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51. Contribution to the Knowledge of the Amphipoda. Two members of *Echinogammarus simoni* group from southern Europe, *E. cari* (S. Kar. 1931) and *E. roco*, n. sp. (fam. Gammaridae).

Abstract

Two species of *Echinogammarus simoni* group were studied. *Echinogammarus cari* (S. Karaman 1931) was redescribed based on the paratypes from the spring Bistra Rijeka near Ogulin (Croatia, Yugoslavia). *Echinogammarus roco*, n. sp. was described from the spring in Ticino and from Capo Pescara (central Italy).

Introduction

The genus *Echinogammarus* was studied very intensively during the last 15 years by many scientists, and thanks to that, there were discovered and described numerous new *Echinogammarus* species from brackish and fresh water in the middle and the southern parts of Europe.

One very rich collection of *Echinogammarus* species exists in Museum of Natural History in Verona. We have studied this material and we have recently described four new *Echinogammarus* species and subspecies from Italy (G. Karaman and Tibaldi 1973). Now I have established one new *Echinogammarus* species from the same collection, *E. roco*, n. sp. This species belongs to *E. simoni* group, with characters similar to *E. tibaldii* and *E. simoni*.

Echinogammarus cari described S. Karaman in 1931 from the spring Bistra Rijeka near Ogulin (Croatia, Yugoslavia). This species is very similar to *E. simoni* (Chevr.). It was necessary to establish the differences between these two species. For this reason I re-described *E. cari* based on the paratypes from my collection in Titograd.

In order to make an easier determination of the *Echinogammarus* species from southern Europe, I constructed a key for determination of all *Echinogammarus* species from Italy and Yugoslavia.

I am much indebted to prof. Dr. S. Ruffo of the Museo Civico di Storia Naturale, Verona, and Dr. E. Tibaldi from the Laboratorio di Zoologia dell'Università Milano for the loan of material for this study.

***Echinogammarus cari* (S. Karaman 1931)**

Figs. I-III

Syn.: *Gammarus cari* S. Karaman 1931, p. 265, fig. 1

Gammarus pungens acarinatus Pljakić 1962, p. 15

Description of the male. Body-length of our specimens up to 7 mm. Body dorsally smooth, urosome with weakly dorsal elevation, saddle on urosomite 1 shallow. Urosomite 1 with 2 dorsal groups of spines, lacking lateral groups of elements. Urosomite 2 with 2 dorsal and lateral groups, urosomite 3 with lateral groups, usually lacking median group of spines (figs. II, 6; III, 3). Approximate formel of the spines: Urosomite 1: 1-1; urosomite 2: 2-1-1-1; urosomite 3: 2-0-1.

Lateral cephalic lobes obtuse, its anterior margin straight, eyes of a middle-size, longer than the diameter of the peduncle of antenna 1 (fig. III, 1).

Antenna 1 nearly 50 percent of the body-size, peduncular articles progressively shorter, poorly setose: article 1 with 2-3 small seta-groups, articles 2-3 with 2-3 small groups of setae at ventral margin. Principal flagellum up to 21-articulate, articles bear short setae and one short aesthetasc each. Accessory flagellum up to 4-articulate (fig. III, 1).

Antenna 2: articles short and broad; peduncular article 3 short, provided with 2 tufts of distal setae, article 4 slightly longer than article 5, provided with 4 transversal groups of setae as long as or longer than the diameter of article 4 itself. Article 5 slightly shorter than article 4, usually with 3 transversal groups of long setae at ventral margin, the setae are longer towards the tip of the article 5. Flagellum up to 8-articulate, articles strong, very densely setose at both faces, but especially at ventral margin; setae are longer than

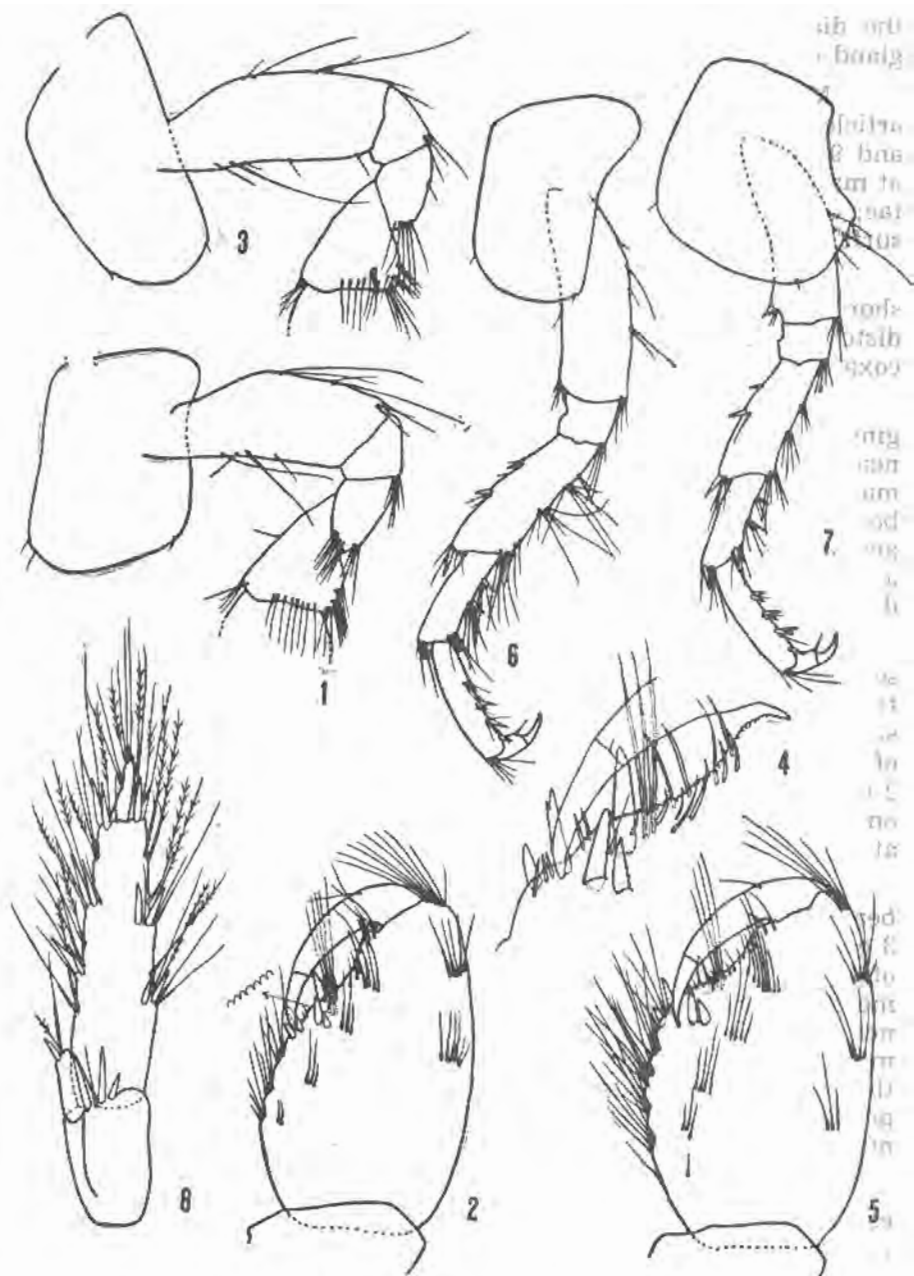


Fig. I. *Echinogammarus cari* (S. Kar. 1931), Bistra Rijeka, paratype, male 7 mm:
 1, 2 = gnathopod 1; 3-5 = gnathopod 2; 6 = pereopod 3; 7 = pereopod 4;
 8 = uropod 3.

the diameter of the articles themselves. Calceola absent. Antennal gland cone usually reaches the tip of article 3 (fig. III, 1).

