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CARIBBEAN LAND MOLLUSCS: NOTES ON CERIONIDAE

by

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Reviewing the enormous amount of literature concerning *Cerion*, one may wonder whether it makes sense to write another article on this genus not dealing with a fundamental problem. However – in the author's opinion – the state of affairs is such that it may still be useful to publish a number of new data, hoping that this important animal-group will be included in modern taxonomical and ecological research to a greater extent as has been the case until now.

The representatives of the genus *Cerion* have a remarkable distribution: a large area in the northern part of the Caribbean region – with three centres of speciation, in Cuba, the Bahamas and the Cayman Islands – yielding many dozens of species and subspecies, and a small area in the southern part, confined to the islands of Curaçao, Aruba and Bonaire, harbouring only one single species. The uniformity of the *Cerion* population of the three islands of the Leeward Group is most striking, compared to the pluriformity of the populations on several much younger and much less diversified Bahamian islands.

According to the material studied – which, unless stated otherwise,

was collected by dr. P. WAGENAAR HUMMELINCK – these "Notes" can easily be divided into a first part, to be regarded as an addition to HUMMELINCK's *Cerion* studies, 1940, and a second one, based on material collected by him in the northern Caribbean in later years.

When studying *Cerion* one may wonder whether the various efforts in subdividing the genus were inspired by the justified wish to create more order in the affluence of forms, rather than by the existence of distinct systematic gaps or taxonomically valuable characteristics. Also, whether the subgenera *Umbonis* Maynard (CLENCH & AGUAYO 1952), *Cyclocerion* Bartsch (BARTSCH 1952) and others (cf. WENZ 1959/60) could not, with good reason, be fitted in the Key which HUMMELINCK (1940, p. 100–101) restricted to the subgenera *Cerion*, *Eostrophia*, *Strophiops* and *Diacerion*.

Among all this, the monotypical subgenus *Cerion* remains in an isolated position, being characterized by a narrowly perforated, pupiform shell with many ribs, a parietal tooth in the angle between columella and parietal wall, and a whitish colour without pattern. Most remarkable is the stability of the species *Cerion uva*, which seems not to have altered during many changes of the islands of Curaçao, Aruba and Bonaire in Pleistocene times, and which even did not differentiate after the scattering of the region long before.

This study was made under supervision of dr. P. WAGENAAR HUMMELINCK, being part of the work required in order to obtain a Master's degree at the University of Utrecht.

The photographs were taken by H. VAN KOOTEN and his assistants at the Zoological Laboratory at Utrecht (Pls. XI–XIV), brother M. ARNOLDO BROEDERS (Pls. VIIIb, IX) and dr. HUMMELINCK (Pls. VIIIa, X). The latter is also responsible for Figs. 95–98 and 100–104, in which he summarized much of his field work.

The material on which this study is based has been presented to the:

American Museum of Natural History, New York: 220, 225A, 237, 319, 557, 813, 881, 940; 704; 615; 692.

British Museum (Natural History), London: 202B, 224, 233, 261, 304, 804, 807, 811, 905; 701A; 615; 692.

Field Museum of Natural History, Chicago: 190Ba, 204A, 226, 328, 876, 910Aa, 942; 701; 615; 692.

Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussel: 35, 45, 49, 92, 186A, 206, 207, 210, 352, 912; 703; 692.

Muséum National d'Histoire Naturelle, Paris: 193Aa, 220a, 316, 317, 559, 910A, 945; 704; 615; 692.

National Museum of Natural History [USNM], Washington: 45, 243, 313, 808, 810, 911, 941, 951; 701; 615; 692.
Naturhistorisches Museum, Basel: 185Aa, 187a, 199c, 213, 222a, 262, 821, 908, 949; 701; 615; 692.
Natur-Museum Senckenberg, Frankfurt am Main: 243Aa, 262A, 314, 341, 343, 803, 807a, 906, 950; 701A, 703; 692.
Rijksmuseum van Natuurlijke Historie, Leiden: 12, 15, 19, 21, 22, 27, 28, 31, 32, 36, 40, 42, 43, 45, 48–50, 53, 57, 58, 66, 78, 81, 82, 91, 95, 100, 221, 242A, 560, 812, 910, Kl. Curaçao; 696, 699, Corozo, Guayacan; 612, 615, Airport; 692; 496; 498, 499; Nassau.
Universitetes Zoologiske Museum, København: 187, 190a, 201, 232, 353, 816, 909; 703; 615; 692.
Zoölogisch Museum, Amsterdam: 4–8, 10, 11, 13, 16, 20, 26, 29, 33, 41, 47, 52, 54, 55, 58, 61, 68, 69, 74, 76, 77, 84, 93, 96, 97, 99, 947; 696, 701A; 692; 496.
Zoölogisch Museum, Utrecht: 1–3, 6, 9, 25, 34, 37–39, 45–47, 51, 56, 58, 62, 63, 70–73, 75, 102, 103, 184A, 197, 212, 230, 231a, 329A, 354, 874, 914a, 950a, Quadirikiri; 703; 692.
Zoölogisch Laboratorium (Taxonomie), Utrecht: remaining specimens.

Measurements

Only fully adult individuals were measured. The *number of whorls* included the embryonic whorls. The *width of three whorls* preceding the ultimate one (penultimate whorls) was taken dorsally. The *altitude* was measured from the tip of the shell to the lowest point of the lip; the *width* as the greatest diameter at right angles to the altitude of the shell. The *number of ribs* was counted on the widest part of the spire.

HUMMELINCK's Station numbers refer to the description of his 1930–1949 localities as published in *Studies 4* (1953) and to those still to be published in the same series. Localities *s.n.* are numbered clockwise, 1, 2, 3, etc., starting from the northwestern part of the islands of Curaçao, Aruba and Bonaire. In Table 18 the localities are quoted in the same way, finishing with those in the central part of the islands.

All measurements and descriptions refer to the material on which this paper has been based.

KEY TO THE SPECIES OF CERION DISCUSSED IN THIS PAPER

(values averaged and approximated)

1a. Whorls strongly compressed in the direction of the axis, separating septa nearly horizontal; parietal tooth in the angle between columella and parietal wall [subgenus *Cerion*: S. Caribbean]. . . . . *C. uva*

Shell not large (21.5 mm), not slender (2.25 as long as wide), not blotched; apex obtuse; whorls 11, width of three whorls 7.1 mm; ribs 23 per whorl (0.75 per mm); peristome reflexed, margin thick [Curaçao, Aruba, Bonaire].

1b. Whorls more or less compressed in the direction of the axis, separating septa usually distinctly dipping; parietal tooth near the middle of the parietal wall [subgenus *Strophiops*: N. Caribbean] 2

2a. Apex obtuse; whorls 8½, width of three whorls 9.3 mm; ribs numerous, 55 per whorl (1.7 per mm) . . . . . *C. crassilabris*
Shell not large (22.5 mm), not slender (2.3 as long as wide), usually blotched; peristome reflexed, margin thick [Puerto Rico, Anegada].

2b. Apex not obtuse; whorls 8½–10, width of three whorls 9.7–10.5 mm; ribs not numerous 3

3a. Peristome expanded; shell large (29 mm) . . . . . *C. rude*
Shell not slender (2.3 as long as wide), not blotched in fossil state; apex acute; ribs 36 per whorl (0.9 per mm); margin of peristome thin [St. Croix, fossil].

3b. Peristome reflexed; shell not large (24–26 mm) 4

4a. Apex acute; shell slender (2.6 as long as wide) 5

4b. Apex more or less acuminate; shell not slender (2.3 as long as wide) 6

5a. Margin of peristome thin; ribs absent . . . . . *C. incanum*
Shell often blotched [Florida].

5b. Margin of peristome thick; ribs 26 per whorl (0.9 per mm) . . . . . *C. pillsburyi*
Shell usually blotched [Cat Cay, South Bimini].

6a. Ribs 35 per whorl (1.1 per mm); shell not blotched . . . . . *C. biminiense*
[North Bimini].

6b. Ribs 24 per whorl (0.7 per mm); shell usually blotched. . *C. glans*
[New Providence].

Cerion uva (Linnaeus, 1758) Röding, 1798

(Figs. 95–104, Pls. VIIIb–XII)

[Continued from WAGENAAR HUMMELINCK 1940]

Cerion uva (L.), DAUTZENBERG 1900, p. 153 ["bords du Schottegat," Curaçao]; WAGENAAR HUMMELINCK 1940a, p. 100–102, pl. 16a [Synonymy, occurrence]; 1940b, p. 116–117, 120, 123–125 [Zoogeography]; 1940c, p. 44–52, pl. 5 [Full synonymy, description, occurrence, key, measurements]; 1943, p. 174, 176–178 [Zoogeography]; 1955, p. 7 [fossil in Lago cave, Aruba]; CLENCH 1957, p. 131 and others; ZILCH 1959–1960, p. 521, fig. 1815 [*not* occurring in Venezuela]; BAKER 1961, p. 34; WAGENAAR HUMMELINCK 1963, p. 1056–1062; THIELE 1963, p. 668, fig. 724; GOULD 1969, p. 185–198, fig. 1, 3–4, 6–8 [Variation, occurrence on Curaçao]; COOMANS 1970, p. 164–166, fig. 13; GOULD 1971, p. 1–21, fig. 4–6 [Indian shells]; WAGENAAR HUMMELINCK 1972, p. 20–21, 62, fig. 104 [Indian shells].

A list of the material studied has been given in TABLE 18. More samples, consisting of a few specimens only were collected at:

CURAÇAO: Westpunt Baai, Boca Grandi (Savonet), Cueba Bosá (Savonet), Bron San Pedro, Rooi Rincón [Indian], Hato Cave [phosphate, 16.IX.1936], Ceru Bordo (Hato), Duivelsklip [phosphate, 27.X.1963], Tafelberg N. slope [phosphate, 4.IX. 1936], Tafelberg W. top [phosphate, 26.II.1970], Spaanse Water, Hofje Santa Barbara, St. Anna Baai, Piscadera Baai, Seroe Cabajé (Porto Marie), Boca St. Martha, Rooi Cajuda (Knip).
KLEIN CURAÇAO: washed ashore [1 spec., 1.X.1948; 24 × 10½ mm].
ARUBA: Cave of Quadirikiri [phosphate, 9.II.1937], Lago Cave [subfossil], Plantersrust [subfossil].
BONAIRE: Washington, Pos di Pía (Onima), escarpment of Fontein [phosphate, 25.III.1937], Boca Washikemba, San Pedro (Lac), Awa di Palu Grandi (Lac), Plenchi, Blauwe Pan, E. of Blauwe Pan [limestone deposit, 20.III.1970], Baca Grandi.
KLEIN BONAIRE: NE shore, Pos di Cas, Pos Calbas, Salinja.

The new material agrees with the description given by WAGENAAR HUMMELINCK (1940c, p. 47).

Measurements of old and new material: Shell 2.0–2.25–2.5 times major-diameter, (14.5)–16.1–*21.5*–26.4–(32) by (7)–8.1–*9.5*–11.2–(12) mm; width of three whorls (5.5)–6.4–*7.1*–7.9–(9) mm; number of whorls (8.5)–9.5–*11.0*–12.7–(15); number of ribs (17)–20–*23*–26–(31).

The higher value of HUMMELINCK's whorl counts 10.2–*11.4*–12.7 is

not astonishing, as the determination of the exact number of the flat embryonic whorls may be considered as being rather subjective.

HUMMELINCK (1940c, p. 48–49) showed "as already pointed out by H. B. BAKER (1924, p. 99), that the variation of this species may be divided into two phases: the number of whorls (or the altitude of the shell) and the width of the whorls (or the diameter of the shell). The former seems to be simply a function of the period of growth, while the latter expresses actual variation in size. The altitude of the shell is closely correlated to the number of whorls, but seems to be rather independent from the diameter of the shell and the width of the whorls. The diameter of the shell is in some way correlated to the width of the whorls on the spire. The size of the peristome is of course largely dependent on the width of the last whorl. Generally higher specimens have also a somewhat wider body-whorl; often however, their aperture is slightly narrowed in submature state. The direct proportional relation between the width of the body-whorl and the diameter of the shell, and between the body-whorl and the whorls on the spire is obvious. Furthermore, the number of ribs appeared to be rather independent from the diameter of the shell.

In *Cerion* we may say, generally speaking, that the size of the shell increases up to a certain point, with richer vegetation of the habitat, therefore in most cases it appears to be inversely proportional to the amount of trade-wind exposure. The polished appearance of the ribs may also be favoured by a certain abundancy of plant-life. In wooded localities the interspaces are usually greyish coloured and less mottled than in other parts of the island. The reduction in size and number of ribs, which occasionally occurs, and the tendency of the last whorl to jut out tangentially, which is most obvious on Aruba and Bonaire, are very probably of a non-ecological nature. The direct influence of the soil could not be ascertained."

GOULD (1969) grouped old and new data in a modern way. "If we are ever to understand the evolution of *Cerion* and thereby unravel the gargantuan muddle of its present classification, we must learn how habitat, climate and geographic isolation affect single species.

For such strategy, I regard the study of *C. uva* as an appropriate beginning."

GOULD considers BAKER's subspecific breakdown of *Cerion uva* according to four geographic regions (E. Curaçao, *uva*; W. Curaçao, *knipensis*; Bonaire, *bonairensis*; Aruba, *arubanum*) to be amply justified by all his analyses, but questions BAKER's secondary divisions which were mainly based on size (see HUMMELINCK's arrangment of samples according to BAKER's classification, 1940c, p. 49).

GOULD doubts *C. uva* being calciphilic. "The relationship of shell size to microenvironment is very evident in many areas of Curaçao. ... the large size of *Cerion* from limestone-free areas is probably related not to the nature of the substrate itself, but to micro-environmental features usually associated with it."

As to GOULD's contemplations on intra-regional morphology, we only should like to state that we – when considering the phenotypic responses to micro-environment as being primarily responsible for variation in this species – did not succeed in finding any distinct correlation of geographic distribution and form.

It is to be regretted that the discovery of a few specimens of *Cerion uva* when digging for Indian remains near the Lago de Valencia (BERRY 1934; cf. WAGENAAR HUMMELINCK 1940a, p. 102), led some authors to suppose this species to be indigenous to the South-American continent (*e.g.* ZILCH 1959/60, p. 521: "pleistozän-Venezuela"). THIELE's record (1963, p. 660) "Guiana" is evidently based on inaccurate data, just as is BROWN's quotation (1903) of *C. uva* from Barbados.

As a matter of fact, no new points of view turned up after continued collecting, and the biology of this most interesting representative of the endemic fauna of Curaçao and neighbouring islands still remained unstudied.

The distribution maps (Figs. 100–104) again prove that no obvious geographic variation in *Cerion uva* exists. The species "does not show such morphological differences, which justify a subdivision of the species in subspecies" (HUMMELINCK 1940, p. 102). No special characteristics of *Cerion* are peculiar to parts of Curaçao, and not even to one of the three islands. As was to be expected no isolating influence was found to have been caused by the valleys, which were cut into the Pleistocene landscape, and drowned afterwards.

TABLE 18

MEASUREMENTS IN CERION UVA

Sample numbers 1–107; station numbers 201 ... 951.
Curaçao and Bonaire localities without limestone below dotted line.

