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ON TWO BOGIDIELLA SPECIES (AMPHIPODA, BOGIDIELLIDAE) FROM SOUTHERN EUROPE

(Contribution to the Knowledge of the Amphipoda 239)

A b s t r a c t

A new subspecies of the subterranean genus *Bogidiella (Crustacea Amphipoda*, fam. *Bogidiellidae)* is described and figured from the subterranean waters of the river Skavkač near Gusinje (Plav Sea drainage system), Crna Gora (=Montenegro), Yugoslavia, *Bogidiella glacialis cataracta*, n. ssp. The species *Bogidiella longiflagellum* S. Kar. 1959 is mentioned from various localities in Crete and Rhodes Island in Greece, and its variability is discussed.

Keywords: Zoology, taxonomy, Crustacea, Amphipoda, Crna Gora, Greece.

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O DVIJEMA VRSTAMA RODA BOGIDIELLA (Amphipoda, Bogidiellidae) IZ JUŽNE EVROPE (239. Prilog poznavanju Amphipoda)

Izvod

Iz podzemnih voda rijeke Skavkač iznad vodopada Grlje kod Gusinja (sliv Plavskog jezera, Crna Gora, Jugoslavija), opisana je nova podvrsta amfipoda (Crustacea) iz familije *Bogidiellidae, Bogidiella glacialis cataracta*, n. ssp. Vrsta *Bogidiella longiflagellum* S. Kar. 1959 nađena je u nekim novim lokalitetima Grčke (u podzemnim vodama otoka Kreta i Rodos), i razmatrana je varijabilnost nekih taksonomskih karaktera te vrste.

Ključne riječi: zoologija, taksonomija, Crustacea, Amphipoda, Crna Gora, Grčka.

INTRODUCTION

Intensive study of the *Amphipoda* fauna from the subterranean waters around the Mediterranean Sea during the last 50 years, made possible the discovery of nearly 40 different taxa of the genus *Bogidiella (Amphipoda*, fam. *Bogidiellidae)* in this region. Despite the only partially resolved generic status of these species and genus *Bogidiella* s. lato itself (STOCK, 1981; G. KARAMAN 1981, 1982; KOENEMANN & HOLSINGER, 1999), the discovery of new taxa is still in process. Recently, we discovered the specimens of the new taxon of this genus in the mountainous part of the river Skavkač near Gusinje in Crna Gora (=Montenegro). These specimens are very similar to the species *Bogidiella glacialis* S. Kar. 1959 known from the subterranean waters in high mountains of Macedonia (Jakupica Mt.) but differ from later by several characters. The species *Bogidiella longiflagellum* S. Kar. 1959 is mentioned now from various local ities of the Greek islands Rhodes and Crete, where this species was found accompanied by several other subterranean amphipodous taxa.

BOGIDIELLA GLACIALIS CATARACTA, n. ssp.
Figs. 1-4

MATERIAL EXAMINED: Crna Gora (Montenegro), Yugoslavia: S-5370= Subterranean waters of Skavkač River above Grlje waterfall near Gusinje, pump, July 26, 1995, 3 exp. (leg. G. Karaman). We tried later twice to collect this species again from this locality, but still without success.

DESCRIPTION. Female (?) 1.8 mm (without oostegites): Body slender, mesosomal segments 1-7 with 2 dorsofacial very slender setulae each; metasomal segments 1-3 with 4-6 posterior marginal setae each (fig. 1F); urosomites 1-3 smooth (fig. 1G).

Head with short lateral cephalic lobes, eyes absent, ventroanterior sinus developed (fig. 1A).

Antenna 1 reaching nearly half of body, peduncular segments 1-3 progressively shorter; peduncular segment 1 with 1 distoventral spine; main flagellum consisting of 7 articles (some of them with 1 aesthetasc as long as or hardly longer than article itself (fig. 3A). Accessory flagellum 2-segmented, longer than last peduncular segment of antenna 1 (fig. 3A).

Antenna 2 normal, peduncular segments 4-5 nearly subequal, flagellum with 5 articles; antennal gland cone short (fig. 3B).

Labrum entire, broader than long (fig. 4A); labium shallow, with well-developed inner lobes, outer lobes semi acute (fig. 4B).

Mandibles with well developed triturative molar, bearing on both mandibles 1 short distolateral seta. Left mandible: incisor with 4 teeth, accompanied by 3 rakers and bifurcate toothed lacinia mobilis (fig. 1C). Right mandible: incisor with 4 teeth accompanied by 4-toothed lacinia mobilis and 3 rakers (fig. 1D). Mandibular palp 3-segmented, first and second segment smooth, third segment with 4 setae (fig. 1B).

