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A new species of *Zosime* (Copepoda: Harpacticoida: Zosimeidae) from shallow subtidal habitats in Korea, with notes on the genus

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Abstract

Zosime destituta sp. nov. is described from shallow subtidal habitats in the southern sea of Korea. The new species is similar to *Z. valida* Sars, 1919, but differs from it primarily by the lack of an inner seta on the third endopodal segment of the fourth swimming leg. Based on morphological comparison of female character states, the genus *Zosime* can be subdivided into three provisional groups, *anneae*-, *incrassata*-, and *typica*-group. These groups are distinguished from each other by differences in the antennule, antennary exopod, mandibular rami, armature of swimming legs, fifth leg, and caudal rami. In addition, *Zosime incrassata bathybia* Bodin, 1968 is removed from its synonymy with *Z. incrassata* Sars, 1910 and upgraded to species level. An amended key to all known species of *Zosime* Boeck, 1873 is given, along with a table of all major characters. The present study is the first report of the family Zosimeidae Seifried, 2003 from Korean waters.

Key words: Harpacticoida, Korea, new species, subtidal, taxonomy, Zosimeidae

Introduction

The family Zosimeidae Seifried, 2003, currently composed of the genera *Zosime* Boeck, 1873, *Peresime* Dinet, 1974, and *Pseudozosime* T. Scott, 1912, was erected by Seifried (2003) based on unique apomorphies in the mouth parts, P1 endopod, and P5 (Seifried 2003; Huys & Clark 2009). These genera can easily be distinguished from each other by the segmentation of the endopods of P2–P4 (Wells 2007; Koller & George 2011). Although the family is small, presently accommodating only 19 species/subspecies and mainly from sublittoral marine habitats (Wells 2007; Koller & George 2011), many unnamed species have been reported in the literature and are awaiting description (Carey & Montagna 1982; Mu *et al.* 2002; Seifried 2003; Chertoprud *et al.* 2009; Huys & Clark 2009). *Zosime* is the most speciose genus in the family, currently comprising 16 species/subspecies and assuming a wide geographical distribution (Koller & George 2011). Recently, Koller & George (2011) noted that some species display derived features in the antennule, fifth leg, and caudal ramus, and suggested that a phylogenetic study based on the type material of most species is necessary to confirm or reject the monophyletic status of the genus.

In the present study, we propose a new species of *Zosime* from Korean waters along with detailed description and illustrations, and provisionally propose three species groups in the genus based on morphological comparison of female character states. Finally, we discuss the taxonomic status of the genus and provide a worldwide identification key to species.

Material and methods

Samples were collected from muddy sediments off Hansando Island, using a van Veen grab sampler at a depth of 10–15 m. Harpacticoids retrieved on a 64 µm sieve were initially fixed with 99.9 % ethanol. Harpacticoid specimens were sorted with a stereomicroscope (Zeiss Discovery V8). Before dissection, the habitus was drawn

and measured from a whole specimen. The hanging drop method of Hume & Gooding (1964) was adopted by using an aluminium hole slide. Dissection was performed using tungsten needles under the stereomicroscope and the drawings were made using a compound light microscope (Nikon Eclipse 80i), equipped with a drawing tube. All examined appendages were transferred and mounted in lactophenol or polyvinyl lactophenol solution on glass slides, and deposited in the National Institute of Biological Resources (NIBR) in South Korea.

The terminology of the body and appendage morphology follows Huys & Boxshall (1991). Abbreviations used in the text, figures and table are: A1, antennule; A2, antenna; ae, aesthetasc; CR, caudal rami; exp, exopod; enp, endopod; P1–P6, first to sixth thoracic legs; exp (enp)-1 (2, 3) to denote the proximal (middle, distal) segment of a three-segmented ramus; L/W, length:width; Md, mandible; seg., segments.

Taxonomy

Family Zosimeidae Seifried, 2003

Genus *Zosime* Boeck, 1873

Zosime destituta sp. nov.

(Figs. 1–4)

Type locality. Off Hansando Island (34°46'17.4"N 128°27'46.9"E), Tongyeong-si, Gyeongsangnam-do, Korea.

Type material examined. Holotype female (NIBRIV0000326501) dissected on a slide. Paratypes: one female (NIBRIV0000326502) dissected on 13 slides; two undissected females (NIBRIV0000364128, NIBRIV0000364129) were preserved in 99.9 % ethanol. All material has been deposited in the National Institute of Biological Resources (NIBR) in South Korea and was collected from the type locality on 24 March 2014.

Description of female (holotype). Body (Fig. 1A, B) fusiform, subcylindrical, tapering posteriorly, with narrow constriction between prosome and urosome; total body length 667 µm measured from anterior margin of rostrum to posterior margin of caudal ramus laterally; surface with reticulate ornamentation (Fig. 1C), covered by minute setules except for cephalothorax. Posterior border of each somite crenate except for pre-anal and anal somites, with 3–8 sensilla; pseudoperculum (Fig. 3C) on pre-anal somite (urosomite 5) with 10 well-developed spinous projections. Rostrum (Fig. 1A) triangular, fused at base to cephalothorax; anterior and lateral margins concave; with paired sensilla and small apical protrusion. Cephalothorax with 31 sensilla; ventrolateral margin crenate. Ventrolateral margin of thoracic somites crenate, possessing sensillum, with row of setules anteriorly. All urosomites except for pre-anal and anal somites with well-developed pleurotergite, bearing one sensillum (Fig. 3A). Original segmentation of genital double-somite marked by dorsal and lateral subcuticular ridges (Figs. 1A, B), fused ventrally (Fig. 3A); posterior margin with 2 small processes ventrally, each bearing sensillum. Genital field (Fig. 3A, B) with median copulatory pore, with paired genital apertures; P6 represented by 1 plumose and 2 naked setae. Posterior margin of pre-anal somite crenulate ventrally. Anal somite (Fig. 3C) small; dorsal surface with 2 sensilla; anal opening triradiate, fringed with deeply incised frill.

