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ГЛАСНИК ОДЈЕЉЕЊА ПРИРОДНИХ НАУКА, 10, 1994.

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TAXONOMICAL PROBLEMS OF BOGIDIELLA (MEDIGIDIELLA)
DALMATINA S. KAR. 1953 (FAM. BOGIDIELLIDAE)
AND ALLIED TAXA

(Contribution to the Knowledge of the Amphipoda 202)

Abstract

The subterranean species *Bogidiella (Medigidiella) dalmatina* S. Karaman 1953 (*Amphipoda Gammaridea*, fam. *Bogidiellidae*) is redescribed based on material from the eastern coast of the Adriatic Sea (Croatia, Montenegro) and its taxonomical validity and relationships to the allied taxa: *Bogidiella (Medigidiella) chappuisi* Ruffo 1952, and *B. (M.) paraichnusae* G. Karaman 1979 from France and Italy are analysed.

TAKSONOMSKI PROBLEMI VRSTE BOGIDIELLA (MEDIGIDIELLA)
DALMATINA S. KAR. 1953 (FAM. BOGIDIELLIDAE)
I SRODNIH TAKSONA
(202. Prilog poznavanju Amphipoda)

Izvod

Podzemna vrsta *Bogidiella (Medigidiella) dalmatina* S. Karaman 1953 (*Amphipoda Gammaridea*, fam. *Bogidiellidae*) ponovno je opisana na osnovu materijala sa istočne obale Jadranskog mora (Hrvatska, Crna Gora), i analizirani su njena taksonska vrijednost i odnosi prema srodnim taksonima: *Bogidiella (Medigidiella) chap-*

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puisi Ruffo 1952 i *B. (M.) paraichnusae* G. Karaman 1979 iz Francuske i Italije.

Introduction

Stanko Karaman (1953) described a new taxon, *Bogidiella albertimagni dalmatina*, n. ssp. from the brackish waters from Lapad (Dubrovnik).

Mestrov (1961) removed it to the species *B. chappuisi* Ruffo 1952 as a distinct subspecies, *B. chappuisi dalmatina* S. Kar.

Later, several authors discussed the validity of this taxon (Ruffo 1953, Mateus & Maciel 1967, Ruffo 1973, etc.).

G. Karaman (1973) redescribed *B. dalmatina* as a distinct species, mentioning that the exact relations between *B. dalmatina* and *B. chappuisi* must be reexamined based on elevated number of samples.

G. Karaman (1979a) redescribed *B. chappuisi* Ruffo 1952 from type-locality and from several other localities in Italy, removing also *B. minotaurus* Ruffo & Schiecke 1976 to *B. chappuisi* as synonym. He described (1979b) a new species, *Bogidiella paraichnusae*, n. sp. from Bay of Napoli (Italy).

Later, he removed (1981, 1982) *B. dalmatina* to the subgenus *Bogidiella* (*Bogidiella*) because he supposed the absence of sexual dimorphism between males and females.

G. Karaman (1989) described a new subspecies, *Bogidiella chappuisi pescei*, n. ssp. from the subterranean waters of Sardinia, discussing again the validity of *B. minotaurus* Ruffo & Schiecke 1976, from Creta Island as a distinct species.

Present first discovery of the males of *B. dalmatina* in the subterranean waters of Cavtat (S. of Dubrovnik) showed that *B. dalmatina* belongs to the subgenus *Medigidiella* Stock 1981.

At the same time, the established variability of the number of spines on telson in *B. dalmatina* and *B. chappuisi*, put a different light on the taxonomy of *Bogidiella chappuisi* — Complex of taxa discussed in this work.

Acknowledgements: I am indebted to Dr. Sandro Ruffo from the Museum of Natural History in Verona (Italy) and Dr. Boris Sket from the University of Ljubljana (Slovenia) for the loan of material used in this study.

BOGIDELLA (MEDIGIDIELLA) DALMATINA S. Karaman 1953

Figs.: I—IV

Bogidiella albertimagni dalmatina S. Karaman 1953: 141, fig. 1—2; S. Karaman 1959: 346

Bogidiella chappuisi dalmatina Mestrov 1961: 79.

- Bogidiella chappuisi* (part.) Ruffo 1963: 190; Mateus & Maciel 1967: 37; Ruffo 1973: 51.
Bogidiella dalmatina G. Karaman 1973: 27, fig. III—V; G. Karaman 1974: 5; G. Karaman 1979a: 24; G. Karaman 1982b: 256, fig. 172.
Bogidiella (*Bogidiella*) *dalmatina* G. Karaman 1981: 31; G. Karaman 1982a; 39; Coineau & Stock 1986: 576.

Material examined: Eastern coast of the Adriatic Sea:
— Dubrovnik (Lapad, Croatia) (holotype) (leg. S. Karaman);
— Cavtat (Croatia) (—955), spring near the coast of the sea, 8 spec. (data?) (leg. B. Sket);
— Boka Kotorska Bay (Crna Gora), various localities along the seashore, Dec. 1971, several spec. (leg. G. Karaman);
— Jaz near Budva (Crna Gora), mesopsammon, Oct. 4, 1965, one spec. (leg. G. Karaman).

