

## The appendages of *Limnoria stephensi* Menzies (Isopoda, Flabellifera)

Torben Wolff

Zoological Museum, University of Copenhagen, Universitetsparken 15, DK 2100 Copenhagen, Denmark

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### Abstract

The appendages of *Limnoria stephensi* are redescribed on the basis of newly collected specimens from Marion Isl. These specimens are compared with type material and some other specimens. The variation and distribution of the species is given.

### Résumé

Les appendices de *Limnoria stephensi* sont redécrits sur quelques exemplaires de l'île Marion. Ces exemplaires ont été comparés avec les spécimens-type et d'autres exemplaires en tenant compte de la variabilité morphologique. La répartition connue est donnée.

### Introduction

In 1988 a Danish student, Peter G. Haxen, submitted to me a considerable number of a *Limnoria* he had collected in holdfasts of the kelp *Durvillaea antarctica* on the subantarctic Marion Island. The species was readily identified as *L. (Phycolimnoria) stephensi* Menzies, 1957, of which the type material from Auckland Island is kept in the Zoological Museum of Copenhagen.

When I received a request to contribute a short paper to the volumes dedicated to my friend, Professor Dr. Jan H. Stock, I started preparing a redescription of the species.

Later, however, I was informed that Dr. Lawrence J. Cookson, Highett, Victoria, Australasian is working on a monograph on the Limnoriidae,

with emphasis on the species from the Australasian region. On my request, Dr. Cookson has kindly sent me a copy of the section of her manuscript dealing with *L. stephensi* from Macquarie Island. In order to avoid unnecessary duplication I have decided to devote this paper to a thorough description of the appendages of the species only. The appendages are so elaborately furnished with spikes and a great variety of setae that they should deserve special attention.

I thank Dr. L.J. Cookson for commenting on my manuscript.

### *Limnoria stephensi* Menzies, 1957

*Limnoria antarctica* Pfeffer – Hale, 1937: 21–23, fig. 6.

?*Limnoria pfefferi* Stebbing – Stephensen, 1927: 361–362.

*Limnoria (Phycolimnoria) stephensi* Menzies, 1957: 189–191, figs. 41–42; Pillai, 1957: 150.

*Limnoria stephensi* – Cookson, in press.

Type material. – 1 mile E. of Auckland Island, in floating “*Lessonia*”, 28 Nov. 1914, Th. Mortensen leg. Designated lectotype ♂ 6.9 mm; paralectotypes: dissected ♀ 6.7 mm; ♂ ca. 6 mm; 22 specimens 4.0–3.7 mm; 2 specimens 3.3 and 2.5 mm; 2 specimens ca. 1.4 and 1 mm. All specimens in Zoological Museum, Copenhagen, except 1 ♂ and 1 ♀ in Museum of Victoria, Melbourne, Australia (NMV J.17240).

Additional material. – Marion Island, 46°54'S, 37°45'E, intertidal, in holdfasts of *Durvillaea antarctica*, 4 Aug. 1979; Peter G. Haxen leg. 1 ♂ 9.8 mm; 1 ♂ 8.9 mm; 1 ♀ 8.7 mm; 1 ♂ 8.3 mm; 1 ♀ 8.2 mm; 2 ♂ 8.0 mm; 2 ♀ 7.8 mm; ovigerous: 1 ♀ 7.8 mm (empty); 1 ♀ 7.7 mm (ca. 30 eggs); 1 ♀ 7.6 mm (ca. 25 embryos); 1 ♀ 6.3 mm (ca. 18 embryos); 1 ♀ 5.9 mm (empty); 25 specimens 7.5–6.5 mm; 38 specimens 6.5–5 mm; 48

