

## **Deep-sea fauna of European seas: An annotated species check-list of benthic invertebrates living deeper than 2000 m in the seas bordering Europe. Echinoidea**

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**ABSTRACT:** An annotated check-list is given of Echinoidea species occurring deeper than 2000 m in the seas bordering Europe. The check-list is based on published data. The check-list includes 28 species. For each species synonymy, data on localities in European seas and general species distribution are provided. Station data are presented separately in the present thematic issue.

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**KEY WORDS:** deep-sea fauna, European seas, Echinoidea.

## **Глубоководная фауна европейских морей: аннотированный список видов донных беспозвоночных, обитающих глубже 2000 м в морях, окружающих Европу. Echinoidea**

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**РЕЗЮМЕ:** Приводится аннотированный список видов Echinoidea, обитающих глубже 2000 м в морях, окружающих Европу. Список основан на опубликованных данных. Список насчитывает 28 видов. Для каждого вида приведены синонимия, данные о нахождении в европейских морях и сведения о распространении. Данные о станциях приводятся в отдельном разделе настоящего тематического выпуска.

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**КЛЮЧЕВЫЕ СЛОВА:** глубоководная фауна, европейские моря, Echinoidea.

**Phylum Echinodermata****Class ECHINOIDEA****Order CIDAROIDA****Family Cidaridae****Genus *Cidaris* Leske, 1778**

COMPOSITION: 6 species (Mortensen, 1928, 1939). Type species: *C. cidaris* (Linnaeus, 1758).

DISTRIBUTION: Atlantic (5 species), Indian Ocean (1 species).

DEPTH RANGE: 50–2010 m.

CENTRE OF DIVERSITY: West Atlantic (3 species).

***Cidaris cidaris* (Linnaeus, 1758)**

*Dorocidaris papillata* — Mortensen, 1903: 31–35, 171, pl. VI: 6–7; pl. VIII: 1, 3, 12, 14, 27, pl. IX: 3, 5, 7, 13–15, 20, 25, 27, pl. XI: 14, 26, 31; *Cidaris cidaris* — Mortensen, 1928: 289–298, pl. XXX: 3–4; pl. XXXI: 1–7, pl. LXXII: 22; *Cidaris cidaris meridionalis* — Mortensen, 1928: 298–301, pl. XXXI: 8–10, pl. LXVII: 5, pl. LXXII: 20–21; Cherbonnier, 1959: 39–41, pl. I: A–J, pl. II: A–E.

REMARKS: *C. cidaris* is very closely related to the west Atlantic *C. rugosa* (H.L. Clark, 1907) and *C. abyssicola* (Agassiz, 1869).

LOCALITIES: “Travailleur” et “Talisman”, St. “27” (33°12'N, 11°53'W, depth 2000 m — unreliable station data) (Mortensen, 1927). Koehler (1909) perhaps erroneously indicated station 1306, “Princesse Alice” located at the depth of 4275 m.

DISTRIBUTION: South of Iceland and Norwegian Sea (68°N) to equatorial west Africa (6°31'S) and Walvis Ridge, including Mediterranean.

DEPTH RANGE: 50–2010 m.

**Order Echinothurioida****Family Echinothuriidae****Genus *Hygrosoma* Mortensen, 1903**

COMPOSITION: 3 species (Mortensen, 1935). Type species: *H. petersii* (A. Agassiz, 1880).

DISTRIBUTION: Atlantic (1 species), Pacific (2 species), Indian Ocean (2 species).

DEPTH RANGE: 200–3800 m.

***Hygrosoma petersii* (A. Agassiz, 1880)**

*Phormosoma uranus* — Koehler, 1898: 10, pls. I, III: 5–6, IX: 49–50 (Non: *Phormosoma uranus* Wyville Thomson, 1877); *Hygrosoma petersii* — Mortensen, 1903: 58, 64, pls. XI: 4, 27; XII: 42; XIII: 8, 13; Mortensen, 1935: 202–208, text-figs 118–119; pls. XIII–XVII, XVIII: 2; XIX: 2; pl. LVIII: 1, 3–5, 24, 25.

LOCALITIES: “Michael Sars”, St. 25A (Grieg, 1932); 35°43'N, 8°16'W, 2150–2300 m (no station number) (Madsen, 1947); “Vityaz II”, St. 80B; “Challenger”, St. ES 129, AT 233, AT 282, ES 283, ES 286, SWT 27, OTSB 51301, OTSB 3/85/5 (Gage et al., 1985; Harvey et al., 1988); “Akademik Mstislav Keldysh”, Sta. 511 (Mironov, 1985, 2006).

DISTRIBUTION: Rockall Trough and south-west Ireland to southern Africa, and New Jersey to the West Indies.

DEPTH RANGE: 200–3800 m.

**Genus *Sperosoma* Koehler, 1897**

COMPOSITION: 11 species (Mortensen, 1935; Shigei, 1977). Type species: *S. grimaldii* Koehler, 1897.

DISTRIBUTION: Atlantic (2 species), Pacific (7 species), Indian Ocean (3 species).

DEPTH RANGE: 300–3230 m.

CENTRE OF DIVERSITY: West Pacific (4 species).

***Sperosoma grimaldii* Koehler, 1897**

*Sperosoma grimaldii* — Koehler, 1898: 15–21, pls. II: 2, III: 3–4, pl. IV: 8, pl. IX: 48; *Sperosoma grimaldii* — Mortensen, 1903: 75–78, 177, pls. IV: 3–5, XI: 9, XII: 16, XIII: 12, 23, XIV: 2, 4, 4a, 6, 11, 31, 33; *Sperosoma grimaldii* — Döderlein, 1906: 147–150, taf. XVIII: 1–3; *Sperosoma grimaldii* — Mortensen, 1935: 184–187, text-figs. 107–108, pl. VIII: 1–2.

