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A new species of *Syrticola* Willems & Claeys, 1982 (Copepoda: Harpacticoida) from Japan with notes on the type species

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CONTENTS

Synopsis. A new species of *Syrticola* Willems & Claeys, 1982 (Harpacticoida: Cylindropsyllidae) is described from Okinawa, Japan. Morphological notes on the type species *S. flandricus* Willems & Claeys, 1982 and a key to the species are given. The inadequately described *S. trispinosus* A. Scott, 1896 is ranked as *species inquirenda*. The diagnosis of the genus is amended and its position in the Cylindropsyllidae re-assessed. Both sexes of *S. intermedius* sp. nov. were found to be infested by early parthenogenetic female stages of an as yet undescribed genus of Tantulocarida.

INTRODUCTION

The interstitial harpacticoid fauna of Japan is very poorly known, as is that of most east Asian countries. The paucity of data on marine interstitial species stands in marked contrast with the number of studies on subterranean copepods produced by workers like Miura and Takashi Ito. In fact, with the possible exception of *Microsetella norvegica* (Boeck, 1864) only 11 genuinely interstitial harpacticoids have been recorded from marine and brackish water habitats in Japan (Table 1) and the majority of these was described by the latter author's namesake, the late Tatsunori Itô, whose activities were mainly focussed on the fauna from Hokkaido in the north and the Bonin Islands in the southeast. The only other information on mesopsammic harpacticoids is contained in the papers of Kikuchi (1970, 1972) and Kikuchi & Yokota (1984), reporting on species from Lake Hinuma, a brackish lagoon near the central east coast of the Japanese mainland.

In the course of a survey of the sandy bottom copepods off Nagannu Island, Okinawa (Ryukyu Archipelago) by one of us (S.O.), several interstitial harpacticoids were found to be infested with tantulocaridans (Huys *et al.*, in preparation). This paper describes a new species of *Syrticola* Willems & Claeys (Cylindropsyllidae) based on two specimens that were parasitized by parthenogenetic females of an as yet undescribed tantulocarid.

MATERIALS AND METHODS

Specimens of *Syrticola intermedius* sp. nov. were collected by dredging of a sandy bottom off Nagannu Island, Okinawa, South Japan (26° 14′ N, 127° 32′ E, depth 46.49 m; leg. S. Ohtsuka) on 9 April 1992. The dredge (mouth area: 50 cm wide x 15 cm high; mesh size 5 mm) was towed along the bottom at a speed of 2 knots by the T/V Toyoshio-maru of the Hiroshima University for about 5 minutes. Copepods were

Table 1 Interstitial harpacticoid copepods reported from marine localities in Japan.

Species	Locality	Reference
ECTINOSOMATIDAE		
Microsetella norvegica (Boeck, 1864)	Hokkaido	Itô (1968)
Arenosetella bidenta Itô, 1972	Hokkaido	Itô (1972, 1984)
Noodtiella sp.	Hokkaido	Itô (1984)
DARCYTHOMPSONIIDAE		
Leptocaris brevicornis (van Douwe, 1904)	Lake Hinuma[1]	Kikuchi & Yokota (1984)
PARAMESOCHRIDAE		
Paramesochra sp.	Hokkaido	Itô (1984)
LEPTASTACIDAE		
Cerconeotes japonicus (Itô, 1968)	Hokkaido	Itô (1968, 1984)
Paraleptastacus unisetosus Itô, 1972	Hokkaido	Itô (1972, 1984)
CYLINDROPSYLLIDAE		
Arenopontia ishikariana Itô, 1968	Hokkaido	Itô (1968, 1984)
Arenopontia sakagamii Itô, 1978	Bonin Islands	Itô (1978)
Stenocaris intermedia Itô, 1972	Hokkaido	Itô (1972)
Psammopsyllus imamurai Kikuchi, 1972	Lake Hinuma[1]	Kikuchi (1972)
PARASTENOCARIDIDAE		
Parastenocaris hinumaensis Kikuchi, 1970	Lake Hinuma[1]	Kikuchi (1970)

[1] Brackish lagoon.

fixed and preserved in 10% neutralized formalin/sea-water. Females of *S. flandricus* Willems & Claeys, 1982 were collected by the senior author in different localities along the coast of The Netherlands in the course of the biological monitoring programme BIOMON. All specimens have been deposited in the collections of The Natural History Museum, London.

Specimens were dissected in lactic acid and the dissected parts were placed in lactophenol mounting medium. Preparations were sealed with glyceel (Gurr®, BDH Chemicals Ltd, Poole, England). All drawings have been prepared using a camera lucida on a Leitz Diaplan differential interference contrast microscope. The descriptive terminology is adopted from Huys & Boxshall (1991). Abbreviations used in the text are: P1–P6, first to sixth thoracopod.

DESCRIPTIONS

Family Cylindropsyllidae

Subfamily Leptopontiinae Lang, 1948

The genus *Syrticola* was established by Willems & Claeys (1982) to accommodate the type species *S. flandricus* Willems & Claeys, 1982 and *Tetragoniceps trispinosus* A. Scott, 1896. Previously, the latter species had been considered '*species incerta*' in the genus *Evansula* T. Scott and thus placed in the subfamily Cylindropsyllinae (Lang, 1948). The close relationship between *Syrticola* and *Notopontia* Bodiou noted by Willems & Claeys (1982) was already hinted at by Bodiou (1977) who recognized a certain resemblance between *T. trispinosus* and *N. stephaniae* Bodiou, 1977, and indirectly also by Mielke (1982) who described *(?) N. galapagoensis*, a species provisionally placed in *Notopontia* but subsequently allocated to *Syrticola* (Bodiou & Colomines, 1986; Willems *et al.*, 1987). However, none of these authors has formally assigned either of these genera to any of the subfamilies of the Cylindropsyllidae recognized at that time. The only attempt was that by Bodiou (1977) who suggested that *Notopontia* is closest to *Evansula* (Cylindropsyllinae) but to a certain extent is also related to *Arenopontia* Kunz and *Leptopontia* T. Scott (Leptopontiinae).

