



Referral of *Thyone neofusus* Deichmann, 1941, *Thyone adinopoda* (Pawson & Miller, 1981) and *Havelockia obunca* (Lampert, 1885) to the genus *Sclerothyone* Thandar, 1990, and a replacement name for the preoccupied genus *Neothyone* Deichmann, 1941 (Echinodermata: Holothuroidea: Dendrochirotida)

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Abstract

Thyone neofusus Deichmann, 1941, *Thyone adinopoda* Pawson & Miller, 1981 and *Havelockia obunca* (Lampert, 1885) are referred to the genus *Sclerothyone* Thandar, 1989, and a taxonomic key is provided to all species currently contained in the family Sclerothyonidae Thandar (*sensu* Smirnov 2012). Since the nomen *Neothyone* in the family Thyonidae (*sensu* Smirnov 2012), is preoccupied [(having been used by Hampson (1914) for a group of moths belonging to the family Arctiidae)], the name *Lisacucumis* **nomen nov.** is here proposed, with *Stolus gibber* Selenka as type species, as designated for *Neothyone* by Deichmann (1941).

Key words: Sclerothyonidae, Thyonidae, nomen new, combinations new

Introduction

In his elaborate revision of the Cucumariidae, Panning (1949) failed to consider Deichmann's (1941) *Thyone neofusus*, and hence this species remained within Thyoninae Panning, 1949. However, in her as yet unpublished dissertation on the "Taxonomic status of the dendrochirotid subfamilies Sclerodactylinae and Thyoninae, with the taxonomic management of the genus *Thyone*", Arumugam (2011) was clear in her assignment of *Thyone neofusus* Deichmann, 1941 to *Sclerothyone* within the dendrochirotid subfamily Sclerothyoninae, based on Deichmann's description and the current senior author's examination of type material from the Museum of Comparative Zoology (MCZ) (AHF no. 30). This species, together with *Thyone adinopoda* Pawson & Miller, 1981 and *Cucumaria obunca* Lampert, 1885, are now also formally referred to *Sclerothyone*, as proposed by Arumugam (2011), although the type material of the latter species appears to be lost and Mitsukuri's (1912) specimens could not be located.

Taxonomic account

Order Dendrochirotida Grube, 1840

Family Sclerothyonidae Thandar, 1989

Remarks. This taxon, erected as Sclerothyoninae by Thandar (1989) within the family Sclerodactylidae, was raised to full family rank by Smirnov (2012) in his revision of the classification of the Holothuroidea. Although not totally accepted by WoRMS (accessed May 2012), it is listed as an alternative nomen.

Diagnosis. [from Thandar 1989, as amended by Martins & Tavares 2019]. Tentacles 10, ventral-most two much reduced. Calcareous ring not tubular, radial and interradial plates separate or united at base only. Posterior paired processes of radial plates long, 2–8 times the length of ring, either entire or broken into several pieces.

Included genera. *Sclerothyone* (type genus), *Temparena* Thandar, 1989, *Neopentamera* Deichmann, 1941, *Thandarum* Martinez & Brogger, 2012, and *Paulayellus* Martins & Tavares, 1998.

Genus *Sclerothyone* Thandar, 1989

Diagnosis (from Martins & Tavares 2019, amended herein). Tube feet in double rows, restricted to ambulacra, interambulacra mostly naked, or tube feet scattered over body. Calcareous ring compact, non-tubular, posterior processes of radial plates long, entire or subdivided. Body wall tables with regular, oval, four-holed disc, with or without a handle, or large, irregular multilocular disc, also with or without a handle. Spire with pillars separate or fused. Introvert with plates, rods, rosettes and/or tables. Tentacles with rods, plates, rosettes or tables. Tube feet with endplate, supporting tables and plates.

Included species. All genera and species included, except those here dealt with, are tabulated by Martins & Tavares (1998), together with their distribution and ossicle morphology and there is no need to repeat this here, except that *Cucumaria nozawai* Mitsukuri, 2012, from Japan, was transferred to *Sclerothyone* by Thandar (2021) and, in the current paper, *Thyone neofusus* Deichmann, 1941 from the West Atlantic, *Thyone adinopoda* Pawson & Miller, 1981 also from the West Atlantic and *Havelockia obunca* (Lampert, 1885) from Japan, are also now transferred to this genus as suggested by Arumugam (2011). The inclusion of *T. adinopoda* was not questioned by Martins & Tavares (2019) but they excluded it from their table and the key. Hence altogether 13 species currently stand in *Sclerothyone*. The key provided by Martins & Tavares (2019) is here modified to include all the species. The debatable species are discussed below.

