REVIEW OF THE BROWN LACEWING GENUS
BIRAMUS (NEUROPTERA: HEMEROBIIDAE:
HEMEROBIINAE), WITH THE DESCRIPTION OF
A NEW SPECIES FROM COSTA RICA AND PANAMA

Oswald, J. D., 2004. Review of the brown lacewing genus *Biramus* (Neuroptera: Hemerobiidae: Hemerobiinae), with the description of a new species from Costa Rica and Panama. – Tijdschrift voor Entomologie 147: 41–48, figs. 1–7. [ISSN 0040-7496]. Published 1 June 2004. The brown lacewing genus *Biramus* is reviewed and a new species, *B. aggregatus*, is described. The neotropical range of this genus is extended northwesterly from Venezuela to now include Costa Rica and Panama. The new species is differentiated on the basis of male terminalic characters, primarily structures of the ectoproct and gonarcus/mediuncus complex. Synapomorphies previously identified for the formerly monobasic genus *Biramus* are reviewed and differentiated from autapomorphies now attributable to its two included species.

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The family Hemerobiidae, brown lacewings, is a cosmopolitan clade of approximately 600 extant species of small predaceous insects in the order Neuroptera. The phylogeny, taxonomy, and biogeography of the world genera of this family have been broadly treated by Oswald (1993a, 1993b, 1994). The species were last comprehensively catalogued by Monserrat (1990).

The genus *Biramus* and its single originally included species *B. lunatus* were described by Oswald (1993a) on the basis of eight specimens collected at several sites in Venezuela. This new genus proved to be of particular phylogenetic interest as cladistic evidence suggested that its type species constituted the sister-group of the relatively speciose subfamily Hemerobiinae (sensu Oswald, 1993b), which contains ca. 200 species, or approximately one-third of the species-level diversity of extant brown lacewings.

This paper reports the discovery of a second species of *Biramus* from Costa Rica and Panama. This finding extends the known range of the genus northwesterly into southern North America. The discovery of this new species provides an opportunity to reassess the universality of characters previously identified as joint synapomorphies of *Biramus* and its single originally included species. Investigations in this regard support

the conclusion that many of the exceptional morphological features previously identified in *Biramus lunatus* now support the monophyly of the genus *Biramus*. This result further strengthens the interpretation of *Biramus* as the sister-group to all other extant hemerobiine brown lacewings. The taxonomic review below reassesses the distributions of *Biramus* character states and represents the first opportunity to distinguish between intraspecific autapomorphic ('species-level') and interspecific synapomorphic ('genus-level') traits within this clade.

MATERIALS AND METHODS

Abbreviations and Symbols

*, in synonymical listings indicates one or more figures pertaining to the annotation it follows, in descriptive text indicates a putative synapomorphy of the relevant taxon; dst, distribution; FT, female terminalia; MT, male terminalia; OD, original description; TAMU, Texas A&M University Insect Collection, College Station, TX, USA; W, wing; UCV, Universidad Central de Venezuela, Maracay, Venezuela; USNM, United States National Museum of Natural History, Washington, DC, USA. For morphological abbreviations see the caption to figs. 1–7.

Illustrations

Drawings were prepared with the aid of drawing tubes attached to compound and dissecting microscopes. Terminalic figures were drawn from elements macerated in KOH and stained with Chlorazol Black.

Terminology

Morphological terminology, particularly for wing venation and male and female terminalia, follows that of Oswald (1993a, b).

Genus *Biramus* Oswald

Biramus Oswald, 1993a: 363. Type species: *Biramus lunatus* Oswald, 1993, by original designation.

Etymology: Bi- (< *L. bi-*, two) + -ramus (< *L. ramus* [masc.], branch), in reference to the two oblique radial branches of the forewing radius of its type species, see Oswald 1993a: 364. Gender: masculine, from the gender of the *L. noun ramus*, Art. 30.1.1.): Monserrat 2002:238 (dst [Costa Rica]).

