Emendation of the foraminiferal genus *Cribrorstonoides* Cushman, 1910, and its taxonomic implications

**Introduction**

The lituolid (agglutinated benthonic foraminiferal) genus *Cribrorstonoides* Cushman, 1910 is an ubiquitous component of modern deep-sea faunas. It has been reported by numerous authors from "flysch-type" foraminiferal assemblages of Late Cretaceous to Oligocene age. Unfortunately, this widely cited genus does not benefit from having a well-defined description. There is much confusion in the literature concerning its type species, coiling mode and apertural characteristics. This is partly attributable to the poor quality of the original illustrations, and to the fact that the original description was based solely upon the external morphology of the test. The purpose of the present study is to stabilise the concept of *Cribrorstonoides* based upon lectotypification of the type species (and emendation of the generic diagnosis). For this purpose we have illustrated type specimens from the collections of J.A. Cushman, H.B. Brady, and G.O. Sars, and have dissected specimens to reveal the mode of coiling and wall structure.

**ABSTRACT**

A review of the taxonomic history of the agglutinated (benthonic) foraminiferal genus *Cribrorstonoides* Cushman, 1910 reveals much confusion concerning its type species, coiling mode and apertural characteristics. We believe the originally designated type species of *Cribrorstonoides* Cushman, 1910, *C. bradyi* Cushman, 1910, to be no more than varietally (i.e. infra-subspecifically) distinct from, and therefore a junior synonym of, *Haplophragmoides subglobosus* Cushman, 1910. The coiling of *Cribrorstonoides*, as typified by *C. subglobosus* (Cushman, 1910), is in the form of an involute streptospire characterised by a repeated alternation in axis. The aperture of the genus is equatorially or asymmetrically placed and interio-areal and single (in megalospheric and juvenile microspheric specimens) to areal and multiple (in microspheric adults). In order to stabilise the concept of *Cribrorstonoides*, we have designated lectotypes for both *C. bradyi* and *H. subglobosus*, and have also emended the generic diagnosis of Loeblich and Tappan (1987). Criteria for the discrimination of *Cribrorstonoides* mend. herein and allied genera are tabulated. *J. Micropalaeontol.* 12 (2): 181-193, December 1993.

**TAXONOMIC HISTORY OF THE GENUS CRIBROSTOMOIDES CUSHMAN, 1910**

In his "North Pacific Monograph", Cushman (1910: 108-109) first described the new genus *Cribrorstonoides*, with the new species *C. bradyi* as the type. The type description for *C. bradyi* reads thus:

"Test free, planospiral, of several coils, chambered, the last-formed coil with several chambers progressively increasing in size, arenaceous wall, with much cement... , aperture in young specimens a simple elongate slit at the base of the apertural face, later subdivided by tooth-like processes, and in the adult represented by a linear series of distinct rounded [interio-areal or areal] openings." The type figures are reproduced in Fig. 1.1a-c.

In his subsequent "North Atlantic Monograph", Cushman (1920: 52-54) acknowledged the possibility that *Cribrorstonoides bradyi* might be synonymous with *Haplophragmoides subglobosum* (Sars) (sic). However, he retained the two as separate species, stating that "Cribrorstonoides may be easily distinguished in the adult by the row of pores forming the aperture, while the aperture of *H. subglobosum* is always simple."

