

## A new species of *Holothuria* (Aspidochirotida, Holothuriidae) from Kenya

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### ABSTRACT.

Samyn Y., Massin C. & Muthiga N. A. 2001. A new species of *Holothuria* (Aspidochirotida, Holothuriidae) from Kenya. *Annls Mus. R. Afr. Centr. (Zool.)* 285: 101-110. A new species, *Holothuria* (*Mertensiothuria*) *arenacava* (Echinodermata, Holothuroidea) from the littoral waters of Kenya is described. This species is characterized by its sand-burrowing behaviour, its small tentacles, the variously developed tables, corpuscules, buttons, plates and rods in the tube feet, and by the smooth, spiny and knobbed rods in the tentacles.

**Keywords** – Echinodermata, East Africa.

### RESUME.

*Holothuria* (*Mertensiothuria*) *arenacava* sp. nov. (Echinodermata, Holothuroidea), provenant des eaux littorales du Kenya, est décrite. L'espèce se caractérise par son comportement fouisseur, par ses petits tentacules et par les spicules de ses podia (tables plus ou moins développées, corpuscules, boutons, plaques et baguettes) et de ses tentacules (baguettes lisses, noduleuses ou épineuses).

### Introduction

The Kenyan Coast has been intensively investigated by SCUBA diving for echinoderms between 1997 and 1999. This survey has resulted in an annotated checklist of the echinoids and holothurians from the Kiunga Marine National Reserve adding several echinoid and holothurian species to the Kenyan fauna (Samyn & Vanden Berghe, in press). Further collecting from the Mombasa Marine National Reserve (1998-2000) yielded several specimens of a burrowing holothurian which is new to science, the description of which is the object of the present note.

### Material and methods

Material originates from 2 expeditions, August 1998 and April 2000, resulting from a joint effort by the Free University of Brussels (Unit of Ecology & Systematics) and Kenya Wildlife Service. Collecting was done by hand-picking while SCUBA diving down to depths of 12 m. Although the new species

is a sand-burrowing species, destructive sampling techniques like dredging were never used.

The specimens were anaesthetized in 5 % magnesium chloride for 5 hours, transferred to 100 % buffered alcohol for one day and transferred to 70 % buffered alcohol for permanent storage. Ossicles were prepared for light microscopy as described by Massin (1999).

The holotype and 3 paratypes are deposited in the collections of the Institut royal des Sciences naturelles de Belgique, Brussels (IRSNB), under the number IG 28628. Two paratypes are deposited in the collections of the Royal African Museum, Brussels (MRAC), under the number MRAC 1662 and 1663, two paratypes are deposited in the collections of the Muséum National d'Histoire Naturelle, Paris (MNHN), under the number EcHh 8070 and EcHh 8071, two paratypes in the collections of the Smithsonian Institution, Washington (SI), under the numbers USNM E53097 and 53098 and two paratypes in the collections of the British Museum of Natural History, London (BMNH), under the numbers NHM 2000.2414 and NHM 2000.2415.

Material has been compared with species from the collections of the RBINS and with the type material of *Holothuria (Mertensiothuria) papillifera* Heding in Mortensen, 1938 from the Zoologisk Museum (ZM), Copenhagen.

### Taxonomy

Family Holothuriidae LUDWIG, 1894  
Genus *Holothuria* LINNAEUS, 1767  
Subgenus *Mertensiothuria* DEICHMANN, 1958  
*Holothuria (Mertensiothuria) arencava* sp. nov.

### Material

*Holotype*: KENYA, Mombasa, VIII.1998, 11 m depth, coll. Y. Samyn (IRSNB IG 28628/KMom/9897-6)

*Paratypes* in the collections of IRSNB: KENYA, Mombasa, VIII.1998, 12 m depth, coll. Y. Samyn (IRSNB IG 28628/KMom/9897-2); KENYA, Mombasa, VIII.1998, 12 m depth, coll. Y. Samyn, (IRSNB IG 28628/KMom/9897-3); KENYA, Mombasa, IV.2000, 10 m depth, coll. N.A. Muthiga (IRSNB IG 28628/KMom/0002-2).

*Paratypes* in the collections of MRAC: KENYA, Mombasa, VIII.1998, 9 m depth, coll. Y. Samyn (KMom/9897-1:MRAC 1662); KENYA, Mombasa, IV.2000, 10 m depth, coll. N.A. Muthiga, (KMom/0002-1:MRAC 1663).

