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**CARENZIA, A NEW GENUS OF SEGUENZIACEA
(GASTROPODA: PROSOBRANCHIA) WITH THE
DESCRIPTION OF A NEW SPECIES**

James F. Quinn, Jr.

Abstract.—*Carenzia* is proposed for three species of seguenziacean gastropods, with *Seguenzia carinata* Jeffreys, 1877, as type-species. *Carenzia carinata* and *C. trispinosa* (Watson, 1879) are redescribed and illustrated with photomicrographs and scanning electron micrographs; *C. inermis* is described as new and illustrated with photomicrographs. *Carenzia carinata* is known from both sides of the North Atlantic Ocean in depths of 1000–2000 m; *C. trispinosa* occurs in similar depths but is restricted to the western side of the North Atlantic; *C. inermis* is reported from off Oregon in depths of about 2000 m.

Several species-groups within the genus *Seguenzia* Jeffreys, 1876, which were informally recognized by Quinn (in press), should be accorded generic rank. Diagnoses of these new genera were to be published as part of a systematic review of the western Atlantic species of Seguenziacea (Quinn, in preparation). However, in a monograph of New Zealand seguenziaceans Marshall (in press) is providing diagnoses for at least two of these genera, leaving only the *Seguenzia carinata* group to be diagnosed among western Atlantic *Seguenzia*. Publication of this paper prior to a full review is prompted by discovery of a new species of the *S. carinata* group from off Oregon which is to be included in a monograph of northeastern Pacific archaeogastropods (McLean, personal communication). *Carenzia*, new genus, is herewith diagnosed, and the two western Atlantic species, *C. carinata* (Jeffreys, 1877) and *C. trispinosa* (Watson, 1879), are redescribed and illustrated. *Carenzia inermis*, new species, is described from the northeastern Pacific. Two New Zealand species of *Carenzia* will be described by Marshall (in press).

Institutional abbreviations used in this paper are: BM(NH), British Museum (Natural History); LACM, Los Angeles County Museum of Natural History; UMML, Rosenstiel School of Marine and Atmospheric Science (RSMAS), University of Miami; USNM, U.S. National Museum of Natural History.

Carenzia, new genus

Seguenzia.—Auct. (partim).

Type-species.—*Seguenzia carinata* Jeffreys, 1877; herein designated.

Diagnosis.—Shell small, trochoid, peripherally carinate, nacreous under a porcelaneous layer; spire evenly conical to turreted, with mid-whorl carina at least on early whorls; base convex, usually with deep, wide umbilicus, occasionally with spiral threads; aperture rhomboidal; outer lip with shallow, V-shaped sinus at suture, and another in peripheral part of base; columella strongly arched, with or without distinct tooth; protoconch smooth or with spiral ridges, terminal varix low; animal, operculum and radula as in *Seguenzia*.

Institute for the Study of the Earth's History
Prinses J. Beatrixlaan 69
8401 Breda - Belgium - tel. 059/80 37 15

Remarks.—*Carenzia* differs from *Sequenzia* in the more conical shape of the shell, lack of strong axial and spiral sculpture on the later whorls, V-shaped anal sinus, and lack of a distinct sinus in the periphery. From the genus which includes *Fluxina discula* Dall, 1889 (to be described by Marshall, in press), *Carenzia* differs in the much more elevated shell, prominent protoconch, and presence of a mid-whorl carination in addition to the peripheral carina. Although animals of this genus are undescribed, Bouchet and Warén (personal communication) have material of *C. carinata* (Jeffreys, 1877) from which they will prepare an anatomical discussion of the species. Marshall (in press) will present illustrations of the radula of at least one of his new species. *Carenzia* is known from the Atlantic and northeastern Pacific oceans, and New Zealand waters (Marshall, in press).

Etymology.—From the Latin *carina*, a keel, and *Sequenzia*; gender feminine.

