Chapter 4

**TAXONOMIC NOTES AND ILLUSTRATIONS OF BENTHIC FORAMINIFERA FROM COLD-WATER CORAL ECOSYSTEMS**

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**SYSTEMATIC DESCRIPTION OF BENTHIC AND PLANKTONIC FORAMINIFERA**

The benthic foraminiferal taxonomy presented in the Atlas is primarily based on the criteria and the rules formulated by the “International Commission on Zoological Nomenclature” and reported in the “International Code of Zoological Nomenclature (ICZN)” (Ride and others, 1999). The code fixes the criteria of selection and naming of holotypes of each known taxon. Holotypes illustrated in the Ellis and Messina catalogues (Ellis and Messina, 1940 and later) are used as reference for comparison of each illustrated specimen. At genus level the recent foraminiferal taxonomy is based on Loeblich and Tappan (1987). The taxonomic concepts from the ICZN, Ellis and Messina (1940 and supplements) as well as Loeblich and Tappan (1987) and the Stratigraphic Atlas of foraminifera from the Norwegian Continental Shelf (Kihle and Løfaldli, 1975), are applied to foraminiferal species reported in Plates 1 to 37. Note that Kihle and Løfaldli (1975) contain the photographic documentation of the species cited in the synonymies, but no page, plate or figure numbers. In case of discrepancies with the cited publications a note is added in the remarks. When the original illustration and/or description could be found the reference to the holotype and/or first description of each species is indicated as “in” or “fide” referring to the most important publication where it is found (e.g., the Ellis and Messina catalogue). Poorly documented species are generally illustrated in the plates. The list of all species is reported in the range charts in the Appendices.

In the paragraph “Remarks” the occurrence of each benthic species in the different sedimentary facies is reported, which characterizes the cold-water coral ecosystems, together with some taxonomical and ecological notes (not included in Table 3.1, Chapter 3), when needed. Since sedimentary facies are strictly related to environmental parameters and water masses as described in detail in Chapter 3, we omit their description and refer only to facies names in the following systematic description and list of synonyms.

Order FORAMINIFERIDA Eichwald, 1830
Suborder TEXTULARIINA Delange and Hérouard, 1896
Superfamily ASTRORHIZACEA Brady, 1881
Family ASTRORHIZIDAE Brady, 1881
Subfamily ASTRORHIZINAE Brady, 1881
Genus Astrorhiza Sandahl, 1858
Type species: Astrorhiza limnicola Sandahl, 1858, p. 301.
Astrorhiza sp. cf. A. catenata Norman, 1877
Pl. 1, fig. 1
Astrorhiza catenata Norman in Norman, 1877, p. 213.
Aschemonella catenata (Norman) in Jones, 1994, p. 35, pl. 27, fig. 3; pl. 27A, fig. 3.

Remarks. This form is found in samples retrieved in the sandy pebbly facies along the Norwegian margin and is generally very rare. The documented specimen consists of a single chamber with tubes at the opposite sides. The agglutinated grains dominantly consist of sand and a variety of siliceous sponge spicules.

Family BATHYSIPHONIDAE Avnimelech, 1952
Genus Bathysiphon Sars, 1872
Type species: Bathysiphon filiformis Sars, 1872, p. 251.

Bathysiphon filiformis Sars in Sars, 1872, p. 251, pl. 6, fig. 4.
Bathysiphon filiformis Sars in Brady, 1884, p. 248, pl. 26, figs. 15, 17-20.
Bathysiphon filiformis Sars in Cushman, 1921, p. 41, pl. 2, fig. 1.
Bathysiphon filiformis Sars in Gooday, 1988, p. 98, text-fig. 1.
Bathysiphon filiformis Sars in Jones, 1994, p. 34, pl. 26, figs. 15, 17-20.

Remarks. This species is very rare and present in samples from the mud facies along the Norwegian margin only. The documented specimen displays very fine agglutination. Clearly visible are the thick horizontal lines perpendicular to the direction of growth that are typical of this species.

Family RHABDAMMINIDAE Brady, 1884
Subfamily RHABDAMMININAE Brady, 1884
Genus Rhabdammina Sars, 1869
Type species: Rhabdammina abyssorum Sars, 1869, p. 61.

Rhabdammina abyssorum Sars, 1869
Pl. 1, fig. 3
Rhabdammina abyssorum Sars in Carpenter, 1869, p. 61.
Rhabdammina abyssorum Sars in Brady, 1884, p. 266, pl. 21, figs. 1-8, 10-13.
Rhabdammina abyssorum Sars in Höglund, 1947, p. 25, pl. 1, fig. 2.
Rhabdammina abyssorum Sars in Jones, 1994, p. 32, pl. 21, figs. 1-8, 10-13.

Remarks. This rare species is found only in the mud facies from the Norwegian margin, it displays an irregularly agglutinated wall texture composed of sand grains and sponge spicules. It is usually tri- or quadri-radiate. It is usually very fragile and the documented specimens broke during SEM operations. The two fragments are represented in Plate 1, figs. 3a (the elongated part) and 3b the tri-radiate portion.

Family HIPPOCREPINELLIDAE Loeblich and Tappan, 1984
Genus Hippocrepinella Heron-Allen and Earland, 1932
Type species: Hippocrepinella hirudinea Heron-Allen and Earland, 1932, p. 71.

Hippocrepinella hirudinea Heron-Allen and Earland, 1932
Pl. 1, fig. 4
Hippocrepinella hirudinea Heron-Allen and Earland, 1932, p. 258, pl. 1, figs. 7-15.
Hippocrepinella hirudinea Heron-Allen and Earland in Majewski and others, 2005, figs. 4.1-3.

Remarks. This species is found only in the mud facies from the Norwegian margin where it is rare. The wall texture is finely agglutinated. The documented specimens closely resemble the holotype.

Family PSAMMOSPHAERIDAE Haeckel, 1894
Subfamily PSAMMOSPHAERINAE Haeckel, 1894
Genus Psammosphaera Schulze, 1875
Type species: Psammosphaera fusca Schulze, 1875, p. 113.

Psammosphaera fusca Schulze, 1875
Pl. 5, fig. 5
Psammosphaera fusca Schulze in Schulze, 1875, p. 113, pl. 2, fig. 8.
Psammosphaera fusca Schulze in Brady, 1884, p. 249, pl. 18, figs. 1-8.
Psammosphaera fusca Schulze in Höglund, 1947, p. 46, pl. 4, figs. 9-14.
Psammosphaera fusca Schulze in Hofker, 1972, p. 32, pl. 7, figs. 1-3.
Psammosphaera fusca Schulze in Schröder, 1986, p. 36, pl. 10, fig. 1.
Psammosphaera fusca Schulze in Jones, 1994, p. 31, pl. 18, figs. 1-8.
Psammosphaera fusca Schulze in Milker and Schmiedl, 2012, p. 26, figs. 9, 2-3
Psammosphaera fusca Schulze in Hobourn and other, 2013, p. 428-429, figs. 1-2.
Psammosphaera fusca Schulze var. testacea Flint, 1899
Pl. 1, fig. 6
Psammosphaera fusca var. testacea Flint in Flint, 1899, p. 268, pl. 8, fig. 2.
Psammosphaera testacea Flint in Cushman 1918, p. 38, Pl. 15, figs. 1-3.

Remarks. This species is extremely rare in the studied samples and it is present only in the mud facies from the Norwegian margin. The agglutinated wall texture of the documented specimen consists of sandy grains, sponge spicules and fragments of small benthic and planktonic foraminifers.

Family SACCAMMINIDAE Brady, 1884
Subfamily SACCAMMINIAE Brady, 1884
Genus Lagenammina Rhumbler, 1911
Type species: Lagenammina laguncula Rhumbler, 1911, p. 92, 111.
Lagenammina fusiformis (Williamson, 1858)
Pl. 1, fig. 7
Proteonica fusiformis Williamson in Williamson, 1858, p. 1, pl. 1, fig. 1.
Reophax fusiformis (Williamson) in Brady, 1884, p. 290, pl. 30, figs. 7-11.
Reophax fusiformis (Williamson) in Schroeder, 1986, p. 44, pl. 15, fig. 9.
Lagenammina fusiformis (Williamson) in Cimerman and Langer, 1991, p. 15, pl. 1, figs. 4-5.
Reophax fusiformis (Williamson) in Jones, 1994, p. 37, pl. 30, figs. 7-11.

Remarks. This form is found only in samples from the mud facies from the Norwegian margin, and it is always very rare. The wall texture is coarsely agglutinated. This species may present a large morphological variability. The holotype of L. fusiformis does not display a neck, however, the illustrated specimen seems to have a very short neck. Lagenammina atlantica (Cushman) differs from L. fusiformis because of its very elongated neck.

Lagenammina arenulata (Skinner, 1961)
Pl. 1, fig. 8
Reophax diffugiformis Brady var. arenulata Skinner in Skinner, 1961, p. 1239, pl. 30, fig. 5.
Lagenammina arenulata (Skinner) in Jones, 1994, p. 37, pl. 30, fig. 5.

Remarks. This species has been found only in samples from the mud facies of the Norwegian margin. It differs from L. atlantica (Cushman) in lacking the distinctive neck.

Superfamily HIPPOCREPINACEA Rhumbler, 1895
Family HIPPOCREPINIDAE Rhumbler, 1895
Subfamily HYPERAMMININAE Eimer and Fickert, 1899
Genus Hyperammina Brady, 1878
Type species: Hyperammina elongata Brady, 1878, p. 433.
Hyperammina elongata Brady, 1878
Pl. 1, fig. 10
Hyperammina elongata Brady in Brady, 1878, p. 433, pl. 20, fig. 2.
Hyperammina elongata Brady in Brady, 1884, p. 257, pl. 23, fig. 8.
Hyperammina elongata Brady in Hofker, 1972, p. 45, pl. 12, figs. 4-7.
Hyperammina elongata Brady in Schroeder, 1986, p. 34, pl. 6, fig. 2.
Hyperammina elongata Brady in Zheng, 1988, p. 28, pl. 4, figs. 4-5.
Hyperammina elongata Brady in Jones, 1994, p. 33, pl. 23, fig. 8.
Hyperammina elongata Brady in Holbourn and other, 2013, p. 310-311, figs. 1-2.
Remarks. This species is very rare and present only in a few samples from the pebbly sand facies of the Norwegian margin. The illustrated specimen shows a sub-globular base with a larger diameter with respect to the tubular extension. It displays a rounded and large aperture. The wall texture is coarsely agglutinated.

Genus Saccorhiza Eimer and Fickert, 1899
Type species: *Hyperammina ramosa* Brady, 1879, p. 33.

*Saccorhiza ramosa* (Brady, 1879) in Schröder, 1986, p. 35, pl. 7, fig. 1.
*Saccorhiza ramosa* (Brady) in Loeblich and Tappan, 1987, p. 43, pl. 32, figs. 10-15.
*Saccorhiza ramosa* (Brady) in Cimerman and Langer, 1991, p. 16, pl. 2, figs. 4-5.
*Saccorhiza ramosa* (Brady) in Jones, 1994, p. 33, pl. 23, figs. 15-19.
*Saccorhiza ramosa* (Brady) in Hobourn and other, 2013, p. 502-503, fig.1.

Remarks. This species is very rare in the off-mound sediments from the Porcupine Seabight and Rockall Bank region. Along the Norwegian margin it may be very abundant in the mud facies and pebbly sand facies from the Røst Reef. The documented specimen broke into two pieces during SEM operations: the sub-globular base (Plate 1, fig. 11a) and the tubular extension bearing a rounded and large aperture (Plate 1, fig. 11b). The agglutinated wall consists of almost exclusively a variety of siliceous sponge spicules. It differs from *H. elongata* in having the diameter of the sub-globular base equidimensional with the tubular extension. This species may develop several ramifications.

Family AMMODISCIDAE Reuss, 1862
Subfamily AMMODISCINAE Reuss, 1862
Genus Ammodiscus Reuss, 1862
Type species: *Ammodiscus infimus* Bornemann, 1874, p. 725.

*Ammodiscus incertus* (d’Orbigny, 1839)
Pl. 2, fig. 4

*Operculina incerta* d’Orbigny in d’Orbigny, 1839, p. 49, pl. 6, figs. 16-17.

*Ammodiscus incertus* (d’Orbigny) in Brady, 1884, p. 330, pl. 38, figs. 1-3.
*Ammodiscus incertus* (d’Orbigny) in Cushman, 1910, p. 73, figs. 95-96.
*Ammodiscus incertus* (d’Orbigny) in Schröder, 1986, p. 39, pl. 10, fig. 10.
*Ammodiscus anguillae* Høglund in Jones, 1994, p. 43, pl. 38, figs. 1, 3.

Remarks. This species is very rare in the samples from the coral rubble facies from the Norwegian margin. The wall texture is finely agglutinated. The illustrated specimen shows an elliptical and irregular profile, possibly due to post-mortem deformation.

Subfamily TOLYPAMMININAE Cushman, 1928
Genus Ammolagena Eimer and Fickert, 1899
Type species: *Trochammina irregularis* d’Orbigny var. clavata Jones and Parker, 1860, p. 304.

*Ammolagena clavata* (Jones and Parker, 1860)
Pl. 2, fig. 7
*Trochammina irregularis* d’Orbigny var. clavata Jones and Parker in Jones and Parker, 1860, p. 304.
*Webbina clavata* (Jones and Parker) in Brady, 1884, p. 349, pl. 41, figs. 12-16.
*Ammolagena clavata* (Jones and Parker) in Cushman, 1921, p. 61, pl. 6, figs. 1-4; pl. 10, figs. 3-4.
*Ammolagena clavata* (Jones and Parker) in Saidova, 1961, p. 24, pl. 7, fig. 32.
*Ammolagena clavata* (Jones and Parker) in Schröder, 1986, p. 40, pl. 11, figs. 5-6.
*Ammolagena clavata* (Jones and Parker) in Jones, 1994, p. 46, pl. 41, figs. 12-16.
*Ammolagena clavata* (Jones and Parker) in Abu-Zied and others, 2008, p. 51, pl. 1, fig. 1.
*Ammolagena clavata* (Jones and Parker) in Hobourn and others, 2013, p. 40-41, figs. 1-2.

Remarks. This species is very rare and present in samples from the coral rubble facies along the Norwegian margin. The wall texture is finely agglutinated.

Subfamily AMMOVERTELLININAE Saidova, 1981
Genus Glomospira Rzehak, 1885
Type species: *Trochammina squamata* Jones and Parker var. gordialis Jones and Parker, 1860, p. 304.

*Glomospira charoides* (Jones and Parker, 1860)
Pl. 2, fig. 5
*Trochammina squamata* Jones and Parker var. gordialis Jones and Parker in Jones and Parker, 1860, p. 304.
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_Trochammina squamata_ Jones and Parker var. _charoides_ Jones and Parker in Jones and Parker, 1860, p. 304.

_Ammodiscus charoides_ (Jones and Parker) in Brady, 1884, p. 334, pl. 36, figs. 10-16.

_Glomospira charoides_ (Jones and Parker) in Cushman, 1918, p. 100, pl. 36, figs. 10-15.

_Glomospira charoides_ (Jones and Parker) in Högland, 1947, p. 129, pl. 3, fig. 11.

_Glomospira charoides_ (Jones and Parker) in Resig, 1981, pl. 9, fig. 8.


_Reophax charoides_ (Jones and Parker) in Cimerman and Langer, 1991, p. 17, pl. 3, figs. 6-9.

_Uzbekistania charoides_ (Jones and Parker) in Jones, 1994, p. 43, pl. 38, figs. 10-16.

_Glomospira charoides_ (Jones and Parker) in Abu-Zied and others, 2008, p. 51, pl. 1, figs. 2-3.

_Glomospira charoides_ (Jones and Parker) in Holbourn and others, 2013, p. 268-269, fig. 1.

**Remarks.** This species is very rare in the studied samples and it is present in the coral rubble facies from the Norwegian margin only. The wall texture is very finely agglutinated.

_Superfamily HORMOSINACEA_ Haeckel, 1894

_Family HORMOSINIDAE_ Haeckel, 1894

_Subfamily REOPHACINAE_ Cushman, 1910

**Genus Hormosinella** Shchedrina, 1969

_Type species:_ _Reophax distans_ Brady, 1881, p. 50.

_Hormosinella guttiferana_ (Brady, 1881)

_Pl. 2, fig. 2

_Reophax guttiferana_ Brady in Brady, 1881, p. 49, pl. 31, figs. 10-15.

_Hormosinella guttiferana_ (Brady) in Jones, 1994, p. 38, pl. 31, figs. 10-15.

_Hormosinella guttiferana_ (Brady) in Lobegeier and Gupta, 2008, p. 110, pl. 4, fig. 6.

_Hormosinelloides guttiferana_ (Brady) in Holbourn and others, 2013, p. 306-307, fig. 1.

**Remarks.** This species is very rare in the studied samples and it is present in the coral rubble facies from the Norwegian margin only. The wall texture is very finely agglutinated.

_Superfamily LITUOLACEA_ de Blainville, 1827

_Family HAPLOPHRAGMOIDIDAE_ Maync, 1952

**Genus Cribrorostomoides** Cushman, 1910

_Type species:_ _Cribrorostomoides bradyi_ Cushman, 1910, p. 108.

_Cribrorostomoides subglobosum_ (Sars, 1868)

_Pl. 2, fig. 6

_Lituola subglobosum_ (Sars) in Carpenter, 1869, p. 250.

_Lituola subglobosum_ (Sars) in Sars, 1872, p. 253.

_Haplophragmoides subglobosa_ (Sars) in Cushman, 1910, p. 105, figs. 162-164; p. 108, fig. 167.

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**Genus Reophax** de Montfort, 1808

_Type species:_ _Reophax scoriarius_ de Montfort, 1808, p. 331.

_Reophax scoriarius_ de Montfort, 1808

_Pl. 2, fig. 3

_Reophax scoriarius_ de Montfort in de Montfort, 1808, p. 291, pl. 30, figs. 15-17.

_Reophax scoriarius_ de Montfort in Cushman, 1921, p. 65, pl. 6, fig. 6.


_Reophax sp. nov. (2) in Jones, 1994, p. 37, pl. 30, figs. 15-17.

_Reophax scoriarius_ de Montfort in Milker and Schmiedl, 2012, p. 32, fig. 9, 8.

**Remarks.** This species is rare in the off-mound sediments from the Porcupine/Rockall region, it is common to abundant in samples from the Norwegian margin, especially from the mud facies of Røst Reef, where it is sometimes dominant. The wall texture is coarsely agglutinated. It differs from _H. guttiferana_ because it possesses more quadrangular and larger chambers.

_Reophax agglutinatus_ Cushman, 1913

_Pl. 2, fig. 1

_Reophax agglutinatus_ Cushman in Cushman, 1913, p. 637, pl. 79, fig. 6.

_Reophax agglutinatus_ Cushman in Jones, 1994, p. 37, pl. 30, fig. 13.

**Remarks.** This species is found only in the mud facies from the Norwegian margin. It is very rare.

_Superfamily LITUOLACEA_ de Blainville, 1827

_Family HAPLOPHRAGMOIDIDAE_ Maync, 1952

**Genus Cribrorostomoides** Cushman, 1910

_Type species:_ _Cribrorostomoides bradyi_ Cushman, 1910, p. 108.

_Cribrorostomoides subglobosum_ (Sars, 1868)

_Pl. 2, fig. 6

_Lituola subglobosa_ (Sars) in Carpenter, 1869, p. 250.

_Lituola subglobosa_ (Sars) in Sars, 1872, p. 253.

_Haplophragmoides subglobosa_ (Sars) in Cushman, 1910, p. 105, figs. 162-164; p. 108, fig. 167.

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Cribrostomoides bradyi (Sars) in Cushman, 1910, p. 108, fig. 167.
Cribrostomoides bradyi (Sars) in Loeblich and Tappan, 1987, p. 65, pl. 49, figs. 1-3.
Cribrostomoides subglobosum (Sars) in Schröder, 1986, p. 48, pl. 18, figs. 15-16.
Cribrostomoides subglobosus (Sars) in Jones, 1994, p. 40, pl. 34, figs. 8-10.
Cribrostomoides subglobosum (Sars) in Schröder, 1986, p. 48, pl. 18, figs. 15-16.
Cribrostomoides subglobosus (Sars) in Jones, 1994, p. 40, pl. 34, figs. 8-10.

**Remarks.** The abundance of this species varies from rare to dominant especially in the mud facies along the Norwegian margin. The wall texture is finely to coarsely agglutinated. The agglutinated grains may include small benthic and planktonic foraminifera.

**Genus Haplophragmoides** Cushman, 1910

**Type species:** Nonionina canariensis d’Orbigny, 1839, p. 128.

*Haplophragmoides robertsoni* Brady, 1887
Pl. 3, figs. 1-2

*Haplophragmoides robertsoni* Brady in Brady, 1887, p. 893.

*Haplophragmoides brady Robertson in Robertson, 1891, p. 388.

*Haplophragmoides brady Robertson in Höglund, 1947, p. 134, pl. 10, fig. 1; fig. 111.

*Haplophragmoides brady Robertson in Murray, 1971, p. 25, pl. 5, figs. 1-2.

*Haplophragmoides brady Robertson in Schröder, 1986, p. 46, pl. 18, fig. 8.

**Remarks.** This form is very rare and present exclusively in the mud facies and in the fine sediments from the coral rubble facies along the Norwegian margin. The wall texture is very finely agglutinated.

*Haplophragmoides membranaceum* Höglund, 1947
Pl. 3, fig. 3

*Haplophragmoides membranaceum Höglund in Höglund, 1947, p. 136, pl. 10, fig. 5.


