PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

A Revised Definition of the Genus Epileucon Jones (Crustacea, Cumacea), With Descriptions of Species from the Deep Atlantic

J. D. D. Bishop

Phil. Trans. R. Soc. Lond. B 1981 **291**, 353-409
doi: 10.1098/rstb.1981.0003

A REVISED DEFINITION OF THE GENUS *EPILEUCON* JONES (CRUSTACEA, CUMACEA), WITH DESCRIPTIONS OF SPECIES FROM THE DEEP ATLANTIC

By J. D. D. Bishop

Department of Marine Biology, University of Liverpool, Port Erin, Isle of Man, U.K.

(*Communicated by G. Fryer, F.R.S.* – *Received* 5 *February* 1980 – *Revised* 14 *July* 1980)

CONTENTS

Vol. 291. B 1052. 34 [Published 3 March 1981

The genus *Epileucon* Jones, 1956 is redefined on the basis of carapace, pereon and appendage characters. The following species are transferred to *Epileucon* from the genus *Leucon* Kröyer, 1846: *E. spiniventris* (Hansen, 1920), *E. longirostris* (G. O. Sars, 1871), *E. tenuirostris* (G. O. Sars, 1887), *E. latispina* (Jones, 1963) and *E. bengalensis* (Lomakina, 1967). A lectotype is selected for *E. spiniventris*. Known Atlantic and Mediterranean species are redescribed, and five new species, *E. ensis*, *E. pusillus*, *E. craterus*, *E. socius* and *E. acclivis*, are described. Keys to males and females of the Atlantic and Mediterranean species are provided.

The geographical distribution of the group is discussed. The genus is known in deep water ($\geqslant$ 200 m) in the Atlantic, Pacific and Indian oceans and in the Mediterranean Sea, and also on the continental shelf (at around 100 m depth) off New Zealand.

Introduction

The genus *Epileucon* Jones, 1956 (Cumacea, Leuconidae) was founded to receive *E. galatheae*, a new form from a depth of 220 m off the coast of West Africa, which differed from members of the genus *Leucon* Kröyer, 1846 in 'the absence of a serrated dorsal crest on the carapace of the female'. A second species, *E. pacifica*, was described by Jones (1969) from a single specimen, also lacking dorsal serrations, taken at 915 m in the Gulf of Panama.

The haul from station 203 of the Woods Hole Oceanographic Institution *Atlantis II* cruise 42 in 1968 yielded numerous specimens referred here to *E. galatheae*. However, some individuals of the more recent collection differ from the type material in possessing several small teeth or serrations dorsally on the carapace. The supposed distinction between *Epileucon* and *Leucon* is therefore eroded.

Studies on an extensive collection of cumacean material, mainly from depths exceeding 200 m in the Atlantic Ocean, show that a group of species with dorsal teeth on the carapace, presently residing somewhat uneasily in the genus *Leucon*, share a set of unifying characters with *Epileucon galatheae*. In the present paper, a redefinition of the genus *Epileucon* based on these characters is proposed, members of the group previously referred to the genus *Leucon* are transferred to *Epileucon*, and five new species are described. The status of *E. pacifica* is discussed.

Station details

The Atlantic and Mediterranean stations that yielded specimens discussed below are listed in table 1. In this table, SMBA represents Scottish Marine Biological Association; COB, Centre Océanologique de Bretagne; and WHOI, Woods Hole Oceanographic Institution.

Gear used was the epibenthic sledge except in the following: *Valorous* 9 (dredge); *Thor* 166 (trawl); *Galathea* 46 (Petersen grab); *Puritan* 17 and 39 (bottom sledge); SMBA SBC61, SBC63, SBC64 and SBC65 (spade box corer); COB Thalassa 70 W357 (*chalut à perche*); Thalassa 73 Z426, Z429, Z437, Z438, Z443, Z445 and Z451 (Boillot dredge), Z447 (*chalut à panneaux*); Biogas VI CP21a, CP23a, CP24a and CP25a (*chalut à perche*, accessory net).

Measurements

Measurements were made on sketches produced by means of a drawing-tube attachment on a Wild M5 microscope.

Carapace length was taken as the length of the straight line between the anterior margin of the frontal lobe and the posterior margin of the carapace, both points being taken on the dorsal midline (figure 1*a*, *b*). Pseudorostrum length (not included in carapace length) was measured

TABLE 1

ship and/or cruise	station	year	latitude	longitude	depth/m
Valorous	9	1875	59° 10′ N	50° 25′ W	3200
Puritan	17	1902	} Gulf of Salerno, near Capri		1100
	39				1100
Thor	166	1903	62° 57′ N	19° 58′ W	*ca.* 930
Galathea	46	1950	05° 36′ N	00° 48′ E	220
Sarsia	40	1967	43° 36′ N	03° 25′ W	860
	56		43° 43′ N	03° 48′ W	641
Discovery	6696	1968	28° 06′ N	13° 28′ W	1780
	6697		27° 57′ N	13° 46′ W	1564
	6701		27° 45′ N	14° 13′ W	1934
			institution: SMBA		
	ES4	1973	56° 52′ N	10° 01′ W	1993
	ES12		56° 49′ N	10° 15′ W	2076
	ES18		56° 44′ N	09° 20′ W	1392
	ES20		56° 46′ N	09° 17′ W	1271
	ES22		56° 41′ N	09° 11′ W	1028
	SBC61	1976	57° 08′ N	12° 09′ W	2000
	SBC63		56° 40′ N	09° 49′ W	1800
	SBC64		56° 38′ N	09° 29′ W	1400
	SBC65		56° 39′ N	09° 40′ W	1600
			institution: COB		
Thalassa 70	W357	1970	43° 37′ N	02° 18′ W	770–1000
Thalassa 73	Z426	1973	48° 28′ N	09° 39′ W	860
	Z429		48° 28′ N	09° 50′ W	1300
	Z437		48° 35′ N	10° 24′ W	610
	Z438		48° 34′ N	10° 25′ W	1400
	Z443		48° 56′ N	11° 02′ W	660
	Z445		48° 52′ N	11° 07′ W	1200
	Z447		48° 47′ N	11° 14′ W	1430–1550
	Z451		48° 39′ N	10° 37′ W	1400
Biogas I	DS09	1972	47° 30′ N	08° 16′ W	2130
	DS13		47° 34′ N	08° 40′ W	2165
Polygas	DS20	1972	47° 33′ N	09° 37′ W	4226
	DS21		47° 32′ N	09° 41′ W	4190
	DS22		47° 34′ N	09° 38′ W	4144
	DS23		46° 33′ N	10° 21′ W	4734
	DS25		44° 08′ N	04° 16′ W	2096
	DS26		44° 08′ N	04° 15′ W	2076
	DS28		44° 24′ N	04° 48′ W	4413
Biogas II	DS30	1973	47° 38′ N	09° 34′ W	4106
Biogas III	DS38	1973	47° 33′ N	08° 36′ W	2138
	DS48		44° 29′ N	04° 54′ W	4203
	DS49		44° 06′ N	04° 16′ W	1845
	DS50		44° 09′ N	04° 16′ W	2124

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Table 1 (cont).

		institution: COB			
Biogas IV	DS51	1974	44° 11′ N	04° 15′ W	2430
	DS52		44° 06′ N	04° 22′ W	2006
	DS55		47° 35′ N	09° 41′ W	4125
Biogas V	DS66	1974	47° 28′ N	09° 00′ W	3480
	DS67		47° 31′ N	09° 35′ W	4150
Biogas VI	DS76	1974	47° 35′ N	09° 33′ W	4228
	DS78		46° 31′ N	10° 24′ W	4706
	DS79		46° 30′ N	10° 27′ W	4715
	DS86		44° 05′ N	04° 19′ W	1950
	DS87		44° 05′ N	04° 19′ W	1913
	DS88		44° 05′ N	04° 16′ W	1894
	CP21a		44° 21′ N	04° 49′ W	4453
	CP23a		44° 04′ N	04° 21′ W	1980
	CP24a		44° 08′ N	04° 16′ W	1995
	CP25a		44° 05′ N	04° 17′ W	1894
		institution: WHOI			
Chain 50	85	1965	37° 59′ N	69° 26′ W	3834
Chain 106	313	1972	51° 32′ N	12° 36′ W	1500–1491
	328		50° 05′ N	15° 45′ W	4426–4435
	330		50° 44′ N	17° 52′ W	4632
Atlantis II 17	95	1965	38° 33′ N	68° 32′ W	3753
Atlantis II 31	142	1967	10° 30′ N	17° 52′ W	1624–1796
	145		10° 36′ N	17° 49′ W	2185
	147		10° 38′ N	17° 52′ W	2934
Atlantis II 42	188	1968	23° 00′ S	12° 58′ E	619–622
	189		23° 00′ S	12° 45′ E	1007–1014
	191		23° 05′ S	12° 32′ E	1546–1559
	192		23° 02′ S	12° 19′ E	2117–2154
	195		14° 45′ S	09° 55′ E	3797
	200		09° 42′ S	10° 56′ E	2644–2754
	201		09° 27′ S	11° 35′ E	1964–2031
	202(B)		09° 01′ S	12° 16′ E	1427–1643
	203		08° 47′ S	12° 50′ E	527–542
Atlantis II 60	245	1971	36° 56′ S	53° 01′ W	2707
	262		36° 05′ S	52° 18′ W	2440–2480
	264		36° 13′ S	52° 43′ W	2041-2048
Knorr 25	287	1972	13° 16′ N	54° 53′ W	4934–4980
	288		11° 03′ N	55° 05′ W	4417–4429
	293		08° 58′ N	54° 04′ W	1456–1518
	299		07° 55′ N	55° 42′ W	1942–2076

as a straight line from the anterior margin of the frontal lobe on the dorsal midline to the distal tip of the pseudorostrum (figure 1*b*).

Pereon length was estimated as the length of the line (straight or curved) passing approximately midway between the dorsal and ventral surfaces of the pereonites, from the posterolateral margin of the carapace to the lateral point of articulation of the fifth pereonite and first pleonite (figure 1*a*). This measurement was rather unsatisfactory, the placing of the line being somewhat

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

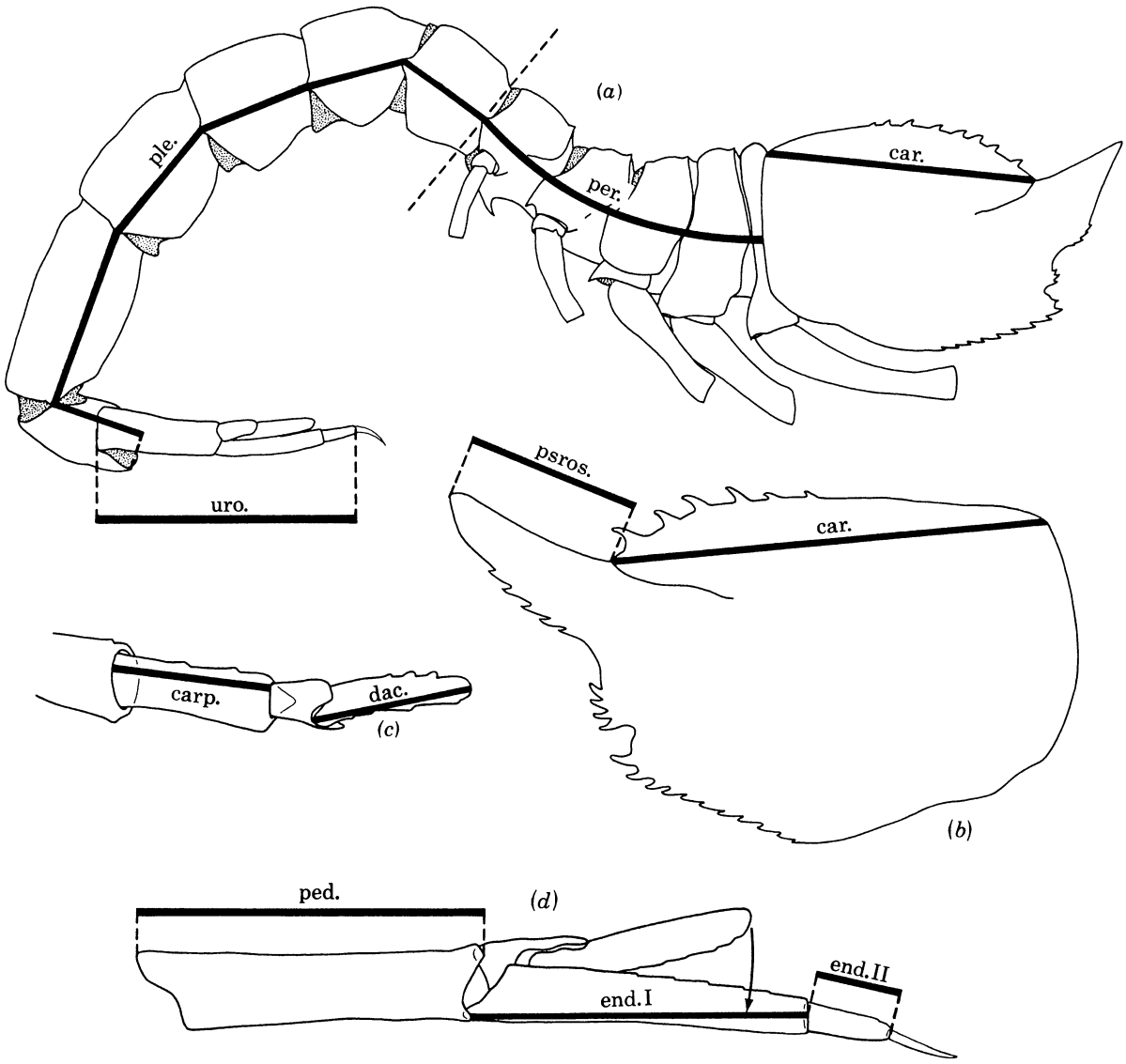

FIGURE 1. Measurements. (*a*) Whole animal, lateral view (distal parts of pereopods not shown). (*b*) Carapace, lateral view. (*c*) Distal segments of 2nd pereopodal endopodite. (*d*) Uropod. Abbreviations: car., carapace; carp., carpus; dac., dactyl; end. I, end. II, first and second endopodal segments; ped., peduncle; per., pereon; ple., pleon; psros., pseudorostrum; uro., uropod.

arbitrary and the length estimated depending to some extent on the posture of each specimen. Pleon length equalled the sum of individual pleonite lengths, measured as straight lines joining the lateral points of articulation of the somites (figure 1*a*).

Segment lengths of the second pereopod were estimated with the appendage in lateral view (figure 1*c*). Dactyl length included the U-shaped ventral portion at the propodus–dactyl joint. Carpus length did not include the prolongation on the distal margin of this segment, since this was not always discernible in lateral view in undissected material.

Total uropod length was taken, with the uropod in lateral view, as the distance from the

lateral articulation of the uropodal peduncle with the sixth pleonite to the distal tip of the uropodal endopod, the terminal spine being excluded (figure 1*a*). The relative lengths of uropod segments were estimated with the appendage in dorsal or ventral view when attached to the pleon, always in dorsal view in dissected material (figure 1*d*). The length of the peduncle was taken from its proximal lateral margin to its most distal point in the region of the articulation with the exopod. The length of the first endopodal segment was taken from the most distal point on the margin of the peduncle in the region of articulation with the endopod to the midpoint of the somewhat sloping joint between the first and second segments. The length of the second endopodal segment, measured from the midpoint of the joint between first and second segments, did not include the terminal spine. The point on the endopod reached by the exopod was determined with both rami lying parallel to the peduncle.

Total body length was the sum of carapace, pereon and pleon lengths only. It is considered that the exclusion of pseudorostrum and uropods from this measurement gives a more meaningful comparison of general body size between different forms.

Notes on the figures

All carapace figures are lateral views. Except for figure 5*c*, illustrations of pereonites and pleonites are lateral views with the armature only shown on one side of the body.

Pereopodal oostegites (when present) are not shown; the setation of the exopodal flagellum is not included on pereopod diagrams. The entire exopod is omitted in diagrams of the third pereopod of mature males.

Uropods are shown in dorsal view.

In illustrations of the first antenna of the mature male, not all of the sensory setae on the first segment of the flagellum are shown.

Symbols and abbreviations

Stations listed in table 1 are shortened in the text as follows: *Thor* station 166 becomes Thor-166; *Atlantis* II cruise 17, station 95, becomes AII17-95 (for example). Immature (in this context covering all stages between manca and mature) is abbreviated to imm., and mature to mat.; females with fully developed marsupia, with or without broods, were designated mature.

Systematic description of genus *Epileucon* Jones

Epileucon Jones, 1956 (Type species *E. galatheae* Jones, 1956; by monotypy.)

The genus may be distinguished from *Leucon* as follows: fifth pereonite (i.e. last thoracic segment) with at least one pair of anteriorly curved ventral teeth (hooks) in females, immature males and, in most known species, mature males; these teeth placed on either side of ventral midline. Teeth of median dorsal row on carapace of females and immature males individually spaced or in small groups, not forming continuous row; generally few teeth (17 is maximum seen, fewer than ten more usual; dorsal teeth lacking in some specimens of *E. galatheae*). Carapace without lateral teeth on or near frontal lobe. Antennal notch of females small, shallow; anterolateral corner of carapace not, or poorly, produced; anterior margin of carapace with group of teeth dorsal to antennal notch; ventral margin of pseudorostrum with group of teeth. Siphon not projecting far beyond tip of pseudorostrum. Accessory flagellum of first antenna of females and immature males extending at least halfway along first segment of flagellum (prob-

able exception *E. bengalensis* n.comb.; see below). Carpus of second pereopod fairly short (usually shorter than propodus plus dactyl) in both sexes. Endopod of uropod extending further than exopod in both sexes.

Members of the genus *Leucon* Kröyer, 1846 may show any of the above characters, with the probable exception of the paired, anteriorly curved ventral teeth on the fifth pereonite. However, all the characters are not found together. In females and immature males of many *Leucon* species, a row of contiguous teeth occupies most or all of the dorsal margin of the carapace. There may be lateral teeth on the carapace. The antennal notch may form a deep, wide U- or V-shaped excavation of the anterior margin of the carapace, leaving the anterolateral corner prominent. The ventral margin of the pseudorostrum and the anterior margin of the carapace dorsal to the antennal notch may be without teeth. The accessory flagellum of the first antenna is rudimentary in many forms. In some species the carpus of the second pereopod is considerably elongated, clearly exceeding the combined lengths of propodus and dactyl. The uropodal exopod may be equal to or extend further than the endopod.

A comparatively recent diagnosis of the genus *Leucon* (within the context of Stebbing's familial classification) is provided by Given (1961, pp. 131, 132).

General morphological notes

In well preserved specimens of all the Atlantic *Epileucon* species discussed below, the integument is whitish and fairly well calcified (especially so in the larger species). The carapace is moderately laterally compressed and usually has a rather matt appearance caused by a fine reticulate pattern on its surface. The pseudorostrum is generally fringed with setae on the distal part of its ventral margin; however, these setae are easily lost, e.g. by abrasion during sorting. The tip of the pseudorostrum is frequently worn away or damaged in the material studied. A slightly thickened and raised portion of the carapace at the end of the lateral suture represents the point of articulation of the mandible with the carapace; this region is stippled in many of the diagrams. A small, nearly horizontal tooth may often be seen on the margin of the carapace between the antennal notch and the anterolateral corner; however, this condition is not constant for a given species, and the tooth is not generally used as a taxonomic character below. The ocular lobe is minute or absent.

All five pereonites are free.

The non-geniculate first antenna of females and immature males, in all those species of which the appendage has been studied under the compound microscope, has a single-segmented accessory flagellum and a three-segmented flagellum. The accessory flagellum has three distal setae. The second and third segments of the flagellum each have an aesthetasc. The second antenna of females is three-segmented in all forms studied in detail. The basal segment bears two stout pappose setae and the short middle segment usually has a single, more slender seta (known to be absent in two species; see below).

Reference to the figures will demonstrate that the basic patterns of setation and spinulation of each of the appendages studied are similar throughout the group. In females, the third maxillipeds and first to third pereopods have exopods. The dactyl of the first pereopod is fairly slender, and furnished with a U-shaped row of curved, bare setae on its distal portion; it is about equal to or slightly longer than half the length of the propodus. The propodus is about equal in length to the carpus. The basis (unless otherwise stated) is about equal in length to the ischium, merus and carpus together plus half or two-thirds of the length of the propodus. The ischium of the

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

second pereopod seems distinct, although extremely short, in all species studied in detail; however, it may be very hard to detect except in well preserved material.

Both uropodal rami are two-segmented.

The setae borne on the dorsal posterior margin of the fifth pleonite show considerable variation in length and number within most of the species discussed, and their degree of development is not considered to afford a taxonomically useful character.

The general aspect of the body is similar throughout the genus. Hence whole-animal figures are provided for only one species (figure 14*a*, *b*).

The manca larvae (fifth pereopods undeveloped; probably at least two instars) of many of the forms described below may, in some individuals, lack the ventral teeth seen in later stages on the fifth pereonite. The armature and setation of the carapace and appendages are generally less extensive than in the corresponding adults. The uropodal exopod and endopod may be subequal.

During the growth of immature males, the antennal notch is progressively lost and the anteroventral margin of the carapace becomes swollen as the second antenna enlarges. The number of teeth in the group that previously lay dorsal to the antennal notch may increase slightly. Several small teeth in the ventral portion of this group may be ventrally directed (figure 8*b*, *c*, cf. *a*), but these do not persist into the mature stage. The pseudorostrum length and the number of dorsal teeth on the carapace are not noticeably reduced before the moult to the mature condition. The free thoracic somites may be comparatively shorter in males in the last instar before maturation than in conspecific females.

At the moult to the mature male stage, the pseudorostrum becomes relatively shorter than that of females and immature males of the same species, and may have a somewhat truncate appearance; there is generally a minute tooth-like projection at the tip of each pseudorostral lobe, although this is frequently damaged. The dorsal teeth of the carapace are lost in mature males of many species, and the dorsal margin of the carapace is somewhat depressed posteriorly. The anteroventral margin of the carapace is swollen to receive the peduncle of the enlarged second antenna, the antennal notch being lost. The tooth row on the ventral margin of the carapace is considerably reduced. Teeth on the somewhat inflated sternite of the fifth pereonite are retained in most species but are somewhat smaller than in corresponding females. Ventral spinulation of the anterior pleonites, when present in females, is lost in mature males. Distinct epimera are developed on the more posterior pereonites. The teeth on the pleural plates of these somites seen in females of some species are lost. Two genital papillae are seen ventrally on the fifth pereonite, close to the coxae of the fifth pereopods (figure 5*c*). The posterodorsal portion of the sixth pleonite of the mature male is enlarged somewhat compared with the female condition, projecting posteriorly beyond the anal valves.

The first antenna of mature males has a single-segmented accessory flagellum and a four-segmented flagellum. The extra flagellum segment compared with the female and immature male condition appears to arise from the division of the first (basal) segment. A number of sensory setae are borne ventrally on the basal segment of the flagellum, and several thin, stiff setae arise ventrally from the distal end of the second segment. The accessory flagellum also bears a small group of extra setae about halfway along its length. The flagellum of the second antenna reaches a point near the posterior end of the pleon; it passes under the thoracic epimera, being held in place by curved setae of the epimera (figure 5*c*). Males possess additional exopods on the fourth pereopods. In mature males the bases of the first to fourth pereopods are thickened and muscular.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

The ischium of the third pereopod is without the abnormal setae seen in mature males of many species of *Leucon*; the basis has a frill of strongly setuliferous setae near its proximal end, on the posteromedian surface. The first and second pleonites each have a pair of pleopods. The uropods of males generally undergo elongation and changes in the relative lengths of the segments at the maturation moult; their setation and spinulation is more extensive than in the female or immature male condition.

Epileucon galatheae Jones, 1956 (figures 2, 3)

Epileucon galatheae (Jones 1956, pp. 205–207, figs 13, 14)

Material examined

Galathea-46: 4 imm. ♀♀, 5 mat. ♀♀, 2 large unstaged ♀♀; 2 imm. ♂♂, 1 mat. ♂ (including holotype brooding ♀ and allotype mature ♂). AII42-203: 1 manca ♀, 91 imm. ♀♀, 19 mat. ♀♀; 1 manca ♂, 88 imm. ♂♂, 6 mat. ♂♂; 2 fragments.

