Hi Wolfe!
Michel.

Mayflies (Insecta, Ephemeroptera) of Saudi Arabia

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Abstract: Four species of Ephemeroptera are recorded for the first time from Saudi Arabia. The nymph of *Caenis corana* n. sp. is described and compared with its closest relatives. Some zoogeographical and ecological data are also given.

Keywords: Ephemeroptera, Caenidae, Baetidae, Leptophlebiidae, Saudi Arabia, taxonomy, zoogeography.

ذبـاب النُوار (الحشرات : Ephemeroptera) فى المملكة العربية السعودية

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خلاصة : يورد البحث ٤ تسجيلات من ذباب النُوار لأول مرة من المملكة العربية السعودية . كذلك وصف الباحث حورية النوع الجديد *Caenis corana* و قارنها بالأنواع القريبة الصلة بها . تم أيضاً إعطاء معلومات حول البيئة و التوزيع الجغرافى الحيوانى لهذه المجموعة .

INTRODUCTION

The mayflies of the Arabian peninsula are so poorly known that this area can be regarded as a "terra incognita" for these insects. For this reason, the collections made by Prof. W. Büttiker between 1980 and 1984 are of great interest. Because of the low density of the permanent hydrographic system, as well as the lack of most diversified freshwater biota, the Ephemeroptera of Saudi Arabia are not very numerous. At the present time, the identified taxa belong to three families and represent five genera. In this first contribution, four species are recorded, one of which is new to science.

LIST OF SPECIES

Baetidae

Baetis balcanicus Müller-Liebenau & Soldán, 1981

Baetis balcanicus Müller-Liebenau & Soldán, 1981. - Spixiana *4*: 291.

Material: Wadi Buwah, 1340 m, 20°47′N 41°12′E, 4 larvae (L), 15.IX.1980; Wadi Turabah, 1310 m, 20°35′N 41°18′E, 1 L, 20.IV.1980.

Described from Bulgaria and Greece. Since then, found only once in Turkey (unpubl. results, N. Kazanci leg.).

Centroptilum dimorphicum Soldán & Thomas, 1985

Centroptilum dimorphicum Soldán & Thomas, 1985. - Acta entomol. bohemoslov. *82*: 180.

Material: Wadi Buwah, 1340 m, 1 L, 15.IX.1980; Wadi Minsah, 550 m, 20°31'N 40°40'E, 1 L, 7.-8.IV.1983.

Recently described from Algeria; also found in Morocco (BADRI 1985) and in Tunisia (BOUMAIZA & THOMAS in press). The generic assignement of this species is still uncertain.

Cloeon sp.

So far, the specimens available, from Wadi Minsah, W. Ghat, W. Marum, Durma, Baharah, Jeddah and Riyadt, cannot be assigned with certainty to a species.

Leptophlebiidae

Choroterpes (Euthraulus) sp.

The lack of male adults, from Wadi Asidah, W. Turabah, W. Shukub and W. Hanaq, does not permit a specific identification.

Caenidae

Caenis luctuosa (Burmeister, 1839)

Oxycypha luctuosa Burmeister, 1839. - Handb. Ent. II: 797.

Caenis moesta Bengtsson, 1917. - Ent. Tidskr. *38*: 182.

Caenis felsinea Grandi, 1951. - Bol. Ist. Ent. Univ. Bologna *18*: 120.

Caenis luctuosa. - Jacob, 1974; Reichenbachia, Mus. Tierk. Dresden *15*: 94.

Material: Rahifa, 2320 m, 18°01'N 42°46'E, 5 L, 7.IX.1984; Wadi Buwah, 1340 m, 2 L, 6.IV.1980; Wadi Aziza, 2410 m, 18°13'N 42°28'E, 3 L, 1 ♂, 17.-18.IX.1983; Abalah, 2390 m, 18°55'N 42°10'E, 2 L, 6.X.1980.

Eurytopic species, markedly tolerent of water conductivity (BOUMAIZA & THOMAS 1986), and widely distributed, especially in Western Europe and North Africa (MALZACHER 1984, 1986).

