STUDIES ON THE FAUNA OF CURAÇAO AND OTHER CARIBBEAN ISLANDS: No. 61.

CARIBBEAN LAND MOLLUSCS: STREPTAXIDAE

by

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The material on which the present paper is based consists of a small number of Streptaxidae collected by Dr. P. WAGENAAR HUMMELINCK during his visits to the Caribbean Islands and the mainland of Venezuela since 1930, and further of some specimens which, at various times, have reached the author through the generosity of Mr. SERGIO ARIAS, Caracas, Dr. G. MARCUZZI, Padova, Professor S. JAECKEL, Berlin, and Mr. TJOA TJIEN MO, Bogor.

Besides this material I also investigated some material present in the following collections and kindly put at my disposal: Naturhistorisches Museum, Basel; Zoologisches Staatsinstitut und Museum, Hamburg; British Museum (N.H.), London; American Museum of Natural History, New York; United States National Museum, Washington. I have to thank for their kind assistance: Dr. L. FORCART, Basel; Professor G. WEIDNER and Dr. P. KAISER, Hamburg; Dr. W. J. REES and Dr. GALBRAITH, London; Miss

† Dr. VENMANS completed the manuscript of this paper only a few weeks before his death on 26th December 1959 at the age of 61. He was a gifted classics teacher, with a remarkable grasp of modern languages, who became an official concerned with social welfare and labour projects which took up so much of his time that, in order to pursue his hobby, malacology, he was forced to sacrifice many hours of the night to it. His friends regret that the great strain of his duties, combined with his hobby, proved so detrimental to his health that it was not granted to him to reach retiring age — to which he had greatly looked forward because he would then have had the time (as he would have said) "to begin work seriously" on his malacological studies.

He had a good collection, which has been deposited at the State Museum of Natural History, Leiden. Obituary notices and a list of his malacological papers were given in *Correspondentieblad Ned. Malacol. Vereniging* No. *86*, 1960, p. 862–863; *J. of Conch.* *24*, 1960, p. 449–450; and *Memoria Soc. Cienc. Nat. La Salle 20*, 1960, p. 77.

The Editor

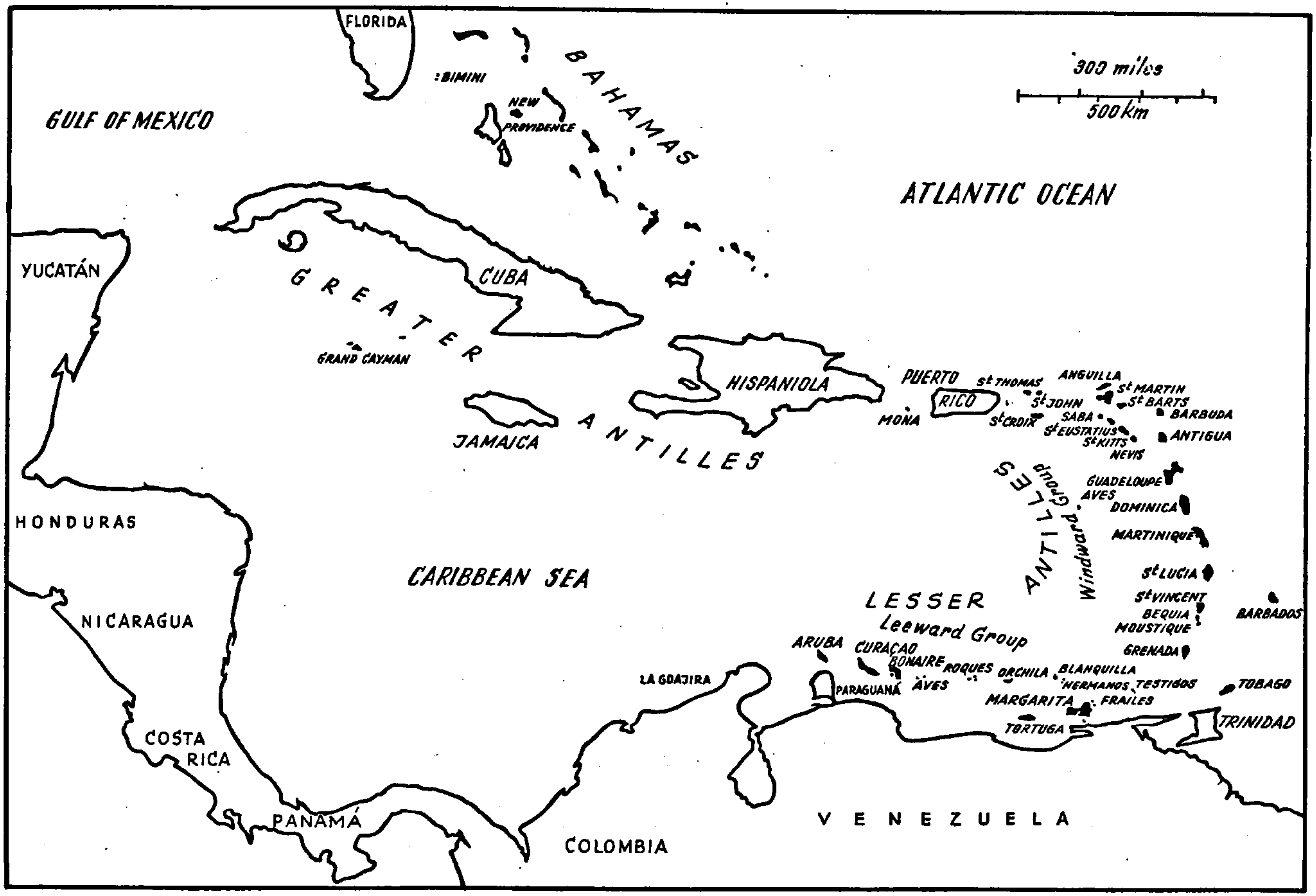


Fig. 5. Localities of Lesser Antillean Ophiuroidea mentioned in this paper.

D. E. BLISS, New York; Dr. H. A. REHDER, Washington; and last but not least the late Mr. HUGH WATSON, Cambridge, England, for his most valuable and expert advice. I am also greatly obliged to Mr. PAUL KESSELS, Tilburg, Netherlands, for his help in composing the histograms.

The photographs were taken by Dr. P. WAGENAAR HUMMELINCK and Mr. H. VAN KOOTEN, Utrecht.

Abbreviations: AMNH = American Museum of Natural History, New York; BM = British Museum (Natural History), London; NMB = Naturhistorisches Museum, Basel; USNM = United States National Museum, Washington; VRL = Collection Venmans, Rijksmuseum van Natuurlijke Historie, Leiden; ZMA = Zoölogisch Museum, Amsterdam; ZMH = Zoologisches Museum, Hamburg.

As regards classification and nomenclature the author followed THIELE, 1931.

The method of measuring the shells is shown in Figure 6. Each shell was measured to the nearest one-hundredth of a millimetre. The height was determined by measuring from the apex to the farthest extremity of the lip, parallel to the axis of the normal whorls; the major diameter by measuring at right angles to the axis, in a plane approximately parallel to that containing the aperture. The Index of Shell (mentioned in Tables 5–9) = $\frac{100 \times \text{major diameter}}{\text{height of shell}}$.

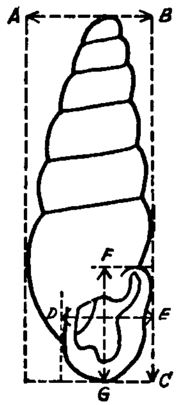


Fig. 6. Drawing showing the method of measuring the shells. A–B: major diameter of shell; B–C: height of shell; D–E: major diameter of aperture; F–G: height of aperture.

The family **Streptaxidae** consists of a great number of genera, most of which live in tropical Africa, India, China, the Philippines and the East Indian Archipelago.

The representatives of this family are rapacious snails; they are holopod and jawless. Their radula bears a great number of aculeate teeth arranged in V-form. The broad kidney is of about the same length as the pericardium. The animals are mostly vividly tinged in yellow or reddish colours. They are hermaphroditic. In all species the shells are well developed, and in most of them the aperture is provided with one or more lamellae or folds.

Only two genera are represented exclusively in the New World: *Martinella* Jousseaume, 1887, in Ecuador and Brasil, and *Streptaxis* Gray, 1837, in South America and the Caribbean area. A third genus, *Gulella* L. Pfeiffer, 1856, most of the species of which live in Africa and south-east Asia, is represented in the Caribbean area by one single species, which seems to have been introduced there by human agency.

In the present paper five species, and one subspecies, of the genus *Streptaxis*, and one species of the genus *Gulella*, have been considered, these being the only species present in the material available.:

Gulella (*Huttonella*) *bicolor* (Hutton)
Streptaxis (*Streptartemon*) *glaber* (Pfeiffer)
Streptaxis (*Streptartemon*) *deplanchei* (Drouet)
Streptaxis (*Streptartemon*) *deplanchei* var. *martiniana* n. var.
Streptaxis (*Rectartemon*) *funcki* (Pfeiffer)
Streptaxis (*Rectartemon*) *meridaensis* n. sp.

Gulella (Huttonella) bicolor (Hutton, 1834) Pilsbry, 1930

Figs. 7–11.

Carychium Gigas FÉRUSSAC, 1827, Bull. Univ. Sc. Nat. *10*, p. 408, No. 56.
Pupa bicolor HUTTON, 1834, J. Asiat. Soc. Bengal *3*, p. 86, 93.
Pupa Largillierti PHILIPPI, 1844, Ztschr. Malakozool. *1*, p. 352.
Pupa bicolor, KÜSTER, 1844, Mart. Chemn. Syst. Conch. Cab. *1* (*15*), p. 95, pl. 13 fig. 9–10.
Pupa mellita GOULD, 1846, Proc. Boston Soc. *2*, p. 99.
Pupa bicolor, PFEIFFER, 1848, Mon. Helic. viv. *2*, p. 352, No. 119.
Pupa bicolor, BENSON, 1849, Ann. Mag. Nat. Hist. (*2*) *4*, p. 125.
Pupa mellita, PFEIFFER, 1853, Mon. Helic. viv. *3*, p. 545, No. 117.
Pupa bicolor, PFEIFFER, 1853, Mon. Helic. viv. *3*, p. 551, No. 163.
Pupa (*Torquilla*) *mellita*, H. & A. ADAMS, 1855, Gen. rec. Mollusca *2*, p. 169.
Ennea bicolor, H. & A. ADAMS, 1855, Gen. rec. Mollusca *2*, p. 171.
Ennea ceylanica H. & A. ADAMS, 1855, Gen. rec. Mollusca *2*, p. 171.
Pupa ceylanica, PFEIFFER, 1855, Proc. Zool. Soc. London, p. 9.
Ennea ceylanica, PFEIFFER, 1855, Malakozool. Bl. *2*, p. 63.
Ennea mellita, PFEIFFER, 1855, Malakozool. Bl. *2*, p. 63.
Ennea bicolor, PFEIFFER, 1855, Malakozool. Bl. *2*, p. 63.
Ennea bicolor, PFEIFFER, 1857, Novit. Conch. *1*, p. 114, No. 200, pl. 32 fig. 15–17.
Ennea ceylanica, PFEIFFER, 1857, Novit. Conch. *1*, p. 114, No. 201, pl. 32 fig. 18–20.
Pupa bicolor, BLAND, 1858, Ann. Lyc. Nat. Hist. N.Y. *6*, p. 147.
Ennea bicolor, PFEIFFER, 1859, Mon. Helic. viv. *4*, p. 342, No. 28.
Ennea mellita, PFEIFFER, 1859, Mon. Helic. viv. *4*, p. 342, No. 29.

Ennea ceylanica, PFEIFFER, 1859, Mon. Helic. viv. *4*, p. 342, No. 30.
Pupa bicolor, MORELET, 1860, Sér. Conch. *2*, Iles Orientales d'Afrique, p. 93, No. 55.
Pupa (*Gonospira*) *bicolor*, MARTENS, 1861, in Albers, Die Heliceen (*2*), p. 301.
Pupa (*Gonospira*) *ceylanica*, MARTENS, 1861, in Albers, Die Heliceen (*2*), p. 301.
Pupa bicolor, DESHAYES, 1863, Catal. Moll. Réunion, p. 90, No. 290.
Ennea bicolor, GUPPY, 1866, Ann. Mag. Nat. Hist. (*3*) *17*, p. 52.
Pupa (*Gonospira*) *bicolor*, MARTENS, 1867, Ostas. Landschn., p. 384.
Pupa (*Gonospira*) *bicolor* var. *abbreviata* MARTENS, 1867, Ostas. Landschn., p. 384.
Ennea bicolor, PFEIFFER, 1868, Mon. Helic. viv. *5*, p. 456, No. 37.
Ennea mellita, PFEIFFER, 1868, Mon. Helic. viv. *5*, p. 456, No. 38.
Ennea ceylanica, PFEIFFER, 1868, Mon. Helic. viv. *5*, p. 456, No. 39.
Gonospira(?) *bicolor*, HEYNEMANN, 1869, Nachr.bl. d. Malakozool. Ges. *1*, p. 178, pl. 1 fig. 3 (radula).
Ennea (*Huttonella*) *bicolor*, NEVILL, 1869, Proc. Zool. Soc. London, p. 64, No. 15.
Ennea bicolor, SEMPER, 1870, Reisen Arch. Philipp. *2*, 3, p. 250, pl. 8 fig. 14.
Ennea (*Huttonella*) *bicolor*, STOLICZKA, 1871, J. Asiat. Soc. Bengal *40*, 2, p. 169, No. 1, pl. 8 fig. 7, 8.
Ennea bicolor, MÖRCH, 1872, J. de Conchyl. *20*, p. 315.
Ennea bicolor, ISSEL, 1874, Molluschi Borneensi, Ann. Mus. Civ. Storia Nat. Genova *6*, p. 414. (repr. p. 51)
Ennea bicolor, SEMPER, 1874, Reisen Arch. Philipp. *2*, 3 p. 137–138.
Pupa ceylanica, HANLEY & THEOBALD, 1876, Conchol. Indica, pl. C fig. 4.
Pupa (*Ennea*) *bicolor*, HANLEY & THEOBALD, 1876, Conchol. Indica, p. x, 40, pl. C fig. 6.
Ennea bicolor, PFEIFFER, 1877, Mon. Helic. viv. *8*, p. 603, No. 53.
Ennea ceylanica, PFEIFFER, 1877, Mon. Helic. viv. *8*, p. 603, No. 55.
Ennea bicolor, LIÉNARD, 1877, Catal. Moll. Maurice, p. 80, No. 109.
Ennea (*Huttonella*) *bicolor*, NEVILL, 1878, Handlist Moll. Ind. Mus. Calcutta *1*, p. 6, No. 17.
Ennea (*Huttonella*) *bicolor*, MARTENS, 1880, in Möbius, Beitr. Meeresfauna Mauritius, p. 205.
Ennea cafaeicola CRAVEN, 1880, Proc. Zool. Soc. London, p. 215, pl. 22 fig. 10a–10e.
Ennea bicolor, CROSSE, 1881, J. de Conchyl. *29*, p. 192, No. 1.
Ennea (*Huttonella*) *bicolor*, TRYON, 1885, Man. Conch. (*2*) *1*, p. 104, pl. 19 fig. 14, 17, 18, pl. 20 fig. 24.
Ennea (*Huttonella*) *bicolor*, KOBELT, 1905, Mart. Chemnitz Syst. Conch. Cab. *1* (*12B*) 1, p. 128, pl. 19 fig. 1–3.
Ennea bicolor, BLANFORD & GODWIN AUSTEN, 1908, Fauna of Brit. India (Testacellidae and Zonitidae), p. 19 sq.
Ennea bicolor, KOBELT, 1909, Abh. Senckenb. Naturf. Ges. *32*, p. 93–94.
Ennea bicolor, LESCHKE, 1914, Jahrb. Hamburg. Wiss. Anst. *31*, Beiheft *2*, p. 223.
Ennea bicolor, ANNANDALE & PRASHAD, 1920, Rec. Ind. Mus. Calcutta *19*, p. 193.
Ennea (*Huttonella*) *bicolor*, GERMAIN, 1921, Faune Malacol. Mascareignes, p. 6–9.
Gulella bicolor, PILSBRY, 1930, Proc. Acad. Nat. Sc. Philadelphia *82*, p. 345, 346.
Gulella (*Indoennea*) *bicolor*, RENSCH, 1932, Zool. Jahrb. (Syst.) *63*, p. 4, fig. 1.
Ptychotrema (*Ennea*) *bicolor*, PARAVICINI, 1935, Arch. Mollusk. *67*, p. 60.
Ennea bicolor, PARAVICINI, 1935, Arch. Mollusk. *67*, p. 171.
Ennea bicolor, WAGENAAR HUMMELINCK, 1940, Studies fauna Curaçao *1*, p. 103.
Gulella (*Indoennea*) *bicolor*, VAN BENTHEM JUTTING, 1941, Arch. Néerl. Zool. *5*, p. 320.