*Paratypes* in the collections of MNHNP: KENYA, Mombasa, VIII.1998, 10 m depth, coll. Y. Samyn, (EcHh8070 KMom/9897-4); KENYA, Mombasa, IV.2000, 10 m depth, coll. N.A. Muthiga (EcHh8071 KMom/0002-3)

*Paratypes* in the collections of SI: KENYA, Mombasa, VIII.1998, 11 m depth, coll. Y. Samyn, (USNME 53098 KMom/9897-5); KENYA, Mombasa, IV. 2000, 10 m depth, coll. N.A. Muthiga, (USNME 53097 KMom/0002-4);

*Paratypes* in the collections of BMNH: KENYA, Mombasa, VIII.1998, 10 m depth, coll. Y. Samyn, (NHM 2000.2414 KMom/9897-7); Kenya, Mombasa, IV.2000, 10 m depth, coll. N.A. Muthiga, (NHM 2000.2415 KMom/0002-5)

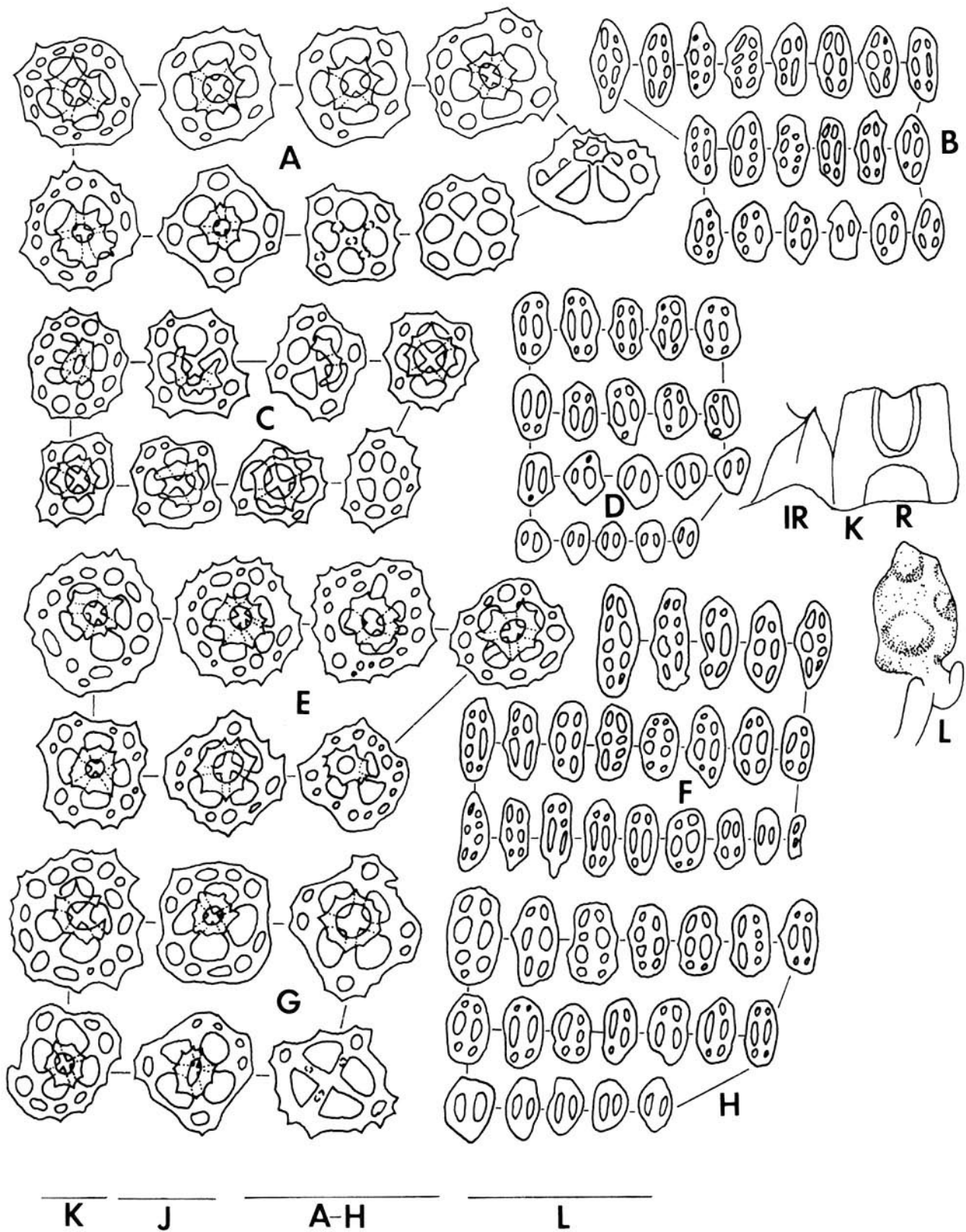
### Type locality

Mombasa Marine National Reserve, off the Reef Hotel (Map 1).

