

# New records of water mites from springs and running waters in the Mediterranean region (Acari, Actinedida: Anisitsiellidae, Aturidae, Momoniidae)

R. Gerecke<sup>1</sup>

Keywords : water mites, new records, new species, springs, interstitial, Mediterranean.

The author reports new collections of 10 water-mite species from the Peloponnes (Greece), Sardinia (Italy), Corsica (France), and Andalusia (Spain). *Barbaxonella reverendissima* is described as a new species; first descriptions are given of the male of *Bandakia corsica*, the larva of *Manotonia tegulata* and the deutonymphs of *Psammotorrenticola gracilis*, *Utaxatax ventriplax* and *Momonides lundbladi*. *Momonisia phreatica* and *Bandakia concreta* were found for the first time in the Mediterranean region. The zoogeographical significance of the new records is briefly discussed.

**Nouvelles récoltes d'Acariens dans les sources et les eaux courantes de la région méditerranéenne (Acari, Actinedida : Anisitsiellidae, Aturidae, Momoniidae)**

Mots clés : acariens, nouvelles récoltes, nouvelle espèce, sources, milieu interstitiel, région méditerranéenne.

De nouvelles récoltes de 10 espèces d'Acariens sont signalées du Péloponèse (Grèce), de Sardaigne (Italie), de Corse (France) et d'Andalousie (Espagne). Une nouvelle espèce *Barbaxonella reverendissima* est décrite ; le mâle de *Bandakia corsica*, la larve de *Manotonia tegulata* et les deutonymphes de *Psammotorrenticola gracilis*, *Utaxatax ventriplax* et *Momonides lundbladi* sont décrits pour la première fois.

*Momonisia phreatica* et *Bandakia concreta* sont signalés pour la première fois de la région méditerranéenne. La signification biogéographique des nouvelles récoltes est brièvement discutée.

## 1. Introduction

The studies of E. Angelier (1959) on the water mite fauna of Corsica produced a surprisingly high number of systematically isolated taxa, either with enigmatically disjunct areals, or as presumable endemics of the island. However, until recent times the zoogeographic interpretation of his results was hampered by the nearly complete lack of information about the fauna of the surrounding geographical regions.

This paper deals with interesting new records from several Mediterranean countries, with particular regard to the fauna of Corsica and Sardinia. These additional morphological and faunistic data are

published as a part of the puzzle of the historical zoogeography of Mediterranean fresh water mites. The aim of this research is to contribute elements for a more comprehensive knowledge about the diversity and composition of the Tyrrhenian water mite fauna (Gerecke & Di Sabatino, in press.).

## 2. Material and Methods

Water mites were collected by hand netting and by Karaman-Chappuis digs from interstitial habitats, sorted on the spot from the living material, and conserved in Koenike's fluid.

A description of the preparation method is given by Gerecke (1991a).

Specimens of *Manotonia tegulata* were reared in the laboratory at room temperature in petri disks.

<sup>1</sup>. Biesingerstrasse, 11, D-72070 Tübingen, Allemagne.

The terminology used for the description of the larva of *M. tegulata* follows Gerecke & Smith (1993 b).

The following abbreviations are used I-I-6 = Leg I, sixth segment, p-1 = palp, first segment, l/h = length/height, l/w = length/width, cx-1 = first coxae.

### 3. Results

#### 3.1. Family Anisitsiellidae Koenike, 1910

##### *Bandakia concreta* Thor, 1913

**Locality records** : Greece, G 71, Peloponnes, Achaia (Patras) ; Aroánia Oros, Planiteron, E Arbounas, rheohelocrenic spring at 1 200 m asl. (22°17'E, 37°50'N), 03-VI-1992, 1 ♀, France, F 77, Corse (2A), Cargése, Forêt d'Esigna, Bocca di Gradella, rheopsammocrenic spring at 300 m asl., 29-V-93, 2 ♂.

**Morphology** : The palp morphology of the recently detected mediterranean specimens (Fig. 1 A, B ; one ♀ from Greece and one ♂ from Corse were measured) is in good agreement with specimens from Southern Germany (Mindelsee region, KN, see Schwoerbel 1991) : The range of relative length and l/h ratio (in parentheses) of palp segments is : p-1 10.0-10.4 (0.4-0.5), p-2 40.7-42.7 (1.5-1.6), p-3 11.6-13.1 (0.6-0.7), p-4 20.1-21.7 (1.5-1.7), p-5 14.0-15.6 (1.5-1.9). Some slight differences are found only in p-3 and p-4 (measurements for Central European species in parentheses) : in Mediterranean specimens both segments are slightly more slender, l/h p-3 0.7 (0.6), p-4 1.7 (1.5). Further little differences are found in the shape of the dorsal shield - l/h 1.4 (1.3) total length of coxae - 297-310 (270-275)  $\mu\text{m}$ , and in width of cx-3 - 265-279 (247-256)  $\mu\text{m}$ . However, in Northern and Central Europe *B. concreta* has been known as a highly variable species (Lundblad 1968). A sexual dimorphism is developed in the dimensions of the external genital organ (for further measurements and discussion of distinctive characters see the remarks on *B. corsica*).

**Biology** : Normally, *B. concreta* is found in rheohelocrenic and helocrenic springs, but there are also records from surface and interstitial running waters (see Lundblad 1968). Both localities cited here are weakly flowing springs with elevated temperature (13-23°C). The station in Greece is completely exposed to sunlight and intense cattle impact.

**Distribution** : Apart from one record from Macedonia (without locality and date identification, « *Bandakia concreta longissima* Schw. 1955 », Schwoerbel 1963), until now the distribution area of *Bandakia concreta* seemed restricted to Central and Northern Europe (Viets 1978).

##### *Bandakia corsica* E Angelier, 1951

**Locality records** : France, F 38 I, Corse (2B), Murato (Bastia), Bevinco near Mulino alle Noci (locus typicus) (09°21'E, 42°35'N), 310 m asl., 03-X-91, 1 ♂ ; Italy, Sardinia, I 1162 I (NU), Genargentu. Vallada Tedderi near Bacu s'Argiolas (NK 32 25), interstitial dig at 800 m asl., 15-IX-91, 1 ♂, 3 ♀ ; I 1165 I, Sardegna (CA), Gerrei. Dolianova, R. Lassini near Case Porru (NJ 21 64), interstitial dig at 380 m asl., 17-IX-91, 3 ♂, 7 ♀, 1 deutonymph.

**Morphology** : The additional findings allow for the first description of the male. Males are smaller than females (see Gerecke 1991) in many body measurements : dorsal shield length 468-482  $\mu\text{m}$ , width 314-320  $\mu\text{m}$  (l/w 1.5) ; coxae total length 270-279  $\mu\text{m}$  ; cx-3 maximum width 256-260  $\mu\text{m}$  ; insertions I-IV, distance 218-238  $\mu\text{m}$  (Fig. 1E). On the other hand, dimensions of the external genital organ and of the mouthparts (Fig. 1 C, D) are nearly the same as in females : Genital organ length 94-96  $\mu\text{m}$ , width 76-78  $\mu\text{m}$  (l/w 1.2) ; Capitulum, ventral length 99-101  $\mu\text{m}$ , height 76-81  $\mu\text{m}$  ; chelicera, total length 147-148  $\mu\text{m}$  (basal segment/claw 3.5-3.9, l/h 3.3-3.6) ; palp, total length 223-229  $\mu\text{m}$ , relative length [%] and l/h ratio (in parentheses) of the segments : p-1 9.4-10.0 (0.5), p-2 40.2-41.3 (1.4), p-3 13.0-13.5 (0.6-0.7), p-4 25.8-26.0 (2.0), p-5 10.3-10.5 (1.5-1.7). As compared with *B. concreta*, *B. corsica* is characterized by the following features : high relative length of p-4 (about 26 %, in *B. concreta* 20-22 % - p-4/p-3 ration 1.6-1.7, in *B. concreta* about 2.0) and l/h ratio (2.0, in *B. concreta* 1.5-1.7) ; shorter p-5 (length < 25  $\mu\text{m}$  [about 10 %], in *B. concreta* > 29  $\mu\text{m}$  [14-15 %]) ; the ventral surface of p-2 is smooth in *B. corsica*, but provided with a long, lamellate ventral protrusion in *B. concreta* ; the body measurements are nearly the same in both species, while the genital field is less extended in *B. corsica* : length/width of the genital organ in *B. corsica* is 94-96/76-78  $\mu\text{m}$ , without pronounced sexual dimorphism, but in *B. concreta* 112-116/99-105  $\mu\text{m}$  in males, and

