



New species and a new record of sea cucumbers from deep waters of the South African temperate region (Echinodermata: Holothuroidea)

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Abstract

Two new species, *Pseudostichopus langeae* and *Psolus griffithsi*, and a new South African record, *Molpadia musculus* Risso, are described from some deep-sea material collected off the South African west and south coasts. This material also contains the well known *Pseudocnella insolens* (Théel), *Ocnus capensis* (Théel), *Rhopalodinopsis capensis* Heding and an indeterminate *Thyone* sp.

Key words: Holothuroidea, Synallactidae, Molpadiidae, Phylloporidae, Psolidae, South Africa, new species, new records

Introduction

Subsequent to the writer's last paper on "Additions to the holothuroid fauna of the southern African temperate faunistic provinces, with descriptions of new species" (Thandar 2008), a few more species from deep waters of the South African temperate region have come to light from material sent to the writer by Prof. Charles Griffiths and Ms. Louise Lange of the University of Cape Town, South Africa. The material, trawled between 84–407 m, off the South African south and west coasts, although scant, reveals the presence of two new species, a new record of *Molpadia musculus* Risso, an indeterminate *Thyone* sp and the well known *Pseudocnella insolens* (Théel), *Ocnus capensis* (Théel) and *Rhopalodinopsis capensis* Heding. The two new species are described as *Pseudostichopus langeae* and *Psolus griffithsi*. In addition, this paper also describes the new *Molpadia musculus* record and the indeterminate *Thyone* sp.

Order Aspidochirotida Grube, 1840

Family Synallactidae Haeckel, 1896

Genus *Pseudostichopus* Théel, 1886

Pseudostichopus langeae n. sp.

Figures 1 & 2

Diagnosis. Length up to 60 mm; colour off-white. Mouth ventral, tentacles about 20; anus sub-ventral. Encrustations include sand grains, broken shells, coral debris, echinoid spines and foraminifera but no pteropod shells or sponge spicules. Podia thin, mostly on dorso-lateral radii. Polian vesicle single. Ossicles only in tentacles, podia, respiratory trees and gonad. Tentacle and podial ossicles as slender, curved rods with

mostly spinulated, rarely branched, sometimes perforated ends. Gonad and respiratory tree ossicles mostly as x- or y-shaped rods with central thickening and tapering branches, sometimes straight, c- or s-shaped bodies, sometimes irregularly branched. Pygal lobes without deposits.

Etymology. This species is named after its collector Louise Lange of the University of Cape Town for making the material available to me.

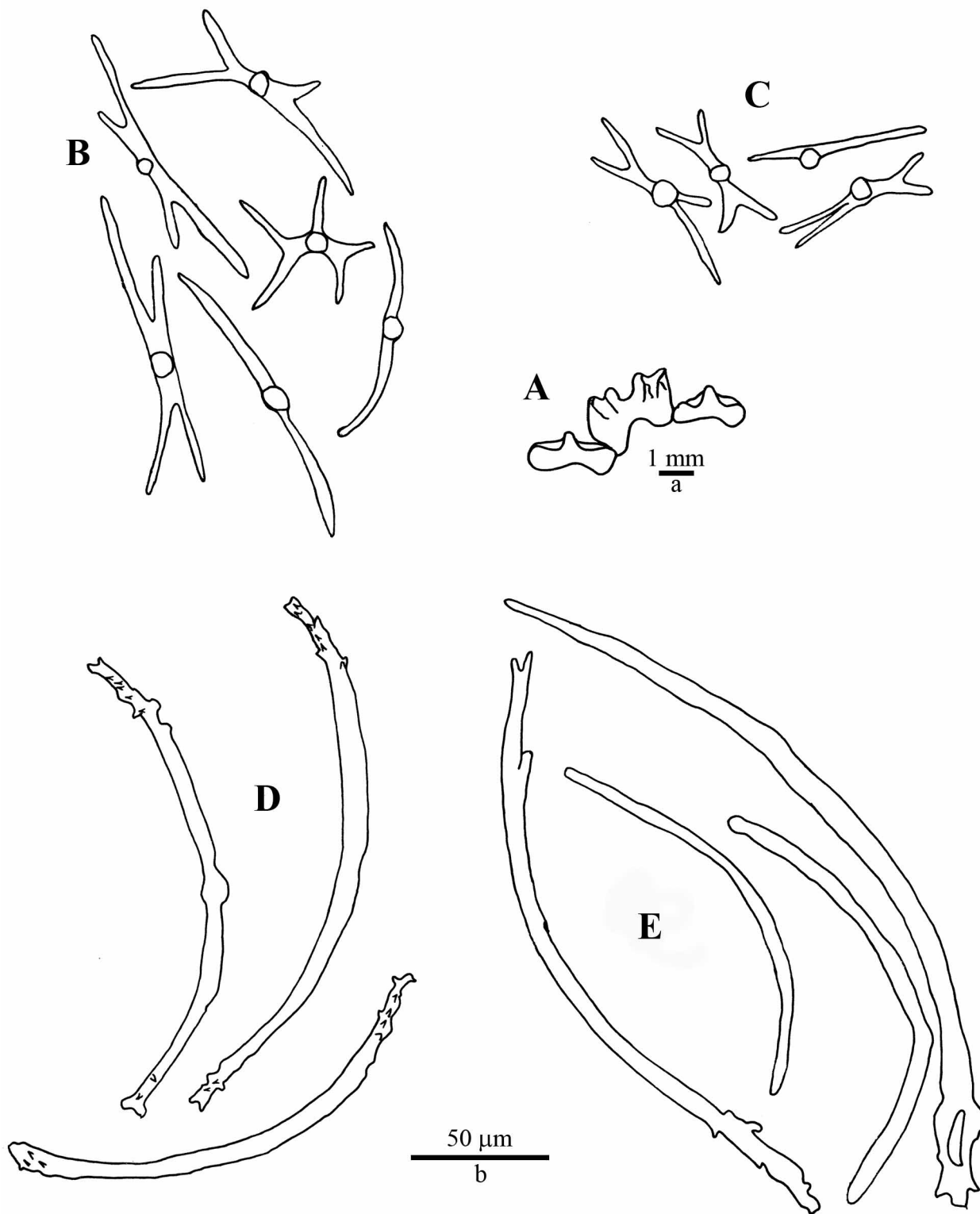


FIGURE 1. *Pseudostichopus langeae* n. sp. A. part of calcareous ring ; B branched and unbranched rods from gonad; C. same from respiratory tree; D. rods from podia; E. rods from tentacle. A. scale a; rest scale b.

