

Deep-sea Cirripedia Thoracica (Crustacea) from the northeastern Atlantic collected by French expeditions

Paulo S. YOUNG

Museu Nacional / UFRJ,
Quinta da Boa Vista,
20940-040 Rio de Janeiro RJ (Brazil)
psyong@acd.ufrj.br

Young P. S. 2001. — Deep-sea Cirripedia Thoracica (Crustacea) from the northeastern Atlantic collected by French expeditions. *Zoosystema* 23 (4): 705-756.

ABSTRACT

The French expeditions SEAMOUNT 2, PROSPEC, MARVEL, BENGAL, DIVA II, SAINT PAUL and EQUAMARGE collected samples from the West European, Iberian, and Canary basins, the Mid-Atlantic Ridge near the Azores Archipelago, and the Ivory Coast-Ghana ridge. These expeditions recovered 36 species of cirripeds: three heteralepdomorphs, seven lepadomorphs, 14 scalpellomorphs, seven verrucomorphs and five balanomorphs. Among these two are new: *Heteralepas segonzaci* n. sp. characterized by a capitulum with irregular deep and wide grooves, aperture more than half of capitulum length, carinal margin without conspicuous crests, peduncle almost one-third of capitulum length, median articles of cirri VI with distal margin with simple scales on posterior half; and *Barbascalpellum rossi* n. sp. characterized by a capitulum with occludent margin little convex, scutum length of lateral arm less than one-third length of tergal margin, upper-latus pentagonal with subapical umbo, rostro-latus with width almost four times height, rostrum absent, caudal appendage with five articles, length nearly length of propodite. *Heteralepas meteorensis* Carriol, 1998, is considered a junior subjective synonym of *Heteralepas microstoma* (Gruvel, 1901), and *Poecilasma inaequilaterale breve* Pilsbry, 1907 is synonymous with *Poecilasma crassa* (Gray, 1848). *Amigdoscalpellum semisculptum* (Pilsbry, 1907) is considered to be distinct from *Arcoscalpellum mamillatum* (Aurivillius, 1898) n. comb. *Teloscalpellum atlanticum* (Gruvel, 1900) is transferred to *Arcoscalpellum*.

KEY WORDS

Crustacea,
Cirripedia,
Thoracica,
Northeast Atlantic,
new species,
deep-sea.

RÉSUMÉ

Cirripedia Thoracica (Crustacea) de grande profondeur du Nord-Est atlantique récoltés par des campagnes françaises.

Les expéditions françaises SEAMOUNT 2, PROSPEC, MARVEL, BENGAL, DIVA II, SAINT PAUL et EQUAMARGE ont récolté des échantillons des bassins ouest européens, ibérique et Canaries, des dorsales de la ride médio-atlantique près de l'archipel des Açores et de la ride Côte-d'Ivoire-Ghana. Ces expéditions ont récolté 36 espèces de cirripèdes : trois hétéralépadomorphes, sept lepadomorphes, 14 scalpellomorphes, sept verrucomorphes et cinq balanomorphes. Parmi ces deux derniers groupes, deux espèces nouvelles : *Heteralepas segonzaci* n. sp. caractérisée par un capitulum à cannelures irrégulières, profondes et larges, une ouverture de plus de la moitié de la longueur du capitulum, bord de carinal sans crêtes remarquables, pédoncule presque un tiers de la longueur du capitulum, articles médians des cirri VI avec bord distal et écailles simples sur la moitié postérieure ; et *Barbascalpellum rossi* n. sp. caractérisée par un capitulum avec le bord de fermeture un peu convexe, longueur du scutum du bras latéral de moins d'un tiers du bord tergal, pentagonal supérieur-latus avec l'umbo subapical, rostro-latus avec une largeur de presque quatre fois la taille, rostrum absent, partie caudale avec cinq articles, de longueur presque égale à celle du protopodite. *Heretalepas meteorensis* Carriol, 1998 est considéré synonyme subjectif plus récent de *Heteralepas microstoma* (Gruvel, 1901), et *Poecilasma inaequilaterale* breve Pilsbry, 1907 est synonyme de *Poecilasma crassa* (Gray, 1848). *Amigdoscalpellum semisculptum* (Pilsbry, 1907) est considéré comme distinct d'*Arcoscalpellum mamillatum* (Aurivillius, 1898) n. comb. *Teloscalpellum atlanticum* (Gruvel, 1900) est transféré dans *Arcoscalpellum*.

MOTS CLÉS

Crustacea,
Cirripedia,
Thoracica,
Nord-Est atlantique,
nouvelles espèces,
mer profonde.

INTRODUCTION

Several French expeditions have made collections along the northeastern Atlantic, especially during the last decade. These expeditions were designed to study the deep-sea fauna by systematic dredging by oceanographic vessels (*Jean Charcot*, *Discovery*, *Thalassa* etc.), or direct collecting by a submersible (*Nautile*). The following paper deals with the barnacles sampled by the following expeditions: the SEAMOUNT Expedition, which dredged the Atlantic seamounts from 23° to 43°N, at depths between 200 and 2235 m; the PROSPEC Expedition, which collected samples between 55° and 56°N between depths of 1170 and 1589 m; the MARVEL Expedition, which studied the hydrothermal vent areas of Menez Gwen (MAR) sampling from 850 to 2364 m; the BENGAL Expeditions, which collected several

samples at 48°N, 16°W, at a depth of 4850 m. The DIVA II (MAR) Expedition samples were reported on previously (Young 1998c) but more samples from Lucky Strike and Menez Gwen are included herein. The SAINT PAUL Expedition samples come from the equatorial Atlantic, near Saint Paul Rocks (3100 m) and, finally, a sample was taken from the Ivory Coast-Ghana ridge during the EQUAMARGE Expedition (2420 m).

Besides the new species included in this paper, as well as in three previously published papers (Young 1998a, b, c), I redescribe several species dredged by the *Challenger*, *Hirondelle*, *Princesse Alice*, *Travailleur* and *Talisman* (Hoek 1883; Aurivillius 1898; Gruvel 1900a, 1902a, 1920). All these samples make possible a comprehensive view of the deep-sea barnacle fauna of the West European, Iberian, and Canary basins and of the Mid-Atlantic ridge in the Azores region.

The list of expeditions, stations, localities, depth and species collected are presented in appendix 1. The list of species collected, stations and catalogue numbers are presented in appendix 2. Appendix 3 lists all of the species known from the eastern Atlantic, exclusive of the shallow-water intertidal species.

ABBREVIATIONS

cl	capitulum length;
tl	total length;
rc	rostrum-carinal diameter;
MNHN Ci	Muséum national d'Histoire naturelle, Paris, Cirripèdes;
MNRJ	Museu Nacional, Rio de Janeiro.

SYSTEMATICS

Suborder HETERALEPADOMORPHA

Newman, 1987

Family HETERALEPADIDAE Nilsson-Cantell, 1921

Genus *Heteralepas* Pilsbry, 1907

Heteralepas cornuta (Darwin, 1852)

(Figs 1-3)

Alepes cornuta Darwin, 1852: 165, pl. 3, fig. 6. — Hoek 1883: 29; 1907a: 34. — Weltner 1897: 239. — Gruvel 1905: 161, fig. 178.

Heteralepas cornuta – Pilsbry 1907a: 101. — Nilsson-Cantell 1921: 246; 1927: 756; 1938: 27. — Broch 1927a: 538, fig. 510; 1927b: 16, pl. 4, figs 26-29. — Newman 1960: 109. — Ross *et al.* 1964: 312. — Stubbings 1964: 107; 1965: 880; 1967: 239. — Ross 1975: 17, fig. 1. — Weisbord 1979: 9, pl. 1, fig. 6. — Rosell 1981: 287, pl. 4, fig. g-l; 1991: 31, fig. 5d. — Zevina 1982: 116, fig. 102. — Jones *et al.* 1990: 6. — Young 1995: 239; 1998a: 12, figs 3, 4c.

Heteralepas (Heteralepas) cornuta – Krüger 1911: 29.

MATERIAL EXAMINED. — SEAMOUNT 2, stn CP 121, 28°06.26'N, 15°51.82'W, 200 m to 28°06.76'N, 15°51.06'W, 200 m, 22 specimens, tl up to 6.8 mm (MNHN Ci 2821, MNRJ 13884).

DESCRIPTION

Cuticle (Fig. 1A) smooth on capitulum, except for minor transverse grooves near aperture, and wrinkles on peduncle, not pilose. Aperture nearly half length of capitulum, folded. Scutal area inconspicuous. Carinal margin of capitulum with

two conspicuous triangular projections, one at middle of capitulum margin and another on capitulum base, both projections with distinctly hyaline apex. Peduncle cylindrical, almost length one-third of capitulum, with one obtuse projection on middle of carinal margin. Appearance of carinal projections are progressive with growth; smaller specimens may have only uppermost projection and intermediate size specimens may have only two carinal projections (Fig. 3).

Labrum (Fig. 1B) prominent, with one row of equal teeth (33). Palp (Fig. 1C) acuminate with long pinnate setae on distal half and few short simple setae on proximal half of inner margin. Mandible (Fig. 1D) with three acute teeth and pointed denticulate lower angle; distance between first and second teeth twice distance between second and third; second and third teeth with upper margins slightly denticulate. Maxilla I (Fig. 1E) with three large spines on upper angle, followed by wide notch with few small spines (four to five), and lower squared projection with several (20-19) unpaired medium to small spines. Maxilla II (Fig. 1F) bilobed, anterior lobe large, nearly squared; posterior lobe small, rounded; both covered by several long simple setae.

Cirri with article setation of lasiopod type. Cirrus I (Fig. 2A) with unequal rami, anterior ramus two-third length of posterior ramus; shorter ramus with wider articles than those of posterior ramus, both rami covered by numerous simple or slightly pinnate setae; articles of protopodite with plumose setae on postero-distal angle. Cirrus II rami subequal, but articles of anterior ramus much wider, with simple and long pinnate setae. Cirri III and IV with rami equal in length and width. Cirri V and VI (Fig. 2B) with anterior rami long and posterior rami greatly reduced, approximately one-third length of anterior rami. Median articles of cirri V and VI 1.7 time wider than long (Fig. 2C), with one pair of long simple setae, more than four times width of article, and two pairs of short simple setae; postero-distal angle with one-third simple setae. Articles of reduced rami approximately six times longer than wide



FIG. 1. — *Heteralepas cornuta* (Darwin, 1852), SEAMOUNT 2, stn CP 121; **A**, left lateral view; **B**, labrum and palp outline; **C**, palp; **D**, mandible; **E**, maxilla I; **F**, maxilla II. Scale bars: A, 2 mm; B-F, 0.2 mm.

(Fig. 2D), with one small seta on antero-distal angle and few setae on postero-distal angle. Caudal appendage (Fig. 2B, E) multiarticulated (eight to nine articles) approximately equal to length of protopodite of cirrus VI, with setae on distal margins. Number of articles of cirri I-VI and caudal appendage is presented in Table 1. Penis short, covered with fine setae.

TABLE 1. — Number of articles for anterior and posterior rami of cirri I-VI, and caudal appendages of *Heteralepas cornuta* (Darwin, 1852), SEAMOUNT 2, stn DW 121. Abbreviations: **CI-VI**, cirri I to VI; **ca**, caudal appendage; **rc**, right cirri; **lc**, left cirri.

	CI	CII	CIII	CIV	CV	CVI	ca
rc	11/16	30/38	41/44	43/47	45/12	42/10	9
lc	10/16	29/38	40/43	43/45	46/12	45/10	8

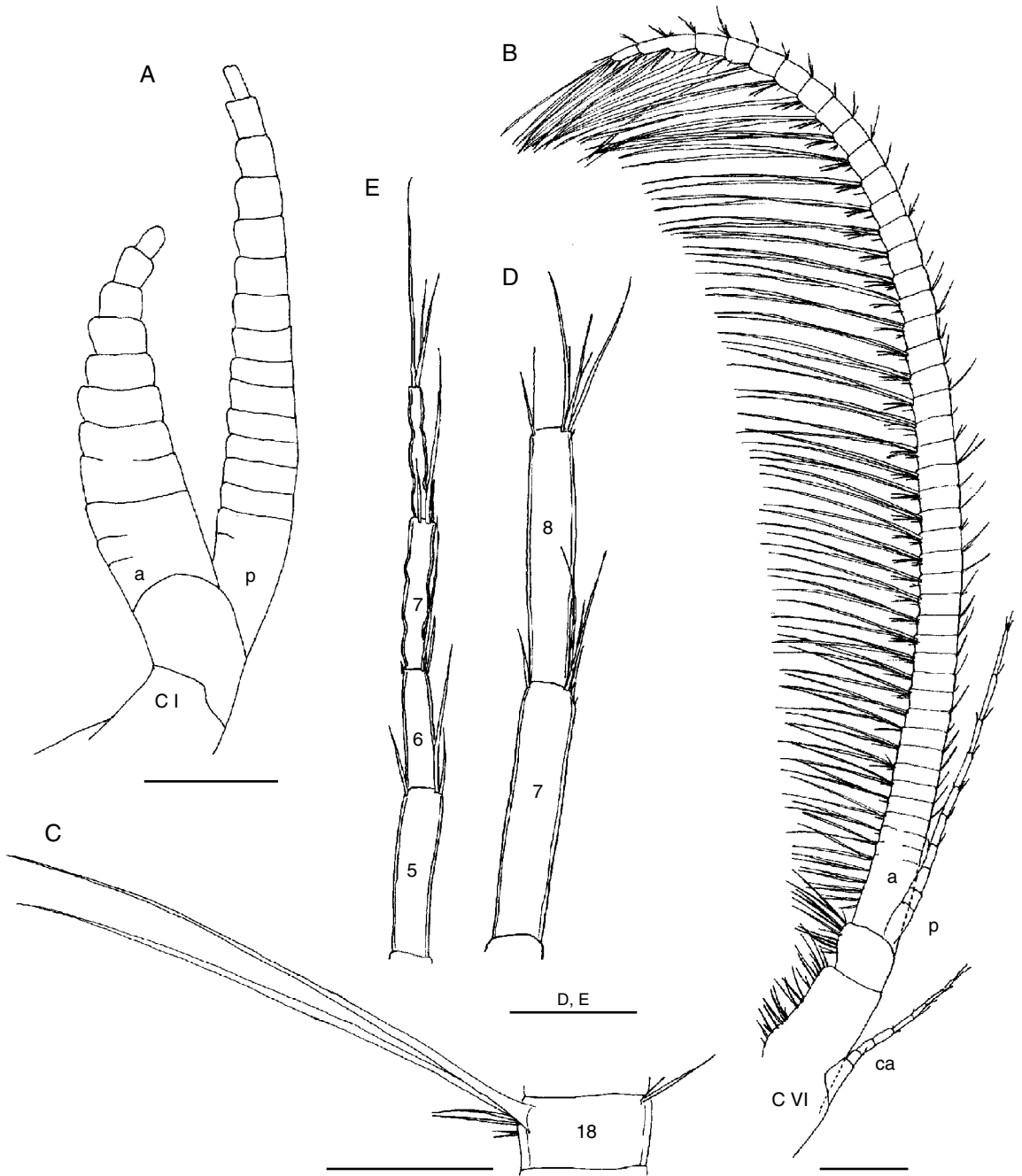


FIG. 2. — *Heteralepas cornuta* (Darwin, 1852), SEAMOUNT 2, stn CP 121; **A**, cirrus I; **B**, cirrus VI and caudal appendage; **C**, median article of cirrus VI; **D**, detail of the 7 and 8th article of posterior ramus of cirrus VI; **E**, detail of the 6 and 7th article of caudal appendage. Abbreviations: a, anterior ramus; **C I**, cirrus I; **C VI**, cirrus VI; ca, caudal appendage; p, posterior ramus. Scale bars: A, B, 0.5 mm; C, 0.3 mm; D, E, 0.1 mm.

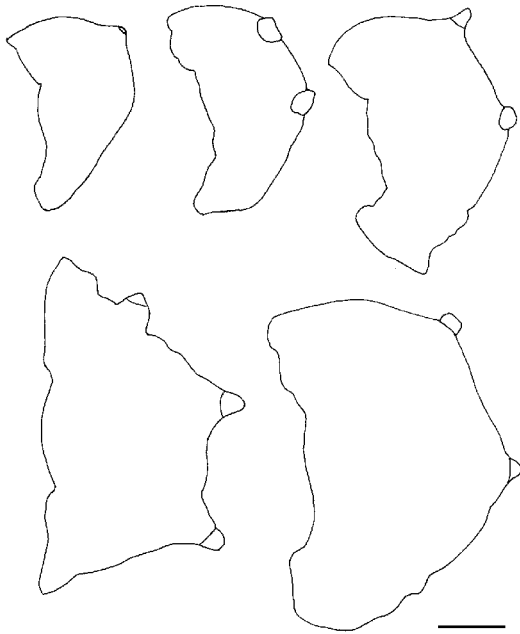


FIG. 3. — *Heteralepas cornuta* (Darwin, 1852), SEAMOUNT 2, stn CP 121. Outlines of the capitulum and peduncle of some specimens with different sizes. Scale bar: 1 mm.

REMARKS

Heteralepas cornuta has an unusual distribution, with records from the Indo-Malaysian region, Atlantic Ocean (Senegal, Florida, West Indies [type locality] and Brazil) and off Chile (Darwin 1852: 165; Broch 1927b: 16; Nilsson-Cantell 1938: 27; Ross *et al.* 1964: 312; Ross 1975: 17; Stubbings 1964: 107, 1965: 880; Rosell 1981: 287, 1991: 31; Jones *et al.* 1990: 6; Young 1995: 239, 1998a: 12). Most of these records were from depths between 70 and 200 m, but Stubbings (1965) found it at 750 m from Senegal and Ross (1975) at 4235–4315 m from off Chile. The new record of this species from the Canary Islands at 200 m is in consonance with its known distribution. The odd distribution, especially its depth distribution, suggests we may be identifying more than one species as *H. cornuta*. Some differences on the figures of various authors are apparent in external characters: Darwin (1852: pl. 3, fig. 6) figured a specimen with three equal-sized triangular projections on the posterior margin of the capitulum, and a smooth peduncular margin.

Broch (1927b: pl. 4, fig. 29) in his fully developed specimen, observed only two triangular projections on the capitulum and a small projection on the peduncle. In his figure the third projection, depicted by Darwin near the occludent margin, is lacking. Ross (1975: fig. 1) figured a specimen with three small blunt projections on the capitulum and a smooth peduncle. Rosell (1981: pl. 4, fig. g) only figured two short projections on the posterior margin of the capitulum. The full grown specimens I reported from the eastern Atlantic (Young 1998a: fig. 4c; herein, Fig. 1A) have the pattern described by Broch (1927b) which was also based on northeastern Atlantic specimens. Furthermore, no stage of the present specimens (Fig. 3) have the patterns observed by Darwin (1852) and Ross (1975).

There are no difference between the appendages of eastern Atlantic specimens of Broch (1927b) and the specimens studied herein, except they have a larger number of articles. Darwin (1852: 166) described in detail the appendages of specimens from the West Indies. Of this description, I could observe only differences between the mandible and cirral counts. The mandibles described by Broch (1927b) and by myself from the eastern Atlantic had the upper margins of the teeth denticulate. Furthermore, Darwin's (1852) article counts are larger than those of mine, but his caudal appendage has fewer articles. Darwin's larger specimens was about 7 mm in capitulum length, the one figured by Broch about 6 mm (inferred from his pl. 4) and mine 5 mm. Ross (1975: fig. 1) figured the appendages of *H. cornuta* from deep water in the eastern Pacific. On the intermediate articles of his specimens cirrus VI has small spines on the lateral surface which are absent in the present specimens and the article counts are far greater.

Therefore, there are some differences between the specimens from the Atlantic (East and West), Pacific and Indian oceans. I cannot propose if these differences are populational or specific variations but the latter seems more likely. Several specimens from these localities must be studied to solve this problem. Hutchins (1952: 194) recorded *H. cornuta* fouling buoys, based on the unpublished data of I. M. Newell, from Woods Hole Oceanographic

Institution. The depth range of *H. cornuta* does not encompass shallow waters where buoys are found. Therefore, this is probably a misidentification.

Heteralepas microstoma (Gravel, 1901)

Alepa microstoma Gravel, 1901: 259; 1902a: 282, pl. 24, figs 1, 7, 8; 1905: 162, fig. 180.

Heteralepas microstoma – Krüger 1911: 29. — Zevina 1982: 118, fig. 104. — Young 1998a: 10, figs 6, 7; 1998b: 33. — Southward 1998: 17, fig. 1.

Heteralepas meteorensis Carriol, 1998: 506, fig. 1.

MATERIAL EXAMINED. — SEAMOUNT 2, stn CP 138, 30°01.94'N, 28°29.00'W, 300 m to 30°01.98'N, 28°27.81'W, 310 m, 1 specimen, tl 4.2 mm (MNHN Ci 2822). — Stn CP 142, 30°02.95'N, 28°29.42'W, 302 m to 30°02.96'N, 28°28.21'W, 310 m, 7 specimens, tl 4.5–22.0 mm (MNHN Ci 2823, MNRJ 13885). — Stn CP 177, 29°58.43'N, 28°38.09'W, 315 m to 29°56.51'N, 28°38.57'W, 7 specimens, tl 18.4–25.3 mm (MNHN Ci 2824, MNRJ 13886).

REMARKS

Heteralepas microstoma is commonly found in the Azores and Madeira Archipelagos, and the Great Meteor Seamounts, occurring between depths of 269 and 623 m. The present samples, from the Meteor and Atlantis Seamounts, were dredged between 300 and 315 m. Young (1998a) suggested a depth preference of about 300 m for this species. Carriol (1998) described *Heteralepas meteorensis* from the Meteor Bank. The characters he used to diagnosis that species are a peduncle longer than the capitulum, the capitulum lacking scuta, and a carinal crest, without protuberances, continuous on the peduncle. The length of the peduncle used to separate species by Zevina (1982: 106) is not a stable character. Gravel (1902a) only cited one measurement for his specimens and in this specimen the length of the capitulum and peduncle was similar. Young (1998a) studied more than 1000 specimens of *H. microstoma*, that were usually found in clusters attached to the substrate, and the length of their peduncles varied from the length of the capitulum to three times its length. The aggregated habit of some species of *Heteralepas* results in a large variability in the peduncle length. Specimens occupying the central position in a cluster have

their peduncles longer than those growing marginally. Also, the carinal crest, lacking protuberances is common to *H. microstoma*. The presence of a scutum in the Heteralepadidae remains controversial. Some authors have described a degenerated scutum on the capitulum, but it appears only to be a thickening of the cuticle in the area of attachment of the adductor muscle and is not directly related to the presence of a scutum. Gravel (1902a) described *H. microstoma* as lacking scuta and having a dorsal crest. Therefore, the maintenance of *Heteralepas meteorensis* Carriol is not justified, and it is considered a junior synonym of *H. microstoma*.

Heteralepas segonzaci n. sp.
(Figs 4; 5)

TYPE MATERIAL. — Holotype: 1 hermaphrodite, SEAMOUNT 2, stn TS 267, 34°22.50'N, 30°22.50'W, 2235 m, tl 23.5 mm (MNHN Ci 2825); paratype: 1 complementary male originally attached to the hermaphrodite, tl 1.0 mm (MNHN Ci 2826).

ETYMOLOGY. — Named in honor of Dr Michel Segonzac, who was largely responsible for making them available for this study.

DIAGNOSIS. — Capitulum with irregular deep and wide grooves; aperture more than half length of capitulum; carinal margin without crest, only a wide, angled region basally. Peduncle almost one-third length of capitulum. Cirrus I with anterior ramus three-quarter length of posterior ramus. Median articles of cirri VI almost three times wider than long, having short, wide seta posterior to major apical setae of anterior margin; distal margin with simple scales on posterior half.

DESCRIPTION

Cuticle (Fig. 4A, B) with irregular deep and wide grooves on the capitulum, especially one surrounding aperture; transverse grooves near aperture, wrinkled near aperture and on peduncle, not pilose. Aperture (Fig. 4C, D) more than half of capitulum length, folded. Scutal area inconspicuous, without crest. Carinal margin of capitulum without conspicuous crests, only a wide and angled region basally. Peduncle cylindrical, almost one-third of capitulum length. Labrum (Fig. 5A) little prominent, with one row of equal teeth (± 20) and some smaller teeth (± 4) on lateral surfaces. Palp (Fig. 5A, B) long, acuminate with several long simple setae on distal half

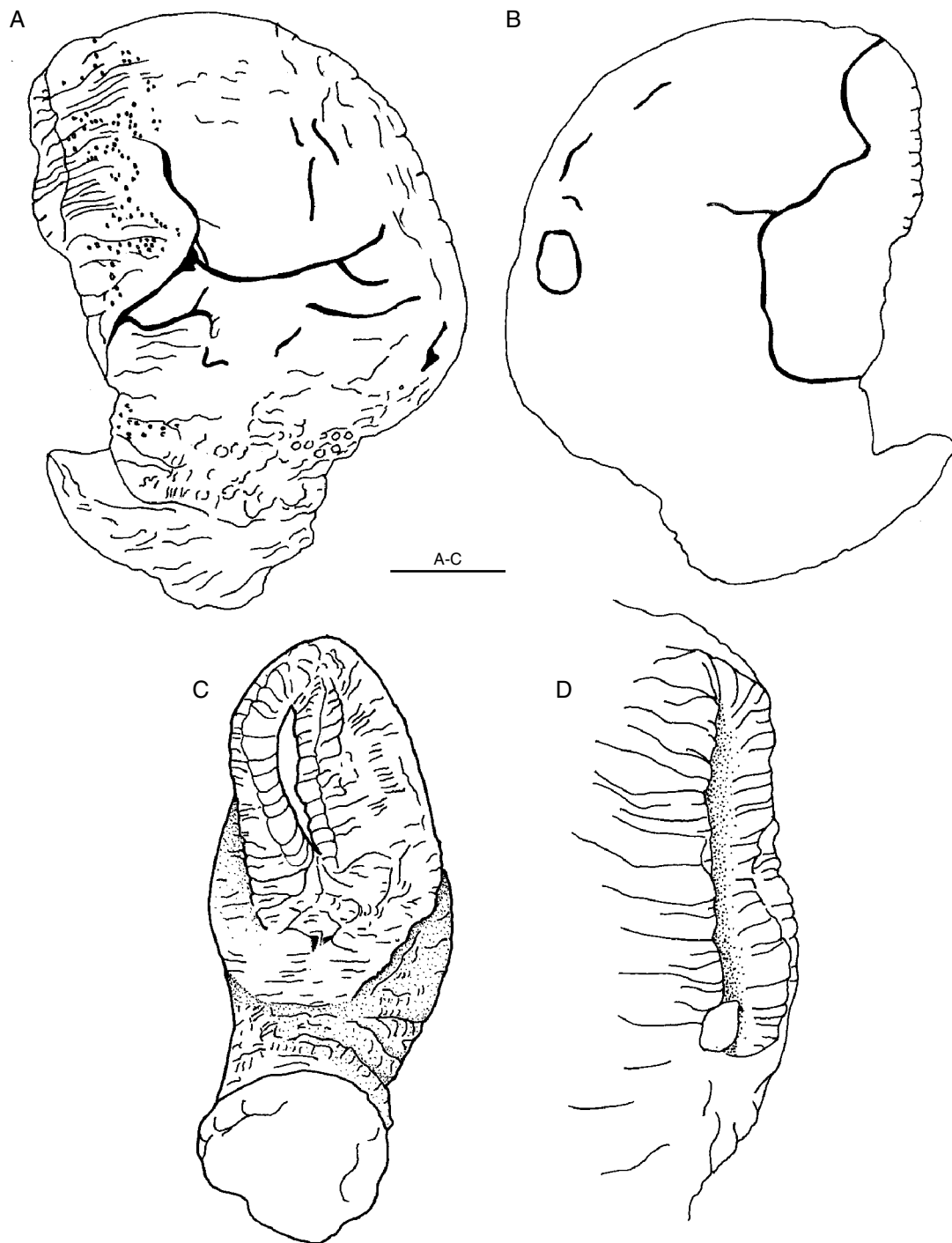


FIG. 4. — *Heteralepas segonzaci* n. sp., holotype, SEAMOUNT 2, stn TS 267; **A, B**, right and left lateral view; **C**, rostral view; **D**, detail of the aperture with small male below. Scale bars: A-C, 5 mm; D, 2 mm.