REMARK: *S. grimaldii* agrees very closely with *S. antillense* Mortensen, 1934 from the west Atlantic in every aspect except for the fact that the test of *S. antillense* is looking more bare.

LOCALITIES: “Michael Sars”, St. 25 A (Grieg, 1932); 35°43'N, 8°16'W, 2150–2300 m (no station number) (Madsen, 1947); BIOGAS, St. 1, 2, 6 (David, Sibuet, 1985); “Challenger”, St. ES 135 (Gage et al., 1985); “Shackleton”, AT 121 (Gage et al., 1985); “Vityaz II”, St. 170 (Mironov, 1985; 2006); “G.O. Sars”, St. 42/368 and 50/373 (Mironov, 2008).

DISTRIBUTION: South of Iceland and the Faeroes to the Gulf of Guinea.

DEPTH RANGE: 235–2910 m.

**Genus *Tromikosoma* Mortensen, 1903**

COMPOSITION: 6 species (Mortensen, 1935). Type species: *T. koehleri* Mortensen, 1903.

DISTRIBUTION: Atlantic (2 species), Pacific (4 species), Indian Ocean (1–2 species).

DEPTH RANGE: 510–3800 m.

CENTRE OF DIVERSITY: Unknown.

***Tromikosoma uranus*  
(Thomson, 1877)**

*Echinoma uranus* — Mortensen, 1903: 57, 63, 80, 81, 176, pl. XII: 17, 36; *Tromikosoma uranus* — Mortensen, 1935: 168–170, text-figs. 101, pls. VI: 2, 3; LXXV: 19–21.

LOCALITIES: “Challenger”, St. 6 (Agassiz, 1881).

REMARKS: The record of *T. uranus* in the Indian Ocean (3345 m) is questionable, because the specimens are juveniles (Mortensen, 1939).

DISTRIBUTION: Atlantic, Gorrige Ridge and off Senegal.

DEPTH RANGE: 938–2745 m.

### ***Tromikosoma koehleri* Mortensen, 1903**

*Tromikosoma koehleri* — Mortensen, 1903: 78–80, pls. XI: 2, 13, XII: 22, 3, 41, XIV: 12, 16, 19, 21, 23, 25, 28, 30; Mortensen, 1935: 167–168, text-figs. 100, pl. V.

REMARKS: Two Atlantic species of *Tromikosoma* are very closely related and may perhaps ultimately prove to be identical. Very little material is known on these two species. Therefore it is difficult to tell exactly differences between the two species.

LOCALITIES: INGOLF, St. 36 (Mortensen, 1903); “Akademik Mstislav Keldysh”, St. 390 (Mironov, 1985); “G.O. Sars”, St. 40/367, 50/373, 52/374, 54/377, 66/383, 72/386 (Mironov, 2008).

DISTRIBUTION: Davis Strait and the northern part of the Mid-Atlantic Ridge.

DEPTH RANGE: 2517–3509 m.

## **Family Phormosomatidae**

### **Genus *Phormosoma* Thomson, 1872**

COMPOSITION: 4 species (Mortensen, 1935).

Type species: *P. placenta* Thomson, 1872

DISTRIBUTION: Atlantic (1 species), Pacific (3 species) and Indian Oceans (2 species).

DEPTH RANGE: 170–4100 m.

### ***Phormosoma placenta placenta* Thomson, 1872**

*Phormosoma placenta* — Mortensen, 1935: 125–135, text-figs. 80–82, pls. I: 1–5; II: 1–19; LXXIV: 1–6, 19.

REMARKS: Three varieties were distinguished by Mortensen (1935) the typical form in the North and East Atlantic, *P. placenta sigsbei* in the West Atlantic and *P. placenta africana* in the South Africa area.

LOCALITIES: INGOLF, St. 24 (Mortensen, 1903); “Travailleur” et “Talisman”, St. 38 (Mortensen, 1927); 35°43'N, 8°16'W, 2150–2300 m (no station number) (Madsen, 1947); BIOGAS, St. 1, 2, 3, 6 (David, Sibuet, 1985); “Challenger”, St. AT 107A, AT 161, AT 171, AT 181, AT 186, AT 191, AT 228, ES 231, AT 288, SWT 10, SWT 11 (Gage et al., 1985; Harvey et al., 1988).

DISTRIBUTION: Davis Strait, Iceland and the Faroes south to the West Indies and South Africa.

DEPTH RANGE: 260–4100 m.

## **Order Salenoida**

### **Family Saleniidae**

### **Genus *Salenocidaris* Agassiz, 1869**

COMPOSITION: 7 species (Markov, 1988a–c).

Type species: *S. varispina* A. Agassiz, 1869.

REMARKS: Markov (1988a–c) proposed the genus *Salenocidaris* (7 species) to be combined with *Salenia*.

DISTRIBUTION: Atlantic (3 species), West Pacific (4 species), northwest Pacific (4 species), southwest Pacific (2 species), East Pacific (2 species) and Indian Oceans (3 species).

DEPTH RANGE: 200–4300 m.

CENTRES OF DIVERSITY: West Pacific (4 species) and northwest Pacific (4 species).