Carenzia carinata (Jeffreys, 1877)

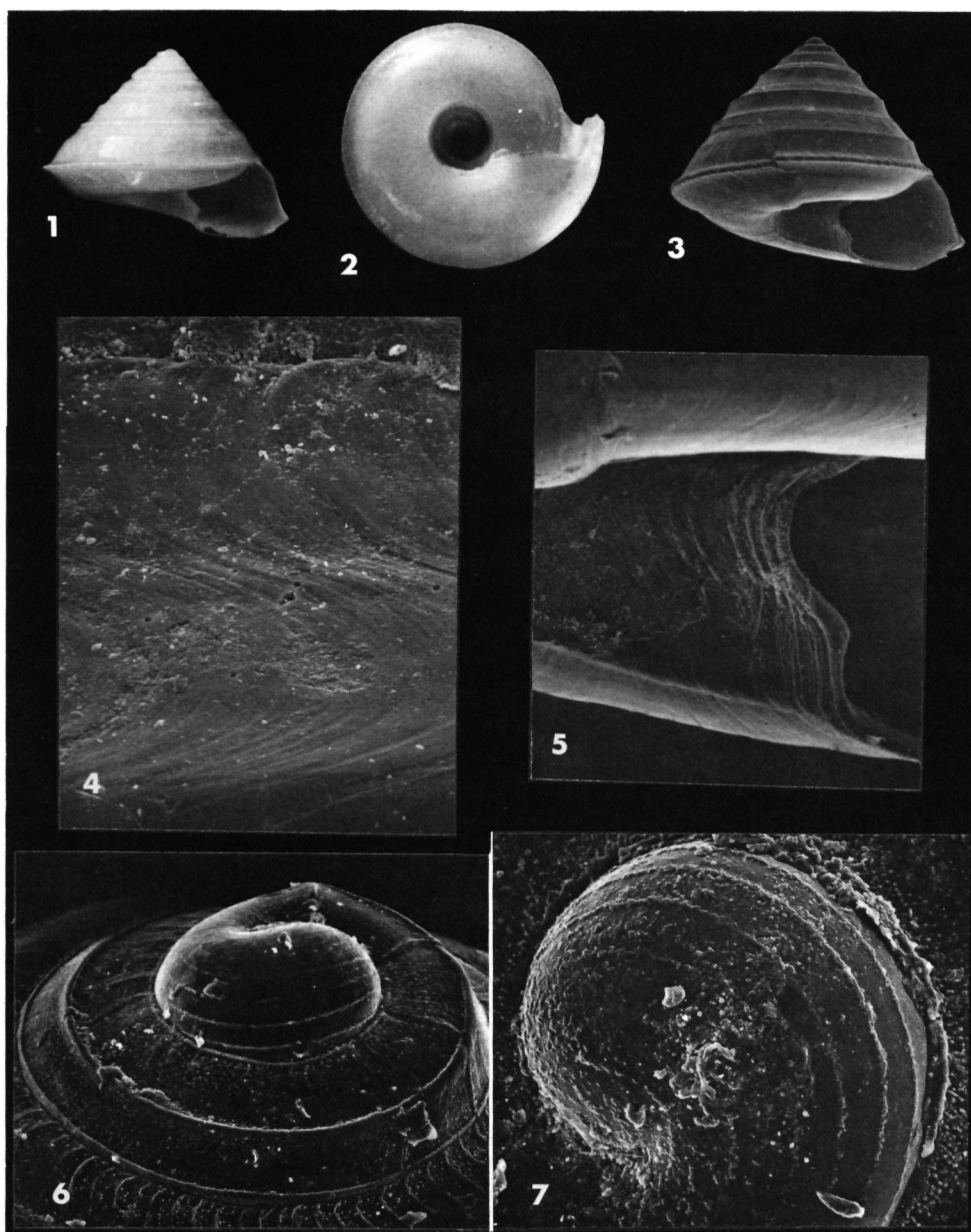
Figs. 1–7

Sequenzia carinata Jeffreys, 1876:201 (nomen nudum); 1877:320; 1879:606; 1885:43, pl. 5, figs. 3, 3a.—Kobelt, 1878:163; 1888:256.—Watson, 1879:590; 1886:108, pl. 7, fig. 2.—Nobre, 1884:50; 1932:182; 1936:130; 1938—40:339, 341.—Tryon, 1887:47, pl. 8, figs. 81–83.—Dall, 1889a:383; 1889b:142.—Dautzenberg, 1889:55; 1927:144.—Dautzenberg and Fischer, 1897:162; 1906:54.—Locard, 1898:68.—Johnson, 1934:74.—? Clarke, 1961:350, pl. 4, fig. 6; 1962:11 (partim ?).—Nordsieck, 1968:20, pl. 4, fig. 09.73.—Abbott, 1974:38.—Laubier and Bouchet, 1976:470–472.—Warén, 1980:15.

Sequenzia carinata var. *attenuata* Locard, 1898:68.

Material examined.—1 specimen, USNM 181657 (lectotype, herein designated); 1 specimen, USNM 821198 (paralectotype); *Valorous* station 13, 56°01'N, 34°42'W, 1263 m; 20 August 1875.—1 specimen, USNM 181658 (paralectotype); *Porcupine* station 22, 56°08'N, 13°34'W, 2311 m; July 1870.—1 specimen, USNM 181659; *Talisman* station, off Azores, 1246 m.—1 specimen, BM(NH) 1887.2.9.374a; *Challenger* station 73, 38°30'N, 31°14'W, 1829 m; 30 June 1873.—1 specimen, BM(NH) 1887.2.9.375a; *Challenger* station 78, 37°26'N, 25°13'W, 1829 m; 10 July 1873.—3 specimens, BM(NH) 1887.2.9.376–379; *Challenger* station 85, 28°42'N, 18°06'W, 2059 m; 19 July 1873.—6 specimens, UMML 30.8021; *Gerda* station G-1111, 23°51.9'N, 80°42.7'W, 1080–1089 m; 10' otter trawl; 30 April 1969.—3 specimens, UMML 30.8020; *Gerda* station G-1106, 24°02'N, 81°30'W, 1706–1723 m; 10' otter trawl; 29 April 1969.—8 specimens, USNM 94307; *Blake* station 34, 23°52'N, 88°56'W, 732–1098 m.—1 specimen, UMML 30.8288; *John Elliott Pillsbury* station P-604, 18°58'N, 87°28'W, 970–988 m; box dredge; 17 March 1968.—4 specimens, BM(NH) 1887.2.9.380; *Challenger* station 120, 8°37'S, 34°28'W, 1115 m; 9 September 1873.

