

CYPRAEACEA FROM HAWAII

By

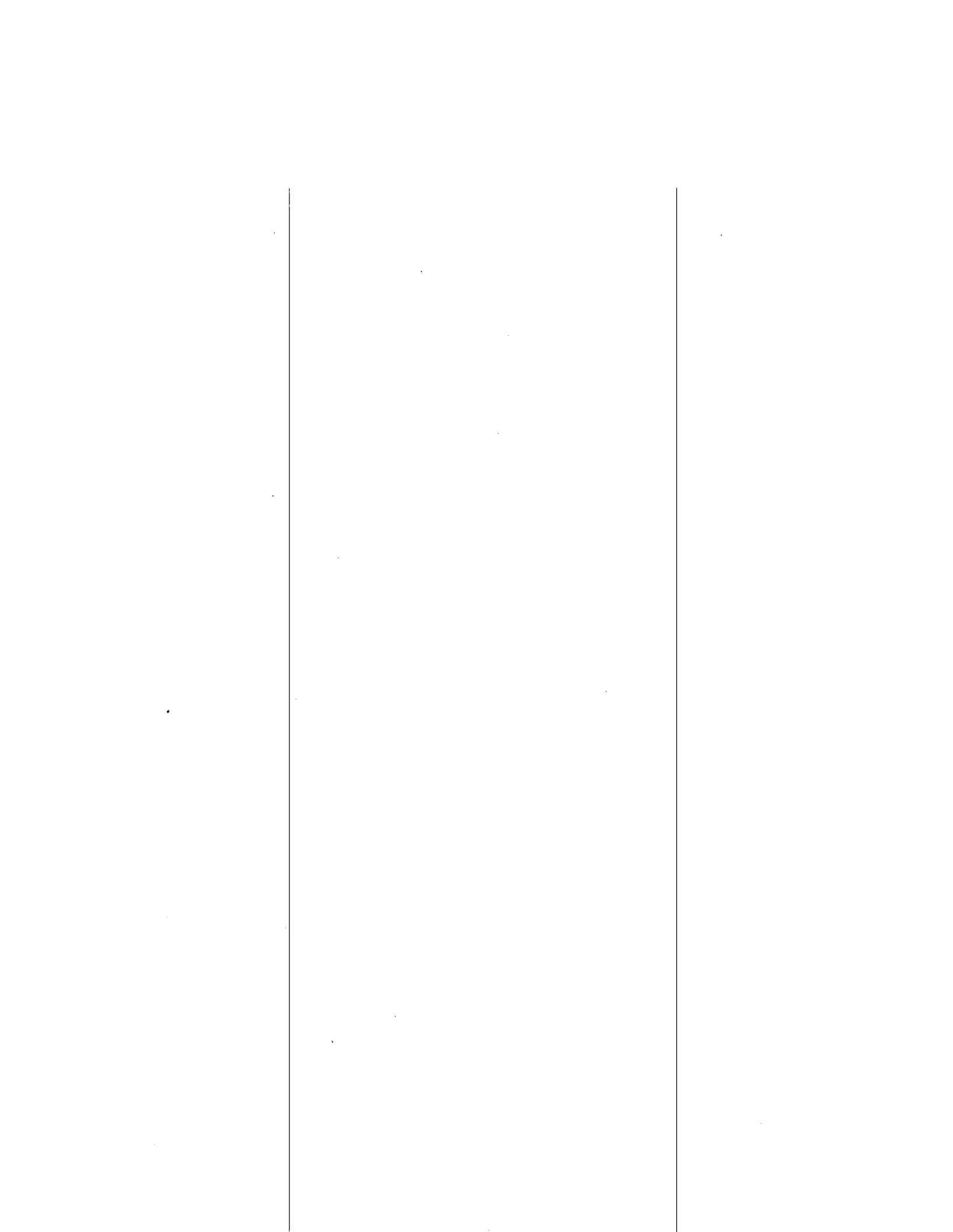
F. A. SCHILDER

BERNICE P. BISHOP MUSEUM

OCCASIONAL PAPERS

VOLUME X, NUMBER 3

HONOLULU, HAWAII  
PUBLISHED BY THE MUSEUM  
1933



# CYPRAEACEA FROM HAWAII\*

By

F. A. SCHILDER  
NAUMBURG-SAALE, GERMANY

## INTRODUCTION

In 1928 Dr. Victor Pietschmann, Ichthyologist of the Museum of Vienna, Austria, collected some marine Mollusca on the beaches of Pearl and Hermes Reef, Laysan Island, and French Frigates Shoal, Hawaii. The Cypraeacea (including the families Eratoidae, Cypraeidae, and Amphiperatidae) have been referred to the writer by Dr. W. Adensamer, Curator of Mollusca, Museum of Vienna.

The collection contains 594 specimens belonging to 19 species. Most of them are well-known shells found on other Hawaiian islands. Nevertheless the collection is interesting, as it proves that some Hawaiian species range as far north as Pearl and Hermes Reef, latitude 28 degrees. Also, the rather large number of individuals of many species makes possible the investigation of local variability by the methods of statistics.<sup>1</sup>

Distribution of species of Cypraeacea previously credited to the Hawaiian islands, especially to Oahu, Kauai, Hawaii, and Maui, and those found by Dr. Pietschmann in the leeward islands, is shown in Table 1. Fifty-four species have been credited to the Hawaiian islands, but of these, 11 species must be rejected and 15 need further confirmation. Of the 28 species that have undoubtedly been found on the shores of the larger islands, 19 were collected at French Frigates Shoal, Laysan Island, and Pearl and Hermes Reef. Nine of these 28—or 43—Hawaiian species are confined to the Hawaiian islands, though allied species occur in other parts of the Pacific (*Pustularia tessellata* is the only species without close relations to other living Cypraeacea). Four—or 6—species also occur in other islands of Polynesia, 7 species range to eastern Asia or Australia, and 8—or 21—species are distributed as far as the Indian Ocean.

<sup>1</sup> Schilder and Schilder, Eine Ansbeute von Cypraeacea aus Port Alfred: Ann. Nat. Mus., Wien, vol. 43, p. 229, 1929. Variationsstatistische Studien an *Monetaria annulus*: Mitt. Zool. Mus. Berlin, vol. 16, p. 543, 1930.

\* This is the fourth in a series of publications resulting from investigations of Pacific faunas by Dr. Victor Pietschmann, Bishop Museum Fellow in Yale University, 1927-1928. The first paper is by Anton Böhm, "Distribution and variability of *Ceratium* in the northern and western Pacific": B. P. Bishop Mus., Bull. 87, 1931. The second paper is by Otto Schindler, "Sexually mature larval Hemiramphidae from the Hawaiian islands": B. P. Bishop Mus., Bull. 97, 1932. The third paper is by Maximilian Holly, "Echinodermata from Pearl and Hermes Reef": B. P. Bishop Mus., Occ. Papers, vol. 10, no. 1, 1932.

All species found by Dr. Pietschmann in the leeward Hawaiian islands have also been observed in the eastern islands before, but his collection includes one species (*Mauritia scurra*) which was unknown to Garrett, and two species (*Lyncina arenosa*, *Talostolida rashleighana*) unknown to both Garrett and Baldwin. Dr. Pietschmann did not collect *Mauritia mauritiana*, *Staphylaea polita*, and *Cribraria gaskoini*, which are rather common on the larger eastern islands, so one would suggest that these do not range to the western islands.

