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## Revision of the Italian species of the *Ecdyonurus helveticus*-group: taxonomy of the nymphs (Ephemeroptera, Heptageniidae)

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On the basis of larval stages, a revision of the Italian species of the *Ecdyonurus helveticus*-group has been carried out. New diagnostic features are suggested to discriminate the nymphs of this group from those of the *venosus*-group. *E. helveticus* (EATON), *E. picteti* (MEYER-DÜR), *E. zelleri* (EATON) and *E. alpinus* HEFTI, TOMKA & ZURWERRA (the last two newly recorded for Italy), are described and keyed considering a new set of diagnostic characters.

Keywords: Ephemeroptera, *Ecdyonurus helveticus* group, nymphs, taxonomy, morphology, Italy

### INTRODUCTION

The *Ecdyonurus helveticus*-group may be subdivided into two further subgroups, well distinguishable by the morphological characters of male imagines: a) “East-European” species, characterized by the arcuated and pointed apical sclerite of penis; “West-European” species, with L-shaped apical sclerite, with a round and expanded end.

In this paper we deal with some Western species, which occur in Italy, pointing to diagnostic characters of the nymphs. The species considered are *Ecdyonurus helveticus* (EATON), 1885, *E. picteti* (MEYER-DÜR, 1864), *E. zelleri* (EATON, 1885) and *E. alpinus* HEFTI, TOMKA & ZURWERRA, 1987. The last two species are newly recorded for Italy.

The *helveticus*-group was recently revised by JACOB & BRAASCH (1984) and by HEFTI *et al.* (1989). The nymphs belonging to this group were identified mainly by the long hairs on lateral lobes of hypopharynx, not extending over the tip of lobes. We can add the following characters: aligned bristles of the two converging series on the ventral surface of labrum are slender (except the first 3-4) and straight, arranged in two regular rows on each side (figs 2-5) (in the *venosus*-group these bristles are stouter, slightly curved and usually arranged in a single row: fig. 1); more than 3 hairs are on the outer margin of maxilla (0-2 in the *venosus*-group). The bristles on the ventral side of femora, near the hind margin, are also a useful character for group attribution: the species of *venosus*-group always have one or more rows of strong bristles; *E. picteti* and *E. alpinus* have just an irregular row of tiny bristles, *E. helveticus* and *E. zelleri* do not present them at all.

*Ecdyonurus helveticus* (EATON, 1885)*Description of nymph*

Body length (mature nymphs): 11-16 mm.

Colour and markings. Very variable, general colour brownish; two rounded light spots in front of bases of antennae, sometimes joined; I-VII tergites with a medial longitudinal brown band; within this band there are two curved light submedial spots and a rounded or triangular light spot near the hind margin; these light spots are larger in the VIII and IX tergite, which are sometimes entirely pale, and may be fused into a large V-shaped light area; towards lateral margins there are a light irregular stripe, which can be very wide, and a dark (reddish) one which includes a light L-shaped marking. X tergite is usually brownish with two faint small submedial stripes, but sometimes it is light all over. Gills are usually yellowish brown, sometimes with a violet tinge.

Mouthparts. On ventral side of labrum there are two series of bristles converging to the midst of labrum. In the species of *helveticus*-group these bristles are placed in two almost regular rows; in *E. helveticus* all these bristles are very slender (fig. 2). Maxilla (fig. 8): on the fore margin of the first segment of maxillary palpus there are very few (0-5) tiny and long hairs; 7-30 long bristles are along the outer margin of galea-lacinia; on the dorsal part of the outer forecorner of galea-lacinia there are 20-50 long bristles. The long hairs on the lateral lobes of hypopharynx do not reach the apex of each lobe, as is usual in all species of *helveticus*-group. Glossae are rectangular and bent outwards.

Pronotal projections are generally highly variable, but in most cases are long, pointed, and bent slightly inwards: they can hardly be used for the diagnosis of species.

There are no (or very few: 0-3) bristles on the ventral side of femora, near the hind margin; bristles on the upper surface of the fore femur are rounded at apex, with parallel or slightly convergent sides; there are generally two denticles on tarsal claws.

On hind margin of tergites there are long and pointed teeth, among which are smaller ones.

First gill with a high number (40-65) of filaments (counting all tips)(Fig. 7).

*Distribution and ecology*

*E. helveticus* is distributed all over Italy, from the Alps to Sicily; not present in the Po Valley.

Altitude range varies from a few meters above sea level to over 1,700 m.