Nr.	Locality	Date	nrs. coll.	nrs. meas.	whorls aver.	altitude (mm) aver. (min.-max.)	diam. (mm)	alt. / diam.	ribs	ribs / mm
	CURAÇAO									
1	Un Boca	24- 2-70	15	13	9.9	20.8 (16.5–25.5)	9.3	2.24	22.6	0.77
237	Boca Tabla	27-10-36	110	30	10.8	20.6 (17.0–25.5)	9.5	2.17	22.4	0.75
2	Boca Tabla	24- 2-70	19	10	9.6	19.2 (17.5–21.0)	9.0	2.12	22.2	0.79
3	Savonet W	24- 6-62	20	20	9.7	16.1 (14.9–18.5)	8.1	1.99	23.2	0.94
4	Boca Grandi (a)	19-11-63	120	20	9.6	18.8 (15.5–21.0)	8.8	2.13	22.2	0.80
5	Boca Grandi (b)	19-11-63	34	20	9.5	18.5 (14.5–21.5)	8.6	2.18	23.1	0.86
6	Savonet (a)	19-11-63	78	20	10.7	22.9 (19.0–26.0)	10.0	2.31	23.9	0.76
7	Savonet (b)	19-11-63	28	20	10.7	22.8 (21.0–26.5)	9.8	2.31	23.6	0.77
8	Boca Grandi E	19-11-63	38	20	10.2	20.8 (18.5–23.0)	9.4	2.22	22.1	0.75
228	Calbas Boshi	29-10-36	250	30	10.6	19.8 (17.0–23.0)	9.4	2.11		
227	Seroe di Cueba	29-10-36	100	30	10.8	20.2 (16.0–23.5)	9.5	2.14	22.0	0.74
231	Seroe Teintje	27-10-36	70	30	11.3	22.5 (19.5–28.0)	9.7	2.32	22.6	0.74
231a	Seroe Teintje	29- 3-70	104	20	10.4	21.5 (19.0–25.0)	9.6	2.24	22.4	0.74
9	Seroe Teintje	20- 2-49	35	20	10.9	21.2 (18.0–23.5)	9.4	2.26	22.0	0.75
232	Tafelberg S.H.	10-11-36	90	30	11.3	22.5 (19.5–26.5)	9.9	2.27	22.7	0.79
10	Tafelberg S.H.	3- 1-64	11	10	10.8	22.6 (20.5–26.0)	9.7	2.35	21.2	0.70
229	Seroe Bartool	29-10-36	190	30	11.0	23.5 (20.0–27.0)	10.1	2.32		
11	Sal. Ascención	22-10-68	81	20	11.1	21.5 (19.0–25.5)	10.0	2.15	21.3	0.68
12	Ascención S	21-11-68	16	10	10.7	21.8 (20.0–26.0)	9.8	2.22	25.1	0.82
226	San Pedro	22-10-36	340	30	11.5	20.6 (16.5–25.0)	9.1	2.26	22.6	0.79
13	San Pedro S	17-11-68	74	20	10.6	20.7 (18.0–26.0)	9.7	2.13	22.6	0.74
912	San Pedro	22-10-68	37	20	10.0	18.1 (15.5–20.0)	8.9	2.04	22.2	0.79
14	San Pedro SE	13- 2-49	32	20	11.6	21.1 (18.3–24.0)	9.6	2.20	23.5	0.78
15	Seroe Dakwé N	22-11-68	77	20	10.7	22.6 (20.5–26.5)	10.2	2.21	21.9	0.68
16	Road to Siberië	7-11-68	87	20	10.8	22.2 (20.0–24.5)	10.0	2.23	22.2	0.71
17	Pos di Wanga	2- 3-49	15	15	11.9	22.8 (19.9–26.0)	10.0	2.28	20.6	0.66
18	Shin Got	23- 5-55	8	5	10.7	18.5 (17.2–20.4)	8.6	2.15	22.6	0.84
19	Hata N Kl. Berg	23-11-68	46	20	10.6	19.8 (8.5–10.0)	9.1	2.17	24.2	0.86
20	Hato N Kl. Berg	23-11-68	9	9	11.3	22.1 (20.0–24.5)	9.7	2.27	22.6	0.74
911	Daniël NE	7-11-68	28	20	10.8	21.2 (18.0–26.0)	10.1	2.10	21.0	0.66
21	Daniel Bahada	7- 3-49	33	20	10.8	20.5 (18.7–22.6)	9.8	2.09	22.8	0.74
949	Daniel	27- 3-70	106	20	10.8	20.9 (18.0–23.5)	9.4	2.22	21.7	0.74
344	Martha Koosje	24- 8-48	149	20	11.8	21.9 (18.5–24.2)	9.9	2.21	20.1	0.65
343	Kleine Berg	24- 8-48	87	20	12.0	22.2 (18.0–25.1)	10.3	2.16	20.4	0.63
22	Kleine Berg	7-11-68	30	20	10.9	20.4 (17.5–25.0)	9.8	2.09	20.6	0.67
221	Groote Berg	22-10-36	400	30	12.0	22.7 (19.0–26.0)	10.0	2.27	21.3	0.68
23	Cueba di Raton	4- 1-64	86	20	10.8	20.5 (18.5–23.0)	9.6	2.10	22.3	0.74
910	Hato Airport W	7-11-68	16	16	9.8	17.5 (14.5–21.5)	8.7	2.02	20.4	0.75
910A	Hato Airport W	7-11-68	67	20	11.0	22.1 (19.0–25.0)	10.5	2.12	20.2	0.61

Table 18 (*continued*)

Nr.	Locality	Date	nrs. coll.	nrs. meas.	whorls	altitude (mm) aver. (min.-max.)	diam. (mm)	alt. / diam.	ribs	ribs / mm
910Aa	Hato Airport W	21- 2-70	33	20	11.1	22.0 (18.0–23.5)	10.2	2.16	20.2	0.63
24	Sua N	27- 2-70	58	20	10.8	21.2 (18.0–25.5)	9.9	2.13	21.2	0.68
25	Rooi Rincón	4-11-68	51	20	11.2	22.0 (19.5–24.0)	9.8	2.25	21.2	0.69
220	Bron Wandongo	6-10-36	350	300	12.0	23.2 (19.0–28.5)	10.6	2.18	20.0	0.60
220A	Bron Wandongo	31-12-63	19	15	11.1	22.0 (19.0–24.5)	10.0	2.22	20.5	0.65
217	Hato cave	17- 9-36	100	30	11.4	21.4 (17.0–27.5)	9.8	2.18	20.6	0.67
26	Hato cave E	4-11-68	70	20	10.7	21.7 (18.0–24.5)	10.2	2.13	20.4	0.64
947	Seroe Rondó	21- 2-70	14	12	11.0	22.2 (19.5–25.5)	10.0	2.23	22.1	0.70
27	Seroe Papaya W	4-11-68	57	20	10.6	21.5 (17.0–25.0)	10.0	2.16	21.7	0.69
28	Seroe Fortuna	4-11-68	47	20	10.6	21.4 (18.0–25.0)	9.8	2.19	21.6	0.70
29	Tanki Monpos	28-11-48	43	20	12.0	22.4 (20.3–26.1)	9.8	2.29	20.8	0.68
30	Seroe Papaya E	4-11-68	48	20	10.8	22.0 (18.0–25.0)	10.1	2.17	20.3	0.64
31	Noordkant	21- 8-48	36	20	11.1	19.3 (16.3–22.2)	9.0	2.14	20.5	0.73
32	Ronde Klip N	22-11-68	53	20	10.7	21.0 (18.0–24.0)	9.5	2.23	22.8	0.76
201	Ronde Klip	20-10-36	220	30	11.1	20.0 (16.5–24.5)	9.2	2.17	23.4	0.81
33	Boca Labadera	29- 3-70	116	20	9.9	19.3 (16.0–24.5)	8.8	2.19	24.5	0.89
34	Koraal Tabak	8-10-62	30	30	10.5	17.7 (16.0–21.8)	8.4	2.10	23.5	0.89
559	Seroe Stela	20- 2-55	32	20	11.0	19.1 (16.7–22.0)	9.0	2.12	23.8	0.84
35	Seroe Stela	22-11-63	538	40	9.9	19.6 (16.0–24.0)	9.2	2.12	25.3	0.88
202	Seroe di Boca	7- 9-36	220	30	11.2	20.7 (16.5–26.5)	8.8	2.35	24.4	0.88
202B	Seroe di Boca E	25- 2-70	71	20	10.8	21.1 (18.5–24.0)	9.2	2.30	23.0	0.80
36	Kl. St. Joris NE	30- 1-49	42	20	11.1	19.6 (16.1–25.0)	8.7	2.25	23.9	0.83
203	Seroe Mainsjie	7- 9-36	100	30	11.2	20.0 (23.5–16.5)	9.2	2.17		
37	Seroe Mainsjie	10- 2-40	41	20	11.1	19.8 (16.9–22.7)	9.2	2.15	21.4	0.74
38	Oranjeberg N	22- 2-70	54	20	9.9	18.2 (16.0–20.0)	8.5	2.15	23.6	0.88
39	Oranjeberg NE	30- 3-70	41	20	10.1	19.5 (17.0–25.0)	8.8	2.31	23.0	0.83
813	Seroe Pretoe	22-11-63	71	20	10.3	19.9 (17.0–24.0)	9.2	2.17	22.5	0.78
812	Seroe Blanco	22-11-63	6	5	10.6	20.4 (19.0–22.0)	8.9	2.29	22.2	0.79
40	Oranjeberg SW	21- 9-68	47	20	9.7	18.7 (16.0–23.0)	8.7	2.16	23.9	0.87
914a	Oranjeberg SW	22-11-70	8	8	10.7	20.9 (18.0–24.0)	9.3	2.26	24.0	0.82
906	Oostpunt NW	21- 9-68	47	20	10.5	21.4 (18.5–24.0)	9.7	2.22	22.9	0.75
905	Oostpunt W	21- 9-68	47	20	10.5	20.4 (17.0–24.0)	9.3	2.20	23.7	0.81
41	Awa di Oostpunt	30- 1-49	15	15	10.9	20.2 (17.1–23.2)	9.3	2.17	24.8	0.85
42	Awa di Oostpunt	21- 9-68	35	20	10.0	19.8 (16.5–22.5)	9.2	2.16	24.9	0.86
43	Awa di Oostpunt	30- 3-70	89	20	10.2	19.8 (17.5–23.0)	8.7	2.27	24.1	0.88
945	Oostpunt	22- 2-70	60	20	10.5	20.0 (17.0–23.0)	8.6	2.32	24.2	0.90
810	Seroe Patía	27-10-63	114	20	10.4	20.6 (18.5–23.0)	9.7	2.12	22.2	0.73
811	Duivelsklip	27-10-63	78	20	10.8	21.4 (17.5–26.0)	9.8	2.19	23.1	0.75
908	Fuikbaai E	5-10-68	92	20	9.7	18.5 (16.0–21.0)	9.0	2.07	22.0	0.78
44	Fuikbaai E	28-10-67	106	20	10.2	20.6 (17.0–23.5)	9.5	2.17	23.2	0.78
45	Cueba dos Placa	29-10-67	64	38	11.3	22.9 (20.5–26.0)	10.1	2.26	23.0	0.73
45	C. dos Placa (Ind.)	29-10-67	170	50	.	24.8 (18.0–31.0)	10.2	2.41	23.2	0.72
45a	C. dos Placa (Ind.)	24-11-63	200	50		25.2 (18.5–32.0)	10.7	2.38	23.7	0.71
46	Tafelberg S.B. NE	26- 2-70	12	10	10.7	20.6 (19.0–25.5)	9.5	2.15	22.9	0.77
328	Tafelberg S.B.	10- 4-49	18	15	11.0	20.3 (17.6–23.7)	9.4	2.16	21.2	0.72

Table 18 (*continued*)

Nr.	Locality	Date	nrs. coll.	nrs. meas.	whorls	altitude (mm) aver.	(min.-max.)	diam. (mm)	alt. / diam.	ribs	ribs / mm
206	Tafelberg S.B. N	4- 9-36	160	30	11.8	22.2	(17.5–26.5)	9.4	2.36	21.0	0.71
47	Tafelberg S.B. NW	29-10-67	78	50	10.7	20.9	(18.0–25.5)	9.3	2.23	22.4	0.77
47a	Tafelberg S.B. (Ind.)	29-10-67	74	50		25.2	(21.0–32.0)	10.4	2.43	23.6	0.72
48	Tafelberg S.B. top	26- 2-70	19	17	10.6	20.4	(18.5–22.5)	9.6	2.13	23.1	0.77
329	Tafelberg S.B.	29-10-48	71	20	11.5	21.4	(18.5–24.6)	9.9	2.16	21.9	0.70
207	Newport cave	2- 9-36	250	30	11.3	20.5	(17.0–25.5)	9.6	2.14	21.3	0.71
49	Newport bath	20-11-48	32	20	11.1	20.4	(17.2–23.5)	9.4	2.16	21.2	0.72
330	Tafelberg S.B. SW	8-12-48	37	20	11.5	21.6	(10.6–23.7)	10.2	2.12	23.0	0.72
50	Rooi Loki	26- 2-70	76	20	10.8	22.1	(19.0–25.0)	9.8	2.25	21.7	0.71
51	Fuikbaai W	26- 2-70	18	15	11.1	22.0	(20.0–24.0)	9.7	2.27	22.5	0.74
52	S. Barbara beach E	26- 2-70	17	15	9.9	18.9	(17.5–22.0)	9.0	2.11	23.3	0.82
53	S. Barbara beach	26- 2-70	50	20	10.0	19.2	(17.0–24.0)	9.0	2.19	23.0	0.81
54	S. Barbara beach	7- 7-62	44	30	11.1	20.6	(18.5–24.1)	9.5	2.16	22.9	0.77
55	Vredeberg S	20- 5-55	145	20	11.1	20.1	(16.7–25.0)	8.9	2.26	23.1	0.83
56	Spaanse Water N	17- 9-68	100	20	9.9	19.3	(15.5–23.5)	8.3	2.25	22.5	0.86
57	Kabrietenberg SE	6- 8-55	53	20	11.2	21.1	(19.6–24.2)	9.6	2.20	23.7	0.79
210	Quarantaine	16-10-36	350	300	11.5	21.8	(18.0–27.0)	9.6	2.25	23.7	0.79
211	Beekenburg	16-10-36	100	30	11.5	21.6	(19.0–25.5)	9.2	2.35		
58	Kintjan	6-10-68	82	50	10.8	21.8	(19.5–25.0)	9.9	2.21	23.1	0.74
58	Kintjan (Indian)	6-10-68	220	50		24.4	(17.0–31.0)	10.3	2.35	23.7	0.73
212	Schaarloo	26-10-36	110	30	11.4	21.2	(18.0–24.0)	9.5	2.25	22.4	0.75
59	Otrabanda	5-39	189	20	11.6	21.8	(17.8–25.2)	9.8	2.22	23.5	0.76
60	Mundo Nobo	39	155	20	11.9	23.8	(19.8–27.9)	10.0	2.38	22.3	0.71
213	Seroe Pretoe	9-10-36	150	30	11.9	23.0	(20.0–26.0)	10.0	2.30	21.5	0.68
61	Veerisberg	28- 1-49	100	20	11.0	21.0	(18.8–23.1)	9.4	2.23	21.5	0.73
816	Piscadera E	30-12-63	56	20	10.8	21.2	(19.0–23.5)	9.9	2.15	22.3	0.72
62	Piscaderabaai W	21-12-63	244	20	10.0	19.4	(16.5–22.5)	9.5	2.15	23.0	0.77
63	Piscaderabaai W	23-11-63	71	20	10.0	19.5	(17.5–22.0)	9.2	2.12	22.4	0.78
214	Evertszberg	10-10-36	400	30	11.3	21.6	(16.5–25.5)	9.6	2.25	22.2	0.74
215	Seroe Spreit	23-10-36	180	30	11.8	22.1	(18.5–26.0)	9.9	2.23	22.0	0.71
909	Pest baai	9-10-68	49	20	10.2	19.9	(16.5–23.5)	9.4	2.13	21.7	0.74
341	Bullenbaai	22-10-48	38	20	11.9	21.1	(17.3–23.8)	9.6	2.20	20.5	0.68
223	Hermanus	9-11-36	70	20	11.9	21.8	(17.5–24.5)	9.8	2.22	21.5	0.70
64	Boca St. Marie	22-12-63	192	20	10.7	20.1	(17.5–22.5)	9.5	2.11	21.8	0.73
224	Seroe Kabritoe	9-11-36	90	30	11.8	22.7	(19.0–28.0)	10.1	2.25	23.2	0.73
225	Seroe Cabajé	9-11-36	120	30	11.1	21.4	(17.5–24.0)	9.8	2.18		
225A	Seroe Cabajé	21-11-63	148	20	9.9	20.0	(17.0–23.0)	9.5	2.10	21.5	0.72
65	Lagoen St. Jan	6- 3-55	12	10	10.4	20.4	(17.9–22.6)	9.5	2.15	22.0	0.74
950	Seroe di Boca	20- 2-70	61	20	10.4	21.7	(19.5–25.0)	9.3	2.39	22.5	0.77
950a	Boca St. Martha E	29- 3-70	25	18	10.4	21.7	(19.5–25.0)	9.4	2.32	23.3	0.79
66	Boca St. Martha W	24- 2-55	6	4	9.5	17.8	(16.5–19.0)	8.5	2.09	22.0	0.82
560	Plaja Frankie	27- 2-55	52	30	11.2	21.8	(18.4–25.2)	9.9	2.20	21.7	0.70
353	Seroe Baha So top	16- 2-49	52	20	10.3	21.2	(18.5–23.6)	10.0	2.12	21.5	0.68
354	Seroe Baha So S	16- 2-49	29	20	11.1	22.7	(19.8–25.3)	10.1	2.25	21.7	0.68
244	Santoe Pretoe	24-10-36	50	30	10.7	21.8	(19.0–25.5)	10.1	2.15	22.2	0.70

