789. CASSIDULINIDAE (FORAMINIFERIDA) FROM THE EASTERN PART OF LÜTZOW-HOLM BAY, ANTARCTICA*

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Abstract. Four species of Cassidulinidae, Globocassidulina biora (Crespin), Cassidulinoides porrectus (Heron-Allen and Earland), C. parvus (Earland) and Ehrenbergina glabra Heron-Allen and Earland, from the raised beaches and modern bottom sediments in the eastern part of Lützow-Holm Bay, Antarctica are described and revised on the basis of ontogenetic and new anatomic information.

The ontogenetic development of the aperture in G. biora is divided into the following three steps: I-shaped, I-shaped, and =-shaped, so that G. biora is morphologically similar to Globocassidulina subglobosa (Brady) and G. crassa rossensis Kennett in immature stages respectively. Uncoiled forms, such as C. porrectus and C. parvus, are also similar to G. subglobosa in globular immature stages.

Introduction

During systematic studies of the foraminiferal family Cassidulinidae, many specimens were obtained from the bottom sediments and Pleistocene raised beaches in the eastern part of Lützow-Holm Bay, Antarctica. As a result of detailed examination, four species assigned to three genera were determined: Globocassidulina biora (Crespin), Cassidulinoides porrectus (Heron-Allen and Earland), Cassidulinoides parvus (Earland) and Ehrenbergina glabra Heron-Allen and Earland. They are the most characteristic species in the Antarctic foraminiferan province.

In recent years, a number of paleontologists have focused attention on the wall structure and internal character of foraminifera. Among foraminiferal taxa, the family Cassidulinidae has attracted the most attention because members possessing different wall structures in spite of their having a similar external morphology. Ever since Loeblich and Tappan (1964a) erected the family Islandiellidae for the forms having radial wall texture and a toothplate, and distinguished it from the family Cassidulinidae, there has been much confusion in foraminiferan systematics. However, their suprageneric classification has been questioned by several subsequent workers as described by Nomura (1983b).

Further pertinent information is needed to resolve this controversial problem, such as the internal character of the test and its morphologic variability, in addition to the wall structure. Thus the purpose of the present work is to provide systematic information on the Antarctic cassidulinid foraminifera by integrating several taxonomic characters, including the ontogenetic and anatomic observations, in order to document the similarities and differences in internal and external morphology within the Cassidulinidae.

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Materials and Methods

Materials used in this study were taken from the raised beaches (9 and 11.5 m above sea level) in Skarvsnes and Langhoyde and Recent bottom sediments at the depths 31.5 and 98 m around East Ongul Island, which were collected by Mr. M. Hayashi of Geographical Institute, Shimane University, during the 16th Japanese Antarctic Research Expedition, 1975—1976. Their localities are as follows:

Sample 75012901: Raised beach sand, 11.5 m above sea level, Skarvsnes (69°29.2’S, 39°38.4’E).
Sample 75110201: Raised beach sand, 9 m above sea level, East Ongul Island (69°0.7’S, 39°34.5’E).
Sample 75112101: Recent bottom sediments, 31.7 m in depth, northeast of East Ongul Island (68°59.7’S, 39°37.3’E).
Sample 75112102: Recent bottom sediments, 98 m in depth, north of East Ongul Island (69°00’S, 39°33.1’E).

The materials from the raised beaches consist of massive, poorly sorted sand containing molluscan fossils, *Laternula elliptica* (King and Boderip), *Adamussium colbecki* Smith, and other fossils such as serpuloid tubes. The material studied here is from the foraminifer assemblages from the Pleistocene raised beach sediments described by Nomura (1983d).

For anatomical observations using a SEM, the specimens were prepared using the Canada balsam-xylene method described by Nomura (1983a).

Systematic Description

Before going further, several morphologic terms for apertural structures based on comparative anatomy, which were defined by Nomura (1983b) in the study of Japanese Cassidulinidae need to be explained.

Primary tongue (PT): internal free portion of toothplate.
Cristate tooth (CT): external free portion of toothplate.

