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Mayflies from Israel (Insecta, Ephemeroptera) II. - Caenidae

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Besides the common and widely distributed *Caenis macrura* STEPH., three new species are described. *Caenis gilbonensis* spec. nov. from the Golan is closely related to *C. macrura*. *C. antoniae* spec. nov. and *C. parabrevipes* spec. nov., both from the southern parts of the country, seem to be related to species from the Ethiopic region (*C. occulta* MALZ. and *C. brevipes* KIMM.).

Keywords: taxonomy, mayflies, new species, *Caenis*, Israel, Levant.

INTRODUCTION

For the historical aspect of the researches of the mayfly fauna of Israel and the Near East see SARTORI (1992).

The present paper is a further contribution to a work on Israel mayflies the first part of which is the above mentioned paper from SARTORI, dealing with the Hep- tageniidae, the Ephemerellidae, the Leptophlebiidae and the Palingeniidae, 11 species of which could be recorded for the region. The investigations base on the collections of M. SAMOCHA and the Institute of Life Sciences, Jerusalem.

The *Caenis* material of these collections, left to me by the arrangement of Dr. R. ORTAL, consists nearly completely of larvae. For getting the imaginal stages rear- ings of nymphs were done by Dr. R. ORTAL and Dr. M. SARTORI. I wish to thank both colleagues for their help.

Only one *Caenis* species was known from Israel: *Caenis macrura* STEPH. reported by SAMOCHA (1972). Another species he mentioned, *Caenis luctuosa* BURM. (sub. *C. moesta* BENGTS.), could not be found, neither in his collection nor in the other samples. Three new species have been included in the material and will be described here.

DESCRIPTION

Caenis macrura STEPHENS, 1835

STEPHENS, 1835; SAMOCHA, 1972; MALZACHER, 1986

Caenis macrura is widely distributed in the Western Palaearctic. For the Levant it was recorded by SAMOCHA (1972), PUTHZ (1973) and KOCH (1988). In Israel it's by far the most abundant *Caenis* species. From 630 samples more than 500 from all over the country contain *C. macrura*.

In the Mediterranean *C. macrura* has developed several subspecies or geo- graphical races, the characters of which are highly variable. In Israel, Lebanon and Syria there are also different forms that could be caused by endemism in the arid areas. Differences in size and in some morphological features can also be found

between the generations of winter/spring and of summer/autumn. In the summer generation size seems to be a function of habitat conditions such as food supply and the duration of water conducting in temporary waters.

For the diagnosis of *C. macrura*, see MALZACHER (1986, p. 15 ff.). Some diagnostic features of the larvae can be taken from the key below. Those features of the adults are the male genitalia (fig. 3e,f), the base of the antennal bristle (fig. 3d) and the shape of the scutellum (fig. 4c).

Caenis gilbonensis spec. nov.

Material

A lot of nymphs and larvae of different stages from Nahal Gilbon (6 samples) and Nahal Daliyyot (4 samples). Holotypus: 1 mature male nymph with well developed subimaginal genitalia (micro-slide), Nahal Gilbon 2; 30.III.86; IES 5035. Paratypes: about 50 nymphs and larvae from the same sample. Holotypus housed in the Zoological Museum of Tel-Aviv University as well as most of the paratypes. Other paratypes in the author's collection and in the Museum of Zoology, Lausanne.

Nymph

Body length of mature nymph: male: 3.3-3.7 mm; female: 4.5-5.5 mm.

Coloration of chitinous layers: rather evenly brown. Abdomen, legs and a diffuse area in front of the wingbases paler.

Epidermal pigmentation: head with two transverse bands separated by the pale frontal-suture. The band on the vertex is often interrupted in the middle; two branches surround the hind parts of the lateral ocelli. The frontal band extends forward between the antenna-bases and the frontal ocellus. Pronotum with extensive pigmentation and irregular pale areas on both sides. Mesonotum with lateral spots on the fore margin and the bases of the wing-sheathes.

Abdominal tergites 1 and 2 strongly, the others weakly browned. Second gills (gillcovers) speckled; in its basal parts the spots are merging.

Second segment of the labial palpus along the centre line about two and a half time as long as the third. Pronotum diverging to the front; lateral margins convex, regularly curved (fig. 1h). Transverse row of spines on the fore femur straight or irregular, spines more or less broad and truncate, finely frayed at the tip. A small number of similar spines on the surface of the middle and the hind femora. Claws with small teeth; a line of microteeth, apically following them at the hind claws, is more or less visible. Shieldshaped microtrichia on the wing-sheathes (as on great parts of the body surface) large, often overlapping each other. The veins and the spaces between them are studded with them (fig. 2b) (in the other species only the veins).