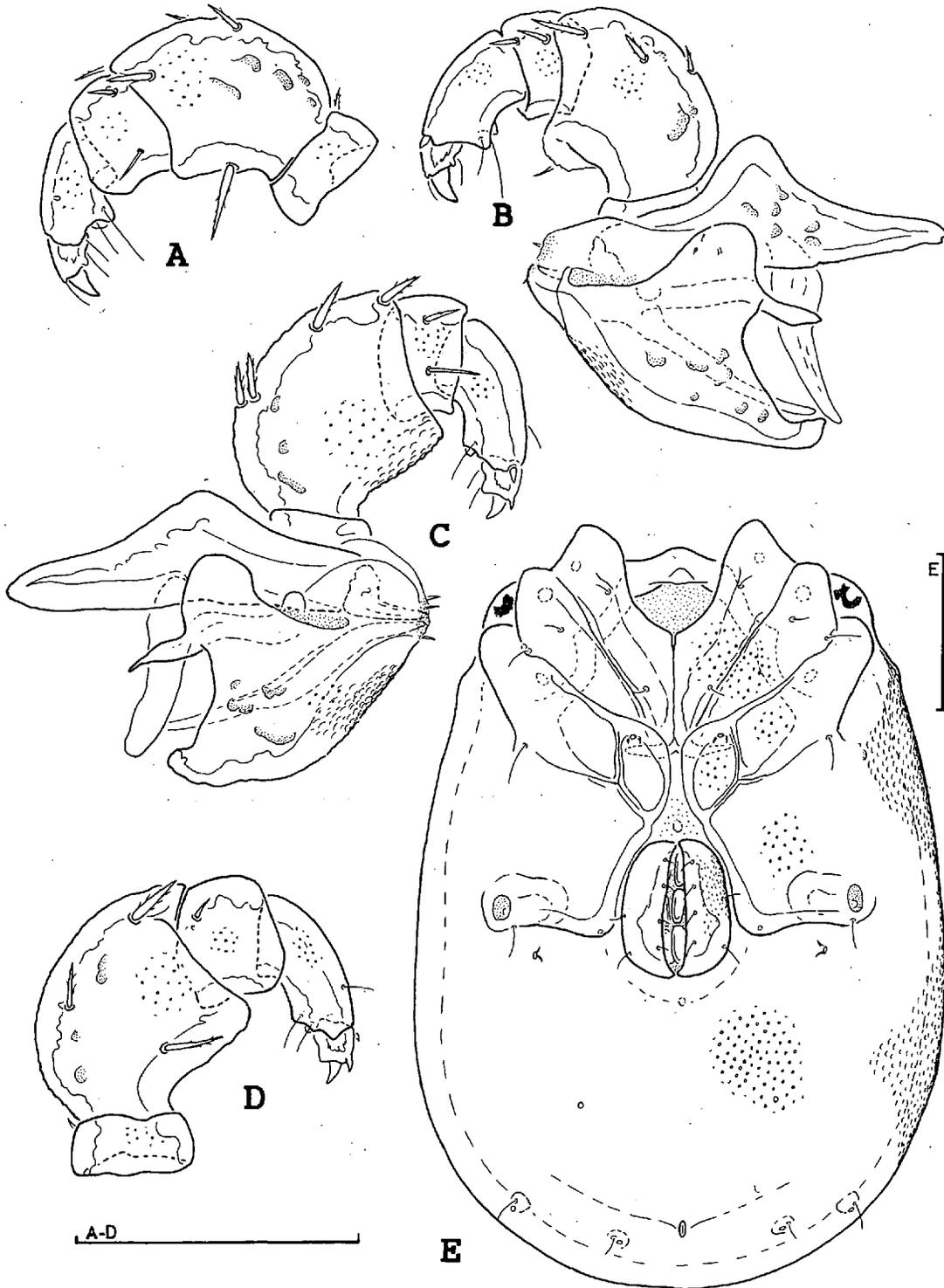


Fig. 1. A., B. *Bandakia concreta*, male from Corsica. - A. left palp laterally ; B. gnathosoma and right palp medially. - C.-E. *Bandakia corsica*, male from the type locality (Corsica). - C. capitulum and right palp medially ; D. left palp laterally ; E. idiosoma, ventral view. Bar = 100  $\mu$ m.

Fig. 1. A., B. *Bandakia concreta*, mâle de Corse. - A. palpe gauche, vue latérale ; B. gnathosoma et palpe droit, vue médiane. - C.-E. *Bandakia corsica*, mâle du locus typicus (Corse). - C. gnathosoma et palpe droit, vue médiane ; D. palpe gauche, vue latérale ; E. idiosoma, face ventrale. Trait = 100  $\mu$ m.

144-150/110-122  $\mu\text{m}$  in females. The degree of rostral extension of the tips of cx-1/2 (projecting beyond the frontal body margin or terminating before reaching this margin) is no suitable character for the separation of the two species in question. Both conditions can be found in *B. concreta* as well as in *B. corsica*.

Finally, the measurements on the additional material of *B. corsica* now available confirm the diagnostic characters of this species compared with *B. speciosa* and *B. norma* discussed by Gerecke (1991).

**Biology:** All specimens of *B. corsica* were taken in interstitial habitats of undisturbed rhithral habitats.

**Distribution:** Until now, the female holotype from Corsica was the only known specimen of *B. corsica*; all records published under this name from other regions in Europe refer to *B. speciosa* K. Viets (Gerecke 1991). Most probably, *B. corsica* is a Corso-Sardinian endemite.

#### ***Utaxatax ventriplax* Gerecke, 1990**

**Locality records:** Italy, I 1110, Calabria (CS), Pellegrino mountains, Saracena, SW M. Trieste, rheopsammocrenic spring at 670 m asl. (WE 973 052), 07-X-90, 1 ♀; I 1126, Calabria (CS), Pellegrino mountains, Orsomarso, Argentino valley, Pantagnoli, rheopsammocrenic spring at 400 m asl. (WE 835 062), 13-X-90, 1 ♂; I 1153, Sardegna (NU), Talána, Br. cu e Pisucerbu, S. Basilio di Manurri, rheopsammocrenic spring at 470 m asl. (NK 43 36), 12-IX-91, 1 ♀; I 1154, Sardegna (NU), Talána, M. Telemula, R. de Ficarba, rheopsammocrenic spring at 700 m asl. (NK 41 30), 13-IX-91, 1 ♂; I 1169, Sardegna (NU), Barbágia Seúlo, W Seúlo, Contrada Tornolù, rheopsammocrenic spring at 650 m asl. (NK 17 14), 18-IX-91, 1 ♂; I 1171, Sardegna (NU), Gennargentu, Aritzo, F. Cheressia near Brcu, Istiddi, rheopsammocrenic spring at 580 m asl. (NK 14 26), 19-IX-91, 3 ♂, 3 ♀ (= type locality); I 1172, Sardegna (NU), Gennargentu, Aritzo, Sorgente Illare near S.ra G.na Uà, rheopsammocrenic spring at 600 m asl. NK 11 25, 20-IX-91, 3 ♂; Spain, E 115, Andalusia (CA), Sierra de la Gallina, NE Puerto de Galiz, rheohelocrenic spring at 460 m asl. (TF 79 34), 03-IV-94, 1 ♂, 2 ♀, 2 Ny.

**Morphology:** The sexual dimorphism in the shape of claws of I-III discussed in the original

description cannot be recognized with certainty in all specimens. Generally, males have stronger claws, but in several cases also male claws bear dorsal and ventral clawlets. Especially in the Spanish material, sexes cannot be separated using this character. Furthermore, adult specimens from Spain in both sexes differ slightly from the original description in having a straight ventral margin of p-2 (Fig. 2 C, D; convexly protruding in Italian specimens) and by slight differences in the shape of leg setae. If the differences between populations from the Iberian peninsula and populations from the Central Mediterranean region are confirmed after the study of more material from Spain, we could accept the taxonomic separation of an independent species in Iberia.

The finding of two deutonymphs allows for the description of this development stage, so far unknown in *Utaxatax*. Both specimens are distended and nearly as wide as long (1/w 490/450 resp. 450/405  $\mu\text{m}$ ); they were probably close to moulting to the tritonymphal resting stage. The idiosoma bears no complete dorsal and ventral shields as in adults, but is membranous with fine lineation in the lateral and posterior parts of the body. The dorsum (Fig. 2 B) bears an extended plate (1/w 288/230  $\mu\text{m}$ ), bluntly rounded anteriorly and with undulate margins. It includes three pairs of glandular openings; near its anterior margin, a further pair of glandularia lays in the membranous integument. A pair of frontal platelets and a pair of platelets bearing the lateral eye lenses are placed separately from each other at the rostral margin of the idiosoma. The rostral part of the ventrum (Fig. 2 A) is very similar to adult *U. ventriplax*; the posterior margin of cx-2 is completely fused with the anterior margin of cx-3, as it is characteristic for the subgenus *Rospatax*. In both specimens, the suture line cx-3/4 obviously does not reach the medial margin of the coxal plates but is abruptly bent anteriorly and ends in the cx-2/3 suture line near a characteristic glandular opening. This observation implies that also in adults the pair of sutures paralleling the median line between the anterior margin of the genital organ and the cx-2/3 sutures may be the rostrally directed internal part of the cx-3/4 suture line. Consequently, the subrectangular areas extending rostrally from the genital organ in adult *Utaxatax* and also in the closely related *Bandakia*, as well as their glandular openings belong to anteriomedial extensions of cx-4

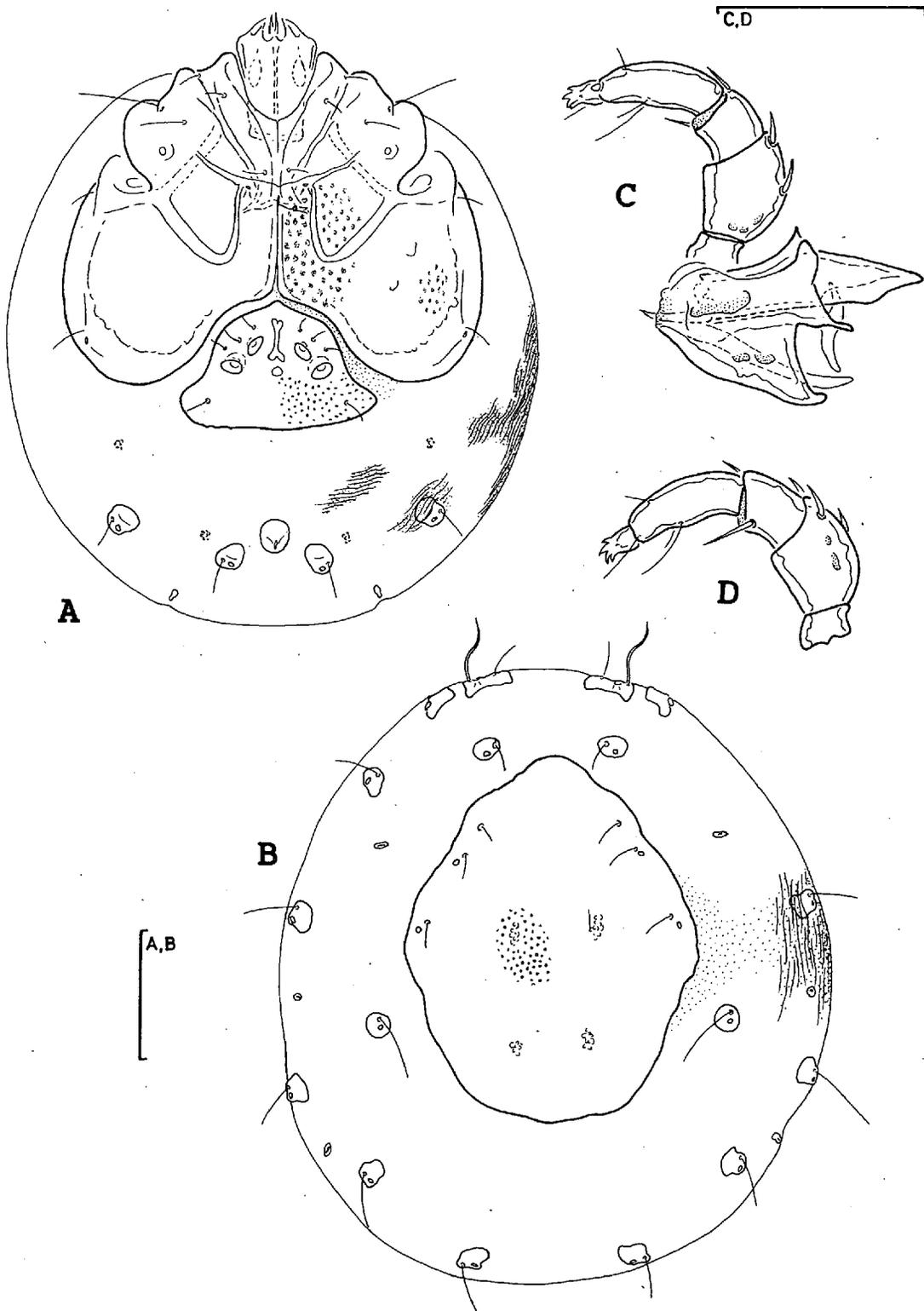


Fig. 2. *Utaxatax ventriplax*, deutonymph, idiosoma. - A. ventral view ; B. dorsal view ; C. gnathosoma and right palp medially ; D. left palp laterally. Bars = 100  $\mu$ m.

