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## The *Discovery* Expedition sea cucumbers (Echinodermata: Holothuroidea)

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### Abstract

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Identifications of all lots of Holothuroidea specimens collected from February 1926 to January 1939 by the *Discovery* Expedition are listed with station data, locality and depth. This report includes identifications reported previously by Heding (in Heding & Panning), O'Loughlin & Ahearn, O'Loughlin *et al.* and O'Loughlin & VandenSpiegel. New taxa from the *Discovery* Expedition have been reported previously, and a summary is provided. The new taxa herein are for equatorial West Africa specimens: new genus *Cucusquama* O'Loughlin and new species *Cucusquama wesafrika* O'Loughlin. Systematic notes are provided for genera *Clarkiella* Heding (in Heding & Panning) and *Echinopsolus* Gutt, and species *Ocnus capensis* (Théel), genera *Parathyonidium* Heding (in Heding & Panning) and *Pentactella* Verrill, and species *Psolus dubiosus* Ludwig & Heding, *Psolus lockhartae* O'Loughlin & Whitfield and *Sigmodota contorta* (Ludwig). Earlier echinoderm specialists who studied *Discovery* Expedition holothuroids are acknowledged: Cynthia Ahearn, Elizabeth Deichmann, Svend Heding, Melanie Mackenzie, Albert Panning and Emily Whitfield.

### Keywords

Falkland Islands, New Zealand, Ross Sea, South Georgia, West Africa, *Clarkiella*, *Echinopsolus*, *Parathyonidium*, *Pentactella*, *Psolus*, new genus, new species.

### Introduction

In 1918 an *Interdepartmental Committee on Research and Development in the Falkland Islands Dependencies* was formed. Its report to the British Parliament in 1920 resulted in the appointment of a *Discovery Committee* in 1923. The first *Discovery* Expedition sailed south on 24 September 1925 aboard Robert Falcon Scott's *Discovery* as its research vessel (Figure 1a). It had been built for Scott's 1901–1904 *British National Antarctic Expedition*. In the Falklands it was found to be unsuitable for scientific operations in open waters. The *William Scoresby* (Figure 2) was built in 1925 and was used principally in whale research. A marine biological station (known as *Discovery House*) was built at King Edward Point on South Georgia. In 1927 the *Discovery II* (Figure 1b) was built and was judged to be an outstanding success. The *Discovery Committee* was dissolved in 1949 when it became part of the National Institute of Oceanography, located in Surrey, UK. The Whale Research Unit moved, briefly, to the Natural History Museum in London. It later became part of the British Antarctic Survey (BAS), based in Cambridge. In 1995 the Institute of Oceanographic Sciences became part of the Southampton Oceanography Centre. Scott's second

Antarctic expedition on the *Terra Nova* (1910–1913) collected marine invertebrate animals amongst which was a large collection of sea cucumbers. This *Terra Nova* sea cucumber collection is referred to below.

The results of the *Discovery* Expedition have been documented in the 37 volumes of *Discovery Reports* (1928–1980). The ships used in the early decades of the Expedition were the RRS *Discovery I* (Figure 1a; from 25 September 1925 to 1927), RRS *Discovery II* (Figure 1b; five voyages from 1929 to 1935, and sixth voyage in 1950), and RRS *William Scoresby* (Figure 2, eight voyages from 1926 to 1951). The localities visited by the Expedition were predominantly the Falkland Islands and Falkland Islands Dependencies (South Georgia, S. Sandwich Is, S. Shetland Is, S. Orkney Is) and the Ross Sea. Some collections were made from the Marine Biological Station (*Discovery House*) at King Edward Point, South Georgia. Some collections were made during voyages to and from the Falkland Islands. Thus species identifications are included here for Antipodes I., Balleny I., the Haakon VII Sea, Marion I., New Zealand, the Ross Sea, Marine Station 82 in Saldanha Bay in south-west Africa, and equatorial west Africa.



Figure 1. Ships from which the early *Discovery* Expedition was conducted. a, Scott's RRS *Discovery I* (collected from 25 Sep 1925 to 1927); b, RRS *Discovery II* (collected for five voyages from 1929 to 1935, and a sixth voyage in 1950).

The *Discovery* Expedition to the South Sandwich Islands in 1927 was not conducted by RRS *Discovery* or RRS *William Scoresby*, and is reported in *Discovery* Report Vol. 3. The *Discovery* Expedition to the Ross Sea from Nov. 1928 to Feb. 1929 was not conducted by RRS *Discovery* or RRS *William Scoresby*, and is reported in *Discovery* Report Vol. 3. There are no holothuroid lots from these expeditions in the collection reported here. *The British Antarctic Survey* commenced its survey of the Falkland Islands Dependencies in 1943, and the BAS surveys continue to the present day.

Three papers have been published in the *Discovery* Reports on the early echinoderm collections. Mortensen (1936, Vol. 12) reported on the *Discovery* Echinoidea and Ophiuroidea collected from 1925 to 1935. Dilwyn John (1938, in Vol. 18) reported on the *Discovery* Crinoidea collected from 1935 to 1937. Fisher (1940, in Vol. 20 issued in 1941) reported on the *Discovery* Asteroidea collected from 1925 to 1936. Some *Discovery* Expedition Holothuroidea have been reported in Heding & Panning (1954), O'Loughlin & Ahearn (2008),

O'Loughlin & VandenSpiegel (2010) and O'Loughlin *et al.* (2014). This paper includes these taxa reported previously, and is the first comprehensive *Discovery* report on the Holothuroidea that were collected from 28 February 1926 to 30 January 1939.

The Danish holothuroid specialist Svend Geisler Heding (1902–1949, see Acknowledgments, Figure 3a) studied the *Discovery* Expedition holothurians in the Zoological Museum in the University of Copenhagen (ZMUC) until his death. He described two new genera and species: *Clarkiella discoveryi* Heding (in Heding & Panning 1954); *Parathyonidium incertum* Heding (in Heding & Panning 1954). These new taxa were ascribed to Heding posthumously by the German sea cucumber specialist Albert Panning (1894–1978, Figure 3b). Panning included the descriptions in Heding & Panning 1954 from Heding's notes and mentioned that he did this in collaboration with Elizabeth Deichmann (working at that time on the *Discovery* Expedition holothuroids in the Museum of Comparative Zoology at Harvard). The Heding types are lodged in London (NHMUK), Paris (MNHN) and Copenhagen (ZMUC) (see Table 2 below).



Figure 2. RRS *William Scoresby* served the *Discovery* Expedition for eight voyages from 1926 to 1951.

Shortly after Heding's death in 1949, H. W. Parker (the Keeper of Zoology in the British Museum) wrote on 25<sup>th</sup> July in 1950 to Elizabeth Deichmann (c/o F. Jensenius Madsen in the Zoology Museum in the University of Copenhagen) inviting her to work on the holothurians in the *Terra Nova*, *BANZARE* and *John Murray* collections. The letter noted that these collections belonged to the British Museum. She was also invited to consider contributing to the "Reports of the John Murray Expedition". The letter of invitation anticipated that Dr. Macintosh (in the National Institute of Oceanography that managed the *Discovery* collections) would probably also like Deichmann to study the *Discovery* Expedition holothurians and contribute to the *Discovery* Reports. These four collections were still in Copenhagen at the time. The letter notes that Dr. Madsen had the notes left by Heding. These notes were evidently passed on to Deichmann and were presumably the source from which Albert Panning published the new taxa that he ascribed to Heding. Shortly after this communication the collections were returned to the British Museum in London.

Elizabeth Deichmann (1896–1975, Figure 4a), like Heding, was Danish and a protégée of echinoderm specialist Theodor Mortensen (1868–1952). In 1929 Deichmann began working in The Museum of Comparative Zoology in Harvard University in Massachusetts. In response to the invitation to work on the four major holothuroid collections she visited London in 1950 to study the collections. A National Institute of Oceanography internal letter (David Pawson *pers. comm.*) of 7 August 1963, directed to Dr Macintosh, noted: "In Miss Ailsa Clark's absence in America (Miss Clark is in charge of Echinoderms), Dr Deichmann arranged with an assistant in the department to have a considerable part of the material packed up and sent over to Harvard. Unfortunately no list was made of the station numbers and species selected by Dr Deichmann, but I have asked Miss Clark to check what remains of the *Discovery* specimens in her department against my list of material originally sent to Heding. I enclose the full data on a separate sheet". This letter noted that the last communication with Deichmann was in 1961, and at the time of this communication (1963) she had retired from work at the MCZ, Harvard