Caudal ramus (Fig. 3A, C) cylindrical, 1.8 times as long as greatest width, with slightly convex inner and outer lateral margins, and possessing with 7 setae: seta I small, inserted ventrally at about halfway down outer margin; seta II twice as long as seta I, inserted distally at 3/4 distance of outer margin; seta III as long as seta II, inserted subdistally at outer corner; distal setae IV and V well-developed, covered with minute spinules except for proximal part; seta VI as long as seta III, inserted distally at inner corner; seta VII tri-articulated at base, inserted distally on dorsal surface.

Antennule (Fig. 2A) robust, short, 6-segmented: segment 1 with 2 rows of spinules on anterior margin; segment 2 longest, with subcuticular ridge medially; segments 4 and 6 with aesthetasc; segment 6 with transverse suture, indicating former division between segments 6 and 7. Setal formula as follows: 1-[1], 2-[15], 3-[3], 4-[3+ae], 5-[5], 6-[8+ae].

Antenna (Fig. 2B). Coxa small. Basis elongate, with 2 rows of spinules, with 1 pinnate abexopodal seta. Exopod 3-segmented; proximal segment with small plumose seta; middle segment shortest, with 1 spinulose seta; distal segment longer than preceding segments combined, with 3 spinulose and 1 pinnate setae. Endopod 2-

segmented; proximal segment with long spinulose inner seta; distal segment longer than proximal one, inner margin with 2 long spinulose and 1 short delicate setae, and 2 groups of spinules, distal margin with 1 long spinulose, 4 long pinnate and 1 delicate pinnate setae, inner distal corner with row of spinules.

Mandible (Fig. 2C). Gnathobase well-developed, armed with 6 teeth and 1 pinnate seta; outermost tooth largest and multicuspidate, innermost one small and spinule-like. Palp consisting of basis, exopod, and endopod; basis with 3 plumose setae distally; exopod small, 1-segmented, bilobate, inner and outer lobes with 1 and 2 apical plumose setae, respectively; endopod 1-segmented, with 4 plumose setae.

Maxillule (Fig. 2D). Praecoxal arthrite well-developed, with 7 pinnate or spinulose spines on distal margin and 2 setae on anterior surface. Coxa with pinnate outer seta; coxal endite with 3 pinnate setae distally. Basal endite elongate, with 5 pinnate setae distally, with row of spinules on surface. Exopod 1-segmented, with 3 plumose setae. Endopod 1-segmented, wide, with 6 plumose setae.

Maxilla (Fig. 2E). Syncoxa with row of outer spinules proximally, with 3 endites: proximal endite bilobate, each lobe with 2 pinnate and 1 bare setae; middle endite with 1 pinnate and 2 bare setae; distal endite with 2 spine-like elements and 1 bare seta. Basal endite with 2 spine-like elements and 2 bare setae. Endopod 1-segmented, elongate, with 3 apical and 2 lateral elements.

Maxilliped (Fig. 2F). Syncoxa elongate, with row of setules along lateral margin proximally. Basis shorter and narrower than syncoxa, with pinnate seta at distal corner and row of setules on lateral margin distally. Endopod 1-segmented, small, with 1 plumose and 1 pinnate setae apically, with 1 delicate and 1 long bare setae laterally.

P1 (Fig. 3D). Intercoxal sclerite wide and arched. Coxa with 3 rows of spinules on anterior surface. Basis slightly smaller than coxa, with 3 rows of spinules on anterior surface, 1 plumose outer seta, and 1 long pinnate inner spine. Exopod 3-segmented; outer margin of each segment with spinules as shown; exp-1 with row of inner setules and 1 spinulose outer spine; exp-2 with 1 spinulose outer spine and 1 plumose inner seta; exp-3 with 1 plumose inner and 2 spinulose apical elements, and 2 outer spinulose spines. Endopod 2-segmented, reaching to end of exopod; outer margin of each segment with spinules as shown; enp-1 slightly longer than wide, with plumose inner seta; enp-2 narrower and longer than preceding segment, with 1 plumose inner and 1 spinulose apical setae and 1 outer spinulose spine.

P2–P4 (Figs. 3E, 4A, B). Intercoxal sclerite wide, arched. Coxa with 4 rows of spinules on anterior surface. Basis smaller than coxa, with 1–3 rows of spinules on anterior surface and 1 plumose outer seta. Both rami 3-segmented; exopod longer than endopod; each exopodal segment with outer spinules and inner setules; exp-1 and exp-2 each with 1 plumose inner seta and 1 spinulose outer spine, exp-3 with 2 plumose inner setae, 2 apical elements, and 3 spinulose outer spines; each endopodal segment with setules or spinules along outer margin; enp-2 and P4 enp-3 with inner setules; enp-1 and enp-2 each with 1 plumose inner seta, enp-3 except for P4 with 1 plumose inner seta, 2 apical elements, and 1 spinulose outer spine; P4 enp-3 with 2 apical elements and 1 spinulose outer spine.

P5 (Fig. 4C). Intercoxal sclerite small. Baseoendopod wide, with outer cylindrical peduncle bearing pinnate seta; endopodal lobe reaching halfway down of exopod, with 2 long pinnate setae. Exopod fused to baseoendopod, with 3 marginal and 1 surface setae.

Male. Unknown.

Etymology. The specific name, *destituta*, is derived from the Latin adjective *destitutus*, meaning ‘lacking’. This name refers to the absence of the inner seta on P4 enp-3 in the female of the new species.

