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# REMARKS ON THE IDENTITY OF *ECHINOGAMMARUS THONI* (SCHÄFERNA, 1922) WITH DESCRIPTION OF A NEW SPECIES, *ECHINOGAMMARUS CYRTUS*, FROM SOUTHERN FRANCE (CRUSTACEA, AMPHIPODA)

Sjouk PINKSTER & Dirk PLATVOET

ABSTRACT

The identity of *Echinogammarus thoni* is discussed and a redescription is given based on topotypic material. Comparative descriptions are given of *E. cyrtus* n. sp. and *E. antalyae* G. Karaman, new rank, that hitherto have been confused with *E. thoni*.

## INTRODUCTION

When Schäferna, 1922, described *Echinogammarus thoni*, he classified it within the genus *Carinogammarus* Stebbing, 1906, together with species that are presently known to belong to other genera like *Gammarus roeseli* Gervais, 1835, *Gammarus argaeus* Vavra, 1902, *G. triacanthus*, *E. scutarensis* and *E. pungentiformis* (all Schäferna, 1922). His main reason for doing so was the presence in all these species of a distinct, more or less compressed keel on all pleon segments. Apparently, to Schäferna this feature was so characteristic that he did not pay much attention to other characters which are now considered to be of generic value like the relative length of the endopodite in uropod 3, or of specific value like the setation of the pereiopods, thus creating a basis for later confusion. Because of the short endopodite of uropod 3, Schellenberg (1937) ranked *thoni* with the (sub)genus *Echinogammarus*, an opinion followed by Straškraba (1967), Stock (1968) and subsequent authors.

Because of the keeled meta- and urosome *E. thoni* seemed to be a well defined species within the *Echinogammarus pungens*- group (Stock, 1968) and Stock did not hesitate long to identify the *Echinogammarus* populations from the source and upper course of the river Lez in southern France as *E. thoni* although he did not study any material from the type-locality.

In 1977 the senior author restudied this material and some samples of Yugoslavian *E. thoni* in the collections of G. Karaman, Titograd and to his surprise these animals showed important morphological differences with those from southern France.

Morphological characters of freshwater gammarids may vary considerably both geographically (Goedmakers, 1972; Pinkster, 1983) and seasonally (Karaman & Pinkster, 1977). Therefore, be-

