

***Ecdyonurus belfiorei* nov. sp. from Italy,
with a note on *E. aurantiacus androsianus* Braasch, 1983
[Ephemeroptera : Heptageniidae]**

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Keywords : *Ecdyonurus*, new species, systematics, morphology, imagoes, larva.

A new species of the *Ecdyonurus venosus* - group, *Ecdyonurus belfiorei* nov. sp., formerly confused with *E. aurantiacus* Burmeister, 1839 is recorded from Italy. Male imago, female imago and fullgrown larva are described and figured. The new species is close to *E. aurantiacus* from which it can be separated as follows : the male imago mainly by the shape of the eyes, the structure of the penis, and some differences in wing and abdominal colouration ; the female imago by the colour of wing venation as well as details in abdominal colouration ; last-instar larva mainly by fine structures of the mouthparts and femora. *E. belfiorei* n. sp. also shows affinities to *E. dispar* Curtis which is widespread throughout Europe. The differences are discussed and figured. In addition, *E. aurantiacus androsianus* Braasch, 1983 from the Greek island Andros, does not seem to be closely related to *E. aurantiacus*, and is raised from subspecies to species level : *E. androsianus* status novus.

***Ecdyonurus belfiorei* nov. sp. d'Italie, avec une note sur *E. aurantiacus androsianus* Braasch, 1983
[Ephemeroptera : Heptageniidae]**

Mots-clés : *Ecdyonurus*, espèce nouvelle, systématique, morphologie, imagos, larve.

Une espèce nouvelle du groupe *Ecdyonurus venosus*, *Ecdyonurus belfiorei* nov. sp. a été découverte en Italie ; elle a été confondue jusqu'ici avec *E. aurantiacus* Burmeister, 1839. Les imagos mâle et femelle, ainsi que la larve au dernier stade sont décrites et figurées. L'espèce nouvelle est proche d'*E. aurantiacus* dont elle peut être distinguée comme suit : l'imago mâle principalement par la forme des yeux, la structure du pénis et quelques différences de coloration sur l'aile et l'abdomen ; l'imago femelle par la couleur de la nervation alaire et par des détails de la coloration abdominale ; la larve au dernier stade essentiellement par la structure fine des pièces buccales et des fémurs. *E. belfiorei* n. sp. montre aussi des affinités avec *E. dispar* Curtis qui est répandu dans toute l'Europe. Les différences sont discutées et illustrées. En outre, *E. aurantiacus androsianus* Braasch, 1983 de l'île grecque Andros ne paraît pas étroitement apparenté à *E. aurantiacus* et est élevé du rang de sous-espèce au rang d'espèce : *E. androsianus* nov. comb.

Introduction

Ecdyonurus aurantiacus has been described from a male from the Saale River in central Germany. In consequence of its poor description by BURMEISTER (1839), this species has been confused for a long period with other species of the same genus and also a species of the genus *Rhithrogena*, before its revision by PUTHZ (1973). In this revision, besides a brief description, the synonyms *Ecdyurus pазsiczkyi* Pongracz, 1913 and *Ecdyonurus fluminum* auct. p. p. [including Grandi, 1960] nec Pictet, 1843-45 were established.

Comparison of specimens (larvae and adults) throughout Central Europe (Hungary, Poland, Germany, and France), mainly with the help of a set of larval characters pointed out by HAYBACH (1999), clearly emphasizes the uniqueness of the Italian material which was generously sent us for comparison by Dr. Carlo Belfiore.

Ecdyonurus belfiorei n. sp.

STUDY MATERIAL.

Italy, C. Belfiore leg., sub. nom. *E. aurantiacus*. Holotype : 1 male imago, Italy-Marche, Penabilli (Pesaro) R. Masécchia, 04.V.1995. Paratypes : 1 male, 2 females (same collection site and date), leg. and reared from larvae to imagoes by Dr. Belfiore. 2 larvae (non types), same location : R. Masécchia, alt. 450 m, 20.VIII. 1992.

The material is preserved in 70 % alcohol, and is deposited as follows : holotype and paratypes with their exuviae, as well as one slide with the penis of male paratype in the Naturhistorisches Museum, Vienna. 2 larvae provisionally in Coll. Haybach, Mainz. The left foreleg of the holotype is atrophied. The right foreleg -used for description- is disjointed between trochanter and femur.

MALE IMAGO

General colouration : light brown to yellowish.

Size : forewings : 9 mm ; body length : 8 mm ; cerci : 19 mm. The other male (paratype) is a little larger (forewing : 11 mm).

Head

Eyes : colouration not well preserved, blue-grey with two violet to dark brown stripes at its base (Fig. 2). In dorsal view, a gap of the size of the median ocellus is visible between the eyes (Fig. 1).

Thorax

Light brown, pleura lighter, yellowish. The prolongation of the costa of the forewing is markedly spotted with violet, the prolongation of the subcosta too, but not so pronounced (Fig. 2).

Legs : foreleg : 9 mm ; femur : 2.2 mm ; tibia : 2.41 mm ; tarsus 1 (T1) = 0.86 mm, T2 = 1.08 mm, T3 = 1.08 mm, T4 = 0.76 mm, T5 = 0.36 mm. Forelegs brown, basal part of femur lighter, yellowish, as are coxa and subcoxa. Middle and hind legs yellowish. Wings : not fully transparent in our material, somewhat opaque. Forewings : pterostigmal area distal the bulla clearly opaque, only with few anastomoses. Longitudinal veins light brown, crossveins -especially in basal part and in costal, subcostal and radial 1 areas- at least up to the bulla, distinctly darker, blackish.

