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Descriptions of Larvae of *Desmopachria* Babington (Coleoptera: Dytiscidae: Hydroporinae): the *D. vicina* Sharp Species Group

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Abstract

Larval morphology of the *Desmopachria vicina* Sharp species group is investigated. For this purpose, the three larval instars of *Desmopachria concolor* Sharp and *Desmopachria punctatissima* Zimmermann are described and illustrated for the first time, with an emphasis on the morphometry and chaetotaxy. Both species have the setae LA3, LA4 and LA5 inserted proximally on the prementum and the seta LA10 inserted distally on the second labial palpomere, the two larval autapomorphies that define the genus *Desmopachria* Babington. They are also characterized by the presence of secondary setae on the ventral surface of the siphon of third-instar larva; this character state is a synapomorphy of *Desmopachria* + *Hyphydrus* Illiger. *Desmopachria concolor* and *D. punctatissima* are very similar morphologically, suggesting that they could be closely related phylogenetically. Larvae of the *D. vicina* species group differ from those of the *Desmopachria convexa* (Aubé) species group in the presence of one additional seta on the dorsal surface of the prementum, the more distal insertion of the seta LA2 on the prementum, and the absence of one of the distal pores (LAb or LAd) on the first labial palpomere.

Desmopachria Babington includes 92 species of small diving beetles of the New World (Nilsson 2001). It is included in the tribe Hyphydrini of the subfamily Hydroporinae, and has a wide range of distribution, with one species reaching Southern Canada in North America, and another found as far south as Southern Patagonia (Argentina). However, the genus is most speciose in Neotropical lowlands (Miller 1999). *Desmopachria* has a complicated taxonomic history. During the twentieth century, six subgenera and several species groups were erected within the genus (Guignot 1950*a*, *b*; Young 1980), and for some time this classification was accepted. Some authors, however, were uncomfortable with this classification (Young 1980, 1990*a*, *b*; Miller 1999). Recently, Miller (2001*a*) discussed extensively the taxonomy of the genus and concluded that some of the subgenera were weakly supported by characters and/or were probably para-

phyletic. Miller (2001*a*) rejected the use of subgenus names within *Desmopachria*, reorganized the species into eight informal groups and left several species ungrouped. These problems evidence the complexity of the genus, once called a 'taxonomic nightmare' by Young, and the necessity of comprehensive studies including parsimony methods and comprising as many taxa and characters as possible.

The study of dytiscid larvae has improved in recent years with the incorporation of detailed morphometric and chaetotaxic analyses. The development of a system for naming and coding primary sensilla in larvae of the subfamily Hydroporinae (Alarie and Harper 1990; Alarie *et al*. 1990; Alarie 1991; Alarie and Michat 2007) is very important, as it allows the exploration of new sets of characters that contribute both to diagnosis of the taxa under study and to establishing the phylogenetic hypothesis of relationships among them. In this context, the study of larvae of *Desmopachria* could be of the utmost interest. Larval morphology of this genus is in need of much research, since only a single species (*Desmopachria convexa* (Aubé), included in the species group *D. convexa*) has been described (Barman 1973; Alarie and Harper 1990; Alarie *et al*. 1990, 1997; Alarie 1991; Larson *et al*. 2000). Larvae of the remaining species groups and ungrouped species are unknown.

In spite of the numerous changes the taxonomy of *Desmopachria* has experienced so far, the species group *Desmopachria vicina* Sharp (Miller 2001*a*) (previously known as subgenus *Nectoserrula* Guignot) has remained unaltered in species composition. This group is Neotropical in distribution and comprises four species: *D. vicina* occurring in Mexico, and *Desmopachria concolor* Sharp, *Desmopachria mendozana* (Steinheil) and *Desmopachria punctatissima* Zimmermann inhabiting South America. Adult members of this species group are unique within *Desmopachria* being characterized by the presence of a serrate anterior metatibial spur. This paper aims at describing for the first time the larvae of *D. concolor* and *D. punctatissima* and to compare these species with the larvae of *D. convexa*, the only other species of *Desmopachria* with known larval stages. Comments on the phylogenetic relationships of *Desmopachria* with other Hyphydrini genera are also provided.

Materials and Methods

Specimens were cleared in lactic acid, dissected and mounted on glass slides with polyvinyl-lacto-glycerol. Observation (at magnifications up to 1000×) and drawings were made using a compound microscope equipped with camera lucida. Drawings were scanned and digitally edited. The material is held in the larval collections of the authors.