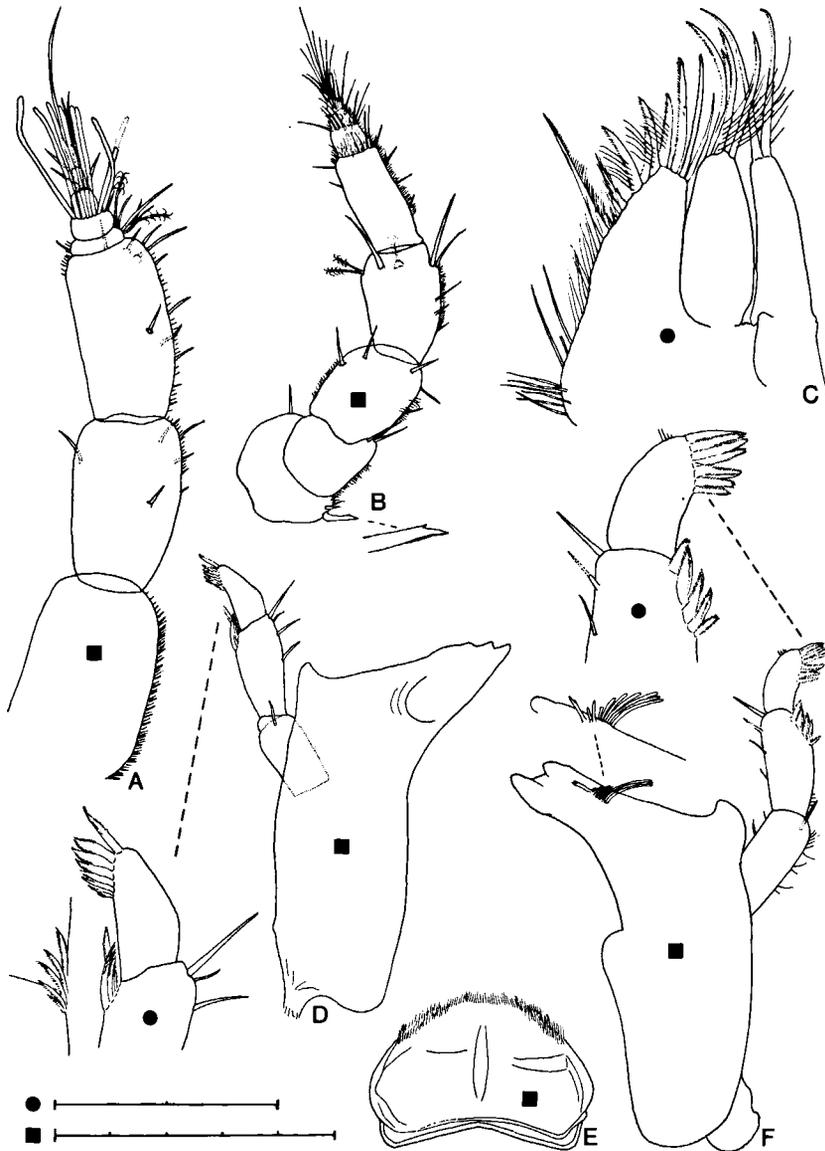


Fig. 1. *Limnoria stephensi*, male from Marion Isl.: A, left antenna 1; B, left antenna 2; C, right maxilla 2; D, left mandible; E, labrum; F, right mandible. Scales 0.2 and 0.5 mm.

specimens 5–4 mm; 70 specimens 4–2.0 mm. Zoological Museum, Copenhagen and Peter Haxen's private collection; five specimens in Museum of Victoria, Melbourne, Australia (NMV J.17241).

**Description.** – (Marion Island material). The recently collected material from Marion Island is considerably more transparent and less filthy than the type material and thus better suited for illustrating

details in setal equipment. The description is based on a male, length 6.7 mm.

**Antenna 1** (fig. 1A). Peduncle with 3, flagellum with 4 articles. First article of flagellum with 2 plumose setae, second with 8 aesthetascs, third with 1 somewhat stouter aesthetasc and three simple setae and fourth with 1 very long and 2 half as long, simple setae.

