»POLJOPRIVREDA I ŠUMARSTVO« XXV 1, 17-30, 1979, TITOGRAD

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Contribution to the Knowledge of the Amphipoda 92. Bogidiella chappuisi Ruffo 1952 and its variability with remarks to some other species (fam. Gammaridae).

Abstract

Bogidiella chappuisi Ruffo 1952 was studied from several localities and its redescription and variability is presented. The species *Bogidiella minotaurus* Ruffo et Schiecke 1976, described from Creta Island (Hierapetra) is synonimized with *B. chappuisi*. *Bogidiella balearica* Dancau 1973 known from Maiorca Island (Spain) is probably synonym of *B. chappuisi*. Taxonomical problem of *B. skopljensis* S. Kar. 1933 is discussed. New diagnosis of genus *Bogidiella* is given.

Introduction

Genus *Bogidiella* established Hertzog (1933) for a new species *B.albertimagni n.* sp. from the subterranean freshwater of Germany (the valley of Rhein near Strassbourg). Independently but contemporary, S. Karaman described (1933) the new genus and species *Jugocrangonyx skopljensis* n. gen. n. sp. from the subterranean waters of Vardar River near Skoplje (Yugoslavia). This species remais valid, but the genus *Jugocrangonyx* was removed later to genus *Bogidiella* as synonym.

Later, many new *Bogidiella* species from the fresh, brackish and marine subterranean waters in Europe, Asia, North and South America and Pacific islands were discovered: *arganoi* Ruffo et Vig. Tagl. 1973, *balearica* Dan. 1973, *brasiliensis* Siewing 1953, *bredini*