Habitat preferences involve cold waters and slow flowing current.

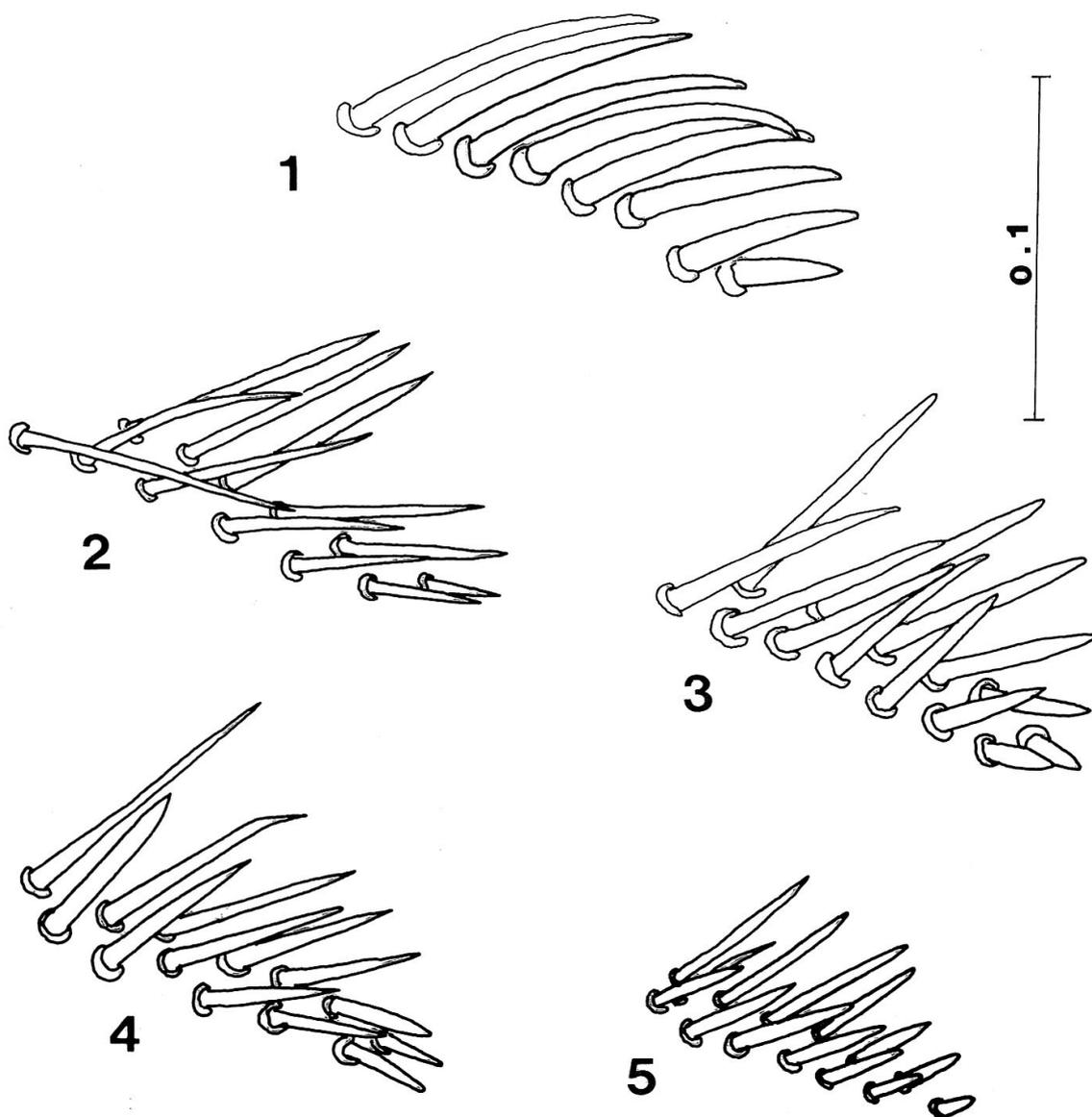
The flight period is very long, from Spring to Autumn.

