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A NEW SPECIES OF *LABIDOCERA* (COPEPODA, CALANOIDA,
PONTELLIDAE) FROM THE ARABIAN GULF

BY

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ABSTRACT

A new species of marine epiplanktonic copepod of the genus *Labidocera* Lubbock, 1853 (Calanoida, Pontellidae), *Labidocera kuwaitiana* sp. nov., is described from the coastal waters of the Arabian Gulf [=Persian Gulf] near Kuwait. The species belongs to the ‘*darwinii*’ species group because it has an endopod on the left fifth leg of the male, but differs distinctly from other members of the group in having a dorsal process on the genital double-somite in the female and a greatly elongated, toothed process on segments XXI-XXIII at the prehensile antennule in the male. The new species is closely related to *L. acutifrons* (Dana, 1849), but may be distinguished from *L. acutifrons* by details of the urosome and fifth leg in the female and details of the fifth leg and prehensile antennule in the male. The size of the eye lenses in *Labidocera kuwaitiana* sp. nov. males is shortly discussed. A key to the species of the ‘*darwinii*’ group is presented.

RIASSUNTO

In questo studio viene descritta una nuova specie di copepode marino epiplanctonico del genere *Labidocera* Lubbock, 1853 (Calanoida, Pontellidae), *Labidocera kuwaitiana* sp. nov., ritrovata nelle acque costiere del Golfo Arabo vicino al Kuwait. La specie appartiene al gruppo ‘*darwinii*’, per la presenza di un endopodite sulla quinta zampa sinistra del maschio, ma differisce distintamente dagli altri membri del gruppo per avere, nella femmina, un processo dorsale sul doppio somite genitale e, nel maschio, un processo fortemente allungato e dentellato sui segmenti XXI-XXIII dell’antennula prensile. La nuova specie è strettamente affine alla specie *L. acutifrons* (Dana, 1849), da cui può essere distinta per alcune caratteristiche dell’urosoma della femmina, dell’antennula prensile del maschio, e della quinta zampa dientrambi i sessi. Vengono brevemente discusse le dimensioni delle lenti oculari nei maschi di *Labidocera kuwaitiana* sp. nov. Viene infine fornita una chiave tassonomica per l’identificazione delle specie conosciute del gruppo ‘*darwinii*’.

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INTRODUCTION

To date, 5 species of the genus *Labidocera* have been recorded in the northwestern Arabian Gulf: *L. acuta* (Dana, 1849); *L. bengalensis* Krishnaswamy, 1952; *L. kroyeri* (Brady, 1883); *L. minuta* Giesbrecht, 1889; and *Labidocera* sp. Al-Yamani & Prusova, 2003 (Al-Yamani et al., 2011). *Labidocera* sp. Al-Yamani & Prusova was first reported in the region in 2003 (Al-Yamani & Prusova, 2003) with brief descriptions and drawings of some body parts of a female and male given. A thorough re-examination of this species using neuston samples collected in Kuwait waters in 2012 has shown it to be distinct from other known species of *Labidocera*. We now establish the specific name for this species and provide its detailed description and drawings.

MATERIAL AND METHODS

Neustonic zooplankton was collected from Kuwait's coastal waters in the northwestern Arabian Gulf as part of the neuston project which was funded by the Kuwait Institute for Scientific Research. The sampling equipment used was a neuston net of 300- μ m mesh aperture with a rectangular net mouth of 130 cm in length and 40 cm in width. The net was towed in a horizontal haul for 5 min, at approximately 15 cm depth. Samples were preserved in 4% borax-buffered formaldehyde in seawater. Temperature and salinity data were collected in situ using a JFE AAQ177 RINKO water quality profiler (JFE Advantech). Type material was obtained from the sample collected at Station 6 (29°19'00"N 48°09'59"E) on 17 October 2012. Sea surface temperature during sampling was 28.78°C, salinity was 42.33‰ (data from CTD cast). *Labidocera* specimens were sorted out from the sample and immersed in a 50:50 solution of glycerin and distilled water. Oral parts and swimming legs were dissected from glycerin-mounted specimens, line drawings were made using a camera lucida attached to a Leica DM LS2 brightfield compound microscope.

Terminology follows Huys & Boxshall (1991). The following abbreviations are used: A1, antennule; P1-P5, swimming legs 1-5; Enp, endopod; Exp1-2, exopods 1-2; SD, standard deviation. Articulating segments of the antennule are designated by Arabic numerals, ancestral segments by Roman numerals. One seta and one aesthetasc on a segment of the antennule are designated as 1s + 1ae.

Type material is formalin-preserved and deposited at the Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia (ZIN).

DESCRIPTION

Family PONTELLIDAE Dana, 1853

Genus *Labidocera* Lubbock, 1853***Labidocera kuwaitiana* sp. nov. (figs. 1-10)**

Material examined.— Nineteen adult females, total length range 2.41-2.66 mm, mean 2.53 mm; 28 adult males, total length range 2.27-2.83 mm, mean 2.51 mm. Holotype: adult female, total length 2.66 mm, body and dissected appendages in vial (ZIN 91115). Allotype: adult male, total length 2.76 mm, body and dissected appendages in vial (ZIN 91116). Paratypes: 18 females and 23 males in vial (ZIN 91117).

Description of adult female.— Body (fig. 1A, B) robust, with prosome approximately 4.5 times as long as urosome. Cephalosome and first pedigerous somite separate, fourth and fifth pedigerous somites fused; posterior corners of prosome with acute triangular processes, symmetrical in dorsal view, directed posteriorly and extending to posterior end of genital double-somite. Cephalosome without lateral hooks, with small median crest and a pair of dorsal eye lenses, lenses spherical, small and situated apart; rostrum 2-pointed, with points widely spaced, with a widened base incorporating a lens, gap between rostral points is about the length of point itself (fig. 2C, D). Urosome of 3 somites. Genital double-somite wider than long, asymmetrical (fig. 1C, D), with dorsally extended robust process arising from dorsal surface on the right (arrowed in fig. 1A, B, C, E), genital pores dorsal, situated at the process's base (fig. 1F). Caudal rami strongly asymmetrical: left ramus partly fused to anal somite with proximal half swollen laterally, right ramus separated from anal somite. Left ramus with seta II naked and directed anteriorly, setae III-VII plumose and directed posteriorly, setae IV and V slightly expanded in their proximal part; right ramus with seta I rudimentary and naked, setae II-VII plumose and directed posteriorly, setae IV and V with no proximal thickening (fig. 1C, D).

Antennule (figs. 1B, 2A): symmetrical, reaching to mid-length of urosome when extended posteriad, consisting of 23 articulated segments; posterior margin of segments 2-12 (ancestral segments II-XVI) fringed with fine hairs; ancestral segments II-IV completely fused and VII-IX incompletely fused; armature as follows: I, 3s + 1ae; II-IV, 4s + 1ae; V, 2s + 1ae; VI, 2s; VII-IX, 6s + 2ae; X, 2s; XI, 2s + 1ae; XII, 2s; XIII, 2s + 1ae; XIV, 2s + 1ae; XV, 2s + 1ae; XVI, 2s + 1ae; XVII, 2s + 1ae; XVIII, 2s + 1ae; XIX, 2s + 1ae; XX, 2s + 1ae; XXI, 2s + 1ae; XXII, 1s; XXIII, 1s; XXIV, 1s + 1s; XXV, 1s + 1s + 1ae; XXVI, 2s; XXVII-XXVIII, 4s + 1ae.

Antenna (fig. 3A): coxa with 1 plumose seta; basis and first endopodal segment fused, with 4 setae; second endopodal segment bilobed with 9 and 7 setae on proximal and distal lobes, respectively, distal lobe armed with row of spinules; exopod incompletely 7-segmented, with 1, 4, 2, 1, 1 and 3 setae.