Process on the hind margin of the second abdominal tergite with a broad base, continuously widened to the middle, with a short triangular tip. Spines on the hind corners of the abdominal segments of medium size often bent inwards. Spines of the segment 3 and 4 (5) daggershaped (fig. 1a and b). Hind margin of the ninth sternite with an indentation of medium depth often shaped like a notch (fig. 1b and c). With a large shagreen field consisting of irregular rows of small teeth or tubercles.

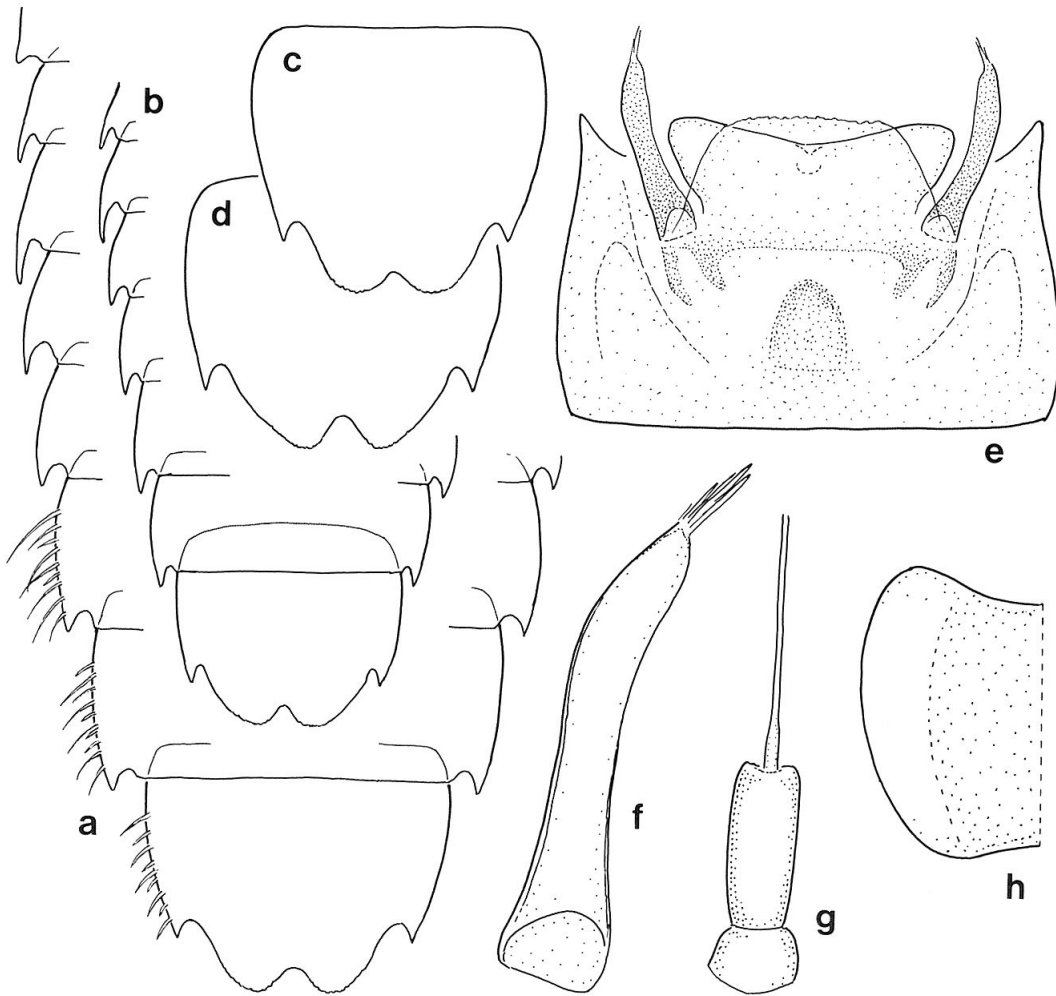


Fig. 1. *Caenis gilbonensis*, nymph. - a. outline of female abdomen; lateral bristles are shown on the segments 7-9; b. outline of male abdomen; - c, d. different shapes of 9th sternite of female nymphs; - e. subimaginal genitalia taken from a mature male nymph; - f. forceps from subimaginal genitalia; - g. base of subimaginal antenna from a mature male nymph; - h. side of pronotum.