Gulella bicolor, E. H. MADGE, 1946, The Mauritius Institute Bulletin *2*, p. 229, pl. 7 fig. 6.
Gulella (*Huttonella*) *bicolor*, VAN BENTHEM JUTTING, 1950, Treubia *20*, p. 504, 505, fig. 106, 107.
Huttonella bicolor, LAIDLAW, 1950, Sarawak Mus. Journ. *5*, p. 372.

DESCRIPTION

Shell turreted to subcylindrical, hyaline, cream-coloured, moderately shiny, delicately striated according to the growth lines; towards the suture and over the entire surface of the last whorl the striae become more conspicuous and stronger. Apex obtuse. Whorls 6.75–8.25, moderately convex, the first two apical whorls smooth, the last whorl slightly ascending. Aperture almost quadrate, slightly higher than broad, with rounded base, armed with four teeth: one simple lamella on the parietal wall close to the peristome, a deeply situated columellar lamella winding round the columella in the interior of the shell, a small blunt tooth situated on the left side of the basal margin, and a broad triangular tooth on the palatal wall. Peristome white, thickened, reflected, not continuous, the upper ends joined by a very delicate callus. Just behind the peristome there are two shallow pits on the outside of the last whorl, corresponding with the internal palatal fold. The umbilicus is closed.

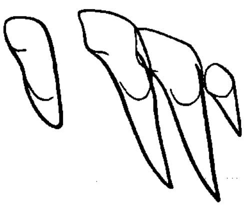


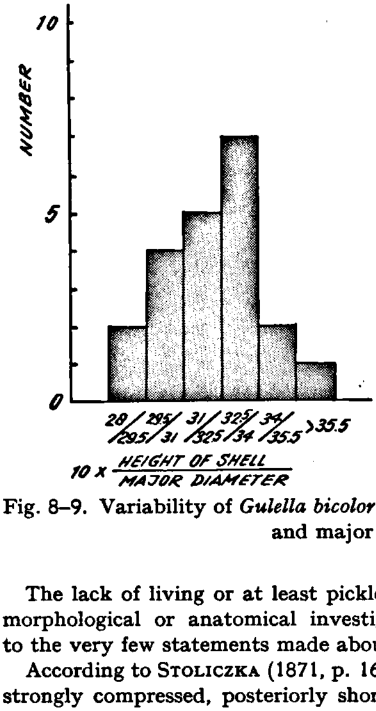
Fig. 7. Radula elements of *Gulella bicolor* — from left to right: 9 2 1 0; after RENSCH, Zool. Jahrb. (Syst.) *63*, 1932, p. 5.

As may be seen in Table 5 the measurements and their mutual ratios are rather variable in this species. The only separate form described is the var. *abbreviata*, which was set apart by VON MARTENS in 1867 for shells which have a height of 6.5 mm, a diameter of 2 mm, and an aperture of which the height is 1.5 mm and the breadth 1.0 mm. However, as has already appeared from the specimens RENSCH (1932) collected in Java, this form cannot be considered a separate geographical race, because it lives together at the same localities with the heavier normal form known from other places. Our material proves this fact once more. VON MARTENS' variety fits fully into the range of variation of the species.

TABLE 5. Average Measurements of *Gulella bicolor*

Locality	Number of spec. measured	Number of whorls	Height of shell in mm	Major diam. of shell in mm	Index of shell	Height of aperture in mm	Height of shell: major diam.	Height of shell: height of aperture
JAMAICA	9	7.25(6.75–7.75)	5.24(4.48–5.96)	1.74(1.52–1.96)	33(31–35)	1.55(1.28–1.76)	3.00(2.84–3.24)	3.38(3.05–3.55)
St. Thomas	6	7.04(6.75–7.50)	5.47(5.30–5.70)	1.88(1.70–2.10)	35(21–38)	1.35(1.20–1.40)	2.92(2.67–3.24)	4.08(3.79–4.58)
St. Thomas	5	6.85(6.75–7.25)	5.68(5.30–6.40)	1.80(1.70–2.00)	32(31–33)	1.56(1.50–1.70)	3.16(3.05–3.24)	3.64(3.53–3.76)
ST. THOMAS	11	6.95(6.75–7.50)	5.56(5.30–6.40)	1.85(1.70–2.10)	33(31–38)	1.45(1.20–1.70)	3.03(2.67–3.24)	3.88(3.53–4.58)
ST. JOHN	1	7.00	5.60	1.68	30	1.72	3.33	3.26
St. Croix	5	7.35(7.25–8)	6.26(6–7)	1.97(1.80–2.12)	32(30–33)	1.85(1.76–1.92)	3.18(3.06–3.33)	3.39(3.13–3.72)
St. Croix	1	7.25	6.24	1.96	31	1.88	3.18	3.32
St. Croix	1	7.75	6.68	1.98	30	1.84	3.37	3.63
ST. CROIX	7	7.39(7.25–8)	6.32(6–7)	1.97(1.80–2.12)	31(30–33)	1.85(1.76–1.92)	3.21(3.06–3.37)	3.42(3.13–3.72)
St. Martin	2	7.63(7.50–7.75)	6.68(6.56–6.80)	2.12(2.12–2.12)	32(31–32)	1.90(1.84–1.96)	3.15(3.09–3.21)	3.52(3.47–3.57)
St. Martin	1	7.75	6.84	1.96	29	1.84	3.49	3.72
ST. MARTIN	3	7.67(7.50–7.75)	6.73(6.56–6.84)	2.07(1.96–2.12)	31(29–32)	1.88(1.84–1.96)	3.26(3.09–3.49)	3.59(3.47–3.72)
Trinidad	1	7.50	4.96	1.76	35	1.64	2.82	3.02
Trinidad	1	7.75	6.64	2.00	30	1.84	3.32	3.61
TRINIDAD	2	7.63(7.50–7.75)	5.80(4.96–6.64)	1.88(1.76–2.00)	33(30–35)	1.74(1.64–1.84)	3.07(2.82–3.32)	3.32(3.02–3.61)
Curaçao	3	7.58(7–8.25)	6.83(6.24–7.44)	2.00(1.88–2.08)	29(28–30)	1.84(1.72–1.92)	3.41(3.32–3.58)	3.71(3.54–3.96)
Curaçao	2	7.50(7.25–7.75)	6.46(6.20–6.72)	1.94(1.88–2.00)	30	1.68	3.33(3.30–3.36)	3.85(3.69–4.00)
CURAÇAO	5	7.55(7–8.25)	6.68(6.20–7.44)	1.98(1.88–2.08)	30(28–30)	1.78(1.68–1.92)	3.38(3.30–3.58)	3.76(3.54–4.00)
Venezuela	1	7.75	6.84	1.84	27	1.72	3.72	3.98
Venezuela	1	7.50	6.20	2.04	33	1.98	3.04	3.13
VENEZUELA	2	7.63(7.50–7.75)	6.52(6.20–6.84)	1.94(1.84–2.04)	30(27–33)	1.85(1.72–1.98)	3.38(3.04–3.72)	3.56(3.13–3.98)
PANAMÁ	10	7.68(7.50–8.00)	6.76(6.28–7.22)	2.02(1.88–2.20)	30(29–31)	1.84(1.72–2.00)	3.34(3.20–3.50)	3.67(3.52–3.91)
BOURBON	1	6.75	5.30	1.70	32	1.40	3.10	3.80
Java	2	7.38(7.25–7.50)	5.04(4.80–5.28)	1.54(1.48–1.60)	31(30–31)	1.30(1.24–1.36)	3.27(3.24–3.30)	3.88(3.87–3.88)
Java	1	7.75	5.36	1.64	31	1.60	3.27	3.35
JAVA	3	7.50(7.25–7.75)	5.15(4.80–5.36)	1.57(1.48–1.64)	31(30–31)	1.40(1.24–1.60)	3.27(3.24–3.30)	3.70(3.35–3.88)
Tonkin	3	7.17(7–7.50)	5.13(4.96–5.32)	1.72(1.68–1.76)	33(32–34)	1.51(1.44–1.56)	2.98(2.91–3.09)	3.41(3.18–3.69)
Tonkin	2	7.38(7.25–7.50)	4.96(4.88–5.04)	1.66(1.64–1.68)	34(33–34)	1.42(1.36–1.48)	2.99(2.98–3.00)	3.50(3.41–3.59)
TONKIN	5	7.25(7–7.50)	5.06(4.88–5.32)	1.70(1.64–1.76)	33(32–34)	1.47(1.36–1.56)	2.99(2.91–3.09)	3.45(3.18–3.69)
	59	7.36(6.75–8.25)	5.93(4.48–7.44)	1.87(1.48–2.20)	32(27–38)	1.65(1.20–2.00)	3.17(2.67–3.72)	3.60(3.02–4.58)

From the literature and on the basis of my own experience, the variability appears to be as follows: the height of the shell varies between 4.48 and 7.44 mm, the major diameter between 1.48 and 2.20 mm, and the height of the aperture between 1.20 and 2.00 mm. Compare Table 5, Figs. 8 and 9 (histograms), and 10–11 (apertures of the specimens).



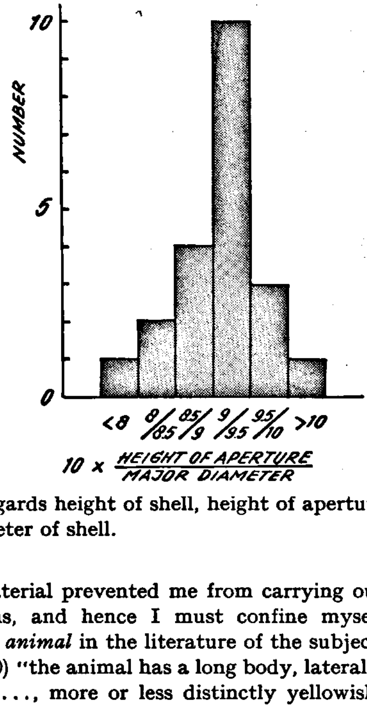


Fig. 8–9. Variability of *Gulella bicolor* as regards height of shell, height of aperture and major diameter of shell.

The lack of living or at least pickled material prevented me from carrying out morphological or anatomical investigations, and hence I must confine myself to the very few statements made about the *animal* in the literature of the subject.

According to Stoliczka (1871, p. 169–170) "the animal has a long body, laterally strongly compressed, posteriorly shortened..., more or less distinctly yellowish; on the head reddish; pedicles long, slightly thickened at the end, their external skin is yellow, but the internal eye-bearing peduncles are vermilion, eyes very small; tentacles small, pale reddish; mantle deep-red, and so is also the whole of the internal lining of the shell which exhibits the same deeper, or brighter red colour as soon as the animal moves about. When retracted only the median whorls appear as deep red.... The lateral line of the foot is rather distinct. The mantle is only slightly swollen on either side of the pulmonary opening, rarely produced into a distinct lobe..."

According to Rensch (1932) the foot is bright yellow, and the upper side of the head, the mantle and the tentacles are a brilliant orange.

Semper (1870, p. 250) studied the internal organs and gives the following details: the genitalia are quite simple; the hermaphroditic gland consists of a very short, thick, slightly finger-shaped tube; the hermaphroditic duct is long and hardly convoluted; the albumen gland is normal, the uterus is much more extensive than the prostate and empties at the base of the mucous glands into a thicker gland; the vas deferens empties into the penis, which is quite simple, beneath the retractor penis; the spermatheca has a long stalk and is without a diverticulum; neither the male nor the female parts have any accessory glands.

As in all Streptaxidae there is no jaw present. The radula is very long and narrow, and bears, according to STOLICZKA (1871), RENSCH (1932) and other authors, 80–90 transverse, moderately curved rows of teeth. The central tooth is short and sharply pointed (Fig. 7). The adjoining teeth are much longer, sharply pointed, slightly curved, with a blunt lobe near their bases, and gradually decrease in size towards the margins. According to STOLICZKA and RENSCH, on each side of the central tooth there are nine teeth in each transverse row, but according to SEMPER (1870, p. 250) there are only eight.

Bionomics

Like most Streptaxidae, *Gulella bicolor* lives hidden in the soil. As regards substratum, the species seems to be not very fastidious: in the West Indies it has been found on diabase rocks and cherts as well as in clayey and sandy soil, on calcareous as well as on non-calcareous substrata; and though in earlier literature it is almost always stated to prefer damp localities, even adaptation to a more or less arid environment does not seem to present too many difficulties. As long ago as 1867 VON MARTENS mentioned the species as occurring at the foot of calcareous rocks along the sea coast of Timor, and also in the barren limestone hills of Amboina.

Gulella bicolor likes to live among dead leaves and decaying material, but has also been found in grass, moss and other low vegetation, as well as under stones and even in damp gravel. According to STOLICZKA its movements are rather rapid. It is not known whether the animal feeds on plants, but ANNANDALE & PRASHAD (1920, p. 193) observed it preying upon *Opeas gracile*, while SEMPER (1874, p. 137–138) mentions a case in which *Gulella bicolor* was attacking *Opeas panayense*.

Distribution

Most of the representatives of the genus *Gulella* L. Pfeiffer, 1856, are indigenous to Africa; some, however, live exclusively in south and east Asia or in the Philippines and the East Indian islands. Perhaps it is not too bold to presume that, in the course of prehistoric times, a number of *Gulella* species spread from tropical Africa — which seems to be the cradle of the genus — via the Comoro Islands, Madagascar, the Seychelles and other islands, to the north-east of the Indian Ocean, where each of them found its optimum living conditions in the areas it has occupied in historic times. One of these species — our little *Gulella bicolor*, which was first found by HUTTON at Mirzapur, N.W.India — appeared even to have cosmopolitan inclinations, and spread from its Indian base almost all over the tropics, although, strange to say, it is not known to occur in the mother country of the genus.

According to SEMPER, it seems to have been introduced into the neighbourhood of Manila shortly before 1870. In 1885 TRYON mentions the species as occurring in India, the Seychelles and Mascarene Islands, Burma, Cochin-China, the Indo-Australian Archipelago, China, New Caledonia, and the islands of St. Thomas, Grenada and Trinidad. In 1930 PILSBRY reports it from near Panama City, and states that it is widely distributed in the Canal Zone and Panama, where it has been found together with the little African snail *Tomostele musaecola* (Morelet). The collection of the United States National Museum also includes ten specimens from the same locality. — H. BURRINGTON BAKER (1924, Occ. Pap. Mus. Zool. Michigan *152*) makes no mention of the species either in his studies on the land and freshwater molluscs of the Dutch Leeward Islands, or in his paper on the Mollusca collected by the University of Michigan-Williamson Expedition in Venezuela, in which he speaks of the Streptaxidae (1925, Occ. Pap. Mus. Zool. Michigan *156*; 1926, *167*).

As regards the Caribbean and Venezuelan areas, until 1940 *Gulella bicolor* was only known from St. Thomas, Grenada and Trinidad, where it seems to have been introduced in bales of rice (GERMAIN 1921, p. 9). But in that year P. WAGENAAR HUMMELINCK published his discovery of three specimens in 1936 at Schaarloo, Curaçao, near Willemstad, where J. P. E. MORRISON had already found the species in 1925.

