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Leucon (Crymoleucon) rossi, a New Species (Crustacea: Cumacea: Leuconidae) From the Shelf Waters of the Ross Sea (Antarctica), With a Key to the Genus Leucon South of 60 Degrees S

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Leucon (Crymoleucon) rossi, a new species (Crustacea: Cumacea: Leuconidae) from the shelf waters of the Ross Sea (Antarctica), with a key to the genus *Leucon* south of 60°S

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SUMMARY: A new leuconid cumacean, *Leucon (Crymoleucon) rossi* n. sp., is described from depths of 84 to 458 m in the Ross Sea off the Victoria Land coast. *Leucon rossi* n. sp. is distinguished from other members of the genus by a combination of characters including 1) a blunt, horizontally directed pseudorostrum without a distinctly protruding siphon; 2) strongly developed antennal notch; 3) entire dorsomedian margin of carapace appearing serrate, armed with 14 to 19 anteriorly curved spines in female (up to 21 in subadult males); 4) a small, but distinct, spine behind the frontal lobe; and 5) the uropodal peduncle slightly shorter than the exopod. After *Leucon antarcticus* Zimmer, 1907, *L. rossi* was the second most frequently occurring cumacean in the samples collected off Victoria Land. Statistical analyses showed significant differences in the proportion of carapace length and height of adult (all incubating in the present study) and immature females compared to immature males; no adult males were available for study.

Keywords: Crustacea, Cumacea, Leuconidae, *Leucon rossi*, new species, Antarctica, Ross Sea.

RESUMEN: Leucon (Crymoleucon) rossi (Crustacea: Cumacea: Leuconidae), una nueva especie de aguas poco profundas del Mar de Ross (Antártida), y una clave para las especies del género Leucon de latitudes mayores a los 60ºS. – Se describe un nuevo cumáceo, *Leucon (Crymoleucon) rossi* n. sp., hallado entre los 84 y 458 m de profundidad en el mar de Ross, frente a la costa de la Tierra de Victoria. *Leucon rossi* n. sp. se distingue de los otros miembros del género por poseer la siguiente combinación de caracteres: 1) un pseudorostro truncado, horizontal, sin un sifón proyectándose más allá de este; 2) una escotadura antenal bien desarrollada; 3) el margen dorsal del caparazón aserrado en toda su extensión, con 14-19 dientes dirigidos hacia adelante en la hembra (hasta 21 en el macho subadulto); 4) una pequeña espina por detrás del lóbulo frontal; y 5) el pedúnculo del urópodo es ligeramente más corto que el exopodito. Tras *Leucon antarcticus* Zimmer, 1907, *L. rossi* fue el cumáceo más abundante en las muestras recolectadas frente a la costa de Tierra de Victoria. La proporción alto/largo del caparazón de las hembras inmaduras y adultas difiere estadísticamente de aquella de los machos preadultos. No se contó con machos adultos para su estudio.

Palabras clave: Crustacea, Cumacea, Leuconidae, *Leucon rossi*, nueva especie, Antártida, mar de Ross.

INTRODUCTION

Leucon antarcticus, Zimmer 1907 is the only species of the genus *Leucon* Krøyer, 1846 currently reported from the Ross Sea (Jones, 1971). During the Victoria Land Transect Project onboard the Italian research vessel *Italica* in 2004, five additional species of the genus were obtained: *Leucon assimilis* Sars, 1887; *Leucon intermedius* Mühlenhardt-Siegel, 1996; *Leucon parasiphonatus* Mühlenhardt-Siegel,

1994; *Leucon* cf. *sagitta* Zimmer, 1907; and a new species, *Leucon* sp. A (Rehm *et al*., 2007), the description of which is the subject of this report.

MATERIAL AND METHODS

The material of *Leucon rossi* was collected during the 19th expedition of RV *Italica* to the Ross Sea. From February 9 to 22, 2004, 13 of 19 samples containing specimens of the species were collected in depths of 84 to 458 off the coast of Victoria Land with a modified Rauschert dredge (compare Rehm *et al*., 2006). Type material was collected at Terra Nova Bay and Cape Russell. For detailed data on the stations and further information on the species diversity and distribution see Rehm *et al*. (2007) in which *Leucon* sp. A refers to *L. rossi*.

Drawings were created from digital photographs using a digital drawing tablet as described by Coleman (2003, 2006). Measurements of body dimensions were statistically compared using the Mann-Whitney Rank Sum Test. Body length is measured from the tip of the pseudorostrum to the tip of the pleotelson. Carapace length is measured from the tip of the pseudorostrum to the posterior margin of the carapace, whereas carapace height is measured from the ventralmost to the dorsalmost margins. Length of articles is measured according to Mühlenhardt-Siegel (2005) and given as relative length of peduncle articles 1 to 3 of antenna 1 compared to total peduncle length (RLP). As the basis of appendages is part of the protopodite it is treated separately and compared with the endopodite (ischium to dactylus not including terminal seta) in the ratio B/R and given for maxillipeds and pereiopods. RLA refers to the relative length of each article of the endopodite (from ischium to dactylus) excluding terminal seta.