*Haplophragmoides membranaceum Höglund in de Stigter and others, 1998, p. 45, pl. 1, fig. 8.

**Remarks.** This species is rare and present in the coral rubble, sediment clogged coral and sandy pebbly facies along the Norwegian margin. Clearly visible in the documented specimen is the evolute coiling of the last three whorls.

*Genus Labrospira* Höglund, 1947

**Type species:** Haplophragmium crassimargo Norman, 1892, p. 17.

*Labrospira jeffreysii* (Williamson, 1858)
Pl. 2, figs. 8-9

*Nonionina jeffreysii* Williamson in Williamson, 1858, p. 34, pl. 3, figs. 72-73.

*Haplophragmium canariensis* d’Orbigny in Brady, 1884, p. 310, pl. 35, figs. 1-3, 5.

*Cribrostomoids jeffreysii* (Williamson) in Oki, 1989, p. 71, pl. 1, fig. 14.

*Veleroninoides jeffreysii* (Williamson) in Jones, 1994, p. 41, pl. 35, figs. 1-3, 5.

*Cribrostomoids jeffreysii* (Williamson) in Murray, 2003, p. 11, pl. 2, fig. 5.


**Remarks.** This species is very rare and present in the coral rubble, mud and sediment clogged coral framework facies along the Norwegian margin.

**Family LITUOLIDAE** de Blainville, 1827

**Subfamily AMMOMARGINULININAE** Podobina, 1978

**Genus Ammobaculites** Cushman, 1910

**Type species:** Spirolina agglutinans d’Orbigny, 1846, p. 137.

*Ammobaculites agglutinans* (d’Orbigny, 1846)
Pl. 3, fig. 4

*Spirolina agglutinans* d’Orbigny in d’Orbigny, 1846, p. 137, pl. 7, figs. 10-12.

*Haplophragmium agglutinans* (d’Orbigny) in Brady, 1884, p. 301, pl. 32, figs. 19-20, 24-26.

*Ammobaculites agglutinans* (d’Orbigny) in Schröder, 1986, p. 50, pl. 21, figs. 1-4.


*Ammobaculites agglutinans* (d’Orbigny) in Holbourn and other, 2013, p. 26-27, fig. 1.

**Remarks.** This species is extremely rare and present only in one sample from the coral rubble facies along the Norwegian margin. It is coarsely agglutinated. The test of the specimen in Plate 3, fig. 4 is slightly more arched than the holotype.
Superfamily HAPLOPHRAGMIACEA Eimer and Fickert, 1899
Family AMMOSPHAEROIDINIDAE Cushman, 1927
Subfamily AMMOSPHAEROIDININAE Cushman, 1927
Genus Adercotryma Loeblich and Tappan, 1952
Type species: Lituola glomerata Brady, 1878, p. 433.

Adercotryma wrighti Br¨onnimann and Whittaker, 1987
Pl. 3, fig. 5

Remarks. This species is very rare in the Porcupine Seabight and exclusively present in the off-mound facies. Along the Norwegian margin it is slightly more abundant and present in the mud, the living coral and in the sediment clogged coral framework facies. The documented specimen closely resembles the holotype even in the size of the agglutinated grains, which are coarser on the spiral and finer on the umbilical side.

Superfamily SPIROPLECTAMMINACEA Cushman, 1927
Family SPIROPLECTAMMINIDAE Cushman, 1927
Subfamily SPIROPLECTAMMININAE Cushman, 1927
Genus Spiroplectinella Kisel’man, 1972
Type species: Spiroplecta wrightii Silvestri, 1903, p. 63.

Spiroplectinella wrightii (Silvestri, 1903)
Pl. 3, fig. 6

Remarks. This species is present in the coral rubble, sediment clogged coral and mud facies along the Norwegian margin and generally in the off-mound and dead coral facies in the Porcupine/Rockall region. The documented specimen is finely to moderately agglutinated.

Subfamily VULVULININAE Saidova, 1981
Genus Vulvulina d’Orbigny, 1826
Type species: Vulvulina capreolus d’Orbigny, 1826 = Nautilus (Ortoceras) pennatula Batsch, 1791.

Vulvulina pennatula Batsch, 1791
Pl. 4, fig. 1

Remarks. This species is very rare in the off-mound sediments from the Porcupine/Rockall region and in the pelagic drape from the Alboran Sea (Maya Mud volcano). The documented specimen displays several biserial chambers and may be interpreted as a microspheric generation. The wall texture is very finely agglutinated.

Superfamily TROCHAMMINACEA Schwager, 1877
Family TROCHAMMINIDAE Schwager, 1877
Subfamily TROCHAMMININAE Schwager, 1877
Genus Portatrochammina Echols, 1971
Type species: Portatrochammina eltaninae Echols, 1971

Portatrochammina antarctica (Parr, 1950)
Pl. 4, fig. 4

Remarks. This species is very rare and present only in the sediment clogged coral framework from the Norwegian margin. The test surface is coarsely
agglutinated on the spiral side and finely agglutinated on the umbilical side.

Genus *Tritaxis* Schubert, 1921
Type species: *Tritaxis fusca* Williamson, 1858, p. 55.

*Tritaxis fusca* (Williamson, 1858)

Pl. 4, fig. 3

*Rotalina fusca* Williamson in Williamson, 1858, p. 55, pl. 5, figs. 114-115.


*Tritaxis fusca* (Williamson) in Jones, 1994, p. 54, pl. 49, fig. 13.

Remarks. This species is very rare and present only in the coral rubble and pebbly sand facies from the Norwegian margin and in the off-mound sediments from the Porcupine Seabight.

Genus *Trochammina* Parker and Jones, 1859
Type species: *Nautilus inflatus* Montagu, 1808, p. 81.

*Trochammina labiosa* Höglund, 1947

Pl. 4, fig. 2

*Trochammina labiosa* Höglund in Höglund, 1947, p. 207, pl. 15, fig. 6.

*Trochammina labiosa* Höglund in Gabel, 1971, p. 40, pl. 8, figs. 3-5.

Remarks. This species is very rare and present only in the living coral facies along the Norwegian margin. The wall texture is very finely agglutinated.

Subfamily POLYSTOMAMMININAE Brönnimann and Beurlen, 1977

Genus *Lepidodeuterammina* Brönnimann and Whittaker, 1983
Type species: *Rotalina ochracea* Williamson, 1858, p. 55.

*Lepidodeuterammina ochracea* (Williamson, 1858)

Pl. 4, fig. 5

*Rotalina ochracea* Williamson in Williamson, 1858, p. 55, pl. 5, fig. 112, pl. 5, fig. 113.

*Lepidodeuterammina ochracea* (Williamson) in Vazquez Riveiros and Patterson, 2008, p. 10, pl. 4, fig. 3.

Remarks. This species is very rare and present only in the coral rubble facies from the Norwegian margin.

Superfamily VERNEUILINACEA Cushman, 1911
Family VERNEUILINIDAE Suleymanov, 1973
Subfamily VERNEUILININAE Cushman, 1911
Genus *Gaudryina* d’Orbigny, 1839
Type species: *Gaudryina rugosa* d’Orbigny, 1840, p. 44.

*Gaudryina rudis* Wright, 1900

Pl. 4, fig. 6

*Gaudryina rudis* Wright in Wright, 1900, p. 53, pl. 2, fig. 1.

*Gaudryina rudis* Wright in Gabel, 1971, p. 34, pl. 5, figs. 1-2.

*Gaudryina rudis* Wright in Wagener, 1988, p. 126, pl. 21, fig. 15.

*Connemarella rudis* (Wright) in Cimerman and Langer, 1991, p. 23, pl. 8, figs. 1-4.


Remarks. This species occurs in the mud facies from the Norwegian margin, the dropstone, living coral, sandwave facies in the Porcupine/Rockall region and in the coral-rich horizons in the Alboran Sea. The documented specimen clearly shows the initial triserial coiling, which becomes biserial during ontogeny.

Superfamily TEXTULARIACEA Ehrenberg, 1838
Family EGGERELLIDAE Cushman, 1937
Subfamily EGGERELLINAE Cushman, 1937
Genus *Eggerella* Cushman, 1935
Type species: *Verneuilina bradyi* Cushman 1911, p. 54.

*Eggerella humboldti* Todd and Brönnimann, 1957

Pl. 5, fig. 2


Remarks. This species is present only in the coral rubble facies from the Norwegian margin and it is very rare. The wall texture is moderately coarse grained.

Genus *Eggerelloides* Haynes, 1973
Type species: *Bulimina scabra* Williamson, 1858, p. 65.

*Eggerelloides scaber* (Williamson, 1858)

Pl. 5, fig. 4
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_Bulimina scabra_ Williamson in Williamson, 1858, p. 65, pl. 5, figs. 136-137.

_Eggerelloides scabrus_ (Williamson) in Loeblich and Tappan, 1987, p. 170, pl. 189, figs. 5-7.

_Eggerelloides scabrus_ (Williamson) in Cimerman and Langer, 1991, p. 21, pl. 8, fig. 7.

_Eggerelloides scaber_ (Williamson) in Jones, 1994, p. 52, pl. 47, figs. 15-17.

_Eggerelloides scaber_ (Williamson) in Murray, 2003, p. 13, pl. 2, fig. 11.

**Remarks.** This species occurs in the coral rubble facies and in the mud facies along the Norwegian margin. In the mud facies it may be dominant. In the Porcupine Seabight it is more abundant in the sandwave facies. It occurs in the pelagic drape in the Alboran Sea. Wall texture is moderately coarse.

**Genus Karreriella Cushman, 1933**

_Type species:_ Gaudryina siphonella Reuss, 1851, p. 78.

_Karreriella bradyi_ (Cushman, 1911) 
Pl. 5, fig. 3

_Gaudryina bradyi_ Cushman in Cushman, 1911, p. 67, pl. 107.

_Gaudryina bradyi_ Cushman in Cushman, 1921, p. 149, pl. 29, fig. 3.

_Karreriella bradyi_ (Cushman) in Schröder, 1986, p. 55, pl. 22, figs. 8-9.

_Karreriella bradyi_ (Cushman) in Jones, 1994, p. 50, pl. 46, figs. 1-4.

_Karreriella bradyi_ (Cushman) in Loeblich and Tappan, 1994, p. 25, pl. 30, figs. 8-16.

_Karreriella bradyi_ (Cushman) in Holbourn and Henderson, 2002, p. 11, pl. 2, figs. 4-5.

_Karreriella bradyi_ (Cushman) in Holbourn and others, 2013, p. 318-319, figs. 1-4.

**Remarks.** This species is very rare in all the studied sites (1-3 specimens) and it does not seem to prefer a specific environment. The observed specimens strongly resemble the holotype.

**Family TEXTULARIIDAE Ehrenberg, 1838**

**Subfamily TEXTULARIINAE Ehrenberg, 1838**

**Genus Bigenerina d’Orbigny, 1826**

_Type species:_ Bigenerina nodosaria d’Orbigny, 1826, p. 27.

_Bigenerina nodosaria_ d’Orbigny, 1826 
Pl. 5, fig. 5

_Bigenerina nodosaria_ d’Orbigny, 1826, p. 261, pl. 11, figs. 9-12.


_Bigenerina nodosaria_ d’Orbigny in Murray, 2003, p. 11, pl. 2, fig. 4.

_Bigenerina nodosaria_ d’Orbigny in Duchemin and others, 2005, p. 205, pl. 1, fig. 5.

_Bigenerina nodosaria_ d’Orbigny in Holbourn and others, 2013, p. 64-65, fig. 1.

**Remarks.** This species is very rare in the mud facies from the Norwegian and Porcupine/Rockall regions and it is absent in the Alboran Sea.

_Bigenerina cylindrica_ Cushman, 1922 
Pl. 5, fig. 6

_Bigenerina cylindrica_ Cushman in Cushman, 1922, p. 26, pl. 3, figs. 7-8.


**Remarks.** This species characterizes only the mud facies along the Norwegian margin and can be relatively abundant.

**Genus Textularia Defrance, 1824**

_Type species:_ Textularia sagittula Defrance in de Blainville, 1824, p. 177.

_Textularia lateralis_ Laliker, 1935 
Pl. 5, fig. 8

_Textularia lateralis_ Laliker in Laliker, 1935, p. 1, pl. 1, figs. 3-5.

_Textularia lateralis_ Laliker in Zheng, 1988, p.111, pl. 26, fig. 4.

_Textularia lateralis_ Laliker in Loeblich and Tappan, 1994, p. 28, pl. 33, figs. 13-16.

**Remarks.** This species is present only in a few samples from the buried cold-water coral facies from the Alboran Sea (Dhaka MV). Some specimens have short spines at the periphery of each chamber. The specimen illustrated in Plate 5, fig. 8 does not show spines but only slightly lobulate periphery of the chambers.

_Textularia truncata_ (Höglund, 1947) 
Pl. 6, fig. 1

_Textularia truncata_ Höglund in Höglund, 1947, p. 175, pl. 12, figs. 8-9.

_Textularia truncata_ Höglund in Gabel, 1971, p. 32, pl. 4, figs. 20-21.

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**Textularia truncata** Högland in Murray, 2003, p. 15, pl. 3, figs. 17-18.

**Remarks.** This species is generally rare and present in the pebbly sand, sediment clogged coral and coral rubble facies from the Norwegian margin, from the mud facies (off-mound) in the Porcupine/Rockall region, and in buried cold-water coral facies from the Alboran Sea (Dhaka MV).

**Textularia earlandi** Parker, 1952
Pl. 2, fig. 2

**Textularia elegans** Lacroix in Lacroix, 1931, p. 14.

**Textularia elegans** Lacroix in Lacroix, 1932, p. 8, pl. 4-6.

**Textularia tenuissima** Earland in Earland, 1933, p. 3, pl. 21-30.

**Textularia tenuissima** Earland in Murray, 2003, p. 15, pl. 3, figs. 15-16.

**Remarks.** The name **Textularia tenuissima** was amended by Parker (1952) because it was pre-occupied by **Textularia tenuissima** Häusler 1881, a different species. He proposed the name **T. earlandi** for Earland’s species. It is present in the mud facies from the Norwegian margin.

**Textularia pseudotrochus** Cushman, 1922
Pl. 5, fig. 1

**Remarks.** This species is very rare and present in the living coral facies from the Porcupine/Rockall region.

**Subfamily SIPHOTEXTULARINAE** Loeblich and Tappan, 1985

**Genus Siphotextularia** Finlay, 1939

**Type species:** **Siphotextularia wairoana** Finlay, 1939.

**Siphotextularia obesa** Parr, 1950
Pl. 5, fig. 7

**Remarks.** This species is extremely rare and present only in the mud (off-mound) facies in the Porcupine Seabight. In the studied specimens the shape of the aperture varies from slit-like to circular.

**Family VALVULINIDAE** Berthelin, 1880

**Subfamily VALVULININAE** Berthelin, 1880

**Genus Clavulina** d’Orbigny, 1826

**Type species:** **Clavulina parisiensis** d’Orbigny, 1826, p. 268.

**Remarks.** This species is present only in the buried cold-water coral facies from the Alboran Sea.

**Suborder SPIRILLININA** Hohenegger and Piller, 1975

**Family SPIRILLINIDAE** Reuss and Fritsch, 1861

**Genus Mychostomina** Berthelin, 1881

**Type species:** **Spirillina vivipara** Ehrenberg var. revertens Rhumbler, 1906, p. 32.

**Remarks.** It differs from **S. vivipara** because the last portion of the enrolling tube turns toward the inner part of the test. It is found in the coral facies and sediment clogged coral facies from the Norwegian margin.

**Family Spirillina** Ehrenberg, 1843

**Type species:** **Spirillina vivipara** Ehrenberg, 1843.

**Spirillina vivipara** Ehrenberg in Heron-Allen and Earland, 1930, p. 178.

**Spirillina vivipara** Ehrenberg in Le Calvez, 1958, p. 181.
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Spirillina vivipara Ehrenberg in Barker, 1960, pl. 85, figs. 1-5.

Spirillina vivipara Ehrenberg in Loeblich and Tappan, 1987, p. 304, pl. 318, figs. 4-7.

Spirillina vivipara Ehrenberg in Murray, 2003, p. 15, pl. 4, fig. 1.

Spirillina vivipara Ehrenberg in Milker and Schmiedl, 2012, p. 43, figs. 11.15-16.

Remarks. This species is documented from the living coral facies and sediment clogged coral facies from the Norwegian margin and Porcupine/Rockall regions and in the buried cold-water coral facies from the Alboran Sea.

Family PATELLINIDAE Rhumbler, 1906
Subfamily PATELLININAE Rhumbler, 1906
Genus Patellina Williamson, 1858
Type species: Patellina corrugata Williamson, 1858, p. 46.

Patellina corrugata Williamson, 1858
Pl. 6, fig. 6

Patellina corrugata Williamson in Williamson, 1858, p. 46, pl. 3, figs. 86-89.


Patellina corrugata Williamson in Jones, 1994, p. 93, pl. 86, figs. 1-7.


Patellina corrugata Williamson in Murray, 2003, p. 24, pl. 9, figs. 6-7.

Patellina corrugata Williamson in Milker and Schmiedl, 2012, p. 43-44, figs. 11.21-23.

Patellina corrugata Williamson in Holbourn and others, 2013, p. 394-395, figs. 1-3.

Remarks. This species has been found only in the living coral, pebbly sand and coral rubble facies from the Norwegian margin.

Suborder MILIOLINA Delange and Hérouard, 1896
Superfamily CORNUSPIRACEA Schultze, 1854
Family CORNUSPIRIDAE Schultze, 1854
Subfamily CORNUSPIRINAE Schultze, 1854
Genus Cornuspira Schultze, 1854
Type species: Orbis foliaceus Philippi, 1844.

Cornuspira foliacea (Philippi, 1844)
Pl. 6, fig. 8

Orbis foliaceus Philippi in Philippi, 1844, p. 147, pl. 24, fig. 26.

Cornuspira foliacea (Philippi) in Loeblich and Tappan, 1987, p. 310, pl. 322, figs. 7-8.


Cornuspira foliacea (Philippi) in Milker and Schmiedl, 2012, p. 44, figs. 11.24-25.

Remarks. This species is very rare and present only in the coral rubble facies from the Norwegian margin. It differs from C. involvens by the crescentic size of the enrolling tube.

Cornuspira involvens (Reuss, 1850)
Pl. 6, fig. 7

Operculina involvens Reuss in Reuss, 1850, p. 370, pl. 46, fig. 20.

Cornuspira involvens (Reuss) in Cimerman and Langer, 1991, p. 25, pl. 15, figs. 4-7.

Cornuspira involvens (Reuss) in Jones, 1994, p. 26, pl. 11, figs. 1-3.

Cornuspira involvens (Reuss) in Murray, 2003, p. 15, pl. 4, fig. 5.

Cornuspira involvens (Reuss) in Milker and Schmiedl, 2012, p. 44, fig. 12.1.

Remarks. This species is present in all the investigated regions but it is always very rare (1-2 specimens) and does not show any particular habitat preference.

Family HEMIGORDIOPSIDAE Nikitina, 1969
Subfamily HEMIGORDIOPSINAE Nikitina, 1969
Genus Gordiospira Heron-Allen and Earland, 1932
Type species: Gordiospira fragilis Heron-Allen and Earland, 1932.

Gordiospira elongata (Collins, 1958)
Pl. 6, fig. 10

Glomospira elongata Collins in Collins, 1958, p. 347, pl. 1, figs. 6-7.

Gordiospira elongata (Collins) in Loeblich and Tappan, 1994, p. 37, pl. 56, figs. 17-18; pl. 57, figs. 1-4.

Remarks. It is very rare and present only in the buried cold-water coral facies from the Alboran Sea.

Gordiospira sp.
Pl. 6, fig. 9

Remarks. The test is discoidal and planispiral with the proloculus followed by an undivided second chamber, which is irregularly enrolled. The surface
shows transverse growth wrinkle. This species is always very rare and is present only in the pebbly sandy facies from the Norwegian margin.

Superfamily MILIOLACEA Ehrenberg, 1839
Family SPIROLOCULINIDAE Wiesner, 1920
Genus Spiroloculina d’Orbigny, 1826
Type species: Spiroloculina depressa d’Orbigny, 1826.

Spiroloculina dilatata d’Orbigny, 1846
Pl. 7, fig. 2
Spiroloculina dilatata d’Orbigny in d’Orbigny, 1846, p. 271, pl. 16, figs. 16-18.
Spiroloculina dilatata d’Orbigny in Wiesner, 1923, p. 35, pl. 4, fig. 26.
Remarks. This species is very rare and present only in the buried cold-water coral facies from the Alboran Sea.

Spiroloculina excavata d’Orbigny, 1846
Pl. 7, fig. 3
Spiroloculina excavata d’Orbigny in d’Orbigny, 1846, p. 271, pl. 16, figs. 19-21.
Spiroloculina excavata d’Orbigny in Sgarrella and Moncharmont-Zei, 1993, p. 169, pl. 5, fig. 6.
Spiroloculina excavata d’Orbigny in Murray, 1991, p. 17, pl. 4, figs. 13-14.
Spiroloculina excavata d’Orbigny in Milker and Schmiedl, 2012, p. 50, figs. 13.3-4.
Remarks. This species is rare and present only in the buried cold-water coral facies from the Alboran Sea (Dhaka MV).

Spiroloculina tenuiseptata Brady, 1884
Pl. 7, fig. 1
Spiroloculina tenuiseptata Brady in Brady, 1884, p. 153, pl. 10, fig. 5.
Spiroloculina tenuiseptata Brady in Le Calvez, 1958, p. 162, pl. 1, fig. 7.
Spiroloculina tenuiseptata Brady in Cimerman and Langer, 1991, p. 31, pl. 24, figs. 6-9.
Spiroloculina tenuiseptata Brady in Milker and Schmiedl, 2012, p. 50, figs. 13.7-8.

