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The holothurians of Easter Island

by Claude MASSIN

Abstract

The holothurians collected during the "DIS RAPA NUI 270 Expedition (27-xi-93 to 25-xii-93) at Easter Island are described together with all the species already mentioned from the Island. Nine species are known. Distribution, variability and endemism of these species are discussed.
Key-words: holothurian, distribution, endemism, Easter Island.

Résumé

Les holothuries récoltées lors de l'expédition, "DIS RAPA NUI 270" (du 27-11-93 au 24-12-93) à l'île de Pâques sont décrites, de même que toutes les espèces déjà mentionnées de l'île. Il y a en tout neuf espèces connues. La distribution, la variabilité et l'endémisme de ces espèces sont discutés.
Mots-clefs: holothuries, distribution, endémisme, île de Pâques.

Introduction

Easter Island, lying 3,700 km west off the Chilean Coast (lat 29°09'S, long 109°23'W), is one of the remotest places in the Pacific Ocean. Known by Europeans since the beginning of the 18th century, the study of its marine fauna began only in the early 20th century. The first holothurians reported from Easter Island were by CLARK (1920). One or two species have also been briefly mentioned by DEICHMANN *et al.* (1924), CODOCEO (1974), REDHER (1980) and CASTILLA & ROZBACZYLO (1987). A more extensive checklist has been given by DI SALVO *et al.* (1988). Except for the work of CLARK (1920), none of the species have been discussed or illustrated.
The present paper gives an account of the species collected during a Belgian Expedition (DIS RAPA NUI 270 Expedition) from Easter Island between 27 November and 25 December, 1993 and includes all species previously recorded from the Island.

Material and methods

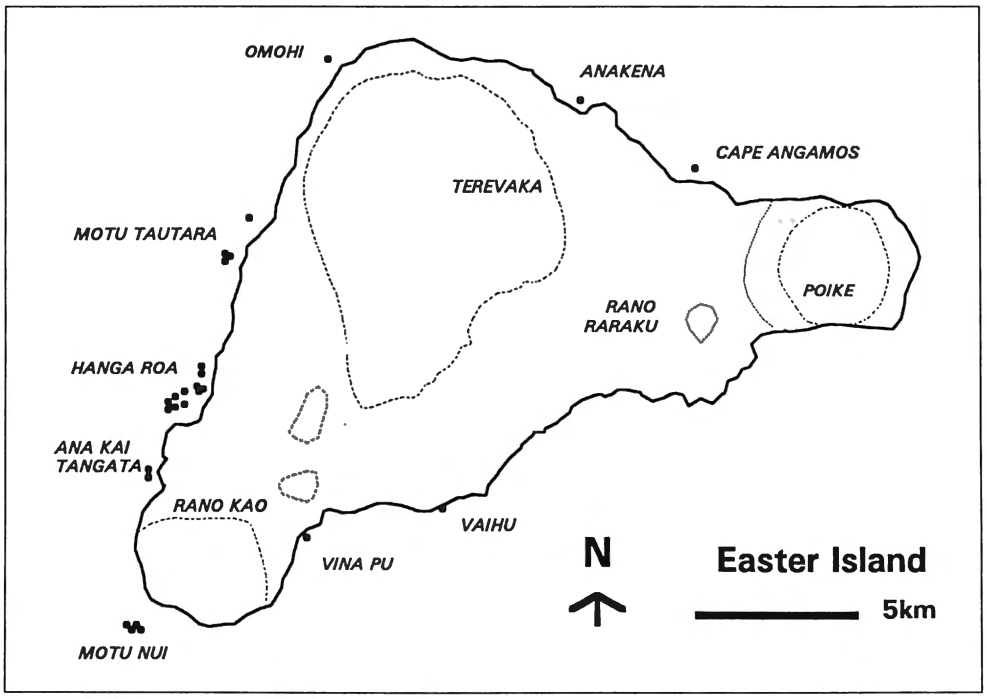
Holothurians were collected during day and night scuba dives around Easter Island (see map 1) between 0 and 35 m depth. Material was also collected twice at low tide at Hanga Roa and Anakena Bay, respectively. The specimens were anesthetized with 10% $MgCl_2$ for a few hours, fixed by injecting concentrated buffered formalin into the body cavity and by submerging the whole specimens in 10% buffered formalin. Later, they were transfered to 70% alcohol. Ossicles have been prepared for light microscopy.
The material collected during the "DIS RAPA NUI 270 Expedition" is held in the collections of the Institut Royal des Sciences Naturelles de Belgique, Brussels (IRSNB). It was compared with relevant collections of the Smithsonian Institution, Washington (USNM), collections of the Museum of Amsterdam (Z.M.A.) and of the Muséum National d'Histoire Naturelle, Paris (MNHN).

Taxonomical account

Order ASPIDOCHIROTIDA GRUBE, 1840
Family Holothuriidae LUDWIG, 1894
Genus *Holothuria* LINNAEUS, 1767
Subgenus *Microthele* BRANDT, 1835
Holothuria (Microthele) nobilis (SELENKA, 1867)
Figs. 1, 2 & Pl. 1B

SYNONYMY

Mulleria nobilis SELENKA, 1867: 313, pl. 17 fig. 13-15.
Holothuria (Microthele) nobilis; PANNING, 1929: 131 fig. 15 (synonymy and literature records before 1929); LIAO, 1975: 220 fig. 21(1-3); SLOAN *et al.*, 1979: 122; CHERBONNIER, 1979: 861; ROWE, 1983: 157; REYES-LEONARDO, 1984: 150, pl. 7 figs. 1a-g; MARSH, 1986: 73; CANNON & SILVER, 1986: 24, fig. 2i, 7a; FÉRAL & CHERBONNIER, 1986: 88; CHERBONNIER, 1988: 142, fig. 58A-L (synonymy and literature records before 1975); JANGOUX *et al.*, 1989: 163; CHAO & CHANG, 1989: 117, figs 15, 30b, 33A; MARSH *et al.*, 1993: 64; ROWE & GATES, 1995: 295.
Holothuria nobilis; DI SALVO *et al.*, 1988: 460.



Map 1. – Easter Island: ●: scuba diving sites.

MATERIAL

Easter Island, Motu Nui, USNM E33997 (one specimen); Hanga Roa, IRSNB IG 28126/19 (2 specimens).

DESCRIPTION

The specimens measure 92 × 60 mm, 140 × 70 mm and 165 × 75 mm. Their colour is deep brown to black dorsally and pale brown to beige with dark brown spots ventrally. The flat ventral surface is covered by numerous, densely crowded, small brown tube feet. The dorsal surface is arched and covered by numerous fine papillae. The mouth surrounded by 20 large brown tentacles is ventral, whereas the anus surrounded by 5 small teeth looking like blunt spines is terminal. The body wall is very thick (7-13 mm). The tentacle ampullae are very long (40-70 mm long for the largest specimen). There is one large Polian vesicle (33 mm long for the largest specimen) and one very short stone canal. The calcareous ring (fig. 1A) has radial pieces twice as wide as the interradial pieces; interradial pieces with an anterior tooth (fig. 1A), radial pieces with an anterior central notch either side of which is a lateral depression. There are Cuvierian tubules which are not sticky.

The ossicles of the dorsal body wall are tables (fig. 1B) and buttons (fig. 1C). The disc of the tables is squarish with a smooth or undulated edge and 65-100 μm in diameter. It is perforated by 4 central holes and 8-14 small peripheral holes. The four pillars, short and united by one cross beam, end in a cluster or a crown of short, blunt spines. The buttons are abundant, nodulous, some of them looking like fenestrated ellipsoids. They are 70-100 μm long. The dorsal papillae have perforated rods (fig. 1D) and tables. In the ventral body wall the buttons (fig. 1E) and the tables (fig. 1F) are identical to those of the dorsal body wall. However, the buttons are more numerous and nearly always very nodulous. In the ventral tube feet, there are tables and buttons similar to those of the body wall, and perforated plates. Tables and buttons are sparse, and only present at the base of the tube feet, whereas the perforated plates are numerous (fig. 2A). These plates are elongated or squarish, slightly curved, ranging from 100 to 170 μm long. The terminal plate sustaining the sucker is 450-550 μm in diameter.

In the tentacles there are tables, often reduced to the disc (fig. 2B) and spiny curved rods (fig. 2C, D), 60-530 μm long. The tables are restricted to the base of the tentacles.

ECOLOGY

H. nobilis was observed at Hanga Roa and Motu Nui. Its known depth range is 5-45 m. All the specimens are covered by a thin layer of sand. They occur on rocky bottoms covered at wide intervals by small colonies of *Pocillopora damicornis* and *Porites lobata* (Pl. 1B).

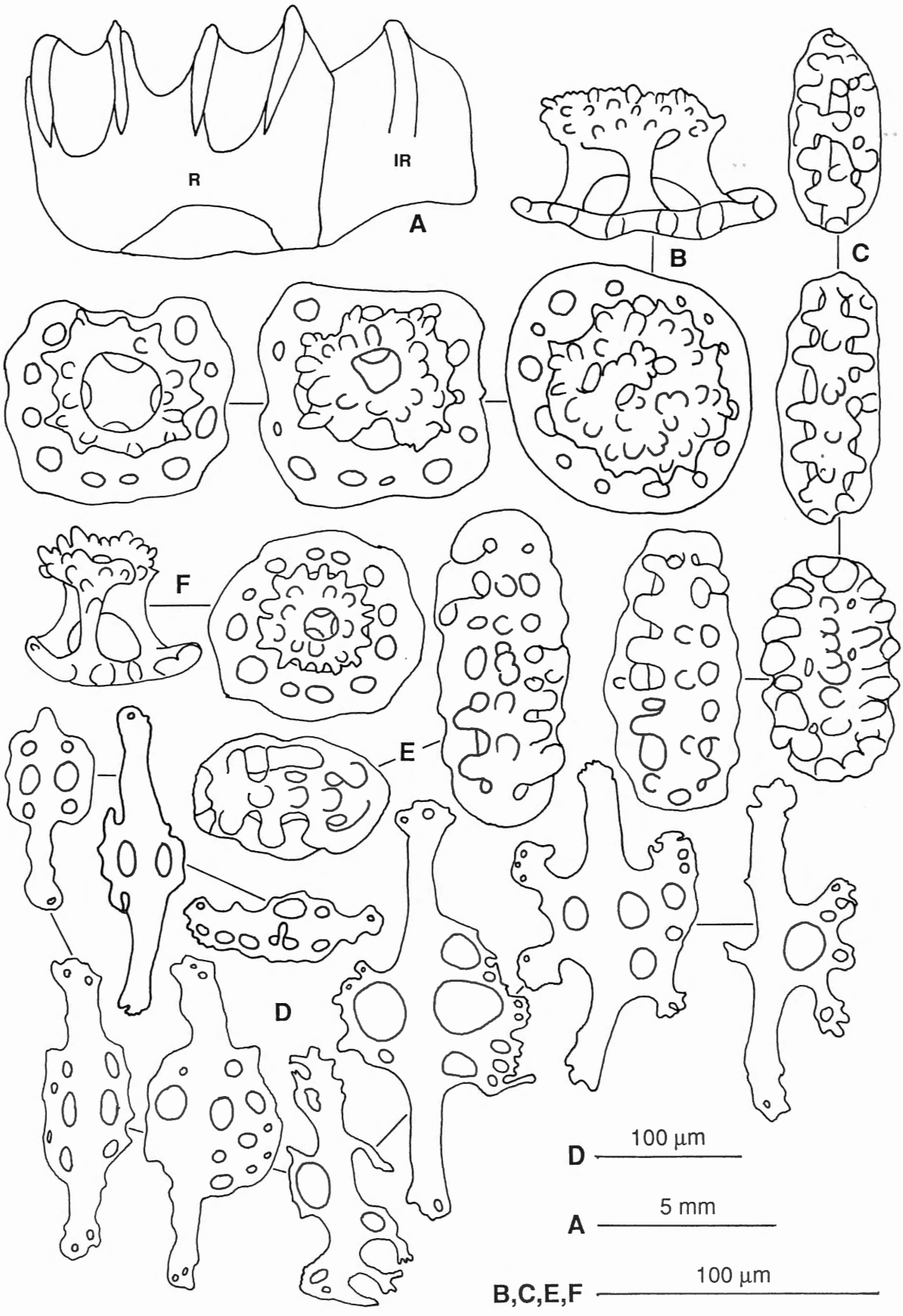


Fig. 1. – *Holothuria (Microthele) nobilis* (SELENKA, 1867). A: calcareous ring (r: radial piece; ir:interradial piece); B: tables of the dorsal body wall; C: buttons of the dorsal body wall; D: perforated rods of the dorsal papillae; E: buttons of the ventral body wall; F: tables of the ventral body wall.

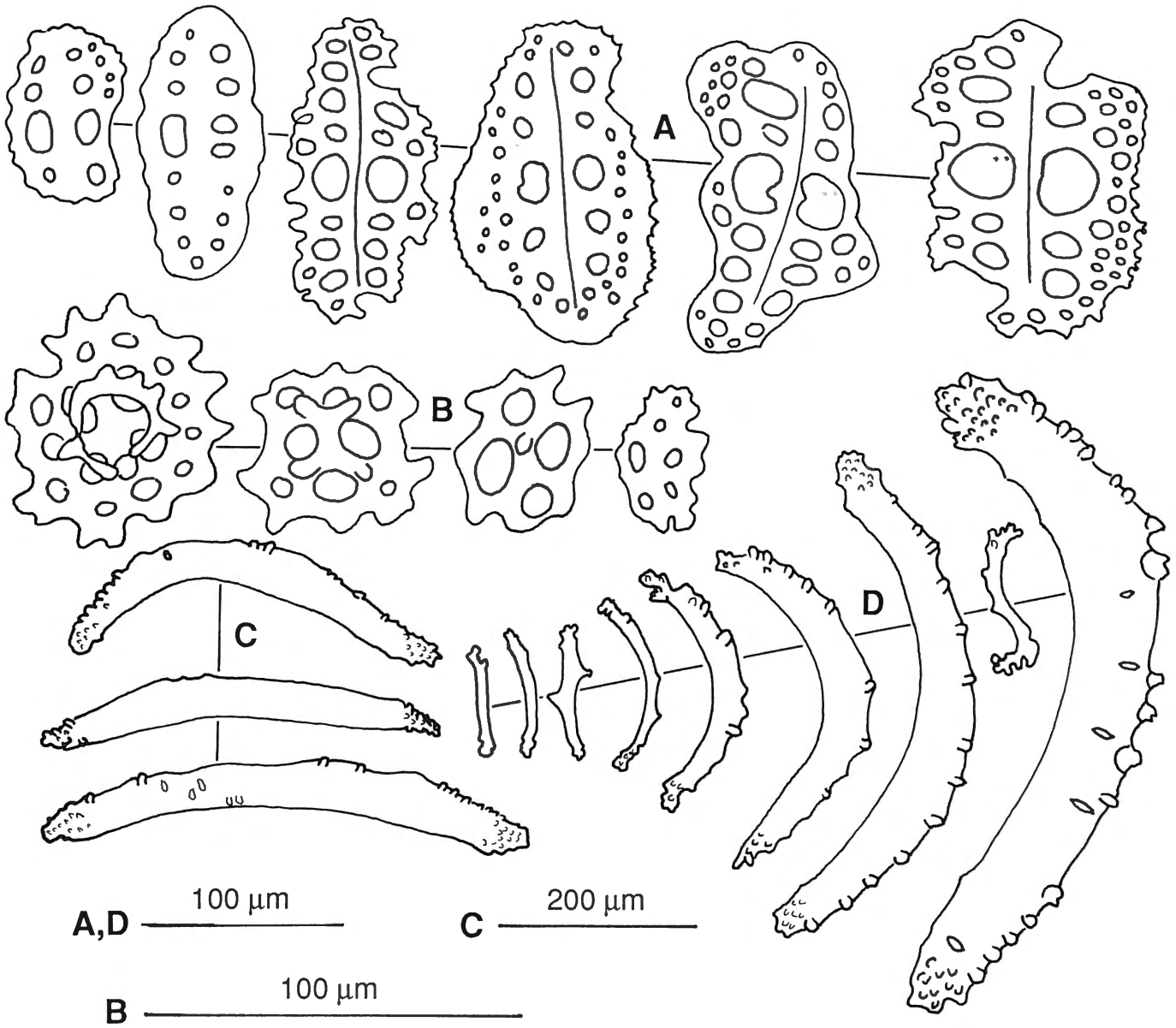


Fig. 2. – *Holothuria (Microthele) nobilis* (SELENKA, 1867). A: perforated plates of the ventral tube feet; B: tables of the tentacles; C-D: rods of the tentacles.

