

DESCRIPTIONS OF NEW DEEP-WATER SPECIES OF THE FAMILY CUSPIDARIIDAE (MOLLUSCA: BIVALVIA) AND INCLUDING A BIBLIOGRAPHY OF THE KNOWN SPECIES FROM THE ATLANTIC

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Abstract Four new cuspidariid species from the deep Atlantic are described. In addition, a listing is given of all other species of the family Cuspidariidae reported so far from the Atlantic.

Key words Bivalvia, Cuspidaria, deep-water, Atlantic, new species, bibliography

INTRODUCTION

This paper continues the descriptive accounts of the bivalve species of the deep Atlantic based on material obtained by expeditions by American, French and British research vessels between the years 1960 and 1980. This is the second paper on the Cuspidariidae of the deep Atlantic based on material from these expeditions. The first was by Allen & Morgan (1981) and, because at that time not all the samples had been sorted, it did not contain accounts of all the species collected. Here, new species from the collections are described, and the locations at which they were found. The earlier paper (Allen & Morgan, 1981) gave detailed descriptions of the genera and subgenera of the family. Since then, Heppell & Morgan (1983), Krylova (1989, 1993, 1994a & b, 1995, 2006), Marshall (2002), Poutiers, 1984, Poutiers & Bernard, 1995 and Scarlato & Starobogatov (1983) have further defined the taxonomy of the family with a number of new genera erected and some subgenera being raised to full generic rank. To bring this information up to date, the known cuspidariid species of the Atlantic are listed here together with their synonyms. In particular, accounts giving figures of the species are listed, this because many species are extremely similar in their shape and ornamentation.

RESULTS

Family CUSPIDARIIDAE Dall 1886

Genus *Cuspidaria* Nardo 1840

Subgenus *Luzonia* Dall & Smith in Dall 1890

Cuspidaria (Luzonia) morganae new species
(Figs 1–3, Pls 1A & B)

Distribution Specimens were recorded from three deep-water epibenthic sledge samples taken from the Brazil Basin

Ship	date	station	latitude	longitude	depth/m	no.
Atlantis II	19.02.67	162	08°02.0'S	34°09.0'W	1493	32
Atlantis II	20.02.67	167	07°02.0'S	34°17.0'W	1007	89
Atlantis II	20.02.67	169	08°03.0'S	34°25.0'W	827	34

Description Shell small (largest specimen 3.7 mm in length), inequivalve, left valve (the larger) overlapping right at ventral margin, posterior dorsal margin of right valve slightly overlaps that of left; umbos small, anterior to midline with beaks anteriorly inclined; antero-dorsal shell margin relatively straight then sharply curved where it meets the anterior margin; anterior margin somewhat flattened; ventral shell margin evenly curved with a shallow sinuation posteriorly where it joins the rostrum, the sinuation of the right valve more marked than that of the left; slightly curved postero-dorsal margin slopes downwards from the apex at an angle of approximately 10°; rostrum is relatively short and blunt ended; an oblique rostral ridge extends from the shell apex to the ventral limit of the rostrum; very distinctive shell sculpture of sharp co-marginal ridges is present in all but the smallest specimens, the largest specimens have a maximum of four such ridges; the ridges do not extend onto the rostrum; in addition the entire shell surface is closely set with fine co-marginal growth

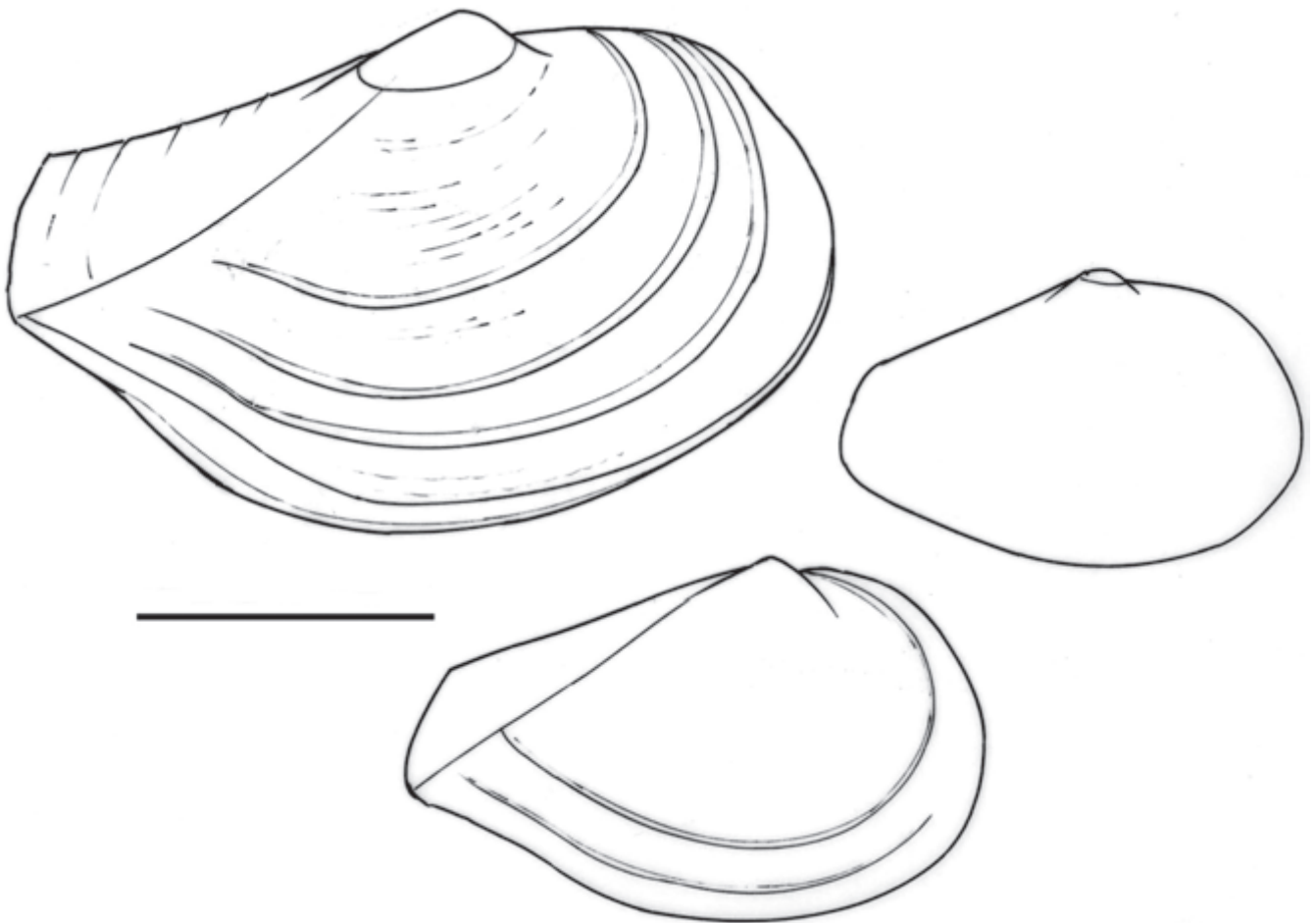


Figure 1 *Luzonia morganae*. Lateral views of three shells from the right side to show change in shell ornamentation with increasing growth. Scale = 1 mm.

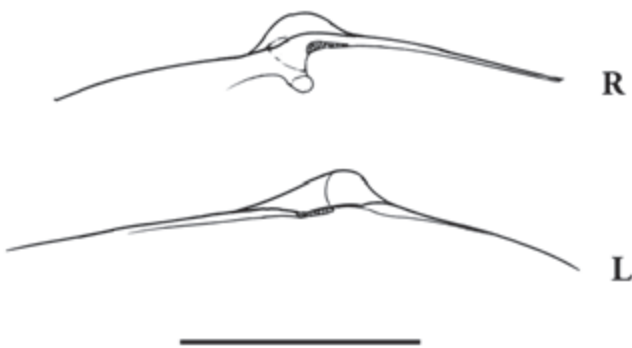


Figure 2 *Luzonia morganae*. Detail of left and right hinges. Scale = 1 mm. L, left; R, right.

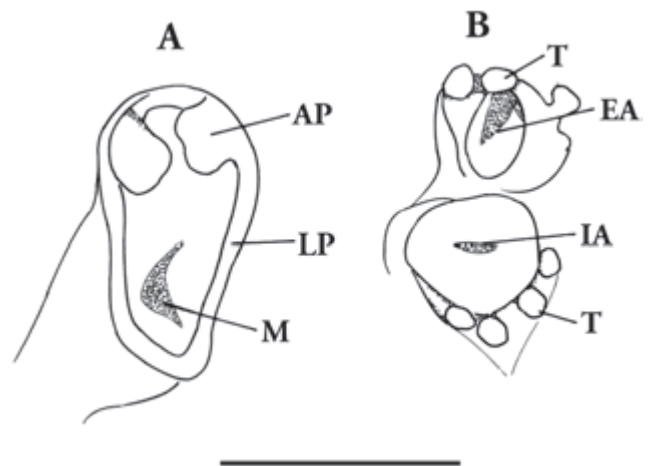
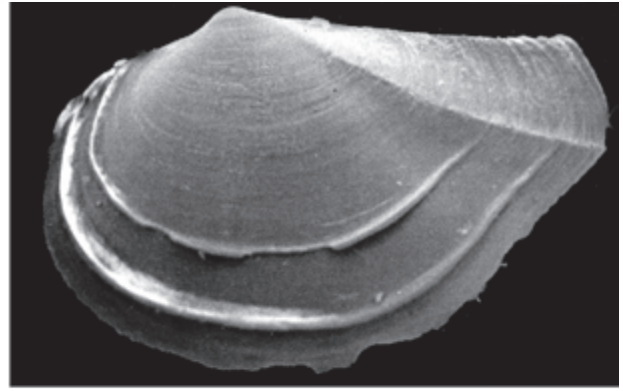
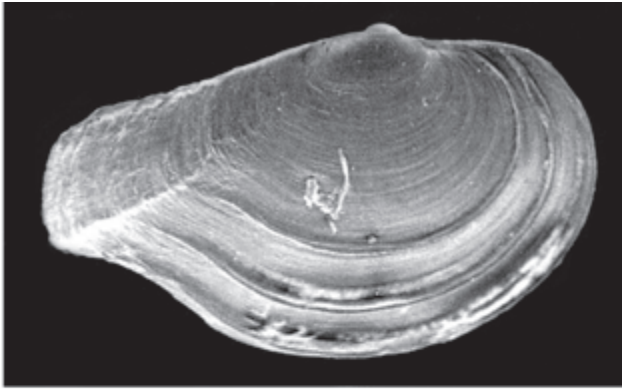