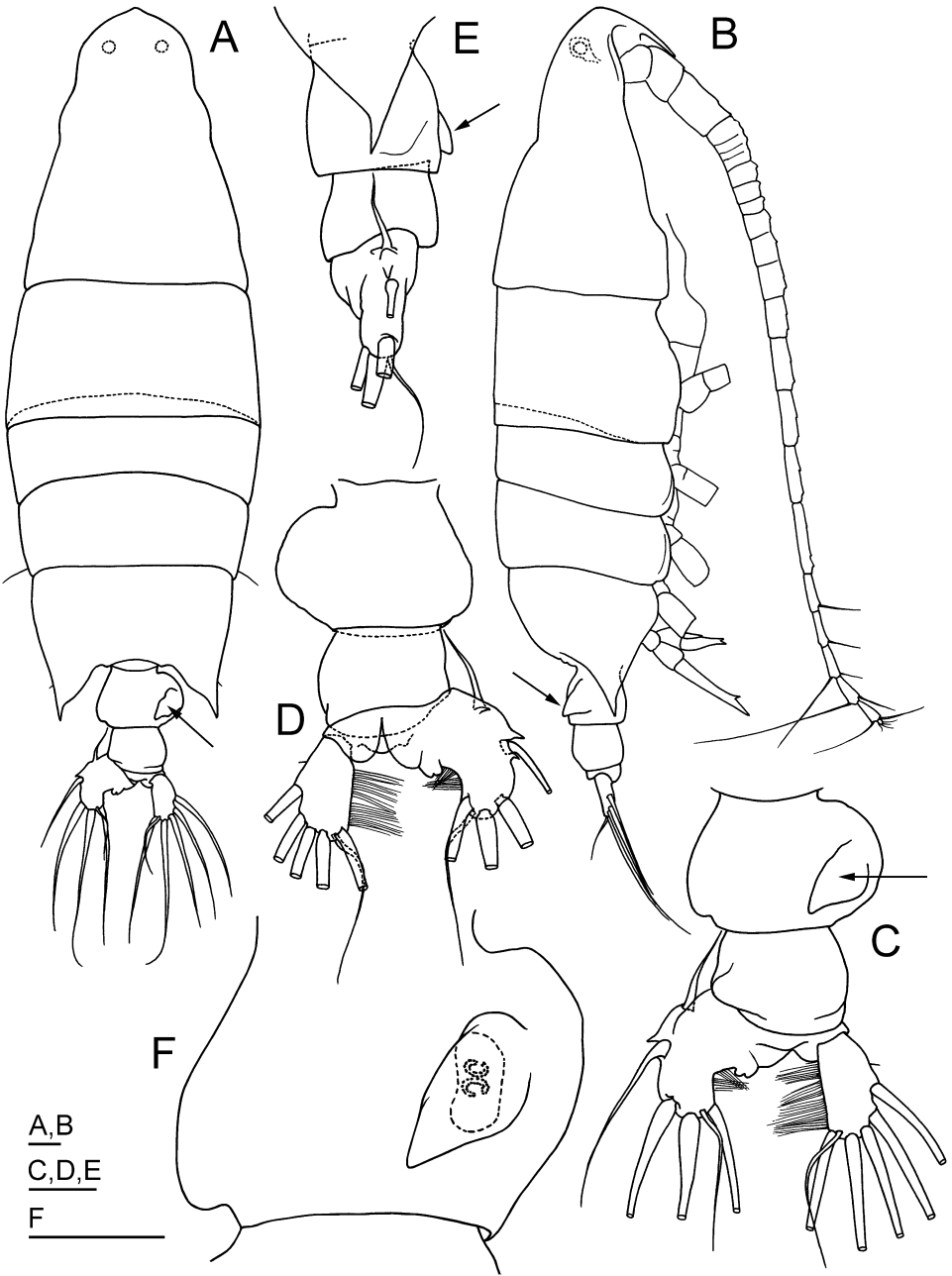


Fig. 1. *Labidocera kuwaitiana* sp. nov., female. A-E, holotype, F, paratype; A, habitus, dorsal; B, habitus, lateral; C, urosome, dorsal; D, urosome, ventral; E, urosome, left lateral; F, genital double-somite, dorsal. Arrows indicate the dorsally extended process on the genital double-somite. Scale bars = 0.1 mm.

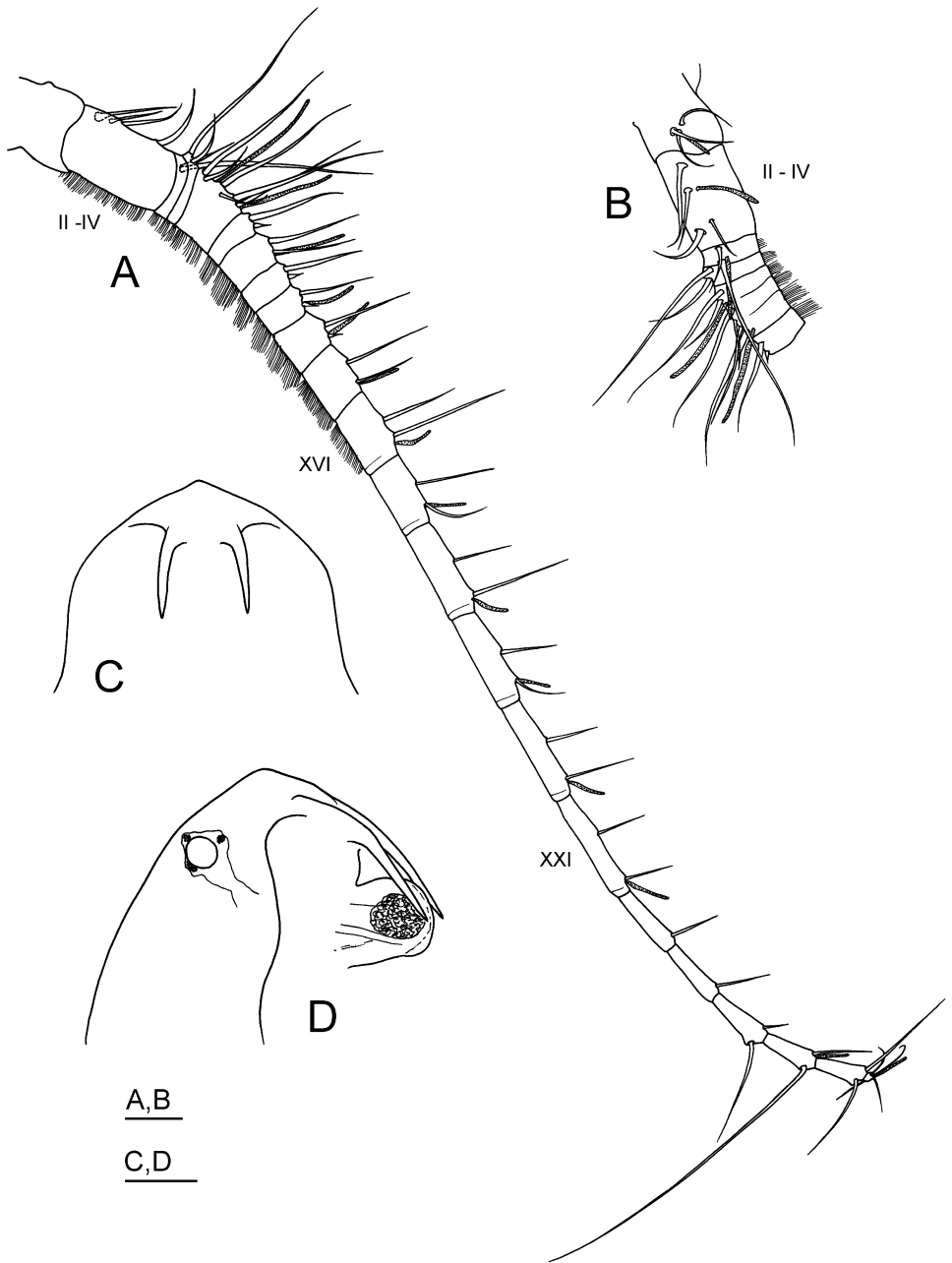


Fig. 2. *Labidocera kuwaitiana* sp. nov., female. A-D, holotype; A, right antennule, lateral view; B, right antennule, articulated segments 1-6 (ancestral segments I-X); C, anterior head with rostrum, ventral; D, anterior head with rostrum, right lateral. Scale bars = 0.1 mm.