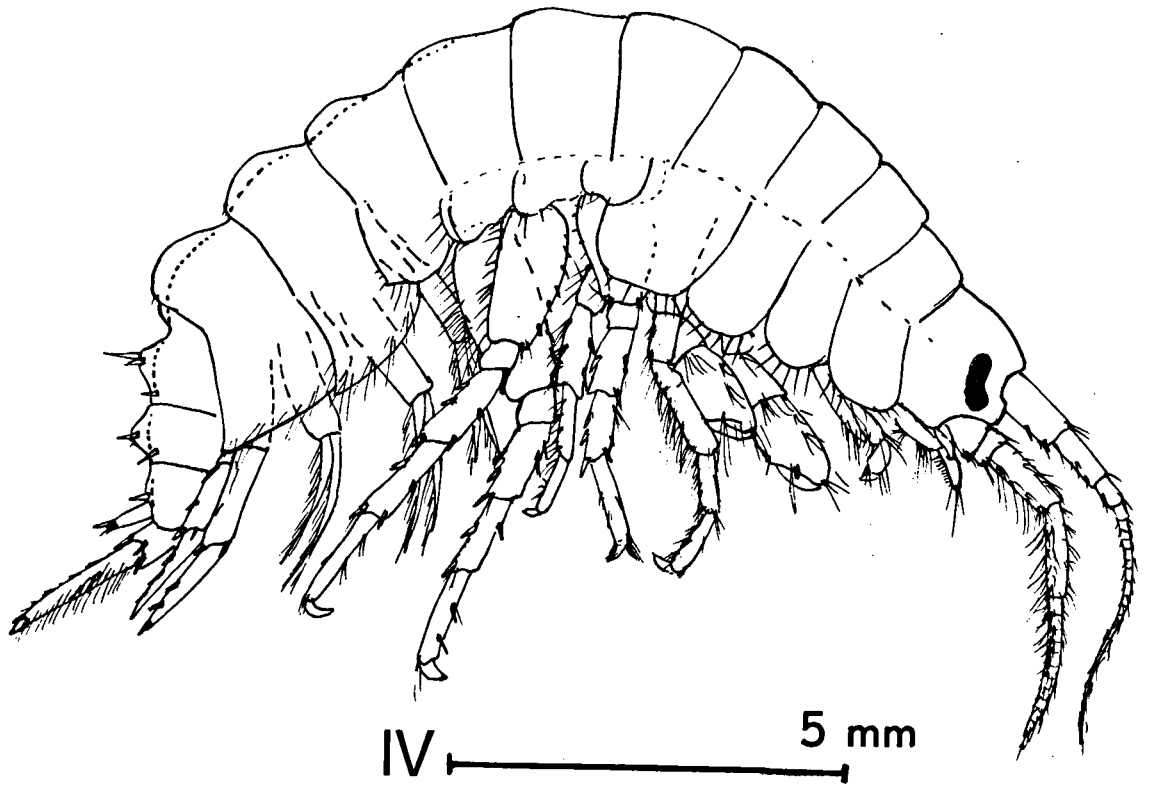


Fig. 1. *Echinogammarus cyrtus* n.sp., from the source of the river Lez, dépt. Hérault, France Habitus of male (scale IV).

fore drawing conclusions large samples were collected at the type-locality of *E. thoni* and in adjacent areas to be compared with samples from southern France collected at different times of the year. The differences found appeared to be stable and consequently we decided that the populations from southern France should be considered an independent species.

In Titograd we also studied the type-material of *E. thoni antalyae* G. Karaman, 1971 and found that important differences exist between these Turkish subspecies and the nominal (sub)-species from Yugoslavia, especially in the shape of the metasome segments. Although this form is known from the type-locality only and little is known about the variability of certain characters, we are of the opinion that these differences are important enough to consider it a separate species, *E. antalyae*.

## DESCRIPTIVE PART

### *Echinogammarus thoni* (Schäferna, 1922)

(Figs. 2, 3)

*Carinogammarus thoni* Schäferna, 1922: 42-45, 99, 102, figs. 19-21, pls. 1, 4; S. Karaman, 1929: 93-94.
*Gammarus (Echinogammarus) thoni;* Schellenberg, 1937: 271.
*Echinogammarus thoni* Straškraba, 1967: 205; G. Karaman, 1974: 8 (part); Pinkster, 1978: 247; Barnard & Barnard, 1983: 490, map 40; non: Stock, 1968: 38-40, figs. 11-13.
Position uncertain: *Ostiogammarus thoni semicarinatus* S. Karaman, 1934: 329-330.

Material examined.-

Yugoslavia, prov. Bosna i Hercegovina: Deransko Jezero, near mouth of Neretva River, near Dračevo, E. of Metkovic, 10 May 1977 (=type-locality), many specimens (Z.M.A.). River Bregava, at Klepci, N.E. of Metkovic, 10 May 1977, many specimens (Z.M.A.). River Buna, at Buna