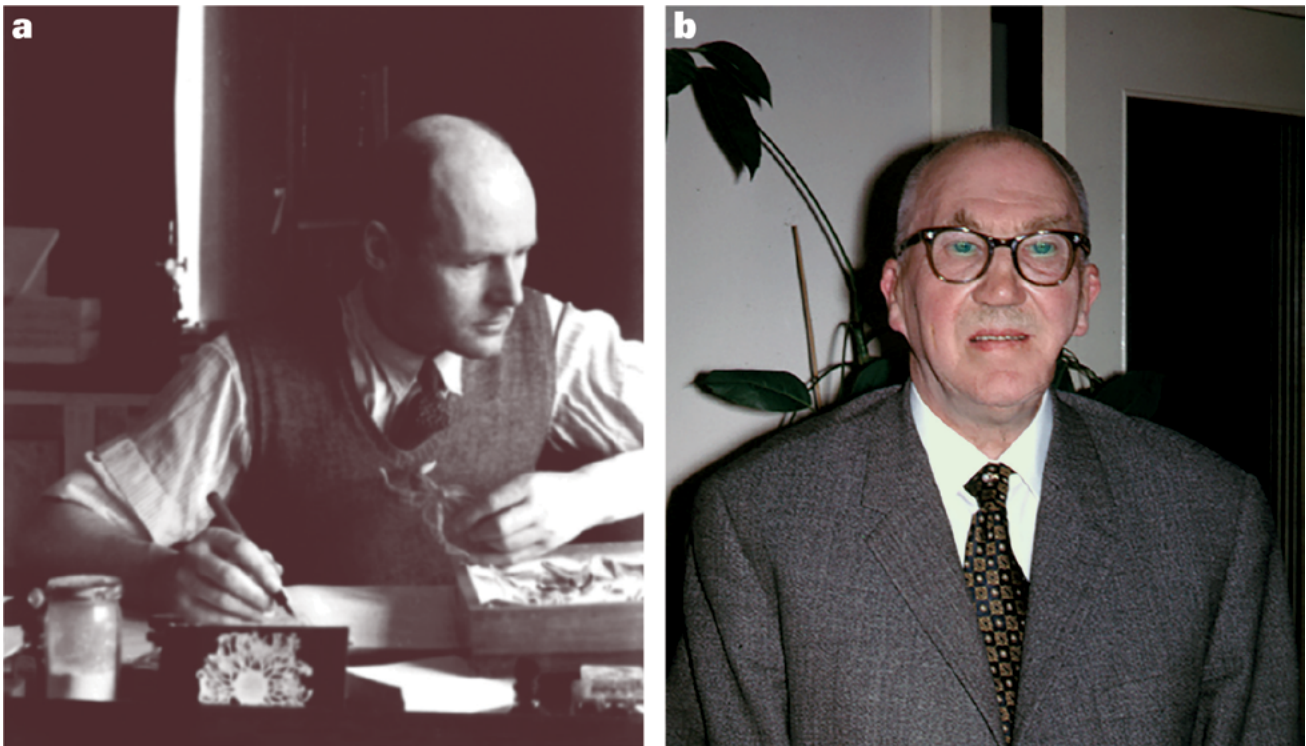


Figure 3. Authors who published the first new sea cucumber genera and species from the *Discovery* Expedition in their monograph on the Phyllophoridae in 1954. a, Danish holothuroid specialist Svend Geisler Heding (1902–1949; photo provided by Tom Schioette in ZMUC); b, German holothuroid specialist Albert Panning (1894–1978; photo provided by David Pawson in USNM).

University. But in a letter to David Pawson (*pers. comm.*) on 25 February 1967 it appears that she was still working at the MCZ and hoped to work with Pawson on the *Discovery* holothuroids. This did not eventuate. Deichmann published her last paper in 1958. None of her papers mentions any *Discovery* Expedition holothuroids.

The collections arrived at the MCZ in 1950. In a letter dated 25<sup>th</sup> February 1967 to David Pawson (Smithsonian Institution, *pers. comm.*), Deichmann commented that the collection was in poor condition when she received it and that localities were “somewhat mixed up”. But she wrote that she “got good help from Ailsa Clark” to resolve issues. Elizabeth further commented that she had made good headway and had a lot of notes about the genus *Psolus*. There was some evidence of Deichmann’s work when we received the collection in Museum Victoria (2008). Deichmann did not publish on any of the taxa or contribute to any report. Unfortunately we do not have her notes on *Psolus*.

Following Deichmann’s retirement the *Discovery* and *Terra Nova* collections were transported by David Pawson (*pers. comm.* probably in 1973) from the MCZ to the United States National Museum in Washington (Smithsonian Institution). In the Smithsonian an echinoderm specialist Cynthia (Gust) Ahearn (1952–2008, Figure 4b) identified many lots personally, and then collaboratively with Mark O’Loughlin. O’Loughlin & Ahearn (2008) included numerous lots of *Discovery* Expedition psolid species (see Table 3 below).

Ahearn had the *Discovery* holothuroid collection sent to Museum Victoria in 2008, with permission from the Natural History Museum (UK). Mark O’Loughlin, Melanie Mackenzie (Figure 4c) and Emily Whitfield (Figure 4d) then continued with identifications. This work was delayed in 2010 until related systematic issues were resolved. But O’Loughlin & VandenSpiegel (2010) included numerous *Discovery* synaptids (as apodids) in their comprehensive review (see Table 4 below). Identification by O’Loughlin in Museum Victoria recommenced in 2015, and identifications of the *Discovery* holothuroid lots have now been completed and earlier identifications changed or confirmed. The results are collated and reported here (see Table 1 below). Apart from the Heding types lodged in Copenhagen (ZMUC) and Paris (MNHN), the *Discovery* holothuroids are lodged in the NHMUK.

The *Discovery* Expedition holothuroid lots that are the subject of this report were collected in the 1920’s and 1930’s. The collection has been transported on loan numbers of times, and studied by several specialists. Today, the collection is in only fair condition in terms of quality of preservation and clarity of labelling. Apart from the thorough work of Cynthia Ahearn in the Smithsonian there were very few attempted identification labels in the lots. David Pawson (*pers. comm.*) commented that he noticed that very few lots had labels when he transported the collection from Harvard to Washington. We found that the condition of some specimens was such that we could not identify them. We note again the National Institute of Oceanography



Figure 4. Sea cucumber specialists who contributed to the identifications of the specimen lots that are the subject of this report. a, Elizabeth Deichmann (1896–1975; photo provided by David Pawson in USNM); b, Cynthia (Gust) Ahearn (1952–2008); c, Melanie Mackenzie (Museum Victoria); d, Emily Whitfield (volunteer in Museum Victoria).

reported that Deichmann had “a considerable part of the material packed up and sent over to Harvard”, and Deichmann’s comment that some of the locality data were “somewhat mixed up”. We found some discrepancies between the data on labels in lots and the lists of data in the *Discovery* Reports. We thus have some reservations about the absolute accuracy of what we are reporting here.

The *Terra Nova* (1910–1913) collection was sent to Museum Victoria from the Smithsonian with the *Discovery* collection, and the lots have been identified where possible. This collection and the documentation are in poor condition. The collection currently in Museum Victoria is being prepared for return to the Natural History Museum in London. We are collaborating with Stefano Schiaparelli (*pers. comm.* University of Genova) who is developing a report on the holothuroids of Terra Nova Bay that will incorporate some of the *Terra Nova* collection data. O’Loughlin (2009) published a final report on *The British, Australian and New Zealand Antarctic Research Expedition* holothuroids (BANZARE, 1929–1930). This collection is lodged in the South Australian Museum.

#### Abbreviations

BAS	British Antarctic Survey
D	Station data prefix for RRS <i>Discovery I</i> and <i>II</i> collections
MCZ	Museum of Comparative Zoology, Harvard University
MS	Station data prefix for the Marine Biological Stations in South Georgia and in South Africa
MNHN	Muséum national d’Histoire naturelle, Paris
NHMUK	Natural History Museum, London
NMV	Museum Victoria, Australia
USNM	United States National Museum (part of Smithsonian Institution)
WS	Station data prefix for RRS <i>William Scoresby</i> collections
ZMUC	Zoological Museum University of Copenhagen

#### Methods

The macro images of preserved specimens were taken by Caroline Harding, with Mark O’Loughlin, using a Canon 5D mark ii camera mounted on a camlift Visionary Digital auto stepper, and Zerene Image Stacker, Adobe Lightroom and Photoshop for image processing and editing. The photos of ossicles were taken by Caroline Harding, with Mark O’Loughlin, using a LEICA DM5000 B microscope, Leica application software, and Helicon Focus montage software.

#### New taxa from the *Discovery Expedition* (1926–1939)

Order **Dendrochirotida** Grube, 1840

Family **Cucumariidae** Ludwig, 1894

Subfamily **Cucumariinae** Ludwig, 1894 *sensu* Panning 1949

*Remarks.* The subfamily Cucumariinae has plates only in the

body wall, while the second subfamily Colochirinae Panning, 1949 has plates and bowl/cup/basket ossicles in the body wall.

#### ***Cucusquama*** O’Loughlin gen. nov.

*Zoobank* *LSID.* <http://zoobank.org/urn:lsid:zoobank.org:act:0BE9B60F-195B-4F04-A06A-7EAF0BAA9D44>

*Diagnosis.* Cucumariinid genus; body sub-pentagonal in transverse section, fusiform; tentacles 10, short, lobed; calcareous ring cucumariid-like; complete calcareous body cover of imbricating, single-layered, perforated plates/scales, free ends point posteriorly; tube feet radial only, walls covered with scales; absence of cups and tables.