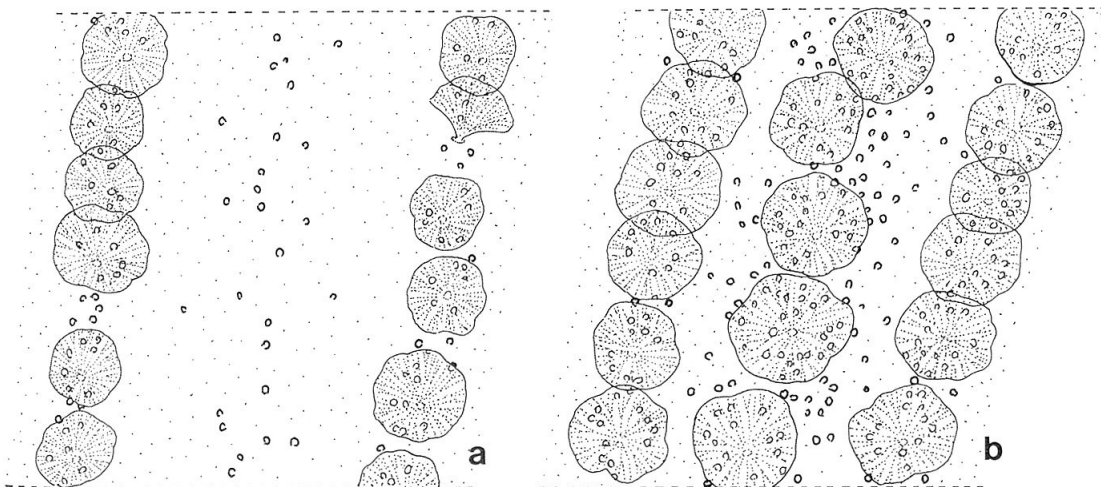


Fig. 2. Shield-shaped microtrichia from the surface of the nymphal wingsheath. - a. *Caenis macrura*; - b. *Caenis gilbonensis*.

Some subimaginal features can be seen in male nymphs immediately before emerging, such as the genitalia (fig. 1e) and the antenna whose bristle is not basally dilated (fig. 1g).

Caenis antoniae spec. nov.

Material

A great number of nymphs and larvae of different stages from over 100 samples from about 30 localities in the southern parts of the country especially from the Dead Sea and other desert areas. Some male and female imagines and subimagines from Nahal Arugot and Nahal David reared from the nymphs by R. ORTAL and M. SARTORI. A few males from Ein Nvrema from the coll. SAMOCHA.