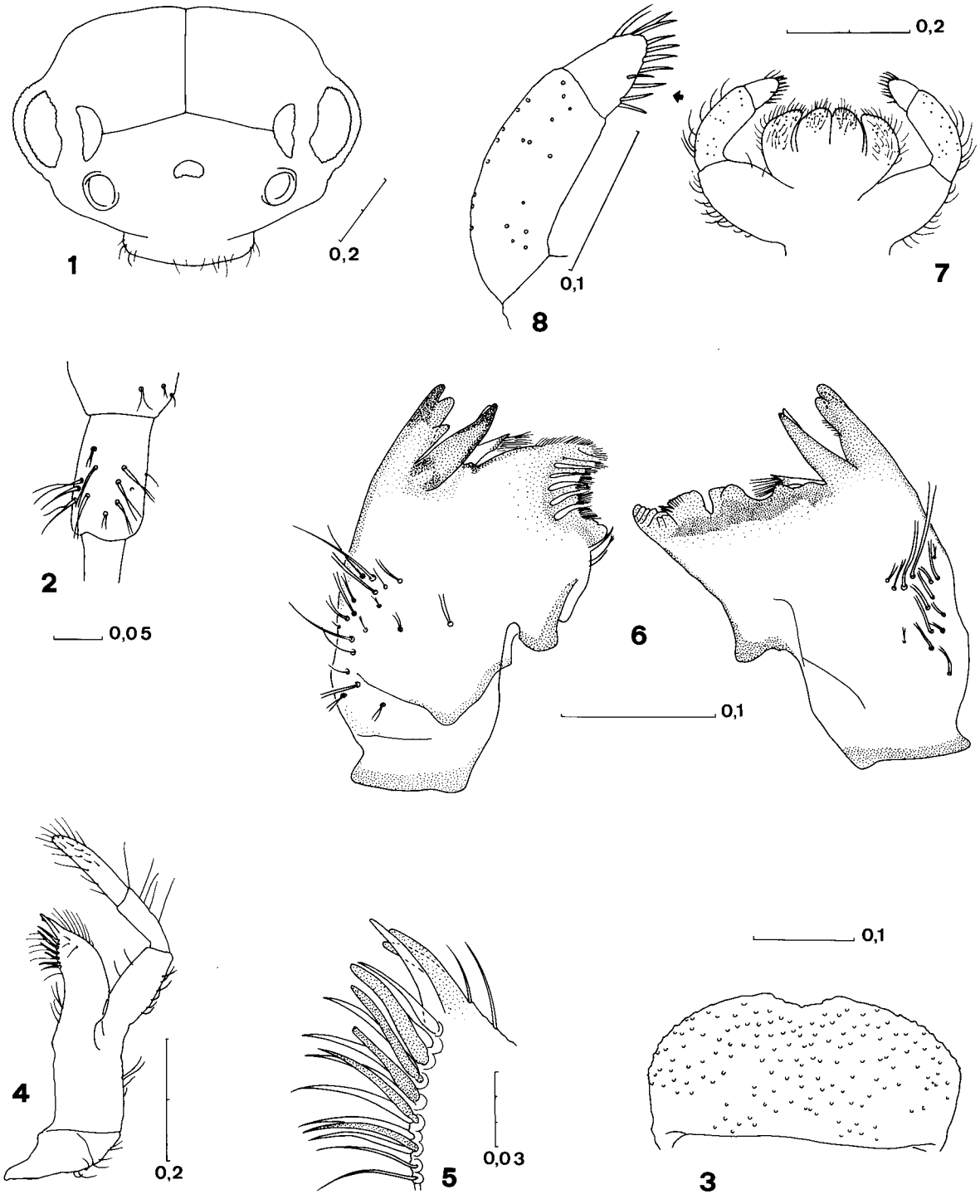
Caenis corana n. sp.

Material: Holotype: 1 L, Saudi Arabia, Makkah, Wadi Marwan, 180 m, 22°10'N 40°00'E, 4.II.1983, leg. W. Büttiker. - Paratypes: 3 L, same data as the holotype; Wadi Minsah, 550 m, 5 L, 7.-8.IV.1983; Wadi Hanaq (Camp 2), 100 m, 22°44'N 39°15'E, 7 L, 19.-20.I.1984.

Holotype and paratypes deposited in the Naturhistorisches Museum Basel, except two paratypes in the senior author's collection, and three paratypes in the Musée zoologique de Lausanne.