In descriptions and collection records of species the following abbreviations have been used:

- FF = French Frigates Shoal, March 4-5, 1928.  
 FK = French Frigates Shoal, King Island, March 5, 1928.  
 LA = Laysan Island, March 1, 1928.  
 PH = Pearl and Hermes Reef, without precise indication of island or date.  
 PE = Pearl and Hermes Reef, Southeast Island.  
 PG = Pearl and Hermes Reef, Grass Island.  
 PS = Pearl and Hermes Reef, Sand Island, February 18, 1928.  
 Ma = maximum length of shell.  
 Mi = minimum length of shell.  
 X = number of specimens (4X = four specimens).  
 L = length of shell in mm.  
 BL = relative breadth (100 X breadth : length).  
 HL = relative height (100 X height : length).  
 LT = number of labial teeth from anterior extremity of outer lip to interior of posterior outlet.  
 CT = number of columellar teeth, excluding anterior terminal ridge (generally widely separated from the following teeth) and slight crenulations on left border of posterior outlet.  
 IR = intercalate ribs on the inner lip of *Nuclearia*.  
 MR = marginal ribs, number of ribs crossing periphery of shell.  
 DR = dorsal ribs, number of ribs starting from dorsal sulcus or median line in both directions (the dorsum therefore is crossed by one-half the number of dorsal ribs), the rather longitudinal ribs on both extremities excluded.

Dimensions, proportions, and number of teeth of the shell have been expressed by a formula, as,  $22(66/52)20:17$ , which expresses: L, 22; BL, 66; HL, 52; LT, 20; CT, 17. In Triviinae there are two accessory figures, and the formula runs as follows,  $5.1(80/71)16:12/46:18$ , which expresses: L, 5.1; BL, 80; HL, 71; LT, 16; CT, 12; MR, 46; DR, 18 (the dorsum is crossed by 18:2, or 9, ribs).

In the text tables given with discussions of species to show the differences between populations from different islands and regions, the second figure of each character (L, BL, HL, LT, CT, MR, DR) indicates the mean, whereas the first and third figure indicate the limits of 50 per cent of the specimens investigated which approach

the mean.<sup>2</sup> The absolute extremes observed have been indicated only with regard to the length of the shell with respect to maximum and minimum length.

## NOTES TO TABLE 1

1. Abbreviations used in the table are:
  - H = confined to Hawaii.
  - P = found in Hawaii and in small islands of Micronesia and eastern Polynesia, but not as far west as Fiji and New Caledonia.
  - S = widely distributed in the South Pacific east of Malacca.
  - I = living in the Indian Ocean and Pacific Ocean.
  - GR = credited to Hawaii by Gray (Ann. Mag. Nat. Hist., ser. 3, vol. 2, p. 49, 1858).
  - MA = credited to Hawaii by Martens and Langkavel (Südsee-Conchylien: Donum Bismarckianum, p. 65, Berlin, 1871).
  - GA = credited to Hawaii by Garrett (Jour. Conch., vol. 2, p. 105, 1879).
  - BA = credited to Hawaii by Baldwin (Nautilus, vol. 11, p. 123, 1898).
- Species not personally known to Baldwin are marked "o" instead of "X".
- HI = credited to Hawaii by Hidalgo (Mem. Ac. Cienc. Madrid, vol. 25, p. 182, 1906—includes review of all localities given by previous writers).
- M = Hawaiian specimens preserved in museums and private collections examined by the writer.
- F = number of specimens collected at French Frigates Shoal.
- L = number of specimens collected at Laysan Island.
- P = number of specimens collected at Pearl and Hermes Reef.
2. Pease's description of 1860 (*Erato sandwicensis*) is antedated by that of Sowerby (Thes. Conch., vol. 3, 1859).
3. Schilder (Zoolog. Anz., vol. 96, p. 71, 1931).
4. *Trivia globosa* Sowerby and *T. sphaerula* Mighels.
5. *Trivia sphaerula* Mighels.
6. *Cypraea (Trivia) insecta* Mighels.
7. Shaw (Malac. Soc. London, Proc., vol. 8, p. 310, 1909).
8. *Cypraea (Trivia) oryza* Lamarck.
9. *Cypraea (Trivia) grando* Gaskoin.
10. Mus. Vienna: 6.9 (66/—) 31:26/—:27, rostrate, dorsal sulcus shallow, sometimes crossed by the ribs (collected by Pease).
11. *Cypraea termesa* Duclos.
12. Schilder (Zoolog. Anz., vol. 100, p. 165, 1932).
13. *Cypraea reticulata* Martyn.
14. The question mark (?) indicates species the occurrence of which needs confirmation. Species that should be excluded from the Hawaiian fauna are named, but not numerated.
15. Schilder (Malac. Soc. London, Proc., vol. 19, p. 50, 1930).
16. *Cypraea intermedia* Gray.
17. *Cypraea gillei* Jousseau.
18. Writer's collection: 33 (70/50) 23:17, said to come from Hawaii, but collector unknown.
19. Young or oblong specimens of *Mauritia maculifera* may have been mistaken for *M. arabica*.

<sup>2</sup> "Hälftespielraum." See Johannsen: Elem. exakt. Erblichkeitslehre, 3d ed., p. 22, 1926.

- 19-a. C. M. Cooke told me that there is no authentic specimen of *Cypraea tigris* from Hawaii (see Schilder, Zoolog. Anz., vol. 100, p. 165, 1932).
20. One shell in Dautzenberg collection, Paris: 69 (63/54).
21. "Sandwich (Upolu)" is evidently a slip.
22. Rochebrune's specimens of *Monetaria annulus* and *M. moneta icterina* Lamarck, said to come from Hawaii (see Schilder: Malac. Soc. London, Proc., vol. 19, p. 55, 1930), do not prove the occurrence of these species in the islands. *M. moneta* has been used for adornment by the natives of Hawaii (see Finsch: Südseearbeiten, p. 112, 1914), but that fact does not prove anything.
23. The Hawaiian specimens probably belong to *Pustularia cicercula*.
24. The occurrence of the typical *Ravitrona caputserpentis* Linnaeus has been rejected by Garrett.
25. *Cypraea caputanguis* Philippi and *C. caputserpentis* Linnaeus.
26. *Cypraea caputserpentis* Linnaeus.
27. *Cypraea helvola* Linnaeus.
28. *Cypraea helvola* Linnaeus and *C. citrina* Gray; young specimens of *C. helvola* have often been mistaken for *C. citrina*, which is confined to the southwestern Indian Ocean.
29. A necklace composed of some *Erosaria eburnea*, used by the natives of Hawaii and now preserved in the British Museum (Natural History), Department of Ethnology, does not prove the occurrence of this species on the islands.
30. The second variety of *Cypraea staphylaea*, well described by Gray.
31. The young shells have been incorrectly separated from *Staphylaea semiplota* as *C. spadix* Mighels.
32. *Cypraea spadix* Mighels.
33. Treated as variety of *Cypraea limacina* Lamarck.
34. I have seen 13 specimens mostly varying as follows: L, 14-18; BL, 66-73; HL, 53; LT, 17-20; CT, 16-18. All specimens are well separable from *Staphylaea semiplota* by their expanded and mostly suffused margins.
35. The first variety of *Cypraea staphylaea*, well described by Gray.
36. *Cypraea limacina* Lamarck.
37. British Museum (Natural History): pellucid, pale orange, base pale, extremities orange; the only specimen differs from *Staphylaea polita* in its straight aperture, and in the teeth, which are shorter than those of *S. limacina*, but not confined to the edge of the aperture in the second third of the shell. Hawaii.
38. Garrett's specimens probably belong to another species of the genus.
39. It seems not to be probable that the typical *Nuclearia nucleus* really occurs in the Hawaiian islands.
40. Schilder (Archiv für Naturgesch., vol. 91, pt. A-10, p. 148, note 287, 1927).
41. *Nuclearia madagascariensis* Gmelin.
42. Gray's identification of some shells as *Erronea caurica* Linnaeus and *E. cruenta* Gmelin has evidently been wrong.
43. British Museum (Natural History): 36 (54/43) 24:22, pellucid, base callous, Hawaii.
44. See page 19.
45. Gray's description of his "*fimbriata?*" evidently fits into the species described on page 19 as *Palmadusta waikikiensis*.
46. *Palmadusta fimbriata* Gmelin.