Lang (1948) subdivided the family into the Cylindropsyllinae, Leptastacinae and Leptopontiinae and a fourth subfamily, the Psammopsyllinae, was added by Krishnaswamy (1956). Recently, the Leptastacinae has been upgraded to full family status (Huys, 1993). The diagnostic sexual dimorphism displayed on thoracopods 2 and 3 by all genera of the Cylindropsyllinae excludes *Notopontia* and *Syrticola* from this subfamily since their swimming leg sexual dimorphism is only slightly developed (and therefore might well have been overlooked in *Notopontia* for which it has been recorded as being completely absent). A detailed comparison with the Leptopontiinae, currently encompassing *Arenopontia*, *Pararenopontia* Bodiou & Colomines and *Leptopontia*, reveals a suite of apomorphic characters supporting a sister-group relationship between *Leptopontia* and the *Notopontia*-*Syrticola* lineage. These characters include: (i) anal operculum drawn out into spinous process(es); (ii) outer distal corner of caudal ramus produced into backwardly directed spinous process; (iii) first antennulary segment extremely elongated, much longer than second; (iv) mandibular gnathobase stylet-like with teeth along one side; (v) distal exopod segment P1 with 3 armature elements (proximal outer spine lost); (vi) middle exopod segment P1 without outer spine (in *Syrticola* and *Notopontia* the middle and distal segment are fused or have failed to separate); (vii) apical spines of distal exopod segments P3–P4 setiform; (viii) sexual dimorphism endopod P3 involving fusion of distal spine to segment; (ix) P5 exopod with 3 elements in both sexes. There is little evidence that *Arenopontia* and *Pararenopontia* share a close relationship with this core group, however pending a revision of these genera it is preferable to retain them in the Leptopontiinae.

Syrticola Willems & Claeys, 1982

Diagnosis (amended). Leptopontiinae. Body cylindrical, but not particularly vermiform. Hyaline frill of all body somites incised. Antennule 6- or 7-segmented in ♀. Maxilla with one syncoxal endite. Midventral spinous process anterior to intercoxal sclerite of P1. P1 exopod 2-segmented. Distal segment P1 endopod with 1 geniculate seta and 1 claw. Distal segment P3–P4 exopods with 1 outer spine. P2–P4 endopods 1-segmented in ♀, P3 endopod 1- or 2-segmented and sexually dimorphic in ♂. P5 with fused baseoendopod and exopod in both sexes; endopodal lobe drawn out into triangular process with 0-1 seta, exopodal lobe a tubercle with 3 elements. Genital apertures not fused in ♀. Anal operculum with a series of small spinous processes or one large median spike. Caudal ramus seta III inserted proximal to seta V.

Type species. *Syrticola flandricus* Willems & Claeys, 1982

Other species. *S. trispinosus* (A. Scott, 1896), *S. galapagoensis* (Mielke, 1982), *S. mediterraneus* Willems *et al.*, 1987, *S. intermedius* sp. nov.

Syrticola intermedius sp. nov. (Figs. 1–4, 5A–C, 6)

Material examined. Holotype ♀ dissected on 8 slides, deposited under reg. no. 1992.1075. Paratype ♂ dissected on 6 slides, deposited under reg. no. 1992.1076. Drawings based on the paratype are Figs. 2E–F, 4D–F, 5A–C, 6A–G; all others were drawn from the holotype ♀.

Female. Body length measured from tip of rostrum to posterior margin of caudal rami 485 μm (Figs. 1A–B). Maximum width 75 μm measured at rear margin of cephalothorax. Integument pitted. Pleural areas of cephalothorax not well developed so that appendages are clearly exposed in lateral aspect (Fig. 1B). Posterior margin of body somites (except cephalothorax and anal somite) fringed dorsally and laterally with finely incised hyaline frill; this frill also present ventrally on genital double-somite and abdominal somites (Figs. 1B, 4A–B). Abdominal somites also with transverse spinular row in anterior half which is usually concealed beneath the hyaline frill of the preceding somite as shown in Fig. 5A.

Rostrum triangular, with 2 delicate sensillae (as in male, Fig. 6B).

Genital double-somite (Fig. 4B) about as long as wide; original segmentation not marked by any external or internal cuticular structure; anterior margin with 2 transverse spinular rows. Genital apertures located in anterior quarter of genital double-somite, closely set together but separate and each closed off by small operculum derived from sixth leg; no armature observed but posterior margin of operculum with minute spinous processes and a circular scar at the outer distal corner (probably indicating insertion site of long seta as in *S. flandricus*, cfr. Fig. 5G). Copulatory pore located far anteriorly between genital apertures (arrowed in Fig. 4B). Seminal receptacles not confirmed. Paired widely separated secretory pores at about 2/5 distance from anterior margin.

Anal somite (Figs. 1A–B; 4A; 5A–B) with dorsal operculum drawn out into median, posteriorly directed, spike; process about as long as anal somite proper; ventral posterior margin spinulose medially.

Caudal rami (Figs. 4A; 5A–B) divergent; outer distal corner drawn out into backwardly directed, acutely recurved, spinous process; with 7 setae; seta I minute, setae II and III located anterior to seta I, seta IV tiny and located between spinous process and large seta V, seta VII long and tri-articulate at base, seta VI minute.

Antennule (Fig. 2A) 7-segmented, articulating on a small pedestal as in the male (Fig. 6B); slender, anteriorly directed (Fig. 1A); first segment extremely elongate, about 4 times as long as maximum width, with 1 short seta distally; aesthetasc on fourth segment fused basally to long seta; distal 2 setae of last segment fused basally. All setae bare; setal formula: [1, 8, 3, 2+ae, 1, 2, 9].

Antenna (Figs. 2B–D). Coxa small, not ornamented. Basis and proximal endopod segment fused to form allobasis, original segmentation marked by internal chitinous rib anteriorly and incomplete suture line posteriorly near exopod; basis with serrate seta located on inner lateral surface; exopod small, 1-segmented, with 1 small, apical seta; free endopod articulating with allobasis at right angle (Fig. 1B), lateral margin with 2 spines, distal margin with 1 pinnate spine and 4 geniculate setae, the largest of which is fused basally with vestigial seta and bearing coarse spinule at about midway.

Labrum (Fig. 5C) a ventrally projected, elongate, membranous outgrowth, distinctly tapering distally. Paragnaths small membranous lobes.

Mandible (Figs. 2E–F) with conspicuous coxa, drawn out to form a slender, stylet-like gnathobase bearing small teeth and a long serrate seta near the apex. Palp elongate, 2-segmented; proximal segment representing basis, slightly sigmoid, swollen in distal half, with 1 seta and spinular row; distal segment representing endopod, with 2 lateral and 3 apical setae.

Maxillule (Fig. 2G). Praecoxa with large, cylindrical arthrite bearing 2 anterior surface setae and 6 setae along the distal margin; coxal endite with 2 setae; palp representing fused basis and rami; exopod, endopod, proximal and distal basal endites represented by 1, 2, 2 and 3 setae, respectively.

Maxilla (Fig. 2H) reduced, 2-segmented. Syncoxa with single endite bearing unipinnate seta and conspicuous aesthetasc-like structure representing modified seta with chitinized dorsal margin and tubular membranous part ventrally; exit of maxillary gland discernible in proximal half. Allobasis drawn out into pinnate claw bearing serrate seta at its base. No trace of endopod.