Type material has been deposited in the Zoological Museum Hamburg (ZMH) and in the Senckenberg Museum, Frankfurt (SMF). Additional paratypes have been deposited in the Museum of the University of Southern Mississippi Gulf Coast Research Laboratory (GCRL).

TABLE 1. – Body dimensions of *Leucon (Crymoleucon) rossi,* n. sp.; C = carapace, inc = incubating, pm = premature, SD = standard deviation

stage/sex		n	range (mm)	mean (mm)	SD
Carapace height					
	inc female	29	0.66-0.91	0.81	0.06
	pm female	95	0.58-0.98	0.80	0.07
	pm males	75	0.68-0.90	0.79	0.09
Carapace length					
	inc female	29	0.97-1.22	1.11	0.06
	pm female	95	0.87-1.30	1.11	0.08
	pm male	75	1.05-1.30	1.18	0.06
Carapace and free thorax segments length					
	inc female	28	1.85-2.32	2.06	0.11
	pm female	94	1.53-2.25	1.92	0.14
	pm males	74	1.76-2.25	2.04	0.09
Total length					
	inc females	28	3.69-4.54	4.01	0.24
	pm females	91	3.01-4.49	3.76	0.28
	pm males	71	2.01-4.28	3.94	0.27
C height / C length					
	inc females	29	0.62-0.84	0.73	0.06
	pm females	95	0.62-0.82	0.72	0.04
	pm males	75	0.56-0.79	0.67	0.04

SYSTEMATICS

Family LEUCONIDAE Sars, 1878
Genus *Leucon* Krøyer, 1846
Subgenus *Crymoleucon* Watling, 1991
Leucon (Crymoleucon) rossi n. sp.
(Figs. 1-4)

Synonym. Leucon sp. A (Rehm *et al*., 2007)

Type material. Holotype. Incubating female (ZMH K-41271). *Type locality*. Terra Nova Bay, Station SMN: 74°43.2'S/164°13.1'E, sand substratum with gravel and stones, 366 m, 20 February 2004. *Paratypes.* 4 incubating females, 1 premature female, 5 premature males (ZHM K-41272) same collection data as holotype; 2 incubating females (SMF 31783) same collection data as holotype; 3 premature females, 2 premature males (SMF 31784) and 3 adult females (GCRL 2931) Cape Russell Station R3: 74°49.3'S/164°11.5'E, rocky sand substratum with mud and pebbles, 330 m, 20 February 2004.

Etymology. The new species is named after the Antarctic explorer Sir James Clarke Ross (1800-1862), who discovered Victoria Land, the Ross Sea, and Ross Island

Diagnosis. Pseudorostrum blunt, protruding horizontally. Carapace with 14-19 (adult females) or up to 21 (premature males) anteriorly curved spines along entire dorsomedian margin; single small, distinct, spine behind the frontal lobe. Antennal notch large and well developed. Peduncle of uropod slightly shorter than exopod.

Description. Adult (incubating) female.

Carapace (Fig. 1B), without setae, ridges or tubercles, but with single spine directly behind fron-