Diagnosis

Differentiated from all other hemerobiid genera by the following combination of forewing characters (see Oswald 1993a: 365, fig. 1b): (1) radius bearing two oblique radial branches [=ORB's, =radial-sectors'], (2) subcosta and anterior radial trace well separated in basal half of wing [closely adjacent in *Notiobiella*, pantropical], (3) first (most proximal) fork of ORB1 located distal to most proximal fork of ORB2 [the relative positions of these forks are reversed in most other hemerobiid genera with only two ORB's, e.g., *Nomero-bius*, *Neosymphorobius*, *Psectra*, *Symphorobius*, *Zachobiella*], and (4) crossvein linking base of ORB1 to anterior radial trace absent [present in *Carobius*, Australia]. See also the putative synapomorphies identified in the description below by an asterisk (*).

Description

Medium-sized hemerobiids, forewing length from base of tegula to wing apex 6.9–8.5 mm (mean=8.0, n=11 wings).

Head. Temporal costae poorly developed; epicranial suture absent; clypeus bearing paired dorsomedial, dorsolateral, ventromedial, and ventrolateral setae, unpaired dorsomedian seta absent; maxillary palp with five primary palpomeres, ultimate (5th) palpomere with a small apical subsegment; labial palp with three primary palpomeres, ultimate (3rd) palpomere with a small apical subsegment.

Thorax. Some specimens exhibit a pale dorsolongitudinal vitta extending from head vertex to meso- or metacutellum, but this is lacking in other specimens (postmortem loss?); pronotum transverse, lateral margins produced as prominent lateral lobes.

Forewing (Oswald 1993a: 365, fig. 1). Very slight-

ly falcate; marginal trichosores prominent proximally and distally; proximal humeral trace recurrent and pectinately branched; costal space broad proximally, narrowed distally; stigmal region distinct; 1 proximal Sc-R crossvein present (=1sc-r), crossvein 2sc-r absent (Oswald 1993b:170, character 28); anterior radial trace bearing only 2 oblique radial branches (no variation observed in 22 wings from 11 specimens), distal ORB (=ORB2) forked proximal to first fork of proximal ORB (=ORB1); precubital portion of 4th (=outer) gradate series nearly absent (lost?), limited to crossveins 4m-cu and 4ir1; most wings with a crescentic hyaline region located at site of forewing falcation.

Hind wing (Oswald 1993a: 365, fig. 2). CuP absent or vestigial.

Male terminalia (figs. 1-5). Tergite 9 (fig. 1, 9t): Entire (not divided sagittally), narrow dorsally, broadened ventrolaterally; posterior margin slightly flared outward in region of articulation with ectoproct; Sternite 9 (9s): prominent, shield-shaped in ventral view, i.e., broad proximally, tapered posteriorly, posterior margin entire; Ectoproct (ect): narrow dorsally; posteroventral angle produced as a long, slender posteroventral lobe (pvl); proximoventral angle giving rise to a linear depression (area of cuticular weakness), the ventral cleft (vc), that runs longitudinally onto base of posteroventral lobe (*); callus cercus (cc) and trichobothria present, trichobothrial alveoli rosetiform; dorsomedial margin of ectoproct opposite callus cercus bearing a small peninsulate lobe (fig. 2, pl) (*), lobe joined to main body of ectoproct by a narrowed isthmus that inserts on ectoproct at posterior end of a shallow, asetose, furrow that traverses ectoproct above callus cercus; distal margin of peninsulate lobe bearing a densely packed field of specialized (shortened and thickened) setae; adjacent margin of inner process (ipe) also bearing a field of specialized (shortened and thickened) setae (*); Gonarcus (fig. 5): intragonarcus (igps + ihgs) present, variable in extent; extrahemigonarcus absent (its structural function replaced by neohemigonarcus); gonosaccal membrane attached to hemigonarcus along its inner face at junction of intrahemigonarcus (ihgs) and neohemigonarcus (nhgs); extragonopons (Oswald 1993a: 365, fig. 6, egps) limited to a pair of small triangular sclerotized lobes that issue from antextragonarcal commissure and (at least pleiomorphically) support proximolateral angles of mediuncus; gonofenestra present in region between extragonopontal lobes and proximal margin of mediuncus; mediuncus (med) a slender membrane-margined plate proximally, distally bearing a pair of dissimilar sagittal teeth; neogonopons (ngps) well-developed, overlying extragonopontal lobes (when present) and proximal portion of gonofenestra, dorsomedial neogonopontal carina present or absent; neohemigonarcus well developed but weakly sclero-