Mature female

Body length of holotype 5.3 mm, of AII42-203 specimens 5.7–6.6 mm.

Carapace (figure 2*a*, *b*). No dorsal median teeth (Galathea-46, AII42-203 in part) or one to three inconspicuous teeth on anterior quarter of margin (AII42-203 in part). Posterior portion of dorsal margin, viewed from side, straight or slightly concave in females with marsupium; whole margin more evenly arched in immature stages. Anterior portion of ventral margin of carapace with 12–16 small teeth in regular row, which continues indistinctly into posterior portion. Anterolateral corner moderately prominent. Tooth usually present between anterolateral corner and antennal notch. Group of two to four teeth dorsal to antennal notch connected by series of indistinct serrations to group of one to four very small teeth on ventral margin of pseudorostrum (this group absent in one specimen). Pseudorostrum 0.19–0.24 times carapace length, nearly horizontal; anteroventral margin dorsal to group of teeth variable, straight to moderately concave.

Pereon and pleon (figure 2*c*). Pereon 1.1–1.3 times carapace length; pleon 2.4–2.7 times carapace length. Sternite of fifth pereonite with four spiniform teeth, two teeth on each side of midline sharing common base; anterior teeth directed anteroventrally, posterior teeth ventrally or posteroventrally. First pleonite with two- or three-pointed process on each side of ventral midline, similar one- or two-pointed processes on second pleonite. Pleural plate of third pereonite may have one or two ventrally directed teeth on anteroventral and posteroventral corners. Pleural plate of fourth pereonite with one, occasionally two, hooked teeth on posteroventral corner, and irregular, variable row of weak teeth along ventral portion of anterior margin. Pleural plate of fifth pereonite with one hooked tooth on posteroventral corner; scattered teeth on anterior margin.

First antenna (figure 2*d*). Accessory flagellum extending 0.5–0.7 of way along first segment of flagellum. Third segment of peduncle with one bare and two or three plumose laterally directed setae.

Second antenna (figure 2*e*). Without seta on middle segment.

First pereopod (figure 2*f*). Galathea-46 specimens with subterminal lateral tooth on basis (indistinct in specimens from AII42-203); some specimens with one or two weak lateral teeth in distal half of basis. Ischium with weak tooth on ventral margin.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

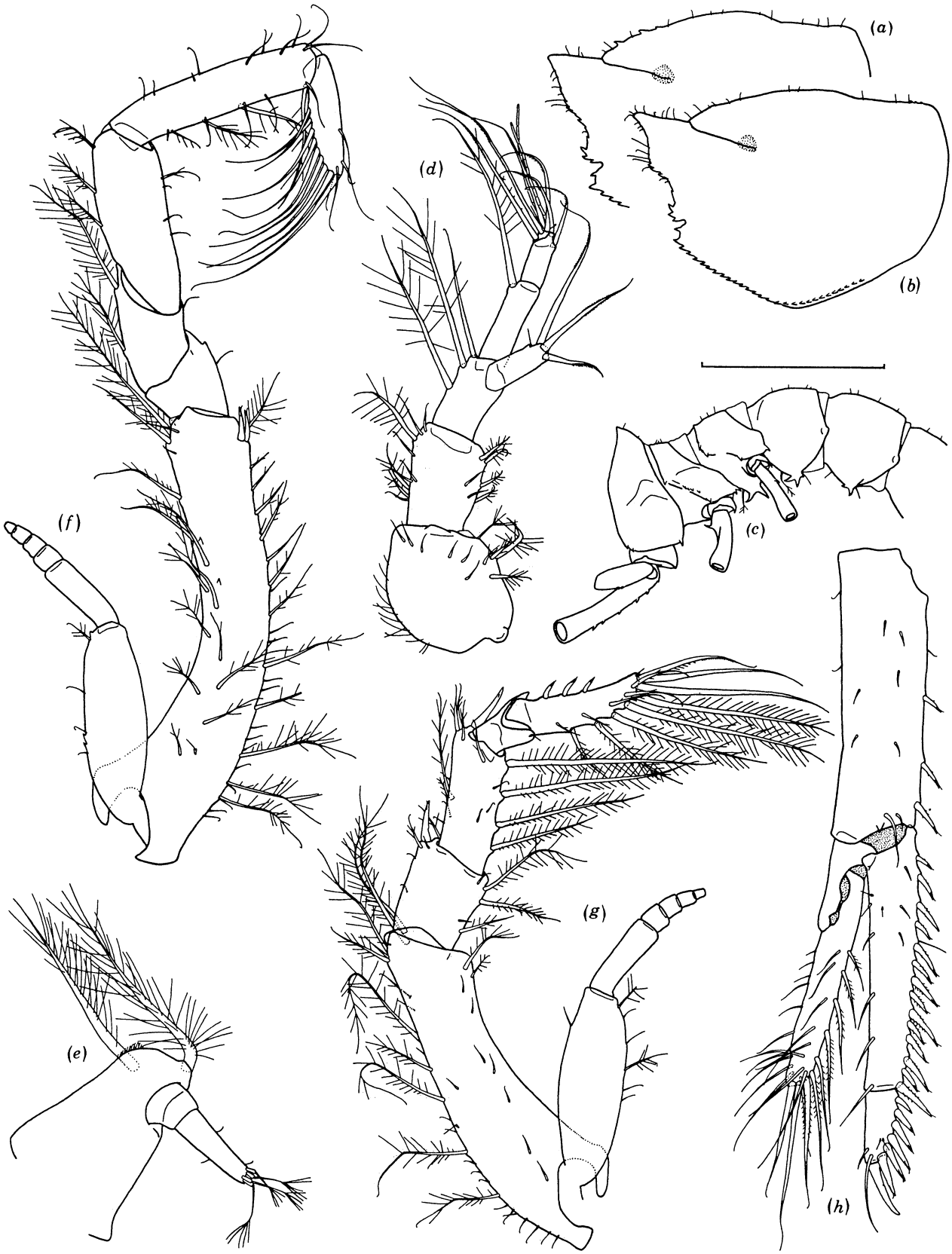

FIGURE 2. For description see opposite.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Second pereopod (figure 2*g*). Dactyl fairly slender, about equal in length to carpus. Carpus with four, rarely five, laterodorsal setae. Galathea-46 specimens may have subterminal lateroventral tooth on basis.

Third pereopod. Posteroventral margin of coxa may form small, indistinct point; basis often with one to six small teeth on posterior margin (see figure 2*c*), although these teeth may be absent.

Fourth pereopod. Posteroventral margin of coxa forming distinct point; basis with two, less frequently one, anteromedian spiniform teeth close to proximal end (see figure 2*c*).

Fifth pereopod. Posteroventral margin of coxa forming strong point; proximal half of basis with up to three small posterior teeth (see figure 2*c*); basis also with one or two small anteromedian spiniform teeth near proximal end in some specimens.

Uropod (figure 2*h*). Uropod 0.19–0.22 times body length. Peduncle approximately equal in length to first endopodal segment plus half of second. Exopod extending 0.85–0.95 of way along first endopodal segment. First endopodal segment 3.4–3.9 times length of second. Number of spines on median margin: peduncle, three or four; first endopodal segment, 13–16; second endopodal segment, four to six. Terminal spine of second endopodal segment shorter than or equal to this segment.

Mature male

Body length of allotype 5.2 mm, of AII42-203 specimens 5.8–6.4 mm.

Carapace (figure 3*a*). No dorsal teeth. Up to four teeth on anterior portion of ventral margin of carapace, becoming progressively smaller posteriorly. No teeth dorsal to anterolateral corner. Anteroventral margin of pseudorostrum may have two or three minute teeth or serrations. Pseudorostrum 0.15–0.17 times carapace length, horizontal, subvertically truncate.

Pereon and pleon (figure 3*b*). Pereon 1.0–1.1 times carapace length; pleon 2.3–2.4 times carapace length. Sternite of fifth pereonite with four spiniform teeth, arranged as in female. First to fourth pleonites with one posteriorly directed tooth or tubercle on posterior portion of lateral margin on each side; some of these teeth double in allotype.

First antenna (figure 3*c*). Accessory flagellum extending about 0.6 of way along first segment of flagellum. About ten sensory setae in transverse band approximately midway on first segment of flagellum of dissected specimen.

Third pereopod (figure 3*d*). Ischium with group of four or five bare setae, some clearly longer than remaining segments. No teeth on basis (nor on bases of fourth and fifth pereopods).

Uropod (figure 3*e*). Uropod 0.22–0.24 times body length. Peduncle about equal to first endopodal segment in length. Exopod extending 0.8–1.0 of way along first endopodal segment. First endopodal segment 3.6–4.7 times length of second. Number of spines and setae on median margin: peduncle, 12 or 13 (about half of which are long, strongly setuliferous setae); first endopodal segment, 21–26 spines and six to eight longer setuliferous setae; second endopodal segment, six spines. Setae on lateral margin of endopod fairly short, bare. Setae on exopod long.

Manca

Two specimens available, body length 2.0 and 2.1 mm respectively. Pseudorostrum 0.18, 0.19 times carapace length. Pereon 0.7, 0.8 times carapace length; pleon 2.1 times carapace

FIGURE 2. *Epileucon galatheae* Jones, 1956. (*a*), (*c*), (*e*) Preparatory female, AII42–203. (*b*), (*d*), (*f*), (*g*), (*h*) Mature female, AII42–203. (*a*), (*b*) Carapace; (*c*) third to fifth pereonites and first and second pleonites (with proximal parts of appendages); (*d*) first antenna; (*e*) second antenna; (*f*) first pereopod; (*g*) second pereopod; (*h*) uropod. Scale bar, 1mm, applies to (*a*)–(*c*).

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

length in both. Inflated sternite of fifth pereonite with two minute teeth, directed posteroventrally. First pleonite with two small ventral teeth, directed ventrally; second pleonite without teeth. Accessory flagellum of first antenna only slightly shorter than first segment of flagellum. Basis of fourth pereopod may have single anteromedian spiniform tooth close to proximal end. Uropodal rami subequal, exceeding peduncle in length. First endopodal segment 2.3, 2.4 times length of second.

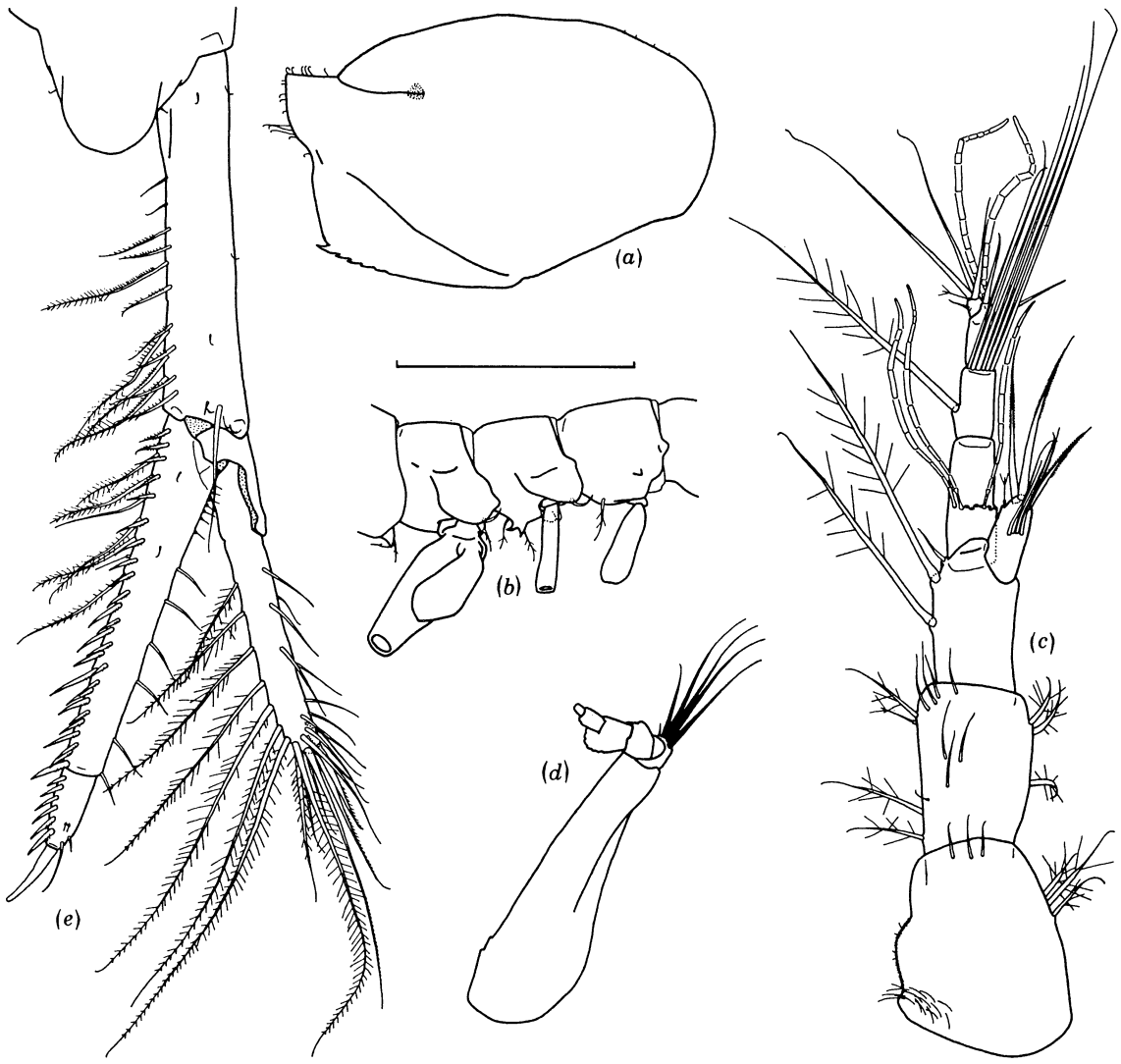

FIGURE 3. *Epileucon galatheae* Jones, 1956. Mature male, AII42–203. (*a*) Carapace; (*b*) fourth and fifth pereonites and first pleonite (with proximal parts of appendages); (*c*) first antenna; (*d*) third pereopod (setae on ischium, only, shown); (*e*) uropod and part of sixth pleonite. Scale bar, 1mm, applies to (*a*) and (*b*) only.

Immature male

(Notes refer to stage before maturation moult.) Anterior portion of ventral margin of carapace with 8–15 teeth in row. Two to four dorsally directed and one to five ventrally directed teeth dorsal to previous site of antennal notch. Process on first pleonite each side of ventral midline with up to four points; two or three small anteroventrally directed teeth on first pleonite just lateral to point of insertion of each pleopod. Second pleonite may have one- or two-pointed

ventral processes. Pleural plates of third and fourth pereonites with up to four ventrally directed teeth on posteroventral corners. Basis of third pereopod with up to nine small teeth on posteromedian surface and one or two on anterior surface. Basis of fourth pereopod without, or with, one small anteromedian proximal spiniform tooth; may have scattered small teeth on posteromedian and anterior surfaces. First endopodal segment of uropod 2.9–3.7 times length of second. Number of spines on median margin of uropod: peduncle, four or five; first endopodal segment, 15–19; second endopodal segment, four or five.

Distribution

Epileucon galatheae is known only from upper slope stations (depths 220 m and 527–542 m) off the west coast of Africa, close to the Equator (figure 19*b*).

Epileucon spiniventris (Hansen, 1920) n.comb. (figures 4, 5)

Leucon spiniventris (Hansen 1920, pp. 11, 12, pl. I, figs 3*a–d*)

Material examined

Thor-166: 1 imm. ♀, 1 mat. ♀ (syntypes; lectotype selected below). Discovery-6701: 1 imm. ♀. SMBA-ES4: 5 imm. ♀♀; 6 imm. ♂♂. SMBA-ES12: 1 imm. ♀. SMBA-ES18: 4 manca ♀♀, 10 imm. ♀♀, 3 mat. ♀♀; 4 imm. ♂♂; 1 fragment. SMBA-ES20: 9 imm. ♀♀; 1 imm. ♂. SMBA-SBC61: 1 manca ♀. SMBA-SBC63: 2 imm. ♂♂. SMBA-SBC64: 1 imm. ♂. SMBA-SBC65: 1 imm. ♀. Thalassa73-Z429: 3 imm. ♀♀; 2 imm. ♂♂. Thalassa73-Z438: 1 imm. ♀. Thalassa-73-Z447: 1 imm. ♀, 2 mat. ♀♀; 1 manca ♂, 3 imm. ♂♂; 1 unsexed manca; 1 fragment. Thalassa-73-Z451: 3 imm. ♂♂. BiogasI-DS09: 2 imm. ♀♀. BiogasI-DS13: 1 imm. ♀. Polygas-DS25: 5 imm. ♀♀; 8 imm. ♂♂, 1 mat. ♂. Polygas-DS26: 6 imm. ♀♀, 2 mat. ♀♀; 3 imm. ♂♂, 1 mat. ♂; 1 fragment. BiogasIII-DS38: 1 imm. ♀. BiogasIII-DS49: 1 manca ♀, 5 imm. ♀♀, 1 mat. ♀; 3 imm. ♂♂. BiogasIII-DS50: 1 imm. ♀; 1 imm. ♂. BiogasIV-DS51: 1 mat. ♂. BiogasIV-DS52: 2 imm. ♀♀, 1 mat. ♀; 1 manca ♂, 1 imm. ♂. BiogasVI-DS86: 4 manca ♀♀, 6 imm. ♀♀, 7 mat. ♀♀; 4 manca ♂♂, 10 imm. ♂♂. BiogasVI-DS87: 2 manca ♀♀, 13 imm. ♀♀, 4 mat. ♀♀; 1 manca ♂, 8 imm. ♂♂; 1 fragment. BiogasVI-DS88: 1 manca ♀, 7 imm. ♀♀, 2 mat. ♀♀; 5 imm. ♂♂. BiogasVI-CP23a: 1 imm. ♀. BiogasVI-CP24a: 1 imm. ♂. BiogasVI-CP25a: 1 imm. ♀; 2 manca ♂♂, 1 imm. ♂. Chain106-313: 8 imm. ♀♀, 1 mat. ♀; 2 manca ♂♂, 7 imm. ♂♂, 1 mat. ♂. AII31-142: 2 imm. ♀♀; 4 imm. ♂♂. AII31-145: 5 imm. ♀♀, 1 mat. ♀; 3 imm. ♂♂. AII31-147: 1 imm. ♀; 1 imm. ♂, 1 mat. ♂. AII42-201: 2 imm. ♀♀; 2 imm. ♂♂; 1 fragment.

Preparatory (i.e. with developing oostegites) and mature female

Body length 5.6–8.9 mm.

Carapace (figure 4*a*, *b*). Anterior portion of dorsal margin generally with one to four irregularly spaced median teeth, occupying slightly less than one-quarter to slightly more than one-third of margin; immature specimens from AII31 and AII42 may have five to eight fairly regularly spaced teeth, which may occupy slightly more than half of margin. Anterior portion of ventral margin of carapace with 11–16 teeth in regular row. Anterolateral corner more prominent than in most members of genus. One to three small teeth immediately dorsal to antennal notch; one to five teeth (plus smaller serrations) on basal part of ventral margin of pseudorostrum. Pseudorostrum 0.30–0.39 times carapace length, slightly upturned; viewed from side, moderately deep at base, narrowing rapidly distally, tip acutely pointed; dorsal margin and anteroventral margin anterior to group of teeth slightly concave in most specimens.

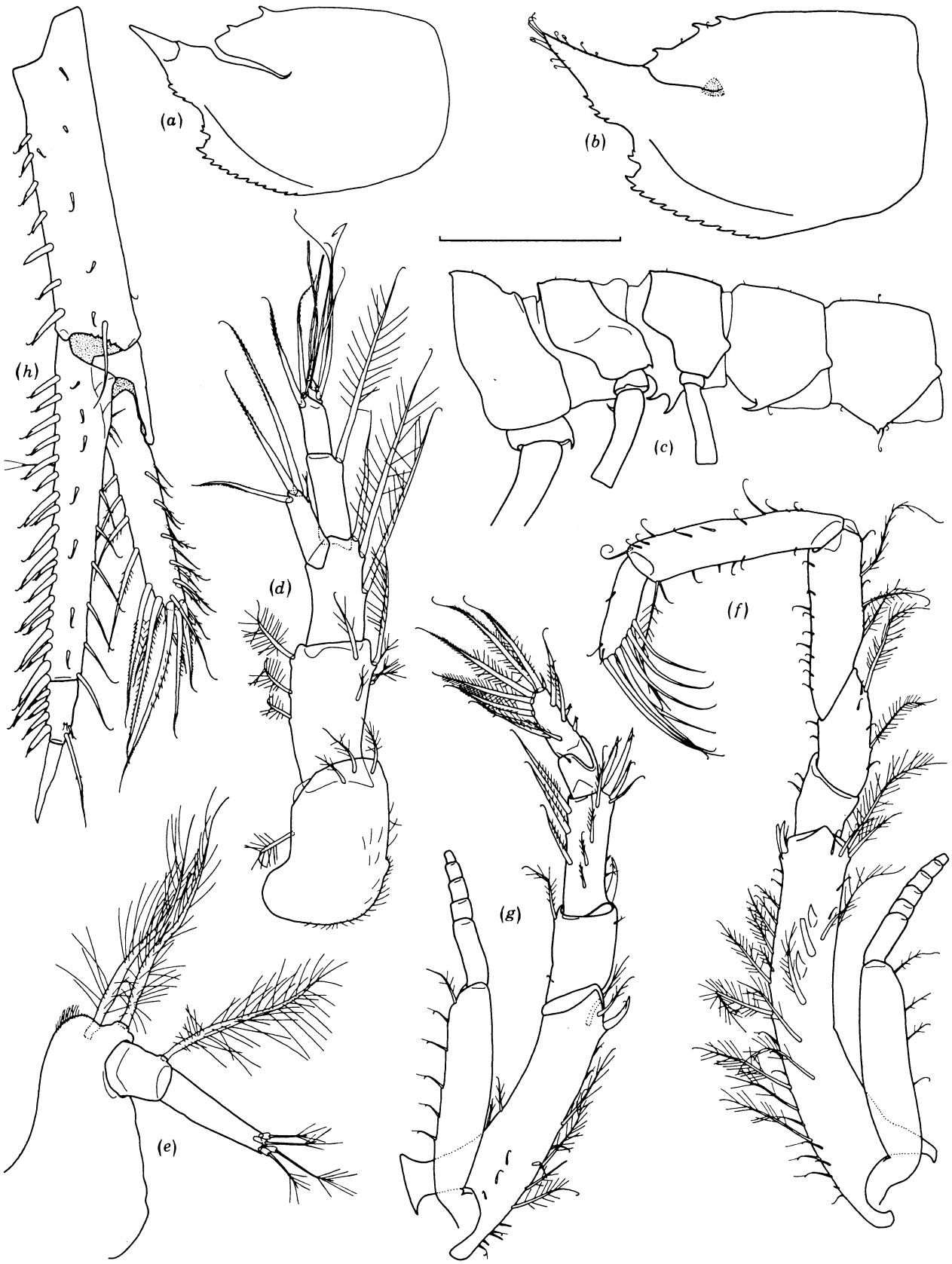

FIGURE 4. For description see opposite.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Pereon and pleon (figure 4*c*). Pereon 1.1–1.3 times carapace length; pleon 2.6–3.1 times carapace length. Sternite of fifth pereonite with four anteroventrally directed spiniform teeth, two teeth on each side of midline sharing common base (as in *E. galatheae*); in one specimen (AII42-201), small third tooth from common base on one side. First pleonite usually with one-pointed process on each side of ventral midline; processes three-pointed in immature specimens from AII31-142. Second pleonite usually without ventral processes, may have one- or two-pointed processes in specimens from AII31-142, AII31-145 and AII42-201. Pleural plate of fourth pereonite with one ventrally directed tooth on posteroventral corner (occasionally absent in mature specimens, frequently in immature). Pleural plates of third and fifth pereonites without teeth.