47. The study of more specimens from the Hawaiian islands proves that there is only one cylindrical species in the archipelago. Its fossula is very narrow and steep as in *Palmadusta marmorata* Schroeter from the Indian Ocean, but the Pacific shells are smaller (most of them 11 mm. to 12 mm. instead of 12 mm. to 14 mm.) and exhibit no spots on the margins. As *P. unifasciata* Michels is described from Oahu, this name must be retained for the species from eastern Polynesia, while the species with distinctly concave fossula called *P. unifasciata* (Schilder: Zoolog. Anz., vol. 96, p. 67, 1931) becomes *P. minoridens* Melvill.

48. *Palmadusta microdon* Gray.

49. *Cribraria gaskoini* has often been confused with the pellucid variety of *esontropia* from Mauritius in the collections; there is a pellucid *esontropia* labeled "Hawaii" in the Sullioti collection, Museum of Genoa, but Sullioti's indications of habitat have often been incorrect.

50. *Cribraria esontropia* Duclos.

51. A shell from Maui (Dautzenberg collection, collected by Ancey) named *Cribraria fischeri* (11 (61/49) 17:15) is a dwarf *C. gaskoini*. The type of *C. fischeri* from Upolu (Vayssière collection) (13 (61/—) 17:15) has larger, not ringed ocelli on the dorsum and larger spots on the margins; it seems to be allied to *C. cribellum* Gaskoin. Both paratypes cited by Vayssière belong to *Erosaria labrolineata* Gaskoin (worn), as I stated when visiting Vayssière's collection.

52. Schilder (Jour. Conch., vol. 19, p. 169, 1931).

#### FAMILY ERATOIDAE

The five species of the subfamily Triviinae known from the Hawaiian islands can be distinguished as follows:

- |  |                                   |
|--|-----------------------------------|
| 1. Globular, round like a pea, extremities blunt.....  | 1. <b>Cleotrivia pilula</b>       |
| Subrostrate to subcylindrical.....   | 2                                 |
| 2. Dorsal sulcus distinctly impressed, ribs very fine; elongate, extremities less pronounced, posterior outlet never ear-shaped.....   | 3                                 |
| Dorsal sulcus entirely absent; or, if slightly impressed, the dorsal ribs are very coarse; subglobular, extremities subrostrate, posterior outlet encircled by the ear-shaped connection between both lips.....  | 4                                 |
| 3. Dorsal sulcus very narrow, but long and usually entirely interrupting the ribs, DR very numerous; aperture less central, as the outer lip is rather narrow; inner lip rather truncate posteriorly; subcylindrical to elongate, extremities less produced..... | 2. <b>Trivirostra hordacea</b>    |
| Dorsal sulcus rather broad, relatively short, mostly crossed by the ribs, DR less numerous; aperture rather central, inner lip acuminate posteriorly; elongate, subrostrate.....   | 3. <b>Trivirostra edgari</b>      |
| 4. Dorsal sulcus absent, ribs fine; white.....   | 4. <b>Trivirostra pellucidula</b> |
| Dorsal sulcus often impressed, ribs coarse; spotted with pink, spots mostly visible even in worn shells.....   | 5. <b>Trivirostra exigua</b>      |

#### 1. **Cleotrivia pilula** Kiener.

White, globular, extremities blunt, fossula hardly broader than the expanded columellar sulcus.

FF, 4 ×, much worn, dorsal sculpture not recognizable.

If compared with shells from the southern Pacific, the Hawaiian specimens are smaller and exhibit less numerous teeth on both lips:

	L			Mi Ma		BL		HL		LT		CT		MR		DR							
FF	2.8	3.0	3.3	2.8	3.7	84	87	90	78	81	84	17	18	18	17	18	18	47	51	55	29	31	33
Pacific	2.9	3.4	3.8	2.7	4.6	87	89	91	77	79	80	20	21	22	18	19	20	47	51	55	29	31	33

### 2. *Trivirostra hordacea* Kiener.

White, characterized by the fine, very numerous ribs which are entirely interrupted by the long narrow dorsal sulcus in at least 70 per cent of the specimens, while in other shells the ribs cross the narrow sulcus, which very rarely (4 ×) becomes obsolete. Most specimens are very slender, but there are also stunted ones which are cylindrical though rather inflate. The general shape varies from cylindrical with blunt extremities and the hind top of the inner lip abruptly cut out so that the posterior outlet becomes better marked ( $\alpha$ , typical *T. hordacea*), to subglobular with substrate extremities and the inner lip acuminate produced posteriorly in a way (variety  $\beta$ ) which approaches *T. edgari*. Variety  $\beta$  is relatively gibbous, but there is no distinct difference in size or ribs.

PH, 49 × (all more or less cylindrical, only the typical form  $\alpha$  collected); FF, 115 × (50 × are cylindrical, 65 × are subglobular or substrate, most specimens rather worn).

These shells are usually slightly smaller than the specimens from the Hawaiian islands preserved in various collections; specimens from the southern Pacific are still larger, and relatively less elongate, but there is no difference in the relative number of teeth and ribs:

	L			Mi Ma		BL		HL		LT		CT		MR		DR							
PH	4.2	4.3	4.5	3.6	5.8	62	63	65	52	53	54	22	23	24	21	21	22	57	62	66	25	26	27
FF	3.9	4.1	4.4	3.3	5.9	63	64	66	50	52	54	22	23	23	20	21	21	58	59	61	24	25	26
Hawaii	4.1	4.6	5.1	3.6	5.8	62	64	66	52	53	54	22	24	26	20	21	22	56	59	62	26	28	30
Pacific	4.6	5.4	6.0	3.7	6.6	66	68	70	52	56	58	24	25	26	21	23	24	63	66	69	28	29	31

Although intermediate shells are more common than the extremes,  $\alpha$  and variety  $\beta$ , their dimensions and number of ribs may be indicated separately:

	L			Mi Ma		BL		HL		LT		CT		MR		DR							
$\alpha$ FF	3.9	4.1	4.5	3.4	5.2	63	64	65	50	51	52	22	22	23	20	21	21	58	59	61	24	26	26
$\beta$ FF	4.0	4.1	4.3	3.3	5.9	64	65	66	55	56	57	22	23	24	19	20	21	58	59	61	22	24	26

### 3. *Trivirostra edgari* Shaw.

FF, 18 ×. Much-worn specimens are hardly separable from *T.*



*hordacea* variety  $\beta$ ; in *T. edgari* there are relatively more numerous labial teeth, but less numerous ribs; the chief difference consists in the dorsal sulcus.

The Hawaiian specimens are smaller and more elongate than the shells from the southern Pacific, and their labial teeth and marginal ribs seem to be relatively more numerous.