Copula (CP): conjugate portion of primary tongue and cristate tooth.
Cavity (CA): depressed portion between septal chamber wall and primary tongue.
Sulcus (S): depressed portion between septal chamber wall and cristate tooth or lip.
Lip (L): overturned structure of septal chamber wall, which is linked with the cristate tooth.
Secondary tongue (ST): free portion formed on the anterior corner of the aperture.
Apertural ridge (AR): ridge-like structure at the base of the aperture, which is formed on the preceding chamber.
Apertural flap (AF): imperforate plate formed on the lower side of the aperture.
Capitals in brackets indicate the abbreviation used in illustrations.

Family Cassidulinidae d’Orbigny, 1839
Genus *Globocassidulina* Voloshinova, 1960

*Globocassidulina biora* (Crespin)

Pl. 90, Figs. 1a, b—3, 12; Pl. 91, Figs. 1—7; Text-fig. 1

*Cassidulina biora* Crespin, 1960, p. 28, 29, pl. 3, figs. 1—10.
*Cassidulina crassa* d’Orbigny. Crespin, 1960, p. 29, pl. 3, figs. 12, 13.
*Cassidulina* sp. Crespin, 1960, p. 29, 30, pl. 3, fig. 11.

*Globocassidulina biora* (Crespin). Fillon, 1974, p. 139, pl. 1, figs. 9—12, 14, 15; Osterman and Kellogg, 1979, p. 264, pl. 2, fig. 1; Finger and Lipps, 1981, p. 129, pl. 4, figs. 6a—c, 7a, b.

*Globocassidulina biora* ? (Crespin). Fillon, 1974, p. 139, pl. 1, figs. 8, 13.

*Globocassidulina* ? sp. Fillon, 1974, p. 140, 40, pl. 4, fig. 4.

*Anticleina antarctica* Saidova, 1975, p. 331, pl. 89, fig. 14, pl. 114, fig. 5.


*Globocassidulina crassa* rossensis Kennett. Milam and Anderson, 1981, pl. 10, figs. 1a, b.

*Globocassidulina* sp. Finger and Lipps, 1981, p. 129, pl. 4, figs. 1a—c, 2a—c, 3a—c, 4a—c.
External morphology:—The external morphology of *Globocassidulina biora* has been described in detail by Crespin (1960) in her original description. The test is generally sub-globular, but somewhat prolonged and compressed-oval in side and edge views respectively in mature stage. Chambers in final whorl are usually five pairs, and slightly inflated or not; so that the periphery of the test is lobulate or sometimes smooth. The umbilical region is slightly depressed. Sutures are almost straight and narrowly limbate. The aperture, as described below, consists of two openings parallel with each other at the middle portion of the final apertural face. However, its shaped varies from a vertical slit to tripartite in the immature stage. The test wall is polished and translucent and pierced with fine pores.

Through ontogenetic development, the external morphology of the test is divided into three growth stages: nepionic to neanic, ephobic and geronic stages. In nepionic to neanic stages, two forms, the megalospheric and microspheric are easily distinguished as follows: the former is characterized by a globular test with proloculus diameter of 72 μm in average, whereas the latter shows a compressed test having a proloculus diameter of less than 10 μm. In the ephobic stage, the test shows the shape described above. The geronic stage is characterized by having a more prolonged test with a tendency toward an uncoiled appearance.

Apertural structure:—The peculiar structure of the aperture in both external and internal views is the most diagnostic feature of this species. As noted in Crespin's original description, the aperture is divided into two narrow openings both parallel to the periphery of the preceding chamber margin; the longer one is usually situated on the proximal side.

SEM observation reveals that the apertural compartment is formed by the junction of a strongly developed cristate tooth and partly protruded lip (Text-fig. 1, nos. 4, 5). Text-fig. 1 shows the developmental mode of the cristate tooth and lip. As seen in these figures, the development of the cristate tooth through ontogeny is larger than that of the lip. Similar developmental pattern is noted by Finger and Lipps (1981) as described later. Owing to the conspicuous elongation of the cristate tooth toward the lip, the sulcus is not significant. Each tip of the cristate tooth and lip is nodulate, and an apertural ridge is also formed in early growth stage.