Figure 3 *Luzonia morganae*. A. Frontal view of mouth and palps. B. End on view of the inhalant and exhalant siphons and the associated retracted tentacles. Scale = 1 mm. AP, anterior palp; EA, exhalant aperture; IA, inhalant aperture; LP, lip; M, mouth; T, tentacle.

lines and at high magnification (10,000×) the shell surface is minutely pitted; the shell hinge comprises a peg-like anterior cardinal tooth in the right valve which is directed inwards and

A



B

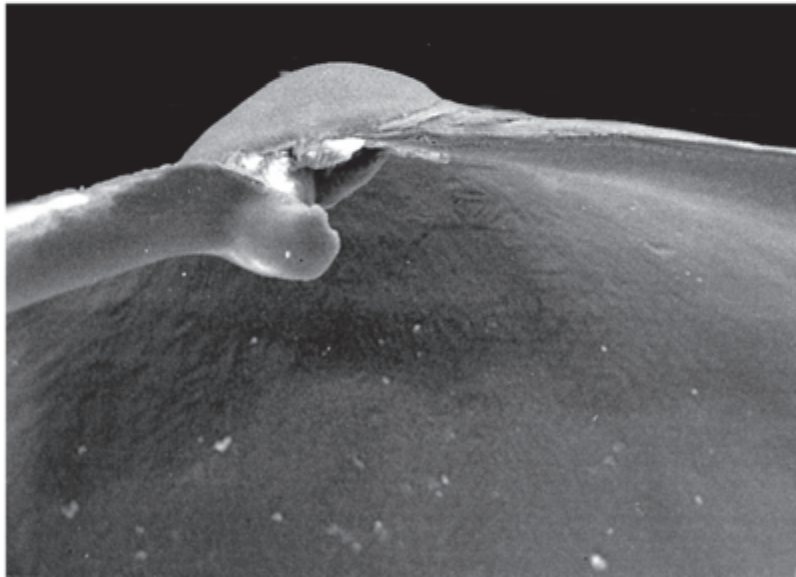


Plate 1 *Luzonia morganae*. A. Left and right valves ($\times 30$), from different shells to show differences in ornamentation; B. right hinge ($\times 200$).

somewhat posteriorly; the left valve is without teeth; the antero-dorsal inner shell margin of the right valve is somewhat thickened but without forming lateral teeth or buttresses, the postero-dorsal margin and the internal dorsal margins of the left valve are slender and without lateral teeth or ridges; the ligament is internal, short and amphidetic with a curved lithodesma. The larval shell measures 140 μm in length.

Type and paratype specimens taken from Station 162 have been lodged with the Natural History Museum, London.

Internal anatomy This is similar to that of other species of *Cuspidaria*. A thin homogenous muscular septum is very similar to that described for that of other species (e.g. *Cuspidaria atlantica* Allen & Morgan 1981). Lateral septal muscles are continuous along the outer edges of the septum

and not paired as they are in some species (e.g. *Cuspidaria barnardi* Knudsen 1970) (see Allen & Morgan, 1981 figs 22 & 24). A thin membrane extends posteriorly between the posterior septal muscles and connects with the siphonal bridge that separates the inner limits of the inhalant and exhalant siphons. From the inner side of the anterior septal muscles a membrane connects with the foot, mouth and laterally to the mantle. The aperture of the exhalant siphon has three short club-shaped dorsal tentacles and, similarly, the larger dome-shaped inhalant siphon has four short ventral tentacles. A pair of anterior palps hang from the thickened rim of the mouth. There are no posterior palps extending from this rim. The stomach is similar to those described for other species of *Cuspidaria* (Allen & Morgan, 1981), being cylindrical with a rounded style sac and with the mid gut opening ventrally and

slightly to the right of the mid-line at the anterior end. The ovary lies posterior to the stomach and does not surround the stomach.

Remarks Although other cuspidariids are somewhat similarly shaped with co-marginal ridges (e.g. *Cuspidaria fraterna* Verrill & Bush 1898), no described species have similar shell outlines, nor ridges of the slender fineness and limited number that are exhibited by *L. morganae*.

Derivation of the name This species is named after Rhona Morgan who was joint author in the earlier account of the deep-sea Cuspidariidae of the Atlantic.

Genus *Cardiomya* A. Adams 1864

***Cardiomya unistriata* new species**
(Figs 4 & 5, Pl. 2)

Distribution A single valve was obtained from an abyssal epibenthic sledge sample taken in the West European Basin.

Ship	date	station	latitude	longitude	depth/m	no.
Jean Charcot	26.10.74	Biogas IV DS79	46°30.4'N	10°27.1'W	4715m	1

Description Shell moderately small (8 mm in length), slightly inequivalve, umbos moderately pronounced and central to length, beaks face inwards; antero-dorsal shell margin initially straight before curving ventrally to meet with anterior margin in a continuous curve, ventral margin curved, posterior ventral margin forms a broad sinuous curve to form the ventral margin of a relatively broad rostrum, the postero-ventral margin is inwardly curved with the tip of the rostrum somewhat upturned; the postero-ventral margin of the left valve slightly overlaps the right, at this point the postero-ventral margin of the right valve is extended by a thin inset of shell so that the margin matches that of the left valve, a single radial ridge extends from the posterior margin of the umbo to the posterior point of the ventral margin at the anterior point of overlap of the valves; the hinge comprises a relatively broad extended posterior lateral tooth in the right valve and which extends to form a fine ridge at the posterior margin of the posterior adductor muscle scar, there is also a small cardinal tooth below the

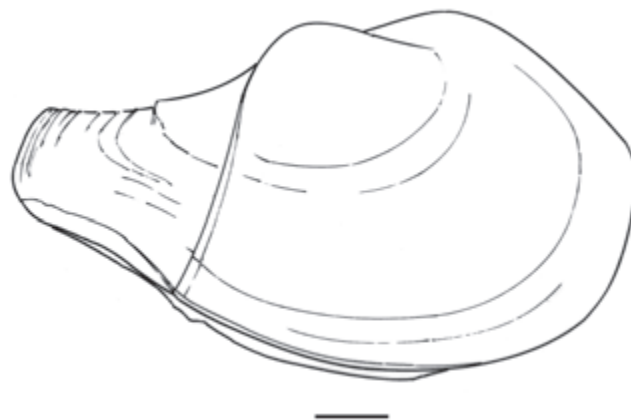


Figure 4 *Cardiomya unistriata*. Lateral view of the type specimen from the right side. Scale= 1 mm.

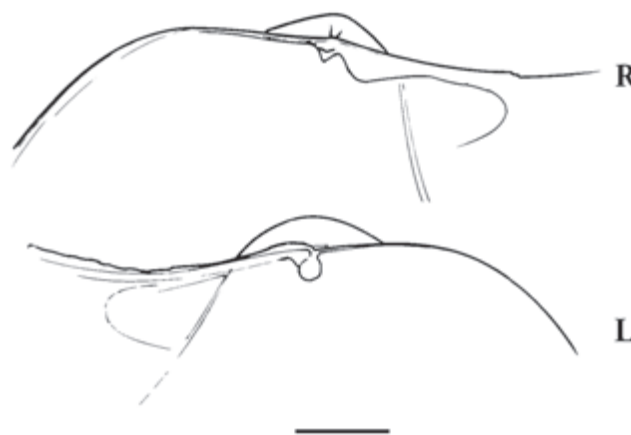


Figure 5 *Cardiomya unistriata*. Detail of left and right hinges. Scale = 1 mm. L, left; R, right.

beak of the right valve, the left valve is without a posterior lateral tooth, however the shell margin is somewhat thickened to fit the dorsal edge of the right posterior lateral tooth, a fine ridge surrounds the posterior margin of the adductor muscle scar, there is well-developed rounded cardinal tooth, neither valve has a lateral tooth, nor is the antero-dorsal shell margin thickened to any degree.

This, the type specimen, has been lodged at the Natural History Museum, London.

Remarks No account of the internal anatomy can be given because the only specimen comprises a shell alone that has been drilled by a carnivorous gastropod. Normally, a single specimen comprising the shell alone would perhaps not have warranted a named description. However, this particular shell, apart from the small drill hole, is in perfect condition and has such a



Plate 2 *Cardiomya unistriata*. A. Left and Right valves ($\times 8.5$).

distinct ornamentation, unlike that of any other described species of *Cardiomya*, that an exception has been made.