***Sclerothyone neofusus* (Deichmann, 1941) comb. nov.**

Although the holotype is now devoid of the calcareous ring and ossicles, perhaps completely decalcified, a dissected paratype demonstrated a well-developed calcareous ring (Figure 1A) typical of the Sclerothyonidae and the body wall ossicles (Figure 1B) as delicate 2-pillared tables but on their way to corrosion. The paratype corresponds well with Deichmann's (1941) description of the species except that the pedicel ossicles are badly affected and appear as corroded rods (?plates) with central and terminal perforations (Figure 1C). The tentacle ossicles comprise slender, curved, perforated rods (Figure 1D) and open rosettes (Figure 1E). No ossicles were detected in the introvert. From this we conclude that the calcareous ring and ossicles of the examined paratype are close to the type species of *Sclerothyone* [i.e. *S. velligera* (Ludwig & Heding, 1935)] and also closely resemble those of *S. unicolunus* Thandar, 2006. However, Martins and Tavares (2019) opined that *Thyone neofusus* may belong in *Temparena* (also in Sclerothyoninae), rather than in *Sclerothyone*, as they mistook the plate-like ossicles illustrated by Deichmann (1941), to have also come from the body wall. This observation is erroneous because of misinterpretation of Deichmann's (1941) figure legend. It is here noted that the so-called plates are actually supporting plates, labelled as such in Deichmann's legend, while in the description she herself stated that the plates may be reduced tables from the tube feet. However, it is noteworthy that Deichmann mentioned only rosettes in the introvert, but her figure clearly illustrates a "disc of table from introvert". This may perhaps be contamination from another preparation. Hence, Deichmann's description of the introvert deposits require clarification from a study of more material.

***Sclerothyone adinopoda* (Pawson & Miller, 1981) comb. nov.**

Arumugam's (2011) re-assignment of *Thyone adinopoda* Pawson & Miller, 1981, to *Sclerothyone*, on the current senior author's advice, was not questioned by Martins & Tavares (2019) and hence it is now formally included in *Sclerothyone* although it has scattered podia.