Remarks. The new species, *Zosime destituta* sp. nov., is very similar to *Z. valida* Sars, 1919 which was originally described from outside the Oslofjord (Sars 1919). Females of both species share the presence of 5 elements on P1 exp-3 and 2 setae on P5 endopodal lobe, and the length to width ratio of caudal ramus (about 2.0:1; Table 1). However, *Zosime destituta* and *Z. valida* can be differentiated by the combination of the following features: the number of segments of the antennule (6 segments in *Z. destituta*, but 7 segments in *Z. valida*); the absence of the inner seta on P4 enp-3 in *Z. destituta*, but it is present in *Z. valida*; P6 being represented by 3 setae in *Z. destituta*, but with 2 setae in *Z. valida*. The absence of the inner seta on P4 enp-3 of *Z. destituta* is unique within the genus. The only other species that displays 3 elements on P4 enp-3 is *Z. bathyalis* Por, 1967, but in this species the outer spine appears to be absent and the inner seta present (Por 1967).

TABLE 1. List of valid species of *Zosime* Boeck, 1873, with some of the most commonly used morphological features and newly proposed groups (based on females only)

Subgroup	Species	A1 no. of seg.	A2 exp. setal formula	Md exp/emp, no. of setae	Setal formula of thoracic legs (exp/emp)		
					P1	P2	P3
<i>anneae</i> -group	<i>Z. anneae</i>	8	1.1.4	3/4	0.1.123/1.121	1.1.223/1.1.121	1.1.223/1.1.121
<i>incrassata</i> -group	<i>Z. incrassata</i>	7	1.0.2	1/2	0.1.122/1.121	1.1.223/1.1.121	1.1.323/1.1.221
	<i>Z. bathybia</i>	7	1.0.3	1/2	0.1.122/1.121	1.1.223/1.1.121	1.1.323/1.1.221
	<i>Z. reyssi</i>	7	1.0.2	1/-	0.1.122/1.020	1.1.223/1.1.121	1.1.323/1.1.1(2)21
<i>typica</i> -group	<i>Z. typica</i>	6	1.1.3	3/4	0.1.123/1.121	1.1.223/1.1.121	1.1.223/1.1.121 ^(a)
	<i>Z. major</i>	6	1.1.3 ^(b)	3/4 ^(b)	0.1.123/1.121	1.1.223/1.1.121	1.1.223/1.1.121 ^(b)
	<i>Z. valida</i>	7	1.1.4	2 or 3/4	0.1.122/1.111	1.1.223/1.1.121	1.1.223/1.1.121
	<i>Z. gisleni</i>	6	unknown	3/4 ^(c)	0.1.123/1.121	1.1.223/1.1.121	1.1.223/1.1.121 ^(d)
	<i>Z. mediterranea</i>	6 ^(e)	1.1.3 ^(e)	3/4 ^(e)	0.1.123/1.111	1.1.223/1.1.121 ^(e)	1.1.223/1.1.121 ^(e)
	<i>Z. bathyalis</i>	6	0.1.5	3/3	0.1.122/1.111	1.1.222/1.1.121	1.1.222/1.1.120
	<i>Z. erythraea</i>	6	unknown	3/4	0.0.122(3)/1.111	1.1.223/1.1.121 ^(f)	1.1.223/1.1.121 ^(f)
	<i>Z. atlantica</i>	7	1.1.3	4/4	0.1.123/1.111	1.1.223/1.1.121	1.1.223/1.1.121
	<i>Z. paramajor</i>	6	1.1.4	3/4	0.1.122/1.111	1.1.223/1.1.121	1.1.223/1.1.121
	<i>Z. bergensis</i>	6 ^(g)	1.1.3 ^(g)	3/4 ^(g)	0.1.123/1.111	1.1.223/1.1.121 ^(g)	1.1.223/1.1.121 ^(g)
	<i>Z. paratypica</i>	7	1.1.4	3/4	0.1.123/1.121	1.1.223/1.1.121	1.1.223/1.1.121
	<i>Z. pacifica</i>	6	1.1.4	3/4	0.1.123/1.121	1.1.223/1.1.121	1.1.223/1.1.121
	<i>Z. destituta</i>	6	1.1.4	3/4	0.1.122/1.111	1.1.223/1.1.121	1.1.223/1.1.121

.....continued on the next page

TABLE 1. (Continued)

