

Further Records of Mayflies (Insecta: Ephemeroptera) from the Arabian Peninsula. Leptophlebiidae and Baetidae

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Abstract: Additions to the mayfly fauna of the Arabian peninsula are recorded. All stages of a new leptophlebiid species, *Choroterpes (Euthraulius) arabica* n.sp., are described from material collected in Saudi Arabia and South Yemen. This species appears to be endemic to the Arabian peninsula, and is more closely related to Afrotropical elements than to Mediterranean or Oriental ones. A baetid species, *Cloeon saharensis* Soldán & Thomas, 1983 is recorded from Saudi Arabia and Oman. This is the first record of this species from outside North Africa.

Keywords: Ephemeroptera, Leptophlebiidae, *Choroterpes*, *Euthraulius*, Baetidae, *Cloeon*, Saudi Arabia, taxonomy.

تسجيلات إضافية لذباب النوار (صنف الحشرات: Ephemeroptera) من شبه الجزيرة العربية
(Leptophlebiidae و Baetidae)

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خلاصة: يحتوي البحث على تسجيلات إضافية لمجموعة الذباب النوار من شبه الجزيرة العربية. تم وصف جميع مراحل النوع الجديد *Choroterpes (Euthraulius) arabica* اعتماداً على عينات جمعت من المملكة العربية السعودية واليمن الجنوبي ويبدو أن هذا النوع مستوطن في شبه الجزيرة العربية وقريب الصلة بالأصول الإفريقية الأستوائية أكثر من تلك لحوض البحر الأبيض المتوسط والشرقية. كذلك تم تسجيل النوع *Cloeon saharensis* من المملكة العربية السعودية وعمان، حيث يشكل ذلك أول تسجيل لهذا النوع خارج شمال إفريقيا.

INTRODUCTION

Recently we recorded for the first time six taxa of mayflies from Saudi Arabia (THOMAS & SARTORI 1989). Material of the two genera *Choroterpes* Eaton, 1881 and *Cloeon* Leach, 1815 remained unidentified. In particular, specimens of *Choroterpes* (subgenus *Euthraulius* Barnard, 1932) could not be assigned to a species at that time, because of the lack of male imagoes and the scarcity of larval specimens. More than 30 years ago, one of us (M. T. G.) collected some material of *Choroterpes* that has remained unstudied up till now. After comparison of the nymphs, it appears that the Saudi Arabian and the Yemeni populations are conspecific. Moreover, they belong to a new species, of which we give the description below.

Fam. Leptophlebiidae

Choroterpes (Euthraulius) arabica n. sp.

Material: South Yemen (M.T. Gillies). Holotype: 1♂, Najd al Mizar, Wadi Bayhan al Qasab, 1336 m, 14°36'N 45°45'E, 11. X. 1957. Paratypes: 5 nymphs (N), same locality, 10. X. 1957. – Saudi Arabia (W. Büttiker). Paratypes: 1 N, Wadi Shukub, 1390 m, 20°44'N 41°09'E, 12. IX. 1984; 26 subimagos (s.) ♂♂, 7 s. ♀♀, Wadi Aridah, 1480 m, 20°25'N 41°12'E, 9–10. IX. 1983; 14 s. ♂♂, 10 s. ♀♀, Wadi Hanaq (Camp 2), 100 m, 22°44'N 39°15'E, 5–6. V. 1983; 13 s. ♂♂, 14 s. ♀♀, Wadi Turabah, 1430 m, 20°30'N 41°17'E, 15–16. IX. 1980; 21 s. ♂♂, 14 s. ♀♀, Wadi Turabah, 1470 m, 20°29'N 41°12'E, 15–16. IX. 1980.

Holotype (genitalia in microscopic preparation) and three paratypes deposited in the British Museum (Nat. Hist.) in London. Some other paratypes in the authors' collections. Most of the Saudi Arabian material deposited in the Naturhistorisches Museum in Basel.

Description:

Nymph (last instar larva): Head middle brown; intraocellar area dark brown; occiput light brown; the whole antenna yellowish. Anterior margin of the labrum with a moderate median emargination. Two rows of fine setae (fig. 1). Mandibles as in fig. 2; outer margin with a row of fine setae. Anterolateral margin of the lacinia with a small projection (fig. 3). Second segment of the maxillary palp about twice as long as the third one (fig. 4). Outer margin of the third segment slightly concave near the apex. Second segment of the labial palp a little less than twice as long as third segment (fig. 5). Hypopharynx with well-developed lateral projection and a regular line of hairs on outer margin (fig. 6).