Derivation of the name This reflects the unusualness of the shell ornamentation.

Genus *Cuspidaria* Nardo 1840

***Cuspidaria (Cuspidaria) krylovae* new species**
(Figs 6–9, Pls 3A & B)

Distribution Specimens were recorded from four epibenthic dredge samples taken at abyssal abyssal depths from the Brazil and Canaries Basins.

Ship	date	station	latitude	longitude	depth(m)	no.
Atlantis II	13.02.67	155	00°03.0'S	27°48.0'W	3730	26
Atlantis II	14.02.67	156	00°46.0'S	29°28.0'W	3459	24
Discovery	19.03.68	6711	27°14.9'N	15°36.3'W	2988	1
Discovery	20.03.68	6714	27°13.0'N	15°41.0'W	3301	3

Description Shell small (largest specimen 4.4 mm in length), equivalve, umbos moderately pronounced, slightly anterior to the midline, beaks face inwards; antero-dorsal shell margin

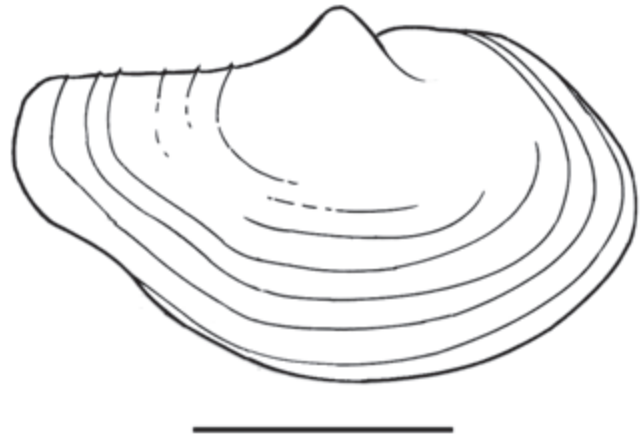


Figure 6 *Cuspidaria krylovae*. Lateral view of shell from the right side. Scale = 1 mm.

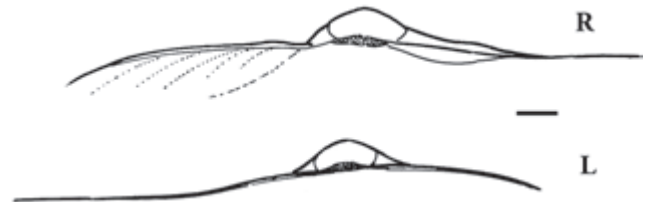


Figure 7 *Cuspidaria krylovae*. Detail of left and right hinges. Scale = 0.1 mm. L, left: R, right.

slightly sinuous, slightly angulate at junction with the anterior margin the upper part of which curves shallowly to the anterior limit of the shell, this latter lies ventral to the mid-height of the shell, thereafter the anterior margin joins the ventral margin in a smooth curve, the posterior ventral margin is slightly sinuate where it forms the ventral margin of a short and relatively broad rostrum, the posterior margin of the rostrum is curved, the postero-dorsal shell margin is relatively straight up to the point where it meets the umbo; the shell is white, with 17 fine broadly spaced co-marginal ridges in the largest specimen that are equidistant from each other, the outer ridges are more pronounced than the inner, the ridges extend the length of the shell; a faint diagonal rostral ridge is present in the largest specimens but is not apparent in smaller specimens; the co-marginal growth lines are pronounced where they join the postero-dorsal shell margin; hinge of the right valve bears a slender, thin, fragile posterior lateral tooth that extends at right angles to the margin, it is more slender and fragile than any other cardiomiid species described to date and is without a cardinal tooth, the right valve is edentate.

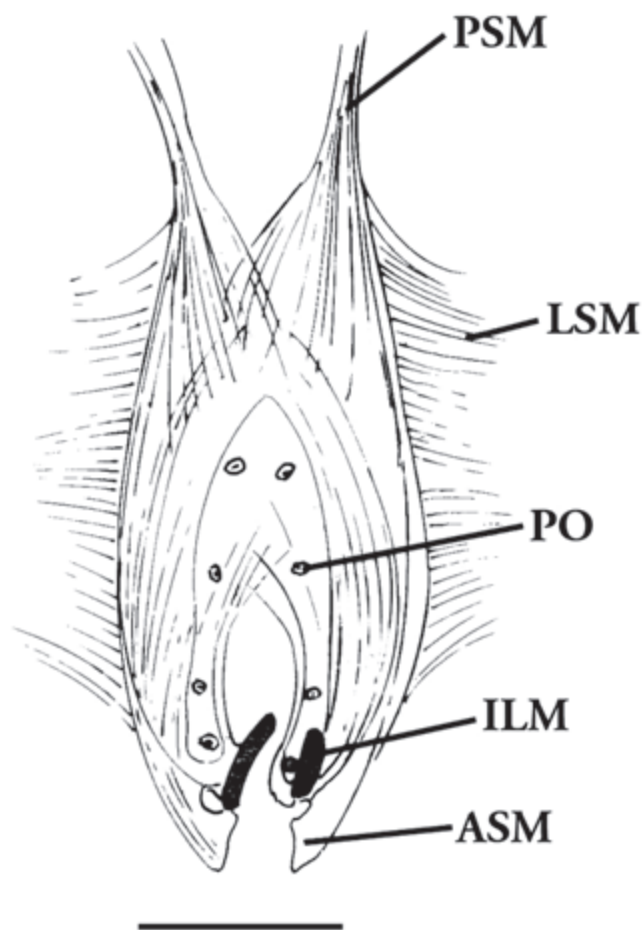


Figure 8 *Cuspidaria krylovae*. Ventral view of the septum. Scale = 0.5 mm. ASM, anterior septal muscle, ILM, inner lateral muscle; LSM, lateral septal muscle; PO, septal pore; PSM, posterior septal muscle.

Type and paratype specimens Taken from Station 156 (Brazil Basin) and lodged at the Natural History Museum, London.

Internal anatomy This is similar to that described for other species of *Cuspidaria*; the most taxonomically significant parts include a thin septum with four pairs of septal pores, paired longitudinal bands of septal muscles extend from a position adjacent to the posterior and anterior adductor muscles, laterally broad anterior and posterior lateral septal muscles extending into the mantle; the pair of anterior labial palps are long and finger-like and the paired posterior palps are but slight enlargements of the rim of the mouth; the inhalent siphon bears four ventral tentacles and the exhalent siphon bears three dorsal tentacles; the gonads lie posterior to the stomach.

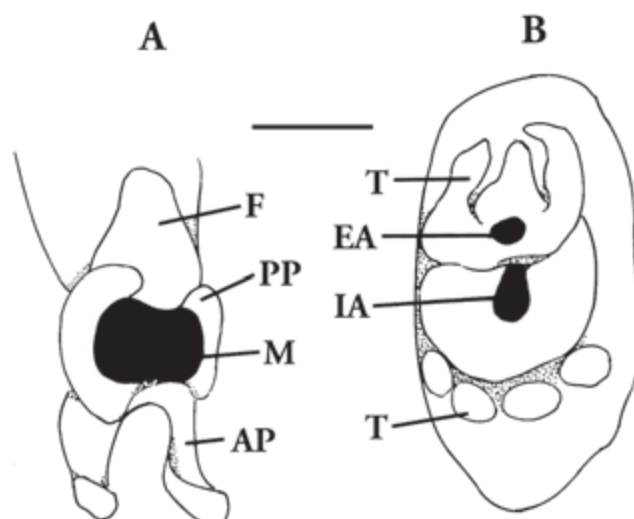


Figure 9 *Cuspidaria krylovae*. A. Frontal view of mouth and palps. B. End on view of the inhalant and exhalant siphons and the associated retracted tentacles. Scale = 0.1 mm. AP, anterior palp; EA, exhalant aperture; F, foot; IA, inhalant aperture; M, mouth; PP, posterior palp; T, tentacle.

Remarks This species is distinguished by the broadness of its rostrum when compared to other species of *Cuspidaria* and also by the prominence of the co-marginal ridges. In other respects, both shell and internal anatomy, it corresponds to *Cuspidaria* s.s.

Derivation of the name The species is named after Dr Elena Krylova of the P. P. Shirshov Institute of Oceanology, Moscow who has done so much recent descriptive work on the deep water cuspidariids of the world's oceans.

Genus *Octoporia* Scarlato & Starobogatov 1983

***Octoporia poutiera* new species**
(Figs 10–13, Pl. 4)

Distribution Specimens were recorded from epibenthic samples taken predominantly at abyssal depths from the Brazil and Surinam Basins.

