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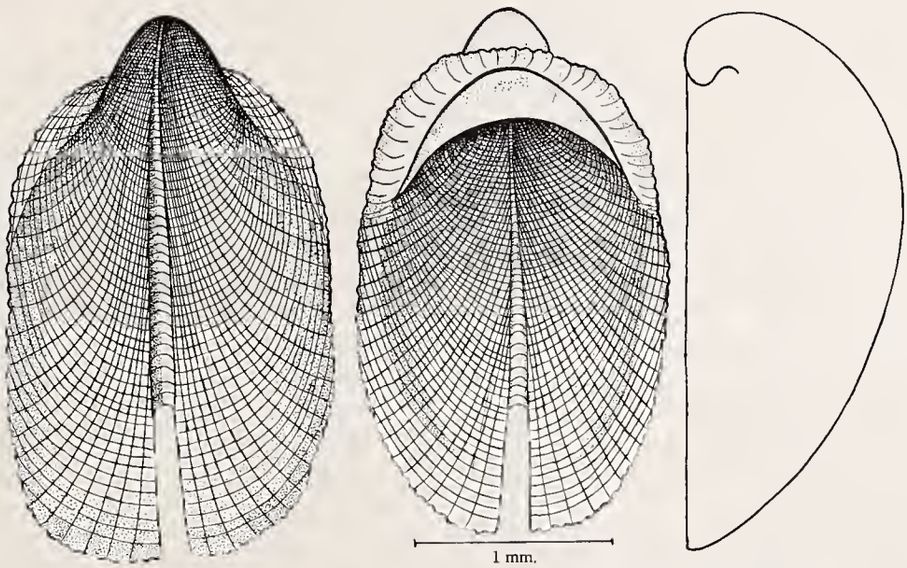
THE GENERA ZEIDORA, NESTA, EMARGINULA, RIMULA AND PUNCTURELLA IN THE WESTERN ATLANTIC

BY
ISABEL PÉREZ FARFANTE

These genera belong to the same subfamily Emarginulinae. All possess an internal muscle scar with the ends incurved backwards, forming a hook on either side of the mid-line of the anterior slope. *Emarginula* and *Puncturella*, the two genera in which the soft anatomy is known, show similar types of crop and gill filaments. The several genera considered in this report form a remarkable series almost as though they represented progressive stages in the evolution of the family. *Zeidora*, *Nesta* and *Emarginula* have both the same type of fissure in the form of a deep slit, open in front, and a long anal fasciole. *Zeidora* is probably the most primitive. *Rimula* has the fissure closed in front and placed about at the middle of the anterior slope; in consequence the anal fasciole is much shorter. In the genus *Puncturella* there has been developed an internal septum at the fissure. Successive stages in the position of the fissure are expressed by the three subgenera in this genus. In the subgenus *Cranopsis*, which is nearest in its relationship to *Rimula*, some species have the fissure at about the middle of the anterior slope. In *Puncturella* s. s. the fissure has moved to the base of the apical whorls with



Drawing by R. D. Turner

Plate 41. *Zeidora bigelowi* Pérez Farfante.
Bahía de Cochinos, Cuba. (Holotype.)

certain species still possessing a remnant of the anal fasciole. In the subgenus *Fissurisepta* the fissure is at the apex, causing the loss of the apical whorls.

Key to the genera and subgenera of Fissurellidae in the Western Atlantic

1. Shell with a conspicuous orifice or fissure at the apex, along the anterior slope, or forming a deep slit on the margin — 2
   Shell with only a notch or a very small slit on the anterior margin — *Hemitoma* *

2. Shell with the fissure forming a deep marginal slit — 3
   Shell with the fissure not forming a marginal slit — 5

3. Shell with the apex drawn backwards to the posterior end and placed immediately above the margin, at the margin, or below the margin — 4
   Shell with the apex drawn backwards but placed higher on the shell — *Emarginula*, p. 99

4. With a septum — *Zeidora*, p. 95
   Without a septum — *Nesta*, p. 97

5. Shell with an internal septum at the fissure — 6
   Shell without an internal septum at the fissure — 8

6. Apical whorls absent — *Fissurisepta*, p. 144
   Apical whorls present — 7

7. Anal fasciole long or moderately so, with a well marked groove from the fissure to the margin, showing both on the inside and on the outside — *Crauopsis*, p. 118
   Anal fasciole absent or very short, with the groove from the fissure to the margin absent or only showing on the inside — *Puncturella* s.s., p. 128

8. Shell with the fissure about at the middle of the anterior slope — *Rimula*, p. 110
   Shell with the fissure at the summit or replacing the apex — 9

9. Shell with the internal callus around the orifice the same width throughout — 10
   Shell with the internal callus around the orifice truncated and sometimes excavated posteriorly — 12

10. Margin of the shell entirely in one plane — 11
    Shell with its two extremities raised so that when placed on a plane it rests on its sides — *Clypidella*, **Johnsonia 1**, No. 10, p. 12

11. Margin very finely crenulated; sculpture consisting of radiating and practically smooth riblets — *Fissurella* s.s., **Johnsonia 1**, No. 10, p. 2
    Margin strongly crenulated: sculpture consisting of strong radiating ribs which are nodulose or which have small scales — *Cremides*, **Johnsonia 1**, No. 10, p. 3

12. Muscle impression circular. The mantle covering about one third of the outside of the shell or with narrow processes extending over the shell margin — 13
    Muscle impression not circular but with the anterior ends incurved. Shell not covered by the mantle or by mantle processes at the margin — *Diodora*, **Johnsonia 1**, No. 11

13. Internal margin of the shell thickened to form a callus — *Lucapinella*, **Johnsonia 1**, No. 10, p. 18
    Internal margin of the shell not thickened — *Lucapina*, **Johnsonia 1**, No. 10, p. 14

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* To be published in a later number of Johnsonia.

Genus **Zeidora** *A. Adams*

Zeidora A. Adams 1860, Ann. Mag. Nat. Hist. (3) **5**, p. 301; Pilsbry 1891, Man. of Conch. (1) **12**, p. 246; Thiele 1913, Conchy.-Cab. (2), **2**, pt. 4a, p. 41.

Crepiemarginula Seguenza 1880, Atti. Royal Acc. Lincei, Memorie (3) **6**, p. 273 (Genotype, *C. reticulata* Seguenza = *Zeidora seguenzae* Watson; *non Zeidora reticulata* A. Adams).

Legrandia Beddome 1883, Proc. Royal Soc. Tasmania for 1882, p. 169; *non Legrandia* Hanley 1872 (Genotype, *L. tasmanica* Beddome).

Zidora P. Fischer 1885, Manuel de Conchyliologie, p. 861.

Genotype, *Zeidora calceolina* A. Adams (monotypic, A. Adams 1860).

Shell small, convexly depressed, the apex drawn backwards and downwards over the extreme posterior end, so that the anterior slope occupies the whole length of the shell. The posterior slope is reduced to a small area around the apical whorl. The portion of the posterior slope nearest the margin generally bends outwards forming a narrow shelf upon which the apical whorl generally rests. The latter is very small and turned slightly to the right. The most striking character is the septum on the inside of the shell, extending forward from the shelf, or from above the anterior margin and surrounding the posterior part of the intestinal mass. It is considered similar to the margin of the columella in most spiral shells. A band, the anal fasciole, extends from the apex to the fissure along the middle of the anterior slope. It is formed as growth proceeds by the filling in of the posterior end of the fissure with shell material; each succeeding period of growth in the anal fasciole is marked by ineremental semilunar lines or lamellae. The fissure forms a slit on the anterior margin and extends some distance back from it and is directed toward the left.

Zeidora seems to be the most primitive genus in the family Fissurellidae. Unfortunately the anatomy of the group is unknown.

Zeidora bigelowi, new species, Plate 41, fig. 1–3

Description. Shell small, about 2.5 mm. in length, very delicate and semitransparent, glossy and depressed, the height being 40% of the length. Base oblong; the margin at the posterior end bends outwards forming a small shelf. Apical whorl turned to the right and resting on the shelf. Anal fasciole shallow, running from the apex to the fissure, with numerous, semilunar ineremental lines. Fissure rather long, about one-third the length of the anterior slope, and conspicuously turned to the left. From the borders of the anal faseiole fine ribs start and eontinue to the margin. As the shell grows, new ribs are intercalated between the older ribs. The whole shell is crossed by numerous threads which divide the intercostal spaees into squares. These threads are not perfectly concentric: some originate in the posterior portion, the rest are intercalated between them nearer the anterior slope. Margin finely denticulated. The septum is attaehed at the base of the posterior margin, being slightly arched with its anterior edge concave.

length	width	height	
2.5	1.5	1 mm.	Holotype

Types. Holotype, Museum of Comparative Zoölogy, no. 179559, from Bahía de Cochinos, *Atlantis*, station 3332, in 175 to 225 fathoms. Paratype, at the Museo Poey, University of Habana, from the same locality.

Remarks. This species is very closely related to *Z. naufraga*, from which it differs in having a narrower septum. In *Z. bigelowi* it is about 10% of the shell length, while in *Z. naufraga* the septum is about 25% of the shell length. In addition, *Z. bigelowi* has a much deeper fissure and a different shape, being broader in front and having the anterior slope more strongly convex.

Zeidora bigelowi is a very rare species, since only two specimens were collected by the *Atlantis* at the many dredging stations along the south coast of Cuba.

This species is named for Dr. Henry Bryant Bigelow, Curator of Oceanography at the Museum of Comparative Zoölogy.

Zeidora naufraga *Watson*, Plate 42

Zeidora naufraga Watson 1883, Journ. Linn. Soc. London **17**, p. 27; Watson 1886, Challenger Report **15**, p. 36, pl. 4, fig. 3a–d (northwest of Culebra Island, West Indies); Dautzenberg and Fischer 1897, Mémoires Soc. Zool. France **10**, p. 179 (Azores).

Description. "*Shell.* White, delicate, depressed, oblong, pointed behind, with a minute short apex, rounded and cleft in front, with a broad flat keel bearing the old cleft-scar and extending the whole length of the shell: the enormous mouth is closed behind by a crepidula-like partition. *Sculpture.* Longitudinals—from the apex to the cleft across the middle of the back runs a broad raised keel, flat on the top, where it is scored by the minute delicate, sharp, prominent, close-set, but not contiguous scars of the old cleft; on either side it is bordered by a sharp marginal line: from these marginal lines branch off feeble irregular diverging threadlets, between which, as they go wider apart, others arise; the intervals between them are two to three times the breadth of the threadlets. Spirals—strictly speaking there are none, but the whole surface is scored at right angles to the longitudinals with a series of threadlets, very similar in form but rather more closely-set; these radiate from the apex and indicate the old mouth-edges. *Colour* porcellaneous white, which is dead on the threadlets, but almost translucent elsewhere from the extreme thinness of the shell. *Apex*—at the posterior end of the shell there is a narrow, rounded, prominent beak, within which, a little bent to the right and projecting slightly above the margin of the mouth, is the minute apex of one whorl. *Mouth* oblong. *Margin* minutely denticulated by the ends of the ribs: cleft in front by a strong, parallel-sided, blunt-ended fissure; behind, it is peculiarly patulous, being markedly bent outwards

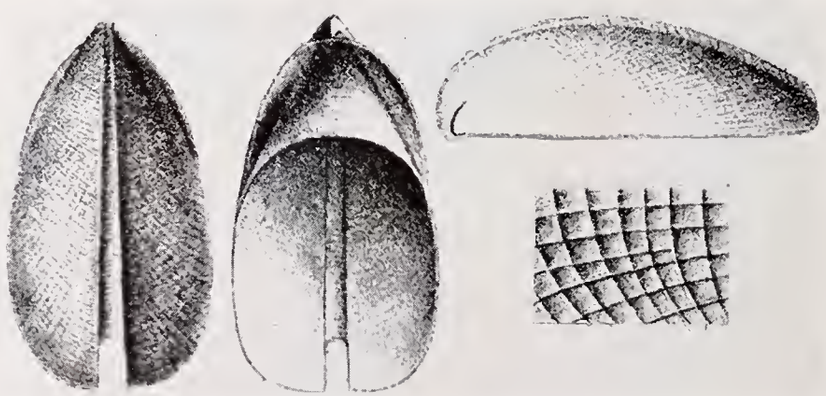


Plate 42. *Zeidora naufragra* Watson.
Off North of Culebra Island, Lesser Antilles, $4\frac{1}{2}\times$ (after Watson).

from the line of attachment of the septum, this bending being strongly shown on the outside of the shell. *Inside* glossy, smooth; a strong depression corresponding to the exterior keel extends from end to end of the shell. *Septum*—a little way within the margin and deepest at the end, is the short oblique septum, which is faintly arched, with a concave edge in front.

The present species, though somewhat chipped, is of great beauty. It differs from *Z. calceolina* A. Adams, which is rudely cancellated, and is also wider and more depressed. It is liker *Z. reticulata* A. Adams; but is larger, deeper, has the old cleft scar raised on a projecting ridge which forms a strong internal furrow, has the beak sharper and more projecting, the form is more oblong and more pinched-in at the sides; the sculpture-lines are much finer and less regular than in that species."

length	width	height	
9.5	5	4 mm.	Holotype

Types. The Holotype is in the British Museum, from N.W. of Culebra Island, West Indies, *Challenger*, station 24, N. Lat. 18°38′30″; W. Long. 65°5′30″, in 390 fathoms.

Remarks. We have not seen this species. The description above and the figures are taken from Watson. The lateral view is apparently incorrectly drawn since it shows the apical whorl curving below the posterior margin of the shell while Watson states in the text that the apical whorl projects above the margin. The interior view, which is another of the shell shown on Watson's plate shows the apical whorl resting on the posterior margin and projecting from it, but without any indication of curving below it.

Range and *Records.* Known only from the type locality, N.W. of Culebra Island, West Indies, in 390 fathoms and from the Azores, where it was collected by the *Princesse-Alice* (1896), station 90 in 874 fathoms.

Genus **Nesta** *H. Adams*

Nesta H. Adams 1870, Proc. Zool. Soc. London, pt. 1, p. 5, pl. 1, fig. 1, 1a.
Nesta (as a section of *Emarginula*), Pilsbry 1891, Manual of Conchology (1), **12**, p. 269.

Genotype, *Nesta candida* H. Adams (monotypic, H. Adams 1870).

Shell low and elongated, with the apex drawn backwards to the posterior end and placed just above the margin, at the margin, or below it. Apical whorl very small and turned slightly to the right. Generally the portion of the posterior slope nearest the margin bends outwards forming a narrow shelf. There is no septum. The anal fasciole extends from the apex to the fissure. The latter forms a slit on the anterior margin, extending some distance back from it and is directed toward the left.

Nesta was considered by Pilsbry to be a section of *Emarginula*. The depressed-convex shape of the shell, the extremely low position of the retracted apex, and the almost constant formation of a shelf, places this group nearer to *Zeidora* than to *Emarginula*. However the lack of a septum separates it from *Zeidora*.

Nesta atlantica, new species, Plate 43, fig. 1–3

Description. Shell small, about 10 mm. in length, thin and convexly depressed. Base long ovate. Apical whorl very minute, turned a little to the right and placed at the extreme posterior end, generally resting on the margin. Anterior slope occupies the whole

length of the shell, the posterior slope being very reduced; the portion nearest the margin may bend outward forming a narrow shelf. Anal fasciole shallow, smooth to the naked eye but under a lens provided with numerous, incremental semilunar lines. Fissure short and inclined slightly to the left. Sculpture consists of close-set, very fine radiating ribs; some originate at the apex, the rest are intercalated farther down as growth proceeds. There is no true concentric sculpture, only the concentric incremental lines being present. Margin smooth. Interior glossy, smooth, the anal fasciole being marked by a very shallow depression. Muscular impression narrow and rather far from the margin. It turns sharply inward at the anterior end and extends backwards on each side of the anal fasciole to the apex.

length	width	height	
9.5	4.75	2.8 mm.	off Palm Beach, Florida
8	4.5	2.5	Holotype

Types. Holotype is in the collection of T. McGinty, collected by him off Palm Beach, Florida. Paratypes from the same locality, in the Museum of Comparative Zoölogy, and from off Pelican Island, Barbados, State University of Iowa Expedition, station 456, in 80 fathoms, in the United States National Museum.

Remarks. This is the only known species of *Nesta* in the Western Atlantic and the second found in the world. Its nearest relative is *Nesta candida*[1] from the Red Sea. They differ quite sharply, *Nesta atlantica* having the apical whorl just above or resting on the margin while in *N. candida* it curves below the narrow shelf. In addition, *N. candida* is highly sculptured, possessing elevated radiating ribs and concentric cords, while in *atlantica* the radiating ribs are low and fine and there is no true concentric sculpture, only incremental lines being visible. Finally, in *candida* the anal fasciole shows very strong and widely-spaced incremental lines, while in *atlantica* these are almost inconspicuous.

Range. Palm Beach, and probably south along the eastern coast of Florida, Florida Keys and the West Indies to Barbados.

Records. See under *Types.*

Photographs by Marion Bills

Plate 43. *Nesta atlantica* Pérez Farfante.
Off Palm Beach, Florida (Holotype, 7×).

[1] This is not to be confused with *Emarginula candida* A. Adams.

Genus **Emarginula** *Lamarck*

Emarginula Lamarck 1801, Syst. Animaux sans Vert., p. 69 (refers to Conchy.-Cab. (1), **1**, pl. 12, fig. 109, 110).

Emarginulus Montfort 1810, Conchy. Syst. p. 74.

Imarginula Gray 1821, London Medical Repository **15**, p. 233 (nude name).

Genotype, *Emarginula conica* Lamarck (monotypic, Lamarck 1801).

Shell from very small to moderately large, generally uniformly white or yellowish, but a few species have colored rays or freckles. Apex not removed, recurved backwards, its position varying along the posterior half of the shell. Apical whorls from one to two, very small and turned slightly to the right. Fissure forming a slit open in front and extending some distance up the middle of the anterior slope. A band, the anal fasciole, extends from the apex to the fissure. It is formed as growth proceeds, by the filling in of the posterior end of the fissure with shell material; each succeeding period of growth in the anal fasciole is marked by either incremental lines or lamellae. It may be depressed or raised above the shell surface. Sculpture varies from coarse to very fine and consists of numerous radiating ribs crossed by concentric threads or cords. In the interior of the shell there is a callus grooved in the middle, following the anal fasciole.

Subgenus **Emarginula** *Lamarck*

Shell moderately high, the fissure the same width throughout its length. Anal fasciole shallowly depressed or in the same plane as the rest of the shell, not keeled. Muscular impression rather wide, following the margin of the shell and turning inward at the fissure in the shape of a hook. There is no septum. The mantle border does not extend over the margin. Central tooth of the radula is wider than in *Fissurella* and a large bifid lateral tooth is found. Odhner (1932, Jena Z. Naturw. **67**, p. 292–309, fig. 1–41) has made a very careful study of the anatomy of most genera of the family Fissurellidae. They show very striking anatomical differences that at the same time allowed him to establish the relationships. The following are extracts from his paper which Dr. J. Bequaert has been kind enough to translate. "In *Emarginula* the space of the mantle-border between the median and the lowermost fold is thickened, thus producing a wide zone, which is limited above and below by the corresponding folds; this mantle-border zone or mantle edging is covered with fine warts and is almost smooth at the margin. On the right tentacle, behind the eye tubercle, is found a long feeler, the sexual cirrus, and a small papilla. The shape of the gill filaments also provides a taxonomically important character. Each gill filament has the shape of a triangle drawn out to a point; the longer side of the filament bears a marginal supporting lamella and corresponds to the dorsal margin of the reversed ctenidium, while the shorter side corresponds to the ventral margin of the same. The tip between the two sides together with the supporting lamella, is noticeably lengthened and reaches beyond the ventral margin. In *Emarginula* the crop, a more or less wide pouch before the narrow hind oesophagus, is expanded posteriorly into a more spacious pouch which fills up the entire body cavity ventrally, and has inner walls bearing villi everywhere. On either side of the crop there are a right and a left oesophageal pocket which are separated from it by a median and a dorsal or ventral guide-pad. In *Emarginula* these guide-pads are surprisingly narrow, especially the median one which forms a band-like fold. This fold starts directly behind the tongue, deflects however at once and

directly to the right side, climbs onto the dorsal wall of the crop and runs on this, posteriorly, toward the narrow oesophagus. This course of the median fold indicates a high degree of torsion of the crop and this torsion influences the oesophageal pockets. The right pocket is much reduced in size; since it lies to the right side of the median fold, it is found in *Emarginula* only in the most anterior area and as a strip between the median and dorsal guide-pads. The dorsal guide-pad runs very obliquely, its hind portion lying dorsally above the left pocket. The left pocket is in proportion more strongly developed and expands at the left side of the median guide-pad into a spacious pouch which sends forth posteriorly, to the right of the narrow oesophagus, the long caecum extending to the hind extremity of the body cavity. Medially this caecum is split by an obliquely placed partition, a continuation of the ventral guide-pad. Upward also a widening of the left oesophageal pocket extends toward the right side as far as the dorsal fold."

Key to the Western Atlantic species of *Emarginula*

1. Apical whorls placed slightly in front, even with, or beyond the posterior shell margin — 2
   Apical whorls varying in position from one immediately posterior to the shell center, to one at one fifth of the shell's length from the posterior end — 3

2. Shell sculptured with 20 to 24 primary ribs; the square pits well defined — *E. phrixodes*
   Shell sculptured with more than 30 primary ribs; the square pits very small — *E. tuberculosa*

3. Radiating ribs very closely-set, about equal in size, and beaded by elongated nodules concentrically arranged but not linked to form concentric cords — *E. nordica*
   Radiating ribs rather widely-spaced or closely-set; but if closely-set they are crossed by concentric cords — 4

4. Shell with broadened radiating ribs — *E. pumila*
   Shell without broadened radiating ribs — 5

5. Anal fasciole formed by widely-spaced, raised lamellae. Radiating ribs and concentric threads rather widely-spaced, and raised so that the shell surface has a lattice-like appearance — *E. sicula*
   Anal fasciole formed by very closely-set and fine lamellae. Radiating ribs and concentric threads closely-set so that the shell surface does not have a lattice-like appearance, but a granular one — *E. crassa*

Emarginula tuberculosa *Libassi*, Plate 44, fig. 1–7

Emarginula tuberculosa Libassi 1859, Atti dell'Acca. Sci. Lett. Palermo (n.s.) **3**, p. 15, fig. 1 (fossil from Altavilla and Ficarazzi, Palermo); Monterosato 1892, Journ. de Conchy. **40**, p. 78.

Emarginula compressa Jeffreys 1883, Proc. Zool. Soc. London, pt. 4, p. 679 (off Portugal); Dall 1889, Bull. Mus. Comp. Zoöl. **18**, p. 406 (Yucatan Strait; off Havana; near Barbados); Dall 1889, Bull. United States Nat. Mus. **37**, p. 170 (off Georgia, Florida Keys, West Indies, Barbados); Pilsbry 1891, Man. of Conch. **12** (1), p. 250 (off Portugal, Georgia, Florida Strait to Barbados); Dall 1927, Proc. United States Nat. Mus. **70**, Art. 18, p. 113 (off Georgia, Portugal and the Mediterranean. Yucatan Strait to the Lesser Antilles); *non E. compressa* Cantraine 1835.

Emarginula guernei Dautzenberg and Fischer 1896, Mém. Soc. Zool. France **9**, p. 490, pl. 22, fig. 8, 9 (Azores).