tized, neogonarcus commissure often indistinct due to gradual transition between sclerotized neogonarcus and associated paragonosaccal membrane; Parabaculum (figs. 3–4): parabacular apophysis (pa) with apophyseal shaft (as) simple (baculiform) and apophyseal lamella (al) small; two slender, elongate, terminal lobes (tl) present; terminal cleft reaching or nearly reaching base of terminal lobes; each terminal lobe apically divided into a pair of processes – a (ventro)lateral ‘outer process’ (op) and (dorso)medial ‘inner process’ (ip); outer process smoothly rounded in lateral view, subvertical in orientation and with inner face concave, inner process horizontally oriented and deeply pectinate on outer lateral margin (*) in dorsal view; 9th Gonocoxites: absent; Hypandrium Intermedium: present; of typical hemerobiid form, i.e., more or less triangular in dorsal view with a depressed median keel and revolute lateral margins; Accessory Structures: gonosaccal membrane above parabaculum bearing a pair of bilaterally symmetrical ‘supraparabacular processes’ (*) (fig. 3, spp), conformation of supraparabacular processes variable within genus, see Discussion below and species treatments for details and for species-specific accessory structures.

Female terminalia (figs. 6–7). Tergite 9 (9t): Entire (not divided sagittally); Ectoproct (ect): callus cercus (cc) and trichobothria present, trichobothrial alveoli rosetiform; posteroventral angle slightly protruded; 9th Gonocoxites (9gcx): semicircular to subrectangular; stylus absent [lost]; Gonapophyses Posteriores: well-developed, elongate; Subgenitales (sg): prominent, linguiform; borne on a short membranous tube; rounded or slightly emarginate distally; Insemination/Fertilization Canal: very similar to the condition found in *Wesmaelius*, i.e., composed of a short postbursal duct leading into a well-sclerotized, inflated, c-shaped chamber with verrucose surface sculpture (the ‘spermatheca’), followed by a long ‘postspermathecal’ duct, the medial third of which is tightly and finely looped, and the proximal and distal ends of which are relatively straight; Bursa Copulatrix: entirely membranous.

Included species

B. lunatus: Venezuela; *B. aggregatus* sp. n.: Costa Rica and Panama.

Distribution

Currently known only from Costa Rica, Panama and Venezuela, but the true range of this genus is probably much larger in the northern neotropics.

Natural history and immature stages

Adults have been collected in montane forest and cloud forest sites (1100–1540m) in Costa Rica, Panama and Venezuela, and from lowland (<100m) ‘sea-

sonal’ forest sites in Venezuela. Adults of *B. lunatus* appear to be present for much of the year in Venezuela (the eight known specimens were collected in January, February, May, July and November). Adults of *B. aggregatus* (only three known specimens) are currently known only from June and July. Biology and immature stages are unknown for both species.

Discussion

The cladistic analysis of Oswald (1993a) established and supported the hypothesis that *Biramus* constituted the sister-group of all other extant hemerobiid genera previously placed in the subfamily Hemerobiinae by Oswald (1993b). The discovery of the second species reported here establishes *Biramus* as a lineage containing multiple extant species and presents an opportunity to reassess the levels of universality of the apomorphies identified by Oswald (1993a). The character suite found in the new species described below strengthens the hypothesis that *Biramus* is a monophyletic group and that it represents the extant sister-group of other hemerobiine hemerobiids.

The four characters previously identified by Oswald (1993a) as distinctive apomorphies of *Biramus lunatus* are all confirmed here as synapomorphies of the expanded genus/clade *Biramus*, furthermore, a fifth synapomorphic character is identified in the list below.

Proposed synapomorphies of *Biramus*: (1) male ectoproct bearing a small, peninsulate lobe on its dorso-medial margin, distal margin of lobe bearing modified macrotrichia; (2) medial margin of male ectoproct distally adjacent to peninsulate lobe bearing a field of modified macrotrichia; (3) proximoventral angle of male ectoproct marked by a longitudinal depression; (4) inner process of terminal lobe of male parabaculum pectinate on lateral (outer) margin; (5) supraparabacular process present.