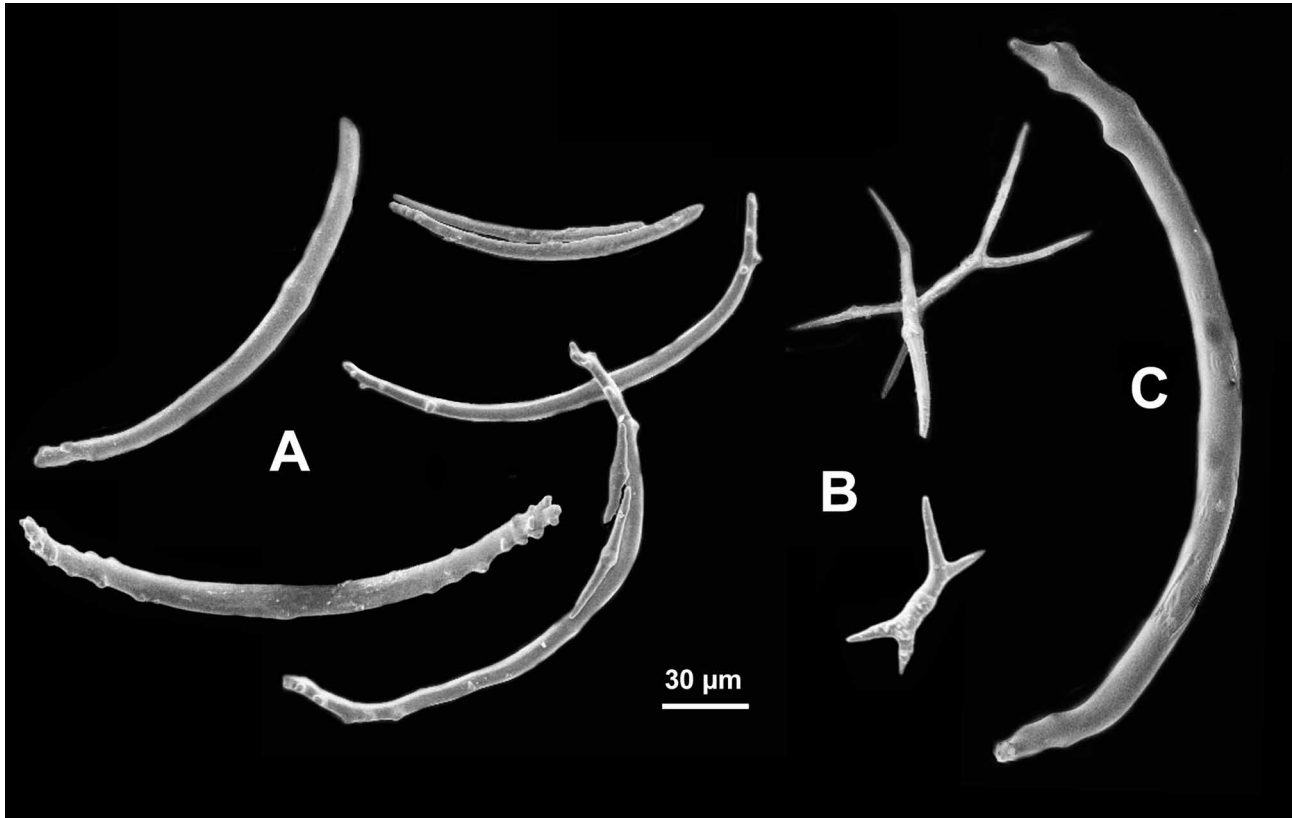


FIGURE 2. *Pseudostichopus langeae* n. sp. SE micrograph. A. Rods from tentacle; B. rods from gonad (above), respiratory tree (below); C. rod from podium. All to same scale.

Material examined. Holotype, SAM-A28041, 'Africana 232', Trawl 11, St. 27333, south coast (36° 18'S, 20° 10'E), 186 m, 05.iv.2007, Louise Lange; Paratype, SAM-A28042, same data as holotype; paratypes, SAM-A28043, 'Nansen 401', Trawl T025, St. 1311, west coast (34° 28'S, 59.1° 34'E), 333 m, 15.i.2007, Louise Lange, 2 spec.

Description of holotype. Specimen partially eviscerated, one respiratory tree and part of another projecting out from anus. Length 42 mm, breadth in mid-body 6 mm, anterior and posterior ends of approximately same diameter. Colour, in alcohol, uniformly off-white. Body form sub-cylindrical but ventral surface only slightly flattened and dorsal only slightly arched, with longitudinal ridges and depressions throughout length, perhaps due to preservation. Mouth ventral, encircled by a narrow collar, tentacles approximately 20, distinctly peltate, protruding through mouth, each tentacle about 1 mm long and disc about 1 mm in diameter. Anus sub-ventral, pygal furrow conspicuous from both dorsal and ventral surfaces. Body wall encrusted with sand grains, small stones, broken shells, coral debris, echinoid spines, foraminifera, all easily rubbed off; pteropod shells and sponge spicules absent. Body wall thick, leathery.

Podia thin, non-retractile, microscopic, numerous, mostly developed in the paired radii, especially dorso-laterally, none in ventral radius. Each podium slightly expanded terminally but sucker and end-plate absent, largest podium 2 mm long.

Calcareous ring (Figure 1 A) delicate, radial plates sculptured, each with an anterior notch and a concave posterior margin; interradial plates also slightly sculptured with a shallow posterior concavity and an anterior tooth-like projection with the tooth lying in the middle of paired ridges. Polian vesicle single, sac-like; stone canal not detected. Gonad (testis) as tuft of unbranched tubules arranged serially along entire length of stolon. Longitudinal muscles thick, partially paired, folded, appearing cylindrical. Respiratory trees well branched, yellowish, one longer than the other, but reaching only anterior third of body. Stomach filled with foraminifera, sand grains, coral debris, etc.