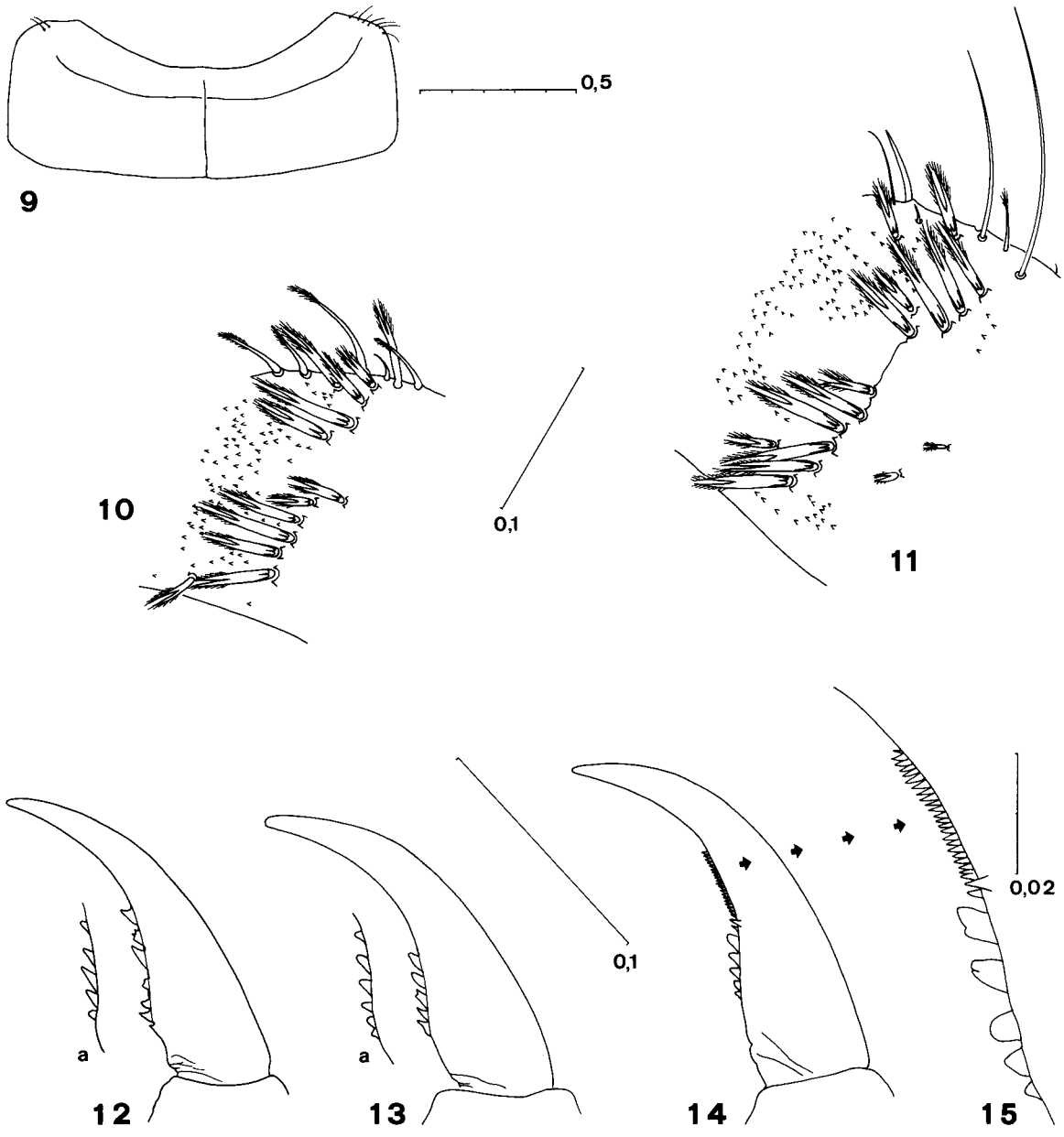
Diagnosis: Body-size very small, general colouration showing few contrasts, middle part brown to dark brown, subgenital plate deeply incised, row of strong distal bristles on the dorsal surface of fore femora.

Description: Head: Intraocellar pigmented spot, with a lighter transverse area, situated between the median ocellus and extreme hind-margin of lateral ocelli. Outline of genae (fig. 1) slightly protruding. Antennae (fig. 2): pedicel with mostly deeply forked bristles. Labrum (fig. 3) moderately emarginate and covered with numerous single setae. Third segment of the maxillary palpus (fig. 4) markedly longer than the second one. Inner apical margin of the lacinia (fig. 5) with three anterior stout teeth and about 15 strong bristles becoming progressively thinner (fig. 5). Mandibles (fig. 6) on the dorsal surface with lateral tufts of bristles mostly forked from the base. Incisors, prosthecae and molar surfaces similar to those of *C. luctuosa.* Labium (fig. 7) very similar to *C. luctuosa,* especially the palps. Segment 2 of labial palpus (fig. 8) about 2.5 times as long as segment 3.



Figs 1–8: *Caenis corana* n.sp., last instar larva, head and mouth-parts. Scale in mm. 1, head (♀) in front view; 2, pedicel; 3, labrum; 4, maxilla; 5, lacinia; 6, mandibles; 7, labium; 8, segments 2 & 3 of the labial palpus.