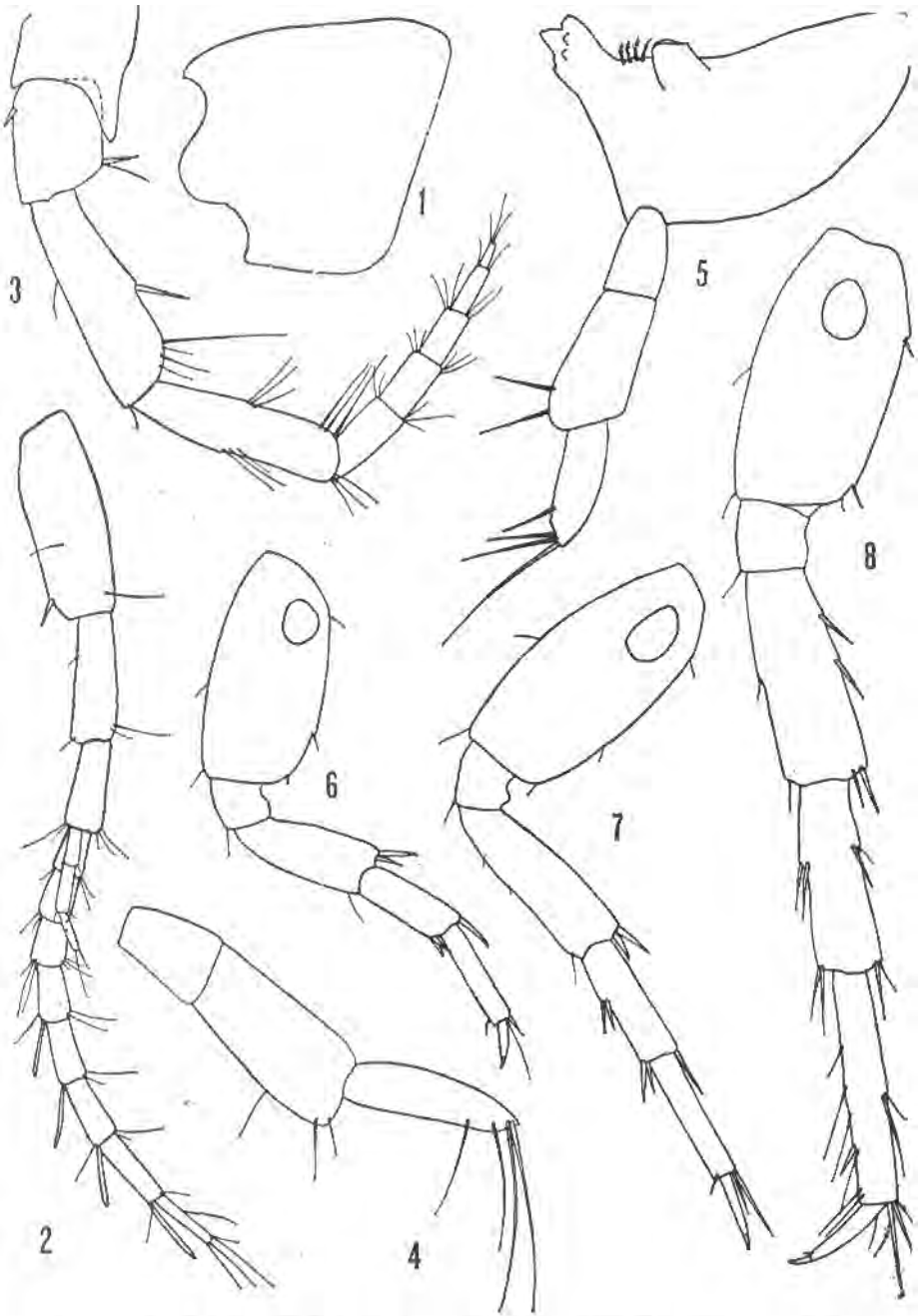

Fig. I. **Bogidiella chappuisi** Ruffo, Racou near Argeles, female 1.7 mm ; 1 = head; 2 = antenna 1; 3 = antenna 2; 4 = mandible palp; 5 = mandible, female 2 mm, Porto Badisco; 6-8 = pereopods 5-7, female 2 mm, Porto Badisco.

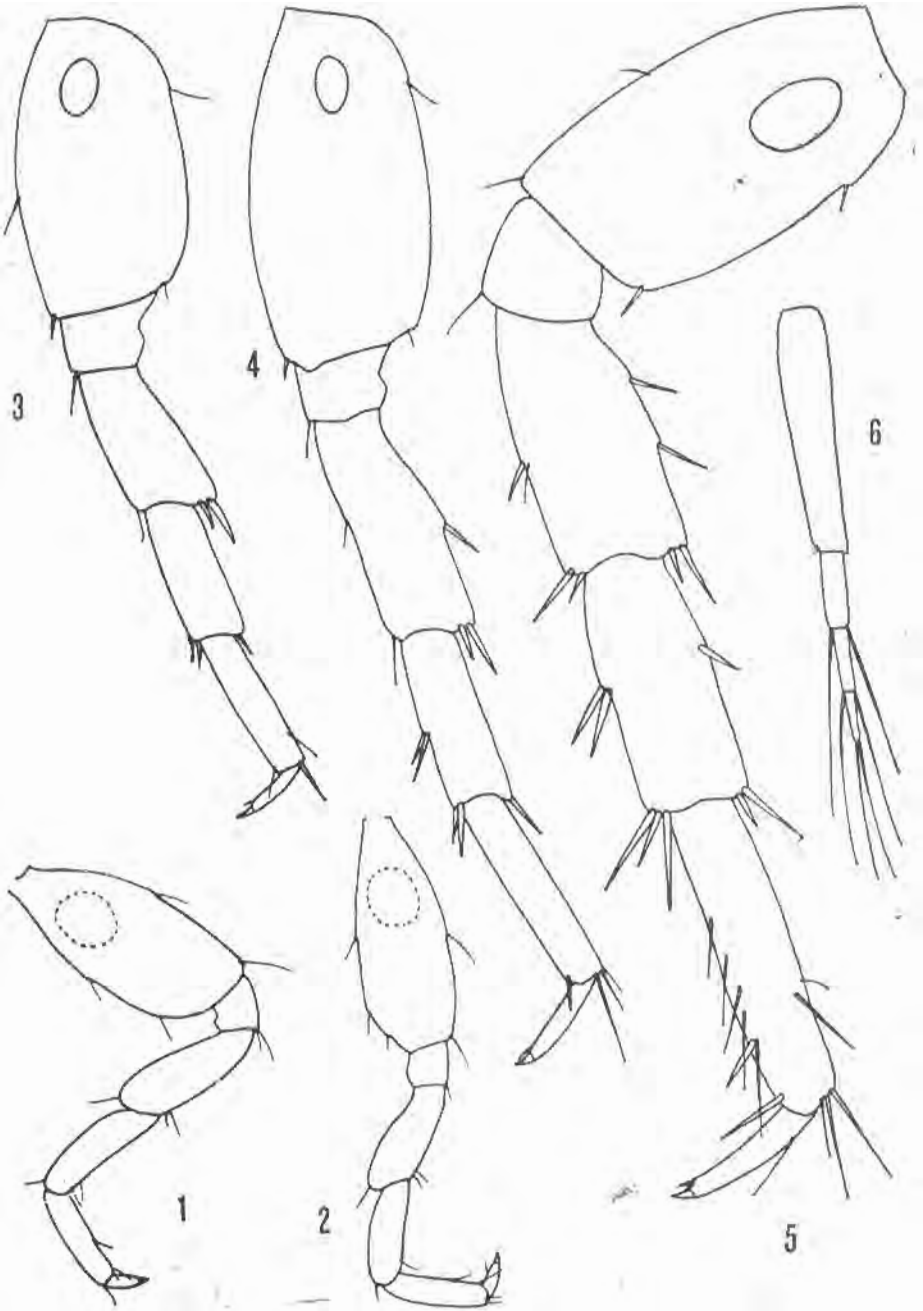

Fig. II. **Bogidiella chappuisi** Ruffo, Racou near Argeles, female 1.7 mm : 1-2 = pereopods 3-4; 3-5 = pereopods 5-7; 6 = pleopod.

