

Figures 54–57. *Fedikovella beanii* (Dall, 1882). 54. Dorsal view of radular ribbon. Scale bar = 25 μm . 55. Dorsal view of radular ribbon with marginal teeth folded back. Scale bar = 25 μm . 56. Detail of rachidian and lateral teeth. Scale bar = 12.5 μm . 57. Detail of distal ends or outer marginal teeth. Scale bar = 5 μm .

Fedikovella beanii (Dall, 1882)

Figures 51–57

Cocculina beanii Dall, 1882:403; Dall, 1889:347, pl. 25, figs. 2, 4, 8; Pilsbry, 1890:132, pl. 25, figs. 23, 24 [copy Dall]; Thiele, 1909:6, pl. 2, figs. 3, 4; C.W. Johnson, 1934:66 [checklist only]; Abbott, 1974:34, fig. 194 [copy Dall].

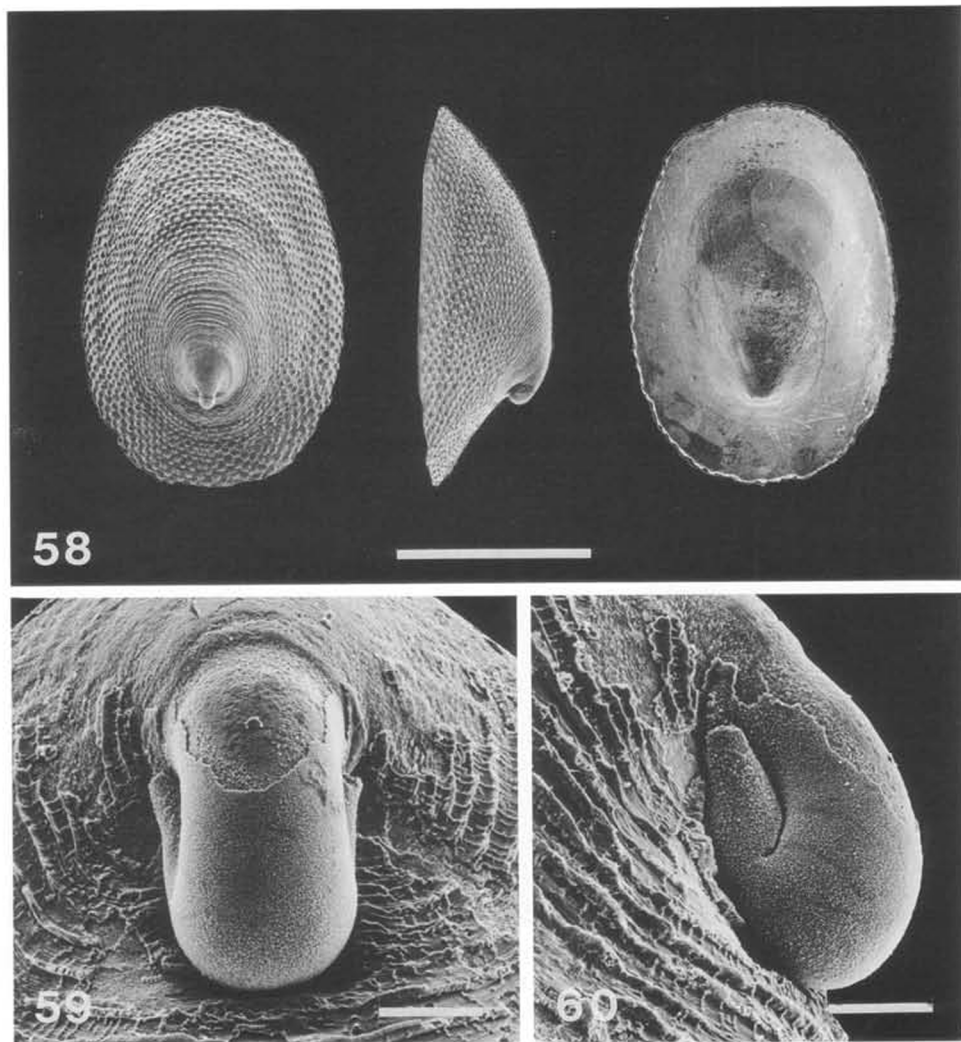
Fedikovella beanii; Moskalov, 1976:64 [as *beanii*].