Mouthparts like those of *E. pungens*. Palpus mandibularis: first article smooth, second article bears 3-4 setae in proximal portion, and 9-11 setae in distal portion of article. Article 3 (distal article): at margin appear 15-16 weakly pectinate D-setae and 4-6 long E-setae; outer surface provided with up to 4 A-groups of setae, inner surface with one group of B-setae (figs. II, 1, 2).

Coxae 1-4 weakly setose at distal margin: coxae 1-3 bear one short seta at distoposterior corner, coxae 2-4 bear one short seta at distoanterior corner, coxa 1 with 2 setae at distoanterior margin, and coxa 4 with several short setae at posterior margin (figs. I, 1, 3, 6, 7).

Gnathopod 1: article 2 bears several longer setae at both margins, article 3 short, article 4 slightly longer and broader, article 5 nearly triangular, with 3-4 transversal groups of setae at posterior margin. Article 6 of the middle size, pyriform, its posterior margin bears 3 groups of setae, lacking spines; palm concave, fine crenellated and provided with 2 corner- and one median spine on outer surface and 2 corner spines on inner surface. Dactyl recurved, with one median seta at superior margin (fig. I, 1, 2).

Gnathopod 2: article 2 longer than that of gnathopod 1, bears several longer setae at both margins; articles 3-4 short, article 5 triangular, with 3 groups of setae at posterior margin. Article 6 slightly broader than that of gnathopod 1, provided with 4-5 groups of setae at posterior margin. Palm concave, fine crenellated, with 2 corner- and one median spine on outer surface and 2 corner spines on inner surface (figs. I, 3-5). Dactyl recurved, with one median seta at superior margin.

Pereopod 3 with slightly stout articles (fig. I, 6). Article 2 bears several setae at both margins, article 3 short, article 4 bears 3 groups of spines and short setae at anterior margin and 4-5 groups of longer setae at posterior margin (setae are longer than the diameter of the article itself). Article 5 with anterodistal bunch of spines and setae, and 3 groups of spines and longer setae at posterior margin (setae are longer than the diameter of the article itself). Article 6 with anterodistal bunch of setae and 4 groups of spines accompanied by short setae at posterior margin. Dactyl strong recurved, nail nearly half of the dactyl length.

Pereopod 4 like pereopod 3 but rather shorter and less setose, especially articles 4-5: article 4 with 3 groups of setae at posterior margin (setae are not longer than the diameter of the article itself), article 5 with setae shorter than those of pereopod 3 (fig. I, 7).

Pereopods 5-7 with stout articles, their dactyl strong and recurved, nail nearly as long as the half of the dactyl itself.

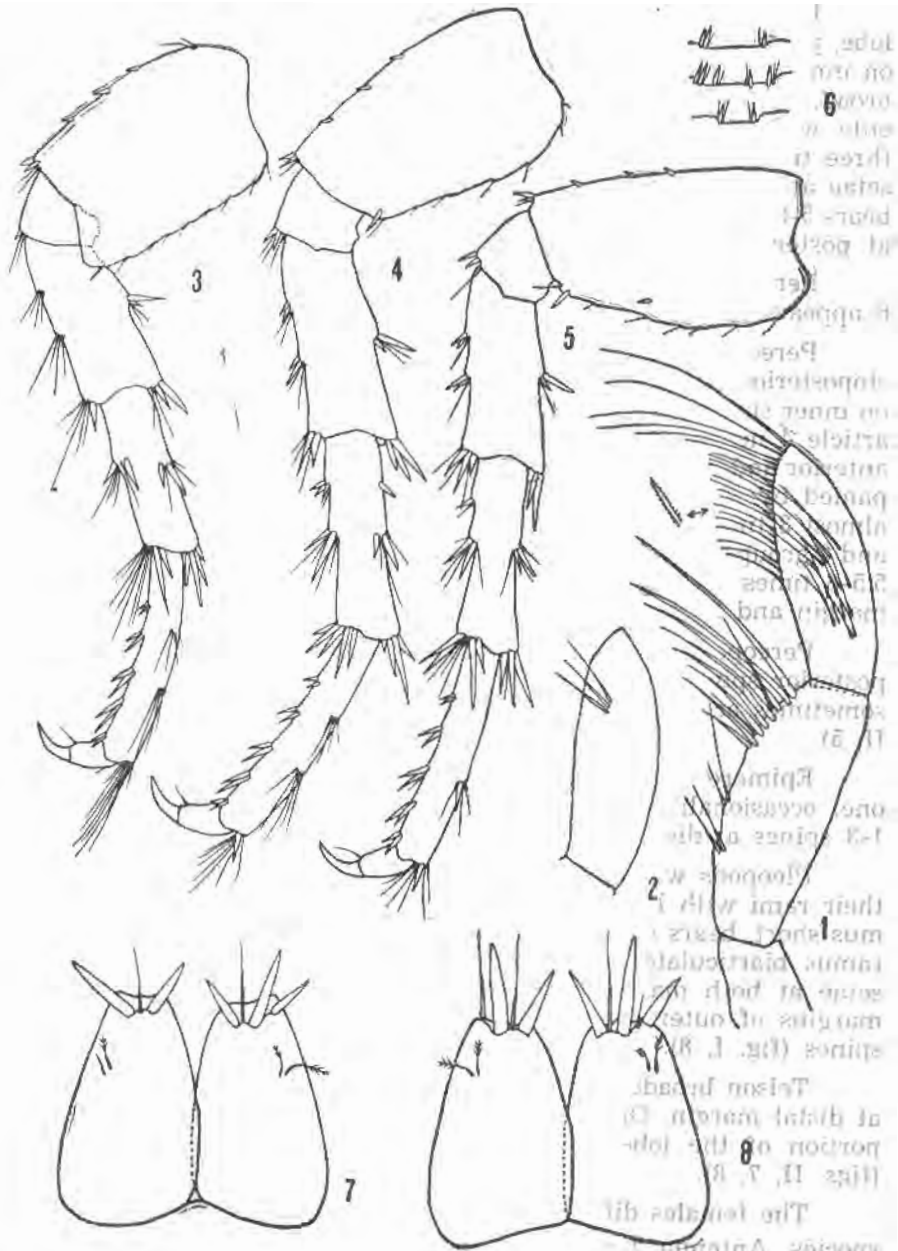


Fig. II. *Echinogammarus cari* (S. Kar. 1931), Bistra Rijeka, paratype, male 7 mm: 1 = mandibular palp, outer face; 2 = third palpal article of mandible, inner face; 3 = pereopod 5; 4 = pereopod 6; 5 = pereopod 7; 6 = urosome, dorsal projection; 7-8 = telson.

Pereopod 5: article 2 dilated, with remarkable distoposterior lobe, posterior margin of article 2 with up to 9 short setae; no setae on inner surface (fig. II, 3). Article 3 short, article 4 twice as long as broad, usually lacking median group of spines at anterior margin, only with distal group of species accompanied by setae. Article 5 three times as long as broad, provided with 2 groups of spines and setae at both margins. Article 6 is 5.5 to 6 times as long as broad, bears 5-6 groups of spines at anterior margin, and 2-4 groups of setae at posterior margin.

Pereopods 6-7 like to each other in the shape, only pereopod 6 appears slightly longer, with smaller article 2.