Description.—Shell small, conical, whorls about 5, weakly inflated, strongly carinate peripherally, polished, white, iridescent under porcelaneous layer. Protoconch small, about 275 μ m in diameter, prominent, glassy, with minute spiral ridges, set off from teleoconch by fine growth discontinuity visible only under high magnification. Spire whorls carinated by sharp spiral angulation at or slightly above mid-whorl, flat above, slightly concave below angulation, smooth, sometimes with obscure, slightly flexuous, axial lirae near the suture lines; suture



Figs. 1-7. *Carenzia carinata*. 1, Lectotype, USNM 181657, height 2.7 mm, width 4.4 mm; 2, Same, basal view; 3, SEM micrograph of specimen from *Gerda* station G-1111, UMML 30.8021, apertural view, 13.4 \times ; 4, Same, close-up of whorl surface, growth lines trace outline of anal sinus, 335 \times , s = suture line; 5, Same, oblique basal view, 67 \times ; 6, same, oblique view of protoconch, 134 \times ; 7, Specimen from *Blake* station 34, USNM 94307, vertical view of protoconch, 268 \times .

indistinct. Periphery marked by strong, obscurely crenulate carina, visible only on last whorl. Base smooth, convex to flat proximally, concave under periphery. Umbilicus wide, approximately 25% width of shell, bounded peripherally by spiral thread; ridge behind columella not developed. Aperture rhomboidal; outer lip

bisinate; sinuses broadly V-shaped, with rounded apices, shallow; anal sinus on whorl shoulder, apex just above mid-whorl carina; basal sinus in outer $\frac{1}{3}$ of basal lip, edge very weakly flared; columella arcuate, terminating in weak, obtuse denticle. Animal undescribed.