First antenna (figure 4*d*). Accessory flagellum extending 0.6–0.8 of way along first segment of flagellum. Third segment of peduncle generally with one bare and two plumose laterally directed setae.

Second antenna (figure 4*e*). With seta on middle segment.

First pereopod (figure 4*f*). Basis with one to four lateroventral teeth in distal half, without subterminal tooth. Ischium without tooth.

Second pereopod (figure 4*g*). Dactyl stout, clearly shorter than carpus. Carpus with three or four laterodorsal setae.

Third pereopod. Posteroventral margin of coxa distinctly hooked or pointed (see figure 4*c*); basis unarmed.

Fourth pereopod. Coxa not pointed posteriorly, without ventrally directed seta; proximal half of basis with one or two anteromedian spiniform teeth (see figure 4*c*).

Fifth pereopod. Coxa not pointed posteriorly; basis unarmed.

Uropod (figure 4*h*). Uropod 0.20–0.23 times body length. Peduncle length varies from equal to that of first endopodal segment alone to equal to that of first plus half that of second endopodal segment. Exopod extending 0.80–0.91 of way along first endopodal segment. First endopodal segment 4.1–5.5 times length of second (5.8 times in specimen from AII31–145, 6.6 times in specimen from AII42–201). Number of spines on median margin: peduncle, five to eight; first endopodal segment, 13–21; second endopodal segment, two to five. Terminal spine of second endopodal segment longer than this segment; most distal median spine of first endopodal segment may extend to distal margin of second segment.

Mature male (previously unknown)

Five specimens, only two in good condition. Body length 6.7, 7.6 mm (two measurements only).

Carapace (figure 5*a*). No dorsal teeth. Anterior portion of ventral margin of carapace with two or three teeth. Two teeth dorsal to anterolateral corner, or none. Two or three small teeth on anteroventral margin of pseudorostrum (none seen in one specimen, possibly damaged). Pseudorostrum 0.18, 0.22 times carapace length, horizontal, subvertically truncate.

Pereon and pleon (figure 5*b*, *c*). Pereon 1.2 times carapace length; pleon 2.7 times carapace length. Sternite of fifth pereonite with four spiniform teeth. Pleonites without lateral teeth.

FIGURE 4. *Epileucon spiniventris* (Hansen, 1920) n.comb. (*a*) Immature female, Thor-166 (lectotype). (*b*), (*c*) Preparatory female, AII42–201. (*d*)–(*h*) Mature female, BiogasVI-DS87. (*a*), (*b*) Carapace; (*c*) third to fifth pereonites and first and second pleonites (with proximal parts of appendages); (*d*) first antenna; (*e*) second antenna; (*f*) first pereopod; (*g*) second pereopod; (*h*) uropod. Scale bar, 1mm, applies to (*a*)–(*c*).

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

First antenna (figure 5*d*). Accessory flagellum extending to distal margin of first segment of flagellum. About 20 sensory setae in transverse band approximately midway on first segment of flagellum of dissected specimen.

Third pereopod (figure 5*e*). Posteroventral margin of coxa pointed (see figure 5*b*). Ischium with two subequal bare setae, slightly longer than remaining segments.

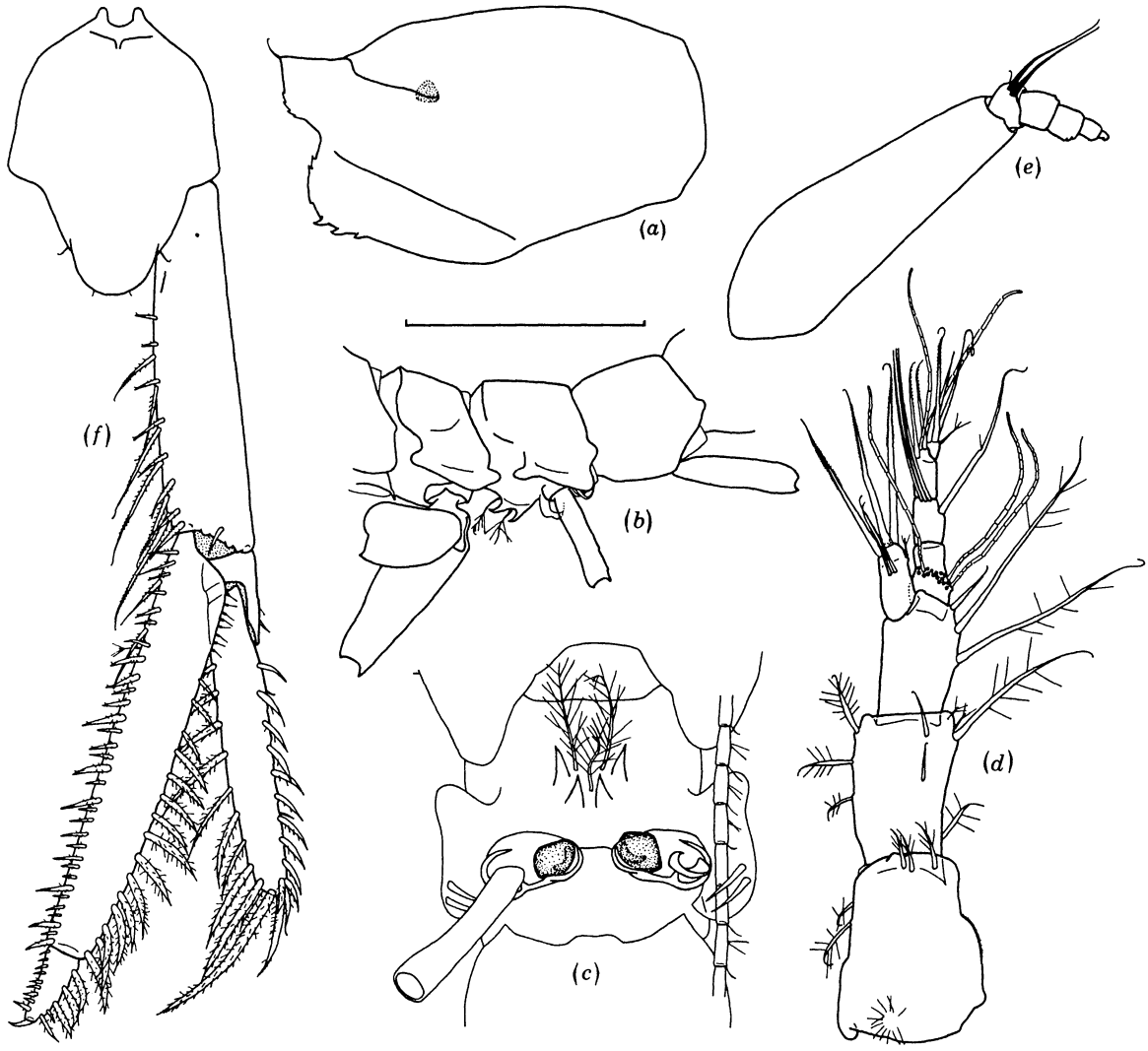

FIGURE 5. *Epileucon spiniventris* (Hansen, 1920) n.comb. Mature male, Chain106–313. (*a*) Carapace; (*b*) fourth and fifth pereonites and first pleonite (with proximal parts of appendages); (*c*) fifth pereonite, ventral view (with coxae of fifth pereopods, basis of right fifth pereopod and part of flagellum of left second antenna); (*d*) first antenna; (*e*) third pereopod (setae on ischium, only, shown); (*f*) uropod and sixth pleonite. Scale bar, 1 mm, applies to (*a*) and (*b*) only.

Uropod (figure 5*f*). Uropod 0.27 times body length. Peduncle 0.8–0.9 times length of first endopodal segment. Exopod extending 0.80–0.84 of way along first endopodal segment. First endopodal segment 5.6–7.3 times length of second. Number of spines and setae on median margin: peduncle, eight or nine spines and about six longer setuliferous setae; first endopodal segment, 25–32 spines and one to four longer setae; second endopodal segment, six to nine very small

spines. Terminal spine of second endopodal segment very short, curved. Lateral margin of endopod densely fringed with stout, curved, strongly setuliferous setae.

Manca

Body length 2.3–3.0 mm. Pseudorostrum 0.39–0.45 times carapace length. Inflated sternite of fifth pereonite with two small anteroventrally directed teeth. First pleonite with two small ventrally directed ventral teeth; second pleonite without teeth. Accessory flagellum of first antenna equal to in length or very slightly shorter than first segment of flagellum. Coxa of third pereopod not pointed posteriorly. Basis of fourth pereopod with single anteromedian spiniform tooth on proximal portion. Uropodal exopod extending beyond distal margin of first endopodal segment (may almost extend to distal margin of second segment). Uropodal peduncle equal to or shorter than exopod. First endopodal segment 2.6–3.0 times length of second. Most distal median spine of first endopodal segment of uropod large, extending to or slightly beyond distal margin of second endopodal segment.

Immature male

(Notes refer to stage before maturation moult.) One to three dorsally directed and one to five ventrally directed teeth dorsal to previous site of antennal notch of carapace. First and second pleonites without ventral pointed processes. Single tooth on posteroventral corner of pleural plate of fourth pereonite generally retained to this stage. Anteromedian spiniform teeth on basis of fourth pereopod very small, single (rarely double), close to proximal end of segment.

Selection of lectotype

Hansen described *E. spiniventris* from two female specimens, one immature and one mature, from Thor-166. The immature female (body length 6.0 mm) is selected here as lectotype. Although this specimen is in two pieces, the carapace, pereon and appendages are in much better condition than in the mature female. The posture of the specimens is very similar, making it hard to tell which was illustrated. Hansen's text implies that his fig. 3*c* (erroneously referred to as 3*e*) is of the immature specimen. From present comparison of specimens and figures, his fig. 3*a*, *b* is probably also of this individual. However, fig. 3*d* (uropod) is certainly of the mature specimen, 17 spines being shown on the median margin of the first endopodal segment, in agreement with Hansen's text.

Distribution

E. spiniventris is recorded over a wide latitudinal range from just south of Iceland to off Luanda (figure 19*c*), the depth of occurrence being between 1200 and 2200 m, except for the type material, at 930 m, and the AII31-147 sample, at 2934 m (off Dakar).

Epileucon longirostris (G. O. Sars, 1871) n.comb. (figures 6, 7, 8)

Leucon longirostris (G. O. Sars 1871, pp. 42, 43, pl. xv, fig. 75)
L. longirostris (Calman 1906, pp. 412–416, pl. 27, figs 1–8)
L. longirostris (Stebbing 1913, pp. 64, 70, 71)
L. longirostris (Fage 1951, pp. 53–55, figs 46, 47)
L. longirostris (Lomakina 1958, pp. 52, 53, 230, 245, 246, fig. 160)
L. longirostris (Băcescu 1961, p. 498, fig. 2, C and D)

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

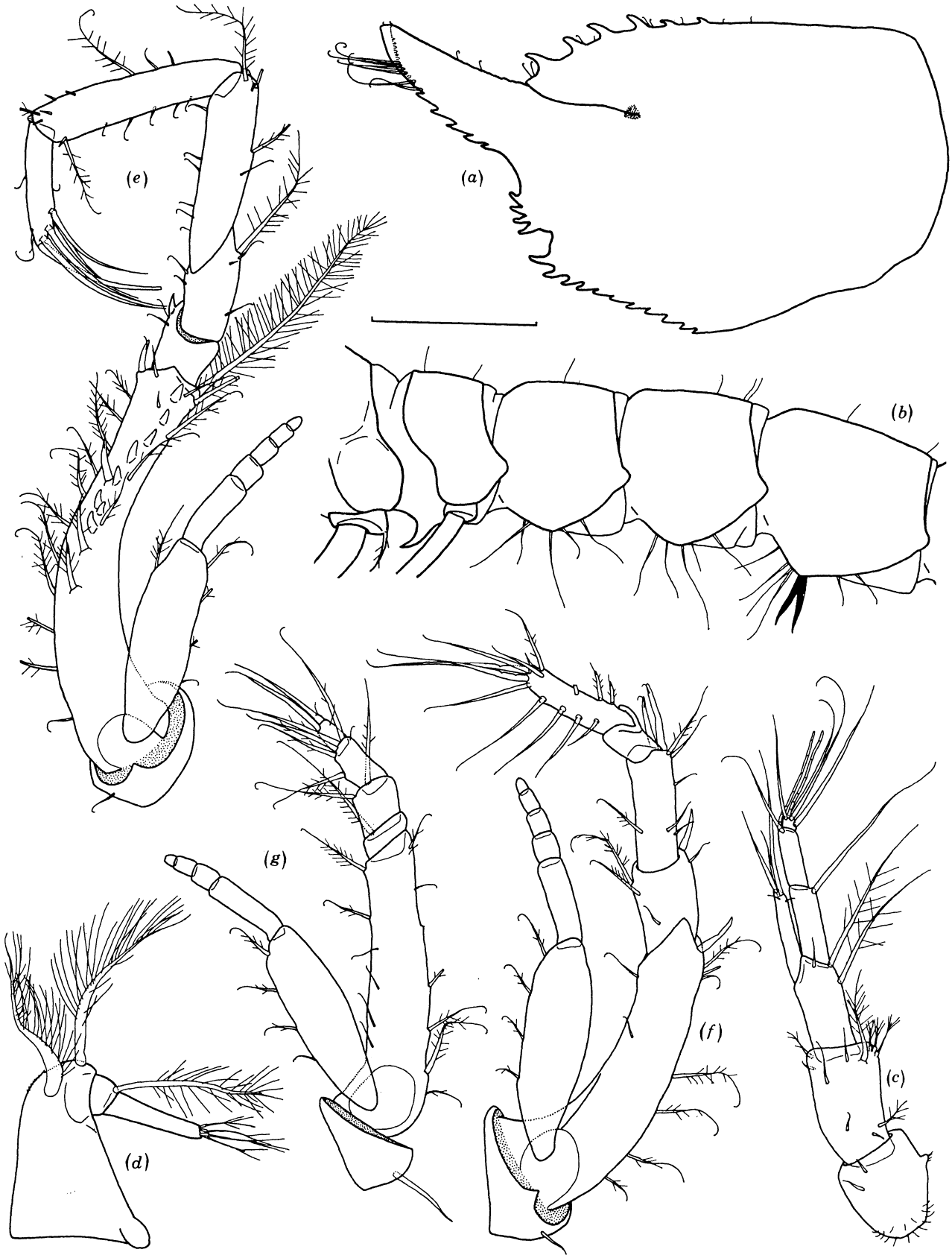

FIGURE 6. For description see opposite.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

The specimen described by Norman (1879) from Valorous-9 under the name *Leucon longirostris* is referred here to *Epileucon craterus* n.sp. A single *Leucon longirostris* was noted by Calman (1912) from *Albatross* station 2084 (40° 17′ N, 67° 05′ W, depth 2359 m). This individual (USNM 44140) is in fact an immature female of *Leucon tener* Hansen, 1920, or, possibly, of a closely related undescribed species.

The following papers also refer to *Leucon longirostris*: Zimmer (1908, 1941, 1980); Hansen (1920); Fage (1929); Reyss & Soyer (1966); Reyss (1972, 1973, 1974); Lagardère (1977).

Material examined in the present study belongs to three morphologically distinct forms, which will be discussed separately. The type of this species (38° 07′ N, 9° 18′ W, depth 1006 m) could not be found, and it is not certain from the original description to which form this specimen belongs. The possible provision of official taxonomic status for the three forms is postponed until more material is available and geographical ranges are better understood.

Epileucon longirostris form A (figures 6, 7)

Material examined

Polygas-DS25: 16 imm. ♀♀, 17 mat. ♀♀; 1 manca ♂, 8 imm. ♂♂, 6 mat. ♂♂; 1 fragment. Polygas-DS26: 18 imm. ♀♀, 9 mat. ♀♀; 6 imm. ♂♂, 13 mat. ♂♂. BiogasIII-DS49: 11 imm. ♀♀, 8 mat. ♀♀; 1 manca ♂, 8 imm. ♂♂, 3 mat. ♂♂; 2 fragments. BiogasIII-DS50: 6 imm. ♀♀, 2 mat. ♀♀; 4 imm. ♂♂, 3 mat. ♂♂; 1 fragment. BiogasIV-DS51: 6 imm. ♀♀, 3 mat. ♀♀; 1 imm. ♂, 7 mat. ♂♂; 1 unsexed manca; 3 fragments. BiogasIV-DS52: 7 imm. ♀♀, 4 mat. ♀♀; 1 manca ♂, 6 imm. ♂♂, 3 mat. ♂♂. BiogasVI-DS86: 1 manca ♀, 37 imm. ♀♀, 16 mat. ♀♀, 1 unstaged ♀; 6 manca ♂♂, 22 imm. ♂♂, 12 mat. ♂♂; 1 fragment. BiogasVI-DS87: 4 manca ♀♀, 37 imm. ♀♀, 6 mat. ♀♀, 1 unstaged ♀; 2 manca ♂♂, 24 imm. ♂♂, 12 mat. ♂♂. BiogasVI-DS88: 7 imm. ♀♀, 1 mat. ♀; 3 imm. ♂♂. BiogasVI-CP23a: 2 imm. ♀♀. BiogasVI-CP24a: 1 fragment. BiogasVI-CP25a: 3 manca ♀♀, 1 imm. ♀; 6 manca ♂♂, 3 imm. ♂♂, 1 mat. ♂. AII31-142: 1 mat. ♀; 1 mat. ♂. AII31-145: 1 manca ♀, 4 imm. ♀♀, 2 mat. ♀♀; 2 manca ♂♂, 1 imm. ♂, 1 mat. ♂. AII42-191: 2 imm. ♀♀, 1 mat. ♀; 4 imm. ♂♂. AII42-192: 1 imm. ♀; 1 imm. ♂, 1 mat. ♂. AII42-201: 2 imm. ♀♀, 1 mat. ♀; 2 mat. ♂♂.

Preparatory and mature female

Body length 4.9–6.6 mm.

Carapace (figure 6*a*). Anterior portion of dorsal margin generally with four to eight median teeth, usually strong and fairly regular in size and spacing, more posterior teeth becoming smaller, occupying between one-third and two-thirds of margin. Anterior portion of ventral margin of carapace with about 12 teeth in row. Anterolateral corner not prominent. Two to four strong teeth dorsal to antennal notch; three to five rather broad-based teeth on ventral margin of pseudorostrum. Pseudorostrum 0.39–0.50 times carapace length, moderately upturned; viewed from side, becoming progressively shallower from base to moderately pointed tip, dorsal margin straight or slightly concave, ventral margin generally slightly convex.

Pereon and pleon (figure 6*b*). Pereon 1.0–1.2 times carapace length; pleon 2.3–2.7 times carapace length. Sternite of fifth pereonite with two anteroventrally directed spiniform teeth, one on

FIGURE 6. *Epileucon longirostris* (G. O. Sars, 1871) n.comb., form A. Mature female, BiogasVI-DS86. (*a*) Carapace; (*b*) fourth and fifth pereonites and first to third pleonites (with proximal parts of appendages); (*c*) first antenna; (*d*) second antenna; (*e*) first pereopod; (*f*) second pereopod; (*g*) third pereopod. Scale bar, 0.5 mm, applies to (*a*) and (*b*) only.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

FIGURE 7. *Epileucon longirostris* (G. O. Sars, 1871) n.comb., form A. (*a*), (*b*), (*c*) Mature female, BiogasVI-DS86. (*d*)–(*h*) Mature male, BiogasVI-DS86. (*a*) Fourth pereopod; (*b*) fifth pereopod; (*c*) uropod; (*d*) carapace; (*e*) fifth pereonite; (*f*) first antenna; (*g*) third pereopod (seta on ischium, only, shown); (*h*) uropod and sixth pleonite. Scale bar, 0.5 mm, applies to (*d*) and (*e*) only.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

either side of midline. First and second pleonites without ventral spiniform processes. Pleural plates of pereonites without teeth. Ventral surface of third pleonite with two transparent, straight, fairly stiff, ventrally directed processes (presumably modified setae), each tapering to point, lying close together, one on either side of midline. (No processes in other forms of *E. longirostris*, nor in other members of genus.) First to fifth pleonites each with several long ventral setae and scattered dorsal setae.

First antenna (figure 6*c*). Accessory flagellum equal to, slightly longer than or slightly shorter than, first segment of flagellum. Third segment of peduncle with two subequal plumose setae on lateral margin.

Second antenna (figure 6*d*). With seta on middle segment.

First pereopod (figure 6*e*). Basis with row of 6–8 strong lateroventral teeth occupying most of distal half, and very large dorsal terminal seta generally extending more than halfway along carpus. Ischium with medioventral tooth.

Second pereopod (figure 6*f*). Dactyl slender, about equal to carpus. Carpus with one to three laterodorsal setae. Basis with weak subterminal lateroventral tooth in some specimens.

Third pereopod (figure 6*g*). Posteroventral margin of coxa not pointed; basis unarmed.

Fourth pereopod (figure 7*a*). Coxa with ventrally directed seta on posteroventral corner (see also figure 6*b*); basis unarmed.

Fifth pereopod (figure 7*b*). Coxa not pointed posteriorly (see figure 6*b*); basis unarmed.

Uropod (figure 7*c*). Uropod 0.21–0.23 times body length. Peduncle slightly longer than first endopodal segment (at most, equal to first endopodal segment plus half of second). Exopod extending to or just beyond distal margin of first endopodal segment (at most, extending halfway along second endopodal segment). First endopodal segment 3.4–4.5 times length of second. Number of spines on median margin: peduncle, four to six; first endopodal segment, 8–11; second endopodal segment, two. Terminal spine of second endopodal segment about equal to this segment.

Mature male

Body length 5.3–5.5 mm.

Carapace (figure 7*d*). No dorsal teeth. Two to four teeth on anterior portion of ventral margin of carapace, followed posteriorly by several smaller serrations. Two or three teeth dorsal to anterolateral corner. One to three small teeth on anteroventral margin of pseudorostrum. Pseudorostrum 0.18–0.24 times carapace length, slightly upturned, subvertically truncate.

Pereon and pleon. Pereon 1.1–1.2 times carapace length; pleon 2.4–2.7 times carapace length. Sternite of fifth pereonite with two spiniform teeth (figure 7*e*). Pleonites without lateral teeth. Third pleonite without ventral processes.

First antenna (figure 7*f*). Accessory flagellum extending from one-third to slightly more than half of way along second segment of flagellum. About 16 sensory setae in very oblique band approximately midway on first segment of flagellum of dissected specimen.

Third pereopod (figure 7*g*). Ischium with single bare seta, slightly shorter than or equal to remaining segments.

Uropod (figure 7*h*). Uropod 0.26–0.29 times body length. Peduncle 0.8–0.9 times length of first endopodal segment. Exopod extending 0.86–0.95 of way along first endopodal segment. First endopodal segment 3.7–4.5 times length of second. Number of spines and setae on median margin: peduncle, six to eight (no long setuliferous setae); first endopodal segment, 16–20 (no long setuliferous setae); second endopodal segment, one large and two or three very small

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

spines. Lateral margin of endopod with few, short spines. Setae on exopod few, slender, rather short.

Manca

Peculiar transparent ventral processes on third pleonite of immature specimens of both sexes and mature females not generally seen in manca larvae. Pair of ventral spiniform teeth on fifth pereonite may be well developed or absent.

The following notes on forms B and C emphasize the main differences between each form and form A.

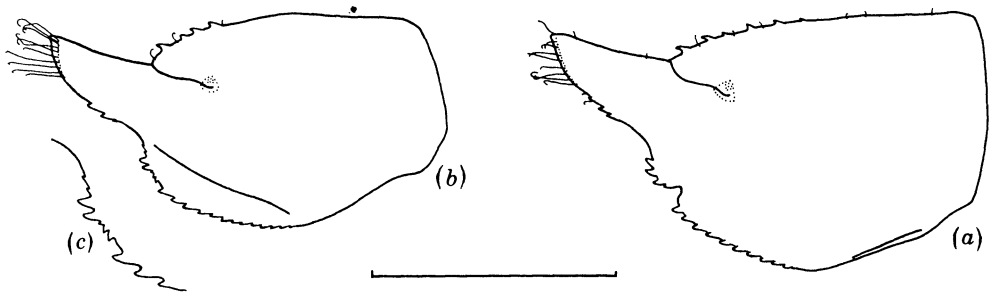

FIGURE 8. *Epileucon longirostris* (G. O. Sars, 1871) n.comb., form B. (*a*) Mature female, AII42-188. (*b*), (*c*) Immature male, AII42-188. (*a*), (*b*) Carapace; (*c*) carapace margin around anterolateral corner, at greater magnification. Scale bar, 1mm, applies to (*a*) and (*b*).