Remarks. This species is rare and only present in the buried cold-water coral facies from the Alboran Sea and in the coral rubble facies from the Norwegian margin.

Family HAUERINIDAE Schwager, 1876
Subfamily SIPHONAPERTINAE Saidova, 1975
Genus Ammomassilina Cushman, 1933
Type species: Massilina alveoliniformis Millett, 1898, p. 609.

Ammomassilina arenaria (Brady, 1884)
Pl. 7, fig. 4
Ammomassilina arenaria Brady in Brady, 1884, p. 153, pl. 8, fig. 12.
Remarks. This species is very rare and present only in the buried cold-water coral facies from the Alboran Sea (Dhaka MV).

Subfamily HAUERININAE Schwager, 1876
Genus Cycloforina Luczkowska, 1972
Type species: Quinqueloculina contorta d’Orbigny, 1846, p. 298.

Cycloforina laevigata (d’Orbigny, 1839)
Pl. 7, fig. 5
Quinqueloculina laevigata d’Orbigny in d’Orbigny, 1839, p. 301, pl. 3, figs. 31-33.
Quinqueloculina laevigata d’Orbigny in Cimerman and Langer, 1991, p. 57, Pl. 33, figs. 8-11.
Remarks. Several specimens have been found in the buried cold-water coral facies from the Alboran Sea (Dhaka and Maya MVs). Only one specimen has been found in the coral rubble facies from the Porcupine Seabight. This species is attributed to the genus Cycloforina Luczkowska (1972) because it shows the typical rounded aperture with a short tooth.

Cycloforina stalkeri (Loeblich and Tappan, 1953)
Pl. 7, fig. 6
Quinqueloculina stalkeri Loeblich and Tappan in Loeblich and Tappan, 1953, p. 40, pl. 5, figs. 5-9.
Remarks. Only a few specimens have been found in the mud facies (off-mound) and dead coral facies from
the Porcupine Seabight and in the buried cold-water coral facies from the Alboran Sea (Dhaka MV). This species is attributed to the genus *Cycloforina* Luczkowska (1972) because it shows the typical rounded aperture.

Genus *Quinqueloculina* d’Orbigny, 1826
Type species: *Serpula seminulum* Linné, 1758, p. 786.

*Quinqueloculina seminula* (Linné, 1758)
Pl. 7, fig. 8
*Serpula seminula* Linné in Linné, 1758, p. 786, pl. 2, fig. 1.
*Quinqueloculina seminula* (Linné) in Schlumberger, 1893, p. 208, pl. 4, figs. 80-81.
*Quinqueloculina seminula* (Linné) in Murray, 1971, p. 65, pl. 24, figs. 1-6.
*Quinqueloculina seminula* (Linné) in Cimerman and Langer, 1991, p. 38, pl. 34, figs. 9-12.
*Quinqueloculina seminula* (Linné) in Milker and Schmiedl, 2012, p. 59, figs. 15.30-31.

Remarks. This species is found in several samples from the buried cold-water coral facies from the Alboran Sea (Dhaka and Maya MVs) and in coral rubble and sediment clogged facies along the Norwegian margin.

*Quinqueloculina arctica* Cushman, 1933
Pl. 8, fig. 1
*Quinqueloculina arctica* Cushman in Cushman, 1933, p. 2, pl. 1, fig. 3.
*Quinqueloculina arctica* Cushman in Hermelin and Scott, 1985, p. 216, Pl.2, fig. 1.

Remarks. Very few specimens are documented from the Porcupine Seabight/Rockall region and the Norwegian margin. They do not show any habitat preference as they occur in the living and dead coral, coral rubble and mud facies.

*Quinqueloculina viennensis* Le Calvez and Le Calvez, 1958
Pl. 7, fig. 7
*Quinqueloculina viennensis* Le Calvez and Le Calvez in Véneç-Peyré, 1984 pl. 4, fig. 1.
*Quinqueloculina viennensis* Le Calvez and Le Calvez in Sgarrella and Monchamont-Zei, 1993, p. 176, pl. 7, fig. 8.

Remarks. This species is found in the buried cold-water coral facies from the Alboran Sea (Dhaka and Maya MVs). It occurs also in the coral rubble and pebbly sand, more rarely in the sediment clogged facies from the Norwegian margin.

Subfamily MILIOLINELLINAE Vella, 1957
Genus *Biloculinella* Wiesner, 1931
Type species: *Biloculina labiata* Schlumberger, 1891, p. 556.

*Biloculinella depressa* (Wiesner, 1923)
Pl. 8, fig. 3
*Biloculina labiata* Schlumberger var. *depressa* Wiesner in Wiesner, 1923, p. 89-90, pl. 18, fig. 263.
*Biloculina depressa* Wiesner in Cimerman and Langer, 1991, p. 39, pl. 36, fig. 11.
*Biloculina depressa* Wiesner in Murray, 2003, p. 15, pl. 4, figs. 2-3.

Remarks. Only one specimen of this species has been found in the coral rubble facies from the Norwegian margin.

*Biloculinella fragilis* Le Calvez and Le Calvez, 1958
Pl. 8, fig. 4

Remarks. Only one specimen of this species has been found in the buried cold-water coral facies from the Alboran Sea.

*Biloculinella globula* (Bornemann, 1855)
Pl. 8, fig. 2
*Biloculina globula* Bornemann in Bornemann, 1855, p. 349, pl. 19, fig. 3.
*Biloculina globula* Bornemann in Milker and Schmiedl, 2012, p. 62, fig. 16.19.

Remarks. This species is present in several samples from the buried cold-water coral facies from the Alboran Sea, and in the coral rubble, living, sediment clogged coral and mud facies from Norway.
Genus *Miliolinella* Wiesner, 1931
Type species: *Vermiculum subrotundum* Montagu, 1803, p. 521.

*Miliolinella subrotunda* (Montagu, 1803)
Pl. 8, fig. 5

*Vermiculum subrotundum* Montagu in Montagu, 1803, p. 521.


*Miliolinella subrotunda* (Montagu) in Jones, 1994, p. 20, pl. 4, fig. 3.

*Miliolinella subrotunda* (Montagu) in Murray, 2003, p. 15, pl. 4, fig. 6.

*Miliolinella subrotunda* (Montagu) in Duchemin and others, 2007, p. 16, pl. 1, fig. 9.

*Miliolinella subrotunda* (Montagu) in Milker and Schmiedl, 2012, p. 63, figs. 16.31-32.

Remarks. It is present but never common in the dead, living and dropstone facies from the Porcupine/Rockall region, coral rubble and sediment clogged coral facies from Norway in the buried cold-water coral facies from the Alboran Sea.

*Miliolinella elongata* Kruit, 1955
Pl. 9, fig. 1

*Miliolinella circularis* Borneman var. *elongata* Kruit in Kruit, 1955, p. 468, pl. 1, fig. 15.

*Miliolinella elongata* Kruit in Cimerman and Langer, 1991, p. 41, pl. 37, fig. 8.

*Miliolinella circularis* var. *elongata* Kruit in Sgarrella and Moncharmont-Zei, 1993, p. 187, pl. 8, fig. 2.


Remarks. It is only present in two samples from the buried cold-water coral facies from the Alboran Sea and in the coral rubble and pebbly sand facies from the Porcupine Seabight.

Genus *Pyrgo* Defrance, 1824
Type species: *Pyrgo laevis* Defrance, 1824, p. 273.

*Pyrgo anomala* (Schlumberger, 1891)
Pl. 9, fig. 4

*Biloculina anomala* Schlumberger in Schlumberger, 1891, p. 569, pl. 11, figs. 84-86; pl. 12, fig. 101.

*Pyrgo anomala* (Schlumberger) in Cimerman and Langer, 1991, p. 44, pl. 41, figs. 3-5.

*Pyrgo anomala* (Schlumberger) in Milker and Schmiedl, 2012, p. 64, figs. 17.8-9.

Remarks. It is rare and present in only a few samples from the buried cold-water coral facies from the Alboran Sea, the sandwave facies from the Porcupine/Rockall region and in the coral rubble, sediment clogged and mud facies from Norway.

*Pyrgo comata* (Brady, 1881)
Pl. 9, fig. 3

*Biloculina comata* Brady in Brady, 1881, p. 45, pl. 3, fig. 9.

*Biloculina comata* Brady in Brady, 1884, p. 144, pl. 3, figs. 9 a, b.

*Biloculina comata* Brady in Schlumberger, 1891, p. 565, pl. 10, figs. 72-73.

*Biloculina comata* Brady in Cushman, 1917, p. 81, pl. 34, fig. 1.

*Biloculina comata* Brady in Cimerman and Langer, 1991, p. 44, pl. 41, fig. 9.

*Biloculina comata* Brady in Jones, 1994, p. 19, pl. 3, fig. 9.

*Pyrgo comata* (Brady) in Holbourn and others, 2013, p. 452-453, figs. 1-2.

Remarks. This species is generally rare and only present in the coral facies from Norway. All the observed specimens show the distinctive longitudinal striae.

*Pyrgo elongata* (d’Orbigny, 1826)
Pl. 10, fig. 5

*Biloculina elongata* d’Orbigny in d’Orbigny, 1826, p. 298.

*Pyrgo elongata* (d’Orbigny) in Cimerman and Langer, 1991, p. 44, pl. 41, figs. 6-8.

*Pyrgo elongata* (d’Orbigny) in Gabel, 1971, p. 38, pl. 7, figs. 27-28.

*Pyrgo elongata* (d’Orbigny) in Sgarrella and Moncharmont-Zei, 1993, p. 182, pl. 9, fig. 1.

*Pyrgo elongata* (d’Orbigny) in Milker and Schmiedl, 2012, p. 66, fig. 17.12.

Remarks. This species is very rare in the the buried cold-water coral facies from the Alboran Sea, the coral rubble and pebbly sand facies from the Norwegian margin and dead coral facies from the Porcupine region.

*Pyrgo inornata* (d’Orbigny, 1846)
Pl. 9, fig. 2

*Biloculina inornata* d’Orbigny in d’Orbigny, 1846, p. 266, pl. 16, figs. 7-9.
Remarks. This species is very rare in the buried cold-water coral facies from the Alboran Sea, and in the living coral facies from the Porcupine area.

Pyrgo lucernula (Schwager, 1866)
Pl. 10, fig. 4
Biloculina lucernula Schwager in Schwager, 1866, p. 202, pl. 4, fig. 17.
Pyrgo lucernula (Schwager) in Cimerman and Langer, 1991, p. 45, pl. 41, figs. 10-11.
Pyrgo lucernula (Schwager) in Jones, 1994, p. 18, pl. 2, figs. 5-6.
Pyrgo lucernula (Schwager) in Holbourn and others, 2013, p. 456-457, figs. 1-2.

Remarks. It is very rare and found only in the coral rubble facies from Norway.

Pyrgo murrhina (Schwager, 1866)
Pl. 10, fig. 3
Biloculina murrhina Schwager in Schwager, 1866, p. 203, pl. 4, fig. 15.
Pyrgo murrhina (Schwager) in Mullineaux and Lohmann, 1981, p. 38, pl. 1, fig. 13.
Pyrgo murrhina (Schwager) in Murgese and De Deckker, 2005, p. 34, text-fig. 4, figs. 9-10.
Pyrgo murrhina (Schwager) in Abu-Zied and others, 2008, p. 51, pl. 1, figs. 16-17.
Pyrgo murrhina (Schwager) in Holbourn and others, 2013, p. 458-459, figs. 1-2.

Remarks. It is very rare and found only in the pebbly sand facies from the Porcupine/Rockall region.

Pyrgo sarsi (Schlumberger, 1891)
Pl. 10, figs. 1-2
Biloculinella sarsi Schlumberger in Schlumberger, 1891, p. 553, pl. 9, figs. 55-59.
Pyrgo sarsi (Schlumberger) in Jones, 1994, p. 18, pl. 2, fig. 7.

Remarks. This species is generally rare but can have abundance peaks in the muddy sediments in the living coral facies from the Porcupine region.

Biloculina subsphaerica d’Orbigny in d’Orbigny, 1839, p. 162, pl. 8, figs. 25-27.

Remarks. Only one specimen has been found in the muddy sediments in the living coral facies from the Porcupine region.

Pyrgo williamsoni (Silvestri, 1923)
Pl. 9, figs. 6
Biloculina ringens Lamarck “typica” Williamson in Williamson, 1858, p. 79, pl. 6, figs. 169-170.
Biloculina williamsoni Silvestri in Silvestri, 1923, p. 73.
Pyrgo williamsoni (Silvestri) in Haynes, 1973, p. 61, text-fig. 14 (1-3).
Pyrgo williamsoni (Silvestri) in Murray, 2003, p. 17, pl. 4, figs. 7-8.

Remarks. It is very rare and present only in the living coral and coral rubble facies along the Norwegian margin.

Genus Triloculina d’Orbigny, 1826
Type species: Miliolites trigonula Lamarck, 1804, p. 351.

Triloculina trigonula (Lamarck, 1804)
Pl. 11, fig. 2
Miliolites trigonula Lamarck in Lamarck, 1804, p. 351, pl. 17, fig. 4.
Triloculina trigonula (Lamarck) in Cushman, 1917, p. 65, pl. 25, fig. 3.
Triloculina trigonula (Lamarck) in Whittaker and Hodgkinson, 1979, p. 34, pl. 3, fig. 8.
Triloculina trigonula (Lamarck) in Zheng, 1988, p. 242, pl. 19, fig. 3; pl. 23, fig. 9; pl. 33, fig. 5; text-fig. 59.
Triloculina trigonula (Lamarck) in Jones, 1994, p. 20, pl. 3, figs. 15-16.
Triloculina trigonula (Lamarck) in Hayward and others, 1999, p. 106, pl. 5, figs. 31-32.
Triloculina trigonula (Lamarck) in Holbourn and others, 2013, p. 566-567, figs. 1-2.

Remarks. It is rare and only present in a few samples from the buried cold-water coral facies of the Alboran Sea and is very rare in the living coral facies from Norway.

Triloculina marioni Schlumberger, 1893
Pl. 11, fig. 1
Triloculina marioni Schlumberger in Schlumberger, 1893, p. 62, pl. 1, figs. 38-41.
Triloculina marioni Schlumberger in Le Calvez and Le Calvez, 1958, p. 191, pl. 6, figs. 54-56.
Triloculina marioni Schlumberger in Cimerman and Langer, 1991, p. 46, pl. 43, figs. 1-5.


Remarks. It is very rare and present only in a few samples from the buried cold-water coral facies of the Alboran Sea.


Triloculina tricarinata d’Orbigny, 1826
Pl. 11, fig. 3

Triloculina tricarinata d’Orbigny in d’Orbigny, 1826, p. 299.

Triloculina tricarinata d’Orbigny in Cimerman and Langer, 1991, p. 46, pl. 44, figs. 3-4.


Triloculina tricarinata d’Orbigny in Hottinger and others, 1993, p. 65, pl. 68, figs. 7-12.


Triloculina tricarinata d’Orbigny in Holbourn and others, 2013, p. 564-565, figs. 1-2.

Remarks. This species is very rare and present only in the Alboran Sea and in the coral rubble and mud facies from Norway.

Subfamily SIGMOILINITINAE Luczkowska, 1974
Genus Sigmoinella Saidova, 1975
Type species: Sigmoinella borealis Saidova, 1975, p. 157.

Sigmoinella borealis Saidova, 1975
Pl. 11, fig. 4

Sigmoinella borealis Saidova in Saidova, 1975, p. 158, pl. 45, fig. 2.


Remarks. This species is very rare and has been found only in one sample from the buried cold-water coral facies of the Alboran Sea.

Subfamily SIGMOILOPSINAE Vella, 1957
Genus Sigmoilopsis Finlay, 1947
Type species: Sigmoilopsis schlumbergeri Silvestri, 1904, p. 267.

Sigmoilopsis schlumbergeri (Silvestri, 1904)
Pl. 11, fig. 5

Sigmoilopsis schlumbergeri Silvestri in Silvestri, 1904, pp. 267, 269.

Sigmoilopsis schlumbergeri Silvestri in Kihle and Løfaldli, 1975.


Sigmoilopsis schlumbergeri (Silvestri) in Cimerman and Langer, 1991, p. 48, pl. 46, figs. 10-14.

Sigmoilopsis schlumbergeri (Silvestri) in Milker and Schmiedl, 2012, p. 69-70, figs. 18.7-8.

Sigmoilopsis schlumbergeri (Silvestri) in Holbourn and others, 2013, p. 506-507, figs. 1-2.

Remarks. This species is very rare and present only in the buried cold-water coral facies of the Alboran Sea.

Sigmoilopsis woodi Atkinson, 1968
Pl. 11, fig. 6

Sigmoilopsis woodi Atkinson in Atkinson, 1968, p. 161, pl. 18, fig. 4.

Remarks. This species is only present in the coral rubble facies from the Norwegian margin.

Suborder LAGENINA Delange and Hérouard, 1896
Superfamily NODOSARIACEA Ehrenberg, 1838
Family NODOSARIIDAE Ehrenberg, 1838
Subfamily NODOSARIINAE Ehrenberg, 1838
Genus Dentalina Risso, 1826
Type species: Nodosaria cuvieri d’Orbigny, 1826, p. 255.

Dentalina cuvieri (d’Orbigny, 1826)
Pl. 12, fig. 1

Nodosaria cuvieri d’Orbigny in d’Orbigny, 1826, p. 255, pl. 9, fig. 57.

Remarks. This species is very rare and present only in off mound (muddy) sediments from the Porcupine Seabight.

Dentalina lamarcki Neugeboren, 1856
Pl. 12, fig. 2
**Dentalina lamarcki** Neugeboren in Neugeboren, 1856, p. 91, fig. 16.

*Remarks*. This species is very rare and only found in the buried cold-water coral facies from the Alboran Sea (Dhaka MV)

Genus *Grigelis* Mikhalevich, 1981

Type species: *Nodosaria pyrula* d’Orbigny, 1826, p. 253.

*Grigelis orectus* (Loeblich and Tappan, 1994)

Pl. 12, fig. 3

*Nodosaria pyrula* d’Orbigny in d’Orbigny, 1826, p. 253.

*Nodosaria pyrula* d’Orbigny in Brady, 1884, p. 497, pl. 62, figs. 10-12.

*Dentalina guttifera* (d’Orbigny) in Barker, 1960, p. 130, pl. 62, figs. 10-12.

*Grigelis guttifera* (d’Orbigny) in Loeblich and Tappan, 1987, p. 396, pl. 441, figs. 2-3.

*Grigelis orectus* (Loeblich and Tappan) in Loeblich and Tappan, 1994, p. 64, pl. 115, fig. 22.

*Remarks*. This species is very rare and present only in one sample from the buried cold-water coral facies from the Alboran Sea (Dhaka MV) and in one sample from the coral rubble facies of Norway.

Genus *Laevidentalina* Loeblich and Tappan, 1986


*Laevidentalina sidebottomi* (Cushman, 1933)

Pl. 12, fig. 4

*Dentalina sidebottomi* Cushman in Cushman, 1933, p. 12, pl. 3, fig. 4.


*Remarks*. This species is very rare and present only in one sample from the buried cold-water coral facies retrieved in the Alboran Sea on the Dhaka MV.

Family VAGINULINIDAE Reuss, 1860

Subfamily LENTICULININAE Chapman, Parr and Collins, 1934

Genus *Lenticulina* Lamarck, 1804

Type species: *Lenticulites rotulata* Lamarck, 1804, p. 153.

*Lenticulina calcar* (Linné, 1758)

Pl. 12, fig. 5

*Nautilus calcar* Linné in Linné, 1758, p. 709, figs. b-c.


*Lenticulina calcar* (Linné) in Sgarrella and Moncharmont-Zei, 1993, p. 194, pl. 12, fig. 11.

*Lenticulina calcar* (Linné) in Milker and Schmiedl, 2012, p. 72, fig. 18.14.

*Remarks*. This species occurs only in a very few samples from the buried cold-water coral facies from the Alboran Sea.

*Lenticulina gibba* (d’Orbigny, 1826)

Pl. 12, fig. 7

*Cristellaria gibba* d’Orbigny in d’Orbigny, 1826, p. 292, no. 17.

*Lenticulina gibba* (d’Orbigny) in Kihle and Løfaldli, 1975.


*Lenticulina gibba* (d’Orbigny) in Jones, 1994, p. 81, pl. 69, figs. 8-9.

*Lenticulina gibba* (d’Orbigny) in Holbourn and others, 2013, p. 334-335, figs. 1-2.

*Remarks*. This species is only present in the mud and coral rubble facies from Norway and in a few samples from the buried cold-water coral facies in the Alboran Sea (Dhaka and Maya MVs).

*Lenticulina inornata* (d’Orbigny, 1846)

Pl. 12, fig. 9

*Robulina inornata* d’Orbigny in d’Orbigny, 1846, p. 102, pl. 4, figs. 25-26.

*Remarks*. This species is generally rare along the Norwegian margin and present in the muddy-sandy sediments in the coral rubble, pebbly sand, sediment clogged framework and living coral facies. It is present and rare to common in the buried coral facies from the Alboran Sea and it is very rare in the off-mound and dropstone facies in the Porcupine/Rockall region.

*Lenticulina orbicularis* (d’Orbigny, 1846)

Pl. 12, fig. 8

*Robulina orbicularis* d’Orbigny in d’Orbigny, 1846, p. 288, pl. 15, figs. 8-9.