In their studies of "Upper Cretaceous" [Palaeocene] material from the Lizard Springs Formation of Trinidad, Cushman & Jarvis (1927, 1932) applied the generic name *Cribrorstonoides* to a species (C. trilitatensis Cushman & Jarvis, 1927) characterised by multiple interio-marginal rather than interio-areal openings, in so doing implicitly emended the concept of the genus. In fact, *Cribrorstonoides* *trilitatensis* appears distinct from *Cribrorstonoides* s.s. in its...
Fig. 1.1. Cribrostomoides subglobosus forma subglobosus (Cushman, 1910). x32. Reproduction of type figures of Haplophragmoides subglobosus Cushman, 1910, (Textfigs. 102-104). Textfig. 104 from Albatross Station D3603 (1771 fm or 3241 m). Fig. 1.2. Cribrostomoides subglobosus forma subglobosus (Cushman, 1910). x36. Lectotype of Haplophragmoides subglobosus Cushman, 1910 (herein designated). From Albatross Station D3603 (1771 fm or 3241 m). United States National Museum Registered Number USNM8219b. Specimen illustrated by Cushman (1910) as Textfig. 164. Compare with our Fig. 1.1. Also illustrated by SEM in Pl. I, figs. 1a,b. Fig. 1.3. Cribrostomoides subglobosus forma subglobosus (Cushman, 1910). x36. Paralectotype of Haplophragmoides subglobosus Cushman, 1910 (herein designated). From Albatross Station D3603 (1771 fm or 3241 m), USNM8219b. Specimen illustrated by Cushman (1910) as Textfig. 162. Fig. 1.4. Cribrostomoides subglobosus forma bradyi (Cushman, 1910). x16. Reproduction of type figure of Cribrostomoides bradyi Cushman, 1910 (Textfig. 167). From Albatross Station D3346, North Pacific. Fig. 1.5. Cribrostomoides subglobosus forma subglobosus (Cushman, 1910). x20. Reproduction of Pl. 34, fig. 8 of Brady (1884) (identified as Haplophragmium latidorsatum (Bornemann)). From Challenger Station 24, off Culebra Island, West Indies (390 fm or 714 m). The Natural History Museum (BMNH) Registered Number ZF1542. Placed by Cushman (1910) in Haplophragmoides subglobosus G.O. Sars (sic). Fig. 1.6. Cribrostomoides subglobosus forma bradyi (Cushman, 1910). x15. Reproduction of Pl. 34, fig. 9 of Brady (1884) (identified as Haplophragmium latidorsatum (Bornemann)). From Challenger Station 246, North Pacific (2050 fm or 3752 m), BMNH ZF1543. Placed by Cushman (1910) in Cribrostomoides bradyi n. sp. For a modern SEM illustration see Fig. 2.3.
interio-marginal rather than interio-areal aperture (and from Barkerina Frizzell & Schwartz, 1950 (where it was placed by Frizzell & Schwartz (1950)) in its arenaceous rather than microgranular wall and in lacking internal partitions). We believe "C. trinitatensis" probably represents a separate genus.

Höglund (1947: 144-145) synonymised Cribrostomoides Cushman, 1910 with Labrospira n. gen., apparently rejecting it on the grounds of the inappropriateness of the name (observing a complete gradation from specimens with simple slit-like apertures ("Labrospira") to rare specimens with multiple apertures ("Cribrostomoides") and arguing that Cushman was "...in no way justified..." in "...singlying out such specimens [as the latter] and setting them up...as a... new genus!). In fact, Articles 18 and 23m of the International Code of Zoological Nomenclature (Ride et al., 1985) state that the "inappropriateness" of a name does not affect its availability, and that no valid available name can be rejected on this or any other ground. Moreover, Höglund also synonymised the type-species of Cribrostomoides Cushman, 1910 (C. bradyi Cushman) with Labrospira subglobosa (G.O. Sars, 1871 (1872)) (sic), in so doing, automatically making Labrospira a junior synonym of Cribrostomoides.

Frizzell & Schwartz (1950: 3) emended Cribrostomoides on the basis of its apertural characteristics, citing as typical a simple "elliptical or crescent-shaped" slit, located "...slightly above..." the base of the septal face and "...completely surrounded by it...". They added that "provisionally, it seems advisable to regard bradyi and subglobosa as distinct species, each including variant individuals in which multiple apertures are developed".

Loeblich & Tappan (1964: C225) followed Höglund (1947) in synonymising Cribrostomoides bradyi Cushman, 1910 with Lituola subglobosa G.O. Sars, 1871 (1872) (sic), citing the latter as the type species of Cribrostomoides Cushman, 1910. They also synonymised Labrospira (see above) with Cribrostomoides. In their diagnosis of Cribrostomoides Cushman, 1910, they essentially reverted to the original, stating the chamber arrangement to be "similar to Haplophragmoides" [i.e. planispiral] and the aperture to be "areal" (single in "young" and dentate or multiple in "very large" individuals).