*Type species and locality.* *Cucusquama wesafrika* O’Loughlin sp. nov. (equatorial west Africa). Monotypic.

*Etymology.* Named *Cucu* from the family name Cucumariidae, with recognition of cucumariid like characters, and *squama* from the Latin *squama* (meaning scale) with reference to the body cover of imbricating scales.

*Remarks.* The sub-pentagonal form, complete body cover of imbricating scales, 10 short lobed tentacles, and radial series of tube feet is a unique combination of morphological characters within family Cucumariidae. We reluctantly establish a new monotypic genus.

#### ***Cucusquama wesafrika*** O’Loughlin sp. nov.

*Zoobank* *LSID.* <http://zoobank.org/urn:lsid:zoobank.org:act:D4A442DB-36E7-453C-945D-47FA23AB6CAA>

Table 1; figures 5, 6

*Material examined.* Holotype. West Africa, Luanda, Angola, *Discovery* stn D 274, -8.84 13.23 64–65 m, 4 Aug 1927, NHMUK 2016.148.

Paratypes (4). West Africa, off Cape Lopez, Gambon (French Congo), *Discovery* stn D 279, -0.63 8.70 58–67 m, 10 Aug 1927, NHMUK 2016.149–152.

*Description.* Body (preserved) up to 13 mm axial length, up to 3 mm high, body form sub-pentagonal, body tapered anteriorly and posteriorly, long posterior taper to create a tail; body completely invested in imbricating scales, free ends of imbricating scales point posteriorly; oral disc at base of oral cavity created by anteriorly-projecting scales; no anal scales detected; 10 short, lobed, black tentacles in ring on oral disc; ring not strongly calcified, form weakly evident, cucumariid-like; internal organs shriveled, brittle; tube feet on radii only, in single spaced series, up to 12 tube feet on any radius, tube feet more strongly developed on mid-ventral and ventro-lateral radii, wall of tube feet covered with imbricating scales.

Body wall ossicles single-layered perforated plates only, irregularly oval; large plates scales up to 600  $\mu$ m long; some irregular smaller plates up to about 170  $\mu$ m long; no evidence of cups or tables detected. No tube foot endplates detected. No tentacle ossicles detected.

*Distribution.* Equatorial West Africa, off Angola and Gambon, 58–67 m.

Table 1. Complete list of *Discovery* Expedition taxa collected from 1926 to 1939 (H indicates holotype; P indicates paratype(-s)).

Taxa (grouped in orders, in alphabetical sequence)	Station number	Locality	Depth	NHMUK registration (+ MNHN, ZMUC)
<b>Aspidochirotida</b>				
<i>Pseudostichopus spiculiferus</i> (O'Loughlin, 2002)	D 1658	Ross Sea	520 m	2011.169–170 (3)
<i>Pseudostichopus spiculiferus</i> (O'Loughlin, 2002)	D 600	South Shetland Islands	501–527 m	2011.297 (1)
<i>Pseudostichopus spiculiferus</i> (O'Loughlin, 2002)	D 1660	Ross Sea	351 m	2016.175–177
<b>Dendrochirotida</b>				
<i>Amphicyclus thomsoni</i> (Hutton, 1878)	D 941	Cook Strait, New Zealand	128 m	2016.134–135
<i>Cladodactyla crocea</i> (Lesson, 1830)	WS 869	Falkland Islands	187 m	2016.100
<i>Cladodactyla crocea</i> (Lesson, 1830)	WS 231	Falkland Islands	159–167 m	2016.101
<i>Cladodactyla crocea</i> (Lesson, 1830)	WS 867	Falkland Islands	147–150 m	2016.102
<i>Cladodactyla crocea</i> (Lesson, 1830)	WS 804	Falkland Islands	143–150 m	2016.147
<b><i>Clarkiella discoveryi</i> Heding, 1954 (in Heding &amp; Panning, 1954) H</b>	D 474	W of Shag Rocks, South Georgia	199 m	ZMUC HOL–64
<b><i>Clarkiella discoveryi</i> Heding, 1954 (in Heding &amp; Panning, 1954) P</b>	D 474	W of Shag Rocks, South Georgia	199 m	ZMUC HOL–247
<i>Crucella scotiae</i> (Vaney, 1906)	D 2567	Haakon VII Sea	100–124 m	2011.196
<i>Crucella scotiae</i> (Vaney, 1906)	D 175	South Shetland Islands	200 m	2011.168
<i>Cucamba psolidiformis</i> (Vaney, 1908)	D 1872	South Shetland Islands	247 m	2016.140
<i>Cucamba psolidiformis</i> (Vaney, 1908)	D 1660	Ross Sea	351 m	2016.145
<i>Cucumaria dudexa</i> O'Loughlin & Manjón-Cabeza, 2009b	D 456	Ross Sea	40–45 m	2011.141–150 (16)
<b><i>Cucusquama wesafrika</i> O'Loughlin sp. nov. H</b>	D 274	off Luanda, Angola	64–65 m	2016.148
<b><i>Cucusquama wesafrika</i> O'Loughlin sp. nov. P</b>	D 279	Cape Lopez, French Congo	58–67 m	2016.149–152
<i>Echinopsolus acanthocola</i> Gutt, 1990	D 1660	Ross Sea	351 m	2016.141
<i>Echinopsolus acanthocola</i> Gutt, 1990	D 1660	Ross Sea	351 m	2016.156–161
<i>Echinopsolus acutus</i> (Massin, 1992)	D 1652	Ross Sea	567 m	2011.341
<i>Echinopsolus acutus</i> (Massin, 1992)	D 1872	South Shetland Islands	247 m	2011.342–344
<i>Echinopsolus acutus</i> (Massin, 1992)	D 1652	Ross Sea	567 m	2016.162–170
<i>Echinopsolus attenuatus</i> (Vaney, 1906)	D 1652	Ross Sea	567 m	2011.366
<i>Echinopsolus georgiana</i> (Lampert, 1886) group Gutt, 1988	D 1652	Ross Sea	567 m	2011.367
<i>Echinopsolus georgiana</i> (Lampert, 1886) group Gutt, 1988	WS 228	Falkland Islands	229–236 m	2016.154
<i>Echinopsolus koehleri</i> (Vaney, 1914)	WS 245	Falkland Islands	209–304 m	2016.171–173
<i>Echinopsolus koehleri</i> (Vaney, 1914)	D 159	South Georgia	160 m	2011.314–315
<i>Echinopsolus koehleri</i> (Vaney, 1914)	D 160	Shag Rocks	0–180 m	2011.316–320
<i>Echinopsolus koehleri</i> (Vaney, 1914)	WS 33	South Georgia	0–130 m	2011.321
<i>Echinopsolus koehleri</i> (Vaney, 1914)	WS 33	South Georgia	0–130 m	2011.322
<i>Echinopsolus koehleri</i> (Vaney, 1914)	D 156	South Georgia	200–236 m	2011.323
<i>Echinopsolus koehleri</i> (Vaney, 1914)	D 148	South Georgia	132–148 m	2011.324
<i>Echinopsolus koehleri</i> (Vaney, 1914)	WS 840	Falkland Islands	368–463 m	2011.325
<i>Echinopsolus koehleri</i> (Vaney, 1914)	D 175	South Shetland Islands	200 m	2011.326
<i>Echinopsolus koehleri</i> (Vaney, 1914)	D 363	South Sandwich Islands	278–329 m	2011.327–328
<i>Echinopsolus koehleri</i> (Vaney, 1914)	D 160	Shag Rocks	0–180 m	2011.329–336
<i>Echinopsolus mollis</i> (Ludwig & Heding, 1935)	D 363	South Sandwich Islands	278–325 m	2016.104–107
<i>Hemioedema spectabilis</i> (Ludwig, 1883)	WS 797	Falkland Islands	112–114 m	2016.136
<i>Heterocucumis steineni</i> (Ludwig, 1898)	D 456	Ross Sea	40–45 m	2011.162–167
<i>Heterocucumis steineni</i> (Ludwig, 1898)	D 2567	Haakon VII Sea	100–124 m	2011.197

