

The taxonomic status of *Attheyella (B.) wulmeri* (Kerhervé, 1914) (Crustacea : Copepoda : Harpacticoida)

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Keywords : Copepoda, Harpacticoida, *Attheyella*, Montenegro, taxonomy.

After examination of 44 populations of *Attheyella (Brehmiella) wulmeri* (Kerhervé, 1914) (Copepoda : Harpacticoida) from Montenegro (SE Europe), its taxonomic status is revised. Three new synonyms of this species are established : *A. (B.) osmana* Kiefer, 1955, *A. (B.) naphthalica* Por, 1983, and *A. (B.) paranaphthalica* Pesce & Galassi, 1988. Detailed description, map of distribution, as well as a review of all important variable characteristics are presented.

Position taxonomique de *Attheyella (B.) wulmeri* (Kerhervé, 1914) (Crustacea : Copepoda : Harpacticoida)

Mots-clés : Copepoda, Harpacticoida, *Attheyella*, Monténégro, taxonomie.

A la suite de l'examen de 44 populations de *Attheyella (Brehmiella) wulmeri* (Kerhervé, 1914) (Copepoda, Harpacticoida) provenant du Monténégro (Europe du Sud-Est), la position taxonomique de cette espèce est discutée, ce qui a conduit à la création de trois synonymes nouveaux : *A. (B.) osmana* Kiefer, 1955, *A. (B.) naphthalica* Por, 1983 et *A. (B.) paranaphthalica* Pesce & Galassi, 1988. Après une redescription détaillée des femelles et des mâles de *A. (B.) wulmeri*, la variabilité de certains importants caractères morphologiques est soulignée. Une carte indiquant la répartition géographique de l'espèce a été établie.

1. Introduction

Kerhervé (1914) described a new species, *Canthocamptus wulmeri*, from Pas-de-Calais in France. After revision of the genus *Canthocamptus*, made by Chappuis (1929a), it was obvious that this species belongs to the genus *Attheyella*, and to the new formed subgenus *Brehmiella*. Although Chappuis (1929a, 1929b) considered this taxon just as a subspecies of the species *A. (B.) northumbrica*, several new findings from France and England (Lowndes 1928a, 1928b, Gurney 1932, Lang 1948) supported its specific status. After World War II, Stephanides (1948) found a pretty large population of this species on the island Corfu (Gree-

ce), and also provided some other very important data about its variability and ecology. Very soon after that, Margalef (1954) found it in Italy, as well as Vesentini (1960). The confusion about *A. (B.) wulmeri* started when Kiefer (1955) described the new subspecies *osmana*, from the European part of Turkey, which was distinguishable from the nominate subspecies only by the absence of inner seta on the first endopodite segment of the fourth swimming leg. Petkovski (1956), who found similar population in Macedonia, doubted about its taxonomic status, because he found this character very variable. But he left this population as subspecies *osmana*. He remained this opinion also few years later (Petkovski 1964), when he discovered new populations from Portugal (nominate subspecies) and from Croatia (subspecies *osmana*). But after several findings of this species in Bulgaria (Mihailova-Neikova 1966, Basamakov 1969, Apostolov 1973, Basamakov & Apostolov 1977) and in Italy (Pesce 1983) it

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was clear that these two forms are not subspecies, because their areas are intermingled. Probably therefore Por (1983) decided to raise specimens without seta on the first endopodite segment of the fourth leg (osmana) on specific rank. Beside this character, he emphasized "the sculpture of the cephalothorax" as additional one, although Kerhervé (1914) said "Le cephalothorax ... est parseme de dessins tres caracteristiques..." and also Dussart (1967), describing *A. (B.) wulmeri* from France, explicitly claimed: "Cphth avec, en outre, de nombreux plis chitineux". Even more Por (1983) described one new species from Israel, *A. (B.) naphthalica*, which he distinguished from *A. (B.) wulmeri* and *A. (B.) osmana* only by the presence of 3 (instead of 4) setae on antennal exopodite. This very doubtful Por's taxonomic review of "*Attheyella wulmeri* (Kerhervé) group" was accepted by Apostolov & Pesce (1989) and by S. Petkovski (1992). Pesce & Galassi (1988) described one more species within "gruppo *trispinosa*", how they called this group of species, but without any important distinguishable character. During an investigation of the copepod fauna in Montenegro we had an opportunity to collect and to study a lot of material of *Attheyella (Brehmiella) wulmeri*, especially its variability. That helped us to resolve the taxonomic status of this interesting freshwater harpacticoid copepod.

2. Material and methods

For this study the samples were taken with different methods. From wells they were taken with phreatic net constructed following the instructions by Cvetkov (1968). From springs, streams and rivers, samples were taken with different types of hand nets, while from interstitial waters they were taken or by Karaman-Chappuis method or by phreatic pump similar to that of Bou & Rouch (1967). The material was preserved by adding several drops of 36 % formaldehyde. Copepods were separated with a Wild-M5 stereomicroscope and moved to 70% ethanol. Specimens were dissected in a mixture of equal parts of distilled water and glycerol, with fine entomological needles (mark 000). Dissected appendages were placed on a slide, in the same mixture of distilled water and glycerol, and covered with a coverslip. For larger parts (urosome, etc.) two human hairs were mounted between slide and coverslip, so the parts could not be crushed. By moving the coverslip carefully by hands, the whole animal or a particular appendage was placed in different positions, making possible the observation of morphological details. During the examination water slowly evaporated, and after some time appendages remained in the pure glycerol. All drawings have been prepared using a dra-

wing attachment (tube) on Leica-DMLS microscope, with C-PLAN achromatic objectives. Dissected appendages were preserved in Faure's medium, which was prepared following the old procedure, recently discussed by Stock & Vaupel Klein (1996). Non-dissected specimens, after examination, were again preserved in 70 % ethanol.

The material of *Attheyella (B.) wulmeri* was collected by the author from the Adriatic drainage area of Montenegro, from 44 following localities :