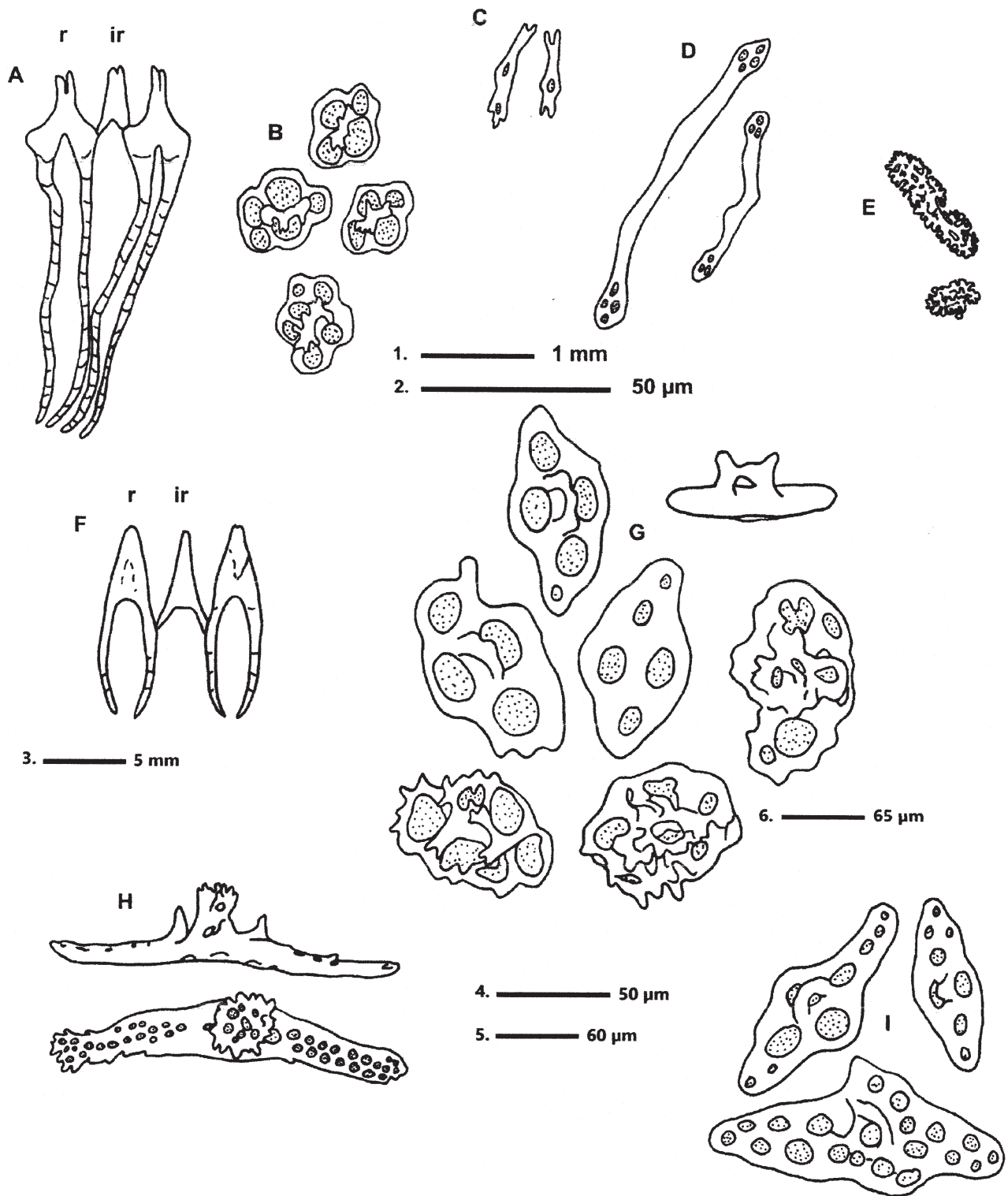


FIGURE 1. *Sclerothyone neofusus* comb. nov. (Deichmann, 1941), paratype (MCZ, AHF no. 30). A. calcareous ring of paratype (mid-dorsal view); B. tables of body wall; C. corroded rods of tube feet; D. rods of tentacles; E. rosettes of tentacles. (A—scale 1; B–E scale 2). *Sclerothyone obunca* comb. nov. (Lampert, 1885), F. calcareous ring, mid-dorsal view; G. tables of body wall; H. tables of tentacles; I. tables of introvert [(all copied from Östergren (1938), perhaps from holotype)]. (r = radial plate; ir = interradial plate); A. Scale 1; B–E Scale 2; F. Scale 3; G. Scale 6; H. Scale 4; I. Scale 5).

Sclerothyone oloughlini Martins & Tavares, 2019

Martins & Tavares' (2019) referral of this species to *Sclerothyone* is here questioned as the calcareous ring appears to be of the Sclerodactylid type. However, since the tube feet are restricted to the ambulacra and the tables have a handle on one side, it is here left to stand in *Sclerothyone* as intermediate forms are to be expected.

Sclerothyone obunca (Lampert, 1885) comb. nov.

Another species considered by Arumugam (2011) as belonging to *Sclerothyone* is *Havelockia obunca* (Lampert, 1885). Lampert placed this species in *Cucumaria* but provided a rather vague description without even mentioning the number of specimens he had examined. He described the holotype as 30 mm long and the calcareous ring as 3 mm high, but illustrated only a single ossicle, presumably from the body wall. Mitsukuri (1912) described two specimens from Asamushi (Japan), which he claimed to belong to *Cucumaria obunca* (Lampert, 1885), but neither described nor illustrated the calcareous ring or any ossicles. Long after Östergren's death, Heding (in Östergren *et al.*, 1938) compiled Östergren's incomplete works, in which he presented an illustration of the calcareous ring and ossicles of this species but without a description or any locality or other data. We, therefore, opine that the illustration was from Östergren's incomplete work on this species, presumably from the type material from the Copenhagen/Stuttgart Museums (as there were only two records of the species to that date [that of Lampert (1885) and Mitsukuri (1912)]). According to the curator at the Copenhagen Museum (pers. comm.), the holotype of *C. obunca* appears to be lost and attempts to locate it at other museums were unsuccessful. Mitsukuri (1912) dubiously assigned two of his specimens to this species, but without illustrations, but attempts to locate these specimens also proved unsuccessful. Mitsukuri (1912) stated that in some respects his specimens resembled *Cucumaria chronhjelmi* Théel, 1886 but with which Deichmann (1938) disagreed and described Mitsukuri's (not Théel's *C. chronhjelmi*) as *Eupentacta pseudoquinquesemita?* with some doubt, while designating Selenka's (1867) *Cucumaria quinquesemita* as type species of her new genus *Eupentacta* (accessed WoRMS, October 2022). She, further, declared that both species are North-East Pacific in distribution, perhaps extending to Japan. In addition, Deichmann (1938) stated that Selenka's record of *E. quinquesemita* from South Carolina, proved on examination to be referable to *Pentamera pulcherrima* (Ayres), thus clearing up a puzzling distribution range.

