

Description of *Gnathophylleptum tellei* gen. nov., sp. nov., a remarkable new gnathophyllid shrimp from Canary Islands (Crustacea, Decapoda, Caridea)

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Abstract

A new genus *Gnathophylleptum* gen. nov. is erected for a highly characteristic new species of gnathophyllid shrimp from the Canary Islands: *Gnathophylleptum tellei* gen. nov., sp. nov. This species, which has been found in the coastal waters of Gran Canaria, is unusually slender for a member of the Gnathophyllidae and possesses quite distinctive third maxillipeds. The relationship between *Gnathophylleptum* and related genera is discussed in detail. An identification key to all gnathophyllid genera is given.

Key-words: *Gnathophylleptum*, Gnathophyllidae, Palaemonoidea, Caridea, Decapoda, shrimp, taxonomy, phylogeny, corneal papilla, Canary Islands, Eastern Atlantic

Résumé

Un nouveau genre *Gnathophylleptum* gen. nov. est proposé pour une crevette Gnathophyllidae hautement caractéristique des îles Canaries: *Gnathophylleptum tellei* gen. nov., sp. nov. Cette espèce qui a été récoltée dans les eaux côtières de Gran Canaria présente une silhouette singulièrement gracile pour une Gnathophyllidae, et la morphologie de ses maxillipèdes de la troisième paire est tout à fait particulière. Les relations entre *Gnathophylleptum* gen. nov. et les genres apparentés sont discutées d'une manière approfondie. Une clé d'identification est donnée pour tous les genres de Gnathophyllidae.

Mots-clés: *Gnathophylleptum*, Gnathophyllidae, Palaemonoidea, Caridea, Decapoda, crevette, taxonomie, phylogénie, papille cornéenne, îles Canaries, Atlantique oriental

Introduction

Our current knowledge of the decapod fauna of Europe and neighbouring areas is usually considered fairly good but is by no means complete. Each year, one or two new species are described from the area (D'UDEKEM D'ACUZ, 1999), but in most cases, these new species are closely related to already described taxa. The discovery of new genus remains exceptional, especially in the coastal waters. So, it was a real surprise to discover a new shallow-water Canarian gnathophyllid shrimp with a spectacular colour pattern and not closely related to any member of this family. A new genus

is here erected for this remarkable new species, which has been found by Mr. Arthur TELLE (Gran Canaria). It may be distinguished by many characters, the two most conspicuous being the considerable length and slenderness of the second pereopod, and the complex tridimensional structure of the third maxilliped.

Systematics

Gnathophylleptum gen. nov.

TYPE SPECIES

Gnathophylleptum tellei gen. nov., sp. nov.

ETYMOLOGY

The name derives from *Gnathophyllum*, the type genus of the family Gnathophyllidae, and from λεπτός, slender. The genus is neutral.

DESCRIPTION

Rostrum moderately long, armed both dorsally and ventrally. Antennal spine present and well developed. Cornea with well developed distal papilla, without ocellum. First segment of antennular segment long and narrow, with short styliform stylocerite. Basicerite with well developed lateral tooth. Scaphocerite narrow. Mandible very small, devoid of palp and incisor process. Upper lacinia of maxillula much larger than palp and lower lacinia. Maxilla fairly small, with well developed palp, with basal endite entire and reduced to a short blunt lobe. First maxilliped very large, with well developed epipod and exopod, well developed palp; basal endite triangular, narrowing gradually towards its tip which is angular; coxal endite protruding and completely fused to basal endite. Second maxilliped unmodified, with well developed epipod. Third maxilliped with well developed exopod; ultimate and penultimate segment somewhat flattened; ischiomerus strongly flattened, with outer face concave; maximal width of ischiomerus similar to that of basis, these two segments being well separated. Carpus of first pereopod very long and much longer than propodus; dactylus much shorter than palm. Second pereopod slender and extremely

long; carpus longer than merus and about as long as propodus; dactylus considerably shorter than palm; chela toothless. Dactylus of third, fourth and fifth pereopod robust and bifid.

Gnathophylleptum tellei gen. nov., sp. nov.
(Figs. 1-7)

MATERIAL

Canary Islands, Gran Canaria, Sardina del Norte, *Caulerpa racemosa* (FORSSKÅL) J. AGARDH meadow, under a hand-sized stone, 15 m depth, SCUBA diving, Arthur TELLE coll., 18/1/2001: 1 female holotype (collection Institut royal des Sciences Naturelles de Belgique, Brussels, N° I.G. 29411).

ETYMOLOGY

It is a pleasure to dedicate the species to Mr. Arthur TELLE who discovered the species. The name is a genitive.

DESCRIPTION

Rostrum straight, slender, moderately long, overreaching mesial margin of first segment of antennular peduncle but not reaching tip of distolateral tooth, 0.8 times as long as carapace; dorsal margin gently sloping downwards, with 7 dorsal teeth spread evenly over its length, posteriormost situated on carapace behind level of orbital margin; ventral margin horizontal, with 2 ventral teeth on distal 0.3; tip entire and styliform. Posterior 0.9 of carapace unarmed, faintly convex and nearly horizontal. Antennal spine situated above inferior orbital angle, sharp and fairly large but not reaching tip of inferior orbital lobe. Pterygostomian area bluntly triangular, overreaching tip of antennal spine. Third pleonite moderately convex in lateral view. Pleura of first three pleonites rounded; pleura of fourth and fifth pleonites with postero-ventral tooth, that of fifth pleonite being quite long. Posterolateral angle of sixth pleonite with a sharp tooth. Dorsal length of sixth pleonite 1.6 x as long as fifth. Ratio dorsal length / height of sixth pleonite = 1.6. Telson robust, armed with 2 pairs of strong dorsolateral spines at 0.4 and 0.7 of its length. Tip of telson triangular with 2 pairs of long spines, the inner spines being twice as long as outer spines; with a pair of setulose, robust short setae between the inner teeth; with 2 pairs of short thin non-setulose setae, both situated between the inner spines and the setulose setae.

Eye large, overreaching stylocerite; cornea considerably shorter than stalk, with dorsal surface slightly convex, with ventral surface strongly convex, and bearing a well developed distal papilla at the confluence of the dorsal and ventral surfaces; no ocellum.

First segment of antennular peduncle very narrow, 3 times as long as wide, with a long and sharp distolateral tooth slightly overreaching second segment, with well developed ventromesial tooth reaching tip of stylocerite, with short but sharp stylocerite reaching 0.4 of first segment (distal tooth included). Second and third segments of antennular peduncle subequal, slightly longer than broad, 0.2 x as long as first segment (distal tooth included). Upper antennular flagellum

with fused rami consisting of 6 broad segments; long ramus with 6 narrow segments; short ramus with 1 segment.