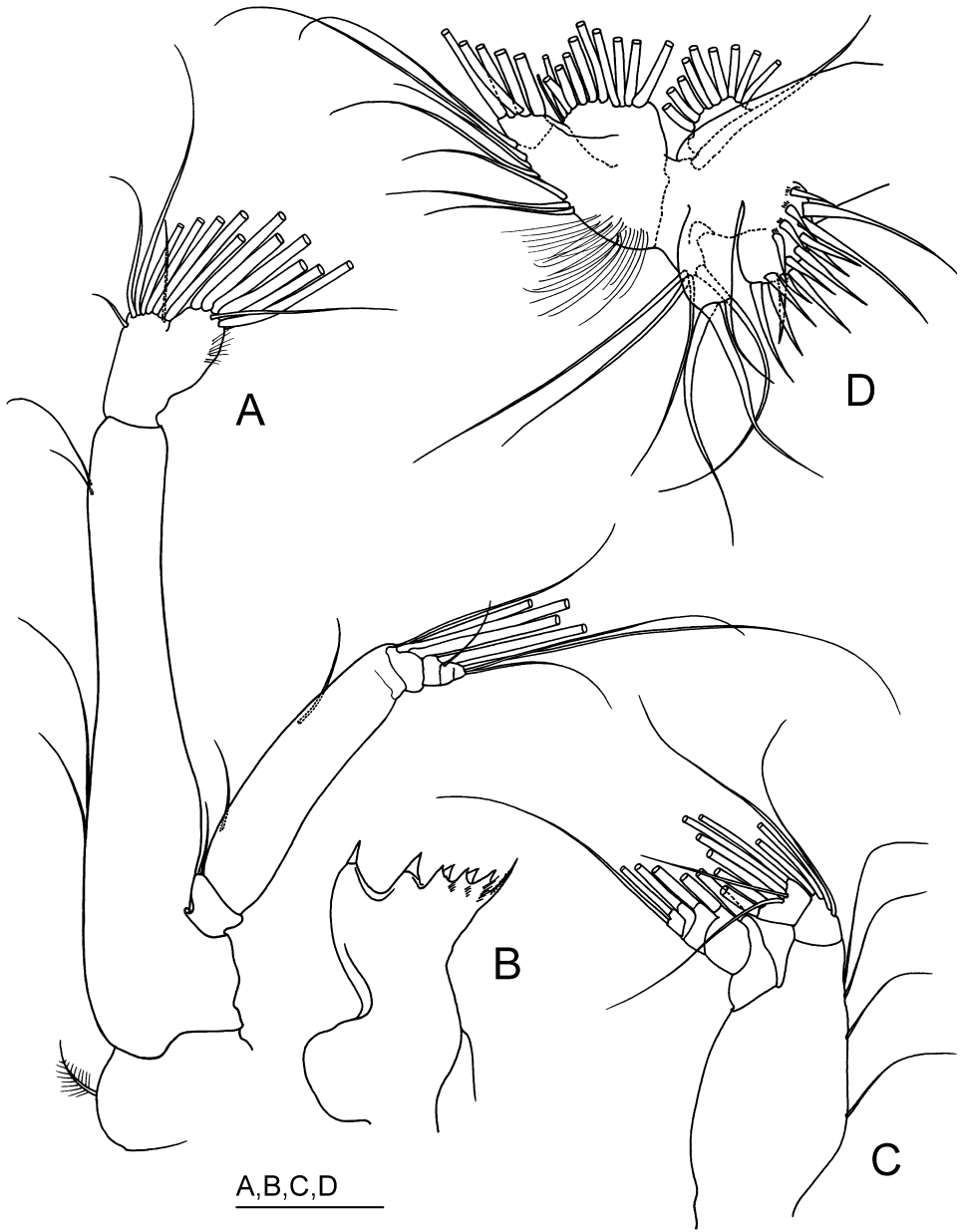


Fig. 3. *Labidocera kuwaitiana* sp. nov., female. A-D, holotype; A, antenna; B, mandible, gnathobase; C, mandible, palp; D, maxillule. Scale bar = 0.1 mm.

Mandible (fig. 3B, C): gnathobase with 5 teeth and 1 dorsal seta, third and fourth (counted from ventral) teeth bicuspidate, base of third, fourth and fifth teeth with

row of small spinules; mandibular palp with 4 setae on basis; endopod 2-segmented with 4 and 8 setae, respectively; exopod 5-segmented with 1, 1, 1, 1 and 2 setae.

Maxillule (fig. 3D): praecoxal arthrite with 16 spines, coxal endite with 3 setae and coxal epipodite with 9 setae, basis with 4 setae on proximal endite and 3 setae on distal endite fused to endopod and with fine long hairs on proximal part of distal endite, exite with 1 seta; endopod with 4 lateral and 5 apical setae, exopod with 11 setae.

Maxilla (fig. 4A) with long, strong and spinous setae: first praecoxal endite with 6 setae, second praecoxal endite with 3 setae; first and second coxal endites with 3 setae each idem; basis with 3 setae; endopod 4-segmented with 1, 2, 2 and 2 setae.

Maxilliped (fig. 4B) relatively small: praecoxa and coxa fused bearing long spinulose setae, with setal formula of 0, 2, 3, 3; basis fringed with row of small teeth on inner margin, bearing 2 small setae distally; endopod 4-segmented, first segment with 2 proximal and 2 distal setae, second, third and fourth segments with 1, 1 and 3 setae, respectively.

Swimming legs 1-4 (fig. 5A-D) with 3-segmented exopods and 2-segmented endopods, coxa bearing inner plumose seta; outer margin of first endopodal segment of legs 1-4 irregular, with a shallow notch at its mid-length; basis of leg 4 with tiny outer seta on posterior side (fig. 5E). Spine and setae formula as in table I.

Leg 5 (fig. 6A-D): coxae and intercoxal sclerite completely fused, left and right bases of approximately equal size, with 1 plumose seta each, left basis with small distal projection on posterior side; endopods rudimentary, spiniform, symmetrical; exopods 1-segmented, asymmetrical, of unequal length and shape. Right exopod 1.7-1.8 times as long as the left one, ornamented with a short row of tiny setules along its inner edge submedially, terminating in 2 relatively large unequal divergent pointed processes and 1 minute sub-apical inner process; left exopod terminates in 2 small pointed processes, with 1 short distal outer spine.

Description of adult male.— Body (fig. 7A, B) in general shape and proportions close to that of female, prosome approximately 4 times as long as urosome. Cephalosome and first pedigerous somite separate, fourth and fifth pedigerous somites fused; posterior corners of prosome with sharp triangular processes, symmetrical in dorsal view, slightly divergent, extending to posterior end of first urosomal somite. Cephalosome without lateral hooks, with small median crest and a pair of dorsal spherical lenses; rostrum 2-pointed, with points widely spaced, with a widened base incorporating a lens, gap between rostral points is about the length of point itself (fig. 7D, E). Urosome (fig. 7C) of 5 somites, symmetrical; genital somite slightly swollen laterally, genital opening on the left. Caudal rami symmetrical, each ramus with 6 plumose setae and 1 rudimentary naked seta, thickening of basal part of setae is not present.