	L	Mi Ma	BL	HL	LT	CT	MR	DR
FF	4.0 4.2 4.6	3.8 5.2	64 65 67	53 55 57	24 24 25	20 21 23	55 58 60	20 22 24
Pacific	4.6 5.0 5.8	4.0 7.6	67 70 73	57 60 62	24 26 27	21 22 23	56 58 63	24 27 29

#### 4. *Trivirostra pellucidula* Gaskoin.

PH,  $5 \times$ ; FF,  $24 \times$ . The shells from PH are distinctly larger, with the extremities more produced, the teeth less numerous though the dorsum is more finely sculptured. Specimens from the southern Pacific are still much larger, stunted, and more coarsely ribbed:

	L	Mi Ma	BL	HL	LT	CT	MR	DR
FF	4.1 4.3 4.5	3.3 5.5	65 67 70	57 58 59	23 25 25	20 21 22	49 52 54	20 21 22
PH	4.5 4.7 4.9	3.9 5.3	65 66 67	55 56 56	23 24 25	19 20 22	53 57 61	24 25 26
Pacific	5.3 5.6 5.8	4.5 7.5	68 69 71	58 59 61	25 27 28	20 21 23	56 58 60	22 25 27

#### 5. *Trivirostra exigua* Gray.

PH,  $11 \times$ ; FF,  $15 \times$ . The shells from FF are more humped, but the slight differences in the number of teeth and ribs are probably only accidental. *T. exigua* from the southern Pacific is much larger, though a population ( $49 \times$ ) from Lifu, which I received from the Dautzenberg collection, Paris, approaches the mean of the Hawaiian shells. The pink markings and the number of teeth are identical.

	L	Mi Ma	BL	HL	LT	CT	MR	DR
PH	3.9 4.0 4.1	3.2 4.5	68 70 71	59 61 62	18 20 21	16 17 18	44 47 48	16 16 18
FF	3.8 4.0 4.1	3.3 4.4	69 70 72	62 63 64	20 21 22	17 17 18	42 43 45	16 16 16
Lifu	3.9 4.1 4.3	3.2 4.7	.....	.....	21 21 22	17 17 18	.....	.....
Pacific	4.2 4.6 5.0	3.6 5.4	70 71 72	60 61 63	21 22 24	17 19 20	46 48 50	16 17 18

### FAMILY CYPRAEIDAE

#### *Mauritia maculifera* Schilder.

Margins swollen, but rather angular, base flattened, teeth rather short, produced to one-fifth or one-sixth of the basal diameter only, anterior terminal ridge of the inner lip oblique; dorsum reticulate, lateral spots large, the dark blotch in the center of the inner lip always distinct. Rarely the lateral spots

are smaller, or confluent (a rather young shell) or both lips suffused with bluish.

FK, 9 ×. The Hawaiian specimens are extremely large, but otherwise typical; the following table contains the data from shells from the southern Pacific as well as the data of *Mauritia depressa* Gray, an allied species from the southern Pacific, similar in shape, but always smaller, with small lateral spots and no basal blotch:

	L	Mi Ma	BL	HL	LT	CT
FK, maculifera	69 70 71	62 72	65 67 68	52 53 53	29 30 31	25 27 28 <sup>3</sup>
Pacific, maculifera	49 58 66	38 78	66 68 71	50 51 52	28 30 32	23 24 26
Pacific, depressa	31 35 40	24 45	68 70 73	50 51 52	23 24 26	17 18 20

#### *Mauritia scurra* Gmelin.

PH, 32(49/41)40:29 and 40(53/45)40:28; PE, 43(51/43)39:33; LA, 52(55/46)42:30. The smallest specimen evidently belongs to the dwarf race *M. indica* Gmelin<sup>4</sup>; the other shells from PH and PE recall the intermediate variety common in the Malay Archipelago, while the shell from LA which is the largest *scurra* known at all, is evidently a typical *scurra*. The first-named specimen became subpellucid by being washed and bleached on the shore, while the three other shells are rather calcified. The following data may facilitate comparison of Pietschmann's shells with populations from the southern Pacific and from the Malay Archipelago:

	L	Mi Ma	BL	HL	LT	CT
Pacific, indica	28 30 32	25 35	48 48 49	37 38 39	37 39 40	27 28 30
Malay, indica	38 39 41	34 45	50 52 53	40 41 42	42 44 45	31 32 34
Pacific, scurra	45 45 45	42 51	53 54 56	42 43 45	44 45 46	30 31 33

#### *Talparia talpa* Linnaeus.

PH, 1 ×; LA, 4 ×. If compared with *talpa* from the southern Pacific and the Indian Ocean, and from the Malay Archipelago, the five Hawaiian shells are extremely large, broad, inflate, the teeth are rather coarse:

	L	Mi Ma	BL	HL	LT	CT
PH, LA	68 71 74	62 75	54 55 56	45 46 47	44 46 48	36 37 39 <sup>5</sup>
Pacific, Indian oceans	57 62 68	40 100	51 52 54	42 43 44	43 46 50	36 38 39
Malay Archipelago	51 54 58	43 66	53 53 54	43 44 45	41 43 45	32 34 36

<sup>3</sup> A long, but less accentuated rib between the terminal ridge and the first coarse columellar tooth in three specimens has not been included.

<sup>4</sup> Schilder, F. A., Beiträge zur Kenntnis der Cypraeaacea: Zoolog. Anz., vol. 92, p. 75, 1930.

<sup>5</sup> Four to five and five to six denticles, which serrate the left wall of the posterior outlet in the Hawaiian specimens and in the shells from other countries respectively, have not been included.

The shell from PH is rather dark, base almost black, while the bleached shells from LA exhibit the dorsum almost white and the base reddish brown; but otherwise the specimens from both localities are identical.

### *Lyncina carneola* Linnaeus.

Cylindrical, right margin thickened, slightly margined, but not expanded, aperture rather wide, outer lip subrostrate posteriorly; dorsum bleached, aperture purple.

FK, 77(59/49)33<sup>6</sup>:26. Such giants of *carneola* especially seem to occur in the eastern Pacific: a shell from Hawaii [Dautzenberg collection: 69(63/54)] and a shell from Tahiti [Museum Copenhagen: 89(57/49)46:33] are as large as a small collection of *carneola* from the Tuamotus (Vayssière collection), while the mean size of populations from Tjilatjap, Ternate, Kaju Ragi (Pleistocene of northern Celebes, studied by Schepman) and from other localities of the Malay Archipelago (all preserved in the Museum of Leiden) is much smaller, as it is also in the greyish race *crassa* Gmelin from Zanzibar and from the Red Sea:

	L			Mi Ma		BL			HL			LT			CT		
Tjilatjap, <i>carneola</i>	25	28	35	19	51	59	62	64	50	51	53	25	26	28	19	21	23 <sup>7</sup>
Ternate, <i>carneola</i>	28	31	33	25	41	58	59	60	48	49	50	25	26	27	19	20	21
Kaju Ragi, <i>carneola</i>	32	36	40	27	46	55	56	58	45	46	47	26	27	28	21	22	23
Malay, <i>carneola</i>	25	28	31	17	55	58	59	61	48	49	50	24	25	26	19	20	22
Zanzibar, <i>crassa</i>	24	25	27	20	32	62	63	65	49	50	51	23	24	25	18	19	20
Red Sea, <i>crassa</i>	22	25	29	18	41	61	65	66	49	52	54	21	23	24	18	19	20

### *Lyncina arenosa* Gray.

Dorsum four-banded with reddish fulvous, margins reddish brown, striate, teeth and the two interior thirds of the base white, interstices of the fine columnar teeth brownish.