Femora with long, acuminate bristles on the outer margin. Dorsal surface with sharp, pointed bristles of varying lengths (fig. 8). On the dorsal surface of fore tibiae, the bristles are feathered on both sides, while on the margin they appear to be feathered on the inner side only (fig. 7). Hind tibiae with a row of 35–40 external bristles; on the ventral side, the bristles are likewise feathered (fig. 10), whereas on the dorsal side, both types can be seen (fig. 9), although simple bristles seem dominant. Tarsal claws with 13–16 teeth (fig. 11).

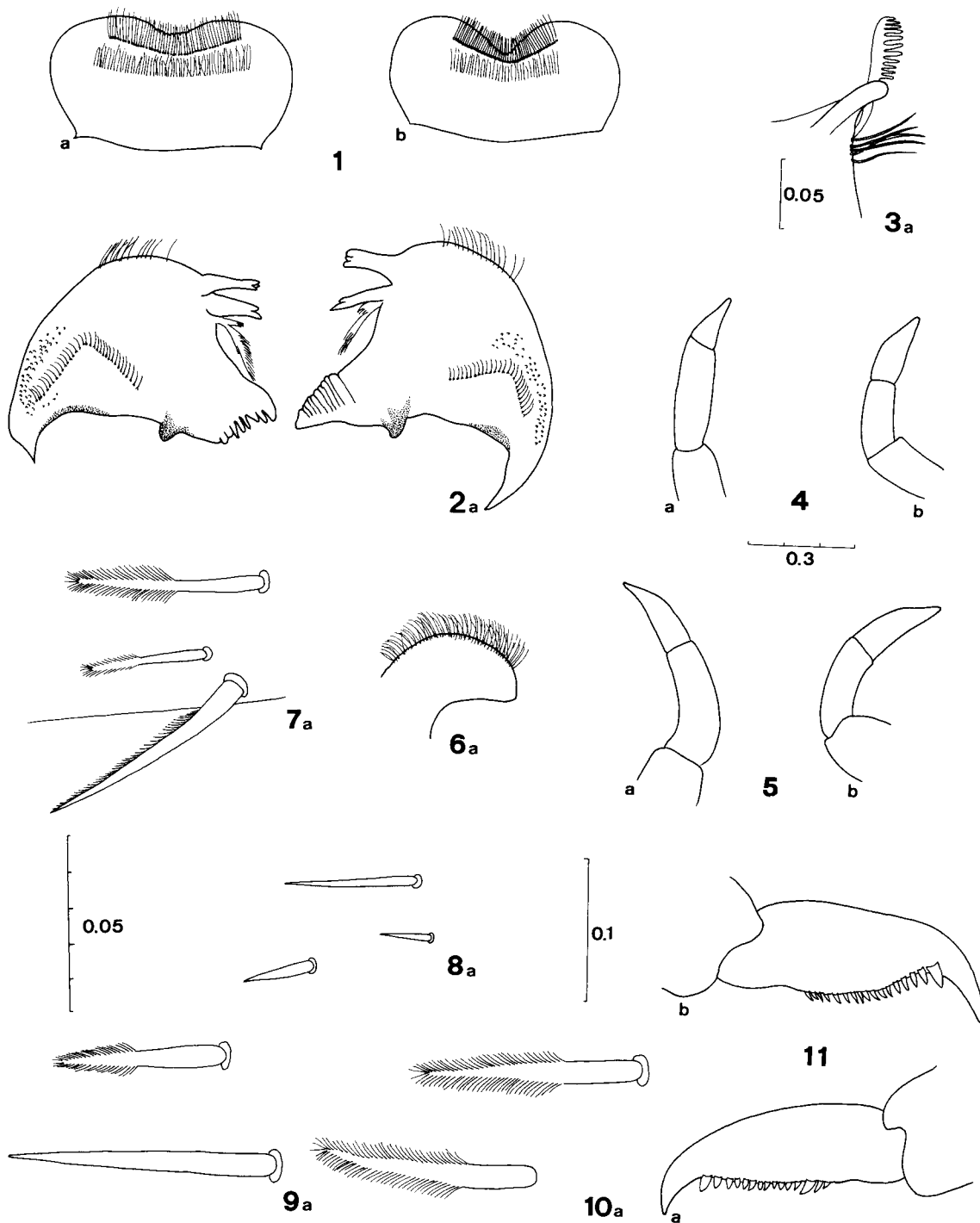
Gills in shape typical of the subgenus *Euthraulius*. Gill I long, slender and lanceolate (fig. 12). On one specimen, this first gill is constituted of two lamellae (fig. 13). Gills II–VII alike (fig. 14), dorsal and ventral lamellae plate-like and terminating in three slender, subequal processes. Lateral margin of terga VII–IX with postero-lateral projections, each one broader than the previous (fig. 15). IXth sternum as in fig. 16 in male, and as in fig. 17 in female. Cerci and median filament brownish.

