

A revision of the genus *Laophontina* NORMAN & T. SCOTT (Copepoda, Harpacticoida)

by Frank FIERS

Abstract

The genus *Laophontina* is revised after re-examination of the type-series of the species and analyses of new materials from the East African coast and the Caribbean. The genus *Laophontina* as redefined herein unifies *L. dubia*, *L. acantha*, *L. noodti* and *L. posidoniae*. The recently described *L. paradubia* is considered as conspecific with *L. dubia*. All other species presently assembled in the genus are allocated to different genera. *Galapalaophonte* is redefined and comprises *G. pacifica*, *G. triarticulata* and *G. variabilis* besides four new species. *Laophontina distincta* and *W. striata* n. sp. are unified in the genus *Wellsiphontina* n. gen. whereas *Laophontina reducta* is allocated to *Amerolaophontina* n. gen. ? *Laophontina* spec. MIELKE, 1982 is removed to the genus *Mexicolaophonte* and considered as a separate species: *Mexicolaophonte mielkei* n. sp. Keys to the species are given where relevant.

Key-words: *Laophontina*, *Galapalaophonte*, *Wellsiphontina*, *Amerolaophontina*, Harpacticoida, Zoogeography.

Résumé

Le genre *Laophontina* est révisé, après un nouvel examen des séries-type et des analyses de matériel nouveau, provenant des côtes de l'Afrique de l'Est et de la mer des Antilles. Le genre *Laophontina* tel qu'il est redéfini ici, réunit *L. dubia*, *L. acantha*, *L. noodti* et *L. posidoniae*. *L. paradubia*, récemment décrit, est considéré comme étant de la même espèce que *L. dubia*. Toutes les autres espèces actuellement regroupées sont attribuées à des genres différents. *Galapalaophonte* est redéfini et comprend *G. pacifica*, *G. triarticulata* et *G. variabilis*, en plus de quatre nouvelles espèces. *Laophontina distincta* et *W. striata* n. sp. sont regroupés dans le genre *Wellsiphontina* n. gen., tandis que *Laophontina reducta* est attribué à *Amerolaophontina* n. gen. ? *Laophontina* spec. MIELKE, 1982 est inclus dans le genre *Mexicolaophonte* et considéré comme une espèce séparée: *Mexicolaophonte mielkei* n. sp. Les clés de détermination spécifique sont données partout où cela s'imposait.

Mots-clefs: *Laophontina*, *Galapalaophonte*, *Wellsiphontina*, *Amerolaophontina*, Harpacticoida, Zoogéographie.

Introduction

The genus *Laophontina* has a rather complex and confusing history. Defined by NORMAN & T. SCOTT (1905) for the remarkable *L. dubia*, SARS (1909) synonymized the genus with *Pseudolaophonte*. In contrast, MONARD (1927) and NICHOLLS (1941), and especially LANG

(1948) who thoroughly discussed the systematic status of *Laophontina*, considered the genus well defined and clearly distinct from *Pseudolaophonte*.

Laophontina remained monotypic until the 1950's. With the increasing interest in the copepod fauna of the marine interstitial, several laophontid species were discovered, characterized by highly reduced legs and a cylindrical body shape and consequently designated to *Laophontina*. It soon became apparent that the genus represented a polyphyletic assemblage, unifying at least three different evolutionary lines (NOODT, 1958; LANG, 1965). With *L. dubia* and *L. acantha*, *Laophontina* became clearly distinguished from two other laophontid genera, *Afrolophonte* and *Klieonychocamptoides* displaying comparable adaptations related to their interstitial life.

More recently, COULL & ZO (1980) amended the generic diagnosis to accommodate some remarkable animals they discovered along the south-eastern coast of the United States. Instead of erecting new genera for the unique features of those animals, they opted for an extension of the generic diagnosis of the genus *Laophontina*.

At approximately the same time, MIELKE (1981) erected the genus *Galapalaophonte* for a remarkable *Laophontina*-shaped animal he found abundantly in the interstitia of Galapagos beaches. It turned out that *G. pacifica* closely resembled *Laophontina triarticulata* previously described by COULL & ZO (1980). In his subsequent papers, MIELKE (1982, 1985) synonymized *Galapalaophonte* with *Laophontina sensu* COULL & ZO and considered *Galapalaophonte pacifica* conspecific with *Laophontina triarticulata* although he discussed several differences between his specimens and the original description of the latter.

FIERS (1986), describing a new *Laophontina* species from the Mediterranean Sea, pointed to the presence of two geographically separated species-groups in the genus: a Boreal — Mediterranean and an Amphi — American group. The former unified species without a thorn on the anal operculum, with a spinulose integument and with two smooth setae on the exopodite of

the female P5. The Amphi — American species — group accommodated those species with conspicuously upwards directed thorns on the anal operculum and anal segment, with a pitted integument and with only one smooth seta on the exopodite of the female P5. However *Laophontina distincta* and ? *Laophontina* spec. MIELKE (1982), two species currently considered as members of the genus *Laophontina sensu* COULL & ZO were not included in his discussion.

As part of a revision of the family Laophontidae the genus *Laophontina* was already revised (FIERS, 1988). Based on re-examinations of the type-series of most of the known species and on additional materials from the East-African coast and the Caribbean, the genus as it is presently known, is divided out into four different genera. As shown in Table I the original genus *Laophontina* unifies the Boreal — Mediterranean species — group while *L. distincta* is allocated to the genus *Wellsiphontina* n. gen., together with a new species from Kenya. The problematic genus *Galapalaophonte* is re-established and redefined to include seven species, among them *G. pacifica* and *G. triarticulata* as two clearly distinct species. *Laophontina reducta* which displays highly reduced legs and shows no marked sexual dimorphism in the legs of the male is thought to represent a distinct evolutionary branch and is placed in the separate genus, *Amerolaophontina* n. gen.

The male specimen known from the Pacific coast of Panama, referred by MIELKE (1982) as ? *Laophontina* spec, cannot remain in *Laophontina*, nor in the related genera defined herein. The remarkable transformed P3

of the male in combination with the shape of the P2 and P5, is as far as known typical for the genus *Mexicolaophonte* COTTARELLI, 1977. The salient features of this animal viz. presence of a P2 exopodite, a two-segmented exopodite in P3 and a three-segmented exopodite in the P4, distinguish it from the two other known *Mexicolaophonte* species. It is named hereafter *Mexicolaophonte mielkei* n. sp., in honour of Dr. W. MIELKE (Göttingen). Description of the relevant features will be given in a subsequent paper dealing with the genus *Mexicolaophonte*.

Materials and methods

The present study is mainly based on re-examination of type-specimens unless otherwise stated. Observations were made with a light microscope equipped with phase contrast. Drawings were made using a camera lucida. Descriptions of the species were kept as concise as possible. Most species were treated in detail in the original descriptions. In the present contribution, only the diagnostically important features are illustrated and described. For the other appendages and structures, the original descriptions of the animals should be consulted. A differential diagnosis based on the published information is given for those species which were not re-studied. The synonymy list of each species includes only the most recent catalogue of BODIN (1988). Morphologic terminology and abbreviations are used according to LANG (1948, 1965). Abbreviations used for

Table I :
Division of the genus *Laophontina*.

<i>sensu</i> COULL & ZO, 1980	the present work
<i>Laophontina</i> NORMAN & T. SCOTT	<i>Laophontina</i> NORMAN & T. SCOTT
<i>L. dubia</i> NORMAN & T. SCOTT	<i>L. dubia</i> NORMAN & T. SCOTT
<i>L. paradubia</i> COTTARELLI	<i>L. dubia</i> NORMAN & T. SCOTT
<i>L. acantha</i> NOODT	<i>L. acantha</i> NOODT
<i>L. noodti</i> KUNZ	<i>L. noodti</i> KUNZ
<i>L. posidoniae</i> FIERS	<i>L. posidoniae</i> FIERS
<i>L. reducta</i> COULL & ZO	<i>Amerolaophontina</i> n. gen.
	<i>A. reducta</i> COULL & ZO
<i>L. variabilis</i> COULL & ZO	<i>Galapalaophonte</i> MIELKE
<i>L. triarticulata</i> COULL & ZO	<i>G. variabilis</i> COULL & ZO
	<i>G. triarticulata</i> COULL & ZO
	<i>G. pacifica</i> MIELKE
	<i>G. carolinensis</i> n. sp.
	<i>G. chilensis</i> n. sp.
	<i>G. antillensis</i> n. sp.
	<i>G. biarticulata</i> n. sp.
<i>L. distincta</i> WELLS	<i>Wellsiphontina</i> n. gen.
	<i>W. distincta</i> WELLS
	<i>W. striata</i> n. sp.

institutes are B.M.N.H. (British Museum of Natural History, London), U.S.N.M. (United States National Museum, Washington) and K.B.I.N. (Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels). Specimens deposited in the collections of the latter are labeled COP. They are partially stored in 75% neutralized ethyl alcohol, partially mounted in glycerine.

Systematic account

Genus *Laophontina* NORMAN & T. SCOTT, 1905

DIAGNOSIS

Female :

Body cylindrical; dorsolateral edges of the anal segment and the margin of the anal operculum without markedly upwards directed thorns; furcal rami with an upwards directed thorn in front of the dorsal seta; principal seta thick in the proximal half, ending in a blunt tip bearing a slender setulose distal seta; integument spinulose or striated; genital field with two setae on the P6 vestiges and a triangular copulatory pore beneath the transversal ridge; antennule six-segmented with blunt or sharp processes on the prolonged first segment and a hook-shaped process on the second one; exopodite of the antenna well-developed and bearing four setae, the lateral (= ventral) one smooth and very long; exopodite P1 one-segmented; terminal endopodal segment with a claw and a little spine and a small seta; exopodite P2 vestigial, represented as a single setulose seta; endopodite entirely absent or represented as a small globulose segment without setae; exopodite P3 one-segmented, endopodite one-segmented or absent; P4 with a two- or three-segmented exopodite and a one-segmented endopodite; baseoendopodite with three or four setae and exopodite P5 with five setae; apicalmost and outer proximal exopodal setae smooth, the others feathered.

Male :

Sexual dimorphism : endopodal segment P2 normally absent, if present with a hyaline tip; endopodite P3 and P4 reduced, without setae, having a globulous appearance; outer exopodal spinules sometimes stronger than in the female; P5 with a baseoendopodite without setae and an exopodite having three setae.

TYPE SPECIES

Laophontina dubia NORMAN & T. SCOTT, 1905, by monotypy.

COMMENTS

A important diagnostic feature not mentioned by FIERS (1986) in his discussion about the species-groups within the genus *Laophontina* is the particular shape of the female genital field. The chaetotaxy of the P6 vestiges, but especially the position of the copulatory pore, clearly distinguish the genus-group *Laophontina-Wellsiphontina* from *Galapalaophonte-Amerolaophontina*.

In *Laophontina-Wellsiphontina* the genital field is characterized by the presence of two setae on each P6 vestige and, most important, by the position of the copulatory pore beneath the transversal ridge connecting the two opposite rami of the P6 (Fig. 1a-d). In contrast, the genital field in *Galapalaophonte-Amerolaophontina* bears only a single seta on each P6 vestige and has a copulatory pore situated distinctly posteriorad the ridge (Fig. 1e-l). In the *Galapalaophonte-Amerolaophontina* genus group, the copulatory pore forms the posterior margin of a triangular or funnel shaped receptaculum seminis.

Within the genus *Laophontina* the general appearance of the female genital field is nearly identical in all the species. Only some minor differences such as the relative lengths of the setae and the dimensions of the copulatory pore seem to be species specific.

Table II :

Chaetotaxy of the species of *Laophontina*

		P2*		P3		P4		P5	
		exo	end	exo	end	exo	end	exo	bas
<i>L. acantha</i>	♀	1	—	021	—	0-021	110	5	3
	♂	1	—	011	000	0-010	000	3	0
<i>L. dubia</i>	♀	1	—	021	—	0-0-021	110	5	4
	♂	1	—	021	—	0-0-021	000	3	0
<i>L. noodti</i>	♀	2	—	020	000	0-011	120	5	3
	♂	unknown							
<i>L. posidoniae</i>	♀	1	000	021	010	0-0-011	120	5	4
	♂	1	010	021	000	0-0-011	000	3	0

* : the P2 exopodite is only represented by setae; "000" indicates a segment without setae and "—" means the absence of a segment.

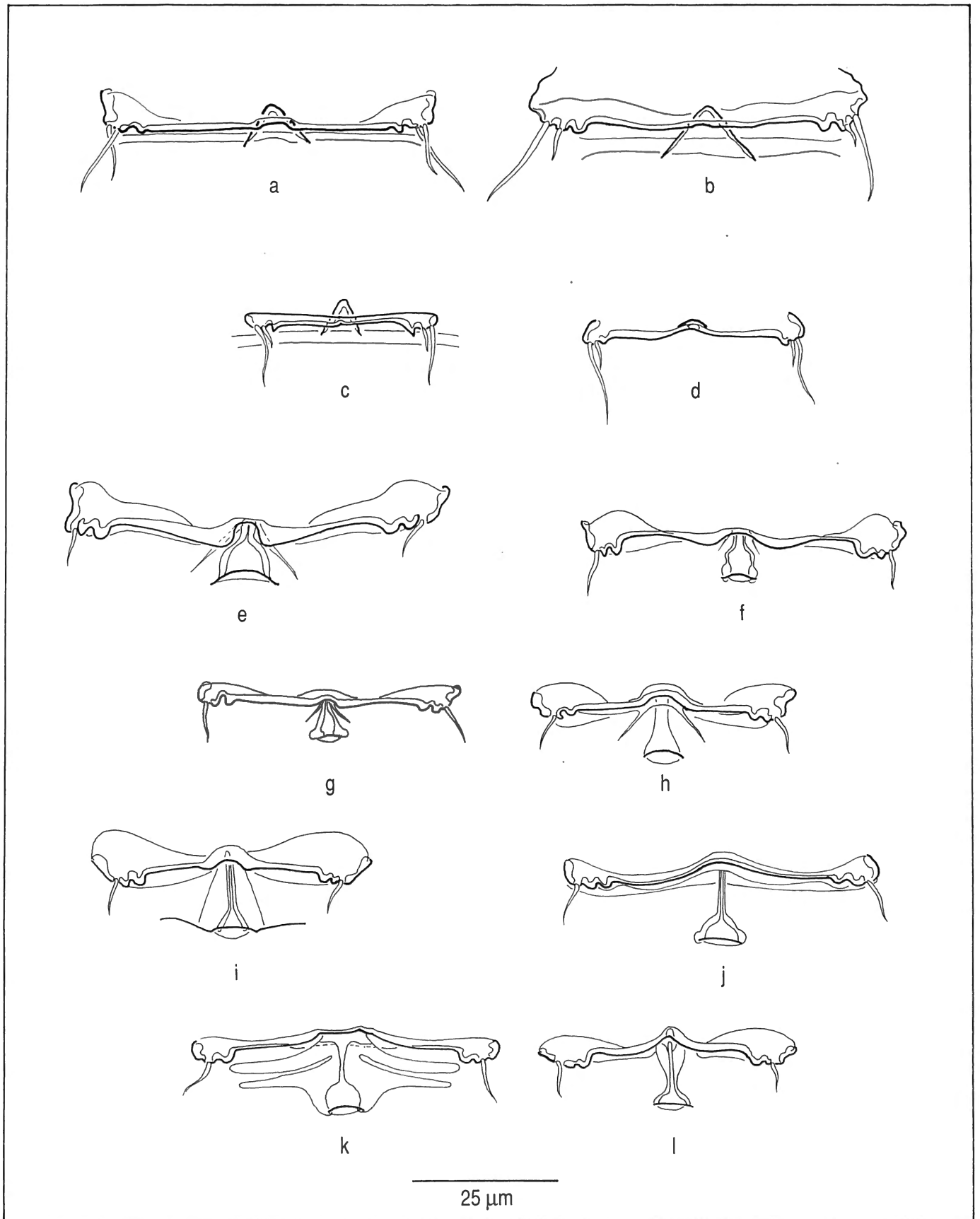


Fig. 1. – Female genital fields: a, *Laophontina dubia*; b, *L. posidoniae*; c, *L. acantha*; d, *Wellsiphontina distincta*; e, *Galapalaophonte pacifica*; f, *G. biarticulata n. sp.*; g, *G. antillensis n. sp.*; h, *G. triarticulata*; i, *G. variabilis n. sp.*; j, *G. chilensis*; k, *G. carolinensis n. sp.*; l, *Amerolaophontina reducta*.

The genital field in *Wellsiphontina* n. gen. is nearly identical but differs from that of its congener by the reduced shape of the copulatory pore area. In both species presently known, the genital fields are very similar. They differ only in the dimensions of the transversal ridge.

KEY TO THE SPECIES OF *LAOPHONTINA*

- 1 - Baseoendopodite of the female P5 with three setae : 2
 - Baseoendopodite of the female P5 with four setae : 3
- 2 - Endopodite of P3 present, without setae; endopodite of P4 with three setae (male unknown) : *L. noodti*
 - Endopodite of P3 absent; endopodite of P4 with two setae; endopodite of P4 absent in the male : *L. acantha*
- 3 - Endopodite P3 absent in the female; both rami of P2 vestigial, represented as setae, in male and female : *L. dubia*
 - Endopodite of P3 single-segmented in the female; exopodite of P2 vestigial endopodite one-segmented, without setae in the female but with a hyaline tip in the male : *L. posidoniae*

***Laophontina dubia* NORMAN & T. SCOTT, 1905**

Fig. 1a, 2a-g

Laophontina dubia, sp.n. - NORMAN & T. SCOTT, 1905 : p. 292-293.

Laophontina dubia : NORMAN & T. SCOTT, 1906 : p. 165-166; Fig. 10(12-15), 11(8), 12(7-8); 15(11); 16(7), 17(7), 18(5); NICHOLLS, 1941 : p. 94; LANG, 1948 : p. 1337-1338, 1425; Fig. 582; CHAPPUIS, 1954 : p. 60; VERVOORT, 1964 : p. 370; LANG, 1965 : p. 446-447; WELLS & CLARK, 1965 : p. 99; GEDDES, 1972 : p. 74; WELLS, 1976 : p. 172, 188; COULL & ZO, 1980 : 37, table I; GEDDES, 1982 : p. 105-107; Fig. 1-2; WELLS, 1983 : p. 6; KUNZ, 1983 : p. 197-198; BODIN, 1984 : p. 11; FIERS, 1986 : p. 71.; BODIN, 1988 : p. 198.

Laophontina paradubia n. sp. - COTTARELLI, 1983 : 1-10; Fig. 1-24; FIERS, 1986 : p. 71; BODIN, 1988 : p. 198.

TYPE MATERIAL

Syntypes : two females in the NORMAN-collection deposited in the B.M.N.H. labeled 1911.11.8.44978-979, and preserved in alcohol (GEDDES, 1982; present contribution).

TYPE LOCALITY

Great Britain : Isles of Scilly, St. Mary's (NORMAN & T. SCOTT, 1905).

FIGURES

Fig. 1a and 2a-g, illustrates the habitus and appendages of one of the females of the type-series.

AMENDMENTS

Habitus (Fig. 2a, b) cylindrical; cephalothorax about a quarter of the entire body length; postero-ventral edge of the cephalothorax protruded posteriorly; second genital and second abdominal segments with small but distinct posteriorly directed lateral edges.

Integumental structures : cephalothorax densely furnished with curved striae, except for the anteriormost part and the rostrum; thoracic and abdominal pleurotergites clothed with minute spinules, irregular; posterior margin of the head straight and set with fragile hairs; posterior margin of the other segments undulated; pleural regions of the thoracic segments with large spiniform projections posteriorly; ventral surface of the genital and abdominal segments smooth; margin of the anal operculum incised, forming large teeth-like processes.

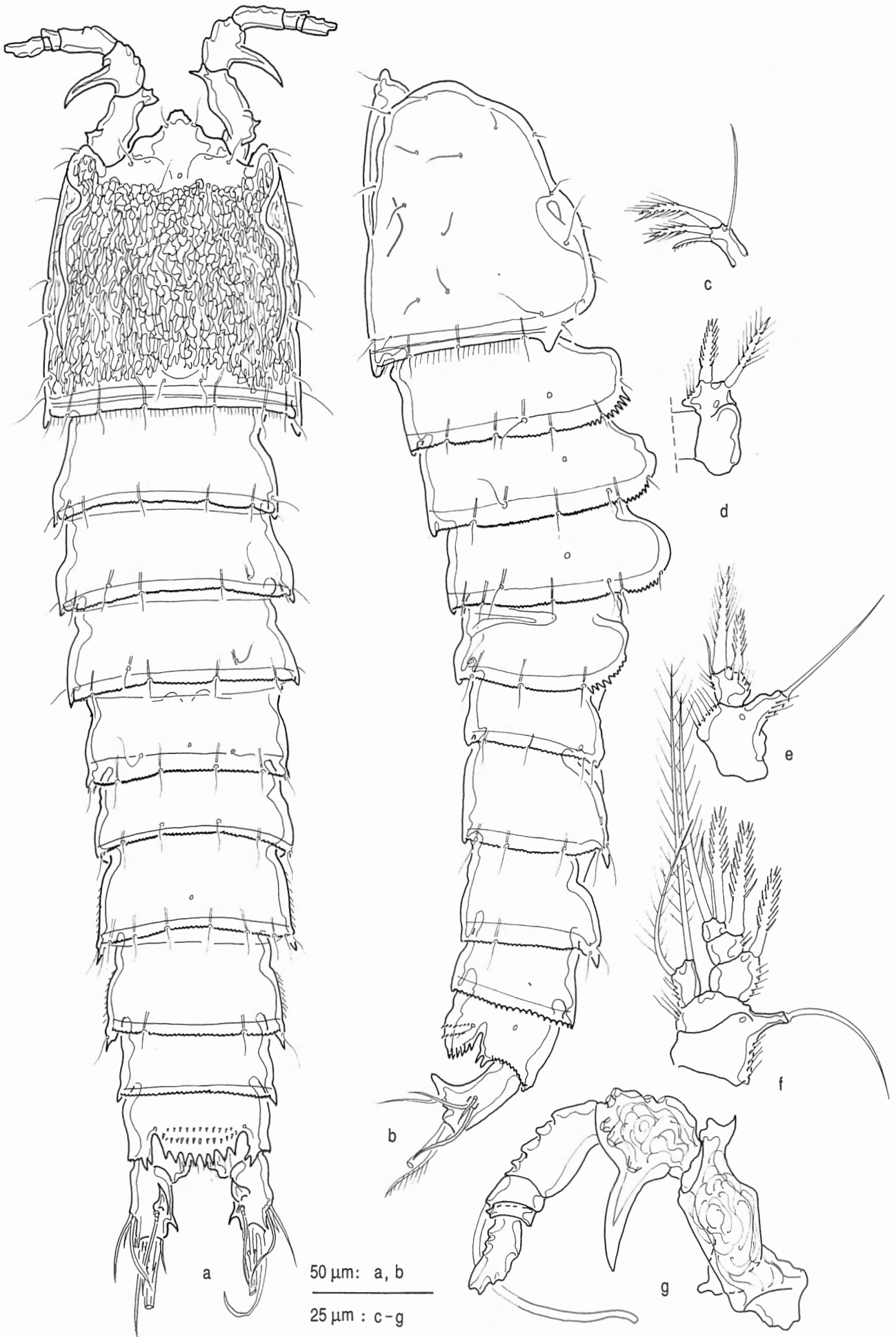
Furcal rami about twice as long as wide, having a large upwards directed dorsal and a small lateral spiniform process; dorsal seta implanted beyond dorsal process; three lateral setae; outer principal seta slightly longer than the ramus; inner apical seta small; proximal, thickened part of the inner principal seta only slightly longer than the supporting ramus; integument of the rami smooth.