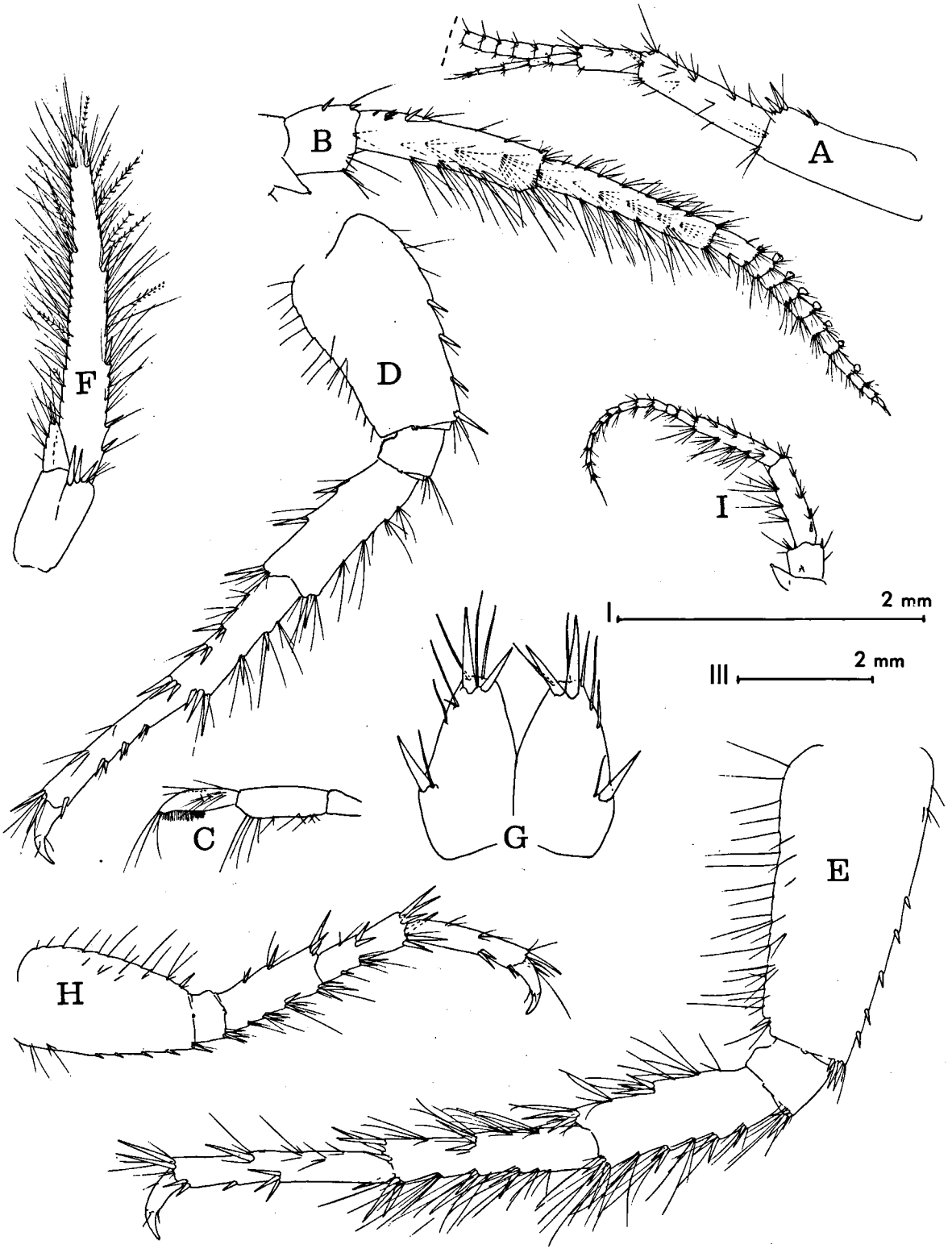


Fig. 2. *Echinogammarus thoni* (Schäferna, 1922), A-G, ♂; H-I, ♀ from the Deransko Jezero, Yugoslavia. A, first antenna (scale I); B, second antenna (I); C, mandible palp (I); D, fifth pereiopod (I); E, seventh pereiopod (I); F, third uropod (I), G, telson (II); H, seventh pereiopod (II); I, second antenna (I).

