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# Three new ameirid harpacticoids from Korea and first record of *Proameira simplex* (Crustacea: Copepoda: Ameiridae)*

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## Abstract

Ameiridae Monard, 1927 was previously known from Korea only after one endemic and four cosmopolitan species of the genus *Nitokra* Boeck, 1865, and a single widely distributed species of the genus *Ameira* Boeck, 1865, all from brackish enviroments. After a survey of 22 sampling sites and close to 3,500 harpacticoid specimens from various marine enviroments, we report on two new endemic species of *Ameira*, *A. zahaae* **sp. nov.** and *A. kimchi* **sp. nov.**, from the West Sea and the South Sea respectively. They are both relatively closely related to the previously recorded cosmopolitan *A. parvula* (Claus, 1866), but show many novel morphological structures in the caudal rami shape and ornamentation. The identity of the cosmopolitan *A. parvula* in Korea is questioned, and an alternative hypothesis of a species-complex proposed. The fine ornamentation of body somites (especially the pores/sensilla pattern) is studied in detail, and proves to be a very useful new morphological tool in distinguishing closely related spacies in this genus. The genus *Pseudameira* Sars, 1911 is reported for the first time in Korea, after four females of *P. mago* **sp. nov.** from the South Sea. A single damaged female of *Proameira cf. simplex* (Norman & Scott, 1905) represents the first record of the genus *Proameira* Lang, 1944 in Korea, Asia, and anywhere in the Pacific. A key to Korean ameirids is also provided, and their apparent rarity in this part of the world noticed.

**Key words:** Harpacticoida, marine, taxonomy, endemism, sister species, microcharacters

## Introduction

With more than 300 valid species (Boxshall & Halsey 2004), Ameiridae is the third largest harpacticoid family, just after Canthocamptidae Sars, 1906 and Miraciidae Dana, 1846. They are currently classified into 46 valid genera (Walter & Boxshall 2011) and two subfamilies: Ameirinae Monard, 1927 and Stenocopiinae Lang, 1944. The sexually dimorphic basal spine on the male first swimming leg is the most important synapomorphy that unites all ameirids, and this character state has (probably) been secondarly lost in only a few species (Lee & Huys 2002; Karanovic 2006; Karanovic & Hancock 2009). The primary taxonomic subdivisions in this family have traditionally been based on the swimming legs segmentation (Lang 1948, 1965; Petkovski 1976), an approach characterised as overly simplistic by Conroy-Dalton & Huys (1997, 1998), Lee & Huys (2002), Reid *et al.* (2003), Boxshall & Halsey (2004), and Karanovic (2006). Recently, Karanovic & Hancock (2009) made the first attempt to revise a freshwater branch of this family with extremely reduced endopods of the swimming legs, based on a cladistic analysis of 57 morphological characters, and defined six new genera. Although primarily marine, ameirids have successfully radiated into freshwater habitats and can be found today from abyssal depths to freshwater caves (Boxshall & Halsey 2004), with especially rich and diverse fauna discovered recently in the calcrete aquifers of Western Australia (Karanovic 2004, 2006, 2010; Karanovic & Hancock 2009). A few species were also found in association with flatworms (Liddell 1912), medusae (Humes 1953), and malacostracan crustaceans (Chappuis 1926; Bowman 1988), but most ameirids are free-living benthic or interstitial marine animals.

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In Korea, however, reported diversity of this family is surprisingly low (Chang 2010), which prompted this study. No freshwater ameirids have been recorded so far in Korea, and only representatives of two ameirid genera were reported from brackish environments: *Ameira* Boeck, 1965 and *Nitokra* Boeck, 1865. KSSZ (1997) lists the widely distributed *Nitokra lacustris* (Schmankevitch, 1875) as the only Korean representative of the family, without any locality data, drawings or comments. Chang (2007) described so far the only endemic species, *Nitokra koreana* Chang, 2007 (note: the original spelling was *N. koreanus*), from Cheongchoho Lake in Sokcho (type locality) on the north-east coast of South Korea, and nine other estuaries, reed marshes, and brackish lakes all around the Korean peninsula, including Jeju Island (also repeated in Chang 2009, 2010). He remarked that this species is rather common in genuine brackish waters and supposedly abundant during the cold-water season. In the same paper Chang (2007) also reported the first record in Korea of the widely distributed (nearly cosmopolitan) *Ameira parvula* (Claus, 1866) from six river estuaries and salt marshes on the southern cost of South Korea (including one from Jeju Island), although recognising that previous records of this species would suggest its unusually high variability, and noting several smaller morphological differences from the geographically closest Indian population, which was redescribed by Wells & Rao (1987). The identity of this species in Korea is questioned in this paper (see below), as more data become available as a result of a more careful examination of microcharacters that were mostly neglected in earlier studies. As proven in some recent studies of presumably cosmopolitan copepods (Karanovic & Krajicek 2012), combined morphological and molecular methods reveal them to be complexes of closely related species,1

sometimes with very unusual distribution patterns as well (suggesting anthropogenic translocation for example). Two new endemic Korean species are described in this paper, both relatively closely related to the Korean specimens attributed to *A. parvula* by Chang (2007), although many characters could not be compared due to only a partial redescription of the latter taxon.

Chang & Yoon (2008) reported and partly redescribed (no mouth appendages studied for example) five *Nitokra* species from the Korean brackish waters, confirming the presence of *N. lacustris* all around the Korean peninsula (including Jeju Island), which was collected in 11 different estuaries and salt marshes. They also recorded the Korean endemic *N. koreana* in two additional localities: Taehwa River near Ulsan, and estuary of the Gwangogcheon Streem in Hadong. Three widely distributed marine species were recorded by Chang & Yoon (2008) for the first time in Korea: *N. affinis californica* Lang, 1965, *N. pietschmanni* (Chappuis, 1934), and *N. spinipes* Boeck, 1864. *Nitokra affinis californica* was reported from the estuary of the Hyeongsan River near Pohang, and from a salt marsh in Jeju Island; *N. pietschmanni* from 11 different localities all around the peninsula (excluding Jeju Island); while *N. spinipes* was found in 11 localities (nine on the mainland peninsula, and two on Jeju Island). All these data, including partial redescriptions, were repeated in Chang (2009, 2010), although these two monographs provided one additional locality for each *N. lacustris* and *N. koreana*. Chang (2010) additionally listed one unidentified species of *Nitokra* in his key to species, but without locality data or any comments whatsoever.

For this study we analysed 22 samples from the Korean West Sea (Yellow Sea) and South Sea, from a range of marine and brackish habitats, and from a range of depths (including the intertidal zone). Ameirids proved to be surprisingly rare here, with only ten specimens found in two samples (a muddy beach on Jangbong Island, West Sea; and littoral near Memuld Island, East Sea), out of 3496 harpacticoids examined.

## Material and methods

The littoral sample from near Memuld Island was taken with a small Eckman grab, from which a core sample was taken once on the boat. The intertidal sample from Jangbong Island was taken directly with an acrylic corer (diameter 3.57 cm). Both samples were fixed in the field in 5% buffered formalin. They were decanted in the laboratory trough a 38 µm mesh sieve and washed with tap-water. Copepods were extracted from the sediment by isopycnic separation technique (Burgess 2001), using Ludox® (DuPont) HS 40 colloidal silica and a centrifuge at 15,000 rpm, and repeating the same procedure twice more. After that, the samples were fixed in 70% ethanol and sorted under a dissecting microscope. Copepods were kept in 70% ethanol until further study.

Specimens were dissected and mounted on microscope slides in Faure's medium, which was prepared following the procedure discussed by Stock & von Vaupel Klein (1996), and dissected appendages were then

covered by a coverslip. For the urosome or the entire animal two human hairs were mounted between the slide and coverslip, so the parts would not be compressed, and they were drawn in glycerol before dissection. By manipulating the coverslip carefully by hand, the whole animal or a particular appendage could be positioned in different aspects, making possible the observation of morphological details. During the examination of dissected appendages in Faure's medium water slowly evaporated and appendages eventually remained in completely dry Faure's medium, ready for long term depositing. All drawings were prepared using a drawing tube attached to a Leica MB2500 phase-interference compound microscope, with N-PLAN (5x, 10x, 20x, 40x and 63x dry) or PL FLUOTAR (100x oil) objectives. Specimens that were not dissected were mounted *in toto* on slides, also in Fuare's medium. Locality data and number of specimens are listed for every species separately and all types are deposited in the National Institute of Biological Resources (NIBR), Seoul.

Morphological terminology follows Huys & Boxshall (1991), except for the caudal ramus setae numbering and small differences in the spelling of some appendages (antennula, mandibula, maxillula instead of antennule, mandible, maxillule), as an attempt to standardise the terminology for homologous appendages in different crustacean groups. Descriptions of second and third new species, as well as the redescription of the fourth species, were shortened by making them comparative. Pores and sensilla on all somites (body segments) were given provisional numbers, letters or signs, to aid recognision of homologous structures in different taxa; they are not intended as a novel terminology.

## Systematics

Subphylum **Crustacea** Brünich, 1772

Class **Maxillopoda** Dahl, 1956

Suclass **Copepoda** H. Milne Edwards, 1840

Order **Harpacticoida** Dana, 1846

Family **Ameiridae** Monard, 1927

Subfamily **Ameirinae** Monard, 1927

Genus ***Ameira*** Boeck, 1865

### *Ameira zahaae* sp. nov.

(Figs. 1–4)

**Type locality.** South Korea, West Sea, Jangbong Island, muddy beach, intertidal zone, 37.539231°N 126.343417°E.

**Specimens examined.** Types only: holotype female dissected on one slide (collection number NIBRIV0000232633), and allotype male dissected on one slide (collection number NIBRIV0000232634); both collected from type locality, 12 August 2010, temperature 25.9 °C, leg. W. Lee.

**Etymology.** The species name is dedicated to a renowned contemporary Iraqi-British architect Ms Zaha Hadid, who is designing one of the most ambitious projects in Seoul: the Dongdaemun Design Plaza & Park. Senior author's admiration of her work worldwide may contribute to a view of this architectural complex as an embodiment of modern Korea. The name is a noun in genitive singular.

**Description.** Female. Total body length, measured from tip of rostrum to posterior margin of caudal rami (excluding appendages and caudal setae), 448 μm. Preserved specimen yellowish. Nauplius eye not visible. Prosome comprising cephalothorax with completely fused first pedigerous somite, and three free pedigerous somites; urosome six-segmented, comprising fifth pedigerous somite, genital doble somite (fused genital and first abdominal somites) and three free abdominal somites. No sclerotized joint between prosome and urosome. Habitus (Fig. 1A, B) cylindrical, gently tappering towards posterior end, not very slender, podoplean boundary between prosome and urosome inconspicuous; prosome/urosome ratio nearly 1.1 and greatest width in dorsal view at posterior end of cephalothorax. Body length/width ratio about four; cephalothorax 1.2 times as wide as genital double-somite. Free pedigerous somites without pronounced lateral or dorsal expansions, pleural plates only partly covering coxae of swimming legs in lateral view. Integument relatively strongly chitinized and without cuticular

windows or pits anywhere. Surface ornamentation of somites consisting of 85 pairs and three unpaired pores and sensilla (numbered with Arabic numerals consecutively from anterior to posterior end of body, and from dorsal to ventral side in Figs. 1A, B, 2A, B), and several rows of spinules on urosomites only. Rostrum small, membranous, linguiform with relatively sharp tip, reaching just beyond half length of first antennular segment, about twice as long as wide and not demarcated at base; ornamented with two dorsal sensilla (no. 1 in Fig. 1A, B).

Cephalothorax (Fig. 1A, B) almost gradually tapering towards anterior end in dorsal view, about 1.2 times as long as wide; represents 28% of total body length. Surface of cephalic shield ornamented with one pair of lateral pores (no. 14), one unpaired dorsal sensillum (no. 17), and 23 pairs of long sensilla (nos. 2–13, 15, 16, 18–26); sensilla nos. 19–26 belong to first pedigerous somite incorporated into cephalothorax. Second pedigerous somite (first free) ornamented with one pair of pores antero-laterally (no. 28), and eight pairs of long sensilla (nos. 27, 29–35); antero-dorsal pair of sensilla (no. 27) serially homologous to pair no. 19 on first pedigerous somite. Third pedigerous somite ornamented similarly to second one, only difference being additional pair of dorsal sensilla near posterior margin (no. 38). Fourth pedigerous somite ornamented with antero-dorsal pair of pores (no. 46), as in previous two somites, and seven pairs of long posterior sensilla (nos. 47–53); recognising serially homologous pairs not as easy as with two previous somites. Hyaline fringes of all prosomites braod and smooth, except on fourth pedigerous somite where fringe narrow dorsally. Fifth pedigerous somite (first urosomite) ornamented with four pairs of posterior sensilla (nos. 54–57), as well as with one pair of lateral pores (no. 58); hyaline fringe smooth and very narrow.

Genital double-somite (Figs. 1A, B, 2A) as long as wide (ventral view); internal suture (remnant of segmental fusion) strongly sclerotised, visible dorsolaterally at midlength of somite, furnished with four parallel short rows of small spinules (two dorsal and two lateral), four pairs of sensilla (nos. 59–62), and lateral pair of cuticular pores (no. 63); posterior part of genital double-somite ornamented with two pairs of large lateral pores (nos. 64, 65), one unpaird ventral pore (no. 66), posterior row of spinules on eash side laterally, and four pairs of posterior sensilla (nos. 67–70); hyaline fringe finely serrated. Genital complex (Fig. 2A) with single large copulatory pore, weakly sclerotized and almost stright copulatory duct, and two small ovoid seminal receptacles. Single median genital aperture covered by fused reduced sixth legs, represents 45 % of somite's width. Third urosomite (first free abdominal somite) ornamented with posterior row of spinules (interrupted dorsally), unpaired dorsal cuticular pore (no. 71), two pairs of cuticular pores (nos. 72, 73) laterally and ventrally respectively, unpaired dorsal posterior sensillum (no. 74), and three pairs of posterior sensilla (nos. 75–77); hyaline fringe finely serrated. Fourth urosomite (preanal) ornamented with single pair of lateral cuticular pores (no. 78), and short posterior row of slender spinules ventrally; hyaline fringe finely serrated. Anal somite (Figs. 1A, B, 2A, B) clefted medially at last third, ornamented with pair of large dorsal sensilla (no. 81), seven pairs of cuticular pores (nos. 79, 80, 82–86), ventro-lateral anterior row of slender spinules, ventro-lateral posterior row of spinules at base of each caudal ramus, and two short parallel rows of slender spinules ventrally posterior and anterior of most median cuticular pore (no. 86); anal operculum convex, narrow and short, reaching 2/3 of anal somite, represents 35% of somite's width, ornamented with numerous minute spinules near posterior margin on inner side and only slightly protruding beyond posterior margin of anal operculum; anal sinus ornamented with two parallel diagonal rows of hair-like spinules on each side, widely open, with weakly sclerotised walls, and without any chitinous projections.

Caudal rami (Figs. 1A, B, 2A, B) short but robust, about half as long as anal somite, about 0.8 times as long as wide (ventral view), parallel and nearly cylindrical, with space between them about 0.7 times one ramus width, and with dorsal diagonal suture in anterior half; with seven elements (three lateral, one dorsal and three apical); ornamentation consists of two spinules at base of both large lateral setae, four spinules along posterior margin ventrally (at base of inner apical seta), and two pairs of pores (nos. 87, 88). Dorsal seta relatively short and slender, smooth, inserted close to postero-median corner, about 1.2 times as long as caudal ramus, triarticulate at base (i.e. inserted on two pseudojoints). Lateral setae all smooth and slender; distalmost seta longest, inserted closer to ventral side and very close to posterior margin, more than six times as long as smaller proximal seta, 1.7 times as long as larger proximal seta, and about 2.5 times as long as caudal ramus; proximal lateral setae inserted very close to each other in cuticular depressions similar to those of typical sensilla. Inner apical seta smooth, broken off on both rami but certainly longer than dorsal or any of lateral setae. Middle apical seta strongest, with breaking plane, broken off on both rami. Outer apical seta also with breaking plane and strong, broken off on both rami.

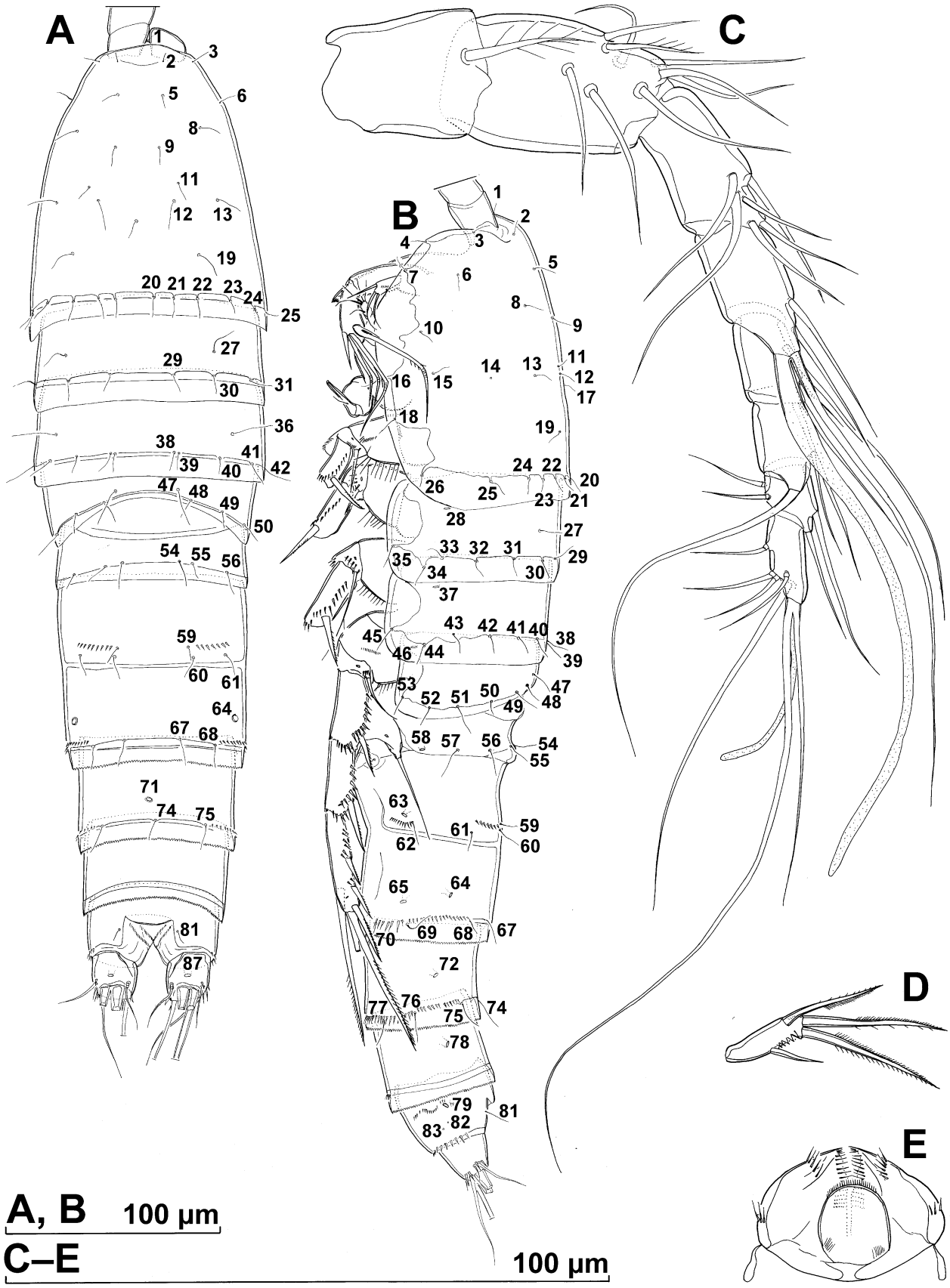


**FIGURE 1.** *Ameira zahaae* **sp. nov.**, holotype female: A, habitus, dorsal view; B, habitus, lateral view (with last two exopodal segments of first three swimming legs missing); C, antennula, ventral view; D, exopod of antenna, anterior view; E, paragnaths, posterior view. Arabic numerals numbering sensilla and pores consecutively from anterior to posterior end of body, and from dorsal to ventral side (excluding appendages).