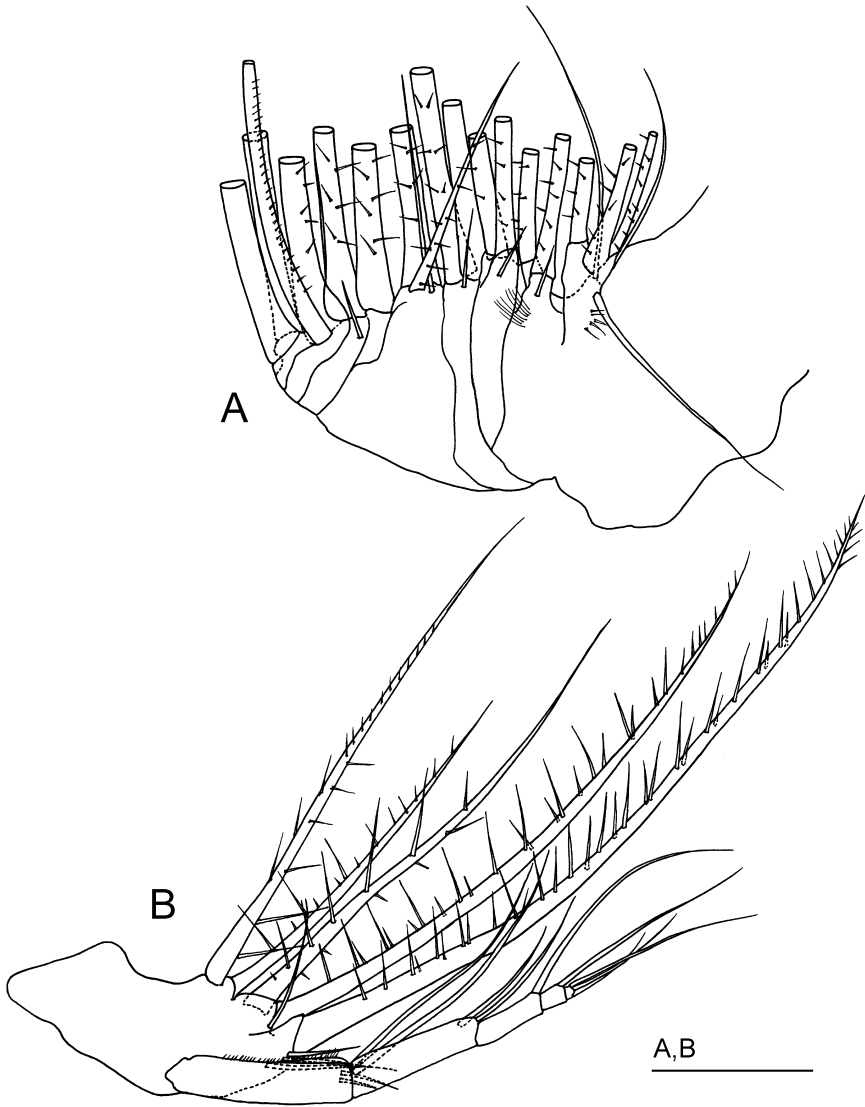


Fig. 4. *Labidocera kuwaitiana* sp. nov., female. A-B, holotype; A, maxilla; B, maxilliped. Scale bar = 0.1 mm.

Antennule: left one nongeniculated, reaching to mid-length of urosome, with segmentation and setal formula as in female, posterior margin of segments 2-13 fringed with fine hairs; right one prehensile (figs. 7B, 8A), slightly shorter than the left one, indistinctly 15-segmented, hairs along posterior margin lacking, segments V-IX incompletely fused. Fusion pattern and setal formula of prehensile antennule as follows: I, 3s + 1ae; II-IV, 4s + 1ae; V-IX, 10s + 3ae; X-XI, 4s + 1ae; XII-XIV, 6s + 2ae; XV-XVI, 4s + 2ae; XVII, 2s + 1ae; XVIII, 2s + 1ae; XIX, 1s +

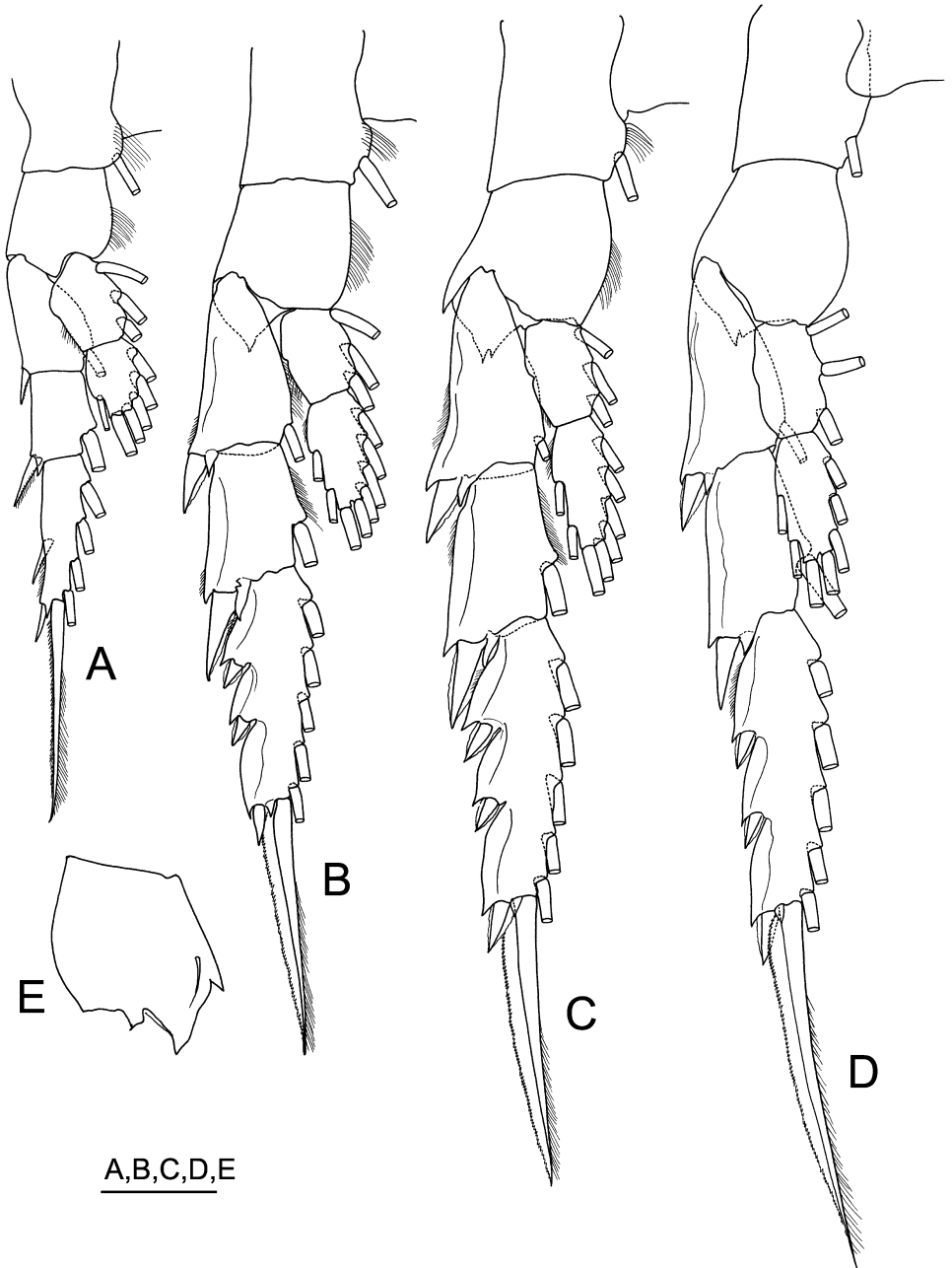


Fig. 5. *Labidocera kuwaitiana* sp. nov., female. A-E, holotype; A, P1, anterior; B, P2, anterior; C, P3, anterior; D, P4, anterior; E, P4 basis, posterior. Scale bar = 0.1 mm.

TABLE I
Armature of the swimming legs 1-4 of *Labidocera kuwaitiana* sp. nov. female

| | Coxa | Basis | Exopodal segments | | | Endopodal segments | |
|-----|------|-------|-------------------|-----|-----------|--------------------|---------|
| | | | 1 | 2 | 3 | 1 | 2 |
| P 1 | 0-1 | 0-0 | I-1 | I-1 | II, I, 4 | 0-3 | 1, 2, 3 |
| P 2 | 0-1 | 0-0 | I-1 | I-1 | III, I, 5 | 0-3 | 2, 2, 4 |
| P 3 | 0-1 | 0-0 | I-1 | I-1 | III, I, 5 | 0-3 | 2, 2, 4 |
| P 4 | 0-1 | 1-0 | I-1 | I-1 | III, I, 5 | 0-3 | 2, 2, 3 |

Arabic numerals represent setae, roman numerals indicate spines.

1ae + hooked ridge; XX, 1s + 1ae + hooked ridge; XXI-XXIII, 2s + 1ae + serrated ridge; XXIV, 1s + 1s + hooked ridge; XXV, 1s + 1s + 1ae; XXVI, 1s + 1s; XXVII-XXVIII, 4s + 1ae. Segment XIX with anterior hooked process proximally, segment XX with enlarged toothed process at the proximal anterior margin extending anterior of segment XIX and reaching its proximal anterior hooked process, compound segments XXI-XXIII with enlarged toothed process at the distal anterior margin extending to distal 1/7 of segment XXIV, segment XXIV with lamelliform process (fig. 8B).

Antenna, mandible, maxillule, maxilla, maxilliped well-developed, with segmentation and setal formula as in female.

Swimming legs 1-4 with segmentation and armature as in female.