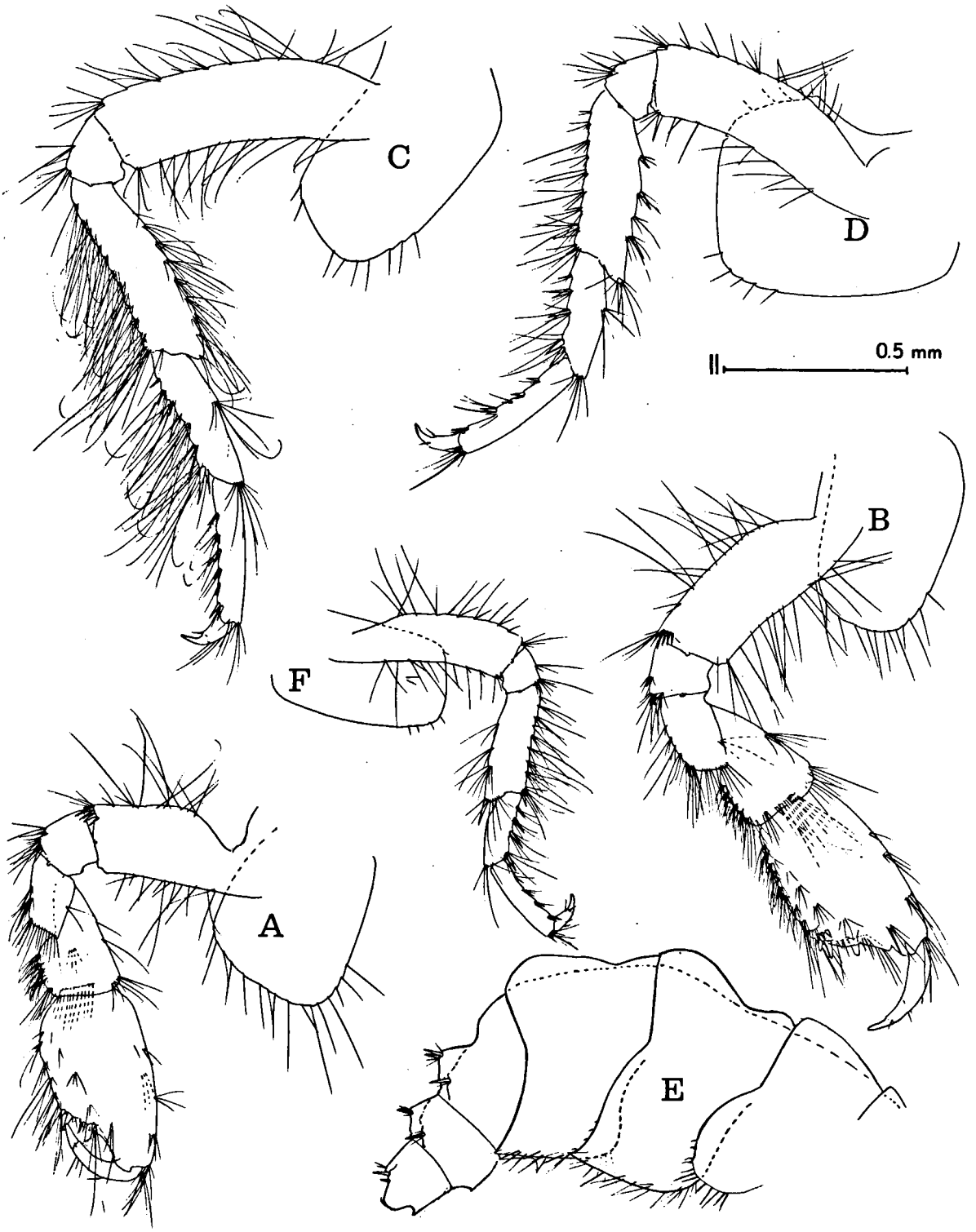


Fig. 3. *Echinogammarus thoni* (Schäferna, 1922), A-E, ♂; F, ♀ from the Deransko Jezero, Yugoslavia. A, first gnathopod; B, second gnathopod; C, third pereiopod; D, fourth pereiopod (all scale I); E, meta- and urosome (scale III); F, third pereiopod (I).

near confluence with River Neretva, S. of Mostar. 10 May 1977, many specimens (Z.M.A.). Spring Morino, near Metković, 11 Nov. 1968, many specimens (collection G. Karaman, Titograd).