Scaphocerite narrow, 3.5 times as long as wide, with lateral margin slightly concave; lateral tooth nearly reaching tip of blade; tooth and blade separated by wide space; tip of blade regularly rounded, and barely overreaching tip of antennular peduncle. Antennal peduncle short and moderately slender, reaching 0.27 of scaphocerite. Basicerite with well developed sharp tooth.

Mandible very small, devoid of palp and incisor process; molar process armed with long sharp teeth.

Upper lacinia of maxillula much larger than palp and lower lacinia, with double row of stout spines; palp and lower lacinia normally developed; lower angle of palp with a straight spine pointing laterally.

Maxilla fairly small, with well developed palp, with basal endite entire and reduced to a short blunt lobe without setae.

First maxilliped very large, with large epipod consisting of two well separated rounded lobes (upper one largest), long exopod, well developed palp nearly as long as basal endite and longer than caridean lobe; basal endite large, triangular, narrowing gradually towards its tip which is angular, with very long slender and non-setulose marginal setae; coxal endite well developed, protruding, bluntly subquadrate and completely fused to basal endite, with only one seta in upper position; caridean lobe with tip broadly rounded, not protruding, much shorter than basal endite.

Second maxilliped unmodified, with fairly small unilobed epipod and with very long exopod.

Third maxilliped without arthrobranch, without epipod, with long exopod overreaching ischiomerus, with well developed lateral plate; ultimate and penultimate segment subequal, much shorter than ischiomerus, somewhat flattened but much longer than broad; penultimate segment with an outer subquadrate distal projection; outer angle of this projection with a tiny but sharp tooth; inner angle with a large blunt tooth. Ischiomerus flattened and curved both longitudinally (upwards) and laterally, outer face transversally concave and inner face transversally convex, well developed distal outer tooth, low triangular median projection on tip of inner face; outer border broadened (rounded in cross section); mesial border thin with a row of spines. Ischiomerus and basis quite distinct (not fused), with maximal width similar, but proximal part of ischiomerus narrower than tip of basis.

First pereopod with sparse setae; cutting edges of chela toothless; carpus 1.2 x as long as merus, 1.7 x as long as propodus; propodus 1.6 x as long as ischium; dactylus 0.33 x as long as propodus; carpus 6.2 x as long as wide.

Second left pereopod extremely long and slender, with sparse setae; cutting edges of chela toothless; merus overreaching short ramus of upper antennular flagellum; merus 1.1 x as long as ischium; carpus 1.3 x as long as merus, 0.9 x as long as propodus; dactylus 0.27 x as long as propodus; carpus 7.0 x as long as wide. Second right pereopod lacking.

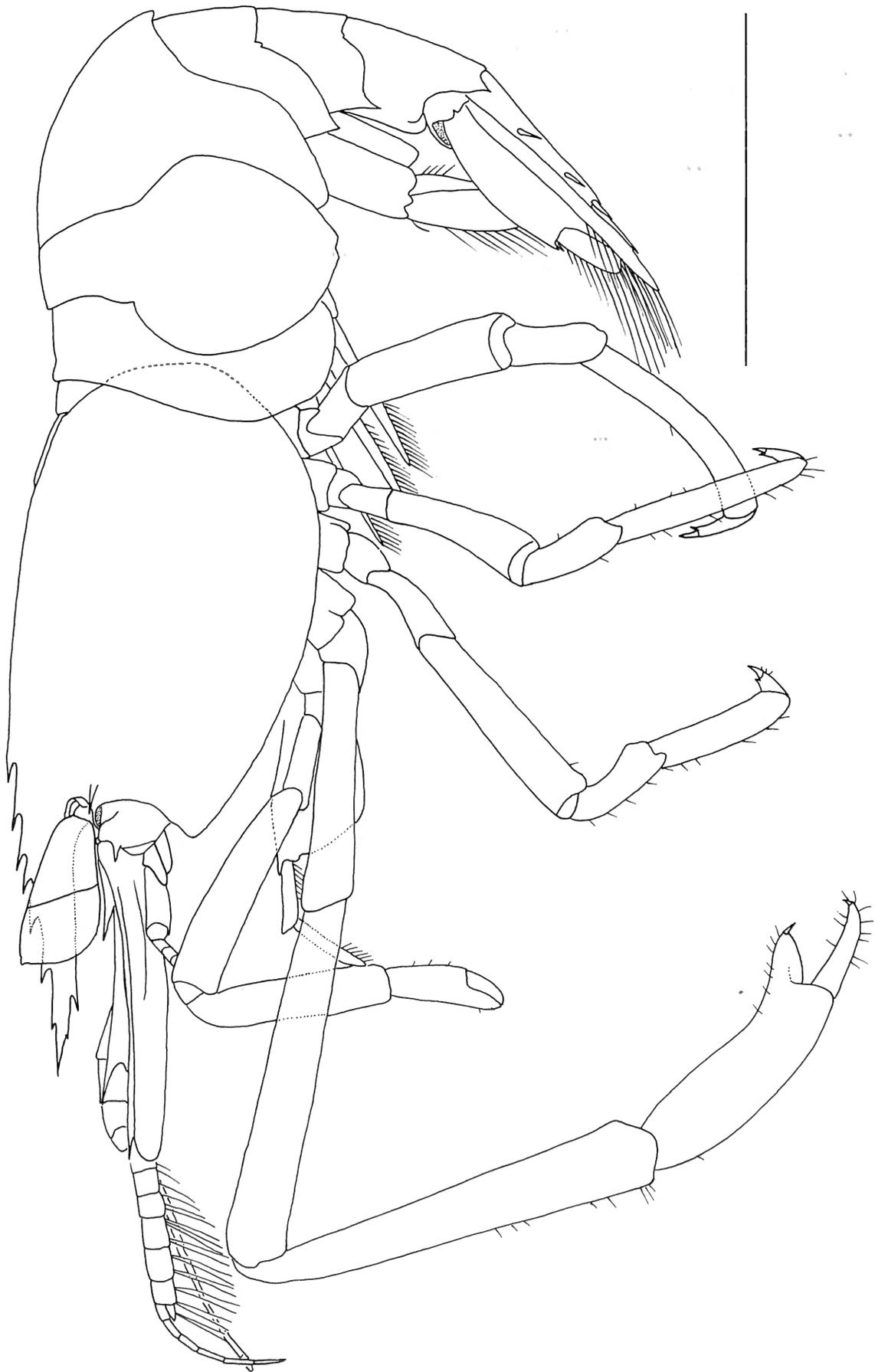


Fig. 1. *Gnathophylleptum tellei* gen. nov., sp. nov. Shrimp in lateral view. Scale bar 3.0 mm.