**Antenna 2** (fig. 1B). Both peduncle and flagellum

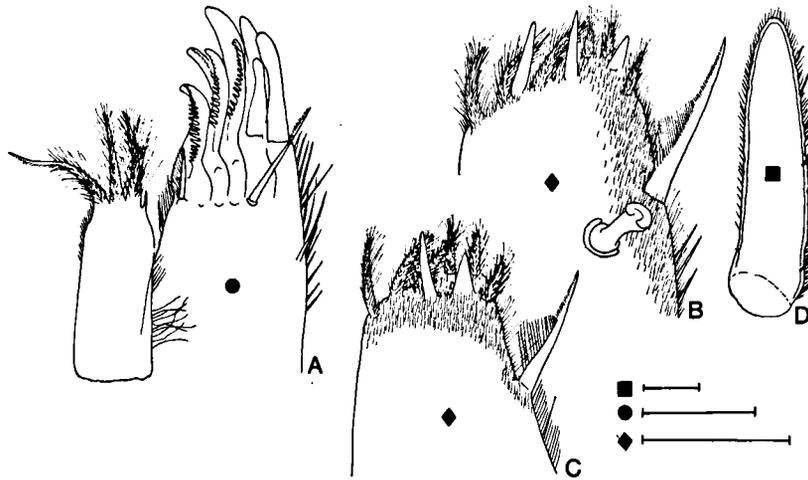


Fig. 2. *Limnoria stephenseni*: A–B, D, male from Marion Isl.; C, paralectotype. A, right maxilla I; B–C, distal part of endite of left maxilliped; D, epipod of left maxilliped. Scales 0.1 mm.

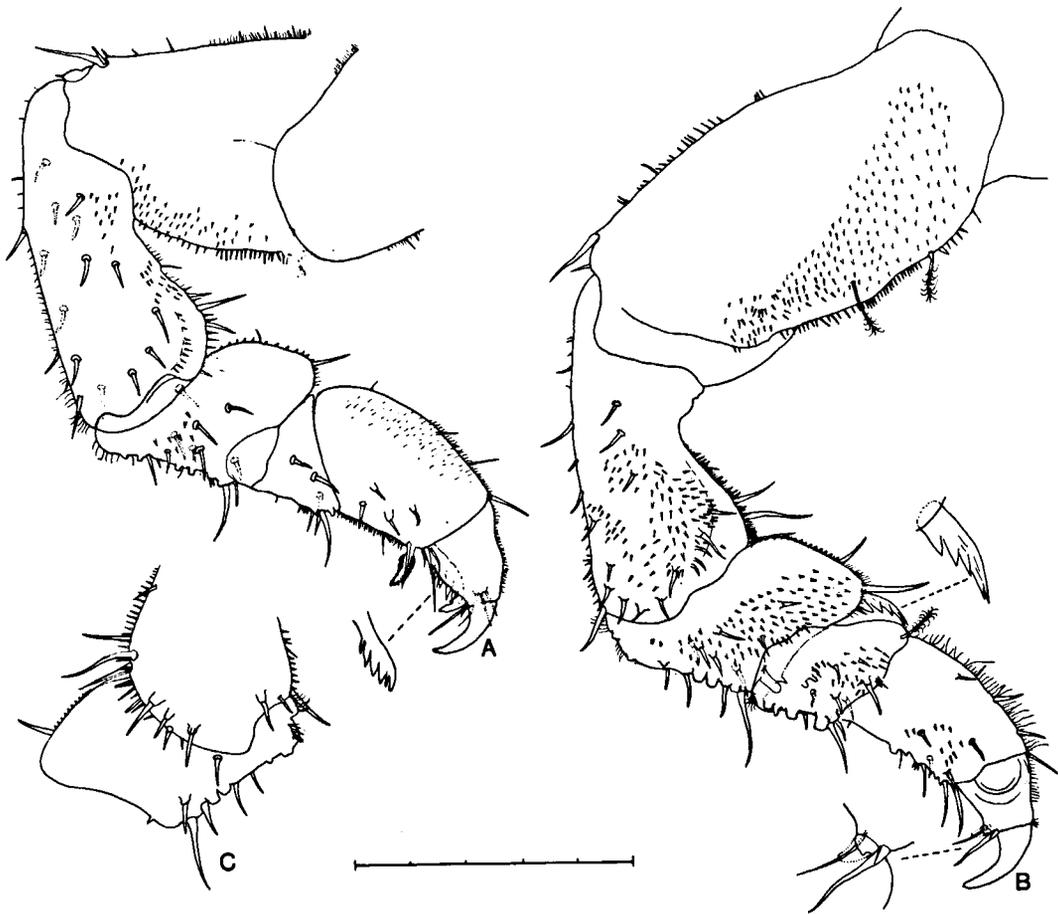


Fig. 3. *Limnoria stephenseni*, male from Marion Isl.: A–B, right pereopods I and II, from outside; C, merus and part of ischium of pereopod II from inside. Scale 0.5 mm.

with 4 articles. Last article of peduncle with 2 outer and 1 ventral, plumose seta. Many simple setae on all flagellar articles.

Labrum (fig. 1E). With closely set, short setae along the margin.