Abdomen

Figs : 4 and 5. General colouration light brown to yellow. Lateral pattern consists of two different components : a small dark brown patch in the anterior basal edge of each segment, and a clearly lighter brown lateral stripe. Lateral stripes of both sides are connected dorsally by a darker

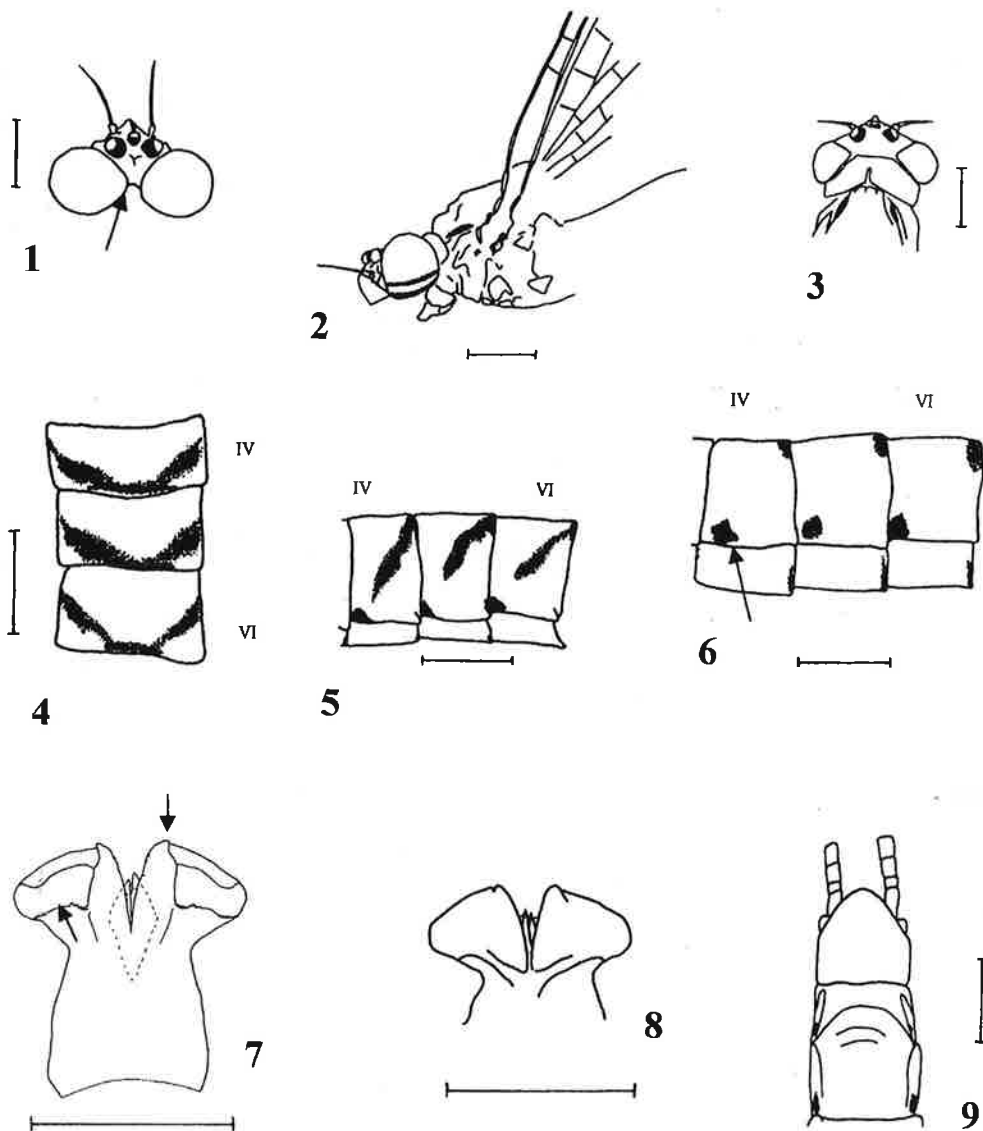


Plate I. Imaginal features of *Ecdyonurus belfiorei* nov. sp.

1, 2, 4, 5, 7, 8 : male imago ; 3, 6, 9 : female imago. 1 : tête, vue dorsale. 2 : pigmentation du prothorax et de la base de l'aile antérieure, vue latérale. 3 : tête et partie antérieure du thorax, vue dorsale. 4-6 : segments abdominaux IV à VI (4 : vue dorsale ; 5 et 6 : vue latérale). 7 : pénis, vue dorsale. 8 : pénis, vue ventrale. 9 : de la plaque sous-génitale à la plaque sous-anale, vue ventrale. Barres d'échelle = 1 mm, exceptées 7 et 8 = 0,5 mm. Arrows indicate important structures.

Planche I. Structures imaginale de *Ecdyonurus belfiorei* nov. sp.

1, 2, 4, 5, 7, 8 : imago mâle ; 3, 6, 9 : imago femelle. 1 : tête, vue dorsale. 2 : pigmentation du prothorax et de la base de l'aile antérieure, vue latérale. 3 : tête et partie antérieure du thorax, vue dorsale. 4-6 : segments abdominaux IV à VI (4 : vue dorsale ; 5 et 6 : vue latérale). 7 : pénis, vue dorsale. 8 : pénis, vue ventrale. 9 : de la plaque sous-génitale à la plaque sous-anale, vue ventrale. Barres d'échelle = 1 mm, exceptées 7 et 8 = 0,5 mm. Les flèches indiquent des structures importantes.

brown band on the hind margin of each segment. The dark brown basal patch and the lateral stripes are disconnected in our material. However this may be due to the limited study material and may show some variation. The shape of the lateral stripes is somewhat diffuse. These are well visible up to the seventh segment, while the basal dark path is also visible on the eighth and ninth segments. Sternites yellowish, only the basal parts of each segment is a little brownish. Ganglion chain inconspicuous white, except the caudal ganglionic knob that is spotted violet, what is also the case in fullgrown larva (Fig. 24).

Genitalia

Forceps brown ; forceps base with two small teeth similar to *E. aurantiacus* (Fig. 13). Penis (Figs 7 and 8) with moderately expanded side-lobes. As in many Mediterranean species, the basal sclerite covers a little the base of the lateral sclerite, and the borders of all sclerites are only badly visible. The tip of the apical sclerite rises a little above the lobes. Cerci : length 19 mm, brown in its basal part, becoming lighter and lighter to its distal end, joints of segments darker. In fresh material the annulation of the cerci may be apparent.