Taxa (grouped in orders, in alphabetical sequence)	Station number	Locality	Depth	NHMUK registration (+ MNHN, ZMUC)
<i>Heterothyone ocnoides</i> (Dendy, 1897)	D 939	off Dargaville, New Zealand	87 m	2016.113–115
<i>Neopsolidium convergens</i> (Hérouard, 1901)	D 724	Strait of Magellan	0–5 m	2011.126–132
<i>Neopsolidium convergens</i> (Hérouard, 1901)	WS 84	Falkland Islands	74–75 m	2011.133
<i>Neopsolidium convergens</i> (Hérouard, 1901)	D 51	Falkland Islands	115 m	2011.134–137
<i>Neopsolidium kerguelensis</i> (Théel, 1886)	D 1564	Marion Island	108–113 m	2016.178
<i>Neothyonidium armatum</i> Pawson, 1965	D 941	Cook Strait, New Zealand	128 m	2016.153
<i>Ocnus capensis</i> (Théel, 1886)	MS 82	Saldanha Bay, South Africa	7–14 m	2016.143
<i>Paracucumis turricata</i> (Vaney, 1906)	D 1651	Ross Sea	594 m	2011.139–140
<sup>2</sup> <i>Parathyonidium incertum</i> Heding, 1954 (in Heding & Panning, 1954) H	<sup>2</sup> D 170	<sup>2</sup> South Shetland Islands	<sup>2</sup> 342 m	<sup>3</sup> ZMUC HOL–93
<i>Parathyonidium incertum</i> Heding, 1954 (in Heding & Panning, 1954) P	D 170	South Shetland Islands	342 m	ZMUC HOL–300
<i>Parathyonidium incertum</i> Heding, 1954 (in Heding & Panning, 1954) P	D 170	South Shetland Islands	342 m	2011.171–173
<i>Parathyonidium incertum</i> Heding, 1954 (in Heding & Panning, 1954) P	No data	Elephant Island	600 m	MNHN–IE–2013–2479
<i>Pentactella leonina</i> (Semper, 1867)	WS 867	Falkland Islands	148–150 m	2016.116–129
<i>Pentactella leonina</i> (Semper, 1867)	WS 84	Falkland Islands	74–75 m	2011.81–90 (23)
<i>Pentactella leonina</i> (Semper, 1867)	WS 85	Falkland Islands	79 m	2011.91–99
<i>Pentactella leonina</i> (Semper, 1867)	D 51	Falkland Islands	115 m	2011.100–101
<i>Pentactella leonina</i> (Semper, 1867)	WS 804	Falkland Islands	143–150 m	2011.102–110
<i>Pentactella leonina</i> (Semper, 1867)	WS 863	Patagonia Shelf	117–121 m	2011.111
<i>Pentactella leonina</i> (Semper, 1867)	WS 93	Falkland Islands	130–133 m	2011.112
<i>Pentactella leonina</i> (Semper, 1867)	D 652	Burdwood Bank	169–171 m	2011.113
<i>Pentactella leonina</i> (Semper, 1867)	WS 56	Larsen Harbour, South Georgia	2 m	2016.132–133
<i>Pentactella leonina</i> (Semper, 1867)	D 1909	Falkland Islands	132 m	2016.174
<i>Pentactella leonina</i> (Semper, 1867)	WS 243	Falkland Islands	141–144 m	2011.114
<i>Pentactella leonina</i> (Semper, 1867)	WS 81	Falkland Islands	81–82 m	2011.115
<i>Pentactella leonina</i> (Semper, 1867)	WS 80	Falkland Islands	152–156 m	2011.116
<i>Pentactella leonina</i> (Semper, 1867)	WS 865	Patagonia Shelf	126–128 m	2011.117
<i>Pentactella leonina</i> (Semper, 1867)	WS 804	Falkland Islands	143–150 m	2011.118
<i>Pentactella leonina</i> (Semper, 1867)	WS 834	off Patagonia	27–38 m	2011.119
<i>Pentactella leonina</i> (Semper, 1867)	WS 65	Undine Harbour, South Georgia	1 m (kelp)	2011.120
<i>Pentactella leonina</i> (Semper, 1867)	WS 80	Falkland Islands	152–156 m	2011.121–123
<i>Pentactella leonina</i> (Semper, 1867)	D 52	Falkland Islands	17 m	2011.124
<i>Pentactella leonina</i> (Semper, 1867)	WS 216	Falkland Islands	133–219 m	2011.125
<i>Pentactella leonina</i> (Semper, 1867)	D 51	Falkland Islands	115 m	2011.186–192
<i>Pentactella leonina</i> (Semper, 1867)	WS 804	Falkland Islands	143–150 m	2011.193
<i>Pentactella leonina</i> (Semper, 1867)	WS 56	Larsen Harbour, South Georgia	2 m	2011.194–195
<i>Pentactella leonina</i> (Semper, 1867)	D 724	Fortesque Bay, Magellan Strait	0–5 m	2011.184–185
<i>Pentactella leonina</i> (Semper, 1867)	WS 836	Patagonia Shelf	64 m	2011.228
<i>Pentactella leonina</i> (Semper, 1867)	WS 247	Falkland Islands	172 m	2011.229



Taxa (grouped in orders, in alphabetical sequence)	Station number	Locality	Depth	NHMUK registration (+ MNHN, ZMUC)
<i>Pentactella leonina</i> (Semper, 1867)	D 53	Port Stanley, Falkland Islands	0–2 m	2011.230–231
<i>Pentactella leonina</i> (Semper, 1867)	D 55	Port Stanley, Falkland Islands	10–16 m	2011.232–235
<i>Pentactella leonina</i> (Semper, 1867)	WS 576	Falkland Islands	24–34 m	2011.236–237
<i>Pentactella leonina</i> (Semper, 1867)	WS 249	Falkland Islands	166 m	2011.238
<i>Pentactella leonina</i> (Semper, 1867)	WS 848	Patagonia Shelf	115–117 m	2011.239–240
<i>Pentactella leonina</i> (Semper, 1867)	D 53	Port Stanley, Falkland Islands	0–2 m	2011.241
<i>Pentactella leoninoides</i> (Mortensen, 1925)	D 2215	NZ Antipodes Island	163–210 m	2011.174
<i>Pentactella marionensis</i> (Théel, 1886)	D 1563	Marion Island	101–106 m	2011.221–224
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 867	Falkland Islands	148–150 m	2016.99
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 804	Falkland Islands	143–150 m	2016.146
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 840	Falkland Islands	386–463 m	2011.1
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 246	Falkland Islands	208–267 m	2011.2–5
<i>Pentactella perrieri</i> (Ekman, 1927)	D 51	Falkland Islands	115 m	2011.6–9
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 246	Falkland Islands	208–267 m	2011.10–13
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 65	Undine Harbour, South Georgia	1 m (kelp)	2011.14
<i>Pentactella perrieri</i> (Ekman, 1927)	D 1909	Falkland Islands	132 m	2011.15
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 225	Falkland Islands	161–162 m	2011.16
<i>Pentactella perrieri</i> (Ekman, 1927)	D 388	Cape Horn	121 m	2011.17–21
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 243	Falkland Islands	141–144 m	2011.22–23
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 228	Falkland Islands	229–236 m	2011.24–26
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 840	Falkland Islands	368–463 m	2011.27
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 228	Falkland Islands	229–236 m	2011.28–30
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 73	Falkland Islands	121–130 m	2011.31–33
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 804	Falkland Islands	143–150 m	2011.34–36
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 84	Falkland Islands	74–75 m	2011.37
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 583	Magellan Strait	14–78 m	2011.38–40
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 243	Falkland Islands	141–144 m	2011.41–42
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 237	Falkland Islands	150–256 m	2011.43
<i>Pentactella perrieri</i> (Ekman, 1927)	D 1909	Falkland Islands	132 m	2011.44–46
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 88	Falkland Islands	118 m	2011.47–56
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 246	Falkland Islands	208–267 m	2011.57–59
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 825	Falkland Islands	135–144 m	2011.60–69
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 839	Falkland Islands	503–534 m	2011.70
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 804	Falkland Islands	143–150 m	2011.71
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 825	Falkland Islands	135–144 m	2011.72–75
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 93	Falkland Islands	130–133 m	2011.76–77
<i>Pentactella perrieri</i> (Ekman, 1927)	D 141	Cumberland Bay, South Georgia	17–27 m	2011.78
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 841	Falkland Islands	100–110 m	2011.79
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 231	Falkland Islands	159–167 m	2011.80
<i>Pentactella perrieri</i> (Ekman, 1927)	WS 825	Falkland Islands	135–144 m	2011.198–204
<i>Pentamera chiloensis</i> (Ludwig, 1887)	WS 816	Patagonia Shelf	150 m	2011.227
<i>Pentamera chiloensis</i> (Ludwig, 1887)	WS 71	Falkland Islands	80–82 m	2011.225–226
<i>Pseudocnella insolens</i> (Théel, 1886)	MS 82	Saldanha Bay, South Africa	7–14 m	2011.284–293 (10+)