Table 18 (*continued*)

Nr.	Locality	Date	nrs. coll.	nrs. meas.	whorls	altitude (mm) aver.	(min.-max.)	diam. (mm)	alt. / diam.	ribs	ribs / mm
67	Santoe Pretoe	28-10-48	49	20	10.7	21.4	(16.6–26.8)	9.8	2.18	21.7	0.71
68	Seroe Pretoe N	23- 6-62	45	30	10.7	21.5	(19.8–24.1)	10.0	2.15	21.4	0.67
243Aa	Seroe Commandant	26-10-63	166	20	10.4	22.6	(19.5–27.0)	10.0	2.25	23.2	0.74
243	St. Kruisbaai	24-10-36	30	30	11.1	22.6	(18.0–25.5)	9.6	2.35	21.6	0.72
352	Plaja Djerimi	11-12-48	36	20	10.8	20.2	(17.6–22.3)	9.0	2.24	21.5	0.76
242	Seroe Djerimi	6-11-36	160	30	10.9	21.2	(17.0–25.0)	9.3	2.28	21.5	0.74
242B	Seroe Djerimi NW	6-11-36	110	30	10.2	20.5	(17.0–23.5)	9.4	2.18	21.0	0.71
241	Plaja Abau S	6-11-36	30	30	11.0	21.9	(19.0–25.5)	9.5	2.31	21.8	0.73
240A	Plaja Abau N	6-11-36	50	30	11.0	21.7	(18.5–24.0)	9.7	2.24	21.9	0.72
240	Plaja Abau N	6-11-36	140	30	11.0	22.0	(19.0–24.5)	9.9	2.22	23.4	0.75
239	Westpunt	27-10-36	80	30	10.6	21.9	(18.5–28.0)	9.6	2.28		
238	Boshi Westpunt	27-10-36	50	30	10.5	21.1	(18.0–24.5)	9.6	2.20	22.2	0.74
69	Playa Kalkie	12-10-68	53	20	9.8	20.4	(18.0–23.5)	9.4	2.17	21.8	0.74
235	S. Christoffel NW	10-11-36	30	30	11.8	24.8	(22.0–28.0)	11.0	2.25	22.8	0.66
70	S. Christoffel W	11- 2-49	18	15	12.0	25.6	(23.3–28.5)	11.2	2.29	23.3	0.66
71	S. Christoffel W	12-10-68	72	20	11.5	25.6	(22.5–31.0)	11.1	2.31	23.7	0.68
234	S. Christoffel top	7- 3-37	10	10	12.1	26.4	(24.0–29.5)	11.2	2.36	25.5	0.73
72	Seroe Batata S	17- 8-48	17	15	11.2	24.1	(20.8–26.4)	10.6	2.27	24.0	0.72
951	Sint Kruis NE	27- 3-70	51	20	10.8	22.7	(20.0–25.0)	10.0	2.28	24.6	0.78
821	Hofje St. Kruis	30-11-63	32	20	11.1	23.6	(18.5–27.0)	10.1	2.33	24.8	0.78
245A	Hofje St. Kruis	24-10-36	10	10	12.0	24.4	(19.5–27.0)	10.2	2.39	23.5	0.73
230	St. Silvester	22-11-36	40	30	11.5	23.4	(19.0–28.0)	10.5	2.23	24.8	0.75
73	Barber	15-10-62	31	30	11.0	21.4	(19.0–26.2)	9.6	2.23	23.1	0.77
74	Dokterstuin	16-10-62	4	4	12.2	24.2	(22.7–27.1)	10.1	2.40	25.5	0.80
75	Seroe Largoe	4-12-48	24	20	11.4	22.9	(21.0–25.1)	9.4	2.44	23.5	0.80
76	Sint Sebastiaan	22-11-68	31	20	10.6	22.6	(20.0–26.0)	9.9	2.28	23.8	0.77
77	Sal. St. Marie E	22-11-68	35	20	11.4	23.4	(20.5–26.5)	9.9	2.35	22.6	0.73
222	Koenoekoe Abau	9-11-36	60	30	12.7	24.5	(21.0–29.5)	11.0	2.23	22.9	0.66
222a	Koenoekoe Abau	20- 8-48	22	20	12.5	24.2	(19.9–26.6)	10.2	2.37	20.8	0.65
78	Wechi	7-11-68	10	9	11.5	23.1	(21.5–25.0)	10.1	2.28	22.7	0.72
79	Jan Thiel N	10-62	21	20	11.8	24.2	(21.7–26.0)	10.3	2.35	24.9	0.77
205	Rooi Manzalienja	4- 9-36	10	10	12.0	22.1	(20.0–24.5)	9.3	2.38	21.9	0.75
204A	Seinpost	9- 9-36	40	30	11.8	22.1	(19.0–25.5)	9.6	2.30		
204Aa	Seroe Grandi	22-11-63	18	18	10.8	22.0	(20.0–24.5)	9.5	2.32	23.3	0.78
	ARUBA										
80	Quadirikiri cave	9- 2-36	20	10	11.4	22.2	(20.0–24.5)	9.5	2.34	25.0	0.84
253A	Boca Grandi	5- 1-37	10	5	10.3	22.2	(22.0–23.0)	10.8	2.05	25.5	0.75
256	Savaneta	5- 1-37	5	5	11.6	21.4	(20.5–22.5)	9.7	2.21		
259	Isla	29-12-36	10	5	12.0	21.9	(19.5–23.5)	10.0	2.19	21.5	0.68
258	Rooi Lamoenchi E	29-12-36	90	30	11.4	22.0	(19.0–24.0)	9.9	2.22	25.1	0.81
258A	Rooi Lamoenchi W	29-12-36	60	30	11.6	21.9	(19.0–24.5)	9.8	2.23	21.5	0.70
260B	Rooi Taki	29-12-36	30	30	11.7	22.0	(19.5–24.5)	9.4	2.34	22.2	0.75
261	Spaans Lagoen E	5- 1-37	70	30	11.9	22.7	(19.0–25.0)	9.4	2.41	21.3	0.72

Table 18 (*continued*)

Nr.	Locality	Date	nrs. coll.	nrs. meas.	whorls	altitude (mm) aver. (min.-max.)	diam. (mm)	alt./diam.	ribs	ribs/mm
81	Spaans Lagoen E	25- 3-70	42	20	11.1	21.6 (18.5–25.5)	9.1	2.38	21.3	0.75
262	Spaans Lagoen W	5- 1-37	160	30	11.9	22.1 (18.5–26.0)	9.1	2.43	22.1	0.77
262B	Spaans Lagoen W	1- 1-49	20	20	11.6	22.0 (19.2–26.3)	9.7	2.27	21.7	0.71
82	Spaans Lagoen W	25- 3-70	48	20	11.1	21.4 (19.0–24.5)	9.4	2.29	21.2	0.72
83	Sp. Lag. W bridge	15- 5-55	7	5	11.3	21.2 (20.1–22.9)	9.2	2.30	21.8	0.75
84	Spaans Lagoen NW	24- 3-70	44	20	11.0	21.5 (19.0–24.0)	9.7	2.33	21.9	0.72
262A	Balashi	29-12-36	50	30	11.6	21.6 (19.5–25.0)	9.8	2.20	20.5	0.67
85	Balashi	14-11-63	61	20	11.4	22.6 (19.0–25.0)	9.3	2.43	20.7	0.71
264	Barcadera	5- 1-37	60	30	11.4	22.4 (19.5–25.0)	9.4	2.38	21.5	0.73
86	Barcadera	16- 1-49	23	20	11.3	21.1 (19.7–23.4)	9.2	2.29	24.3	0.84
87	Seroe Canashito	7-12-36	25	25	11.6	23.6 (20.5–27.0)	10.7	2.21	25.1	0.75
88	Seroe Canashito	7-12-36	5	5	11.0	22.6	9.7			2.33
265	Perkietenbosch	5- 1-37	10	10	11.9	22.8 (21.0–25.5)	9.9	2.30	22.7	0.73
89	Baca Morto	15-12-36	5	5	11.8	22.8 (21.5–25.0)	9.9	2.30		
90	Sabana Blancu	31-12-48	6	5	11.0	20.7 (19.6–22.5)	9.3	2.23	25.5	0.87
	BONAIRE									
91	Malmok	29-10-68	58	20	9.9	19.9 (17.5–22.5)	9.1	2.19	24.6	0.86
92	Seroe Ventana	29-10-68	33	20	10.1	19.5 (17.5–22.5)	9.6	2.19	22.5	0.75
196	Boca Onima W	13- 1-36	30	30	11.0	21.5 (19.5–26.0)	9.8	2.19		
195	Boca Onima E	13- 1-36	30	30	10.7	20.5 (18.0–24.5)	9.3	2.20		
193Aa	Hofje Fontein	8- 9-67	9	9	10.4	21.1 (20.0–22.5)	9.8	2.16	21.1	0.69
190a	Fontein S	1- 9-48	16	15	10.5	18.9 (17.4–20.5)	9.4	2.01	23.1	0.78
190Ba	Fontein escarpm.	8- 9-67	5	5	9.9	19.0 (18.5–20.5)	9.4	2.06	23.4	0.79
93	Fontein escarpm.	7-12-63	28	20	10.7	22.0 (20.0–24.5)	9.7	2.27	20.7	0.68
94	Porta Spanjo	27- 3-37	20	10	10.8	21.4 (19.5–23.0)	10.0	2.14		
557	Bolivia farm	15- 4-55	5	5	10.9	22.4 (19.5–25.4)	10.5	2.13	23.5	0.71
95	Soebi Blanco	12- 3-70	23	20	10.5	22.2 (20.0–23.5)	9.5	2.32	23.0	0.77
96	Pos Spelonk W	27-10-68	44	20	10.0	19.9 (17.5–22.5)	9.3	2.14	23.1	0.79
187	Spelonk	24- 3-37	50	30	10.6	21.3 (18.5–23.5)	9.8	2.17	24.0	0.78
187a	Spelonk	15- 4-55	34	20	10.6	20.5 (18.2–22.7)	9.6	2.15	25.0	0.83
97	Lagoen N	14- 9-49	64	20	11.5	24.5 (20.8–27.5)	10.5	2.33	25.8	0.78
98	Washikemba S	25- 2-49	5	5	11.1	23.3 (21.0–25.5)	10.1	2.31	24.4	0.77
881	Cai N	9- 8-67	98	20	10.2	20.2 (18.5–22.5)	9.0	2.26	25.6	0.91
99	Isla di Chico	17- 8-67	24	15	10.2	19.8 (17.5–22.0)	8.8	2.26	24.5	0.89
876	Isla di Juwana	13- 8-67	82	20	10.2	20.6 (18.5–22.5)	8.8	2.36	24.3	0.88
874	Boca di Pedro	4- 9-67	106	20	10.2	20.2 (18.0–22.5)	9.3	2.18	24.8	0.85
100	Yellow dike S	1- 3-70	27	13	10.2	19.9 (19.0–21.0)	9.3	2.15	25.9	0.89
181	Zuidpunt	26- 3-37	30	30	10.6	19.4 (17.5–21.0)	8.8	2.20		
101	Blauwe Pan E	9- 4-55	12	10	10.5	20.1 (17.6–21.4)	9.0	2.23	25.2	0.89
102	Blauwe Pan	2- 3-70	9	6	10.2	19.8 (18.5–22.0)	8.5	2.33	24.2	0.91
184	Lima SW	14-11-36	80	30	10.8	20.5 (18.0–23.0)	9.0	2.28	23.6	0.84
184A	Lima SW	31- 3-37	40	30	11.2	22.6 (19.5–31.5)	9.6	2.35		
304	Punt Vierkant E	5- 9-48	8	5	10.3	18.8 (17.4–20.0)	8.9	2.11	24.4	0.87
185Aa	Kralendijk S	20- 9-48	28	20	10.9	21.6 (19.1–24.3)	9.7	2.23	24.0	0.79

Table 18 (*continued*)

Nr.	Locality	Date	nrs. coll.	nrs. meas.	whorls aver.	altitude (mm) aver. (min.-max.)	diam. (mm)	alt. / diam.	ribs	ribs / mm
186A	Kralendijk N	20- 9-48	57	20	10.8	20.9 (17.9–23.5)	9.6	2.18	24.2	0.80
186	Deenterra	25- 3-37	30	30	11.5	24.0 (19.5–26.5)	10.1	2.35		
803	Montagne	4-12-63	29	20	10.5	21.8 (19.5–25.5)	9.5	2.31	21.5	0.76
314	Oeroesjan Blanco	3- 9-48	17	15	10.7	19.6 (17.4–21.2)	9.7	2.02	22.7	0.75
313	Pos Dominica	15- 9-48	6	5	10.9	22.5 (21.5–22.7)	10.0	2.25	23.0	0.73
941	Karpat	3- 3-70	8	8	10.2	20.8 (19.0–22.0)	9.3	2.24	21.9	0.75
316	Wecua Point	23- 2-49	5	5	11.1	21.7 (21.0–22.7)	9.3	2.33	22.2	0.76
804	Druif	5-12-63	75	20	10.3	21.2 (18.5–24.0)	9.3	2.28	21.8	0.75
317	Slagbaai N	12- 9-48	27	20	10.9	21.1 (18.5–23.6)	10.0	2.11	22.3	0.71
103	Sal. Wayaca SW	15- 3-70	58	20	10.5	21.8 (19.5–22.5)	9.6	2.28	21.7	0.72
197	S. Brandaris SW	27- 3-37	30	30	10.9	22.5 (21.0–25.0)	9.7	2.32	22.5	0.74
938	Shishiribana	18- 3-70	6	5	10.4	20.2 (20.5–23.0)	9.6	2.03	21.6	0.72
104	Ceru Pretu	19- 3-70	45	20	10.7	23.9 (21.5–26.0)	10.0	2.40	23.3	0.74
105	Caracao W	19- 3-70	16	15	11.0	24.1 (21.5–27.5)	9.9	2.44	23.7	0.76
106	Caracao S	19- 3-70	60	20	11.2	24.7 (22.0–27.5)	10.1	2.46	25.1	0.79
940	Sal. Matijs NE	17- 3-70	46	20	10.0	19.9 (18.0–22.0)	9.4	2.12	22.2	0.75
939	Seroe Matijs	17- 3-70	79	20	11.2	24.8 (22.0–27.5)	10.0	2.48	24.2	0.77

The altitude of the shell of *Cerion uva* is not only high in the Christoffel area, but also in some other places (such as near St. Kruisbaai, Middle Curaçao, and Tafelberg St. Barbara). The large shells from the Indian middens (Pl. XII) may point to a more favourable (micro)climate in prehistoric times (as GOULD 1971 already stated). Remarkably small are the shells in various populations near the sea, especially along the north-northeastern coast, suggesting a distinct influence of eastern tradewinds.

