Reallocation of *Cyamiocardium crassilabrum* Dell, 1964, into *Perrierina* Bernard, 1897 (Bivalvia: Cyamiidae)

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ABSTRACT

Re-examination of the holotype of *Cyamiocardium crassilabrum* Dell, 1964, allowed confirmation that the species was wrongly allocated to the genus *Cyamiocardium*. This material, together with additional specimens from the western Malvinas (Falklands) Islands allowed for a re-description of that species. The species is also properly illustrated through scanning electron microscopy, and its updated generic placement discussed. The presence of a "taxodont" hinge plate is the main morphological character supporting the re-allocation of this species in the genus *Perrierina* Bernard, 1897. Information on the brooding condition of the species is provided.

Additional Keywords: Perrierina, Cyamiidae, Magellanic Region

INTRODUCTION

Study of the mollusks collected by the R/V William Scoresby in the Magellan Region and adjacent Antarctic waters resulted in the discovery of several species new to this region, among them, a small bivalve described by Dell (1964) as *Cyamiocardium crassilabrum*. The only subsequent record of this species was reported by Castellanos (1980) from the western Malvinas (Falkland) Islands.

The genus *Cyamiocardium* was introduced by Soot-Ryen (1951) to allocate *Cyamium denticulatum* E. A. Smith, 1907 (the type species by original designation), a species widely distributed throughout the Antarctic Region (Lamy, 1910, 1911; Powell, 1958; Dell, 1990). Other Antarctic species assigned to this genus by Soot-Ryen (1951) were *Cyamiocardium rotundatum* (Thiele, 1912), *C. dahli* Soot-Ryen, 1957, and *Cyamiocardium crassilabrum* Dell, 1964, from the Magellan Region. In the context of a systematic revision of these species (currently in progress), the type material and additional specimens of "*Cyamiocardium*" *crassilabrum* were examined. As a result, I have concluded in that the placement of this species in *Cyamiocardium* is incorrect. In the present paper the generic placement of this species is revised, and the taxon is re-described and properly illustrated by first time.

MATERIALS AND METHODS

This study is based on dried preserved specimens collected during the R/V Shinkai Maru expedition (1978–79). Voucher specimens have been deposited in the collections of the Museo de La Plata (MLP). Photographs of the holotype of *Cyamiocardium crassilabrum* were received from The Natural History Museum (NHM), London. For comparative purposes, specimens of *Cyamiocardium denticulatum*, *C. rotundatum*, and *C. dahli* were also examined.

The specimens reported by Castellanos (1980) as *Cyamiocardium crassilabrum* could not be located either at the MLP or the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN). The material here studied, originally at the Instituto Nacional de Investigaciones y Desarrollo Pesquero (INIDEP), comes from the same Shinkai Maru sampling station than the material previously reported by Castellanos (1980).

Shell measurements were made under a stereoscopic microscope, according to the following criteria: L: maximum antero-posterior distance; H: maximum dorso-ventral distance, perpendicular to L; W: maximum distance across valves, perpendicular to H. Shell morphology was studied under scanning electron microscope; for this, Philips XL30 TMP and JEOL JSN-6360 LV scanning electron microscopes were used.

SYSTEMATICS

Cyamiidae G. O. Sars, 1878
Perrierina Bernard, 1897

Perrierina crassilabrum (Dell, 1964) **new combination**
(Figures 1–12)
Cyamiocardium crassilabrum Dell, 1964: 204, fig. 4, numbers 1, 2, and pl. 6, figs. 1, 2; Castellanos, 1980: 135.

Type Locality: 50°17′ S, 60°06′ W, station 211, R/V William Scoresby, 161–174 m

Material Examined: Photographs of the holotype (NHM 1962863); 7 dried specimens and 1 valve, 51° 29′ S, 61° 50′ W, Malvinas (Falkland) Islands, 192 m (MLP 12606).

Literature Records: 50°17′ S, 60°06′ W, station 210, R/V William Scoresby, 161 m; 50°35′ S, 57°20′ W, station 229, R/V William Scoresby, 210–271 m (Dell, 1964); 51°29′ S, 61°50′ W, 192 m (Castellanos, 1980).

Distribution: Only known from the Atlantic sector of the Magellan Region, in the vicinity of the Malvinas (Falkland) Islands, 161–271 m.