Maxilliped (Fig. 4F) subchelate. Syncoxa and basis without armature but with 3 spinular rows each. Endopod represented by strong claw bearing tiny spinules along distal half of inner margin; an accessory setule is located at the base of the claw.

P1 (Fig. 3A). Praecoxa a small sclerite located around the outer lateral margin of the limb base. Intercoxal sclerite a minute rounded plate. Coxa with spinular row. Basis with inner and outer basal seta and with spinules at middle distal margin. Exopod 2-segmented, proximal segment with blunt spine bearing long setules, distal segment with 2 geniculate setae and 1 unipinnate spine. Endopod 2-segmented, elongate, prehensile; proximal segment about twice as long as exopod, with serrate inner seta near proximal margin; distal segment with 1 geniculate seta, 1 short claw and a patch of

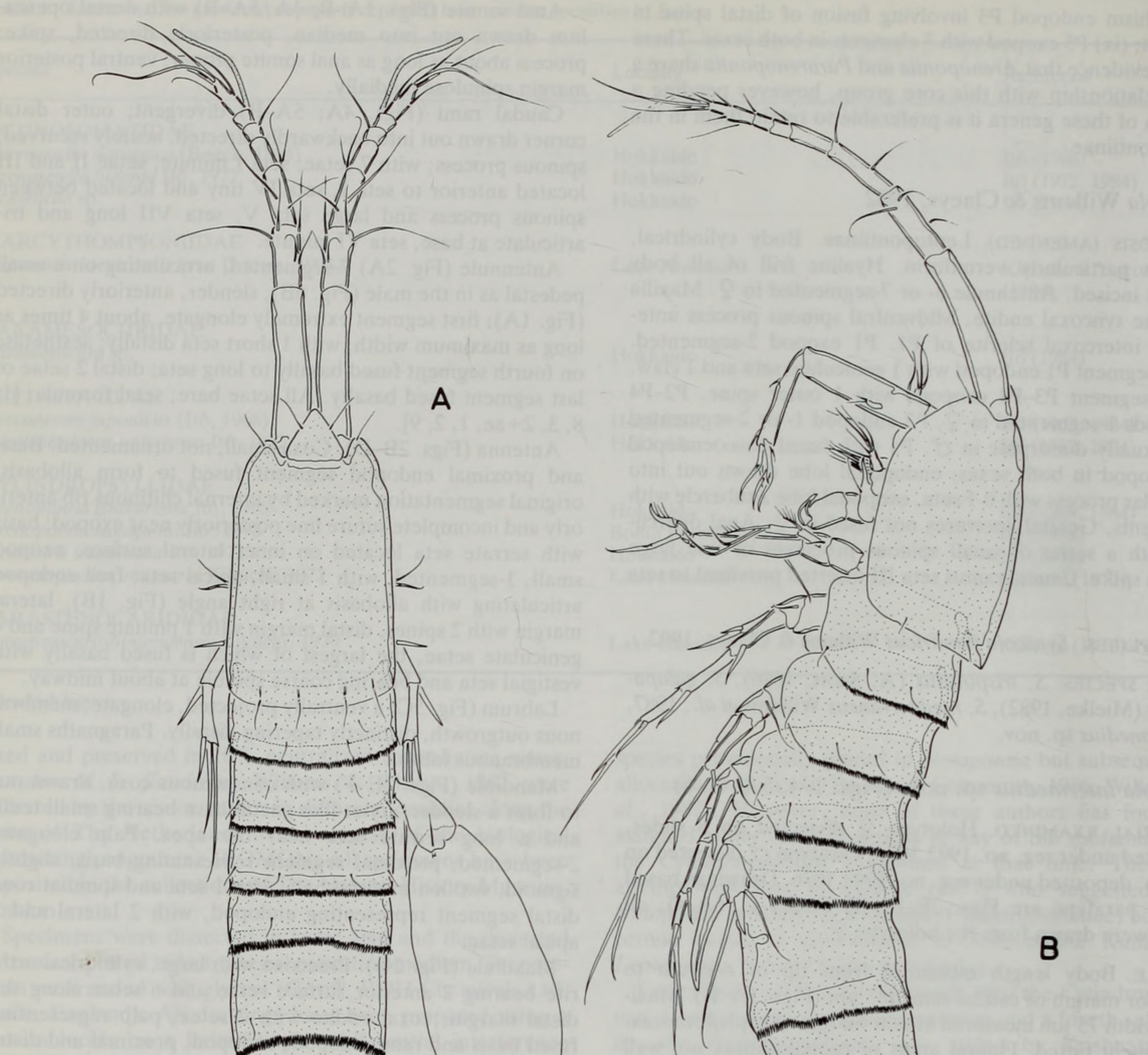


Fig. 1 *Syrticola intermedius* sp. nov. female. A, Habitus, dorsal; B, same, lateral.