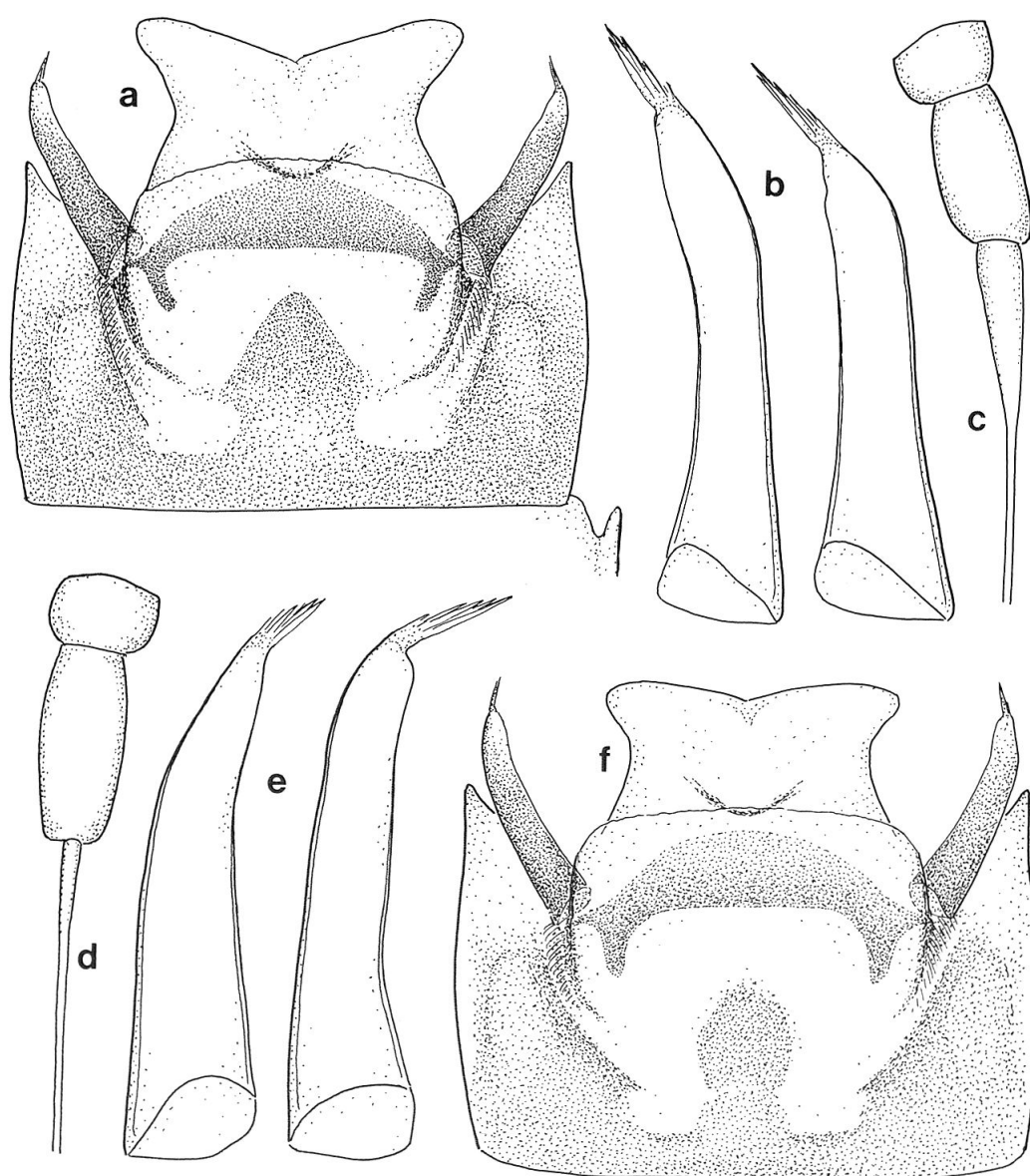


Fig. 3. a-c. *Caenis antoniae*; - d-f. *Caenis macrura*. - a,f. male genitalia; - b,e. forceps; - c,d. base of antenna.

Besides the records from Israel the species have been found in Wadi Musa (near Petra), Southwest Jordan. (larvae and nymphs; coll. KINZELBACH).

Holotypus: 1 male (micro-slide), Dead Sea Area, Nahal Arugot; 12.V.91 leg. SARTORI. Paratypes: 7 males, 21 females, 7 larvae and some nymphal skins from the same sample. Holotypus housed in the Museum of Zoology, Lausanne. Paratypes shared between the Zoological Museum of Tel-Aviv University, the Museum of Zoology in Lausanne and the author's collection.

Male

Body length: 2.3-2.8 mm; wing length: 2.4-2.6 mm; length of fore leg: 2.2-2.4 mm. Ratio of fore femur : fore tibia = 0.51-0.54 : 1; ratio of fore tibia : fore tarsus = 1.40-1.57 : 1; ratio of fore leg : hind leg - 1.79 - 1.86 : 1; ratio of first segment of the fore tarsus : 2nd : 3rd : 4th : 5th = 1 : 2.6-3.5 : 1.7-2.4 : 2.1-2.8 : 1.8-2.2; the segments 1+2 about as long as the segments 3+4, sometimes a little bit longer but not as long as the segments 3-5.

Coloration of chitinous layers: the thorax, parts of the legs, of the mouth parts rudiments, the 10th tergite, the sclerites of the genitalia and the forceps intensively brown. Antenna base and sternites weakly yellowish-brown.

Epidermal pigmentation: Dorsal and frontal parts of the head, lateral and frontal parts of the pronotum, the praecalariae, the tergites of the abdomen and the frontal veins of the wings with blackish-brown pigmentation; fore tibiae, tarsi and caudal filaments greyish, the latter basally with dark rings.