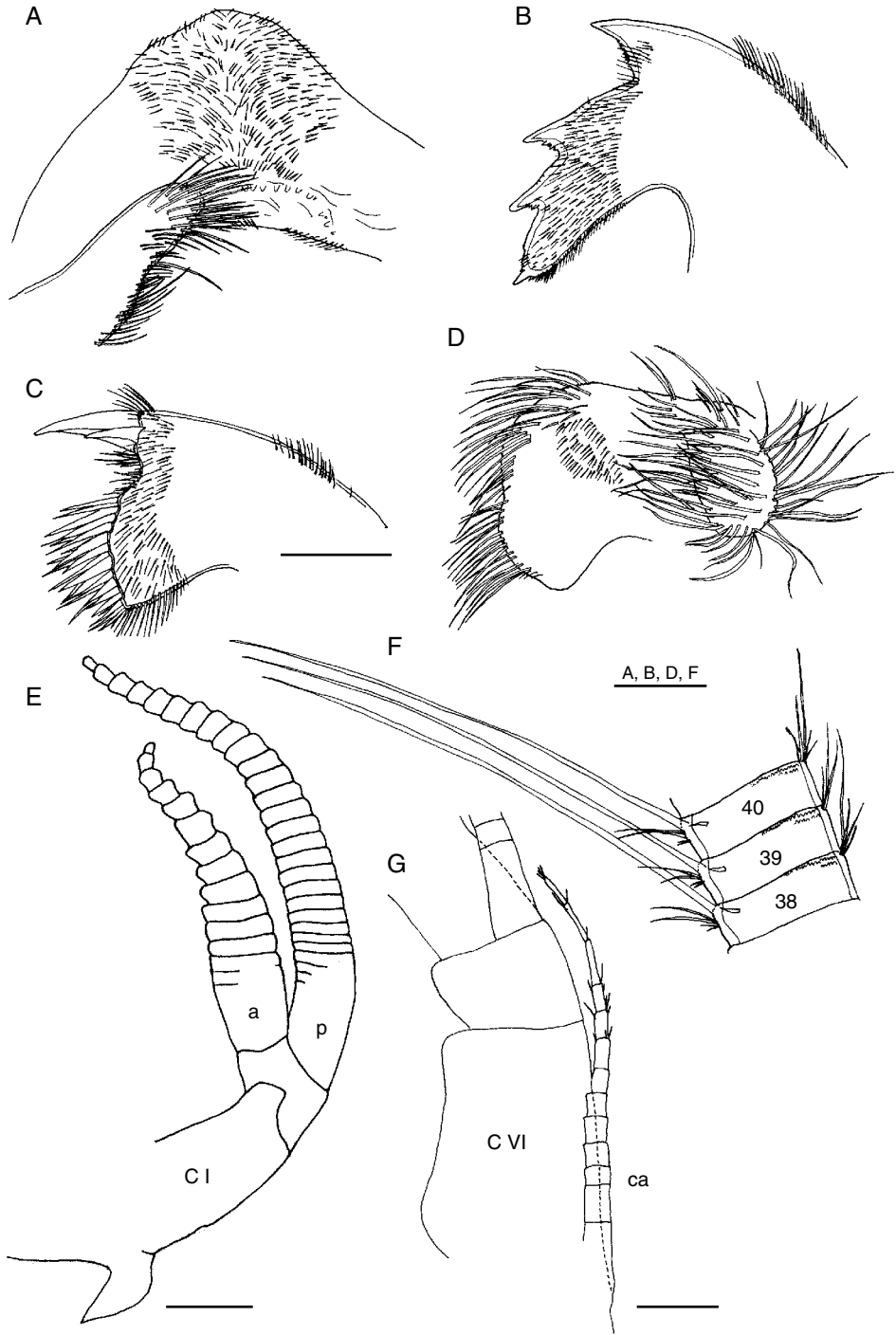


FIG. 5. — *Heteralepas segonzaci* n. sp., holotype, SEAMOUNT 2, stn TS 267; **A**, labrum and palp; **B**, mandible; **C**, maxilla I; **D**, maxilla II; **E**, cirrus I; **F**, median articles of cirrus VI; **G**, protopodite of cirrus VI and caudal appendage. Abbreviations: a, anterior ramus; **C I**, cirrus I; **C VI**, cirrus VI; ca, caudal appendage; p, posterior ramus. Scale bars: A-D, F, 0.5 mm; E, G, 1 mm.

TABLE 2. — Number of articles for anterior and posterior rami of cirri I-VI, and caudal appendages of *Heteralepas segonzaci* n. sp., holotype, SEAMOUNT 2, TS 267. Abbreviations: **CI-VI**, cirri I to VI; **ca**, caudal appendage; **rc**, right cirri; **lc**, left cirri; **+**, broken ramus.

	CI	CII	CIII	CIV	CV	CVI	ca
rc	14/27	54/64	75/73	79/75	78/29	81/23	13
lc	15/28	50/66	72/79	76/79	77/3+	75/22	15

and on inner margin. Mandible (Fig. 5C) with four acute teeth, last on rounded, sparsely denticulate, lower angle; distance between first and second teeth twice or less distance between second and third; first to third teeth with lower margin having strong, sharp denticles; second to fourth teeth with upper margins slightly denticulate. Maxilla I (Fig. 5D) with two large and one medium spine on upper angle, followed by wide notch with few fine, medium spines and strong, small spines (four to five), lower squared projection with numerous (20-30) unpaired medium to small spines. Maxilla II (Fig. 5E) bilobed, anterior lobe large, slightly notched in middle, nearly quadrangular; posterior lobe small, rounded; both covered by several, long, slightly pinnate setae. Cirri with article setation of lasiopod type. Cirrus (Fig. 5F) with unequal rami, anterior ramus three-quarter length of posterior ramus; shorter ramus with articles slightly wider than those of posterior ramus, both rami covered by numerous simple or long pinnate setae; articles of protopodite with plumose setae on postero-distal angle; one filamentary appendage at its base. Cirri II with subequal rami, and cirri III and IV with equal rami, both having simple and long, slightly pinnate setae. Cirri V and VI with anterior rami long, posterior rami reduced, approximately one-third and two-fifth length of anterior rami, respectively. Median articles of cirri V and VI (Fig. 5G) almost three times wider than long, anterior margin with one pair of long slightly pinnate setae, four times width of article, and two pairs of short simple setae, and one short strong seta posterior to large setae; postero-distal angle with one to five simple setae; distal margin with simple scales on posterior

half. Distal articles of reduced rami approximately two times longer than wide, basal articles as long as wide, with few setae on distal margin. Caudal appendage (Fig. 5H) with 13-15 articles little longer than protopodite of cirrus VI, with setae on distal margins. Number of articles of cirri I-VI and caudal appendage is presented in Table 2. Penis short, covered with fine setae. Complementary male only reduced in size, with fully developed cirri.

REMARKS

The single specimen has a small complementary male attached immediately below the aperture. When examining the specimen I had doubts if it was actually a male or a juvenile which attached to the first one. The position where it was fixed, just beneath the aperture of the hermaphrodite strongly suggests it is a male. Otherwise the hermaphrodite was incubating several nauplii.

Kolbasov & Zevina (1999) described a species of *Paralepas* which has the first complementary male known for the family. This present find suggests that complementary males are perhaps more widely distributed in the Heteralepadidae.

Heteralepas segonzaci n. sp. was collected at a greater depth than *H. microstoma*, which first alerted me that it was probably a different species. I first thought that the grooves on the capitulum were only generated by external factors instead of by its own growth. None of the other species of *Heteralepas* have these deep irregular grooves on the capitulum. On its left side, a rounded scar is due to the presence of a serpulid tube, but the other grooves especially a large one posterior to the aperture does not appear to be the result of settlement of other animals or by predators. Besides the grooves, the aperture size, the absence of crests and the peduncle size distinguish this species from *H. microstoma*.

Aside from the characteristic reduction of the posterior rami of cirri V and VI, the other characters of mouth and thoracic appendages appear to be very conservative in *Heteralepas* species. Observable differences appear to be only the relative size of the cirral rami and caudal appendages, the number of articles and the ornamentation of the articles. Presently, however, it is difficult to review these

characters because most of the appendages of the species are poorly or not described at all.

Besides *H. segonzaci* n. sp. found at 2235 m only *H. cornuta* (Darwin) from 4315 m (Ross 1975: 17) and *H. lankesteri* (Gruvel, 1900) from 1497 m (Gruvel 1900a: 195) were recorded in depths greater than 1000 m. On the other hand, only *H. cornuta* (Darwin, 1852), *H. microstoma* (Gruvel, 1901) and *H. rex* (Pilsbry, 1907) (Gabon) are recorded from the eastern Atlantic.

Suborder LEPADOMORPHA Pilsbry, 1916

Family OXYNASPIDIDAE Gruvel, 1905

Genus *Oxynaspis* Darwin, 1852

Oxynaspis patens Aurivillius, 1894

Oxynaspis patens Aurivillius, 1894: 38, pl. 3, figs 1-2, pl. 6, figs 13-15; pl. 8, fig. 9. — Totton 1940: 476, fig. 16. — Zevina 1982: 36, fig. 26. — Young 1998a: 3, figs 1-3; 1998b: 33.

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 172, 30°05.11'N, 28°41.50'W, 455 m to 30°04.77'N, 28°41.54'W, 455 m, 34 specimens, tl (cl) up to 8.8 (5.4) mm (MNHN Ci 2827, MNRJ 13887).

REMARKS

Oxynaspis patens was originally described from the Anguilla Islands in the Caribbean (Aurivillius 1894: 38) and was subsequently recorded from the Great Meteor Bank (Young 1998a: 3). These new specimens were also collected at the Great Meteor Seamount, near the same latitude previously recorded by Young (1998a: 3). The occurrence of this sample increases the depth range of *O. patens* from 125-355 m to 455 m.

Family POECILASMATIDAE Annandale, 1909

Genus *Poecilasma* Darwin, 1852

Poecilasma crassa (Gray, 1848)

(Figs 6-9)

Anatifa crassa Gray, 1848: 44, pl. 3, figs 5, 6.

Poecilasma crassa – Darwin 1852: 107, pl. 2, fig. 3. — Barnard 1924: 52. — Zevina 1982: 96, fig. 85; 1983: 1635; 1990: 184. — Southward 1998: 18.

Poecilasma crassum – Hoek 1883: 28; 1907a: 4. — Weltner 1897: 243; 1922: 78, pl. 4, fig. 17. — Gruvel 1902b: 525; 1905: 116, fig. 132; 1920: 38.

Poecilasma inaequilaterale breve Pilsbry, 1907a: 87, pl. 6, figs 9-10. — Nilsson-Cantell 1921: 254 (in part). — Barnard 1924: 53. — Henry 1954: 444. — Zullo 1968: 211. — Weisbord 1979: 42, pl. 4, figs 4-5. — Zevina 1982: 96.

Poecilasma (Poecilasma) crassa – Stubbings 1936: 6.

Trilasmis (Poecilasma) crassa – Hiro 1937: 409.

Trilasmis crassa – Nilsson-Cantell 1938: 9.

Trilasmis (Poecilasma) crassum – Stubbings 1967: 241.

Trilasmis kaempferi inaequilaterale – Spivey 1981: 170.

Non *Poecilasma crassa* – Visscher 1928: 199. — Hutchins 1952: 194.

MATERIAL EXAMINED. — Mid-Atlantic Ridge, hydrothermal vents sites, DIVA II, stn PL 12, 37°50.54'N, 31°31.30'W, Menez Gwen, 866 m, 16 specimens on *Chaceon affinis*, tl (cl) 7.1 (5.0) to 22.0 (12.5) mm (MNHN Ci 2828, MNRJ 13888).

MARVEL, stn PL 1201, 37°50.54'N, 31°31.22'W, Menez Gwen, 850 m, 2 specimens, tl (cl) 6.7 (4.5) to 7.1 (4.4) mm (MNHN Ci 2829).

DESCRIPTION

Capitulum (Fig. 6A, B) strongly globose, asymmetric, with white plates; occludent margin slightly convex, nearly straight at upper portion; carinal margin convex. Peduncle (Fig. 6A, B) short, usually about half the capitular length.

Scutum (Fig. 6A, B) very convex with fine growth lines sparsely marked and thin longitudinal striae; apico-basal ridge prominent, usually with groove running along carinal side. Tergal portion with nearly straight area between apico-basal ridge and line between umbo and carinal apex, another strongly curved portion between carina and peduncle. Carinal margin convex, tergal straight, occludent margin straight at upper portion, slightly convex below. Internally with thick rim basally curving toward occludent margin, without umbonal teeth. Scuta of different sizes and curvatures, less convex with umbonal portion overlying more convex one.

Tergum (Fig. 6A) small, positioned between apico-basal ridge of scutum and carina apex; usually very eroded.

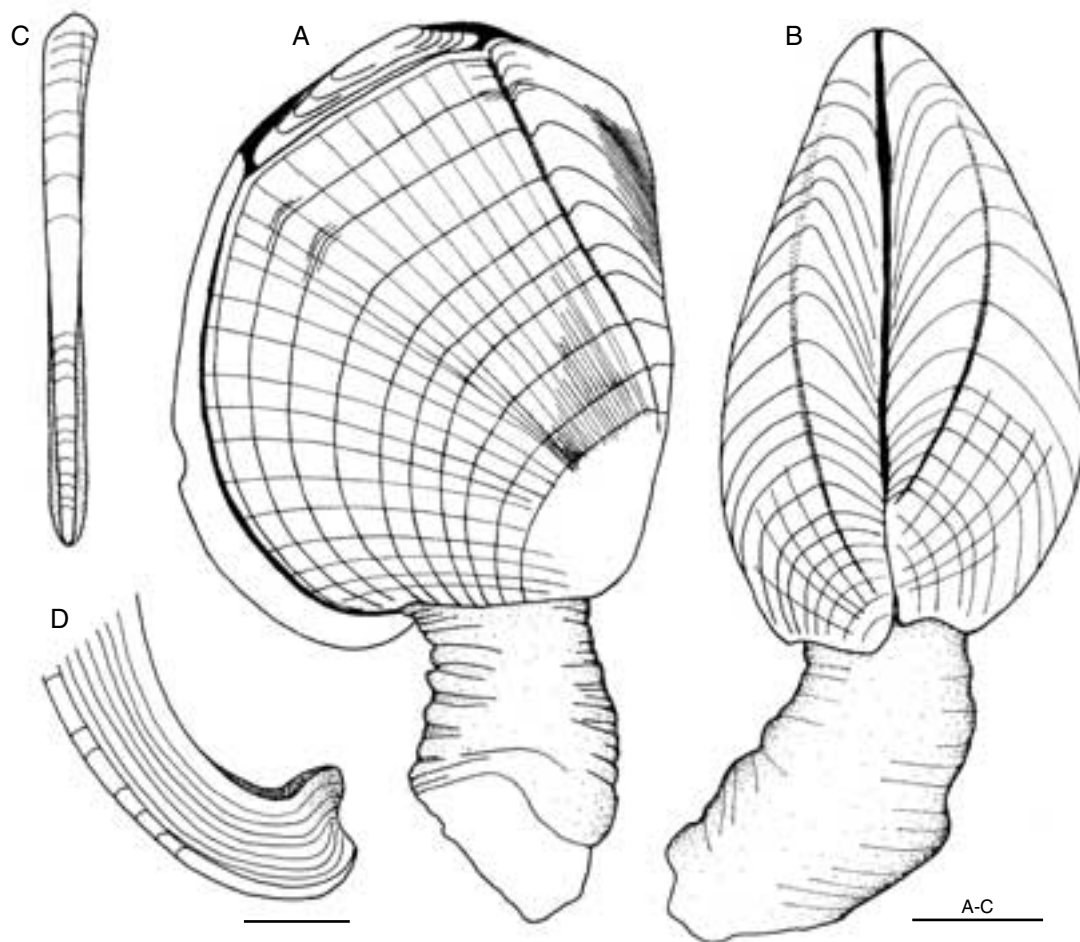


FIG. 6. — *Poecilasma crassa* (Gray, 1848), DIVA II, stn PL 12; **A**, left lateral view; **B**, rostral view; **C**, carina, dorsal view; **D**, detail of the base of the carina, lateral view. Scale bars: A-C, 3 mm; D, 1 mm.

Carina (Fig. 6A, C, D) strongly curved at basal half, keeled basally, nearly flat apically; apex not inserting between terga; lower end with tooth projecting inward.

Labrum bullate (Fig. 7A) with one row of nearly 80 acute teeth. Palp (Fig. 7A, B) acuminate, short, covered by long finely pinnate setae on inner margin and setulae on outer margin. Mandible (Fig. 7C) with four equal teeth, denticulate on lower margin, lower angle produced with small tooth; large number of simple fine setae on lateral, lower and dorso-proximal margins. Maxilla I (Fig. 7D) with

notch and lower portion produced; upper angle with one large and strong spine and five to seven medium-sized spines, below notch almost 20-22 small spines; large number of simple fine setae on lateral and lower margins. Maxilla II (Fig. 7E) quadrangular, with few simple setae, more densely present on upper portion.

Cirri of acanthopod type; articles with few finely and relatively small pinnate setae on antero-distal angle and several stout spines on postero-distal angle, which may be distributed in transverse row near distal margin; spaces

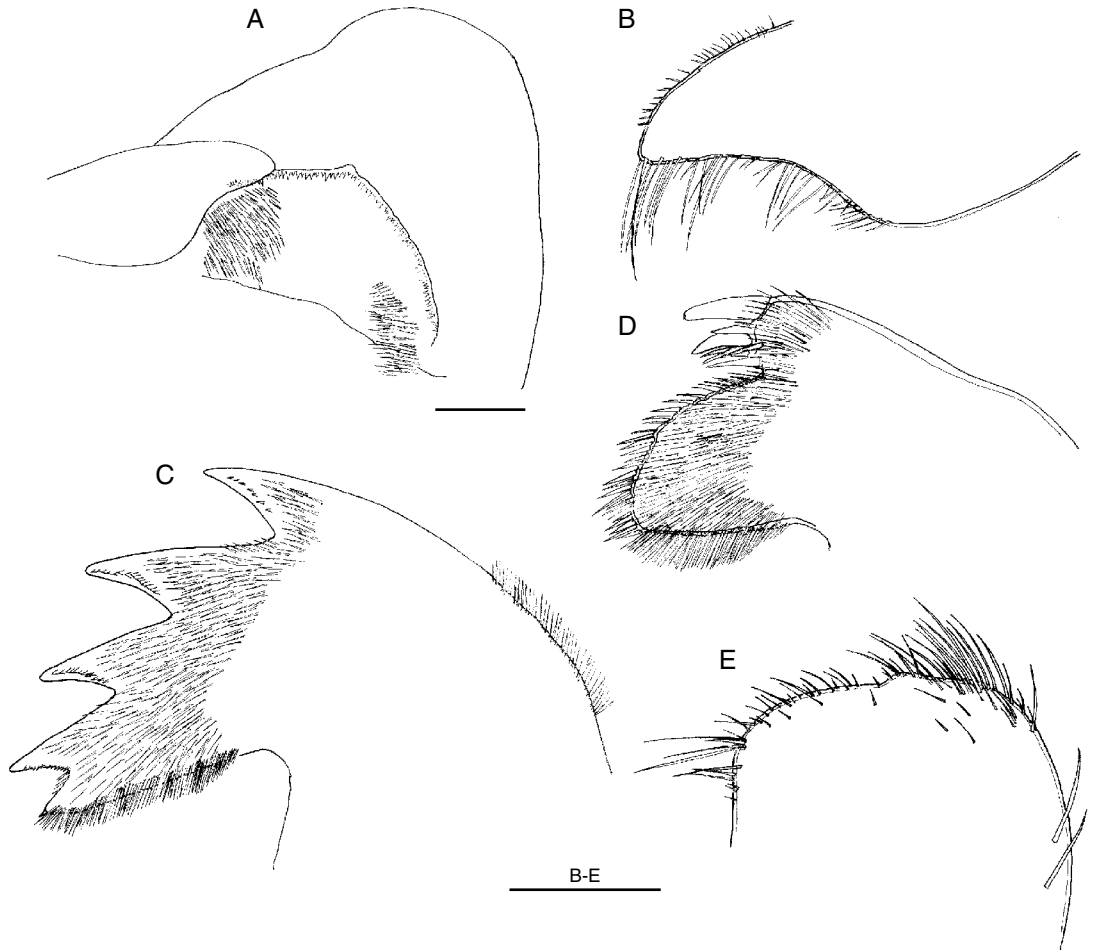


FIG. 7. — *Poecilasma crassa* (Gray, 1848), DIVA II, stn PL 12; **A**, labrum and palp outline; **B**, palp; **C**, mandible; **D**, maxilla I; **E**, maxilla II. Scale bar: 0.5 mm.

between spines usually with multifid scales (Fig. 8B, C). Cirri I (Fig. 8A) and II (Fig. 8D) with proportionally short rami and large propodites; rami unequal $3/2$ and $4/3$, respectively. Cirri III to VI (Fig. 8E) with subequal rami, length of medial articles equal to its width. Caudal appendage (Fig. 8E) smaller than coxopodite, unarticulate, with tuft of long setae distally. Filamentary appendage large, wide, projecting anteriorly from base of cirrus I. Number of articles of cirri I-VI and caudal appendage is presented in Table 3. Penis annulated, covered with fine setae.

REMARKS

Poecilasma crassa was first described from Madeira on "Gorgonia" (Gray 1848: 44). All subsequent records are for individuals found on the carapace and appendages of crabs. There are no records of anything that look like *Poecilasma* on Madeira gorgonians. Probably the citation by Gray of a gorgonian as a substrate is a mistake. *Poecilasma crassa* was found on several samples of crab *Chaceon affinis* (A. Milne Edwards & Bouvier, 1894) observed from Madeira Island where and it was attached to the anterior region, usually on the maxillipeds of the crabs. The same crabs hosted

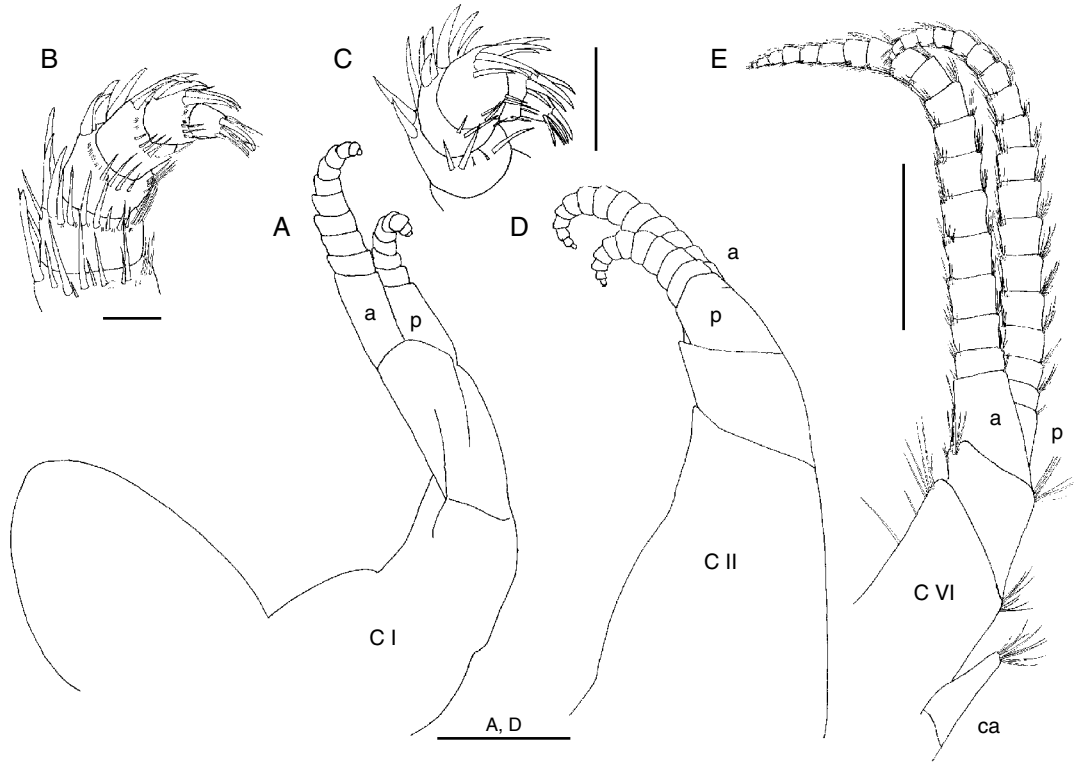


FIG. 8. — *Poecilasma crassa* (Gray, 1848), DIVA II, stn PL 12; **A**, cirrus I; **B**, detail of the distal articles of anterior ramus; **C**, detail of the distal articles of posterior ramus; **D**, cirrus II; **E**, cirrus VI and caudal appendage. Abbreviations: **a**, anterior ramus; **C I**, cirrus I; **C II**, cirrus II; **C VI**, cirrus VI; **ca**, caudal appendage; **p**, posterior ramus. Scale bars: A, D, E, 1 mm; B, C, 0.1 mm.

TABLE 3. — Number of articles for anterior and posterior rami of cirri I–VI, and the caudal appendages of *Poecilasma crassa* (Gray, 1848), DIVA II, stn PL 12. Abbreviations: **C I–VI**, cirri I to VI; **ca**, caudal appendage; **rc**, right cirri; **lc**, left cirri.

	I	II	III	IV	V	VI	ca
rc	10/8	14/12	15/16	18/18	21/19	18/19	1
lc	11/9	14/12	15/16	17/18	21/20	19/19	1

Poecilasma aurantia Darwin, 1852 on the dorsum of the carapace. On the other hand, Southward (1998) observed *P. crassa* occurring more abundantly on the telson than on the limbs.

Nilsson-Cantell (1921: 254) considered *Poecilasma inaequilaterale breve* Pilsbry, 1907 to be synonymous with *P. kaempferi* Darwin, 1852 and Barnard (1924: 53) and Zevina (1982: 96) considered it synonymous with *P. crassa*. I have to agree with

these last two authors in their synonymy. Pilsbry (1907a) described *Poecilasma inaequilaterale breve* and commented that it was distinguished from *P. crassa* only by “the straight occludent border of the scutum”. The figure 3 in Darwin (1852) indeed has a more convex occludent margin than found in *P. inaequilaterale breve*. The specimens examined vary greatly in size and show the variation in the curvature of the occludent margin of the scutum discussed by Darwin (1852: 107). The apico-basal ridge of the scutum sometimes has a conspicuous parallel groove and other times it is absent. The presence of an apico-basal ridge and groove on the scutum do not appear to be related to the size of the specimens. Therefore, both species should be considered synonymous. On the other hand, several characters in the shape of the plates of *P. kaempferi* separates it from *P. crassa* (Gray, 1848).

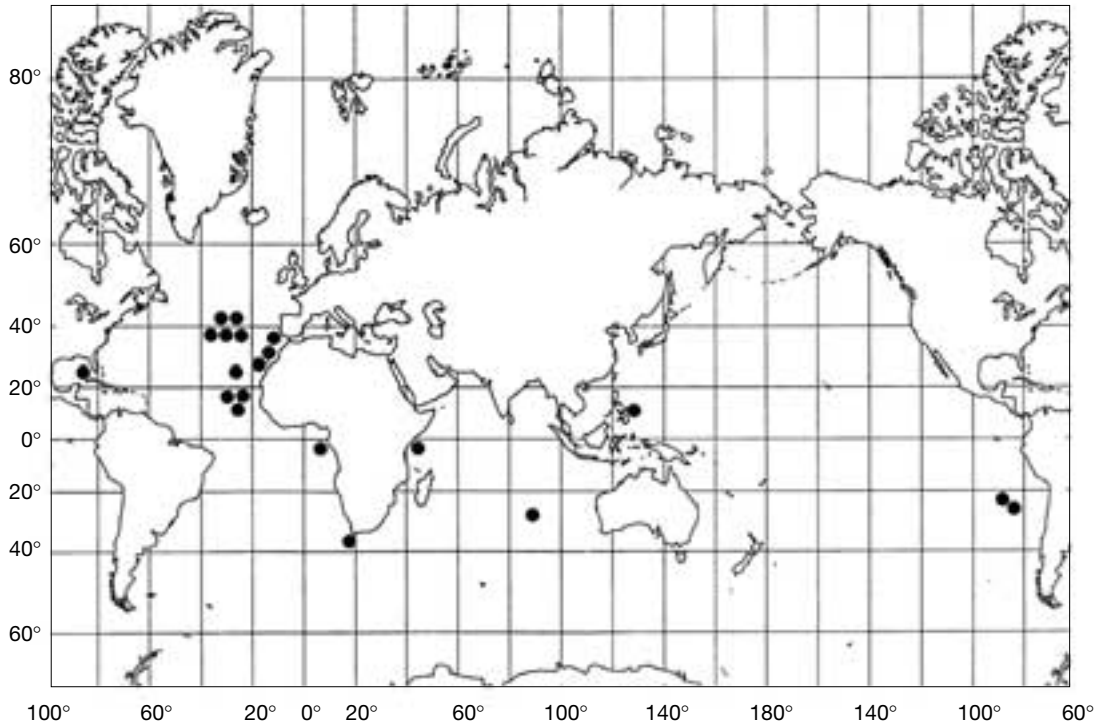


FIG. 9. — Geographic distribution of *Poecilasma crassa* (Gray, 1848).

Darwin (1852) described briefly the cirri of *P. crassa*, but Pilsbry (1907a) did not describe them for *P. inaequilaterale breve*. The cirri of *P. crassa* are typically acanthopod, very different from the ctenopod type of *P. kaempferi* and *P. inaequilaterale*. Other characteristics of *P. crassa* which should be considered are the relative length of cirri I and II. Both rami have very short rami and long and very large protopodites.

Visscher (1928: 199) recorded *P. crassa* as a species fouling ships, which was cited in the list of fouling barnacles by Hutchins (1952: 194). *P. crassa* is a deep-sea species and does not occur in shallow waters. Essentially all records are between 217 and 1386 m, although Weltner (1922: 78) recorded it at shallower depths (25 m). Therefore, it is improbable this species can be found on ships.

P. crassa is commonly recorded in the Atlantic, especially in the northeastern part, where there

have been a large number of dredgings. It is found on deep-sea crabs, especially on *Chaceon affinis*. This species occurs in the active vent field, very near mytilid mussels beds (Biscoito & Saldanha 2000, as *Poecillasma* [sic] cf. *kaempferi* [Darwin]).

In the Pacific, Hoek (1907a: 12) described *P. obliqua* from the Moluccas area, a species related to *P. crassa*, especially in the external characters of the plates. Both species have asymmetrical convex valves, with the scutum having a longitudinal groove, keeled carina and reduced terga. The appendages are also very similar: mandible with four equal teeth, with a denticulate lower margin, lower angle produced, with several setae; maxilla I with the upper angle with strong spines followed by a notch and the lower portion produced and covered by several setae; maxilla II quadrangular, with few setae. But, in *P. obliqua* Hoek, 1907

the scutum has an internal triangular tooth on the basal part of the occludent margin; the carina is internally convex, with a little fork basally and the cirri of both sides are unequal, the right side smaller. These characters justify the maintenance of *P. obliqua* as a valid species. *P. obliqua* was recorded from the Malayan Archipelago and Japan between 204-304 m on *Macrocheira kaempferi* (De Haan) as noted by Zevina (1982: 96).