Lenticulina orbicularis (d’Orbigny) in Jones, 1994, p. 81, pl. 69, fig. 17.
Lenticulina orbicularis (d’Orbigny) in Kihle and Løfaldli, 1975.
Lenticulina orbicularis (d’Orbigny) in Milker and Schmiedl, 2012, p. 73, figs. 18.19-20.

Remarks. This species is present in all the studied regions and does not seem to have any habitat preference.

Lenticulina vortex (Fichtel and Moll, 1798)
Pl. 12, fig. 6

Nautilus vortex Fichtel and Moll in Fichtel and Moll, 1798, p. 33, pl. 2, figs. 4-1.

Lenticulina vortex (Fichtel and Moll) in Jones, 1994, p. 81, pl. 69, figs. 14-16.

Remarks. This species is rare and has been observed only from the buried cold-water coral facies from the Alboran Sea (Dhaka and Maya MVs).

Genus Neolenticulina McCulloch, 1977

Neolenticulina peregrina (Schwager, 1866)
Pl. 12, fig. 10

Cristellaria peregrina Schwager in Schwager, 1866, p. 245, pl. 7, fig. 89.
Cristellaria variabilia Reuss in Brady, 1884 (not Reuss, 1850), p. 541, pl. 68, figs. 11-16.
Lenticulina peregrina (Schwager) in Cushman and McCulloch, 1950, p. 302, pl. 39, fig. 15.
Dimorphina peregrina (Schwager) in Hofker, 1978, p. 37, pl. 3, figs. 3-4, 7-8.
Neolenticulina peregrina (Schwager) in Loeblich and Tappan, 1987, p. 406, pl. 447, figs. 9-12, 16.
Neolenticulina variabilis (Reuss) in Jones, 1994, p. 80, pl. 68, figs. 11-16.
Neolenticulina peregrina (Schwager) in Milker and Schmiedl, 2012, p. 73, fig. 18.21.
Neolenticulina peregrina (Schwager) in Holbourn and others, 2013, p. 368-369, figs. 1-2.

Remarks. This species is very rare and observed only in one sample from the Porcupine Seabight and in a few samples from the Alboran Sea.

Genus Saracenaria Defrance, 1824
Type species: Saracenaria italica Defrance, 1824, in de Blainville, 1824, p. 176.

Saracenaria caribbeana Hofker, 1976
Pl. 13, fig. 1

Saracenaria caribbeana Hofker in Hofker, 1976, p. 191, pl. 65.
Saracenaria caribbeana Hofker in Jones, 1994, p. 80, pl. 68, fig. 17.

Remarks. This species is only observed from the Porcupine Seabight.

Subfamily MARGINULININAE Wedekind, 1937
Genus Amphicoryna Schlumberger, 1881
Type species: Nautilus scalaris Batsch, 1791, p. 1, 4.

Amphicoryna scalaris (Batsch, 1791)
Pl. 13, figs. 2-3

Nautilus (Ortoceras) scalaris, Batsch in Batsch, 1791, p. 91, pl. 2, figs. 4.
Nodosaria scalaris (Batsch) in Cushman, 1921, p. 199, pl. 35, fig. 6.
Amphicoryna scalaris (Batsch) in Barker, 1960, pl. 63, figs. 28-31.
Amphicoryna scalaris (Batsch) in Jones, 1994, p. 75, pl. 63, figs. 28-31.
Amphicoryna scalaris (Batsch) in Milker and Schmiedl, 2012, p. 73, figs. 18.22-25.
Amphicoryna scalaris (Batsch) in Holbourn and others, 2013, p. 42-43, fig. 1.

Remarks. This species is very abundant in the buried cold-water coral facies from the Alboran Sea and rare in the mud and dead coral facies of the Porcupine/Rockall region. It is very rare in the mud and coral rubble facies from Norway.

Genus Astacolus de Montfort, 1908
Type species: Nautilus crepidula Fichtel and Moll, 1798, p. 64.

Astacolus beerae Brenner and McMillan, 1976
Pl. 13, fig. 4


Remarks. This species has been observed only in the pebbly sand facies from Norway and it is always very rare.
TAXONOMY AND ILLUSTRATION OF BENTHIC FORAMINIFERA

Subfamily VAGINULININAE Reuss, 1860
Genus Planularia Defrance, 1824
Type species: Peneroplis auris Defrance in de Blainville, 1824, p. 178.

Planularia perculata McCulloch, 1977
Pl. 13, fig. 5
Remarks. This species is only found in the buried cold-water coral facies from the Alboran Sea (Maya MV), where it is rare.

Planularia costata (d’Orbigny, 1826)
Pl. 13, fig. 7
Robulina costata d’Orbigny in d’Orbigny, 1826, p. 43, pl. 44, fig. 3.
Remarks. This species is only observed in one sample from the Porcupine Seabight.

Family LAGENIDAE Reuss, 1862
Genus Lagena Walker and Jacob, 1798
Type species: Serpula (Lagena) sulcata Walker and Jacob, in Kanmacher, 1798, p. 634.

Lagena substriata Williamson, 1848
Pl. 13, fig. 6
Lagena substriata Williamson in Williamson, 1848, p. 15, pl. 2, fig. 12.
Lagena substriata Williamson in Murray, 2003, p. 17, pl. 5, fig. 7.
Lagena substriata Williamson in Jones, 1994, p. 64, pl. 57, fig. 19.
Remarks. This species is only present in one sample from the mud facies along the Norwegian margin.

Lagena meridionalis Wiesner, 1931
Pl. 13, fig. 8
Lagena gracilis Williamson var. meridionalis Wiesner in Wiesner, 1931, p. 117, pl. 18, fig. 211.
Lagena meridionalis Williamson in Jones, 1994, p. 66, pl. 58, fig. 19.
Lagena meridionalis Williamson in Vazquez Riveiros and Patterson, 2008, p. 16, pl. 6, fig. 4.
Remarks. This species is rare and can be found in the buried cold-water coral facies from the Alboran Sea, and in the coral rubble, pebbly sand and living coral facies in Norway.

Lagena semilineata var. spinigera Earland, 1934
Pl. 13, fig. 9
Lagena semilineata Wright var. spinigera Earland in Earland, 1934, p. 173, pl. 7, fig. 21.
Lagena semilineata Wright var. spinigera Earland in Jones, 1994, p. 65, pl. 58, figs. 4, 17.
Remarks. This species is only present in one sample from the coral rubble facies from Norway.

Lagena squamososalata Brady, 1881
Pl. 13, fig. 11
Lagena squamososalata Brady in Brady, 1881, p. 61, pl. 60, fig. 23.
Lagena squamososalata Brady in Jones, 1994, p. 70, pl. 60, fig. 23.
Remarks. It is only found in one sample from the dropstone facies from the Rockall Bank.

Lagena trigonolaevigata Balkwill and Millett, 1884
Pl. 13, fig. 12
Lagena trigonolaevigata Balkwill and Millett in Balkwill and Millett, 1884, p. 86, pl. 3, fig. 4.
Remarks. This species is only present in the pebbly sand facies of the Norwegian margin.

Genus Pygmaeoseistron Patterson and Richardson, 1987
Type species: Lagena hispidula Cushman, 1913, p. 14.

Pygmaeoseistron laevis ovalis (Walker and Boys, 1798)
Pl. 13, fig. 10
Serpula laevis ovalis Walker and Boys in Walker and Boys, 1784, p. 3, pl. 1, fig. 9.
Vermiculum laeve Montagu in Montagu, 1803, p. 524, pl. 1, fig. 9.
Remarks. This species is observed only in the coral rubble facies from Norway.

Genus Hyalinonetrion Patterson and Richardson, 1987
Type species: Hyalinonetrion sahulense Patterson and Richardson, 1987.

Hyalinonetrion gracillimum (Costa, 1856)
Pl. 14, fig. 1
Amphorina gracilis Costa in Costa, 1856, p. 121, pl. 11, fig. 11a (A).
Lagena gracillima (Costa) in Feyling-Hansen, 1954, p. 206, pl. 4, fig. 1.
Lagena gracillima (Costa) in Gabel, 1971, p. 45, pl. 10, figs. 1-2.
Hyalinonetrion gracillimum (Costa) in Cimerman and Langer 1991, p. 52, pl. 55, figs. 1-2.
Hyalinonetrion gracillimum (Costa) in Milker and Schmiedl, 2012, p. 74, fig. 18.30.

**Remarks.** This species is recorded only in one sample from the coral rubble facies from Norway.

Family POLYMORPHINIDAE d’Orbigny, 1839
Subfamily POLYMORPHININAE d’Orbigny, 1839
Genus **Globulina** d’Orbigny, 1839
Type species: *Polymorphina gibba* d’Orbigny, 1826, p. 266.

**Globulina aequalis** d’Orbigny, 1846
Pl. 14, fig. 2

**Globulina aequalis** d’Orbigny in d’Orbigny, 1846, p. 227, pl. 13, figs. 11, 12.

**Remarks.** This species is rare and observed only from the coral rubble facies from Norway.

Genus **Pseudopolymorphina** Cushman and Ozawa, 1928
Type species: *Pseudopolymorphina hanzawai* Cushman and Ozawa, 1928, p. 15.

**Pseudopolymorphina** sp.
Pl. 14, fig. 3

**Remarks.** This species is only found in one sample from coral rubble facies recovered along the Norwegian margin. This species resembles *Pseudopolymorphina suboblonga* Cushman and Ozawa 1930, but it differs for its less elongated test and its larger aboral side.

Genus **Pyrulina** d’Orbigny, 1839
Type species: *Polymorphina gutta* d’Orbigny, 1826, p. 267, 310.

**Pyrulina cylindroides** (Roemer, 1838)
Pl. 14, fig. 4

**Pyrulina cylindroides** Roemer in Roemer, 1838, p. 385, pl. 3, fig. 26.

**Pyrulina cylindroides** (Roemer) in Feyling-Hansen, 1954, p. 219, pl. 5, figs. 10-11.

**Pyrulina cylindroides** (Roemer) in Bolli, Beckmann and Saunders, 1994, p. 123, figs 33, 21-22.

**Pyrulina cylindroides** (Roemer) in Holbourn and others, 2013, p. 462-463, figs. 1-5.

**Remarks.** This species has been observed only from the living coral facies along the Norwegian margin.

Family ELLIPSOLAGENIDAE Silvestri, 1923
Subfamily OOLININAE Loeblich and Tappan, 1961
Genus **Favulina** Patterson and Richardson, 1987
Type species: *Entosolenia squamosa* Montagu var. hexagona Williamson, 1848, p. 20.

**Favulina squamosa** (Montagu, 1803)
Pl. 14, fig. 5

**Vermiculum squamosum** Montagu in Montagu, 1803, p. 526, pl. 14, fig. 2.

**Oolina squamosa** (Montagu) in Jones, 1994, p. 66, pl. 58, fig. 32.

**Oolina squamosa** (Montagu) in Kihle and Lofeldli, 1975.

**Remarks.** This species is observed in only 1 sample from the buried coral facies in the Alboran Sea (1 specimen), and a few specimens have been found in the pebbly sand and coral rubble facies in Norway.

Genus **Favulina melo** d’Orbigny, 1839
Type species: *Entosolenia squamosa* Montagu var. hexagona Williamson, 1848, p. 20.

**Favulina hexagona** (Williamson, 1848)
Pl. 14, fig. 7

**Entosolenia squamosa** (Montagu) var. hexagona Williamson in Williamson, 1848, p. 20, pl. 2, fig. 23.

**Oolina hexagona** (Williamson) in Jones, 1994, p. 66, pl. 58, fig. 33.

**Favulina hexagona** (Williamson) in Cimerman and Langer, 1991, p. 55, pl. 58, figs. 8-9.

**Favulina hexagona** (Williamson) in Milker and Schmiedl, 2012, p. 77, fig. 19.4.

**Remarks.** It differs from *F. squamosa* by the larger size of the ornamentations. This species is present in the coral rubble and sediment clogged coral facies from the
Norwegian margin and the dead coral facies from the Porcupine Seabight.

Genus *Homalohedra* Patterson and Richardson, 1987
Type species: *Lagena guntheri* Earland, 1934, p. 151

*Homalohedra williamsoni* (Alcock, 1865)

- Remarks. This species is observed in the pebbly sand and coral rubble facies and in one sample from the living coral facies from Norway. It differs from *H. apiopleura* for the more spaced costae on the test surface.

*Homalohedra apiopleura* (Loeblich and Tappan, 1953)

- Remarks. It is very rare and found only in the buried coral facies in the Alboran Sea and Lopphavet.

*Homalohedra borealis* (Loeblich and Tappan, 1954)

- Remarks. This species is observed in the pebbly sand and coral rubble facies and from the muddy sediments of the living coral facies from Norway. It differs from *H. williamsoni* and *H. apiopleura* because of the thinner and well spaced longitudinal costae and a more spherical test. The name *Oolina borealis* was proposed by Loeblich and Tappan 1954 to replace the name *Oolina costata* Williamson to avoid homonymy when *Entosolenia costata* Williamson was placed in the genus *Oolina*, where the species *Oolina costata* Egger, already existed. The genus *Homalohedra* was successively proposed for these species having longitudinal costae (Patterson and Richardson, 1987).

*Homalohedra eucostata* (McCulloch, 1977)

- Remarks. It is very rare and present only in the coral rubble facies along the Norwegian margin. It differs from the other species belonging to the genus *Homalohedra* because of the very thin and dense costae, which ornament its test.

Genus *Oolina* d'Orbigny, 1839
Type species: *Oolina laevigata* d'Orbigny, 1839, p. 19.

*Oolina laevigata* d'Orbigny, 1839

- Remarks. This species is rare and present only in the coral rubble facies from Norway.

*Oolina lineata* subsp. *communis* McCulloch, 1977

- Remarks. It is very rare and present only in the pebbly sand facies from Norway.

*Oolina ampulladistoma* (Jones, 1874)

- Remarks. It is very rare and present only in the muddy-sandy fraction of the coral rubble facies from Norway.
Oolina globosa (Montagu, 1803)

Pl. 15, fig. 5

Vermiculum globosum Montagu in Montagu, 1803, p. 523, pl. 1, fig. 8.

Lagena globosa (Montagu) in Brady, 1884, p. 452, pl. 56, figs. 1-3.


Oolina globosa (Montagu) in Jones, 1994, p. 61, pl. 56, figs. 1-3.

Remarks. Generally very rare, this species occurs in the mud facies and in the finer sediment fraction of the living coral facies from the Norwegian margin.

Genus Fissurina Reuss, 1850

Type species: Fissurina laevigata Reuss, 1850, p. 366.

Fissurina agassizi Todd and Brännimann, 1957

Pl. 15, fig. 7

Fissurina agassizi Todd and Brännimann in Todd and Brännimann, 1957, p. 36, pl. 9, fig. 14.

Remarks. This species is very rare and present only in the buried coral facies from the Alboran Sea (Maya MV).

Fissurina annectens (Burrows and Holland, 1895, fide Jones, 1895)

Pl. 16, fig. 4

Lagena annectens Burrows and Holland in Jones, 1895, p. 203, pl. 7, fig. 11.

Lagena annectens Burrows and Holland in Buchner, 1940, p. 48, pl. 15, figs. 279-293.

Fissurina annectens (Burrows and Holland) in Kähle and Løfaldli, 1975. Figs. A-B.

Fissurina annectens (Burrows and Holland) in Sgarrella and Moncharmont-Zei, 1993, p. 200.

Remarks. This species is present only in the coral rubble facies from the Norwegian margin. It differs from F. crassiporosa because it possesses a keel along the peripheral margin in the lower part of the test.

Fissurina circularis Todd, 1954

Pl. 15, fig. 8

Fissurina circularis Todd in Todd, 1954, p. 351, pl. 87, fig. 27.

Remarks. This species is only found in the dropstone facies from the Porcupine/Rockall region.
annectens, because it has a keel on the aboral side instead of spines.

*Fissurina longpointensis* McCulloch, 1977

Pl. 16, fig. 6

*Fissurina longpointensis* McCulloch in McCulloch, 1977, p. 114, pl. 59, fig. 9.

Remarks. This species is very rare and present only in the coral rubble facies from the Norwegian margin. It differs from *F. crassiporosa* because of its wider aperture.

*Fissurina pseudoorbignyana* (Buchner, 1940)

Pl. 17, fig. 3

*Lagena pseudoorbignyana* Buchner in Buchner, 1940, p. 460, pl. 10, figs. 157-160.

Remarks. This species is very rare in the pebbly sand and coral rubble facies from the Norwegian margin.

*Fissurina dublini* McCulloch, 1977

Pl. 17, fig. 4

*Fissurina dublini* McCulloch in McCulloch, 1977, p. 102, pl. 62, fig. 8.

Remarks. This species is very rare and present only in the off-mound (mud) facies from the Porcupine Seabight.

*Fissurina derogata* McCulloch, 1977

Pl. 17, fig. 5


Remarks. This species is present in the muddy-sandy sediments from the coral rubble and the living coral facies in Norway. It is very rare in the buried coral facies from the Alboran Sea.

*Fissurina lacunata* (Burrows and Holland, 1895, *fide* Jones, 1885)

Pl. 17, fig. 6

*Lagena castrensis* Brady in Brady, 1884, p. 485, pl. 1, figs. 1-3.

*Lagena lacunata* (Burrows and Holland) in Jones, 1895, p. 205, pl. 7, fig. 12.


Remarks. This species is only present in the pebbly sand facies from the Norwegian margin. Brady (1884) termed this species *Lagena castrensis* Schwager, and indicated as characteristic the “large exogenous beads irregularly scattered over the large lateral face of the test”. However, this species has surface ornamentations consisting of shallow pittings (Burrows and Holland, 1895).

*Fissurina nucelloides* (Buchner, 1940)

Pl. 17, fig. 7

*Lagena nucelloides* Buchner in Buchner, 1940, p. 518, pl. 22, figs. 476-477.

Remarks. This species is very rare in the sandwave facies from the Porcupine/ Rockall region.

*Fissurina pseudolucida* Zheng, 1979

Pl. 17, fig. 8


Remarks. This species is only present in the coral rubble facies from the Norwegian margin.

Genus *Palliolatella* Patterson and Richardson, 1987

Type species: *Palliolatella avita* Patterson and Richardson, 1987, p. 219.

*Palliolatella semimarginata* (Reuss, 1870)

Pl. 18, fig. 1

*Lagena marginata* (Montagu) var. *semimarginata* Reuss in Reuss, 1870, p. 468, pl. 4, figs. 4-6, 10-12.

*Fissurina semimarginata* (Reuss) in Jones, 1994, p. 68, pl. 59, figs. 17, 19.

Remarks. This species is very rare in the Porcupine Seabight and only present in the off-mound muddy sediments. It is found also in the pebbly sand facies from Norway.

Subfamily PARAFISSURININAE Jones, 1984

Genus *Parafissurina* Parr, 1947

Type species: *Lagena ventricosa* Silvestri, 1904, p. 10.

*Parafissurina basispinata* McCulloch, 1977

Pl. 17, fig. 1

*Parafissurina basispinata* McCulloch in McCulloch, 1977, p. 139, pl. 72, figs. 1-3.
Remarks. This species is very rare and only found in one sample from the buried coral facies from the Alboran Sea.

*Parafissurina marginata* (Walker and Boys, 1784)

Pl. 17, fig. 2

*Serpula* (*Lagena*) *marginata* Walker and Boys, 1784, p. 2, pl. 1, fig. 7.

*Fissurina marginata* (Murray) in Murray, 2003, p. 17, pl. 5, figs. 3-4.

Remarks. This species does not show any habitat preference along the Norwegian margin, where it is rather common. It is, however, rare in the Porcupine/Rockall region and in the buried coral facies from the Alboran Sea.

*Parafissurina felsinea* (Fornasini, 1894)

Pl. 18, fig. 4


*Oolina felsinea* (Fornasini) in Anderson, 1975, pl. 7, fig. 12.

*Parafissurina felsinea* (Fornasini) in Jones, 1994, p. 61, pl. 56, fig. 4.

Remarks. This species is very rare and present only in the mud facies from Norway. It has been described by Fornasini (1894) referring to drawings of the holotype published in Fornasini (1891) and previously identified as *Lagena* cf. *ovum* Ehrenberg.

*Parafissurina lateralis* (Cushman, 1913)

Pl. 18, fig. 2

*Lagena lateralis* Cushman in Cushman, 1913, p. 9, pl. 1, fig. 1.

*Parafissurina lateralis* (Cushman) in Jones, 1994, p. 62, pl. 56, figs. 17-18.

Remarks. This species is very rare and only present in the mud facies from Norway.

*Parafissurina robusta* (Zheng, 1979)

Pl. 18, fig. 6

*Fissurina robusta* Zheng in Zheng, 1979, pp. 215-216, pl. 13, fig. 11.

Remarks. This species is very rare and only present in the muddy fraction in the coral rubble facies from Norway.

Suborder *ROBERTININA* Loeblich and Tappan, 1984

Superfamily *CERATOBULIMINACEA* Cushman, 1927

Family *EPISTOMINIDAE* Wedekind, 1937

Subfamily *EPISTOMININAE* Wedekind, 1937

Genus *Hoeglundina* Broten, 1948

Type species: *Rotalia elegans* d’Orbigny, 1826, p. 272.

*Hoeglundina elegans* (d’Orbigny, 1826)

Pl. 18, fig. 3

*Rotalia* (*Turbinulina*) *elegans* d’Orbigny in d’Orbigny, 1826, p. 276.

*Hoeglundina elegans* (d’Orbigny) in Hermelin and Scott, 1985, p. 210, pl. 6, figs. 6-7.


*Hoeglundina elegans* (d’Orbigny) in Kiilhe and Løfaldli, 1975, figs. A-D.