Description male.-

A medium large species; the largest male available (out of some 1000 specimens) about 17 mm long. Lateral lobes of the head truncate. The eyes 1.75 to 2 times as long as wide; distance of the upper margin of the eye to the middorsal line rather large.

Segments 1 and 2 of the first antenna (fig. 2A) equally long, sparsely setose. Flagellum with up to 26 segments, assesory flagellum with 5 or 6.

Second antenna (fig. 2B) shorter than first; gland cone short, straight. Peduncle segments 4 and 5 each provided with a great number of setae, implanted in tufts, varying in length from short (on upper margin) to medium long on inferior margin. Flagellum short, up to 12-segmented; calceoli always present.

Mandible palp with unarmed first segment (fig. 2C). Inferior margin of third segment with a regular, comb-like row of spinules.

Coxal plates of gnathopods 1 and 2 (figs. 3A, B) with numerous small notches, each set with a long spinule. Propodus of gnathopod 1 elongate, twice as long as wide, armed with an obtuse midpalmar spine and some palmar angle spines. Setation scarce. Propodus of second gnathopod also elongate. The strong, obtuse midpalmar spine separated from the group of palmar angle spines by a wide gap. A few groups of straight setae implanted on the inner surface of the propodus. Setation of coxal plates 3 and 4 (figs. 3C, D) less long than those of plates 1 and 2. Long segments of pereiopod 3 armed with long, often curled setae, varying in length from 1.5 to 3 times as long as the diameter of the segments on which they are implanted. Dactylus rather short and stout. Setation of pereiopod 4 less dense and shorter than in pereiopod 3.

Fifth pereiopod (fig. 2D) with subrectangular basis, with a more or less backward protruding lobe. In pereiopods 6 and 7 (fig. 2E) the aspect of the basis gradually changes into a more elongate one. Posterior margins of basal segments set with setae, relatively short in P5, but long and numerous in P7. Varying number of setae implanted on postero-interior surface of basal segments, increasing in length and number from P5 to P7. Numerous, often very long setae, much longer than the spines, on the long segments of P5 to P7. These setae always present (in both sexes) but length and number increase with age.

The most characteristic feature of this species is, of course, the presence of a distinctly compressed dorsal keel on all pleon segments (figs. 3E, 4). Even the 7th pereion segment bears an indication of a keel.

Urosome segments 1 and 2 (and often 3) with distinctly compressed dorsal elevations, which can be very high in older specimens. Dorsal armature consisting of a varying number of spines and (shorter) setae. Second and third epimeral plates (fig. 3E) with relatively sharp postero-inferior corners. A number of short setae along the inferior margin.

Third uropod (fig. 2F) long and slender. Plumose setae along both inner and outer margins of exopodite.

Telson lobes about twice as long as wide. Armature usually consisting of terminal group and one or two lateral (and/or subbasal) groups of elements; setae in these groups about equally long as the spines.

Colour of live specimens very conspicuous; basic colour greenish with vertical red stripes along distal part of each segment. Small red dots on coxal and epimeral plates.

Description female.-

Smaller than male. As in other gammarids marked sexual dimorphism exists in almost every appendage. The most striking are: (1) A1 and A2 (fig. 2I) relatively shorter and setation of both flagellum and peduncle segments less developed. (2) Propodi of P1 and P2 relatively smaller, never armed with midpalmar spine. (3) Setation of P3 (fig. 3F) to P7 (fig. 2H) less dense, usually shorter. (4) Absence of plumose setae on uropod 3. In spite of these differences, female *E. thoni* is still very characteristic because of the keeled meta- and urosome and the setation of the segments in P5 to P7.