FK, 35(64/52)30<sup>8</sup>:23. Rather worn, but all chief characters are well recognizable. The shell is rather oblong, but it agrees otherwise with typical *arenosa* usually living in the Tuamotus:

	L			Mi Ma		BL			HL			LT			CT		
Tuamotus	29	32	36	23	40	64	67	70	52	53	54	26	28	29	22	23	24

<sup>6</sup> A small denticle on the base of the anterior outlet has been excluded.

<sup>7</sup> One or two small denticles on the base of the anterior outlet, and one or two slight crenulations on the left wall of the posterior outlet have not been included; in 5 to 10 per cent of all *carneola* there is a small denticle intercalate behind the terminal ridge.

<sup>8</sup> Two denticles on the base of the anterior outlet have not been included.

**Lyncina sulcidentata** Gray (fig. 1).

Shell callous, teeth always thickened as in typical *sulcidentata*; on the base of the anterior outlet there are usually two small denticles well separable from the coarse labial teeth (they have been excluded in the table); the first columellar tooth which approaches the blunt terminal ridge is often rather smaller than the second tooth. Dorsum, if not worn, brownish grey with four distinct reddish brown bands (PH), rarely bluish grey with greyish brown bands (PE; 1 X), but never bright orange or fulvous as it is in the subpellucid variety *xanthochrysa* Melvill from Hawaii; margins greyish fulvous, finely punctate, base and teeth fulvous. Most specimens are worn and calcified: pale fulvous to brown, bands obsolete; when bleached practically colorless (FF).

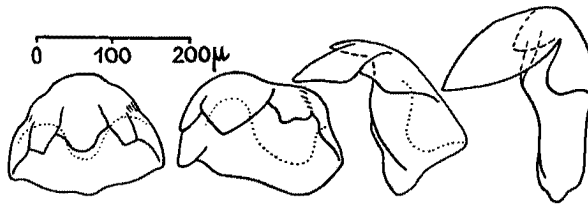


FIGURE 1. Half of row, radula of *Lyncina sulcidentata*.

Oliviform shells: fulvous, with four close brownish bands (23 mm.: PH). Young shells: bands reddish brown, protoconch and teeth white; spire slightly projecting, composing about 22 per cent of the diameter of the body whorl in each direction. Very callous adult shells exhibit the margins expanded and rather edged as it is in *Mauritia mauritiana* (25(74/61)24:17, PE). One shell from PH still contained remains of the animal: the radula (fig. 2: about 230 rows) is very similar to the other species of *Lyncina* so that Vayssi re's identification of a specimen without shell, the anatomy of which has been described by him,<sup>9</sup> cannot be correct.

PH, 24 X; PG, 8 X; PE, 4 X; FF, 2 X; FK, 3 X; LA, 23 X.

There are striking differences in size between the populations collected by Dr. Pietschmann: the shells from LA are approximately as large as the specimens from Hawaii preserved in various collections, while the shells from PH, PG, and PE are extremely small and humped. The shell 59(68/55)28:24 from LA is the largest *sulcidentata* known at all.

	L		Mi Ma		BL		HL		LT		CT	
PH, PG, PE	33	37 40	25	48	69	71 73	58	59 61	24	25 25	20	21 22
FF, FK	41	42 43	35	43	68	69 71	56	57 58	22	24 26	20	22 22
LA	42	46 50	36	59	69	72 75	56	57 60	26	26 28	22	23 24
Hawaii	42	45 50	30	55	68	70 72	55	56 57	25	27 28	22	23 25

<sup>9</sup> Vayssi re, A., Recherches zoologiques et anatomiques sur les mollusques de la famille des Cypraeid s: Ann. Mus. Hist. Nat. Marseille, Zool., vol. 18, p. 75, pl. 11, figs. 157-161, 1923.

**Basilitrone isabella** Linnaeus (fig. 2).

PH, 35 ×; PS, 5 ×; PG, 15 ×; PE, 16 ×; LA, 3 ×; FK, 1 ×.  
The length in millimeters of these shells varies as follows:

L	15	20	25	30	35	40	45
×	19	28	17	4	2	3	2

There are evidently two varieties, the common smaller form being the typical *isabella*, while the heavy, callous shells exceeding 32 mm. belong to the variety *controversa* Gray<sup>10</sup>. All shells collected in LA and FK are *controversa*; 1 × from PH and 2 × from PG also belong to *controversa* and are rather calcified, whereas the typical *isabella* from PH and PG are more or less bleached on the shore, but never calcified: therefore *controversa* evidently lives in different conditions.

The variety *controversa* is much larger, broader, higher, and more callous than the typical *isabella* from Pietschmann's collections, but the number of its teeth is increased only proportionately to the length of the shell,<sup>11</sup> and the percentage of specimens which show blackish spots in the red blotches of the extremities is very similar in both. *B. isabella* from Kaju Ragi (Pleistocene), Ternate, Tjilatjap, and from other localities of the Malay Archipelago, are intermediate in size, recall *controversa* in relative breadth and height, and exhibit finer, more numerous teeth and almost no dark spots on the extremities (see also fig. 2):

	L			Mi Ma		BL			HL			LT			CT			E
PH, <i>isabella</i>	17	20	23	12	31	48	50	51	38	39	41	27	29	31	20	23	25 <sup>12</sup>	91
PG, <i>isabella</i>	19	21	25	15	28	47	48	48	37	38	38	28	30	32	21	23	25	85
PE, <i>isabella</i>	17	20	22	15	27	48	49	51	38	40	42	26	28	30	21	23	25	82
PS, <i>isabella</i>	17	19	21	15	22	46	47	48	36	37	39	29	31	33	23	25	27	80
PH, PG, PE, PS, <i>isabella</i>	17	20	23	12	31	47	48	49	37	39	40	28	30	32	21	23	25	87
<i>Controversa</i>	37	40	44	33	46	54	55	56	45	46	47	38	39	40	33	34	36	71
Kaju Ragi, <i>isabella</i>	25	28	30	20	34	51	52	53	42	42	43	36	39	40	28	30	31	00
Ternate, <i>isabella</i>	27	28	30	22	34	53	54	55	44	45	46	35	38	39	28	29	32	39
Tjilatjap, <i>isabella</i>	27	29	32	19	36	55	56	58	46	47	48	36	38	41	28	30	32	12
Malay, <i>isabella</i>	22	24	27	16	38	53	54	56	44	45	46	33	35	37	25	27	30	19

Column E = percentage of specimens which show blackish spots in the red blotches of the extremities.

<sup>10</sup> Schilder, F. A., Remarks on type specimens of some recent Cypraeidae: Malac. Soc. London, Proc., vol. 19, p. 56, 1930.

<sup>11</sup> Schilder, F. A., Die Korrelation zwischen Grösse und Zahnzahl bei den Cypraea: Arch. Zool. Italiano, vol. 16, p. 219, 1931.

<sup>12</sup> The inner margin of the fossula is adorned with distinct denticles; there are generally 6 to 8 teeth in Malayan shells, 6 or 7 in *isabella* from Hawaii, and 7 to 9 in *controversa*.

