Journal of the Marine Biological Association of the United Kingdom, 2012, 92(5), 1073–1081.
doi:10.1017/S0025315411001949

A review of *Leptocaris* including a description of *L. ryukyuensis* sp. nov. (Copepoda: Harpacticoida: Darcythompsoniidae)

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We provide a review on scientific contributions concerned with Leptocaris *(Harpacticoida: Copepoda) that includes the zoogeography, ecology, biology, and morphology of this genus. A tabular key is given to aid in the identification of the* ignavus*-group.* Leptocaris ryukyuensis *sp. nov. is included on the basis of specimens collected from Akeijima sandy beach of the Ryukyu Islands in Japan. The new species can be distinguished from its congeners by an abexopodal seta and 3 exopodal setae on A2, a barbed inner seta on the proximal, endopodal segment of female P1 to P3, setae of the caudal ramus (setae I and II are very small, and the basal seta is transformed to a big spine), and modified inner setules of P2 enp-2 and P3 enp-2 in the males. The new species belongs to the* ignavus*-group established by Kunz (1994) and is the third species of the genus* Leptocaris *in East Asia.*

Keywords: taxonomy, Copepoda, Harpacticoida, *Leptocaris*, new species, Japan

Submitted 2 October 2011; accepted 25 October 2011; first published online 6 December 2011

INTRODUCTION

The Darcythompsoniidae are a family of harpacticoid copepods with considerably cylindrical and slender body shape. This family comprises worldwide distributed taxa, containing presently 27 species, designated to the following 4 genera: *Leptocaris* T. Scott, 1899; *Darcythompsonia* T. Scott, 1906; *Kristensenia* Por, 1983; and *Pabellonia* Gomez, 2000. These four genera are defined by the following characters: (1) the absence, or presence of rudimentary or well developed maxillipeds; (2) sexual dimorphism in the male P2 enp-2, anal operculum and caudal rami; (3) shape of anal operculum and caudal rami; (4) sexual dimorphic structures on the 2nd and 3rd male urosomite; and (5) P1 enp-1 without or with an anteriorly directed inner seta with combed tip (Gomez, 2000).

Historically Sars (1909) considered *D'Arcythompsonia*, *Cylindropsyllus*, *Stenocaris*, and *Leptocaris* as belonging to the Cyclindropsyllidae. Gurney (1920) added *Horsiella* to this family. Kessler (1913) considered even *Parastenocaris* as being closely related to these. Later Monard (1927) established the phylum Agnatha for the families Metidae, Cylindropsyllidae and Louriniidae. At the same time he excluded the genera *Parastenocaris* and *Stenocaris* and established the family Stenocaridae for them. Lang (1936) demonstrated the close phylogenetic position of *Stenocaris* and *Cylindropsyllus* (belonging to the Stenocaridae). At the same time he reallocated *Leptocaris*, *D'Arcythompsonia* and *Horsiella* to a new family he named D'Arcythompsoniidae (Lang, 1936). Thus, the genera *Leptocaris* T. Scott, 1899 with *Darcythompsonia* T. Scott, 1906 and *Horsiella* Gurney, 1920, belonged to the family Darcythompsoniidae Lang, 1936. Later, Kunz (1961) considered the genus *Horsiella* as a synonym of the genus *Leptocaris* and provided a key to species of this genus, and Lang (1965) followed Kunz in unifying the two genera with descriptions of three species from the California coast.

Kunz (1994) placed the then nine species of the genus *Leptocaris* including two new species and one new subspecies, into four groups all having the maxilliped either completely absent or reduced to a small triangular lobe and the P1 endopod proximal with an anteriorly directed seta bearing a terminal comb. The 4 groups are characterized by the number of segments of the endopod of P1 and the number of setae on exopod 3 of P2 to P4: *brevicornis*-group (10 spp.); *ignavus*-group (10 spp.); *minimus*-group (3 spp.); and *mangalis*-group (3 spp.). The species *L. ignavus* (Noodt, 1953) that was redesignated by Kunz (1994) was later synonymized with *L. minutus* T. Scott, 1899 by Huys *et al.* (1996). Recently, one species and one subspecies were described: *L. islandica* Apostolov, 2007 collected from brackish water rock pools from Iceland (Apostolov, 2007) and *L. trisetosus pacificus* Lee & Chang, 2008 collected from salt marshes in Korea (Lee & Chang, 2008). These taxa belong to the *ignavus*-group and *brevicornis*-group, respectively. The genus *Leptocaris* T. Scott, 1899 currently comprises 27 species.

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During a comprehensive study of marine harpacticoid assemblages of Ryukyu, Japan, a new species of the genus *Leptocaris* was discovered and was named *L. ryukyuensis* sp. nov. The new species belongs to the *ignavus*-group and is the third record of the genus in East Asia including *L. brevicornis* (van Douwe, 1905) and *L. trisetosus pacificus* Lee & Chang, 2008. Herein, we describe this new species of *Leptocaris* and compare it to other species within the genus. A revised key to *Leptocaris* is presented.

MATERIALS AND METHODS

Sediment samples were collected from a sandy beach of the island of Ikeijima, Okinawa Prefecture, of Ryukyu Islands, Japan, and specimens were fixed in 95% ethanol. In the laboratory the sediment samples were thoroughly rinsed on a 38 μm sieve to collect the meiofauna. Harpacticoid copepods were sorted, using an Olympus SZ11 (Tokyo, Japan) stereomicroscope. Specimens were then cleared and dissected in lactic acid. Dissected parts were mounted on slides in lactophenol as a mounting medium, and these slide preparations were sealed with transparent nail varnish. All drawings were prepared using an Olympus BX60 (Tokyo, Japan) differential interference contrast microscope equipped with Nomarski optics and drawing tube. Abbreviations used are: A1, antennules; A2, antenna; Benp, baseoendopodite; Cr, caudal ramus; Enp, endopod; Exp, exopod; Md, mandible; Mxl, maxillula; Mx, maxilla; Mxp, maxilliped; P1-P6 = leg 1–leg 6; R, rostrum.