Measurements.—Lectotype: 2.7 mm high, 4.4 mm wide, 5+ whorls.

Type-locality.—*Valorous* station 13, 56°01'N, 34°42'W, 1263 m (herein designated).

Remarks.—The simple, unornamented or obscurely crenulated mid-whorl carina, lack of subsutural carina and spiral threads on the base, smaller protoconch with spiral ridges, and weaker columellar tooth distinguish *C. carinata* from *C. trispinosa* (Watson, 1879), the only other species of *Carenzia* known from the North Atlantic Ocean. From *C. inermis*, new species, *C. carinata* differs in being smaller, having a more conical shell outline, stronger mid-whorl and peripheral carinae, flatter base, much wider umbilicus, and distinct columellar tooth. The mid-whorl carina of *C. carinata* is rather variable: always sharp and strong on the early teleoconch whorls, but in many specimens becoming weak, or even disappearing on later whorls. This latter condition prompted Locard (1898) to establish the varietal name *attenuata*; however, both forms may be found in the same lot of specimens, so no distinction of morphotypes is warranted.

The occurrence of *C. carinata* is somewhat more widespread than would be expected from experience with species in other seguenziacean genera. *Carenzia carinata* is amphi-Atlantic in distribution, extending from the northern end of the Mid-Atlantic Ridge (56°01'N) to the Canary Islands (28°42'N) in the east, and to off the northeastern bulge of Brazil (8°37'S) in the west. Most other seguenziaceans in the Atlantic Ocean are more provincial in distribution, occurring on only one side of the ocean, often in or along the edges of only one or two basins (unpublished data). A record for the southeastern Atlantic (Clarke 1961) is of questionable validity. As noted by Laubier and Bouchet (1976), the photographed specimen does not appear to be *C. carinata*. Since I have not examined the specimens, I am here including Clarke's report in the synonymy with a query. *Carenzia carinata* is known principally from depths of 1000–2000 m, but has been recorded from as shallow as 732 m and as deep as 2311 m. Although rare in collections from the western Atlantic, *C. carinata* is rather common in depths of about 2000 m in the Bay of Biscay (Laubier and Bouchet 1976; Bouchet, personal communication).