Taxa (grouped in orders, in alphabetical sequence)	Station number	Locality	Depth	NHMUK registration (+ MNHN, ZMUC)
<i>Psolirux coatsi</i> (Vaney, 1908)	WS 56	Larsen Harbour, South Georgia	2 m	2011.151–152
<i>Psolirux iuvenilesi</i> O'Loughlin & Manjón-Cabeza, 2009b	D 363	South Sandwich Islands	278–329 m	2011.153
<i>Psolirux iuvenilesi</i> O'Loughlin & Manjón-Cabeza, 2009b	D 159	South Georgia	160 m	2011.313
<i>Psolidium dorsipes</i> Ludwig, 1887	WS 834	Cape Virgenes, Argentina	27–38 m	2008.3182
<i>Psolidium gaini</i> Vaney, 1914	D 1660	Pennell Bank, Ross Sea	0–351 m	2008.3183–3189
<i>Psolidium incubans</i> Ekman, 1925	MS 67	Cumberland Bay, South Georgia	38 m	2008.3190
<i>Psolidium tenue</i> Mortensen, 1925	D 181	Palmer Archipelago	160–335 m	2008.3191
<i>Psolidium tenue</i> Mortensen, 1925	D 182	Palmer Archipelago	278–500 m	2008.3192
<i>Psolidium tenue</i> Mortensen, 1925	D 187	Palmer Archipelago	0–195 m	2008.3193
<i>Psolidium tenue</i> Mortensen, 1925	D 190	Palmer Archipelago	0–250 m	2008.3194–3196
<i>Psolidium tenue</i> Mortensen, 1925	D 599	Antarctic Peninsula	0–150 m	2008.3197–3198
<i>Psolidium tenue</i> Mortensen, 1925	D 1644	Ross Sea	626 m	2008.3199
<i>Psolidium tenue</i> Mortensen, 1925	D 1649	Ross Sea	695 m	2008.3200–3201
<i>Psolidium tenue</i> Mortensen, 1925	D 1652	Ross Sea	567 m	2008.3202–3205
<i>Psolidium tenue</i> Mortensen, 1925	D 1660	Ross Sea	0–351 m	2008.3206–3208
<i>Psolidium tenue</i> Mortensen, 1925	D 2200	Balleney Islands	512–532 m	2008.3209–3218
<i>Psolus antarcticus</i> (Philippi, 1857)	D 55	Port Stanley, Falkland Islands	10–16 m	2016.69–74
<i>Psolus antarcticus</i> (Philippi, 1857)	D 1909	Burdwood Bank	132 m	2016.75
<i>Psolus antarcticus</i> (Philippi, 1857)	D 1909	Burdwood Bank	132 m	2011.345–354
<i>Psolus antarcticus</i> (Philippi, 1857)	D 1909	Burdwood Bank	132 m	2011.355
<i>Psolus antarcticus</i> (Philippi, 1857)	WS 804	Falkland Islands	143–150 m	2016.76
<i>Psolus antarcticus</i> (Philippi, 1857)	WS 243	Falkland Islands	141–144 m	2016.77
<i>Psolus antarcticus</i> (Philippi, 1857)	WS 825	Falkland Islands	135–144 m	2016.78–80
<i>Psolus antarcticus</i> (Philippi, 1857)	WS 244	Falkland Islands	253–247 m	2016.81
<i>Psolus antarcticus</i> (Philippi, 1857)	D 2200	Balleney Islands	512–532 m	2016.82
<i>Psolus carolineae</i> O'Loughlin & Whitfield, 2010	D 1952	South Shetland Islands	367–383 m	2016.108–110
<i>Psolus dubiosus</i> Ludwig & Heding, 1935	D 1652	Ross Sea	567 m	2016.84–88
<i>Psolus dubiosus</i> Ludwig & Heding, 1935	D 1660	Ross Sea	351 m	2016.89–90
<i>Psolus dubiosus</i> Ludwig & Heding, 1935	D 1652	Ross Sea	567 m	2016.91–92
<i>Psolus dubiosus</i> Ludwig & Heding, 1935	D 474	West of Shag Rocks	199 m	2016.93–98
<i>Psolus figulus</i> Ekman, 1925	MS 67	Cumberland Bay, South Georgia	38 m	2016.43
<i>Psolus figulus</i> Ekman, 1925	WS 56	Larsen Harbour, South Georgia	2 m	2016.44–46
<i>Psolus lockhartae</i> O'Loughlin & Whitfield, 2010	WS 840	Falkland Islands	368–463 m	2016.83
<i>Psolus paradubiosus</i> Carriol & Féral, 1985	D 1563	Marion Island	99–113 m	2016.111–112
<i>Psolus patagonicus</i> Ekman, 1925	D 175	South Shetland Islands	200 m	2016.130
<i>Psolus patagonicus</i> Ekman, 1925	D 1957	South Shetland Islands	785–810 m	2016.131
<i>Psolus patagonicus</i> Ekman, 1925	WS 56	East Falklands	10–16 m	2011.376–377
<i>Psolus patagonicus</i> Ekman, 1925	WS 85	Falkland Islands	79 m	2011.356–365
<i>Psolus patagonicus</i> Ekman, 1925	D 1909	Falkland Islands	132 m	2011.369–371
<i>Psolus patagonicus</i> Ekman, 1925	WS 848	Patagonia Shelf	115–117 m	2011.372
<i>Psolus patagonicus</i> Ekman, 1925	D 724	Strait of Magellan	0–5 m	2011.373

Taxa (grouped in orders, in alphabetical sequence)	Station number	Locality	Depth	NHMUK registration (+ MNHN, ZMUC)
<i>Psolus patagonicus</i> Ekman, 1925	WS 243	Falkland Islands	141–144 m	2011.374
<i>Psolus patagonicus</i> Ekman, 1925	WS 841	Falkland Islands	100–110 m	2011.375
<i>Psolus patagonicus</i> Ekman, 1925	WS 820	Falkland Islands	351–368 m	2011.378
<i>Psolus punctatus</i> Ekman, 1925	D 148	South Georgia	132–148 m	2016.1–24
<i>Psolus punctatus</i> Ekman, 1925	D 474	West of Shag Rocks	199 m	2016.25
<i>Psolus punctatus</i> Ekman, 1925	D 140	South Georgia	122–136 m	2016.26–27
<i>Psolus punctatus</i> Ekman, 1925	D 27	South Georgia	110 m	2016.28
<i>Psolus punctatus</i> Ekman, 1925	D 179	Palmer Archipelago	4–10 m	2016.29–32
<i>Psolus punctatus</i> Ekman, 1925	D 42	Cumberland Bay, South Georgia	120–204 m	2016.33–39
<i>Psolus punctatus</i> Ekman, 1925	D 190	Palmer Archipelago	130 m	2016.40–42
<i>Staurocucumis liouvillei</i> (Vaney, 1914)	D 456	Ross Sea	40–45 m	2016.137–139
<i>Staurocucumis liouvillei</i> (Vaney, 1914)	WS 225	Falkland Islands	161–162 m	2016.155
<i>Staurocucumis liouvillei</i> (Vaney, 1914)	D 140	South Georgia	122–136 m	2011.159–161
<i>Staurocucumis liouvillei</i> (Vaney, 1914)	D 366	South Sandwich Islands	77–152 m	2011.154–158
<i>Staurocucumis liouvillei</i> (Vaney, 1914)	D 123	South Georgia	230–250 m	2011.340
<i>Trachythyone bouvetensis</i> (Ludwig & Heding, 1935)	D 27	Cumberland Bay, South Georgia	110 m	2016.142
<i>Trachythyone bouvetensis</i> (Ludwig & Heding, 1935)	D 144	South Georgia	155–178 m	2011.175
<i>Trachythyone bouvetensis</i> (Ludwig & Heding, 1935)	D 160	Shag Rocks	0–180 m	2011.176–177
<i>Trachythyone bouvetensis</i> (Ludwig & Heding, 1935)	D 1652	Ross Sea	567 m	2011.178
<i>Trachythyone bouvetensis</i> (Ludwig & Heding, 1935)	D 170	South Shetland Islands	342 m	2011.179–180
<i>Trachythyone bouvetensis</i> (Ludwig & Heding, 1935)	D 1660	Ross Sea	351 m	2011.181–182
<i>Trachythyone bouvetensis</i> (Ludwig & Heding, 1935)	D 1658	Ross Sea	520 m	2011.183
<i>Trachythyone bouvetensis</i> (Ludwig & Heding, 1935)	WS 71	Falkland Islands	80–82 m	2011.337–338
<i>Trachythyone bouvetensis</i> (Ludwig & Heding, 1935)	D 42	Cumberland Bay, South Georgia	120–204 m	2011.339
<i>Trachythyone parva</i> (Ludwig, 1875)	WS 795	Falkland Islands	157–161 m	2016.103
<i>Thyone aurea</i> (Quoy & Gaimard, 1834)	MS 82	Saldanha Bay, South Africa	7–14 m	2011.294–296
<b>Elasipodida</b>				
<i>Peniagone vignoni</i> Hérouard, 1901	D 181	Palmer Archipelago	160–335 m	2011.311–312
<i>Rhipidothuria racovitzae</i> Hérouard, 1901	D 181	Palmer Archipelago	160–335 m	2011.298–307 (20)
<i>Rhipidothuria racovitzae</i> Hérouard, 1901	D 1952	South Shetland Islands	367–383 m	2011.308–310
<b>Synaptida</b> (sensu Smirnov 2012)				
<i>Chiridota pisanii</i> Ludwig, 1887	WS 750	off Patagonia	95 m	2010.110
<i>Chiridota pisanii</i> Ludwig, 1887	WS 388	Cape Horn	121 m	2010.111
<i>Paradota weddellensis</i> Gutt, 1990	WS 217	Falkland Islands	146 m	2011.242
<i>Paradota weddellensis</i> Gutt, 1990	D 600	South Shetland Islands	501–527 m	2011.243
<i>Scoliorhapis massini</i> O’Loughlin & VandenSpiegel, 2010	WS 756	Falkland Islands	119 m	2010.105–109
<i>Scoliorhapis massini</i> O’Loughlin & VandenSpiegel, 2010 (“probably”)	MS 67	Cumberland Bay, South Georgia	38 m	2010.112–113
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 816	Patagonia Shelf	150 m	2010.55–62
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 88	Falkland Islands	118 m	2010.63–68
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 84	Falkland Islands	75 m	2010.69–70
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 773	Falkland Islands	296 m	2010.71–74
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 82	Falkland Islands	140–144 m	2010.75–84