DISTRIBUTION

The distribution of *H. nobilis* ranges from the Red Sea and Madagascar to Hawaii and Easter Island, and from Japan to Northern Australia and New Caledonia (see map 2).

REMARKS

Some confusion exists between *H. nobilis*, *H. fuscogilva* CHERBONNIER, 1980 and *H. whitmaei* BELL, 1887. According to ROWE (in ROWE & GATES, 1995) these species can be easily distinguished by their colour: *H. nobilis* (syn. *H. fuscogilva*) is of a mottled cream/black colour whereas *H. whitmaei* is uniform black. Following this point of view, many records of the literature dealing with *H. nobilis* may well refer to *H. whitmaei* (e.g. CHERBONNIER, 1980; TAN TIU, 1981; KERR, 1994).

The three specimens of *H. nobilis* are similar to specimens collected in other Indo-Pacific areas as the Red Sea (CHERBONNIER, 1955), Madagascar (CHERBONNIER, 1988) or New Caledonia (CHERBONNIER & FÉRAL, 1986). *H. nobilis* is known to eject its Cuvierian tubules in extreme conditions only (CONAND, 1989); the tubules are not sticky because of their particular histological structure (VAN DEN SPIEGEL, 1993).

Subgenus *Platyperona* ROWE, 1969
Holothuria (Platyperona) difficilis SEMPER, 1868
Figs. 3, 4

SYNONYMY

Holothuria difficilis SEMPER, 1868: 92, pl. 30 fig. 21; CODOCEO, 1974: 53; CASTILLA & ROZBACZYLO, 1987: 211; DI SALVO *et al.*, 1988: 460.
Holothuria (Platyperona) difficilis; LIAO, 1975: 213, fig. 13(1-2); ROWE & DOTY, 1977: 232, fig. 3h; SLOAN *et al.*, 1979: 122; ROWE, 1983: 157; ROWE, 1985: 282; CANNON & SILVER, 1986: 24, fig. 7b; CHERBONNIER, 1988: 99, fig. 40A-K (synonymy and literature records before 1975); CHAO & CHANG, 1989: 117, figs. 16, 30c, 33B; MARSH *et al.*, 1993: 64; KERR, 1994: 169; ROWE & GATES, 1995: 296.
Actinopyga difficilis; DEICHMANN *et al.*, 1924: 382.
Actinopyga parvula; CLARK, 1920: 151.

MATERIAL

Easter Island: Hanga Roa, USNM E33999 (2 specimens); Vaihu, IRSNB IG28126/27 (7 specimens); Vaihu, IRSNB IG28126/28 (one specimen); Anakena Bay, IRSNB IG28126/73 (one specimen).

DESCRIPTION

The eleven specimens are cylindrical and their size ranges from 23 × 5 mm to 67 × 16 mm. In alcohol they are uniformly chocolate brown. On relaxed specimens, the skin is thin and granulous. The mouth is ventral, surrounded by a collar of papillae. There are 20 large, peltate, dark brown tentacles. The anus is dorsal and surrounded by five small triangular anal teeth. On the ventral surface the tube feet are very large and densely crowded on the entire surface. They are pale brown with a large dark brown sucker. The dorsal papillae are present all over the dorsal surface but much less crowded than the tube feet. The calcareous ring (fig. 3A) has large radial pieces, the dorsal ones bearing two small posterior projections. The interradial pieces are narrow with a strong anterior tooth. There is one very short Polian vesicle and one very short stone canal ending in a dark brown rounded madreporic plate (fig. 3B). The stone canal is so short that the madreporic plate joins the ambulacral ring canal. There are numerous, long, white and fine Cuvierian tubules.
The ossicles of the body wall are tables (fig. 3C, D) and buttons (fig. 3E) which are identical dorsally and ventrally. The disk of the tables is 65-100 μm in diameter, squarish with a smooth or undulated edge. The disc has 4 central holes and 8 large peripheral holes alternating with small peripheral holes (fig. 3C). In small specimens (L = 26 mm) some irregular tables are present, mainly dorsally (fig. 3D). The four pillars, connected by one transversal beam, end in a crown of spines (fig. 3C). The buttons are 95-100 μm long and have three to six pairs of small holes (fig. 3E). They are smooth with a median longitudinal ridge. In the dorsal papillae, there are tables (identical to those of the body wall), buttons which differ from those of the body wall by larger holes (fig. 3F), and curved rods (fig. 3G). In the ventral tube feet, there are tables, buttons and large perforated plates. The tables and the buttons are identical to those of the body wall. The large perforated plates (fig. 4A) are 100-300 μm long with numerous holes and a central longitudinal ridge. The holes along the central ridge are larger than the peripheral ones; intermediary stages exist between the buttons and the perforated plates (fig. 4A). The terminal plate of the tube feet is 360-520 μm in diameter.
In the tentacles there are tables, often reduced to the disc (fig. 4B) and spiny curved rods (fig. 4C, D, E), 50-600 μm long.

ECOLOGY

Holothuria difficilis is very abundant in shallow water (0-4 m) of well sheltered areas, especially at Vaihu where 17 specimens were counted on a small stone (25 × 10 × 10 cm). It was also collected at low tide at Anakena Bay. Cuvierian tubules are readilly expelled when the animal is touched.
According to local people, up to WWII, *H. difficilis* was eaten when no other food was available. The use of *H. difficilis* as trepang is quite unusual (see PANNING, 1944; GENTLE & CONAND, 1979; CONAND, 1986; JAMES, 1989; CONAND & BYRNE, 1993).

DISTRIBUTION

H. difficilis extends from the Red Sea and Madagascar to the tropical coasts of Central America and Mexico, and from Japan and China to New Caledonia and Easter Island (see map 2).

REMARKS

The *H. difficilis* from Easter Island are identical to material collected in other Indo-Pacific areas as Madagascar (CHERBONNIER, 1988) or Southern Taiwan (CHAO & CHANG, 1989).

Subgenus *Semperothuria* DEICHMANN, 1958
Holothuria (Semperothuria) cinerascens (BRANDT, 1835)
Figs. 5, 6 & Pl. 1A

SYNONYMY

Stichopus (Gymnochirota) cinerascens BRANDT, 1835: 35.
Holothuria cinerascens; PANNING, 1934: 37, fig. 32

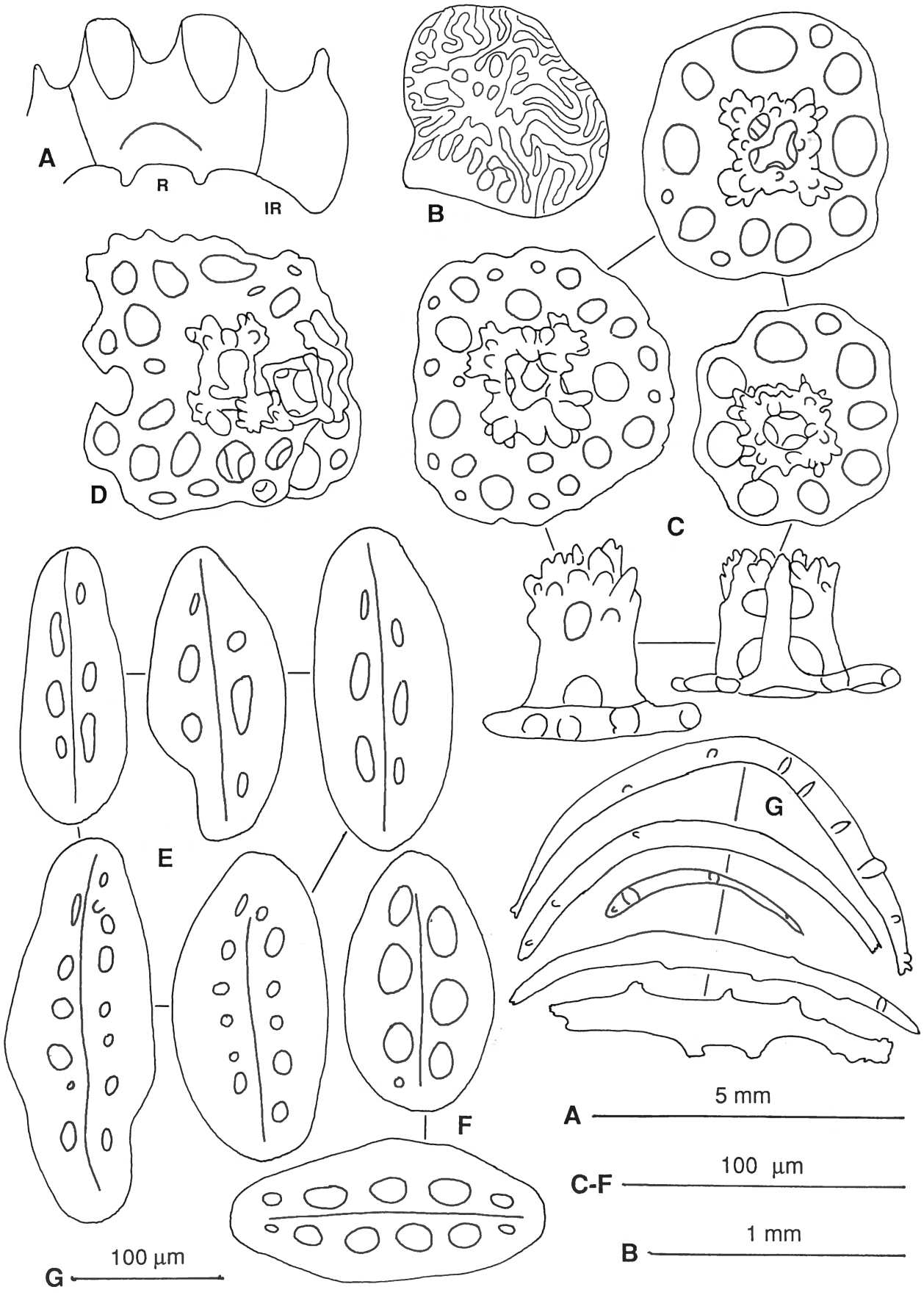


Fig. 3. – *Holothuria (Platyperona) difficilis* SEMPER, 1868. A: calcareous ring (r: radial piece; ir: interradial piece); B: madreporic plate; C: tables of the body wall; D: irregular body wall table of a small specimen (L = 26 mm); E: buttons of the body wall; F: buttons of the dorsal papillae; G: rods of the dorsal papillae.

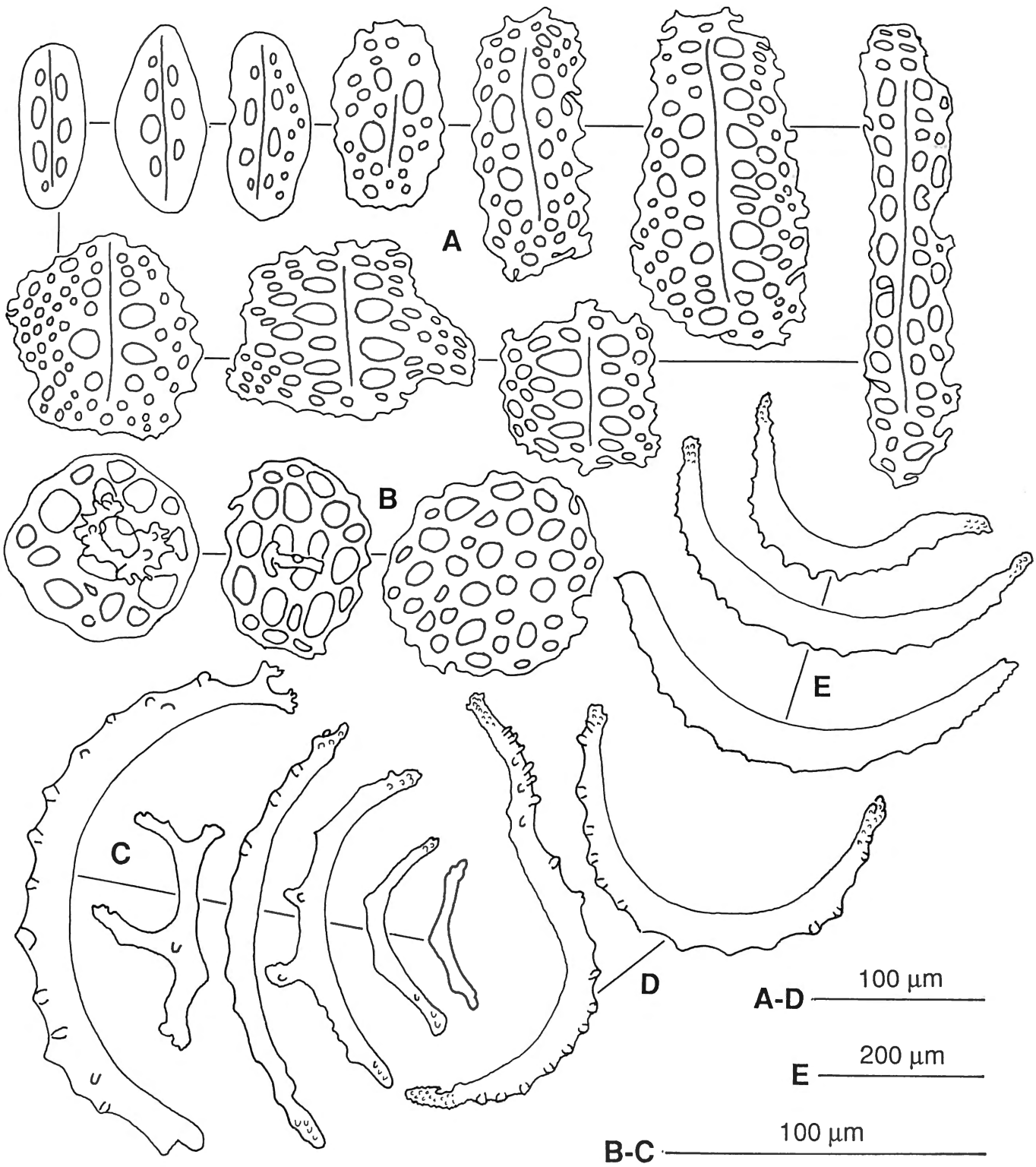


Fig. 4. – *Holothuria (Platyperona) difficilis* SEMPER, 1868. A: perforated plates of the ventral tube feet; B: tables of the tentacles; C-E: rods of the tentacles.