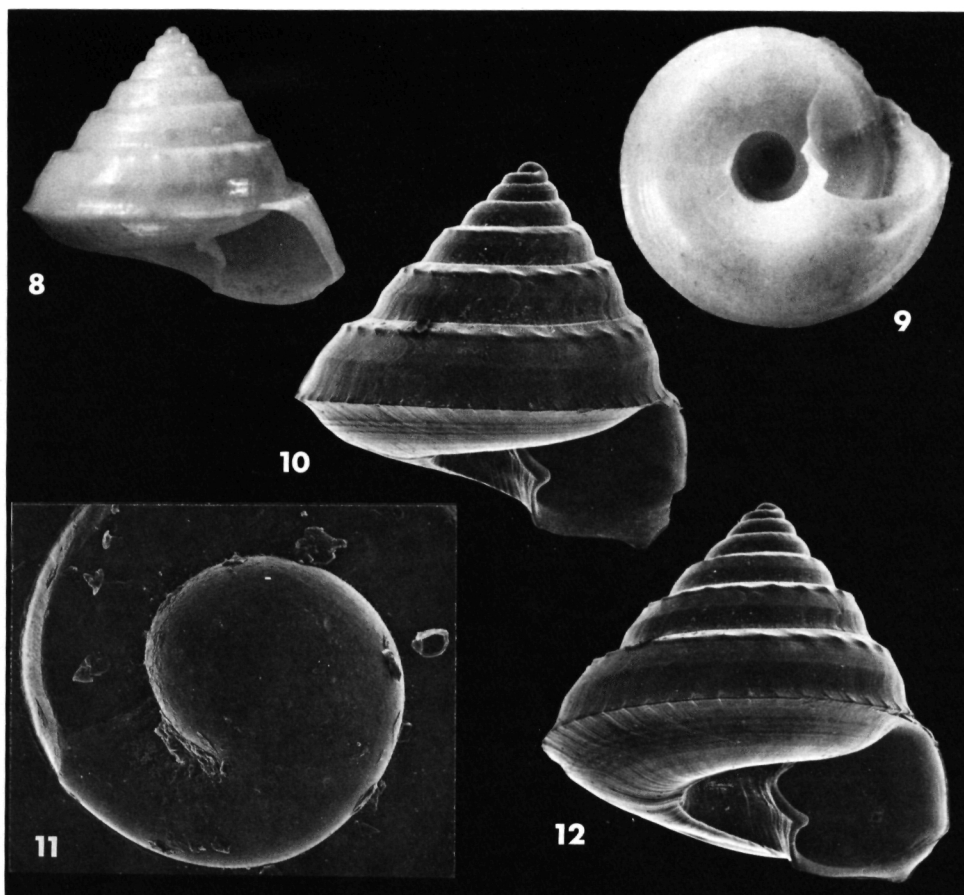
As noted by Warén (1980), the name *carinata* dates from 1877, not 1876. Jeffreys' (1876) listing included no figure, and his description consisted only of the phrase "base perforated or umbilicated," certainly not adequate to make the name available under the current rules governing zoological nomenclature.

Carenzia trispinosa (Watson, 1879)

Figs. 8–12

Seguenzia trispinosa Watson, 1879:591; 1886:110, pl. 7, fig. 4.—Tryon, 1887:47, pl. 8, figs. 79, 80.—Dall, 1889a:268; 1889b:142; 1890:335.—Maury, 1922:90.—Johnson, 1934:74.—Pulley, 1952:170.—Clarke, 1962:11.—Abbott, 1974:38.

Material examined.—1 specimen, USNM 94912; *Albatross* station, south of Cape Hatteras.—1 specimen, UMML 30.8289; *Columbus Iselin* station CI-356,



Figs. 8–12. *Carenzia trispinosa*. 8, Lectotype, BM(NH) 1887.2.9.381, height 3.35 mm, width 3.9 mm; 9, Same, basal view; 10, SEM micrograph of specimen from *Albatross* station 2751, USNM 614078, apertural view, 13.4 \times ; 11, Same, vertical view of protoconch, 134 \times ; 12, same, oblique basal view, 13.4 \times .

24°21.8'N, 77°24.8'W, 1561–1547 m; 41' otter trawl; 20 August 1975.—3 specimens, UMML 30.8016; *Gerda* station G-368, 24°03'N, 81°10'W, 961–1016 m; 16' otter trawl; 15 September 1964.—1 specimen, UMML 30.8292; *Gerda* station G-370, 23°54'N, 81°19'W, 1281 m; 16' otter trawl; 16 September 1964.—4 specimens, UMML 30.7745; *Gerda* station G-964, 23°46'N, 81°51'W, 1390–1414 m; 10' otter trawl; 1 February 1968.—5 specimens, UMML 30.7758; *Gerda* station G-965, 23°45'N, 81°49'W, 1394–1399 m; 10' otter trawl; 1 February 1968.—2 specimens, UMML 30.8023; *Gerda* station G-1112, 23°44'N, 81°14'W, 2276–2360 m; 10' otter trawl; 30 April 1969.—1 specimen, UMML 30.8015; *Gerda* station G-214, 23°43'N, 82°49'W, 1354–1620 m; 6' Isaacs-Kidd midwater trawl; 20 January 1964.—2 specimens, UMML 30.8290; *Gerda* station G-960, 23°30'N, 82°26'W, 1692–1697 m; 10' otter trawl; 31 January 1968.—6 specimens, UMML 30.8017; *Gerda* station G-959, 23°25'N, 82°35'W, 1830 m; 10' otter trawl; 31 January 1968.—1 specimen, USNM 821199; *Blake* station 34, 23°52'N, 88°56'W, 732–1098 m.—