Poecilasma aurantia Darwin, 1852

Poecilasma aurantia Darwin, 1852: 105, pl. 2, fig. 2. — Young 1998a: 5, fig. 4 (with synonymy); Southward 1998: 17, fig. 2.

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 231, 32°01.49'N, 27°54.51'W, 745 m to 32°01.75'N, 27°54.70'W, 750 m, 12 specimens, tl (cl) 3.7 (2.9) to 13.8 (11.3) mm (MNHN Ci 2830, MNRJ 13889). — Stn CP 232, 32°01.18'N, 27°54.09'W, 750 m to 32°02.60'N, 27°55.91'W, 750 m, 11 specimens, tl (cl) 1.9 (1.4) to 9.2 (7.4) mm (MNHN Ci 2831, MNRJ 13890). — Stn DW 277, 33°59.92'N, 28°20.56'W, 1000 m to 33°59.64'N, 28°20.81'W, 945 m, 1 specimen, tl (cl) 11.4 (9.3) mm (MNHN Ci 2832).

DIVA II, stn PL 12, 37°50.54'N, 31°31.30'W, Mid-Atlantic Ridge, Menez Gwen, 850 m, 3 specimens, tl (cl) 7.9 (6.3) to 14.2 (11.3) mm (MNHN Ci 2833).

MARVEL, stn PL 1201, 37°50.54'N, 31°31.22'W, Menez Gwen, 850 m, 2 specimens, tl (cl) 7.0 (5.7) to 10.9 (7.6) mm (MNHN Ci 2834).

REMARKS

Poecilasma aurantia was first described from Madeira, and recorded elsewhere from the eastern Atlantic. Young (1998a: 5, b: 33) considered this species distinct from *P. kaempferi* which is known to occur in the western Pacific region. The validity of the species of *Poecilasma* has yet to be reevaluated.

Genus *Glyptelasma* Pilsbry, 1907

Glyptelasma hamatum (Calman, 1919)

(Figs 10A, B; 11)

Megalasma (*Glyptelasma*) *hamatum* Calman, 1919: 370, figs 5-7. — Nilsson-Cantell 1927: 770, fig. 12;

1928: 23, fig. 11; 1931: 10; 1934: 49; 1955: 219. — Weisbord 1979: 48, pl. 5, figs 1, 2, pl. 14, fig. 3. — Zevina 1982: 93, fig. 83. — Jones *et al.* 1990: 9.

Megalasma hamatum – Hutchins 1952: 194. — Zevina 1969: 67; 1976: 1155.

Megalasma carinatum – Foster 1978: 26, pl. 3b, fig. 12 [non *Megalasma carinatum* (Hoek, 1883)].

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 216, 31°53.72'N, 28°02.97'W, 270 m to 31°53.92'N, 28°02.94'W, 270 m, 6 specimens, tl (cl) 3.7 (2.8) to 8.4 (7.1) mm (MNHN Ci 2835, MNRJ 13891). — Stn DW 222, 32°20.81'N, 28°15.66'W, 1150 m to 32°21.02'N, 28°15.72'W, 1150 m, 56 specimens, tl (cl) few to 6.6 (5.3) mm (MNHN Ci 2836, MNRJ 13892). — Stn DW 249, 33°12.41'N, 29°14.83'W, 1700 m to 33°12.36'N, 29°15.19'W, 1800 m, 1 specimen, tl (cl) 11.6 (10.9) mm (MNHN Ci 2837). — Stn DW 250, 33°12.65'N, 29°17.25'W, 1500 m to 33°12.66'N, 29°17.66'W, 1450 m, 7 specimens, tl (cl) 1.6 (1.5) to 7.5 (6.9) mm (MNHN Ci 2838, MNRJ 13893). — Stn TS 267, 34°22.50'N, 30°22.50'W, 2225 m, 8 specimens, tl (cl) 6.6 (5.5) to 20.1 (17.8) mm (MNHN Ci 2839, MNRJ 13894). — Stn DW 276, 34°02.06'N, 28°18.96'W, 1520 m to 34°01.85'N, 28°19.15'W, 1460 m, 5 specimens, tl (cl) 3.4 (3.0) to 10.6 (9.2) mm (MNHN Ci 2840).

DIVA II, stn PL 09, 37°16.32'N, 32°16.51'W, Tour Eiffel, 1685 m, 9 specimens, tl (cl) 6.1 (4.8) to 23.5 (18.6) mm (MNHN Ci 2841, MNRJ 13895).

MARVEL, stn PL 1199, Famous, 36°32.26'N, 33°27.40'W, 2364 m, > 40 specimens, tl (cl) few to 20.0 (15.5) mm (MNHN Ci 2884).

REMARKS

See discussion under *G. carinatum* below.

Glyptelasma carinatum (Hoek, 1883)

(Figs 10C, D; 12)

Poecilasma carinatum Hoek, 1883: 44, pl. 1, figs 8-10, pl. 2, fig. 1, pl. 7, figs 6-7. — Weltner 1895: 289; 1897: 243. — Gruvel 1902c: 157, pl. 17, figs 9-16; 1902d: 45, 49; 1905: 115, fig. 130. — Hoek 1907a: 4, pl. 1, fig. 1; 1908: 111; 1914: 4. — Gruvel 1920: 37.

Megalasma (*Glyptelasma*) *carinatum* – Pilsbry 1907a: 93; 1907b: 416. — Calman 1918a: 401, figs 1-3; 1919: 370. — Barnard 1924: 54. — Zevina 1972: 61; 1982: 92, fig. 82.

Poecilasma (*Glyptelasma*) *carinatum* – Nilsson-Cantell 1921: 258.

Glyptelasma carinatum – Broch 1931: 32, fig. 11. — Southward 1998: 13. — Young 1999: 612, fig. 2a.

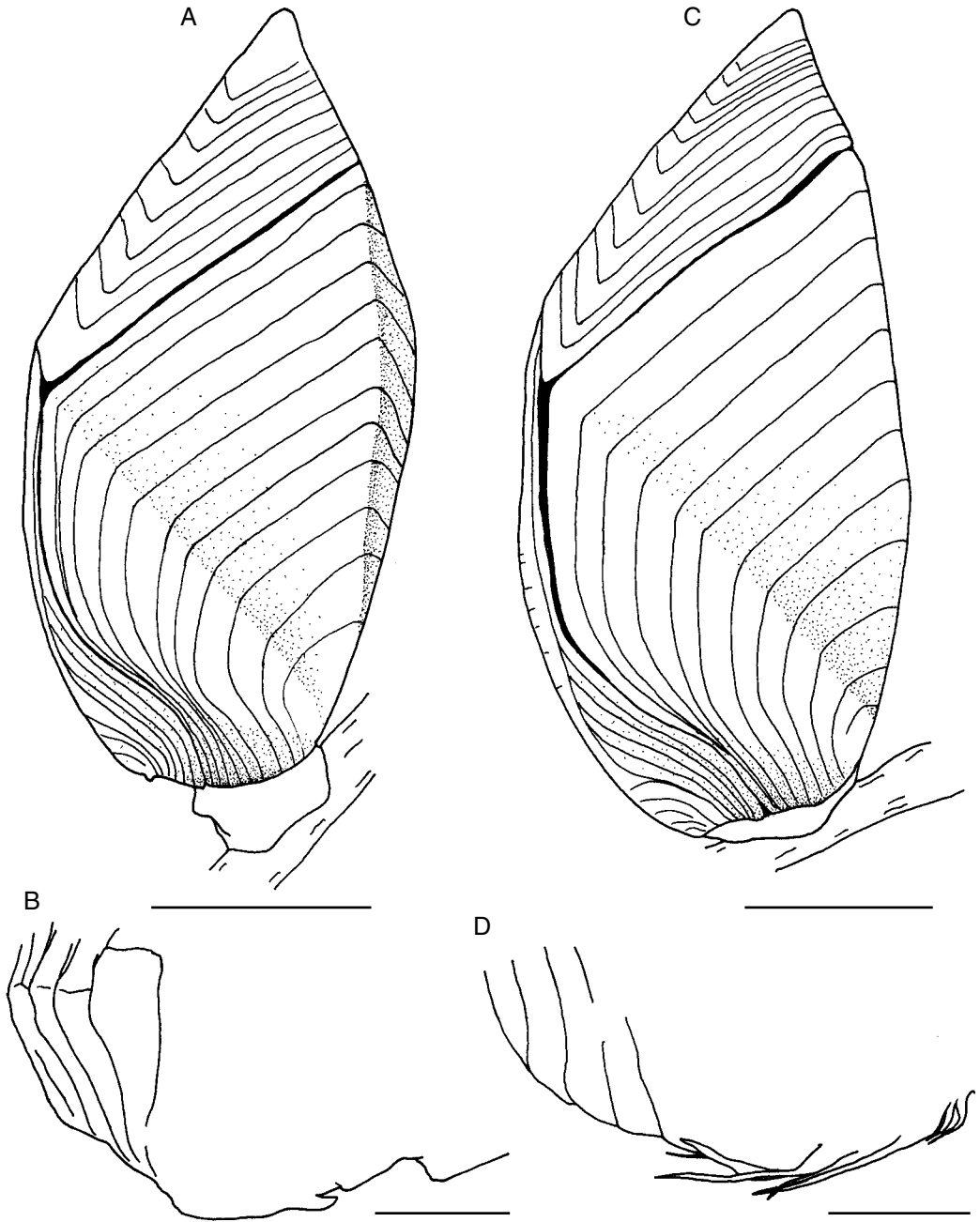


FIG. 10. — **A, B**, *Glyptelasma hamatum* (Calman, 1919), SEAMOUNT 2, stn DW 267; **A**, left lateral view; **B**, dorsal filamentary appendage on prosoma; **C, D**, *Glyptelasma carinatum* (Hoek, 1883), SEAMOUNT 2, stn DW 267; **C**, left lateral view; **D**, dorsal filamentary appendages on prosoma. Scale bars: A, C, 5 mm; B, D, 2 mm.

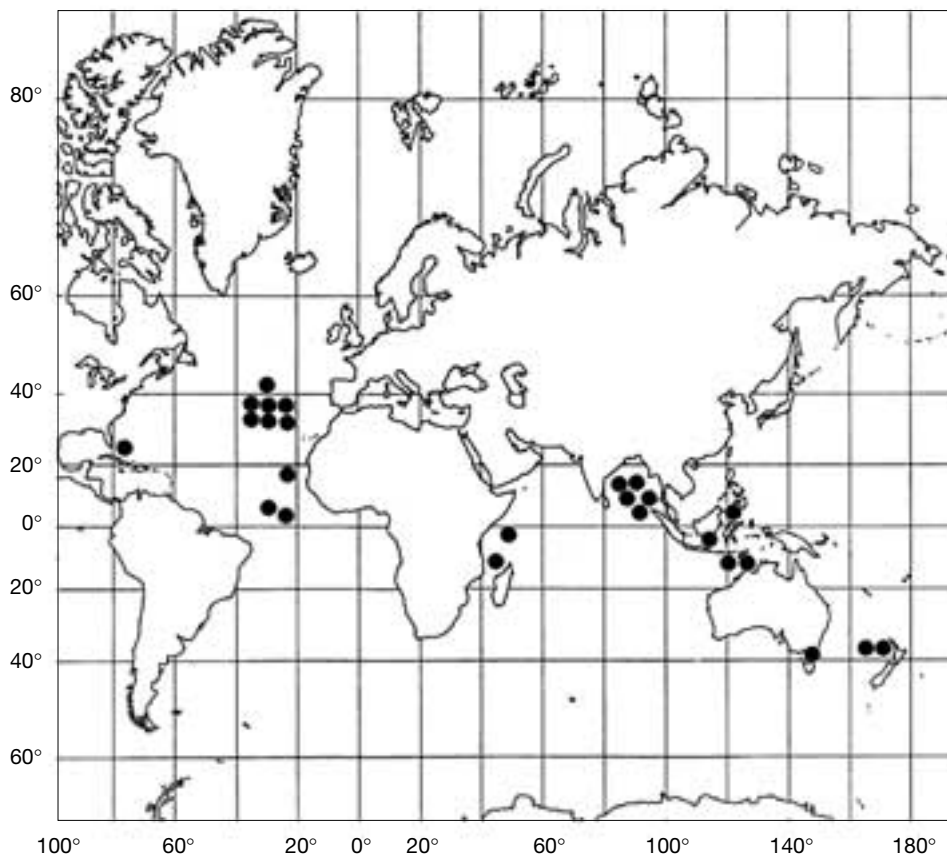


Fig. 11. — Geographic distribution of *Glyptelasma hamatum* (Calman, 1919).

Megalasma carinatum — Ciurea *et al.* 1933: 14. — Hutchins 1952: 194.

Non *Megalasma carinatum* — Foster 1978: 26, pl. 3b, fig. 12 (= *Glyptelasma hamatum* Calman).

MATERIAL EXAMINED. — SEAMOUNT 2, stn TS 267, 34°22.50'N, 30°22.50'W, 2225 m, 1 specimen, tl (cl) 21.2 (20.1) mm (MNHN Ci 2842).

REMARKS

Comparing the description of *G. carinatum* with that of *G. hamatum* (Calman 1918a, 1919), I list some differences in the external characters of the capitular plates as follows. *G. hamatum* has a scutum with the basal margin straight and forming a right or obtuse angle with the occludent margin whereas *G. carinatum* has its basal margin form-

ing an even curve with the occludent margin. But the specimens of *G. carinatum* figured by Hoek (1907a) show the basal margin as described for *G. hamatum* by Calman (1919). Hoek's figure from specimens taken by the *Challenger* Expedition (Hoek 1883) also has a straight basal margin forming an angle with the occludent margin.

Calman (1918a) observed a well-marked umbo-apical ridge, curved and distant from the occludent margin for *G. carinatum* and in 1919 he observed a submarginal umbo-carinal ridge, straight or curved for *G. hamatum*. He noted a relation between the carinal and occludent margins of tergum of one-third to half for *G. hamatum* and only half for *G. carinatum*.

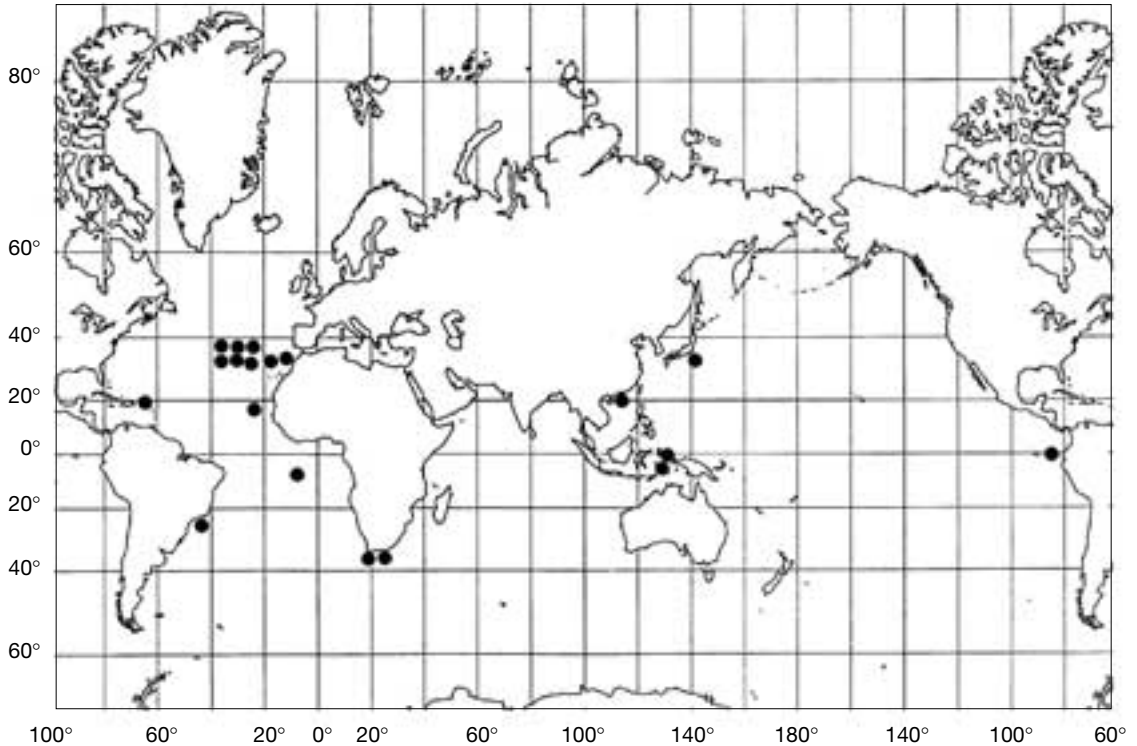


FIG. 12. — Geographic distribution of *Glyptelasma carinatum* (Hoek, 1883).

Nilsson-Cantell (1928: fig. 11) figured a specimen of *G. hamatum* with a conspicuous apicobasal ridge and an angle between the occludent and basal margins of the scutum.

Young (1999: 612) also observed an apicobasal ridge on the scutum of *G. carinatum* which was collected off the Brazilian coast.

Dissecting all the *Glyptelasma* sampled I found a large number of *G. hamatum* but only one specimen of *G. carinatum*. I tried to observe the external characters of these two species to evaluate the differences cited by Calman (1918a, 1919) and others. All the specimens have an angle between the basal and occludent margins of the scutum (Fig. 10A, C). The scutum of *G. carinatum* did not have an apicobasal ridge, but rather a well-marked lateral (Fig. 10A, C). Therefore the development of an apicobasal ridge on the scutum is variable in both species. The relationship of half between the carinal and occludent margins of the

tergum of *G. carinatum* may change if more specimens are examined. I cannot observe any external character which could be used to separate these species.

Certainly, the best character to separate both species is the number of filamentary appendages on the dorsal margin of the prosoma: *G. carinatum* has two rows of numerous fine and long filamentary appendages and *G. hamatum* has only two short projections, which Calman (1919: 372) named dorsal hooks (Fig. 10B, D).

G. carinatum and *G. hamatum* were collected at the same station on the axes of gorgonians.

The general distribution of both species of *Glyptelasma* are similar: mainly North Atlantic and Indo-Malayan. *Glyptelasma hamatum* is also found from East Africa, south to Australia and New Zealand (Fig. 11) and *G. carinatum* from the South Atlantic, Japan and near the Galapagos Island (Fig. 12).

Genus *Dichelaspis* Darwin, 1852

Dichelaspis thieli Young, 1998
(Fig. 13A-C)

Dichelaspis thieli Young, 1998a: 7, figs 5, 6.

MATERIAL EXAMINED. — SEAMOUNT 2, stn TS 267, 34°22.50'N, 30°22.50'W, 2225 m, 3 specimens, tl (cl) 7.0 (5.7) to 12.0 (9.3) mm (MNHN Ci 2843, MNRJ 13896).

REMARKS

The present specimens have a scutum less reduced than those described in the original description (Young 1998a: 8); the basal arm is shorter and the occludent arm is still calcified. The terga do not develop an undulated basal margin, which was also observed in a smaller specimen described previously. But all three of the present specimens have the capitulum with a typical triangular shape and the height 2.5 times its width. The differences in the calcification of the plates are considered different stages of development.

Dichelaspis thieli was recorded from off Morocco from 1300 m. These new records extend its distribution to the Azores region and to depth between 1300 and 2225 m.

Dichelaspis sp.
(Fig. 13D)

MATERIAL EXAMINED. — SEAMOUNT 2, stn CP 268, 34°22.03'N, 30°23.14'W, 2205 m to 34°20.54'N, 30°25.00'W, 2145 m, 1 specimen, tl (cl) 20.0 (14.1) mm (MNHN Ci 2844).

REMARKS

The single full grown specimen, which at first view, I thought may be *D. thieli*. But some characters in the shape of the capitulum and reduction of its plates show it is probably a distinct species.

The capitulum is short, with its height less than two times its width and with a strongly curved carinal margin. The carina is strongly curved without a basal flattened projection. The scutum has an L-shape with a very thin and long basal arm and an occludent arm which enlarges apically. The peduncle is short and robust.

It is difficult to trace a reduction of the plates of *D. thieli* to attain the scutum and carina form observed in this specimen. Otherwise the proportion of the capitulum and peduncle is very different from the *D. thieli*.

All of the other species of *Dichelaspis* are very distinct from this specimen. Because there is only one specimen I prefer to maintain the identification as *Dichelaspis* sp., until more samples become available.

Family LEPADIDAE Darwin, 1852

Genus *Lepas* Linnaeus, 1758

Lepas anserifera Linnaeus, 1767

Lepas anserifera Linnaeus, 1767: 1109. — Darwin 1852: 81, pl. 1, fig. 4 (with synonymy). — Pilsbry 1907a: 80, pl. 8, figs 1-3.

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 229, 32°02.04'N, 28°24.39'W, 1715 m to 32°02.01'N, 28°24.12'W, 1715 m, 1 disarticulated plate (MNHN Ci 2845).

REMARKS

Lepas anserifera is a species commonly found attached to floating objects at the sea surface (Pilsbry 1907a; Weisbord 1979). The capitular plate collected from a depth of 1715 m clearly is derived from a dead individual and *L. anserifera* probably does not live at this depth.

Suborder SCALPELLOMORPHA Newman, 1987

Family CALANTICIDAE Zevina, 1987

Genus *Aurivillialepas* Newman, 1980

Aurivillialepas bocquetae (Newman, 1980)
(Figs 14; 15)

Calantica calyculus – Bocquet-Védrine 1971: 761, figs 1-3 [non *Aurivillialepas calyculus* (Aurivillius, 1898)].

Scillaelepas (Aurivillialepas) bocquetae Newman, 1980: 387, figs 7, 8.

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 225, 32°08.59'N, 28°10.73'W, 1030 m to 32°08.92'N, 28°10.50'W, 1035 m, 1 specimen, tl (cl)

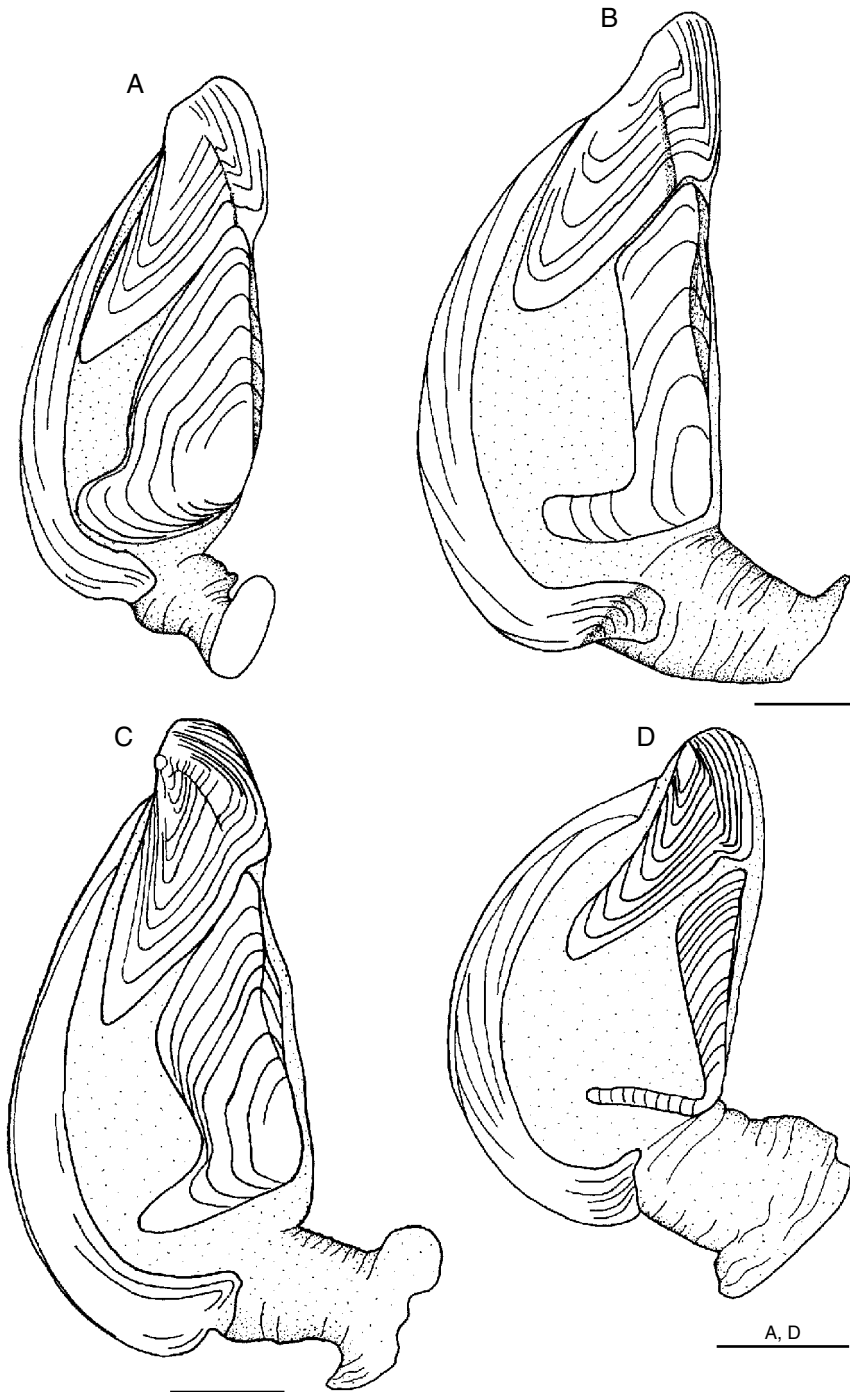


FIG. 13. — Left lateral views; **A-C**, *Dichelaspis thieli* Young, 1998, SEAMOUNT 2, stn DW 267; **D**, *Dichelaspis* sp., SEAMOUNT 2, stn CP 268. Scale bars: A-C, 2 mm; D, 5 mm.

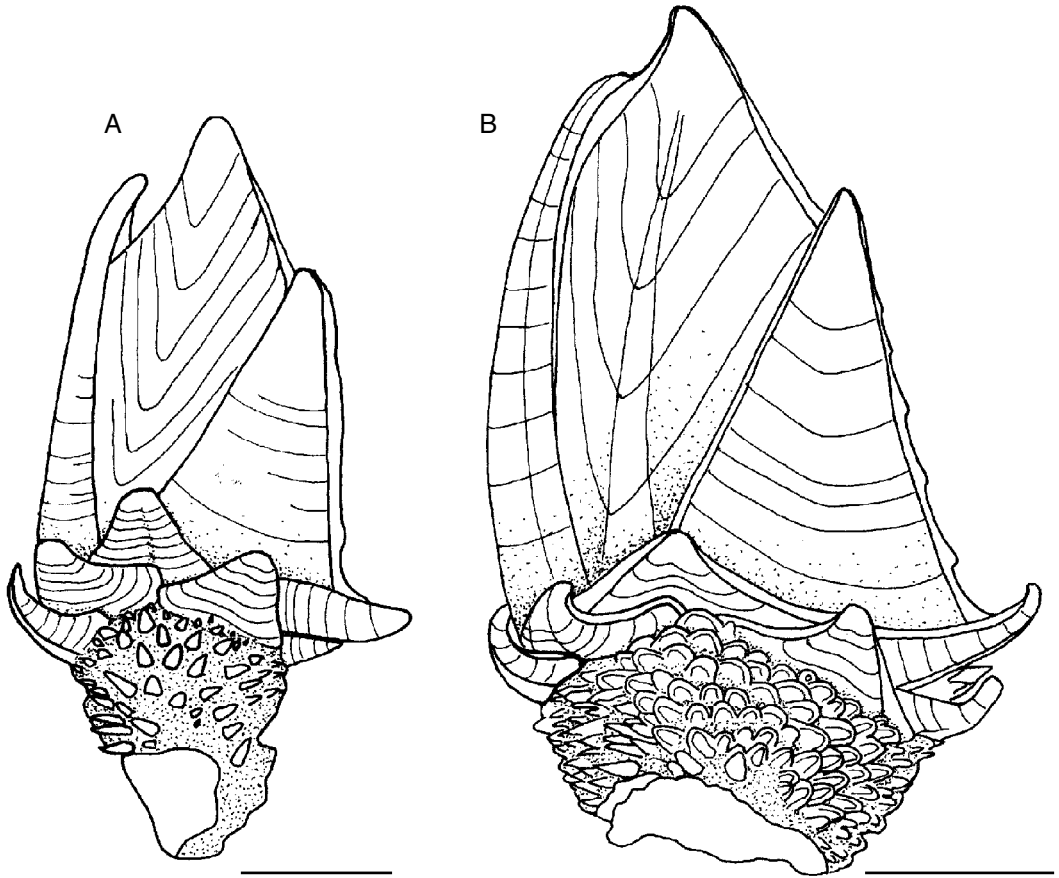


FIG. 14. — *Aurivillialepas bocquetiae* (Newman, 1980), SEAMOUNT 2, right lateral view; **A**, stn DW 256; **B**, stn CP 257. Note the small space between rostrum and subrostrum of specimen A and the presence of the male between these valves in B. Scale bars: A, 1 mm; B, 2 mm.

9.0 (6.2) mm (MNHN Ci 2847). — Stn DW 256, 34°06.21'N, 30°16.03'W, 340 m to 34°06.47'N, 30°16.21'W, 345 m, 2 specimens, tl (cl) 5.2 (3.5) to 8.9 (6.2) mm (MNHN Ci 2848, MNRJ 13897). — Stn CP 257, 34°04.51'N, 30°15.05'W, 338 m to 34°03.21'N, 30°14.25'W, 330 m, 2 specimens, tl (cl) 9.9 (6.9) to 13.2 (9.3) mm (MNHN Ci 2846, MNRJ 13898).

REMARKS

The specimens ranged from 5 to 13 mm in length and the presence of males varied between the specimens. The smallest one did not have a male, probably because this specimen had not yet developed the space between the rostrum and subrostrum where the male cyprids attach nor-

mally. The larger specimens had one or two males in the rostral position, but one of them did not have a male. I infer the life time of the males is significantly less than the females, therefore, the females acquire several male cyprids during their life.