The descriptive terminology is adopted from Huys *et al.* (1996). Abbreviations used in the text are: ae, aesthetasc; exp, exopod; enp, endopod; and P1-P6, first to sixth thoracopod; exp (enp)-1 (2, 3) to denote the proximal (middle, distal) segment of a ramus. The term acrothek is the trifid seta complement found apically on the distal antennulary segment. Scale bars are in micrometre (μm).Type species are deposited in the collection of The Natural Institute of Biological Resources (NIBR), Incheon, Korea.

RESULTS

SYSTEMATICS
Subclass COPEPODA Milne-Edwards, 1840
Order HARPACTICOIDA Sars, 1903
Family DARCYTHOMPSONIIDAE Lang, 1936
Genus *Leptocaris* T. Scott, 1899
Leptocaris ryukyuensis sp. nov. Song, Dahms & Khim
(Figures 1–5)

TYPE MATERIAL

Holotype (NIBRIV0000226070): ovigerous female preserved in alcohol; 25 August 2004, Coll. Dr Sung Joon Song and Dr Hyun Soo Rho.

Allotype undissected male in ethanol (NIBRIV0000226071), sampling data as in holotype.

Paratypes: 5 females and 43 males preserved in alcohol (NIBRIV0000226072). One female and one male dissected on 12 and 6 slides, respectively, are kept in the personal research collection of the first author (S.J.S.) (SACOP3007 and SACOP3008)—having the same collection data as the holotype.

TYPE LOCALITY

Ikeijima, Okinawa, Japan (26°23′06″N 127°59′54″E); 1 m depth, sandy beach.

ETYMOLOGY

The species is named after the ancient name for the type locality, Ryukyu Archipelago (being equivalent to the Japanese name Okinawa).

FEMALE

Body shape (Figure 1A) vermiform, cylindrical with parallel margins except for the anal somite; total body length 688 μm (mean 609 ± 54 μm, N = 9), measured from the anterior margin of the rostrum to the posterior margin of the caudal rami. Largest width measured at posterior margin of cephalosome, 81 μm. Cephalothorax elongate, with few integumental sensilla (Figure 1A); posterior and posterolateral margin smooth. Rostrum small and curved downward. Pedigerous somites (Figure 1A) with sensilla on dorsal surface, and small protuberances on surface.

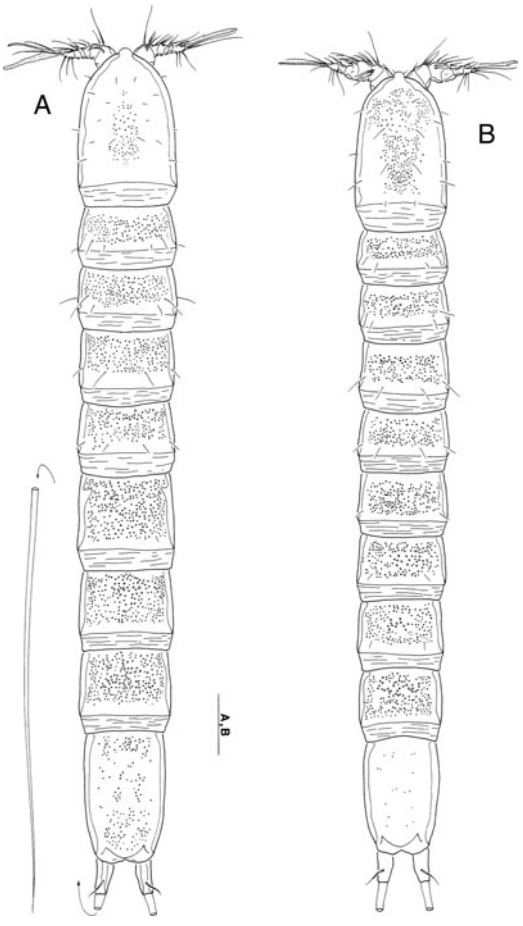

Fig. 1. *Leptocaris ryukyuensis* sp. nov., female: (A) habitus, dorsal; male: (B) habitus, dorsal. Scale bars: A, B = 50 μm.

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Urosome (Figures 1A & 2A) 5-segmented, comprising P5-bearing somite, genital-double somite and 3 free abdominal somites. All urosomites with many protuberances on dorsal surface. Genital-double somite (Figure 2A) as long as wide, with 2 lateral and 2 ventral sensilla; urosomites 2 and 3 (genital-double somite) completely fused dorsally and ventrally with weakly sclerotized traces laterally.

Anal somite (Figures 1A & 2A) tapering posteriorly, about 1.5 times as long as wide. Anal operculum semicircular, without ornamentation on posterior margin. Caudal rami (Figures 1A & 2B) cylindrical, about 2.6 times as long as wide; each ramus tapering distally with 6 bare setae, and 1 long, thick seta.

Antennule (Figure 2C): the limb is 7-segmented; segment 1 longest, with 3 spinular rows on outer surface and 1 tiny seta on distal corner; segment 4 with aesthetasc fused basally to a seta on a pedestal; segment 5 shortest. Armature formula: 1-[1 tiny], 2-[7], 3-[5], 4[3 + ae], 5-[3], 6-[1], 7-[4 + acrothek]. Acrothek composed of 2 bare setae and 1 aesthetasc.