Description: (Specimens from Cavtat): Male 1,9 mm; Body smooth, head with short subrounded lateral cephalic lobes and developed ventroanterior sinus (fig. I, 4), eyes absent.

Antenna 1 reaching $2/5 - 1/2$ of the body; peduncular segments 1—3 progressively shorter (fig. I, 1), peduncular segment 1 with 2 ventral spines; peduncular segment 3 short; main flagellum consisting of 7 articles (most of articles with one long aesthetasc); accessory flagellum short, 2 — segmented, hardly exceeding the length of last peduncular segment (fig. I, 1, 9), rarely flagellum is 3-segmented (in this case, the division between first and second segment is not quite distinct) (fig. I, 3).

Antenna 2: peduncular segments 3—4 with one ventral spine (fig. I, 2); flagellum 5-segmented, antennal gland cone short (fig. I, 2).

Labrum broader than long, entire (fig. I, 8). Labium with angular entire outer lobes and narrow ventral parts, inner lobes short, subrounded (fig. I, 7).

Mandibles with well developed cylindrical molar bearing one longer subdistal seta (fig. IV, 5). Left mandible: incisor with 5 teeth, lacinia mobilis with 5—6 teeth (fig. IV, 8, 13). Right mandible: incisor with 5 teeth, lacinia mobilis bifurcate, pluritoothed (fig. IV, 5, 7, 12). Mandibular palp 3-segmented, second segment with 1—2 setae; third segment slightly shorter than second one, bearing 4 distal setae (fig. IV, 5, 6).

Maxilla 1: inner plate with 2 setae, outer plate with 7 slender spines bearing 1—2 lateral teeth each (only inner spine pluritoothed) (fig. IV, 4); palp 2-segmented, nearly reaching tip of spines of outer plate, with 3 distal setae (fig. IV, 4).

Maxilla 2: both plates with distomarginal setae only.

Maxilliped: inner plate short, with 2 bicuspid spines (fig. III, 5); outer plates short, with 3 distal spines and with serrate distoinferior margin (fig. III, 5); palp segment 4 with short nail and with one long ventral seta.

Coxae 1—4 shallow, much broader than long (high) (fig. II, 7—10); coxae 5—7 with narrow posterior lobe bearing distal spine.

Gnathopods 1—2 moderately large, almost of the subequal size. Gnathopod 1: segment 2 stout, at posterior margin with one long median and one short distal seta (fig. II, 1); segment 5 narrow, lobed, with 3 distal posterior setae (fig. II, 1); segment 6 longer than broad; palm oblique nearly to the half of posterior margin of segment 6, defined on outer face by 1 corner spine, on inner face by 1 subcorner and one submarginal spine (fig. II, 2); palm is finely serrate in proximal and distal part and smooth in the middle, and provided with several slender bicuspid spines and setae (fig. II, 2, 5, 6); or, palm can be finely serrate along whole its length (fig. II, 6); dactyl is provided with 2 teeth along inner margin and with 1 seta at outer margin (fig. II, 2).

Gnathopod 2: segment 2 narrower and longer than that of gnathopod 1, along posterior margin with one long median and one short distal seta (fig. II, 3); segment 5 triangular, exceeding half of segment 6-length, unlobed; segment 6 with almost parallel lateral margins, longer than broad, with 2 groups of setae along posterior margin (fig. II, 3, 4); palm oblique nearly to $1/3$ — $2/5$ of posterior margin of segment 6 (fig. II, 3, 4), with several slender bicuspid spines and setae and with 1 corner spine on outer face and 1 subcorner spine on inner face (fig. II, 4); palm is, like that of gnathopod 1, finely serrate in proximal and distal part, and smooth in the middle (fig. II, 4, 5), or finely serrate along whole its length (fig. II, 6); dactyl like that of gnathopod 1.

Pereopods 3—4 similar to each other (fig. III, 1, 2); segment 2 dilated in the middle, with 2—3 setae along both margins; dactyl slightly shorter than half of segment 6, with short nail (fig. III, 1, 2).

Pereopods 5—7 progressively longer (fig. III, 3, 4, 6), Pereopod 5: segment 2 ovoid, narrow, unlobed, bearing 2 setae along posterior margin (fig. III, 3); dactyl short and stout, reaching nearly half of segment 6-length.

Pereopod 6 like pereopod 5, but longer; segment 2 at posterior margin with 1—2 stouter setae (fig. III, 4), dactyl slightly exceeding half of segment 6.

Pereopod 7: segment 2 with 2 spines along posterior margin (fig. III, 6); segment 6 with row of long marginal setae; dactyl slender, slightly longer than half of segment 6, nail short (fig. III, 6).

Segment 2 of pereopods 3—7 with indistinct or hardly visible small Hertzog's organ on some of pereopods only (fig. III, 1—4, 6).

Epimeral plates 1—3 with pointed ventroposterior corner (obtuse or acute point) and with convex posterior margin (fig. I, 5). Along posterior margin of epimeral plates 1—3 appear 2 longer setae (fig. I, 5).