Fig. 2. *Utaxatax ventriplax*, deutonymphe, idiosoma. - A. face ventrale ; B. face dorsale ; C. gnathosoma et palpe droit, vue médiane ; D. palpe gauche, vue latérale. Traits = 100  $\mu$ m.

rather than the medial parts of cx-3. A similar, convergently developed situation is found in two systematically distant groups: in *Limnolegeria* Motas, 1928 (Gerecke 1988) and in *Hygrobatodes*, subgen. *Hygrobatides* Lundblad, 1936 (see Cook 1974), too, an anterior protrusion of the cx-3/4 suture line brings a pair of glandularia (in related taxa placed on cx-4) towards the posterior margin of the cx-2/3 suture line. As a difference to adult specimens, the cx-4 do not embrace the genital area. Their medio-caudal margins are concave, forming a genital bay, the caudolateral margins are convexly rounded. All the posterior part of the ventrum is membranous, the excretory porus is surrounded by a simple sclerified ring.

The provisory genital organ is bell-shaped (1/w 100/135  $\mu\text{m}$ ), with a blunt medial tip, convexly rounded anteriolateral margins, an abruptly enlarged posterior part and straight caudal margin. Its anterior part bears six fine setae and four acetabula. The acetabula are oval, and on each side their main axes form a 90° angle. The zone of the future gonopore bears a longitudinal bone-shaped sclerification, the enlarged posterior part of the genital platelet bears regularly arranged pores as in other idiosoma sclerites, and a pair of setae in lateral position. The mouthparts differ only slightly from the adult. The ventral length of capitulum is 87  $\mu\text{m}$ , the chelicera measurements are 99/34/40  $\mu\text{m}$  (basal segment length / claw length / maximum height), the total length of palp is 181  $\mu\text{m}$ . The measurements of the palp segments are as follows (dorsal length/height - relative length, 1/h ratio): p-1 14/24  $\mu\text{m}$  - 7.7, 0.58; p-2 56/38  $\mu\text{m}$  - 31.0, 1.47; p-3 32/28  $\mu\text{m}$  - 17.0, 1.14; p-4 59/21  $\mu\text{m}$  - 33.7, 2.8; p-5 20/12  $\mu\text{m}$  - 11.0, 1.66. The ventral margin of p-2 is straight and without setae.

**Biology:** *U. ventriplax* is a typical inhabitant of weakly flowing springs with sandy substratum rich in organic matter at middle and low elevations. All collection sites are completely shaded by forest or dense macchia vegetation all over the year, the range of water temperature was 13-17°C.

**Distribution:** So far, this species had been known only from three specimens collected in Sicily and Sardinia. The additional records presented here confirm a much more extended distribution in the Western Mediterranean area.

### *Nilotonia longipora* (Walter, 1925)

**Locality record:** Greece, G 71, Peloponnes, Achaia (Patras); Aroánia Oros, Planiteron, E Arbounas, rheohelocrenic spring at 1 200 m asl. (22°17'E, 37°50'N), 03-VI-1992. 2 ♀, 1 deutonymph.

**Morphology:** The diagnostic features of *N. longipora* are summarized by Gerecke (1991).

**Biology:** *N. longipora* is a characteristic species of rheohelocrenic spring habitats with low discharge at low and middle elevations with full exposure to sunlight. In Greece, the species was found in a spring habitat of this type, together with *Manotonia tegulata* and *Bandakia concreta*. *N. longipora* feeds on fresh invertebrate carrion, the larvae probably parasitize Ceratopogonid Diptera (Gerecke & Smith in press).

**Distribution:** The species is widely distributed in Mediterranean and Eastern Europe. This is the first of adult specimens of *N. longipora* from Greece. A previous record from Theben is based on a deutonymph, published under the name « *Limnesia tuberculata* » by K. Viets (1950) (Gerecke 1991).

### *Manotonia tegulata* K. Viets, 1951

**Locality records:** Greece, G 71, Peloponnes, Achaia (Patras); Aroánia Oros, Planiteron, E Arbounas, rheohelocrenic spring at 1 200 m asl. (22°17'E, 37°50'N), 03-VI-1992. 4 ♂, 3 ♀. Italy, I 1135, Calabria, Catena Costiera (CS), Montalto Uffugo, Vallone Manco di Fave, rheohelocrenic spring at 240 m asl. (XD 014 646), 17-X-1990, 1 ♀; I 1136, Calabria, Cresta di Zungri (CZ), Tropea, Contrada Gásponi, rheohelocrenic spring at 80 m asl. 18-X-1990, 7 ♂, 3 ♀; I 1168, Sardegna, Gerrei (CA), Dolianova, Minza sei Gradi near Case Perra, rheohelocrenic spring at 550 m asl. (NJ 21 64), 18-IX-1991, 5 ♂, 4 ♀, 2 deutonymphs; Spain, E 115, Andalusia (CA), Sierra de la Gallina, NE Puerto de Galiz, rheohelocrenic spring at 460 m asl. (TF 79 34), 03-IV-1994, 1 ♂, 1 ♀.

**Morphology:** The measurements for specimens from the Peloponnes, Continental Italy, Sardinia and Spain (one male and one female from all sampling sites have been measured) correspond to the variability ranges established for a population from Sicily (Gerecke 1991). In many of the male specimens, the postgenital sclerite is not subrectangular in shape, but conspicuously enlarged in its anterior

part. One of the males from Sardinia has an aberrantly-shaped dorsal shield : it is not entirely sclerified, but the postfrontalia are placed on separate platelets. However, the right platelet contacts the posterior dorsal plate by a narrow bridge of porous chitin and the anterior platelets as well as the posterior dorsal plate are longer than in females.

In most regards, the larva of *M. tegulata* fits well the description given for *Nilotonia longipora* (Gerecke & Smith 1993). The list of measurements shows that in all proportions there are only slight differences : Dorsal plate length 202-211  $\mu\text{m}$ , width 114-121  $\mu\text{m}$  ; ventral plate length 213-215  $\mu\text{m}$ , width (one side, level of insertions of 1-III) 72-76  $\mu\text{m}$  ; cx-1 width (one side, level of C2) 38-41  $\mu\text{m}$  ; excretory plate length 11-13  $\mu\text{m}$ , width 18  $\mu\text{m}$  ; capitulum length 65-70  $\mu\text{m}$ , height 44  $\mu\text{m}$ , chelicera length

70  $\mu\text{m}$ , height 12  $\mu\text{m}$ . In most dimensions, *N. longipora* larvae are slightly taller than those of *M. tegulata*. The following leg measurements are specified in the order tarsus-femur-gena-tibia-tarsus ; for most segments the dorsal length was measured, but for the tarsus the total length is given (with dorsal length put in parentheses), 1-I 29-36-23-33-36 (23)  $\mu\text{m}$ , 1-II 30-35-23-33-40 (25)  $\mu\text{m}$ , 1-III 40-40-25-40-41 (31)  $\mu\text{m}$ . As all other parts of idiosoma and gnathosoma, also 1-III is slightly smaller (total length 186  $\mu\text{m}$ ) than in *N. longipora* (218  $\mu\text{m}$ ). The shape of idiosoma sclerites (Fig. 3 A-C) is similar in both species, but the porosity of all sclerifications is rather continuous in *M. tegulata*, not arranged in regular groups as in *N. longipora*. The urstigmata are embraced by the most outer parts of the anterior margin of cx-1, while they are placed

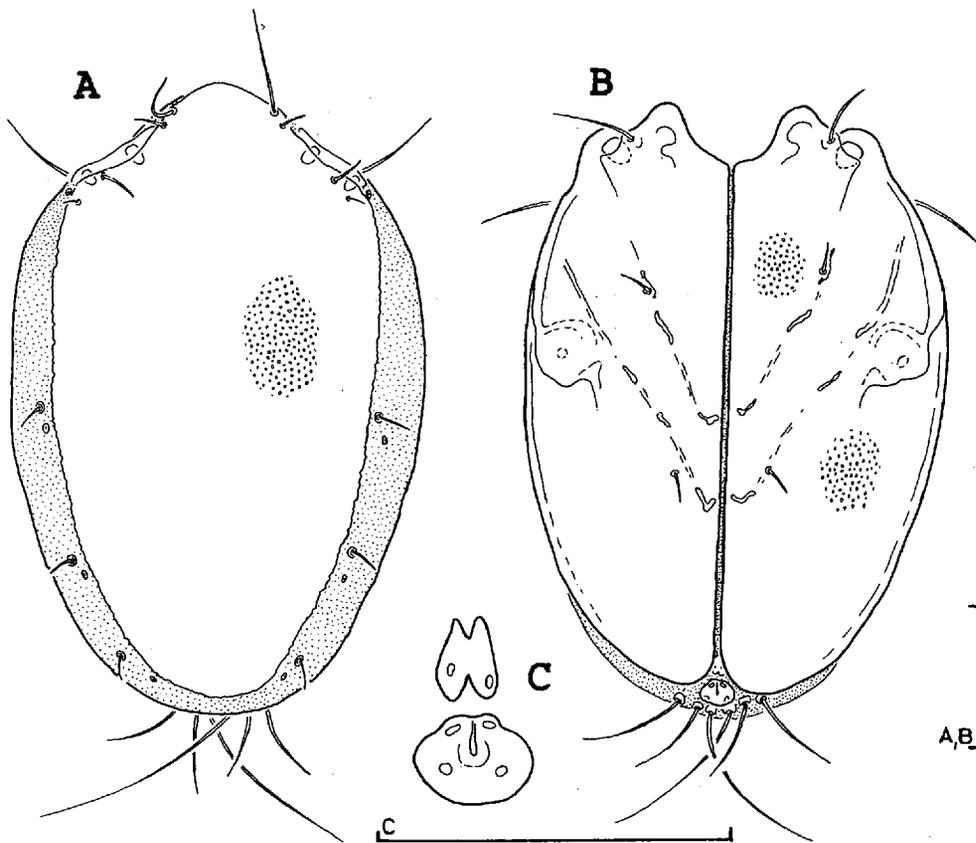


Fig. 3. *Manotonia tegulata*, larva, idiosoma. A. dorsal view ; B. ventral view ; C. region of excretory platelet (detail). Bars = 50  $\mu\text{m}$ .