Epileucon longirostris form B (figure 8)

Material examined

AII42-188: 1 manca ♀, 7 imm. ♀♀, 5 mat. ♀♀; 9 imm. ♂♂, 3 mat. ♂♂. AII42-189: 3 imm. ♀♀, 1 mat. ♀; 2 imm. ♂♂.

Preparatory and mature female

Body length 5.2-6.1 mm. Carapace (figure 8*a*) with three to eight dorsal median teeth, which may be rather weak; in specimens with three teeth, these may occupy less than one-third of dorsal margin. Pseudorostrum deeper than in form A, 0.38–0.42 times carapace length. Pleural plate of fourth pereonite usually with ventrally directed tooth on posteroventral corner. Third pleonite without transparent ventral processes. Carpus of second pereopod with about four lateral setae. Uropod 0.23–0.25 times body length. Uropodal exopod may extend more than halfway along second endopodal segment. First endopodal segment 2.9–3.3 times length of second. Number of spines on median margin of uropod: peduncle, six or seven; first endopodal segment, 12–16; second endopodal segment, four to seven.

Mature male

Uropodal peduncle about equal to first endopodal segment; exopod extending one-quarter to one-third of way along second endopodal segment. First endopodal segment 3.2–3.4 times length of second. Number of spines and setae on median margin of uropod: peduncle, ten, including about three long setuliferous setae; first endopodal segment, 24–26 spines and three or four long setuliferous setae; second endopodal segment, seven or eight spines of similar size.

Epileucon longirostris form C

See figures in Calman (1906).

Material examined

Puritan-17: 4 manca ♀♀, 11 imm. ♀♀; 3 manca ♂♂, 1 imm. ♂. Puritan-39: 6 manca ♀♀, 6 imm. ♀♀; 2 manca ♂♂, 9 imm. ♂♂, 4 mat. ♂♂.

Preparatory female

Body length 4.7–5.5 mm. Carapace with five to eight strong dorsal median teeth, occupying between half and two-thirds of dorsal margin; third or fourth tooth from anterior end usually largest, more posterior teeth becoming smaller. Two to four broad-based teeth plus smaller serrations on ventral margin of pseudorostrum. Pseudorostrum 0.50–0.59 times carapace length (0.47 in one specimen); tip acutely pointed. Pleon 2.5–2.9 times carapace length. Pleural plate of fourth pereonite with ventrally directed tooth on posteroventral corner. Third pleonite without transparent ventral processes. Basis of second pereopod with fairly strong subterminal ventral tooth. Posteroventral margin of coxa of third pereopod pointed. Uropod 0.20–0.24 times body length; first endopodal segment 3.0–3.6 times length of second. Number of spines on median margin of uropod: peduncle, about five; first endopodal segment, about 15; second endopodal segment, about five.

Mature male

Body length 5.7 mm (one measurement only). Pseudorostrum about 0.3 times carapace length, pereon 1.0 times carapace length (one measurement only in each). In contrast to statement by Calman (1906, p. 416), accessory flagellum of first antenna extends one-third to half of way along second segment of flagellum (thereby agreeing with form A). First endopodal segment of uropod 3.5–4.0 times length of second. Number of spines and setae on median margin of uropod: peduncle, about ten (including long setuliferous setae); first endopodal segment, about 30 (including long setuliferous setae); second endopodal segment, about eight spines.

Distribution

The southern Bay of Biscay, where it occurs at depths of 1845 to 2430 m, is the most northerly record for *E. longirostris* in the present paper (figure 19*d*). The species is also found off Dakar (1624–1796 and 2185 m), Luanda (1964–2031 m) and Walvis Bay (form A, 1546–1559 and 2117–2154 m; form B, 619–622 and 1007–1014 m). Form C, comprising the material described by Calman (1906), was recorded from 1100 m in the Mediterranean. Previous records of *E. longirostris* from the northwestern Atlantic, made by Norman (1879) and Calman (1912), are considered to be erroneous (see above). The identities of specimens forming the basis of other records from the eastern Atlantic and Mediterranean in the literature were not checked.

Epileucon ensis n.sp. (figures 9, 10)

Material examined

Discovery-6696: 1 imm. ♀, 1 mat. ♀. Discovery-6697: 1 mat. ♀; 1 mat. ♂. Puritan-17: 1 imm. ♂ (doubtful record). SMBA-ES18: 2 imm. ♀♀, 2 mat. ♀♀. SMBA-ES20: 1 manca ♀, 2 imm. ♀♀, 2 mat. ♀♀; 5 imm. ♂♂. SMBA-ES22: 2 imm. ♀♀; 1 imm. ♂. BiogasIII-DS49: 1 imm. ♀. BiogasIV-DS52: 1 imm. ♂. BiogasVI-DS86: 1 mat. ♀; 3 imm. ♂♂. BiogasVI-DS87: 2 imm. ♀♀. BiogasVI-CP23a: 1 imm. ♀. Chain106-313: 3 manca ♀♀, 12 imm. ♀♀, 4 mat. ♀♀; 2 manca ♂♂, 13 imm. ♂♂; 1 unsexed manca; 3 fragments. AII31-142: 3 imm. ♀♀, 1 mat. ♀; 5 imm. ♂♂. AII42-202(B): 1 imm. ♀.

Preparatory and mature female

Body length 3.7–4.6 mm.

Carapace (figure 9*a*). Dorsal median teeth in two groups; one group at or very near anterior margin of frontal lobe, two to four teeth; other group (sometimes absent) within anterior third

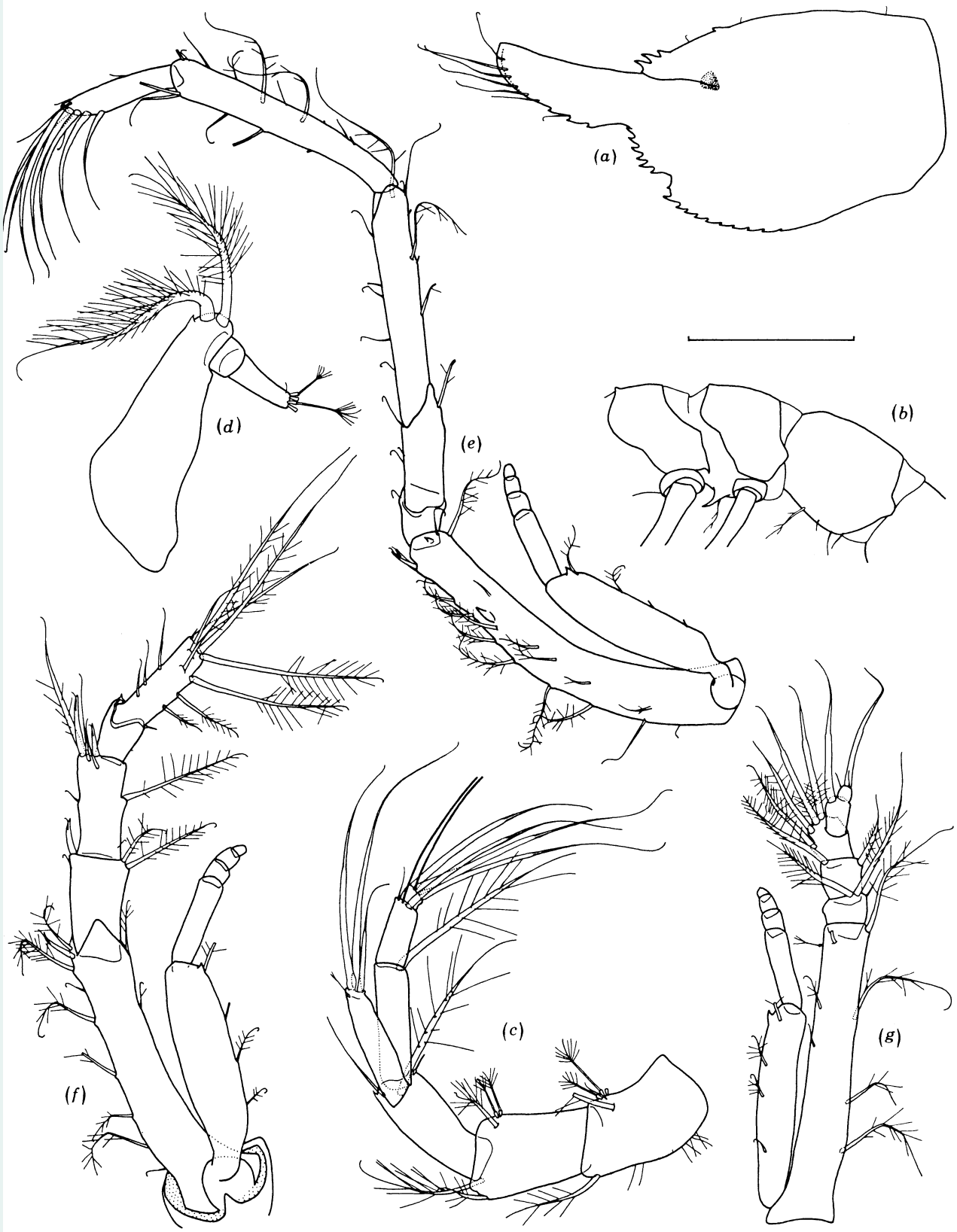

FIGURE 9. For description see opposite.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

of dorsal margin of carapace, one to three teeth; teeth within each group contiguous. Anterior portion of ventral margin of carapace with 9–15 teeth in regular row. Anterolateral corner not prominent. Small tooth usually present between anterolateral corner and antennal notch. Five or six rather small, regular teeth occupying whole of margin of carapace between antennal notch and base of pseudorostrum. Pseudorostrum with three to five broad-based teeth on ventral margin, 0.48–0.54 times carapace length, slightly upturned; viewed from side, almost parallel-sided, dorsal margin weakly concave, ventral margin weakly convex; tip very blunt, ventral margin curving dorsally to meet dorsal margin.

Pereon and pleon (figure 9*b*). Pereon 1.1–1.3 times carapace length; pleon 2.8–3.2 times carapace length. Sternite of fifth pereonite with two anteroventrally directed spiniform teeth, one on either side of midline. First and second pleonites without ventral processes. Pleural plate of fourth pereonite with single ventrally directed tooth on posteroventral corner (see also figure 10*a*). Pleural plates of third and fifth pereonites without teeth.

First antenna (figure 9*c*). Accessory flagellum extending 0.7–1.0 of way along first segment of flagellum; median margin of accessory flagellum with rather inconspicuous serrations (as in male, figure 10*e*). Third segment of peduncle with one bare and one longer setuliferous seta on lateral margin.

Second antenna (figure 9*d*). Without seta on middle segment.

First pereopod (figure 9*e*). Noticeably long and slender. Merus somewhat elongate. Basis about equal to or slightly longer than following three segments, generally with single lateroventral tooth in distal half and rather weak lateral subterminal tooth. Ischium without tooth. Peduncle of exopod with distal tooth.

Second pereopod (figure 9*f*). Dactyl fairly slender, about equal to carpus, distal setae may exceed twice length of segment. Carpus with one or two laterodorsal setae. Peduncle of exopod with distal tooth.

Third pereopod (figure 9*g*). Posteroventral margin of coxa not pointed. Peduncle of exopod with tooth near distal margin.

Fourth pereopod (figure 10*a*). Coxa not pointed posteriorly, without ventrally directed seta; basis unarmed.

Fifth pereopod (figure 10*b*). Coxa not pointed posteriorly; basis unarmed.

Uropod (figure 10*c*). Uropod 0.23–0.26 times body length. Peduncle length varies from equal to that of first endopodal segment plus half that of second to equal to that of whole ramus (first and second segments). Exopod extending from one-quarter to half of way along second endopodal segment. First endopodal segment 2.2–2.5 times length of second. Number of spines on median margin: peduncle, five or six; first endopodal segment, seven to nine (rarely ten); second endopodal segment, four or five. Terminal spine of second endopodal segment shorter than this segment.

Mature male

Single specimen, damaged and incomplete.

Carapace (figure 10*d*). Two small dorsal median teeth near anterior margin of frontal lobe.

FIGURE 9. *Epileucon ensis* n.sp. (*a*)–(*d*), (*f*), (*g*) Preparatory female, BiogasVI-DS87 (holotype). (*e*) Preparatory female, Chain106-313. (*a*) Carapace; (*b*) fourth and fifth pereonites and first pleonite (with proximal parts of appendages); (*c*) first antenna; (*d*) second antenna; (*e*) first pereopod; (*f*) second pereopod; (*g*) third pereopod. Scale bar, 0.5 mm, applies to (*a*) and (*b*) only.

Anterior portion of ventral margin of carapace probably with single tooth; two teeth dorsal to anterolateral corner. About three broad-based teeth on ventral margin of pseudorostrum. Pseudorostrum damaged, between 0.3 and 0.4 times carapace length, truncate or bluntly rounded anteriorly.

Pereon and pleon. Pereon 1.1 times carapace length; pleon incomplete. Sternite of fifth pereonite with two spiniform teeth.

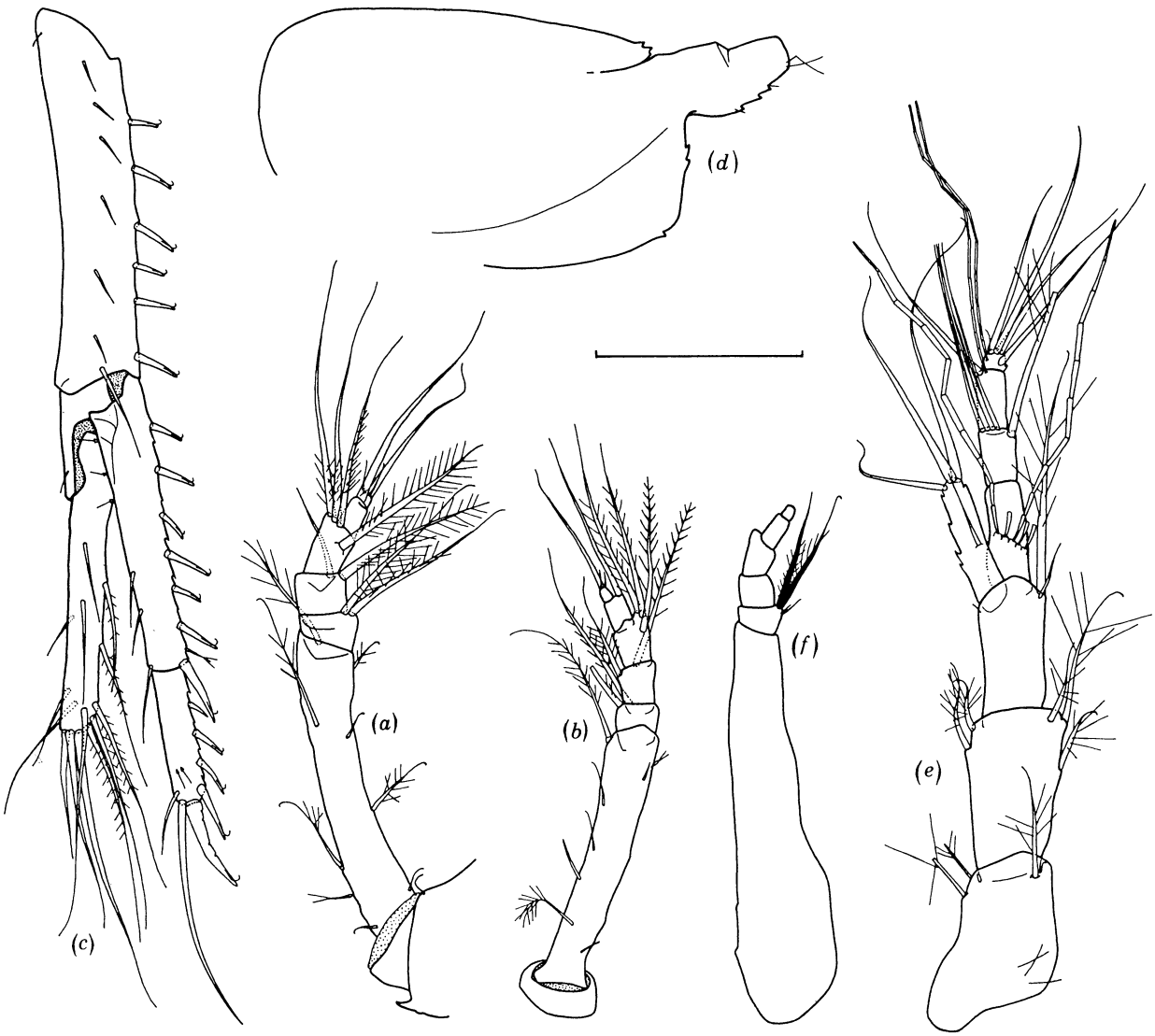

FIGURE 10. *Epileucon ensis* n.sp. (*a*)–(*c*) Preparatory female, BiogasVI-DS87 (holotype). (*d*)–(*f*) Mature male, Discovery-6697 (allotype). (*a*) Fourth pereopod; (*b*) fifth pereopod; (*c*) uropod; (*d*) carapace (damaged); (*e*) first antenna; (*f*) third pereopod (setae on ischium, only, shown). Scale bar, 0.5 mm, applies to (*d*) only.

First antenna (figure 10*e*). Accessory flagellum extending about one-quarter of way along second segment of flagellum; median margin of accessory flagellum with serrations. Five sensory setae in transverse band approximately midway on first segment of flagellum.

Third pereopod (figure 10*f*). Ischium with two setuliferous setae slightly longer than remaining segments.

Uropod. Lost (pleon incomplete).

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Manca

Body length 2.0–2.2 mm. Two or three teeth in anterior dorsal median group on carapace, one or two teeth in posterior group (sometimes absent). Pseudorostrum about half carapace length. Pereon about equal to carapace in length; pleon about 2.8 times carapace length. Inflated sternite of fifth pereonite without teeth. Accessory flagellum of first antenna equal to or slightly shorter than first segment of flagellum. Uropod 0.21–0.23 times body length. Uropodal exopod extending to distal half of second endopodal segment; both rami clearly longer than peduncle. First endopodal segment of uropod 2.2–2.4 times length of second.

Immature male

In stage before maturation moult, about six dorsally directed and two to four ventrally directed teeth dorsal to anterolateral corner of carapace. Single tooth on posteroventral corner of pleural plate of fourth pereonite retained to this stage.

The small immature male from Puritan-17 strongly resembles *E. ensis* in the shape of its pseudorostrum and in the pattern of dorsal dentition of its carapace. However, the pseudorostrum is only about 0.4 times the length of the carapace; other characters can not be checked because of the poor state of preservation. This Mediterranean record must therefore be regarded with caution.

Type material

Type material will be deposited in the Muséum National d'Histoire Naturelle, Paris, France. Paratype material will be deposited in the British Museum (Natural History), London, U.K.

Holotype. Female with developing marsupium, length 4.5 mm, BiogasVI-DS87, registration number Cu 179.

Allotype. Mature male, incomplete, Discovery-6697, registration number Cu 180.

Remarks

The female may be readily distinguished from others of the genus by the blunt-tipped pseudorostrum, gently curving in lateral view, and by the grouping of the dorsal median teeth on the carapace. The specific name refers to the fact that the general shape of the pseudorostrum is reminiscent of the shell of some species of the lamellibranch genus *Ensis* Schumacher.

Distribution

E. ensis is known to occur on the continental slope in the east Atlantic at depths of 1028 to 2006 m, the most northerly stations being west of Scotland and the most southerly station off Luanda (figure 20*a*). It was not recorded from the stations in the Western Approaches and the northern Bay of Biscay. A specimen probably belonging to this species was taken in the Mediterranean at 1100 m.

Epileucon pusillus n.sp. (figures 11, 12)

Material examined

Discovery-6696: 2 imm. ♀♀. Sarsia-40: about 25 specimens, condition very poor. Sarsia-56: 1 imm. ♀; 1 imm. ♂. SMBA-ES18: 3 imm. ♀♀, 3 mat. ♀♀; 2 imm. ♂♂, 1 mat. ♂. SMBA-ES20: 4 imm. ♀♀, 4 mat. ♀♀, 1 unstaged ♀; 1 manca ♂, 2 imm. ♂♂. SMBA-ES22: 1 manca ♀, 3 imm. ♀♀; 2 manca ♂♂. Thalassa70-W357: 5 imm. ♀♀, 4 mat. ♀♀; 5 imm. ♂♂, 1 mat. ♂; 1 fragment.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

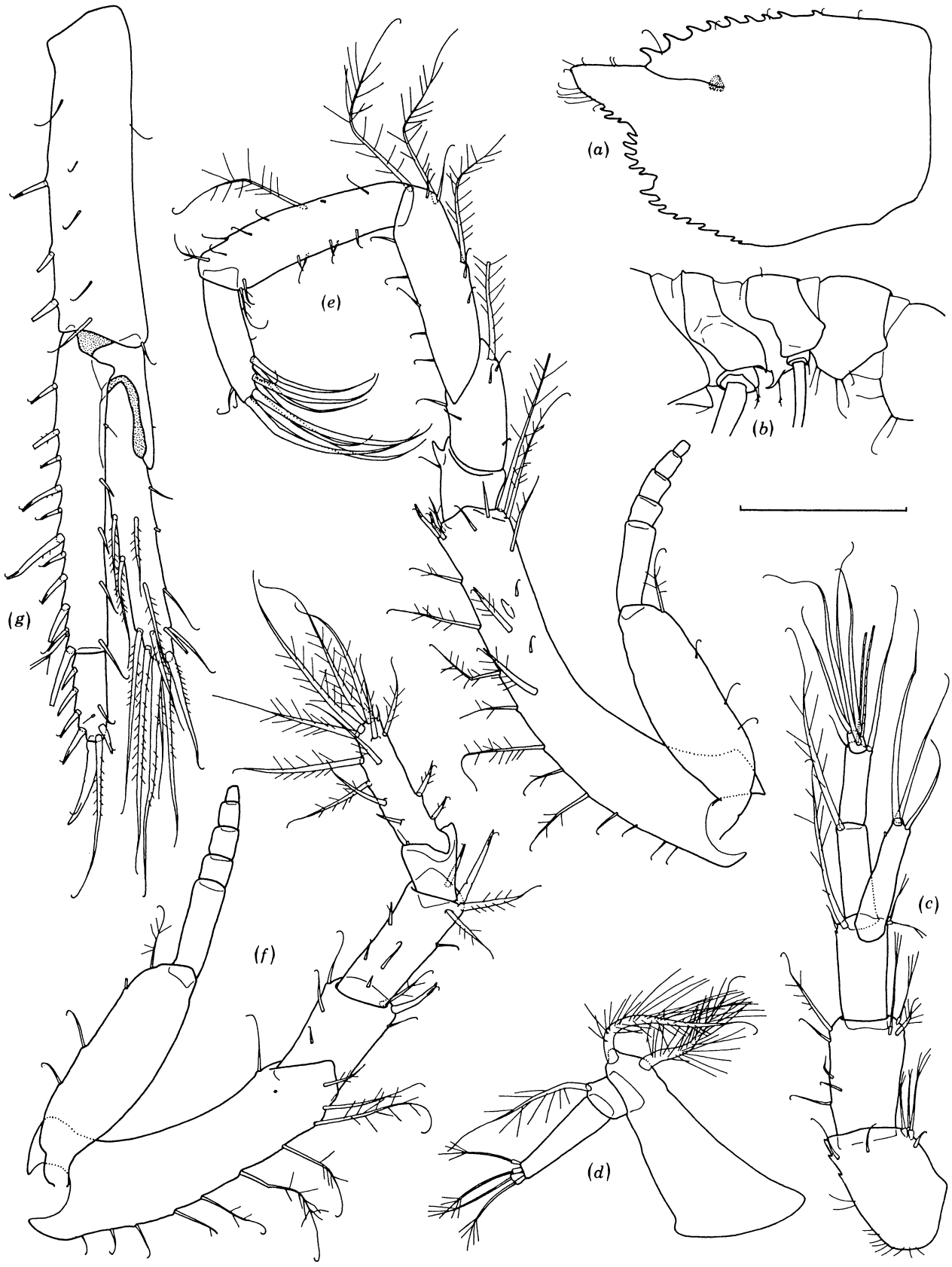

FIGURE 11. For description see opposite.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Thalassa73-Z426: 3 imm. ♀♀, 2 mat. ♀♀; 5 imm. ♂♂. Thalassa73-Z437: 1 imm. ♀. Thalassa73-Z443: 1 imm. ♀, 1 mat. ♀. Thalassa73-Z445: 1 mat. ♀. Chain106-313: 3 manca ♀♀, 13 imm. ♀♀, 11 mat. ♀♀; 2 manca ♂♂, 2 imm. ♂♂, 11 mat. ♂♂.