6 specimens, USNM 94306; *Blake* station, Yucatan Strait.—5 specimens, USNM 96575; 4 specimens, USNM 97111; 28 specimens, USNM 330745; *Albatross* station 2751, 16°54'N, 63°12'W, 1257 m; large beam trawl; 28 November 1887.—1 specimen, *Albatross* station 2117, 15°24'40"N, 63°31'30"W, 1250 m; large beam trawl; 27 January 1887.—23 specimens, USNM 96603; 1 specimen, USNM 406699; *Albatross* station 2760, 12°07'N, 37°17'W, 1865 m; large beam trawl; 18 December 1887.—49 specimens, USNM 96878; *Albatross* station 2754, 11°40'N, 58°33'W, 1609 m; large beam trawl; 5 December 1887.—1 specimen, UMML 30.8291; *John Elliott Pillsbury* station P-754, 11°36.9'N, 68°42.0'W, 684–1574 m; 10' otter trawl; 26 July 1968.—1 specimen, BM(NH) 1887.2.9.381 (lectotype, herein designated); 3 specimens, BM(NH) 1887.2.9.382–384 (paralectotypes); *Challenger* station 120, 8°37'S, 34°28'W, 1115 m; 9 September 1873.—44 specimens, USNM 330854; *Albatross* station 2764, 36°42'S, 56°23'W, 21 m; large beam trawl; 12 January 1888.

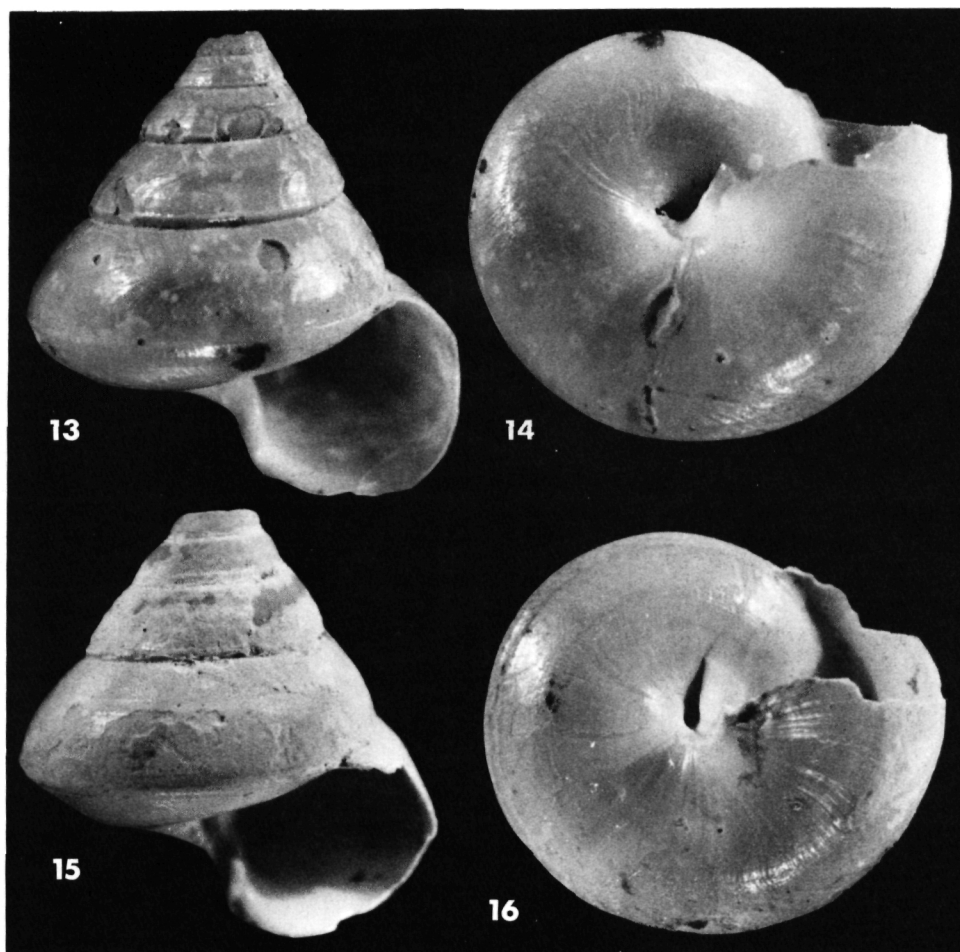
Description.—Shell small, conical, polished, white, iridescent under porcelainous layer; whorls 6, strongly shouldered near suture, weakly to strongly carinate at mid-whorl, strongly carinate at periphery. Protoconch rather large, about 380 μ m in diameter, glassy, prominent. First 2 teleoconch whorls with sharp mid-whorl angulation which may become obsolete or strongly tuberculate on later whorls. All whorls subsequent to second with strong subsutural carina forming narrow, horizontal subsutural shelf; carina usually strongly tuberculate, often with fine spiral thread running across tops of tubercles. Periphery marked by strong, sharp, obscurely crenulate to tuberculate carina, visible only on last whorl. Base with narrow concave zone peripherally and broad convex inner area separated by weak, sharp spiral angulation or thread; inner area smooth and polished, with fine spiral striae, or with distinct spiral cords. Umbilicus wide, approximately 25% width of shell, bounded peripherally by spiral cord and shallow groove; walls convex above and below strong spiral groove corresponding to columellar tooth. Aperture rhomboidal; outer lip bisinuate; sinuses broadly V-shaped, with rounded apices, shallow; anal sinus on whorl shoulder, apex about midway between subsutural and mid-whorl carinae; basal sinus slightly peripheral to middle of basal lip; columella strongly arcuate, terminating in rather strong, narrow, blunt tooth. Animal unknown.