Subsequently, Loeblich & Tappan (1987: 65-66) reinstated Labrospira and quoted bradyi as the type species of Cribrostomoides without reference to subglobosa. In their revised diagnosis of the genus, they stated the coiling mode to be "slightly streptospiral" in early stages, later becoming "planispiral and symmetrical". They further stated the aperture to be "equatorial, just above the base of the final chamber face, ... a simple slit in the early chambers, later ... a linear series of irregular to rounded openings".

OBSERVATIONS ON THE GENUS CRIBROSTOMOIDES
CUSHMAN, 1910

I. On the type species
The type species (by original designation) of the genus Cribrostomoides Cushman, 1910 is unequivocally Cribrostomoides bradyi Cushman, 1910. Confusion arises from the arguable synonymy of C. bradyi Cushman, 1910 and C. subglobosa actu.

The earliest citations of Lituola subglobosa (M. Sars, 1868 (1869); G.O. Sars, 1871 (1872); Brady, 1881a,b) are unaccompanied by figures or descriptions, and are invalid. The next citation (Brady, 1884) synonymised Lituola subglobosa with the fossil species Haplophragmium latidorsatum Bornemann, which is herein regarded as distinct and referable to the genus Haplophragmoides Cushman, 1910. Interestingly, one of the slides in the Brady Collection in the Natural History Museum (BMNH) (which was evidently sent to Brady by Michael Sars) bears the pencilled inscription "Lituola subglobosa" crossed out and replaced by the inked inscription "Haplophragmium latidorsatum" (see our Fig. 2.3). It follows that if Brady had used Sars' designation instead of trying to synonymise it under Bornemann's species, he would have validated subglobosa in his Challenger Report.

Cushman (1910) was the first to validate the specific name subglobosa, though at the time of writing he was evidently unaware of this. This is noted on an undated addendum slip in the Natural History Museum's edition of the Ellis & Messina Catalogue of Foraminifera (1940 et seq.) (the full text of which states that "although Cushman credited the specific name [Haplophragmoides (sic) subglobosa] to G.O. Sars it should be credited to Cushman since Sars was responsible for the name alone and not for the description or figures [ICZN, Article 21]).

Both Cribrostomoides bradyi Cushman, 1910 and Haplophragmoides subglobosa Cushman, 1910 were validated in the same publication (Cushman, 1910), the former species on p. 108 and the latter on p. 105.

The microfossil collections in the United States National Museum of Natural History, Smithsonian Institution, house about six trays of slides labelled "Cribrostomoides bradyi" and "Haplophragmoides subglobosa" from Albatross and Nero stations studied by Cushman (1910, 1920, 1921). The bulk of this material is from the North Atlantic (Cushman, 1920), but some is also from the North Pacific (Cushman, 1910) and some from the Philippines (Cushman, 1921). All of the Pacific specimens of both "species" are considered cotypic (synotypic).

Based partly on a study of syntypic suites of both "species", we believe Cribrostomoides bradyi Cushman, 1910 (see our Fig. 1.4,6; Fig. 2. and Pl. 3) and Haplophragmoides subglobosa Cushman, 1910 (see our Fig. 1. 1-3, 5 and Pls. 1.2) to be no more than infra-subspecifically distinct and therefore for practical purposes synonymous (Lukina (1980) reached a similar conclusion). Forma bradyi differs from forma subglobosa essentially only in its size (being larger), and in its wall texture (being finer) and composition (apparently being selective in its use of mafic particles). These differences are interpreted as due to differences in substrate rather than genetic effects (i.e. phenotypic rather than genotypic).

