

Western Australian Cowries

A Second, Revised, and Expanded Report

BY

CRAWFORD N. CATE

12719 San Vicente Boulevard, Los Angeles, California 90049

(Plates 21 to 34; 5 Maps)

INTRODUCTION

SEVERAL IMPORTANT FACTORS have made this sequel to my 1964 report advisable. First is the need to record subsequent information gathered in the area; new range extensions are given, with special reference to the area including Port Hedland, Onslow, the outer shore of North West Cape from Yardie Creek south to Dongara; moreover, this report includes information gathered on a recent collecting expedition to the Abrolhos Islands for the express purpose of learning the extent of cypraeid populations there and the relationships of the island fauna to that of the mainland.

Secondly, the new generic arrangement of SCHILDER (1965, 1966), in which the species are listed in order from the most primitive to the most specialized forms, has been adopted; note should be taken, therefore, that the taxonomic arrangement used here will supersede that of CATE, 1964. A limited number of species has been shifted into different genera, and subspecific recognition has been accorded a West Australian form of *Cypraea leviathan* SCHILDER & SCHILDER, 1937, *Zoila friendii* (GRAY, 1831), and *Palmadusta saulae* (GASKOIN, 1843).

Thirdly, photographs have been added to illustrate all the species of cowries presently known to inhabit West Australian waters, from Cape Leeuwin in the south to Port Darwin in the north. These illustrations will assist in identification, and the revised text will offer a uniform taxonomic approach to the species and their generic relationships.

The locality data as shown in CATE, 1964, will not be repeated in the new text, unless they are incidental to the listing of a newly recorded species in a previously reported area. It has also been necessary to omit latitude and longitude readings in most instances, since many of the remote collecting stations do not appear on maps. In these cases

appropriate bearings in miles will be given in relation to better known localities.

I was able to examine a great number of cowrie species in the South Australian Museum, Adelaide, and in the West Australian Museum, Perth, as well as in many private West Australian collections. I found that most of the shells fell within the size-range of the largest and smallest shell dimensions recorded in CATE, 1964. It therefore seemed appropriate to take an average of their sizes for use in this overall study, as a median of shell dimension. The five figures given in parentheses are, in order: length, width, and height (in millimeters), number of teeth on outer lip, and on the columellar lip. The numbers in parentheses in the text under individual species discussions indicate the locality references. The list of localities is amended to include a South Australian locality where a West Australian species has been recently discovered, or overlaps in a natural range extension.

THE HOUTMAN ABROLHOS ISLANDS

The Houtman Abrolhos Islands Group, often referred to as the "Houtman Rocks," is an archipelago lying approximately 49 miles off the west coast of Australia in the Indian Ocean, almost due west of Geraldton. Named for its discoverer, Cornelis de Houtman, it consists of three separate groups of islands lying approximately parallel to the mainland, between the latitudes 28° 15' and 29° 01' South.

Little has heretofore been known about the mollusca living in these remote island waters; our limited knowledge of the fauna is necessarily based upon the shells found in fishermen's crayfish pots, and upon visits to the islands by Archer Whitworth of Geraldton in 1964 and a recent trip of my own.

During October, 1966 (it was Spring in Australia) I visited the Houtman Abrolhos Islands, personally collecting at nearly every island of the southern Pelsart group and of the middle Easter group. The cowrie populations living in the intertidal zones were sampled and representative lots of each available species were sent home for study. In earlier years, Archer Whitworth, Geraldton, and James "Jimmy" Seabrook of Perth have made repeated trips to the islands, the former working the littoral and adjacent shallow water, the latter, in the motor vessel "*Lancelin*" of the Fisheries Department, Perth, using baited crayfish pots and limited dredging in the islands and other mainland offshore reef areas. It is interesting to note that many of the common mainland shore cowries are absent, as far as we have been able to determine from the Abrolhos fauna. The ecological conditions seem much the same in many instances, although the islands have, generally speaking, much rougher water and are more exposed to the storm force of the normal southerly winds. The island waters are perhaps more varied as to depth, condition of food, food source, and substrate (there appears to be a noticeable scarcity of algae; a large portion of the coral is living, thus being devoid of marine plants) and in the distribution of sand, mud, and dead coral. Shallow water – scarcely ever more than 30 fathoms deep – and the combination of many reef patterns in and out of the water, plus the endless broad, shallow-water, spongy, white coral sand flats, and minimal coral and rock habitats, must surely affect the distribution of many of the mainland mollusks.