Mandibles (figs. 1D, F). With a strong process on anterior, outer corner and 3 moderately long, simpler setae on second article of palp. Incisive part of right mandible with 2 rounded teeth, 9 setae in the spine-row and a bifid movable lacinia. Second and third articles of palp with 5 and 6 comb setae, respectively. Left mandible without a setal row. Second and third articles of mandibular palp with 5 and 6 comb setae, respectively.

Maxillae. Outer lobe of maxilla 1 (fig. 2A) with 8 stout setae, 4 of which are combed, and 2 straight, hair-bearing setae proximally; inner lobe with 3 hair-covered setae and a short, additional one exteriorly. Outer lobes of maxilla 2 (fig. 1C) with 2 and 4 comb setae, with a row of hairs; inner lobe with 4 comb setae (3 with a row of hairs) and 4 simple setae, the 2 proximal ones hair-bearing.

Maxilliped (figs. 2B–D). Endite with 6 hair-covered spinelike setae, 5 in a row and 1 more proximally on inner corner; another row of 2 naked spinelike setae and 1 spine; on inner margin 1 long and strong seta with a row of hairs. A single stout coupling hook. Distal part of articles 2–5 in palp with 6, 10, 5, and 4 setae, respectively. Epipod almost straight, 4 times longer than greatest width and reaching beyond articulation of palp.

Pereopods. All nearly circular in transect. Basis of pereopod I (fig. 3A) is comparatively longer than in succeeding pereopods and only basis and ischium are furnished with a limited number of the same small, thin spikes which cover the exterior surface of all succeeding pereopods and most of the body, including pleotelson (Cookson, in press, fig. 53B). Basis with only 1 plumose seta medially; propodus with 2 comb setae distally on lower margin and interior side. Pereopod II (fig. 3B) and succeeding pereopods (except VII) with 1 plumose seta on upper distal corner of carpus; merus with 1 stout comb seta. Pereopod III (fig. 4A) with 1 similar comb seta on merus; basis exactly like in pereopod II. Pereopod IV (fig. 4B) with exceptionally many spikes on basis. Pereopod V (fig. 4E) with rather few spikes

near upper margin of basis; merus with 3 comb setae and 1 plumose seta distally on propodus. Pereopod VI (fig. 5B) with 4 comb setae on carpus and 6 on merus; 1 plumose seta distally on propodus. Pereopod VII (fig. 5C) with a row of 20 comb setae on merus and 11 on carpus; 1 additional comb seta distally on lower margin of merus and 2 closely set, plumose setae on basis.

All coxal plates with closely set, thin spikes. Plates of pereopods I–IV with rows of short setae along the margins and 3–5 long, simple setae on the lateral margin. Coxal plates of pereopod V (fig. 5B) with a limited number of long, simple and plumose setae along the margins. On VI and VII there are distinct rows of both simple and plumose setae along both margins. The simple setae on V–VII are of a brownish colour like the long setae forming rows dorsally on the pleonites and pleotelson.

Pleopods (fig. 6). The relative maximum width of endopod versus exopod in pleopods I–V is 0.44, 0.60, 0.67, 0.73, and 1.40, respectively. Sympod of pleopods I–IV with 2 setae medially; the outer with fine hairs (fig. 6A). All pleopods with a pattern which is more open on the exopod (fig. 6B), except in pleopod V.

Uropod (fig. 5A). Sympod with a keel furnished with almost 20 plumose setae. Exopod 0.4 times as long as endopod which is slightly more than half as long as the sympod. Both rami with several simple setae of which the terminal four are longer than the endopod.

#### Comparison with type material (and other material)

Antenna 1. Armament in paralectotypes with aesthetascs and setae on articles 2–4 of flagellum similar, although the number of aesthetascs on article 2 may be as low as 4. First article with only 2 short simple setae and thus no plumose setae, while there are 2 plumose setae on the inner margin of the last article of peduncle, in addition to only 2 simple setae. Cookson (in press, fig. 53D) shows 2 plumose setae on the first article of flagellum plus 1 plumose and 3 simple setae on the scale; 1 additional plumose seta on article 4; there is also an additional aesthetasc on article 3.

