The Holothurioidea (Echinodermata) collected during the Tyro Mauritania-II expedition 1988

C. Massin

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During the Tyro Mauritania-II expedition (5-21.vi.1988) 15 holothurian species were collected between 19 and 1,900 m depth. Twelve species are new to the fauna of Mauritania, including *Paracucumaria deridderae* spec. nov.

Mauritania represents the southern distribution limit of four species also known from Europe, and the northern distribution limit of five species also known from southern Africa.

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Introduction

The Holothurioidea of Mauritania were described by Perrier (1902), Koehler & Vaney (1906), Hérouard (1929) and Cherbonnier (1949b; 1972). So far 16 species have been reported, including 11 deep-sea species collected by the "Travailleur" and the "Talisman" (Perrier 1902). The shallow-water fauna was poorly known, but the material of the Tyro Mauritania-II expedition, here described (table 1), fills this gap at least partly. The expedition took place during the period 5-21 June 1988. Sampling was mainly done on the continental shelf and slope between Cap Blanc and Cap Timiris.

Table 1: List of the species with stations, depth range (in m) and total number of specimens.

Species	Station numbers	Depth range	Total number of specimens
Holothuria arguinensis	MAU 69, 72, 90, 98	26-52	5
Stichopus regalis	MAU 39, 60, 82, 96, 130, 131, 144	95-350	20
Paroriza pallens	MAU 104	1500	1
Paelopatides grisea	MAU 105	1600-1900	4
Benthogone rosea	MAU 104	1500	7
Cladodactyla senegalensis	MAU 73	19	2
Hemioedema gruveli	MAU 73	19	1
Panningia bispicula	MAU 69	32	1
Paracucumaria deridderae	MAU 64	24	23
?Pseudocnus spec.	MAU 64	24	1
Stereoderma colochiriformis	MAU 22	60-66	1
Trachythyone fallax	MAU 22, 69, 70, 71, 88, 80	32-66	8
Phyllophorus pedinaequalis	MAU 131, 132, 133, 134	25-700	41
Echinocucumis tenera	MAU 80, 99	42-70	3
Labidoplax digitata	MAU 77, 78, 86, 87	35-65	17

Material and methods

Most of the holothurians were collected with Agassiz trawls of 1.2, 2.4, and 3.5 m opening and some with a van Veen grab. Collecting data are briefly presented in table 2. A full description of localities and sampling methods is given by van der Land (1988). The holothurians were sorted on board, fixed in 70% alcohol or in 10% formalin and later transferred to 70% alcohol. When a species was particularly abundant at a given station,

Table 2. List of Tyro Mauritania-II stations wich yielded holothurians. AT = Agassiz trawl; FMS = fine muddy sand; HC = hard calcareous; MB = muddy bottom; MS = muddy sand; M+SG = mud + shell gravel; SMG = sandy mud gravel; VVG = van Veen grab.

Station number	Depth in m	Position	Bottom	Gear	Species	Number of specimens	RMNH Ech. nr.
MAU 022	60-66	18°50'N-16°25'W	MS	AT	*Trachythyone fallax*	1	05822
					Stereoderma colochiriformis	1	05823
MAU 039	260-280	18°48'N-16°43'W	MB	AT	*Stichopus regalis*	1	05824
MAU 060	280-350	19°06'N-16°46'W	-	AT	*Stichopus regalis*	4	05825
MAU 064	24	20°00'N-17°10'W	MS	VVG	*Paracucumaria deridderae*	23	05826
					? Pseudocnus spec.	1	05827
MAU 069	32	20°00'N-17°17'W	MS	AT	*Holothuria arguinensis*	2	05828
					Trachythyone fallax	2	05829
					Panningia bispicula	1	05830
MAU 070	38-41	20°00'N-17°18'W	MS	AT	*Trachythyone fallax*	1	05831
MAU 071	43	20°00'N-17°21'W	MS	AT	*Trachythyone fallax*	1	05832
MAU 072	48-52	20°00'N-17°24'W	MS	AT	*Holothuria arguinensis*	1	05833
MAU 073	19	20°03'N-17°09'W	HC	AT	*Cladodactyla senegalensis*	2	05834
					Hemioedema gruveli	1	05835
MAU 077	35	20°00'N-17°17'W	FMS	VVG	*Labidoplax digitata*	3	05836
MAU 078	41	20°00'N-17°21'W	FMS	VVG	*Labidoplax digitata*	1	05837
MAU 080	60-70	20°02'N-17°26'W	-	AT	*Echinocucumis tenera*	2	05838
					Trachythyone fallax	2	05839
MAU 082	100	19°59'N-17°30'W	-	AT	*Stichopus regalis*	3	05840
MAU 086	52	19°32'N-16°52'W	M+SG	VVG	*Labidoplax digitata*	9	05841
MAU 087	65	19°32'N-16°54'W	M+SG	VVG	*Labidoplax digitata*	4	05842
MAU 088	64	19°33'N-16°55'W	Mud	AT	*Trachythyone fallax*	1	05843
MAU 090	38	19°35'N-16°51'W	-	AT	*Holothuria arguinensis*	1	05844
MAU 096	110-200	19°33'N-17°02'W	-	AT	*Stichopus regalis*	1	05845
MAU 098	26	19°24'N-16°48'W	MS	AT	*Holothuria arguinensis*	1	05846
MAU 099	42	19°25'N-16°49'W	SMG	VVG	*Echinocucumis tenera*	1	05847
MAU 104	1500	19°43'N-17°06'W	-	AT	*Paroriza pallens*	1	05848
					Benthogone rosea	7	05849
MAU 105	1600-1900	19°43'N-17°44'W	-	AT	*Paelopatides* cf. *grisea*	4	05850
MAU 130	95-100	20°25'N-17°40'W	MS	AT	*Stichopus regalis*	3	05851
MAU 131	225-235	20°29'N-17°41'W	-	AT	*Stichopus regalis*	1	05852
					Phyllophorus pedinaequalis	25	05853
MAU 132	305-325	20°34'N-17°45'W	-	AT	*Phyllophorus pedinaequalis*	5	05854
MAU 133	400-450	20°39'N-17°48'W	-	AT	*Phyllophorus pedinaequalis*	11	05855
MAU 134	630-700	20°44'N-17°48'W	-	AT	*Phyllophorus pedinaequalis*	9	05856
MAU 144	200-210	20°43'N-17°39'W	-	AT	*Stichopus regalis*	7	05857

only a few specimens were preserved.

The bulk of the material is deposited in the collection of the Nationaal Natuurhistorisch Museum [NNM; formerly Rijksmuseum van Natuurlijke Historie (RMNH)], Leiden, The Nederlands. A few specimens of abundant species are now in the collections of the Royal Belgian Institute of Natural Sciences (IRSNB).

Comparisons were made with material from the Muséum National d'Histoire Naturelle (MNHN, Paris, France), the Institute of Oceanographic Sciences (IOS, Wormley, U.K.) and the Royal Belgian Institute of Natural Sciences (IRSNB, Brussels, Belgium).

Taxonomy

Order **Aspidochirotida** Grube, 1840
Family **Holothuriidae** Ludwig, 1894
Genus **Holothuria** Linnaeus, 1767
Sub-genus **Roweothuria** Thandar, 1988
Holothuria (R.) arguinensis Koehler & Vaney, 1906
(fig. 1)

Holothuria arguinensis Koehler & Vaney, 1906: 62, pl. 5 figs. 5-13, pl. 6 figs. 14-21; Gruvel, 1909: 1018; Hérouard, 1925: 7, fig. 6; Hérouard, 1929: 48, fig. 3A-K, pl. 1 fig. 5.
Holothuria (Holothuria) arguinensis; Panning, 1935: 49, fig. 44.
Holothuria (Lessonothuria) arguinensis; Rowe, 1969: 149.
Holothuria (Roweothuria) arguinensis; Thandar, 1988: 48.

Material.— **Mauritania**: RMNH Ech. 05828 (2 specimens); RMNH Ech. 05833 (1 specimen); RMNH Ech. 05844 (1 specimen); RMNH Ech. 05846 (1 specimen).

Descriptive notes.— The general aspect, colour and ossicles (fig. 1) are in accordance with the description and figures given by Koehler & Vaney (1906) and Hérouard (1929). The specimens were 160, 150, 137, 110 and 76 mm long and 95, 50, 65, 50 and 30 mm wide, respectively. These measurements are close to those given by Koehler & Vaney (1906) and Hérouard (1929).

Distribution.— This shallow-water species (26-52 m), collected for the last time in 1929 (Hérouard), is restricted to South Morocco and North Mauritania.

Family **Stichopodidae** Haeckel, 1896
Genus **Stichopus** Brandt, 1835
Stichopus regalis (Cuvier, 1817)

Synonymy.— See Tortonese, 1965: 66.
Material.— **Mauritania**: RMNH Ech. 05824 (1 specimen); RMNH Ech. 05825 (4 specimens); RMNH Ech. 05840 (3 specimens); RMNH Ech. 05845 (1 specimen); RMNH Ech. 05851 (3 specimens); RMNH Ech. 05852 (1 specimen); RMNH Ech. 05857 (7 specimens).

Descriptive notes.— The specimens present no variation in comparison with material from the Mediterranean Sea (Tortonese 1965).

Distribution.— The depth distribution (95-350 m) is in accordance with the data

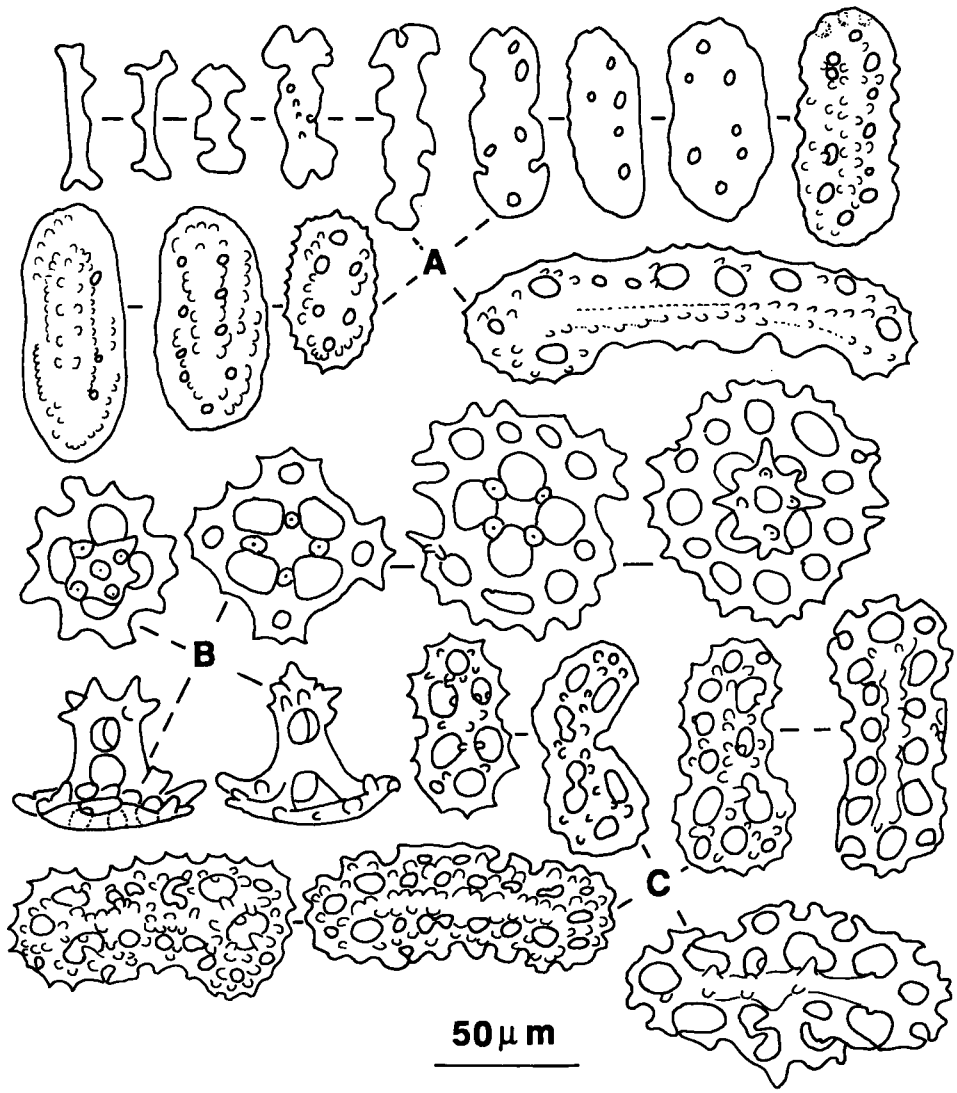

Fig. 1. *Holothuria (R.) arguinensis* Koehler & Vaney, 1906. A: buttons of ventral body wall; B: tables of dorsal body wall; C: buttons of dorsal body wall.

previously reported by Koehler (1921) for Atlantic specimens. *Stichopus regalis* is already known from the eastern Atlantic Ocean (Koehler 1921; Clark 1922; Hérouard 1929; Cherbonnier 1958b) south to Angola (Cherbonnier 1965a). This is the first record of the species from the coast of Mauritania where it appears as one of the most abundant species

Family **Gephyrothuridae** Koehler & Vaney, 1905
Genus **Paroriza** Hérouard, 1902
Paroriza pallens (Koehler, 1896)
(fig. 2)

Stichopus pallens Koehler, 1896: 11, pl. 1 fig. 1, pl. 4 fig. 45.
Stichopus (?) pallens; Perrier, 1902: 287.
Paroriza pallens; Heding, 1940: 143; Sibuet, 1977: 554; Khripounoff & Sibuet, 1980: 22; Massin, 1987: 117; Billet et al., 1988: 423; Tyler et al., 1992: 447.

Material.— **Mauritania**: RMNH Ech. 05842 (1 specimen).