### ***Salenocidaris hastigera* (Agassiz, 1879)**

*Salenia hastigera* — Döderlein, 1906: 177–178, taf. XXI: 1; XXII:1, XLV: 45, 3; *Salenocidaris hastigera* — Mortensen, 1935: 360–363 text-fig. 193: d, pls. LXVI: 1–2, LXXXV: 5–7, 31–33, LXXXVI: 86, 17–20; Markov, 1988b: 376–378, fig. 1: a, e, fig. 2: a, d.; Non: *Salenocidaris hastigera acuminata* — Mortensen, 1935: 362–363, pls. LXXXV: 14, LXXXVI: 11–13 (= *S. profundi profundi*).

REMARKS: There has been confusion of *S. hastigera* with *S. profundi*, *S. varispina* and *S. miliaris* (see Mortensen, 1935; Markov, 1988b). H.L. Clark (1925) suggested that they were probably one cosmopolitan species. Mortensen (1935) considered them all as distinct species, *S. profundi* and *S. varispina* occurring only in the Atlantic, *S. miliaris* in the Pacific and *S. hastigera* in the Pacific and Indian Oceans. Markov (1988a–c) concluded that three cosmopolitan species (*S. hastigera*, *S. varispina* and *S. profundi*) are represented both in the Atlantic and Indo-Pacific. Because of confusions, localities listed below require confirmation.

I have examined numerous *Salenocidaris* from the north-eastern Atlantic obtained by the French expeditions BIAÇORES and SEAMOUNT II. A preliminary study showed that *S. varispina* is common shallower than 2000 m, whereas *S. hastigera* usually occurs deeper than 1900 m.

LOCALITIES: “Challenger”, St. 70 (Agassiz, 1881); “Princesse Alice”, St. 624 (Koehler, 1909); “Akademik Mstislav Keldysh”, St. 511 (Markov, 1988b).

DISTRIBUTION: Malay Archipelago, mid-Pacific Seamounts, near Norfolk Island, off North Cape (New Zealand), off Maldives; 370–2605 m. Koehler (1909) recorded *S. hastigera* at 25 stations from the Azores area, at depths from 793 to 2102 m, but he did not give any information on morphology. Markov (1988b) reported *S. hastigera* from the Atlantis Seamounts, 2100 m. I examined specimens from the Azores, maximum depth 2440 m.

DEPTH RANGE: 370–2605 m.

### ***Salenocidaris varispina* Agassiz, 1869**

*Salenocidaris varispina* — Mortensen, 1935: 350–354, text-figs. 179: e, 180: a, 183: d, 186, 187, 193: a, pls. LXVI: 9, LXXXIV: 4, LXXXV: 3, 4, 8, 16, 17, 37; *Salenocidaris brachygnatha* — Mortensen, 1935: 363–364, pl. LXXXVI: 3, 4, 14, 16; *Salenia varispina* — Markov, 1988c: 572–573, fig. 1: v, d, e, fig. 2: v, g.

REMARKS: Mortensen (1935) established the species *S. brachygnatha* Mortensen, 1934 based on a single specimen from the Kermadec Islands. Markov (1988c) considered *S. brachygnatha* as a junior synonym of *S. varispina*. Records from the northeast Atlantic deeper 2000 m (Agassiz, 1881; Madsen, 1947) apparently correspond to *S. hastigera*.

DISTRIBUTION: The Azores, Bay of Biscay, Morocco, Atlantis and Tropic Seamounts, Ascension Island, from the West Indies to Brazil (09°05'S), northeast of the Kermadec Islands, the Emperor Seamounts, Mascarene Ridge.

DEPTH RANGE: 650–2600 m.

***Salenocidaris profundus profundus*  
Duncan, 1877**

*Salenocidaris profundus* — Mortensen, 1935: 354–358, text-figs. 181:c, 183: e, pls. LXXXV: 1,2,29, LXXXVI: 1,2; *Salenocidaris hastigera* var. *acuminata* — Mortensen, 1935: 362–363, pls. LXXXV: 14, LXXXVI: 11–13; *Salenia profundus profundus* — Markov, 1988b: 379–380, fig. 1: b, j, i, k, fig. 2: v.e.

REMARKS: According to Markov (1988b), the species *S. profundus* consists of 6 subspecies: *S. profundus profundus*, *S. profundus miliaris* Agassiz, 1898, *S. profundus indica* Mortensen, 1939, *S. profundus brevispina* Markov, 1988, *S. profundus intermedius* Markov, 1988, *S. profundus megalospina* Markov, 1988.

LOCALITIES: “Michael Sars” 1910, St. 88 (Grieg, 1932); “Travailleur” et “Talisman”, St. 41 (Mortensen, 1927).

DISTRIBUTION: Southeast of Iceland, Bay of Biscay, the Azores, Canaries, Tristan da Cunha, the West Indies, Indonesian seas.

DEPTH RANGE: 1700–3470 m.

**Order Aspidodiadematoida  
Family Aspidodiadematidae**

**Genus *Plesiadiadema* Pomel, 1883**

COMPOSITION: 7 species (Mortensen, 1940; Mironov, 1981). Type species: *P. microtuberculatum* (A. Agassiz, 1879).

DISTRIBUTION: Atlantic (2 species), West Pacific (2 species), East Pacific (2), Indian Ocean (2 species).

DEPTH RANGE: 300–5800 m.

CENTRE OF DIVERSITY: Not recognizable.

***Plesiadiadema antillarum*  
(A. Agassiz, 1880)**

*Plesiadiadema antillarum* — Mortensen, 1940: 27–29, figs. 2a, 4c, 11a, 15; *Plesiadiadema microtuberculatum* — Mironov, 1981: 175–177, figs. 1: a, b, v, g, d, pl. I: 5, 6, pl. II: 4, 6, 7 (Non: *Aspidodiadema microtuberculatum* A. Agassiz, 1879).