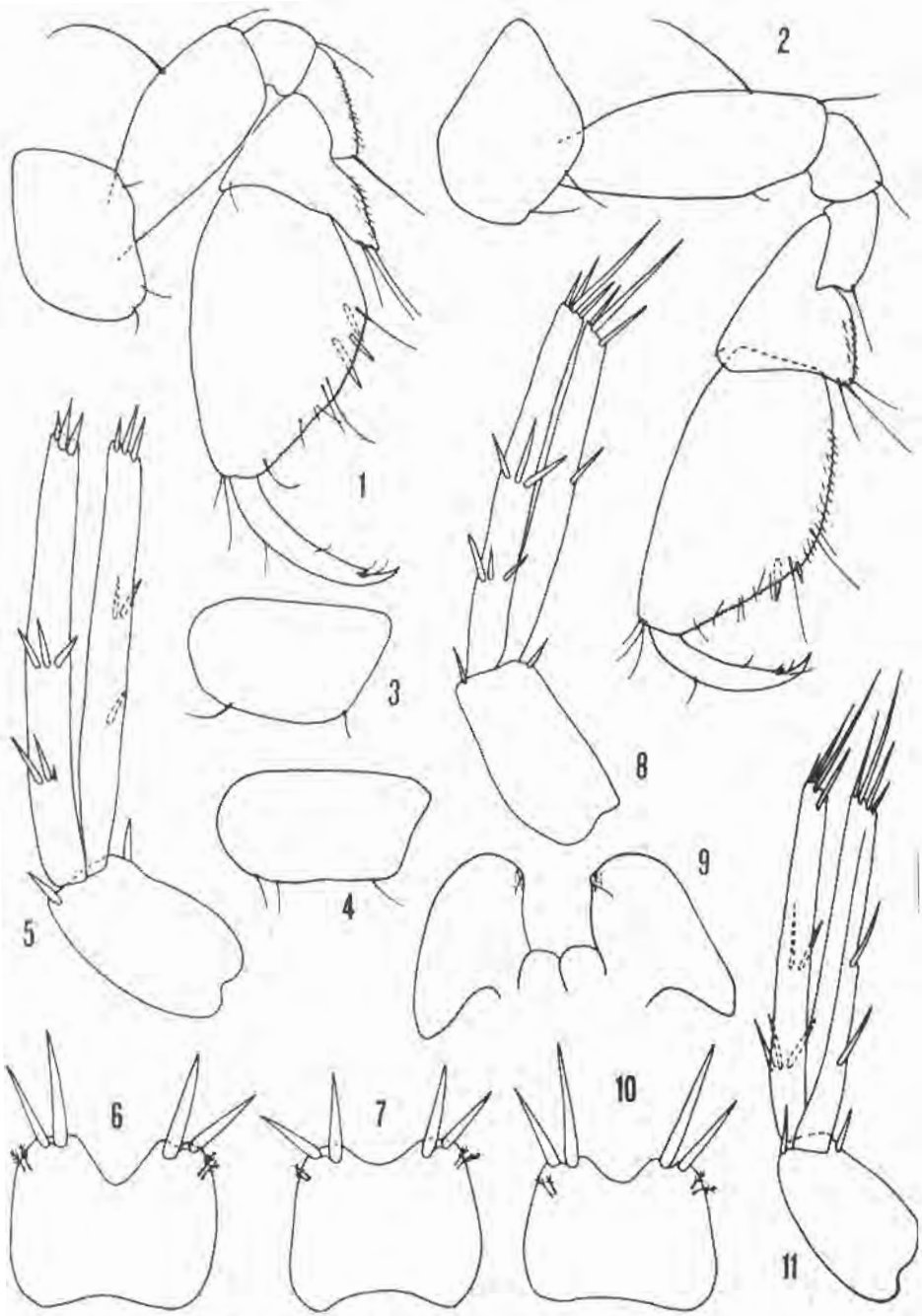

Fig. III. **Bogidiella chappuisi** Ruffo, Racou near Argeles, female 1.7 mm : 1 = gnathopod 1; 2 = gnathopod 2; 3 = coxa 3; 4 = coxa 4; 5 = uropod 3; 6 = telson; 7 = telson, female 1.75 mm; 8 = uropod 3, female 1.75 mm; 9 = labium, female 2.0 mm, Porto Badisco; 10 = telson, female 2.0 mm, Porto Badisco; 11 = uropod 3, female 2.0 mm, Porto Badisco.