Taxa (grouped in orders, in alphabetical sequence)	Station number	Locality	Depth	NHMUK registration (+ MNHN, ZMUC)
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 25	Undine Harbour, South Georgia	18–27 m	2010.85–94
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 56	Larsen Harbour, South Georgia	2 m	2010.95–96
<i>Sigmodota contorta</i> (Ludwig, 1875)	D 39	Cumberland Bay, South Georgia	179–235 m	2010.97–98
<i>Sigmodota contorta</i> (Ludwig, 1875)	D 126	South Georgia	0–100 m	2010.99
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 62	Wilson Harbour, South Georgia	15–45 m	2010.100–103
<i>Sigmodota contorta</i> (Ludwig, 1875)	D 1941	South Georgia	22–25 m	2010.104
<i>Sigmodota contorta</i> (Ludwig, 1875)	D 1562	Marion Island	88–104 m	2016.47–68
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 83	Falkland Islands	129–137 m	2011.138
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 804	Falkland Islands	143–150 m	2011.205–211
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 228	Falkland Islands	229–236 m	2011.212–220
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 869	Patagonia Shelf	187 m	2011.244–253 (50+)
<i>Sigmodota contorta</i> (Ludwig, 1875)	D 45	South Georgia	238–270 m	2011.254–263 (20+)
<i>Sigmodota contorta</i> (Ludwig, 1875)	D 145	South Georgia	26–35 m	2011.264–273 (10+)
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 838	Patagonia Shelf	149–159 m	2011.274–283 (10+)
<sup>4</sup> <i>Sigmodota magnibacula</i> (Massin & Hétériér, 2004)	?	?	?	2016.144
taeniogyrid species (very poor condition)	WS 182	Palmer Archipelago	278–500 m	2010.114

<sup>1</sup>See note 1 with Table 2 below.

<sup>2</sup>See note 2 with Table 2 below.

<sup>3</sup>Holotype specimen is thought to be lost. See note 3 with Table 2 below.

<sup>4</sup>Specimen and locality source not recognized. May not be *Discovery* Expedition. Handwritten label with: St. 105, 13/2/31, 163 m.

**Etymology.** Named *wesafrica* for the geographical occurrence of the species on the West Africa coast.

**Remarks.** All the type specimens have dried during preservation, and the calcareous ring and ossicles are partly at least eroded. The ring does not have a recognizable outline in any specimen that was dissected. The form and number of the tentacles are difficult to observe. The sub-pentagonal form, complete body cover of imbricating scales with free ends pointing posteriorly, 10 short lobed tentacles, radial series of tube feet, and absence of cups or tables distinguish the new genus and species.

**Previous publications with *Discovery* Expedition Holothuroidea (included in Table 1 and listed in Tables 2, 3, 4).**

1. Albert Panning (in Heding & Panning 1954) recorded that Svend Heding died (in 1949) before their manuscript was completed, and before Heding was able to complete any *Discovery* Expedition Report. Panning acknowledged that descriptions of the new genera and species *Clarkiella* Heding, 1954, *Clarkiella discoveryi* Heding, 1954, *Parathyonidium* Heding, 1954 and *Parathyonidium incertum* Heding, 1954 were from the notes of Heding. In collaboration with Elizabeth Deichmann (at the MCZ at Harvard University at the time) Panning included these new taxa in the comprehensive paper

Heding & Panning 1954. Panning (in Heding & Panning 1954) recorded that the work on the *Discovery* material was taken over by Dr. Deichmann. This was not completed, and no *Discovery* Report has been published.

O'Loughlin (2009), in a paper on the BANZARE holothuroids, discussed *Clarkiella* Heding, and referred a new holothuroid species from the Kerguelen Islands and Tasmania to Heding's genus: *Clarkiella deichmannae* O'Loughlin, 2009.

O'Loughlin *et al.* (2009a), in reporting some observations of reproductive strategies of dendrochirotid species, referred to an as then undescribed species of *Parathyonidium* Heding from Eastern Antarctica that exhibited brood-protection in the coelom. Subsequently O'Loughlin *et al.* (2014) included an illustrated revision of genus *Parathyonidium* Heding and species *Parathyonidium incertum* Heding. Their revision was based on the original description and on three paratypes from the South Shetland Islands. Additional specimens were recognized from South Georgia, from the Antarctic Peninsula, and off Enderby Land in Eastern Antarctica. The specimen referred to *Parathyonidium* by O'Loughlin *et al.* (2009a) was identified as *P. incertum*. ZMUC records (see note 3 under Table 2) indicate that the holotype for *Parathyonidium incertum* "must probably be considered lost". O'Loughlin *et al.* (2014) listed three lots of paratypes that are held respectively in Copenhagen (ZMUC), Paris (MNHN) and London

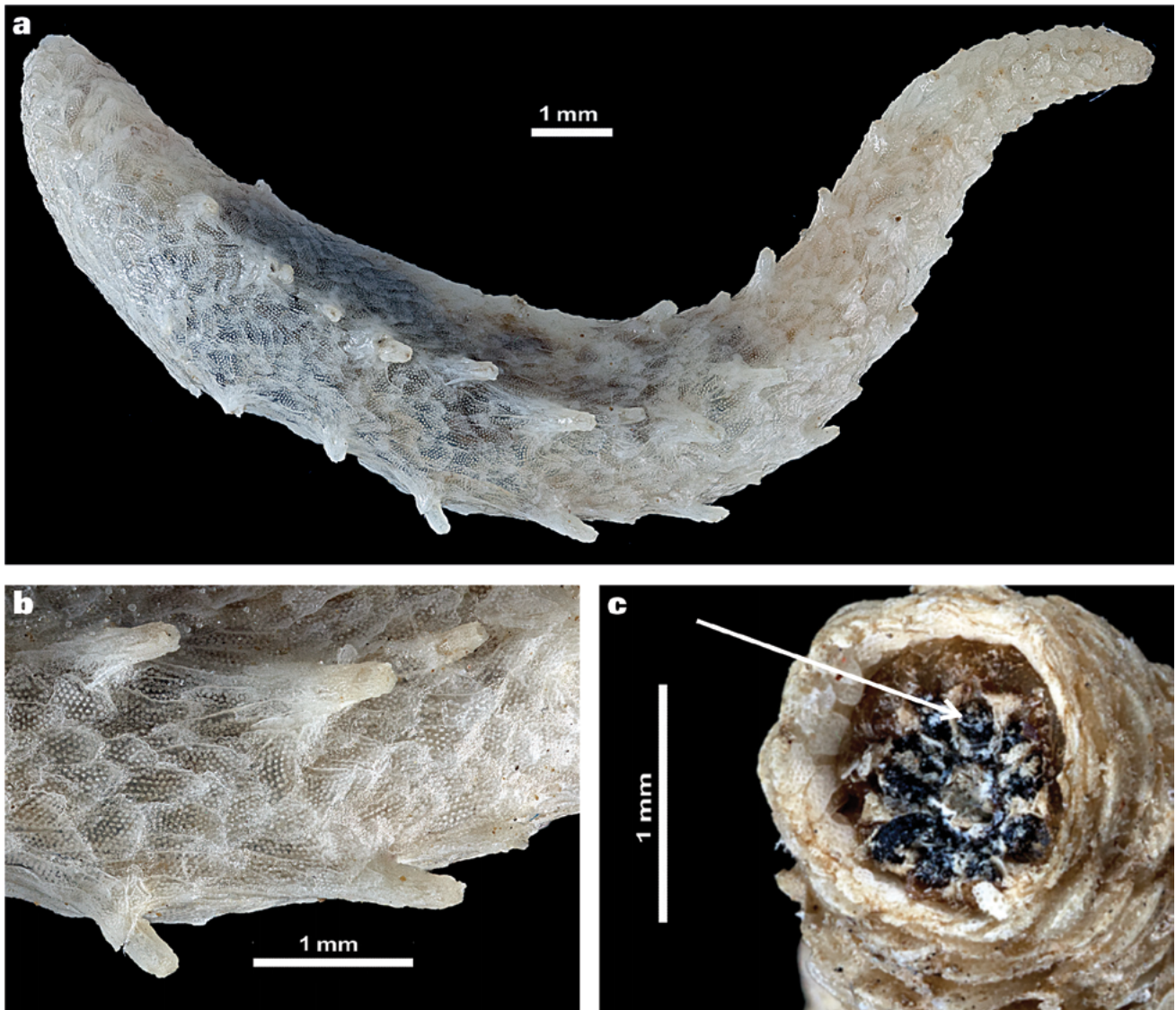


Figure 5. a & b, photos of preserved holotype of *Cucusquama wesafrika* O'Loughlin gen. & sp. nov. from Angola (oral end left; axial length 13 mm; NHMUK 2016.148); c, photo into mouth cavity of a preserved paratype from Gambon (French Congo) (arrow pointing to one black tentacle; NHMUK 2016.149).