LOCALITIES: “Travailleur” et “Talisman”, St. 41 (Mortensen, 1927). 35°43'N, 8°16'W, 2150–

2300 m (no station number) (Madsen, 1947); “Vityaz II”, St. 159, 170 (Mironov, 2006).

DISTRIBUTION: Straits of Gibraltar, Great Meteor and Irving seamounts south to the Gulf of Guinea and St. Helena; west Atlantic from New Jersey and Bermuda to Brazil.

DEPTH RANGE: 650–3100 m.

**Order Gamarodonta**

**Family Echinidae**

**Genus *Gracilechinus* Fell et Pawson,  
in Moore, 1966**

COMPOSITION: 10 species (Minin, in preparation). Type species: *E. gracilis* A. Agassiz, 1869.

REMARKS. Recently two works on the morphological variability and phylogeny of two closely related genera *Echinus* and *Gracilechinus* were published (Minin, 2012; Minin et al., 2012). Those data together with unpublished results (Minin, in preparation) suggest that *Gracilechinus* consists of the following 10 species: *G. acutus*, *G. affinis*, *G. alexandri*, *G. atlanticus*, *G. elegans*, *G. euryporus*, *G. gracilis*, *G. lucidus*, *G. multidentatus* and *G. stenoporus*.

DISTRIBUTION: North Atlantic (5 species), southeast Atlantic (3 species), northwest Pacific (1 species), southwest Pacific (1 species), southeast Pacific (1 species).

DEPTH RANGE: 20–4700 m.

CENTRE OF DIVERSITY: northeast Atlantic (5 species).

***Gracilechinus affinis* Mortensen, 1903**

*Echinus affinis* — Mortensen, 1943b: 83–86, text-figs. 34, 35: a, b; pls. XI: 1–7, LV: 15, 17, 19; *Echinus affinis* — Gage et al., 1985: 183–184.

LOCALITIES: INGOLF, St. 49 (Mortensen, 1903); “Challenger”, St. ES 12, AT 114, AT 139, AT 144, AT 151, AT 153, AT 154, AT 161, AT 167, AT 171, AT 175, ES 176, AT 177, AT 181, ES 182, ES 184, AT 186, AT 191, AT 195, ES 197, AT 198, ES 200, AT 201, ES 202, ES 218, AT 228, ES 232, ES 244, AT 245, AT 247, ES 264, AT 267, AT 271, AT 273, AT 288, ES 289, 3/85/7 OTRB, SWT 10, SWT 17, SWT 32 (Gage et al., 1985; Harvey et al., 1988); “Akademik Mstislav Keldysh”, St. 317, 499 (Mironov, 1985).

DISTRIBUTION: Iceland and the Denmark Strait south to the Azores and Georgia (USA).

DEPTH RANGE: 770–2700 (?5300) m.

***Gracilechinus alexandri*  
Danielssen et Koren, 1883**

*Echinus alexandri* — Mortensen, 1943b: 65–68, text-figs. 20: a, 21: a, b, 22: a, pl. XI: 8–11; Gage et al., 1985: 184.



LOCALITIES: “Caudan”, St. 2 (Koehler, 1896); INGOLF, St. 49 (Mortensen, 1903); “Michael Sars 1910”, St. 88, (Grieg, 1932); BIOGAS, St. 1, 2, 3, 4, 6 (David, Sibuet, 1985); “Challenger”, St. AT 107A, AT 167, AT 288 (Gage et al., 1985; Harvey et al., 1988); “G.O. Sars”, St. 54/377 (Mironov, 2008).

DISTRIBUTION: Norwegian Sea, Atlantic, Iceland south to the Mediterranean and the Lucky Strike hydrothermal vent area and Cape Hatteras; probably off Tristan da Cunha.

DEPTH RANGE: 365–3509 m; David, Sibuet (1985) recorded the species at depths up to 4700 m in the Bay of Biscay.

### Order Clypeasteroidea Family Echinocyamidae

#### Genus *Echinocyamus* Van Phelsum, 1774

COMPOSITION: 11 species (Mironov, Sagaidachny, 1984). Type species: *E. pusillus* Müller, 1776.

REMARKS: The genus includes two recent subgenera, *Echinocyamus* Van Phelsum, 1774 and *Lepidocyamus* Mironov et Sagaidachny, 1984.

DISTRIBUTION: Atlantic (3 species), northwest, West and southwest Pacific (9 species), East Pacific (1) and Indian Oceans (6 species);

DEPTH RANGE: 0–3140 m.

CENTRE OF DIVERSITY: southwest Pacific (6 species).

#### *Echinocyamus scaber macrostomus* Mortensen, 1907

*Echinocyamus macrostomus* — Mortensen, 1907: 36–37, pl. 12: 2, 7, 17, 24; *Echinocyamus scaber macrostomus* — Mironov, Sagaidachny, 1984: 186–187, fig. 2: 2.

REMARKS: Mironov, Sagaidachny (1984) distinguished seven morphological varieties of *E. scaber*, among them *E. scaber macrostomus* which is most similar to *E. scaber scaber* from the Indo – West Pacific. *E. scaber macrostomus* differs slightly from the typical form by a more prolonged and flattened test and more numerous ambulacral pore-pairs.