When viewed from the interior in dissected specimens, it is noted that the anterior and posterior corners of the aperture are devoid of free structures corresponding to primary and secondary tongues (Pl. 91, Fig. 4).

Another notable character of the aperture is the variable feature in the outline of apertural openings through the nepionic to geronic. Nepionic to neanic apertures are almost vertically arranged loop-like slits to the basal suture of the apertural face. Subsequently the early ephobic stage aperture shows a tripartite feature consisting of basal and areal apertural branches, in

Text-fig. 1. Apertural development of *Globocassidulina biora* (Crespin). CT=cristate tooth, L=lip, AR=apertural ridge. 1; neanic stage, 10 μm scale. 2; early ephobic stage, 10 μm scale. 3; early ephobic stage, 10 μm scale. 4; ephobic stage, 10 μm scale. 5; late ephobic stage, 100 μm scale.
which the cristate tooth is formed on the posterior side of the areal one. Such mature stages as ephebic and gerontic demonstrate the parallel openings (Text-fig. 1).

Wall texture.—Fragments of test wall crushed in Lakeside cement reveal a jagged-granular texture under crossed nicols. However, the septal wall of the proloculus, being very thin, is also sometimes similar to the mosaic structure (Pl. 90, Fig. 12).

Perforation.—Pores are slit-shaped, parallel with each other on the earlier portion (Pl. 91, Fig. 1), irregular in later (Pl. 3, Fig. 2), and rounded on the final chamber; length of slit-shaped pores is 3.3 μm in average; pore density is 16 pores per 20 μm × 20 μm.

Remarks.—Since Crespin (1960) described this species from the Vestfold Hills area of Antarctica, it has been reported as being very common in the Antarctic region. However, the apertural morphology of this species is not uniform and the ontogenetic variation of the aperture used to distinguish this species from other related species has not been well known until now. Owing to the morphological change of the aperture through ontogeny, much confusion, particularly in the form of immature stages, is seen in recent literature.

In the original description of this species, Crespin was not aware of its ontogenetic variation, so that seemingly immature forms which should have been assigned to this species were not included in the continuous range of the variation (e.g., Cassidulina sp. in her pl. 3, fig. 11 clearly shows a rudimentary cristate tooth). All dissected specimens here examined clearly demonstrate that continuous variation of the aperture is divided into three basic steps through ontogeny: slit (I-shaped) → tripartite (L-shaped) → parallel openings (= shaped). Finger and Lipps (1981) similarly noted these ontogenetic changes of the aperture in the Globocassidulina crassa plexus (particularly G. crassa rossensis and G. biora), in stating that the G. subglobosa-like aperture grades into the aperture characterized by one or two apertural branches.

In fact, this ontogenetic variation has per-plexed the species identification and the relationship of G. biora, G. crassa rossensis Kennett, and G. subglobosa (Brady) as discussed by Fillon (1974), Kellogg et al. (1979), and Finger and Lipps (1981). Fillon (1974) considered that G. biora and G. crassa rossensis are in close phylogenetic relationship because of their close similarity in adult forms. On the other hand, pointing out the resemblance of immature forms of G. biora and G. crassa rossensis, Finger and Lipps (1981) stated "dissection reveals that earlier chambers of the larger (adult) G. crassa rossensis and G. biora display their characteristic (fully developed) apertures without any indication of apertural growth stages". So far as G. biora, however, their observations are not in agreement with the present ones. As already stated, G. biora shows the variation of apertural shape during ontogeny.