For analyses of morphometry and chaetotaxy we employed, with minimal modifications and additions, the terms used in previous papers dealing with larval morphology of Hydroporinae (Alarie and Harper 1990; Alarie *et al*. 1990; Alarie 1991). Paired structures of each individual were considered independently. The following measures were taken. Total length (excluding urogomphi) (TL). Maximum width (MW). Head length (HL): total head length including the frontoclypeus, measured medially along the epicranial stem. Head width (HW): maximum head width. Length of frontoclypeus (FRL): from apex of nasale to posterior margin of ecdysial suture. Occipital foramen width (OCW): maximum width measured along dorsal margin of occipital foramen. Coronal line length (COL). Length of mandible (MN): measured from laterobasal angle to apex. Width of MN: maximum width measured at base. Length of antenna (A),

maxillary (MP) and labial (LP) palpi were determined by adding the lengths of the individual segments; each segment is denoted by the corresponding letter(s) followed by a number (*e.g.*, A1: first antennomere). A3′ is used as an abbreviation for the apical lateroventral process of third antennomere. Length of leg (L) including the longest claw (CL) was obtained by adding the lengths of the individual segments; each leg is denoted by the letter L followed by a number (*e.g.*, L1: prothoracic leg). Length of trochanter includes only the proximal portion, the length of distal portion is included in the femoral length. The legs of the larvae studied are considered to be composed of six segments following Lawrence (1991). Dorsal length of last abdominal segment (LAS): measured along midline from anterior to posterior margin. Length of urogomphus (U) was obtained by adding the lengths of the individual segments; each segment is denoted by the letter U followed by a number (*e.g.*, U1: first urogomphomere). These measurements were used to calculate several ratios, which characterize body shape.

Primary (present in first-instar larva) and secondary (added in later instars) setae and so-called pores were distinguished in the head capsule, head appendages, legs, last abdominal segment and urogomphus. Sensilla were coded by two capital letters, in most cases corresponding to the first two letters of the name of the structure on which are located, and a number (setae) or a lower case letter (pores). The following abbreviations were used: AB: abdominal segment VIII, AN: antenna, CO: coxa, FE: femur, FR: frontoclypeus, LA: labium, MN: mandible, MX: maxilla, PA: parietal, PT: pretarsus, TA: tarsus, TI: tibia, TR: trochanter, UR: urogomphus. Setae and pores present in the larvae studied were labeled by comparison with the ground plan of chaetotaxy of the subfamily Hydroporinae (Alarie and Harper 1990; Alarie *et al*. 1990; Alarie 1991; Alarie and Michat 2007). Homologies were established using the criterion of similarity of position (Wiley 1981). Setae located at the apex of maxillary palpus were extremely difficult to distinguish due to their position and small size. Accordingly, they are not well represented.

Description of the larvae of *Desmopachria* Babington, species group *D. vicina* Sharp

The following descriptions are based on the two species available. Thus, larvae of *D. concolor* and *D. punctatissima* should be considered similar in all aspects described except otherwise indicated. Also, under the treatment of each species only the diagnostic characters are included.

Diagnosis. Nasale strongly elongate, parallel sided, without lateral branches. A3 with a ventroapical spinula. Cardo fused to stipes. Galea absent. Prementum very elongate, slender, much longer than broad, without lateral spinulae. LP2 broad, robust, rounded apically. Legs with natatory setae (instars II–III). Segment VI sclerotized ventrally. Siphon elongate, subconical, sharp apically. Ventral surface of siphon with spine-like, secondary setae basally (instar III). U with few basal, spine-like, secondary setae (instars II–III). Pore FRb absent. Pores PAd, PAe and PAj absent. Pores ANf and ANh absent. Seta MX4 absent. Setae LA3, LA4, LA5, LA6 and LA8 dorsoproximal. One additional hair-like seta on dorsal surface of prementum. Setae LA13, LA14 and LA15 absent; setae LA10 and LA12 elongate, located apically. Seta TR2 absent. Pore FEa absent. Seta TI7 elongate, hair-like. Pores ABa and ABd absent. Seta AB2 pore-like. Seta AB10 spine-like. Setae AB5 and AB7 strongly developed, spine-like. Pore URb absent. Setae UR2, UR3 and UR4 arising contiguous. Seta UR5 short. Seta UR8 inserted proximally.

Instar I.

Color. Head capsule light brown. Head appendages pale yellow to light brown, mandible slightly darker; thoracic and abdominal sclerites light brown, sides of mesotergite somewhat lighter or not; membranous parts pale yellow; legs pale yellow to light brown; urogomphus light brown.