The relative proportions of the capitulum of *Aurivillialepas bocquetiae* change during growth. The smaller specimens are more slender with the height about twice the width, changing to about 1.5 times in the grown specimens.

Aurivillialepas bocquetiae was recorded only from off France, between 44°-48°N and 7°-8°W and from 340 to 519 m (Newman 1980). These new records extend its distribution to the Azores region.

Genus *Scillaelepas* Seguenza, 1872*Scillaelepas grimaldi* (Aurivillius, 1898)

(Fig. 15)

Scalpellum grimaldii Aurivillius, 1898: 191. — Gruvel 1920: 15, pl. 5, figs 7-9.

Scillaelepas (Scillaelepas) grimaldii – Newman 1980: 381 (with synonymy).

MATERIAL EXAMINED. — EQUAMARGE 2, stn DR 08, 3°30'N, 2°40'E, 2420 m, 1 specimen (MNHN Ci 2849).

REMARKS

The single specimen collected was badly preserved and all of its plates were disarticulated. Aurivillius (1898) and Gruvel (1920) recorded *Scillaelepas grimaldi* from the Azores region between 845–1230 m. Hiro (1932) considered *S. superbum* (Pilsbry, 1907) a junior synonym of *S. grimaldi* which was accepted by Zevina (1981). But, Newman (1980), in his revision of *Scillaelepas* did not recognize this synonymy. The new record of this species from the Gulf of Guinea extends southward its distribution and its depth to 2420 m.

Genus *Smilium* Gray, 1825*Smilium acutum* (Hoek, 1883)

Scalpellum acutum Hoek, 1883: 80, pl. 3, fig. 19; pl. 8, fig. 12.

Smilium acutum – Newman & Ross 1971: 38, pl. 5F (with synonymy). — Zevina 1981: 82, fig. 54 (with synonymy).

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 180, 30°04.09'N, 28°45.09'W, 1575 m to 30°03.90'N, 28°44.74'W, 1610 m, 9 specimens, tl (cl) 1.8 (1.4) to 10.4 (7.4) mm (MNHN Ci 2850, MNRJ 13899). — Stn DW 222, 32°20.81'N, 28°15.66'W, 1150 m to 32°21.02'N, 28°15.72'W, 1150 m, 1 specimen, tl (cl) 1.5 (1.1) mm (MNHN Ci 2851). — Stn DW 249, 33°12.41'N, 29°14.83'W, 1700 m to 33°12.36'N, 29°15.19'W, 1800 m, 3 specimens, tl (cl) 6.9 (5.1) to 10.9 (7.4) mm (MNHN Ci 2852, MNRJ 13900). — Stn DW 261, 34°22.37'N, 30°27.79'W, 1340 m to 34°22.52'N, 30°27.99'W, 1190 m, 1 specimen, tl (cl) 10.9 (8.0) mm (MNHN Ci 2853). — Stn DW 276, 34°02.06'N, 28°18.96'W, 1520 m to 34°01.85'N, 28°19.15'W, 1460 m, 2 specimens, tl (cl) 13.5 (9.2) to 13.6 (9.7) mm (MNHN Ci 2854, MNRJ 13901). — Stn DW 278, 33°57.77'N, 28°22.40'W, 890 m to 33°57.47'N, 28°22.48'W, 925 m, 1 specimen, tl (cl) 11.7 (8.3) mm (MNHN Ci 2855).

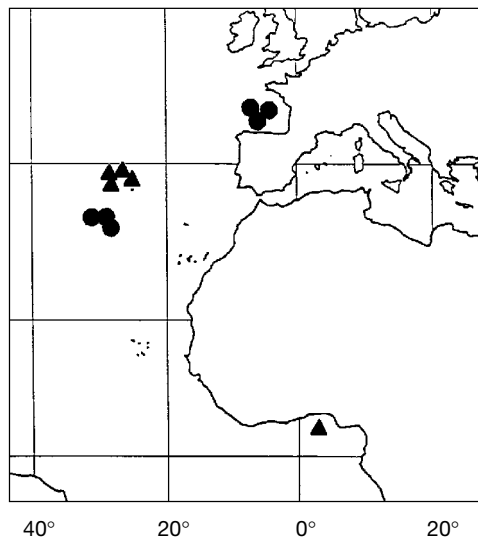


Fig. 15. — Geographic distribution of *Aurivillialepas bocquetae* (Newman, 1980) (circles) and *Scillaelepas grimaldi* (Aurivillius, 1898) (triangles).

REMARKS

Smilium acutum purportedly has a worldwide distribution occurring between 61 and 2480 m. It is commonly collected in the northeastern Atlantic (Hoek 1883; Calman 1918a; Gruvel 1920; Foster & Buckeridge 1995; Young 1998b).

Family SCALPELLIDAE Pilsbry, 1907
Subfamily SCALPELLINAE Pilsbry, 1907
Genus *Scalpellum* Leach, 1817

Scalpellum scalpellum (Linnaeus, 1767)

Lepas scalpellum Linnaeus, 1767: 1109.

Scalpellum scalpellum – Darwin 1852: 222, pl. 5, fig. 15 (with synonymy). — Pilsbry 1907a: 16. — Zevina 1981: 94, fig. 65.

MATERIAL EXAMINED. — SEAMOUNT 2, stn CP 121, 28°06.26'N, 15°51.82'W, 200 m to 28°06.76'N, 15°51.06'W, 200 m, 7 specimens, tl (cl) 3.0 (2.1) to 8.0 (5.5) mm (MNHN Ci 2856, MNRJ 13902).

REMARKS

Scalpellum scalpellum is a common species of the northeastern Atlantic occurring in shallow waters of Europe and North Africa (Nilsson-Cantell 1978: 16).

Subfamily MEROSCALPELLINAE Zevina, 1978
Genus *Neoscalpellum* Newman & Ross, 1971

Neoscalpellum debile (Aurivillius, 1898)

Scalpellum debile Aurivillius, 1898: 189.

Neoscalpellum debile – Newman & Ross 1971: 96, figs 49, 50 (with synonymy). — Young 1998a: 13, figs 10-11 (with synonymy).

MATERIAL EXAMINED. — BENGAL 2, stn 13078#1, 48°50.13'N, 16°39.86'W to 48°59.06'N, 16°38.58'W, 4844 m, 1 specimen, tl (cl) 35.5 (23.0) mm (MNHN Ci 2857). — Stn 13078#11, 48°59.19'N, 16°35.98'W, 4844 m, 5 specimens, tl (cl) 30.7 (23.4) to 37.1 (28.6) mm (MNHN Ci 2858, MNRJ 13903).

BENGAL 3, stn 13200#70, 48°51.62'N, 16°31.80'W, 4845 m to 48°50.09'N, 16°33.98'W, 4848 m, 2 specimens, tl (cl) 42.5 (31.0) to 43.8 (31.3) mm (MNHN Ci 2859, MNRJ 13904). — Stn 13200#93, 48°50.55'N, 16°25.30'W, 4844 m to 48°47.46'N, 16°30.42'W, 4849 m, 2 specimens, tl (cl) 41.6 (31.6) to 44.4 (29.2) mm (MNHN Ci 2860, MNRJ 13905). — Stn 13200#94, 48°50.99'N, 16°23.03'W, 4847 m to 48°47.29'N, 16°32.23'W, 4851 m, 3 specimens, tl (cl) 21.5 (16.6) to 44.7 (31.6) mm (MNHN Ci 2861, MNRJ 13906).

BENGAL 5, stn 13368#47, 48°51.63'N, 16°25.18'W to 48°50.93'N, 16°25.99'W, 4844 m, 2 specimens, tl (cl) 39.4 (28.9) to 41.8 (29.0) mm (MNHN Ci 2862, MNRJ 13907). — Stn 13368#48, 48°49.64'N, 16°30.12'W, 4841 m to 48°45.78'N, 16°32.37'W, 4845 m, 1 specimen, tl (cl) 37.8 (31.6) mm (MNHN Ci 2863). — Stn 13368#53, 48°50'N, 16°23.53'W, 4842 m, 9 specimens, tl (cl) 16.7 (13.3) to 49.8 (32.8) mm (MNHN Ci 2864, MNRJ 13908).

BENGAL 6, stn 13627#11, 48°47.82'N, 16°44.37'W, 4840 m, 4 specimens, tl (cl) 26.4 (20.8) to 42.9 (32.4) mm (MNHN Ci 2865, MNRJ 13909). — Stn 13627#24, 48°50.47'N, 16°44.37'W, 4840 m, 2 specimens, tl (cl) 42.4 (30.4) to 46.9 (30.5) mm (MNHN Ci 2866, MNRJ 13910).

REMARKS

The present samples contain only full grown specimens of *Neoscalpellum debile*. This species has been commonly dredged on both sides of the North Atlantic between 2321 and 5318 m (Gravel 1920; Pilsbry 1907a as *Scalpellum dicheoplax*; Newman & Ross 1971; Young 1998a, b). It was also recorded in the South Atlantic: off Tristan da Cunha, Angola, and Brazil (Foster & Buckeridge 1995 as *Meroscalpellum bifurcatum* [Zevina, 1973] [Young 1999]).

Genus *Barbascalpellum* Zevina, 1978

Barbascalpellum rossi n. sp.

(Figs 16; 17)

TYPE MATERIAL. — Holotype 1 ♀, N. Ireland, PROSPEC, stn CPH 10, 55°18.69'N, 10°14.83'W, 1589 m to 55°18.11'N, 10°15.38'W, 1578 m, 1600 m, tl (cl) 43.1 (26.6) mm (MNHN Ci 2867); paratypes, same locality, 6 specimens, tl (cl) 29.9 (18.9) to 49.4 (27.8) mm (MNHN Ci 2868, MNRJ 13911).

ETYMOLOGY. — Named in honor of my friend and spiritual mentor Arnold Ross.

DIAGNOSIS. — Scutum with lateral arm less than one-third length of tergal margin. Upper-latus pentagonal with subapical umbo. Inframedian-latus vase shaped, with umbo almost basal. Caudal appendage with five articles, length nearly equal to propopodite.

DESCRIPTION

Capitulum (Fig. 16A) oval, flattened, length less than twice width; growth lines thin and inconspicuous. Cuticle reddish, thick, sparsely pilose and with well-marked sutural plate scars.

Tergum (Fig. 16A) divided into two arms, with original surface area larger than that of scutum. Basal margin with deep concavity. Carinal margin slightly concave with lateral thickening near apex of carina. Occludent margin straight turning strongly convex in apical portion. Apex curved toward carina.

Scutum (Fig. 16A) convex, with short lateral arm, length less than one-third length of tergal margin; height more than twice greatest width. Basal margin slightly convex. Tergal margin nearly straight. Occludent margin convex. Apex not overlying on tergum.

Carina (Fig. 16A, B) regularly arched, with umbo situated at three-quarters of length. Tectum flat; lateral angularly bent; basal margin straight.

Upper-latus (Fig. 16A) nearly pentagonal with umbo subapical, slightly projecting above surface of capitulum. Tergal and scutal margins symmetrical, slightly concave; other margins having an irregular outline.

Carino-latus (Fig. 16A, B) higher than wide, with umbo basal, slightly projecting outward. Lateral margin having an irregular outline. Carino-latera not in contact with one another.

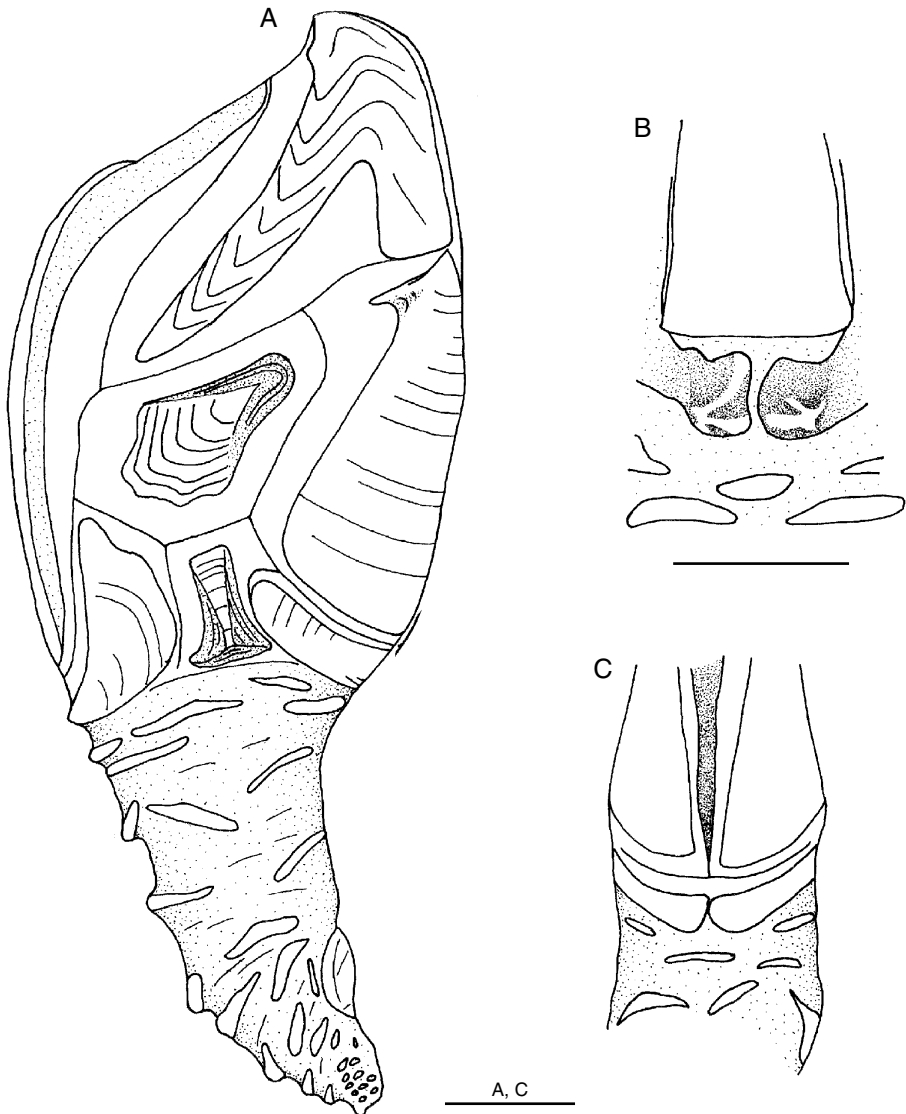


FIG. 16. — *Barbascalpellum rossi* n. sp., holotype, PROSPEC, stn CPH 10; **A**, left lateral view; **B**, carinal view; **C**, rostral view. Scale bars: 5 mm.

Inframedian-latus (Fig. 16A) vase shaped with umbo almost basal; umbo projecting outwards.

Rostro-latus (Fig. 16A, C) wider than high, width almost four times height, without apico-basal ridge. Upper margin slightly concave; lateral margin rounded.

Rostrum (Fig. 16C) absent.

Peduncle (Fig. 16A) little shorter than capitulum, covered sparsely by scales deeply immersed in cuticle. Scale whorl eight-plate pattern: rl-cl, sr-l-sc. Labrum (Fig. 17A) bullate, without teeth. Palp (Fig. 17A, B) elongated with several fine setae on apex and few small setae on inner margin. Mandible (Fig. 17C) with three teeth; lower

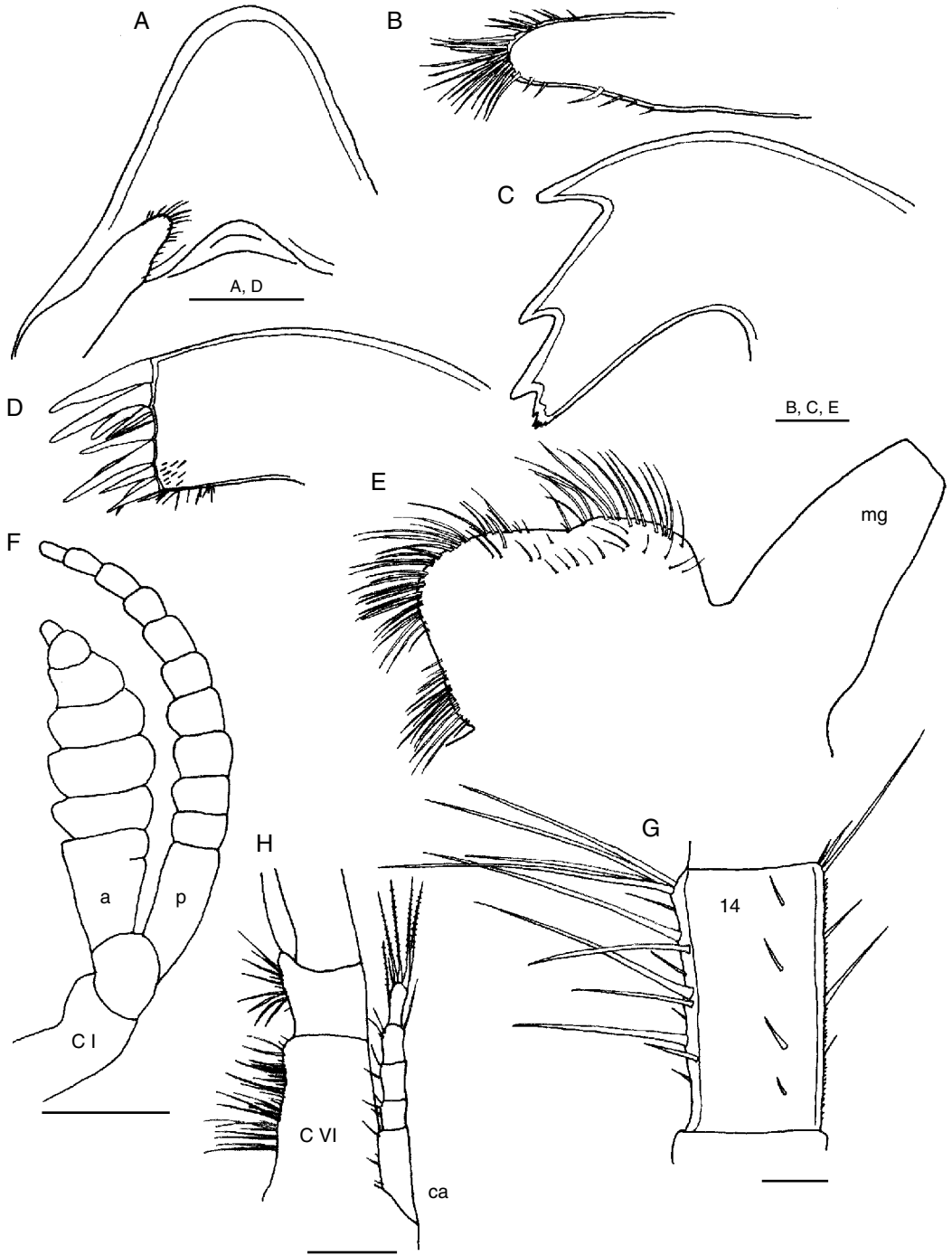


FIG. 17. — *Barbascalpellum rossi* n. sp., holotype, PROSPEC, stn CPH 10; **A**, labrum and palp; **B**, palp; **C**, mandible; **D**, maxilla I; **E**, maxilla II; **F**, cirrus I; **G**, median article of cirrus VI; **H**, cirrus VI protopodite and caudal appendage. Abbreviations: **a**, anterior ramus; **C I**, cirrus I; **C VI**, cirrus VI; **ca**, caudal appendage; **mg**, maxillary gland; **p**, posterior ramus. Scale bars: A, H, 1 mm; B-E, G, 0.3 mm; F, 2 mm.

angle denticulate, without setae. Maxilla I (Fig. 17D) small, with straight anterior border, and 11 large and smaller and unpaired spines. Maxilla II (Fig. 17E) squared; covered with numerous large and simple setae except for median space on anterior margin and another on upper margin; papilla of maxillary gland pronounced.

Cirrus I (Fig. 17F) with anterior ramus two-thirds length of posterior ramus; former with protuberant articles; both rami covered by numerous large, simple setae. Cirrus II to VI with equal rami. Median article of cirrus VI (Fig. 17G) almost two times longer than wide, four groups of setae on anterior margin, upper one with four setae, uniformly distributed small setae on lateral surface, scales and intercalated setae on posterior margin and three setae on posterior angle.

Caudal appendage (Fig. 17H) with five articles, nearly same length as protopodite of cirrus VI; articles with few, small setae on anterior margins, and cluster of pinnate setae on apex. Number of articles of cirri I-VI and caudal appendage is presented in Table 4.

REMARKS

Barbascalpellum rossi n. sp. is the first species of this genus recorded from the Atlantic Ocean. The genus is represented in the Pacific Ocean by *B. sanctabarbarae* (Pilsbry, 1907) from California and by *B. cochlearium* (Hiro, 1933) from Japan.

B. rossi n. sp. is very distinct from *B. cochlearium* and can be distinguished by the latter having the upper-latus with a distinct shape and a fringed basal margin, the tergum with thinner branches, the carina with the roof bordered by prominent ridges, and the carino-latus with a concavity.

On the other hand, *B. sanctabarbarae* is very similar to *B. rossi* n. sp. but the former has the capitulum with a strongly convex occludent margin, the rostro-latus is very low, and it has a rostrum.

Barbascalpellum rossi n. sp. is known only from the type locality, N. Ireland, from 1600 m.

TABLE 4. — Number of articles for anterior and posterior rami of cirri I-VI, and caudal appendages of *Barbascalpellum rossi* n. sp., holotype, PROSPEC, stn CPH 10. Abbreviations: **Ci-VI**, cirri I to VI; **ca**, caudal appendage; **rc**, right cirri; **lc**, left cirri.

	Ci	CII	CIII	CIV	CV	CVI	ca
rc	8/11	20/23	25/26	28/31	34/33	28/31	5
lc	7/11	20/24	26/24	28/27	29/29	31/32	5

Subfamily ARCOSCALPELLINAE Zevina, 1978
Genus *Arcoscalpellum* Hoek, 1907

Arcoscalpellum michelottianum (Seguenza, 1876)
(Fig. 18)

Scalpellum michelottianum Seguenza, 1876: 381, pl. 6, figs 15-25, pl. 10, fig. 26.

Scalpellum velutinum Hoek, 1883: 96, pl. 4, figs 10-11, pl. 9, figs 7-9.

Arcoscalpellum michelottianum — Newman & Ross 1971: 71, fig. 34, pl. 9b (with synonymy). — Young 1998a: 19, figs 13-14 (with synonymy).

MATERIAL EXAMINED. — PROSPEC, stn CPH 10, 55°18.69'N, 10°14.83'W, 1589 m to 55°18.11'N, 10°15.38'W, 1578 m, 3 specimens, tl (cl) 29.5 (19.7) to 49.0 (33.4) mm (MNHN Ci 2869, MNRJ 13912). SAINT PAUL, stn SP 09-13, 01°00.73'N, 29°21.61'W, 3114 m, 1 specimen, tl (cl) 15.5 (12.2) mm (MNHN Ci 2870).

REMARKS

Arcoscalpellum michelottianum is probably a complex of several distinct species (Ross *in litt.* 1999). He noted conspicuous differences between specimens of Hoek's types series of *Scalpellum velutinum* Hoek, 1883, photographed by Young (1998a: fig. 13a-d). The specimens differ in the relative development of the upper-latus, the position of the apex of the carina relative to the apex of the scutum and in the number and size of the plates on the peduncle. The specimens herein studied comprises the "*Arcoscalpellum velutinum*" type of Hoek, shown in Young (1998a: fig. 13c-d). A question about the peduncular pattern is if there are any changes in this pattern during the development? The three specimens recorded have distinct sizes (tl of 29.5, 37.5 and

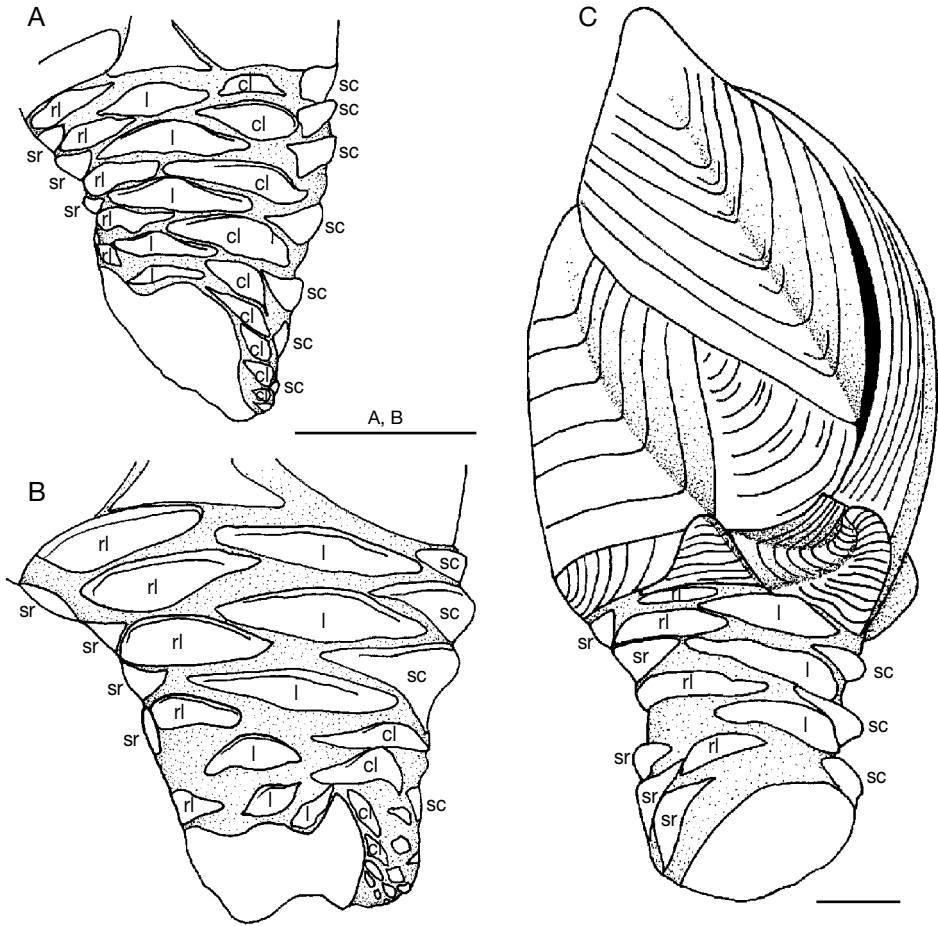


FIG. 18. — *Arcoscalpellum michelottianum* (Seguenza, 1876), PROSPEC, stn CPH 10; **A-B**, peduncle of two specimens; **C**, right lateral view; note the change in peduncular plate patterns from the smaller specimen A to the larger one C. Abbreviations: cl, carino-lateral scale; l, lateral scale; rl, rostro-lateral scale; sc, subcarinal scale; sr, subrostrum scale. Scale bars: 5 mm.

49.0 mm). If all the scales of the specimens are figured some differences can be observed. In the smaller stage the peduncular plate pattern is the basic eight-plate pattern with one row of rl-cl and another of sr-l-sc (Fig. 18A). The large specimen has a six-plated pattern lacking the cl plates (Fig. 18C). In the intermediate size individual, there is a change in the pattern from eight-plates to large plates in a six-plate pattern also with the exclusion of the cls (Fig. 18B). During ontogeny, the narrow basal part of the peduncle has irregularly spaced plates, which obscures the original pattern.

On the other hand, this observation reaffirms the supposition of an eight-plate pattern as a simple-siomorphic character in scalpellids (Newman & Ross 1998).

Arcoscalpellum mamillatum
(Aurivillius, 1898), n. comb.
(Figs 19-22)

Scalpellum mamillatum Aurivillius, 1898: 191. — Gravel 1905: 69; 1920: 21, pl. 5, figs 19-21. — Nilsson-Cantell 1955: 218. — Belloc 1959: 3. — Zevina 1976: 1155.

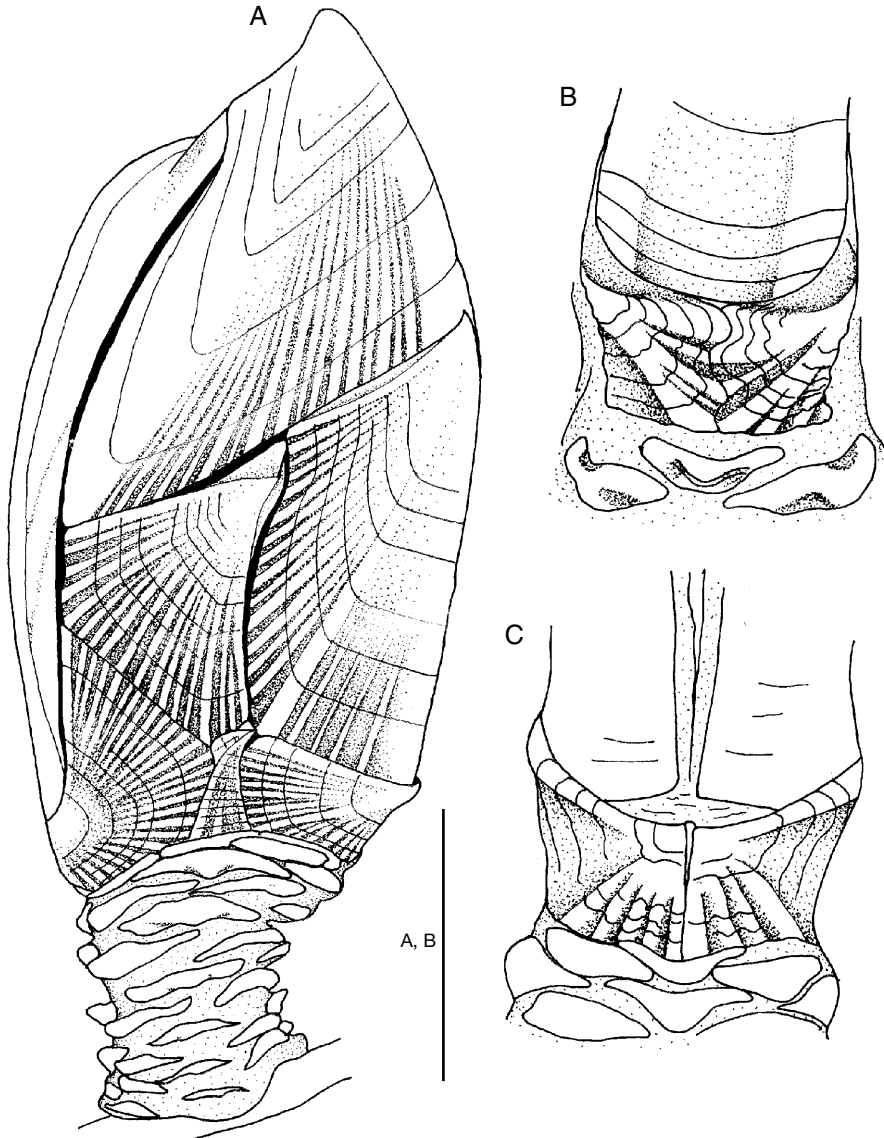


FIG. 19. — *Arcoscalpellum mamillatum* (Aurivillius, 1898), ECOFER 1, stn CP 01; **A**, left lateral view; **B**, carinal view; **C**, rostral view. Scale bars: A, 5 mm; B, C, 3 mm.