FEMALE IMAGO

Body length : 10 mm ; forewings : 11 mm. Head and thorax (Fig. 3) with the violet pigmentation in prolongation of the subcosta more pronounced than in male. Wings : similar to the male with light brown longitudinal veins and conspicuous darker, blackish crossveins, but without a blackish hue around the basal crossveins. Abdomen (Fig. 6) : in our material, probably due to long time preservation in alcohol, the central part of the lateral stripe is only hardly detectable, while the basal patch is clearly visible. Subgenital and subanal plates as in Fig. 9.

LARVA

N.b. : The identity of the larva with the adult stages is suggested by some relevant taxonomic features of the maxillae and femora, as well as the shape of the pronotum with those of the exuviae of the type material. In addition these specimens were captured at the type locality in summer, while adult type specimens were captured in spring.

General appearance and colouration : small to medium sized, faint species with distinct markings.

Body length : fullgrown female larva, excluding cerci : 8,4 mm.

Head

Somewhat trapezoidal (Fig. 19), with the widest part at the level of the eyes.

Mouthparts

Labrum without specific features, the median bristles in the inner area of the underside consist of only one row (Fig. 18), as typical for the *venosus*-group in general (BELFIORE & BUFFAGNI 1994). Hypopharynx : superlinguae with long hairs on outer margin, also over the top of the lobes, as typical for all members of the *venosus*-group.

Mandibles with 8-9 prosthecal bristles. For the maxillae and labial palp a set of characters has been introduced by HAYBACH (1999). The morphological nomenclature follows BELFIORE (1994, 1996) for the related genus *Electrogena*. However some additional features are necessary for discriminating *Ecdyonurus* species. For general relationships see Figs 14 and 17. Number of comb-shaped-bristles (N_CBS) about 16, plus 2 smaller bristles. Number of teeth on 5th CBS (N_TCB5) only 13-14. Number of hairs on dorsal upper side (N_DOR) = 3 ; number of hairs on outer margin of maxillae (N_OUT): 0 ; number of hairs on ventral basal part of maxillae (N_VEN) = 6-7. The maxillary palp has three taxonomically important groups of hairs (long and slender), and setae (so-

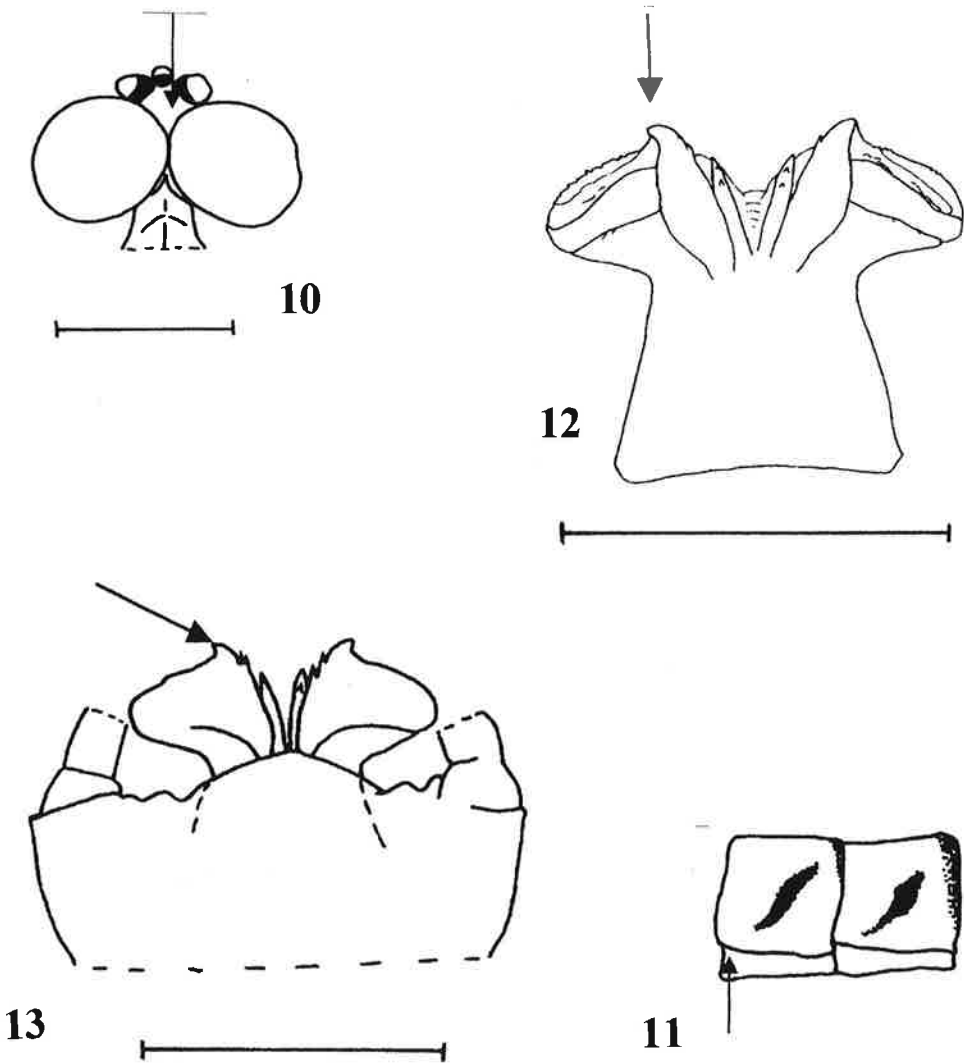


Plate II. Imaginal features of *Ecdyonurus aurantiacus* from Germany.

