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SHORT COMMUNICATIONS

THE LARVAL STAGES OF *ISCHNURA FOUNTAINEI* MORTON (ZYGOPTERA: COENAGRIONIDAE)

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The larva is described and illustrated. A note on its ecology is given, and a comparison is provided with the other European *Ischnura* larvae.

INTRODUCTION

The European *Ischnura* species are often the commonest damselflies in the areas where this genus exists. Their commonness is so typical that in the first paper devoted to the larval stages of Odonata there is the description of an *Ischnura* species (ROUSSEAU, 1909). However, the descriptions remained incomplete for a long time, until Fraser's (1949) description of *I. pumilio*, CONCI & NIELSEN's (1956) description of *I. genei* and finally FERRERAS ROMERO's (1981) description of *I. graellsii*. Nevertheless, ASKEW (1988), in his recent monograph on European Odonata, judges only the description of *I. elegans* and *I. pumilio* satisfactory.

Recently *Ischnura fountainei* Morton, 1905 was added to the European fauna, when some adults had been found in the Pantelleria Island (LOHMANN, 1989). It is a very common species (DUMONT, 1977), and widespread from Algeria to Uzbekistan (ASKEW, 1988). It could be sympatric to other *Ischnura* species, as shown by its discovery well inside the range of *I. graellsii* in Tunisia (DUMONT, 1977), and also by its frequent association with *I. evansi* and *I. senegalensis* in the Levant (DUMONT, 1991). Figures of *I. fountainei* larvae have recently been published by DUMONT (1991) but without any description.

The aim of this paper is to describe, with some accuracy, the morphology of the last larval instars of *I. fountainei*.

METHODS

We adopted here CORBET's well known terminology (1953) for the labium. However, in addition to the usual two rows of long premental setae, two other groups of short spiniform setae exist on the prementum, between the previous setae and the articulation with the postmentum (Fig. 2a). Because these were not defined by CORBET (1953), we indicate them as "premental subsidiary setae".

Abdominal segments ranged from S1 to S10.

The material described here is composed of exuviae from the ecdysis of some specimens reared in the laboratory up to emergence, and of some larvae dead before emergence. Instars were defined with respect to emergence: the last larval stage was indicated as "F" (final), and the previous instars as "F-1" and "F-2" (respectively 1 and 2 instars before the last).

For the larvae that died before emergence, the stages were deduced by comparison with the dimensions of the exuviae of the emerged individuals. Both exuviae and larvae were stored in 70% ethyl alcohol, and were drawn using a microscope and stereomicroscope with a camera lucida. Measurements were made using a micrometric eyepiece and were approximated at the nearest 0.1 to 0.02 mm, depending on the magnification.

MATERIAL AND SITE

Eleven larvae were collected from a little stream, which crosses the road between Remada and Tatouine, near Bir Amor, southern Tunisia, 13 May 1987, G. Carchini, M. Lucarelli, G. Pandolfi leg. Seven individuals emerged in the laboratory after one or two ecdyses, four died before emergence after two, one or no ecdysis. Together with the *I. fountainei*, several larvae of *Orthetrum chrysostigma* (Burm.) were also collected in the stream.

The bottom of the stream was sandy with some submerged plants. The area is rather desolate, and there are no trees but only a few scattered tufts of grass. A sample of water was taken and analyzed in Italy after several days. The results of the chemical analyses were: pH = 7.4; – conductivity in microsiemens μS = 15,000; – hardness in french degree °F = 47; – total alkalinity ($CaCO_3$) = 720 ppm; – Cl^- = 126 ppm; – Na^+ = 4,830 ppm; – K^+ = 125; – NO_3^- = 9 ppm; – F^- = 1.3 ppm.

MORPHOLOGICAL DESCRIPTION OF THE LARVAE

ISCHNURA FOUNTAINEI MORTON

Figures 1-5

Larvae similar to the other *Ischnura* species, but smaller, colour very pale cream, without dark area or spots. Body relatively short (Fig. 1a, b).