Amygdoscalpellum mamillatum – Zevina 1978: 1349.

Amygdoscalpellum [sic] *mamillatum* – Zevina 1981: 269 (part, not fig. 202 (= *Amygdoscalpellum semisculptum* [Pilsbry, 1907])).

MATERIAL EXAMINED. — ECOFER 1, stn CP 01, 44°46.20'N, 02°38.15'W, 3017 m, 1 specimen, tl (cl) 25.4 (19.0) mm (MNHN Ci 2871).

DESCRIPTION

Capitulum (Fig. 19A) oval, flattened, length almost twice width, occludent and carinal margins convex and similar. Plates with strong radial ribs, except on carinal part of tergum; with spaced, thin growth lines. Cuticle thin, not pilose.

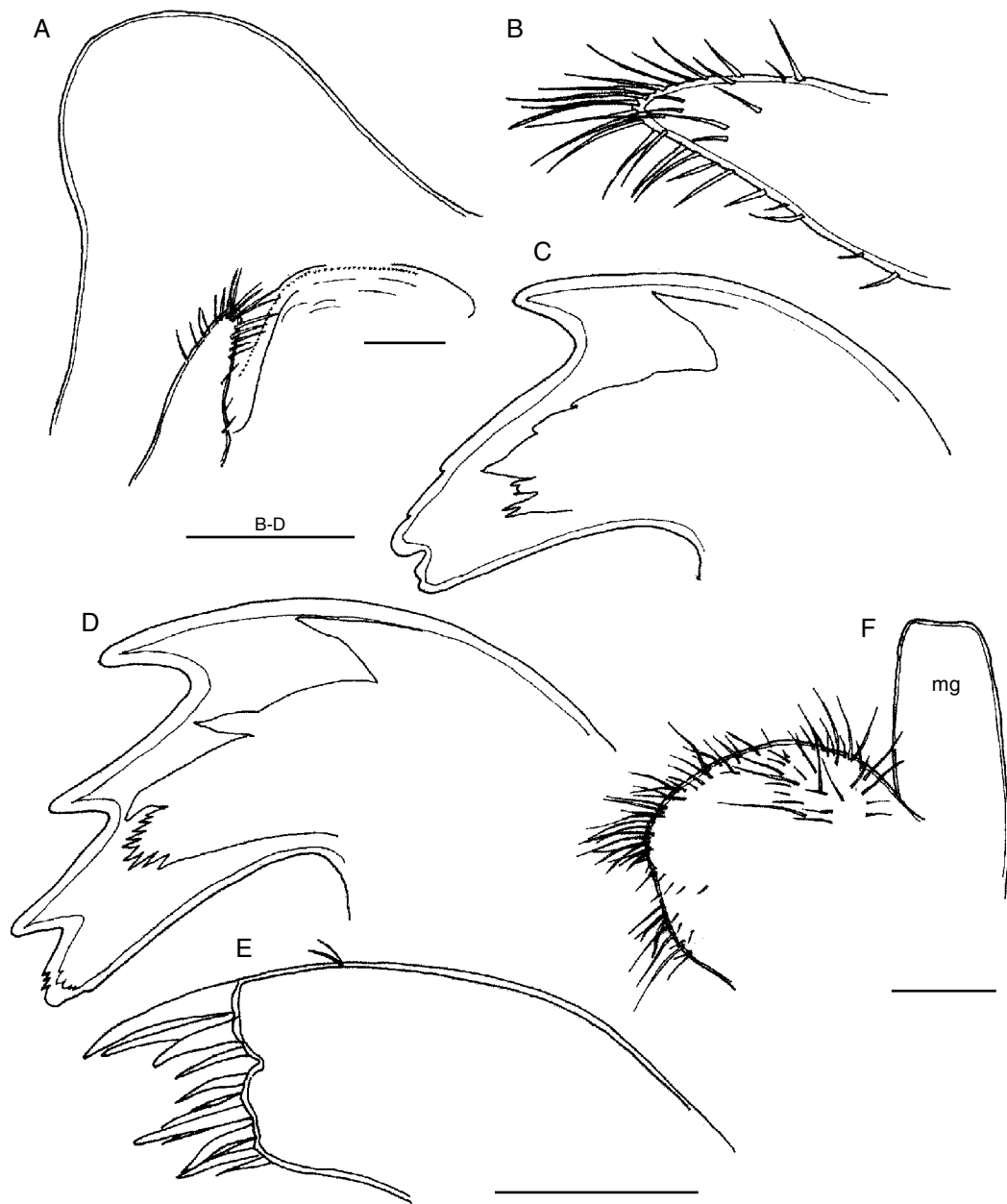


FIG. 20. — *Arcoscalpellum mamillatum* (Aurivillius, 1898), ECOFER 1, stn CP 01; **A**, labrum and palp; **B**, palp; **C-D**, mandibles; **E**, maxilla I; **F**, maxilla II. Abbreviation: **mg**, maxillary gland. Scale bars: 0.3 cm.

Tergum (Fig. 19A) with its surface area greater than scutum; inconspicuous apicobasal ridge. Basal margin straight. Carinal margin slightly convex, with lateral thickening near apex of carina.

Occludent margin convex. Apex slightly curved toward carina.

Scutum (Fig. 19A) with conspicuous apicobasal ridge, separating two surfaces; height more than

twice greatest width. Basal margin straight. Tergal margin slightly concave, presenting a lid. Occludent margin nearly straight, only distally convex. Lateral margin convex except for upper concavity to accept apex of upper-latus. Apex curved, superimposed on tergum.

Carina (Fig. 19A, B) arching more conspicuously at apex, wider at upper portion, with umbo slightly subapical. Tectum flat, bordered by lateral ridges; basal margin nearly straight.

Upper-latus (Fig. 19A) pentagonal with apex curved toward scutum, umbo subapical, projecting. Scutal margin concave; other margins straight.

Carino-latus (Fig. 19A, B) nearly pentagonal, higher than wide, with umbo at carinal base, not projecting backward. Carino-latera interdigitating with one another below carina.

Inframedian-latus (Fig. 19A) triangular, with umbo curved toward scutum, with two apical wings projecting toward carinal margin.

Rostro-latus (Fig. 19A, C) trapezoidal, wider than high, width almost two times height, with an apico-basal ridge. Lower margin two-thirds length of upper margin.

Rostrum (Fig. 19C) small, reduced to narrow slip between rostro-latera.

Peduncle (Fig. 19A) one-third length of capitulum, covered by large scales projecting outward. Scale whorl eight-plate pattern: rl-cl; sr-l-sc.

Labrum (Fig. 20A) bullate, with series of about 47 denticles. Palp (Fig. 20A, B) short, acuminate with few simple setae. Mandible (Fig. 20C, D) with three teeth or with second and third reduced; lower angle denticulate. Maxilla I (Fig. 20E) with anterior border having medial notch, and two large and 10 smaller unpaired spines. Maxilla II (Fig. 20F) rounded, globose; covered by numerous simple setae; papilla of maxillary gland pronounced.

Cirrus I (Fig. 21A) with unequal rami, anterior ramus three-quarter length of posterior ramus; former with protuberant articles. Cirrus II with equal rami but shorter than posterior cirri. Cirri III to VI with equal, long rami. Cirri I to III with several long, simple setae on anterior margin, lateral face and posterior margin, which decreases progressively in size and number toward posterior

TABLE 5. — Number of articles for anterior and posterior rami of cirri I-VI, and caudal appendages of *Arcoscalpellum mamillatum* (Aurivillius, 1898), ECOFER 1, stn CP 01. Abbreviations: **CI-VI**, cirri I to VI; **ca**, caudal appendage; **rc**, right cirri; **lc**, left cirri; +, broken ramus.

	CI	CII	CIII	CIV	CV	CVI	ca
rc	9/11	17/21	23/24	23/23	27+/24+	25/29	6
lc	9/11	16/20	22/24	26/25	29/25	30/26	7

rami (Fig. 21B-D). Larger setae of median article of cirri II, III and IV, 2.5, 3.3, 1.8 times length of article, respectively (Fig. 21B-D). Median article of cirrus VI less than two times longer than wide, three pairs of simple setae unequal in length and few fine setulae on anterior margin; unpaired simple setae on lateral face; intercalated setae on posterior margin and one or two setae on posterior angle. Number of articles of cirri I-VI and caudal appendage is presented in Table 5.

Caudal appendage (Fig. 21E), with six to seven articles, shorter than length of coxopodite of cirrus VI; articles with few, small setae on distal margins, one or two long setae on anterior margin, and cluster of simple setae on apex. Penis absent.

REMARKS

Gruvel (1920) considered *Scalpellum semisculptum* Pilsbry, 1907 to be synonymous with *Arcoscalpellum mamillatum* n. comb. This synonymy was considered doubtful by Broch (1953: 7) and Nilsson-Cantell (1955: 218) but accepted by Zevina (1981: 269) in her revision of the scalpellid. This species is transferred to *Amigdoscalpellum* because the apex of the inframedian-latus does not reach the upper margin of the lower row of plates. Herein the synonymy between these species is not considered and both species are placed in different genera: *Amigdoscalpellum semisculptum* and *Arcoscalpellum mamillatum* n. comb. The latter species has a large inframedian-latus, with its apex reaching the upper margin of the rostro- and carino-latus. Table 6 presents the differences between both species justifying their separation.

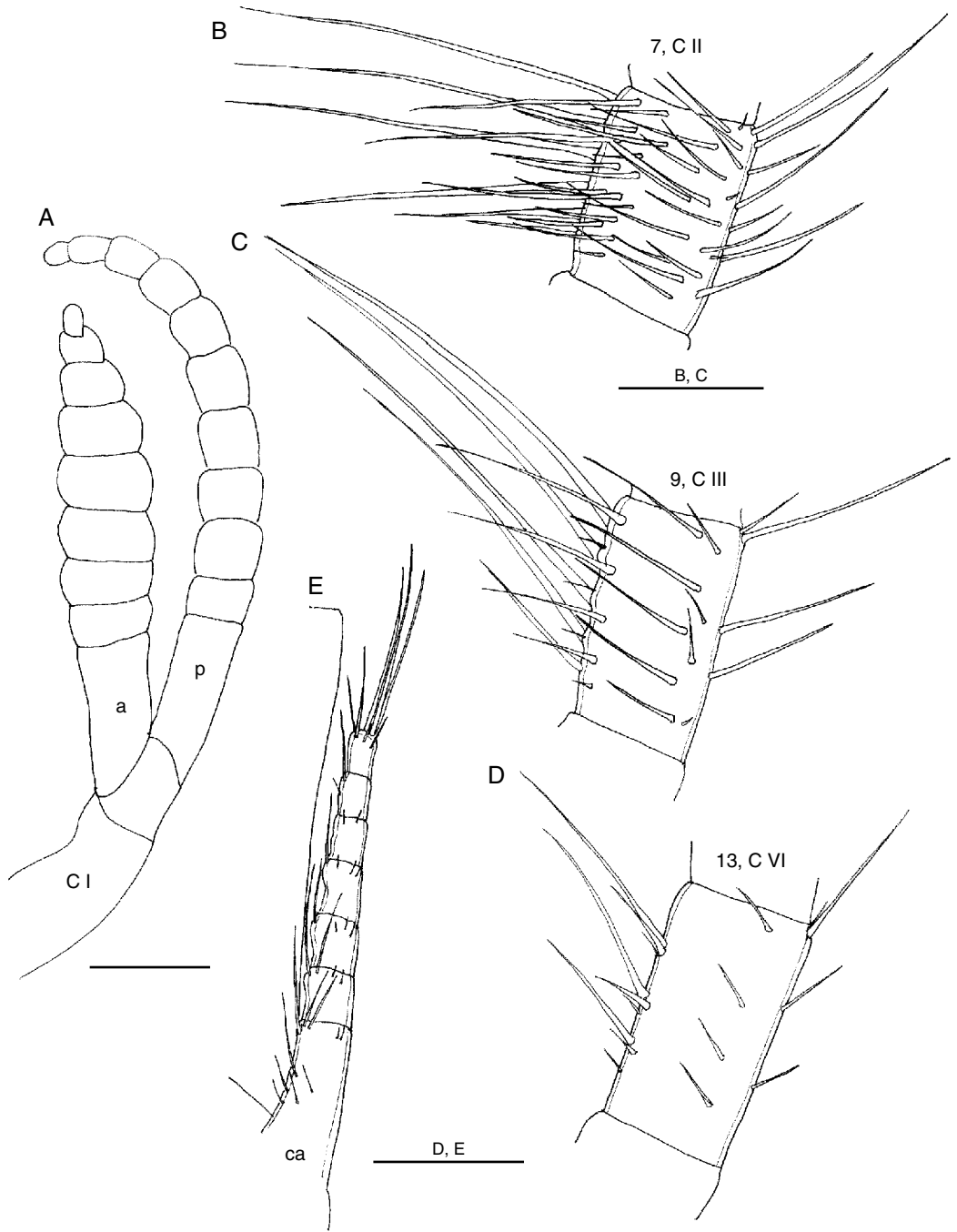
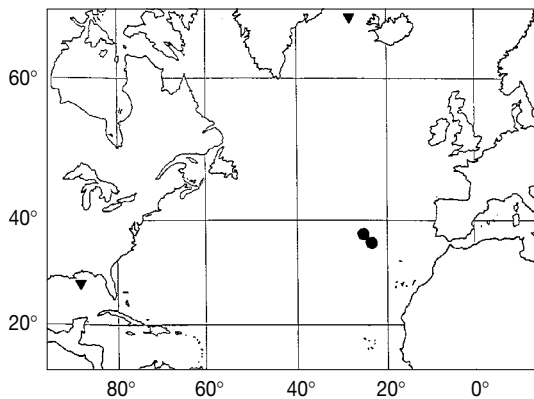


FIG. 21. — *Arcoscalpellum mamillatum* (Aurivillius, 1898), ECOFER 1, stn CP 01; **A**, cirrus I; **B-D**, detail of the 7th article of posterior ramus of cirrus II, 9th article of posterior ramus of cirrus III, and 13th article of posterior ramus of cirrus VI, respectively; **E**, caudal appendage. Abbreviations: **a**, anterior ramus; **C I**, cirrus I; **C II**, cirrus II; **C III**, cirrus III; **C VI**, cirrus VI; **ca**, caudal appendage; **p**, posterior ramus. Scale bars: A, 1 cm; B-E, 0.5 cm.

TABLE 6. — Distinguishing characters between *Arcoscalpellum mamillatum* (Aurivillius, 1898) and *Amigdoscalpellum semisculptum* (Pilsbry, 1907). Abbreviations: **cl**, carino-lateral; **rl**, rostro-lateral.

Characters	<i>Arcoscalpellum mamillatum</i>	<i>Amigdoscalpellum semisculptum</i>
1) Height of inframedian-latus	Reaching the upper margins of cl and rl plates	Below the upper margins of cl and rl plates
2) Shape of inframedian-latus	Triangular and curved, with apex prominent	Linear and straight, apex not prominent
3) Plate ornamentation	All plates strongly sculptured with radial ribs	Only the cl strongly sculptured with radial ribs
4) Position of the umbo of the upper-latus	Nearly apical and prominent	Apical and not prominent
5) Lateral margin of scutum	With an upper notch for the upper-latus apex	Without an upper notch
6) Height of rostro-latus	Less than its width	Equal to its width
7) Relative length of basal margin of rostro-latus	Two third of the upper margin	Half of the upper margin
8) Position of the umbo of the carina	Subapical	Apical

FIG. 22. — Geographic distribution of *Arcoscalpellum mamillatum* (Aurivillius, 1898) (circles) and *Amigdoscalpellum semisculptum* (Pilsbry, 1907) (triangles).

The distribution of *Arcoscalpellum mamillatum* n. comb. is therefore restricted by the original samples (Azores region) and the new record (Bay of Biscay). *Amigdoscalpellum semisculptum* is recorded from the Gulf of Mexico and west of Iceland (Fig. 22) (Broch [1953] cited *Scalpellum semisculptum* as collected at stn10 but when he figured it on map 12 he marked in the stn 25, I considered the citation of stn 10 [West of Iceland] as the correct one).

Arcoscalpellum atlanticum (Gravel, 1900) n. comb.
(Figs 23; 24)

Scalpellum atlanticum Gravel, 1900a: 190; 1902d: 74, pl. 2, figs 17, 18; 1905: 68, fig. 76; 1920: 26, pl. 7, fig. 5. — Hoek 1914: 4. — Belloc 1959: 3.

Teloscalpellum atlanticum — Zevina 1978: 1350; 1981: 377, fig. 294.

Arcoscalpellum tritonis — Young 1998a: 19, figs 15, 16; 1998b: 36, fig. 1 [non *Arcoscalpellum tritonis* (Hoek, 1883)].

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 185, 31°25.46'N, 28°51.85'W, 1250 m to 31°25.19'N, 28°51.89'W, 950 m, 1 specimen, tl (cl) 8.3 (6.5) mm (MNHN Ci 2872). — Stn DW 200, 31°19.07'N, 28°36.01'W, 1060 m to 31°19.27'N, 28°35.92'W, 1100 m, 1 specimen, tl (cl) 11.4 (8.7) mm (MNHN Ci 2873). — Stn DW 277, 33°59.92'N, 28°20.56'W, 1000 m to 33°59.64'N, 28°20.81'W, 945 m, 2 specimens, tl (cl) 11.9 (9.4) to 12.8 (10.3) mm (MNHN Ci 2874, MNRJ 13913). — Stn DW 278, 33°57.77'N, 28°22.40'W, 890 m to 33°57.47'N, 28°22.48'W, 925 m, 3 specimens, tl (cl) 5.6 (4.9) to 9.6 (8.3) mm (MNHN Ci 2875; MNRJ 13914).

REMARKS

The specimens examined (Fig. 23) agree with the description of Gravel (1902d: 74) including the general eight-plate pattern of the peduncle. I only observed a variation in the roof of the carina. It

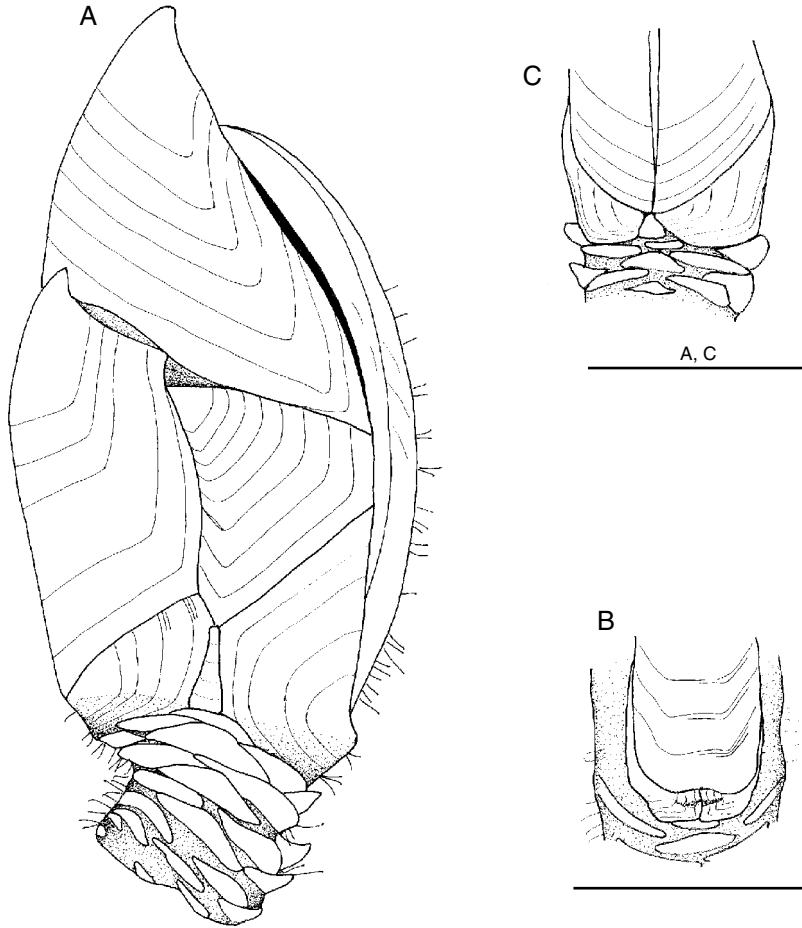


FIG. 23. — *Arcoscalpellum atlanticum* (Gruvel, 1900) n. comb., SEAMOUNT 2, stn DW 277; **A**, right lateral view; **B**, carinal view; **C**, rostral view. Scale bars: 2 mm.

varied from flat with conspicuous high bordering ribs in smaller specimens to flat with very low inconspicuous bordering ribs in larger ones.

The specimens I identified as *Arcoscalpellum tritonis* (Hoek, 1883) from Portugal, Morocco and Azores should be placed in *A. atlanticum* (Gruvel, 1900) n. comb. (Young 1998a: 19, b: 36). I originally thought *A. tritonis* may be a junior synonym but a few character differences and its geographic distribution (Fig. 24) suggests maintaining both species as valid. *A. tritonis* has the rostro-latus more trapezoidal, and the infra-median-latus with a curved apex, more scales on the peduncle and it does not have a rostrum.

Genus *Verum* Zevina, 1978

Verum striolatum (G. O. Sars, 1877)

Scalpellum striolatum G. O. Sars, 1877: 364; 1885: 245, pl. 20, figs 5-7. — Hoek 1883: 29; 1909: 269. — Weltner 1897: 250; 1898: 11; 1900: 302. — Gruvel 1905: 64, fig. 71. — Broch 1927a: 513; 1927c: 251; 1953: 5, fig. 2. — Arndt 1933: 290. — Tarasov 1936: 46; 1937: 45. — Stephensen 1936: 22, fig. 9. — Krüger 1940: 466. — Tarasov & Zevina 1957: 138, figs 10, 42, 43. — Zevina & Tarasov 1964: 232, figs 4-6.

Scalpellum (*Episcalpellum*) *striolatum* — Broch 1924: 41, fig. 14. — Nilsson-Cantell 1978: 31, fig. 13, map 8.

Verum striolatum [sic] – Zevina 1978b: 1348.

Verum striolatum – Zevina 1981: 222, fig. 159.

MATERIAL EXAMINED. — MARVEL, Mid-Atlantic Ridge (Rainbow vent site), stn PL 1196, 36°13.78'N, 33°54.14'W, 2295 m, 1 specimen, tl (cl) 6.8 (5.8) mm (MNHN Ci 2876).

REMARKS

Only one small specimen with broken plates was collected during the MARVEL Expedition. It does not have the longitudinal ridges fully developed, especially on the tergum and scutum.

When reviewing the literature, I noted that different stages of peduncular development were figured by different authors (Sars 1885; Broch 1924, 1953; Stephensen 1936; Tarasov & Zevina 1957; Nilsson-Cantell 1978). Their small specimens had an eight-plate pattern of scales in two whorls (rl-cl and sr-l-sc) which is transformed in larger specimens to two whorls of approximately four to five similar plates. *Verum striolatum* is a common species from the Arctic Ocean ranging between 62°N and 80°N, and between 342 and 2700 m (Zevina 1981: 222). This new sample extends significantly its distribution to the Azores region.

Genus *Catherinum* Zevina, 1978

Catherinum recurvitergum (Gruvel, 1900)
(Fig. 25)

Scalpellum recurvitergum Gruvel, 1900a: 190; 1902d: 67, pl. 2, figs 3h, 21, 22.

Catherinum recurvitergum – Zevina 1978: 1348; 1981: 245, fig. 181. — Young 1998b: 40, figs 4-5 (with synonymy).

MATERIAL EXAMINED. — ECOFER 1, stn CP 01, 44°46.20'N, 02°38.15'W, 3017 m, 1 specimen, tl (cl) 17.7 (13.8) mm (MNHN Ci 2877). — Stn CP 02, 44°46.14'N, 02°38.92'W, 3033 m, 1 specimen, tl (cl) 26.4 (20.2) mm (MNRJ 13915).

REMARKS

The specimens have a more inflated capitulum in the region of the base of the scutum instead of having a uniform breadth as observed by Young (1998b: 40). The rostro-latus is as high as wide in

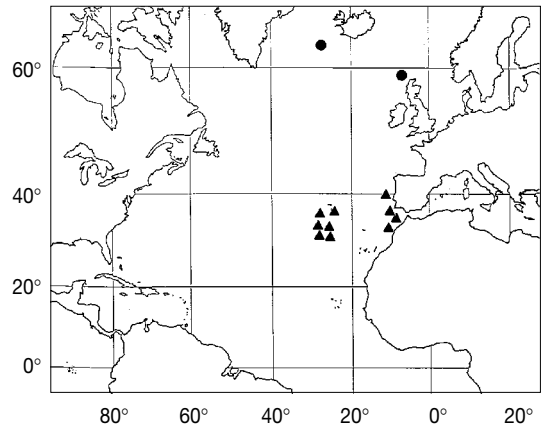


FIG. 24. — Geographic distribution of *Arcoscalpellum atlanticum* (Gruvel, 1900) n. comb. (triangles) and *Arcoscalpellum tritonis* (Hoek, 1883) (circles).

smaller specimens (Fig. 25A) and higher than wide in larger specimen (Fig. 25B) and the rostrum is not visible between the rostro-latera. The specimens are larger than that observed by Young (1998b). The strength of the longitudinal ridges of capitular plates varies among the specimens, the smaller had them more pronounced than the larger one.

Catherinum recurvitergum has been recorded from the Azores region (type locality) and eastern Africa (Gruvel 1900a: 190; Weltner 1922: 72). The new records extend its septentrional distribution from the Bay of Biscay, France.

Genus *Amigdoscalpellum* Zevina, 1978

Amigdoscalpellum rigidum (Aurivillius, 1898)
(Fig. 26)

Scalpellum rigidum Aurivillius, 1898: 189.

Amigdoscalpellum rigidum – Zevina 1978: 1349; 1981: 277, fig. 209. — Young 1998a: 25, figs 16, 19 (with synonymy); 1998b: 42.

MATERIAL EXAMINED. — BENGAL 2, stn 13078#27, 48°50.13'N, 16°39.86'W to 48°59.06'N, 16°38.58'W, 4844 m, 1 specimen, tl (cl) 38.8 (29.8) mm (MNRJ 13916). — SEAMOUNT 2, stn CP 236, 32°03.72'N, 27°40.59'W, 1925 m to 32°05.52'N, 27°39.69'W, 1960 m, 1 specimen, tl (cl) 21.6 (17.0) mm (MNHN Ci 2878).

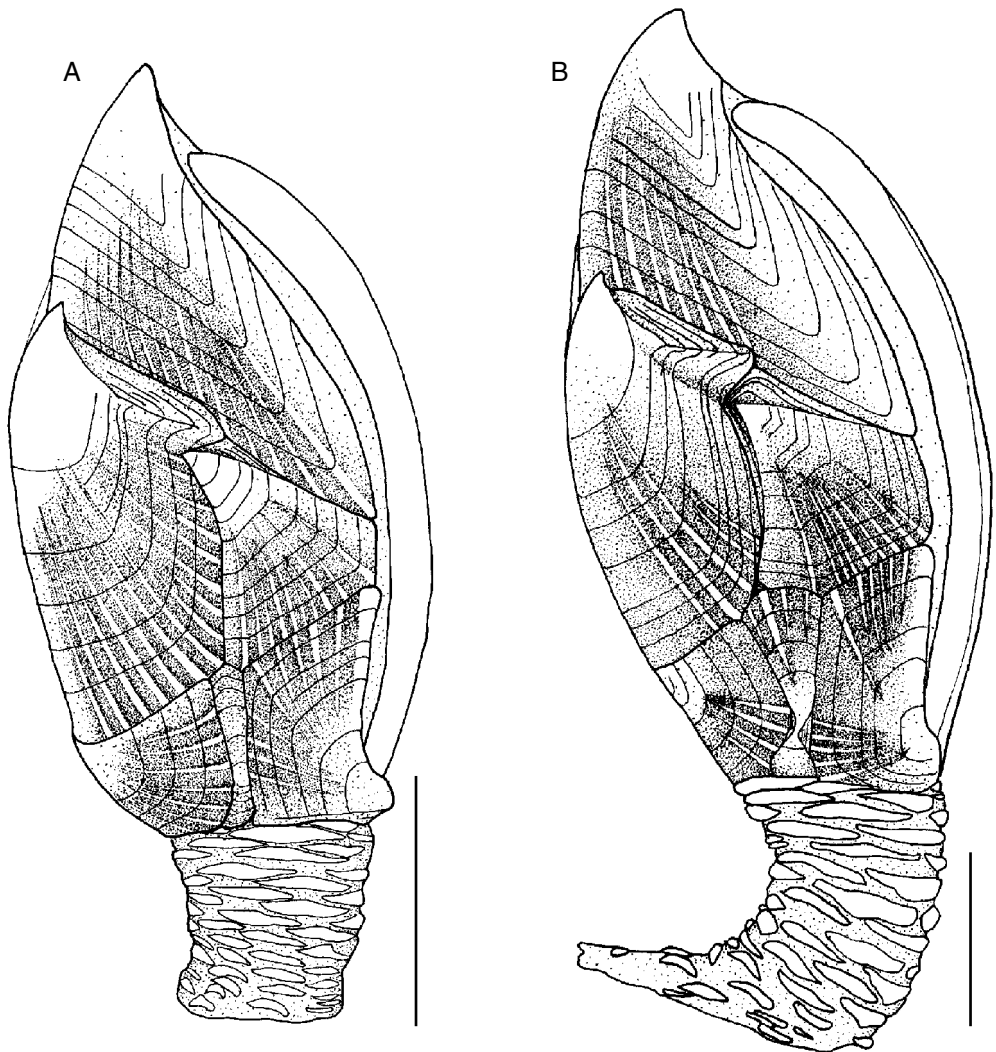


FIG. 25. — *Catharinum recurvitergum* (Gruvel, 1900), ECOFER, right lateral views of two specimens; **A**, stn CP 01; **B**, stn CP 02. Scale bars: 4 mm.