(NHMUK). Details are provided in Tables 1 & 2. O'Loughlin *et al.* (2014) reported the holotype locality for *Parathyonidium incertum* as Shag Rocks near South Georgia, based on Heding & Panning (1954). We judge here that this was a mistake (see note 2 with Table 2 below).

2. O'Loughlin & Ahearn (2008) reported 13 lots of *Discovery* Expedition holothuroids that represent four species of *Psolidium* Ludwig, 1875. Details are provided in Tables 1 and 3.

3. O'Loughlin & VandenSpiegel (2010) reported 16 lots of *Discovery* Expedition Synaptida (as Apodida) holothuroids that represented 3 species. Details are provided in Tables 1 and 4.

#### Systematic notes on *Discovery* holothuroid taxa.

##### 1. *Echinopsolus* Gutt, 1990.

Bohn & Hess (2014) reassigned a group of Antarctic cucumariid species to genus *Echinopsolus* Gutt, 1990, based on their shared and unique set of morphological characters related to their reproductive mode. The group comprised: *Echinopsolus acanthocola* Gutt, 1990; *E. acutus* (Massin, 1992); *E. charcoti* (Vaney, 1906); *E. koehleri* (Vaney, 1914); *E. mollis* (Ludwig & Heding, 1935); *E. parvipis* (Massin, 1992); *E. splendidus* (Gutt, 1990). In the same paper Bohn & Hess (2014) reassigned genus *Echinopsolus* to family Cucumariidae.

Table 2. Type specimens of *Discovery* Expedition Holothuroidea published in Heding & Panning 1954.

Taxon	Type status	Station collected	Locality collected	Depth	Date collected	Institution lodged	Registration
<i>Clarkiella discoveryi</i> Heding (in Heding & Panning, 1954)	<sup>1</sup> Holotype	D 474	W of Shag Rocks South Georgia	199 m	19 Nov 1930	ZMUC	HOL-000064
<i>Clarkiella discoveryi</i> Heding, 1954	<sup>1</sup> Paratype	D 474	W of Shag Rocks South Georgia	199 m	19 Nov 1930	ZMUC	HOL-000247
<i>Parathyonidium incertum</i> Heding (in Heding & Panning, 1954)	<sup>2,3</sup> Holotype	<sup>3</sup> Lost specimen					<sup>3</sup> HOL-000093
<i>Parathyonidium incertum</i> Heding, 1954	Paratypes (3)	D 170	Clarence Island S Shetland Islands	342 m	23 Feb 1927	ZMUC	HOL-000300
<i>Parathyonidium incertum</i> Heding, 1954	Paratypes (3)	D 170	Clarence Island	342 m	23 Feb 1927	NHMUK	NHMUK 2011.171-173
<i>Parathyonidium incertum</i> Heding, 1954	Paratypes (2)	No record	Elephant Island	600 m	No record	MNHN	MNHN-IE-2013-2479

<sup>1</sup>No *Discovery* station data were reported for *Clarkiella discoveryi* with the description of the new taxa in Heding & Panning 1954, but registered and labelled holotype and paratype (one) specimens are in the ZMUC with type status, station number and collection data (see Table 2 above with station data from the labels with the types in the ZMUC). Both type specimens were collected from the same type locality, station D474.

<sup>2</sup> The station data reported for the type for *Parathyonidium incertum* in Heding & Panning (1954) is station D474. We judge that this may be a mistake since it is the type locality on the labels for *Clarkiella discoveryi*. The holotype specimen is assumed to be lost as no “holotype” has been found. But there are paratypes from station D170, and a note on the label with them translated by Tom Schioette in 2013 reads: “Does the identification with them include also the large specimens? Heding’s serial number 234–236 st. 170”. With some reservation we judge that the holotype was most probably also from the paratype station D170, and not station D474 as published in Heding & Panning (1954).

<sup>3</sup> Note by Tom Schioette in 2013: “The holotype of *Parathyonidium incertum*, which should probably have been (or perhaps was) returned with the “Discovery” material after Heding’s death, was later given the ZMUC number HOL-93 in absentia. It must probably be considered lost, since later workers on the material have not succeeded in finding it”.

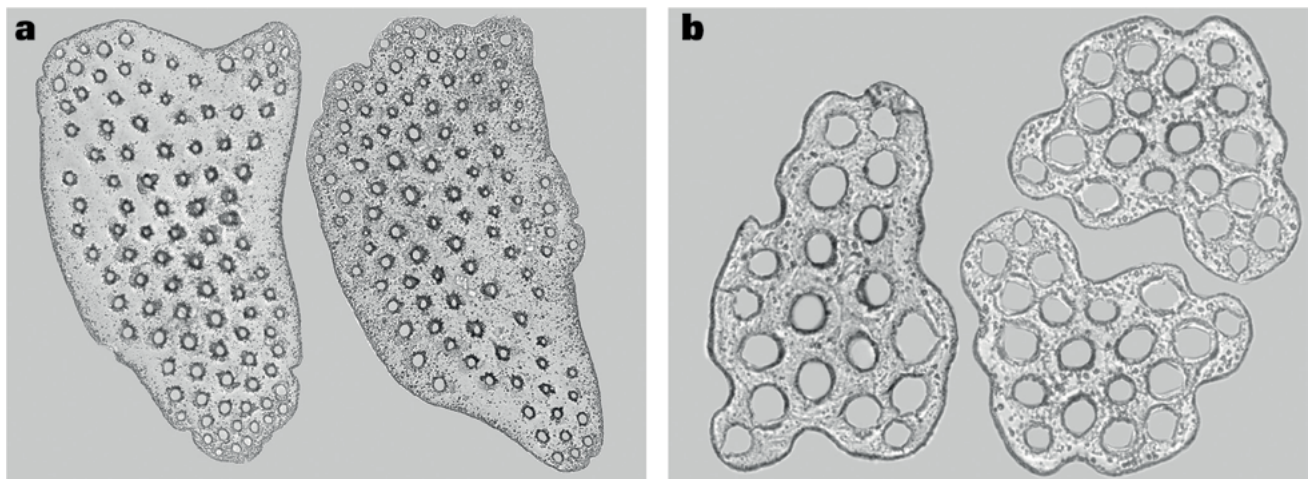


Figure 6. Photos of eroding ossicles from the mid-body wall of *Cucusquama wesafrika* O'Loughlin gen. & sp. nov. a, large single-layered perforated plates (scales) from the holotype (up to 600  $\mu$ m long; NHMUK 2016.148); b, body wall and tube foot small perforated plates from a paratype (up to 168  $\mu$ m long; NHMUK 2016.150).

Table 3. Discovery Expedition Holothuroidea published in O'Loughlin &amp; Ahearn 2008.

Taxon	Station collected	Locality collected	Depth	Institution lodged	Registration
<i>Psolidium dorsipes</i> Ludwig, 1887	WS 834	Cape Virgenes Southern Argentina	27–38 m	NHMUK	2008.3182
<i>Psolidium gaini</i> Vaney, 1914	D 1660	Pennell Bank Ross Sea	0–351 m	NHMUK	2008.3183–3189
<i>Psolidium incubans</i> Ekman, 1925	MS 67	South Georgia	38 m	NHMUK	2008.3190
<i>Psolidium tenue</i> Mortensen, 1925	D 181	Palmer Archipelago Antarctica	160–335 m	NHMUK	2008.3191
<i>Psolidium tenue</i> Mortensen, 1925	D 182	Palmer Archipelago Antarctica	278–500 m	NHMUK	2008.3192
<i>Psolidium tenue</i> Mortensen, 1925	D 187	Palmer Archipelago Antarctica	0–195 m	NHMUK	2008.3193
<i>Psolidium tenue</i> Mortensen, 1925	D 190	Palmer Archipelago Antarctica	0–250 m	NHMUK	2008.3194–3196
<i>Psolidium tenue</i> Mortensen, 1925	D 599	W of Adelaide Island Antarctic Peninsula	0–150 m	NHMUK	2008.3197–3198
<i>Psolidium tenue</i> Mortensen, 1925	D 1644	Ross Sea	626 m	NHMUK	2008.3199
<i>Psolidium tenue</i> Mortensen, 1925	D 1649	Ross Sea	695 m	NHMUK	2008.3200–3201
<i>Psolidium tenue</i> Mortensen, 1925	D 1652	Ross Sea	0–500 m	NHMUK	2008.3202–3205
<i>Psolidium tenue</i> Mortensen, 1925	D 1660	Ross Sea	0–351 m	NHMUK	2008.3206–3208
<i>Psolidium tenue</i> Mortensen, 1925	D 2200	Balleny Island Antarctica	512–532 m	NHMUK	2008.3209–3218

Table 4. Discovery Expedition Holothuroidea published in O'Loughlin &amp; VandenSpiegel 2010.