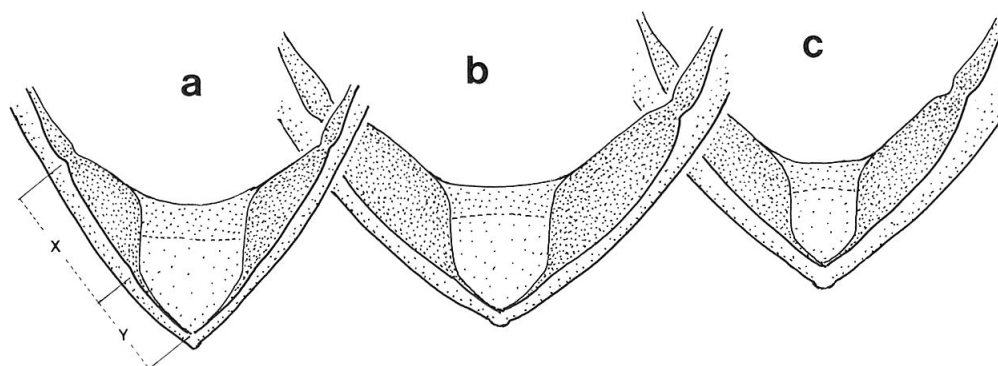


Fig. 4. Scutellum of the mesothorax. - a. *Caenis antoniae* - b. *Caenis luctuosa* from Central Europe, - c. *Caenis macrura*.

Base of antennal bristle strongly dilated; dilated part as long as the pedicellus (fig. 3c). Sclerotized triangle of the prosternum pointed, a little elongated, with concave sides. Scutellum of the mesothorax elongated backwards, its sides forming an angle of 80-90°; the segment X of its lateral sclerites is less than two times as long as the segment Y (fig. 4a). Lateral filaments of the abdominal segments of middle length.

Genitalia like in fig. 3a; penis lobes a little elongated; central sclerite triangular; forceps like in fig. 3b, with an apically tuft of strong spines, basally stuck together.

Female

Body length: 3.5-4.5 mm; wing length: 2.9-3.2 mm.

The coloration of the females is like in the males. A character to distinguish them from females of other species is the shape of the scutellum sclerites (like in fig. 4a).

Larva

Body length of mature nymph: male: 2.3-3.8 mm; female: 3.0-5.5 mm

Like in *C. macrura* the great difference in the body length results from the fact that there are two generations per year the summer/autumn one has got distinctly smaller specimens than the winter/spring generation. Each generation for its own shows a variability in the size of specimens because of different food and water conditions.

