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Oligoclada mortis sp. nov. from Rondônia State, Brazil, and distributional records of other species of the genus (Odonata: Libellulidae)

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Oligoclada mortis sp. nov. (holotype male deposited in MZSP: Brazil, Rondônia State, Porto Velho municipality, "T[ransect] 5-21, seg[ment]12" (09°35′19″S, 65°02′50″W, 106 m asl, 13 v 2010, leg. Nogueira & Mendes) is described and illustrated based on two males. The new species fits within Borror's Group III, differing from all other described species in the genus by the combination of an entirely black labium, a large posterior hamule, sickle-shaped and ventrally longer than the genital lobe, and long cerci, with the ratio between epiproct and cerci less than 0.67. A key to males of the seven species of Group III and distributional records based on the specimens deposited in the DZRJ and MZSP Brazilian collections are also presented. The new species is the eighth species of *Oligoclada* reported from Rondônia, this being the richest Brazilian State for this genus.

Keywords: Dragonfly; Libellulidae; *Oligoclada*; new species; taxonomy; Rondônia State; Amazonia Forest

Introduction

Oligoclada Karsch, 1890 comprises a group of small, bluish libellulids, mainly distributed in South America, with its greatest richness in the Amazonian region (Borror, 1931, with additions). Indeed, just two species have been recorded outside the continent, i.e. *O. umbricola* Borror, 1931 in Costa Rica (Ramírez et al., 2000), Guatemala (Paulson, 1982) and Nicaragua (Daigle, 2002), and *O. heliophila* Borror, 1931 in Panama (Borror, 1931). Due to the uniform pattern of coloration with black and whitish-blue pruinosity of male adults, species are virtually undistinguishable in the field, some of them even from other genera with similar species such as *Erythrodiplax* Brauer, 1868 (cf. Santos, 1945b).

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Borror's (1931) revision was a milestone in the taxonomy of the genus, with his clear illustrations, diagnoses and keys, an aspect repeatedly highlighted in recent works (Garrison et al., 2006; Rehn, 2003; von Ellenrieder & Garrison, 2008). However, Borror (1931) dealt with just 14 of the currently 24 described species (von Ellenrieder & Garrison, 2008). After 1931 nine new species were described, one from Ecuador (Rehn, 2003), two each from Argentina (Fraser, 1947; von Ellenrieder & Garrison, 2008) and Brazil (Santos, 1945b, 1951), and four from Venezuela (De Marmels, 1989, 1992, 2008). Furthermore *Podothemis nemesis* Ris, 1909 was transferred to *Oligoclada* (Santos, 1945a), *O. raineyi* Ris, 1911 was synonymized with *O. abbreviata* (Rambur, 1942), and *O. risi* Geijskes, 1984 was proposed as a new name for *O. abbreviata sensu* Borror (Geijskes, 1984). Finally, a new subspecies, *Oligoclada abbreviata limnophila* Machado & Machado, 1993 was described (Machado & Machado, 1993). These changes render Borror's key out-of-date, making it necessary to compare specimens with primary descriptions for secure identification (Garrison et al., 2006).

Recently Heckman (2006) presented an updated version of Borror's key containing 22 species. In spite of containing a higher number of species than in Borror's work, this key was entirely compiled from the literature, and as was also observed for other genera (e.g. Carvalho et al., 2009; Pinto & Lamas, 2010), accumulated several imprecisions and thus cannot guarantee secure identifications. This is exemplified by the incomprehensible confusion between *O. abbreviata* and *O. risi* (cf. Heckman, 2006, p. 24, 107, 302–304). On the other hand, the three Argentinean species were accurately revised, diagnosed and included in a key of their own by von Ellenrieder & Garrison (2008).

Oligoclada species have been generally recognized as inhabitants of lotic habitats (e.g. Borror, 1931; Machado & Machado, 1993). However, descriptions of ultimate larval stadia (Fleck, 2003; Souza et al., 2002) and notes on biology in taxonomic descriptive studies of adults (De Marmels, 1989; Machado, 1954; Rehn, 2003; Santos, 1951; von Ellenrieder & Garrison, 2008) challenge this statement, as all larvae were collected in typical lentic habitats, although some of these water bodies were associated with river systems. Thus the breeding sites are probably variable among the species, with a trend to lentic environments.

During recent expeditions for an environmental impact assessment required for installation of hydroelectric power station under construction on the Rio Madeira, Rondônia State, in Brazilian Amazonia, we identified a striking new species of *Oligoclada*, which is described, illustrated and diagnosed in this paper. The number of species of the genus now known from that state has thus reached the impressive total of eight (Borror, 1931; Dunkle, 1989; Garrison, 1989).

Material and methods

Specimens studied are deposited in Museu de Zoologia, Universidade de São Paulo (MZSP), São Paulo, and Coleção Entomológica Prof. José Alfredo Pinheiro Dutra, Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio do Janeiro (DZRJ), Rio de Janeiro, both in Brazil.

Descriptions, illustrations, and measurements were made with the aid of a stereoscopic microscope equipped with a camera lucida. For measurements greater than 10 mm a manual caliper was used. All measurements are in millimeters.

Terminology for wing venation follows Riek & Kukalová-Peck (1984) with additions summarized by Fleck et al. (2003). For description of the structures of the vesica spermalis (VS) the nomenclature proposed by Miller (1991), which is essentially the same system used by Kennedy (1922) and Borror (1931), was adopted, in preference to Pfau's (2005) terminology in order to facilitate comparisons among the species, since all descriptions of *Oligoclada* employed the Kennedy–Borror system. The VS was extracted, together with sternite S3, after relaxing the specimen with drops of 10% ammonia solution on the S2–3 venter. The VS was immersed in a 10%

Figure 1. *Oligoclada mortis* sp. nov.: (a) scan image of male holotype in lateral view; (b) type locality at "T[ransect] 5-21, seg[ment] 12" (09°35′19″S, 65°02′50″W, 106 m asl), small stream (igarapé) in Brazilian Amazonia, Porto Velho municipality, Rondônia State; (c) aspect of forested adjacent area; (d) general view of Rio Madeira river and the slope of type locality. Photos (c) and (d) Rogério R. Silva 2010, (b) Odonata's ARCADIS Tetraplan S.A. working group.