*Hoeglundina elegans* (d’Orbigny) in Milker and Schmiedl, 2012, p. 79, figs. 19.15-16.

*Hoeglundina elegans* (d’Orbigny) in Holbourn and others 2013, p. 298-299, figs. 1-3.

Remarks. This species is very rare in the coral rubble facies of Norway, it is rare in the muddy (off-mound) sediment and in the sandwave facies from the Porcupine Seabight and it is common in the buried coral facies in the Alboran Sea.

Superfamily *CONORBOIDACEA* Thalmann, 1952

Family *ROBERTINIDAE* Reuss, 1850

Subfamily *ROBERTININAE* Reuss, 1850

Genus *Robertinoides* Höglund, 1947

Type species: *Bulimina normani* Goës, 1894, p. 47.

*Robertinoides bradyi* (Cushman and Parker, 1936)

Pl. 18, fig. 7

*Bulimina subteres* Brady in Brady, 1881, p. 55.

*Robertinoides bradyi* (Cushman and Parker) in Cushman and Parker, 1936, p. 99, pl. 16, fig. 9.

*Robertinoides bradyi* (Cushman and Parker) in Jones, 1994, p. 55, pl. 50, fig. 18.

Remarks. This species is present in the sediment clogged, coral rubble and living coral facies from the Norwegian margin.
Robertinoides pumilum Höglund, 1947

Pl. 18, fig. 8

Robertinoides pumilum Höglund in Höglund, 1947, p. 227, pl. 18, fig. 5.

Robertinoides pumilum Höglund in Kihle and Løfaldli, 1975, figs. A-B.

Remarks. This species is present in the coral rubble and living coral facies from Norway.

Suborder ROTALIINA Delange and Hérouard, 1896
Superfamily BOLIVINACEA Glaessner, 1937
Family BOLIVINIDAE Glaessner, 1937
Genus Bolivina d’Orbigny, 1839

Type species: Bolivina plicata d’Orbigny, 1839, p. 31.

Bolivina alata (Seguenza, 1862)

Pl. 19, fig. 1

Valvulina alata Seguenza in Seguenza, 1862, p. 115, pl. 2, fig. 5.

Brobolina alata (Seguenza) in Cimerman and Langer, 1991, pl. 61, figs. 12-14.

Bolivina alata (Seguenza) in Sgarrella and Moncharmont-Zei, 1993, p. 207, pl. 14, fig. 8.

Remarks. This species is relatively rare in the mud facies of Norway. It is common off-mound (muddy-sandy sediments) and rarer in the living coral facies of the Porcupine/Rockall region. It is common in the Holocene in the buried coral facies from the Lopphavet. It is present but never abundant in the buried coral facies from the Alboran Sea. We retain here the generic attribution to Bolivina, accepted in Hayward and others (2013).

Bolivina dilatata (Reuss, 1850)

Pl. 19, fig. 2

Brizalina dilatata Reuss in Reuss, 1850, p. 381, pl. 48, figs. 15 a-c.

Brizalina dilatata (Reuss) in Cimerman and Langer, 1991, p. 59, pl. 62, fig. 2.

Remarks. This species characterizes the muddy-sandy fractions in all facies in Norway and it is very rare in the Porcupine Seabight and Alboran Sea. All the observed specimens show the typical crenulation of the sutures and the rough surface of the wall texture.

Bolivina pseudoplicata Heron-Allen and Earland, 1930

Pl. 19, fig. 4

Bolivina pseudoplicata Heron-Allen and Earland in Heron-Allen and Earland, 1930, p. 81, pl. 3, figs. 36-40.


Remarks. This species characterizes the muddy-sandy fractions in all facies in Norway and it is very rare in the Porcupine Seabight and Alboran Sea. All the observed specimens show the typical crenulation of the sutures and the rough surface of the wall texture.

Bolivina difformis (Williamson, 1858)

Pl. 19, fig. 6

Textularia variabilis var. difformis Williamson in Williamson, 1858, p. 77, pl. 6, figs. 166-167.

Bolivina difformis (Williamson) in Cushman, 1937, p. 164, pl. 15, figs. 13, 17.

Bolivina difformis (Williamson) in Cimerman and Langer, 1991, pl. 61, figs. 9-11.

Brizalina difformis (Williamson) in Murray, 2003, p. 20, pl. 6, fig. 2.

Remarks. This species is generally rare in the coral rubble and pebbly sand facies from the Norwegian margin. It is common to abundant in the buried coral facies from the Alboran Sea. All the observed specimens display the spine-like elongation of the chambers along the peripheral margin.

Bolivina spinescens (Cushman, 1911)

Pl. 19, fig. 7

Bolivina textilarioides Brady in Brady, 1884, p. 419, pl. 52, figs. 24-25.

Bolivina spinescens Cushman in Cushman, 1911, p. 47, fig. 76.

Remarks. This species is very rare and present only in the coral rubble facies along the Norwegian margin.

Bolivina subsplinescens Cushman, 1922

Pl. 19, fig. 8

Bolivina subsplinescens Cushman in Cushman, 1922, p. 48, pl. 7, fig. 5.

Brizalina subsplinescens (Cushman) in Gabel, 1971, p. 54, pl. 15, figs. 4-5.


Remarks. It is rare in the coral rubble, pebbly sand and sediment clogged framework facies in Norway. It is very rare in the off-mound (muddy) and dropstone facies from the Porcupine/Rockall region, and rare to
common in the Alboran Sea. We retain here the generic attribution of *Bolivina* according to the accepted genus in Hayward and others (2013).

**Genus Bolivinellina Saidova, 1975**
Type species: *Bolivinellina pescicula* Saidova, 1975, p. 301.

*Bolivinellina pseudopunctata* (Höglund, 1947)
Pl. 19, fig. 3


*Bolivinellina pseudopunctata* (Höglund) in Murray, 2003, p. 20, pl. 6, fig. 1.

**Remarks.** This species is very rare and characteristic of the coral rubble facies from Norway, and from the off-mound facies from the Porcupine Seabight. It is slightly more abundant in the buried coral facies of the Alboran Sea.

*Bolivinellina striatula* (Cushman, 1922)
Pl. 19, fig. 5

*Bolivina striatula* Cushman in Cushman, 1922, p. 27, pl. 3, fig. 10.

*Bolivina striatula* Cushman in Cushman, 1937, p. 154, pl. 18, figs. 30, 31.

*Brizalina striatula* (Cushman) in Cimerman and Langer, 1991, p. 60, pl. 62, figs. 6-9.

**Remarks.** This species is very rare (one sample only) from the coral rubble facies from Norway, it is present but rare in the buried coral facies from the Alboran Sea and very rare in the off-mound facies and the finest sediments from within the living coral branches in the living coral facies.

**Genus Brizalina Costa, 1856**
Type species: *Brizalina aenariensis* Costa, 1856, p. 296.

*Brizalina subaenariensis* (Cushman, 1922)
Pl. 20, fig. 1

*Bolivina aenariensis* Costa in Brady, 1884, p. 423, pl. 53, figs. 10-11.

*Brizalina subaenariensis* Cushman in Cushman, 1922, p. 46, pl. 7, fig. 6.

**Remarks.** It is very rare in the off-mound facies from the Porcupine/Rockall region and in the buried coral facies from the Alboran Sea.

Superfamily CASSIDULINACEA d’Orbigny, 1839
Family CASSIDULINIDAE d’Orbigny, 1839
Subfamily CASSIDULININAE d’Orbigny, 1839

**Genus Cassidulina d’Orbigny, 1826**
Type species: *Cassidulina laevigata* d’Orbigny, 1826, p. 282.

*Cassidulina laevigata* d’Orbigny in d’Orbigny, 1826, p. 282, pl. 15, figs. 4-5.

*Cassidulina laevigata* d’Orbigny in Cimerman and Langer, 1991, p. 61, pl. 63, figs. 1-3.

*Cassidulina laevigata* d’Orbigny in Murray, 2003, p. 21, pl. 6, fig. 10.

*Cassidulina laevigata* d’Orbigny in Milker and Schmiedl, 2012, p. 83, figs. 20.5-6.

**Remarks.** It is always present in samples from the Norwegian margin and is generally more abundant in the muddy facies, off-mound, coral rubble facies and among living coral branches. It is common in the buried coral facies from the Alboran Sea and in the off-mound facies of the Porcupine/Rockall region.

*Cassidulina reniforme* Nørvang, 1945
Pl. 20, fig. 3

*Cassidulina crassa* d’Orbigny var. *reniforme* Nørvang in Nørvang, 1945, p. 41, fig. 6.

*Cassidulina reniforme* Nørvang in Wollenburg and Mackensen, 2009, p. 18, pl. 3, fig. 12.

**Remarks.** This species is very rare and present only in the coral rubble facies along the Norwegian margin. It shows the slightly marked typical sutures as in the holotype.

*Cassidulina carinata* Silvestri, 1896
Pl. 20, fig. 5

*Cassidulina laevigata* d’Orbigny var. *carinata* Silvestri in Silvestri, 1896, p. 104, pl. 2, fig. 10.

*Cassidulina laevigata carinata* Silvestri in Jorissen, 1987, p. 34, pl. 1, fig. 8.

*Cassidulina carinata* Silvestri in Sagrell and Moncharmont-Zei, 1993, p. 236, pl. 23, figs. 8-9.

*Cassidulina laevigata carinata* Silvestri in Seidenkrantz, 1995, p. 148, pl. 1, figs. 7-9; p. 156, pl. 5, figs. 7-8.

**Remarks.** It is present in most of the samples from the Norwegian margin and shows a marked preference for
muddy-sandy sediment in all facies. It is very abundant to dominant in the off-mound facies from the Porcupine Seabight and it is common to abundant in the Alboran Sea. It is distinguished from *C. laevigata* by the distinct keel along the peripheral margin.

*Cassidulina teretis* Tappan, 1951

*Pl. 20, fig. 6*

*Cassidulina teretis* Tappan in Tappan, 1951, p. 7, pl. 1, fig. 30.
*Cassidulina teretis* Tappan in Holbourn and others, 2013, p. 138-139, figs. 1-5.

Remarks. This species has been found only in the mud facies from the Norwegian margin. *Cassidulina teretis* differs from *C. neoteretis* by its crescent-shaped, serrate, apertural plate, while *C. neoteretis* has smooth, broader apertural plate with a more distinct angle at the marginal end giving a subtriangular shape (Seidenkrantz, 1995).

*Cassidulina neoteretis* Seidenkrantz, 1995

*Pl. 21, fig. 1*

*Cassidulina neoteretis* Seidenkrantz in Wollenburg and Mackensen, 2009, p. 18, fig. 3, fig. 10.

Remarks. This species has been found only in the pebbly sand facies from the Norwegian margin.

*Cassidulina crassa* d’Orbigny, 1839

*Pl. 21, fig. 3*

*Cassidulina crassa* d’Orbigny in d’Orbigny, 1839, p. 56, pl. 7, figs. 18-20.
*Cassidulina crassa* d’Orbigny in Jones, 1994, p. 60, pl. 54, fig. 4.
*Cassidulina crassa* d’Orbigny in Wollenburg and Mackensen, 2009, p. 18, fig. 3, fig. 9.

Remarks. This species has been found only in the pebbly sand facies from the Norwegian margin. It differs from the other species of the genus *Cassidulina* by having a very thick and massive shell.

Genus *Takayanagia* Nomura, 1983

Type species: *Cassidulina delicata* Cushman, 1927, p. 168.

*Takayanagia delicata* (Cushman, 1927)

*Pl. 21, fig. 2*

*Cassidulina delicata* Cushman in Cushman, 1927, p. 168, pl. 6, fig. 5.
*Takayanagia delicata* (Cushman) in Loeblich and Tappan, 1987, p. 507, pl. 560, figs. 5-10.

Remarks. It is present in the mud facies (off-mound) from the Porcupine/Rockall region. This species is included in the genus *Takayanagia* Nomura instead of *Cassidulina* d’Orbigny because of the optical characteristic of the wall texture, which is radial instead of granular.

Genus *Globocassidulina* Voloshinova, 1960

Type species: *Cassidulina globosa* Hantken, 1876, p. 64.

*Globocassidulina subglobosa* (Brady, 1881)

*Pl. 21, fig. 4*

*Cassidulina subglobosa* Brady in Brady, 1881, p. 60, pl. 54, fig. 17.
*Globocassidulina subglobosa* (Brady) in Jones, 1994, p. 60, pl. 54, fig. 17.
*Globocassidulina subglobosa* (Brady) in Murray, 2003, p. 24, pl. 8, fig. 7.
*Globocassidulina subglobosa* (Brady) in Cimerman and Langer, 1991, p. 61, pl. 63, figs. 4-6.
*Globocassidulina subglobosa* (Brady) in Holbourn and others, 2013, p. 264-265, figs 1-2.

Remarks. This species is generally common in the Alboran Sea, it is continuously present but more abundant in mud facies (off-mound) from the Porcupine/Rockall region and Norwegian margin.

Genus *Cassidulinoides* Cushman, 1927

Type species: *Cassidulina parkeriana* Brady, 1881, p. 59.

*Cassidulinoides bradyi* (Norman, 1881)

*Pl. 21, fig. 6*

*Cassidulinoides bradyi* Norman in Norman, 1881, p. 59, pl. 54, figs. 6-10 (fide Ellis and Messina, 1940 and later).
*Cassidulinoides bradyi* (Norman) in Sgarrella and Moncharmont-Zei, 1993, p. 211, pl. 4, fig. 5.
*Cassidulinoides bradyi* (Norman) in Milker and Schmiedl, 2012, p. 84, fig. 20.9.

Remarks. This species is present, but never abundant, in the buried coral facies from the Alboran Sea. It also

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characterizes the mud and pebbly sand facies from Norway.

Genus Islandiella Nørvang, 1959
Type species: Cassidulina islandica Nørvang, 1945, p. 41.

Islandiella norcrossi (Cushman, 1933)
Pl. 21, fig. 5
Cassidulina norcrossi Cushman in Cushman, 1933, p. 7, pl. 2, fig. 7.
Islandiella norcrossi (Cushman) in Wollenburg and Mackensen, 2009, p. 18, text-fig. 3, fig. 13.

Remarks. This species is included in the genus Islandiella following Wollenburg and Mackensen (2009), because of its radial wall texture and internal tooth, although in the observed specimens these structures were not investigated in detail. It is present in the coral rubble facies from Norway.

Subfamily EHRENBERGININAE Cushman, 1927
Genus Ehrenbergina Reuss, 1850
Type species: Ehrenbergina serrata Reuss, 1850, p. 377.

Ehrenbergina trigona Goës, 1896
Pl. 22, fig. 1
Ehrenbergina serrata Brady var. trigona Goës in Goës, 1896, p. 434, pl. 55, figs. 2-7.
Ehrenbergina trigona Goës in Jones, 1994, p. 61, pl. 55, figs. 2-3, 5.
Ehrenbergina trigona Goës in Hermelin and Scott, 1985, p. 206, pl. 4, figs. 15-16.

Remarks. This species is very rare and present only in the dropstone facies from the Porcupine/Rockall area. One specimen has been found also in the living coral facies in the Porcupine Seabight.

Superfamily TURRILINACEA Cushman, 1927
Family STAINFORTHIIDAE Reiss, 1963
Genus Stainforthia Hofker, 1956
Type species: Virgulina concava Höglund, 1947, p. 257.

Stainforthia fusiformis (Williamson, 1858)
Pl. 22, fig. 2

Stainforthia loeblichi (Feyling-Hanssen, 1954)
Pl. 22, fig. 3
Stainforthia loeblichi (Feyling-Hanssen) in Kihle and Lafaldli, 1975, figs. A-B.

Remarks. It differs from S. fusiformis in being more elongated and less inflated. However, both species share similar ecological conditions; it is present along the Norwegian margin from the muddy-sandy sediments in several facies.

Stainforthia skagerakensis (Höglund, 1947)
Pl. 22, fig. 5
Stainforthia skagerakensis (Höglund) in Kihle and Lafaldli, 1975, figs. A-C.

Remarks. This species is typical of the same facies as the other species of the genus Stainforthia. It differs from S. fusiformis and S. loeblichi in having the most elongated test.

Superfamily BULIMINACEA Jones, 1875 in Griffith and Henfrey, 1875
Family SIPHOGENERINOIDIDAE Saidova, 1981
Subfamily SIPHOGENERINOIDINAE Saidova, 1981
Genus Parabrizalina Zweig-Strykowski and Reiss, 1976
Type species: Bolivina porrecta Brady, 1881, p. 57.
Parabrizalina porrecta (Brady, 1881)
Pl. 20, fig. 2
**TAXONOMY AND ILLUSTRATION OF BENTHIC FORAMINIFERA**

*Bulimina* (*Bolivina*) *porrecta* Brady in Brady, 1881, p. 57, pl. 52, fig. 22.

*Parabrizalina* *porrecta* (Brady) in Holbourn and others, 2013, p. 390-391, figs. 1-2.

**Remarks.** Only a few specimens have been observed in the pebbly sand facies from Norway and in the buried coral facies of Lopphavet.

Subfamily *TUBULOGENERININAE* Saidova, 1981

Genus *Rectuvigerina* Mathews, 1945

Type species: *Siphogenerina multicostata* Cushman and Jarvis, 1929, p. 14.

*Rectuvigerina* *elongatastriata* (Colom, 1952)  
Pl. 22, fig. 6

*Uvigerina* *cf. tenuistriata* Reuss in Colom, 1952, p. 17, pl. 3, figs. 57-58.

*Angulogerina* *elongatastriata* (Colom) in Colom, 1952, p. 29, pl. 4, figs. 6-9.

*Rectuvigerina* *elongatastriata* (Colom) in Cimerman and Langer, 1991, p. 61, pl. 63, figs. 7-9.

**Remarks.** This species is only present in the buried coral facies from the Alboran Sea where it is rare to common.

Genus *Siphogenerina* Schlumberger, 1882

Type species: *Siphogenerina costata* Schlumberger, 1883, p. 26.

*Siphogenerina* *columellaris* (Brady, 1881)  
Pl. 22, fig. 7

*Uvigerina* *columellaris* Brady in Brady, 1881, p. 64, pl. 75, figs. 15-17.

*Siphogenerina* *columellaris* (Brady) in Jones, 1994, p. 87, pl. 75, figs. 15-17.

**Remarks.** This species has been found in the Alboran Sea only, where it is generally very rare. The observed specimens strongly resemble the holotype, with a very small triserial initial coiling and a long series of uniserial chambers.

Family *BULIMINIDAE* Jones, 1875 in Griffith and Henfrey, 1875

Genus *Bulimina* d’Orbigny, 1826

Type species: *Bulimina marginata* d’Orbigny, 1826, p. 269.

*Bulimina* *marginata* d’Orbigny, 1826  
Pl. 22, fig. 9

*Bulimina* *marginata* d’Orbigny in *d’Orbigny, 1826, p. 269, pl. 12, figs. 10-12.


*Bulimina marginata* d’Orbigny in Cimerman and Langer, 1991, p. 62, pl. 64, figs. 9-11.

*Bulimina marginata* d’Orbigny in Murray, 2003, p. 20, pl. 6, figs. 4-5.

*Bulimina marginata* d’Orbigny in Milker and Schmiedl, 2012, p. 87, fig. 20.23.

*Bulimina marginata* d’Orbigny in Holbourn and others, 2013, p. 108-109, figs. 1-2.

**Remarks.** This species characterizes the muddy sandy sediments from all facies along the Norwegian margin. It is abundant to very abundant both in the off-mound sediments from the Porcupine/Rockall region and the buried coral facies from the Alboran Sea.

*Bulimina* *aculeata* d’Orbigny, 1826  
Pl. 22, fig. 8

*Bulimina* *aculeata* d’Orbigny in *d’Orbigny, 1826, p. 269, n. 7.

*Bulimina* *aculeata* d’Orbigny in Cimerman and Langer, 1991, p. 61, pl. 63, figs. 10-11.

*Bulimina* *aculeata* d’Orbigny in Sgarrella and Moncharmont-Zei, 1993, p. 211, pl. 15, fig. 1.

*Bulimina* *aculeata* d’Orbigny in Murray, 2003, p. 20, pl. 6, figs. 4-5.

*Bulimina* *aculeata* d’Orbigny in Van Marle, 1991, p. 88, pl. 5, figs. 6-8.

*Bulimina* *aculeata* d’Orbigny in Loeblich and Tappan, 1994, p. 125, pl. 242, figs. 8-14.

**Remarks.** This species is very rare in the coral rubble and sediment clogged framework coral facies from the Norwegian margin. It is present but never abundant in the buried coral facies from Norway and common in the off-mound (muddy) facies in the Porcupine/Rockall Basin. In some specimens the spines-like structures in the aboral part of the test are very well developed, in others they resemble short pustules.

*Bulimina* *striata* d’Orbigny, 1826  
Pl. 22, fig. 10

*Bulimina* *striata* d’Orbigny in *d’Orbigny, 1826, p. 269.

*Bulimina* *infinita* Seguenza in Brady, 1884, p. 406, pl. 51, figs. 11, 13.

*Bulimina* *striata* var. *notoensis* Asano in Wang and others, 1988, p. 150, pl. 21, fig. 4.

*Bulimina* *striata* d’Orbigny in Akimoto, 1990, p. 194, pl. 16, fig. 8.

*Bulimina* *striata* d’Orbigny in Van Marle, 1991, p. 88, pl. 5, figs. 6-8.

*Bulimina* *striata* d’Orbigny in Holbourn and others, 2013, p. 125, pl. 242, figs. 8-14.

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Remarks. It is rare to common in the Alboran Sea and very rare in the off-mound sediments of the Porcupine/Rockall region.