Ship	date	station	latitude	longitude	depth(m)	no.
Atlantis II	10.02.67	155	00°03.0'S	27°48.0'W	3783	2
Atlantis II	20.02.67	167	07°58.0'S	34°17.0'W	1007	70
Knorr	24.02.72	287	13°16.0'N	54°56.8'W	4960	5
Knorr	27.02.72	291	10°06.1'N	55°14.0'W	3859	131

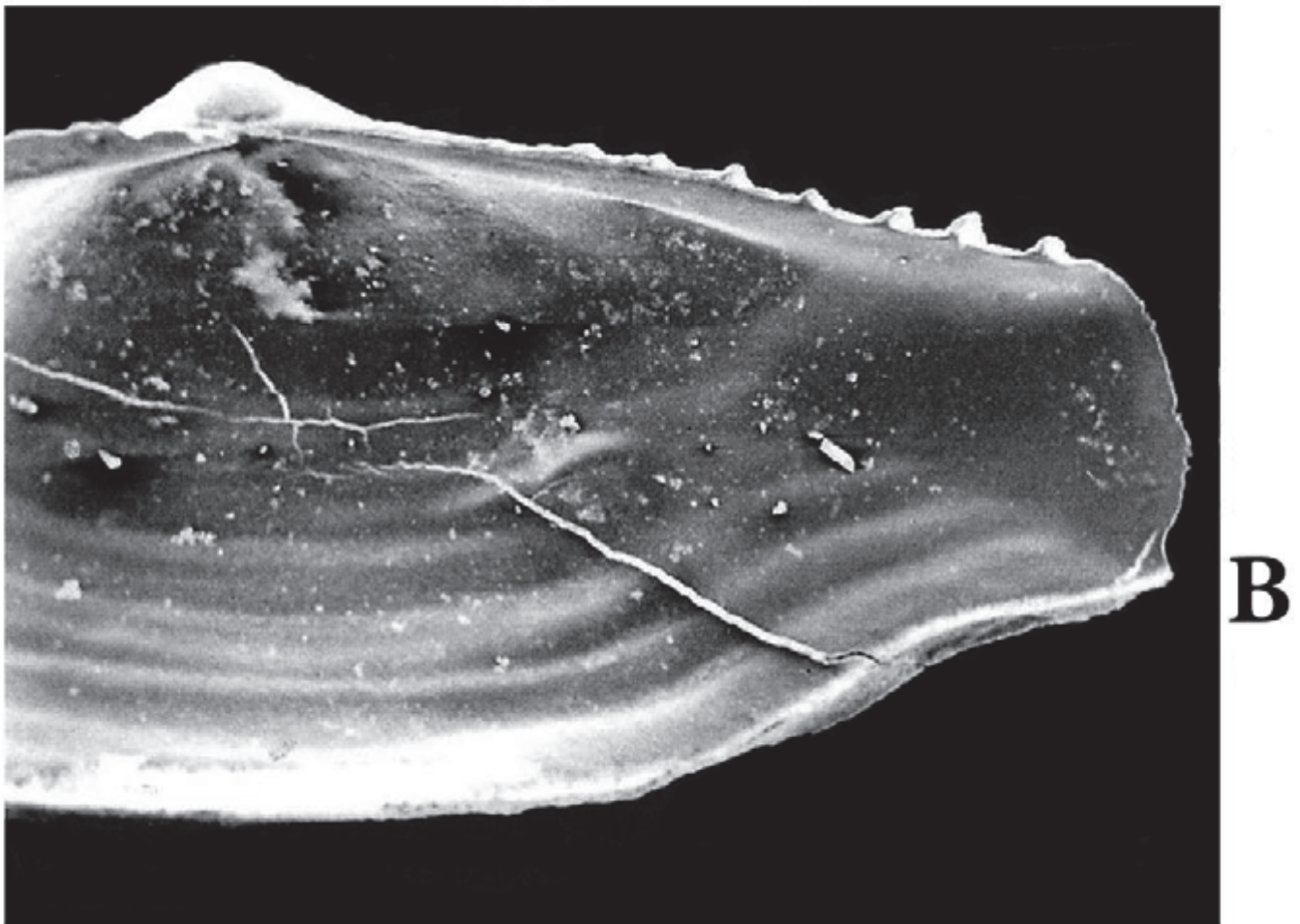
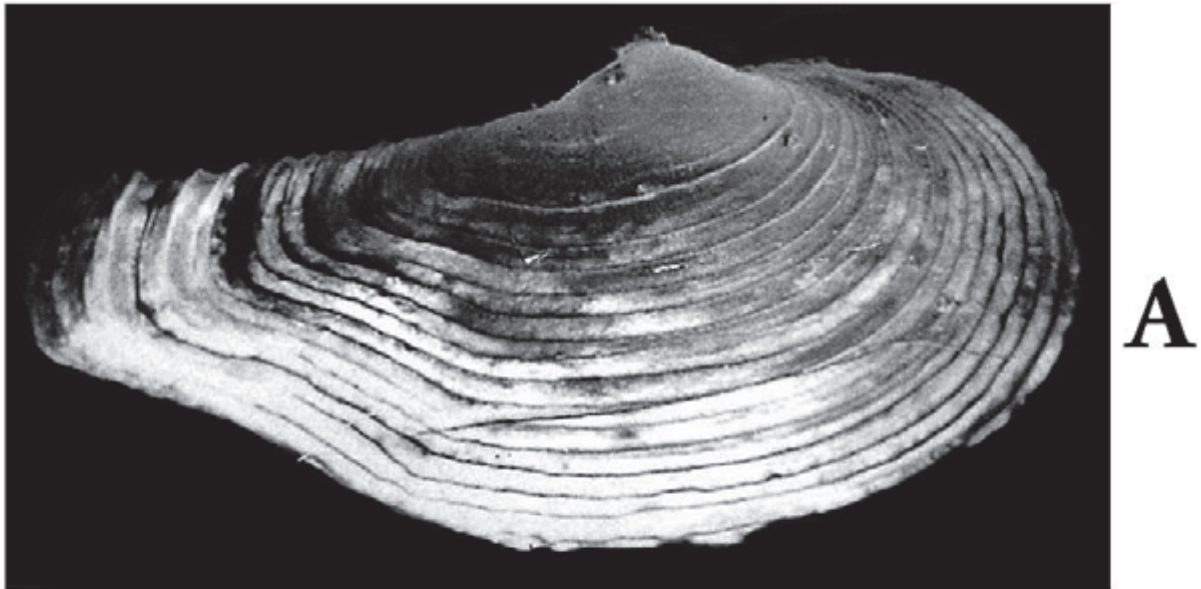


Plate 3 *Cuspidaria krylovae*. A. Right valve ($\times 20$); B. internal view of right valve ($\times 40$).

Description Shell moderately small (largest specimen 7 mm in length), equivalve, umbos pronounced and are anterior to midline, beaks

face inwards; antero-dorsal shell margin slopes down at a slight angle, slightly angulate in many specimens where it meets the anterior shell

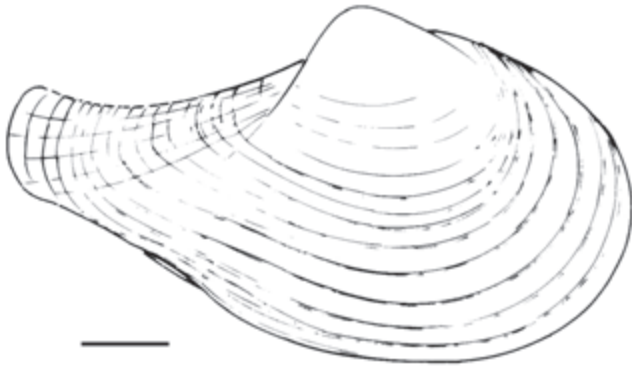


Figure 10 *Octoporia poutiera*. Lateral of shell from the right side. Scale = 1 mm.

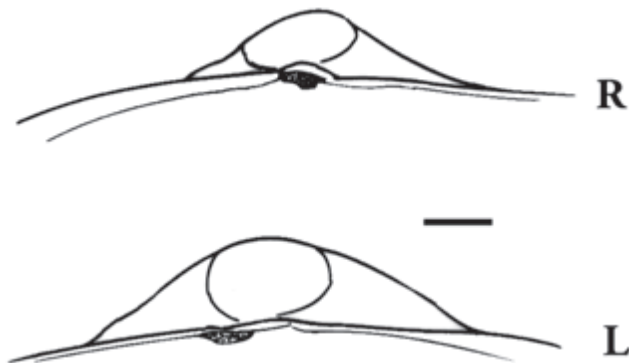


Figure 11 *Octoporia poutiera*. Detail of left and right hinges. Scale = 0.1 mm. L, left; R, right.

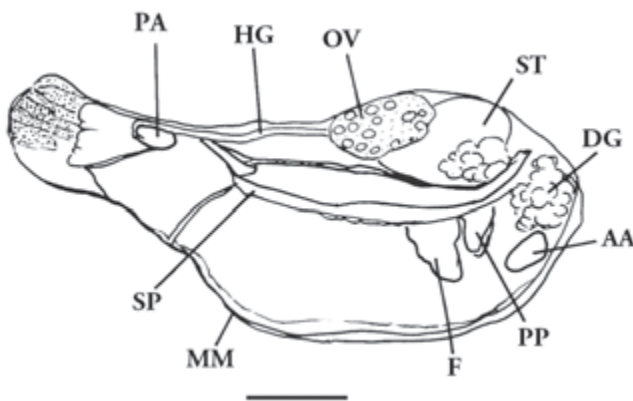


Figure 12 *Octoporia poutiera*. Lateral view of the internal anatomy as seen from the right side. Scale = 1 mm. AA, anterior adductor muscle; DG, digestive gland; F, foot; HG, hind gut; MM, mantle margin; OV, ovary; PA, posterior adductor muscle; PP, posterior palp; SP, septum; ST, stomach.

margin, the anterior margin curves continuously with the ventral margin, the posterior ventral margin is broadly sinuate where it meets with

the base of the rostrum, the postero-dorsal margin slopes downwards in a gentle curve and is continuous with the dorsal margin of the rostrum, the rostrum is relatively slender and the posterior margin is gently rounded; the shell is white and characteristically ornamented with sharp, raised co-marginal ridges that originate approximately 1 mm ventral to the umbo, with 13 ridges present in the largest specimen, these lines extend across the rostrum but are less pronounced; a sharp diagonal rostral ridge extends from the umbo to the ventral limit of the rostrum, dorsal to this a further 3–4 faint diagonal rostral lines extend to the posterior margin; in addition to the shell ridges fine co-marginal growth lines are present; the shell hinge is simple without cardinal and lateral teeth in either valve, the anterior dorsal shell margin is very slightly thickened in both valves; the ligament is small, internal, slightly elongate and lies below the beak of the shell.