DESCRIPTION. Shell (figure 51) medium-sized for family (maximum length 8 mm, original description), thin, not eroded, white, periostracum thin. Shell moderately high, that of illustrated specimen 0.47 times length. Anterior slope convex, posterior slope concave, lateral slopes nearly straight. Outline in dorsal view oval, anterior end slightly narrower than posterior end; aperture planar, ends not raised relative to sides of shell. Apex posterior to center, to left of midline; situated at $\frac{2}{3}$ shell length from anterior end. Protoconch below highest point of shell, extending posteriorly. Proto-

conch length 240 μm , protoconch sculpture (at least near tip where unworn) of parallel, concave ridges aligned to extend across but not longitudinally. Surface near ridges with fine pits (figures 52, 53). Tip of protoconch immersed in posterior slope of shell. Sculpture of raised concentric ridges and radial ribs of lesser strength, producing beaded effect particularly on posterior slope and at growth stages greater than 3 mm in shell length. Shell edge thin and sharp. Interior with well marked muscle and pallial attachment scars.

Dimensions. Length 8, width 5, height 4 mm (original description); length 5.1, width 3.7, height 2.4 mm (figure 51).

External Anatomy. Dall (1882) reported equal cephalic tentacles and the gill longer and larger than that of *Cocculina rathbuni*. Preservation was poor in the present material, and it was not used for critical-point drying and SEM examination. No gill or penis was apparent; pigmented eyes were lacking; two posterior epipodial tentacles were present.



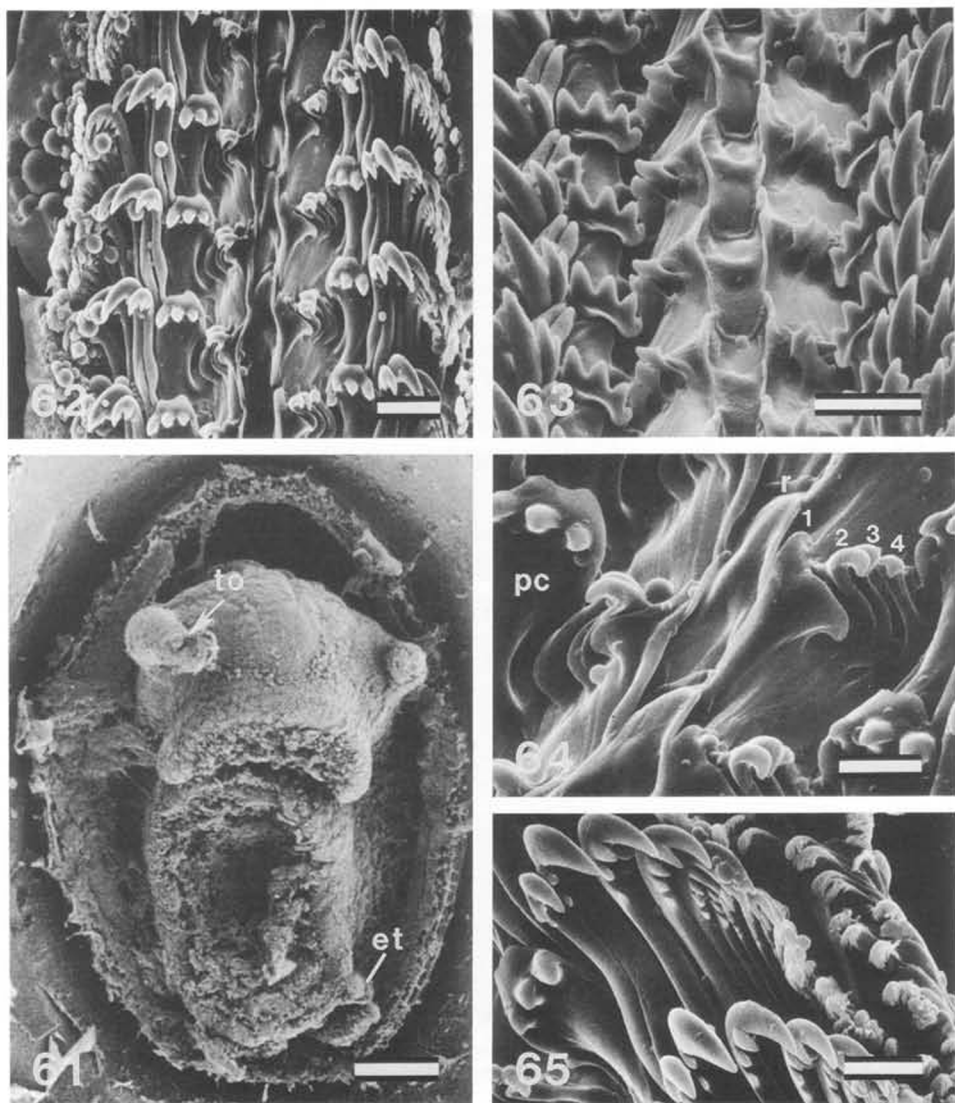
Figures 58–60. *Notocrater houbrickii*, new species. 58. Dorsal, lateral, and ventral views of holotype. Scale bar = 1.0 mm. 59, 60. Dorsal and lateral views of protoconch of holotype. Scale bars = 50 μ m.