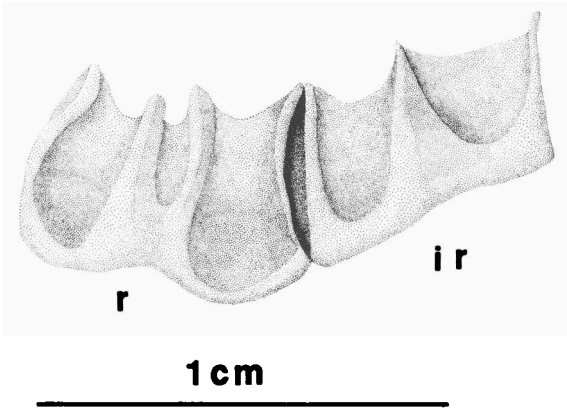

Fig. 2. *Paroriza pallens* (Koehler, 1896). Calcareous ring. R: radial piece; IR: interradial piece.

Descriptive notes.— The body is cylindrical, 75 mm in diameter and 195 mm long. The calcareous ring (fig. 2), the absence of ossicles, the gonad divided into two bundles on the right and left sides of the dorsal mesentery, the absence of tentacular ampullae and the presence of tube feet dorsally and ventrally, are characteristic of *Paroriza pallens*.

Distribution.— This is a deep-sea species living on the upper part of the continental slope. So far it had only been reported from the eastern Atlantic, north of 44° N (Bay of Biscay, Porcupine Seabight). This is the first record from the coast of Mauritania.

Family **Synallactidae** Ludwig, 1894
Genus **Paelopatides** Théel, 1886
Paelopatides cf. **P. grisea** Perrier, 1902
(fig. 3)

Paelopatides grisea Perrier, 1902: 361; Heding, 1940: 137; Billet et al., 1985: 407; Gage et al., 1985: 195; Harvey et al., 1988: 183.
Paelopatides gigantea; Sibuet, 1977: 554.

Material.— **Mauritania**: RMNH Ech. 05850 (4 specimens) (n.b. 35 specimens were collected at station MAU105 but only four specimens were preserved).— **Ireland**: IOS (Discovery Collection) 50602#3 (2 specimens).

Description.— Skin abraded, torn and lacking any ossicles. No dorsal papillae distinguishable. Body flat, rounded at both ends (figs. 3A and B); the specimens are 230, 198, 180 and 153 mm long and 90, 90, 65 and 65 mm wide, respectively. Mouth

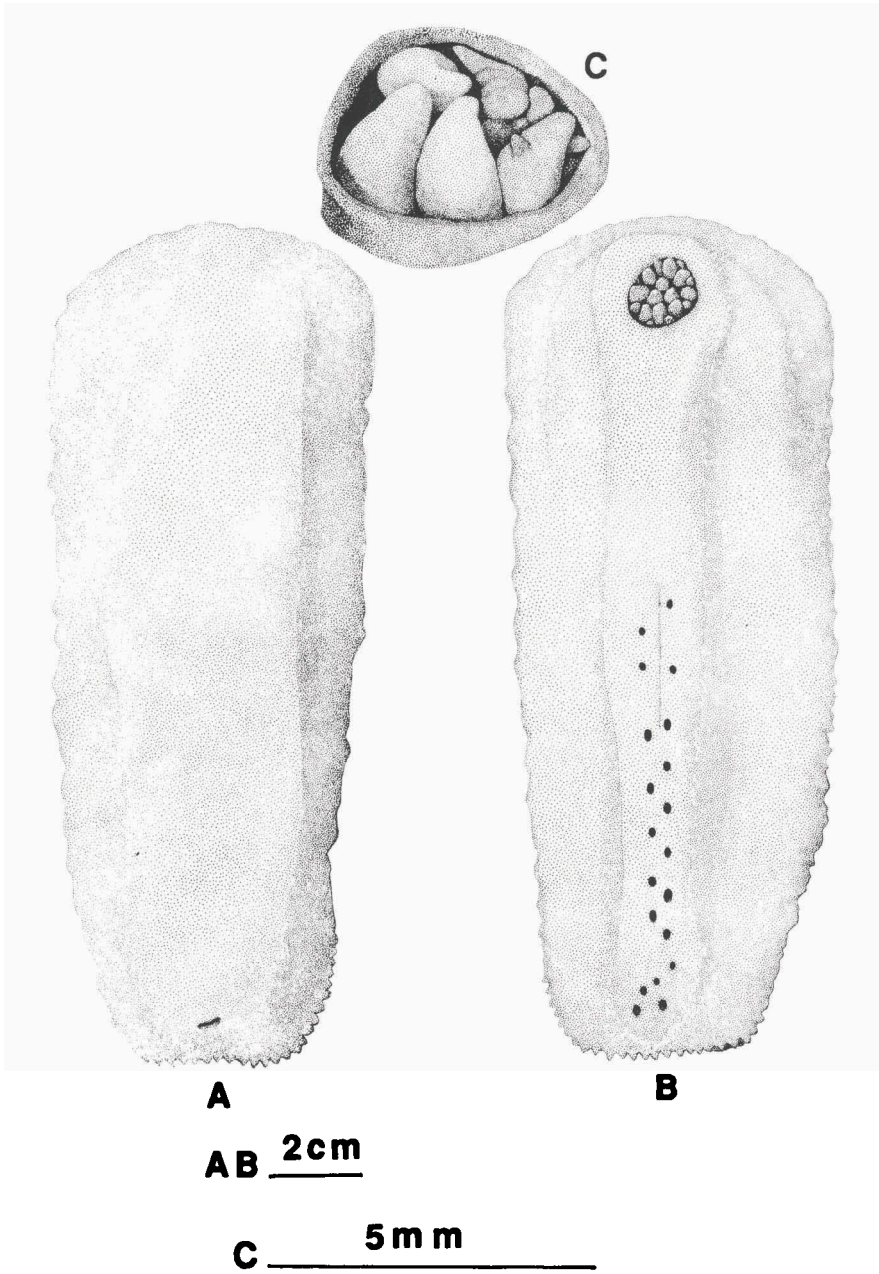

Fig. 3. *Paelopatides* cf. *P. grisea* Perrier, 1902. A: ventral view; B: dorsal view; C: tentacle.

ventral, anus dorsal. Skin gray-white, thick and gelatinous. Tentacle crown placed at some distance from anterior edge of body (fig. 3A). Tentacles 15-20 in number, black-violet. Each tentacle retractile, its stalk and tips made of a soft pliable disc with seven long finger-like processes (fig. 3C). Some processes bear secondary knobs.

Mid-ventral tube feet small and retracted, in a zig-zag pattern, absent from the anterior third of the ventral sole. They appear as black-violet spots on the gray-white skin.

Coelomic cavity very narrow. Five longitudinal muscles flat and close to each other, each as two broad bands. Two Polian vesicles. The right respiratory tree occupies the whole length of the coelomic cavity. All specimens had auto-eviscerated.

Discussion.— The general aspect of the body (fig. 3), the mid-ventral tube feet restricted to the posterior part of the body and the dorsal anus are characteristic of the genus *Paelopatides* Théel, 1886. Although the four specimens lack ossicles, and their dorsal body wall was damaged, they fit well with the detailed description of *Paelopatides grisea* given by Perrier (1902, 361).

Distribution.— The depth (1,900 m) at which the specimens were collected corresponds to the upper bathymetric limit of the species, where it is the most frequent according to Gage et al. (1985). *P. grisea* is a NE Atlantic species, known from Ireland to the Gulf of Guinea. This is the first record from the coast of Mauritania.

Order **Elasipodida** Théel, 1882
Family **Laetmogonidae** Ekman, 1926
Genus **Benthogone** Koehler, 1896
Benthogone rosea Koehler, 1896

Synonymy.— See Hansen, 1975: 48.

Material.— **Mauritania**: RMNH Ech. 05249 (7 specimens) (n.b. 41 specimens were collected at station MAU 104 but only seven specimens were preserved).

Descriptive notes.— Along the coast of Mauritania, *Benthogone rosea* is a well known and abundant deep sea species, previously collected by the "Travailleur" and "Talisman" (Perrier 1902).

Distribution.— It is a cosmopolitan species. Its bathymetrical range in the eastern Atlantic is 1,100-2,480 m (Hansen, 1975).

Order **Dendrochirotida** Grube, 1840
Family **Cucumariidae** Ludwig, 1894
Genus **Cladodactyla** Brandt, 1835
Cladodactyla senegalensis Panning, 1940
(figs. 4, 5)

Cladodactyla senegalensis Panning, 1940: 172, figs. 5-7; 1949: 414, fig. 1; 1957: 29, figs. 14-19; Cherbonnier, 1950b: 476, figs. a-m.

Material.— **Mauritania**: RMNH Ech. 05835 (2 specimens).

Description.— Both specimens are cylindrical, slightly curved with mouth and anus terminal. They are 17 and 48 mm long, and four and ten mm in diameter, respectively; ten dendritic tentacles, the two ventral smaller; tube feet restricted to the radii, especially numerous ventrally and more sparse dorsally.

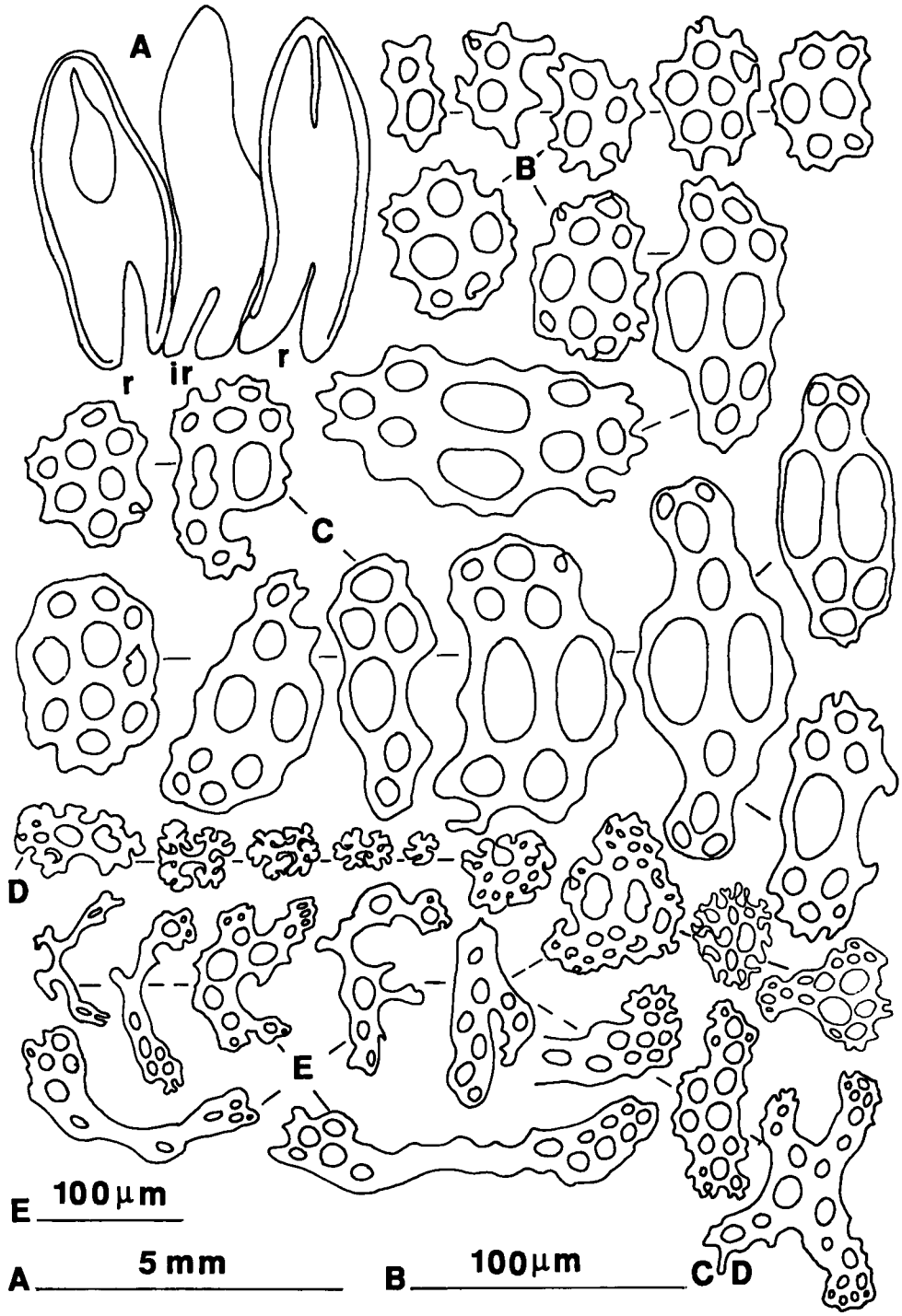

Fig. 4. *Cladodactyla senegalensis* Panning, 1940. A: calcareous ring (R: radial piece; IR: interradial piece); B: ossicles of body wall; C: anal ossicles; D: rosettes of tentacles; E: rods and plates of tentacles.

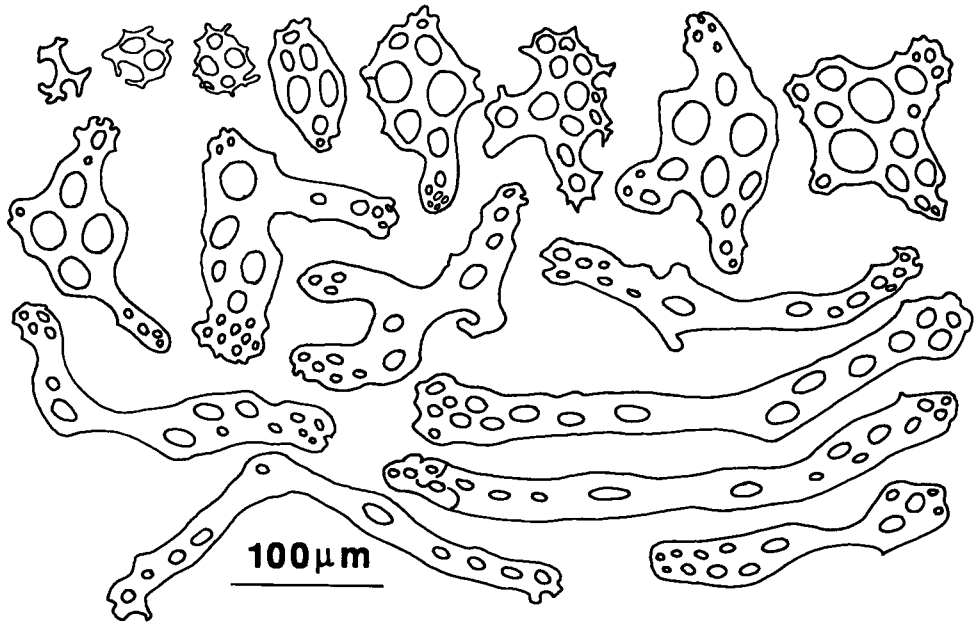

Fig. 5. *Cladodactyla senegalensis* Panning, 1940. Ossicles of tube feet.