Close examination of the final apertures of the holotype and paratypes illustrated by Kennett (1967, p. 134, pl. 11, figs. 4–6) and subsequent workers including Finger and Lipps (1981) shows that G. crassa rossensis possesses a tripartite aperture with a very long basal and less developed cristate tooth. These apertural features indicate that the two are clearly differentiated in the mature stage. However, G. biora and G. crassa rossensis have a similar ontogenetic development in the shape of the test (Text-fig. 2) and G. biora possesses a tripartite (L-shaped) aperture like that of G. crassa rossensis in immature stage. Taking these features into consideration, the two taxa are not conspecific, but they are expected to be grouped in the closest phylogenetic relationship as stated by Fillon (1974).

Genus Cassidulinoides Cushman, 1927

Cassidulinoides porrectus (Heron-Allen and Earland)

Pl. 90, Figs. 4a, b–7, 13; Pl. 92, Figs. 6–9

Cassidulina crassa d'Orbigny var. porrecta Heron-Allen and Earland, 1932, p. 358, 359, pl. 9, figs. 34–37.
Text-fig. 2. Interrelations of test length and width (A) and test width and thickness (B) for *Globocassidulina biora* (Crespin) showing the apertural type. Sample from 75012901.

**Explanation of Plate 90**

Figs. 1-3. *Globocassidulina biora* (Crespin)
1a, b; ephebic stage (DESS 82038), ×60. 2; early ephebic stage (DESS 82039), ×105. 3; neanic stage (DESS 82040), ×105.

Figs. 4-7. *Cassidulinoides porrectus* (Heron-Allen and Earland)
4a, b; ephebic stage (DESS 82041), ×45. 5; neanic stage (DESS 82042), ×60. 6; neanic stage (DESS 82043), ×60. 7; neanic stage (DESS 82044), ×60.

Figs. 8, 9. *Ehrenbergina glabra* (Heron-Allen and Earland)
8; megalospheric form (DESS 82045), ×65. 9a, b; microspheric form (DESS 82046), ×80.

Figs. 10a-c. *Cassidulinoides parvus* (Earland), (DESS 82047), ×80.

Figs. 11-14. Wall textures, 40 μm scale.
11; jagged-granular texture (*Ehrenbergina glabra*). 12; mosaic-granular texture (aneanic stage of *Globocassidulina biora*). 13; indistinctly radial texture (*Cassidulinoides porrectus*). 14; distinctly radial texture (*Cassidulinoides parvus*).

DESS: Department of Earth Sciences, Shimane University
**Cassidulinoides porrectus** (Heron-Allen and Earl. and Earl.), Parr, 1950, p. 344, pl. 12, fig. 26; Fillion, 1974, p. 139, pl. 4, figs. 1–3.

**Cassidulina crassa porrecta** Heron-Allen and Earl. McKnight, 1962, p. 126, 127, pl. 21, fig. 139.

**Cassidulinoides porrecta** (Parr). Osterman and Kellogg, 1979, p. 264, pl. 2, figs. 8, 9.

**Cassidulinoides porrecta** (Heron-Allen and Earl. Milam and Anderson, 1981, pl. 6, fig. 6.

**External morphology:**—**Cassidulinoides porrectus** has been considered to have a pyriform test, though in the immature (nepionic to neanic) stage it has a globular test like that of **Globocassidulina subglobosa** (Brady). Therefore, the relative growth shows isometry in the immature stage and positive allometry in the mature stage (Text-fig. 3). These features are described in the following three growth steps.

Nepionic to neanic tests showing isometric growth are globular to oval, and have three pairs of chamber just before attaining the ephebic stage (Pl. 90, Figs. 5, 6). Ephemetic tests, showing positive allometry, form an uncoiled chamber arrangement. In the gerontic growth stage, tests are somewhat cylindrically prolonged (Nomura, 1983d, pl. 2, figs. 2a, b).

In contrast to the original description, chambers are distinct and somewhat inflated through these growth stages. Sutures are distinct, slightly depressed and limbate. The last-formed chamber is narrowed. The aperture is a loop-like slit arranged almost at right angles to the basal suture of the apertural face, and situated at the middle portion of the face. The wall in well-preserved state is transparent, polished, pierced by numerous fine pores, and earlier chambers in the preceding whorl are visible externally. However, poorly preserved walls are opaque as in the original description.