Preparatory and mature female

Body length 3.4–4.4 mm.

Carapace (figure 11*a*). Five to thirteen dorsal median teeth, generally rather regularly spaced and decreasing in size posteriorly, occupying one-third to slightly more than two-thirds of dorsal margin. Anterior portion of ventral margin of carapace with nine to twelve teeth in regular row. Anterolateral corner not prominent. Three to six strong teeth dorsal to antennal notch. Pseudorostrum with one to three teeth on ventral margin, 0.25–0.30 times carapace length, horizontal; viewed from side, dorsal margin straight or weakly convex, distal portion of ventral margin inflected to meet dorsal margin; tip not acutely pointed, general outline of pseudorostrum subtriangular.

Pereon and pleon (figure 11*b*). Pereon 1.1–1.3 times carapace length; pleon 2.5–3.0 times carapace length. Sternite of fifth pereonite with two anteroventrally directed spiniform teeth, one on either side of midline. First and second pleonites without ventral processes. Pleural plate of fourth pereonite with single ventrally directed tooth on posteroventral corner. Pleural plates of third and fifth pereonites without teeth.

First antenna (figure 11*c*). Relative length of accessory flagellum varying from extending 0.8 of way along first segment of flagellum to extending slightly beyond this segment. Third segment of peduncle with one setuliferous seta on lateral margin (plus one very small bare seta, not always seen).

Second antenna (figure 11*d*). With seta on middle segment.

First pereopod (figure 11*e*). Basis with one to five lateral teeth scattered in distal half; may have subterminal tooth. Ischium usually with ventral tooth.

Second pereopod (figure 11*f*). Dactyl fairly slender, about equal to carpus. Carpus with two, sometimes three, rather short, slender, inconspicuous laterodorsal setae. Basis usually with lateral or lateroventral subterminal tooth.

Third pereopod. Posteroventral margin of coxa not pointed (see figure 11*b*).

Fourth pereopod. Coxa with ventrally directed seta posteriorly (see figure 11*b*); basis unarmed.

Fifth pereopod. Coxa not pointed posteriorly (but with seta); basis unarmed (see figure 11*b*).

Uropod (figure 11*g*). Uropod 0.22–0.25 times body length. Peduncle length varies from equal to first endopodal segment plus one-fifth of second to equal to whole ramus (first and second segments). Exopod extending to or slightly beyond distal margin of first endopodal segment (at most, extending one-third of way along second endopodal segment). First endopodal segment 3.1–4.0 times length of second. Number of spines on median margin: peduncle, three; first endopodal segment, 8–13; second endopodal segment, four or five (rarely three). Terminal spine of second endopodal segment equal to or shorter than this segment.

Mature male

Body length 3.6–3.8 mm.

Carapace (figure 12*a*). No dorsal teeth. Anterior portion of ventral margin of carapace with

FIGURE 11. *Epileucon pusillus* n.sp. (*a*), (*b*) Preparatory female, Chain106-313 (2 different specimens). (*c*)–(*g*) Mature female, Chain106-313 (holotype). (*a*) Carapace; (*b*) fourth and fifth pereonites and first pleonite (with proximal parts of appendages); (*c*) first antenna; (*d*) second antenna; (*e*) first pereopod; (*f*) second pereopod; (*g*) uropod. Scale bar, 0.5 mm, applies to (*a*) and (*b*) only.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

two to four teeth. One to three teeth dorsal to anterolateral corner. Three or four very small teeth or serrations on anteroventral margin of pseudorostrum. Pseudorostrum 0.18–0.22 times carapace length, horizontal or slightly upturned, subvertically truncate (rather rounded).

Pereon and pleon. Pereon 1.1–1.2 times carapace length; pleon 2.7–2.9 times carapace length. Sternite of fifth pereonite with two spiniform teeth (figure 12*b*). Pleonites without lateral teeth.

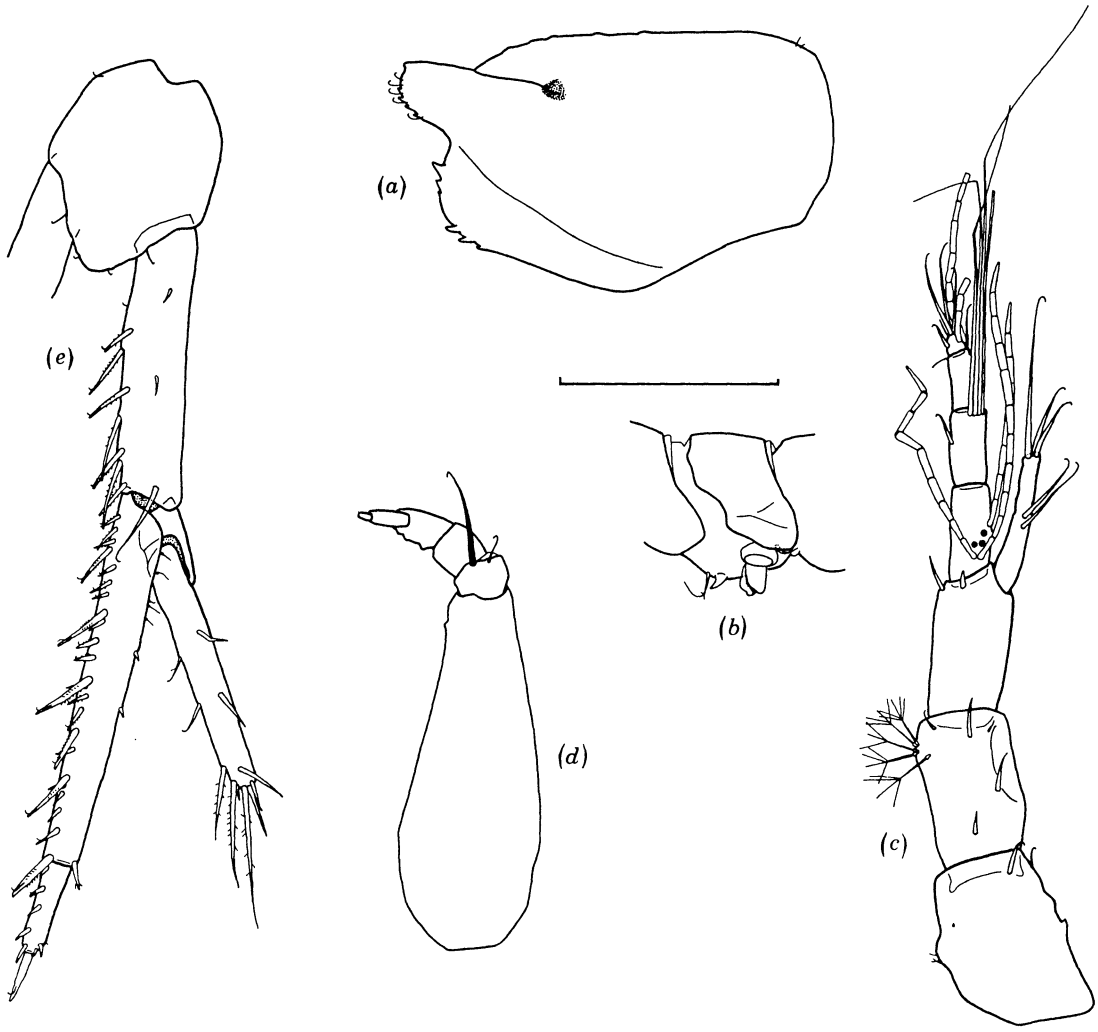

FIGURE 12. *Epileucon pusillus* n.sp. Mature male, Chain106-313 (allotype). (*a*) Carapace; (*b*) fifth pereonite; (*c*) first antenna; (*d*) third pereopod (setae on ischium, only, shown); (*e*) uropod and sixth pleonite. Scale bar, 0.5 mm, applies to (*a*) and (*b*) only.

First antenna (figure 12*c*). Slender accessory flagellum extending from one-third to slightly more than half of way along second segment of flagellum. About seven sensory setae in diagonal band approximately midway on first segment of flagellum of dissected specimen.

Second pereopod. Basis with one (rarely two) fairly strong subterminal lateroventral tooth.

Third pereopod (figure 12*d*). Ischium with one bare seta shorter than remaining segments (plus at least one very small, inconspicuous seta).

Uropod (figure 12*e*). Uropod 0.27–0.30 times body length. Peduncle about 0.8 times length of first endopodal segment. Exopod extending 0.78–0.83 of way along first endopodal segment.

First endopodal segment 3.7–4.1 times length of second (3.4 times in one specimen). Number of spines and setae on median margin: peduncle, seven spines and fairly short setae; first endopodal segment, 18–23 spines and fairly short setae; second endopodal segment, four or five spines, becoming longer distally. Terminal spine of second endopodal segment clearly shorter than this segment. Lateral margin of endopod with few, short spines. Setae on exopod rather sparse, short (although setae on distal margin may be longer than in illustrated specimen).

Manca

Body length 1.7–2.2 mm. Two to six dorsal median teeth on carapace. Pseudorostrum 0.29–0.34 times carapace length. Pereon 0.9–1.0 times carapace length; pleon 2.5–2.7 times carapace length. Inflated sternite of fifth pereonite with two ventrally or anteroventrally directed teeth. Accessory flagellum of first antenna clearly extending beyond distal margin of first segment of flagellum. Uropod 0.21–0.22 times body length. Uropodal exopod extending to distal half of second endopodal segment (rami may be subequal). First endopodal segment 2.3–2.7 times length of second.

Immature male

(Notes refer to stage before maturation moult; five specimens available.) Five to eight dorsal median teeth on carapace. Three to five dorsally directed and up to three very small ventrally directed teeth dorsal to anterolateral corner of carapace. Tooth on posteroventral corner of pleural plate of fourth pereonite retained to this stage. Uropod 0.25, 0.27 times body length (two measurements), i.e. possibly slightly elongated compared with female condition. Uropodal exopod not quite extending to distal margin of first endopodal segment; first endopodal segment 3.5, 3.7 times length of second (two measurements).

Type material

Type material will be deposited in the British Museum (Natural History), London, U.K.

Holotype. Mature female, length 3.8 mm, Chain106-313, reg. no. 1980; 126.

Allotype. Mature male, length 3.8 mm, Chain106–313, reg. no. 1980; 127.

Remarks

The female of this small species may be distinguished from others of the genus by the following combination of characters: pseudorostrum short, horizontal, subtriangular in lateral view, tip not acutely pointed; sternite of fifth pereonite with two spiniform teeth; first and second pleonites without pointed ventral processes; pleural plate of fourth pereonite with ventrally directed tooth on posteroventral corner; coxa of fourth pereopod with ventrally directed seta.

Distribution

E. pusillus has been found on the continental slope of the NE Atlantic at depths of 610 to 1780 m, the most northerly stations being west of Scotland and the most southerly station near the Canaries (figure 20*b*). The vertical range of this species therefore extends somewhat further up the continental slope than the ranges of *E. spiniventris*, *E. longirostris* form A and *E. ensis*.

Epileucon craterus n.sp. (figures 13, 14)

Material examined

Valorous-9: 1 imm. ♂. Polygas-DS20: 1 imm. unsexed. Polygas-DS21: 3 imm. ♂♂. Polygas-

FIGURE 13. For description see opposite.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

DS22: 3 imm. ♀♀. Polygas-DS23: 1 manca ♀, 3 imm. ♀♀; 1 imm. ♂. Polygas-DS28: 1 imm. ♀. BiogasII-DS30: 1 imm. ♀; 1 manca ♂. BiogasIII-DS48: 1 imm. ♀, 1 mat. ♀. BiogasIV-DS55: 1 manca ♀, 6 imm. ♀♀, 1 mat. ♀; 2 manca ♂♂, 5 imm. ♂♂, 1 mat. ♂; 1 imm. unsexed; 4 fragments. BiogasV-DS66: 1 mat. ♀; 1 manca ♂, 1 imm. ♂; 1 fragment. BiogasV-DS67: 1 imm. ♀; 1 imm. ♂; 2 imm. unsexed. BiogasVI-DS76: 4 imm. ♀♀; 1 imm. unsexed. BiogasVI-DS78: 1 manca ♀, 4 imm. ♀♀; 1 imm. unsexed. BiogasVI-DS79: 1 manca ♀, 3 imm. ♀♀, 2 mat. ♀♀; 2 manca ♂♂, 2 imm. ♂♂; 2 imm. unsexed. Chain50-85: 3 imm. ♀♀; 1 imm. ♂; 1 imm. unsexed; 1 fragment. Chain106-328: 2 manca ♀♀, 9 imm. ♀♀, 5 mat. ♀♀; 2 manca ♂♂, 14 imm. ♂♂; 2 imm. unsexed; 6 fragments. Chain106-330: 1 manca ♀, 2 imm. ♀♀; 2 manca ♂♂, 3 imm. ♂♂. AII17-95: 1 imm. ♂. AII42-195: 1 manca ♀, 2 imm. ♀♀; 1 manca ♂. Knorr25-287: 2 imm. ♀♀; 4 imm. ♂♂; 2 fragments. Knorr25-288: 3 imm. ♂♂; 1 fragment.

Preparatory and mature female

Body length 8.2–9.1 mm.

Carapace (figure 13*a*). Four to seven dorsal median teeth, irregularly spaced (often in groups of two or three), occupying one-third to slightly less than two-thirds of dorsal margin (holotype, from BiogasIV-DS55, possibly damaged, with only two dorsal teeth apparent, within anterior third of margin). Anterior portion of ventral margin of carapace with 7–11 teeth in regular row. Anterolateral corner more prominent than in most members of genus (about as in *E. spiniventris*). One to three small teeth immediately dorsal to antennal notch. Pseudorostrum with two to six small, fairly narrow-based teeth on basal part of ventral margin, 0.30–0.35 times carapace length (shorter when delicate tip worn or damaged), horizontal or slightly upturned; viewed from side, moderately deep at base, becoming shallower rapidly distally, tip acutely pointed when complete; dorsal margin straight or slightly concave, ventral margin anterior to group of teeth straight, slightly convex or very slightly concave. Siphon often projecting slightly beyond tip of pseudorostrum.

Pereon and pleon (figures 13*b*, and 14*a*, *b*). Pereon 1.0–1.2 times carapace length; pleon 2.6–2.8 times carapace length. Sternite of fifth pereonite with two broad-based, anteroventrally directed spiniform teeth, one on either side of midline. First and second pleonites without ventral processes. Pleural plates of pereonites without teeth.

First antenna (figure 13*c*). Accessory flagellum extending 0.8–1.0 of way along first segment of flagellum. Third segment of peduncle with two (rarely three) setuliferous setae and one bare seta.

Second antenna (figure 13*d*). With seta on middle segment.

First pereopod (figure 13*e*). Basis with two (occasionally one or three) lateral or lateroventral teeth in distal half, without subterminal tooth. Ischium without tooth.

Second pereopod (figure 13*f*). Dactyl shorter than carpus. Carpus with two to four laterodorsal setae.

Third pereopod. Posteroventral margin of coxa not pointed (see figure 13*b*).

Fourth pereopod. Coxa not pointed posteriorly, without ventrally directed seta (see figure 13*b*); basis unarmed.

FIGURE 13. *Epileucon craterus* n.sp. (*a*) Preparatory female, BiogasIV-DS55. (*b*)–(*g*) Mature female, BiogasIV-DS55 (holotype). (*a*) Carapace; (*b*) fourth and fifth pereonites and first pleonite (with proximal parts of appendages); (*c*) first antenna; (*d*) second antenna; (*e*) first pereopod; (*f*) second pereopod; (*g*) uropod. Scale bar, 1 mm, applies to (*a*) and (*b*) only.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

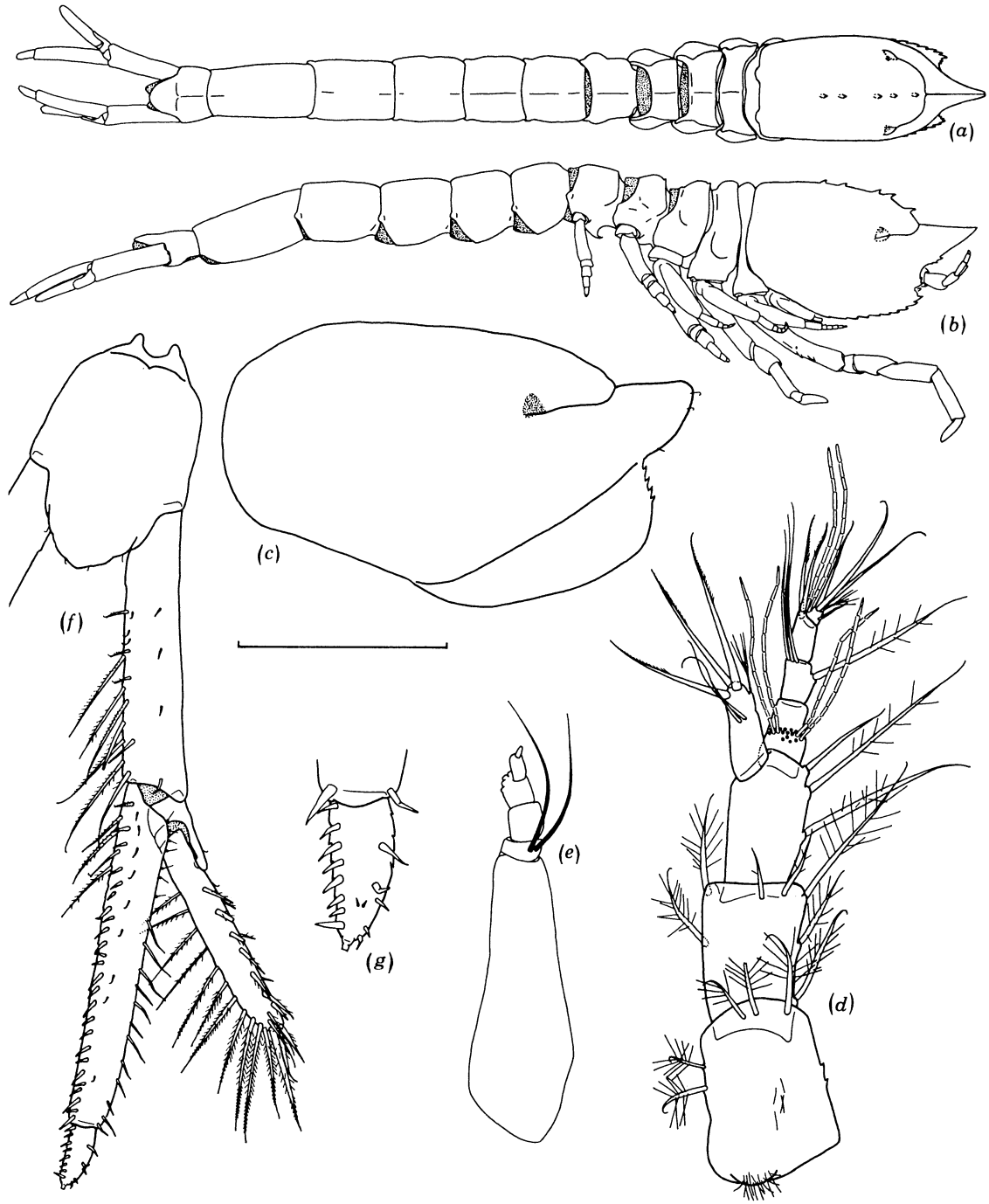

FIGURE 14. *Epileucon craterus* n.sp. (*a*), (*b*) Immature female, BiogasVI-DS78. (*c*)–(*g*) Mature male, BiogasIV-DS55 (allotype). (*a*) Whole animal, dorsal view; (*b*) whole animal, lateral view; (*c*) carapace; (*d*) first antenna; (*e*) third pereopod (setae on ischium, only, shown); (*f*) uropod and sixth pleonite; (*g*) second endopodal segment of uropod (terminal spine damaged). Scale bar, 1 mm, applies to (*c*) only.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Fifth pereopod. Coxa not pointed posteriorly (see figure 13*b*); basis unarmed.

Uropod (figure 13*g*). Uropod 0.20–0.23 times body length. Peduncle length varies from equal to 0.9 times length of first endopodal segment to equal to first plus half of second endopodal segments. Exopod extending 0.81–0.91 of way along first endopodal segment. First endopodal segment 3.5–5.0 times length of second. Number of spines on median margin: peduncle, three to five; first endopodal segment, 12–17; second endopodal segment, three or four. Terminal spine of second endopodal segment slightly shorter than this segment.

Mature male

Single specimen, body length 8.3 mm.

Carapace (figure 14*c*). No dorsal teeth. Anterior portion of ventral margin of carapace without teeth. Three or four teeth dorsal to anterolateral corner. Ventral margin of pseudorostrum without teeth (probably lost by abrasion). Pseudorostrum damaged (left and right lobes separated and worn), 0.21 times carapace length, apparently slightly upturned (probably horizontal when undamaged); anteroventral margin convex, ascending; tip blunt (worn).

Pereon and pleon. Pereon 1.1 times carapace length; pleon 2.7 times carapace length. Sternite of fifth pereonite with two teeth (damaged). Pleonites without lateral teeth.

First antenna (figure 14*d*). Accessory flagellum extending slightly less than halfway along second segment of flagellum. About 20 sensory setae in transverse band approximately midway on first segment of flagellum.

Third pereopod (figure 14*e*). Ischium with two bare setae longer than remaining segments.

Uropod (figure 14*f*, *g*). Uropod 0.26 times body length. Peduncle 0.85 times length of first endopodal segment. Exopod extending 0.76 of way along first endopodal segment. First endopodal segment 5.5 times length of second. Number of spines and setae on median margin: peduncle, seven setuliferous setae and four shorter spines; first endopodal segment, three or four setuliferous setae and about 25 small spines; second endopodal segment, eight small spines. Terminal spine of second endopodal segment damaged but apparently very small. Lateral margin of first endopodal segment with about 12 rather short, bare setae; lateral margin of second endopodal segment with five or six small spines or short bare setae. Exopod with numerous rather short, slender setuliferous setae.

Manca

Body length 2.9–3.8 mm. Five to eight dorsal median teeth on carapace. Pseudorostrum 0.37–0.44 times carapace length. Pereon 0.8–1.1 times carapace length; pleon 2.3–2.6 times carapace length. Inflated sternite of fifth pereonite with two small teeth. Accessory flagellum of first antenna slightly shorter than, slightly longer than or equal to, first segment of flagellum. Uropodal peduncle about 0.9 times length of first endopodal segment; exopod extending to proximal half of second endopodal segment. First endopodal segment of uropod 2.8–3.4 times length of second. Most distal median spine of first endopodal segment of uropod large, extending beyond distal margin of second endopodal segment.

Immature male

(Notes refer to stage before maturation moult.) Five or six dorsal median teeth on carapace. Four or five dorsally directed and one to three ventrally directed teeth dorsal to anterolateral corner of carapace. Accessory flagellum of first antenna equal to or slightly shorter than first segment of flagellum.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

FIGURE 15. For description see opposite.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Type material

Type material will be deposited in the Muséum National d'Histoire Naturelle, Paris, France. Paratype material will be deposited in the British Museum (Natural History), London, U.K.

