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Groundwater crustaceans of Spain, 13 (Copepoda Calanoida)

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Abstract

Two calanoid copepods were collected from groundwaters in Spain by the University of Amsterdam Expeditions in 1983–84 and 1985. *Copidodiaptomus numidicus* was found in southwestern Spain, in provincias Huelva and Sevilla. *Mixodiaptomus laciniatus*, previously known in Spain only from the Pyrenees, was collected in the Cantabrian Mountains.

Resumen

Dos copépodos calanoida fueron colectados de aguas subterráneas españolas durante las expediciones de 1983–84 y 1985, por el grupo de la Universidad de Amsterdam. *Copidodiaptomus numidicus* fue encontrado en el sudoeste de España, en las provincias de Huelva y Sevilla. *Mixodiaptomus laciniatus*, registrado unicamente para las Montes Pirineos, fue colectado en las Montañas de Cantabria.

Introduction

The University of Amsterdam Expeditions to the West Indian Islands in 1978 and 1979, led by Professor Jan H. Stock, enabled me to describe two new species of groundwater diaptomid copepods: *Notodiaptomus caperatus* Bowman (1979) from Barbuda, and *Mastigodiaptomus nesus* Bowman (1986) from the Bahamas, Caicos, Cuba, and the Cayman Islands. Continuing Professor Stock's tradition, the University sent several expeditions to Spain to sample the groundwater fauna. In two of these expeditions calanoid copepods were collected, in August 1983 to September 1984, and in June to July 1985. The first expedition collected at 490 stations; 2 of the samples contained calanoids. The second expedition collected at 132 stations, 7 of which yielded calanoids. A single species of calanoid was collected on each expedition: *Mixodiaptomus laciniatus* (Liljeborg, 1889) on the 1983–1984 expedition, *Copidodiaptomus numidicus* (Gurney, 1909) on the 1985 expedition. For lists of stations and preliminary results see Notenboom & Meijers (1985) and Van den Hurk & Leys (unpublished).

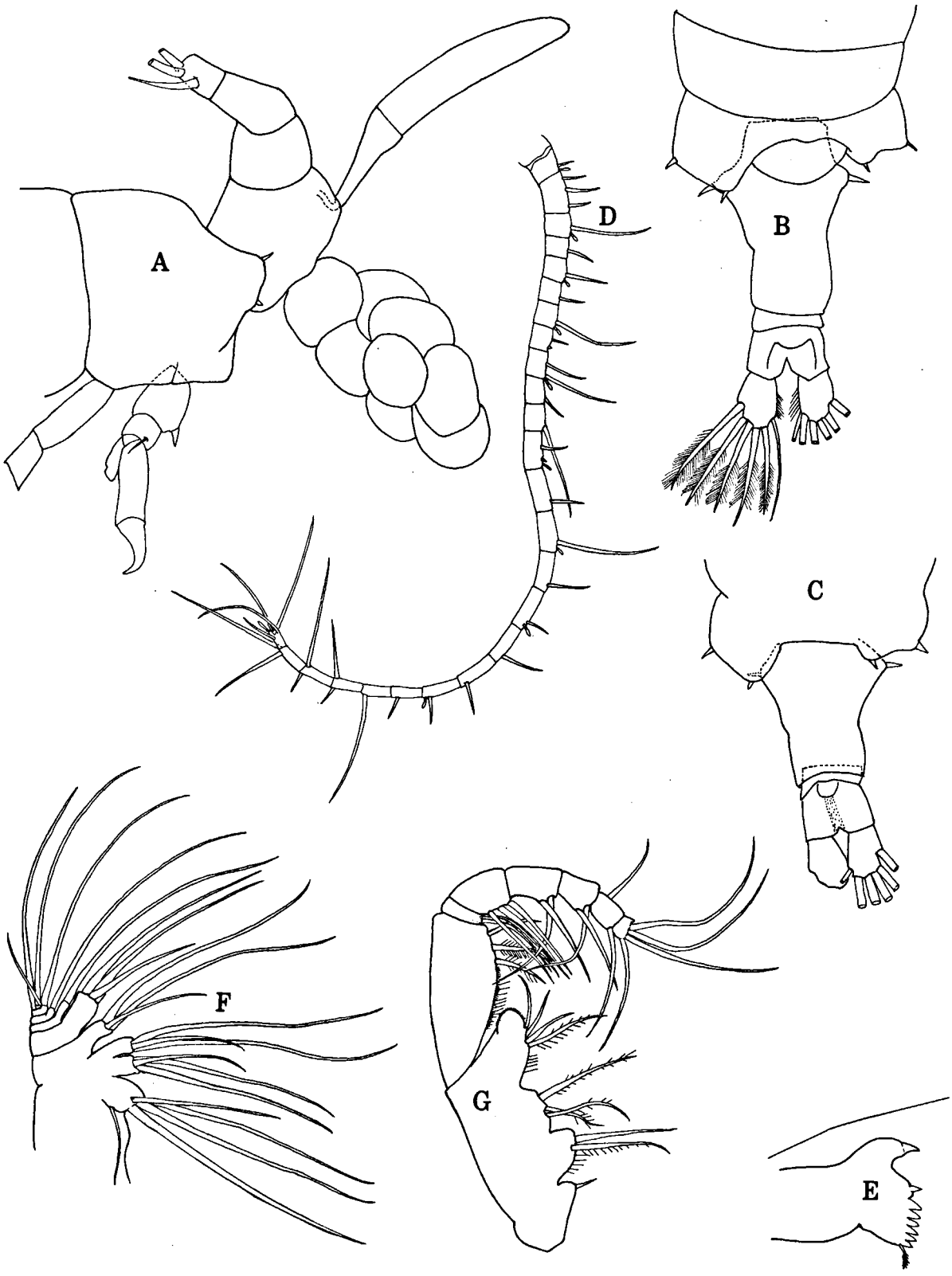
Copidodiaptomus numidicus (Gurney) (Figs. 1, 2)