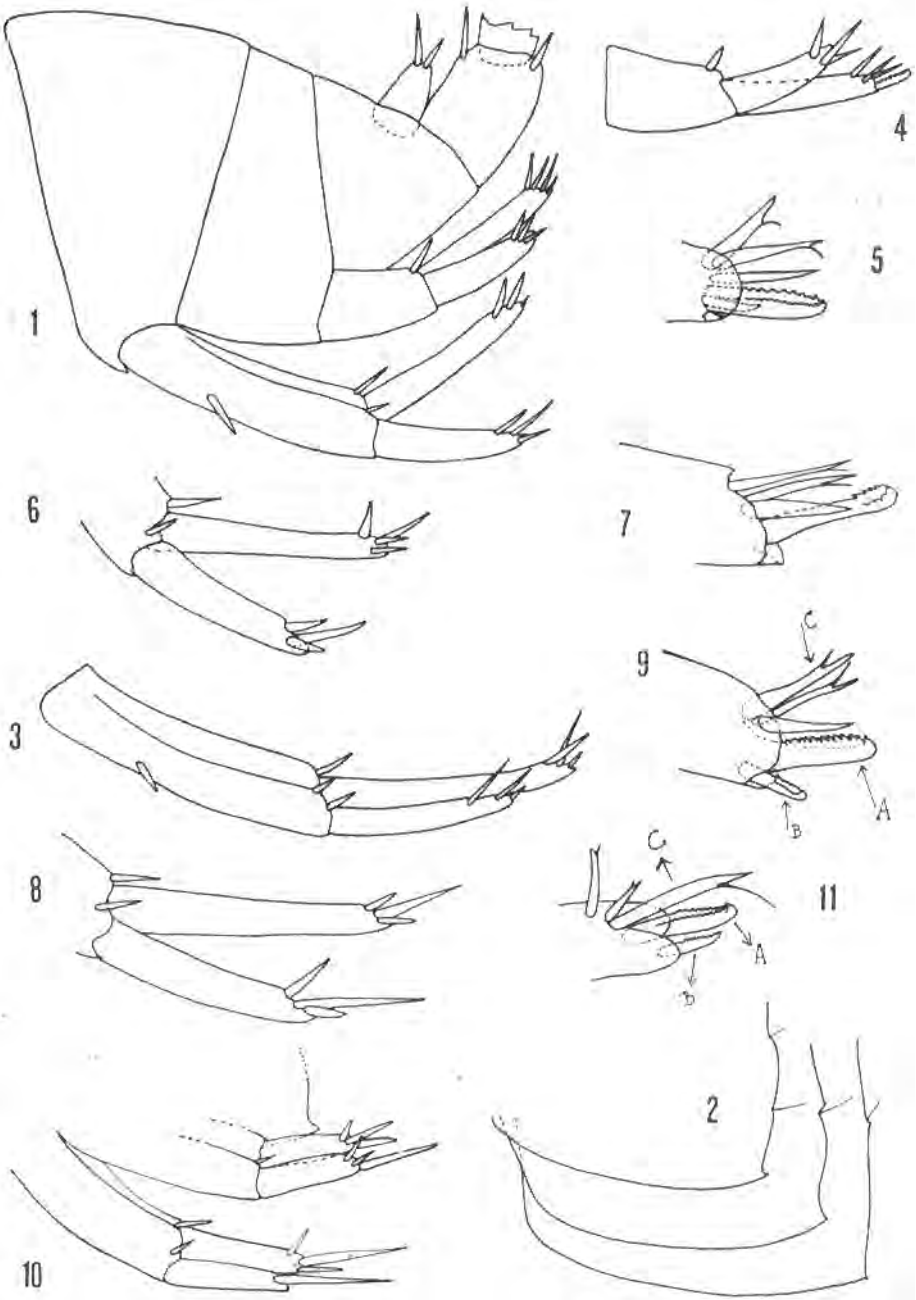

Fig. IV. **Bogidiella chappuisi** Ruffo, Racou near Argeles, female 1.7 mm : 1 = urosome with uropods 1-2; 2 = epimeral plates 1-3; 3 = uropod 1, male 1.7 mm; 4 = uropod 2, male 1.7 mm; 5 = top of uropod 2, inner ramus, male 1.7 mm; 6 = uropod 1, female 1.8 mm, Porto Badisco; 7 = top of uropod 2, inner ramus, male 1.8 mm, Porto Badisco; 8 = uropod 1, male 1.9 mm, Sele River; 9 = top of uropod 2, inner ramus, male 1.9 mm, Sele River; 10 = uropods 1-2, male 2 mm, Hierapetra; 11 = top of uropod 2, inner ramus, male 2 mm, Hierapetra.