Radula (figures 54–57). Rachidian tooth with narrow, elevated shaft, overhanging cusp with central and two lateral denticles of similar size; base of shaft bifurcated, superimposed on broader basal membrane; first and second lateral teeth narrow, elbowed, with main cusp and one or two lateral cusps on outer edge, third lateral tooth with single cusp. Pluricuspid broad, with tapered main cusp and inner and outer lateral cusps. Marginals of similar size.

NEW RECORD. Off Chateau Belair Bay, St. Vincent, Lesser Antilles ($13^{\circ}10.5'N$, $61^{\circ}15.5'W$, 421 m, on wood, with *Coccolpigya mikkelsenae*, new species. Eight specimens collected by deep-submersible *Johnson-Sea-Link II*, dive 1742, 23 April 1989. Distribution: 3 specimens USNM 860358, 3 specimens HBOM 065:03787, 2 specimens LACM 151188.

REMARKS. Dall's original description gave several localities and station numbers, including south of Martha's Vineyard Island, Massachusetts, and Martinique, but did not cite a catalog number or designate a type locality. Here we designate a lectotype, USNM 333751 from USFC sta. 997, 335 fms off Martha's Vineyard Island. The specimen is 6.46 mm in length, chipped at the posterior margin. A slip marked "Type Fig'd." accompanies the specimen. This seems to be the specimen illustrated by Dall (1889). The largest specimen of *Fedikovella beanii* in the USNM collection is 7.2 mm in length, from Blake sta. 195, 502.5 fms, off Martinique.

Dall's original description emphasized that the anterior slope was longer than in *Cocculina rathbuni* and the sculpture stronger and more cancellated, "even slightly spinous at intersections." The rachidian (figured later by Dall, 1889) was said to