Diaptomus numidicus Gurney, 1909: 295–298, pl. 12, figs. 28–32, pl. 13, figs. 33–34; Roy & Gauthier, 1927: 559.

Eudiaptomus numidicus; Kiefer, 1932: 502; Gauthier, 1934: passim; Borutskii, 1960: 37, fig. 12 (1); Dussart, 1964: 121–122, fig. 2; 1967: 96–97.

Copidodiaptomus numidicus; Kiefer, 1968: 62–64, fig. 57; Stella, 1970, figs. 21–29; 1982: 47, fig. 29; 1984: 65–67, fig. 26; Stella & Margaritora, 1976: passim; Galhano et al., 1982: 14.

Material. – Spain. Provincia Huelva, collected from wells with a vertical closing net (Cvetkov) with a diameter of 30 cm and a mesh size of 400 μm: Sta. A85/6–4, Valle de San Francisco, Cartaya, UTM coordinates PB 664269, altitude 10 m, 22 June 1985, 32 specimens. A85/6–5, Valle del Pozo, Cartaya, UTM coordinates PB 675297, altitude 45 m, 22 June 1985, 26 specimens. A85/6–12, Madre del Aqua, Villanueva de los Castillejos, UTM coordinates PB 618452, altitude 140 m, 23 June 1985, 26 specimens. A85/6–13, Pozo de Fuente Blanco, Villanueva de los Castillejos, UTM coordinates PB 646465, altitude 140 m, 23 June 1985, 1 ♂ and 1 ♀. A85/6–29, 4 km S.S.W. of Villanueva de los Castillejos, UTM coordinates PB 44, altitude


A
D
B
C
F
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E

180 m, 25 June 1985, 47 specimens. A85/6–30, Fuente de Cachajón, Puebla de Guzmán, UTM coordinates PB 56, altitude 195 m, 25 June 1985, 30 specimens. Provincia Sevilla, collected with Bou-Rouch pump: A85/7–2, Presa de Retortillo, Peñaflor, UTM coordinates TG 967800, altitude 55 m, 1 July 1985, 14 specimens.