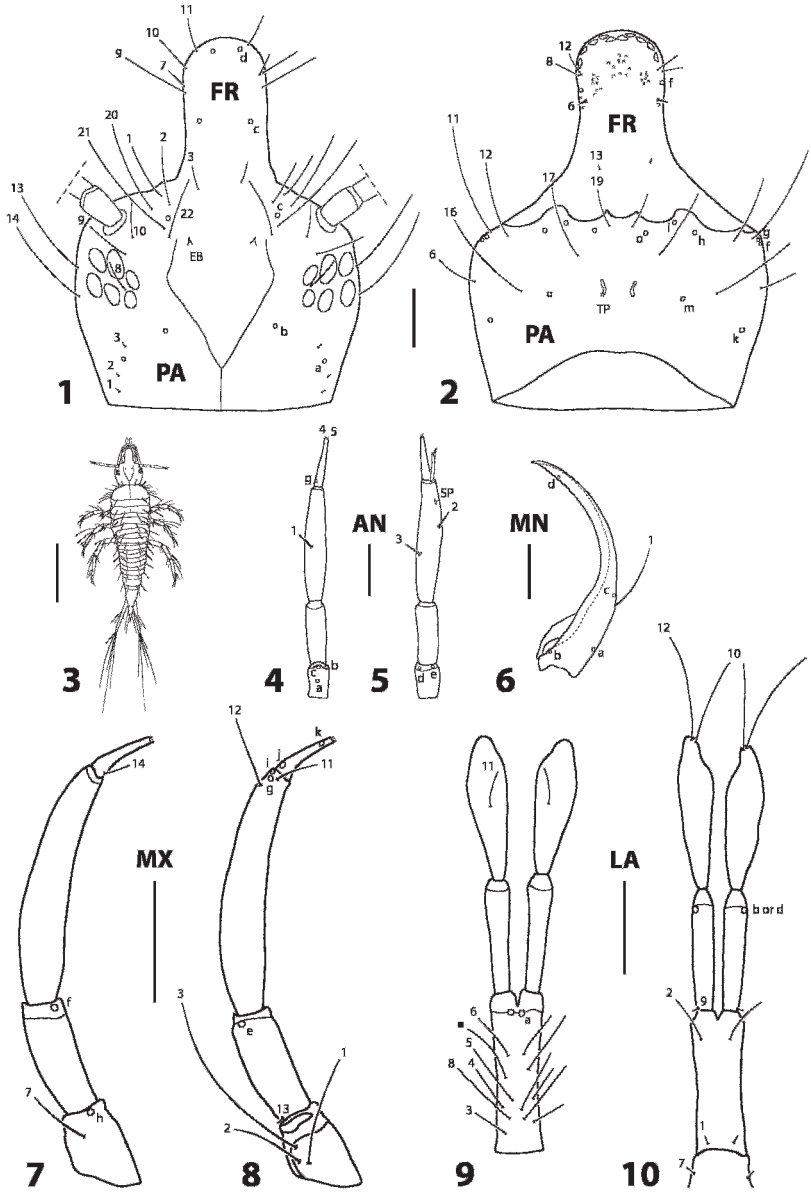
Body. Subcylindrical, narrowing towards abdominal apex (Fig. 3).

Head. Head capsule (Figs. 1, 2). Longer than broad; surface with reticulation; basal half (excluding nasale) subovate, maximum width at stemmata, progressively narrowing towards the occipital foramen, without neck constriction; occipital suture absent; ecdysial line well marked but hardly visible anteriorly, coronal line short; occipital foramen broadly emarginate ventrally; posterior tentorial pits visible ventrally; FR elongate, slightly convex, lateral margins sinuate, with 2 lateral, spine-like egg bursters at mid length; nasale strongly elongate, parallel sided, rounded apically, without lateral branches, ventral surface with blunt, subapical spinulae, anteroventral margin with a half circle of 10 short, spatulate setae directed downwards, the 2 anteromedial ones somewhat longer than the others; 6 subequal, dorsolateral stemmata arranged in 2 parallel rows. *Antenna* (Figs. 4, 5). Elongate, 4-segmented, subequal in length to HW; A1 and A4 the shortest, A3 the longest, with a ventroapical spinula; A3′ elongate, apically bifid in some specimens. *Mandible* (Fig. 6). Prominent, slender, obliquely oriented, distal half strongly curved inwards and upwards, apex sharp; mandibular channel present. *Maxilla* (Figs. 7, 8). Cardo fused to stipes; stipes short, broad, incompletely sclerotized; galea and lacinia absent; MP elongate, 3-segmented, MP3 the shortest, MP2 the longest, curved inwards and upwards. *Labium* (Figs. 9, 10). Prementum very elongate, slender, much longer than broad, without lateral spinulae, anterior margin shortly indented medially; LP elongate, 2-segmented; LP2 broad, robust, rounded apically, longer than LP1.

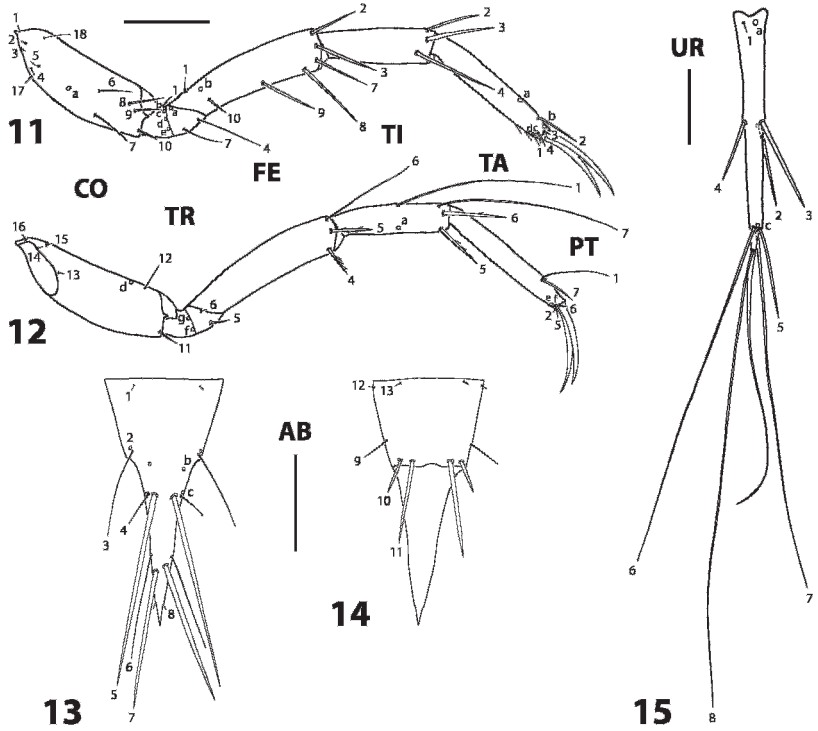
Thorax. Terga convex, pronotum somewhat shorter than meso- and metanotum combined, meso- and metanotum subequal; protergite subovate, margins rounded, more developed than meso- and metatergite; meso- and metatergite transverse; sagittal line visible on pro- and mesotergite; thoracic sterna membranous; spiracles absent. *Legs* (Figs. 11, 12). Long, 6-segmented, L1 the shortest, L3 the longest; CO robust, elongate, TR divided into 2 parts, FE, TI and TA slender, subcylindrical, PT with 2 long, slender, slightly curved claws; posterior claw shorter than anterior one on L1 and L2, claws subequal in length on L3; most surface of legs covered with slender spinulae, TA with a row of elongate, ventral spinulae, more developed on proTA.