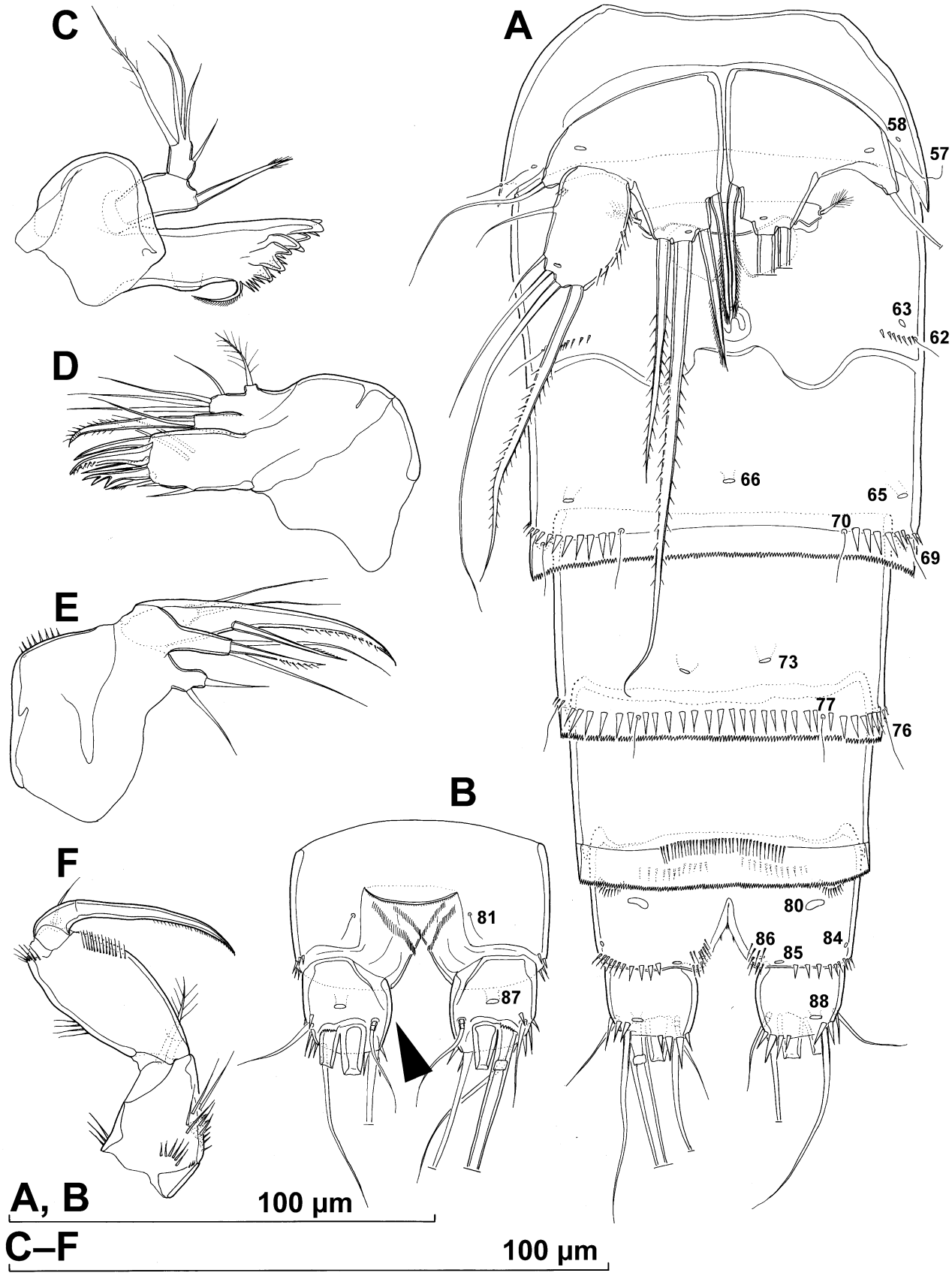


**FIGURE 2.** *Ameira zahaae* **sp. nov.**, holotype female: A, urosome, ventral view (exopod of left fifth leg broken off); B, anal somite and caudal rami, dorsal view; C, mandibula, anterior view; D, maxillula, anterior view; E, maxilla, anterior view; F, maxilliped, posterior view. Arabic numerals on urosome numbering sensilla and pores as in previous figure. Arrow pointing smooth inner margin of caudal rami.

Antennula (Fig. 1C) eight-segmented, joined to cephalotholax with small triangular pseudosegment laterally, approximately 0.9 times as long as cephalothorax, unornamented. Long aesthetasc on fourth segment very slender, fused basally with adjacent large seta, and reaching beyond tip of appendage for length of last four segments combined; slender apical aesthetasc on eighth segment fused basally with two apical setae, forming apical acrothek. Setal formula: 1.9.6.4.2.3.4.7. Only seta on first segment bipinnate and one seta on second segment unipinnate, all other setae smooth. Two lateral setae on seventh segment and four lateral setae on eighth segment biarticulatedat base (i.e. inserted on small pseudojoint); all other setae uniarticulatedand without breaking planes. Length ratio of antennular segments, from proximal end and along caudal margin, 1 : 2 : 1.1 : 1 : 0.9 : 0.7 : 0.4 : 0.9.

Antenna (Fig. 3E) relatively short, composed of coxa, basis, two-segmented endopod and one-segmented exopod, although basis and first endopodal segment partly fused on posterior surface. Coxa very short, unarmed and unornamented. Basis more than twice as long as coxa and about 1.2 times as long as wide, ornamented with two large spinules along inner margin distally, unarmed. First endopodal segment about 1.6 times as long as wide and nearly 1.5 times as long as basis, unornamented and unarmed. Second endopodal segment 1.5 times as long as first endopodal segment, with two surface frills subdistally, armed laterally with two spines flanking thin seta; apical armature consisting of five geniculate setae, longest one fused basally to additional smaller seta; smallest seta bearing proximal tuft of fine setules; longest seta bipinnate, others finely unipinnate; ornamentation consisting of two spinules on ventral surface basally and several long spinules at base of lateral spines. Exopod slightly longer than basis, with narrow basal part and somewhat wider distal part; ornamented with longitudinal row of spinules on anterior surface, proximalmost one exceptionally large; with one lateral (inserted at about 3/4) and two apical strong and bipinnate setae; apical setae subequal, about 1.4 times as long as lateral seta and 1.8 times as long as exopod.

Labrum (Fig. 1B) large compared with cephalothorax, trapezoidal, rigidly sclerotized, with relatively short and somewhat concave cutting edge, ornamented subapically with two rows of six or seven strong spinules and apically with minute spinules. Not mounted in satisfactory position to allow independent drawing.

Paragnaths (Fig. 1E) ellipsoid, about twice as long as wide, with several parallel rows of spinules of different length apically, few spinules laterally in proximal part, as well as row of four large spinules along inner margin on each lobe; lobes fused basally into medial linguiform plate, wich ornamented apically with row of hair-like spinules.

Mandibula (Fig. 2C) with wide cutting edge on elongated coxa, with two tricuspidate strong ventral teeth, three unicuspidate strong teeth and several spinules in middle, four fine teeth (or strong spinules) in dorsal part, and single dorsal unipinnate seta. Palp uniramous, comprising basis and one-segmented endopod. Basis with inflated distal part, about 1.8 times as long as wide, with single strong and distally bipinnate inner seta, unornamented. Endopod slender and small, also unornamented, about half as long as basis and 1.3 times as long as wide; with four slender setae apically and one laterally on inner margin; all seta smooth, except outermost apical, which sparsely bipinnate.

Maxillula (Fig. 2D) with large praecoxa; arthrite rectangular, unornamented, with two anterior surface setae, three lateral and four apical elements (probably three spines and one seta; dorsalmost of apical elements characteristically antler-like). Coxal endite much shorter than praecoxal arthrite, armed apically (on inner margin) with one curved and stout, bipinnate seta, and another smooth and slender seta. Basis significantly shorter than coxal endite, with four smooth setae apically and subapically. Endopod represented by minute segment, basally fused to basis, with single plumose slender seta apically.

Maxilla (Fig. 2E) ornamented with row of strong spinules distally on outer margin of syncoxa. Proximal endite of syncoxa well developed although not strongly sclerotized, not highly mobile, somewhat bulbous, with smooth setae: one apically and one subapically. Distal endite of syncoxa cylindrical, well sclerotised and highly mobile, armed apically with one strong unipinnate seta, and two smooth and sleder setae; smooth setae of subequal length, about 1.6 times as long as unipinnate seta, and 2.6 times as long as endite. Basis drawn out into long claw, with shorter spiniform and curved seta at base, ornamented with minute spinules along convex margin. Endopod represented by minute segment, basally fused to basis, with two long and smooth apical setae of subequal length; enopodal setae about 1.2 times as long as basal seta, and all reaching 4/5 of basal claw.

Maxilliped (Fig. 2F) with short and stout syncoxa, ornamented with several rows of spinules of various lengths (some very long), and with single bipinnate seta subapically. Basis about 1.9 times as long as wide and 1.4 times as long as syncoxa, unarmed, ornamented with longitudinal row of slender spinules along inner margin distally, as well as with two shorter rows of spinules on outer margin (one near midlenght, other close to distal margin).

Endopod represented by long curved claw, about as long as basis, ornamented with row of spinules along concave side distally, accompanied at base by thin smooth and short seta.

All swimming legs (Fig. 3A, B, C, D) of similar size and length in comparison to body length, composed of small triangular and unarmed praecoxa, large rectangular and unarmed coxa, shorter and nearly pentagonal basis, slender three-segmented exopod, and also slender and three-segmented endopod; each leg joined to its pair on opposite side of body by simple quadriform intercoxal sclerite.

First swimming leg (Fig. 3A) with smooth intercoxal sclerite, its distal margin nearly straight. Praecoxa small and triangular, ornamented with row of small spinules on anterior surface along distal margin. Coxa 1.2 times as wide as long, ornamented with cuticular pore on anterior surface close to inner margin, and with two parallel rows of long spinules along outer margin. Basis with one short but not very strong spine on outer corner (with four long spinules on its surface), and one finely bipinnate strong spine on inner distal corner; ornamented with spinules at base of each spine, as well as with distal row of spinules between exopod and endopod, short row of slender spinules on inner margin, and cuticular pore on anterior surface close to outer spine. Exopod with all segments of about same length, each about 1.6 times as long as wide and ornamented with spinules along both inner and outer margins; first two segments with single strong and finely bipinnate spine on outer distal corner; third segment with three strong and finely bipinnate spines on outer margin and two setae apically; outer apical seta geniculate and unipinnate along outer margin, inner apical seta not geniculate and bipinnate, with spinules on inner margin much longer than those on outer margin. Endopod geniculate and 1.8 times as long as exopod; first endopodal segment slightly longer than exopod and 4.4 times as long as wide, ornamented with slender spinules along inner margin and three spinules along distal margin, with single bipinnate inner seta, which about 0.7 times as long as segment; second segment smallest, about as long as wide and only 0.24 times as long as first segment, ornamented with two spinules on outer distal corner, and with single slender and bipinnate seta on inner distal corner; third segment slender, about five times as long as wide and more than twice as long as second segment, armed apically with three elements; outermost apical element probably spine, strong and 0.8 times as long as third segment, unipinnate along outer margin; middle element very strong and geniculate seta, nearly twice as long as outer element, and finely unipinnate along outer margin distally; innermost element slender bipinnate seta, slightly shorter than outer element.

Second swimming leg (Fig. 3B) with intercoxal sclerite ornamented with two arched rows of small spinules on anterior surface, its distal margin deeply concave. Praecoxa small and triangular, ornamented with row of small spinules on anterior surface along distal margin. Coxa nearly 1.5 times as wide as long, ornamented with transverse row of minute spinules on anterior surface, and with two parallel rows of long spinules along outer margin (one on anterior and other on posterior surface). Basis with single unipinnate and short but not very strong spine on outer distal corner; ornamented with spinules at base of spine, as well as with distal row of spinules between exopod and endopod, several parallel rows of very slender spinules along inner margin, and cuticular pore on anterior surface close to outer spine. Exopod with all segments of about same width; first two segments of about same length, each almost twice as long as wide, ornamented with spinules along both inner and outer margins (those on outer margin much stronger), and with inner distall frill; first segment with single strong and finely bipinnate spine on outer distal corner; second segment with similar outer distal spine, but additionally with slender and bipinnate inner seta, about as long as segment, and additionally ornamented with cuticular pore on anterior surface near outer dista corner; third segment about 1.6 times as long as second segment, ornamented with pore near outer distal corner and spinules along outer margin, with three strong and finely bipinnate outer spines, two apical bipinnate setae, and two slender and bipinnate inner setae; outer apical seta very strong (spiniform) with spinules along outer margin much shorter than those along inner margin, about 1.5 times as long as segment, and 2.7 times as long as outer spines; inner apical seta slender, with long spinules on both sides, slightly longer than outer apical seta; distal inner seta slightly shorter than third segment and 1.5 times as long as proximal inner seta. Endopod straight (not geniculate) and 0.7 times as long as exopod; all segments of about same length, but progressively narrower from proximal to distal end, each ornamented with single pore on anterior surface close to outer distal corner, and row of strong spinules along outer margin; first two segments additionally ornamented with small frill on inner distal corner, and with single bipinnate inner seta; third segment with one inner seta, two apical setae and one subapical outermost spine; apical setae of equal length, bipinnate with slender pinules on both sides, 1.4 times as long as entire endopod, 1.6 times as long as inner seta, and nearly five times as long as outer spine; inner setae on second and third segment with short spinules along inner margin, and long spinules along outer margin.

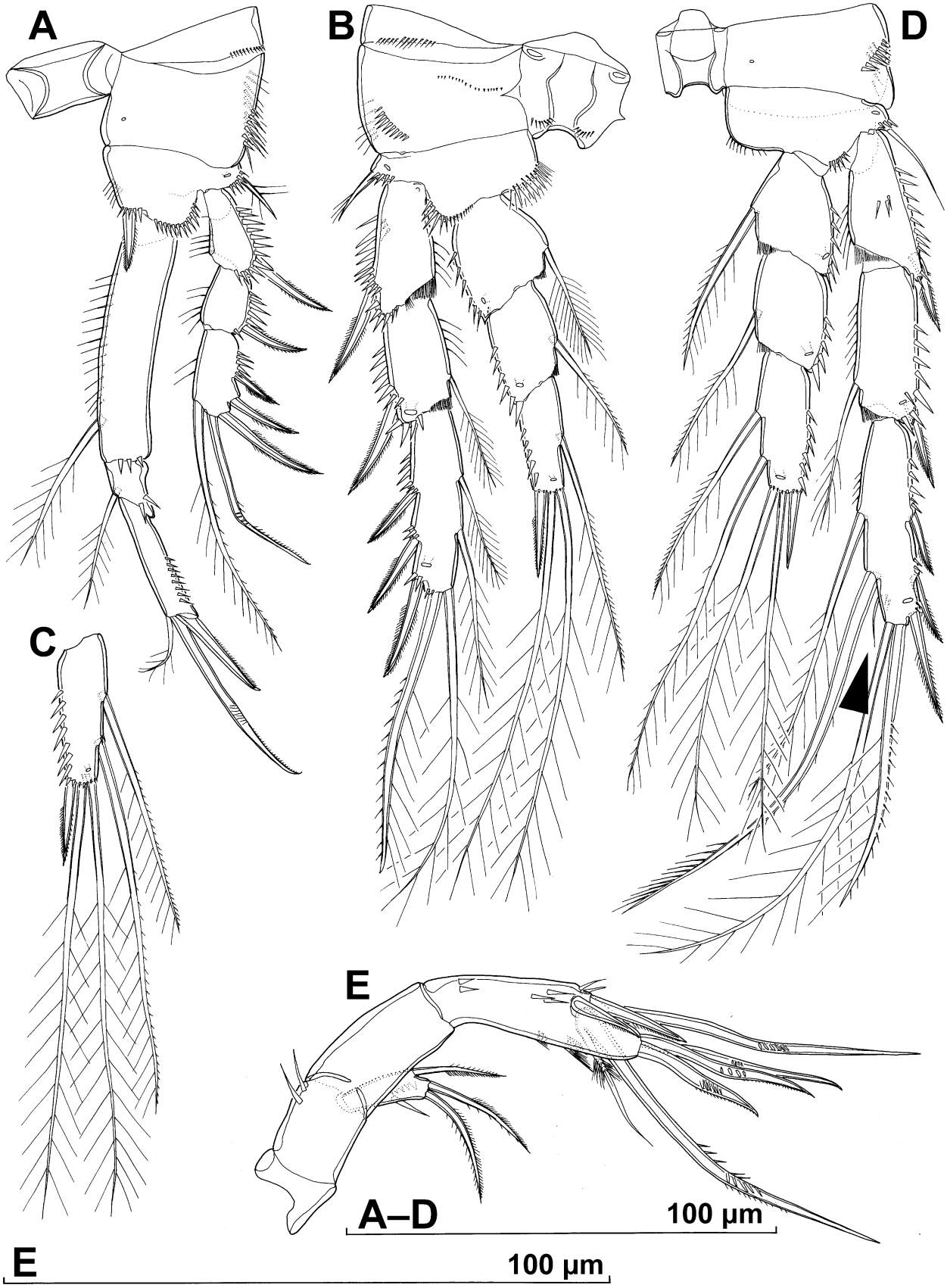


**FIGURE 3.** *Ameira zahaae* **sp. nov.**, holotype female: A, first swimming leg, anterior view; B, second swimming leg, anterior view; C, third endopodal segment of third swimming leg, anterior view; D, fourth swimming leg, anterior view; E, antenna, posterior view. Arrow pointing minute inner distal seta.

Third swimming leg (Fig. 3C) very similar to second swimming leg, except for slender outer seta on basis and two inner setae on third endopodal segment.