Distribution. – Originally found in pools at Oued Tindja, near Tunis (Gurney, 1909), *C. numidicus* was subsequently reported from other localities near the coast in Tunisia and Algeria (Roy & Gauthier, 1927; Gauthier, 1934). Dumont & Decraemer (1977) did not find it in collections from Morocco, although they predicted that it will almost certainly be found in that country. It has been found on the Mediterranean islands of Corsica (Champeau, 1971), Sardinia (Stella, 1970), and Sicily (Stella, 1979). In southern Spain it occurs in the marshy 'Las Marismas' near the mouth of the Guadalquivir River in Provincia Sevilla (Dussart, 1964, 1967). Further north it is found in three reservoirs in the central stretch of the Guadiana River, which separates Provincias Badajoz and Caceres (Armengol et al., 1988). Finally it has been taken from impoundments on the Douro River where it forms the Portugal-Spain boundary (Galhano et al., 1982).

The 1985 expedition collected in all the southern coastal provinces of Spain (Huelva, Cádiz, Málaga, Granada, and Almería) plus Sevilla and Jaén, but found *C. numidicus* only in six wells in Huelva and in one Bou-Rouch pump sample in Sevilla. The 1983–84 expedition put most effort into collecting in the northern and eastern provinces, but also took samples in Cádiz, Málaga, and Jaén. No calanoids were taken in these last three provinces. It appears that the distribution of *C. numidicus* in Spain, excluding the Douro River impoundments, is limited to the most southwestern provinces.

The known distribution of *C. numidicus* is doubly disjunct. The most western record in Algeria, near Algiers, is about 900 km from Las Marismas, and the Douro River impoundments lie almost 400 km north of Provincia Huelva. These gaps could be the result of inadequate collecting; if not, a comparison of the three populations might be revealing.

Remarks. – The present specimens agree with published descriptions and illustrations except for a few aspects:

The antenna 1 (Fig. 1D, 2A) has not been illustrated previously. Despite repeated examination of the antenna 1 in different aspects, I failed to find an esthete on segment 2, where it is characteristically present in the Diaptomidae.

Mandibular blade, 2nd maxilla, and maxilliped (Figs. 1E, F, G) are typical for the Diaptomidae.

Female leg 5 endopod (Fig. 2F) with weak transverse suture proximal to midlength; apex with short seta only at medial end of row of 4–5 hairs rather than at both ends as shown by Stella (1970: figs. 23, 24; 1982: fig. 29B; 1984: fig. 26C).

Legs 1–4 similar in both sexes (Figs. 2B–E). Pedigers 4–5 and urosome as illustrated (Figs. 1A–C).

Male leg 5 (Figs. 2G–H), right 2nd exopod with small papilla on medial margin proximal to midlength and curved shallow sulcus on central part of posterior surface; apex of right endopod with short seta at lateral end but not at medial end of row of hairs.

Mixodiaptomus laciniatus (Liljeborg) (Fig. 3)

Diaptomus laciniatus Liljeborg, in: De Guerne & Richard, 1889: 47–49 (99–101), pl. 1 figs. 22, 24, 25; Gurney, 1931: 139–148, figs. 170–182.

Mixodiaptomus laciniatus; Kiefer, 1932: 506; Dussart, 1967: 145–147, fig. 50; Rey & Capblancq, 1975: passim; Stella, 1982: 63–64, fig. 39; 1984: 85–87, fig. 34.

Material. – Spain. Provincia León, collected with Bou-Rouch pump: Sta. 83–10/36, Río Porma, Venta de Remellán, Bonar, UTM coordinates UN 117522, altitude 1000 m, 20 October 1983, 53 specimens. Sta. 83–10/37, Río Porma, Camposolillo, UTM coordinates UN 162618, altitude 1150 m, 20 October 1983, 2 ♂♂ and 3 ♀♀.

Distribution. – *M. laciniatus* is a boreoalpine species ranging from Iceland and Scotland to Scandi-

Fig. 1. Copidodiaptomus numidicus, ♀, from sta. A85/6–4: A, pedigers 4–5 and urosome, with attached egg sac and spermatophore, lateral; B, C, pedigers 4–5 and urosome, dorsal; D, antenna 1; E, gnathal lobe of mandible; F, maxilla 2; G, maxilliped.