(1) Nameless spring on the island Vranjina, Skadar Lake, 16 March 1995 : 8 males and 11 females. (2) Nameless spring near the cave Strugarska, Strugari Village, Rijeka Crnojevic County, 28 April 1995 : 1 copepodid. (3) Nameless spring in the village Vranjina on the island Vranjina, Skadar Lake, 20 March 1994 : 6 females and 1 copepodid. (4) Nameless spring in the village Dinosa, on the right coast of the river Sitnica, 4 March 1995 : 21 males, 44 females (6 ovigerous). (5) Prodo Well in the village Rasic Ugle, near Gostilje, Bjelopavlici Region, 28 May 1994 : 3 males, 8 females and 4 copepodids. (6) Ribnicka Vrela Spring, Podgorica, 11 March 1995 : 3 copepodids. (7) Nameless spring near Ribnicka Vrela Spring, Podgorica, 23 May 1994 : 1 copepodid. (8) Nameless spring in Jabukov Do Valley, Crmnica Region, 30 April 1995 : 36 males and 47 females. (9) Temporary ditch in the village Beri near Podgorica, 28 February 1994 : 2 males. (10) Nameless spring and stream near the cave Golubija on the island Vranjina, Skadar Lake, 16 March 1995 : 15 males and 21 females (1 ovigerous). (11) Matica River near its main spring, 28 September 1994 : 1 male and 5 females. (12) Sitnica River near the bridge on the road Niksic-Podgorica, 28 September 1994 : 5 males and 7 females. (13) Tunnel between Kotor and Tivat, Adriatic Coast, 19 February 1995 : 4 males, 6 females and 11 copepodids. (14) Velja Spilja Cave near the village Donja Seoca, Rumija Mountain, 4 February 1997 : 2 males, 10 females and 1 copepodid. (15) Pozalica Cave near the village Donja Seoca, Rumija Mountain, 8 February 1997 : 24 males, 43 females and 2 copepodids. (16) Nameless spring near the road in the village Medun, Kuci Region, 2 May 1997 : 16 females (1 ovigerous) and 4 copepodids. (17) Temporary pools near the tunnel between Kotor and Tivat, Adriatic Coast, 19 February 1995 : 2 males and 6 females (1 ovigerous). (18) Small pool near the hydroelectric power station Glava Zete, 1 May 1997 : 1 female. (19) Suvi Potok Stream near the village Fundina, Kuci Region, 2 May 1997 : 6 females and 12 copepodids. (20) Nameless spring near the village Donja Seoca, Rumija Mountain, 4 February 1997 : 10 males, 24 females (1 ovigerous) and 8 copepodids. (21) Marsh near the old saltworks in the town Tivat, Adriatic Coast, 19 February 1995 : 1 male and 9 females (4 ovigerous). (22) Cijevna River near its middle part of canyon, 24 May 1997 : 1 female. (23) Izvor Nabrijeg Spring near the village Medun, Kuci Region, 2 May 1997 : 4 males and 16 females (3 ovigerous). (24) Susica Spring in the village Trnovo, Crmnica Region, 2 February 1997 : 2 females and 2 copepodids. (25) Nameless spring near the hydroelectric power station Glava Zete, 1 May

1997 : 1 female. (26) Nameless spring near the church in the village Orahovac, Adriatic Coast, 10 May 1998 : 5 males and 7 females. (27) Nameless stream in the village Djurmani, Adriatic Coast, interstitial, 7 June 1997 : 1 male, 3 females, 1 copepodid. (28) Temporary puddle near the village Medun, Kuci Region, 2 May 1997 : 5 females and 2 copepodids. (29) Nameless stream in the village Buljarice, Adriatic Coast, 7 June 1997 : 1 female. (30) Sutorina River in the town Igalo, Adriatic Coast, interstitial, 10 May 1998 : 1 female and 1 copepodid. (31) Zeta River near the hydroelectric power station Glava Zete, interstitial, 1 May 1997 : 1 female. (32) Vrbica Stream near the village Medun, Kuci Region, 2 May 1997 : 3 males and 10 females (2 ovigerous). (33) Mala Rijeka River near the village Jelin Dub, interstitial, 15 June 1997 : 2 females. (34) Nameless spring near the tunnel between Kotor and Tivat, Adriatic Coast, 19 February 1995 : 3 males and 3 females. (35) Sitnica River near the village Beri, Podgorica, interstitial, 24 May 1997 : 21 males, 18 females and 17 copepodids. (36) Nameless spring near the Sutorina River, Adriatic Coast, 10 May 1998 : 2 females. (37) Suvi Potok Stream in the village Fundina, Kuci Region, 2 May 1997 : 1 male and 1 female. (38) Moraca River near the village Bioce, interstitial, 17 September 1997 : 1 female. (39) Nameless spring near the village Tunjevo, Danilovgrad County, 11 April 1997 : 2 females. (40) Ivanova Korita Stream, Lovcen Mountain, 12 June 1998 : 5 males, 10 females (1 ovigerous) and 6 copepodids. (41) Nameless stream near the town Grahovo, 11 June 1997 : 1 male. (42) Skurda Stream in the town Kotor, Adriatic Coast, 13 May 1988 : 1 male and 8 females. (43) Ribnica River in the town Podgorica, interstitial, 7 July 1995 : 2 males and 7 females. (44) Nameless well in the village Rasic Ugle, near Gostilje, Bjelopavlici Region, 28 May 1994 : 1 male and 4 females.

All material is deposited in the author's working collection in Italy.

3. Results

3.1. Synonymy

Canthocamptus Wolmeri n.sp. - Kerhervé 1914, p. 100, figs 1-4.

Canthocamptus wolmeri Kerhervé - Gurney 1932, p. 200, figs 804-817.

Attheyella wolmeri (Kerhervé) - Lowndes 1928a, p. 69, figs 67-70 ; Lowndes 1928b, p.458.

Attheyella wolmeri Kerhervé - Margalef 1954, p. 147, fig. 1/f, g, h, i, j, k.

Attheyella (Brehmiella) northumbrica Wolmeri (Kerhervé) - Chappuis 1929a, p.48.

Attheyella (Brehmiella) northumbrica Wolmeri Kerhervé - Chappuis 1929b, p. 488.

Attheyella (Brehmiella) wolmeri (Kerhervé) - Lang 1948, p. 982, fig. 390 ; Borutzky 1952, p. 274, figs 77/18 and 78/12-13 ; Vesentini 1960, p. 211, figs 1 and 2 ; Mihailova-Neikova 1966, p. 210, fig. 7 ; Apostolov

1973, p. 290, fig. 8 ; Kiefer 1978, p. 218 ; Pesce 1983, p. 76.

Attheyella (Brehmiella) wolmeri Kerhervé - Stephanides 1948, p. 63, figs 251-256.

Attheyella (Mrazekiella) wolmeri (Kerhervé) - Dussart 1967, p. 273, fig. 113 ; Dussart & Defaye 1990, p.100.

Attheyella (Brehmiella) wolmeri wolmeri (Kerhervé) - Petkovski 1964, p. 19, figs 47 and 48.

Attheyella (s. str.) Wolmeri osmana n. subsp. - Kiefer 1955, p. 128, figs 44-56.

Attheyella (Brehmiella) wolmeri osmana Kiefer - Petkovski 1956, p. 187, figs 6-14 ; Kiefer 1978, p. 218.

Attheyella (Mrazekiella) osmana Kiefer - Por 1983, p. 119, figs 24-41 and 61-63 ; Dussart & Defaye 1990, p. 102 ; S. Petkovski 1992, p.5.

Attheyella (Mrazekiella) osmana (Kiefer) - Apostolov & Pesce 1989, p. 122, fig. 3/1-14.

Attheyella (Mrazekiella) naphthalica n.sp. - Por 1983, p. 125, figs 42-56 and 64 ; Dussart & Defaye 1990, p.103.

Attheyella (Brehmiella) paranaphthalica n.sp. - Pesce & Galassi 1988, p.1, figs 1-14.