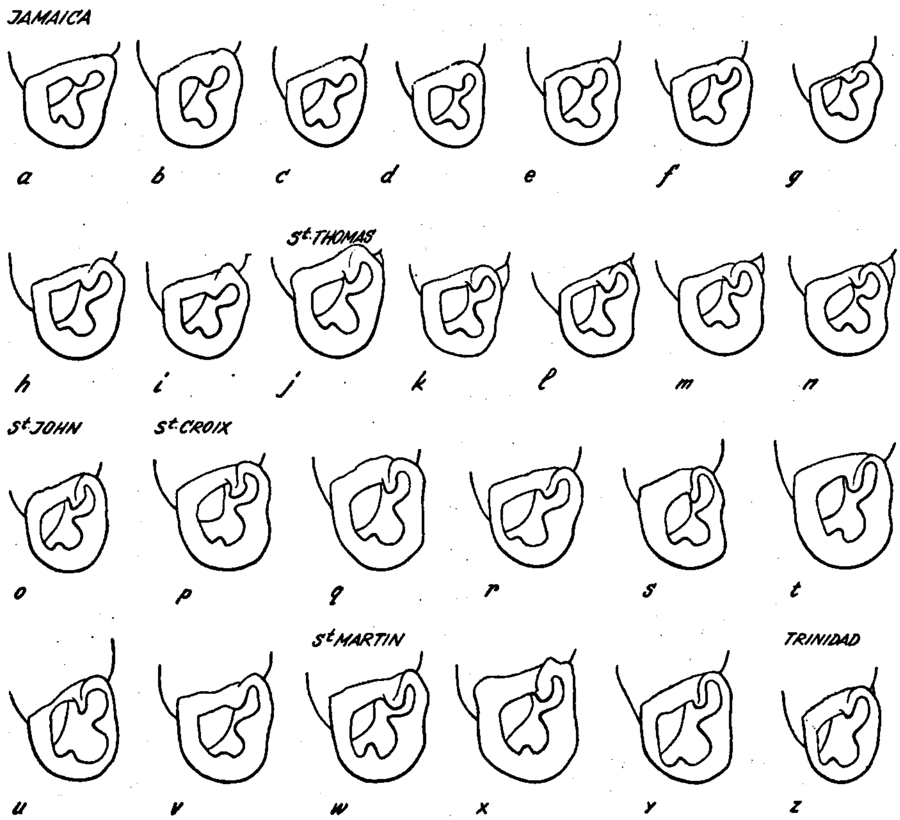


Fig. 10. Apertures of *Gulella bicolor* from: JAMAICA, *a–g* USNM 395556, *h–i* USNM 395731; ST. THOMAS *j–n*; ST. JOHN, *o* VRL 7732; ST. CROIX, *p–t* VRL 7730, *u* VRL 7731, *v* USNM 523542; ST. MARTIN, *w–x* VRL 7728, *y* 7729; TRINIDAD, *z* VRL 7726.

In the present paper I am able to record HUMMELINCK's first discovery of specimens in the West Indian islands of St. Martin, 1949, St. Croix, 1955, and St. John, 1955, and on the Venezuelan mainland at La Guaira, 1948. A second Venezuelan specimen was found by G. MARCUZZI at El Pilar, Sucre. The collection of the U.S. National Museum contains a specimen collected by H. A. BEATTY on St. Croix, while two specimens are listed from Jamaica, 1928. As far as I know this is the first record of the species from that island.

Material (cf. Figs. 10–11).

JAMAICA, St. Mary, Robins Bay, 27.I.1928, 7 + 2 specimens, Chamberlain Collection (USNM 395556, 395781).

ST. THOMAS, legit Dohrn?, 6 spec. (ZMH). — St. Thomas, from the Crooke collection, No. 14859, 6 spec. (AMNH 65512).

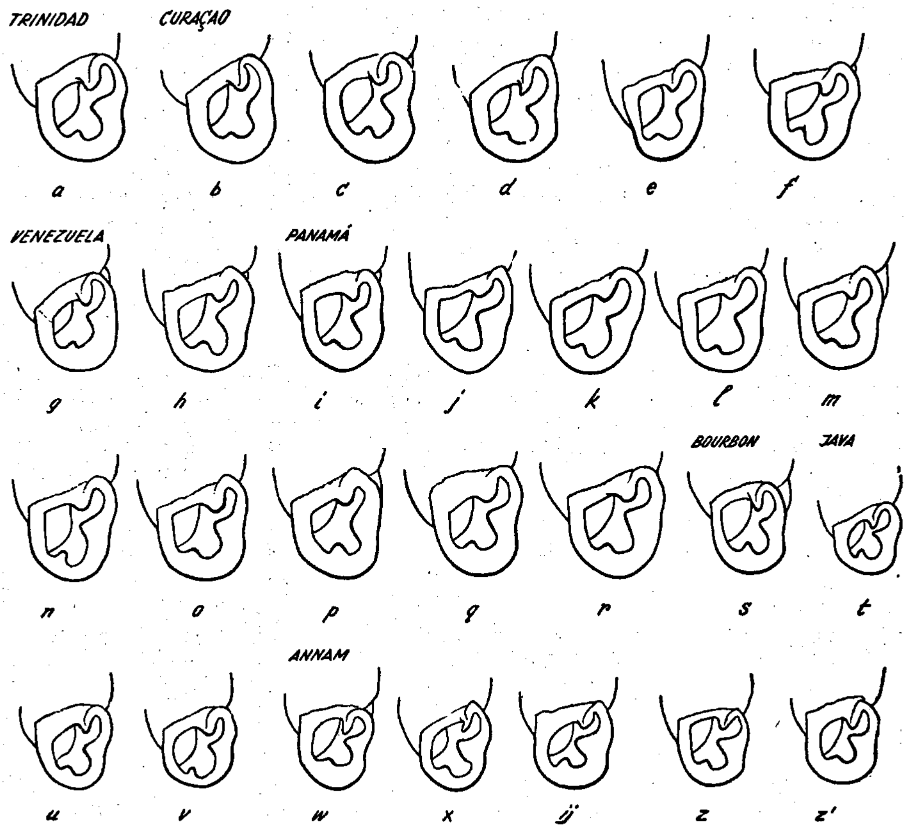


Fig. 11. Apertures of *Gulella bicolor* from: TRINIDAD, *a* VRL 7727; CURAÇAO, *b–d* ZMA, *e–f* USNM 428049; VENEZUELA, *g* VRL 6906, *h* USNM 592916; PANAMÁ *i–r* USNM 218164; BOURBON *s* ZMH; JAVA *t*, *v* VRL 6900, *u* VRL 6472; ANNAM, *w–y* VRL 5755, *z–z'* VRL 5701.

St. John, Chocolate Hole, 19.VI.1955, Hummelinck, Sta. 618, 1 spec. (VRL 7732); under dry shrubs and small trees, not far from the shore, among diabase rocks and cherts with sandy debris and some leaf decay.
St. Croix, Upper Bethlehem, 14.VI.1955, Hummelinck, Sta. 612, 5 spec. (VRL 7730); eastern hill slope consisting of limestone and grown over with shrubs and small trees, in part grassy and cultivated. — Upper Bethlehem, Agr. Experiment Station, 13.VI.1955, Hummelinck, Sta. 613, 1 spec. (VRL 7731); under shrubs and trees on low limestone hill, at the roadside, partly grassy and cultivated — St. Croix, legit H. A. Beatty, 1 spec. (USNM 523542).
St. Martin, Cul de Sac, Agr. Exp. Station St. Peter, 24.V.1949, Hummelinck, Sta. 467A, 2 spec. (VRL 7728); under cut-down Guinea grass, on non-calcareous subsoil consisting of porphyrite and quartz diorite, rather exposed to the trade-wind and seriously affected by recent cultivation. — Cul de Sac, near bridge, 24.V.1949, Hummelinck, Sta. 469, 1 spec. (VRL 7729); between leaf decay of manchioneel leaves, substratum consisting of porphyrite and quartz diorite, among rock debris overgrown by grass, some shrubs and small trees, fairly well protected from the trade-wind and only slightly affected by recent cultivation.
Trinidad, St. Augustine, near Imperial College of Tropical Agriculture, 8.VIII.1948, Hummelinck, Sta. 366, 1 spec. (VRL 7726); in layer of decaying cocoa leaves on weathered, non-calcareous soil, protected from the trade wind and only slightly affected by recent cultivation. — Port-of-Spain, shore, 8.VIII.1948, Hummelinck, Sta. 367, 2 spec. (VRL 7727); among calcareous debris and sand, overgrown with shrubs and weeds, fully exposed to the trade-wind. — Trinidad, from the Crooke collection, No. 14858, 1 spec. (top damaged) (AMNH 65513); not mentioned in Table 1, because not all measurements can be given.
Curaçao, St. Jago, Schaarloo, Willemstad, 26.X.1936, Hummelinck, Sta. 212, 4 spec. (ZMA); under pieces of coral-limestone with some decay of mainly *Croton flavens* leaves, rather exposed to the trade-wind and not seriously affected by recent cultivation (erratic rainfall of 200–900 mm per year). — Willemstad, 23.VI.1925, legit J. P. E. Morrison, 2 spec. (USNM 428049); limestone upland, Acacia association.
Venezuela, Cabo Blanco, West of La Guaira, 10.VIII.1948, Hummelinck, Sta. 121A, 1 spec. (VRL 6906); among some plant decay on weathered non-calcareous soil, between a few low shrubs, not seriously affected by recent cultivation (erratic rainfall of 200–900 mm per year). — El Pilar, Sucre, X.1948, G. Marcuzzi, 1 spec. (USNM 592916).
Panamá, 10 spec. (USNM 218164).
Bourbon, 1 spec. (ZMH).
Java, Tulungagung, central Java, XI.1954, legit Tjoa Tjien Mo, 2 spec. (VRL 6900). — Bogor, west Java, 1952, legit Tjoa Tjien Mo, 1 spec. (VRL 6472).
Annam = Tonkin, 3 spec., ex. Zool. Mus. Berlin (VRL 5755). — Tonkin, 2 spec., ex Zool. Mus. Berlin (VRL 5701).

Streptaxis (Streptartemon) glaber Pfeiffer 1849

Figs. 12–19, Pl. II 1–12.

Helix deformis FÉRUSSAC, 1821, Prodrome, p. 42; Hist. nat., p. 392, pl. 32A fig. 1.
Helix candeana PETIT, 1842, Revue Zool., p. 177.
Helix (Streptaxis) candeana, Pfeiffer, 1842, Symbolae Hist. Helic. *2*, p. 109.
Helix deformis, PFEIFFER, 1848, Mon. Helic. viv. *1*, p. 7.
Streptaxis glabra PFEIFFER, 1849, Proc. Zool. Soc. London, p. 126.
Streptaxis glabra, PFEIFFER, 1853, Mon. Helic. viv. *3*, p. 287.
Streptaxis deformis, PFEIFFER, 1859, Mon. Helic. viv. *4*, p. 332.
Helix (Streptaxis) candeana, MARTENS, 1861, in Albers, Die Heliceen (*2*), p. 307.
Streptaxis deformis, GUPPY, 1866, Ann. Mag. Nat. Hist. (*3*) *17*, p. 53.
Streptaxis candeanus, PFEIFFER, 1868, Mon. Helic. viv. *5*, p. 441.
Streptaxis deformis, PFEIFFER, 1868, Mon. Helic. viv. *5*, p. 445.
Streptaxis glaber, PFEIFFER, 1868, Mon. Helic. viv. *5*, p. 445.
Streptaxis glaber, STOLICZKA, 1871, J. Asiat. Soc. Bengal. *40*, p. 159.
Helix (Streptaxis) candeana, MARTENS, 1873, Binnenmoll. Venez., p. 9.
Streptaxis candeanus, TRYON, 1885, Man. Conch. (*2*) *1*, p. 70, pl. 14 fig. 89–91.
Streptaxis glaber, TRYON, 1885, Man. Conch. (*2*) *1*, p. 74, pl. 15 fig. 24–26.
Streptaxis deformis, TRYON, 1885, Man. Conch. (*2*) *1*, p. 74, pl. 27 fig. 10.
Streptaxis normalis JOUSSEAUME, 1889, Mém. Soc. Zool. France *2*, p. 247, pl. 9 fig. 19–21.
Streptaxis (Streptartemon) normalis, KOBELT, 1906, Mart. Chemn. Syst. Conch. Cab. *1* (*12B*) 2, p. 38.
Streptaxis (Streptartemon) candeanus, KOBELT, 1906, Mart. Chemn. Syst. Conch. Cab. *1* (*12B*) 2, p. 39, pl. 51 fig. 18–19.
Streptaxis (Streptartemon) deformis, KOBELT, 1906, Mart. Chemn. Syst. Conch. Cab. *1* (*12B*) 2, p. 39, pl. 51 fig. 20.
Streptaxis (Streptartemon) glaber, KOBELT, 1906, Mart. Chemn. Syst. Conch. Cab. *1* (*12B*) 2, p. 40, pl. 51 fig. 16–17.
Streptaxis deformis, PILSBRY, 1907, Man. Conch. (*2*) *19*, p. x, pl. 52 fig. 5.
Streptaxis deformis, VANATTA, 1915, Nautilus *29*, p. 82.
Streptaxis (Odontartemon) glaber glaber, BAKER, 1925, Occ. Pap. Mus. Zool. Michigan *156*, p. 39, fig. 58.
Streptaxis (Odontartemon) glaber normalis, BAKER, 1925, Occ. Pap. Mus. Zool. Michigan *156*, p. 39, fig. 59.
Streptaxis (Odontartemon) glaber aroae BAKER, 1925, Occ. Pap. Mus. Zool. Michigan *156*, p. 40, fig. 60.
Streptaxis (Odontartemon) glaber normalis, BAKER, 1926, Occ. Pap. Mus. Zool. Michigan *167*, p. 6–7.
Streptaxis glaber, WAGENAAR HUMMELINCK, 1940, Studies fauna Curaçao *1*, p. 103.
Streptaxis glaber, RICHARDS & WAGENAAR HUMMELINCK, 1940, Notulae naturae *62*, p. 6.

DESCRIPTION

Shell globose, depressed conoidal, narrowly umbilicate, pellucid, whitish, smooth, shiny. Whorls 6, slightly convex, the penultimate

TABLE 6.

AVERAGE MEASUREMENTS of *Streptaxis glaber*.