Ossicles present only in tentacles, podia, respiratory trees and gonad. Tentacle ossicles as slender curved rods (up to 300 μm long), ends rarely branched, mostly spinulated, sometimes perforated once or twice (Figures 1E, 2A). Podial ossicles of same form (up to 200 μm) (Figures 1D, 2C), arranged concentrically along length of podium, end-plates absent. Gonad ossicles (up to 120 μm) (Figures 1B, 2B) mostly branched, in the form of smooth x- or y-shaped rods with a central thickening, with each branch always tapering to a point, rods rarely branched more than once or not at all, then appearing as straight or as c- or s-shaped bodies, always with central thickening. Respiratory trees with similar but smaller and sparser deposits (up to 70 μm) (Figures 1C, 2B). Pygal lobes and longitudinal muscles without deposits.

Description of paratypes (SAM-A28043). Body form as in holotype but one specimen with longitudinal folds forming ridges and furrows all along length, perhaps an artefact of preservation. Colour dull-greyish to creamish-white, length 50–60 mm, width in mid-body 8–10 mm. Tentacles 17–19. Encrustations as in holotype, but scarce in one individual. Podia mostly in the ventro-lateral radii, in double rows, none dorsally or mid-ventrally, filiform, 1.5–2.0 mm in length, suckers and end-plates absent. Both dissected specimens without most of the internal organs except for some remains of the gut, part of the respiratory trees and in one specimen, a small portion of the gonad. Ossicles as in holotype.

SAM-A28043 (spec 1): tentacle rods 100–360 μm (mean 192 μm , SD \pm 78.4, n = 25), podial rods 50–150 μm (mean 117 μm , SD \pm 19.5, n = 25).

SAM-A28043 (spec 2): tentacle rods 120–450 μm (mean 251 μm , SD \pm 93.3, n = 25), podial rods 120–200 μm (mean 152 μm , SD \pm 17.9, n = 25).

Distribution. South and west coasts of South Africa, 186–333 m.

Remarks. The pygal-furrowed synallactids were recently reviewed by O’Loughlin and Ahearn (2005). Although their synonymies appear far too sweeping, they were the first to critically look at this rather difficult taxon, examining numerous type and other materials from various institutions. They describe some new species, present several new combinations and provide a well-constructed key to the group. In fact, their revision is the most comprehensive yet done on a group which offers so few diagnostic features. The southern African material does not appear to be referable to any of the nominal species. It keys down close to *P. occultatus* Marenzeller, 1893 from the Mediterranean Sea and the North-East Atlantic Ocean and to the virtually cosmopolitan *P. peripatus* (Sluiter, 1901) with its numerous synonyms. However, it does not appear to be identical to any one of these two species. It differs from the former in the absence of a lateral brim, presence of gonad ossicles, the absence of pygal lobe ossicles and podial end-plates and from the latter in the absence of a dorso-ventrally depressed body, absence of serrated ventro-lateral margins and the type of gonad ossicles. The distinguishing features of the new species are the presence of characteristically branched x- and y-shaped rods with central thickening and tapering branches in the gonad and respiratory trees, the absence of sponge spicules and pteropod shells in its encrustations, and the absence of papillae or tuberosities on the body wall, ossicles in the pygal lobes and end-plates in the podia.

Order Molpadida Haeckel, 1896

Family Molpadiidae Müller, 1850

Genus *Molpadia* Risso, 1826

Molpadia musculus Risso, 1826

Figure 3

Molpadia musculus Risso, 1826: 293; H.L. Clark, 1907: 165, Pl. 11; Pawson, 1977: 100, text-figs: 1, 2, 3, 4a–c, e, Map 1 (synonymy).

Material examined. SAM-A28044, ‘Nansen 404’, Trawl TO16, west coast of South Africa (33° 53.7’S, 17°

26.9°E), 407 m, 10.iv.2007, Louise Lange, 1 spec.

Description. Specimen large, well preserved, barrel-shaped with short tail. Length along ventral surface 80 mm, width of mid-body 15 mm, tail length 2 mm. Colour uniformly violet except at extreme anterior end and the tail which are white to greyish-white. Body wall rough to the touch. Phosphatic deposits abundant (Figure 3B). Calcareous deposits of body wall delicate, localised mostly in tail and at extreme anterior end, and include fusiform and tri-forked rods, up to 600 μm , with 1 – 4 (usually 3) small central holes and easily fragmented racquet-shaped bodies (Figure 3A); anchors may be present but only a single broken one detected in the body wall sampled, may be of foreign origin.