### Description

Preserved specimens range between 160 x 40 to 190 x 48 mm in length and breadth, respectively. Living specimens range up to approximately 250 x 50 mm. Colour in life identical to colour in alcohol. Trivium uniform chestnut brown, bivium chestnut brown with sometimes an orange-brown median area, anus underlined with orange-brown in some specimens. Body wall with numerous, irregular transversal wrinkles. Five clearly distinguishable longitudinal grooves in the ambulacral areas, over the total body length. Body wall covered by numerous short, brown cylindrical tube feet, distributed evenly over both the radial and interradial areas. Bivium also bears a few conical papillae of the same colour. Mouth ventral, surrounded by 20 small tentacles; one specimen with only 12 tentacles (eight dorsal and four ventral, the latter reduced). Tentacle crown surrounded dorsally by a semicircle of light brown conical papillae. Anus terminal, surrounded by a semicircle of chestnut brown, conical papillae. Longitudinal muscles bifid, prominent. Body wall up to 8 mm thick. Cuvierian tubules present. Calcareous ring (fig 1K) with radial plates almost twice the width and one and a half times the length of the interradial ones. Single, well developed Polian vesicle, 1/6 of the body length. Stone canal (Fig. 1L) very short, contorted, ending in an irregular quadrangular madreporic plate. Respiratory trees dendritic, very long extending forward to reach the calcareous ring.

Ossicles of the ventral and dorsal body wall (Fig.1) consist of tables, buttons and corpuscles (plates with 2-3 holes). Tables (Figs 1A, C, E, G) numerous, disc 45 to 67  $\mu$ m across, perforated by four central holes and 5-14 peripheral holes of various sizes; disc quadrangular or more rounded with a spinose rim; pillars short (0-1 cross beam) ending in a spiny crown with a large central opening; sometimes, pillars reduced to knobs. Buttons (Figs 1B, D, F, H) numerous, 25 to 55  $\mu$ m long, with 3-4 pairs of irregular holes; rim of button smooth but irregular. Corpuscles (Figs 1D, F, H), from 20 to 30  $\mu$ m long, with 2-3 holes; more numerous in small specimens. Ventral tube feet with plates, buttons, modified buttons, corpuscles, rods and tables. Plates (Fig. 2B) up to 75  $\mu$ m long, with up to four columns of holes. Buttons in large specimens (Fig. 2B) up to 85  $\mu$ m long and 43  $\mu$ m wide, mostly with 2-3 rows of holes. Buttons in small specimens (Fig. 2D), up to



**Fig 1** *Holothuria (Mertensiothuria) arenacava* sp. nov. A. Tables of ventral body wall (L=160 mm); B. Buttons of ventral body wall (L=160 mm); C. Tables of ventral body wall (L=73 mm); D. Buttons and corpuscles of ventral body wall (L=73 mm); E. Tables of dorsal body wall (L=160 mm); F. Buttons and corpuscles of dorsal body wall (L=160 mm); G. Tables of dorsal body wall (L=73 mm); H. Buttons and corpuscles of dorsal body wall (L=73 mm); K. Calcareous ring (L=160 mm; R. radial plate; IR. Interradial plate); L. Stone canal and madreporic plate (L=73 mm). Scale bar A-H represents 100  $\mu$ m; scale bar J represents 100  $\mu$ m; scale bar K represents 5 mm; scale bar L represents 5 mm.