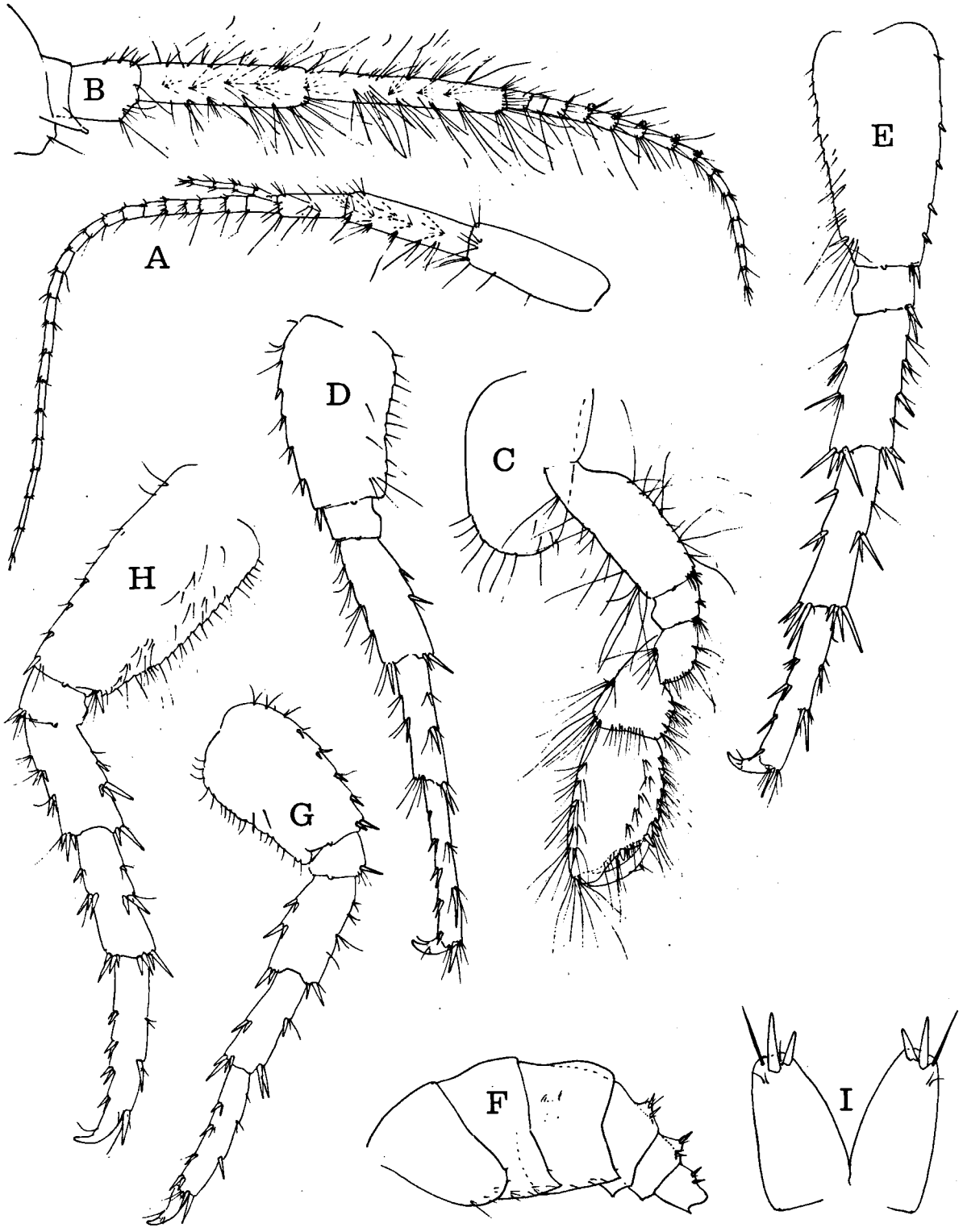


Fig. 4. *Echinogammarus antalyae* Karaman, 1971, new rank, ♂ from Kirgöz, prov. Antalya, Turkey. A, first antenna; B, second antenna; C, second gnathopod; D, fifth pereiopod; E, seventh pereiopod (all scale I); F, meta- and urosome (scale III).
G–I, *Echinogammarus cyrtus* n.sp., ♂ from the source of the river Lez, dépt. Hérault, France. G, fifth pereiopod; H, seventh pereiopod (both scale I); I, telson (scale II).