Antenna (Figure 2D): allobasis with vestigial suture line indicating fusion of 2 segments; with several spinules on inner margin; exopod represented by 3 bare setae on small protuberance; strong abexopodal seta mid-length bearing thorns on its tip. Endopod stout, ornamented with 2 rows of spinules on surface and 1 transverse hyaline frill subapically. Lateral armature consisting of 2 blunt spines; distal armature consisting of 1 blunt spine and 2 bare setae.

Mandible (Figure 2E): strong gnathobase bearing several multicuspidate teeth ventrally and 1 pinnate long seta in proximal corner; with a spinular row on surface. Palp reduced and represented by 2 tiny setae.

Maxillule (Figure 2F): praecoxa without ornamentation. Arthrite strongly developed, with 1 unipinnate seta and 1 bare seta on inner corner, and 4 distal spines. Palp elongated and 1-segmented, with 3 outer setae, 2 surface setae, 1 inner seta and 4 distal setae.

Maxilla (Figure 2G): syncoxa without ornamentation. Proximal endite with 1 strong spine bearing 4 spinules and 1 bare seta; distal endite with 2 bare setae. Allobasis drawn out into pectinate claw; accessory armature consisting of 1 small seta posteriorly. Endopod represented by 2 long setae on its distal surface.

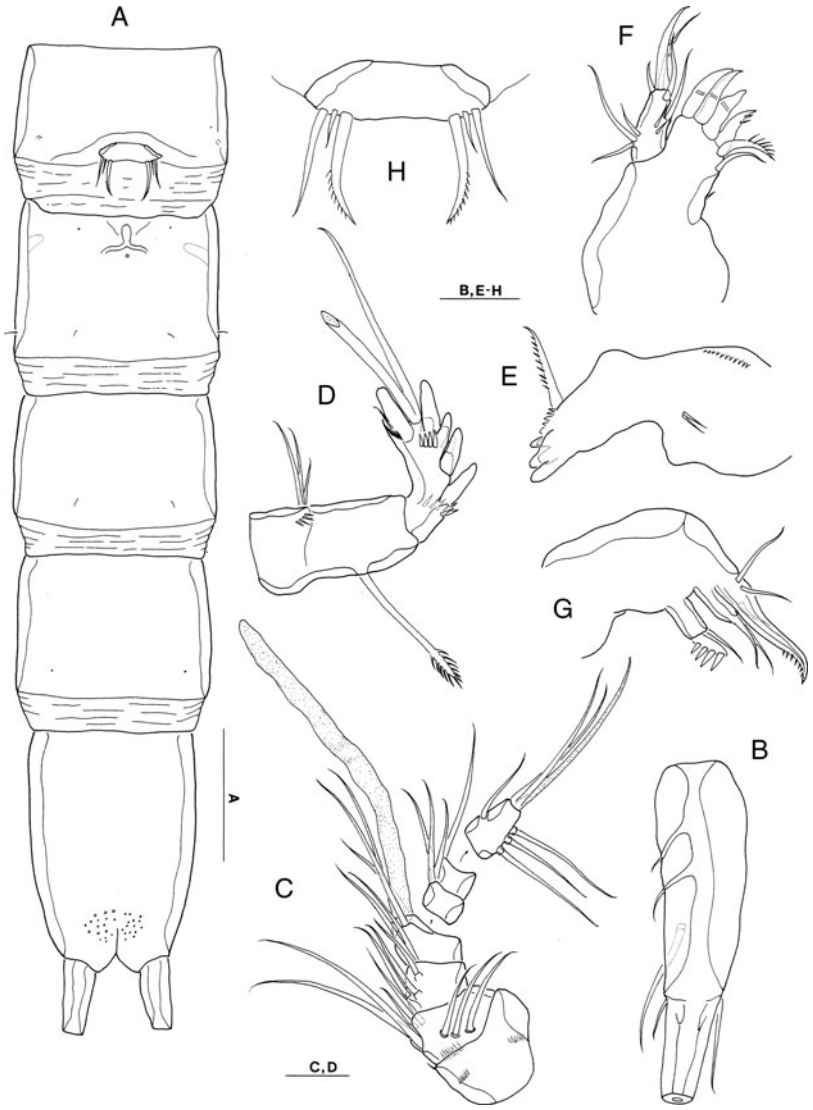

Fig. 2. *Leptocaris ryukyuensis* sp. nov., female: (A) urosome, ventral; (B) caudal ramus, ventral; (C) antennule; (D) antenna; (E) mandible; (F) maxillule; (G) maxilla; (H) P5. Scale bars: A = 50 μm; B–H = 10 μm.

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Maxilliped: absent.

P1 (Figure 3A): wide intercoxal sclerite lacking ornamentation. Praecoxa triangular without ornamentation. Coxa with 1 row of spinules on anterior surface. Basis with robust spinular row on anterior surface, with bare seta/spine on inner and outer corners. Exopod 3-segmented; exp-1 with strong outer spinules around outer spine; exp-2 slightly longer than first segment and with similar ornamentation; exp-3 longest, with 1 tiny seta and 1 seta on outer margin, 1 bare seta and 1 unipinnate seta distally, and 1 unipinnate inner seta. Endopod 2-segmented, reaching end of exp-2; enp-1 with spinules on outer corner and 1 peculiarly barbed inner seta; enp-2 ornamented with 3 spinules on outer margin, with 2 distal setae and 1 tiny inner seta.