Fig. 3. *Manotonia tegulata*, larve, idiosoma. A. face dorsale ; B. face ventrale ; C. région de la plaque excrétrice (détail). Traits = 50  $\mu\text{m}$ .

laterally from the anteriolateral angles of cx-1 in *N. longipora*. It was not possible to clarify whether the eye lenses are arranged with one single or with two separate platelets, and the SS setae were identified only in one of the specimens examined. There are no differences in the chaetotaxy of legs, but many setae are of considerably smaller dimensions. An example is seta 4 of leg-III tibia (Fig. 4 D) which surpasses widely the distal end of the tarsus in *N. longipora*, but reaches only the distal third of that segment in *M. tegulata*. In both species, all leg claws are divided distally in three fine tips (Fig. 4 E).

The ventral margin of the gnathosoma (Fig. 4 A, B) is S-shaped, with a more markedly developed convex basal protrusion than in *N. longipora*. In ventral view, the membranous area surrounding the mouth opening displays a centripetal pleating. The chelicerae are curved, with slender separate bases. The palp femur bears one medial seta, the gena and tibia 2 setae each, and the tarsus 6 setae. As a difference to *N. longipora*, palp tarsal setae are generally longer, and tarsal claws are profoundly split, with two strong tips.

When compared with *N. longipora*, most conspicuous diagnostic characters of larval *M. tegulata* are found in the shape of the palp claws and in the reduced dimensions of leg setae. These differences could indicate also ethological distinctions (swimming behaviour, host range, attachment sites?). In laboratory experiments, larvae of *N. longipora* were attracted by Ceratopogonid pupae (Gerecke & Smith in press) while *M. tegulata* larvae display indifferent reactions when confronted with immature stages of this dipteran family. However, we are provided neither with clear evidence for specific parasitic relations between *Nilotonia* and adult Ceratopogonid midges, nor with any additional information about the behaviour of immature *Manotonia* mites. Recently, the taxonomic separation of the two genera has been questioned after the discovery of a species with intermediate characters (Gerecke 1992). However, the identification of clear diagnostic features also in the larval stage demonstrates that the two species here taken in consideration are of distant phylogenetic origin. Additional studies should clarify if larval and adult character sets outlined here are linked also in other *Nilotonia*- and *Manotonia*-species.

**Biology:** The new findings confirm that *M. tegulata* is a characteristic inhabitant of rheohelocrenic springs at low and middle elevations. In the laboratory, a population from Greece survived for about 6 months in a petri disk at room temperature. As a difference to *Nilotonia longipora* (see Gerecke & Smith in press), *M. tegulata* is not attracted by fresh invertebrate carrion; experiments with various types of living and dead organic matter from natural springs failed to produce any information on its feeding habits. Nevertheless, several females deposited egg clusters (about 10 eggs/individual, diameter ca. 175  $\mu\text{m}$ ) on moss leaves. Larvae hatched after about three weeks and were conserved for dissection.

**Distribution:** The new records confirm that *M. tegulata* is widely distributed in the Mediterranean region. However, for reasons of its particular habitat requirements, the species can be found only in patchy areas with intact seepage habitats at middle and low elevations.

#### ***Psammotorrenticola gracilis* E. Angelier, 1951**

**Locality records:** France, F 81, Corse (2B), Evisa, Rau. d'Aitone above Gorges de Spelunca, interstitial dig at 300 m asl., 02-VI-93, 1 ♀, 1 deutonymph.

**Morphology:** The description given by E. Angelier (1959) is based on two male and two female specimens, not on a single specimen, as stated by Cook (1974). The general arrangement of glandularia and setae on dorsal and ventral shields agrees well with the original description for the genus *Stygomamerosopsis* given by Cook (1974). The deutonymph measures 605  $\mu\text{m}$  in length, 365  $\mu\text{m}$  in width. The idiosomal sclerification (Fig. 5 A, B) is much less extended than in adults, several parts of the dorsum and ventrum are covered with membranous, finely lineated integument. The dorsum bears two large medial plates (1/w anterior plate 220/193  $\mu\text{m}$ , posterior plate 195/207  $\mu\text{m}$ ) and a pair of small, triangular lateral plates (1/w 85/63  $\mu\text{m}$ ) placed at the lateral edges of the central membranous zone separating the medial plates. The anterior plate bears both a pair of setae and one pair of glandularia at its anterior margin, the lateral plates one glandulare each at their anterior edges, and the posterior one pair of glandularia (? - no setae observed) in their posterior part. At the anterior margin, two ocular plates bear one seta, one glandulare and one lyrifissure each. Eye lenses can't be observed with certainty,

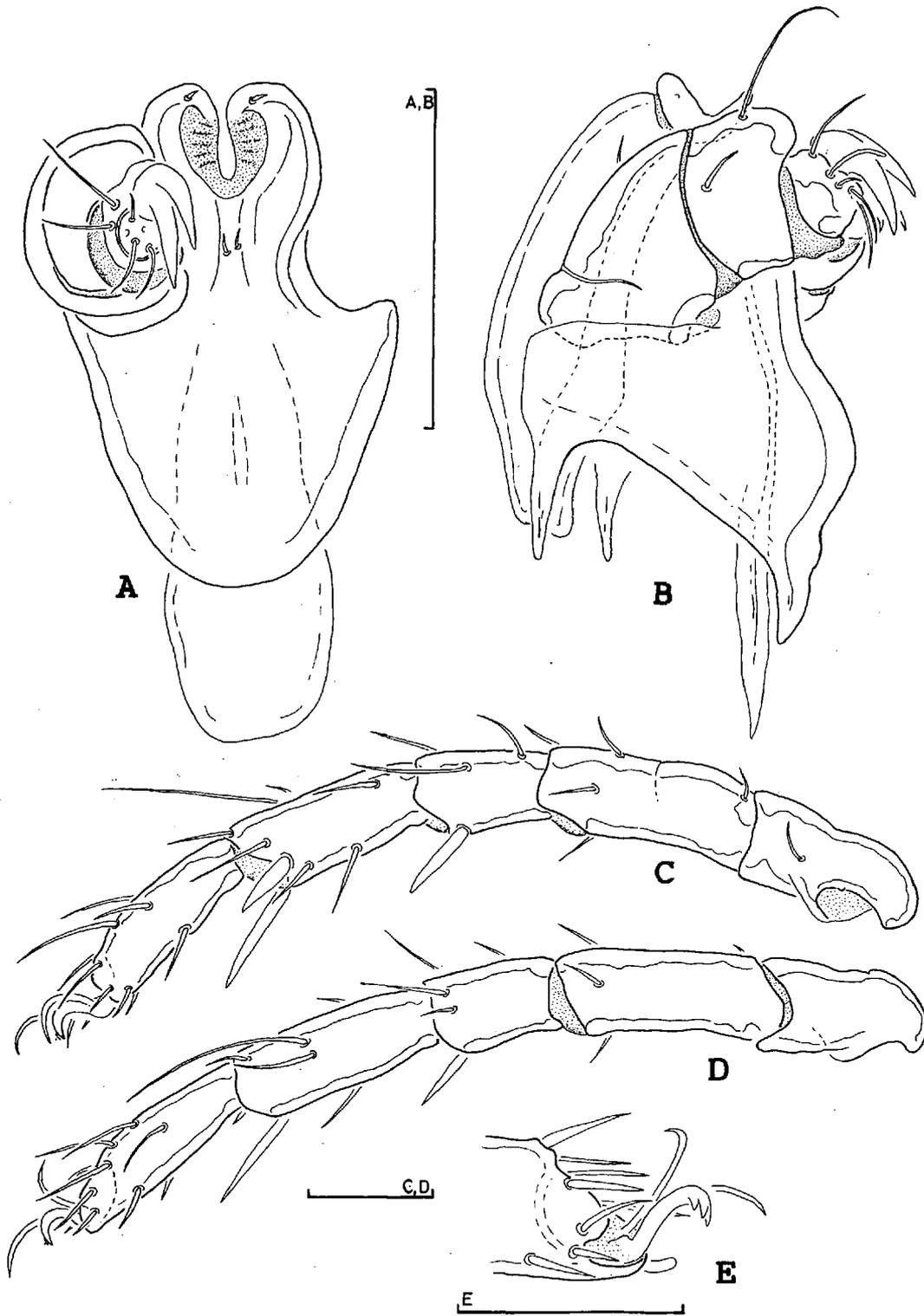


Fig. 4. *Manotonia tegulata*, larva. A. gnathosoma, ventral view ; B. gnathosoma, lateral view ; C. leg-III, anterior view ; D. leg-III, posterior view ; E. leg-III-5, claws (detail). Bars = 50  $\mu$ m.

Fig. 4. *Manotonia tegulata*, larve. A. gnathosoma, vue ventrale ; B. gnathosoma, vue latérale ; C. patte-III, vue antérieure ; D. patte-III, vue postérieure ; E. patte-III-5, griffes (détail). Traits = 50  $\mu$ m.