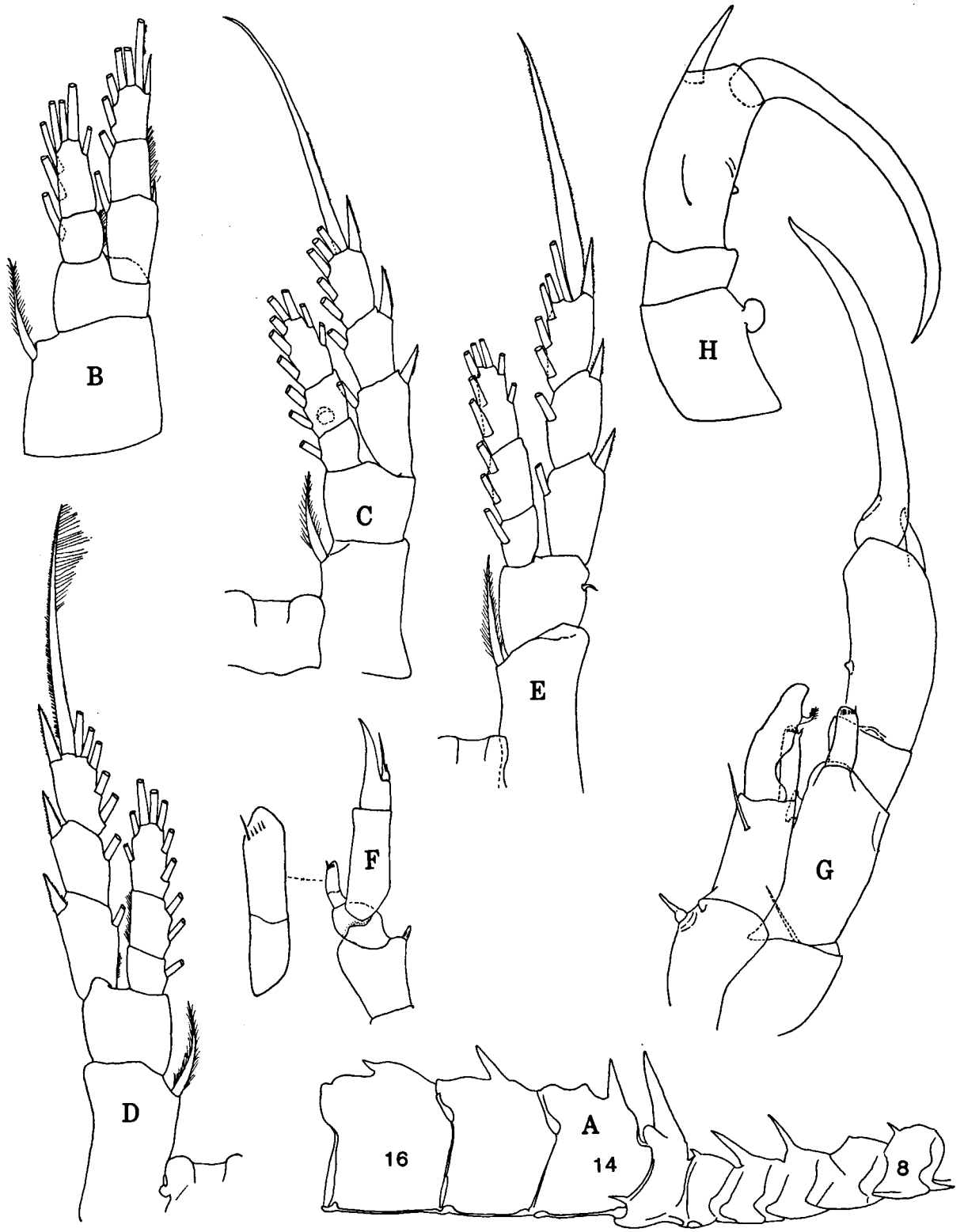

Fig. 2. Copidodiaptomus numidicus from sta. A85/6–4: A, right antenna 1 ♂, segments 8–16; B, leg 1; C, leg 2; D, leg 3; E, leg 4; F, leg 5 ♀; G, leg 5 ♂, anterior; H, basipod and exopod of leg 5 ♂, posterior.