P2-P4 (Figures 3B & 4A, B): narrow intercoxal sclerites lacking ornamentation. Praecoxa and coxa without ornamentation. Basis wider than long, with lateral seta and spinular row on distal margin. Rami 3-segmented (exopod) and 2-segmented (endopod); P2 enp-1 and enp-2, P3 enp-2 with peculiar barbed seta similar to that on P1. Armature formulae of P2-P4 as in Table 1.

P5 (Figure 2H): forming a small plate protruding medially, both rami of P5 confluent basally, with 1 bare long seta, 1 bare tiny seta and 1 bipinnate curved spine.

MALE

Habitus (Figure 1B) similar to female, except somatic setae and protuberances more numerous, and dorsal protuberances more prominent and complexly sculptured. Total body length 659 μm (mean 585 ± 50 μm, N = 6), measured from anterior margin of rostrum to posterior margin of caudal rami. Largest width measured at posterior margin of cephalic shield, 75 μm.

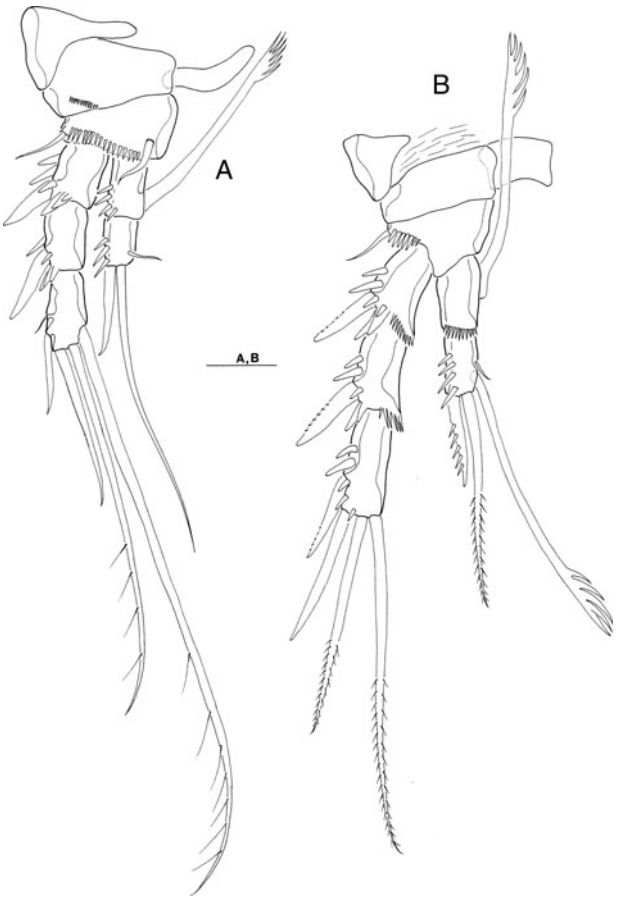

Fig. 3. *Leptocaris ryukyuensis* sp. nov., female: (A) P1; (B) P2. Scale bars: A, B = 10 μm.

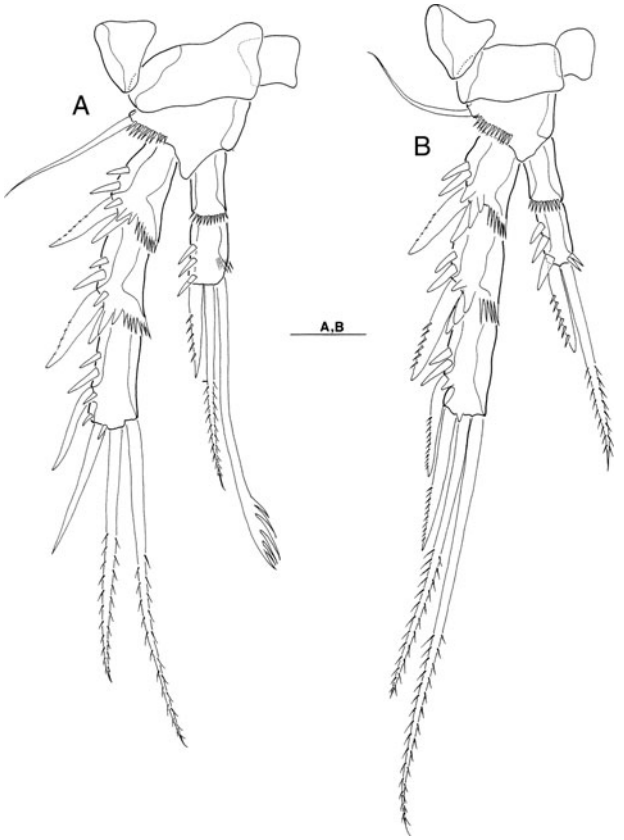

Fig. 4. *Leptocaris ryukyuensis* sp. nov., female: (A) P3; (B) P4. Scale bars: A, B = 10 μm.

Prosome (Figure 1B) 4-segmented, comprising cephalothorax and 3 free pedigerous somites. Cephalothorax elongate, with few integumental sensilla as figured (Figure 1B); posterior and posterolateral margin smooth. Rostrum as in female.

Urosome (Figures 1B & 5A) 6-segmented, comprising P5-bearing somite, genital somite and 4 abdominal somites.

Caudal ramus (Figures 1B & 5B) sexually dimorphic, slightly shorter than that of female (about 2.3 times); seta I very short, seta II modified as a thick and long seta ventrally, seta VII long; other setae similar to those of female.