Pleopods 1—3 progressively shorter towards pleopod 3 (fig. IV, 1—3), similar to each other, unmodified; peduncle with 2 reti-

nacula each, smooth; inner ramus absent (fig. IV, 1—3); outer ramus exceeding 2/3 of peduncle-length, 3-segmented, each segment with 2 long plumose setae.

Urosomite 1 ventrally near basis of peduncle of uropod 1 without any spine or seta (fig. I, 6). Uropod 1: peduncle with one basifacial spine (fig. I, 6) and 2 distal spines; inner ramus is remarkably longer than outer one, both rami with 4 distal short simple spines (fig. I, 6).

Uropod 2 modified: peduncle with 2 distal spines (fig. I, 6); outer ramus is hardly shorter than inner one, with 4 distal short simple spines; inner ramus is with 3 slender spines and with one long strong modified spoon-shaped spine toothed distally (fig. I, 6), that spine exceeding the length of other simple adjacent spines.

Uropod 3: peduncle with 2 distal spines (fig. IV, 9); rami nearly subequal, each one with lateral and distal long spines (the longest distal spine reaching half of ramus length) (fig. IV, 9).

Telson is hardly broader than long, tapering distally and with more or less deep distal broad excavation (fig. IV, 10, 11, 14); each lobe of telson with 1—2 distal spines shorter than telson itself; a pair of short plumose setae appears on each side of telson.

Coxal gills short, ovoid, occur on pereonites 4—6 (fig. III, 3).

Females: Like males in most of the characters, including the presence of 1—2 spines on each lobe of telson, partially or completely serrate palm of segment 6 in gnathopods 1—2, by shape of uropods 1 and 3, epimeral plates and pleopods 1—3.

Uropod 2 is unmodified, inner ramus is longer than outer one, both rami with distal simple short spines (fig. I, 10).

Oostegites occur on pereonites 2—5, narrow, with long setae.

Variability: Within the population of Cavtat, we found the specimens with 1 spine and the specimens with 2 spines on each lobe of telson, as well as one specimen with 2 spines on one lobe, and 1 spine on another lobe of telson (fig. IV, 10, 11, 14).

One detailed analyse of other taxonomical characters of specimens (males and females) having 4 spines on telson, with these of specimens having 2 spines on telson, showed the absence of any further differences between them, including the spoon-shaped distal modified spine on inner ramus of uropod 2 in males.

Localities cited: Eastern coast of the Adriatic Sea: Lapad (Dubrovnik); Cavtat (S. Karaman, 1953); Boka Kotorska Bay (Verige); Jaz near Budva (G. Karaman, 1973; 1982; present work).

Loc. typ.: Lapad (Dubrovnik).

Distribution: Known from eastern coast of the Adriatic Sea only.

Ecology: Found in the subterranean fresh and brackish waters near Sea, in springs or mesopsammon.

BOGIDIELLA (MEDIGIDIELLA) CHAPPUISI CHAPPUISI Ruffo 1952
Fig. V, 1—8

Bogidiella chappuisi Ruffo 1952; 1636, fig. 1—4.

Bogidiella chappuisi (part.) G. Karaman 1982b: 252, fig. 169—171.

Bogidiella chappuisi chappuisi (part.) G. Karaman 1989: 29.

Material examined: France: Le Racou, July 26, 1951, many spec. (paratypes):

Italy: — Mouth of Sele River (Paestum), May 20, 1975, one male (leg. Cottarelli);

— Beach on mouth of torrent Liscia (N. part of Sardinia), April 30, 1979, several spec. (leg. Chelazzi).

Remarks: The specimens from type-locality (Le Racou), males and females, are provided mostly with 4 spines on telson, and only a few of specimens with 2 spines on telson (fig. V, 1, 7).

The males bearing 2, and males bearing 4 spines on telson are similar to each other, including 3-segmented accessory flagellum and short linear modified distal spine on inner ramus of uropod 2, serrate longitudinally along dorsal margin (fig. V, 2, 3); that spine not exceeding the length of adjacent distal simple spines.

The mouthparts like these in *B. dalmatina*. Right mandible: incisor with 5 teeth, lacinia mobilis bifurcate, pluritoothed (fig. V, 5). Left mandible: incisor with 5 teeth, lacinia mobilis with 4 teeth (fig. V, 6).

Maxilliped: inner plate with 2 bicuspid spines (fig. V, 4), outer plate with serrate distoinferior margin bearing distolateral smooth spines (fig. V, 4).

Hertzog's organ on pereopods 3—7 is not or hardly visible in preserved material from type-locality.

The specimens from Liscia (Sardinia) agree with these from Le Racou, including telson provided with 2 or 4 distal spines (fig. V, 8), the shape of short modified spine on inner ramus of uropod 2 in males and 3-segmented accessory flagellum.

The single male in hands from Sele River was with telson bearing 4 distal spines, 3-segmented accessory flagellum and with modified spine on inner ramus of uropod 2 like that in males from Le Racou and Liscia.

Loc. typ.: Le Racou (France).

Distribution: Known from the coastal zone of southern France (Mediterranean coast) and Italy.

Ecology: Fresh and brackish subterranean waters near the sea shore, mesopsammon.