10 : head of male, dorsal view. 11 : female, abdominal segments V and VI, lateral view. 12 : penis, dorsal view. 13 : penis and forceps, ventral view. 10, 12 and 13 : material from River Main at Lohr, VIII/1928, leg. Schoenemund, sub. nom. *E. fluminum*, Coll. ZFMK, Bonn, det. A. Haybach. 11 : material from River Danube at Bad Abbach, VII/1997. Bars : 10 and 13 = 1 mm ; 12 = 0,5 mm. Arrows indicate relevant structures.

Planche II. Structures imaginales d'*Ecdyonurus aurantiacus* d'Allemagne.

10 : tête du mâle, vue dorsale. 11 : femelle, segments abdominaux V et VI, vue latérale. 12 : pénis, vue dorsale. 13 : pénis et pince génitale, vue ventrale. 10, 12 et 13 : matériel de la Rivière Main à Lohr, VIII/1928, leg. Schoenemund, sub. nom. *E. fluminum*, Coll. ZFMK, Bonn, dét. A. Haybach. 11 : matériel de la Rivière Danube à Bad Abbach, VII/1997. Echelle : 10 et 13 = 1 mm ; 12 = 0,5 mm. Les flèches indiquent des structures importantes.

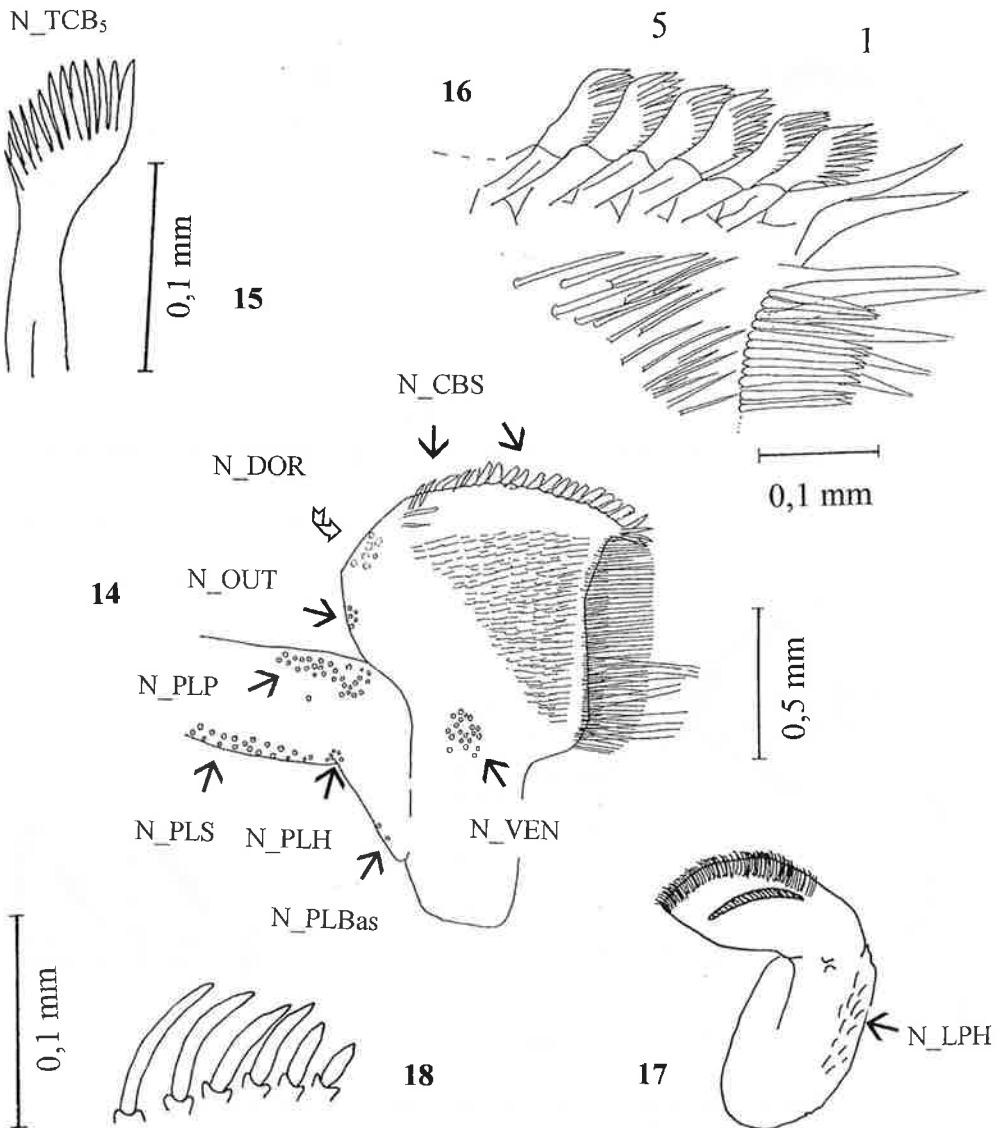


Plate III. General distribution and naming of important hair fields on mouthparts of larvae of the genus *Ecdyonurus* [from HAYBACH (1999) with permission].

14 : maxilla. 15 : comb-shaped-bristle no. 5. 16 : detail of 14, showing the front edge of maxillae with enumeration of bristles. 17 : labial palp. N_XXX = numerical features considering the number of hairs on a special side. See text for explanations. 18 : bristles on inner central part of labrum.

Planche III. Répartition générale et nomenclature de la pilosité discriminante des pièces buccales de larves du genre *Ecdyonurus* [d'après HAYBACH (1999) avec permission].

14 : maxille. 15 : soie maxillaire pectinée no. 5. 16 : détail de 14, montrant le bord antérieur de la maxille avec le comptage des soies. 17 : palpe labiale. N_XXX = désignation numérique des soies présentes sur un côté déterminé. Voir le texte pour explications. 18 : fortes soies de la partie centrale interne du labre.

mewhat shorter and more robust). The first is a small group of hairs at the base of the maxillary palp (N_PLBas), which is represented by only three hairs in *E. belfiorei*. Hairs on the outer base of the first segment of the maxillary palp (N_PLH) consist of only 4-5 in number, followed by 21-26 setae in 2-3 rows. Their length reaches about half of the width of the palp segment. On the inner side of the first segment is a group of about 40 long hairs (N_PLP) that are restricted to the proximal first third of the segment. Labial palp : there is a field of hairs on the dorsal side of its first segment (N_LPH in Fig. 17). This field consists of 2-3 rows of hairs (N_LPH = 24-31).