70 µm long, always with 2-4 pairs of holes. Some buttons reduced to rods (Fig. 2B). Some small corpuscles (Fig. 2D), up to 25 µm long, with two holes. Tables similar in small and large specimens (Figs 2A,C); disc from 30 to 48 µm across with a rim always more or less spinose; disc always perforated by four large central holes and a variable number of peripheral holes; spire variably developed, often reduced to only a few knobs. End plate of ventral tube feet up to 765 µm across. Ventral tube feet at the anal side with similar poorly developed tables (Fig. 2E); numerous perforated rods (Fig. 2F) up to 110 µm long; end plate, small, only 80 µm across (Fig. 2G); numerous buttons (Fig. 2H), always with 1-6 pairs of irregular holes. Oral papillae in small specimens with simple rods (Fig. 3A), sometimes perforated at the extremities, from 30 to 110 µm long; buttons (Fig. 3B) with 2-5 pairs of holes, up to 75 µm long; some small corpuscles (Fig. 3B) with 2-4 holes. Oral papillae in large specimens with buttons (Fig. 3C) and variously developed tables (Fig. 3D). Dorsal papillae with buttons (Fig. 3G), from 30 to 85 µm long, with 2-7 pairs of irregular holes; complex rods derived from the largest plate-like buttons (Fig. 3E); tables (Fig. 3F) similar to the ones in the body wall. Dorsal tube feet with tables (Fig. 3H), buttons (Fig. 3J), and rods (Fig. 3K) similar to the ones in the ventral tube feet, both in size and in shape. End plate of dorsal tube feet 500-600 µm across. Tentacles with smooth, spiny and knobbed rods (Figs 3N, P), 35 to 160 µm long.

### Ecology

*Holothuria (Mertensiothuria) arenacava* lives in the sand at depths ranging from 9 to 12 meters. The animal lies flat, just below sand surface, only exposing a part of its dorsal surface.

### Distribution

*Holothuria (Mertensiothuria) arenacava* is only known from the type locality.

### Etymology

The name *arenacava* refers to the sand-burrowing behavior of the species; *arena* meaning sand and *cava* is derived from *cavare*, meaning to dig.

### Discussion

The species described here clearly belongs to the subgenus *Mertensiothuria* Deichmann, 1958, by the calcareous ring which has radial plates which are almost twice as wide as the interradial plates, by the body wall which always contains tables with a spiny disc and wide central, variously developed crown, by the irregular buttons, perforated by 4-8 holes, and by the dorsal and ventral tube feet that contain similar elongated buttons, perforated by 2-4 rows of holes, small plates, variously developed tables, and perforated rods.

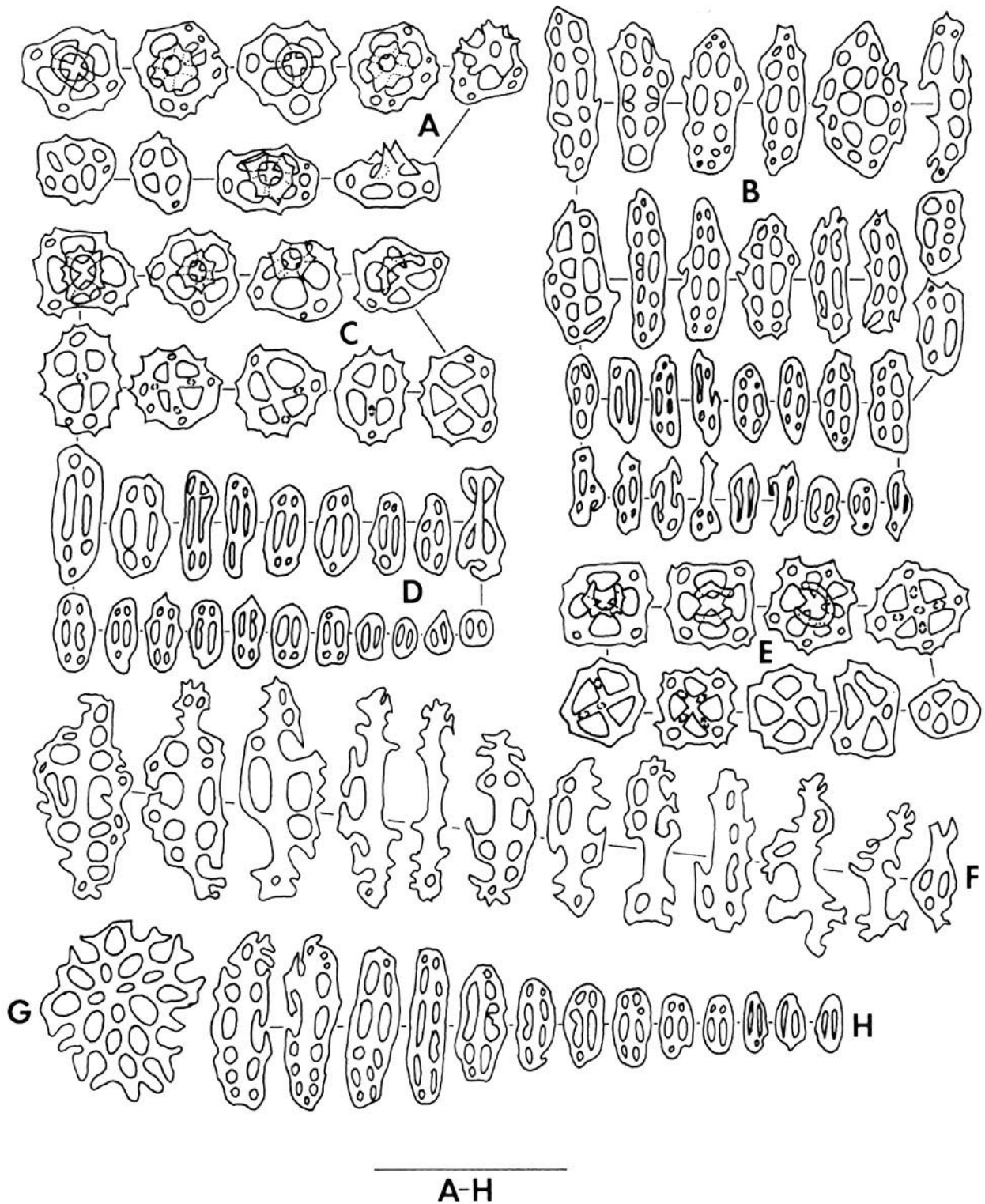
At present seven species are generally included in the subgenus *Mertensiothuria*: *H. (M.) albofusca* Cherbonnier, 1988, *H. (M.) artensis* Cherbonnier & Féral, 1984, *H. (M.) exilis* Koehler & Vaney, 1908, *H. (M.) fuscorubra* Théel 1886, *H. (M.) leucospilota* Brandt, 1835, *H. (M.) papillifera* Heding in Mortensen, 1938, and *H. (M.) platei* Ludwig, 1898. Rowe (1969) states that *H. (M.) papillifera* is probably conspecific with *H. (M.) leucospilota*. However, examination of the type material of *H. (M.) papillifera* showed that it is clearly distinct from *H. (M.) leucospilota*.