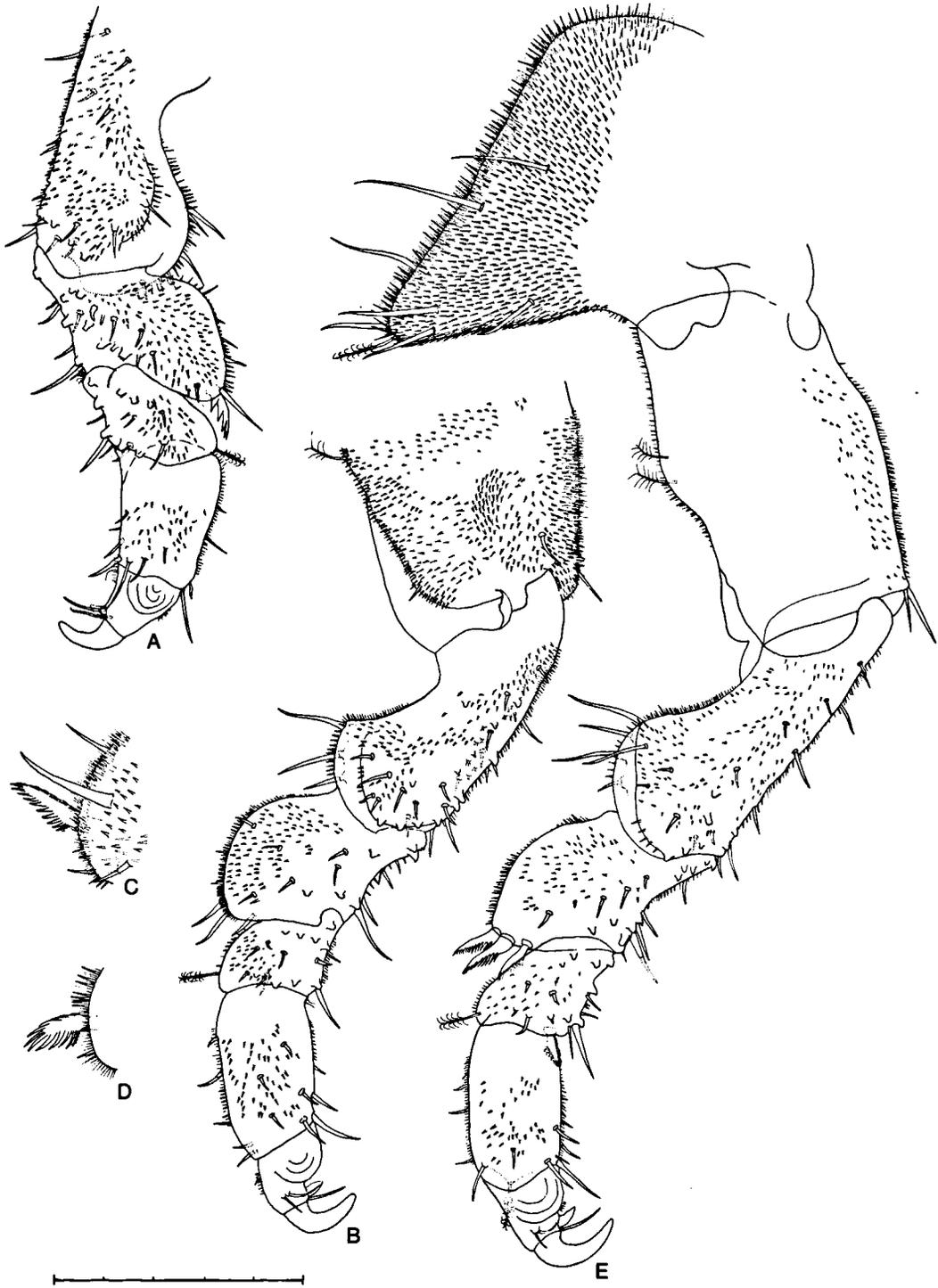


Fig. 4. *Limnoria stephensi*: A–C, E, specimens from Marion Isl.; D, paralectotype. A, pereopod III; B, pereopod IV; C–D, lower corner of merus of pereopod IV; E, pereopod V. Scale 0.5 mm.