Remark : Although there may be some variation in pilosity of the maxillae and labial palp when more material is considered, the general relationships of the named hair fields proved to be highly conservative in a series of central European species (HAYBACH 1999), and this is assumed to be the case here.

Thorax

Pronotum (Fig. 19) rounded, with only a very short caudal prolongation.

Legs : spine-like bristles on upper surface of the proximocentral part of the femur as in Fig. 21, mainly blunt at their ends. Bristles on the distal part, and on middle and hind femora are more pointed. There is a row of sharp pointed large spine-like bristles behind the row of long hairs at the hind margin of all femora (Fig. 35, "venosus-gr."). This last feature is also of high specific relevance in the related *helveticus*-group, as well as in the related genus *Electrogena*. Tarsi with a distal darker ring, and 2-3 teeth under the tarsal claws in our specimens (Fig. 22).

Abdomen

Fullgrown larvae show the typical colouration of the adult (Fig. 23), including some darker spots on the foremargin of each segment, which are not visible in the adult. Hindmargin of central part of tergites as in Fig. 29. Sternites (Fig. 24) with only small caudolateral projections ; ganglionic chain not visible, except the ganglion in the seventh segment, which is spotted with violet.

Gills (Fig. 25-28): 1st gill (25) very large (2/3 the length of central gills), 7th gill (28) without any tuft of tracheal filaments.

Diagnosis :

The new species is closest to *E. aurantiacus* Burmeister, and has been confused with it by PUTHZ (1973) and auct. sequi. It shares only some similarities with *E. dispar*, mainly in larval stage. Differences of diagnostic relevance are as follows.

In the male adult, the gap between the eyes is not present in *E. aurantiacus* (Fig. 10) nor *E. dispar*, whose eyes are larger and more globular. The crossveins of *E. aurantiacus* are heavily tinged blackish in the basal part of the forewing in both sexes ; also visible in subimaginal stage. This feature is similar in *E. belfiorei* n. sp. but not so pronounced. Abdomen : the shape of the lateral stripes is somewhat diffuse and not as distinct as in *E. aurantiacus*, where it is black on yellow ground, and where a basal patch is always missing in both sexes (Fig. 11, and see THOMAS 1968, photo 1).

Genitalia : forceps base only with two small teeth, while in *E. dispar* these teeth are larger and curved inside in most cases (see THOMAS 1968, fig. 2). Penis lobes (Fig. 7) : apical and lateral sclerites distinctly broader than in *E. aurantiacus* ; general shape similar to *E. dispar* (THOMAS 1968, fig. 4). The tip of the apical sclerite rises a little above the lobes. But this feature is not as prominent as in *E. aurantiacus* (Figs 12 and 13), where it is one of the most characteristic features. In *E. dispar* the apical sclerites do not rise above the tip.

The general appearance of the larva is very similar to *E. aurantiacus* with respect to features such as body length, general colouration, shape of pronotum, shape of femoral spine-like bristles and sternites, and the number of comb-shaped bristles on maxilla margin, that gives the "classical"

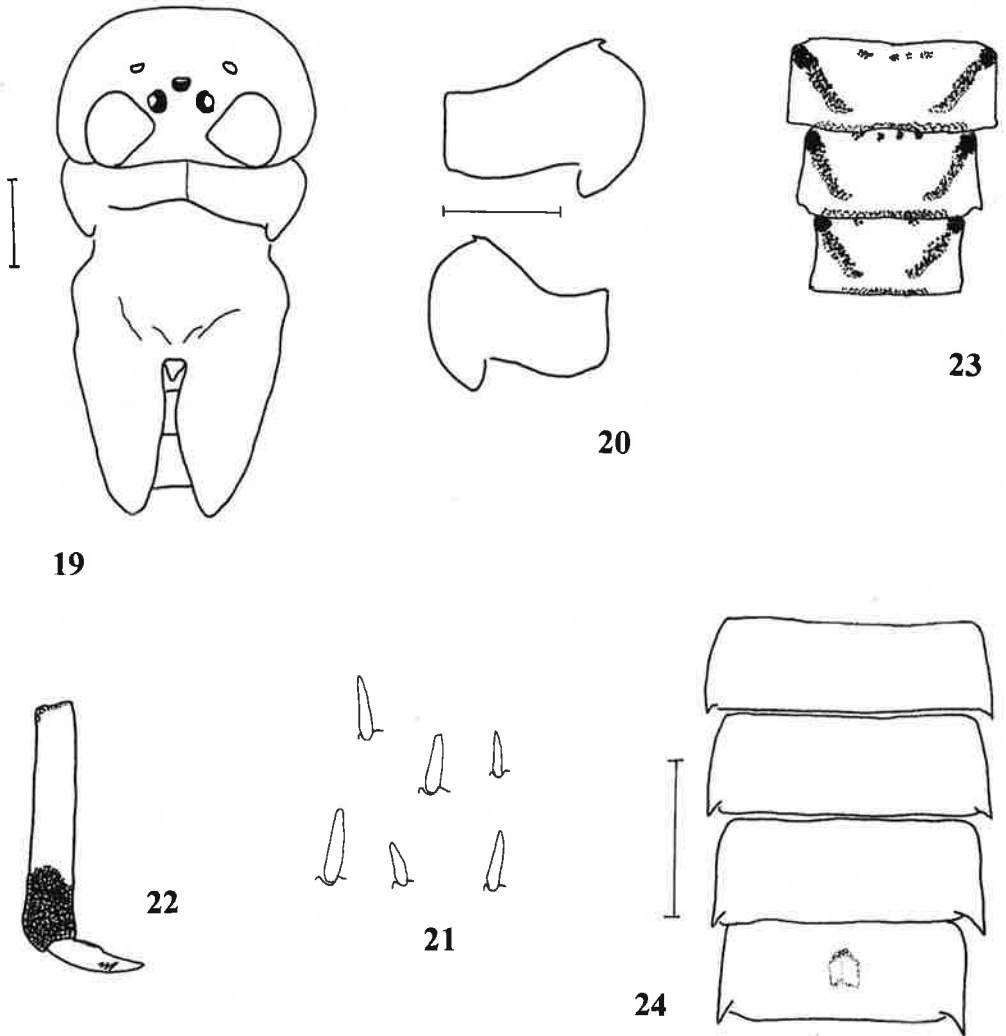


Plate IV. Larval structures of *Ecdyonurus belfiorei* nov. sp.