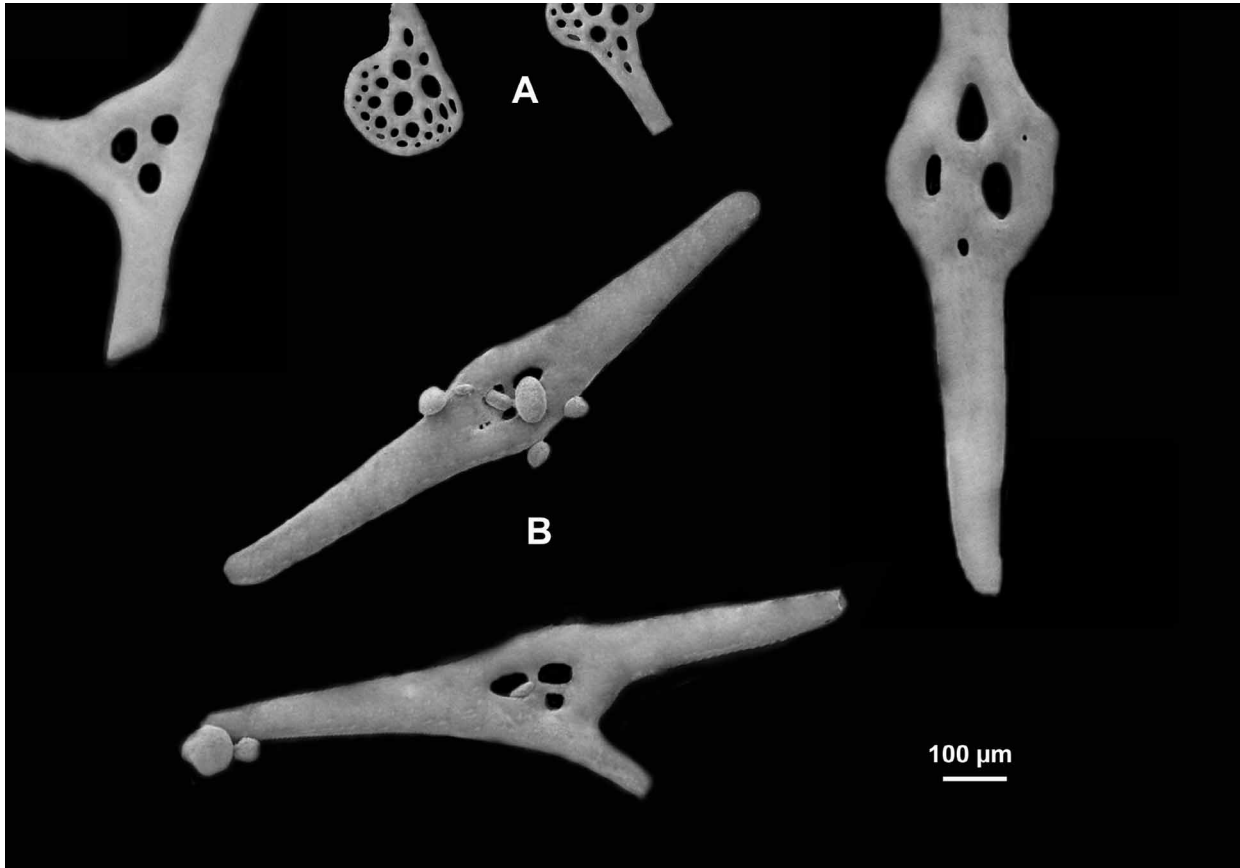


FIGURE 3. *Molpadia musculus* Risso. SE micrograph of deposits from tail region. A. racquet-shaped ossicles; B. rods and phosphatic bodies.

Distribution. Essentially cosmopolitan but not yet known from above the Arctic Circle, 35–5205 m. (Pawson 1977)

Remarks. Pawson (1977) revised the molpadiid sea cucumbers of the Southern, Atlantic, Pacific and Indian Oceans, describing four new species and presenting a key to the nine species he recognized as valid. Since then, a few more species have been added. After having examined 170 specimens, Pawson showed that *Molpadia musculus* is a very varied species with its calcareous deposits changing drastically with age. His synonymy of *M. musculus* hence appears rather drastic but despite this he comments that it is incomplete “for the limits of variation of the species are far from clearly defined.” (Pawson 1977:100). Based on this, the single southern African specimen, briefly described above, appears referable to this species. It is characterized by the presence of fusiform rods in the body wall, best developed in the tail and much smaller racquet-shaped bodies. Pawson states that anchors, rosettes of racquet-shaped plates and tables with three or more perforations and a solid spire are usually absent in specimens over 30 mm, “having being transformed into very numerous light to dark red phosphatic deposits.” (Pawson 1977:100). Hence the propensity of phosphatic bodies and the scarcity of racquet-shaped bodies and spired tables. This is the second record of this species

from southern Africa, the first is that of Cherbonnier (1965) from a single 41 mm specimen collected at 480 m from Cabinda (Angola). The South African material differs from Cherbonnier's specimen by the rarity of racquet-shaped deposits and spired tables, perhaps due to its size and/or age.

Order Dendrochoritida Grube, 1840

Family Phylloporidae Östergren, 1907

Genus *Thyone* Oken, 1815

Thyone sp.

Figure 4

Material examined. SAM-A28045, 'Africana 232', Trawl 39, St.27362, south coast of South Africa (34° 24'S, 23° 08'E), 102 m, 12.iv.2007, Louise Lange, 1 spec. (red).

Description. Specimen received dried-out but prolonged soaking in alcohol softened body wall to some extent. Form cylindrical, gherkin-like, posterior end narrowed and constricted, perhaps an artefact of preservation. Length 40 mm, diameter in mid-body 8 mm, posterior end diameter 2 mm. Live colouration recorded as red but preserved specimen a dull-greyish brown, darker anteriorly and posteriorly. Mouth anterior, tentacle number impossible to determine due to previous desiccation; anus terminal, anal teeth conspicuous. Podia minute, scattered, ventrally with some indication of their arrangement in rows, suckers reduced. Body wall thin (<1 mm), leathery, slightly rough to the touch.

Calcareous ring (Figure 4A) complex, tubular, tube about 7 mm long, fragmented into a mosaic. Anterior tips of radial plates bifid, tips wing-like; interradial plates triangular, each with sharp anterior projection; radial plates prolonged posteriorly before bifurcating into paired processes. Processes up to 10 mm long, delicate, intertwined but distally well separated, each process broken into a series of delicate fragments. Polian vesicle(s) not detected. Stone canal short, thin, membranous. Madreporite white, bean-shaped. Gonad (testis) mature, tubules long, coiled, unbranched, situated in middle of body. Respiratory trees poorly branched, left one more so, restricted to posterior half of body; right tree longer, both trees open independently into cloaca. Retractor muscles arise from unpaired longitudinal bands to insert on anterior projections of radial plates of calcareous ring.

Except for reduced and often incomplete end-plates in the podia (Figure 4B, C), no ossicles detected in body wall (including anal region), podia and introvert. End-plates up to 80 µm. Tentacles with straight or slightly curved rods, up to 200 µm, usually perforated in the middle and at ends (Figure 4D).

Remarks. Due to the singularity of the specimen, its previous drying-up and the absence of body wall, podial and introvert ossicles, it is not possible to name it with any degree of certainty. It does not appear to be identical to any *Thyone* species currently known from the southern African region. Because of the peculiarities of its calcareous ring it appears highly likely that more and better preserved specimen will lead to the description of a new species. As the South African temperate dendrochiroitids are highly endemic it does not seem likely that the single specimen is referable to a species outside the southern African region.

