

REVUE SUISSE DE ZOOLOGIE 106 (4): 1025-1034; décembre 1999

**Redescription of *Electrogena galileae* (Demoulin, 1973)
(Ephemeroptera, Heptageniidae)**

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Redescription of *Electrogena galileae* (Demoulin, 1973) (Ephemeroptera, Heptageniidae). - Male imagines and larvae of *Electrogena galileae* (Demoulin, 1973), from Israel and Lebanon, are redescribed using the standard diagnostic characters, both quantitative and qualitative, recently proposed for the species of the genus *Electrogena*. Three new larval characters (one meristic and two multistate ones), useful for the taxonomy of *E. galileae*, are added to the former set. *E. galileae* proved to be distinctly separated from the other species described by the standard set.

Key-words: Ephemeroptera - Heptageniidae - *Electrogena galileae* - redescription - taxonomy - Lebanon - Israel.

INTRODUCTION

A lot of *Electrogena* species were described from Near and Middle East (BRAASCH 1978, 1980a, b, 1981, 1983a, b; KAZANCI 1986, 1987, 1990; KAZANCI & BRAASCH 1986) and many other entities belonging to this genus are possibly still unknown. As pointed out by SARTORI (1992), most of the species from those areas were only partially and summarily described. Therefore any attempt of identification is still very difficult. Recently several diagnostic characters for the separation of *Electrogena* species were proposed (BELFIORE 1994, 1995, 1996, 1997; BELFIORE & DESIO 1995; BELFIORE *et al.* 1997; MALZACHER 1996), which proved to be very **useful** for the identification and discrimination of most European species. Male imagines can be identified mainly by the markings on abdomen, some characteristics of genitalia (i.e. shape of penis lobes and titillators, denticulation of outer sclerites (MALZACHER 1996)), wing and body colouration. Diagnostic characters for female imagines are abdominal markings, wing colouration, shape of the subgenital plate and morphology of eggs. Many more characters are available for the identification of larvae: a set of sixteen diagnostic features, both quantitative and qualitative, was proposed by BELFIORE (1994). Redescriptions of species using these new taxonomic tools is a necessary step for checking the validity of *Electrogena* species and understanding the relationships among them. This would be particularly useful for those areas, like Near and Middle East where the diversification of the genus seems very high.

Manuscript accepted 15.06.1999

In this paper we begin the revision of the Middle Eastern species with a redescription of *Electrogena galileae*, formerly described by DEMOULIN (1973) and SARTORI (1992).

REDESCRIPTION

***Electrogena galileae* (Demoulin, 1973)**

Ecdyonurus golanicus Samocha, 1972, nomen nudum

Ecdyonurus galileae Demoulin, 1973

Ecdyonurus galileae: DIA 1983; MOUBAYED 1986; KOCH 1988

Electrogena galileae: SARTORI 1992

Material. ISRAEL (Museum of Zoology, Lausanne; Michel Sartori leg. et det.): Hula Valley, Nahal Dan, Tel Dan, 170 m. 8.V.1990, 1 male imago (reared) with nymphal skin, 3 larvae; Hula Valley, Nahal Dan, 180 m. 7.V.1990, 3 larvae; Hula Valley, Enot Layish (Tel Springs), 200m, 12.V.1990, 5 larvae. LEBANON (C. Belfiore Collection; A. Dia leg.): Aouali River, 710m, 4.VII.1980: 1 male imago; Nabaa Mourched, 800 m, 13.VI.1981, 2 male imagines; Santa Yahfoufah, 8.IV.1985, 1 male imago.

MALE IMAGO (in alcohol)

Body 9.5 mm; cerci: 23 mm. Eyes grey, ventral margin bordered with a dark grey band. Thoracic tergites and sternites light brown, pleurae pale yellowish. Fore legs light brown: femora with a wide dark band in the middle and a smaller one near the junction with the tibia; the last two segments of tarsi are lighter. Mid and hind legs yellowish with the same markings as fore legs; tarsi slightly darker. Wings uniformly tinged with yellowish brown; veins light brown, cross veins darker, bordered with brownish violet in the fore part of fore wing. First costal cross vein bold, coloured with violet brownish. Abdomen yellowish, with violet brown markings (Fig. 1), Cerci greyish brown, slightly darker at joints. Genitalia (Figs 2-3): styliger yellowish, hind margin with two flat and widely rounded projections. Gonopodes greyish, last segment lighter. Penis stem very short. Penis lobes asymmetrical, outer edge rounded, inner edge straight. 2-4 small denticles on outer sclerite, near basis of lobes.