Shoemaker 1959, *chappuisi* Ruffo 1952, *dalmatina* S. Karaman 1953, *glacialis* S. Karaman 1959, *hebraea* Ruffo 1963, *helenae* Mateus et Maciel 1967, *holsingeri* Ruffo et Vig. Tagl. 1973, *ichnusae* Ruffo et Vig. Tagl. 1975, *lindbergi* Ruffo 1958, *longiflagellum* S. Karaman 1959, *martini* Stock 1978, *minotaurus* Ruffo et Schiecke 1976, *neotropica* Ruffo 1952, *ruffoi* Birst. et Liov. 1968, *semidenticulata* Meštrov 1961, *sbordonii* Ruffo et Vig. Tagl. 1973, *somala* Ruffo 1970, *tabascensis* Villalobos 1961, *tyrrhenica* Schiecke 1977 and *vandeli* Coineau 1968. Among all these species, only several of them were found in the subterranean brackish waters near the sea coast (*chappuisi, dalmatina, tyrrhenica, minotaurus* along the Mediterranean coasts, *helenae* from the Atlaitic coast of Europe, *brasiliensis* along the Atlantic coast of South America) and all other species were found in the continental subterranean waters.

Thanks to prof. S. Ruffo from Museum of Natural History in Verona, Italy, I have a possibility to study the variability of some *Bogidiella* species from Europe of Verona Museum collection, among them *B. chappuisi* and *B. minotaurus* also. The species *B. minotaurus* from Creta Island is considered a synonym of *B. chappuisi.*

Bogidiella chappuisi Ruffo

figs. I-IV

Syn.: *Bogidiella Chappuisi* Ruffo 1952, p. 1636, fig. 1-4; Ruffo 1954, p. 145, fig. 1-2.

Bogidiella chappuisi Ruffo 1953, p. 670; Balazuc 1954, p. 187; Coineau 1966, p. 389; Mateus, A. et Maciel 1967, p. 37; Ruffo 1958, p. 393; Karaman, G. 1973, p. 33.

Bogidiella chappuisi (part.) Ruffo 1973, p. 51.

Bogidiella minotaurus Ruffo et Schiecke 1976, p. 148, fig. 1-4.

?*Bogidiella balearica* Dancau 1973, p. 113, fig. 1-4.

Description (paratypes from Racou): Female 1. 7 mm: Body smooth, urosomites free (fig. IV, 1), head nearly as long as two thoracal segments combined. Rostrum short, lateral cephalic lobes subrounded, ventroanterior sinus present, eyes absent (fig. I, 1).

Antenna 1 reaching neary 1/2 of body, peduncle segments 1-3 progressively shorter towards segment 3 (fig. I, 2), 1-2 spines occur at ventral margin of ped. segment 1; principal flagellum consisting of up to 9 articles, provided with one aesthetasc each; accessory flagellum with 3 articles (fig. I, 2).

Antenna 2 shorter than antenna 1, with short peduncle article 3; ped. article 4 slightly longer than ped. article 5, both po-

orly setose; flagellum with 5 articles; antennal gland cone short, not reaching top of ped. article 3 (fig. I, 1).

Mouthparts normal: labrum entire, labium with small inner lobes. Maxilla 1: inner lobe with 2 distal plumose setae, outer lobe with 7 distal spines bearing 1-2 lateral teeth each; palp 2-segmented, with 3 distal setae. Maxilla 2 with several distal setae on each lobe, inner lobe without dorsal oblique row of setae. Maxilliped: inner and outer lobe short, palp long, 4-articulate, segment 4 with nail shorter than the remaining part of article 4.

Mandible: body normal, incisor and molar well developed, palp 3-segmented: first segment short, second segment with 2-3 setae, third segment longer than first one, with 4-5 distal setae (fig. I, 4).

Coxae 1-4 short, broader than long, poorly setose (fig. III, 1-4), coxa 5 as long as coxa 4.

Gnathopod 1 slightly larger than gnathopod 2, both gnathopods with slightly enlarged article 2 and with short articles 3-4 (fig. III, 1-2). Article 5 of gnathopod 1 short, with produced distoposterior lobe; article 6 subovoid, longer than broad; palm inclinated 1/2 of article 6, finely crenellated, bearing one corner and 2 subcorner spines, dactyl with one dorsal seta (fig. III, 1).

Gnathopod 2 with article 5 triangular, longer than half of article 6, without distinct distoposterior lobe (fig. III, 2); article 6 longer than broad, with almost parallel lateral margins; palm inclinated 40% of article 6-length, finely crenellated and provided with one corner and one subcorner spine, dactyl with one dorsal seta (fig. III, 2).

Pereopods 3-4 with enlarged, ovoid article 2 bearing ovoid small Hertzog's organ, articles 3-6 narrow, dactyl almost reaching 1/2 of article 6 (fig. II, 1-2).

Pereopods 5-7 progressively longer: article 2 enlarged but longer than broad, with entire posterior margin bearing 1-2 setae or spines (fig. II, 3-5), distoposterior lobe absent; articles 3-6 moderately narrow, Hertzog's organ small, ovoid, present on article 2. Anterior margin of article 6 of pereopod 7 provided with a row of long plumose setae (fig. II, 5): these setae can be absent by smaller specimens. Dactyl of pereopods 5-7 slightly longer than 1/2 of article 6, with short nail (fig. II, 3-5).