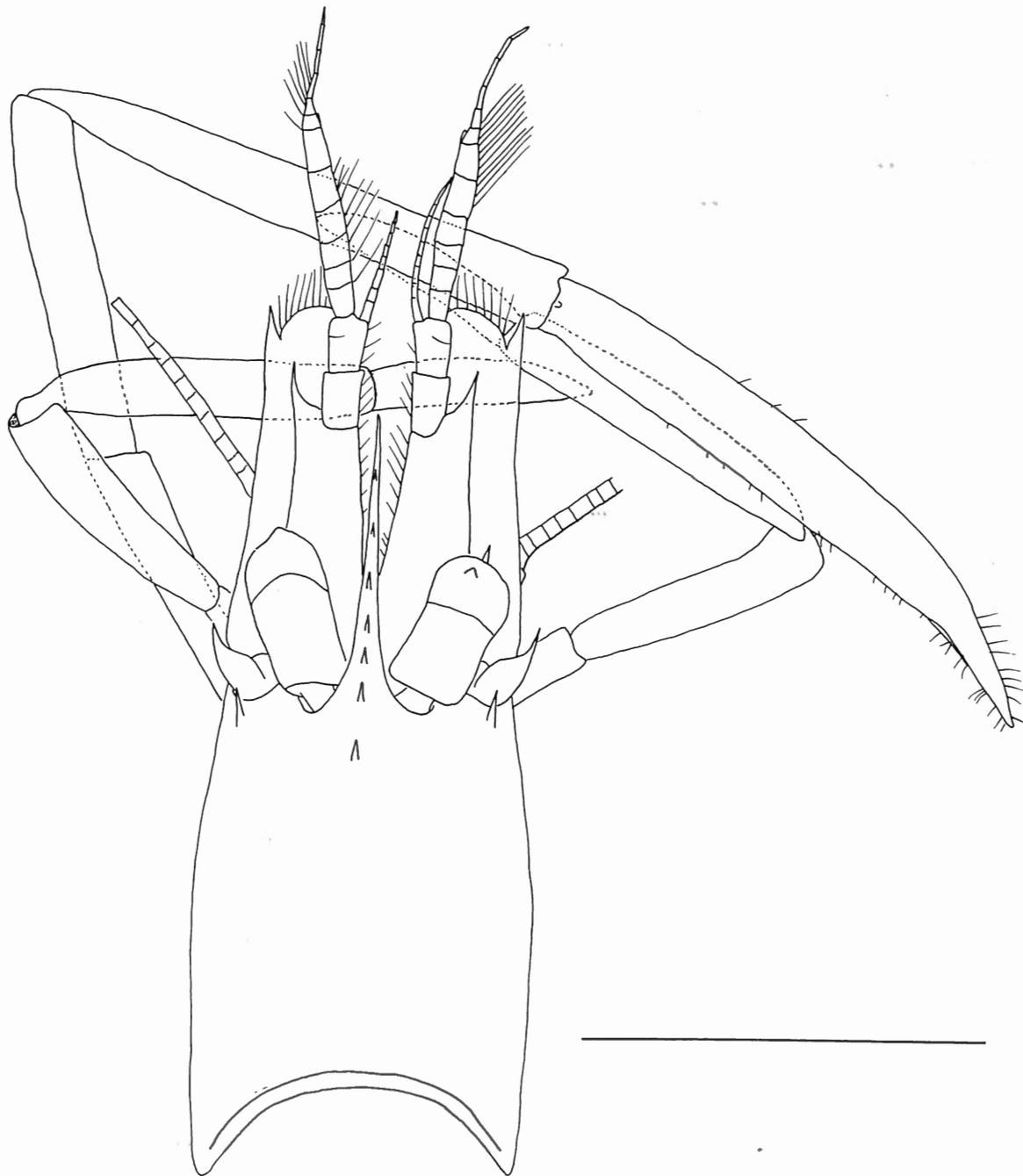


Fig. 2. *Gnathophylleptum tellei* gen. nov., sp. nov. Anterior part of shrimp in dorsal view. Scale bar 3.0 mm

Last three pereopods morphologically similar, although P3 propodus < P4 propodus < P5 propodus, long, fairly robust (P3 merus = 5.5 x as long as wide), with sparse setae; propodus > merus > ischium > carpus > dactylus; propodus with 4 widely spaced small spines on distal 0.6 of flexor border; dactylus short and robust, with terminal unguis and sharp triangular accessory tooth on flexor border; anterior border of accessory tooth perpendicular to flexor border of terminal unguis.

COLOUR PATTERN (ON THE BASIS OF COLOUR SLIDES)

Most parts of body blood red with faintly contrasted dots of a darker red. Rostrum transparent, tinged with white. Carapace

with an anterior V-shaped marking pointing posteriorly; each branch of the "V" made by a row of white dots on a blood red background; branches of "V" arising from anterior lower part of carapace and dorsally converging at anterior 0.25 of carapace midline; a few white dots within the space comprised between the "V" and the anterior part of the carapace. Posterior 0.2 of carapace with a dorsal transverse stripe made up of white dots on a whitish pink background. Third pleonite with a large dorsal semi-circular spot, anteriorly rounded and posteriorly straight, made up of white dots on a whitish pink background. Space between the transverse stripe and the semi-circular spot, as well as dorsal part of fourth and fifth pleonites made of a paler red than the rest of the body. Sixth pleonite and tail fan transparent with a few