Antennule (Figure 5C) 7-segmented; subchirocer, with geniculation between segment 5 and 6; segment 1 with 3 outer spinular rows and 1 seta; segment 4 longest; segment 5 and 6 modified. Armature formula: 1-[1 bare], 2-[7 bare],

Table 1. Setal formula of swimming legs of *Leptocaris ryukyuensis* sp. nov.

	Exopod	Endopod
P2	0, 0, 022	1, 120
P3	0, 0, 022	0, 120
P4	0, 0, 022	0, 020

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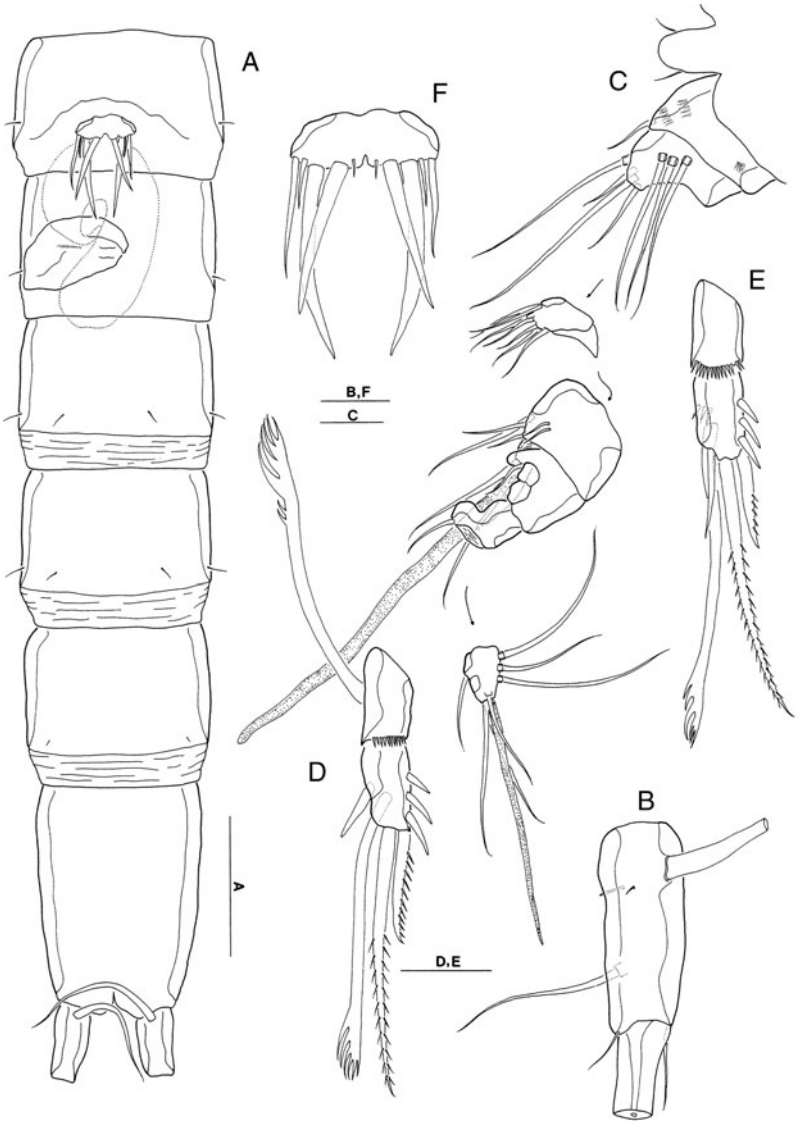

Fig. 5. *Leptocaris ryukyuensis* sp. nov., male: (A) rosome, ventral; (B) caudal ramus, lateral; (C) rostrum and antennule; (D) P2 endopod; (E) P3 endopod; (F) P5. Scale bars: A = 50 μm; B–F = 10 μm.

3-[7 bare], 4-[4 bare + 2 tiny + (1 + ae)], 5-[1 tiny], 6-[1 bare], 7-[5 bare + acrothek] (there is no arthrodial membrane between segments 5 and 6). Apical acrothek consisting of 2 long setae and aesthetasc.

Antenna, mouth appendages, and P1, P4 as in female except inner margins of basipods more heavily sclerotized and more produced than in female.

Articulations and major setation of P1 and P4 as in female. Inner margins of basipods more heavily sclerotized and more produced than in female. Setae of endopods 2 of legs 2 and 3 modified, shorter and stouter than those of female and bent laterally at proximal third, each having a tapered tip bearing a comb of setules.

P2 (Figure 5D): exopod as in female. Endopod modified, 2-segmented; enp-1 with peculiarly barbed inner seta having differences in barb structure; enp-2 with 1 strong spine and 1 peculiar barbed seta on inner margin, 1 bipinnate and 1 unipinnate seta distally, and outer margin ornamented with 3 strong spinules.

P3 (Figure 5E): exopod as in female. Endopod slightly modified, enp-1 as in female; enp-2 similar to female except an additional inner seta. Setae on enp-2 of P2 and P3 shorter and stouter than those of female.

P5 (Figure 5F) as single fused plate distinct from somite, each side with slender, normally 2 slender outer setae and 2 strong inner setae, and with 1 tiny innermost setule.

P6 (Figure 5A) consisting of trapezoidal protrusion, most developed and ornamented with few rows of spinules on left side of somite.

DIFFERENTIAL DIAGNOSIS

Leptocaris ryukyuensis is distinguished from the other species of the genus by its conspicuous semicircular anal operculum and spinular rows on the first article of the antennules. In the male, rudimentarily sculptured protuberances are present on the thoracic somites. Caudal ramus possesses very small seta represented in seta I and seta II, and basal seta transformed to a fused big spine. Antenna has a barbed abexopodal seta and 3 exopodal setae, and a barbed inner

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seta appeared on P1 to P3 distal endopod in female and on P2 and P3 in male.