Maxilla 1: inner plate with 2 setae, outer plate with 6 spines (2 spines with 1 strong lateral tooth, other spines seems to be smooth), palp 2-segmented, not reaching tip of spines of outer plate and bearing 3 setae (fig. 2A).

Maxilla 2: both plates normal, with distomarginal setae only (fig. 2B).

Maxilliped: inner plate short, with 2 distal spines accompanied by single strong setae; outer plate reaching outer tip of first palp segment

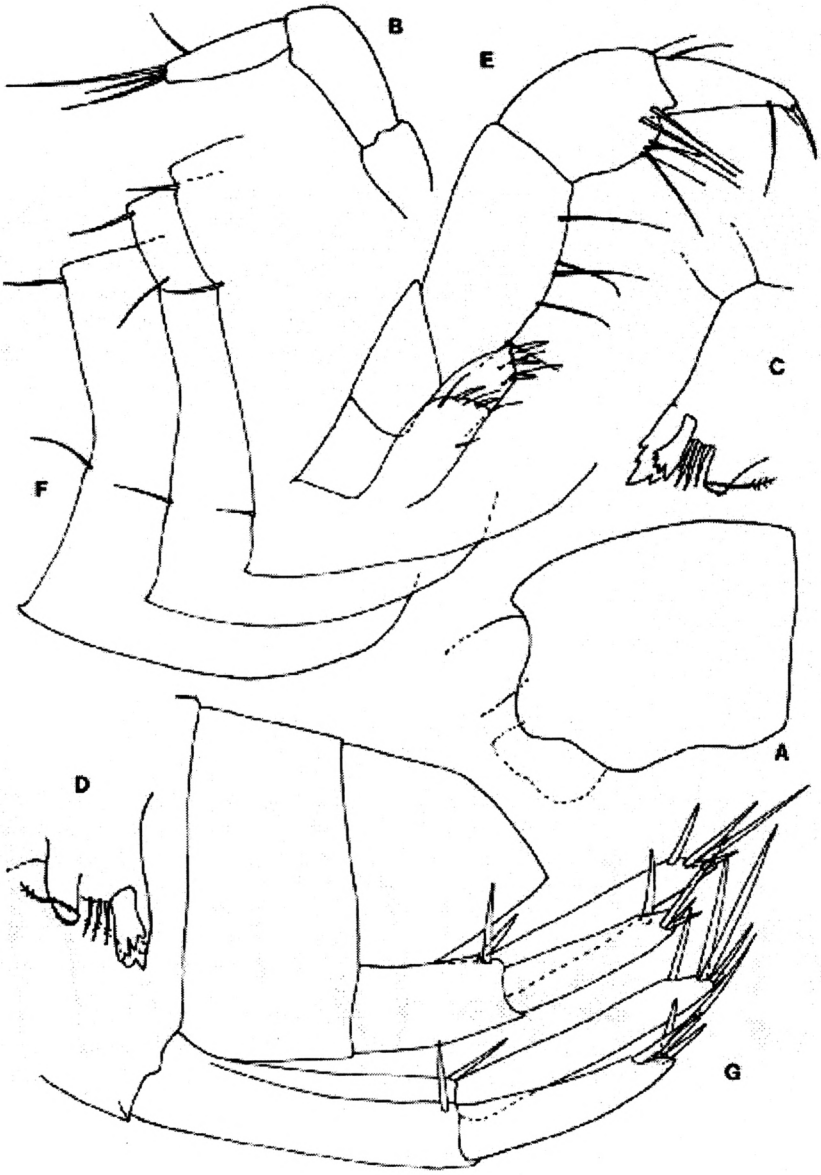

Fig. 1. *Bogidiella glacialis cataracta*, n. ssp., Skavkač, Crna Gora, 1.8 mm (?female): A= head; B= mandibular palp; C= tip of left mandible; D= tip of right mandible; E= maxilliped; F= epimeral plates 1-3; G= urosome with uropods 1-2.

only, with smooth inner margin, and bearing 3 distal spines (fig. 1E); palp 4-segmented, strong, palp segment 4 with one long inner marginal seta, nail much shorter than pedestal (fig. 1E).

Coxae short and shallow, coxa 1 only slightly broader than long (=high) (fig. 2C), coxae 2-7 much shorter than broad (fig. 2D; 3C,D; 4C,D,E); coxae 5-6 bi-lobed, coxa 7 only slightly excavated distoposteriorly; coxae 5-7 with posterior marginal spine each (fig. 4C-E).