Subgroup	Species	Setal formula of thoracic legs (exp/enp)		P5 exp. surface seta	rami	P6 no. of setae	CR L/W ratio	Reference
		P4	P5					
<i>anneae</i> -group	<i>Z. anneae</i>	1.1.223/1.1.121	4/4	present	fused	3	4.0	Koller & George (2011)
<i>incrassata</i> -group	<i>Z. incrassata</i>	1.1.323/1.1.121	4/3	absent	separate	unknown	1.1	Sars (1910)
	<i>Z. bathybia</i>	1.1.323/1.1.121	4/3	absent	separate	1	1.2	Bodin (1968), Apostolov & Petkovski (1980)
	<i>Z. reyssi</i>	1.1.323/1.1.121	4/4	absent	partially separate	unknown	1.2	Dinet (1974)
<i>typica</i> -group	<i>Z. typica</i>	1.1.223/1.1.121	4/3	present	fused	unknown	2.6	Boeck (1873), Sars (1903, 1910), Wells (2007)
	<i>Z. major</i>	1.1.223/1.1.121	4/4	present	fused	unknown	3.0	Sars (1919), Wells (2007)
	<i>Z. valida</i>	1.1.223/1.1.121	4/2	present	fused	2	1.7	Sars (1919), Por (1964), Kornev & Chertoprud (2008)
	<i>Z. gisleni</i>	1.1.223/1.1.121	4/3	present	fused	unknown	3.0	Lang (1948), Por (1967)
	<i>Z. mediterranea</i>	1.1.223/1.1.121 ^(c)	4/4	present	fused	unknown	2.0	Monard (1937), Lang (1948), Wells (2007)
	<i>Z. bathyalis</i>	1.1.222/1.1.120	4/4	present	fused	unknown	2.3	Por (1967)
	<i>Z. erythraea</i>	1.1.223/1.1.121 ^(d)	4/4	present	fused	unknown	4.0	Por (1967)
	<i>Z. atlantica</i>	1.1.223/1.1.121	4/4	present	fused	unknown	2.2	Bodin (1968)
	<i>Z. paramajor</i>	1.1.223/1.1.121	4/4	present	fused	2	2.9	Bodin (1968)
	<i>Z. bergensis</i>	1.1.223/1.1.121 ^(e)	4/3	present	fused	unknown	3.3	Drzycimski (1968)
	<i>Z. paratypica</i>	1.1.223/1.1.121	4/3 or 4	present	fused	unknown	4.0	Becker & Schriever (1979)
	<i>Z. pacifica</i>	1.1.223/1.1.121	4/2	present	fused	2	2.0	Fiers (1991)
	<i>Z. destituta</i>	1.1.223/1.1.021	4/2	present	fused	3	1.8	Present study

^(a)Boeck (1873) described inadequately the type species, *Z. typica*, without illustration. Sars (1903) described subsequently *Z. typica* and provided the illustrations of most appendages without P3. According to Well's (2007) keys, the exp-3 and enp-2 of P3 have 7 and 4 setae in *Z. typica*, respectively.

^(b)Sars (1919) mentioned that the antenna, mouth parts, and P1-P4 of *Z. major* are similar to those of the type species.

^(c)Lang (1948) mentioned that the mandible of *Z. gisleni* is normal.

^(d)Lang (1948) mentioned that the P1-P4 of *Z. gisleni* are similar to those of type species.

^(e)This species was first described as *Z. major* by Monard (1937) and subsequently revised to a new species as *Z. mediterranea* on the basis of the differences in the caudal rami, pseudopericulum, and P1 by Lang (1948). According to Well's (2007) keys, the exp-3 and enp-2 of P2-P4 have 7 and 4 setae in *Z. mediterranea*, respectively.

^(f)Por (1967) mentioned that the P2-P4 of *Z. erythraea* are similar to those of *Z. gisleni*.

^(g)Drzycimski (1968) mentioned that the antennule, antenna, mouth parts, and P2-P4 of *Z. bergensis* are similar to those of the type species.