Panning (1949), in his revision of the Cucumariidae, transferred Lampert's *C. obunca* to *Pentathyone* after synonymizing the latter with *Havelockia*. Thus, this species currently remains in *Havelockia* (WoRMS, accessed October 2022), despite the fact that the tube feet are restricted to the ambulacra. Hence, this species, on the basis of Martin & Tavares' amendment of the diagnosis of the family, is now also transferred to *Sclerothyone*, despite the presence of shorter posterior processes to the radial plates (Figure 1F). It perhaps belongs to a new genus within the Sclerothyonidae, but because of its restriction of the podia to the ambulacra and the resemblance of its ossicles to those of other species of *Sclerothyone*, it is here also referred to this genus. Despite the presence of 2-pillared tables in the body wall (Figure 1G) and introvert (Fig. 1I), *S. obunca* differs from other species within *Sclerothyone* in possessing peculiar, elongated tables in the tentacles (Fig. 1H).

Another specimen collected from the type locality in 1896 and identified as *Pentathyone obunca* (Lampert) (USNM 30629), appears to have dried up prior to preservation, with the internal anatomy difficult to discern and the body wall and tube feet ossicles corroded. However, its tube feet are not restricted to the ambulacra. Therefore, whether this specimen is really *S. obunca* or another species is open to question.

Sclerothyone nozawai (Mitsukuri, 1912)

This species which was recently transferred to *Sclerothyone* by Thandar (2021), on advice from Martins & Tavares in their review, is now also included in the key below without further remarks.

Key to the genera and species of Sclerothyonidae

1. Posterior processes from radial plates undivided; body wall ossicles include cups *Paulayellus gustavi*
- Posterior processes from radial plates divided; body wall lacking cups 2

2. Ossicles from body wall knobbed buttons and plates *Neopentamera anexigua*
 - Ossicles from body wall tables and/or plates 3
3. Tables from body wall 2-pillared 4
 - Tables from body wall 4-pillared 12
4. Body wall ossicles as tables and plates, the former with usually 4-holed disc, sometimes with accessory holes, handle absent; in addition smooth, multilocular, handle-less plates also present *Temparena chuni*
 - Body wall ossicles tables only, disc usually 4-holed or multilocular, with or without a handle; distinct plates absent from body wallgenus *Sclerothyone*...5
5. Table disc usually 4-holed, sometimes with one or two accessory holes; handles absent, spire low to high, pillars fused.
 *Sclerothyone unicolunus*
 - Table disc 4-holed or multilocular, handles present/absent, spire low to high or distorted, pillars not fused, distinct when spire not distorted, not 6
6. Table disc from body wall 4-holed, handle usually present; spire low, regular, pillars not fused *Sclerothyone velligera*
 - Table disc usually 4-holed or multilocular, handle present/absent, spire low to high, sometimes arched, but not fused 7
7. Tables with 4-holed disc, sometimes with few accessory holes; spire nearly always abbreviated and arched, tentacles with rods and rosettes *Sclerothyone neofusus*
 - Table with 4-holed disc, sometimes with few accessory holes, or multilocular, handle present or absent, spire not abbreviated and arched; tentacles with rods, rosettes and/or tables 8
8. Table disc 4-holed, sometimes with a few accessory holes, handle present, spire high, pillars apparently fused, with two or more transverse bars leaving a few gaping holes; tentacles with rods, rosettes and tables *Sclerothyone adinopoda*
 - Tables from body wall with 4-holed or multilocular disc, handle present/absent; spire arched or considerably distorted without cross-bars 9
9. Tables from body wall with 4-holed or irregular disc, spire arched or considerably distorted and irregular; tentacle ossicles as spinous tables *Sclerothyone obunca*
 - Tables from body wall mostly with 4-holed or multilocular disc, spire low or stunted, ending in several teeth, or very much reduced, then discs resembling plates but always with evidence of a reduced spire, distinct plates absent; tentacle ossicles as rods or plates 10
10. Tables with multilocular disc, no handle, spire often reduced, then disc resembling multilocular plates, nearly always with evidence of a reduced spire; tentacle ossicles as irregular plates *Sclerothyone nozowai*
 - Body wall tables with multilocular disc, handle present or absent; tentacle ossicles as rods 11
11. Multiperforate tables from body wall without handle; spire well-developed, of moderate height; podia scattered
 *Sclerothyone reichi*
 - Multilocular disc often with distinct handle on one side, spire low, podia restricted to ambulacra. *Sclerothyone oloughlini*
12. Tube feet in double rows per radius, endplate stellate, buttons of body wall simple, regular, of one form with few holes
 *Thandarum hernandezi*
 - Tube feet in double rows per radius; endplates rounded, buttons and/or plates, multilocular, of varying form, rarely regular ..
 *Thandarum manoelina*

Note. The species name *manoelina* is consistently misspelt as *manuelina* in the figure legend of the original paper by Tommasi (1971).