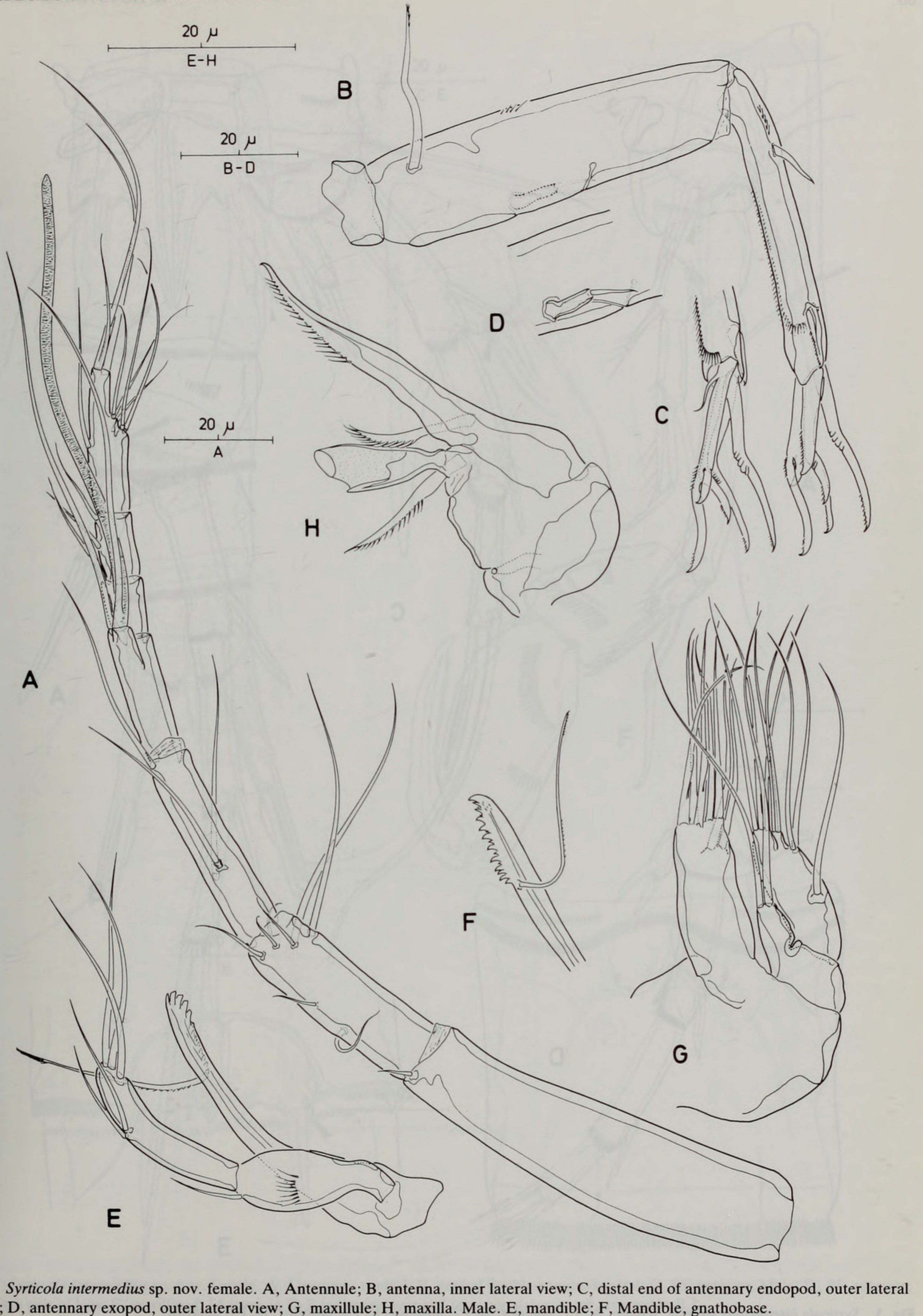


Fig. 2 *Syrticola intermedius* sp. nov. female. A, Antennule; B, antenna, inner lateral view; C, distal end of antennary endopod, outer lateral