KEY FOR THE SPECIES OF THE GENUS *LEPTOCARIS**

1. P1 enp 1-segmented ..... 2 (*mangalis*-group)
   P1 enp 2-segmented 4
2. A1 5-segmented; ♀ P5 with 3 setae..... *L. stromatolicolus*
   A1 4-segmented; ♀ P5 with 2 setae 3
3. P1 exp-1 with 3 setae..... *L. mangalis*
   P1 exp-1 with 4 setae..... *L. noodti*
4. P2 exp-3 with 3 setae ..... 5 (*minimus*-group)
   P2 exp-3 with 4 setae..... 6
5. ♀ P5 with 6 setae; P1 exp-3 with 4 setae; P4 enp-2 with 3 setae..... *L. armatus*
   ♀ P5 with 4 setae; P1 exp-3 with 4 setae; P4 enp-2 with 2 setae..... *L. minimus*
   ♀ P5 with 4 setae; P1 exp-3 with 3 setae; P4 enp-2 with 2 setae..... *L. marinus*
6. P3 and P4 exp-3 with 5 setae.....7 (*brevicornis*-group)
   P3 and P4 exp-3 with 4 setae.....12 (*ignavus*-group)
7. P1 enp-1 without inner seta..... 8
   P1 enp-1 with inner seta..... 10
8. ♀ P5 with 4 setae; P4 enp-1 with inner seta..... *L. vermicularis*
   ♀ P5 with 2 setae; P4 enp-1 without inner seta..... *L. sibiricus*
   ♀ P5 with 3 setae..... 9
9. P1 enp-2 with 3 setae..... *L. echinatus echinatus*
   P1 enp-2 with 2 setae..... *L. echinatus nudus*
10. ♀ P5 with 2 setae..... *L. brevicornis*
    ♀ P5 with 4 setae ..... *L. itoi*
    ♀ P5 with 3 setae 11
11. A1 4-segmented; P3 enp-2 with 4 setae... *L. mucronatus*
    A1 5-segmented; P3 enp-2 with 5 setae..... *L. trisetosus pacificus*
    A1 6-segmented; P3 enp-2 with 4 setae..... 12
12. Caudal ramus with normal seta V..... *L. trisetosus trisetosus*
    Caudal ramus with modified seta V..... *L. trisetosus breviseta*
13. P2 enp-1 with inner seta..... 14
    P2 enp-1 without inner seta..... 18
14. P2 enp-2 with 4 setae..... 15
    P2 enp-2 with 3setae 16
15. P4 enp-2 with 4 setae; ♂ P5 with 6 setae/spines..... *L. insularis*
    P4 enp-2 with 3 setae; ♂ P5 with 5 setae/spines..... *L. pori*
16. P1 enp-2 with 3 setae..... 17
    P1 enp-2 with 2 setae; P4 enp-2 with 2 setae..... *L. ryukyuensis* sp. nov.
17. P4 enp-2 with 3 setae..... *L. biscayensis*
    P4 enp-2 with 2 setae..... *L. doughertyi*
18. A1 7-segmented..... 19
    A1 5- or 6-segmented..... 20
19. P2 enp-2 with 3 setae; ♀ P5 with 4 setae..... *L. minutus*
    P2 enp-2 with 5 setae; ♀ P5 with 3 setae..... *L. kunzi*
20. P1 enp-2 with 1 seta..... *L. igneus*
    P1 enp-2 with 2 setae..... 21
    P1 enp-2 with 3 setae..... *L. glaber*
21. P2 to P4 enp-2 with 2 setae..... *L. canariensis*
    P2 to P4 enp-2 with 3 setae..... *L. islandica*

*The key is amended after Fleeger & Clark (1979).

DISCUSSION

Systematics

Lang (1965) based his phylogenetic system of *Leptocaris* on the male P5. Here the innermost seta is greatly enlarged to a stout spine in *L. pori*, *L. minutus*, *L. ignavus*, *L. insularis* and *L. trisetosus*. This character is difficult to use though since males are unknown as yet in several species of the genus. This is also the reason why phylogenetic relationships within the genus are only tentative as yet. The discovery of males as in the present study will certainly throw more light on the systematics of the genus *Leptocaris*.

According to Kunz (1978) there are 3 species groups among *Leptocaris*. The *minimus*-group is characterized by a low number of setae on the distal segment of exopod P3 and P4, namely 3 setae. It consists of *L. minimus* (Jakobi), *L. armatus* Lang and *L. marinus* (Por). The other species groups of *Leptocaris* contain 4 or 5 setae on the exopods of P3 and P4, respectively. Setal numbers range from 3/4 and 3/5 on the distal segments of the exopods P1/P2 and P3/P4, respectively. According to Kunz (1994) the segment number and setae on the P1-P4 of females provide the most decisive distinction of the then 4 species groups of *Leptocaris* that Kunz (1994) was identifying:

(1) *minimus*-group (according to Kunz, 1978), containing: *L. minimus* (Jakobi, 1954); *L. marinus* (Por, 1964), *L. armatus* (Lang, 1965).
(2) *ignavus*-group (according to Kunz, 1983), containing: *L. minutus* T. Scott, 1899; *L. ignavus* (Noodt, 1953); *L. biscayensis* (Noodt, 1955); *L. insularis* (Noodt, 1958); *L. canadensis* Lang, 1965; *L. pori* Lang, 1965; *L. doughertyi* Lang, 1965; *L. kunzi* Fleeger & Clark, 1980; *L. igneus* Cottarelli & Baldari, 1982; *L. glaber* Fiers, 1986.
(3) *brevicornis*-group (according to Kunz, 1983), containing: *L. brevicornis* (van Douwe, 1905); *L. trisetosus trisetosus* (Kunz, 1935); *L. gurneyi* (Nicholls, 1944); *L. sibiricus* (Borutzky, 1952); *L. vermicularis* (Oliveira, 1957); *L. mucronatus* Fiers, 1986; *L. echinatus echinatus* Fiers, 1986; *L. mucronatus* Fiers, 1986; *L. itoi* Kunz, 1994.
(4) *mangalis*-group (according to Kunz, 1994), containing: *L. mangalis* Por, 1983; *L. stromatoliticolus* Zamudio Valdez & Reid, 1990; *L. noodti* Kunz, 1994.

Leptocaris ryukyuensis belongs to the *ignavus*-group of species which is characterized by a 2-segmented P1 endopod, and P2 to P4 exp-3 with 4 setae respectively (Table 2).

Leptocaris ryukyuensis has some characters which may be considered as derived, chiefly the subcircular anal operculum and the spinule rows on the first article of the antennules, and, in the male, rudimentarily sculptured hyaline protuberances on some prosomites. Partly because of the lack of male descriptions in several species, proposed arrangements of species-groups within the genus *Leptocaris* are at present problematic (Fleeger & Clark, 1980).

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Table 2. Comparison of morphological characteristics in *ignavus*-group species (female only).

ignavus-group	A1	P1		P2		P3		P4		P5		References
	no. seg.	exp	enp	exp	enp	exp	enp	exp	enp	F	M	
Leptocaris minutus T. Scott, 1899	7	0 0 4	1 3	0 0 4	0 3	0 0 4	0 3	0 0 4	0 3	4	5	Lang, 1948; Kunz, 1978; Huys *et al.*, 1996
Leptocaris biscayensis (Noodt, 1955)	6	0 0 4	1 3	0 0 4	1 3	0 0 4	0 3	0 0 4	0 3	3	4	Petkovski, 1955; Noodt, 1955; 1958; Kunz, 1978; Cottarelli & Baldari, 1982
Leptocaris insularis (Noodt, 1958)	6	0 0 4	1 3	0 0 4	1 4	0 0 4	0 4	0 0 4	0 4	3	6	Noodt, 1958
Leptocaris pori Lang, 1965	6–7?	0 0 4	1 2	0 0 4	1 4	0 0 4	0 4	0 0 4	0 3	3	5	Lang, 1965
Leptocaris doughertyi Lang, 1965	6–7?	0 0 4	1 3	0 0 4	1 3	0 0 4	0 3	0 0 4	0 2	3	4	Lang, 1965
Leptocaris. canariensis Lang, 1965	5–6?	0 0 4	1 2	0 0 4	0 2	0 0 4	0 2	0 0 4	0 2		4	Noodt, 1958
Leptocaris kunzi Fleeger & Clark, 1980	7	0 0 4	1 2	0 0 4	0 5	0 0 4	0 3	0 0 4	0 3	3	4	Fleeger & Clark, 1980
Leptocaris igneus Cottarelli & Baldari, 1982	5	0 0 4	1 1	0 0 4	0 3	0 0 4	0 3	0 0 4	0 3	3	u	Cottarelli & Baldari, 1982
Leptocaris glaber Fiers, 1986	5	0 0 4	1 3	0 0 4	0 4	0 0 5	0 4	0 0 5	0 4	3	u	Fiers, 1986
Leptocaris islandica Apostolov, 2007	6	0 0 4	1 2	0 0 4	0 3	0 0 4	0 3	0 0 4	0 3	3		Apostolov, 2007
Leptocaris ryukyuensis sp. nov.	7	0 0 4	1 2	0 0 4	1 3	0 0 4	0 3	0 0 4	0 2	3	4	Present study

no. seg., number of segments; exp, exopod; enp, endopod.

Biogeography

Among the Darcythompsoniidae, the genera *Leptocaris* and *Darcythompsonia* have a worldwide distribution while *Kristensenia* and *Pabellonia* are more restricted. Representatives of *Leptocaris* are known from China, Korea, Japan, the Americas (Brazil, El Salvador and USA), Africa (Egypt and Algeria), Iran, Israel and Europe (Mediterranean Sea, Black Sea, Atlantic coasts of Britain and France, the North Sea). The *ignavus*-group of *Leptocaris* is distributed worldwide but restricted to the northern hemisphere (Figure 6). In the *ignavus*-group only *L. minutus* and *L. biscayensis* were recorded at more than one locality—namely from 3 localities in Ireland, England and Germany and 4 localities in the Mediterranean and from the Canary Island of Tenerife in the Atlantic. All other species were found only for one time, primarily in marine European waters and one species, *L. kunzi* from an estuarine lake in Louisiana, USA. The present record of *Leptocaris ryukyuensis* sp. nov. provides the first record from the Pacific Ocean.