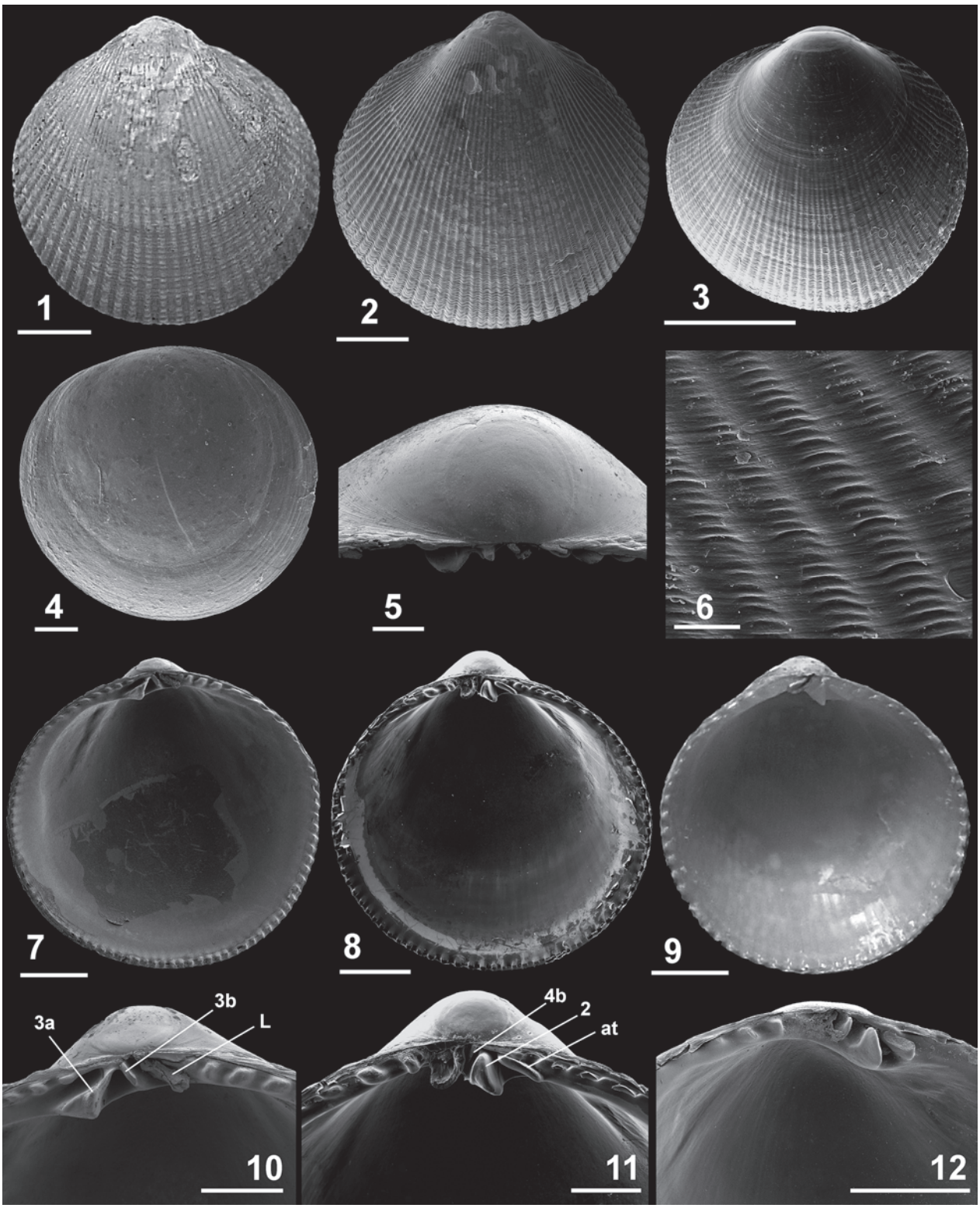
Description: Shell solid, small (maximum L: 6.3 mm), outline nearly circular (H/L = 0.99 ± 0.01, n = 6), slightly inequilateral, not inflated (W/H = 0.65 ± 0.01, n = 5), whitish, glossy. Anterior margin short, curved, continuous with ventral margin, which is evenly arcuate; posterior end rounded, slightly expanded (Figures 1, 2). Juvenile shell slightly ovate in outline, elongated anteroposteriorly (Figure 3). Beaks full, subcentral, directed slightly anteriorly. Protoconch ovate, smooth, about 590 μm in diameter (Figure 5). Shell surface sculptured with rounded, strongly marked, and regularly spaced radial cords, 50–60 in larger specimens (Figure 6); cords separated by interspaces wider than ribs. Regularly separated, microscopic commarginal threads also present. Radial sculpture also evident on inner margins, where they produce prominent crenulations (Figures 7–9). Hinge plate narrow, somewhat broader anterior to beaks, where the cardinal teeth are inserted. Right valve with large, hooked cardinal 3: 3a high, solid, triangular, enlarged at base, which is frequently bifid; 3b delicate, narrow, nearly straight, one-third of size of 3a (Figures 7, 10). Left valve with prominent triangular cardinal 2, thin and styliform cardinal 4b behind resilifer, and slender but solid, nearly straight anterior tooth (referred to as "cardinal 4a" by Bernard (1897) and as "anterior lateral II" by Lamy (1917)) (Figures 8, 9, 11). Both valves with two series of tubercles anterior and posterior to beaks, producing the appearance of a taxodont hinge plate (Figures 10, 11); each series composed of four tubercles; posterior series stronger than anterior in juveniles (Figure 12). In both series, tubercles diminish in size and degree of development from beaks to anterior and posterior ends, where they are followed by marginal crenulations. Internal ligament somewhat solid, located in short, oblique resilifer posterior to cardinal teeth. External ligament short.

