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The Larva of *Diplectrona magna* Mosely, 1930 (Trichoptera: Hydropsychidae)

JOHANN WARINGER¹ and WOLFRAM GRAF²

¹Department of Freshwater Ecology, University of Vienna, Althanstraße 14, 1090 Vienna, Austria

²Institute of Hydrobiology and Aquatic Ecology Management, University of Natural Resources and Applied Life Sciences, Max Emanuelstraße 17, 1180 Vienna, Austria

Abstract

The larva of *Diplectrona magna* Mosely, 1930 is described and compared with the other European *Diplectrona* larvae described so far. Information for the identification of three species (*D. atra*, *D. felix* and *D. magna*) is given and some zoogeographical and ecological notes are presented.

Keywords

Trichoptera; *Diplectrona magna*; description; habitat; ecology

Introduction

Genus *Diplectrona* is represented in most faunal regions except tropical Africa and South America (Wiggins, 1998), with six species being present in Europe. From the latter, two species are known in the larval stage: *D. felix* (Edington & Hildrew, 1995; Neu & Tobias, 2004; Pitsch, 1993; Tachet et al., 2000; Vieira Lanero, 2000; Waringer & Graf, 1997, 2004) and *D. atra* (Waringer, Graf & Vicentini, 2007). During a collection trip made in July 2007 to springs and spring brooks in the Apuanian Alps in Italy W. Graf managed to collect adults, pupae and two very obvious larvae of another unknown *Diplectrona* species characterised by a high number of black, long bristles at the abdomen visible even under field conditions. Pupae and adults from the larval habitats clearly identified the unknown larva as *Diplectrona magna* Mosely, 1930. This material enabled us to investigate morphological characters usable for the separation from *D. felix* and *D. atra*.

Morphological separation of *Diplectrona magna* from other European Trichoptera

Within the framework of the keys by Edington & Hildrew (1995), Neu & Tobias (2004), Pitsch (1993), Vieira Lanero (2000) and the Trichoptera atlas by Waringer and Graf (1997, 2004), *Diplectrona magna* is separated from other Trichoptera species by the combination of the following features:

Correspondence: Johann Waringer, Department of Freshwater Ecology, University of Vienna, Althanstraße 14, 1090 Vienna, Austria. johann.waringer@univie.ac.at.

- all three thoracic nota completely covered by sclerites (Fig. 4);
- tufted gills present at abdominal segments;
- frontoclypeus constricted at the level of the eyes (Fig. 3);
- meso- and metanotum with transverse suture at posterior third of the sclerites (Fig. 4, arrow);
- anterior prosternite deeply indented laterally, posterior prosternites lacking (Fig. 6);
- prothoracic trochantin with a single point only.

At this position *D. magna* keys out together with *D. atra* and *D. felix*. The latter species can be separated from the other two remaining species by the number of gill filaments originating at the bases of the midlegs which consist of tufts of 7-10 filaments in *D. felix* (Fig. 5 in Waringer, Graf & Vicentini, 2007) but of 1-3 filaments in *D. atra* and *D. magna* (Fig. 8). In addition, a prominent bulge-like projection at the median section of both mandibles (best seen from venter) with a batch of bristles is present in *D. felix* (Figs. 10, 11 in Waringer, Graf & Vicentini, 2007) which is completely lacking in *D. magna* and *D. atra* (Fig. 9). The latter two species can be separated by the presence of numerous blackbrown bristles at all lateral and dorso-lateral fleshy, pillow-like protuberances on the abdominal segments of *D. magna* (Fig. 1); in *D. atra*, only a soft, short pilosity common also for *Diplectrona felix* is present (Fig. 2). Finally, in fifth instar larvae, which can be identified by the presence of buds of pupal gills in Hydropsychidae (Pitsch 1993; Fig. 10), there is a difference in head width: in *D. atra* we measured head widths up to 1.11 mm, in *D. felix* up to 1.52 mm and in *D. magna* 1.67 mm. This is in concordance with adult morphology where the anterior wing length of the three species reflects these proportions (5--6 mm in *D. atra*, 6--7 mm in *D. felix* and 7.5--9.0 mm in *D. magna*). A synopsis of characters separating the three European *Diplectrona* species known in the larval stage so far is given in Table 1.

Description of the fifth instar larva of *Diplectrona magna* (head width 1.67 mm)

Material examined

Diplectrona magna: 3 males, 2 females, one male pupa and 2 fifth instar larvae from Vinca, 44°7.589' N, 10°10.45' E, Alpi Apuane, Tuscany, Italy, collected by W.G. on 17 July 2007 by W.G.. *Diplectrona atra*: Switzerland: 2 fifth instar larvae from a spring in Vignino, Montagnola, 460 m a.s.l., collected by H. Vicentini on 26 March, 2003; Italy : 2 fifth instar larvae from Trentino, Monti Lessini, Camposilvane south-east of Rovereto, 45°45.391' N, 11°09.445' E; 1171 m a.s.l collected by W. G. on 15 October, 2006. *Diplectrona felix*: United Kingdom, Cefn Onn, Cardiff, collected by J.M. Edington on 2 April, 1994.

Body length of final instar larva: 11.9—12.0 mm; head width: 1.6--1.7 mm. Head capsule rounded dorsally, with many yellowish, short bristles at frontoclypeus and parietalia. As in *D. felix* and separating *Diplectrona* from *Hydropsyche*, the frontoclypeus is distinctly constricted at the level of the eyes and broadest in the middle of the sclerite (Fig. 3).