(synonymy and literature records before 1934); REDHER, 1980: 57: DI SALVO *et al.*, 1988: 460.
Holothuria (Semperothuria) cinerascens; LIAO, 1975: 211; SLOAN *et al.*, 1979: 123; CANNON & SILVER, 1986: 24; FÉRAL & CHERBONNIER, 1986: 90; CHERBONNIER, 1988: 70, fig. 27A-F (synynomy and literature records before 1975); CHAO & CHANG, 1989: 117, figs. 14, 30A, 33DB; MARSH & PAWSON, 1993: 291; ROWE & GATES, 1995: 298.

MATERIAL

Easter Island: north of Tahai (just north of Hanga Roa), USNM E34004 (one specimen); Hanga Roa, IRSNB IG28126/9 (4 specimens); Hanga Roa, IRSNB IG28126/11 (one specimen); Hanga Roa, IRSNB IG28126/13 (one specimen); Ana Kai Tangata, IRSNB IG28126/30 (one specimen); Ana Kai Tangata, IRSNB IG28126/45 (one specimen).

DESCRIPTION

The specimens are cylindrical with mouth and anus terminal, and measure from 80 × 20 mm to 120 × 48 mm. The body wall is thick and smooth. In alcohol the colour is chocolate brown to pale brown with, dorsally, large dark dots are aligned on two lines. On some specimens brown longitudinal lines are also visible. When the dorsal surface is chocolate brown, the dorsal tube feet appears as numerous tiny pale brown dots. The ventral surface is always paler. The numerous tube feet are densely crowded on the ventral surface. Dorsally, they are distributed in the ambulacral and interambulacral areas but are less numerous than ventrally. The tentacles number 19-21 (only one specimen with 21) with a very long stem ending in short dendritic ramifications (fig. 5A, pl. 1A).
The calcareous ring has radial pieces twice as large as the interradial pieces. The radials have a small anterior notch (fig. 5B) and the interradials a strong anterior tooth (fig. 5B). There are 3 large Polian vesicles and 1-2 short stone canals (one specimen with 8 Polian vesicles and 8 stone canals). The tentacle ampullae are very long. There are no Cuvierian tubules.
There are two kind of ossicles in the body wall: tables and granulous rods. The tables are few dorsally and very rare if not absent ventrally. The disc of the dorsal tables is 30-40 μm in diameter with a smooth edge, and is perforated by four large holes (fig. 5C). There are four pillars united by one cross beam and ending in a crown of 12 spines (4 groups of 3) forming a Maltese cross (fig. 5C). The crown of spines is larger than the disc (fig. 5C). The ventral tables (fig. 5D) are larger (40-50 μm in diameter) than the dorsal ones and their disc is perforated by 4 central holes and 4-9 small peripheral holes. Dorsally the rods are 100-215μm long (fig. 5E), very granulous with bifurcated ends and lateral processes. The ventral rods are less nodulous (fig. 5F) and 135-145 μm long.
In the ventral tube feet only rods occur (fig. 5G), very similar to those of the ventral body wall; they are 120-170 μm long. The sucker of the tube feet is supported by a terminal plate 450-700 μm in diameter. The dorsal tube feet have a few small tables and granulous rods, 95-195 μm long, the largest with bifurcated ends (fig. 6A); the terminal plate is 300-310 μm in diameter.
In the tentacles there are numerous rods (fig. 6B), 50-120 μm long, the longest ones with numerous small lateral processes giving them a ragged appearance.

ECOLOGY

Holothuria cinerascens has been collected between 2 and 19 m depth at Hanga Roa, Vaihu, Ana Kai Tangata and north of Tahai (just north of Hanga Roa). The animal lives more or less hidden under stones or in crevices where it is firmly attached to the substrate by the numerous ventral tube feet. Only the tentacles, with short dendritic ramifications, are visible (pl. 1A). The specimens which are exposed on the substrate are coated with sand. *H. cinerascens* is the most abundant holothurian species of Easter Island. The dendritic tentacles, extended in the water, suggest a suspension feeding role. However, the digestive tract contains mainly coarse sand with particles up to 3 mm in diameter, indicating that the animals use tentacles for browsing sediment.

DISTRIBUTION

Holothuria cinerascens extends from the Red Sea and Madagascar to Hawaii and Easter Island, and from Japan to Northern Australia (see map 2).

REMARKS

The *H. cinerascens* from Easter Island are very similar to those of Madagascar (CHERBONNIER, 1988), the Red Sea (CHERBONNIER, 1955) or Hawaii (FISHER, 1907). Nevertheless, they present some differences like the less granulous rods in the ventral body wall, the small variation between dorsal and ventral tables of the body wall, and the higher number of Polian vesicles and stone canals.

Subgenus *Lessonothuria* DEICHMANN, 1958
Holothuria (Lessonothuria) hawaiiensis FISHER, 1907
Figs. 7, 8

SYNONYMY

Holothuria hawaiiensis FISHER, 1907: 668, pl. 68 fig. 4, 4a-g; PANNING, 1935: 92, fig. 78a-n.

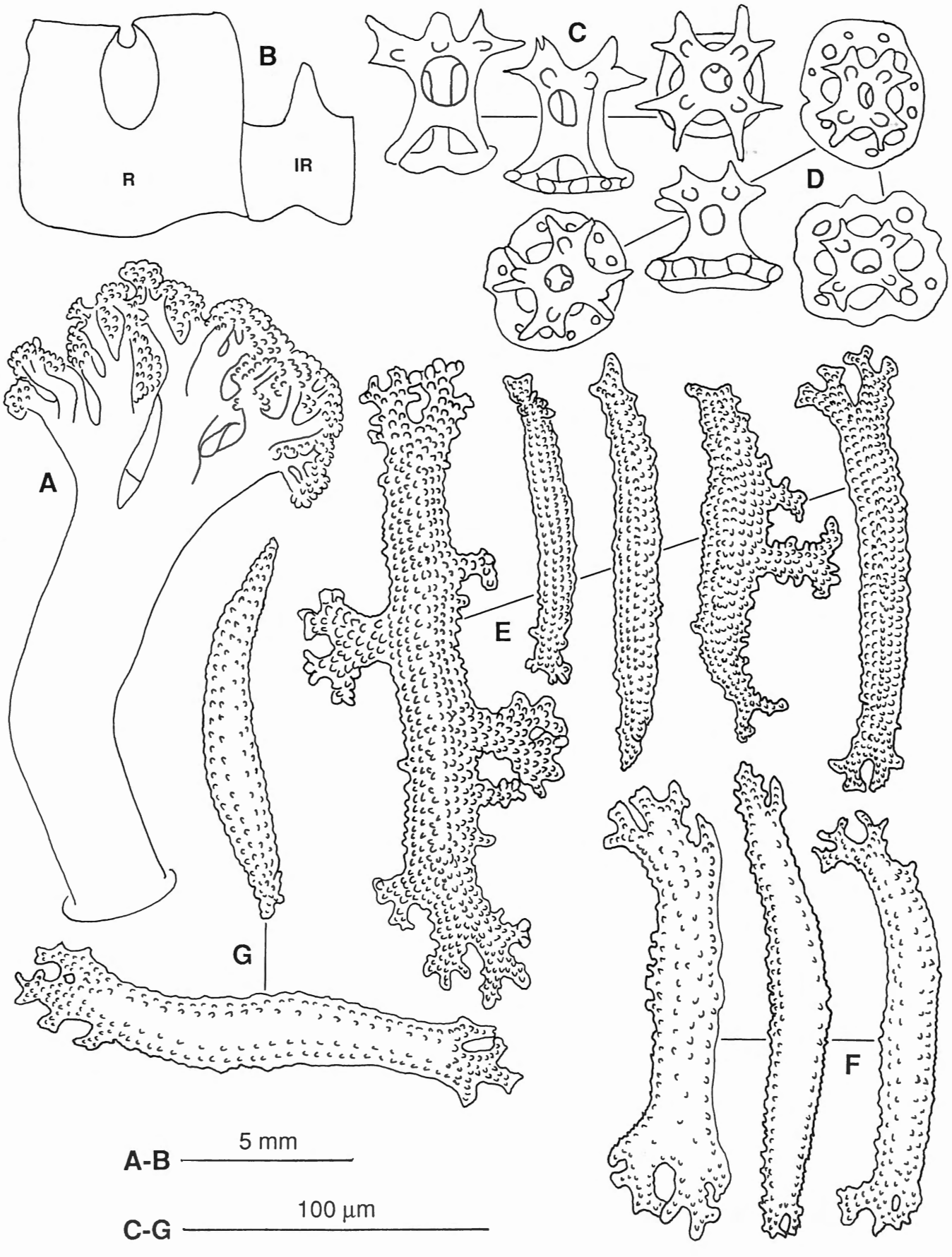


Fig. 5. – *Holothuria (Semperothuria) cinerascens* (BRANDT, 1835). A: tentacle; B: calcareous ring (r: radial piece; ir: interradial piece); C: tables of the dorsal body wall; D: tables of the ventral body wall: E: rods of the dorsal body wall; F: rods of the ventral body wall; G: rods of the ventral tube feet.

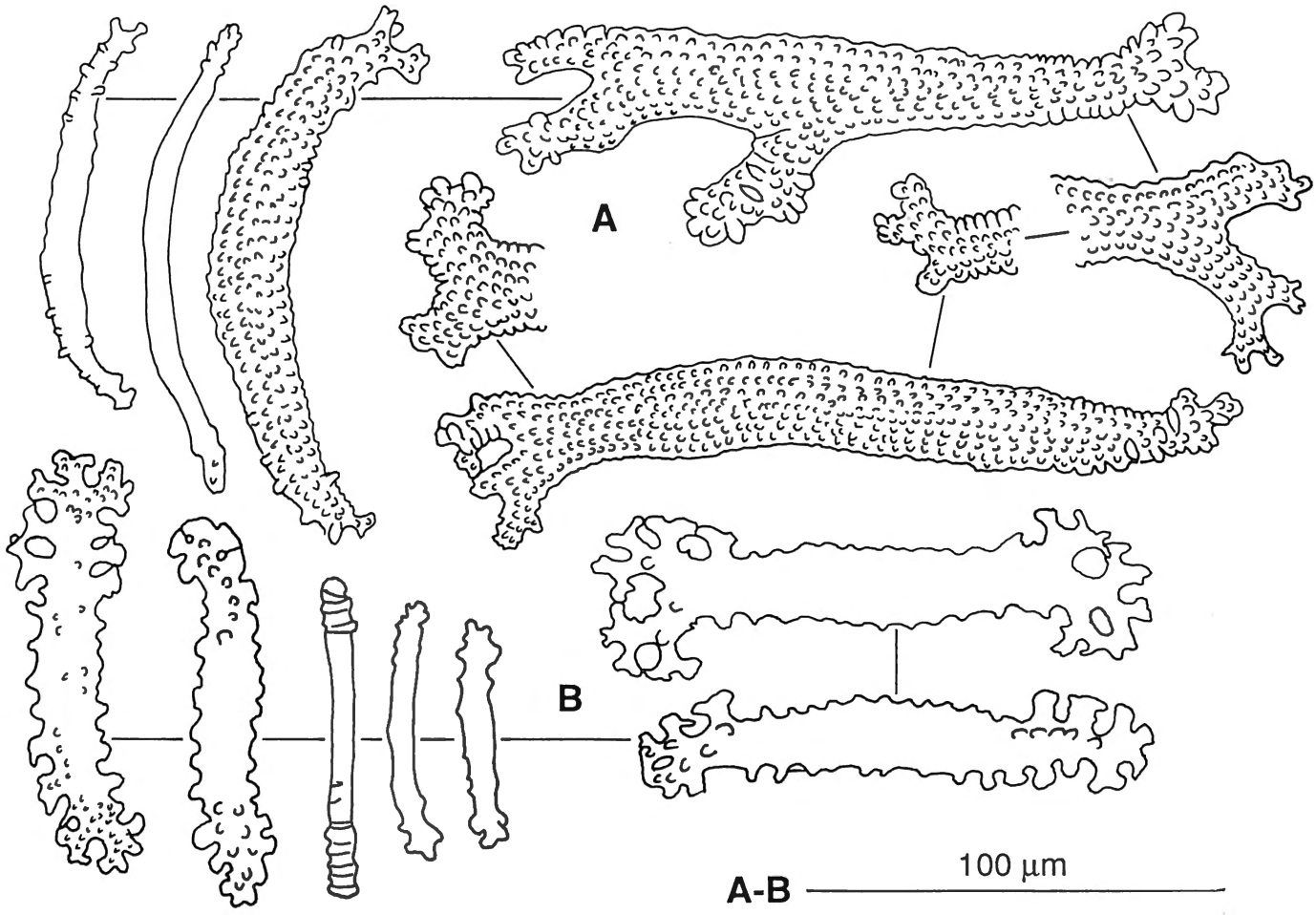


Fig. 6. – *Holothuria (Semperothuria) cinerascens* (BRANDT, 1835). A: rods of the dorsal tube feet; B: rods of the tentacles.

Holothuria (Stauropora) hawaiiensis; ROWE, 1969: 141; CLARK & ROWE, 1971: 178; ? CHERBONNIER, 1979: 865, fig. 3A-N; CHERBONNIER, 1988: 77, fig. 30A-N.
Holothuria squamifera; DI SALVO *et al.*, 1988: 460.
Holothuria (Lessonothuria) hawaiiensis; ROWE & FILMER-SANKEY, 1992: 89, 184.

MATERIAL

Holothuria hawaiiensis: Easter Island, Hanga Piko (just south of Hanga Roa), USNM E34003 (one specimen); Hanga Roa, IRSNB IG28126/10 (one specimen); Vaihu, IRSNB IG28126/29 (one specimen).
Holothuria squamifera: Indonesia, Jakarta Bay, ZMA U.Ech3251 (3 specimens).