Size: male nymphs up to 5.3 mm, female nymphs up to 6.6 mm.

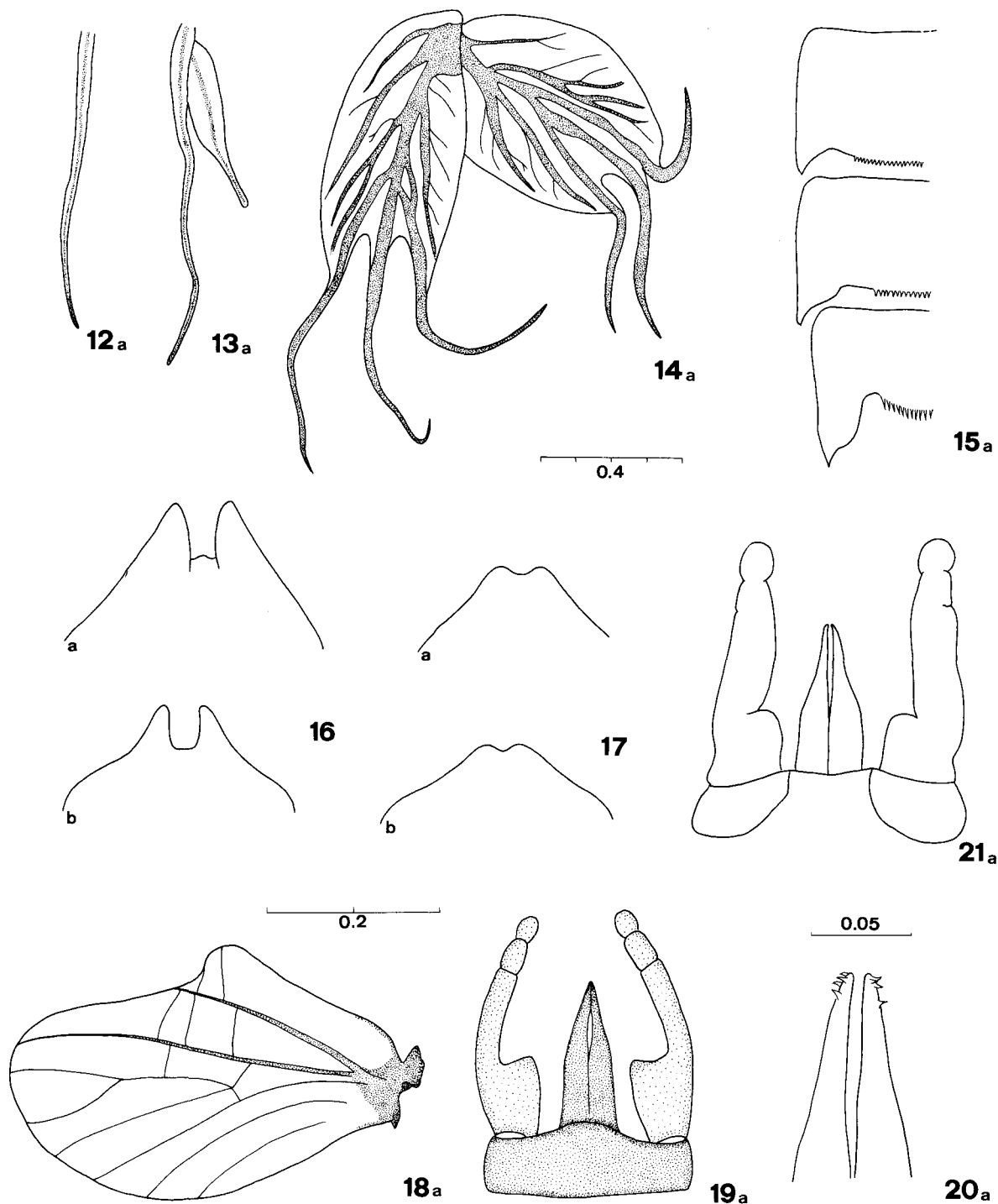
Male imago: Eyes orange-brown. Thorax more or less uniformly dark brown. Fore legs with femora medium brown and with a large blackish-brown area in the middle. Tibiae medium to light brown, tarsi yellowish-brown. Mid and hind legs the same. Forewings entirely translucent and colourless, except veins C, Sc, and R₁. Pterostigma with 5–6 simple cross veins. Vein MA forked over half of distance from base to margin, and symmetrical. MP forked in the middle and asymmetrical; in some specimens (of subimagos) lateral branch not or incompletely attached to MP. Hind wings with a well-developed costal process, distinctly asymmetrical; subcostal vein reaching costa immediately behind the process (fig. 18). Abdominal terga greyish-brown, sterna paler.