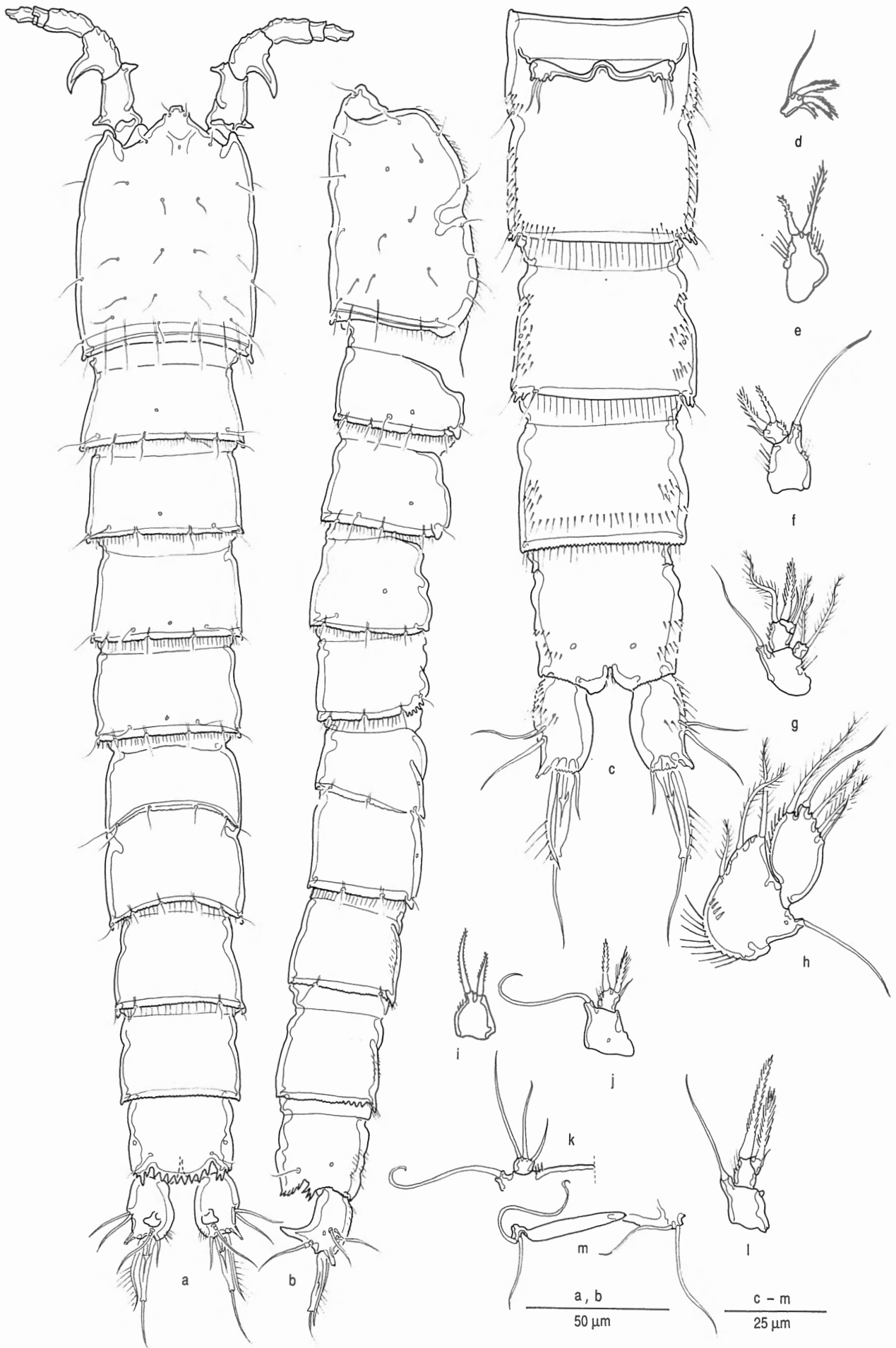
Antennule (Fig. 2g) with a dense pattern of striae on the dorsal surface of the first and second segment; ventral surface smooth; posteriorly directed margin of the first segment with a blunt prominent process and anteriorly directed margin with a median strong ridge and a sharp process on the distal edge.

P2-P4 (Fig. 2d-f) : outer spine of P2 and distal spine of P3 armed with long spinules; all other spines on the exopodites armed with small spinules.

VARIABILITY

According to COTTARELLI (1983, see discussion below) the P4 exopodite may be two-segmented in the female and sometimes lacks an inner distal seta on the third segment in the male. Variability has also been illustrated in the shape of the outer spine of the P3 exopodite.





COMMENTS

L. dubia, originally described by NORMAN & T. SCOTT (1905) has been outstandingly redescribed by GEDDES (1982) after examination of the syntypes and additional specimens he found near Anglesey (GEDDES, 1972). Re-examination of the type-material for the present contribution, revealed the presence of an additional spiniform process on the inner margin of the furcal rami. This small detail becomes of major importance in the discussion on the specificity of *L. paradubia*.

COTTARELLI (1983) compared the specimens he gathered near Sardinia with the original description of *L. dubia*. Unaware of amendments given by GEDDES (1982) he distinguished *L. paradubia* from *L. dubia* by the chaetotaxy of the legs, the shape of the P4 endopodite and the shape of the furcal rami. Regarding the amended description of *L. dubia*, most of the features distinguishing both species are not relevant. Only the shape of the P3 exopodal elements and the male P4 chaetotaxy display marked differences. Taking however, the considerable variability of these appendages into account (see COTTARELLI, 1983 : fig. 30, 31), *L. paradubia* cannot be distinguished from *L. dubia* and should be considered as conspecific with the latter.

DISTRIBUTION

L. dubia is known from only a few localities : Isles of Scilly (NORMAN & T. SCOTT, 1905), Anglesey (GEDDES, 1972), Sardinia (COTTARELLI, 1983) and the Gulf of Douarnenez (BODIN, 1984). It appears that the species is widely distributed throughout the Eastern Atlantic and in the Western Mediterranean.

Laophontina acantha NOODT, 1955

Fig. 1c, 3a-m

Laophontina acantha n. sp. - NOODT, 1955 : p. 106-107; Fig. 100-113.

Laophontina acantha : RENAUD-DEBEYSER, 1963 : p. 50, 54, 55; VERVOORT, 1964 : p. 370; LANG, 1965 : p. 446-447; WELLS & CLARK, 1965 : p. 97-99; Fig. 24-27; WELLS, 1967 : p. 349; WELLS, 1976 : p. 172, 188; COULL & ZO, 1980 : p. 34, 37; COTTARELLI, 1983 : p. 7; KUNZ, 1983 : p. 197-198; FIERS, 1986 : p. 71.; BODIN, 1988 : p. 198.

TYPE MATERIAL

One male, holotype, deposited in the collection of W. NOODT, Zoologisches Institut, Kiel.

TYPE LOCALITY

France, Lancau-Océan (NOODT, 1955).

MATERIAL

Numerous females and males from Peniche, Portugal (WELLS & CLARK, 1965) deposited in the collections of B.M.N.H. (Coll. no. 1964.12.1.19-21).

FIGURES

Fig. 1b and 3a-m are drawn after the specimens of Peniche, Portugal.

AMENDMENTS

Habitus (Fig. 3a, b) cylindrical; ventro-lateral edges of the genital and abdominal segments slightly protruded posteriorly; postero-ventral edge of the cephalothorax rounded, not extended markedly.

Integument of cephalothorax furnished with curved striae as in *L. dubia*; integument of the other segments striated; posterior margin of the cephalothorax straight, set with hairs; posterior margin of the other segments undulate and hairy; pleural region of the thoracic segments each with one posterior directed extension, except for the fifth segment having several large triangular structures; lateral margins of genital and abdominal segments clothed with slightly stronger spinules; pre-anal segment with a transversal row of long fragile spinules; ventral surface of the abdominal segments smooth (Fig. 3c); anal operculum, as in *L. dubia*.

Furcal rami less than twice as long as wide and having a bulbous shape in dorsal view; dorsal spiniform process arising close to the distal furcal margin; inner margin without processes; proximal part of inner principal seta as long as the supporting ramus.

Antennule, antenna and mouthparts as in *L. dubia*. Legs as illustrated in Fig. 3e-h : P4 exopodite with a setulose long spine on the first segment and P5 exopodite with two smooth and three feathered setae.

Male resembling the female closely : integumental structures of the body and antennule segments as in the female but ventral surfaces of the abdominal segments having a pattern of striae, longitudinally orientated.

P2 and P3 (Fig. 3i, j) as in the female; P4 (Fig. 3l) with an endopodite represented by a minute rounded segment, with a robustly armed spine on the first segment and only two elements (one spine and one seta) on the second segment.

◁ Fig. 3. - *Laophontina acantha* NOODT : a, female habitus in dorsal view; b, *idem*, in lateral view; c, female abdomen in ventral view; d, exopodite of the antenna; e, female P2; f, female P3; g, female P4; h, female P5; i, male P2; j, male P3; k, male P5; l, male P4; m, male P6.

COMMENTS

WELLS (1967) corrected his former description of the female antennulae, stating that the species bears six-segmented antennulae instead of five-segmented ones (WELLS & CLARK, 1965). Re-examination of the specimens confirms this but there seems to be no aesthetasc on the ultimate segment.

L. acantha is closest to *L. noodti*. Both species are the sole species within the genus possessing a two-segmented exopodal ramus in the P4 and having only three endopodal setae on the baseoendopodite of the female P5. *L. acantha* is easily distinguishable from *L. noodti* by the chaetotaxy of the P2, P3 and P4 (see table II).

DISTRIBUTION

So far, *L. acantha* has been mentioned from two localities: Bay of Biscay (type-locality: NOODT, 1955; RENAUD-DEBYSER, 1963) and the Portuguese coast (WELLS & CLARK, 1965).

***Laophontina noodti* KUNZ, 1983**

Laophontina noodti n. sp.- KUNZ, 1983 : p. 192-197; Fig. 41, 42, 43(A-E).

Laophontina noodti : WELLS, 1985 : p. 14; FIERS, 1986 : p. 71.; BODIN, 1988 : p. 198.

TYPE MATERIAL

Holotype : one female deposited in the collections of the "Zoologisches Institut", Kiel.

TYPE LOCALITY

Azores, Isle of Sao Miguel, Praia do Popolo (KUNZ, 1983).

DIAGNOSIS

Exopodite P1 with four setae, the innermost dwarfed; exopodite P2 represented by two feathered setae, endopodite absent; endopodite P3 one-segmented without setae; exopodite P4 two-segmented and endopodite one-segmented; baseoendopodite P5 with three setae; principal furcal rami thick, without a slender distal part; male unknown.

COMMENTS

L. noodti is a remarkable species. It unifies a marked combination of advanced and primitive characteristics. The two-segmented exopodite P3, the reduced number of setae on the last exopodal segments of P3 and P4 and the presence of only three baseoendopodal setae on the female P5 are undoubtedly derived conditions, al-

luding to a close relationship with *L. acantha*. The primitive features, which it shares with *L. posidoniae* are : two exopodal setae on the P2, an endopodal segment in P3 and three setae on the endopodite P4. This remarkable combination points to a rather complex phylogenetic history of the genus *Laophontina*.

DISTRIBUTION

L. noodti is only known from the Azores, the type-locality of the species (KUNZ, 1983).

***Laophontina posidoniae* FIERS, 1986**

Fig. 1b, 4a-h

Laophontina posidoniae spec. nov.- FIERS, 1986 : p. 65-71; Fig. 2-5.

Laophontina posidoniae : BODIN, 1988 : p. 198.

TYPE MATERIAL

Holotype : one female dissected and labeled COP 1500; allotype : dissected and labeled COP 1501; paratypes : 3 females and 3 males preserved in alcohol, COP 1502. All specimens deposited in the collections of the K.B.I.N., collection reg. nr. : IG. 25852.

TYPE LOCALITY

Corsica, Gulf of Calvi, interstitia of the *Posidonia*-beds.

FIGURES

Fig. 1c and 4 drawn from the type-specimens (partially after FIERS, 1986).

AMENDMENTS

Female : ventral integument of the genital segment and abdominal segments finely reticulated; postero-ventral margin of the genital and abdominal segments straight, set with fragile hairs; pre-anal segment with a toothed postero-ventral margin.

Antennule (Fig. 4b) : dorsal integument of the first segment reticulated, of the second segment striated and of the other segments smooth.

Natatorial legs (Fig. 4c, e, g) : protopodal components indistinct from each other but clearly separated from the inter-coxal plate.

Male resembling the female. Ventral integument of the abdominal segments reticulated and having one or two rows of long and slender spinules on both sides of their surface; postero-ventral margins of the abdominal segments spinulose (Fig. 4a).

Natatorial legs (Fig. 4d, f, h) differing in many aspects from those of the female; protopodal components indistinct but clearly separated from the intercoxal plate.

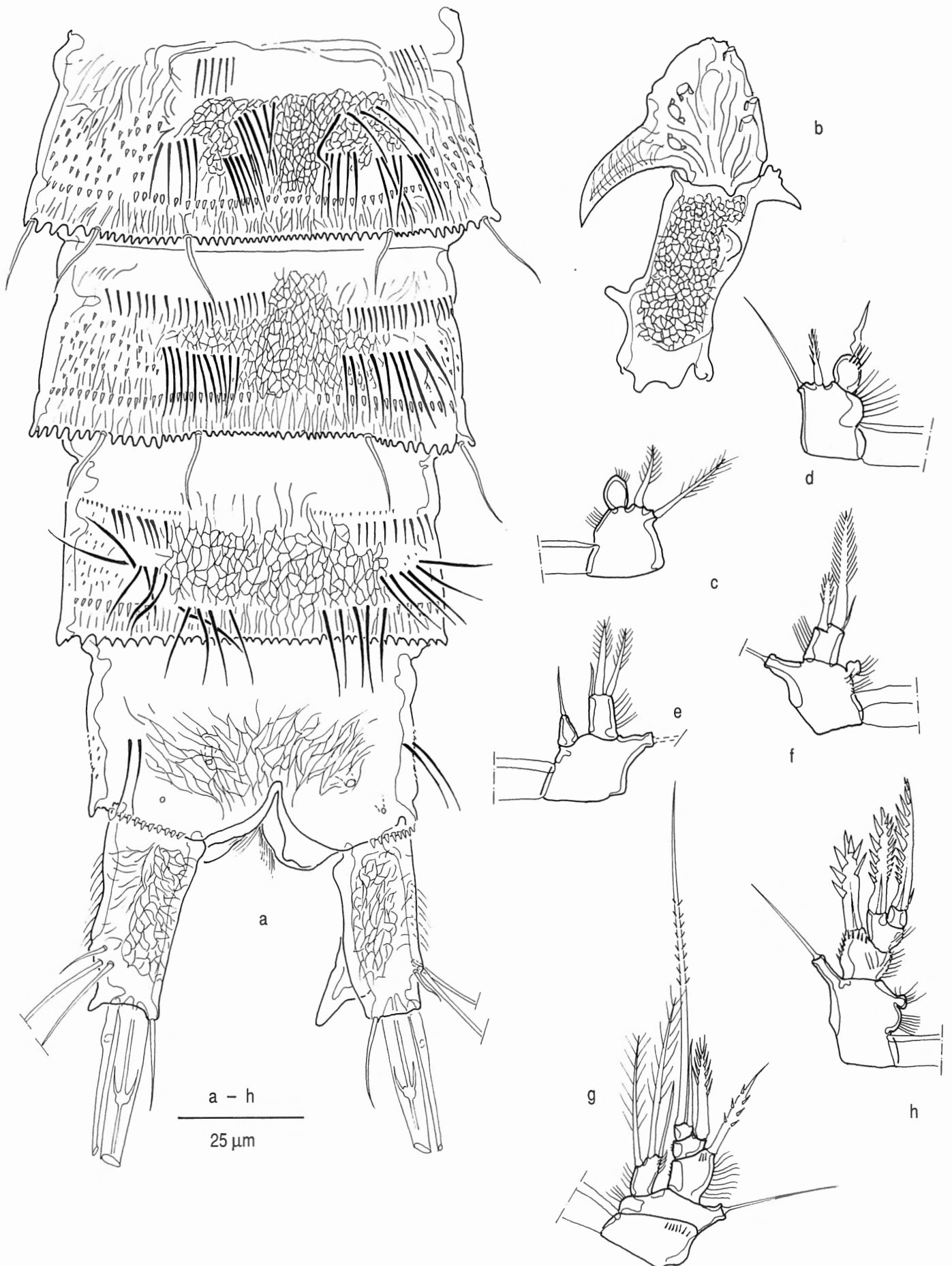


Fig. 4. – *Laophontina posidoniae* FIERS : a, male abdomen in ventral view; b, first segments of the antennula; c, female P2; d, male P2; e, female P3; f, male P3; g, female P4; h, male P4.

COMMENTS

L. posidoniae is in many aspects the most primitive representative of the genus. This species bears an endopodal segment in P2 and P3 of the male and female. In contrast with those primitive features, *L. posidoniae* bears only two setae on the ultimate exopodal segment of the P4. In all other species, of the genus the ultimate segment has three setae/spines in the female but only two (apical) ones in the male. Like in the other species the shape of the dimorphic spines on the P4 is very striking. The reduction of the number of elements on the P4 exopodite should be considered as an autapomorphy of *L. posidoniae*.

DISTRIBUTION

L. posidoniae is only known from the type-locality, the Gulf of Calvi (FIERS, 1986). The distribution of this species in the gulf is closely correlated with the *Posidonia*-herbs and its associated substrate.

Genus *Wellsiphontina* n. gen.

DIAGNOSIS

Female :

Body cylindrical without marked upwards directed thorns on the anal segment and anal operculum; the latter denticulate; furcal rami with a dorsal thorn in front of the dorsal seta; principal furcal seta with a distinct thorn on its stem; genital field with two setae on the P6 vestiges and with a small copulatory pore situated beneath the transversal ridge; antennule six-segmented, first segment with an inner distal hook, an outer concave ridge and a ventral process, the second one with a posteriorly directed curved thorn; antenna with a well-developed exopodite, bearing three feathered, equal setae and a lateral smooth one; exopodite P1 one-segmented; terminal endopodal segment P1 with a claw, a little spine and a small seta; exopodites of P2-P4 present, one segmented in P2 and P3, two- or three-segmented in P4;

endopodites of P2 and P3 absent, in the P4 one-segmented; chaetotaxy in table III; exopodite P5 reaching beyond the baseoendopodite, the former with 5, the latter with 4 setae, all feathered.

Male :

Sexual dimorphism : P2 and P3 resembling the female homologues; endopodite P4 absent; exopodite with a different appearance and chaetotaxy than in the female; exopodite of the P5 small, bearing 3 setae; baseoendopodite represented as a slender cuticular strip, without setae.

TYPE SPECIES

Wellsiphontina striata n. sp., here designated.

ETYMOLOGY

The generic name is chosen in honour of Dr.J.B.J. WELLS, Wellington. The generic name is a compound of his name and the suffix *-phontina* (gender feminine).

DISCUSSION

WELLS (1967) placed *L. distincta* in the genus *Laophontina* because of the dentiform process on the dorsal surface of the furcal rami but pointed out the marked differences between it and the other species known in the genus *Laophontina*. Indeed, the presence of an exopodal segment in the P2, the chaetotaxy of the legs and the shape of the antennulae are unique features. The discovery of a closely related species, described below, emphasizes the importance of these differences.

Wellsiphontina n. gen. seems most closely related with *Laophontina*. Both genera share a spinulose integument, a denticulate operculum and a typically transformed male P4, features which distinguish these sister-taxa from *Galapalaophonte* and *Amerolaophontina* n. gen. Regarding the P4 dimorphism, *Wellsiphontina* n. gen. as well as *Laophontina* display marked differences in the general appearance of the exopodite and the chaetotaxy of the distal segment between both sexes. In both

Table III :

Chaetotaxy of the species of *Wellsiphontina* n. gen.

		P2		P3		P4		P5	
		exo	end	exo	end	exo	end	exo	bas
<i>W. striata</i>	♀	021	—	011	—	0-0-021	120	5	4
	♂	021	—	011	—	0-0-020	—	3	0
<i>W. distincta</i>	♀	021	—	121	—	0-022	020	5	4
	♂	021	—	121	—	0-012	—	3	0

“—” means ramus absent.

genera the male P4 is considerably smaller, has much stronger exopodal spines and bears fewer elements on the ultimate segment. In contrast, the male P4 exopodite in *Galapalaophonte* and *Amerolaophontina* n. gen. resembles closely the female homologue viz. the general appearance of the segments and the chaetotaxy of the ultimate segment.

***Wellsiphontina striata* n. sp.**

Fig. 5-7

TYPE MATERIAL

Holotype: one female dissected, labeled COP 1932, allotype dissected and labeled COP 1933, paratypes: 7 females, 1 male and 1 CV, preserved in alcohol, COP 1934. All specimens deposited in the collections of the K.B.I.N.

TYPE LOCALITY

Kenya, Tiwi Beach (near Mombasa). Sediments between algae growing in an intertidal pool. Leg. Dr. M. BERGMANS, 18 April 1985, Collection reg. no.: IG. 24409.

ETYMOLOGY

The specific name *striata* (Latin, meaning ribbed) refers to the striated integument of the cephalothorax.

FIGURES

Holotype: Fig. 5a, c, d; Fig. 6a, d; Fig. 7a, d, c, h; allotype: Fig. 5a, Fig. 6b, c; Fig. 7b, e, f, g.

DESCRIPTION

Female (holotype): habitus (Fig. 5b,c and d) cylindrical; cephalothorax parallel sided; total body length 480 µm; thoracic and abdominal segments tapering slowly towards the anal segment; anal segment convex; genital and second abdominal segments with ventrolateral wings.

Furcal rami slightly longer than broad bearing a small dorsal thorn in front of the implantation of the dorsal seta; principal seta long and slender, with a thorn nearby the middle of the stem; outer apical seta long, not fused with the principal one.

Rostrum broad at base, slightly prominent with a broad and curved tip.

Integumental structures: (Fig. 5d and fig. 6d): cephalothorax furnished with a pattern of curved striae; posterior margin set with long hairs; thoracic and abdominal pleurotergites with a dense pattern of small spinules in the posterior half; posterior margin with spinules and long hairs; ventrolateral wings of the genital and second

abdominal segments with strong spinules prolonging the posterior edges; ventral surface of the first genital segment striated; the second one smooth; ventral surface of abdominal segments and anal segment with small spinules along the lateral margins, but smooth in the middle; posterior margin of the anal operculum set with spinules; furcal rami with a dorsal and a ventral transversal row of small teeth.

Antennule (Fig. 6a) six-segmented; first segment with a long sclerified process along the posterior margin, a sharp thorn on the anterodistal edge and a blunt process on the ventral surface; second segment with a blunt curved posterior thorn; surfaces of the first and second segments striated, of the other segments smooth.

Antenna and mouthparts as in *W. distincta*.

P1 (Fig. 7a): prae-coxa triangular having a transversal row of teeth near the inner edge; coxa globulous bearing long hairs and a comb of strong spinules along the outer margin; basis cylindrical bearing a one-segmented exopodite with three lateral and two apical setae; first endopodal segment about six times as long as wide and furnished with small teeth along the outer margin; second segment with a smooth surface bearing one seta and an armed claw.

P2 and P3 as in the male.

P4 (Fig. 7h): coxa covered with rows of spinules, basis furnished with long hairs along the inner margin and some spinules near the implantation of the extern seta; exopodite three-segmented; first and second segment with strong armed spines; third segment bearing one outer smooth seta and two apical feathered ones; endopodite one-segmented bearing three setae.

P5 (Fig. 7c): baseoendopodite with a smooth surface and furnished margins; both proximal spines armed along one side; both distal setae feathered; exopodite ovate, surface smooth and bearing five feathered setae. Male (allotype): habitus (Fig. 5a and 6c) as in the female, body length 430 µm; without lateral wings on the abdominal segments; ventral surface of the abdominal segments covered with spinules, of the anal segment with a median smooth area.

Antennule (Fig. 6b) six-segmented; first and second segment as in the female, but without a hyaline strip on the former; third to sixth segments sub-chirocer, surfaces smooth.

P2 (Fig. 7b) coxa with an outer and inner row of spinules; inner margin of the basis with long hairs; exopodite one-segmented bearing one outer spine and two apical setae; endopodite absent and replaced by an indistinct rounded knob with an apical pore.

P3 (Fig. 7d): coxa and basis as in the preceding leg; exopodite one-segmented having one outer spine and one apical seta; endopodite absent.

P4 (Fig. 7g): protopodite as in the former legs; exopodite three-segmented, more compressed; first and second segments with very large outer spines; ultimate segment having two apical setae; endopodite absent.