On Bonaire the altitude does not differ much from that of the Curaçaoan shells, while there is only small variation. Samples from the northwestern non-limestone area are somewhat above the average, and so are others from more or less accidentated habitats.

Variation in height is small on Aruba. The size of fossil specimens hardly differs.

On Curaçao there are several areas in which the number of ribs is above average (e.g. around Boca Grandi, St. Jorisbaai – Oostpunt, Spaanse Water) while in other localities the number is below average

(e.g. Middle Curaçao, Hato – St. Marie). Specimens with weak ribs are rare.

On Bonaire the average number of ribs is higher than on Curaçao. Populations with a very low number were not observed. High numbers occurred on the low limestone terraces of Klein Bonaire and on South Bonaire which are similar to the limestone-area of Oostpunt, Curaçao. Weak ribs have been observed in a few populations (e.g. Isla di Juwana, Lac).

On Aruba the average number of ribs of the fossil specimens is distinctly higher than that of the recent ones. Hardly any ribs (forma *desculpta*) were found in fossil specimens (HUMMELINCK 1940c, p. 49, pl. 1a).

Cerion striatella ("Férussac" Guérin, 1832) Dall & Simpson, 1902

(Pl. XIIIa–i)

Pupa striatella "Férussac" GUÉRIN, 1832, p. 16, pl. 6 fig. 12 ["Hab. les Antilles"; fig. not seen]. – KÜSTER 1852, p. 91–92, pl. 10 fig. 14–15 [Puerto Rico]. – PFEIFFER 1853, p. 539. – PFEIFFER 1854, p. 207 [in part], p. 3 fig. 11–14. – SHUTTLEWORTH 1854, p. 53 [P. Rico]. – PFEIFFER 1859, p. 659. – BLAND 1862, p. 351, 352, 354, 358. – SOWERBY 1875, pl. 3 sp. 18 ["Hab. Cuba, Haïti, Porto Rico, &c," in part.]. – MARTENS 1891, p. 132 [P. Rico, Penuelas].

Pupa microstoma Pfr. var. PFEIFFER 1854, p. 208 [P. Rico only]. MARTENS 1877, p. 355.

Pupa crassilabris "Shuttleworth" SOWERBY, 1875, pl. 2 sp. 14 ["Hab. India"].

Strophia striatella (Fér.) Crosse, 1892, p. 31 [P. Rico, Ponce "Saint-Domingue. Cuba. Anegada. Bahamas."; in part.].

Cerion crassilabre (Shuttl.) PILSBRY & VANATTA 1896, p. 324–325 ["Porto Rico may be considered the type locality, for here large specimens such as that figured by Sowerby occur. They are either maculated or unicolored. On Anagada a short, egg-shaped race is found. On Necker Island the shells are pure white, but white ones also occur at Ponce and Puna, Porto Rico."]. – BARTSCH 1925, p. 222 [Breeding exp.]. – BARTSCH 1927, p. 86 [Breeding exp.].

Cerion crassilabris (Shuttl.), PILSBRY 1901–02, p. 192–193, pl. 33 fig. 47–52 [P. Rico, Anegada, Necker I.]. – BARTSCH 1920, p. 7 seq. [Breeding exp.]. – PILSBRY 1943, p. 34–35. – VAN DER SCHALIE 1948, p. 18, 97, pl. 7 fig. 5 [P. Rico: sev. loc. "mainly along the coast in the southwestern part"].

Cerion striatellum [Fér. Guérin) DALL & SIMPSON, 1902, p. 376 [P. Rico: Cabo Rojo, Ponce.] – PILSBRY 1943, p. 34–35 [in syn. of *C. crass.*]. – CLENCH 1952, p. 108. – AGUAYO 1961, p. 95 [P. Rico]. – COOMANS 1965, p. 18 [Isla Magueyes].

Cerion striatella ("Férussac" Guérin), CLENCH 1957, p. 131, 164. – BAKER 1961, p. 33–34 [P. Rico, genitalia]. – AGUAYO 1966, p. 6 [P. Rico].

PUERTO RICO. – Cabo Rojo, scanty vegetation with cactuses on limestone, Cyperaceae, Sta. 696, 18.IX.1963, 68 exx. – Cabo Rojo, on limestone near beach, Hummelinck leg., 18.IX.1963, 18 exx. – Limestone flat near Salina Corozo, N of Cabo Rojo, Hummelinck leg., 18.IX.1963, 103 exx. - Isla Magueyes, S of La Parguera, scattered shrubs with cacti, in rock fissures, no limestone, Sta. 700, 10.IX.1963, 34 exx. – Magueyes, J. H. Stock leg., 30.I.1963, 5 exx.; 18.II.1963, 22 exx. ZMA. – Parguera, Stock leg., II.1963, 7 ad. exx. ZMA. – Isla Cueba, SW of La Parguera, low limestone area, Sta. 701, 701A, 11.IX.1963, 83 exx. – Isla Cueba, John van den Bergh & Carlos Nagel leg., 20.IX.1963, 24 exx. – Isla Guayacán, W of I. Cueba, v.d. Bergh & Nagel leg., 20.IX.1963, 28 exx. – Salina Papayo, Sta. 699, 13.IX.1963, 5 exx. – Guánica, 8 km E, limestone with shrubs and cacti, Sta. 703, 15.IX.1963, 97 exx. – Guánica, 10 km E, same, Sta. 704, 15.IX.1963, 33 exx. – Porto Rico, 2 + 2 + 1 exx. ZMA. ANEGADA. – Anegada, G. A. Seaman leg., 7.X.1954, 12 exx.

DESCRIPTION

Shell oblong-oval, rarely cylindrical, with an obtuse apex, altitude (1.77)–2.13–*2.25*–2.31–(2.74) times major diameter of spire, (16.5)–20.1–*22.5*–24.1–(27.5) by (8.0)–9.1–*10.1*–10.7–(11.5) mm, solid, ribbed, very narrowly perforated.

Whorls (7.0)–8.2–*8.5*–8.9-(10.5), in cross-section quadrangular, the outer wall scarcely convex; the first 3–4 whorls form a short obtuse cone with convex sides, the last two whorls of equal diameter or the last one slightly smaller.

Suture distinct, scarcely channelled.

Umbilical-channel beginning abruptly after the second whorl, about 1½ mm wide, gradually narrowing in the penultimate and last whorl, visible only as a small, narrow slit from the outside.

Aperture vertical, rounded to subquadrate, exceptionally elongated in cylindrical specimens, internally more or less porcellaneous.

Peristome not continuous, but with parietal callus usually rather thin and transparent, narrow, reflexed, often moderately thickened; the last whorl near the aperture tends to jut out tangentially, so that the palatal wall of the peristome projects from the maximum width of the spire.

Parietal tooth small, usually situated near the middle of the parietal wall, penetrating no more than ¼ of the whorl.

Axial lamella distinct, but smaller than the parietal one, visible from the outside, ascending the columella as far as the 5–7th whorl.

Sculpture consisting of numerous straight or slightly parasygmoidal ribs, which gradually go from oblique above to vertical at the base; it begins on the 3th whorl and gradually increases; in some specimens growth-lines are visible. Smooth specimens were not found.

Ridges usually (43)–48–*55*–62–(71) per whorl on the widest part of spire, as a rule regularly placed, but not corresponding in the successive whorls, fine, rounded or a

little flattened; they are as wide as or somewhat narrower than their interspaces; surface of the ribs often polished, those of the interspaces nearly always dull.

Colour very variable, mostly white, greyish- or creamy-white, at many stations there are light brown, greyish-brown, light brownish-red and brownish-red specimens; they are nearly always blotched with touches of blue and/or light brown, grey or brownish-red; at some stations the blotches form vertical zig-zag stripes according to a certain pattern. When appearing unicoloured, the specimens show a haze of blue, grey or brown. The ribs are whitish, often partly with the colour of the blotches. Aperture whitish, beige, light brown or light greyish-brown. Embryonic whorls (2–2½) white, greyish, beige or light brown.

Shell oblong-oval, rarely cylindrical, with an *obtuse apex* and suture scarcely channelled; *whorls* about *8.5*, not distinctly compressed, scarcely convex.

Altitude of shell 16.5–*22.5*–27.5 mm, 2.3–*2.25*–2.3 *times major diameter* of spire.

Aperture rounded to subquadrate, having a *reflexed*, often moderately *thickened peristome*, a thin, transparent parietal callus and *two lamellae* of which *one*, small, *tooth-like*, situated *near* the *middle of* the *parietal wall* and a smaller one on the columella.

Sculpture consisting of *numerous*, regularly placed, somewhat parasygmoidal, fine *ridges*, about *55 per whorl* on the widest part of the spire (Pl. XIII a-g), from oblique above to vertical at the base.

Colour whitish, greyish, generally light brown to brownish-red; *usually blotched*, sometimes forming vertical zig-zag stripes according to a certain pattern.

The SPECIMENS FROM ANEGADA (Pl. XIIIh–i) are smaller and more egg-shaped; 19.0–*20.1*–22.5 mm long, 2.0–*2.13*–2.3 times major diameter. They have a thin peristome (similar to that of the specimens from Saliña Corozo, P.R.) and are commonly light brown to brownish red, with blotches forming a certain pattern.

Since *Pupa striatella* "Férussac" – figured in GUÉRIN's "*Iconographie*" (1832) – has been provided with another species name (*crassilabris* or *crassilabre*), one could get the impression that more than one species of *Cerion* would occur on Puerto Rico, also inhabit-

ing other islands. When forced to make a more or less arbitrary choice between *Cerion crassilabris* (Sowerby, 1875) and *Cerion striatella* ("Férussac" Guérin, 1832) the latter name was preferred.

Cerion rude (Pfeiffer, 1856) Pilsbry & Vanatta, 1896

(Pl. XIIIj–n)

Pupa rudis PFEIFFER, 1856, p. 102–103, pl. 5 fig. 1–2. [Descr., "Legitur subfossilis in plantationibus "Dimond" et "Paradise" insulae St. Croix."]. – PFEIFFER 1856, p. 175 [in group *Strophia* Alb.]. – PFEIFFER 1859, p. 657–658 [Descr. repeated.]. – BLAND 1862, p. 359. – CLENCH 1957, p. 161 ["subfossil, Diamond, Blessing and Paradise Plantations, St. Croix"].

Pupa latilabris PFEIFFER, 1856, p. 103, pl. 5 fig. 3. [Descr., "Legitur subfossilis in plantatione "Blessing" insulae St. Croix."]. – PFEIFFER 1856, p. 175 [in group *Strophia* Alb.]. – PFEIFFER 1859, p. 658 ["Legitur subfossilis in insulae St. Croix (Riise)."]. – CLENCH 1957, p. 150 ["Is *C. rude* Pfr."].

Cerion rude (Pfeiffer) PILSBRY & VANATTA 1896, p. 324 [Group of *C. crassilabre*. St. Croix. A quaternary fossil."]. – PILSBRY 1901–2, p. 194, pl. 33 fig. 54–57. [Descr.; "has not been found living, but occurs in abundance as a fossil."]. – JACOBSON 1968, p. 25 ["Rust-op-Twist; Slob; Hogensborg; Fair Plain...; La Grande Princess"].

ST. CROIX. – Upper Bethlehem, E hill slope, marly limestone, Sta. 612, 14.VI.1955, 3 exx. – Fredensborg Hill, S. slope, marly limestone, Sta. 615, 11.VI.1955, 80 exx. – Airport N., 11.VI.1955, 3 exx. [All fossil] – St. Croix, C. M. Poulsen leg., W. J. Clench det., ZMA 2 exx.

Shell sub-cylindrical-oval, with an *acute apex* and suture scarcely channelled; *whorls* about *10.1*, not compressed, scarcely convex.

Altitude of shell 23.0–*29.0*–34.0 mm, 1.9–*2.30*–2.6 *times major diameter* of spire.

Aperture rounded to subquadrate, having an *expanded, thin peristome*, an usually thin parietal callus and *two lamellae*, of which *one, tooth-like*, situated *near* the *middle of* the *parietal wall* and a smaller one on the columella.

Sculpture consisting of *many*, regularly placed, rather narrow, somewhat parasygmoidal *ridges*, about *36 per whorl* on the widest part of the spire, from oblique above to vertical at the base (if not weathered).

Colour whitish, chalky, sometimes with a touch of yellowish-brown; most specimens sandy-white (because they *fossilized* in marl; colour in life unknown).

Following PILSBRY (1901–02) – and JACOBSON 1968 – *Pupa latilabris* Pfr. was taken for a small form of *Pupa rudis* Pfr.

Cerion incanum (Binney, 1851) Pilsbry & Vanatta, 1896

(Pls. VIIIa, XIVa–i)

Pupa mumia POTIEZ & MICHAUD, 1838, p. 169, pl. 17 fig. 1–2 ["Hab. Les Antilles"; fig. not seen, fide BINNEY, 1878].

Pupa incana BINNEY, 1851, p. 119, 153 [name only; "The Peninsula of Florida"]; cf LEIDY in BINNEY 1851, p. 230, 259, pl. 15 fig. 2–4 [anatomy]. – BINNEY 1852, pl. 68. – PFEIFFER 1856, p. 175 [in group *Strophia* Alb.]. – BINNEY 1859, p. 141–142. – PFEIFFER 1859, p. 657 [Syn., descr. "Key West in Florida, nec non in insula Cuba (Poey)."]. – BLAND 1862, p. 352, table II. – BINNEY & BLAND 1869, p. 246–248, fig. 430–432 [Descr., subgen. *Strophia*]. – CLENCH 1957, p. 148.

Pupa incana var. *fasciata*, BINNEY 1859, p. 142, pl. 79 fig. 17 [Key Biscayne]. – CLENCH 1957, p. 145.