Number of popu-lations	Locality	Number of spec. measured	Number of whorls	Height of shell in mm	Major diam. of shell in mm	Index of shell	Height of aperture in mm	Height of shell: major diam.	Height of shell: height of aperture
1	Barbados	2	5.75(5.75–5.75)	5.75(5.70–5.80)	6.60(6.60–6.60)	115(114–116)	3.00(3.00–3.00)	0.87(0.86–0.88)	1.92(1.90–1.93)
2	Barbados	2	5.75(5.75–5.75)	6.00(6.00–6.00)	6.90(6.90–6.90)	115(115–115)	3.25(3.20–3.30)	0.87(0.87–0.87)	1.85(1.82–1.88)
3	Barbados	1	5.50	5.00	5.60	112	2.40	0.89	2.08
4	Barbados	3	5.50(5.50–5.50)	5.70(5.40–6.00)	6.60(6.00–7.00)	116(111–119)	3.00(2.80–3.30)	0.87(0.84–0.90)	1.89(1.73–2.00)
5	Barbados	12	5.71(5.50–6.00)	5.77(5.00–6.80)	6.39(6.00–6.70)	112(91–137)	3.03(2.70–3.60)	0.90(0.75–1.10)	1.91(1.67–2.00)
6	Barbados	2	5.88(5.75–6.00)	6.15(5.80–6.50)	6.65(6.40–6.90)	108(106–110)	3.30(3.20–3.40)	0.93(0.91–0.94)	1.86(1.81–1.91)
7	Barbados	4	5.69(5.50–5.75)	5.58(5.00–6.00)	6.33(6.20–6.40)	114(107–124)	2.98(2.80–3.20)	0.88(0.81–0.94)	1.88(1.79–2.03)
8	Barbados	3	5.75(5.75–5.75)	6.07(5.70–6.50)	6.83(6.70–7.00)	113(105–118)	3.27(3.00–3.40)	0.89(0.85–0.96)	1.86(1.76–1.91)
9	Barbados	3	5.67(5.50–5.75)	5.67(5.40–5.90)	6.53(6.20–7.00)	116(105–123)	3.07(3.00–3.10)	0.87(0.81–0.95)	1.85(1.80–1.90)
10	Barbados	13	5.62(5.50–5.75)	5.52(5.00–6.30)	6.38(6.20–6.80)	116(103–126)	2.97(2.70–3.30)	0.86(0.79–0.97)	1.86(1.67–2.03)
11	Barbados	2	5.75(5.50–6.00)	6.00(5.40–6.60)	6.50(6.30–6.70)	110(102–117)	3.20(2.90–3.50)	0.93(0.86–0.99)	1.88(1.86–1.89)
12	Barbados	2	5.75(5.75–5.75)	6.25(6.00–6.50)	6.70(6.60–6.80)	108(105–110)	3.30(3.20–3.30)	0.94(0.91–0.96)	1.93(1.82–2.03)
13	Barbados	13	5.69(5.50–5.75)	5.81(5.20–6.60)	6.38(6.00–6.60)	110(91–123)	3.00(2.80–3.20)	0.91(0.81–1.10)	1.94(1.84–2.13)
14	Barbados	6	5.63(5.50–5.75)	5.68(5.20–6.20)	6.52(6.30–6.70)	115(108–123)	3.05(2.80–3.20)	0.85(0.78–0.90)	1.87(1.71–1.94)
	BARBADOS	68	5.68(5.50–6.00)	5.74(5.00–6.80)	6.46(5.60–7.00)	113(91–137)	3.04(2.40–3.60)	0.89(0.75–1.10)	1.89(1.67–2.13)
15	Trinidad	1	5.25	4.60	5.00	109	2.30	0.92	2.00
16	Trinidad	1	5.50	5.00	5.60	112	2.70	0.89	1.85
17	Trinidad	1	5.75	5.40	5.40	100	2.50	1.00	2.16
18	Trinidad	2	5.63(5.50–5.75)	5.15(4.90–5.40)	5.85(5.70–6.00)	114(111–116)	2.80(2.70–2.90)	0.88(0.86–0.90)	1.84(1.81–1.86)
19	Trinidad	2	5.50(5.50–5.50)	5.00(5.00–5.00)	5.60(5.60–5.60)	112(112–112)	2.70(2.70–2.70)	0.89(0.89–0.89)	1.85(1.85–1.85)
20	Trinidad	1	5.75	4.80	6.10	127	2.70	0.79	1.78
21	Trinidad	2	5.75(5.75–5.75)	5.00(4.90–5.10)	5.50(5.50–5.50)	110(108–112)	2.45(2.40–2.50)	0.91(0.89–0.93)	2.04(1.96–2.13)
22	Trinidad	1	5.50	5.20	5.70	110	2.50	0.91	2.08
23	Trinidad	1	5.75	5.50	5.90	107	2.90	0.93	1.90
24	Trinidad	3	5.75(5.75–5.75)	5.33(4.90–5.70)	5.87(5.50–6.30)	110(107–112)	2.70(2.50–2.80)	0.91(0.89–0.93)	1.97(1.93–2.04)
25	Trinidad	2	5.75(5.75–5.75)	5.35(5.00–5.70)	5.65(5.30–6.00)	106(105–106)	2.60(2.40–2.80)	0.95(0.94–0.95)	2.06(2.04–2.08)
	TRINIDAD	17	5.65(5.25–5.75)	5.15(4.60–5.70)	5.68(5.00–6.30)	110(100–127)	2.64(2.30–2.90)	0.91(0.79–1.00)	1.95(1.78–2.16)
26	Margarita	27	5.49(5.25–5.75)	4.70(4.20–5.30)	5.54(5.20–5.90)	118(102–136)	2.49(2.10–2.80)	0.85(0.74–0.98)	1.86(1.13–2.27)
28	Margarita	1	5.00	3.90	5.00	128	2.30	0.78	1.70
29	Margarita	1	5.50	5.00	5.80	116	2.70	0.86	1.85
	MARGARITA	29	5.48(5.00–5.75)	4.70(3.90–5.30)	5.54(5.00–5.90)	118(102–136)	2.49(2.10–2.80)	0.85(0.74–0.98)	1.86(1.13–2.27)
30	Colombia	4	5.25(5.00–5.50)	4.55(4.10–5.00)	5.10(4.50–5.50)	113(104–126)	2.33(2.10–2.70)	0.90(0.80–0.96)	1.96(1.85–2.18)
31	Colombia	26	5.71(5.50–6.00)	5.32(4.80–5.90)	5.17(4.70–6.00)	97(85–113)	2.55(2.20–2.90)	1.03(0.88–1.18)	2.09(1.92–2.29)
32	Colombia	23	5.47(5.25–5.50)	4.63(4.40–4.90)	5.05(4.70–5.40)	109(104–115)	2.37(2.00–2.60)	0.92(0.87–0.96)	1.97(1.73–2.25)
	COLOMBIA	49	5.60(5.25–6.00)	5.00(4.40–5.90)	5.11(4.70–6.00)	103(85–115)	2.47(2.00–2.90)	0.98(0.87–1.18)	2.03(1.73–2.29)

33	Venezuela	1	5.25	4.70	5.00	106	2.50	0.94	1.88
34	Venezuela	3	5.33(5.25–5.50)	4.40(4.30–4.50)	5.10(5.10–5.10)	116(113–119)	2.27(2.20–2.40)	0.86(0.84–0.88)	1.94(1.83–2.05)
35	Venezuela	3	5.67(5.50–5.75)	5.53(5.30–5.90)	6.17(6.10–6.20)	112(105–117)	2.77(2.70–2.80)	0.90(0.85–0.95)	2.00(1.89–2.11)
36	Venezuela	1	5.50	4.50	5.70	127	2.70	0.79	1.67
37	Venezuela	2	5.38(5.25–5.50)	4.50(4.50–4.50)	4.95(4.90–5.00)	110(109–111)	2.45(2.40–2.50)	0.91(0.90–0.92)	1.84(1.80–1.88)
38	Venezuela	2	5.50(5.50–5.50)	4.55(4.50–4.60)	5.55(5.40–5.50)	120(120–120)	2.60(2.50–2.70)	0.84(0.83–0.84)	1.75(1.70–1.80)
39	Venezuela	1	5.00	4.30	5.70	133	2.70	0.75	1.59
40	Venezuela	1	5.25	4.60	4.90	107	2.30	0.94	2.00
41	Venezuela	7	5.25(5.00–5.50)	4.54(4.10–5.00)	5.51(5.20–5.70)	122(104–134)	2.41(2.30–2.60)	0.83(0.75–0.96)	1.88(1.76–2.00)
43	Venezuela	8	5.31(5.25–5.50)	5.00(4.60–5.30)	6.41(6.00–6.60)	129(123–140)	2.96(2.90–3.00)	0.78(0.71–0.82)	1.69(1.57–1.83)
44	Venezuela	1	5.25	4.80	6.00	125	2.80	0.80	1.71
45	Venezuela	40	5.21(5.00–5.25)	4.66(4.30–5.30)	6.00(5.50–6.40)	129(117–140)	2.77(2.40–3.20)	0.78(0.71–0.85)	1.68(1.40–1.83)
46	Venezuela	1	5.50	5.60	6.40	114	3.00	0.88	1.87
47	Venezuela	1	5.50	5.10	6.10	120	2.70	0.84	1.89
48	Venezuela	3	5.67(5.50–5.75)	5.50(5.40–5.60)	6.47(6.30–6.70)	118(116–120)	2.97(2.90–3.00)	0.85(0.84–0.86)	1.95(1.80–2.13)
49	Venezuela	3	5.58(5.50–5.75)	5.43(5.00–5.70)	6.20(5.60–6.60)	114(112–116)	3.13(2.80–3.40)	0.88(0.86–0.89)	1.74(1.65–1.79)
50	Venezuela	1	5.50	5.00	6.40	128	3.00	0.78	1.67
51	Venezuela	1	5.25	4.50	6.20	138	2.90	0.73	1.55
52	Venezuela	8	5.06(5.00–5.50)	4.01(3.90–4.40)	4.84(4.60–5.00)	121(114–128)	2.11(2.00–2.30)	0.83(0.78–0.88)	1.90(1.77–2.00)
	VENEZUELA	88	5.28(5.00–5.75)	4.70(3.90–5.90)	5.83(4.60–6.70)	124(104–140)	2.69(2.00–3.40)	0.81(0.71–0.96)	1.76(1.40–2.13)
53	Br. Guiana	3	5.25(5.25–5.25)	4.90(4.60–5.20)	5.67(5.40–6.00)	116(104–122)	2.43(2.40–2.50)	0.87(0.82–0.96)	2.02(1.84–2.17)
54	Br. Guiana	16	5.33(5.25–5.75)	4.94(4.60–5.40)	5.71(5.40–6.00)	116(106–124)	2.61(2.30–2.80)	0.86(0.81–0.95)	1.81(1.74–2.12)
55	Br. Guiana	22	5.25(5.00–5.50)	5.08(4.30–6.00)	5.60(5.10–5.90)	111(92–130)	2.64(2.40–3.00)	0.91(0.77–1.09)	1.94(1.70–2.50)
57	Br. Guiana	4	5.69(5.50–6.00)	5.08(4.50–5.50)	6.15(5.80–6.30)	122(115–129)	2.83(2.70–3.00)	0.84(0.79–0.87)	1.80(1.61–1.96)
58	Br. Guiana	10	5.90(5.50–6.00)	6.60(5.50–7.30)	6.79(6.00–7.30)	103(96–114)	3.32(3.00–3.60)	0.97(0.88–1.05)	1.99(1.83–2.21)
59	Br. Guiana	2	5.75(5.75–5.75)	5.80(5.60–6.00)	6.60(6.20–7.00)	114(111–117)	3.10(3.00–3.20)	0.87(0.82–0.92)	1.87(1.87–1.88)
	BR. GUIANA	57	5.43(5.00–6.00)	5.32(4.30–7.30)	5.92(5.10–7.30)	112(92–130)	2.77(2.30–3.60)	0.90(0.77–1.09)	1.93(1.61–2.50)
61	Brasil	8	5.78(5.50–6.00)	4.98(4.80–5.20)	5.79(5.50–6.10)	117(108–122)	2.64(2.20–2.90)	0.87(0.82–0.93)	1.90(1.72–2.27)
62	Brasil	3	5.58(5.25–5.75)	4.60(4.50–4.70)	5.40(5.00–5.60)	117(111–122)	2.40(2.30–2.50)	0.85(0.82–0.90)	1.92(1.88–2.00)
63	Brasil	2	5.75(5.75–5.75)	5.20(5.00–5.40)	5.95(5.60–6.30)	115(112–117)	2.80(2.60–3.00)	0.88(0.86–0.89)	1.86(1.80–1.92)
64	Brasil	1	5.75	4.70	5.70	121	2.50	0.82	1.88
65	Brasil	4	5.81(5.50–6.00)	5.00(4.60–5.60)	6.35(6.30–6.50)	127(113–141)	2.75(2.60–3.00)	0.80(0.71–0.89)	1.83(1.70–1.93)
66	Brasil	2	5.50(5.50–5.50)	4.15(4.00–4.30)	5.40(5.00–5.80)	130(125–135)	2.40(2.30–2.50)	0.77(0.74–0.80)	1.73(1.72–1.74)
	BRASIL	20	5.73(5.25–6.00)	4.86(4.00–5.60)	5.82(5.00–6.50)	120(108–141)	2.61(2.20–3.00)	0.84(0.71–0.93)	1.87(1.70–2.27)

one inflated, the last one strongly deviating from the original axis. Suture distinct but shallow. Aperture very obliquely produced. Parietal wall with a minute blunt tooth, which is, however, often reduced to a scarcely perceptible little streak or is completely absent. Peristome white, more or less thickened and reflected.

In the literature three subspecies are distinguished in the area treated here:

1) ssp. *glaber*, a higher, somewhat more globose form with generally well-developed parietal lamella, somewhat larger than the ssp. *normalis*, and having 5¾ whorls. — Loc. typ.: Demerara, British Guiana.

2) ssp. *normalis*, a more depressed form with scarcely developed parietal lamella or without any trace of it, and having 5½ whorls. — Loc. typ.: Río Macuto, Venezuela.

3) ssp. *aroae*, smaller than ssp. *normalis*, usually more excentrically depressed, although with slightly more prominent apex, without parietal tooth, and having 5¼ whorls. — Loc. typ.: Aroa, Venezuela.

These forms are apparently extremes. There is some difference in the means of the measurements in the various localities, as may be seen from the following Table 6 and the diagrams. Nevertheless the ranges of variation of the number of whorls, the height and major diameter of the shells, and the height of the aperture in the specimens examined clearly show that we have only to do with one and the same species, and that specimens which agree in size and shape with the extremes described above may be found in a great number of localities. For that reason I have made no attempt to divide the material into subspecies, or create still more new names.

As regards the parietal tooth, the material I have studied shows that it is just as variable as the form and the measurements of the shell. It is present in all specimens from every locality; sometimes it has the shape of a strong oblique lamella, sometimes it is reduced to a more or less perceptible thickening on the thin callus. No relation could be observed between the degree of its development and the size of the shell, well-developed lamellae and scarcely perceptible thickenings being present in almost every locality.

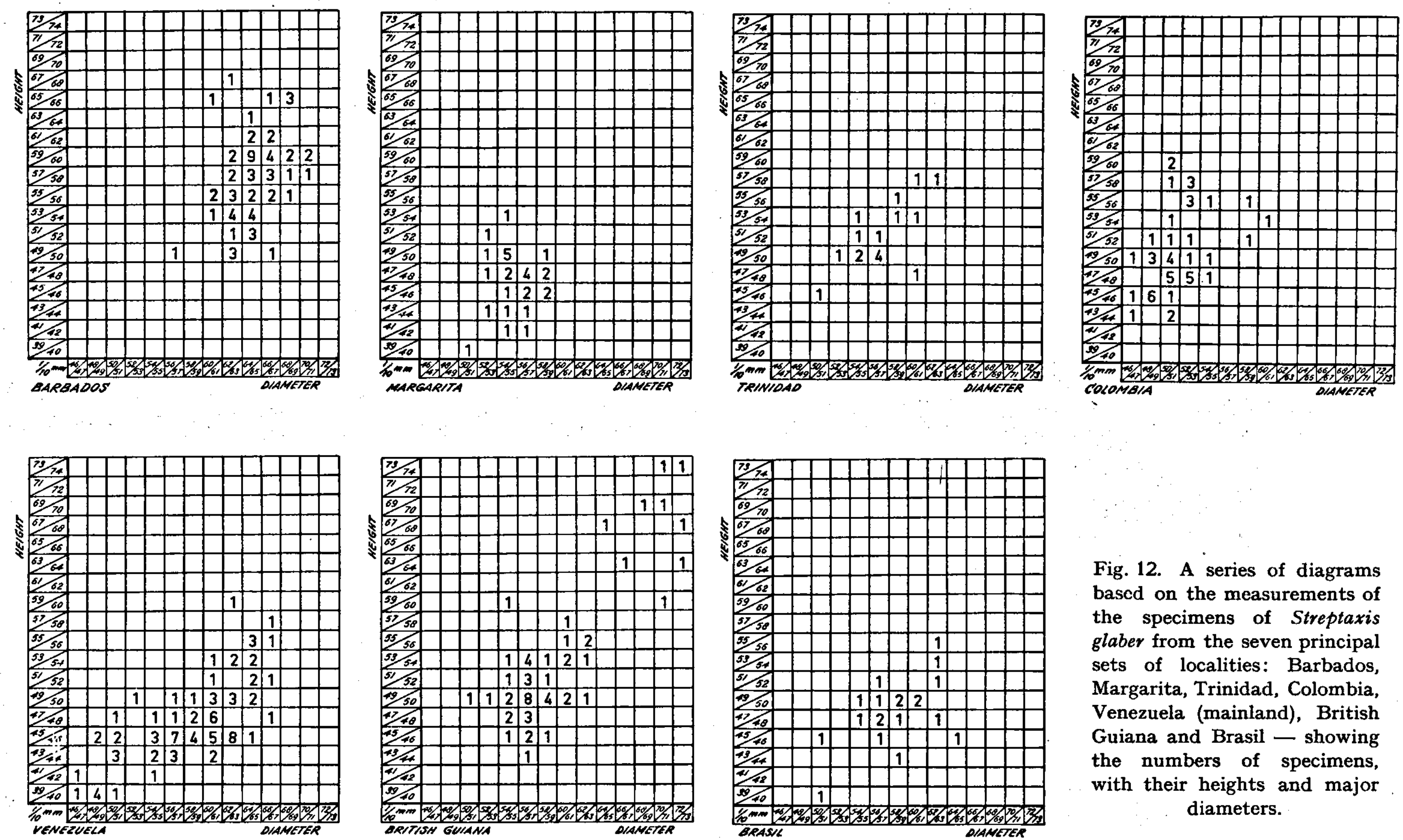
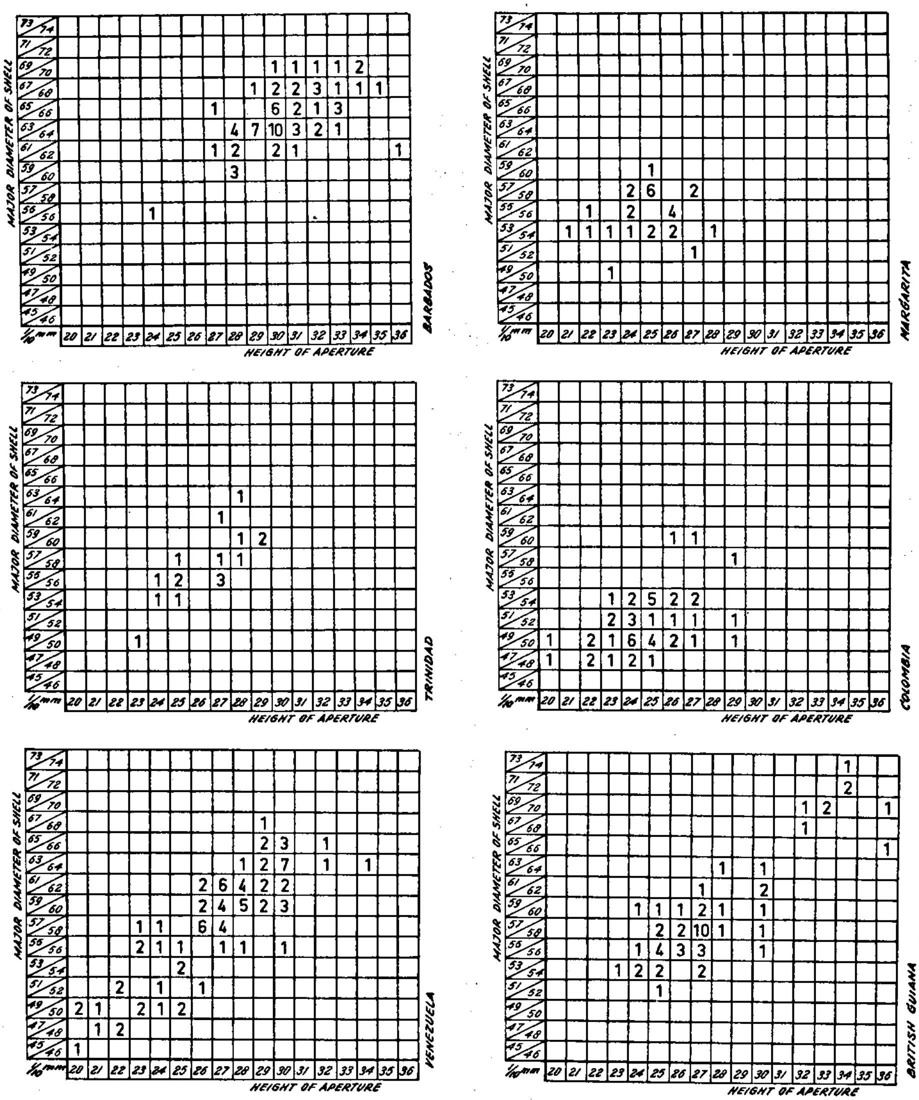