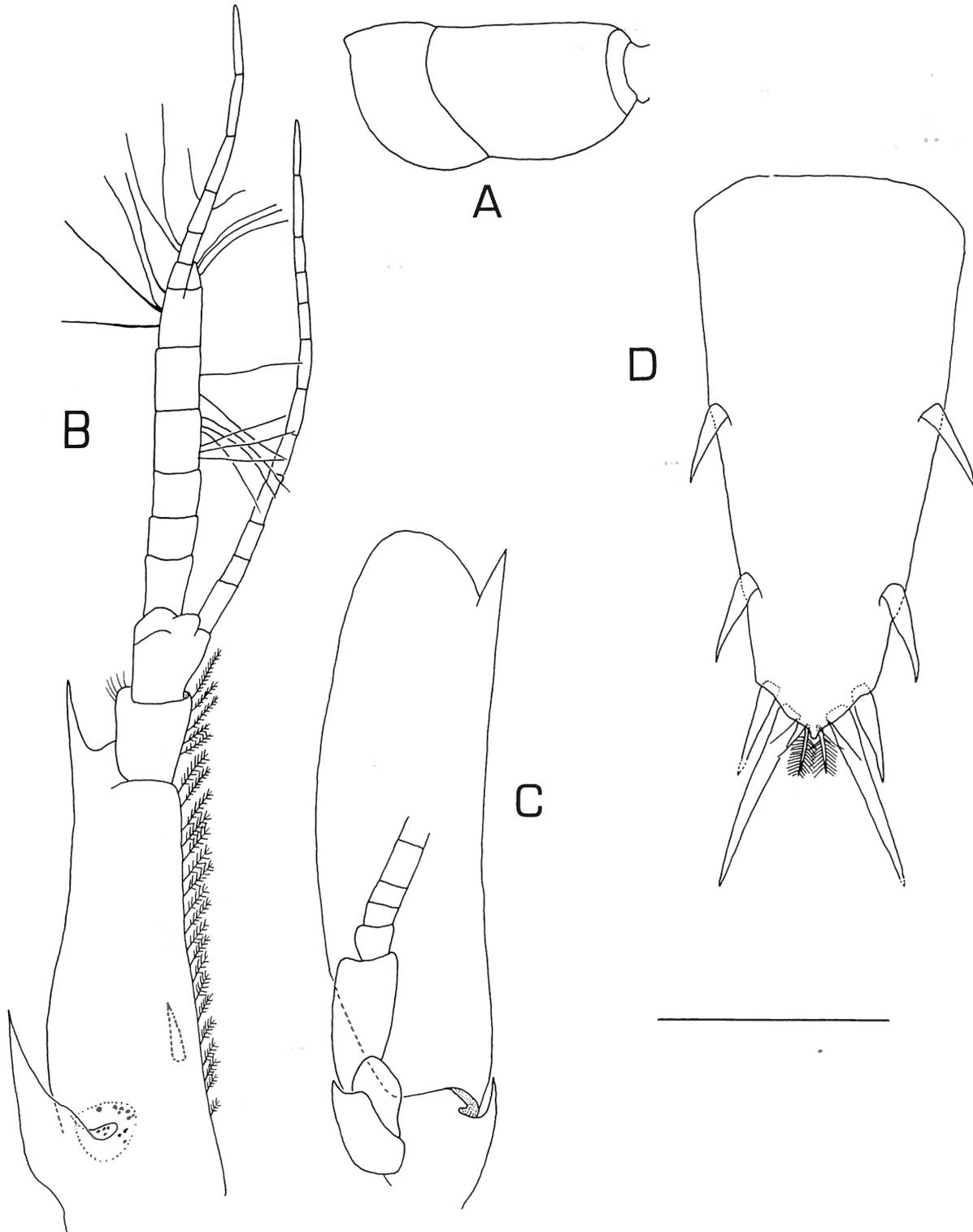


Fig. 3. *Gnathophylleptum tellei* gen. nov., sp. nov. A, left eyestalk in lateral view; B, first left antenna; C, second left antenna; D, telson. Scale bar: A, B, C 1.0 mm; D 0.68 mm.

discrete milky-white dots. Eyestalks transparent with white dots and a few faint red marks; cornea grey. Antennulae and antennae transparent with a few white dots. Proximal 0.4 of third maxilliped red; distal 0.6 transparent with white dots. Proximal part of pereopods up to tip of ischium red; distal part of pereopods from basal part of merus onwards trans-

parent with a few white dots; transition between the red and the transparent part abrupt. Pleopods transparent, with a few milky-white dots.

Size.- Carapace length = 2.8 mm; total length = 12 mm.

Ecology

The unique specimen of *Gnathophylleptum tellei* gen. nov., sp. nov. studied has been found in a *Caulerpa racemosa* (FORSSKÅL) J. AGARDH meadow, under a stone, at 15 m depth. According to Mr. Arthur TELLE who collected it during SCUBA diving, there was no evidence of any association between the shrimp and any other organism. However, its strongly modified mouthparts suggest a specialized feeding habit.

Morphological affinities of *Gnathophylleptum* gen. nov.

The Gnathophyllidae are a small family of palaemonoid shrimps, which have a highly specialized morphology, especially their mouthparts, and which are usually brightly coloured. *Gnathophylleptum* gen. nov. shows some affinities, especially regarding the morphology of the second maxilliped, with one member of the very heterogenous genus *Gnathophylloides* SCHMITT, 1933: *G. mineri* SCHMITT, 1933. However, the latter species can be distinguished at first glance from *Gnathophylleptum* gen. nov. by its very short and robust walking legs, whose dactylus are devoid of accessory tooth. The general appearance of *Gnathophylleptum* gen. nov. is similar to that of the very homogenous genus *Gnathophyllum* LATREILLE, 1819, but a closer examination reveals profound differences, and both genera are obviously not closely related. A detailed comparison between *Gnathophylleptum* gen. nov. and *Gnathophyllum* is given here below, as well as a key to all gnathophyllid genera. The data on the morphology of *Gnathophyllum* are based on a Sicilian *Gnathophyllum elegans* (RISSO, 1816) which has been dissected and on the detailed illustrated accounts of HOLTHUIS (1949), MANNING (1963), CHACE & FULLER (1971), TITGEN (1989) and MANNING & CHACE (1990).

Specifically, the following differences are apparent between *Gnathophylleptum* gen. nov. and *Gnathophyllum*.

In *Gnathophylleptum* gen. nov., the rostrum is slender, especially in its distal part, while in *Gnathophyllum* it is fairly robust.

In *Gnathophylleptum* gen. nov., the pleura of the fourth and the fifth pleonites have a posterior tooth, that of the fifth being very sharp. In *Gnathophyllum*, the fourth pleonite is regularly rounded and the fifth is rounded or bluntly angular.

In *Gnathophylleptum* gen. nov., the eyestalks are more slender, with a more conical cornea than in *Gnathophyllum*. In *Gnathophylleptum* gen. nov., the first segment of the antennular peduncle is very slender with a short stylocerite, while it is very broad with a very long stylocerite in *Gnathophyllum*. The scaphocerite in *Gnathophylleptum* gen. nov. is slender, while it is very broad in *Gnathophyllum*.

No incisor process is present on the mandible of *Gnathophylleptum* gen. nov., whilst in *Gnathophyllum*, it is either absent or vestigial, depending on the species.