Character notes: Supraparabacular processes: Males of both species of *Biramus* possess a pair of structures located bilaterally symmetrically above the parabaculum – the supraparabacular processes. Although the location these structures is similar in both species (and is the basis of their presumed homology here), their form is quite different. In *B. lunatus*, the processes are elongate, tapering and weakly sclerotized, while in *B. aggregatus* the processes comprise a pair of subcircular convexities whose surface is apparently formed from the closely aggregated bases of a dense field minute macrotrichia. Based on the inferred phylogenetic position of this genus as a member of the subfamily Hemerobiinae (see Oswald 1993a), the supraparabacular processes in *Biramus* do not appear to be homologous with the accessory male terminal sclerites found dorsal to the parabaculum in at least some species of the genera *Drepanepteryx* (Drepanepteryginae, Palearctic), *Gayomyia* (Drepanepteryginae,

southern neotropics) and *Nusalala* (Microminae, widespread neotropical).

Pectinate parabaculum processes: The intriguing pectinate processes (fig. 4, ip) located at the apex of the male parabaculum in *Biramus* species are unique within the Hemerobiidae (and the Neuroptera?), and some speculative comments about their possible function seems appropriate here. The minute size of these processes, their laterally pectinate form and their terminal position on the parabaculum, are consistent with their use as 'membrane attachment' devices. In the operation of such a device, the tips of the parabaculum would most likely attach to the membranous wall of the female bursa during copulation. Weak abduction of the apices of the terminal lobes of the parabaculum through the contraction of muscles inserting on the sclerotized bases of the terminal lobes (or their adjacent membranes) could engage the pectinate processes as holdfasts in the bursal membrane. The more rounded outer processes (fig. 4, op), which flank the pectinate processes, may act as sheaths to protect or disengage the pectinate processes or to prevent penetration of the processes through the membranous bursal wall. If apical parabaculum attachment occurred near or within the bursal opening to the female insemination canal, the slender shafts of the terminal lobes might form a 'core' around which the male spermatophore could be formed. Subsequently, when the terminal lobes were withdrawn at the end of copulation, the channel through the spermatophore left by the lobes might aid in directing spermatozoa into the female insemination canal.

Key to *Biramus* species (adult males and females)

1. Males (ectoproct with an elongate posteroventral lobe; fig. 1, pvl)2
- Females (ectoproct without an elongate posteroventral lobe; fig. 6, ect)3
2. Posteroventral lobe of male ectoproct obtusely triangular (figs. 1-2, pvl); lobe bearing a dense oval aggregation of setae (figs. 1-2, sa) on inner face near mid-length above obtuse ventral angle [Costa Rica, Panama]*Biramus aggregatus* sp. n.
- Posteroventral lobe of male ectoproct digitiform, not obtusely triangular (Oswald 1993a: 365, fig. 3-4); lobe not bearing a dense oval aggregation of setae on inner face near mid-length [Venezuela]..*Biramus lunatus*
3. Subgenitale with apex rounded, length approximately twice width (fig. 7) [Costa Rica, Panama]*Biramus aggregatus* sp. n.
- Subgenitale with apex truncate, length approximately 1.5 times width (Oswald 1993a: 365, fig. 10) [Venezuela].....*Biramus lunatus*

Biramus lunatus Oswald

Biramus lunatus Oswald, 1993a: 364-365, figs. 1-11 (OD, MT*, FT*, W*); Monserrat 1998:128 (dst, W*).

Diagnosis

See *Diagnosis* under *B. aggregatus* below.

Description

Medium-sized hemerobiids, forewing length from base of tegula to wing apex 6.9–9.1 mm (mean=8.0, n=8 wings).

Head, thorax and forewing. As for genus, see above.

Hind wing (Oswald 1993a: 365, fig. 2). CuP absent.

Male terminalia (Oswald 1993a: 365, figs 3-9). Ectoproct (Oswald 1993a: 365, figs 3-4): posteroventral lobe long and attenuate in lateral view, inner face of lobe without a dense aggregation of setae near mid-length; inner face of posteroventral lobe at base not produced as a slender, elongate process, but its proximal margin bearing specialized (shortened and thickened) setae; Gonarcus (Oswald 1993a: 365, fig. 6): intragonarcus (igps + ihgs) a narrow ribbon of sclerotization supporting other gonarc elements (figured specimen probably a young adult, intragonarc development probably more extensive in older adults), intrahemigonarcus (ihgs) lacking a dorsal extension and associated semisclerotized postgonarc lobes in region of hemigonarc conjunction; extragonopons (egps) well developed relative to *B. aggregatus*, present as a pair of triangular sclerotized lobes that clearly extend to and support proximolateral angles of mediuncus; mediuncus (med) as for genus; neogonopons lacking a dorsomedial carina; neohemigonarcus (nhgs) well developed, terminating simply at hemigonarc conjunction; Parabaculum (Oswald 1993a: 365, figs 8-9): terminal lobes closely parallel over full length (not distally divergent); inner process concealed by outer process in lateral view; Accessory structures: supra-parabaculum processes (ap) present as a pair of stout, acuminate, weakly sclerotized lobes (*); postgonarc lobes absent.