Measurements.—Lectotype: 3.35 mm high (measured from tip of protoconch to tip of columellar tooth), 3.9 mm wide, 5½ whorls. Largest specimen: 4.6 mm high (overall), 4.8 mm wide, 6½ whorls.

Type-locality.—*Challenger* station 120, 8°37'S, 34°28'W, 1115 m.

Remarks.—This species is the most highly sculptured of any described species of *Carenzia*. The tuberculate subsutural, mid-whorl and peripheral carinae, and striate base immediately distinguish *C. trispinosa* from *C. carinata* and *C. inermis*. As in *C. carinata*, *C. trispinosa* has a variable expression of sculptural elements: the tubercles on the carinae may be strong, sharp and closely spaced, or rather weak, blunt and widely spaced; the mid-whorl carina may become very reduced or absent after the first 2 or 3 teleoconch whorls; the base may be completely smooth, have fine impressed striae or distinct cords. All variations may be found in a lot with numerous specimens.

Carenzia trispinosa has been reported only from the western Atlantic Ocean from off North Carolina south to off Argentina (36°42'S). Bathymetric occurrence of *C. trispinosa* is similar to that of *C. carinata*, having been reported from 684–



Figs. 13–16. *Carenzia inermis*. 13, Holotype, LACM 1806, height 6.8 mm, width 6.4 mm; 14, Same, basal view; 15, Paratype, USNM 784742, height 6.3 mm, width 6.3 mm; 16, Same, basal view.