Ecology

Although new species and new records of species of this family were frequently published, the ecology of these groups of animal remains poorly understood. Representatives inhabit bottom sediments with high organic matter content at coastal marshes or lagoons. Most representatives are known from brackish coastal habitats (Fleeger & Clark, 1980). Kunz (1978) claimed that isolated brackish pools or sand beaches are the most common habitats of *Leptocaris*. Indeed, most collections are from sandy habitats, but some are from phytal decomposing habitats and from mud. A stromatolite and a

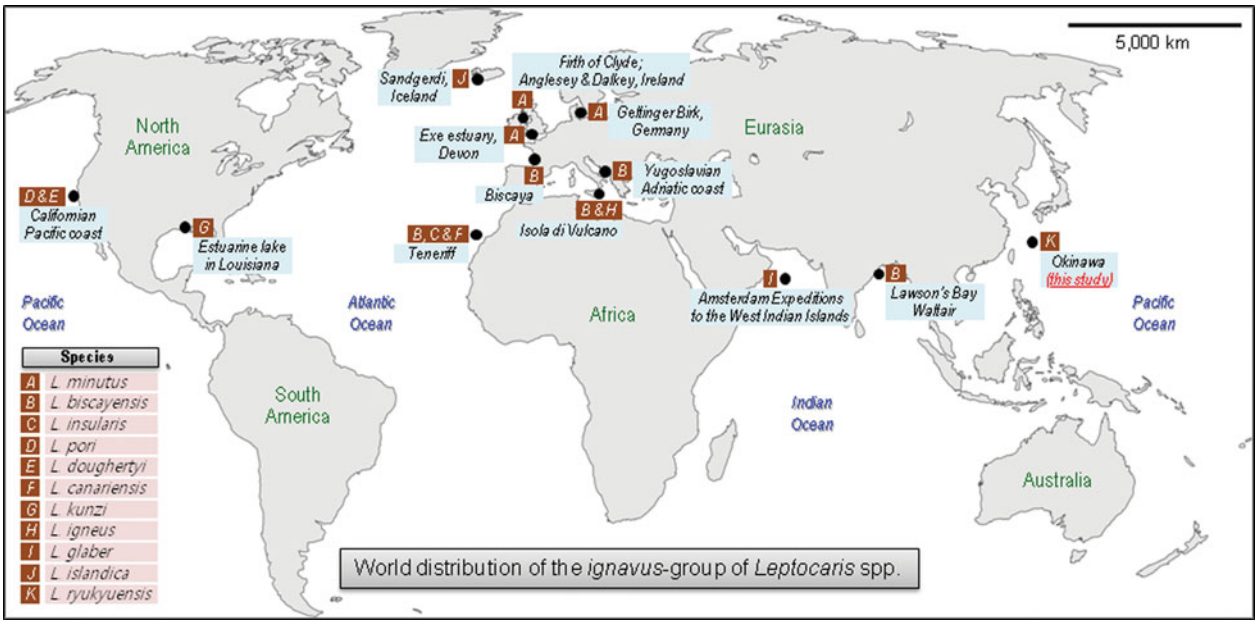

Fig. 6. World distribution of the *ignavus*-group (*sensu* Kunz, 1994) of *Leptocaris* spp. References for: (A) Lang, 1948; Noodt, 1953; Huys *et al.*, 1996; (B) Noodt, 1955; Petkovski, 1955; Kunz, 1978; Cottarelli & Baldari, 1982; (C) Noodt, 1958; (D) Lang, 1965; (E) Lang, 1965; (F) Noodt, 1958; Lang, 1965; (G) Fleeger & Clark, 1980; (H) Cottarelli & Baldari, 1982; (I) Fiers, 1986; (J) Apostolov, 2007; (K) present study.

https://doi.org/10.1017/S0025315411001949 Published online by Cambridge University Press

marsh habitat for *L. stromatolicolus* is suggested to provide an appropriate interstitial situation by Valdez & Reid (1990). Por (1983) supported the idea that *Leptocaris* are distributed in the material of decomposing mangrove tree leaves. Fiers (1986) noted that these apparently highly specialized animals are adapted to live in particular 'marginal' habitats (euryhaline, eurythermal and temporary) where colonization by most other harpacticoid groups is failing. The species newly described here and most other species are found in contrasting habitats. Among the 27 species belonging to the genus *Leptocaris* T. Scott, 1899 (see Boxshall & Halsey, 2004) there are 3 species that are reported from continental waters (Dussart & Defaye, 1990; Lee & Chang, 2008): *L. sibiricus* Borutzky, 1952, *L. trisetosus trisetosus* (Kunz, 1935) and *L. brevicornis* (van Douwe, 1905).

Most members of the genus occur in euryhaline and eurythermal habitats, sometimes as members of a typically estuarine species assemblage (Fleeger & Clark, 1980), but most often in isolated brackish pools or beach sands (Kunz, 1978). Two congeners, *L. brevicornis* (van Douwe, 1905) and *L. sibirica* (Borutsky, 1952), have been found in Eurasian continental fresh as well as brackish waters (van Douwe, 1905; Borutsky, 1952). Most records are from sandy substrates, but some are from mud and phytal substrates, including decomposing mangrove leaves, a niche to which members of the genus seem pre-adapted (Por, 1983).

ACKNOWLEDGEMENTS

We thank Dr Jinsoon Park (Korea University) and Dr Huyn Soo Rho (KORDI, Korea) for technical assistance for drawings and collecting samples from Okinawa, Japan. We are particularly indebted to Dr Frank D. Ferrari (Smithsonian Institution, Washington, DC) for critical amendments to a previous MS version. Mr Minkyu Kim and Mr Jae Hyuk Kim of Korea University provided a developed world map. This research was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology to H.-U. Dahms (2010-A001-0057). This work was also supported by the NRF of Korea Grant funded by the Korean Government (MEST) (NRF- 2011-0004261).

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https://doi.org/10.1017/S0025315411001949 Published online by Cambridge University Press