Genitalia (fig. 19): subgenital plate and penes dark brown. Forceps yellowish-brown. Hind margin of the subgenital plate slightly convex. Forceps 3-segmented; second and third together about one third length of the first segment. First segment with an inner broad expansion. Penis lobes long, pointed with 4–5 small external spines at apex (fig. 20). Cerci and terminal filament whitish with brownish junctions.

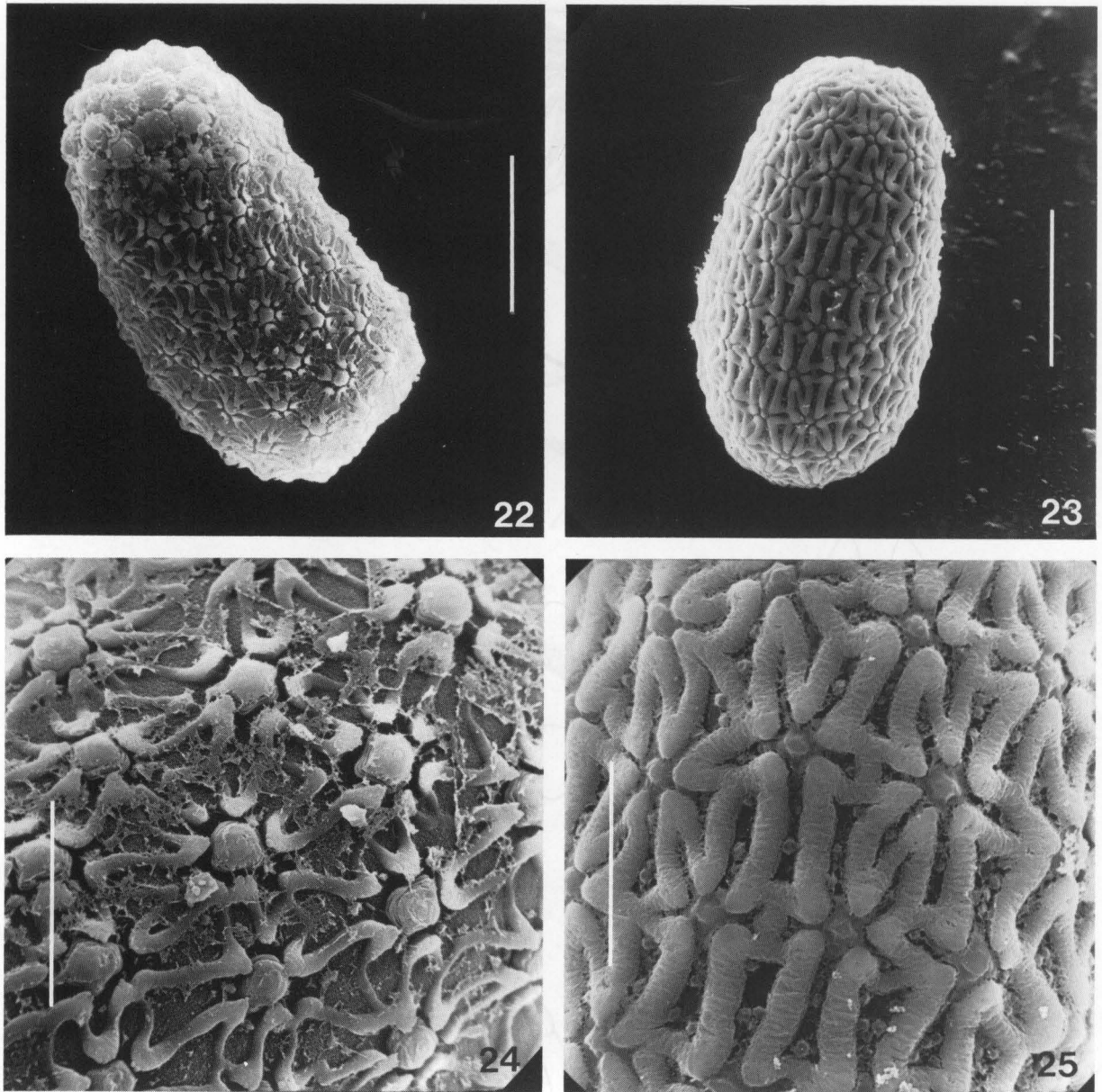
Size: forewing: 5.9 mm; body: 5.1 mm.