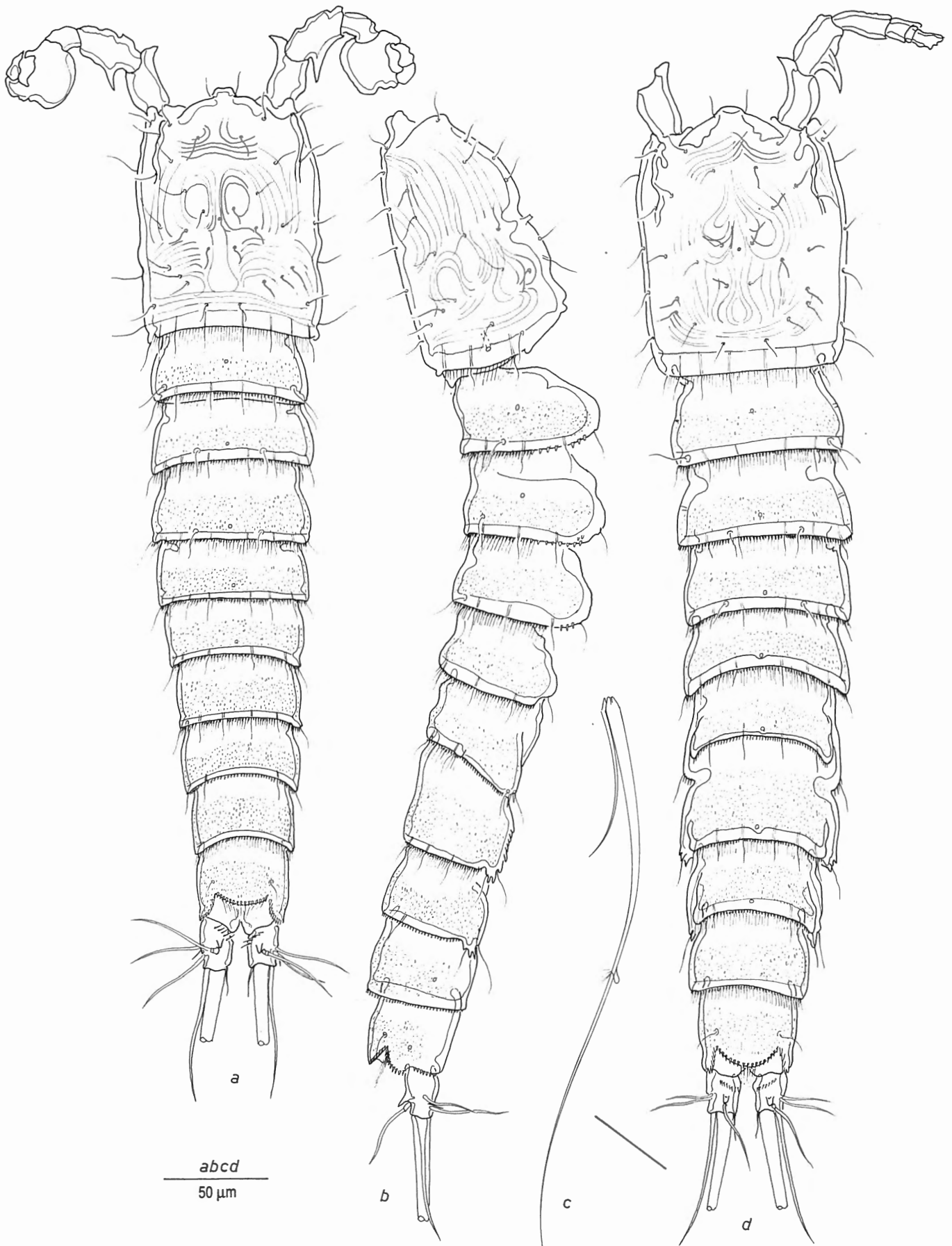


Fig. 5. – *Wellsiphontina striata* n. gen., n. sp.: a, male habitus in dorsal view; b, female habitus in lateral view; c, apical furcal setae; d, female habitus in dorsal view.

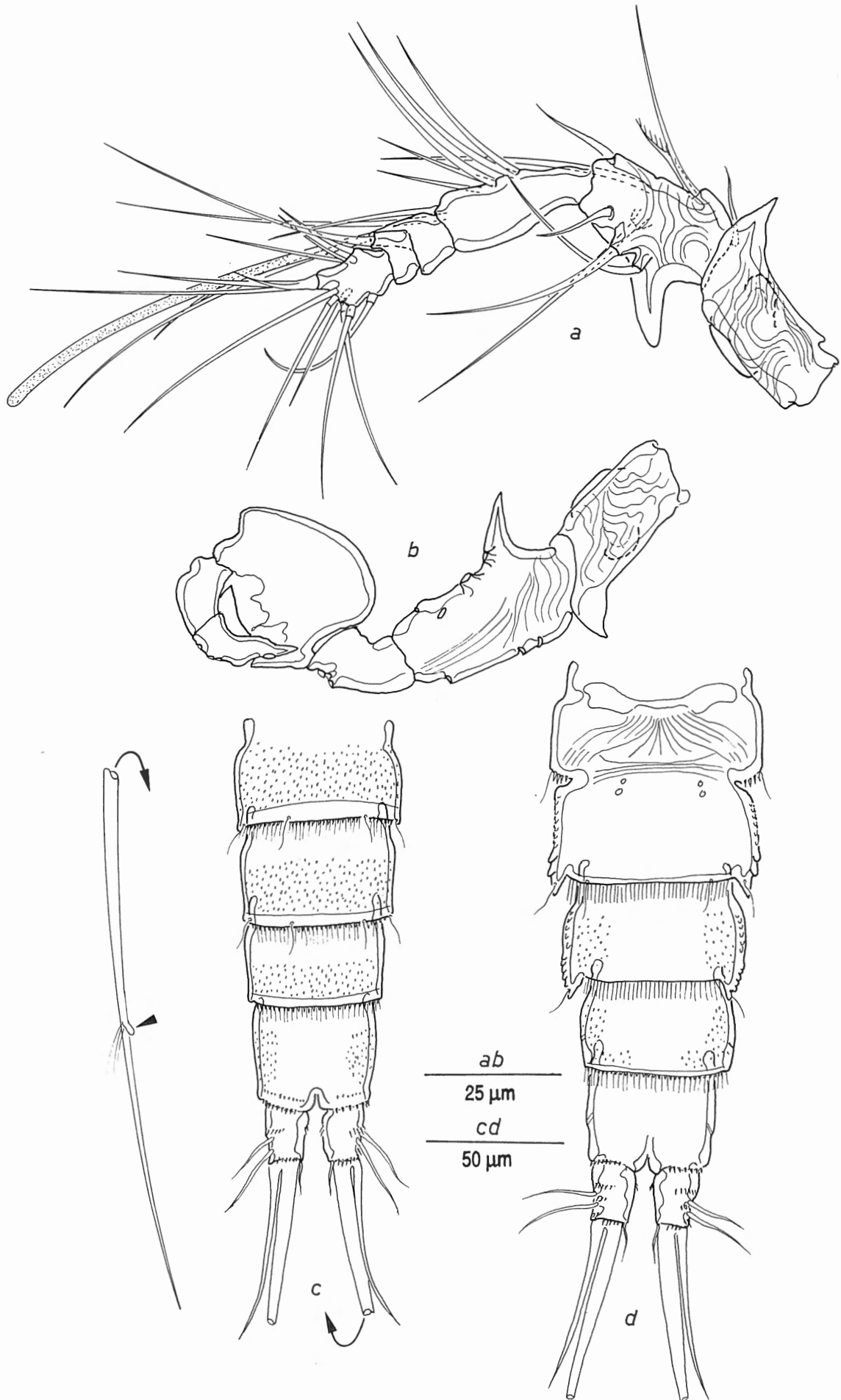


Fig. 6. – *Wellsiphontina striata* n. gen., n. sp. : a, female antennule in dorsal view; b, male antennule in dorsal view; c, male abdominal segments in ventral view; d, female abdomen in ventral view.

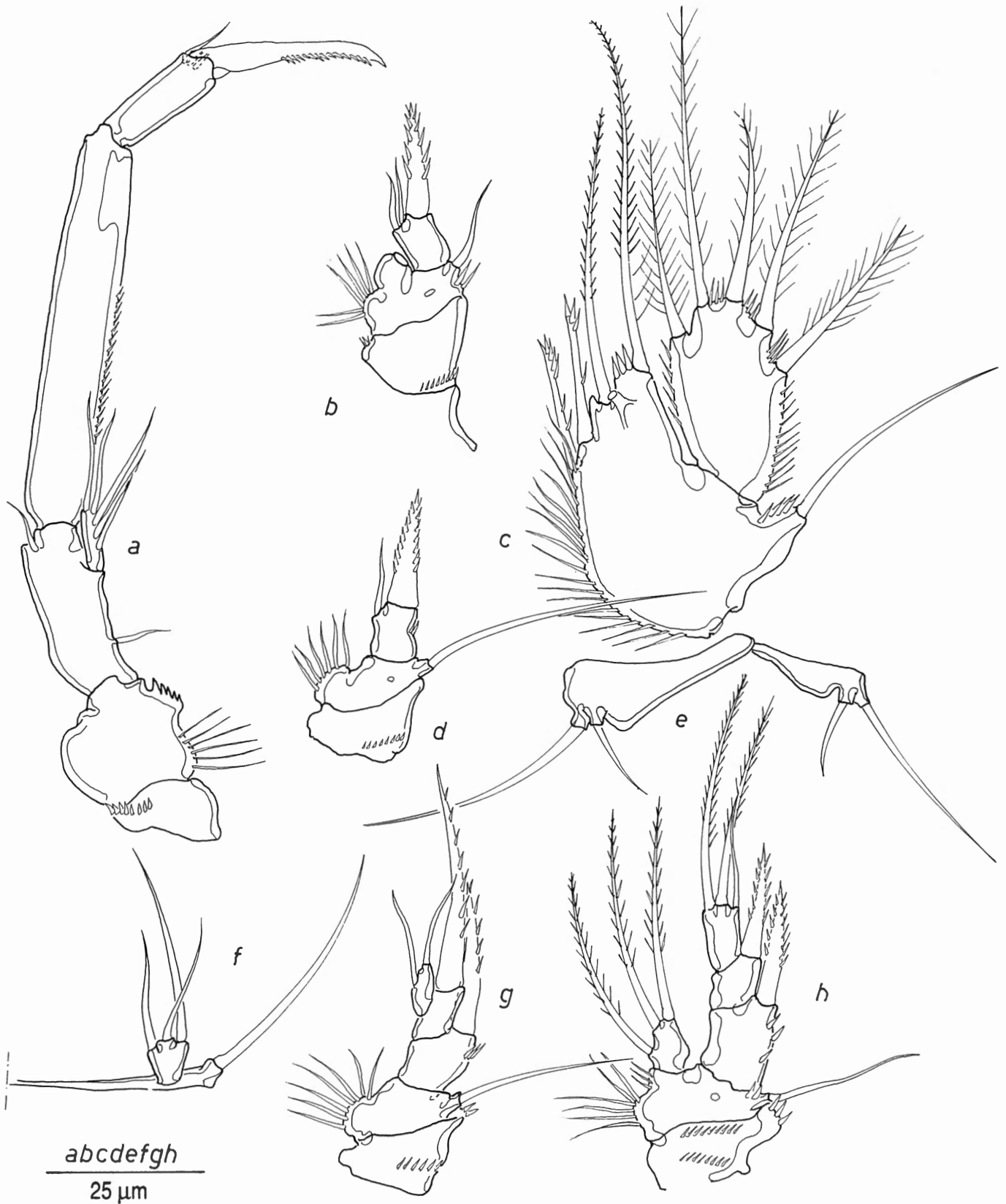


Fig. 7. – *Wellsiphontina striata* n. gen., n. sp.: a, P1; b, male P2; c, female P5; d, male P3; e, male P6; f, male P5; g, male P4; h, female P4.

P5 (Fig. 7f) : basis represented as a small chitinous strip, exopodite small, bearing three setae.

P6 (Fig. 7e) composed of two asymmetrical plates; right plate much larger than left one; both bearing two smooth setae.

AFFINITIES

Wellsiphontina striata n. sp., is easily distinguishable from *W. distincta* by its three-segmented P4 exopodite. Other differences between the two species are : the setal formula of P3 with only 2 appendages in *W. striata* n. sp. and the chaetotaxy of P4 with 3 endopodal setae and 3 setae on the ultimate exopodal segment (in *W. distincta* 2 setae, respectively 4 setae).

Wellsiphontina distincta (WELLS, 1967)

Fig. 1d, 8a-k

Laophontina distincta n. sp. - WELLS, 1967 : p. 346-349; Fig. 77.

Laophontina distincta WELLS, 1967 : WELLS, 1976 : p. 172, 188; COULL & ZO, 1980 : p. 34, 37, 42; COTTARELLI, 1983 : p. 7; KUNZ, 1983 : p. 197-198; FIERS, 1986 : p. 71-72; BODIN, 1988 : p. 198.

TYPE MATERIAL

Material deposited in the B.M.N.H. Holotype : slide 1967.8.4.118; paratypes : slide 1967.8.4.119 (female), slide 1967.8.4.120 (male). Other paratypes in the collection of J.B.J. WELLS, Wellington.

TYPE LOCALITY

Mozambique, Inhaca Island (WELLS, 1967).

FIGURES

Fig. 1d and 8a-k drawn from the type-series.

AMENDMENTS

Integumental structures : cephalothorax striated; pleurotergites of the other body segments spinulose (Fig. 8b); ventral surface of the genital and abdominal segments smooth; postero-ventral margin of these segments furnished with hairs (Fig. 8a); anal operculum protruded and denticulate.

Furcal rami short, only slightly longer than wide, tapering posteriad and bearing, dorsally, a curved spiniform process in front of the dorsal seta; inner principal furcal seta modified and about 2.5 times as long as the supporting ramus; lateral setae implanted medially.

Rostrum (Fig. 8h) prominent, triangular with a blunt tip; ventral surface with a distinct longitudinal ridge.

Antennule (Fig. 8c) six-segmented; first segment at least twice as long as wide, having a sharp process on the outer distal edge and two strongly sclerified ridges along the posteriorly directed margin; second segment with a triangular thorn; aesthetasc implanted on the fourth segment.

P2-P3 (Fig. 8f,e, respectively) with distinct protopodal components and one-segmented exopodite; endopodite represented as a small process in P2, absent in P3; P4 (Fig. 8g) with a two-segmented exopodite and a one-segmented endopodite; protopodal components distinct. Chaetotaxy of the legs in table III.

P5 as in the preceding species.

Male resembling closely the female; integument as in the female.

Antennule (Fig. 8d) six-segmented and chirocer; first and second segment as in the female.

P2-P3 (Fig. 8i, j, respectively) resembling closely those of the female; P4 (Fig. 8g) without endopodite; exopodite smaller than in the female and bearing three spiniform elements on the second segment, besides a minute smooth seta.

DISTRIBUTION

So far, *Wellsiphontina distincta* has been mentioned from its type-locality : Inhaca Island, Mozambique.

Genus Galapalaophonte MIELKE, 1981

DIAGNOSIS

Female :

Body cylindrical, slightly depressed; anal segment with dorsolateral sharp extensions; anal operculum with an upwards directed median thorn; dorsal surface of the furcal rami with a large extension arising in front of the dorsal seta; integument of the cephalothorax pitted, of the thoracic and abdominal segments spinulose or pitted; genital field with one seta on the P6 vestiges; copulatory pore situated posteriad the transversal ridge; antennule five to six-segmented, prolonged first segment with dorsal and lateral blunt processes; second segment with a large curved or straight hook; exopodite of antenna with three feathered setae and a long lateral smooth one; exopodite P1 one-segmented; terminal endopodal segment P1 with a claw, a little spine and a small seta; exopodite P2 vestigial, represented as one or two setae; P2 endopodite one- or two-segmented; P3 with a two- or three-segmented exopodite and a two-segmented endopodite; exopodite P4 three-segmented and endopodite one-segmented; baseoendopodite P5 bearing four setae at the most; exopodite P5 ovate, reaching beyond the baseoendopodite and bearing five setae, the apical-most smooth.

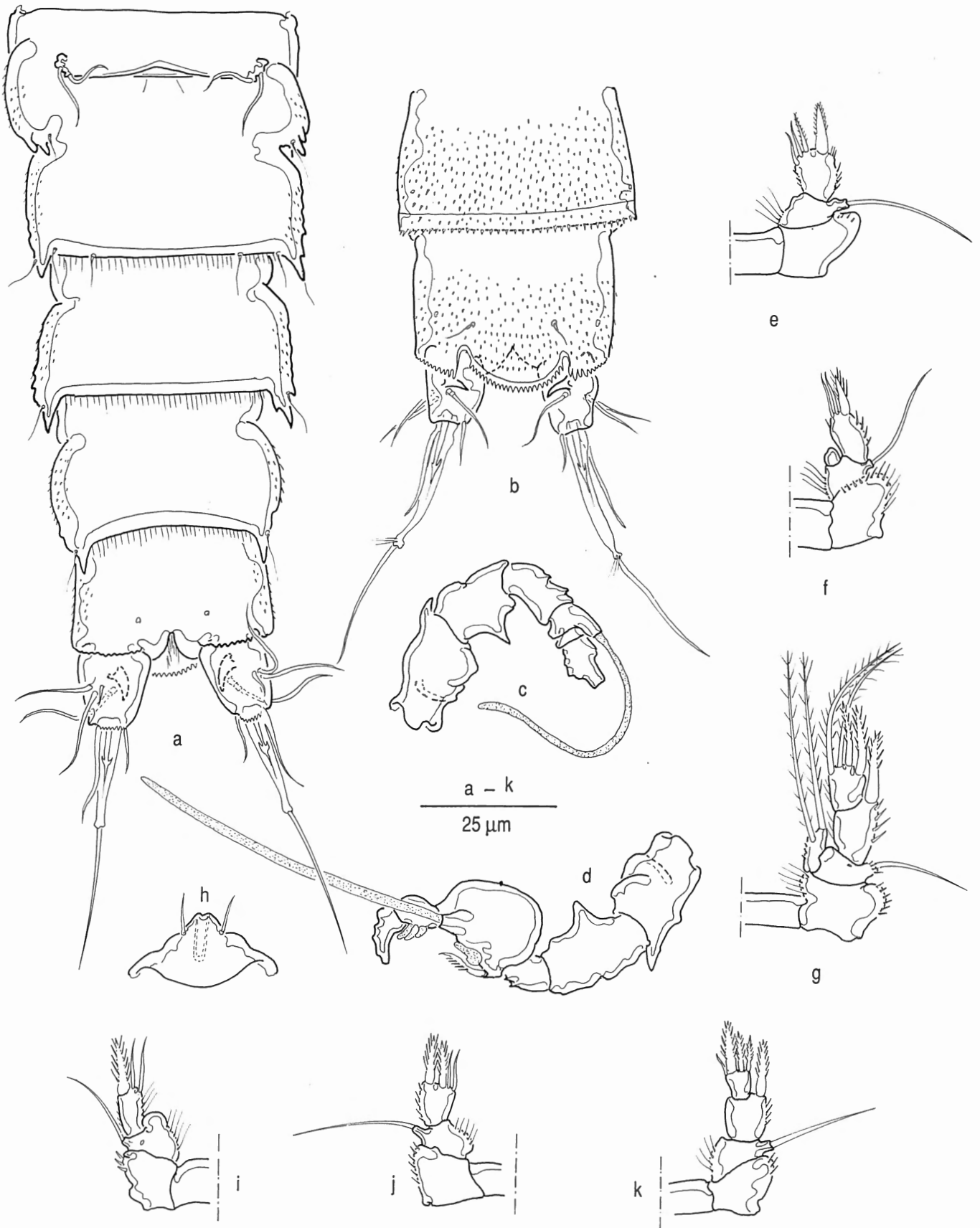


Fig. 8. — *Wellsiphontina distincta* (WELLS): a, female abdomen in ventral view; b, ultimate female abdominal segments in dorsal view; c, female antennule, ventral view; d, male antennule, ventral view; e, female P3; f, female P2; g, female P4; h, rostrum; i, male P2; j, male P3; k, male P4.

Table IV :
Chaetotaxy of the species of *Galapalaophonte*

	P2		P3		P4		P5 ♀		P5 ♂	
	exo	end	exo	end	exo	end	exo	bas	exo	bas
<i>G. pacifica</i>	2	0-020	0-0-021	0-120	0-0-022	020	5	4	3	0
<i>G. carolinensis</i>	2	0-020	0-0-021	0-120	0-0-022	020	5	4	3	0
<i>G. triarticulata</i>	1	0-020	0-0-021	0-120	0-0-022	020	5	4	?	?
<i>G. chilensis</i>	2	0-020	0-0-021	0-120	0-0-022	010	5	4	3	0
<i>G. antillensis</i>	(1)2	0-020	0-0-021	0-120	0-0-022	020	5	4	3	0
<i>G. biarticulata</i>	1	0-020	0-021	0-020	0-0-022	010	5	3-4	3	0
<i>G. variabilis</i>	1	010	0-021	(0)-020	0-0-022	020	5	4	?	?

Male :

P2 endopodite bearing a long thickened seta with three downwards directed hooks and a short feathered tip; second segment of the endopodite P3 prolonged into a hyaline curved hook, mostly bearing a minute seta; P4 endopodite absent, exopodite with chaetotaxy as in the female; P5 represented as a transversal cuticular strip without endopodal setae and having a small exopodite, bearing three setae.

TYPE SPECIES

Galapalaophonte pacifica MIELKE, 1981, by monotypy.

ETYMOLOGY

The generic name is a conjunction of *Galapagos* and *Laophonte*, gender feminine, referring to the type-region of the type-species.

COMMENTS

The genus *Galapalaophonte* is clearly distinguished from *Laophontina*, as redefined herein, by several characteristics : presence of a median spiniform thorn on the anal operculum, strongly spiniform processes on the lateral edges of the anal area, presence of only one smooth seta on the female P5, pitted integument of the cephalothorax, shape of the genital field and, least but not least by the peculiar sexual dimorphic characteristics of the P2 and P3.

While the shape of the genital field is fairly constant in *Laophontina* and *Wellsiphontina* n. gen., it displays a marked inter-specific variability in the genus *Galapalaophonte* (Fig. 1e-1). Most important is the shape of the receptaculum seminis. This organ is rather short and has thick walls in *G. pacifica*, *G. antillensis* n. sp. and *G. biarticulata* n. sp. but shows a marked narrow anterior part in *G. variabilis* and *G. chilensis* n. sp. Moreover, *G. triarticulata*, formerly considered as conspecific with *G. pacifica* differs from the latter by the long receptacu-

lum and the prolonged lateral structures on both sides of it. The most remarkable modification of the genital field is found in *G. carolinensis* n. sp. which has a large laterally extended receptaculum showing two wing-shaped structures along both sides. It is obvious that such differences in the shape of the genital fields as observed here support the specificity of the several species described below.

KEY TO THE SPECIES OF GALAPALAOPHONTE

- 1 - Basis of P2 with 2 outer setae/spines : 2
- Basis of P2 with 3 outer setae/spines : 3
- 2 - Exopodite P3 three-segmented; female P4 endopodite with 2 setae; body-segments with pitted integument : *G. triarticulata*
- Exopodite P2 two-segmented; female P4 with a single seta; body-segments with spinulose integument : *G. biarticulata*
- 3 - P2 endopodite two-segmented; P3 exopodite three-segmented : 4
- P2 endopodite one-segmented; P3 exopodite two-segmented : *G. variabilis*
- 4 - Inner margin furcal rami without additional inner spiniform process; female P4 endopodite with 2 setae; integument pitted : 5
- Inner margin furcal rami with an additional spiniform process; female P4 endopodite with 1 seta; integument not pitted : *G. chilensis*
- 5 - Furcal rami cylindrical, twice as long as wide : 6
- Furcal rami more globulous, 1.5 times as long as wide : *G. antillensis*
- 6 - Modified proximal part of inner principal furcal seta as long as the ramus; ventral integument of abdominal segments densely striated in female, clothed with hairs in male : . *G. pacifica*
- Modified proximal part of inner principal furcal seta much longer than the ramus; ventral integument of abdominal segments nearly smooth in female, spinulose in male : *G. carolinensis*

Galapalaophonte pacifica MIELKE, 1981

Fig. 1e, 9-10

Galapalaophonte pacifica spec. nov., MIELKE, 1981 : p. 195-206, fig. 47-56.

Galapalaophonte pacifica : BODIN, 1988 : p. 203; *Laophontina triarticulata* COULL & ZO, 1980 : MIELKE, 1982 : p. 8-9; WELLS, 1983 : p. 6; FIERIS, 1986 : p. 72 [part].

non *Laophontina triarticulata* COULL & ZO, 1980 : MIELKE, 1985 : p. 228-231, fig. 29-31, pl. 4E (= *G. chilensis* n. sp.); BODIN, 1988 : p. 198.

TYPE MATERIAL

Female holotype dissected, labeled II Gal 30a-m and four paratypes (2 females, 2 males) deposited in the collections of the "Zoologisches Institut Göttingen".

TYPE LOCALITY

Galapagos, Santa Cruz : Bahia Academia (MIELKE, 1981).

FIGURES

Fig. 1e, 9 and 10 are drawn from specimens from the locus typicus. They are deposited in the K.B.I.N., COP 3093.

AMENDMENTS

Female : habitus cylindrical, body only tapering beyond the genital segments; length 465 μ m; entire body about 3.5 times as long as the head.