Pleopods 1-3 with long peduncle bearing 2 retinacula each; outer ramus is 3-articulate, inner ramus absent (fig. II, 6).

Epimeral plates 1-3 angular, with weakly pointed distoposterior corner (fig. IV, 2).

Uropods 1-2 well developed. Uropod 1: peduncle longer than rami, provided with one medio-lateral spine and 2 short distal spines; inner ramus longer than outer one, both with spines shorter than 1/2 of rami-length (fig. IV, 1). Uropod 2: peduncle without medioventral spine, inner ramus longer than outer one, spines like these of uropod 1 (fig. IV, 1).

Uropod 3 much exceeding top of uropods 1-2, consisting of shorter peduncle and long uniarticulated subequal 2 rami provided with short or long spines (fig. II, 5, 8).

Telson short, broader than long, excavated distally, provided with 4 unequal spines (two longer spines are not longer than telson itself); a pair of short plumose setae occurs in the upper part of each lobe (fig. III, 6, 7). Gills occur on thoracal segments 4-6. Oostegyts narrow, occur on thoracal segments 2-5.

The males differs from females by the presence of modified toothed spines on inner ramus of uropod 2, and by slightly longer spines on uropods 1-3. Distal top of inner ramus of uropod 2 in males is provided with one long strong spine toothed along dorsal margin (A-spine), one short toothed spine (B-spine) and with 3 smooth long more or less slender spines (C-spines) (fig. IV, 5).

Variability: Within the same population of *B. chappuisi* from Racou, the large variability of some characters was observed: the variable length of the spines on uropod 3 (the distal spines reaching 1/7 to 2/5 of rami lenght) (fig. III, 5, 8); the longest distal spines on telson reaching 3/5 to 5/6 of telson-length (fig. III, 6, 7).

Large variability was observed between different populations of *B. chappuisi*. The specimens from Porto Badicso (Puglia, Italy) have slightly more narrow pereopods 3-7, the longest spines on telson reaching nearly the length of telson (fig. III, 10), the longest distal spines on uropods 1-2 as long as or sligltly longer than 1/2 of the rami-length (fig. IV, 6).

The specimens from mouth of Sele River (Italy) are with distal spines on uropod 1 longer than 1/2 of ramus-length (fig. IV, 8), and the spines on telson reaching 4/5 of teleson-length.

The specimens of *B. minotaurus* from Creta (Hierapetra) differs from *B. chappuisi* only by longer spines on uropods 1-2 and on telson; the longest distal spines on rami of uropod 1 reaching 3/4 to 4/4 of rami-length (fig. IV, 10); the longest spines on rami of uropod 2 reaching 2/3 to 4/5 of rami-length. The longest distal spines on telson are as long as or slightly longer than the length of telson, like these of Porto Badisco (fig. III, 10).

Because the specimens from different populations of *B. chappuisi* have similar characters and variability regarding the length of spines on uropods 1-3 and telson like these of *B. minotaurus*, it

was impossible to distinguish the species *B. minotaurus* from *B. chappuisi*. For this reason, we consider the species *B. minotaurus* a synonym of *B. chappuisi* Ruffo 1952.

Dancau described (1973) *Bogidiella balearica* n. sp. from two caves on Maiorca Island in the Mediterranean Sea (Spain) (Cuevas del Drach and Cuevas del Puente). The morphological characters of this species, (based on Dancau's description and figures) are identic with these of *B. chappuisi* except weakly more slender pereopods 5-7. But, within the populations of *B. chappuisi*, one remarkable variability of this character was observed (fig. I, 6-8; II, 3-5). Dancau mentioned that the main character of *B. balearica* differing it from *B. chappuisi* is the presence of numerous long setae at article 6 of pereopod 7. But, these setae are usually present in all adult specimens of *B. chappuisi*, although the number and the length of these setae is rather variable regarding the age and the length of the specimens. For this reason, we consider *B. balearica* as a probably synonym of *B. chappuisi*.

The species *B. dalmatina* S. Karaman 1953 from the Adriatic coasts is also very close to *B. chappuisi*, but differs from later by longer telson (telson is as long as broad). Untill now, no intergradation in telson-shape between *B. chappuisi* and *dalmatina* was observed; on the other hand, *B. dalmatina* is known only from the Adriatic Sea, where *B. chappuisi* was never find. So, *B. dalmatina* must be considered as a distinct species.

The character, recently very poorly known in all *Bogidiella* species, is the shape of distal spines on inner ramus of uropod 2 in males. These spines have probably some role during the reproductive period, but no detailes are still known.

Inner ramus of uropod 2 in males of Le Riou is provided with 3 simple spines (C-spines), one strong spine toothed along 2 dorsal margins (A-spine) and with one short small toothed spine (B-spine)

The similar structure was observed in males of Sele River and of Hierapetra (Creta).