KOH solution for few hours at room temperature and subsequently rinsed in water. Generally, VS inflates after this process probably due to osmotic pressures (cf. Santos, 1945a), but unfortunately this was not achieved with the only specimen examined, which precludes accurate identification of its structures. Material was later stored in a microvial with glycerin and stored with the specimen.

The following abbreviations were used in the text: Ax = antenodal crossveins; Fw = forewing; Hw = hind wing; Px = postnodal crossveins; pt = pterostigma; S1–10 = abdominal segments; VS = vesica spermalis; V1–V4 = vesica spermalis segments.

Oligoclada mortis sp. nov.

(Figures 1a, 2a–k)

Etymology

From the Latin *mors* (f. genitive *mortis*), personification of death, in reference to the sickle shape of posterior hamule recalling the tool used by the mythological entity to reap the life of the living beings.

Specimens studied

Holotype ♂: Brazil, Rondônia State, Porto Velho municipality, "T[ransect] 5-21, seg[ment]12" (09°35′19″S, 65°02′50″W, 106 m asl), 13 v 2010, leg. Nogueira & Mendes (MZSP); 1 ♂ paratype: same data as holotype but "Abunã area, T[ransect] 10-P2 seg[ment] 4" (*c.*09°35′43.70″S, 65°20′55.70″W, 108 m asl), 17 v 2010, leg. Nogueira & Mendes (MZSP). The specimens

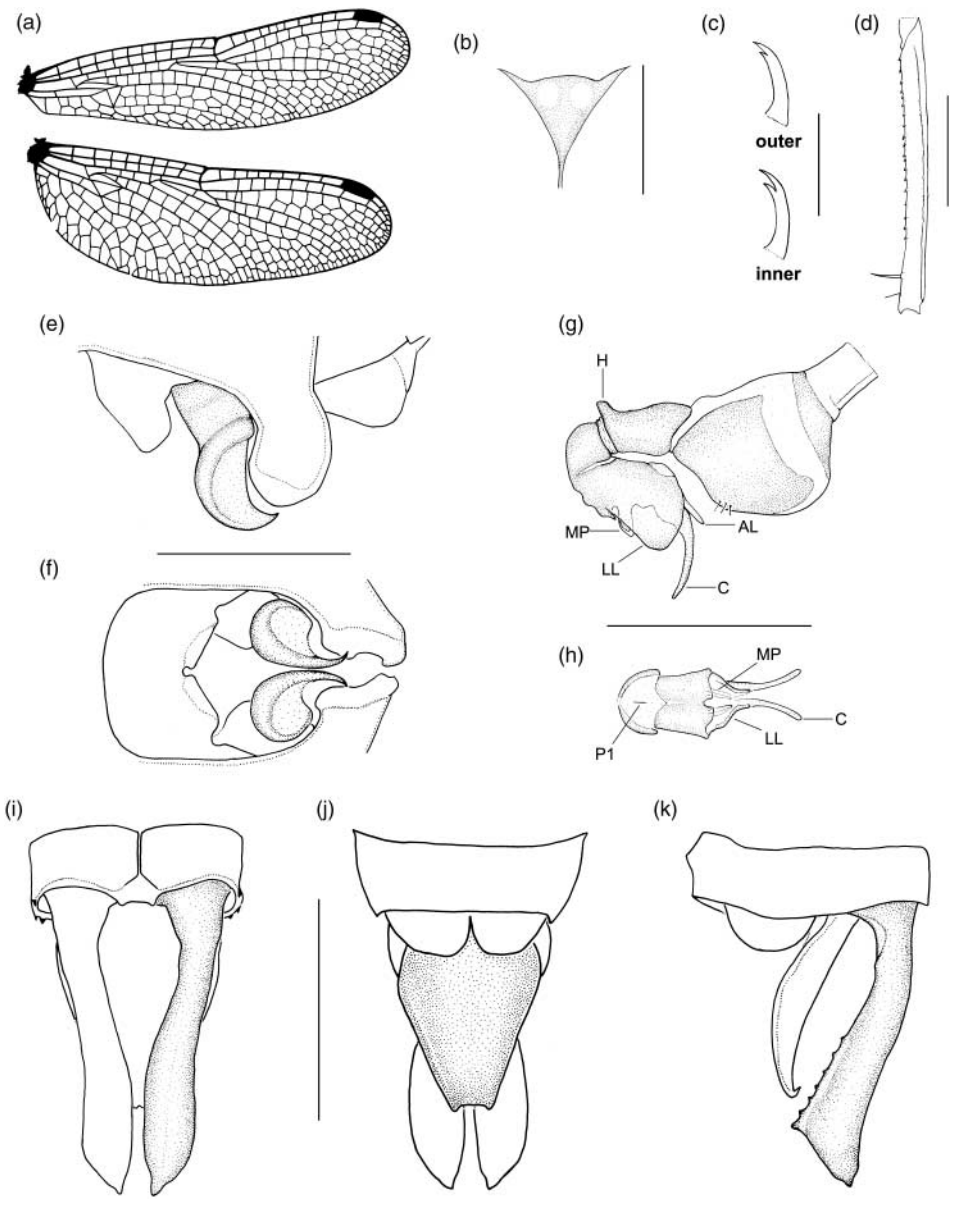

Figure 2. Adult male of *Oligoclada mortis* sp. nov.: (b–f, i–k) Holotype; (a, g–h) Paratype – (a) wings; (b) occiput, dorsal view; (c) metathoracic tarsal claws, lateral view; (d) metathoracic femur, lateral view; (e–f) genital fossa, (e) lateral view, (f) ventral view; (g–h) vesica spermalis, (g) lateral view, (h) ventral view of second to fourth segments; (i–k) caudal appendages, (i) dorsal, (j) ventral, and (k) lateral views. Scale lines (b, e–k) 1 mm; (c) 0.5 mm; (d) 2 mm. AL: apical lobe; C: cornua; H: dorsoapical hump; LL: lateral lobe; MP: medial process; P1: sperm filling pore.