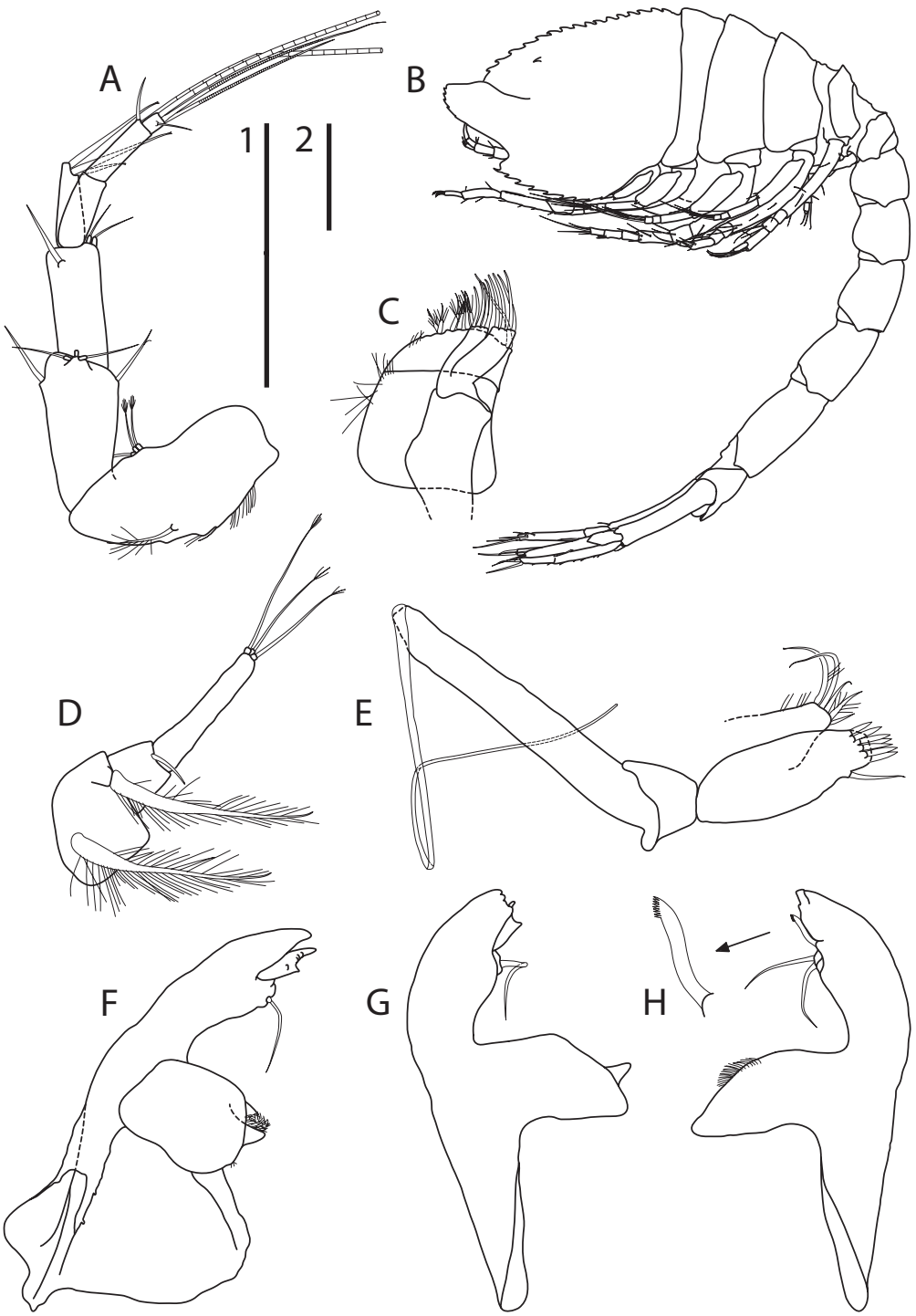

FIG. 1. – *Leucon (Crymoleucon) rossi* n. sp. Incubating female. A, antenna 1; B, habitus; C, maxilla 2; D, antenna 2; E, maxilla 1; F, left mandible, inner aspect; G, left mandible; H, right mandible. Scale 1 = 0.2 mm (A, C-H); Scale 2 = 0.5 mm (B).

tal lobe; surface granulated. Dorsomedian line entirely serrated, bearing 14 to 19 denticles, first and last two often very small or weakly indicated. Pseudorostrum moderately produced, about 1/6 of total carapace length (including pseudorostrum), directing forward; anterior margin with 5 to 7 serrations, ventral margin with up to nine minute serrations, with 8-13 setae on anterior and ventral margin. Siphonal tube not discernable. Eye lobe rudimentary, eyes missing. Antennal notch distinct. Ventral margin of carapace strongly serrated starting with forward pointed spine at antero-ventral edge. First and