Family Psolidae Perrier, E., 1902

Genus *Psolus* Oken 1815

Psolus griffithsi n. sp.

Figures 5, 6 & 7

Diagnosis. Holotype 25 mm, sole distinct. Colour beige-grey. Scales imbricating, about ten scales between

mouth and anus. Mouth sub-dorsal, oral valves smooth. Tentacles bushy. Anus dorsal, anal valves sub-equal, some accessory valves present. Ventral podia in two rows around sole - outer row of minute podia and an inner row of much larger podia, mid-ventral podia absent except anteriorly and posteriorly. Polian vesicle single. Dorsal scales up to 3 mm, covered with minute granules, easily rubbed off, and baskets arranged in heaps. Baskets mostly flat, 30–80 μm in length (mean 70 μm), with fine knobs. Sole with similar but larger baskets, 60–190 μm (mean 126 μm). Tubefeet and tentacles with smooth perforated plates, end-plates present.

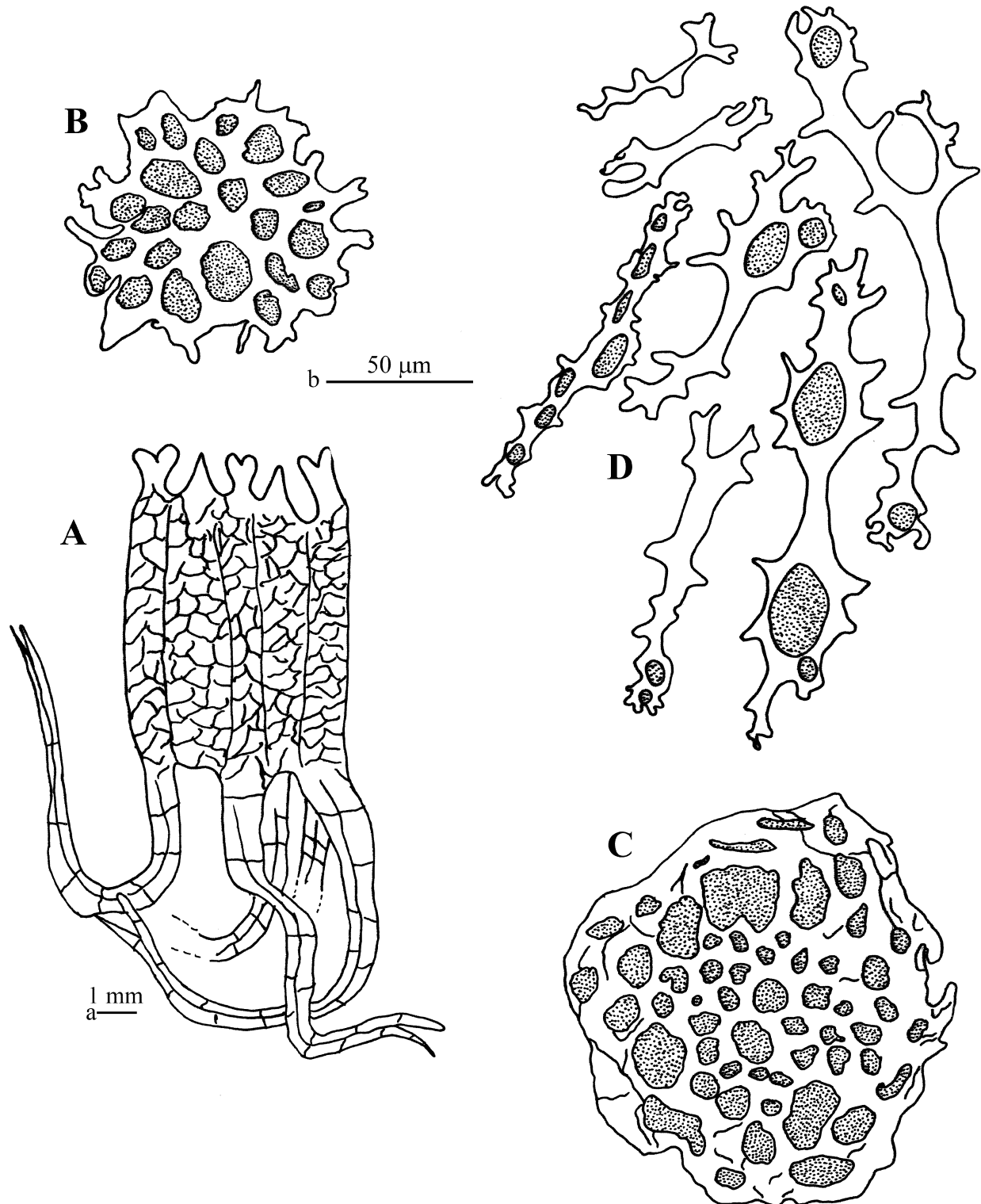


FIGURE 4. *Thyone* sp. A. Dorsal part of calcareous ring; B. reduced end-plate from a dorsal podium; C. complete end-plate from ventral podium; D. rods from tentacle. A scale a; rest scale b.