REMARKS

The specimen collected at station 13078 is exceptionally large (38.8 mm) and probably represents the greatest length this species attains. The plates appear to be old with a considerable amount of erosion. It is interesting to note how reduced the inframedian-latus is in this specimen, when compared with younger ones (Fig. 26). The inframedian-latus seems to lose its function of covering

the suture between the lower latera and becomes an eroded small plate situated over the rostro-latus.

Amigdoscalpellum rigidum is a common deep-sea pedunculate occurring between 1267 and 4810 m from the Azores, Cape Verde, Iberian, West European and Newfoundland basins (Aurivillius 1898; Gruvel 1905; Young 1998a, b).

Genus *Trianguloscalpellum* Zevina, 1978*Trianguloscalpellum regium*
(Wyville Thomson, 1873)

Scalpellum regium Wyville Thomson, 1873: 347 (description only, non figs 1, 2 = *Trianguloscalpellum ovale* [Hoek, 1883]).

Trianguloscalpellum regium – Zevina 1978: 1350. — Young 1998a: 28, figs 20–22 (with synonymy); 1998b: 44; 1998c: 111, fig. 2c.

MATERIAL EXAMINED. — BENGAL 2, stn 13078#27, 48°47.26'N, 16°34.01'W to 48°48.67'N, 16°31.76'W, 4844 m, 1 specimen, tl (cl) 56.8 (34.2) mm (MNHN Ci 2879).

BENGAL 3, stn 13200#93, 48°50.55'N, 16°25.30'W, 4844 m to 48°47.46'N, 16°30.42'W, 4849 m, 1 specimen, tl (cl) 71 mm (MNRJ 13917).

BENGAL 6, stn 13627#11, 48°47.82'N, 16°40.37'W, 4847 m, 2 specimens, tl (cl) 27.0 (20.7) to 27.9 (20.8) mm (MNHN Ci 2880, MNRJ 13878).

REMARKS

The taxonomy of *Trianguloscalpellum regium* was recently reviewed (Young 1998a: 28). This species has been reported from all the oceans, but probably this distribution encompasses more than one species (Young 1998a). It is frequently recorded from the abyssal plain of the North Atlantic.

Trianguloscalpellum ovale (Hoek, 1883)

Scalpellum regium Wyville Thomson, 1873: 347 (in part, only figs 1, 2).

Trianguloscalpellum ovale – Young 1998a: 32, figs 21a–d, g, 22 (with synonymy); 1998b: 42.

MATERIAL EXAMINED. — BENGAL 5, stn 13368#53, 48°50'N, 16°33.53'W, 4842 m, 2 specimens, tl (cl) 41.4 (27.3) to 50.3 (29.5) mm (MNHN Ci 2881, MNRJ 13919).

REMARKS

The taxonomic status of *Trianguloscalpellum ovale* was recently reviewed (Young 1998a: 32). This species is frequently recorded from the abyssal plain of the North Atlantic.

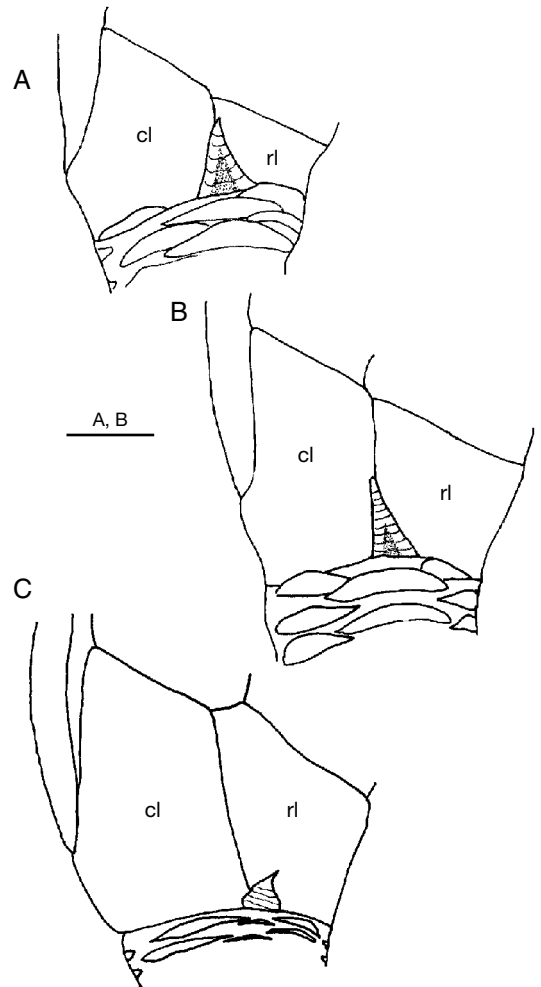


FIG. 26. — *Amigdoscalpellum rigidum* (Aurivillius, 1898); **A–C**, stages of reduction of the inframedian-latus in different sizes of the specimens, left lateral view; **A**, from Biaçores Expedition, MNRJ 8879; **B**, SEAMOUNT 2, stn CP 236; **C**, BENGAL 2, 13078#27. Abbreviations: cl, carino-lateral; rl, rostro-lateral. Scale bars: A, B, 2 mm; C, 5 mm.

Order SESSILIA Lamarck, 1818
Suborder VERRUCOMORPHA Pilsbry, 1916
Family VERRUCIDAE Darwin, 1854
Genus *Altiverruca* Pilsbry, 1916

Altiverruca erecta (Gravel, 1900)
(Fig. 27)

Verruca erecta Gravel, 1900b: 243; 1902d: 93, pl. 5, figs 7, 8.

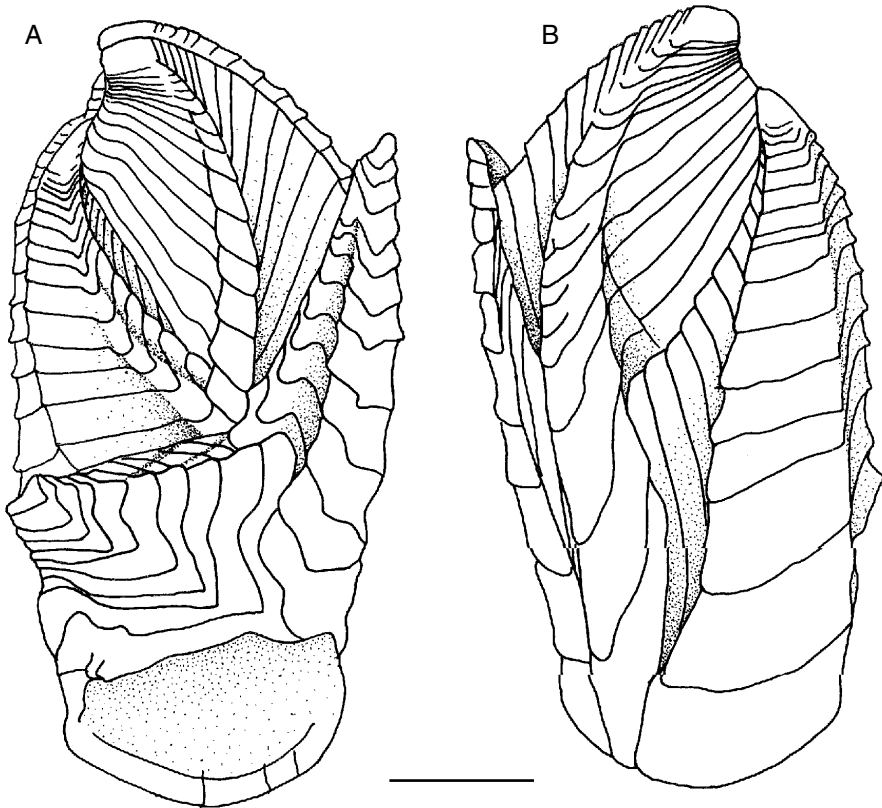


FIG. 27. — *Altiverruca erecta* (Gruvel, 1900), SEAMOUNT 2, stn DW 278; **A**, top view; **B**, fixed-tergum and fixed-scutum view. Scale bar: 1 mm.

Altiverruca erecta – Young 1998a: 77; 1998c: 111, figs 3, 4 (with synonymy).

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 278, 33°57.77'N, 28°22.40'W, 890 m to 33°57.47'N, 28°22.48'W, 925 m, 1 specimen, rc 2.9 mm (MNRJ 13920).

MARVEL, stn PL 1196, Mid-Atlantic Ridge, Rainbow vent site, 36°13.78'N, 33°54.14'W, 2295 m, 2 specimens, rc 2.8 mm (MNHN Ci 2882).

REMARKS

Altiverruca erecta was redescribed and discussed by Young (1998c: 111). The specimens collected during the present expeditions are similar to that figured by Gruvel (1902d: pl. 5, figs 7, 8) and indicate the growth ridges are more prominent on the carina (Fig. 27). It was collected from the Azores at 3175 m and from the Mid-Atlantic

Ridge between 3947 and 3375 m (Gruvel 1902d: 93; Young 1998c: 111). These new records agree with the previous geographic distribution but increase its depth range to 890-3947 m.

Altiverruca obliqua (Hoek, 1883)
(Fig. 28)

Verruca obliqua Hoek, 1883: 143, pl. 12, figs 15-17.

Altiverruca obliqua – Young 1998b: 46, figs 7-9 (with synonymy); 1998c: 115.

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 186, 31°26.14'N, 28°51.77'W, 1520 m to 31°26.34'N, 28°51.93'W, 1520 m, 1 empty shell, rc 3.2 mm (MNHN Ci 2883). — Stn DW 277, 33°59.92'N, 28°20.56'W, 1000 m to 33°59.64'N, 28°20.81'W, 945 m, 1 specimen, rc 4.5 mm (MNRJ 13921).

REMARKS

The specimens from both stations have shells similar to that described by Hoek (1883: 143) with the carina very convex (Fig. 28). *Altiverruca obliqua* was redescribed and discussed by Young (1998b: 46). It was first described from off Southwestern Spain (Hoek 1883) and subsequently recorded from the Azores region (Young 1998b, c) from depths between 1003 to 2788 m. These new records agree with the previous distribution. They were collected south of the Azores Archipelago at depths of 945 and 1000 m.

Altiverruca quadrangularis (Hoek, 1883)

Verruca quadrangularis Hoek, 1883: 140, pl. 11, figs 10, 11, pl. 12, figs 8-12; 1907b: 9. — Murray 1895: 386. — Weltner 1895: 289; 1897: 274; 1898: 9. — Gruvel 1905: 174, fig. 193; 1912: 5; 1920: 40. — Lahille 1910: 78. — Nilsson-Cantell 1955: 219. — Ross & Newman 1969: 31.

Verruca quadrangularis sect D *Altiverruca* – Pilsbry 1916: 41.

Altiverruca quadrangularis – Zevina 1988: 39; Buckridge 1994: 93. — Foster & Buckridge 1995: 367, fig. 11a-o. — Young 1998a: 77.

Verruca (Altiverruca) quadrangularis – Rosell 1989: 24, pl. 7, figs a-e.

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 203, 31°09.52'N, 28°43.52'W, 845 m to 31°09.67'N, 28°43.38'W, 990 m, 2 specimens, rc 3.1 to 4.2 mm (MNHN Ci 2885, MNRJ 13922). — Stn DW 240, 33°12.26'N, 29°01.87'W, 565 m to 33°12.25'N, 29°01.41'W, 575 m, 4 specimens and 1 empty shell, rc 2.0 to 2.7 mm (MNHN Ci 2886, MNRJ 13923). — Stn DW 251, 33°13.47'N, 29°28.39'W, 985 m to 33°13.49'N, 29°28.75'W, 900 m, 1 specimen, rc 4.0 mm (MNRJ 13924). — Stn DW 278, 33°57.77'N, 28°22.40'W, 890 m to 33°57.47'N, 28°22.48'W, 925 m, 2 specimens, rc 2.0 to 3.1 mm (MNHN Ci 2888, MNRJ 13925).

MARVEL, stn PL 1196, Mid-Atlantic Ridge, Rainbow vent site, 36°13.78'N, 33°54.14'W, 2295 m, 2 specimens, rc 3.9 to 4.7 mm (MNHN Ci 2889, MNRJ 13926).

REMARKS

The present specimens (Fig. 29) agree with the original description of *A. quadrangularis*. The

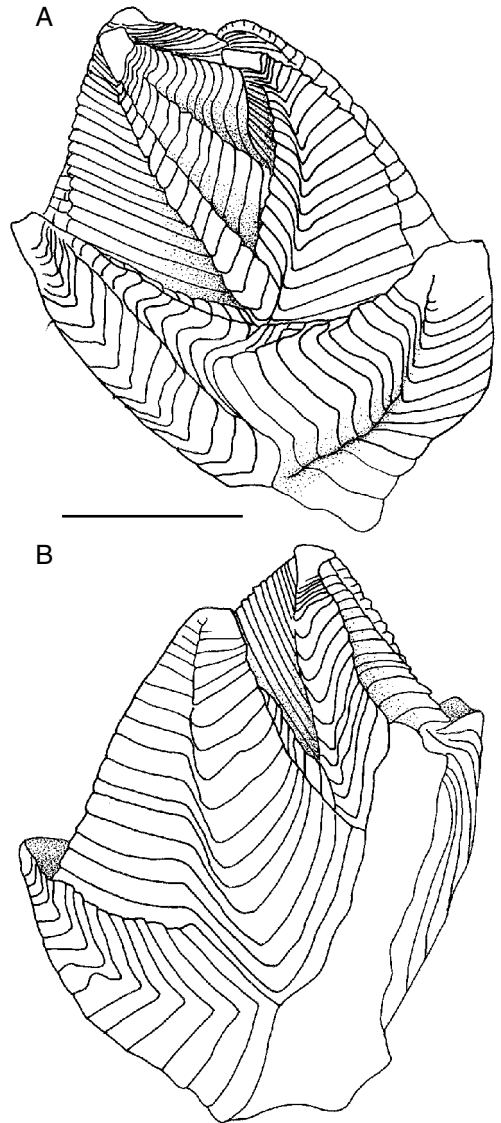


FIG. 28. — *Altiverruca obliqua* (Hoek, 1883), SEAMOUNT 2, stn DW 251; A, top view; B, fixed-tergum and fixed-scutum view. Scale bar: 1 mm.

complete specimen figured by Hoek (1883: pl. 12, fig. 8) differs from the details of the opercular valves shown in his pl. 12, figs 11, 12. In his fig. 12, the tergum has a flat surface between the tergal margin and it has longitudinal ridges, which are missing from the specimen in his fig. 8. My specimens have this area

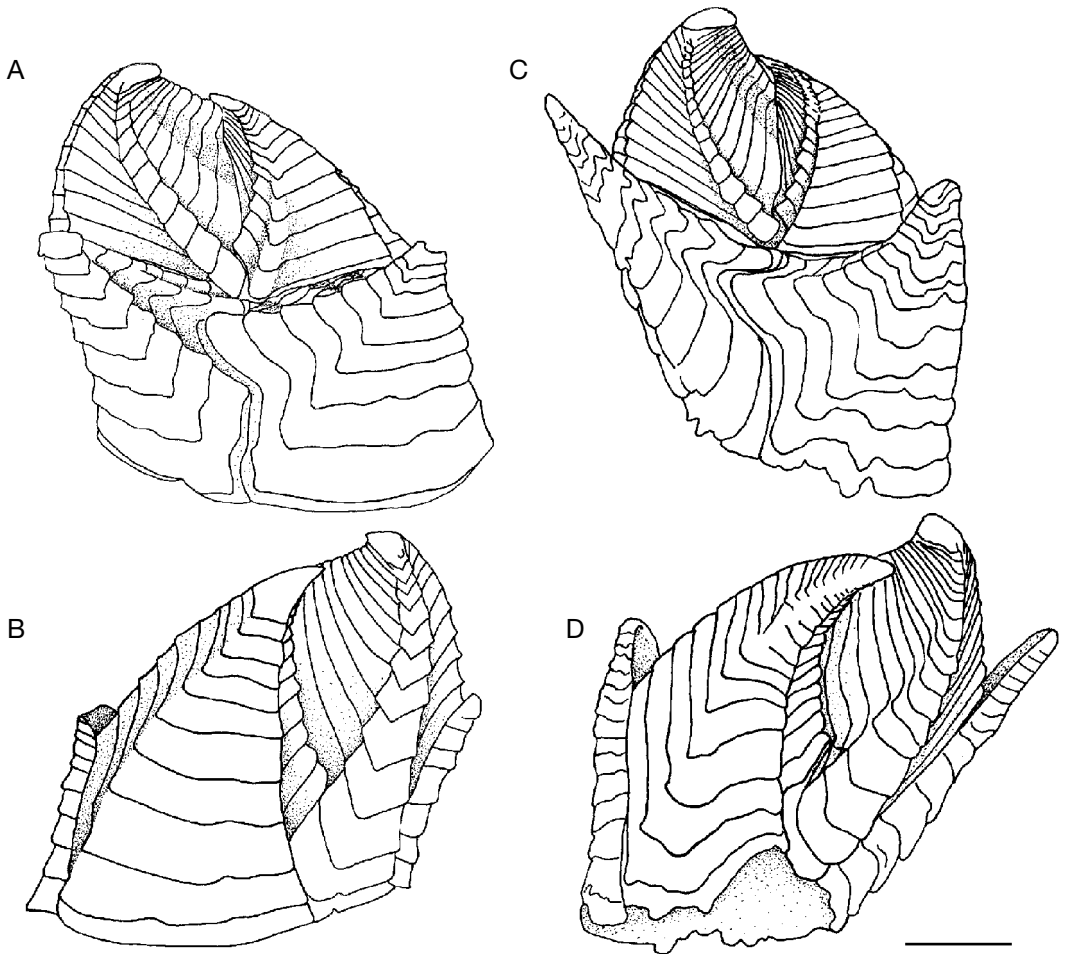


FIG. 29. — *Altiverruca quadrangularis* (Hoek, 1883); **A-B**, MARVEL, stn PL 1196, top and fixed-tergum and fixed-scutum views of an specimen with short carina; **C-D**, SEAMOUNT 2, stn DW 251, top and fixed-tergum and fixed-scutum views of an specimen with elongated carina. Scale bar: 1 mm.

well-developed (Fig. 29A, C). Otherwise, the medial ridge of the tergum is more pronounced in his fig. 11 when compared with his fig. 8. This ridge is barely distinguished in the present specimens.

The specimens exhibit variable development of the carinal apex. Sometimes it projects (Fig. 29C, D), and is reminiscent of the carinal apex of *Altiverruca longicarinata* (Gravel, 1900). However, this latter species has a distinct rostrum and carina, both with a flat surface near the opercular margins.

Genus *Costatoverruca* Young, 1998

Costatoverruca cornuta (Aurivillius, 1898)

Verruca cornuta Aurivillius, 1898: 197.

Metaverruca cornuta – Young 1998a: 42, figs 28-30 (with synonymy).

Costatoverruca cornuta – Young 1998b: 58.

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 209, 31°59.17'N, 27°55.95'W, 460 m to 31°58.93'N, 27°56.19'W, 435 m, 1 specimen, rc 3.5 mm (MNHN Ci 2905). — Stn DW 231, 32°01.49'N, 27°54.51'W, 745 m to 32°01.75'N, 27°54.70'W, 750 m, 1 specimen,

rc 10.3 mm (MNRJ 13927). — Stn DW 247, 33°13.69'N, 9°35.26'W, 580 m to 33°13.69'N, 29°35.54'W, 625 m, 1 specimen, rc 3.9 mm (MNHN Ci 2907).

REMARKS

Costatoverruca cornuta was redescribed and discussed by Young (1998a: 42). The geographic record and depth were given previously: Azores region between 450 and 1229 m.

Genus *Metaverruca* Pilsbry, 1916

Metaverruca aequalis (Aurivillius, 1898)

Verruca aequalis Aurivillius, 1898: 196.

Metaverruca aequalis – Young 1998b: 51, figs 9, 11, 12 (with synonymy).

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 251, 33°13.47'N, 29°28.39'W, 985 m to 33°13.49'N, 29°28.75'W, 900 m, 1 specimen, rc 4.5 mm (MNHN Ci 2890). — Stn DW 262, 34°23.36'N, 30°29.06'W, 1160 m to 34°23.58'N, 30°29.35'W, 1000 m, 1 specimen, rc 4.4 mm (MNRJ 13928).

REMARKS

Metaverruca aequalis was redescribed and discussed by Young (1998b: 51). New distribution records were given previously: Azores and off Spain and Morocco (Gravel 1920: 42; Young 1998b: 51) but the depth of occurrence (900–1160 m) is somewhat less than the previous known range (1022–3215 m).

Metaverruca recta (Aurivillius, 1898)

Verruca recta Aurivillius, 1898: 195.

Metaverruca recta – Young 1998a: 35, figs 23–25 (with synonymy); 1998b: 52; 1999: 620, fig. 7a.

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 202, 31°16.50'N, 28°43.15'W, 640 m to 31°16.70'N, 28°43.08'W, 655 m, 1 specimen, rc 6.6 mm (MNHN Ci 2891). — Stn DW 219, 32°00.99'N, 27°53.35'W, 760 m to 32°00.97'N, 27°53.72'W, 760 m, 1 specimen, rc 6.1 mm (MNHN Ci 2892). — Stn DW 226, 32°06.75'N, 28°08.81'W, 580 m to 32°06.88'N, 28°08.67'W, 1 specimen, rc 4.8 mm (MNHN Ci 2893). — Stn DW 237, 32°15.86'N, 27°31.85'W, 670 m to 32°16.17'N, 27°31.61'W, 715 m, 1 specimen and 10 empty

shells, rc 11.4 to 15.2 mm (MNHN Ci 2894). — Stn DW 238, 32°17.35'N, 27°32.32'W, 890 m to 32°17.51'N, 27°32.08'W, 900 m, 1 specimen, rc 5.5 mm (MNHN Ci 2895). — Stn DW 246, 33°13.94'N, 29°36.07'W, 520 m to 33°13.92'N, 29°35.72'W, 550 m, 4 specimens, rc 5.5 to 8.4 mm (MNHN Ci 2896, MNRJ 13929). — Stn DW 247, 33°13.69'N, 9°35.26'W, 580 m to 33°13.69'N, 29°35.54'W, 625 m, 2 empty shells, rc 10.6 to 13.0 mm (MNHN Ci 2897). — Stn DW 255, 34°04.92'N, 30°15.27'W, 340 m to 34°05.08'N, 30°15.39'W, 355 m, 1 empty shell, rc 8.0 mm (MNHN Ci 2898). — Stn DW 262, 34°23.36'N, 30°29.06'W, 1160 m to 34°23.58'N, 30°29.35'W, 1000 m, 1 specimen, rc 7.4 mm (MNHN Ci 2899). — Stn DW 263, 34°25.89'N, 30°32.49'W, 610 m to 34°26.14'N, 30°32.78'W, 655 m, 6 specimens and 2 empty shells, rc 4.3 to 8.5 mm (MNHN Ci 2900, MNRJ 13930). — Stn DW 265, 34°28.65'N, 30°35.73'W, 545 m to 34°28.85'N, 30°35.94'W, 540 m, 8 specimens and 3 empty shells, rc 5.6 to 8.4 mm (MNHN Ci 2901, MNRJ 13931). — Stn DW 277, 33°59.92'N, 28°20.56'W, 1000 m to 33°59.64'N, 28°20.81'W, 945 m, 1 specimen, rc 6.1 mm (MNRJ 13932). — Stn DW 278, 33°57.77'N, 28°22.40'W, 890 m to 33°57.47'N, 28°22.48'W, 925 m, 3 specimens and 1 empty shell, rc 5.0 to 8.1 mm (MNHN Ci 2902, MNRJ 13933). PROSPEC, stn CPH 8, 55°17.83'N, 10°09.84'W, 1170 m to 55°18.58'N, 10°09.43'W, 1184 m, 1 specimen, rc 11.7 mm (MNHN Ci 2903).

REMARKS

Metaverruca recta was collected from ahermatypic corals and sponges. This species is possibly the most commonly dredged deep-sea verrucid. It has a circumtropical and temperate distribution but is unknown from the western coast of the Americas.

Metaverruca trisulcata (Gravel, 1900)

Verruca trisulcata Gravel, 1900b: 243.

Metaverruca trisulcata – Young 1998a: 54, figs 9, 13–14 (with synonymy).

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 200, 31°19.07'N, 28°36.01'W, 1060 m to 31°19.27'N, 28°35.92'W, 1100 m, 1 specimen, rc 5.0 mm (MNHN Ci 2904). — Stn DW 203, 31°09.52'N, 28°43.52'W, 845 m to 31°09.67'N, 28°43.38'W, 990 m, 1 specimen, rc 5.4 mm (MNRJ 13934).

REMARKS

Metaverruca trisulcata was redescribed and discussed by Young (1998b: 54). It was recorded

from the Azores region and off Morocco (Gravel 1920: 49; Foster & Buckeridge 1995: 177). The present records are from south of the Azores and their depth of occurrence is included in the previously known range: 622-1378 m.

Suborder BALANOMORPHA Pilsbry, 1916
Superfamily PACHYLASMATOIDEA Utinomi, 1968
Family PACHYLASMATIDAE Utinomi, 1968
Genus *Pachylasma* Darwin, 1854

Pachylasma giganteum (Philippi, 1836)

Chthamalus giganteus Philippi, 1836: 250.

Pachylasma giganteum – Young 1998b: 44, fig. 31 (with synonymy).

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 202, 31°16.50'N, 28°43.15'W, 640 m to 31°16.70'N, 28°43.08'W, 655 m, 1 specimen and disarticulated plates, rc 16.8 mm (MNHN Ci 2908). — Stn DW 209, 31°59.17'N, 27°55.95'W, 460 m to 31°58.93'N, 27°56.19'W, 435 m, 4 specimens and disarticulated plates, rc 13.4 to 25.3 mm (MNHN Ci 2909, MNRJ 13935). — Stn DW 246, 33°13.94'N, 29°36.07'W, 520 m to 33°13.92'N, 29°35.72'W, 550 m, 4 specimens and disarticulated plates, rc 11.0 to 29.7 mm (MNHN Ci 2910, MNRJ 13936).

REMARKS

Pachylasma giganteum was attached to ahermatypic corals and glass-sponges. The new records are included in its known distribution: Mediterranean Sea to Azores region (Darwin 1854: 477; Foster & Buckeridge 1995: 183; Young 1998b: 44).

Superfamily CORONULOIDEA Leach, 1817
Family CORONULIDAE Leach, 1817
Genus *Coronula* Lamarck, 1802

Coronula diadema (Linnaeus, 1767)

Lepas diadema Linnaeus, 1767: 1108.

Coronula diadema – Pilsbry 1916: 273, pl. 65, figs 3, 4 (with synonymy).

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 277, 33°59.92'N, 28°20.56'W, 1000 m to 33°59.64'N, 28°20.81'W, 945 m, 1 disarticulated plate (MNHN Ci 2911).

REMARKS

Coronula diadema only occurs on cetaceans. However, it is common to collect eroded pieces of its shell from the seafloor at greater depths (Young 1999: 621, 2000: 97).

Superfamily TETRACLITOIDEA Gravel, 1903
Family BATHYLASMATIDAE
Newman & Ross, 1971
Subfamily BATHYLASMATINAE
Newman & Ross, 1971
Genus *Bathylasma* Newman & Ross, 1971

Bathylasma hirsutum (Hoek, 1883)

Balanus hirsutus Hoek, 1883: 158, pl. 13, figs 8-15.

Bathylasma hirsutum – Newman & Ross 1971: 149, fig. 73, pls 23-24 (with synonymy); 1976: 46. — Foster & Buckeridge 1995: 184, fig. 16c-d. — Young 1998b: 66.

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 148, 30°12.01'N, 28°24.64'W, 615 m to 30°11.94'N, 28°24.60'W, 585 m, 12 eroded disarticulated plates (MNHN Ci 2912). — Stn DW 221, 32°17.84'N, 28°15.32'W, 1180 m to 32°18.03'N, 28°15.47'W, 1160 m, 6 disarticulated plates (MNHN Ci 2913). — Stn DW 243, 33°13.18'N, 29°08.24'W, 1420 m to 33°13.47'N, 29°07.85'W, 1360 m, 38 disarticulated plates (MNHN Ci 2914). — Stn DW 264, 34°24.74'N, 30°30.77'W, 830 m to 34°24.85'N, 30°31.08'W, 795 m, 1 disarticulated plate (MNHN Ci 2915). — Stn DW 283, 43°34.51'N, 22°19.61'W, 1175 m to 43°34.32'N, 22°19.43'W, 1210 m, 7 eroded disarticulated plates (MNHN Ci 2916).