Pereopod 6: article 2 lacking distoposterior lobe, bears one distoposterior spine, posterior margin provided with 6 short setae; on inner surface appears sometimes one spine or seta. Article 3 short, article 4 nearly twice as long as broad, with 3 groups of spines at anterior and 2 groups of spines at posterior margin; spines are accompanied by setae shorter than the diameter of the article. Article 5 almost 3 times as long as broad, with 3 groups of spines at anterior and 2 groups of spines at posterior margin (fig. II, 4). Article 6 nearly 5.5-6 times as long as broad, with 4-5 groups of spines at anterior margin and 2 groups of spines and setae at posterior margin.

Pereopod 7: article 2 lacking distoposterior lobe, with distoposterior spine, posterior margin of article 2 bears 6-7 short setae sometimes accompanied by one spine or seta on inner surface (fig. II, 5).

Epimere 2-3 with pointed distoposterior corner, epimere 2 with one, occasionally 2 longer setae at distal margin; epimere 3 with 1-3 spines at distal margin (fig. III, 2).

Pleopods with 2 retinacula each. Uropods 1-2 well developed, their rami with lateral and distal spines. Uropod 3 stout, inner ramus short, bears one spine and several setae at distal margin. Outer ramus biarticulate, first article with several groups of spines and setae at both margins. Plumose and simple setae appear at both margins of outer ramus. Second article short but longer than the spines (fig. I, 8).

Telson broader than long, each lobe bears 2-3 spines and setae at distal margin. One pair of short plumose setae appears in upper portion of the lobe; no spines or setae at proximolateral margin (figs. II, 7, 8).

The females differ from the males like other *Echinogammarus* species. Antenna 2 slender and much less setose than that in the males (fig. III, 4).

Gnathopod 1: article 6 elongated, with 2-3 groups of setae at posterior margin. Palm less inclined, fine crenellated, provided

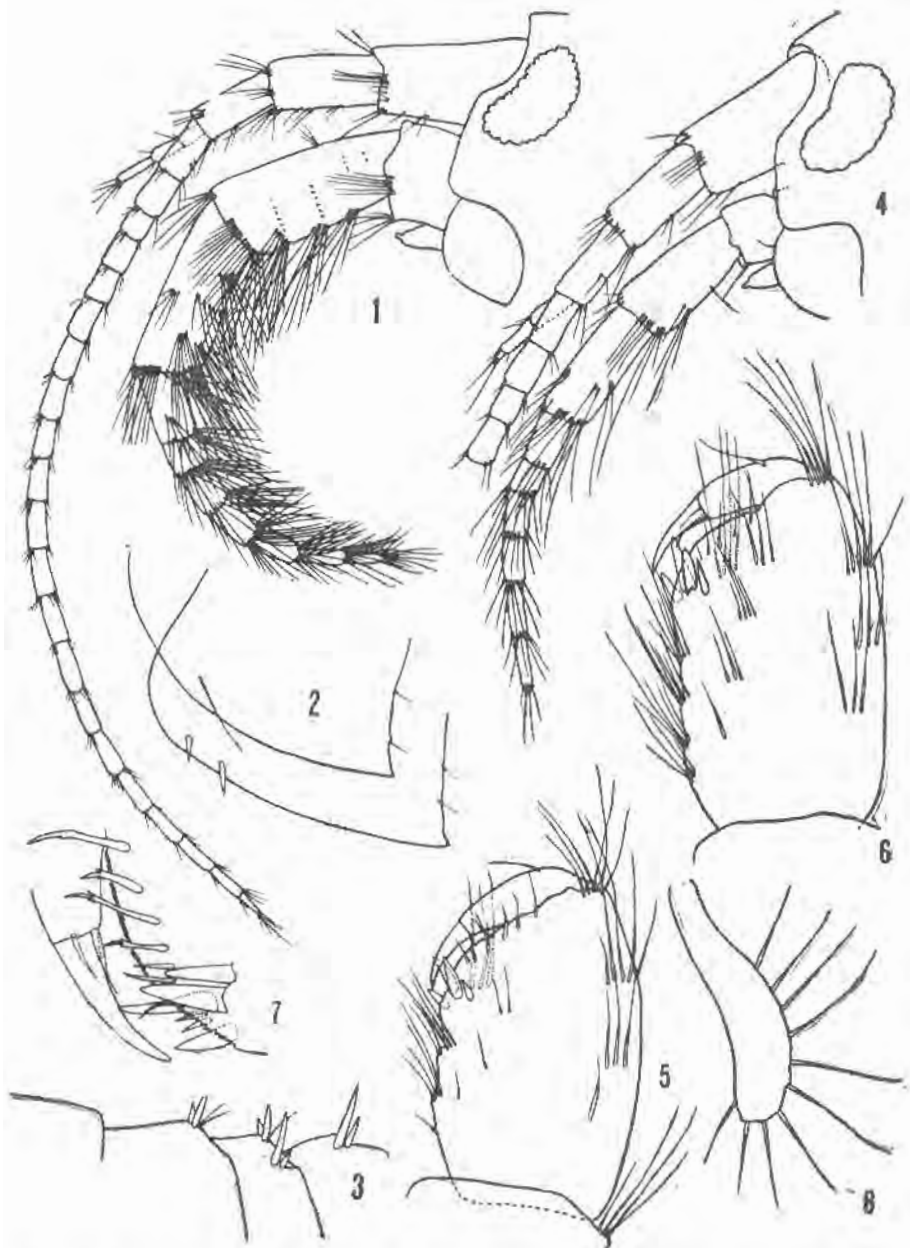


Fig. III. *Echinogammarus cari* (S. Kar. 1931), Bistra Rijeka, paratype, male 7 mm: 1 = head with antennae; 2 = epimere; 3 = urosome, lateral projection female, 4.9 mm: 4 = head with antennae; 5 = gnathopod 1; 6, 7 = gnathopod 2; 8 = oostegite.

with 2 corner spines at outer and 2 corner spines at inner surface; no median spine (fig. III, 5).

Gnathopod 2: article 6 slightly longer than that of gnathopod 1, with 4 groups of setae at posterior margin. Palmar corner spines and palm like those of gnathopod 1. Palm of both gnathopods is not inclined (figs. III, 6, 7).

Oostegys slender. Urosome like that in the males.

Variability. The number and the position of the spines on urosome is variable: the median spines on urosomites 1-2 appear more or less drifted apart, the number of all groups of spines appears 1 or 2, the setae are usually as long as the spines. The length of peduncular articles 4-5 of antenna 2 is constant by all our specimens (males): article 5 is shorter than article 4. Telson lobes provided with 2-3 distal spines.

Material examined: holotype and paratypes from Bistra Rijeka near Ogulin (Croatia, Yugoslavia), spring.

Holotype and paratypes are deposited in my collection in Titograd.

Loc. typ.: Bistra Rijeka near Ogulin (Lika, Croatia).

Distribution: see sub loc. typ.

Remarks and Affinity. *E. cari* is very closed to *E. simoni* (Chevreux 1894). I have not in hand the specimens of *E. simoni*, but based on the study of the paratypes of *E. cari* and description of *E. simoni* of Stock in 1972, I established differences between these two species.