19 : tête et thorax. 20 : pronotum, agrandi. 21 : proximocentrale spine-like bristles of the dorsal side of foreleg. 22 : foretarsus. 23 : coloration of abdominal tergites IV to VI. 24 : abdominal sternites IV to VII. Bars = 1 mm.

Planche IV. Structures larvaires d'*Ecdyonurus belfiorei* nov. sp.

19 : tête et thorax. 20 : pronotum, agrandi. 21 : fortes soies en épines proximocentrales de la face dorsale de la patte antérieure. 22 : tarse antérieur. 23 : coloration des tergites abdominaux IV à VI. 24 : sternites abdominaux IV à VII. Echelle = 1 mm.

set of characters to describe *Ecdyonurus* larvae (see HAYBACH 1999 for figures of *E. aurantiacus*). The main difference to *E. aurantiacus* is the presence of a row of pointed spine-like bristles behind the row of long hairs on the hind margin of the femora, similar to *E. dispar* and all other known species of the *E. venosus*-group except *E. aurantiacus*, where this row is reduced : 1 to 3 spine-like bristles and some smaller spatulate bristles may be visible (Fig. 34).

Among the mouthparts, especially the maxillae show a set of differences. In general *E. aurantiacus* (Fig. 33) has much more hairs and setae. N_PLBas consists of 10-15 hairs. The inner side of the first segment is covered over 2/3 of its length by long hairs, that partly reach the width of the palpus segment. The situation of the basal group of hairs on the basal part of the outer margin of the segment (N_PLH) is very species specific. There are numerous long hairs, that cover the first half to two thirds of the segment, followed by a reduced number of obviously shorter setae. In *E. dispar* (Fig. 32) the situation is more similar to *E. belfiorei*. However the number of basal hairs (N_PLBas) is significantly higher (9-26), and there are numerous long hairs at the basal half of the outer margin followed by a small number of very short (in comparison with other species) setae. Labial palp : while the situation in *E. belfiorei* is somewhat similar to *E. dispar* (N_LPH = 11-22, in 1-2 rows) but in general with more numerous setae (24-31, in 2-3 rows in our scarce material of *E. belfiorei*), in *E. aurantiacus* at larger magnifications (~ 400 X) a second group of long tiny hairs is characteristic. Other features as N_VEN, N_DOR, and N_OUT show a large overlap in all species, while N_CBS in *E. dispar* (17-21) shows significant differences to *E. belfiorei* and *E. aurantiacus*.

The shape of the gills in *E. belfiorei* is similar to *E. dispar*, but in the latter species the 1st gill is broader. In *E. aurantiacus* the first gill is much smaller.

Discussion

N.b. : See the comprehensive study of the discriminating characters in central european species of the genus *Ecdyonurus* by BAUERNFEIND (1997).

GRANDI (1960) described in detail a species from Italy that she named *E. fluminum* (Pictet). The description given by PICTET (1843-45) was general enough to have led to a series of misunderstandings and confusions throughout Europe. Up to the revision by THOMAS (1968) many "*E. fluminum*" had been reported from all Mediterranean peninsulas, as well as from central Europe. However only few belong to *E. dispar*, the species discovered by THOMAS to be the valid name of *E. fluminum* (Pictet). It was JACOB (1972) who detected the priority of the name *E. aurantiacus* over *E. pазsiczkyi*, which had been redefined by THOMAS (1968) shortly before. PUTHZ (1973) revised the types of Burmeister, confirming JACOB's (1972) conclusion. He also made some general remarks regarding larval and imaginal characters of *E. aurantiacus*, and put the Italian "*E. fluminum*" sensu GRANDI, 1960 in synonymy with *E. aurantiacus*. In our opinion, having to our disposal a couple of species with a similar abdominal coloration pattern, moderately expanded penis lobes, and larvae that share most of the characters given as "classical" above, this synonymy was not correct. The drawings of penis by GRANDI (1960) (fig. 29.4) is identical with our specimen and show exactly the same differences to *E. aurantiacus* as described above. The same is with the lateral stripes on abdomen showing a darker anterolateral patch (fig. 29.7). In fig. 27 of Grandi, a small gap between the eyes of the male is visible in dorsal view. The figures of maxillae in GRANDI (1960) are generally of high accuracy (figs 129-130, pp 336-337) and fig. 129.3 shows exactly the situation as described here for *E. belfiorei*. By far this fig. 129.3 does not correspond to figured pilosity of *E. aurantiacus* (see Figs 31 and 33 for comparison).

