

## ***Stolus kilberti*, a new species from the east coast of South Africa (Echinodermata: Holothuroidea: Dendrochirotida) with a key to the genus *Stolus* Selenka**

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A new species of phylloporid dendrochirotid, collected from subtidal waters off the east coast of South Africa, is described as *Stolus kilberti* sp. nov. in the subfamily Thyoninae. It is distinctive in the form of its calcareous ring and body wall plates in combination, and appears to be closely related to *S. rapax* (Koehler & Vaney, 1908) from the Bay of Bengal, differing from it in having elongated, rather than spherical multi-layered plates. If the calcareous ring were not fragmented the species could well be referred to the genus *Pseudothyone* Panning, 1949 of the subfamily Sclerodactylinae, closely allied to *P. mosaica* (Koehler & Vaney, 1910) from the Persian Gulf. The remarkable similarity in the body wall deposits of genera currently classified in two separate subfamilies challenges the use of the calcareous ring to separate subfamilies, since it demands a degree of evolutionary convergence which hardly seems probable. Of the eleven nominal species of *Stolus*, eight are keyed and a table provided to compare the three similar species – *S. kilberti*, *S. rapax* and *P. mosaica*.

### Introduction

A single complete specimen of a dendrochirotid holothuroid dredged at 40 m off Liefeldt's Rock, northern KwaZulu-Natal, South Africa, is here described as *Stolus kilberti* sp. nov. The genus *Stolus* was hitherto represented in southern Africa by only its type species, *Stolus buccalis* (Stimpson, 1856). The new species appears to be unique in the form of its calcareous ring and spicules in combination and is referred to *Stolus* on the basis of the diagnosis provided by Panning (1949: 462).

Thandar (1990), in his revision of the southern African phylloporid holothuroids, recorded nine species in the subfamily Thyoninae – seven in the genus *Thyone*, one in *Thyonina* and one in *Stolus*. Since then one more *Thyone* species has been described (Thandar & Rajpal in press). The description here of *Stolus kilberti* increases to 11 the number of Thyoninae and to 13 the number of Phylloporids (sensu Pawson & Fell 1965), currently known from southern Africa.

In his revision of the family Cucumariidae, Panning (1949) separated the subfamily Thyoninae from the Sclerodactylinae on the basis of the presence of a completely fragmented mosaic-like calcareous ring in the former. In the latter subfamily only the posterior processes of the ring are stated to be subdivided and not the plates themselves. He included nine genera in the Thyoninae with the genus *Stolus* as the only one characterised exclusively by either smooth or knobbed plates in the body wall. Of the nine species included in the genus *Stolus* by Panning (1949) only the following seven remain:

- *cognatus* (Lampert, 1885)
- *punctatus* (Ohshima, 1915)
- *molpadioides* (Semper, 1868)
- *buccalis* (Stimpson, 1856)
- *canescens* (Semper, 1868)
- *rapax* (Koehler & Vaney, 1908)
- *minutus* (H.L. Clark, 1938)

*Stolus huttoni* (Dendy, 1896) has long been referred to their genus *Placothuria* by Pawson & Fell (1965) and *S. microp-*

*unctatus* (Sluiter, 1910) has been referred to the synonymy of *Thyone belli* Ludwig, 1887 (= *Pseudothyone belli*) by Deichmann (1954) and confirmed by Pawson & Miller (1981).

Two more species have recently been referred to this genus, namely *S. conjungens* (Semper, 1868) by Clark & Rowe, 1971 and *S. papillatus* (Sluiter, 1887) by Massin, 1987. However, *S. minutus* (Clark, 1938) probably based on a juvenile, is suspected by Rowe & Gates (1995) to be synonymous with *S. conjungens*, whereas *S. papillatus* appears to be referable to the genus *Pseudothyone* in the subfamily Sclerodactylinae (sensu Panning 1949 and Thandar 1989b) or, according to Massin (pers. com.) perhaps to the subfamily Sclerothyoniinae. Hence the genus is here considered to be comprised of only seven valid species. To this is now added *S. kilberti* sp. nov. from South Africa which appears to be quite close to *S. rapax* (Koehler & Vaney, 1908) as well as to *Pseudothyone mosaica* (Koehler & Vaney, 1910). All eight species are here keyed.