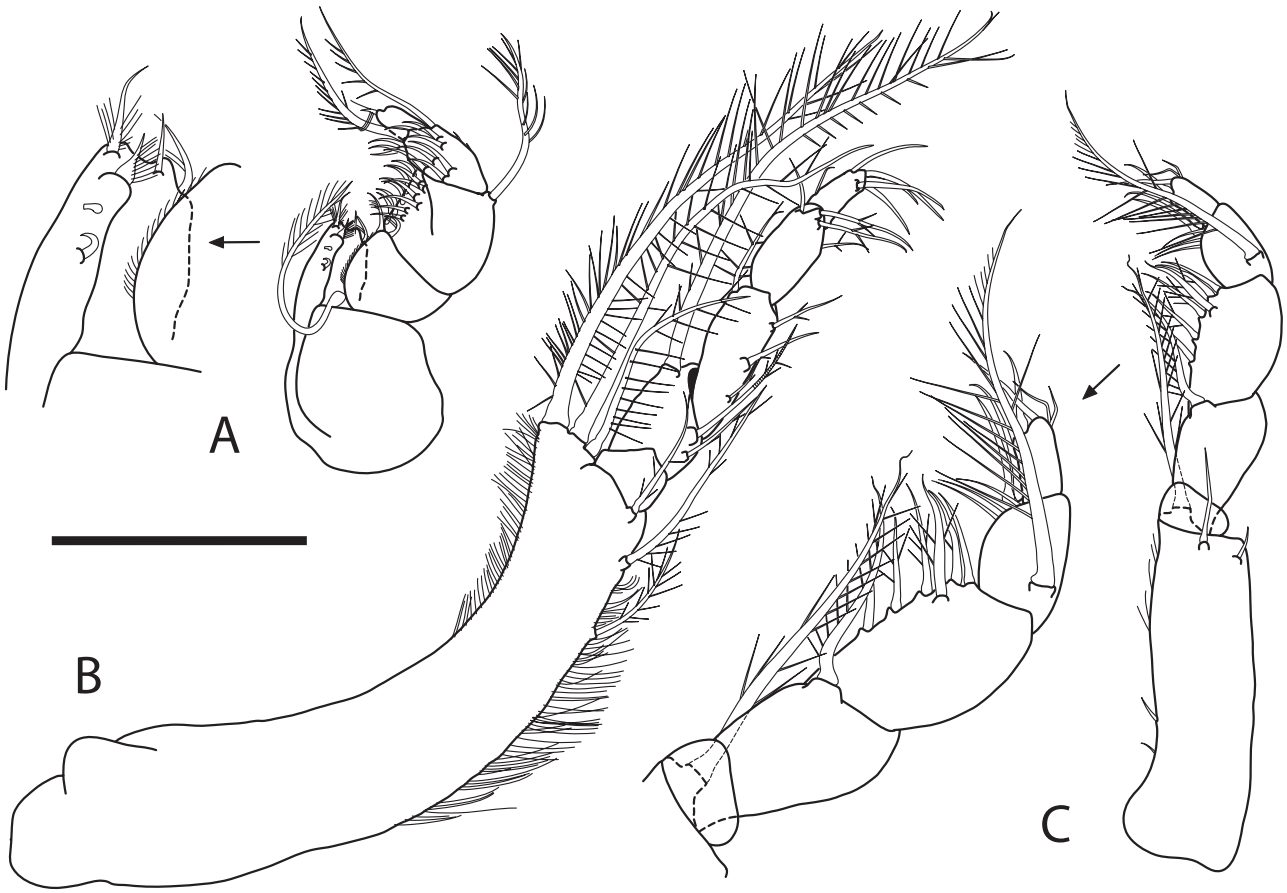

FIG. 2. – *Leucon (Crymoleucon) rossi* n. sp. Incubating female. A, maxilliped 1 (palp not shown); B maxilliped 3 (exopod not shown); C, maxilliped 2. Scale = 0.2 mm.

second free thoracic segments overlapped by the antero-lateral margin of the following segments. Pleon approximately as long as cephalothorax; pleonite 6 shorter than uropod peduncle. For dimensions of body see Table 1.

Antenna 1 (RLP 25/32/43) (Fig. 1A). Peduncle geniculate between basal and second article. First article with group of 3 sensory setae close to distal margin next to these sensory setae, and plumose seta on distal third of article, proximal half of article with several hair-like setae; second article with simple seta and sensory seta close to distal margin, group of 3 sensory setae on tubercle close to distal margin; third article with seta near distal end and two sensory setae at distal margin. Accessory flagellum uniarticulate slightly longer than article 1 of main flagellum, with 3 strong terminal setae each bearing a flagellum and sensory seta. Main flagellum with 3 articles; article 2 bearing seta and single aesthetasc; terminal article (article 3) about one fourth length of articles 2 and 1, with an aesthetasc, 2 simple setae, and 2 long terminal setae.

Antenna 2 (Fig. 1D). Diminutive; first peduncle article slightly shorter than wide, with 2 plumose setae; second article slightly shorter than wide, about one third of size of article 3, with simple seta; article 3 cylindrical, nearly equal in size of peduncle; terminal 3 sensory setae.

Mandibles (Fig. 1F-H). Left mandible, lacinia mobilis and simple seta between molar and incisor process. Right mandible with single stout seta bearing denticles on inner margin distally and 2 simple setae between incisor und molar processes.

Maxilla 1 (Fig. 1E). Outer endite with 10 stout spiniform setae, single subdistal curved seta inserted on outer margin. Inner endite with 2 minute simple setae, 2 plumose setae of intermediate length, and 2 long plumose setae, innermost ending trifurcate, inner edge with hair-like setae. Palp ending in single seta.

Maxilla 2 (Fig. 1C). Distal margin of protopod with row of plumose setae and long simple setae at outer distal edge, inner margin with hair-like setae. Outer lobe of endite with 4 stout setae, outer most plumose; inner lobe of endite with 4 stout setae.