E. cari differs from *E. simoni* by following characters: longer eyes, more acute lateral cephalic lobes (?) (by *simoni* rounded), longer antennal gland cone as long as article 3 (by *simoni* half of the length of article 3 of antenna 2), less number of D-setae on third palpar article of mandible (by *cari* 15-16, by *simoni* 23 setae), less number of flagellar articles of antenna 2 (by *cari* 7-8, by *simoni* 10-12), palm of gnathopods 1-2 is concave and crenellated (by *simoni* appears straight), less number of palmar spines of gnathopods 1-2, more setose pereopods 3-4, especially their articles 4-5; coxae 1-4 are less setose, pereopods 3-7 appear more stout (articles shorter and broader), posterior margin of article 2 of pereopods 5-7 with less number of setae, the metasome lacking longer setae on dorsal surface near the articulation of the articles (if setae are present, they are very short), urosomite 1 lacking lateral groups of spines and setae (by *simoni* with lateral groups of spines and setae), urosomite 1 with shallow saddle in the middle (by *simoni* lacking one), urosome with shallow dorsal elevation (by *simoni* no dorsal elevation), peduncular article 4 of antenna 2 slightly longer than article 5 (by *simoni* article 4 is shorter than article 5), uropod 3 pro-

vided with longer setae, telson with rather broader lobes, lacking subdistal simple setae (by *simoni* telson lobe appears narrower and provided with subdistal simple setae), epimere 2 lacking spines (by *simoni* with spines).

Based on these differences appears *E. cari* one distinct species belonging to group of *E. simoni*.

E. cari differs from *E. roco* from Italy by the shape and pilosity of the gnathopods, epimere, uropod 3, pereopods, antenna 1 etc.

Ecology. *E. cari* lives in fresh water (rivers, springs) far from the sea.

***Echinogammarus roco*, n. sp.**

Figs. IV-VII

Description of the male. Body-length up to 12 mm, body dorsally smooth, urosome with dorsal elevation shallow, like that of *E. stammeri* (fig. V, 6), the saddle on urosomite 1 well developed, urosomite 1-3 with lateral and one median group of spines accompanied by short setae.

Lateral cephalic lobes acute, its anterior margin concave, eyes of medial length, longer than the diameter of the peduncle of antenna 1 (fig. IV, 1).

Antenna 1: nearly 60 percent of the body-length, peduncular articles progressively shorter, usually with many groups of long setae. Article 1 with 5-7 groups of ventral setae, article 2 with 7-9 groups of long setae, article 3 nearly 75 percent of article 2-length, provided with 4-5 groups of long setae at ventral margin (fig. IV, 1). Principal flagellum up to 26-articulate, distal portion of flagellum scarcely setose, proximabasal one with long setae. Flagellar articles bear one short aesthetasc each. Accessory flagellum up to 6-articulate.

Antenna 2: it is very inflated, peduncular article 3 short, provided with very long distal setae; article 4 shorter than article 5, provided with 5-7 big transversal rows of long setae. Article 5 with 7-10 transverse rows of numerous long setae. Flagellum up to 12-articulate, articles very broad, very densely setose, setae are longer than the diameter of the articles themselves and curled distally. The setae appear shorter towards the tip of the flagellum (fig. IV, 1).

Mouthpart like other *Echinogammarus* species. Mandibular palp: article 1 smooth, article 2 with 9-11 setae in proximal portion and 12-15 setae in distal portion. Article 3 with 25-33 marginal D-setae and 4-6 long E-setae; on outer surface appear 4 groups of A-setae, on inner surface appear 2 groups of B-setae; C-setae are absent (figs. IV, 3; V, 1).

Coxae 1-4 are provided with long setae at distal margin like those of *E. pungens* (figs. IV, 4, 5; V, 2, 4).

Gnathopod 1: article 2 bears many longer setae at both margins, articles 3-4 are short; article 5 triangular, provided with 4-5 groups of setae at posterior margin. Article 6 pyriform, at posterior margin with 4-5 groups of setae. Palm straight or weakly concave, provided with 3 corner- and one median spine on outer surface, and with 1-2 corner spines on inner surface. Dactyl recurved, with one median seta at superior margin. The setae of article 6 are long, curled partially (figs. V, 2, 3).

Gnathopod 2: article 2 longer than that of gnathopod 1, articles 3-4 short; article 5 triangular, provided with 5-6 groups of setae at posterior margin. Article 6 elongated, with 7-9 groups of setae at posterior margin, palm straight, provided with 3 corner and one median spine on outer surface and 2 corner spines on inner surface (figs. V, 4, 5). Dactyl like that of gnathopod 1. Gnathopod 2 is slightly broader than gnathopod 1.

Pereopod 3: articles of medial length, posterior margin of articles 2-5 with numerous setae as long as or longer than the diameter of the articles themselves (fig. IV, 4). Articles 5-6 bear several groups of small spines at posterior margin.

Pereopod 4 like pereopod 3 but is something shorter (fig. IV, 5). Posterior margin of articles 2-5 bears shorter setae, especially articles 5 and 6 (fig. IV, 5). Dactyl of pereopods 3-7 is stout, nail short.

Pereopod 5: article 2 dilated, with strong distoposterior lobe, posterior margin of article 2 bears numerous shorter setae (up to 19), article 4 with several median groups of setae at anterior, and 2 groups of median spines at posterior margin. Article 5-6 subequal in length, both longer than article 4, provided with several groups of spines or setae at anterior margin (fig. VI, 1).

Pereopod 6: article 6 narrowed, lacking distoposterior lobe, with distoposterior spine (fig. VI, 2). Posterior margin of article 2 with up to 20 setae of medial length; several setae appear on inner surface of article 2. Articles 3-7 like those of pereopod 5, but slightly longer.

Pereopod 7 like pereopod 6, but slightly shorter (fig. VI, 3). Article 2 slightly broader proximally than distally, with up to 20 long setae at posterior margin; distoposterior lobe absent, spine appears in distoposterior corner. Several longer setae appear on inner surface of the article 2. Articles 3-7 like those of pereopod 6.

Pleopods with 2 coupling hooks (retinacula) each. Epimere 2-3 with pointed distoposterior corner, both with numerous long setae at distal margin (fig. VI, 4). Epimere 2 bears also several subdistal setae on outer surface.