Type and paratype Specimens were taken from Station 292 (Surinam Basin) and are lodged in the Natural History Museum, London.

Internal anatomy This differs little from that of the other species of *Octoporia* (Allen & Morgan, 1981; Krylova, 1994). The only items of particular note are the posterior palps which are particularly large and scrolled while the anterior are much more modest in size. As in other species of *Octoporia* the pairs of septal pores exceeds the typical cuspidariid number of four or five, in *O. poutiera* these number seven.

Remarks Comparison with other Atlantic species shows that *O. poutiera* differs from *O. octopora* and *O. sinuosa* not only in the number of pairs of septal pores, but also in that the co-marginal ridges are far more pronounced, sharp edged and more widely spaced. In addition the posterior ventral situation of the shell margin is more pronounced, the posterior dorsal margin much less curved.

Derivation of the name This species is named after my colleague and friend Jean-Maurice Poutiers of the Muséum National d'Histoire Naturelle, Paris and senior author of a major contribution to the cuspidariids of the Pacific Ocean.

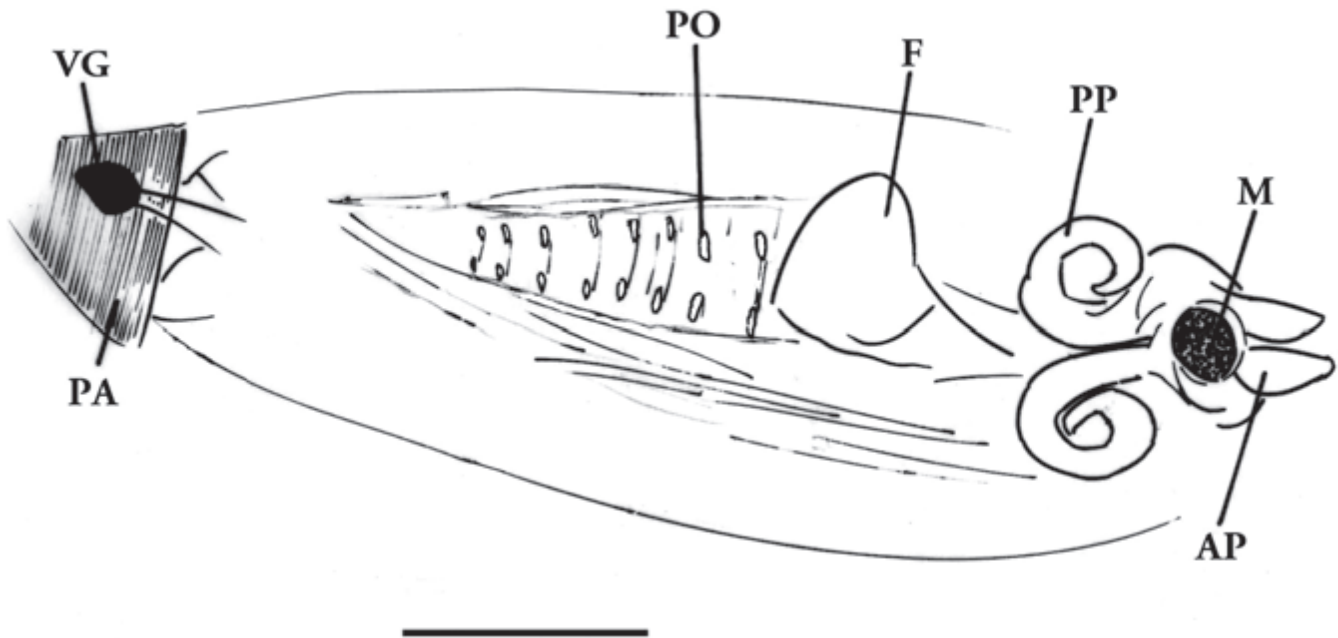


Figure 13 *Octoporia poutiera*. Ventral view of the septum, foot and palps. Scale = 1 mm. AAP, anterior palp; F, foot; M, mouth; PA, posterior adductor muscle; PO, septal pore; PP, posterior palp; VG, visceral ganglion.

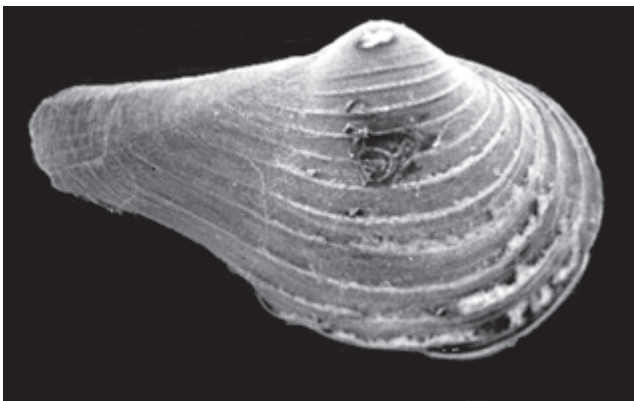


Plate 4 *Octoporia poutiera*. Right valve ($\times 35$).

DISCUSSION

It has to be recognized that the three species of *Octoporia* that have been described from the Atlantic and the species that occur in the Pacific (Krylova, 1994) are very similar in shell form and internal morphology. Those in the Atlantic have been recorded from widely separated locations – *O. octoporosa* from the N. Atlantic and Brazil basins, *O. sinuosa* the Canaries and South Australia basins and *O. poutiera* the Surinam Basin. Whether the differences warrant specific separation or should be considered as subspecies that are possibly in the process of distinct separation is debatable. Similarly, the differences in the

number of septal pores may simply be variants related to the post-pedal length of the septum. Simply, the differences between the species may be related to the separation of the populations and limited larval dispersal.

A further consideration is whether the separation by Scarlato & Starobogatov (1983) of *Octoporia* from *Myonera* is justified, particularly when the difference is restricted to additional septal pores and not to shell differences. Poutiers & Bernard (1995) clearly had similar reservations, though they decided that, as further species had been described following that of (*Myonera*) *octoporosa* by Allen & Morgan (1981), they would accept the generic distinction.

It should also be noted that species with shell ornamentation of co-marginal ridges are common to many cuspidariid genera, frequently these also have a well-defined posterior diagonal ridge that runs from the posterior margin of the umbo to the postero-ventral limit of the rostrum. A particularly good example of this is the description of *O. poutiera* given above as compared with that of the Antarctic species *Cuspidaria concentrica* Thiele 1912. The latter has been recently been redescribed by Zelaya and Ituarte (2006). A comparison of the external features of the two species shows that *O. poutiera* is slightly more elongate and has fine additional diagonal ridges on the rostrum. There are, of

course, additional differences in hinge structure and the number of septal pores.

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ZELAYA DG & ITUARTE C 2006 Redescriptions of two Antarctic species of *Cuspidaria*: *C. concentrica* Thiele, 1912 and *C. minima* (Egorova, 1993) (Bivalvia: Cuspidariidae). *The Veliger* 48: 170–177.

APPENDIX

Cuspidariidae of the Atlantic – listing the original descriptions and identifications as well as subsequent publications which include name changes and detailed anatomical accounts with figures.

Genus *Bathyneera* Scarlato & Starobogatov 1983.

- B. globulosa* Krylova 1993: 55, fig. 1i–l.
B. hadalis (Knudsen 1970)(=*Cuspidaria hadalis*: 146, figs 33 & 34).
 Krylova (1993): 2, fig. 1a–e.
B. paleifera Krylova 1993: 57, fig. 2a–d.
B. laticella (Dall 1886) (= *Myonera laticella*: 305).
B. tillamookensis (Dall 1916) (= *Myonera tillamookensis*: 407).
 Abbott (1974): 567.
 Barnard (1974): 71, text-fig. 9, pls 2, 3 & 19(2).
 Allen & Morgan (1981): 475, fig. 39.
 Krylova (1993): 54, fig. 1F–1H.

Genus *Cardiomya* A Adams 1864.

- C. abyssicola* Verrill & Bush 1898: 806, pl. LXXIII, fig. 4, pl. LXXVII, fig. 9 (non pl. LXXIV, fig. 1).
 Dall (1889a): 66, pl. XCV, fig. 1.
 Knudsen (1970): 138, pl. 16, fig. 1 & text-fig. 95.
 Abbott (1974): 567, fig. 6216.
C. alternata (d'Orbigny 1846) (= *Sphena alternata*: 286).
 Abbott (1974): 565.
C. cleryana (d'Orbigny 1842) (= *Sphaenia cleryana*: 708, pl. 83, figs 16–18).
C. corpulenta (Dall 1886) (= *Neaera costellata* var. *corpulenta*: 297).
 Dall (1889a): p. 68, pl. III, fig. 9.
C. costata (Sowerby 1834) (= *Anatina costata*: 87) (= *C. dulcis* Pilsbury & Lowe 1932: 104, pl. 17).
 Olsson (1961): 465, pl. 83.
 Barnard (1974): 53, pl. 17, figs 1 & 2.
C. costellata (Deshayes 1833) (= *Corbula costellata*: 86, pl. VII, figs 1–3) (= *Neaera costellata* Hinds 1843, *Neaera sulcata* Lovén 1846, *Corbula rostratocostellata* Acton 1855) (= *Cuspidaria striolata* Locard 1897: 193 & *C. gemma* Verrill & Bush 1898: 809, pl. LXXI, figs 3 & 4 & pl. LXXIV, fig. 11).