LARVA (in alcohol)

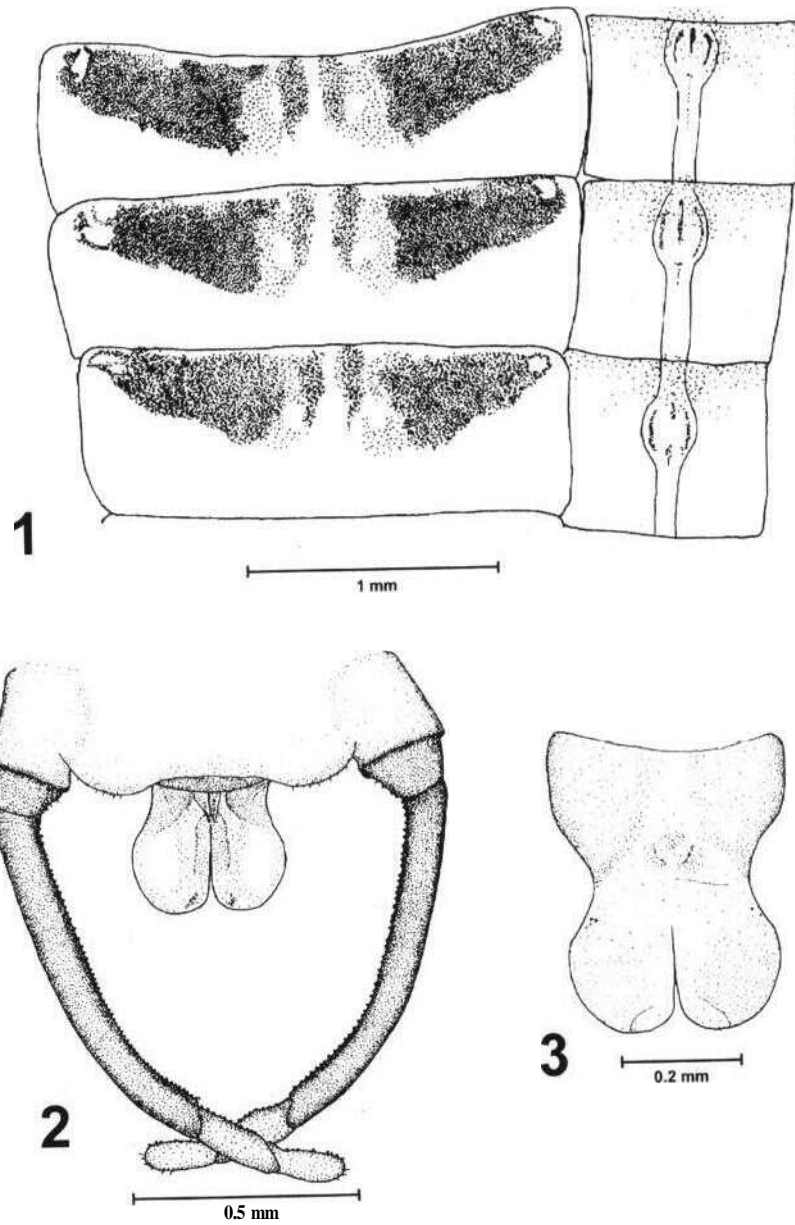
Body length (full-grown larvae): 8 mm (male); 8.5 mm (female). Cerci: 14-15 mm.

General aspect and colouration. Larvae of *E. galileae* are small with long and slender legs. General colouration is brown with lighter markings. Two light rounded spots are at sides of median line, near the fore margin of head (Fig. 4). Imaginal markings are visible also in half grown larvae.

Diagnostic characters (number of specimens examined=11). The set of larval diagnostic characters is fully explained and figured in BELFIORE (1996,1997).