Both *Gnathophylleptum* gen. nov. and *Gnathophyllum* have the upper lacinia of the maxillula considerably larger than the

palp and the lower lacinia, but these size differences are much more pronounced in *Gnathophyllum*. In *Gnathophylleptum* gen. nov., the lower distal spine of the palp is directed outwards, while in *Gnathophyllum* it is curved inwards.

The basal endite of the maxilla of *Gnathophylleptum* gen. nov. forms a reduced but distinct blunt protrusion, while in *Gnathophyllum*, it is absent.

In *Gnathophylleptum* gen. nov., the exopod and the endopod of the first maxilliped are close to each other, while they are separated by a large space in *Gnathophyllum*. In *Gnathophylleptum* gen. nov., the tip of the caridean lobe is not protruding; in *Gnathophyllum* it is always long. In *Gnathophylleptum* gen. nov., the palp considerably overreaches the caridean lobe and nearly reaches the tip of the basal endite, while in *Gnathophyllum* it is shorter than the caridean lobe and is much shorter than the basal endite. In *Gnathophylleptum* gen. nov., the basal endite is triangular, gradually narrowing towards tip which is angular; in *Gnathophyllum*, it is elliptic with a rounded tip. In *Gnathophylleptum* gen. nov., the coxal endite is large, while it is quite small in *Gnathophyllum*.

In *Gnathophylleptum* gen. nov., the second maxilliped shows little specialization in contrast with *Gnathophyllum*. In *Gnathophylleptum* gen. nov., half of the exopod overreaches the endopod (terminal setae not considered), while in *Gnathophyllum*, the exopod and the endopod are subequal; the proximal part of the endopod is considerably broadened in *Gnathophyllum*, but not so in *Gnathophylleptum* gen. nov.; in *Gnathophylleptum* gen. nov., the ultimate segment is smaller than the antepenultimate and both segments have a normal morphology; in *Gnathophyllum*, the ultimate segment is very large and very elongate in a downwards direction, and is much larger than the antepenultimate segment which is reduced.

In *Gnathophylleptum* gen. nov., the third maxilliped has 2 distal teeth on the outer border of its penultimate segment; these teeth are lacking in *Gnathophyllum*. In *Gnathophylleptum* gen. nov., the ischiomerus is quite distinct from the basis, while these segments are fused and scarcely distinct in *Gnathophyllum*. In *Gnathophylleptum* gen. nov., the outer face of the ischiomerus is strongly concave in the transverse plane, while it is slightly convex in *Gnathophyllum*. In *Gnathophylleptum* gen. nov., the outer border of the ischiomerus is thickened, whilst it is thin in *Gnathophyllum*. In *Gnathophylleptum* gen. nov., the outer border has a strong distal tooth which is absent in *Gnathophyllum*.

The second left pereopod in *Gnathophylleptum* gen. nov. is extremely long and slender, with a carpus nearly as long as the propodus, and without teeth on the cutting edges of its chela (the second right pereopod is lacking in the unique specimen examined); in *Gnathophyllum*, the second left pereopod is much shorter, not especially slender, has its carpus much shorter than propodus, and the cutting edges of its chelae are toothed.

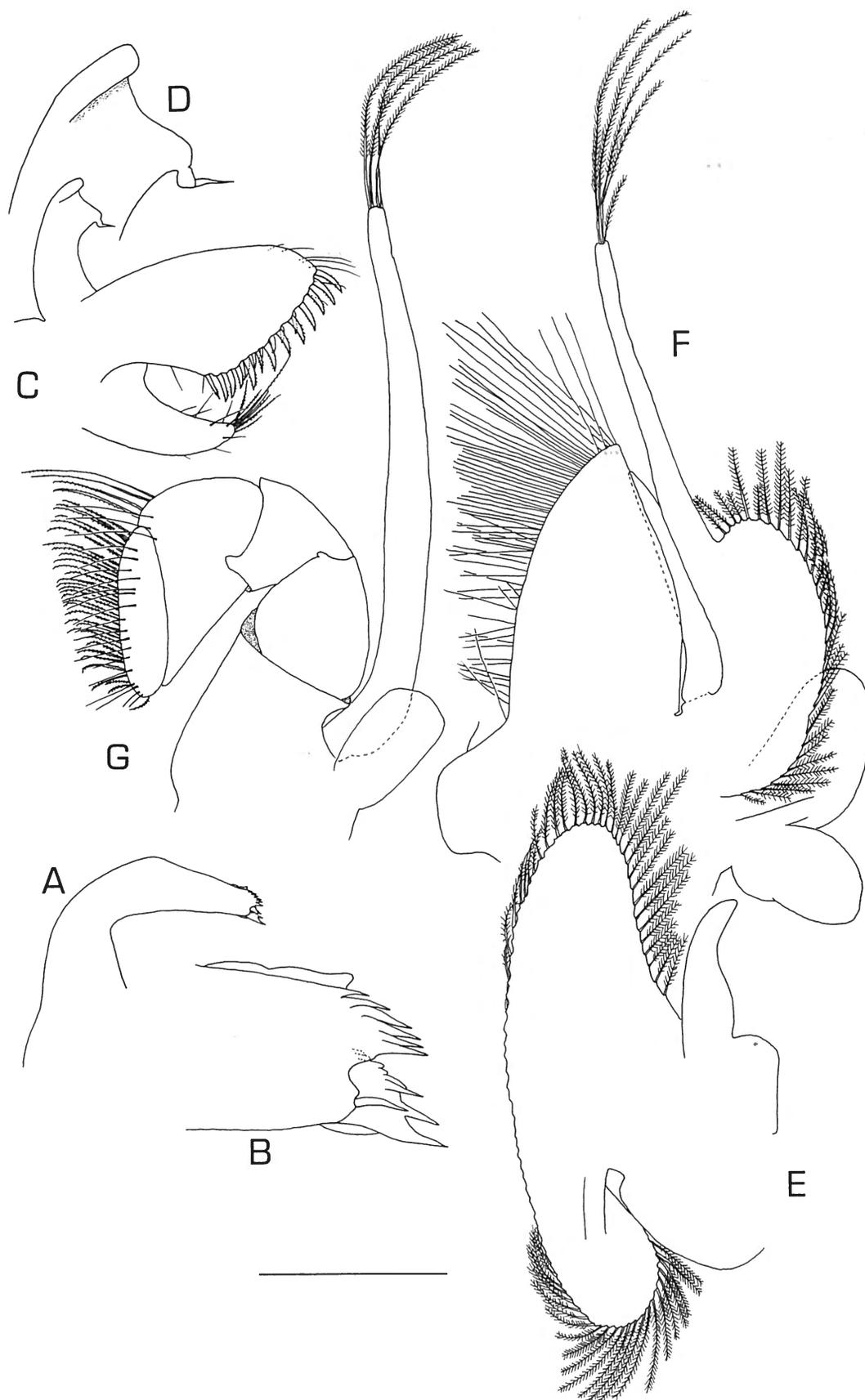


Fig. 4. *Gnathophylleptum tellei* gen. nov., sp. nov. A, right mandible; tip of right mandible; C, first right maxilla; D, palp of first right maxilla; E, second right maxilla; F, first left maxilliped; G, second left maxilliped. Scale bar: A, C, E, F, G 0.50 mm; B 0.083 mm; D 0.17 mm.