Gnathopods 1-2 subchelate, with almost sub equal length. Gnathopod 1: segment 2 with only one short distoposterior and one distoanterior marginal seta; segments 3-4 short, with 1 posterior strong seta; segment 5 triangular, short, with strong posterior tapering lobe bearing 2 setae; segment 6 ovoid, longer than broad; palm oblique nearly to the half of posterior margin of segment 6, convex, finely serrate, defined on outer face by 1 strong seta, on inner face by 1 strong spine; dactyl recurved, with one median seta on outer margin (fig. 2C).

Gnathopod 2: segment 2 along outer and inner margin with 1 short distal seta only, like that in gnathopod 1; segments 3-4 short, with 1 posterior seta; segment 5 triangular, without posterior lobe; segment 6 almost twice as long as broad, with parallel lateral margins; palm oblique almost to the half of posterior margin of segment 6, finely serrate, defined on outer face by 1 strong seta, on inner face by 1 strong spine; dactyl likes that in gnathopod 1 (fig. 2D).

Pereopods 3-4 relatively slender, segment 2 with strongly inflated anterior margin; segments 3-6 slender, bearing single setae; dactyl slender, reaching nearly half of segment 6, with nail shorter than pedestal (fig. 3C,D).

Pereopods 5-7 progressively longer, with segment 2 strongly dilated medioposteriorly, but without ventroposterior lobe or dilatation; segments 3-6 linear, bearing spines; dactyl slender, exceeding half of segment 6, with nail much shorter than pedestal and with 1 plumose seta along outer margin (fig. 4C-E).

Hertzog's organ (=lenticular organ) not visible neither on the gnathopods nor on pereopods.

Epimeral plates 1-3 remarkably pointed, with slightly concave posterior margin (fig. 1F).

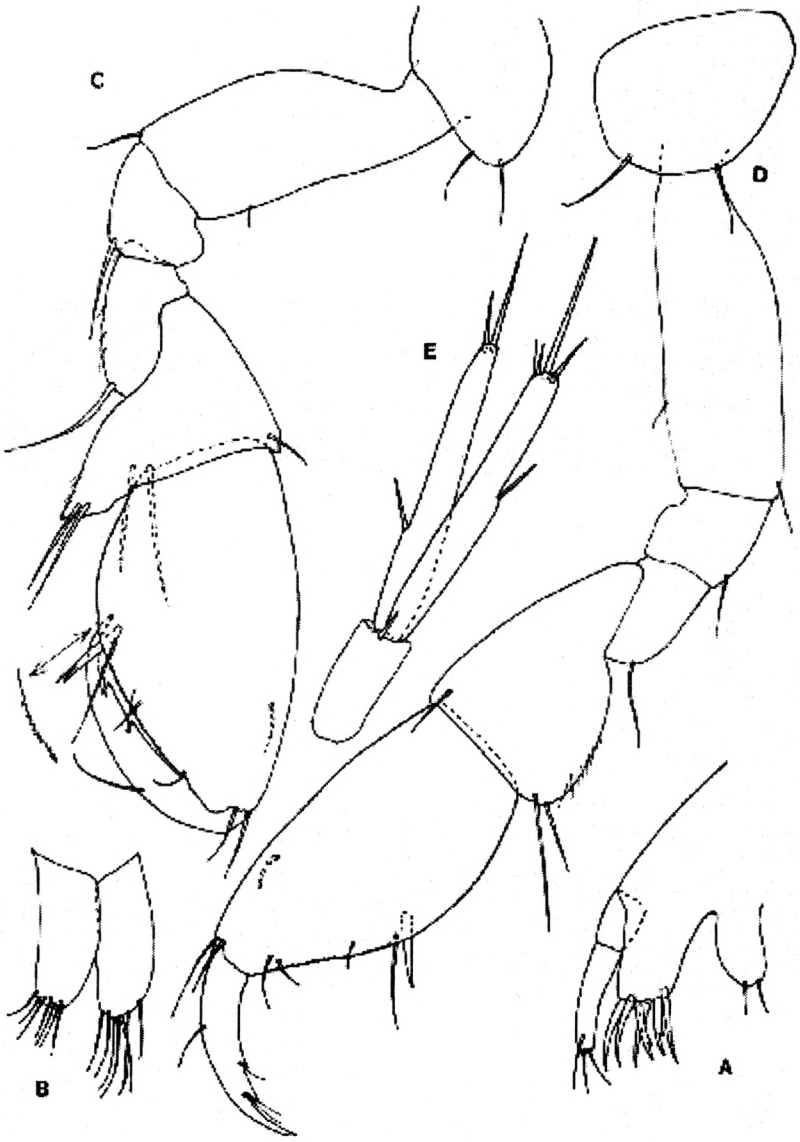

Fig. 2. *Bogidiella glacialis cataracta*, n. ssp., Skavkač, Crna Gora, 1.8 mm (?female): A= maxilla 1; B= maxilla 2; C= gnathopod 1; D= gnathopod 2; E= uropod 3.