BOGIDIELLA PARAICHNUSAE G. Karaman 1979
Fig. V, 9—12

Bogidiella paraichnusae G. Karaman 1979b: 109, fig. IV—VI.
Bogidiella chappuisi chappuisi (part.) G. Karaman 1989: 29, fig. I.

Material examined: Italy: — Napoli, July 29, 1968, coast of the Sea, depth 0,2—0,3 m, sandy bottoms, several spec. (leg. U. Schiecke);

— Bay of Napoli, July 22, 1968, several spec. (leg. U. Schiecke);

— Porto Badisco (Puglia, Otranto), spring in the water (sea level, Oct. 11, 1971, several spec. (leg. U. Schiecke).

Remarks: The specimens from both localities have been provided with 2 or 4 spines on telson. Often, the specimens bearing 4 spines of telson are provided with 3-segmented accessory flagellum, and these with 2 spines on telson with 2-segmented accessory flagellum (but holotype of *B. paraichnusae* is with 3-segmented accessory flagellum). No other differences between specimens with 2 and 4 spines on telson have been observed, including distal modified spine on inner ramus of uropod 2 in males; this spine is elongated and dilated distally (spoon-shaped), exceeding the tip of adjacent simple distal spines, like that in *B. dalmatina* (fig. V, 9, 10).

The males from Porto Badisco are provided also with spoon--like long modified spine on inner ramus of uropod 2 (fig. V, 11—12).

The present abolition of number of distal spines on telson, as a good taxonomic character within the *B. chappuisi*-Complex, has opened a problem about the validity and the differences between taxa: *chappuisi*, *dalmatina* and *paraichnusae*.

B. paraichnusae differs from *B. chappuisi* by different shape of distal modified spine on inner ramus of uropod 2 in males, and from *B. dalmatina* by shallow telson only.

B. dalmatina differs from *B. chappuisi* by different shape of modified spine on uropod 2 in males and by high (long) telson, and from *B. paraichnusae* by high (long) telson only. Consequently, the taxonomic relations between *B. dalmatina* and *B. paraichnusae* request further studies on more elevated number of new samples from various localities.

The small size and the poorly known variability of distal modified spine on inner ramus of uropod 2 in males request further studies of this spine by scanning microscope (high magnification)

to establish the limits of variability and its taxonomical value. For this reason, we leave at the moment, all three studied taxa of *B. chappuisi* — Complex as a distinct species.

Loc. typ.: Bay of Napoli, Italy.

Distribution: Coast of Italy (Thyrrhenian Sea and Otranto).

Ecology: Brackish subterranean waters near sea-shore (me-sopsammon).

Conclusion

The taxonomic characters of the males of *Bogidiella dalmatina* S. Karaman 1953 from Cavtat showed that this taxon belongs to the subgenus *Medigidiella* Stoch 1981.

The discovery of specimens of *Bogidiella chappuisi* Ruffo 1952, *B. dalmatina* S. Kar. 1953 and *B. paraichnusae* G. Kar. 1979, provided with 2, 3 or 4 spines on telson, within the same sample, indicated that this character can not be used as a valid taxonomical character within the *Bogidiella chappuisi* — Complex of species.

A different shape of distal modified spine on inner ramus of uropod 2 in males from various localities of *Bogidiella chappuisi* — Complex of taxa, suggested that this taxonomical characters can be used as a valid character for recognition of some species (*paraichnusae*, *chappuisi*, *dalmatina*), despite the fact that this character must be studied more in detail on much higher number of samples from various localities, in order to establish the limits of its variability and its taxonomical value.

All three studied taxa (*chappuisi*, *dalmatina*, *paraichnusae*) differ to each other by the combination of the characters: shape of modified spine on inner ramus of uropod 2 in males, and by the shape of telson only. Further studies on other new samples will show a real taxonomic relations and taxonomical value of these three taxa, especially because the shape of telson can be not always accepted as one strong taxonomical character.