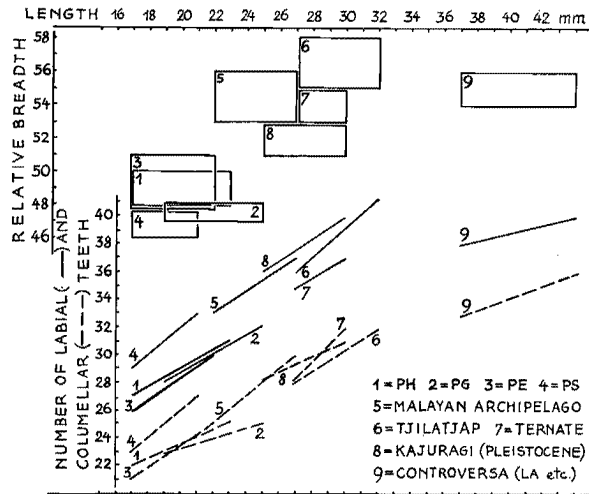


FIGURE 2. Variability of *Basilitrona isabella* Linnaeus: PH, Pearl and Hermes Reef; PG, Pearl and Hermes Reef, Grass Island; PE, Pearl and Hermes Reef, Southeast Island; PS, Pearl and Hermes Reef, Sand Island.

### *Pustularia tessellata* Swainson.

PH, 35 ×; PG, 6 ×; PE, 5 ×; LA, 1 ×; FK, 1 ×. The specimens from PH, PG and PE are very similar in size, proportions, and denticulation, the only shell from FK does not exceed the extreme limits of these populations, while the shell from LA differs in its enormous size: it is the largest specimen of *tessellata* known at all. The *tessellata* preserved in various collections labeled as coming from Hawaii or Honolulu, are as broad as the shells from PH, but slightly larger:

	L	Mi Ma	BL	HL	LT	CT
PH	23 24 27	20 32	69 71 73	54 55 56	25 26 27	20 21 22 <sup>13</sup>
PG	25 28 30	23 35	69 69 70	53 55 57	26 28 30	21 22 23
PE	25 28 31	24 34	64 68 72	53 55 57	26 27 28	21 22 23
FK	.... 24 ....	.... ....	.... 64 ....	.... 55 ....	.... 28 ....	.... 21 ....
LA	.... 42 ....	.... ....	.... 71 ....	.... 57 ....	.... 37 ....	.... 32 ....
Hawaii	27 31 34	19 36	70 72 75	55 56 57	26 29 31	23 25 27

<sup>13</sup> The fossula exhibits 3 to 5, mostly 4 teeth interiorly, which are not placed on the margin itself but at a short distance towards the concavity, as it is in *Pustularia cicercula* too. These teeth are well developed also in rather young shells.

In fresh shells the dorsal bands are brown, the lateral spots dark brown to almost black, in close relation to the pale basal zones. The anterior extremity is adorned by a small tubercle dorsally, which is better marked in slightly worn specimens because it becomes whitish. The diameter of the spire is about 26 per cent of the body whorl in each direction. Young shells exhibit three brown bands, but no lateral spots, the nucleus of the spire is brown, the following whorls are pale, the suture of the body whorl is accompanied by a darker brown zone (PE). The only specimen from FK is subpellucid, unspotted white, shining though evidently bleached, teeth white. The giant shell from LA has rather short extremities and the aperture rather curved posteriorly. In the shells from PH there is some variability in the thickening of the margins and in the rostration of the extremities, well indicated by the indices BL and HL, respectively, in one shell (25(77/58)24:17) the thickened margins are suffused with greyish callus which makes the lateral blotches almost invisible.

**Ravitriona caputanguis** Philippi.

PH, 1 ×; FK, 7 ×; LA, 2 ×. If compared with *caputserpentis* Linnaeus *caputanguis* is more humped (though the margins often are expanded in a similar way), it exhibits slightly more numerous teeth, the interstices of which are distinctly tinged with reddish brown; the inner margin of the fossula usually exhibits three small denticles instead of two denticles in *caputserpentis*. The specimens from PH, FK, and LA seem to be identical; they also agree with *caputanguis* from Hawaii, Japan, and eastern Australia in all characters, though they are smaller and relatively broader. The dorsal spots are of different size, larger ocelli being surrounded by smaller spots, margins angular, greyish brown to very dark, base rather convex, the central third whitish, the interstices of the teeth mostly distinctly chestnut. The following table also indicates the data of *caputserpentis* from Ternate, Tjilatjap, other Malayan localities, and the data of all *caputserpentis* without locality known to the writer.

	L	Mi Ma	BL	HL	LT	CT
PH, FK, LA, <i>caputanguis</i>	25 28 31	23 35	74 76 80	49 50 51	16 18 19	14 14 15
Hawaii, Japan, <i>caputanguis</i>	30 32 34	26 37	69 72 75	49 51 53	18 19 19	13 14 15
Australia, <i>caputanguis</i>	30 31 34	23 43	69 70 71	49 50 51	16 17 18	13 14 15
Ternate, <i>caputserpentis</i>	25 26 27	22 32	74 76 77	48 49 50	16 16 17	12 13 13
Tjilatjap, <i>caputserpentis</i>	30 31 32	27 35	73 75 76	47 48 49	17 18 19	13 13 14
Malay, <i>caputserpentis</i>	29 30 32	25 35	73 74 76	48 48 49	17 17 18	13 13 14
No locality, <i>caputserpentis</i>	26 29 33	15 43	72 75 78	47 48 50	16 17 18	13 14 15

**Erosaria helvola** (Linnaeus) **hawaiiensis** Melvill.

All specimens of *helvola* I have ever seen credited to the Hawaiian islands exhibit the margins suffused with pinkish flesh color varying to pinkish fulvous and pale straw color or even white, while in all shells of *helvola* from the Indian and Pacific Oceans (the Hawaiian islands excluded) the margins are reddish brown varying to fulvous and chestnut. In all Hawaiian specimens the reddish brown color is confined to the aperture, if it is not entirely wanting; the extremities are more bluish lilac or whitish than pinkish lilac. Therefore the Hawaiian shells evidently must be separated as local subspecies, at least, called *hawaiiensis* by Melvill (1888) and—a pale variety?—*ostergaardii* by Dall (1921).

PH, 47 ×; PG, 6 ×; PE, 6 × FK, 1 ×; LA, 1 ×. Among the shells from PH are four specimens which are not fresh or simply worn, but also bleached, as are the specimens from FK and LA, too; they evidently came from other environments. Their size is relatively enormous: 23, 24, 26, and 28 mm. The other shells from PH and those of PG are slightly smaller than the shells from PE, FK and LA; the specimens from PE are relatively slender and exhibit less numerous teeth; the few specimens from PG are rather humped. If compared with *hawaiiensis* from Honolulu and Hawaii (preserved in various collections), Dr. Pietschmann's shells are slightly larger, relatively broader and higher; the table contains also populations of typical *helvola* from the southern Pacific, from the Malayan Archipelago, from the Indian Ocean (mostly without exact locality) and from Durban (Natal) for comparison:

	L	Mi Ma	BL	HL	LT	CT
PH, <i>hawaiiensis</i>	18 21 23	15 28	68 72 75	51 51 52	16 17 18	13 14 15
PG, <i>hawaiiensis</i>	19 21 22	18 23	69 73 77	51 55 59	17 18 19	14 15 16
PE, <i>hawaiiensis</i>	20 23 26	18 27	66 69 72	50 51 52	16 18 18	13 15 16
FK, <i>hawaiiensis</i>	23	.....	65	52	20	14
LA, <i>hawaiiensis</i>	23	.....	72	53	16	14
Hawaii, <i>hawaiiensis</i>	17 19 20	15 30	64 67 70	48 50 51	16 17 18	13 14 15
Pacific, <i>helvola</i>	15 17 18	14 19	65 67 72	49 50 52	15 16 17	13 13 14
Malay, <i>helvola</i>	17 18 20	14 24	67 70 73	50 51 52	16 16 18	13 13 14
Indian Ocean, <i>helvola</i>	18 20 23	12 34	62 64 68	49 50 51	16 18 19	14 15 16
Natal, <i>helvola</i>	21 23 24	18 28	65 67 70	49 51 53	17 18 19	14 14 15

In 30 specimens the dorsal color is well recognizable: it varies from fulvous (10 per cent) to chestnut (37 per cent), greyish brown (23 per cent) and greenish grey (30 per cent). In 40 per cent the brown dorsal spots are scattered, in 47 per cent they cover about the



same area as the white ocelli, and in 13 per cent the brown spots predominate or are even confluent. This percentage 40:47:13 is altered in *hawaiiensis* from Hawaii into 17:83:0, in *helvola* from the Pacific into 57:43:0, in *helvola* from the Malayan Archipelago into 33:50:17, in *helvola* from the Indic into 28:51:21, and from Natal into 0:10:90.

There are 3 to 5 denticles on the inner margin of the fossula, as there are in the populations from Hawaii and from the Malayan Archipelago, too. Young shells are blue grey, with one or three brown bands of various intensity, suture whitish, the slightly projecting protoconch lilac to purple; the diameter of the spire is about 24 per cent of the body whorl in each direction. The radula of *hawaiiensis* from PH does not exhibit any difference from typical *helvola*.

#### **Staphylaea semiplota** Mighels.

Dorsum smooth, in fresh specimens blackish brown, with numerous white spots, extremities orange, lateral pittings chestnut, base white, teeth lined with orange, columellar teeth very short in the central third, but elongate anteriorly and posteriorly; when worn, the dorsum is reddish brown, pittings orange. Young shells are greyish brown, top of the spire chocolate, spots confined to the margins.

PH, 41 ×; PS, 1 ×; PG, 14 ×; PE, 3 ×; LA, 1 ×. One shell from PH is subpellucid, but not subrostrate as is *polita* Roberts; the specimen from LA recalls the latter species in shape, but is not transparent. If compared with *semiplota* from Hawaii and eastern Polynesia, the shells from the western islands visited by Dr. Pietschmann are much larger, but the general shape, and the number of teeth correspond to the increased length; the populations from PH, PS, and PE are practically identical; the shells from PG are slightly larger and possibly broader; the unique shell from LA is a giant, as it is in other species from LA, too.

	L	Mi Ma	BL	HL	LT	CT
Hawaii, Polynesia	9 9.5 10	8 15	58 58 61	47 48 49	17 17 18	13 14 15 <sup>14</sup>
PH, PS, PE	13 14 15	9 23	57 58 60	45 47 48	18 19 19	15 16 17
PG	14 15 16	12 20	57 59 61	46 47 48	19 20 21	16 17 18
LA	... 19 ...	... ..	... 56 ...	... 45 ...	... 21 ...	... 19 ...

#### **Nuclearia honoluluensis** Melvill.

PH, 5 ×; PG, 1 ×; PE, 1 ×. Rather worn, so that the shells are uniformly pale grey or pinkish, in one specimen the reddish lines,

<sup>14</sup> In the space behind the anterior columellar ridge, in 63 per cent of specimens there is a less accentuated smaller rib (not included in the number of columellar teeth), rarely there are 2-3 ribs or no rib. The fossula usually exhibits 5-6 denticles interiorly.

which surround the dorsal tubercles and the basal ribs, are visible. If compared with the well-known *honoluluensis* from the larger eastern Hawaiian islands, the shells from PH, PG, and PE are smaller, more depressed [one shell from PH is extremely depressed: 26(70/42)21:13 + 6], but similar in dentition, even in the number of finer intercalate ribs (IR), which start from the outer margin of the inner lip and reach the aperture, where they are well separable from the coarse primary ribs. The table also contains the data of *N. nucleus* Linnaeus from various localities of the Indian and Pacific Ocean for comparison. *N. nucleus* can easily be distinguished by the acuminate extremities, the more numerous labial teeth and the wanting of the intercalate columellar ribs, which almost never reach the aperture, whenever they are present.

	L	Mi Ma	BL	HL	LT	CT <sup>15</sup>	IR
Hawaii honoluluensis	25 30 34	21 38	62 67 70	44 45 46	23 24 25	13 14 16	6 6 7
PH, PG, PE, honoluluensis	23 26 29	18 31	65 67 69	42 43 45	20 21 23	12 13 14	6 6 7
Nucleus	18 19 22	11 28	60 62 63	48 50 52	24 25 26	15 16 17	.. - -

In only 8 per cent of all shells investigated by the writer there are one or two IR.

#### *Talostolida rashleighana* Melvill.

Adult specimen much worn, depressed, margins angularly expanded, left margin bent upward, extremities also margined and expanded, dorsally callous; fossula and columellar sulcus equally broad in their entire length; dorsum pinkish lilac, with brown interrupted bands, the two central ones almost confluent, margins with 38 and 28 rather large dark spots which extend as far as two-thirds of the dorsal surface. The young shell is colored in the same way, but there are only 14 smaller spots on the right margin which is not yet margined; it seems to be similar to *T. teres* Gmelin, but is more humped.

PH, 27(61/48)23:23 (young). FK, 33(63/44)23:20 (adult). The following table contains the data of *rashleighana* from Hawaii from several collections and of *teres* from localities of the Pacific and Indian Oceans:

	L	Mi Ma	BL	HL	LT	CT
Rashleighana	22 24 29	15 32	62 64 66	47 49 50	19 20 22	17 19 21
Teres	22 26 29	16 37	53 54 55	42 43 44	22 23 26	21 23 25

<sup>15</sup> A smaller rib intercalate in the space behind the slit terminal ridge and 1-3 oblique ribs on the hind top of the inner lip are not included.

**Palmadusta unifasciata** Mighels.

Subcylindrical, aperture straight, outer lip sinuous anteriorly, but not projecting posteriorly, inner lip slightly swollen on its posterior top, anterior columellar teeth much coarser than the posterior ones, fossula narrow, steep, not concave, the columellar teeth extending to its inner margin hardly compressed, columella smooth posteriorly; formerly greyish blue, now worn, pinkish lilac, with an interrupted brown central band, margins white, unspotted, extremities with four pink spots.

PH, 1 ×; PG, 4 ×; PE, 1 ×. The specimens from PH, PG, and PE are smaller and more inflate than *unifasciata* from the southern Pacific, but the relative number of teeth is identical; the still smaller *P. minoridens* Melvill from Lifu has relatively more numerous teeth and a broader fossula with the inner margin distinctly produced.