Female terminalia. Subgenitale (Oswald 1993a: 365, fig. 10): short and broadly rectangular, less than 1.5 times as long as greatest width.

Natural history and immature stages

Adults have been reported from montane cloud forest (1100m) and lowland 'seasonal' forest (<100m) sites in Venezuela. Biology and immature stages are unknown.

Distribution

Presently known only from Venezuela (estados: Aragua and Barinas, see details in Oswald 1993a), but range potentially much larger in northern neotropics.

Primary type

Holotype ♂ (UCV). Type locality: Venezuela: Aragua: Rancho Grande (ranch) [10°22'N 67°41'W]. Verbatim label data: 'Venezuela Aragua / Rancho Grande / 1100m, 10.v.1991' [white rectangular label], 'Col. / R. Garcia' [white rectangle], 'Holotype / Biramus / lunatus Oswald / J.D. Oswald 1992' [red rectangle]. Condition: Good. Pinned through pterothorax, tips of antennae and left protarsus missing, right wings folded and matted. Terminalia cleared, stained with Chlorazol Black, and placed in a glycerin-filled microvial pinned below specimen.

Etymology

From the L. adjective *lunatus*, shaped like a crescent moon, in reference to the pale subapical mark of the forewing posterior margin.

Biramus aggregatus sp. n.
(figs. 1-7)

Diagnosis

Males are readily identified by the obtusely triangular form of the posteroventral ectoproct lobe [lobe digitiform in *B. lunatus*] and the small, dense, setal aggregation located near mid-length on the inner face of this lobe [setal aggregation absent in *B. lunatus*]; the more elongate and slender form of the subgenitale may prove to be diagnostic for females of *B. aggregatus*, though this should be considered tentative until it can be confirmed by the examination of additional females of both species.

Description

Medium-sized hemerobiids, forewing length from base of tegula to wing apex 8.0–8.5 mm (mean=8.2, n=3 wings).

Head, thorax and forewing. As for genus, see above.

Hind wing. CuP absent or vestigial; extreme base of CuP faintly visible in male holotype and medial portion marked by a tenuous line of macrotrichia; no CuP vein remnants or macrotrichia visible in female paratype. The wings of *B. aggregatus* are so nearly identical with those of *B. lunatus* (see Oswald 1993a: 365, fig. 1) in shape, venation and maculation, that a separate illustration of them is not warranted.

Male terminalia (figs. 1-5). Ectoproct (figs. 1-2): posteroventral lobe (pvl) obtusely triangular in lateral view (*), inner face of lobe bearing a dense, oval, aggregation of setae (sa) (*) just above obtuse ventral angle of lobe; inner face of posteroventral lobe at base produced as a slender, elongate process (ipe) (*), apex of process bearing specialized (shortened and thickened) setae; Gonarcus (fig. 5): intragonarcus (igps + ihgs) a broad, well developed plate; intrahemigonarcus

(ihgs) extended dorsally as a slender process in region of hemigonarcus conjunction (ihgp) (*), process surrounded by semisclerotized, lightly tanned, cuticle (sc) (*), apex of process acting as a brace for articulation of a slender postgonarcus lobe (pl) (*) composed of cuticle of similar consistency; extragonopons distinguishable but vestigial, not extending to proximolateral angles of mediuncus (*); mediuncus (med) structurally as for genus, but effective articulation shifted from extragonopons lobes to posterior margin of neogonopons (*); neogonopons (ngps) well developed, with a short dorsomedial carina present (*) bracing its connection to intragonopons (carina development perhaps functionally related to shift of mediuncus articulation); neohemigonarcus (nhgs) well developed, with complex termination at hemigonarcus conjunction; Parabaculum (figs. 3-4): terminal lobes (tl) distally divergent (not closely parallel over full length; perhaps an artifact of maceration); inner process (ip) lying largely above outer process (op) (not concealed by outer process in lateral view); Accessory Structures: supraparabacular processes (spp) present as a pair of small, densely trichose, pulvinate lobes (*); lobes not clearly sclerotized; postgonarcus lobes (pgl) present.