were collected under IBAMA 02001.006797/2008-30 and CGFAP 260/2010 licenses. Paratype with the left genital lobe lost and apex of right posterior hamule broken. Left pair of wings detached and mounted in clear plastic. Both specimens with the head and thorax slightly smashed.

Male holotype

Head. Labium shining black. Labrum ivory, a narrow black spot at center of ventral margin narrowing laterally; base of mandibles ivory, irregularly spotted with brown to black. Clypeus and narrow ventral stripe of antefrons ivory; remainder of frons and vertex blue, with metallic reflections. Frons smashed, precluding precise measurement of width of ivory stripe on antefrons. Antennae dark brown to black. Occipital triangle blackish brown with pair of ill-defined rounded orange spots on each side (Figure 2b); rear of head black. Postfrons with wide-shallow medial furrow; vertex rounded; posterior margin of occipital triangle slightly convex without any differentiated process (Figure 2b).

Thorax. Prothorax black, except for brown spot lateral to middle lobe, narrowed dorsally; margin of posterior lobe with long, white, hair-like setae. Synthorax (Figure 1a) brown to black, irregularly covered with whitish-blue pruinosity; mesepisternum black dorsally, lightening to dark brown towards mesepimeron; metapleura brown with irregular dark areas, without distinct pattern of pale and dark areas. Legs black, covered with whitish-blue pruinosity on ventral surface; ventral surface of prothoracic trochanter ivory; anteroventral surface of metafemora armed with 21 short spines followed distally by one spine, 6.2 times longer than proximal ones (Figure 2d); anteroventral surface of metathoracic tibia with 12 spines, longer than intervening spaces; metathoracic pretarsal claws with distinct acute supplementary inferior tooth at *c.*0.75 (outer claw) and 0.66 (inner claw) of their length (Figure 2c).

Wings. Membrane hyaline; venation black; pt pale brown, contrasting with black of surrounding veins, rectangular; membranula small, anterodistal base whitish, remainder brown to dark brown. Venation as follows: 9–10 Ax in Fw (distal one incomplete), 7 Ax in Hw; 7–9 Px in Fw, 8 Px in Hw; 7 postsubnodals in Fw, 7–8 in Hw; one bridge crossvein arising proximal to RP2 in all wings; arc between Ax1 and 2, closer to Ax2; sectors of arc (MA+RP) stalked, their common origin located *c.*0.30 distance from posterior to anterior end of arc in all wings; Rspl with one cell row, composed of 5 cells in Fw, 4 in Hw; discoidal triangles, supratriangles and subtriangles not crossed in four wings; Hw triangle base arising obliquely to arc; space between CuP-crossing and proximal side of discoidal triangle not crossed in Fw, with an additional crossvein in both Hw; Fw discoidal field with two rows of cells up to level of nodus, increasing to 6–7 cells at wing margin; Hw discoidal field divergent, with 4 rows of one cell followed by 1–3 double cells, then broadening to 9–10 cells towards wing margin; Mspl indistinct in all wings; anal loop elongated with distinct midrib, with well-developed toe, foot-shaped, reaching distally to level of RP-midfork; total cells in anal loop 17–18 (proximal row 8 cells, distal 9–10); two paranal cells in Hw; anal field with 2–3 cells rows posterior to anal loop (2 cell rows at triangle level).

Abdomen. Almost black, covered with whitish-blue pruinosity on S1–4 and ventral portions of S5–8; S2–3 paler, brownish orange with black carinas; dorsal center of S4–7 with ill-defined brownish-orange stripe, not reaching anterior and posterior margins of respective segment; ventrotergal portion of S9 with a small, indistinct, brownish rounded spot in posterior half; transverse carina of S4 barely distinguishable, suture-like in shape. Secondary genitalia: anterior surface of anterior lamina without spines, in ventral view (Figure 2f) with posterior margin concave, abruptly accentuated medially, in lateral view lower than posterior hamule and genital lobe (Figure 2e); posterior hamule unbranched, sickle-shaped, distinctly higher than genital lobe, apex acute, directed posterodorsally in lateral view (Figure 2e) and outwards with apex diverging from opposite hamule in ventral view (Figure 2f), inner surface between base and apex of hook seemingly membranous; angle of curvature formed by the hamular ridge distinctly obtuse and of about 70°; ridge strongly pronounced at base and gradually disappearing toward apex in lateral view (Figure 2e); genital

lobe rounded with anterior and posterior margins similar, 1.25 longer than wide (Figure 2e). For VS description see paratype. Cerci (Figure 2i–k) black, in lateral view regularly smoothly curved, slightly constricted at anterior 0.2 to 0.3, then gradually expanding posteriorly; apex tapering into a thumb-like process directed obliquely dorsad; posterior margin obliquely truncated; ventral margin with row of 6–7 spines on a ridge-like process from anterior 0.46 to posterior 0.79 of cercus length (Figure 2k); in dorsal view, cerci converging along anterior 0.5 of cercus length, then slightly diverging with somewhat flattened converging apexes (Figure 2i). Epiproct slightly bifid at tip, extending to 0.64 length of cerci (Figure 2j).