Antennae: in the F instar 6-segmented in three, 7-segmented in two and 6- and 7- in the other two specimens; in the F-1 instar 6-segmented. The third segment always the longest. Mandibles as in Figure 2c-d. Mask relatively short, articulation between prementum and postmentum reaching the mesosternum (Fig. 1b). Prementum with two series of premental setae and two groups of subsidiary setae. Premental setae 4 + 4, $4_1 + {}_04$, $4_1 + {}_14$, 5 + 5, $5_1 + {}_05$ in the F instar; $4_1 + {}_04$ or $4_1 + {}_14$ in the F-1 instar and $4_1 + {}_04$ in the F-2 instar. Two series of spiniform setae, starting from the palpus articulation and reaching ½ or ⅓ of the lateral edge of the prementum in all instars (Fig. 2b).

Palpus as usual in *Ischnura*. Palpal setae 5 & 5 , 6 & 6 or 6 & 7 in the F instar, 5 & 6 or 6 & 6 in the F-1 instar, and unknown in the F-2 instar. Distal margin of palpus as in Figure 3a.

Legs relatively short, femoral setae as in Figure 4a. Thorax without row or group of spiniform setae on the ventral surface of the meso- and metathorax.

Wing sheaths, in the F instar reaching halfway or (in two specimens) to distal margin on S3; in the F-1 instar reaching halfway or to distal margin on S2 (Fig 1a).

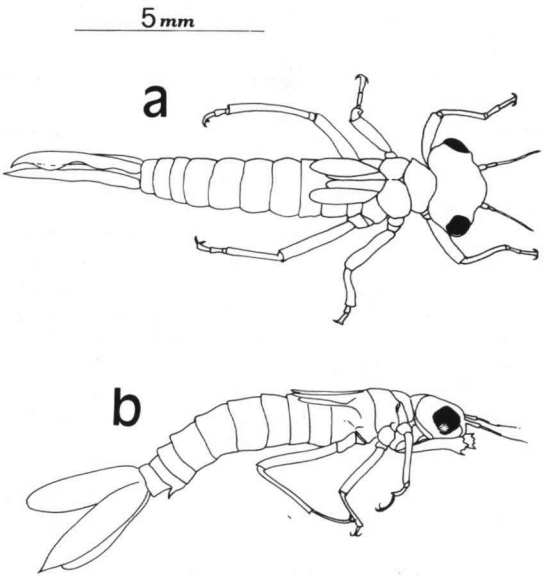

Fig. 1. *Ischnura fountainei*, habitus: (a) dorsal view; – (b) lateral view.

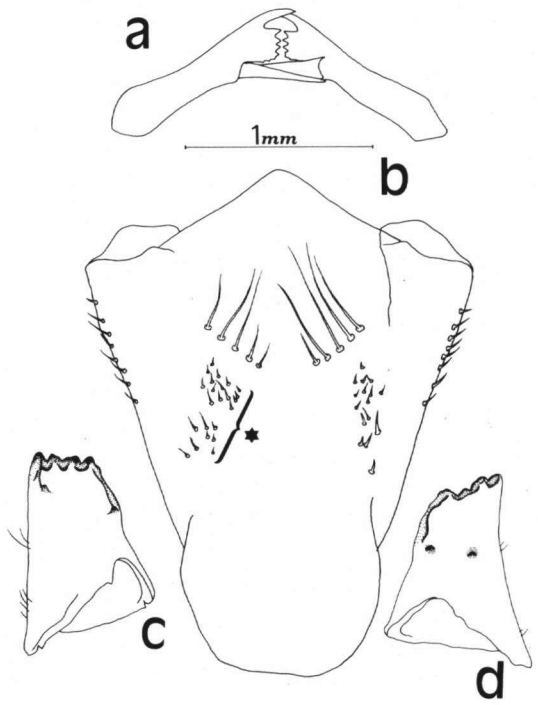

Fig. 2. *Ischnura fountainei:* (a) palpi; – (b) prementum; – (c) left mandible; – (d) right mandible. [* premental subsidiary setae].