DESCRIPTION

Medium sized holothurians, cylindrical with mouth ventral and anus terminal. The three specimens are 55, 90 and 120 mm long on 7, 11 and 21 mm in diameter, respectively. The skin is thin and rough to the touch. In alcohol the body wall is pale to dark gray dorsally with white spots around the larger papillae, and gray white ventrally. There are minute white dots all over the body. On contracted specimens, the podia are densely crowded on the entire ventral surface. On relaxed specimens, a serial arrangement appears along the ambulacra. The papillae, large and small, are irregularly arranged dorsally. There are 29, short, peltate tentacles.
The calcareous ring has large radial pieces with an anterior notch (fig. 7A) and narrow interradial pieces with a strong anterior tooth (fig. 7A). There are two Polian vesicles: a small one and a very long one (22 mm long for the 90 mm long specimen). The stone canal is short, contorted, at the right side of the dorsal mesentery. The Cuvierian tubules are numerous, thin and white.
In the body wall there are tables and buttons. The tables of the dorsal and ventral body wall are similar (fig. 7B). They are 50-60 µm in diameter. Their disc is round with a knobbed to spiny edge and is perforated by 4 central and 11-12 peripheral holes (fig. 7B). The four pillars are short, united by one cross beam and ending in a small crown of short spines. A few tables are larger (65-75 µm

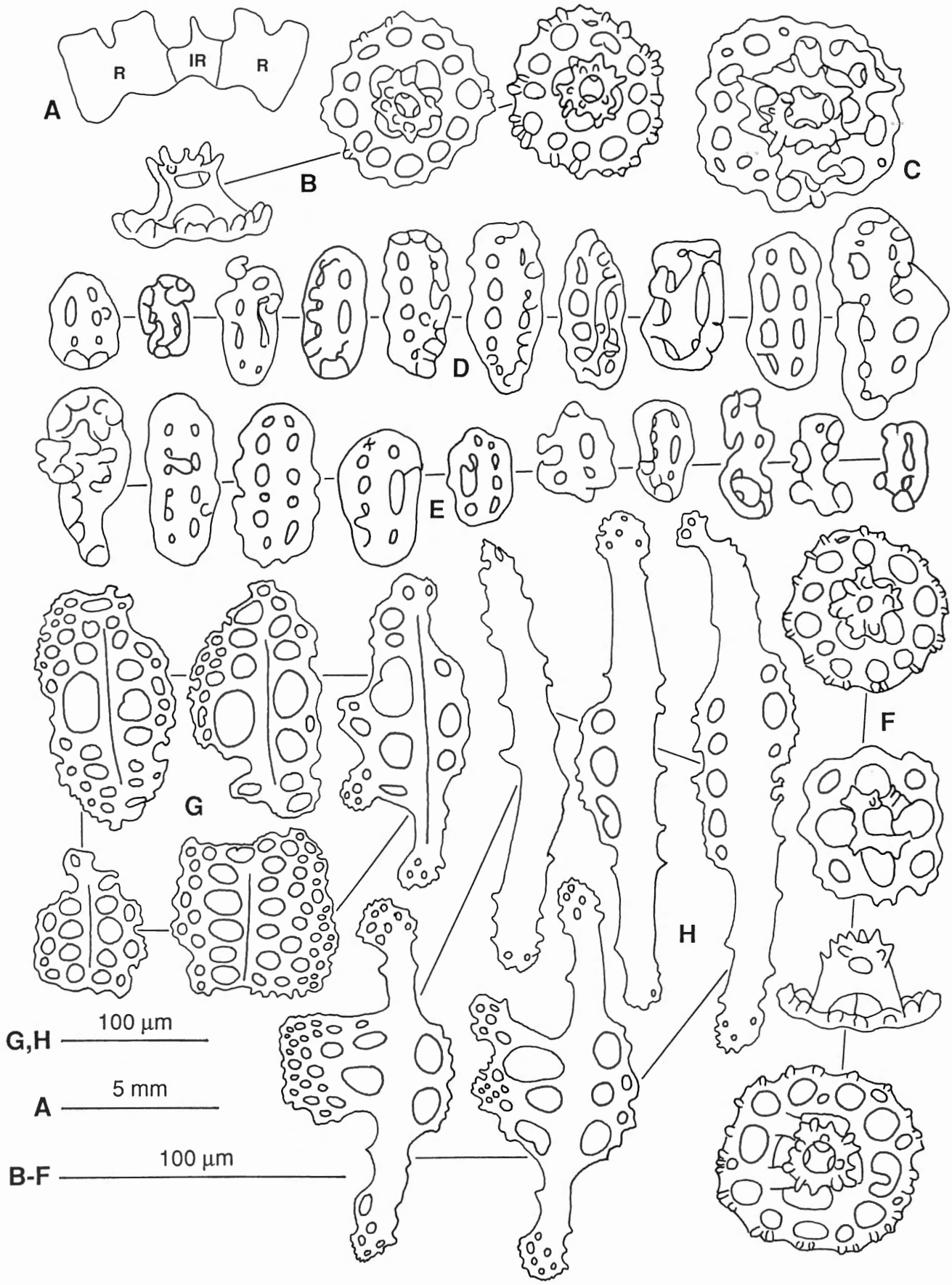


Fig. 7. – *Holothuria (Lessonothuria) hawaiiensis* FISHER, 1907. A: calcareous ring (r: radial piece; ir: interradial piece); B: tables of the body wall; C: large table of the body wall; D: buttons of the dorsal body wall; E: buttons of the ventral body wall; F: tables of the ventral tube feet; G: perforated plates of the ventral tube feet; H: rods of the ventral tube feet.

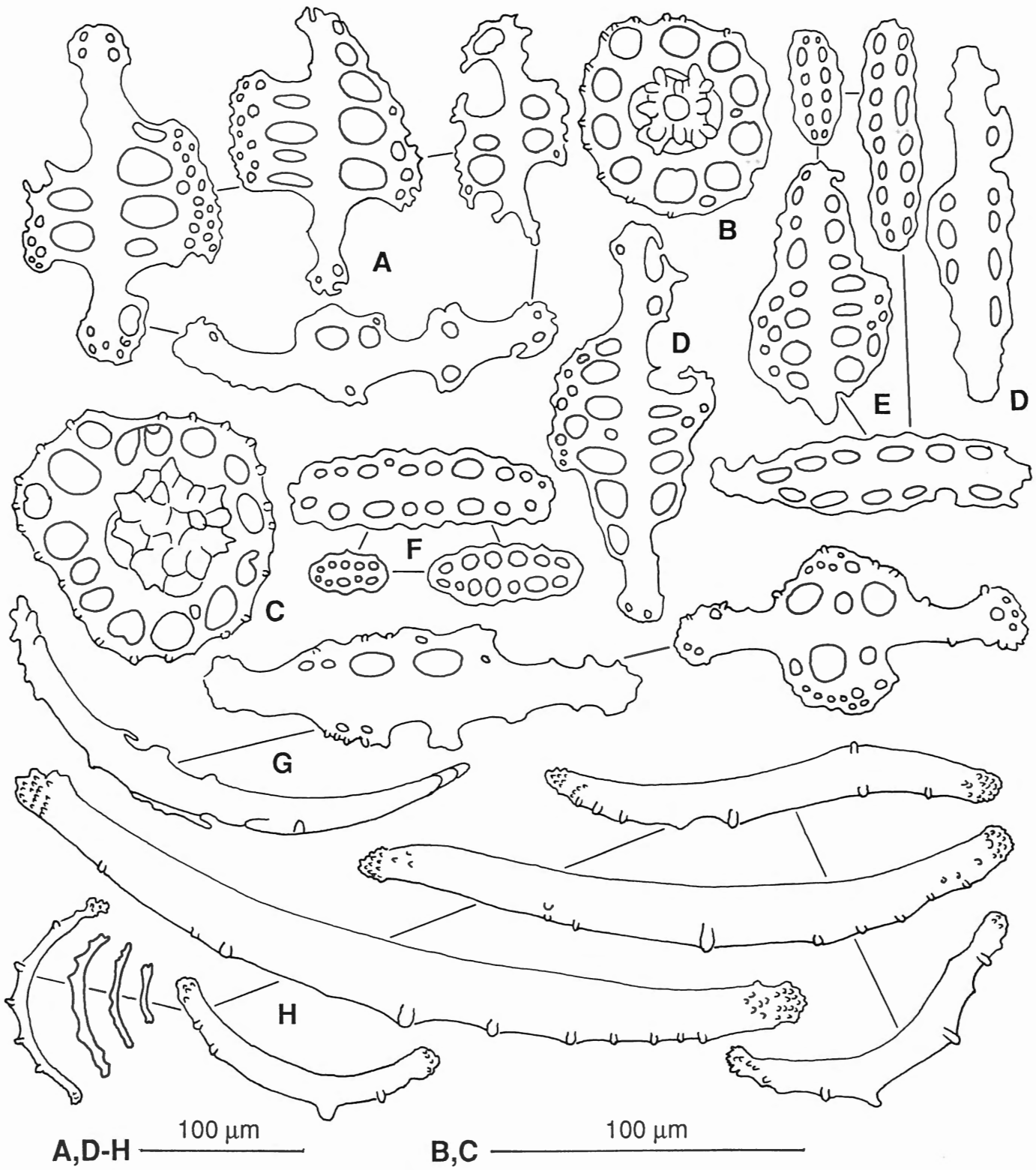


Fig. 8. – *Holothuria (Lessonothuria) hawaiiensis* FISHER, 1907. A: rods of the small dorsal papillae; B: table of the large dorsal papillae (base); C: tables of the large dorsal papillae (apex); D: rods of the large dorsal papillae (base); E: plates of the large dorsal papillae (base); F: plates of the large dorsal papillae (apex); G: rods of the large dorsal papillae (apex); H: rods of the tentacles.

in diameter) with a squarish disc and an irregular crown of spines (fig. 7C). The buttons are gathered in small heaps corresponding to the minute white dots previously mentioned. Buttons of the dorsal body wall are 35-75 μm long, knobbed and irregular. Complete buttons have 3-6 pairs of holes (fig. 7D). The buttons of the ventral body wall (fig. 7E) are 30-65 μm long, irregular and somewhat less knobbed than the dorsal ones.
In the tube feet, there are tables (fig. 7F) similar to those of the body wall; the terminal plate is 410 μm, 550 and 630 μm in diameter in the 55, 90 and 120 mm long specimens, respectively. This plate is surrounded by perforated plates (fig. 7G). Going from the apex to the base of the tube feet, the perforated plates are gradually replaced by rods with perforated ends and centro-lateral perforated process (fig. 7H). These rods are 215-380 μm long.
In the small dorsal papillae there are tables, larger than those of the body wall (up to 90 μm in diameter), and perforated rods (150-230 μm long) (fig. 8A). In the large dorsal papillae there are tables (70-90 μm in diameter) (fig. 8B, C), perforated rods (220-270 μm long) (fig. 8D, G) and perforated plates, 50-200 μm long (fig. 8E, F). All the tables of the papillae have always one cross beam.
In the tentacles, there are only rods, 35-530 μm long with spiny ends and a few short, blunt spines on the shaft (fig. 8H).

ECOLOGY

Holothuria hawaiiensis has been collected between 1 and 18 m depth at Hanga Roa, Hanga Piko and Vaihu. It lives, firmly attached by the tube feet, under stones and in crevices. The Cuvierian organs are readily expelled at the first touch.

DISTRIBUTION

Madagascar, Tasman Sea, Great Barrier Reef, Cook Is., Hawaii and Easter Island (see map 3).

REMARKS

The smallest specimen has been identified as *Holothuria (Theelothuria) squamifera* SEMPER, 1868 by DI SALVO *et al.* (1988) (USNM n° 34003). However, a comparison with *H. squamifera* from Indonesia shows that the specimen from the USNM does not belong to this species: general aspect, consistency of the body wall, number of tentacles and ossicles are different from *H. squamifera*.
The three specimens fit well with the description of *Holothuria hawaiiensis* given by FISHER (1907). The *H. hawaiiensis* from Easter Island differ from those of Hawaii by the lack of the tables with three cross beams between the pillars and by the colour of the body wall. Those differences are possibly linked to growth since the specimens from Easter Island are larger (55-120 mm long) than those of Hawaii (maximum 45 mm long) or the one of Madagascar (40 mm).
Up to 1988, *H. hawaiiensis* was recorded only from Hawaii. CHERBONNIER (1988) identified it from Madagascar. Its presence at Easter Island suggests a very wide Indo-Pacific distribution. This point of view is confirmed by records from Cook Is. (West Pacific) and Elizabeth Reef (Tasman Sea) by ROWE & FILMER-SANKEY (1992) and from Heron I. (GBR) by ROWE (unpublished data).
The identification of *H. hawaiiensis* by CHERBONNIER (1979) from the Red Sea is doubtful since it is based on juveniles (7-10 mm long) with only 12 tentacles and the form and distribution of the 'buttons' spicules precludes identification with *H. hawaiiensis*.

Family Stichopodidae HAECKEL, 1886
G. *Stichopus* BRANDT, 1835
Stichopus monotuberculatus (QUOY & GAIMARD, 1833)
Figs. 9, 10 & Pl. 1C, D

SYNONYMY

Holothuria monotuberculata QUOY & GAIMARD, 1833: 131, [pl. 432, fig. 1].
Stichopus monotuberculatus; CHERBONNIER, 1952: 23, pl. 3, fig. 4, text-fig. 8a-t; CLARK & ROWE, 1971: 178; ROWE & GATES, 1995: 325 (discussion of validity of *S. variegatus*).
Stichopus variegatus SEMPER, 1868: 73, pl. 16, pl. 30 figs. 1, 6, pl. 35 figs. 1, 11-13 (part: Philippine specimens); CLARK, 1920: 147; CODOCEO, 1974: 53; LIAO, 1975: 204; SLOAN *et al.*, 1979: 124; TAN TIU, 1981: 66 (partim), pl. 8 figs. 1-2; REYES-LEONARDO, 1984: 152 (partim), pl. 9 fig. 2a-g, pl. 10 fig. 1a-e; MARSH, 1986: 74; CASTILLA & ROZBACZYLO, 1987: 211; CHERBONNIER, 1988: 151, fig. 62A-S (synonymy and literature records before 1974); CHAO & CHANG, 1989: 115, figs. 9, 29D, 32C.
Stichopus chloronotus; DI SALVO *et al.*, 1988: 460.

MATERIAL

Easter Island, Hanga Piko (just south of Hanga Roa), USNM G825 (one specimen); Motu Tautara, USNM E34002 (one specimen); Hanga Roa, IRSNB IG28126/17 (one specimen); Ana Kai Tangata, IRSNB IG28126/46 (one specimen).

DESCRIPTION

Three specimens are contracted and measure 145 × 65, 145 × 80 and 180 × 60 mm. The fourth one (IRSNB, IG28126/46) is broken in several pieces and is not measurable. The living specimens are pale brown to rust coloured dorsally and ventrally (pl. 1C, D). Dorsally, there are numerous white and deep brown dots. The white dots often clumped together forming a whitish surface (pl. 1D). Dorsally, the numerous papillae have a white apex. One row of 9-10 very large papillae on each side of the body, posterior ones being the largest. The tube feet are well developed and abundant along the three ventral ambulacra. They are located on 3-6 rows along the lateral ambulacra and on 8-14 rows along the median ambulacrum. The tube feet are translucent, ending in a large deep brown sucker. There is a circle of papillae around the 20 large tentacles.