Figs 1-11: *Choroterpes (Euthraulius) arabica* n. sp. (a) and *Ch. (Eu.) bugandensis* (b), nymph, head and thorax. Scale in mm: figs 1, 2, 4, 5, 6 same scale; 8, 11 same scale; 7, 9, 10 same scale. 1, labrum; 2, mandibles; 3, antero-lateral area of lacinia; 4, segments 2 & 3 of maxillary palpus; 5, segments 2 & 3 of labial palpus; 6, lateral expansion of hypopharynx; 7, bristles on fore tibiae; 8, bristles on upper face of femora; 9, bristles on upper face of hind tibiae; 10, bristles on inner face of hind tibiae; 11, tarsal claw.



Figs 12-21: *Choroterpes (Euthraulius) arabica* n.sp. (a) and *Ch. (Eu.) bugandensis* (b), nymph (12-17), male imago (18-20) and male subimago (21). Scale in mm: figs 12-17, same scale; figs 18, 19 & 21, same scale. 12, first gill; 13, atypical first gill; 14, fourth gill; 15, abdominal tergites VII-IX; 16, IXth sternite of male nymph; 17, IXth sternite of female nymph; 18, hind wing; 19, genitalia of male imago; 20, apex of penes lobes; 21, genitalia of male subimago.



Figs 22–25: *Choroterpes (Euthraulius) arabica* n.sp. (22 & 24) and *Ch. (Eu.) bugandensis* (23 & 25), eggs. 22, 23, general shape of the egg (scale: 50 μ m); 24, 25, detail of the exochorion (scale: 20 μ m.) Critical point drying, gold-coated, 25 kV, JEOL JSM-35.

Male subimago: General colour lighter than in imago. Thorax medium brown. Wings milky. Abdominal terga greyish, sterna yellowish-brown. Genitalia as in fig. 21.

Female subimago: General colour medium brown. Legs with same patterns as in the male. Abdominal terga with a median longitudinal line, especially well marked on terga II–VIII. Subgenital plate narrow at apex, with a moderate incision.

Eggs: General shape ovoid (fig. 22); length 150–160 μ m, width 75–86 μ m. Exochorionic structures with cross or asteroid costae more or less regularly placed. In the centre of each asteroid costa, a

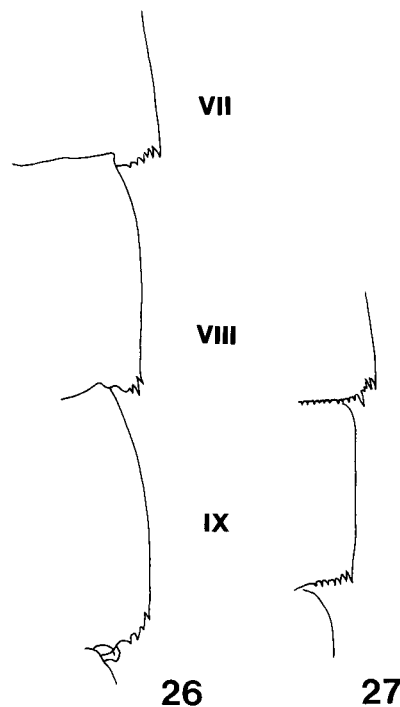
rounded adhesive element is present (fig. 24). A polar cap is visible on one pole, and characterized by very large adhesive structures.