**Apertural structure:**—Detailed examination of the aperture reveals that the loop-like slit opening is surrounded by a well-developed crista tooth on the posterior side and a lip on the anterior side (Pl. 92, Fig. 6). In the immature stage, the crista tooth is attached to the lip on its anterior end, but not in mature stages (Pl. 92, Figs. 6, 8, 9).

Dissected specimens show that the primary tongue is very narrow even in the mature stage, but it appears to be present from the nepionic aperture onwards; a rudimentary primary tongue with cavity is clearly observable in the first whorl (Pl. 92, Fig. 8). On the contrary, the secondary tongue is not formed throughout ontogeny.

Morphological change in the aperture through ontogeny is very slight and not serious for specific distinction of this species from other similar forms; the loop-like slit gradually increases in length as chambers are added.

**Wall texture:**—In polarized light, fragments of test wall reveal indistinctly radial texture (Pl. 90, Fig. 13).

**Perforation:**—Pores are rounded in all growth stages (Pl. 92, Fig. 7); pore diameter is 1.3 μm in average and pore density is 7 pores in 20 μm x 20 μm.

**Remarks:**—In at least immature forms such as the nepionic and neanic stages, there are some apparent similarities between **C. porrectus** and **Globocassidulina subglobosa**. The two species

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**Text-fig. 3.** Interrelation of test length and width for **Cassidulinoides porrectus** (Heron-Allen and Earl.), indicating the isometry in immature stage and positive allometry in mature stage. Sample from 75012901.
have subglobular tests and the apertures are perpendicular to the basal suture. However, the wall texture differs; the wall of *G. subglobosa* is of jagged-granular texture (Nomura, 1983c).

The ephbic to geronic specimens of this species are apparently close to *Cassidulinoides parkerianus* (Brady), illustrated in the Challenger Report, in the size and shape of the test, having a protruded final chamber. However, *C. porrectus* differs from *C. parkerianus* in having a more compressed test and narrower apertural face.

*Cassidulinoides parvus* (Earland)

Pl. 90, Figs. 10a–c, 14; Pl. 92, Figs. 1–5

*Ehrenbergina parva* Earland, 1934, p. 139, 140, pl. 6, figs. 28–32.

*Cassidulinoides parkerianus* (Brady). Parr, 1950, p. 344, pl. 12, fig. 25; McKnight, 1962, p. 127, pl. 22, fig. 14; Fillon, 1974, p. 139, pl. 4, fig. 5; Finger and Lipps, 1981, p. 129, pl. 2, fig. 8.

*External morphology:*—Test is small for the genus; test width is up to 120 µm in microspheric form and 170 µm in megalospheric, and length is up to 600 µm in microspheric form and 400 µm in megalospheric. As described by Earland (1934), this species possesses a biseral arrangement throughout, and it is usually found at the crosier-shaped state consisting of a very small coiled or loosely coiled early portion and linear or arcuate later one. Many microspheric forms here examined indicate the following two growth stages: Neopionic to neanic tests are very small (140 µm in length, 120 µm in width, and 100 µm in thickness) and globular in shape; ephbic to geronic stages show uncoiled-linear development (Pl. 92, Fig. 3).

Chambers are inflated, particularly distinct in later growth stages; sutures are therefore depressed and the test periphery is lobulate. The aperture is a loop-like slit set obliquely in the middle portion of the final apertural face, but in mature stages it is usually situated subterminally on the apertural face. Well-preserved walls are transparent, showing the earlier chambers.

*Aperture structure:*—Viewed from the exterior, the apertural structure is simple (Pl. 92, Fig. 1). The cristate tooth is prominent, but its anterior and posterior ends are linked to the lip (Pl. 92, Fig. 2). Internally no free structures are observed (Pl. 92, Figs. 3–5); a copula without the primary tongue originates from the middle portion of the anterior apertural face, close to the preceding aperture. The proximal end of the aperture is not fused with the preceding or previous chamber, so that an oval apertural opening is formed in the subterminal face. Thus, there is apparently no marked change in apertural structure and shape of the apertural opening through ontogenetic growth.