The calcareous ring has large radial pieces and narrow interradial pieces (fig. 9A). The radial pieces have a posterior notch and four short anterior points whereas the interradial pieces have a long anterior tooth. There is one large Polian vesicle and one contorted stone canal, embedded in the dorsal mesentery.In the dorsal body wall, there are tables (fig. 9B), rosettes (fig. 9C) and C-shaped rods (fig. 9D, E). The tables are small (35-60 μm in diameter) with a squarish disc perforated by 4 large central holes and 3-10 small peripheral holes. The four short pillars are united by one cross beam and end in a crown of spines which is often as wide as the disc. In a few large tables, the disc is perforated by numerous holes of variable size (fig. 9B). The rosettes are 25-45 μm long, sparse and irregular (fig. 9C). The C-shaped rods are 45-75 μm long, smooth or with a few excrescences (fig. 9D, E). In the ventral body wall, there are only tables (fig. 9F) which are very small (30 μm in diameter) with a few exceptions.

At the base of the dorsal papillae, the ossicles are the same as in the body wall whereas at the apex there are large perforated plates (fig. 9G), smooth or spiny rods (fig. 9H) 170-500 μm long, a few tables (fig. 9J) and C-shaped rods (fig. 9K). In the tube feet there are reduced tables (25-50 μm in diameter) (fig. 10A), sometimes without pillars, perforated plates (100-120 μm long) (fig. 10B) and spiny rods (320-500 μm long) with an enlarged central process, very often perforated (fig. 10C).

In the tentacles there are rods, spiny at their ends (fig. 10D, E, F). They are 100-850 μm long at the base of the tentacles (fig. 10D) and 25-75 μm long at their apex (fig. 10F). The smallest rods are spiny on their whole length.

ECOLOGY

Stichopus monotuberculatus was observed only on the west coast of Easter Island (Motu Tautara, Hanga Roa, Hanga Piko, Ana Kai Tangata) from tide pools up to 45 m depth. It forages on the substrate mainly at night, as previously observed by DI SALVO *et al.* (1988).

DISTRIBUTION

Stichopus monotuberculatus is widely distributed in the Indo-Pacific Ocean from the Red Sea and Madagascar to Easter Island, and from Japan to Australia (see map 3).

REMARKS

All specimens observed are *Stichopus monotuberculatus*. The specimen of the USNM (E34002) identified by DI SALVO *et al.* (1988) is not a *S. chloronotus* because of the colour of the body wall and of the shape of the rosettes in the dorsal body wall. However, the rosettes are sparse whereas they are numerous in *S. monotuberculatus* from other Indo-Pacific areas (see CHERBONNIER, 1988). Moreover, a few rosettes have been mentioned in the body wall of some *S. chloronotus* (THÉEL, 1886; SLUITER, 1887; MITSUKURI, 1912). However, these rosettes are derived from C-shaped rods and not similar to those of the figure 9C. *S. monotuberculatus* appears to exhibit a wide colour range from green/bluish-green to orange-brown.

The specimen labeled USNM G825 is damaged and large pieces of the skin are torn away; most of the ossicles are broken; rosettes and C-shaped rods are missing. However, the general aspect of the specimen and of the remaining ossicles of the body wall and the tentacles match with *S. monotuberculatus*.

Order APODIDA BRANDT, 1835
Family Synaptidae BURMEISTER, 1837
Genus *Euapta* OESTERGREN, 1898
Euapta godeffroyi (SEMPER, 1868)
Fig. 11

SYNONYMY

Synapta godeffroyi SEMPER, 1868: 231, pl. 39 fig. 13. *Euapta godeffroyi*; LIAO, 1975: 221, fig. 23(1-6); ROWE & DOTY, 1977: 235, figs. 5c, 8h; SLOAN *et al.*, 1979: 124; CHERBONNIER & FÉRAL, 1984: 837, fig. 22A-G; FÉRAL & CHERBONNIER, 1986: 104; MARSH, 1986: 74; CANNON & SILVER, 1986: 41, figs. 8h, 10g; DI SALVO *et al.*, 1988: 460; CHERBONNIER, 1988: 249, fig. 11A-J (synonymy and literature records before 1975); THANDAR & ROWE, 1989: 151, fig. 4(a-i); MARSH *et al.*, 1993: 64; KERR, 1994: 171; ROWE & GATES, 1995: 332, fig. 14.

MATERIAL

Easter Island, Tahai (just north of Hanga Roa), USNM E34005 (3 specimens).

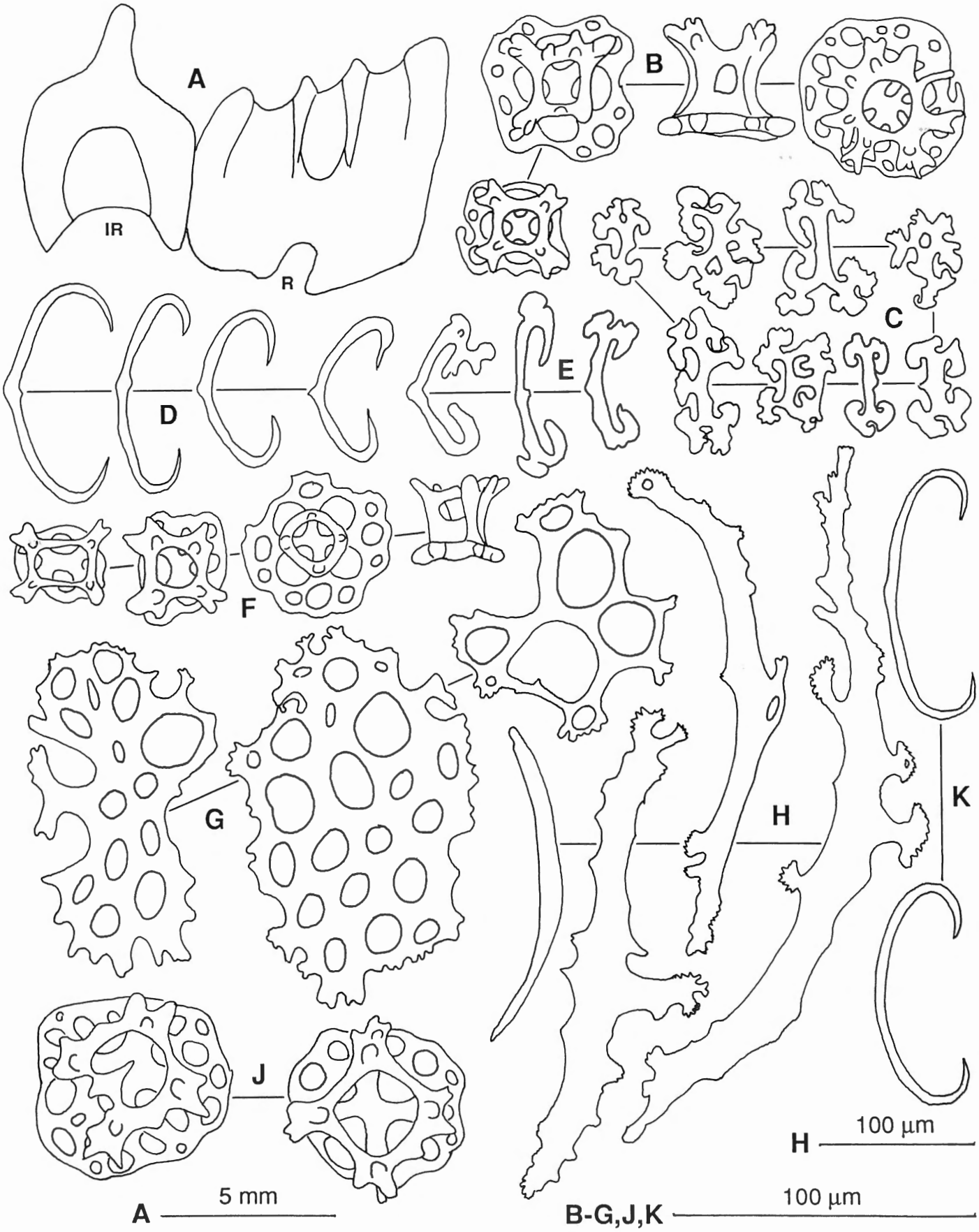


Fig. 9. – *Stichopus monotuberculatus* (QUOY & GAIMARD, 1833), 1868. A: calcareous ring (r: radial piece; ir: interradial piece); B: tables of the dorsal body wall; C: rosettes of the dorsal body wall; D-E: C-shaped rods of the body wall; F: tables of the ventral body wall; G: perforated plates of the dorsal papillae (apex); H: rods of the dorsal papillae (apex); J: tables of the dorsal papillae (apex); K: C-shaped rods of the dorsal papillae (apex).

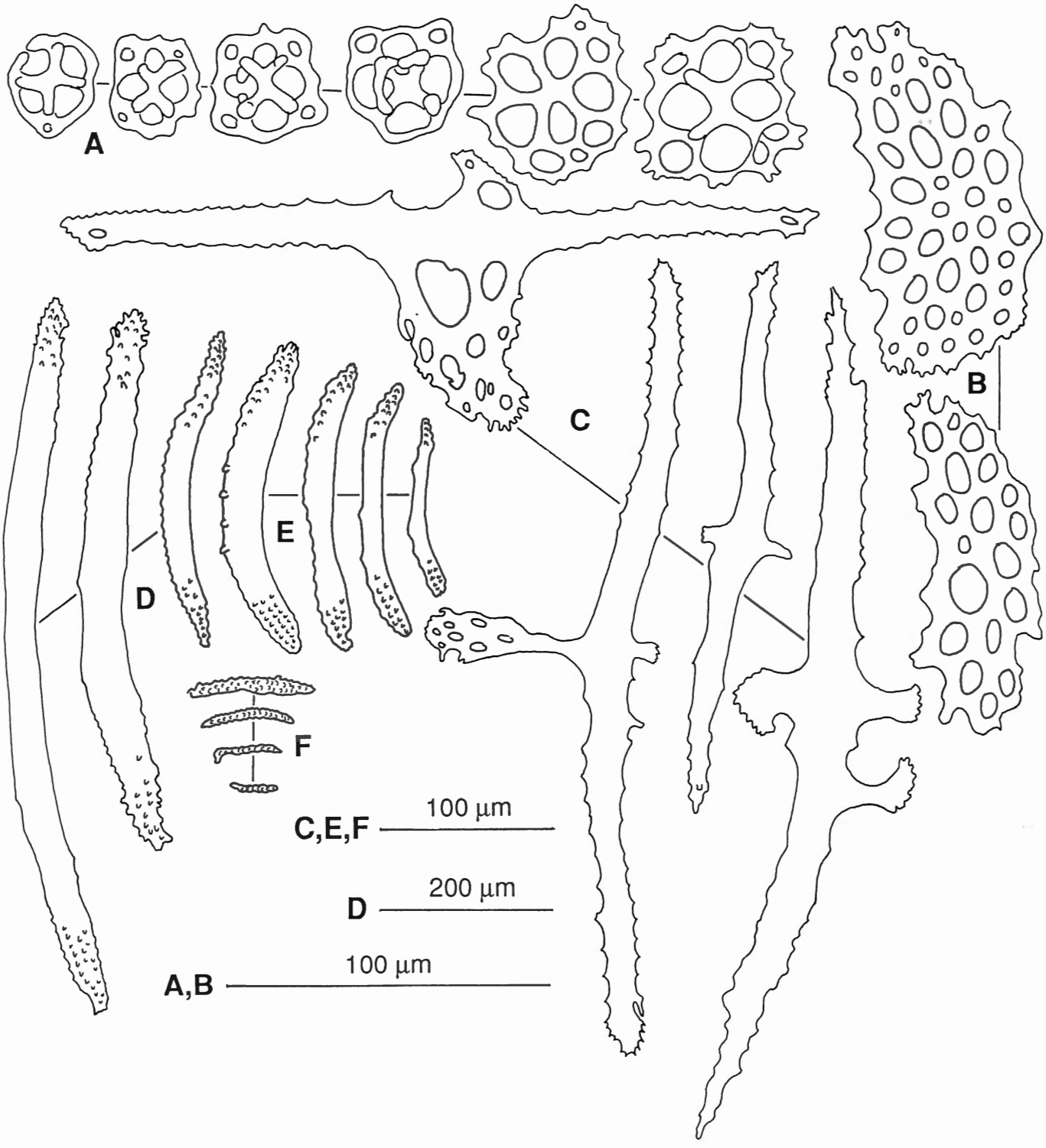


Fig. 10. – *Stichopus monotuberculatus* (QUOY & GAIMARD, 1833). A: tables of the tube feet; B: perforated plates of the tube feet; C: rods of the tube feet; D-F: rods of the tentacles.

DESCRIPTION

The three specimens are 140, 280 and 290 mm long on 14.5, 13.5 and 13 mm in diameter, respectively. The 290 mm long specimen is lacking the tentacles and calcareous ring, whereas the 140 mm long specimen is without its posterior part. In alcohol, the specimens are uniformly beige. The body wall presents numerous folds and is rough but not sticky to the touch. Each ambulacrum is marked by a longitudinal ridge, the three ventral ones being more prominent. There are 17-19 tentacles each with 15-20 pairs of digits. Because of the contraction of the specimens, the presence of a web between the digits is difficult to assert. There is one stone canal and at least 23 Polian vesicles, some of them being very short. The calcareous ring is green and comprises 15 pieces with two interradial pieces alternating with one radial piece (fig. 11A); radial and interradial pieces have more or less the same width, the radial pieces being perforated; there is no cartilaginous ring.

In the body wall there are anchors and anchor-plates which are similar in size and form anteriorly and posteriorly. The anchors are 316 ± 16 μm long and 190 ± 10 μm wide (n = 18). The arms are smooth, the vertex bears numerous small granules or short blunt spines (fig. 11B) and the stock is branched and spiny (fig. 11C). The anchor-plates are 215 ± 8 μm long and 155 ± 8 μm wide (n = 10) (fig. 11D). They are oval with the posterior part narrower. There are seven large serrated holes. The two articular holes are smooth and there are 1-2 (exceptionally 3) posterior small holes. The bridge is well developed, smooth or slightly serrated. There are no miliary granules in the body wall.

In the tentacles there are only rods (fig. 11E), 100-230 μm long, smooth with granulous ends (fig. 11F).

ECOLOGY

Euapta godeffroyi has been observed between 15 and 55 m depth (DI SALVO *et al.*, 1988) and as *Polyplectana kefersteini* is more active at night.

DISTRIBUTION

Euapta godeffroyi is known from the Red Sea and South Africa to Hawaii and Easter Island and from China to New Caledonia (see map 3).

REMARKS

The specimens fit well with *Euapta godeffroyi* (SEMPER, 1868), by their general form, by their calcareous ring, anchors and anchor-plates. However, they differ in the number of tentacles, by the absence of miliary granules and by the smooth rods of the tentacles. *E. godeffroyi* has 12-16 tentacles with granulous rods, and miliary granules in the body wall (SEMPER, 1868; SLUITER, 1901; FISHER, 1907; CHERBONNIER, 1955; LIAO, 1975; CANNON & SILVER, 1986; CHERBONNIER, 1988; THANDAR & ROWE, 1989). The absence of miliary granules could be explained by the acidity of the preserving fluid that could readily dissolve those minute ossicles. The anchors and anchor-plates show, indeed, strong corrosion marks. The same problem of acidity could explain the smooth tentacular rods presenting also corrosion evidences.