- Hinds (1843): 77.
 Deshayes (1843): 194, pl. 12, figs 9 & 11.
 Lovén (1846): 48.
 Forbes & Hanley (1848): 199, pl. VII, figs 8 & 9.
 Jeffreys (1865): 49 & 191, pl. XLI, fig. 3.
 Jeffreys (1869): 192, pl. XLIX, fig. 3.
 Dall (1889): 66, pl. XCIV, figs 3 & 4 & pl. XCV, fig. 11.
 Locard (1891): 259.
 Locard (1897): 193, pl. VIII, figs 20–25.
 Tebble (1966): 204, figs 109a & b & 110^a.
 Nordsieck (1969): 177, fig. 98.81 & fig. 98.83.
 Abbott (1974): 566, fig. 6209.
 Allen & Morgan (1981): 464, fig. 29.
 De Boer (1993): 225.
 Salas (1995): 76, figs 137 & 138.
 Porcheddu *et al.* (1996): 157
 (?*C. costellata* var. *lactea* Jeffreys 1865, p. 50).
C. curta (Jeffreys 1876) (= *Neaera curta*: 495).
 Jeffreys (1882): 943, pl. LXXI, fig. 10.
 Smith (1885): 49.
 Locard (1897): 192, pl. IX, figs 24–26.
 Dautzenberg & Fischer (1897): 221.
 Nordsieck (1969): 177, fig. 98.82.
 Allen & Morgan (1981): 468.
 Salas (1995): 76, figs 135 & 136.
 (?= *Neaera costellata* var. *corpulenta* Dall 1886).
 Krylova (2006): 92.
C. dulcis – see *C. costata*.
C. gemma – see *C. costellata*.
C. glypta – see *C. ornatissima*.
C. greenii Smith 1889: 424.
C. guineensis Knudsen 1970: 143, pl. 16, fig. 8 & text-figs 100 & 101.
C. knudseni Allen & Morgan 1981: 466, figs 30–32.
C. multicostata – see *C. striata*.
C. obliqua De Boer 1985: 101, figs 1 & 2.
C. ornatissima (d'Orbigny 1842) (= *Sphena ornatissima*: 286, pl. XXVII, figs 13–16) (= *Neaera costata* Bush 1885: 472, pl. XLV, fig. 21 & p. 587 & *C. glypta* Verrill & Bush 1898: 810, pl. LXXI, fig. 1 & pl. LXXVI, figs 3 & 7) (not Sowerby 1834).
 Dall (1886): 296.
 Dall (1889a): 66, pl. XCIV, fig. 1 & pl. XLI, fig. 21.
 Abbott (1974): 566, fig. 6212 & p. 567, fig. 6215.
 Johnson (1989): 39.
 Knudsen (2005) 130, fig. 5.
C. perrostrata (Dall 1881) (= *Neaera ornatissima* var. *perrostrata*: 110).
 Verrill (1882): 561.
 Verrill (1884): 277.
 Dall (1886): 296, pl. 2, fig. 3a & b.

- Dall (1889a): 66, pl. II, fig. 3a & b.
 Dall (1903): pl.XCV, fig. 3.
 Verrill & Bush (1898): 809, pl.LXXIII, fig. 2 & pl. LXXIV, figs 1 (labelled *C. abyssicola*) & 3.
 Abbott (1974): 567, fig. 6213.
 Allen & Morgan (1981): 461, figs 27 & 28.
Cardiomya saba Knudsen 1982: 113.
C. striata (Jeffreys 1876) (= *Neaera striata*: 495) (= *Neaera multicostata* Verrill 1880: 398 & *Neaera multicostata* var *curta* Verrill 1882)(not *C. striata* Dall 1886 & 1889a & b).
 Jeffreys (1882): 944, pl. LXXI, fig. 11.
 Verrill (1882): 559, pl.LVIII, fig. 40.
 Verrill (1884): pl.XXX, fig. 129.
 Locard (1897): 190, pl. IX, figs 18–23.
 Verrill & Bush (1898): 808, pl. LXXIII, fig. 3.
 Nordsieck (1969): 176, fig. 98.80.
 Abbott (1974): 567, fig. 6214.
 De Boer (1993): 225.
 Salas (1995): 76, figs 133 & 134.
C. striolata – see *C. costellata*.
C. sulcata – see *C. costellata*.
C. sulcifera (Jeffreys 1880) (= *Neaera sulcifera*: 316).
 Jeffreys (1882): 937, pl. LXX, fig. 10.
 Locard (1897): 176.
 Salas (1995): 74.
C. surinamensis Altena 1971a: 78, fig. 3a & b.
 Altena (1971b): 83, figs 25a & b.
 Knudsen (2005): figs 6 & 16.
- Genus *Cuspidaria* Nardo 1840.
C. altenai Knudsen 2005: 128, figs, 4, 14 & 15.
C. angularis (Jeffreys 1876) (= *Neaera angularis*: 498).
 Jeffreys (1882): 943, pl. LXXI, fig. 9.
 Salas (1995): 76, figs 127 & 128.
C. arctica (M Sars 1869)(= *Neaera arctica*: 62).
 Sars GO (1878): 85, pl. 6, fig. 5a–c.
 Dall (1889a): 66, pl. XCIV, fig. 2 & pl. XCV, fig. 7.
 Verrill & Bush (1898): 803, pl. LXXI, fig. 2 & pl. LXXIV, fig. 7.
 Ockelmann (1958): 166, pl. 3, figs 7 & 8.
 Nordsieck (1969): 175.
 Abbott (1974): 565, fig. 6190.
 Scarlato (1981): 420, fig. 206.
C. arcuata (Dall 1881)(= *Neaera arcuata*: 113).
 Dall (1889a): 66, pl. III, figs 3 & 4.
 Abbott (1974): 565, fig. 6193.
C. atlantica Allen & Morgan 1981: 455, figs 21–23.
C. attenuata – see *C. rostrata*.
C. azorica (Smith 1885)(= *Neaera azorica*: 41, pl. X, fig. 7, 7a & b).
 Nordsieck (1969): 176, fig. 98.77.
C. barnardi Knudsen 1970: 139, figs 96 & 97.
 Allen & Morgan (1981): 457, fig. 24.
C. bicarinata (Jeffreys 1882)(= *Neaera bicarinata*: 939, pl. LXXI, fig. 1)(= *Jeffreysomya bicarinata* Nordsieck 1969).
 Locard (1897): 180.
 Nordsieck (1969): 177.
C. braziliensis Smith 1915: 104, pl. 2, fig. 23.
C. brevirostrata and *C. brevirostris* – see *C. cuspidata*.
C. brucei – see *C. undata*.
C. capensis (Smith 1885)(= *Neaera capensis*: 43, pl. IX, fig. 5, 5a & b).
 Locard (1897): 175.
 Nordsieck (1969): 175, fig. 98.68.
C. centobi Bouchet & Warén 1979: 218, figs 6a–c 7 7a–d.
C. circinata (Jeffreys 1876) (= *Neaera circinata*: 497).
 Philippi (1836): 17, pl. 1, fig. 19.
 Jeffreys (1882): 942, pl. LXXI, fig. 6.
 Smith (1885): 42, pl. X, fig. 4, 4a & b.
 Locard (1897): 185.
 Nordsieck (1969): 175, fig. 98.66.
 Allen & Morgan (1981): 459, fig. 25.
 Salas (1995): 74, figs 125 & 126.
C. congenita – see *C. inflata*.
C. consociata (Smith 1885)(= *Neaera consociata*: 41, pl. IX, fig. 7, 7a & b).
 Knudsen (1982): 121.
C. contracta (Jeffreys 1882)(= *Neaera contracta*: 941, pl. LXXI, fig. 4)(?= *C. limatula* Dall 1881).
 Dall (1889a): 66, pl. XCV, fig. 8.
 Locard (1897): 190.
 Nordsieck (1969): 176.
C. cuspidata (Olivi 1792) (= *Tellina cuspidata*: 101, pl. 4, fig. 3)(= *Erycina cuspidata* Risso 1826, *Anatina brevirostris* Brown 1827, *Neaera brevirostris* Lovén 1846, *Neaera cuspidata* Adams & Adams 1858).
 Risso (1826): 366.
 Brown (1844): 110.
 Lovén (1846): 48.
 Forbes & Hanley (1848): 195, pl. VII, figs 4–6.
 Deshayes (1850): 192, pl. 12, figs 6–8.
 Adams & Adams (1858): 369, pl. XCVII, fig. 4.
 Jeffreys (1869): 191, pl. XLIX, fig. 5.
 Hidalgo (1877): 174, pl. 74, fig. 8.
 Kobelt (1878): 326, pl. 93, fig. 15.