Aside from the collectors already mentioned, the following persons should also be listed: Alec Gilbertson, Max Cramer, George Barker, Martin van der Oord, W. Hemsley, Joseph Burton, Terry Butterworth, O. Hewitt of Geraldton; F. I. "Sonny" Healy, Dongara; and Edward Nickles of Mandurah. These and many others have contributed in one way or another with specimens and information, all of which have been used in this study. For the most part these men are cray fishermen, and are to be credited for having discovered and made available such rare deep water species as *Bernaya catei* SCHILDER, 1963, *Zoila marginata* (GASKOIN, 1849), *Z. venusta* (SOWERBY, 1846), the northern form of *Z. friendii* (GRAY, 1831), *Z. rosselli* COTTON, 1948, and the round northern form of *Cypraea reevei* SOWERBY, 1832. These rare species and others are found feeding on the bait (often fish, dried meat, but more often than not on dried split lamb's heads and other dried bone material) set in the crayfish pots.

The Wallabi Group to the north (see map) includes North Island, East and West Wallabi Islands, with North East Reef, Morning Reef, Noon Reef, and Evening Reef

providing the most important collecting areas in this section.

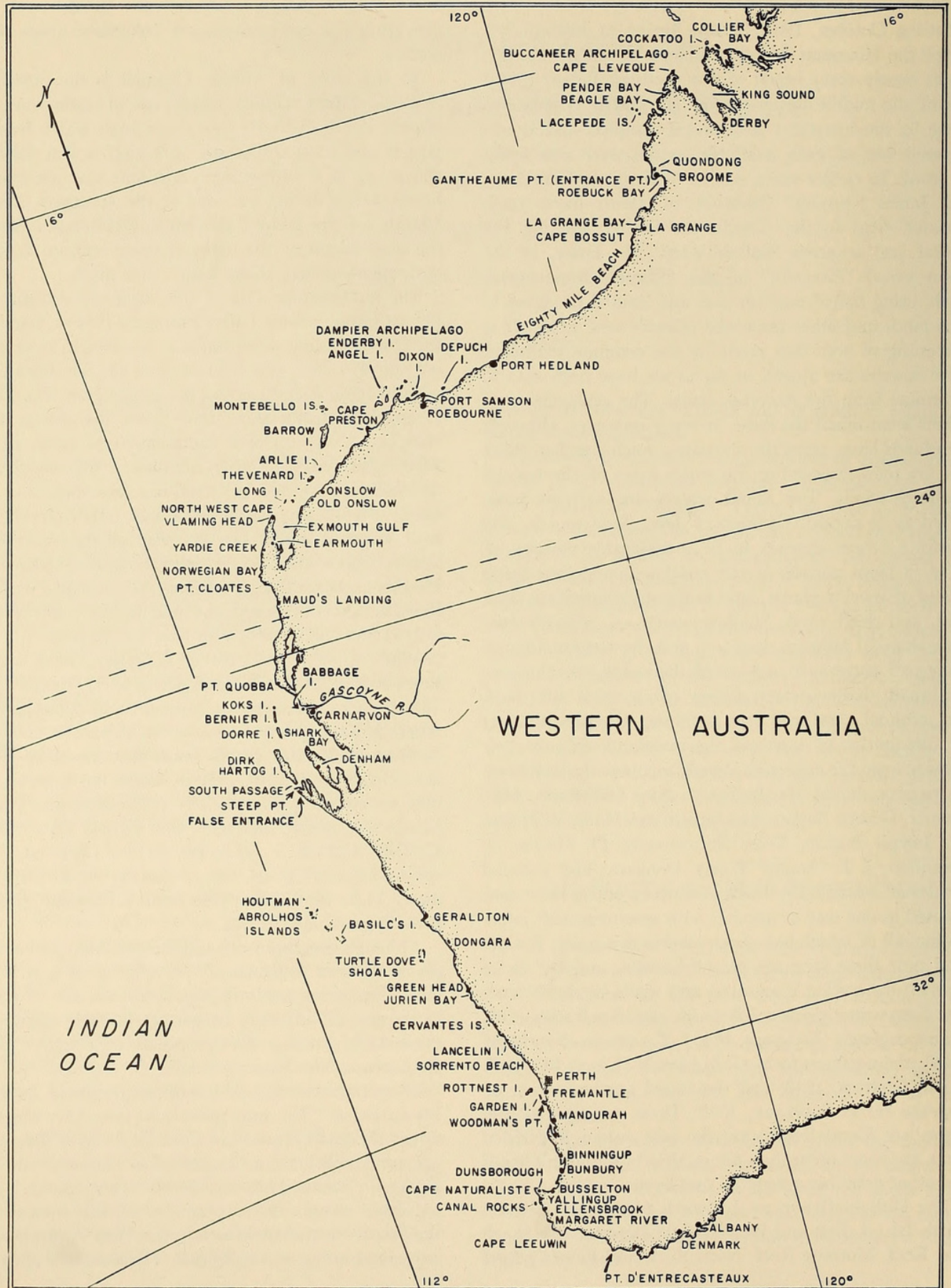
To the south of Middle Channel is the central (or middle) Easter Group, made up of numerous small islands, barely 8 to 10 feet above high water level, the largest and most important of which is Rat Island. It was at one of the fishermen's huts here that we made our headquarters during our stay at the Houtman Abrolhos Islands. Of this group Little North and Sandy Islands are the most recent of the many growing reefs to develop a permanent footing above high water mark.