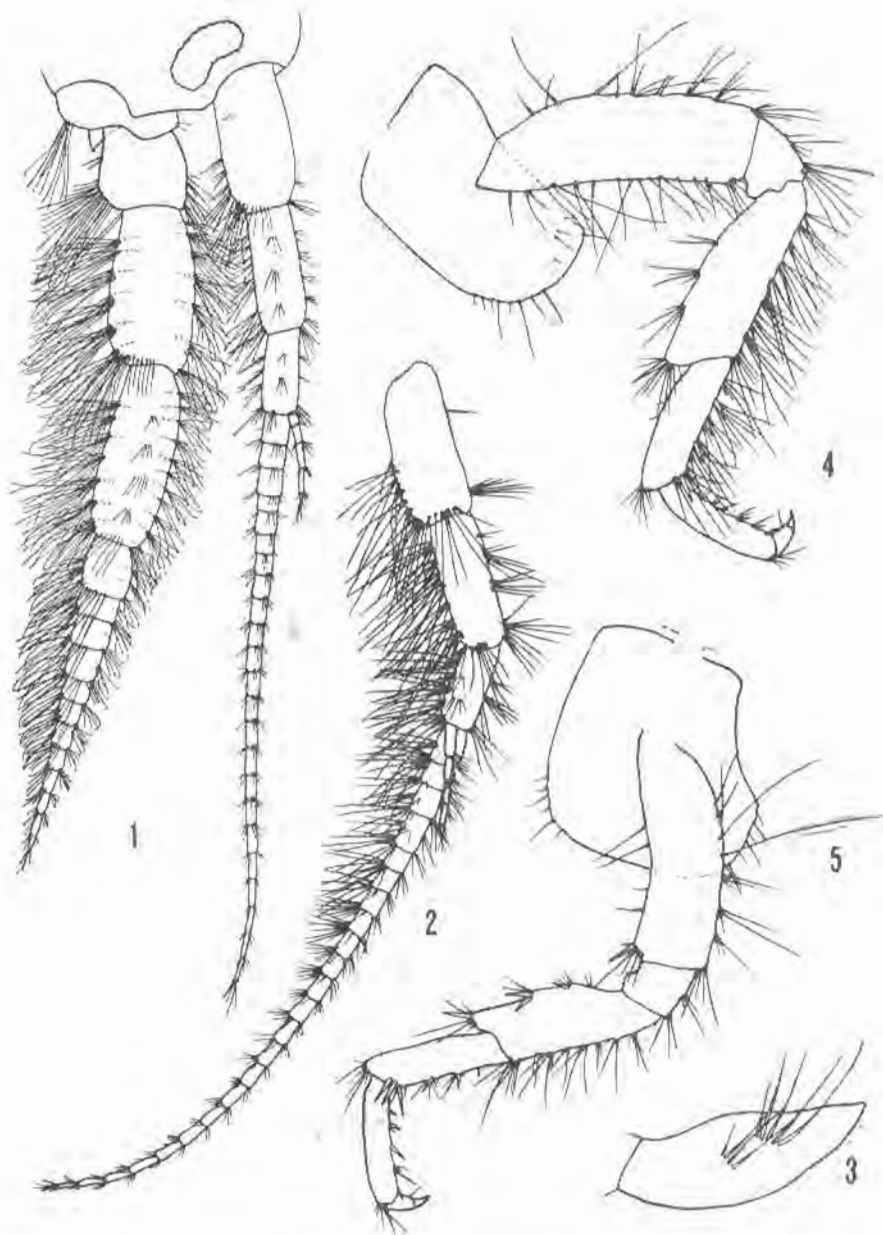


Fig. IV. *Echinogammarus roco*, n. sp., spring of Tirino, male 10 mm: 1 = head with antennae; 2 = antenna 1 of one other male 9.9 mm; 3 = third peduncular article of mandible, inner face; 4 = pereopod 3; 5 = pereopod 4.

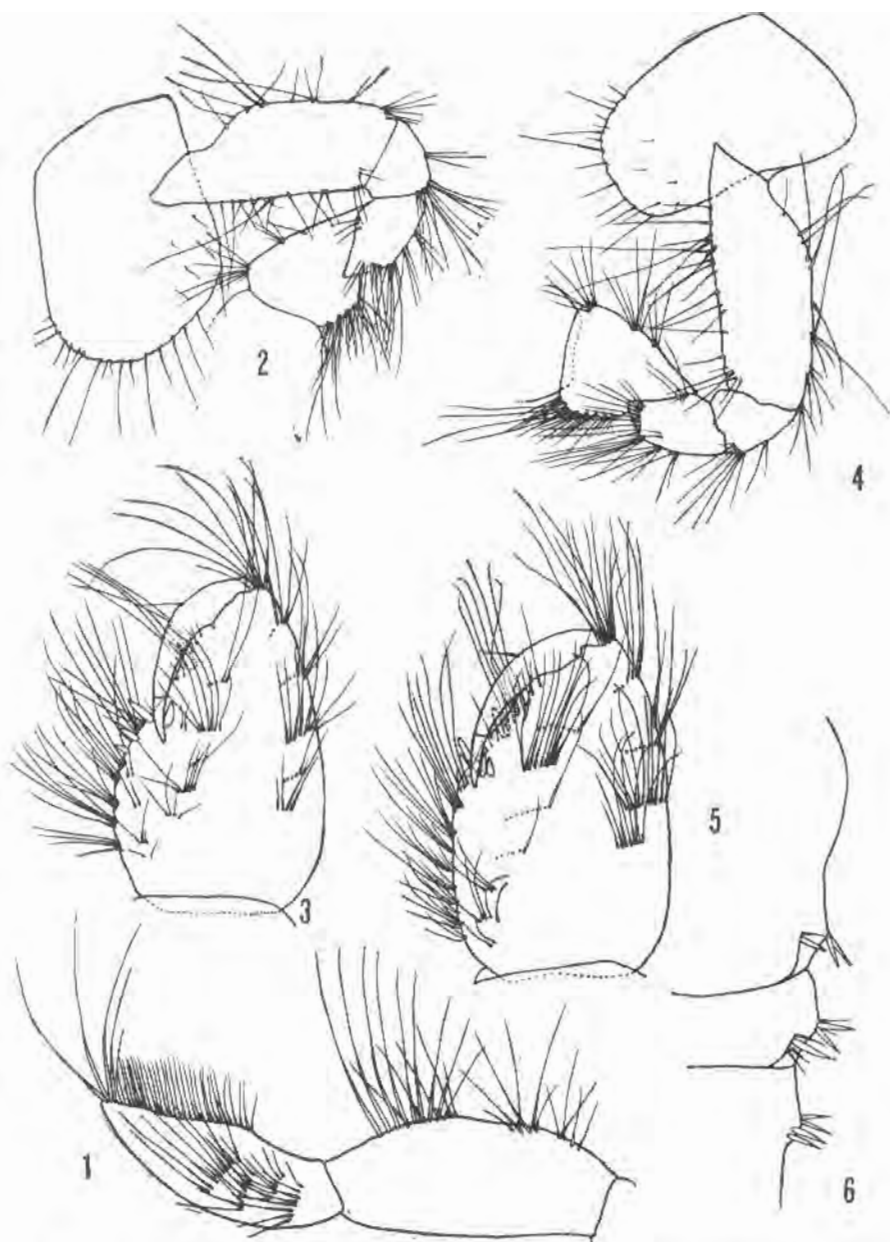


Fig. V. *Echinogammarus roco*, n. sp., spring of Tirino, male 10 mm: 1 = mandibular palp, outer face; 2, 3 = gnathopod 1; 4, 5 = gnathopod 2; 6 = urosome, lateral projection.