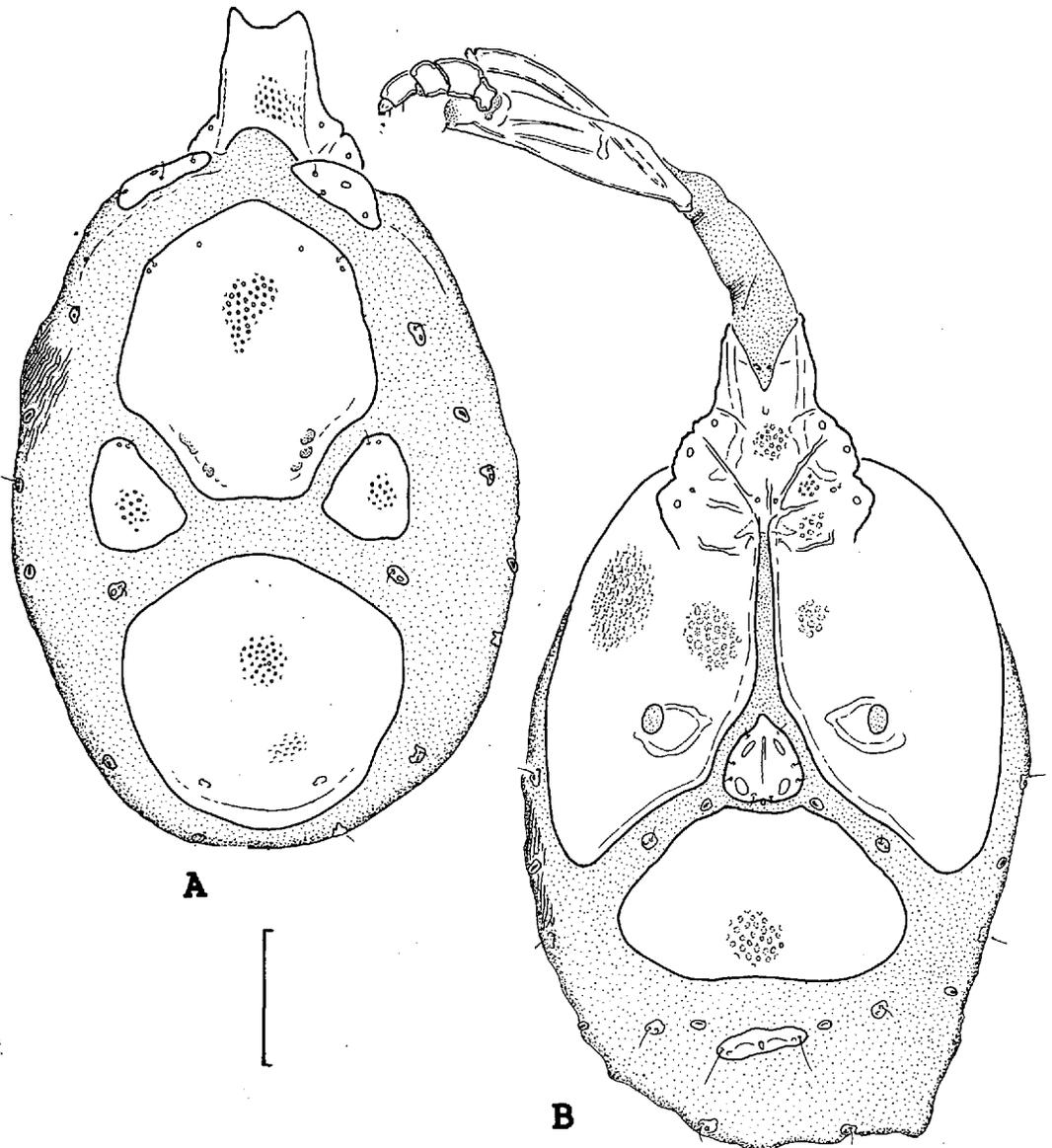


Fig. 5. *Psammotorrenticola gracilis*, deutonymph. A. idiosoma, dorsal view ; B. idiosoma, ventral view.  
Bar = 100  $\mu\text{m}$ .

Fig. 5. *Psammotorrenticola gracilis*, deutonymphe. A idiosoma, face dorsale ; B. idiosoma, face ventrale.  
Trait = 100  $\mu\text{m}$ .

but are present in adults. For the arrangement of further lyrifissures and glandularia in the integument, see Fig. 5 A, B. The coxal plate including the camerostome measure 400  $\mu\text{m}$  in length and 340  $\mu\text{m}$  in width. Like in adults, cx-1/2/3 form the base of the protruding camerostome, but the central and

caudal part of the ventrum are completely different. The cx-4 cover the anterior part of the ventrum only and are separated from each other by a membranous medial line. Their mediocaudal margins are slightly concave, protrude convexly near the caudal end of the provisory genital organ, and pass with

an abrupt angle into the lateral margin. The provisory genital organ (1/w 56/58  $\mu\text{m}$ ) has a blunt anterior tip, equally-rounded lateral margins and is slightly concave caudomedially. It bears three pairs of setae at its lateral margins and two pairs of oval acetabula ; the main axis of the anterior acetabulum is in anteriomedial-caudolateral direction, that of the posterior one in anteriolateral-caudomedial direction. A subtrapezoidal postgenital sclerite (1/w 128/215  $\mu\text{m}$ ) covers the surface caudal of the provisory genital organ. The most caudal region of the ventrum bears an enlarged excretale (width 66  $\mu\text{m}$ ) with the excretory porus accompanied by a pair of glandularia. All sclerites carry groups of fine pori arranged in regular rings. Measurements of mouthparts : Capitulum, ventral length 195  $\mu\text{m}$  ; chelicera, basal segment length 140  $\mu\text{m}$ , height 16  $\mu\text{m}$ , claw length 22  $\mu\text{m}$  ; palp (1/h - relative length, 1/h ratio) : p-1 16/19  $\mu\text{m}$  - 13.8, 0.84 ; p-2 37/28  $\mu\text{m}$  - 31.9, 1.32 ; p-3 20/25  $\mu\text{m}$  - 17.2, 0.80 ; p-4 29/17  $\mu\text{m}$  - 25.0, 2.8 ; p-5 20/12  $\mu\text{m}$  - 17.2, 1.66.

**Biology :** *P. torrenticola* has been found only in interstitial habitats. The two specimens recorded here were taken from a Karaman-Chappuis-dig in sandy substratum near a large pool of a rhithral brook.

**Distribution :** The monotypic genus is known only from Corsica. Santucci (1970, 1971) presumed the presence of a second species in the Porto region (the same region as this record), but the female specimen studied here agrees well with the original description.

### 3.2. Family Aturidae Thor, 1900

#### *Barbaxonella reverendissima* sp. nov.

**Type series :** Holotype  $\sigma$ , prep. 67/6/1 in coll. Gerecke, F 44g, France, Corse (2B), Ajaccio, Vico, F. Porto, Ponte Vecchiu, 08°46'E, 42°15'N, 230 m, 15.03.91, leg. Schwarz ; Paratype  $\sigma$  67/6/2 in coll. Gerecke, I 388 I, Sardegna (CA), Gerrei, Dolianova, R. Flumini near S.S. 387, U.T.M. NJ 14 61, 170 m, 31.05.86, leg. Gerecke. Both specimens dissected and imbedded in Hoyer's fluid. The paratype was almost dead and heavily damaged when it was found in an interstitial dig : palps and all leg segments 4-6 are lacking ; of both legs IV, only the basal segment is saved ; in left leg II, segments 2 and 3 are detached ; left leg III is lacking completely, and the proximal chamber of the genital skeleton is damaged.

**Diagnosis :** Male genital region as in *B. spectabilis* Gerecke & Meyer 1989, with groups of about 8 strong, medially-curved hook-like caudal setae. Deep, V-shaped depressions separate the genital area from the transverse ridge on the dorsal shield anteriolateral from the hair-bearing area surrounding the gonopore ; the posteriomedial margins of these depressions are evident as strongly-chitinized stripes under the lateral margins of the hair-bearing genital plates.

**Description :** Total length 430  $\mu\text{m}$ , width 355  $\mu\text{m}$  (dorsal shield 306  $\mu\text{m}$ ). Arrangement of eyes and of the organs in the dorsal furrow, and the structure of the dorsal plate are without peculiarities.

The posterior part of the dorsal shield (Fig. 6 A) is separated by a transversal ridge extended between a pair of glandularia about 200  $\mu\text{m}$  apart from each other. The slit-shaped dorsal part of the gonoporus is surrounded by a heart-shaped weakly chitinized area bearing fields of about 20 fine hairs, continuing into a row of hairs placed on both sides of the terminal part of the gonoporus. In the anterior angles of this inner genital area, a pair of openings can be seen, perhaps of glandular function. The outer genital area is formed by a pair of densely pilose plates that can be interpreted as the expanded anterior parts of genital plates. The small excretory porus is placed in the medial contact zone between the symmetric genital plates. Laterocaudally the pilose genital plates are on the same level with the surrounding chitinous areas, while they are increasingly elevated in anteriomedial direction, forming some kind of a bridge that reaches the elevated finely-porose region between the excretory porous and the transverse dorsal ridge. The bridge-like parts of the genital plates slope steeply towards the V-shaped incisions that separate the genital area from the lateral part of the dorsal ridge. The contact zone between the genital area and the transverse dorsal ridge is restricted to a 60  $\mu\text{m}$  wide stripe. The groups of about 10 strong caudal setae originate in the caudal transition zone between the inner genital area and the pilose genital plates. The most conspicuous of these caudal setae are strongly curved and terminate in a fine apical filament, while the two most lateral ones are relatively fine and only slightly curved ; ventrally, there are one or two shorter, sometimes bifurcate setae.

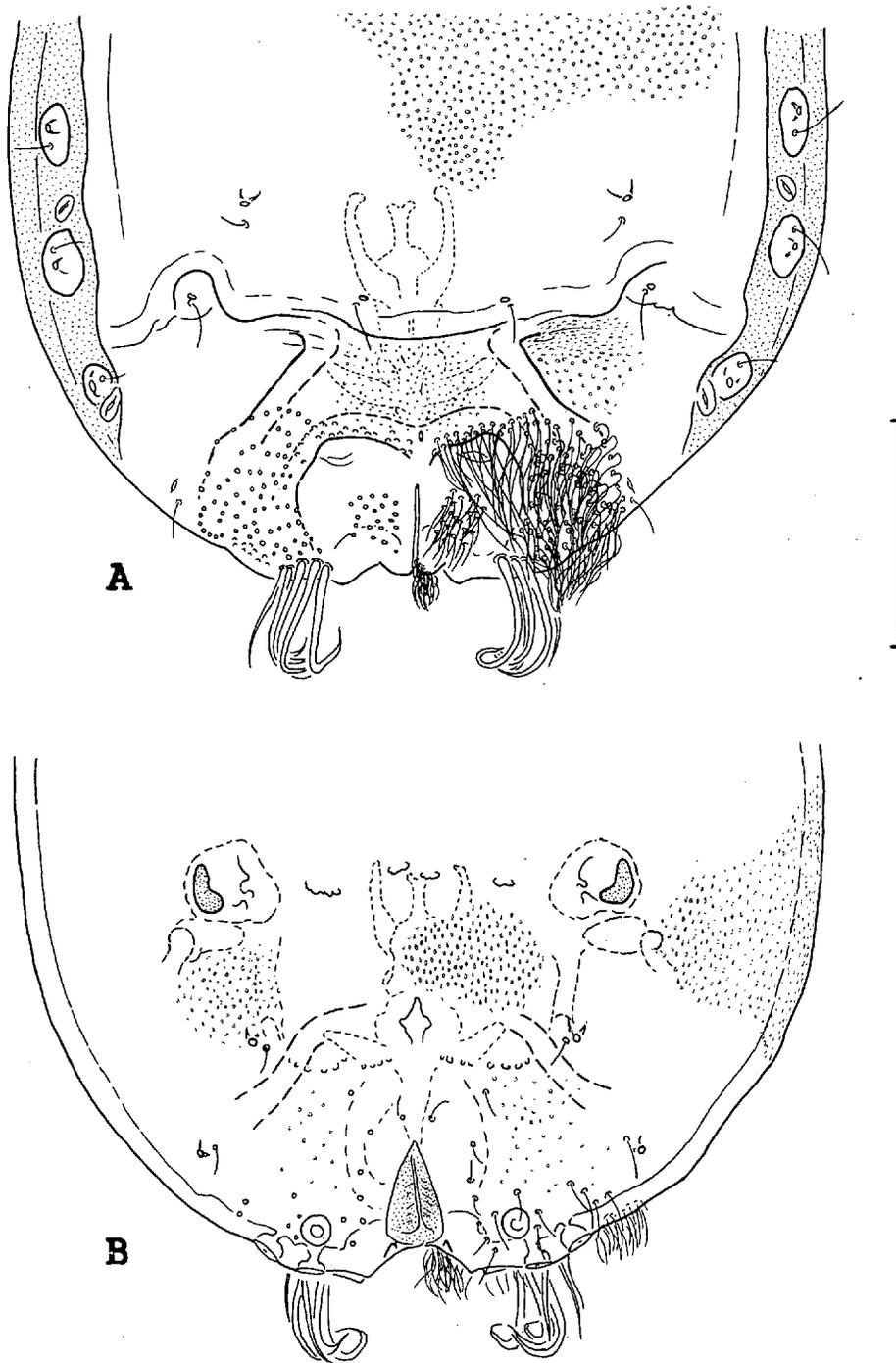


Fig. 6. *Barbaxonella reverendissima*, male, caudal region of idiosoma. A. dorsal view ; B. ventral view.  
Bar = 100  $\mu$ m.