- Jeffreys (1882): 938.
 Fischer (1886): 1155, pl. 23, fig. 5 & text-fig. 879.
 Locard (1891): 259, fig. 238.
 Locard (1897): 173.
 Tebble (1966): 203, fig. 108^a.
 Nordsieck (1969): 174, fig. 98.60.
 Allen & Morgan (1981): 452.
 De Boer (1993): 225.
 Salas (1995): 74, figs 115 & 116.
 Krylova (2006): 89, fig. 5E & F.
- C. elliptica* Di Geronimo 1974: 157, fig. d.
C. exigua (Jeffreys 1876)(=*Neaera exigua*: 496).
C. filocarinata – see *Rhinoclama notabilis*.
C. formosa Verrill & Bush 1898: 803, pl. LXXIV, fig. 6 & pl. LXXIX, fig. 9.
 Dall (1889a): 66, pl. XCV, fig. 6 & pl. LXXVIII, fig. 9.
 Abbott (1974): 565, fig. 6198.
- C. fraterna* Verrill & Bush 1898: 803, pl. LXXI, figs 7 & 8 & pl. LXXV, fig. 6.
 Dall (1889a): 66, pl. XCIV, figs 7 & 8.
 Abbott (1974): 565, fig. 6199.
- C. glacialis* (GO Sars 1878)(=*Neaera glacialis*: 88, pl. 6, fig. 8a–c).
 Verrill (1882): 562, pl. XLIV, fig. 10a & b.
 Dall (1889a): 66, pl. XCIV, fig. 9.
 Verrill & Bush 1898: 803, pl. LXXI, fig. 9, pl. LXXIII, fig. 5 & pl. IX, fig. 9.
 Oldroyd (1924): 98, pl. 19, fig. 3 & 3a.
 Ockelmann (1956): 164, pl. 3, fig. 10.
 Nordsieck (1969): 175, fig. 98.71.
 Knudsen (1970): 155, pl. 16, figs 4 & 5.
 Abbott (1974): 564, fig. 6181.
 Barnard (1974): 36, pl. 13, figs 3 & 4.
- C. gracilis* (Jeffreys 1882)(=*Neaera gracilis*: 938, pl. LXX, fig. 11).
 Locard (1897): 175.
 Nordsieck (1969): 176.
- C. guineensis* Knudsen 1970: 143, text figs 100 & 101 & pl. 16, fig. 8.
- C. imbricata* (Jeffreys 1880)(=*Neaera imbricata*: 383).
 Locard (1897): 187, pl. IX, figs 5–11.
- C. inflata* (Jeffreys 1882)(=*Neaera inflata*: 942, pl. 71, fig. 8)(=*Neaera congenita* Smith 1885: 52, pl. X, fig. 1, 1a & b).
 Locard (1897): 180.
 Salas (1995): 74, figs 121 & 122.
- C. jeffreysi* (Dall 1881)(=*Neaera jeffreysi*: 111).
 Dall (1886): 295, pl. III, fig. 2.
 Dall (1889a): 66, pl. III, fig. 2.
 Abbott (1974): 565, fig. 6183.
 Allen & Morgan (1981): 453, figs 19 & 20.
- C. jugosa* – see *C. lamellosa*.
- C. lamellosa* (M Sars 1859)(=*Neaera lamellosa*: 52)(=*Neaera jugosa* GO Sars 1878, not S Wood 1856).
 Sars GO (1878): 88, pl. 6, fig. 9.
 Jeffreys (1882): 940.
 Verrill (1882): 561.
 Verrill (1884): pl. XXX, fig. 3.
 Dall (1889^a): 66, pl. XCV, fig. 10 & pl. XLV, fig. 3.
 Locard (1897): 189.
 Verrill & Bush (1898): 799, pl. LXXIV, fig. 10.
 Nordsieck (1969): 176.
 Abbott (1974): 565, fig. 6188.
- C. limatula* – see *C. contracta*.
- C. lucifuga* – see *C. undata*.
- C. luymesii* Knudsen 2005: 126, figs 3 & 4.
- C. maxima* – see *M. gigantea*.
- C. media* Verrill & Bush 1898: 800, pl. LXXI, figs 5 & 6 & pl. LXXIII, fig. 6.
 Dall (1889a): 66, pl. XCIV, figs 5 & 6.
 Abbott (1974): 565, fig. 6189.
- C. meteoris* Krylova 2006: 90, figs 5G & 9A–I.
- C. microrrhina* Dall 1886: 295.
 Dall (1889b): 440, pl. XL, figs 2 & 3.
 Abbott (1974): 565, fig. 6187.
- C. munieri* Dautzenberg & Fischer 1897: 225, pl. VII, figs 5 & 6.
 Dautzenberg (1927): 339, pl. IX, fig. 516.
- C. nitens* Locard 1897: 181, pl. IX, figs 12–17.
- C. nybelini* – see *C. undata*.
- C. obesa* Lovén 1846 (= *Neaera obesa*: 202).
 Sars GO (1878): 86, pl. VI, fig. 4a–c.
 Jeffreys (1882): 937.
 Verrill (1882): 563, pl. XLIV, fig. 10c.
 Dall (1889a): 66, pl. III, fig. 1.
 Locard (1897): 172.
 Verrill & Bush (1898): 804, pl. LXXV, fig. 7.
 Ockelmann (1958): 160, pl. 3, fig. 6.
 Nordsieck (1969): 175, fig. 98.70.
 Abbott (1974): 565, fig. 6185.
 Allen & Morgan (1981): 429, figs 1–12.
- C. papyria* (Jeffreys, 1876)(=*Neaera papyria*: 498).
- C. parva* Verrill & Bush 1898: 801, pl. LXXIV, fig. 9 & pl. LXVII, fig. 7.
 Dall (1889a): 66, pl. XCV, fig. 9.
 Abbott (1974): 565.
 Allen & Morgan (1981): 446, figs 13–18.
- C. pellucida* (Stimpson, 1853)(=*Neaera pellucida*: 21, pl. 1, fig. 13).
 Gould (1870): 61, fig. 378.
 Verrill & Bush (1898): 805, pl. LXXV, fig. 8 & pl. LXXVI, fig. 8 (not *C. obesa*).

- C. platensis* (Smith 1885)(=*Neaera platensis*: 45, pl. IX, fig. 4, 4a & b).
- C. renovata* – see *C. rostrata*.
- C. rostrata* (Spengler 1793) (= *Mya rostrata*, p. 42, pl. II, fig. 16) (= *Anatina longirostris* Lamark 1818, p. 463, *Neaera attenuata* Forbes 1843 & *C. renovata* Tiberi 1855, p. 9, p. 1.1, figs 5–9).
GO Sars (1878): pl. VI, fig. 7a & b.
Jeffreys (1882): 938.
Verrill (1882): 562, pl. LVIII, fig. 39.
Locard (1891): 259.
Locard (1897): 109.
Verrill & Bush (1898), p. 800, pl. LXXII, fig. 6.
Dautzenberg (1927): 335.
Tebble (1966): 204, fig. 108b.
Nordsieck (1969): 174, fig. 98.62.
Abbott (1974): 565, fig. 6182.
Salas (1995): 74, figs 113–114.
Krylova (2006): 89.
(Note: *C. rostrata* var. *major* Dautzenberg & Fischer 1897: 220.
Dautzenberg (1927): 336).
- C. semirostrata* – see *M. gigantea*.
- C. semistrigosa* (Jeffreys 1881) (= *Neaera semistrigosa*: 941, pl. LXXI, fig. 4).
De Boer (1993): 226.
- C. subtorta* (GO Sars. 1878) (= *Neaera subtorta*: 87, pl. 6, fig. 6a–c).
Dall (1889a): 66, pl. XCV, figs 4 & 5.
Verrill & Bush (1898): 806, pl. LXXIII, fig. 1 & pl. LXXIV, figs 4 & 5.
Ockelmann (1958): 161, pl. 3, fig. 9.
Nordsieck (1969): 176, fig. 98.72.
Abbott (1974): 565, fig. 6200.
- C. sulcifera* (Jeffreys 1882) (= *Neaera sulcifera*: 937, pl. 70, fig. 10).
(nom. nud. Jeffreys, 1880: 316).
- C. testai* – see *R. notabilis*.
- C. truncata* (Jeffreys 1881) (= *Neaera truncata*: 936, pl. LXX, fig. 9) (= *Jeffreysomya truncata* Nordsieck 1969).
Locard (1897): 179, pl. VIII, figs 16–19.
Nordsieck (1969): 177, fig. 98.90.
Salas (1995): 76, figs 131 & 132
- C. turgida* Verrill & Bush 1898: 799, pl. LXXII, fig. 7 & pl. LXXVII, fig. 4.
Abbott (1974): 565.
- C. undata* (Verrill 1884) (= *Neaera undata*: 223) (= *Neaera lucifuga* Fischer 1886, *C. brucei* Melvill & Standon 1907, *C. nybelini* Odhner 1960) (not *Myoneaera undata* Dall 1886 & Dall 1889, in part).
- Fischer (1886): 1155.
Locard (1897): 184, pl. VII, figs 48–51.
Verrill & Bush (1898): 798, pl. LXXII, fig. 1 & pl. LXVIII, figs 3 & 4.
Melvill & Standen (1907): 122, pl. 1, fig. 19.
Odhner (1960): 381, pl. 1, figs 6 & 7, text figs 7–10.
Knudsen (1970): 136, figs 93 & 94.
Abbott (1974): 565, fig. 6191.
Allen & Morgan (1981): 458.
- C. ventricosa* Verrill & Bush 1898: 802, pl. LXXII, fig. 5 & pl. LXXVI, fig. 6.
Abbott (1974): 565.
Allen & Morgan (1981): 460, fig. 26.
- C. wollastoni* (Smith 1885) (= *Neaera wollastoni*: 40, pl. 10, fig. 6a & b).
Locard (1897): 171, pl. VIII, figs 6–11.
Nordsieck (1969): 175, fig. 98.65.
Abbott (1974): 565.
Salas (1995): 74, figs 111 & 112.
- Subgenus *Leiomya* A Adams 1864.
L. striatella (Verrill & Bush 1898) (= *Halonympha striatella*: 810, pl. LXXII, figs 2 & 3 & pl. LXXVII, fig. 10).
Abbott (1974): 568.
- Subgenus *Luzonia* Dall & Smith 1890 (in Dall 1890).
L. simplex Allen & Morgan 1981: 485, fig. 50.
- Subgenus *Rhinoclama* Dall & Smith 1886 (in Dall 1886).
R. abrupta Allen & Morgan 1981: 479, figs 42–45.
R. halimera (Dall & Smith 1886) (in Dall 1886 = *Leiomya (Rhinoclama) halimera*: 300).
Abbott (1974): 568.
Allen & Morgan (1981): 484, fig. 49.
- R. notabilis* (Jeffreys 1876) (= *Neaera notabilis*: 497) (= *Neaera filocarinata* Smith 1885, *Leiomya (Rhinoclama) notabilis* Dall 1886, *Cuspidaria filocarinata* Locard 1898, *Cuspidaria testai* Knudsen 1970).
Smith 1885: 44, pl. X, fig. 5, 5a & b.
Dall (1886): 300.
Locard (1898): 177.
Nordsieck (1969): 174, fig. 98.63
Knudsen (1970): 154, pl. XVI, fig. 13, text-fig. 112.
Allen & Morgan (1981): 481, figs 46–48.
- R. teres* (Jeffreys 1882) (= *Neaera teres*: 939, pl. LXXI, fig. 2).