2360 m, principally between 1000 and 2000 m. The depth record of 21 m (*Albatross* station 2764, off Rio de la Plata, Argentina) is certainly a mistake. *Calliotropis actinophora* (Dall, 1890) was also collected at this station, and, like *C. trispinosa*, rarely occurs shallower than 1000 m (Quinn 1979). Since the other stations off the Rio de la Plata are in depths comparable to 2764, the specimens were probably mislabelled as to station number. Two stations may be possibilities: *Albatross* 2763 (24°17'S, 42°48'30"W, off Rio de Janeiro, Brasil, 1228 m) and *Albatross* 2754 (11°40'N, 58°33'W, SE of Barbados, 1610 m). Both stations are within the normal depth range of *C. trispinosa* and simple transcription errors could change either to 2764. *Albatross* 2754 is more likely the correct station since it was near other stations from which *C. trispinosa* had been collected. The 30° latitudinal gap between the most southern undisputed localities of this species reflects the woeful lack of collecting effort along the northeastern coast of South America.

Carenzia inermis, new species

Figs. 13–16

Material examined.—1 specimen, LACM 1806; R/V *Cayuse* station BmT-331, 44°33.0'N, 128°20.2'W, 2820 m; 3 November 1973 (holotype).—1 specimen, USNM 784742; R/V *Yaquina* station OTB-186, 44°39.4'N, 125°36.3'W, 2800 m; 26 July 1967 (paratype).

Description.—Shell small, conical, whorls 5+, inflated, weakly carinate, iridescent under porcelaneous layer. Protoconch and one or more teleoconch whorls missing from both specimens. Early remaining whorls with faint, regularly spaced, flexuous axial plicae above and below suture; mid-whorl area smooth except for obscure spiral angulation visible only with oblique lighting and high magnification; later whorls almost smooth, with only collabral growth lines and evanescent spiral threads. Periphery weakly carinated by single spiral thread, slightly overhanging succeeding whorl, giving slightly channeled look to suture; last ¼ whorl without peripheral thread, slightly flattened between anal sinus and periphery. Base convex, well-rounded, smooth except for two or three obscure spiral threads near peripheral thread, collabral growth lines, and some spiral threads similar to those above periphery. Umbilicus narrow, edge defined by strong, rounded ridge, internally constricted by broad spiral ridge, with narrow channel formed between circumumbilical and internal ridges. Aperture roughly quadrate; outer lip thin, bisinuate; sinuses (reconstructed from growth lines) shallow, broadly V-shaped, with rounded apices; anal sinus on whorl shoulder; basal sinus just peripheral to middle of base; columella broadly arcuate, without tooth, melding smoothly with outer lip, buttressed by intraumbilical ridge. Animal unknown.

Measurements.—Holotype: 6.8 mm high, 6.4 mm wide, 5 whorls. Paratype: 6.3 mm high, 6.3 mm wide, 4 whorls. Both specimens missing apex.

Type-locality.—R/V *Cayuse* station BmT-331, off Oregon, 44°33.0'N, 128°20.2'W, 2820 m.

Remarks.—The relatively large, smooth shell with very weak peripheral carina and narrow umbilicus readily distinguishes *C. inermis* from *C. carinata* and *C. trispinosa*. *Carenzia inermis* is known only from the two types, so no discussion of variation, areal distribution, or bathymetry is possible at this time.

Acknowledgments

James H. McLean (LACM) brought the new species to my attention and kindly allowed me to include it in this report. In addition, he has provided a great deal of information without which our current understanding of the Seguenziacea would be considerably diminished. Bruce A. Marshall (National Museum of New Zealand) provided photographs of several of his new species and generously deferred description of *Carenzia* to me. I am grateful to the following for the opportunity to examine specimens in their care: Joseph Rosewater and Richard S. Houbrick, USNM; Kathie Way, BM(NH); and Gilbert L. Voss, RSMAS. Some of the specimens examined for this report were collected during the National Geographic-University of Miami Deep-Sea Expeditions. W. G. Lyons, D. Crewz, and J. Darovec (Florida Department of Natural Resources) read and commented on this paper. Lana Tester (Florida Department of Natural Resources) supplied the SEM

micrographs. Sally D. Kaicher provided photomacrographs of all type material. This report constitutes a scientific contribution from the University of Miami.

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Florida Department of Natural Resources Marine Research Laboratory, 100 Eighth Avenue SE, St. Petersburg, Florida 33701.