In consequence, although we did not examine, as did Puthz, the specimens studied and figured by Madam Grandi, we have good reasons to assume their identity with *Ecdyonurus belfiorei* n. sp. The conspecificity of *E. aurantiacus* with *E. pазsiczkyi* (terra typica : Hungary) is accepted for

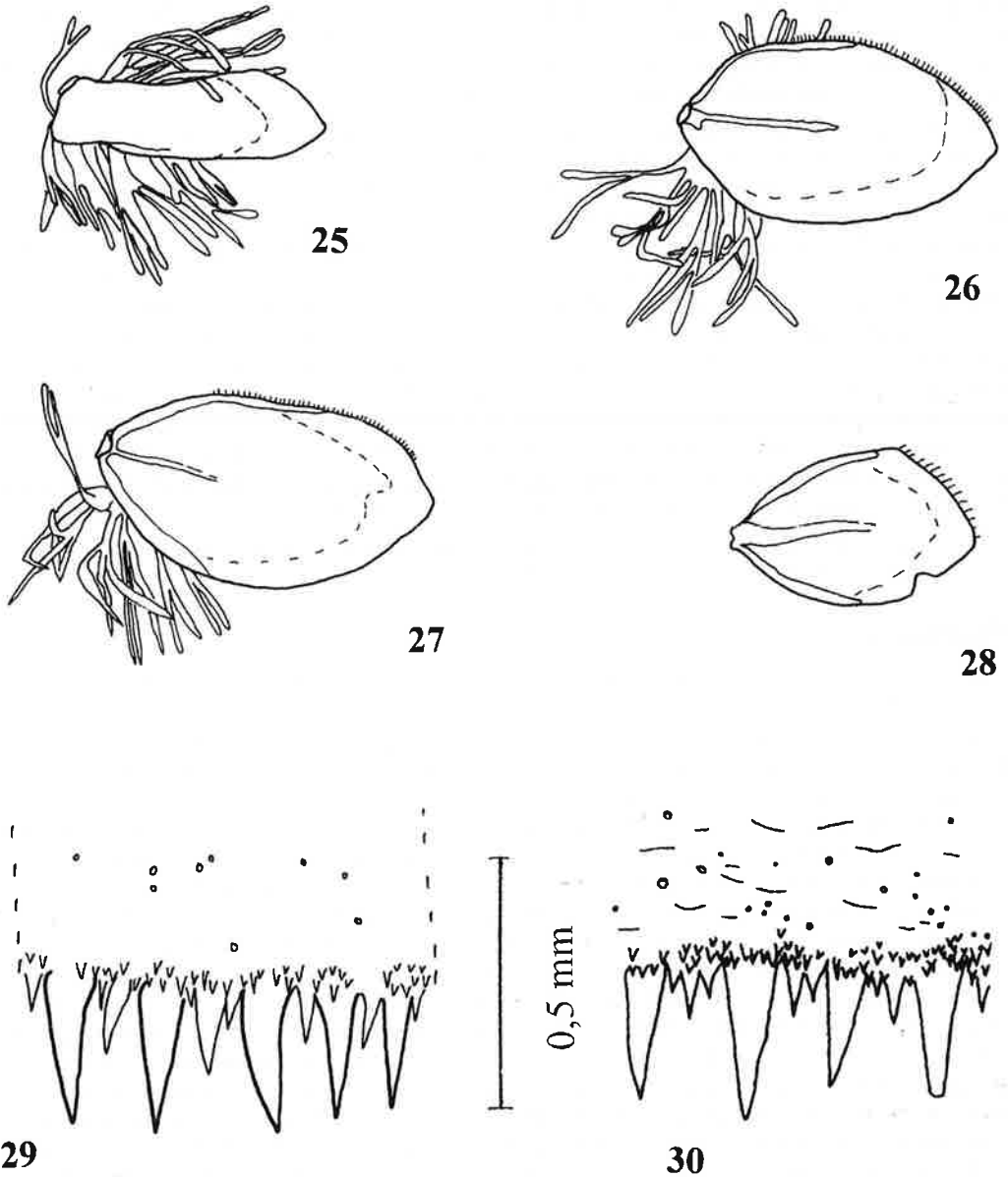


Plate V. Larval structures of *Ecdyonurus belfiorei* nov. sp. (25-29) and *E. dispar* (30).
 25-28 : gills 1 (25), 3 (26), 5 (27) and 7 (28). 29 and 30 : central part of the hindmargin of Vth tergite.
 Planche V. Structures larvaires d'*Ecdyonurus belfiorei* nov. sp. (25-29) et d'*E. dispar* (30).
 25-28 : branchies 1 (25), 3 (26), 5 (27) et 7 (28). 29 et 30 : région centrale du bord postérieur du V^e tergite.