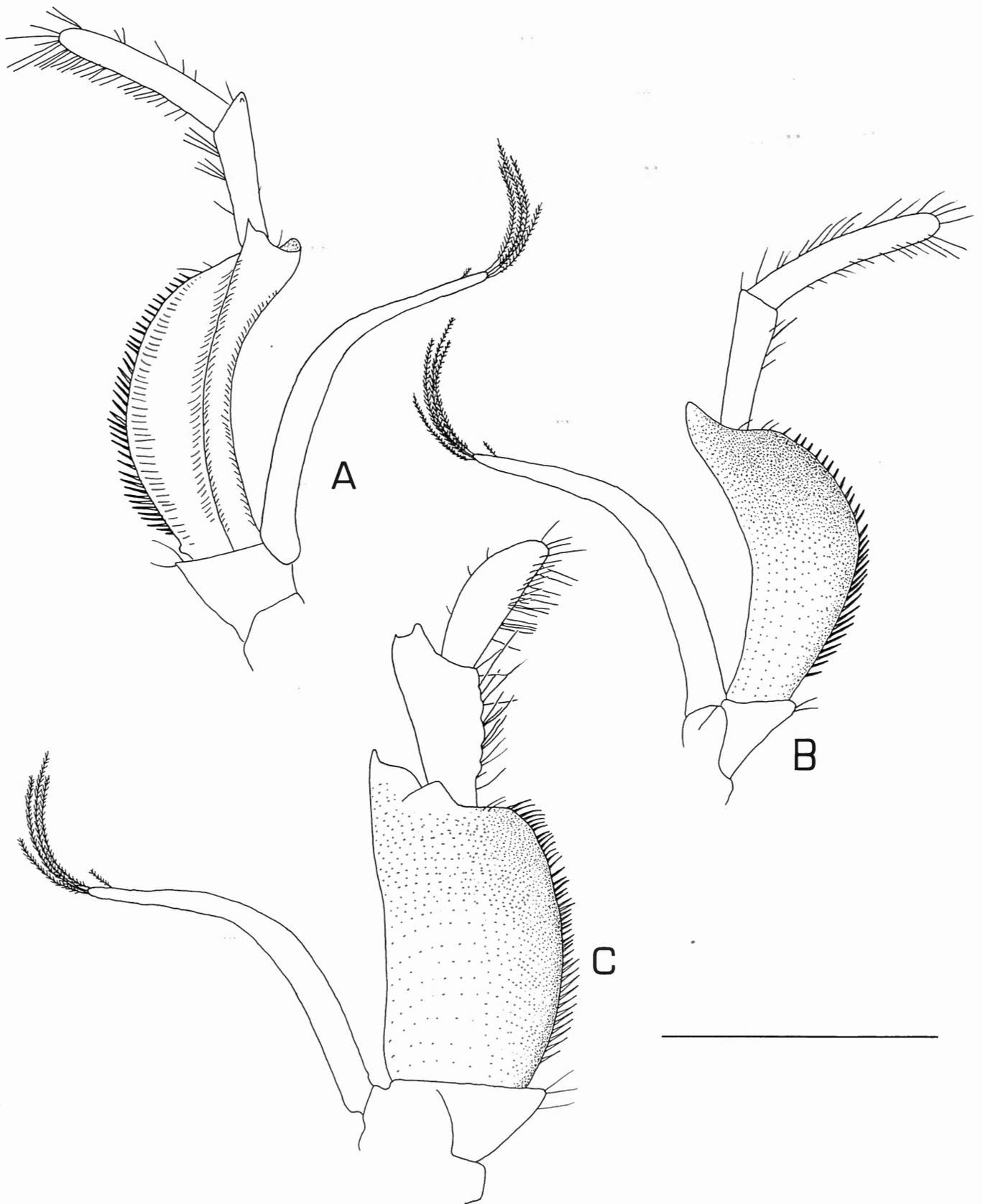


Fig. 5. *Gnathophylleptum tellei* gen. nov., sp. nov., third left maxilliped. A, lateral outer view; B, lateral inner view; C, facial inner view. Scale bar 1.0 mm.