The southernmost link of this coral island chain is the Pelsart Group (named after Francisco Pelsart, Captain of the Dutch trading vessel *Batavia*, wrecked in these islands on June 4, 1629), also referred to as the Southern Group, with its main island bearing the same name. The Zeewyk Channel separates this group from the Easter Group complex. Made up of a combination of reefs, partially submerged jetties, interior landlocked lagoons that rise and fall with the tide, and atoll-like sand spits, it provides excellent collecting stations, the most important of which is at Wreck Point at the west end of mile-long Pelsart Island. Otherwise, the best areas are Mangrove Island, Hummock Island, Square Island, White Banks, and King Reef, the latter becoming awash at high tide and accessible only at low tide, and then for only a short time.

While *Zoila friendii vercoi* SCHILDER, 1930 is almost surely a South Australian subspecies of *Z. friendii* (GRAY, 1831), there are labels in Museum collections and elsewhere indicating a questionable incidence for these shells in West Australian waters. I am omitting them here as not being a part of the western fauna, but it seems pertinent to remark on them briefly at this time (see Plate 23, Figure 11, which illustrates this form). Cate coll. no. C 1706 (83.3 53.1 39.0 26 10) = (2a); no. C 3500 (76.8 49.2 35.4 24 9) = (59a); no. C 3501 (73.8 44.0 34.3 22 5) = (59a) are additional specimens for comparative statistics.

Although geographically adjacent to *Zoila friendii friendii* of Western Australia, *Z. friendii vercoi* may be considered as being an intra-population variant. WILSON & SUMMERS (1966) may be correct in their appraisal of these shells. Among other proposals, they suggest placing *Z. f. vercoi* into synonymy with *Z. f. friendii* as being "either clinical or subject to non-geographical, inter-locality variation." This may possibly be true. One way or the other, the south Australian form *Z. f. vercoi* does possess apertural and teeth arrangement so characteristic of *Z. f. friendii*, linking them very closely to one another.

I have examined 11 specimens of this subspecies, in the South Australian Museum, the West Australian Museum, and in my own collection. The answer is always the