Integumental structures (Fig. 9a, f, 10a, b) of the cephalothorax, thoracic and abdominal segments pitted dorsally; posterodorsal margin of the cephalothorax straight, set with hairs, of the other body segments undulate and furnished with hairs, except for the first genital segment; lateral parts of the thoracic tergites with markedly stronger spiniform processes than the more dorsally directed parts; pleural regions of the thoracic segments smooth; ventral surface of the genital segments densely striated with longitudinally directed striae; ventral surfaces of the second and third abdominal segments with a complex pattern of striae; anal segment smooth ventrally, but densely clothed with long fragile hairs along the lateral margins; posterolateral edges of the genital and abdominal segments spinulose, not protruded into spiniform processes; posteroventral margin of the genital segment hairy, of the second and third abdominal segments spinulose and hairy.

Furcal rami (Fig. 10b) cylindrical, about twice as long as wide; dorsal process situated in the distal half on

some distance from the distalmost margin; modified part of the inner principal furcal seta only as long as the supporting ramus; integument striated dorsally, hairy ventrally.

Antennule (Fig. 9b, c) : first segment with a thorn on the anteriorly directed distal edge, in the proximal half of the posteriorly directed margin and on the dorsal surface, close to the anterior margin; integument of the first segment pitted dorsally, smooth ventrally.

Male : dorsal integument as in the female; the whole ventral surface of the abdominal segments densely clothed with long hairs except for the medioventral region of the anal segment; posteroventral margins of the abdominal segments hairy.

VARIABILITY

As illustrated by MIELKE (1981) and in Fig. 9 of the present paper, *G. pacifica* displays a rather large variability of the thorns on the first two antennular segments. MIELKE (1981) also observed variability in the male endopodites of the P3 and P4.

COMMENTS

The specimens of *Laophontina triarticulata* reported by MIELKE (1982) from the Atlantic coast of Panama are considered here as conspecific with *Galapalaophonte pacifica* since MIELKE (*op. cit.*) mentioned no differences between them.

DISTRIBUTION

G. pacifica is found throughout the Galapagos Archipelago (MIELKE, 1981) and is reported from the Atlantic coast of Panama (MIELKE, 1982).

Galapalaophonte triarticulata COULL & ZO, 1980

Fig. 1h, 11

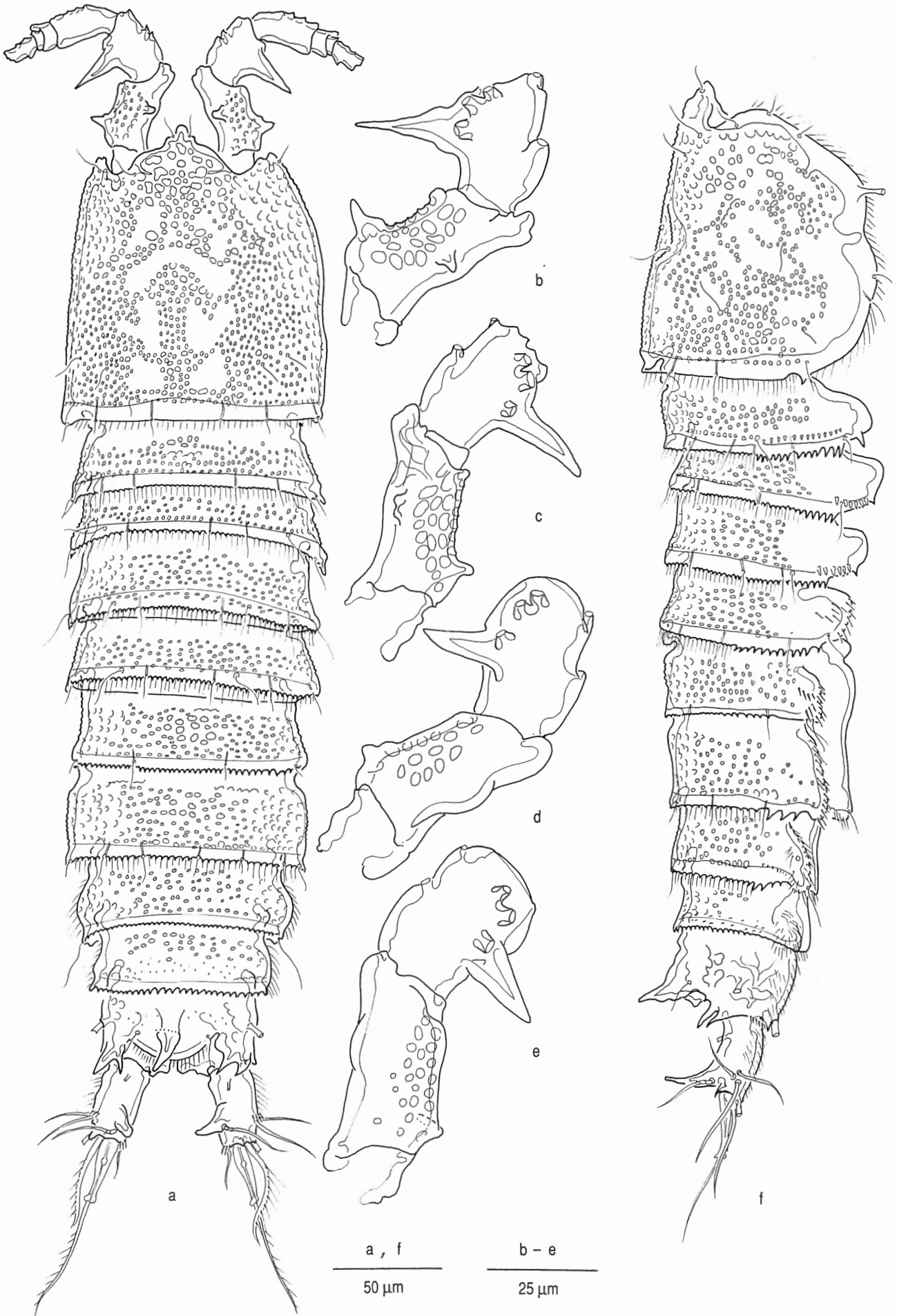
Laophontina triarticulata n. sp., COULL & ZO, 1980 : p. 36-38, fig. 2, 3 [part]; WELLS, 1981 : p. 10 [part]; FIERIS, 1986 : p. 72 [part]; BODIN, 1988 : p. 198 [part].

non *Laophontina triarticulata* : MIELKE, 1982 : p. 8-9 (= *G. pacifica*); WELLS, 1983 : p. 6 (= *G. pacifica*); MIELKE, 1985 : p. 228-231, fig. 30-31 (= *G. chilensis* n. sp.).

TYPE MATERIAL

One female, mounted in toto, labeled *Laophontina triarticulata* COULL & ZO, Holotype. Deposited in the U.S.N.M., reg. no. : 173454 (Acc. 338041).

Fig. 9. — *Galapalaophonte pacifica* MIELKE : a, female habitus in dorsal view; b, first and second antennule segment of the female, dorsal view; c, *idem*, of another specimen; d, *idem*, of a male specimen; e, *idem*, of another male specimen; f, female habitus in lateral view. ▷



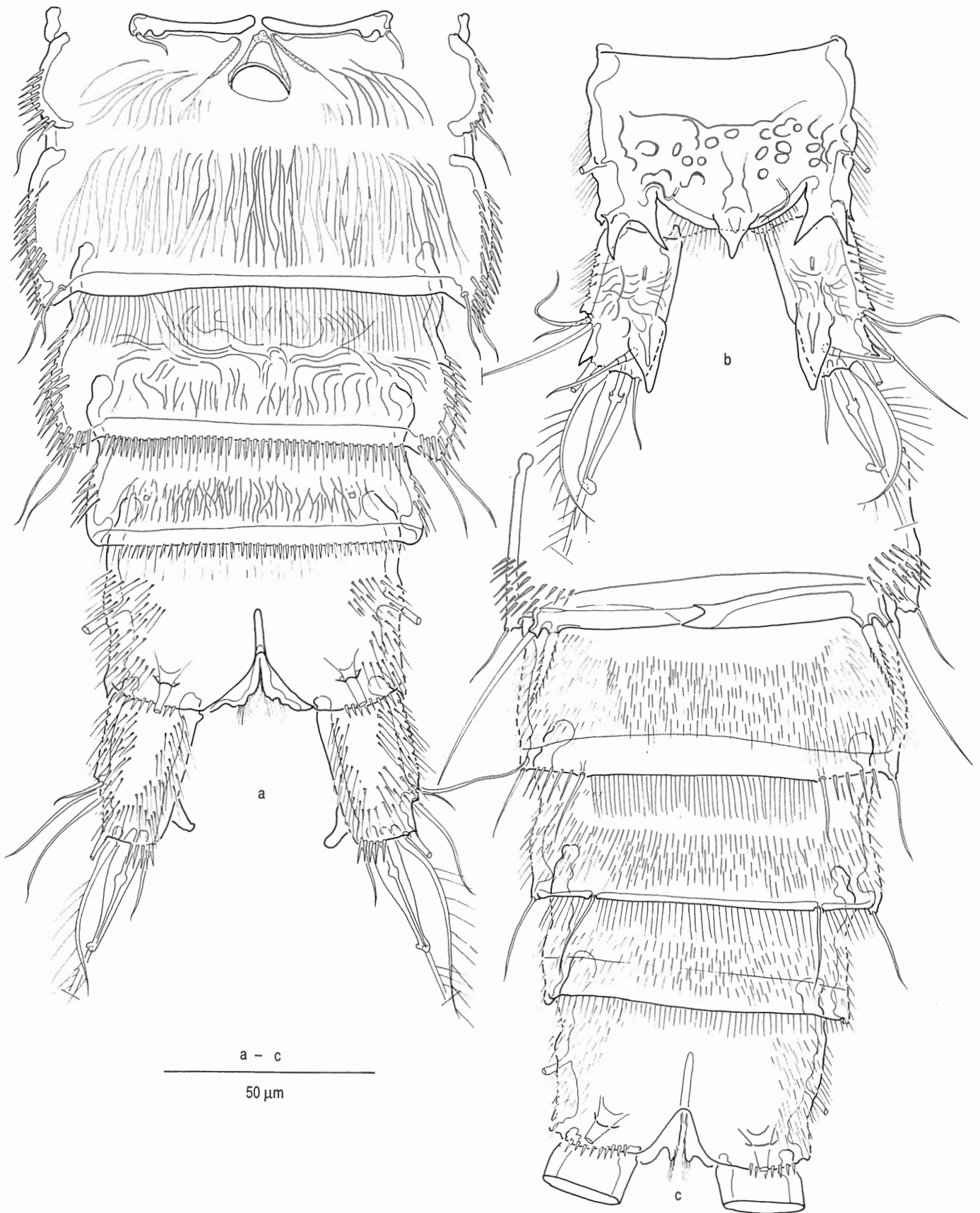


Fig. 10. — *Galapalaophonte pacifica* MIELKE: a, female abdomen in ventral view; b, female anal segment in dorsal view; c, male abdomen in ventral view (furcal rami omitted).

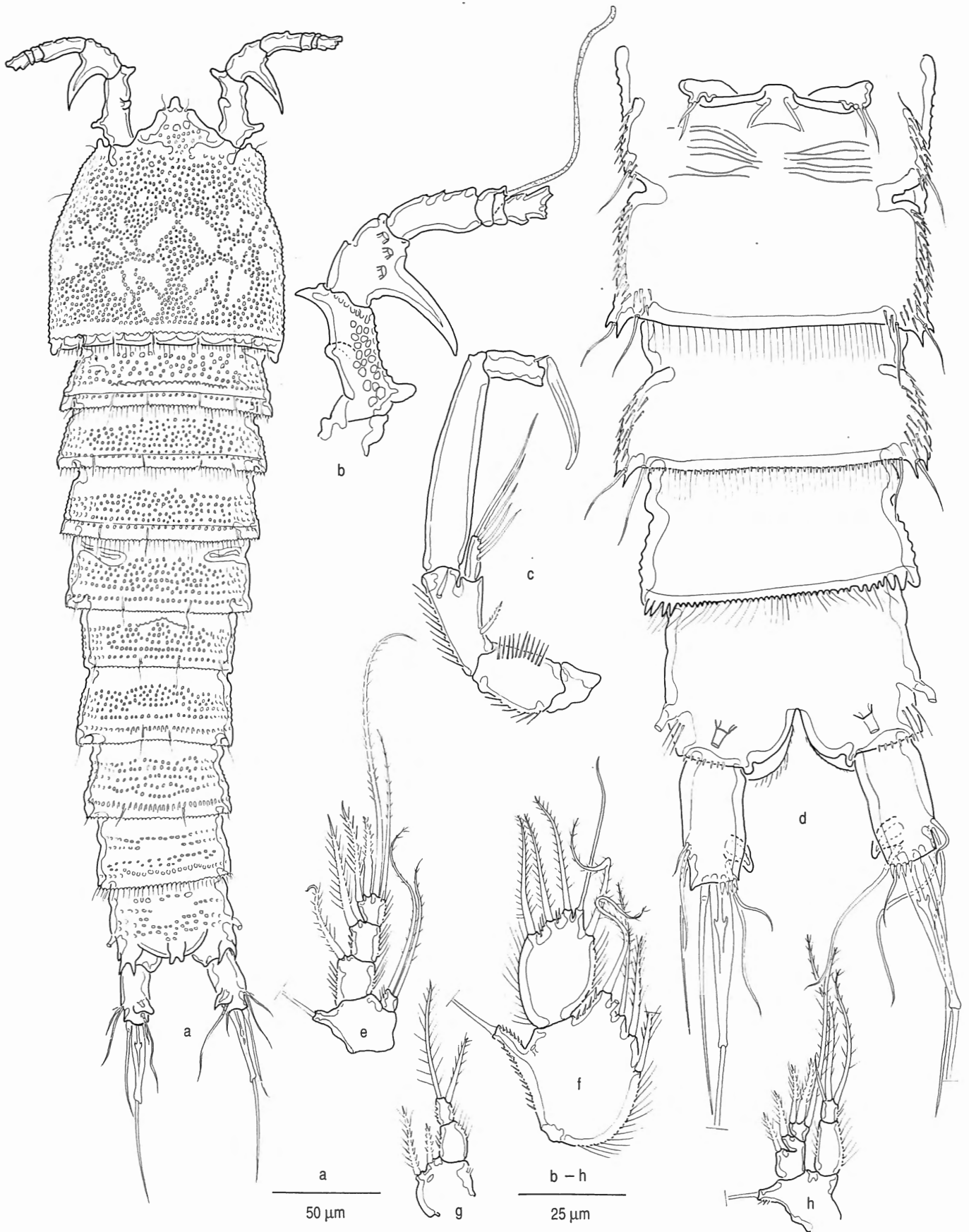


Fig. 11. – *Galapalaophonte triarticulata* (COULL & ZO) : a, female habitus in dorsal view; b, antennule in dorsal view; c, P1; d, abdomen in ventral view; e, P4; f, P5; g, P2; h, P3.

TYPE LOCALITY

South-eastern United States continental shelf (31° 06' N 81° 08' W). At 11 m depth in sediments with a medium grain size of 0.55 mm (COULL & Zo, 1980).

FIGURES

Fig. 1h and 11 is drawn from the sole female specimen (holotype).

REDESCRIPTION

Female (holotype) : habitus (Fig. 11a) typically slowly tapering posteriorly; length 435 µm; lateral edges of second genital and second abdominal segments protruded (Fig. 11d).

Integumental structures : surface of the body segments pitted; cephalothorax with a symmetrical pattern of smooth areas; pits small and regular; pits situated near the posterior margin ovate; posterior margin of cephalothorax straight, set with fragile hairs; posterior margins of thoracic and abdominal segments crenulate, also furnished with fragile hairs; ventral surface of genital segment with a few striae near the genital field; abdominal segments with smooth surfaces; lateral margin of genital segments and second abdominal segment set with slender spinules; posteroventral margin of genital segment with hairs, of second abdominal segment with minute spinules and hairs; third abdominal segment with a crenulate posteroventral margin, set with hairs; anal segment with a bifid process on the operculum and a small tuft of hairs near the lateral pore orifice.

Furcal rami almost twice as long as wide; proximal part of principal seta 1.5 times as long as the supporting ramus; integument smooth (without striae or hairs).

Antennule (Fig. 11b) six-segmented with a long curved hook-shaped process on the second segment; first segment with a pitted dorsal surface, a blunt posteriorly directed and two anteriorly directed processes; ventral surface of first segment with a few striae.

P1 (Fig. 11c) : inner and outer margin of the coxa, and inner margin of the basis set with hair-like spinules; endopodal segments smooth; exopodite with five elements : two apical and three lateral ones.

P2 (Fig. 11g) : basis, coxa and intercoxal plate united; outer spine of basis present; endopodite absent, represented by a single spine; exopodite two-segmented, set with slender hairy spinules along the margins; apical endopodal segment with two feathered setae.

P3 (Fig. 11h) : protopodal components unified; exopodite three-segmented, endopodite two-segmented; exopodal spines armed with slender spinules; endopodite resembling P2 endopodite closely but bearing three setae on the apical segment; first endopodal segment as long as the entire exopodite; articulation between proximal

and median exopodal segments incomplete in the left leg, complete in the right one.

P4 (Fig. 11e) : with unified protopodal elements, three-segmented exopodite and one-segmented endopodite : exopodal spines armed with slender spinules; outer apical exopodal spine slightly smaller than proximal one; apical exopodal setae feathered; endopodite with two setae, inner one smaller than outer one.

P5 (Fig. 11f) with smooth surfaces; apicalmost baseendopodal edge not reaching the middle of the exopodite; exopodite ovate, about 1.5 times as long as wide; outer margin of baseendopodite spinulose, inner margin setulose; inner setae on baseendopodite as long as the exopodal ramus and feathered.

Male : unknown.

DISCUSSION

Three slides deposited in the collections of the U.S.N.M. are labeled *Laophontina triarticulata*. Only the slide comprising the holotype is considered here as this species. The two designated paratypes (one female and one male) differ in many aspects from the holotype and represents a separate species, *Galapalaophonte carolinensis* n. sp. described below.

Galapalaophonte triarticulata is unique within the genus because of the very long first endopodal segment of the P3. While in all other species, this segment never reaches beyond the pre-ultimate exopodal segment *G. triarticulata* exhibits a very long proximal segment which is as long as the entire exopodite.

Other features discriminating the present species from its congeners are the chaetotaxy of the P1, bearing five setae instead of six, the reduced chaetotaxy of the basis of the P2, displaying only two elements, and the marked smoothness of the ventral surfaces of the genital and abdominal segments.

It is obvious that *G. triarticulata* cannot be confused with *G. pacifica*. Besides the above-mentioned differences, the much longer modified proximal part of the inner principal furcal seta and the less strongly armed exopodal spines of the legs in the former clearly distinguish it from *G. pacifica*.

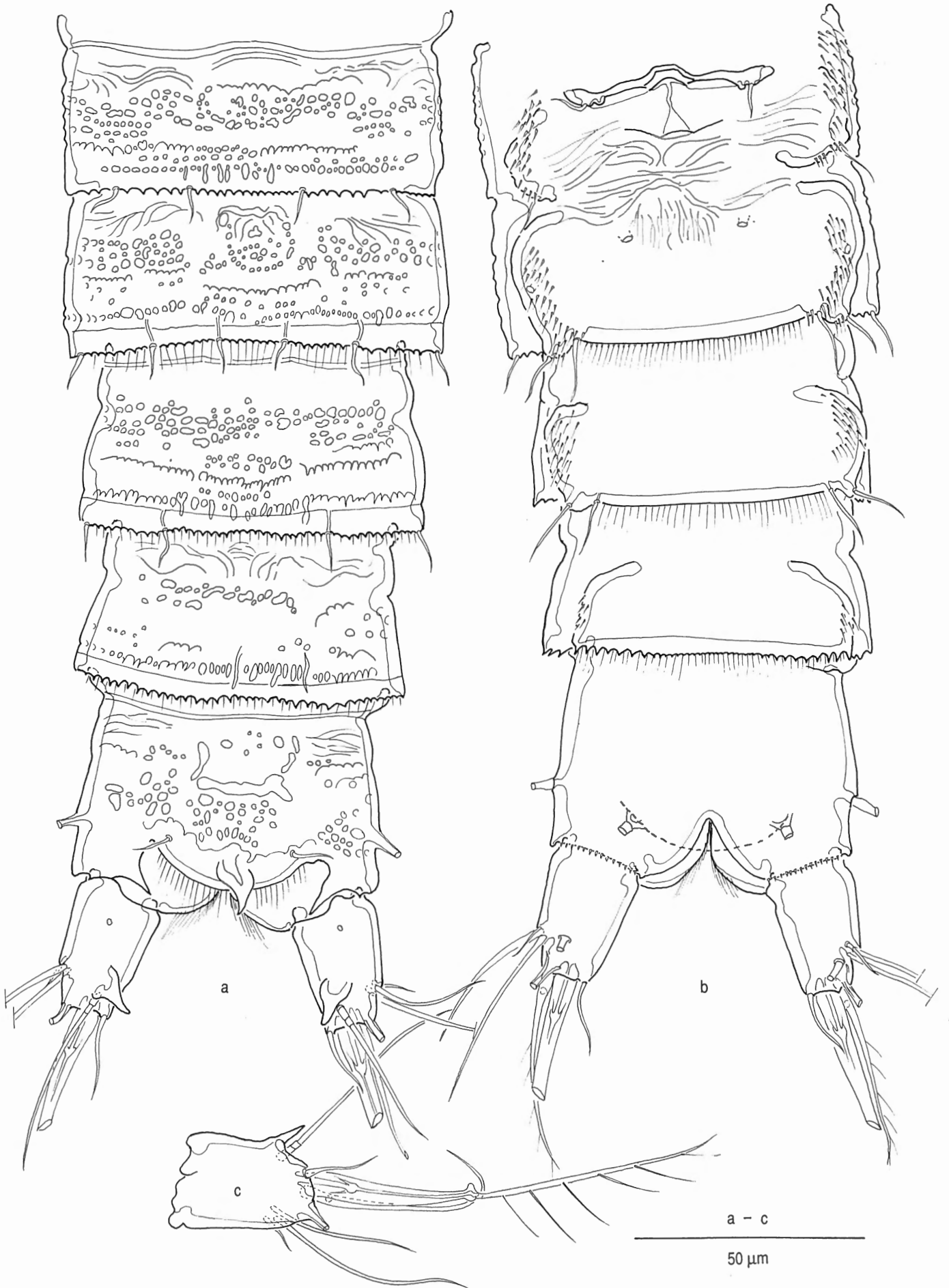
DISTRIBUTION

G. triarticulata is known from the type-region only.

Galapalaophonte variabilis (COULL & Zo, 1980)

Fig. 1i, 12 - 13

Laophontina variabilis n. sp. : COULL & Zo, 1980 : p. 38-41, fig. 4; *Laophontina variabilis* COULL & Zo, 1980 : WELLS, 1981 : p. 10; FIERS, 1986 : p. 72; BODIN, 1988 : p. 198.



TYPE MATERIAL

Holotype : one female, mounted in toto, deposited in the collections of the U.S.N.M., reg. no. 173456 (Acc. 338041); two female paratypes, mounted in toto on a single slide, deposited in the U.S.N.M., reg. no. 173457 (Acc. 338041).

TYPE LOCALITY

South-eastern United States continental shelf (31° 06' N 80° 21' W). At 32 m depth in sediments with a medium grain size of 0.46 mm (COULL & ZO, 1980).

FIGURES

Holotype : Fig. 13a-e; paratypes : Fig. 1i, Fig. 12a-c, Fig. 13f-h.

AMENDMENTS

Female : length 410 µm; facies as in the other species; length of the head one third of the entire body length; body tapering posteriad beyond the fifth thoracic segment.

Integumental structures : head densely pitted, except for some smooth areas; thoracic and abdominal segments with a considerably less dense pattern of pits; some transversal rows nearly forming an undulate comb; anterodorsal areas of the pleurotergites showing some striae; posterior margin of the head straight and hairy, of the other body segments undulate and hairy; pleural areas of the thoracic segments furnished with some large triangular teeth; ventral surface of the genital segments striated medially, of the abdominal segments smooth except for a posterior spinulose transversal row; posteroventral margins of the second and third abdominal segments straight, set with hairs; fourth abdominal segment undulate and hairy.

Furcal rami (Fig. 12c) tapering posteriad, slightly longer than 1.5 times the width; dorsal thorn small; proximal part of the inner principal furcal seta longer than the supporting ramus; integument of the rami smooth.

Antennule (Fig. 13a, b) six-segmented; first segment with a thorn on anteriorly and the posteriorly directed margin and on the ventral surface; second segment bearing the typical curved hook; dorsal surface of the first segment pitted and ventral surface striated.

P1 with a one-segmented exopodite, bearing six setae; P2 (Fig. 13 c) with three outer spines on the protopodite; endopodite one-segmented, bearing a single seta; P3 (Fig. 13d) having a two-segmented exopodite and a one-segmented endopodite; the latter with a short and a long seta; P4 (Fig. 13e) with a three-segmented exopodite and a one-segmented endopodite; terminal exopodal segment with an inner seta longer than the outer spines; endopodite with two setae.