Genus *Globobulimina* Cushman, 1927
Type species: *Globobulimina pacifica* Cushman, 1927, p. 67.

*Globobulimina affinis* (d’Orbigny, 1839)

Pl. 23, fig. 2

*Bulimina affinis* d’Orbigny in d’Orbigny, 1839, p. 105, pl. 2, figs. 25-26.
*Bulimina affinis* d’Orbigny in Brady, 1884, p. 400, pl. 50, fig. 14.
*Bulimina affinis* d’Orbigny in Cushman, 1911, p. 79, text-fig. 130.
*Bulimina affinis* d’Orbigny in Phleger and Parker, 1951, p. 15, pl. 7, figs. 21-22.
*Globobulimina affinis* (d’Orbigny) in Sgarrella and Moncharmont-Zei, 1993, 212, pl. 15, figs. 8-9.
*Globobulimina affinis* (d’Orbigny) in Milker and Schmiedl, 2012, p. 89, fig. 20.24.

Remarks. This species is very rare and present only in the off-mound mud facies of the Porcupine Seabight.

Family *BULIMINELLIDAE* Hofker, 1951
Genus *Buliminella* Cushman, 1911
Type species: *Bulimina elegantissima* d’Orbigny, 1839, p. 51.

*Globobulimina doliolum* (Terquem and Terquem, 1886)

Pl. 23, fig. 5

*Bulimina doliolum* Terquem and Terquem in Terquem and Terquem, 1886, p. 333, pl. 11, figs. 17-18.

Remarks. This species is very rare in the living coral facies from Norway. It is more abundant in the buried coral facies from the Lopphavet reef (Northern Norway).

*Globobulimina turgida* (Bailey, 1851)

Pl. 23, fig. 1

*Bulimina turgida* Bailey in Bailey, 1851, p. 12, figs. 28-31, 67.
*Globobulimina turgida* (Bailey) in Gabel, 1971, p. 52, pl. 14, fig. 21.

Remarks. This species is present, but very rare only in the mud facies from the Oslo Fjord. It differs from the other species belonging to the genus *Globobulimina* by its more spherical morphology.

Genus *Praeglobobulimina* Hofker, 1951
Type species: *Bulimina pyrula* d’Orbigny var. *spinescens* Brady, 1884, p. 400.

*Praeglobobulimina ovata* (d’Orbigny, 1846)

Pl. 23, fig. 4

*Bulimina ovata* d’Orbigny in d’Orbigny, 1846, p. 185, pl. 11, figs. 13-14.
*Bulimina ovata* d’Orbigny in Brady, 1884, p. 400, pl. 50, fig. 13.
*Praeglobobulimina ovata* (d’Orbigny) in Jones, 1994, p. 54, pl. 50, fig. 13.

Remarks. This species is very rare and present only in the off-mound mud facies of the Porcupine Seabight.

Genus *Uvigerina* d’Orbigny, 1826
Type species: *Uvigerina pygmaea* d’Orbigny, 1826, p. 268.

*Uvigerina pygmaea* d’Orbigny, 1826

Pl. 24, fig. 5

*Uvigerina pygmaea* d’Orbigny in d’Orbigny, 1826, p. 269, pl. 12, figs. 8-9.
*Uvigerina pygmaea* d’Orbigny in Thomas, 1980, pl. 3, fig. 3.
*Uvigerina pygmaea* d’Orbigny in Timm, 1992, p. 68, pl. 6, figs. 1a, b.
*Uvigerina pygmaea* d’Orbigny in Lütze, 1986, p. 36, pl. 3, figs. 6-8.
*Uvigerina pygmaea* d’Orbigny in Schönfeld, 2006, p. 357, pl. 1, figs. 6-11.
*Uvigerina pygmaea* d’Orbigny in Holbourn and others, 2013, p. 600-601, figs. 1-3.
**Remarks.** This species is rare and recorded only in the living coral facies from the Porcupine Seabight.

*Uvigerina auberiana* d’Orbigny, 1839

Pl. 24, fig. 3

Uvigerina auberiana d’Orbigny in d’Orbigny, 1839, p. 106, pl. 2, figs. 23-24.

Uvigerina auberiana vari. auberiana d’Orbigny in Brady, 1884, p. 578, pl. 75, figs. 6-8.

Uvigerina auberiana d’Orbigny in Ujiié, 1990, p. 31, pl. 13, figs. 7-8.

Uvigerina auberiana d’Orbigny in Jones, 1994, p. 86, pl. 75, figs. 6-9.

Remarks. It is very rare in the Alboran Sea, where it occurs only in a few samples. It is very rare in the pebbly sand facies along the Norwegian margin and in the off-mound facies from the Porcupine Seabight. In this region it rarely occurs also in the living coral facies.

*Uvigerina mediterranea* Hofker, 1932

Pl. 24, fig. 1

Uvigerina mediterranea Hofker in Hofker, 1932, p. 118, fig. 32.


Uvigerina mediterranea Hofker in Milker and Schmiedl, 2012, p. 89, fig. 20.28.

Remarks. This species is present only in a few samples from the pebbly sand facies from Norway. It is abundant in the mud and dropstone facies from the Porcupine/Rockall region, and abundant in the buried coral facies from the Alboran Sea. It differs from *U. mediterranea* by the more spaced and thicker costae that ornament the wall of the test.

*Uvigerina peregrina* Cushman, 1923

Pl. 24, fig. 2

Uvigerina peregrina Cushman in Cushman, 1923, p. 166, pl. 42, figs. 7-10.


Remarks. This species is rare and observed only in one sample from the living coral facies from the Porcupine region. It differs from *U. peregrina* in its less elongated morphology and the more inflated chambers.

**Genus Trifarina** Cushman, 1923

Type species: *Trifarina bradyi* Cushman, 1923, p. 99.

*Trifarina bradyi* (Cushman, 1923)

Pl. 24, fig. 7

Rhabdogonium tricarinatum d’Orbigny in Brady, 1884, p. 525, pl. 67, figs. 1-3.

Trifarina bradyana Cushman in Cushman, 1923, p. 99, pl. 22, figs. 3-9.


Trifarina bradyana Cushman in Jones, 1994, p. 78, pl. 67, figs. 1-3.

Trifarina bradyana Cushman in Loeblich and Tappan, 1994, p. 128, pl. 251, figs. 6-16.

Trifarina bradyana Cushman in Holbourn and others, 2013, p. 560-561, figs. 1-2.

Remarks. It is present in the pebbly sand and coral rubble from the Norwegian margin. It rarely occurs in the living coral facies from the Porcupine Seabight and it is very rare also in the buried coral facies from the
Alboran Sea. It differs from *T. fornasini* for its more elongated and less inflated test.

*Trifarina angulosa* (Williamson, 1858)  
Pl. 24, fig. 6  
*Uvigerina angulosa* Williamson in Williamson, 1858, p. 67, pl. 5, fig. 140.  
*Trifarina angulosa* (Williamson) in Barker, 1960, pl. 74, figs. 15-16.  
*Angulogerina angulosa* (Williamson) in Loeblich and Tappan, 1987, p. 525, pl. 574, figs. 5-9.  
*Trifarina angulosa* (Williamson) in Holbourn and others, 2013, p. 558-559, figs. 1-4.

Remarks. This species is present in the fine sediment fraction (muddy-sandy) from all facies along the Norwegian margin. It is relatively abundant in the off-mound facies from the Porcupine/Rockall region. It rarely occurs in the dropstone facies and it is common to abundant in the Holocene buried coral facies from the Lopphavet area. In the Alboran Sea this species is generally present but not abundant.

*Trifarina fornasini* (Selli, 1948)  
Pl. 24, fig. 8  
*Angulogerina fornasini* Selli in Selli, 1948, p. 40, pl. 43, figs. 1-4.  
*Trifarina fornasini* (Selli) in Milker and Schmiedl, 2012, p. 91, fig. 21.5.

Remarks. This species is very rare and present only in the Alboran Sea. It differs from *T. bradyi* in having more inflated and less elongated test.

Superfamily FURSENKOINACEA Loeblich and Tappan, 1961  
Family FURSENKOINIDAE Loeblich and Tappan, 1961  
Genus *Fursenkoina* Loeblich and Tappan, 1961  
Type species: *Virgulina squammosa* d’Orbigny, 1826, p. 267.

*Fursenkoina complanata* (Egger, 1893)  
Pl. 22, fig. 4  
*Virgulina schreibersiana* Cziczcek var. *complanata* Egger in Egger, 1893, p. 292, pl. 8, figs. 91-92.

*Sagrina virgula* Brady in Brady, 1884, pl. 76, fig. 8.  
*Fursenkoina virgula* (Brady) in Jones, 1994, p. 88, pl. 76, fig. 8; suppl. pl. 2, figs. 2-3, 14.

Remarks. This species is only observed from the mud facies along the Norwegian margin where it is very rare.

Superfamily DISCORBACEA Ehrenberg, 1838  
Family BAGGINIDAE Cushman, 1927  
Subfamily BAGGININAE Cushman, 1927  
Genus *Cancris* de Montfort, 1808  
Type species: *Nautilus auricula* Fichtel and Moll, 1798, p. 108.

*Cancris auriculus* (Fichtel and Moll, 1798)  
Pl. 24, fig. 10  
*Nautilus auricula* Fichtel and Moll in Fichtel and Moll, 1798, p. 102, pl. 18, figs. g-i.  
*Cancris auriculus* (Fichtel and Moll) in Jones, 1994, p. 105, pl. 106, fig. 4.  
*Cancris auricula* (Fichtel and Moll) in Murray, 2003, p. 19, pl. 6, figs. 6-7.  
*Cancris auriculas* (Fichtel and Moll) in Holbourn and others, 2013, p. 134-135, figs. 1-3.

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Remarks. This species is only recorded in a few samples from the buried coral facies of the Alboran Sea and Lopphavet area.

Genus Valvulineria Cushman, 1926
Type species: *Valvulineria californica* Cushman, 1926, p. 59.

*Valvulineria bradyana* (Fornasini, 1900)
Pl. 25, fig. 1

Discorbina bradyana Fornasini in Fornasini, 1900, p. 393, text-fig. 43.

Valvulineria bradyana (Fornasini) in Sgarrella and Moncharmont-Zei, 1993, 220, pl. 18, figs. 1-2.

Remarks. This species is rarely observed in the mud and coral rubble facies along the Norwegian margin, and it is present, but rare, in the buried coral facies of the Alboran Sea.

Family EPONIDIDAE Hofker, 1951
Subfamily EPONIDINAE Hofker, 1951

Genus Ioanella Saidova, 1975
Type species: *Truncatulina tumidula* Brady, 1884, p. 666.

*Ioanella tumidula* (Brady, 1884)
Pl. 25, fig. 2

Truncatulina tumidula Brady in Brady, 1884, p. 666, pl. 95, fig. 8.

Ioanella tumidula (Brady) in Duchemin and others, 2007, p. 18, pl. 3, figs. 16-18.

Ioanella tumidula (Brady) in Wollenburg and Mackensen, 2009, p. 18, text-fig. 3, fig. 4.

Ioanella tumidula (Brady) in Holbourn and others, 2013, p. 312-313, figs. 1-5.

Remarks. This species is very rare in the pebbly sand facies and in the living coral facies from Norway and in the buried coral facies of the Lopphavet.

Subfamily STOMATORBININAE Saidova, 1981

Genus Stomatorbina Doreen, 1948
Type species: *Lamarckina torrei* Cushman and Bermudez, 1937, p. 21.

*Stomatorbina concentrica* (Parker and Jones, 1864)
Pl. 25, fig. 3

Pulvinulina concentrica Parker and Jones in Parker and Jones, 1864, p. 470, pl. 48, fig. 14.

Stomatorbina concentrica (Parker and Jones) in Cimerman and Langer, 1991, p. 65, pl. 68, figs. 7-9.

Mississippina concentrica (Parker and Jones) in Jones, 1994, p. 104, pl. 105, fig. 1.

Stomatorbina concentrica (Parker and Jones) in Milker and Schmiedl, 2012, p. 95, figs. 21-24-25.

Remarks. This species is rarely observed in the dead coral facies from the Porcupine Seabight. It is also very rare in the buried coral facies from the Alboran Sea and Lopphavet and present in the coral rubble facies from Norway. Along the Norwegian margin it rarely occurs in the living coral facies.

Family ROSALINIDAE Reiss, 1963

Genus Hyrrokkin Cedhagen, 1994
Type species: *Hyrrokkin sarcophaga* Cedhagen, 1994, p. 66.

Hyrrokkin sarcophagahagen, 1994
Pl. 25, figs. 4-5

Pulvinulina repanda var. punctulata d’Orbigny in Parker and Jones, 1865, p. 394, pl. 14, figs. 12-13.

Rosalina carnivora Todd in Todd, 1965, pp. 834-835, pl. 1, figs. 1-3; pl. 2, figs. 1-4; pl. 3, fig. 1.

Hyrrokkin sarcophaga Cedhagen in Cedhagen, 1994, p. 66, text-figs. 1-17.

Hyrrokkin sarcophaga Cedhagen in Freiwald and Schonfeld, 1996, p. 202, text-fig. 2.

Remarks. This species occurs in the coral rubble and pebbly sand facies from Norway, the buried coral facies from the Lopphavet and the living coral facies from the Porcupine Seabight. It is very rare in the Alboran Sea. The first description of this species was given in Parker and others (1865) as *Pulvinulina repanda var. punctulata* d’Orbigny, 1826. However, the description does not correspond to the holotype of d’Orbigny deposited at the National History Museum in Paris (Cedhagen, 1994). The name *Hyrrokkin sarcophaga* was introduced by Cedhagen (1994) to designate species corresponding to the description of *Pulvinulina repanda var. punctulata* d’Orbigny, 1826 sensu Parker and others (1865). This species differs from *Rosalina carnivora* Todd 1965 by having a more rounded peripheral margin.
Genus *Gavelinopsis* Hofker, 1951

Type species: *Discorbina praegeri* Heron-Allen and Earland, 1913, p. 122.

*Gavelinopsis nitida* (Williamson, 1858)

Pl. 26, fig. 1

Rotalina nitida Williamson in Williamson, 1858, p. 54, pl. 4, figs. 106-108.

*Discorbina nitida* (Williamson) in Heron-Allen and Earland, 1913, p. 269, pl. 42, figs. 26-30

*Discorbis nitida* (Williamson) in Cushman, 1931, p. 26, pl. 6, fig. 1.

Remarks. This species is rare in the coral rubble and pebbly sand facies and slightly more abundant in the living coral facies from Norway and the buried facies from Lopphavet. It differs from *G. praegeri* in the absence of the umbilical boss.

*Gavelinopsis praegeri* (Heron-Allen and Earland, 1913)

Pl. 26, fig. 2

*Discorbina praegeri* Heron-Allen and Earland in Heron-Allen and Earland, 1913, p. 122, pl. 10, figs. 8-10.

*Gavelinopsis praegeri* (Heron-Allen and Earland) in Hofker, 1951, p. 486, text-figs. 332-334.


*Gavelinopsis praegeri* (Heron-Allen and Earland) in Loeblich and Tappan, 1987, p. 560, pl. 608, figs. 6-12.


*Gavelinopsis praegeri* (Heron-Allen and Earland) in Murray, 2003, p. 24, pl. 8, figs. 5-6.

*Gavelinopsis praegeri* (Heron-Allen and Earland) in Milker and Schmiedl, 2012, p. 96, figs. 22-3-4.

Remarks. This species does not show any habitat preference and it is present in variable numbers in all facies. It is, however, slightly more abundant in the off-mound facies from the Porcupine Seabight. It is abundant in the buried coral facies from the Alboran Sea and Lopphavet. The observed specimens all show a well-marked boss in the umbilical area.

*Gavelinopsis caledonia* Murray and Whittaker, 2001

Pl. 26, fig. 3

*Gavelinopsis caledonia* Murray and Whittaker in Murray and Whittaker, 2001, p. 179, pl. 1, figs. 1-10; pl. 2, figs. 1-7.

*Gavelinopsis caledonia* Murray and Whittaker in Murray, 2003, p. 24, pl. 8, figs. 2-4.

Remarks. This species is present and relatively common in one sample from the coral rubble facies from Norway. It differs from the other species of the genus *Gavelinopsis* by its flatter morphology and more rounded peripheral margin.

Genus *Rosalina* d’Orbigny, 1826

Type species: *Rosalina globularis* d’Orbigny, 1826, p. 62.

*Rosalina globularis* d’Orbigny, 1826

Pl. 26, fig. 4

Rosalina globularis d’Orbigny in d’Orbigny, 1826, p. 271, pl. 13, figs. 1-4.

*Discorbina globularis* (d’Orbigny) in Brady, 1884, p. 643, pl. 86, fig. 13.

*Rosalina globularis* d’Orbigny in Todd, 1965, p. 11, pl. 3, fig. 4.

*Rosalina globularis* d’Orbigny in Loeblich and Tappan, 1987, p. 561, pl. 610, figs. 1-5; pl. 611, figs. 1-3.

*Rosalina globularis* d’Orbigny in Jones, 1994, p. 93, pl. 86, fig. 13.

Remarks. This species is present in the coral rubble and pebbly sand facies from Norway where it has been rarely observed also in the living coral facies. It is rather common in the buried coral facies from the Alboran Sea and Lopphavet. It differs from *R. brady* in its depressed sutures and for the chamber morphology on the umbilical side. Chambers do not show the triangular prolongation into the umbilicus that is normally seen in *R. brady*.

*Rosalina brady* (Cushman, 1915)

Pl. 26, fig. 5

*Discorbina globularis* var. *bradyi* Cushman in Cushman, 1915, p. 12, pl. 8, fig. 1.

*Discopulvinulina bradyi* (Cushman) in Hofker, 1951, p. 452, fig. 310.


*Rosalina bradyi* (Cushman) in Milker and Schmiedl, 2012, p. 98, figs. 22-9-10.

Remarks. This species rarely occurs in the coral rubble facies from Norway and in the buried coral facies of the Lopphavet area.

*Rosalina semipunctata* (Bailey, 1851)

Pl. 27, fig. 1

Rotalina semipunctata Bailey in Bailey, 1851, p. 11, figs. 17-19, 67.
**Discanomalina semipunctata** (Bailey), in Medioli and Scott, 1978, p. 297, pl. 2, figs. 5-20.

**Remarks.** This species is found in the pebbly sand facies from the Norwegian margin. All specimens display the typical tubulospine-like structures. Medioli and Scott (1978) have included in the genus *Discanomalina* the species *R. semipunctata*, *Discanomalina japonica* and *Discanomalina coronata*. Their revision is not retained herein because *D. coronata* and *D. japonica* are clearly planispiral and *R. semipunctata* is typically trochospiral. In the absence of a morphometric analysis we retain the three morphologies as separate species.

Family SPHAEROIDINIDAE Cushman, 1927

Genus *Sphaeroidina* d’Orbigny, 1826

Type species: *Sphaeroidina bulloides* d’Orbigny, 1826, p. 267.

*Sphaeroidina bulloides* d’Orbigny, 1826

Pl. 27, fig. 2

*Sphaeroidina bulloides* d’Orbigny in d’Orbigny, 1826, p. 267, pl. 2, fig. 58.

*Sphaeroidina bulloides* d’Orbigny in Kihle and Løfaldli, 1975, Figs. A-C.

*Sphaeroidina bulloides* d’Orbigny in Loeblich and Tappan, 1987, p. 564, pl. 617, figs. 1-6.

*Sphaeroidina bulloides* d’Orbigny in Milker and Schmiedl, 2012, p. 100, fig. 23.3-4.

*Sphaeroidina bulloides* d’Orbigny in Holbourn and others, 2013, p. 520-521, figs. 1-3.

**Remarks.** It has been observed in the coral rubble and pebbly sand facies from Norway and the buried coral facies of Lopphavet. It is present in the off-mound and dropstone facies from the Porcupine Seabight, where it rarely occurs in the living coral facies. It is always present and relatively common in the Alboran Sea.

Superfamily GLABRATELLACEA Loeblich and Tappan, 1964

Family GLABRATELLIDAE Loeblich and Tappan, 1964

Genus *Glabratella* Dorreen, 1948

Type species: *Glabratella crassa* Dorreen, 1948, p. 294.

*Glabratella patelliformis* (Brady) in Brady, 1884, p. 647, pl. 88, fig. 3; pl. 89, fig. 1.

*Glabratella patelliformis* (Brady) in Jones, 1994, p. 94, pl. 88, fig. 3; p. 95, pl. 89, fig. 1.

*Glabratella patelliformis* (Brady) in Milker and Schmiedl, 2012, p. 102, fig. 23.16-17.

**Remarks.** This species is very rare and present only in the Alboran Sea samples.

Superfamily SIPHONINACEA Cushman, 1927

Family SIPHONINIDAE Cushman, 1927

Genus *Siphonina* Reuss, 1850

Type species: *Rotalia reticulata* Czjzek, 1848, p. 294.

*Siphonina reticulata* (Czjzek, 1848)

Pl. 27, fig. 4

*Rotalia reticulata* Czjzek in Czjzek, 1848, p. 145, pl. 13, figs. 7-9.

*Siphonina reticulata* (Czjzek) in Cimerman and Langer, 1991, p. 69, pl. 73, figs. 11-13.

*Siphonina reticulata* (Czjzek) in Loeblich and Tappan, 1987, p. 571, pl. 624, figs. 4-6, 13-15.

*Siphonina reticulata* (Czjzek) in Milker and Schmiedl, 2012, p. 103-104, fig. 23.24-26.