Abdomen. Eight-segmented; segments I–V sclerotized dorsally, membranous ventrally; tergites I–VI similar to each other, narrow, transverse, laterally rounded; segment VII somewhat longer; sagittal line absent; segments VI and VII sclerotized both dorsally and ventrally, ventral sclerite independent from dorsal one; spiracles absent on segments I–VII; LAS (Figs. 13, 14) the longest, completely sclerotized, ring-like, covered with slender spinulae; siphon elongate, subconical, sharp apically. *Urogomphus* (Fig. 15). Elongate, 2-segmented; U1 robust; U2 very slender, setiform, longer than U1.

Chaetotaxy (Figs. 1–15). Similar to that of generalized Hydroporinae larva (Alarie 1991; Alarie and Harper 1990; Alarie *et al.* 1990; Alarie and Michat 2007) except for the following features: pore FRb absent; seta FR6 marginal; seta FR7 elongate, hair-like; pores PAd, PAe and PAj absent; pore PAg present; pores ANf and ANh absent; setae MX5 and MX6 absent (however, 2 minute structures that may be interpreted as rudimentary setae, are present where MX5 and MX6 are



Figs. 1–10. *Desmopachria concolor* (first-instar larva). **1–2)** cephalic capsule, dorsal and ventral aspects, respectively; **3)** habitus, dorsal aspect; **4–5)** antenna, dorsal and ventral aspects, respectively; **6)** mandible, dorsal aspect; **7–8)** maxilla, dorsal and ventral aspects, respectively; **9–10)** labium, dorsal and ventral aspects, respectively. Numbers and lower case letters refer to primary setae and pores, respectively. Solid square refers to additional seta. EB = egg burster, TP = tentorial pit, SP = spinula. Scale bars = 0.50 mm for Fig. 3 and 0.05 mm for Figs. 1–2 and 4–10.



Figs. 11–15. *Desmopachria concolor* (first-instar larva). **11–12)** metathoracic leg, anterior and posterior aspects, respectively; **13–14)** abdominal segment VIII, dorsal and ventral aspects, respectively; **15)** urogomphus, dorsal aspect. Numbers and lower case letters refer to primary setae and pores, respectively. Scale bars = 0.10 mm.

commonly located); seta MX4 absent; pore MXh with the appearance of 2 contiguous pores; setae LA3, LA4, LA5, LA6 and LA8 dorsoproximal; 1 additional hair-like seta on dorsal surface of prementum; one pore of LP1 (LAb or LAd) absent; setae LA13, LA14 and LA15 absent; setae LA10 and LA12 elongate, located apically; seta CO12 hair-like; seta TR2 absent; pore FEa absent; several setae on FE and TI compound, especially on L1; seta TI7 elongate, hair-like; pores ABa and ABd absent; seta AB2 pore-like; seta AB10 spine-like; seta AB6 elongate; setae AB5 and AB7 strongly developed, spine-like; pore URb absent; setae UR2, UR3 and UR4 arising contiguous; seta UR5 short; seta UR8 inserted proximally.

Instar II. As first-instar larva except for the following features:

Color. Color pattern of body as in instar III (see below) but less marked.

Head. Head capsule. Basal half (excluding nasale) subquadrate; surface without reticulation; occipital suture present dorsally, projecting forwards laterally; lateroventral margins of nasale with blunt, stout spinulae directed downwards; anteroventral margin of nasale with 15–22 spatulate setae. *Antenna*. Slightly shorter than HW; A3′ not bifid.

Thorax. Sagittal line visible on the 3 tergites; meso- and metatergite with anterotransverse carina. *Legs*. Spinulae reduced except on ventral surface of TA.

Abdomen. Segments I–II sclerotized dorsally, membranous ventrally; segments III–VI sclerotized dorsally and ventrally, ventral sclerite independent from dorsal one; segments VII–VIII completely sclerotized, ring-like; LAS without spinulae.