P5 as in the preceding species and with a smooth integument.

Male : unknown.

VARIABILITY

The endopodite of the P3 can be two-segmented (Fig. 13 g) or elongated (Fig. 13 f). The outer seta of the P3 endopodite is generally smooth and short but one paratype possess a rather long endopodal seta furnished with minute setules (Fig. 13 f). Furthermore, all the specimens show a distinctly three-segmented exopodite in the P4 except one paratype female which has a two-segmented ramus (Fig. 13 h). In the latter, the chaetotaxy and the general appearance is the same as in the P4 of the other specimens.

***Galapalaophonte carolinensis* n. sp.**

Fig. 1k, 14 - 15

Laophontina triarticulata n. sp. : COULL & ZO, 1980 : p. 36-38 [part]

TYPE MATERIAL

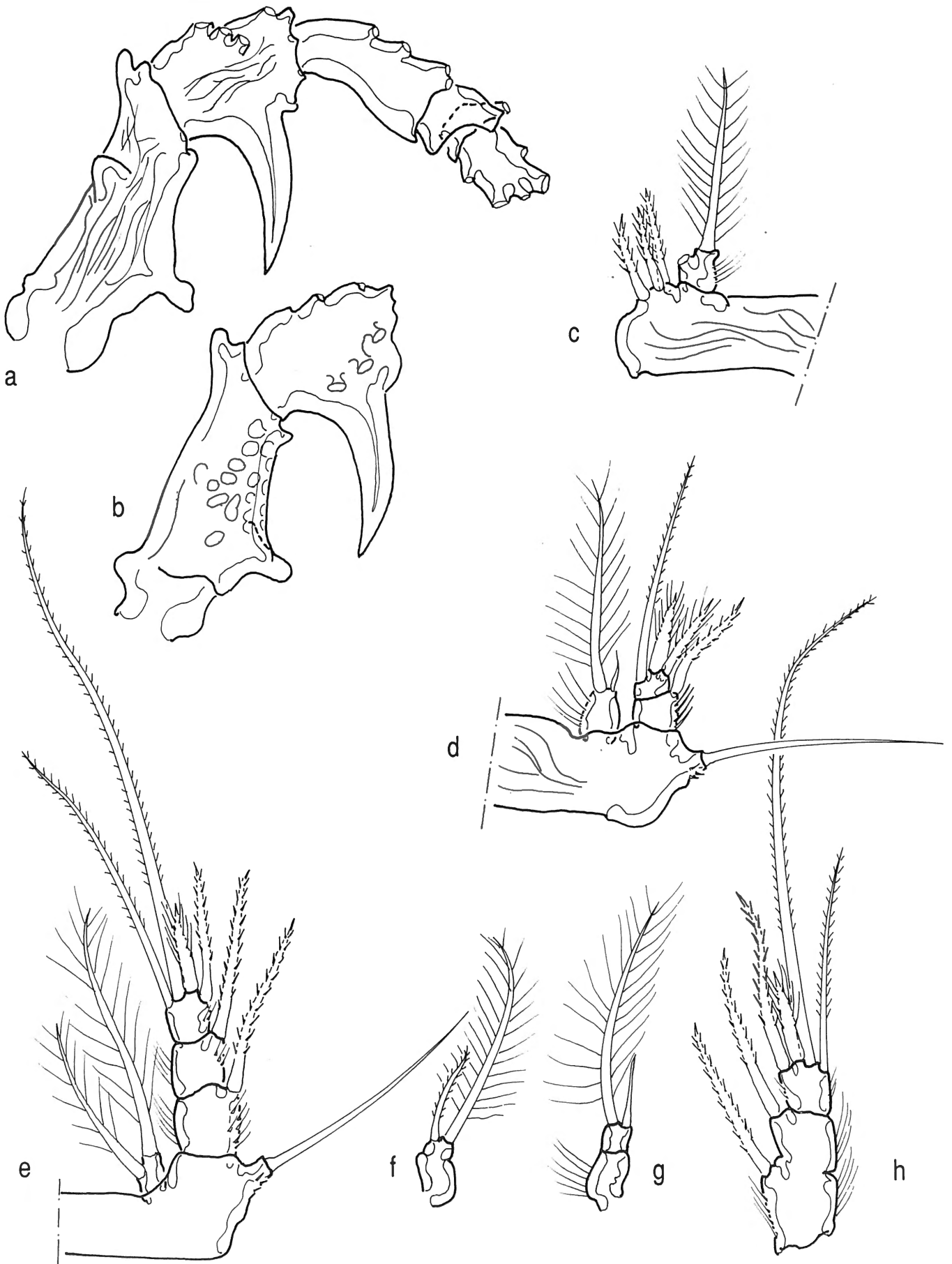
Holotype : one male mounted in toto, deposited in the collections of the U.S.N.M., reg. no. 173455 (Acc. 338041); paratypes : two females, each mounted in toto on separate slides, deposited in the collections of the U.S.N.M., reg. no. 173455 (Acc 338041).

TYPE LOCALITY

South-eastern United States continental shelf. The exact locality is not indicated on the labels. The location given for *G. triarticulata* (31° 06' N 81° 08' W, at 11 m depth

◁ Fig. 12. – *Galapalaophonte variabilis* (COULL & ZO) : a, female abdominal segments in dorsal view; b, *idem*, in lateral view; c, left furcal ramus, inner view.

Fig. 13. – *Galapalaophonte variabilis* (COULL & ZO) : a, female antennule in ventral view; b, proximal antennular segments in dorsal view; c, P2; d, P3; e, P4; f, endopodite P3 of a paratype; g, *idem* of another paratype; h, exopodite P4 of a paratype. ▷



25 μ m: a - h

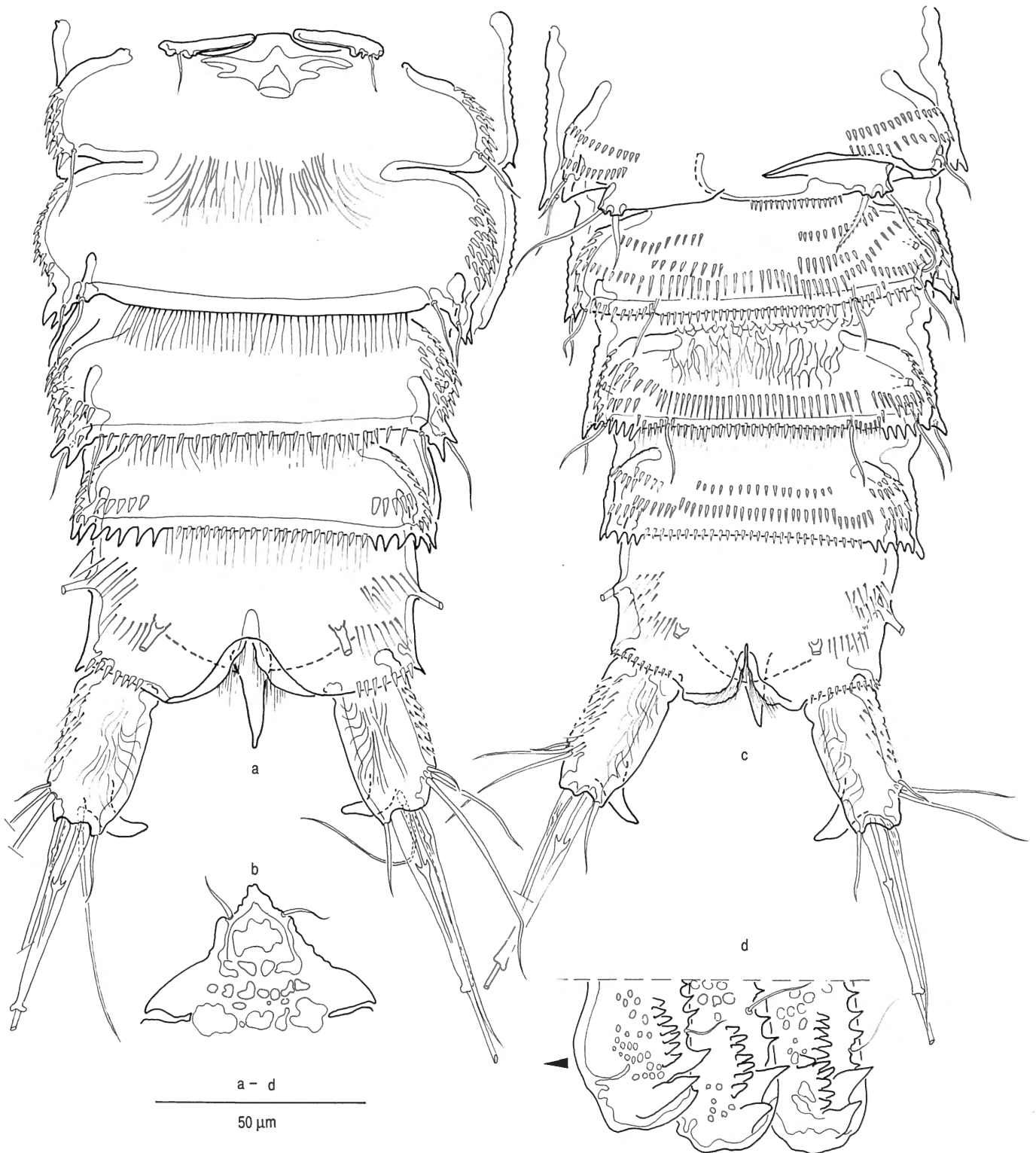
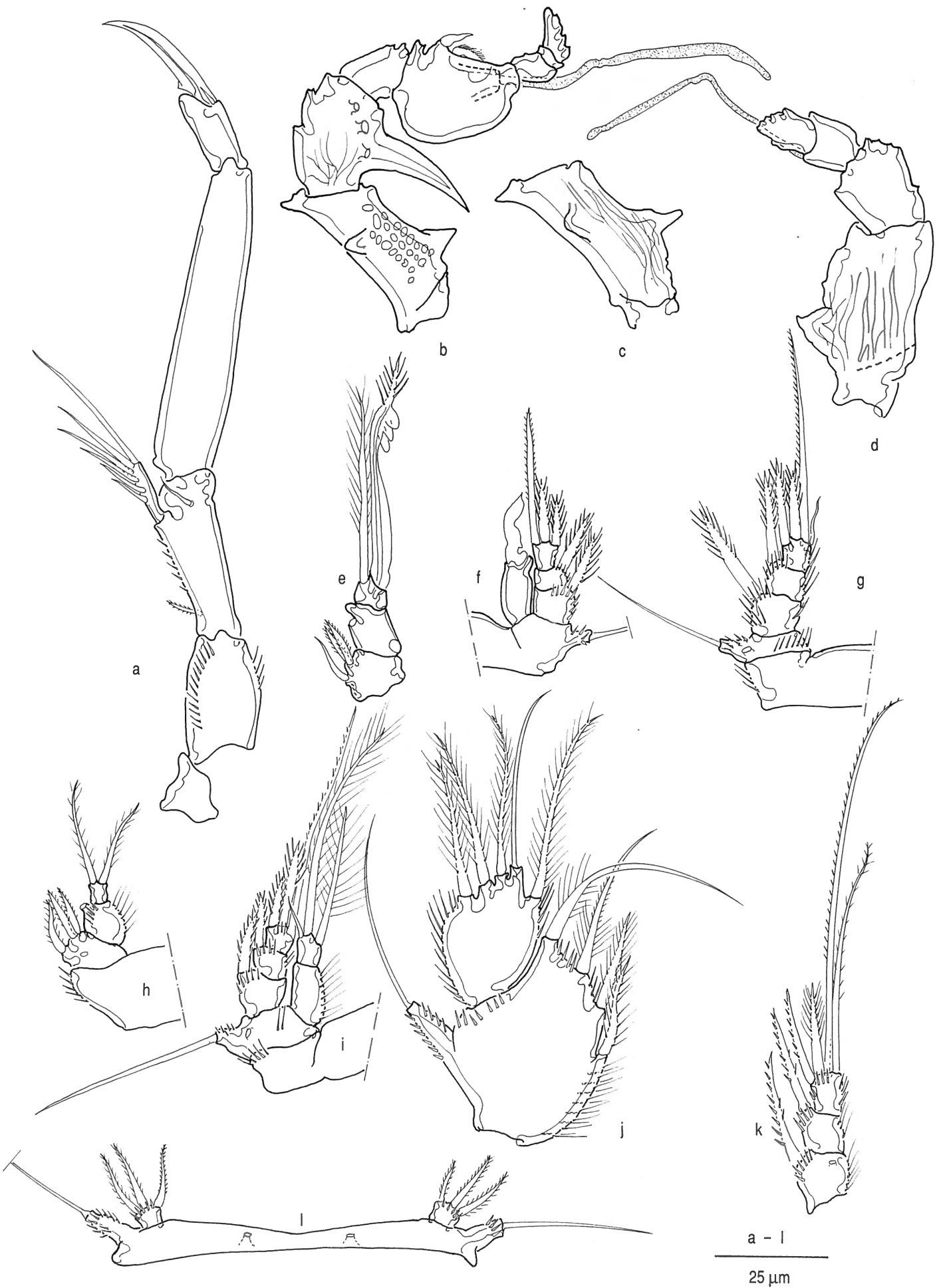


Fig. 14. — *Galapalaophonte carolinensis* n. sp. : a, female abdomen in ventral view; b, rostrum, dorsal view; c, male abdomen in ventral view; d, pleural regions of thoracic segments 2-4 (arrow pointing antieriad).



in sediments with a medium grain size of 0.55 mm in COULL & ZO, 1980) is not necessarily correct.

ETYMOLOGY

The specific name refers to the type-region of the species on the continental shelf off South Carolina.

DESCRIPTION

Female (paratype) habitus as in the other species of the genus; length 430 μm ; thoracic body segments parallel-sided; abdomen tapering posteriad.

Integumental structures: dorsal integument of the cephalothorax and body segments pitted, except for some smooth areas on the head; pits on the body segments arranged in transversal rows; the depressions close to one another; posterior margin of the head nearly straight and hairy, of the thoracic and abdominal segments spinulose and hairy; pleural regions of the thoracic segments with large posteriorly directed triangular processes (Fig. 14d); anal operculum and area with the upwards directed thorns; lateral edges of the second and third abdominal segments protruded in strongly sclerified dentiform processes; lateral sides of the genital and abdominal segments set with strong spinules; posteroventral margin of the genital segment furnished with hairs, of the second and third abdominal segment furnished with spinules and hairs; ventral surface of the genital segments with a hardly visible median pattern of striae; ventral surface of the following segments smooth, except for a short row of spinules on the third segment; anal segment with some hairs near the ventral pore orifices (Fig. 14a).

Furcal rami nearly cylindrical, twice as long as wide; outer margin clothed with hairs, ventral surface and inner margin with striae; dorsal thorn arising close to the distal margin of the ramus; modified part of the inner principal furcal seta 1.5 times as long as the supporting ramus.

Antennule (Fig. 15c) six-segmented; first segment with thorns on the posteriorly, anteriorly directed margins and on the dorsal and ventral surface; surface of the first segment pitted dorsally, striated ventrally.

Antenna and mouthparts as in *G. pacifica*.

P1 (Fig. 15a) with six setae on the one-segmented exopodite; anterior surface of the coxa with a row of spinules, of the basis smooth.

P2 (Fig. 15h): basis distinct, bearing one seta and two spines; endopodite two-segmented with a large pore on the first segment and two setae on the second one.

P3 (Fig. 15i) with three-segmented exopodite and two-segmented endopodite; the latter smaller than the exopodal ramus; exopodal spines armed with short spinules. P4 (Fig. 15k) protopodal components and endopodite not observed, hidden behind the preceding leg; exopodite three-segmented; spines on the first and second segment and proximalmost spine of the third segment armed with short spinules; distal exopodal spine of the ultimate segment as long as the proximal one but set with long spinules; inner seta of ultimate segment 2.5 times as long as the outer spines.

P5 (Fig. 15j) with an ovate exopodite and a baseoendopodite reaching beyond the middle of the exopodal segment; inner baseoendopodal spines with long and slender spinules; surface of the rami smooth except for a short row of spinules near the articulation of the exopodite.

Male (holotype) with a more slender facies; length as in the female: 430 μm .

Integumental structures: dorsal integument of all body segments pitted as in the female; ventral surface of the abdominal segments furnished with curved rows of long spinules; integument between the spinules striated, as illustrated for the third abdominal segment in Fig. 14c; posteroventral margins of the abdominal segments spinulose and hairy.

Furcal rami, antenna and mouthparts as in the female. Antennule (Fig. 15b) seven-segmented with identical processes and integumental structures on the first and second segment.

P2 (Fig. 15e) showing the typically transformed seta on the second endopodal segment; outer seta of the endopodite as long as the transformed part of the inner one.

P3 (Fig. 15f) exopodite bearing spines set with long spinules; endopodite with the transformed upper part, showing no inner fragile seta.

P4 (Fig. 15g) without endopodite; exopodite three-segmented; outer spine of the first exopodal segment the longest; outer distal spine of the ultimate segment slightly shorter than the proximal spine.

P5 (Fig. 15l) with a wide baseoendopodal ridge; exopodite small, bearing three feathered setae.

VARIABILITY

One of the female paratypes has aberrant antennulae (Fig. 15d) being only four-segmented and showing no hook-shaped thorn on the second segment. The aberrant antennulae exhibit a remarkable resemblance with the antennulae known in the first copepodid stage of *G. biarticulata* (see Fig. 21a).

Fig. 15. — *Galapalaophonte carolinensis* n. sp.: a, P1; b, male antennule, dorsal view; c, first segment of male antennule, ventral view; d, female antennule, aberrant; e, male P2; f, male P3; g, male P4; h, female P2; i, female P3; j, female P5; k, exopodite of female P4; l, male P5.



COMMENTS

G. carolinensis n. sp. differs in many aspects from *G. triarticulata*. The most important features distinguishing the former from its congener are the presence of three setae on the basis of the P2, the chaetotaxy of the P1 exopodite and the short endopodal ramus in the P3.

G. carolinensis n. sp. is easily recognizable among the other species by its unique female genital field which shows remarkable laterally extended structures of the wall. In all the species of the genus known, the receptaculum seminis is a rather slender funnel-shaped structure as illustrated in Fig. 1.

Galapalaophonte chilensis n. sp.

Fig. 1j, 16 - 17

Laophontina triarticulata COULL & ZO, 1980 : MIELKE, 1985 : p. 228-231, fig. 30-31, pl. 4E.

Laophontina triarticulata : FIERS, 1986 : p. 72 [part]; BODIN, 1988 : p. 198 [part].

TYPE MATERIAL

Female, holotype, dissected and mounted on two slides, labeled CHI 140a and b; allotype, dissected and mounted on two slides, labeled 139a and b. Paratypes : 2 females, 20 males and 2 copepodites. The specimens are deposited in the collection of Dr. W. MIELKE, Göttingen.

TYPE LOCALITY

Beach of Isla Maiquillahue, south of Mehuin, Chili (MIELKE, 1985).

FIGURES

All illustrations are of the holotype and the allotype.

DESCRIPTION

The descriptions are based on two dissected specimens kindly lent by Dr. W. MIELKE.

Female (holotype) : regarding the abdomen, facies rather slender; length, 570 μm ; proportional lengths of the body segments unknown.

Integumental structures : cephalothorax pitted except for several ovate smooth areas, forming a symmetrical pattern; pleurotergites clothed with a dense pattern of distinct striae; genital segments with small spiniform processes in the posterior part of the segments; ventrolateral edge of the head and pleural regions of the thoracic

segments with a sharp posteriorly directed extension and with some small, strongly sclerified teeth on the surface; posterodorsal margin of the head straight and hairy, of the other body segments undulate and hairy; ventral surface of the abdominal segments densely striated with longitudinal striae; lateral edges of the abdominal segments rounded, set with spinules (Fig. 16a, d).

Antennule (Fig. 17c) five-segmented with a distinct transversal dorsal slit on the aesthetasc-bearing segment; first segment with thorns on the anterior and posterior margin and on the dorsal surface; second segment with the typical curved hook; integument of the two first segments striated.

Furcal rami : not fully twice as long as wide; dorsal thorn arising distantly anteriorly to the distal margin; one more slender thorn arising on the inner margin; modified part of the inner principal seta nearly 1.5 times as long as the supporting ramus; integument of the rami striated and having long hairs along the outer margin.

Antenna and mouthparts as in *G. pacifica*.

P1 (Fig. 17a) with six setae on the exopodite; coxa striated and furnished with slender spinules; basis with long hairs along the inner margin; first endopodal segment with a spinulose outer margin; second endopodal segment nearly three times as long as wide.

P2 (Fig. 17d) furnished with spinules on the proximal protopodal part; exopodite represented as two armed spines; endopodite two-segmented, bearing two equal setae, apically.

P3 (Fig. 17j) with a three-segmented exopodite and a two-segmented endopodite; the latter not reaching beyond the apical edge of the exopodite; exopodal spines armed with rather long spinules.

P4 (Fig. 17f) with a three-segmented exopodite; inner apical seta 2.5 times as long as the outer spines; distal spine slightly longer than the proximal one; endopodite one-segmented, strongly sclerified and bearing one seta. P5 (Fig. 16c) with a broad endopodal part of the baseoendopodite, striated; endopodal part reaching to the middle of the exopodite; the latter rounded, about 1.5 times as long as broad.

Male (allotype) : length 530 μm , showing the same integumental ornamentation as in the female; ventral surfaces of the abdominal segments set with long spinules, forming a transversal row on the second and third abdominal segments; median parts of the abdominal segments and anal segment densely furnished with a pattern of curved striae.

Antennule (Fig. 17b) seven-segmented, bearing the aesthetasc on the fourth segment; integument of the first two segments striated.

P2 (Fig. 17e) typically transformed; outer distal seta shorter than the transformed part of the inner one.