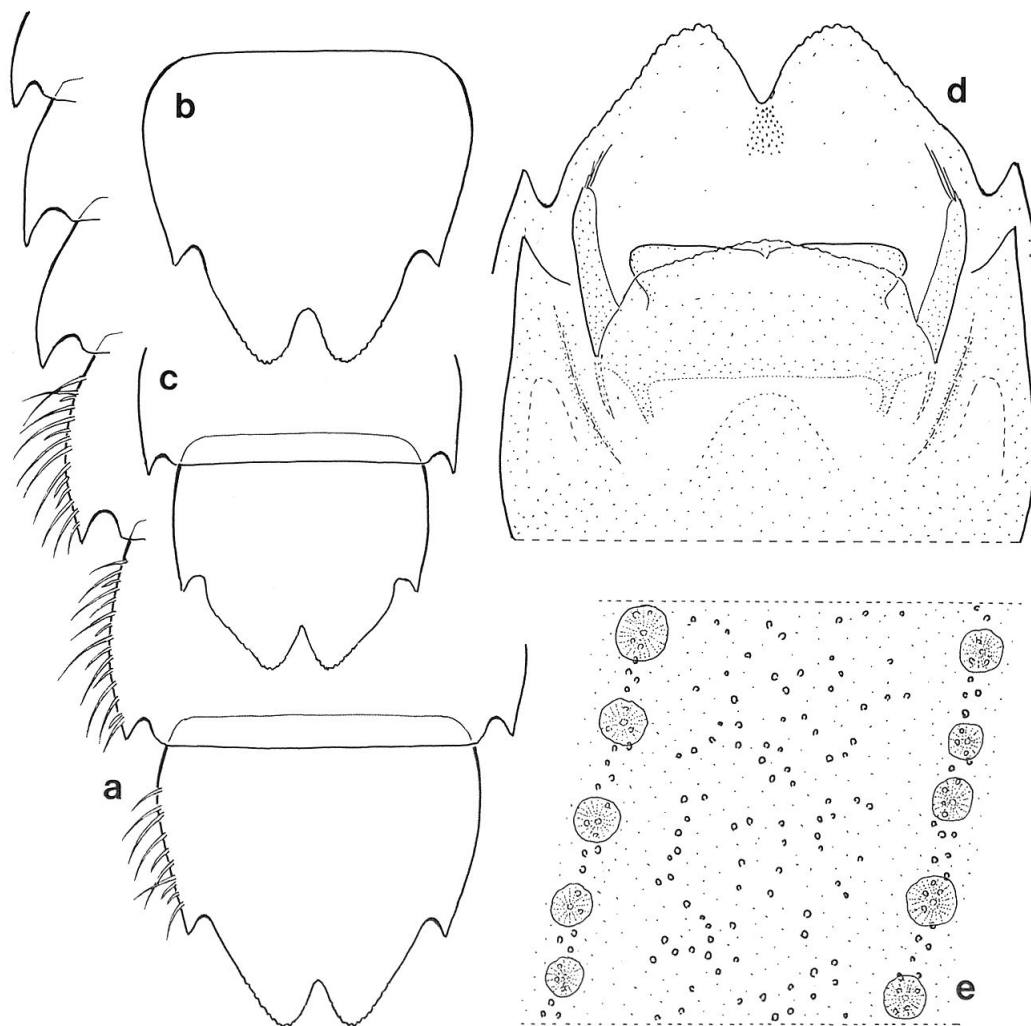


Fig. 5. *Caenis antoniae*; nymph. - a. outline of female abdomen; lateral bristles are shown on the segments 7-9; - b. 9th sternite of another female nymph; - c. 9th sternite of a male nymph; - d. part of the 9th sternite of a mature male nymph with shagreen-field and subimaginal genitalia; - e. shieldshaped microtrichia from the surface of the nymphal wingsheath.

Coloration of the chitinous layers: yellowish brown. Two pairs of longitudinal pale spots on the mesothorax between the wingsheathes (insertion of muscles) are more or less visible.

Epidermal pigmentation: The intensity of the pigmentation is very variable. Transverse bands on the head are fused together. The vertex between the lateral ocelli often with a reticular pattern. A small paramedian spot on the mesothorax between the spots on the fore corners and on the wing bases. Apart from that the pigmentation of head and thorax is like in *C. gilbonensis*. Tergites of the abdomen strongly pigmented.

Second segment of the labial palpus along the centre line about two and a half to nearly three times as long as the third. Sides of the pronotum diverging forwardly; in the middle part straight or only slowly convex. Transverse row of more or less short, broad and truncate spines on the fore femora which are apically long and finely frayed. The row is straight and close, often more or less irregular. Similar spines of different length on the middle and hind femora. Base of the claws with small or very small teeth (often nearly invisible). Shieldshaped microtrichia on the wingsheathes (as on great parts of the body surface) small. The gaps in the rows are often as large as the diameters of the microtrichia. Between the rows there are broad spaces without any microtrichia (fig. 5e). Process on the second tergite abruptly projecting from the base which is not continuously widened to the middle. Spines on the hind corners of the abdominal segments (especially the middle ones) large, with a broad base. Sides of all segments with large and very large bristles (fig. 5a). Indentation at the ninth sternite deep and often notchshaped (fig. 5a-c). With a small triangular shagreen field with continuously distributed teeth or tubercles (fig. 5d).

Subimaginal features as to be seen in mature male nymphs: genitalia as in fig. 5d. Base of antennal bristle dilated.

Caenis parabrevipes spec. nov.

Material

About 100 nymphs and larvae of different stages from the lower Jordan river near Allenby bridge and Abdalla bridge and from Nahal Zippori. Holotypus: 1 mature male nymph with well developed subimaginal genitalia (micro-slide). Lower Jordan river, st. 9; 13.V.79; IES 1484. Paratypes: about 45 nymphs and larvae from the same sample. Holotypus housed in the Zoological Museum of Tel-Aviv University as well as most of the paratypes. Other paratypes in the author's collection and in the Museum of Zoology, Lausanne.

Nymph

Body length of mature nymph: male: 3.2-3.4 mm; female: 3.7-4.0 mm.

Coloration of chitinous layers light brownish.

Epidermal pigmentation cannot be observed. Maybe it's faded away because of the long time of preservation (since 1976 to 1979).