Chaetotaxy. Head capsule with several secondary hair-like setae anterior to occipital suture, and 1 spine-like secondary seta on each side of ventral surface; MN with 1 hair-like secondary seta on basoexternal margin; thoracic tergites with several elongate secondary setae; secondary leg setation detailed in Table 2; rows of natatory setae on posterodorsal margin of FE, TI and TA (Table 2), absent on metaFE; abdominal sclerites I–VII with several spine-like secondary setae on posterior half; LAS with several spine-like secondary setae; U with few basal, spine-like, secondary setae.

Instar III. As second-instar larva except for the following features:

Color (Figs. 16, 17). Head capsule with distinct dorsal color pattern, composed of a light brown background and 1 large, irregular, brown macula at each side of the frontoclypeus; head appendages pale yellow except mandible light brown; anterior half of protergite dark brown, posterior half pale yellow; mesotergite dark brown medially, pale yellow laterally; metatergite and abdominal tergites I–IV dark brown, with small, rounded, pale yellow maculae in some specimens; abdominal tergites V–VII pale yellow; abdominal segment VIII dark brown; legs pale yellow; urogomphus light brown.

Head (Fig. 17). *Head capsule*. Anteroventral margin of nasale with 20–23 spatulate setae. *Antenna*. Shorter than HW. *Maxilla*. MP1 or MP2 the longest.

Thorax. Spiracles present on mesothorax. *Legs* (Figs. 18, 19). Spinulae absent except on ventrodistal margin of proTA.

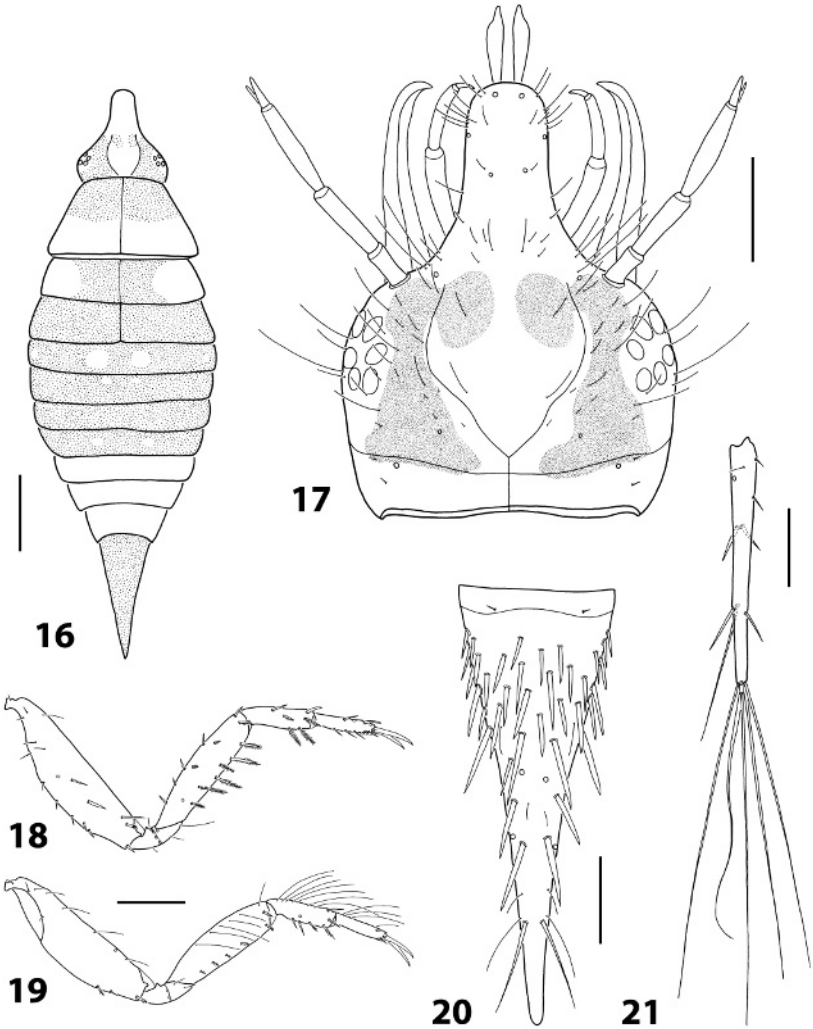
Abdomen (Figs. 20, 21). Segment I sclerotized dorsally, membranous ventrally; segments II–VI sclerotized dorsally and ventrally, ventral sclerite independent from dorsal one. Spiracles present on segments I–VII.

Chaetotaxy. Ventral surface of head capsule with 4–11 spine-like secondary setae on each side; MN with 2 hair-like secondary setae on basoexternal margin; thoracic tergites with numerous hair-like secondary setae; secondary leg setation detailed in Table 2; row of natatory setae on metaFE sometimes present; abdominal sclerites I–VIII with numerous spine-like secondary setae all over the surface; ventral surface of siphon with 3–5 spine-like secondary setae basally.