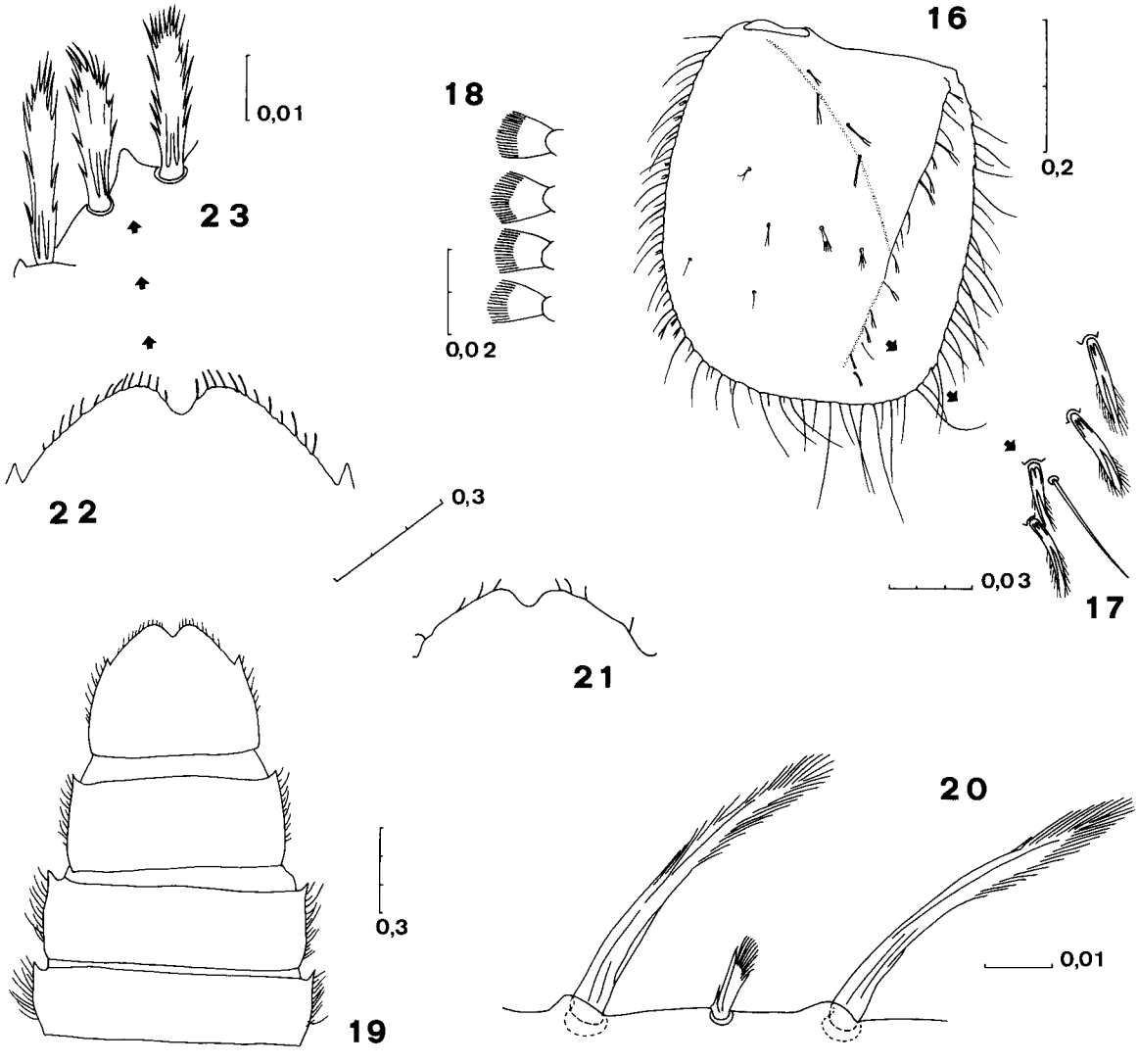
Thorax: Pronotum (fig. 9) with lateral spots, oval and light in colour. Lateral outline almost straight and parallel, with rounded angles as in *C. pusilla.* Fore femora (figs 10, 11) on dorsal surface with a transverse row of large, forked, feathery bristles, similar to those of *C. luctuosa.* Tarsal claws (figs 12, 13) rather strong and moderately hooked, with 5–7 well-separated teeth on the proximal part, as in *C. pusilla.* Moreover, claws on the hind legs (figs 14, 15) with one row of very close-set and numerous microteeth (more than 20). This feature can also be observed in *C. luctuosa.*



Figs 9–15: *Caenis corana* n. sp., last instar larva, thorax and legs. Scale in mm. 9, pronotum; 10–11, distal area of the fore femora of ♂ (10) and ♀ (11); 12–14, tarsal claws of the fore (12), middle (13)and hind (14) legs (a: 2nd larva); 15, teeth and microteeth on the hind claw.