Distribution.-

The species is known from the drainage basins of the rivers Buna and Neretva in the Yugoslavian province Bosna and Hercegovina. Karaman, 1974 restricted the type-locality to the Deransko Jezero (Jezero = Lake), near the mouth of the Neretva River, E. of Metkovic.

Ecology.-

Lakes, sources and mid-courses of rivers, where it is usually accompanied by *Echinogammarus acarinatus* (Karaman, 1929) and *Gammarus balcanicus* Schäferna, 1922, (own material; personal communication G.S. Karaman).

*Echinogammarus cyrtus* n. sp.

(Figs. 4 G-I, 1)

*Echinogammarus thoni;* Stock, 1968: 38-40, figs. 11-13; part. Straskraba, 1967: 205; part. Pinkster, 1978: 247; part. Barnard & Barnard, 1983: 490, map 40.
*Gammarus pungens* (de Montpellier); Chevreux & Fage, 1925: 252-253, fig. 263.
*Gammarus pungens* (du Lez); Brun & Brun, 1964: 754-759, pl. I, 1, pl. II, 2.

Material examined.-

France - Dépt. Herault: Sources of the river Lez, N of Montpellier, 8 Jan. 1968, many specimens (Z.M.A.); same locality, 1 May 1968, many specimens (Z.M.A.); same locality, 7 July 1968, many specimens (Z.M.A.); same locality, no date many specimens (R.M.N.H.). The ♂ holotype, ♀ allotype and many paratypes (1 May 1968) have been deposited in the collections of the Zoölogisch Museum Amsterdam, cat. no. ZMA Amph. 102.031 a, b, c. Le Lez at Castelnou, 20 Sept. 1970, many specimens; same locality, 29 Aug. 1969, many specimens (both Z.M.A.). Le Lez at Prades-de-Lez, 29 Febr. 1970, many specimens; same locality, July 1970, 15 specimens (both Z.M.A.). Le Lez at Montpellier, 4 Aug. 1968, 6 specimens (Z.M.A.). La Mosson, N of Villeneuve, 2 Aug. 1970, 6 specimens (Z.M.A.). La Mosson SW of Montpellier, 8 Jan. 1968, 20 specimens (Z.M.A.). Le Vidourle at Marsillargues, 27 Apr. 1968, many specimens (Z.M.A.). Small brook alongside road D 127, N of Grabels, July 1970, 12 specimens (Z.M.A.).

Dépt. Gard: Source of the river Vidourle, at Ste.-Hippolyte, 4 Sept. 1966, many specimens (Z.M.A.). Le Vidourle at Sommières, in cascade, 9 Jan. 1968, 13 specimens; same locality, 1 Apr. 1972, many specimens (both Z.M.A.).

Description male.-

Medium large species; maximum length observed 16 mm. Resembling *E. thoni* in shape of head, eyes, in shape and setation of coxal and epimeral plates, as well as in shape and setation of antennae and gnathopods. Like in *E. thoni*, a distinctly compressed keel is present on all pleosome segments and sometimes on 7th pereion segment as well, which certainly caused the confusion between these species.

The most easily observable differences are found in the setation of pereiopods 5 to 7. As in *E. thoni*, the basal segments of these pereiopods are crenulated and set with many setules, but unlike the other taxon their long segments are poorly setose, the setae being shorter, hardly longer than the spines. The telson, although variable, is also different because of the absence of lateral and subbasal (groups of) armature (figs. 4I).

Description female.-

The female shows the same sexual dimorphism as observed in *E. thoni*. It can be distinguished from the latter because of the absence of setae on the distal segment of the pereiopod 5 to 7.

The colour of live specimens is greenish, often striated with lighter bands.