view; D, antennary exopod, outer lateral view; G, maxillule; H, maxilla. Male. E, mandible; F, Mandible, gnathobase.

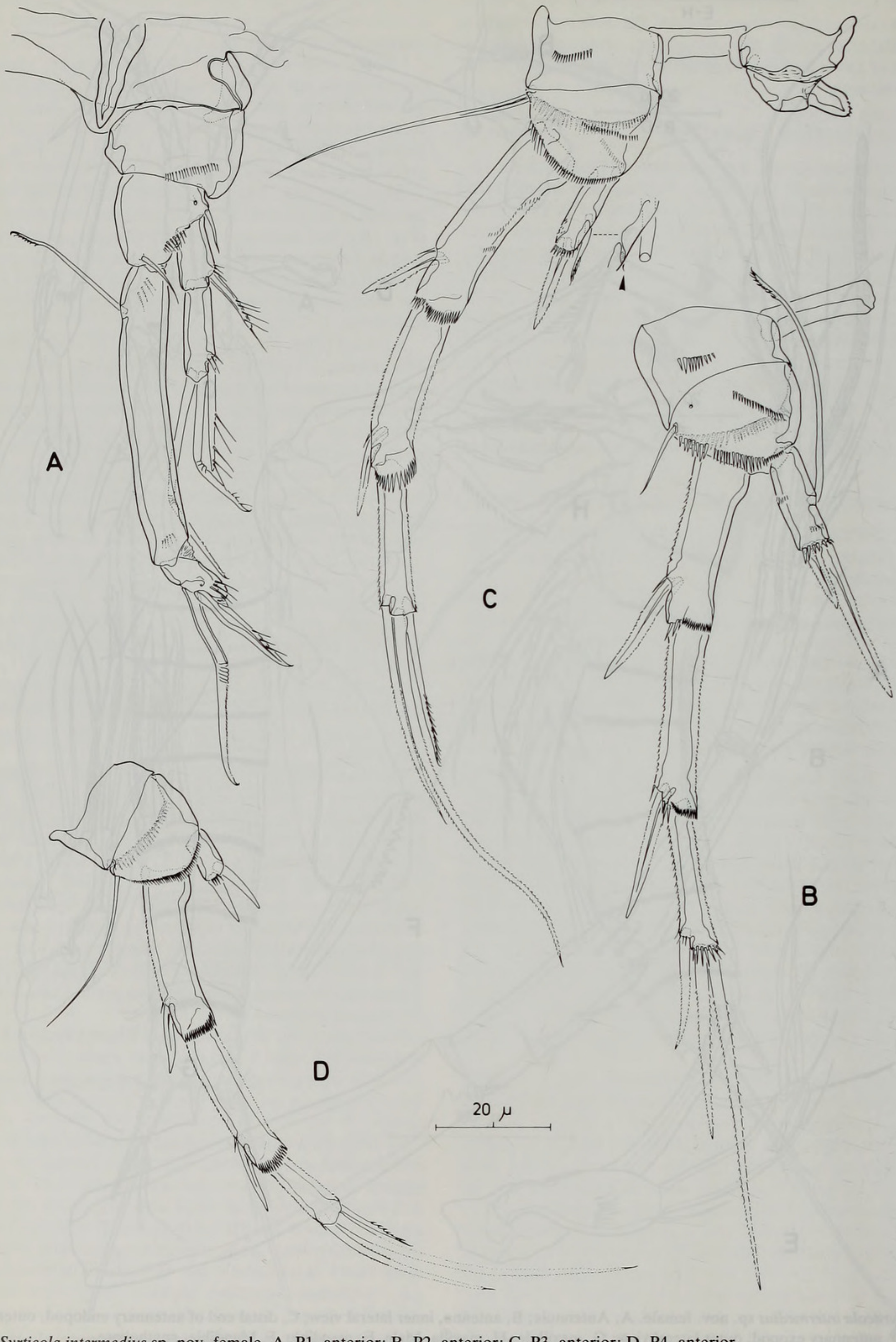
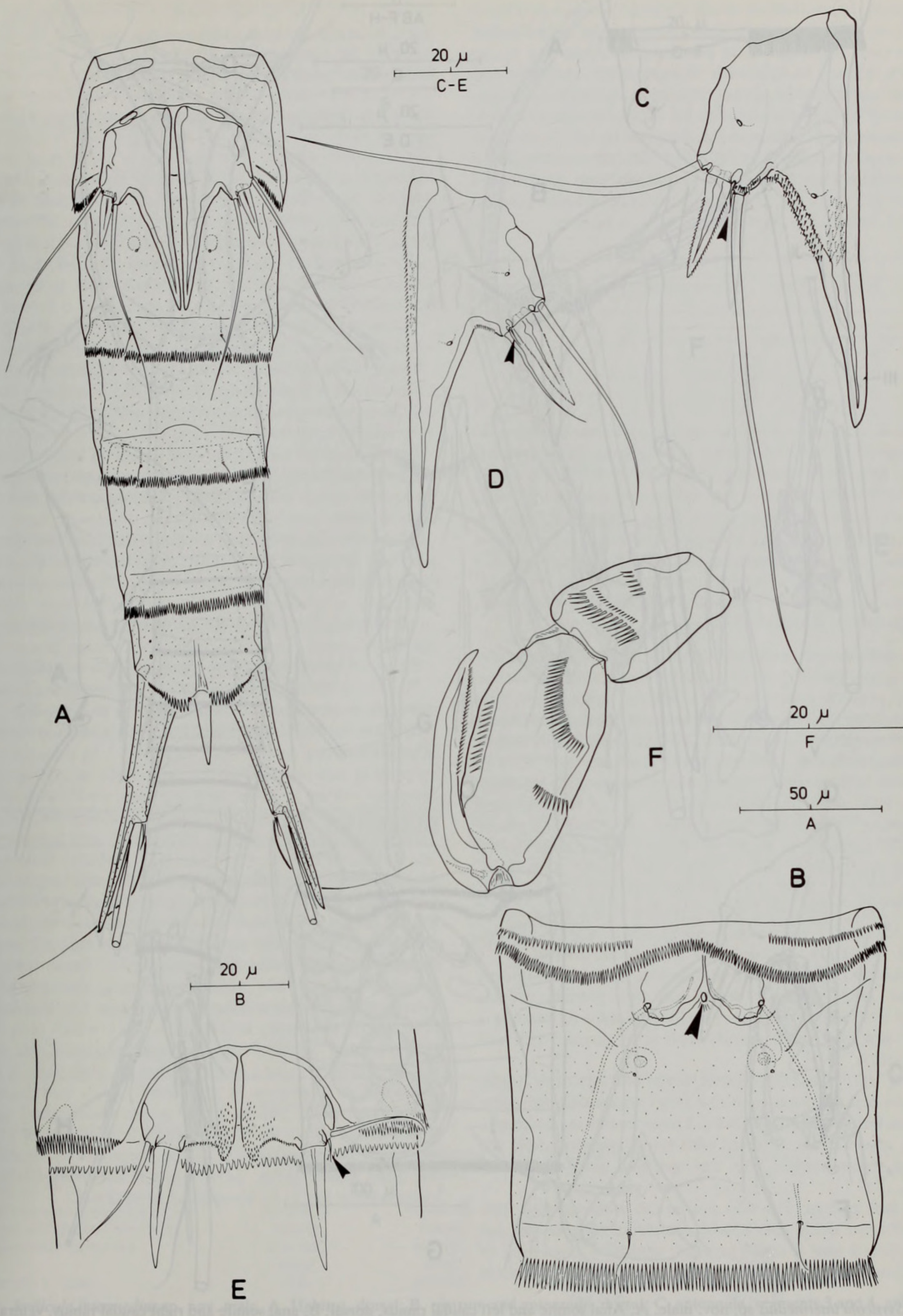