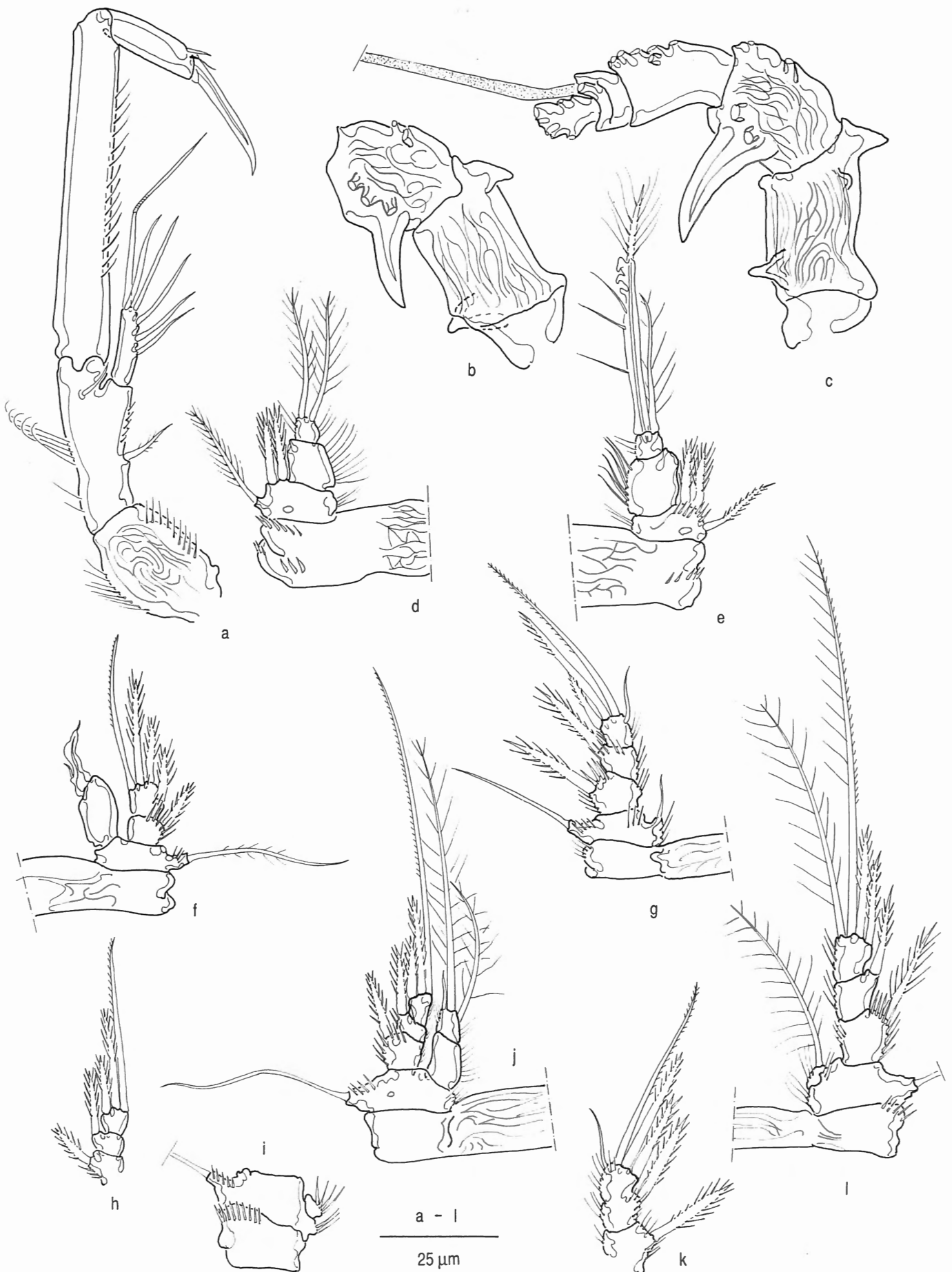
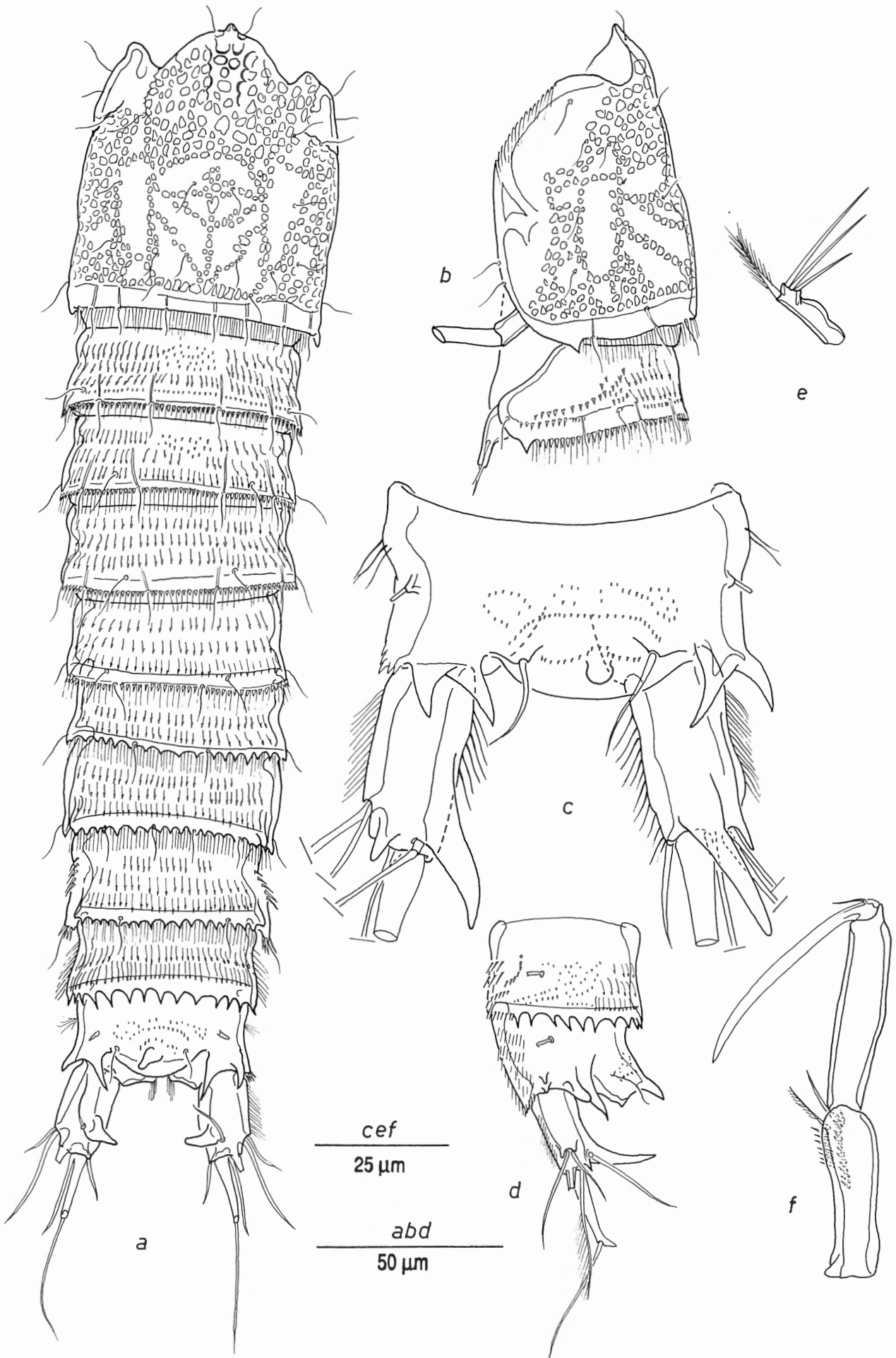


Fig. 17. – *Galapalaophonte chilensis* n. sp.: a, P1; b, first antennular segments of male, dorsal view; c, female antennule, ventral view; d, female P2; e, male P2; f, male P3; g, male P4; h, opposite male P3 exopodite; i, female P4 protopodite; j, female P3; k, opposite male P4 exopodite; l, female P4.



P3 (Fig. 17f, h) endopodal process strongly curved, bearing an inner seta.

P4 (Fig. 17g) with a three-segmented exopodite; inner distal seta of the ultimate exopodal segment short and smooth; endopodite obsolete, represented as a single small and smooth seta.

P5 and P6 as in *G. pacifica*.

VARIABILITY

MIELKE (1985) listed several variable features. Besides these, the present specimens exhibited a two-segmented exopodite in the male P3 and P4 (Fig. 17f, k) and a small seta on an irregularly shaped endopodal segment in the female P4 (Fig. 17i).

DISTRIBUTION

G. chilensis n. sp. is known from two localities along the Chilean coast : Isla Maiquillahue and Vina del Mar, Renaca (MIELKE, 1985).

Galapalaophonte biarticulata n. sp.

Fig. 1f, 18 - 21

TYPE MATERIAL

Holotype : 1 dissected female, COP 2390; allotype, dissected, COP 2391; paratypes : 2 females, 1 male, in alcohol, COP 2391. Deposited in the collections of the K.B.I.N., collection reg. no. : IG. 27588.

TYPE LOCALITY

Guadeloupe, Grande Terre : Anse de la Gourde. Interstitia. Leg. J. RENAUD-MORNANT & N. GOURBAULT, April 14, 1979 (full description in RENAUD-MORNANT & GOURBAULT, 1981 : stat. 6, prél. 46)

ETYMOLOGY

The specific name *biarticulata* refers to the two-segmented exopodite of the P3.

FIGURES

Holotype : Fig. 18a-f; Fig. 19a-c, e, f; Fig. 20a-e; allotype : Fig. 19d, g, h; Fig. 20f-h; paratype (female) : Fig. 20i; paratypes (juveniles) : Fig. 21.

ADDITIONAL MATERIALS

Guadeloupe, Grande Terre : Porte d'Enfer (Stat. 3, prél. 56, April 17, 1979 : COP 3240); Le Moule (Stat. 4, prél. 27, April 9, 1979 : COP 3241); Martinique : Les Anses d'Arlets (Stat. 14, prél. 31, February 23, 1981). Full descriptions of the stations in RENAUD-MORNANT & GOURBAULT, 1981 (Gouadeloupe); 1983 (Martinique).

DESCRIPTION

Female (holotype) : (Fig. 18a, b, c and Fig. 20i) length 320 μm ; body cylindrical; cephalothorax with almost parallel margins, tapering only slightly towards the anterior margin; thoracic and abdominal segments parallel-sided; anal segment extended in strong spiniform thorns on the lateral and dorsolateral edges; anal operculum with a blunt median thorn; furcal rami somewhat longer than twice the width, having a strong upwards directed spinule in front of the dorsal seta and arising close to the distal margin of the ramus; inner principal furcal seta with a proximal basal part as long as the supporting ramus.

Integumental structures : cephalothorax with pitted integument except for some smooth areas, forming a symmetrical pattern; thoracic and abdominal pleurotergites clothed with cuticular ribs running into small upwards directed spinules; this pattern becomes less dense and even disappears on the ventrolateral surface; posterior margin of the cephalothorax straight, set with hairs only; posterior margins of the thoracic segments furnished with small teeth and long hairs; margins of the abdominal segments crenulate; third abdominal segment without hairs; anal segment with some spare minute spinules arranged in an irregular pattern; ventral surface of the abdominal segments covered with transversal rows of teeth; ventral frill toothed and hairy; dorsal surface of the furcal rami smooth but hairy along the margins and spinulose on the ventral surface.

Rostrum (Fig. 19e) broad, triangular with a prominent tip; surface pitted.

Antennule (Fig. 19a) six-segmented; first and second segment striated; first segment with three extensions : one dorsal, one antero-apical and one in the proximal third of the posterior margin; aesthetasc implanted on the fourth segment; fifth segment rather small.

Antenna (Fig. 19b and c) and mouthparts (Fig. 18e and f) as in *G. pacifica*.

P1 (Fig. 20a) : coxa and basis set with spinules along the outer margin; exopodite one-segmented, bearing four lateral and two apical setae; endopodite about 5.5 times as long as wide; second endopodal segment two times

◁ Fig. 18. – *Galapalaophonte biarticulata* n. sp. : a, female habitus in dorsal view; b, cephalothorax and second thoracic segment in lateral view; c, anal segment and furcal rami in dorsal view; d, idem, in lateral view; e, mandibular palp; f, maxilliped.

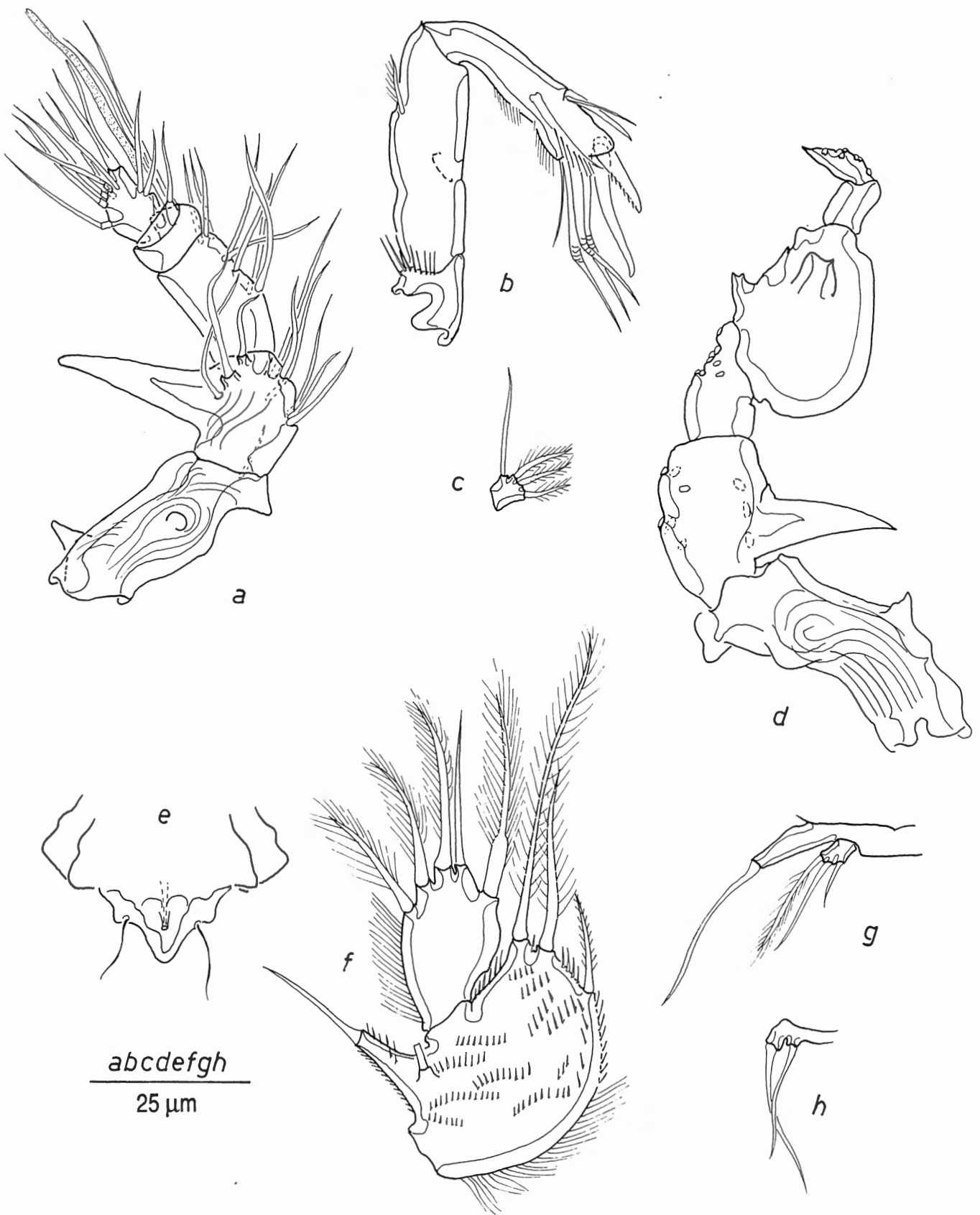


Fig. 19. – *Galapalaophonte biarticulata* n. sp.: a, female antennule, in dorsal view; b, antenna; c, exopodite of the antenna; d, male antennule, ventral view; e, rostrum, ventral view; f, female P5; g, male P5; h, male P6.

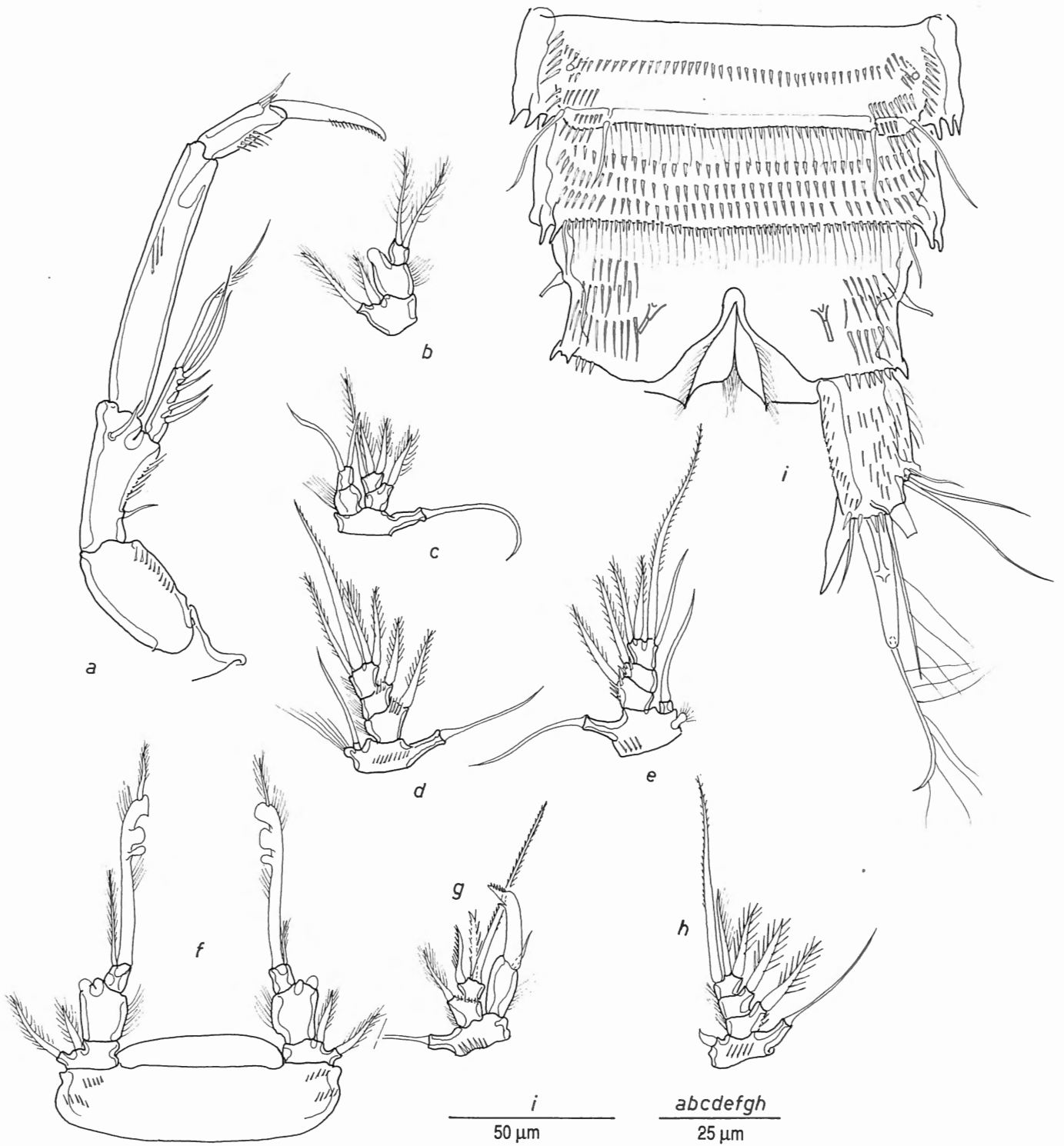


Fig. 20. – *Galapalaophonte biarticulata* n. sp.: a, P1; b, female P2; c, female P3; d, female P4; e, idem of another specimen; f, male P2; g, male P3; h, male P4; i, ultimate abdominal segments of the female, in ventral view.

as long as wide and bearing an armed claw, a small seta and some small spinules.

P2 (Fig. 20b) : exopodite vestigial, represented as one seta; endopodite two-segmented without setae on the first segment and with two apical ones on the second segment; first endopodal segment with a large pore on the outer apical edge.

P3 (Fig. 20c) : exopodite and endopodite two-segmented.

P4 (Fig. 20d and e) : exopodite three- and endopodite one-segmented; endopodal segment very small, represented as a subquadrate socle bearing a smooth seta.

P5 (Fig. 19f) : baseoendopodite with several rows of teeth and furnished with long hairs along the proximal inner margin; three baseoendopodal setae; exopodite ovate, reaching far beyond the apical margin of the baseoendopodite and bearing five setae, the apicalmost slender and smooth; exopodal surface smooth, outer margin hairy.

Male (allotype) : length 300 μm ; habitus as in the female except for the free genital segments; dorsal integumental structures as in the female; ventral surface of the abdominal segments densely clothed with long and slender spinules; anal segment largely smooth ventrally, showing some slender spinules near the ventral pore orifice. Antennule (Fig. 19d) : first and second segment as in the female; third to sixth segments forming a chirocer apparatus.

P2 (Fig. 20f) exopodite represented as a single seta; endopodite transformed as in *G. pacifica* but outer seta on the second segment at the most half as long as the transformed one.

P3 (Fig. 20g) exopodite two-segmented; second endopodal segment transformed in an externally directed hook furnished with minute spinules near the tip and having a slender seta; first endopodal segment reaching beyond the exopodite.

P4 (Fig. 20h) exopodite three-segmented; endopodite represented as a small curved hyaline process; distal exopodal spine of the ultimate segment as long as the proximal one.

P5 (Fig. 19g) baseoendopodite represented by a transversal strip, without setae; exopodite having three setae.

VARIABILITY

In the pattern of integumental structures, in the dimensions of the P4 endopodite and in the length of the outer seta on the second endopodal segment of the male P2.

COPEPODID DEVELOPMENT

First copepodid.

Habitus (Fig. 21a) : body with five somites, length 175 μm ; cephalothorax parallel-sided; rostrum as in the adult; first, second and third thoracal segments distinct;

anal segment with dorsolateral extensions; anal operculum with a median thorn; furcal rami twice as long as wide; outer margin somewhat globulose in the distal half; dorsal thorn present; lateral, dorsal, principal and outer apical setae present; inner apical one absent; additional dorsal seta present; integument spinulose; hyaline frill of the somites milled; ventral surface of the anal segment with a transversal row of long and sharp spinules.

Antennule (Fig. 21c) three-segmented; first segment about three times as long as wide; inner extension present, outer apical one only slightly visible; second segment short, bearing the aesthetasc; ultimate segment as in the adult.

Antenna and mouthparts as in the adult.

P1 (Fig. 21b) : coxa present and sub-quadrate; basis with the external seta only; exopodite one-segmented bearing an adult chaetotaxy; endopodite one-segmented with convex margins; second segment already distinct; endopodal claw strong and smooth; apical seta as long as the claw.

P2 (Fig. 21) protopodite fused with the somite; exopodite represented as one seta; endopodite represented as a bulbous outgrowth bearing one seta.

P3 (Fig. 21) protopodite fused with the somite; exopodite represented as a seta; endopodite as a small protuberance.

Second copepodid.

Body with six somites; antennule (Fig. 21d) three-segmented; first segment with posterior, dorsal and antero-apical extensions; second segment almost as long as the former; antenna and mouthparts as in the adult.

P1 as in the adult : endopodite two-segmented; apical seta smooth and short.

P2 (Fig. 21) as in the first copepodid; P3 (Fig. 21) : exopodite somewhat protruded, bearing three setae; endopodite represented as a single seta. P4 (fig 21) is a small socle with the basal seta and an additional one.

Third copepodid.

Body with seven somites; antennule four-segmented; first segment as in the adult, second one still small but with a posterior thorn.

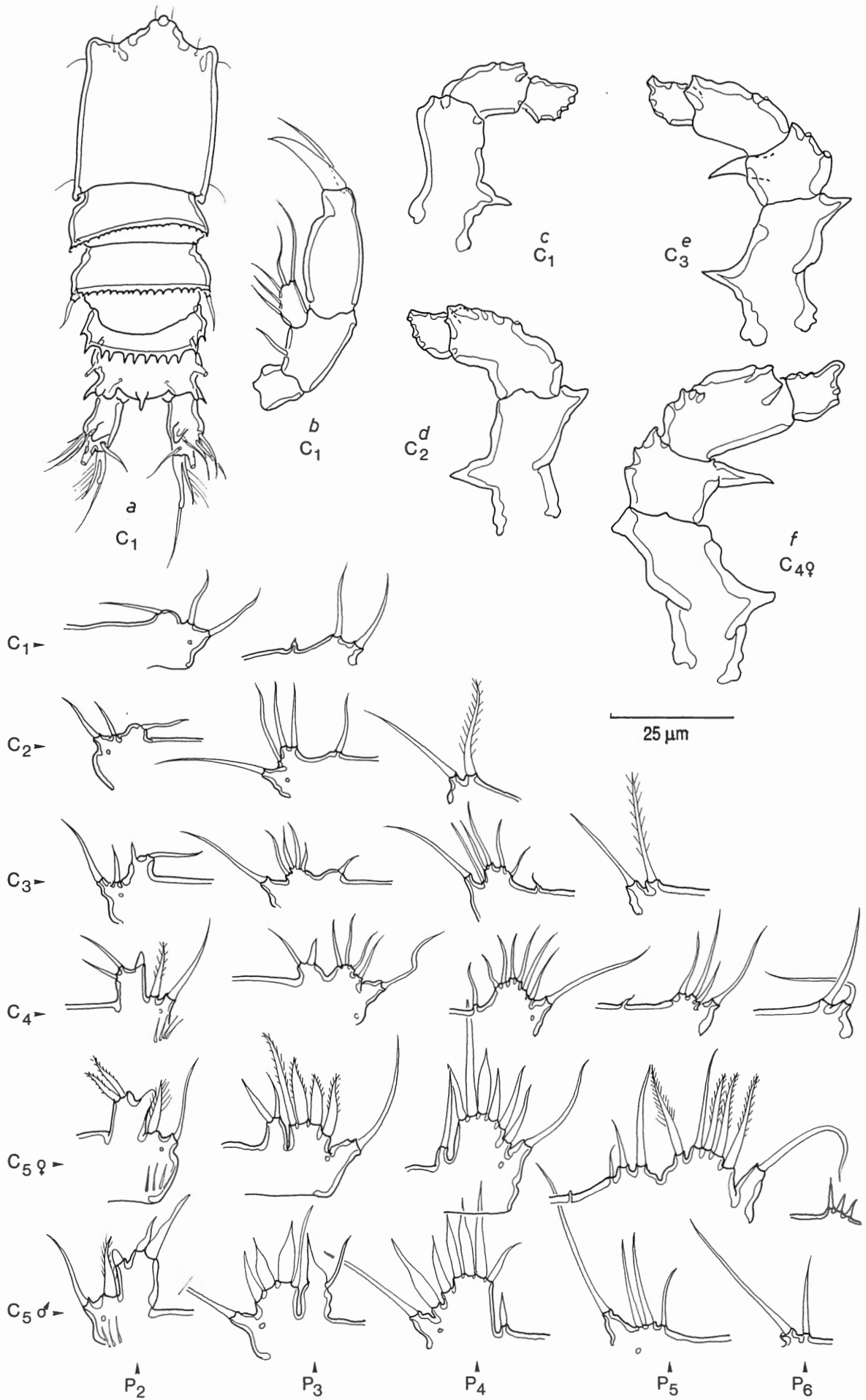
Antennule (Fig. 21e) four-segmented : first segment as in the preceding stage; second segment with a distinct thorn on the posteriorly directed margin.