Holotype. Mature female (with brood), length 8.8 mm, BiogasIV-DS55, registration number Cu 181.

Allotype. Mature male, length 8.3 mm, BiogasIV-DS55, registration number Cu 182.

Remarks

This relatively large, powerfully built species most closely resembles *E. spiniventris* (Hansen, 1920). Points of similarity between females of the two species include: general shape of pseudorostrum; relatively prominent anterolateral corner of carapace; sparse, irregularly spaced dorsal median teeth on carapace; relatively short dactyl of second pereopod; relatively short second segment of uropodal endopod; ischium of first pereopod without tooth. Females may be distinguished most easily by the reduced armature of the fourth and fifth pereonites and first pleonite in *E. craterus* compared with *E. spiniventris*. *E. craterus* also lacks the spiniform teeth on the basis of the fourth pereopod seen in *E. spiniventris*. The uropodal endopods of mature males of both species have short second segments, with very small terminal spines. The median endopodal spines on the uropods of both are very small. However, the lateral endopodal setation and the expodal setation differ markedly in mature males of the two species. Furthermore, *E. craterus* has only two ventral spiniform teeth on the fifth pereonite, whereas four are seen in mature males of *E. spiniventris*.

The specimen from Valorous-9 recorded by Norman (1879, pp. 69, 70) as *Leucon longirostris* and used by him to supplement Sars's description of that species is in fact an individual of *Epileucon craterus*. Contrary to Norman's findings, the specimen is a young male (pleopod buds absent but with developing exopod on fourth pereopod); there are two, not one, forward-curving spiniform teeth 'between the last pair of legs'; the telson cannot be distinguished.

Distribution

E. craterus is known: SW of Eire and in the northern and southern Bay of Biscay at depths of 3480 to 4734 m; off Angola, depth 3797 m; off SW Greenland, depth 3200 m; near Hudson Canyon, depths 3834 and 3753 m; off Surinam, depths 4934–4980 and 4417–4429 m (figure 20*c*). This seems to be a species inhabiting the foot of the continental slope, the continental rise and the abyssal plain very close to the slope and rise.

Epileucon socius n.sp. (figures 15, 16)

Material examined

Discovery-6697: 1 imm. ♂ (doubtful record). Discovery-6701: 1 manca ♂, 1 imm. ♂ (doubtful record). Polygas-DS20: 1 imm. ♂. Polygas-DS21: 1 imm. ♂. Polygas-DS22: 2 imm. ♀♀, 1 mat. ♀. Polygas-DS23: 1 imm. ♀; 1 mat. ♂. Polygas-DS28: 1 imm. ♀; 2 imm. ♂♂. BiogasII-DS30: 1 mat. ♀. BiogasIII-DS48: 1 imm. ♂. BiogasIV-DS55: 2 manca ♀♀, 6 imm. ♀♀, 1 mat. ♀; 8 imm. ♂♂, 4 mat. ♂♂. BiogasV-DS66: 4 imm. ♀♀; 1 imm. ♂. BiogasV-DS67: 1 mat. ♀. BiogasVI-DS78: 1 imm. ♀; 1 manca ♂. BiogasVI-DS79: 4 imm. ♀♀, 2 mat. ♀♀; 3 imm. ♂♂,

FIGURE 15. *Epileucon socius* n.sp. Mature female, BiogasVI-DS79 (holotype). (*a*) Carapace; (*b*) fourth and fifth pereonites and first pleonite (with proximal parts of appendages); (*c*) first antenna; (*d*) second antenna; (*e*) first pereopod (exopodite missing); (*f*) second pereopod; (*g*) uropod (second endopodal segment slightly foreshortened). Scale bar, 1 mm, applies to (*a*) and (*b*) only.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

3 mat. ♂♂. BiogasVI-CP21a: 1 manca ♂. Chain106-328: 4 imm. ♀♀, 5 mat. ♀♀; 2 imm. ♂♂, 4 mat. ♂♂; 1 imm. unsexed. Chain106-330: 1 imm. ♀, 3 mat. ♀♀; 3 imm. ♂♂, 1 mat. ♂. AII42-200: 1 mat. ♀ (doubtful record). AII42-201: 1 manca or imm. ♂ (doubtful record). Knorr 25-287: 1 imm. ♀; 1 imm. ♂. Knorr25-288: 1 imm. ♀; 1 manca ♂.

Preparatory and mature female

Body length 6.1–7.0 mm.

Carapace (figure 15*a*). Eight to eleven dorsal median teeth, generally rather regularly spaced and decreasing in size posteriorly, occupying more than half (up to two-thirds) of dorsal margin. Anterior portion of ventral margin of carapace with 7–11 teeth in regular row. Anterolateral corner moderately prominent or not prominent. One to four teeth immediately dorsal to antennal notch; one to three narrow-based teeth on basal part of ventral margin of pseudorostrum; indistinct serrations may be present between these two groups of teeth. Pseudorostrum 0.28–0.33 times carapace length, horizontal; viewed from side, dorsal margin straight or very slightly concave, ventral margin straight or smoothly convex; tip (when undamaged) acutely pointed, general outline of pseudorostrum subtriangular.

Pereon and pleon (figure 15*b*). Pereon 0.9–1.1 times carapace length; pleon 2.2–2.6 times carapace length. Sternite of fifth pereonite with two anteroventrally directed spiniform teeth, one on either side of midline. First and second pleonites without ventral processes. Pleural plates of pereonites without teeth.

First antenna (figure 15*c*). Relative length of accessory flagellum varying from not quite extending to distal margin of first segment of flagellum to extending beyond this segment by about one-fifth of its length. Third segment of peduncle with one (rarely two) setuliferous seta on lateral margin.

Second antenna (figure 15*d*). With seta on middle segment.

First pereopod (figure 15*e*). Basis with two to eight lateroventral teeth in distal half (subterminal tooth may be separated from others by gap). Ischium with ventral tooth.

Second pereopod (figure 15*f*). Dactyl slender, equal to or slightly shorter than carpus. Carpus with three or four laterodorsal setae. Basis with lateroventral subterminal tooth (may be rather weak).

Third pereopod. Posteroventral margin of coxa not pointed (see figure 15*b*).

Fourth pereopod. Coxa not pointed posteriorly, without ventrally directed seta (see figure 15*b*); basis unarmed.

Fifth pereopod. Coxa not pointed posteriorly (see figure 15*b*); basis unarmed.

Uropod (figure 15*g*). Uropod 0.21–0.25 times body length. Peduncle length varying from equal to first endopodal segment alone to equal to first plus half of second endopodal segment. Exopod extending to or just beyond distal margin of first endopodal segment (at most, extending one-third of way along second endopodal segment). First endopodal segment 3.0–4.1 times length of second. Number of spines on median margin: peduncle, three plus several slender setae; first endopodal segment, 12–16; second endopodal segment, five or six (rarely four). Terminal spine of second endopodal segment slightly shorter than this segment.

Mature male

Body length 6.7–7.4 mm.

Carapace (figure 16*a*). Eight to eleven dorsal median teeth, occupying half or more (although

less than two-thirds) of dorsal margin. Anterior portion of ventral margin of carapace with two to six teeth. One to four teeth dorsal to anterolateral corner. One to four teeth on anteroventral margin of pseudorostrum. Pseudorostrum 0.15–0.19 times carapace length, slightly upturned or horizontal, subvertically truncate.

Pereon and pleon. Pereon 0.9–1.1 times carapace length; pleon 2.3–2.6 times carapace length. Sternite of fifth pereonite with two spiniform teeth (figure 16*b*). Pleonites without lateral teeth.

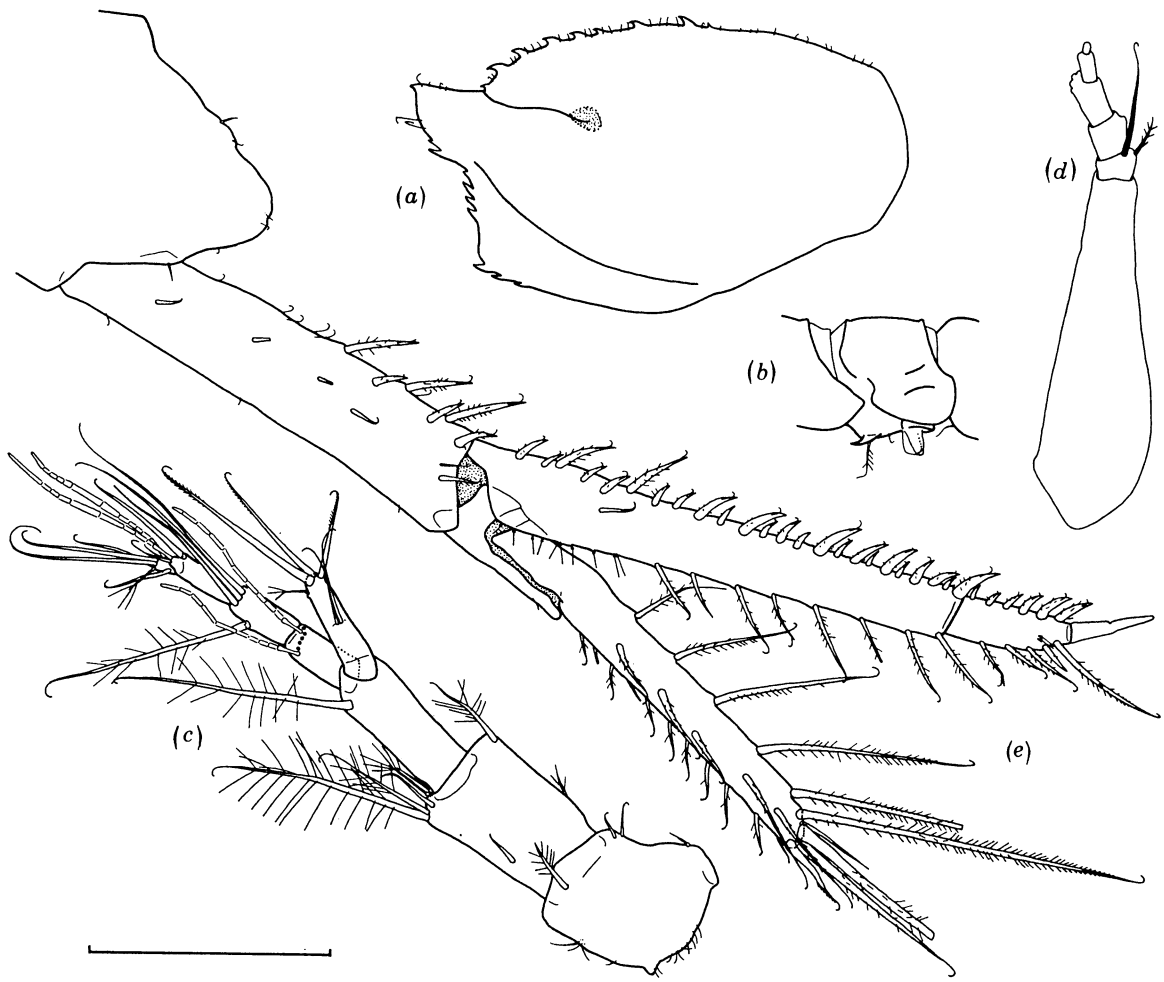

FIGURE 16. *Epileucon socius* n.sp. Mature male, BiogasVI-DS79 (allotype). (*a*) Carapace; (*b*) fifth pereonite; (*c*) first antenna; (*d*) third pereopod (setae on ischium, only, shown); (*e*) uropod and part of sixth pleonite. Scale bar, 1 mm, applies to (*a*) and (*b*) only.

First antenna (figure 16*c*). Accessory flagellum extending between one-third and half of way along second segment of flagellum. About seven sensory setae in transverse band clearly in distal half of first segment of flagellum of dissected specimen.

First pereopod. Basis with three to ten lateroventral teeth in distal half.

Second pereopod. Basis with strong subterminal tooth.

Third pereopod (figure 16*d*). Ischium with one bare seta about equal in length to remaining segments, and one very small plumose seta.

Uropod (figure 16*e*). Uropod 0.24–0.25 times body length. Peduncle length varying from about

0.9 times length of first endopodal segment to equal to entire first endopodal segment plus one-quarter of second. Exopod extending 0.89–1.00 of way along first endopodal segment. First endopodal segment 3.8–4.6 times length of second. Number of spines and setae on median margin: peduncle, five to seven spines and fairly short setuliferous setae; first endopodal segment, 24–29 spines and fairly short setuliferous setae; second endopodal segment, five to eight spines. Terminal spine of second endopodal segment shorter than this segment. Lateral margin of endopod with several fairly short, slender setuliferous setae. Exopod with numerous setuliferous setae, several of those on lateral and distal margins rather long and slender.

Manca

Five specimens available, body length about 3 mm. Six to eight dorsal median teeth on carapace, occupying between half and three-quarters of dorsal margin. Pseudorostrum 0.36–0.45 times carapace length. Pereon 0.8–0.9 times carapace length; pleon 2.2–2.4 times carapace length. Inflated sternite of fifth pereonite with two small teeth in four out of five specimens. Accessory flagellum of first antenna may be relatively slightly longer than in mature female, extending one-third of way along second segment of flagellum. Uropod 0.21–0.23 times body length. Peduncle of uropod slightly longer than first endopodal segment; exopod extending to distal half of second endopodal segment. First endopodal segment of uropod 2.4–3.2 times length of second.

Immature male

(Notes refer to stage before maturation moult; six specimens available.) Two to five dorsally directed and up to three very small ventrally directed teeth dorsal to anterolateral corner of carapace. Uropodal peduncle may be slightly shorter than first endopodal segment. Uropodal exopod may not quite extend to distal margin of first endopodal segment.

Doubtful records

Discovery-6697, Discovery-6701, AII42-200 and AII42-201 yielded specimens only tentatively identified as the present species. Immature and manca specimens were few in number and rather poorly preserved, but agreed with *E. socius* n.sp. in all characters that could be checked. The mature female from AII42–200 was atypical in that the slightly upturned pseudorostrum was 0.37 times the length of the carapace; the second pereopod had no subterminal tooth on the basis; the uropodal peduncle had four median spines. This specimen agreed in other respects with the above description.

Type material

Type material will be deposited in the Muséum National d'Histoire Naturelle, Paris, France. Paratype material will be deposited in the British Museum (Natural History), London, U.K.

Holotype. Mature female, length 6.7 mm, BiogasVI-DS79, registration number Cu 183.

Allotype. Mature male, length 7.1 mm, BiogasVI-DS79, registration number Cu 184.

Remarks

The female is perhaps most easily confused with that of *E. pusillus*, from which it may be distinguished by the following characters: tip of pseudorostrum acutely pointed (when undamaged); pleural plate of fourth pereonite without tooth on posteroventral corner; coxa of

fourth pereopod without ventrally directed seta. *E. socius* is also considerably larger than *E. pusillus*.

The mature male of *E. socius* is distinguished from all other known members of the genus by the possession of 8–11 dorsal median teeth on the carapace.

The specific name refers to the frequent co-occurrence of this form with *E. craterus*.

Distribution

E. socius has been recorded SW of Eire and in the northern and southern Bay of Biscay at depths of 3480 to 4734 m, and off Surinam, depths 4934–4980 and 4417–4429 m (figure 20*d*). It occurs with *E. craterus* in all samples except BiogasVI-CP21a, which yielded a single specimen of *E. socius*. Doubtful records have also been obtained at considerably lesser depths off the west coast of Africa: near the Canaries, depths 1564 and 1934 m; off Luanda, depths 2644–2754 and 1964–2031 m.

Epileucon acclivis n.sp. (figure 17)

Material examined

AII42-203: 1 manca ♀, 14 mat. ♀♀; 7 imm. ♂♂.

Mature female

Body length 3.6–4.5 mm.

Carapace (figure 17*a*). Three to five dorsal median teeth, generally individually spaced and occupying less than one-quarter to slightly more than one-third of dorsal margin. Anterior portion of ventral margin of carapace with 10–14 teeth in regular row. Anterolateral corner not prominent, whole anteroventral margin of carapace ascending fairly steeply to join ventral margin of pseudorostrum. One to three teeth immediately dorsal to antennal notch. Pseudorostrum with two to five teeth on basal part of ventral margin, 0.29–0.34 times carapace length, upturned; viewed from side, becoming shallower rapidly over distal half, dorsal margin almost straight, tip pointed.

Pereon and pleon (figure 17*b*). Pereon 1.1–1.3 times carapace length; pleon 2.3–2.6 times carapace length. Sternite of fifth pereonite with two anteroventrally directed spiniform teeth, one on either side of midline. First and second pleonites without ventral processes. Pleural plate of fourth pereonite with ventrally directed tooth on posteroventral corner. Pleural plates of third and fifth pereonites without teeth.

First antenna (figure 17*c*). Accessory flagellum extending 0.8–1.0 of way along first segment of flagellum. Third segment of peduncle with one setuliferous seta on lateral margin.

Second antenna (figure 17*d*). With seta on middle segment.

First pereopod (figure 17*e*). Basis with four to seven lateroventral teeth in distal half, and large dorsal terminal seta generally extending slightly more than halfway along carpus. Ischium with ventral tooth.

Second pereopod (figure 17*f*). Dactyl slender, equal to or slightly longer than carpus. Carpus without large laterodorsal setae.

Third pereopod. Posteroventral margin of coxa not pointed (see figure 17*b*).

Fourth pereopod. Coxa with ventrally directed seta on posteroventral corner (see figure 17*b*); basis unarmed.

Fifth pereopod. Coxa not pointed posteriorly (see figure 17*b*); basis unarmed.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

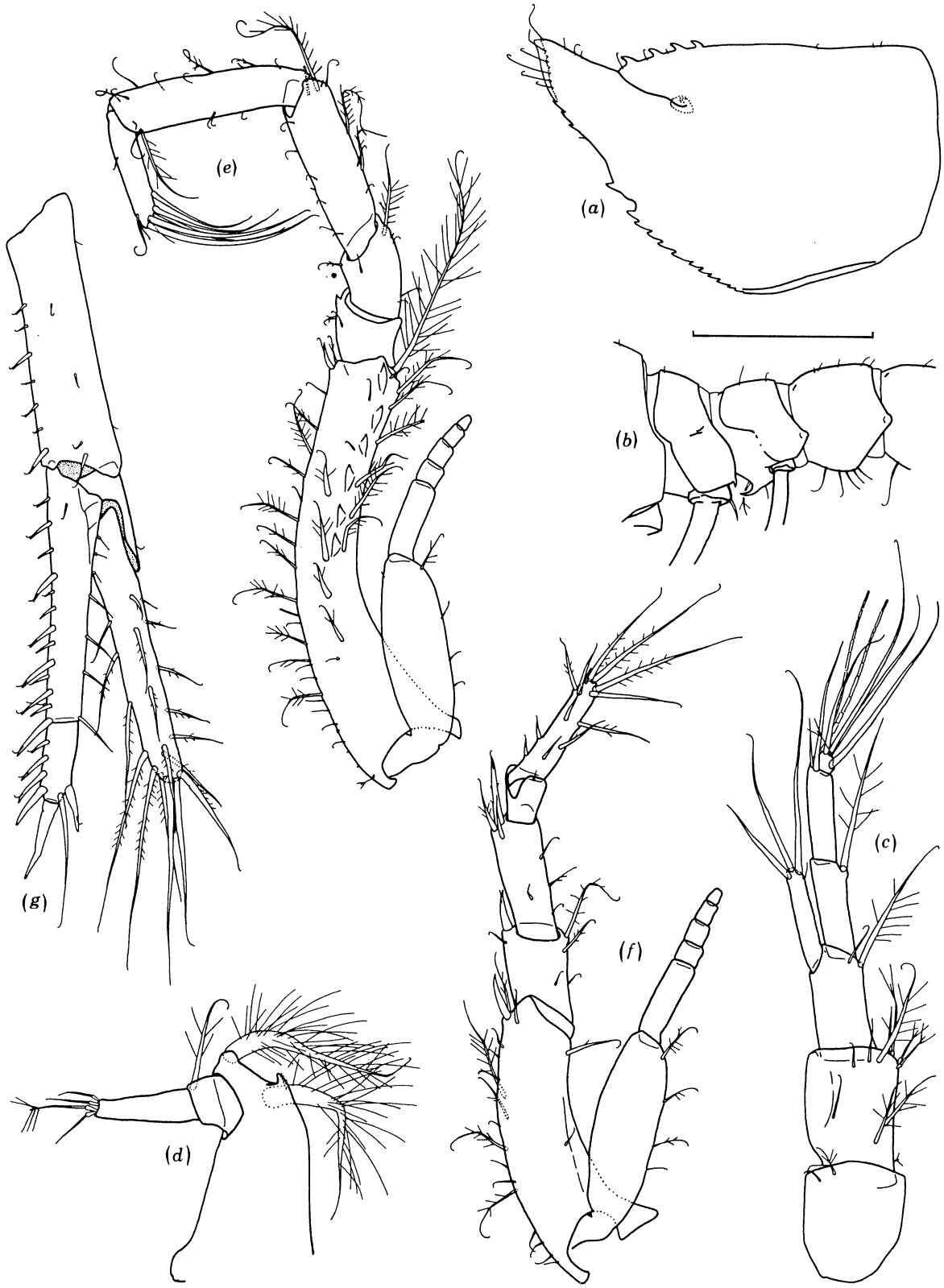

FIGURE 17. *Epileucon acclivis* n.sp. (*a*), (*c*)–(*g*) Mature female, AII42-203 (holotype). (*b*) Mature female, AII42-203 (not the holotype). (*a*) Carapace; (*b*) fourth and fifth pereonites and first pleonite (with proximal parts of appendages); (*c*) first antenna; (*d*) second antenna; (*e*) first pereopod; (*f*) second pereopod; (*g*) uropod. Scale bar, 0.5 mm, applies to (*a*) and (*b*) only.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Uropod (figure 17*g*). Uropod 0.22–0.25 times body length. Peduncle length varies from equal to first endopodal segment alone to equal to first plus two-fifths of second segment. Exopod extending to distal half of second endopodal segment (i.e. clearly extending beyond first endopodal segment). First endopodal segment 2.8–3.5 times length of second. Number of spines on median margin: peduncle, six or seven (occasionally five), some very small; first endopodal segment, 12–14; second endopodal segment, four or five. Terminal spine of second endopodal segment about equal to this segment.

Mature male

Unknown.

Manca

Single specimen available, body length 1.4 mm. Two median teeth within anterior third of dorsal margin of carapace. Pseudorostrum 0.32 times carapace length. Pereon 0.7 times carapace length; pleon 2.0 times carapace length. Slightly inflated sternite of fifth pereonite without teeth. Accessory flagellum of first antenna extending slightly beyond first segment of flagellum. Coxa of fourth pereopod without ventrally directed seta. Uropod 0.24 times body length. Uropodal peduncle slightly longer than first endopodal segment; exopod extending slightly beyond endopod (*sic*). First segment of uropodal endopod 2.4 times length of second.

Immature male

None of available specimens belonged to stage before maturation moult.

Dorsal margin of carapace more strongly arched than in mature female. Posteroventral tooth on pleural plate of fourth pereonite occasionally double.

Type material

Type material will be deposited in the British Museum (Natural History), London, U.K.

Holotype. Mature female, length 3.9 mm, AII42-203, reg. no. 1980; 128.

Remarks

This species is very close to *E. longirostris* form B (AII42-188 and AII42-189), being distinguished only by: the smaller body size; the shorter pseudorostrum, which is deeper at its base; the whole anteroventral margin of the carapace and ventral margin of the pseudorostrum forming a single, slightly sinuate, ascending line (hence the specific name).

It will be necessary to include *E. acclivis* in any future reassessment of the taxonomic status of the *E. longirostris* group of forms described above. However, it is considered that the modification of the form of the carapace shown by *E. acclivis* is too extreme to allow its listing as a form of *E. longirostris* in the present paper.