Fig. 12. A series of diagrams based on the measurements of the specimens of *Streptaxis glaber* from the seven principal sets of localities: Barbados, Margarita, Trinidad, Colombia, Venezuela (mainland), British Guiana and Brasil — showing the numbers of specimens, with their heights and major diameters.



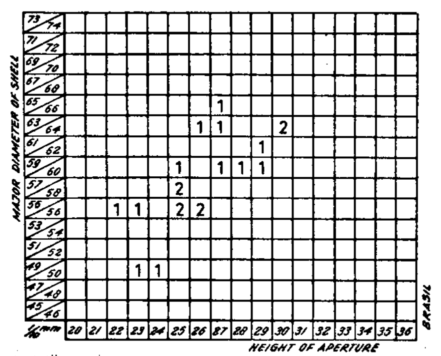
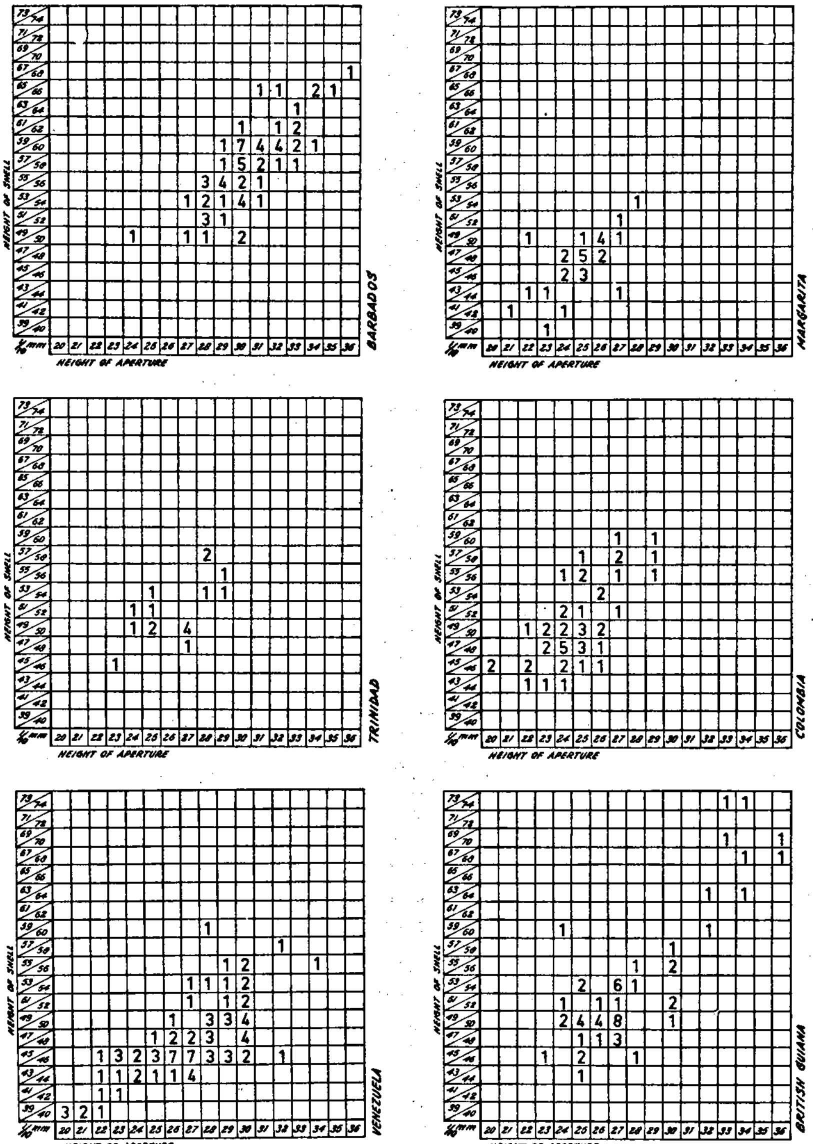


Fig. 13. A series of diagrams based on the measurements of the specimens of *Streptaxis glaber* from Barbados, Margarita, Trinidad, Colombia, Venezuela (mainland), British Guiana and Brasil — showing the numbers of specimens, with their heights of shell and heights of aperture.



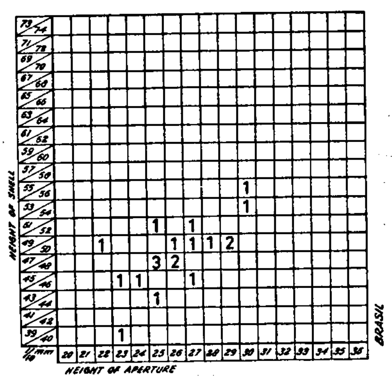


Fig. 14. A series of diagrams based on the measurements of the specimens of *Streptaxis glaber* from Barbados, Margarita, Trinidad, Colombia, Venezuela (mainland), British Guiana and Brasil — showing the numbers of specimens, with their diameters of shell and heights of aperture.

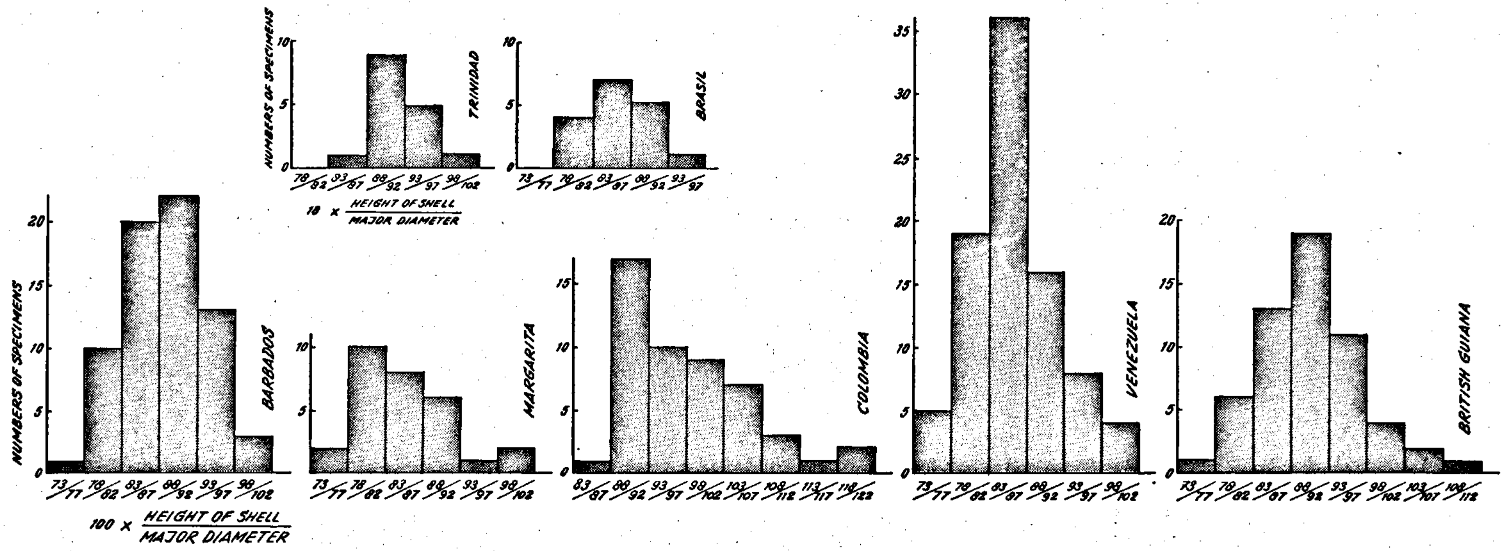


Fig. 15. A series of diagrams based on the measurements of the specimens of *Streptaxis glaber* from Barbados, Margarita, Colombia, Venezuela British Guiana, Trinidad and Brasil — arranged according to the height of the shell compared with its major diameter.

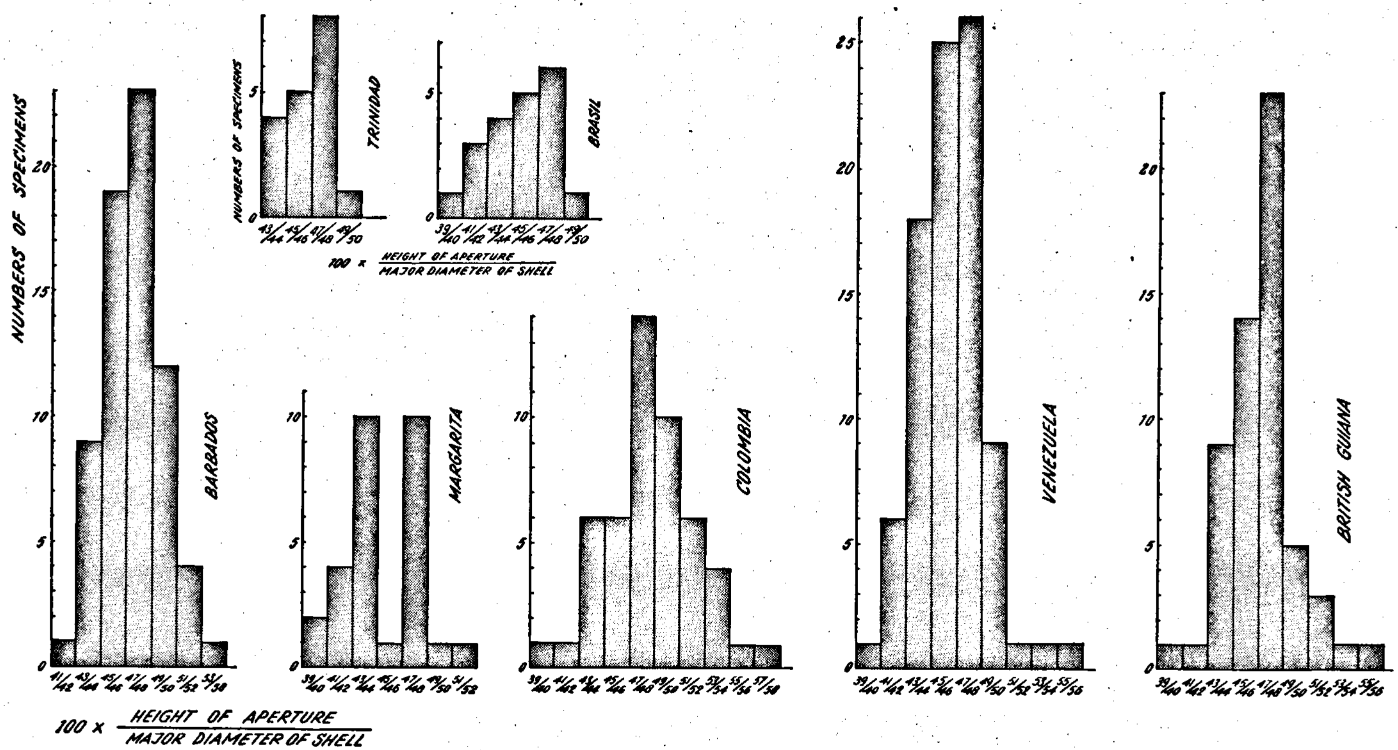


Fig. 16. A series of diagrams based on the measurements of the specimens of *Streptaxis glaber* from Barbados, Margarita, Colombia, Venezuela, British Guiana, Trinidad and Brasil — arranged according to the height of the aperture compared with the major diameter of the shell.

The first series of diagrams is based on the measurements of the specimens from the seven principal sets of localities: Barbados, Trinidad, Margarita, Colombia, Venezuela (mainland), British Guiana, and Brasil. The few specimens from Barranquilla have been left out of account.

Fig. 12 shows the numbers of specimens, with their heights and major diameters.

Fig. 13 shows the numbers of specimens, with their heights of shell and heights of aperture.

Fig. 14 shows the numbers of specimens, with their diameters of shell and heights of aperture.

The second series of diagrams is also based on the measurements of the specimens from the same set of localities, but for each set the average has been calculated of *a*) the major diameter of the shells, *b*) the height of the shells, *c*) the height of the apertures.

To enable the average measurements to be compared, the major diameter of each shell has been given an index value of 100. Both the height of the shells and the height of the apertures have been reduced to indices based on the major diameter.

The measurements obtained in this manner have been arranged firstly, according to the height of the shell compared with its major diameter (Fig. 15, showing 10 groups with an interval of 5); secondly according to the height of the aperture compared with the major diameter of the shell (Fig. 16, showing 10 groups with an interval of 2).

For the third series of diagrams (Figs. 17–18), the averages of major diameter, height of shells and height of apertures of the specimens from each locality form the starting point. Here too the major diameter of each shell has been given a value of 100, and both height of shell and height of aperture have been reduced to indices related to the major diameter as basis. In these diagrams, however, measurements of the shells from all 62 localities have been included.

The records arranged and illustrated in this manner demonstrate a nearly ideal ratio of major diameter : height of shell : height of aperture, of 100 : 88 : 46½.

As regards this ideal ratio, the second series of diagrams shows that none of the individual sets of localities deviate widely from it, their ratios being as follows:

Barbados	100 : 88.53 : 46.93	Venezuela	100 : 86 : 46.02
Trinidad	100 : 91.18 : 46.09	Br. Guiana	100 : 90.09 : 46.76
Margarita	100 : 82.67 : 44.97	Brasil	100 : 84.25 : 45
Colombia	100 : 97.86 : 48.13		

In the fourth series of diagrams (Fig. 19) the ratios calculated have been divided into eight groups, represented by triangles the base of which is the major diameter and the right side the height of the aperture. Between these two sides of the triangle there is a ratio which is constant for each group, viz. for:

Group 1 100 : 43. To this group belong the shells of localities 65, 53 and 3, with their heights of 80, 87 and 89 respectively.

Group 2 100 : 44. To this group belong the shells of localities 20, 64, 41, 62 and 22, with their heights of 79, 82, 83, 85 and 91 respectively.

Group 3 100 : 45. To this group belong the shells of localities 66, 52, 26, 4, 1, 35 and 21, with their heights of 77, 83, 85, 86, 87, 90 and 91 respectively.