The number of tentacles being highly variable within some species, the difference between 12-16 and 17-19 is not sufficient to characterize even a subspecies. Specimens originating from localities between Samoa Islands and Easter Island would be useful to check a possible gradation in the tentacle number of *E. godeffroyi*.

Genus *Polyplectana* H.L. CLARK, 1907
Polyplectana kefersteini (SELENKA, 1867)
Fig. 12

SYNONYMY

Synapta Kefersteini SELENKA, 1867: 360, pl. 20, figs. 120-121.

Polyplectana kefersteini; CLARK, 1907: 16 & 77, pl. 4, figs. 20-22; ROWE & DOTY, 1977: 235, figs. 5b, 8f; SLOAN *et al.*, 1979: 124; CHERBONNIER & FÉRAL, 1984: 840, fig. 24A-N (synonymy); FÉRAL & CHERBONNIER, 1986: 106; CANNON & SILVER, 1986: 42, figs. 2m, 11b; DI SALVO *et al.*, 1988: 460; CHAO & CHANG, 1989: 121, figs. 24, 31E; ROWE & GATES, 1995: 334.

MATERIAL

Easter Island, USNM E33998 (one specimen); Hanga Roa, IRSNB IG28126/18 (one specimen).

DESCRIPTION

The two specimens examined measure 165 and 370 mm long on 8 and 18 mm in diameter, respectively. Living specimen are brownish-red. In alcohol they are uniformely brown or pale beige. The body wall is thin and sticky to the touch. There are 25 tentacles with numerous lateral digits (30-40 pairs) not united by a web. The calcareous ring is completely embedded in a huge cartilaginous ring (fig. 12A). The calcareous ring is white, with the radial pieces perforated for the nerve. Two interradial pieces alternate with one radial piece (fig. 12A), the ring comprising 15 pieces. Polian vesicles are numerous (more than 30).

The ossicles of the body wall are anchors and anchor-plates. The anchors (fig. 12B) have smooth arms with a few knobs on the vertex; their stock has a spinous rim,

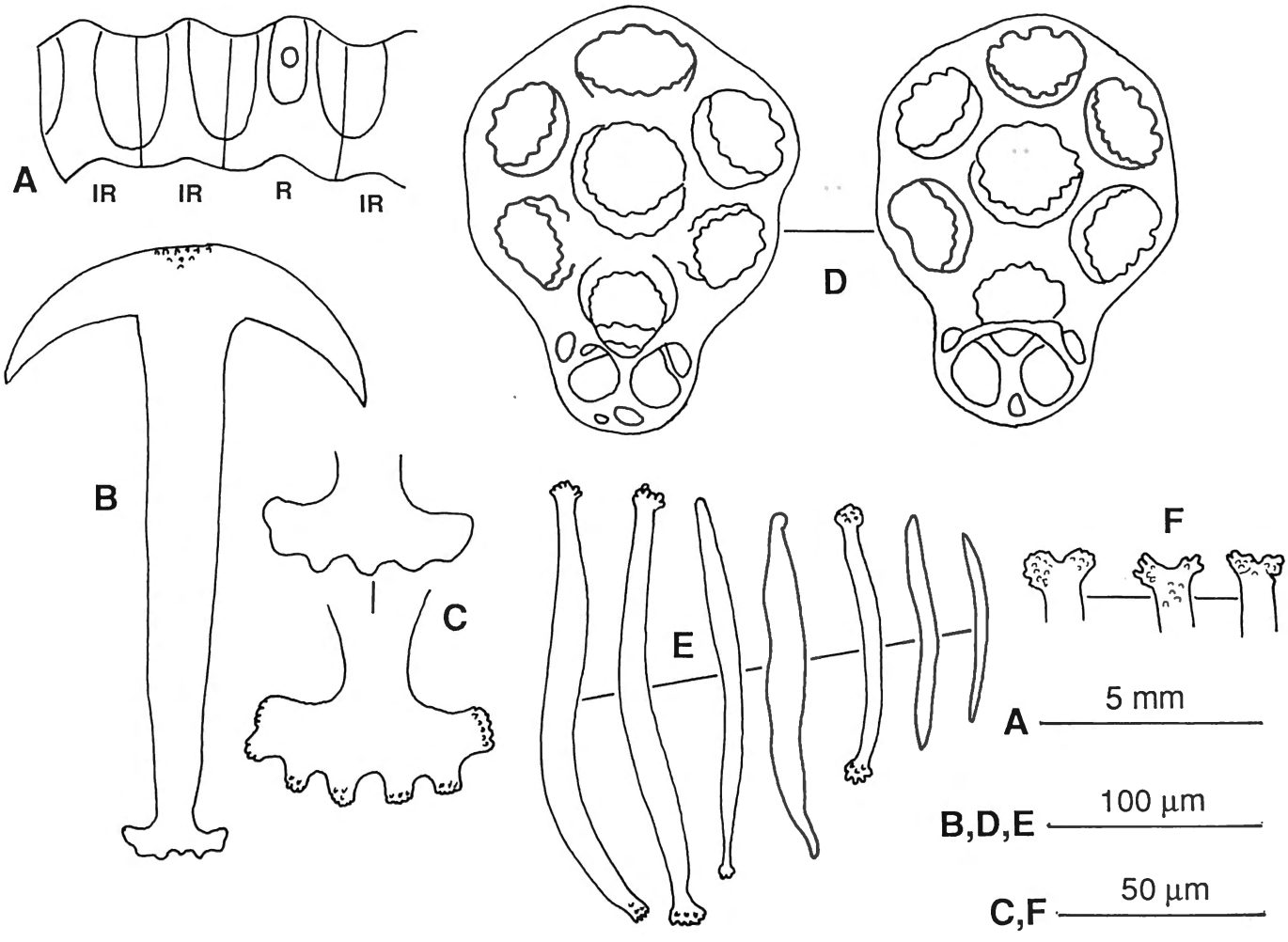


Fig. 11. – *Euapta godeffroyi* (SEMPER, 1868). A: calcareous ring (r: radial piece; ir: interradial piece); B: anchor; C: stocks of anchors; D: anchor-plates; E: rods of the tentacles; F: extremities of the tentacular rods.

spines being sometimes clumped, suggesting a subdivision of the stock in several lobes (fig. 12C). The anterior anchors are 315 ± 5 µm long (n = 10) and 196 ± 4.5 µm wide (n = 10), whereas the posterior ones are 293 ± 16 µm long (n = 10) and 171 ± 7 µm wide (n = 10). The anchor-plates are oval (fig. 12D, E), perforated by seven dentated holes, the posterior one being smooth. Posteriorly, there are two large smooth articular holes and several small posterior holes. The bridge is well developed, smooth or exceptionnally with one or two very short blunt spines. The anteriorly located anchor-plates have 6-7 posterior small holes (fig. 12D), the posteriorly located only 3-5 (fig. 12E). The anteriorly located anchor-plates are somewhat larger (248 ± 3 µm long and 170 ± 10 µm wide, n = 10) than the posteriorly located (213 ± 6 µm long and 167 ± 5 µm wide; n = 10).

In the body wall no rosettes nor miliary granules have been observed. There are no ossicles in the tentacles.

DISTRIBUTION

P. kefersteini is known from the Red Sea and Aldabra to Easter Island and from China to New Caledonia (see map 4).

ECOLOGY

The two *P. kefersteini* have been collected at 14 and 15 m depth. During day time *P. kefersteini* hides in crevices; it is more active at night, foraging on the substrate.

REMARKS

Colour, calcareous ring, tentacles and ossicles of the specimens fit well with *P. kefersteini*. However, some

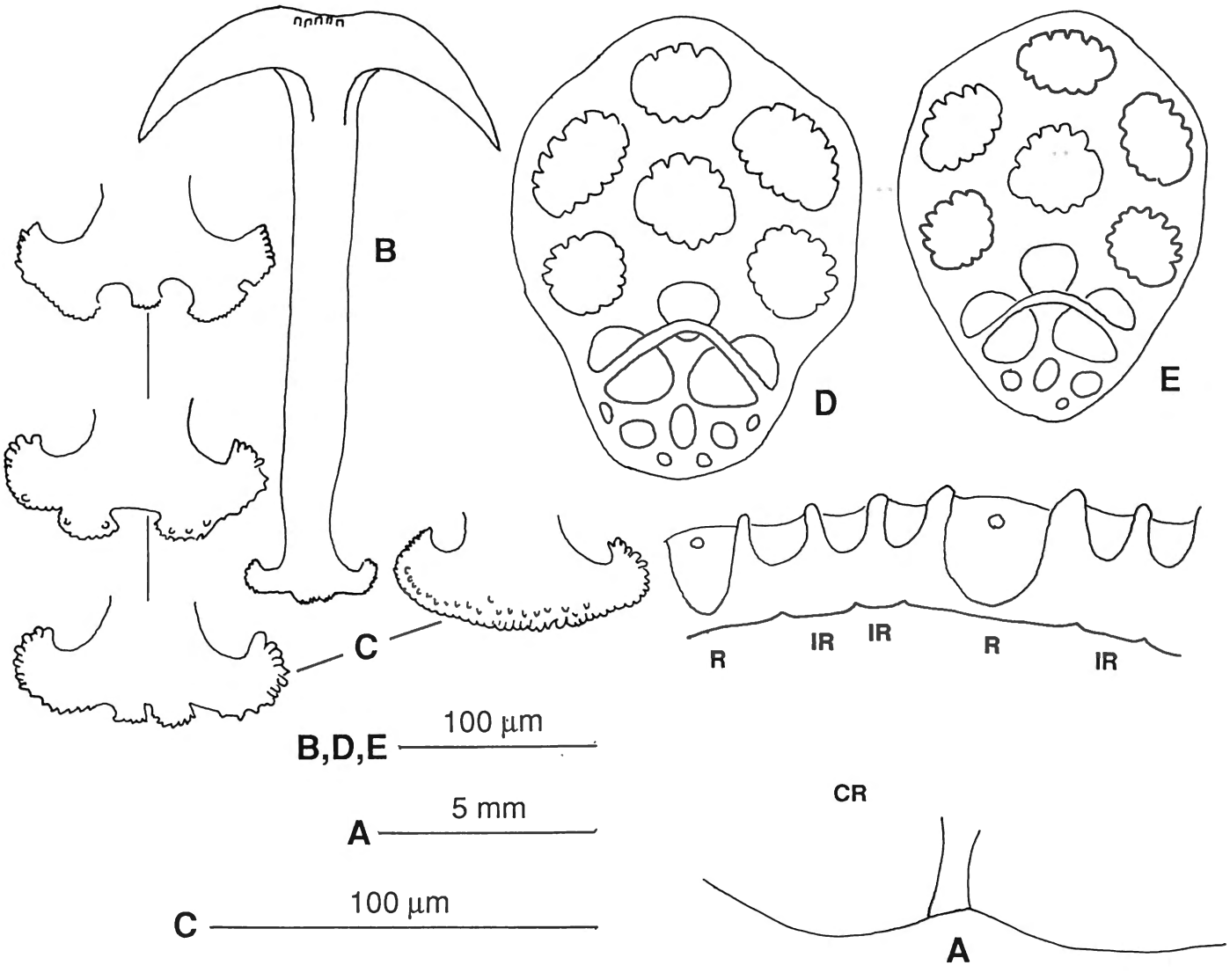


Fig. 12. – *Polyplectana kefersteini* (SELENKA, 1867). A: calcareous ring and cartilaginous ring (r: radial piece; ir: interradial piece; cr: cartilaginous ring); B: anchor; C: stocks of anchors; D: anchor-plate anteriorly located; E: anchor-plate posteriorly located.

variability occurs in the ossicles. The bridge of the anchor-plate of *P. kefersteini* is described or figured as well dentated (HEDING, 1928; LIAO, 1975; ROWE & DOTY, 1977; CHERBONNIER & FÉRAL, 1984; CHAO & CHANG, 1989). The specimens from Easter Island have a smooth bridge (as in the original drawing of SELENKA) or with 2-3 faint blunt spines. Moreover there are no small branched ossicles (miliary granules) which are said to be characteristic of the species (CHERBONNIER & FÉRAL, 1984). The absence of miliary granules can be linked to problems of dissolution in the preserving fluid but also to intraspecific variations. Other ossicles, as the ones of the tentacles, are absent according to SELENKA (1867), CLARK (1907), CHERBONNIER & FÉRAL (1984) and the present study whereas they are said to be present according to CHAO & CHANG (1989).

The two specimens at hand appears to fit *Polyplectana galatheae* HEDING, 1928, the only *Polyplectana* species described has lacking miliary granules. However, HEDING (1928) erected this species from a single specimen which, considering the susceptability of delicate ossicles to poor preservation techniques, suggests it is of doubtful validity. *P. galatheae* is most probably a synonym of *P. kefersteini.*

Family Chiridotidae OESTERGREN, 1898
Genus *Chiridota* ESCHSCHOLTZ, 1829
Chiridota rigida SEMPER, 1868
Fig. 13

SYNONYMY

Chiridota rigida SEMPER, 1868: 18, pl. 3 fig. 3, pl. 5 figs. 3, 13, pl. 6 fig. 4, pl. 8 fig. 11; THÉEL, 1886: 35; LUDWIG, 1888: 819; BEDFORD, 1889: 143; LUDWIG, 1889-92: 359; SLUITER, 1901: 133; CLARK, 1907: 117, pl. 2 fig. 3, pl. 7 figs. 26-29 (synonymy); CLARK, 1920: 125; CLARK, 1921: 162; HEDING, 1928: 284; HEDING, 1929: 149, fig. 6(1-10); DOMANTAY, 1933: 90, pl. 3 fig. 7a-f; CLARK, 1938: 555; CLARK, 1946: 457; CLARK & ROWE, 1971: 188, pl. 31 fig. 9; LIAO, 1975: 223, fig. 26(1-5); ROWE & DOTY, 1977: 26, figs. 4h, 8d; CANNON & SILVER, 1986: 43, figs. 2o, 11f; DI SALVO *et al.*, 1986: 460; CHAO & CHANG, 1989: 121, figs. 28, 35CB; THANDAR & ROWE, 1989: 153, fig. 5(a-h); MARSH *et al.*, 1993: 65; KERR, 1994: 172; ROWE & GATES, 1995: 266.

MATERIAL

Easter Island, Hanga Piko (just north of Hanga Roa), USNM E34000 (3 specimens).