Pleopods 1-3 with 2 retinacula each; inner ramus absent, outer ramus consisting of 3 articles bearing 2 plumose setae each (fig. 3E).

Uropod 1: peduncle without basifacial spine, but with 2 distal short spines; outer ramus remarkably shorter than inner one, both rami with 4 long distal spines each (the longest spine exceeding half of rami themselves) (fig. 1G).

Uropod 2: inner ramus longer than peduncle, outer ramus reaching nearly 2/3 of inner ramus, both rami with 4 long distal spines (the longest spine exceeding half of rami themselves) (fig. 1G).

Uropod 3: peduncle short, rami sub equal, 1-segmented, the longest distal spine reaching half of rami themselves (fig. 2E).

Telson short, slightly broader than long, with shallow distal excavation and with 2 distal spines longer than telson itself (fig. 3F).

Coxal gills ovoid, short (fig. 3D, 4C). Sexual dimorphism unknown. Males unknown.

VARIABILITY: It seems that the specimens in hands are not of the maximal length and the new material is requested to establish the eventual sexual dimorphic characters.

REMARKS AND AFFINITIES. The specimens from Skavkač river are very similar to the species *Bogidiella glacialis* S. Karaman 1959, known only from the subterranean waters of Jakupica Mt. in Macedonia (1900 meters above sea level) by several characters: absence of basifacial spine on peduncle of uropod 1, by anteriorly inflated segment 2 of pereopods 3-4 and posteriorly inflated segment 2 of pereopods 5-7, by absence of inner ramus in pleopods 1-3, by presence of 2 spines on telson.

But, B.*glacialis* differs from our specimens of Skavkač river by presence of long ventroposterior median seta on segment 2 of gnathopods 1-2, by presence of 3 setae on inner plate of maxilla 1, by presence of 7 spines on outer plate in maxilla 1, by more spinose palm of gnathopods 1-2, by lower coxa 1 and telson, by poorly unequal rami of uropod 1, by more or less sub rounded ventroposterior corner of epimeral plates 1-3.

Because of these differences, despite based on the study of not quite adult specimens in hands, we consider the specimens from Skavkač river as a distinct taxon, B. *glacialis cataracta*, n. ssp., very allied to the other high mountainous taxon, B. *glacialis* S. Kar. 1959. But, we