Fig. 3 *Syrticola intermedius* sp. nov. female. A, P1, anterior; B, P2, anterior; C, P3, anterior; D, P4, anterior.



[Fi]g. 4 *Syrticola intermedius* sp. nov. female. A, Urosome, ventral; B, genital double-somite, ventral; C, P5, anterior. Male. D, P5, anterior; E, sixth pair of legs; F, maxilliped. [Arrows in C–E indicating vestigial seta; copulatory pore arrowed in B.]

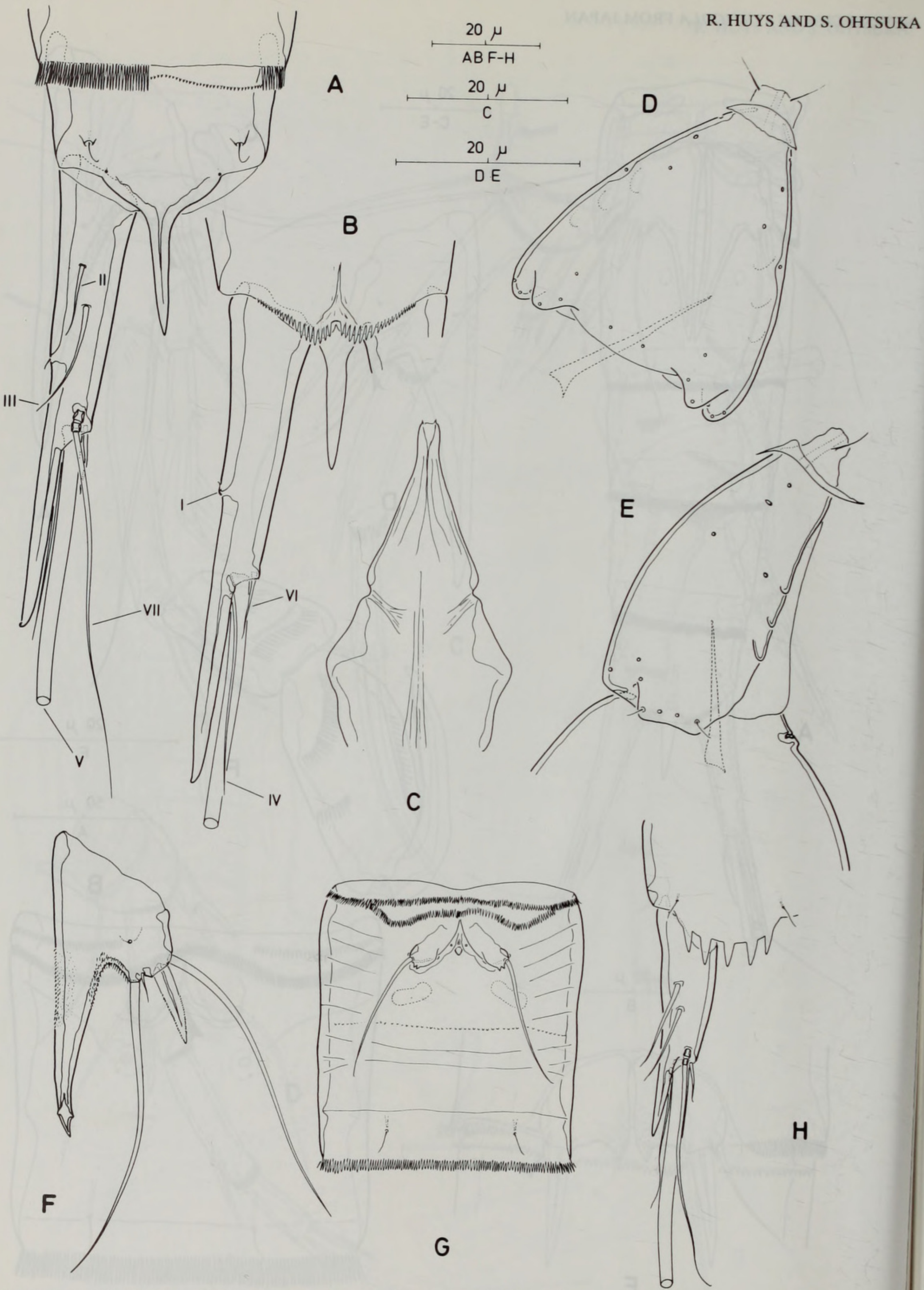


Fig. 5 *Syrticola intermedius* sp. nov. male. A, Anal somite and left caudal ramus, dorsal; B, anal somite and right caudal ramus, ventral; C, labrum, anterior. Female of undescribed tantulocaridan. D, Cephalic shield, dorsal; E, same, lateral. *Syrticola flandricus* female. F, P5, anterior; G, genital double-somite, ventral; H, anal operculum and left caudal ramus, dorsal.

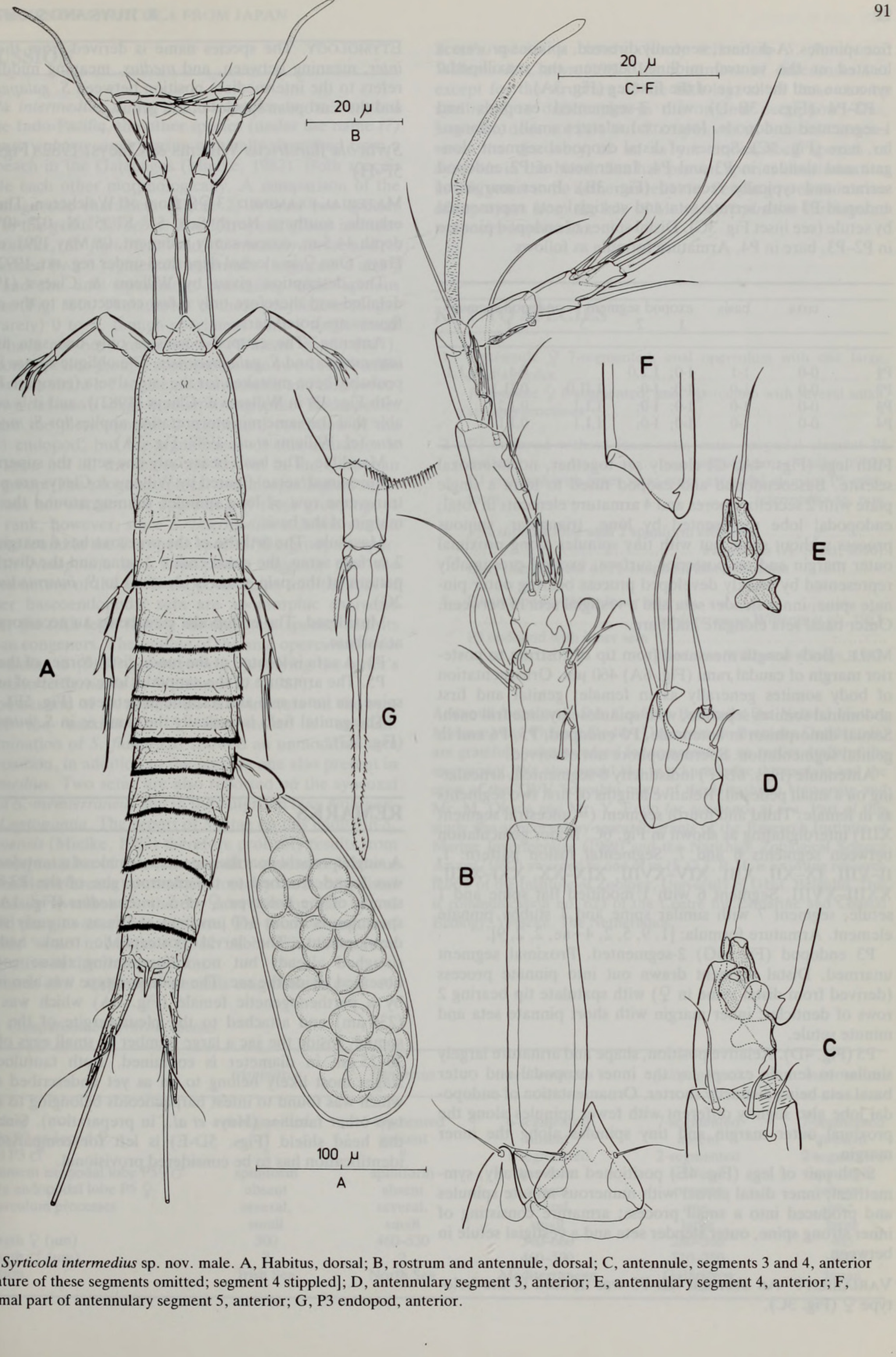


Fig. 6 *Syrticola intermedius* sp. nov. male. A, Habitus, dorsal; B, rostrum and antennule, dorsal; C, antennule, segments 3 and 4, anterior [armature of these segments omitted; segment 4 stippled]; D, antennulary segment 3, anterior; E, antennulary segment 4, anterior; F, proximal part of antennulary segment 5, anterior; G, P3 endopod, anterior.

fine spinules. A distinct, ventrally directed, spinous process is located at the ventral midline between the maxillipedal syncoxae and the coxae of the first leg (Fig. 3A).