Fourth swimming leg (Fig. 3D) similar to third swimming leg, except for ornamentation of coxa and intercoxal sclerite, length of outer basal seta (shorter on fourth leg), and armature of third exopodal segment. Intercoxal sclerite smooth, with deeply concave distal margin. Coxa 1.6 times as long as wide, ornamented with cuticular pore on anterior surface close to inner margin, and with two parallel rows of long spinules along outer margin (one on anterior, other on posterior surface). Inner spinules on basis shorter than those on second and third legs. First exopodal segment with three spinules on anterior surface, which absent on second and third legs. Third exopodal segment ornamented with two spinules on posterior surface distally, row of slender spinules on inner margin proximally, in addition to outer spinules and anterior pore; with three outer finely bipinnate spines, two apical bipinnate setae, and three inner setae; distal inner seta minute (arrowed in Fig. 3D), midlle inner seta very strong and with comb of strong spinules on inner margin distally, while proximal inner seta slender and bipinnate; inner apical seta slender and bipinnate, 1.5 times as long as much stronger outer apical seta, and about as long as middle inner seta. Thrid endopodal segment with apical setae slightly shorter than in second and third legs.

Fifth leg (Fig. 2A), biramous, composed of wide baseoendopod (fused basis and endopod) and much smaller ovoid exopod, without connecting plate and not fused medially. Baseoendopod with outer basal seta long and smooth, arising from long setophore, ornamented with two large pores on anterior surface, one close to outer margin and other close to distal margin on endopodal lobe. Endopodal lobe relatively wide, trapezoidal, extending slightly beyond proximal third of exopod in length, armed with four stout, bipinnate setae, with length ratio (from inner side) 1 : 1.1 : 3.6 : 1.9. Exopod about 1.6 times as long as maximum width, ornamented with slender spinules along inner margin, several spinules on posterior surface close to outer margin proximally, and large cuticular pore on anterior surface close to outer distal corner, armed with five setae; innermost seta strong and bipinnate, other four setae smooth and slender. Length ratio of five exopodal setae, from inner side, 1 : 1.1 : 0.6 : 0.2 : 0.3.

Sixth legs (Fig. 2A) completely fused together, indistinct, forming simple operculum covering single gonopore, without any ornamentation, each with outer short pinnate seta and even much shorter smooth inner spine; setae directed outwards and somewhat anteriorly.

Male. Body length 442 μm. Habitus, ornamentation of almost all somites and caudal rami (Fig. 4A), rostrum (Fig. 4B), colour, antenna, labrum, paragnaths, mandibula, maxillula, maxilla, maxilliped, second swimming leg, third swimming leg, and fourth swimming leg similar to female. Prosome/urosome ratio 1.05, greatest width at posterior end of cephalothorax, body length/width ratio about 4.3; cephalothorax 1.4 times as wide as genital somite. Genital somite and first abdominal (third urosomite) not fused.

Genital somite (Fig. 4A) 1.6 times as wide as long, with small and longitudinally positioned spermatophore visible inside on left side, which somewhat shorter than somite and nearly three times as long as wide.

Thrid urosomite (Fig. 4A) with posterior continous row of large spinules ventrally (between ventral pair of sensilla; pair no. 70).

Anal somite (Fig. 4A) with only one row of spinules near pore no. 86 (note: two rows in female).

Caudal rami (Fig. 4A) slightly more elongated than in female, but with similar armature and ornamentation (although only three ventral spinules at base of inner apical seta).

Antennula (Fig. 4B) broken off on both sides after second segment, thus complete armature unknown. First segment with several spinules on inner margin. Armature of first and second segment same as in female.

First swimming leg (Fig. 4C) with smooth and distally inflated modified inner spine on basis, about as long as basis and directed distally; inner margin of basis smooth.

Third exopodal segment of left second swimming leg (Fig. 4D) abnormal, with three inner setae inserted very close to each other about midlenght of segment; right second swimming leg as in female (normal).

Fifth legs (Fig. 4A, E) smaller than in female and with baseoenopods fused medially, but with similar ornamentation. Endopodal lobe broad, convex, not extending to middle of exopod, unornamented (except for medial cuticular pore), with inflated inner distal margin, with only two elements: inner unipinnate spiniform element slightly shorter than baseoendopod and about twice as long as outer slender and sparsely bipinnate seta. Exopod with less ornamentation along inner margin, and much shorter than in female, only 1.1 times as long as wide, but with additional minute inner seta (arrowed in Fig. 4E), without third seta from inner side (so number of elements same as in female, but setae not homologous if simply numbered from inner side); spiniform bipinnate seta much shorter than in female (arrowed in Fig. 4E).

Sixth legs (Fig. 4A) completely fused basally to each other and to somite, forming single flap with almost straight margin, each with three smooth setae, and ornamented with single pore on anoterior surface; length ratio of setae, from inner side, 1 : 2.9 : 1.3.

**Variability.** As only one male and one female were collected and examined, it cannot be established wich of the small differences in ornamentation (such as the ventral row of spinules between sensilla no. 70; compare Figs. 2A and 4A) are a result of sexual dimorphism and which represent intraspecific variability. The third exopodal segment of the second swimming leg in male with three inner setae (Fig. 4D) is most probably just an abnormality, as the same segment on the opposite leg shows no difference from that in the female.

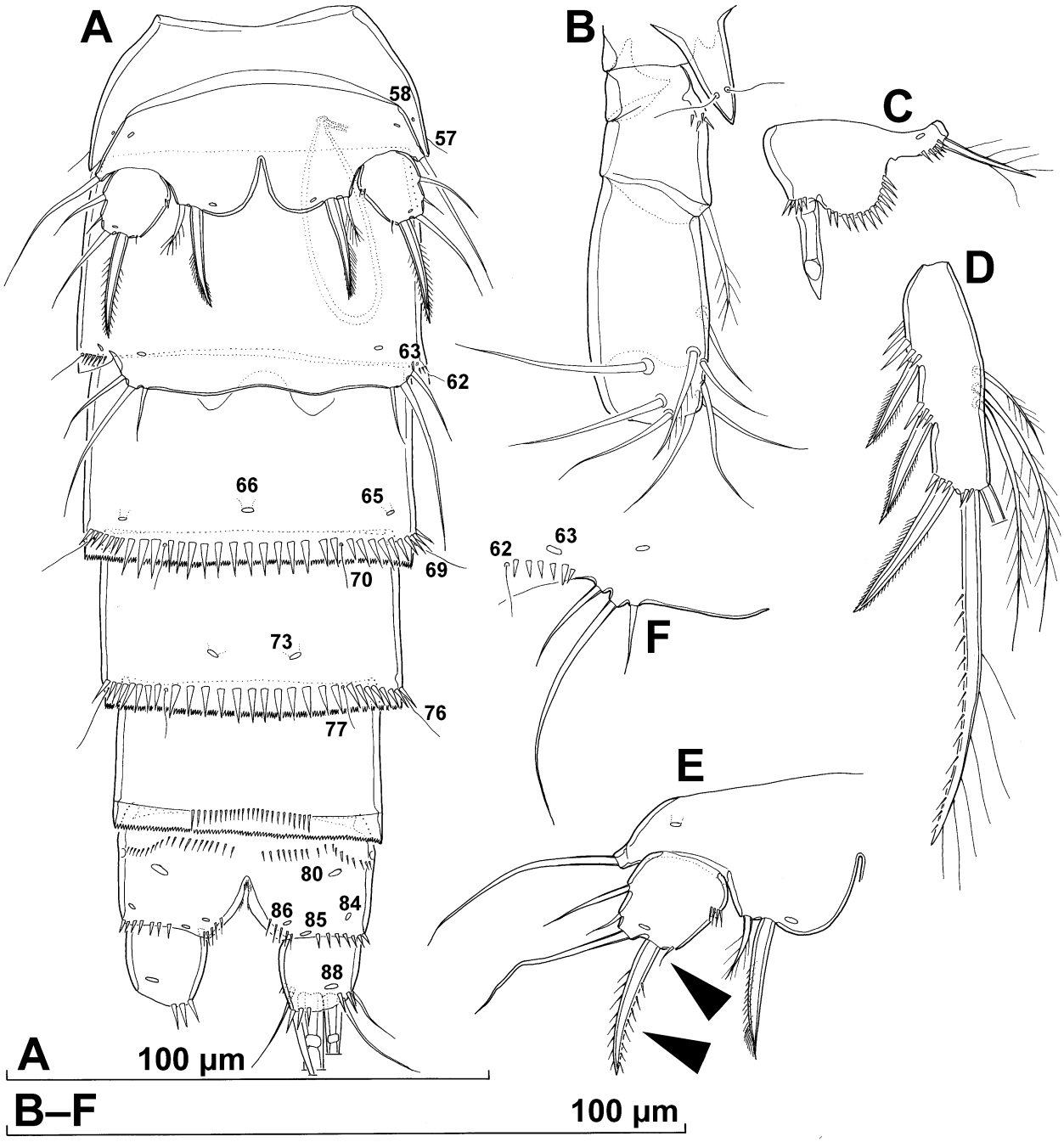


**FIGURE 4.** *Ameira zahaae* **sp. nov.**, allotype male: A, urosome, ventral view; B, rostrum and first two segments of antennula, dorsal view; C, basis of first swimming leg, anterior view; D, abnormal third exopodal segment of second swimming leg, anterior view; E, fifth leg, ventro-lateral view (undissected); F, sixth leg, ventro-lateral view (undissected). Arabic numerals on urosome numbering sensilla and pores as in female. Arrows pointing most prominent specific features.

**Remarks.** The swimming legs armature formula, relative length of the first endopodal segment of the first swimming leg, and short caudal rami of *Ameira zahaae* **sp. nov.** would suggest its close relationship with the cosmopolitan *A. parvula* (Claus, 1866) and the Californian *A. parvuloides* Lang, 1965. *Ameira parvuloides* was described by Lang (1965) with a great hesitation, given its close similarity with *A. parvula* and an amazing array of variability reported for the latter species, as observed for many species with a presumed cosomopolitan distribution. *Ameira pavula* was also recorded in Korea and partly redescribed by Chang (2007), which was also repeated in Chang (2009, 2010) (see the Introduction section above).

Lang (1948) gave an extensive overview of previous records of *A. parvula*, synonymising several forms, and listing this species for 16 countries from Europe, Africa, and North America. After that, the species was reported by almost everybody who surveyed marine harpacticoids in his/her area of study. Nicholls (1940) found it in Canada, Noodt (1952) in Germany, Noodt (1955) in Turkey, Noodt (1956) in Germany, Pesta (1959) in Italy, Wells (1961) in the Great Britain, Vervoort (1962) in New Caledonia, Petkovski (1964) in Portugal, Vilela (1965) in Portugal, Griga (1969) in Russia, Wells (1970) in the Great Britain, Apostolov (1972) in Bulgaria, Por & Marcus (1972) in Egypt, Marinov (1974) in Bulgaria, Mielke (1974) in Spitsbergen (Norway), Pallares (1975) in Argentina, Mielke (1975) in Germany, Chislenko (1917) in the Franz Joseph Land (Russia), Apostolov (1977) in Bulgaria, Caccherelli & Rossin (1979) in Italy, Arlt (1983) in the Baltic Sea, Wells & Rao (1987) in India, Apostolov & Pandourski (1999) in the Antarctic, and this chronological list is by no means exhaustive. Thus, it was not a big surprise when Chang (2007) reported it from Korea, although this was the first record for the Northwestern Pacific, and he did notice some morphological differences from the closest (Indian) population.

This was not, however, the first time that morphological differences were observed in this cosmopolitan species, and several taxonomists pointed some features of their populations that differed from the figures provided by Lang (1948), or some others. Mielke (1975) lists five differences between his German population and material he had examined a year earlier from Spitsbergen (Mielke 1974). The latter population was reported with three setae on the basis of mandibula, while the population from New Caledonia, as reported by Vervoort (1962), had only one seta on this segment, as well as a one-segmented antennal exopod. Wells & Rao (1987) reported two setae on the basis of mandibula in the Indian population. Pallares (1975) observed that in the Argentinian population the exopod of the male fifth leg is much longer than in any other population. Most researchers contributed the differences they observed to different styles of drawing, or to the presumed great variability of this widely distributed species, and nobody challeanged its status or tried to redescribe his/her population in great detail, although partial redescriptions were provided by several authors. After recent advances in the combined molecular and morphological approach on presumably widely distributed harpacticoid (Karanovic & Cooper 2011) and cyclopoid (Karanovic & Krajicek 2012) copepods, it became plausible to consider *A. parvula* as a species-complex. What is holding this complex together is the armature formula of the swimming legs, short caudal rami, and first endopodal segment of the first leg about as long as exopod. The first two are certainly plesiomorphic character states, as they are shared with a number of other *Ameira* species (the whole *lacustris*-group has the same armature formula), and the third feature may have easily arisen a number of times convergently, if not also being a plesiomorphic character sate (and most probably it is). That is why we studied two Korean populations presented here in great detail (one from the West Sea, the other from the South Sea), as they both could be identified within the wide concept of the very variable *A. parvula.* They not only proved to be different species, but also both differed markedly from the brackish population reported and illustrated by Chang (2007). We believe the latter represents an undescribed new Korean species, but we refrained here from naming it, as we did not examine any material and many features were not illustrated or described by Chang (2007, 2009, 2010) (mouth appendages, urosomal ornamentation, etc.).

*Ameira zahaae* differs from the specimens of *"A. parvula"* illustrated by Chang (2007) in a number of characters, the most prominent being the size and ornamentation of the caudal rami (much larger in *A. zahaae* and without dorsal proximal spinules; arrowed in Fig. 2B), relative width of the anal operculum and anal sinus (both narrower in *A. zahaae*), segmentation of the antennal exopod (one-segmented in *A. zahaae*), relative size of the distal inner seta on the third exopodal segment of the fourth leg (shorter in *A. zahaae*; arrowed in Fig. 3D), shape and size of the female fifth leg exopod, and relative size of the two innermost setae on the male fifth lex exopod (innermost minute, next one short and robust in *A. zahaae*; both arrowed in Fig. 4E). Extremely reduced innermost seta on the male fifth leg exopod is an autapomorphic character state in *A. zahaae*, while similarly short and extremely robust spines on this appendage were only additionally observed in the Indian population of *"A.*

*parvula"* by Wells & Rao (1987). The Indian population differs from our new species by many features, such as the presence of two setae on the mandibular basis (vs. one in *A. zahaae*), three seate on the baseoendopod of the male fifth leg (vs. two in *A. zahaae*), only three elements on the third endopodal segment of the second leg (vs. four in *A. zahaae*), ornamented inner margin of the caudal rami (vs. smooth in *A. zahaae*), wider anal sinus, relative length of the outermost seta on the baseoendopod of the fifth leg in female etc., and in our opinion also represents an undescribed new species. All other populations of *A. parvula* have been reported to have a much more slender and longer spine on the fifth leg exopod in male, and differ from *A. zahaae* by at least several other characters. Unfortunately, many characters and almost all microcharacters cannot be compared, and to revise this species-complex based on examination of material from around the world was beyond the scope of this paper.

*Ameira zahaae* differs from *A. parvuloides* by the shape and ornamentation of the caudal rami, armature of the mandibular basis, ornamentation of the maxilliped, relative length of the third endopodal segment of the first swimming leg, relative length of the distal inner seta on the third exopodal segment of the fourth leg, length and shape of the fifth leg exopod, and relative length of the elements on the fifth leg in male (see Lang 1965). Major differences between *A. zahaae* and *A. kimchi* **sp. nov.** are discussed in the Remarks section of the latter species (see below).

### *Ameira kimchi* sp. nov.

(Figs. 5–7)

**Type locality.** South Korea, South Sea, Memuld Island, littoral, depth 33 m, 34.654683°N 128.593633°E.

**Specimens examined.** Types only: holotype ovigerous female dissected on one slide (collection number NIBRIV0000232635), one paratype ovigerous female in toto on slide (collection number NIBRIV0000232636), one paratype ovigerous female dissected on one slide (collection number NIBRIV0000232637), and allotype male dissected on one slide (collection number NIBRIV0000232638); all collected from type locality, 18 December 2010, temperature 15.1 °C, salinity 33.84 psu, pH 7.54, leg. W. Lee.

**Etymology.** The species in named after kimchi, traditional Korean food, which is a range of fermented vegetables (most usually cabbages) consumed today by most Koreans on a daily basis. Senior author's fondness for kimchi, even before living in Korea, contribute to a view of this dish as an embodiment of the traditional Korea. The name should be treated as a Latin noun in apposition.

**Description.** Female (based on holotype and two paratypes). Total body length, measured as in previous species, from 442 to 452 μm (445 μm in holotype). Preserved specimen yellowish. Nauplius eye not visible. Body segmentation as in previous species. Most somite ornamentation also similar to previous species, and presumably homologous pore and sensilla also numbered with same Arabic numerals (see Figs. 5A, B, 6A, B) to allow easier comparison. Habitus (Fig. 5A, B) more or less cylindrical, and generally tappering towards posterior end, with clear constriction on podoplean boundary between prosome and urosome in dorsal view; prosome/urosome ratio only 0.9 but greatest width in dorsal view also at posterior end of cephalothorax as in previous species. Body length/width ratio about 3.8 in dorsal view; cephalothorax 1.2 times as wide as genital double-somite. Free pedigerous somites without lateral or dorsal expansions, pleural plates only partly covering coxae of swimming legs in lateral view. Integument relatively strongly chitinized and smooth, without cuticular windows or pits except small area between genital aperture and copulatory pore (arrowed in Fig. 6A). Surface ornamentation of somites consisting of 83 pairs and seven unpaired pores and sensilla (those homologous with previous species indicated with Arabic numerals in Figs. 5A, B, 6A, B; those not present in previous species numbered with Roman numerals consecutively from anterior to posterior end of body, and from dorsal to ventral side), and several rows of spinules on urosomites only. Unpaired dorsal pore no. 17 homologous to sensillum no. 17 in previous species. Rostrum similar to previous species in shape and size, and also ornamented with two dorsal sensilla (pair no. 1).

Cephalothorax (Fig. 5A, B) gradually tapering from 3/4 of its length towards anterior end in dorsal view, about 1.2 times as long as wide; represents 30% of total body length. Surface of cephalic shield ornamented with three pairs of lateral pores (nos. I, II, 14), two unpaired dorsal pores (nos. IV, 17), one unpaired dorsal sensillum (no. V), and 21 pairs of long sensilla (nos. 2–10, 12, 13, 15, 16, 18–21, 23–26, ); sensilla 19–26 & VI belong to first pedigerous somite incorporated into cephalothorax; pairs of sensilla nos. 11 and 22 observed in previous species missing. Second pedigerous somite (first free) without pair of pores antero-laterally (no. 28 in previous species),

ornamented with nine pairs of long sensilla (nos. 27, 29–35, VII); antero-dorsal pair of sensilla (no. 27) serially homologous to pair no. 19 on first pedigerous somite. Third pedigerous somite ornamented similarly to second one (also without antero-lateral pair of pores, no. 37 in previous species), with nine pairs of long sensilla (nos. 36, 38–45); antero-dorsal pair of sensilla (no. 36) serially homologous to pairs nos. 19 and 27 on previous two pedigerous somites. Fourth pedigerous somite also missing antero-dorsal pair of pores (no. 46), as in previous two somites, ornamented with seven pairs of long posterior sensilla (nos. 47–53). Hyaline fringes of all prosomites braod and smooth, except on fourth pedigerous somite where fringe very narrow dorsally. Fifth pedigerous somite ornamented with four pairs of posterior sensilla (nos. 54–57), as well as one pair of lateral pores (no. 58); hyaline fringe smooth and narrow.