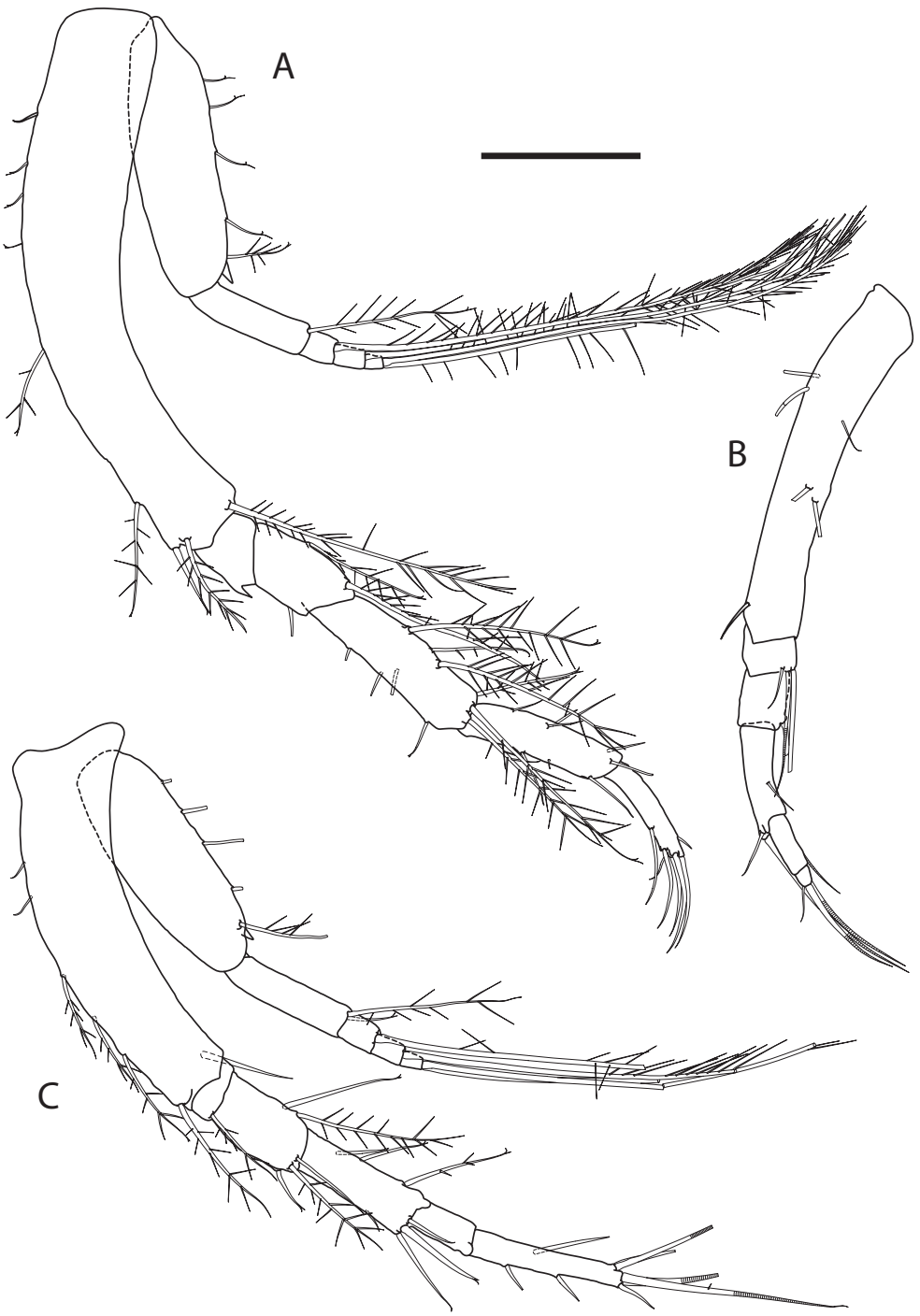

FIG. 3. – *Leucon (Crymoleucon) rossi* n. sp. Incubating female. A, pereiopod 1; B, pereiopod 4; C, pereiopod 2. Scale = 0.2 mm.

Maxilliped 1 (B/R 0.5; RLA -/25/33/26/17) (Fig. 2A). Endite of basis with plumose setae at inner margin and distal end; 2 retinacula present; ischium not present; strongly developed plumose seta between basis and merus (probably inserting at basis) directed proximally turning 180° at about half length of endite of basis, slightly exceeding endite; merus with 2 plumose seta on inner edge of distal margin; numerous simple setae at and close to inner margin of carpus and propodus; carpus with large plumose seta on distal outer margin; propodus with 2 large plumose setae, one at distal end and one on outer margin; dactylus with single plumose seta distally.

Maxilliped 2 (B/R 0.7; RLA 9/28/30/21/12) (Fig. 2C). Basis, 2 small simple setae at inner margin and

several small hair-like setae at inner margin of distal third, close to distal margin simple seta and small simple seta, inner edge of distal margin with strong pappose seta; merus, inner edge of distal margin with strong pappose seta; carpus, along inner margin 5 setae, all but distal most seta pappose, 2 pappose setae close to inner margin; propodus having well-developed pappose seta proximally, distal margin with several simple and pappose setae; dactylus, terminal 2 pappose setae, a few simple setae and hair-like setae.

Maxilliped 3 (B/R 1.5; RLA 7/24/30/25/13) (Fig.2B). Basis curved, distal half of inner margin and distal third of outer margin with hair-like setae, 4 plumose setae at distal margin, 2 long plumose setae extending beyond dactylus, 2 plumose setae at distal fourth of inner margin; ischium present; merus with 2 plumose setae close to inner margin, one annulated and one strong, long, and plumose seta distally at outer margin; carpus with 3 plumose setae at inner margin and plumose seta distally at outer margin; propodus distally 3 plumose setae and simple seta; dactylus small setae on outer proximal margin, 2 seta subterminal, 3 terminal setae; exopod with spine on distal margin of basal article.