### Material and methods

The single specimen was dredged by collectors from the Natal Museum on board the R.V. Meiring Naudé, off the KwaZulu-Natal north coast on 9 June 1988. The specimen is deposited in South African Museum, Cape Town, with SAM-A catalogue number. The preparation of spicules for light and scanning electron microscopy is described elsewhere (Thandar 1989a).

### Key to the species of *Stolus*

1. Body wall deposits single-layered plates ..... 2  
body wall deposits multi-layered plates ..... 7
2. body wall plates somewhat smooth ..... 3  
body wall plates distinctly nodular ..... 4  
introvert with irregular rosettes .....  
..... *cognatus* (Lampert, 1885)  
introvert with multilocular plates .....  
..... *punctatus* (Ohshima, 1915)

4. body wall plates (buttons) oval, predominantly quadri-locular. . . . . 5  
body wall plates rhomboidal, multilocular. . . . .  
. . . . . *molpadioides* (Semper, 1868)
5. knobs of plates large, central ones forming handles on both sides; multilocular plates absent from body wall. . . . .  
. . . . . *buccalis* (Stimpson, 1856)  
knobs of plates small or large, central ones not united by a handle but may form a short one or two-pillared spire on one side only . . . . . 6
6. knobs of plates large, central ones from plates of only the superficial layer of skin forming a pointed spire; other plates not spired  
. . . . . *canescens* (Semper, 1868)  
knobs relatively minute; central knobs often forming a short two-pillared spire on one side . . . . .  
*conjungens* (Semper, 1868)  
body wall plates rounded, compact, about 1 mm in diameter . . . . . *rapax* (Koehler & Vaney, 1908)  
body wall plates rectangular to triangular to irregular, never rounded, up to 0.50 mm in diameter . . . . .  
. . . . . *kilberti* sp. nov.

## Family Phyllophoridae Oestergren, 1907

### Subfamily Thyoninae Panning, 1949

Genus *Stolus* Selenka, 1867

Diagnosis (modified from Panning 1949: 462): Tentacles 10, ventral two much reduced. Calcareous ring conspicuously tubular with the radials carrying long paired prolongations, both ring and prolongations finely broken into a mosaic of numerous pieces. Spicules of body wall only in the form of smooth or knobbed plates ('buttons'), the latter often quite regular with 10–12 marginal knobs and four holes, whereas the former sometimes complex, multi-layered.

### *Stolus kilberti* sp. nov. (Figures 1 & 2)

#### Diagnosis

Body cylindrical, U-shaped, colour in alcohol, uniformly white. Tentacles 10 (ventral two reduced). Podia dense, uniformly scattered. Plates and processes of calcareous ring fragmented. Anterior projections of both radial and interradial plates bifid. Deposits of body wall mostly complex, multi-layered, smooth plates; a few simple smooth plates also found. Podia with reduced end plates, two-pillared tables and other simple to complex plates, similar to those of body wall but much smaller. Tentacles with rods and rosettes. Introvert with tables and rosettes.

#### Type

South African Museum, Cape Town, SAM-A27727.

#### Type locality

North East of Liefeldt's Rock, Zululand, South Africa (27°42.9' S. 32°39.1' E), 40 m.

#### Etymology

The new species is named after its collectors, Drs Richard Kilburn and Dai Herbert, malacologists from the Natal Museum, Pietermaritzburg.

## Description

Form cylindrical, U-shaped (Figure 2C); dorsal and ventral surfaces not clearly distinguishable. Length along ventral surface 37 mm, along dorsal surface 24 mm, width in mid-body 4 mm, tapering to 2 mm and 1.5 mm at anterior and posterior ends respectively. Colour, in alcohol, uniformly white. Body wall creased and villose. Podia, small, dense, non-retractile, uniformly scattered throughout the body, of same colouration as body wall. Tentacles 10, ventral two reduced. Anus flanked by 10 distinct papillae and five calcareous teeth.

Calcareous ring complex, tubular, elongate (Figure 1D). Radial and interradial plates fused for most of their length and subdivided into a few large pieces; radial plates anteriorly bifid each with a deep depression at anterior end for insertion of retractor muscle. Anterior projections of interradial plates also bifid but less pronounced, triangular, almost same length as those of radial plates. Total height of ring about 5 mm, including posterior processes, the latter, made up of 8–11 pieces of calcite, about 1.5 × height of ring. Polian vesicle single, sac-like. Stone canal short, white, straight; madreporite (Figure 1C) well formed, both lodged in dorsal mesentery. Respiratory trees well-branched, right slightly longer than left, both unite before opening into cloaca. Gonadal tubules not observed. specimen probably immature. Longitudinal muscles thin, unpaired. Retractors arise from extreme anterior end of longitudinal muscles as single strands, all more or less at same level.