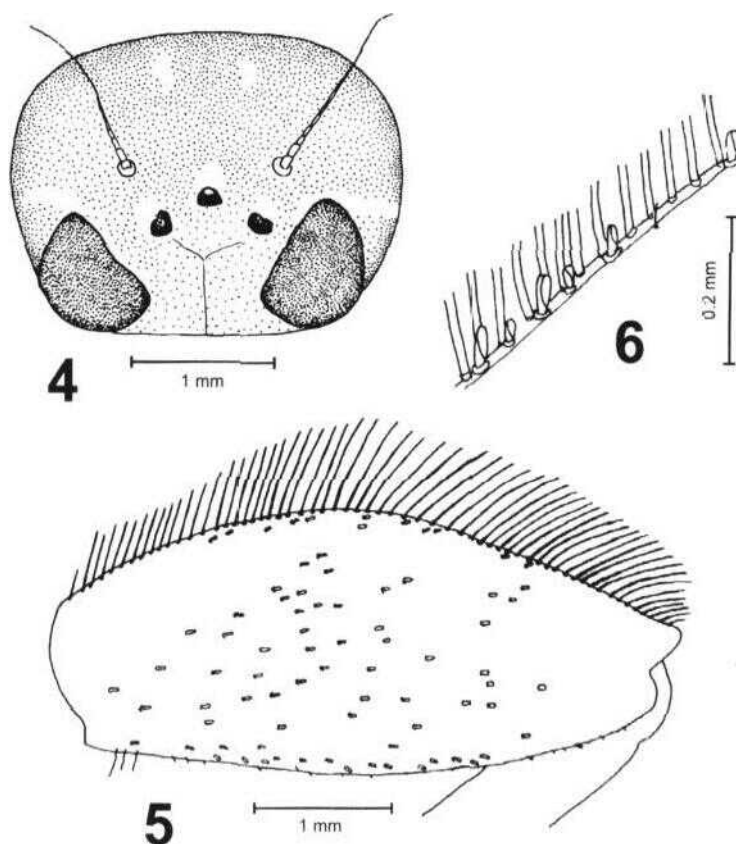
A. *Quantitative characters*

Mean, range and variance are reported, *E. galileae* is compared with the *Electrogena* species previously examined by the standard set of diagnostic characters:



FIGS 1-3

Electrogena galileae, male imago: III-V tergites and stemites (from a slide) (1); genitalia from ventral view (2); penis from dorsal view (3).