P2–P4 (Figs. 3B–D) with 3-segmented exopods and 1-segmented endopods. Intercoxal sclerites small, rectangular, bare (Fig. 3C). Spines of distal exopodal segment elongate and slender in P3 and P4. Inner seta of P2 endopod serrate and typically recurved (Fig. 3B). Inner margin of endopod P3 with serrate seta and vestigial seta represented by setule (see inset Fig. 3C). Distal spines of endopod pinnate in P2–P3, bare in P4. Armature formula as follows:

	coxa	basis	exopod segment 1	2	3	endopod segment 1	2
P1	0-0	1-1	I-0;	I,2,0		0-1;	0,I,1
P2	0-0	1-0	I-0;	I-0;	I,II,0	0,II,1	
P3	0-0	1-0	I-0;	I-0;	I,I,1	0,I,2	
P4	0-0	1-0	I-0;	I-0;	I,I,1	0,I,I	

Fifth legs (Figs. 4A, C) closely set together, no intercoxal sclerite. Baseoendopod and exopod fused to form a single plate with 2 secretory pores and 4 armature elements in total; endopodal lobe represented by long, triangular, spinous process without setae but with tiny spinules along proximal outer margin and on posterior surface; exopod presumably represented by weakly developed process bearing outer pinnate spine, inner slender seta and a vestigial seta in between. Outer basal seta elongate and bare.

MALE. Body length measured from tip of rostrum to posterior margin of caudal rami (Fig. 6A) 460 μm. Ornamentation of body somites generally as in female; genital and first abdominal somites separate, with spinulose hyaline frill each. Sexual dimorphism in antennule, P3 endopod, P5, P6 and in genital segmentation. Spermatophore not observed.

Antennule (Figs. 6B–F) indistinctly 8-segmented, articulating on a small pedestal. Relative lengths of first two segments as in female. Third and fourth segment (= ancestral segment XIII) interdigitating as shown in Fig. 6C. Major geniculation between segments 6 and 7. Segmental fusion pattern: I, II–VIII, IX–XII, XIII, XIV–XVIII, XIX–XX, XXI–XXII, XXIII–XVIII. Segment 6 with 1 modified flat spine and 1 setule, segment 7 with similar spine and 1 stubby pinnate element. Armature formula: [1, 9, 5, 2, 4+ae, 2, 2, 9].

P3 endopod (Fig. 6G) 2-segmented. Proximal segment unarmed. Distal segment drawn out into pinnate process (derived from distal spine in ♀) with spatulate tip bearing 2 rows of denticles; inner margin with short pinnate seta and minute setule.

P5 (Fig. 4D). Relative position, shape and armature largely similar to female except for the inner exopodal and outer basal seta being distinctly shorter. Ornamentation of endopodal lobe also slightly different with fewer spinules along the proximal outer margin and tiny spinules along the inner margin.

Sixth pair of legs (Fig. 4E) positioned midventrally, symmetrical; inner distal corner with numerous minute spinules and produced into a small process; armature consisting of inner strong spine, outer slender seta and a vestigial setule in between.

VARIABILITY. An aberrant left P3 was noticed in the holotype ♀ (Fig. 3C).

ETYMOLOGY. The species name is derived from the Latin *inter*, meaning between, and *medius*, meaning middle, and refers to the intermediate position between *S. galapagoensis* and the European species of the genus.

Syrticola flandricus Willems & Claeys, 1982 (Figs. 5F-H)

MATERIAL EXAMINED. 3 ♀♀ from off Walcheren, The Netherlands, southern North Sea, 51° 57′25″ N, 02° 40′45″ E, depth 44.5 m, coarse sandy sediment, 08 May 1991, coll. R. Huys. One ♀ in alcohol deposited under reg. no. 1992.1077.

The description given by Willems & Claeys (1982) is detailed and therefore only a few corrections to the original figures are noted here.

Antenna. The exopod possesses only one seta as in *S. intermedius* and *S. galapagoensis*. The oblique suture line has probably been mistaken for the lateral seta (compare Fig. 2D with Fig. 2B in Willems & Claeys (1982)), and it is conceivable that the same misinterpretation applies for *S. mediterraneus* (cf. Willems *et al.*, 1987: Fig. 3A).

Mandible. The basis bears only one seta; the supernumerary proximal 'setae' figured by Willems & Claeys are part of a transverse row of long spinules running around the lateral margin of the basis.

Maxillule. The arthrite of the praecoxa has 6 marginal and 2 surface setae, the coxal endite 2 setae and the distribution pattern of the palp setae is identical to *S. intermedius* (Fig. 2G).

Maxilliped. The endopodal claw bears an accessory setule at its base.

P1. A seta is located at the inner distal corner of the basis.

P5. The armature of the exopodal lobe consists of an outer spine, an inner seta and a setule in between (Fig. 5F).

The genital field is basically the same as in *S. intermedius* (Fig. 5G).

REMARKS

A single probably parthenogenetic female of a tantulocaridan was found attached to the pleurotergite of the P3-bearing somite of the holotype ♀ of *S. intermedius* (Fig. 1A). The specimen is about 160 μm long and is at an early stage of development. The larval postcephalic trunk had been sloughed already but no differentiating tissue could be observed inside the sac. The male paratype was also infested by a parthenogenetic female (Fig. 6A) which was larger (235 μm) and attached to the pleurotergite of the genital somite. Inside the sac a large number of small eggs of about 20–25 μm in diameter is contained. Both tantulocaridan stages most likely belong to an as yet undescribed species which was found to infest harpacticoids belonging to at least two other families (Huys *et al.*, in preparation). Since only the head shield (Figs. 5D-E) is left for comparison this identification has to be considered provisional.

DISCUSSION

Syrticola intermedius is the second species to be reported from the Indo-Pacific, the other species (under the name *(?) Notopontia galapagoensis*) being originally described from a sandy beach in the Galápagos (Mielke, 1982). Both species resemble each other morphologically. A comparison of the major diagnostic characters (Table 2) reveals two species groups in the genus *Syrticola*. The European group includes *S. trispinosus*, *S. flandricus* and *S. mediterraneus* and is characterized by a 6-segmented antennule (segments 6 and 7 fused) and the anal operculum possessing small spinous processes (Fig. 5H). The number of these projections ranges from (rarely) 0 to 5, though specimens with a single small process have not been recorded yet (Willems *et al.*, 1987). The second species group encompasses the two Indo-Pacific species which share a 7-segmented antennule and an operculum drawn out into a single median strong spike. Both species also share the plesiomorphic 2-segmented condition of the male P3 endopod, but the significance of this character is limited since not all the males are known in the European species group. The zoogeographical and morphological separation does not warrant the upgrading of these groupings to generic rank, however, since *S. intermedius* exhibits certain characters found in the European species. Outgroup comparison with *Notopontia* and *Leptopontia* suggests that the spiniform nature of the outer exopodal spine and the loss of the inner baseoendopodal seta are apomorphic character states for the fifth legs, linking the Japanese species with its European congeners. The outline of the anal operculum links *S. intermedius* to *(?) N. galapagoensis*, justifying the latter's re-allocation to *Syrticola* by Willems *et al.* (1987).