Article 24 of the ICZN (Ride et al., 1985) (the "Principle of the First Reviser") states that "If two ... names are published
Fig. 2. Syntypes of "Cribrostomoides bradyi" from the Cushman Collection. **Fig. 2. 1a,b. Cribrostomoides subglobosus forma bradyi** (Cushman, 1910). Lectotype (designated herein) of "Cribrostomoides bradyi", North Pacific, Albatross Station D3346, specimen displays crenulated lip, x28. **Fig. 2. 2a,b. Cribrostomoides subglobosus forma bradyi**. Paralectotype (designated herein) of "Cribrostomoides bradyi", North Pacific, Albatross Station D3346, specimen without crenulated lip, x28. **Fig. 2.3. Cribrostomoides subglobosus forma bradyi**. Brady's specimen of "Haplophragmium latidorsatum", from Challenger Station 246, North Pacific. This specimen was placed by Cushman (1910) in "Cribrostomoides bradyi". BM(NH) ZF1543, x10.

**Explanation of Plate 1**

Type specimens of "Cribrostomoides subglobosus". **Fig. 1a,b. Cribrostomoides subglobosus forma subglobosus** (Cushman, 1910). Lectotype (designated herein) of "Cribrostomoides subglobosus", North Pacific, Albatross Station D2603, 1771 fathoms, USNM 8219b. Specimen illustrated by Cushman (1910) in Textfig. 104, x45. **Fig. 2a,b. Cribrostomoides subglobosus forma subglobosus**. Paralectotype (designated herein) of "Cribrostomoides subglobosus", North Pacific, NERO Station 160, 1907 fathoms, USNM 8219a, x45. **Fig. 3a,b. Cribrostomoides subglobosus forma subglobosus**. Lofoten Islands, Norway "very deep water". Specimen was sent to H.B. Brady from the collection of G.O. Sars. Brady Collection, BMNH 1958:11:3-7-12, x63. **Fig. 4. Cribrostomoides subglobosus forma subglobosus**. Stereo-pair of a specimen sectioned to show involute streptospiral coiling ALBATROSS Station D2572. Slide labelled "Cribrostomoides bradyi" from the Cushman Collection, donated to the British Museum (Natural History). BMNH 1961:1:9:77. **Fig. 5. Detail of wall, showing non-canaliculate wall structure, x615.**
The Foraminiferal genus *Cribrostomoides*
Paralectotypes
ALBATROSS Station 3346 (North Pacific)

Metatypes
ALBATROSS Station D2035 (North Atlantic)

Fig. 3. Apertural characteristics of adult specimens of "Cribrostomoides bradyi". All specimens are from the Cushman Collection (USNM), camera lucida drawings. The paralectotypes have broad apertures with crenulate lips, whereas Atlantic specimens display a greater tendency to possess true multiple apertures. All specimens drawn to the same size.

on the same date, ... in the same or different works, ... by the same or different authors, ... and ... subsequently considered to be synonyms ... their relative precedence is determined by the first reviser”.

We accordingly assign precedence to Haplophragmoides subglobosus Cushman, 1910. This is the more widely used name and the one whose retention would best maintain nomenclatorial stability. It also has "position precedence" (defined as that "given to the the nominal species cited first in the work, page or line"). Recommendation 69B(ii) of the ICZN suggests that this be recognised in the event of "all other things being equal" (Ride et al., 1985).

(2) On the coiling mode
The widely-held belief (e.g. of Cushman, 1910, Frizzell and Schwartz, 1950, and Loeblich & Tappan, 1964) that the chamber arrangement in the genus Cribrostomoides is planispiral is in our opinion untenable. This was first called into question by the work of Högglund 1947: 144-145), who noted that Labrospira subglobosa (G.O. Sars) (sic) (which he regarded as a senior synonym of Cribrostomoides bradyi Cushman) "is not formed as a completely flat spiral", that "this is frequently plainly visible in the last volution, which is more or less twisted" and that "the irregularity is particularly noticeable in the initial portion, where the arrangement of the chambers is difficult to determine in a section". Högglund’s figured section (Textfigure 126) seems to indicate that later whorls are arranged more or less at right angles to earlier ones. This kind of coiling conforms to that which Banner & Blow (1967) defined (in the case of the planktonic genus Pulleniatina Cushman) as "streptospiral". Hofker (1976: 54-55) also observed of Cribrostomoides bradyi Cushman that "especially the early chambers are streptospirally arranged, so that in a section transverse to the last formed coil the whole spiral is seen, whereas in sections in the plane of the last formed coil, several chambers of the first coils are sectioned transversely". He erroneously added that Högglund's subglobosa "does not show" the streptospiral initial part.