Distribution

E. acclivis is known from one station on the upper slope (depth 527–542 m) off the west coast of Africa, close to the Equator (figure 19*b*).

Epileucon tenuirostris (G. O. Sars, 1887) n.comb. (figure 18*a*)

Leucon tenuirostris (Sars 1887, pp. 33, 38–40, pl. V, figs 1–4)

L. tenuirostris (Calman 1905, p. 20)

L. tenuirostris (Zimmer 1908, p. 177 (key))

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

L. tenuirostris (Stebbing 1913, pp. 63, 65)
L. tenuirostris (Lomakina 1958, pp. 52, 53, 229, 247, figs 3, 163)

Notes on holotype

Challenger station 246, 36° 10′ N, 178° 00′ E (North Pacific), 3750 m, trawl.

The holotype is the only recorded specimen of this species, and was not dissected. It is an immature female, with the oostegite rudiments not yet developed.

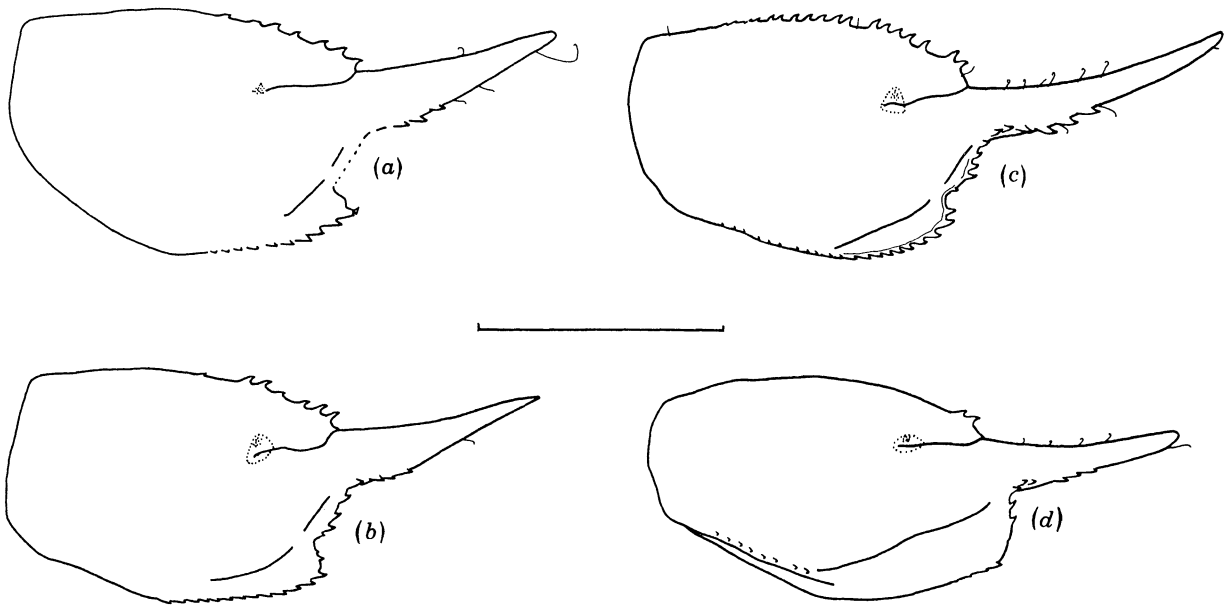

FIGURE 18. Carapaces. (*a*) *Epileucon tenuirostris* (G. O. Sars, 1887) n.comb. Immature female, *Challenger* station 246 (holotype). (*b*) *E.* cf. *tenuirostris* form A, immature female, BiogasVI-DS78. (*c*) *E.* cf. *tenuirostris* form B, preparatory female, AII60-262. (*d*) *E.* cf. *tenuirostris* form D, mature male, Knorr25-287. Scale bar, 1 mm.

Body length 7.5 mm. Lateral suture of carapace on left side split open, giving rather odd appearance depicted by Sars (pl. v, fig. 3). Margin of carapace dorsal to antennal notch on right hand side damaged. At least three teeth on ventral margin of pseudorostrum on right hand side (see figure 18*a*). In undamaged condition, teeth dorsal to antennal notch and on ventral margin of pseudorostrum apparently forming single group. Pseudorostrum 0.61 times carapace length, tip narrowly rounded or truncate (possibly damaged). Pereon 1.2 or 1.3 times carapace length; pleon 3.2 times carapace length. Sternite of fifth pereonite with two anteriorly directed spiniform teeth, one on either side of midline, lying rather flat against somite (apparently overlooked by Sars).

First and second pleonites without ventral processes. Pleural plates of pereonites without teeth. Basis of first pereopod with at least two lateroventral teeth; merus somewhat elongate. Coxae of third, fourth and fifth pereopods not pointed posteriorly; coxa of fourth pereopod without ventrally directed seta. Uropodal peduncle about equal to endopod; exopod extending halfway along second endopodal segment. First endopodal segment 2.0 times length of second. Number of spines on median margin: peduncle, four; first endopodal segment, five; second endopodal segment, three. Terminal spine of second endopodal segment shorter than this segment.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Females of the four Atlantic forms discussed below share with *E. tenuirostris*: a pseudorostrum greater than 0.6 times the length of the carapace; a single group of teeth extending from a point dorsal to the antennal notch on to the ventral margin of the pseudorostrum; a slender first pereopod, with a somewhat elongate merus; in most specimens, pereon and pleon armature of the simplest form (i.e. the sternite of the fifth pereonite with two teeth, the first and second pleonites without ventral processes, and the pleural plates of the pereonites without teeth).

Epileucon cf. *tenuirostris* form A (figure 18*b*)

Material examined

BiogasVI-DS78: 1 imm. ♀; 1 manca ♂. BiogasVI-DS79: 1 imm. ♀.

Immature female

Two specimens, oostegite rudiments not developed, body length 6.7, 5.6 mm respectively.

Carapace (figure 18*b*). Six, seven dorsal median teeth, irregularly spaced and occupying slightly less than half of weakly arched dorsal margin. Anterior portion of ventral margin of carapace with about 13 teeth in regular row. Anterolateral corner moderately prominent. Two minute teeth between anterolateral corner and antennal notch. About eight teeth in group extending from point immediately dorsal to antennal notch onto basal portion of ventral margin of pseudorostrum. Pseudorostrum 0.67, 0.68 times carapace length, slightly upturned, tapering gradually, tip acutely pointed.

Pereon and pleon. Pereon 1.2, 1.3 times carapace length; pleon 3.0, 3.1 times carapace length. Sternite of fifth pereonite with two spiniform teeth, one on either side of midline, lying rather flat against somite in one specimen (BiogasVI-DS78); fifth pereonite without teeth in other, smaller specimen (BiogasVI-DS79). First and second pleonites without ventral processes. Pleural plates of pereonites without teeth.

First antenna. Accessory flagellum extending to or very slightly beyond distal margin of first segment of flagellum. Third segment of peduncle with one bare and one or two setuliferous setae.

First pereopod. (Distal portion retained in one specimen only.) Basis equal in length to ischium, merus and carpus plus one-third of propodus. Basis with one strong lateroventral tooth in distal half, plus weak subterminal tooth in one specimen. Ischium without tooth. Merus elongate.

Second pereopod. Dactyl about equal in length to rather stout carpus.

Third pereopod. Posteroventral margin of coxa not pointed.

Fourth pereopod. Coxa not pointed posteriorly, without ventrally directed seta; basis unarmed.

Fifth pereopod. Coxa not pointed posteriorly; basis unarmed.

Uropod. Notes refer to larger specimen (BiogasVI-DS78). Peduncle equal in length to first endopodal segment plus five-sixths of second. Exopod extending about halfway along second endopodal segment. First endopodal segment 2.3 times length of second. Number of spines on median margin: peduncle, four; first endopodal segment, five; second endopodal segment, three. Terminal spine of second endopodal segment shorter than this segment.

Manca

Pseudorostrum 0.70 times carapace length. Sternite of fifth pereonite without teeth. Accessory flagellum of first antenna clearly extending beyond first segment of flagellum. Uropodal ped-

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

uncle equal to first endopodal segment plus half of second. Uropodal exopod extending about two-thirds of way along second endopodal segment; first endopodal segment 2.2 times length of second.

Epileucon cf. *tenuirostris* form B (figure 18*c*)

Material examined

AII60-245: 1 imm. ♀. AII60-262: 14 manca ♀♀, 31 imm. ♀♀, 15 mat. ♀♀; 12 manca ♂♂, 32 imm. ♂♂, 6 mat. ♂♂; 3 fragments. AII60-264: 4 manca ♀♀, 7 imm. ♀♀; 2 manca ♂♂, 4 imm. ♂♂, 1 mat. ♂; 1 fragment.

Preparatory and mature female

Body length 6.8–7.9 mm.

Carapace (figure 18*c*). Dorsal median teeth generally arranged in three groups: most anterior group (one to four teeth) on strongly arched anterior portion of dorsal margin of frontal lobe; middle group of three to five teeth; posterior group (five to ten teeth, plus smaller serrations) may extend into posterior third of dorsal margin; middle and posterior groups may join. Anterior portion of ventral margin of carapace with about ten teeth in regular row, which continues posteriorly along entire margin as series of small teeth immediately dorsal to ventral margin. Anterolateral corner not prominent; generally one strong tooth between anterolateral corner and antennal notch. Group of 8–12 teeth extending from point immediately dorsal to antennal notch, via lateroventral surface of basal portion of pseudorostrum, to ventral margin of pseudorostrum around midpoint. Pseudorostrum 0.67–0.80 times carapace length, slender; viewed from side, horizontal at base, curving slightly upwards distally, becoming shallower gradually towards narrowly rounded tip.

Pereon and pleon. Pereon 1.1–1.3 times carapace length; pleon 2.8–3.0 times carapace length. Sternite of fifth pereonite with two anteroventrally directed spiniform teeth, one on either side of midline (double tooth on one side in one immature female from AII60–264). First and second pleonites generally without ventral processes, except very small seta-bearing tubercles on posterior margin of sternite (one mature female from AII60-262 with two small ventrally directed spiniform teeth on first pleonite, one on either side of ventral midline). Pleural plates of pereonites without teeth.

First antenna. Slender. Relative length of accessory flagellum varies from extending 0.8 of way along first segment of flagellum to extending slightly beyond this segment. Third segment of peduncle with one (rarely two) setuliferous seta and one bare seta.

Second antenna. With rather small seta on middle segment.

First pereopod. Slender. Basis about equal to following three segments, with one (occasionally two) subterminal lateral tooth. Ischium with ventral tooth. Merus rather elongate.

Second pereopod. Dactyl shorter than slender carpus. Carpus with two to four laterodorsal setae.

Third pereopod. Posteroventral margin of coxa not pointed.

Fourth pereopod. Coxa not pointed posteriorly, without ventrally directed seta; basis unarmed.

Fifth pereopod. Coxa not pointed posteriorly; basis unarmed.

Uropod. Uropod 0.22–0.23 times body length. Slender. Peduncle slightly longer than endopod, with several long setae on lateral margin. Exopod extending to point on distal two-thirds of second endopodal segment. First endopodal segment 2.6–3.4 times length of second. Number of spines on median margin: peduncle, six or seven; first endopodal segment, seven or eight;

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

second endopodal segment, three (occasionally two). Terminal spine of second endopodal segment shorter than this segment.

Mature male

Body length 7.2, 7.6 mm (two measurements only).

Carapace. (Very similar to that of *E.* cf. *tenuirostris* form D; see figure 18*d*.) Two median teeth near anterior end of dorsal margin. Anterior portion of ventral margin of carapace with three to six teeth; row of small teeth immediately dorsal to posterior portion of ventral margin. Five to eight teeth in group dorsal to anterolateral corner passing onto ventral margin of pseudorostrum. Pseudorostrum 0.54 times carapace length (single measurement); viewed from side, horizontal at base, curving slightly upwards distally, becoming shallower gradually towards very narrowly rounded tip.

Pereon and pleon. Pereon 1.2 times carapace length (two measurements); pleon 2.7, 2.8 times carapace length (two measurements). Sternite of fifth pereonite without spiniform teeth. Pleonites without lateral teeth.

First antenna. Accessory flagellum extending from one-third to half of way along second segment of flagellum. Several sensory setae approximately midway on first segment of flagellum.

First pereopod. Basis with one (occasionally two) subterminal lateral tooth.

Second pereopod. Basis may have one subterminal lateroventral tooth.

Third pereopod. Ischium with two rather stout bare setae, slightly longer than or equal to remaining segments.

Uropod. Uropod 0.24, 0.26 times body length (two measurements). Peduncle about equal to endopod. Exopod extending to or slightly beyond distal margin of first endopodal segment (at most, extending one-third of way along second endopodal segment). First endopodal segment 3.0–3.4 times length of second. Number of spines and setae on median margin: peduncle, about eight spines and three or four slender setuliferous setae; first endopodal segment, 12–15 large, slightly curved, setuliferous spines and two slender setuliferous setae; second endopodal segment, four or five spines. Lateral margin of endopod with several fairly short setuliferous setae. Exopod with setuliferous setae, many of those on median and distal margins long and slender.

Manca

Body length 2.5–3.3 mm. Dorsal median teeth on carapace: anterior group, two to four teeth; middle group, two to four teeth; posterior group, two to six teeth; middle and posterior groups may join. Pseudorostrum 0.79–0.91 times carapace length. Pereon 0.9–1.0 times carapace length; pleon 2.4–3.0 times carapace length. Sternite of fifth pereonite generally with two teeth (tooth may be missing on one or both sides; tooth occasionally double on one or both sides). Accessory flagellum of first antenna extending slightly to clearly beyond first segment of flagellum. First pereopod with strong subterminal lateral tooth on basis. Uropod 0.19–0.25 times body length. Uropodal rami subequal; peduncle very slightly longer than, equal to, or slightly shorter than rami. First endopodal segment of uropod 1.9–2.6 times length of second.

Immature male

(Notes refer to stage before maturation moult.) Group of teeth dorsal to anterolateral corner of carapace, extending onto ventral margin of pseudorostrum, with 11–13 teeth, none ventrally directed; this group and teeth on anteroventral margin of carapace may be separated by very

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

small gap, or form continuous row. Uropod 0.22–0.24 times body length. Uropodal peduncle equal to or slightly longer than endopod; exopod extending up to three-quarters of way along second endopodal segment.

Epileucon cf. *tenuirostris* form C

Material examined

AII42-195: 2 mat. ♀♀. Knorr25-293: 2 manca ♀♀, 8 imm. ♀♀, 3 mat. ♀♀; 5 imm. ♂♂, 1 mat. ♂; 5 fragments. Knorr25-299: 2 manca ♀♀, 5 imm. ♀♀, 3 mat. ♀♀; 1 manca ♂, 8 imm. ♂♂, 1 mat. ♂; 1 fragment.

In the notes below, emphasis is placed on the main features separating this form from the very similar *E.* cf. *tenuirostris* form B.

Preparatory and mature female

Body length 5.9–7.5 mm. Median teeth occupying less than half (but more than one-third) of dorsal margin of carapace; anterior group of one or two teeth, middle group of two to four teeth and posterior group of about four minute teeth; groups may merge to form single irregular row. Frontal lobe, viewed from side, weakly arched. Pleon 2.8–3.3 times carapace length. Ventral spiniform teeth on fifth pereonite occasionally double. Third segment of peduncle of first antenna with one bare and two or three setuliferous setae on lateral margin; first segment of flagellum with one or two setuliferous setae on distal portion of lateral margin. Teeth on ischium and basis of first pereopod may be absent or weak. Dactyl of second pereopod equal to or slightly shorter than carpus. Uropod 0.20–0.21 times body length; number of spines on median margin of specimens from AII42-195: peduncle, four or five; first endopodal segment, five or six; second endopodal segment, three; specimens from Knorr25-293 and Knorr25-299 as *E.* cf. *tenuirostris* form B in this respect.

Mature male

Two specimens, body length 7.4, 7.5 mm respectively. Specimen from Knorr25-293 without dorsal teeth on carapace; specimen from Knorr25-299 (damaged) may have one minute tooth at extreme anterior end of dorsal margin of carapace. Pseudorostrum 0.48 times carapace length (single measurement, Knorr25-299). Pereon 1.2, 1.3 times carapace length; pleon 2.9, 3.1 times carapace length. Accessory flagellum of first antenna extending one-quarter of way along second segment of flagellum. Basis of first pereopod with very weak subterminal tooth (Knorr25-293), or none (Knorr25-299). Uropod 0.22, 0.23 times body length; exopod extending to distal margin of first endopodal segment; first endopodal segment 3.6, 3.9 times length of second.

Manca

Five specimens. Three to six dorsal median teeth on carapace, generally in two groups. Pseudorostrum 0.83–0.94 times carapace length. Frontal lobe may be strongly arched dorsally (as in *E.* cf. *tenuirostris* form B). Pereon 0.8–1.1 times carapace length.

Immature male

(Notes refer to stage before maturation moult; five specimens.) Four or five dorsal median teeth on carapace, in single group and occupying less than one-third of dorsal margin (two

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

observations). Group of teeth dorsal to anterolateral corner of carapace may include ventrally directed teeth.

Epileucon cf. *tenuirostris* form D (figure 18*d*)

Material examined

Knorr25-287: 3 imm. ♀♀, 2 mat. ♀♀; 1 manca ♂, 2 imm. ♂♂, 1 mat. ♂; 1 fragment. Knorr25-288: 1 imm. ♂; 2 fragments.

In the notes below, emphasis is placed on the main features separating this form from the very similar *E.* cf. *tenuirostris* form B.

Preparatory and mature female

Three specimens, body length 6.0–6.7 mm. Median teeth occupying more than half (but less than two-thirds) of dorsal margin of carapace; anterior group of two teeth, middle group of three teeth, posterior group of four teeth (single observation). Frontal lobe, viewed from side, moderately arched. Group of six to nine teeth extending from point immediately dorsal to antennal notch onto ventral margin of pseudorostrum. Pseudorostrum 0.74, 0.83 times carapace length (two measurements). Pleon 2.9–3.3 times carapace length. Sternite of fifth pereonite with two spiniform teeth, one on either side of midline (double tooth on one side in one immature female from Knorr25-287). Basis of first pereopod with one strong lateroventral tooth in distal half, may also have one or two subterminal teeth; ischium may have ventral tooth. Dactyl of second pereopod about equal to carpus. Uropod 0.18, 0.19 times body length (two measurements); peduncle equal to endopod; first endopodal segment 2.4 times length of second (single measurement). Number of spines on median margin of uropod: peduncle, four; first endopodal segment, five; second endopodal segment, three (single observation).

Mature male

Single specimen, body length 7.1 mm. Carapace (figure 18*d*) as in *E.* cf. *tenuirostris* form B; pseudorostrum 0.61 times carapace length. Pereon 1.3 times carapace length; pleon 3.1 times carapace length. Accessory flagellum of first antenna extending one-quarter of way along second segment of flagellum. Basis of first pereopod with four lateroventral teeth in distal portion. Basis of second pereopod without subterminal tooth. Uropod 0.20 times body length; exopod extending about three-quarters of way along second endopodal segment. First endopodal segment of uropod 2.2 times length of second. Number of spines and setae on median margin: peduncle, three spines and one or two slender setuliferous setae; first endopodal segment, seven or eight bare spines (smaller than in *E.* cf. *tenuirostris* forms B and C) and one or two slender setuliferous setae; second endopodal segment, five or six spines (observations on left and right uropods). Lateral margins of uropodal endopod and exopod with very sparse, short setae. Median and distal margins of exopod with several long, slender setuliferous setae.

Manca

Single specimen. Two median teeth in anterior dorsal group on carapace; dorsal margin of carapace posterior to this group damaged. Pseudorostrum 0.93 times carapace length. Sternite of fifth pereonite without teeth. Accessory flagellum of first antenna equal to first segment of flagellum. Basis of first pereopod with strong subterminal tooth.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Immature male

No specimens in stage before maturation moult available.

Remarks

Epileucon cf. *tenuirostris* forms B, C and D may belong to a single species showing a high level of variation in the following characters: (in females) extent of dorsal median groups of teeth on carapace; depth (degree of arching) of frontal lobe; lateral setation of third segment of peduncle of first antenna; armature of basis and ischium of first pereopod; spinulation and segment length ratios of uropod; (in mature males) occurrence of dorsal median teeth on carapace; spinulation, setation and segment length ratios of uropod. These are the only *Epileucon* forms known to lack teeth on the sternite of the fifth pereonite in mature males. A doubling of the tooth complement of the sternite of the fifth pereonite is shown occasionally in females of each form.

The carapace of females of *E.* cf. *tenuirostris* forms B, C and D has the following points of similarity with that of *E. ensis*: dorsal median teeth arranged in fairly discrete groups; pseudorostrum curving gently upwards; extensive group of teeth dorsal to antennal notch; entire anteroventral carapace margin somewhat rounded.

Epileucon cf. *tenuirostris* form A seems distinct from forms B, C and D, especially in carapace and pseudorostrum form; this form agrees in almost all respects with the holotype of *E. tenuirostris*, and may belong to that species. However, the definite recording of *E. tenuirostris* from the Atlantic is deferred until mature specimens from the Atlantic and Pacific are available for comparison.

Distribution

E. cf. *tenuirostris* form A is known only from the NW Bay of Biscay at depths of 4706 and 4715 m. *E.* cf. *tenuirostris* form B is recorded off Montevideo (depths 2707, 2440–2480 and 2041–2048 m). *E.* cf. *tenuirostris* form C occurs in samples taken off Angola (depth 3797 m) and off Surinam (depths 1456–1518 and 1942–2076 m). *E.* cf. *tenuirostris* form D has been found off Surinam (depths 4934–4980 and 4417–4429 m).

Notes on non-Atlantic species and doubtful members of the genus

(See also the notes on the Pacific form *E. tenuirostris*, p. 395.)

Epileucon latispina (Jones, 1963) n.comb.

Leucon (?) *latispina* (Jones 1963, pp. 40–42, figs 112–122)

Material examined

One immature female (paratype, in N. S. Jones's collection). Hawke Bay, New Zealand, 4 September 1957, 119 m, cone dredge.

The single preparatory female examined differs from the original description in that the sternite of the fifth pereonite has only two anteroventrally directed spiniform teeth; these are well separated, one on either side of the midline. (One tooth was presumably double on one side in the specimen referred to in the description.) The two ventral spiniform projections on the first pleonite mentioned in the description are well spaced, situated one on either side of the midline. There are nine dorsal median teeth on the carapace, and the pseudorostrum is less markedly upturned and less acutely pointed than in Jones's fig. 113. The dactyl of the second

pereopod is more slender than is shown in Jones's fig. 118. The uropodal peduncle is slightly shorter than the endopod; the first endopodal segment has about 12 spines on its median margin.

This species clearly belongs to the redefined genus *Epileucon*. The ventral armature of the fifth pereonite (and first pleonite) conform more closely to the pattern seen in other species of *Epileucon* than the original description would suggest.

Jones recorded this species from five stations in Hawke Bay at depths of 84 to 121 m.

Epileucon bengalensis (Lomakina, 1967) n.comb.

Leucon bengalensis (Lomakina 1967, pp. 102, 103, figs 4, 5)

This species belongs to the genus *Epileucon* on the basis of its carapace morphology and possession of a pair of anteriorly curved ventral teeth on the fifth pereonite, as detailed in Lomakina's written description and illustrations of a single immature female from the northern Bay of Bengal. The second pereopod and uropod also conform to the pattern described for the genus. However, Lomakina clearly states that the accessory flagellum of the first antenna is rudimentary, and shows it as minute and knoblike in her fig. 5; it therefore departs from the form regarded as typical for the genus.

Lomakina gives the depth of occurrence as 2560 m, although the depth of station 327, at which the specimen was taken, is stated elsewhere in her paper to be 2250 m.

Epileucon pacifica Jones, 1969

Epileucon pacifica (Jones 1969, pp. 115–117, fig. 8)

Material examined

One female with brood (holotype), carapace squashed. *Galathea* station 745, 16 May 1952, 7° 15′ N, 79° 25′ W (Gulf of Panama), 915 m, ST600.