Attheyella (Brehmiella) paranaphthalica Pesce & Galassi - Pesce & Galassi 1987, p.218.

3.2. Description

FEMALE

Body elongated, cylindrical, brown light. Nauplius eye present. Prosome comprising cephalothorax, incorporating first pedigerous somite, and 3 free pedigerous somites. Surface of dorsal shield covering cephalothorax with characteristic sculpture (cuticular striae which are concentrically disposed around central pit), and with many sensillae (Figs 1 and 3). Its hind margin smooth. Surface of dorsal shields covering 3 free pedigerous somites also with many sensillae, but without any cuticular sculpture. Their hind margins serrated. Urosome comprising fifth pedigerous somite, genital double-somite (representing fused genital and first abdominal somite), and 3 free abdominal somites. Genital double-somite about 1.5 times broader than long, with two short lateral rows of spines, posteriorly on ventral side with two sensillae, and with many transverse rows of spinules (Fig. 2). Fused sixth leg (P6) with two short setae, of which outer one plumose, while inner one smooth. Egg-sack about 1.8 times longer than wide, and contains 20 eggs (Fig. 4). First and second free abdominal somites with transverse row of spines which interrupted only dorsally (Fig. 5). Anal somite (last abdominal somite) ornamented with pair of sensillae dorsally, with 1 interrupted and arched row

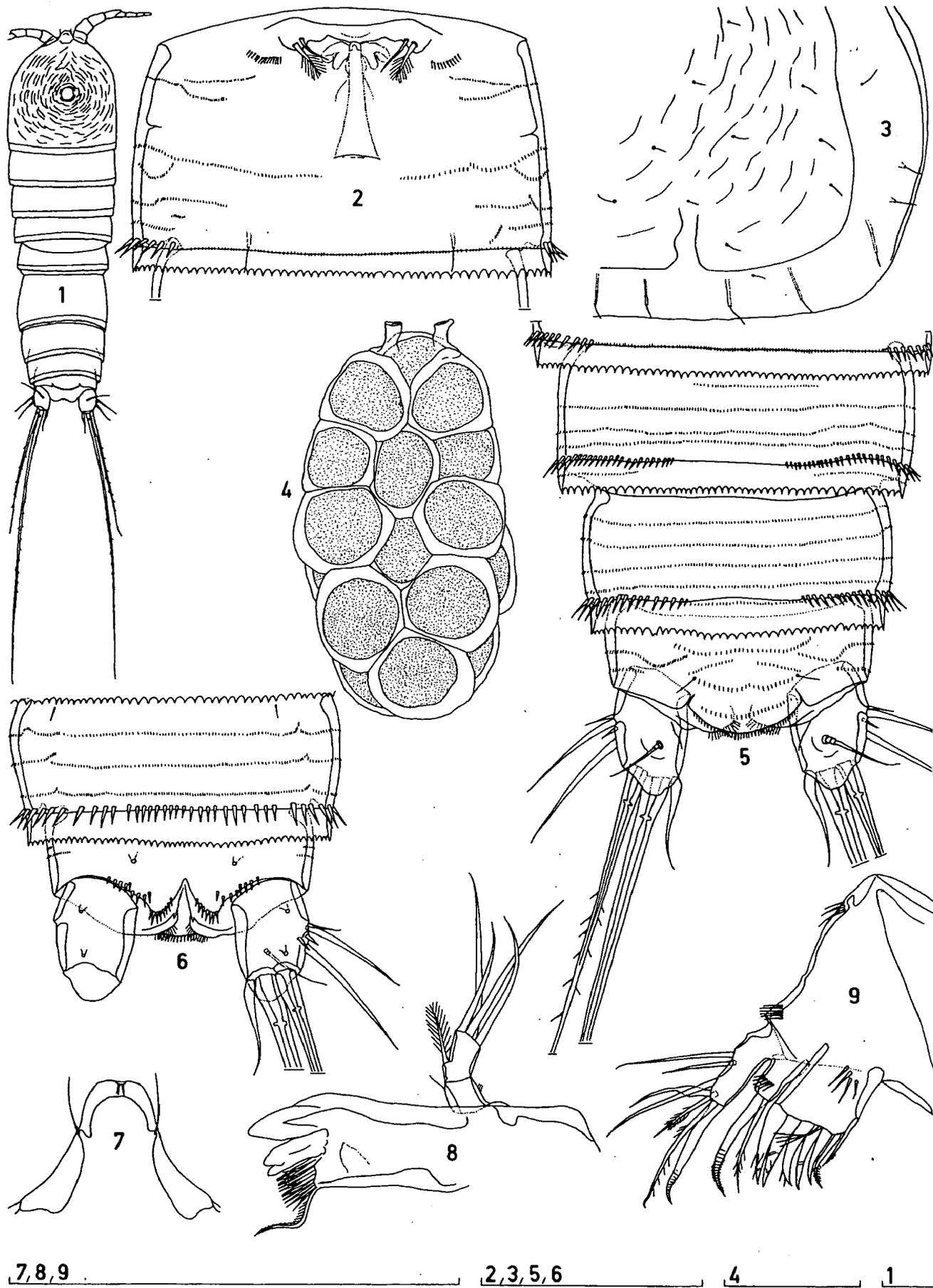
of spines at base of furcal rami ventrally, and with several rows of spinules dorsally and laterally (Figs 5 and 6). Anal operculum convex, slightly reaching beyond limit of anal somite, and with many spinules on its margin. Anal sinus with two lateral rows of hairs. Furcal rami slightly divergent, about 1.5 times longer than wide, and with complete armature (2 lateral, 1 dorsal and 3 apical setae). There are 2 spines at base of distal lateral seta, which inserted ventrolaterally, and 1 spine at base of proximal lateral seta (Fig. 6). Dorsal seta short and thin. Inner apical seta smooth, almost as long as caudal ramus, bulging at base, curved (Fig. 5). Outer apical seta very strong, plumose, and almost as long as abdomen. Middle apical seta strongest one, also plumose, and about twice longer than outer apical seta (Fig. 1). Rostrum trapeziforme, with two long lateral sensillae (Fig. 7). Antennula 8-segmented, with 1 slender aesthetasc on ultimate segment, 1 relatively short aesthetasc on 4th segment (not reaching beyond end of 7th segment), and with setal formula as follows : 1.9.5.2.1.3.2.7 (Fig. 11). Antenna comprising unornamented coxa, basis with long and strong epipodite seta, 1-segmented endopodite, and 1-segmented exopodite (Fig. 18). Exopodite armed with 4, 3 or even 2 setae (Figs 19, 25, 26 and 27). Labrum similar to male. Mandibula with two very strong teeth on distal end of coxa, and with 2-segmented palp (Fig. 8). Proximal segment of mandibular palp unarmed, while distal segment bearing 1 plumose lateral seta and 4 smooth apical setae. Arithrite of praecoxa of maxillula with 5 strong spines and 2 plumose setae ; coxa with 1 strong and 1 fine seta ; basipodite with 2 apical and 5 lateral setae (Fig. 9). Syncoxa of maxilla with two endites of which proximal bearing 3, while distal bearing 2 setae (Fig. 20). Basipodite of maxilliped with plumose seta on distal-inner corner and with several rows of spines ; 1st endopodite segment with row of spinules on inner margin and with short row of spines on distal-outer corner : 2nd endopodite segment with strong, recurved, thorn and 1 smooth seta (Fig. 15). All swimming legs (P1-P4) with 3 segmented exopodites, as well as endopodite of P1, while endopodites of P2-P4 2-segmented (Figs 10, 12, 16 and 17). Spine and setal formula on exopodites and endopodites (legend : inner / outer spine or seta ; inner / terminal / outer) :