Pereiopod 1 (B/R 0.9; RLA 11/19/30/24/17) (Fig. 3A). Basis with 4 small sensory setae at proximal half of lower margin, distal half with 2 pappose setae, close to distal margin one pappose seta, long pappose seta, and sensory seta; ischium with tooth at distal lower margin; merus, pappose, long and pappose seta at upper margin, simple seta at lower margin; carpus, 2 pappose and 2 long and pappose setae at upper margin, 3 simple setae at lower margin, 2 long pappose setae at distal margin; propodus, 9 simple setae of very small to moderate size; dactylus, small seta and strong seta at distal third, terminal 4 strong and small seta; exopod with spine at distal margin of basal article.

Pereiopod 2 (B/R 0.4; RLA 5/20/29/14/32) (Fig. 3C). Basis, 2 small simple setae at margin of proximal third, simple seta close to distal margin, 4 pappose setae at distal half of lower margin; ischium, pappose seta at edge of lower distal margin; merus, 2 pappose setae, 2 sensory setae, and simple seta close to distal margin; carpus, 2 simple setae, and sensory seta at margins; pappose, 2 simple setae, and sensory seta at distal margin; propodus, no setae; dactylus with 3 simple setae, terminal 2 simple setae, 2 annulated setae, and elongated annulated seta; exopod with spine at distal margin of basal article.

Pereiopod 3 (B/R 1.7; RLA 17/19/37/20/7) (Fig. 4A). Basis, 2 simple and plumose annulated setae at distal third, simple seta at edge of distal margin; ischium, small simple seta close to distal margin, 2 strong annulated setae at edge of distal margin, one reaching tip of dactylus; merus, simple seta close to distal margin and strong annulated seta at edge of distal margin; carpus, small simple seta in proximal and distal parts, small simple seta, strong and annulated seta and blunt tooth-like structure at distal margin; propodus cylindrical with strong annulated seta at distal margin; dactylus, terminal small seta and strong annulated seta; exopod with spine at distal margin of basal article.

Pereiopod 4 (B/R 1.3; RLA 18/19/37/19/7) (Fig. 3B). Basis, with 5-7 plumose setae, 2 sensory setae, and simple seta in proximal half of article, simple seta at lower edge of distal margin; ischium, small simple seta close to distal margin, 2 longer setae at edge of upper distal margin (one annulated); merus, strong seta close to edge of upper distal margin; carpus, small simple seta at middle of article, at edge of lower distal margin small simple seta and strong, elongated, and annulated seta; propodus, annulated seta distal at upper margin, strong annulated seta at distal margin; dactylus, small simple seta and strong annulated terminal seta; exopod in premature males only.

Pereiopod 5 (B/R 0.9; RLA 17/23/34/16/10) (Fig. 4B). Basis, small sensory seta, 2 simple setae (one minute), 4 plumose setae and plumose setae at distal margin; ischium with 2 annulated setae at edge of distal margin; merus, annulated seta close to distal margin; carpus, 2 simple setae (one minute), 2 annulated setae at edge of distal margin (one strong and elongated); propodus, strong (annulated) seta at distal margin; dactylus small seta and annulated seta distally.

Uropod (Fig. 4C). Length of peduncle and endopod equal; inner margin of peduncle with 8-9 stout cuspidate setae, outer margin with 3-4 hair-like setae, simple seta at distal margin. Exopod 0.9 times length of endopod. Endopod two segmented, inner margin of basal article of endopod with 9 stout cuspidate setae, between distal 6-7 minute stout spines each, outer distal edge with simple seta. Inner margin of distal article with 4 stout cuspidate setae and 4 stout minute spines alternating; 2 terminal setae; outer margin of distal article with 2 small simple setae. Inner margin of exopod with 2 simple setae and longer seta, outer margin with 5 setae, terminal 2 long annulated setae and shorter seta.