**Remarks.** A few specimens of this species have been recorded only in the Alboran Sea.

Superfamily DISCORBINELLACEA Sigal, 1952

Family PARRELLOIDIDAE Hofker, 1956

Genus *Cibicidoides* Thalmann, 1939
Type species: *Truncatulina mundula* Brady, Parker and Jones, 1888, p. 228.

*Cibicidoides mundulus* Brady, Parker and Jones, 1888

Pl. 28, fig. 1

*Truncatulina mundula* Brady, Parker and Jones in Brady, Parker and Jones, 1888, p. 228, pl. 45, fig. 25.

*Cibicides kullenbergi* (Parker) in Boltovskoy, 1978, pl. 3, figs. 9-12.

*Cibicoides mundulus* Brady, Parker and Jones in Hermelin, 1989, p. 86, pl. 17, figs. 9-11.

*Cibicoides mundulus* Brady, Parker and Jones in Holbourn and others, 2013, p. 196-197, figs. 1-8.

Remarks. This species occurs in the coral rubble, pebbly sand and sediment clogged coral facies from the Norwegian margin. Schweizer and others (2009) suggested that *Cibicoides pachyderma* and *C. kullenbergi* may belong to the same species because they form a single clade, we retain the distinction between *C. mundulus* (= *C. kullenbergi*) and *C. pachyderma* because of their distinct morphologies, and occurrence in cold-water coral ecosystems. *Cibicoides mundulus* has a flatter test, it is rare in cold-water coral ecosystems, whereas, *C. pachyderma* is inflated and always very abundant in living coral facies.

*Cibicoides pachyderma* (Rzehak, 1886)

Pl. 28, fig. 2

*Truncatulina pachyderma* Rzehak in Rzehak, 1886, p. 87, pl. 1, fig. 5.

*Truncatulina pseudoungeriana* Cushman in Cushman, 1922b, p. 97, pl. 20, fig. 9.

*Cibicides pseudoungeriana* Cushman in Cushman, 1931, p. 123, pl. 22, fgs. 3-7.

*Cibicoides pachyderma* (Rzehak) in van Morkhoven and others, 1986, p. 68, pl. 22, fig. 1.

*Cibicides pachyderma* (Rzehak) in Jones, 1994, p. 98, pl. 94, fig. 9.


*Cibicides pachyderma* (Rzehak) in Holbourn and others, 2013, p. 198-199, fgs. 1-3.

Remarks. This species is very abundant in the coral rubble and pebbly sand facies from Norway. It is also present, and sometimes abundant, in the off-mound facies from the Porcupine Seabight. It dominates the Holocene buried coral facies from Lopphavet. It is less abundant in the Alboran Sea. Concerning taxonomical attribution see also remarks for *C. mundulus*.

*Cibicoides wuellerstorfi* (Schwager, 1866)

Pl. 30, fig. 2

*Anomalina wuellerstorfi* Schwager in Schwager, 1866, p. 258, pl. 7, fgs. 105, 107.

*Planulina wuellerstorfi* (Schwager) in Cushman, 1931, p. 910, pl. 19, fgs. 5-6.

*Fontbotia wuellerstorfi* (Schwager) in Gonzales-Donoso and Linares, 1970, p. 238, pl. 1, fig. 4.

*Fontbotia wuellerstorfi* (Schwager) in Loeblich and Tappan, 1987, p. 538, pl. 634, fgs. 1-3.

*Cibicides wuellerstorfi* (Schwager) in Jones, 1994, p. 98, pl. 93, fgs. 8-9.

*Cibicides wuellerstorfi* (Schwager) in Abu-Zied and others, 2008, p. 53, pl. 3, fgs. 6-7.

*Planulina wuellerstorfi* (Schwager) in Holbourn and others, 2013, p. 416, fgs. 1-3.

Remarks. This species dominates the mud facies from the Norwegian margin (including the buried facies of Lopphavet). It is rare in the Porcupine Seabight and very rare in the Alboran Sea. According to Schweizer and others (2009) and based on molecular evidence, we include this species in the genus *Cibicoides*.

Family PSEUDOPARRELLIDAE Voloshinova, 1952

Subfamily PSEUDOPARRELLINAE Voloshinova, 1952

Genus *Epistominella* Husezima and Maruhasi, 1944

Type species: *Epistominella pulchella* Husezima and Maruhasi, 1944, p. 397.

*Epistominella vitrea* Parker, 1952

Pl. 28, fig. 3

*Epistominella vitrea* Parker in Parker and others, 1953, p. 9, pl. 4, fgs. 34-36, 40-41.

*Epistominella vitrea* Parker in Hayward and others, 1999, pl. 13, fgs. 14-16.

*Epistominella vitrea* Parker in Duchemin and others, 2007, p. 17, pl. 2, fgs. 5-6.

*Epistominella vitrea* Parker in Margreth and others, 2009, p. 2230, pl. 1, fig. 7.

Remarks. This species is common in the coral rubble and it is rare, but present, in the pebbly sand and sediment clogged coral facies from Norway (including Lopphavet). It does not show any habitat preference in the Porcupine Seabight where it is, however, more abundant in the off-mound sediments. It is rare in the Alboran Sea.
**TAXONOMY AND ILLUSTRATION OF BENTHIC FORAMINIFERA**

*Epistominella exigua* (Brady, 1884)

Pl. 28, fig. 4

*Pulvinulina exigua* Brady in Brady, 1884, p. 696, pl. 103, figs. 13-14.

*Epistominella exigua* (Brady) in Hermelin and Scott, 1985, p. 208, pl. 4, fig. 1.

*Epistominella exigua* (Brady) in Wollenburg and Mackensen, 2009, p. 18, text-fig. 3, fig. 5.

*Epistominella exigua* (Brady) in Margreth and others, 2009, p. 2230, pl. 1, fig. 6.

*Epistominella exigua* (Brady) in Holbourn and others, 2013, p. 240-241, figs. 1-6.

**Remarks.** This species is common in the mud facies and slightly rarer but present in the pebbly sand and sediment clogged coral facies from Norway (including Lopphavet). It is present in the off-mound facies from the Porcupine Seabight and it is rare in the Alboran Sea.

**Family DISCORBINELLIDAE** Sigal, 1952

**Subfamily DISCORBINELLINAE** Sigal, 1952

**Genus Discorbinella** Cushman and Martin, 1935

Type species: *Discorbinella montereyensis* Cushman and Martin, 1935, p. 89.

*Discorbinella bertheloti* (d’Orbigny, 1839)

Pl. 28, fig. 5

*Rosalina bertheloti* d’Orbigny in d’Orbigny, 1839b, p. 135, pl. 1, figs. 28-30.

*Discorbinella bertheloti* (d’Orbigny) in Brady, 1884, p. 650, pl. 89, figs. 10-12.

*Discorbis bertheloti* (d’Orbigny) in Cushman, 1931, p. 16, pl. 3, fig. 2.

*Discopulvinulina bertheloti* (d’Orbigny) in Hofker, 1951, p. 449.

*Discorbinella bertheloti* (d’Orbigny) in Loeblich and Tappan, 1987, p. 577, pl. 630, figs. 4-6.

*Discorbinella bertheloti* (d’Orbigny) in Jones, 1994, p. 95, pl. 89, figs. 10-12.


*Discorbinella bertheloti* (d’Orbigny) in Holbourn and others, 2013, p. 230-231, figs. 1-3.

**Remarks.** This species is present, but never abundant in the coral rubble and pebbly sand facies from Norway. It rarely occurs in the living coral facies. It is present in the buried coral facies of the Alboran Basin and the Lopphavet.

**Genus Planulina** d’Orbigny, 1826

Type species: *Planulina ariminensis* d’Orbigny, 1826.

*Planulina ariminensis* d’Orbigny, 1826, p. 280 pl. 14, figs. 1-3.

*Planulina ariminensis* d’Orbigny in Hermelin and Scott, 1985, p. 214, pl. 4, figs. 9-11.

*Planulina ariminensis* d’Orbigny in Jones, 1994, p. 98, pl. 93, figs. 10-11.

*Planulina ariminensis* d’Orbigny in Abu-Zied and others, 2008, p. 52, pl. 2, figs. 31-32.

*Planulina ariminensis* d’Orbigny in Milker and Schmiedl, 2012, p. 106, figs. 24.3-4.

*Planulina ariminensis* d’Orbigny in Holbourn and others, 2013, p. 402-403, figs. 1-2.

**Remarks.** Along the Norwegian margin this species is generally rare and present in the coral rubble, pebbly sand and sediment clogged coral facies. In the Porcupine Seabight it occurs in all facies, but it is more abundant in the dropstone and dead coral facies. It is rare to common in the Alboran Sea.

**Genus Hyalinea** d’Orbigny, 1826

Type species: *Nautilus balthicus* Schröter, 1783.

*Hyalinea balthica* (d’Orbigny, 1826)

Pl. 29, fig. 2

*Nautilus balthicus* Schröter in Schröter, 1783, p. 20, pl. 1, fig. 2.

*Nautilus balthicus* Schröter in Gmelin, 1791, p. 3370.

*Hyalinea balthica* (Schröter) in Murray, 1971, p. 173, Pl. 72, figs. 5-7.

*Hyalinea balthica* (Schröter) in Jones, 1994, p. 110, pl. 112, figs. 1-2.

*Hyalinea balthica* (Schröter) in Cimerman and Langer, 1991, p. 70, pl. 74, figs. 4, 7.


*Hyalinea balthica* (Schröter) in Holbourn and others, 2013, p. 308-309, figs. 1-2.

**Remarks.** Along the Norwegian margin this species characterizes all facies but it is more abundant in the mud and sediment clogged coral facies. It is present in the buried coral facies from Lopphavet. In the
Porcupine Seabight it is abundant in the off-mound facies. It is also common to abundant in the Alboran Sea.

Family CIBICIDIDAE Cushman, 1927
Subfamily CIBICIDINAE Cushman, 1927
Genus Cibicides de Montfort, 1808
Type species: Cibicides refulgens de Montfort, 1808, p. 122.

Cibicides refulgens de Montfort in de Montfort, 1808, p. 122.
Cibicides refulgens de Montfort in Kihle and Løfaldli, 1975.
Cibicides refulgens de Montfort in Cimerman and Langer, 1991, p. 70, pl. 75, figs. 5-9.
Cibicides refulgens de Montfort in Murray, 2003, p. 21, pl. 7, figs. 1-2.
Cibicides refulgens de Montfort in Schweizer and others, 2009, p. 301, figs. 1m, 1n.
Cibicides refulgens de Montfort in Holbourn and others, 2013, p. 154-155, figs. 1-3.

Remarks. This species is abundant in the coral rubble facies and is common in the pebbly sand and sediment clogged coral facies from Norway. It is present in the buried coral facies of Lopphavet, in the Porcupine Seabight it is rare but present in all facies. It is rare to common in the buried coral facies from the Alboran Sea.

Cibicides ungerianus (d’Orbigny, 1826)
Pl. 29, fig. 3
Rotalina ungeriana d’Orbigny in d’Orbigny, 1846, p. 157, pl. 8, figs. 16-18.
Cibicides ungerianus (d’Orbigny) in Schweizer and others, 2009, p. 301, text-figs. 1, fig. k-1.

Remarks. This species is rare but present in all facies from the Norwegian margin and Porcupine Seabight it is. However, it is more frequent in coral rubble and pebbly sand facies. It is common in the Holocene buried coral facies from the Lopphavet.

Cibicides aravaensis Perelis and Reiss, 1976
Pl. 29, fig. 5
Cibicides aravaensis Perelis and Reiss in Perelis and Reiss, 1976, p. 93, pl. 8, figs. 1-7.

Remarks. Along the Norwegian margin (including the buried coral facies of Lopphavet) this species is observed in the coral rubble, pebbly sand and sediment clogged coral facies. However, the maximum abundance is recorded in the living coral facies. In the Porcupine Seabight it is present in the dropstone, dead coral and living coral facies. It differs from C. ungerianus in having a large umbilical boss.

Genus Lobatula Fleming, 1828
Type species: Nautilus lobatus Walker and Jacob in Kanmacher, 1798, p. 642.

Lobatula lobatula (Walker and Jacob, 1798)
Pl. 30, fig. 1
Nautilus lobatus Walker and Jacob in Kanmacher, 1798, p. 642, pl. 14, fig. 36.
Cibicides lobatulus (Walker and Jacob) in Jones, 1994, p. 97, pl. 93, figs. 4-5.
Cibicides lobatulus (Walker and Jacob) in Murray, 2003, p. 21, pl. 6, figs. 13-15.

Remarks. This species is present in all facies from Norway that provide suitable substrate (e.g., coral rubble, pebbly sand, sediment clogged and living coral facies). It is rare and present in all facies in the Porcupine Seabight and rare to common in the Alboran Sea. Schweizer and other (2009) attribute this species to the genus Cibicidoides, however, they state that in phylogenetic analyses it forms a monophyletic clade, which includes a mosaic of genotypes, with at least two geographic populations, in the Mediterranean and in the North Atlantic, respectively, that might represent separate species. The attribution to a clade separated from other Cibicidoides, in our opinion, justifies its attribution to the genus Lobatula instead of Cibicidoides.

Superfamily ASTERIGERINACEA d’Orbigny, 1839
Family EPISTOMARIIDAE Hofker, 1954
Subfamily EPISTOMARIINAE Hofker, 1954
Genus Pseudoepionides Uchio, 1950
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Type species: *Pseudoeponides japonicus* Uchio, in Kawai and others, 1950.

*Pseudoeponides falsobeccarii* Rouvillois, 1974
  Pl. 30, fig. 3

*Pseudoeponides falsobeccarii* Rouvillois in Rouvillois, 1974, p. 4, pl. 1, fgs. 1-12.

*Ammonia falsobeccarii* (Rouvillois) in Murray, 2003, p. 19, pl. 5, fgs. 14-16.

*Pseudoeponides falsobeccarii* Rouvillois in Mojtabih and others, 2009, p. 188, pl. 1, fig. 2.

Remarks. This species is found only in one sample from Norway, and it is also rare in the Alboran Sea.

Subfamily NUTTALLIDINAE Saidova, 1981

Genus *Nuttallides* Finlay, 1939

Type species: *Eponides truempyi* Nuttall, 1930.

*Nuttallides umbonifera* (Cushman, 1933)
  Pl. 30, fig. 4

*Pulvinulinella umbonifera* Cushman in Cushman, 1933, p. 90, pl. 9, fig. 9.

*Nuttallides umbonifera* (Cushman) in Hermelin, 1989, p. 69, pl. 12, fgs. 15-17.

*Nuttallides umbonifera* (Cushman) in Holbourn and others, 2013, p. 380-381, fgs. 1-3.

Remarks. This species is very rare along the Norwegian margin where it is present only in the pebbly sand facies. It occurs in the buried coral facies of the Lopphavet. In the Porcupine Seabight it is very rare and present in the off-mound (mud) facies and in the fine sediments from the living coral facies. It is rare, but consistently present, in the Alboran Sea.

*Nuttallides decorata* (Phleger and Parker, 1951)
  Pl. 30, fig. 5

*Pseudoparrella? decorata* Phleger and Parker in Phleger and Parker, 1951, p. 28, pl. 15, fgs. 4-5.


Remarks. This species is abundant in the Holocene buried coral facies from the Lopphavet. It is very rare in the Alboran Sea. It differs from *N. umbonifera* in its smaller size, the less numerous chambers in the last whorl and the less pustulose wall on both sides.

Family ASTIGERINATIDAE Reiss, 1963

Genus *Astigerinata* Bermudez, 1949

Type species: *Astigerinata dominicana* Bermudez, 1949.

*Astigerinata mamilla* (Williamson, 1858)
  Pl. 31, fig. 1

*Rotalina mamilla* Williamson in Williamson, 1858, p. 54, pl. 4, fgs. 109-111.

*Astigerinata mamilla* (Williamson) in Cimerman and Langer, 1991, p. 73, pl. 82, fgs. 1-4.


Remarks. This species has been observed only in a few samples from the buried coral facies from the Alboran Sea.

Superfamily NONIONACEA Schultze, 1854

Family NONIONIDAE Schultze, 1854

Subfamily NONIONINAE Schultze, 1854

Genus *Nonion* de Montfort, 1808

Type species: *Nautilus faba* Fichtel and Moll, 1798, p. 103.

*Nonion fabum* (Fichtel and Moll, 1798)
  Pl. 31, fig. 2

*Nautilus faba* Fichtel and Moll in Fichtel and Moll, 1798, p. 103, pl. 19, fgs. a-e.

*Nonionina boueana* d’Orbigny in Brady, 1884, p. 729, pl. 109, fgs. 12-13.

*Nonion fabum* (Fichtel and Moll) in Loeblich and Tappan, 1987, p. 617, pl. 690, fgs. 1-7, 14-16.


Remarks. This species is present only in one sample from the buried coral facies in the Alboran Sea.

*Nonion pauperatus* (Balkwill and Wright, 1885)
  Pl. 31, fig. 3

*Nonion pauperata* Balkwill and Wright in Balkwill and Wright, 1885, p. 353, pl. 13, fgs. 25-26.

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Nonion pauperatus (Balkwill and Wright) in Murray, 2003, p. 24, pl. 9, fig. 1.

**Remarks.** Along the Norwegian margin this species occurs only in the coral rubble facies. It is very rare in the buried coral facies from the Alboran Sea. It differs from *N. pauciloculum* in having a sub-acute margin and the very arched sutures.

*Nonion pauciloculum* Cushman, 1944

Pl. 31, fig. 5

**Remarks.** This species occurs only in the mud facies from Norway where it is very rare. It differs from *N. pauperatus* in its more rounded margin and the presence of straight sutures.

Genus *Nonionella* Cushman, 1926

Type species: *Nonionella miocenica* Cushman, 1926, p. 64.

*Nonionella turgida* (Williamson, 1858)

Pl. 32, fig. 1

**Remarks.** This species occurs in all facies from Norway (including the buried facies of Lopphavet), with higher abundances in the living coral facies. It is very rare in the mud facies from the Porcupine Seabight and rare in the buried coral facies from the Alboran Sea.

Genus *Nonionellina* Cushman, 1926

Type species: *Nonionellina labradorica* Dawson, 1860, p. 192.

*Nonionellina labradorica* (Dawson, 1860)

Pl. 31, fig. 4

**Remarks.** This species is present in all facies from Norway, where it is slightly more abundant in the coral rubble facies. It is very rare in the Porcupine Seabight. It dominates the glacial sediments transitional to the living coral facies in the Lopphavet area (Chapter 3, Fig. 3.4B).

Subfamily ASTRONONIONINAE Saidova, 1981

Genus *Astrononion* Cushman and Edwards, 1937

Type species: *Nonionina stelligera* d’ Orbigny, 1839, p. 128.

*Astrononion gallowayi* Loeblich and Tappan, 1953

Pl. 32, fig. 3

**Remarks.** This species is present in all facies from the Norwegian margin (including Lopphavet) but it is more common in the coral rubble and pebbly sand facies. In the Porcupine Seabight it is rare and restricted to the off-mound (mud) facies. It is common in the buried Holocene coral facies from Lopphavet.
Astrononion antarcticus Parr, 1950

Pl. 32, fig. 4

Nonionina stelligera d’Orbigny, in d’Orbigny, 1839, pl. 3, figs. 1, 2.

Nonion stelliger (d’Orbigny) in Earland, 1934, p. 189.

Astrononion antarcticus Parr in Parr, 1950, p. 371, pl. 15, figs. 13-14.

Remarks. This species is rare and it is recorded only in the coral rubble facies from Norway and in the buried facies of Lopphavet. It differs from *A. gallowayi* for its very irregular coiling, the strongly arched sutures and the irregular general morphology.

Subfamily PULLENIINAE Schwager, 1877

Genus *Melonis* de Montfort, 1808

Type species: *Nautilus pompilioides* Fichtel and Moll, 1798, p. 31.

*Melonis pompilioides* (Fichtel and Moll, 1798)

Pl. 32, fig. 5

*Nautilus pompilioides* Fichtel and Moll in Fichtel and Moll, 1798, p. 31, pl. 2, figs. a-c.

*Melonis etruscus* de Montfort in de Montfort, 1808, p. 67.

*Melonis pompilioides* (Fichtel and Moll) in Hermelin and Scott, 1985, p. 212, pl. 6, fig. 5.


*Melonis pompilioides* (Fichtel and Moll) in Holbourn and others, 2013, p. 356-357, figs. 1-2.

Remarks. This species characterizes all the facies along the Norwegian margin. It is however, more abundant in the mud and pebbly facies. In the Porcupine Seabight it is abundant in the off-mound (mud) facies and less abundant in the other facies. In the Alboran Sea it is always common to abundant. It differs from *M. pompilioides* in having a less inflated and flatter test.

Genus *Pullenia* Parker and Jones, 1862

Type species: *Nonionina bulloides* d’Orbigny, 1846, p. 107.

*Pullenia bulloides* (d’Orbigny, 1826)

Pl. 33, figs. 3-4

*Nonionina bulloides* d’Orbigny in d’Orbigny, 1846, p. 107, pl. 5, figs. 9-10.

*Pullenia sphaeroides* d’Orbigny in Brady, 1884, p. 615, pl. 84, figs. 12-13.

*Pullenia bulloides* (d’Orbigny) in Ujiı‘, 1990, p. 42, pl. 23, figs. 1-2.

*Pullenia bulloides* (d’Orbigny) in Jones, 1994, p. 92, pl. 84, figs. 12-13.

*Pullenia bulloides* (d’Orbigny) in Holbourn and others, 2013, p. 442-443, figs. 1-3.

Remarks. This species is relatively abundant in the mud, pebbly sand facies and in the finer sediments from the coral reef facies in Norway. It is less abundant in the other facies, but present in the buried facies from the Lopphavet. It is very rare (one specimen) in the buried coral facies from the Alboran Sea. It differs from *P. bulloides* in having more numerous chambers in the last whorl and a sub-acute peripheral margin.