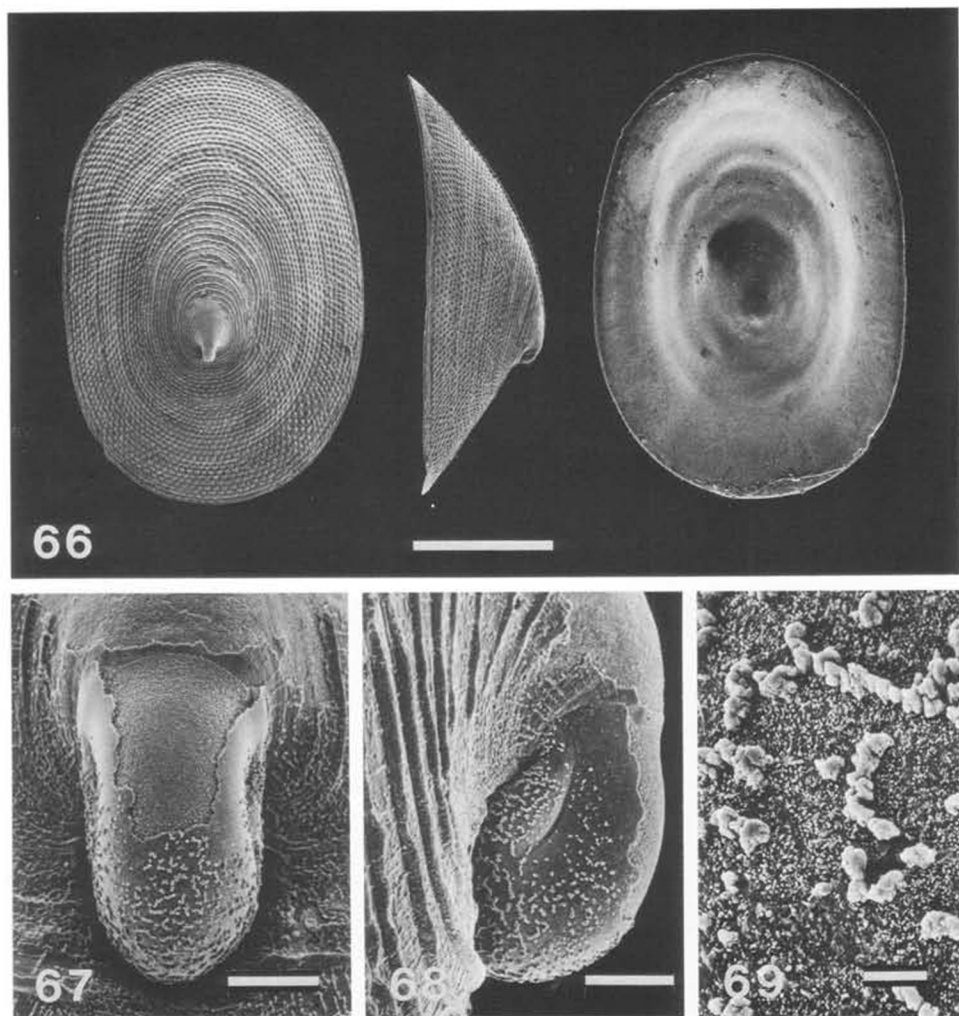
Figures 61–65. *Notocrater houbricki*, new species. 61. Ventral view of critical-point-dried animal of paratype 1. Scale bar = 100 μm . 62. Dorsal view of radular ribbon. Scale bar = 10 μm . 63. Anterior view of rachidian, lateral, and pluricuspid teeth. Scale bar = 10 μm . 64. Detail of rachidian and lateral teeth. Scale bar = 5 μm . 65. Detail of pluricuspid and marginal teeth. Scale bar = 5 μm .

et = epipodial tentacle; pc = pluricuspid tooth; r = rachidian tooth; to = tentacular opening; 1 = first lateral tooth; 2 = second lateral tooth; 3 = third lateral tooth; 4 = fourth lateral tooth.

have a tridentate cusp and bifurcate base. This is consistent with figure 56 here, in which a more extended base of the rachidian is revealed, but one that would have been obscured in the optical microscopic preparation available to Dall. Dall reported seven to eight cusps on the pluricuspid, compared to a main and two lateral cusps indicated in figure 54. However, Dall's preparation may have been worn and the actual cusp count unclear, as in figure 55. This possible discrepancy and the fact that our material showed no gill (due perhaps to poor preservation) casts some doubt on our con-

clusion that the present material represents Dall's species. However, the profile view of our illustrated specimen (figure 51) is a good match for the first 5-mm shell length in profile view of the supposed 8-mm specimen figured by Dall.

Fedikovella beanii differs from *F. caymanensis* in not having the apex overhang the posterior margin of the shell, as specified, but not illustrated by Moskalev. The depth range of *F. beanii* is consistent with the shelf and slope depths of other cocculinids, unlike the abyssal depth reported for the type species.



Figures 66-69. *Notocrater youngi*, new species. 66. Dorsal, lateral, and ventral views of holotype. Scale bar = 1.0 mm. 67, 68. Dorsal and lateral views of protoconch of holotype. Scale bars = 50 μ m. 69. Detail of protoconch sculpture in figure 68. Scale bar = 5 μ m.