Pupa incana var. *variegata*, PFEIFFER 1868, p. 289. – CLENCH 1957, p. 167.

Pupa maritima Pfeiffer, GOULD 1851, p. 316–319 [= *P. incana*; Key West].

Pupa maritima Pfr. var. γ, PFEIFFER 1853, p. 539 [E. Florida].

Pupa detrita Shuttleworth, PFEIFFER 1854, p. 205–206, pl. 3 fig. 9–10 [Key West]. – SOWERBY 1975, pl. 3 sp. 17 [Florida].

Strophia incana (Binney) BINNEY, 1878, p. 220–222, pl. 68 fig. 125–126 [incl. var. *fasciata*, fig. 126].

Strophia fasciata Maynard, 1889, p. 133. – Pilsbry 1901–02, p. 215 [= f. *vaccinum*].

Cerion incanum (Binney) PILSBRY & VANATTA, 1896, p. 320 [Key West]. – PILSBRY 1898, p. 26 [Gun Cay]. – PILSBRY 1901–02, p. 213–216, pl. 29 fig. 48–50 [Syn., descr., occurrence.]. – SIMPSON 1905, p. 137–138 ["upper end of Biscayne Bay"]. – BARTSCH 1920, p. 7 seq. [Breeding exp.]. – BARTSCH 1924, p. 225 [Breeding exp.]. – PILSBRY 1946, p. 158–169, fig. 76–80 [Syn., descr., occurrence; Florida Keys and mainland, Gun Cay.]. – BAKER & BAKER 1950, p. 108 [accid. escape.].

Cerion incanum var. *saccharimeta* "Blanes" PILSBRY & VANATTA, 1898, p. 477, fig. 5 [Sugarloaf Key].

Cerion incanum var. *vaccinum* Pilsbry 1901–02, p. 215, pl. 29 fig. 51 [Key Vaccas; form *vaccinum*.].

FLORIDA. – Miami Beach, J. N. Farnum leg., ZMA 8 exx.; 2½ mi. N of Miami Beach, D. L. Emery leg. July 1921, ZMA 10 exx. – Cape Florida, ZMA 8 exx. – *Key Biscayne*, S. Crandon Park, Sta. 692, on shrubs, on stems of Cocos, and among plant decay, 2.IX.1963, 766 exx. – Key Biscayne, L. B. Holthuis leg., 7.II.1965, RMNH 1913, 3 exx. – *Key Largo*, Chermock leg. 1851, ZMA 2 exx. – *Big Pine Key*, J. Chester

Bradley leg., RMNH 1 ex. – Big Pine Key, ZMA 20 exx. – *Lower Matecumbe Key*, Clench-Mac Coy-Russell leg., ZMA 12 exx. – *Key West*, E. Deyrolle, RMNH 1 ex.; Key West, Weeks coll., ZMA 6 exx. – *Tortugas*, H. Boschma leg. VII.1925, RMNH 627, 7 exx.

Shell sub-cylindrical, the last three whorls of about equal diameter, those above slowly tapering to an *acute apex*, with suture scarcely channelled; *whorls* about *9.6*, not compressed, scarcely convex.

Altitude of shell 20.0–*24.5*–32.5 mm, 2.1–*2.57*–3.2 *times major diameter* of spire.

Aperture rounded to subquadrate, having a *reflexed, thin peristome*, an usually thin and transparent callus and *two lamellae*, of which *one, tooth-like*, small, *near* the *middle of* the *parietal wall* and a smaller one on the columella.

Sculpture only consisting of little *wrinkles*; embryonic whorls smooth, the following whorl often very finely striated.

Colour whitish, greyish or flesh-coloured, with a touch of blue and/or light brown, among them a form with light to dark *brown* vertical *stripes*, sometimes zig-zag, on a creamy-white or pale brown ground; the different forms shade off into one another.

Pupa incana was first mentioned in the "Terrestrial airbreathing mollusks" I by BINNEY (1851). In part II BINNEY's complete description followed in which GOULD (editor) felt the necessity to change the name to *P. maritima* Pfr., because the shell exactly resembled this species. Later on he revoked this. PFEIFFER himself (1853) considered *P. incana* to be a variety of *P. maritima*, but in 1854 he arrived at an entirely different species viz. *P. incana*.

Pupa maritima occurs at the north coast of Cuba.

From 1878 till 1896 the species belonged to *Strophia*, with *Strophia incana* as type species.

The variation in size, form and colour within our material from a single population on Key Biscayne lessens the significance of a number of varieties mentioned in literature. The almost exclusive occurrence of *Cerion incanum* on the Florida Keys (and not on the mainland) may, according to CLENCH (1938) be due to the absence of small mammals on the Keys.

Cerion biminiense Henderson & Clapp, 1913

(Pl. XIVk–m)

Cerion biminiense HENDERSON & CLAPP, 1913, p. 64–65 [Descr., "Southern end of North Bimini Cay," in subgen. *Strophiops*.]. – CLENCH 1942, p. 62 [North & South Bimini]. – MAYR & ROSEN 1956, p. 26 seq., fig. 9 [Variation, N. and S. Bimini, hybrids.]. – CLENCH 1956, p. 2–3.
Cerion biminiensis Henderson & Clapp, CLENCH 1957, p. 138.

NORTH BIMINI. – Near Alice Town, sandy shore of lagoon with beach rock debris, beach vegetation, few coconut trees, abandoned garden, Sta. 496, 18.VIII.1949, 46 exx.
BIMINI. – Bimini, L. M. J. U. van Straaten leg., RMNH 1277, 4 exx.

Shell sub-cylindrical-oval, with a *sub-acuminate apex* and suture scarcely channelled; *whorls* about *8.6*, not compressed, scarcely convex.

Altitude of shell 21.5–*24.2*–27.0 mm, 2.9–*2.28*–2.6 *times major diameter* of spire.

Aperture rounded to subquadrate, having a *reflexed*, moderately *thickened peristome*, an usually heavy parietal callus (in brown specimens often thin and transparent) and *two lamellae*, of which *one*, *tooth-like*, small, *near* the *middle of* the *parietal wall* and a smaller one on the columella.

Sculpture on about 50% of specimens consisting of *many*, regularly placed, somewhat parasygmoidal, rather narrow *ridges*, about *35 per whorl* on the widest part of spire, from oblique above to vertical at the base; other 50% only lightly *wrinkled* and the last whorl ribbed.

Colour (1) generally light brown with lighter ribs and whitish at base of last whorl (16 spec., ribbed); (2) white (23 spec., a few ribs only); (3) white, blotched with light brown (1 spec., smooth).

MAYR & ROSEN (1956) considered the Cerions from the Bimini Group as belonging to one and the same species, to be divided into three groups. The populations of the south end of North Bimini have been described by HENDERSON & CLAPP (1913) as *Cerion biminiense*.

Our material from Alice Town (S. end of N. Bimini) agrees with the shells from the type-locality. Museum material from the same place was studied by MAYR & ROSEN.

Cerion pillsburyi Pilsbry & Vanatta, 1897

(Pl. XIVn–o)

Cerion pillsburyi PILSBRY & VANATTA, 1897, p. 366–367, fig. 5 [Descr., Gun Cay.]. – PILSBRY 1898, p. 26 [Gun Cay]. – PILSBRY 1901–02, p. 244, pl. 36 fig. 41–42 [Descr., Gun Cay]. – CLENCH 1942, p. 62 [N. & S. Bimini, Gun Cay, N. & S. Cat Cay]. – CLENCH 1956, p. 2–3. – MAYR & ROSEN 1956, p. 26 seq., fig. 8 [Variation, N. and S. Cat Cay, Gun Cay hybr.].

Cerion canonicum DALL, 1905, p. 442, pl. 58 fig. 13 [Descr., Gun Cay, in subgen. *Strophiops*.]. – CLENCH 1957, p. 139 [= *C. pillsburyi*].

Cerion northropi DALL, 1905, p. 442, pl. 58 fig. 11 [Descr., "probably one of the westermost islets near Gun Cay"]. – CLENCH 1957, p. 155 [= *C. pillsburyi*].

SOUTH BIMINI. – Near muddy well ("Fountain of Youth") in low limestone flat with scanty vegetation, Sta. 498, 20.VIII.1949, 6 exx.
SOUTH CAT CAY. – Near landing, limestone debris at base of coconut trees, Sta. 499, Sta. 499, 21.VIII.1949, 13 exx. – Northern part, R. W. Foster leg., 1941, ZMA 14 exx.
GUN CAY. – Northern part of Gun Cay, Foster & Huntington leg., VI.1941, ZMA 12 exx.

Shell sub-cylindrical, the last two whorls of nearly equal diameter, those above slowly tapering to an *acute apex*, with suture scarcely channelled; *whorls* about *9.6*, not compressed, scarcely convex.

Altitude of shell 23.0–*24.4*–27.5 mm, 2.4–*2.64*–2.9 *times major diameter* of spire.

Aperture rounded to subquadrate, having a *reflexed, thickened peristome*, an usually thin and transparent parietal callus (one spec. with thick par. callus) and *two lamellae*, of which *one, tooth-like*, small, *near* the *middle of* the *parietal wall* and a smaller one on the columella.

Sculpture consisting of *few*, regularly placed, somewhat parasygmoidal, rather narrow *ridges*, about *26 per whorl* on the widest part of spire, from oblique above to vertical at the base (òne spec. partly almost smooth).

Colour light to dark brown with beige or white, usually irregularly *blotched*, sometimes with a touch of grey.

Our material from South Cat Cay and South Bimini – which belongs to MAYER & ROSEN's group of Cat Cay populations – was identified as *Cerion pillsburyi* after comparing the shells from South Cat Cay, collected by R. W. FOSTER, which according to CLENCH belong to this species.

Cerion glans (Küster, 1844) Dall, 1894

(Pl. XIVj)

Pupa glans KÜSTER, 1844, p. 74, pl. 11 fig. 1–2 [loc. unknown, cf. CLENCH 1957). – PFEIFFER 1848, p. 316. – PFEIFFER 1856, p. 175 [group *Strophia* Alb.]. – BLAND 1862, p. 354. – SOWERBY 1875, pl. 1 sp. 2 ["Hab. New Providence, Bahamas."].

Cerion glans (Küster) DALL, 1894, p. 117 [Name only, doubtful ident., subg. *Strophiops*, Watling Island.]. – PILSBRY & VANATTA 1896, p. 323–324 [Synonymy]. – PILSBRY 1901–02, p. 253–263, pl. 40–43 [Synonymy!, descr. of typical *C. glans*, p. 260–261, pl. 42, fig. 48–52.]. – PLATE 1907, p. 589–592, pl. 1–2 [Descr., variab., New Providence.]. – JAENICKE 1933 [Anatomy]. – CLENCH 1957, p. 147 [also sub *agava*, *coryi*, *neglecta*, etc.].

NEW PROVIDENCE. – Pall's Waterworks, limestone, Hummelinck leg., 23.VIII.1949, 16 exx. – Nassau, near Governor's Palace, Hummelinck leg., 23.VIII.1949, 8 exx. subfossil fragm. – New Providence: var. *agava* Mayn., H. C. Fulton, 3 exx.; var. *cinerea* Mayn., Fulton, 3 exx.; var. *coryi* Mayn., James Zetek, 8 exx.; var. *mutata* Mayn., Fulton, 2 exx.; *neglecta* Mayn, Fulton, 2 exx.; subsp. *varia* Bonnet, Fulton, 3 exx.; all RMNH 98, 23a. – New Providence: Nassau, var. *coryi* Mayn., 13 exx.; var. *coryi*, Shelly Denton leg., 5 exx.; var. *varium* Bonnet, Shelly Denton, 7 exx.; 4 mi. NNW of Nassau, *C. argentinum* Mayn., Clench-Russell-Huntington leg. 1935, 23 exx.; 5½ mi. SSW of Nassau, *C. agrestina* Mayn., Russell & Mc.Lean leg. 1936, 11 exx.; Fort Charlotte, ½ mi. W of Nassau, Clench-Russell-Huntington leg. 1935, 25 exx. – Hog Island, var. *cinereum* Mayn., Clench c.s. leg. 1935, 16 exx. – North Cay, 4 mi. NNW of Nassau, *C. argentinum* Mayn., Clench c.s. leg. 1935, 23 exx. – All from ZMA.

ANDROS. – Mangrove Cay, O. Bryant leg., 15 exx. ZMA.

Shell sub-cylindrical-oval, lustreless, with an *acuminate apex* and suture scarcely channelled; *whorls* about 9.1, not compressed, scarcely convex.

Altitude of shell 24.5–*26.1*–28.5 mm, 2.2–*2.31*–2.5 *times major diameter* of spire.

Aperture rounded to subquadrate, brown within, having a *reflexed, thickened peristome*, a usually thick parietal callus, that often forms a ridge and *two lamellae*, of which *one, tooth-like*, well developed, white, situated *near* the *middle of* the *parietal wall* and a smaller one on the columella.

Sculpture consisting of *few*, regularly placed, somewhat parasygmoidal, rather narrow, but thick *ridges*, about *24 per whorl* on the widest part of spire, from oblique above to vertical at the base.

Colour light to dark brown, reddish brown, usually irregularly *blotched*, with white or beige; ridges lighter.

PILSBRY (1901–02) as well as PLATE (1907) called attention to the enormous variability of *Cerion glans* on the island of New Providence. PILSBRY distinguished several subspecies, while PLATE discerned series of forms, shading off into one another from West to East. These forms he provided with some names on subspecies-level. Our material from Pall's Waterworks belongs to PLATE's *Cerion glans glans* (= PILSBRY's *C. glans coryi* = *Strophia neglecta agava* Maynard). The subfossil specimens from the Governor's Palace at Nassau are similar to *C. agassizi* Dall.

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FIGURES

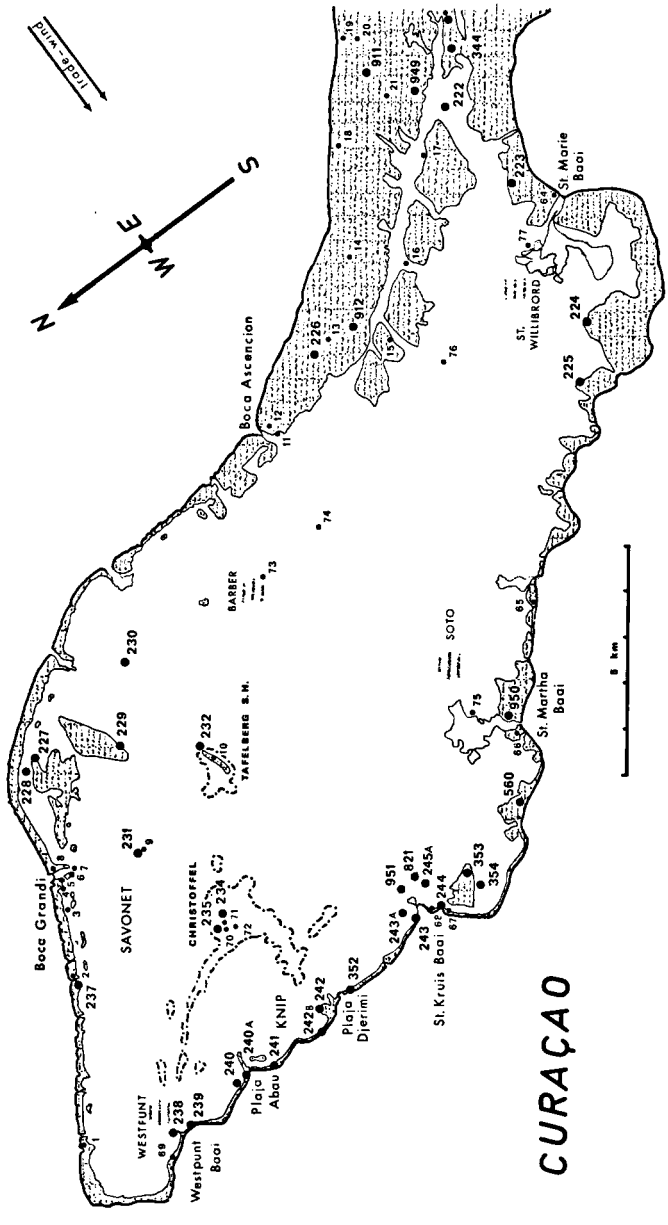


Fig. 95. Sketch map of western Curaçao showing localities discussed in this paper.