Desmopachria concolor Sharp

Source of material. Five specimens of instar I, three of instar II and three of instar III were used for the descriptions. Larvae were collected in association with adults at the following locality: Argentina, Buenos Aires City, November 2001 and October 2002, temporary rain pool about 50 m long, with clear water, soil bottom and abundant vegetation (mainly grasses).

Diagnosis. Sides of mesotergite of same color as central portion (instar I). Anteroventral margin of nasale with 15–16 (instar II) and 20–23 (instar III) spatulate setae. Ventral surface of head capsule with 4–7 (instar III) spine-like secondary setae on each side. MP2 the longest (instar III). FE, TI and TA with a smaller number of natatory setae (Table 2). Measurements and ratios that characterize the body shape are shown in Table 1.



Figs. 16–21. Third-instar larva of species of *Desmopachria*. **16)** *D. punctatissima*, habitus, dorsal aspect; **17)** *D. concolor*, head, dorsal aspect; **18–19)** *D. concolor*, prothoracic leg, anterior and posterior aspects, respectively; **20)** *D. concolor*, abdominal segment VIII, dorsal aspect; **21)** *D. concolor*, urogomphus, dorsal aspect. Scale bars = 0.50 mm for Fig. 16 and 0.15 mm for Figs. 17–21.

Desmopachria punctatissima Zimmermann

Source of material. Two specimens of instar I, three of instar II and seven of instar III were used for the descriptions. Larvae were collected in association with adults at the following localities. Argentina: Chubut province, Nant y Fall Creek at Road 17 to Corcovado, February 5 and 13, 2004, 47° 13′ S, 71° 25′ W,

Table 1. Measurements and ratios for the three larval instars of species of *Desmopachria*. l: length, w: width.

	D. concolor			*D. punctatissima*		
Measure	Instar I (n = 3)	Instar II (n = 3)	Instar III (n = 3)	Instar I (n = 2)	Instar II (n = 3)	Instar III (n = 3)
TL (mm)	1.40–1.60	2.00–2.70	2.80–3.70	1.50–1.70	2.42–3.00	3.38–4.06
MW (mm)	0.30–0.35	0.50–0.60	0.80–0.90	0.30–0.35	0.62–0.70	0.90–1.12
HL (mm)	0.31–0.35	0.48–0.49	0.62–0.63	0.36–0.37	0.50	0.67–0.70
HW (mm)	0.23–0.25	0.34–0.35	0.44–0.47	0.26	0.35–0.37	0.49–0.58
FRL (mm)	0.26–0.30	0.40–0.42	0.53–0.54	0.31–0.32	0.43–0.44	0.56–0.60
OCW (mm)	0.18–0.20	0.25–0.28	0.33–0.36	0.18–0.19	0.26–0.28	0.40–0.46
HL/HW	1.29–1.40	1.40–1.44	1.33–1.42	1.36–1.42	1.35–1.44	1.21–1.36
HW/OCW	1.23–1.35	1.21–1.33	1.25–1.33	1.36–1.44	1.31–1.35	1.23–.26
COL/HL	0.10–0.17	0.14–0.17	0.14	0.12–0.13	0.13	0.14–0.16
FRL/HL	0.83–0.90	0.83–0.86	0.86	0.88	0.87	0.84–0.86
A/HW	1.00–1.09	0.87–0.91	0.73–0.83	1.00–1.02	0.90–0.91	0.73–0.79
A3/A1	2.75–3.67	3.00–3.63	2.42–3.00	3.43	2.25–2.90	2.59–2.93
A3/A2	1.83–2.20	1.59–2.07	1.26–1.42	1.85–2.18	1.53–1.76	1.29–1.45
A4/A3	0.33–0.41	0.31–0.36	0.30–0.34	0.38–0.42	0.31–0.32	1.26–0.31
A3′/A4	0.67–0.75	0.67–0.80	0.78–0.89	0.56–0.60	0.67–0.78	0.90–1.09
MN(l/w)	3.80–4.67	4.00–4.83	3.78–4.13	4.20–4.67	4.58–4.83	4.17–4.50
MN(l)/HL	0.59–0.67	0.56–0.60	0.53–0.56	0.57–0.59	0.54–0.65	0.53–0.59
A/MP	1.23–1.38	1.11–1.20	0.99–1.06	1.27–1.33	1.15–1.26	1.06–1.24
MP2/MP1	1.67–2.00	1.26–1.44	1.13–1.29	2.00–2.09	1.29–1.50	0.86–0.97
MP2/MP3	3.00–4.40	3.00–4.00	4.13–4.86	3.14–3.29	4.00–5.54	3.75–4.75
MP/LP	1.26–1.37	1.26–1.32	1.27–1.45	1.25–1.37	1.29–1.38	1.14–1.30
LP2/LP1	1.14–1.42	1.10–1.22	1.04–1.24	1.31–1.46	1.10–1.29	1.04–1.16
L3 (mm)	0.82–0.94	1.22–1.25	1.58–1.66	0.95	1.28–1.30	1.71–2.06
L3/L1	1.28–1.30	1.32–1.35	1.40–1.44	1.28–1.31	1.33–1.36	1.39–1.42
L3/L2	1.11–1.15	1.16–1.19	1.19–1.23	1.13–1.15	1.13–1.19	1.17–1.21
L3/HW	3.51–3.78	3.51–3.71	3.54–3.70	3.61–3.69	3.53–3.73	3.49–3.74
L3 (CO/FE)	0.98–1.05	0.97–1.03	0.98–1.01	1.00–1.02	0.93–0.98	0.96–0.97
L3 (TI/FE)	0.68–0.75	0.67–0.72	0.65–0.68	0.73–0.77	0.70–0.72	0.67–0.69
L3 (TA/FE)	0.86–0.98	0.77–0.84	0.63–0.67	0.88–0.95	0.80–0.83	0.67–0.70
L3 (CL/TA)	0.57–0.63	0.50–0.54	0.44–0.54	0.61–0.65	0.48–0.54	0.40–0.47
LAS (mm)	0.25–0.29	0.46–0.48	0.71–0.78	0.26–0.28	0.46–0.49	0.73–0.80
LAS/HW	1.02–1.16	1.35–1.37	1.64–1.68	0.98–1.08	1.24–1.40	1.37–1.48
U (mm)	0.60–0.78	0.88–1.00	1.08–1.14	0.68–0.69	0.86	1.10–1.14
U/LAS	2.44–2.72	1.93–2.17	1.46–1.54	2.50–2.67	1.89	1.38–1.57
U/HW	2.59–3.16	2.62–2.97	2.45–2.52	2.60–2.69	2.35	1.90–2.33
U1/U2	0.67–0.81	0.77–0.87	0.68–0.71	0.77–0.79	0.83	0.63–0.83