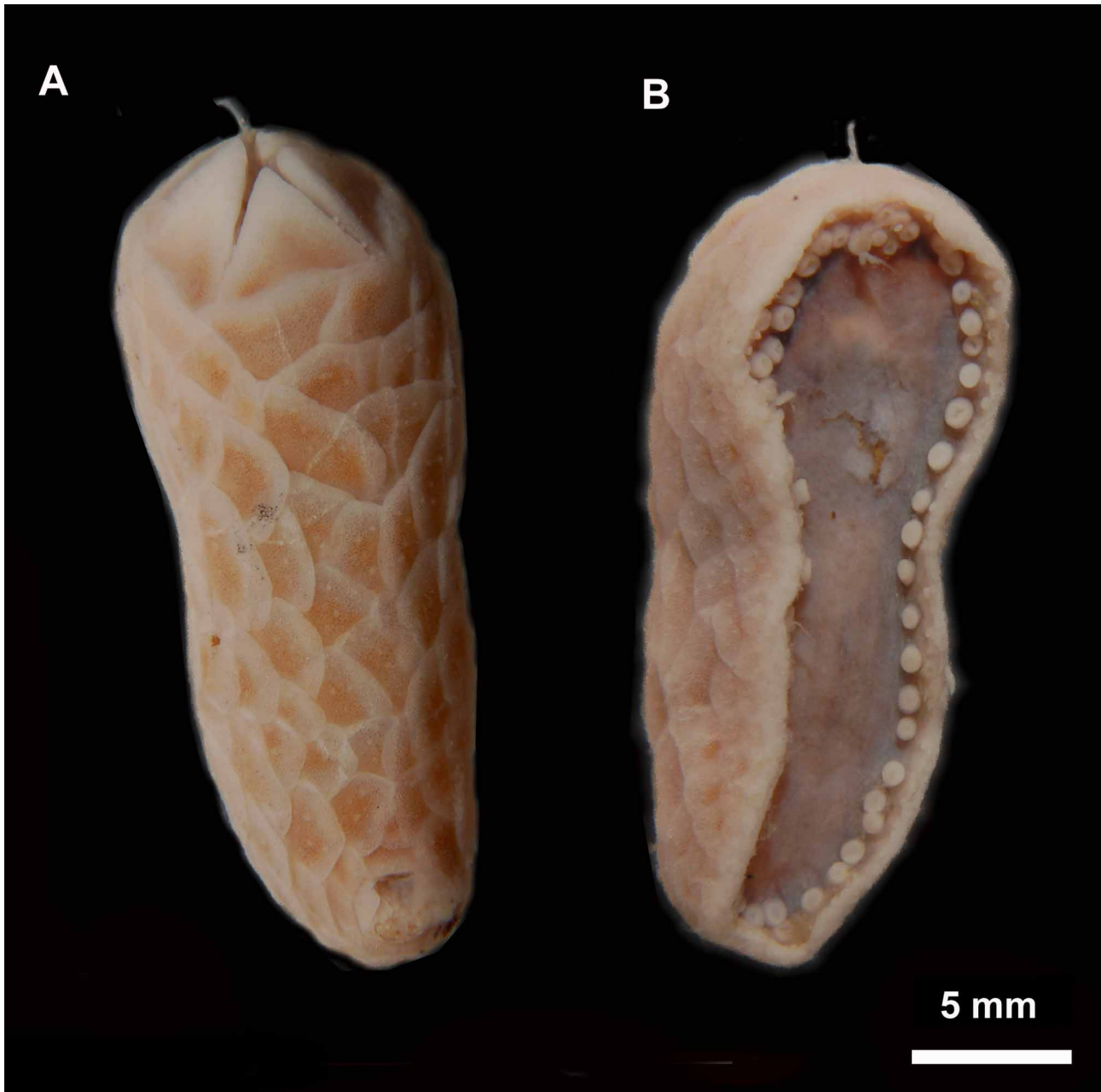


FIGURE 5. *Psolus griffithsi* n. sp. Entire. A. Dorsal view ; B. ventral view (courtesy Charles Griffiths).

Etymology. The species is named after Prof. Charles Griffiths of the University of Cape Town for passing this unique form onto me for its description.

Material examined. Holotype: SAM –A28046, ‘Nansen 401’, Trawl T003, St. 1289, west coast of South Africa (34° 37.9’S, 18° 18.7’E), 407 m, 11.i.2007, Louise Lange, 1 spec.

Description. Specimen small, 25 mm long, elliptical, broad anteriorly (8 mm), narrower posteriorly (6 mm), length of sole 20 mm. Dorsal surface (Figure 5A) well-arched, covered with scales, slightly imbricating, dorsal scales large, lateral scales reduced, about ten scales between mouth and anus. Mouth sub-dorsal, anteriorly directed, bordered by five distinct, large (3 mm), somewhat granular oral valves of more or less equal size, left dorsal one slightly bifurcated. Minute podia often visible between valves. Tentacles well branched, number and size not verified. No accessory valves detected. Anus dorsal, distinct, situated on a slight elevation bordered by five sub-equal valves with about five ill-defined, accessory valves situated within (Figure 6E). A few podia present in association with some anal valves. Ventral surface flattened, sole distinct

(Figure 5B). Dorsal podia absent. Ventral podia in two sharply defined rows bordering sole, outer row of minute podia lying just underneath margin of sole and an inner row of much larger podia with well developed suckers. Mid-ventral podia absent except for a clump of five at the anterior end of sole and a clump of three at posterior end. Dorsal scales with a slightly elevated part showing accumulation of baskets into heaps. Baskets of sole not macroscopic. Colour uniformly beige-grey.

Calcareous ring typical, simple, radial plates slightly longer than interradial plates, anteriorly bifid, each with a deep groove on outer surface for attachment of retractor muscle, interradial plates triangular, posterior margin of ring slightly undulating. Polian vesicle single, situated slightly to left of mid-ventral part of water ring, sac-like. Stone canal short, free. Madreporite delicate, lying in posterior depression of mid-dorsal interradial plate of calcareous ring. Respiratory trees well developed, right one more so, each arising independently from cloaca, both trees with short but well ramified, medial supplementary branch, and a longer lateral branch, terminally ramified. End branches of trees white. Gonad (testis) well developed, with both mature and immature, unbranched tubules in various stages of development, attached anteriorly on dorsal mesentery. Longitudinal muscles unpaired, thin, retractors well developed, arising from longitudinal bands in mid-body, more anteriorly in the mid-ventral ambulacra.

Dorsal body wall encased in a layer of slightly imbricating scales external to which occur minute granules which are easily rubbed off, and a layer of sparse baskets accumulated into heaps, simulating a 'superstructure'. Scales/plates (Figure 7A), up to 3 mm in length, multi-layered, highly complex. Dorsal baskets (Figure 6A) minute, scarce, 30–80 μm in length (mean 70 μm , $n = 9$), with up to 10 holes and up to 30 fine knobs on surface, rarely knobs absent, baskets seldom deep and cup-like. Sole deposits also include granules, also easily rubbed off, and baskets, larger than those of dorsal surface (Figures 6B, 7B), 60–190 μm (mean 126 μm , $SD \pm 23.3$, $n = 20$), with up to 13 holes and up to 24 fine knobs; most baskets ($\pm 80\%$) flat but some with raised margins, giving the baskets the appearance of shallow cups. Buttons absent. Tubefeet with simple, perforated plates 70–200 μm (mean 112 μm , $SD \pm 37.1$, $n = 20$) of various shapes (Figures 6C); end-plates apparently made up of several individual plates, each with a fine calcareous mesh-work. Tentacle ossicles (Figures 6D, 7C) of two types: one type as few, coarse, delicate plates with large holes; the other type smaller, commoner, less coarse and less delicate, 50–260 μm (mean 106 μm , $SD \pm 43.8$, $n = 20$) plates with small holes (up to 30). No deposits in gonadal tubules, respiratory trees and retractor muscles.