Fig. 6. *Barbaxonella reverendissima*, mâle, idiosoma, région caudale. A. face dorsale ; B. face ventrale.  
Trait = 100  $\mu$ m.

In ventral view (Fig. 6 B), the three acetabula can be seen in triangular position on the level of the caudal setae. The ventral part of the gonoporus is enlarged caudally, accompanied by six pairs of fine setae; additional scattered setae surround the acetabular region. The heavily sclerified transverse anteriolateral margins of the dorsal genital plates can also be recognized from the ventral side. The coxae are shaped as described for *B. spectabilis*; the distance between lateral margins of cx-3 is 220  $\mu\text{m}$ .

The genital skeleton is 90  $\mu\text{m}$  in length, its general shape agrees with the description of *B. spectabilis*.

The measurements of the mouthparts are as follows: gnathosoma length 84  $\mu\text{m}$ , height 60  $\mu\text{m}$ ; chelicerae total length 150  $\mu\text{m}$ , height 28  $\mu\text{m}$  (1/h 5.3), claw 51  $\mu\text{m}$ , basal segment 98  $\mu\text{m}$  (basal segment/claw 1.9); palp total length 185  $\mu\text{m}$ , relative length [% total length] and 1/h ratio (in parentheses) of single segments: p-1 13 (1.6), p-2 23.8 (1.6), p-3 17.3 (1.5), p-4 33.0 (2.9), p-5 13.0 (3.4). Shape and chaetotaxy of mouthparts and legs are without notable differences when compared with *B. spectabilis*. Female unknown.

**Discussion:** The presence of strong, hook-like caudal setae on both sides of the genital organ characterizes *B. spectabilis* and *B. reverendissima* as members of a clearly separate clade («*spectabilis*-group») within the genus. Between the two species are only slight differences in body size (*B. spectabilis* generally taller, total length > 450  $\mu\text{m}$ , width > 370  $\mu\text{m}$ , width dorsal ridge > 220  $\mu\text{m}$ , width cx-3 > 240  $\mu\text{m}$ ), but measurements of mouthparts do not differ remarkably. The general shape of legs and mouthparts is also in good agreement: there are only slight differences in the relative length of p-1 (longer in *B. reverendissima*) and p-4 (longer in *B. spectabilis*), without significance for taxonomic separation of the two taxa. The key character of *B. reverendissima* is the isolation of the dorsal genital area from the lateral part of the dorsal ridge by a pair of profound, V-shaped incisions directed against each other. On each side, the mediocaudal margin of these incisions forms a heavily sclerified transverse ridge the margin of the pilose genital plate, while in *B. spectabilis* the sclerification of this area is at most slightly condensed.

**Biology:** Both specimens were taken from clean lowland streams with well developed hyporheic

habitats. Like *B. spectabilis* and other species of the genus, the new species should probably be regarded as hyporheophilous.

**Distribution:** *Barbaxonella* species of the *spectabilis*-group are only known from running water habitats in an area surrounding the Tyrrhenian Sea, with *B. spectabilis* present in Sicily and continental Italy (Gerecke 1991a) and *B. reverendissima* probably endemic to the Corso-Sardinian region.

### ***Prymnopsella bucculata* Gerecke, 1991**

**Locality records:** Italy, I 1162, Sardegna (NU), Gennargentu, Vallada Tedderi near Bacu s'Argiolas at 800 m asl. (NK 32 25), 15-IX-91, 2  $\sigma$ , 1  $\varphi$ . France, F 43b, Corse (2B), Ajaccio, Vico, F. Porto near Aitone, P. des Condamnés at 1 200 m asl. (08°52'E, 42°16'N), 14-XII-90, leg. Schwarz, 2  $\varphi$ ; F 43e, same station, 02-II-91, leg. Schwarz, 1  $\varphi$ ; F 43h, same station, 14-IV-91, leg. Schwarz, 2  $\varphi$ ; F 75, Ajaccio, Vico, F. Porto, Pont di a Tavulella near Evisa at 620 m asl., 5-VI-1990 leg. Schwarz, 1  $\sigma$ ; F 81, Corse (2B), Evisa, Rau. d'Aitone above Gorges de Spelunca at 300 m asl., 02-VI-93, 1  $\varphi$ ; F 92, Corse (2B), Galéria, Rau. de Tavulaghiu NE Pinzu di Corbi at 150 m asl., 11-VI-93, 2  $\sigma$ , 3  $\varphi$ .

**Morphology:** The additional specimens of this recently detected species agree well with the original description.

**Biology:** The new records demonstrate that *P. bucculata* is able to colonize a wide range of rhithral habitats, including brooks at low elevation. In Sardinia, it is restricted to mountain ranges, probably due to the pollution impact in other regions of the island.

**Distribution:** The monotypic genus is most probably endemic to Corsica and Sardinia.

### **3.3. Family Momoniidae Viets, 1926**

#### ***Momonides lundbladi* E. Angelier, 1951**

**Locality records:** France, F 52, Corse (2B), Calacuccia (Corte), Fango below station, 13-V-89 leg. Schwarz & al., 1  $\sigma$ ; F 35, Corse (2B), Calacuccia, Castiria, E slopes Capo d'Alici, rheocrenic spring at 390 m asl., 09°08'E, 42°23'N, 30-IX-91, 2  $\varphi$ ; F 39 I, Corse (2B), Murato (Bastia), Bevinco below Cinquerue (09°24'E, 42°36'N), interstitial dig at 50 m, 03-X-91, 1 deutonymph; F 79, Corse (2B),

Ota, Rau. de Furtolaccia in Gorges de Spelunca, 250 m, 02-VI-93, 1 ♂ ; Italy, I 1162 I, Sardegna (NU), Gennargentu, Vallada Tedderi near Bacu s'Angiolas, NK 32 25, interstitial dig at 800 m, 15.09.1991, 1 ♂, 5 ♀ ; I 1165 I, Sardegna (CA), Gerrei, Dolianova, R. Lassini near Case Porru, NJ 21 64, interstitial dig at 380 m asl., 17.09.1991, 2 ♂, 1 ♀.

**Morphology :** *M. lundbladi* is extremely similar to the two other species of the genus, *M. trabecularis* Lundblad, 1941 (for a description, see Lundblad, 1956) and *M. landbergi* Lundblad, 1971, both from East Asia. As to judge from the original descriptions, a diagnostic difference of *M. lundbladi* could be in the ventral denticules of p-5. They are finer and placed more closely to the anterior margin in the Asian species. More detailed information is needed on the latter, particularly on leg chaetotaxy and the male genital skeleton. Here, some additional information is provided on characteristics of *M. lundbladi*. The membranous integument is covered by a sod of finest spikes. In lateral position caudal from the insertion of I-IV, the cx-4 bear a porus of uncertain homology, containing membranous villi. The spherical genital acetabula are placed in three groups, each surrounded by a sclerified ring. The three groups consist of about 4-8 (group 1), 8 (group 2), and 8-12 (group 3) acetabula. This arrangement could be also interpreted as the presence of three pairs of acetabula (the plesiomorphic condition in Momoniidae), each subdivided in a larger number of secondary acetabula in the sense of Springer & Gerecke (1993). The male genital skeleton (Fig. 7 C, D) is similar to *Momonis falcipalpis* (Gerecke 1991a), with an arrow-like distal part formed by the brachia distalia in right-angled position, with short, robust brachia proximalia and well developed processus proximales with their tips frayed as muscle insertions. The carina anterior is a weakly-developed sclerified ridge, the carina posterior is completely reduced. All segments of L-I are longer than in the Asian species (L-I-1 - L-I-6 : 45, 78, 116, 119, 269, 90  $\mu\text{m}$ ). Legs II-IV bear numerous fine, long setae that could serve as swimming hairs. Additionally, on the ventral margin of L-IV-3/4/5 are series of three-pointed or multiply bifurcated setae (Fig. 7 B).

No descriptions have been published so far of deutonymphs of the genus *Momonides*. The deutonymph of *M. lundbladi* is in most regards similar to the adult. Total length of idiosoma is 390  $\mu\text{m}$ ,

width is 320  $\mu\text{m}$ , the length/height measurements of palp are p-1 23/19  $\mu\text{m}$ , p-2 35/26  $\mu\text{m}$ , p-3 40/43  $\mu\text{m}$ , p-4 33/21  $\mu\text{m}$  and p-5 23/12  $\mu\text{m}$ . A septangular platelet bears the provisory genital organ (Fig. 7 A) with two pairs of acetabula, the anterior subdivided into 6, the posterior into 8-11 secondary acetabula.

**Biology :** Most of the specimens so far recorded were collected in interstitial habitats. However, several findings in surface waters indicate that the species could be regarded as hyporheophilous rather than hyporheobiontic.

**Distribution :** The collecting sites in Sardinia are the first records outside Corsica. The species is most probably endemic to Sardinia and Corsica, and at the same time the only European representative of the aberrant subfamily Momonidinae.

#### **Momonisia phreatica Petrova, 1974**

**Locality records :** France, F 38 I, Corse (2B), Murato (Bastia), Bevinco near Mulino alle Noci, 09°21'E, 42°35'N, interstitial dig at 310 m asl., 03-X-91, 1 ♀ ; F 39 I, Corse (2B), Murato (Bastia), Bevinco below Cinquerue (09°24'E, 42°36'N), interstitial dig at 50 m asl., 03-X-91, 2 ♀.

**Morphology :** The specimens from Corsica correspond to all features published in the original description. Their total length/width is 450-550/370-430  $\mu\text{m}$ . Dorsally and laterally, the integument is densely covered by slender spikes and is finely lined in the area between the coxae. In its anterior part, the dorsum bears three pairs of sclerified plates, two of them smaller and placed in a transverse row, followed by one pair of larger plates ; the posterior part carries one pair of oval plates. The glandularia resemble little volcanoes, with a « main crater » formed by the glandular opening, accompanied by a « secondary crater » with the seta insertion. The coxae have fine pores, with some larger, lunate openings, the coxoglandularia 3 lie unfused in the membranous zone between cx-2 and cx-3. An anteriolateral protrusion of cx-3 partially covers the insertion of L-II.