Calcareous ring of five radial and five interradial pieces without posterior projections; radial and interradial pieces are long, triangular and all of the same height (fig. 4A); one Polian vesicle; retractor muscles of the pharynx wide, flat, attached at the anterior third of the body length; gonad well developed in the larger specimen.

Ossicles in the body wall scarce, small perforated plates (fig. 4B), larger near the anus (fig. 4C). Tube feet with straight or curved perforated rods and perforated plates (fig. 5). Tentacles with rods, numerous irregular perforated plates (fig. 4E) and some rare but characteristic rosettes (fig. 4D).

Discussion.— The specimens from Mauritania show no difference with the specimens from Dakar.

Distribution.— *Cladodactyla senegalensis* was previously known only from Dakar (Senegal).

Genus **Hemioedema** Hérouard, 1929
Hemioedema gruveli Hérouard, 1929
(figs. 6, 7)

Hemioedema gruveli Hérouard, 1929: 45, fig. 2, pl. 1, fig. 4; Cherbonnier, 1958c: 321, figs. 1 and 2.

Type material.— MNHN 7013 (holotype and paratype: type locality Port Etienne, **Mauritania**).
Other material.— **Mauritania**: RMNH Ech. 05835 (1 specimen).

Description.— Body contracted, nearly spherical, 40 mm in diameter; tube feet all over the body, more numerous ventrally than dorsally; radii visible only near the

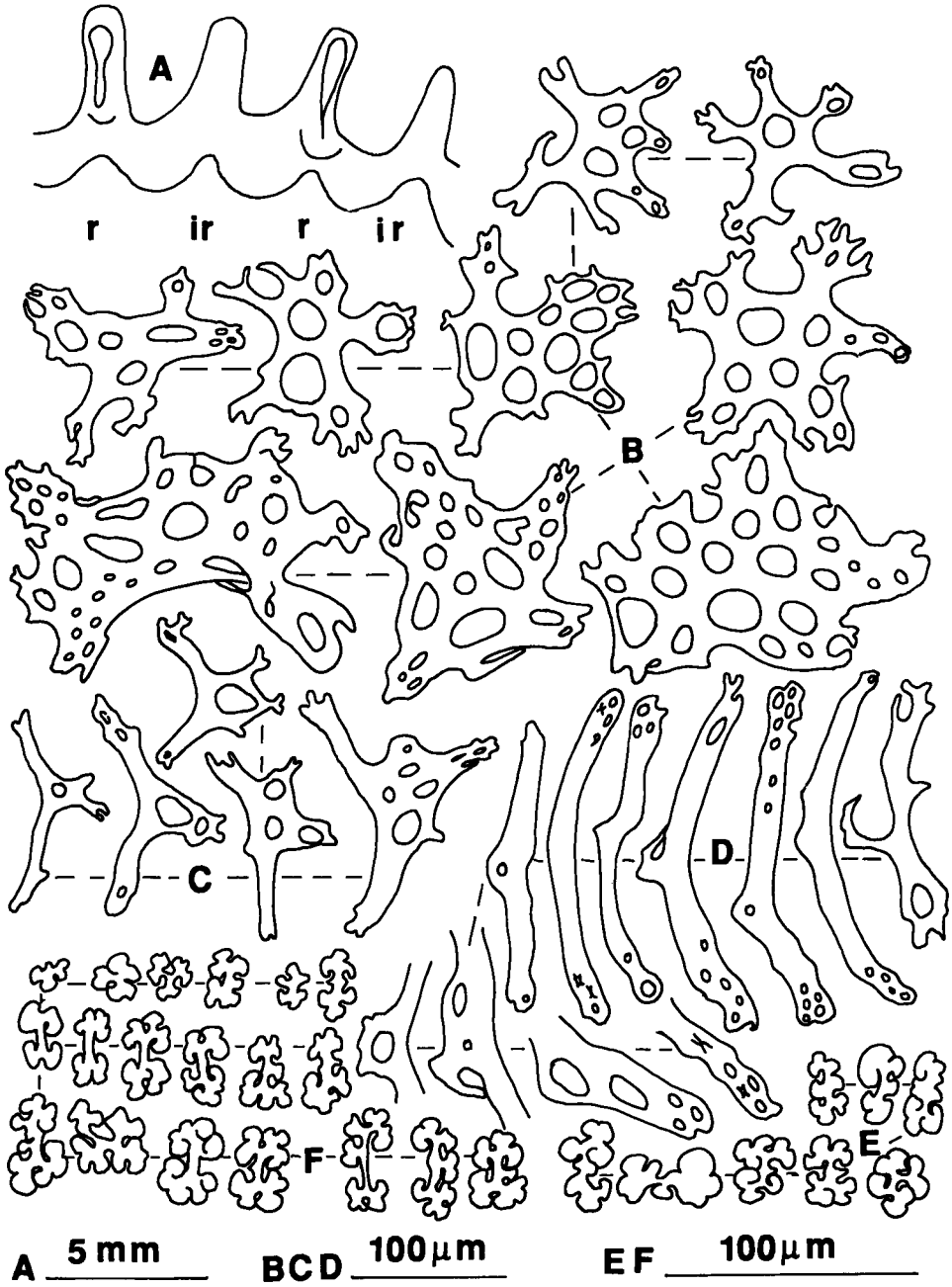

Fig. 6. *Hemioedema gruveli* Hérouard, 1929. A: calcareous ring (R: radial piece; IR: interradial piece); B: anal ossicles; C: ossicles of anal tube feet; D: ossicles of tube feet; E: rosettes of tube feet; F: rosettes of introvert.

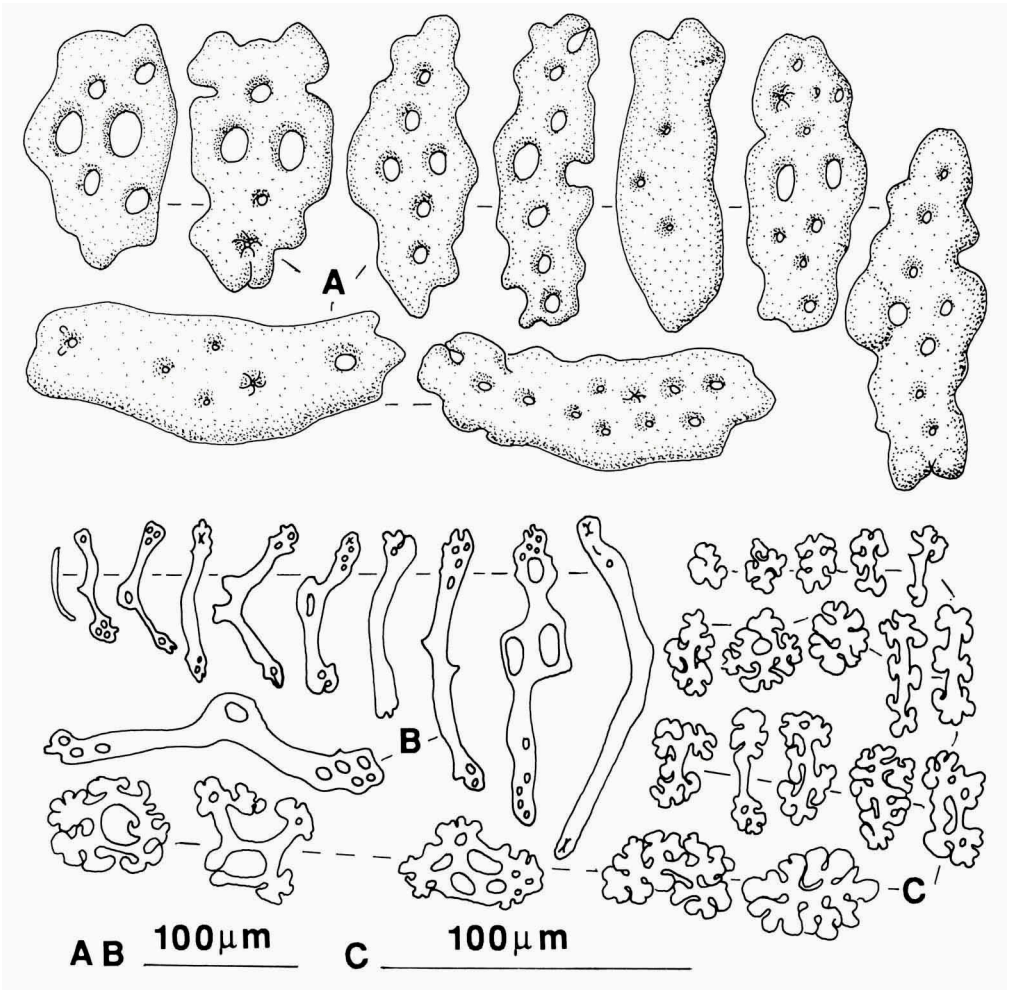

Fig. 7. *Hemioedema gruveli* Hérouard, 1929. A: body wall ossicles; B: rods of tentacles; C: rosettes of tentacles.

mouth; mouth and anus terminal. Body wall thin (0.4-1.0 mm).

Calcareous ring without posterior projections (fig. 6A); five radial and five interradial pieces of approximately the same height. Retractor muscles of the pharynx cylindrical, originating approximately at mid-body; ten dendritic tentacles; one Polian vesicle; gonad well developed.

No ossicles in body wall except around the base of tube feet (fig. 7A) and near the anus. Anal ossicles large reticulated plates up to 230 µm long, and star-shaped plates (fig. 6B). Tube feet with rods (180 to 250 µm long) with perfotated extremities, and rosettes (fig. 6D); no terminal plates. Only a few rods with large perforated central process in the anal tube feet (fig. 6C). Tentacles with a few rods (50 to 230 µm long) (fig. 7B) and numerous rosettes (fig. 7C); the rosettes also present in the introvert (fig. 6F).

Discussion.— *Hemioedema gruveli* Hérouard, 1929, was known only from two type specimens in the collections of the MNHN.

The material collected by the Tyro Mauritania-II expedition is very similar to the type material, except for the thickness of the body wall: 0.4-1.0 mm for the collected specimen versus over five mm for the type specimens (all the specimens are strongly contracted).

Distribution.— This species is limited to Mauritania. The known distribution of the genus *Hemioedema* is also restricted, from Gabon to Mauritania (Hérouard, 1929; Cherbonnier 1949a, 1950a, 1957, 1958c, 1965a, 1973). Three of the four known species viz. *H. gruveli*, *H. albofusca* Cherbonnier, 1949, and *H. multipodia* Cherbonnier, 1973, so far only have been collected at the type locality. The fourth one, *H. goreensis* Cherbonnier, 1949, is known from Gabon, Sierra Leone and Senegal.

Genus **Paracucumaria** Panning, 1949
Paracucumaria deridderae spec. nov.
(figs. 8-10)

Material.— **Mauritania**: RMNH Ech. 05826 (23 specimens) (the specimen labelled 05826/5 is designated as holotype).

Description.— All specimens are fragmented. The number of 23 specimens corresponds to the number of anterior ends with a calcareous ring.

Small holothurians (estimated 30-60 mm long), cylindrical with mouth and anus terminal. Tube feet restricted to radii, in two rows, evenly distributed along body length. Ten tentacles, the two ventral ones smaller.

Calcareous ring thin with triangular radial and interradial pieces (fig. 8A); both pieces with deep posterior notch delimiting short posterior projections (fig. 8B). Retractor muscles of the pharynx thick and short; one long Polian vesicle; short and narrow stone canal ends in a small bean-shaped madreporic plate (fig. 8C).

Body wall with one ossicle type, viz. large elongate knobbed perforated plates. Those from the anterior body wall are 200-340 µm long and 100-160 µm wide, and knobbed at one extremity (fig. 8D). The posterior plates are longer (250-400 µm) and wider (160-210 µm), and their knobbed extremity is also spiny (fig. 8E).

Tube feet contain irregular perforated rods with a central perforated process (fig. 9B); large central processes are knobbed and as a consequence, the rods appear as knobbed plates (fig. 9B). Ossicles of posterior tube feet (fig. 10A) larger than ossicles of anterior tube feet (fig. 9B).

In the introvert occur scarce small (80-160 µm long), knobbed, perforated plates, sometimes with spines (fig. 9A).

Tentacles with large, massive V-shaped or straight rods (200-400 µm long)(fig. 10B) located in the stem and short (40-90 µm long), thin, more or less straight rods located at the tips (fig. 10C).