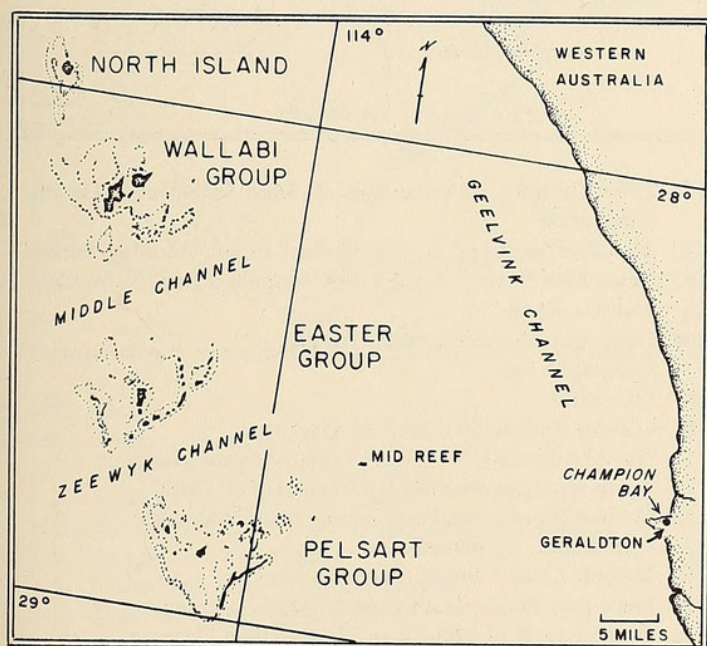


same; the mollusks from the southwest coast localities do vary remarkably in morphological development. A student could say there is a distinct difference in these shells, and could maintain there is some point of geographical separation between the southern and western populations in the area between Cape Naturaliste and Cape Leeuwin, though it is a narrow one and open to possible question. The subspecies, *Zoila friendii vercoi*, does retain many of the shell characters of the western nominate species. These would include the familiar apertural appearance, the number of teeth (almost never more than 6 to 10 on the abapical columella), and their arrangement. Particularly unifying these two variants are the limited and knobby, comparatively rudimentary teeth on the abapical quarter of the columellar lip, adjacent to the fossula; the remaining three fourths of the columella, adapically, is normally smooth and without teeth. However, these shells are distinctive enough, so that for purposes of distinguish-

their contributions of shells and information toward this work, I wish to express my gratitude to Molly and Robert Gedling, to Iris and Robert Thomas, both families (the latter in the earlier days of this study) light keepers at Vlaming Head, North West Cape. To Brian Kember, Port Hedland, to Theodore Crake, Broome, to Mrs. D. Clarke, Onslow, to Ned Harrold, Victoria Park, Perth, to Dr. Helene Laws, South Australian Museum, Adelaide, and to Dr. Barry Wilson, West Australian Museum, Perth, for permission to inspect the collections in their care; to Mrs. Emily Reid for the excellent maps; to Takeo Susuki for assistance with photography; to Archer Whitworth, a dear friend of long standing living in Geraldton; and to Jean Cate for assistance in many helpful ways.

LOCALITY INDEX

Due to the wild, uninhabited nature of much of the present coastline of West Australia, distances given, and many of the indicated localities, are only approximate. Even so, they are reasonably correct as to landfall, and truly represent the localities and ranges of the Cypraeidae as we know them today.



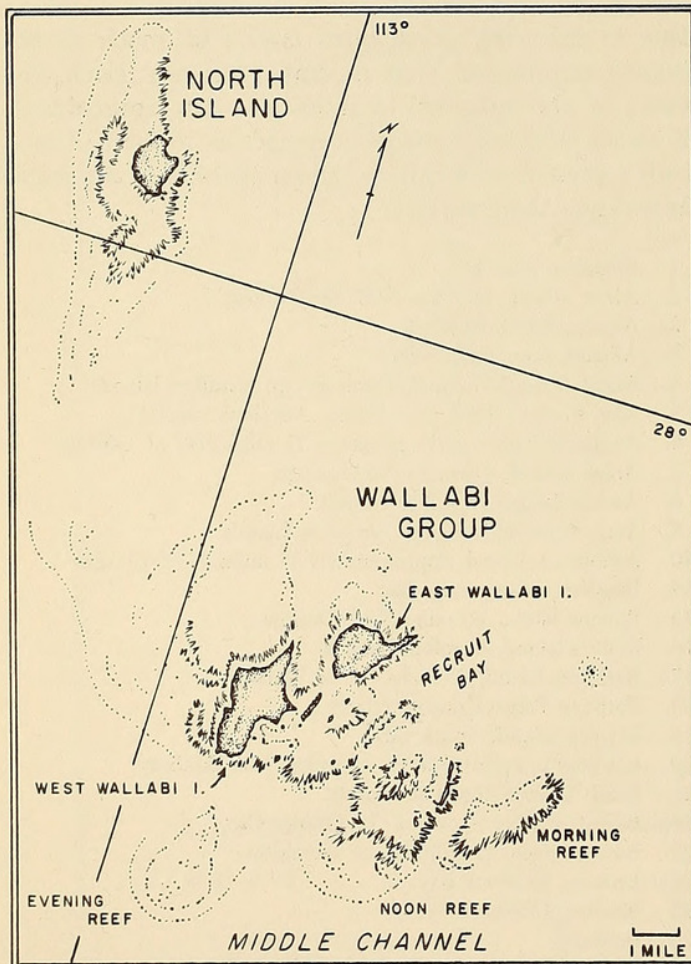
ing the south southwest Australian shells I am tentatively retaining the available name for this 'end of cline' group as a South Australian subspecies (see Table 1 for comparative statistics).