Unknown in the F-2 instar.

Abdomen conical in shape, lateral keel of S2 - S9 not very prominent, but with a row of spiniform setae stronger than those of the remaining surface. No lines of setae along the distal ventral margins of the abdominal segments (Fig 4b). Lamellae relatively broad, the maximum width occurring at the distal ½ - ⅔, more or less pointed but without apical

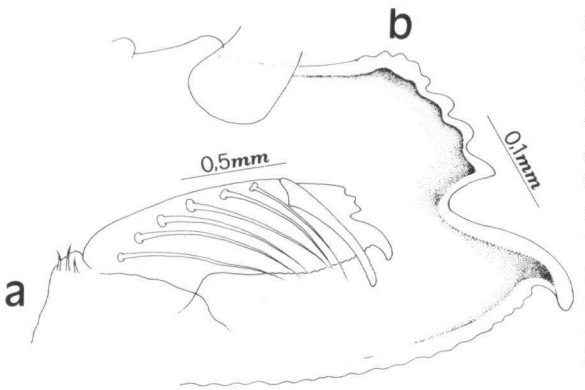

Fig. 3. *Ischnura fountainei:* (a) palpus; – (b) distal margin of palpus.

attenuation. Typical alternation of dark and light tracts on the tracheae, but less marked than in *I. elegans*. Nodal line not evident in all specimens, proximal part of the lamellae with marginal rows of spiniform setae disposed as usual in *Ischnura*, distal part of the lamellae with very few hair-like setae (Fig 5a-b).

Measurements as in Table I. Our specimens differ in some characters from DUMONT's (1991) figures. They show dark marks on the body, medio-caudal lamella attenuate, different teeth on the mandibles and no subsidiary setae on the prementum. Except for this last character, which is considered below, all remaining differences may refer to intraspecific variations usual in the Coenagrionidae larvae.

Table I

Measurements (mm) of *Ischnura fountainei* larvae. – [n: number of measured specimens; – S.E.: standard error; – "total": sum of left and right setae]

Features measured	Instar F					Instar F-1					Instar F-2
	n	min.	max.	mean	S.E.	n	min.	max.	mean	S.E.	
Head width	5	2.72	3.60	3.28	0.30	5	2.84	3.00	2.90	0.05	2.52
antenna length	6	1.88	2.20	1.99	0.12	3	1.60	1.76	1.68	0.07	
distance between insertions	8	1.14	1.28	1.19	0.05	5	1.00	1.08	1.03	0.04	0.90
antenna length/insertion ratio	6	1.57	1.72	1.65	0.05	3	1.56	1.76	1.64	0.09	
prementum length	9	1.84	2.48	2.26	0.19	4	1.76	1.92	1.85	0.06	1.52
prementum width	9	1.74	2.20	1.90	0.13	4	1.60	1.64	1.62	0.02	1.40
total prem. subsidiary setae	8	37	70	48	12	3	23	43	35	8	
metatibia length	9	2.60	3.04	2.79	0.12	5	2.36	2.56	2.47	0.08	2.00
wing sheaths length	9	3.68	4.00	3.82	0.10	3	1.88	2.60	2.23	0.29	
S10 length	5	0.63	0.76	0.69	0.05	2	0.40	0.44	0.42	0.02	
lateral lamella length	2	4.56	4.69	4.63	0.06	2	3.80	4.00	3.90	0.10	
medial lamella length	4	4.00	4.56	4.31	0.23	2	3.12	3.32	3.22	0.10	
lateral lamella width	2	0.88	1.44	1.16	0.28	2	1.08	1.16	1.12	0.04	
medial lamella width	1	1.64	1.64			2	1.20	1.20	1.20	.00	
medial lamella/S10 length ratio	4	6.00	7.00	6.63	0.41	2	7.00	8.30	7.65	0.65	

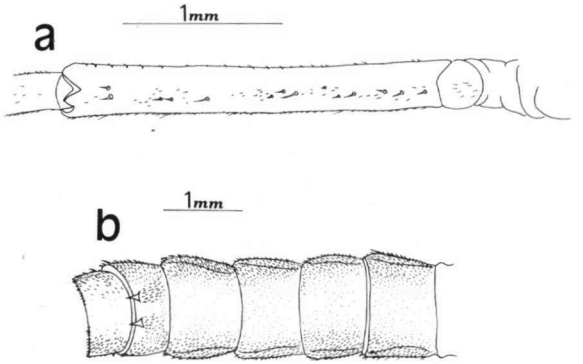

Fig. 4. *Ischnura fountainei:* (a) femur; – (b) abdomen in ventral view.

