

Review of *Cyclodostomia* Sacco, 1892 and *Marginodostomia* Nomura, 1936, two taxa of the Pyramidelloidea (Gastropoda: Heterobranchia)

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It is shown that *Cyclodostomia* Sacco, 1892, is a monotypic subgenus of *Odostomia* Fleming, 1813, with the only (type-) species *Odostomia (Cyclodostomia) italiana* Corgan & Van Aartsen, 1998. *Marginodostomia* Nomura, 1936, which has been considered as synonymous, is here shown to be a full genus and its contents critically evaluated. Species of *Marginodostomia* occur throughout the world from Paleocene to Recent. Fifteen species are referred to it.

Key words: Gastropoda, Heterobranchia, Pyramidelloidea, *Cyclodostomia*, *Marginodostomia*, nomenclature, systematics.

INTRODUCTION

The pyramidellocean gastropod taxa *Cyclodostomia* Sacco, 1892, and *Marginodostomia* Nomura, 1936, are often misunderstood. Twenty-three nominal species have been referred to this pair of genus-group taxa. They range from Paleocene to Recent and occur in Europe, the Middle East, Asia, and North America. Many of these 23 species are morphologically distinct from the type species of the genus-group taxon to which they are referred. *Cyclodostomia* and *Marginodostomia* have been interpreted as subjective synonyms but that view is not tenable. The present text clarifies the morphology, geographic distribution, and geologic range of these dissimilar taxa and refers three additional species-group taxa to *Marginodostomia*.

EARLY USAGE OF *CYCLODOSTOMIA* SACCO, 1892

Cyclodostomia Sacco, 1892, was initially ranked as a subgenus of *Odontostomia* Jeffreys, 1839. *Odontostomia* is an unjustified emendation of *Odostomia* Fleming, 1813. It lacks status in zoological nomenclature (Van Aartsen & Corgan, 1996). *Cyclodostomia* was proposed for two gastropods from the Pliocene of Italy: *O. (C.) mutinensis* Sacco, 1892, and *O. (C.) cingulata* Sacco, 1892. Sacco's first species was designated as the type by Verrill & Bush (1900: 333).

The original Latin description of *Cyclodostomia* is: "Testa parva, plus minusve conica. Anfractus interdum angulati et prope suturam superam cingulo sat perspicuo muniti. Columella uniplicata." (Sacco, 1892: 46). It can be loosely translated as: Shell small, rather conical; periphery angular; suture prominent, set off by a bold cord; with a single

columellar plication. Sacco's figure of the type-species is small and unrecognizable (Sacco, 1892: pl. 1 fig. 102).

When Sacco established *Cyclodostomia*, he described 11 other new genus-group taxa within the Pyramidelloidea and scores of other taxa representing many molluscan groups. Sacco's study helped to establish him as a paleontologist (Desio, 1951) and was widely viewed as a significant attempt to clarify molluscan taxonomy. Students of Mollusca soon applied Sacco's taxonomic concepts to modern and fossil faunas from many regions. In the case of *Cyclodostomia*, this produced confusion.

Sacco's type specimens are in Italian museums. For many decades they were little used. Initially, interpreting his work depended on his text and plates. The first published reaction to *Cyclodostomia* was negative. Cossmann (1894: 797) considered it a nominal taxon of little value. In French, he called it and some of Sacco's other taxa 'an abuse of nomenclature'. Sacco's work was accepted by other workers. For *Cyclodostomia*, interpretations of morphology varied.

1. *Odontostomia (Cyclodostomia) cingulata* Sacco (1892: 46, 48, pl.1 fig. 103). Pliocene, Italy. To *Odostomia* s.l. See text discussion.
2. *Odostomia (Cyclodostomia) didyma* Verrill & Bush (1900: 333, pl. 65 fig. 14). Recent, Bermuda. To *Eulimastoma* Bartsch, 1916 (fide Wise, 1996).
3. *Odostomia hilgendorfi* Clessin (1900: 119, pl. 28 fig. 5). Recent and Tertiary, Asia. See Hatai & Nisiyama (1952). In *Marginodostomia* (fide Kuroda & Habe in Kuroda, Habe & Oyama, 1971: 276). See also Dall & Bartsch, 1906: 364, pl.24 fig.5. See text, should be viewed as *Odostomia*.
4. *Odostomia (Cyclodostomia?) letsonae* Pilsbry (1918: 323, fig. 23). Recent, Hawaii. To the eulimid genus *Pyramidelloides* Nevill, 1885 (fide Kay, 1979).
5. *Odostomia subangulata* A. Adams (1860b: 416). Recent, Asia. In *Marginodostomia* (fide Kuroda & Habe in Kuroda, Habe & Oyama, 1971: 276). (= *Odostomia clara* Brazier, 1877, fide Ponder & Stanbury, 1972: 46). See text, should be viewed as *Odostomia* s.l.
6. *Odostomia (Cyclodostomia) suta* Pilsbry (1918: 322, 323, fig. 22). Recent, Hawaii. To the eulimid genus *Pyramidelloides* Nevill, 1885 (fide Kay, 1979).
7. *Odostomia tenera* A. Adams (1860a: 21). Recent, Asia. In *Marginodostomia* (fide Kuroda & Habe in Kuroda, Habe, & Oyama, 1971: 277). See text, should be viewed as *Odostomia*.

Table 1. Problem taxa.

When Verrill & Bush selected a type species, they characterized *Cyclodostomia* as 'Shell small, more or less conic. Whorls angular sometimes and near the suture above with a small but distinct cingulum. Columella uniplicate' (Verrill & Bush, 1900: 532). After this awkward description, they assigned a new species to the subgenus *Odostomia* (*C.*) *didyma* Verrill & Bush (table 1) is from the Recent fauna of Bermuda. It has been studied by Waller (1973) and Wise (1996). Wise assigned it to *Eulimastoma* Bartsch, 1916. It does not have the prominent spiral cord mentioned in Sacco's description.

The next discussions of *Cyclodostomia* came in a pair of dichotomous keys by Dall & Bartsch (1904: 12; 1909: 15). They characterized it as an odostomiid subgenus with two tumid spiral ridges, one near the periphery and one near the suture. They did not expand its content. Then, Cossmann & Peyrot (1917: 125) identified *Cyclodostomia* as a taxon with a single spiral sulcus near the suture. They added a new species, *O. (C.) aturensis* (table 2). Next, Pilsbry (1918) described two new species from the Hawaiian Islands (table 1).

1. *Odontostomia (Cyclodostomia) aturensis* Cossmann & Peyrot (1917: 124, pl. 9 fig. 52-54). Tertiary, Europe. See Cossmann (1921).
2. *Odostomia cambonensis* Vasseur fide Cossmann (1921: 240). Tertiary, Europe. Note that we have only Cossmann's citation for this species.
3. *Odostomia daniana* Corgan & Van Aartsen, 1998 [= *Odontostoma obtusum* Von Koenen, 1885: 51, pl. 3 figs 8a-d, not *Odostomia obtusa* Gould, 1861]. Tertiary, Denmark.
4. *Acteon (sic) melanellus* I. Lea (1833: 113, pl. 4 fig. 99) (= *Odostomia laevigata* Heilprin, 1879: 212, pl. 13 fig. 5; = *Actaeon magnoplicatus* H. C. Lea, 1841: 94, pl. 1 fig. 5, fide Palmer & Brann, 1966: 804-805). Tertiary, North America. See Cossmann (1921).
5. *Odontostoma pupaeforme* Von Koenen (1885: 52, pl. 3 fig. 7a-c). Tertiary, Denmark. See Ravn (1939).
6. *Odostomia submarginata* Boettger (1906: 113). Tertiary, Europe. See Zilch (1934: 237, pl. 12 fig. 13).
7. *Odostomia verneuiliensis* de Raincourt & Munier-Chalmas (1863: 200, pl. 7 figs. 8a-c). Tertiary, Europe. See Cossmann (1921).

Table 2. European and North American species referred to *Cyclodostomia* Sacco in the sense of Cossmann, 1921.

By 1918, concepts of *Cyclodostomia* were diverse. Sacco stressed a spiral cord, Dall & Bartsch mentioned two spiral cords, and Cossmann & Peyrot emphasized a spiral sulcus. Then, Cossmann (1921: 239) changed Sacco's name to *Cyclodontostomia*, an unjustified emendation to improve Sacco's Latin. The new name was accompanied by a detailed characterization, similar to that of Cossmann & Peyrot (1917). Cossmann said "...tours peu convexes, lisses,.....séparés par des sutures profondes et finement rainurées, au-dessus desquelles on aperçoit un sillon spiral, situé au cinquième environ de la hauteur de chaque tour... Diagnose refaite d'après les figures médiocres du génotype ...; et d'après un plesiogénotype plus étroit, de l'Aquitainien de Dax: *O. aturensis* Cossm. et Peyr..." (Cossmann, 1921: 239). This can be very loosely translated as: ... whorls somewhat convex, smooth ... separated by a deeply furrowed suture ... with a spiral sulcus about a fifth of the way down the whorl... after the mediocre figures of the genotype ... and after ... *O. aturensis* Cossm. et Peyr....

The type species of *Cyclodostomia* is not necessarily excluded from Cossmann's *Cyclodontostomia* since a spiral band and spiral sulcus can co-occur. Still, Cossmann's phrasing created the impression of a taxon defined primarily in terms of a sulcus. Cossmann's work is both widely known and much esteemed. His concept of a taxon primarily defined by a sulcus has been almost universally accepted as valid for *Cyclodostomia* Sacco, 1892. Table 2 is a catalogue of European and North American species that have been referred to *Cyclodostomia* Sacco in this sense.

While Cossmann's concept was used by European and North American authors, it was little used by Asian authors. Eventually Nomura (1936: 34) created a taxon that resembles Cossmann's interpretation of *Cyclodostomia* as *Cyclodontostomia*.

EARLY USAGE OF *MARGINODOSTOMIA* NOMURA, 1936

Marginodostomia Nomura began as a section of *Odostomia* with *O. suturamarginata* Nomura (1936: 34, pl. 5 figs. 35a, 35b) as its type by monotypy. The original description was simple: "*Odostomia* having marginate sutures; aperture rhomboidal with a strong columellar fold." While the type species has a spiral sulcus near the suture, Nomura initially viewed this as a species-group character, not significant at the genus-group level. Apparently because of this initial view, species 3, 5 and 7 of table 1 have been referred to *Odostomia (Marginodostomia)* although they lack the distinctive morphology of the type species.

1. *Odostomia* (*Marginodostomia*) *misakiensis* Nomura (1939: 151-152, pl. 9 fig. 41). Recent, Asia.
2. *Odostomia* (*Marginodostomia*) *suturamarginata* Nomura (1936: 34, pl. 5 figs 35a, 35b). Recent, Asia. Type species of *Marginodostomia*.
3. *Odostomia* (*Marginodostomia*) *unicordata* Nomura (1938: 114, pl. 9 fig. 17). Tertiary, Asia.

Table 3. Some Asian species referred to *Marginostomia* Nomura, 1936.

Soon, Nomura (1938: 826) ranked *Marginodostomia* as a subgenus. Then, he redescribed it, saying "Whorls with a faint spiral cord in front of the suture; microscopic spiral lines may or may not be present on the surface" (Nomura, 1939: 129). Nomura and others eventually recognized six supposed species of *Marginodostomia* in Asian faunas (tables 1, 3).

SAURIN'S VIEW

Saurin (1958: 64) interpreted *Marginodostomia* Nomura as a junior subjective synonym of "*Cyclodostomia* Cossmann, 1921." This discussion shows clear signs of confusion because *Cyclodostomia* was named by Sacco in a study Saurin may never have seen. He used this name as Cossmann used it. His definition for the synonymous pair was brief, "Mince cordon ou ruban spiral sous la suture [Minute spiral cord or ribbon near the suture]." Eventually he made it even more brief: "Sillion spiral sous la suture [spiral sulcus near the suture]" (Saurin, 1959: 234). In this discussion he cited both Sacco and Cossmann but Cossmann is the only text listed in his list of references. He clearly equated *Cyclodostomia*, not *Cyclodostomia*, with *Marginodostomia*.

Referring to Cossmann (1921: 239, pl. 5 fig. 72) and Nomura (1936: 34, pl. 5 figs 35a, 35b) it is apparent that Saurin was right. *Marginodostomia* and *Cyclodostomia* Sacco sensu Cossmann are synonymous. Because Saurin viewed it as the senior name, he referred two species to *Odostomia* (*Cyclodostomia*). They are listed in table 4.

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1. *Synola charpentieri* Hornung & Mermod (1924: 291, 292, fig. 16). Recent, Red Sea and Southeast Asia. See Saurin (1958: 70, pl. 1 fig. 5; 1959: 239-240, pl. 2 fig. 6; 1961: 240).
 2. *Odostomia* (*Cyclodostomia*) *prava* (Saurin 1961: 240, pl. 1 fig. 4). Southeast Asia, Recent.
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Table 4. Asian species referred to *Cyclodostomia* by Saurin.

REDESCRIPTION, RANKING, AND DISTRIBUTION

The type species of *Cyclodostomia* and many of the nominal species named listed in tables 1-4 have long been misinterpreted. Part of the confusion is nomenclatural. Text discussions of content, given below, mention 31 valid, synonymous, or replacement names for 23 meaningful species-group taxa. Almost 25% of the names applied to these taxa are, basically, superfluous. While nomenclatural complexity is a factor, much of the difficulty in interpreting *Cyclodostomia* and *Marginodostomia* is rooted in Sacco's obscure illustrations, Cossmann's innovative view of Sacco's taxon, and Nomura's brief descriptions. Redescriptions and an appraisal of content should clarify these taxa.

EXCLUDED SPECIES

Species listed in tables 1 must be excluded from the *Cyclodostomia*-*Marginodostomia* complex before meaningful genus-group taxa can be characterized. Modern evaluations

of Sacco's type and reference specimens, cited below, do not include data on *Odontostomia* (*C.*) *cingulata* Sacco, 1892. Apparently the type is lost. While the written description of this species is rather comparable to that of the type species, the illustration does not show complex morphology near the suture. Without type material, this species is virtually uninterpretable. It should be referred to *Odostomia* s.l.

The six other species listed in table 1 must also be excluded from the *Cyclodostomia*-*Marginodostomia* complex. In the table, each species is referred to an appropriate genus.

Cyclodostomia Sacco, 1892

Recently Sacco's type and reference specimens were restudied and well illustrated (Janssen, 1972, and Ferrero-Mortara et al., 1984). Sacco's type species was originally named *Odontostomia* (*C.*) *mutinensis*. Because of homonymy with *O.* (*Macrodostomia*) *mutinensis* Sacco, 1892, the species was renamed *Odostomia italiana* Corgan & Van Aartsen (1998).

Redescription.- Shells belonging to the Odostomiidae, conical in shape without any conspicuous sculpture. The adapical suture is thickened by a broad swollen spiral cord that is only poorly differentiated from the rest of the whorl. Columella with one, clearly defined tooth.

Discussion.- The type species of *Cyclodostomia* has a broad inflated spiral cord adjoining the suture below which the whorl seems to be concave. This is best shown in a figure by Ferrero Mortara, et al. (1984, fig. 13b). It is not the presence of these sculptural features per se that is distinctive of *Cyclodostomia*, the distinctive feature is the broad, poorly defined style of the sculpture. Taxa that have been incorrectly referred to *Cyclodostomia* have narrow, clearly defined sculpture. Differences in appearance are pronounced.

Content.- No species listed in tables 1-4 has the diffuse spiral ornamentation of *O.* (*C.*) *italiana*. *Cyclodostomia* Sacco is, therefore, interpreted as a monotypic taxon.

Distribution.- Sacco's type specimen of this species is from the Pliocene of Italy. There are apparently reliable late twentieth century records from Miocene strata of Germany (Janssen, 1972) and Denmark (Sorgenfrei, 1958).

Ranking.- Because *Cyclodostomia* has a long history of use, it is here retained as a subgenus although differences from *Odostomia* s.s. are relatively minor.

Marginodostomia Nomura, 1936

While descriptions by Nomura fail to adequately characterize *Marginodostomia*, this taxon is a well-marked and significant component of the global fauna.

Redescription.- Shells belonging to the Odostomiidae, conical in shape without conspicuous sculpture except for a well defined, clearly incised spiral line or groove below the adapical suture, at about one-fifth from above. The whorls are flat or only very slightly convex. Columella with one well-developed tooth.

Discussion.- Comparing this taxon to *Cyclodostomia* with its poorly defined spiral cord along the suture, the clearly delineated narrow spiral sulcus differentiates *Marginodostomia* immediately.

Content.- *Marginodostomia* includes the 12 apparently meaningful species listed in tables 2-4. In addition, it includes *Acteon* (sic) *alveatus* H. C. Lea, 1841 (= *A. striatus* I. Lea, 1833

not Sowerby, 1824, fide Palmer & Brann, 1966: 804-805), *Odontostomia occidentalis* Gougerot (1981: 40, pl. 1 fig. 14), and *Odostomia verduini* Van Aartsen (1987: 5, pl. 3 fig. 24).

Van Aartsen's taxon is distributed in the East Atlantic and Mediterranean (see Van Aartsen et al. 1998: 31). Gougerot's taxon was described from the Tertiary of France and was initially ranked as a subspecies of *O. submarginata* Boettger (table 2). H. C. Lea's taxon is sometimes ranked as a subspecies of *Acteon* (sic) *melanellus* I. Lea, 1833 (e.g. Palmer & Brann, 1966: 805). It is from the Tertiary of North America. In total, 15 species group taxa are here referred to *Marginodostomia*.