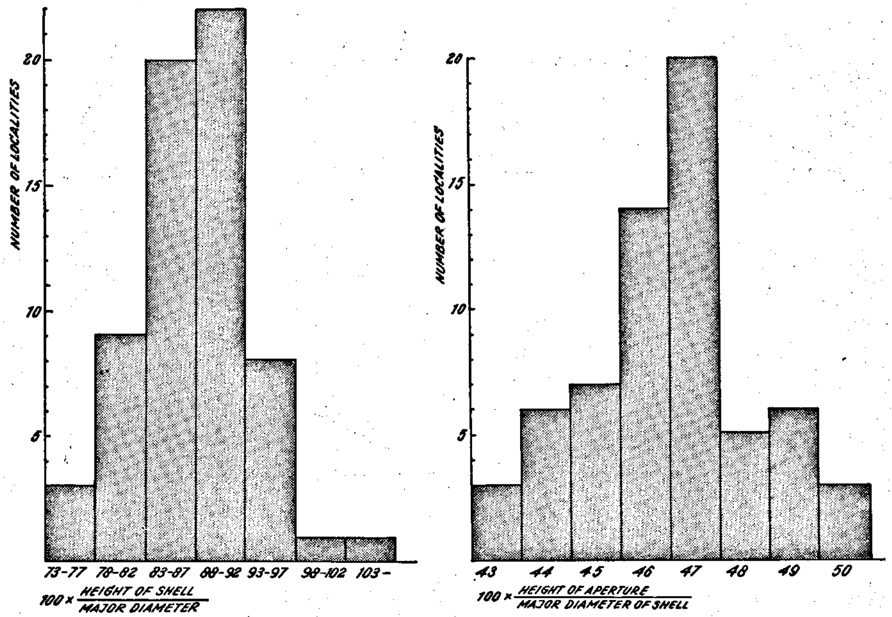


Fig. 17–18. Two diagrams of *Streptaxis glaber* in which the averages of major diameter, height of shells and height of apertures of the specimens from each locality form the starting point. (See text.)

Group 4 100 : 46. To this group belong the shells of localities 28, 43, 45, 57, 48, 54, 34, 61, 30, 24, 15, 25 and 17, with their heights of 3 × 78, 84, 85, 2 × 86, 87, 90, 91, 92, 95 and 100 respectively.

Group 5 100 : 47. To this group belong the shells of localities 51, 39, 50, 36, 44, 38, 14, 10, 29, 2, 9, 7, 63, 59, 46, 5, 13, 55, 32 and 40, with their heights of 73, 75, 78, 79, 80, 84, 85, 2 × 86, 2 × 87, 4 × 88, 90, 2 × 91, 92 and 94 respectively.

Group 6 100 : 48. To this group belong the shells of localities 27, 18, 8, 16 and 19, with their heights of 85, 88 and 3 × 89 respectively.

Group 7 100 : 49. To this group belong the shells of localities 37, 11, 23, 12, 58 and 31, with their heights of 91, 2 × 93, 94, 97 and 103 respectively.

Group 8 100 : 50. To this group belong the shells of localities 49, 6 and 33, with their heights of 88, 93 and 94 respectively.

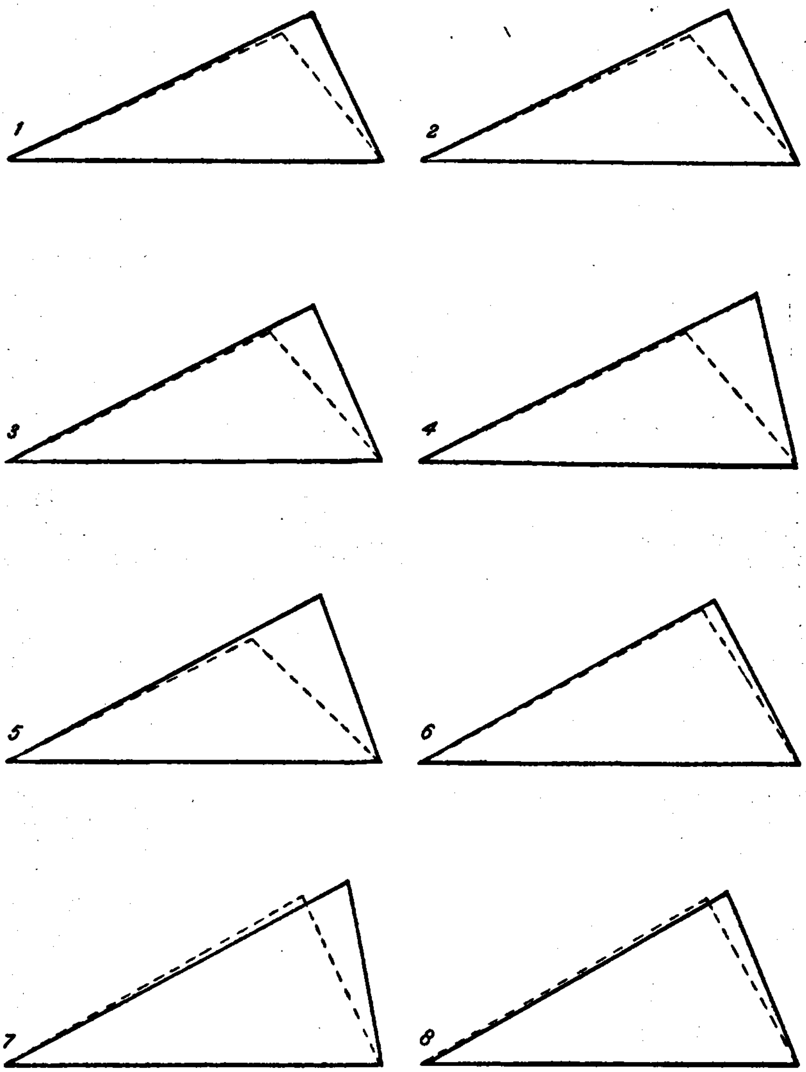


Fig. 19. A series of diagrams of *Streptaxis glaber* in which the ratios calculated have been divided into eight groups, represented by triangles the base of which is the major diameter and the right side the height of the aperture. Between these two sides of the triangle there is a ratio which is constant for each group. (See text.)

The longer, left side of the triangle, representing the height of the shells, is the variable factor in each group (varies in length). In every case only the longest (bold) line and the shortest (dotted) line have been drawn. The others have not been drawn; they would lie between the two extremes.

These diagrams clearly show that there is a rather regular ratio between major diameter, height of shell, and height of aperture.

The animal has been examined and illustrated by PILSBRY (1907) and BAKER (1925 and 1926). It has a holopod foot with coarse granulations on the sides, and a bluntly pointed tail.

The mantle edge shows two overlapping frontal lobes. The mantle cavity is long and narrow. Its roof shows a main pulmonary vein, which is accompanied by a fleshy ridge. No secondary venation is visible.

The kidney is oval and lies transversely at the rear end of the mantle cavity; it gives rise to a sigmoid primary ureter, which passes into a closed, tubular, secondary ureter (PILSBRY 1907, pl. 53 fig. 5: pallial region of a specimen from Barbados).

As in all Streptaxidae the jaw is absent. The transverse rows of the radula are chevron-shaped near the centre, but recurved at the outer margins. In a specimen of *Streptaxis glaber normalis* from Río Macuto near La Guaira, Venezuela, BAKER (1925, pl. 10 fig. 57) found 66 transverse rows with the formula 20-1-20. The central tooth is small and was difficult to detect. It has a weak, raised cusp and a very thin, oval base. The first five laterals next to the central tooth are well developed, and increase gradually in length; they are unicuspid and their anterior part is very powerful and broad. Beyond them the teeth decrease in size and become more slender. The outermost ones are but little larger than the central tooth and lack the peculiar enlargement of the anterior portion.

Little is known of the central nervous system. In the specimen from Barbados mentioned above, PILSBRY found that the cerebral ganglia were situated almost in contact, united only by a very short commissure.

The penial retractor is very broad at its insertion on the apex of the penis, but tapers gradually towards its attachment to the diaphragm near the side of the spermoviduct. The pharyngeal retractor branches off at a high level.

The hermaphrodite gland (BAKER 1926, pl. 17 figs. 84–86) is small and has only a few tubulo-alveolar lobes; the hermaphrodite duct is weakly convoluted and has a bladder-like enlargement just before it enters the apex of the spermoviduct. The albumen gland has a long-ovoid form. The spermoviduct is large; the male side is furnished with a rather slender prostate gland. The free oviduct is short and stout, and shows a narrowed, longitudinally plicate cavity. The vagina has an ovoid enlargement and is almost filled with a complex series of anastomosing folds at the base of the oviduct. The receptacular duct is slender and thin-walled; the oval spermatheca is situated near the base of the liver, just above the loop of the aorta.

The vas deferens arising from the base of the oviduct runs straight across to the upper edge of the penial sheath, enters this, becomes slightly enlarged, extends almost to the base of the penis, then turns abruptly, and finally passes up along the side to enter apically into the penis itself. The penial papilla is represented by a very slight, rounded elevation on the apical wall.

The penis is short and rather broad, tapering anteriorly; its basal part is surrounded by a heavy, muscular sheath; the upper portion has a large lumen which shows numerous, recurved, corneous spines on its wall; the lower portion has a narrower, longitudinally plicate cavity.

Bionomics

Very little is known of the life history of the species. Like most of the Streptaxidae the animals live under stones, fallen trees, dead leaves and mould. Whether they are carnivorous is uncertain. According to STOLICZKA (1871, p. 159) the species is oviparous.

Distribution

The species is known from the northern mainland of South America (Colombia, Venezuela, British and Dutch Guiana, and north-eastern Brasil) and from the islands of Margarita, Trinidad and Barbados in the eastern part of the Caribbean Sea.

Material (with population numbers, as used in Table 6)

1 BARBADOS, Blowers, legit H. G. Kugler, 1935, 2 specimens (NMB 1527-c).
2 Christchurch, Hastings, legit H. G. Kugler, 1950, 2 spec. (NMB 1527-d).
3 Peters Wood, S.U.D. Expedition, Henderson collection, 1 spec. (USNM 460545).
4 St. Agnes Churchyard, Henderson Coll., 3 spec. (USNM 618873).
5 Exp. Bryant Walker, Henderson Coll., 14 spec. (USNM 618874).
6 Vendryes, 2 spec. (USNM 366615).
7 legit Simpson, Henderson Coll., 4 spec. (USNM 515797).
8 legit Bland, 3 spec. (USNM 124386).
9 legit Stearns, 3 spec. (USNM 57415).
10 Sir Gilbert Carter's Place, S.U.D. Exp., Henderson Coll., 13 spec. (USNM 460544).
11 legit Caziot, Chamberlain Fund, 2 spec. (USNM 336003).
12 legit L. B. Brown, 2 spec. (USNM 162767).
13 St. John's Church, S.U.D. Exp., Henderson Coll., 13 spec. (USNM 460547).
14 1 mile north of Bridgetown, S.U.D. Exp., Henderson Coll., 6 spec. (USNM 460546).
15 TRINIDAD, Monos island, 10.I.1955, Hummelinck, Sta. 578, 1 spec. (VRL 7724); underbrush.
16 Gasparo Grande island, cave entrance, 11.I.1955, Hummelinck, Sta. 655, 1 spec. (VRL 7725); wet plant debris, dark.
17 Pointe à Pierre, Bon Accord, legit H. G. Kugler, 1950, 1 spec. (NMB 1527-e).
18 San Fernando, legit H. G. Kugler, 1926, 2 spec. (NMB 1527-b).
19 legit J. H. Ponsonby, 2 spec. (BM 95.9.10.6–7).
20 Belmont, near Port-of-Spain, legit A. P. Spencer, 12.II.1903, Henderson Coll. ex Coll. G. H. Clapp, 1 spec. (USNM 618876).
21 Botanic Gardens, Port-of-Spain, 2.IX.1929, Bartsch — W. R. Bacon Scholarship, 2 spec. (USNM 393973).
22 Belmont, near Port-of-Spain, Henderson Coll., 1 spec. (USNM 618875).
23 legit Ulrich, 1 spec. (USNM 203555).
24 St. Ann's, legit W. E. Broadway, I.1923, Chamberlain Coll., 3 spec. (USNM 348702).
25 2 spec. (BM, marked M.C.).

26 MARGARITA, bluffs S. side of road between Pampatar and Asunción, 7.IX. 1929, Bartsch — W. R. Bacon Scholarship, 28 spec. (USNM 393069).
27 northern slope of hill W. of La Asunción, 250 m, 3.VII.1936, Hummelinck, Sta. 146, 1 spec. (ZMA); thin layer of leaf decay on rock debris chiefly consisting of serpentine, among shrubs.
28 northern slope of hill W. of La Asunción, 300 m, 3.VII.1936, Hummelinck, Sta. 145, 1 spec. (ZMA); as before.
29 El Valle, legit G. Marcuzzi, I.1949, 1 spec. (VRL 7721).
30 COLOMBIA, Barranquilla, Henderson Coll., 4 spec. (USNM 331909).
31 Río Ranchería, Dept. Magdalena, legit O. Haught, 26 spec. (USNM 618564).
32 Quebrada Paradero, Com. Guajira, 18 km SW of Carrayeia, 100–200 m, legit O. L. Haught, 1943, 23 spec. (USNM 599647).
33 VENEZUELA, San Juan de los Morros, legit Sergio Arias, 1953, 1 spec. (VRL 6650).
34 San Juan de los Morros, legit S. Arias, 1953, 3 spec. (VRL 6375).
35 Cabo Blanco, W. of La Guaira, 10.VIII.1948, Hummelinck, Sta. 121A, 3 spec. (VRL 6137); among plant decay on non-calcareous soil.
36 Lagunillas, Estado Mérida, legit G. Marcuzzi, VII.1949, 1 spec. (VRL 6904).
37 Cerro de los Baños, along the Río Mitare, Edo. Falcón, legit H. G. Kugler, 1947, 2 spec. (NMB 5262-d).
38 Between Maracaibo and central Falcón, legit H. G. Kugler, 1929, 2 spec. (NMB 5262-c).
39 S. of Coro, near Caujarab, Falcón, legit H. G. Kugler, 1949, 1 spec. (NMB 4914-b).
40 Acosta, Cerro Riecito, Falcón, legit H. G. Kugler, 1925, 1 spec. (NMB 4914-a).
41 Morro de Esmerarda, W. of Carúpano, 10.VI.1936, Hummelinck, Sta. 124, 8 spec. (ZMA); on island of about $\frac{1}{4}$ km², 200 m from mainland, among rock debris and plant decay.
42 Falcón, 1 spec. (USNM 538931).
43 Silva, Falcón, legit H. G. Kugler, V.1934, 11 spec. (USNM 508815).
44 Acosta, Falcón, legit H. G. Kugler, V.1934, 1 spec. (USNM 508840).
45 Acosta, Riecito, Falcón, legit H. G. Kugler, 50 spec. (USNM 508779).
46 Puerto Cabello, 1 spec. (AMNH 55468).
47 Puerto Cabello, 1 spec. (AMNH 65508).
48 Puerto Cabello, Chamberlain Coll., 3 spec. (USNM 522333).
49 W. of Cumarebo, Falcón, Chamberlain Collection, 3 spec. (USNM 522334).
50 Venezuela, legit H. S. Ladel, 1 spec. (USNM 420511).
51 6 Miles W. of Puerto Cabello, legit Arnold, 1 spec. (USNM 252582).
52 Venezuela, 11 spec. (USNM 24040).
53 BRITISH GUIANA, Kijk-over-al, legit J. P. E. Morrison, 11.VIII.1925, Chamberlain Collection, 3 spec. (USNM 428143).
54 Kijk-over-al, under leaves, among shrubbery, legit J. P. E. Morrison, 11.VIII.1925, Chamberlain Coll., 16 spec. (USNM 428144).
55 Kijk-over-al, in leaf mould, legit J. P. E. Morrison, 20.VIII.1925, Chamberlain Coll., 24 spec. (USNM 428155).
56 Kijk-over-al, under leaves, among shrubbery, legit J. P. E. Morrison, 11.VIII.1925, Chamberlain Coll., 3 juveniles (USNM 428145).
57 Demerara, Collection Haines, 4 spec. (AMNH 65474).

58 Georgetown, legit I. I. Duelch, 13 spec. (BM 90.5.17.5–17).
59 Essequibo River, legit. I. I. Duelch, 2 spec. (BM 89.10.24.42–3).
60 Kartabo, under leaves, old wharf trail, legit J. P. E. Morrison, 7.VII.1925, Chamberlain Coll., 1 juvenile (USNM 428090).
61 BRASIL, 8 spec. (AMNH 65486).
62 Bahia, legit A. C. Fulton, Chamberlain Coll., 3 spec. (USNM 522338).
63 Pará, legit G. Nevill, Stearns Coll., 2 spec. (USNM 98738).
64 Brasil, legit Evezard, Henderson Coll., 1 spec. (AMNH 316238).
65 Amazon River, Pará, 5 spec. (USNM 32094).
66 Bahia, legit Nevill, Stearns Coll., 2 spec. (USNM 98737).