*Pullenia subcarinata* (d’Orbigny, 1839)

Pl. 33, fig. 2

*Nonionina subcarinata* d’Orbigny in d’Orbigny, 1839, p. 28, pl. 5, figs. 23-24.

*Nonionina quinqueloba* d’Orbigny in Reuss, 1851, p. 71, pl. 5, fig. 31.

*Pullenia simplex* Rhumbler in Wiesner, 1931, p. 132, pl. 22, fig. 263.

*Pullenia quinqueloba* (d’Orbigny) in Jones, 1994, p. 92, pl. 84, figs. 14-15.

Remarks. This species is relatively abundant in the mud facies and in the fine sediments from the coral
rubble facies in Norway. It is rarer in the other facies and present in the buried coral facies of Lopphavet.

Superfamily CHILOSTOMELLACEA Brady, 1881
Family CHILOSTOMELLIDAE Brady, 1881
Subfamily CHILOSTOMELLINAE Brady, 1881
Genus Chilostomella Reuss, 1849
Type species: Chilostomella ovoidea Reuss, 1850, p. 380.

Chilostomella oolina Schwager, 1878
Pl. 33, fig. 5

Chilostomella oolina Schwager in Schwager, 1878, p. 527, pl. 1, fig. 16.
Chilostomella ovoidea Reuss in Brady, 1884, p. 436, pl. 55, figs. 12-14, 17-18.
Chilostomella oolina Schwager in Cushman and Todd, 1949, p. 91, pl. 15, figs. 23-24.
Chilostomella oolina Schwager in Jones, 1994, p. 61, pl. 55, figs. 12-14, 17-18.
Chilostomella oolina Schwager in Holbourn and others, 2013, p. 148-149, figs. 1-2.

Remarks. This species is present but never abundant in the buried coral facies from the Alboran Sea.

Family HETEROLEPIDAE Gonzales-Donoso, 1969
Genus Anomalinoides Brotzen, 1942
Type species: Anomalina pinguis Jennings, 1936, p. 195.

Anomalinoides globulosa (Chapman and Parr, 1937)
Pl. 34, fig. 1

Anomalina globulosa Chapman and Parr in Chapmann and Parr, 1937, p. 117, pl. 9, fig. 27.
Anomalina globulosa Chapman and Parr in Feyling-Hansen, 1954, p. 258, pl. 9, figs. 1-3.
Cibicidoides globulosus (Chapman and Parr) in Jones, 1994, p. 98, pl. 94, figs. 4-5.
Anomalinoideas globulosa (Chapman and Parr) in Holbourn and others, 2013, p. 53-53, figs. 1-3.

Remarks. This species is very rare in the studied samples and occurs only in the dropstone facies from the Porcupine/Rockall region.
Gyroidina soldanii d’Orbigny var. altiformis Steward and Steward in Cushman and others, 1930, p. 67, pl. 9, fig. 2.

Gyroidina soldanii d’Orbigny var. altiformis Steward and Steward in Cushman, 1931, p. 41, pl. 8, fig. 10; pl. 9, fig. 1.

Gyroidina soldanii d’Orbigny var. altiformis Steward and Steward in Renz, 1948, p. 140, pl. 8, fig. 13.

Hansenisca altiformis (Steward and Steward) in Finger, 1990, pp. 124-125, figs. 1-8; text-fig. 2.

Gyroidina altiformis Steward and Steward in Sgarrella and Moncharmont-Zei, 1993, 240, pl. 25, figs. 3-4.

Remarks. This species is rare to common in the Alboran Sea. It differs from the other species belonging to the genus Gyroidina in having a higher conical morphology, a wide and deep umbilicus and more raised sutures.

Gyroidina laevigata d’Orbigny, 1826

Pl. 34, fig. 4

Gyroidina laevigata d’Orbigny in d’Orbigny, 1826, p. 278.

Gyroidinosoides laevigata (d’Orbigny) in Hasegawa and Sprovieri, 1990, pl. 5, figs. 7-9.

Remarks. This species is very rare along the Norwegian margin where it occurs in the mud, coral rubble and sediment clogged coral facies. In the Alboran Sea it is present but never abundant. We retain here the original genus Gyroidina.

Gyroidina lamarckiana (d’Orbigny, 1839b)

Pl. 34, fig. 5

Rotalia lamarckiana d’Orbigny in d’Orbigny, 1839b, p. 131, pl. 2, figs. 13-15.

Gyroidina lamarckiana (d’Orbigny) in Phleger and others, 1953, p. 41, pl. 8, figs. 33-34.

Gyroidina lamarckiana (d’Orbigny) in Todd, 1965, p. 19, pl. 6, fig. 3.

Gyroidina lamarckiana (d’Orbigny) in Loeblich and Tappan, 1994, p. 163, pl. 361, figs. 7-12.

Remarks. This species has been observed in the Alboran Sea only. It differs from G. laevigata in having a more compressed test and more numerous chambers in the last whorl.

Gyroidina neosoldanii Brotzen, 1936

Pl. 35, fig. 2

Rotalia soldanii (d’Orbigny) in Brady, 1884, p. 107, figs. 6-7.

Gyroidina neosoldanii Brotzen in Brotzen, 1936, p. 158.

Gyroidinosoides soldanii (Brotzen) in Jones, 1994, p. 106, pl. 107, figs. 6-7.

Gyroidina neosoldanii Brotzen in Hermelin, 1989, p. 81, pl. 15, figs. 16-18.

Remarks. This species is very rare in the coral rubble and pebbly sand facies from Norway and in the buried facies of Lopphavet. It is rare in the fine sediment from the mud, coral rubble, dead coral and dropstone facies from the Porcupine Seabight. It is also rare in the Alboran Sea. It differs from G. soldanii in having a higher, more conical test, and having a wider umbilicus. The species was described by Brotzen (1936), who erected as holotype the specimen documented in Brady (1884), pl. 107, figs. 6-7.

Gyroidina soldanii d’Orbigny, 1839

Pl. 35, fig. 1

Gyroidina soldanii d’Orbigny in d’Orbigny, 1826, p. 278, no. 5.

Rotalia soldanii (d’Orbigny) in d’Orbigny, 1846, p. 155, pl. 8, figs. 10-12.

Gyroidina soldanii d’Orbigny in Papp and Schmid, 1985, p. 60, pl. 50, figs. 4-9.

Hansenisca soldanii (d’Orbigny) in Loeblich and Tappan, 1987, p. 639, pl. 719, figs. 5-9.


Gyroidinosoides soldanii (d’Orbigny) in Holbourn and others, 2013, p. 278-279, figs. 1-3.

Remarks. This species is present but rare in the coral rubble facies from Norway and in the buried facies of Lopphavet. In the Porcupine Seabight it is present in fine sediments from the mud, coral rubble, living, dropstone and dead coral facies, but it is always very rare. This species is rare in sediments from the Alboran Sea. We retain the generic attribution to Gyroidina and not Hansenisca for this species. The umbilical chamber flaps surrounding the umbilicus, identified by Loeblich and Tappan (1987) as typical of Hansenisca are also typical of other genera of the Family Gyroidinoidinae, thus their presence does not justify the genus Hansenisca.

Genus Hanzawaia Asano, 1944

Type species: Hanzawaia nipponica Asano, 1944, p. 98.

Hanzawaia boueana (d’Orbigny, 1846)

Pl. 35, figs. 4-5

Truncatulina boueana d’Orbigny in d’Orbigny, 1846, p. 169, pl. 9, figs. 24-26.

Cibicides boueanus (d’Orbigny) in Graham and Militante, 1959, p. 116, pl. 19, fig. 11.
**Hanzawaia boueana** (d'Orbigny) in Zheng, 1980, p. 171, pl. 5, fig. 10.  

**Remarks.** This species occurs in all facies from the Norwegian margin and the Porcupine Seabight and the Alboran Sea. However, it is usually never abundant except in the Holocene buried coral facies from Lopphavet.

Family **TRICHOHYALIDAE** Saidova, 1981  
**Genus Buccella** Andersen, 1952  
Type species: *Eponides hannai* Phleger and Parker, 1951, p. 21.

*Buccella frigida* (Cushman, 1922)  
Pl. 36, fig. 1

_Palvinalina frigida_ Cushman in Cushman, 1922, p. 144.  
*Buccella frigida* (Cushman) in Feyling-Hanssen and others, 1971, p. 253, pl. 8, figs. 12-14; pl. 19, fig. 1.  
*Buccella frigida* (Cushman) in Kihle and Løfaldli, 1975.

*Buccella frigida* (Cushman) in Vazquez Riveiros and Patterson, 2008, p. 30, pl. 13, fig. 3.

**Remarks.** This species occurs in the pebbly sand facies from Norway, where it is slightly more abundant in the living coral facies. It occurs also in the buried coral facies from Lopphavet.

Superfamily **ORBITOIDACEA** Schwager, 1876  
Family **ELPHIDINAE** Galloway, 1933  
**Genus Elphidium** de Montfort, 1808  
Type species: *Nautilus macellus* var. "β" Fichtel and Moll, 1798, p. 66.

*Elphidium albiumbilicatum* (Weiss, 1954)  
Pl. 36, fig. 2

*Elphidium albiumbilicatum* (Weiss) in Feyling-Hanssen and others, 1971, p. 268, pl. 10, figs. 15-19; pl. 19, figs. 4-8.  
*Elphidium albiumbilicatum* (Weiss) in Murray and others, 2003, p. 687, text-fig. 6.

**Remarks.** A single specimen of this species has been found in the living coral facies from Norway. It is common in the glacial facies from Lopphavet. All specimens show the granulose wall texture in the umbilical area as well as along the sutures.

*Elphidium groenlandicum* Cushman, 1933  
Pl. 36, fig. 3

*Elphidium groenlandicum* Cushman in Cushman, 1933, p. 4, pl. 1, fig. 10.  
*Elphidium groenlandicum* Cushman in Feyling-Hanssen and others, 1971, p. 275, pl. 12, figs. 1-8; pl. 21, figs. 1-3.  
*Elphidium groenlandicum* Cushman in Kihle and Løfaldli, 1975, Figs. A-C.

**Remarks.** This species is very rare and occurs only in the mud facies from the Norwegian margin.

*Elphidium hanzawai* Asano, 1939  
Pl. 36, fig. 4

*Elphidium hanzawai* Asano in Asano, 1939, p. 426, figs. 3-4.

**Remarks.** Rare specimens are found in samples from the buried coral facies from the Alboran Sea. They display the flat test typical of the species.

*Elphidium incertum* (Williamson, 1858)  
Pl. 37, fig. 1

_Polystomella umbilicata_ Walker var. _incerta_ Williamson in Williamson, 1858, p. 44, pl. 3, fig. 82a.  
_Polystomella striatopunctata_ Brady in Brady, 1884, p. 739, pl. 109, fig. 23.  
*Elphidium incertum* (Williamson) in Feyling-Hanssen and others, 1971, p. 277, pl. 12, figs. 11-12; pl. 21, figs. 8-9.  
*Elphidium incertum* (Williamson) in Kihle and Løfaldli, 1975, Figs. A-C.  
_Cribronion incertum* (Williamson) in Jones, 1994, p. 108, pl. 109, fig. 23.  
*Elphidium incertum* (Williamson) in Milker and Schmiedl, 2012, p. 121, fig. 27.19-20.

**Remarks.** Rare specimens occur in the finer sediments from the mud, coral rubble and pebbly sand facies from Norway. This species is abundant in the glacial facies from the Lopphavet. These specimens display the typical morphology of the species with the small and elongated crenulations along the sutures.

*Elphidium magellanicum* Heron-Allen and Earland, 1932  
Pl. 37, fig. 2

Remarks. A few specimens have been found in the pebbly sand facies from the Norwegian margin. It differs from *E. albiumbilicatum* in having smaller granular areas in the umbilical region and along the sutures and a more inflated test.

**Elphidium subarcticum** Cushman, 1944

Pl. 37, fig. 3

Remarks. This species is generally rare and occurs only in the pebbly sand facies from the Norwegian margin. This species differs from *E. albiumbilicatum* in having more marked openings along the sutures and more numerous and slightly developed retral processes.
Plate 1. 1a-b Astrorhiza cf. catenata Norman, 1877, Hypotype from PS70/038-2 2a-b Bathysiphon filiformis M. Sars, 1872, Hypotype from PS70/038-2 3a-b Rhabdammina abyssorum M. Sars, 1869, a) Hypotype from AL232 1026; b) Hypotype from PS70/039-2 4a-b Hippocrepinella biradulina Heron-Allen and Earland, 1932, Hypotype from PS70/033-2 5a-b Psammosphaera fusca Schulze, 1875, Hypotype from PS70/039-2 6a-b Psammosphaera fusca Schulze var. testacea Flint, 1899, Hypotype from PS70/037-2 7a-b Lagenammina fusiformis (Williamson, 1858), Hypotype from PS70/037-2 8a-b Lagenammina arenulata (Williamson, 1858), Hypotype from PS70/039-2 9a-b Saccammina sphaerica M. Sars, 1872, Hypotype from AL232 1025 10a-b Hyperammina elongata Brady, 1878, Hypotype from POS391 558-1 11a-b Saccorhiza ramosa (Brady, 1879), Hypotype from PS70/028-2
PLATE 2. 1a-b Reophax agglutinatus Cushman, 1913, Hypotype from PS70/037-2 2a-b Hormosinella guttifera (Brady, 1881), Hypotype from PS70/039-2 3a-b Reophax scoriurus de Montfort, 1808, Hypotype from P292 577-1 4a-b Ammodiscus incertas (d’Orbigny, 1839), Hypotype from PS70/011-1 5a-c Glomospira charoides (Jones and Parker, 1878), Hypotype from PS70/011-1 6a-b Cribrostomoides subglobosum (M. Sars, 1868), Hypotype from PS70/011-1 7a Ammolagena clavata (Jones and Parker, 1860), Hypotype from PS70/002-2 8a-c Labrospira jeffreysii (Williamson, 1858), Hypotype from PS70/002-2 9a-c Labrospira jeffreysii (Williamson, 1858), Hypotype from AL232 1025
PLATE 3  1a-c Haplocystites robertsoni Brady, 1887, Hypotype from POS391 550-1  2a-c Haplocystites robertsoni Brady, 1887, Hypotype from POS391 550-1  3a-c Haplocystites membranaceum Högland, 1947, Hypotype from PS70/029-3  4a-b Ammobaculites agglutinans (d’Orbigny, 1846), Hypotype from PS70/032-2  5a-c Adercotryma wrighti Brüninemann and Whittaker, 1987, Hypotype from AL232 1022  6a-c Spiroplectinella wrightii (Silvestri, 1903), Hypotype from POS391 550-1
PLATE 4  1a-c Vulvulina pennatula Batsch, 1791, Hypotype from TTR17 MS411G 15 2a-b Trochammina labiosa Höglund, 1947, Hypotype from POS391 571-1 3a-c Tritaxis fusca (Williamson, 1858), P292 580-1 4a-c Portatrochammina antarctica (Parr, 1950), Hypotype from PS70/002-2 5a-c Lepidodeuterammina ochracea (Williamson, 1858), POS325 455 6a-c Gaudryina rudis Wright, 1900, Hypotype from AL232 1025
PLATE 5. 1a-c Gaudryina pseudotrochus (Cushman, 1922), Hypotype from GeoB 9204-1 2a-b Eggerella humboldti Todd and Brönnimann, 1957, Hypotype from M07-21 3a-c Karreriella bradyi (Cushman, 1911), Hypotype from M07-23 4a-b Eggerelloides scaber (Williamson, 1858), Hypotype from AL232 1025 5a-c Bigenerina nodosaria d’Orbigny, 1826, Hypotype from P292 577-1 6a-b Bigenerina cylindrica Cushman, 1922, Hypotype from AL232 1025 7a-c Siphotextularia obesa Parr, 1950, Hypotype from P292 578-1 8a-b Textularia lateralis Laliker, 1935, Hypotype from TTR-17 MS411G 20
PLATE 6. 1a-c Textularia truncata Högland, 1947, Hypotype from TTR17 MS411G 25 2a-c Textularia tenuissima Earland, 1933, Hypotype from AL232 1025 3a-b Clavulina parisiensis d’Orbigny, 1826, Hypotype from TTR17 MS411G 0 4a-c Mychostomina revertens (Rhumbler, 1906), Hypotype from PS70/002-2 5a-c Spirillina vivipara Ehrenberg, 1843, Hypotype from POS391 550-1 6a-b Patellina corrugata Williamson, 1858, Hypotype from POS391 550-1 7a-c Cornuspira involvens (Reuss, 1850), Hypotype from PS70/011-1 8a-b Cornuspira foliacea (Philippi, 1844), Hypotype from TTR17 MS411G 15 9a-b Gordiospira sp., Hypotype from PS70/028-2 10a-b Gordiospira elongata Collins, 1958, Hypotype from TTR17 MS411G45
PLATE 7. 1a-b Spiroloculina tenuiseptata Brady, 1884, Hypotype from TTR17 MS411G 30 2a-b Spiroloculina dilatata d’Orbigny, 1846, Hypotype from TTR17 MS419G 94 3a-b Spiroloculina excavata d’Orbigny, 1846, Hypotype from TTR17 MS411G 10 4a-b Ammomassilina arenaria (Brady, 1884), Hypotype from TTR17 MS411G 30 5a-c Cycloforina laevigata (d’Orbigny, 1839), Hypotype from TTR17 MS411G 0 6a-c Cycloforina stalkeri (Loeblich and Tappan, 1953), Hypotype from TTR17 MS411G 10 7a-c Quinqueloculina viennensis Le Calvez and Le Calvez, 1958, Hypotype from POS391 556-2 8a-c Quinqueloculina seminula (Linne, 1758), Hypotype from TTR17 MS411G 15
PLATE 8. 1a-c Quinqueloculina arctica Cushman, 1933, Hypotype from GeoB9257 2a-c Biloculinella globula (Bornemann, 1855), Hypotype from POS391 334-1 3a-c Biloculinella depressa (Wiesner, 1923), Hypotype from POS325 455 4a-c Biloculinella fragilis Le Calvez and Le Calvez, 1958, Hypotype from TTR17 MS411G 45 5a-c Miliolinella subrotunda (Montagu, 1803), Hypotype from POS325 455
PLATE 9. 1a-c Miliolinella elongata Kruit, 1955, Hypotype from TTR17 MS411G 50 2a-c Pyrgo inornata (d’Orbigny, 1846), Hypotype from TTR17 MS411G 55 3a-c Pyrgo comata (Brady, 1881), Hypotype from Hermi-1_1 4a-c Pyrgo anomala (Schlumberger, 1891), Hypotype from M07-15 5a-c Pyrgo subsphaerica (d’Orbigny, 1840), Hypotype from POS391 559-1 6a-c Pyrgo williamsoni (Silvestri, 1923), Hypotype from AL232 1022
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3a-b Fissurina kerguelensis Parr, 1950, Hypotype from TTR17 MS419G 35  
4a-c Fissurina annectens (Burrows and Holland, 1895), Hypotype from POS391 555-1  
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2a-c Nonionella iridea Heron-Allen and Earland, 1932, Hypotype from TTR17 MS419G 100
3a-c Astronion gallowayi Loeblich and Tappan, 1953, Hypotype from POS325 455
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**PLATE 33**  1a–c *Melonis barleeanum* (Williamson, 1858), Hypotype from P292 581-1  2a–c *Pullenia subcarinata* (d’Orbigny, 1839), Hypotype from PS70/023-3  3a–c *Pullenia bulloides* (d’Orbigny, 1826), Hypotype from TTR17 MS419G 25  4a–c *Pullenia bulloides* (d’Orbigny, 1826), Hypotype from Hermi1_1  5a–c *Chilostomella oolina* Schwager, 1878, Hypotype from P292 580-1
PLATE 34. 1a-c Anomalinoideas globulosa (Chapman and Parr, 1937), Hypotype from GeoB 9288 2a-c Discanomalina coronata (Parker and Jones, 1857), Hypotype from GeoB9204-1 3a-c Discanomalina japonica Asano, 1951, Hypotype from GeoB9205-1 4a-c Gyroidina laevigata d’Orbigny, 1826, Hypotype from GeoB 6721-1 5a-c Gyroidina lamarckiana (d’Orbigny, 1839), Hypotype from TTR17 MS411G 10
PLATE 35

1a-c Gyroidina soldanii d’Orbigny, 1839, Hypotype from GeoB 9220
2a-c Gyroidina neosoldanii Brotzen, 1936, Hypotype from GeoB9220
3a-c Gyroidina altiformis Steward and Steward, 1930, Hypotype from TTR17 MS419G 15
4a-c Hanzawaia boueana (d’Orbigny, 1846), Hypotype from GeoB12748-1
5a-c Hanzawaia boueana (d’Orbigny, 1846), Hypotype from POS391 558-1
PLATE 36  1a-c *Buccella frigida* (Cushman, 1922), Hypotype from POS391 558-1  2a-c *Elphidium albumbilicatum* (Weiss, 1954), Hypotype from POS391 571-1  3a-c *Elphidium groenlandicum* Cushman, 1933, Hypotype from PS70/039-2  4a-c *Elphidium hanzawai* Asano, 1939, Hypotype from TTR17 MS419G 45
PLATE 37. 1a-c Elphidium incertum (Williamson, 1858). Hypotype from P292 578-1 2a-c Elphidium magellanicum Heron-Allen and Earland, 1932, Hypotype from POS391 534-1 3a-c Elphidium subarcticum Cushman, 1944, Hypotype from POS391 534-1
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