Spicules of body wall predominantly in the form of large, smooth, complex, somewhat imbricating, multi-layered elongate, sometimes triangular plates. 260–470 µm in length (mean 370 µm) (Figures 1A&B and 2A). Pedicel deposits in the form of tables and plates. Table discs (Figures 1F & 2D) curved, multilocular, elongate to somewhat circular or irregular in shape, 90–140 µm in length (mean 116 µm); spire two-pillared, 70–110 µm high (mean 87 µm), tapering to a smooth spine; a few tables with reduced spires also found. Pedicel plates (Figures 1E & 2B) simple, one-layered to complex, multi-layered, 75–150 µm (mean 107 µm). End plates reduced, rounded. Introvert deposits tables and rosettes (Figures 1H & 2E), the former, either with smooth, irregular, multilocular discs and 2-pillared spires terminating in 1–6 large teeth, or with nodular rosette-like discs and a low 2-pillared spire often reduced to paired knobs on disc. Rosettes of introvert as minute, branched rods. Tentacles with perforated rods and minute branched rosettes of the same form as those of the introvert (Figures 1G & 2F).

## Distribution

Known only from type locality.

## Remarks

This species is strongly characterized by the almost exclusive presence of multilayered, complex, smooth plates in the body wall and a mosaic-like calcareous ring with fairly long, paired posterior processes. Plates of the type found in the body wall of this species are variable in shape and never occur as rounded formations. They are, in addition, always smooth and never knobbed. Such plates in combination with a complex calcareous ring have only been reported in the genera *Stolus* and *Pseudothyone*, which fall respectively in two separate