Genital double-somite (Figs. 5A, B, 6A) 0.9 times as long as wide (ventral view); internal suture (remnant of segmental fusion) very strongly sclerotised, wide, visible all around somite, furnished with two parallel short rows of spinules (two dorsal and two lateral) which much longer than in previous species, four pairs of sensilla (nos. 59–62), and two lateral pairs of cuticular pores (nos. 63, VIII); posterior part of genital double-somite ornamented with two pairs of large lateral pores (nos. 64, 65), one unpaird ventral pore (no. 66), one unpaired dorsal pore (no. IX), posterior row of spinules on eash side laterally (also longer than in previous species), and four pairs of posterior sensilla (nos. 67–70); hyaline fringe finely serrated. Genital complex (Fig. 6A) with single large copulatory pore, weakly sclerotized and narrow stright copulatory duct (tapering towards anterior part), and two large triangular seminal receptacles. Single median genital aperture covered by fused reduced sixth legs, represents 41% of somite's width. Integument between genital aperture and copulatory pore covered with shallow cuticular pits (arrowed in Fig. 6A). Third urosomite ornamented with posterior row of spinules dorsolaterally (narrowly interrupted dorsally), with unpaired dorsal cuticular pore (no. 71), three pairs of cuticular pores (nos. 72, 73, X), unpaired dorsal posterior sensillum (no. 74), and three pairs of posterior sensilla (nos. 75–77); hyaline fringe finely serrated. Fourth urosomite ornamented with single pair of lateral cuticular pores (no. 78), and short posterior row of slender spinules ventrally; hyaline fringe finely serrated. Anal somite (Figs. 5B, 6A, B) clefted medially at posterior third, with median posterior margin on both sides of cleft strongly sclerotised and produced posteriorly (arrowed in Fig. 6B), with pair of large dorsal sensilla (no. 81), seven pairs of cuticular pores (nos. 79, 80, 82, 84, 85, XI), ventro-lateral anterior row of slender spinules, dorso-lateral posterior row of spinules at base of each caudal ramus, and row of slender spinules ventrally posterior to most median cuticular pore (no. 85); pairs of pores nos. 83, 84, 86, 87 missing (present in revious species); anal operculum convex, wide and short, reaching only proximal half of anal somite, represents 47% of somite's width, smooth; anal sinus also completely smooth, widely open.

Caudal rami (Figs. 5A, 6A, B) extremely small compared to anal somite (arrowed in Fig. 6A), only about 0.25 times as long as anal somite, about 0.8 times as long as wide (ventral view), parallel and nearly cylyndrical, with space between them twice that of one ramus width, and with dorsal sclerotised side very short; with seven elements (three lateral, one dorsal and three apical); ornamentation consists of two spinules at base of both large lateral setae, and single ventral pair of pores (no. 88); dorsal piar of pores (no. 87) missing. Dorsal seta long and slender, smooth, inserted on postero-median corner, about 3.7 times as long as caudal ramus, triarticulate at base. Lateral setae all smooth and slender, all inserted very close to each other and close to posterior margin; ventralmost seta (ancestral distal) longest, more than five times as long as minute middle seta (ancestral smaller proximal), 1.3 times as long as dorsalmost seta (ancestral larger proximal), about as long as ventral seta, and about 3.3 times as long as caudal ramus. Inner apical seta smooth, about as long as ventralmost lateral seta. Middle apical seta strongest, with breaking plane, finely bipinnate at middle third of its length, almost as long as all free (post-cephalothoracic) somites combined. Outer apical seta also with breaking plane and strong, finely unipinnate along outer margin, about 0.4 times as long as middle apical seta.

Antennula (Fig. 5B) eight-segmented, joined to cephalotholax with small triangular pseudosegment laterally, approximately 0.8 times as long as cephalothorax, unornamented, armed as in previous species.

Antenna (Fig. 5C) armed and ornamented as in previous species, but exopod missing enlarged spinule, and its other spinules much more slender.

Labrum (Fig. 5B) large compared with cephalothorax, trapezoidal, rigidly sclerotized, with relatively short and somewhat concave cutting edge, ornamented subapically with two rows of eight strong spinules and apically with minute spinules. Also not mounted in satisfactory position to allow independent drawing

Paragnaths very similar to previous species.

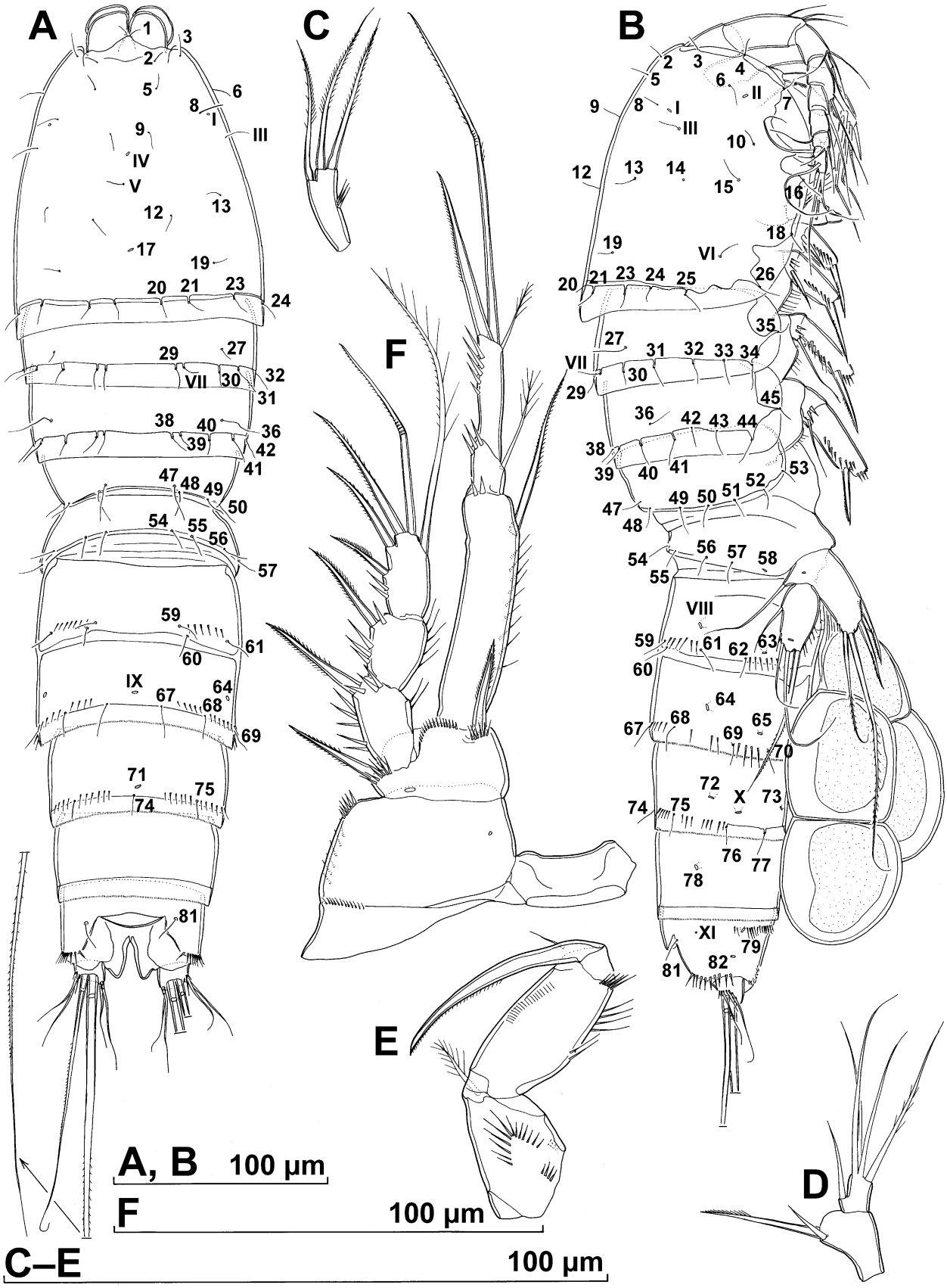


**FIGURE 5.** *Ameira kimchi* **sp. nov.**, holotype female: A, habitus, dorsal view; B, habitus, lateral view (with last two exopodal segments of swimming legs missing); C, exopod of antenna, anterior view; D, mandibular palp, anterior view; E, maxilliped, posterior view; F, first swimming leg, anterior view. Arabic numerals indicating sensilla and pores presumably homologous with those in *A. zahaae* **sp. nov.**; Roman numerals indicating sensilla and pores not present in *A. zahaae*; both numbering consecutively from anterior to posterior end of body, and from dorsal to ventral side (excluding appendages).

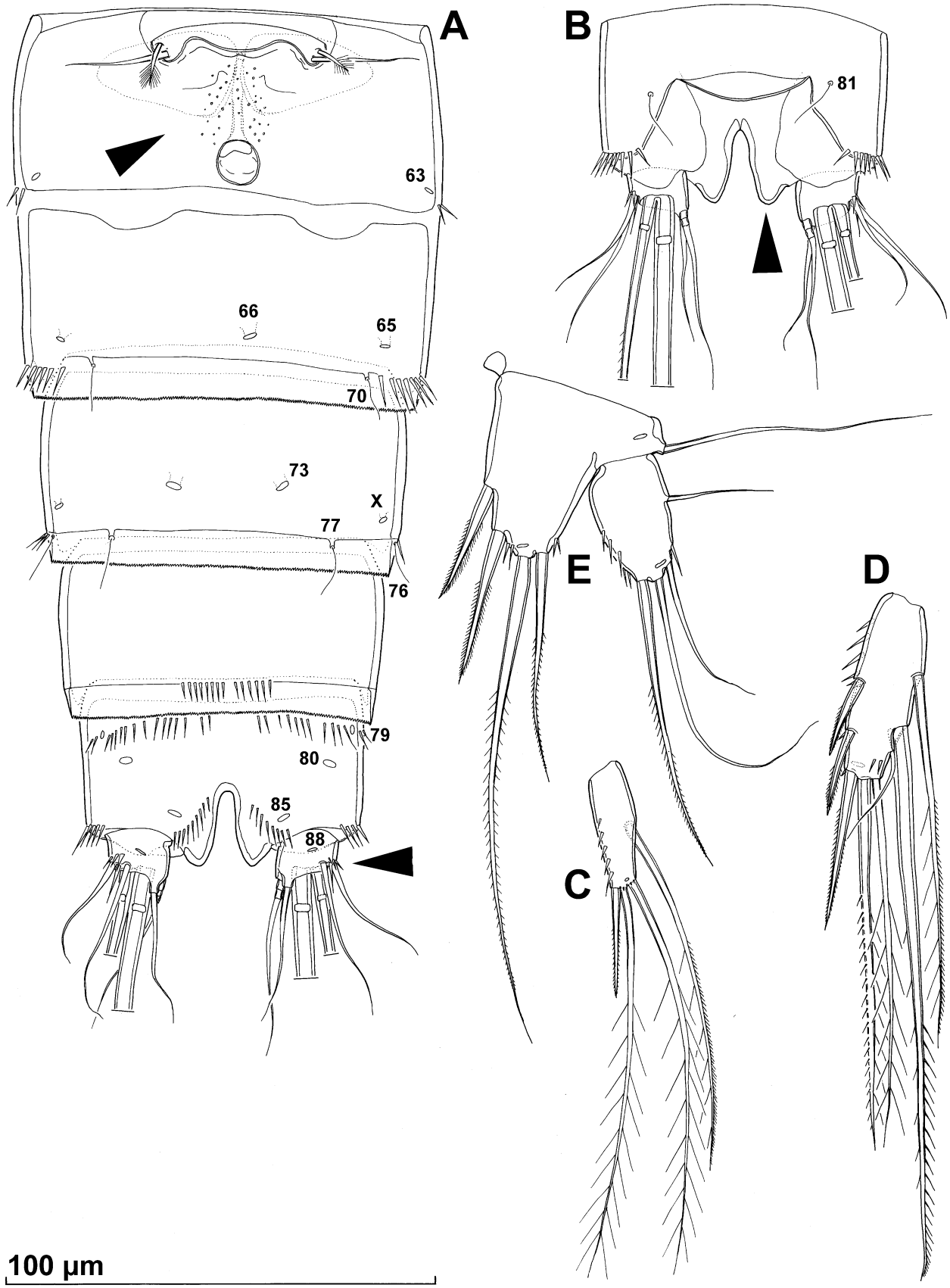


**FIGURE 6.** *Ameira kimchi* **sp. nov.**, holotype female: A, urosome without fifth pedigerous somite, ventral view; B, anal somite and caudal rami, dorsal view; C, third endopodal segment of second swimming leg, anterior view; D, third exopodal segment of fourth swimming leg, anterior view; E, fifth leg, anterior view. Arabic and Roman numerals on urosome numbering sensilla and pores as in previous figure. Arrows pointing most prominent specific features.

Mandibula (Fig. 5D) with coxa very similar to previous species. Palp with additional large spinule at base of basal seta, and also with basis more inflated distally; lateral endopodal seta longer and inserted more proximally than in previous species.

Maxillula and maxilla without any difference from those in previous species.

Maxilliped (Fig. 5E) segmentation and armature as in previous specis; syncoxa with fewer and smaller spinules; basis with shorter spinules on inner margin, and one additional distal row of long and slender spinules on outer margin; endopodal claw slightly proportionately longer than in previous species.

All swimming legs (Figs. 5F, 6C, D) of similar size and with same segmentation, armature, and ornamentation as in previous species.

First swimming leg (Fig. 5F) with smooth intercoxal sclerite, its distal margin slightly concave. Praecoxa small and triangular, ornamented with row of small spinules on anterior surface along distal margin. Coxa 1.6 times as wide as long, with cuticular pore on anterior surface close to inner margin, and with two parallel rows of spinules along outer margin, which shorter than in previous species. Basis with longer and stronger spine on outer corner than in previous species (also finely bipinnate), and one finely bipinnate strong spine on inner distal corner, which also longer than in previous species; ornamented with spinules at base of each spine, as well as with distal row of spinules between exopod and endopod, and cuticular pore on anterior surface close to outer spine; inner margin smooth. Exopod as in previous species, except for smooth inner margin of third segment. Endopod geniculate and 1.6 times as long as exopod; first endopodal segment as long as exopod and 4.2 times as long as wide, ornamented with slender spinules along inner margin and two spinules along distal margin, with single strong and finely bipinnate inner seta, which about 0.7 times as long as segment; second segment smallest, about 1.5 times as long as wide and only 0.25 times as long as first segment, ornamented with three spinules on outer distal corner, and with single slender and sparsely bipinnate seta on inner distal corner; third segment slender, about four times as long as wide and nearly twice as long as second segment, armed apically with three elements; innermost apical element probably spine, strong and 1.6 times as long as third segment, unipinnate along outer margin; middle element more slender and geniculate, twice as long as outer element, and finely unipinnate along outer margin distally; innermost element slender bipinnate seta, 0.4 times as long as outer element.

Second swimming leg (Fig. 6C), third swimming leg, and fourth swimming leg (Fig. 6D) same as in previous species, except for inner seta on third endopodal segment of second leg proportionately longer (compare Figs. 3B and 6C), as well as third exopodal segment of fourth leg with longer distal inner seta and shorter inner apical seta (compare Figs. 3D and 6D).

Fifth leg (Fig. 6E) segmentation, armature and ornamentation very similar to that in previous specis, except endopodal lobe more elongated (reaching 2/3 of exopod) and additionally ornamented with four spinules along distal margin; most spiniform elements not as strong as in previous species.

Sixth legs (Fig. 6A) completely fused together, indistinct, forming simple operculum covering single gonopore, without any ornamentation, each with two setae; inner seta smooth, directed laterally, and about three times as long as outer seta, which bipinnate distally and directed postero-laterally.

Male (allotype). Body length 430 μm. Habitus shape, colour, ornamentation of almost all somites and caudal rami (Fig. 7A, B), rostrum, antenna, labrum, paragnaths, mandibula, maxillula, maxilla, maxilliped, second swimming leg, third swimming leg, and fourth swimming leg similar to female. Prosome/urosome ratio 1.1, greatest width at posterior end of cephalothorax, body length/width ratio about 4.1; cephalothorax 1.3 times as wide as genital somite. Genital somite and first abdominal (third urosomite) not fused.

Genital somite (Fig. 7A, B) 1.7 times as wide as long, with large and longitudinally positioned spermatophore visible inside on left side, which longer than somite and 3.6 times as long as wide, its distal part reaching proximal half of third urosomite.

Thrid urosomite (Fig. 7A, B) with posterior row of large spinules continuous ventrally (between ventral pair of sensilla; pair no. 70), but without pair of lateral pores no. 65 (arrowed in Fig. 7A, B).

Fourth urosomite (Fig. 7A, B) with posterior continous row of large spinules ventrally (between ventral pair of sensilla; pair no. 77).

Anal somite (Fig. 7A, B) shape and ornamentation as in female, also with produced and strongly sclerotised inner median corners at base of cleft (arrowed in Fig. 7B).

Caudal rami (Fig. 7A, B) shape, proportions, armature and ornamentation as in female.