Localities mentioned by WAGENAAR HUMMELINCK (1940, p. 103) but not checked: MARGARITA, hill near El Cerrito, W. of La Asunción, 27.V.1936, Sta. 138, between marble schists among scattered shrubs. — Foot of the Cerro del Piache, SE of El Valle, 10.VII.1936, Sta. 140, coarse marble schists overgrown by shrubs and small trees. — Toma de Agua del Valle, 250 m, 4.VII.1936, Sta. 143, among decaying leaves of *Clusia rosea*.

Streptaxis (Streptartemon) deplanchei Drouet 1859

Figs. 20–21; Pl. II 13–15.

Streptaxis Deplanchei DROUET, 1859, Moll. Guyane française, p. 56, pl. 1 fig. 6–9.
Streptaxis Deplanchei, PFEIFFER, 1868, Mon. Helic. viv. *5*, p. 450.
Streptaxis Deplanchei, TRYON, 1885, Man. Conch. (*2*) *1*, p. 79, pl. 16 fig. 80–82.
Streptaxis (*Streptartemon*) *deplanchei*, KOBELT, 1906, Mart. Chemn. Syst. Conch. Cab. *1* (*12B*) 2 p. 37, pl. 46 fig. 26–27.

DESCRIPTION

Shell globose conoidal, rather strongly oblique, moderately umbilicate, rather solid, diaphanous, smooth, very shiny, whitish. Whorls 5–6, irregular, convex, the last ones deviating from the original axis. Aperture obliquely produced, somewhat triangular. Parietal wall with a strong, rather long lamella, slightly thickened anteriorly at its right side, the outer lip bearing a small, slightly deeper-situated, not very conspicuous, blunt tooth, the basal margin showing an extended thickening parallel to it. Lip white, reflected.

As regards the armature of the aperture, DROUET's figure does not agree with his description, to which fact KOBELT (1906, p. 37) has already called attention. In DROUET's figure, which is also reproduced by KOBELT (1906, pl. 46, fig. 26–27), the outer lip does not show any tooth or thickening, and the parietal lamella is conspicuously broader than long, and bifid, whereas the basal tooth is relatively less prominent.

The measurements of the height and major diameter of the specimens from Cayenne in the British Museum agree quite well with those given by DROUET.

The specimens found on St. Martin fully correspond with the original description and with the specimens from Cayenne which I was able to examine, but they differ greatly as regards the measurements of their height and major diameter; the average height and major diameter of the St. Martin specimens being respectively 5.07 (4.80–5.40) and 6.33 (6.00–6.60) mm, of the Cayenne specimens 4.18 (3.90–4.40) and 5.56 (5.30–5.90) mm. Moreover, the number of whorls is greater in the St. Martin specimens, showing an average of 5.75 (5.50–6.00), whereas the Cayenne specimens only reach an average of 5.40 (5.00–5.75). The height of the aperture also appears to be greater, showing an average of 2.70 (2.50–2.80) mm in the St. Martin specimens, as compared with 2.32 (2.10–2.50) mm in the specimens from Cayenne.

The conformity in outer appearance, and the difference in measurements and number of whorls, justify the supposition that the specimens from St. Martin belong to an ecological race of the species, for which I would propose the name **Streptaxis (Streptartemon) deplanchei** var. **martiniana,** nov. var.

Nothing is known about the outer characteristics of the animal of *Streptaxis deplanchei*, or about its internal structure, and among the material available no animal from Cayenne suitable for anatomical investigations was at my disposal. I managed to get part of the head out of the shell of only one specimen of the new variety, belonging to the lot of four specimens from Sta. 469, and to separate and mount the radula (Fig. 20).

The radula has a length of 3.5 mm and, if flattened, a breadth of 0.6 mm. It bears about 66 transverse rows of teeth, and the formula is 18-1-18. In Fig. 20 half of a transverse row on the flattened radula is shown in its normal course.

The central tooth is very short and thin, and can scarcely be found. It is only 0.03 mm high and a little more than 0.01 mm broad. It has a small mesocone with a somewhat smaller cusp on each side. The base is rounded, as in *Streptaxis glaber normalis* Jousseaume (BAKER 1925, pl. X 57), but the margins are more parallel to each other than in that species, while the cusps are slightly broader and a little more blunt.

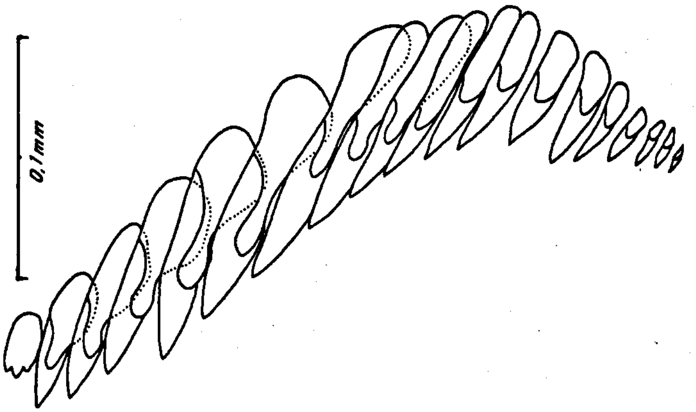


Fig. 20. Part of the radula of *Streptaxis deplanchei* var. *martiniana* from ST. MARTIN (VRL 7723) — half a transverse row.

The first lateral tooth is 0.06 mm long. It has a relatively broad, bluntly pointed, long cusp; the anterior part of the tooth is outwardly largely expanded, and the basal margin is rounded.

The first six laterals are of about the same shape, and gradually increase in length to about 0.12 mm. The enlargement of the anterior part of these teeth begins in the first lateral from about the middle of the tooth, but in every succeeding tooth it moves up more anteriorly, until in the sixth tooth it only occupies the first third of the total length, and gradually diminishes. Beyond the sixth lateral the teeth gradually decrease in size, both in length and in breadth, until the outermost ones are about half the length of the central tooth and lack the enlargement of the basal part.

The radula is on the whole very similar to that of *Streptaxis glaber normalis*, but it differs from the latter in the somewhat different shape of the central tooth, the fact that the laterals increase in

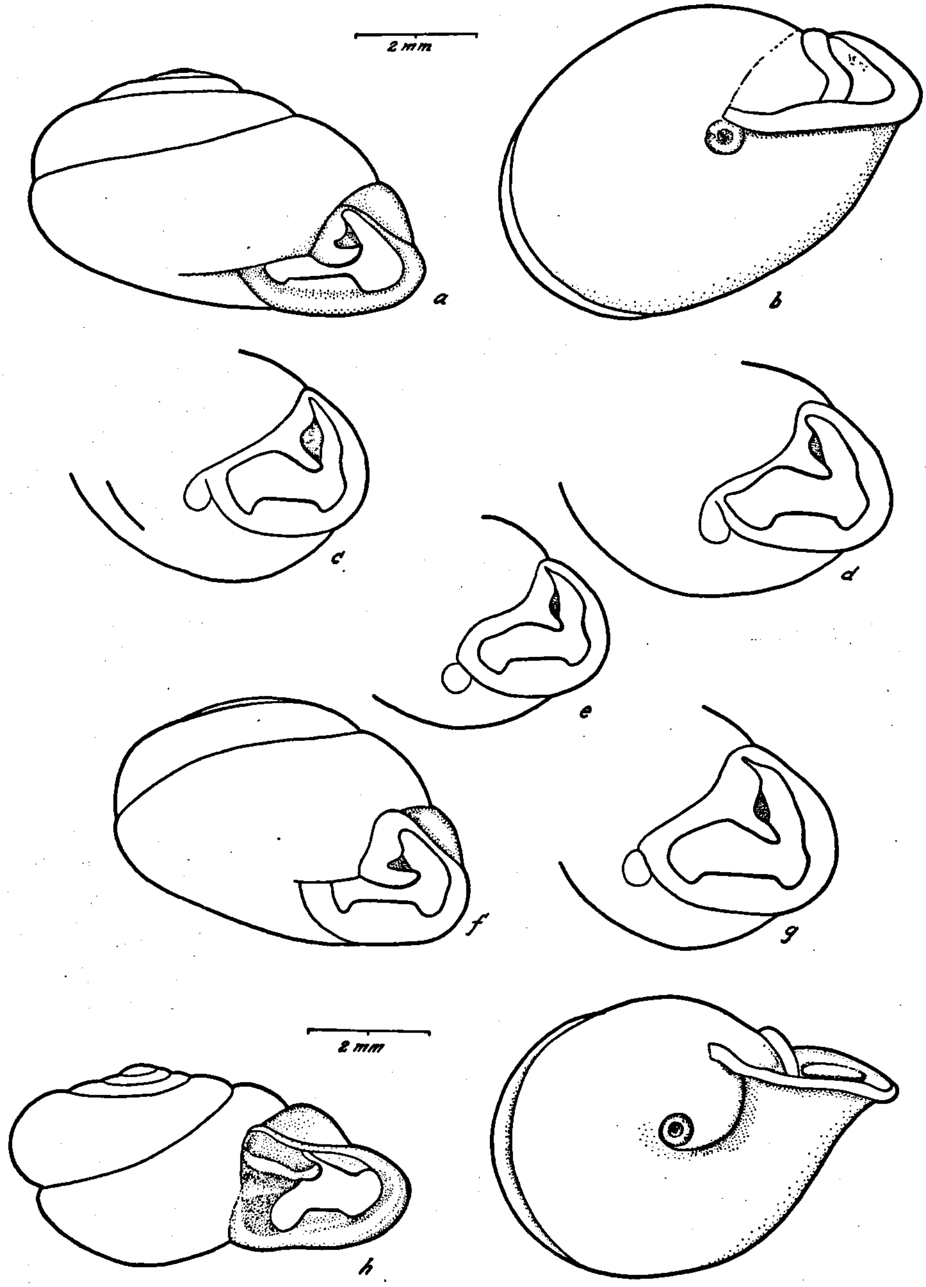


Fig. 21. *Streptaxis deplanchei* from CAYENNE, *a–e* (BM), *f* (USNM 307600). — *Str. deplanchei* var. *martiniana* from ST. MARTIN, *g* (VRL 7722). — *Str. demerarensis* from DEMERARA, *h-i* (AMNH 65474, holotype). (*a* and *b* same specimen)

TABLE 7.

Average measurements of *Streptaxis deplanchei*.

Locality & material	Number of spec.	Number of whorls	Height of shell in mm	Major diameter of shell in mm	Index of shell	Height of aperture in mm	Height of shell: major diameter	Height of shell: height of aperture
St. Martin	1	6.00	5.4	6.60	122	2.80	0.82	1.93
St. Martin Sta. 469	2	5.63 (5.50–5.75)	4.90 (4.80–5.00)	6.20 (6.00–6.40)	127	2.65 (2.50–2.80)	0.79 (0.78–0.80)	1.86 (1.79–1.92)
ST. MARTIN	3	5.75 (5.50–6.00)	5.07 (4.80–5.40)	6.33 (6.00–6.60)	125 (122–127)	2.70 (2.50–2.80)	0.80 (0.78–0.82)	1.88 (1.79–1.93)
Cayenne BM	2	5.37 (5.00–5.75)	4.10 (4.00–4.20)	5.55 (5.40–5.70)	136 (135–136)	2.45 (2.40–2.50)	0.74	1.68 (1.67–1.68)
Cayenne BM	1	5.25	4.40	5.30	120	2.20	0.83	2.00
Cayenne AMNH	1	5.50	3.90	5.50	141	2.10	0.71	1.86
Cayenne USNM	1	5.50	4.40	5.90	134	2.40	0.75	1.83
CAYENNE	5	5.40 (5.00–5.75)	4.18 (3.90–4.40)	5.56 (5.30–5.90)	133 (120–141)	2.32 (2.10–2.50)	0.75 (0.71–0.83)	1.81 (1.67–2.00)

TABLE 8.

Average measurements of *Streptaxis demerarensis*.

Locality & material	Number of whorls	Height of shell in mm	Major diameter of shell in mm	Index of shell	Height of aperture in mm	Height of shell: major diameter	Height of shell: height of aperture	Breadth of aperture
Demerara	6	3.43	6.80	198	2.32	0.50	1.48	2.82
6 spec.	5½	3.32	6.40	193	2.43	0.52	1.37	2.75
AMNH	5½	3.29	6.50	197	2.36	0.51	1.39	2.71
	5½	3.25	6.00	185	2.25	0.54	1.44	2.61
	5¾	3.14	6.20	197	2.38	0.51	1.32	2.86
	5½	2.86	5.60	192	2.25	0.51	1.27	2.31
DEMERARA	5.63 (5.5–6.0)	3.22 (2.86–3.43)	6.25 (5.60–6.80)	194 (185–198)	2.33 (2.25–2.43)	0.52 (0.50–0.54)	1.38 (1.27–1.48)	2.67 (2.31–2.86)

TABLE 9.

Average measurements of *Streptaxis funcki*.

Locality & material	Number of spec.	Number of whorls	Height of shell in mm	Major diameter of shell in mm	Index of shell	Height of aperture in mm	Height of shell: major diameter	Height of shell: height of aperture
Venezuela BM	3	7.25 (7.00–7.50)	19.57 (18.2–20.5)	25.27 (24.1–26.1)	128 (121–138)	12.53 (12.0–13.5)	0.78 (0.70–0.83)	1.56 (1.50–1.67)
Venezuela USNM	1	6.75	17.50	23.70	95	11.50	0.74	2.06
Venezuela VRL	2	7.25 (7.25–7.25)	16.55 (16.5–16.6)	22.95 (22.9–23.0)	139 (138–139)	10.75 (10.6–10.9)	0.72 (0.72–0.72)	1.54 (1.37–1.57)
VENEZUELA	6	7.15 (6.75–7.50)	18.22 (16.5–20.5)	24.23 (22.9–26.1)	126 (121–139)	11.76 (10.6–13.5)	0.75 (0.70–0.83)	1.64 (1.37–2.06)

length up to the sixth instead of to the fifth one, and the slightly different measurements of the details. Since, however, I had at my disposal only one single specimen of *Streptaxis deplanchei* var. *martiniana* and the radula of the typical form had nowhere been published, comparison with more radulae of the species was precluded. Consequently, at the moment it remains impossible to say whether the description is essentially characteristic in every detail.

Bionomics

Nothing is known as yet about the biology of the species. As far as may be concluded from the very few localities where specimens have been found, it seems to prefer dry places and to lead a hidden life on non-calcareous soil under rocks and among low vegetation.

Distribution

Streptaxis deplanchei, in its typical form, has been collected only at Ilet-la-Mère, near Cayenne; the variety *martiniana* is found on St. Martin, Lesser Antilles.

Material

ST. MARTIN (var. *martiniana*), Agricultural Experiment Station St. Peter, Cul de Sac, 24.V.1949, Hummelinck, Sta. 467, 1 spec. (VRL 7722); under non-calcareous rock debris of stone wall, with plant decay of scanty shrubs and grasses; the island has a marked dry season with an irregular rainfall of 800–1600 mm.
Cul de Sac, near bridge, 24.V.1949, Hummelinck, Sta. 469, 4 spec. (VRL 7723); among leaf decay of *Hippomane mancinella*, with non-calcareous rock debris and clay, overgrown by grasses, some shrubs and small trees.
CAYENNE, 2 spec. (BM). Cayenne, 1 spec. (BM). Cayenne, 1 spec. (AMNH 65499). Cayenne, 1 spec. (USNM 307600).

Streptaxis (Streptartemon) demerarensis n. sp.

Fig. 21; Pl. V.

Shell depressed with low conic spire, very strongly oblique, widely umbilicate, rather solid, diaphanous, smooth, shiny, whitish. Whorls 6, irregular, slightly convex, the last one deviating strongly from the original axis. Suture rather deep, somewhat ascending towards the aperture. Aperture very obliquely produced, distinctly triangular. Parietal wall with strong, rather long lamella, somewhat pinched-in in the middle, the outer lip bearing a large blunt tooth about parallel to the margin and quite close to it, the basal margin showing another tooth also parallel to the margin. On the outside of the shell just behind the peristome, two pits correspond with both teeth on the inner side of the aperture. Lip sharp, white and strongly reflected. Last whorl laterally compressed at its end, very flatly and indistinctly, rather regularly striate, the striae becoming more conspicuous around the large umbilicus.