- Smith (1885): 50, pl. X fig. 3 & 3b
 Nordsieck (1969): 127, pl. 24, fig. 98.50.
 Salas (1995): 74, figs 119 & 120.
 Krylova (2006): 91.
- Subgenus *Tropidomya* Dall & Smith 1886 (in Dall 1886).
- T. abbreviata* (Forbes 1843) (= *Neaera abbreviata*: 75) (= *Neaera vitrea* Lovén 1846, *Cuspidaria (Tropidomya) abbreviata* Thiele 1935).
 Forbes & Hanley (1848): 201, pl. VII, fig. 7.
 Jeffreys (1869): 191, pl. XLIX, fig. 2.
 Jeffreys (1882): 934.
 Locard (1891): 259.
 Locard (1897): 186.
 Thiele (1935): 947.
 Tebble (1966): 205, fig. 110b.
 Nordsieck (1969): 173, fig. 98.30.
 Allen & Morgan (1981): 456, figs 51 & 52.
 Salas (1995): 76, figs 129 & 130.
- T. diagonalis* Allen & Morgan 1981: 487, figs 53 & 54.
- T. ledaeformis* – see *H. depressa*.
- Genus *Halonympha* Dall & Smith 1886 (in Dall 1886).
- H. atlanta* Allen & Morgan 1981.
- H. claviculata* (Dall 1881) (= *Neaera claviculata* Dall 1881: 112).
 Smith (1885): 52, pl. IX, fig. 8, 8a & b.
 Dall (1886): 301, pl. II, fig. 2 & 2a.
 Dall (1889a): 66, pl. II, fig. 2 & 2a.
 Abbott (1974): 568, fig. 6232.
 Knudsen (1982): 121.
- H. depressa* (Jeffreys 1882) (= *Neaera depressa*: 940, pl. LXXI, fig. 3) (= *Cuspidaria depressa* Locard 1897: 183; *Cuspidaria (Tropidomya) ledaeformis*: 224, pl. VII, figs 7–10; *Jeffreysomya depressa* Nordsieck 1969).
 Nordsieck (1969): 176 & p. 177.
 Allen & Morgan (1981): 490, figs 55–59.
 De Boer (1993): 226.
 Salas (1995): 76, figs 139 & 140.
 Krylova (2006): 89.
- Genus *Multitentaculata* Krylova 1995.
- M. composita* Krylova 1995: 21, figs 1A–1G & 6J.
- Subgenus *Dentaria* Krylova 1995.
- D. amoena* Krylova 1995: 28, figs 2L & 2M.
D. parvula Krylova 1995: 26, figs 2I–2K & 6F.
- D. paulula* Krylova 1995: 26, figs 4A–4D, 6D & 6E.
- Genus *Myonera* Dall & Smith 1886 (in Dall 1886).
- M. acuticarinata* (Dautzenberg & Fischer 1906) (= *Cuspidaria acuticarinata*: 95, pl. V, figs 12–15).
M. alleni Poutiers & Barnard 1995: 168 (= *M. atlantica* Allen & Morgan 1981: 470, figs 35 & 36).
M. angularis Jeffreys 1876: 498.
 Jeffreys (1881): pl. 71, fig. 9.
M. canariensis De Boer 1985: 102, figs 3–5.
M. demistriata Allen & Morgan 1981: 469, figs 33 & 34 (?= *B. hadalis* Krylova 1993: 54).
M. dispar – see *M. paucistriata*.
M. gigantea (Verrill 1884) (= *Neaera gigantea*: 223 & 277) (= *Cuspidaria semistriata* Locard 1898: 177, pl. VIII, figs 12–15; *Cuspidaria maxima* Dautzenberg & Fisher 1897: 222, pl. VII, figs 1 & 2).
 Verrill (1885): 574.
 Verrill & Bush (1898): 811, pl. LXXVI, figs 4 & 5.
 Dautzenberg (1927): 337, pl. IX, figs 1 & 2.
 Nordsieck (1969): 174, fig. c98.63 & 175, fig. 98.67.
 Abbott (1974): 565, fig. 6194.
 De Boer (1973): 226.
- M. lamellifera* Dall 1881: 113.
 Dall (1886): 304, pl. III, fig. 7.
 Dall (1889a): 68, pl. III, fig. 7.
 Abbott (1974): 567, fig. 6224.
 De Boer (1993): 226.
 Knudsen (2005): 132, figs 7 & 17.
- M. limatula* (Dall 1881) (= *Neaera limatula*: 112).
 Smith (1885): 35.
 Dall (1886): 304, pl. III, fig. 5.
 Dall (1889a): 68, pl. III, fig. 5.
 Dall (1903): pl. VC, fig. 8.
 Abbott (1974): 568, fig. 6225.
 Knudsen (1982): 121.
- M. octoporosa* – see *O. octoporosa*.
- M. paucistriata* Dall 1886: 302 (= *M. bicarinata* Smith 1896, *M. dispar* Dall, Bartsch & Rehder 1938) (not Bush 1885: 473).
 Dall (1890): 283, pl. 13, fig. 12.
 Bush (1893): 227, pl. II, fig. 18.
 Smith (1896): 374.
 Dall, Bartsch & Rehder (1938): 225, pl. 58, figs 5–7.
 Abbott (1974): 568, fig. 6227.
 Allen & Morgan (1981): 473, figs 37 & 38.
 Knudsen (2005): 132, figs 7, 18 & 19.

M. pretiosa Verrill & Bush 1898: 812, pl. 77, fig. 5.
Abbott (1974): 568.

M. undata (Verrill 1884)(=*Neaera undata*: 223)
(=*Cuspidaria lucifuga* Locard 1896: 181, pl. VII,
figs 46–51 & *Jeffreysomya lucifuga* Nordsieck
1969).

Nordsieck (1969): 178, fig. 9894.

Abbott (1974): 568.

Genus *Octoporia* Scarlato & Starobogatov 1983.

O. octopora (Allen & Morgan 1981)(=*Myonera*
octopora: 476, figs 40 & 41).

Krylova (1994): 40.

O. sinuosa Krylova 1994: 40, pl. 2, fig. A–G.

Genus *Plectodon* Carpenter 1864.

Plectodon granulatus (Dall 1881)(=*Neaera granu-*
lata: 111) (= *Leiomya (Plectodon) granulata* var.
velvetina Dall 1886: 300, pl. III, fig. 8).

Dall (1889^a): 66, pl. III, fig. 8.

Abbott (1974): 567.

Knudsen (1982): 136.

Knudsen (2005): 133, fig. 8, 20 & 21.

Genus *Protocuspidaria* Allen & Morgan 1981.

P. fragilis Krylova 1995: 31, figs 5A & B & 6K.

P. verityi Allen & Morgan 1981: 496, figs 61 & 62.

Subgenus *Bidenteria* Allen & Morgan 1981.

B. colpodes (Dautzenberg & Fischer 1897)
(=*Cuspidaria colpodes*: 223, pl. 7, figs 3 & 4)
(=*Jeffreysomya colpodes* Nordsieck 1969).

Dautzenberg (1927): 339, pl. IX, figs 3 & 4.

Nordsieck (1969): 177, fig. 98.93.

Salas (1995): 76, figs 123 & 124.

Krylova (1995): 33.

B. atlanta Allen & Morgan 1981: 499, figs 64–67.

Krylova (1995): 33.

Subgenus *Edenteria* Allen & Morgan 1981.

E. ruginosa (Jeffreys 1881)(=*Neaera ruginosa*: 942,
pl. LXXI, fig. 7).

Smith (1885) 35.

Dall (1889a): 66, pl. XCV, fig. 2.

Dautzenberg & Fischer (1897): 222.

Locard (1897): 187.

Verrill & Bush (1898): 811, pl. LXXII, fig. 4 & pl.
LXXIV, fig. 2.

Abbott (1974): 568, fig. 6229.

Morgan & Allen (1981): 495.

Krylova (1995): 29.

E. simplis Allen & Morgan 1981: 498, fig. 63.

E. speciosa Krylova 1995: 30, fig. 5C–F.