Discussion.— Three species of *Paracucumaria* are known from the NE Atlantic Ocean: *Paracucumaria hyndmani* (Thompson, 1840), *P. mauritanica* (Hérouard, 1929) and *P. thalassae* Cherbonnier, 1969. *P. mauritanica* and *P. thalassae* are readily distinguished from *P. deridderae* spec. nov. because they have numerous small (90-180 µm long) perfo-

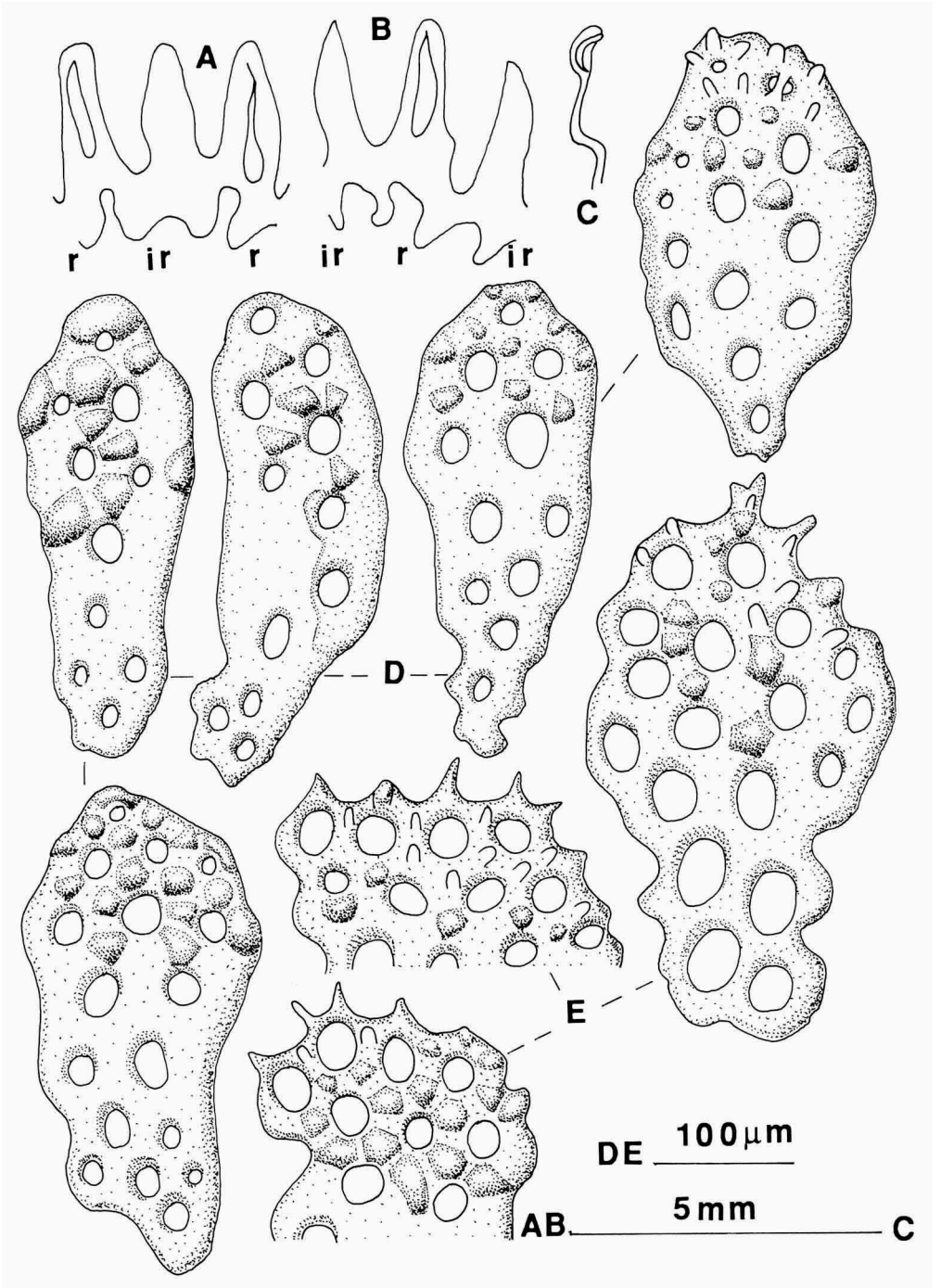

Fig. 8. *Paracucumaria deridderae* spec. nov. A: calcareous ring, dorsal pieces; B: calcareous ring, ventral pieces (R: radial piece; IR: interradial piece); C: stone canal with madreporic plate; D: large plates of anterior body wall; E: large plates of posterior body wall.

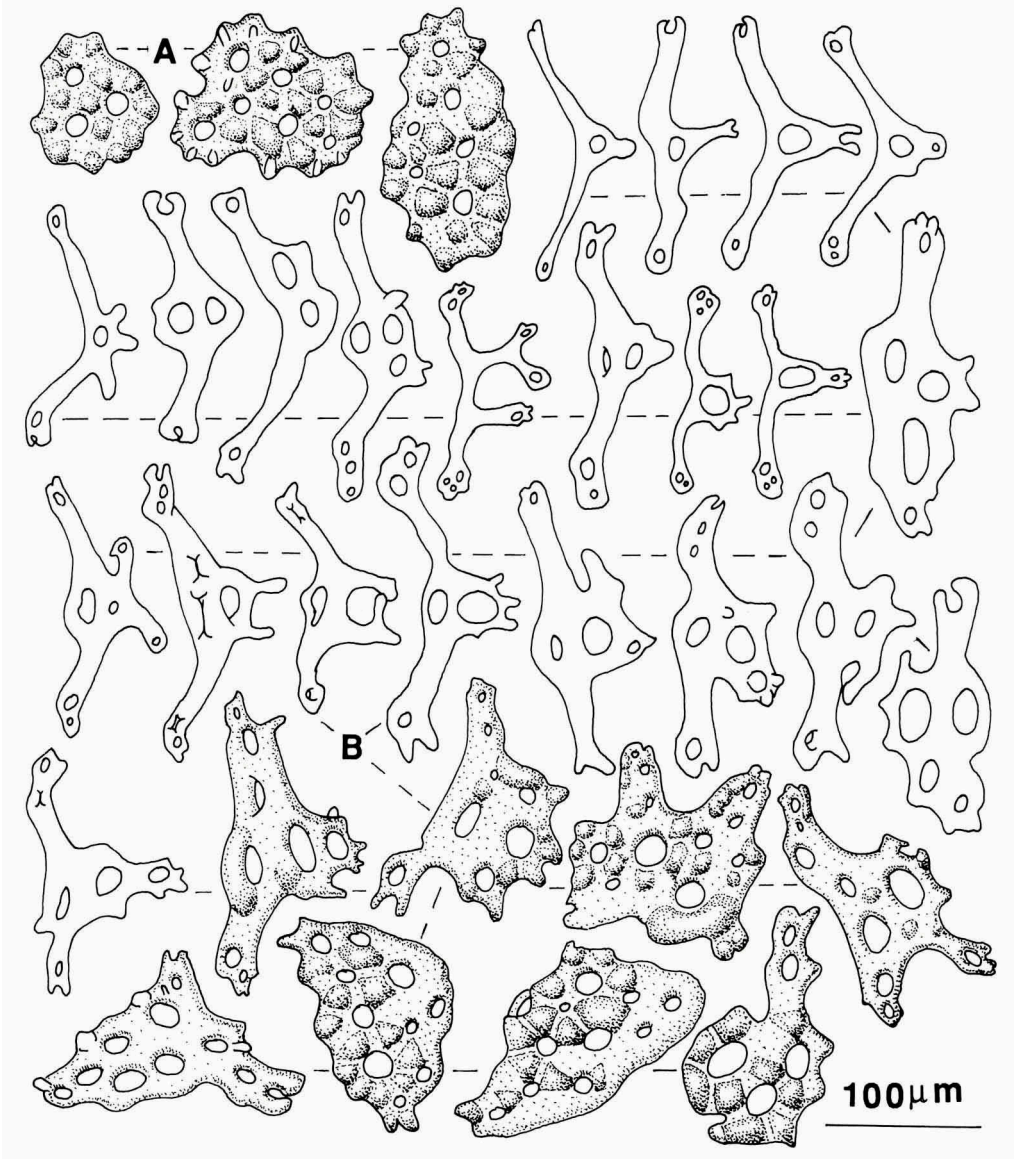

Fig. 9. *Paracucumaria deridderae* spec. nov. A: ossicles of introvert; B: ossicles ot anterior tube feet.

rated plates (with 2-5 perforations) in the body wall, whereas in *P. deridderae* the plates are longer (200-400 µm) with more numerous perforations (10-18).

P. deridderae is close to *P. hyndmani*, whose ossicles show great variation. Madsen (1942) distinguished two subspecies of *P. hyndmani*: *P. hyndmani robusta* (Madsen, 1942) from England, and *P. hyndmani typica* (Madsen, 1942) from Scandinavia. The body wall plates of *P. hyndmani robusta* are rounded, thick, smooth plates, with the perforations often obliterated (Madsen 1942; personal observation on the holotype and on material from Spain and the Bay of Biscay). This is quite different from *P.*

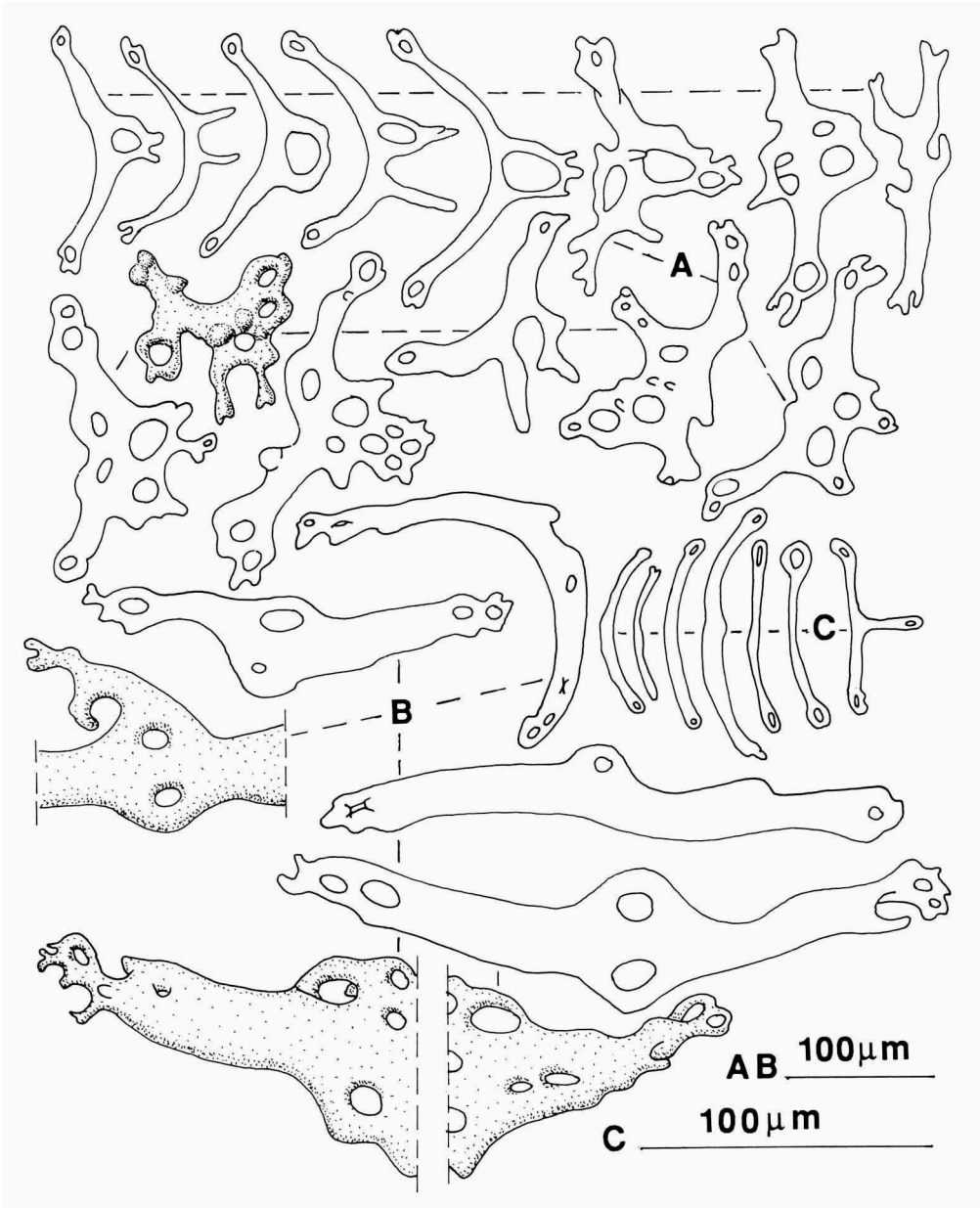

Fig. 10. *Paracucumaria deridderae* spec. nov. A: ossicles of posterior tube feet; B: large rods of tentacles; C: small rods of tentacles.

deridderae which has elongated, knobbed body wall plates with well defined perforations.

Some specimens of *P. hyndmani typica* show body wall plates very similar to *P. deridderae*. However, *P. deridderae* differs from *P. hyndmani typica* by: 1. the absence of smooth plates with large perforations, 2. the presence of spiny knobbed plates in the

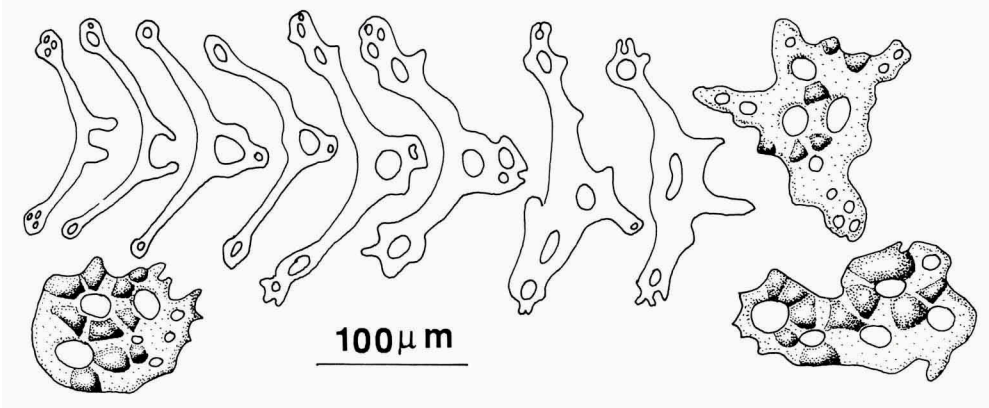

Fig. 11. *Pseudocnus* spec. Ossicles of posterior tube feet.

body wall, 3. the presence of knobbed plates and knobbed rods in the tube feet.

Etymology.— The species is named after Dr. Chantal De Ridder who sorted the material on board.

Genus **Pseudocnus** Panning, 1949
? **Pseudocnus** spec.
(figs. 11, 12)

Material.— **Mauritania**: RMNH Ech. 05827 (1 specimen).

Description.— A small holothurian (approximately 41 mm long), slightly U-shaped, with the body tapering anteriorly and posteriorly. Mid-ventral diameter 13 mm; posterior and anterior diameter 4-5 mm. No calcareous ring, no tentacles and no introvert because the specimen is eviscerated. Tube feet numerous, restricted to the radii, dorsally and ventrally, in double rows; mid-ventrally, four rows of tube feet. Skin rigid because of numerous plates.