Formerly *Holothuria canaliculata* Tan Tiu, 1981, *H. dietrichii* Ludwig, 1875, *H. dofleinii* Augustin, 1908, *H. fuscocinerea* Jaeger, 1833 and *H. pervicax* Selenka, 1867 were recognized within the subgenus *Mertensiothuria*. According to Rowe (in Rowe & Gates 1995) who re-examined the type material, *H. dietrichii* is a junior synonym of *Thyone papuensis* Théel, 1886. The others have been moved to the subgenus *Stauropora* by Rowe (in Rowe & Gates 1995). Moreover, according to this author *H. canaliculata* is a junior synonym of *H. dofleinii*.

From all known species within the genus *Mertensiothuria*, *H. (M.) arenacava* sp. nov. is readily distinguished from all the known species allocated to the subgenus *Mertensiothuria* by its burrowing habit.

Of the known species, *H. (M.) albofusca*, *H. (M.) fuscorubra*, *H. (M.) leucospilota*, and *H. (M.) papillifera* are species which are known to occur in the western Indian Ocean and/or the Red Sea (table 1). *H. (M.) leucospilota* and *H. (M.) fuscorubra* have a similar colour pattern as *H. (M.) arenacava*, but





**Fig 2.** *Holothuria (Mertensiothuria) arenacava* sp. nov. A. Tables of ventral tube feet (L=160 mm); B. Buttons and plates of ventral tube feet (L=160 mm); C. Tables of ventral tube feet (L=73 mm); D. Buttons and corpuscles of ventral tube feet (L=73 mm); E. Tables of ventral tube feet at anal side (L=73 mm); F. Plates and rods of ventral tube feet at anal side (L=73 mm); G. Endplate of ventral tube feet at anal side (L=73 mm); H. Plates, buttons and corpuscles of ventral tube feet at anal side (L=73 mm). Scale bar A-H represents 100  $\mu$ m.