The males of *B. chappuisi* from Porto Badisco have at distal top of inner ramus of uropod 2 one strong spine dilated and toothed only distally (A-spine) and 3 simple smooth spines (C-spines); B-spine (=small toothed spine) was not observed (fig. IV, 7).

Taxonomical value of this character is still unknown, and for this reason we have not removed the specimens from Porto Badisco into a distinct taxon.

Ruffo and Vigna-Taglianti observed similar modifications of distal spines on uropod 1 in some *Bogidiella* species from Mexico *(B. holsingeri)* or on uropod 2 *(B. arganoi)*.

Material examined: FRANCE: Le Racou, Argeles, July 26, 1951, (paratypes), Coll. Museo Civ. S. N. Verona;

ITALY: Porto Badisco (Puglia), October 11, 1971, several spec. (leg. U. Schiecke), Coll. Museo Civ. S. N. Verona; — Mouth of Sele River (Paestrum), several spec. Coll. Museo Civ. S. N. Verona;

GREECE: Hierapetra (Creta Island), May 18, 1975 (leg. Schiecke, U.) (paratypes of *B. minotaurus).*

Localities cited: FRANCE: Le Racou (Pyr. Orientales) (Ruffo 1952, 1954), Mouth of Liscia River (Corsica Island) (Coineau 1966);

ITALY: Golfo di Napoli; Porto Badisco (Ruffo 1973);

GREECE: Creta Island (Hierapetra) (Ruffo et Schiecke 1976 sub *B. minotaurus);*

SPAIN: Maiorca Island (Dancau 1973 sub B. balearica);

ALGERIA: Miramar near Stora (Ruffo 1953).

Loc. typ.: Le Racou near Argeles.

Distribution: along the coast or in the caves near coast of the sea in the central and western part of the Mediterrannean Sea, in fresh and brackish subterranean waters more or less near the sea.

Bogidiella skopljensis S. Karaman

Syn.: *Jugocrangonyx skopljensis* S. Karaman 1933, p. 45, fig. 2.
Bogidiella skopljensis S. Karaman 1943, p. 181, fig. 1-19;
Carausu, Dobreanu, Manolache 1955, p. 355, fig. 1, 331-332; Coineau 1968, p. 195, fig. 24 c-j, 25; G. Karaman 1973, p. 45, fig. 12-14.

This species was described from the subterranean waters of Vardar River near Skoplje (Yugoslavia). Hertzog removed it (1935) as synonym of *B. albertimagni*, but later S. Karaman (1943) and other authors showed that *skopljensis* is one distinct species characterized by presence of inner ramus of pleopods 1-3.

B. skopljensis was known only from Macedonia. Later Dobreanu and Manolache (1951) and Carausu, Dobreanu et Manolache (1955) redescribed this species from Transylvania (Romania). Coineau mentioned and redescribed this species from subterranean waters of Tech (Pyrenees Orientales, France) (1968). The specimens from Romania and from France differs from specimens of Macedo-

nia only by presence of 3-articulated accessory flagellum and by absence of Hertzog's organ on pereopods 3-7. But already by macedonian specimens, Hertzog's organ is poorly visible, sometimes almost unvisible. The presence of 2-articulated accessory flagellum in *B. skopljensis* from Macedonia (type locality) and 3-articulated accessory flagellum in specimens from France and Romania is not good taxonomic character to separate specimens from France and Romania into distinct species or subspecies. For this reason, these specimens must be still consider as members of *B. skopljensis*.

Diagnosis of genus Bogidiella:

Body laterally compressed, urosomites free, eyes absent, rostrum short. Labrum entire or emarginate, labium with small inner lobes; outer lobe of maxilla 1 with 7 spines, palp 2-articulated (1-articulated in *tyrrhenica* and *brasiliensis*, but sometimes the line between palp articles is poorly visible or undistinct). Inner lobe of maxilla 2 without dorsal oblique row of setae. Inner and outer lobe of maxilliped small, palp strong, 4-articulated, article 4 strong. Mandible incisor toothed, molar triturative, palp 3-articulate, non falciform. Coxae 1-4 very short (in *somala* are long coxae), coxa 5 not shorter than 4, coxa 4 not lobed. Gnathopods 1-2 subchelate, strong; article 5 of gnathopod 1 produced posteriorly, distinctly lobed; article 5 of gnathopod 2 not lobed. Pereopods 3-7 with dilated article 2 often provided with Hertzog's organ. Pereopods 5-7 progressively longer (except in tyrrhenica). Pleopods with 3-articulated outer ramus (2-articulated in *brasiliensis*, must be reexamined) inner ramus long, styliform (*tyrrhenica, brasiliensis*), short, unisegmented or absent. Uropods 1-2 normal or partially reduced (*tyrrhenica, brasiliensis*). Uropod 3 long, lanceolate, biramous, with nearly subequal unisegmented rami. Telson short, entire or partially excavated distally, with spines. Oostegyts short, narrow, occur on thoracal segments 2-5 (almost all species) or on thoracal segments 3-5 (*sbordonii*). Coxal gills occur on thoracal segments 4-6.