In the skin two kinds of ossicles. Anteriorly, large, very thick knobbed perforated plates 75-200 µm long (fig. 12A), rounded or oval with 2-10 perforations. Posteriorly, large, smooth thick perforated plates (200-500 µm long) with knobs and spines at one end (fig. 12B).

Anterior tube feet with perforated rods more or less straight, 170-230 µm long (fig. 12C). Posterior tube feet with irregular V-shaped rods (130-200 µm long) (fig. 11) and irregular knobbed plates (100-150 µm long) (fig. 11).

Discussion.— General shape and ossicles of this specimen are suggestive of the genus *Pseudocnus* Panning, 1949, and resemble the South African *Pseudocnus dubiosus africanus* (Britten 1910) (see Panning, 1962: 64, figs. 8 and 9). However, the absence of tentacles, calcareous ring and introvert do not allow identification of the present specimen to the generic level with any confidence.

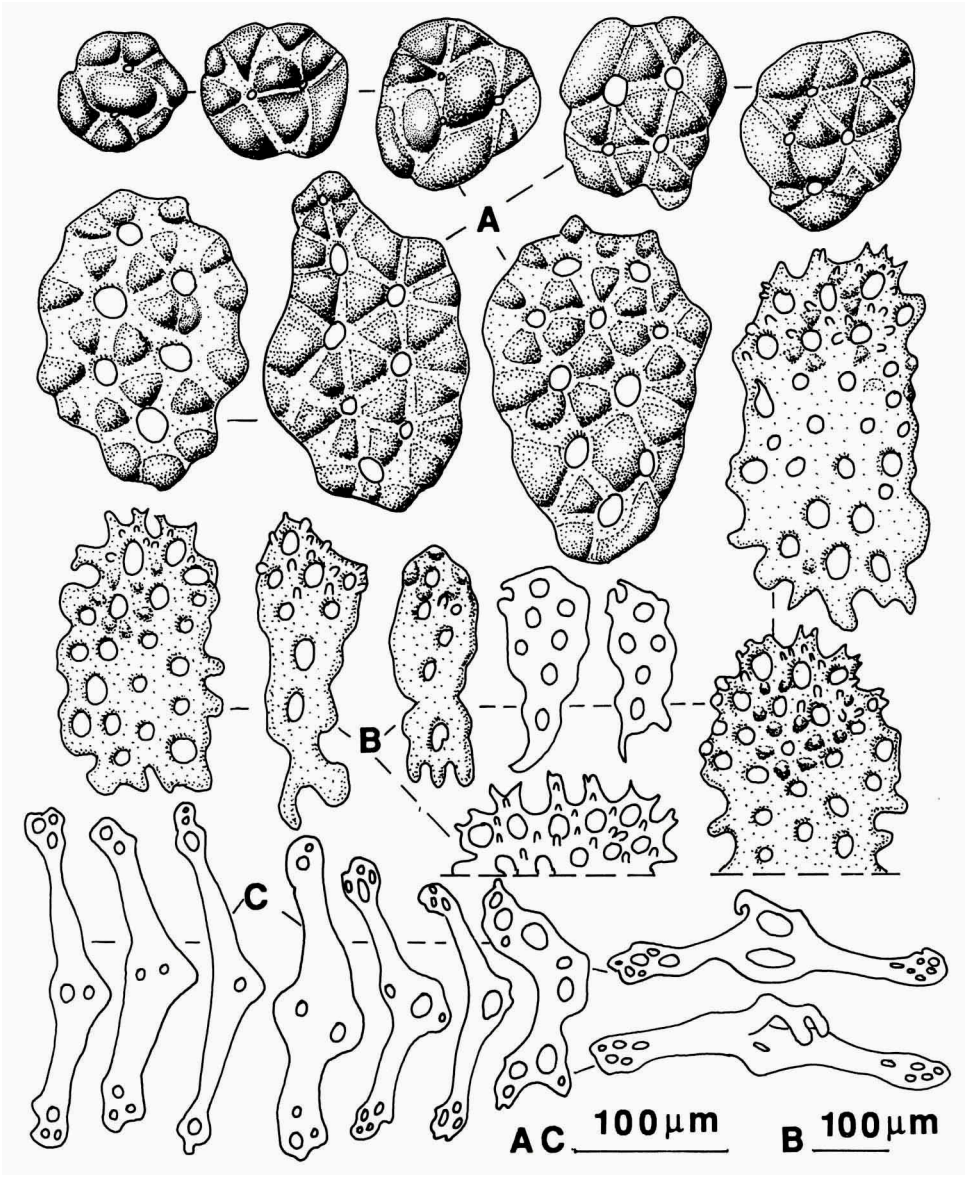

Fig. 12. *Pseudocnus* spec. A: ossicles of anterior body wall; B: ossicles of posterior body wall; C: rods of anterior tube feet.

Genus **Stereoderma** Ayres, 1851
Stereoderma colochiriformis (Ludwig & Heding, 1935)
(fig. 13)

Cucumaria kirschbergi var. *colochiriformis* Ludwig & Heding, 1935: 169, figs. 34-35.
Stereoderma colochiriformis; Cherbonnier, 1957: 487, fig. 1; Cherbonnier, 1965b: 648.

Material.— **Mauritania**: RMNH Ech. 05823 (1 specimen).

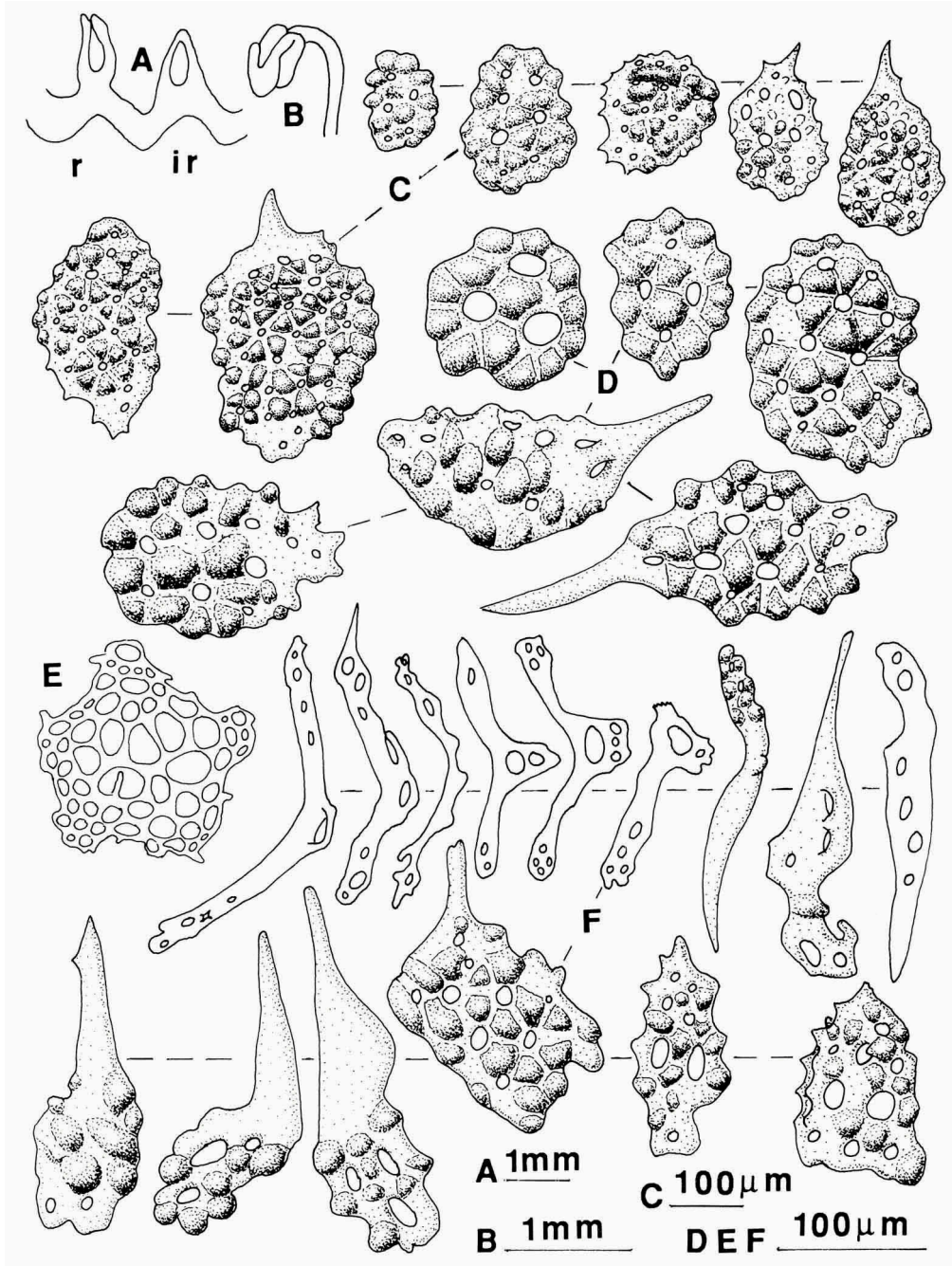

Fig. 13. *Stereoderma colochiriformis* (Ludwig & Heding, 1935). A: calcareous ring (R: radial piece; IR: interradial piece); B: stone canal with madreporic plate; C: plates of body wall; D: plates of dorsal papillae; E: end plate of tube foot; F: ossicles of ventral tube feet.

Description.— Body U-shaped, 65 mm long, pentagonal, tapering at both ends; colour in alcohol gray-white with brown-red spots; skin thin, rigid because of numerous ossicles; tube feet and dorsal papillae bristling with spines of the ossicles; ventral podia restricted to the radii, in two rows. Dorsal papillae scarce, arranged in one row in a zig-zag pattern along the radii.

Calcareous ring without posterior projections (fig. 13A), thin and fragile; radial pieces with a small notch on the anterior tooth and somewhat higher than the interradial pieces (fig. 13A). Retractor muscles of the pharynx short, thin, round, originating at the anterior $^1/_6$ of the body length; one Polian vesicle; one short and narrow stone canal, the madreporic plate convoluted (fig. 13B).

Ossicles from body wall nodulous perforated plates (100-370 µm long) sometimes with one long or several short spines (fig.13C); ventral tube feet with nodulous perforated plates, most of them bearing a strong spine at one extremity (fig. 13F); ventral tube feet also with rods (fig. 13F) and a very characteristic pentagonal end plate (fig. 13E). Dorsal papillae with nodulous perforated plates (fig. 13D) similar to those of the ventral tube feet.

Discussion.— The specimen from Mauritania is very similar to the specimen from Sierra Leone described by Cherbonnier (1957), differing only in the presence of end plates in the tube feet.

Distribution.— *Stereoderma colochiriformis* is a tropical West African species (Zaire, Togo, Sierra Leone) collected up to now between 44 and 80 m. The present record from Mauritania extends the known northern distribution limit considerably.

Genus **Trachythyone** Studer, 1876
Trachythyone fallax Cherbonnier, 1958
(figs. 14-16)

Trachythyone fallax Cherbonnier, 1958a: 101, fig. 3; Cherbonnier, 1965a: 6; Cherbonnier, 1965b: 648.

Type material.— MNHN (ossicles from holotype; type locality **Sierra Leone** 13°30'N 17°10'W).
Other material.— **Mauritania**: RMNH Ech. 05822 (1 specimen); RMNH Ech. 05829 (2 specimens); RMNH Ech. 05831 (1 specimen); RMNH Ech. 05832 (1 specimen); RMNH Ech. 05839 (2 specimens); RMNH Ech. 05843 (1 specimen).— **Cameroun**: MNHN (ossicles) (1 specimen).— **Cabinda**: IRSNB IG20403 (2 specimens).

Description.— Small U-shaped or S-shaped holothurian (24-41 mm); body tapering at both ends with mouth and anus terminal. Skin thin, rigid because of numerous ossicles. Podia scarce, short, rigid, in a single zig-zag row along radii; mid-ventrally, longer and in a double row. Calcareous ring thin, fragile with radial pieces higher than interradial pieces; both pieces with deep anterior notch (fig. 14A). Retractor muscles of pharynx slender and short.

Two kinds of ossicles in the body wall: in the upper layer, small baskets (45-55 µm in diameter) derived from a primary cross and with 4-8 peripheral short rounded spines (fig. 15A); in the deeper layer, large perforated plates (fig. 14B) up to 700 µm long and 350 µm wide. At base of tube feet, long (up to 420 µm), narrow perforated plates, sometimes curved (fig. 15B); near apex of tube feet, small curved rods (125-200 µm long) with perforated extremities (fig. 16A), irregular plates (fig. 16A) and