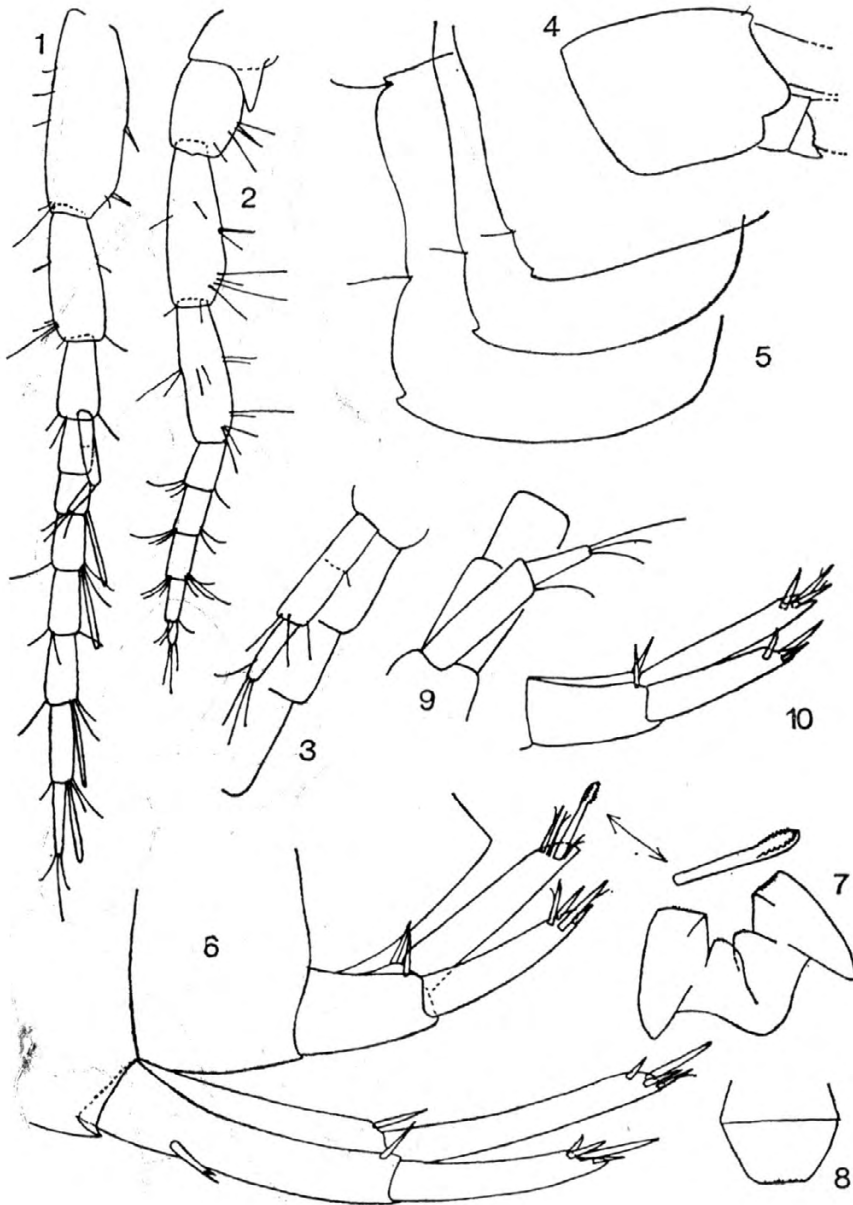


Fig. 1. *Bogidiella* (*Medigidiella*) *dalmatina* S. Kar. 1953, Cavtat, male 1,9 mm: 1 = antenna 1; 2 = antenna 2; 3 = accessory flagellum; 4 = head; 5 = epimeral plates 1-3; 6 = uropods 1-2; 7 = labium; 8 = labrum; 9 = accessory flagellum, male 1,95 mm; 10 = uropod 2, female 1,8 mm.