Distribution. West coast of South Africa, 407 m.

Remarks. From figures of entire specimens of *P. ehipiffier* Wyville-Thompson, 1846, provided by Théel (1886) and Carriol & Féral (1985), the present specimen, based on shape and the dorsal position of the anus, appears to resemble this species. However, *P. ehipiffier* is, according to Carriol & Féral, characterized by unflattened (cup-like) ventral baskets unlike the mostly flat, plate-like baskets of the current material. Flattened ventral baskets are said to occur in *P. paradubiosus* Carriol & Féral, which is also described as having an external row of small tubefeet and an internal row of larger tubefeet. It is for this reason the specimen was at first thought to represent this species, a viewpoint also expressed by Samyn (pers. comm.). However, it differs from *P. paradubiosus*, in its smaller size, probable absence of accessory oral plates, accumulation of dorsal baskets into heaps, smaller size of the ventral baskets (up to 250 μm in *P. paradubiosus*) and the presence of accessory post-anal plates/scales. Although *P. paradubiosus* is described as having unequal tubefeet, some material of this species, initially identified as *P. dubiosus* Ludwig & Heding, 1935, received from the Muséum national d'Histoire naturelle, Paris, and included with the type material of *P. paradubiosus* by Carriol & Féral, show two rows of equal tubefeet. In fact, in their comparative table of the four related *Psolus* species, Carriol & Féral show that all are characterized by equal-sized tubefeet. Further, equal-sized tubefeet are reported for the species by Branch *et al.* (1993) in material from Marion and Prince Edward Islands, identified by Massin, while O'Loughlin (pers. comm.) states that *P. paradubiosus* is characterized by two rows of equal-sized tubefeet. Therefore, one wonders how remarkable is the size difference between the two rows of tubefeet in the type of *P. paradubiosus* when compared with the type of *P. griffithsi*. Another point to consider is that there is, in most animal groups, a very low relationship between the southern African and the Antarctic-Subantarctic fauna. In fact, as far as our current knowledge goes, South

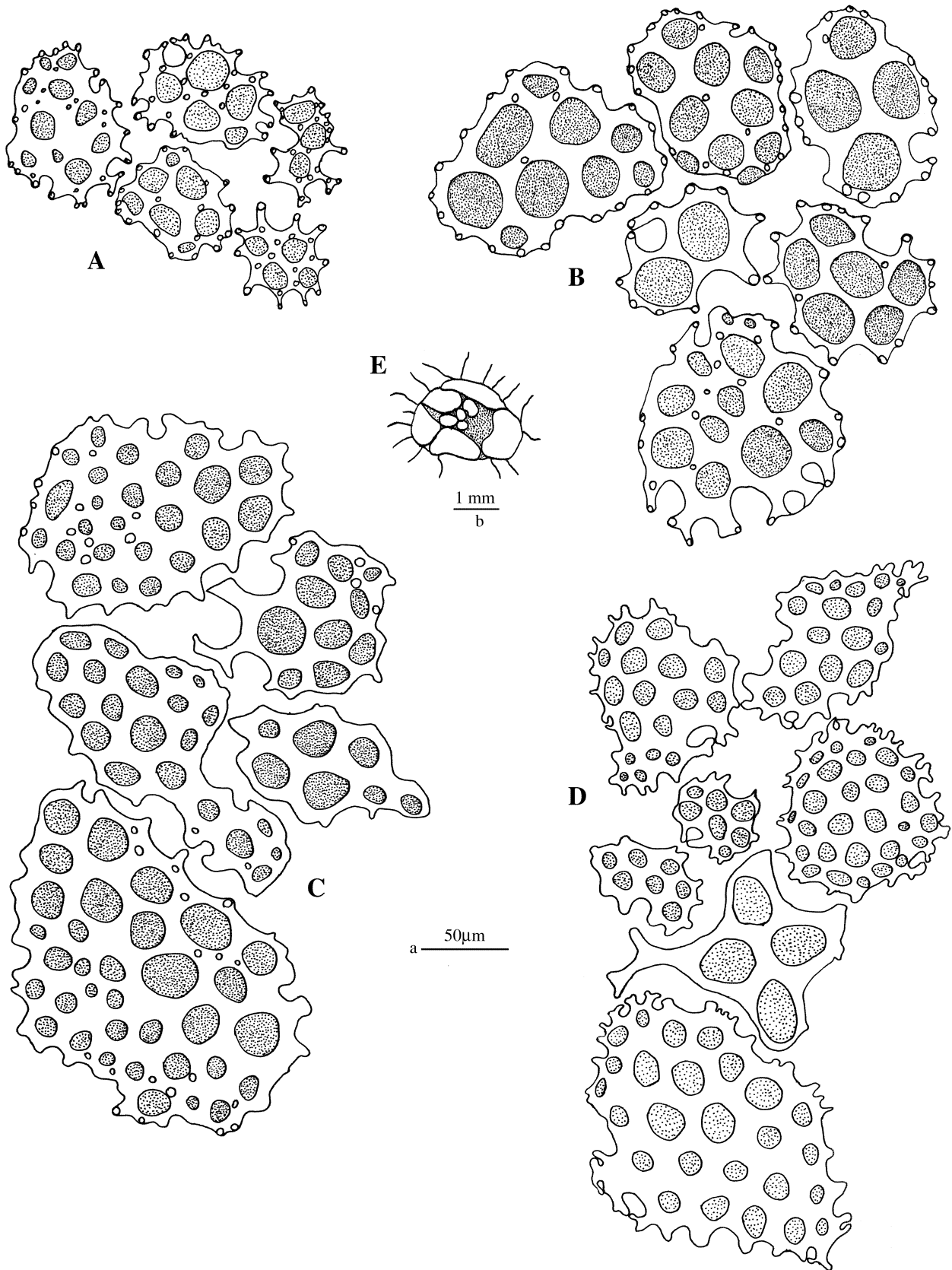


FIGURE 6. *Psolus griffithsi* n. sp. A. Baskets from dorsal surface; B. baskets from sole; C. minutely knobbed plates from podium; D. smooth plates from tentacle; E. anus with anal and accessory anal plates. E. scale b; rest scale a.