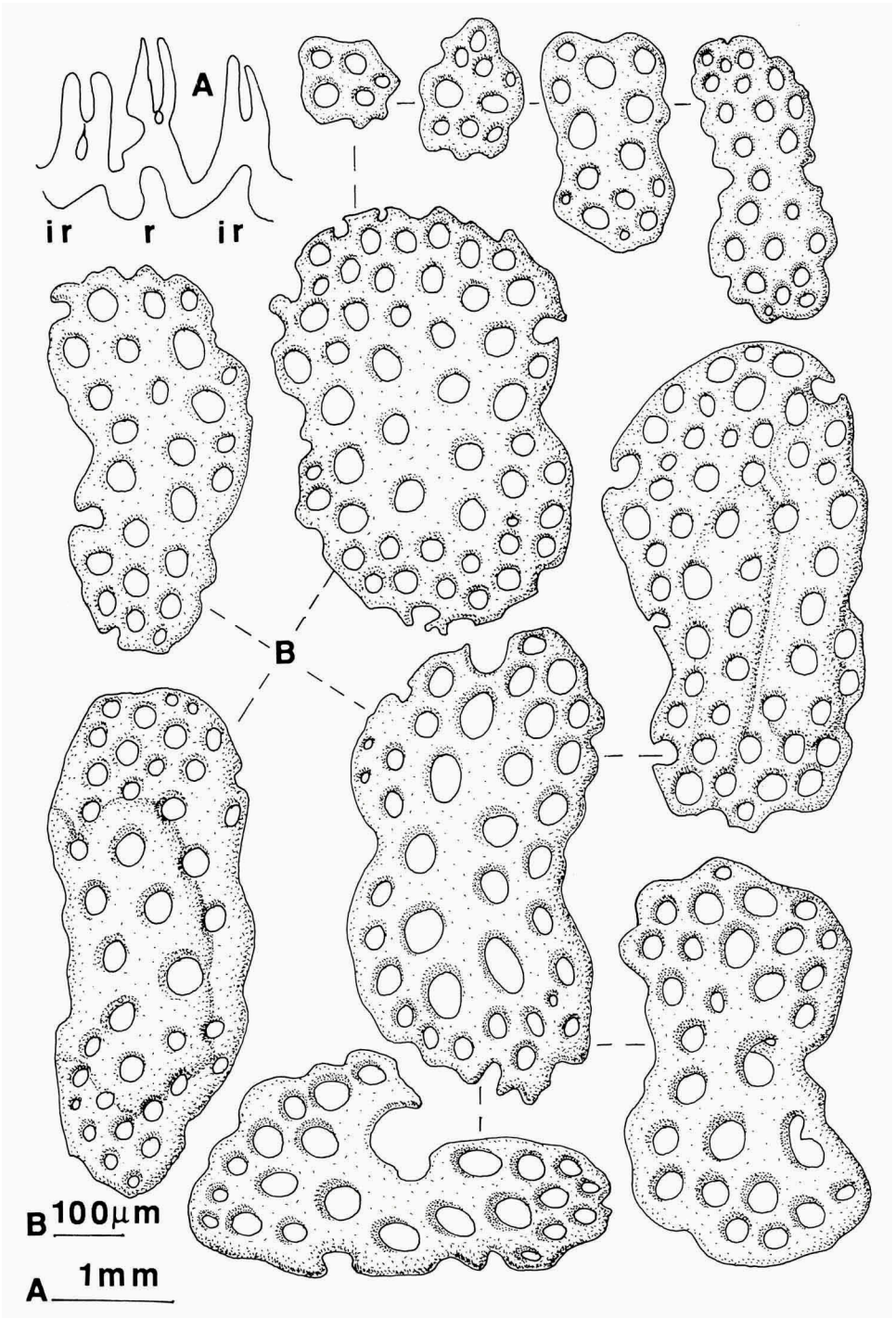

Fig. 14. *Trachythyone fallax* Cherbonnier, 1958. A: calcareous ring (R: radial piece; IR: interradial piece); B: large plates of body wall.

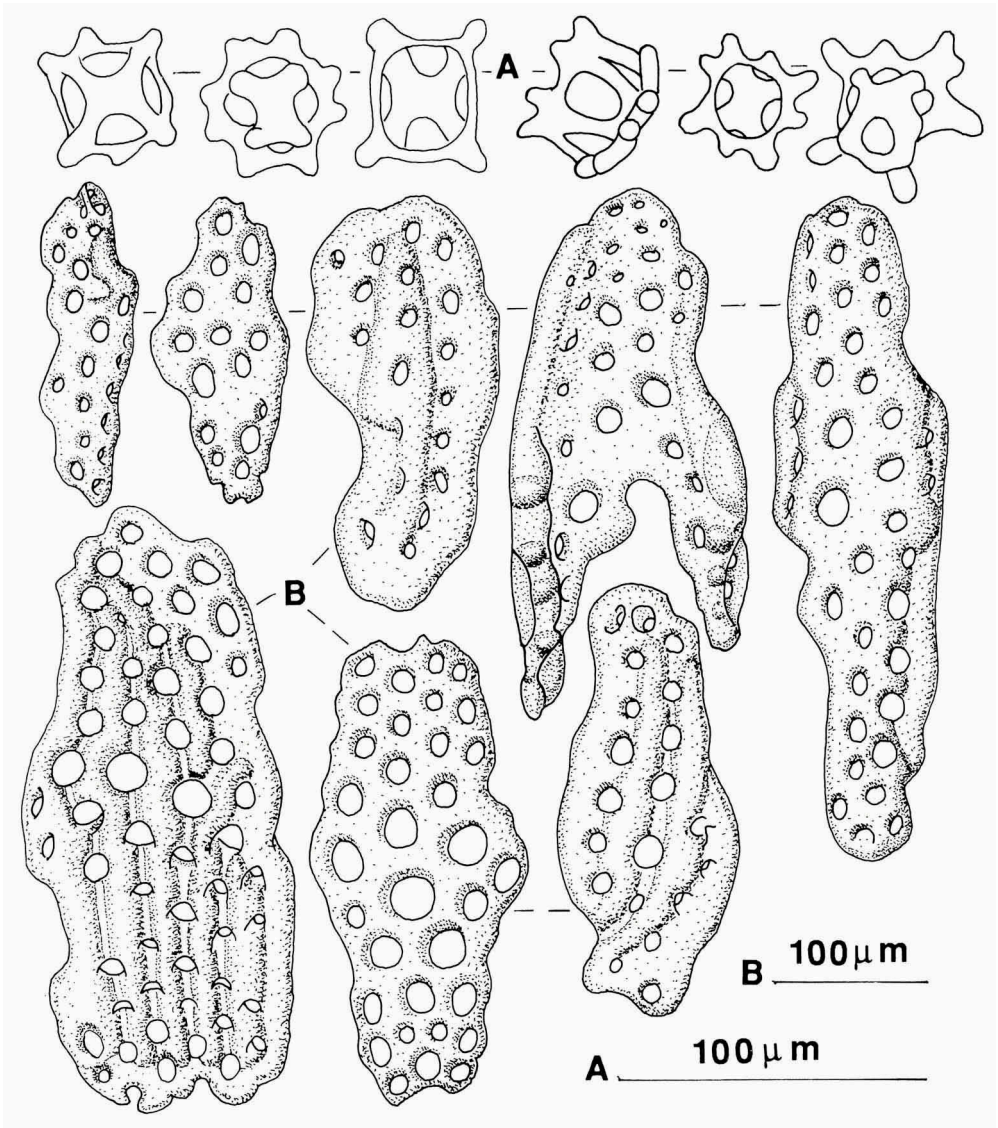

Fig. 15. *Trachythyone fallax* Cherbonnier, 1958. A: cups of body wall; B: large plates of tube feet.

baskets (fig. 16B) identical to those of body wall.

Tentacles with large rods (150-350 µm long) in stalk (fig. 16C) and small rods (40-80 µm long) at tips (fig. 16D); both rods with peforated tips.

Discussion.— The specimens from Mauritania closely resemble the type material from Sierra Leone. However, the species is variable; specimens from e.g. Cameroun and Cabinda have thinner and smoother perforated plates in the body wall.

Distribution.— The species is known from Cabinda, Dahomey, Cameroun and Sierra Leone. This find of *T. fallax* represents the first record of this species for Mauritania and an extension of its known northern distribution limit just as for *Stereoderma colochiriformis*.

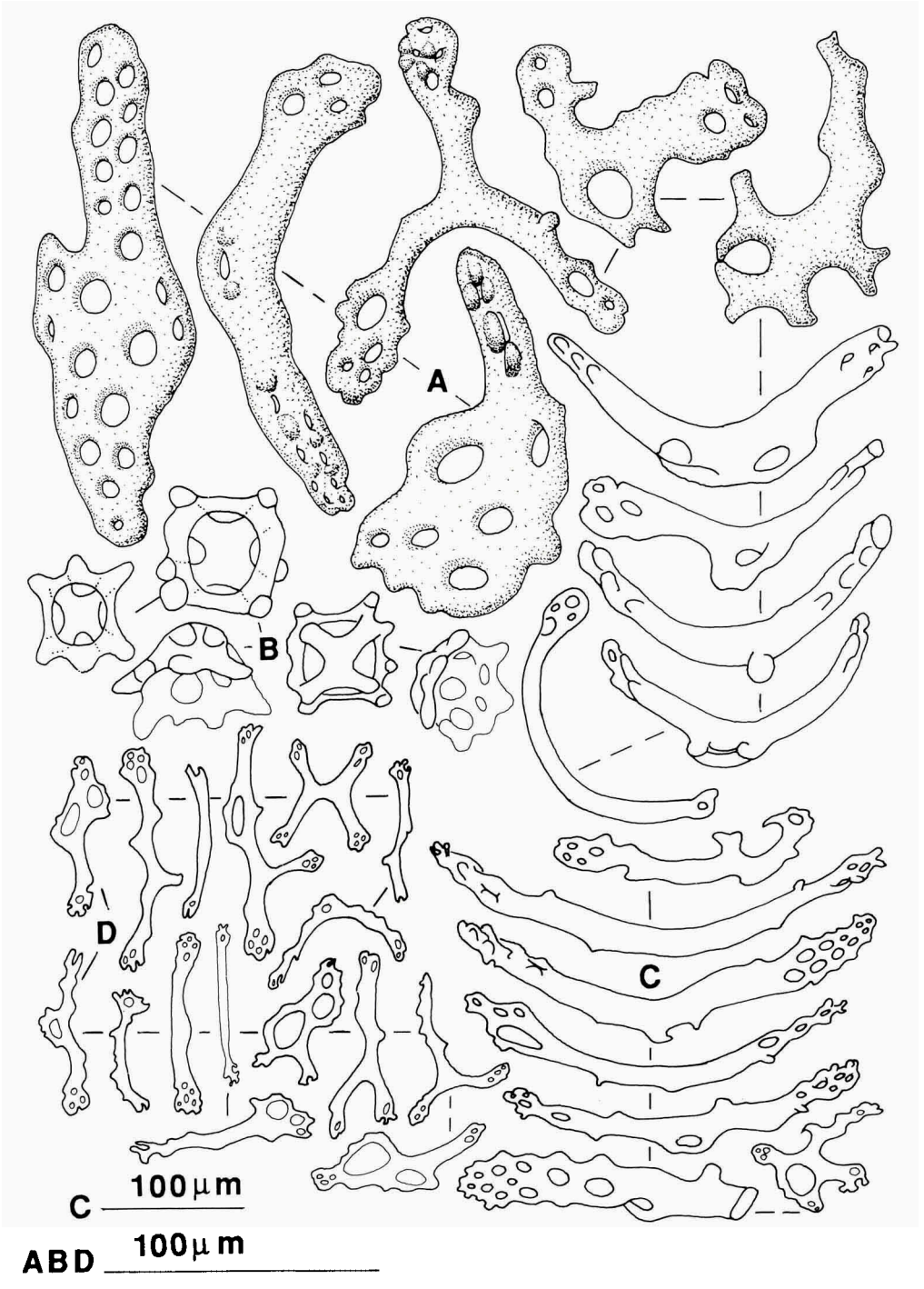

Fig. 16. *Trachytthyone fallax* Cherbonnier, 1958. A: rods and plates of tube feet. B: cups of tube feet; C: large rods of tentacles; D: small rods of tentacles.

Family **Phyllophoridae** Oestergren, 1907
Genus **Phyllophorus** Grube, 1840
Sub-genus **Phyllophorus** Grube, 1840
Phyllophorus (P.) pedinaequalis Cherbonnier, 1969
(figs. 17, 18)

Phyllophorus pedinaequalis Cherbonnier, 1969: 357, fig. 5; Cherbonnier 1970: 1267.

Type material.— MNHN (ossicles from holotype and paratypes: type locality **Bay of Biscay** 43°53'1N 08°42'2W).
Other material.— **Mauritania**: RMNH Ech. 05853 (25 specimens); RMNH Ech. 05854 (5 specimens); RMNH Ech. 05855 (11 specimens); RMNH Ech. 05856 (9 specimens).

Description.— Body U-shaped, cylindrical, slightly tapering anteriorly and strongly posteriorly; anus and mouth terminal; skin soft, thin, translucent in extended specimens; body 20-56 mm long and 5-12 mm in diameter; tube feet all over body, no radii visible. Anus surrounded by five large anal papillae. Tentacles 18-20 in two concentric crowns; external crown with 14-15 large tentacles and internal crown with 4-5 small tentacles. Calcareous ring with five radial and five interradial pieces; radial pieces much longer than interradial (fig. 18A); interradial pieces triangular (fig. 18A); radial pieces rectangular with posterior short projections and anterior notches (one large central and two small lateral) (fig. 18A). One Polian vesicle; one short stone canal terminating in a morula shape madreporic plate (fig. 18B). Retractor muscles of pharynx originating in anterior fourth of body length.