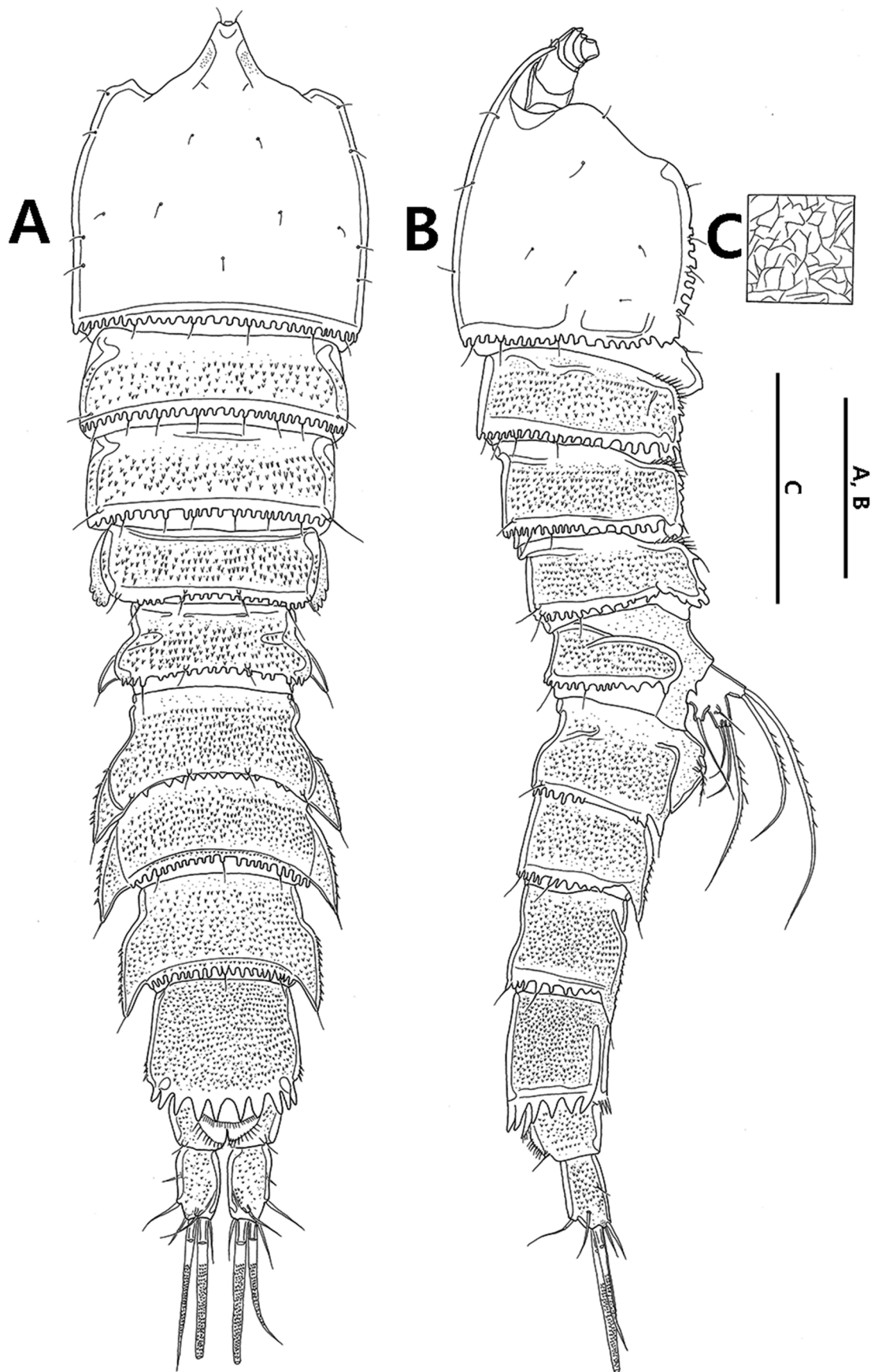


FIGURE 1. *Zosime destituta* sp. nov., female: A, habitus, dorsal; B, habitus, lateral; C, detail of the surface of the cephalothorax. Scale bars: 100 μ m (A, B); 50 μ m (C).

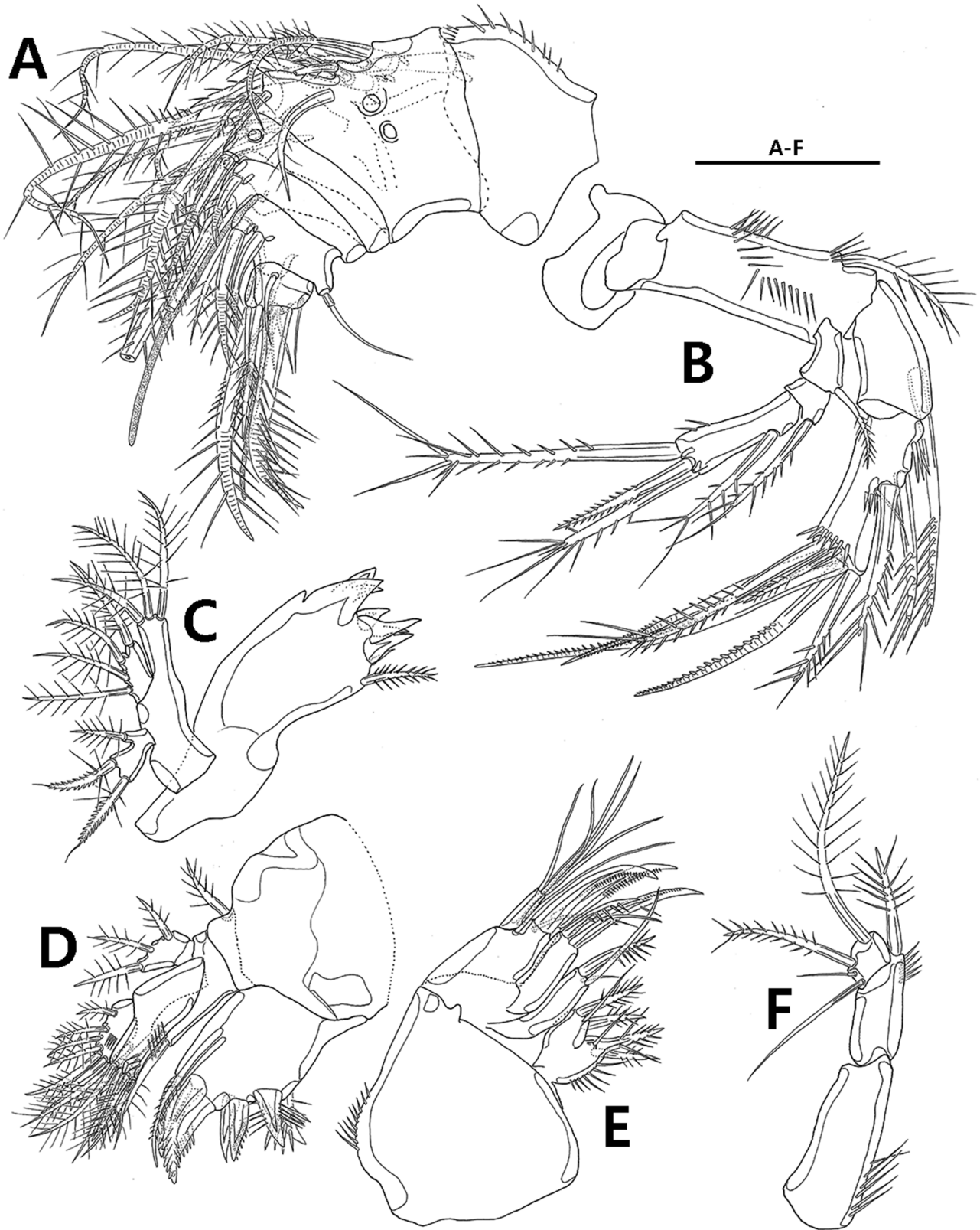


FIGURE 2. *Zosime destituta* sp. nov., female: A, antennule; B, antenna; C, mandible; D, maxillule; E, maxilla; F, maxilliped. Scale bar: 30 μ m.