Abdomen: Colour of terga I–X becoming progressively darker. Outline of the gill cover (gill II: fig. 16) with numerous single long bristles, mixed with short scaled and forked bristles on the external ridge. Base of the triangular ridge (fig. 17) with some identical forked bristles. On the ventral side of the gill cover, long broad microtrichiae in one row (fig. 18), at least as long as in *C. luctuosa.* The bristles are short on the lateral margins of the abdominal segments (fig. 19), reaching just to the hind-margin. Strong lateral bristles, long and apically feathered (fig. 20). Hind-margin of subgenital plate (figs 21, 22) deeply incised in the middle in both sexes. Marginal bristles (fig. 23) rather short and strongly feathered. Cerci with strong sexual dimorphism, thicker and darker in the male.

Size: Male larvae: body length up to 3.25 mm; cerci up to 2.25 mm. Female larvae: body length up to 4.25 mm; cerci up to 2.6 mm.



Figs 16–23: *Caenis corana* n. sp., last instar larva, abdomen. Scale in mm. 16, gill cover in dorsal view; 17, forked bristles on the triangular ridge; 18, microtrichiae on the inner surface; 19, abdominal segments VII–X in ventral view; 20, feathery bristles on the margin of segment X; 21–22, apex of the subgenital plate of ♂ (21) and ♀ (22); 23, feathery bristles on the edge of the subgenital plate.

Affinities: *Caenis corana* n. sp. is known only from the larval stages. It shows some morphological relationships to two species that are found in several countries of the Mediterranean area: *C. luctuosa* (Burmeister, 1839) and *C. pusilla* Navás, 1913. Tab. 1 lists the principal common or similar features of *C. corana* and the two other species. Apart from its intermediate position between *C. luctuosa* and *C. pusilla, C. corana* is characterized by the stout forked bristles on the base of the triangular ridge of the gill cover. This last feature has been used by several authors to separate the genus *Caenodes* Ulmer, 1924 (THEW 1960; DEMOULIN 1970, 1981; SOLDÁN 1978), but this appears very doubtful to us. Moreover, KLUGE (1985) has recently drawn attention to the lack of distinctive characters between these two genera, and also with *Caenomedea* Thew, 1960.

Tab. 1: Principal common or similar morphological characters of *C. corana* and its two closest relatives.

Morphological characters	*C. luctuosa*	*C. corana*	*C. pusilla*
Comparative length of labial palp segments 2 & 3	———		———
Lateral outline of the pronotum		———	———
Proximal teeth on the tarsal claws		———	———
Distal microteeth on the hind claws	———		———
Shape of the microtrichiae under the gill cover	———		———
Length of the microtrichiae insertion line	———		———
Hind-margin of the subgenital plate	———		———

Caenodes species are known from the Oriental and especially the Afrotropical regions. Several species have been described from East Africa, but they are known almost exclusively from the adult stages (see review and references in DEMOULIN 1970). In Africa, the *Caenis-Caenodes-Caenomedea* complex includes about 14 species, none of which has been described in the larval stage! Only six species are known in the immature stages, but none can be related to any previously described species (VERRIER 1951; DEMOULIN 1956, 1965, 1970).

ZOOGEOGRAPHY

The collecting sites are all situated on the western side of the Arabian peninsula. For more precise details, see BÜTTIKER (1981, 1983, 1985) and also MALICKÝ (1986). This area can be considered as the boundary between the Palaearctic and Afrotropical regions (ASHE et al. 1987), and is therefore dominated by faunistical introgressions from both regions (LARSEN 1987; POR 1987).

Three species represent the Palaearctic element: *Baetis balcanicus, Centroptilum dimorphicum* and *Caenis luctuosa,* the first two clearly Mediterranean. The unnamed species of the genus *Choroterpes* seems to possess many more features in common with Afrotropical elements than with Mediterranean ones. As regards *C. corana* n. sp., this species has affinities with the West Palaearctic fauna, especially the Mediterranean, although some supposed Afrotropical influences have also been noticed.

In the area under study, both *Caenis* species show a clear altitudinal replacement: *C. luctuosa* was found between 1 300 and 2 400 m (a.s.l.), and *C. corana* between 100 and 550 m (a.s.l.). The fact that *C. luctuosa,* a thermophilous species in Europe, can live at high altitude has also recently been shown in the High Atlas of Morocco (Bouzidi 1989).

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