*Material examined*

(in brackets the number of specimens examined; all specimens are preserved in authors' collections)

ITALY: Trentino. Tesero (Trento), effluent of Lagorai Lake, 19.viii.1987 (2); Cavalese (Trento), 15.viii.87 (1); Lombardia. Rovagnate (Como), River Curone, 15.iii.1992 (7); Grosio (Sondrio), Roasco Stream, 13.vii.1992 (4); Montespluga (Sondrio), affluent of Montespluga Lake, 20.viii.1992 (1); Ballabio (Como),

Pioverna Stream, 30.viii.92 (5); Mezzoldo (Bergamo), River Brembo, 25.i.1992 (2); Piemonte. Craveggia (Novara), Melezso Stream, 1.i.1993 (1); Usseglio (Torino) River Stura di Viù, 30.iii.1990 (4); Gozzano (Novara), Agogna Stream, 19.ix.1991 (3); Liguria. Millesimo (Savona), River Bormida, 15.v.1989 (3); Sesta Godano (La Spezia), Gottero Stream, 18.iv.1992 (2); Marche - Montefortino (Ascoli Piceno), River Ambro, 13.vi.1991 (2 reared); Calabria. Cardeto (Reggio Calabria), Sant'Agata Stream, 2.viii.1986 (1); Aiello Calabro (Cosenza), River Oliva, 17.v.1993 (1); Petilia Policastro (Catanzaro), River Soleo, 17.v.1993 (3); Sicilia. Canicattini Bagni (Siracusa), River Manghisi, 31.v.1988 (2); Moio Alcantara (Messina), River Alcantara, 7.vi.1988 (2); SWITZERLAND: Champéry (Val d'Illicez), Saufla Stream, 18.vii.1992 (5).



Figs 1-5. *Ecdyonurus* spp., bristles on the ventral surface of labrum (right side): (1) *E. sp. gr. venosus*; (2) *E. helveticus*; (3) *E. picteti*; (4) *E. zelleri*; (5) *E. alpinus*. (scale in mm)

*Ecdyonurus picteti* (MEYER-DÜR, 1864)

*Description of nymph*

Body length: 15 mm.

Colour and markings. General colour greenish brown; tergites with light sub-medial and hind spots usually fused in a large V-shaped area. Lateral light stripes more reduced than *E. helveticus* and *E. zelleri*, often present only in the hind half of each tergite.

Mouthparts. The first 1-3 medial bristles in the rows on the ventral part of the labrum are stout, the others are stronger than those of *E. helveticus* (fig. 3). Maxilla: there are more than 15 long bristles on the fore margin of the first segment of maxillary palpus, more than 20 bristles along the outer margin and 20-60 bristles on the dorsal side of the galea-lacinia.

There is a row of small (as compared with those present in *E. spp. gr. venosus*) pointed bristles on the ventral side of femora, near the hind margin. Denticulation on the hind margin of tergites is longer and sharper than those of *E. helveticus*.

Other characters like *E. helveticus*.

*Distribution and ecology*

*E. picteti* is widely distributed on the Alps, above 1000 m, in fast flowing cold waters. Mature nymphs can be collected in early Spring and late Summer.

*Material examined*

ITALY: Friuli. Tarvisio (Udine), Rio del lago del Predil, 13.viii.1977 (2); Forni Avoltri (Udine), Acqualena Stream, 31.vii.1992 (2); Veneto. Sappada (Belluno), River Piave, 31.vii.1992 (2); Lombardia. Mezzoldo (Bergamo), River Brembo, 25.i.1992 (4); Sondalo (Sondrio), River Adda, 13.x.1992 (2); Val D'Aosta. Val Veny (Aosta), River Dora Baltea, 25.vii.1992 (6), 21.03.1992 (4); SWITZERLAND: Splügen (Rheinwald), Häusern Stream, 20.viii.1992 (2).

*Ecdyonurus zelleri* (EATON, 1885)

*Description of nymph*

Body length: 9-11.5 mm.

Colour and markings. General colour pale yellowish brown, lighter than in previous species; the two light spots in front of the antennal basis are often medially fused. Sublateral light stripes are wide, rectangular or triangular, with well defined borders. Gills yellow whitish.

Mouthparts. Bristles on the ventral part of labrum (Fig. 4) intermediate between *E. picteti* and *E. helveticus*. Maxilla: 5-20 tiny bristles on the fore margin of the first segment of maxillary palpus; 4-25 bristles on outer margin and 15-50 on dorsal side of the galea-lacinia. Glossae are slightly more rounded than in the previous species.

No bristles on the ventral side of femora. The examined populations can be divided into two groups on the basis of the shape of the dorsal bristles of femora: populations from Slovenia, Austria and Friuli have bluntly pointed bristles on upper

side of fore femur; these bristles are parallel sided and with a rounded or squared end in the populations from Veneto, Lombardia and Switzerland.