Type species: Bogidiella albertimagni Hertzog 1933.

Species: *albertimagni, arganoi, brasiliensis, bredini, chappuisi, dalmatina, glacialis, hebraea, helenae, holsingeri, ichnusae, lindbergi, longiflagellum, martini, neotropica, ruffoi, semidenticulata, sbordonii, skopljensis, tabascensis, tyrrhenica, vandeli.*

The taxons *minotaurus* and *balearica* are synonyms of *chappuisi*. *B. somala* don't belongs to this genus because of long coxae and shape of mandible.

The species *B. tyrrhenica* and *B. brasiliensis* are aberrant species of this genus because of 1-articulated palp of maxilla 1, by long styliform inner ramus of pleopods 1-3 and partially reduced

uropods 1-2 *(tyrrhenica)* and 2-segmented outer ramus of pleopods 1-3 *(brasiliensis)*.

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REZIME

92. PRILOG POZNAVANJU AMPHIPODA. BOGIDIELLA CHAPPUISI RUFFO 1952 I NJEN VARIJABILITET SA OSVRTOM NA NEKE DRUGE VRSTE (FAM. GAMMARIDAE)

Rod *Bogidiella* je postavio Hertzog 1933 godine za novu vrstu *B. albertimagni* iz podzemnih voda Njemačke (Štrazburg). Istovremeno je S. Karaman (iste godine i mjeseca, ali sa zakašnjenjem od svega 8 dana) opisao novi rod *Jugocrangonyx* sa novom vrstom *J. skopljensis* iz podzemnih voda rijeke Vardar kod Skoplja. Vrsta *skopljensis* je ostala samostalna vrsta, a rod *Jugocrangonyx* je uvršten kao sinonim roda *Bogidiella*.

Kasnije su mnoge vrste ovog roda bile pronađene u podzemnim vodama Evrope, Sjeverne i Južne Amerike, Azije kao i nekih otoka u Tihom okeanu: *arganoi* Ruffo et Vig. Tag. 1973, balearica Danc. 1973 *brasiliensis* Siew. 1953, *bredini* Shoem. 1959, *chappuisi* Ruffo 1952, *dalmatina* S. Kar. 1953, *glacialis* S. Kar. 1959, *hebraea* Ruffo 1963, *helenae* Mat. et Mac. 1967, *holsingeri* Ruffo et Vig. Tag. 1973, *ichnusae* Ruffo et Vig. Tag. 1975, *lindbergi* Ruffo 1958, *longiflagellum* S. Kar. 1959, *martini* Stock 1978, *minotaurus* Ruffo et Schiecke 1976, *neotropica* Ruffo 1952, *ruffoi* Birst. et Ljov. 1968, *semidenticulata* Meštr. 1961, *sbordonii* Ruffo et Vig. Tag. 1973, *somala* Ruffo 1970, *tabascensis* Villal. 1961, *tyrrhenica* Schiecke 1977 i *vandeli* Coineau 1968.

Bogidiella chappuisi Ruffo 1952 je bila opisana iz Francuske (Le Racou) i kasnije je nađena i u Italiji, Španiji i Alžiru.

Na osnovu analize karaktera ove vrste iz većeg broja lokaliteta iz Italije i Francuske, utvrdili smo da je ova vrsta veoma varijabilna, i do sada je poznata samo iz centralnog i zapadnog dijela Mediterana.

Ruffo i Schiecke su opisali 1976 godine vrstu *Bogidiella minotaurus* iz podzemnih voda otoka Kreta u Grčkoj (Hierapetra). Ova vrsta se razlikuje od vrste *B. chappuisi* samo po nešto dužim trnovima na telsonu i na prvom do trećem uropodu. Na osnovu analize varijabiliteta vrste *chappuisi*, utvrdili smo da je *minotaurus* identičan sa vrstom chappuisi i stavili smo ga kao sinonim vrste *chappuisi*.

Dancau je opisao vrstu *B. balearica* (1973) iz podzemnih voda pećina na otoku Majorka u Sredozemnom moru (Španija). Ova vrsta se razlikuje od vrste *B. chappuisi* samo po malo tanjim nogama, karakteru koji veoma varira kod vrste *chappuisi*. Stoga smatramo da je ova vrsta također sinonim vrste *B. chappuisi*.

U rodu *Bogidiella* većina vrsta predstavlja jednu homogenu cjelinu, dok se vrste *somala, brasiliensis* i *tyrrhenica* mogu smatrati aberantnim vrstama toga roda i njihov status će se morati ponovo proučiti. Vrsta *B. somala* se razlikuje od svih drugih vrsta po dužim koksama i lijevkastom žljebu na tijelu mandibule, te se mora izdvojiti iz roda *Bogidiella*.