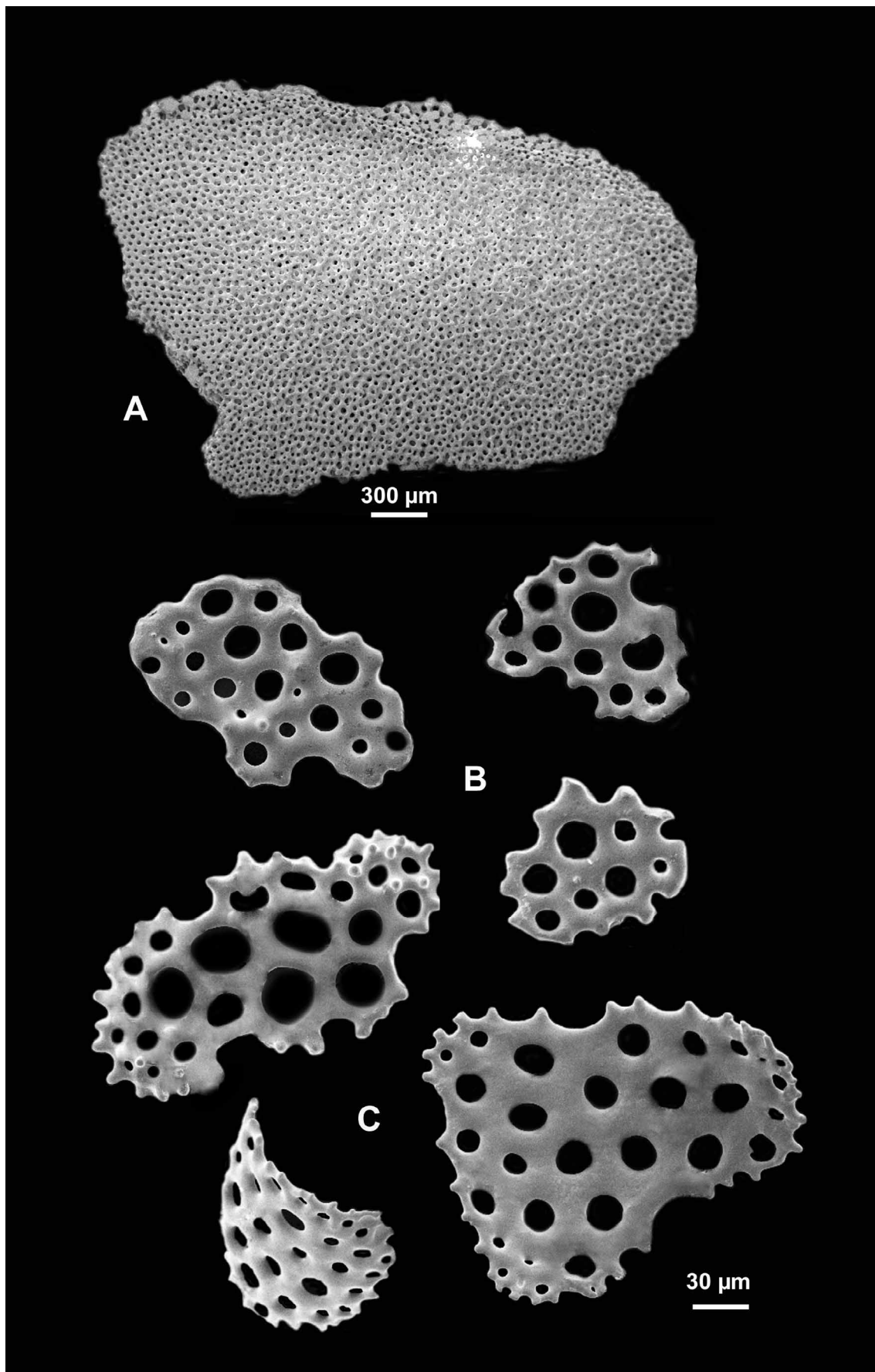


FIGURE 7. *Psolus griffithsi* n. sp. SE micrograph of A. single dorsal plate; B. baskets from sole; C. plates from tentacle.

Africa shares no holothuroid species with the Antarctic-Subantarctic region. I am thus certain that the current material is not identical with *P. paradubiosus* and must be referred to a new species. It is regretted that, despite repeated requests, attempts to obtain the actual type material of *P. paradubiosus* were unsuccessful. It is therefore imperative that all materials referred to this species be re-examined.

The current specimen was also thought to represent *P. antarcticus* Philippi, 1857, based on the description provided by Théel (1886) or *P. capensis* Ludwig & Heding, 1935 from South Africa. However, *P. antarcticus*, was originally described as having only five scales between the mouth and anus. In *P. capensis*, on the other hand, the oral and anal valves and the tentacle deposits are of a different kind. Only three other southern African or Antarctic-Subantarctic species with distinct oral and anal valves and/or rows of unequal tubefeet are *P. arnaudi* Cherbonnier, 1974, *P. punctatus* Ekman, 1925, and *P. granulosus* Vaney, 1906. However, *P. arnaudi* is a large (75 mm), cylindrical species with pseudobaskets; *P. punctatus* has lantern-like baskets and spheres dorsally and perforated plates ventrally; whereas *P. granulosus* has irregular plates dorsally and oval perforated plates with tubercles ventrally, and no anal valves. The remaining Antarctic-Subantarctic species are all characterized by equal-sized marginal tubefeet.

Acknowledgments

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