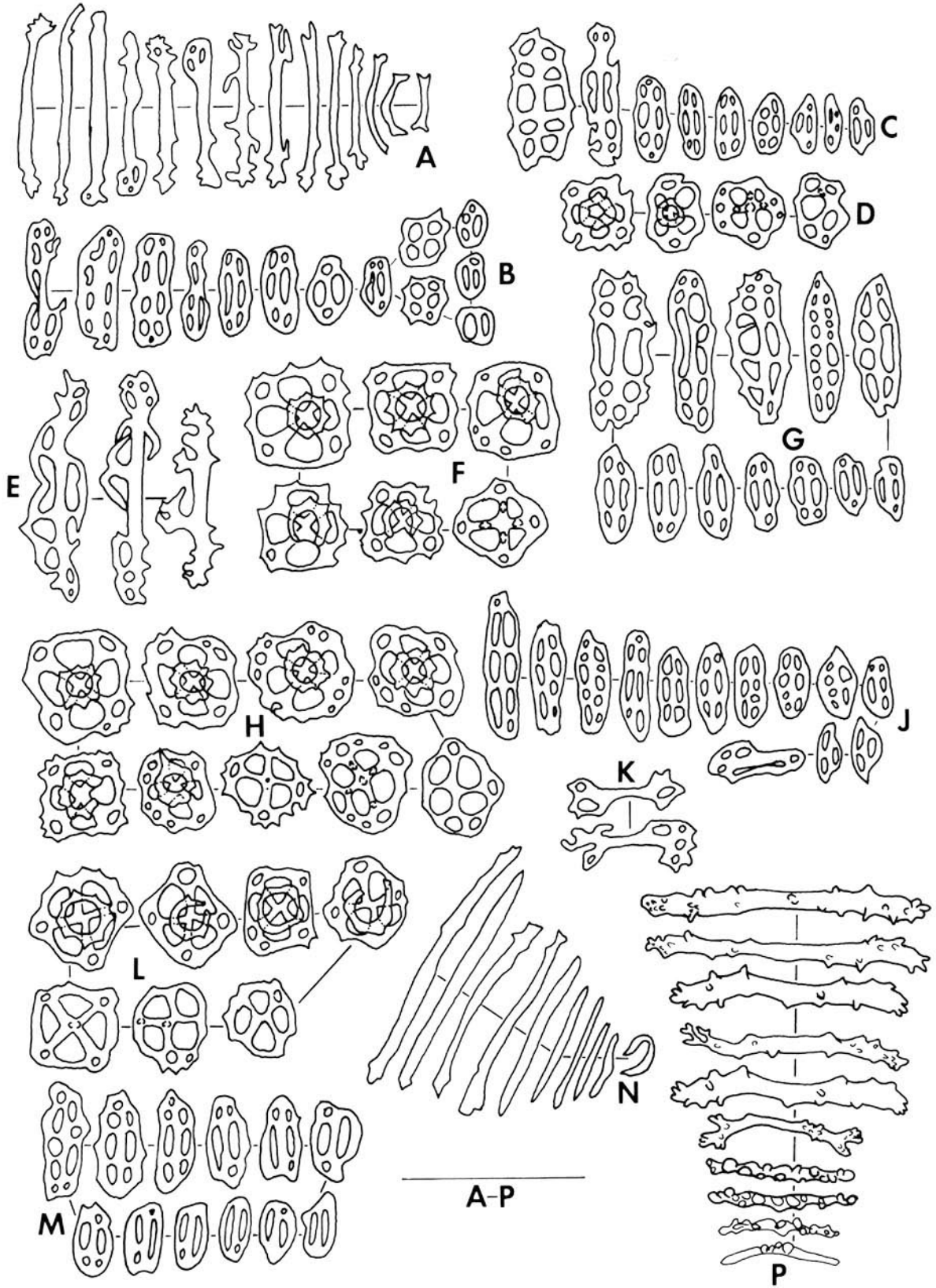


Fig. 3. *Holothuria (Mertensiothuria) arenacava* sp. nov. A. rods of oral papillae (L=73 mm); B. Plates, buttons and corpuscles of oral papillae (L=73 mm); C. Plates and buttons of oral papillae (L=160 mm); D. Tables of oral papillae (L=160 mm); E. Rods of dorsal papillae (L=73 mm); F. Tables of dorsal papillae (L=73 mm); G. Plates and buttons of dorsal papillae (L=73 mm). H. Tables of dorsal tube feet (L=160 mm); I. Buttons of dorsal tube feet (L=160 mm); J. Buttons of dorsal tube feet (L=73 mm); K. Rods of dorsal tube feet; L. Tables of dorsal tube feet (L=73 mm); M. Buttons of dorsal tube feet (L=73 mm); N. Smooth rods of tentacles; O. Knobbed rods of tentacles; P. Knobbed rods of tentacles. Scale bar A-P represents 100  $\mu$ m.