P2 (Fig. 21) endopodite more extended but still fused with the protopodite bearing one seta and a small hyaline structure.

P3 (Fig. 21) : rami still represented as small bumps, exopodite with three setae and endopodite with one.

P4 (Fig. 21) : exopodite represented as a bump having four setae; endopodite represented as a small hyaline structure.

P5 (Fig. 21) as the P4 in the third copepodite.



Fourth copepodid.

Body with eight somites; antennule (Fig. 21 f) nearly as in the adult but second segment still having a smaller thorn and third, fourth and fifth still fused.

P2 (Fig. 21) endopodite sub-quadrated, still fused with the protopodite, bearing two setae and an outer tubular pore.

P3 (Fig. 21) : exopodal bump with four setae, endopodal one with two setae.

P4 (Fig. 21) exopodal extension larger, bearing six setae; endopodite represented as a seta.

P5 (Fig. 21) exopodal extension with three setae, endopodite represented as a small hyaline structure.

P6 (Fig. 21) symmetrical and represented as two setae.

Fifth copepodid (female).

Body with nine somites; antennule as in the adult but with smooth integument.

P2 (Fig. 21) endopodite still fused with the protopodite; appendages as in the former stage.

P3 (Fig. 21) rami as in the former copepodid but somewhat larger and bearing stronger setae.

P4 (Fig. 21) rami and number of appendages as in the fourth copepodid but larger and bearing stronger setae.

P5 (Fig. 21) exopodal and endopodal bumps with five and three setae respectively; apicalmost exopodal seta smooth.

P6 (Fig. 21) symmetrical and situated along the postero-ventral side of the seventh somite; represented as three small and smooth setae.

Fifth copepodid (male).

Body as in the female; antennule as in the female but with a much broader third segment.

P2 (Fig. 21) endopodal setae smooth and rather irregular in shape.

P3 (Fig. 21) : exopodal expansion with four setae, the outer ones swollen; endopodite with one seta; outer apical edge extended into a hyaline sharp process.

P4 (Fig. 21) : almost as in the female but with a smaller endopodal seta implanted on a small elevation.

P5 (Fig. 21) : exopodite not extended, bearing three setae; baseoendopodite without setae.

P6 (Fig. 21) : symmetrical, adult plates not differentiated, bearing two long and smooth setae.

DISCUSSION

The present species is mainly distinguished from the other members of the genus by the presence of a two-segmented exopodite P3 and the presence of a single seta on the P4 endopodite. Other differences are the

strongly reduced chaetotaxy of the endopodite of P4 in the female and the long P3 endopodal segment bearing a long transformed second segment furnished with spinules on its apical edge.

DISTRIBUTION

G. biarticulata n. sp. is known from three localities in Guadeloupe and from one station in Martinique.

Galapalaophonte antillensis n. sp.

Fig. 1g, 22

TYPE MATERIAL

Holotype : one dissected male labeled COP 2387; allotype : one dissected female, labeled COP 2388; paratypes : seven females preserved in alcohol, COP 2389. Deposited in the collections of the K.B.I.N., collection reg. no. : IG. 27588.

TYPE LOCALITY

Guadeloupe, Grande-Terre : Porte d'Enfer. Interstitia. Leg. J. RENAUD-MORNANT & N. GOURBAULT, April 17, 1979 (full description in RENAUD-MORNANT & GOURBAULT, 1981 : stat. 3, prel. 56).

ETYMOLOGY

The specific name refers to the island arc where the species was found.

FIGURES

Holotype : Fig. 1g, 22c, e-h; allotype : Fig. 22a, b, d, i-l.

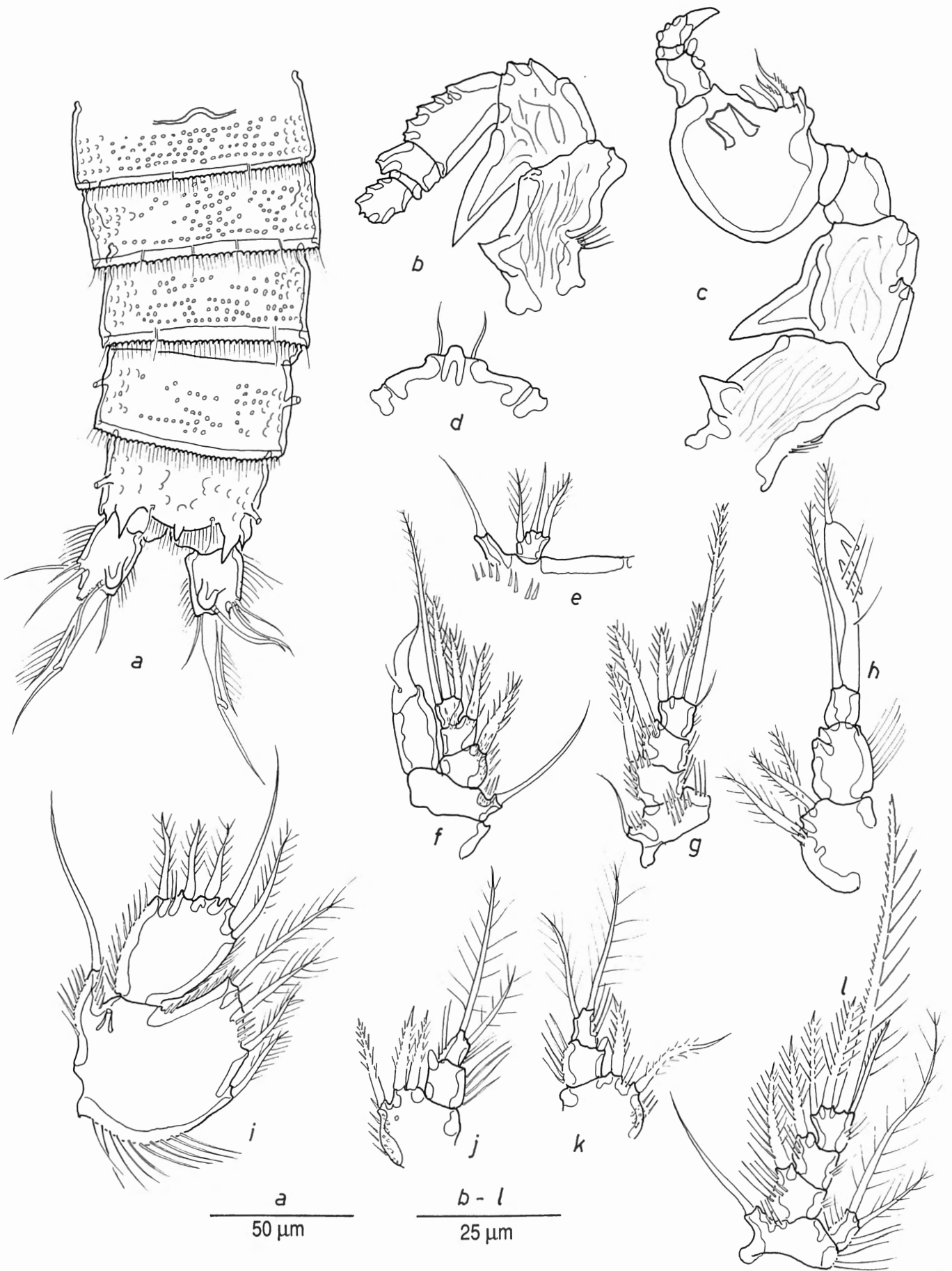
ADDITIONAL MATERIALS

Guadeloupe, Grande Terre : Anse Laborde. Interstitia. Leg. J. RENAUD-MORNANT & N. GOURBAULT, April 17, 1979, COP 3243. Full description in RENAUD-MORNANT & GOURBAULT (1981 : stat. 2, prel. 54).

DESCRIPTION

Female (holotype) : Body (Fig. 22a) cylindrical with a parallel-sided cephalothorax and thorax; length, 246-295 μm ; genital and abdominal segments without marked posteriorly prolonged lateral edges; abdominal somites slightly tapering towards the anal segment.

◁ Fig. 21. – *Galapalaophonte biarticulata* n. sp. : a, habitus of the first copepodid; b, P1 of first copepodid; c-f, antennule of first, second, third and fourth copepodid, respectively; remaining figures : copepodid development of the legs : columns representing the legs 1-6, rows representing the copepodid stages.



Integumental structures : integument of the somites pitted, pattern irregular, showing large smooth areas on the abdominal segments; anal segment with some sparse incomplete pitted; posterior margins of the thoracic and abdominal segments milled and hairy; ventral surface of the genital segments striated; of the other abdominal segments clothed with long and fragile spinules; anal segment smooth medially but having long spinules around the ventral pore orifice.

Furcal rami only slightly longer than wide and with rather convex lateral margins; dorsal thorn blunt, arising close to the middle of the dorsal surface; principal furcal seta with proximal modified part 1.5 times as long as the supporting ramus; dorsal surface smooth, ventral surface and margins densely set with long hairs.

Rostrum (Fig. 22d) slightly prominent with a small protruded tip.

Antennule (Fig. 22b) six-segmented, typical for the genus; posterior hook on the second segment broad at base, almost as broad as the length of the entire segment; dorsal integument of the first two segments striated.

Antenna and mouthparts as in *G. pacifica*.

P2 (Fig. 22j) : basis with an outer feathered seta; exopodite represented by two setae; endopodite two-segmented with a large hyaline tube on the outer distal edge of the first segment and with two setae on the second one.

P4 (Fig. 22l) : closely resembling the P4 of *P. pacifica*; sub-apical outer spine of the third exopodal segment as long as the proximal one; inner apical seta shorter than the outer spines.

P5 (Fig. 22i) : general appearance as in *P. pacifica* but without spinules on the surface of the baseoendopodite. Male : habitus as in the female except for the free genital segments; length 240 μm .

Integumental structures as in the female, dorsally; ventral surface of the abdominal segments with long spinules, arranged in transversal rows.

P2 (Fig. 22h) : basis and exopodal seta as in the female; endopodite two-segmented; first endopodal segment with an outer distal hyaline tube, second segment with a long modified seta, having two blunt processes and running out into a finely feathered seta; outer seta reaching beyond the modified part of the inner seta.

P3 (Fig. 22f) : basis as in the female; exopodite three-segmented with one outer spine on the first and second segment and three spines on the last segment; endopodite one-segmented, having a modified hook-shaped seta, curved with a fine tip, and a very fragile setule.

P4 (Fig. 22g) : basis as in the female; endopodite absent; exopodite three-segmented, bearing one outer spine on the first two segments and three spines and a very slen-

der inner seta on the last one; outer spine on the second segment large; outer apical spine on the third segment longer than the proximal one.

P5 (Fig. 22e) : baseoendopodite represented as a slender transversal band, without endopodal setae; exopodite quadrate, having three setae.

VARIABILITY

Except for the pattern of pitted on the integument of the somites (which is highly variable but never as dense as in *G. triarticulata* or *G. pacifica*) variability is only observed in the P2 of the holotype. In this specimen the right leg bears two setae representing the vestigial exopodal ramus, whereas the left exopodite is represented by a single seta.

DISCUSSION

The short, slightly bulbous furcal rami, the massive thorn on the antennule and the shape of the female genital field are the most salient features distinguishing clearly *G. antillensis* n. sp. from all other species in the genus.

DISTRIBUTION

The present species is known from two localities in Guadeloupe.

Genus *Amerolaophontina* n. gen.

DIAGNOSIS

Female :

Habitus cylindrical, slightly depressed; body segments pitted dorsally; anal operculum with medially an upwards-directed spiniform process and anal segment with large thorns near the anal region; furcal rami with a upwards-directed thorn in front of the dorsal seta; principal inner seta thickened in anterior half; genital field with one seta on the P6 vestiges; copulatory pore situated posteriad the transversal ridge; antennule with blunt processes on the first segment and a long curved hook-shaped process on the second one; six-segmented; antenna with allobasis, bearing a one-segmented exopodite with four elements; exopodite P1 one-segmented; terminal endopodal segment P1 with a claw, a little spine and a small seta; rami of P2 obsolete; exopodite P3 and P4 present but endopodites vestigial, represented by a single seta; P5 with four baseoendopodal setae at the most and five exopodal setae; one exopodal seta smooth.

◁ Fig. 22. — *Galapalaophonte antillensis* n. sp. : a, female abdomen in dorsal view; b, female antennule in ventral view; c, male antennule in ventral view; d, rostrum; e, male P5; f, male P3; g, male P4; h, male P2; i, female P5; j, female P2; k, female P2, opposite side; l, female P4.

Table V :

Chaetotaxy of the species of *A. reducta*.

	P2		P3		P4		P5	
	exo	end	exo	end	exo	end	exo	end
Female	2	—	022	1	0-0-022	1	5	3(4)
Male	2	—	022	1	0-0-012	0	3	0

Male :

Antennule chirocer; P4 without endopodal setae; baseoendopodite P5 without inner setae, exopodite with three setae.

TYPE-SPECIES

Laophontina reducta COULL & ZO, 1980, here designated, monotypic.

ETYMOLOGY

The generic name refers to the type-region (America) of the only species presently known. The gender is feminine.

DISCUSSION

The new genus *Amerolaophontina* is defined to accommodate *Laophontina reducta* COULL & ZO. It is obvious that this species has many features in common with the species of the genus *Galapalaophonte*. However, there are several reasons to exclude *L. reducta* from *Galapalaophonte* and to place it in a separate genus.

The genus *Galapalaophonte* is characterized by the presence of endopodal rami in P2-P4. *Laophontina reducta* lacks entirely the endopodite in P2 and bears no endopodal segments in P3 and P4. Endopodites in P3 and P4 are obsolete and represented by a single seta only.

Of more importance are the displayed sexual dimorphic characteristics. In *Galapalaophonte* male dimorphic features include remarkable transformations of the endopodal setae in P2 and P3. Such marked structures are not present in *L. reducta* males. In contrast, the male P3 endopodite in *L. reducta* tends to be much smaller than its female homologue.

The strongly reduced rami and the absence of marked dimorphic structures in the male, are features characteristic for the genera *Laophontina* and *Wellsiphontina*. However, it seems more reasonable to assume that *L. reducta* is branched off from a common ancestral stock it shared with *Galapalaophonte*. As such, the above

discussed differences are considered as evolutionary novelties allowing the erection of a separate genus, *Amerolaophontina* n. gen. for this species.

***Amerolaophontina reducta* (COULL & ZO, 1980)**

Fig. 11, 23 - 24

Laophontina reducta n. sp. : COULL & ZO, 1982 : p. 41-42, fig. 5-6; WELLS, 1981 : p. 10; FIERS, 1986 : p. 71; BODIN, 1988 : p. 198.

TYPE MATERIAL

One female holotype, mounted in toto (U.S.N.M. reg. no. : 173458, Acc 338041); paratypes : two females and two males, mounted in toto (U.S.N.M. reg. no. : 173459, Acc 338041).

TYPE LOCALITY

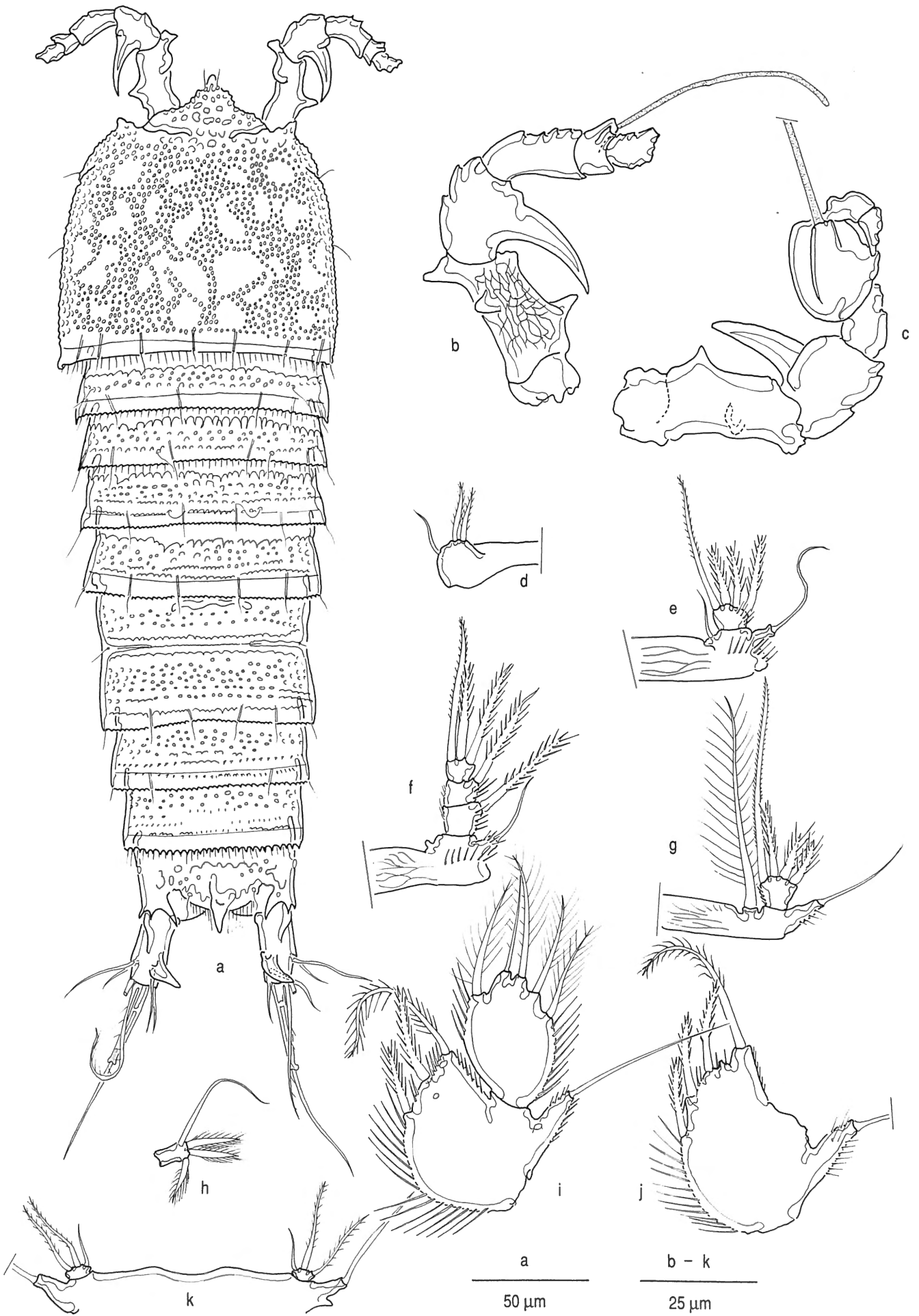
South-eastern United States continental shelf (32° 16' N 79° 25' W), at 43 m depth in sediments with median grain size of 0.45 mm (COULL & ZO, 1980).

DESCRIPTION

Female (holotype) : habitus resembling *Galapalaophonte* closely (Fig. 23a); length of the cephalothorax slightly inferior to one third of the entire body length; largest width near the posterior margin of the cephalothorax; thoracic region parallel-sided; genital and abdominal segments tapering posteriad; ventro-lateral edges of the genital and abdominal segments slightly protruded posteriad, spinulose.

Integumental structures : all body segments more or less densely pitted; cephalothorax with a symmetrical pattern of smooth areas; thoracic and abdominal segments showing undulating transversal ridges anteriorly and/or posteriorly; dorsal integument of the second and third abdominal segments clothed with some minute spinules in the posterior half; posterior margin of the cephalotho-

Fig. 23. — *Amerolaophontina reducta* (COULL & ZO) : a, female habitus, in dorsal view; b, female antennule in dorsal view; c, male antennule in ventral view; d, female P2; e, male P3; f, male P4; g, female P3; h, exopodite of antenna; i, female P5; j, baseoendopodite P5 of a paratypic female; k, male P5. ▷



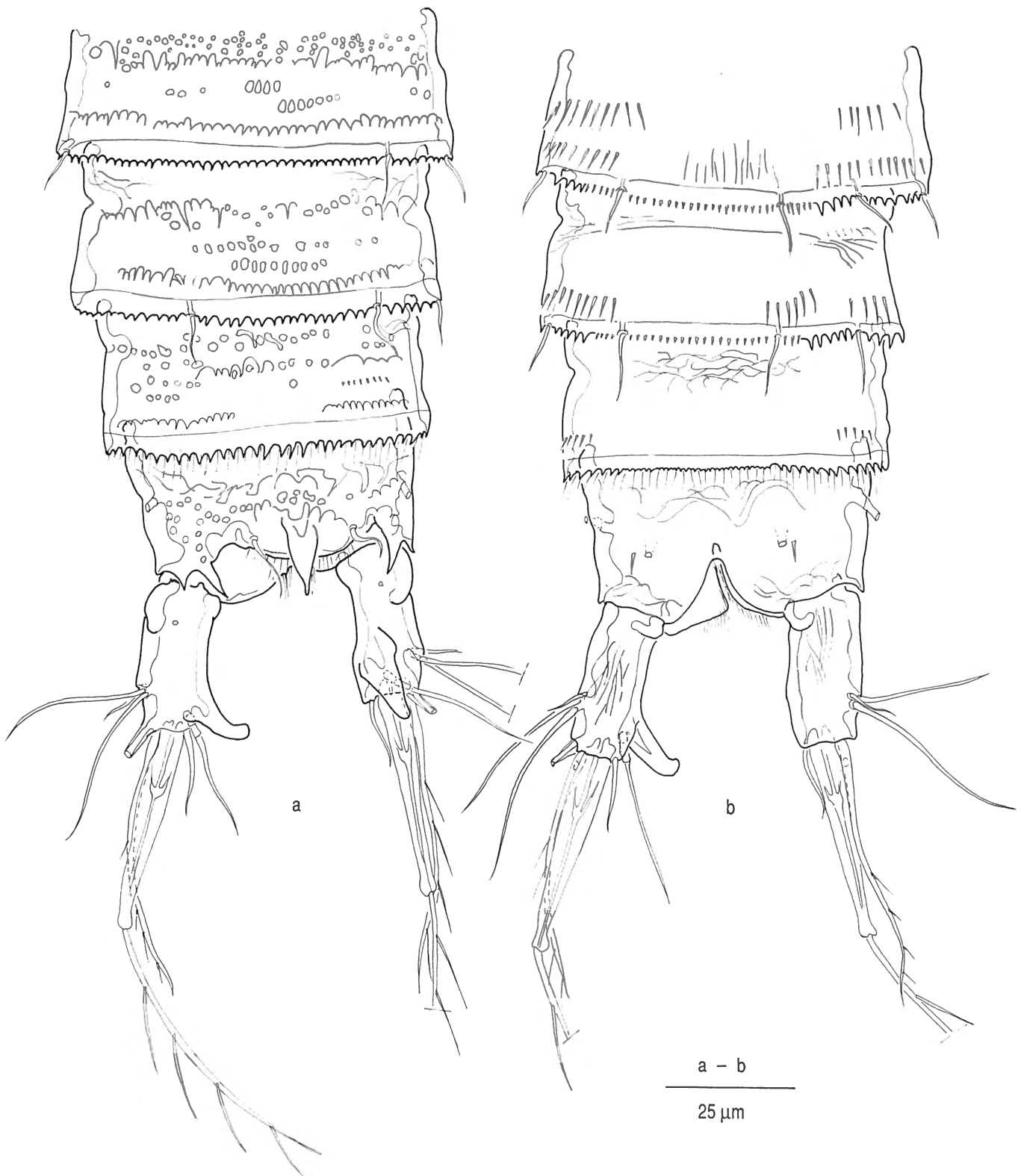


Fig. 24. – *Amerolaophontina reducta* (COULL & ZO) : a, male abdomen in dorsal view; b, male abdomen in ventral view.

rax straight and hairy; posterior margin of the other segments undulated without hairs except for the pre-anal segment; ventral surface of the genital segments smooth, of the abdominal segments with a few, hardly visible, longitudinal striae; postero-ventral margin of the genital segment and second abdominal segment set with slender spinules; pre-anal segment furnished with hairs along the postero-ventral margin; anal segment pitted dorsally, smooth ventrally; operculum with a large dorsally directed median spiniform process.

Furcal rami slightly longer than twice the width, cylindrical in dorsal view; spiniform process arising in the distal half of the ramus; outer margin with a thickened ridge in the anterior half; integument smooth except for some striae on the ventral surface; proximal part of the principal inner seta longer than the supporting ramus.

Antennule (Fig. 23b) five-segmented with aesthetasc arising from the fourth segment; first segment with two processes along the anteriorly directed margin and one process in the middle of the posteriorly directed margin; dorsal integument of the first segment striated; ventral integument of the latter and integument of the other segments smooth.