Second segment of the labial palpus along the centre line about two times as long as the third. The third segment is a little bit longer than in the other species described here. Lateral margins of the pronotum straight and parallel. Transverse row of spines on the fore femur more or less straight. Spines short broad and truncate, apically finely frayed. A small number of similar spines can be found on the other femora, some of them are longer but never pointed. Hind margin of the femora,

besides spines of middle length, with 3-6 ones that are very long ($1/4 - 1/3$ of the femur length). Surface structure consisting of small and short pickles the bases of which are joint by a network of raised lines. (Great parts of the upper body surface show this pattern). Base of the claws strongly dentated. Hindclaws with a subapical row of microteeth.

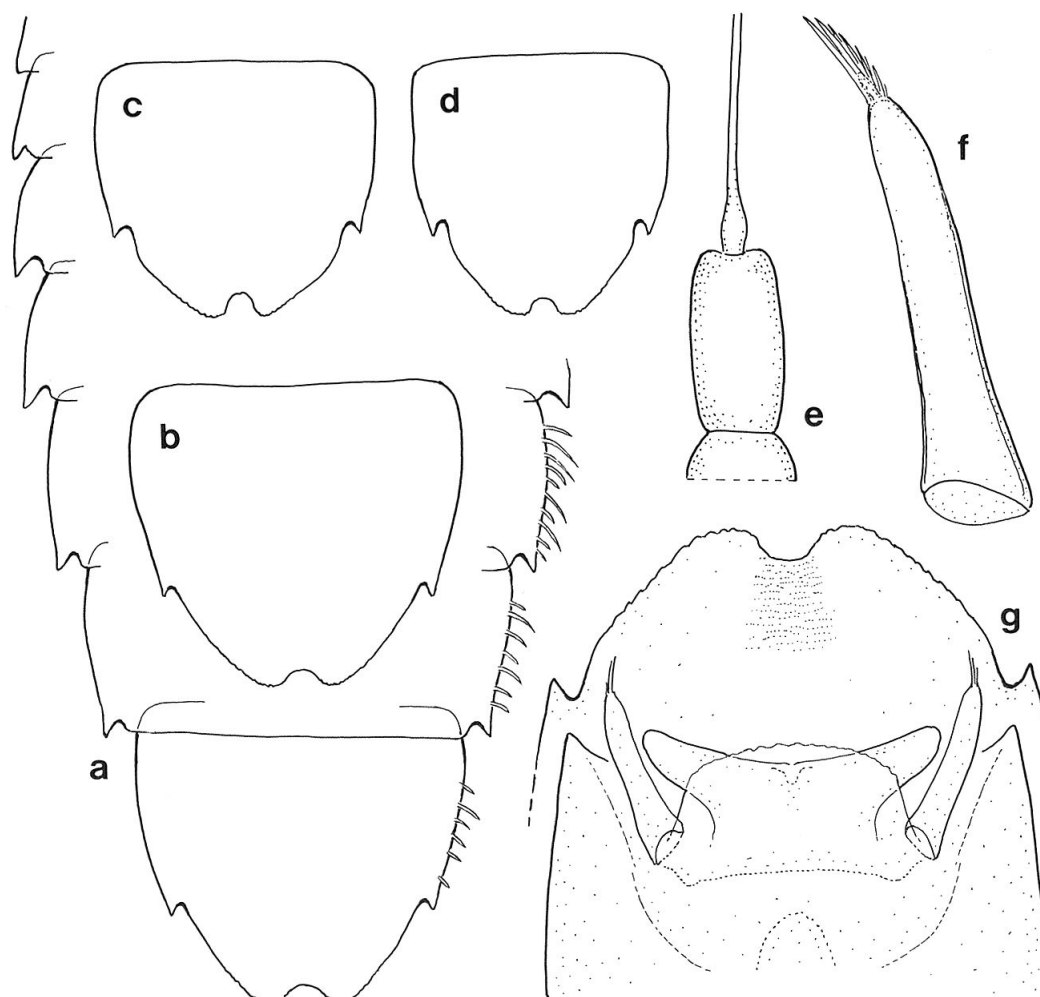


Fig. 6. *Caenis parabrevipes*; nymph. - a. outline of female abdomen; lateral bristles are shown on the segments 7-9; b. 9th sternite of another female nymph; - c, d. 9th sternites of male nymphs; - e. base of subimaginal antenna from a mature male nymph with shagreen-field and subimaginal genitalia. - f. forceps from subimaginal genitalia. - g. part of the 9th sternite of a mature male nymph with shagreen—field and subimaginal genitalia.