The membranous zone surrounding the gonoporus is smooth (Fig. 8 D). The genital plates measure 31  $\mu\text{m}$  in length. Both post- and praegenital sclerites bear a long, rope-like, medial apodeme that extends towards the center of the idiosoma. The genital plates bear 4 lateral setae each. The excretory

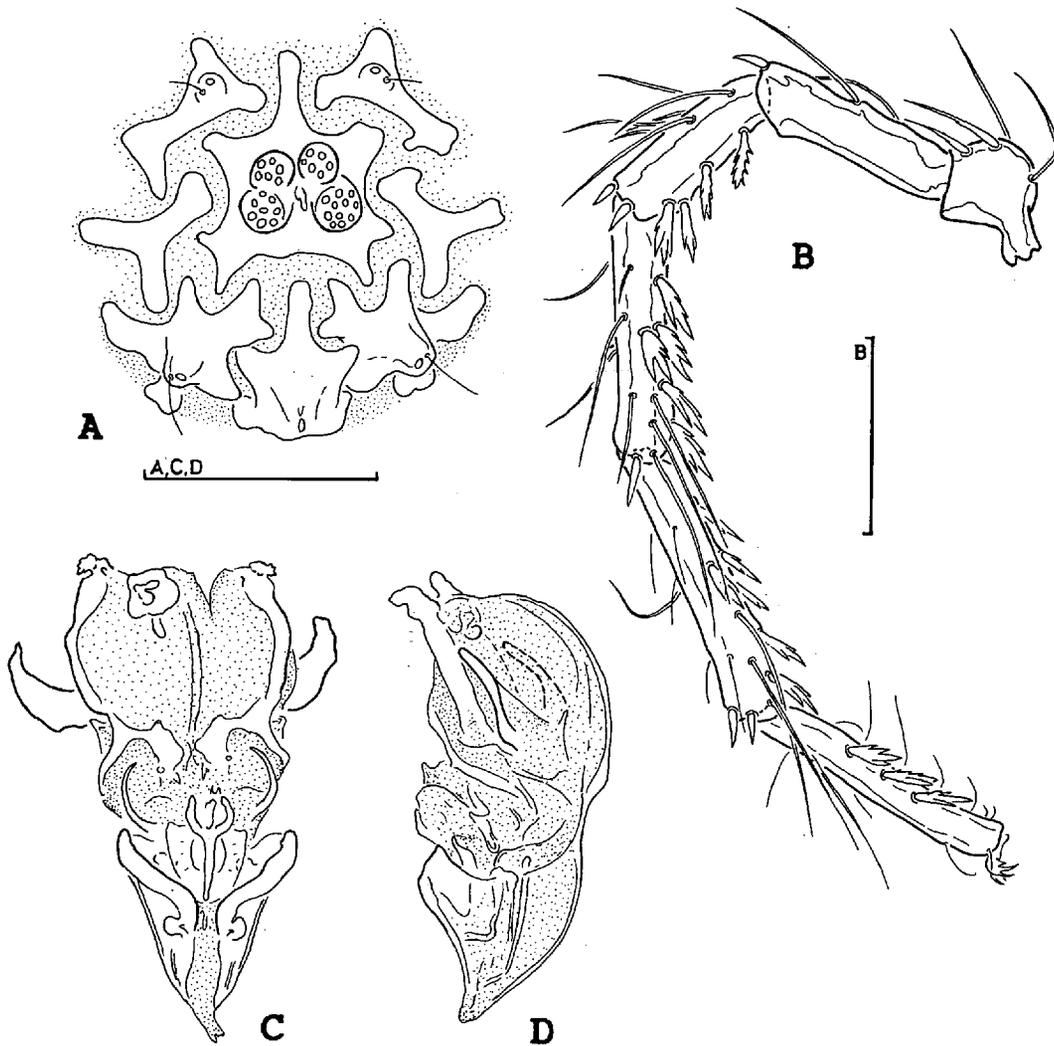


Fig. 7. *Momonides lundbladi*. A. deutonymph, provisory genital organ ; B. male, leg-IV ; C. genital sceleton, anterior view ; D. genital sceleton, lateral view. Bar = 100  $\mu\text{m}$ .

Fig. 7. *Momonides lundbladi*. A. deutonymphe, organe g nital provisoire ; B. M le, patte-IV ; C.D. Structure du support chitineux du p nis. C. vue ant rieure ; D. vue lat rale. Trait = 100  $\mu\text{m}$ .

porus is a small slit in an oval field without integumental spikes. In the most caudal region of the ventrum, a pair of small sclerified platelets bears two fine setae placed at both sides of a glandular opening, and an additionnal glandular porus (Fig. 8 D).

Measurements of mouth parts (Fig. 8 B, C) : capitulum, ventral length 108  $\mu\text{m}$ , palp total length 204  $\mu\text{m}$  ; palp segments (length/height, relative 1, l/h ratio) p-1 21/26  $\mu\text{m}$ , 10.3 %, 0.80 ; p-2 55/41  $\mu\text{m}$ , 27 %, 1.34 ; p-3 32/29  $\mu\text{m}$ , 15,7 %, 1.10 ; p-4 51/25  $\mu\text{m}$ , 25.0 %, 2.04 ; p-5 45/10  $\mu\text{m}$ , 22,1 %, 4.50. The capitulum bears a short rostrum ; the structure of its surface is similar to the coxae, the ventral margin in lateral view undulate. The chelicerae bear fine claws, the maximum height of the basal segment is near the distal end of the cheliceral cavity. The shape of the palp is typical for Momoniidae, with one dorsal seta on p-1, groups of long dorsal setae on p-2 and p-3. The ventral margin of p-2 is convexly protruded. The distal part of

1.10 ; p-4 51/25  $\mu\text{m}$ , 25.0 %, 2.04 ; p-5 45/10  $\mu\text{m}$ , 22,1 %, 4.50. The capitulum bears a short rostrum ; the structure of its surface is similar to the coxae, the ventral margin in lateral view undulate. The chelicerae bear fine claws, the maximum height of the basal segment is near the distal end of the cheliceral cavity. The shape of the palp is typical for Momoniidae, with one dorsal seta on p-1, groups of long dorsal setae on p-2 and p-3. The ventral margin of p-2 is convexly protruded. The distal part of

p-4 is enlarged ; it bears in the distal third two strong conic setae in ventrodistal and lateral position, one fine seta placed in the centre of the dorsal margin and one dorsodistal seta, shifted slightly towards the medial surface. The principal claw of p-5 is very strong, accompanied at its base by three accessory denticules and two hairs placed on the dorsal resp. ventral margins.

The legs are not robust. Segments 1-4 of all legs bear numerous long setae, the B-I-5 is elongated and swollen (length/height 240/58  $\mu\text{m}$ ). It bears one simple, short dorsal seta proximally, and a cornice of setae surrounding the distal margin (Fig. 8 A). The B-I-6 is boat-shaped, its insertion point divides the segment with a 1:4 ratio. The short basal tip bears three pointed denticules as a counterpart against

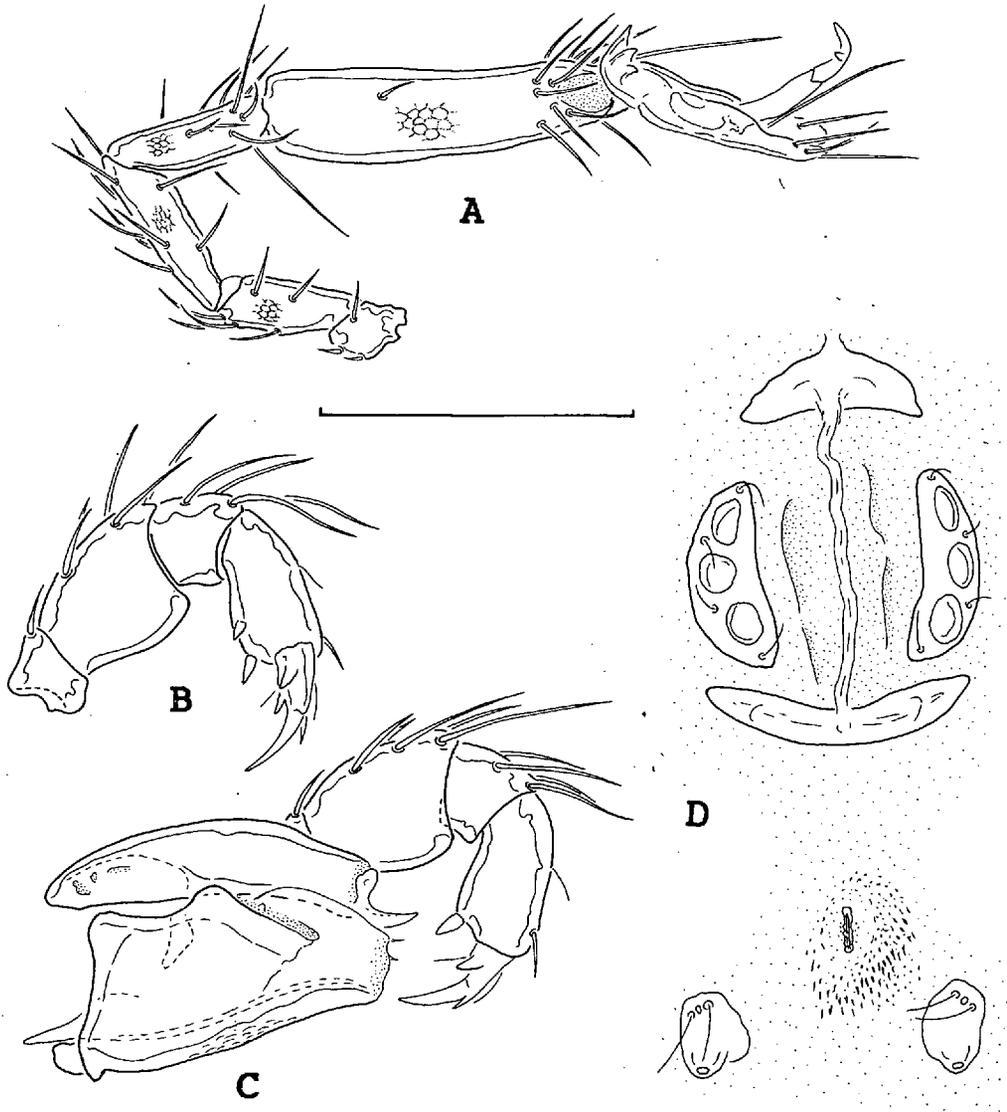


Fig. 8. *Momonisia phreatica*, female. A. leg-I ; B. right palpus, lateral view ; C. gnathosoma and left palpus, medial view ; D. genital organ and area of excretory porus. Bar =  $\mu\text{m}$ .