PROSPEC, stn CPH 4, 56°32.53'N, 10°17.03'W to 56°32.75'N, 10°15.39'W, 1185 m, 4 specimens, rc 13.3-13.5 mm (MNHN Ci 2917, MNRJ 13937).

REMARKS

All the samples consisted of disarticulated eroded plates except those from station CPH 4. The identification was based on comparison between solid plated balanomorphs from this region and depth: *Pachylasma giganteum*, *Bathylasma hirsutum* and *Hexelasma americanum*. In the southern area of the Azores, *Bathylasma hirsutum* was recorded by Young (1998b: 66).

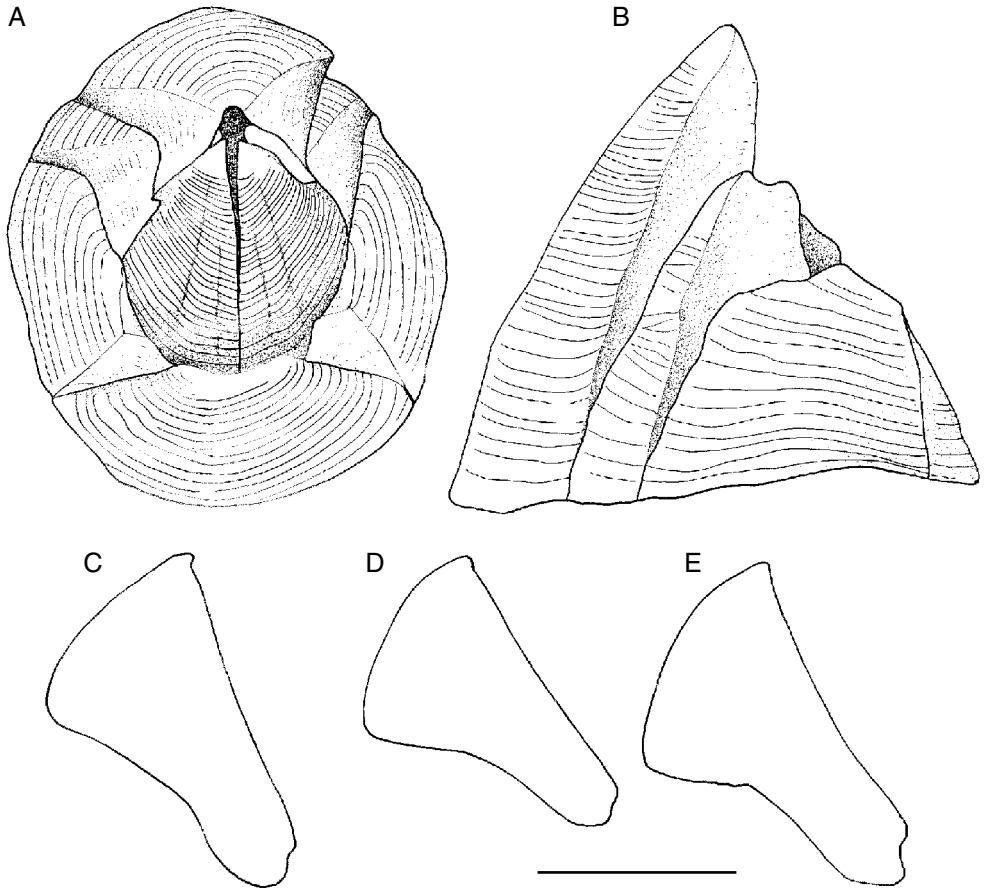


FIG. 30. — *Hexelasma americanum* Pilsbry, 1916, SEAMOUNT 2, stn DW 222; **A**, top view; **B**, lateral view; **C-E**, terga outlines. Note the variation on the shape of the spur. Scale bar: 10 mm.

Subfamily HEXELASMATINAE Newman & Ross, 1976
Genus *Hexelasma* Hoek, 1913

Hexelasma americanum Pilsbry, 1916
(Fig. 30)

Hexelasma americanum Pilsbry, 1916: 330, fig. 98, pl. 69, figs 1-3. — Young 1998c: 117 (with synonymy).

MATERIAL EXAMINED. — SEAMOUNT 2, stn DW 198, 31°18.60'N, 28°35.05'W, 1240 m to 31°18.79'N, 28°34.88'W, 1250 m, 2 specimens and disarticulated plates, rc 12.6 to 14.9 mm (MNHN Ci 2918). — Stn DW 200, 31°19.07'N, 28°36.01'W, 1060 m to 31°19.27'N, 28°35.92'W, 1100 m, 64 specimens and 6 empty shells, rc 3.6 to 19.4 mm (MNHN Ci 2919, MNRJ 13938). — Stn DW 203, 31°09.52'N, 28°43.52'W, 845 m to 31°09.67'N,

28°43.38'W, 990 m, 11 specimens and disarticulated plates, rc 13.1 to 28.9 mm (MNHN Ci 2920, MNRJ 13939). — Stn DW 221, 32°17.84'N, 28°15.32'W, 1180 m to 32°18.03'N, 28°15.47'W, 1160 m, 11 specimens and disarticulated plates, rc 10.0 to 16.4 mm (MNHN Ci 2921, MNRJ 13940). — Stn DW 222, 32°20.81'N, 28°15.66'W, 1150 m to 32°21.02'N, 28°15.72'W, 1150 m, 29 specimens and disarticulated plates, rc 12.3 to 19.7 mm (MNHN Ci 2922, MNRJ 13941). — Stn DW 243, 33°13.18'N, 29°08.24'W, 1420 m to 33°13.47'N, 29°07.85'W, 1360 m, 1 specimen and disarticulated plates, rc 22.4 mm (MNHN Ci 2923). — Stn DW 262, 34°23.36'N, 30°29.06'W, 1160 m to 34°23.58'N, 30°29.35'W, 1000 m, 4 specimens and disarticulated plates, rc 11.7 mm (MNHN Ci 2924). — Stn DW 264, 34°24.74'N, 30°30.77'W, 830 m to 34°24.85'N, 30°31.08'W, 795 m, 2 specimens and disarticulated plates, rc 14.2 to 20.3 mm (MNHN Ci 2925). — Stn DW 271, 33°54.08'N,

30°09.33'W, 1220 m to 33°54.14'N, 30°09.34'W, 1220 m, 27 disarticulated plates (MNHN Ci 2926). — Stn DW 277, 33°59.92'N, 28°20.56'W, 1000 m to 33°59.64'N, 28°20.81'W, 945 m, 12 specimens and disarticulated plates, rc 9.5 to 25.0 mm (MNHN Ci 2927, MNRJ 13942).

REMARKS

Most of the specimens have the carinal plate significantly higher than the other plates (Fig. 30A, B). The outline of the terga varied with the spur varying from distally rounded to a more square termination (Fig. 30C-E).

Hexelasma americanum was described from the western Atlantic by Pilsbry (1916: 330) based on specimens taken on the Blake Plateau, Florida. It was also recorded from the Mid-Atlantic Ridge and Azores region (Young 1998b: 66, c: 117). The new samples, consisting a large number of specimens, suggest that *H. americanum* is a common species on the eastern Atlantic seamounts, between 715 and 1420 m.

Superfamily BALANOIDEA Leach, 1817

Family BALANIDAE Leach, 1817

Subfamily ARCHAEOBALANINAE

Newman & Ross, 1976

Genus *Solidobalanus* Hoek, 1913

Solidobalanus fallax (Broch, 1927)

Balanus (Hesperibalanus) fallax Broch, 1927b: 26, figs 7-9, pl. 2, figs 12-17, pl. 3, figs 18-19.

Solidobalanus fallax – Young 1998a: 45, fig. 31 (with synonymy).

MATERIAL EXAMINED. — SEAMOUNT 2, stn CP 121, 28°06.26'N, 15°51.82'W, 200 m to 28°06.76'N, 15°51.06'W, 200 m, 1 specimen, rc 5.7 mm (MNHN Ci 2928).

REMARKS

Solidobalanus fallax is a common balanid occurring along the west African coast between 15-220 m (Broch 1927b: 26; Utinomi 1959: 402; Stubbings 1963: 3, 1967: 287) but also known to range as far north as England (Southward 1995). This is the first record for the Canary Islands.

Acknowledgements

I wish to acknowledge Michel Segonzac (Ifremer/EP-CENTOB, Brest) and Serge Gofas (MNHN-Paris) for allowing me to study these collections and for information about the expeditions, and also to Michel, Annemarie Ohler and two anonymous referees for comments on the manuscript, and Arnold Ross (Scripps Institution of Oceanography, San Diego), my personal reviser, for numerous discussions during this study, which significantly improved this paper.

I would like also to acknowledge the following leaders of the expeditions which collected the barnacles studied herein and in a previous paper (Young 1998c): ECOFER: A. Dinet (CNRS Banyuls/Mer), FARANAUT: H. Bougault (Ifremer, Brest), KANAUT: J.-M. Auzende (Ifremer, Brest), GRAVINAUT: J. Dubois (IPG, Paris), DIVA I: Y. Fouquet (Ifremer, Brest), DIVA II: D. Debruyères (Ifremer, Brest), SEAMOUNT 2: Serge Gofas (MNHN, Paris), PROSPEC: J.-C. Brabant (Ifremer, Boulogne), MARVEL: D. Debruyères (Ifremer, Brest), EQUAMARGE: G. Mascle (CNRS, Villefranche/Mer); BENGAL 2: A. L. Rice (Soc, Southampton); BENGAL 3: B.J. Bett (Soc, Southampton), BENGAL 5: A. L. Rice (Soc, Southampton), BENGAL 6: M. Sibuet (Ifremer, Brest), and SAINT PAUL: R. Hékinian (Ifremer, Brest); and the crews of both the RV *Nadir & Atalante* and the submersible *Nautile* that participated in the sampling. The BENGAL and Amores projects were supported by the European Community of Marine Science and Technology (MAST) Programme under contract MAST3-CT95-0018 and MAST3-CT95-0040.

This study was supported by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and additional financial support from Fundação Universitária José Bonifácio (FUJB) and Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ).

REFERENCES

ARNDT W. 1933. — Die biologischen Beziehungen zwischen Schwämmen und Krebsen. *Mitteilungen aus dem Zoologischen Museum in Berlin* 19: 221-305.

- AURIVILLIUS C. W. S. 1894. — Studien über Cirripeden. *Kungliga Svenska Vetenskaps-Akademiens Handlingar*, Uppsala 26 (7): 1-107, 9 pls.
- AURIVILLIUS C. W. S. 1898. — Cirrhipèdes nouveaux provenant des Campagnes Scientifiques de S. A. S. le Prince de Monaco. *Bulletin de la Société zoologique de France* 23: 189-198.
- BARNARD K. H. 1924. — Contributions to the crustacean fauna of South Africa. Cirripedia. *Annals of the South African Museum*, Cape Town 20 (1): 1-103.
- BELLOC G. 1959. — Catalogue des types de Cirrhipèdes du Musée océanographique de Monaco. *Bulletin de l'Institut océanographique*, Monaco 1157: 1-7.
- BISCOITO M. & SALDANHA L. 2000. — Occurrence of *Chaceon affinis* (Decapoda: Geryonidae) in the vicinity of a hydrothermal vent site on the Mid-Atlantic Ridge. *Journal of Crustacean Biology* 20 (1): 128-131.
- BOCQUET-VÉDRINE J. 1971. — Redescription du Cirripède pédonculé *Calantica calyculus* (Aurivillius) et analyse de ses rapports avec *Scalpellum pilsbryi*. *Archives de Zoologie expérimentale et générale* 112 (4): 761-770.
- BROCH H. 1924. — Cirripedia Thoracica von Norwegen und dem Norwegischen Nordmeere. Eine systematische und biologisch-tiergeographische Studie. *Videnskapselskapets Skrifter. I: Matematik og Naturvidenskabelig Klasse*, Kristiana 17: 1-121, pl. 1-3.
- BROCH H. 1927a. — Ordnung der Crustacea Entomostraca: Cirripedia, in KÜKENTHAL & KRUMBACH (eds), *Handbuch der Zoologie*. De Gruyter, Berlin, vol. 3, n° 5: 503-552.
- BROCH H. 1927b. — Studies on Moroccan Cirripeds (Atlantic coast). *Bulletin de la Société des Sciences naturelles du Maroc* 7: 11-38.
- BROCH H. 1927c. — Plattenhomologien, Ontogenie und Phylogenie der Cirripeden. *Paleontologische Zeitschrift* 8 (4): 247-262.
- BROCH H. 1931. — Papers from Dr Th. Mortensen's Pacific Expedition. 1914-1916. Indomalayan Cirripedia. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening*, Copenhagen 91: 1-146.
- BROCH H. 1953. — Cirripedia Thoracica. *Danish Ingolf-Expedition* 3 (14): 1-16.
- BUCKERIDGE J. S. 1994. — Cirripedia Thoracica: Verucomorpha of New Caledonia, Indonesia, Wallis and Futuna Islands, in CROSNIER A. (ed.), Résultats des Campagnes Musorstom. Vol. 12. *Mémoires du Muséum national d'Histoire naturelle* 161: 87-125.
- CALMAN W. T. 1918a. — The type specimens of *Poecilasma carinatum*, Hoek (Cirripedia). *Annals and Magazine of Natural History*, series 9, 1: 401-408.
- CALMAN W. T. 1918b. — On barnacles of the genus *Scalpellum* from deep-sea telegraph-cables. *Annals and Magazine of Natural History*, series 9, 1: 96-124.
- CALMAN W. T. 1919. — On barnacles of the genus *Megalasma* from deep-sea telegraph-cables. *Annals and Magazine of Natural History*, series 9, 4: 361-374.
- CARRIOL R. P. 1998. — A new pedunculate cirripede (Thoracica, *Heteralepas*) from the Northeast Atlantic Ocean. *Zoosystema* 20 (3): 505-509.
- CIUREA J., MONOD T. & DINULESCO G. 1933. — Présence d'un Cirripède Operculé sur un poisson dulceaquicole européen. *Bulletin de l'Institut océanographique*, Monaco 615: 1-32.
- DARWIN C. 1852. — *A Monograph on the Subclass Cirripedia, with Figures of all the Species. The Lepadidae; or Pedunculate Cirripedes*. Ray Society, London, 400 p.
- DARWIN C. 1854. — *A Monograph on the Subclass Cirripedia, with Figures of all the Species. The Balanidae, the Verrucidae, etc.* Ray Society, London, 684 p.
- FOSTER B. A. 1978. — The marine fauna of New Zealand: Barnacles (Cirripedia: Thoracica). *Memoirs, New Zealand Oceanographic Institute*, Wellington 69: 1-160.
- FOSTER B. A. & BUCKERIDGE J. S. 1995. — Barnacles (Cirripedia: Thoracica) of seas off the Straits of Gibraltar. *Bulletin du Muséum national d'Histoire naturelle* sér. 4, 17: 163-191.
- GRAY J. E. 1848. — Description of a new species of *Anatifa*. *Proceedings of the Zoological Society of London*: 44.
- GRUVEL A. 1900a. — Sur quelques espèces nouvelles du genre *Scalpellum* provenant des dragages du *Talisman*. *Bulletin du Muséum national d'Histoire naturelle* 6: 189-194.
- GRUVEL A. 1900b. — Sur les espèces nouvelles du genre *Verruca* provenant du *Talisman*. *Bulletin du Muséum national d'Histoire naturelle* 6: 242-244.
- GRUVEL A. 1900c. — On new species of the genus *Alepas* (*A. Lankesteri*) from the collection of the British Museum. *Annals and Magazine of Natural History* series 7, 6: 195-199, pl. 8.
- GRUVEL A. 1901. — Diagnoses de quelques espèces nouvelles de Cirrhipèdes. *Bulletin du Muséum national d'Histoire naturelle* 7: 256-263.
- GRUVEL A. 1902a. — Sur quelques espèces nouvelles de la collection du British Museum. *Transactions of the Linnean Society of London*, 2nd ser. Zoology 8: 277-294, pl. 24.
- GRUVEL A. 1902b. — Catalogue des Cirrhipèdes appartenant à la collection du Muséum. *Bulletin du Muséum d'Histoire naturelle de Marseille* 8: 522-526.
- GRUVEL A. 1902c. — Étude d'une espèce nouvelle de Lepadides (*Scalpellum giganteum*, n. sp.) et de *Poecilasma carinatum*, Hoek. *Transactions of the Linnean Society of London*, 2nd ser. Zoology 8: 153-161, pl. 17.
- GRUVEL A. 1902d. — Cirrhipèdes. *Expéditions scientifiques du Travailleur et du Talisman, pendant les années 1880, 1881, 1882, 1883*. Masson, Paris, 178 p., pls 1-7.
- GRUVEL A. 1905. — *Monographie des Cirrhipèdes ou Thecostracés*. Masson et C^{ie}, Paris, 472 p.
- GRUVEL A. 1912. — Note préliminaire sur les Cirrhipèdes recueillis pendant les campagnes de S. A. S. le

- Prince de Monaco. *Bulletin de l'Institut océanographique*, Monaco 241: 1-7.
- GRUVEL A. 1920. — Cirripèdes provenant des campagnes scientifiques de S. A. S. le Prince de Monaco. *Résultats des Campagnes scientifiques accomplies sur son yacht par Albert I^{er}, Prince Souverain de Monaco* 53: 1-89, pls 1-7.
- HENRY D. P. 1954. — Cirripedia: The barnacles of the Gulf of Mexico. Gulf of Mexico its origin, waters, and marine life. *Fishery Bulletin. U.S. Fish and Wildlife Service*, Washington 55: 443-446.
- HIRO F. 1932. — Report on the Japanese species of the genus *Calantica* (Cirripedia). *Annotationes Zoologicae Japonenses* 13 (5): 467-485.
- HIRO F. 1933. — Report on the Cirripedia collected by the surveying ships of the imperial fisheries experimental station on the continental shelf bordering Japan. *Records of Oceanographic Works*, Japan 5: 11-84, pl. 1-3.
- HIRO F. 1937. — Studies of the Cirripedian fauna of Japan. II: Cirripeds found in the vicinity of the Seto Marine Biological Laboratory. *Memoirs of the College of Science, Kyoto Imperial University*, series B 12 (3): 385-478.
- HOEK P. P. C. 1883. — Report on the Cirripedia collected by H. M. S. *Challenger* during the years 1873-1876. *Reports of the Scientific Results of the Voyage of H. M. S. Challenger*, Zoology, part 25 8: 1-169, 13 pls.
- HOEK P. P. C. 1907a. — The Cirripedia of the *Siboga* Expedition. A: Cirripedia Pedunculata. *Siboga Expeditie*, Leiden 31a: 1-127, pl. 1-10.
- HOEK P. P. C. 1907b. — Cirripedia, in *Résultats Voyage du S. Y. Belgica, 1897-1899. Expédition Antarctique belge, Rapports scientifiques*, Zoologie: 3-9.
- HOEK P. P. C. 1908. — Some results of the investigation of the Cirripeds collected during the cruise of the Dutch man-of-war *Siboga* in the Malay Archipelago. *Akademie van Wetenschappen Amsterdam, Afd. Natuur*. 11: 110-116.
- HOEK P. P. C. 1909. — Die Cirripeden des nordischen Plankton, in BRANDT K. & APSTEIN C. (eds), *Nordisches Plankton*. Verlag von Lipsius & Tischer, Kiel: 265-331.
- HOEK P. P. C. 1914. — Cirripedia. Michael Sars *North Atlantic Deep-sea Expedition 1910*, Zoology 3: 1-6.
- HUTCHINS L. W. 1952. — Species recorded from fouling, in *Marine Fouling and its Prevention*. U.S. Naval Institute, Annapolis: 165-207.
- JONES D. S., ANDERSON J. T. & ANDERSON D. T. 1990. — Checklist of the Australian Cirripedia. *Technical Reports of the Australian Museum* 3: 1-38.
- KOLBASOV G. A. & ZEVINA G. B. 1999. — A new species of *Paralepas* (Cirripedia: Heteralepadidae) symbiotic with *Xenophora* (Mollusca: Gastropoda); with the first complementary male known for the family. *Bulletin of Marine Science*, Miami 64 (3): 391-398.
- KRÜGER P. 1911. — Beiträge zur Cirripedenfauna Ostasiens. *Abhandlungen der Mathematisch-Physikalischen Classe der Königlich Bayerischen Akademie der Wissenschaften* 2, suppl. 6: 3-72.
- KRÜGER P. 1940. — Cirripedia, in BRONNS H. G. (ed.), *Klassen und Ordnungen des Tierreichs*. Akademische Verlagsgesellschaft, Leipzig, vol. 3, no. 5: 1-391.
- LAHILLE F. 1910. — Los Cirripedios en la Argentina. *Revista del Jardín Zoológico de Buenos Aires* ser. 2, 6: 69-89.
- LINNAEUS C. 1767. — *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis...* ed. 10, reformata. Holmiae, L. Salvii, vol. 2: 533-1327.
- MURRAY J. 1895. — A summary of the scientific results obtained at the sounding, dredging, and trawling stations of H. M. S. *Challenger*. *Report H. M. S. Challenger (1872-1876) summary* 1 (1): 1-509.
- NEWMAN W. A. 1960. — Five pedunculate cirripeds from the Western Pacific, including two new forms. *Crustaceana*, Leiden 1: 100-116.
- NEWMAN W. A. 1980. — A review of extant *Scillaelepas* (Cirripedia: Scalpellidae) including recognition of new species from the North Atlantic, West Indies and New Zealand. *Tethys* 9 (4): 379-398.
- NEWMAN W. A. & ROSS A. 1971. — Antarctic Cirripedia. *Antarctic Research Series*, Baltimore 14: 1-257.
- NEWMAN W. A. & ROSS A. 1976. — Revision of the balanomorph barnacles; including a catalog of species. *Memoirs of the San Diego Society of Natural History* 9: 1-108.
- NEWMAN W. A. & ROSS A. 1998. — Peduncular armament in the Scalpellomorpha (Cirripedia) and a new abyssal species from the East Pacific Rise. *Journal of Crustacean Biology* 18 (3): 572-580.
- NILSSON-CANTELL C. A. 1921. — Cirripeden-Studien. Zur Kenntnis der Biologie, Anatomie und Systematik dieser Gruppe. *Zoologiska Bidrag från Uppsala* 7: 75-395, 3 pls.
- NILSSON-CANTELL C. A. 1927. — Some barnacles in the British Museum (Nat. Hist.). *Proceedings of the Zoological Society*: 743-790, 1 pl.
- NILSSON-CANTELL C. A. 1928. — Studies on cirripeds in the British Museum (Nat. Hist.). *Annals and Magazine of Natural History* ser. 10, 2 (7): 1-39.
- NILSSON-CANTELL C. A. 1931. — Cirripeds from the Indian Ocean and Malay Archipelago in the British Museum (Nat. Hist.), London. *Arkiv för Zoologi* 23 A (18): 1-12.
- NILSSON-CANTELL C. A. 1934. — Cirripeds from the Malay Archipelago in the Zoological Museum of Amsterdam. *Zoologische Mededeelingen* 17: 31-63.
- NILSSON-CANTELL C. A. 1938. — Cirripedes from the Indian Ocean in the collection of the Indian Museum, Calcutta. *Memoirs of the Indian Museum*, Calcutta 13 (1): 1-81, 3 pls.

- NILSSON-CANTELL C. A. 1955. — Cirripedia. *Reports of the Swedish Deep-Sea Expedition 2 Zoology* (17): 215-220.
- NILSSON-CANTELL C. A. 1978. — Cirripedia Thoracica and Acrothoracica. *Marine Invertebrates of Scandinavia* (5): 1-133.
- PHILLIPI R. A. 1836. — Cirripedia, in *Enumeratio Molluscorum Sicilaeum viventium in tellure tertiaria fossilium quae in itinere suo observati*. [s. n.], Berolini, 267 p.
- PILSBRY H. A. 1907a. — The barnacles (Cirripedia) contained in the collections of the U.S. National Museum. *Bulletin of the United States National Museum*, Washington 60: 1-122, 11 pl.
- PILSBRY H. A. 1907b. — Notes on the cirripeds genus *Megalasma*. *Proceedings of the Academy of Natural Sciences of Philadelphia* 59: 408-416, pl. 31.
- PILSBRY H. A. 1916. — The sessile barnacles (Cirripedia) contained in the collections of the U.S. National Museum; including a Monograph of the American species. *Bulletin of the United States National Museum*, Washington 93: 1-366.
- ROSELL N. C. 1981. — Crustacea: Cirripedia, in *Résultats des Campagnes Musorstom*. Tome 1: *Philippines*. Mémoires Orstom 91. ORSTOM; Muséum national d'Histoire naturelle, Paris: 277-307.
- ROSELL N. C. 1989. — Thoracica Cirripeds from the Musorstom 2 expedition, in FOREST J. (ed.) *Résultats des Campagnes Musorstom*. Vol. 5. *Mémoires du Muséum national d'Histoire naturelle* 144 (A): 9-35.
- ROSELL N. C. 1991. — Crustacea Cirripedia Thoracica: Musorstom 3, Philipinnes collection, in *Résultats des Campagnes Musorstom*. Vol. 9. *Mémoires du Muséum national d'Histoire naturelle* (A) 152: 9-61.
- ROSS A. 1975. — *Heteralepas cornuta* (Darwin) in the eastern Pacific abyssal fauna (Cirripedia, Thoracica). *Crustaceana*, Leiden 28 (1): 17-20.
- ROSS A., CERAME-VIVAS M. J. & MCCLOSKEY L. R. 1964. — New barnacle records for the coast of North Carolina. *Crustaceana*, Leiden 7 (4): 312-313.
- ROSS A. & NEWMAN W. A. 1969. — Cirripedia, in HEDGPETH J. W. (ed.) *Distribution of Selected Groups of Marine Invertebrates in Waters South of 35°S Latitude*. Folio 11. American Geographical Society, [s. l.]: 30-32.
- SARS G. O. 1877. — Prodomus descriptionis Crustaceorum et Pycnogonidarum quae in expeditione Norvegicae, anno 1876 observant. *Archiv für Mathematisk og Naturvidenskabeling* 1876: 337-371.
- SARS G. O. 1885. — Cirripedia. *The Norwegian North-Atlantic Expedition 1876-1878, Zoology. Crustacea II* 6 (15): 81-82, 241-253, pl. 20.
- SEGUENZA G. 1876. — Ricerche paleontologiche intorno ai Cirripedi Terziarii della Provincia di Messina. Parte II: Terza famiglia Lepadidi Darwin. *Atti dell'Accademia Pontoniana* 10: 369-481, pls 6-10.
- SOUTHWARD A. J. 1995. — Occurrence in the English Channel of a warm-water cirripede, *Solidobalanus fallax*. *Journal of the Marine Biological Association of United Kingdom* 75: 199-210.
- SOUTHWARD A. J. 1998. — New observations on barnacles (Crustacea: Cirripedia) of the Azores region. *Arquipelago. Life and Marine Sciences*, Azores 16 (A): 11-27.
- SPIVEY H. R. 1981. — Origins, distribution, and zoogeographic affinities of the Cirripedia (Crustacea) of the Gulf of Mexico. *Journal of Biogeography*, Dorking 8: 153-176.
- STEPHENSEN K. 1936. — Cirripedia. I: Lepadomorpha. *Meddelelser om Gronland udgivne af Kommissionen for Videnskabelige Undersogelser I Gronland* 80.
- STUBBINGS H. G. 1936. — Cirripedia. *John Murray Expedition, Scientific Reports, Zoology* 4 (1): 1-70.
- STUBBINGS H. G. 1963. — Cirripedia of the tropical South Atlantic coast of Africa. *Expédition océanographique belge dans les eaux côtières africaines de l'Atlantique Sud (1948-1949), Résultats scientifiques*, Bruxelles 3 (10): 1-39.
- STUBBINGS H. G. 1964. — Cirripedia. Campagnes de *La Calypso*: îles du Cap-Vert. *Annales de l'Institut océanographique de Monaco* 41: 103-112.
- STUBBINGS H. G. 1965. — West African Cirripedia in the collections of the Institut français d'Afrique noire, Dakar, Senegal. *Bulletin de l'Institut de l'Afrique noire sér. A* 27 (3): 876-907.
- STUBBINGS H. G. 1967. — The cirriped fauna of tropical West Africa. *Bulletin of the British Museum of Natural History, Zoology* 15 (6): 229-319, 1 pl.
- TARASOV N. I. 1936. — On the Arctic fauna of Cirripedia Thoracia II. *Transactions of the Arctic Institute*, Leningrad 33: 45-49 (in Russian).
- TARASOV N. I. 1937. — Contribution to the fauna of Cirripedia Thoracia of the Arctic Ocean III. *Transactions of the Arctic Institute*, Leningrad 50: 35-59 (in Russian).
- TARASOV N. I. & ZEVINA G. B. 1957. — Cirripedia. *Fauna SSSR*, Leningrad NS 69: 1-268 (in Russian).
- TOTTON A. K. 1940. — New species of the Cirripede genus *Oxynaspis*, commensal with Antipatharia. *Annals & Magazine of Natural History* ser. 11, 6 (36): 465-486.
- UTINOMI H. 1959. — Cirripedia Thoracica from the Western Mediterranean. *Résultats des Campagnes du "Professeur Lacaze-Duthiers"*. I: Algérie, 1952. *Vie et Milieu* 10 (4): 400-404.
- VISSCHER J. P. 1928. — Nature and extent of fouling of ships' bottoms. *Bulletin of the Bureau of Fisheries* 43 (2): 193-252.
- WEISBORD N. E. 1979. — Lepadomorph and Verrucomorph barnacles (Cirripedia) of Florida and adjacent waters, with an addendum on the Rhizocephala. *Bulletin of American Paleontology*, Ithaca 76 (306): 1-156.
- WELTNER W. 1895. — Die Cirripedien von Patagonien, Chile und Juan Fernandez. *Archiv für Naturgeschichte Berlin* 61 (2): 288-292.