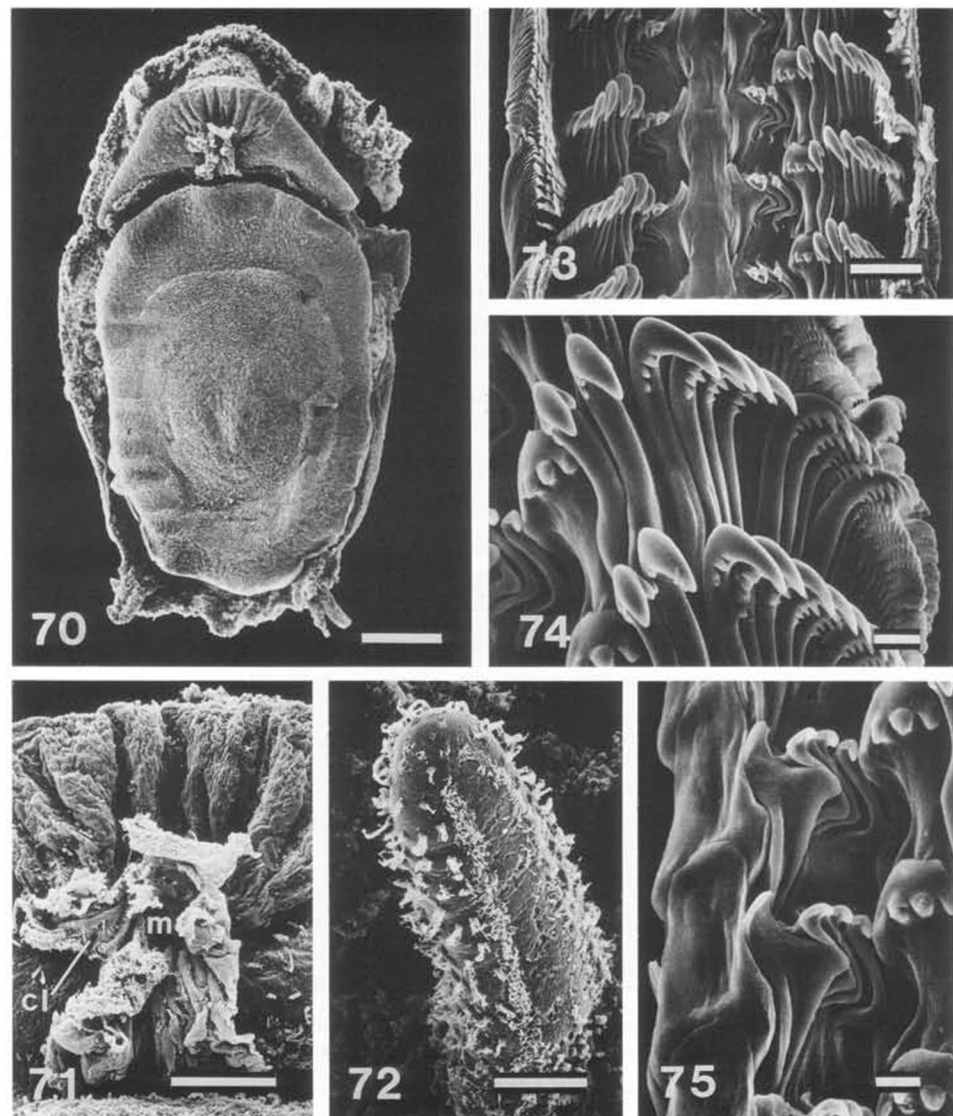
Family Pseudococculinidae Hickman, 1983

DIAGNOSIS. Apical fold of protoconch long and narrow; protoconch sculpture of pustulose crystals or anastomosing threads. Radula strongly asymmetrical, inner lateral teeth 4.

REMARKS. Hickman (1983) was the first to argue that the radula of *Pseudococculina* Schepman, 1908, was sufficiently different from that of *Cocculina* to place it in a separate family. Marshall (1986) further defined the family on shell and radular characters and Haszprunar (1988a, 1988b) treated genera and relationships based on study of anatomy. Genera in Pseudococculinidae have a greater range of expression of protoconch sculp-

ture, teleoconch sculpture, and radular and gill conditions than Cocculinidae. The right cephalic tentacle is modified and usually enlarged to function as the copulatory organ. Gill structures are secondary and, if present, are positioned in the pallial groove on either side of the foot.