DESCRIPTION

The three specimens observed have, in preservative, contracted to become bottle-shaped with a more or less long, narrow "tail". They are 27, 30 and 45 mm long, their diameter at the largest point being 6, 7 and 4.5 mm respectively. The "tail" has an average diameter of 2 mm. Specimens are also C-shaped (fig. 13A) indicating animals living in the sand with mouth and anus at level with the sand surface. The skin is smooth and thin with white wheel-filled papillae located on the dorsal and ventral surfaces. Ventrally the papillae are sparse, even lacking at mid-body. Dorsally they are much more crowded, especially anteriorly and posteriorly (fig. 13A); no rows can be detected. In alcohol the colour of the anterior and posterior parts is beige whereas in between it is whitish translucent. There are large longitudinal muscles. The mouth, surrounded by 12 tentacles each with 4 pairs of long digits, and the anus are terminal.

The ossicles of the body wall are wheels, C-shaped rods and straight rods. The wheels (fig. 13B) are gathered in the wheel papillae. They are 45-105 μm in diameter, with six spokes, and are dentated on their inner edge. The C-shaped rods (fig. 13C, D) are present in the wheel papillae and in the body wall. Those of the wheel papillae are 40-55 μm long and have smooth or slightly bifurcated ends (fig. 13C). Those of the body wall are 35-50 μm long (fig. 13D). The rods of the body wall (fig. 13E) are 35-65 μm long, massive or thin with smooth or slightly knobbed ends.

In the tentacles there are 50-105 μm long, straight smooth rods with forked ends (fig. 13F). A few rods have serrated edges.

DISTRIBUTION

Chiridota rigida is mainly known from the Pacific Ocean, from Indonesia to Easter Island and from China and Hawaii to Northern Australia (see map 4). There are two records from the Indian Ocean (North West Coast of Australia) by MARSH *et al.* (1993) and South Africa by THANDAR & ROWE (1989).

REMARKS

The three specimens fit particularly well with the description of *Chiridota hawaiiensis* FISHER, 1907. However, this species, together with *C. liberata* SLUITER, 1887 and *C. amboinensis* LUDWIG, 1888 are considered by CLARK (1907) as synonyms of *Chiridota rigida* SEMPER, 1868, a highly variable species. This opinion is not followed by HEDING (1928; 1929) and CLARK & ROWE (1971). However, THANDAR & ROWE (1989) admitted the high variability of *C. rigida* and the possible synonymy of *C. hawaiiensis* with *C. rigida*.

One of the main differences between both *C. hawaiiensis* and *C. liberata*, and *C. rigida* is the number of digits on each tentacle: 8-10 versus 12-13, respectively (SEMPER, 1868; SLUITER, 1887; BEDFORD, 1898, 1899; FISHER, 1907; DOMANTAY, 1933). However, the holotype of *C. liberata* and *C. hawaiiensis* are small specimens (28-30 mm and 15-45 mm long, respectively), smaller than the smallest *C. rigida* described by SEMPER (1868; 50-75 mm long) or DOMANTAY (1933; up to 75 mm). All the specimens collected up til now on Easter Island were also small specimens: 25-30 mm long (CLARK, 1920) or 27-45 mm long (present study based on the material of DI SALVO *et al.*, 1988).

As already mentioned by CLARK (1907) for the genus *Chiridota*, "...the number and length of digits on the tentacles is closely correlated with age and size...". *C. liberata* and *C. hawaiensis* could thus be considered as juvenile of *C. rigida*. This opinion is reinforced by the fact that *C. liberata*, and to a lesser extent *C. hawaiiensis*, have body wall rods with smooth ends whereas they are knobbed or branched for *C. rigida*. It is also known for other holothurians that with increasing size, ossicles become more and more spiny or knobbed (MASSIN, 1994). CLARK's synonymies (1907) are thus acceptable.

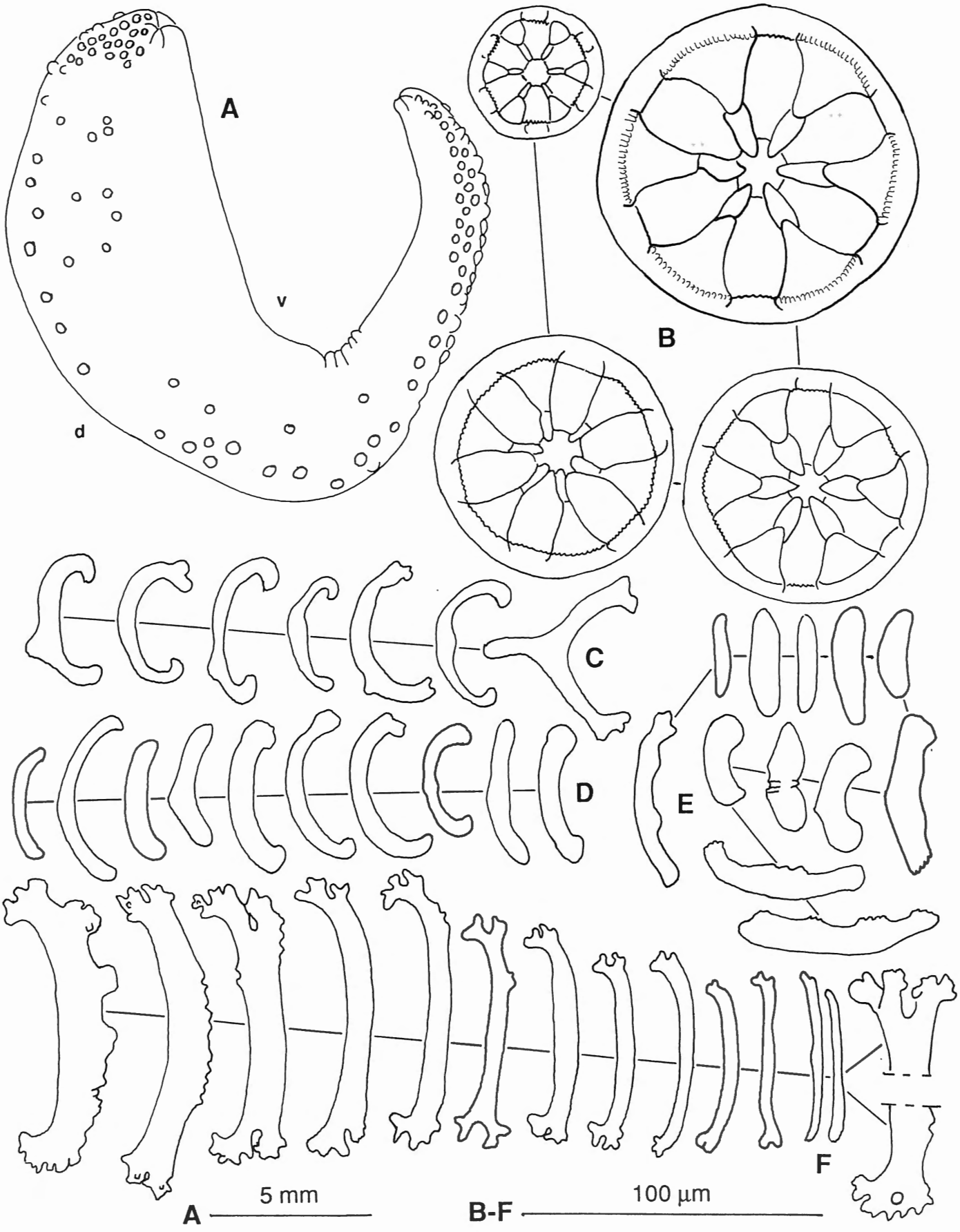


Fig. 13. – *Chiridota rigida* SEMPER, 1868. A: general view of a specimen (d: dorsal surface; v: ventral surface); B: wheels; C: C-shaped rods of the wheel papillae; D: C-shaped rods of the body wall; E: rods of the body wall; F: rods of the tentacles.

Genus *Polycheira* H.L. CLARK, 1907
? *Polycheira rufescens* (BRANDT, 1835)
Fig. 14

SYNONYMY

Chiridota rufescens BRANDT, 1835: 59.
Polycheira rufescens; CLARK, 1907: 120; LIAO, 1975: 225; SLOAN *et al.*, 1979: 125; ROWE, 1983: 161; CANNON & SILVER, 1986: 43, fig. 8k; RHO & SIN, 1986: 252, pl. 5, figs. 1-8; DI SALVO *et al.*, 1988: 460; CHAO & CHANG, 1989: 121, figs. 27, 31f, 35D; THANDAR, 1989: 451, figs. 1a, 2a-j (synonymy); ROWE & GATES, 1995: 267.
Polycheira fusca; CHERBONNIER, 1952: 16, fig. 5A-H; CHERBONNIER, 1988: 269, fig. 12A-L.

MATERIAL

Easter Island, USNM E33996 (one specimen).

DESCRIPTION

The specimen examined lacks tentacles and calcareous ring. It is 36 mm long and 8 mm in diameter. The skin is thin and tranlucent. The longitudinal muscles are very large (1.8 mm) and each marked by a white longitudinal band. The wheel papillae are densely crowded dorsally along the three ambulacral zone, especially anteriorly and posteriorly (fig. 14A). The ventral surface is without wheel papillae except a few ones near the mouth and the anus. The gut is filled with very large particles: coral rubbles up to 3.7 mm long and 2.1 mm wide.
The ossicles are miliary granules, C-shaped rods and wheels. The wheels (fig. 14B) are gathered in the wheel papillae. They have six spokes, measure 45-95 μm in diameter and have a smooth or slightly serrated inner edge. The miliary granules are smooth and 25-50 μm long (fig. 14C). The C-shaped rods (fig. 14D) are 50-100 μm long with smooth, swollen ends. The largest ones have their ends slightly knobbed.

DISTRIBUTION

Polycheira rufescens is known from the East Coast of Africa, up to South Africa to Easter Island and from Korea to Northern Australia and Fiji (see map 4).

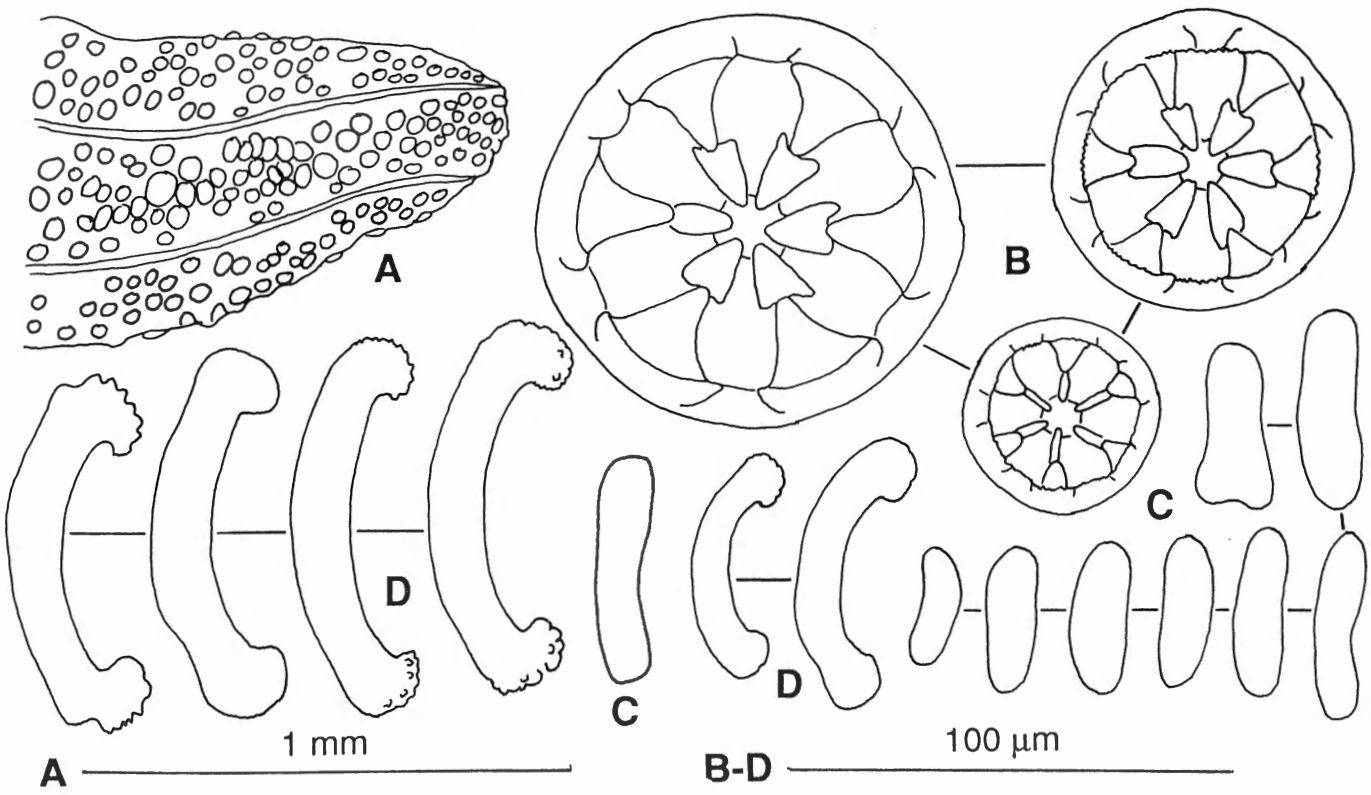


Fig. 14. – ? *Polycheira rufescens* (BRANDT, 1835). A: dorsal view of the posterior part of the specimen showing the density of wheel papillae; B: wheels; C: miliary granules; D: C-shaped rods.

REMARKS

The specimen at hand being incomplete (no tentacles, no calcareous ring, no ciliated funnels), some uncertainty remains in the identification. However, the ossicles appear to fit well with the species *Polycheira rufescens* (BRANDT, 1835).
CHERBONNIER (1952) has demonstrated, after examination of the type material, that *P. rufescens* is a junior objective synonym of *Polycheira fusca* (QUOY & GAIMARD, 1833). However, CLARK (1963), followed by the Commission of Zoological Nomenclature (OPINION 762, 1966), considers *P. fusca* as a name to be rejected. The request by CLARK (1963) is based mainly on the fact that "the name *rufescens* has been widely used for additional material of the species". Since 1966, the name *P. fusca* has only been used by CHERBONNIER (1988).

P. rufescens is a highly variable species (see HEDING, 1928; THANDAR, 1989) in which colour or size of the wheels varies according to the locality. For example, the diameter of the wheels is 70-120 μm for specimens from Taiwan (CHAO & CHANG, 1989), 28-112 μm for specimens from China (CHANG, 1934), 80-140 μm for specimens from the Gulf of Siam (HEDING, 1928), 40-100 μm for specimens of South Africa (THANDAR, 1989) and 45-95 μm for the specimen of Easter Island. Its presence at Easter Island extends its distribution further to the East.