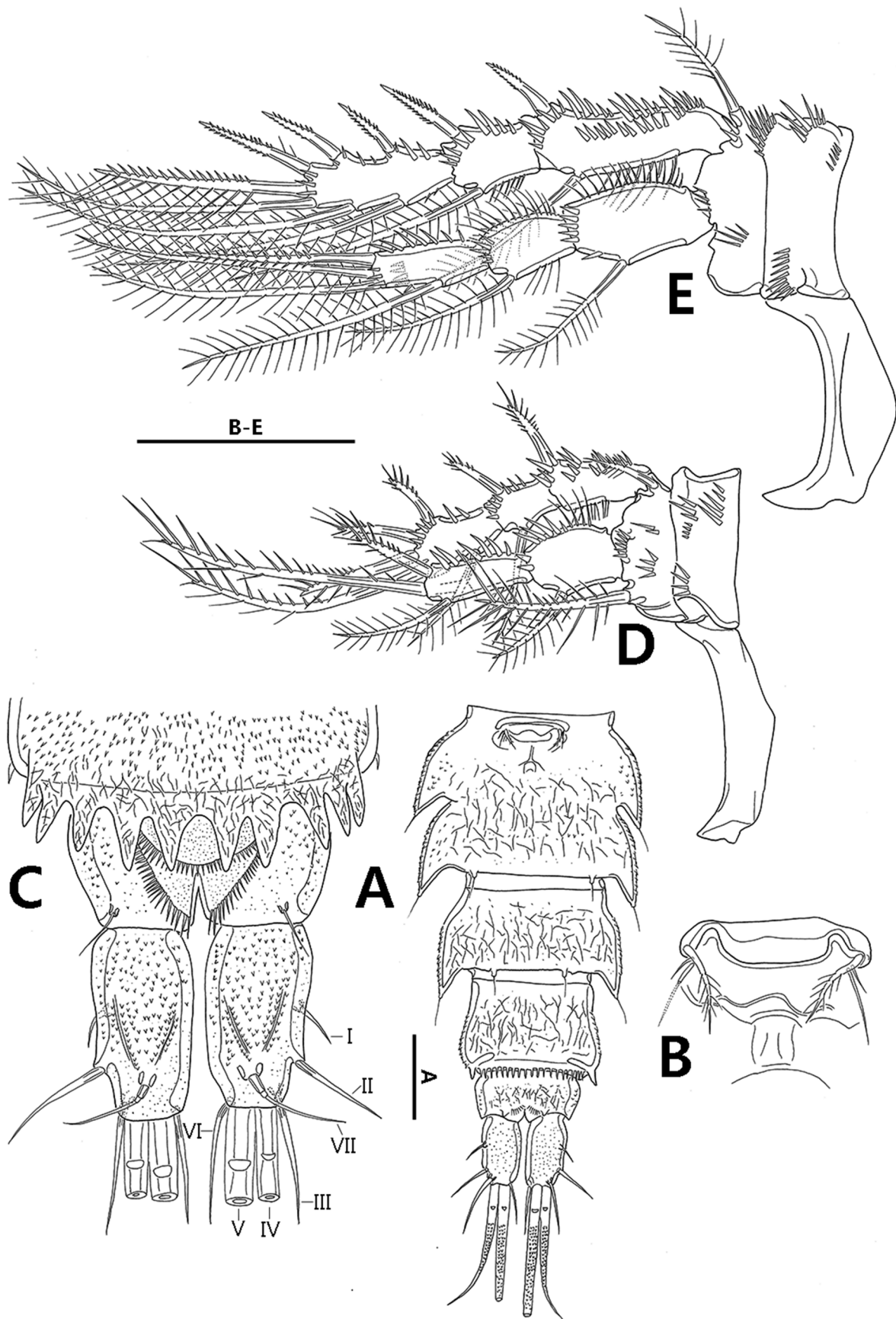


FIGURE 3. *Zosime destituta* sp. nov., female: A, urosome (excluding P5-bearing somite), ventral; B, genital field; C, posterior margin of pre-anal somite, anal somite, and caudal rami; D, P1; E, P2. Scale bars: 50 μm.