Female terminalia. Subgenitale (fig. 7): slender and elongate, about twice as long as greatest width.

Natural history and immature stages

Of the three adults reported here, two were collected in mid June at a biological field station situated in montane cloud forest at ca. 1540m in the Tilarán Mountains (Cordillera de Tilarán) of northwestern Costa Rica, and one was collected in montane forest in early July at 1300m in the Palo Alto Valley of western Panama. Biology and immature stages are unknown.

Distribution

Presently known only from Puntarenas Province, Costa Rica and Chiriquí Province, Panama; but range potentially much larger in northern neotropics.

Type material

Holotype male (USNM), by present designation. Type locality: Costa Rica: Puntarenas: Estación Biológica Monteverde (biological station) (10°19'23"N 84°48'38"W), 1540 m. Verbatim label data: 'Costa Rica: Puntarenas Prov., / Estación Biológica Monteverde, / 1540 m, 10°19'23"N, 84°48'38"W / S.D. Gaimari, 12-VI-2000 / ex: at lights at night' [white rectangular label], '♂' [small blue square], 'Holotype / Biramus / aggregatus Oswald / J.D. Oswald 2002' [red rectangle]. Condition: Excellent. Pinned through mesothorax, only left hind leg distal to trochanter missing, wings spread. Terminalia cleared, stained with Chlorazol Black, and placed in a glycerin-filled microvial pinned below specimen. – Paratypes, 2♀:

Figs. 1-7. *Biramus aggregatus*. – 1, Male abdominal apex, lateral; 2, male ectoproct, dorsal; 3, parabaculum and supra-parabacular process, lateral; 4, parabaculum, terminal lobe apex, dorsolateral; 5, gonarcus and mediuncus, lateral; 6, female abdominal apex, lateral; 7, subgenitale, ventral. Abbreviations: 7s, 8s, 9s, sternites; 7t, 8t, 9t, tergites; 9gcx, 9th gonocoxite; al, apophyseal lamella; as, apophyseal shaft; cc, callus cercus; ect, ectoproct; igps, intragonopons; ihgp, intrahemigonarc process; ihgs, intrahemigonarcus; ip, inner process (of parabacular terminal lobe); ipe, inner process (of ectoproct); med, mediuncus; ngps, neogonopons; nhgs, neohemigonarcus; op, outer process; pa, parabacular apophysis; pgl, postgonarc lobe; pl, peninsulate lobe; pvl, posteroventral lobe; sa, setal aggregation; sc, semisclerotized cuticle; sg, subgenitale; spp, supra-parabacular process; tc, transverse cleft; tl, terminal lobe; vc, ventral cleft.

COSTA RICA: Puntarenas: 1 ♀, Estación Biológica Monteverde (10°19'23"N 84°48'38"W), 12.vi.2000, 1540m (*Gaimari*) (USNM); PANAMA: Chiriquí: 1 ♀, Palo Alto Valley (ca. 8°46'N 82°26'W), 1.6 km E Boquete, 2.vii.1996, 1300m (Gillooly & Schaffner) (TAMU).

Etymology

From the L. adjective *aggregatus*, collected or clustered, in reference to the dense, oval, aggregation of setae found on the inner face of the posteroventral lobe of the male ectoproct.

Comments

The male terminalia of *B. aggregatus* appear to be generally more derived than those of *B. lunatus*. Specific features that support this conclusion include: (on the ectoproct) the broadly triangular distal process; the compact setal aggregation on the medial face of the distoventral ectoproct process; the deep division between the pair of proximal, setose, ectoproct processes, which forms an articulation zone across the ectoproct and permits dorsal-ventral flexion of the distoventral process; (on the ninth tergite) the protrusion and outward flaring of its posterior margin, where it supports the articulatory flange of the ectoproct; and (on the gonarcus) the complex of weakly sclerotized lobes and internal bracing apodemes developed around and dorsal to the hemigonarcus conjunction; the apparent shift of the articulation of the mediuncus from a pair of extragonopons lobes to the posterior margin of the neogonopons.

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