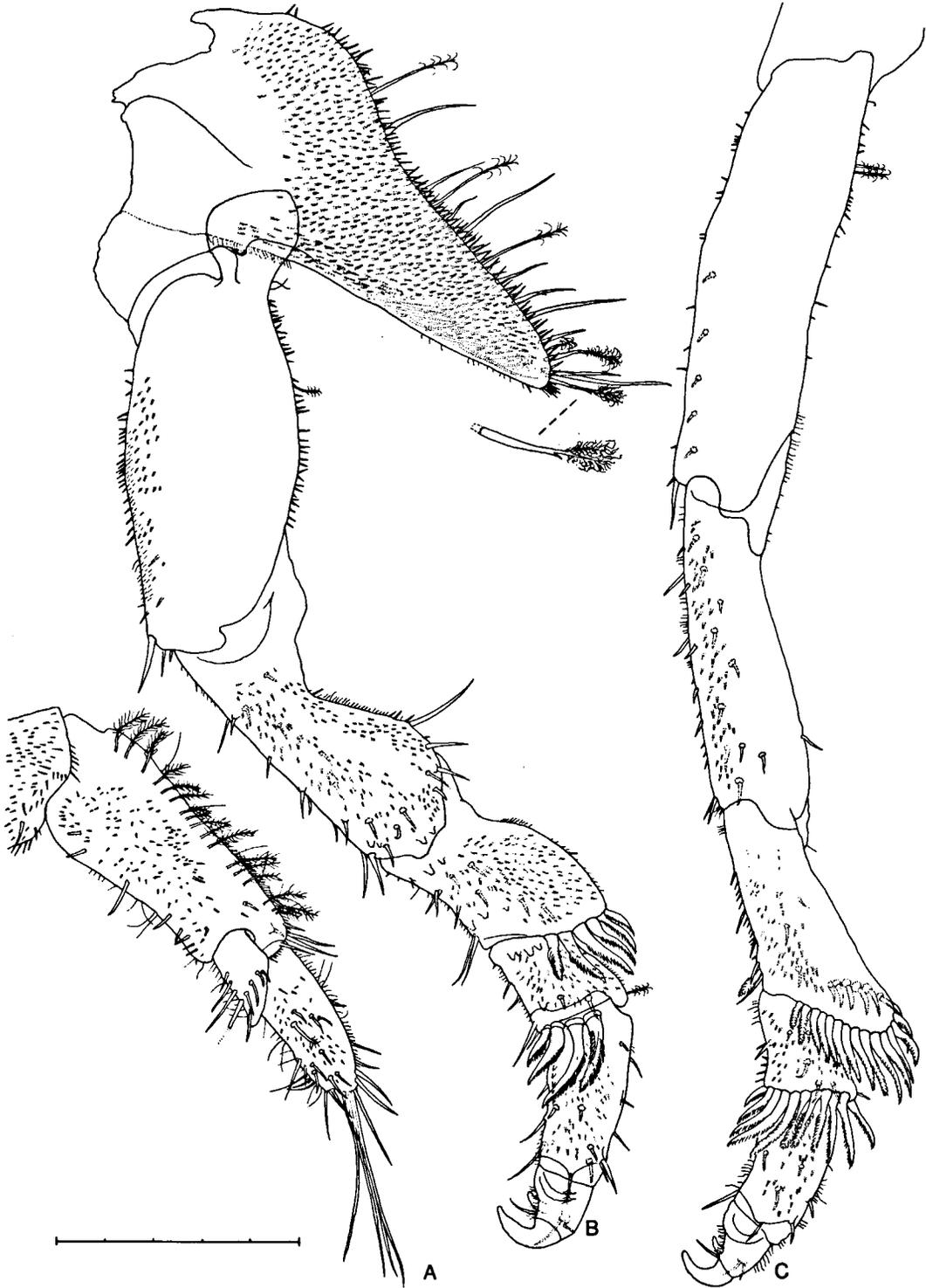


Fig. 5. *Limnoria stephensi*, male from Marion Isl.: A, right uropod; B–C, right pereopods VI and VII from inside. Scale 0.5 mm.