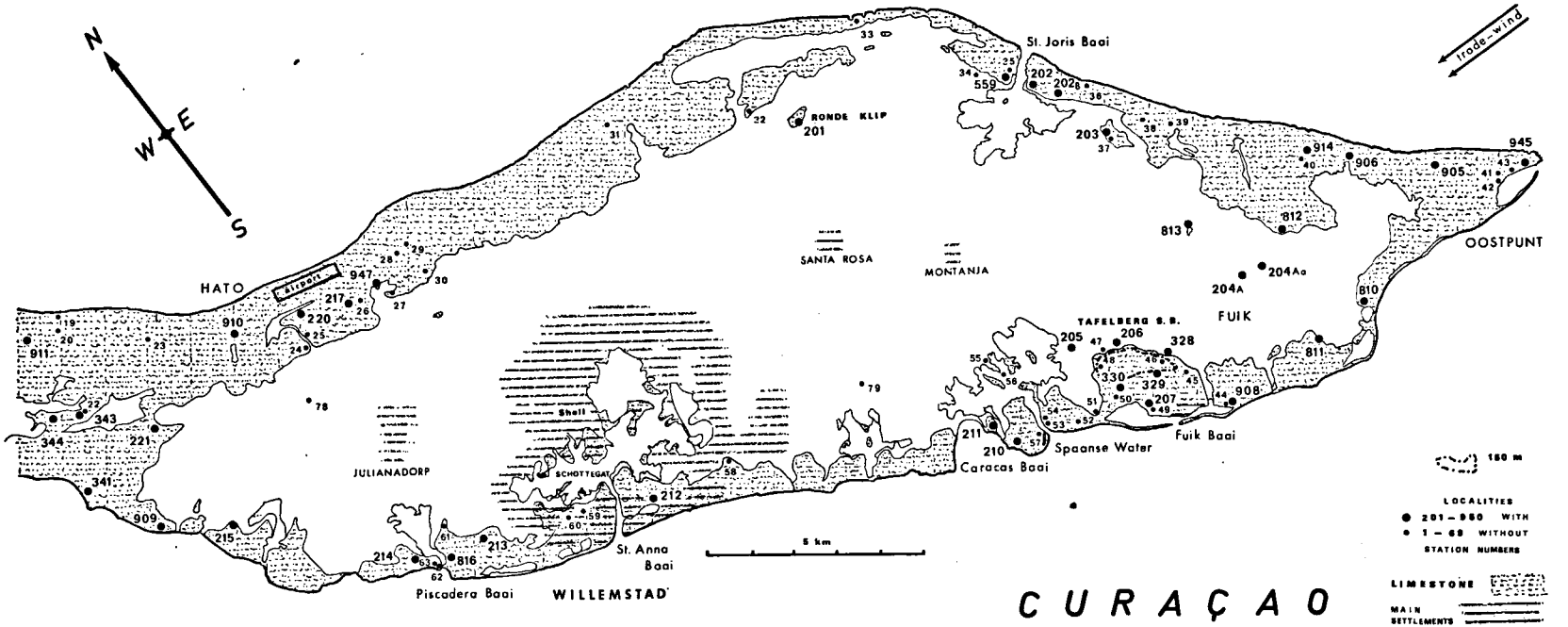


Fig. 96. Sketch map of eastern Curaçao showing localities discussed in this paper.

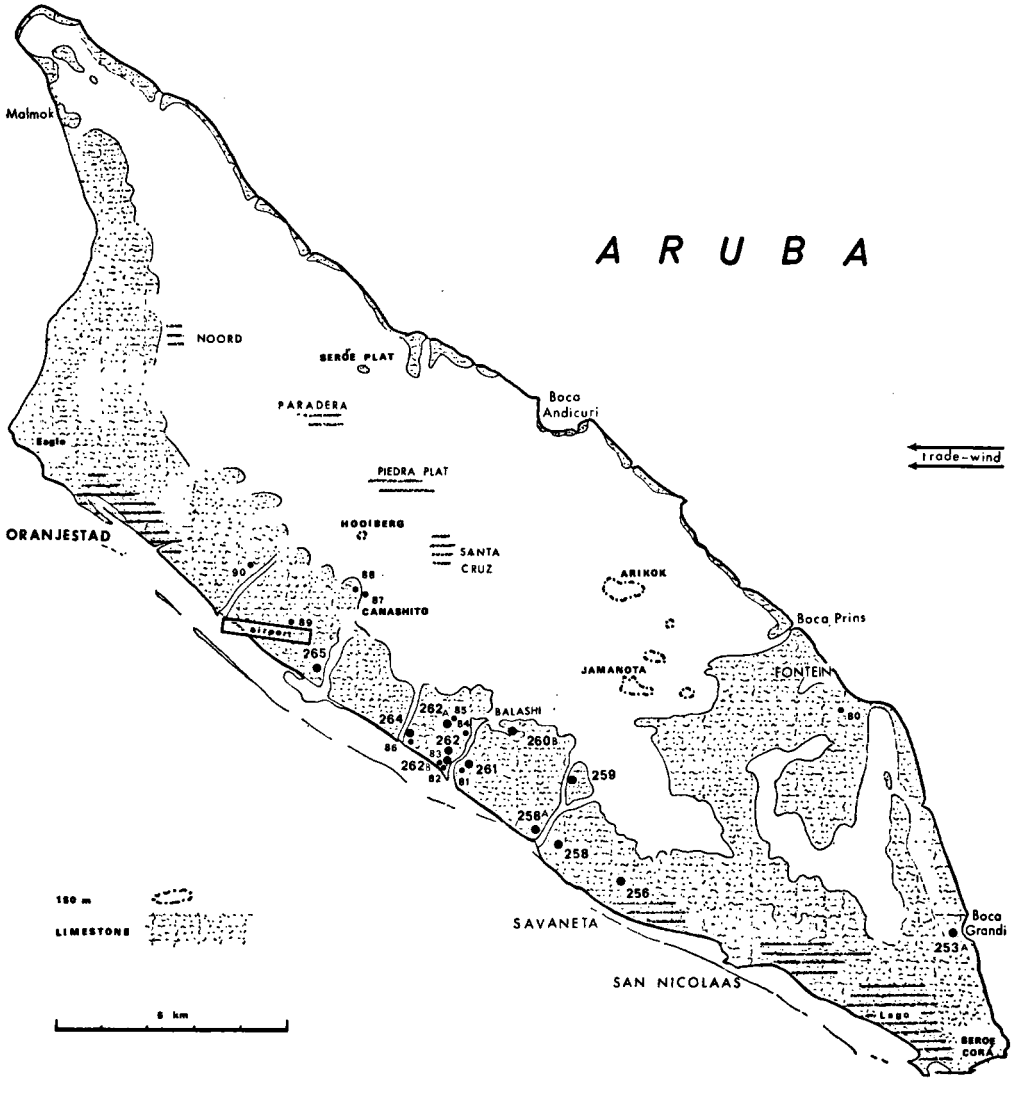


Fig. 97. Sketch map of Aruba showing localities discussed in this paper.

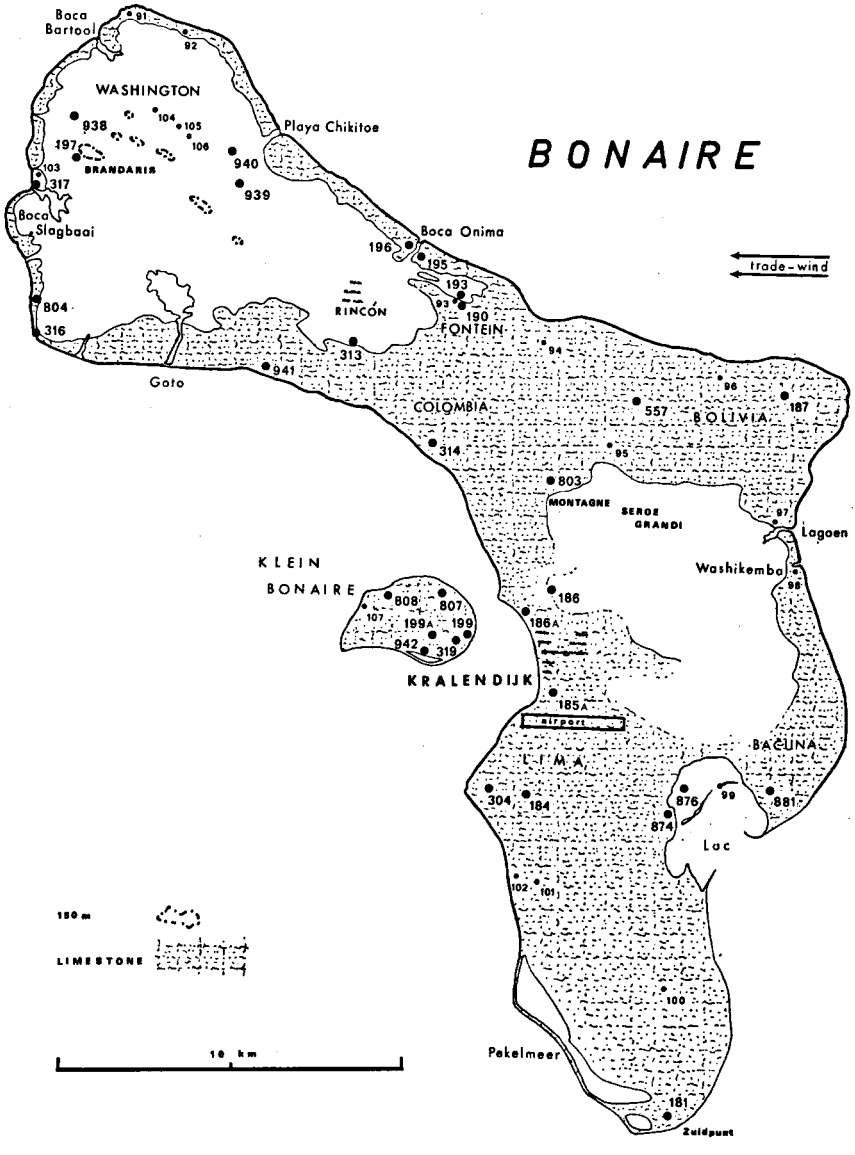


Fig. 98. Sketch map of Bonaire showing localities discussed in this paper.

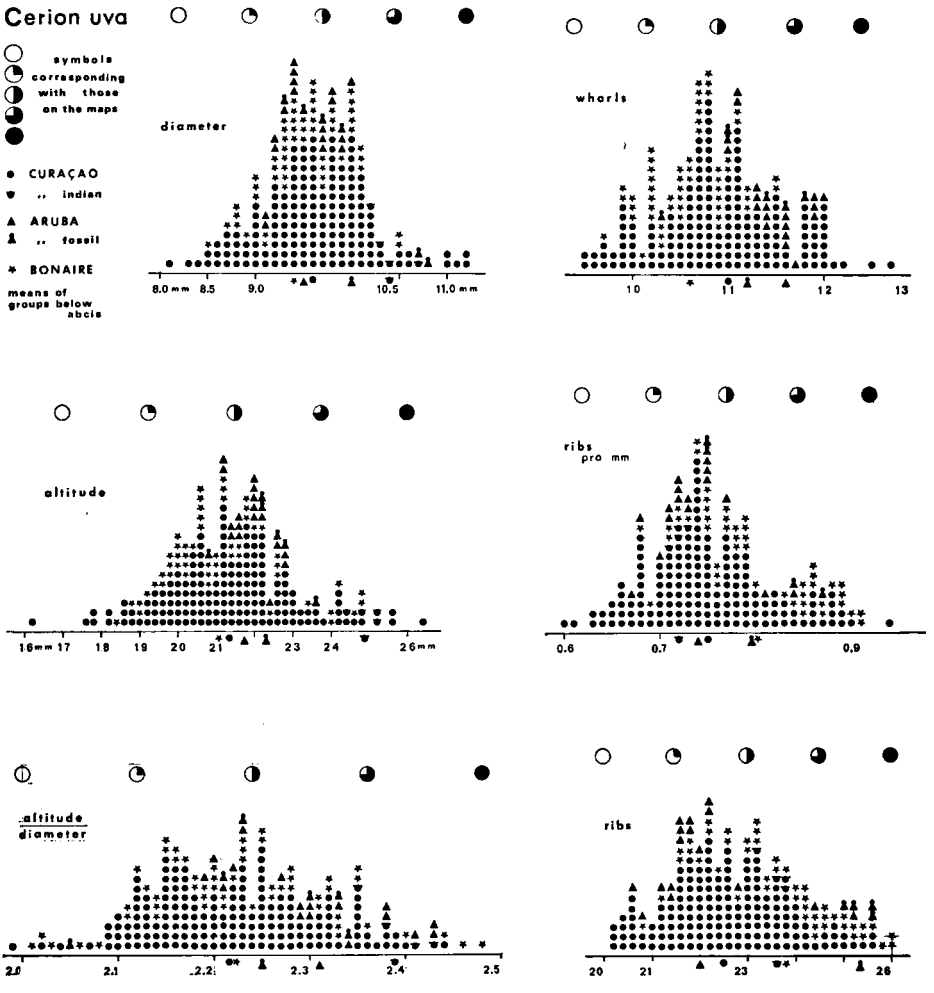


Fig. 99. Measurements in *Cerion uva* from Curaçao, Aruba and Bonaire.

VIIIa. *Cerion incanum* on stem of *Cocos* at Key Biscayne, Florida, 2.IX.1963
VIIIb. *Cerion uva* on fallen *Opuntia wentiana*, Curaçao, 1963.