Antenna, mouthparts and P1 as in *Galapalaophonte pacifica*. P2 (Fig. 23d) represented as a small elevation at either end of the intercoxal plate and bearing three setae: outer one smooth, median and inner ones setulose; P3 (Fig. 23g) with a one-segmented exopodite and a vestigial endopodite; protopodal components not distinct; P4 as P3 but with a three-segmented exopodite; chaetotaxy in table V.

P5 (Fig. 23i) with a rounded exopodite, extending far beyond the baseopodite; the former with five setae, the latter with three; margins of the rami set with slender fragile spinules; surface smooth.

Male: facies resembling the female habitus closely; abdominal region more parallel-sided than the female (Fig. 24a).

Integumental structures as in the female, dorsally; ventral surface of abdominal segment (Fig. 24b) with some rows of slender spinules laterally; median surface nearly smooth, showing some hardly visible striae; postero-ventral margins of the second and third abdominal segments furnished with minutes spinules medially, of the pre-anal segment undulated; the former hairless, the latter set with fragile hairs; ventral surface of the anal segment largely smooth except for some striae in the anterior half and near the articulation of the furcal rami; margin near the furcal rami without spinules.

Antennule (Fig. 23c) six-segmented, chirocer; dorsal surface of the first segment clothed as in the female; ventral surface and surfaces of the other segments smooth.

P2 as in the female; P3 (Fig. 23e): inner exopodal and endopodal seta shorter; the former set with minute setules, the latter smooth; P4 (Fig. 23f) with four elements on the third exopodal segment: three large spines and

a minute inner seta; endopodite vestigial, probably represented by a small elevation of the inner margin of the basis; endopodal seta absent.

P5 (Fig. 23k) with undifferentiated baseopodite; exopodite less high than wide, bearing three setae.

VARIABILITY

One female paratype exhibits four baseopodite setae on a P5 (Fig. 23j). The opposite leg bears the normal configuration as described for the holotype. The right antennule of another female paratype is six-segmented, showing two segments beyond the aesthetasc-bearing segment instead of one as in the holotype.

DISTRIBUTION

A. reducta is known from the type-region only. This species was encountered in six samples from the South Carolina continental shelf at depths ranging from 0 to 200 m (COULL & ZO, 1980).

Conclusions

Recently, HICKS (1988) stressed the need of an in-depth revision of the genus *Laophonte* arguing that reassessment of the diagnostic significance of the features generally accepted in generic diagnoses will result in the definition of many more genera. In an attempt to revise the family (FIERS, 1988) the importance of several unique characteristics became recognized. The present paper, representing only a small part of the revision, clearly illustrates that many laophontid genera, if not all, have to be critically re-evaluated.

The division of the genus *Laophontina sensu* COULL & ZO in four different genera is based on several characteristics which rarely or never have been used as genus diagnostic features within the Laophontidae. The salient features of the four genera, discussed throughout the paper, are briefly summarized in table VI making quick reference more easily.

On the basis of several characteristics i.e. genital field, integumental structures, ornamentation of the anal operculum and P5 chaetotaxy, two lines appear within this group of genera: *Laophontina-Wellsiphontina* and *Galapalaophonte-Amerolaophontina*. Morphologically clearly distinguishable, the question remains if both branches shared a common ancestor or evolved independently from two distinct stocks.

At first sight, the general appearance and the comparable reductions of the legs indicate a common origin. However, there are several indications that both groups have a separate history. Of peculiar interest in this discussion is a single juvenile specimen (male, fifth copepodid) recently found in samples from the Seychelles.

Briefly, the juvenile specimen is characterized by the following features (see Fig. 25):

Table VI :
Comparison of the studied genera.

	<i>Laophontina</i>	<i>Wellsiphontina</i>	<i>Galapalaophonte</i>	<i>Amerolaophontina</i>
Body facies	cylindrical	cylindrical	depressed	depressed
Integument				
cephalothorax	striated	striated	pitted	pitted
Female P5 exo	2 smooth set.	all furnished	1 smooth set.	1 smooth set.
Gonopore	anteriad	anteriad	posteriad	posteriad
Anal oper.	denticulate	denticulate	median thorn	median thorn
P2 exopodite	absent	present	absent	absent
male P2 end	+ small hyaline structure, at the most reduced	unmodified	long modified outer seta	unmodified
male P3 end	reduced	unmodified	modified	reduced
male exo ₃ P4	reduced	reduced	as in female	as in female

- Habitus : cylindrical, 550 μm long; integument of the head striated, of the other segments spinulose; anal operculum denticulate; anal segment having a set of four mediodorsal strong teeth; furcal rami with two large upwardly directed thorns, in front of the dorsal seta; inner principal furcal seta with a modified proximal part;
- Antennule with processes on the anteriorly, posteriorly and dorsally directed surfaces of the first segment; second segment with a large hook-shaped process;
- P1 with a long one-segmented exopodite which probably will be reorganized in a two-segmented one in the adult stage;
- P2-P3 with one-segmented exopodites and obsolete endopodites; the latter represented by a single seta;
- P5 with a distinct exopodal lobe, bearing three setae; baseoendopodal region without setae.

This specimen was found in a sample from Ile Mahé, Anse Bougainville (east coast). It occurred in the upper sediments of a sand patch between dead coral, at -1 m (leg. Dr. Med. W. WELLENS, K.B.I.N., 11 November 1990). The animal is spirit preserved and labeled COP 3269.

The specimen is undoubtedly related to the genus-group under study and cannot be confused with *Indolaophonte* because of the chaetotaxy of the P5 and the position of the thorns on the furcal rami (FIERS, in prep.). Furthermore, the specimen should not be assigned to *Wellsiphontina* n. gen. since the number of outer exopodal spines in P2 and P3, and the proportional lengths of the P1 exopodite significantly differ and display clear indications that the rami will be at least two-segmented in the adults.

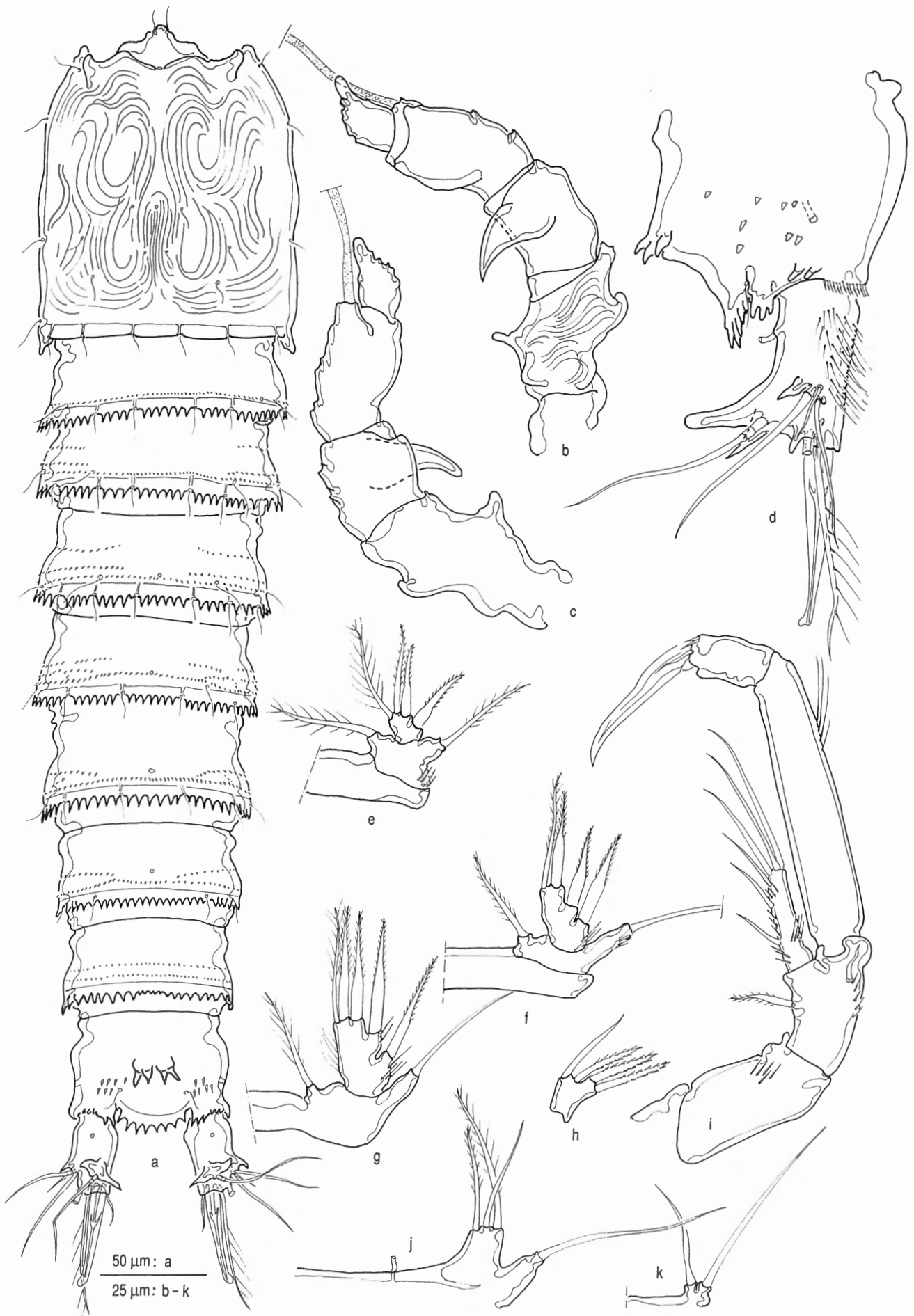
However, the presence of an exopodal segment in the P2 in combination with a striated integument of the head and absence of any indication of sexual dimorphic setae (see Fig. 21 for *Galapalaophonte* juvenile features) in the natatorial legs, suggest a more close relationship to the genus *Wellsiphontina* n. gen. than to the *Galapalaophonte*-*Amerolaophontina* lineage.

As such, it is supposed here that the *Galapalaophonte*-*Amerolaophontina* lineage branched off from a different stock. To which genus or genus-group this branch is most related is not clear yet. The display of sexual dimorphic characteristics in the legs and the presence of a median thorn on the anal operculum may be regarded as indications that the group originated from a stock they shared with *Hoplolaophonte* and/or *Mexicolaophonte*. However, the sexual dimorphic structures of the P3 in both genera are probably not homologous with those transformations found in *Galapalaophonte* males. Moreover, *Hoplolaophonte* as well as *Mexicolaophonte* exhibit a different chaetotaxy in the P5 with six baseoendopodal spines in the female and four exopodal setae in the male. *Galapalaophonte* and *Amerolaophontina* bear respectively, four and three setae/spines on their P5 rami.

FIERS (1986) previously distinguished two geographical species-groups in the genus *Laophontina* sensu COULL & ZO. The distribution pattern of the species and genera as mapped in Fig. 26 clearly illustrates that each of the four genera defined herein occur in a rather restricted part of the world's oceans.

With the allocation of *Laophontina distincta* to the genus *Wellsiphontina* n. gen., the genus *Laophontina* comprises only those species known from the Mediterranean and East-Atlantic (the Boreal-Mediterranean group in

Fig. 25. — *Laophontidae* gen. spec., male copepodid V : a, habitus in dorsal view; b, antennule, dorsal view; c, antennule, ventral view; d, anal segment; e, P2; f, P3; g, P4; h, exopodite of the antenna; i, P1; j, P5; k, P6. ▷



50 μm : a
25 μm : b-k

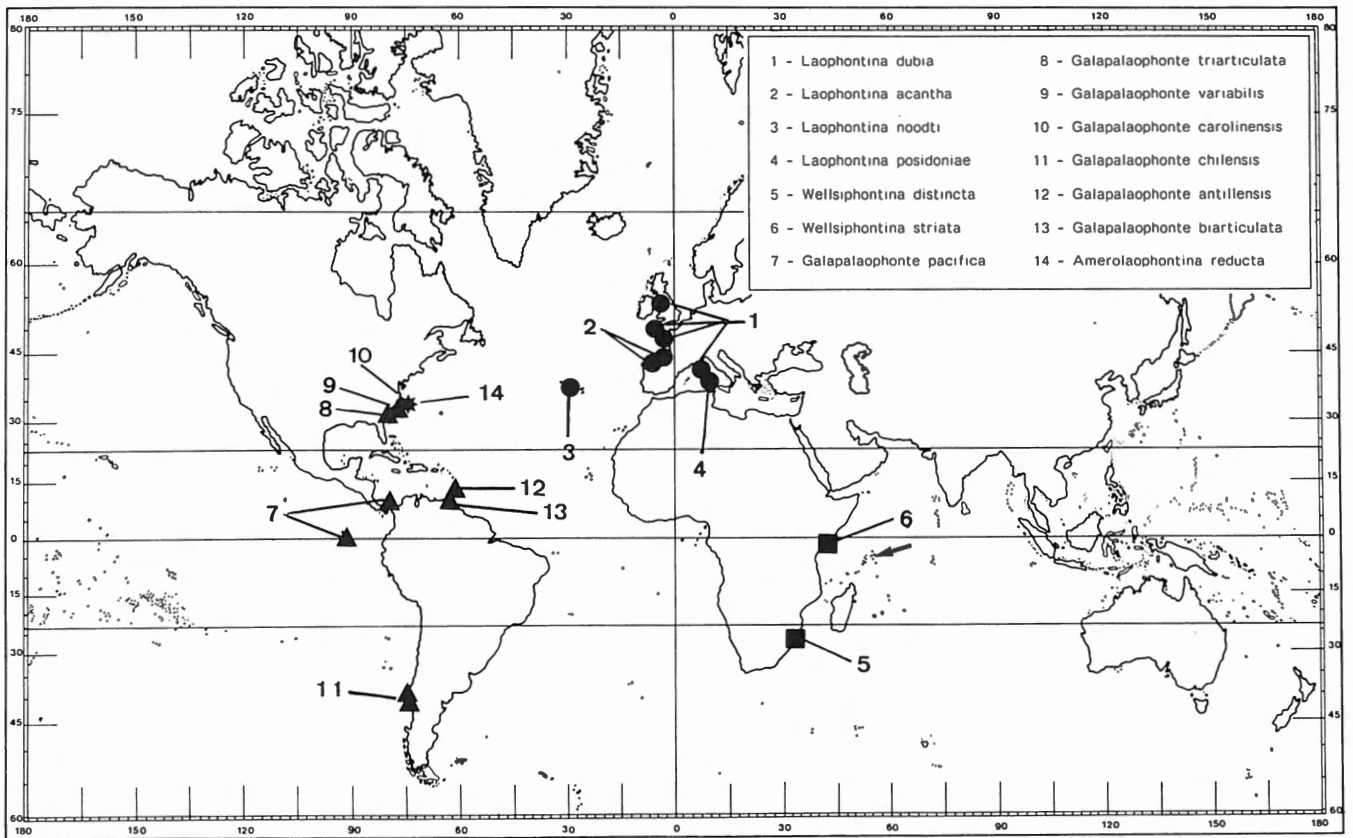


Fig. 26. – Distribution areas of *Laophontina* (●), *Wellsiphontina* (■), *Galapalaophonte* (▲), *Amerolaophontina* (★) and the juvenile specimen, *Laophontina* gen. spec., (arrow).

FIERS, 1986). *Wellsiphontina* n. gen. seems to be indigenous to the western parts of the Indian Ocean. Other representatives of this genus have never been found although over 200 samples from diverse localities in the Indo-West Pacific Region were analysed. As evidenced above, *Laophontina* originated from a *Wellsiphontina*-related group. Regarding the distribution of *Wellsiphontina* n. gen. along the East-African shores, it seems fairly possible that *Laophontina* evolved after the initial closure of the sea-way between the Indian Ocean and the Mediterranean Sea. *Laophontina* clearly is not a recent migrant into the Mediterranean basin (POR, 1975). The wide extension of the distribution area and the species diversity in the genus point to a longer history of this taxon.

The genus *Galapalaophonte* occurs in the southern parts of the East-Pacific, the Caribbean Sea and along the south-eastern coast of North-America. It is assumed that the genus has an East-Pacific origin and became dispersed eastwards into the Caribbean. Thus, *Galapalaophonte* represents a faunal component of the eastern Pacific-Caribbean track (ROSEN, 1976). The absence of representatives of this genus along the West-African coast supports the hypothesis of the East-Pacific origin. Plate tectonics as well as dispersion via continental seas

before the Panama Isthmus was formed may explain the present-day distribution. The presence of the genus along the south-eastern coasts of North-America, apparently resulted from dispersion via the northwards flowing Antilles Current (BRIGGS, 1974).

The genus *Amerolaophontina* n. gen. comprises only one known species and seems to be derived from the *Galapalaophonte* stock. Originally, the species was assigned to the amphi-American species-group. However, regarding the separate generic status of it, we assume here that *Amerolaophontina* is an endemic taxon of this region.

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References

- BODIN, Ph., 1984. Densité de la méiofaune et peuplements de copépodes harpacticoïdes en baie de Douarnenez (Finistère). - *Annales de l'Institut Océanographique*, 60 : 5-17.
- BODIN, Ph., 1988. *Catalogue des nouveaux Copépodes Harpacticoïdes marins*, Université de Bretagne Occidentale, Brest. 288 pp.
- BRIGGS, J.C., 1974. *Marine Zoogeography* i-xi, 1-475 (McGraw-Hill, New York).
- CHAPPUIS, P.A., 1954. Recherches sur la faune interstitielle des sédiments marins et d'eau douce à Madagascar : IV. Copépodes Harpacticoïdes psammiques de Madagascar. - *Mémoires de l'Institut Scientifique de Madagascar*, sér. A, 9 : 45-73.
- COTTARELLI, V., 1977. Mexicolaophonte arganoi n. gen. n. sp. di Laophontidae (Crustacea, Copepoda, Harpacticoida) di acque interstiziali litorali messicane. - *Accademia Nazionale dei Lincei. Problemi attuali di scienza e di cultura, sezione : Missioni ed Esplorazioni*, 171 : 91-99.
- COTTARELLI, V., 1983. Osservazioni sul genere *Laophontina* e descrizione di *Laophontina paradubia* n. sp. (Crustacea, Copepoda, Harpacticoida). - *Fragmenta Entomologica*, Roma, 17 : 1-10.
- COULL, B.C. & ZO, Z., 1980. Revision of *Laophontina* (Copepoda, Harpacticoida), including three new species and a key. - *Transactions of the American Microscopical Society*, 99 : 32-43.
- FIERS, F., 1986. *Laophontina posidoniae* n.sp. from the Gulf of Calvi (Copepoda, Harpacticoida, Laophontidae). - *Vie et Milieu*, 36 (1) : 65-73.
- FIERS, F., 1988. *Taxonomie, Fylogenie en Zoogeografie van de Laophontidae (Copepoda, Harpacticoida)* Vol. 1 : 377 pp, Vol. 2 : 771 pp. Thesis.
- GEDDES, D.C., 1972. The Copepoda Harpacticoida of Anglesey and the North Wales Coast. - *The Naturalist*, Hull. 921 : 61-76.
- GEDDES, D.C., 1982. A redescription of *Laophontina dubia* NORMAN & T. SCOTT (Crustacea, Copepoda, Harpacticoida). *Zoological Journal of the Linnean Society*, 74 : 105-109.
- HICKS, G.R.F., 1988. Harpacticoid copepods from biogenic substrata in offshore waters of New Zealand. 1 : New species of *Paradactylopodia*, *Stenhelia* (St.) and *Laophonte*. - *Journal of the Royal Society of New Zealand*, 18 (4) : 437-452.
- KUNZ, H., 1983. Harpacticoiden (Crustacea, Copepoda) aus dem Litoral der Azoren. *Arquipelago. Revista do Instituto Universitario dos Acores; Ciencias da Natureza*, 4 : 117-208.
- LANG K., 1948. *Monographie der Harpacticiden*. Hakan Ohlsson, Lund, 2 vol. : 1-1682.
- LANG, K., 1965b. Copepoda Harpacticoida from the Californian coast. *Kungliga Svenska Vetenskapsakademiens Handlingar*, 10 (2) : 1-566.
- MIELKE, W., 1981. Interstitielle Fauna von Galapagos XXVIII. Laophontinae (Laophontidae), Ancorabolidae (Harpacticoida). - *Akademie der Wissenschaften und der Literatur, Mainz, mathematisch naturwissenschaftlichen Klasse. Mikrofauna des Meeresbodens*, 84 : 1-104.
- MIELKE, W., 1982. Einige Laophontidae (Copepoda, Harpacticoida) von Panama. *Crustaceana*, 42 : 1-11.
- MIELKE, W., 1985. Interstitielle Copepoda aus dem zentralen Landesteil von Chile : *Cylindropsyllidae*, *Laophontidae*, *Ancorabolidae*. - *Microfauna Marina*, 2 : 181-270.
- MONARD, A., 1927. Les Harpacticoïdes marins de Banyuls. - *Archives de Zoologie Expérimentale et Générale*, 67 : 259-443, figs. 1-48.
- NICHOLLS, A. G., 1941. A revision of the families Diosaccidae Sars, 1906 and Laophontidae T. Scott, 1905 (Copepoda, Harpacticoida). - *Records of the South Australian Museum, Adelaide*, 7 : 65-110.
- NOODT, W., 1955. Copepoda Harpacticoida von Teneriffa (Kanarische Inseln). - *Zoologischer Anzeiger*, 154 (9/10) : 200-222.
- NOODT, W., 1958. Die Copepoda Harpacticoida des Brandungsstrandes von Teneriffa (Kanarische Inseln). - *Akademie der Wissenschaften und der Literatur, Mainz, Abhandlungen der mathematisch naturwissenschaftlichen Klasse*, 2 : 51-116.
- NORMAN, A.M. & T. SCOTT, 1905. Crustacea Copepoda new to science from Devon and Cornwall. - *Annales and Magazine of natural History*, (7) 15 : 284-300. (III-1905).
- NORMAN, A.M. & T. SCOTT, 1906. *The Crustacea of Devon and Cornwall*. London, 1-232, pls. 1-14.
- POR, F.D., 1975. Pleistocene Pulsation and Preadaptation of Biotas in Mediterranean Seas : Consequences for Lessepsian Migration. *Systematic Zoology*, 24 : 72-78.
- RENAUD-DEBEYSER, J., 1962. Recherches écologiques sur la faune interstitielle des sables. Bassin d'Arcachon - île de Bihimi, Bahamas. - *Vie et Milieu*, suppl. 15 : 1-57.
- RENAUD-MORNANT, J. & GOURBAULT, N., 1981. Premières prospections méiofaunistiques en Guadeloupe : I. Les Biotopes et leurs peuplements. - *Bulletin du Museum national d'Histoire naturelle*, sér. 4, 3A (4) : 1011-1034.
- RENAUD-MORNANT, J., GOURBAULT, N. & HELLEOUET, M.-N., 1981. Prospections méiofaunistiques en Martinique : I. Les Biotopes et leurs peuplements. - *Bulletin du Museum national d'Histoire naturelle*, sér. 4, 5A (1) : 221-234.
- ROSEN, D.E., 1976. A Vicariance Model of Caribbean Biogeography. *Systematic Zoology*, 24 : 431-464.
- SARS, G.O., 1909. *An account on the Crustacea of Norway. V : Copepoda Harpacticoida*, pp. 1-441, Pls. 1-230, suppl. 1-54. (Bergen Museum, Bergen Christiania).
- VERVOORT, W., 1964. Free-living Copepoda from Ifaluk Atoll, in the Caroline Islands. *Smithsonian Institution, U.S.A., National Museum*, 236 : 1-431.
- WELLS, J.B.J., 1967. The littoral Copepoda (Crustacea) of Inhaca Island, Mozambique. *Transactions of the Royal Society of Edinburgh*, 67 (7) : 189-358.
- WELLS, J.B.J., 1976. Keys to aid in the identification of marine harpacticoid copepods. *Department of Zoology, University of Aberdeen, U.K., publications*, 1-215.
- WELLS, J.B.J., 1981. Keys to Aid in the Identification of Marine Harpacticoid Copepods. Amendment Bulletin No 3. *Zoology Publications from Victoria University of Wellington*, 75 : 1-13.
- WELLS, J.B.J., 1983. Keys to Aid in the Identification of Marine Harpacticoid Copepods. Amendment Bulletin No 4. *Zoology Publications from Victoria University of Wellington*, 77 : 1-9.

WELLS, J.B.J., 1985. Keys to Aid in the Identification of Marine Harpacticoid Copepods. Amendment Bulletin No 5. *Zoology Publications from Victoria University of Wellington*, 80 : 1-19.

WELLS, J.B.J. en M.E. CLARK, 1965. The interstitial Crustacea of two beaches in Portugal. *Revista Biologia*, 5 (1-2) : 87-108.

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