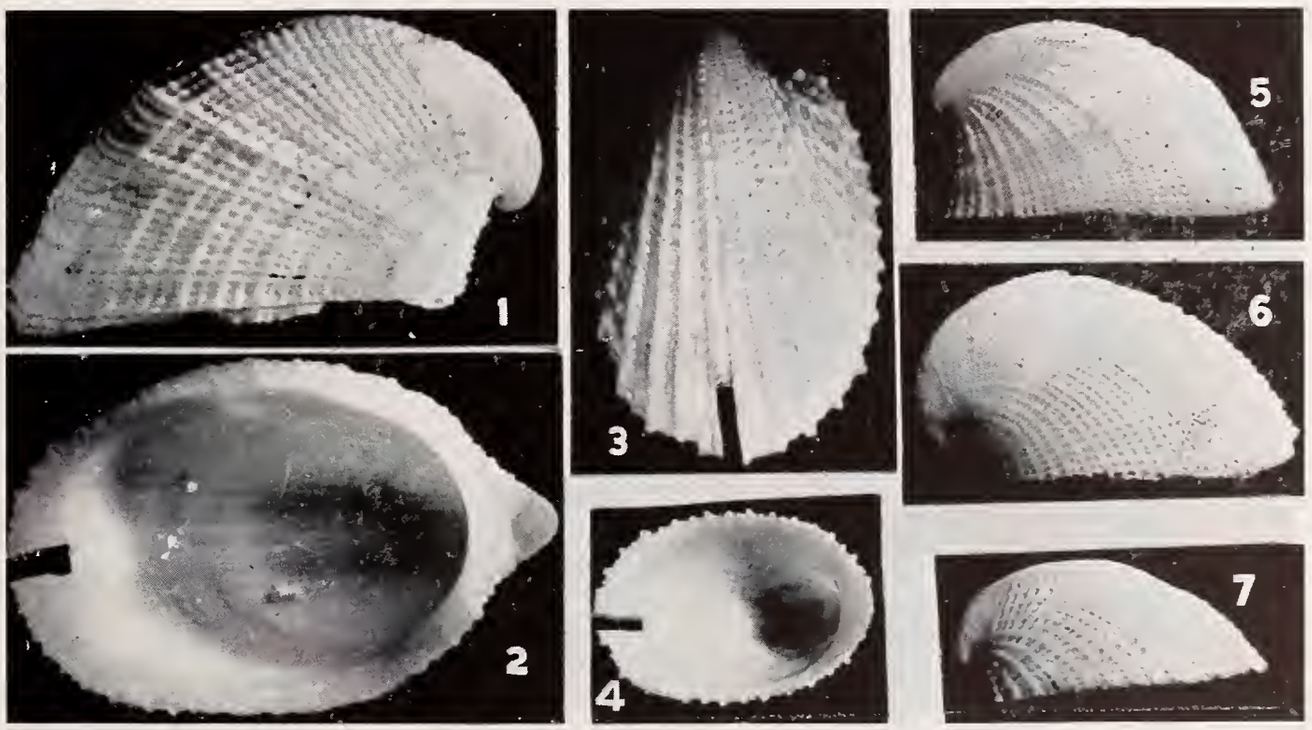
Description. This species reaches a large size, up to 18 mm. in length. The shell is highly sculptured, elevated, the height being about two thirds the length, with the anterior slope strongly convex and the posterior slope straight or concave. Apical whorls one and one half. These whorls are sometimes reduced to a small pointed hook (Plate 44, fig. 5). The position of the apical whorls varies from one high on the shell, close to but a little below the summit and immediately in front of the posterior end, to one near

the base and projecting beyond the posterior end. Anal fasciole with numerous, rather closely-set, arched lamellae which are frequently in greater numbers than the concentric cords that cross the shell. Fissure rather wide and about one-sixth the length of the anterior slope. Sculpture consists of numerous raised primary ribs radiating from the apex to the margin. Secondary ribs, which start some distance from the apex, alternate with them. Sometimes very fine riblets that originate lower down than the secondary ribs are intercalated between the primary and secondary ribs. Numerous concentric cords cross the surface of the shell forming thickened nodules where they intersect the ribs. These cords divide the spaces between the ribs into more or less square pits. Sometimes two very short chalky white lines are found in the square pits. Color opaque white or buff. Margin finely and strongly crenulated by the termination of the ribs. Interior of shell highly polished, the sculpture of the outside showing through as radiating and concentric translucent lines. The anal fasciole is marked inside by a grooved callus.

	length	width	height	
(large)	18	13	11 mm.	off Georgia
(average)	12	9	6	off Sand Key, Florida

Types. The disposition of the types is unknown to me. The type locality is given as two stations, in the Miocene of Altavilla and Ficarazzi, Palermo, Sicily.

Remarks. *Emarginula tuberculosa* is rather common throughout its range in the Western Atlantic, having been found in depths of from 33 to 450 fathoms. This species shows a variation in the thickness of the shell and in the strength of the sculpture. Specimens from some localities are much thinner and more delicate than those from other places. In the former the shell is sculptured by fine radiating and concentric threads while in heavy specimens there are raised ribs and strong cords. This variation has no



Photographs by Marion Bills (fig. 1–2); Frank White (fig. 3–7)

Plate 44. *Emarginula tuberculosa* Libassi.

Fig. 1, 2. Off Cumberland, Georgia ($3\frac{1}{2}\times$). Fig. 3, 4 and 7. Off Habana (fig. 3, $5\times$; fig. 4 and 7, $3\times$). Fig. 5. Off Cumberland, Georgia ($2\times$). Fig. 6. Yucatan Strait ($2\frac{1}{2}\times$).

geographical significance since all forms varying from thin to heavy are found in adjacent localities throughout the range of this species.

Monterosato in 1892, discussed Jeffreys' misidentification of *E. tuberculosa* Libassi as *E. compressa* Cantraine. He presents the characters that distinguish the true *compressa*, proposing for it a new genus, *Agariste*.

Range. Eastern Atlantic: off Portugal and Azores. Western Atlantic: Georgia, Florida and south through the West Indies to Brasil.

Records. Western Atlantic: Georgia: off Cumberland Id., *Albatross*, station 2415, in 440 fathoms (USNM). Florida: off Key West, *Eolis*, station 333, in 110 fathoms; off Sambo Reef, *Eolis*, station 329–331, in 118 to 135 fathoms; off Sand Key, *Eolis*, station 322, in 115 fathoms; off Western Dry Rocks, *Eolis*, station 321, in 65 fathoms; Pourtalés Plateau, in 200 fathoms. Cuba: off Bahía Honda, *Blake*, station 21, in 310 fathoms and 287 fathoms; off Morro Light, *Blake*, station 16, in 292 fathoms; off Habana, *Blake*, station 65, in 127 fathoms (all MCZ); off Sagua la Grande, *Atlantis*, station 3442, in 335 fathoms (Univ. of Habana); off Puerto Tánamo, *Atlantis*, station 3372, in 300 fathoms (MCZ); Bahía de Cochinos, *Atlantis*, station 2963-C, in 205 fathoms (Univ. of Habana); Yucatan Strait, *Blake* in 640 fathoms. Lesser Antilles: Barbados, *Blake*, station 282, in 154 fathoms and station 296, in 84 fathoms; and off Pelican Id., State University of Iowa Exp., station 413, in 33 fathoms; and off Lazaretto, State University of Iowa Exp., station 483, in 90–100 fathoms (all USNM). Brasil: off Bahía, *Hassler* (Lat. 11°49′; W. Long. 37°10′) in 450 fathoms (MCZ).

Emarginula sicula *Gray*, Plate 45, fig. 1–3

Emarginula sicula Gray 1825, Annals of Philosophy (n.s.) **9**, p. 407; Potiez and Michaud 1838, Galerie des Mollusques **1**, p. 518, pl. 36, fig. 11, 12 (Mediterranean); Monterosato 1884, Nomenclatura Generica Specifica Conchiglie Mediterranee, p. 35; Locard 1886, Prodr. Malac. Française, Moll. Mar., p. 336 (coast of Atlantic Ocean, Capbreton, Landes, France; after de Folin); Locard 1898, Exp. Scient. Travailleur et du Talisman, Moll. Test. **2**, p. 83 (Madeira Islands and West of Morocco).

Emarginula reticulata Risso 1826, Hist. Nat. L'Europe Méridionale **4**, p. 260; *non E. reticulata* Sowerby 1813.

Emarginula fissura Payraudeau 1826, Cat. Moll. de Corse, p. 92; *non Patella fissura* Linné 1758.

Emarginula cancellata Philippi 1836, Enumeratio Moll. Siciliae **1**, p. 114, pl. 7, fig. 15 a, b, c; Jeffreys 1883, Proc. Zool. Soc. London, pt. 4, p. 679 (Guernsey, Channel Islands); Bucquoy, Dautzenberg and Dollfuss 1886, Moll. Mar. du Roussillon **1**, p. 452, pl. 54, fig. 5, 6; Dall 1889, Bull. Mus. Comp. Zoöl. **18**, p. 406 (off Cuba and off Barbados).

Emarginula squamulosa Aradas 1846, Atti. Acc. Gioenia Sci. Nat. Catania, p. 183, pl. 2, fig. 4a, b (Sicilia).

Emarginula squamosa Locard 1898, Exp. Scient. Travailleur et du Talisman, Moll. Test. **2**, p. 83 (error for *squamulosa* Aradas).

Description. Shell reaching a comparatively large size, up to about 16 mm. in length, the height from one half to two thirds the length. Color oyster white or cream. Base ovate or subcircular; young specimens have almost circular bases. Anterior slope convex, posterior slope straight or slightly concave. Apex elevated, close to but a little below the summit, and at the posterior fourth of the shell. Nuclear whorls minute. Anal fasciole conspicuous, provided with elevated arched lamellae which generally stand out above the margins of the fasciole. These lamellae are less numerous and are farther apart than the concentric cords that cross the shell. Fissure narrow and long, its length being one fourth that of the anterior slope. Sculpture consists of about 26 rather strong ribs

radiating from the apex. A short distance from the apex a secondary rib appears between each two of the primary ribs; they are at first rather fine, increasing in diameter until they equal the size of the primary ribs. Finally a thread is intercalated between the primary and the secondary ribs. In some specimens the differentiation of these three types of ribs is not very clear. Numerous concentric threads cross the shell forming small nodules where they intersect the ribs. These threads divide the spaces between the ribs into small, more or less square, pits; this gives to the shell a very fine lattice-like appearance. The sculpture near the apex is very fine, becoming increasingly coarser as it approaches the margin in adult specimens. Margin crenulated by the termination of the ribs. Interior of shell glossy with the outside sculpture showing through in the form of radiating and concentric translucent lines. The primary ribs are marked by shallow grooves. On the interior, the anal fasciole is marked by a grooved callus.

	length	width	height	
(large)	17	12	8 mm.	off Sand Key, Florida
(average)	12	10	6	off Barbados, Lesser Antilles

Types. Probably in the British Museum. The type locality probably is Sicily, Italy, as indicated by the specific name.

Remarks. Comparison of specimens of *E. sicula* from the Mediterranean with those from the Western Atlantic, bring us to the same conclusion that Dall reached, that there are no differences which would make possible their separation. We adopt Gray's name *E. sicula* instead of the better known *E. cancellata* Philippi, because we agree with many European authors that Gray's description applies to Philippi's species.

E. sicula differs quite sharply from *E. tuberculosa*, the Western Atlantic species to which it appears nearest in relationship. In *E. sicula* the apex is subcentral and the apical whorls minute while in *E. tuberculosa* the apex is placed near the posterior margin and the whole upper portion of the shell is drawn out and extremely recurved. The lamellae of the anal fasciole in *E. sicula* are more prominent and more widely spaced than those of *E. tuberculosa*.

This species is found in depths of from 8 to 250 fathoms. In the Western Atlantic it has been dredged from 100 to 150 fathoms and seems to be quite rare.

Range. Eastern Atlantic: Channel Islands, probably in the Cantabric Sea, along the coast of Portugal and south to west of Morocco, and in the Mediterranean Sea. Western Atlantic: Florida Keys and south all along the West Indies.

Records. Western Atlantic: Florida: off Sand Key, in 100 fathoms (MCZ). Cuba: off Habana, *Blake*, station 65, in 127 fathoms; Bahía de Cochinos, *Eolis*, station 232, in 100 to 150 fathoms (both USNM). Lesser Antilles: off Anegada Id., Johnson-Smithsonian Exp., in 140 fathoms; off Barbados, in 100 fathoms (MCZ); off Pelican Id., State University of Iowa Exp., station 400, in 100 fathoms (USNM).

Emarginula phrixodes *Dall*, Plate 45, fig. 4–6

Emarginula phrixodes Dall 1927, Proc. United States Nat. Mus. **70**, Art. 19, p. 8 (off Sambo Reef, Florida).

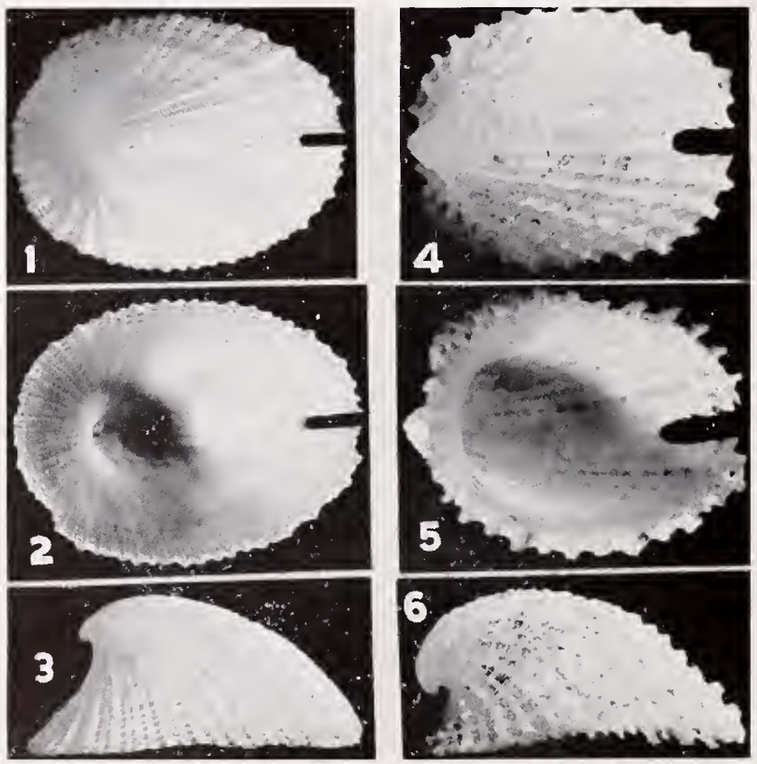
Description. Shell small, generally not exceeding 7 mm. in length, rather thin but strong, the height being 50% to 75% of the length. Base oval. Anterior slope convexly arched; posterior slope concave immediately below the apex, then extending downward

in a straight line. Apical whorls one and one half in number, very small, and placed about half way down the shell and at the posterior end or immediately in front of it. Anal fasciole with arcuate transverse lamellae, which are more numerous than the concentric cords that cross the shell; there may be as many as three lamellae to each cord. Radial sculpture consists of 20 to 24 widely-spaced ribs beginning at the apex, with a few finer intermediate ribs starting lower down the shell. Concentric sculpture consists of widely-separated cords which are knobbed at the points of intersection with the ribs and cut the interstices into deep square pits. Inside these pits there are series of minute chalky-white punctules or very small depressions, varying in number from two at the apex to four near the margin in adult specimens. In each series there are four or five of these punctules. Color translucent white. Interior of shell glossy with the sculpture of the outside showing through in the form of radiating and concentric very shallow grooves or lines. Anal fasciole is marked interiorly by a callus grooved in the middle.

	length	width	height	
(large)	6.5	5	4 mm.	New Providence, Bahamas
(average)	6	4.5	3	Holotype

Types. Holotype, at the United States National Museum, no. 333734, the type locality being off Sambo Reef, Florida, *Eolis*, station 329, in 135 fathoms. Paratype, from off Sambo Reef, Florida, *Eolis*, station 330, in 120 fathoms. Both were collected in 1916.

Remarks. This beautiful little species has been found in moderate depths of 20 to 124 fathoms throughout its very wide distribution. Specimens of *E. phrixodes* can be separated from young specimens of *E. compressa* by their much stronger sculpture, consist-



Photographs by Frank White

Plate 45. Fig. 1–3. *Emarginula sicula* Gray. Cuba (3×). Fig. 4–6. *Emarginula phrixodes* Dall. Off Sambo Reef, Florida (Holotype, 7×).

ing of more prominent and widely-spaced radial ribs and concentric threads resulting in more marked interstitial pits. The minute depressions inside the pits are much less conspicuous and more numerous in *E. compressa*. Adult specimens of *E. phrixodes* never reach the size of those of *E. compressa*.

Range. North Carolina, Florida, and probably along the gulf coast of the continent and throughout the West Indies to Barbados.

Records. North Carolina: Cape Hatteras, *Albatross*, station 2602, in 124 fathoms (USNM). Florida: off Lantana, in 90 fathoms (T. McGinty): off Hollywood, in 35–60 fathoms (L. A. Burry): off Miami, *Eolis*, station 49, in 60 fathoms: off Sambo Reef, *Eolis*, station 320, in 120 fathoms, and station 330, in 120 fathoms; off Key West, *Eolis*, station 42, in 60 fathoms and station 334, in 90 fathoms; off Sand Key, *Eolis*, station 302, in 100 fathoms (all USNM). Bahamas: Bastion Point, Mangrove Key, Andros Id. (USNM); New Providence Id. (D. Brown). Cuba: off Habana, in 6–10 fathoms (M. L. Jaume); La Chorrera (C. G. Aguayo); Matanzas Bay, in 25 fathoms (P. J. Bermúdez); *Eolis*, station 232, in 100–150 fathoms (USNM); *Atlantis*, station A2963 in 155–190 fathoms and *Atlantis*, station 3332 in 175–225 fathoms, all in Bahía de Cochinos; off Cienfuegos, *Atlantis*, station 3538, in 1075 fathoms (all Univ. of Habana). Hispaniola: Samaná Bay, Johnson Smithsonian Exp., station 56, in 165 fathoms. Lesser Antilles: Barbados, off Carlisle Bay, State University of Iowa Exp., station 466, in 12 fathoms; and off Pelican Id., station 453, in 100 fathoms. Panama: Colón (all USNM).

Emarginula crassa *Sowerby*, Plate 46

Emarginula crassa Sowerby 1812, Mineral Conchology of Great Britain **1**, p. 73, tab. 33 upper figures (the Crag near Ipswich, England); Forbes 1844, Ann. Mag. Nat. Hist. (1), **14**, p. 410, pl. 10, fig. 1 (Loch Fine, Scotland); Lovén 1846, Öfvers. K. Vet. Akad. Förhandlingar, Stockholm, Index Moll. Scandinaviae, p. 152; Forbes and Hanley 1850, British Mollusca **2**, p. 481, pl. 63, fig. 2 and plate CC, fig. 2; Jeffreys 1865, British Conchology **3**, p. 263, and 1869, *ibid.*, **5**, p. 200, pl. 59, fig. 4; G. O. Sars 1878, Mollusca Regionis Arcticae Norvegiae, p. 125; Dautzenberg and Fischer 1897, Mém. Soc. Zool. France **10**, p. 179 (La Coruña [Spain]); Jeffreys 1883, Proc. Zool. Soc. London, pt. 4, p. 678 (Donegal and Dingle Bay, Ireland, and off S.W. Norway); Hidalgo 1911, Revista de la Real Acad. Ciencias Madrid **9**, p. 976 (Santander); Thiele 1913, Conch.-Cab. (2) **2**, p. 4a, p. 47, pl. 5, fig. 19; Dautzenberg 1927, Result. Camp. Scient. Monaco, Fasc. **72**, p. 220 (La Coruña and off S. Miguel, Azores).

Emarginula magnifica Pilsbry 1891, Man. of Conch. (1), **12**, p. 251 (St. Croix, West Indies).

Description. Shell moderately heavy, large, reaching 27 mm. in length, conical, the height being only 40% to 50% of the length of the shell, although the elevated position of the apex gives to the shell the appearance of being quite high. Color opaque white or cream. Base broadly ovate. Anterior slope convex, posterior slope concave immediately below the apex, then extending downward in a straight line to the margin. Apical whorls one and one quarter in number, very small, close to but a little below the summit and at a point removed from the posterior end of the shell by about a third or a fourth of the length of the shell. Anal fasciole narrow and formed by very closely-set lamellae. Fissure small, one fifth to one sixth the length of the anterior slope. Sculpture compact, consisting of numerous, closely-set, slightly raised, radiating ribs. At the apex the primary ribs begin as fine threads, becoming stronger and broader as growth proceeds; lower down the shell, finer ribs are intercalated between them. Sometimes the primary

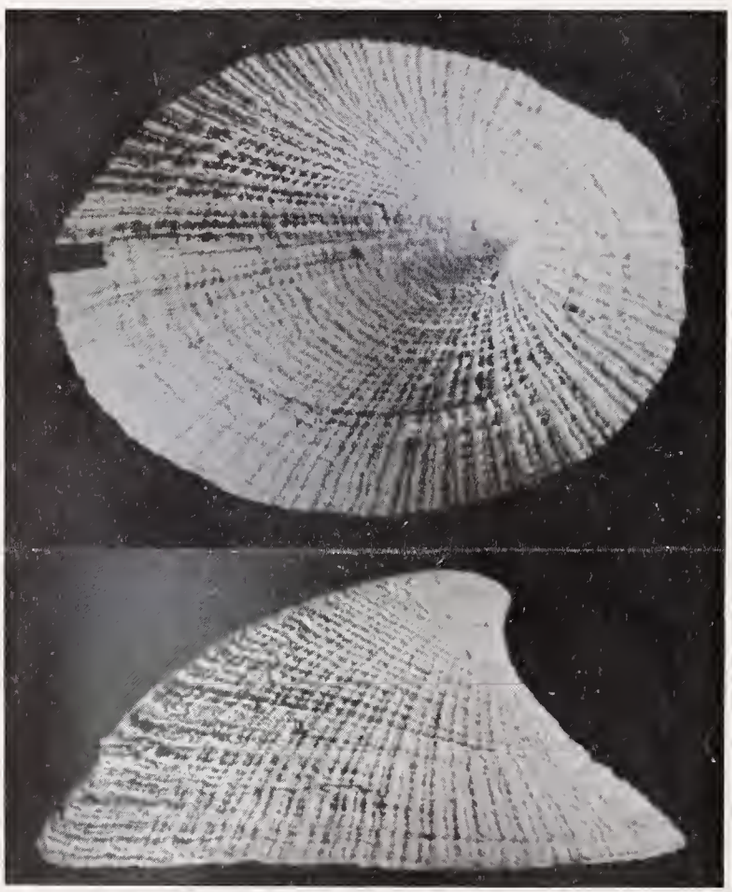
ribs divide into three or four while still maintaining their identity as rounded bundles. Numerous concentric coarse and wavy cords cross the shell giving rise to nodules where they intersect the ribs. Since ribs and cords are closely set the shell has a granular appearance. Margin finely crenulated by the terminations of the ribs. Interior of shell smooth and opalescent, the anal fasciole being marked by a thick grooved callus.

	length	width	height	
(large)	27	20	11 mm.	Thiele, 1913 (*l.c.*)
(average)	21	15	10	Saint Croix, Virgin Islands

Types. The type specimen of *Emarginula crassa* Sowerby is probably at the British Museum, and was collected by Mrs. Cobbold in the Crag near Ipswich, England. The types of *E. magnifica* are at the Academy of Natural Sciences of Philadelphia, no. 40913, from Saint Croix, Virgin Islands and were collected by R. E. Griffith.

Remarks. We have compared the types of *E. magnifica* with specimens of *E. crassa* from the British Isles and have come to the same conclusion as Thiele, that no differences can be found which would justify their separation. Some European specimens are fasciculated while others remain regularly ribbed. The latter is the case with the Saint Croix specimens.

Pilsbry's types appear to be fossil shells and not dead recent specimens. Though described as a fossil form, *E. crassa* is found alive in European waters. So far no live material has been collected anywhere in the Western Atlantic.



Photographs by Marion Bills

Plate 46. *Emarginula crassa* Sowerby. Saint Croix, Virgin Islands ($3\frac{1}{4}\times$). (Holotype of *E. magnifica* Pilsbry).

Range. Eastern Atlantic: Norway and south to Spain and the Azores.

Records. Western Atlantic: Virgin Islands: Saint Croix (fossil?) (ANSP).

Emarginula pumila *A. Adams*, Plate 47, fig. 1–5

Subemarginula pumila A. Adams 1851, Proc. Zool. Soc. London, pt. 19, p. 91 (locality unknown).

Emarginula rollandii P. Fischer 1856, Journ. de Conchy. **5**, p. 356, pl. 12, fig. 10 (Guadeloupe).

Emarginula pumila A. Adams 1863, in Sowerby's Thesaurus Conchyliorum **3**, p. 216, *Fissurellidae* pl. 12, fig. 80 (locality unknown); Sowerby 1873, in Reeve's Conchologia Iconica **19**, *Emarginula*, pl. 7, fig. 46 (Honduras).

Emarginula dentigera Heilprin 1889, Proc. Acad. Nat. Sci. Philadelphia, p. 142, pl. 8, fig. 7, 7a (Bermuda).

Emarginula pileum Heilprin 1889, Proc. Acad. Nat. Sci. Philadelphia, p. 142, pl. 8, fig. 6, 6a (Bermuda).

Emarginula tumida Dall 1889, Proc. United States Nat. Mus. **12**, p. 358 (Cape San Roque, Brasil); Simpson 1889, Proc. Davenport Acad. Nat. Sci. **5**, p. 63 (Tortugas); *non E. tumida* Sowerby 1874.

Subemarginula rollandii Pilsbry 1891, Man. Conch. (1), **12**, p. 274, pl. 29, fig. 36; pl. 64, fig. 36; pl. 41, fig. 18, 19, 26, 27 (Florida, Guadeloupe and St. Thomas, West Indies; Bermuda).