*Wall texture:*—All fragments of test wall show distinctly radial texture in polarized light (Pl. 90, Fig. 14).

*Perforation:*—Pores on coiled and uncoiled

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**Explanation of Plate 91**

CT=cristate tooth, L=lip

Figs. 1–7. *Globocassidulina biora* (Crespin)

1; outer test surface showing slit-shaped pores, 10 µm scale. 2; outer test surface showing irregular pores, 10 µm scale. 3; dissected specimen, 100 µm scale. 4; enlargement of Fig. 3, 100 µm scale. 5; internal structure showing the change of apertural shape, 20 µm scale. 6; internal structure showing proloculus aperture, 10 µm scale. 7; internal structure of neanic stage, 20 µm scale.

Figs. 8, 9. *Ehrenbergina glabra* Heron-Allen and Earland

8; dissected specimen, 100 µm scale. 9; internal structure showing apertural development, 10 µm scale.
chamber walls are rounded without decoration. Pore diameter is 0.5 μm in average and pore density is 8 pores in 20 μm × 20 μm.

Remarks:—This species was originally described under the genus Ehrenbergina by Earland (1934). Compared with other typical Ehrenbergina species, however, such morphological aspects as chamber shape and apertures indicate that this species is more reasonably put in Cassidulinoides; the genus Cassidulinoides is characterized by having a non-compressed test on both dorsal and ventral sides, globular chambers and subterminal loop-shaped aperture, whereas the genus Ehrenbergina is characterized by compressed, laterally prolonged chambers and elongate slit aperture with apertural flap.

The presence of a toothplate has been used as one of the basic criteria for the genus Cassidulinoides (Loeblich and Tappan, 1964a). However, C. parvus does not possess the toothplate as described above. From this point of view, Nomura (1983b) stressed that the structure of the toothplate is variable between respective species as well as within one species. Therefore the presence or absence of a toothplate is not sufficient to justify generic distinction. The same is true for Cassidulinoides parvus, which is devoid of a primary tongue in spite of the presence of a cristate tooth.

It is noted that C. parvus has not been reported so often from the Antarctic region. In the original description, Earland pointed that this species is confined to the Bransfield Strait, South Shetlands and Palmar Archipelago, and that it is easily overlooked owing to the small size. However, this species is commonly found in Lützow-Holm Bay area.

Genus Ehrenbergina Reuss, 1850

Ehrenbergina glabra Heron-Allen and Earland

Pl. 90, Figs. 8, 9a, b, 11, Pl. 91, Figs. 8, 9

Ehrenbergina hystrix Brady var. glabra Heron-Allen and Earland, 1922, p. 140, pl. 5, figs. 1–6, 11.

Ehrenbergina glabra Heron-Allen and Earland. Uchio, 1960, pl. 1, figs. 1–3; McKnight, 1962, p. 127, pl. 22, figs. 142a, b; Fillion, 1974, p. 139, pl. 5, figs. 9, 10; Anderson, 1975, p. 86, pl. 11, figs. 2a, b; Saidova, 1975, pl. 89, fig. 13; Osterman and Kellogg, 1979, p. 264, pl. 2, fig. 4; Milam and Anderson, 1981, pl. 9, fig. 7.

External morphology:—The test is triangular, with laterally prominent spines. Spines are well developed in later ontogenetic stages, as they gradually increase in length in harmony with chamber development. In both megalo- and microspheric forms, the earliest portion is coiled, but its roundness is different due to the size of proloculus; microspheric forms appear to be sharpened, whereas megalospheric ones are more rounded. Chambers are low and broad, not inflated, and overlap about half of the breadth on the dorsal side. Sutures are limbate and well shown on the dorsal side, but on the ventral side the limbation is not distinct. The aperture is a long-narrow arcuate slit almost parallel to the dorsal line in apertural view. The wall is translucent, pierced by fine pores, but not perforate on the apertural flap.