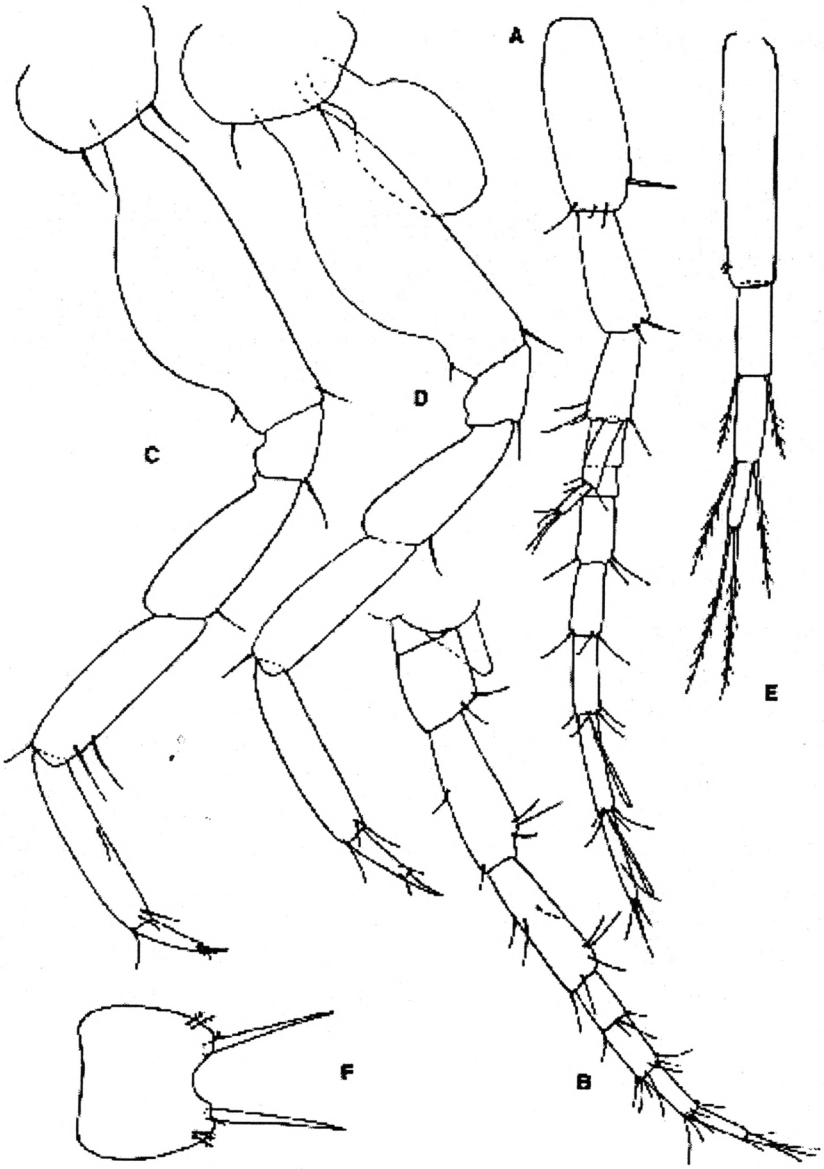

Fig. 3. *Bogidiella glacialis cataracta*, n. ssp., Skavkač, Crna Gora, 1.8 mm (?female): A= antenna 1; B= antenna 2; C= pereopod 3; D= pereopod 4; E= pleopod 1; F= telson.

cannot exclude the possibility that both taxa can be two extreme forms of the same taxon. As neither transitive specimens between both taxa, and other localities of both taxa, are known, we leave the specimens from both localities as a distinct taxa.

The existing of two high mountain taxa, B. *glacialis* S. Karaman 1959 from Jakupica Mt. in Macedonia, and B. *glacialis cataracta*, n. ssp. from Prokletije Mt. in Crna Gora, open the problem of their origin (periglacial elements or endemic mountainous taxa). The discovery of this second taxon in the high mountains indicated the probability that further new taxa of genus *Bogidiella* can be discovered in the subterranean waters of other high mountains over Europe and Asia.

ECOLOGY. Living in the subterranean waters of the mountainous river.

DERIVATIO NOMINIS. The name *cataracta* is originated from Latin name of waterfall, because this species was found in Skavkač River above the waterfall Grlje.

BOGIDIELLA LONGIFLAGELLUM S. Karaman 1959
Fig. 5

Bogidiella longiflagellum S. Karaman 1959: 339, figs. 1 4, 9-15, 20; Ruffo 1963: 190; Dancau & Serban 1965: 341; Mateus & Maciel 1967: 38; G. Karaman 1973: 37, figs. VIII, 6-8,IX; Ruffo 1973: 52; Bou & Ruffo 1979: 296, figs. I-III; Pesce & Maggi 1983: 58, fig. 5 (map); G. Karaman 1987: 47 (key); Vonk et al. 1999: 820, fig. 7 (map);

Bogidiella (skopljensis group) *longiflagellum* Koenemann & Holsinger 1999: 811;

Bogidiella (Bogidiella) longiflagellum G. Karaman 1981: 31; G. Karaman 1982: 39; Koenemann et al. 1998:392.

MATERIAL EXAMINED: GREECE:

S-3917= Island Rhodes, Greece, (Rhodes R-5), June,1981, 2 exp. (leg. G. Pesce);

S-3918= Island Rhodes, Greece, June, 1981 (R-6), 1 exp. (leg. G. Pesce);

S-3919= Island Rhodes, Tolos, Greece, June 1981, 2 exp. (leg. G. Pesce);

S-3920= islad Rhodes, Kalavadra, Greece, June, 1981, 1 exp. (leg. G. Pesce);