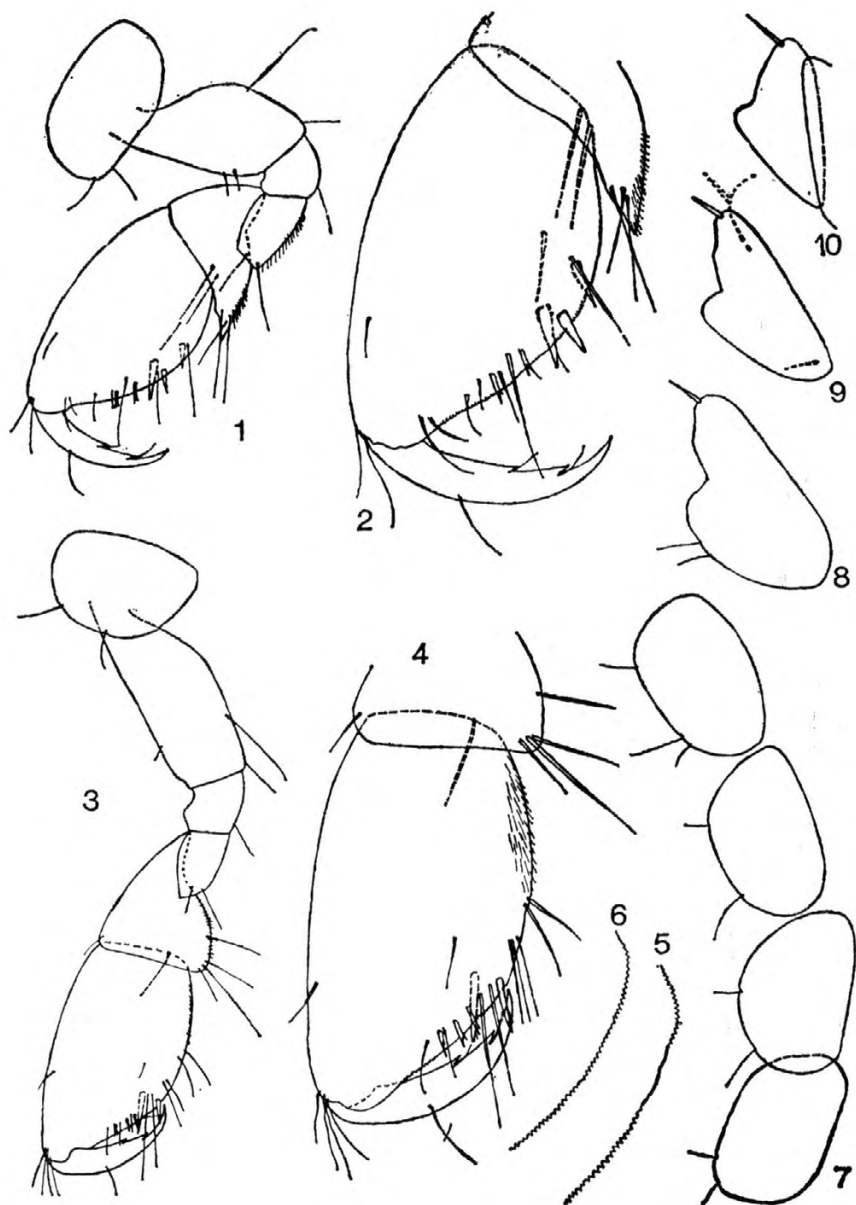


Fig. II. *Bogidiella (Medigidiella) dalmatina* S. Kar. 1953, Cavtat, male 1,9 mm: 1—2 = gnathopod 1; 3—4 = gnathopod 2; 5—6 = serrate palm of gnathopods 1—2; 7 = coxae 1—4; 8 = coxa 5; 9 = coxa 6; 10 = coxa 7.

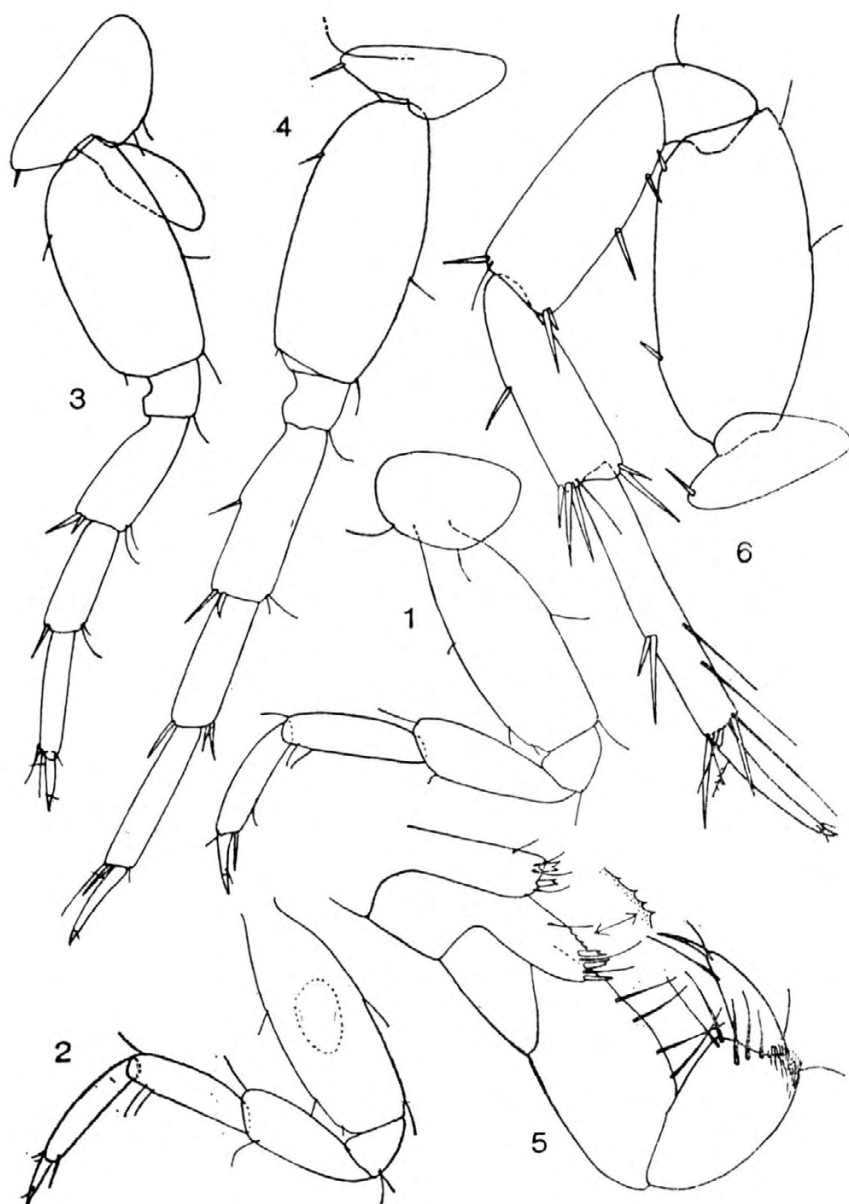


Fig. III. *Bogidiella (Medigidiella) dalmatina* S. Kar. 1953, Cavtat, male 1,9 mm: 1 = pereopod 3; 2 = pereopod 4; 3 = pereopod 5; 4 = pereopod 6, 5 = maxilliped.; 6 = pereopod 7, male 1,95 mm.