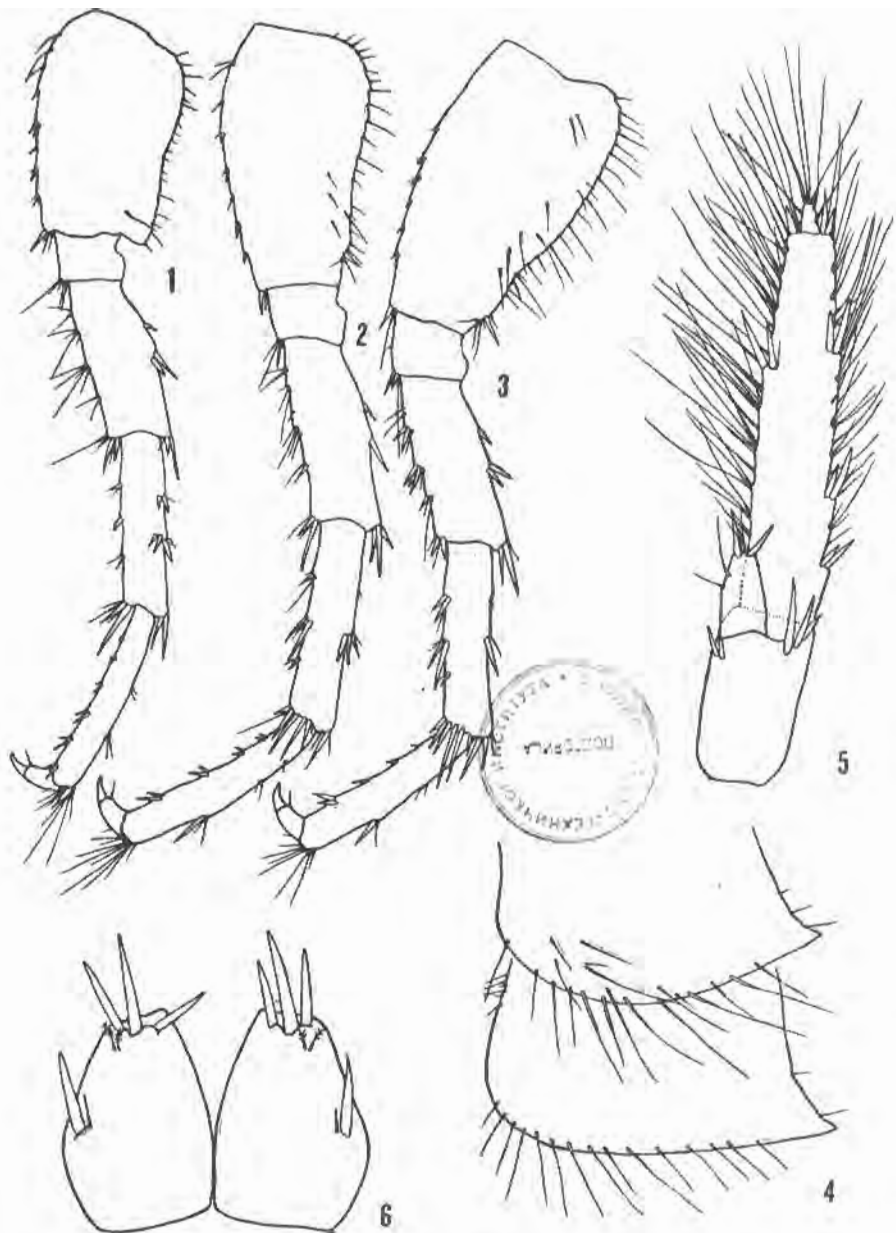


Fig. VI. *Echinogammarus roco*, n. sp., spring of Tirino, male 10 mm: 1 = pereopod 5; 2 = pereopod 6; 3 = pereopod 7; 4 = epimere; 5 = uropod 3; 6 = telson.

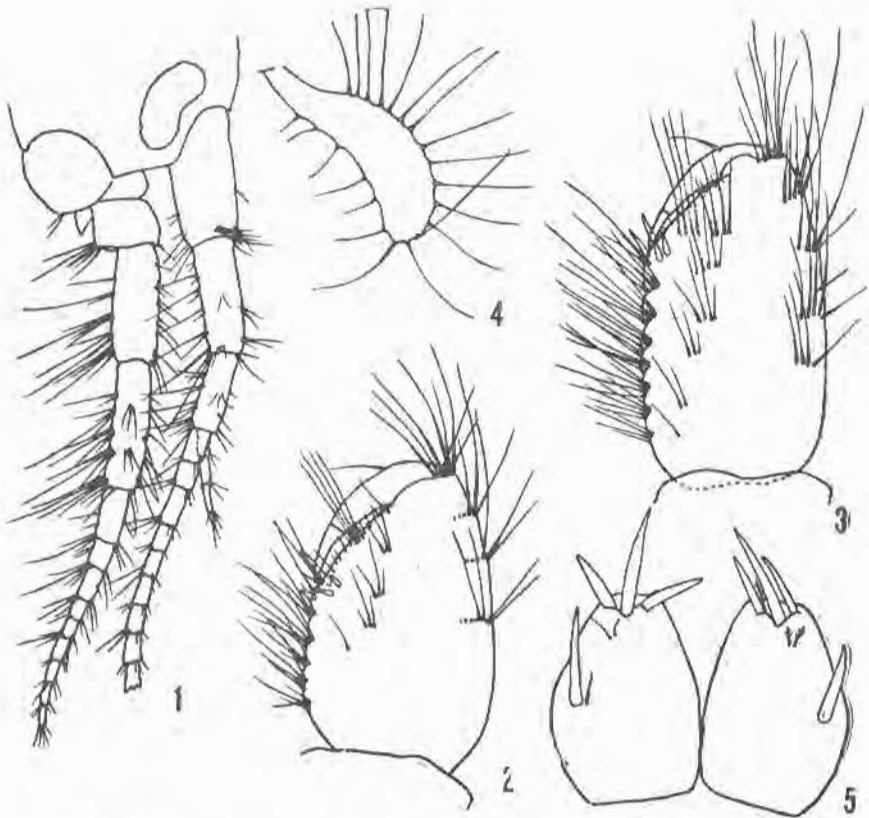


Fig. VII. *Echinogammarus roco*, n. sp., spring of Tirino, female 6.9 mm: 1 = head with antennae; 2 = gnathopod 1; 3 = gnathopod 2; 4 = oostegyte; 5 = telson.

Uropods 1-2 well developed, rami with lateral and distal spines. Uropod 3 of medial length, its inner ramus short, with 2-3 distal spines and several setae. Outer ramus of uropod 3 biarticulate, second article short, nearly as long as the spines. The first article of uropod 3 bears several groups of spines at both margins; the long simple and plumose setae appear at both margins of outer ramus, but they are longer at inner one (fig. VI, 5).

Telson very broad, each lobe bears one lateral spine accompanied usually by one short seta, and 3 distal spines lacking setae. A pair of short plumose setae appears in distal portion of the lobe (fig. VI, 6).

The female differs from the male like other *Echinogammarus* species. Antenna 1 is less setose than that in the male: peduncular article 1 with 2-3, and article 2 with 5-6 groups of long setae at ventral margin; article 3 with 3-4 groups of setae at ventral margin.

Principal flagellum bears in its proximal portion the setae longer than the diameter of the flagellum; the setae in distal portion of flagellum are shorter (fig. VII, 1).

Antenna 2 slender and much less setose than that in the male (fig. VII, 1). Article 3 short, provided with one tuft of setae at distal margin. Article 4 slightly shorter than article 5, both provided with 4-5 groups of longer setae at ventral margin. Calceola absent (fig. VII, 1).

Gnathopod 1: article 6 ovoid, with 4-5 groups of setae at posterior margin, palm straight, with 2-3 spines on outer surface and 2 spines on inner surface; no median spines (fig. VII, 2).

Gnathopod 2: article 6 slightly longer than that of gnathopod 1; posterior margin bears 6-7 groups of setae, palm straight. The setae on article 2 of gnathopod 2 are long (fig. VII, 3).

Oostegys slender (fig. VII, 4).

Variability. The pilosity of antenna 1 is very variable; peduncular and flagellar articles are provided with numerous setae up twice as long as the diameter of the articles themselves; those setae appear sometimes shorter (see figs. IV, 1, 2), nearly as long as the diameter of the articles themselves: I found transition between both extremes.

The pilosity of antenna 2 is much less variable, the variation appears in the numbers of the setae on antenna 2. Calceola are always absent.

Material examined. Springs of Tirino (Abruzzo, Italy), 10 March, 1965, cca 25 spec.; Capo Pescara, 23 Aug., 1955, cca 20 spec. accompanied by *E. tibaldii*.

Holotype. Male of 10 mm from spring of Tirino. Holotype and paratypes are deposited in Museo Civico di Storia Naturale Verona (Italy). Several paratypes are deposited in my collection in Titograd (Yugoslavia).

Loc. typ.: springs of Tirino (Abruzzo, Italy).

Remarks and Affinity. *E. roco* belongs to the *E. simoni* group, based on very inflated and very setose antennae 1-2.

E. roco differs from *E. simoni* by more setose antenna 1, more spinose telson, major number of setae at posterior margin of article 2 of pereopods 5-7, more setose pereopods 3-4 and uropod 3, etc.

E. roco differs from *E. cari* by broader articles of antenna 2, by more setose antenna 1, epimere, pereopods 3-7, by presence of lateral spines on telson, more angular lateral cephalic lobes etc.