Segments	Exopodite			Endopodite		
	1	2	3	1	2	3
P1	0/1	1/1	0/2/2	1/0	1/0	1/2/0
P2	0/1	1/1	1(0)/2/3	1/0	3/2/1	-
P3	0/1	1/1	2/2/3	1/0	3(2)/2/1	-
P4	0/1	1/1	2/2/3	0(1)/0	2/2/1	-

Couplers (intercoxal sclerites) of all swimming legs concave. Those on P1 and P4 without surface ornamentation, while those on P2 and P3 bear two bunches of spines (Figs 10 and 12). Coxae of all swimming legs with 1 bunch of spines on outer margin, while coxa of P3 bearing 1 additional bunch of spine, in proximal part (Fig. 12). Basis of P1 and P2 with epipodite spine on outer margin, while on P3 and P4 it bears seta (on each swimming leg with 3 spines at their base). Basis of P1 also with 1 strong spine on inner-distal corner (Fig. 17). Inner margins of basis of all swimming legs with several spines or hairs. Basiendopodite of P5 with characteristic dentiform edge near exopodite, and with 6 strong setae of which two innermost longest (Figs 14 and 24). 3rd, 5th and 6th setae (from inner side) very short. Epipodite seta on outer corner of basiendopodite well developed, with 3 or 4 spines at its base. Exopodite oviform, about 1.85 times longer than broad, and armed with 5 setae and many cuticular spines (Fig. 14).

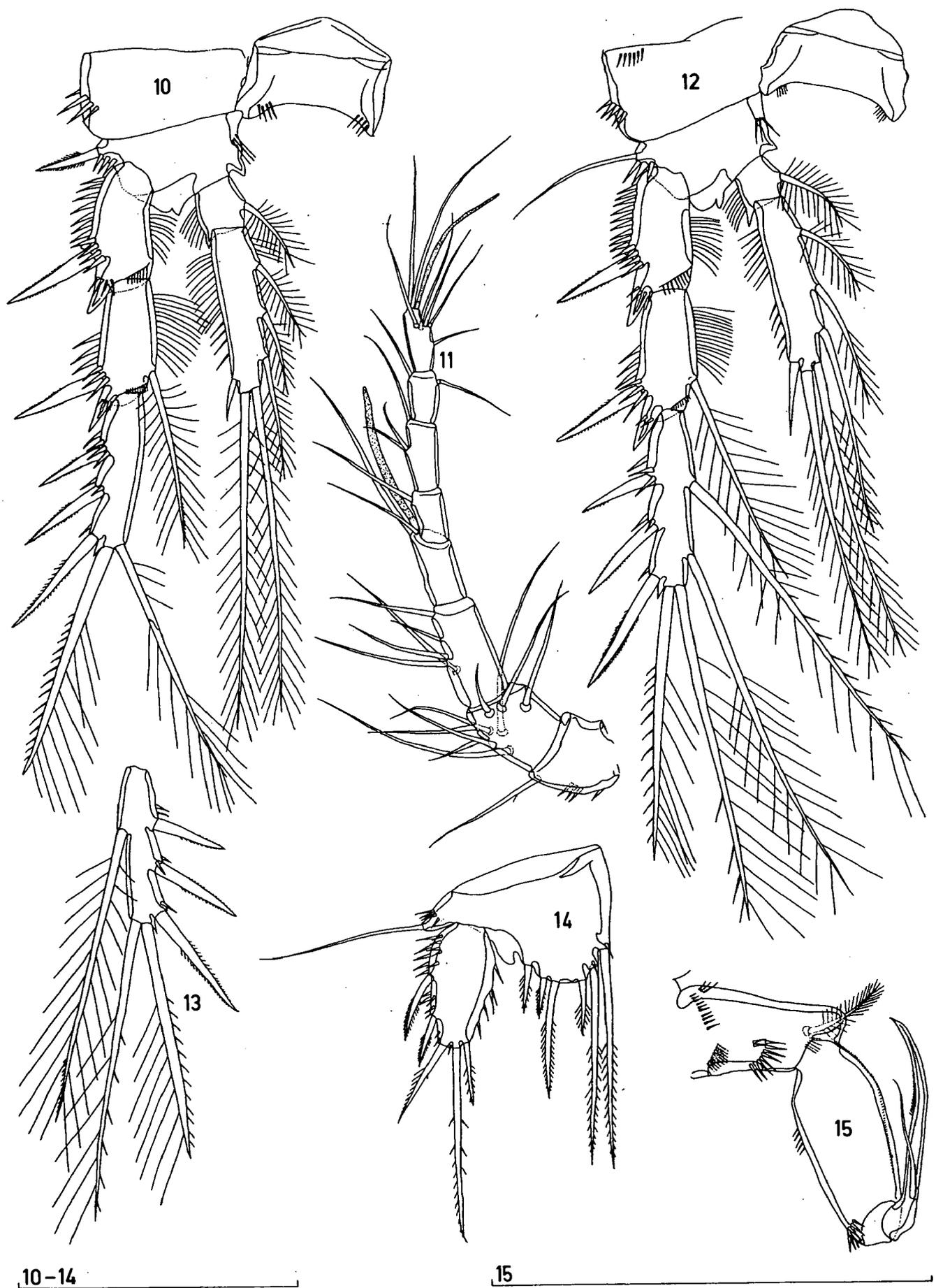
MALE

Body similar to female in general appearance, just little slender. Surface of dorsal shield covering cephalothorax without cuticular striae. Urosome comprising 5th pedigerous somite and 5 free abdominal somites. First abdominal somite (genital somite) about 1.5 times broader than long. Anal sinus smooth. Furcal rami as long as wide, and lateral setae inserted in distal part of furcal length (Fig. 38). Inner apical seta smooth and thin (Fig. 28). Antennula also 8-segmented, but strongly geniculate and with setal formula as follows : 1.8.10.2.1.1.2.9 (Fig. 33). Aesthetasc on segment 4 also not reaching beyond end of penultimate segment. Antenna (Fig. 37), mandibula (Fig. 34), maxillula, maxilla, maxilliped, P1, and exopodites of other swimming legs (Fig. 31) very similar to those of female. Labrum rhomboidal, with short cutting edge on which it bears two groups of spines (5 or 6) and 1 row of spinules (Fig. 35). On inner side, near cutting edge there is irregular circle of many small digestive mushroom-like papillae. Distal endopodite segment of P2 without seta on outer-distal corner (Fig. 30), although there is 1 recess on that place. Endopodite of P3 3-segmented, with 1 inner seta on 1st and 2nd segments and with 2 apical setae on ultimate segment (Fig. 31). Inner margin of second segment characteristically drawn out and modified as one long spiniform process. Proximal endopodite segment of P4 somewhat smaller than in female, and setae on distal segment shorter (Fig. 29). Basiendopodite of P5 with 2 spines, of which inner one about twice longer than outer (Fig. 36). Exopodite subquadrangular, about 1.6 times longer than broad, armed