Leg 5 (fig. 9A-F) asymmetrical, highly modified. Right leg: coxa completely separated from intercoxal sclerite, basis with proximal outer seta, exopod 3-segmented with two first segments forming a chela which is ovoid when closed (fig. 9A-C); first exopodal segment large and orbicular, with stout proximal "thumb" bearing 1 seta, with striate bilobed roundish process proximally and 1 short curved seta distally on lateral margin facing opposing segment; second segment boot-like with 1 medial spine and small conical sub-distal process on lateral margin facing opposing segment, and 1 medio-distal curved seta; third segment narrow and elongated, nearly 7 times as long as wide, bearing 2 setae and 1 small spine apically. Left leg: coxa coalesced into intercoxal sclerite; basis and endopod fused, bearing proximal outer seta and ending in lacinate and inwardly twisted appendage; exopod 2-segmented with first segment being 2.4-2.5 times as long as the second one and bearing 1 small distal outer spine, second segment with 1 small sub-distal spine, 3 apical unequal spinous processes, and hirsute inner border.

Etymology.— The specific name refers to the area (Kuwait waters) where the species was first found. It is an adjective agreeing in gender with the (feminine) generic name.

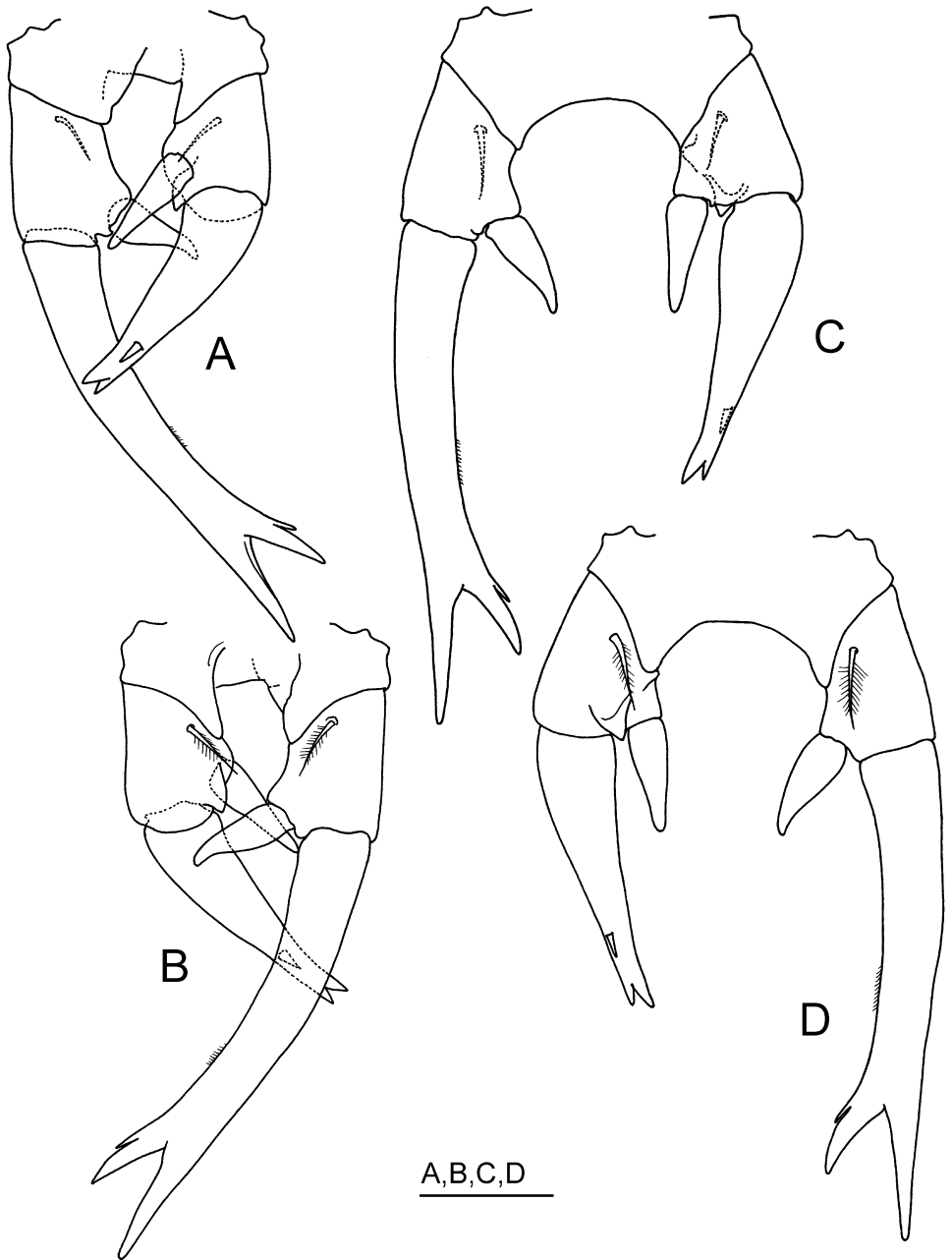


Fig. 6. *Labidocera kuwaitiana* sp. nov., female, P5. A, B, holotype; C, D, paratype; A, C, anterior; B, D, posterior. Scale bar = 0.1 mm.

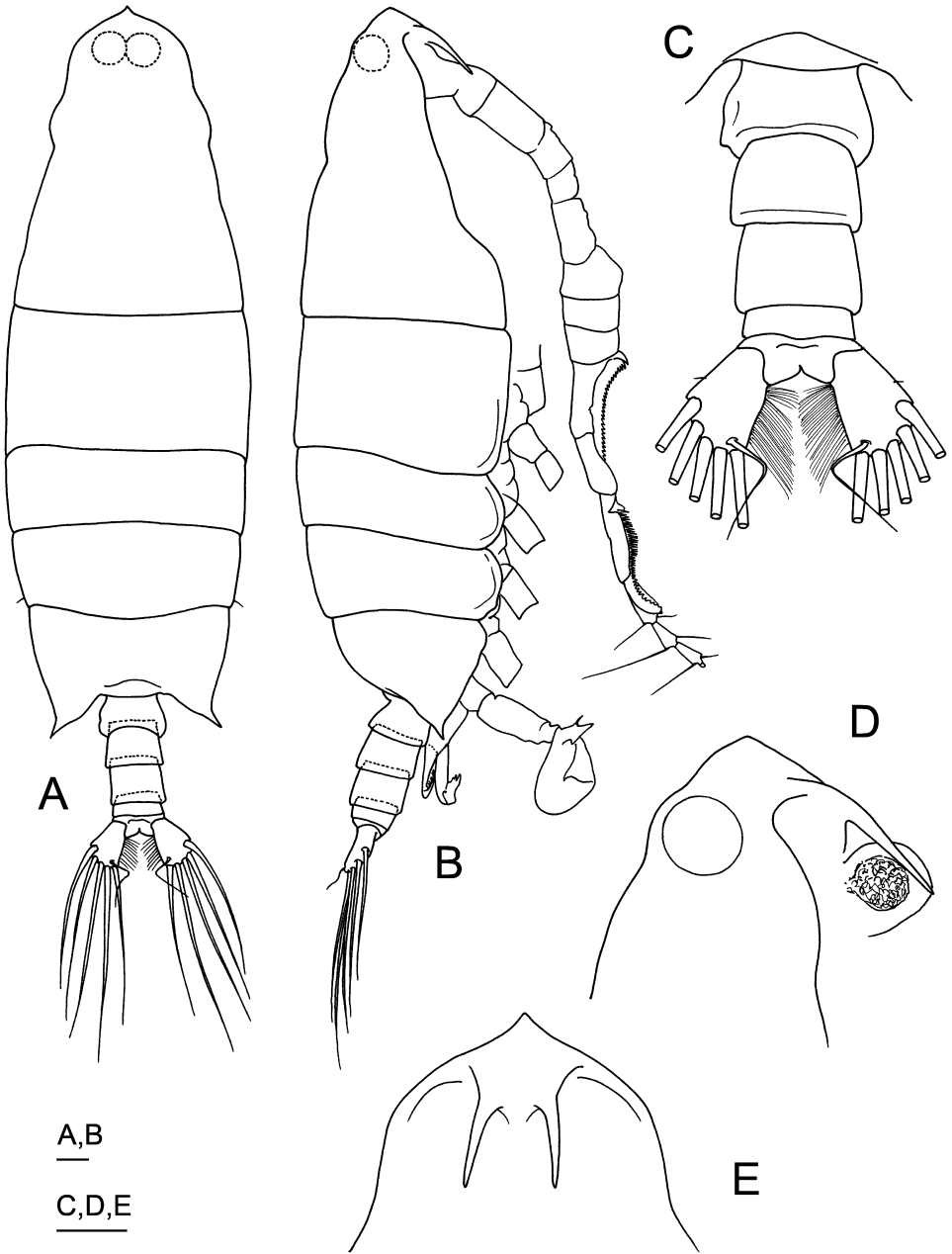


Fig. 7. *Labidocera kuwaitiana* sp. nov., male. A-E, allotype; A, habitus, dorsal; B, habitus, lateral; C, urosome, dorsal; D, anterior head with rostrum, lateral; E, anterior head with rostrum, ventral. Scale bars = 0.1 mm.