The pseudococculinid radula differs from that of Cocculinidae in having the first lateral tooth large and triangular, projecting laterally, followed by three laterals. All four teeth are here numbered 1-4 (figure 64, 1-4), following Marshall (1986). The large multicusped tooth is again called the pluricuspid (figure 64, pc). There is a lateromarginal plate that is seldom revealed in SEM views (Marshall, 1986). Because it is not depicted in our illustrations, it is not mentioned further in our treatment of the pseudococculinid genera.



Figures 70–75. *Notocrater youngi*, new species. 70. Ventral view of critical-point-dried animal of holotype. Scale bar = 250 μm . 71. Detail of mouth, with cuticular lining. Scale bar = 50 μm . 72. Right cephalic tentacle. Scale bar = 50 μm . 73. Dorsal view of radular ribbon. Scale bar = 20 μm . 74. Detail of pluricuspid and marginal teeth. Scale bar = 5 μm . 75. Lateral view of rachidian, lateral, and pluricuspid teeth. Scale bar = 5 μm .

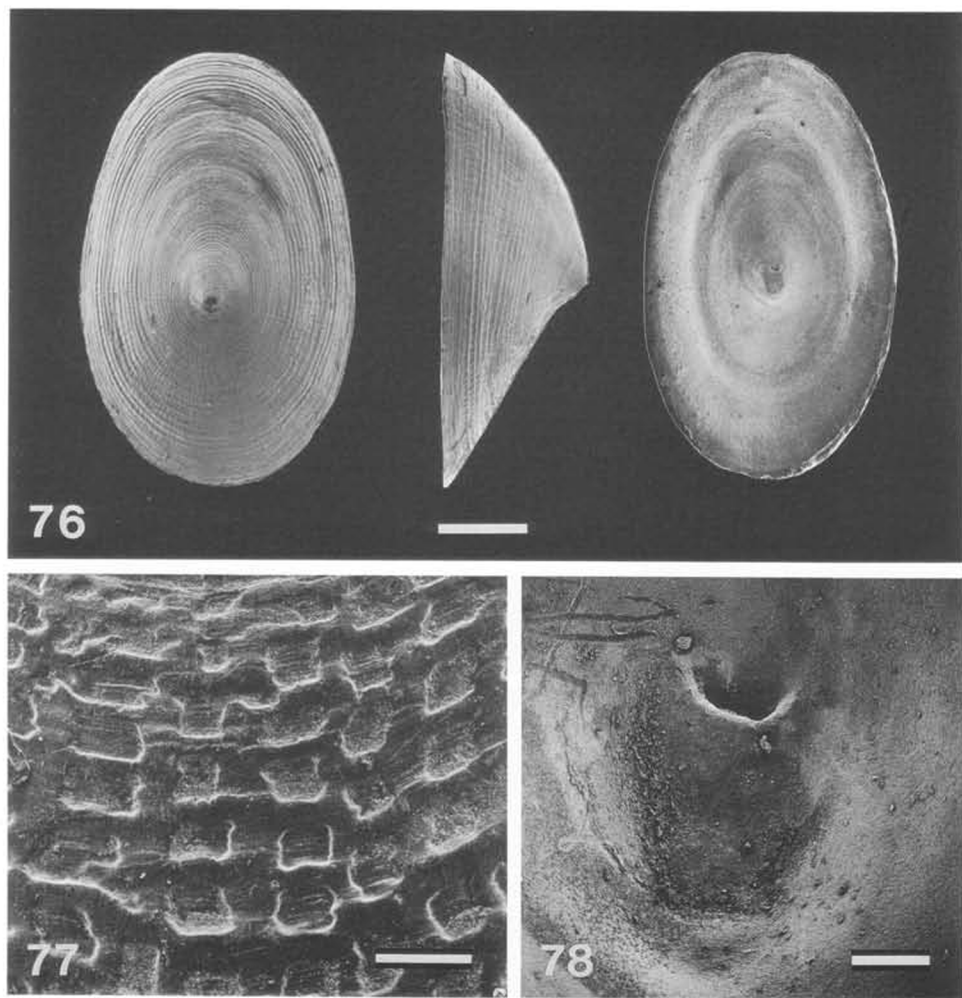
With the exception of the genus *Notocrater* and *Kaiparapelta* and most species of *Tentaoculus*, the genera of Pseudococculinidae tend to occur in deeper water than the Cocculinidae. Many of the genera are known only from abyssal or hadal depths.