Ecology and distribution.-

The species is exclusively known from the sources and middle reaches of some rivers with a high amount of Ca-ions in a limited area in southern France. It is often accompanied by *Gammarus monspeliensis* Pinkster, 1972, *G. gallicus* (S. Karaman, 1939) or *Echinogammarus pungens* (H. Milne Edwards, 1840).

Remarks.-

Up to now, this species has been confused with *E. thoni*. However, well-marked differences can be found in the setation of the pereiopods and armature of the telson. To be sure that these differences are indeed constant we studied the variability of these characters in all available samples, collected in different periods of the year.

Although the setation of the pereiopods increases with the age and likewise shows some variability throughout the year, the differences always remain clearly visible, both in males and females. We therefore decided to consider *E. cyrtus* an independant species.

Derivatio nominis.-

*cyrtus* is from κυρτος = greek for hunch-backed.

*Echinogammarus antalyae* G. Karaman, 1971, new rank.

(Figs. 4A-F)

*Echinogammarus thoni antalyae* G. Karaman, 1971: 21-27; Barnard & Barnard, 1983: 490, map 40.
*Echinogammarus thoni*; part. Pinkster 1978: 247.

Material examined.-

Type locality. Small brook at Kirgöz, Prov. Antalya, Turkey, 30-III-1959, many specimens (collection Karaman, Titograd). Accompanying species *G. agrarius* G. Karaman, 1973 and *G. accolae* G. Karaman, 1973.

Description male.-

Maximum length observed 12 mm. The shape of head and eyes as in *E. thoni*. Peduncle and flagellum of A1 (fig. 4A) more setose than in *E. thoni*. Second antenna making a slender impression, setation little longer than in *E. thoni*. Calceoli present (fig. 4B).

Gnathopods 1 and 2 (fig. 4C) with many groups of long setae on all segments, especially on propodi.

Pereiopods 3 and 4 not showing noteworthy differences with those of *E. thoni*.

Pereiopods 5 to 7 somewhat intermediate between those of *E. thoni* and of *E. cyrtus* n.sp.. So, the characteristic setation along the posterior margin of the basal segment is present, especially in P7. Likewise some setae on the distal segments of P5 to P7, but these setae less numerous and shorter than in *E. thoni*, although longer than in *E. cyrtus* (figs. 4D, E).

Telson identical to that of *E. thoni* (fig. 2G).

Postero-inferior corner of second and third epimeral plates almost rectangular; setation along lower margin scarcely developed (fig. 3F). Uropod 3 identical to that of *E. thoni* (fig. 1F).

The most easily observable differences with the other two species is found in the meso- and metasome. Unlike *E. thoni* the last mesosome segment is flat. Exceptionally, in larger specimens metasome segments 1 and 2 have a low dorsal elevation which is not laterally compressed. metasome segment 3 has a clearly visible, but rather low keel on its posterior part, which however is much lower than in the other two species. The urosome segments each have a compressed elevation which can be very high in larger specimens. The dorsal armature consists of a middorsal and two lateral groups of spines and setae on all urosome segments (fig. 3F).

Description female.-

The female shows the same sexual dimorphism as described for *E. thoni*. Because of the differences in the dorsal keels of the metasome, and the longer setation of the gnathopods it is easily distinguishable from *E. thoni* and *E. cyrtus*.

Distribution.-

Known from the type-locality only.

Remarks.-

The most striking difference between this species and *E. thoni* and *E. cyrtus* is found in the shape of the (meso- and) metasome. In *E. thoni* and *E. cyrtus* all metasome segments have a laterally compressed dorsal elevation forming a characteristic keel. In *E. antalyae* this keel is only found in the posterior part of the third metasome segment. We studied all size classes, including embryos, of *E. thoni* and *E. cyrtus* and found that the dorsal keel is always present on all metasome segments, even in specimens of 1,5 mm long. We therefore decided to consider *E. antalyae* a separate species.

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Sjouk Pinkster,
Dirk Platvoet,
Institute of Taxonomic Zoology,
University of Amsterdam,
P.O. Box 20125,
1000 HC Amsterdam,
The Netherlands.

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