In contrast, Loeblich & Tappan (1964: C225) regarded Cribrostomoides as essentially planispiral. In this work, they defined "streptospiral" genera somewhat imprecisely as "coiled like a ball of twine". Later (1987: 65-66), they came to regard Cribrostomoides as "slightly streptospiral" in early stages, later becoming "planispiral and symmetrical". In this later work they defined streptospiral genera still somewhat imprecisely as "coiled ... in continually changing planes" (p. 741).

Our dissected specimen of Cribrostomoides subglobosus forma subglobosus from the Cushman Collection (Pl. 1, fig. 4) confirms the suspected involute streptospiral coiling mode, characterised by a (repeated) alternation in axis. This is manifest by regular intersections by the plane of section of
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Jones, Bender, Charnock, Kaminski & Whittaker

Cushman (sic). He has demonstrated that morphotypes characterised by single interio-areal apertures represent the megalospheric generation and that those with multiple areal apertures ("with lips which approach each other in several places even to separate the slit into areal openings") are microspheric adults (see also our Fig. 3). The former have a proloculus diameter of 33\(\mu\) and an overall test diameter of 1.5 - 2 mm (A1 generation) or a proloculus diameter of 46\(\mu\) and an overall test diameter of 0.8 - 1.6 mm (A2 generation). The latter have a proloculus diameter of 10 - 18\(\mu\) and an overall test diameter of 2 - 3 mm.

Multiple areal apertures have only been observed in Recent individuals (though this could be a preservational phenomenon or artifact of our sampling). In a few individuals with single elongate apertures the lower lip may be very narrow, giving the impression of an interio-marginal slit. This is also true with the specimen drawn in Brady's (1884) Pl. 34, fig. 7b. A close-up of the aperture reveals the interio-areal position.

(4) On the wall structure
Both C. subglobosus forma bradyi (Fig. 4) and forma subglobosus (Pl. 3) possess a typically tripartate trochoinaceaean wall structure with a thick agglutinated layer bounded by inner and outer organic layers. The chamber walls of forma bradyi and forma subglobosus are several grains thick with coarse quartz and other mineral particles in a fine-grained ground mass. In C. subglobosus forma bradyi, both the exterior and interior test surfaces are finely agglutinated and smoothly finished, and coarser particles are concentrated within the chamber wall. In C. subglobosus forma subglobosus, the coarser grains may project outward as well as into the chamber lumen resulting in rough test surfaces. Sectioned, imperforate chamber walls

(3) On the apertural characteristics
Hofker (1976: 54-55) associated variation in apertural form with alternation of generations in Cribrostomoides bradyi the line of communication between successive intercameral foramina and the primary aperture.

Wall structure of Cribrostomoides subglobosus forma subglobosus. Fig. 1-3 Norwegian-Greenland Sea, Sample 21697-1 (73°45.1' N/10°28.5' W), 3062 m, 1- x40; 2- detail of wall showing inner organic layer (iol), x635; 3- detail of wall showing undifferentiated organic cement at particle contacts, x3180. Fig. 4. Ivory Coast, Sample 16802-1 (4°30.2'N/6°28.0'W), 691 m, x48. Fig. 5-7 Offshore Ghana, Sample 16838-1A, 4°39.0'N/1°11.0'E, 3736 m. 5- Cross section of wall showing outer organic layer (OOL), x1270; 6- Detail of wall showing inner organic layer and undifferentiated organic cement at particle contacts, x1270; 7- Detail of wall showing inner organic layer with net-like organic cement beneath, x6515.
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of well-preserved specimens show an inner organic layer as well as a thin outer organic layer (Fig. 4.1b-d; Pl. 3, figs. 2, 3, 5-7). In both formae all agglutinated particles are organically enveloped and firmly glued together with organic cement. In the distal parts of the chamber wall the cement is developed as morphologically undifferentiated substance which joins particles at their points of contact (Fig. 4.1d, Pl. 3, figs. 3, 5, 6), while in proximal parts of the wall it may have a net-like appearance (Pl. 3, fig. 7). The organic nets are especially found in contact with the inner organic layer, although they may be incomplete in some chamber wall areas.

DESIGNATION OF LECTOTYPE FOR HAPLOPHRAGMOIDES SUBGLOBOSUS CUSHMAN, 1910

The specimen designated as lectotype of Haplophragmoides subglobosus Cushman, 1910 (United States National Museum of Natural History [USNM] Registered Number USNM8219b) has been chosen from the original syntypic suite of that species. The specimen (Pl. 1, fig. 1a,b) is from Albatross Station D3603 in the North Pacific (1771fm or 3241m), material from which was certainly available to Cushman at the time he was working on his "Monograph of the Foraminifera of the North Pacific Ocean" (1910). The lectotypification is therefore in accordance with Article 74(a) of the ICZN (Ride et al., 1985; see also above). The remaining former syntypes of H. subglobosus Cushman, 1910 become paralectotypes in accordance with Article 74a(iv) of the ICZN.

EMENDED DIAGNOSIS OF THE GENUS CRIBROSTOMOIDES

The specimen figured as Textfig. 164 on p. 106 of the "North Pacific Monograph" (Cushman, 1910) (a plesiotype is a figured specimen used subsequently to the original description). The lectotypification is therefore also in accordance with Recommendation 74B of the ICZN, which states that "other things being equal, an author who designates a lectotype should give preference to a syntype of which an illustration has been published".

The remaining former syntypes of H. subglobosus Cushman, 1910 become paralectotypes in accordance with Article 74a(iv) of the ICZN, which states that "The valid designation of a lectotype permanently deprives all specimens that were formerly syntypes ... of the status of syntype [Art. 73b(ii)]; those species become paralectotypes [Rec. 74F]".

DESIGNATION OF LECTOTYPE FOR CRIBROSTOMOIDES BRADYI CUSHMAN, 1910

The specimen designated as lectotype of Cribrostomoides bradyi Cushman, 1910 (hitherto unregistered by the USNM) has also been chosen from the original syntypic suite of that species. The specimen (Fig. 2.1a,b) is from Albatross Station D3346 in the North Pacific, material from which was certainly available to Cushman at the time he was working on his "North Pacific Monograph" (Cushman, 1910). The lectotypification is therefore in accordance with Article 74(a) of the ICZN (Ride et al., 1985; see also above). The remaining former syntypes of C. bradyi Cushman, 1910 become paralectotypes in accordance with Article 74a(iv) of the ICZN.

EMENDED DIAGNOSIS OF THE GENUS CRIBROSTOMOIDES
Cribrostomoides Cushman, 1910, pps. 108-109 [C. bradyi Cushman, 1910, pps. 108-109 = Haplophragmoides subglobosus Cushman, 1910: 105-106 (herein lectotyphified); O.D. = Litula auct., non Lamarck, 1804; Haplophragmium auct., non Reuss, 1860; Haplophragmoides Cushman, 1910: 99 (pars); Cribrostomoides Cushman, 1910: 108-109; Labrospira Höglund, 1947]. Test free, coiled in an involute streptospire, characterised by a (repeated) alternation in axis (usually of ninety degrees); wall agglutinated, solid, imperforate, consisting of a multiple layer of mineral particles covered by an inner and outer organic lining, cement organic, aperture equatorial or slightly asymmetrically placed, interio-areal and single to areal and multiple, surrounded by lips.