No ossicles in body wall except arround anus; anal ossicles large tables (fig. 18C); table disk perforated by 8 to 12 large central holes and smaller peripheral holes; edge of disk sinuous and nodulous; four pillars with two transverse beams; pillars end in

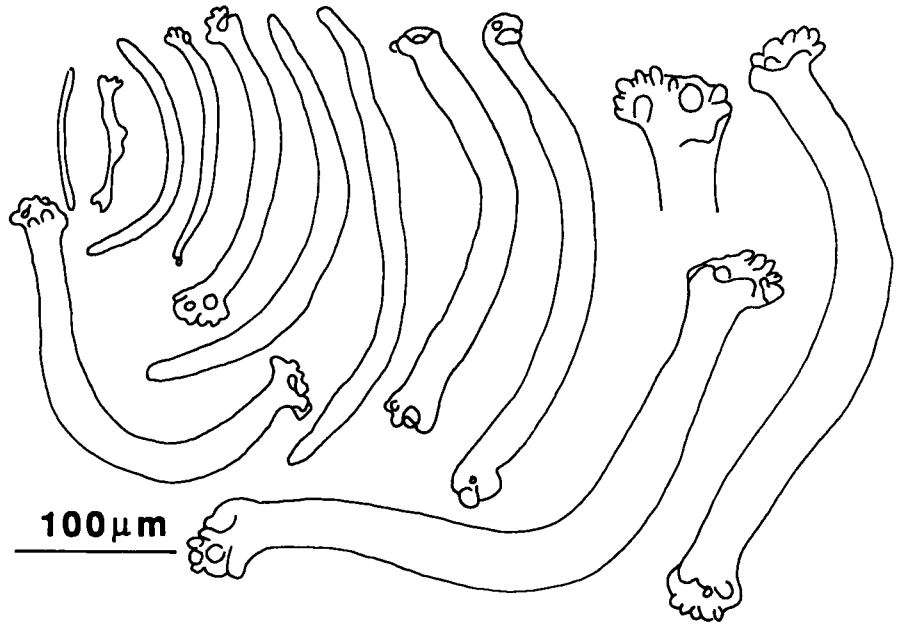

Fig. 17. *Phyllophorus (P.) pedinaequalis* Cherbonnier, 1969. Rods of tentacles

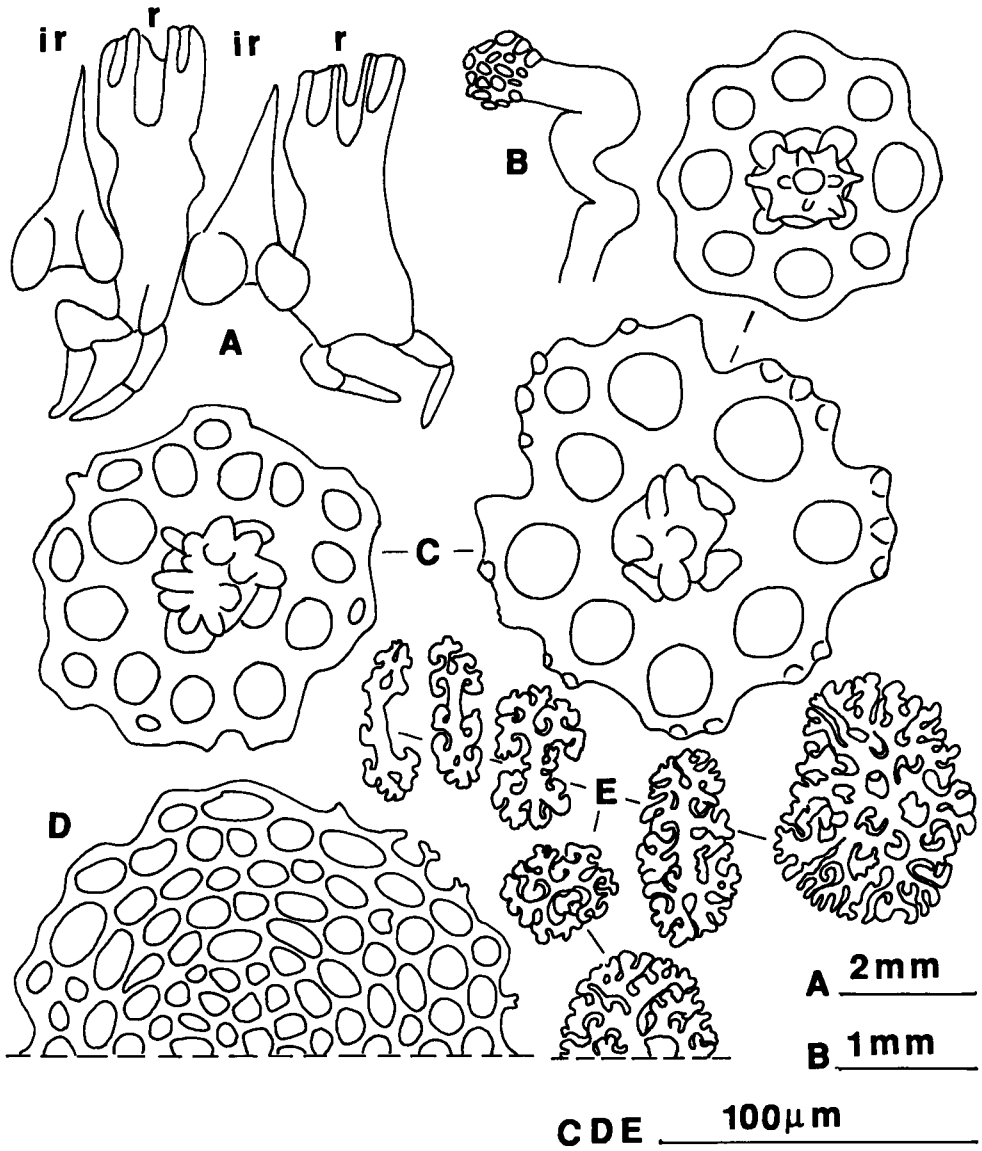

Fig. 18. *Phyllophorus* (*P.*) *pedinaequalis* Cherbonnier, 1969. A: calcareous ring (R: radial piece; IR: interradial piece); B: stone canal with madreporic plate; C: tables of body wall; D: end plate of tube foot; E: rosettes of introvert.

a crown of short spines. Large rosettes in introvert (fig. 18E). Tube feet without ossicles, except for a large terminal plate (fig. 18D). Two kinds of rods in tentacles: 1. thin and smooth curved rods (90-300 µm long) with sharp tips (fig. 17); 2. thick and smooth curved rods (150-440 µm long) with enlarged, nodulous tips (fig. 17).

Discussion.— The specimens from Mauritania are similar to those described by Cherbonnier (1969) from the Bay of Biscay.

Distribution.— The species hitherto was only known from the Bay of Biscay

(Spain, Galicia). It appears to be locally abundant along the coast of Mauritania. The species is typical of the upper part of the continental slope (225-700 m).

Family **Ypsilothuridae** Heding, 1942
Genus **Echinocucumis** Sars, 1859
Echinocucumis tenera Cherbonnier, 1958
(fig. 19)

Echinocucumis tenera Cherbonnier 1958a: 103, fig. 4; 1965a: 8, pl 2 fig. f-j.

Type material.— MNHN (ossicles from holotype: type locality **Sierra Leone** 14°21'N 8°23'W).
Other material.— **Mauritania**: RMNH Ech. 05838 (2 specimens); RMNH Ech. 05847 (1 specimen).— **Cabinda**: IRSNB IG20403 (10 specimens).

Description.— Small U-shaped holothurians (27-47 mm long, and maximally 6 mm in diameter) with body tapering anteriorly and posteriorly (fig. 19A). Tube feet scarce, restricted to radii (fig. 19A), more numerous ventrally than dorsally with maximum density in middle of body.

Calcareous ring (fig. 19B) and ossicles of body wall (fig. 19C) similar to those of holotype. Ossicles of tube feet curved rods with perforated tips and sometimes with enlarged perforated central part (fig. 19E); end plate of tube feet small with four large central holes (fig. 19D). Two kind of rods in tentacles: large rods (200-300 µm long) in stalk (fig. 19F), and small rods (50-150 µm long) in tips (fig. 19G).

Discussion.— The specimens from Mauritania differ only in details from those from Cabinda and Sierra Leone. There are no large plates with curved spines in the body wall as described by Cherbonnier (1965a: pl. 2 figs. i-j) from Cabinda specimens, and no central perforated process on the tentacle rods as decribed by Cherbonnier (1958a; fig. 4h) from the Sierra Leone specimen.

Distribution.— *Echinocucumis tenera* was known from Cabinda and Sierra Leone. So far the species had not been reported from Mauritania, the present record extending the known distributional range considerably to the north.

Genus **Panningia** Cherbonnier, 1958
Panningia bispicula Cherbonnier, 1964
(figs. 20, 21)

Panningia bispicula Cherbonnier, 1964: 533; Cherbonnier, 1965a: 9, pl. 3 figs. a-o; Cherbonnier, 1965b: 653, fig. 3a-b, fig. 4a-p.

Tpe material.— IRSNB IG16808 (holotype: type locality **Zaire** 4°48'S 11°41'E; syntype).
Other material.— **Mauritania**: RMNH Ech. 05830 (1 specimen).— **Zaire**: IRSNB IG20403 (4 specimens).

Description.— Small holothurian (26 mm long), S-shaped, with the body tapering at both ends (fig. 20A). Mouth and anus terminal. Skin thin and rigid because of numerous large plates. Tube feet restricted to radii, scarce dorsally, more abundant mid-ventrally (fig. 20A).

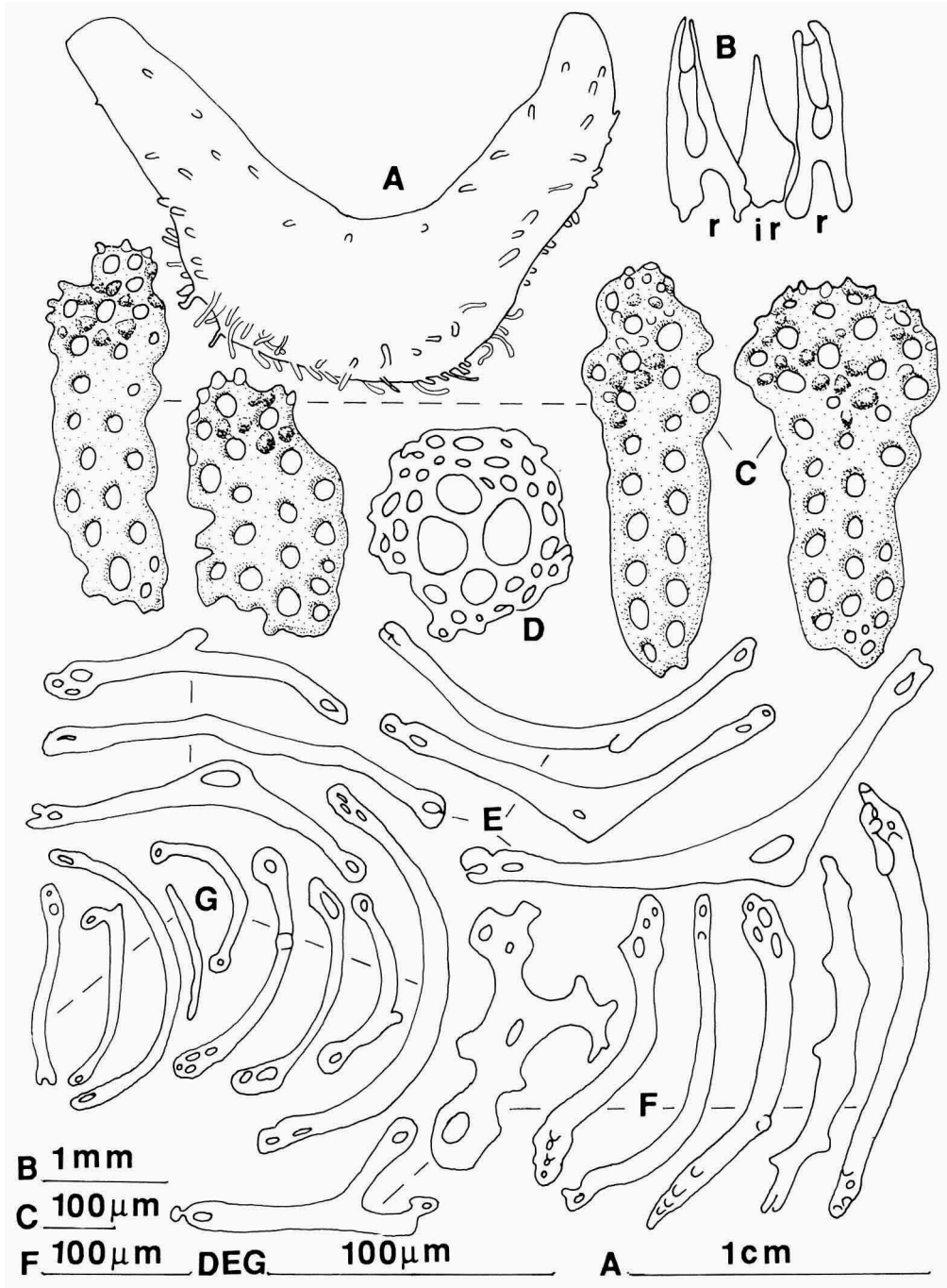

Fig. 19. *Echinocucumis tenera* Cherbonnier, 1958. A: general view; B: calcareous ring (R: radial piece; IR: interradial piece); C: large plates of body wall; D: end plate of tube foot; E: rods of tube feet; F: large rods of tentacles; G: small rods of tentacles.

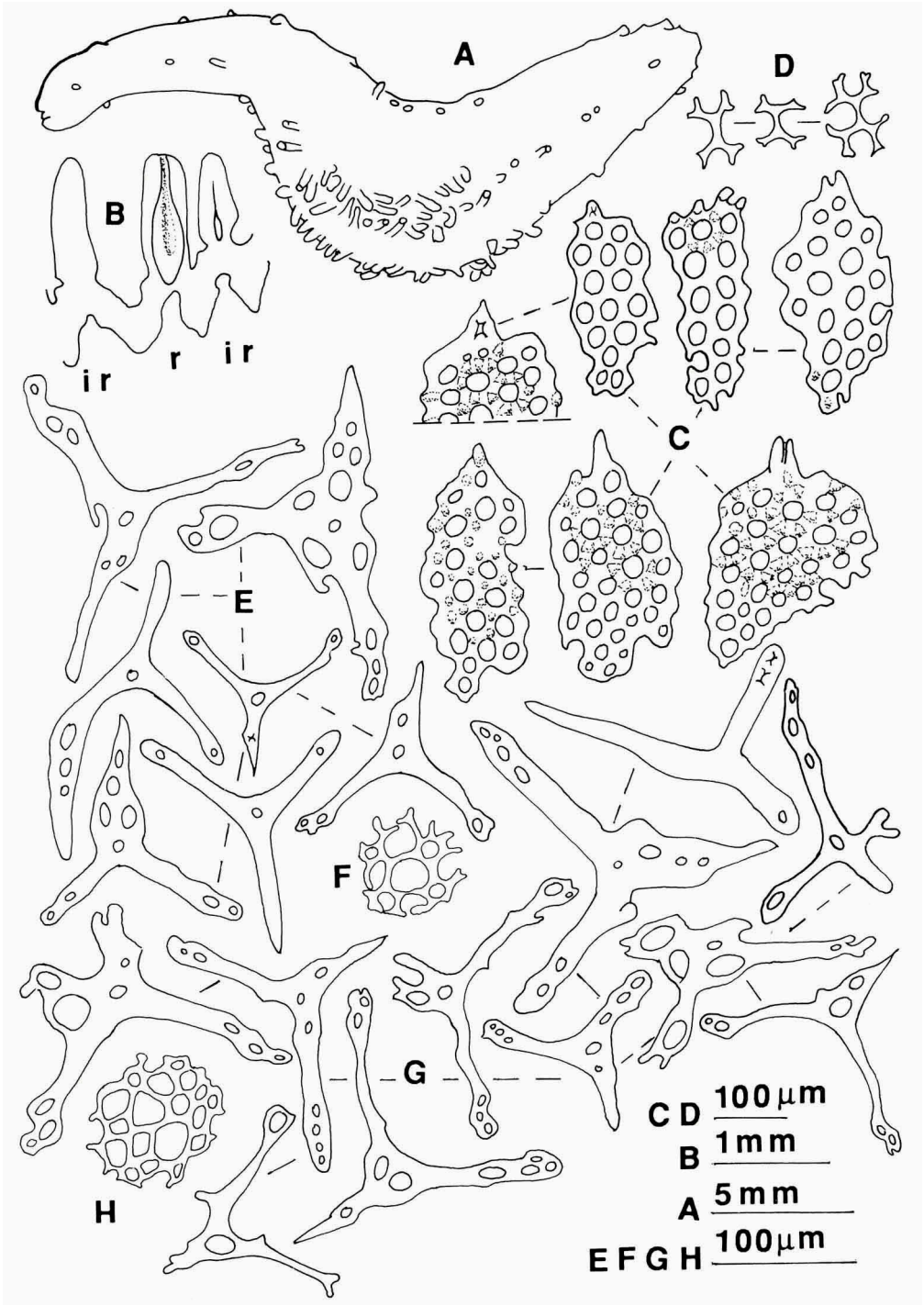

Fig. 20. *Panningia bispicula* Cherbonnier, 1964. A: general view; B: calcareous ring (R: radial piece; IR: interradial piece); C: large plates of body wall; D: X-shaped ossicles of body wall; E: ossicles of dorsal tube feet; F: end plate of dorsal tube foot; G: ossicles of ventral tube feet; H: end plate of ventral tube foot.