Description. Shell generally not exceeding 12 mm. in length, from thin to moderately heavy and translucent. It is extremely variable in shape, from depressed and broad to high and relatively narrow. In the first case the height is about 25% of the length, in the second it may reach as high as 70% of the length. All intermediate stages are found between these two extremes. Color a uniform white or greenish yellow; in the latter case all the primary ribs may be white or only the posterior laterals. The tip of the apical whorls may be of a dark flesh coloration. Base ovate, much narrower in front than behind. Apical whorls one to one and one half and very minute. They are turned to the right and lie against the uppermost part of the posterior slope. However, owing to variations in the shape of the shell, this may mean a location immediately posterior to the center of the shell, or, on the other hand, at the posterior fifth of the length. Anterior slope slightly concave, although sometimes it descends in a straight line or even convexly to the margin. Anal fasciole narrow and formed by thickened, raised, strongly arched lamellae. Fissure short, one seventh to one fifth the length of the anterior slope. Sculpture consisting of eleven to thirteen primary ribs. In addition to these, there occur secondary ribs and between primary and secondary a third series of still smaller and shorter ribs. The primary ribs are always stronger than the others but vary considerably in different specimens. All the ribs are broad, the primary particularly so, and vary from rather widely-spaced to closely-set; in the former case the interspaces are rather deep. Concentric and irregular cords cross the shell. These cords on specimens with open radiating ribs are more prominent when crossing the deep interspaces between the ribs, where they give rise to more or less square pits. In young individuals the ribs and cords stand out only slightly and the shell in consequence looks almost smooth. Numerous rows of punctules radiate from the apex, continuing to the margin of the shell between the ribs. Margin strongly crenulated by the terminations of the ribs, the crenulations caused by the primary ribs being particularly large. Interior of shell glossy, showing the same coloration as the outside, that is, a uniform white or greenish yellow; in the latter case the white ribs show as white rays. The anal fasciole is marked by a thick grooved callus.

	length	width	height	
(large)	12	9.5	3 mm.	La Chorrera, Habana
(average)	8.5	7.25	4.25	Cayo Jutía, Pinar del Río, Cuba

Types. The types of *E. pumila* are at the British Museum. As the locality was unknown to A. Adams, Honduras is here selected to be the type locality, based on a reference in the Conchologia Iconica by Sowerby (above) who as an aid in his diagnosis of this species had access to the original specimens of Adams.

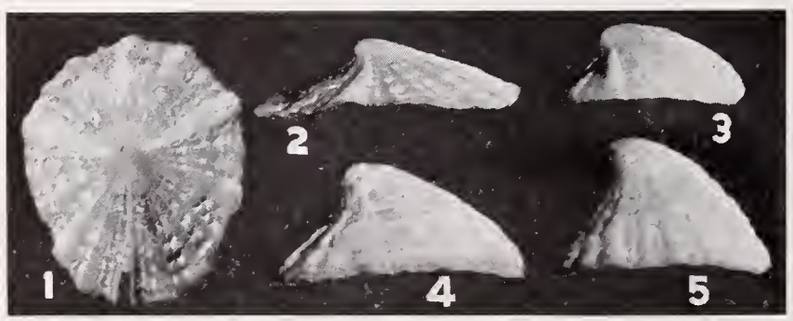
Heilprin's types are at the Academy of Natural Sciences of Philadelphia: those of *E. dentigera* under the no. 61940 and those of *E. pileum* under the no. 61971; both were collected in the Bermudas.

Remarks. This species shows such an extreme variation in shape, from almost flat to highly conical, that it is hard to realize that the two extremes belong to the same species. This variation is undoubtedly the reason for the several names applied to this species. We have been fortunate enough to have had for study a rather large series, and have been unable to consider as good species or varieties, the different forms which have received names from various authors, since all forms are found in the same or adjacent localities.

It is with some doubt that we include this and the following species in the genus *Emarginula.* We have been unable to secure the soft parts for the study of the radula. These two species show a very well differentiated anal fasciole and a fissure which forms a conspicuous marginal slit, as is typical of *Emarginula;* and do not show the longer rib in the place of the anal fasciole and the notch in place of the fissure as in the genus *Hemitoma.*

Range. South East Florida, Florida Keys and Bermudas through the West Indies to Brasil.

Records. Florida: off Miami, *Eolis*, station 62 in 20 fathoms, station 70 in 10 fathoms, station 85 in 6 fathoms, station 93 in 18–25 fathoms, station 103 in 20 fathoms and station 114 in 20 fathoms; off Bear's Cut, *Eolis*, station 113 in 18–20 fathoms; off Fowey Light, *Eolis*, station 88 in 6 fathoms; Ajax Reef, *Eolis*, station 55 in 4 fathoms; Key West, *Eolis*, station 313 in 16 fathoms (all USNM). Bermudas: (ANSP). Bahamas: off South Bight, and Bastion Point, Mangrove Cay, Andros Id. (both USNM). Cuba: Cayo Jutía, *Tomás Barrera*, station 218; Cabañas, *Tomás Barrera*, station 202 in 25 fathoms; Bahía Honda, *Tomás Barrera*, station 208 in 1–12 fathoms (all USNM); La Chorrera, Habana; Matanzas (both C. G. Aguayo); Bahía de Cochinos, *Eolis*, sta-



Photographs by Frank White

Plate 47. *Emarginula pumila* A. Adams.

Fig. 1–3. La Chorrera, Habana, Cuba. Fig. 4. Cayo Jutía, Pinar del Río, Cuba. Fig. 5. Cotype of *E. pileum* Heilprin, Bermudas (all 4×).

tion 232 in 100–150 fathoms (USNM). HISPANIOLA: Jérémie; Samaná Bay, in 16 fathoms. JAMAICA: Black River. BRASIL: off Cabo São Roque, in 20 fathoms (all USNM).

Emarginula nordica, new species, Plate 48

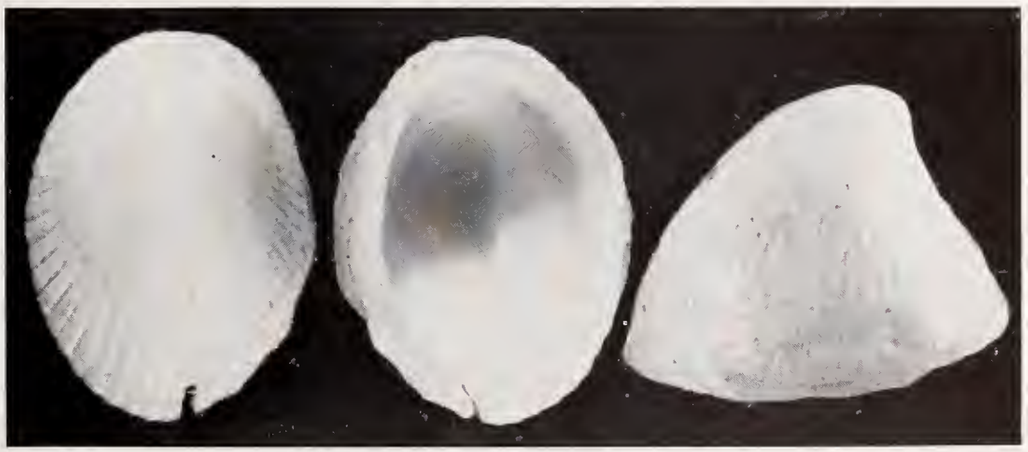
Description. Shell heavy, small, laterally compressed, elevated, the height being about 75% of the length. Base narrow ovate. Anterior slope convex, posterior slope slightly concave below the apex, then straight to the margin. Apex high and at about one fourth of the length of the shell from the posterior end. Anal fasciole very narrow, formed by numerous closely-set incremental lamellae. Fissure about one sixth the length of the anterior slope and turned to the left. Sculpture consists of very compact, almost equal radiating ribs, beaded by elongated and very closely-set nodules concentrically arranged but not linked to form concentric cords. Interior of shell polished, with the muscular impression strongly marked.

length	width	height	
5	3.5	3.75 mm.	Paratype
4.5	3.5	3.25	Holotype

Types. Holotype, Museum of Comparative Zoölogy, no. 179151, from south of Block Island, R. I., in 70 fathoms. Paratype from the same locality. Both were collected by J. Miller.

Remarks. This species is close to *E. solidula* from the Mediterranean Sea, both having the same type of sculpture. They differ quite sharply in shape, *E. nordica* being much compressed, with a narrow oval base, while *E. solidula* has the shape of a broadened cone, with a much wider base. In addition, *E. solidula* is lower, its height being half or less the length and has the apex placed farther from the posterior end.

Range and Records. See under *Types.*



Photographs by Marion Bills

Plate 48. *Emarginula nordica* Pérez Farfante.
South of Block Island, Rhode Island (Holotype, 10×).

Genus **Rimula** *Defrance*

Rimula Defrance 1827, in Dictionnaire des Sciences Naturelles **45**, p. 472.[1]

Rimularia "Defrance" Gotthelf Fischer de Waldheim 1834, Bibliographia Palaeonthologica p. 271; Bronn 1838, Lethaea Geognostica, 2nd. edition, **2**, p. 995 (Genotype by designation of Gray, 1847: *Rimula blainvillii*).

Genotype, *Rimula blainvillii* 'Defrance' de Blainville (subsequent designation, J. E. Gray 1847, Proc. Zool. Soc. London, pt. 15, p. 147).

Shell small, generally white, with the apex entire and recurved downwards toward the posterior extremity. Apical whorls small and inclined a little to the right. Anterior slope convex, posterior slope concave. Fissure narrow and elongated, about in the middle of the anterior slope, and closed at both ends. It has evolved as the result of the closing of the anterior end of the slit in *Emarginula*. The anal fasciole extends from the fissure to the apex. It is formed, as growth proceeds, by the filling in of the posterior end of the fissure with shell material, while the anterior margin of the fissure is absorbed by the animal. In this way the fissure retains its position on the anterior slope. Each succeeding period of growth in the anal fasciole is marked by either incremental lines or lamellae. Shell surface sculpture with numerous radiating ribs and concentric threads. There is no septum. Muscular impression slight with the anterior ends sharply incurved toward the posterior portion in the shape of a hook. In the interior of the shell sometimes a thin callus is found around the fissure, generally continuing on either side of the mid-line of the anterior slope to the margin. This callus is found in a little more developed form in some species of *Puncturella* and reaches its full development only around the fissure in *Diodora* and *Fissurella*.

Key to Western Atlantic species of *Rimula*

1. Apical whorls below the middle of the shell — 2
   Apical whorls above the middle of the shell — 3

2. Basal margin of shell long ovate; concentric cords about as strong as the primary ribs and forming squares with them — *R. fremulata*
   Basal margin of shell broadly elliptical or ovate; concentric cords finer and much closer together than the radiating ribs — *R. pycnonema*

3. Shell with small, inconspicuous, apical whorls; sculpture consisting of 36 to 40, rather fine, radiating primary ribs — *R. aequisculpta*
   Shell with large and prominent apical whorls; sculpture consisting of about 25 very strong radiating primary ribs — *R. dorriae*

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[1] Defrance in 1824 (Tableau des Corps Organisés Fossiles, p. 111) uses only the vernacular name "Rimulaire" with no description or figures. De Blainville in 1824 (Dictionnaire des Sciences Naturelle **32**, p. 291) and 1825, (Manuel de Malacologie, p. 501, pl. 48 *bis*, fig. 1, 1a, 1b) also uses the vernacular names of "Rimule" (1824) and "Rimulaire" (1825) and refers *Emarginula blainvillii* "Defrance" to this group. This was a manuscript name of Defrance which de Blainville first published in Dict. Sci. Nat. with the definition of the genus "Rimule" and later in his Manual with reference to a figure. As such, this species must be credited to de Blainville and not to Defrance.

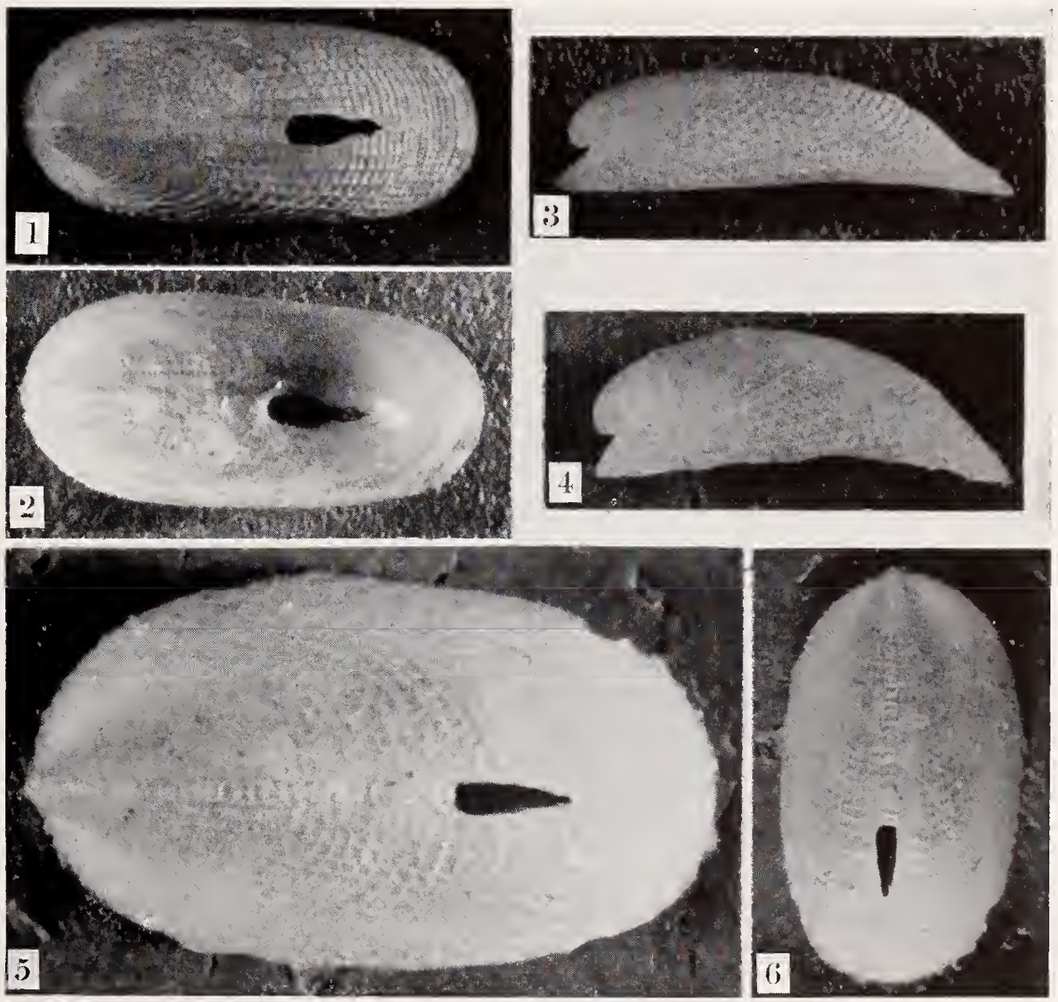
Thiele in 1912 (Conchy.-Cab. (2) **2**, pt. 4a, p. 137) cites *Rimulus* d'Orbigny 1841, in de la Sagra, Histoire Physique, Politique et Naturelle de Cuba, Moll. **1**, p. 199, in the synonymy of *Rimula* Defrance; but this is erroneous as d'Orbigny's genus belongs in the Pleurotomaridae. Moreover, d'Orbigny changed his name *Rimulus* to *Ditremaria*.

Rimula frenulata *Dall*, Plate 49, fig. 1–6

Emarginula (*Rimula*) *frenulata* Dall 1889, Bull. Mus. Comp. Zoöl. **18**, p. 406, pl. 28, fig. 4 (West Florida and the Keys); Pilsbry 1943, Nautilus **57**, pp. 38, 40, pl. 7, fig. 1 (Bonefish Key, Florida).

Rimula longa Pilsbry 1943, Nautilus **57**, p. 38, pl. 7, fig. 2 (off Destin, Florida).

Description. Shell thin, very delicate, small, generally not exceeding 7 mm. in length, the height and width being very variable. The height is from 20% to about 50% of the length; the width is from 33% to 60% of the length. Base long-ovate. Anterior slope convex, occupying most of the length; posterior slope very short, straight or slightly concave. Apical whorls small, one and one quarter, laterally compressed, located low on the shell near the posterior end or projecting a little beyond it. Anal fasciole with rather numerous incremental, semilunar threads. It is limited by two sharp ridges. Fissure small, placed on the anterior half of the front slope of the shell, rounded behind and narrowing in front to a point, with irregular contour. Sculpture consists of fine radiating ribs between each two of which there is a riblet. The whole shell is crossed by concentric cords which divide the intercostal interval into squares. The cords are not perfectly concentric. Since the posterior slope is shorter than the anterior and the sculpture is regular throughout, there are more cords on the latter than on the former. The additional cords



Photographs by Marion Bills

Plate 49. *Rimula frenulata* Dall.

Fig. 1–3. Off Destin, Florida (Holotype of *Rimula longa* Pilsbry, 8×). Fig. 4–6. Tortugas, Florida (fig. 4 and 6, 8×; fig. 5, 12×).

originate as a result of the bifurcation of a cord coming from the posterior slope, or from the intercalation of a new one. Color white, cream, or rust, generally a deeper shade at the apex and fading toward the margin which is finely crenulated. Interior of the shell glossy, the outside color and sculpture showing through; the anal fasciole is marked by two faint ridges extending from the fissure to the apex.

	length	width	height	
(large)	6.5	3	1.8 mm.	off Destin, Florida
(average)	5	2.5	1.75	Barbados

Types. Dall's original type-specimen of this species apparently has been lost, and, therefore, we have selected a neoholotype (USNM no. 61110) collected by Gregor in the Tortugas. The measurements of the neoholotype are exactly the same as those given by Dall for the lost holotype. The type of *R. longa* Pilsbry is at the Academy of Natural Sciences of Philadelphia, no. 178632, from off Destin, Florida, collected by T. McGinty. Dall's general locality of "West Florida and the Keys" is here restricted to Tortugas, Florida.

Remarks. Rimula frenulata is the most abundant species of *Rimula* in the Western Atlantic. This very delicate species is found in diverse situations: under rocks, on the sea-shore, and at depths up to 150 fathoms.

Rimula longa Pilsbry is but a variation of *R. frenulata.* Pilsbry's statement that *longa* is "higher and wider" than *frenulata* is not borne out by the series of measurements taken by us. The ratios of height to length and height to width vary considerably in this species, a circumstance probably brought about by local ecologic conditions. The index of height to length, based on material from several localities on the Florida coast is 2.20 to 4.95. The height-length index of the type specimen of *R. longa* is 3.61, almost intermediate between the two extremes of the several measurements taken of specimens of *R. frenulata.*

Range. North Carolina, south around eastern and western Florida including the Keys, and along the arc of the Greater and Lesser Antilles to Barbados.

Records. North Carolina: off Cape Hatteras, *Albatross*, station 2596 in 49 fathoms; off Cape Lookout, *Albatross*, station 2612 in 52 fathoms. Florida: Turtle Harbor (near Port Orange) in 5 fathoms (USNM); off Palm Beach in 50 fathoms (T. McGinty); off Hollywood in 35–60 fathoms (L. A. Burry); off Miami, *Eolis*, station 103 in 20 fathoms, station 68 in 45 fathoms, station 95 in 90 fathoms; off Bear's Cut, *Eolis*, station 122 in 30 fathoms; off Fowey Light, *Eolis*, station 8 in 25 fathoms, station 142 in 40 fathoms; inside Ajax Reef, *Eolis*, station 55 in 4 fathoms; off Sand Key, *Eolis*, station 57 in 40 fathoms; Boca Grande; Tortugas, *Eolis*, station 32 in 16 fathoms; off Anclote Light, near Sponge Harbor, *Fish Hawk*, station 7106 in 12.5 fathoms (all USNM); off Destin in 13 fathoms (ANSP). Cuba: Cabañas, *Tomás Barrera*, station 203 in 3–12 fathoms (USNM); La Chorrera, Habana; Bacuranao Beach (both MCZ); Bahía de Cochinos, *Eolis*, station 232 in 150 fathoms (USNM); Bahía de Cochinos, *Atlantis*, station 3332 in 175–225 fathoms (MCZ). Barbados: The following are from the State University of Iowa Expedition: Carlisle Bay, station 490 in 5 fathoms, station 509 in 80 fathoms; off Lazaretto, station 503 in 80–90 fathoms, station 483 in 90–100 fathoms; off Pelican Id., station 506 in 25–72 fathoms. Antigua: off English Harbor, station 496 in 110 fathoms (all USNM).

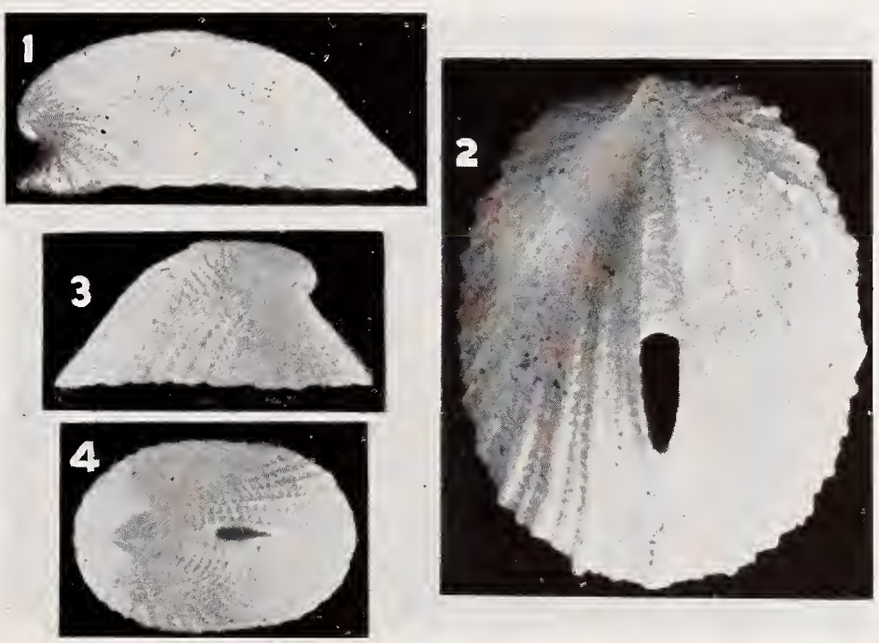
Rimula pycnonema *Pilsbry*, Plate 50, fig. 1, 2

Rimula pycnonema Pilsbry 1943, Nautilus **57**, p. 38, 39, pl. 7, fig. 3 (off Palm Beach, Florida).

Description. Shell very small, from 3 to 4 mm. in length and relatively wide, the width being from 68% to 85% that of the length. Basal margin broadly elliptical, sometimes almost circular. Anterior slope long and convex, posterior slope short and concave. Apical whorls one and a quarter, smooth, placed at the posterior end just below the middle of the shell; they are turned a little toward the right side. The anal fasciole extends from the fissure to the apex, having very numerous, closely set, semilunar, incremental lines along its whole length. Fissure small, with the rounded and wider posterior end placed at the middle of the front slope, the anterior end acute and continuous with a double primary rib. Surface sculptured with about 34 narrow radiating ribs, extending from the apex to the margin, between each two of which there is generally a fine riblet. The whole of the shell is crossed by numerous, irregularly disposed, concentric threads which are arched from rib to rib giving a peculiar spider-web appearance. Color white. Margin finely crenulated. Interior of shell polished, the radiating ribs showing through in the form of fine and very shallow translucent grooves, the concentric threads as concentric lines. The anal fasciole is marked by a very shallow groove.

	length	width	height	
(large)	4.25	3	1.5 mm.	off Miami, Florida
(average)	3.7	2.5	1.5	off Palm Beach, Florida

Types. Holotype at the Academy of Natural Sciences of Philadelphia, no. 178633, from off Palm Beach, Florida, in about 33 to 50 fathoms. Thomas L. McGinty collector. Paratype in the collection of T. L. McGinty.



Photographs by Frank White (fig. 1–2); Marion Bills (fig. 3–4)

Plate 50. Fig. 1–2. *Rimula pycnonema* Pilsbry. Off Hollywood, Florida (fig. 1, 14×, fig. 2, 18×). Fig. 3–4. *Rimula aequisculpta* Dall. Off Ajax Reef, Florida (Holotype, 8×).

Remarks. *Rimula pycnonema* Pils. appears to be nearest in relationship to *R. aequisculpta* Dall. In *aequisculpta* the radiating ribs are more compact and the concentric threads straight, while in *pycnonema* the radiating ribs are more widely spaced and the concentric threads are arched from rib to rib. The apical whorls of *aequisculpta* are very small and are placed at the posterior fourth of the shell while in *pycnonema* the apical whorls are quite prominent and are located at the extreme posterior end of the shell.

Range. South Florida and through the West Indies to Barbados.

Records. Florida: off Palm Beach, in 33–50 fathoms (ANSP and J. S. Schwengel); off Hollywood, in 35–60 fathoms (L. A. Burry); off Miami, *Eolis*, stations 48, 49, 93, 118 and 141, in 18–60 fathoms; off Bear's Cut, Burry-Foster Exp., station 112, in 25 fathoms; off Fowey Light, *Eolis*, station 8, in 25 fathoms and station 142, in 40 fathoms; off Turtle Harbor, *Eolis*, station 61, in 40 fathoms; off Conch Reef, *Eolis*, station 7, in 35 fathoms. Cuba: Bacuranao (M. L. Jaume); off Matanzas, *Atlantis*, station 2999, in 145–230 fathoms (University of Habana). Barbados: off Pelican Id., State University of Iowa Exp., station 413, in 33 fathoms (USNM).

Rimula aequisculpta *Dall*, Plate 50, fig. 3, 4

Rimula aequisculpta Dall 1927, Proc. United States Nat. Mus. **70**, Art. 19, p. 9 (off Ajax Reef, Florida).