Biological Observations: One of the specimens examined contained numerous embryos between the ascending and descending lamellae of inner demibranchs. Embryos were in different stages of development, ranging from incipient (unshelled) to well-developed specimens, the latter numbering 32, and reaching 700 μm in diameter (Figure 4). These observations are consistent with that by Dell (1964), who reported 44 "developing young" contained in one of the specimens he studied.

Remarks: *Perrierina* was proposed by Bernard (1897) for *P. taxodonta* (type species by monotypy; illustrated by Bernard, 1897: fig. 3) a species he described from Île Stewart (New Zealand). The description of the genus was merged with that of the type species, in which Bernard (1897) described the presence of several "lamellae" anterior and posterior to the cardinal teeth, resembling a taxodont hinge. This character, infrequent among Cyamioidea, is also present in *Legrandina* Tate and May, 1901 (type species: *L. bernardi* Tate and May, 1901, by original designation), an Australian genus regarded by Ponder (1971) and Powell (1979) as a subgenus of *Perrierina*.

Perrierina and *Cyamiocardium* have as common characters the number, morphology, and arrangement of hinge teeth, i.e., the presence of a hooked anterior cardinal 3 in the right valve and two prominent cardinal teeth (cardinals 2 and 4) in the left valve. The specimens studied here generally agree with these characteristics, but, additionally, the hinge examined showed several anterior and posterior tubercles, which, as a group produce the appearance of a taxodont hinge, a diagnostic character for *Perrierina* that is absent in *Cyamiocardium*. Furthermore, the studied specimens lack the posterior "pseudo-lateral tooth" described by Smith (1907) for the type species of *Cyamiocardium*. Another character that is useful in separating the genera *Cyamiocardium* and *Perrierina* is the presence in the former of mantle margin papillae (Soot-Ryen, 1951). According to Ponder (1971), mantle margin papillae are absent in *Perrierina*. Unfortunately, the poor preservation of the specimens on which this paper is based made it impossible to confirm the state of this character. Nevertheless, the differences in hinge morphology call for the reallocation of "*Cyamiocardium*" *crassicostatum* into *Perrierina*.

Perrierina crassilabrum shows some characteristics intermediate between the subgenera *Perrierina* and *Legrandina*. The presence of prominent beaks is a characteristic shared with *Perrierina*, whereas a hinge plate broader at the base of the cardinals is characteristic of *Legrandina*. Furthermore, there are some other features of *P. crassilabrum* not previously known for other species of *Perrierina* or *Legrandina*, such as the relatively large adult size, the nearly circular shell outline of adults, and the strong radial ornamentation.



Figures 1–12. *Perrierina crassilabrum*. **1, 9.** Holotype (NHM 1962863). **1.** External view of left valve. **9.** Internal view of left valve. **2–8, 10–12.** Specimens from 51º 29′ S, 61º 50′ W, SEM micrographs. **2.** External view of an adult specimen, right valve. **3.** External view of a juvenile. **4.** External views of larvae removed from an adult. **5.** Dorsal view, showing protoconch and hinge plate. **6.** Detail of shell microsculpture. **7.** Inner view of right valve. **8.** Internal view of left valve. **10, 11.** Detail of adult hinge plates. **10.** Right valve: 3a, 3b = cardinal teeth, L = ligament. **11.** Left valve. 2, 4b = cardinal teeth, at = anterior tooth. **12.** Detail of hinge plate of a juvenile of 2.3 mm length. Scale bars: 1–3, 7–9 = 1 mm; 4 = 100 μm; 5 = 200 μm; 6 = 50 μm; 10–12 = 500 μm.

The familial placement of *Perrierina* is somewhat confusing; the genus was successively placed within the Mactridae (Bernard, 1897), Leptonidae (Dall, 1899), and Crassatellidae (Suter, 1913; Lamy, 1917). Later, Marwick (1928) regarded the "taxodont" lamellae of the hinge as a character sufficient to warrant proposition of the family Perrierinidae, but this family was subsequently regarded as a synonym of Cyamiidae (e.g. Chavan (1969), Thiele, (1934), Fleming (1948), Ponder (1971), and Powell (1979)). The Cyamiidae is a family relatively well-diversified in the Magellanic Region, where a total of 12 species belonging to *Cyamium*, *Cyamiocardium*, *Gaimardia*, and *Kidderia* have been reported and recognized as valid by Zelaya (2005). The present paper represents the first record in Magellanic waters of a species of *Perrierina*, a genus thus far known only from Australia, Tasmania, and New Zealand.