Measurements. Total length (including caudal appendages) 26.5; abdomen length (excluding caudal appendages) 15.5; head maximum width 4.2; Fw length 20; Hw length 19; Hw width 6.6 (proximal to costal nodus); pt length 1.5 in Fw, 1.9 in Hw; length of metathoracic femur 5.6; metathoracic tibia 6.3; length of genital lobe 0.5; width of base of genital lobe 0.4; length of hamule in lateral view 0.8; length of anterior lamina in lateral view 0.5, length of S9+10 in lateral view 1.3; total length of cercus in lateral view 1.4; length of epiproct in lateral view 0.9.

Variation in the paratype

Head. Base of mandibles ivory. Pair of rounded orange spots on occipital triangle clearly defined.

Thorax. Prothorax black. Synthorax brown to black, pruinose areas more extensive; anteroventral surface of metafemora armed with 19 short spines followed distally by one longer distal one (apex broken in both legs); anteroventral surface of metathoracic tibia with 12–13 long spines, tarsal supplementary inferior tooth at *c.*0.75 of their length in both claws. Wing (Figure 2a) venation as follows: 8 Ax in Hw; 9–10 Px in Fw (distal Ax on right wing not reaching the costal margin), 8 Px in Hw; 6–7 postsubnodals in Fw, 6–7 in Hw; Rspl with one cell row, composed of 4–5 cells in Fw; space between CuP-crossing and proximal side of discoidal triangle with an additional crossvein only in left Hw; Hw discoidal field with 4–5 rows of one cell; total of cells in anal loop 15–16 (proximal row 7 cells, distal 8–9).

Abdomen. Dorsal center of S5–7 each with ill-defined brownish-orange stripe, not reaching anterior and posterior margins of segments; ventrotergal portion of S9 with large brownish rounded spot on posterior half; cerci black with internal posterior surface brown. Secondary genitalia: VS with pair of very long, filiform cornua extending distinctly beyond apex of subtriangular lateral lobes and ventrally beyond hood (Figure 2g); medial process with ventrally directed lobe, strongly sclerotized internally and surrounded by membranous (probably inflatable) structures (Figure 2g–h); apex of apical lobe tongue-shaped, covered by minute spines (Figure 2g); inner lobes not discernible.

Measurements. Total length (including caudal appendages) 25.3; abdomen length (excluding caudal appendages) 15.3; head maximum width 4.1; Fw length 20.9; Hw length 19.5; Hw width 6.3 (proximal to costal nodus); pt 1.7–1.8 in Hw; length of metathoracic femur 5.8; metathoracic tibia 6.1; length of S9+10 in lateral view 1.4.

Female and larva. Unknown.

Diagnosis

Small-sized libellulid, predominately blackish brown covered with whitish-blue pruinosity, postfrons blue with metallic reflections, wings hyaline with sectors of arc stalked and Mspl

indistinct, typical of the genus. The combination of uncrossed triangles, discoidal field beginning with two rows of cells in Fw, foot-shaped anal loop, anal field with 2–3 three rows of cells (Figure 2a), transverse carina on S4 barely indicated, tarsal claws with a definite tooth on 0.66–0.75 of their length (Figure 2c), and VS with long filiform cornua reaching distinctly beyond apex of lateral lobes and medial process (Figure 2g–h), separate *O. mortis* sp. nov. from all species positioned in Groups I–II, IV–VI of Borror (1931) also including *O. calverti* Santos, 1951, *O. garrisoni* De Marmels, 2008, *O. haywardi* Fraser, 1947, *O. nemesis*, *O. rubribasalis* von Ellenrieder and Garrison, 2008 and *O. teretidentis* Rehn, 2003 not considered in Borror's revision. Within Group III, in which we also include *O. amphinome* Ris, 1919, *O. crocogaster* Borror, 1931, *O. borrori* Santos, 1945, *O. leucotaenia* De Marmels, 1989 (see discussion), *O. hypophane* De Marmels, 1989 and *O. waikinimae* De Marmels, 1992, the new species can easily be distinguished from all other species by following unique combination of characters: labium entirely black, posterior hamule sickle-shaped, more than two times as long as anterior lamina and 1.6 times as long as genital lobe, proportionally the largest observed in the genus; hamular basal length 0.33 of its total length; ventral edge of genital lobe rounded (Figure 2e); epiproct $\leq$0.66 total length of cercus, ending posteriorly anterior to the last spine of cercus (Figure 2k); venter of S7–9 almost black with a small indistinct brownish rounded spot on tergite of S9; cercus widest at *c.*0.66 posterior of its length; ventral set of 6–7 teeth arranged in ridge-like process; apexes of cerci convergent in dorsal view (Figure 2i–k).

Biological and ecological data

Rondônia State, especially the region of its capital Porto Velho, with its eight recorded species presents the highest richness of *Oligoclada* among the nine Brazilian States covered by the Amazonian biome. However, all other Amazonian States probably have a similar or even higher number of species of this genus. The huge Brazilian Amazonia is very poorly investigated, with no extensive and systematic collecting expeditions, thus several areas are virtually terra incognita. Furthermore the few existing collections are understudied.

The gently sloping locality where the holotype of *O. mortis* was collected (Figure 1d) harbors a small partially shaded stream (igarapé) of second order with abundant leaf litter, and with its bed composed of a mixture of predominantly dark clay, plus sand and small rocks (Figure 1b). Neighboring areas include forest with partially open canopy, ferns and young palms in the understory, superior strata with trees and lianas (Figure 1c). Without identification of its larva, it is impossible to characterize this species as lotic or lentic, since the breeding site could be lentic, for example a stagnant portion of the igarapé, in spite of the latter being running water. The paratype was collected in a similar environment, albeit with denser vegetation.