Family Thyonidae Panning, 1949

Subfamily Thyoninae Panning 1949

Genus *Lisacucumis* nomen nov. (replacement name for junior homonym *Neothyone* Deichmann, 1941)

Stolus Selenka (partim) 1867: 356.

Thyone (partim) Ludwig, 1886 (1887).

Neothyone Deichmann, 1941: 108; Panning, 1949: 458 [homonym of *Neothyone* Hampson, 1914, in lepidopteran family Arctiidae].

Diagnosis (after Deichmann 1941). A genus of medium-sized dendrochirotid holothuroids with a thick body wall, packed with ossicles.. Tube feet numerous, distributed over entire body. Tentacles 10, ventral pair reduced. Plates of calcareous ring subdivided, with radial plates carrying short to medium-sized, fragmented, posterior processes, in some species fairly short and soft, often inwardly curled, thereby escaping notice. Ossicles of body wall a superficial layer of buttons with spinous projections on one side and an inner handle on the other, transformed into reticulated baskets in one species, in some cases lost with advancing age, and an inner layer of numerous, mostly 4-holed knobbed, sometimes smooth, buttons. Supporting tables of tube feet numerous, spire present or reduced; endplates present. Tentacle ossicles as heavy plates or rods. Introvert supported by tables or reduced buttons (plates) and/or tables.

Remarks. Arumugam (2011) pointed out that the nomen *Neothyone* Deichmann, 1941 is preoccupied, having been used by Hampson (1914) for a group of moths belonging to the lepidopteran family Arctiidae, antedating Deichmann's *Neothyone* by some 27 years. Hence, to replace this junior homonym, she proposed the nomen *Lisacucumis* **nomen nov.**, which is here formally published with *Stolus gibber* Selenka, 1867, designated by Deichmann (1941) for *Neothyone*, as the type species of the new genus.

Type species: *Stolus gibber* Selenka, 1867 (designated for *Neothyone* by Deichmann, 1941).

Type locality: Acapulco, Mexico.

Etymology: The new name proposed is in honour of the late Dr Elisabeth Deichmann for her excellent contributions to the taxonomy of the Holothuroidea.

Distribution: East Pacific (from Peru, through Costa Rica to Mexico, from shallow water to several meters).

Other species included: *Thyone panamensis* Ludwig, 1886 (1887); *Neothyone gibbosa* Deichmann, 1941. However, since the erection of *Neothyone*, several other species were referred to it but of these *N. belli* (Ludwig, 1887) and *N. capensis* (Théel, 1886), have been transferred to other genera, whereas those species/subspecies referred to it by Domantay (1953) have been declared either *nomina nuda* and one as *nomen dubiosus* by WoRMS (accessed May 24, 2022). Thus, currently only three species remain, all are well-keyed by Deichmann (1941).

Remarks: Deichmann (1941) referred only 3 species to *Neothyone*. While Selenka's (1867) description of the type species is rather brief and not accompanied by any illustration, that of Ludwig's (1886, 1887) *Thyone similis* (a synonym of *N. gibber* according to Deichmann, 1941), clearly indicates that this species is referable to the synonymy of *N. gibber*. Panning (1949), in his revision of the family Cucumariidae, transferred *Neothyone* to Sclerodactylinae but, like Deichmann (1941), was also unaware that this name was preoccupied. *Neothyone* is included by WoRMS (accessed May 24, 2022) in the subfamily Thyoninae but gives Thyonidae (*sensu* Smirnov 2012) as an alternative representation, which is here used.

Acknowledgments

We are grateful to the National Research Foundation (South Africa) and the University of KwaZulu-Natal, Durban, for financial support during the course of this work, the former provided a generous postgraduate bursary to the second author to complete her dissertation. The senior author acknowledges a generous grant, made by the United States National Museum, through the generosity of Dr David L. Pawson, for a short-term visit to examine all its materials of the subfamilies Thyoninae and Sclerodactylinae.

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