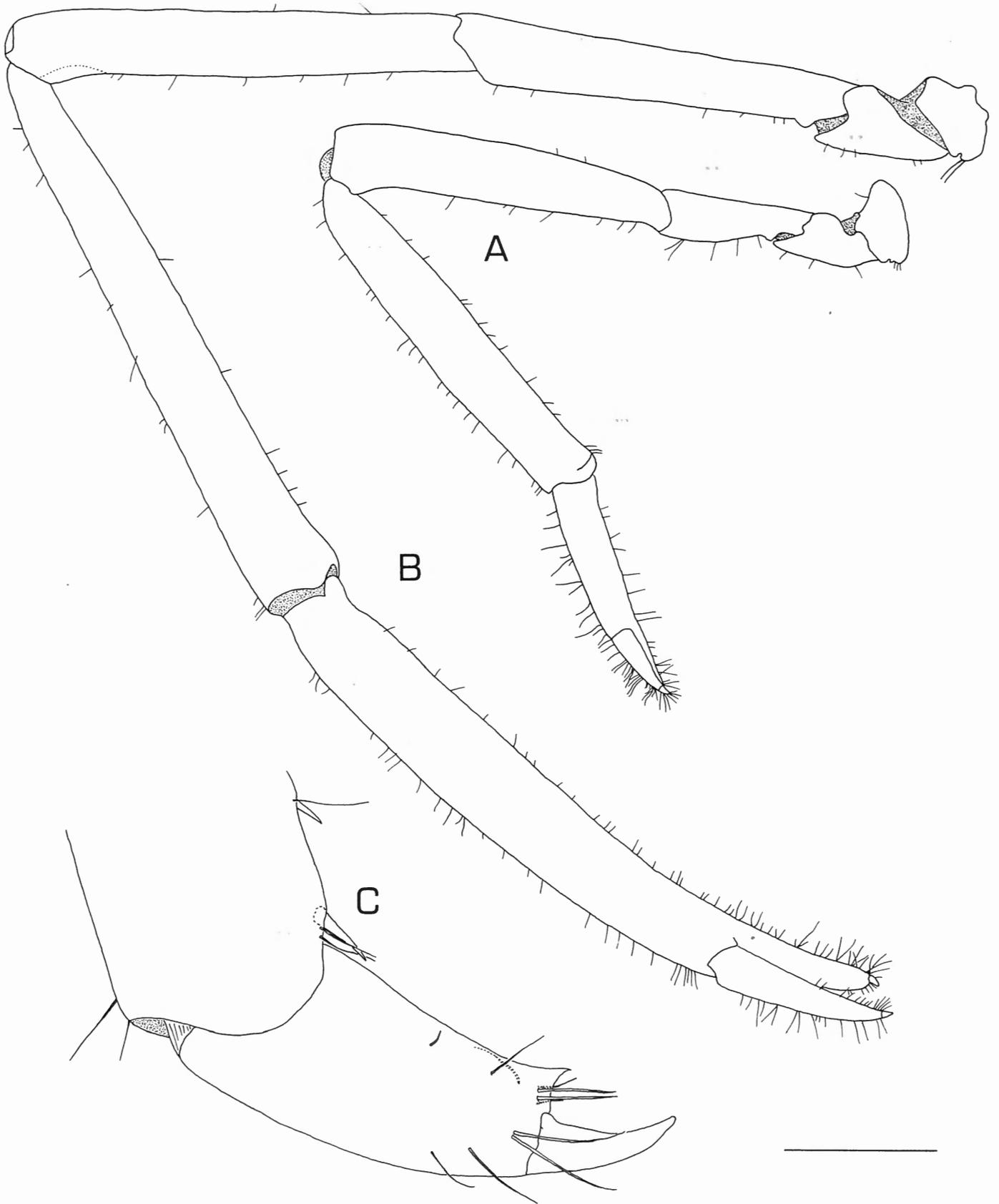


Fig. 6. *Gnathophylleptum tellei* gen. nov., sp. nov., A, first left pereopod; B, second left pereopod; C, dactylus of third left pereopod. Scale bar: A, B 1.0 mm; C 0.17 mm.

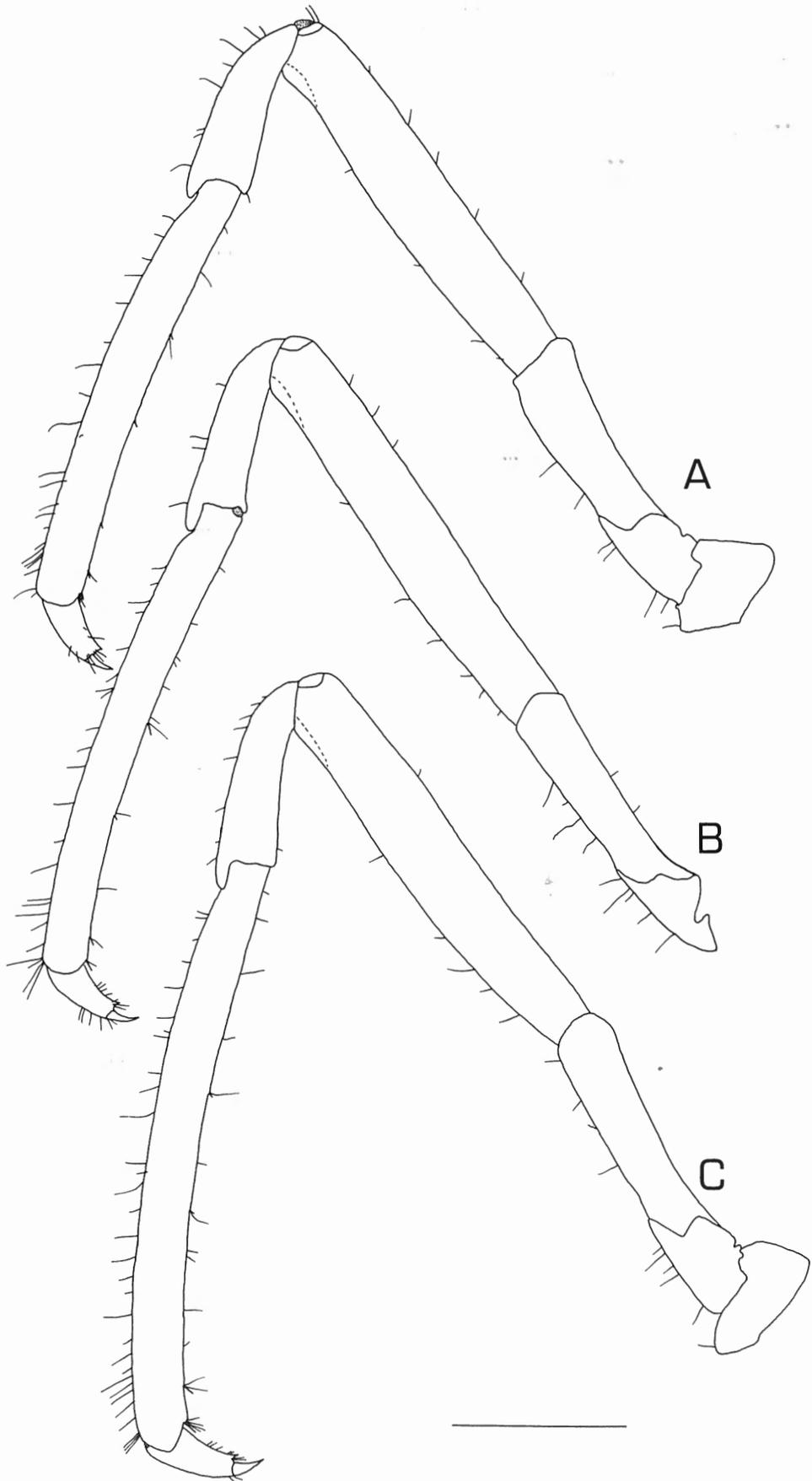


Fig. 7. *Gnathophylleptum tellei* gen. nov., sp. nov., A, third left pereopod; B, fourth left pereopod; C, fifth left pereopod. Scale bar 1.0 mm.