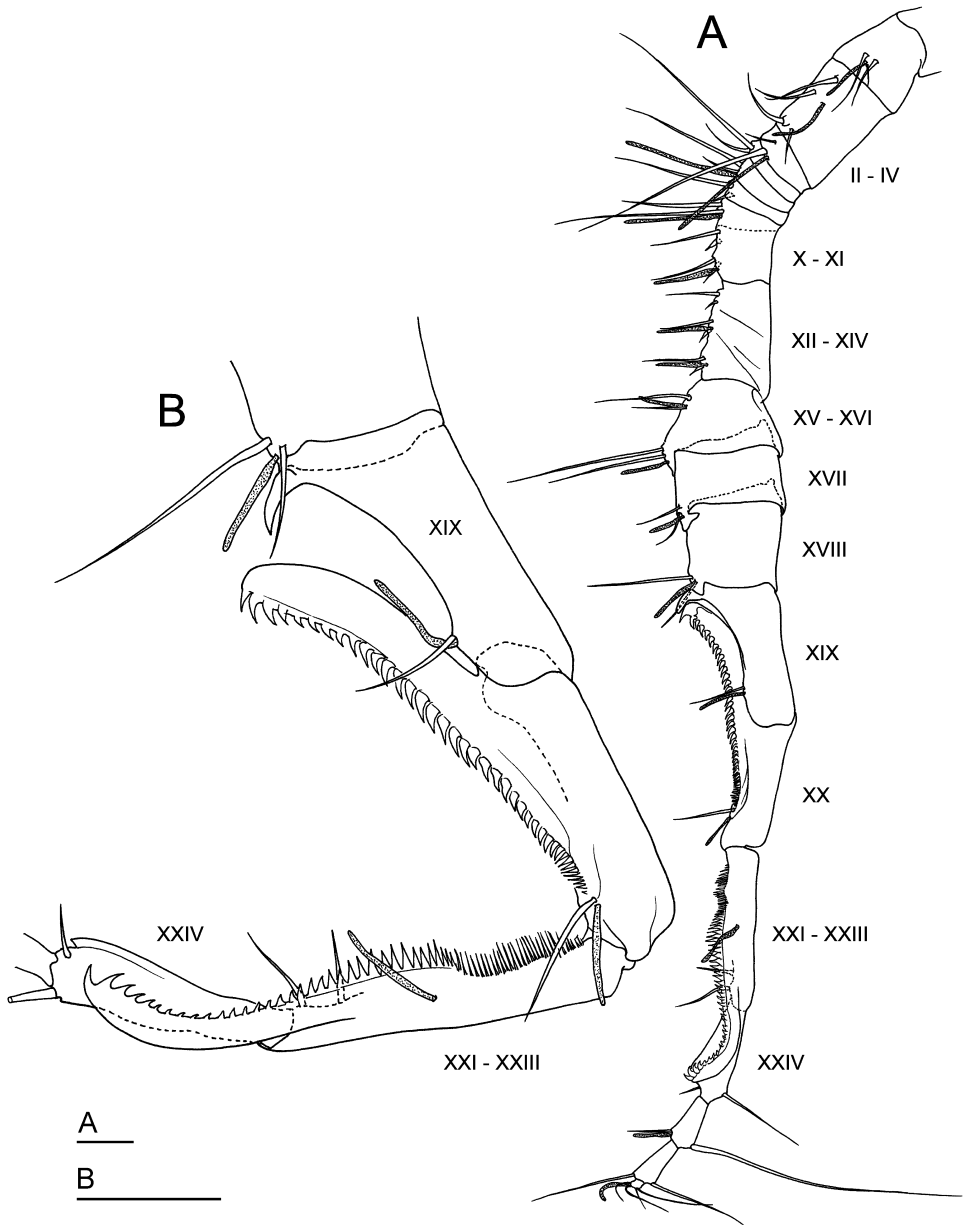


Fig. 8. *Labidocera kuwaitiana* sp. nov., male, prehensile antennule. A, allotype, whole antennule; B, paratype, articulated segments 9-12 (ancestral segments XIX-XXIV). Scale bars = 0.1 mm.

DISCUSSION

To date, there are 53 recognized species in the genus *Labidocera* (Razouls et al., 2005-2014). Fleming (1967), reviewing taxonomic, morphological and distribu-

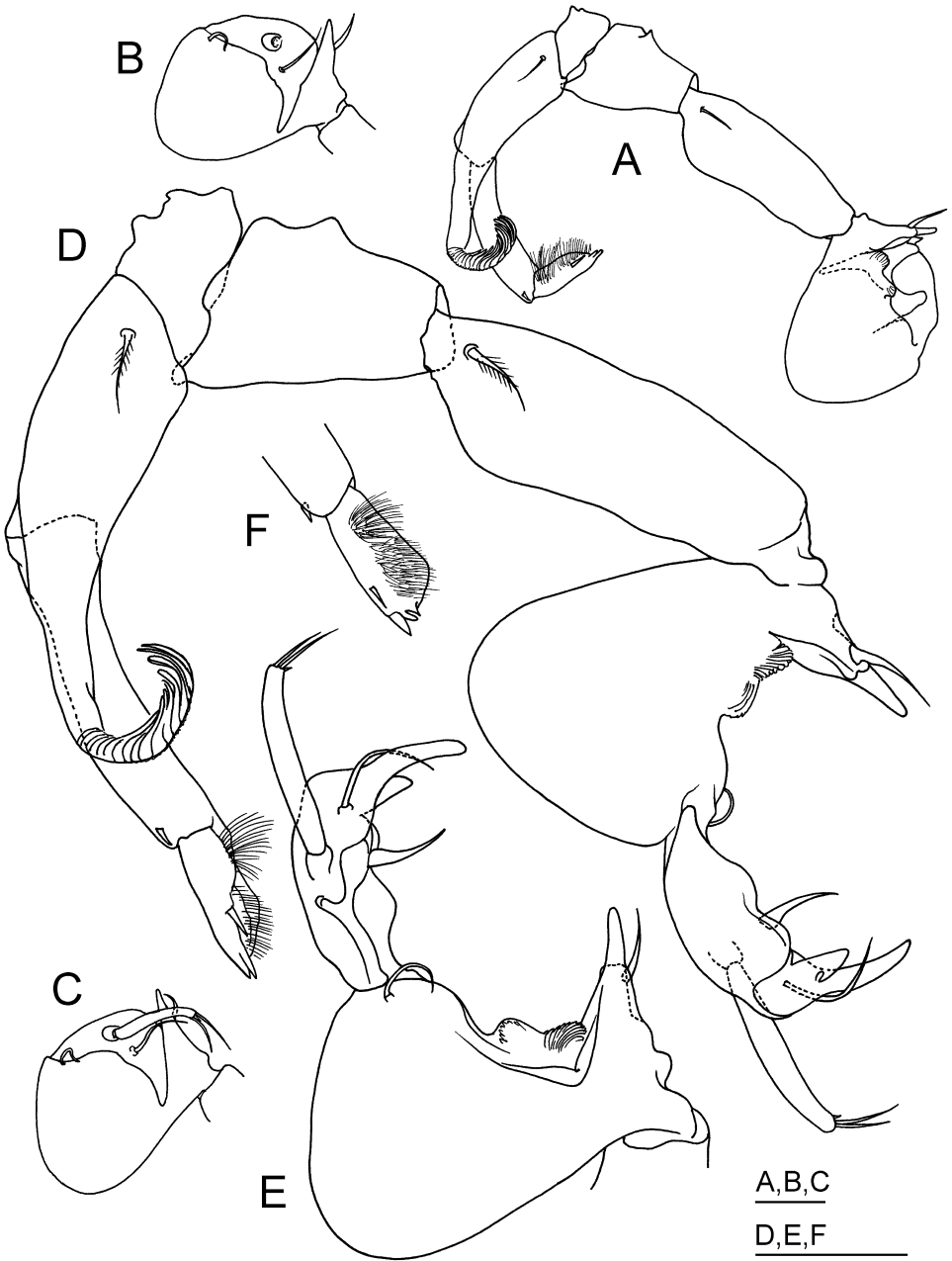


Fig. 9. *Labidocera kuwaitiana* sp. nov., male, P5. A, B, allotype; C, paratype 1; D-F, paratype 2; A, leg with chela closed, posterior; B, right exopod (first and second segments only, third segment is lacking), anterior; C, right exopod, with third segment present, anterior; D, leg with chela open, posterior; E, right exopod, anterior; F, left exopod second segment. Scale bars = 0.1 mm.