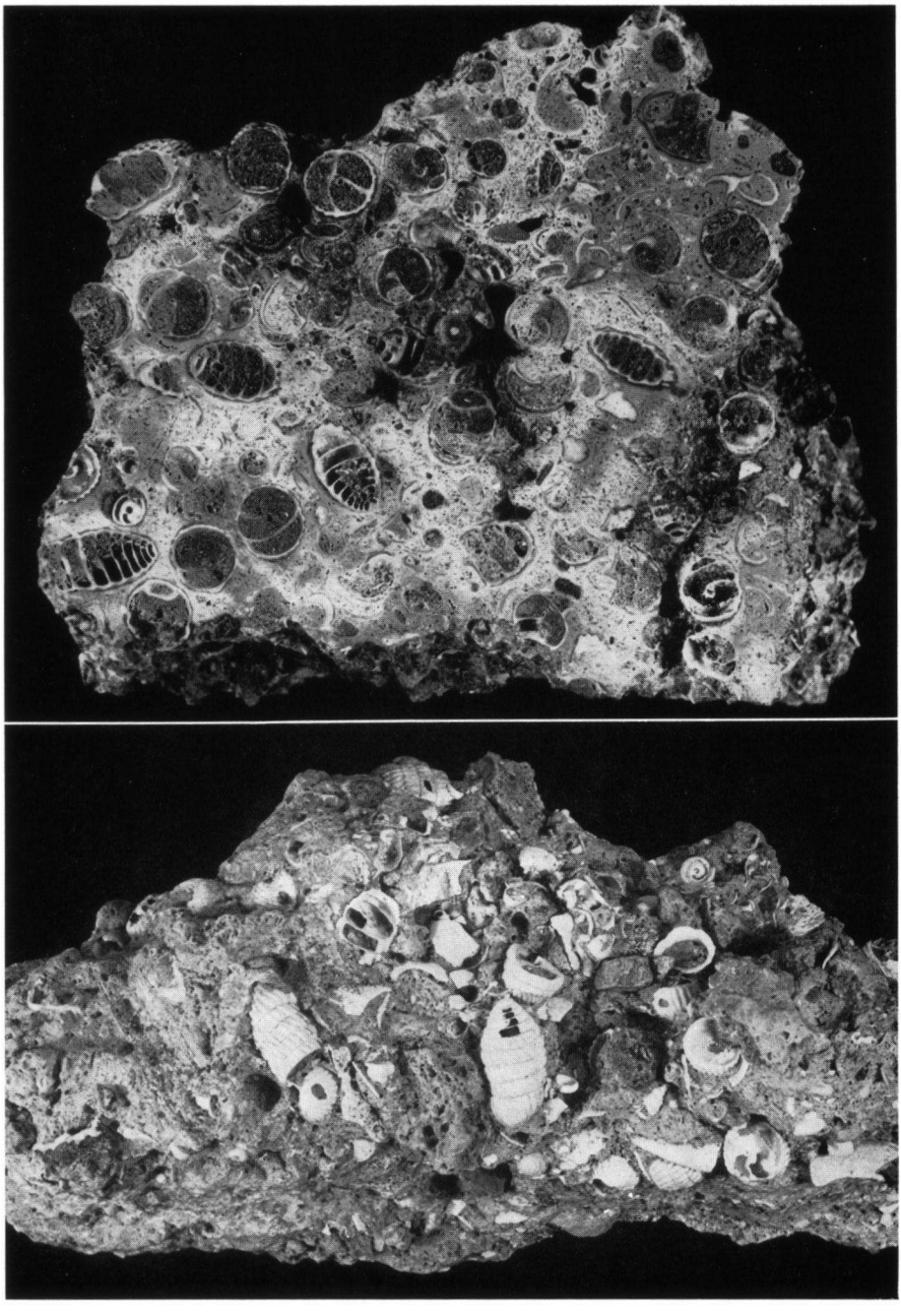
PLATE IX

IX. *Cerion uva* on dead trunk of *Caesalpinia*, among *Croton flavens* shrubs on a limestone terrace at Groot St. Joris, Curaçao, August 1954.

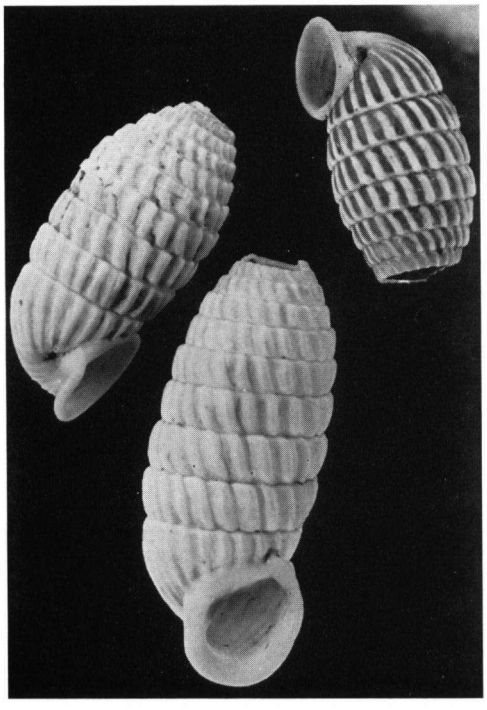
Xa. Clustering *Cerion uva* on limestone pebbles on the barren north coast of Oostpunt, Curaçao, 21.IX.1968.

Xb. Accumulation of *Cerion uva* near an Indian shelter (Cueba dos Placa) on the eastern slope of the Tafelberg, Curaçao, Nr. 45. The apical whorls of all specimens had been removed, no doubt by crushing, so that the contents of the living shells could be easily sucked out.

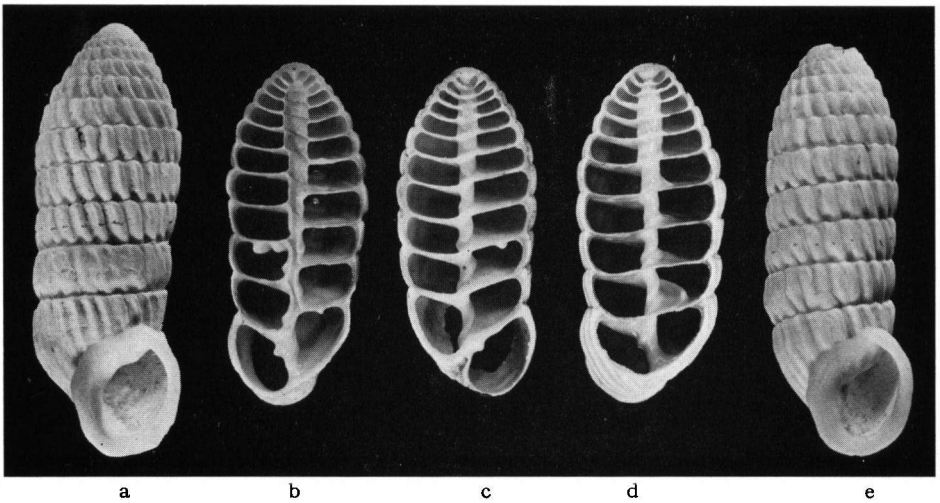
PLATE XI



XIa. A piece of yellowish brown cave phosphate crowded with *Cerion uva*, from the Cueba di Quadirikiri, Aruba, Nr. 80 (sectioned).
XIb. A piece of brown *Cerion*-phosphate from a fissure in limestone at Duivelsklip, Curaçao, 1936.



XII a

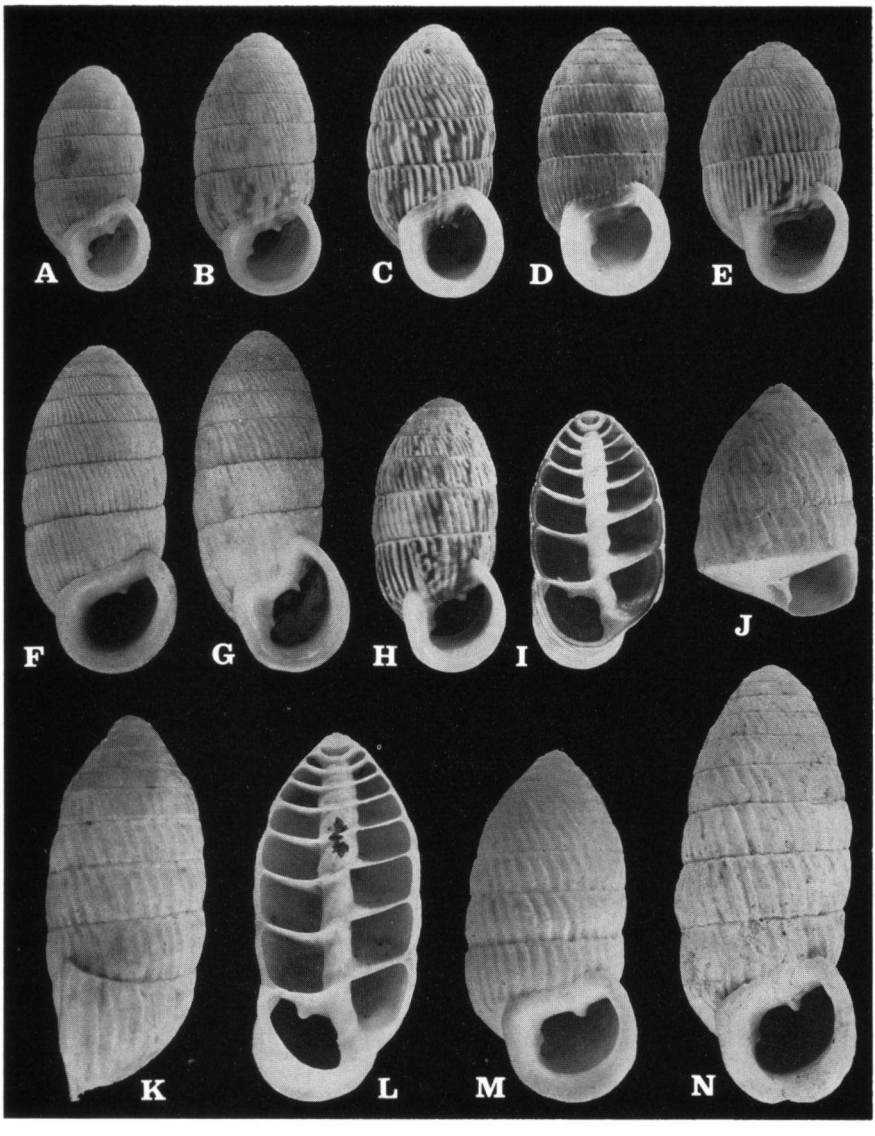


a b c d e

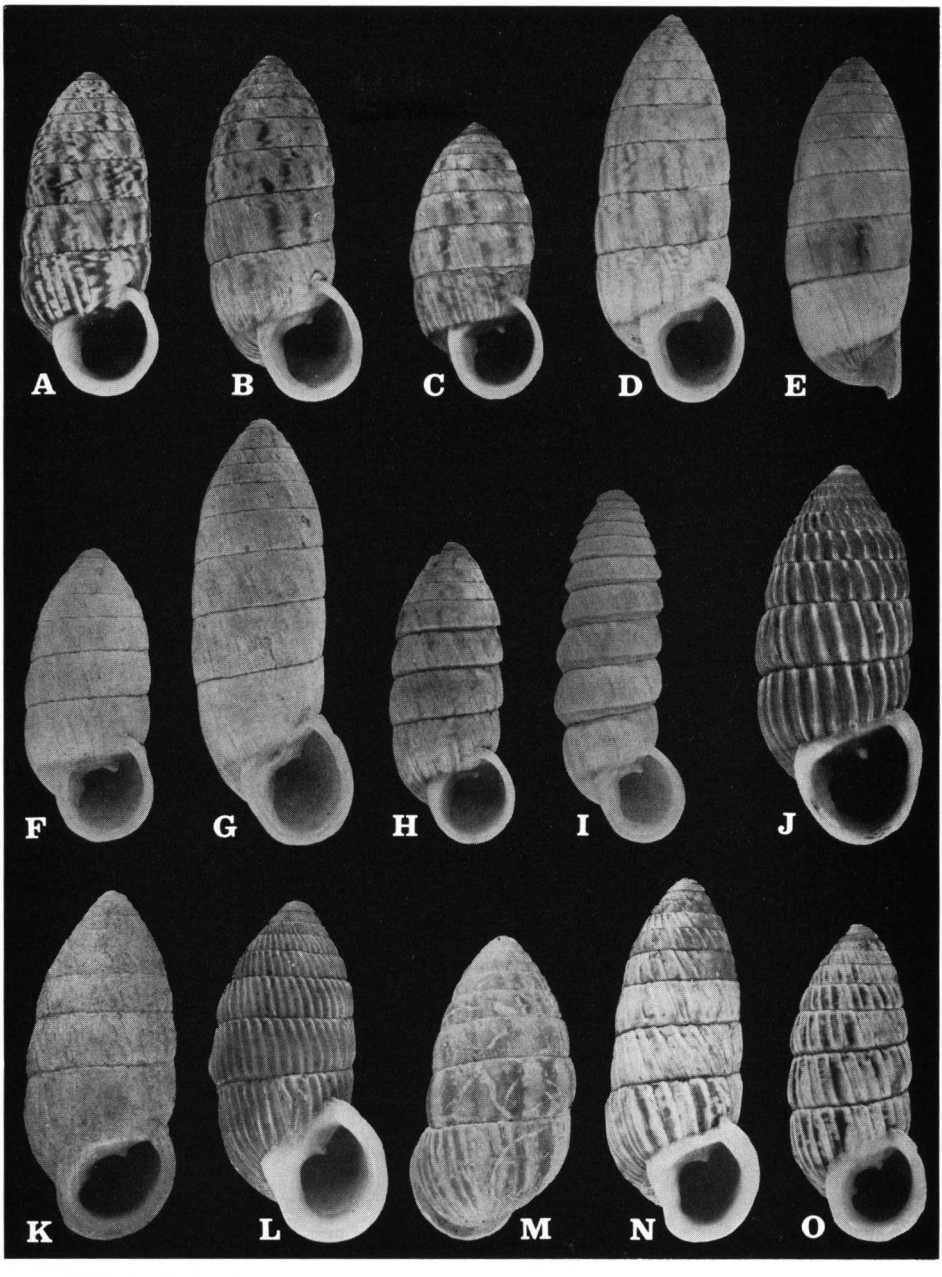
XIIa. *Cerion uva* specimens with crushed apex from the Cueba dos Placa shell mound, Curaçao, Nr. 45a.

XIIb. *Cerion uva* shells from: a, Rooi Rincón, Curaçao, 1949, 32 mm in length; b, Wandongo, Curaçao, Sta. 220, 25 mm (sectioned); c, Lagoen, Aruba, 1936, 21.5 mm (sect.); d, Rooi Lamoenchi, Aruba, Sta. 258, 23.5 mm; e, Cueba dos Placa, Curaçao, Nr. 45, 30 mm (apex crushed). – Sections showing structure of axis, axial-lamellae and parietal tooth, and almost horizontal whorls.

PLATE XIII



XIIIa–g. *Cerion striatella* from Puerto Rico: a–b, Saliña Corozo, 18.IX.1963; c–e, Guánica, Sta. 703; f, Cabo Rojo, Sta. 696; g, Isla Cueba, Sta. 701.
XIIIh–i. *Cerion striatella* from Anegada, 7.X.1954.
XIIIj–n. *Cerion rude* from St. Croix, Fredensborg, Sta. 615; j, juvenile specimen. – Sections showing parietal tooth and oblique whorls.



XIVa–i. *Cerion incanum* from Key Biscayne, Florida, Sta. 692; h–i, scalariform specimens.
XIVj. *Cerion glans* from Pall's Waterworks, New Providence, 23.VIII.1949.
XIVk–m. *Cerion biminiense* from Alice Town, North Bimini, Sta. 496.
XIVn–o. *Cerion pillsburyi* from South Cat Cay, Sta. 499.

