yellow
Colour of pterostigma	brown	brown ochre dorsally, clay yellow below	yellowish-brown	brown, darker dorsally	brown, darker dorsally
Number of antenodals FW / HW	16 / 11	20 / 14	13-17 / 9-11	17-18 / 11-13	14-17 / 9-11
Number of cells of triangle FW / HW	5 / 4?	6 / 6	4-5 / 4-5	5 / 5-6	4-6/4-5
Number of cells between fork of IR3 at the level of pterostigma FW / HW	?	5 / 5	3-4 / 3-4	3-4 / 4	3-4 / 3-4
Length of abdomen (without appendages)	54.5	59.0	47.8 - 51.0	58.5 / 57.4	45.1 - 49.8
Spine of anterior lamina	present	absent	present	present	present
Genital lobe in relation to limit of tergum 2 in ventral view	not exceeding	?	not exceeding?	not exceeding	exceeding
Angle between genital lobe and seg. 3 in lateral view	around 130°	?	?	around 140°	90° - 120°
Length of left cercus	6.0	5.73	5.8 - 6.1	5.75 - 6.14	4.75 - 5.28
External border of cerci in dorsal view	concave	convex?	straight	straight	somewhat concave
Apex of cerci	blunt	?	acute	acute	blunt
Apex of cerci in relation to the dorsal spine of abdominal segment 10 in lateral view	similar	?	more pointed	more pointed	more blunt
Apex of cerci in dorsal view	somewhat convergent	?	somewhat divergent	parallel	convergent
Length of epiproct	3.3	?	3.17	3.32 - 3.46	2.54 - 3.14
AMD	–	–	–	2	2
AD	3	2, 4 - 9 (faded on 4 - 8)	2 - 7	absent	absent
AL	2 - 7	2 - 8	2 - 8	2 - 7	2 - 8
AL of segment 2 in relation to auricles	not reaching	not reaching ?	reaching	reaching	reaching

Table I, continued

MD	2 - 6 (+ 7 - 8 ?)	4 - 9	2 - 8	2 - 8	2 - 8 (+ 10 ?) Variation: absent on 3 (RA)
Fusion of MD pair	2	–	2 - 7	2	2
ML	2 - 8, 10	3 - 9	2 - 8	2 - 8	2 - 8 (+ 10 ?)
Ventral extension of ML	?	?	4 - 8	–	8
PD (or D on segment 1)	1 - 9	3 - 9	1 - 10	1 - 9	1 - 9 (+ 10 ?)
Fusion of PD pair	1 - 2	–	1 - 2	1 - 2	2 (+ 10 ?)
PL (or L seg. 1)	1 - 3, 8 - 10	1, 4 - 9	1 - 10 Variation: absent on 6, 7 in some specimens	1 - 2, 8 - 9	1 - 2, 8 - 9 (+ 10 ?) Variation: absent on 8 (BL)
PMD	absent?	4 - 7	7 - 8	3 - 8	5 - 7 Variation: absent on 5 - 6 (SB)
Fusion of PMD pair	–	–	7 - 8	–	–
AD + MD	–	–	2	–	–
MD + ML	–	–	3 - 6	–	4 (+5 ?)
MD + PD	–	–	2	2	2 (+ 10 ?)
MD + PMD	–	4 - 7	7	3 - 8	5 - 7
ML + PD	2	–	2	–	–
ML + AL	–	–	–	2	2
ML + PL	2	1, 4 - 8	2, 8	2	2
PD + PMD	–	–	7	–	– Variation: 7 (BL)
PD + PL	2	–	2, 8 - 10	–	2 (+ 9 ?) Variation: absent on 9 (male SB)

Abbreviations used: BL = Brejo da Lapa; – SB = Parque Nacional da Serra da Bocaina; – RA = Rio Aiuruoca. – For other symbols see WALKER (1912, pp. 9-10, fig. 1).

main character used to identify this species, can be a defect or produced by bad handling. CALVERT (1953), in the original description of the species, mentioned that the secondary genitalia of the type specimen were coated with a hardened substance that was removed for examination of the region. It is possible that this procedure may have broken the genitalia. Anyway, the material described as *A. serrana* sp. nov. presents some other differences in relation to that described by Calvert as *A. decessus*, both in the original description and in the revision of the Neotropical species of the genus (CALVERT, 1956), especially in relation to the details of the wing venation and colour pattern of abdomen (see Tab. I).