tional relationships of *Labidocera* species, distinguished four species groups (established by him as “superspecies”) in this genus: ‘*darwinii*’, ‘*de truncata*’, ‘*kroyeri*’ and ‘*wilsoni*’; additionally, several species were specified as “unassigned” ones. In terms of morphology, *Labidocera kuwaitiana* sp. nov. corresponds to the ‘*darwinii*’ group by sharing the following combination of characteristics: (i) presence of a rudimentary endopod in the left P5 in the male (vs left P5 endopod absent in the species of other groups), (ii) absence of cephalic lateral hooks in both sexes (vs cephalic lateral hooks present or absent in the species of other groups), and (iii) absence of basal teeth in the mandible (vs basal teeth present or absent in the species of other groups). Fleminger (1967) included nine species in the ‘*darwinii*’ group: *L. acutifrons* (Dana, 1849); *L. aestiva* Wheeler, 1901; *L. brunescens* (Czerniavski, 1868), *L. darwinii* Lubbock, 1853; *L. fluviatilis* F. Dahl, 1894; *L. johnsoni* Fleminger, 1964; *L. lubbockii* Giesbrecht, 1889; *L. scotti* Giesbrecht, 1897, and *L. trispinosa* Esterly, 1905. None of the subsequently described species of *Labidocera* shared characters of the ‘*darwinii*’ group, therefore, with *Labidocera kuwaitiana* sp. nov. included, this group currently comprises 10 species. Distinguishing characters of the 10 species of the ‘*darwinii*’ group are specified in the identification key below.

In the examined specimens (19 females and 28 males of *Labidocera kuwaitiana* sp. nov.), such characters as eye-lens’ diameter and inter-ocular distance were sexually dimorphic: eye lenses were usually small and widely spaced in females and varying in size from small to large and more closely spaced in males (fig. 10). The eye-lens’ diameter in females ranged within fairly narrow limits, from 41 to 55 μm (mean \pm SD = $46 \pm 3 \mu\text{m}$, $n = 19$), while the male eye-lens’ diameter varied within a wide range (fig. 10A-C), from 47 to 109 μm (mean \pm SD = $83 \pm 24 \mu\text{m}$, $n = 28$). There was no correlation between eye-lens’ diameter and total body length in the examined females and males. The distance between lens’ centres in females ranged from 152 to 206 μm (mean \pm SD = $177 \pm 13 \mu\text{m}$, $n = 19$), while in males the range was 98-127 μm (mean \pm SD = $111 \pm 10 \mu\text{m}$, $n = 28$). Our observations support the common knowledge that dorsal eyes in *Labidocera* males are larger than in females. Small-sized lenses in some of the analysed male specimens of *Labidocera kuwaitiana* sp. nov. could be a manifestation of individual variability, physiological state of a specimen, or other factors. Further investigation is needed to obtain accurate information on this matter.

Differential diagnosis.— *Labidocera kuwaitiana* sp. nov. differs distinctly from the other species of the ‘*darwinii*’ group in having a dorsal process (arrowed in fig. 1A, B, C, E) at the genital double-somite in the female (none of the other females of the ‘*darwinii*’ group has such a character) and having enlarged toothed process of segments XXI-XXIII in the prehensile antennule in the male (in *Labidocera kuwaitiana* sp. nov., toothed process of segments XXI-XXIII in

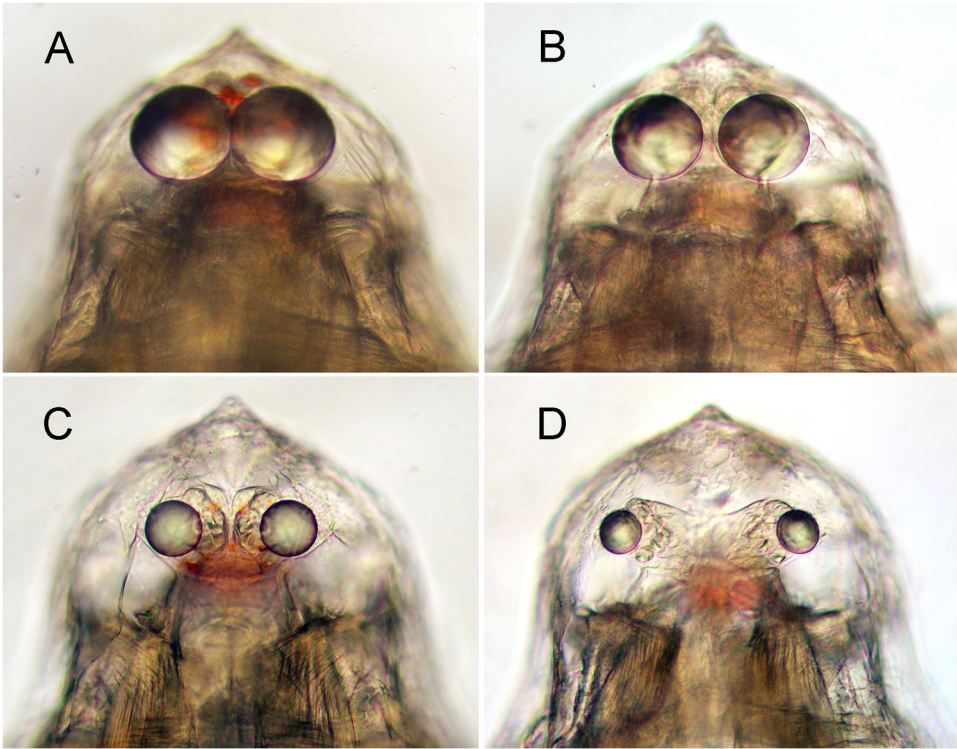


Fig. 10. Position and size of eye lenses in *Labidocera kuwaitiana* sp. nov. A-C, males, dorsal view; D, female, dorsal view. This figure is published in colour in the online edition of this journal, which can be accessed via <http://booksandjournals.brillonline.com/content/journals/15685403>.

the prehensile antennule extends to distal 1/7 of segment XXIV, whereas in all the other ‘*darwinii*’ group members this process is substantially shorter). *Labidocera kuwaitiana* sp. nov. female shows resemblance to *L. acutifrons* but differs in: (i) presence of a dorsal process on the genital double-somite (absent in *L. acutifrons*); (ii) absence of a dorsoposterior process on the second urosomite (present in *L. acutifrons*); (iii) small and not extended anal flap (in *L. acutifrons*, anal operculum remarkably extends posteriad); (iv) relatively long P5 right exopod, 1.7-1.8 times as long as the left one (approximately 1.2 times as long as the left one in *L. acutifrons*); and (v) directed anteriorly naked seta on the left caudal ramus (posterolaterally directed in *L. acutifrons*). *Labidocera kuwaitiana* sp. nov. male differs from *L. acutifrons* in: (i) absence of a distal process on the right P5 basis (present in *L. acutifrons*); (ii) relatively longer third exopod of the right P5, nearly 7 times as long as wide (4.4-5 times as long as wide in *L. acutifrons*); (iii) left P5 endopod terminating in thin elongate naked appendix laciniate at its apex (laciniate at its mid-length in *L. acutifrons*); and (iv) prehensile antennule compound segments XXI-XXIII tooth ridge extending to distal 1/7 of segment

XXIV (extends to distal 1/3 of segment XXIV in *L. acutifrons*). Additionally, the new species differs from *L. acutifrons* by its smaller size: 2.41-2.66 mm in females and 2.27-2.83 mm in males in *Labidocera kuwaitiana* sp. nov. vs 3.20-4.70 mm in females and 3.28-4.56 mm in males in *L. acutifrons* (Razouls et al., 2014). From one of the “unassigned” species, *L. wollastoni*, Lubbock, 1857, which also has an endopod in the left P5 in the male, *Labidocera kuwaitiana* sp. nov. distinctly differs by absence of cephalic lateral hooks (vs cephalic lateral hooks present in *L. wollastoni*) and details of P5 in both sexes.