these species present different ossicles in the tube feet and the tentacles. The tube feet of *H. (M.) leucospilota* present large plates, whereas *H. (M.) arenacava* presents only small plates; the tentacles of *H. (M.) leucospilota* are characterized by the absence of ossicles (Cherbonnier 1988, Massin 1999), while *H. (M.) arenacava* presents characteristic smooth, spiny and knobbed rods. Ossicles of *H. (M.) fuscorubra* are very similar to the ones of *H. (M.) leucospilota*, besides small rods in the tentacles (Cherbonnier 1951). Nevertheless, these rods are very different from the ones found in *H. (M.) arenacava*. *H. (M.) albofusca* is only known from 3 specimens from Madagascar, hence intraspecific variation in this species is largely undocumented. However, its typical colouration pattern with a chocolate brown dorsal side, a white yellowish ventral side and anus circled by chestnut brown is distinct from the more uniform colouration of *H. (M.) arenacava*. Moreover, the ventral tube feet of *H. (M.) albofusca* are characterized by the presence of only large plates (Cherbonnier 1988) while the ventral tube feet of *H. (M.) arenacava* possess tables, buttons and small plates.

*H. (M.) exilis* from the Andaman Islands (Koehler & Vaney 1908), *H. (M.) papillifera* from the Red Sea (Heding in Mortensen 1938), *H. (M.) platei* from Juan Fernandez (Ludwig 1898, Panning 1935), and *H. (M.) artensis* from New Caledonia (Cherbonnier & Féral 1984) are only known from the type locality.

*H. (M.) exilis* is another species only known from a single 2 cm long specimen: grayish chestnut brown body; 20 yellowish tentacles; pedicels spread in bivium, in rows in trivium; presenting tables with smooth rim of disc and low or no spire, very short, sparsely knobbed rods and corpuscles in the body wall; in the tube feet tables with pointed spire with 2-3 cross-beams. General body morphology and the absence of buttons make it markedly distinct from *H. (M.) arenacava*. However, it should be noted that in their description Koehler & Vaney (1908) stated that *H. exilis* is systematically very close to *H. pervicax* Selenka, 1867. In his important review on the Holothuriidae Rowe (1969) also noted that *H. exilis* 'will prove to be conspecific with *H. pervicax* Selenka, 1867' [sic]. Later, Rowe (in Rowe & Gates 1995) placed *H. pervicax* in the subgenus *Stauropora* after re-examination of the type material of *H. pervicax*. Several requests to the Indian Museum in

Calcutta by one of us (CM) were left unanswered, hence we consider the material as being temporarily unavailable. Therefore we cannot make conclusions on the validity of *H. exilis*.

*H. (M.) papillifera* is yet another poorly described species (Heding in Mortensen 1938), characterized by its lack of Cuvierian organs, by tables with well developed disc, pillars united by a single cross-beam and ending in a spiny crown, by very regular, 50 µm long buttons with 6 angular holes, rods in the tentacles and 30-40 µm long oval rings in the longitudinal muscles. Again, these characteristics (especially the regular buttons and the oval rings) are markedly distinct from *H. (M.) arenacava*. Moreover, *H. (M.) papillifera* is characterized by very large, soft dorsal papillae which have not been observed in *H. (M.) arenacava*. *H. (M.) platei* presents large plates in the dorsal and (even longer) in the ventral tube feet; irregular, smooth, variously developed buttons with 6 pairs of holes, and poorly developed tables without spire in the body wall; whereas *H. (M.) arenacava* presents well developed tables, buttons of various sizes in the body wall, and rods, buttons, small plates and tables in the tube feet and papillae.

It appears that *Holothuria (Mertensiothuria) arenacava* has most affinity with the recently described *H. (M.) artensis* Cherbonnier & Féral, 1984, by the tables, the buttons and by the presence of both smooth and spiny rods in the tentacles. However, they differ strikingly by the ossicles of dorsal tube feet: only rosettes for *H. (M.) artensis* versus buttons, corpuscles, tables and rods for *H. (M.) arenacava*. Moreover, the tube feet of *H. (M.) arenacava* do not contain the X-shaped rods and rosettes specific of *H. (M.) artensis*.