In the examined material the denticulation on the hind margin of tergites is not distinguishable from that of *E. helveticus*.

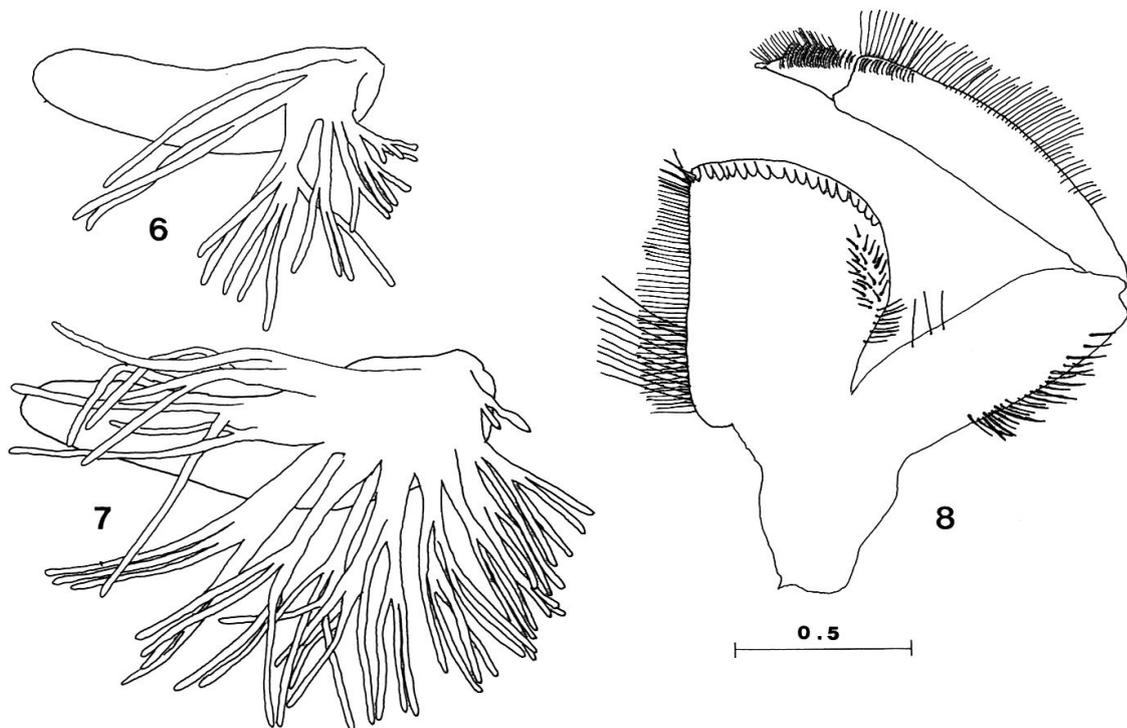
First gill with a low number of filaments (20-30); IV gill sometimes slender, but often very alike to that of *E. helveticus*: its taxonomic value (HEFTI *et al.*, 1987) must be rejected.

*Distribution and ecology*

*E. zelleri* is distributed all over the Alps, above 300 m, along the edges of streams, where the current is slower. Adults fly in August-September.

*Material examined*

ITALY: Friuli. Forni Avoltri (Udine), Acqualena Stream, 31.vii.1992 (5); Coritis (Udine), River Resia, 1.viii.1992 (7); Veneto. Sappada (Belluno), River Piave, 31.vii.1992 (5); Lombardia. Ballabio (Como), Pioverna Stream, 30.viii.1992 (11 + 2 reared), 21.viii.1993 (5); Mandello del Lario (Como), Meria Stream, vi.1989 (2); AUSTRIA: F. Gail, Birnbaum, 6.viii.1987 (1); Schopfernau (Bregenzerwald), Bregenzerach Stream, 13.viii.1992 (2); SLOVENIA: Bled, River Radowna, 2.viii.1992 (3); SWITZERLAND: Champéry (Val d'Illeiez), Saufla Stream, 18.vii.1992 (3).



Figs 6-8. *Ecdyonurus* spp.: (6) *E. zelleri*, 1st gill; (7) *E. helveticus*, 1st gill, (8) maxilla. (scale in mm)

*Ecdyonurus alpinus* HEFTI, TOMKA & ZURWERRA, 1987*Description of nymph*

Body length: 13 mm.