Geographical Distribution
The geographical distribution of Cribrostomoides appears to be worldwide based on the following records: Arctic, Brady (1881a,b), Vilks (1969), Jones (1984, MS); Atlantic (including Caribbean and Gulf of Mexico) and borderlands, Brady (1884), Flint (1899), Cushman (1910, 1920), Höglund (1947), Galhano (1963), Leroy & Hodgkinson (1975), Hofker (1976), Pflum & Frerichs (1976), Pearce (1980, MS), Lutze (1980), Cole (1981), Culver & Buzas (1982), Schafer & Cole (1982), Schafer et al. (1983), Jones (1984, MS), Murray & Taplin (1984) (after Carpenter (1868)), Mackensen et al. (1985); Pacific and borderlands, Brady (1884), Cushman (1910), Theyer (1971), Smith (1973), Saidova (1975), Zheng (1988), Zheng and Fu (1988), Mackensen & Douglas (1989); Southern Ocean and Antarctic, Brady (1884), Herb (1971), Anderson (1975), Lindenberg & Auras (1984), Mackensen & Douglas (1989), Mackensen et al. (1990).

The majority of occurrences are either in comparatively shallow (shelf to upper bathyal) depths in high latitudes or comparatively deep (middle bathyal to abyssal) depths in low to moderate latitudes. The inference is that it is a stenothermal, cryophilic genus. Recent evidence suggests that it might be infaunal in habit (Mackensen & Douglas, 1989).

Stratigraphic Range
The stratigraphic range of Cribrostomoides appears to extend from the Late Cretaceous to the Recent based on the following records: Late Cretaceous - Early Tertiary, Labrador Sea, Miller et al. (1982); Maastrichtian - Palaeogene, Labrador and North Seas, Gradstein & Berggren (1981); Santonian - Palaeocene, Central North Sea, Charnock & Jones (1990); Late Pleistocene, Denmark Strait, Norwegian-Greenland Sea and Iberian Abyssal Plain, Jones (1984, MS); late Quaternary, Norwegian Sea, Sen Gupta (1984).

TAXONOMIC IMPLICATIONS
Our emendation of Cribrostomoides Cushman, 1910 affects the interpretation of its relationship to a number of allied genera. Cribrostomoides Cushman, 1910, as emended herein, is distinguished from Haplophragmoides Cushman, 1910, emend. Höglund, 1947 and Evolutinella Myatlyuk, 1971 on the basis of its streptospiral rather than planispiral coiling and interio-areal rather than interio-marginal aperture, respectively; from Recurvoidei Earland, 1934, emend. Uchio, 1960 on the basis of its involute rather than evolute streptospiral coiling and inflated rather than compressed test; from Conglomegranum Bermúdez & Rivero, 1963 in its well-formed chambers; from Martyschiella Myatlyuk, 1966 and Thalmanurocerovoids Sandulescu, 1971 on the basis of its involute rather than evolute streptospiral coiling and interio-areal rather than interio-marginal aperture, respectively; from Budashevella Loeblich & Tappan, 1964 on the basis of its involute rather than evolute streptospiral coiling, interio-areal rather than interio-marginal aperture and inflated rather than compressed test; from Veleronoinoides Saidova, 1981 on the basis of its involute streptospiral rather than evolute planispiral coiling; from Cribrostomellus Saidova, 1970 on the basis of its organic rather than calcareous cement, and from Buzasina Loeblich & Tappan, 1985 (and its synonym Cystamininella Lukina, 1980, non Myatlyuk, 1966) on the basis of its streptospiral rather than planispiral coiling. Criteria for the discrimination of the aforementioned genera are summarised on Table 1.

Labrospira Höglund, 1947 is automatically a synonym of Cribrostomoides Cushman, 1910 because Höglund included the type species of the latter genus in his description of the former. In our opinion, evolute planispiral species with interio-areal apertures previously erroneously included in Labrospira Höglund, 1947 should now be transferred to Veleronoinoides Saidova, 1981. We are currently reviewing the genus Recurvoidei Uchio, 1960 partly in order to elucidate the nature of its relationship with Cribrostomoides Cushman, 1910.

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