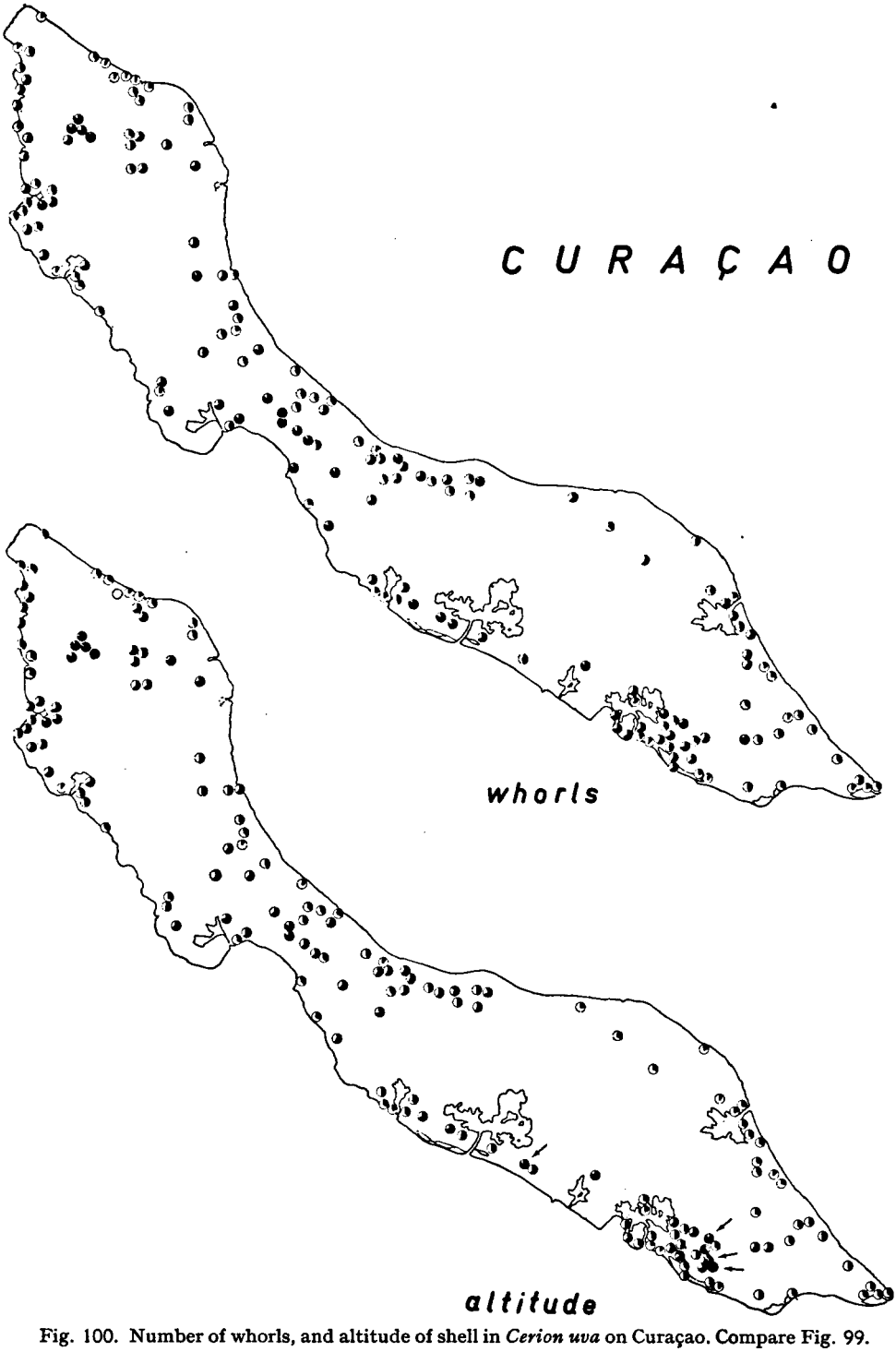


Fig. 100. Number of whorls, and altitude of shell in *Cerion uva* on Curaçao. Compare Fig. 99.

Fig. 101. Diameter, and altitude: diameter of shell in *Cerion uva* on Curaçao. Compare Fig. 99.

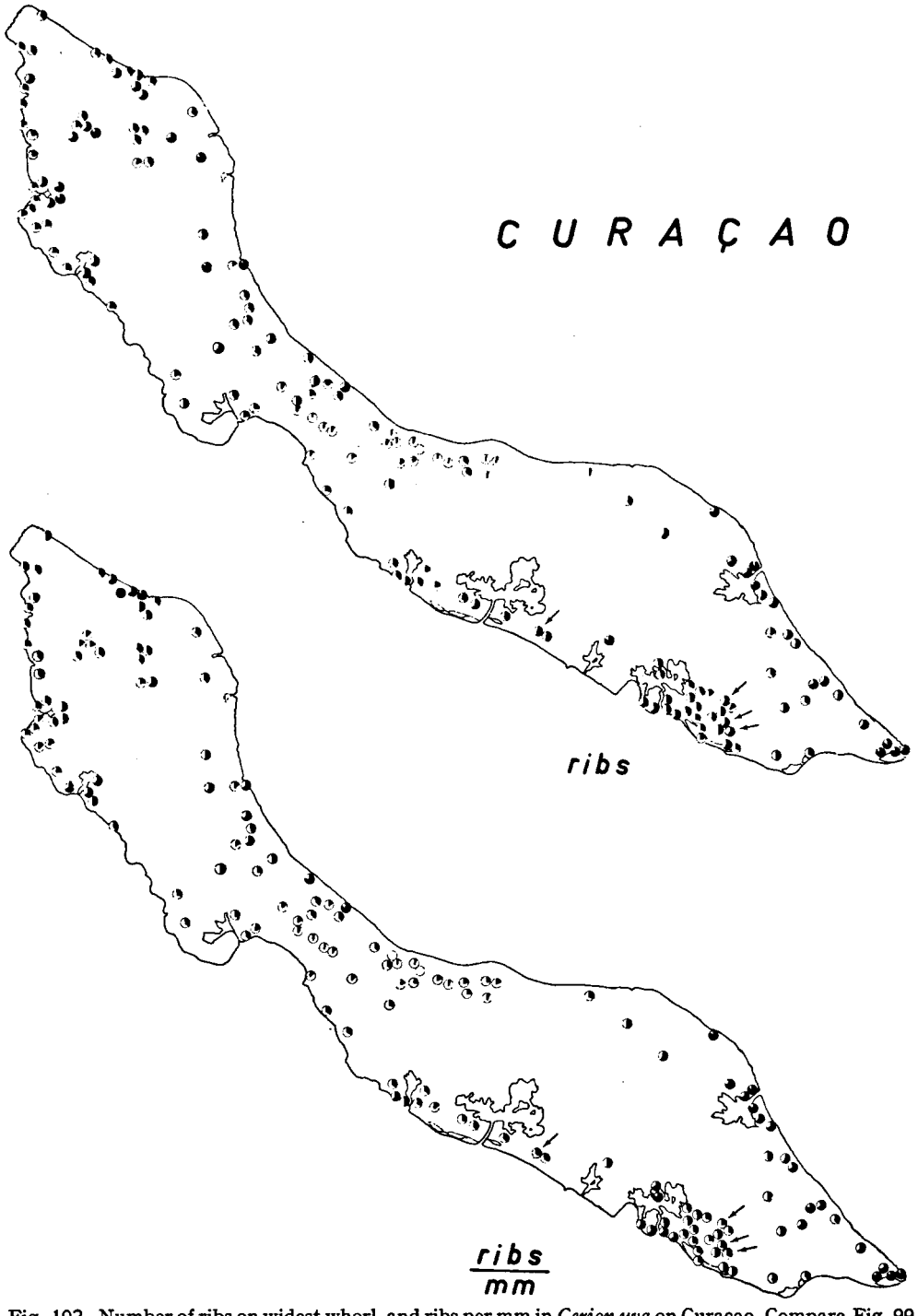


Fig. 102. Number of ribs on widest whorl, and ribs per mm in *Cerion uva* on Curaçao. Compare Fig. 99.

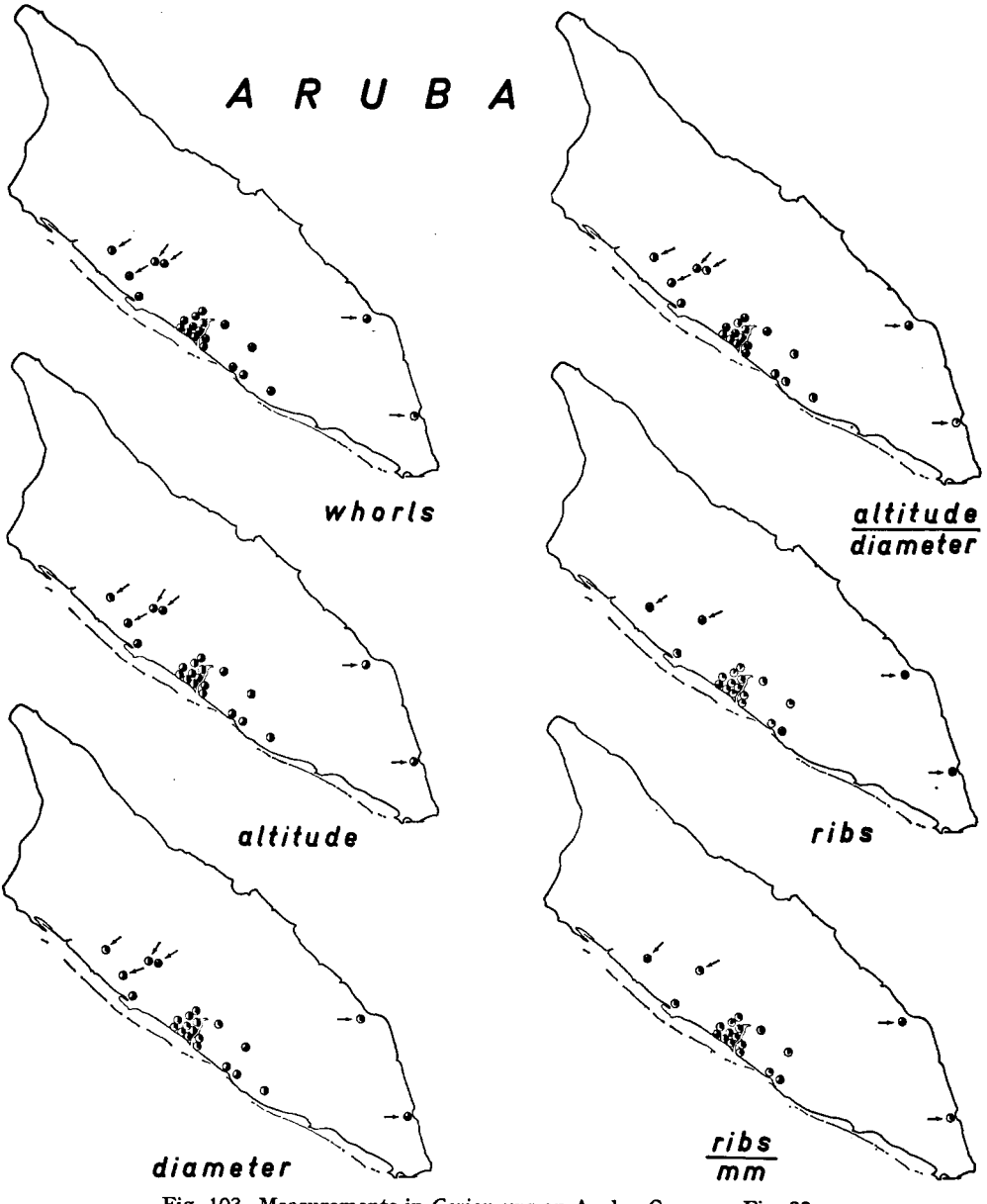


Fig. 103. Measurements in *Cerion uva* on Aruba. Compare Fig. 99.

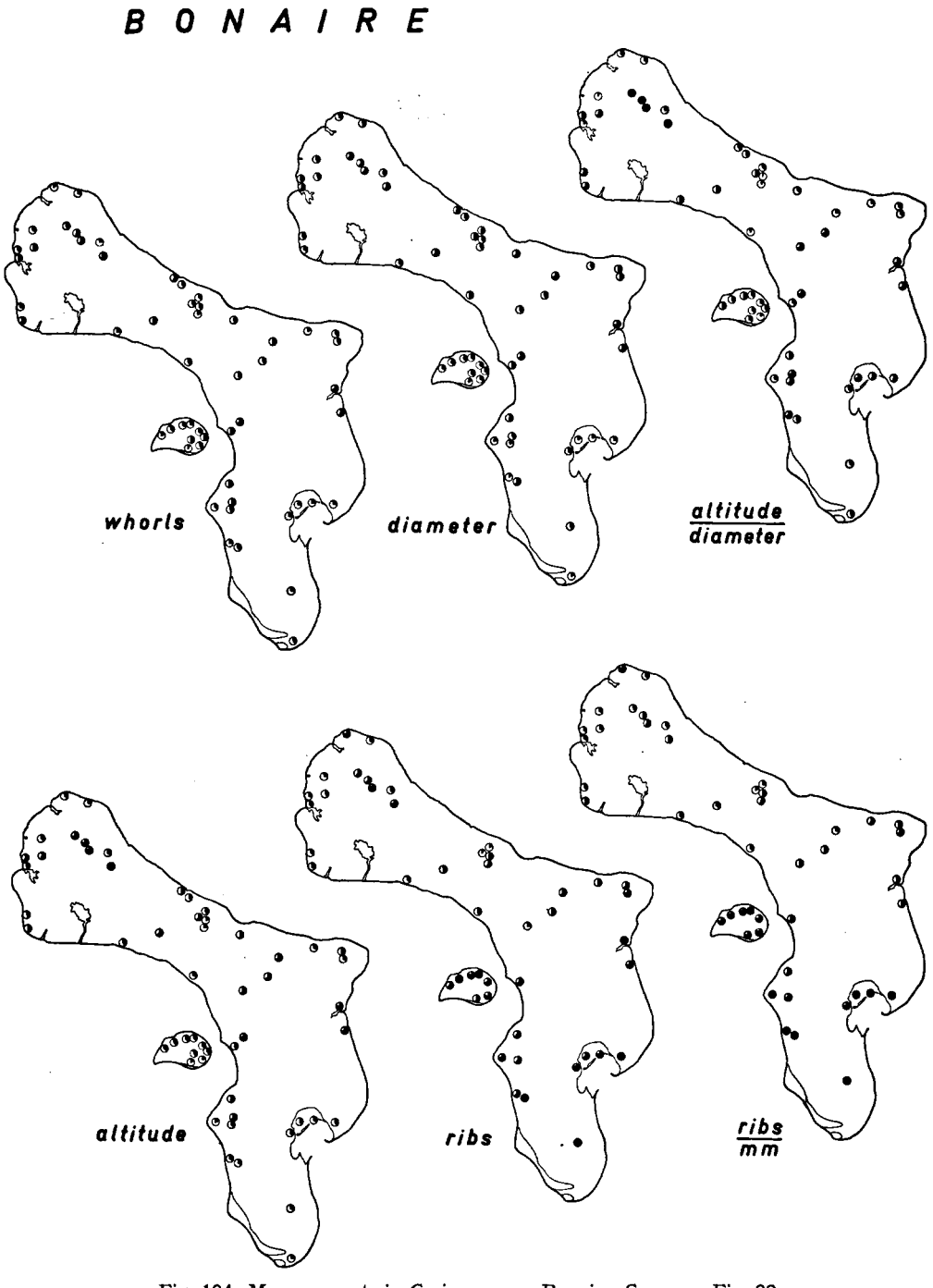


Fig. 104. Measurements in *Cerion uva* on Bonaire. Compare Fig. 99.