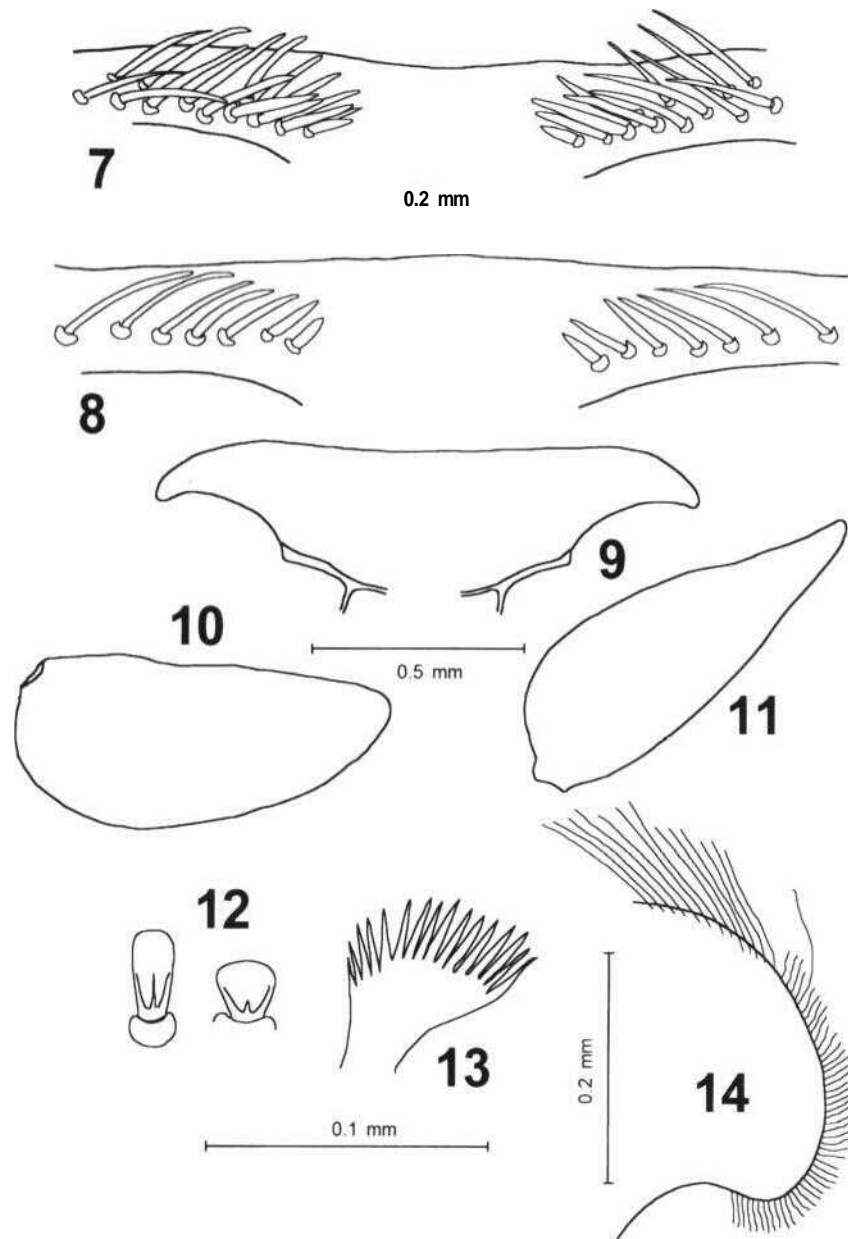
FIGS 4-6

Electrogena galileae, larva: head (4); fore femur from dorsal view (5); magnification of hind side of femur (long bristles are truncated).

E. calabra Belfiore, 1995; *E. fallax* (Hagen, 1864); *E. grandiae* (Belfiore, 1981); *E. gridellii* (Grandi, 1953); *E. hyblaea* Belfiore, 1994; *E. lateralis* (Curtis, 1834); *E. malickyi* (Braasch, 1953); *E. ujhelyii* (Sowa, 1981), *E. zebrata* (Hagen, 1864) (BELFIORE 1996) and *E. lunaris* Belfiore & Scillitani, 1997 (BELFIORE *et al.* 1997). Phenetic affinities between species are discussed by comparison of mean values and ranges.

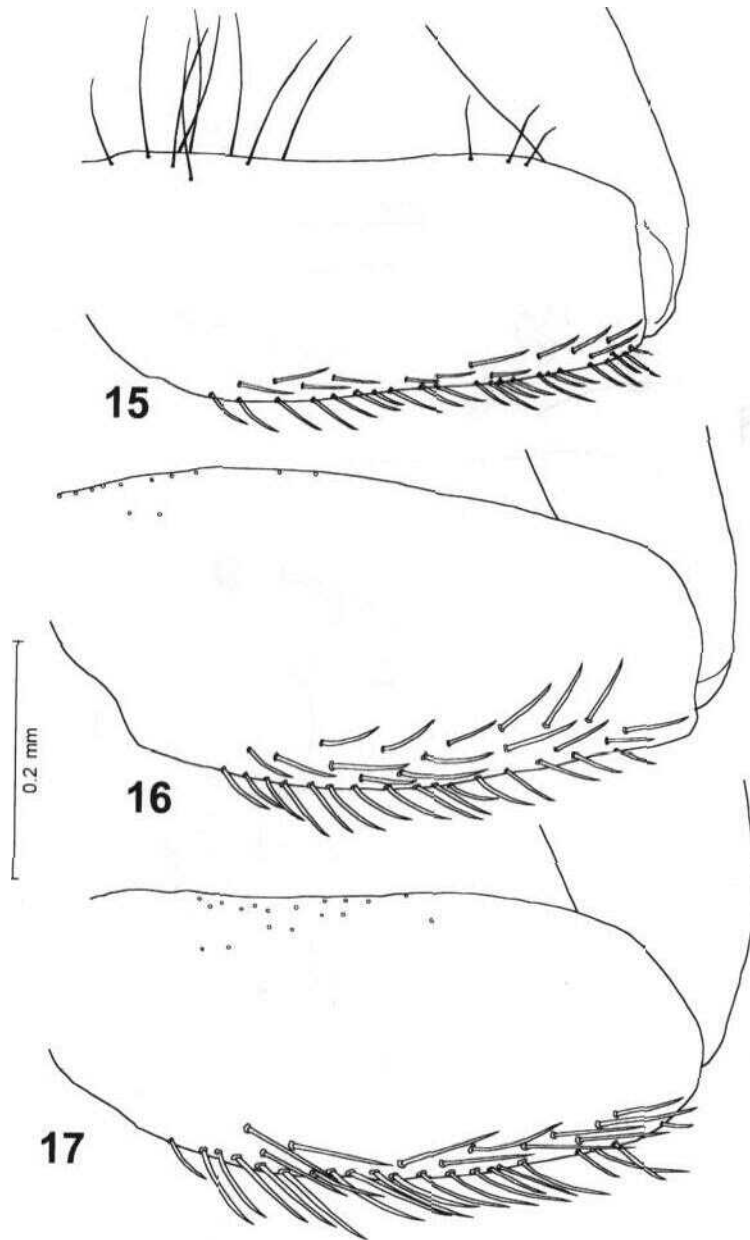
a) *Meristic characters*:

1. N_PLP : 11.09; 7-19; 10.9909. The number of hairs on fore side of first segment of maxillary palpus is moderately low. Hairs are often distributed in two groups, near basis and at apex of segment (Fig. 15). Closest species are *E. calabra* (mean: 9.97) and *E. zebrata* (12.52). Range overlaps with all other species.



FIGS 7-14

Electrogena galileae, larva: bristles on the ventral surface of labrum (7); labrum (9); 1st gill plate (10); 7th gill (11); bristles on upper surface of fore femur (12); 5th comb shaped bristle of galea-lacinia (13); apex of hypopharynx lobe (14). *E. ujhelyii*, larva: bristles on the ventral surface of labrum (8).



FIGS 15-17

First segment of maxillary palpus of larvae: *Electrogena galileae* (15); *E. zebrata* (16); *E. gridellii* (17). In (16) and (17) the long hairs on fore margin are not figured.

2. N_OUT: 0; 0; 0; 0. The only species with no hairs on outer margin of galea-lacinia and zero variance are *E. malickyi* and *E. zebrata*. Species with such hairs always present are *E. calabra*, *E. fallax*, *E. gridellii* and *E. ujhelyii*.
3. N_CBS: 19.77; 19-21.5; 0.7182. The number of comb-shaped bristles on the fore margin of galea-lacinia is moderately high. Closest species are *E. calabra* (19.12) and *E. ujhelyii* (20.38). Range is overlapping with all species.
4. N_TCB (Fig. 13): 14.55; 13-16; 0.7227. The number of teeth on the 5th comb-shaped bristle (fore margin of galea-lacinia) is the highest among species considered. The closest species is *E. malickyi* (13.98). Non-overlapping are *E. grandiae* (6.5-11.5) and *E. lunaris* (5-7).
5. N_CLW: 2.36; 2-4; 0.4545. The number of teeth on the tarsal claw is generally two, with the exception of only one specimen which has 3 to 5 (modal value=4). Closest species is *E. ujhelyii* (2.52), which share the same range and the unusually high variance. The only non-overlapping species are those with an invariant single tooth (*E. lateralis* and *E. lunaris*).
6. N_BVF: 22.45; 6-36; 90.8727. The number of bristles on the ventral side of femora, near the hind margin, shows an unusual wide range. However *E. galileae* can be considered belonging to the group with «many» such bristles (*E. ujhelyii* (27.90), *E. zebrata* (36.65), *E. fallax* (41.59)). The maximum number of bristles shared by all other species is 3. A very distinctive feature of *E. galileae* is the shape of these bristles (Fig. 6), blunt or rounded at apex (pointed in other species).