associated to marginal vegetation (mainly grasses); Buenos Aires Province, Sierra de la Ventana, E. Tornquist Park, December 2005, associated to marginal vegetation in lentic zones of a small stream.

Diagnosis. Sides of mesotergite somewhat lighter than central portion (instar I). Anteroventral margin of nasale with 15–22 (instar II) and 21–22 (instar III) spatulate setae. Ventral surface of head capsule with 6–11 (instar III) spine-like secondary setae on each side. MP1 the longest (instar III). FE, TI and TA with a larger number of natatory setae (Table 2). Measurements and ratios that characterize the body shape are shown in Table 1.

Table 2. Number and position of secondary setae on the legs of larvae of *Desmopachria*. Numbers between slash marks refer to pro-, meso- and metathoracic leg, respectively. A = anterior, D = dorsal, P = posterior, Pr = proximal, V = ventral, NS = natatory setae, range = total number of secondary setae on the segment (excluding primary and natatory setae).

		D. concolor		*D. punctatissima*	
Segment	Position	Instar II (n = 3)	Instar III (n = 3)	Instar II (n = 2)	Instar III (n = 2)
Coxa	PD	1–2 / 2 / 0–3	3–5 / 3–4 / 2–4	2–3 / 2 / 1–2	3–4 / 3–6 / 3–5
	V	1–2 / 1–2 / 2–3	5–6 / 5–7 / 7–10	2–3 / 2–3 / 2	5–6 / 6–7 / 9–10
	Range	3–4 / 3–4 / 3–6	9–11 / 9–11 / 10–14	4–5 / 4–5 / 3–4	8–10 / 9–13 / 12–15
Trochanter	Pr	1 / 0–1 / 1	1 / 1 / 1	1 / 1 / 1	1 / 1 / 1
	Range	1 / 0–1 / 1	1 / 1 / 1	1 / 1 / 1	1 / 1 / 1
Femur	A	0 / 0 / 0	1–2 / 1–3 / 2–3	0 / 0 / 0	2 / 1–2 / 3
	AD	2 / 2 / 2	2–4 / 3–4 / 3–5	2–3 / 2 / 2–3	3–4 / 4–5 / 4–6
	AV	2 / 2 / 2–3	3–4 / 2–4 / 2–4	2 / 1–2 / 2	4–6 / 4–6 / 4–6
	PV	2 / 2 / 3–4	3–5 / 4–5 / 6–8	2 / 2–3 / 4	4–6 / 4–6 / 7–8
	NS	1–2 / 1–2 / 0	3–5 / 4–6 / 0–2	2–3 / 2–3 / 0	5–6 / 6–9 / 0–4
	Range	6 / 6 / 7–9	11–13 / 12–14 / 14–19	6–7 / 5–7 / 8–9	13–17 / 15–18 / 19–23
Tibia	A	0 / 0 / 0	1 / 2 / 2	0 / 0 / 0	1 / 2 / 3
	AD	1–2 / 2 / 2–3	1–2 / 2 / 2–3	1–2 / 2–3 / 2–3	1–3 / 2–5 / 3–5
	AV	1 / 1–2 / 1–2	0–1 / 1 / 1–2	1 / 1–2 / 1–3	0–1 / 1–2 / 1–3
	PV	1–2 / 2 / 2–3	2–3 / 3–4 / 4–5	1–2 / 2–3 / 2–3	3 / 4–6 / 7–8
	NS	2–3 / 3–4 / 4–5	4–6 / 6–8 / 7–9	3–4 / 3–5 / 4–6	8–10 / 11–14 / 13–16
	Range	3–5 / 5–6 / 5–7	5–6 / 8–9 / 9–11	3–5 / 5–8 / 6–8	5–8 / 10–15 / 14–19
Tarsus	AD	1 / 1 / 1–2	1 / 1 / 1–2	1 / 1–2 / 2–3	1 / 1–2 / 2
	AV	0 / 1 / 2–3	0–2 / 1 / 1–2	0 / 1 / 1–2	0 / 1–2 / 2–4
	PV	1–2 / 2–3 / 2–4	1–3 / 3–4 / 4–6	2 / 2–3 / 3–5	3–4 / 5–6 / 6–8
	NS	1–2 / 2–3 / 3–5	2–4 / 4–7 / 7–10	3 / 4 / 5–6	5–7 / 8–11 / 11–14
	Range	2–3 / 4–5 / 5–9	3–4 / 5–6 / 7–9	3 / 4–5 / 7–10	4–5 / 7–10 / 10–14