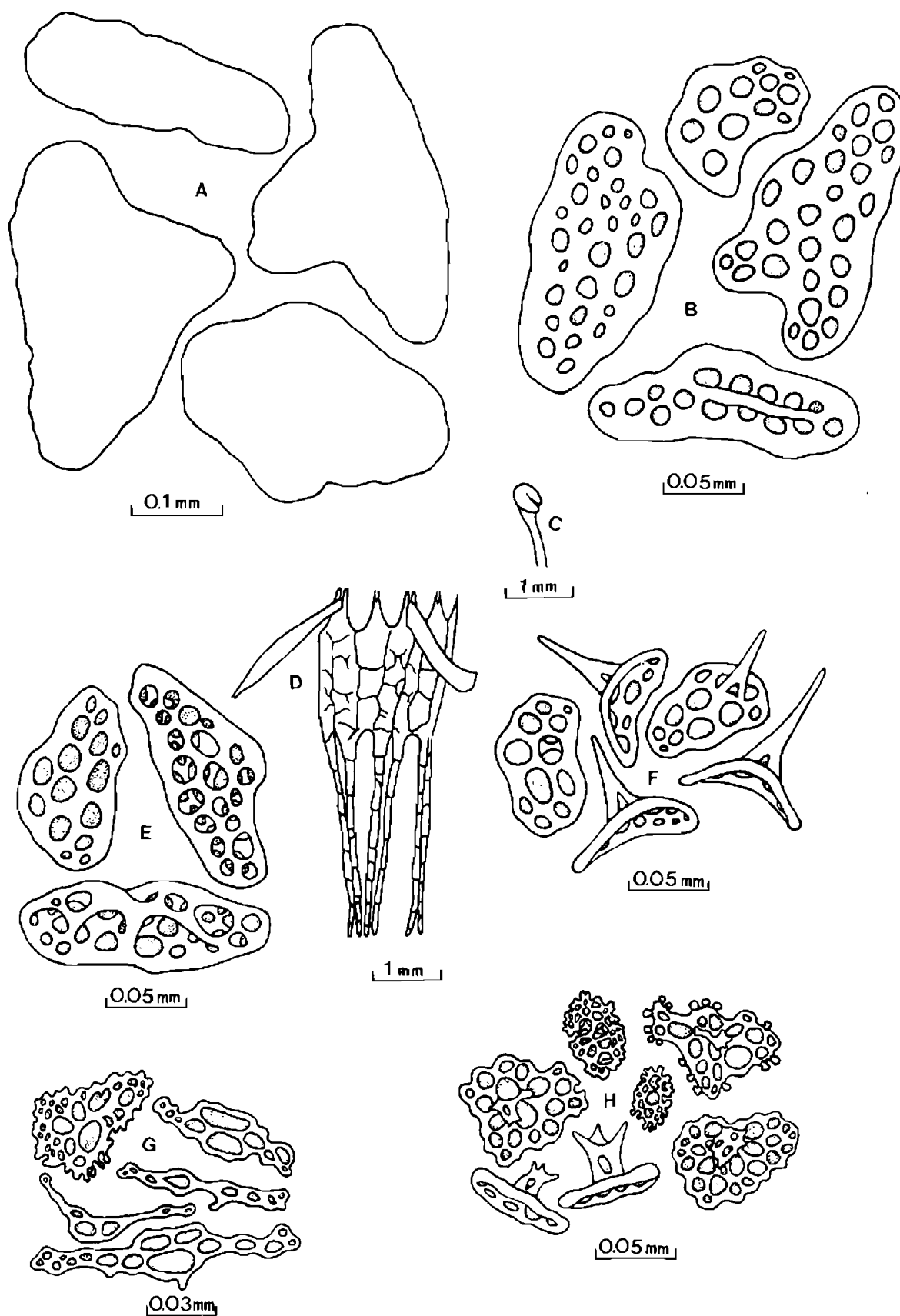


Figure 1 *Stolus kilberti* sp. nov. (A) complex, multi-layered plates from body wall; (B) few simple plates from body wall; (C) madreporic body; (D) part of calcareous ring; (E) pedicel plates; (F) pedicel tables; (G) tentacle deposits; (H) introvert deposits