One more meristic character proved to be relevant to taxonomy of *E. galileae*. It can be added to the standard set:

7. N_HFF: Number of setae (long and tiny hairs) on the fore (ventral) margin of fore femur. Hairs counted are those at least 1.5 times long as bristles along the fore margin of femora. *E. galileae* has generally three long hairs near basis of the femora (Fig. 5). None of the other species share this character.

b) Ratio characters:

8. R_1GI (1st gill length/width): 2.116; 1.798-2.411; 0.0284. First gill is moderately short, intermediate between *E. lateralis* (2.137) and *E. zebrata* (1.992). Range is overlapping with all species. The shape of the first gill (Fig. 10) is relatively constant among individuals.
9. R_7GI (7th gill length/width): 2.613; 2.304-2.807; 0.0247. Seventh gill is moderately long (Fig. 11), intermediate between *E. grandiae* (2.627) and *E. malickyi* (2.423). It cannot be separated from other species by range.
10. R_LBR (total width of labrum/width of lateral projections): 4.157; 3.835-4.511; 0.0352. Labrum is very slender. R_LBR is the lowest among species considered. Closest species is *E. malickyi* (4.331). The only non-overlapping species is *E. lunaris* (4.786-6.744). The shape of labrum is very peculiar (Fig. 9): it recalls the shape of labrum in the *Ecdyonurus* species. The tips of lateral projections are often bent backwards.

11. R_GLA (outer distance/inner distance between glossae): 3.213; 2.958-3.778; 0.0710. Glossae are relatively close each other. Closest species are *E. lateralis* (3.174) and *E. hyblaea* (3.237). This character and the next one are the less discriminating among the *Electrogena* species.
12. R_GLB (outer distance between glossae/mean width of glossae): 2.812; 2.537-3.056; 0.0463. Glossae are moderately wide. Closest species are *E. fallax* (2.777) and *E. ujhelyii* (2.837).

B. Shape and multistate characters

13. S_HLB - the apex of lateral lobes of hypopharynx is covered with short hairs, about 1/4 long as hairs along the fore margin (Fig. 14). This character state is intermediate between species with very short hairs (1/8 of fore hairs: *E. lateralis*, *E. lunaris*, *E. ujhelyii*) and species with long hairs all around the apex (all other species).
14. S_PGL - paraglossae are narrow, somewhat pointed.
15. S_PNT - hind corners of pronotum are smoothly rounded.
16. S_BFE - distal bristles on upper surface of fore femora are short and rounded, with diverging sides (Fig. 12).
17. S_TAR - tarsi are darkened at apex only.
18. S_7GI - 7th gill is gradually narrowing at apex.

Two more characters are relevant to taxonomy of *E. galileae* and are to be added to the previous list. Even if they could be considered quantitatively, two discrete character states can be recorded throughout the species here considered. We provisionally treat them as multistate characters.

19. S_PLB: length of bristles on hind margin of the first segment of maxillary palpus. These bristles are very short in *E. galileae* (1/4 to 1/5 as width of segment) (Fig. 15). The other species have longer bristles (at least 1/3 as width of segment) (Fig. 17) with the exception of *E. zebrata* (about 1/4) (Fig. 16).
20. S_LBB: arrangement of paramedian bristles on ventral side of labrum, near the fore margin (a character used for the discrimination of *helveticus* and *venosus* group within the genus *Ecdyonurus* (BELFIORE & BUFFAGNI 1994). In *E. galileae* these bristles are arranged in two irregular rows (Fig. 7), unlike other *Electrogena* species, which share slender bristles arranged in a single row (Fig. 8).

DIAGNOSIS

E. galileae definitely appears phenetically far from the other considered species. It could be more usefully compared with other *Electrogena* species from the same area, when complete redescriptions of them will be available. At this moment the larval diagnosis is very easy because of some unique features: labrum with lateral projections often bent backwards; bristles on ventral surface of labrum (S_LBB) arranged in two rows; some long hairs at basis of fore margin of femora (N_HFF); apex of lobes of hypopharynx with hairs 1/4 as long as hairs along the fore margin of lobes (S_HLB).

Useful characters for identification are also the following: labrum very slender (R_LBR low); very short bristles on the hind side of the first segment of maxillary palpus (S_PLB), lack of hairs on outer margin of galea-lacinia (N_OUT), a very high number of teeth on the 5th comb-shaped bristle (N_TCB). Male imagines can be identified by markings of abdomen, colouration of wings, pigmentation of wing veins and shape of penis stem and penis lobes.

ACKNOWLEDGMENTS

We are indebted to Prof. A. Thomas (Toulouse) for the kind gift of specimens from Lebanon.

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