Table 3. Summary of characters differentiating among larval instars of *Desmopachria* (species group *D. vicina*).

Character	Instar I	Instar II	Instar III
HW (mm)	0.23–0.26	0.34–0.37	0.44–0.58
Egg bursters	Present	Absent	Absent
Spatulate setae on anterior margin of FR	10	15–22	20–23
Occipital suture	Absent	Present	Present
Ventral spine-like setae on PA	0	1	4–11
Natatory setae on legs	Absent	Present	Present
Spiracular openings on mesothorax and abdominal segments I–VII	Absent	Absent	Present
Spine-like setae on basoventral surface of siphon	Absent	Absent	Present
U/LAS	2.44–2.72	1.89–2.17	1.38–1.57

Discussion

The phylogenetic placement of *Desmopachria* within the tribe Hyphydrini is well supported by the larval characters. Larvae of *D. concolor* and *D. punctatissima* share with the members of other Hyphydrini genera several unique character states that represent synapomorphies of the tribe (see Alarie and Challet 2006*a*, 2006*b*; Alarie *et al*. 1997). On the other hand, the larvae described here are characterized by the proximal insertion of the setae LA3, LA4 and LA5 on the prementum, and by the distal insertion of the seta LA10 on the second labial palpomere, the two larval autapomorphies that define the genus *Desmopachria* (Alarie and Challet 2006*a*, 2006*b*; Alarie *et al*. 1997). Third instars of *D. concolor* and *D. punctatissima* are also characterized by the presence of secondary setae on the ventral surface of the siphon. This character state is a synapomorphy of *Desmopachria* + *Hyphydrus* Illiger (Alarie and Challet 2006*a*, 2006*b*; Alarie *et al*. 1997). A close phylogenetic relationship between *Desmopachria* and *Hyphydrus* was proposed recently based on larval characters (Alarie and Challet 2006*a*, 2006*b*; Alarie *et al*. 1997; Michat and Torres 2005). However, a study of adult characters (Miller 2001*b*) suggested that *Desmopachria* is more closely related to *Pachydrus* Sharp and *Heterhydrus* Fairmaire than to *Hyphydrus*.

According to Miller (2001*a*), adult members of the species group *D. vicina* are very distinctive within *Desmopachria*, being characterized by the presence of a serrate anterior metatibial spur. Within this group, adults of *D. concolor* and *D. punctatissima* are readily distinguished by the denseness and coarseness of punctures on the pronotum and elytra, and by the male genitalia. However, these two species look very similar according to larval morphology, suggesting that they could be closely related phylogenetically. Adults of *D. punctatissima* are somewhat larger than those of *D. concolor*; this difference is also observed in the larvae, as evidenced by the comparison of their relative head width. Other minor differences are summarized under the diagnosis of each species (see above).

There are several differences among the three larval instars of the species of *Desmopachria* described here. The main differences to separate all instars are summarized in Table 3.

Together with the descriptions provided here the number of species of *Desmopachria* with known larval stages rises to three. The remaining known species, *D. convexa* (Barman 1973; Alarie and Harper 1990; Alarie *et al*. 1990, 1997; Alarie 1991; Larson *et al*. 2000) is included in the species group *D. convexa*. With the information available so far, larvae of the species group *D. vicina* differ

from those of the species group *D. convexa* in the following features: (1) presence of one additional seta on the dorsal surface of the prementum, (2) more distal insertion of the seta LA2 on the prementum, and (3) absence of one of the distal pores (LAb or LAd) on the first labial palpomere.

Larval morphology of members of Hyphydrini is in need of much research. The larvae of several genera within the tribe are still unknown, and few species of the remaining genera are known in detail. This is particularly notorious within *Desmopachria*. This genus is presently subdivided into at least eight informal groups of species (Miller 2001*a*), and the larvae of only two of these have been described (*i.e.*, Alarie *et al*. 1997; this paper). Young (1980) stated that at least some of these groups might eventually be proven to represent distinct genera. As currently defined, *Desmopachria* presents a great morphological diversity if we consider the adult stage. However, the lack of knowledge about larval morphology of this genus makes it impossible to test at this point the phylogenetic relationships based on adult characters.

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