The grouping of the teeth dorsal to the anterolateral corner of the carapace conforms more closely to the pattern seen in other species of *Epileucon* than the original description would suggest. There is a small, nearly horizontal tooth between the anterolateral corner of the carapace and the well defined, narrow antennal notch. There are three teeth dorsal to the antennal notch and, at least on one side, the anteroventral margin of the pseudorostrum has a few weak teeth.

The uropodal peduncle is about equal to the first endopodal segment. The uropodal exopod extends just beyond the distal margin of the first endopodal segment. The first endopodal segment is 3.6 times the length of the second.

The sternite of the fifth pereonite is without the spiniform teeth expected in a member of the genus, thus placing the generic identity of this species in some doubt. It will be necessary to examine further material to ascertain whether the absence of teeth on the fifth pereonite is typical.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Leucon kalluropus Stebbing, 1912

Leucon kalluropus (Stebbing 1912, pp. 156–158, pl. LVII)
L. kalluropus (Stebbing 1913, pp. 64, 71, fig. 38)
L. kalluropus (Zimmer 1913, p. 473)

Material examined

One mature male (holotype), condition very poor, uropods missing; 39 km NE of Cape Natal, 805 m.

The characters mentioned in Stebbing's description of this species strongly suggest that it may belong to the genus *Epileucon* (indeed, Stebbing states that the form makes 'a close approach to *Leucon longirostris*'). However, on examination of the holotype, the only specimen as yet referred to this species, the fifth pereonite appeared to have a single, large, anteroventrally directed spiniform tooth on the ventral midline, thereby departing from the pattern seen in *Epileucon*. This is in contrast to the observation in the description (Stebbing 1912, p. 157), which specifies the presence of more than one tooth: 'Fifth pedigerous segment with procurved ventral spines'. The generic identity of this species must remain in doubt until more material, in a better state of preservation, is available.

General comments

It is interesting that Sars (1887), Hansen (1920), Jones (1963) and Lomakina (1967), in their respective descriptions of *Leucon tenuirostris*, *L. spiniventris*, *L.* (?) *latispina* and *L. bengalensis*, all state or imply that *L. longirostris* G. O. Sars, 1871 shows the closest resemblance or relationship to their new species. Thus the recognition of group affinity of those *Leucon* species transferred to *Epileucon* in the present paper is to some extent supported by comments in the previous literature.

Sars (1871, 1887) made no mention of paired ventral teeth on the fifth pereonites of his type specimens. The first accurate description of these was made by Calman (1906), although Norman (1879) had erroneously mentioned a single ventral tooth.

Keys

Key to preparatory and mature females of Atlantic and Mediterranean species of *Epileucon*

1. Pseudorostrum relatively long (> 0.6 times carapace length). Single group of teeth extends from point immediately dorsal to antennal notch onto ventral margin of pseudorostrum (figure 18*b*, *c*). Uropodal exopod extends about halfway along second endopodal segment or beyond, i.e. clearly extends beyond first endopodal segment. *E.* cf. *tenuirostris*

— Pseudorostrum relatively short (≤ 0.6 times carapace length). Two distinct groups of teeth dorsal to antennal notch and on ventral margin of pseudorostrum (although indistinct serrations may occur between these). Uropodal exopod may extend not as far as, to, or beyond, distal margin of first endopodal segment. 2

2. Sternite of fifth pereonite with four spiniform teeth. First (and sometimes second) pleonite with paired one-, two- or three-pointed ventral processes (figures 2*c*, 4*c*). Accessory flagellum of first antenna clearly shorter than first segment of flagellum. Basis of fourth pereopod with one or two anteromedian spiniform teeth in proximal half. 3

— Sternite of fifth pereonite with two spiniform teeth. First and second pleonites without pointed ventral processes. Accessory flagellum of first antenna shorter than, equal to, or longer than first segment of flagellum. Basis of fourth pereopod unarmed. 4

3. Pseudorostrum 0.19–0.24 times carapace length. Pleural plates of third, fourth and fifth pereonites with scattered teeth on anteroventral margin and one or two teeth on posteroventral corner (figure 2*c*). Dactyl of second pereopod about equal in length to carpus (figure 2*g*). Peduncle of uropod with three or four spines on median margin. *E. galatheae* Jones, 1956

— Pseudorostrum 0.30–0.39 times carapace length. Pleural plate of fourth pereonite, only, with one tooth on posteroventral corner (figure 4*c*). Dactyl of second pereopod clearly shorter than carpus (figure 4*g*). Peduncle of uropod with five to eight spines on median margin. *E. spiniventris* (Hansen, 1920) n.comb.

4. Pseudorostrum very blunt-tipped, curving gently upwards when viewed from side (figure 9*a*). Dorsal median teeth on carapace arranged in one or two groups of up to four contiguous teeth. First endopodal segment of uropod 2.2–2.5 times length of second. *E. ensis* n.sp

— Tip of pseudorostrum not bluntly rounded. Dorsal median teeth on carapace scattered or regularly spaced, but not restricted to discrete groups of contiguous teeth. First endopodal segment of uropod 2.8–5.0 times length of second. 5

5. Uropodal exopod extending 0.8–0.9 of way along first segment of endopod. Dactyl of second pereopod shorter than carpus. Anterolateral corner of carapace rather prominent (figure 13*a*). *E. craterus* n.sp.

— Uropodal exopod extending to or beyond distal margin of first segment of endopod. Dactyl of second pereopod slightly longer than, equal to, or very slightly shorter than carpus. Anterolateral corner of carapace not, or only slightly, prominent. 6

6. Pseudorostrum horizontal, subtriangular when viewed from side (figures 11*a*, 15*a*). 7

— Pseudorostrum upturned, not subtriangular when viewed from side (figures 6*a*, 8*a*, 17*a*). 8

7. Body length 3.4–4.4 mm. Tip of pseudorostrum not acutely pointed (figure 11*a*). Pleural plate of fourth pereonite with ventrally directed tooth on posteroventral corner; coxa of fourth pereopod with ventrally directed seta (figure 11*b*). *E. pusillus* n.sp.

— Body length 6.1–7.0 mm. Tip of pseudorostrum acutely pointed when undamaged (figure 15*a*). Pleural plate of fourth pereonite without tooth; coxa of fourth pereopod without ventrally directed seta (figure 15*b*). *E. socius* n.sp.

8. Body length 3.6–4.5 mm. Pseudorostrum 0.29–0.34 times carapace length. Anteroventral margin of carapace ascending comparatively steeply (figure 17*a*). *E. acclivis* n.sp.

— Body length 4.7–6.6 mm. Pseudorostrum 0.38–0.59 times carapace length. Anteroventral margin of carapace ascending less steeply (figures 6*a*, 8*a*). *E. longirostris* (Sars, 1871) n.comb.

Key to mature males of Atlantic and Mediterranean species of *Epileucon*

(N.B. A single, incomplete specimen of *E. ensis* and a single, damaged individual of *E. craterus* were available for study. The mature male of *E. acclivis* is not known.)

1. Pseudorostrum relatively long ($\geqslant$ 0.3 times carapace length). Carapace without dorsal median teeth, or with one or two teeth at anterior end of frontal lobe. 2

— Pseudorostrum relatively short ($\leqslant$ 0.3 times carapace length). Carapace without dorsal median teeth, or with about ten teeth occupying half or more of dorsal margin. 3

2. Pseudorostrum relatively shallow, with narrowly rounded tip (figure 18*d*). Sternite of fifth pereonite without spiniform teeth. *E.* cf. *tenuirostris*

— Pseudorostrum relatively deep, with truncate or broadly rounded tip (figure 10*d*). Sternite of fifth pereonite with two spiniform teeth. *E. ensis* n.sp.

3. Sternite of fifth pereonite with four spiniform teeth. 4

— Sternite of fifth pereonite with two spiniform teeth. 5

4. Accessory flagellum of first antenna extending only about 0.6 of way along first segment of flagellum (figure 3*c*). Ischium of third pereopod with four or five bare setae, some clearly longer than remaining segments (figure 3*d*). First endopodal segment of uropod 3.6–4.7 times length of second; setae on lateral margin of uropodal endopod bare, fairly short; setae on exopod long (figure 3*e*). *E. galatheae* Jones, 1956

— Accessory flagellum of first antenna extending to distal margin of first segment of flagellum (figure 5*d*). Ischium of third pereopod with two bare setae, slightly longer than remaining segments (figure 5*e*). First endopodal segment of uropod 5.6–7.3 times length of second; lateral margin of uropodal endopod densely fringed with stout, curved, strongly setuliferous setae; exopod with numerous fairly short, stout setuliferous setae (figure 5*f*). *E. spiniventris* (Hansen, 1920) n.comb.

5. Carapace with about ten median teeth occupying half or more than half of dorsal margin (figure 16*a*). *E. socius* n.sp.

— Carapace without dorsal median teeth. 6

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

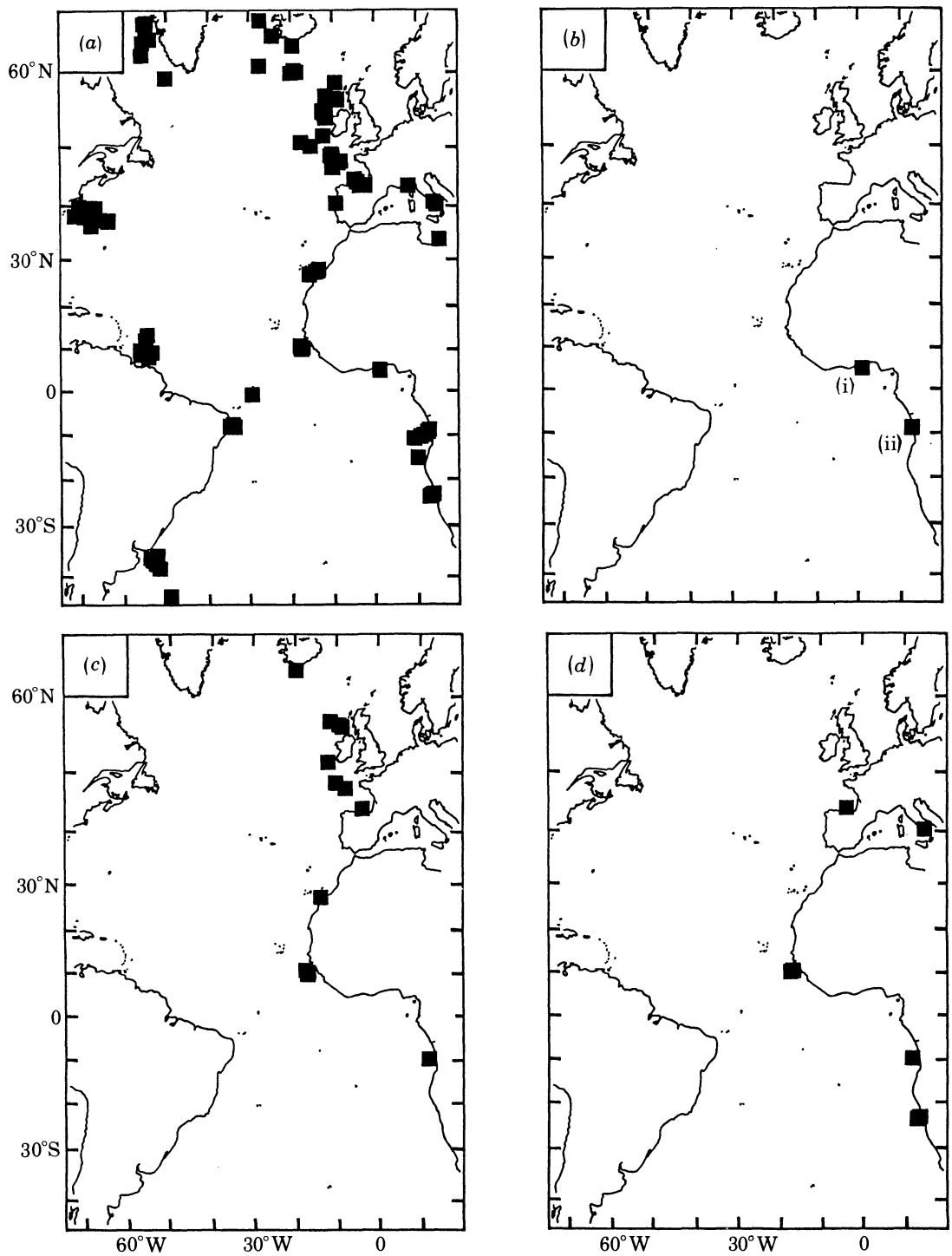

FIGURE 19. Distribution maps: (*a*) all stations yielding leuconid material (not necessarily *Epileucon*); (*b*) *Epileucon galatheae* (i and ii) and *E. acclivis* (ii only); (*c*) *E. spiniventris*; (*d*) *E. longirostris*.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

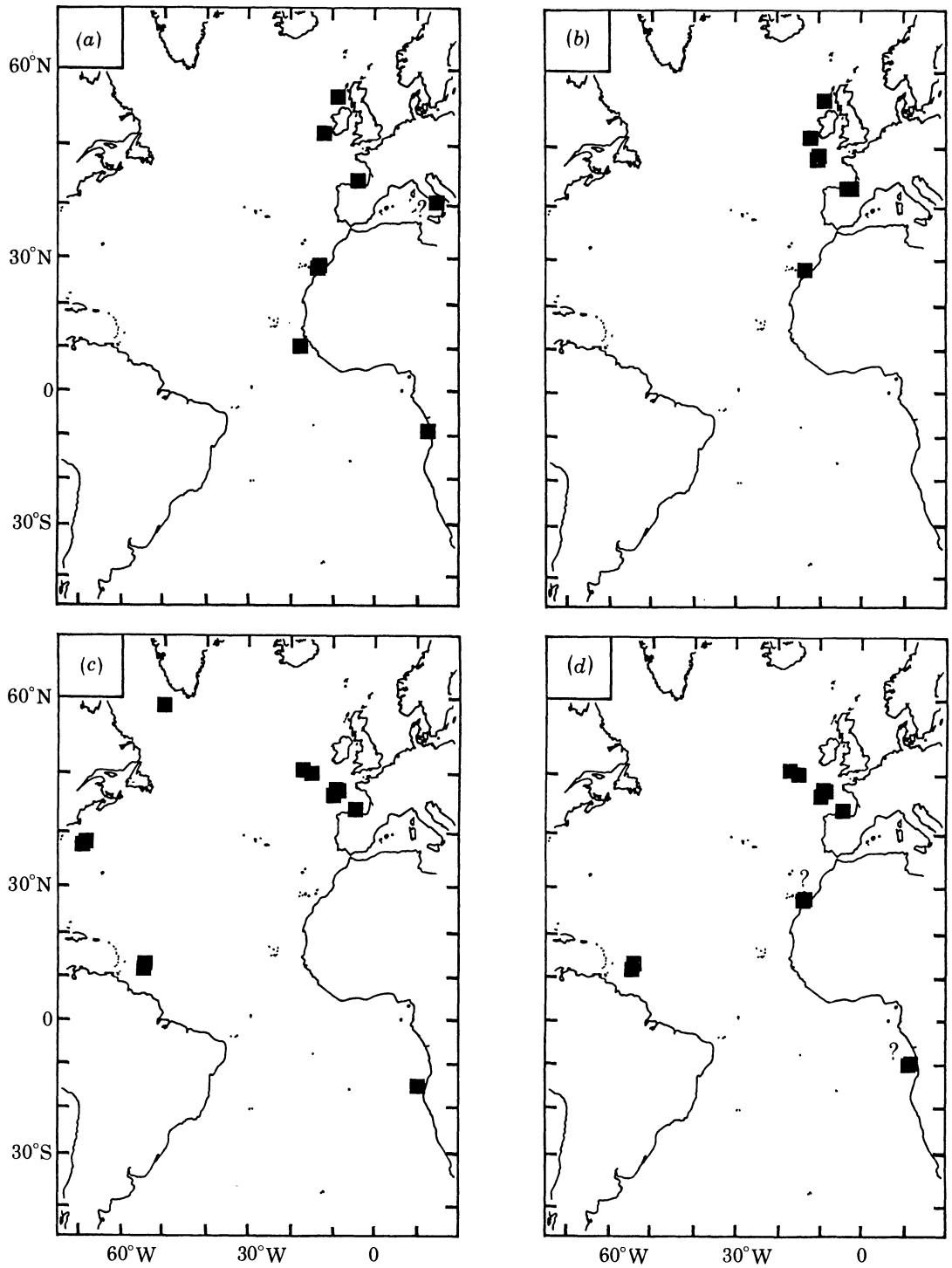

FIGURE 20. Distribution maps: (*a*) *E. ensis*; (*b*) *E. pusillus*; (*c*) *E. craterus*; (*d*) *E. socius*.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

6. Body length about 8.3mm. Ischium of third pereopod with two bare setae longer than remaining segments (figure 14*e*). First endopodal segment of uropod 5.5 times length of second; terminal spine of second endopodal segment (probably) very small (figure 14*f*, *g*). *E. craterus* n.sp.

— Body length 3.6–5.9 mm. Ischium of third pereopod with one bare seta equal to or slightly shorter than remaining segments (figures 7*g*, 12*d*). First endopodal segment of uropod 3.2–4.5 times length of second; terminal spine of second endopodal segment not very small (figures 7*h*, 12*e*). *E. longirostris* (Sars, 1871) n.comb. and *E. pusillus* n.sp.

Mature males of *E. longirostris* form A (body length 5.3–5.5 mm) and the smaller *E. pusillus* (body length 3.6–3.8 mm) closely resemble each other throughout the range of characters used in this study; those of *E. longirostris* forms B and C (body lengths 5.7–5.9 mm) differ from *E. longirostris* form A and *E. pusillus* in the increased number of setae and spines on the median margin of the uropodal peduncle and endopod.

Comments on distribution

The known distribution of *Epileucon* species on the continental slope of the Atlantic shows a pronounced easterly bias, with *E. galatheae*, *E. acclivis*, *E. spiniventris*, *E. longirostris*, *E. ensis* and *E. pusillus* being unknown in the west Atlantic. Failure to find these species in the repeatedly sampled Gay Head – Bermuda transect suggests that they may be genuinely absent from the western sector. *E. craterus* and *E. socius*, living deeper than the other species at or beyond the foot of the continental slope, occur in both the east and west Atlantic. *Epileucon* cf. *tenuirostris* forms B, C and D may prove to be a single, variable species (see systematic part); if so, this species extends in vertical range beyond the foot of the continental slope and follows the pattern set by *E. craterus* and *E. socius* in occurring on both sides of the Atlantic.

In *E. spiniventris*, *E. ensis* and *E. craterus*, the most northerly Atlantic records are also the shallowest.

The genus is represented in deep water ($\geqslant$ 200 m) in the Atlantic, Pacific and Indian oceans and in the Mediterranean Sea, and also on the continental shelf (around 100 m depth) off New Zealand.

I wish to thank the following people for arranging the loan of material: J. L. Barnard (Smithsonian Institution), T. Wolff (Copenhagen University Zoological Museum), J. Ellis and R. J. Lincoln (British Museum [Natural History]). M. Băcescu (*Grigore Antipa* Museum of Natural History) helped with the location of type material and very kindly provided a translation of Lomakina's description of *Leucon bengalensis*. N. S. Jones, my supervisor at Port Erin, lent a paratype specimen of *Leucon* (?) *latispina*, read the manuscript, and provided many useful comments and suggestions. The work was carried out during the tenure of a N.E.R.C. research assistantship.

References

Băcescu, M. 1961 Contribution à l'étude des Cumacés de la Méditerranée et particulièrement des côtes d'Israel. *Rapp. P. -v. Réun. Commn. int. Explor. scient. Mer Méditerr.* **16** (2), 495–502.

Calman, W. T. 1905 The marine fauna of the west coast of Ireland, Part IV. Cumacea. *Fish. Ireland sci. Invest.* **1904**, 3–52.

Calman, W. T. 1906 The Cumacea of the Puritan Expedition. *Mitt. zool. Stn Neapel* **17**, 411–432.

Calman, W. T. 1912 The Crustacea of the order Cumacea in the collection of the United States National Museum. *Proc. U.S. natn. Mus.* **41** (1876), 603–676.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Fage, L. 1929 Cumacés et Leptostracés provenant des campagnes scientifiques de S.A.S. le Prince Albert Ier de Monaco. *Résult. Camp. scient. Prince Albert I* **77**, 1–50.

Fage, L. 1951 Cumacés. *Faune Fr.* **54**, 1–136.

Given, R. R. 1961 The cumacean fauna of the southern California continental shelf. No. 1, family Leuconidae. *Bull Sth. Calif. Acad. Sci.* **60** (3), 130–146.

Hansen, H. J. 1920 Crustacea Malacostraca IV. The order Cumacea. *Dan. Ingolf-Exped.* **3** (6), 1–74.

Jones, N. S. 1956 Cumacea from the west coast of Africa. *Atlantide Rep.* **4**, 183–212.

Jones, N. S. 1963 The marine fauna of New Zealand: crustaceans of the order Cumacea. *Bull. N.Z. Dep. scient. ind. Res.* **152**, 1–80.

Jones, N. S. 1969 The systematics and distribution of Cumacea from depths exceeding 200 meters. *Galathea Rep.* **10**, 99–180.

Lagardère, J.-P. 1977 Recherches sur la distribution verticale et sur l'alimentation des crustacés décapodes benthiques de la pente continentale du Golfe de Gascogne. Analyse des groupements carcinologiques. *Bull. Cent. Étud. Rech. scient., Biarritz* **11** (4), 367–440.

Lomakina, N. B. 1958 Cumacea of the seas of the U.S.S.R. *Opred. Faune SSSR* **66**, 1–301. (In Russian.)

Lomakina, N. B. 1967 New species of Cumacea collected by the Soviet Antarctic Expedition off south-eastern Australia and in the north of the Indian Ocean. *Trudy zool. Inst., Leningr.* **43**, 99–108 (In Russian.)

Norman, A. M. 1879 Crustacea Cumacea of the *Lightning*, *Porcupine* and *Valorous* expeditions. *Ann. Mag. nat. Hist.* ser. 5, **3**, 54–73.

Reyss, D. 1972 Résultats scientifiques de la campagne du N.O. *Jean Charcot* en Méditerranée occidentale, mai–juin–juillet 1970. Cumacés. In *Studies on Peracarida. Crustaceana* (suppl. 3), pp. 362–377.

Reyss, D. 1973 Distribution of Cumacea in the deep Mediterranean. *Deep Sea Res.* **20**, 1119–1123.

Reyss, D. 1974 Cumacés. Résultats scientifiques de la campagne *Polymède II* du N.O. *Jean Charcot* en mer Ionienne et en mer Égée (avril–mai 1972). *Crustaceana* **27** (2), 216–222.

Reyss, D. & Soyer, J. 1966 Cumacés recueillis lors de la campagne de la *Calypso* à Port-Vendres en août–septembre 1964. *Bull. Inst. océanogr. Monaco* **66** (1372), 1–11.

Sars, G. O. 1871 Beskrivelse af de paa fregatten Josephines expedition fundne Cumaceer. *K. svenska VetenskAkad. Handl.* **9** (13), 1–57.

Sars, G. O. 1887 Report on the Cumacea collected by H.M.S. *Challenger* during the years 1873–76. *Rep. Challenger Zool.* **19**, 1–73.

Stebbing, T. R. R. 1912 The Sympoda (part VI of S.A. Crustacea, for the marine investigations in South Africa). *Ann. S. Afr. Mus.* **10**, 129–176.

Stebbing, T. R. R. 1913 Cumacea (Sympoda). *Tierreich* **39**, 1–210.

Zimmer, C. 1908 Die Cumaceen der 'Deutschen Tiefsee-Expedition' *Wiss. Ergebn. dt. Tiefsee-Exped.* '*Valdivia*' **8**, 155–196.

Zimmer, C. 1941 Cumacea. *Bronn's Kl. Ordn. Tierreichs* **5** (1, 4), 1–222.

Zimmer, C. 1980 Cumaceans of the American Atlantic Boreal coast region (Crustacea: Peracarida). *Smithson. Contr. Zool.* **302**, i-v and 1–29.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES