

Daffymitra lindae, a new genus and species of Volutomitridae (Neogastropoda) from the Bellingshausen Abyssal Plain

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ABSTRACT

Daffymitra lindae, new genus, new species, is described from the Bellingshausen Abyssal Plain off Ellsworthland, Antarctica. Known only from its shell, this new taxon is included in the family Volutomitridae, but differentiated from all known living genera and species on the basis of its inflated shell shape, with an attenuated anterior and distinctive siphonal canal, as well as by the shape and disposition of its three recessed, obliquely oriented columellar plaits. This new taxon represents the first record of Volutomitridae from abyssal depths. The conchological similarity of *Daffymitra* to the Upper Cretaceous genus *Volutomorpha* raises the possibility that *Daffymitra* may be a surviving descendent of a lineage presumed extinct since the end of the Cretaceous, and suggests that a reassessment of the relationships between the various Cretaceous genera assigned to Volutoderminae and the earliest Volutomitridae.

INTRODUCTION

The Volutomitridae is a small family of rachiglossan neogastropods characterized by: a fusiform shell (reaching 50 mm) with 2–5 columellar plaits, and a paucispiral, mammillate protoconch; a radula with distinctive, wish-bone-shaped rachidian teeth and small, needle-like lateral teeth that are present in most species; a mid-oesophagus that is long, convoluted, with a muscular posterior end; a gland of Leiblein that is only partially separated from the mid-oesophagus; and a single accessory salivary gland (Ponder, 1972, 1998; Kantor and Harasewych, 1992; Bouchet and Kantor, 2004). The family ranges into the North Pacific, North Atlantic and the Caribbean, but centers of diversity are concentrated in the southern hemisphere, particularly in the waters surrounding Antarctica, Australia, New Zealand, and especially New Caledonia (Bouchet and Kantor, 2004). Six genera and 50 species are currently recognized in the Recent fauna (Bouchet and Kantor, 2004), with a single genus (*Paradmete*) containing six species represented in the Antarctic and Magellanic fauna (Numanami, 1996; Bouchet and Kantor, 2004). Volutomitrids are known from the sublittoral zone to depths of 1980 m (based on

dead specimens), but the majority of species are confined to outer continental shelf and upper continental slope depths (Bouchet and Kantor, 2004: Appendix; see Figure 7 herein).

In the course of our studies of Antarctic and sub-Antarctic neogastropods sampled by the United States Antarctic Program (USAP) and housed in the collections of the National Museum of Natural History (USNM), we encountered a single specimen of a volutomitrid that was collected on the Bellingshausen Abyssal Plain. This specimen represents a new genus and species within the family Volutomitridae, as well as the first record of the family from abyssal depths. This new genus and new species is described herein, and comparisons made with other volutomitrid taxa.

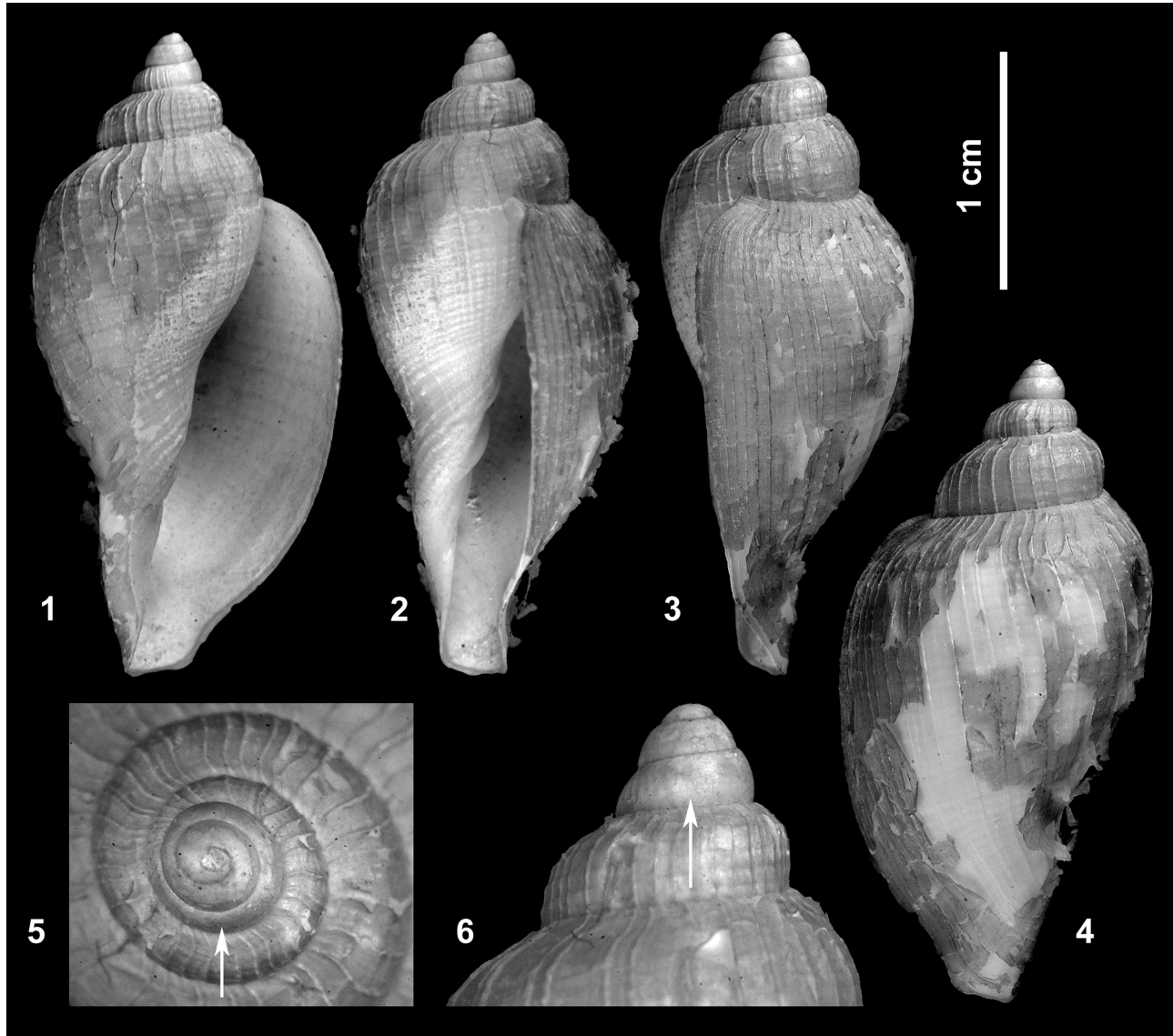
SYSTEMATICS

Class Gastropoda Cuvier, 1797
Order Neogastropoda Wenz, 1938
Family Volutomitridae Gray, 1854
Genus *Daffymitra* new genus

Type Species: *Daffymitra lindae* new species, by original designation.

Description: Shell medium-sized for the family (to 28 mm), with low, conical spire, broadly inflated body whorl. Protoconch conical, large, 2.6 mm in diameter, of 2 5/8 smooth whorls. Teleoconch thin, of about 3 smoothly rounded whorls, with well demarcated, broad siphonal canal. Axial sculpture of distinct, very narrow, broadly spaced ribs that extend from suture to siphonal canal. Spiral sculpture of narrow, cords, alternating in prominence. Aperture high (74% of shell length) broadly ovate. Outer lip thin, smooth. Columella with three columellar folds (central strongest) and siphonal fold. Shell white. Periostracum thin, olive brown. Operculum, anatomy, radula, unknown.

Etymology: This genus is named after Daffy, a tortoiseshell longhair cat that belongs to the senior author's wife Linda.



Figures 1–6. *Daffymitra lindae* new species, holotype. **1.** Apertural view of the shell. **2.** Oblique view, shell is rotated slightly to expose the columellar plaits. **3.** Lateral view of the shell. **4.** Dorsal view of the shell. **5.** Apical and **6.** lateral views of the protoconch. Transition to teleoconch is marked by arrow.

Daffymitra lindae new species
(Figures 1–7)

Description: Shell (Figures 1–4) of moderate size (to 27.9 mm), thin, fragile, with matte surface, inflated, fusiform, tapering anteriorly, with conical spire. Protoconch (Figures 5–6) large, mammilate, 1970 μm in height, diameter increasing from 676 μm to 2570 μm in $2 \frac{5}{8}$ convex whorls. Protoconch-teleoconch transition distinct (Figures 5, 6, arrow), marked by onset of weak closely spaced prosocline ribs. Teleoconch of $3 \frac{1}{8}$ strongly convex, ovate whorls with rounded shoulder. Suture impressed. Axial sculpture of thin, sharply demarcated, weakly prosocline raised ribs, 42 on last whorl, 34 on penultimate whorl. Ribs closely spaced on

first teleoconch whorl, becoming more widely spaced on later whorls, but again closely spaced along final $\frac{1}{8}$ th whorl. Spiral sculpture of very low, narrow cords, subequal in width, alternating in prominence, covering entire shell surface, about 50 on final whorl, 10 on penultimate whorl. Aperture large (0.74 shell length), broadly oval, smooth, deflected from shell axis by 15° . Outer lip very thin, weakly reflected, edge forming final axial rib, with shallow anal sinus at suture. Columella weakly sinuate, convex posteriorly, distinctly concave medially, and again anterior to 3 obliquely oriented, recessed folds (Figure 2). Central fold most pronounced, anteriormost fold even more obliquely oriented than central and posterior fold. Parietal callus, broad, very thin. Siphonal canal broad, long, well delimited from

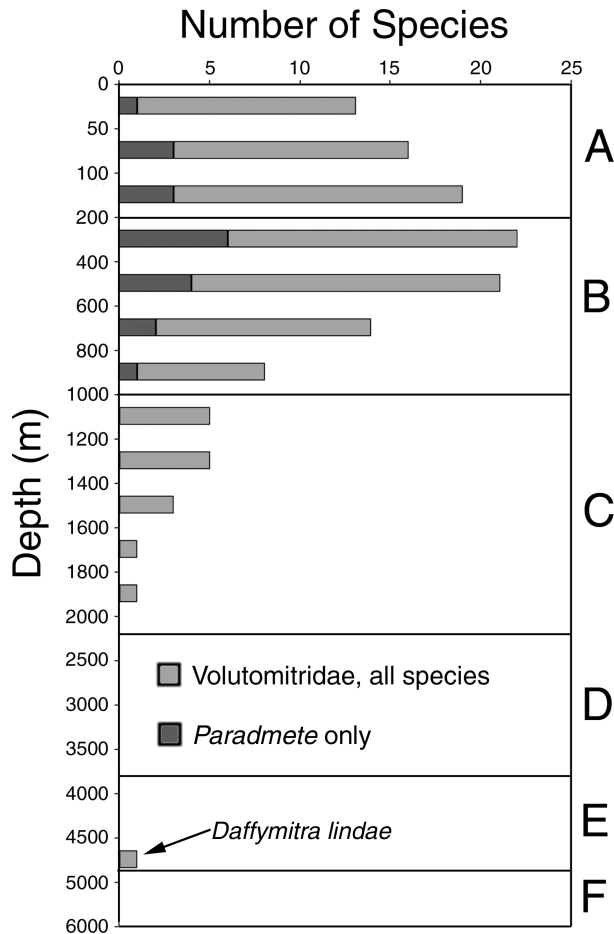


Figure 7. Bathymetric distribution of the Recent species of Volutomitridae, of the Antarctic genus *Paradmete* (data from Bouchet and Kantor, 2004: Appendix), and of *Daffymitra lindae*. A: continental shelf; B: upper continental slope; C: lower continental slope; D: continental rise; E: abyssal plain, F: hadal depths.

aperture. Shell color white. Periostracum thin, olive brown, covering entire shell. Operculum, radula and anatomy unknown.

Type Locality: Bellingshausen Abyssal Plain, 61°27' S, 94°58'–95°22' W, in 4419–4804 m [R/V ELTANIN cruise 23, sta. 1621, 10 Apr. 1966].

Type Material: Holotype, USNM 1080443, shell length 27.9 mm, final whorl length 23.4 mm, aperture length 21.5 mm, shell width, 13.5 mm.

Distribution: Known from the type locality only.

Etymology: This species is named for the senior author's wife, Linda Lee Harasewych.

Remarks: Despite the absence of anatomical and radular data, this new species can be unambiguously assigned to the family Volutomitridae on the basis of its distinctive shell shape, sculpture, presence of the diagnostic paucispiral mammillate protoconch, and weak columellar folds.

Seven genera are currently recognized within the family Volutomitridae (Cernohorsky, 1970; Bouchet and Kantor, 2004). The large size, long, broad aperture, and thin shell of this new species, as well as the presence of three obliquely oriented and deeply recessed columellar folds and a siphonal fold preclude its assignment to either the fossil genus *Proximitra* Finlay, 1927, or the Recent genera *Conomitra* Conrad, 1865; *Microvoluta* Angas, 1877; *Peculator* Iredale, 1924; or *Magdalemitra* Kilburn, 1974.

Conchologically, the new species is closer to the genera *Volutomitra* H. and A. Adams, 1853 and *Paradmete* Strebel, 1908, which are considered to be closely related (Powell, 1951: 165; Cernohorsky, 1970: 91). The 13 known species of *Volutomitra* are widely distributed in the World Ocean, ranging from South Africa, Southern Australia, New Zealand and to the Bering Sea in the Pacific, and from Colombia to the northern part of the Atlantic Ocean. *Daffymitra lindae* differs from all known species of *Volutomitra* in having a proportionally shorter spire and inflated rather than fusiform shell, coarse spiral sculpture and sharp, narrow, broadly spaced axial ribs, as well as columellar folds that are weak, recessed within the aperture and obliquely oriented rather than being strong, prominent, and nearly perpendicular to the columellar axis. The only species of *Volutomitra* with pronounced axial sculpture, *V. erebus* Bayer, 1971, from Colombia, has axial ribs that are thicker, more rounded, orthocone, and more densely spaced.