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Current species name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Distribution
<i>H. (Mertensiothuria) albofusca</i> Cherbonnier, 1988												x			Madagascar only
<i>H. (Stauropora) dofleini</i> Augustin, 1908 cited as <i>Holothuria dofleinii</i> Augustin				x									x		Indo-West Pacific (East Africa & Japan)
<i>H. (Mertensiothuria) fuscocinerea</i> Jaeger, 1833 cited as <i>Holothuria curiosa</i> Ludwig				x			x			x		x		x	Red Sea; Indo-West Pacific
cited as <i>Holothuria fusco-cinerea</i> Jäger					x										Indo-West Pacific
<i>H. (Mertensiothuria) fuscocinerea</i> Théel, 1886 cited as <i>Holothuria fusco-rubra</i> Théel					x										Indo-West Pacific
<i>H. (Mertensiothuria) leucospilota</i> Brandt, 1835 cited as <i>Holothuria vagabunda</i>															Red Sea; Indo-Pacific
cited as <i>Holothuria vagabunda</i> Selenka					x	x									Red Sea
<i>H. (Mertensiothuria) papillifera</i> Heding, 1938						x									Red Sea; Indo-Pacific
<i>H. (Stauropora) perricax</i> Selenka, 1867							x	x	x	x	x	x	x		Red Sea; Indo-Pacific

**Table 1.** Littoral holothurians formerly and actually within the subgenus *Mertensiothuria* from eastern Africa, the Red Sea and the western Indian Ocean Islands. 1. Bell, 1884<sup>1</sup>; 2. Lampert, 1896<sup>2</sup>; 3. Ludwig, 1899<sup>3</sup>; 4. Pearson, 1910<sup>4</sup>; 5. Pearson, 1913<sup>5</sup>; 6. Heding in Mortensen, 1938<sup>6</sup>; 7. Clark & Rowe, 1971<sup>6</sup>; 8. Sloan et al, 1979<sup>7</sup>; 9. Tortonese (1949; 1951; 1980)<sup>8</sup>; 10. Humphreys, 1981<sup>9</sup>; 11. Clark, 1984<sup>10</sup>; 12. Cherbonnier, 1988<sup>11</sup>; 13. Rowe & Richmond, 1997<sup>12</sup>; 14. Samyn & Vanden Berghe, in press<sup>13</sup>.

- Bell (1884) lists echinoderms from Mozambique, the Seychelles, Darros Islands, the Amirante Islands, and from Glorieuses Islands.
- Lampert (1896) describes a collection made mainly in the surroundings of Zanzibar, but sampled also in the Suez region and in the Red Sea.
- Ludwig (1899) briefly describes a collection of echinoderms from the Zanzibar area, i.e. the area bordering the East African coast, from the equator to +20° South, comprising British-East Africa, German East Africa and Portuguese Mozambique, the Island Juan de Nova in the Mozambique Channel, Madagascar (with Nosy-Bé and Nosy-Faly), Mayotte, the Comores, the Glorieuses Islands and Aldabra. In addition the echinoderm fauna of Amirante Islands and the Seychelles are also considered.
- Pearson (1910) gives a brief but concise description of the holothurians from the Kerimba Archipelago (Mozambique)
- Pearson (1913) describes the holothurians in the waters which lie between latitudes 30°N and 30°S and longitudes 30°E and 130°E, an area which falls out of the scope of this paper. Consequently, only the species which have a discrete record in the surroundings of our study region are included in this list.
- Clark & Rowe (1971) lump the holothurians from East Africa and Madagascar in one group, the Islands of the western Indian Ocean in a second group and the Mascarene Islands in a third group. All three geographical areas are considered in this table.
- Sloan et al. (1979) briefly describe the echinoderms from Aldabra.
- The echinoderm fauna of Somalia has been described by Tortonese. This list summarizes the holothurians described in 3 papers (1949; 1951; 1980).
- Humphreys (1981) gives a checklist of the echinoderms from Kenya and Zanzibar.
- Clark (1984) lists of echinoderms from the Seychelles, whereby she also includes the species known from Aldabra, from the Mascarene Islands and/or from East Africa/Madagascar
- Cherbonnier (1988) describes and discusses the holothurians from Madagascar (a few species are also from Zanzibar, the Comores and Glorieuses Islands).
- Rowe & Richmond (1997) briefly describe the echinoderms found in the western Indian Ocean, i.e. "from about central Somalia to the center Kwazulu-Natal coast of South-Africa, embracing the islands of Madagascar, the Comores, Zanzibar, la Réunion Mauritius and the Seychelles".
- Samyn & Vanden Berghe (in press) give an annotated checklist of the echinoids and the holothurians of the Kiunga Marine Reserve, Kenya, bordering Somalia. Hereby they also discuss local distribution.