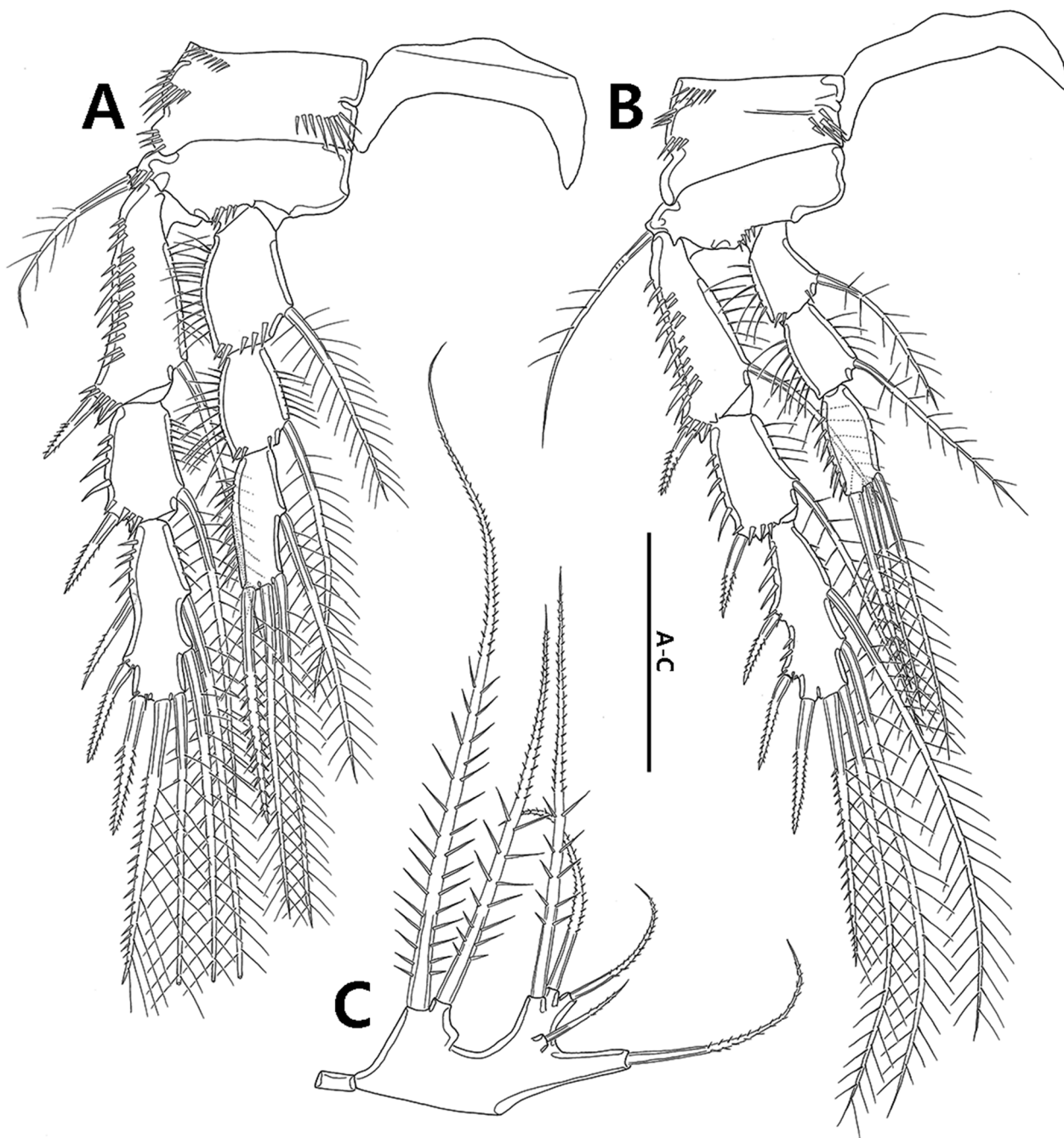


FIGURE 4. *Zosime destituta* sp. nov., female: A, P3; B, P4; C, P5. Scale bar: 50 μ m.

Discussion

Bodin (1968) described *Zosime bathybia* from the Gulf of Gascogne and mentioned that this species differs from *Z. incrassata* in the number of setae on the distal exopodal segment of the antenna (with 3 setae in *Z. bathybia*, but 2 in *Z. incrassata*). Apostolov & Petkovski (1980) doubted the validity of this character as a criterion to separate these species and relegated *Z. bathybia* to a subspecies of *Z. incrassata*. However, these two species are clearly different in body size, the former (550 μ m) being smaller than the latter (745 μ m), and the morphology of the maxilliped in the female. Unfortunately, Sars (1910) omitted the illustration of the maxilliped in the original description of *Z. incrassata*, and mentioned that it was similar to that of the type species, *Z. typica* Boeck, 1873. According to his redescription of *Z. typica*, Sars (1903) shows 2 apical and 1 small lateral setae on the endopod of

the maxilliped, and 1 long terminal seta on the basis. On the other hand, *Z. bathybia* has 2 long apical setae on the endopod and 1 small seta on the basis (Bodin 1968). These differences are considered here enough to separate *Z. incrassata* and *Z. bathybia*.

The potential polyphyly of the genus *Zosime* was first commented upon by Koller & George (2011) who identified divergent character states in some species: *Z. annea* Koller & George, 2011 has an 8-segmented antennule instead of 6- or 7-segmented and shows unique characters in the caudal ramus setae such as the reduction of setae I, II and VII in size and the peculiar position of setae I and II affected by elongation of the caudal rami; *Z. reyssii* Dinet, 1974 lacks the seta on the exopodal surface of P5 in the female (this characteristic is shared also by *Z. incrassata* and *Z. bathybia*); the caudal rami of *Z. incrassata*, *Z. bathybia*, and *Z. reyssii* are as long as wide (Koller & George 2011).

To verify the taxonomic relationships within *Zosime*, the morphology of all the *Zosime* species presently known was compared based on the available literature (Boeck 1873; Sars 1903, 1910, 1919; Monard 1937; Lang 1948; Por 1964, 1967; Bodin 1968; Drzycimski 1968; Coull 1973; Dinet 1974; Becker & Schriever 1979; Apostolov & Petkovski 1980; Fiers 1991; Wells 2007; Kornev & Chertoprud 2008; Koller & George 2011). This comparison revealed that the genus can be subdivided into three provisional groups, *anneae*-, *incrassata*-, and *typica*-group, based on differences in the structure of the antennule, antennary exopod, mandibular rami, armature of the swimming legs, fifth leg, and caudal rami (Table 1). Three groups of the genus *Zosime* are proposed as follows:

anneae-group. This group is characterized by the combination of the following characteristics: 8-segmented antennule in the female; second segment of antennary exopod with 1 seta; mandibular exopod and endopod with 3 and 4 setae, respectively; P3–P4 exp-3 with 2 inner setae; P5 exopod in the female with 3 marginal and 1 surface setae; caudal rami four times as long as wide. This group comprises only 1 species: *Z. annea*.

incrassata-group. This group is characterized by the combination of the following characteristics: 7-segmented antennule in the female; second segment of antennary exopod without seta; mandibular exopod and endopod with 1 or 2 setae, respectively (*Z. reyssii* was shown with only 1 seta on the palp (see Dinet 1974, fig. 8), but this condition may be based on an observational error); P3–P4 exp-3 with 3 inner setae; P5 exopod in the female with 4 marginal setae; caudal rami about as long as wide. This group comprises 3 species: *Z. incrassata*, *Z. bathybia*, and *Z. reyssii*.

typica-group. This group is characterized by the combination of the following characteristics: 6- or 7-segmented antennule in the female; second segment of antennary exopod with 1 seta; mandibular exopod and endopod have 3 or 4 setae, respectively; third exopodal segments of P3 and P4 have 2 inner setae; P5 exopod in the female with 3 marginal and 1 surface setae; caudal rami at least 1.7 times as long as wide. This group comprises 13 species: *Z. typica*, *Z. major* Sars, 1919, *Z. valida*, *Z. gisleni* Lang, 1948, *Z. mediterranea* Lang, 1948, *Z. bathyalis*, *Z. erythraea* Por, 1967, *Z. atlantica* Bodin, 1968, *Z. bergensis* Drzycimski, 1968, *Z. paramajor* Bodin, 1968, *Z. paratypica* Becker & Schriever, 1979, *Z. pacifica* Fiers, 1991, and *Z. destituta*.