LOCALITIES: “Princesse Alice”, St. 536, 581, 2044 (Koehler, 1909); “Talisman”, St. 20 (Mortensen, 1927); “Travailleur” et “Talisman”, St. 38 (Mortensen, 1927); “Vityaz II”, St. 159, 162, 169, 170 (Mironov, Sagaidachny, 1984; Mironov, 1985); “Akademik Mstislav Keldysh”, St. 511 (Mironov, 1985).

DISTRIBUTION: Azores, Madeira and Portugal; Atlantis, Great Meteor, Irving, Josephine and Rockaway Seamounts, Cape Verde Islands; western Atlantic from Blake Plateau to Cuba.

DEPTH RANGE: 1050–3140 m.

### Order Holasteroidea Family Calymnidae

#### Genus *Calymne* Thomson, 1877

COMPOSITION: 1 species (Mortensen, 1950; Saucède et al., 2009).

DISTRIBUTION: Northeast and northwest Atlantic.

DEPTH RANGE: 3720–4860 m.

#### *Calymne relicta* Thomson, 1877

*Calymne relicta* — Mortensen, 1950: 127–131.

LOCALITIES: “Akademik Kurchatov”, St. 3787 (Mironov, 1985; Saucède et al., 2009).

DISTRIBUTION: As for the genus. The fragments of *Calymne relicta* obtained by “Challenger” are labelled: “Fayal. 2650 fms” (Agassiz, 1881). According to H.L. Clark (1925), “the narrative and summary of results of the Challenger show that the true locality was not very far from the Bermuda”.

DEPTH RANGE: 3720–4860 m.

### Family Urechinidae

#### Genus *Urechinus* Agassiz, 1879

COMPOSITION: 5 species. Type species: *U. naresianus* A. Agassiz, 1879.

REMARKS. Mooi, David (1996) restricted the genus from 12 to 3 species: *U. naresianus*, *U. reticulatus* and *U. antipodeanus*. The case for assigning *U. drygalskii* to *Antrechinus* is very weak so *U. drygalskii* and the closely related *U. perfidus* Mironov, 1976 retained in *Urechinus*.

DISTRIBUTION: The Atlantic Ocean (1 species), North (2), East (1) and southwest Pacific Ocean (1), Indian and Pacific sectors of Antarctic and Subantarctic regions (2).

DEPTH RANGE: 3720–4860 m.

CENTRE OF DIVERSITY: Not recognizable.

#### *Urechinus naresianus* Agassiz, 1879

*Urechinus naresianus* — Mortensen, 1950: 111–113, fig. 105; Mironov, 1978: 214–216, fig. 2: b, v, g, pl. 1: 3–6; Mooi, David, 1996: 916, figs. 2 b, 3 e, 8 f, 9 e, 10 b, 11 b, 12 b.

LOCALITIES: INGOLF, St. 18, 36, 37 (Mortensen, 1907); “Akademik Mstislav Keldysh”, St. 316, 317, 390, 499 (Mironov, 1985); “G.O. Sars”, St. 66/383, 68/384, 72/386 and 74/387 (Mironov, 2008).

DISTRIBUTION: Atlantic Ocean from south of Iceland to the Caribbean Sea; North Pacific, Indian and Pacific sectors of Antarctic and Subantarctic regions.

DEPTH RANGE: 770–4400 m.

#### Genus *Plexechinus* Agassiz, 1898

COMPOSITION: 4 species. Type species: *P. cinctus* A. Agassiz, 1896.

REMARKS: David, Mooi (2000) refer 7 species to *Plexechinus*. Re-examination of *Urechinus aote-*

*anus U. planus* and *U. parvus* (Mironov, unpublished data) showed that they are conspecific. In addition, *Urechinus aoteanus* differs significantly from the type species, *P. cinctus*, in the form of the globiferous pedicellariae and the structure of the apical system and should be excluded from *Plexechinus*. Therefore the genus includes 4 species: *P. cinctus*, *P. hirsutus*, *P. spectabilis* and *P. sulcatus*.

DISTRIBUTION: North Atlantic (1 species), West (1) and East (1) Pacific Oceans, Pacific sector of the Subantarctic (1).

DEPTH RANGE: 585–4163 m.

CENTRE OF DIVERSITY: Not recognizable.

### ***Plexechinus hirsutus* Mortensen, 1905**

*Plexechinus hirsutus* — Mooi, David, 1996: 920, figs 5 c, 8 k, 9 k, 10 g, 12 h.

LOCALITIES: INGOLF, St. 11 (Mortensen, 1907); “Akademik Mstislav Keldysh”, St. 499 (Mironov, 1985); BIOGAS, St. 1 (David, Sibuet, 1985).

DISTRIBUTION: North Atlantic, from the Davis Strait and Iceland south to the Bay of Biscay and the Caribbean Sea.

DEPTH RANGE: 885–3060 m.

## **Family Pourtalesiidae**

### **Genus *Pourtalesia* Agassiz, 1869**

COMPOSITION: 12 species (Mironov, 1995b). Type species: *P. miranda* A. Agassiz, 1869.

DISTRIBUTION: Arctic (1 species), Atlantic (2–3 species), Indian Oceans (1 species), Pacific (6 species), Atlantic, Indian and Pacific sectors of the Antarctic region (4 species).

DEPTH RANGE: 50–7340 m.

CENTRES OF DIVERSITY: North Pacific (5 species) and the Antarctic region (4 species).

### ***Pourtalesia jeffreysi jeffreysi***

#### **Thomson, 1873**

*Pourtalesia jeffreysi* — Thomson, 1874: 747–749, pls. LXX, LXXI; *Pourtalesia jeffreysi jeffreysi* — Mironov, 1995a: 69–70.