These sites are located in the area of influence of Jirau hydroelectric plant on Rio Madeira (Figure 1d), which represents one of the large scale projects for energy production of the Brazilian government in Amazonia.

Discussion

Borror's (1931) division of *Oligoclada* into six 'natural' groups based on VS (penis) morphology is practical, in spite of his conflicting nomenclature. Differently from his work on *Erythrodiplax* (Borror, 1942), the distinction of lobes of fourth segment is unclear, especially between inner lobes (internal lobes *sensu* Borror) and the apical lobe (posterior lobe *sensu* Borror). In some species he identified the most dorsal lobe as the apical lobe with inner lobes located immediately ventral to it (e.g. *O. crocogaster*), while in others species the most dorsal lobe was identified as the inner lobe with the apical lobe ventrally (e.g. *O. monosticha* Borror, 1931). Borror (1931) did

not provide an explanation, at least in detail, for calling the dorsal lobe sometimes the apical lobe and at other times the inner lobe. This inconsistency renders comparison complex and unreliable, since identification of lobes is ambiguous and consequently errors of interpretation could be common. The problem was highlighted by Santos (1945a, p. 3) who studied VS structures under full inflation and considered the single most dorsal lobe, labeled as the inner lobe in some species by Borror (1931, pl. VI), as actually the apical lobe. Santos' opinion appears to be most consistent with VS morphology of other libellulids and is followed here.

Based on detailed studies by Pfau (1971, 2005) the filling pore (P1) is positioned in the second segment. However, in Miller's (1991) system it is positioned in the third segment. Indeed a distinct borderline, due to different levels of sclerotization, is observed between the large proximal part of V2 which ends in the dorsoapical hump (the point at which the ligula engages to VS, named as dorsodistal peg in Miller's terminology) and a small distal portion largely in contact with V3 (Figure 2g). Current terminologies are largely contradictory, and certainly the highly variable VS of Libellulidae species represent a great challenge for proposition of a general system. In *Oligoclada* a comprehensive study must be undertaken for unambiguous correspondence in the distal lobes among all species.

In spite of these problems, based on morphology of its VS (observed only in the decompressed state) *O. mortis* can be placed in Group III together with *O. amphinome*, *O. crocogaster*, *O. borrori*, *O. leucotaenia* (see below), *O. hypophane* and *O. waikinimae*. This group is characterized mainly by the presence of a pair of filiform cornua, much longer than inner lobes, extending considerably beyond the apex of lateral lobes; lateral lobes usually triangular, not narrowed basally; and medial process 0.33 as long as cornua or less. In Borror's (1931) work just two species (i.e. *O. crocogaster* and *O. amphinome*) were included in this group, thus we provide a key to males of the seven species currently involved.

De Marmels (1989, p. 51) considered *O. leucotaenia* related to *O. crocogaster* and *O. amphinome*, both species of Group III. In spite of structural characters indicating a correct placement, the author did not describe the VS and the only illustration provided for this organ (p. 77) depicts the cornua as apparently absent. The probable absence of this structure was later validated by De Marmels (1992, p. 45) "En *O. leucotaenia* (serie tipo) … el pene carece de cornua". We provisionally keep *O. leucotaenia* in Group III of Borror (1931), following De Marmels' (1989, 1992) opinion, but probably the group should be reevaluated since this species does not show the main diagnostic character for the group, i.e. the shape and relative length of cornua. Phylogenetic analyses of the genus should be undertaken in order to identify the relationships among species and test the validity of Borrors's groups. Furthermore, Heckman (2006, p. 299) questioned the validity of this species without presenting any reasons supporting his opinion. Based on the description and illustrations provided by De Marmels (1989) and contrary to Heckman's statement we believe *O. leucotaenia* is a valid species, especially considering the shape of posterior hamule and already cited absence of a long cornua in VS.

The sickle shape of the posterior hamules of *O. mortis* shows great similarity to *O. stenoptera* Borror, 1931 and especially to the Venezuelan *O. garrisoni*, although both species belong to Group II. In addition to the larger hamule and distinct morphology of the caudal appendages of *O. mortis*, these two species differ from *O. mortis* in presenting a less developed anal loop, without a distinct heel and sole (not foot shaped), the anal field with just one cell row and the cornua distinctly less developed, being either absent (*O. garrisoni*) or only as long as lateral lobes (*O. stenoptera*).

Key to males of Borror (1931) species Group III of Oligoclada

This key was based on information available in the literature and examination of specimens of *O. amphinome*, *O. borrori*, *O. crocogaster* and *O. mortis* of Group III, besides species of other

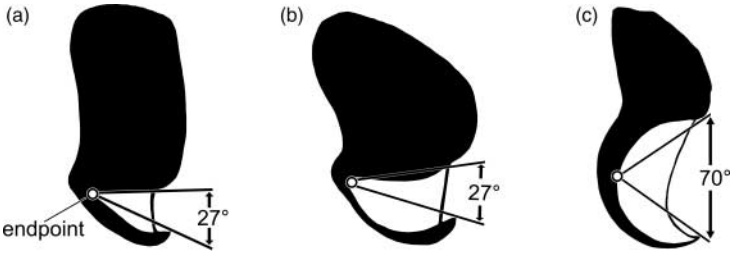

Figure 3. Diagrammatic representation of posterior hamule of species of Group III of *Oligoclada* in lateral view, depicting the measurement of angles of curvature of hamular ridges. (a–b) proximal and distal ridges meeting in a distinctive endpoint (vertex) (c) proximal and distal ridges lacking clear distinction, with a central point used as endpoint.