Test length is up to 765 μm; width up to 740 μm; thickness up to 380 μm.

Apertural structure:—Owing to the development of an apertural flap, the aperture of this species is a simple slit. However, many dissected specimens reveal that a primary tongue and cristate tooth are formed on the dorsal side of the aperture. These structures, which are formed by the turnover of the septal chamber wall on the dorsal side, are internally connected with each other.

Ontogenetically viewed, a rudimentary structure is already formed in the earliest stages, presenting a very shallow cavity beneath the primary tongue. But compared with the development of the cristate tooth, the primary tongue is not so conspicuous (Pl. 91, Figs. 8, 9).

Wall texture:—Examination of the test through polarized light shows that walls are of jagged-granular texture (Pl. 90, Fig. 11).
Perforation:—Pores are slit-shaped on earlier chambers, rounded to irregular on later portion, but absent on the apertural flap as well as the apertural margin. Length of slit-shaped pores is 1.2 μm in average; pore density is 8 pores in 20 μm x 20 μm.

Remarks.—Heron-Allen and Earland (1922) first described this taxon from many stations around the seas of New Zealand’s subantarctic islands and the Antarctic, as one of the most thriving forms in Antarctic cold water. At that time, they considered this species to be a variety of E. hystrix, pointing out such differences as absence of apertural grooves and a more inflated apertural face. As discussed by Loeblich and Tappan (1964a, b), however, this species is distinctly differentiated from E. hystrix (= Reissia hystrix, Loeblich and Tappan, 1964b) in having the test wall of jagged-granular texture. Recognition of E. glabra as a distinct species is safely accepted.

So far as examined in the literature, this species seems to bear a greater resemblance to E. pupa (d’Orbigny). Some specimens show very short peripheral spines, but typical pupa-like forms are not found from Lützow-Holm Bay area.

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References


Explanation of Plate 92

C=cavity, CP=copula, CT=cristate tooth, L=lip, P=proloculus, PT=primary tongue, S=sulcus

Figs. 1-5. *Cassidulinoides parvus* (Earland)

1; external structure of aperture in mature stage, 10 μm scale. 2; external structure of aperture in immature stage, 10 μm scale. 3; dissected specimen, 50 μm scale. 4; internal structure of uncoiled portion, 20 μm scale. 5; enlargement of Fig. 3, showing apertural development, 20 μm scale.

Figs. 6-9. *Cassidulinoides porrectus* (Heron-Allen and Earland)

6; external structure of aperture, 100 μm scale. 7; outer test surface showing rounded pores, 10 μm scale. 8; internal structure of coiled portion, 20 μm scale. 9; internal structure of uncoiled portion, 30 μm scale.


南極のリュツォ・ホルム湾東岸からの Cassidulinidae 科の有孔虫: 南極のリュツォ・ホルム湾東岸の隆起汀線と現世海浜堆植物（海拔 11.5, 9, –31.5, –98 m）から Cassidulinidae 科の 4 種の有孔虫, Globocassidulina biora (Crespin), Cassidulinoides porrectus (Heron-Allen and Earland), Cassidulinoides parvus (Earland), Ehrenbergina glabra Heron-Allen and Earland について個体発生および解剖学的知見のもとに記載した。

G. biora, C. porrectus, C. parvus の 3 種は、個体発生を通じて形態変化がそれぞれ確認される。たとえば、G. biora の口孔は個体発生を通じて I 型→L 型→Ⅲ型の 3 段階の形態変化を示すため、I 型と L 型の幼走期の外部形態は G. subgloboza (Brady) と G. crassa rossensis Kennett にそれぞれ類似する。また、成長が規則を示す C. porrectus と C. parvus は幼走期に G. subgloboza に似る。しかし、これらの種と類似種とは殻構造と口孔の内部構造の違いによって区別することが可能である。