E. roco differs from *E. tibaldii* by much more inflated and more setose antennae 1-2, by the pilosity and shape of telson, by the shape of lateral cephalic lobes etc.

Conclusion

The genus *Echinogammarus* is represented in Yugoslavia by 9 species: *E. acarinatus*, *E. cari*, *E. foxi*, *E. olivii*, *E. pungens*, *E. scutarensis*, *E. stocki*, *E. thoni*, *E. veneris* and probably also *E. stammeri*.

From Italy are known 13 species of *Echinogammarus*: *E. adipatus*, *E. bolo*, *E. foxi*, *E. olivii*, *E. pungens*, *E. roco*, *E. ruffoi*, *E. sicilianus*, *E. stammeri*, *E. stocki*, *E. tabu mutus*, *E. tibaldii* and *E. veneris*.

It is very probably that there are still new *Echinogammarus* species in that region. Stock in 1968 removed *Echinogammarus olivii* from the genus *Echinogammarus* to the genus *Chaetogammarus*, based on the scarce body pilosity. Later, many other authors accepted that opinion.

Now, after the examination of numerous *Echinogammarus* species, I replaced *E. olivii* back to the genus *Echinogammarus*, based on following reasons:

1) *E. olivii* has all characteristics belonging to the genus *Echinogammarus*.

2) The scarce pilosity of the body is not one generis characteristic.

3) There are transition among the species with scarce pilosity of the body (*olivii*, *dahli*) and the species with very strong body-pilosity (*sicilianus*, *tibaldii*, *roco*). The best example of that transition is *E. foxi*; it has a body-shape like *olivii* (dilated and short pereopods, et.) and body-pilosity like other *Echinogammarus* species (*stocki*, *acarinatus*).

The species *Chaetogammarus dahli* Stock 1968 described from Bone (Algeria) and Napoli (Italy) probably belongs to the genus *Echinogammarus* also. I have not the specimens of *C. dahli* in my hands, and for this reason it is not present in the key to the species of *Echinogammarus*.

Key to the species of *Echinogammarus* from Italy and Yugoslavia
(adult males)

1. Antennal gland cone long, recurved
E. scutarensis (Schäf. 1922)
- Antennal gland cone short, straight 2
2. Metasome dorsally with keel. Urosome with very high dorsal elevation
E. thoni (Schäf. 1922).
- Metasome dorsally without keel. Urosome lacking or with shallow dorsal elevation 3

3. Antenna 2 with short and broad articles, very densely setose 4
 — Antenna 2 with more or less slender articles less setose 5
4. Peduncle of antenna 1 poorly setose. Telson lacking lateral spines. Article 6 of gnathopods 1-2 with concave palm. Epimere 2-3 lacking numerous distal setae.
E. cari (S. Kar. 1931).
 — Peduncle of antenna 1 densely setose. Telson usually with lateral spines. Article 6 of gnathopods 1-2 with straight palm. Epimere 2-3 with numerous distal setae.
E. roco n. sp.
5. Pereopods 5-7 stout, short and broad 6
 — Pereopods 5-7 slender and long 7
6. Antenna 2 lacking calceola, pereopods 3-7 very weakly setose, mainly provided with spines. Epimere with distal spines, usually lacking setae. Article 2 of pereopods 5-7 with very short marginal setae
E. olivii (M. Edw. 1830)
 — Antenna 2 with calceola. Pereopods 3-7 much more setose, setae of medial length. Epimere 2-3 lacking spines, provided with marginal setae. Article 2 of pereopods 5-7 with longer marginal setae.
E. foxi (Schell. 1928).
7. Third palpar article of mandible with a row of submarginal C-setae on inner face. Calceola on antenna 2 absent.
E. stocki G. Kar. 1970
 — Third palpar article of mandible lacking a row of submarginal C-setae on inner face. Calceola on antenna 2 present or absent 8
8. Peduncle and proximal flagellar portion of antenna 1 provided with very long setae. Antenna 2 very densely setose
E. tibaldii Pink. et Stock 1970
 — Peduncle and proximal flagellar portion of antenna 1 provided with shorter setae. Antenna 2 sparsely or densely setose 9
9. Telson very broad and short
E. bolo G. Kar. et Tib. 1973
 — Telson longer and more narrow 10
10. Antenna 2 slightly inflated, calceola absent. Telson lacking lateral spines, epimere 2-3 with distal spines
E. acarinatus (S. Kar. 1931).
 — Antenna 2 more or less slender, calceola usually present. Telson with or without lateral spines. Epimere 2-3 lacking distal spines, provided with distal setae 11
11. Articles 3-6 of pereopods 5-7 usually with spines at both margins. Telson lacking lateral spines, urosomite 1 lacking la-

- teral groups of elements *E. tabu mutus* G. Kar. et Tib. 1973
- Articles 3-6 of pereopods 5-7 provided with spines and longer setae at both margins. Telson with or without lateral spines, urosomite 1 with or without lateral groups of elements . . . 12
12. Each lobe of telson provided with one group of 2-3 lateral spines and one group of 4-6 distal spines. Article 6 of gnathopod 2 relatively broad. Urosomites with major number of spines *E. adipatus* G. Kar. et Tib. 1973
- Each lobe of telson with 1-3 distal spines, lateral group of 1-2 spines on telson-lobe is present or absent. Article 6 of gnathopod 2 more narrowed. Urosome with less number of spines 13
13. Urosomite 1 lacking lateral groups of spines and setae *E. sicilianus* G. Kar. et Tib. 1973
- Urosomite 1 with lateral group of spines and setae 14
14. Posterior margin of article 2 of pereopod 7 very densely crenellated, bearing very long setae; numerous groups of setae appear on inner surface of the article 2. Urosome with distinct elevation. *E. pungens* (M. Edw. 1940).
- Posterior margin of article 2 of pereopod 7 less crenellated, relatively small number of setae -groups appear on inner surface of article 2. The elevation on urosome is of different size 15
15. Article 3 of antenna 1 long and slender, 3 times as long as wide, bearing 3-5 groups of setae at ventral margin, urosome with low dorsal elevation *E. stammeri* (S. Kar. 1931)
- Article 3 of antenna 1 shorter, up to 2.5 times as long as wide, bearing 1-3 groups of setae at ventral margin, urosome with shallow or well developed dorsal elevation 16
16. Flagellum of antenna 2 provided with shorter setae, urosome with low dorsal elevation, articles 3-6 of pereopods 5-7 with very long marginal setae, distoposterior margin of article 2 of pereopods 6-7 provided with long setae. *E. ruffoi* Pink. et Stock 1970
- Flagellum of antenna 2 provided with longer setae, urosome with higher dorsal elevation. Articles 3-6 of pereopods 5-7 with shorter marginal setae. Distoposterior margin of article 2 of pereopods 6-7 provided with shorter setae *E. veneris* (Heller 1865)

References

Karaman, S. 1931a. — 4. Beitrag zur Kenntnis der Süßwasseramphipoden. — Bull. Soc. Sc. Nat. Skopje, 9 (3): 93-107.