	L			Mi Ma		BL			HL			LT			CT		
Pacific, <i>unifasciata</i>	11	12	12	9	14	52	53	54	42	43	44	17	17	18	16	17	19
PH, PG, PE, <i>unifasciata</i>	9	10	11	8.5	12	55	57	58	43	44	45	15	16	17	13	15	17
Lifu, <i>minoridens</i>	8.5	8.5	9	7.5	10	53	54	54	42	43	43	18	18	19	17	19	20

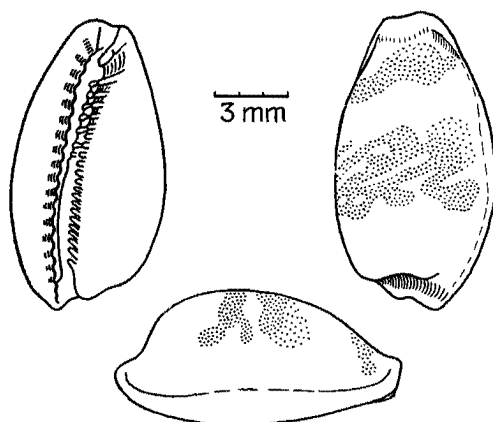


FIGURE 3. *Palmadusta waikikiensis*, new species.

**Palmadusta waikikiensis**, new species (fig. 3).

Subpyriform, outer lip distinctly margined, base convex, aperture slightly curved, anteriorly dilatate, outer lip projecting posteriorly, labial teeth rather coarse, columellar teeth very fine anteriorly and extremely fine posteriorly, fossula narrow, very shallow, but distinctly projecting interiorly; subpellucid, whitish, with a rather broad and interrupted fulvous central band and a second narrower band anteriorly, margins and base white, extremities unspotted.

Type from Honolulu (writer's collection, no. 2754) : 12(55/45)-18:21 (fig. 3). Paratype from Waikiki (Museum Leiden, collected by Heurn) : 15(53/42)19:23, rather calcified.

Differs from all allied species by the columellar teeth, which are more numerous than the labial ones. *Palmadusta waikikiensis* is more pyriform than *P. unifasciata*, it has finer teeth than *P. fimbriata*, and a less concave fossula than *P. minoridens*; its right margin recalls *P. microdon*, but *P. waikikiensis* has coarser labial teeth and a much narrower fossula.

## DISTRIBUTION

Table 2 shows the number of specimens collected in the several islands.

Table 2. Numerical Record, Pietschmann Collection

		PH					PE	PS
		FF	FK	LA	Entire	PHN		
1.	<i>Cleotrivia pilula</i> .....	4	....	....	....	....	....	....
2.	<i>Trivirostra hordacea</i> ( $\alpha$ = typical) .....	50	....	49	49	....	....	....
2a.	<i>Trivirostra hordacea</i> variety $\beta$ .....	65	....	....	....	....	....	....
3.	<i>Trivirostra edgari</i> .....	18	....	....	....	....	....	....
4.	<i>Trivirostra pellucidula</i> .....	24	....	5	5	....	....	....
5.	<i>Trivirostra exigua</i> .....	15	....	11	11	....	....	....
6.	<i>Mauritia maculifera</i> .....	9	....	....	....	....	....	....
7.	<i>Mauritia scurra</i> (typical).....	....	1	....	....	....	....	....
7a.	<i>Mauritia scurra indica</i> .....	....	....	3	2	....	1	....
8.	<i>Talparia talpa</i> .....	....	4	1	1	....	....	....
9.	<i>Lyncina carneola</i> .....	1	....	....	....	....	....	....
10.	<i>Lyncina arenosa</i> .....	1	....	....	....	....	....	....
11.	<i>Lyncina sulcidentata</i> .....	5	23	36	24	8	4	....
12.	<i>Basilitronea isabella</i> (typical).....	....	....	68	34	13	16	5
12a.	<i>Basilitronea isabella</i> controversa..	1	3	3	1	2	....	....
13.	<i>Pustularia tessellata</i> .....	1	1	46	35	6	5	....
14.	<i>Ravitrona caputanguis</i> .....	7	2	1	1	....	....	....
15.	<i>Erosaria helvola hawaiiensis</i> .....	1	1	59	47	6	6	....
16.	<i>Staphylaea semiplota</i> .....	....	1	59	41	14	3	1
17.	<i>Nuclearia honoluluensis</i> .....	....	....	7	5	1	1	....
18.	<i>Talostolida rashleighana</i> .....	1	....	1	1	....	....	....
19.	<i>Palmadusta unifasciata</i> .....	....	....	6	1	4	1	....
	19 species and 3 varieties.....	203	36	355	258	54	37	6

FF, French Frigates Shoal; FK, French Frigates Shoal, King Island; LA, Laysan Island; PH, Pearl and Hermes Reef; PHN, Pearl and Hermes Reef, no particular island; PG, Pearl and Hermes Reef, Grass Island; PE, Pearl and Hermes Reef, Southeast Island; PS, Pearl and Hermes Reef, Sand Island.

The distribution of the Eratoidae (Triviinae) does not indicate any peculiarity. With regard to the Cypraeidae, however, it is evident that the relatively large or callous species (6, 7, 8, 9, 10, 12a, 14) have been collected chiefly in French Frigates Shoal and in Laysan Island, whereas the smaller, less callous, or finely sculptured species (7a, 12, 13, 15, 16, 17, 18, 19) occur chiefly in Pearl and Hermes Reef. This striking difference in the population indicates ecological differences of these islands. *Lyncina sulcidentata* seems to live equally well in both environments. On the other hand, there is no difference between the several islands of Pearl and Hermes Reef; the relative number of specimens of each species corresponds rather to the total number of shells collected in PH, PG, PE, and PS.

The average length of the shells is given in Table 3.

Table 3. Average Length of Shells, Pietschmann Collection.

Expressed in per cent of the usual length of specimens from other regions (marked by an asterisk).

	Pacific	Hawaii	FF FK	LA	PH Entire
1. <i>Cleotrivia pilula</i> .....	*	....	88	....	....
2. <i>Trivirostra hordacea</i> .....	*	86	76	....	80
3. <i>Trivirostra edgari</i> .....	*	....	84	....	....
4. <i>Trivirostra pellucidula</i> .....	*	....	77	....	84
5. <i>Trivirostra exigua</i> .....	*	....	87	....	87
6. <i>Mauritia maculifera</i> .....	*	....	121	....	....
7. <i>Mauritia scurra and indica</i> .....	*	....	....	116	106
8. <i>Talparia talpa</i> .....	*	....	....	115	....
9. <i>Lyncina carneola</i> .....	*	(223)	(248)	....	....
10. <i>Lyncina arenosa</i> .....	*	....	(121)	....	....
11. <i>Lyncina sulcidentata</i> .....	....	*	94	102	82
12. <i>Basilitronea isabella</i> .....	*	....	....	....	74
12a. <i>Basilitronea isabella controversa</i> ...*	Type	....	( 87)	116	100
13. <i>Pustularia tessellata</i> .....	....	*	( 77)	(135)	81
14. <i>Ravitrona caputanguis</i> .....	*	103	93	( 91)	( 96)
15. <i>Erosaria helvola and hawaiiensis</i> *	*	95	(115)	(115)	105
16. <i>Staphylaea semiplota</i> .....	*	....	....	(211)	147
17. <i>Nuclearia honoluluensis</i> .....	....	*	....	....	87
18. <i>Talostolida rashleighana</i> .....	....	*	(125)	....	(113)
19. <i>Palmadusta unifasciata</i> .....	*	....	....	....	83

All Eratoidae are relatively small; the Cypraeidae from Pearl and Hermes Reef are of medium size to small, or if larger they are always surpassed by the specimens from French Frigates Shoal and from Laysan Island, where most species become large to gigantic.

Therefore the conditions of French Frigates Shoal and especially of Laysan Island are evidently favorable to the development of callous species and of large individuals of other species, whereas most Cypraea from Pearl and Hermes Reef are rather small, but otherwise do not exhibit any peculiarity.