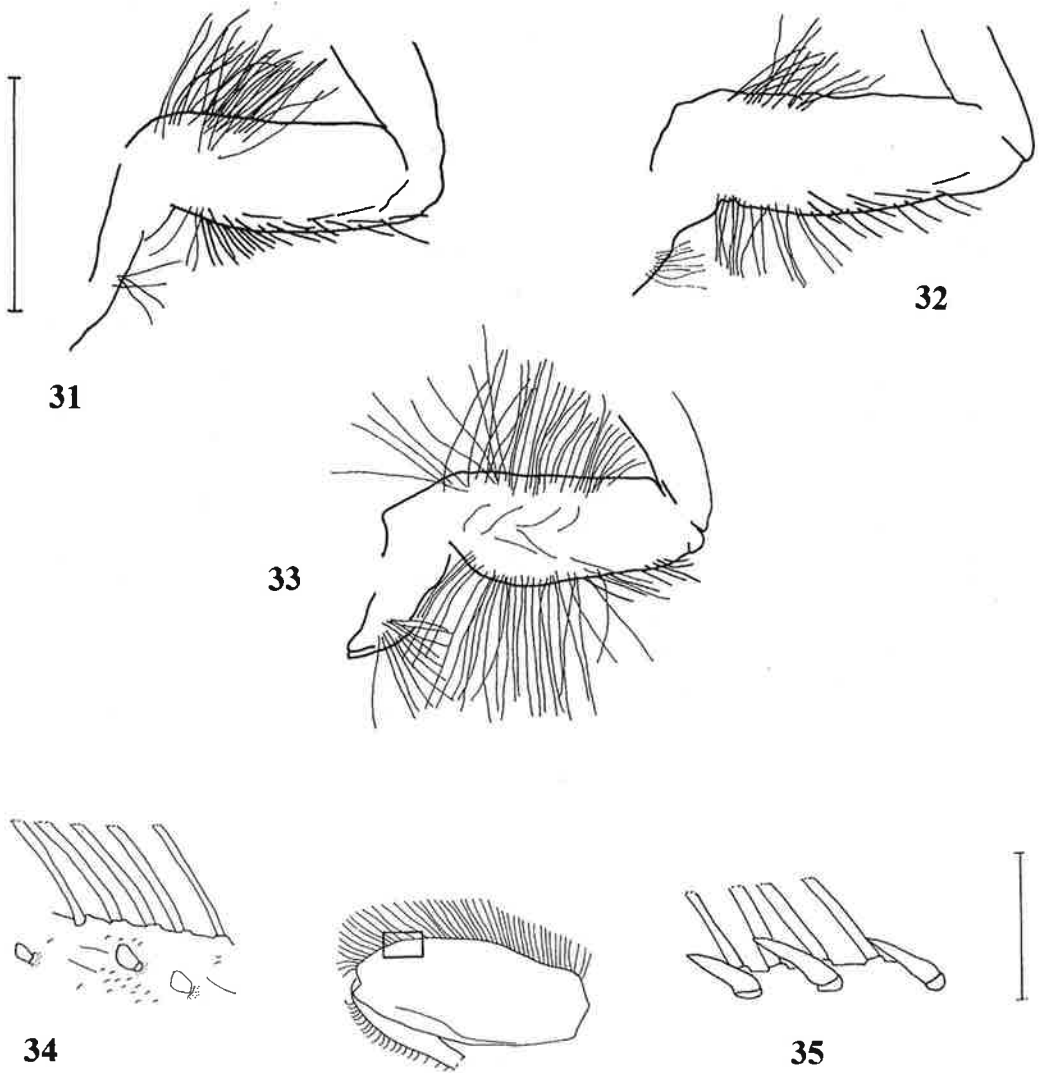


Plate VI. Larval features of *Ecdyonurus* spp.

31-35 : basal part and first segment of maxillar palpus in *E. belfiorei* n. sp (31), *E. dispar* (32) and *E. aurantiacus* (33). 34-35 : row of spine/scale-like bristles behind the row of marginal hairs on ventral hind part of femur in *E. aurantiacus* (34) and all other species of the *E. venosus* group (35). Bar : 31, 32 and 33 = 0.5 mm ; 34 and 35 = 0.1 mm.

Planche VI : Structures larvaires d'*Ecdyonurus* spp.

31-35 : partie basale et premier segment du palpe maxillaire chez *E. belfiorei* n. sp (31), *E. dispar* (32) et *E. aurantiacus* (33). 34-35 : rangée de fortes soies en épines/écailles derrière la rangée de soies marginales sur la partie postérieure ventrale du fémur chez *E. aurantiacus* (34) et chez toutes les autres espèces du groupe *E. venosus* (35). Echelle : 31, 32 et 33 = 0,5 mm ; 34 et 35 = 0.1 mm.

pragmatic reasons. Although the type specimens of *E. pazsiczyi* were destroyed (SACHTLEBEN 1961), no other species with a similar abdominal pattern is known to occur in Hungary and our study material from Tisza River in Hungary indicates a wide distribution of *E. aurantiacus* in this country.

Distribution

Given the fact that most Italian reports of *E. aurantiacus* belong to the new species, it seems to be widely distributed within Italy northwards to the lowlands of the River Po, and southwards to Sicily. However, especially in northern Italy we cannot exclude the occurrence of *E. aurantiacus*.

Remarks on *Ecdyonurus aurantiacus androsianus* Braasch, 1983

In 1983 BRAASCH described *Ecdyonurus aurantiacus androsianus* from the Greek island Andros as subspecies of the continental *E. aurantiacus*. The subspecies level was diagnosed mainly because of the "typical" colouration of the male abdomen (distinct brownish or blackish stripes on a yellowish basic colouration), and because of its occurrence on an island. The male of *E. aurantiacus androsianus* is similar to *E. belfiorei* n. sp. with regard to its forceps base and the large distance between the eyes, but differs clearly in its penis structure. Moreover, the caudal prolongation of the larval pronotum are elongated in *E. aurantiacus androsianus* in contrast to both *E. belfiorei* n. sp. and *E. aurantiacus*. From the latter the subspecies *androsianus* is clearly different by the distance between the eyes and the penis structure in male imago, and by the shape of bristles on the upper side of femora and the shape of pronotum in the larva. Unfortunately the given fine structures of mouthparts are too insufficiently described for a further comparison between all species.

Recently HAYBACH & THOMAS (1999) emphasized that the above mentioned colouration of the abdomen is typical of many Mediterranean species of the *E. venosus* - group, as also confirmed in this paper. Thus, this feature cannot be used to stress closer relationships between species in this genus. With regard to the majority of features which do not support a closer relationship of *E. aurantiacus androsianus* with *E. aurantiacus*, and with regard to a consistent treatment of species within the genus *Ecdyonurus*, *E. aurantiacus androsianus* is raised from subspecies to species level : *E. androsianus* Braasch, 1983 status novus. This opinion has been recently supported by Dr Ernst Bauernfeind (Vienna) in a paper on the Greek mayfly fauna given at the Xth International Conference on Ephemeroptera at Perugia (Italy).

ETYMOLOGY

This species is named after our good friend and colleague Dr. Carlo Belfiore (Napoli), honouring his major contribution to the knowledge of European mayflies.

Aknowledgements

We are sincerely indebted to Dr. Belfiore (Napoli) who made the material of the new species available for study. We thank Dr. Mauch (Dinkelscherben) for his kind permission to reprint some drawings from Lauterbornia. We thank also : Dr. Jacob (Cuxhaven) for support with literature ; Dr. Wendling (Mainz), for the gift of material of *E. aurantiacus* from Hungary ; and Prof. Dr. Rupprecht (Mainz and the University of Mainz), for a travel support in 1998. Dr. Brittain (Oslo) kindly improved the English text.

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