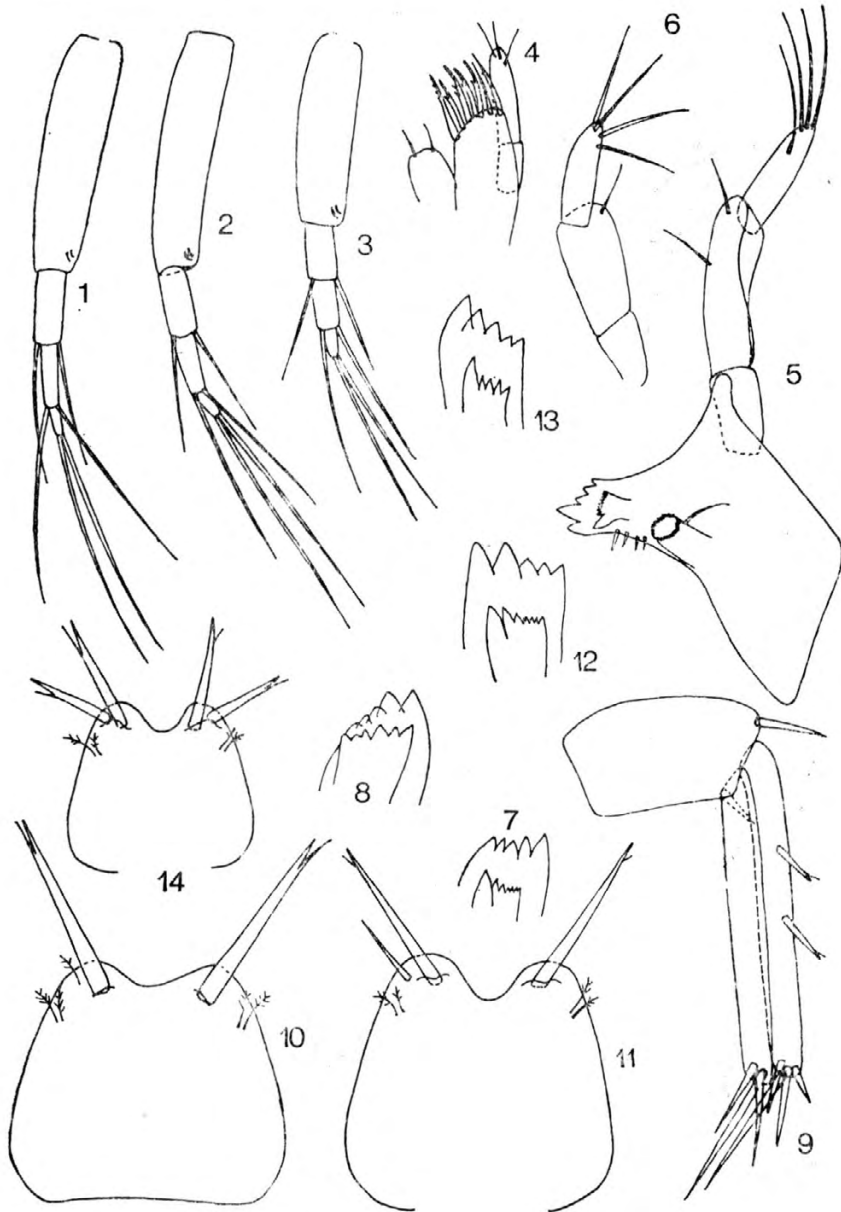


Fig. IV. *Bogidiella (Medigidiella) dalmatina* S. Kar. 1953, Cavtat, male 1,9 mm: 1-3 = pleopods 1-3; 4 = maxilla 1; 5-6 = mandible; 7-8 = right and left mandibular incisor and lacinia; 9 = uropod 3; 10 = telson; 11 = telson, male 1,95 mm; 12-13 = right and left mandibular incisor and lacinia, male 1,95 mm; 14 = telson, male 1,92 mm.