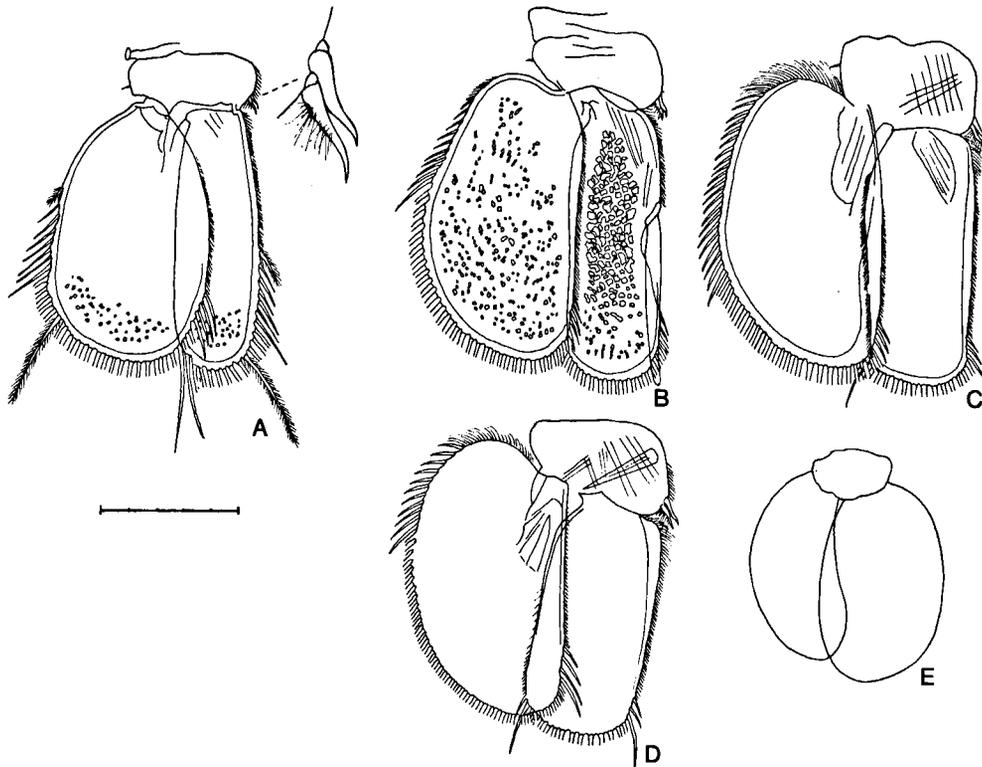


Fig. 6. *Limnoria stephenseni*, male from Marion Isl.: A–E, right pleopods I–V. Scale 0.5 mm.

**Antenna 2.** About as many simple setae in paralectotypes as in the Marion material and thus many more than shown by Menzies (1957, fig. 41F); one paralectotype even with almost twice as many setae as shown in fig. 1B. Only 1 plumose seta on last article of peduncle in paralectotypes while there are 4 altogether in Cookson's material (fig. 53E). Paralectotypes without setae on third peduncular article.

**Right mandible.** Shows a major difference in having the movable lacinia with 2 serrated branches in Cookson's material from Macquarie Island (l.c., fig. 53G), thus closely corresponding to its shape in *Limnoria nonsegni* Menzies and to some extent in *L. segnoides* Menzies. In one paralectotype the lacinia resembles that in Macquarie specimens (although the two branches are held tightly together), in others it is like in Marion material. Paralectotypes with 10 setae in the spine-row, 7 of which are about equally long. Maxillae as in type material.

**Maxilliped.** Number of spinelike setae on endite the same in type material and Cookson's material, but one paralectotype lacks the outer, unhairy seta

(fig. 2C); the long and strong seta on the inner margin was overlooked by Menzies (l.c., fig. 41E). The number of setae on articles 2–5 in palp vary considerably from 6–8, 5–10, 3–8, and 4–8, respectively. Endite not with a lateral bending distally as shown by Menzies (fig. 41E).

**Pereopods.** In addition to differences pointed out below, there are minor differences in number and location of the setae between the margins of each article but very rarely in those situated along the margins. Moreover, many specimens of both the type and the Marion material are more hairy than the illustrated male.

In pereopod II of paralectotype the nodules on lower margin of carpus are less conspicuous, those on merus more conspicuous; one Marion specimen has 2 closely set comb setae on merus instead of 1. In pereopod III of paralectotype upper margin of ischium with 1 long seta only but 3 long setae instead of 2 a little further ventrally. In pereopod IV of one paralectotype 1 comb seta on upper corner of merus (fig. 4D) instead of 2 simple setae; in one Marion specimen a similar comb seta (fig. 4C) in

addition to a single simple seta and 5 nodules along lower margin of merus instead of 2. On the coxal plate of pereopod V of both the other Marion specimens and the paralectotypes there are up to 7 simple and plumose setae along each margin. In pereopod VI there are 5 comb setae on carpus instead of 4 and 4 plumose setae on basis (2 closely set medially). In pereopod VII one paralectotype has 23 comb setae on merus of pereopod VII and 13 on carpus (instead of 21 and 11), while two other paralectotypes have 19 each on merus and a Marion specimen 18 only; basis with 2 plumose setae in addition to the proximal, closely set ones. Particularly in other Marion specimens there is a more distinct row of equally long, simple and plumose setae along the median margin than in the described male (fig. 5B).