Material
DEMERARA (British Guiana), legit Haines, 6 spec. (AMNH 65474). — Type specimen in the collection of the American Museum of Natural History, New York.

The species is closely related to *Streptaxis deplanchei* Drouet, having about the same armature of the aperture. It differs from it in its larger measurements, the much more depressed form, the greater deviation of the last whorl, the more obliquely produced and more triangular aperture, the pits behind the peristome, the sharp and more strongly reflected lip, the compression of the last whorl, the much wider umbilicus, and the obvious striation around it.

Streptaxis (Rectartemon) funcki (Pfeiffer 1847)

Pl. III 1–5.

Helix funcki PFEIFFER, 1847, Proc. Zool. Soc. London, p. 229.
Helix funcki, PFEIFFER, 1847, Mon. Helic. viv. *1*, p. 436.
Streptaxis Dunkeri var. *clausa* LOEBBECKE, 1881, Nachr.bl. D. Malakozool. Ges. *13*, p. 50–51.
Streptaxis Dunkeri var. *clausa*, LOEBBECKE & KOBELT, 1882, Jahrb. D. Malak. Ges. *9*, p. 4–5, pl. 1 fig. 4–5.
Streptaxis funcki, KOBELT, 1906, Mart. Chemn. Syst. Conch. Cab. *1* (*12B*) 2, p. 28, pl. 45 fig. 1–6.
Streptaxis funcki, BAKER, 1925, Occ. Pap. Mus. Zool. Michigan *156*, p. 41.

DESCRIPTION

Shell globose, depressed conoidal, very narrowly umbilicate, rather solid, whitish under the very thin, yellow-brownish epidermis, moderately shiny. Apex obtuse. Whorls 7½, moderately convex, the last one somewhat deviating. The first three whorls are weakly striate, the following ones rather regularly and densely obliquely plicate, except for the last, which is smooth and polished on the underside and shows only a very weak striation on the upper side. The surface of the last 2½ whorls has a peculiar malleation all over. The last whorl is rather convex at its underside and somewhat compressed near the umbilicus, sloping slightly downwards in front. Suture sharp and well impressed. Aperture without teeth, oblique, subtriangular. Basal and columellar margins of the peristome somewhat thickened and distinctly reflected, white.

The measurements of the specimens examined agree quite well with those mentioned in the literature, their height varying between 18.2 and 20.5 mm, their major diameter between 24.1 and 26.1 mm.

One of the lots in the British Museum, from Mérida, Venezuela, contains six young specimens, all of which have a still wide-open umbilicus and a conspicuous keel on the middle of the last whorl.

Loebbecke (1881) describes a variety *clausa* of the Brasilian species *Streptaxis dunkeri* Pfeiffer, which variety, according to Kobelt (1906, p. 29), does not belong to that species but to *Streptaxis funcki*. The variety was based on a couple of specimens said to inhabit Brasil and characterized by a fully closed umbilicus, though, since the author states that both specimens show traces of former injuries, the closed umbilicus may be due to individual abnormality. The variety is also illustrated by Kobelt (1906, fig. 1–4). The measurements of these specimens are: height 18 and 20.5 mm; major diameter 28.5 and 26 mm; minor diameter 22.5 and 21 mm.

Distribution

The species has been described from Mérida, Venezuela. Six juvenile specimens in the collection of the British Museum were also collected at Mérida; the three adult specimens in the same collection are only known to have been collected somewhere in Venezuela.

Material

Venezuela, legit Funck, 3 spec. (BM). Mérida, 6 juv. spec. (BM). Venezuela, 1 spec. (USNM 522335). Mérida, 2 spec. (VRL 7995).

Streptaxis (Rectartemon) meridaensis n. sp.

Pls. III 6, IV.

Shell globose, depressed conoidal, narrowly umbilicate, rather thin, whitish under the thin brownish-grey epidermis, shiny. Apex obtuse. Whorls 6½, moderately convex, the last one deviating. The three embryonic whorls are very weakly striate, the following ones rather regularly and densely obliquely plicate, except for the last, which is smooth and polished on the underside and shows a very weak vertical striation on the upper side. The surface of the last 2½ whorls is malleated all over. The last whorl is convex at its underside and slightly compressed near the umbilicus, gradually sloping downward in front. Suture well impressed. Aperture without teeth, oblique, broadly lunate. Margin of the peristome reflected, white.

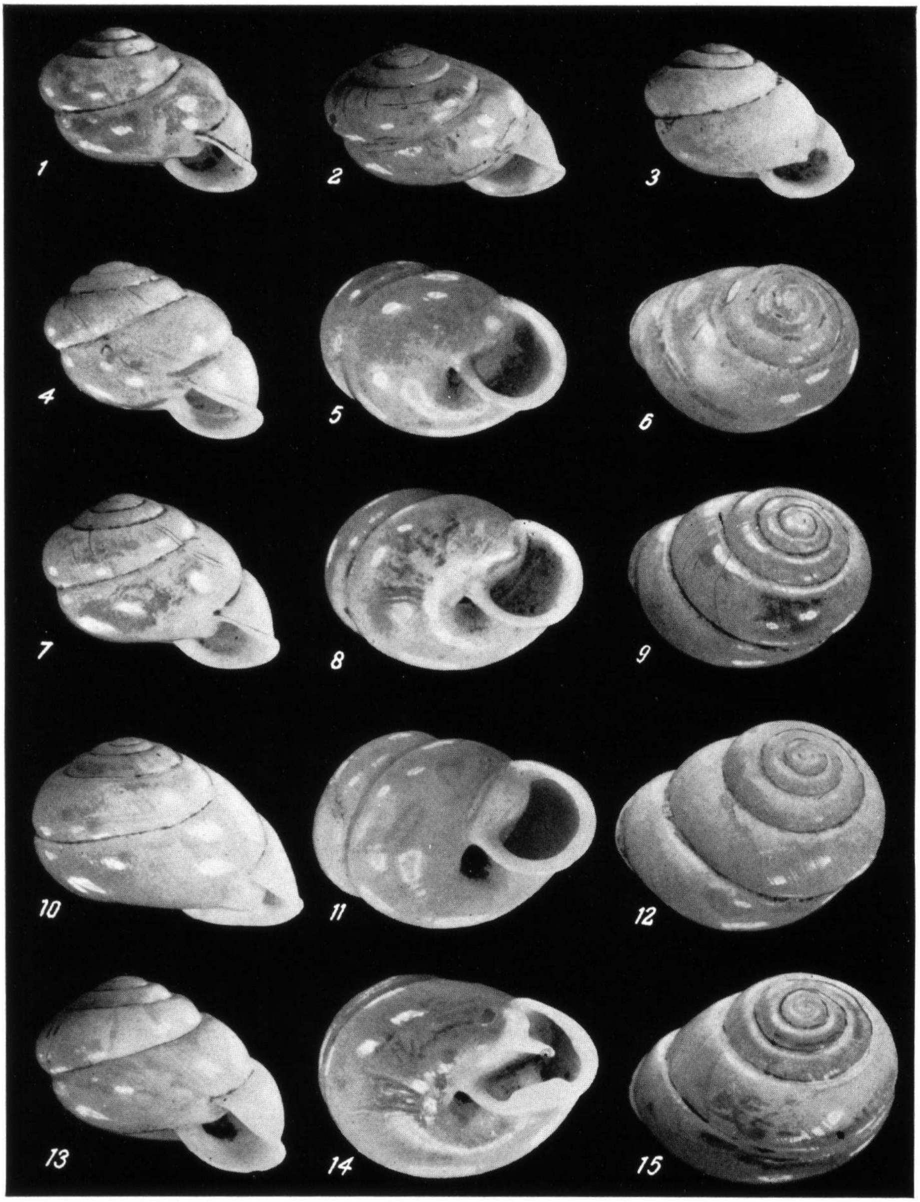
Height: 12	Major diam.: 17	Height of aperture: 7.7 mm	type
12.1	16.4	7.4 mm	paratype
12	18.2	7.9 mm	

The species belongs to the group of *Streptaxis funcki*, but differs from it in being much smaller, in having a comparatively lesser height, a more oblique and more rounded aperture, and in the fact that the last whorl slopes slightly more steeply downward towards the front.

Material

VENEZUELA. There are three specimens in the British Museum. The holotype and one paratype were found at an altitude of 3000 m at Santo Domingo, state of Mérida, in 1906. The third specimen bears only the note "Venezuela", and was collected in 1901.

PLATE II

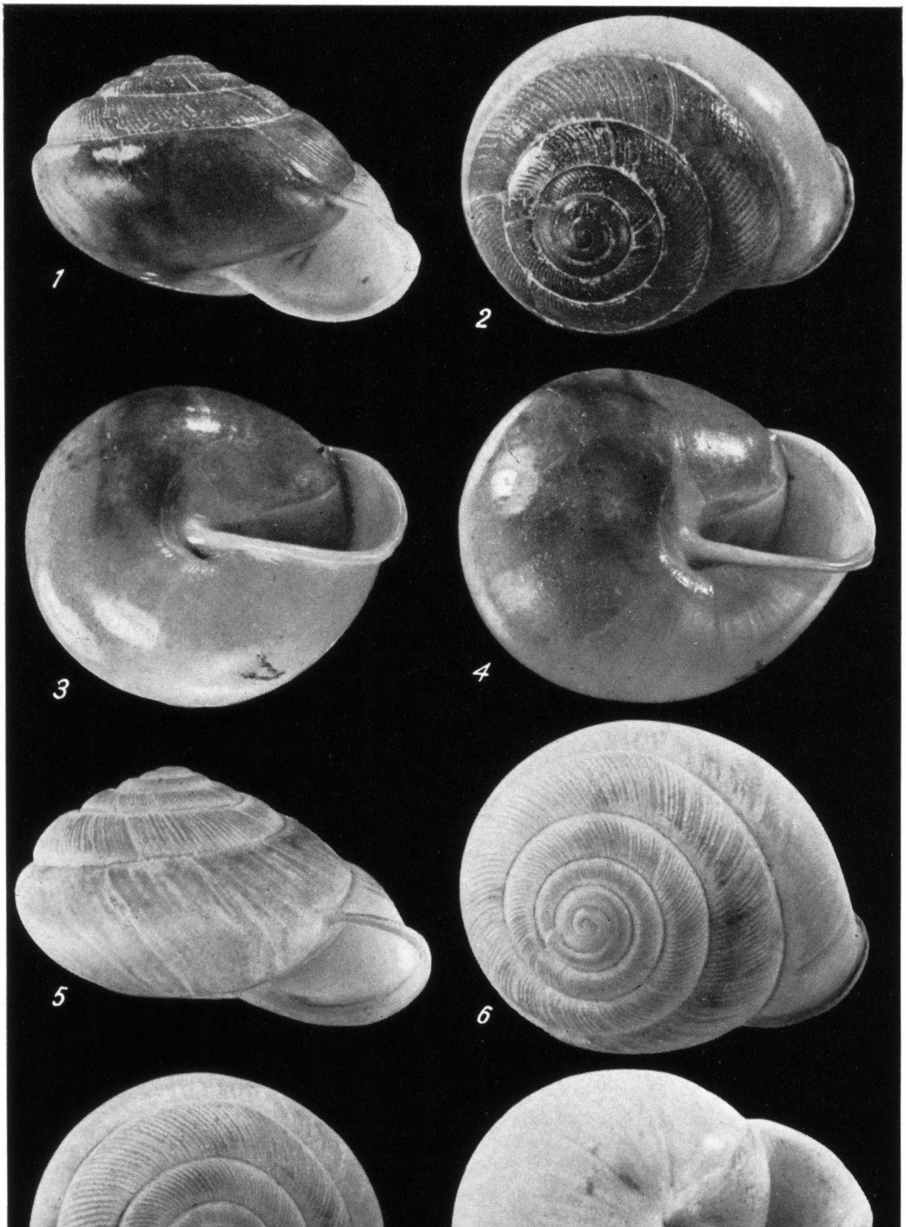


Streptaxis glaber (× 2½) — *1–2, 10–12*, VENEZUELA mainland; *1*, San Juan de los Morros (VRL 6375); *2*, Lagunillas, Mérida (VRL 6904); *10–12*, Cabo Blanco, sta. 121A (VRL 6137). *3, 7–9*, MARGARITA; *3*, sta. 145 (ZMA); *7–9*, El Valle (VRL 7721). *4–6*, TRINIDAD, Gasparee island, sta. 655 (VRL 7725).
Streptaxis deplanchei var. *martiniana* (× 2½) — *13–15*, ST. MARTIN, sta. 467, type specimen (VRL 7722).

PLATE III

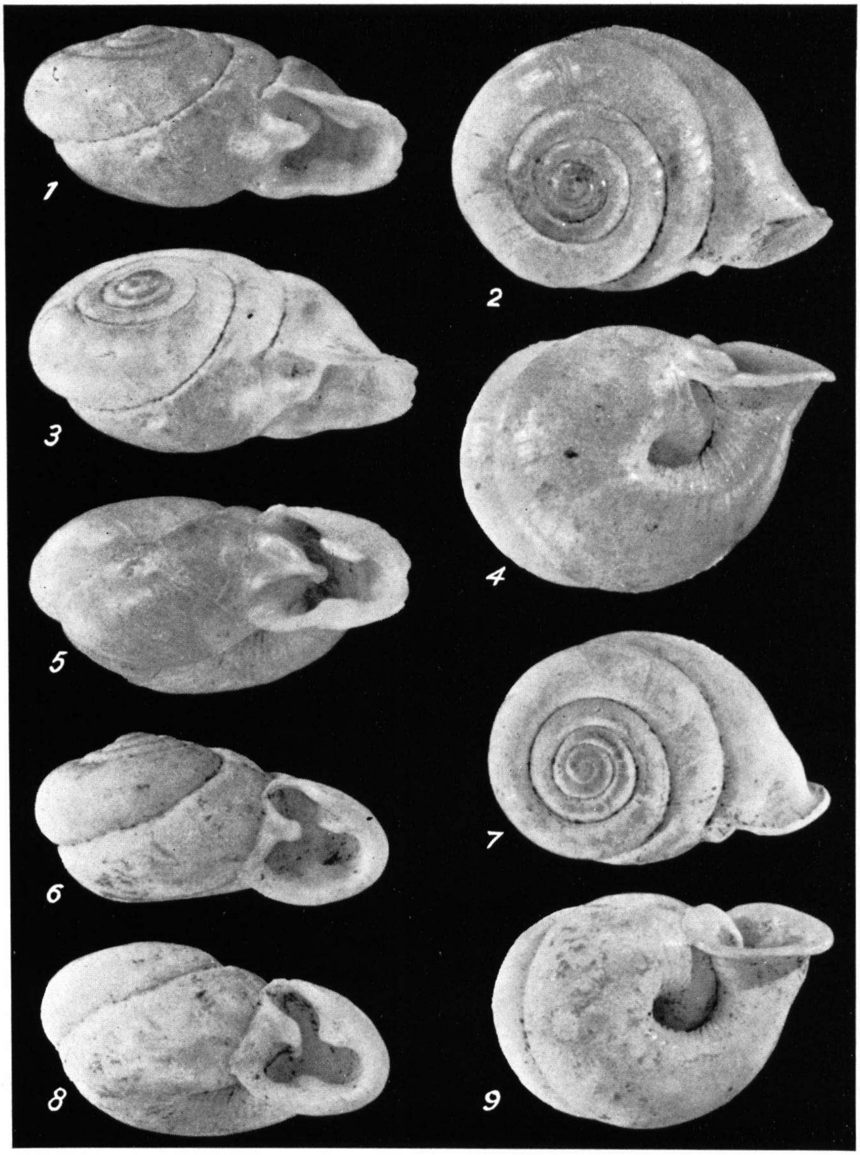
Streptaxis funcki (× 2¼) — *1–5*. VENEZUELA mainland, *1*, *4–5*, specimen A (BM); *2–3*, specimen B (BM).
Streptaxis meridaensis (× 2¼) — *6*, VENEZUELA, Mérida (BM), holotype.

PLATE IV



Streptaxis meridaensis (× 2¼) — *1–8*, VENEZUELA; *1–4*, holotype (BM); *5–8* paratype (BM).

PLATE V



Streptaxis demerarensis (× $3\frac{1}{4}$) — *1–9*, BRITISH GUIANA, Demerara; *1–5*, holotype (AMNH 65474a); *6–9*, cotype (AMNH).