Description. Shell small, from 4–7 mm. in length, high, delicately sculptured. Base oval, the width only a little more than half the length. Anterior slope convex, comparatively short, extending only a little beyond the mid-portion of the shell. Posterior slope straight. Apical whorl very small, smooth, placed high on the shell just below the summit and at a distance from the posterior end of about one fourth the length of the shell. Anal fasciole short, having closely-set incremental semilunar threads. Fissure small, rounded behind, narrowing to a point in front, and placed about midway on the anterior slope. Sculpture consists of from 36 to about 40 radiating ribs, between each two of which there is an intercalated thread. Numerous concentric, closely-set threads cross the shell. Color white. Margin very finely crenulated. Interior of the shell glossy, the radiating ribs and the concentric threads showing through as translucent lines, the spaces between remaining opaque. The anal fasciole is hardly perceptible as a very shallow groove.

	length	width	height	
(large)	6.75	4.5	3 mm.	Bahía Honda, Cuba
(average)	4.5	3.25	2.25	off Pelican Island, Lesser Antilles

Types. Holotype at the United States National Museum, no. 333736, from off Ajax Reef, Florida. Collected by the *Eolis*, station 368, in 80–100 fathoms.

Remarks. See under *Rimula pycnonema* Pilsbry and *R. dorriae* Pérez Farfante.

Range. South Florida and through the West Indies to Barbados.

Records. Florida: off Miami, *Eolis*, station 312, in 25 fathoms; off Fowey Light, *Eolis*, station 128, in 60 fathoms (both USNM); off Lake Worth in 50 fathoms (T. McGinty). Cuba: Cabañas, *Tomás Barrera*, station 203, in 3–12 fathoms and station

202, in 25 fathoms; Bahía Honda, *Tomás Barrera*, station 208, in 1–12 fathoms and station 202, in 25 fathoms (all USNM); Habana; Gibara (both C. G. Aguayo). Barbados: off Pelican Id., State University of Iowa Exp., station 438, in 90–100 fathoms and station 495, in 80 fathoms; off Lazaretto, State University of Iowa Exp., station 483, in 90–100 fathoms and station 500, in 75–80 fathoms (all USNM).

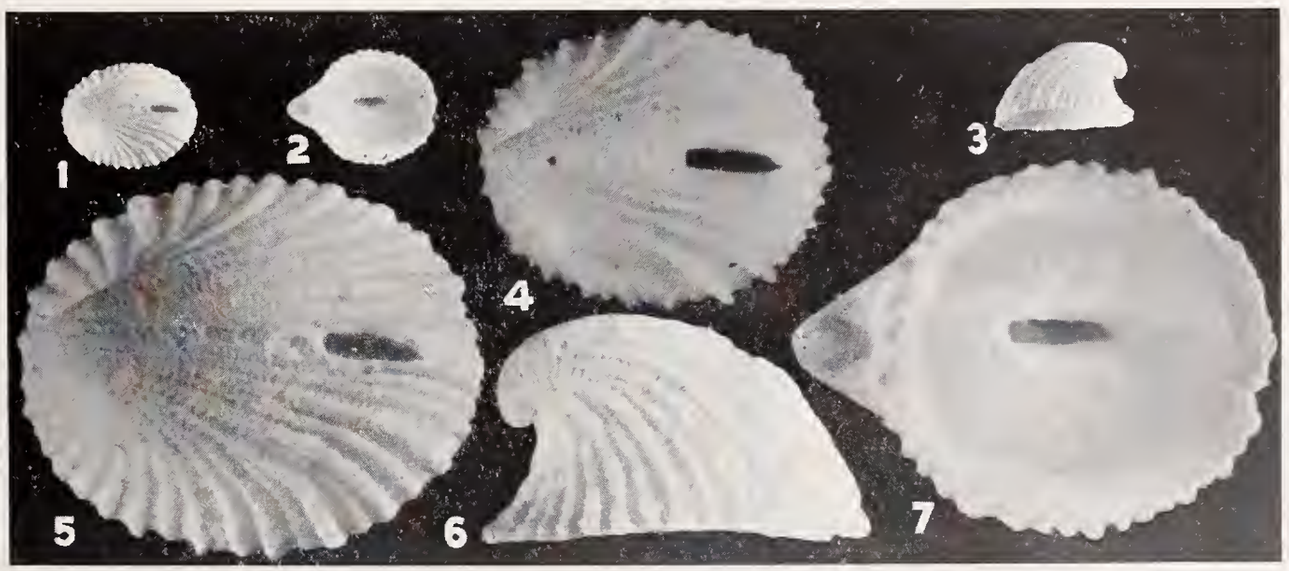
Rimula dorriae, new species, Plate 51, fig. 1–7

Description. Shell small, about 7 mm. in length, high, the height being about two thirds of the length. Base broadly ovate. Anterior slope convex, posterior slope concave. Apical whorls one and one half, prominent, placed high on the shell and just in front of the posterior end. Anal fasciole and fissure with the borders ridged. The fasciole with widely-spaced incremental lamellae. The fissure is rounded behind and tapers to a sharp point in front. Sculpture consists of about 25 radiating, very strong, ribs between each two of which there is a finer one. The shell is crossed by concentric threads which form elongated nodules where they intersect the ribs. Color white. Margin finely crenulated. In the interior of the shell the anal fasciole is rather heavily thickened.

	length	width	height	
(large)	6.25	5	4 mm.	Holotype
(average)	5.50	4.75	3.25	off Western Dry Rocks, Florida Keys

Types. Holotype, United States National Museum no. 454388, from off Western Dry Rocks, Florida, *Eolis*, station 319, in 90 fathoms. Paratypes, from off Western Dry Rocks, *Eolis*, station 320, in 80 fathoms, at the United States National Museum and at the Museum of Comparative Zoölogy, and from off Sambo Reef, Florida, *Eolis*, station 331, in 118 fathoms, at the USNM.

Remarks. This species, while quite different from any other in the Western Atlantic, appears to be nearer *R. acquisculpta* than to the rest of the species. It differs from *acquisculpta* in being higher, heavier, with coarser sculpture. In addition, its apex is much



Photographs by Marion Bills

Plate 51. *Rimula dorriae* Pérez Farfante.

Fig. 1–3 and 5–7. Off Sambo Reef, Florida (fig. 1–3, 2½×; fig. 5 and 7, 7½×; fig. 6, 7×).
Fig. 4. Off Western Dry Rocks, Florida (Holotype, 6×).

larger and more prominent, the anal fasciole is more conspicuous and its growth increase is shown by lamellae rather than by threads, such as occur in *R. acquisculpta*.

Range and Records. See under *Types*.

Named for Dorothea Slater, assistant in the Department of Mollusks at the Museum of Comparative Zoölogy.

Genus **Puncturella** *Lowe*

Puncturella Lowe 1827, Zool. Journ. **3**, p. 77, 78.

Cemoria "Leach" Lowe 1827, Zool. Journ. **3**, p. 77; Leach 1852, Synopsis Moll. Great Britain, p. 213; *non* Risso 1826.

Sipho Brown 1827, in part, Illust. Conch. Great Britain and Ireland, Index, p. 3, pl. 36, fig. 14–16; *non Sipho* Fabricius 1823; *non* "Klein" Mörch 1852.

Sypho Brown 1827, in part, Illust. Conch. Great Britain and Ireland, pl. 36, fig. 14–16 [this name appears in the explanation of the plates].

Rimula "Defrance" Couthouy 1838, Boston Journ. Nat. Hist. **2**, p. 87; Lovén 1846, Öfvers. Vet. Akad. Förhandlingar, Stockholm, Index Moll. Scandinaviae, p. 153; *non Rimula* Defrance 1827.

Diodora Gray 1840, Synopsis of the Contents of the British Museum, p. 151 [name only]; *non Diodora* Gray 1821.

Cremoria Gray 1842, Synopsis Content British Museum, ed. 44, p. 63; 90 [I have not seen this paper].

Diadora "Gray 1821 de Blainville" Gray 1847, Proc. Zool. Soc. London, pt. 15, p. 147 [first reference, 155]; *non Diodora* Gray 1821.

Siphon "Brown" Gray 1847, Proc. Zool. Soc. London, pt. 15, p. 147.

Genotype, *Patella noachina* Linné (monotypic, Lowe 1827).

Much confusion has been created through Gray's use of the name *Diodora*. In 1821 he published his genus *Diodora*, mentioning *Patella apertura* Montagu in connection with it. Although many authors, who presumably had not seen Montagu's specimen, but his poor drawing only, have considered this species to be identical with *Patella noachina* Linné, other authors who did see this specimen, state that this was a young *Patella graeca* Linné. Accepting this latter view, we must include under Gray's *Diodora* the group of species which have the generic characters of *graeca*. This is what we have done in *Johnsonia* **1**, no. 11.

In 1840, however, Gray again published the name *Diodora* without any description or reference, allowing it to be inferred that he was referring to his 1821 *Diodora;* but in 1847 he brought forward his *Diodora* 1840 in association with *P. noachina*. At the same time he erroneously ascribes to de Blainville 1825 (Manuel de Malacologie, p. 501) a reference to his (Gray's) 1821 "*Diadora.*" De Blainville, however, did not spell the name "*Diadora*" but did refer to Gray's *Diodora* with the statement that this was based on *P. apertura* Montagu.

Risso in 1826 (Hist. Nat. L'Europe Méridionale, p. 258) used the name *Cemoria* for a genus he included in the family Fissurellidae and in a foot note indicated that this was a manuscript name of Leach. Risso's description however, does not apply at all to the genus *Cemoria* Leach (=*Puncturella* Lowe) but to *Patella equestris* Linné, his genotype (monotypic), which does not belong in the Fissurellidae.

Shell from a few millimeters to about 60 mm. in length; conical in form with top straight or recurved after the fashion of a Phrygian cap. Base very variable in shape: it may be narrow or broadly elliptical, narrow oval or more often broadly oval. Apex behind the middle of the shell center; it may be entire or absorbed. Apical whorls, when present, turned to the right and backwards, their position varying from one high on the shell and immediately posterior to the shell center, to one nearer the margin and beyond the posterior end. Fissure from lanceolate to circular. It varies in position along the anterior slope, from one near the middle of the slope to one at the summit of the shell. The most striking character is the interior septum which extends more or less obliquely downwards and forwards from the posterior end of the fissure: sometimes almost perpendicularly, when it divides the interior of the shell into two almost equal parts; at other times more obliquely, near the anterior slope, when it gives rise to a funnel-shaped formation. The septum in *Puncturella* is not related in anyway to the one in *Zeidora*. Anal fasciole present or absent: if the former is the case, it is rather deep and may be long or very short. It is formed by a series of erect, semilunar lamellae, which are the result of successive periods of growth. Sculpture very variable: it may be granular or may consist of radiating ribs which generally are crossed by concentric cords. If granular, the granules are arranged in one of the following three patterns: in rows radiating from the top of the shell to the margin; in diagonal and parallel lines; or, finally, in chevron formation. The radiating ribs also may be smooth or beaded: when concentric cords are present, they give rise to nodules where they intersect the ribs. Muscular impression with the ends turned backwards in the shape of a hook. The mantle protrudes through the fissure, forming a short tubular process.

In all genera of Fissurellidae, according to Odhner (*l.c.*, p. 99), "the border of the mantle forms folds of which the outermost (here better called the uppermost) lies close to the margin of the shell and remains small and thin. Then follow the median fold and the innermost fold (here better called the lowermost), both of which may become more complicated by the production of papillae. The flat space between the median and the innermost fold may become very large. The simplest condition of the mantle-border occurs in *Puncturella*, in which the border is divided as described above, but is as yet simple: the median and lower folds lie close together and are only slightly papillose. Since the folds mentioned above run around the shell, it follows that they occur also in the slit. In *Puncturella* all three may be traced distinctly along the margin of the slit. At the fissure the folds occur in reversed order, the uppermost fold forming a peripheral band; the median fold is folded back over the margins of the apical hole and produces here the papillae placed before and behind the fissure; the lowermost fold closes up siphon-like and protrudes through the fissure, but its margins remain free.

"In many genera of Fissurellidae the right tentacle bears behind the eye tubercle a long feeler, which has previously been called the penis in *Puncturella*. This structure is evidently connected with the sexual life since it is found only on the right side of the body, but cannot, however, be regarded as a penis in the strict sense, as it is not hollow and occurs moreover in all individuals, even the females. I call it therefore the sexual cirrus.

"In members of the Fissurellidae the lips surrounding the buccal opening bear erect and brush-like bristles. A circular brush of cuticular bristles is present, though weakly developed in *Puncturella*." In this genus the radula is not essentially different from that of *Emarginula:* the central or rachidian tooth is longer than wide, narrowing anteriorly,

and the outermost lateral tooth is bifid. The crop in *Puncturella* is like that of *Emarginula*, p. 99.

Subgenus **Cranopsis** *A. Adams*

Cranopsis A. Adams 1860, Ann. Mag. Nat. Hist. (3) **5,** p. 302.
Rimulanax Iredale 1924, Proc. Linn. Soc. New South Wales **49,** p. 218.

Subgenotype, *Cranopsis pelex* A. Adams (monotypic, A. Adams 1860).

Shell with the anal fasciole always present, rather deep, long or moderately so, depending on the position of the fissure. This is generally placed near the middle of the anterior slope but may move upwards to a position somewhat near the base of the apical whorls, which are always present. The fissure is rounded behind and narrowing in front. Internal septum convexly arched, generally narrow. From the anterior or lower end of the fissure, a fine groove extends to the anterior margin of the shell, visible on the inside as well as on the outside. In young shells the fissure is a slit open in front; this gives an Emarginula-like form. Later the margins of the slit partially unite, the union being marked by the groove described above.

Key to the species of *Cranopsis* in the Western Atlantic

1. Shell sculptured with radiating ribs and concentric cords — 2
   Shell sculptured with radiating ribs, no concentric cords present — 5

2. Shell with apical whorls placed high on the shell, immediately below the summit, and behind the center — 3
   Shell with the apical whorls placed half way between the summit and the base, and near the posterior end — *P. (C.) antillana*

3. Shell with the fissure at about the middle of the anterior slope — *P. (C.) asturiana*
   Shell with the fissure higher on the anterior slope, near the base of the apical whorls — 4

4. Shell reticulated, strongly sculptured with raised radiating ribs and concentric cords — *P. (C.) erecta*
   Shell not reticulated, finely sculptured with thin radiating riblets and concentric threads — *P. (C.) agger*

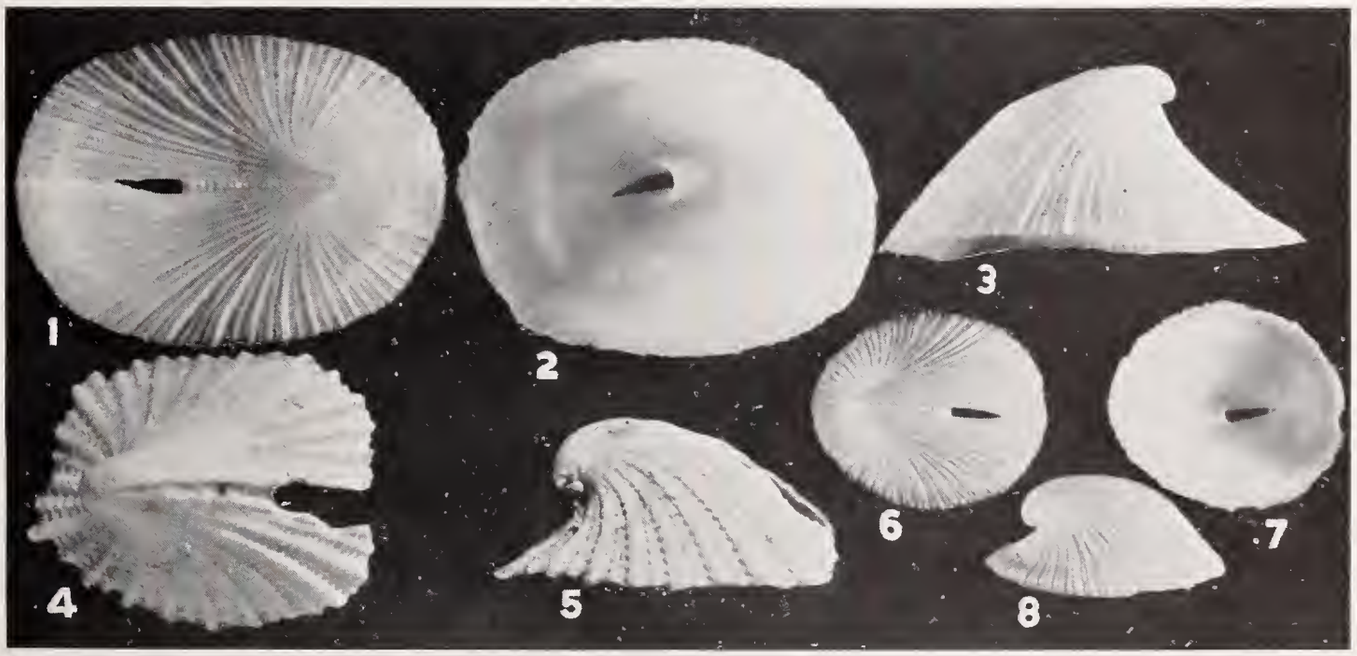
5. Shell with radiating ribs showing elongated thickenings along their length — *P. (C.) billsae*
   Shell with granulose radiating ribs — 6

6. Upper end of the fissure at about the middle of the anterior slope; radiating ribs fine and widely spaced — *P. (C.) larva*
   Upper end of the fissure at the summit; radiating ribs rather strong and closely-set — *P. (C.) granulata*

Puncturella (Cranopsis) asturiana *P. Fischer*, Plate 52, fig. 1–5

Rimula asturiana Jeffreys 1880, Ann. Mag. Nat. Hist. (5) **6,** p. 317 [*nomen nudum*].
Rimula asturiana P. Fischer 1882, Journ. de Conchy. **30,** p. 51 (Gulf of Gascony).
Puncturella (*Cranopsis*) *asturiana* Fischer, Watson 1883, Journ. Linn. Soc. **17,** p. 29; Watson 1886, Challenger Report **15,** p. 45, pl. 4, fig. 4 (off Saint Thomas, north of Culebra Island, West Indies); Dall 1889 [in part], Bull. Mus. Comp. Zoöl. **18,** p. 404 (off Cape Florida); Dall 1889, Bull. United States Nat. Mus. **37,** p. 170 (Cape Hatteras, Georgia, Florida Keys, West Indies to Saint Bartholomew); Dall 1890, Proc. United States Nat. Mus. **12,** p. 358 (off Fernandina, Florida; off St. Bartholomew, West Indies).
Puncturella (*Cranopsis*) *craticia* Watson 1883, Journ. Linn. Soc. **17,** p. 29 (off Saint Thomas, north of Culebra Island, West Indies).
Puncturella asturiana P. Fischer, Locard 1898, Exp. Scient. Travailleur et du Talisman, Moll. Test. **2,** p. 77 (north of Spain, west of Cape Finesterre, west of Portugal, southwest of Spain).
Puncturella asturiana P. Fischer *var. alta* Locard 1898, Exp. Scient. Travailleur et du Talisman, Moll. Test. **2,** p. 78.

Description. Shell highly sculptured, reaching a rather large size, about 21 mm. in length, and medium in height, the latter being about one half of the length. Color a pure or yellowish white. Base rather broadly elliptical or ovate. Anterior slope convex, posterior slope concave. Apical whorls prominent, from one and three quarters to two and one quarter, increasing rapidly in diameter, with the tip glossy, the rest opaque. They lie below but close to the summit on the right side and immediately behind the center of the shell. The anal fasciole starts near the base of the apical whorls: it is deep, bordered by sharp edges and formed by rather widely-spaced incremental lamellae, which are much less numerous than the concentric cords that cross the shell. Fissure at the middle of the anterior slope, rounded behind and narrowing in front to a point. In young individuals the fissure is a slit, open in front (Plate 52, fig. 4). When they approach maturity both sides of the fissure unite leaving a fine groove between them (Plate 52, fig. 1, 2). Sculpture consists of from 24 to 28 rather strong radiating ribs, starting at the base of the apical whorls. Lower down a secondary rib appears between each two of the primary ribs; they are at first rather fine, increasing in diameter until they equal the size of the primary ribs at the margin. Finally, a thread is intercalated between the primary and the secondary ribs. Two ribs, a little stronger than the rest, border the fine groove that extends from the lower end of the fissure to the margin. Numerous concentric cords cross the shell forming nodules where they intersect the ribs. The cords also divide the spaces between the ribs into more or less square and deep pits; this gives to the shell surface a lattice-like appearance. Margin finely denticulated. Interior of shell nacreous-white, and extending into the apical whorls. The primary ribs show through as shallow grooves which increase in depth as they approach the margin. The anal fasciole is marked by a thick callus. Internal septum convex, narrow and short, its length being less than half that of the fissure. A ridge is developed along each side of the fissure, continuous with the outer edge of the septum and extending to the margin. These ridges are separated beyond the fissure by the narrow groove mentioned above.



Photographs by Marion Bills

Plate 52. Fig. 1–3. *Puncturella* (*Cranopsis*) *asturiana* P. Fischer, off Brunswick, Georgia (2×). Fig. 4, 5. *Puncturella* (*Cranopsis*) *asturiana* P. Fischer [young], off Fernandina, Florida (8×). Fig. 6–8. *Puncturella* (*Cranopsis*) *antillana* Pérez Farfante, off Punta Alegre, Camagüey, Cuba (Holotype, 2×).

	length	width	height	
(large)	21	15	10 mm.	off Brunswick, Georgia
(average)	18	12	8	off Fernandina, Florida

Types. Lectotype, here selected, at the United States National Museum, no. 95108, from off Cape Finisterre, Spain, *Travailleur*, in 1103 fathoms (Jeffreys collection).

The lectotype is chosen from the original series of four specimens, collected by the *Travailleur*, on which Fischer based *P.* (*Cranopsis*) *asturiana* and has the same measurements as those given by him in his original description.

Remarks. P. (*Cranopsis*) *asturiana* is the largest species of the group occurring in the Western Atlantic. It lives in relatively deep waters, from 100 to 1103 fathoms.

See *Remarks* under *P.* (*Cranopsis*) *antillana* and *P.* (*Cranopsis*) *erecta.*

Range. Eastern Atlantic: Gulf of Biscay along the north coast of Spain and off Portugal. Western Atlantic: North Carolina and south to Saint Bartholomew, Lesser Antilles.

Smith (1896, Ann. Mag. Nat. Hist. (6) **18,** p. 371; 1904, Ann. Mag. Nat. Hist. (7) **14,** p. 5; and 1906, Ann. Mag. Nat. Hist. (7) **18,** p. 247) has reported this species from the Indian Ocean.

Records. North Carolina: off Cape Hatteras, *Albatross*, station 2601 in 107 fathoms (USNM). Georgia: off Brunswiek, *Atlantis*, station 3781 in 265–290 fathoms (MCZ). Florida: off Fernandina, *Albatross*, station 2668 in 294 fathoms, station 2666 in 270 fathoms, and station 2667 in 273 fathoms (all USNM); off Saint Augustine, *Atlantis*, station 3779 in 230–250 fathoms (MCZ). Lesser Antilles: off Saint Bartholomew, *Albatross*, station 2750 in 496 fathoms (USNM).

Puncturella (Cranopsis) antillana, new species, Plate 52, fig. 6–8

Puncturella (*Cranopsis*) *asturiana* Dall 1889 [in part], Bull. Mus. Comp. Zoöl. **18,** p. 404 (Yucatán Strait; off Habana, off Martinique); *non* P. Fischer 1882.

Description. Shell white, medium in size, generally not exceeding 13 mm. in length, thin and rather low, the height varying from 43% to 50% of the length. Base ovate. Anterior slope long and strongly convex, posterior slope short and strongly concave around the apical whorls, then slightly concave to the margin. Apical whorls very small, one and one half, inclined backwards and downwards to occupy a position halfway between the summit and the base and rather near the posterior end of the shell. They are also conspicuously turned to the right. Anal fasciole long, rather deep, bordered by sharp edges and with widely-spaced, raised, semilunar lamellae which are much less numerous than the concentric cords that cross the shell. Fissure at the middle of the anterior slope, rounded behind and narrowing in front to a point. Sculpture very compact, consisting of about 28 strong radiating ribs starting at the base of the apical whorls. Lower down a secondary rib appears between each two of the primary ribs; they are at first rather fine, increasing in diameter until they equal the size of the primary ribs at the margin. Finally a thread is intercalated between the primary and the secondary ribs. Two ribs, a little stronger than the rest, border the fine groove that extends from the lower end of

the fissure to the anterior margin. Numerous closely-set concentric cords cross the shell forming elongated and rather strong nodules where they intersect the ribs. Since ribs and cords are closely-set the shell has a granular appearance. Margin finely denticulated. Interior of shell nacreous-white, extending into the apical whorls. The radiating sculpture shows through as translucent fine grooves which increase in depth as they approach the margin. The anal fasciole is marked by a thick elongated callus. Internal septum convex, narrow and short, its length being less than half that of the fissure. A ridge is developed along each side of the fissure, starting from the outer edges of the septum and continuing to the margin. These are separated beyond the fissure by a fine groove.

	length	width	height	
(large)	13	11	6.5 mm.	off Saint Thomas, Virgin Islands
(average)	11.5	10	5	Holotype

Types. Holotype, Museum of Comparative Zoölogy, no. 160518, from off Punta Alegre, Camagüey, Cuba, *Atlantis*, station 2982A in 210 fathoms. Paratypes, from off Habana, *Blake*, station 100 in 250–400 fathoms (USNM and MCZ); from off Saint Thomas, Virgin Islands, Johnson Smithsonian Exp., station 94 in 300–400 fathoms (USNM); and from off Martinique, *Blake*, station 208 in 213 fathoms (MCZ).