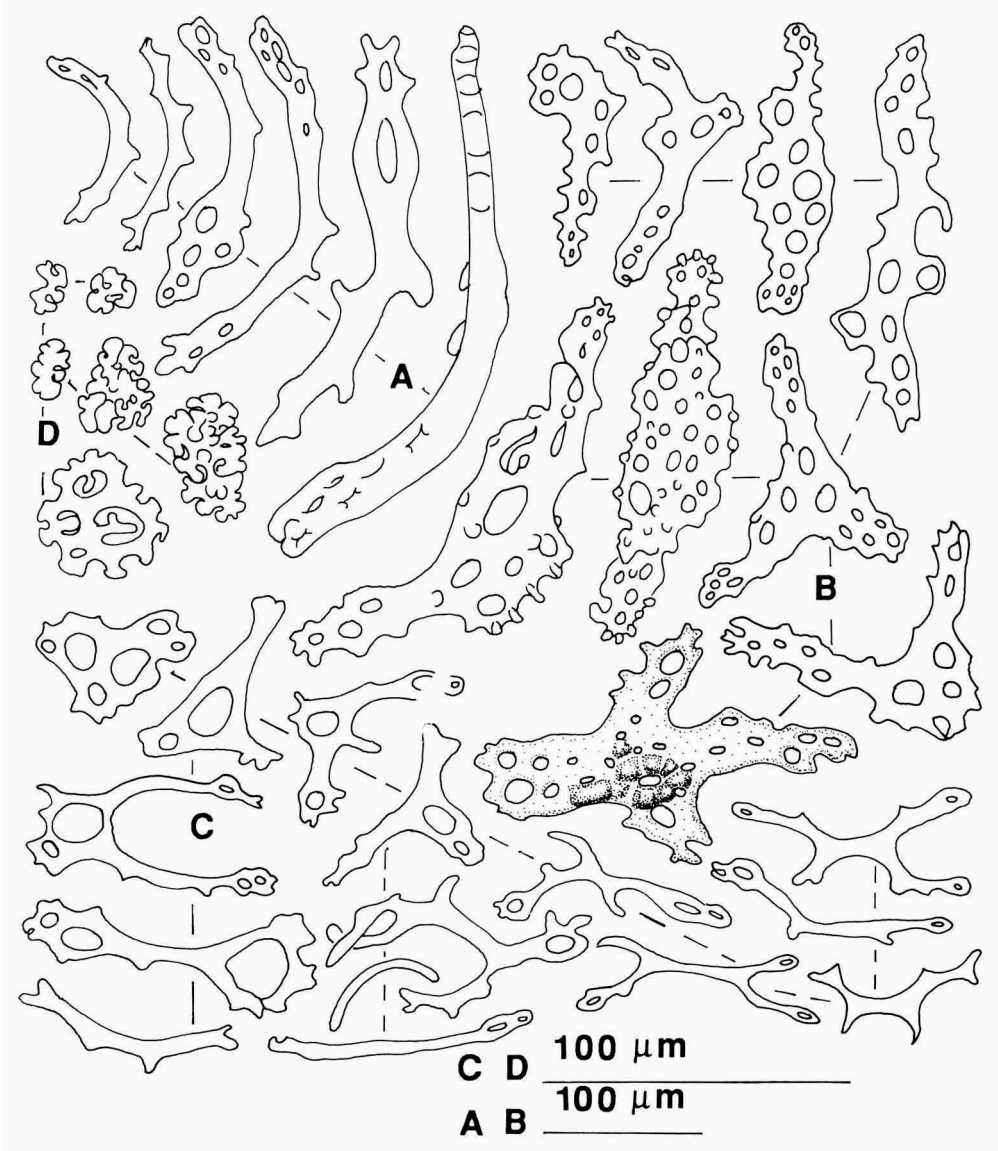

Fig. 21. *Panningia bispicula* Cherbonnier, 1964. Ossicles of tentacles. A: large rods; B: spiny curved plates; C: irregular rods; D: rosettes.

Calcareous ring thin, fragile, made of ten pieces. Radial and interradial pieces of same height, without posterior projections but with deep posterior notch (fig. 20B); radial pieces with deep central groove for insertion of retractor muscles of pharynx. Retractor muscles very thick and short.

One type of ossicle in body wall: large perforated plates with knobs at one tip and a sharp perforated point bending with an angle of 60° to 90° (fig. 20C). These plates (250-400 µm long) derive from X-shaped ossicles (fig. 20D). Dorsal and ventral tube feet with curved rods bearing strong central tooth (figs. 20E and G); the teeth

protrude through the skin, giving the tube feet a spiny surface. In ventral tube feet, these strong spines are sometimes divided into two irregular processes (fig. 20G); very small perforated end plates (figs. 20F and H).

Tentacles with numerous ossicles; large rods (100-370 µm long) with perforated tips (fig. 21A), spiny curved plates (100-300 µm long) (fig. 21B), small irregular rods (50-100 µm long) (fig. 21C) and rosettes (fig. 21D).

Discussion.— The specimen from Mauritania shows no differences from the type material from Zaire (Cherbonnier, 1964, 1965a) and from the material from Dahomey (Cherbonnier, 1965b).

Distribution.— *Panningia bispicula* was known from Zaire and Dahomey. The species is new to the fauna of Mauritania, extending its known distribution much further north.

Order **Apodida** Brandt, 1835
Family **Synaptidae** Burmeister, 1837
Genus **Labidoplax** Oestergren, 1898
Labidoplax digitata (Montagu, 1808)
(fig. 22)

Synonymy.— See Tortonese, 1965: 106.

Material.— **Mauritania**: RMNH Ech. 05836 (3 specimens); RMNH Ech. 05837 (1 specimen); RMNH Ech. 05841 (3 specimens); RMNH Ech. 05842 (4 specimens).

Descriptive notes.— Body shape, tentacles and ossicles (fig. 22) of the specimens are characteristic of *Labidoplax digitata* (Montagu, 1808). Thirteen specimens are intact. Their length varies from 13 to 52 mm.

Distribution and habitat.— The depth range observed (35-65 m) corresponds to the upper limit of the species (Koehler 1921; Tortonese 1965; Cherbonnier 1969, 1970).

L. digitata lives deep in the muddy sand. This explains why 16 of the 17 specimens were collected with a van Veen grab.

This species is common in Europe (Atlantic coast and Mediterranean Sea) and is very abundant along the coast of Morocco (Hérouard 1929). Its occurence in Mauritania represent its southernmost distribution limit. This is the first record of this species for Mauritania.

Zoogeographical comments

The holothurian fauna of Mauritania now includes 28 species which can be divided into five groups (excluding *Pseudocnus* spec.).

1. Species restricted to Mauritania, or almost so (sometimes extending to North Senegal and South Morocco): *Holothuria arguinensis* Koehler & Vaney, 1906; *Thyone basescoi* Cherbonnier, 1972; *Paracucumaria mauritanica* (Hérouard, 1929); *Paracucumaria deridderae* spec. nov.; *Hemioedema gruveli* Hérouard, 1929; *Molpadia loricata* Perrier, 1902.

2. Species also known from Europe and the Mediterranean Sea, for which Mauri-

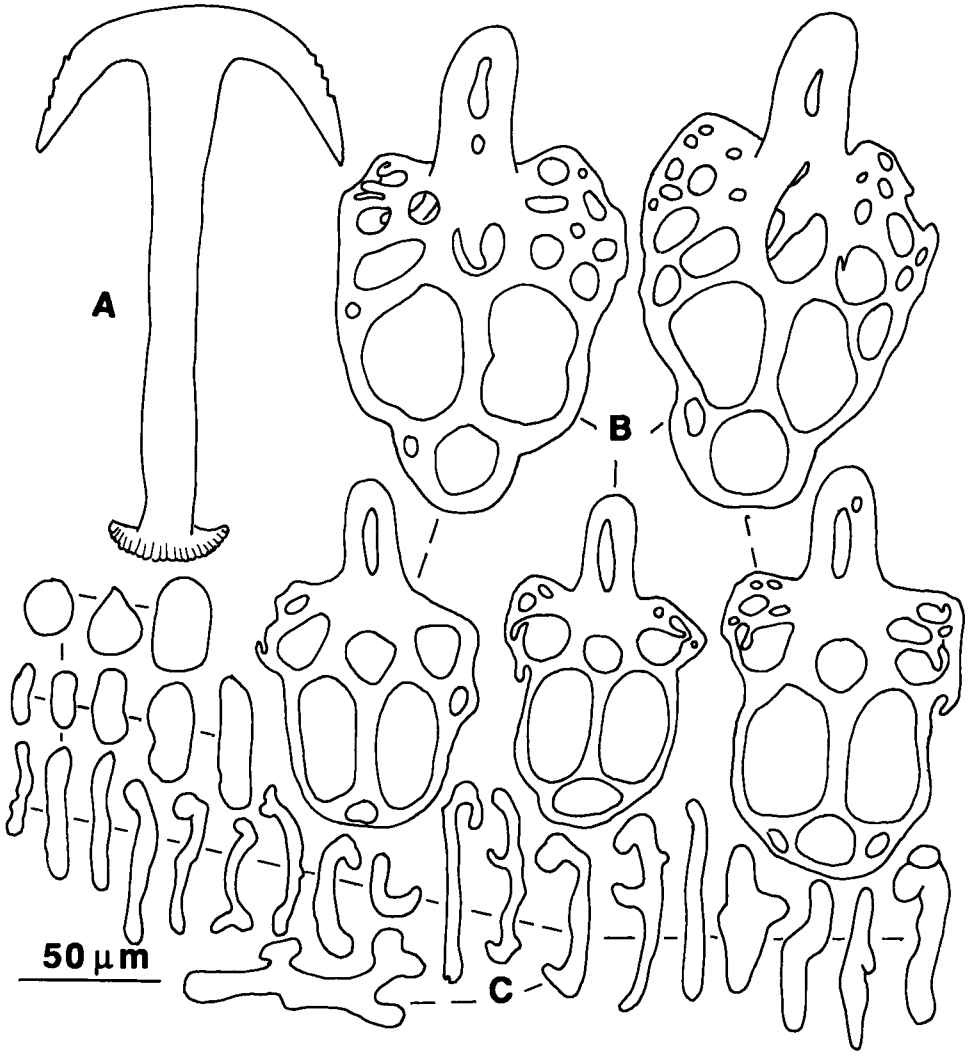

Fig. 22. *Labidoplax digitata* (Montagu, 1808). A: anchor of body wall; B: plates of body wall; C: ossicles of tentacles.

tania is the southern distribution limit: *Paroriza pallens* (Koehler, 1896); *Ocnus planci* Brandt, 1835; *Phyllophorus pedinaequalis* Cherbonnier, 1969; *Labidoplax digitata* (Montagu, 1808).

3. West African species for which Mauritania is the northern distribution limit: *Cladodactyla senegalensis* Panning, 1940; *Stereoderma colochiriformis* (Ludwig & Heding, 1935); *Trachythyone fallax* Cherbonnier, 1958; *Echinocucumis tenera* Cherbonnier, 1958; *Panningia bispicula* Cherbonnier, 1964.

4. Deep-sea species with at least an Atlantic distribution (some of them being cosmopolitan): *Mesothuria verillii* (Théel, 1886); *Benthothuria funebris* Perrier, 1902; *Bathyplotes tizardi* Théel, 1882; *Bathyplotes reptans* Perrier, 1902; *Paelopatides* cf. *P. grisea*

Perrier, 1902; *Benthodytes lingua* Perrier, 1902; *Benthogone rosea* Koehler, 1896; *Laetmogone violacea* Théel, 1879; *Ypsilothuria talismani* Perrier, 1902; *Ypsilothuria attenuata* Perrier, 1902.

5. Species with a wide bathymetrical range and with at least an eastern Atlantic distribution: *Stichopus regalis* (Cuvier, 1817); *Molpadia musculus* Risso, 1826.

The holothurian fauna of the coast of Mauritania is still imperfectly known. More collecting needs to be done, and more species are to be expected. Nevertheless, the material collected during the Tyro Mauritania-II expedition, coupled with data from the literature show that Mauritania forms the southern extreme distribution limit for some European species and the northern distribution limit for some tropical African species.

The zoogeographical "hinge" position of Mauritania, here observed for the Holothurioidea, was already known for other groups of pelagic or benthic animals (see Ekman 1953; Briggs 1974). In fact, Mauritania is known as the border between the Atlantico-Mediterranean fauna (Lusitanian Province) and tropical African fauna (West African Province). This phenomenon is linked to the fact that tropical Atlantic waters and temperate Atlantic waters mix between Cap Blanc and Cap Verde.

Acknowledgements

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