groups listed in the appendix. Therefore the key should be used with caution, and for correct determination illustrations from primary descriptions (Borror, 1931; De Marmels, 1989, 1992; Santos, 1945b) must be consulted. The angle of curvature of hamular ridges corresponds to the angle formed between posterior apexes of hamule and intersection of the proximal and distal ridges (Figure 3a–c). In *O. amphinome* and *O. crocogaster* the proximal and distal ridges meet in a distinctive point (Figure 3a–b, see also Borror 1931: figures 20–21). However, in another extreme in *O. leucotaenia* (De Marmels, 1989, figure 207) and *O. mortis* (Figures 2e, 3c) there is no clear distinction between proximal and distal ridges and a central point was used as endpoint for determination of its angle of curvature (Figure 3c). Dr. N. von Ellenrieder (NvE; pers. comm., 2011) observed specimens in the Rosser W Garrison collection with features distinct from those stated in the key. These differences are provided in square brackets, since they were not examined by us.

1. Cornua of VS greatly developed in a long filiform structure, extending distally considerably beyond apex of lateral lobes, markedly curved, ventrally surpassing the margin of the hood (except ***O. leucotaenia***); eight or more Ax in Fw; discoidal triangles one-celled; subtriangles one-celled (rarely two-celled in one Fw), discoidal field beginning with two rows of cells in Fw, foot-shaped anal loop, anal field with two or three rows of cells; tarsal claws with definite tooth at 0.66–0.75 of its length (Group III) 2

1.′ Character combinations differing from those above..... .....**other species groups of *Oligoclada***

2(3) VS without distinct cornua; labium with an extensive black spot covering at maximum 0.5 of palp width and prolonged over the anterior margin; labrum entirely black; costal side of pt in Fw 1.7 mm..... ***O. leucotaenia***

2′. VS with long filiform cornua; labium with black spot covering less than 0.33 of palp width and not prolonged over anterior margin, or labium entirely black; labrum whitish yellow with a black median spot covering at most ventral 0.66 of its height; costal side of pt usually less than 1.7 mm, or about 2.5 mm..... 3

3(2′). Epiproct almost as long as cerci (ratio of epiproct/cerci 0.91–0.92)..... 4

3′. Epiproct distinctly shorter than cerci (ratio of epiproct/cerci 0.64–0.85)..... 5

4(3). Anal loop composed of 17–20 cells; posterior hamule as high as genital lobe; hamular proximal ridge meets distal one almost in an acute point, forming angle of curvature of less than 35° (34); cerci constricted at posterior 0.66, with 4–6 ventral spines located along posterior 0.6–0.75 of cercus; length of costal side of pt in Fw 1.5 mm..... ..... ***O. amphinome***

4. Anal loop composed of 13–14 cells [NvE, one specimen from Bolivar State, Venezuela with 16–18 cells]; posterior hamule slightly higher than genital lobe; hamular proximal ridge meets distal one in regular rounded curve, forming angle of curvature of more than 35° (40); cerci regularly curved with, 5 ventral spines located along posterior 0.5–0.66 of cercus; length of costal side of pt in Fw 1.2 mm [same specimen from Bolivar has pt in FW with 1.7 mm]..... ***O. hypophane***

5(3′). Length of costal side of pt in Fw *c*.2.5 mm; apex of wings with a brownish spot; anal loop composed usually of 13–16 cells; anterior lamina as long as 0.66 of genital lobe in lateral view..... ***O. borrori***

5′. Length of costal side of pt in Fw at most 1.8 mm; apex of wings hyaline; anal loop composed usually of 15–19 cells [NVE, one specimen from Rondônia State, Brazil, has 13–14 cells]; anterior lamina at least 0.72 as long as genital lobe in lateral view..... 6

6(5′). Labium entirely black; venter of S7–9 almost black with an ill-defined pale spot on posterior 0.5 of S9; posterior hamule distinctly higher than genital lobe; hamular ridge semicircular, forming an angle of curvature of *c*.70°; ventral margin of genital lobe rounded; ratio between epiproct and cerci length in lateral view less than 0.67; apexes of cerci converging in dorsal view; cercus with 6–7 ventral spines on a ridge-like process .... ***O. mortis* sp. nov.**

6′. Labium with a black spot covering at most 0.33 of palp width; venter of S7–9 reddish orange to red; posterior hamule no longer than genital lobe; hamular proximal and distal ridges forming angle of curvature less than 50°; ventral margin of genital lobe somewhat truncated; ratio between epiproct and cerci length greater than 0.75 in lateral view; apexes of cerci parallel to slightly divergent in dorsal view; cercus with 4–6 ventral spines not on a distinct ridge-like process..... 7

7(6′). Labrum with black spot covering ventral 0.25–0.5; hamular proximal ridge meeting distal one in acute point (less acute in Pará specimens), forming angle of curvature of at most 28°; cornua of VS greatly developed, extending distally considerably beyond apex of medial process; lateral lobes distinctly rounded..... ***O. crocogaster***

7′. Labrum whitish yellow without black spots; hamular proximal ridge meeting distal one in regular rounded curve, forming angle of curvature more than 30° (35); cornua of VS less developed extending distally approximately level of apex of medial process; lateral lobes subtriangular..... ***O. waikinimae***

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Appendix. List of *Oligoclada* held in MZSP and DZRJ Brazilian collections

We examined and properly curated all 80 specimens held today in these collections. They belong to 14 nominal species (three distinct species could not be correctly identified) which corresponds to more than half the total number of species included in *Oligoclada*.