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LITERATURE CITED

Bernard, F. 1897. Sur quelques coquilles des Lamellibranches de l' Île Stewart. Bulletin du Muséum d' Histoire Naturelle 7: 309–314.

Castellanos, Z. A. de. 1980. Micromoluscos poco conocidos del sur argentino-chileno. Neotropica 25 (74): 133–140.

Chavan, A. 1969. Superfamily Cyamiacea. Pp. 537–543. In: Leslie Reginald Cox et al., Part. N [Bivalvia], part. 6, vols. 1 and 2: xxxvii + 952 pp. Treatise on invertebrate paleontology. Lawrence, Kansas. Geological Society of America & University of Kansas.

Coan, E. V., P. V. Scott y F. R. Bernard. 2000. Bivalve seashells of Western North America. Santa Barbara Museum of Natural History. Monographs number 2, Studies in Biodiversity nº2, 764 pp.

Dall, W. H. 1899. Synopsis of the Recent and Tertiary Leptonacea of North America and the West Indies. Proceedings of the United States National Museum 21: 873–897, pls. 87–88.

Dell, R. K. 1964. Antarctic and sub-Antarctic Mollusca: Amphineura, Scaphopoda and Bivalvia. Discovery Reports 33: 93–250, pls. 2–7.

Dell, R. K. 1990. Antarctic Mollusca with special reference to the fauna of the Ross Sea. Bulletin of the Royal Society of New Zealand 27: 1–311.

Egorova, E. N. 1982. Biological results of the Soviet Antarctic Expeditions, 7. Explorations of the fauna of the seas 26 (34): 1–143.

Fleming, C. A. 1948. New species and genera of marine Mollusca from the Southland Fiords. Transactions of the Royal Society of New Zealand 77 (1): 72–92.

Lamy, E. 1910. Mission dans l'Antarctique dirigée par M.Le Dr Charcot (1908–1910), collections recueillies par M. le Dr. Jacques Liouville. Bulletin du Muséum National d'Histoire Naturelle 7: 388–394.

Lamy, E. 1911. Gastéropodes prosobranches, scaphopodes et pélécypodes. Deuxième Expédition Antarctique Française (1908–1910) commmandèe par le Dr. J. Charcot. Sciences Naturelles: Documents Scientifiques. 32 pp., pl. 1.

Lamy, E. 1917. Révision des Crassatellidae vivants du Muséum d'Histoire Naturelle de Paris. Journal de Conchyliologie 62 (4): 197–270 + pl. 6.

Marwick, J. 1928. The Tertiary Mollusca, Catham Islands. Transactions and Proceedings of the New Zealand Institute 58 (4): 432–506.

Ponder, W. F. 1971. Some New Zealand and Subantarctic bivalves of the Cyamiacea and Leptonacea with descriptions of new taxa. Records of the Dominion Museum 7 (13): 119–141.

Powell, A. W. B. 1951. Antarctic and Subantarctic Mollusca: Pelecypoda and Gastropoda collected by the ships of the Discovery Committee during the years 1926–1937. Discovery Reports 26: 49–196, pls. 5–10.

Powell, A. W. B. 1958. Mollusca from the Victoria-Ross quadrants of Antarctica. B.A.N.Z.A.R. Expedition B, 6: 165–215.

Powell, A. W. B. 1979. New Zealand Mollusca. Marine, land and freshwater shells. Auckland, William Collins Publishers, 500 pp.

Smith, E. A. 1907. Mollusca. 5. Lamellibranchiata. National Antarctic Expedition 1901–1904. Natural History 2, Zoology (Vertebrata, Mollusca, Crustacea): 1–6.

Soot-Ryen, T. 1951. Antarctic Pelecypods. Scientific Results of the Norwegian Antarctic Expeditions 1927–1928, 32: 1–46 + 1 pl.

Suter, H. 1913. Manual of the New Zealand Mollusca. John MacKay, Government Printer, Wellington. 1120 pp.

Thiele, J. 1934. Handbuch der systematischen Weichtierkunde. Gustav Fischer Verlag, Jena. Bd 3, Dritter Teil, pp.1193–1528.

Zelaya, D. G. 2005. The bivalves from the Scotia Arc islands: species richness and faunistic affinities. Scientia Marina 69 (suppl. 2): 113–122.