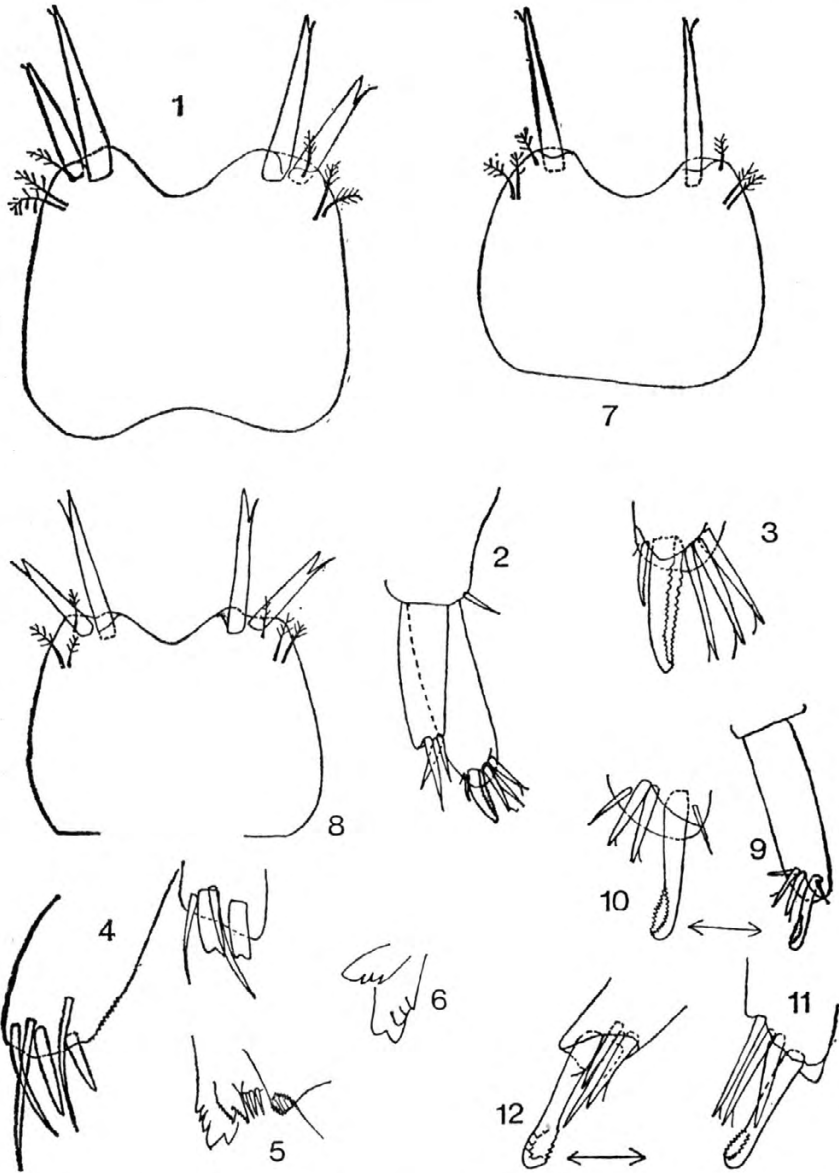


Fig. V. *Bogidiella* (*Medigidiella*) *chappuisi chappuisi* Ruffo 1952, Le Racou, male 2,1 mm: 1 = telson; 2 = uropod 2; 3 = tip of uropod 2; 4 = plates of maxilliped; 5 = tip of right mandible; 6 = tip of left mandible; 7 = telson, male 2 mm; 8 = telson, female 2 mm from Liscia.

Bogidiella (*Medigidiella*) *paraichmusae* G. Kar. 1979; 9-10 = uropod 2, male 2,1 mm from Bay of Napoli; 11-12 = uropod 2, male 1,8 mm from Porto Badisco.

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TAKSONOMSKI PROBLEMI VRSTE BOGIDIELLA (MEDIGIDIELLA) DALMATINA S. KAR. 1953 (FAM. BOGIDIELLIDAE) I SRODNIH TAKSONA (202. Prilog poznavanju Amphipoda)

Rezime

Vrstu *Bogidiella* (*Medigidiella*) *dalmatina* (*Amphipoda Gammaridae*, Fam. *Bogidiellidae*) opisao je S. Karaman 1953. godine iz podzemnih voda Lapada (Dubrovnik) pod nazivom *Bogidiella albertimagni dalmatina*, n. ssp.

Mestrov (1961) postavlja ovaj takson kao zasebnu podvrstu vrste *Bogidiella chappuisi* Ruffo 1952.

Karaman G. (1973) izdvaja *B. dalmatina* kao zasebnu vrstu, na osnovu oblika telzona, a nešto kasnije (1981) stavlja je u podrod *Bogidiella* (*Bogidiella*) Hertzog 1933.

Otkrićem mužjaka, za kojeg je utvrđeno da ima izmijenjeni drugi uropod, vrsta *B. dalmatina* je pripojena podrodu *Bogidiella* (*Medigidiella*) Stock 1981.

Sada ustanovljeno postojanje variranja broja trnova na telzonu (2 ili 4, rijetko 3) unutar jedinki iste populacije kod vrsta *B. chappuisi* Ruffo 1952, *B. dalmatina* S. Karaman 1953 i *B. paraichnusae* G. Karaman 1979, dovelo je u pitanje njihove taksonomske vrijednosti odnosno otvorilo problem međusobnog razlikovanja tih vrsta i pokazao je da ovaj, do sada smatran kao važan taksonomski kriterijum, u stvari nije više upotrebljiv karakter u taksonomiji *B. chappuisi* — kompleksa taksona.

S druge strane, različiti oblik izmijenjenog distalnog trna na unutrašnjoj grani drugog uropoda kod mužjaka kod različitih vrsta *B. chappuisi*-kompleksa, ukazuje da se taj taksonomski karakter može upotrebiti za razgraničavanje pojedinih taksona ove grupe, usprkos činjenici da još nije dovoljno poznata širina varijabiliteta oblika tog trna unutar svake vrste.

Sve tri proučavane vrste, *B. chappuisi* Ruffo 1952, *B. dalmatina* S. Karaman 1953 i *B. paraichnusae* G. Karaman 1979, razlikuju se međusobno uglavnom kombinacijom dva karaktera: oblikom distalnog modifikovanog trna unutrašnje grane drugog uropoda kod mužjaka, i oblikom telzona.

Daljnja proučavanja novih populacija ova tri taksona pokazaće njihove realne međusobne odnose i njihov realni taksonomski položaj unutar *B. chappuisi*-kompleksa vrsta.