The genus *Paradmete*, contains six species, all confined to Antarctic and sub-Antarctic waters. *Daffymitra lindae* may easily be distinguished from *Paradmete fragillima* (Watson, 1882), the type species, as well as from *P. briedensis* Numanami, 1996, and *P. arnaudi* Numanami, 1996, by its larger size, shorter spire, inflated rather than narrowly fusiform shell, and distinctive narrow, prosocline axial ribs, as well as by its well demarcated siphonal canal. The Magellanic *Paradmete crymochara* (Rochebrune and Mabile, 1885) approaches *Daffymitra lindae* in size, but differs in its elongate, fusiform shape, absence of a distinct siphonal canal, and presence of four columellar folds. The distinctive *Paradmete percarinata* Powell, 1951, can be recognized by its prominent peripheral carina, sharply shouldered shell and pronounced columellar folds that are nearly perpendicular to the columellar axis. Most similar to *Daffymitra lindae* is *Paradmete curta* (Strebel, 1908), which reaches a similar size, has a low spire, and has axial ribs, which, however, are opisthocline rather than prosocline. *Daffymitra* differs in lacking a strong shoulder and in having an inflated shell shape with an attenuated anterior and distinctive siphonal canal.

The shell of *Daffymitra lindae* bears a surprising resemblance to some members of the Mesozoic genus *Volutomorpha*, particularly *V. mutabilis* Wade, 1926 (see Wade, 1926: pl. 37, fig. 10, pls. 40, figs. 6, 9; Sohl, 1964: pl. 39, figs. 1, 2, 6). *Volutomorpha* was restricted to the Upper Cretaceous faunas of the Gulf and Atlantic

coastal plains (for a review, see Sohl, 1964: 252–254), and was “the giant of Cretaceous gastropods” (Wade, 1926: 20) with shell lengths extrapolated to exceed 45 cm. Pilsbry and Olsson (1954: 19) included *Volutomorpha* in the Cretaceous subfamily Volutodermatinae, which they placed in the family Volutidae together with Volutomitridae. More recently, Dzhililov (1977: 93) proposed a new subfamily Volutomorphae, also within Volutidae, while Bouchet et al. (2005: 255) considered Volutomorphae a synonym of Volutodermatinae, which they transferred from Volutidae to the extinct family Pholidotomidae.

While *Daffymitra* is easily distinguished from *Volutomorpha* by its far smaller size, thinner shell, absence of thick axial ribs, and lack of a pronounced shoulder, this conchological similarity raises the intriguing possibility that *Daffymitra* is a “living fossil,” a surviving descendent from a group presumed to have become extinct at the end of the Cretaceous. Further research is clearly required to reevaluate the relationships between the various Cretaceous genera assigned to Volutodermatinae and the earliest Volutomitridae.

DISCUSSION

The family Volutomitridae has a broad geographic range, but has previously been known only from continental shelf and continental slope faunas, while the genus *Paradmete* has been reported only from shelf and upper slope depths (Figure 7). The greatest diversities for both the family and the genus occur at upper continental slope depths.

Although *Daffymitra lindae* is represented by a single empty shell, the fragility of the shell, the presence of periostracum, and the fact that it was collected below the aragonite compensation depth indicate that the specimen could not have been dead for long, and that the species inhabits the area in which this specimen was collected. Thus, this taxon represents the first record of Volutomitridae from abyssal depths. In a survey of Antarctic and Magellanic Buccinoidea, Harasewych and Kantor (2004) found that the abyssal buccinoidean fauna of the region has no genera in common with the sublittoral or bathyal faunas, but that credible sister taxa and likely origins for at least some of the abyssal genera occur on the adjacent continental slope. Based on shell morphologies, the genera *Volutomitra*, *Paradmete*, and *Daffymitra* appear to represent a lineage within Volutomitridae distinct from the predominantly austral genera *Proximitra*, *Conomitra*, *Microvoluta*, *Peculator*, and *Magdalemitra*. The genus *Paradmete*, a member of the upper slope fauna of Antarctica, is likely the sister taxon of the abyssal genus *Daffymitra*.

ACKNOWLEDGMENTS

This research was supported by a grant from the NSF – USAP United States Antarctic Program [Contract Number OPP-9509761]. We are grateful to Bruce Marshall for bringing to our attention the similarity of *Daffymitra* and *Volutomorpha*.

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