REMARKS: Mortensen (1907) first recognized two species of *Pourtalesia* in the North Atlantic (*P. miranda* and *P. wandeli*) and one species in the Arctic Ocean (*P. jeffreysi*). Later Mortensen (1950) and other authors (David, Sibuet, 1985; Gage et al., 1985; and others) referred *Pourtalesia* from the Atlantic to one species, *P. miranda*. Morphological differences between bathyal (225–1270 m) and abyssal (2800–3081 m) populations of *P. jeffreysi* are stable and sufficient to distinguish the two subspecies: *P. jeffreysi gibbosa* and *P. jeffreysi lata* (Mironov, 1995a). Both subspecies are widely distributed in the Arctic Ocean and well distinguished from the holotype. The holotype of *Pourtalesia jeffreysi*

*jeffreysi* was obtained in the Faroe-Shetland Channel, 1160 m. Gage et al. (1985) reported three specimens of *P. jeffreysi* from the southern part of the Faroe-Shetland Channel, 1040 m, slightly south of the type locality. They did not give any information on the morphology of these specimens. At the same time *Pourtalesia* from an adjacent area, the Rockall Trough, was referred to *P. miranda* by Gage et al. (1985). However *P. miranda* from the Rockall Trough (Gage et al., 1985, fig. 4, a–c), as well as some of *P. wandeli* (Mortensen, 1907, pl. 5, figs. 6, 12), are not distinguishable from *P. jeffreysi jeffreysi* (Thomson, 1874, LXX, 1) by outlines of the test. Mironov (1995a, 1995b) suggested that in the North Atlantic three *Pourtalesia* species occur: *P. jeffreysi jeffreysi*, *P. aff. alcocki* and *Pourtalesia* sp.

LOCALITIES: It is likely that *P. wandeli* reported by Mortensen from St. 36 INGOLF, *P. miranda* reported by David, Sibuet (1985) from the St. 6 BIOGAS, and *P. miranda* reported by Gage et al. (1985) from several stations of “Challenger” (St. ES 2, ES 6, ES 111, ES 169, ES 176, ES 180, ES 185, ES 190, ES 204, ES 207) and “Shackleton” (St. ES 118) in fact is *Pourtalesia jeffreysi jeffreysi*.

DISTRIBUTION: Faroe-Shetland Channel, 1040–1160 m; maybe south to Rockall Trough and Bay of Biscay.

DEPTH RANGE: 1040–1160 (?2245–2910) m.

### ***Pourtalesia jeffreysi lata* Mironov, 1995**

*Pourtalesia jeffreysi* — Baranova, 1964: 367; David, 1983: figs. A–C, I–K; *Pourtalesia jeffreysi lata* — Mironov, 1995a: 74–76, figs. 2–4.

LOCALITIES: NORWEGIAN NORTH-ATLANTIC Expedition, St. 205, 295, 303 (Danielssen, 1892), INGOLF, St. 113 (Mortensen, 1907), “Sedov”, St. 59 (Gorbunov, 1946), “F. Litke”, St. 37, “Ob”, St. 45 (Baranova, 1964; Mironov, 1995a), “Jean Charcot”, St. 1, 2, 5, 10 and 11 (David, 1983), “Polarstern”, St. 32, 54 (Mironov, 1995a), “Polarstern”, St. 44/93a (unpublished). It is very likely that *Pourtalesia* sp. from St. 078 and St. 108 of R/V “Polarstern” ARK VIII/2 (Piepenburg et al., 1996) are *P. jeffreysi lata*.

DISTRIBUTION: From the Iceland-Faroe Ridge to the Chukchi Sea; 50–3081 m. The subspecies *P. jeffreysi lata* reliably is known only from abyssal basins.

DEPTH RANGE: 2030–3081 m.

### ***Pourtalesia* sp. 1.**

*Pourtalesia* aff. *alcocki* — Mironov, 1995b: 63–64, fig. 3: 2–4; *Pourtalesia* sp. 1 — Mironov, 2008: 12–13, fig. 5A.

LOCALITIES: “Akademik Mstislav Keldysh”, St. 268, 316, 499 (Mironov, 1995b); “G.O. Sars”, St. 68/384 (Mironov, 2008).

DISTRIBUTION: Atlantic Ocean from the Reykjanes Ridge to South Africa.

DEPTH RANGE: 1460–2200 m.

### *Pourtalesia* sp. 2

*Pourtalesia wandeli* — Mortensen, 1907 (part.): pl. V (figs. 2, 7, 11); *Pourtalesia* sp. 2 — Mironov, 2008: 13, fig. 5B–D.

LOCALITIES: “INGOLF”, St. 37 (Mortensen, 1907); “G.O. Sars”, St. 64/381 (Mironov, 2008).

DISTRIBUTION: northeast Atlantic.

DEPTH RANGE: 3229–3465 m.

### Genus *Echinisigra* Mortensen, 1907

COMPOSITION: 8 species (Mironov, 1996, 2008). Type species: *Echinisigra phiale* (Thomson, 1872).

REMARKS: The genus *Echinisigra* was subdivided into two subgenera, *Echinisigra* (4 species) and *Echinogutta* (4 species) (Mironov, 1997, 2008).

DISTRIBUTION: North Atlantic (2 species), North Pacific (3 species), Indian Ocean (3 species), Antarctic region (3 species).

DEPTH RANGE: 1026–7170 m.

CENTRE OF DIVERSITY: Not recognizable.