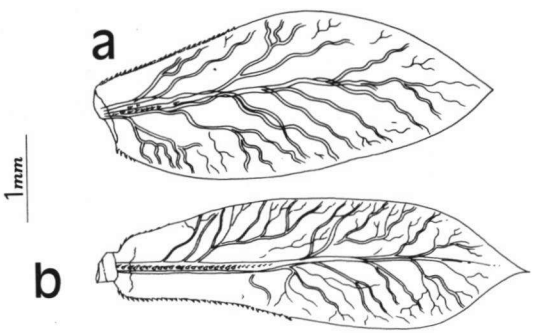

Fig. 5. *Ischnura fountainei:* (a) medial caudal lamella; – (b) lateral caudal lamella.

COMPARISON WITH THE OTHER EUROPEAN *ISCHNURA* LARVAE

Even if, at this moment, we have in our collection several species of *Ischnura*, we lack specimens of *I. graellsii* and *I. saharensis*. For this reason we prefer to refrain from a complete comparison of all European *Ischnura* species. However, some comments are possible now. The most impressive differences between *fountainei* and the other European congeneric larvae seem to be the shape of the caudal lamellae and the subsidiary setae on the prementum.

The lamellae in this species are about 3 times as long as broad, while they are about 4 times as long as broad in *elegans* and *pumilio* (ASKEW, 1988) and the same or more in *graellsii* from the drawing in FERRERAS ROMERO's (1981) paper. In addition, the rows of stout spine-like setae of the lamellae seem rather shorter in *fountainei*, both on dorsal and on ventral margins, than in the other species.

The subsidiary setae on the internal surface of the prementum found in *fountainei* are similar to those described in *pumilio* (cf. POPOVA, 1953). In general, these setae do not appear in the drawings of the prementum published in papers and keys (cf. CONCI & NIELSEN, 1956; AGUESSE, 1968; FRANKE, 1979). It is true that these setae are very difficult to see, especially if the observations are not made on exuviae, therefore it is possible that this character was missed both by these authors and by DUMONT (1991). We did not notice similar setae in several specimens of *elegans* and *genei* from Italy, but they may be present in the other specimens, as shown in *elegans* from Britain in Gardner's key

(HAMMOND, 1977). Anyway, in this case the setae seem to be smaller than in *fountainei*.

The general shape of the body and its reduced length seem also useful to distinguish *fountainei* from the other species. In contrast, premental and palpal setae numbers show such high intraspecific variation that these characters seem quite useless.

NOTES ON HABITAT PREFERENCE AND LIFE CYCLE

The water in which our specimens were found showed a very high mineral content. In particular the conductivity was half the normal value of sea water, i.e. about 30 times the values observed in a little stream in central Italy (CARCHINI & ROTA, 1985). It is interesting that this species was found in Pantelleria Island on a crater lake affected by sulphureous springs, with very high temperature and high salt content (LOHMANN, 1989).This species, thus, occurring in the desert zone oases from North Africa to the Middle East (AGUESSE, 1968), appears to be adapted to water with a high salt content.

As above reported, we found well-grown larvae in mid May in southern Tunisia, therefore the adultseason may commence in late May. However, a sample taken at the Pantelleria crater lake in May 1991 by some Italian zoologists, did not contain any odonate larvae (even though several mayfly larvae were collected). This, and the massive presence of the adults in mid August (H. Lohmann, pers. comm.), suggests a delayed life-cycle in the Pantelleria population.

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