Figs 1-9. *Attheyella* (B.) *wulmeri* (Kerhervé, 1914), locality number 4 (ovigerous female 0.713 mm) : 1 - habitus, dorsal view ; 2 - genital double-somite, ventral view ; 3 - dorsal shield covering cephalothorax, latero-distal corner ; 4 - egg-sack ; 5 - abdomen, dorsal view ; 6 - last two abdominal somites and furcal rami, ventral view ; 7 - rostrum ; 8 - mandibula ; 9 - maxillula. Scales = 0.1 mm.

Figs. 1-9. *Attheyella* (B.) *wulmeri* (Kerhervé, 1914), localité numero 4 (femelle avec oeufs 0,713 mm) : 1 - corps, vue dorsale ; 2 - segment génital, vue ventrale ; 3 - céphalothorax, angle latéro-distal ; 4 - oeufs ; 5 - abdomen, vue dorsale ; 6 - abdomen, vue ventrale ; 7 - rostre ; 8 - mandibule ; 9 - maxillule. Echelles = 0,1 mm.



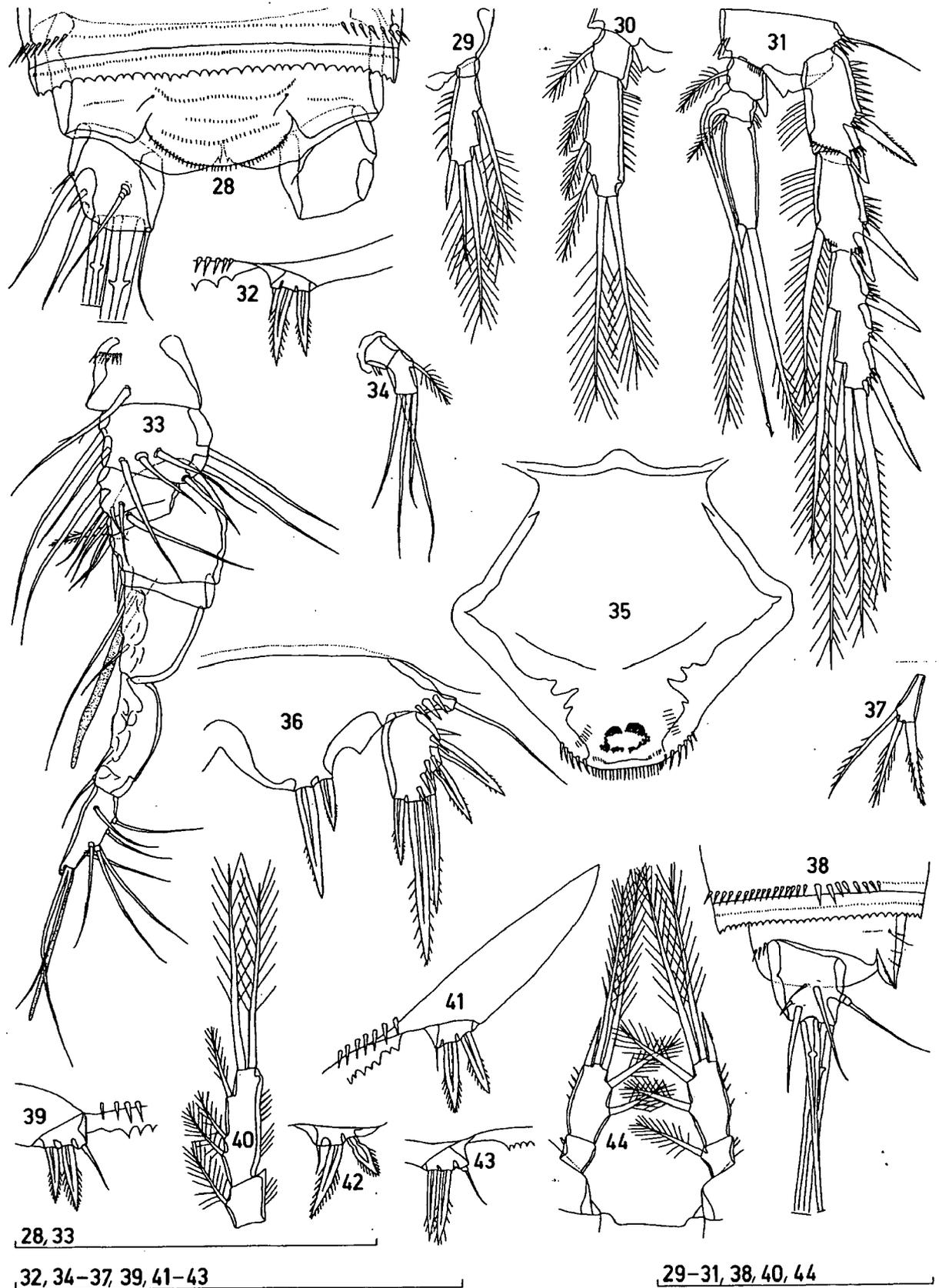
Figs 10-15. *Attheyella (B.) wulmeri* (Kerhervé, 1914), locality number 4 (ovigerous female 0.713 mm) : 10 - second swimming leg ; 11 - antenna ; 12 - third swimming leg ; 13 - ultimate exopodite segment of second swimming leg ; 14 - fifth leg ; 15 - maxilliped. Scales = 0.1 mm.

Figs. 10-15. *Attheyella (B.) wulmeri* (Kerhervé, 1914), localité numéro 4 (femelle avec oeufs 0,713 mm) : 10 - deuxième patte natatoire ; 11 - antenne ; 12 - troisième patte natatoire ; 13 - troisième segment de l'exopodite de la deuxième patte natatoire ; 14 - cinquième patte ; 15 - maxillipède. Echelles = 0,1 mm.



Figs 16-27. *Attheyella* (*B.*) *wulmeri* (Kerhervé, 1914); 16-20, locality number 4 (ovigerous female 0.713 mm); 21-25, locality number 1 (female 0.74 mm); 26, locality number 13 (female 0.673 mm); 27, locality number 3 (female 0.63 mm): 16 - fourth swimming leg; 17 - first swimming leg; 18 - antenna; 19 - exopodite of antenna; 20 - maxilla; 21 - ultimate exopodite segment of second swimming leg; 22 - endopodite of third swimming leg; 23 - distal segment of endopodite of third swimming leg; 24 - basiendopodite of fifth leg; 25 - exopodite of antenna; 26 - exopodite of antenna; 27 - exopodite of antenna. Scales = 0.1 mm.