Remarks. This species is very close to *P.* (*Cranopsis*) *asturiana*, but differs from it by having the apical whorls smaller, placed half way between the summit and the base and near the posterior end of the shell, while in *asturiana* they lie immediately below the summit and behind the center of the shell. In addition, *antillana* is thinner and smaller, probably not exceeding 14 mm. in length, and has a more compact sculpture, which gives a granular appearance to the surface of the shell.

Dall (*l.c.*) made reference to the differences shown by some specimens of *asturiana* from the Antilles, but considered them to be mere variations, stating that these specimens intergraded with the typical in a larger series. We have examined Dall's material and find that they do not intergrade, but show the differences given above.

Range. Along the West Indies.

Records. See under *Types.*

Puncturella (Cranopsis) erecta *Dall*, Plate 53, fig. 1–5

Puncturella Cranopsis? erecta Dall 1889, Bull. Mus. Comp. Zoöl. **18**, p. 405 (off North Carolina).

Puncturella hendersoni Dall 1927 (February), Proc. United States Nat. Mus. **70**, Art. 19, p. 9 (off Sambo Reef, Florida and Maine).

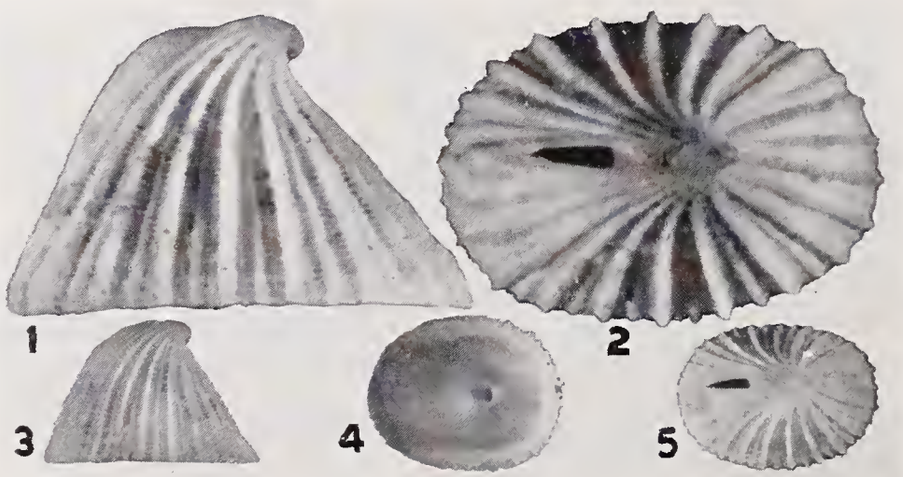
Puncturella hendersoni Dall 1927 (April), Proc. United States Nat. Mus. **70**, Art. 18, p. 111 (off Georgia; off Sambo Reef, Florida Strait).

Description. Shell conical, strong, beautifully sculptured and high, the height being from 65% to 80% that of the length. Base elliptical. Anterior slope extends at first almost horizontally forward, then turns down forming a rounded curve, and finally descends in almost a vertical line to the base. The posterior slope descends gradually to the base and it may be straight, slightly concave or even convex. Apical whorls one and one third or one and one half, small, though increasing rather rapidly in diameter. They lie immediately below the summit, a little behind the middle of the shell, being turned backwards and downwards against the posterior slope and towards the right. Fissure long

and narrow, high on the anterior slope, rounded at the upper end and produced in front to a point. The fissure is generally edged by two narrow extensions of the walls of the shell which merge at the lower end of the fissure with two closely-set ribs that run from the lower end of the fissure to the margin. These two ribs border the groove that extends from the lower end of the fissure to the margin of the shell. A moderately long anal fasciole occupies the summit of the shell; it is formed by several semilunar incremental lamellae. Sculpture consists of 23 strong, markedly raised, widely-spaced radiating ribs starting at the base of the apical whorls. Lower down, a secondary rib appears between each two of the primary ribs; these are at first very fine, increasing in diameter until they equal the size of the primary ribs at the shell margin. Finally a thread is intercalated between the primary and secondary ribs. Numerous concentric cords cross the shell, dividing the spaces between the ribs into rectangular pits, which are relatively deep; this gives to the shell surface a reticulated appearance. Margin strongly crenulated by the ends of the ribs which, near the margin, are marked in the inside by rather strong grooves. Interior of shell nacreous-white, the outside ribs showing through as translucent radiating fine lines. In this species the interior does not extend into the apical whorls, stopping short at their base. The internal septum is strongly convex, rather short, extending forward for about one third the length of the fissure. It continues as a ridge on each side of the fissure, and extends from the lower end of the latter to the margin of the shell. This ridge has a fine groove running down the middle of it.

	length	width	height	
(large)	15	11	10 mm.	off Western Dry Rocks, Florida Keys
(average)	10	7.5	7	Holotype

Types. The holotype of *P. erecta* is at the United States National Museum, no. 95147, the type locality being off Cape Hatteras, North Carolina, *Albatross*, station 2601 in 107 fathoms. The holotype of *P. hendersoni* is at the same institution, no. 333723, from off Sambo Reef, Florida Keys, *Eolis*, station 330 in 120 fathoms. Paratype from off Western Dry Rocks, Florida Keys. The other paratypes mentioned by Dall from Maine are actually specimens of *P. noachina*. Dall published *P. hendersoni* a second time, choosing



Photographs by Marion Bills

Plate 53. *Puncturella* (*Cranopsis*) *erecta* Dall

Fig. 1, 2. Off Cape Hatteras, North Carolina (Holotype, 5×). Fig. 3–5. Off Sambo Reef, Florida (Holotype of *P. hendersoni* Dall, 2½×).

then as type a different specimen, from off Georgia [off Cumberland Island] *Albatross*, station 2415 in 440 fathoms, which is also at the United States National Museum, no. 333491.

Remarks. In 1889 Dall published *P. crecta.* In 1927 he overlooked this species and published it again under the name of *P. hendersoni* and two months later it appeared still another time under the same name as a new species. Different type specimens were selected for all these descriptions.

P. (*Cranopsis*) *crecta* is one of the most beautiful species in the genus, being quite distinctive and readily separable from *P.* (*Cranopsis*) *asturiana*, its nearest relative in the Western Atlantic. *P. asturiana* is a broader shell, with larger apical whorls which stand out conspicuously on the posterior slope. The seulpture however, is much stronger in *crecta*, where the radiating ribs are more elevated and the concentric cords stronger. Finally, the fissure in the latter species is plaeed higher on the anterior slope.

P. crecta is included in the subgenus *Cranopsis* as it possesses a moderately long anal fasciole and a distinctive groove extending from the lower end of the fissure to the shell margin, visible both internally and externally. This species lives in moderate depths, occurring in 107 to 440 fathoms. It appears to be quite rare as only a few specimens have been obtained from the several dredging trips made along the coasts of North Carolina, Georgia and Florida.

Range. Cape Hatteras, North Carolina and south along the coast of Florida to the lower Florida Keys.

Records. See under *Types.* Florida: off Florida Reefs (MCZ).

Puncturella (Cranopsis) billsae, new species, Plate 54, fig. 1–3

Description. Shell very small, about 3.5 mm. in length, strongly compressed and high, the height being 70% to 85% of the length. Color white under a pale green periostracum. Base narrow ovate. Anterior slope strongly convex, posterior slope concave along its entire length. Apical whorls one and one half, the tip smooth and highly glossy, the rest rough. The apical whorls are turned backwards to such an extent that they projeet slightly beyond the posterior end. They lie on the right side of the shell. The anal fasciole runs from the fissure almost to the apex and it is provided with numerous incremental lamellae. Fissure at the summit of the shell, rounded at its upper end and narrowing down to a point. A groove extends from the fissure to the margin of the shell, along the mid-line of the anterior slope bordered by ribs a little stronger than the remaining ribs on the shell. Sculpture consists of numerous elosely-set radiating ribs starting at the base of the apieal whorls. There are no true cords, but the radiating ribs show all along their length elongated thickenings which are eoneentrieally arranged. Between each two ribs there is a series of white punetules which alternate with these thickenings. Margin finely erenulated. Interior of shell glossy with the punctules of the outside showing through as white points. Internal septum long, extending down far beyond the lower end of the fissure. It is slightly convex and runs close to the anterior slope, thus giving rise to a funnel-like formation.

length	width	height	
3.5	2.25	2.75 mm.	off Carysfort Reef, Florida
3	2	2.25	Holotype

Types. Holotype, United States National Museum, no 333728, from off Sand Key, Florida, *Eolis*, station 164 in 92 fathoms. Paratypes, from off Carysfort Reef, Florida, *Albatross*, station 2641 in 60 fathoms, in the United States National Museum; from off Key West, Florida, *Eolis*, station 333 in 110 fathoms, in the Museum of Comparative Zoölogy; and from Bahía de Cochinos, *Atlantis*, station 3332 in 175–225 fathoms, at the University of Habana.

Remarks. This species seems to be related to *P. granulata* but they differ, however, quite sharply. In profile the apical whorls of *P. billsae* are produced beyond the posterior margin, while in *P. granulata* they are located in front of the posterior margin. In *P. billsae* the posterior slope is strongly concave throughout its entire length: in *P. granulata* the posterior slope is straight below the apical whorls. Finally, the sculpture of *P. billsae* consists of very compact radiating ribs which show elongated thickenings along their courses while in *P. granulata* the radiating ribs are not so closely set and show granules rather than thickenings.

Range and *Records.* See under *Types.*

This species is named for Miss Marion A. Bills.

Puncturella (Cranopsis) granulata *Seguenza*, Plate 54, fig. 4–7

Rimula granulata Seguenza 1863, Ann. Acc. Aspir. Natural. (3) **2**, p. 88, pl. 5, fig. 6, 6a (from the Miocene of Rometta, Messina, Sicily).

Puncturella (*Cranopsis*) *granulata* Seguenza, Watson 1883, Journ. Linn. Soc. **17**, p. 31; Watson 1886, Challenger Report **15**, p. 46, pl. 4, fig. 5 (off St. Thomas, north of Culebra Island, West Indies); Dautzenberg and H. Fischer 1896, Mém. Soc. Zool. France **9**, p. 491 and 1897, *ibid.* **10**, p. 180 (Azores).

Puncturella (*Cranopsis*) *tuberculata* Watson 1883, Journ. Linn. Soc. **17**, p. 31 (off St. Thomas, north of Culebra Island, West Indies).

Puncturella Watsoni Dall 1889, Bull. Mus. Comp. Zoöl. **18**, p. 403 (Barbados; off Bahía Honda, Cuba; off Yucatán); Dall 1889, Bull. United States Nat. Mus. **37**, p. 168 (Gulf of Mexico, West Indies to Barbados).

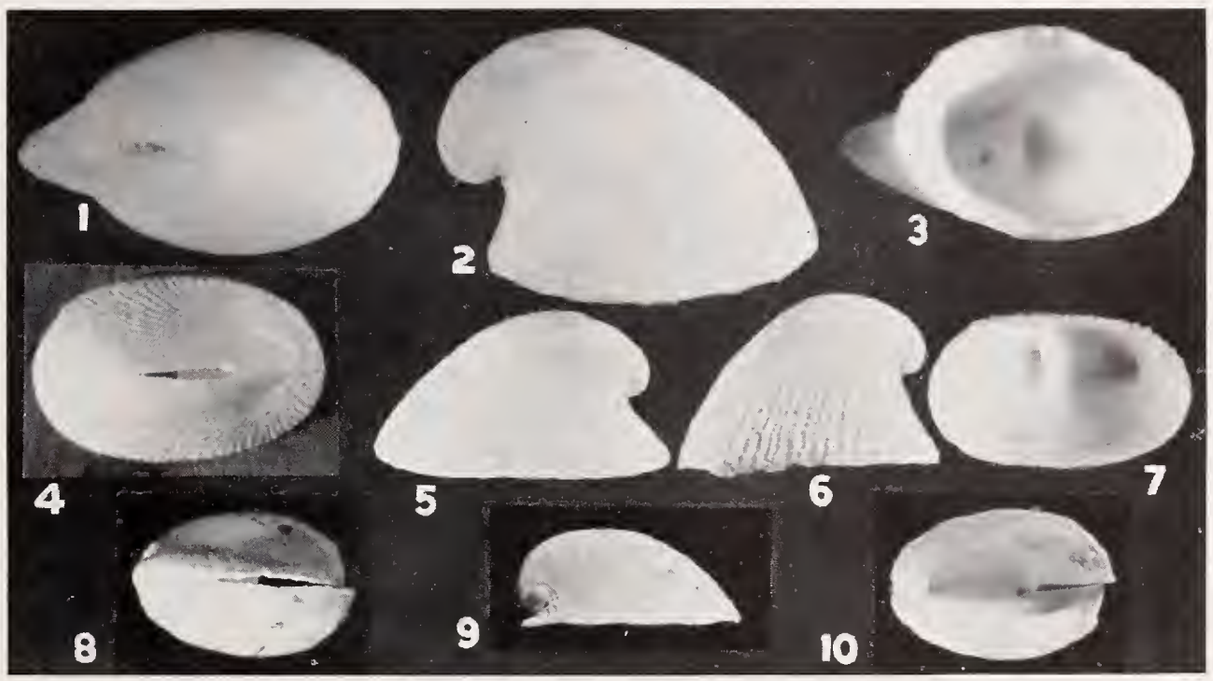
Description. Shell small, probably not exceeding 8 mm. in length, compressed, very variable in height, which may be from 45% to 75% of the length. Color oyster-white under a very thin yellowish periostracum, which is partially flaked off. Base a narrow elongated oval. Anterior slope long and rather strongly convex, posterior slope short, concave around the apical whorls, then straight to the margin. Apical whorls prominent, from one and three quarters to two and one half, increasing rapidly in diameter after the first whorl, smooth, the tip glossy and standing out with considerable distinctness. They lie on the right side of the shell, turned backwards and downwards, their position varying from one rather high on the posterior slope to one somewhat lower down. Anal fasciole with numerous closely-set incremental lamellae. Fissure narrow and elongated, rounded at the upper end and narrowing in front to a point. It lies high on the front slope, its upper end rising to the summit of the shell, but still remote from the apex. From the fissure a fine groove runs down the front slope bordered on each side by a small ridge. Sculpture consists of very numerous radiating granulose ribs. The granules are very fine at first, increasing progressively in size toward the margin where they are rather prominent. There is no true concentric sculpture. Margin finely denticulated. Interior of shell glossy. The internal septum extends down for about three quarters the length of the fissure. The groove that runs from the fissure to the margin is more conspicuous on the inside of the shell where it is edged by very thin calluses which are prolonged to include the fissure.

	length	width	height	
(large)	7.75	4.75	3.75 mm.	off Culebra Island, West Indies (Watson 1883)
(average)	4.5	3	2.75	Campeche Bank, Yucatán, Mexico

Types. The whereabouts of the type specimen of *Puncturella* (*Cranopsis*) *granulata* Seguenza is unknown to me. The type locality is the Miocene of Rometta, Messina, Sicily.

The lectotype of *Puncturella watsoni* Dall, here selected, is in the United States National Museum, no. 85146, from off Barbados, in 100 fathoms. It was collected by the *Blake*. Paratypes, in the same institution, from off Campeche Bank, and off Yucatán, Mexico; and in the Museum of Comparative Zoölogy, from off Bahía Honda, Cuba, and from off Barbados.

Remarks. I am unable to separate *P. watsoni* Dall from *P. granulata* Seguenza. A re-examination of Dall's types definitely places *watsoni* in *Cranopsis* and not in *Puncturella* s.s. as originally stated by Dall. *P. watsoni* agrees in all its characters with *P. granulata:* in having the fissure somewhat distant from the apex; in having a moderately long anal fasciole; and in possessing a well marked groove from the lower end of the fissure to the margin of the shell. Dall states that *watsoni* is higher than *granulata* but our studies indicate a wide range in the ratio of height to length, from 48% to 75%.[1] The ratio of height to length obtained from Seguenza's measurements is 66%, a figure well within



Photographs by Marion Bitts (fig. 1–7); Frank White (8–10)

Plate 54. Fig. 1–3. *Puncturella* (*Cranopsis*) *billsae* Pérez Farfante, off Sand Key, Florida, Holotype (fig. 1, 3, 10×; fig. 2, 13×). Fig. 4, 5. *Puncturella* (*Cranopsis*) *granulata* Seguenza, Campeche Bank, Yucatán, Mexico (7×). Fig. 6, 7. *Puncturella* (*Cranopsis*) *granulata* Seguenza, off Barbados, Lesser Antilles (10×). Fig. 8–10. *Puncturella* (*Cranopsis*) *larva* Dall, off Fernandina, Florida (Holotype, 8×).

[1] I have examined the type series of *watsoni* Dall. There is no specimen remaining whose measurements agree with those he published, which gave a ratio of height to length of 82%.

the range of the ratios for the Western Atlantic form. Again, the anterior and posterior slopes vary in different specimens, a factor of course responsible for the variation of the height-length ratios given above. This variation may be directly due to immediate factors in the environment, that is, the objects upon which these animals are attached. This condition is probably not different from that exhibited by various species in the genus *Crepidula*, in which the slope of the shell varies tremendously, depending upon the flatness or curvature of the place of attachment.

See *Remarks* under *P.* (*Cranopsis*) *billsae*.

Range. Eastern Atlantic: Azores. Western Atlantic: Florida Keys and south along the coast of Mexico and through the West Indies.

Records. Florida: off Sambo Reef, *Eolis*, station 331 in 118 fathoms (USNM). Cuba: off Bahía Honda, *Blake*, station 20 in 220 fathoms (MCZ); Bahía de Cochinos, *Atlantis*, station 3332 in 175–225 fathoms, station 3335 in 200 fathoms and station 3338 in 1075 fathoms (all Univ. of Habana). Lesser Antilles: off English Harbor, Antigua, State Univ. of Iowa Exp., station 496 in 120 fathoms (USNM); off Barbados, *Blake*, in 100 fathoms; off Lazaretto, State Univ. of Iowa Exp., station 483 in 90–100 fathoms; off Pelican Id., State Univ. of Iowa Exp., station 505 in 80–90 fathoms (both USNM).

Puncturella (Cranopsis) larva *Dall*, Plate 54, fig. 8–10

Rimula larva Dall 1927, Proc. United States Nat. Mus. **70**, Art. 18, p. 113 (off Fernandina, Florida).

Description. Shell delicate, low, the height being less than half the length. Basal margin oval. Anterior slope long and convex, posterior slope very short and concave. Apical whorls one and one quarter, glossy, almost terminal, located almost immediately behind the posterior margin and on the right side. Anal fasciole very narrow and depressed, starting rather far from the apex and extending only a short distance. Fissure lanceolate and narrow, continuing to the margin in the form of a very narrow slit. Sculpture consists of rather widely-spaced granulose radiating ribs, stronger on the posterior half of the shell. There is no true concentric sculpture, but the lines of growth are clearly seen. Interior of the shell highly polished. The anal fasciole marked by a slightly convex callus. The posterior end of the fissure is covered by a short septum. Muscular impression clearly marked.

length	width	height	
3	2	1.3 mm.	Holotype

Types. Holotype, United States National Museum, no. 108148, from off Fernandina, Florida, *Albatross*, station 2668 in 294 fathoms. Paratypes from the same locality, also in the USNM.

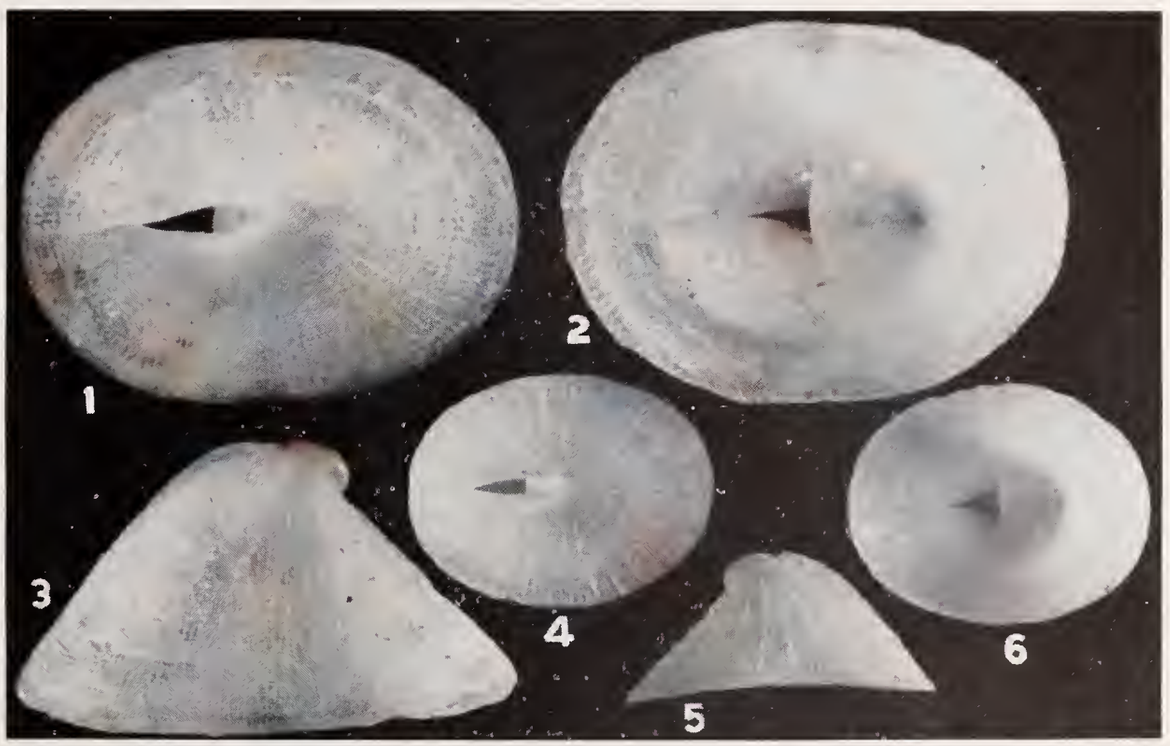
Remarks. Though originally described as a species in the genus *Rimula* by Dall, it is a *Puncturella* in the subgenus *Cranopsis*. It belongs here primarily because it possesses a septum; it has also a fissure continued as a slit to the margin, a condition found in young shells of *Cranopsis*. Dall's types are immature specimens; adults are as yet unknown.

Range and *Records*. See under *Types*.

Puncturella (Cranopsis) agger *Watson*, Plate 55, fig. 1–6

Puncturella agger Watson 1883, Journ. Linn. Soc., London, **17**, p. 32; Watson 1886, Challenger Report **15**, p. 40, pl. 4, fig. 6a–e (off St. Thomas, north of Culebra Island, West Indies); Dall 1889, Bull. United States National Museum **37**, p. 168 (Florida Strait, East Florida, West Indies).

Description. Shell small, generally not exceeding 6 mm. in length, conical, moderately high, with the top slightly flattened. Base elliptical, the same width at both ends. Color translucent-white under a thin brown periostracum which is partially flaked off. Anterior slope convex, posterior slope straight. Apical whorls one and three quarters (the whole shell consisting of two and one quarter whorls), increasing rather rapidly in diameter, the tip glossy and smooth, the rest rough in appearance. They are not set exactly on top of the shell, but are turned backwards and downwards against the posterior slope. The nuclear whorls lie to the right of the shell, but at the same time the axis about which they coil is not at right angles to the anterior-posterior axis of the shell, but is turned to the right. The orifice lies high on the anterior slope, its upper end at the summit of the shell but still not close to the apex. The fissure is long and narrow, rounded at the upper end and narrowing in front to a point. From the lower end two ridges extend to the margin of the shell, these ridges being separated by the groove that is produced along the middle of the anterior slope. Seulpture eonsisting of a series of fine primary riblets, radiating from the base of the apical whorls to the margin. Secondary riblets, which start lower down, alternate with the primary riblets. Finally, in the interspaces between the primary and secondary riblets there may be one to three threads. All the riblets and the threads are very slight but are made more distinct by the closely-set nodules formed at the intersection of the concentric threads and the radiating riblets. Sometimes all the riblets



Photographs by Marion Bills

Plate 55. *Puncturella (Cranopsis) agger* Watson

Fig. 1–3. Off Fowey Rocks, Florida Keys (10×). Fig. 4–6. Campeche Bank, Mexico (7×).

start near the base of the apical whorls thus giving rise to a rather compact sculpture (Plate 55, fig. 1–3). In the spaces between the riblets there is a row of punctules, alternating with the nodules. Margin thin and smooth. Interior of shell glossy, the punctules of the outside showing through as radiating rows of white points. A groove runs from the fissure to the margin, bordered on either side by a shallow callus which is prolonged to include the orifice. Septum glassy and short.

	length	width	height	
(large)	6	4.5	3.25 mm.	off Fowey Rocks, Florida Keys
(average)	5	4	2.5	Campeche Bank, off Yucatán, Mexico

Types. The types are in the British Museum, the type locality being off Saint Thomas, north of Culebra Island, West Indies, *Challenger*, station 24 (N. Lat. 18°38′30″; W. Long. 65°5′30″) in 390 fathoms.