The possession of an aesthetasc-like structure on the syncoxa of the maxilla in *S. intermedius* is unusual. Re-examination of *S. flandricus* showed an unmodified seta in this position, in addition to the pinnate one also present in *S. intermedius*. Two setae are also reported on the syncoxal endite of *S. mediterraneus* and in the outgroup taxa *Notopontia* and *Leptopontia*. The report of 3 setae on this endite in *S. galapagoensis* (Mielke, 1982) therefore probably results from an misinterpretation of an aesthetasc-like structure. Without differential interference contrast microscopy the flaccid distal part is easily overlooked, thereby accentuating the lateral chitinized margins as setoid structures. The relative lengths of the enditic 'setae' in Mielke's (1982: Abb. 18E) illustration are suggestive of this interpretation.

The status of *S. trispinosus* remains enigmatic as ever. A. Scott's species is clearly closely related to *S. flandricus*. Willems & Claeys (1982) list a number of differences but except for the structure of the fifth leg, all of these can be attributed to deficiencies in the original decription. This, however, does not rule out *S. trispinosus* as a distinct species since the discovery of an as yet undescribed species of *Syrticola* in the North Sea has proven species discrimination in this genus to be rather unreliable. Pending re-examination of topotypes from the Isle of Man, *S. trispinosus* is relegated to *species inquirenda*.

KEY TO SPECIES

1. Antennule ♀ 7-segmented, anal operculum with one large, median spike .... 2.
   Antennule ♀ 6-segmented, anal operculum with several small, spinous processes .... 3.

2. P3 endopod without inner seta; outer exopodal element P5 setiform .... *galapagoensis* (Mielke. 1982).
   P3 endopod with inner seta; outer exopodal element P5 spiniform .... *intermedius* sp. nov.

3. P5 exopodal lobe with 2 spiniform elements .... *trispinosus* (A. Scott, 1896).
   Only one element of P5 exopodal lobe spiniform .... 4.

4. P3 endopod without inner seta .... *mediterraneus* Willems *et al.*, 1987.
   P3 endopod with inner seta .... *flandricus* Willems & Claeys, 1982.

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Table 2 Comparison of *Syrticola* species.

	trispinosus	*flandricus*	*mediterraneus*	*galapagoensis*	*intermedius*
Antennule ♀	6-segmented	6-segmented	6-segmented	7-segmented	7-segmented
Inner seta P3 endopod ♀	?	present	absent	absent	present
Endopod P3 ♂	?	?	1-segmented	2-segmented	2-segmented
Outer element exopodal lobe P5♀♂	spiniform	spiniform	spiniform	setiform	spiniform
Inner seta endopodal lobe P5 ♀	absent	absent	absent	present	absent
Anal operculum processes	several, small	several, small	several, small	one, large	one, large
Body length ♀ (μm)	500	460–530	540–660	280–340	485
Body length ♂ (μm)	?	?	460–500	310–350	460
Distribution	Irish Sea	North Sea	Mediterranean	Galápagos	Japan

REFERENCES

Bodiou, J.-Y. 1977. Harpacticoïdes (Crustacés, Copépodes) des îles Kerguelen. III. Description de deux formes nouvelles de la famille des Cylindropsyllidae. In: Le benthos du plateau continental des îles Kerguelen. *CNFRA* **42**: 277–286.

—— & Colomines, J.-C. 1986. Harpacticoïdes (Crustacés, Copépodes) des îles Crozet. I. Description d'une espèce nouvelle du genre *Arenopontia* Kunz. *Vie et Milieu* **36**: 55–64.

Huys, R. 1993. The amphiatlantic distribution of *Leptastacus macronyx* (T. Scott, 1892) (Copepoda: Harpacticoida): a paradigm of taxonomic confusion; and, a cladistic approach to the classification of the Leptastacidae Lang, 1948. *Academiae Analecta*, in press.

—— & Boxshall, G.A. 1991. *Copepod Evolution*. The Ray Society, London. 468 pp.

Itô, T. 1968. Descriptions and records of marine harpacticoid copepods from Hokkaido. I. *Journal of the Faculty of Sciences, Hokkaido University, Zoology* **16**: 369–381.

—— 1972. Descriptions and records of marine harpacticoid copepods from Hokkaido. IV. *Journal of the Faculty of Sciences, Hokkaido University, Zoology* **18**: 305–336.

—— 1978. A new species of marine interstitial harpacticoid copepod of the genus *Arenopontia* from the Bonin Islands, southern Japan. *Annotationes Zoologicae Japonenses*. **51**: 47–55.

—— 1984. Studies on the interstitial animals in the Ishikari beach, Hokkaido, northern Japan — a preliminary report. *Benthos Research, Bulletin of the Japanese Association of Benthology* **26**: 1–14. [In Japanese with English summary.]

Kikuchi, Y. 1970. A new species of *Parastenocaris* (Har-pacticoida) from a sandy beach of the Lake Hinuma. *Annotationes Zoologicae Japonenses* **43**: 170–173.

—— 1972. Psammobiontic harpacticoid copepods of Lake Hinuma, II. *Annotationes Zoologicae Japonenses* **45**: 170–177.

—— & Yokota, K. 1984. New records of two freshwater harpacticoid copepods, *Nannopus palustris* Brady and *Leptocaris brevicornis* (van Douwe), in Lake Hinuma. *Publications of the Itako hydrobiological Station* **1**: 1–9.

Krishnaswamy, S. 1956. *Sewellina reductus* gen. et sp. nov., a new sanddwelling copepod from Madras. *Zoologischer Anzeiger* **157**: 248–250.

Lang, K. 1948. *Monographie der Harpacticiden*. Håkan Ohlsson, Lund. I: 1–896, figs. 1–361; II: 897–1682, figs. 362–607, maps 1–378.

Mielke, W. 1982. Interstitielle Fauna von Galapagos. XXIX. Darcythompsoniidae, Cylindropsyllidae (Harpacticoida). *Mikrofauna Meeresbodens* **87**: 1–52.

Scott, A. 1896. Description of new and rare Copepoda. In: Report on the Investigations carried on in 1895 in connection with the Lancashire Sea-Fisheries Laboratory at University College, Liverpool. *Proceedings and Transactions of the Liverpool Biological Society* **10**: 134–158

Willems, K.A. & Claeys, D. 1982. *Syrticola flandricus* n. g., n. sp., a harpacticoid copepod from the Southern Bight of the North Sea. *Crustaceana* **43**: 1–8.

——, —— & Fiers, F. 1987. *Syrticola mediterraneus* n. sp., a harpacticoid copepod from the Bay of Calvi, Corsica. *Hydrobiologia* **153**: 71–78.