Frontoclypeal area yellowish-brown without distinct markings and very poorly defined muscle attachment spots (Fig. 3). Ventral parts of parietalia and submentum yellowish-brown. Submentum (Fig. 5) triangular, with short lateral lobes; as a typical member of the Diplectroninae, a large posterior ventral apotome is well developed which is marked by a dark posterior margin (Fig. 7). Proximo-median section of mandibles straight, without bulge-like projection (Fig. 9).

Tergites of second and third thoracic segments with distinct transverse sutures (e.g. Fig. 4, arrow); from pronotum to metanotum, they are straw or even whitish in colour with darker shading along anterolateral folds and black lateral and, partly, posterior borders (Fig. 4). Tergites densely covered by short light bristles. Posterior prosternites completely lacking; anterior prosternite deeply indented laterally, pale straw in colour with black-brown markings at the lateral tips and along the posterior and anterior margin (Fig. 6). Gill filaments at the bases of the midlegs consisting of 3 terminal filaments (Fig. 8). As in *D. felix* and *D. atra*, the prothoracic trochantin has only a single point.

All lateral and dorso-lateral fleshy, pillow-like protuberances on abdominal segments with numerous blackbrown bristles which strongly contrast with the whitish background of the soft cuticle; these bristles are distinctly longer and thicker than the small and soft pilosity common in *Diplectrona atra* and *D. felix*. Gills are lacking on 7th abdominal segment.

Habitat and distribution

Diplectrona magna is one of the six species of genus *Diplectrona* known from Europe (*D. atra* McL., 1878: Balkans, Turkey, France, Italy, Switzerland; *D. felix*: Iberian Peninsula, British Isles, France, Germany, Italy, Luxembourg, Belgium (Malicky, 2004, 2005; Fauna Europaea, 2004); *D. ripollensis* Tobias, 1972 and *D. moralesi* Schmid, 1952: Iberian peninsula (Vieira Lanero 2000); *D. meridionalis* (Hagen, 1864): French mainland, Corsica). *D. magna* is known from Italy (Tuscany, Basilicata, Calabria, Elba; Cianficconi 2002), France and Corsica (Tachet et al. 2000; Fauna Europaea 2004).

Diplectrona species are net spinners, with meshes being somewhat squarer in *D. felix* than in other species ($260 \times 200 \mu\text{m}$; Kaiser 1965). Generally, hydropsychids are omnivores with some species, for example *Hydropsyche fulvipes*, showing a marked tendency towards carnivory (Scott 1958) whereas in other species a marked tendency towards phytophagy was found (Schuhmacher 1970). Detailed gut analyses in genus *Diplectrona* are only available for *D. felix* which revealed that animal material was completely lacking in this species from a small North Wales stream (Edington & Hildrew 1995; Williams et al. 1993). With respect to longitudinal zonation patterns, the typical sequence from source to mouth in unpolluted British running waters is *D. felix* - *H. instabilis* - *H. siltalai* - *H. pellucidula* - *H. contubernalis* - *Cheumatopsyche lepida* (Edington & Hildrew 1995). This also applies to Central European locations with mean source distances being only 0.3 – 0.4 km in *D. felix* (Pitsch 1993) and meets the observations of Giudicelli & Orsini (1987) where *D. magna* is a typical inhabitant of springs on Corsica. At our Italian location, *D. magna* was found beneath stones in small trickles of water.

In general, *Diplectrona* species are univoltine, with semivoltine specimens being only seldom observed. The day-swarmer *D. felix*, which is therefore not attracted by light traps, is most abundant in August with emergence taking place in Great Britain from May until August with peaks in late June and early July (Edington & Hildrew 1995). The flight period of *D. magna* lasts from June to October (Malicky, 2002). At our sites, adults of *D. magna* were collected in July.

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Figs. 1--10.

Figs. 1--2. Abdominal segments 3-5 of fifth instar larvae, left lateral view: 1: *Diplectrona magna*; 2: *D. felix*. Figs. 3--9. *Diplectrona magna*, fifth instar larva: 3: Head, dorsal view (the white cracks are due to damage of the head capsule); 4: Metathorax, dorsal view; 5: Submentum; 6: Anterior prosternite, ventral view; 7: Posterior ventral apotome; 8: mesothoracal right gill, anterior view; 9: right and left mandible, ventral view. Fig. 10: *Hydropsyche tabacarui* Botosaneanu, 1960, SEM picture of fifth instar larva, abdomen, left lateral view. Arrows: Fig. 4: transverse suture; Fig. 8: mesothoracal gill; dotted circles in

Fig. 10: buds of pupal gills; in Fig. 3, the right outline of the frontoclypeal suture has been enhanced in white. Scale bars: 1000 μ m except in Figs. 7, 8 and 9 (500 μ m).

Table 1

Synoptic key for the identification of the known larvae of the three European *Diplectrona* species.

Species/character	Median mandible section with projection	Filament number of mesothoracal gills	Abdominal segments densely covered with long black bristles	Head width (mm) of fifth instars (= pupal gill buds present)
<i>D. felix</i>	+ (Fig. 10, 11 in Waringer et al., 2007)	7--10 (Fig. 5 in Waringer et al., 2007)	– (Fig. 2)	1.18--1.52
<i>D. atra</i>	– (Fig. 8, 9 in Waringer et al., 2007)	1--3 (Fig. 6 in Waringer et al., 2007)	–	1.06--1.11
<i>D. magna</i>	– (Fig. 9)	3 (Fig. 8)	+ (Fig. 1)	1.60--1.70