Remarks. Puncturella agger is an intermediate form and consequently difficult to assign to a subgenus. The highly placed fissure and the short anal fasciole would tend to justify its inclusion in *Puncturella* s.s. However, the well marked groove from the lower end of the fissure to the margin of the shell is characteristic of the subgenus *Cranopsis*, in which I have provisionally placed this species.

Puncturella agger superficially resembles *P. profundi* Jeffreys. They differ, however, in the following characters: *P. agger* has the top of the shell flattened while this is not true of *P. profundi*. *P. agger* has a lanceolate fissure while *P. profundi* has one that is pear-shaped; in addition, the latter species does not have those characters which are responsible for the inclusion of *agger* in the subgenus *Cranopsis:* that is to say *P. profundi* has neither anal fasciole, nor groove, and so belongs to *Puncturella* s.s.

Range. Florida Keys and south, probably along the coast of Central America and the West Indies.

Records. Florida: off Fowey Rocks, in 465 fathoms (USNM); off Sand Key, in 136 fathoms (ANSP); off Conch Reefs, *Bibb*, in 169 fathoms (MCZ). Cuba: Bahía de Cochinos, *Atlantis*, station 3338 in 1075 fathoms (Univ. of Habana). Lesser Antilles: north of Culebra Island, *Challenger*, station 24, in 390 fathoms (Watson 1883). Mexico: off Yucatán, Campeche Bank, in 200 fathoms (USNM).

Subgenus **Puncturella** *Lowe*

Shell generally without anal fasciole, sometimes with a very small one. Fissure at or very near the base of the apical whorls, which are always present. Fissure from lanceolate to circular. Internal septum generally very well developed, long and wide, as a shelf extending from side to side; although in a few species it is short. There is no groove on the external surface from the lower end of the fissure to the anterior margin; this is also generally the case on the internal surface but here sometimes a fine groove may be present. Sculpture very variable: all the types described for the genus are found in *Puncturella* s.s.

Puncturella (Puncturella) profundi *Jeffreys*, Plate 56, fig. 1–5

Punctarella profundi Jeffreys 1877, Ann. Mag. Nat. Hist. (4) **19**, p. 232 (off Cape Mondego, Portugal, and off Cape Farewell, Greenland); Jeffreys 1883, Proc. Zool. Soc. London, pt. 4, p. 675, pl. 50, fig. 10 (off Cape Mondego, Portugal; off Cape Farewell, Greenland; Bay of Biscay; and off Culebra Island, West Indies); Watson 1883, Journ. Linn. Soc., London, **17**, p. 35 (north of Culebra Island); Dautzenberg and Fischer 1896, Mém. Soc. Zool. France **9**, p. 491 (Azores); Locard 1898, Exp. Scient. Travailleur et du Talisman, Moll. Test. **2**, p. 80 (west of Finesterre and west of Sahara); Dall 1889, Bull. United States Nat. Mus. **37**, p. 168 (off Fernandina, Georgia, East Florida, West Indies); Dall 1927, Proc. United States Nat. Mus. **70**, Art. 18, p. 111 (off Fernandina and Georgia).

Punctarella acuta Watson 1883, Journ. Linn. Soc., London, **17**, p. 35 (north of Culebra Island, West Indies).

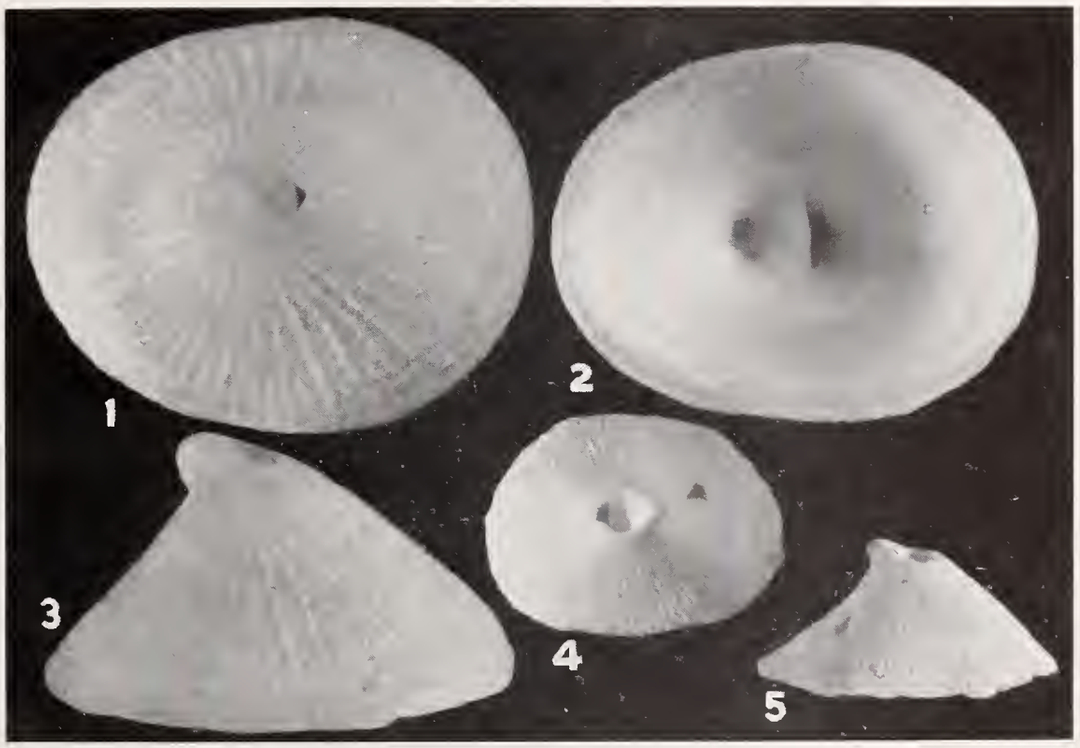
Punctarella (Cranopsis) profundi Jeffreys, Watson 1886, Challenger Report **15**, p. 47 (north of Culebra Island, West Indies).

Punctarella profunda 'Jeffreys' Locard 1886, Prodr. Malac. Franç., Moll. Mar., p. 336 (Gulf of Gascony).

Punctarella profondi 'Jeffreys' Locard 1899, Coq. mar. au large des côtes de France, p. 109.

Punrturella profundi var. *multifila* Dall 1927, Proc. United States Nat. Mus. **70**, Art. 18, p. 111.

Description. Shell small, about 6 mm. in length, thin but strong, conical, expanding gradually from the top to the margin, the height varying from 50% to 80% of the length. The anterior half of the shell has straight or slightly convex sides; the posterior half, slightly concave sides. Base broadly ovate. Apical whorls from one and one quarter to one and one half, smooth, glossy, slightly projecting upwards. They lie immediately behind the orifice, to the right of the shell, but since the axis about which they coil is not at right angles to the anterior-posterior axis of the shell, but is turned to the right, the whorls lie obliquely on the posterior slope. The orifice is rather short, pear shaped, sometimes occupying an almost horizontal position at the top of the shell. Sculpture very fine consisting of numerous radiating riblets starting around the orifice, intermediate ones



Photographs by Marion Bills

Plate 56. *Punrturella (Puncturella) profundi* Jeffreys

Fig. 1–3. Off Fernandina, Florida (12×). Fig. 4, 5. Off Cumberland Island, Georgia (6×).

being intercalated lower down. These riblets are beaded by numerous granules formed at the intersection of fine, closely-set threads with the riblets, giving the shell a granular appearance. Margin smooth in adults and very finely crenulated in young specimens. Interior of shell highly polished and glossy, extending deeply into the apical whorls. Internal septum is a flat shelf reaching from one side of the shell to the other and extending downwards for about a third of the distance from apex to base.

	length	width	height	
(large)	5	4	2.50 mm.	off Fernandina, Florida
(average)	4.25	3.25	3	Holotype [1]

Types. Holotype, United States National Museum, no. 178887, from off Cape Mondego, Portugal (N. Lat. 39°55′; W. Long. 9°56′), *Porcupine* (1870), station 16 in 994 fathoms. Paratypes, from the same locality, from off Cape Farewell, Greenland, *Valorous* station 12 (N. Lat. 56°11′; W. Long. 37°44′) in 1450 fathoms, both series at the United States National Museum: and from off Cape Mondego, Portugal, *Porcupine*, stations 17 and 17a in depths from 740 to 1095 fathoms. The whereabouts of the last mentioned paratypes is unknown to me.

Remarks. P. profundi is a deep sea species, with a wide distribution. Dall (1927, p. 111) described *multifila* from the Western Atlantic as a variety of *profundi* on the following basis: "the radial sculpture alternates stronger and weaker and is more or less granulated by incremental lines." In the Western Atlantic we find typical specimens along with others which have the radiating ribs more widely spaced, the intermediate riblets proportionally finer and the concentric threads almost invisible in the spaces between the ribs and riblets, while the concentric lines of growth are very distinct. All other characters are the same in both forms, and having found intermediate forms that merge one into the other, we conclude that the specimens with a lighter and more widely-spaced sculpture can not possibly be considered to constitute a good variety. The differences referred to above are quite common among the species of *Puncturella: P. noachina* is a good case in point. See *Remarks* under *P. agger* and *P. circularis.*

Range. Eastern Atlantic: from the Bay of Biscay to northwestern Africa and the Azores. Western Atlantic: from Cape Farewell, Greenland, south along the West Indies and the coast of Mexico and Central America.

Records. Western Atlantic: Greenland: off Cape Farewell, *Valorous*, station 12 in 1450 fathoms (Jeffreys 1877). Georgia: off Cumberland Id., *Albatross*, station 2668 in 294 fathoms. Florida: off Fernandina, *Albatross*, station 2415 in 440 fathoms. Lesser Antilles: off Culebra Island, *Challenger*, station 24 in 390 fathoms (Jeffreys 1883 and Watson 1883).

Puncturella (Puncturella) circularis *Dall*, Plate 57, fig. 1–4

Puncturella circularis Dall 1881, Bull. Mus. Comp. Zoöl. **9**, p. 75: Dall 1889, Bull. Mus. Comp. Zoöl. **18**, p. 403, pl. 26, fig. 7, 7b (off Dry Tortugas, Florida); Dall 1927, Proc. United States Nat. Mus. **70**, Art. 18, p. 112 (off Fernandina, Florida).

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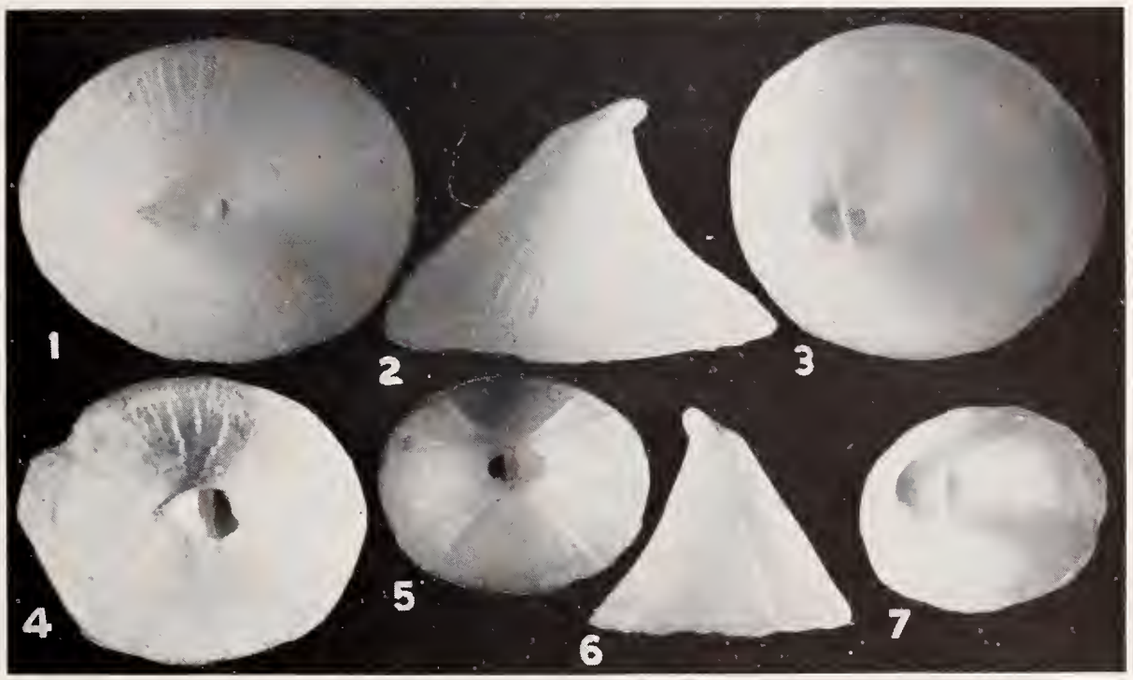
[1] Jeffreys (1877, p. 232) published measurements are in error as they do not agree with those of his holotype or with the length of the shell of his published figure.

Description. Shell thin, small, about 7 mm. in length, conical, expanding rather abruptly toward the margin, height very variable, from 60% to 85% of the length. Color a glossy oyster-white. Anterior half of the shell has straight sides, while the posterior half has concave sides. Apical whorls one and one half, smooth and highly polished. They lie at the summit of the shell, immediately behind the fissure and project markedly backwards instead of lying flat against the side of the shell as in certain other species. Fissure rounded in front and drawn backwards and upwards to a point in the shape of a tear drop. In very young specimens the surface of the shell is smooth. The same is true of adults so far as the area around the summit is concerned; the remainder of the adult shell however is sculptured with fine beaded radiating ribs. These, as they approach the margin, are augmented by finer intercalated ribs. Numerous extremely fine threads cross the shell, beading the ribs at the point of intersection and giving to the surface a peculiar delicately foliated appearance. Margin faintly crenulated. Interior of shell glossy. The radiating ribs of the outside are marked by translucent lines. Well down towards the margin a ridge is found, below which is the muscular scar. The septum is a shelf extending from side to side and down for a short distance. It divides the interior of the shell into two almost equal parts, the anterior being slightly smaller than the posterior.

	length	width	height	
(large)	6.5	5.25	4 mm.	off Bahía de Santa Clara, Cuba
(average)	5	4.25	4.25	off Sagua la Grande, Cuba

Types. Holotype, United States National Museum, no. 333724, off Dry Tortugas, Florida, *Blake*, station 44 (N. Lat. 25°33′; W. Long. 84°35′) in 539 fathoms.

Remarks. This beautiful species is rather rare. It is a deep sea form, living in depths ranging from 380 to 580 fathoms.



Photographs by Marion Bills

Plate 57. Fig. 1–3. *Puncturella* (*Puncturella*) *circularis* Dall, off Bahía de Santa Clara, Matanzas, Cuba (7×). Fig. 4. *Puncturella* (*Puncturella*) *circularis* Dall, off Dry Tortugas, Florida (Holotype, 7×). Fig. 5–7. *Puncturella* (*Puncturella*) *borroi* Pérez Farfante, off Baracoa, Oriente, Cuba (Holotype, 7×).

P. circularis is very closely related to *P. borroi*. See *Remarks* under this latter species. It resembles superficially *P. profundi*, but they can easily be separated: *P. circularis* is narrower near the top and it expands rather abruptly toward the margin, while *P. profundi* expands gradually from the top to the margin. The apical whorls in *P. profundi* are a little larger and lie slightly flattened against the posterior slope, while in *P. circularis* the apical whorls project markedly backward. In addition, the sculpture of *P. profundi* is more compact and extends over the entire shell below the apical whorls while in *P. circularis* the compact sculpture is limited to the basal area of the shell.

Range. Eastern Florida, Florida Keys, Cuba and south to Tobago Island.

Records. Florida: off Fernandina, *Albatross*, station 2668 in 294 fathoms; off Tortugas, *Blake*, station 44 in 539 fathoms (both USNM). Cuba: off Bahía de Cárdenas, *Atlantis*, station 2993 in 580 fathoms; off Bahía de Santa Clara, *Atlantis*, station 2991 in 575 fathoms and station 2988 in 380 fathoms (all MCZ); off Cienfuegos, *Atlantis*, station 3338 in 1075 fathoms (Univ. of Habana). Lesser Antilles: Tobago Island (Dall 1927, p. 112).

Puncturella (Puncturella) borroi, new species, Plate 57, fig. 5–7

Description. Shell very thin and small, about 4 mm. in length, acutely conical, high, the height being from 70% to 90% of the length, and with a few spaced radiating threads front and back but not on the sides. Shell translucent white, the anterior half with straight or slightly convex sides, the posterior half with concave sides. Apical whorls one and one half, smooth and glossy. They lie at the top of the shell, immediately behind the middle and project markedly backwards. Fissure rounded in front and drawn backwards and upwards to a point, in the shape of a tear drop. Shell highly polished with eight to ten radiating, fine, beaded threads in front and seven on the back. These threads begin at the top, while a few intermediate ones appear lower down. Both sets extend to the margin, which is thin and smooth. Interior glossy, with the threads on the exterior of the shell marked as fine radiating lines or grooves. The septum is a flat triangular shelf extending from side to side and down for a short distance. It divides the interior of the shell into two almost equal parts, the anterior being only slightly smaller than the posterior.

	length	width	height	
(large)	4.25	3	3.25 mm.	off Bahía de Cárdenas, Cuba
(average)	4	3	3	Bahía de Cochinos, Cuba

Types. Holotype, Museum of Comparative Zoölogy, no. 160519, from off Baracoa, Oriente, Cuba, *Atlantis*, station 3362 in 1020 fathoms. Paratypes, from off Bahía de Cárdenas, *Atlantis*, station 2993 in 580 fathoms; from off Nuevitas, *Atlantis*, station 3379 in 910 fathoms; from Bahía de Cochinos, *Atlantis*, station 3332 in 175–225 fathoms, all at the Univ. of Habana; and also from east of Tobago Island, Lesser Antilles, in 880 fathoms, and off Río de la Plata, in 11½ fathoms, both in the United States National Museum.

Remarks. P. borroi is a deep sea species, widely distributed in the Western Atlantic. This species is closely related to *P. circularis* from which it differs by being thinner, and by not expanding abruptly toward the margin. Furthermore, *P. borroi* has radiating ribs only in front and back, while *P. circularis* has such ribs on the sides as well. Finally, *P. borroi* seems not to reach a length exceeding 4.5 mm.

Range. Cuba and south through the West Indies and along the coast of South America, as far south as Argentina.

Records. See under *Types.*

Named for Primitivo Borro who has contributed much to our knowledge of Cuban marine mollusks.

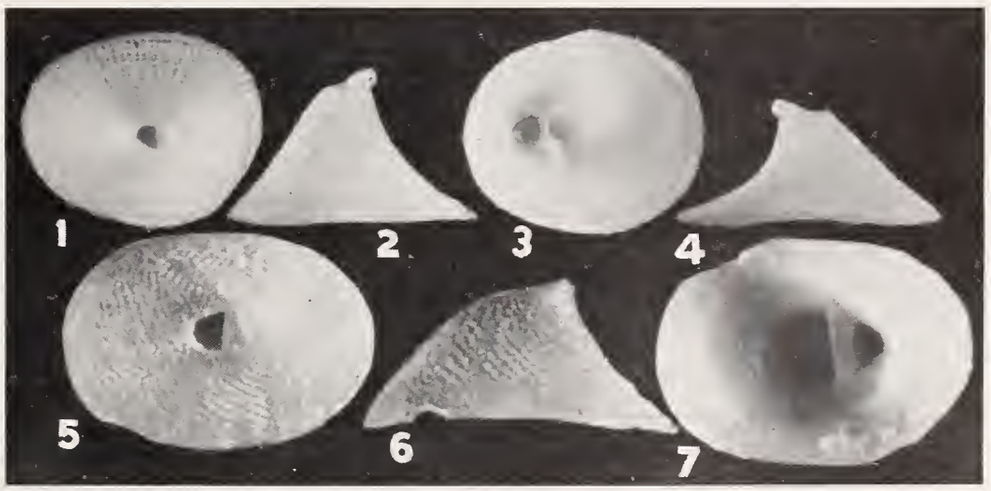
Puncturella (Puncturella) sportella *Watson*, Plate 58, fig. 1–4

Puncturella sportella Watson 1883, Journ. Linn. Soc., London, **17**, p. 37; Watson 1886, Challenger Report **15**, p. 45, pl. 4, fig. 9 (off Saint Thomas, north of Culebra Island, West Indies).

Description. Shell very small, about 4 mm. in length, a dull white and highly sculptured. It is very variable in height, which may be from 50% to 85% of the length. Base broadly ovate. Anterior slope straight, posterior slope concave, expanding toward the margin. Apical whorls one and one half or one and three quarters, small, globose, and porcellaneous-white. They project backwards below the posterior end of the fissure and are turned to the right. Fissure roundish in front and drawn out and up behind, where it is closed by the septum, into a sharp point. The sculpture consists of numerous subequal, raised and somewhat irregular radiating ribs, crossed by concentric, raised threads which form nodules on crossing the ribs and divide the spaces between the ribs into squares. This gives rise to the basket-work appearance from which the name of the species was derived. Margin finely crenulated. Interior of shell glossy, with numerous, very fine, radiating riblets. The septum begins at the base of the apical whorls. At first it occupies an exterior position, then descends vertically, dividing the interior of the shell into two unequal parts, the posterior smaller than the anterior.

	length	width	height	
(large)	4.5	3	3.5 mm.	off Puerto Tánamo, Oriente, Cuba
(average)	3.5	2.5	3	off Sagua la Grande, Cuba

Types. The type specimen is in the British Museum, the type locality being off Saint



Photographs by Marion Bills

Plate 58. Fig. 1–3. *Puncturella* (*Puncturella*) *sportella* Watson, off Bahía de Cárdenas, Cuba (7×). Fig. 4. *Puncturella* (*Puncturella*) *sportella* Watson, off Bahía de Santa Clara, Matanzas, Cuba (7×). Fig. 5–7. *Puncturella* (*Puncturella*) *oxia* Watson, off Georgia (12×).

Thomas, north of Culebra Island, *Challenger*, station 24 (N. Lat. 18°38′30″; W. Long. 65°5′30″) in 390 fathoms.

Remarks. *P. sportella* resembles in general shape *P. circularis*, but its cancellated surface makes it readily separable from the latter.

Range. Georgia, Florida Keys and south through the West Indies.

Records. Georgia: off Cumberland Island, *Albatross*, station 2668 in 294 fathoms (USNM). Florida: off Carysfort, Burry-Foster Exp., station 21 in 117 fathoms; off the Elbow, Key Largo, Burry-Foster Exp., station 14 in 92–100 fathoms (both L. A. Burry). Cuba: off Cabo San Antonio, *Atlantis*, station 3313, in 550 fathoms; off Matanzas, *Atlantis*, station 3485 in 385 fathoms; off Varadero, *Atlantis*, station 2998 in 355 fathoms; off Bahía de Cárdenas, *Atlantis*, station 2993 in 580 fathoms and station 3474 in 490 fathoms; off Bahía de Santa Clara, *Atlantis*, station 3459, in 500 fathoms, and station 2992 in 555 fathoms; off Sagua la Grande, *Atlantis*, station 2991, in 475 fathoms and station 2998 in 360 fathoms; off Puerto Tánamo, *Atlantis*, station 3369 in 600 fathoms; Bahía de Cochinos, *Atlantis*, station 3332 in 175–225 fathoms (all MCZ and Univ. of Habana).

Puncturella (Puncturella) oxia *Watson*, Plate 58, fig. 5–7

Puncturella oxia Watson 1883, Journ. Linn. Soc., London, **17**, p. 36; Watson 1886, Challenger Report **15**, p. 44, pl. 4, fig. 8a–e (off Saint Thomas, north of Culebra Island, West Indies); Dall 1927, Proc. United States Nat. Mus. **70**, Art. 18, p. 111 (off Fernandina [actually off Cumberland Island, Georgia] Florida and Georgia).

Description. Shell very small, from 3 to 4 mm. in length, thin and depressed conical, the height being from 50% to 55% of the length. Base elliptical. Anterior half of the shell has convex sides, posterior half has concave sides. Apical whorls two, lying behind the orifice and turned backwards. Fissure rounded in front, drawn out behind and upwards. The sculpture is very peculiar, consisting of rows of rough tubercles, the rows interrupted and irregular, in chevron formation. Border thin and smooth. Interior of shell glossy, with numerous radiating very fine white lines, extending from the orifice to the margin. In some specimens there is, below the muscular scar, a band of longitudinal, irregular wrinkles. The internal septum is a flat shelf extending from side to side, convexly arched at first but thereafter extending almost vertically downwards.

	length	width	height	
(large)	4	3	2.25 mm.	off Cumberland Island, Georgia
(average)	3.5	2.5	1.75	off Culebra Island, West Indies

Types. The types are in the British Museum. They are from off Saint Thomas, north of Culebra Island, West Indies, *Challenger*, station 24 (N. Lat. 18°38′30″; W. Long. 65°5′30″) in 390 fathoms.