Colour and markings. Light spots on the fore margin of head wide, laterally extended, often fused. VIII-X tergites with marked light-dark pattern. Gills are yellowish with a darker area near the fore margin.

Mouthparts. Bristles on the ventral side of labrum (Fig. 5) like *E. picteti*, but shorter. Maxilla: few (2-10) tiny bristles on the fore margin of the first segment of maxillary palpus; 10-20 bristles on the outer margin, 20-35 bristles on the dorsal side of galea-lacinia. Glossae are rectangular, laterally expanded, bent outwards.

Bristles on the ventral side of femora are absent or reduced, placed in an irregular row of 8-12 small spatulate bristles. Bristles on the upper side of fore femur are short, rounded, with diverging sides. On tarsal claws there are usually no teeth: in some specimens we observed two asymmetrical teeth (like *E. austriacus*: see HEFTI & TOMKA, 1986). The fore trochanter bears a short row of bristles. Denticulation on the hind margin of tergites with short pointed spines and longer rounded ones; the latter have a well sclerotized median spine with two light lateral laminae.

First gill with 20-30 filaments.

*Distribution and ecology*

*E. alpinus* is distributed on Central Alps; HEFTI *et al.* (1987; 1989) considered this species as typical of high mountain fauna: we found it also at 650 m (Sondalo, River Adda). Adults fly in August and September.

*Material examined*

ITALY: Lombardia. Montespluga (Sondrio), affluent of Montespluga Lake, 20.viii.1992 (20); Isolato (Sondrio), Da Isola Stream, 21.viii.1992 (4); Sondalo (Sondrio), River Adda, 13.x.1992 (2); SWITZERLAND: Splügen (Rheinwald), Häusern Stream, 20.viii.1992 (4).

KEY TO THE NYMPHS OF ITALIAN SPECIES OF THE *ECDYONURUS HELVETICUS*-GROUP.

1. Long teeth on hind margin of IV tergite wide and rounded (HEFTI *et al.*, 1989: Fig. 2d) *E. alpinus*
- Long teeth on hind margin of IV tergite pointed (HEFTI *et al.*, 1989: Fig. 2a) 2
2. A row of many bristles on ventral side of femora, near the hind margin (HEFTI *et al.*, 1989: Fig. 7c) *E. picteti*
- 1-3 bristles may be present on ventral side of femora 3
3. Filaments of first gill with 40 or more tips (Fig. 7); medial bristles on ventral side of labrum slender (Fig. 2); 0-5 tiny hairs are on first segment of maxillary palpus (Fig. 8) *E. helveticus*
- Filaments of first gill with 30 or less tips (Fig. 6); medial bristles on ventral side of labrum wider and shorter (Fig. 4); more than 5 hairs on fore margin of first segment of maxillary palpus *E. zelleri*

In Table 1 are listed the states of diagnostic characters in the four species.

ITALIAN SPECIES OF THE *ECDYONURUS HELVETICUS*-GROUP

	bristles on ventral side of labrum	hairs on 1st segment of maxillary palpus	bristles on outer margin of galea-lacinia	bristles on ventral surface of femora	shape of dorsal bristles of femora	teeth on pre-tarsus	spines on hind margin of IV tergite	no. of filaments of 1st gill
<i>E. helveticus</i>	all long and slender	0-5	7-30	0-3	parallel sided, rounded apex	2	long, pointed	40-65
<i>E. picteti</i>	the proximal 1-3 stout, others long and strong	>15	>20	>12, pointed	like helveticus	2	very long and pointed	45-70
<i>E. zelleri</i>	intermediate between <i>helveticus</i> and <i>picteti</i>	5-20	4-25	0	rounded or bluntly pointed	0-2	like <i>helveticus</i>	20-30
<i>E. alpinus</i>	like <i>picteti</i> , shorter	2-10	10-20	0 or 8-12 small and rounded	short and rounded	0-2	short, rounded	20-30

RÉSUMÉ

Une révision des espèces italiennes du groupe *Ecdyonurus helveticus* a été entreprise. On propose ici des nouveaux caractères différentiels pour discriminer les nymphes de ce groupe de celles du groupe *venosus*. *E. helveticus* (EATON), *E. picteti* (MEYER-DÜR), *E. zelleri* (EATON) et *E. alpinus* HEFTI, TOMKA & ZURWERRA (les deux dernières nouvelles pour l'Italie) sont décrites; une clé de détermination est proposée tenant compte de ces nouveaux caractères différentiels.

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