Figs. 16-27. *Attheyella* (*B.*) *wulmeri* (Kerhervé, 1914); 16-20, localité numéro 4 (femelle avec oeufs 0,713 mm); 21-25, localité numéro 1 (femelle 0,74 mm); 26, localité numéro 13 (femelle 0,673 mm); 27, localité numéro 3 (femelle 0,63 mm): 16 - quatrième patte natatoire; 17 - première patte natatoire; 18 - antenne; 19 - exopodite de l'antenne; 20 - maxille; 21 - troisième segment de l'exopodite de la deuxième patte natatoire; 22 - endopodite de la troisième patte natatoire; 23 - segment distal de l'endopodite de la troisième patte natatoire; 24 - basoendopodite de la cinquième patte; 25 - exopodite de l'antenne; 26 - exopodite de l'antenne; 27 - exopodite de l'antenne. Echelles = 0,1 mm.



Figs 28-44. *Attheyella* (B.) *wulmeri* (Kerhervé, 1914); 28-38, locality number 4 (male 0.577 mm); 39 and 40, locality number 9 (male 0.55 mm); 41, locality number 4 (male 0.485 mm); 42, locality number 4 (male 0.563 mm); 43, locality number 4 (male 0.636 mm); 44, locality number 3 (juvenile male 0.58 mm): 28 - anal somite and furcal rami, dorsal view; 29 - endopodite of fourth swimming leg; 30 - endopodite of second swimming leg; 31 - third swimming leg; 32 - sixth leg; 33 - antennula; 34 - mandibular palp; 35 - labrum; 36 - fifth leg; 37 - exopodite of antenna; 38 - anal somite and furcal ramus, lateral view; 39 - sixth leg; 40 - endopodite of second swimming leg; 41 - sixth leg; 42 - sixth leg; 43 - sixth leg; 44 - endopodites of fourth swimming leg. Scales = 0.1 mm.

Figs. 28-44. *Attheyella* (B.) *wulmeri* (Kerhervé, 1914); 28-38, localité numéro 4 (mâle 0,577 mm); 39 et 40, localité numéro 9 (mâle 0,55); 41, localité numéro 4 (mâle 0,485 mm); 42, localité numéro 4 (mâle 0,563 mm); 43, localité numéro 4 (mâle 0,636 mm); 44, localité numéro 3 (juvénile mâle 0,58 mm): 28 - segment anal et branches furcales, vue dorsale; 29 - endopodite de la quatrième patte natatoire; 30 - endopodite de la deuxième patte natatoire; 31 - troisième patte natatoire; 32 - sixième patte; 33 - antennule; 34 - palpe mandibulaire; 35 - labre; 36 - cinquième patte; 37 - exopodite de l'antenne; 38 - segment anal et branche furcale, vue latérale; 39 - sixième patte; 40 - endopodite de la deuxième patte natatoire; 41 - sixième patte; 42 - sixième patte; 43 - sixième patte; 44 - endopodites de la quatrième patte natatoire. Echelles = 0,1 mm.

with 5 stout spines and with several cuticular spines. P6 consisting of small triangular chitinous plate bearing 2 stout spines and thin seta (which is very variable) on outer-distal corner (Figs 32, 39, 41, 42 and 43).

3.3. Variability

From 44 different localities in Montenegro, 635 specimens (558 adults) of *Attheyella (B.) wulmeri* (Kerhervé, 1914) were found and examined. More than 40 specimens were completely dissected and mounted on slides in Faure's medium. This species is very variable, and the most important examples of its variability, noticed in specimens from Montenegro, we already included in the description. Body length of examined males ranges from 0.485 mm to 0.636 mm (0.57 mm in average), while in females it ranges from 0.576 mm to 0.8 mm (0.7 mm in average). The variability of *Attheyella (B.) wulmeri* has not been yet discussed particularly, and because of that here we give the review of all important variable morphological features that are recorded throughout the distribution of this species :

1) body length, excluding furcal setae, ranges from 0.485 mm to 0.65 mm in males, and from 0.576 mm to 0.9 mm in females ;

2) armature of abdominal somites is quite variable ;

3) surface of dorsal shield covering cephalothorax usually with cuticular striae in females, but sometimes without them (Por 1983) ;

4) furcal rami with or without spines on inner margin (Fig. 5 ; Petkovski 1956 ; 1964) ;

5) egg-bag with different number of eggs, from 20 to 25 (Fig. 4 ; Stephanides 1948) ;

6) exopodite of antenna with 4, 3 or even 2 setae (Figs 19, 25, 26 and 27 ; Stephanides 1948), often left and right antennae of the same animal bearing exopodites with different number of setae, and exopodite with only 2 setae is very rare characteristic ;

7) ultimate exopodite segment of the P2 usually with inner seta (Fig. 13), but sometimes without (Fig. 10), and sometimes also with 1 thin seta or hair, which reminds of remnant of second inner seta (Fig. 21) ;

8) distal endopodite segment of P3 in females with 3 (Fig. 12) or 2 (Fig. 22) inner setae, and sometimes their arrangement is irregular (Fig. 23) ;

9) proximal endopodite segment of P4 with or without seta (Fig. 44 ; Petkovski 1956) ;

10) setae on basiendopodite of the P5 in females can be somewhat shorter or longer (Figs 14 and 24 ; Apos-

tolov & Pesce 1989), but general appearance of that appendage is always the same, just once was discovered a female with 7 setae (Stephanides 1948) ;

11) basiendopodite of P5 in males usually with 2 spines, just sometimes with 3 on one leg, while the opposite leg is normal (Stephanides 1948, Petkovski 1956, Vesentini 1960) ;

12) P6 in males with outer seta very thin and hardly visible (Fig. 41) or well developed (Fig. 39), also inner spine can be sometimes deformed (Fig. 42).

3.4. Distribution

All known records of *Attheyella (B.) wulmeri* were marked on the map of its distribution (Fig. 45). It is important to emphasize that in some cases 2 or more different localities, which are close to each other, were marked with one asterisk. In that way all 44 investigated localities from Montenegro were marked with one asterisk. It is pretty clear that *A. (B.) wulmeri* is a Holo-Mediterranean faunistic element, and its presence in the northern part of France and the southern part of the United Kingdom is a consequence of expansion of its area after the last glaciation.