Remarks. *Puncturella oxia* is readily differentiated from other species by its peculiar type of sculpture, that is, by the arrangement of the rough tubercles in chevron formation.

All of the specimens studied have lost the apical whorls.

It is a deep sea species, having been found in depths ranging from 294 to 440 fathoms.

Range. Georgia and south, probably along the West Indies.

Records. GEORGIA: off Cumberland Island, *Albatross*, station 2415 in 440 fathoms and *Albatross*, station 2668 in 294 fathoms (both USNM). LESSER ANTILLES: off Culebra Island (Watson 1883).

Puncturella (Puncturella) plecta *Watson*, Plate 59, fig. 1–3

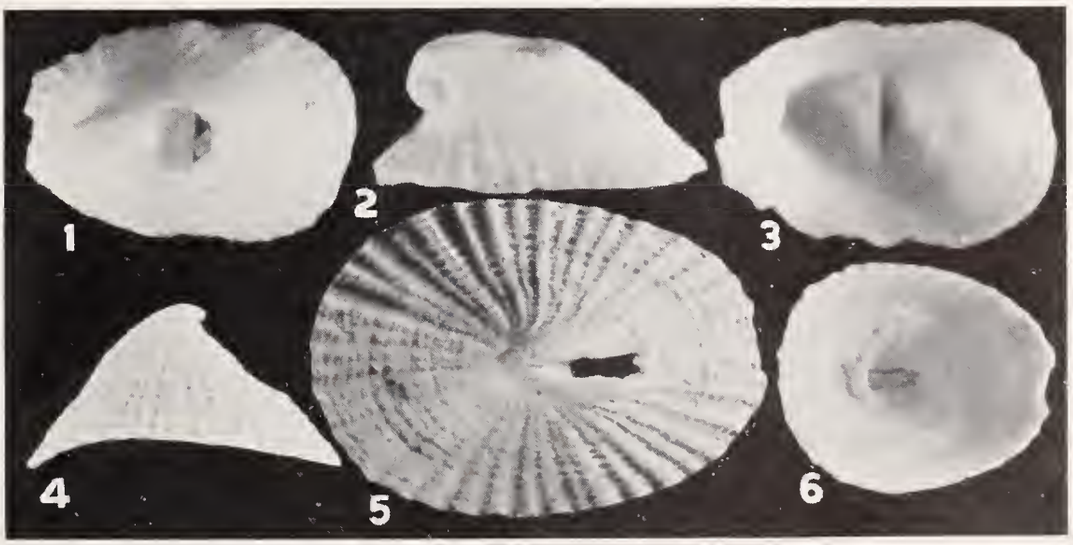
Puncturella plecta Watson 1883 (March), Journ. Linn. Soc. **17**, p. 34; Watson 1886, Challenger Report **15**, p. 39 (off Saint Thomas, north of Culebra Island, West Indies).

Puncturella clathrata Jeffreys 1883 (April), Proc. Zool. Soc. London, pt. 4, p. 676, pl. 50, fig. 11 (off Cape Mondego, Portugal and off Culebra Island, West Indies); Watson 1886, Challenger Report **15**, p. 39 (off Saint Thomas, north of Culebra Island, West Indies).

Description. Shell small, about 4 mm. in length, opaque, white, rather strong and low conical, the height being about 42% of the length. Base elongated oval. The top of the shell is wide and projects slightly backwards; the anterior half of the shell has slightly convex sides, the posterior half, concave sides. Fissure occupies an almost horizontal position; it is elongated, rounded in front and drawn out behind. Apical whorls one and one half, glassy and turned to the right. They lie in front of the posterior end, projecting backwards below the fissure. Sculpture consists of about 40 radiating riblets crossed by concentric threads which form small nodules where they intersect the riblets. Margin crenulated by the ends of the riblets. Interior of shell glossy. The septum is strongly curved; at first it runs very near the outer surface, closing the posterior part of the fissure, then descends obliquely, dividing the interior of the shell into two unequal parts, the anterior much smaller than the posterior.

length	width	height	
3.75	2.5		off Cape Mondego, Portugal
3	2	1.25 mm.	off Cumberland Island, Georgia

Types. The type of *plecta* Watson is in the British Museum, the type locality being off Saint Thomas, north of Culebra Island, West Indies, *Challenger*, station 24 (N. Lat. 18°38′30″; W. Long. 65°5′30″) in 390 fathoms. The disposition of Jeffreys' type is un-



Photographs by Marion Bills

Plate 59. Fig. 1–3. *Puncturella* (*Puncturella*) *plecta* Watson, off Cumberland Island, Georgia (11×). Fig. 4–6. *Puncturella* (*Puncturella*) *pauper* Dall, off Guantánamo, Cuba, Holotype (fig. 4, 6, 7×; fig. 5, 10×).

known to me. The type locality is off Cape Mondego, Portugal, *Porcupine*, station 17a (N. Lat. 39°39′; W. Long. 9°39′) in 795 fathoms.

Remarks. Jeffreys' description of *P. clathrata* apparently was based upon one specimen from Cape Mondego, Portugal. In addition, he included the locality off Culebra Island, West Indies, *Challenger*, station 24, in his record, thus indicating that he had seen another specimen which he identified as belonging to his new species *clathrata*. This specimen seemingly was the one upon which Watson based his *P. plecta*. Furthermore, Watson stated that his species was the same as *P. clathrata* Jeffreys: "*P. plecta* Watson is *P. clathrata* Jeffreys, of which, however, as an unpublished species mine, must, to my regret (for this species has long been differentiated by Jeffreys), take precedence." Watson in 1896 places his species *plecta* in the synonymy of *clathrata*; in this he was in error (like subsequent authors), since in reality his species had antedated Jeffreys' *clathrata* by one month. Consequently the species *plecta* must stand, and *clathrata* be included in its synonymy. Thus we have Jeffreys and Watson agreeing that their specimens belong to the same species. However, a further complication enters into the picture in that Watson's description does not fit the description or figure of *P. clathrata*. He states that his specimen is porcellaneous-white, while *clathrata* is lusterless; that the fissure is short and broad while one of the most striking features of *clathrata* is its very elongated orifice; that the sculpture consists of 60 or 70 riblets, while as a matter of fact *clathrata* has only 40; that the inside of *plecta* is not hollowed into the apex, while *clathrata* is. Finally he makes the contradictory statements that the septum in *plecta* is "very curved" and later that it is "straight and is almost perpendicular." Since both Jeffreys and Watson seem to have seen each other's specimen, and since Jeffreys' description agrees with his figured specimen and also with one specimen I have examined from off Cumberland Island, Georgia, one can only infer that Watson's description must be in error and let the final determination rest upon an examination of Watson's specimen, which unfortunately has never been figured.

Range. Eastern Atlantic: off Portugal. Western Atlantic: south of Georgia, and south, probably along Florida and the West Indies.

Records. Western Atlantic: Georgia: off Cumberland Island, *Albatross*, station 2668 in 294 fathoms. Lesser Antilles: off Culebra Island, *Challenger*, station 24 in 390 fathoms (Watson 1883 and 1886, and Jeffreys 1883).

Puncturella (Puncturella) brychia *Watson*, Plate 63, fig. 1–3

Puncturella brychia Watson 1883, Journ. Linn. Soc., London, **17**, p. 32; Watson 1886, Challenger Report **15**, p 40, pl. 4, fig. 7a–e (off Halifax, Nova Scotia).

Description. "*Shell.* Very small, porcellaneous, translucent, oval, very slightly broader in front; its side slopes are slightly, its front slope extremely convex, its back slope is short and flattened and very much overhung by the protuberant apex; there are sparse and distinct riblets. The slit is short and coarse, though not large; and from it a broad round ridge trending to the right runs to the margin. *Sculpture.* The riblets are neither strong nor sharp; but they are distinct, rising as little round threads from the surface, and being parted by broad intervals, rather strongly pitted by the little specks of the genus; the ridge which runs down the front of the shell is the full breadth of the slit;

the concentric striae are mere slight irregular lines of growth. *Color* clouded, porcellaneous white under the brownish caducuous epidermis. *Apex* very much curled in and bent down, but not spread out on the backward slope; the minute extreme tip is exserted and projects; the whorls $2\frac{1}{4}$. *Slit:* the open part is short and narrowly oblong, and as broad in front as behind, from which point the old scar runs up the crest. *Margin* thin, patulous, especially behind, crenulated by the riblets. *Inside* porcellaneous, deeply hollowed into the apex; scored by the rib-furrows, of which the one in front is very strong, particularly near the slit, which is rather closely covered by the strong, slightly arched septum, which has a retracted edge and is unbuttressed.

In the animal the eye-peduncles are present; but no eyes are visible; the pedal papillae are very small, as is also the funnel-shaped process leading to the shell-slit."

length	width	height	
4.5	3	2.5 mm.	Holotype

Types. The type is probably in the British Museum; the type locality is off Halifax, Nova Scotia, *Challenger*, station 47 (N. Lat. 41°15′; W. Long. 65°45′) in 1340 fathoms.

Remarks. I have not seen this species. The description and the figures are taken from Watson. Although Watson in his description states that in *brychia* the old scars of the fissure run up to the crest, thus seeming to indicate that it possesses an anal fasciole, the figure shows a long septum running very near the surface and closing most of the fissure, very much as in *P. clathrata*. For this reason I include *brychia* in *Puncturella* s.s. and not in *Cranopsis* where it would belong if Watson's description alone were taken into consideration.

Range and *Records.* See under *Types.*

Puncturella (Puncturella) pauper *Dall*, Plate 59, fig. 4–6

Puncturella pauper Dall 1927, Proc. United States Nat. Mus. **70**, Art. 19, p. 10 (south of Cuba).

Description. Shell very small, about 5 mm. in length, conical and moderately high, the height being 60% that of the length. Color a dark cream. Base ovate, narrower in front. Anterior slope gently convex, posterior slope very slightly concave, almost straight. Apex placed high on the shell immediately behind the middle. The apical whorls, so well developed in the majority of the species of this group, are reduced in this species to a very small beak at the summit of the shell. Fissure long, progressively narrowing to its upper end, and provided with a small sharp denticle at the middle of its lower end. It lies high on the anterior slope, its upper end being very near the apex. Sculpture consists of numerous radiating ribs between which intermediate riblets are intercalated. Strong cords cross the shell forming square pits with the radiating ribs and riblets. Margin slightly crenulated. Interior of shell glossy, the ribs of the outside marked as fine radiating grooves. The internal septum is triangular, very small and flat, covering only the extreme upper end of the fissure. The rest of the aperture is surrounded by a thin callus.

length	width	height	
5	4	3 mm.	Holotype

Types. Holotype, United States National Museum, no. 93906, from off Guantánamo, Cuba, *Albatross*, station 2135 in 250 fathoms.

Remarks. This species is very distinct. The denticle at the middle of the lower end of the fissure is very unusual. In addition, the much reduced flat septum is an unique character so far as the Western Atlantic species of *Puncturella* are concerned. This seems to indicate one of the last stages in the evolution of *Puncturella* s.s. The sculpture of *P. pauper* is very close to that of *P. abyssicola*, but they differ in all other characters, *P. abyssicola* having the apical whorls well developed, and at the same time placed farther backwards. The orifice is much shorter, of different shape and lacks the tooth at the lower end. In addition, the septum of *P. abyssicola* is long and strongly arched, giving rise to a funnel-like formation which covers the entire orifice.

P. pauper is a rare species, the only specimen known being Dall's type.

Range and *Records.* See under *Types.*

Puncturella (Puncturella) noachina *Linné*, Plate 60, fig. 1–3; Plate 61, fig. 1–6

Patella noachina Linné 1771, Mantissa Plantarum, p. 551 (locality unknown).

Patella fissurella O.F.Muller 1776, Zoologiae Danicae Prodromus, p. 237; O.F.Muller 1788, Zoologia Danica, p. 24, pl. 24, fig. 4, 5 (in finis Dröbachiensibus raro [Dröbak, Norway]).

Puncturella noachina Lowe 1827, Zool. Journ. **3**, p. 77 (Oban [Scotland]); Forbes and Hanley 1853, Hist. British Mollusca **2**, p. 474; Dautzenberg 1881, Feuille des Jeunes Naturalistes, p. 4 (Cannes); Locard 1898, Exp. Scient. Travailleur et du Talisman, Moll. Test. **2**, p. 80 (West of Cape Finisterre); Dautzenberg and Fischer 1912, Result. Camp. Scient., Prince de Monaco **37**, Moll., p. 288.

Cemoria Flemingii 'Leach' Lowe 1827, Zool. Journ. **3**, p. 77.

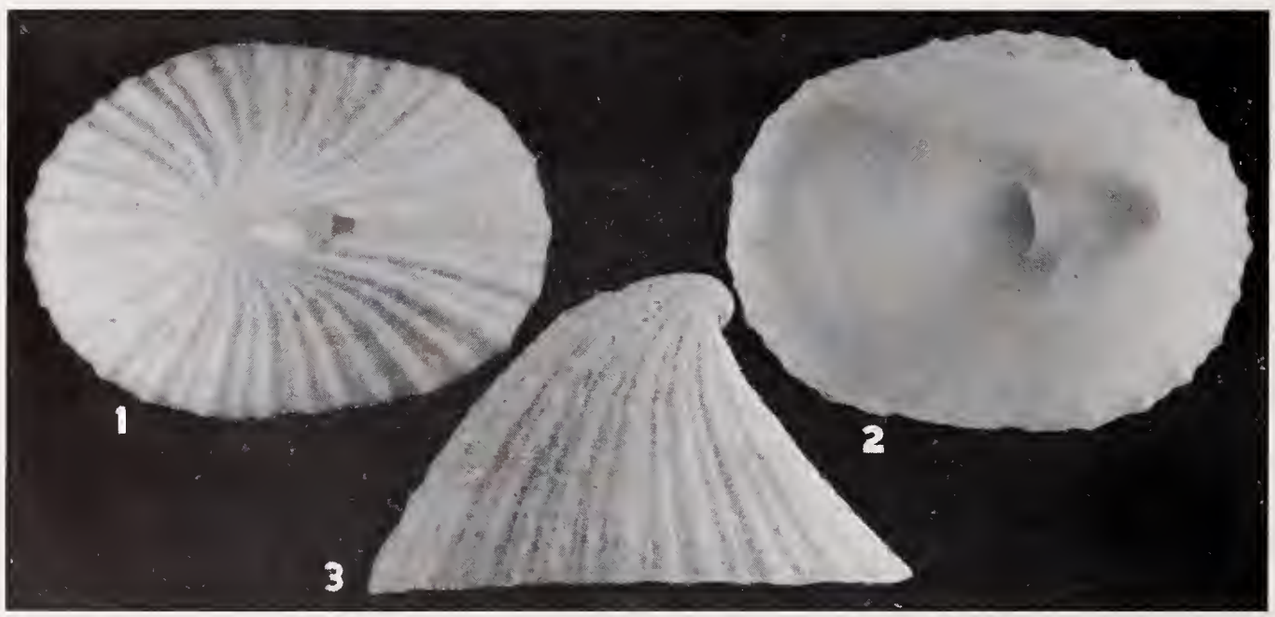
Sipho striatus Brown 1827, Illust. Conch. Great Britain and Ireland, Index, p. 3, pl. 36, fig. 14–16.

Sypho striata Brown 1827, Illust. Conch. Great Britain and Ireland, pl. 36, fig. 14–16 [this name in the explanation of the plate].

Cemoria princeps Mighels and Adams 1842, Boston Journal Nat. Hist. **4**, p. 42, pl. 4, fig. 9; Mighels and Adams 1843, Proc. Boston Soc. Nat. Hist. **1**, p. 49 (stomach of a haddock, 75 to 100 miles off the mouth of the Kennebec River, Maine).

Diodora noachina Gray 1847, Proc. Zool. Soc. London, pt. 15, p. 147.

Cemoria flemingiana Leach 1852, Synopsis Moll. Great Britain, p. 214, pl. 10, fig. 4, 5 (mari Orcadensi et Zetlandiensi [Orkney and Shetland Islands seas]).



Photographs by Marion Bills

Plate 60. *Puncturella* (*Puncturella*) *noachina* Linné
Fig. 1–3. Off Duxbury, Massachusetts (7×).

Description. Shell conical, laterally compressed, medium in size, generally not exceeding 12 mm. in length, usually high, but varying in height from 60% to 85% of the length in adult specimens. Color uniformly white, externally rather dull, internally glossy, the majority of the specimens being translucent. Base narrowly elliptical. Anterior slope slightly convex, posterior slope straight or very slightly concave. Apical whorls one and one-half, at the top and a little behind the middle of the shell, bent backwards and downwards against the posterior slope and turned toward the right. The surface of the apical whorls is slightly rough, without ribs but with several rows of punctules radiating from the apex and continuing to the margin over the rest of the shell where new rows also appear. Fissure high on the posterior slope immediately below the summit, tapering above, enlarging near its lower extremity to contract again at the end. The surface is sculptured with from 21 to 26 primary ribs, starting at the base of the apical whorls, between each two of which a secondary rib appears lower down; sometimes a third series of ribs appears between the other two. The strength of the sculpture varies a great deal, even among individuals in the same locality. This can be observed in the specimens figured in Plate 60 and Plate 61, fig. 1–3, both coming from the same locality. The ribs may be strong or weak, sometimes so weak that they hardly stand out from the surface; in the former case they may be slightly beaded. There is no true concentric sculpture, but some of the lines of growth decussate the surface. Between the primary and secondary ribs there are generally one, two or three rows of chalky-white punctules, some of these being a continuation from the apical whorls. Margin sharp, crenulated, the projections caused by the primary ribs being bolder than those caused by the intermediate ribs. Inside of the shell porcellaneous-white and glossy, sometimes nacreous. In strongly sculptured shells the primary ribs are marked by radiating translucent grooves. The rows of punctules on the outside show through as radiating series of points. Septum narrow, generally strongly convex, producing with the walls of the shell a funnel-like formation and extending a little beyond the end of the fissure. From the lower end of the fissure a shallow and fine groove extends to, or nearly to, the margin of the shell and is bounded on either side by a low ridge or callosity which is a continuation of the side of the septum at its point of attachment to the shell. The septum is sometimes buttressed on each side by a prop. A triangular shallow depression is formed on each side at the base of the septum, bounded by the septum, the prop and the sides of the shell. Forbes and Hanley (*l.c.*) described the animal as follows: "The animal is white. The head, which is tumid but short, bears two rather obtuse subulate stout tentacula, with the eyes, which are very large, on prominent bulgings, or short peduncles at their external bases. The mantle is simple-edged. The foot is oblong and not steep or high-sided; at its junction with the body there are on each side, six or seven short cirrhi, and an odd one, larger than the rest, and behind them on the left side. There are no cirrhi posteriorly. From the anal cleft projects a conspicuous truncated sheath-like membrane, open in front, where are three or more retractile papillae. The branchiae are distinctly visible in the cavity behind the head." Pelseneer (1899, Mém. Cour. L'Acad. Roy. Belgique **57**) and Rammelmeyer (1925, Zoologischer Anzeiger, Leipzig, **64,** p. 105) have made very careful anatomical studies of this species. The radula has been studied several times: for instance, by H. Friele (1877, Archiv. Mathematik og Naturvidenskab **2,** p. 303, pl. 1, fig. 3).

	length	width	height	
(large)	11.25	7.5	8 mm.	Maine
(average)	5	6.5	5.5	off Duxbury, Mass.

Types. The whereabouts of Linné's type is unknown to me. O. F. Müller was the first to give a specific locality for *P. noachina*, namely, Dröbak, Norway, and this is here selected to be the type locality.

Remarks. Puncturella noachina is a widely distributed species extending as it does from Franz Joseph Land in the Arctic Ocean, to off Spain in the Eastern Atlantic and west to the coast of North America from Greenland and North Canada to Cape Cod. It also occurs under various ecological conditions and in depths from near the low water line to 1105 fathoms.

As a consequence of its wide distribution and variation in shell characters, several names have been applied to this species. However, specimens from a single locality frequently show most of the variations that have been reported separately from various parts of its range. Hence the names that have been used for these several variations have to be considered as synonymous. The sculpture varies greatly, even on specimens from a single locality; for example, the ribs may be weak or well developed. There may be many or few rows of conspicuous punctules or these punctules may be relatively indistinct or even absent. The buttresses or props to the septum are generally, though not always, absent in young individuals and generally, though not invariably, present in adult forms. So far as I can determine, these variations exist wherever this species is known to occur. In particular, it has been held that the European and North American forms are distinct, either as species or subspecies, but in an examination of a large series of specimens from both sides of the Atlantic, no difference could be found which would permit such a separation.

Mighels and Adams in the original description of their *Cemoria* (=*Puncturella*) *princeps* stated that it differs from *P. noachina* in the following particulars: the ribs are more elevated in *P. noachina*, slight and obtuse in *P. princeps;* the interior sulci are much more obvious and the posterior slope strongly and regularly curved in *P. noachina*, while

Photographs by Marion Bills

Plate 61. *Puncturella* (*Puncturella*) *noachina* Linné

Fig. 1–3. Off Duxbury, Massachusetts (7×). Fig. 4–6. Maine (7×).

in *P. princeps* the slope is subrectilinear; the shell in *P. noachina* is smaller, proportionately longer, and not so high. All these are variable characters. In addition they stated that the septum in *P. princeps* is strengthened by props while *P. noachina* is without them. However, we possess a single specimen from Mighels in the C. B. Adams collection, determined by him as *P. noachina* (MCZ 156450) coming from Maine, and this specimen possesses "wings" or props to the septum contrary to their statement that this species is without them! Mighels and Adams described *P. princeps* from a small series of specimens (originally taken from the stomach of a haddock) which represent an extreme variation of *P. noachina*. Specimens like the one they figured in their description with a very weak sculpture and with almost straight sides, may be found along with others showing the more pronounced ribs and more marked slopes of typical *noachina*.

Dall (1927, Proc. United States Nat. Mus. **70,** Art. 19, p. 10) considered the Western Atlantic species to be *P. princeps* and made reference to a variety. He stated: "Among our northern forms *P. princeps* is marked by distinct punctuation in the interspaces between the ribs and an obscure beading on the ribs. In the supposed variety [he does not give it a name or make any other reference to it] the ribs and the interspaces are smooth. The latter closely resembles the European *noachina* and may be conspecific." Here again I have examined an enormous amount of material from all along the range of distribution of this species in North America and have been unable to separate specimens either as varieties or as geographical subspecies.

Punctulella galeata Gould has been placed many times in the synonymy of *P. noachina;* however *galeata* is definitely a good species readily separable from *P. noachina* and found in a different area, western North America, from Unalashka, Aleutian Islands and south to Santa Barbara, California.

The Magellanic species *P. cognata* Gould, *P. falklandica* A. Adams and *P. conica* d'Orbigny and *P. analoga* v. Martens, have also been considered to be the same as *P. noachina*. However Dall (1914, The Nautilus **28,** p. 62) states that "the northern species have thickish tentacles with the eyes on protuberanees at their outer bases; the antarctic forms have long slender tentacles with the eyes about one third the length from the insertion of the tentacle." The matter being still open to discussion, I do not include these names in the synonymy of *noachina*.

De Kay's report of this species from New York was based on shells found in stomachs of fishes and this species never has been found elsewhere south of Cape Cod (1843, Zoology of New York, pt. 5, Mollusca, p. 156, pl. 9, fig. 195).

Range. Eastern Atlantic: Franz Josef Land in the Arctic Ocean south to Scotland and northern England and on the continent along the coast of Norway and south to Spain. Western Atlantic: from Greenland and Melville Peninsula, Hudson Bay, south to Cape Cod.