Thirteen genera are now recognized: *Pseudococculina* Schepman, 1908, *Notocrater* Finlay, 1926, *Kaiparapelta* Marshall, 1986, *Kurilabyssia* Moskaliev, 1976, *Caymanabyssia* Moskaliev, 1976 (and subgenus *Dictyabyssia* McLean, 1991), *Bandabyssia* Moskaliev, 1976, *Tentaoculus* Moskaliev, 1976, *Mesopelex* Marshall, 1986, *Colotrachelus* Marshall, 1986, *Yaquinabyssia* Haszprunar, 1988, *Co-*

pulabyssia Haszprunar, 1988, *Amphiplica* Haszprunar, 1988 (with subgenus *Gordabyssia* McLean, 1991), and *Punctabyssia* McLean, 1991.

The monotypic genus *Punctabyssia* McLean, 1991, is represented by *P. tibbettsi* McLean, 1991, from the eastern Pacific, and the monotypic genus *Yaquinabyssia* Haszprunar, 1988, is represented in the eastern Pacific by *Y. careyi* McLean, 1988.

The following genera are unknown in either the western Atlantic or eastern Pacific: *Bandabyssia* Moskaliev, 1976, *Colotrachelus* Marshall, 1986, *Kurilabyssia* Moskaliev, 1976, *Mesopelex* Marshall, 1986, and *Pseudococculina* Schepman, 1908.



Figures 76-78. *Tentaoculus eritmeta* (Verrill, 1884). 76. Dorsal, lateral, and ventral views of holotype. Scale bar = 1.0 mm. 77. Detail of surface sculpture. Scale bar = 100 μ m. 78. Detail of interior septum. Scale bar = 100 μ m.

Genus *Notocrater* Finlay, 1926

Type species by original designation *Cocculina craticulata* Suter, 1908 (New Zealand). Synonym: *Punctolepeta* Habe, 1958.

DIAGNOSIS. Protoconch sculpture of fine anastomosing threads; teleoconch sculpture of concentric ribs and strong pustules in curving rows. Eyes present, right cephalic tentacle serving as copulatory organ. Inner marginal teeth enlarged, second the largest in each row.

REMARKS. *Notocrater* is well represented in Australasia (Marshall, 1986) and Japan. It is reported living in the New World for the first time with the description of the following two new species. Marshall (1986:526) noted that *Cocculina pustulata* Woodring, 1928, from the Jamaican Miocene is a *Notocrater*. Woodring's illustration (Woodring, 1928:449, pl. 38, figs. 22, 23) does not

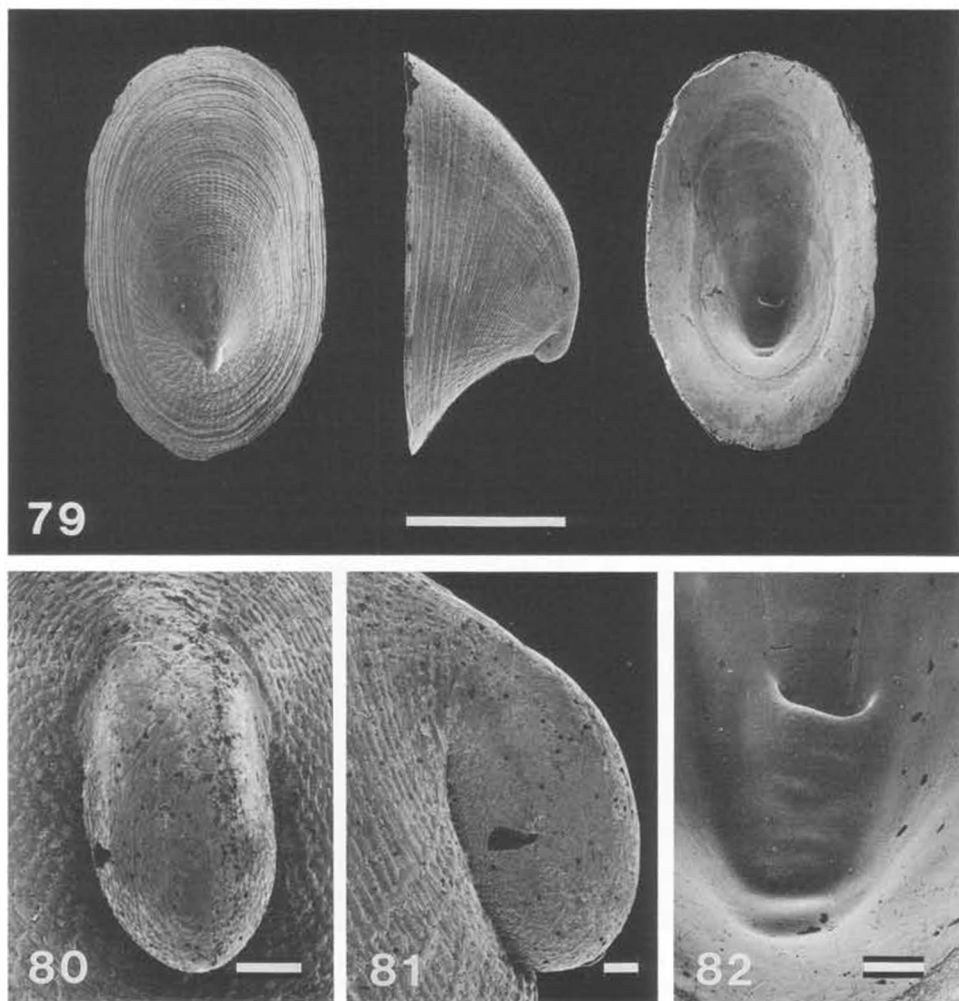
show the pustules, which were described as "minute, closely spaced beads or pustules arranged along intersecting curved radial lines."