Key to the genera of Gnathophyllidae

1. • Dactylus of the last three pairs of pereopods with a terminal unguis and a well developed accessory tooth on the distal part of the flexor border 2
 - Dactylus of the last three pairs of pereopods with a terminal unguis and a blunt granulated lobe instead of an accessory tooth on the flexor border 4
2. • Rostrum with dorsal teeth. Body not depressed. Cornea broader than unpigmented part of eyestalk, with papilla (sometimes weakly developed). Last three pereopods of normal robustness or slender; accessory tooth of their dactylus shorter than terminal unguis 3
 - Rostrum without dorsal teeth. Body depressed. Cornea less broad than unpigmented part of eyestalk, without papilla. Last three pereopods very short and robust; accessory tooth of their dactylus longer than terminal unguis ... genus *Pycnocaris* BRUCE, 1972
3. • Basal antennular segment and scaphocerite very broad. Basal endite of first maxilliped elliptic. Second maxilliped with basal part very broadened and with distal segment strongly elongated downwards. Ischiomerus of third maxilliped with outer face slightly convex. Second pereopod neither especially long nor slender, with carpus much shorter than propodus, with fingers toothed genus *Gnathophyllum* LATREILLE, 1819
 - Basal antennular segment and scaphocerite slender. Basal endite of first maxilliped triangular. Second maxilliped with basal part not especially broadened and with distal segment not especially elongated. Ischiomerus of third maxilliped broadened with outer face concave. Second pereopod very long and slender, with carpus nearly as long as propodus, with fingers toothless genus *Gnathophylleptum* gen. nov.
4. • Second maxilliped extremely long and slender, with very elongate cylindrical merus and carpus, exceeding third maxilliped with more than the last 3 segments *Levicaris* BRUCE, 1973
 - Second maxilliped short, with very robust merus and carpus, not reaching beyond third maxilliped *Gnathophylloides* SCHMITT, 1933

Evolutionary considerations on *Gnathophylleptum* gen. nov. and other palaemonoid shrimps

With the exception of the second pereopod and the ischiomerus of its third maxilliped, which both exhibit apomorphic characters, *Gnathophylleptum* gen. nov. seems to be a primitive Gnathophyllidae, with few morphological specializations. The upper lacinia of the maxillula is only slightly enlarged as in *Pycnocaris*, whilst in the three other genera: *Gnathophylloides*, *Gnathophyllum* and *Levicaris*, it is considerably enlarged. *Gnathophylleptum* gen. nov. is the only genus in which the maxilla has a distinct basal endite. The second maxilliped of *Gnathophylleptum* gen. nov. is unspecialized, as in *Gnathophylloides mineri* (SCHMITT, 1933) (see SCHMITT, 1933), whilst it is moderately modified in *Gnathophylloides robustus* BRUCE, 1973 (see BRUCE, 1973) and *Pycnocaris chagoae* BRUCE, 1972 (see BRUCE, 1972), and deeply modified in *Gnathophyllum* spp. (see HOLTHUIS, 1947; CHACE & FULLER, 1971; TITGEN, 1989; MANNING & CHACE, 1990) and *Levicaris mammillata* (EDMONDSON, 1931) (see EDMONDSON, 1931; BRUCE, 1973; FUJINO & TAKEDA, 1977). Finally, in *Gnathophylleptum*, the separation between the ischiomerus and the basis is more evident than in any other gnathophyllid genus.

Interestingly, both the gnathophyllid *Gnathophylleptum tellei* gen. nov., sp. nov. and the hymenocerid *Phyllognathia ceratophthalma* (BALSS, 1913) (see BALSS, 1913) and *Phyllognathia simplex* FUJINO, 1973 (see BRUCE, 1988b) have two distal teeth on the outer border of the penultimate

segment of the third maxilliped. The Hymenoceridae have recently been removed from the Gnathophyllidae (BRUCE, 1986; CHACE, 1992; HOLTHUIS, 1993; CHACE & BRUCE, 1993), on the basis of the unique morphology of their third maxilliped. Indeed, whilst in other palaemonoid shrimps the ischium and the merus of the third maxilliped are completely fused, in the Hymenoceridae these two segments are quite distinct and freely articulated with each other (BARNARD, 1950; FUJINO, 1973; BRUCE, 1986, 1988b), and therefore it is a priori difficult to derive the hymenocerid disposition from the normal palaemonoid condition.

However, both families have similar larvae, which are also closely related to those of the Pontiinae (Bruce, 1986), and the Gnathophyllidae and the Hymenoceridae have some other features in common. In all gnathophyllid and hymenocerid genera, the body is fairly robust, the mandible is very small, and is devoid of an incisor process or has only a vestigial one; the maxilla has a basal endite entire, very reduced to absent; and the third maxilliped is broadened and flattened. Furthermore, the gnathophyllid genera *Gnathophylleptum* gen. nov. and *Gnathophyllum* (material examined), as well as the hymenocerid genera *Hymenocera* (see BARNARD, 1950) and *Phyllognathia* (see BALSS, 1950; FUJINO, 1973; MINEMIZU, 2000) have a more or less developed corneal papilla, a rare character amongst palaemonoid shrimps.

Interestingly, the few other palaemonoid shrimps which exhibit a corneal papilla: *Parapontonia nudirostris* BRUCE, 1968 (BRUCE, 1968, 1994) and species of the *Periclimenes*

ceratophthalmus group (BRUCE, 1986) are echinoderm associates, just like several gnathophyllid species: *Gnathophyllum americanum* GUÉRIN-MÉNEVILLE, 1855 (MANNING, 1963; TITGEN, 1989; PÉREZ SÁNCHEZ & MORENO BATET, 1991; GONZÁLEZ PÉREZ, 1995), *Gnathophyllum elegans* (RISSO, 1816) (GONZÁLEZ PÉREZ, 1995), *Gnathophylloides mineri* SCHMITT, 1933 (LEWIS, 1956; CHACE, 1972; BRUCE, 1974, 1988a; DEBELIUS, 1999; HICKMAN & ZIMMERMAN, 2000; DE GRAVE, 2001; KATO & OKUNO, 2001), *Gnathophylloides robustus* (BRUCE, 1973) (BRUCE, 1973), *Levicaris mammillata* (EDMONDSON, 1931) (EDMONDSON, 1931; BRUCE, 1973; FUJINO & TAKEDA, 1977; TITGEN, 1989) and the hymenocerid *Hymenocera picta* DANA, 1852 (WICKLER, 1973). Although no symbiotic relationship was recorded for *Gnathophylleptum tellei* gen. nov., sp. nov., the presence of a corneal papilla may indicate a similar echinoderm association.

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