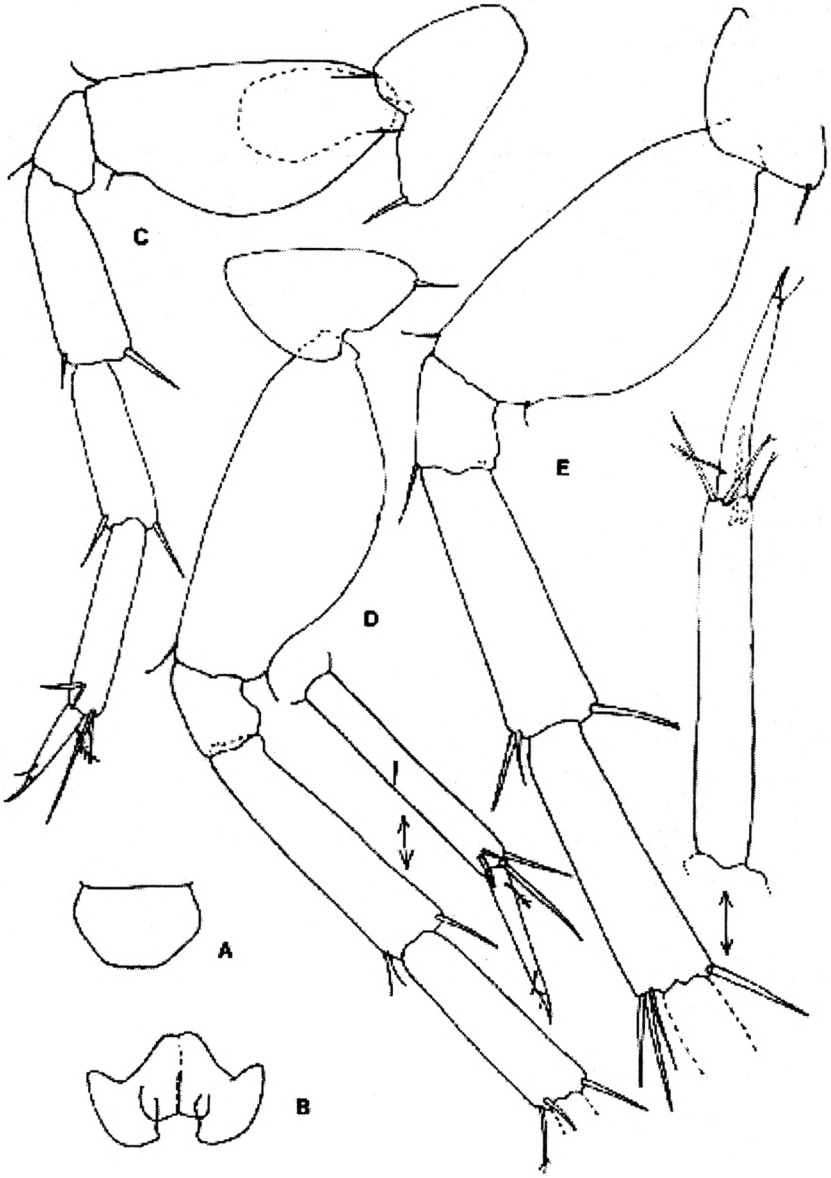

Fig. 4. *Bogidiella glacialis cataracta*, n. ssp., Skavkač, Crna Gora, 1.8 mm (?female): A= labrum; B= labium; C= pereopod 5; D= pereopod 6; E= pereopod 7.

S-3922= Island Rhodes, Greece, Mandrikou, June, 1986, 2 exp. (leg. G. Pesce);

S-3921= Island Crete, Pyrgos, June, 1981, 1 exp. (leg. G. Pesce);

S-4569= Island Crete, Vai, springs near the beach on E. part of the island, Nov. 1988, 2 exp., cf. (leg. B. Sket);

S-6036= Crete island, Preveli, spring on the seashore, Sept., 1988, 1 exp. (leg. B. Sket);

S-6586= Crete island, Iraklion, well 1 km after the road Panagio-Nigiditos, May 4, 1995, 10 exp. mixed with *Niphargus* sp. (leg. ?).

REMARKS. S. KARAMAN (1959) described this species from Macedonia (Negorci; Demir Kapija); Later BOU and RUFFO (1979) cited, redescribed and figured this species in detail from Greece. Our specimens in hands from Greece, i.e. from Rhodes Island and Crete Island, agree mainly with the description of this species given by S. KARAMAN (1959) and BOU & RUFFO (1979).

Our specimens in hands from Greece show some larger variability of certain taxonomic characters:

Accessory flagellum of antenna 1 is always very long, consisting of 3 articles, and much exceeding the length of third peduncular segment of antenna 1 (fig. 5C) main flagellum consisting of 7-8 articles (most of them bearing one aesthetasc each) (fig. 5C).

Labrum trapezoid, broader than long, entire distally.

Mandible with triturative molar, incisor with 4 and 5 teeth, respectively. Inner plate of maxilla 1 with 3 setae, outer plate with 7 spines, palp 2-segmented, with 3 distal setae (fig. 5A).

Maxilliped: inner plate short, with 2 distal spines (fig. 5B), outer ramus short, with 3 marginal spines, palp 4-segmented, with nail.

Segment 2 of gnathopods 1-2 along posterior margin with one short distal and one long proximal marginal seta, along anterior margin with one short distal seta (fig. 5D,E). Gnathopod 1 slightly larger than gnathopod 2, egg-shaped: palm oblique, convex, with 1-2 median, one corner and one subcorner palmar spine; dactyl with one median seta at outer margin (fig. 5D).

Gnathopod 2: segment 6 with parallel lateral margins, palm oblique up to 1/3 of posterior margin of segment 6, defined by one corner and one subcorner spine; dactyl likes that in gnathopod 1 (fig. 5E).