On the other hand, material of *A. itatiaia* sp. nov. had been identified as *A. punctata* using the revisionary study of CALVERT (1956) (e.g. SANTOS, 1966b; 1970). In his monograph, Calvert considered as *A. punctata* specimens from diverse localities of southern and southeastern Brazil, although the types were not examined. Calvert observed many morphological variations in this material that were apparently neither correlationed among them nor with the geographic distribution. In this way, he considered this species as a kind of polymorphic entity. The specimens of *A. itatiaia* sp. nov. studied

are smaller and present a colour pattern of abdomen very different from the lectotype of *A. punctata* (see Tab. I). In relation to the colour pattern of abdomen, *A. itatiaia* sp. nov. is more similar to *A. eduardoi*, but there is no doubt about their definitions, especially due to the presence of many unique characteristics of the latter.

Mapping the occurrences of the "*punctata* group" based on adults (literature and collections) and larvae of *Aeshna* from southeastern Brazil with the apex of epiproct pointed (a probable exclusive condition of the group), deposited in the collections of UFRJ, we observed that the altitudinal distributions of the species are almost restricted in this region to localities above 700 m, most above 1000 m. We know of the occurrence of the forms of this group in South Brazil, in highest latitudes, in localities located below 500 m (CALVERT, 1956). High areas in southeastern Brazil are not so extensive and related with the top of mountains chains, where probably isolations of populations of the group occurred, justifying the existence of the two new species herein described. It is possible that some of the isolated, morphologically differentiated populations of this group can maintain some contact, presenting clinal variation, and so characterizing polymorphism. This possibility can only be detected in the future by a careful examination of many specimens.

KEY TO THE SPECIES OF THE *PUNCTATA* GROUP OF *AESHNA* FROM SOUTHEASTERN BRAZIL

1 Hind wings more than 50 mm in length; abdomen (without appendages) more than 57 mm in length; tibiae reddish-brown, similar to the femora in colour; venation reddish, at least in the basal quarter of the wings; abdominal pale spots: PMD occurring in segment 4; PD and PL not connected (known from males only) 2

– Hind wings less than 50 mm in length; abdomen (without appendages) less than 55 mm in length; tibiae brown to black, darker than the femora in colour; venation brown to black; abdominal pale spots: PMD absent in segment 4; PD and PL connected at least on segment 2 3

2 Spines of anterior lamina of male absent; antenodals 20 in fore wing, 14 in hind wing; 5 rows of cells between branches of IR3 at level of pterostigma; abdominal pale spots: AL of segment 2 not reaching auricles; AD occurring on segments 2 and 4 to 9, although little distinct on segments 4 to 8; ML and PL connected on segments 1 and 4 to 8 ..... ***decessus***

– Spines of anterior lamina of male present; maximum number of antenodals 18 in fore wing, 13 in hind wing; 3 or 4 rows of cells between branches of IR3 at level of pterostigma; abdominal pale spots: AL of segment 2 reaching auricles; AD absent; ML and PL connected on segment 2 ..... ***serrana*** sp. nov.

3 Hind wings more than 49 mm in length; abdomen (without appendages) more than 54 mm in length; abdominal pale spots: AL of segment 2 not reaching auricles; PMD absent; MD and ML not connected; MD and PD not connected ..... ***punctata***

– Hind wings less than 48 mm in length; abdomen (without appendages) less than 52 mm in length; abdominal pale spots: AL of segment 2 reaching auricles; PMD occuring at least on segment 7; MD and ML connected; MD and PD connected at least on segment 2 4

4 Apex of cerci in lateral view sharper than dorsal spine of abdominal segment 10; abdominal pale spots: AD present on segments 2 to 7; AMD absent in segment 2; pair of MD connected on segments 2 to 7; pair of PMD connected on segments 7 and 8; pair of ML and PL connected on segment 8; ML prolonged ventrally on segments 4 to 8 (including lateral carinae) ..... ***eduardoi***

– Apex of cerci in lateral view blunter than dorsal spine of abdominal segment 10; abdominal pale spots:

AD absent; AMD present on segment 2; pair of MD connected on segment 2 only; pair of PMD not connected on segment 7 and absent on segment 8; pair of ML and PL not connected on segment 8; ML prolonged ventrally on segment 8 only (including lateral carinae) ..... ***itatiaia*** sp. nov.

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