Abdominal segments with small spines on the hindcorners the tips of which are often slowly bent outwards (fig. 6a). Lateral margins of segments 9 and 8 each with 5-7 short and truncate bristles (fig. 6a). Indentation at the ninth sternite small and as a rule shallow, sometimes semicircular (fig. 6 a-d). With a large shagreen field consisting of rows of small teeth or tubercles (fig. 6g).

Subimaginal features as to be seen in mature male nymphs: genitalia as in fig. 6g, with long, laterally protruding penis-lobes. Antennal bristle a little dilated at the base (fig. 6e).

KEY TO THE LARVAE

(Besides the above mentioned species another one is taken into account here that may be found in Israel: *Caenis robusta*)

- 1.- Hind margin of the 9th sternite rounded. Fore femur without a transverse row of spines. Fore corners of the pronotum angular. Microtrichia on the underside of the second gills forming a band of transverse rows consisting of 5-8 scales *Caenis robusta*
- Hind margin of the 9th sternite with an indentation of varying depth. Fore femur with a transverse row of spines. Fore corners of the pronotum rounded. Microtrichia on the underside of the second gills forming a simple row 2
- 2.- Abdominal segments with small spines on the hindcorners (fig. 6a). Lateral margins of segments 9 and 8 each with 5-7 short and truncate bristles (fig. 6a). 9th sternite like in fig. 6a-d. Indentation small and shallow, sometimes semicircular *Caenis parabrevipes*
- Spines on the hind corners of the abdominal segments longer. 9th segment of different shape (figs. 1a-c and 5a-d). Bristles on the segments 9 and 8 longer and more numerous (figs 1a and 5a) 3
- 3.- Shieldshaped microtrichia¹ on the wingsheathes small (fig. 5e). Indentation at the 9th sternite deep and more or less notchshaped (fig. 5a-c). In male nymphs (last stage of the larval development) the base of the antennal bristle is dilated (fig. 3c). *Caenis antoniae*
- Shieldshaped microtrichia on the wingsheathes larger (like in figs 2a and b). Base of the antennal bristle of male nymphs not dilated (figs 1g and 3d) 4
- 4.- Spines on the hind cornes of the segments 3 and 4 (5) daggershaped (fig. 1a, b). Indentation at the 9th sternite of medium depth (fig. 1a-c). Shieldshaped microtrichia very large, often overlapping each other. They are to be found also in the spaces between the veins of the wingsheathes (fig. 2b). 2nd gills speckled *Caenis gilbonensis*
- Spines on the hind corner of the segments 3 and 4 short, not daggershaped. Indentation at the 9th sternite deeper and basally rounded. Shieldshaped microtrichia like in fig. 2a, not in the spaces between the veins *Caenis macrura*

RELATIONSHIP AND DISTRIBUTION

All here described species are closely related. They belong to the *C. macrura* species-complex that is characterized by forceps with apically tufts of spines in combination with well developed, laterally more or less protruding penis-lobes and prolonged fore legs in the males and an indentation at the 9th sternite in the larvae.

There is a distribution center of *C. macrura* in the Eastern Mediterranean and it seems that the Israelian populations are situated on its southeastern border. The same goes for *C. robusta* ETN (that is not a member of the *macrura* complex). *C. gilbonensis* may have branched off recently from *C. macrura*.

¹ This structures are very soft and often hardly to be seen. Sometimes they are rubbed off or covered with mud-particles. For making them visible take the wingsheathes off from the larva for separate examination (if possible under PHACO).

C. parabrevipes and *C. antoniae* on the other hand seem to be northeastern outposts of Ethiopian species-groups. *C. parabrevipes* shows characters of the *C. brevipes*-group, very abundant and widely distributed in Africa, such as long protruding penis-lobes, very short apophyses at the styliger-sclerite and base of the antennal bristle only slightly dilated.

C. antoniae is very similar to species of the *C. scotti*-group, especially *C. scotti* (ULM.) and *C. occulta* MALZ. The main distribution of this group is East and South-east Africa. Its diagnostic features are long apophyses at the styliger-sclerite, a strongly dilated base of the antennal bristle and in the larvae small shieldshaped microtrichia (observed in *C. occulta*; see MALZACHER, 1990). There are also similarities between *C. antoniae* and the West Palaearctic *C. luctuosa* (BURM.) that show a strongly dilated antennal bristle, too, but it differs by the shape of the scutellar-sclerites (fig. 4b) and the lacking of shieldshaped microtrichia.

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