Hertzog's organ absent. Dactyl of pereopods 5-7 of rather variable

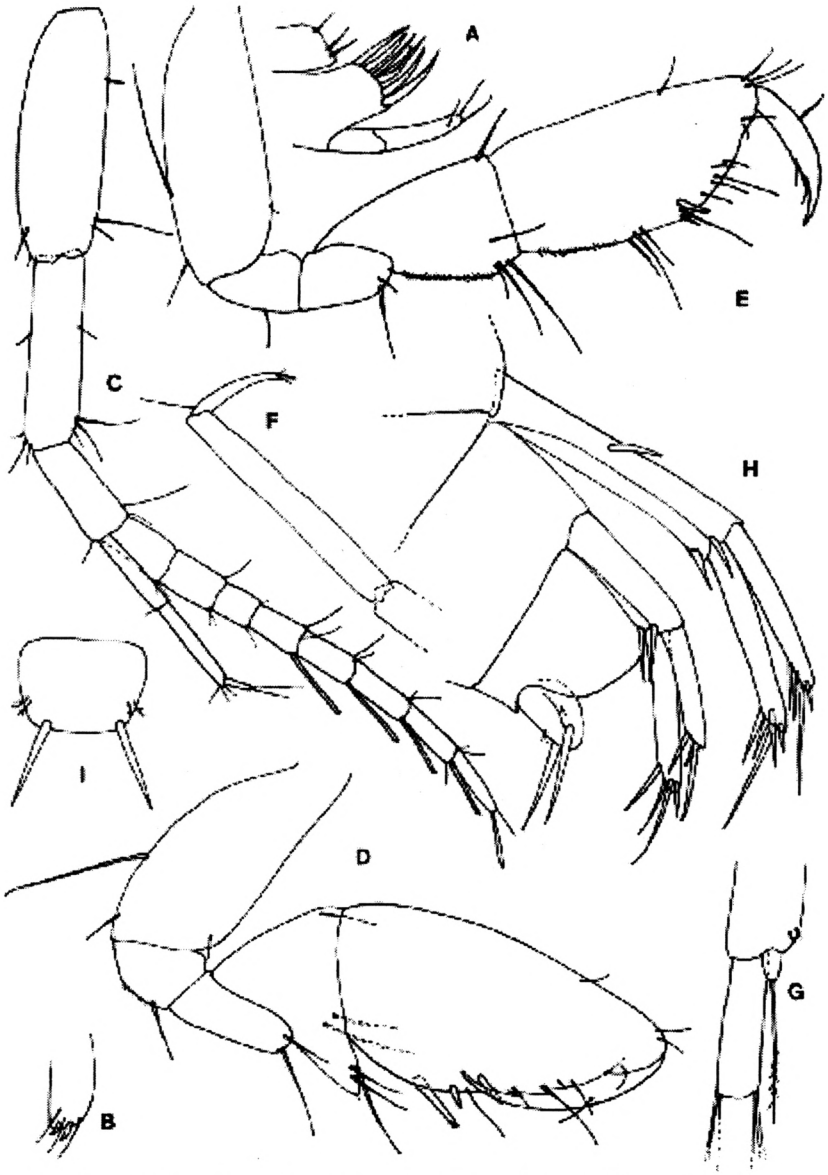

Fig. 5. *Bogidiella longiflagellum* S. Kar., Mandrikou, Rhodes, ovig. female 2 mm: A= maxilla 1; B= inner plate of maxilliped; C= antenna 1; D= gnathopod 1; E= gnathopod 2; F= distal part of pereopod 7 (setae missing); G= pleopod 3; H= urosome with uropods 1-2; I= telson.

length, that of pereopod 7 reaching (Rhodes island) to exceeding the half of segment 6 (Crete island) (fig. 5F).

Epimeral plates 1-3 angular to poorly pointed. Pleopods 1-3 with 2 retinacula each; inner plate short, 1-segmented, outer plate 3 segmented, long (fig. 5G).

Peduncle of uropod 1 with 1 strong mediolateral spine; outer ramus shorter than inner one, both rami with 4-5 distal spines (the longest spines exceeding half of rami-length). Inner ramus of uropod 2 longer than outer one, spines like these in uropod 1 (fig. 5H).

Uropod 3 biramous, with long lateral and distal spines.

Telson short, with 2 distal spines longer than telson itself (fig. 5I).

Oostegites narrow, setose, occur on pereonites 3-5. Coxal gills short.

VARIABILITY. The length of dactyls in pereopods 3-7 is rather variable, as well as the length of accessory flagellum, but the last one is always much longer than last peduncular segment of antenna 1. The length of the spines on uropods 1-3 is also rather variable. Telson is always with 2 long distal spines only.