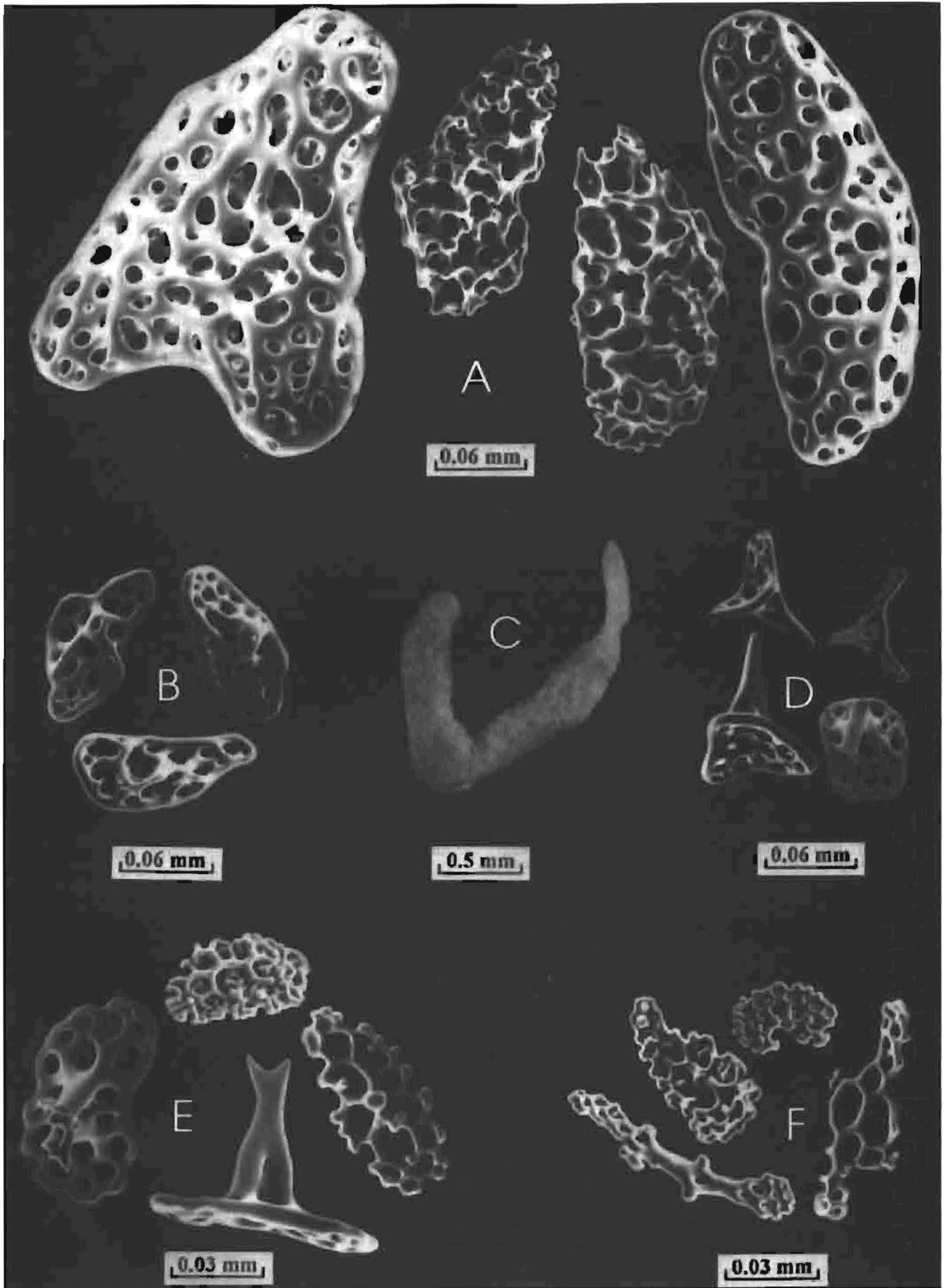


Figure 2 *Stolus kilberti* sp. nov. (A,B,D–F) SEM micrographs; (A) plates from the body wall; (B) pedicel plates; (C) entire; (D) pedicel tables; (E) introvert deposits; (F) tentacle deposits

subfamilies: the Thyoninae in the family Phyllophoridae (sensu Pawson & Fell 1965) and the Sclerodactylinae in the family Sclerodactylidae (sensu Pawson & Fell 1965). Only *S. rapax* (Koehler & Vaney, 1908) and *P. mosaica* (Koehler & Vaney, 1910) have multi-layered rounded plates. It appears that both *S. rapax* and *P. mosaica* are similar except for the undivided nature of the calcareous ring and the absence of body wall tubercles in the latter. Since Koehler and Vaney are authorities to both these species, it is best to let them stand until a direct comparison based on type material is undertaken. Whether we are justified in retaining two very similar species in different families and/or subfamilies is questionable without having to invoke parallel evolution and convergence. An examination of the calcareous ring of *P. mosaica* may indicate subdivided plates, or that of *S. rapax* may show that the plates are undivided. However, the similarity of the calcareous ring, body wall plates and pedicel spicules of these two species are so remarkable that one is inclined to consider them as being at least congeneric if not conspecific. In fact Koehler and Vaney (1910), in their comparison of *mosaica* and *rapax*, distinguished them only by the presence of tubercles on the body wall of the latter species. From the length and the degree of fragmentation of the posterior processes, it appears that both these species belong in the subfamily Thyoninae. The new species is distinct from both *P. mosaica* and *S. rapax* in several features, especially the arrangement of podia, bifid anterior tip of the interradial plates and the form of the pedicel and body wall deposits. These and other differences are summarized in Table 1.

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**Table 1** Comparison of principal characters of *Stolus rapax*, *S. kilberti* and *Pseudothyone mosaica*

	<i>Stolus rapax</i> (Koehler & Vaney, 1908)	<i>Pseudothyone mosaica</i> (Koehler & Vaney, 1910)	<i>Stolus kilberti</i> sp. nov.
Length	10–25 mm	12 mm	37 mm
Colour	Whitish	?	Whitish
Tubercles	Present	Absent	Absent
Tubefeet distribution	Arranged in double rows along the radii, diminishing to single rows towards the anterior and posterior ends, also found scattered along interambulacra, becoming denser ventrally	Restricted to ambulacra, those of ventral surface somewhat large	Scattered uniformly throughout body wall, rather villose
Calcareous ring	Radial plates subdivided, interradial plates compact, non-bifid anteriorly	Radial and interradial plates compact, the latter not bifid anteriorly	Radial and interradial plates subdivided, interradial plates bifid anteriorly
Body wall deposits	Rounded, compact, multi-layered plates, 1 mm in diameter	Imbricating, curved plates of variable size, superimposed in 2 to 3 layers, thus forming complicated anastomosing trabeculae	Elongate to triangular, multi-layered plates, 0.26–0.47 mm in length, never rounded, smaller, smooth, simple plates also found
Pedicel deposits	Tables with regular, curved, elongate discs and 2-pillared spires terminating in a blunt tip	Tables with curved, elongate discs and 2-pillared spires, terminating in a blunt tip	Tables with curved, elongate or sub-circular to irregular discs and 2-pillared spires terminating in a pointed tip