- WELTNER W. 1897. — Verzeichnis der bisher beschriebenen recenten Cirripedienarten. Mit Angabe der im Berliner Museum vorhandenen Species und ihrer Fundorte. *Archiv für Naturgeschichte Berlin* 1 (3): 227-280.
- WELTNER W. 1898. — Cirripedien. *Ergebnisse Hamburger Magalhaensische Sammelreise* 4: 1-15.
- WELTNER W. 1900. — Die Cirripedien der Arktis. *Fauna Arctica* 1: 287-312.
- WELTNER W. 1922. — Cirripedia der Deutschen Tiefsee-Expedition. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer Valdivia 1898-1899* 2: 1-54, pls 1-4.
- WYVILLE THOMSON C. W. 1873. — Notes from the *Challenger*. *Nature* 8: 347-349.
- YOUNG P. S. 1995. — New interpretations of South American patterns of barnacle distribution, in SCHRAM F. R. & HOEG J. (eds), *New frontiers in Barnacle evolution. Crustacean Issues* 10: 229-253.
- YOUNG P. S. 1998a. — The Cirripedia (Crustacea) collected by the Fisheries Steamer *Meteor* in the eastern Atlantic. *Arquivos do Museu Nacional, Rio de Janeiro* 46: 1-53.
- YOUNG P. S. 1998b. — Cirripedia (Crustacea) from the "Campanha Biaçores" in the Azores region, including a generic revision of Verrucidae. *Zoosystema* 20 (1): 31-92.
- YOUNG P. S. 1998c. — Cirripeds (Crustacea) from the Mid-Atlantic Ocean Ridge collected by the submersible *Nautile*. *Cahiers de Biologie marine* 39: 109-119.
- YOUNG P. S. 1999. — The Cirripedia (Crustacea) collected by the RV *Marion Dufresne* along the Vitória-Trindade seamounts (Brazil). *Zoosystema* 21 (4): 607-624.
- YOUNG P. S. 2000. — Cirripedia Thoracica (Crustacea) collected during the "Campanha de *La Calypso* (1961-1962)" from the Atlantic shelf of South America. *Zoosystema* 22 (1): 85-100.
- ZEVINA G. B. 1969. — Cirripedia Thoracica, in KORT V. G. (ed.), *The biology of the Pacific Ocean. Deep-Sea Botton Fauna* 2 (1): 66-68 (in Russian).
- ZEVINA G. B. 1972. — Benthic Lepadomorpha (Cirripedia Thoracica) from the Southeast Pacific. *Crustaceana*, Leiden 22 (1): 39-63.
- ZEVINA G. B. 1976. — Abyssal species of barnacles (Cirripedia, Thoracica) of the North Atlantic. *Zoologicheskii Zhurnal*, Moscow 55 (8): 1149-1156 (in Russian).
- ZEVINA G. B. 1978. — A new system of the family Scalpellidae Pilsbry (Cirripedia, Thoracica). 2: Subfamilies Arcoscalpellinae and Meroscalpellinae. *Zoologicheskii Zhurnal*, Moscow 9: 1343-1352 (in Russian).
- ZEVINA G. B. 1981. — Barnacles of the suborder Lepadomorpha of the world ocean. I: Family Scalpellidae. *Fauna SSSR*, Leningrad 127: 1-406 (in Russian).
- ZEVINA G. B. 1982. — Barnacles of the suborder Lepadomorpha of the world ocean. II. *Fauna SSSR*, Leningrad 133: 1-222 (in Russian).
- ZEVINA G. B. 1983. — The Cirripedia from peaks of the Nasca Ridge Mountains (Pacific Ocean). *Zoologicheskii Zhurnal*, Moscow 62 (11): 1635-1642 (in Russian).
- ZEVINA G. B. 1988. — Deep-sea Verrucomorpha (Cirripedia, Thoracica) of the Pacific. 2: The South Pacific. *Zoologicheskii Zhurnal*, Moscow 67 (1): 31-40 (in Russian).
- ZEVINA G. B. 1990. — Cirripedia Thoracica from the guyots summits of Nasca and Sala-i-Gomes. *Trudy Instituta Okeanologia*, Moscow 124: 174-186 (in Russian).
- ZEVINA G. B. & TARASOV N. I. 1964. — The barnacle fauna (Cirripedia Thoracica) from the Arctic Ocean. *Trudy Arcticheskogo i Antarkticheskogo Nauchno-Isledovatel'skogo Instituta* 259: 229-240 (in Russian).
- ZULLO V. A. 1968. — Catalog of the Cirripedia named by Henry A. Pilsbry. *Proceedings of the Academy of Natural Sciences of Philadelphia* 120 (5): 209-235.

Submitted on 9 August 2000;
accepted on 16 July 2001.

APPENDIX 1. — Expedition, stations, location, and cirriped species from the eastern Atlantic.

Stn	Locality	Depth (m)	Species
Expedition SEAMOUNT 2			
CP 121	28°06.26'N, 15°51.82'W to 28°06.76'N, 15°51.06'W	200-200	<i>Heteralepas cornuta</i> <i>Scalpellum scalpellum</i> <i>Solidobalanus fallax</i>
CP 138	30°01.94'N, 28°29.00'W to 30°01.98'N, 28°27.81'W	300-310	<i>Heteralepas microstoma</i>
CP 142	30°02.95'N, 28°29.42'W to 30°02.96'N, 28°28.21'W	302-310	"
DW 148	30°12.01'N, 28°24.64'W to 30°11.94'N, 28°24.60'W	615-585	<i>Bathylasma hirsutum</i>
DW 172	30°05.11'N, 28°41.50'W to 30°04.77'N, 28°41.54'W	455-455	<i>Oxynaspis patens</i>
CP 177	29°58.43'N, 28°38.09'W to 29°56.51'N, 28°38.57'W	315	<i>Heteralepas microstoma</i>
DW 180	30°04.09'N, 28°45.09'W to 30°03.90'N, 28°44.74'W	1575-1610	<i>Smilium acutum</i>
DW 185	31°25.46'N, 28°51.85'W to 31°25.19'N, 28°51.89'W	1250-950	<i>Arcoscalpellum atlanticum</i> n. comb.
DW 186	31°26.14'N, 28°51.77'W to 31°26.34'N, 28°51.93'W	1520-1520	<i>Altiverruca obliqua</i>
DW 198	31°18.60'N, 28°35.05'W to 31°18.79'N, 28°34.88'W	1240-1250	<i>Hexelasma americanum</i>
DW 200	31°19.07'N, 28°36.01'W to 31°19.27'N, 28°35.92'W	1060-1100	<i>Arcoscalpellum atlanticum</i> n. comb. <i>Metaverruca trisulcata</i> <i>Hexelasma americanum</i>
DW 202	31°16.50'N, 28°43.15'W to 31°16.70'N, 28°43.08'W	640-655	<i>Metaverruca recta</i> <i>Pachylasma giganteum</i>
DW 203	31°09.52'N, 28°43.52'W to 31°09.67'N, 28°43.38'W	845-990	<i>Altiverruca quadrangularis</i> <i>Metaverruca trisulcata</i> <i>Hexelasma americanum</i>
DW 209	31°59.17'N, 27°55.95'W to 31°58.93'N, 27°56.19'W	460-435	<i>Pachylasma giganteum</i> <i>Costatoverruca cornuta</i>
DW 216	31°53.72'N, 28°02.97'W to 31°53.92'N, 28°02.94'W	270-270	<i>Glyptelasma hamatum</i>
DW 219	32°00.99'N, 27°53.35'W to 32°00.97'N, 27°53.72'W	760-760	<i>Metaverruca recta</i>
DW 221	32°17.84'N, 28°15.32'W to 32°18.03'N, 28°15.47'W	1180-1160	<i>Bathylasma hirsutum</i> <i>Hexelasma americanum</i>
DW 222	32°20.81'N, 28°15.66'W to 32°21.02'N, 28°15.72'W	1150-1150	<i>Glyptelasma hamatum</i> <i>Smilium acutum</i> <i>Hexelasma americanum</i>
DW 225	32°08.59'N, 28°10.73'W to 32°08.92'N, 28°10.50'W	1035-1030	<i>Aurivillialepas bocquetae</i>
DW 226	32°06.75'N, 28°08.81'W to 32°06.88'N, 28°08.67'W	580	<i>Metaverruca recta</i>
DW 229	32°02.04'N, 28°24.39'W to 32°02.01'N, 28°24.12'W	1715 -1715	<i>Lepas anserifera</i> (plate)
DW 231	32°01.49'N, 27°54.51'W to 32°01.75'N, 27°54.70'W	745 -750	<i>Poecilasma aurantia</i> <i>Costatoverruca cornuta</i>
CP 232	32°01.18'N, 27°54.09'W to 32°02.60'N, 27°55.91'W	750-750	<i>Poecilasma aurantia</i>
CP 236	32°03.72'N, 27°40.59'W to 32°05.52'N, 27°39.69'W	1925-1960	<i>Amgidoscalpellum rigidum</i>
DW 237	32°15.86'N, 27°31.85'W to 32°16.17'N, 27°31.61'W	670-715	<i>Metaverruca recta</i>
DW 238	32°17.35'N, 27°32.32'W to 32°17.51'N, 27°32.08'W	890-900	"
DW 240	33°12.26'N, 29°01.87'W to 33°12.25'N, 29°01.41'W	565-575	<i>Altiverruca quadrangularis</i>
DW 243	33°13.18'N, 29°08.24'W to 33°13.47'N, 29°07.85'W	1420-1360	<i>Bathylasma hirsutum</i> <i>Hexelasma americanum</i>
DW 246	33°13.94'N, 29°36.07'W to 33°13.92'N, 29°35.72'W	520-550	<i>Metaverruca recta</i> <i>Pachylasma giganteum</i>
DW 247	33°13.69'N, 9°35.26'W to 33°13.69'N, 29°35.54'W	580-625	<i>Metaverruca recta</i> <i>Costatoverruca cornuta</i>
DW 249	33°12.41'N, 29°14.83'W to 33°12.36'N, 29°15.19'W	1700-1800	<i>Glyptelasma hamatum</i> <i>Smilium acutum</i>
DW 250	33°12.65'N, 29°17.25'W to 33°12.66'N, 29°17.66'W	1500-1450	<i>Glyptelasma hamatum</i>
DW 251	33°13.47'N, 29°28.39'W to 33°13.49'N, 29°28.75'W	985-900	<i>Altiverruca quadrangularis</i> <i>Metaverruca aequalis</i>
DW 255	34°04.92'N, 30°15.27'W to 34°05.08'N, 30°15.39'W	340-335	<i>Metaverruca recta</i>
DW 256	34°06.21'N, 30°16.03'W to 34°06.47'N, 30°16.21'W	340-345	<i>Aurivillialepas bocquetae</i>
CP 257	34°04.51'N, 30°15.05'W to 34°03.21'N, 30°14.25'W	338-330	"
DW 261	34°22.37'N, 30°27.79'W to 34°22.52'N, 30°27.99'W	1340-1190	<i>Smilium acutum</i>
DW 262	34°23.36'N, 30°29.06'W to 34°23.58'N, 30°29°35'W	1160-1000	<i>Metaverruca aequalis</i> <i>Metaverruca recta</i> <i>Hexelasma americanum</i>
DW 263	34°25.89'N, 30°32.49'W to 34°26.14'N, 30°32.78'W	610-655	<i>Metaverruca recta</i>
DW 264	34°24.74'N, 30°30.77'W to 34°24.85'N, 30°31.08'W	830-795	<i>Bathylasma hirsutum</i> <i>Hexelasma americanum</i>
DW 265	34°28.65'N, 30°35.73'W to 34°28.85'N, 30°35.94'W	545-540	<i>Metaverruca recta</i>

APPENDIX 1. — Expedition, stations, location, and cirriped species from the eastern Atlantic (suite).

Stn	Locality	Depth (m)	Species
TS 267	34°22.50'N, 30°22.50'W	2235	<i>Heteralepas segonzaci</i> n. sp. <i>Glyptelasma hamatum</i> <i>Glyptelasma carinatum</i> <i>Dichelaspis thieli</i>
CP 268	34°22.03'N, 30°23.14'W to 34°20.54'N, 30°25.00'W	2205-2145	<i>Dichelaspis</i> sp.
DW 271	33°54.08'N, 30°09.33'W to 33°54.14'N, 30°09.34'W	1220-1220	<i>Hexelasma americanum</i>
DW 276	34°02.06'N, 28°18.96'W to 34°01.85'N, 28°19.15'W	1520-1460	<i>Glyptelasma hamatum</i> <i>Smilium acutum</i>
DW 277	33°59.92'N, 28°20.56'W to 33°59.64'N, 28°20.81'W	1000-945	<i>Poecilasma aurantia</i> <i>Arcoscalpellum atlanticum</i> n. comb. <i>Altiverruca obliqua</i> <i>Coronula diadema</i> <i>Hexelasma americanum</i> <i>Smilium acutum</i>
DW 278	33°57.77'N, 28°22.40'W to 33°57.47'N, 28°22.48'W	890-925	<i>Arcoscalpellum atlanticum</i> n. comb. <i>Altiverruca erecta</i> <i>Altiverruca quadrangularis</i> <i>Metaverruca recta</i>
DW 283	43°34.51'N, 22°19.61'W to 43°34.32'N, 22°19.43'W	1175-1210	<i>Bathylasma hirsutum</i>
Expedition PROSPEC (N. Ireland)			
CPH 4	56°32.53'N, 10°17.03'W to 56°32.75'N, 10°15.39'W	1185	<i>Bathylasma hirsutum</i>
CPH 8	55°17.83'N, 10°09.84'W to 55°18.58'N, 10°09.43'W	1170-1184	<i>Metaverruca recta</i>
CPH 10	55°18.69'N, 10°14.83'W to 55°18.11'N, 10°15.38'W	1589-1578	<i>Barbascalpellum rossi</i> n. sp. <i>Arcoscalpellum michelottianum</i>
Expedition DIVA II (Mid-Atlantic Ridge)			
PL 09	37°16.32'N, 32°16.51'W, Lucky Strike (Tour Eiffel)	1685	<i>Glyptelasma hamatum</i>
PL 12	37°50.54'N, 31°31.30'W, Menez Gwen	866	<i>Poecilasma crassa</i> <i>Poecilasma aurantia</i>
Expedition MARVEL (Mid-Atlantic Ridge)			
PL 1196	36°13.78'N, 33°54.14'W, Rainbow, PP27	2295	<i>Verum striolatum</i> <i>Altiverruca erecta</i> <i>Altiverruca quadrangularis</i>
PL 1201	37°50.54'N, 31°31.22'W, Menez Gwen	850	<i>Poecilasma crassa</i> <i>Poecilasma aurantia</i>
Expedition EQUAMARGE 2 (Ride Côte-d'Ivoire-Ghana)			
DR 08	3°30'N, 2°40'E	2420	<i>Scillaelepas grimaldi</i>
Expedition BENGAL 2 (S-G. B.)			
13078#1	48°50.13'N, 16°39.86'W to 48°59.06'N, 16°38.58'W	4844	<i>Neoscalpellum debile</i>
13078#11	48°53.19'N, 16°35.98'W	4844	"
13078#27	48°47.26'N, 16°34.01'W to 48°48.67'N, 16°31.76'W	4844	<i>Amigdoscalpellum rigidum</i> <i>Trianguloscalpellum regium</i>
Expedition BENGAL 3			
13200#70	48°51.62'N, 16°31.80'W to 48°50.09'N, 16°33.98'W	4845-4848	<i>Neoscalpellum debile</i>
13200#93	48°50.55'N, 16°25.30'W to 48°47.46'N, 16°30.42'W	4844-4849	"
13200#94	48°50.99'N, 16°23.03'W to 48°47.29'N, 16°32.23'W	4847-4851	<i>Trianguloscalpellum regium</i> <i>Neoscalpellum debile</i>
Expedition BENGAL 5			
13368#47	48°51.63'N, 16°25.18'W to 48°50.93'N, 16°25.99'W	4844	<i>Neoscalpellum debile</i>
13368#48	48°49.64'N, 16°30.12'W to 48°45.78'N, 16°32.37'W	4841-4845	"
13368#53	48°50'N, 16°23.53'W	4842	"
Expedition BENGAL 6			
13627#11	48°47.82'N, 16°40.37'W	4847	<i>Neoscalpellum debile</i> <i>Trianguloscalpellum regium</i>
13627#24	48°50.47'N, 16°44.37'W	4840	<i>Neoscalpellum debile</i>
Expedition ECOFER 1			
CP 01	44°46.20'N, 02°38.15'W	3017	<i>Arcoscalpellum mamillatum</i> <i>Catherinum recurvitergum</i>
CP 02	44°46.14'N, 02°38.92'W	3033	<i>Catherinum recurvitergum</i>
Expedition SAINT PAUL (Mid-Atlantic Ridge)			
SP 09-13	01°00.73'N, 29°21.61'W	3114	<i>Arcoscalpellum michelottianum</i>

APPENDIX 2. — List of the species, expeditions and stations.

Species	Stn
<i>Heteralepas cornuta</i> (Darwin, 1852)	SEAMOUNT 2, CP 121.
<i>Heteralepas microstoma</i> (Gruvel, 1901)	SEAMOUNT 2, CP 138; CP 142; CP 177.
<i>Heteralepas segonzaci</i> n. sp.	SEAMOUNT 2, TS 267.
<i>Oxynaspis patens</i> Aurivillius, 1894	SEAMOUNT 2, DW 172.
<i>Poecilasma crassa</i> (Gray, 1848)	DIVA II, PL 12. MARVEL, PL 1201.
<i>Poecilasma aurantia</i> Darwin, 1852	SEAMOUNT 2, DW 231; CP 232; DW 277. DIVA II, PL 12. MARVEL, PL 1201.
<i>Glyptelasma hamatum</i> (Calman, 1919)	SEAMOUNT 2, DW 216; DW 222; DW 249; DW 250; TS 267; DW 276. DIVA II, PL 09.
<i>Glyptelasma carinatum</i> (Hoek, 1883)	SEAMOUNT 2, TS 267.
<i>Dichelaspis thieli</i> Young, 1998	SEAMOUNT 2, TS 267.
<i>Dichelaspis</i> sp.	SEAMOUNT 2, CP 268.
<i>Lepas anserifera</i> Linnaeus, 1767	SEAMOUNT 2, CP 229.
<i>Aurivillialepas bocquetae</i> (Newman, 1980)	SEAMOUNT 2, DW 225; DW 256; CP 257.
<i>Scillaelepas grimaldi</i> (Aurivillius, 1898)	EQUAMARGE 2, DR 08.
<i>Smilium acutum</i> (Hoek, 1883)	SEAMOUNT 2, DW 180; DW 222; DW 249; DW 261; DW 276; DW 278.
<i>Scalpellum scalpellum</i> (Linnaeus, 1767)	SEAMOUNT 2, CP 121.
<i>Neoscalpellum debile</i> (Aurivillius, 1898)	BENGAL 2, 13078#1, #11. BENGAL 3, 13200#70, #93, #94. BENGAL 5, 13368#47, #48, 53. BENGAL 6, 13627#11, #24.
<i>Barbascalpellum rossi</i> n. sp.	PROSPEC, CPH 10.
<i>Arcoscalpellum michelottianum</i> (Seguenza, 1876)	PROSPEC, CPH 10.
<i>Arcoscalpellum mamillatum</i> (Aurivillius, 1898)	SAINT PAUL, SP 09-13. ECOFER 1, CP 01.
<i>Arcoscalpellum atlanticum</i> (Gruvel, 1900) n. comb.	SEAMOUNT 2, DW 185; DW 200; DW 277; DW 278.
<i>Verum striolatum</i> (G. O. Sars, 1877)	MARVEL, PL 1196.
<i>Catherinum recurvitergum</i> (Gruvel, 1900)	ECOFER 1, CP 01; CP 02.
<i>Amigdoscalpellum rigidum</i> (Aurivillius, 1898)	SEAMOUNT 2, CP 236. BENGAL 2, 13078#27.
<i>Trianguloscalpellum ovale</i> (Hoek, 1883)	BENGAL 5, 13368#53.
<i>Trianguloscalpellum regium</i> (Wyville-Thomson, 1873)	BENGAL 2, 13078#27. BENGAL 3, 13200#93. BENGAL 6, 13627#11
<i>Altiverruca erecta</i> (Gruvel, 1900)	SEAMOUNT 2, DW 278. MARVEL, PL 1196.
<i>Altiverruca obliqua</i> (Hoek, 1883)	SEAMOUNT 2, DW 186; DW 277.
<i>Altiverruca quadrangularis</i> (Hoek, 1883)	SEAMOUNT 2, DW 203; DW 240; DW 251; DW 278. MARVEL, PL 1196.
<i>Costatoverruca cornuta</i> (Aurivillius, 1898)	SEAMOUNT 2, DW 209; DW 231; DW 247.
<i>Metaverruca aequalis</i> (Aurivillius, 1898)	SEAMOUNT 2, DW 251; DW 262.
<i>Metaverruca recta</i> (Aurivillius, 1898)	SEAMOUNT 2, DW 202; DW 219; DW 226; DW 237; DW 238; DW 246; DW 247; DW 255; DW 262; DW 263; DW 265; DW 277; DW 278. PROSPEC, CPH 8.
<i>Metaverruca trisulcata</i> (Gruvel, 1900)	SEAMOUNT 2, DW 200; DW 203.
<i>Pachylasma giganteum</i> (Philippi, 1836)	SEAMOUNT 2, DW 202; DW 209; DW 246.
<i>Coronula diadema</i> (Linnaeus, 1767)	SEAMOUNT 2, DW 277.
<i>Bathylasma hirsutum</i> (Hoek, 1883)	SEAMOUNT 2, DW 148; DW 221; DW 243; DW 264; DW 283. PROSPEC, CPH 4.
<i>Hexelasma americanum</i> Pilsbry, 1916	SEAMOUNT 2, DW 198; DW 200; DW 203; DW 221; DW 222; DW 243; DW 262; DW 264; DW 271; DW 277.
<i>Solidobalanus fallax</i> (Broch, 1927)	SEAMOUNT 2, CP 121.

APPENDIX 3. — List of the species known from the eastern Atlantic, exclusive of the shallow-water and intertidal species (< 100 m).

- Heteralepdomorpha-Heteralepadidae
 1. *Heteralepas cornuta* (Darwin, 1852)
 2. *Heteralepas microstoma* (Gruvel, 1902)
 Heteralepas meteorensis Carriol, 1998
 3. *Heteralepas segonzaci* n. sp.
 4. *Paralepas minuta* (Philippi, 1836)
- Ibliomorpha, Iblidae
 5. *Ibla atlantica* Stubbings, 1967
- Lepadomorpha, Oxyntopidae
 6. *Oxyntopis celata* Darwin, 1852
 7. *Oxyntopis patens* Aurivillius, 1935
- Lepadomorpha, Poecilostomatidae
 8. *Poecilasma aurantica* Darwin, 1852
 9. *Poecilasma crassa* (Gray, 1848)
 10. *Poecilasma kaempferi kaempferi* Darwin, 1852
 11. *Poecilasma unguiculatus* Aurivillius, 1898
 12. *Glyptelasma carinatum* (Hoek, 1883)
 13. *Glyptelasma hamatum* (Calman, 1919)
 14. *Temnaspis tridens tridens* (Aurivillius, 1894)
 15. *Octolasmis hoeki* (Stebbing, 1894)
 16. *Octolasmis lowei* (Darwin, 1852)
 Octolasmis darwinii (Filippi, 1861)
 17. *Dichelaspis sessilis* (Hoek, 1883)
 18. *Dichelaspis thieli* Young, 1998
- Scalpelloomorpha, Calanticidae
 19. *Aurivillialepas bocquetae* (Newman, 1980)
 20. *Aurivillialepas calyculus* (Aurivillius, 1898)
 21. *Aurivillialepas falcata* (Aurivillius, 1898)
 22. *Gruvelialepas kempfi* (Annandale, 1911)
 23. *Gruvelialepas pilsbryi* (Gruvel, 1911)
 24. *Newmanilepas mirifica*, Zevina, 1976
 25. *Scillaelepas gemma* (Aurivillius, 1894)
 26. *Scillaelepas grimaldi* (Aurivillius, 1898)
 27. *Smilium acutum* (Hoek, 1883)
 Smilium longirostrum (Gruvel, 1900)
- Scalpelloomorpha, Scalpellidae
 28. *Amigdoscalpellum hispidum* (G. O. Sars, 1890)
 29. *Amigdoscalpellum rigidum* (Aurivillius, 1898)
 Scalpellum striatum Gruvel, 1900
 30. *Amigdoscalpellum semisculptum* (Pilsbry, 1907)
 31. *Amigdoscalpellum talismani* (Gruvel, 1900)
 32. *Arcoscalpellum atlanticum* (Gruvel, 1900) n. comb.
 33. *Arcoscalpellum ciliatum* (Hoek, 1907)
 34. *Arcoscalpellum curvatum* (Gruvel, 1900)
 35. *Arcoscalpellum eponkos* Young, 1998
 36. *Arcoscalpellum mamillatum* (Aurivillius, 1898)
 37. *Arcoscalpellum longicarinatum* (Pilsbry, 1907)
 38. *Arcoscalpellum michelottianum* (Seguenza, 1876)
 Arcoscalpellum velutinum (Hoek, 1883)
 Scalpellum erectum Aurivillius, 1898
 Scalpellum sordidum Aurivillius, 1898
 39. *Arcoscalpellum pentagonum* (Nilsson-Cantell, 1955)
 40. *Arcoscalpellum phrygianum* (Broch, 1953)
 41. *Arcoscalpellum tritonis* (Hoek, 1883)
 42. *Barbascalpellum rossi* n. sp.
 43. *Catherinum albatrossianum* (Pilsbry, 1907)
 44. *Catherinum recurvitergum* (Gruvel, 1900)
 45. *Gymnoscalpellum insigne* (Hoek, 1883)
 46. *Hamatoscalpellum hamatum* (G.O. Sars, 1879)
 47. *Litoscalpellum meteoria* Young, 1998
 48. *Mesoscalpellum imperfectum* (Pilsbry, 1907)
 49. *Neoscalpellum debile* (Aurivillius, 1898)
- Scalpellum alboranense* Gruvel, 1914
Scalpellum dicheloplax Pilsbry, 1907
Scalpellum edwardsii Gruvel, 1900
 50. *Ornatoscalpellum stroemii* (M. Sars, 1859)
Scalpellum erosum Aurivillius, 1892
Scalpellum obesum Aurivillius, 1892
Scalpellum septentrionale Aurivillius, 1894
 51. *Planoscalpellum limpidus* (Zevina, 1976)
 52. *Scalpellum angustum* G. O. Sars, 1879
 53. *Scalpellum glabrum* Studer, 1874 *apud* Gruvel (1905) (? *Planoscalpellum*)
 54. *Scalpellum scalpellum* (Linnaeus, 1767)
 Scalpellum siciliae Chenu, 1843
 Scalpellum vulgare Leach, 1824
 55. *Tarasovium cornutum* (G. O. Sars, 1879)
 56. *Teloscalpellum anceps* (Aurivillius, 1898)
 57. *Teloscalpellum incisum* (Aurivillius, 1898)
 58. *Teloscalpellum luteum* (Gruvel, 1900)
 59. *Trianguloscalpellum ovale* (Hoek, 1883)
 60. *Trianguloscalpellum regium* (Wyville-Thomson, 1873)
 Scalpellum molle Aurivillius, 1898
 61. *Verum carinatum* (Hoek, 1883)
 62. *Verum parazelandiae* Young, 1998
 63. *Verum striolatum* (G. O. Sars, 1877)
 64. *Weltnerium nymphocola* (Hoek, 1883)
 Scalpellum angustum G. O. Sars, 1879
 Scalpellum groenlandicum Aurivillius, 1894
 65. *Weltnerium pusillum* (Aurivillius, 1898)
 66. *Weltnerium richardsi* (Gruvel, 1920)
- Verrucomorpha, Verrucidae
 67. *Altiverruca costata* (Aurivillius, 1898)
 68. *Altiverruca crenata* (Aurivillius, 1898)
 69. *Altiverruca erecta* (Gruvel, 1900)
 70. *Altiverruca gibbosa* (Hoek, 1883)
 71. *Altiverruca rathbuniana* (Pilsbry, 1916) (? = *A. gibbosa*)
 72. *Altiverruca sulcata* (Hoek, 1883) (? = *A. gibbosa*)
 73. *Altiverruca inermis* (Aurivillius, 1898)
 74. *Altiverruca obliqua* (Hoek, 1883)
 Altiverruca vertica Foster & Buckeridge, 1995
 75. *Altiverruca quadrangularis* (Hoek, 1883)
 76. *Costatoverruca cornuta* (Aurivillius, 1898)
 77. *Costatoverruca grimaldi* (Gruvel, 1912)
 78. *Metaverruca aequalis* (Aurivillius, 1894)
 79. *Metaverruca linearis* (Gruvel, 1900)
 80. *Metaverruca recta* (Aurivillius, 1898)
 Verruca magna Gruvel, 1901
 Verruca sculpta Aurivillius, 1898
 81. *Metaverruca sensibilis* Young, 1998
 82. *Metaverruca trisulcata* (Gruvel, 1900)
 Verruca striata Gruvel, 1900
 83. *Newmaniverruca ferruginea* Young, 1998
 84. *Newmaniverruca imbricata* (Gruvel, 1900)
 85. *Newmaniverruca radiata* (Gruvel, 1900)
 86. *Verruca spengleri* Darwin, 1854
 87. *Verruca stroemia* (Müller, 1876)
- Balanomorpha, Pachylasmatidae
 88. *Pachylasma giganteum* (Philippi, 1836)
- Balanomorpha, Bathylasmatidae
 89. *Bathylasma hirsutum* (Hoek, 1883)
 90. *Hexelasma americanum* Pilsbry, 1916
- Balanomorpha, Archaeobalanidae
 91. *Solidobalanus (Hesperibalanus) fallax* (Broch, 1927)