VONK et al. (1999) showed the variability of certain taxonomic character within three samples of N. *longiflagellum* from Turkey [inner plate of maxilla 1 with 2-3 setae; 6-7 spines on outer plate of maxilla 1; 2-3 spines on palmar corner of gnathopod 1; two (only exceptionally 3) setae on basis of gnathopods 1-2].

LOC. TYP.: well in Negorci by Gevgelija, Macedonia.

LOCALITIES CITED: ASIA MINOR (Turkey): Vilayet Izmir [sandy beach, one km SW of Sigaçik; one km E. of mosque of Sigaçik; well on 900 m SW of mosque of Seferihisar; well on 400 m N. of Haritacilar; subterranean waters of Derebagaz river, 6.5 km upstream of Gümüssu]; Vilayet Mugla [subtler. waters of Kamis Cayi river, on 900 m W. of Yatagan]; Vilayet Burdur [Insuyu magarasi cave, on 8.5 km SE of Burdur; well on 700 m SW of Incir Han]; Vilayet Antalya [subterranean. waters of Karpuzcay river, 5.5 km E. of Kisilot; well E. of old road to Tilkiler; well on 50 m W. of road Manavgat-Oumapinar] (VONK et al., 1999);

MACEDONIA: well in Negorci by Gevgelija; Demir Kapija on riverbank of Vardar River (S. KARAMAN, 1959; G. KARAMAN, 1973; G. KARAMAN, 1974);

GREECE: Two authors mentioned various localities from Greece:

BOU & RUFFO, 1979: Evrotas near Sparta (Laconia reg.); Erimanthos (Elide (= Eleia) reg.); Ladon, near bridge of Loutra-Iraias (Arcadia reg.); Alpheios, Olimpia Mt. (Elide reg.); Evrinos (Etolia reg. (= Aitolia); Kokkinoraki (on road Tripoli-Sparta, Laconia reg.); Poros (Cefalonia (= Kefallenia); Crete (=Kreta) island (Macrigialos; Pahia Amos);

PESCE & MAGGI, 1983: Peloponnesian [wells in Kokkinorraki (Sparta)]; Ionian Islands: Crete island (wells in Pyrgos); Rhodes island (on road Rhodes-Kamiros near bifurcation toward Tolos; on road Kamiros-Mandrikon, 5 km from Mandrikon; Arhipolis; Cremasti, airport).

GENERAL DISTRIBUTION: Southern part of Macedonia, Greece, Asia Minor (Turkey).

ECOLOGY: This species was found in freshwaters and poorly brackish waters, often accompanied by various other amphipods (*Niphargus* spp., *Salentinella angelieri*, etc.).

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REZIME

Iz podzemnih planinskih voda rijeke Skavkač iznad vodopada Grlje (sliv Plavskog jezera, Crna Gora, Jugoslavija) opisana je jedna nova podvrsta amfipoda iz familije *Bogidiellidae* (*Crustacea, Amphipoda*), *Bogidiella glacialis cataracta*, n.ssp., koja je veoma srodna planinskoj podvrsti *Bogidiella glacialis glacialis* S. Kar. 1959, poznatoj iz podzemnih voda planine Jakupica u Makedoniji (na 1900 metara nadmorske visine). Podvrsta B. *glacialis cataracta* se razlikuje od nominalne podvrste B. *glacialis* odsustvom duge srednje dlake na stražnjem rubu drugog segmenta prvog i drugog gnatopoda, oštrim epimerama, dužim telzonom, prisustvom samo 2 dlake na unutrašnjoj grani prve maksile, prisustvom samo 6 trnova na vanjskoj grani prve maksile, slabije trnovitim gnatopodima 1-2, i dr. Međutim, kako su oba taksona poznata samo iz tipičnog nalazišta, i u relativno malom broju primjeraka, neke detaljnije analize razlika nisu za sada moguće. Naši višekratni pokušaji sakupljanja novih primjeraka iz Skavkača, nisu urodili plodom. Ne

možemo isključiti mogučnost da možda obje populacije ustvari predstavljaju ekstremne različite oblike istog taksona, ali se oba taksona međusobno za sada mogu jasno razlikovati.

Bogidiella longiflagellum S. Kar. 1959, opisana iz Makedonije, a kasnije otkrivena i u Grčkoj i Turskoj (Mala Azija) (BOU & RUFFO, 1979; PESCE &. MAGGI, 1983; VONK et al., 1999), nađena je sada u nekoliko novih lokaliteta na grčkim ostrvima Rodosu i Kreti, te je razmatrana varijabilnost pojedinih taksonomskih karaktera te vrste.

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