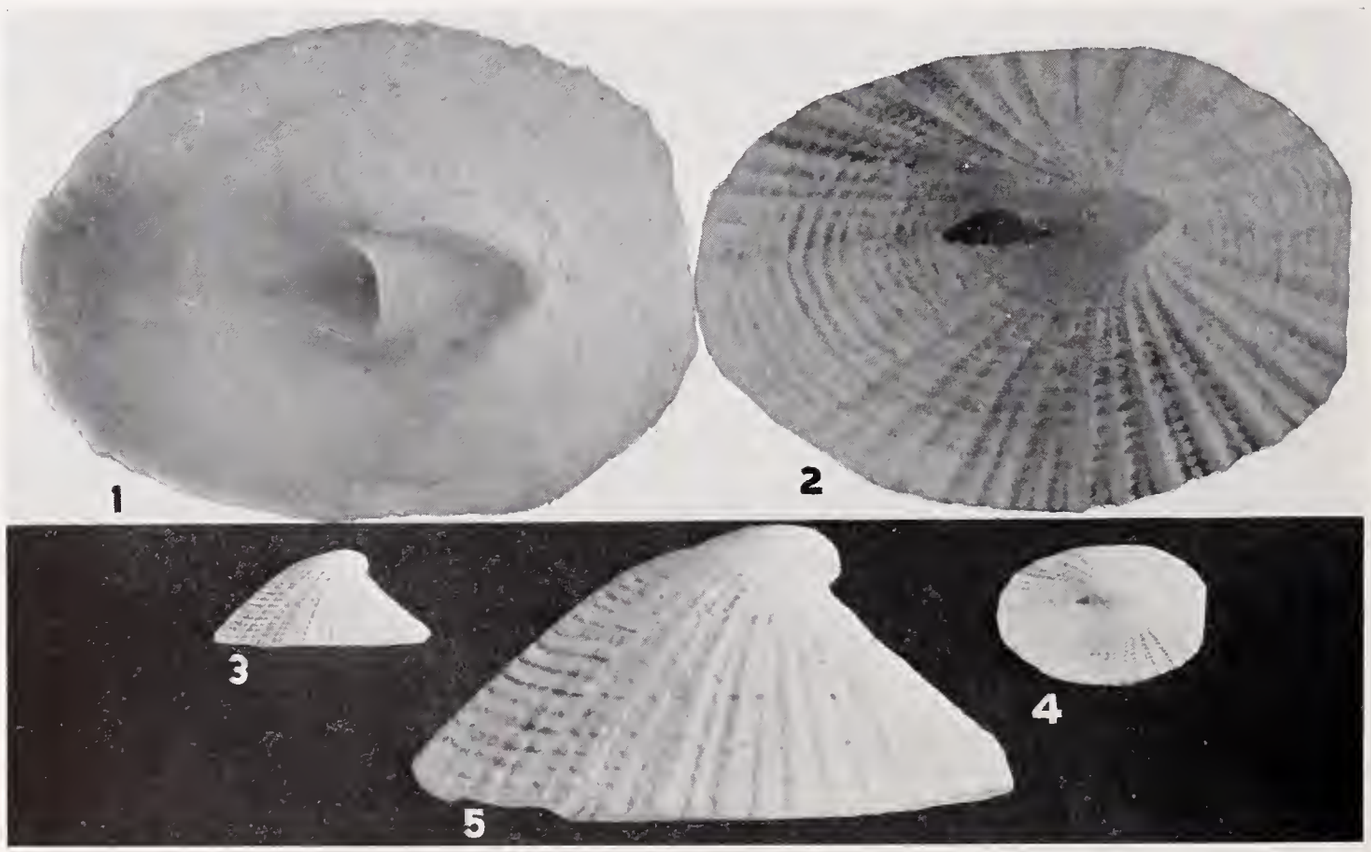
It has also been recorded from the south Indian Ocean. The records from western North America are definitely known to be based upon other species. Records from the Sea of Okhotsk, Korea and Japan should all be restudied to determine if they are *P. noachina* or a closely allied species.

Records. Western Atlantic: Greenland: (MCZ). Northwest Territories: S. end of Melville Peninsula in 7–25 fathoms (USNM). Labrador: Egg Harbor in 7 fathoms; Henley Harbor in 3 fathoms; Shoal Tickle, 20 miles S.E. of Nain (all MCZ).

NEWFOUNDLAND: St. Pierre Id. in 5 fathoms. QUEBEC: off Bonadventure Id. in 9 fathoms (both MCZ). NOVA SCOTIA: off Halifax, *Speedwell*, station 124 in 51 fathoms and station 103 in 92 fathoms (both USNM); Emerald Bank in 45–55 fathoms; S.W. of Cape Sable in 40 fathoms (both MCZ); between St. Pierre and Banquereau Banks, *Albatross*, station 2481 in 116 fathoms; Bay of Fundy (both USNM). CAPE BRETON ISLAND: off Cheticamp (USNM). NEW BRUNSWICK: E. of Grand Manan in 28–52 fathoms. MAINE: Perry: Eastport in 20 fathoms (both MCZ): off Little River, in 40 fathoms; Schoodie Id. (USNM): Frenchman's Bay in 1–35 fathoms: Bar Harbor in 15 fathoms; Egg Rock: Bartlett Id.; Blue Hill Bay, Bass Harbor: Baker Id.; Penobscot Bay (all USNM): Isle au Haute: Kimball Id.; 75 to 100 miles off mouth of the Kennebec River (all MCZ): Casco Bay, Portland Harbor: Platt Bank, *Bache*, station 69B in 32 fathoms; E. of Jeffreys Ledge, *Bache*, station 73B, in 102–105 fathoms (all USNM). NEW HAMPSHIRE: Cashe's Ledge, *Bache*, station 55 and 56B in 30–40 fathoms (both USNM). MASSACHUSETTS: off Duxbury in 10 fathoms (MCZ); off Race Point, *Fish Hawk*, station 1086 in 34 fathoms: Georges Bank, *Bache*, station 96 and 97B in 150 fathoms; E. of Georges Bank, *Albatross*, station 2525 in 72 fathoms and station 2526 in 121 fathoms; Buzzards Bay, *Fish Hawk*, station 1033 in 183 fathoms: off Martha's Vineyard, station 1095 in 321 fathoms and station 1096 in 317 fathoms: off Nantucket, *Albatross*, station 2262 in 250 fathoms (all USNM).

Puncturella (Puncturella) abyssicola *Verrill*, Plate 62, fig. 1–5

Puncturella abyssicola Verrill 1885, Trans. Connecticut Acad. **6**, pt. 2, p. 425 (N. Lat. 39°03′15″; W. Long. 70°50′45″ [south of Martha's Vineyard]).



Photographs by Marion Bills

Plate 62. *Puncturella* (*Puncturella*) *abyssicola* Verrill
Fig. 1–5. South of Martha's Vineyard, Holotype (fig. 1, 2 and 5, 7×; fig. 3, 4, $2\frac{1}{2}$×).

Description. Shell about 10 mm. in length, thin but strong, low conical, expanding toward the margin, its height being 45% of the length. Color a pure dull white. Base ovate, narrower in front. Anterior slope convex, posterior slope straight. Apical whorls one and one quarter, increasing very rapidly in diameter, with the surface puncticulate. They are on top of the shell but at the same time are turned somewhat backwards and downwards and placed a little behind the middle. Fissure short, tear-shaped, the upper end being rounded. From this end of the fissure a short anal fasciole runs to the base of the apical whorls, being provided with only five incremental lamellae. From the anterior end of the fissure a shallow ridge runs down the middle of the front slope. The surface is sculptured with 32 rather strong, radiating ribs between each two of which a finer one is intercalated. Concentric cords cross the shell forming elongated nodules where they intersect the ribs and give to the shell surface a cancellated appearance. Margin finely crenulated by the ends of the ribs. Interior of shell a nacreous-white with the outer ribs showing through in the form of very fine radiating grooves. Internal septum strongly arched and long, extending down beyond the fissure. Below the septum there is a low ridge on each side of a shallow and fine groove which extends toward the anterior margin of the shell. The ridges are extensions of the sides of the septum where it is attached to the shell.

length	width	height	
10	6.75	4.5 mm.	Holotype

Types. Holotype, in the United States National Museum, no. 44837, from South of Martha's Vineyard, Massachusetts, *Albatross*, station 2222 (N. Lat. 39°03′15″; W. Long. 70°50′45″) in 1537 fathoms.

Remarks. This species seems to be related to *P. noachina* but the two can readily be differentiated: *P. abyssicola* is much less elevated and is expanded instead of being compressed; the primary radiating ribs are more numerous, only up to 26 in number in *noachina* while in *abyssicola* there may be 32. Finally, strong concentric cords are very conspicuous in *abyssicola*, but are absent in *noachina*.

Range and *Records.* See under *Types.*

Key to the species of *Puncturella* s.s. in the Western Atlantic

1.	Interior of shell with two ridges continuous with the outer edges of the septum and extending along each side of the mid-line of the anterior slope	2
	Interior of shell not having ridges along each side of the mid-line of the anterior slope	3
2.	Shell sculptured with 32 primary radiating ribs; with concentric cords	*P.* (*P.*) *abyssicola*
	Shell sculptured with no more than 26 primary radiating ribs; without concentric cords	*P.* (*P.*) *noachina*
3.	Shell with a large and more or less convex septum, extending at least as far as the middle of the fissure	4
	Shell with a small, flat septum covering only the extreme upper portion of the fissure	*P.* (*P.*) *pauper*
4.	Shell sculptured with rows of tubercles arranged in chevron formation	*P.* (*P.*) *oxia*
	Shell with some other type of sculpture	5
5.	Shell with a few, very fine, radiating ribs front and back	*P.* (*P.*) *borroi*
	Shell with radiating ribs, fine or strong, all around	6
6.	Shell with the fissure much elongated; septum extending very obliquely near the anterior wall	7
	Shell with the fissure not elongated; septum extending almost vertically or only slightly obliquely	8

7. Shell sculptured with radiating riblets and concentric threads; not having a ridge from the lower end of the fissure to the anterior margin *P. (P.) plecta*
   Shell sculptured with radiating riblets but without concentric threads; with a broad round ridge running on the outer surface from the lower end of the fissure to the anterior margin *P. (P.) brychia*

8. Shell with numerous radiating ribs starting at the summit; as the shell broadens, additional ribs appear so that all are equally spaced over the entire surface 9
   Shell with rather widely spaced radiating primary ribs; an additional series of fine ribs appearing somewhat near the margin. In this arrangement the ribs are widely spaced above and narrowly spaced below *P. (P.) circularis*

9. Shell with raised and moderately spaced radiating ribs and concentric cords which give to the shell a reticulated or basket-work appearance *P. (P.) sportella*
   Shell with fine close-set radiating riblets and concentric threads, with a granular rather than reticulated appearance *P. (P.) profundi*

Subgenus **Fissurisepta** *Seguenza*

Fissurisepta Seguenza 1863, Annali dell'Accademia degli Aspiranti Naturalisti (3) **2**, p. 83.

Subgenotype, *Puncturella* (*Fissurisepta*) *papillosa* Seguenza (subsequent designation, Woodring 1928, Carnegie Institution of Washington, no. 385, Miocene Moll. Bowden, Jamaica, p. 454).

Shell conical and straight, with the apical whorls lost in the adult. Fissure at the summit, circular or ovate. There is no groove from the lower end of the fissure to the anterior margin, either on the outer or on the interior surface. Internal septum generally well developed as a wide shelf extending down beyond the middle, or reduced to a very small triangular lamina. The surface may be smooth or sculptured. If sculptured, there may be radiating ribs and concentric cords or there may be tubercles arranged in different patterns.

Puncturella (Fissurisepta) trifolium *Dall, Plate* 63, fig. 4–7

Puncturella trifolium Dall 1881, Bull. Mus. Comp. Zoöl. **9**, p. 76; Dall 1889, Bull. Mus. Comp. Zoöl. **18**, p. 403, pl. 26, fig. 8, 8b (Yucatán Strait).

Description. "Shell brownish white, acutely conical, with anterior and posterior walls nearly straight, except near the tip where they are slightly concave, especially the latter; tip erect, squarely truncated at the top, not twisted, inclined or recurved; surface ornamented with some twenty-four to thirty strongly elevated rounded ribs, smooth for the most part, but undulating a little as they pass over the concentric sculpture and rarely and irregularly spinous; these spines do not exceed two or three on any rib, occur only on the stronger ribs and are short, pointed, solid, and acutely triangular; between the primary radiating ribs are secondary ones about equal in number, but not spinous, and not raised above the concentric sculpture; the latter is not strictly concentric except in a general sense, and consists of stout spongy bands connecting the ribs, passing from base to base between each pair of primary ribs on a level with the secondaries, but not evenly continuous clear around the shell, and having a pumice-like texture, so that the bands are not defined sharply like the ribs; the spaces left vacant by this reticulation are rather deep, and have a worm-eaten appearance; shell inside smooth, with shallow grooves indicating the stronger external ribs and with a striated space over the head between the anterior horns of the scar of the great pedal muscles. Puncture externally circular, as in *Glyphis* [*Diodora*], internally trefoil-shaped from the projection of the middle of the

septum and two little shelly knobs on each side into the space; septum triangular, very small and short, inclined in about the same plane as the anterior wall of the shell, in the middle of its lower edge produced and thickened like a little short tongue; about half way between the base of the septum and the outer upper surface of the perforation inside the tube and at about equal distances from each other and from the median line of the septum, are two little shelly triangular projections, which give to the interior of the apex, when looked through, the trilobate outline referred to in the specific name; base of the shell ovate, the margin showing projections and indentations corresponding to the sculpture of the exterior."

length	width	height	
14	10.5	7 mm.	Holotype

Types. Holotype at the United States National Museum, no. 333725, from Yucatán Strait. It was collected by the *Blake* at 640 fathoms.

Remarks. Although we have examined the holotype of this species, we have quoted above Dall's excellent description. *P. trifolium* is quite different from any other species known in the genus: the peculiarities of the orifice and its types of sculpture readily differentiate it. The only specimen known is Dall's type.

Range and *Records.* See under *Types.*

Puncturella (Fissurisepta) acuminata *Watson*, Plate 64, fig. 1–3

Puncturella (*Fissurisepta*) *rostrata* 'Seguenza' Watson 1883, Journ. Linn. Soc., London, **17**, p. 38; Watson 1886, Challenger Report **15**, p. 4 [description, not figure] (off Saint Thomas, north of Culebra Island, West Indies).

Puncturella (*Fissurisepta*) *acuminata* Watson 1883, Journ. Linn. Soc., London, **17**, p. 38 (off Saint Thomas, north of Culebra Island, West Indies).

Puncturella (*Fissurisepta*) *triangulata* Dall 1889, Bull. Mus. Comp. Zoöl. **18**, p. 404 (coast of Yucatán); Dall 1890, Proc. United States Nat. Mus. **12**, p. 357 (off Cozumel Island, coast of Yucatán; and off Fernandina, Florida [actually off Cumberland Island, Georgia]).

Fissurisepta triangulata Dall 1927, Proc. United States Nat. Mus. **70**, Art. 18, p. 112 (off Fernandina, Florida [actually off Cumberland Island, Georgia]; coast of Yucatán; Bay of Campeche).

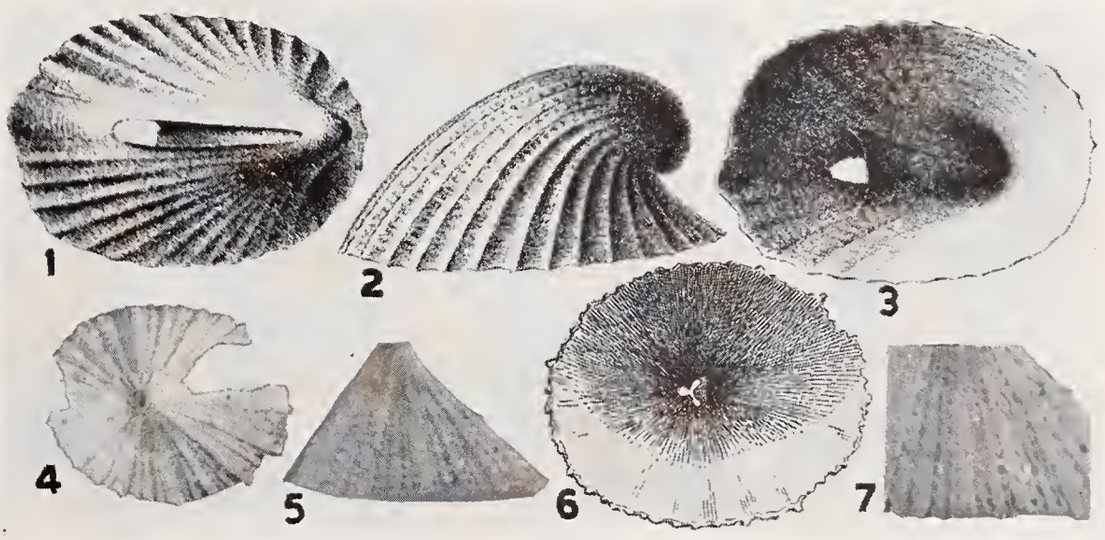


Plate 63. Fig. 1–3. *Puncturella* (*Puncturella*) *brychia* Watson, off Halifax, Nova Scotia, 8× (after Watson). Fig. 4–7. *Puncturella* (*Fissurisepta*) *trifolium* Dall, Yucatán Strait, Mexico, Holotype (fig. 4, 5, 2×; fig. 6, 2½×, after Dall; fig. 7, 4×).

Fissurisepta microphyma Dautzenberg and H. Fischer 1927, Resultats Camp. Scient. Albert 1er, Fasc. **77**, p. 224, pl. 7, fig. 16 (Azores).

Description. Shell very small, about 4 mm. in length, highly conical, the height being from 75% to 130% that of the length, laterally compressed, vitreous, and colored an oyster-white. Base narrow-ovate, slightly wider behind than in front, the sides arched so that when placed on a plane, the shell rests on the ends. Anterior slope slightly convex, posterior slope very slightly concave. Fissure elliptical, placed at the summit from immediately behind the center to the posterior fourth, set obliquely, higher at the posterior end. Sculpture consists of rounded, chalk-white, bluntly-prominent tubercles, generally widely-set in oblique parallel rows. Sometimes the tubercles may be rather closely-set. The two margins of the septum, which are attached to the sides of the shell, show through on the outside as two white lines. Sometimes there exist two sulci that correspond to these two white lines. Margin smooth. Interior of shell glossy. Internal septum a long, thin shelf extending down slightly below midway of the height, running obliquely very near the anterior wall. It divides the interior into two unequal portions, the anterior being much smaller.

	length	width	height	
(large)	5	3.5	4 mm.	off Cozumel Island, Yucatán, Mexico
(average)	4	3	3	off Cumberland Island, Georgia
	3.25	2.5	4.25	off Cumberland Island, Georgia

Types. The types of *acuminata* Watson are in the British Museum, the type locality being off Saint Thomas, north of Culebra Island, West Indies, *Challenger*, station 24 (N. Lat. 18°38′38″; W. Long. 65°5′30″) in 390 fathoms. The types of *triangulata* Dall are in the United States National Museum, no. 61236, from off Cozumel Island, Yucatán, Mexico. I have chosen a lectotype from Dall's cotypes.

Remarks. I agree with Dall that this species is distinct from *rostrata* Seguenza. There are differences in the arrangement of the tubercles: those of *rostrata* being equally disposed both horizontally and vertically, while in *acuminata* the tubercles are disposed in horizontal rows, but alternate rows are offset to form oblique rows from the top to the base or a quincuncial pattern when groups of five tubercles are considered. The position of the fissure also differs in both species: in *rostrata* it is placed in the posterior fourth or beyond the posterior margin of the shell, while in *acuminata* it is placed immediately behind the center to the posterior fourth.

It is unfortunate that this species can not be attributed to Dall, who was first to consider it separate from *rostrata* Seguenza. Watson, following his usual procedure of giving new names to species already described, published the name *acuminata* with *rostrata* Seguenza. However, his description does not apply to the latter species but to *triangulata* Dall, therefore, the name *acuminata* Watson must be used as it was published six years before the name employed by Dall. So far Seguenza's species has not been found on this side of the Atlantic and may very well be strictly an Eastern Atlantic species.

P. (*Fissurisepta*) *acuminata* has in most cases a ratio of height to length of 75% to 100%, but a few specimens from off Cumberland Island have a ratio over 100%, even up to 130%. In this locality typical specimens are also found.

Range. South Carolina and south through the West Indies and along the coast of Mexico.

Records. South Carolina: *Albatross*, station 2314, N. Lat. 32°43′; W. Long. 77° 51′, in 159 fathoms. Georgia: off Cumberland Island, *Albatross*, station 2668 in 294 fathoms (both USNM). Lesser Antilles: off Culebra Island, *Challenger*, station 24 in 390 fathoms (Watson 1883). Mexico: Bay of Campeche in 200 fathoms (USNM and ANSP); off Cozumel Island, Yucatán (USNM).

Puncturella (Fissurisepta) tenuicola *Dall*, Plate 64, fig. 4–6

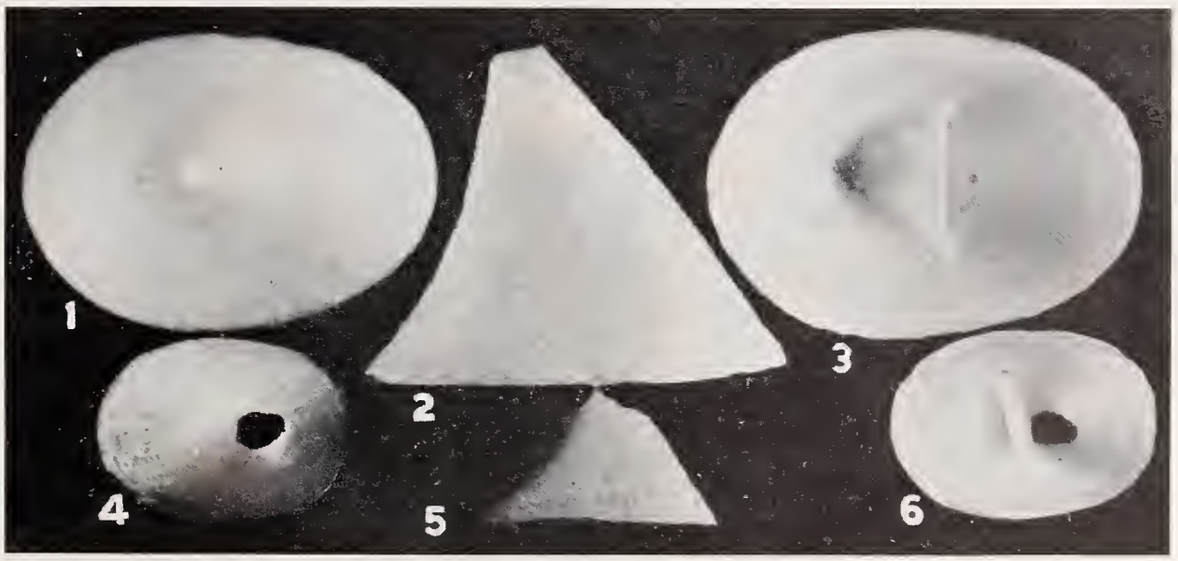
Puncturella tenuicola Dall 1927, Proc. United States Nat. Mus. **70**, Art. 18, p. 112 (off Fernandina, Florida [actually off Cumberland Island, Georgia]).

Description. Shell very small, about 3 mm. in length, thin, semitranslucent and white. Base ovate. Anterior slope straight, posterior slope slightly concave and longer. Apical whorls absent. Orifice ovate, large for the size of the shell. The outer surface has neither radiating ribs nor true concentric sculpture, only numerous concentric growth lines being visible. Interior surface possesses numerous, chalky-white striae radiating from the top to near the margin; lower down on the shell short striae are intercalated, and there is a smooth narrow band above the margin. The striae show on the outside as white lines. Internal septum a rather wide, convex shelf extending very near the posterior wall, forming with it a sheath-like process. The septum also has longitudinal chalky-white striae.

length	width	height	
3	2	1.75 mm.	Holotype

Types. Holotype, United States National Museum, no. 108151, the type locality being off Cumberland Island, Georgia, *Albatross*, station 2668 in 294 fathoms.

Remarks. This little species is readily differentiated from others in this subgenus by



Photographs by Marion Bills (fig. 1–3); Frank White (4–6)

Plate 64. Fig. 1–3. *Puncturella (Fissurisepta) acuminata* Watson, off Cozumel Island, Yucatán, Mexico (10×). Fig. 4–6. *Puncturella (Fissurisepta) tenuicola* Dall, off Cumberland Island, Georgia (Holotype, 10×).

possessing an almost smooth outer surface and by having the rather deeply-marked striae on the inside wall of the shell.

Range and *Records.* See under *Types.*

* * * *

Zeidora, Nesta, Emarginula and *Rimula* occur in tropical and temperate seas. Most species of *Punctarella* also occur in these waters; a limited few, however, reach the Arctic and Antarctic Oceans. A few species live at the low-water line and from there extend into moderate depths; others are known only from very deep water. *Punctarella profundi* Jeffreys, for example, has been obtained in 1640 fathoms by the *Porcupine* expedition. Little is known about their ecology though they are known to occur on most types of bottom, such as sand, mud and broken shells.

* * * *

I am deeply grateful to Miss Marion A. Bills for her splendid photographic work. Most of the species are only a few millimeters in length and lack color making it very difficult to bring out the sculpture most necessary for specific differentiation. I am also grateful to Miss Ruth Turner for the excellent drawing of *Zeidora bigelowi* and to Frank White for some fine photographs. I desire also to express my appreciation to Paul Bartsch, Harald Rehder and H. A. Pilsbry for their kindness in loaning their collections, without which this study would have been impossible. Particular thanks are extended to W. J. Clench and M. E. Champion for their invaluable aid and encouragement.

* * * *

ERRATA

Page 107 under the synonymy of *Emarginula pumila*, line eight should read: *Emarginula tumida* Dall 1890.

Page 110 the first line of the second paragraph of the footnote should read: Thiele in 1917.

Page 112 under *Remarks*, the second sentence of the second paragraph should read: Pilsbry's statement that *frenulata* is higher and wider than *longa* is not borne out by the series of measurements taken by us.

Page 113 under *Description*, the second sentence should read: Basal margin broadly elliptical, or ovate.