***O. abbreviata abbreviata* (Rambur, 1842)**. [SURINAME]: 1♂ [Sipaliwini District], Apetina, 23 iii 1952, leg. G. [D.C. Geijskes?] (MZSP); BRAZIL: 1♂ Pará State, [Paragominas municipality], Coraci – 15 Km NW [of Indian station] Canindé, Rio Gurupi, iv 1963, leg. B[orys] Malkin (MZSP); 4♂ Itaituba municipality, xii 1963, leg. [Richard von Diringshofen] (MZSP); 1♂ same data but Rio Tapajoz [sic. Tapajós] (MZSP); 3♂ same data but Rio Tapajoz [sic. Rio Tapajós], Santarensinho [Ribeirinha Comunity of Santerenzinho], vii 1962 (MZSP); 3♂, 1♀, Altamira municipality, Rio Iriri Camp ca. 100 Km S[outh] of Altamira 03°50′S, 52°40′W [134 m asl], 17 x 1986, leg. P. Spangler & O. Flint (MZSP); 1♂ same data but 18 x 1986; 1♂ Mato Grosso State, [Santa Terezinha municipality], Rio Tapirapé, [locality of] Porto Velho [10°45′27.94″S, 51°01′26.60″W, 181 m asl], iv 1964, leg. R.T. Lima (MZSP); 1♂ Barra do Garças/Nova Xavantina municipalities, Rio Pindaiba, Faz[enda] Vera Cruz (RIPI[05]), 14°56′56.56″S, 52°04′17.07″W, 286 m asl, 10 ii 2005, leg. J.D. Batista & L.A. Castro (DZRJ 753) [Ex-UFG collection].

***O. amphinome* Ris, 1919**. [SURINAME]: 1♂ [Para District], Powakka, 12 x 1962, leg. G. [D.C. Geijskes?] (MZSP).

***O. borrori Santos*, 1945**. BRAZIL: 1♂ Minas Gerais State, [Jaboticatubas municipality], Serra do Cipó, iv 1964, leg. A.B.M. Machado (MZSP) [ex-ABMM collection].

***O. calverti Santos*, 1951**. BRAZIL: 1♂ Minas Gerais State, Florestal municipality, Ribeirão do Ouro, 19 iv 1986, leg. A.B.M. Machado (MZSP) [ex-ABMM collection].

***O. crocogaster* Borror, 1931**. BRAZIL: 3♂ Rondônia State, Porto Velho municipality, 16 xi 1962, leg. A.B.M. Machado (MZSP) [ex-ABMM collection]; 1♂ Pará State, Marapanim municipality, Alegre 15 Km, 09 ix 1965, Exp[edição] D[epartamento de] Z[oologia da USP] (MZSP); 1♂ Barcarena municipality, Igarapé Dendê, T[ransect] B[arcarena] 050 [01°33′57.93″S, 48°44′48.24″W, 14 m asl], north sector, area of construction of the E[letricity] T[rasmission] U[nit], viii or x 2006, leg. N. Ferreira-Jr & J.L. Nessimian (DZRJ 1044).

***O. laetitia* Ris, 1911**. BRAZIL: 2♂ Rio Grande do Sul State, Viamão municipality, Chácara Nossa Senhora das Graças [Instituto de Educação Marista Nossa Senhora das Graças], 30°04′37.08″S, 51°03′10.65″W, 76 m asl, 05 iii 2005, leg. APP & J.G. Da Silva (DZRJ 841-842).

***O. monosticha* Borror, 1931**. BRAZIL: 1♂ Pará State, Altamira municipality, Rio Xingu Camp. *c.*60 Km S[outh] of Altamira 03°39′S, 52°22′W, [110 m a.s.l], 13 x 1986, leg. P. Spangler & O. Flint (MZSP).

***O. mortis* Pinto & Lamas.** BRAZIL: Holotype ♂, Rondônia State, Porto Velho municipality, "T[ransect] 5-21, seg[ment]12" (09°35′19″S, 65°02′50″W, 106 m asl), 13 v 2010, leg. Nogueira & Mendes (MZSP); 1♂ Paratype: same data as holotype but "Abunã area, T[ransect] 10-P2 seg[ment] 4" (*c.*09°35′43.70″S, 65°20′55.70″W, 108 m asl), 17 v 2010, leg. Nogueira & Mendes (MZSP).

***O. nemesis* Ris, 1909**. BRAZIL: 1♂ Minas Gerais State, São João del Rei municipality, xii 1956, leg. A.B.M. Machado (MZSP) [ex-ABMM collection].

***O. pachystigma* Karsch, 1890**. BRAZIL: 2♂ Pará State, Parauapebas municipality, Área de Proteção Ambiental (APA) do Igarapé Gelado, "cela 7", 05°57′56.00″S, 50°13′00.27″W, 235 m asl, 03 iii 2008, leg. N. Ferreira-Jr & A. Santos (DZRJ 1041-1042); 2♂ Paragominas municipality, Santana do Capim, Rio Capim river, 16 i 2002, leg. N. Ferreira-Jr (DZRJ 1047-1048); 1♂ Mato Grosso State, Ribeirão Cascalheira municipality, Rio São João Grande (RISJG), 12°46′20″S, 51°06′36″W, [212 m asl], 15 viii 2003, leg. J.D. Batista & L.A. Castro (DZRJ 754) [ex-UFG collection]; 2♂ Cocalinho municipality [sic. coordinates on Nova Xavantina municipality], Córrego Areões/Lagoa Rosico (LRO), 14°35′38″S, 52°12′07″W, 268 m asl, 31 vii 2005, without collector (DZRJ 755) [Ex-UFG collection]; 1♀ Mato Grosso [do Sul] State, Riacho do Herval, Rio Paraná, iv1952, B. Pohl leg. [Ex-Richard von Diringshofen collection] (MZSP); 2♂, 3♀ Goiás State, Aruanã municipality, v 1960, leg. [Richard von Diringshofen] (MZSP); 1♀ same date but iii [19]62 (MZSP).