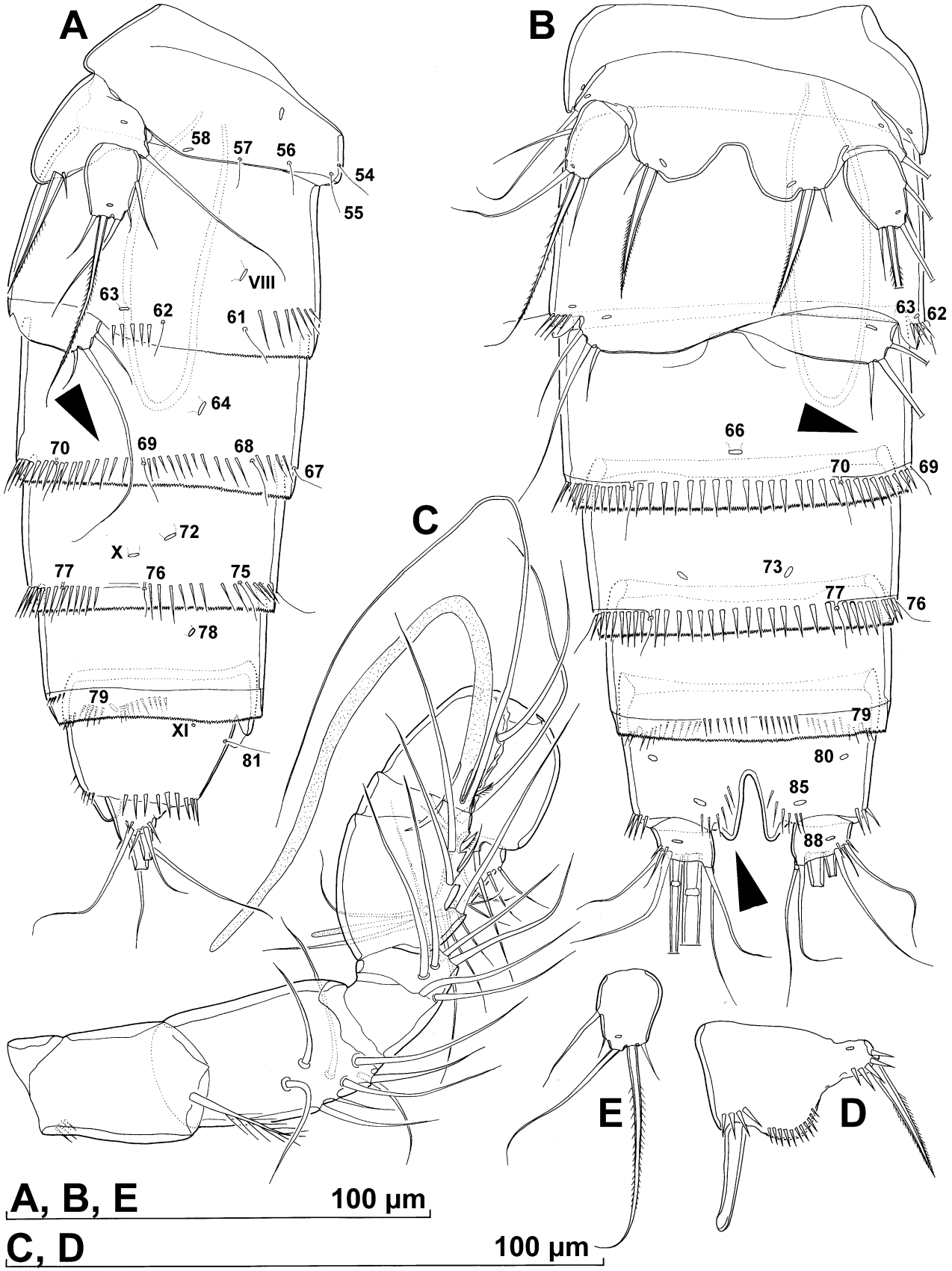


**FIGURE 7.** *Ameira kimchi* **sp. nov.**, allotype male: A, urosome, lateral view; B, urosome, ventral view; C, antennula, ventral view; D, basis of first swimming leg, anterior view; E, exopod of fifth leg, anterior view. Arabic and Roman numerals on urosome numbering sensilla and pores as in female. Arrows pointing most prominent specific features.

Antennula (Fig. 7C) long and slender, eight-segmented, strongly digeniculate, with geniculations between third and fourth and between sixth and seventh segments; ornamented with short row of proximal spinules on first segment. Seventh segment with inner margin strongly chitinized, with several smaller and three larger spine-like structures. Very long and slender aesthetasc on fourth segment fused basally to equally long seta (both about as long as entire antennula when completely closed), and much shorter and more slender aesthetasc on eighth segment apically also fused to two apical setae. First two segments similar to female, and last segment homologous to last two in female. Setal formula: 1.9.7.9.1.2.1.11. Most setae smooth and slender; seta on first segment bipinnate; one seta on fourth and one on sixth segment very short, spiniform and unipinnate; all these setae distally slender and smooth and most with small pore on tip. Only five lateral setae on eighth segment barticulated basally (inserted on small pseudojoint). No setae with breaking plane.

First swimming leg (Fig. 7D) with smooth and distally somewhat inflated modified inner spine on basis, about as long as basis and directed distally; inner margin of basis smooth.

Fifth legs (Fig. 7A, B, E) smaller than in female and with baseoenopods fused medially, with similar shape and ornamentation to that in male of previous species. Endopodal lobe broad, convex, not extending to middle of exopod, unornamented (except for medial cuticular pore), with inflated inner distal margin, with only two elements: inner unipinnate spiniform element slightly longer than baseoendopod and about 3.6 times as long as outer slender and smooth seta. Exopod without spinules, shorter than in female, 1.2 times as long as wide, but with additional minute inner seta (which longer than in previous species), without third seta from inner side (so number of elements same as in female, but setae not homologous); spiniform bipinnate seta much longer than in previous species.

Sixth legs (Fig. 7A, B) partly fused medially to each other and right leg completely fused basally to somite; left leg articulated basally and movable, forming effective flap; each leg with three smooth setae and with single pore on anterior surface; length ratio of setae, from inner side, 1 : 3.3 : 1.8.

**Variability.** Only one male and three females were collected and examined under compound microscope. No variable features or asymmetries were observed, and most differences between male and female specimens are all part of a normal sexual dimorphism in this family. It is unclear at this stage if the absence of the cuticular pore no. 65 in male (arrowed in Fig. 7B) is also part of sexual dimorphism or is it intraspecific variability, because only one male was studied. The same dilemma remains in regard to the posterior rows of spinules on the ventral surface of the third and fourth urosomites in male (compare Figs. 6A and 7B), but this is more probably sexual dimorphism, as it has been observed previously in some species of this family (see, for example, Karanovic 2004, 2006)

**Remarks.** Although the spine formula of the swimming legs and the fifth leg, as well as the relative size of the first endopodal segment of the first leg, are no different from those of the previous species, or from the above mentioned cosmopolitan *A. parvula*, *A. kimchi* **sp. nov.** differs from all described species of the genus *Ameira* by its extremely small caudal rami (arrowed in Fig. 6A), and rigidly sclerotised and posteriorly produced inner median corners of the anal somite (arrowed in Fig. 6B). The latter character has not, in fact, been reported for any member of the family Ameiridae, and produced inner median corners in some other harpacticoids are usually a result of enlarged spinules, never of the somite's margin itself. These structures in *A. kimchi* are so well sclerotised that they are observable even under a dissecting miscroscope.

A close examination of *A. kimchi* and *A. zahaae* showed that these two species also differ markedly in a number of microcharacters, previously not normally studied in detail in this group of crustaceans. Here we primarily refer to the pores and sensilla pattern, but some others are even more obvious, equally useful, and also very stable. For example, in *A. kimchi* the mandibular basis is much wider distally, with an additional large spinule; the first maxillipedal segment is much less ornamented; the genital somite has a field of cuticular pits between the genital aperture and copulatory pore (arrowed in Fig. 6A); the third urosomal somite in female bears no ventral spinules; the habitus is constricted in dorsal view between prosome and urosome, etc. As for the sensilla and pores pattern, when compared to *A. zahaae*, *A. kimchi* has 11 novel pores or sensilla (indicated with Roman numerals in Figs. 5A, B, 6C), nine pairs of sensilla or pores (nos. 11, 22, 28, 37, 46, 83, 84, 86, 87) are missing, and the unpaired ornamentation element no. 17 is expressed as a pore, not as a sensillum. We hope these and similar morphological comparisons will be used more widely in the future, as they hold a potential to resolve some dilemmas about dimorphism in this genus, such as that postulated for *A. longispina* Gee, 2009 with two distinct lengths of the inner basal spine on the male first leg (see Gee 2009). They may also show potential in distinguishing closely related species in species-complexes, as some molecular markers do (Karanovic & Cooper 2011).

Small caudal rami are an unusual feature in the genus *Ameira*, and the only species with somewhat reduced caudal rami (although not as much as in *A. kimchi*) is *A. divagans* Nicholls, 1939, as redescribed by Scheibel (1974) from Germany. The two species, however, differ markedly in many characters. As far as we can judge based on morphology, *A. kimchi* has no close relatives among living congeners, and its place in the *A. parvula* species-complex is almost entirely based on plesiomorphic characters (see the Remarks section for *A. zahaae* above).

Genus ***Pseudameira*** Sars G.O., 1911

***Pseudameira mago* sp. nov.**
(Figs. 8 & 9)

**Type locality.** South Korea, South Sea, Memuld Island, littoral, depth 33 m, 34.654683°N 128.593633°E.

**Specimens examined.** Types only: holotype ovigerous female dissected on one slide (collection number NIBRIV0000232639), one paratype ovigerous female *in toto* on slide (collection number NIBRIV000023264040), and one paratype ovigerous female dissected on one slide (collection number NIBRIV0000232641); all collected from type locality, 18 December 2010, temperature 15.1 °C, salinity 33.84 psu, pH 7.54, leg. W. Lee.

**Etymology.** The species name is taken from the Korean totemic and shamanistic mythology, and reffers to a goddess named Mago, one of the first two deities that appeared at the beginning of the world. Although totemic and shamanistic legends play a minor part in the religious landscape in Korea today, their influence is evident in the love and respect most people here show for the nature in general, and Korean mountains especially. The name thus should be treated as a Latin noun (gender feminine) in apposition to the generic name.

**Description.** Female (based on holotype and two paratypes). Total body length, measured from tip of rostrum to posterior margin of caudal rami (excluding appendages and caudal setae), from 412 to 427 μm (412 μm in holotype). Preserved specimen yellowish. Nauplius eye not visible. Body segmentation as in previous two species. Most somite ornamentation also similar to previous species, and presumably homologous pore and sensilla also numbered with same Arabic and Roman numerals (see Fig. 8A, B) to allow easier comparison. Habitus (Fig. 8A, B) almost perfectly cylindrical in dorsal view, only gently tappering towards posterior end, slender; podoplean boundary between prosome and urosome almost inconspicuous in dorsal view, but more pronounced in lateral view; prosome/urosome ratio nearly 1.1 and greatest width in dorsal view at posterior end of cephalothorax. Body length/width ratio about 4.8; cephalothorax 1.1 times as wide as genital double-somite. Free pedigerous somites without lateral or dorsal expansions, pleural plates better developed than in previous two species, almost completely covering coxae of swimming legs in lateral view. Integument relatively strongly chitinized, without cuticular windows or pits. Surface ornamentation of somites consists of 62 pairs and five unpaired pores and sensilla (those homologous with previous two species indicated with Arabic and Roman numerals respectively in Fig. 8A, B, C; those not present in previous species indicated with Greek letters in alphabetical oder from anterior to posterior end of body, and from dorsal to ventral side), and several rows of spinules on urosomites only. Lateral pair of sensilla no. 14 on cephalothorx probably homologous to cuticular pores no. 14 in previous two species. Rostrum small, membranous, linguiform, with relatively blunt tip, reaching 1/3 of first antennular segment, about twice as long as wide and not demarcated at base; ornamented with two dorsal sensilla (pair no. 1).

Cephalothorax (Fig. 8A, B) gradually tapering towards anterior end in dorsal view, about 1.2 times as long as wide; represents 24% of total body length. Surface of cephalic shield without any pores, ornamented with one unpaired dorsal sensillum (no. V) and 23 pairs of long sensilla (nos. 2, 3, 5–8, 10, 12–16, 18–20, 24–26, III, VI, α, β, γ); sensilla 19–26 & VI belong to first pedigerous somite. Second pedigerous somite (first free) without pair of pores antero-laterally, ornamented with seven pairs of long sensilla (nos. 27, 29–31, 33–35); antero-dorsal pair of sensilla (no. 27) serially homologous to pair no. 19 on first pedigerous somite. Third pedigerous somite also without antero-lateral pair of pores, ornamented with six pairs of long sensilla (nos. 36, 38, 40, 41, 44, 45); antero-dorsal pair of sensilla (no. 36) serially homologous to pairs nos. 19 and 27 on previous two pedigerous somites. Fourth pedigerous somite also missing antero-dorsal pair of pores, as in previous two somites, ornamented with six pairs of long posterior sensilla (nos. 47–50, 52, 53). Hyaline fringes of all prosomites braod and smooth, except on fourth pedigerous somite where fringe relatively narrow dorsally. Fifth pedigerous somite ornamented only with four pairs of posterior sensilla (nos. 54–57); hyaline fringe smooth and narrow.

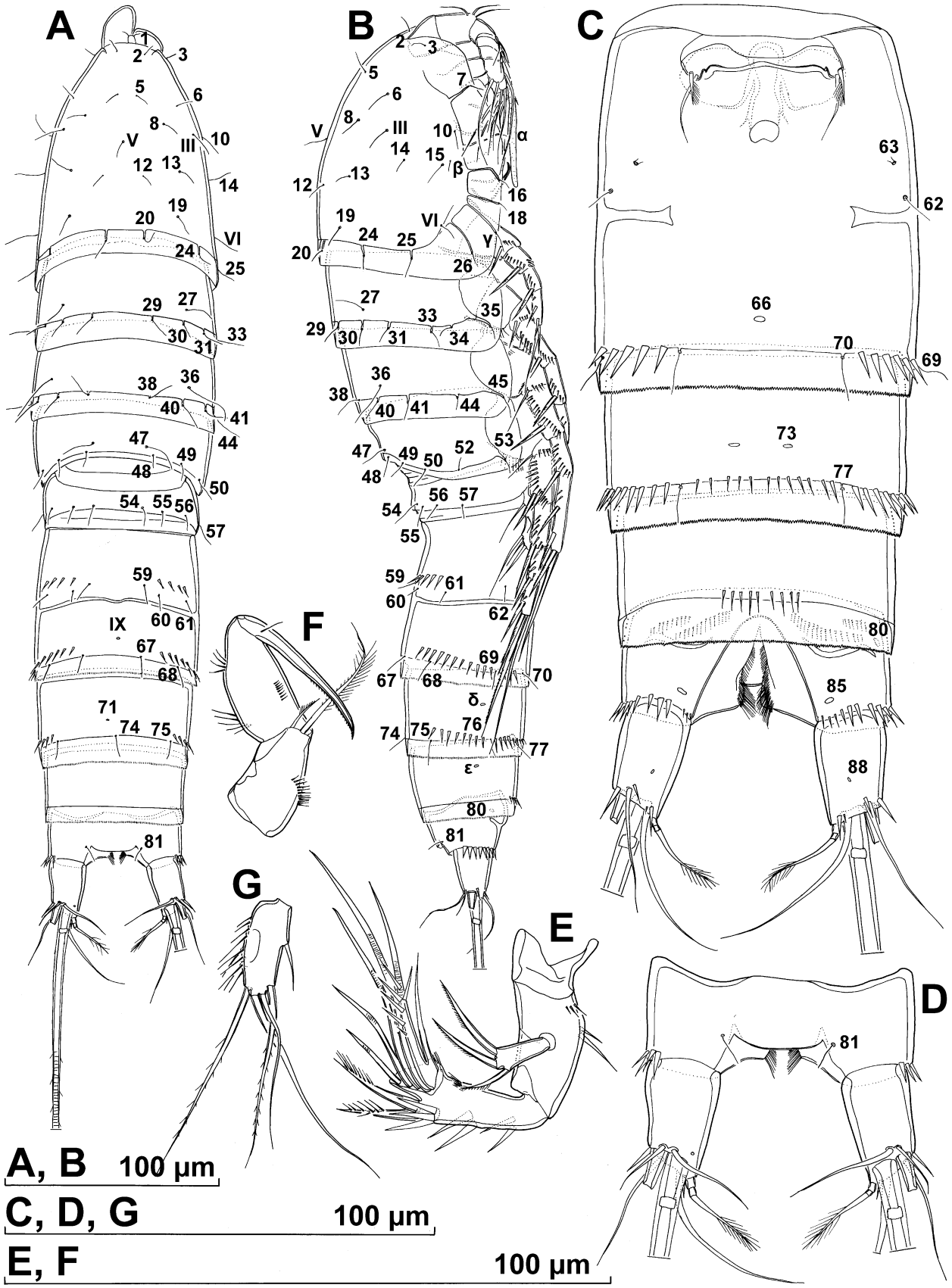


**FIGURE 8.** *Pseudameira mago* **sp. nov.**, holotype female: A, habitus, dorsal view; B, habitus, lateral view; C, urosome without fifth pedigerous somite, ventral view; D, anal somite and caudal rami, dorsal view; E, antenna, anterior view; F, maxilliped, anterior view; G, exopod of fifth leg, posterior view (slightly tilted outwards). Arabic and Roman numerals indicating sensilla and pores presumably homologous with those in *Ameira zahaae* **sp. nov.** and *A. kimchi* **sp. nov.** respectively; Greek letters indicating unique sensilla and pores; all numbering (listing) consecutively from anterior to posterior end of body, and from dorsal to ventral side (excluding appendages).

Genital double-somite (Fig. 8A, B, C) 1.2 times as long as wide (ventral view); internal suture (remnant of segmental fusion) strongly sclerotised, visible dorsolaterally at midlength of somite, furnished with two parallel short rows of strong spinules dorsolaterally, four pairs of sensilla (nos. 59–62), and lateral pair of cuticular pores (no. 63); posterior part of genital double-somite without lateral pores, ornamented with one unpaird ventral pore (no. 66), one dorsal unpaired pore (no. IX), posterior row of large spinules on eash side laterally, and four pairs of posterior sensilla (nos. 67–70); hyaline fringe finely serrated. Genital complex (Fig. 8C) with single large copulatory pore, strongly sclerotized and wide copulatory duct and two small ovoid seminal receptacles. Single median genital aperture covered by fused reduced sixth legs, represents 55 % of somite's width. Third urosomite ornamented with posterior row of spinules (interrupted dorsally), unpaired dorsal cuticular pore (no. 71), two pairs of cuticular pores (nos. 73, δ) ventrally and laterally respectively, unpaired dorsal posterior sensillum (no. 74), and three pairs of posterior sensilla (nos. 75–77); hyaline fringe finely serrated. Fourth urosomite ornamented with single pair of lateral cuticular pores (no. ε), and short posterior row of slender spinules ventrally; hyaline fringe finely serrated. Anal somite (Fig. 8B, C, D) deeply clefted medially (only anterior third of somite not clefted), with transverse internal sclerotised ridge in anterior side which interrupted medially by cleft, ornamented with pair of large dorsal sensilla (no. 81), two pairs of cuticular pores (nos. 80, 85), two parallel ventral anterior rows of slender spinules, ventro-lateral posterior row of spinules at base of each caudal ramus; anal operculum slightly convex, narrow and relatively short, reaching 3/4 of anal somite and covering anterior half of medial cleft, represents 33% of somite's width, smooth; anal sinus ornamented with two parallel diagonal rows of hair-like spinules on each side of median cleft, widely open, with weakly sclerotised walls, and without any chitinous projections.