Distribution.- Recent species of *Marginodostomia* range from the East Atlantic and the Mediterranean through the Red Sea to Southeast Asia and Japan. The oldest known fossil species are from the Paleocene of Denmark (species 3 and 5, table 2). Other fossil species occur in Europe, Asia, and North America. In tables 2 and 3, ages are simply indicated as Tertiary because it was impossible to verify the age of each stratum that contained a *Marginodostomia*. It seems probable that the fossil record is continuous over 60,000,000 years, from Paleocene to Recent.

Ranking.- Species of *Marginodostomia* are clearly part of the odostomiid stock, as discussed above. Still, they are reasonably well-marked, widely distributed, and have been distinct from *Odostomia* for a significant span of time. Ranking as a genus seems appropriate.

SUMMARY AND CONCLUSIONS

While *Marginodostomia* and *Odostomia* (*Cyclodostomia*) have long been confused, they are distinct taxa of the odostomiid stock. *Cyclodostomia* is ranked as a monotypic subgenus of *Odostomia* Fleming, 1813. The type species by subsequent designation (Verrill & Bush, 1900) is *O. (C.) italiana* Corgan & Van Aartsen, 1998 [= *Odontostomia (C.) mutinensis* Sacco, 1892 not *O. (Macroodostomia) mutinensis* Sacco, 1892]. The type specimen is from the Pliocene of Italy. The species is widely distributed in the Tertiary of Europe.

Marginodostomia is ranked as a genus, allied to *Odostomia*. The type species, by original designation, is *O. (O.) suturamarginata* Nomura, 1936, from the Recent of Asia. Fourteen other species-group taxa are referred to this genus: *Odontostomia (C.) aturensis* Cossmann & Peyrot, 1917, Tertiary, Europe; *Odostomia cambonensis* Vasseur fide Cossmann, 1921, Tertiary, Europe; *Synola charpentieri* Hornung & Mermod, 1924, Recent, Middle East and Asia; *O. daniana* Corgan & Van Aartsen, 1998 [= *Odontostoma obtusum* Von Koenen, 1885 not *Odostomia obtusa* Gould, 1861], Tertiary, Europe; *Acteon* (sic) *melanellus* I. Lea, 1833 (= *Odostomia laevigata* Heilprin, 1879 = *Actaeon magnoplicatus* H. C. Lea, 1841), Tertiary, North America; *Acteon* (sic) *melanellus alveatus* H. C. Lea, 1841 (= *Acteon* (sic) *striatus* I. Lea, 1833 not Sowerby, 1824), Tertiary, North America; *O. (M.) misakiensis* Nomura, 1939, Recent, Asia; *Odostomia (C.) prava* Saurin 1961, Recent, Asia; *Odontostoma pupaeforme* Von Koenen, 1885, Tertiary, Europe; *Odostomia submarginata* Boettger, 1906, Tertiary, Europe; *Odontostomia submarginata occidentalis* Gougerot, 1981, Tertiary, Europe; *Odostomia unicordata* Nomura, 1938, Tertiary, Asia; *O. verduini* Van Aartsen, 1987, Recent, East Atlantic and Mediterranean; and *O. verneuilensis* De Raincourt & Munier-Chalmas, 1863, Tertiary, Europe.

Seven species that have sometimes been placed in *Cyclodostomia* Sacco, 1892, or *Marginodostomia* Nomura, 1936, do not belong in either genus. They are *Odontostomia (C.) cingulata* Sacco 1892, Tertiary, Europe (to *Odostomia* Fleming, 1813); *Odostomia (C.) didyma* Verrill & Bush, 1900, Recent, Bermuda (to *Eulimastoma* Bartsch, 1916); *Odostomia hilgen-*

dorfi Clessin, 1900 (to *Odostomia*), Recent and Tertiary, Asia; *O. (C.?) letsonae* Pilsbry, 1918, Recent, Hawaii (to *Pyramidelloides* Nevill, 1885); *O. subangulata* A. Adams, 1860b (= *O. clara* Brazier, 1877), Recent, widespread in Pacific (to *Odostomia*); *O. (C.) suta* Pilsbry, 1918, Recent, Hawaii (to *Pyramidelloides* Nevill, 1885); *O. (M.) tenera* A. Adams (1860a: 21), Recent, Asia (to *Odostomia*).

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