Pleopods, the major difference is that there are 3 setae medially on sympod of pleopod I in paralectotypes (2 only on pleopods II–IV). Furthermore, the endopod in pleopod III is slightly broader and with parallel margins, and the endopod in pleopod V is slightly more elongate.

Uropod, in paralectotypes with generally only about half as many plumose setae on keel as in Marion material. Exopod relatively longer, being 1.5 times as long as endopod.

As shown above, a thorough comparison reveals a considerable number of differences between the described male, other Marion material and particularly the type material from Auckland Island. The only significant differences, however, appear to be the movable lacinia in the right mandible being branched instead of bifid in Cookson's material from Macquarie Island and the presence of a comb seta on merus of pereopod IV in paratypes. A similar seta is, however, also found in at least one specimen from Marion Island.

### Occurrence on Marion Island

The holdfasts of the exclusively intertidal kelp *Durvillaea antarctica* in which P.G. Haxen collected *Limnoria stephenseni* can be large (about 40 cm in diameter) and are smooth and domed in appearance. Many stipes can be attached to a single holdfast (Haxen & Grindley, 1985).

Peter Haxen has kindly informed me that the species is found abundantly in anastomosing burrows

(3–5 mm in diameter) bored in the holdfasts. There are occasional small holes from the burrows to the surface presumably allowing fresh water to enter the burrows. The life-span of the kelp appears to be associated with the boring activities of the isopods (Haxen, in prep.).

The specimens from Macquarie Island were found in holdfasts of *Durvillaea antarctica* (cf. Hicks, 1990) the kelp *Macrocystis pyrifera* (Hale, 1937; Hicks, 1990; Cookson, in press). Haxen did not notice the species in holdfasts of this kelp which is also occurring at Marion, although at greater depth (20–100 m).

### Distribution

Auckland Island (Stephensen, 1927; Menzies, 1957; Cookson, in press; this paper); Macquarie Island (Hale, 1937; Cookson, in press); Marion Island (this paper); ? South Orkney Island (Chilton, 1914).

### References

- Chilton, C., 1914. The species of *Limnoria*, a genus of wood-boring Isopoda. *Ann. Mag. nat. Hist.*, ser. 8, 13: 380–389.
- Cookson, L.J. (in press). Australian species of the Limnoriidae (Crustacea: Isopoda) and phylogeny of the family. *Mem. Mus. Victoria*.
- Hale, H.M., 1937. Isopoda and Tanaidacea. *Sci. Rep. Aust. antarct. Exped.*, (ser. C) (Zool. Bot) 2 (2): 1–45.
- Haxen, P.G. & J.R. Grindley, 1985. *Durvillaea antarctica* production in relation to nutrient cycling at Marion Island. In: Siegfried, W.R., P.R. Condy & R.M. Laws (eds.), *Antarctic nutrient cycles and food webs: 637–640* (Springer Verlag, Berlin).
- Hicks, G.R.F., 1990. A new species of *Donsiella* (Copepoda: Harpacticoida) associated with the isopod *Limnoria stephenseni* Menzies from Macquarie Island. *Mem. Mus. Victoria*, 50 (2): 451–456.
- Menzies, R.J., 1957. The marine borer family Limnoriidae (Crustacea, Isopoda). *Bull. mar. Sci. Gulf Caribb.*, 7: 101–200.
- Menzies, R.J., 1959. The identification and distribution of the species of *Limnoria*. In: Ray, D.L. (ed.), *Marine boring and fowling organisms: 10–33* (University of Washington Press, Seattle).
- Pillai, N.K., 1957. A new species of *Limnoria* from Kerala. *Bull. centr. Res. Inst. Kerala*, 5 (II) (ser. C): 149–157.
- Stephensen, K., 1927. Crustacea from the Auckland and Campbell Islands. *Vidensk. Meddr dansk naturh. Foren.*, 83: 289–390.

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