Taxon	Station collected	Locality collected	Depth	Institution lodged	Registration number
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 816	Falkland Islands	150 m	NHMUK	2010.55–62
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 88	Falkland Islands	118 m	NHMUK	2010.63–68
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 84	Falkland Islands	75 m	NHMUK	2010.69–70
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 773	Falkland Islands	296 m	NHMUK	2010.71–74
<sup>1</sup> <i>Sigmodota contorta</i> (Ludwig, 1875)	WS 82	Falkland Islands	140–144 m	NHMUK	2010.75–84
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 25	South Georgia	18–27 m	NHMUK	2010.85–94
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 56	South Georgia	2 m	NHMUK	2010.95–96
<i>Sigmodota contorta</i> (Ludwig, 1875)	D 39	South Georgia	179–235 m	NHMUK	2010.97–98
<i>Sigmodota contorta</i> (Ludwig, 1875)	D126	South Georgia	0–100 m	NHMUK	2010.99
<i>Sigmodota contorta</i> (Ludwig, 1875)	WS 62	South Georgia	15–45 m	NHMUK	2010.100–103
<i>Sigmodota contorta</i> (Ludwig, 1875)	D 1941	South Georgia	22–55 m	NHMUK	2010.104
<i>Scoliorhapis massini</i> O'Loughlin & VandenSpiegel, 2010	WS 756	Falkland Islands	119 m	NHMUK	2010.105–109
<i>Chiridota pisanii</i> Ludwig, 1887	WS 750	Patagonia	95 m	NHMUK	2010.110
<i>Chiridota pisanii</i> Ludwig, 1887	WS 388	Cape Horn South America	121 m	NHMUK	2010.111

<sup>1</sup>See Systematic note 6 below. This entry has been changed from the O'Loughlin & VandenSpiegel 2010 paper.

O'Loughlin *et al.* (2009a) discussed the “*Cucumaria georgiana* (Lampert, 1886) group” of Antarctic species that was created by Gutt (1988), and followed by Massin (1992). O'Loughlin *et al.* (2009a) listed 11 species in this “group”: *Cucumaria acuta* Massin, 1992; *Cucumaria analis* Vaney, 1908; *Cucumaria aspera* Vaney, 1908; *Cucumaria attenuata* Vaney, 1906; *Cucumaria georgiana* (Lampert, 1886); *Cucumaria joubini* Vaney, 1914; *Cucumaria lateralis* Vaney, 1906; *Cucumaria perfida* Vaney, 1908; *Cucumaria periprocta* Vaney, 1908; *Cucumaria secunda* Vaney, 1908; *Cucumaria vaneysi* Cherbonnier, 1949. Bohn & Hess (2014) also discussed this “group”, and we agree that the systematic status of the species in this group requires resolution. Foundational to this systematic resolution must be an establishment of the systematic status of *Cucumaria georgiana* (Lampert, 1886). Bohn & Hess (2014) did not assign the “group” to *Echinopsolus*. We have assigned some *Discovery* Expedition lots to this “group”. Based on the general similarity of their reproductive morphological features with those of the *Echinopsolus* species we have also assigned this “group” to *Echinopsolus*.

Bohn & Hess (2014) were not able to confirm the systematic status of *Echinopsolus excretiospinosus* Massin, 2010, but noted that no brood pouches were reported and the ventral tentacle pair were apparently not smaller than the other tentacles.

COI genetic data (Gustav Paulay *pers. comm.*; see phylogenetic tree in O'Loughlin *et al.* 2011) support a generic clade that includes *Echinopsolus acanthocola* (with apparently two or three cryptic species with geographic congruence), the “*georgiana* group” (with apparently two or three cryptic species with geographic congruence), and the reassigned *Echinopsolus mollis* (apparently two or three cryptic species with geographic congruence). Generic data thus support in part the work of Bohn & Hess (2014). We note that these species also have mid-body dorsal papillae or tube feet, and lack cup (bowl) ossicles in the body wall.

But COI genetic data (Gustav Paulay *pers. comm.*; see phylogenetic tree in O'Loughlin *et al.* 2011) support a generic clade for *Psolus koehleri* and *Psolus charcoti* that is separate from the *Echinopsolus* clade and do not support the reassignment of these two species to *Echinopsolus*. We note that these two species lack mid-body dorsal tube feet or papillae, and do have cup (bowl) ossicles in the body wall. Genetic data to date do not support their assignment to a *Psolus* Oken, 1815 clade. We leave these two species in their current reassignment to *Echinopsolus* until a necessary reassessment of dendrochirotid generic assignments is supported by additional genetic data.

We do not have a COI sequence for the recently reassigned *Echinopsolus splendidus*. This species lacks dorsal and lateral tube feet / papillae, but also lacks cups / bowls in the body wall. It falls morphologically into neither *Echinopsolus* genetic /generic clade. We judge that it will probably fall into another generic clade but in the absence of supportive genetic data we do not change the current reassignment to *Echinopsolus*.

## 2. *Ocnus capensis* (Théel, 1886).

We have identified a single *Discovery* Expedition specimen from the sub-littoral of Saldanha Bay in south-west South Africa as *Ocnus capensis* (Théel, 1886) (MS 82, off Salamander Point, 7–14 m, 6 Sept 1926, NHMUK 2016.143). We based our determination on the description and illustration by Théel (1886) of the three type specimens collected from 179–274 meters off Cape Town in South Africa. Saldanha Bay is close to the type locality for this species. Based on our laboratory notes and sketches, Frank Rowe (*pers. comm.*) judged that the species is *Ocnus capensis*, but thought that the species would be better assigned to *Pseudocnus* Panning, 1949. Rowe judged that genus *Ocnus* Forbes & Goodson, 1839 (in Forbes, 1841) is restricted to the Mediterranean and north European shore, and that genus *Pentacta* Goldfuss, 1820 is a monotypic endemic South Africa genus. Thandar (1991) described and illustrated and discussed *Ocnus capensis*, and Ahmed Thandar (*pers. comm.*) expressed some doubt about our identification. He considered the species to be a deep water one. We acknowledge that there is thus some doubt about our identification.

## 3. *Pentactella* Verrill, 1876.

Many *Discovery* Expedition lots have been identified as species of *Pentactella* Verrill, 1876. Based on morphological characters and distribution consideration, and with the support of some genetic data, O'Loughlin *et al.* (2014) reassigned numbers of species of *Pseudocnus* Panning, 1949 to a new genus *Laevocnus* O'Loughlin (in O'Loughlin *et al.* 2014). Immediately after publication the authors recognized that the type species for the new genus *Laevocnus* was the type species for the monotypic *Pentactella* Verrill, 1876. *Laevocnus* is an objective junior synonym of *Pentactella*. A detailed systematic history of genus *Pentactella*, and the assigned species, is provided by O'Loughlin *et al.* (2015).

## 4. *Psolus dubiosus* Ludwig & Heding, 1935

COI phylogenetic data (Gustav Paulay *pers. comm.*) strongly support a synonymy for *Psolus arnaudi* Cherbonnier, 1974 and *Psolus cherbonnierii* Carriol & Féral, 1985 with *Psolus dubiosus* Ludwig & Heding, 1935. For *Discovery* Expedition specimens we have not attempted to distinguish the former from *Psolus dubiosus*.

## 5. *Psolus lockhartae* O'Loughlin & Whitfield, 2010.

We have identified a single specimen from deep water off the Falkland Islands as *Psolus lockhartae* O'Loughlin & Whitfield, 2010 (WS 840, S of Falkland Islands, 368–463 m, 6 Feb 1932, NHMUK 2016.83). The distribution of *Psolus lockhartae* was given by O'Loughlin & Whitfield (2010) as Birdwood Bank, South Georgia, South Shetlands and South Orkneys (211–2897 m). The 12 mm long specimen is smaller than the types (up to 20 mm long). The ossicle complement is the same, and the form of the ossicles is similar but the ossicles in the types are larger. We thus have some reservation over our determination.



6. *Sigmodota contorta* (Ludwig, 1875).

O'Loughlin & VandenSpiegel (2010) published the determinations of numbers of *Discovery* Expedition synaptid (as apodid) holothuroids (see Table 4 above). They reported 10 specimens of *Sigmodota contorta* (Ludwig, 1875) (NHMUK 2010.75–84) from Marine Station 82 (Saldanha Bay). The location of Saldanha Bay in South Africa was not noticed, and the locality was mistakenly given as the Falkland Islands. There have been no other reports of *Sigmodota contorta* from South Africa, and this report for Saldanha Bay is now judged to be a mistake. There is also an RRS *William Scoresby* station 82 and this is now judged to be the source of the specimens. This station WS 82 was off the Falkland Islands at 140–144 m.

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