4. Discussion

As we already said *Attheyella (B.) wulmeri* (Kerhervé, 1914) is very variable species, but it is not extreme example of variability in the genus *Attheyella*. Ishida (1994) found almost incredible variability of *Attheyella (A.) nakaii* (Brehm 1927) in Japan, and also some other species in the genus *Attheyella* are considerably more variable than *A. (B.) wulmeri*. In the United Kingdom and the west part of France, as well as in Portugal (Petkovski 1964), *A. (B.) wulmeri* is very rare, while in Italy, Corfu, and in Montenegro it is one of the commonest harpacticoid species. That confirm our assertion that Atlantic part of its area is secondary, and that it is one real Mediterranean faunistic element. Kiefer (1978) claimed that *A. (B.) wulmeri* is distributed also in Asia Minor and north from France (region number 14 in this paper), but we can not accept this without any proof, so we did not mark out these regions on the map of its distribution (Fig. 45). In Montenegro *A. (B.) wulmeri* is very abundant from February to the end of May, especially in temporary springs and streams, and other shallow temporary collections of water. In interstitial waters and in permanent surface waters is much rarer. In the first half of June it is possible to find this species only above 500 m (locality 40 is on 1200 m above sea level). From the second half of June to the end of September we found *A. (B.) wulme-*

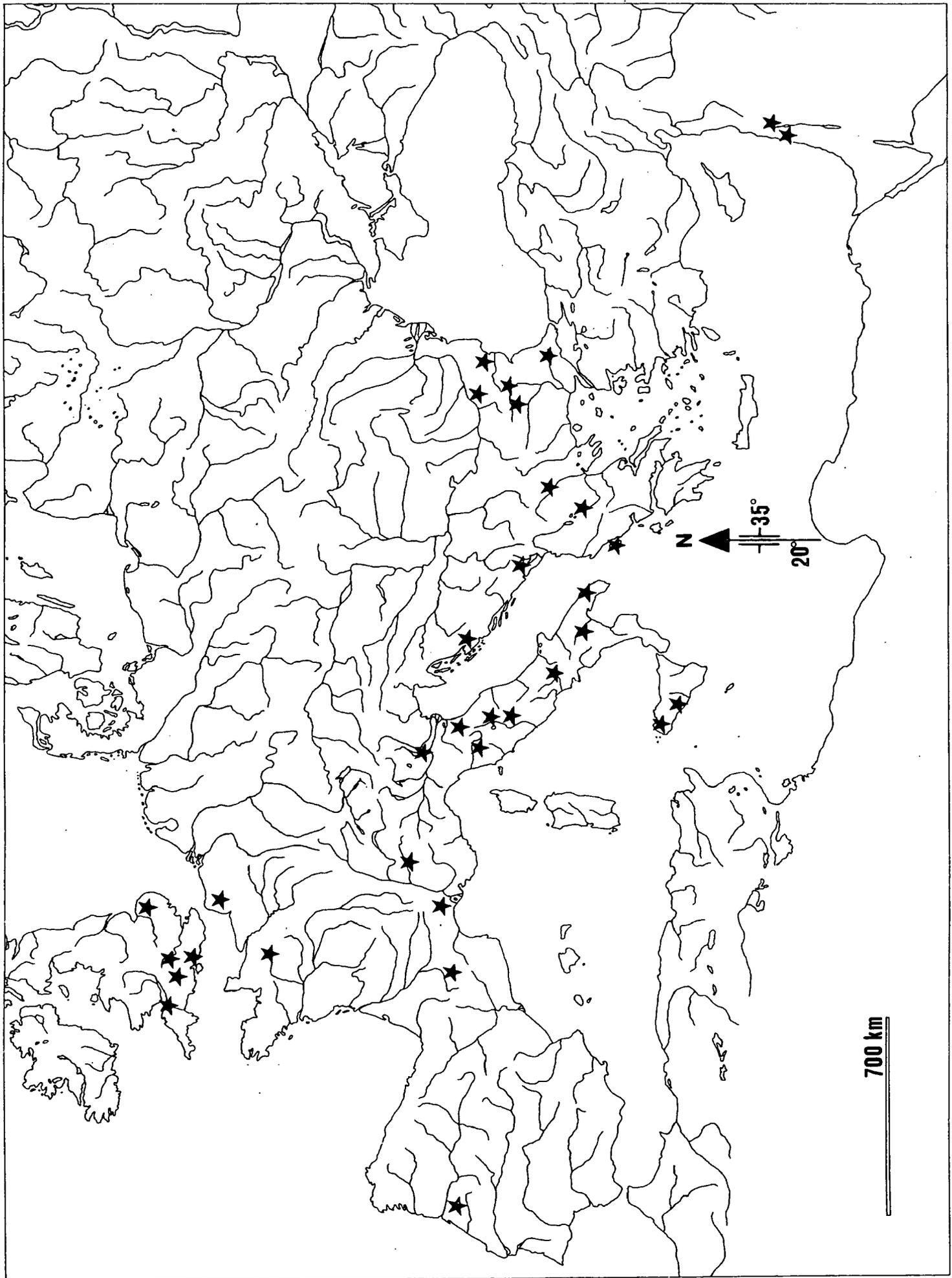


Fig. 45. Distribution of *Artheyella (B.) wulmeri* (Kerhervé, 1914).
Fig. 45. Distribution géographique de *Artheyella (B.) wulmeri* (Kerhervé, 1914).

ri only in interstitial waters, and from October to January we did not find it at all. Two caves in which we found *A. (B.) wulmeri* (localities 14 and 15) are very short, and that is not real underground environment. *A. (B.) wulmeri* is very close to *A. (B.) dentata* (Poggenpol 1874) [syn. *A. (B.) northumbrica* (Brady 1880)], and also to *A. (B.) trispinosa* (Brady 1880), but these three species clearly differ from each other by the shape of the fifth legs (both in female and male) and by the shape of furcal rami.

After the examination of the variability of *A. (B.) wulmeri* it was obvious that *A. (B.) osmana* Kiefer 1955, *A. (B.) naphthalica* Por 1983, and *A. (B.) paranaphthalica* Pesce & Galassi 1988 are just synonymous with that species, and we established these synonyms here for the first time. Por (1983), proposing species rank for *A. (B.) osmana*, also proposed neotype and neoparatype (although type material of that taxon was not lost) and even "large population of Bab el Hawa as a new type locality, because of the completeness of ... description". This is very strange because his description is very problematic. For example describing male's P5 he claimed "6 setae on exopodite", although there are only 5 setae (indeed spines). Also he drew male's distal endopodite segment of the second swimming leg with outer spine, and claimed: "P2 bears modified and smaller external spine (easily torn in the preserved specimens)". But, the truth is that this spine is lacking in males, although there is one recess on that place (Fig. 30; Kiefer 1955). Similar mistake was made by Gurney (1932). Especially Por (1983) made a lot of mistakes describing mouth appendages, and it is very strange why he did not provide a SEM photograph of "cephalothorax without dorsal sculpture" in *A. (B.) naphthalica*, although he provided a lot of SEM photographs. Pesce & Galassi (1988), describing *A. (B.) paranaphthalica* from Italy, placed this species in the same group ("gruppo *trispinosa*") with *A. (B.) naphthalica*, *A. (B.) osmana*, *A. (B.) trispinosa*, *A. (B.) dogieli* (Rylov 1923) and even with *A. (B.) yunnanensis* Shen & Tai 1979, but not with *A. (B.) wulmeri* or *A. (B.) dentata*. As the main character of that group they emphasized absence of inner seta on the proximal endopodite segment of P4, although Petkovski (1956) noticed that character as variable in *A. (B.) osmana*. We think that any grouping of species in the subgenus *Brehmiella* is unnecessary. Brehm (1949) drew attention to the fact that the subgeneric name *Brehmiella* is preoccupied, as well as Wilson (1958), and proposed the new name *Mrazekiella*, but in view of the fact that confusion is impossible, because these two names are in different classes, changing of the name was unnecessary.