navia, Finland, and northern U.S.S.R. from the nothern Ural mountains to the Kola Peninsula. To the south it occurs in the German Black Forest, the Alps and Pyrenees and the Balkans. The most southern localities are the Atlas Mountains of Morocco (François, 1949b; Kiefer, 1954). In the southern part of its range it occurs only at high altitudes. The 1983–1984 expedition sampled 31 localities with elevations of 1000 m or greater, but collected *M. laciniatus* at only the 2 stations listed above, both in the southern foothills of the Cantabrian Mountains. This extends the known range about 400 km to the west in Spain, in which it was previously known only from the Pyrenees (Liljeborg, in: De Guerne & Richard, 1889; François, 1949a; 1950; Rey & Capblancq, 1975).

Remarks. – In addition to the nominotypical subspecies, two subspecies are recognized in *M. laciniatus*: *M. l. migoti* Monard, 1928, from the Pyrenees, and *M. l. atlantis* Kiefer, 1954, from Morocco. Isolated populations of diaptomids in mountain waters can be expected to develop morphological differences, and the discovery of additional subspecies would not be surprising.

Geographically, the nearest population of *M. laciniatus* to the present one is *M. l. migoti*. The latter is characterized by the more acutely pointed tooth at the base of the claw in the ♂ right leg 5, and by the 2-segmented endopod of the ♀ leg 5. However, the tooth at the claw base is illustrated in the original description by Liljeborg (in: De Guerne & Richard, 1889: pl. 1, fig. 22) as a rounded swelling with three low surface lobes. Liljeborg's figure, presumably based on specimens from Bergen, Norway, is reproduced, slightly modified, by Stella (1982: fig. 39B; 1984: fig. 34C). Sars (1902: pl. 62), Gurney (1931: fig. 180), Kiefer (1954: fig. 32), Dussart (1967: fig. 50), and Petkovski (1983: fig. 40E) show a tooth similar to the one in my drawing of ♂ leg 5 (Fig. 3C), pointed, but less acute than in *M. l. migoti*. There is a greater difference between the rounded claw base described by Liljeborg and the pointed ones mentioned by subsequent authors than between the latter and the pointed claw base illustrated for *M. l. migoti* by Monard (1928: fig. 11).

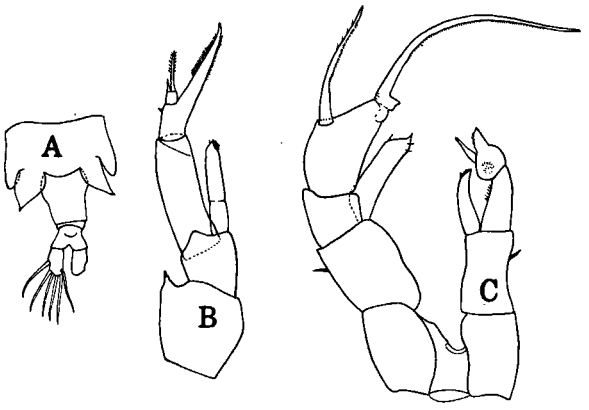

Fig. 3. Mixodiaptomus laciniatus from sta. 83–10/36: A, ♀ pedigers 4–5 and urosome, dorsal; B, leg 5 ♀; C, leg 5 ♂, posterior.

All illustrations of the ♀ leg 5 of *M. laciniatus* show a 1-segmented endopod. The ♀ leg 5 of *M. l. migoti* has not been illustrated, but the endopod is stated by Monard (1928) and Dussart (1967) to be 2-segmented. The Cantabrian specimens have an incompletely divided endopod. A transverse suture is present on the posterior surface but does not continue onto the anterior surface (Fig. 3B). The ♀ pedigers 4–5 and urosome are illustrated in Fig. 3A.

The Cantabrian specimens are not assigned to any of the three subspecies of *M. laciniatus*. They demonstrate the need for a study of the extent of variation over the entire range of the species. Analysis of measurements of a number of characters of populations from different parts of Lake Maggiore in northern Italy have shown significant differences between separate populations within a single lake (Baldi et al., 1945; Baldi, 1946; Baldi et al., 1949).

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