Caudal rami (Fig. 8B, C, D) short but robust, about as long as anal somite in dorsal view, nearly 1.5 times as long as wide (ventral view), slightly divergent and cylindrical (posterior part slightly narrower), space between rami about 1.8 times one ramus width, without dorsal diagonal suture in anterior half; with seven elements (three lateral, one dorsal and three apical); ornamentation consists of two spinules at base of largest lateral setae, two ventral posterior spinules at base of inner apical seta (outer minute), and two pairs of pores (nos. 87, 88). Dorsal seta relatively short and slender, smooth, inserted on postero-median corner, about 0.8 times as long as caudal ramus, triarticulate at base. Lateral setae all smooth and slender; distalmost seta longest, inserted closer to ventral side and very close to posterior margin, 2.6 times as long as smaller proximal seta, 1.3 times as long as larger proximal seta, and also 1.3 times as long as caudal ramus; proximal lateral setae inserted very close to each other in cuticular depressions similar to those of typical sensilla, inserted very close to dorsal side and posterior margin. Inner apical seta smooth, about 1.2 times as long as ventralmost lateral seta. Middle apical seta strongest, with breaking plane, finely bipinnate at middle third of its length, 1.1 times as long as urosome and twice as long as outer apical seta. Outer apical seta also with breaking plane and strong, finely bipinnate distally.

Antennula (Fig. 9A) six-segmented, joined to cephalotholax with small triangular pseudosegment laterally, approximately half as long as cephalothorax, ornamented with very long spinules along posterior margin of second segment and several small spinules on anterior margin of first segment. Long aesthetasc on fourth segment reaching beyond tip of appendage for length of last four segments combined, wider than in previous two species, fused basally with even longer adjacent seta; slender apical aesthetasc on eighth segment about as long as last three segments combined, fused basally with two apical setae, forming apical acrothek. Setal formula: 1.8.7.3.2.14. One seta on second segment, one on third, and three setae on sixth segment pinnate; all other setae smooth. Six lateral setae on sixth segment biarticulated at base (inserted on small pseudojoint); all other setae uniarticulated and without breaking planes. Length ratio of antennular segments, from proximal segment and along caudal margin, 1 : 1 : 0.3 : 0.3 : 0.3 : 1.

Antenna (Fig. 8E) composed of coxa, allobasis (fused basis and first endopodal segment), one-segmented endopod and one-segmented exopod, although ancestral suture between basis and first endopodal segment visible partly on anterior surface. Coxa short, unarmed and unornamented. Allobasis 2.3 times as long as coxa and about 1.6 times as long as wide, ornamented with several large spinules along inner margin proximally, unarmed. Endopod about three times as long as wide and nearly 1.4 times as long as allobasis, with two surface frills subdistally, armed laterally with two strongly pinnate spines flanking thin seta; apical armature consisting of five geniculate setae, strongest one fused basally to additional smaller seta; smallest seta smooth and slender; strongest seta about 0.8 times as long as longest geniculate seta, ornamented with large spinules around area of geniculation; other geniculate setae smooth and strong; ornamentation consisting of seven extremely large spinules on ventral surface, in groups of two, two, and three. Exopod slightly longer than coxa, with narrow basal part and somewhat

wider distal part; unornamented; with one lateral (although inserted close to distal margin) and two apical strong and unipinnate setae; dorsal (outer) apical seta longest, 1.2 times as long as ventral apical seta, about 1.9 times as long as lateral seta, and 1.7 times as long as exopod.

Labrum (Fig. 9B) large compared with cephalothorax, trapezoidal, rigidly sclerotized, with wide and straight cutting edge, ornamented subapically and apically with continuous row of strong spinules.

Paragnaths not mounted in satisfactory position to allow independent drawing or proper observation.

Mandibula (Fig. 9C) with narrow cutting edge on elongated coxa, with three bicuspidate strong ventral teeth, two unicuspidate strong teeth, and single dorsal unipinnate seta. Palp uniramous, comprising basis and one-segmented endopod. Basis with slightly inflated distal part, about 2.5 times as long as wide, with single strong and distally unipinnate inner seta, ornamented with longitudinal row of long and slender spinules along dorsal margin. Endopod very small, unornamented, about 0.3 times as long as basis and 1.1 times as long as wide; with five slender and smooth apical setae.

Maxillula (Fig. 9D) with large praecoxa, ornamented with several spinules on outer margin distally; arthrite rectangular, unornamented, with two anterior surface setae, three lateral, and four apical elements (probably three spines and one seta); dorsalmost of apical elements straight and with slender spinules along dorsal margin; ventralmost element smooth and curved; second element from ventral side strongest and longest, with crown of spinules distally; third element from ventral side also very strong, bicuspidate. Coxal endite much shorter than praecoxal arthrite or basis, armed apically (on inner margin) with one stout bipinnate element, and another smooth and slender seta. Basis significantly shorter than praecoxal arthrite but more than twice as long as coxal endite, with four setae apically and subapically; dorsalmost seta bipinnate, others smooth. Endopod represented by minute but distinct segment, with single bipinnate slender seta apically.

Maxilla (Fig. 9E) ornamented with row of long spinules along outer margin of syncoxa, and another shorter row of smaller spinules on anterior surface; opening of maxillary gland clearly visible on posterior surface. Proximal endite of syncoxa well developed, although not strongly sclerotized, with characteristically inflated ventral part; unornamented; with single apical setae, which fused at base to endite, wide, soft, and distally plumose. Distal endite of syncoxa cylindrical, well sclerotised and highly mobile, armed apically with one strong bipinnate seta, and two smooth and sleder setae; smooth setae of subequal length, only slightly longer than pinnate seta, and 2.3 times as long as endite. Basis drawn out into long claw, with shorter spiniform and curved seta at base, ornamented with minute spinules along convex margin. Endopod represented by minute but distinct square segment, with two long and smooth apical setae of subequal length; enopodal setae about 1.5 times as long as basal seta, but all reaching distal tip of basal claw.

Maxilliped (Fig. 8E) with short and stout syncoxa, ornamented with arched row of spinules on inner margin, and with two setae subapically; inner syncoxal seta bipinnate, 1.1 times as long as syncoxa, and 3.2 times as long as outer unipinnate seta. Basis twice as long as wide and 1.1 times as long as syncoxa, unarmed, ornamented with short longitudinal row of slender spinules along inner margin proximally, as well as with two short rows of spinules on outer margin (one at 1/3, other at 2/3). Endopod represented by long curved claw, about 1.3 times as long as basis, ornamented with row of spinules along concave side distally, accompanied at base by thin smooth and short seta.

All swimming legs (Fig. 9F, G, H, I) of similar size and short in comparison to body length, composed of small triangular and unarmed praecoxa, large rectangular and unarmed coxa, shorter and nearly pentagonal basis, slender three-segmented exopod, also slender and three-segmented endopod; each leg joined to their pair on opposite side of body by simple quadriform intercoxal sclerite.

First swimming leg (Fig. 9F) with smooth and short intercoxal sclerite, its distal margin wide and slightly concave. Praecoxa short and triangular, ornamented with row of small spinules on anterior surface along distal margin. Coxa twice as wide as long, ornamented with long spinules along outer and inner margins, additionally with two short transverse rows of spinules on anterior surface close to outer margin (one proximal and one distal). Basis with one long and not very strong bipinnate spine on outer corner, and one strong spine on inner distal corner, which ornamented with large outer spinules; ornamentation consists of short rows of large spinules at base of each spine, as well as distal row of spinules between exopod and endopod, two rows of slender spinules on inner margin, and cuticular pore on anterior surface close to outer spine. Exopod with all segments of similar length, each about 1.8 times as long as wide and ornamented with spinules along both inner and outer margins (those on outer margin very strong and long, especially on first and second segment); first two segments with single strong and finely

bipinnate spine on outer distal corner, each also with setule near distal tip; third segment with three strong and finely bipinnate spines on outer margin (although shorter than those on first and second segment) and two bipinnate setae apically; outer apical seta geniculate and with shorter spinules along outer margin; inner apical seta slender and with long spinules on both margins. Endopod slightly geniculate and 1.1 times as long as exopod; first endopodal segment about as long as first exopodal segment and 1.5 times as long as wide, ornamented with slender spinules along inner margin and strong and long spinules along outer and distal margins, with single inner seta, which about twice as long as segment, slender, and finely unipinnate distally; second segment smallest, about 1.7 times as long as wide and only 0.8 times as long as first segment, ornamented with long an strong spinules along outer and distal margins, and with single slender and bipinnate inner seta; third segment slender, about 4.4 times as long as wide and almost twice as long as second segment, armed apically with three elements; innermost apical element probably spine, strong and 0.9 times as long as third segment, unipinnate along outer margin; middle element slightly more slender and geniculate seta, nearly 2.4 times as long as outer element, bipinntae distally (with smaller spinules along outer margin); innermost element slender bipinnate seta, 1.8 times as long as outer element.

Second swimming leg (Fig. 9G) with intercoxal sclerite ornamented with four strong spinules on anterior surface, its distal margin narrow and concave. Praecoxa small and triangular, ornamented with short row of long spinules on anterior surface along distal margin. Coxa nearly 1.7 times as wide as long, ornamented with transverse row of small spinules on anterior surface proximally, four extremely long spinules on anterior surface distally, and with long spinules along outer margin. Basis with single bipinnate and long but not very strong spine on outer corner; ornamented with spinules at base of spine, as well as with distal row of spinules between exopod and endopod, four extremely long spinules on inner margin, and cuticular pore on anterior surface close to outer spine. Exopod with all segments of about same width, third segment almost twice as long as second segment and 1.6 times as long as first segment; first two segments ornamented with strong spinules along outer margin and single pore on anterior surface at base of outer spine, with inner distall frill, each with outer bipinnate spine and inner bipinnate seta; third segment ornamented with pore near outer distal corner and spinules along outer margin, with three strong and finely bipinnate outer spines, two apical bipinnate setae, and two slender and bipinnate inner setae; outer apical seta very strong (spiniform) with spinules along outer margin much shorter than those along inner margin, about 1.4 times as long as segment, and 2.5 times as long as outer spines; inner apical seta slender, with sparse long spinules on inner side and short sparse spinules on outer side, 1.2 times as long as outer apical seta; inner setae of same length, about 0.7 times as long as third segment. Endopod straight (not geniculate) and 0.9 times as long as exopod, progressively narrower from proximal to distal end, each segment ornamented with single pore on anterior surface close to outer distal corner, and row of strong spinules along outer margin; third segment about 1.6 times as long as first or second; first two segments additionally ornamented with strong frill on inner distal corner, and with single bipinnate inner seta (that on first segment very short and spiniform, curved); third segment with one inner seta, two apical setae and one subapical outermost spine; apical setae of equal length, bipinnate, 0.9 times as long as entire endopod, about as long as inner seta, and nearly 2.7 times as long as outer spine; outer apical seta on third segment with strong spinules along outer margin and slender spinules along inner margin; inner setae on second and third segment with short spinules along inner margin, and long spinules along outer margin.

Third swimming leg (Fig. 9H) very similar to second swimming leg, except for slender outer seta on basis and two inner setae on third endopodal segment; inner seta on first endopodal segment also short, spiniform and curved.

Fourth swimming leg (Fig. 9I) similar to third swimming leg, except for ornamentation of coxa and basis, length of outer basal seta (shorter on fourth leg), length of inner seta on first endopodal segment, and armature of third exopodal segment. Coxa 1.8 times as long as wide, without proximal row of spinules on anterior surface, with smaller spinules in posterior row on anterior surface, and with fewer and larger spinules along outer margin. Inner spinules on basis much shorter than those on second and third legs. Third exopodal segment ornamented with two spinules on posterior surface distally, in addition to outer spinules and anterior pore; with three outer finely bipinnate spines, two apical bipinnate setae, and two inner setae (as second and third legs), but distal inner seta as strong as outer spines and longest. First endopodal segment with long and slender inner seta. Second endopodal segment with single large spinule on posterior surface, in addition to outer distal frill, anterior pore, and strong spinules along outer margin.

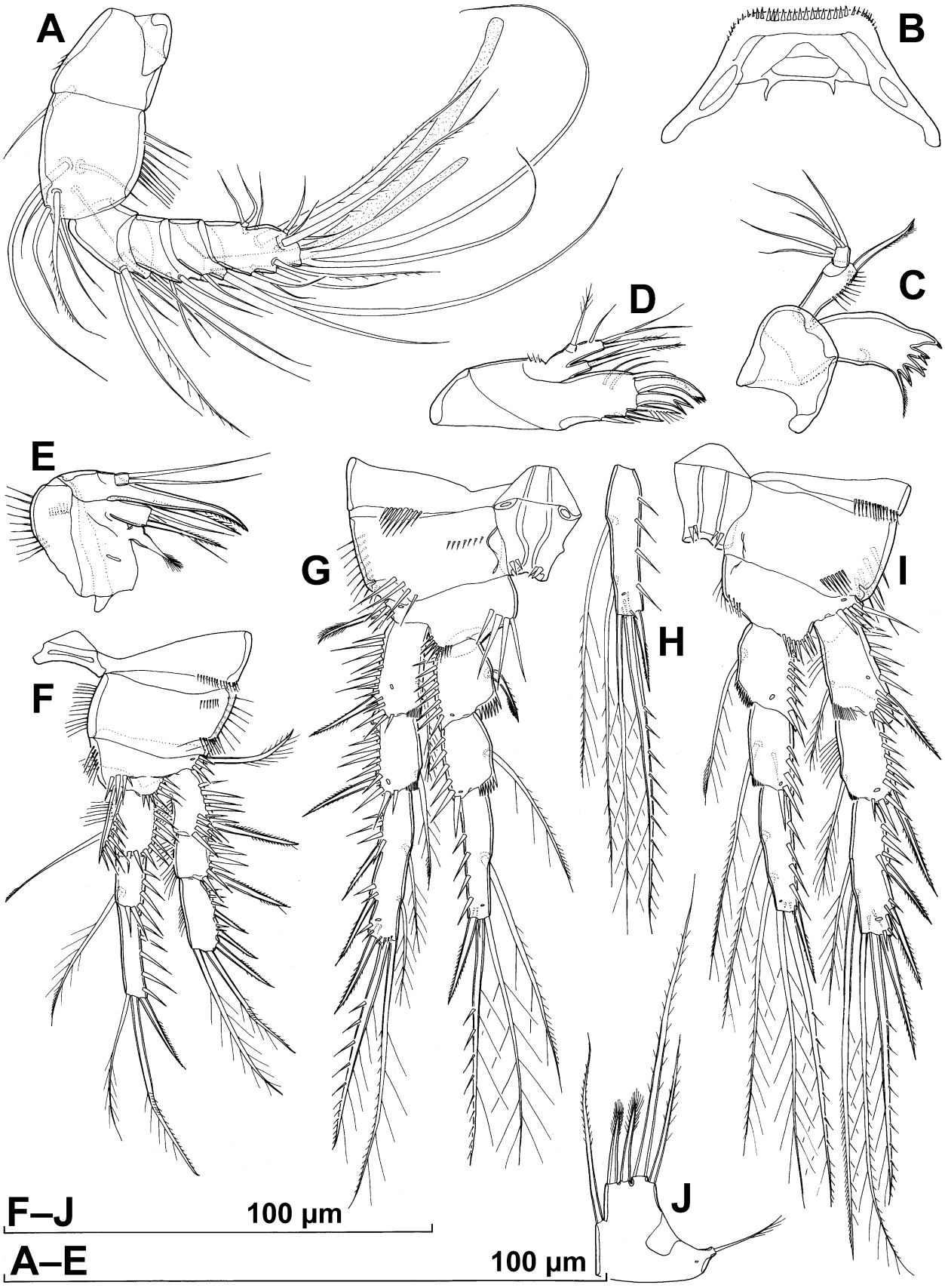


**FIGURE 9.** *Pseudameira mago* **sp. nov.**, holotype female: A, antennula, dorsal view; B, labrum, posterior view; C, mandibula, anterior view; D, maxillula, anterior view; E, maxilla, posterior view; F, first swimming leg, anterior view; G, second swimming leg, anterior view; H, Third endopodal segment of third swimming leg; I, fourth swimming leg; J, baseoendopod of fifth leg, anterior view.

Fifth leg (Figs. 8G, 9J) biramous, both legs distinct and composed of wide baseoendopod (fused basis and endopod). Baseoendopod with outer basal seta slender and unipinnate, arising from long setophore; baseoendopod ornamented with single small pore on anterior surface at base of outer seta. Endopodal lobe relatively wide, trapezoidal, extending slightly beyond proximal half of exopod, with five stout, bipinnate setae, with length ratio (from inner side), 1 : 0.4 : 0.4 : 1.6 : 0.8. Exopod about twice as long as its maximum width, ornamented with long and slender spinules along inner margin, with five setae; innermost and fourth seta from inner side bipinnate, other three setae smooth. Length ratio of five exopodal setae, from inner side, 1 : 1.1 : 0.7 : 0.9 : 0.2.

Sixth legs (Fig. 2A) completely fused together, indistinct, forming simple operculum covering single gonopore, without any ornamentation, each with two setae and minute spine; both seta directed posteriorly; inner seta smooth, and about twice as long as outer seta, which unpinnate.

Male. Unknown.

**Variability.** Only three females have been collected and observed, and no variability was found except slight differences in body length. All appendages are also fully symmetrical.

**Remarks.** This is the first record of the genus *Pseudameira* Sars G.O., 1911 in Korea, and *P. mago* **sp. nov.** also has no close relatives among recent species, at least as one can judge from its morphology. The genus contains today only 15 valid species (Walter & Boxshall 2011) (note: *Pseudameira kunzi* Petkovski, 1956 is a junior subjective synonym of *Nitokra reducta* Schäfer, 1936), but it is a very loose assemblage, with hardly any closely related species, and certainly no sister species. Antennulae range from six- to eight-segmented, fifth legs vary in shape and armature, caudal rami can be short or long, and there are hardly any species with the same armature formula of the swimming legs. This was already noticed by Lang (1948, 1965) and Gee & Fleeger (1986), who provided tables with spine formulas for species known at that time.

*Pseudameira mago* could be distinguished at once from most congeners by its unique armature formula of second to fourth swimming legs. In such a way it can be distinguished from *P. breviseta* Klie, 1950, *P. crassicornis* Sars G.O., 1911, *P. gracilis* Sars G.O., 1920, *P. limicola* Soyer, 1975, *P. reducta* Klie, 1950, *P. signyensis* Gee & Fleeger, 1986, and *P. trisetosa* Schriever, 1984 by the presence of two inner setae on the third exopodal segments of second and third swimming legs (one or none in other species). Presence of an inner seta on the first exopodal segment of the forth leg distinguishes *P. mago* from *P. antennulata* Schriever, 1984, *P. birulai* Smirnov, 1946, *P. brevifurca* Shen & Bai, 1956, *P. furcata* Sars G.O., 1911, and *P. minutissima* Monard, 1928 (all these species lack the inner seta). Finally, the presence of only two inner setae on the third exopodal segment of the fouth leg distinguishes *P. mago* from *P. mixta mixta* Sars G.O., 1920, *P. mixta adriatica* Apostolov & Petkovski, 1980, and *P. perplexa* Soyer, 1975 (all these have three setae instead). Unfortunately, the very limited data we have about *P. reflexa* (Scott T., 1894) do not allow comparison of the swimming legs armature formula, but this species differs from *P. mago* by an eight-segmented antennula, as well as by more elements on the fifth leg (six on the baseoendopod and seven on the exopod). Each of the above mentioned 15 species and one subspecies differs from *P. mago* additionally by a number of morphological characters.