KEY TO SPECIES OF THE ‘DARWINII’ GROUP OF THE GENUS *LABIDOCERA* (MADE ON THE BASIS OF DESCRIPTIONS AND DRAWINGS FROM: ESTERLY, 1905; FLEMINGER, 1964, 1975, 1979; GIBSON & GRICE, 1977; GIESBRECHT, 1893 (“1892”); GIESBRECHT & SCHMEIL, 1898; LEONG ET AL., 2009; LUBBOCK, 1853; RAMIREZ, 1966; SILAS AND PILLAI, 1973; WHEELER, 1900)

Adult females

- | | | |
|----|---|-------------------------------|
| 1 | Urosome of 2 somites | 2 |
| 1a | Urosome of 3 somites | 4 |
| 2 | Genital somite asymmetrical, with wide rounded projection on right in dorsal view | |
| | <i>L. darwinii</i> | |
| 2a | Genital somite symmetrical | 3 |
| 3 | Exp of symmetrical P5 with 2 terminal points | <i>L. fluviatilis</i> |
| 3a | Exp of symmetrical P5 with 3 terminal points | <i>L. aestiva</i> |
| 4 | Genital somite symmetrical, right caudal ramus nearly twice the length of left ramus | |
| | <i>L. scotti</i> | |
| 4a | Genital somite asymmetrical, caudal rami of approximately equal length | 5 |
| 5 | Caudal rami symmetrical, or roughly symmetrical, separate from anal somite | 6 |
| 5a | Caudal rami asymmetrical, partly fused to anal somite | 9 |
| 6 | Exp of nearly symmetrical P5 with 1 terminal point, genital pore ventral | <i>L. brunescens</i> |
| 6a | Exp of nearly symmetrical P5 with 2 or 3 terminal points, genital pore ventro-lateral | 7 |
| 7 | P5 Exp with 3 terminal points, middle one the largest, a fourth point sometimes present ... | |
| | <i>L. johnsoni</i> | |
| 7a | P5 Exp with 2 terminal points, inner one larger | 8 |
| 8 | Second urosomal somite without left lateral swelling proximally | <i>L. lubbocki</i> |
| 8a | Second urosomal somite in dorsal view with small lateral swelling on left proximally | |
| | <i>L. trispinosa</i> | |
| 9 | Genital somite with small lateral lump on right side, genital pore lateral; both P5 Exp with 3 terminal points, outermost the largest | <i>L. acutifrons</i> |
| 9a | Genital somite with dorsal triangle process extending dorsally, genital pore dorsal; right P5 Exp with 3 terminal points, left P5 Exp with 2 nearly equal apical processes and 1 small sub-distal outer spine | <i>L. kuwaitiana</i> sp. nov. |

Adult males

- | | | |
|----|----------------------------|---|
| 1 | Urosome of 4 somites | 2 |
| 1a | Urosome of 5 somites | 4 |

- 2 Left P5 Enp about half the length of Exp1 *L. fluviatilis*
- 2a Left P5 Enp extends to or slightly beyond distal border of Exp1 3
- 3 Right A1 segment's XXI-XXIII toothed process does not reach proximal margin of segment XXIV *L. aestiva*
- 3a Right A1 segment's XXI-XXIII toothed process extends just beyond proximal margin of segment XXIV *L. darwinii*
- 4 Prosome posterior corners symmetrical 5
- 4a Prosome posterior corners asymmetrical, right corner longer or modified 6
- 5 Left P5 Enp, if fully extended, extends beyond distal border of Exp2, and terminates in thin elongate appendix lacinate at its mid-length; right A1 segment's XXI-XXIII toothed process extends to distal 1/3 of segment XXIV *L. acutifrons*
- 5a Left P5 Enp, if fully extended, extends beyond distal border of Exp1, and terminates in thin elongate appendix lacinate at its apex; right A1 segment's XXI-XXIII toothed process extends to distal 1/7 of segment XXIV *L. kuwaitiana* sp. nov.
- 6 Prosome posterior corners moderately asymmetrical, pointed, right single prong longer and curving ventrad *L. scotti*
- 6a Prosome posterior corners strongly asymmetrical, with three prominent spiniform prongs on right, lateral-most the largest 7
- 7 Lateral-most prosomal prong crescent-like in lateral view *L. trispinosa*
- 7a Lateral-most prosomal prong not curved in lateral view 8
- 8 Dorsal-most prosomal prong about one-half length of lateral-most prong; P5 Exp1 with relatively wide rounded process medially *L. johnsoni*
- 8a Dorsal-most prosomal prong less than one-fourth length of lateral-most prong; P5 Exp1 with relatively narrow triangle process medially *L. lubbocki*

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REFERENCES

- AL-YAMANI, F. Y. & I. PRUSOVA, 2003. Common copepods of the northwestern Arabian Gulf: identification guide: 1-162. (Kuwait Institute for Scientific Research, Kuwait).
- AL-YAMANI, F. Y., V. SKRYABIN, A. GUBANOVA, S. KHVOROV & I. PRUSOVA, 2011. Marine zooplankton practical guide (volume 2) for the northwestern Arabian Gulf: 1-197. (Kuwait Institute for Scientific Research, Kuwait).

- ESTERLY, C. O., 1905. The pelagic Copepoda of the San Diego region. University of California Publications in Zoology, **2**(4): 113-233.
- FLEMINGER, A., 1964. *Labidocera johnsoni* species nov. Pilot Register of Zoology, card no. 3A, B.
- —, 1967. Taxonomy, distribution, and polymorphism in the *Labidocera jollae* group with remarks on evolution within the group (Copepoda: Calanoida). Proceedings of the United States National Museum, **120**(3567): 1-61.
- —, 1975. Geographical distribution and morphological divergence in American coastal-zone planktonic copepods of the genus *Labidocera*. In: L. E. CRONIN (ed.), Chemistry, biology and the estuarine system. Estuarine Research, **1**: 392-419. (Academic Press, New York, NY).
- —, 1979. *Labidocera* (Copepoda, Calanoida): new and poorly known Caribbean species with a key to species in the western Atlantic. Bulletin of Marine Science, **29**(2): 170-190.
- GIBSON, V. R. & G. D. GRICE, 1977. The developmental stages of *Labidocera aestiva* Wheeler, 1900 (Copepoda, Calanoida). Crustaceana, **32**: 7-20.
- GIESBRECHT, W., 1893 ("1892"). Systematik und Faunistik der pelagischen Copepoden des Golfes von Neapel und der angrenzenden Meeres-Abschnitte. Fauna und Flora des Golfes von Neapel, **19**: 1-831.
- GIESBRECHT, W. & O. SCHMEIL, 1898. Copepoda I. Gymnoplea. Das Tierreich. Eine Zusammenstellung und Kennzeichnung der rezenten Tierformen, Berlin, **6**: I-XVI, 1-169.
- HUYS, R. & G. A. BOXSHALL, 1991. Copepod evolution: 1-468. (The Ray Society, London).
- JEONG, H. G., H. L. SUH, S. B. JEONG, Y. H. YOON & H. Y. SOH, 2009. *Labidocera* species (Copepoda: Pontellidae) in waters of the Tsushima Warm Current with notes on their genital structure and zoogeography. Zoological Studies, **48**: 508-523.
- LUBBOCK, J., 1853. Description of a new genus of Calanidae. Annals and Magazine of Natural History, **2**(11): 25-29.
- RAMIREZ, F. C., 1966. Copépodos Calanoidos marinos del área de Mar del Plata con la descripción de *Pontella marplatensis* n. sp. Boletín del Instituto de Biología Marina, Mar del Plata, **11**: 1-24.
- RAZOULS, C., F. DE BOVÉE, J. KOUWENBERG & N. DESREUMAUX, 2005-2014. Diversity and geographic distribution of marine planktonic copepods. Available online at <http://copepodes.obs-banyuls.fr/> (accessed 9 May 2014).
- SILAS, E. G. & P. P. PILLAI, 1973. The Calanoid copepod family Pontellidae from the Indian Ocean. Journal of the Marine Biological Association of India, **15**: 771-858.
- WHEELER, W. M., 1900. The free-swimming copepods of the Woods Hole region. Bulletin of the United States Fish Commission, 1899, **459**: 157-192. (30-viii-1900 published as extract and included in the Bulletin in 1901, **19**: 157-192).

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