### *Echinisigra phiale* (Thomson, 1872)

*Echinisigra paradoxa* — Mortensen, 1950: 153; *Echinisigra phiale* — Mironov, 1974: 244, figs. 2 d, e; Gage, 1984: 157–170, figs. 1–11; *Echinisigra* (*Echinisigra*) *phiale phiale* — Mironov, 1997: 174–175, fig. 2; Mironov, 2008: 6–9, figs. 2D, E, 3A–D, 9A.

REMARKS: Norman (1876) did not give any information on the morphology of the specimen from the “Valorous” collection.

LOCALITIES: “Porcupine”, Rockall Trough, 2221 m (Thomson, 1874; Gage et al., 1985); ? “Valorous”, St. 16 (Norman, 1876); INGOLF, St. 11 (Mortensen, 1903); BIOGAS, St. 1, 2 (David, Sibuet, 1985); “Challenger”, St. ES 4, ES 6, ES 27, ES 56, ES 57, ES 58, WS 59, ES 111, ES 129, ES 135, ES 137, ES 140, AT 141, ES 143, ES 147, ES 152, AT 153, AT 154, ES 164, AT 171, ES 172, SBC 174, ES 176, ES 180, ES 184, ES 185, ES 190, ES 197, ES 200, ES 204, SBC 205, ES 207, ES 218, ES 231, AT 245, AT 267, AT 282, ES 283, ES 285, AT 286, ES 289 (Gage, 1984; Gage et al., 1985; Harvey et al., 1988); “Shackleton”, St. ES 118, AT 121, ES 122 (Gage et al., 1985; Harvey et al., 1988); “Akademik Mstislav Keldysh”, St. 268, 317, 390, 499 (Mironov, 1985; 1997); “G.O. Sars”, St. 66/382, 68/384 and 2/386 (Mironov, 2008).

DISTRIBUTION: South and west of Iceland, Reykjanes Ridge, Rockall Trough, Bay of Biscay. Perhaps off Cape Blanc, northwest Africa, 3910 m. The subspecies *E. phiale partita* Mironov, 1997 was

reported from the Pacific Subantarctic region, 1026–1800 m.

DEPTH RANGE: 1535–3800 m.

### *Echinisigra* (*Echinogutta*) *fabrefacta* Mironov, 1974

*Echinisigra amphora fabrefacta* — Mironov, 1974: 248, fig. 2, v, table I, v, table II, a,b; *Echinisigra* (*Echinogutta*) *fabrefacta* — Mironov, 1997: 183, fig. 9; Mironov, 2008: 9–11, figs 2F–I, 3E, F, 5E–J.

LOCALITIES: “G.O. Sars”, St. 64/381 and 66/383 (Mironov, 2008).

DISTRIBUTION: Southern part of the Reykjanes Ridge and northwest Pacific.

DEPTH RANGE: 2995–3464 m.

### Genus *Solenocystis* Mironov, 2008

COMPOSITION: 1 species (Mironov, 2008). Type species: *Solenocystis imitans* Mironov, 2008).

DISTRIBUTION: Northern Mid-Atlantic Ridge, near the Charlie-Gibbs Fracture Zone.

DEPTH RANGE: 2517–2555 m.

### *Solenocystis imitans* Mironov, 2008

*Solenocystis imitans* — Mironov, 2008: 16–18, figs. 2A–C, 7, 8, 9C.

LOCALITIES: “G.O. Sars”, St. 72/386 (Mironov, 2008).

DISTRIBUTION: As for the genus.

DEPTH RANGE: As for the genus.

## Order Spatangoida

### Family Aeropsidae

#### Genus *Aeropsis* Mortensen, 1907

COMPOSITION: 2 species (Mortensen, 1950). Type species: *A. rostrata* (Wyville Thomson, 1876)

DISTRIBUTION: Pacific Ocean (1 species) from the Bering Sea to Peru and Indonesian seas, Atlantic Ocean (1 species).

DEPTH RANGE: 1000–5390 m.

#### *Aeropsis rostrata* (Thomson, 1876)

*Aeropsis rostrata* — Mortensen, 1950: 328, text-figs. 222, 223; David, Sibuet, 1985: 518, fig. 2, e.

LOCALITIES: “Challenger”, Bay of Biscay and off Portugal (Agassiz, 1881); “Valorous”, St. 9 (Norman, 1876); INGOLF, St. 36, 37 (Mortensen, 1907); BIOGAS, St. 1, 2, 3, 4, 5 (David, Sibuet, 1985); “Akademik Mstislav Keldysh”, St. 268 (Mironov, 1985); “Challenger”, St. ES 10, ES 56, ES 185, ES 207 (Gage et al., 1985); “G.O. Sars”, St. 54/377, 64/381, 66/383, 72/386 (Mironov, 2008).

DISTRIBUTION: Davis Strait and Rockall Trough south to Uruguay and the Angola Basin. *Aeropsis rostrata* was found in the Angola Basin on the 43 cruise of the “Akademik Kurchatov” (St. 4956, 1.02 1986, 17°35.3'S, 09°25.3'E, 4240–4290 m).

DEPTH RANGE: 1000–4700 m.

**Family Schizasteridae****Genus *Aceste* Thomson, 1877**

COMPOSITION: 3 species (Mortensen, 1950).  
Type species: *Aceste bellidifera* Thomson, 1877.

DISTRIBUTION: Atlantic Ocean (1 species), East (1) and West Pacific (2 species), Indian Ocean (1 species).

DEPTH RANGE: 435–5550 m.