*Pseudameira perplexa*, described by Soyer (1975) from the Mediterranean Coast of France, seems to share the greatest number of morphological characters with our new species, although many of them (particularly the swimming leg armature formula) seem to be plesiomorphic states. Both species have the innermost seta on the fifth leg baseoendopod in female longer than the next one, which may be an apomorphic feature. They differ, however, by many characters, and we will list here only some of the more prominent ones for *P. perplexa*: genital double-somite with continous posterior row of spinules ventrally, antennula without spinules on the second segment, first two endopodal segments of the first swimming leg as long as the exopod, maxilliped with only one seta on the syncoxa, basis of the second swimming leg with short spinules along inner margin, setae on the first endopodal segments of the second and third legs not spiniform, third exopodal segment of the fourth swimming leg with three inner setae (as mentioned above), and outer exopodal setae on the female fifth leg very short.

Similarly long innermost seta on the fifth leg baseoendopod was reported only in *P. breviseta*, described from Germany by Klie (1950), but this species has six setae on the fifth leg exopod, a seven-segmented antennula, as well as a different armature of the second and third swimming legs. Spinules on the second segment of antennula have been illustrated or described so far, besides *P. mago*, only for *P. furcata* and *P. brevifurca* (see Lang 1948; Shen & Bai 1956). *Pseudameira furcata*, however, has much longer caudal rami than *P. mago*, while *P. bervifurcata* has a seven-segmented antennula, more robust habitus, and an unarmed inner margin of the first exopodal segment of the fourth leg. The latter species is, unfortunately, very poorly described, and the authors admitted to loosing the antenna, first swimming leg, and fifth leg (presumably during dissection). This is

unfortunate, as *P. brevifurca* is the only other Asian representative of the genus. It was decribed from Chefoo in China (also commonly spelled as Zhifu), on the west coast of the Yellow Sea, some 400 km away from the type locality of *P. mago*. Future studies of more specimens of both species from different localities, using both molecular and morphological methods, may shead new light on the status of the genus *Pseudameira* in the Yellow Sea. At present, and given the current level of taxonomy in this group, there is enough evidence to consider *P. brevifurca* and *P. mago* as separate species.

**Genus *Proameira*** Lang, 1944

***Proameira cf. simplex* (Norman & Scott, 1905)**
(Figs. 10–12)

**Material examined.** South Korea, South Sea, Memuld Island, littoral, depth 33 m, 18 December 2010, temperature 15.1 °C, salinity 33.84 psu, pH 7.54, leg. W. Lee, 34.654683°N 128.593633°E: single damaged female dissected on one slide (collection number NIBRIV0000232641).

**Redescription of female.** Based on single damaged specimen habitus not drawn and body length not measured, as prosome almost completely squashed. Preserved specimen colourless. Nauplius eye absent. Body segmentation as in previous three species. Most somite ornamentation also similar to previous species, and presumably homologous pore and sensilla also indicated with same Arabic and Roman numerals and Greek letters (see Figs. 10A, B, C, D, E, F, 11A) to allow easier comparison. Free pedigerous somites without lateral or dorsal expansions, pleural plates well developed but only partly covering coxae of swimming legs in lateral view. Integument relatively strongly chitinized and without cuticular windows or pits. Surface ornamentation of somites consisting of pores, sensilla, and several rows of spinules (latter on urosomites only); exact number of pores and sensilla unknown, but those homologous with previous three species indicated with Arabic and Roman numerals and Greek letters; those not present in previous species indicated with currency symbols (only five).

Surface of cephalic shield (Fig. 10A, B) ornamented with at least one unpaired pore (no. IV), four pairs of pores (nos. 11, 14, I, III), and 20 pairs of long sensilla (nos. 4, 6–8, 10, 12, 13, 15, 16, 18–20, 23–26, α, γ, $, £). Second pedigerous somite (Fig. 10D) with pair of pores antero-laterally (no. 28), and with nine pairs of long sensilla (nos. 27, 29–35, VII). Third pedigerous somite (Fig. 10E) also with antero-lateral pair of pores (no. 37), and with nine pairs of long sensilla (nos. 36, 38–45). Fourth and fifth pedigerous somites mostly missing. Hyaline fringes of cephalothorax and first two free prosomites braod and smooth.

Genital double-somite (Fig. 10F, 11A) flattened during dissection (as well as rest of urosome) about as long as wide; internal suture (remnant of segmental fusion) strongly sclerotised, visible dorsolaterally at midlength of somite, furnished with two parallel short rows of four to six strong spinules dorsolaterally, and four pairs of sensilla (nos. 59–62), anterior part of genital double-somite also ornamented with two lateral pairs of cuticular pores (nos. 63, VIII); posterior part of genital double-somite with single pair of lateral pores (no. 64), ornamented additionally with posterior row of large spinules (narrowly interrupted dorsally and in two places ventrally), and four pairs of posterior sensilla (nos. 67–70); hyaline fringe finely serrated. Genital complex (Fig. 11A) with single large copulatory pore, strongly sclerotized and wide copulatory duct and two small ovoid seminal receptacles. Single median genital aperture covered by fused reduced sixth legs, represents 51 % of somite's width. Third urosomite ornamented with posterior row of spinules (interrupted dorsally), two unpaired dorsal cuticular pores (nos. 71, 74), two pairs of cuticular pores (no. 73, ) ventrally and laterally respectively, and three pairs of posterior sensilla (nos. 75–77); unpaired dorsal pore no. 74 homologous to unpaired sensillum no. 74 in previous three species; hyaline fringe finely serrated. Fourth urosomite ornamented with single pair of lateral cuticular pores (no. 78), and short posterior row of slender spinules ventrally; hyaline fringe finely serrated. Anal somite (Figs. 10F, 11A) deeply clefted medially (especially ventrally, cleft reaching midlength of somite), with short remnants of transverse internal sclerotised ridge in anterior half, ornamented with pair of large dorsal sensilla (no. 81), six pairs of cuticular pores (nos. 80, 84–86, ¥, ₸), and ventro-lateral posterior row of spinules at base of each caudal ramus; anal operculum slightly convex, narrow, short, reaching 3/5 of anal somite and covering anterior half of anal sinus, represents 37% of somite's width, ornamented with posterior row of 22 small spinules along posterior margin on outer surface; anal sinus ornamented with two parallel diagonal rows of hair-like spinules on each side of median cleft, widely open, with strongly sclerotised walls, and without any chitinous projections.

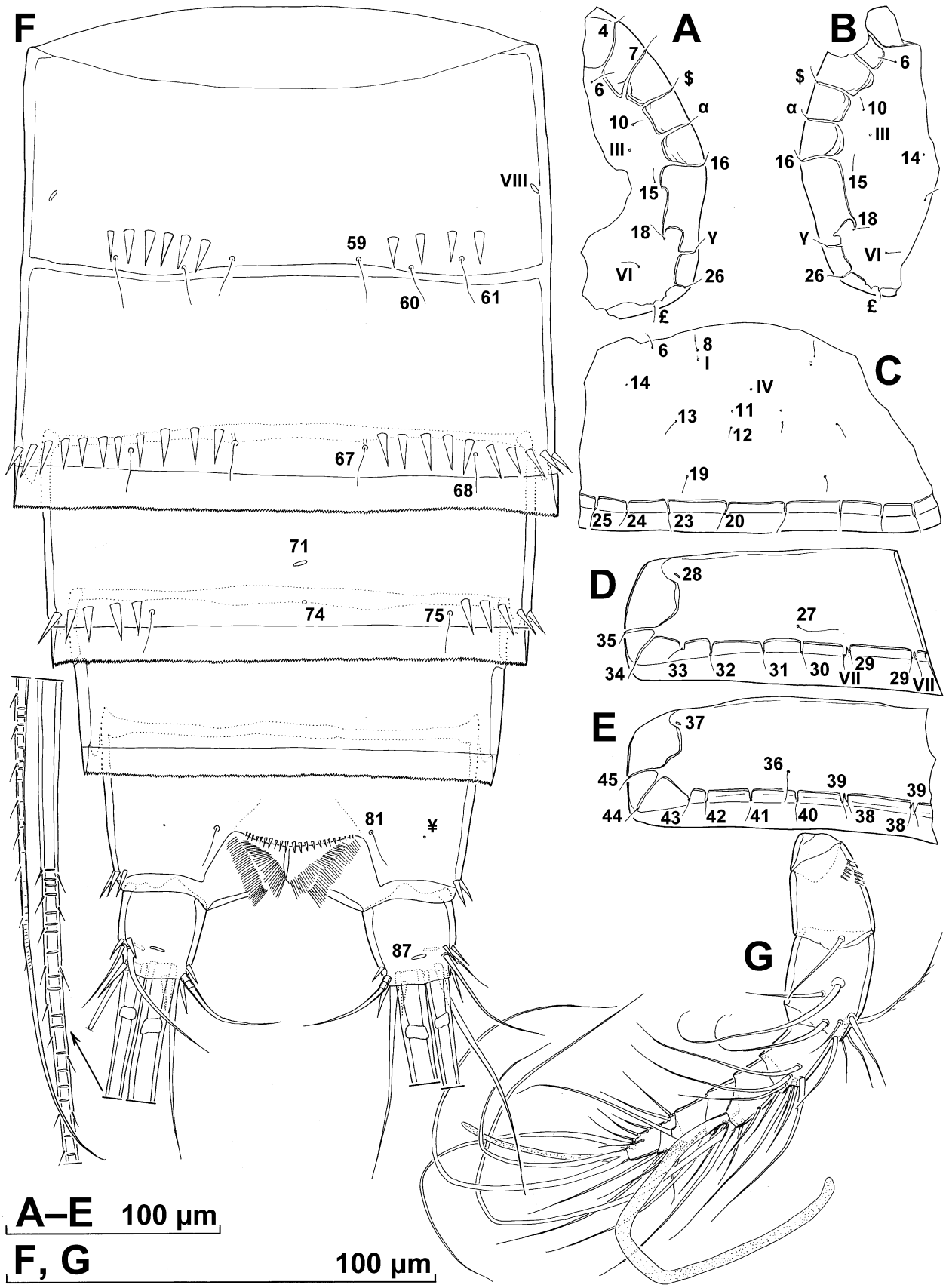


**FIGURE 10.** *Proameira cf. simplex* (Norman & Scott, 1905), female: A, broken right side of cephalic shield; B, broken left side of cephalic shiled; C, broken dorso-posterior side of cephalic shield (drawn from inside); D, pleurotergite of first free thoracic somite; E, broken pleurotergite of second free thoracic somite; F, urosome without fifth pedigerous somite, dorsal view (compressed); G, antennula, ventral view. Arabic and Roman numerals and Greek letters indicating sensilla and pores presumably homologous with those in *Ameira zahaae* **sp. nov.**, *A. kimchi* **sp. nov.** and *Pseuameira mago* **sp. nov.** respectively; currency symbols indicating unique sensilla and pores.

Caudal rami (Figs. 10F, 11A) short, about half as long as anal somite in dorsal view, as long as wide (ventral view), slightly divergent and cylindrical (posterior part only slightly narrowing), with space between them about 1.7 times one ramus width, without dorsal diagonal suture in anterior half; with seven elements (three lateral, one dorsal and three apical); ornamentation consists of three spinules at base of large lateral setae, two spinules on posterior margin ventrally (at base of inner apical seta), single spinule at base of dorsal seta, and two pairs of pores (nos. 87, 88). Dorsal seta relatively short and slender, smooth, inserted on postero-median corner, about 1.4 times as long as caudal ramus, triarticulate at base. Lateral setae all smooth and slender; distalmost seta longest, inserted closer to ventral side and very close to posterior margin, five times as long as smaller proximal seta, twice as long as larger proximal seta, and three times as long as caudal ramus; proximal lateral setae inserted very close to each other in cuticular depressions similar to those of typical sensilla, inserted very close to dorsal side at about 3/4 of ramus length. Inner apical seta smooth, about 0.7 times as long as ventralmost lateral seta. Middle apical seta strongest, with breaking plane, finely bipinnate at middle third of its length, about as long as urosome and 1.5 times as long as outer apical seta. Outer apical seta also with breaking plane and strong, unipinnate along outer margin.

Antennula (Fig. 10G) eight-segmented, joined to cephalotholax with large triangular pseudosegment laterally, approximately half as long as cephalothorax, ornamented with two parallel short rows of spinules on first segment. Long aesthetasc on fourth segment slender, fused basally with adjacent much shorter seta, and reaching beyond tip of appendage for length of last seven segments combined; more slender apical aesthetasc on eighth segment fused basally with two much longer apical setae, forming apical acrothek. Setal formula: 1.9.8.4.2.3.4.7. Only one seta on second segment unipinnate, all other setae smooth. Two lateral setae on seventh segment and four lateral setae on eighth segment biarticulated at base, all other setae uniarticulated and without breaking planes. Length ratio of antennular segments, from proximal end and along caudal margin, 1 : 1.4 : 0.7 : 0.5 : 0.5 : 0.6 : 0.3 : 0.6.

Antenna (Fig. 11B) composed of coxa, allobasis (fused basis and first endopodal segment), one-segmented endopod, and one-segmented exopod, although ancestral suture between basis and first endopodal segment visible in several places. Coxa very short, unarmed and unornamented, about twice as wide as long. Allobasis more than five times as long as coxa and about 2.6 times as long as wide, ornamented with several large spinules along inner margin proximally, unarmed. Endopod 3.7 times as long as wide and nearly 1.2 times as long as allobasis, with two surface frills subdistally, armed laterally with two strongly pinnate spines flanking thin seta; apical armature consisting of five geniculate setae, longest one fused basally to additional smaller seta; smallest seta bearing proximal tuft of fine setules; longest seta bipinnate, others finely unipinnate; ornamentation consisting of seven extremely large spinules on ventral surface, in groups of two, two, and three. Exopod more than twice as long as coxa, with narrow basal part and somewhat wider distal part; unornamented; with one lateral and two apical strong and unipinnate setae; dorsal (outer) apical seta longest, 1.1 times as long as ventral apical seta, about 1.4 times as long as lateral seta, and 1.7 times as long as exopod.

Labrum (Fig. 11C) large compared with cephalothorax, trapezoidal, rigidly sclerotized, with narrow and straight cutting edge, ornamented subapically with two rows of 12 strong spinules each, and apically with numerous minute spinules.

Paragnaths not mounted in satisfactory position to allow independent drawing or proper observation.

Mandibula (Fig. 11D) with narrow cutting edge on elongated coxa, with two tricuspidate strong ventral teeth, three bicuspidate strong teeth in dorsal half, single spinule at middle, and single dorsal unipinnate seta. Coxa ornamented with transverse row of six slender spinules on outer margin. Palp uniramous, comprising basis and one-segmented endopod. Basis with slightly inflated distal part, about 1.6 times as long as wide, with single strong and distally unipinnate inner seta, ornamented with three long and slender spinules along dorsal margin distally. Endopod small, unornamented, about 0.4 times as long as basis and 0.9 times as long as wide; with five slender and smooth apical setae, and one unipinnate inner seta.

Maxillula (Fig. 11E) with large praecoxa, ornamented with three parallel rows of spinules on outer margin; arthrite rectangular, square, with two long anterior surface setae, two lateral, and four apical elements (probably three spines and one seta); dorsalmost two apical elements strong and curved, with apical crown of slender spinules; third element from dorsal side most slender and smooth; ventralmost element extremely strong tooth, with wide and serrated distal margin. Coxal endite much shorter than praecoxal arthrite or basis, armed apically (on inner margin) with one stout and curved element, and another smooth and slender seta. Basis significantly shorter than praecoxal arthrite but more than twice as long as coxal endite,ornamented with arched row of spinules on posterior surface, with four smooth setae apically and subapically; dorsalmost seta strong, others slender. Endopod almost completely fused to basis, with single bipinnate slender seta apically.

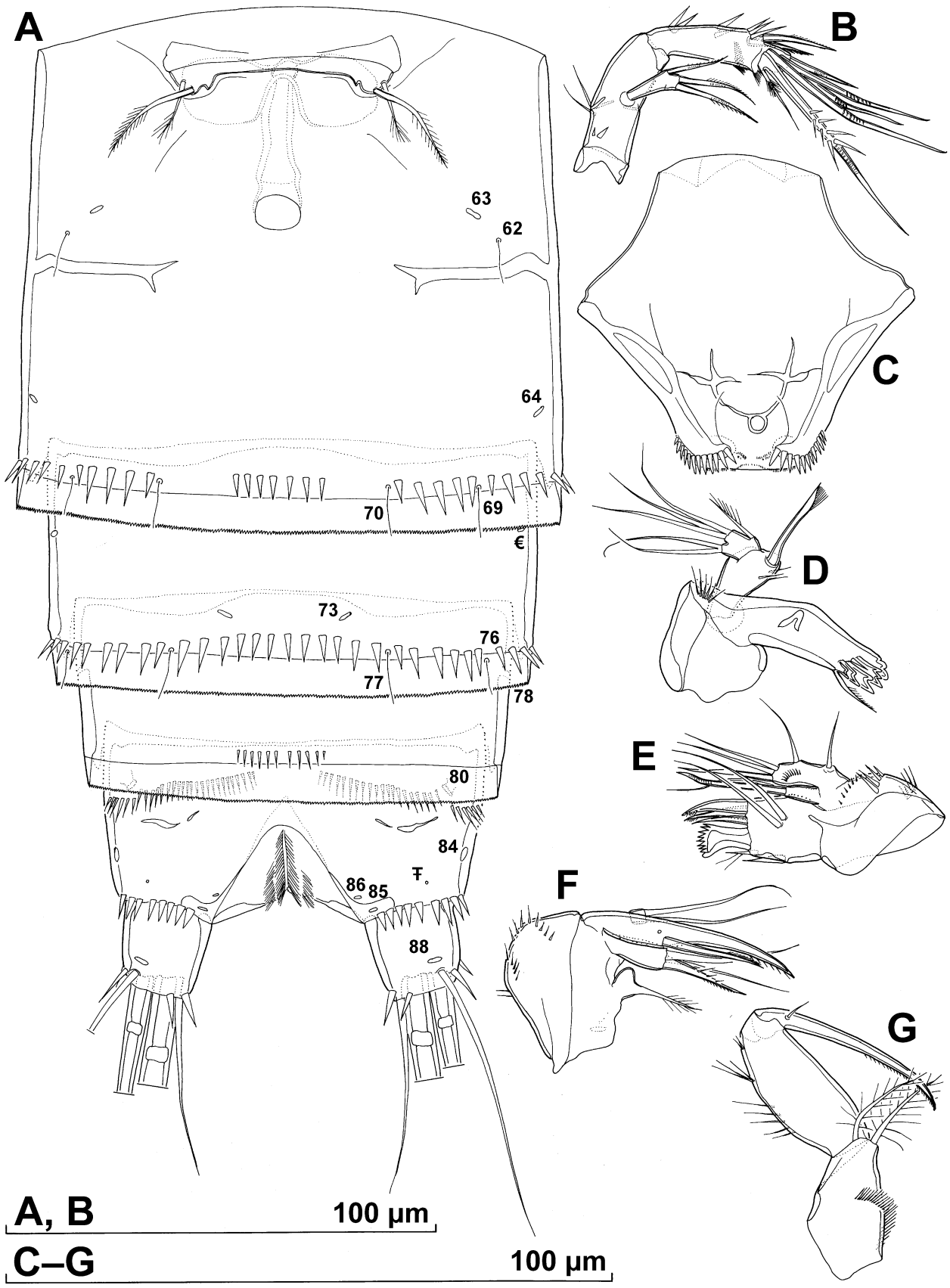


**FIGURE 11.** *Proameira cf. simplex* (Norman & Scott, 1905), female: A, urosome without fifth pedigerous somite, ventral view (compressed and drawn through dorsal side); B, antenna, anterior view; C, labrum, anterior view; D, mandibula, posterior view; E, maxillula, posterior view; F, maxilla, anterior view; G, maxilliped, anterior view. Arabic numerals and currency symbols indicating sensilla and pores as in previous figure.