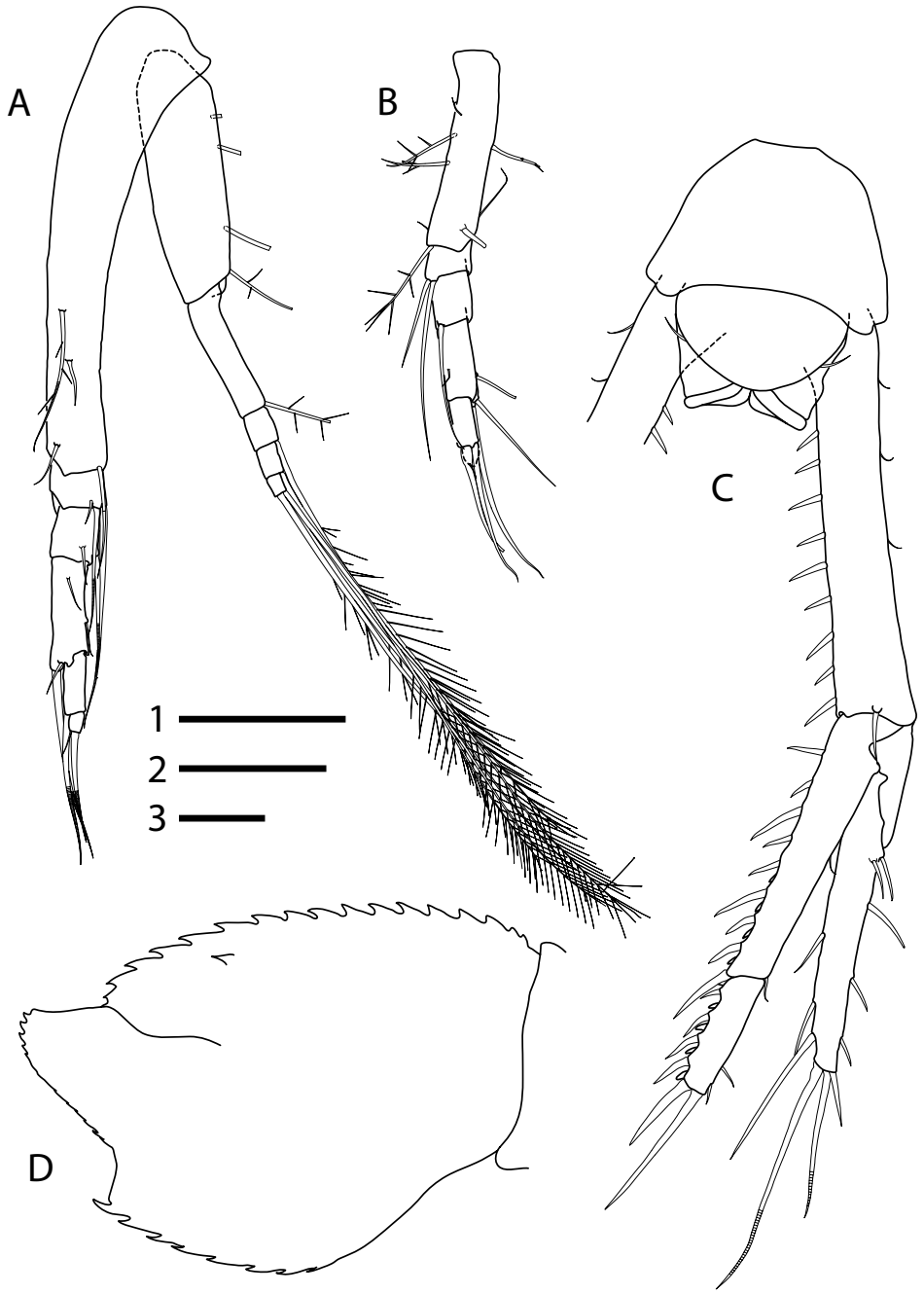

FIG. 4. – *Leucon (Crymoleucon) rossi* n. sp. Incubating female. A, pereiopod 3; B, pereiopod 5; C, pleotelson and right uropod. *Leucon (Crymoleucon) rossi* n. sp. premature male. D, carapace. Scale 1 = 0.2 mm (A,B); Scale 2 = 0.2 mm (C); Scale 3 = 0.2 mm (D).

Premature males. Second antenna incompletely developed and lacking articulation and setae, reaching posteriorly to free thoracic segments. Carapace (Fig. 4D) with dorsomedian margin bearing more denticles than in females (up to 21); denticles of ventral margin of pseudorostrum in premature males more distinct. Exopods developing on pereiopods 1 to 4 and on maxilliped 3; the spine at the distal margin of the basal article in females is followed by 1 or 2 additional spines in the premature males. Pleopod buds present on abdominal segments 1 and 2, with 3 or 4 minute setae distally.

Remarks. Leucon (Crymoleucon) rossi n. sp. resembles *L. (Crymoleucon) antarcticus* Zimmer, 1907 in the general shape of the carapace, which is slightly stouter in *L. rossi*. Both species have an uninterrupted row of dorsomedian denticles from the

eyelobe to the posterior margin. They can be distinguished by the lateral spines on the carapace. A single spine only is situated dorsally directly behind the frontal lobe in *L. rossi*, whereas *L. antarcticus* is armed with a spine on the border of the frontal lobe, close to this spine is another spine on the rostral lobe. A third spine is located below the serrated ridge in a similar position as in *L. rossi*. In addition, 2 or more spines are located in the gastric region. In the redescription of *L. antarcticus* by Ledoyer (1993) only 1 spine on the frontal lobe is shown in the drawing (compare key); in the text the dentition is not mentioned. The pseudorostrum of *L. rossi* is blunt and directed straight forward, while in *L. antarcticus* it is pointed and turned slightly upward. The uropod peduncle is slightly shorter than the exopod and equal to the endopod in *L. rossi*. It differs to the peduncle of *L. antarcticus*, which is shorter than both rami.