Koller & George (2011) mentioned that *Z. annea* has several unique features in the caudal setae which may be derived character states: (1) setae I and II are apart from each other; (2) seta I is minute and setule-like; (3) seta I is inserted on the middle of the caudal rami ventrally; (4) seta II is dwarfed; (5) seta VII is dwarfed and very slender. These features were excluded for the definition of the above groups because for some *Zosime* species the caudal rami have been inadequately described (Sars 1910, 1919; Lang 1948; Por 1967; Drzycimski 1968; Becker & Schriever 1979).

If more species of *Zosime* are described, the *typica*-group could be divided into subgroups. Among 13 species belonging to the *typica*-group, two species, *Z. atlantica* and *Z. bathyalis*, show discrepancy in the mandibular rami with remaining species of this group. The exopod has 4 setae instead of 3 in *Z. atlantica* and the endopod has 3 setae instead of 4 in *Z. bathyalis*. Especially, the latter presents additional differences from other species in the following characteristics: (1) the proximal segment of antennary exopod is bare, but present in other species; (2) the third exopodal segments of P2–P4 have 2 outer spines instead of 3; (3) the third endopodal segments of P3–P4 have 3 elements instead of 4. In addition, there are some differences of the armature of P1 between members of this group: the third exopodal segment is armed with 6 elements in *Z. typica*, *Z. major*, *Z. gisleni*, *Z. mediterranea*, *Z. atlantica*, *Z. bergensis*, *Z. paratypica*, and *Z. pacifica*, but with 5 ones in *Z. valida*, *Z. bathyalis*, *Z. paramajor*, and *Z. destituta* (in *Z. erythraea*, Por (1967) described this species with 6 elements, but provided the figure of P1 exp-3 armed with 5 elements in his original description); the second endopodal segment is armed with 4 elements in *Z. typica*, *Z. major*, *Z. gisleni*, *Z. paratypica*, and *Z. pacifica*, but remaining eight species have only 3.

Since the publication of the latest identification key by Dinet's (1974) the genus *Zosime* has seen the addition of three species, *Z. paratypica*, *Z. pacifica*, and *Z. annea*. Below we present an updated key, which is partly amended from the earlier keys by Coull (1973) and Dinet (1974).

Key to species of the genus *Zosime* Boeck, 1873 (females only)

1. A1 8-segmented. (*anneae*-group) *Z. annea* Koller & George, 2011
- A1 6- or 7-segmented 2
2. P5 exopod with 4 marginal setae; caudal rami as long as wide (*incrassata*-group) ...3
- P5 exopod with 3 marginal and 1 surface setae; caudal rami longer than wide (*typica*-group) ...5
3. P5 endopodal lobe with 4 setae. *Z. reyssi* Dinet, 1974
- P5 endopodal lobe with 3 setae. 4
4. A2 exopod, terminal segment with 2 setae *Z. incrassata* Sars, 1910
- A2 exopod, terminal segment with 3 setae *Z. bathybia* Bodin, 1968
5. Caudal rami at least 2.5 times as long as greatest wide 6
- Caudal rami less than 2.5 times as long as greatest wide 12
6. P1 enp-2 with 3 setae/spines 7
- P1 enp-2 with 4 setae/spines 9
7. P1 exp-3 with 6 setae/spines; P5 endopodal lobe with 3 setae. *Z. bergensis* Drzycimski, 1968
- P1 exp-3 with 5 setae/spines; P5 endopodal lobe with 4 setae. 8
8. Caudal rami about 3 times as long as wide *Z. paramajor* Bodin, 1968
- Caudal rami 4 times as long as wide. *Z. erythraea* Por, 1967
9. A1 7-segmented. *Z. paratypica* Becker & Schriever, 1979
- A1 6-segmented. 10
10. P5 endopodal lobe with 4 setae. *Z. major* Sars, 1919
- P5 endopodal lobe with 3 setae. 11
11. Caudal rami about 3 times as long as wide; pseudoperculum on pre-anal somite ornamented with large protrusions
- *Z. gisleni* Lang, 1948
- Caudal rami about 2.5 times as long as wide; pseudoperculum on pre-anal somite ornamented with small protrusions
- *Z. typica* Boeck, 1873
12. P1 enp-2 with 4 setae/spines *Z. pacifica* Fiers, 1991
- P1 enp-2 with 3 setae/spines 13
13. P5 endopodal lobe with 4 setae 14
- P5 endopodal lobe with 2 setae. 16
14. P2–P4, exp-3 with 6 setae/spines; P4 enp-3 with 3 setae/spines *Z. bathyalis* Por, 1967
- P2–P4, exp-3 with 7 setae/spines, respectively; P4 enp-3 with 4 setae/spines 15
15. A1 7-segmented *Z. atlantica* Bodin, 1968
- A1 6-segmented. *Z. mediterranea* Lang, 1948
16. A1 7-segmented; P4 enp-3 with 4 setae/spines. *Z. valida* Sars, 1919
- A1 6-segmented; P4 enp-3 with 3 setae/spines. *Z. destituta* **sp. nov.**

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