Maxilla (Fig. 11F) ornamented with three transverse rows of long spinules along outer margin of syncoxa; opening of maxillary gland clearly visible on posterior surface. Proximal endite of syncoxa well developed, although not strongly sclerotized, with characteristically inflated ventral part; unornamented; with single apical setae, which fused at base to endite, slender, soft, and distally bipinnate. Distal endite of syncoxa cylindrical, well sclerotised and highly mobile, armed apically with one strong bipinnate seta, and two smooth and slender setae; smooth setae of subequal length, 1.5 times as long as pinnate seta, and 2.5 times as long as endite. Basis drawn out into long and strong claw, with shorter spiniform and curved seta at base, ornamented with minute pore on anterior surface, at base of seta. Endopod represented by minute but distinct square segment, with two long and smooth apical setae of subequal length; endopodal setae about 1.4 times as long as basal seta, not reaching distal tip of basal claw.

Maxilliped (Fig. 11G) with relatively long and stout syncoxa, ornamented with long arched row of spinules on inner margin, and with two subapical bipinnate setae of subequal length; syncoxal setae about 0.8 times as long as syncoxa. Basis 2.4 times as long as wide and 1.4 times as long as syncoxa, unarmed, ornamented with long and slender spinules along outer margin. Endopod represented by long curved claw, about 1.2 times as long as basis, ornamented with row of spinules along concave margin distally, accompanied at base by minute smooth seta.

All swimming legs (Fig. 12A, B, C, D, E, F) of similar size, long in comparison to body length, composed of small triangular and unarmed praecoxa, large rectangular and unarmed coxa, shorter and nearly pentagonal basis, slender three-segmented exopod, also slender and three-segmented endopod; each leg joined to their pair on opposite side of body by simple quadriform intercoxal sclerite.

First swimming leg (Fig. 12A) with smooth and nearly square intercoxal sclerite, its distal margin wide and slightly concave. Praecoxa larger than in previous three species, ornamented with short row of slender spinules on anterior surface along distal margin. Coxa 1.5 times as wide as long, ornamented with long spinules along outer and inner margins, additionally with two short transverse rows of spinules on anterior surface close to outer margin (one proximal and one distal), and one transverse row of four large spinules on anterior surface proximally and close to inner margin; single cuticular pore situated on anterior surface close to inner distal corner. Basis with one long and strong finely bipinnate spine on outer corner, and one even stronger and also finely bipinnate spine on inner distal corner; ornamentation consists of short rows of large spinules at base of each spine, as well as with distal row of spinules between exopod and endopod, several long and slender spinules on inner margin, and cuticular pore on anterior surface close to outer spine. Exopod with all segments of similar length, each about 1.8 times as long as wide and ornamented with spinules along both inner and outer margins (those on outer margin very strong and long); first two segments with single strong and finely bipinnate spine on outer distal corner; third segment with three strong and finely bipinnate spines on outer margin and two bipinnate setae apically (short pinnules along outer margin, long along inner); outer apical seta geniculate, inner seta not. Endopod geniculate and 1.5 times as long as exopod; first endopodal segment about as long as first two exopodal segments combined, 2.5 times as long as wide, ornamented with slender spinules along inner margin and strong and long spinules along outer and distal margins, with single inner seta, which about 1.6 times as long as segment, slender, and bipinnate, but also finely unipinnate along inner distal margin; second segment smallest, about twice as long as wide and only half as long as first segment, ornamented with several long an strong spinules along outer and distal margins, and with single slender and bipinnate inner seta; third segment slender, about six times as long as wide and twice as long as second segment, armed apically with three elements; innermost apical element probably spine, strong and 0.8 times as long as third segment, unipinnate along outer margin; middle element slightly more slender and geniculate seta, twice as long as outer element, unipinnate distally along outer margin; innermost element slender bipinnate seta, 1.7 times as long as outer element.

Second swimming leg (Fig. 12B) with intercoxal sclerite ornamented with four strong spinules on anterior surface, its distal margin wide and concave. Praecoxa small and triangular, ornamented with row of long spinules on anterior surface along distal margin. Coxa nearly 1.6 times as wide as long, ornamented with transverse row of small spinules on anterior surface proximally, diagonal row of eigth long spinules on anterior surface distally, and with long spinules along outer margin; single cuticular pore on anterior surface close to inner distal corner. Basis with single finely bipinnate and strong spine on outer corner; ornamented with spinules at base of spine, as well as with distal row of spinules between exopod and endopod, two rows of extremely long and slender spinules on inner margin, and cuticular pore on anterior surface close to outer spine. Exopod with all segments of about same width, third segment almost 1.7 times as long as second segment and 1.5 times as long as first segment; first two segments

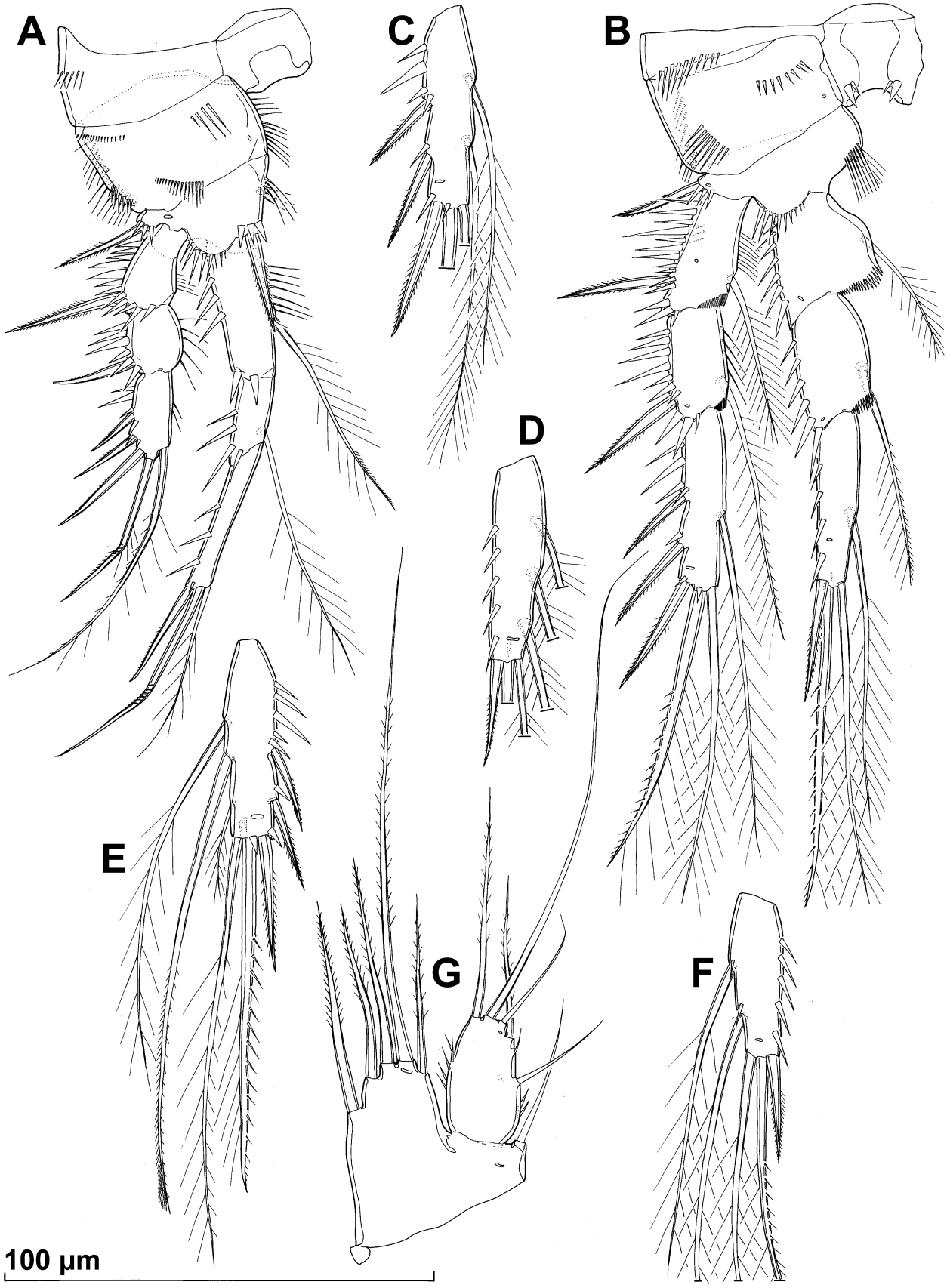


**FIGURE 12.** *Proameira cf. simplex* (Norman & Scott, 1905), female: A, first swimming leg, anterior view; B, second swimming leg, anterior view; C, third exopodal segment of third swimming leg, anterior view; D, third endopodal segment of third swimming leg, anterior view; E, third exopodal segment of fourth swimming leg, anterior view; F, third endopodal segment of fourth swimming leg, anterior view; G, fifth leg, anterior view.

ornamented with strong spinules along outer margin, slender spinules along inner margin, single pore on anterior surface at base of outer spine, and with inner distall frill, each with outer finely bipinnate spine and inner bipinnate seta; third segment ornamented with pore near outer distal corner and spinules along outer and distal margins, with three strong and finely bipinnate outer spines, two apical bipinnate setae, and one slender and bipinnate inner setae; outer apical seta very strong (spiniform) with spinules along outer margin much shorter than those along inner margin, about 1.6 times as long as segment, and 2.3 times as long as outer spines; inner apical seta slender, with sparse long spinules on both inner and outer margins, as long as outer apical seta; inner seta 1.9 times as long as third segment. Endopod straight (not geniculate) and as long as exopod, progressively narrower from proximal to distal end, each segment with single pore on anterior surface close to outer distal corner, and row of strong spinules along outer margin; third segment about 1.5 times as long as first or second; first two segments additionally ornamented with strong frill on inner distal corner, and with single slender bipinnate inner seta; third segment with one inner seta, two apical setae and one subapical outermost spine; apical setae of equal length, bipinnate, 0.8 times as long as entire endopod, about as long as inner seta, and nearly 2.6 times as long as outer spine; outer apical seta on third segment with short spinules along outer margin and slender long spinules along inner margin; inner setae on second segment with short spinules along inner margin, and long spinules along outer margin.

Third swimming leg (Fig. 12C, D) very similar to second swimming leg, except for slender outer seta on basis, and three inner setae on third endopodal segment, and two inner setae on third exopodal segment.

Fourth swimming leg (Fig. 12E, F) similar to third swimming leg, except for length of outer basal seta (shorter on fourth leg) and armature of third exopodal and endopodal segments. Third exopodal segment ornamented with two spinules on posterior surface distally, in addition to outer spinules and anterior pore; with three outer finely bipinnate spines, two apical bipinnate setae, and three inner setae; distal inner seta minute, midlle inner seta very strong and with comb of strong spinules on inner margin distally, while proximal inner seta slender and bipinnate; inner apical seta slender and bipinnate, 1.2 times as long as much stronger outer apical seta, and slightly shorter than middle inner seta. Third endopodal segment with two inner setae.

Fifth leg (Figs. 12G) biramous, composed of wide baseoendopod and smaller ovoid exopod, with minute connecting plate and not fused medially. Baseoendopod with outer basal seta slender and unipinnate, arising from short setophore; baseoendopod with one cuticular pore on anterior surface at base of outer seta, and another near distal margin of endopodal lobe. Endopodal lobe relatively wide, trapezoidal, extending slightly beyond half of exopod , with five stout, bipinnate setae, with length ratio (from inner side), 1 : 0.8 : 1 : 2.4 : 0.8. Exopod about 1.6 times as long as its maximum width, ornamented with several long and slender spinules along inner margin, two proximal spinules on outer margin, one pore on anterior surface, and one pore on posterior surface; with six setae; innermost and fourth seta from inner side bipinnate, other four setae smooth; fifth seta from inner side minute. Length ratio of six exopodal setae, from inner side, 1 : 2.1 : 0.6 : 0.7 : 0.1: 0.5.

Sixth legs (Fig. 11A) completely fused together, indistinct, forming simple operculum covering single gonopore, without any ornamentation, each with two bipinnate setae and minute spine; inner seta pointing postero-laterally, about 1.7 times as long as outer seta, which pointing posteriorly.

**Variability.** Only one specimen was examined and no asymmetric features were observed.

**Remarks.** There is a limit to what one can do with a single damaged specimen. Comparisons based on a limited set of morphological characters will always be limited in their conclusions as well, even if one succeeds in securing type specimens of all potentially closely related species and comparing them morphologically. That is why we only provisionally identified this specimen as *Proameira cf. simplex* (Norman & Scott T., 1905). The record is significant enough to be worth reporting, as the genus *Proameira* Lang, 1955 has not been previously recorded in Korea, or indeed anywhere in Asia, or even in the Pacific. Hopefully, continuing sampling in the South Sea will result in more specimens of this population, which can than be studied in more detail and be compared to the types from England. Although the great geographical distance would suggest little chance of these two populations preserving an efficient gene flow naturally (and thus belonging to the same biological species), anthropogenic translocation of the world fauna these days is such that any unusual disjunct pattern cannot be rejected *a priori* (for a summary regarding copepods see Karanovic & Krajicek 2012).

*Proameira* is a rather small ameirid genus, with only nine species been described so far (Walter & Boxshall 2011). *Proameira arenicola* (Lang, 1935) is known from Sweden, *P. dubia* (Sars, 1920) from Norway, Sweeden, and Israel, *P. echinipes*, 1975 from France, *P. hiddensoensis* (Schäfer, 1936) from Germany, *P. phaedra* (Monard, 1935) from France, *P. psammophila* Wells, 1963 from Ireland, *P. signata* Por, 1964 from Sweden, *P. thetiensis*

Pallares, 1982 from Argentina (see Lang 1948; Klie 1950; Kunz 1954; Wells 1963; Por 1964a, 1964b; Soyer 1974; Pallares 1982). Almost all differ from our specimen by a number of morphological characters, such as the length of the first endopodal segment of the first swimming leg, shape of the fifth leg, and relative length of some elements on the swimming legs. Unfortunately, most descriptions of these species are lacking in detail, so many characters cannot be compared even with our very limited set of characters from a single Korean specimen (mouth appendages, for example, were studied only superficially previously, if at all). Nevertheless, having compared only the drawings and descriptions of these species (without access to types), we conclude that *P. signata* could possibly be a junior subjective synonym of *P. simplex*, as the morphological similarities are compelling, and the latter was recorded not far away from the type locality of the former (Lang, 1948). Por (1964a) only compares his *P. signata*to the very different *P. arenicola*, and not at all to *P. simplex*, so it is quite possible that he somehow overlooked the existence of *P. simplex.*

*Proameira simplex* was described originally from Devon (England), and was subsequently recorded from Russia (Barents Sea), Norway, Sweden, Germany, France, Algeria, and the United States (see Lang 1948; Soyer 1966; Chislenko 1967; Kornev & Chertoprud 2008). The specific identity of the Algerian and American populations were questioned by Lang (1948). The original description by Norman & Scott (1905) is hardly usable today, as is their redescription (Norman & Scott 1906). One of the most complete redescriptions so far is that by Sars (1907) (note: almost completely reproduced in Lang 1948), but this was done on Norwegian specimens. We have to concide that the identity of this species will remain problematic until a full redescription is supplied, based on the type material. The Korean specimen shows very few differences from those illustrated by Sars (1907), and most of them could be explained by the quality of microscopes available more than a century ago. For example, Sars (1907) does not illustrate the minute seta on the fifth leg exopod, but this armature element (Fig. 12G) could be observed only on the highest of magnifications, as it is smaller and certainly much thiner than most spinules on that segment. We are very confident that the absence of some ornamentation elements on the swimming legs (pores for example, and some rows of spinules) could be explained in the same way. Note that Por (1964a) did illustrate the minute seta on the fifth leg endopod for *P. signata*. The only difference between the drawings of Sars (1907) and our specimen that can not be explained in this manner is the relative length of the outermost seta on the fifth leg baseoendopod, which calls for caution in positive identification. This can, however, be a variable feature too. Por (1964a) showed that even the armature formula of the swimming legs can be variable in *P. signata*. We cannot answer these questions until more specimens of the Korean population become available, so that its variability can be studied.

## Key to species of Korean Ameiridae

1. Antennula eight-segmented . . . . . 2
– Antennula six-segmented . . . . . *Pseudameira mago* **sp. nov.**
2. First exopodal segment of second to fourth legs without inner seta . . . . . 3
– This segment with inner seta . . . . . *Proameira cf. simplex* (Norman & Scott T., 1905)
3. Anal operculum with smooth dorsal side; second exopodal segment of first leg without inner seta . . . . . 4
– Anal operculum with strong spinules dorsally; second exopodal segment of first leg with inner seta . . . . . 6
4. Inner medial corners of anal somite not produced posteriorly and weekly sclerotised . . . . . 5
– These corners produced posteriorly and strongly sclerotised . . . . . *Ameira kimchi* **sp. nov**
5. Caudal rami with smooth inner margin; innermost exopodal seta on male fifth leg minute . . . . . *Amira zahaae* **sp. nov.**
– Caudal rami with spinules on inner margin; innermost exopodal seta on male fifth leg well-developed . . . . . *Ameira parvula* (Claus, 1866) *sensu* Chang (2007)
6. Third exopodal segment of fourth leg with seven elements . . . . . 7
– This segment with eight elements . . . . . *Nitokra affinis californica* Lang, 1965
7. Third endopodal segment of second leg with three inner setae . . . . . 8
– This segment with two inner seae . . . . . *Nitokra lacustris* (Schmankevitch, 1875)
8. First endopodal segment of first leg shorter than first two exopodal segments combined . . . . . 9
– This segment as long as first two exopodal segments combined . . . . . *Nitokra spinipes* Boeck, 1865
9. All elements on fifth leg baseoendopod in male of same length and strength; female fifth leg exopod less than twice as long as wide . . . . . *Nitokra pietschmanni* (Chappuis, 1934)
– Innermost element on fifth leg baseoendopod in male much stronger and longer than other two; female fifth leg exopod more than twice as long as wide . . . . . *Nitokra koreana* Chang, 2007

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