References

- Apostolov A. 1973. — Harpacticoides des Eaux Saumâtres et des Etangs Côtiers. *Zool. Anz. Leipzig*, 191(3/4) : 281-294.
- Apostolov A. & Pesce G.L. 1989. — Copépodes Harpacticoides stygobies de Bulgarie. *Riv. Idrobiol.*, 28(1/2) : 113-149.
- Basamakov I. 1969. — Harpacticoida (Crustacea, Copepoda) ot Sredna Gora. *Muzei Pametn. na kultura*, 3 : 28-32.
- Basamakov I. & Apostolov A. 1977. — Prinos km izuzhavane na harpaktikoidna fauna na Strandza planina. *Izvestija na Muz. Juzsna Blgarija*, 3 (27) : 27-42.
- Bou C. & Rouch R. 1967. — Un nouveau champ de recherches sur la faune aquatique souterraine. *C.R. Acad. Sc. Paris*, 265 : 369-370.
- Brehm V. 1949. — Prioritätsbedingte Namensänderung. *Arch. Hydrobiol.*, 42 : 515.
- Chappuis P.A. 1929a. — Révision du genre *Canthocamptus* Westwood (Note préliminaire). *Bull. Soc. Sci. Cluj*, 4 (2) : 41-50.
- Chappuis P.A. 1929b. — Die Unterfamilie der Canthocamptinae. *Arch. Hydrobiol.*, 20 : 471-516.
- Cvetkov L. 1968. — Un filet phréatobiologique. *Bull. Inst. Zool. Mus. Sofia*, 27 : 215-219.
- Dussart B. 1967. — *Les Copépodes des eaux continentales d'Europe occidentale, I : Calanoides et Harpacticoides*. M. Boubée et Cie, Paris : 1-500.
- Dussart B. & Defaye D. 1990. — Répertoire mondial des crustacés copépodes des eaux intérieures. III. Harpacticoides. *Crustaceana*, Suppl. 16 : 1-384.
- Gurney R. 1932. — *British freshwater Copepoda, II. Harpacticoida*. Ray Society, London, : 1-336.
- Ishida T. 1994. Variation in the species of freshwater harpacticoid copepods in Japan. II. *Atheyella nakaii* (Brehm). *Hydrobiologia*, 292/293 : 53-57.
- Kerhervé B. de 1914. — Harpacticidae : genres *Nitocra* et *Canthocamptus*. Espèces trouvées en France, *Canthocamptus Wulmeri* n. species. *Bull. Soc. Zool. France*, 39 : 97-106.
- Kiefer F. 1955. — Freilebende Ruderfusskrebse (Crustacea Copepoda) aus Türkischen Binnengewässern, II. Cyclopoida und Harpacticoida. *Istanbul Univ. Fen Fak. Hidrobiologi*, 2 (4) : 108-132.
- Kiefer F. 1978. — Copepoda non-parasitica. In : Illies J. *Limnofauna Europaea*. Gustav Fischer Verlag, Stuttgart - New York, Swets & Zeitlinger B.V., Amsterdam : 209-225.
- Lang K. 1948. — *Monographie der Harpacticiden*. Nordiska Bokhandeln, Lund, A-B. : 1-1682.
- Lowndes A.G. 1928a. — *Attheyella wulmeri* Kerhervé. *Malborough Coll. Nat. Hist. Soc. Report*, 76 : 1-5.
- Lowndes A.G. 1928b. — Freshwater Copepoda and Hydrogen Ion Concentration. *Ann. Mag. Nat. Hist.*, 10 (1) : 457-460.
- Margalef R. 1954. — Algunos crustaceos de agua dulce y salobre de la Romagna (Colección Zarrgheri). *Boll. Soc. Entomol. Italiana*, 34 (9/10) : 146-150.
- Mihailova-Neikova M. 1966. — Harpacticoida (Copepoda) ot Trakiyskata nizina. *Fauna na Trakiia, Blgarska Akad. Nauk. Zool. Inst. Muz.*, 3 : 201-216.
- Pesce G.L. 1983. — Contributo alla conoscenza degli arpacticoidi delle acque sotterranee della regione Pugliese (Crustacea : Copepoda). *Thalassia Salentina*, 13 : 62-81.
- Pesce G.L. & Galassi D.P. 1987. — Copepodi di acque sotterranee della Sicilia. *Animalia*, 14 (1/3) : 193-235.
- Pesce G.L. & Galassi D.P. 1988. — Una nuova *Attheyella* di acque sotterranee italiane : *Attheyella (Brehmiella) paranaphthalica* n.sp. (Crustacea, Copepoda, Canthocamptidae). *Fragm. Entomol. Roma*, 21 (1) : 1-7.

- Petkovski S. 1992. — Über die Plankton-Cladoceren des Kastorias-Sees in N.W. Griechenland (Crustacea, Anomopoda). *Scopolia*, 26 : 1-24.
- Petkovski T.K. 1956. — Über einige Copepoden aus Höhlen- und Grundwässern jugoslaviens. *Izdaniya Inst. Piscicult. Macedoine*, 1 (8) : 185-208.
- Petkovski T. 1964. — Zur Kenntnis der Harpacticiden Portugals (Crustacea, Copepoda). *Lunds Univ. Arsskrift.*, 59 (14) : 1-22.
- Por F.D. 1983. — The freshwater Canthocamptidae (Copepoda : Harpacticoida) of Israel and Sinai. *Israel Jour. Zool.*, 32 : 113-134.
- Stephanides T. 1948. — A survey of the freshwater biology of Corfu and of certain other regions of Greece. *Praktika, Athena*, 2 (2) : 1-263.
- Stock J.H & Vaupel Klein J.C. von 1996. — Mounting media revisited : the suitability of Reyne's fluid for small crustaceans. *Crustaceana*, 69 (6) : 794-798.
- Vesentini G. 1960. — Contributo alla conoscenza degli harpacticidi (crostacei copepodi) della regione Veronese. *Mem. Mus. Civ. St. Nat. Verona*, 8 : 197-222.
- Wilson M.S. 1958. — North American harpacticoid copepods, 5. The status of *Attheyella americana* (Herrick) and the correct name for the subgenus *Brehmiella*. *Proc. Biol. Soc. Washington*, 71 : 49-52.