The first antenna of *Leucon rossi* is geniculate between articles 1 and 2. Following the key presented by Watling (1991) the species should either belong to the genus *Bytholeucon* Watling, 1991 or *Pseudoleucon* Zimmer, 1903. However, in *Leucon rossi* two pleopods occur in premature males (*Bytholeucon* only 0 or 1), the uropod endopod is somewhat longer than the exopod (*Pseudoleucon* much smaller), and the pseudorostrum is extending straight forward (*Pseudoleucon* upturned). The remaining characters indicate that the species belongs to the genus *Leucon,* subgenus *Crymoleucon* since the accessory flagellum of antenna 1 is longer than the first article of the main flagellum. The character states "antenna 1 not or weekly geniculate" and "antenna 1 geniculate between peduncle article 1 and 2", are unfavourable features for dividing the genera *Nippoleucon* Watling, 1991 and *Leucon* from *Bytholeucon* and *Pseudoleucon*. The key itself contains contradicting information, since in the pictures provided, which were taken from the original descriptions, the angles between peduncles one and two of the first antenna of the species *Bytholeucon hiscens* Bishop, 1981 and *Leucon (Alytoleucon) medius* Bishop, 1982 are about 90°. The first antenna of *Pseudoleucon japonicus* Gamô, 1964 is geniculate as indicated in the text of the original description. However, in the drawing it is straight, and an articulation is only indicated between peduncles 1 and 2 (Gamô, 1964). This demonstrates that this character state of the first antenna can be variable within a species and therefore it should be treated carefully.

Bionomy. The species was found along a latitudinal transect off the Victoria Land coast in depths ranging from 84 to 458 m. Depth distribution was limited by the depth sampled. Specimens were found in high numbers (in total 1090 specimens, from 2 to as many as 378 were found in 12 samples from 13 stations) and in all areas sampled. Adult specimens were restricted to incubating females and occurred in low numbers only (3%). Premature (12%) and juvenile (24%) females were found more frequently than males of the same stages (8% and 14% respectively), while mancas (39%) dominated the samples. The species is a typical component of the cumacean fauna of the Victoria Land coast of the Ross Sea and it appears to be endemic to the Ross Sea.

The statistical comparison between premature males and premature females showed significant differences ($p<0.001$) in all variables measured (Table 1), except carapace height ($p = 0.681$). The index of carapace height vs. carapace length was also compared with the incubating females; premature males and incubating females show significant differences ($p<0.001$), whereas differences in premature and incubating females were not significant ($p<0.072$).

Artificial key to the females of the genus *Leucon* from Antarctic waters south 60ºS

1 Siphon greatly attenuated, as long as carapace .2
– Siphon not greatly attenuated, much shorter than length of carapace 3

2 Carapace with 2 dorsomedian spines near mid-anterior margin of frontal lobe and with 7 spines on lateral surface ....*Leucon weddelli* Ledoyer, 1993
– Carapace lacking dorsomedian and lateral spines .....*Leucon parasiphonatus* Mühlenhardt-Siegel, 1994

3 Dorsomedian teeth ("serrations") confined to the anterior 2/3 of carapace 4
- Dorsomedian teeth extending from anterior margin of frontal lobe to or immediately adjacent to posterior margin of carapace 7

4 Carapace with 4-8 dorsomedial teeth the last 1-3 after a gap ..... *Leucon intermedius* Mühlenhardt-Siegel, 1996
– Carapace with 9-12 acute dorsomedial teeth in uninterrupted row 5

5 Carapace with distinct slanting dorsolateral ridge 6
– Carapace without dorsolateral, slanting ridge ....*Leucon breidensis* Gamô, 1987

6 Uropod peduncle longer than last abdominal segment; ischium of paraeopod 2 present..... .....*Leucon costatus* Corbera, 2000
– Uropod peduncle a little shorter than last abdominal segment; ischium of paraeopod 2 fused to basis .....*Leucon sagitta* Zimmer, 1907

7 Carapace lacking small spine or spines on lateral face of frontal lobe; second article of uropodal endopod with distal article acutely tipped (without apical or terminal seta) with long subdistal seta on outer margin..... .....*Leucon plarsterni* Ledoyer, 1993
- Carapace with at least one spine on lateral face of frontal lobe; uropodal endopod with distal article with apical seta, not acutely tipped, long subdistal seta absent 8

8 Carapace with row of dorsomedial teeth interrupted posteriorly; lateral margin of frontal lobe with 3 spines .....*Leucon assimilis* Sars, 1887
- Carapace with row of dorsomedial teeth not interrupted posteriorly, lateral margin of frontal lobe with no more than 1 spine present 9

9 Carapace with dorsomedial teeth becoming smaller posteriorly; 1 small spine present near mid-ventral margin of frontal lobe (*sensu* Ledoyer 1993) or having an additional 4 or 5 spines on antero- and mid-lateral region (*sensu* Zimmer 1907). Pereopod 1 with exopod lacking ventrodistal spine on first article ....*Leucon antarcticus* Zimmer, 1907
- Carapace with dorsomedial teeth well-developed posteriorly; 1 dorsolateral spine present just posterior to end of ventrolateral suture of frontal lobe. Pereopod 1 with exopod having distinct ventrodistal spine or tooth on first article ....*Leucon rossi*, n. sp.

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