Affinities:

The adults of *Ch. (Eu.) arabica* n. sp. are much closer to Afrotropical elements than to Mediterranean ones. In particular, the asymmetrical shape of the costal process of the hind wing is very similar to those of the African species *Ch. (Eu.) elegans* (Barnard), *Ch. (Eu.) curta* (Kimmins), *Ch. (Eu.) bugandensis* (Kimmins) or *Ch. (Eu.) tropicalis* (Gillies) for example. Moreover, the subcostal vein of the hind wing of *Ch. arabica* is very short, reaching the costa just behind the costal process, as in the previous species. On the other hand, circum-mediterranean species have a hind wing with a symmetrical costal process, and a longer subcostal vein; see for example PETERS (1980) and VITTE & THOMAS (1988) for *Ch. (Eu.) lindrothi*, IKONOMOV (1961) for *Ch. (Eu.) balcanica*, or GAINO & SOWA (1985) for *Ch. (Eu.) assimilis*. As already mentioned by VITTE & THOMAS (1988) subgeneric characters for *Euthraulius* as proposed by PETERS & EDMUNDS (1964, 1970) do not fit Mediterranean forms and need to be reinvestigated.

The male genitalia of *Ch. arabica* are very close to those of *Ch. bugandensis*. They differ, however, in the outer margin of penis lobes (subparallel on the proximal third in *Ch. bugandensis*, whereas subparallel on the proximal two-thirds in *Ch. arabica*), as well as in the number and arrangement of spines at apex of penis lobes.

The nymphs of *Ch. arabica* are easily separable from those of *Ch. bugandensis*, described by CORBET (1960), by the shape of the labrum (fig. 1 b), the proportions of the maxillary and labial palpi (figs 4 b & 5 b), the shape of the IXth sternum (figs 16 b & 17 b), and also the number of bristles on the outer margin of hind tibiae (28 vs 35-40). This last character is not mentioned by CORBET (1960), but is often proved to be correct. The tarsal claw of *Ch. bugandensis* is also illustrated (fig. 11 b) because



Figs 26-27: *Cloeon saharense* Soldán & Thomas, nymph. Lateral margin of terga VII-IX (26) and terga VIII-IX (27) in two specimens.

CORBET's drawing seemed wrong, especially in the number of teeth. Nymphs of *Ch. arabica* present also some affinities with those of *Ch. tropicalis* and *Ch. sp. no. 1* (DEMOULIN 1964).

The eggs of *Ch. arabica* can be distinguished from those of *Ch. bugandensis* by the presence of a polar cap (fig. 23) and by the structure of the exochorion (fig. 25). They are also quite different from those of *Ch. assimilis* (exochorionic surface entirely smooth) or *Ch. lindrothi* (see SOLDÁN & THOMAS 1983 plate I – sub. nom. *Ch. mauritanicus*). *Ch. arabica* presents fewer affinities with Oriental and east Palaearctic elements such as *Ch. parvula* (GILLIES 1951), *Ch. nanjingensis* (YOU et al. 1980; YOU & SU 1987) or *Ch. sumbarensis* (KLUGE 1984).

As mentioned previously (THOMAS & SARTORI, 1990), all the collecting sites are situated on the western and southern sides of the Arabian peninsula. *Ch. arabica* evidently represents the introgression of Afrotropical elements in this area.

Fam. Baetidae

Cloeon saharensis Soldán & Thomas, 1983

Cloeon saharensis Soldán & Thomas, 1983. – Acta entomol. bohemoslov. 80: 366.

Material: Saudi Arabia (W. Büttiker). 5 N, Jeddah, 10 m, 21°30'N 39°10'E, 24.III.1981; 1♂, Durma, 580 m, 24°35'N 46°06'E, 6.VI.1978; 1♀, Riyadh, 598 m, 24°39'N 46°35'E, 11.IX.1977. – Oman (M. Maffi). 1 N, Wadi Fayd, Shinas (northern end of the Batinah), 24°40'N 56°25'E, 4.III.1983.

C. saharensis has been described from Algeria and lives in intermittent streams and pools in arid and subarid zones, as well as in oases. The nymphs can be distinguished from all other *Cloeon* species by the absence of lateral abdominal spines (figs 26–27). The presence of these specimens in Saudi Arabia and Oman extends the known distribution of *C. saharensis* right across the southern Palaearctic from the Magreb to near the border with the Afrotropical region in southern Arabia and across to the eastern tip of the Arabian peninsula. In this, it conforms with the pattern seen in, for example, another baetid species, *Centroptilum dimorphicum* (THOMAS & SARTORI 1989), and in certain Diptera that inhabit ground pools in North Africa.

The remaining material belonging to the genus *Cloeon* consists of one or possibly two other species. But in the absence of associated adults and nymphs specific identifications are not possible.

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