Discussion

Table I gives a summary of the shallow water holothurian fauna of Easter Island. It is composed of nine species, three of which being dominant: *Holothuria (Platyperona) difficilis*, *Holothuria (Semperothuria) cinerascens* and *Stichopus monotuberculatus*. The shallow water holothurian fauna of Easter Island is of Indo-West Pacific origin and lacks an East Pacific component. A similar phenomenon occurs for other marine invertebrates including mollusks (REDHER, 1980). All the shallow water holothurians species of Easter Island are widespread in the Indo-Pacific area. The nine species recorded represent an impoverished fauna if compared to the one from Islands further West. The affinity of Easter Island fauna with the Indo-Pacific fauna and the impoverishment going East are well known for mollusks (REDHER, 1980) and fishes (SPRINGER, 1982). Pitcairn Island presents a similar phenomenon (PREECE, 1995). Easter Island being at the edge of distribution of the tropical reef fauna, it is not surprising that most of its holothurians are species with a very wide distribution, able to adapt to different biotopes. Less tolerant species, even if they have reached Easter Island, must have rapidly disappeared.
Only two orders of holothurians are represented at Easter Island: Aspidochirotida and Apodida. Dendrochirotida were expected to be present, if not abundant, because they often dominate in cold and temperate waters (BAKUS, 1973). Easter Island with water temperature which can drop to 15.6 °C (OSORIO, 1992) should be favorable to Dendrochirotida. Moreover, as some mollusk species have a distribution extending from South Australia to Easter Island through New Zealand and Kermadec Islands (REDHER, 1980), one could expect the same for Dendrochirotida which are very abundant in New Zealand (PAWSON, 1970). However, Dendrochirotida have not yet been recorded at Easter Island and this could be linked to their reproductive strategy. The Dendrochirotida have a short planktonic stage and are more direct developers. Moreover, going from West to East in the Pacific Ocean a strong decline has been reported for suspension feeding organisms (PREECE, 1995). This means that even if some Dendrochirotida larvae could have reached Easter Island, it is not a favourable place for the feeding strategy of their adults. Only Aspidochirotida and Apodida have *auricularia* larvae which reach metamorphosis in 2-3 weeks. If food conditions are poor, metamorphosis can be delayed for up to 7 weeks (MORTENSEN, 1938). This means that with a one knot current, larvae could reach remote Easter Island from Pitcairns Islands group (Pitcairn, Ducie, Enderson). The larval flow could also have been facilitated by the chain of seamounts connecting the Tuamotu to Easter Island. Some of them, though very important, were discovered only recently (MONASTERSKY, 1995) and others are certainly still to be discovered. The top of these seamounts are sometimes relatively shallow (100-500 m) and with the tectonic movement of the sea-floor and Quaternary sea-level fluctuations, they could have acted as stepping stones for marine shallow-water species coming from the west in the recent past.
The marine fauna of Easter Island is known for its high percentages of endemism, varying from 10 to 42% according to the phylum (REDHER, 1980; CASTILLA & ROZBACZYLO, 1987). Among Echinoderms the rate of endemism varies between zero (Holothuroidea, Ophiuroidea) and 50% (Asteroidea) (FELL, 1974; CODOCEO, 1974; DI SALVO *et al.*, 1988).
Intraspecific skeletal differences in the species *Holothuria hawaiiensis*, *Euapta godeffroyi*, *Polyplectana kefersteini* or *Chiridota rigida* appear insufficient to justify the erection of new species but could indicate the beginning of a speciation through possible isolation and insufficient inward gene flow.

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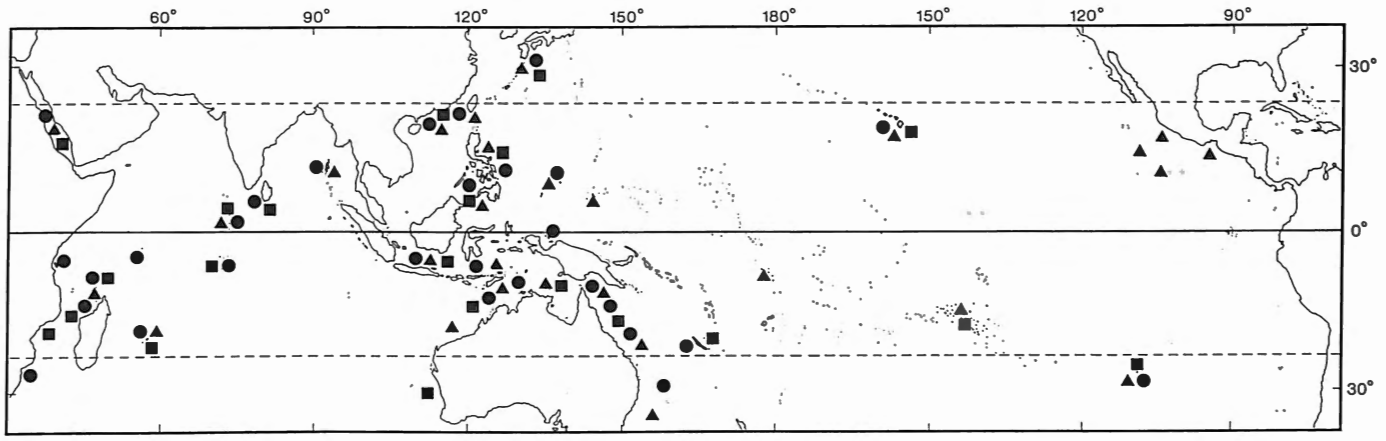
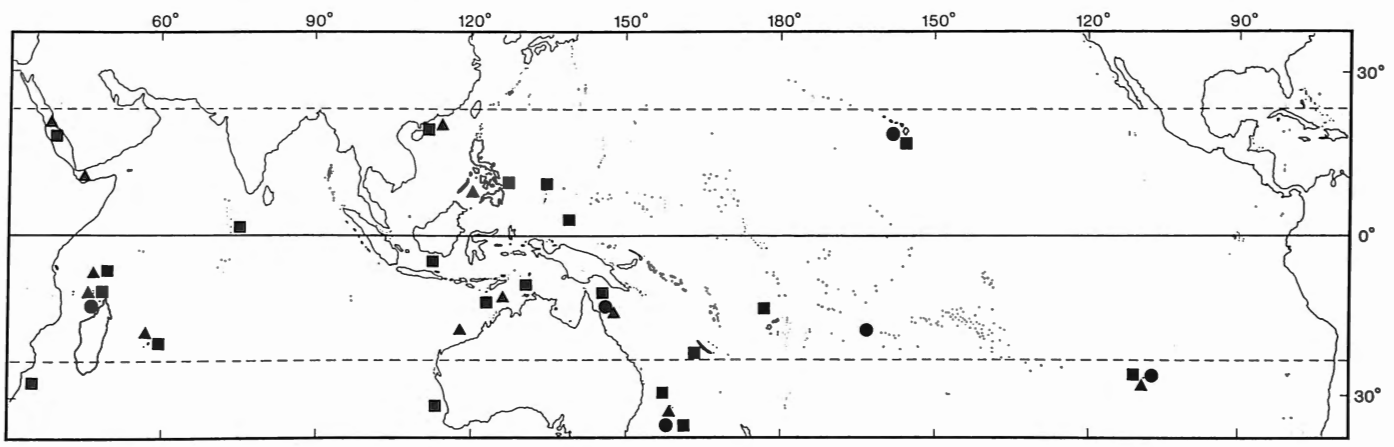
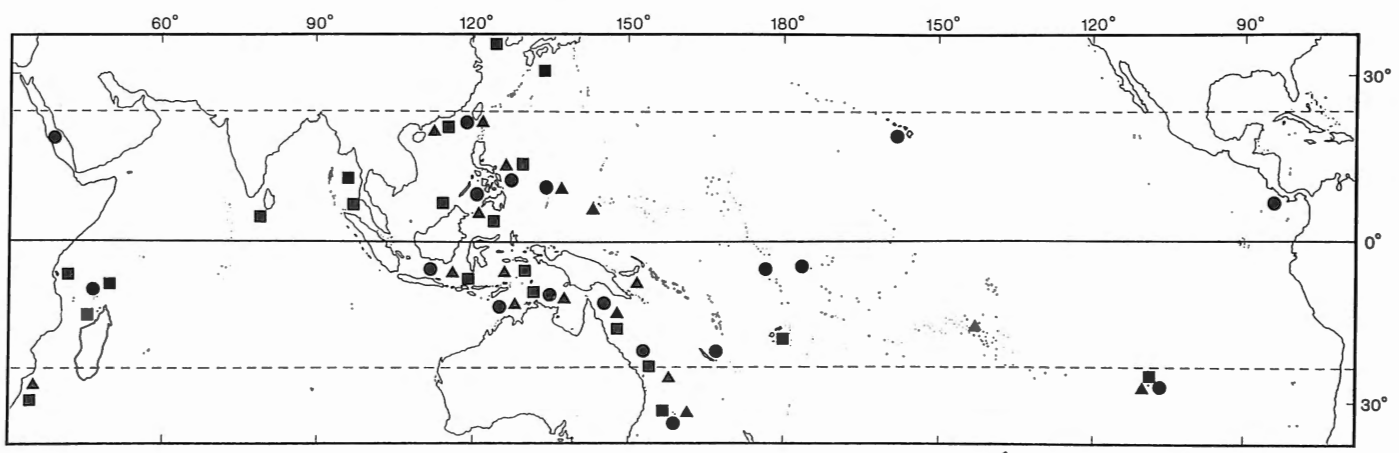


Map 2. – ●: Distribution of *Holothuria (Microthele) nobilis* (SELENKA, 1867).
▲: Distribution of *Holothuria (Platyperona) difficilis* SEMPER, 1868.
■ : Distribution of *Holothuria (Semperothuria) cinerascens* (BRANDT, 1835).



Map 3. – ●: Distribution of *Holothuria (Lessonothuria) hawaiiensis* FISHER, 1907.
▲: Distribution of *Stichopus monotuberculatus* (QUOY & GAIMARD, 1833).
■ : Distribution of *Euapta godeffroyi* (SEMPER, 1868).



Map 4. – ●: Distribution of *Polyplectana kefersteini* (SELENKA, 1867).
▲: Distribution of *Chiridota rigida* SEMPER, 1868.
■ : Distribution of *Polycheira rufescens* (BRANDT, 1835).

Table 1: Holothurian fauna of Easter Island. A: CLARK, 1920; B: DEICHMANN *et al.*, 1924; C: CODOCEO, 1974; D: REDHER, 1980; E: CASTILLA & ROZBACZYLO, 1987; F: DI SALVO *et al.*, 1988; G: present study

Present status	Cited as	A	B	C	D	E	F	G
Holothuria (Micothele) nobilis	*Holothuria nobilis*						X	X
Holothuria (Platyperona) difficilis	*Holothuria difficilis*		X				X	X
	Actinopyga parvula	X						
	Actinopyga difficilis			X		X		
Holothuria (Semperothuria) cinerascens	*Holothuria cinerascens*				X		X	X
Holothuria (Lessonothuria) hawaiiensis	*Holothuria squamifera*						X	X
Stichopus monotuberculatus	*Stichopus variegatus*	X		X		X		X
	Stichopus chloronotus						X	
Euapta godeffroyi	*Euapta godeffroyi*						X	
Polyplectana kefersteini	*Polyplectana kefersteini*						X	X
Chiridota rigida	*Chiridota rigida*	X					X	
? *Polycheira rufescens*	*Polycheira rufescens*						X	

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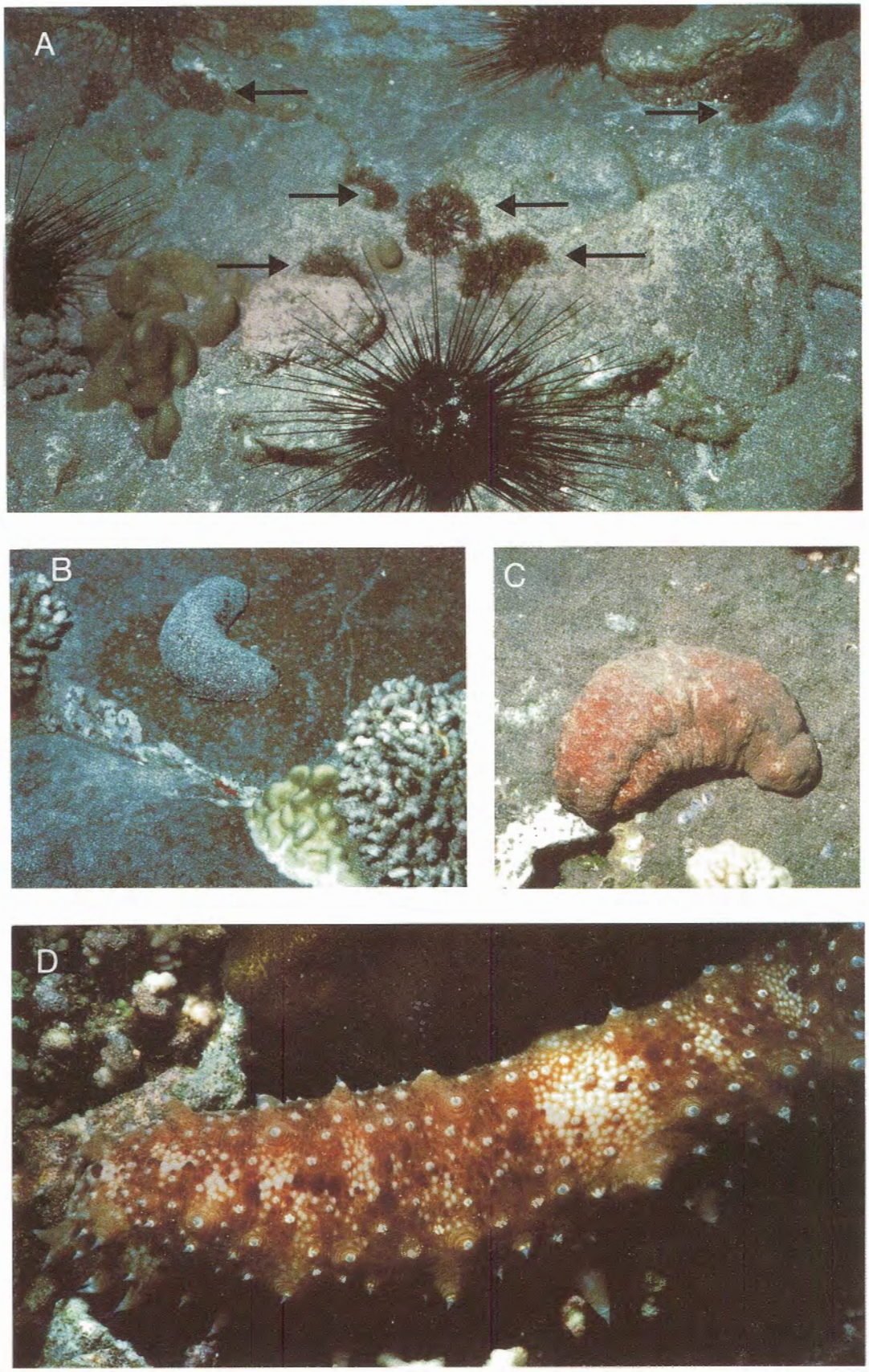

Pl. 1. – A: *Holothuria (Semperothuria) cinerascens* (BRANDT, 1867). Arrows indicate extended tentacles; B: *Holothuria (Microthele) nobilis* (SELENKA, 1867); C: *Stichopus monotuberculatus* (QUOY & GAIMARD, 1833). Contracted specimen; D: *Stichopus monotuberculatus* (QUOY & GAIMARD, 1833).