- Karaman, S. 1931b. — *Gammarus cari* n. sp. aus Westjugoslawien. — Zoolog. Anzeiger, 94 (9-10): 265-268.
- Karaman, G. 1969. — XXVII Beitrag zur Kenntnis der Amphipoden. Arten der Genera *Echinogammarus* Stebb. and *Chaetogammarus* Mart. an der jugoslawischen Adriaküste. — Glas. Rep. zavoda za zaštitu prirode, prir. Zbirke, Titograd, 2: 59-84.
- Karaman, G. 1970. — XXV Beitrag zur Kenntnis der Amphipoden. Kritische Bemerkungen über *Echinogammarus acarinatus* (S. Kar. 1931) und *Echinogammarus stocki* n. sp. — Poljoprivreda i šumarstvo Titograd, 16 (1-2): 45-66.
- Karaman, G. 1971. — XXX Beitrag zur Kenntnis der Amphipoden. Über einigen Amphipoden aus Griechenland und Kleinasien. — Acta Mus. Mac. Sc. Nat. Skopje, 12 (2): 21-40.
- Karaman, G. 1971 (72). — XXXVI Contribution to the Knowledge of the Amphipoda. On some *Echinogammarus* and *Chaetogammarus* species from France and Italy. *Echinogammarus stammeri* (S. Kar. 1931) and *E. tabu* n. sp. — Glas. Rep. zavoda za zašt. prirode, prir. muzeja, Titograd, 4: 83-99.
- Karaman, G. et Tibaldi, 1973. — Some new *Echinogammarus* species Amphipoda, Gammaridae) from Italy. — Mem. Mus. Civ. St. Naturale Verona (in press).
- Pinkster S. et Stock 1970. — On three new species of *Echinogammarus*, related to *E. veneris* (Heller 1965) from Italy and Switzerland (Crust. Amph.) — Beaufortia, Zool. Mus. Univ. Amsterdam, 17 (228): 85-104.
- Pinkster, S. et Stock 1972. — Members of the *Echinogammarus simoni*-group and the genus *Eulimnogammarus* (Crust. Amph.) from the Iberian peninsula and North Africa, with description of a new species. — Bulletin Zoolog. Mus. Univ. Amsterdam, 2 (10): 85-115.
- Stock, J. 1968. — A revision of the European species of the *Echinogammarus pungens*-group (Crust. Amph.). — Beaufortia, Zool. Mus. Univ. Amsterdam, 16 (211): 13-78.

Rezime

51. PRILOG POZNAVANJU AMPHIPODA. DVA PRIPADNIKA GRUPE ECHINO GAMMARUS SIMONI (FAM. GAMMARIDAE) IZ JUŽNE EVROPE, E. CARI (S. KAR. 1931) I E. ROCO, N. SP.

Vrste roda *Echinogammarus* bile su predmet vrlo intenzivnih istraživanja posljednjih dvadesetak godina. Opisane su velike broj novih vrsta iz cirkummediteranske oblasti, posebno iz Francuske i Italije.

U ovom radu je opisana jedna nova vrsta roda *Echinogammarus* iz centralne Italije, *E. roco*, n. sp. koja je veoma slična jednoj drugoj vrsti opisanoj 1931. god. iz izvora Bistre Rijeke kod Ogulina, u Hrvatskoj. Da bi se utvrdile sve razlike koje postoje između ove dvije vrste, detaljno je ponovo opisana vrsta *E. cari* (S. Karaman 1931) na osnovu paratipova koje posjedujemo u našoj zbirci.

Kratka dijagnoza vrste (mužjaka): dužina tijela do 7 mm. Tijelo glatko, urozom sa slabim dorzalnim uzvišenjima. Urozomalni prvi segment bez bočnih grupa trnova ili dlaka. Bočne glavene ploče tupe, sa ravnim prednjim krajem.

Držak prve antene slabo dlakav, bič sastavljen od 21 segmenta, slabo dlakav. Druga antena vrlo kratka i zadebljana, svi njeni segmenti nose duge i guste dlake. Četvrti segment drške druge antene duži je nego peti segment, calceole nedostaju, bič sastavljen od samo 8 segmenata.

C-dlake na trećem segmentu palpusa mandibule nedostaju. Koksa ploče vrlo slabo dlakave na distalnom rubu. Šesti segment prvog gnatopoda kruškastog oblika, njegova palma udubljena i fino nazubljena, nosi jedan srednji i po dva ugaona trna na unutrašnjoj i vanjskoj površini.

Šesti segment drugog gnatopoda veći od istog kod prvog gnatopoda, sa 4-5 grupa dlaka na stražnjem rubu, palma udubljena i fino nazubljena i nosi jedan srednji trn i po dva trna na vanjskoj i unutrašnjoj površini.

Pereopod 3 sa malo sabijenim segmentima koji nose na stražnjem rubu duže dlake. Pereopod 4 malo je manji od pereopoda 3, i nešto je slabije dlakav.

Pereopod 5 sa jasnim stražnjim lobusom na drugom segmentu, segmenti 3-6 dosta trnoviti sa obje strane. Pereopodi 6 i 7 nešto su veći od pereopoda 5, njihov drugi članak je uži i bez stražnjeg lobusa.

Epimera 2 nosi 1, rjeđe 2 distalne dlake, epimera 3 nosi 2-3 trna na distalnom rubu. Objе epimere su straga zašiljene.

Uropodi 1-2 dobro razvijeni, uropod 3 sa kratkom unutrašnjom granom, vanjska grana je dvočlana, vršni članak kratak. Vanjska grana nosi veći broj grupa i jednostavnih i perastih dlaka sa obje strane. Telzon je širi nego dug, sa po 2-3 trna na vrhu, dok bočnih trnova nema.

E. cari se razlikuje od slične vrste *E. simoni* (Chevr. 1894) po dužim očima, dužim antenalnim konusom, udubljenom palmom prvog i drugog gnatopoda, slabije trnovitom telzonu i dr.

E. cari živi u izvorima daleko od mora, i do sada je poznata samo iz izvora Bistre Rijeke (kod Ogulina).

***Echinogammarus roco*, n. sp.**

Kratka dijagnoza vrste (mužjaka): dužina tijela do 12 mm, tijelo glatko, urozom sa dorzalnim i bočnim grupama trnova. Antena 1

je u prednjem dijelu jako dlakava. Druga antena je vrlo jako naduvena, svi njeni segmenti su vrlo jako dlakavi i široki, dok kalceola nema.

Lateralne glavene ploče su odrezane, oči izdužene.

Palma drugog gnatopoda uglavnom je ravna i nosi nekoliko trnova na rubu. Šesti članak drugog gnatopoda malo je veći nego isti od prvog gnatopoda, njegova palma kao kod prvog gnatopoda.

Pereopodi 3 i 4 nisu sabijeni, i nose veći broj dužih dlaka na stražnjem rubu.

Pereopodi 5-7 nose veći broj trnova sa obje strane, drugi segment 6-7 pereopoda nosi veći broj dlaka na stražnjem rubu.

Epimere 2 i 3 su zašiljene na stražnjem rubu, i nose veći broj dlaka na donjem rubu.

Uropodi 1-2 dobro razvijeni, uropod 3 srednje veličine i nosi peraste i obične dlake na obje strane vanjske grane. Telzon je vrlo širok, svaki njegov lobus nosi jedan bočni i 3 vršna trna uz koje se nalazi po koja dlaka.

E. roco je jedna vrlo interesantna vrsta, jer se razlikuje od svih do sada poznatih vrsta ovog roda po vrlo naduvenoj drugoj anteni koja je veoma dlakava.

E. roco se razlikuje od *E. cari* po obliku telzona, dlakavosti epimera, pereopoda i antena, urozomu itd.

E. roco je nađena u dva lokaliteta srednje Italije: izvori Tirino (Abruzzo), i Capo Pescara, i predstavlja jednu endemsku vrstu Italije koja je slična vrsti *E. cari* iz Jugoslavije.

U Jugoslaviji je sada poznato 9 vrsta roda *Echinogammarus*: *E. acarinatus*, *E. cari*, *E. foxi*, *E. olivii*, *E. pungens*, *E. scutarensis*, *E. stocki*, *E. thoni*, *E. veneris* i vjerovatno *E. stammeri*.