***Aceste bellidifera* Thomson, 1877**

*Aceste bellidifera* — Mortensen, 1950: 332–333, text-figs. 224, 225.

LOCALITIES: “Academic Petrovsky”, Sta. 7 (1); “Vityaz”, St. 7940, 7941 (Mironov, 1985); “Akademik Mstislav Keldysh”, St. 123, 131 (Mironov, 1985); BIOGAS, St. 5 (David, Sibuet, 1985); “Cryos” (BALGIUM Expedition), St. unknown, west of the Strait of Gibraltar (David, 1989).

REMARKS: It seems doubtful that there is any real distinction between the Atlantic species *A. bellidifera* and the Indo-Pacific species *A. ovata* (Mortensen, 1950; Mironov, 1975).

DISTRIBUTION: The Iberian Basin and Azores to the Canaries and the northwest Atlantic (37°41'N) to the Argentine Basin.

DEPTH RANGE: 860–5400 m.

**Family Loveniidae****Genus *Araeolampas* Serafy, 1974**

COMPOSITION: 5 species (Serafy, 1974). Type species: *A. fulva* (A. Agassiz, 1879).

DISTRIBUTION: Atlantic (1 species), Pacific (3), Indian Ocean (1).

DEPTH RANGE: 538–4500 m.

***Araeolampas atlantica* Serafy, 1974**

*Araeolampas atlantica* — Serafy, 1974: 44–46, figs. 1 a–c, 2 a, b.

LOCALITIES: “Atlantis”, cruise 152: St. 20 (Clark A.H., 1949; Serafy, 1974); “G.O. Sars”, St. 50/373 and 52/374 (Mironov, 2008).

DISTRIBUTION: East Atlantic north of the Azores to Gabon; west Atlantic from Virginia to north of Haiti.

DEPTH RANGE: 1920–3595 m.

**Family Hemiasteridae****Genus *Holanthus* Lambert et Thiéry, 1924**

COMPOSITION: 5 species (Mortensen, 1950). Type species: *Holanthus hickmanni* (Koehler, 1914).

DISTRIBUTION: Atlantic Ocean (1 species), West (2 species) and East Pacific (1 species), Indian Ocean (2 species).

DEPTH RANGE: 140–4897 m.

***Holanthus expergitus* (Loven, 1874)**

*Hemiaster expergitus* — Gage et al., 1985: 186; David, Sibuet, 1985: 519, fig. 2 f.

LOCALITIES: INGOLF, St. 24 (Mortensen, 1907); “Akademik Mstislav Keldysh”, St. 268, 316 (Mironov, 1985); BIOGAS, St. 1, 3, 6 (David, Sibuet, 1985); “Challenger”, St. ES 27, SBC 58, SBC 61, ES 129, ES 137, ES 143, AT 144, ES 172, ES 176, AT 177, AT 181, ES 184, ES 186, ES 190, ES 197, ES 200, ES 202, ES 204, SBC 205, ES 207, ES 216, ES 218, ES 232, ES 244, AT 245, AT 271, AT 282, ES 289 (Gage et al., 1985; Harvey et al., 1988) “Shackleton”, St. ES 118 (Gage et al., 1985).

DISTRIBUTION: South of Iceland and Davis Strait to Namibia and Brazil; the subspecies *H. expergitus gibbosus* occurs in the West Pacific from Japan to New Zealand.

DEPTH RANGE: 380–4897 m.

**Family Palaeostomatidae****Genus *Sarsiaster* Mortensen, 1950**

COMPOSITION: 1 species (Mortensen, 1950).

DISTRIBUTION: North of the Azores and west Atlantic.

DEPTH RANGE: 1900–3120 m.

***Sarsiaster griegii* Mortensen, 1950**

*Sarsiaster griegii* — Mortensen, 1950: 398–400, pl. XIII: 4.

LOCALITIES: “Michael Sars, 1910”, St. 88 (Grieg, 1932).

DISTRIBUTION: As for the genus.

DEPTH RANGE: As for the genus.

**Family Brissidae****Genus *Brissopsis* L. Agassiz in Agassiz et Desor, 1847**

COMPOSITION: 17 species. Type species: *B. lyrifera* (Forbes, 1841).

REMARKS. According to Mortensen (1951), the genus contains 17 species. Following Cheshier (1968), Mironov (2006) recognized *B. atlantica mediterranea* as a separate species and consider *B. jarllii* as a subspecies of *B. elongata*.

DISTRIBUTION: Atlantic Ocean (6 species), northwest (2), West (6), southwest (3) and East Pacific (2), Indian Ocean (5).

DEPTH RANGE: 5–3873 m.

CENTRE OF DIVERSITY: West Pacific (6 species).

***Brissopsis ?lyrifera* (Forbes, 1841)**

*Brissopsis ?lyrifera* — Harvey et al., 1988: 178–180.

REMARKS: *B. lyrifera* is typically an inshore species. There are few somewhat doubtful records from depths below 1000 m. It seems unlikely that this species was recorded by Wyville Thomson (1874) from the depth of 2090 fathoms (3873 m). However, the absence of any confluence in the posterior petals of the deep water *Brissopsis* from the North Atlantic



clearly distinguishes the species from *B. atlantica* and *B. mediterranea* occurring at great depths in the east and west Atlantic (Harvey et al., 1988).

LOCALITIES: "Porcupine" 1869, St. unknown, 3873 m (Thomson, 1874).

DISTRIBUTION: Atlantic from Iceland-Faeroe Ridge to south of the Canary Islands.

DEPTH RANGE: 5–1400 m (?3873 m).

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