This genus is an exception among pseudococculinids in living at continental slope depths, a habitat that correlates with the presence of eyes.

Notocrater houbricki, new species

Figures 58-65

DESCRIPTION. Shell (figure 58) small for family (maximum length 2.6 mm), thin, not eroded, white, periostracum thin. Shell height moderate, that of holotype 0.31 times length. Anterior slope convex, posterior slope concave, lateral slopes slightly convex to straight. Outline in dorsal view elongate-oval, anterior end slightly narrower than posterior end; aperture planar, ends not raised relative to sides of shell. Apex posterior to center, at about $\frac{3}{4}$ shell length from anterior margin, protoconch be-



Figures 79–82. *Tentaoculus georgiana* (Dall, 1927). 79. Dorsal, lateral, and ventral views of lectotype. Scale bar = 1.0 mm. 80, 81. Dorsal and lateral views of protoconch of lectotype. Scale bars = 50 μ m. 82. Detail of interior septum. Scale bar = 100 μ m.

low highest point of shell, extending posteriorly. Protoconch length 170 μ m, protoconch sculpture of low, densely scattered crystals (figures 59, 60). Tip of protoconch immersed in posterior slope of shell. Early sculpture of raised concentric ribs and fine radial striae. Mature sculpture of elongate pustules on evenly spaced concentric ribs, arranged in curving rows. Shell edge thin and sharp. Muscle scar not well marked.

Dimensions. Length 2.6, width 1.5, height 0.8 mm (holotype); the paratype shell is broken.

External Anatomy (figure 61). Eyes large, black; right cephalic tentacle (copulatory organ) larger than left, with small lobe (figure 61, to) marking tentacular opening; two posterior epipodial tentacles, both clearly bifid (figure 61, et). Foot and mantle edge with minute dark brown spots.

Radula (figures 62–65). Rachidian uncusped,

tooth rows asymmetrical, right skewed; first lateral uncusped, shaft large, with laterally projecting elbow, second, third, and fourth lateral with bowed shafts and single cusps. Pluricuspid with broad overhang and three large, blunt cusps; first three marginals larger than remaining marginals, second the largest (figure 65).

TYPE LOCALITY. South of Settlement Point, Grand Bahama Island, Bahama Islands (26°37'31"N, 78°58'56"W), 412 m, on pencil-sized piece of wood along with *Cocculina messingi*, new species.

TYPE MATERIAL. Two specimens from type locality, collected by Charles Messing using deep-submersible *Johnson Sea Link II*, sta. 2335, 18 May 1992. Holotype USNM 860359, 1 paratype LACM 2737.

REMARKS. Comparisons to *N. youngi*, new species, are given under that species.