Fig. 8. *Momonisia phreatica*, femelle. A. patte-I ; B. palpe droit, vue latérale ; C. gnathosoma et palpe droit, vue médiane ; E. organe génital et région du pore excréteur. Trait = 100  $\mu\text{m}$ .

which the modified (two-pointed) claw can be folded. The claw insertion is in the distal third of the segment; apically from there, the segment is divided into two setigerous tips that can be interpreted as the modified claw sheath. Legs II-IV are without particular modifications. The claws bear a claw blade, and dorsal and ventral clawlets. The segments 1-5 bear strong dorsal setae and single fine hairs; on segments 4-6 long ventral setae are regularly arranged. The distal margins of segments 2-5 are with scattered sword-like setae, some of them are conspicuously long.

**Biology:** As indicated by the few so far known records, *M. phreatica* is probably a hyporheobiontic species.

**Distribution:** Presently, the genus *Momonisia* (with the only species *M. phreatica*) is known from Bulgaria and Corsica, but its distribution is probably more extended. The low number of findings in widely separate geographical regions is probably due to its general rareness as well as to our restricted knowledge of the interstitial fauna in large parts of Europe. Furthermore, the attribution of the Corsican populations to the species should be verified by studies on male specimens.

#### 4. Zoogeographical considerations

Among the species dealt with in this paper, *Bandakia concreta* is widely distributed in the W palaeartic region. *Utaxatax ventriplax*, *Nilotonia longipora*, *Manotonia tegulata* are widely distributed in Southern Europe, or at least in SW Europe.

These four species, all members of the family Anisitsiellidae, are crenobiontic and were believed to have very restricted distribution areas or were known only from single specimens. They belong to the particular fauna of weakly flowing springs rich in detritus at low elevations, a kind of habitat to which only rarely attention has been given during hydrobiological field work. Spring habitats probably represent the plesiotypical habitat in Anisitsiellid water mites (Smith 1991, Gerecke & Smith, in press). Our new data suggest that these species in S Europe have conserved their tertiary distribution patterns and were few affected by the pleistocenic climatic changings. The larger ecological plasticity of *B. concreta* possibly allowed to this species to survive the glacial periods in circumglacial interstitial and helocrene

habitats, or at least has favoured the postglacial recolonization of Central and Northern Europe.

To this group could belong also the hyporheobiontic *Momonisia phreatica*, but so far it has been found only in Corsica and Bulgaria, and the attribution of the Corsican specimens to this species needs confirmation.

*Bandakia corsica*, *Psammotorrenticola gracilis*, *Barbaxonella reverendissima*, *Prymnopsella bucculata* and *Momonides lundbladi* are most probably endemic to Sardinia and Corsica - *P. gracilis* is recorded only from Corsica.

Two of them, *Psammotorrenticola gracilis* and *Prymnopsella bucculata* represent endemic genera with uncertain taxonomic relations: *Psammotorrenticola* is most probably a sister group of *Stygomamersopsis*, a genus represented by two species in interstitial habitats on the Iberian peninsula (Cook 1974). However, the completely different shape and function of the mouthparts (camerostome lacking in *Stygomamersopsis*) indicate that these two taxa have been developing independently for very long times. The genera most closely related to *Prymnopsella* are *Hexaxonopsalbia* (Southern France, Spain) and *Sumatralbia* (Sumatra, Java). However, the completely different shape of the caudal region in these three genera does not permit an interpretation of their phylogenetical relations (Gerecke 1991b).

*Momonides lundbladi* is the only European representative of the subfamily Momonidinae (with the only genus *Momonides*, known from two further species collected in Sumatra and Java).

The separate taxonomic position, in *M. lundbladi* also the extremely disjunct distribution area, suggest that all these species should be regarded as palaeoendemic elements of the Tyrrhenian fauna, representatives of clades extinct for a long time in the remaining palaeartic region or at least separated from their closest parents since the separation of the Sardo-Corsican microplate in the late miocene aera (Maldonado 1985).

On the other hand, *Bandakia corsica* and *Barbaxonella reverendissima* are morphologically relatively close to continental species and could have well developed from ancestor populations that have reached the Tyrrhenian islands after their separation from the European continent: The character sets of European *Bandakia* species do not allow to interpret their phylogenetic interrelations, but

*Barbaxonella reverendissima* is clearly the sister species of *B. spectabilis*, a species living in Central and Southern Italy.

These new results confirm the exceptional properties of the water mite fauna of Corsica and Sardinia, and the close zoogeographical relations between these two islands, in accordance with the peculiarities rendered by studies on other aquatic invertebrate groups (Burmeister et al. 1987, Cianficconi & Moretti 1990, Giudicelli 1975).

#### Acknowledgements

I'm thankful to Astrid Schwarz for the gift of her water mite collection from Corsica, including the holotype of the new *Barbaxonella* species described here, and to Barbara Helm and Tim Starck for critically reading a former draft of this paper.

#### References

- Angelier E. 1959. — Hydrobiologie de la Corse. *Vie et Milieu*, Suppl. 8 : 1-195.
- Burmeister E.-G., Dettner K. & Holmen M. 1987. — Die Hydradeptera Sardiniens (Insecta, Coleoptera : Gyrimidae, Halplidae, Noteridae, Hygrobiidae, Dytiscidae). *Spixiana*, 19 : 157-185.
- Cianficconi F. & Moretti G. 1990. — Zoogeographical aspects of the trichopteran fauna (Insecta Trichoptera) of Corsica, Sardinia and Sicily. *Acc. Naz. Linc., Atti Convegni Lincei*, 85 : 493-519.
- Cook D.R. 1974. — Water mite genera and subgenera. *Mem. Am. Ent. Inst.*, 21 : VII + 1-860, Ann Arbor.
- Gerecke R. 1988. — *Limnolegeria longiseta* Motas (Acari, Actiniedida) : Zur Morphologie, systematischen Stellung und Ökologie einer wenig bekannten Wassermilbe, mit Erstbeschreibung der Nymphe. *Arch. Hydrobiol.*, 112 : 611-626.
- Gerecke R. 1991. — Über drei Arten der Gattung *Bandakia* Thor, 1913 aus Mittel- und Südeuropa (Acari : Actiniedida : Anisitsiellidae). *Senck. Biol.*, 71 : 139-153.
- Gerecke R. 1991a. — Systematische, faunistische und ökologische Untersuchungen an Wassermilben aus Sizilien, unter Berücksichtigung anderer aquatischer Invertebraten. *Lauterbornia*, 7 : 1-303.
- Gerecke R. 1991b. — *Prymnopsella bucculata*, gen. nov., sp. nov., a New Water Mite (Aturidae, Actiniedida, Acari) from the Gennargentu Mountains (Sardinia, Italy). *Aquatic Insects*, 13 (2) : 107-114.
- Gerecke R. 1992. — A remarkable New *Nilotonia*-Species from the Pollino Mountains (Southern Italy). *Spixiana*, 15 (1) : 97-105.
- Gerecke R. & Di Sabatino A. In press. — Historical zoogeography and evolution of habitat preference in water mites (Acari : Hydrachnellae) of the Central Mediterranean region. Proc. 9th Int. Congr. Acarol., Columbus (Ohio), 1994.
- Gerecke R. & Meyer L.E. 1989. — *Barbaxonella spectabilis* n. sp., eine neue Wassermilbe (Acari, Actiniedida, Aturidae) aus den Monti Iblei (Sizilien). *Lauterbornia*, 2 : 13-24.
- Gerecke R. & Smith I.M. 1993b. — Description of larvae of *Nilotonia longipora* (Walter, 1925) (Acari : Hydrachnidia) with remarks on the relationships and classification of *Nilotonia* Thor, 1905. *Internat. J. Acarol.*, 19 (3) : 259-266.
- Gerecke R. & Smith I.M. In press. — On the Biology of the Spring-dwelling Water mite *Nilotonia longipora* (Walter, 1925) (Acari, Actiniedida, Anisitsiellidae). Proc. 2nd Congress EURAAC, Krynica 1992.
- Giudicelli J. 1975. — Analyse de l'endemisme dans la faune des eaux courantes de la Corse. *Ecol. Med.*, 1 : 133-147.
- Lundblad C.O. 1956. — Einige Wassermilben aus Java. *Boll. Lab. Zool. Gen. Agr. « Filippo Silvestri », Portici*, 33 : 640-656.
- Lundblad C.O. 1968. — Die Hydracarinen Schwedens, III. *Ark. Zool.*, (2) 21 (1) : 1-633.
- Lundblad C.O. 1971. — Weitere Beiträge zur Kenntnis der Fließwassermilben Javas. *Ark. Zool.*, (2) 23 (5) : 293-359.
- Maldonado A. 1985. — Evolution of the Mediterranean Basins and a Detailed Reconstruction of the Cenozoic Paleogeography. Chapter 2 in : Margalef R. [ed.] : *Western Mediterranean. Key environments*, Pergamon Press : 17-59.
- Santucci J. 1970. — Contribution à l'étude du comportement estival de quelques hydracariens (Hydrachnellae) psammiques d'un torrent de Corse - Le Porto. *Ann. Fac. Sci.*, 44 : 191-211.
- Santucci J. 1971. — Contribution à l'étude de la répartition des Hydracariens (Hydrachnellae) des eaux superficielles d'un torrent de Corse - Le Porto. *Ann. Fac. Sci.*, 45 : 81-99.
- Schwoerbel J. 1963. — Süßwassermilben aus Mazedonien. *Acta Mus. Macedon. Sci. Nat.*, 9 (4) : 215-226.
- Schwoerbel J. 1991. — Eine interessante Wassermilbenfauna in Quellen am Mindelsee. Veröff. Natursch. Landschaftspflege Bad.-Würt., 66 : 409-413.
- Smith I.M. 1991. — Water mites (Acari : Parasitengona : Hydrachnidia) of spring habitats in Canada. *Mem. ent. Soc. Can.*, 155 : 141-167.
- Springer M. & Gerecke R. 1993. — The male of *Neotorrenticola plumipes* from Costa Rica (Acari, Actiniedida, Limnesiidae). *Studies Neotrop. Fauna Environment*, 27 (4) (1992) : 243-252.
- Viets K. 1950. — Water mites (Hydrachnellae) from Greece. *Journ. Quekett Microsc. Club, London*, (s.4), 3, 3 : 150-161.
- Viets K.O. 1978. — Hydracarina. In : Illies J. [ed.], *Limnofauna Europaea*, 2. Aufl., G. Fischer, Stuttgart : 154-181.