***O. risi* Geijskes, 1984**. BRAZIL: 1♂ Roraima State, Igarapé caminho Cipó, Orindoc[?], vii 1960, leg. A.B.M. Machado (MZSP) [ex-ABMM collection]; 1♂ Pará State, Altamira municipality, ix 1963, leg. [Richard von Diringshofen] (MZSP); 1♂ same data but Rio Xingu, x 1963 (MZSP).

***O. sylvia* Kirby, 1889**. BRAZIL: 1♂ Amazonas State, Rio Nhamundá or Rio Abacaxis rivers, [probably in the locality of Paxiúba 04°28′48″S, 58°34′24″W, 20 m asl, boundary between Borba and Nova Olinda do Norte municipalities, DMT pers. comm.], 14 v to 06 vi 2008, leg. D.M. Takiya (DZRJ 1046); 1♂ Barcelos municipality, 15–20 ix 2005, leg.

L.M. Pessôa (DZRJ 1117) [These specimens differs from Borror's (1931) description by the distinctive teeth on ventral surface of their cerci].

***O. walkeri* Geijskes, 1931**. BRAZIL: 1♂ Pará State, [Paragominas municipality], Coraci – 15 Km NW [of Indian station] Canindé, Rio Gurupi, iv 1963, leg. B[orys] Malkin (MZSP); 1♂ [Marabá municipality, Rio] Itaca[iúnas], Lot 571, [coord. ca. 05°34′50.27″S, 49°47′15.59″W, 130 m a.s.l], 11 vii [19]86, leg. [R.B. Francini] (MZSP); 3♂ same but L[ot] 576, 18 vii [19]86 (MZSP); 1♂ Parauapebas muncipality, FLONA de Carajás, "ponto mais abaixo do Buritizal I", 06°6′14.08″S, 50°8′13.01″W, 569 m asl, 16 ix 2006, leg. N. Ferreira Jr. & L.L. Dumas (DZRJ 1039); 1♂ same data but 28 ix 2007, leg. N. Ferreira-Jr & V. Alecrim (DZRJ 1040); 1♂ Pará State, Altamira municipality, Rio Xingu Camp. *c.*60 Km S[outh] of Altamira 03°39′S, 52°22′W, [110 m a.s.l], Igarapé N[orth] of camp, trail 4, 13 x 1986, leg. P. Spangler & O. Flint (MZSP); 1♂ Maranhão State, [probably Centro Novo do Maranhão municipality], Igarapé Gurupi-Uma, Aldeia Araçu, 50 Km E[ast] of [Indian station] Canindé, v 1963, leg. [Borys] Malkin; 1♂ Acre State, Sena Madureira municipality, Monte Rico, Rio Macauã, 05 xi 1997, leg. J.L. Nessimian (DZRJ 1043).

***O. xanthopleura* Borror, 1931**. BRAZIL: 3♀ Pará State, Óbidos municipality, Praia de Curumu, 01°52′20.7″S, 55°31′03.6″W, 84 m asl, 19 ix 2010, Expedição Mocoronga MZUSP (MZSP); 1♀, [Santarém municipality, Village of] Alter do Chão, 18 ix 1969, leg. E[xpedição] P[ermanente a] A[mazônia MZUSP] (MZSP); 1♂ Altamira municipality, Rio Iriri Camp *c.*100 Km S[outh] of Altamira 03°50′S, 52°40′W [134 m asl], 17 x 1986, leg. P. Spangler & O. Flint (MZSP); 1♂ Parauapebas municipality, FLONA de Carajás, "ETA" 06°04′55.49″–06°05′12.72″S, 50°09′06.10″–50°08′49.84″W, 664–680 m asl, iii 2005, leg. N. Ferreira-Jr (DZRJ 1053); 2♂, 4♀ Mato Grosso State, [Santa Terezinha municipality], Rio Tapirapé, [locality of] Porto Velho [10°45′27.94″S, 51°01′26.60″W, 181 m asl], iv 1964, leg. R.T. Lima (MZSP); 1♀ Barra do Tapiraré, 02-16.I.1966, leg. [Borys] Malkin (MZSP); 1♂ Ribeirão Cascalheira municipality, Lago do Mateiro (LGMT), Point 10, 12°25′53″S, 50°59′52″W, [203 m a.s.l], 23 v 2004, leg. J.D. Batista & L.A. Castro (DZRJ 756) [ex-UFG collection]; 1♂ same data but Corixo Manoel Taurino (COMAT), Point 10, 12°40′16″S, 50°59′25″W, 15 viii 2003 (DZRJ 757) [ex-UFG collection]; 1♂ [Novo Santo Antônio municipality?], Coricho sucupira (access road, COSUE), 25 v 2004, leg. J.D. Batista & L.A. Castro (DZRJ 758) [ex-UFG collection].

***Oligoclada* sp.A.** BRAZIL: 1♂ [Rondônia State], Porto Velho municipality, Rio Madeira. i 1944, leg. B. Pohl [Ex-Richard von Diringshofen collection] (MZSP).

***Oligoclada* sp.B.** BRAZIL: 1♂, 1♀, Amazonas State, Barcelos municipality, 15–20 ix 2005, leg. LM. Pessôa (DZRJ 1118) [badly preserved specimens, male similar to *O. stenoptera* but differs by shape of hamuli and cerci; female is in the same paper envelope but has an unusual three-celled triangle and complete last antenodal in both Fw, thus it may correspond to another species].

***Oligoclada* sp.C.** BRAZIL: 1♀ Amazonas State, [Manaus municipality], L[ago] Puraquequara, 01 xi 1969, leg. E[xpedição] P[ermanente a] A[mazônia MZUSP] (MZSP) [likely a female of *O. stenoptera*].