ACKNOWLEDGMENT

As is always the case in a work like this, many persons have given generously of their help in countless tangible and intangible ways; to them all I express my thanks. In addition to those mentioned elsewhere in this paper for

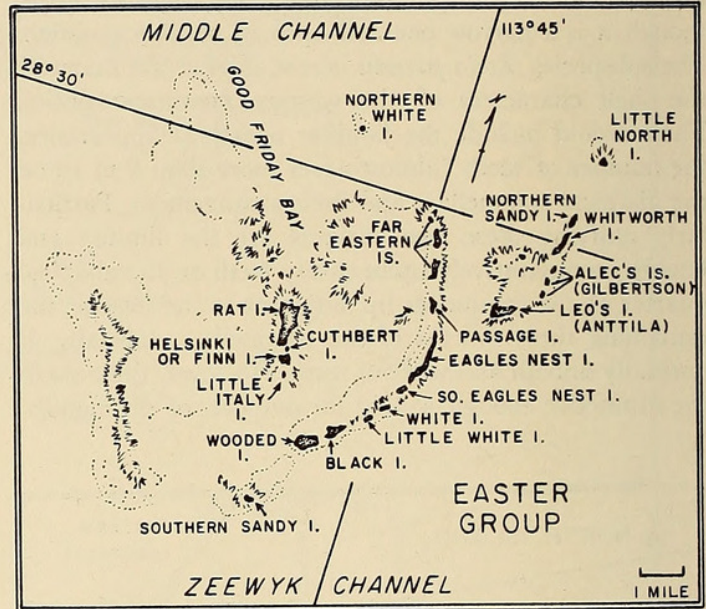
1. Abrolhos Islands
2. Airlie Island, 16 miles NNE of Onslow
- 2a. Albany, South Australia
3. Albany, Frenchman's Bay
4. Alec Gilbertson Island, Easter group, Abrolhos Islands
5. Alec Finlay Island (the nook), Abrolhos Islands
6. Anchor Island, 5 miles off-shore, 22 miles NW of Onslow
7. Angel Island, Dampier Archipelago
8. Anttila Island, Abrolhos Islands
9. Arch Whitworth Island, Abrolhos Islands
10. Ashburton Island, approximately 11 miles W of Onslow
14. Busselton, Geographe Bay
15. Barrow Island, 60 miles N of Onslow
16. Basil's Island, Abrolhos Islands
17. Bathurst Island, 60 miles NE of Darwin
18. Bathurst Point, Rottnest Island
19. Bernier Island, Shark Bay
20. Binningup, approximately 15 miles N of Bunbury
21. Black Island, Abrolhos Islands
22. Bossut, southern point of La Grange Bay
23. Bowes River, 28 miles N of Geraldton
24. Broome, Roebuck Bay
25. Broome, Coconut Well
- 25a. Bunbury
26. Bunker Bay, 1½ miles E of Cape Naturaliste
28. Capel, 17 miles S of Bunbury
29. Cape Bossut
30. Calgadup Brook, near Margaret River S of Cape Naturaliste
- 30a. Cape Jervis, South Australia
31. Cape Leeuwin
32. Cape Naturaliste

33. Cape Preston, Onslow
34. Cape Villaret, 30 miles N of Broome
- 34a. Carnac Island, just N of Garden Island
35. Carnarvon
36. Cervantes Island
37. Chabjuwardoo Bay, S of Point Cloates
38. Coburn
39. Cockburn Sound, S of Fremantle
40. Cockburn Sound, Pamela Bank off Woodman's Point
41. Cockatoo Island, Buccaneer Archipelago
42. Cottesloe Beach, Perth
43. Cowrie Creek, 35 miles S of Port Hedland
44. Cambridge Gulf, Wyndham, 250 miles S of Darwin
45. Darwin
46. Delambre Island, Dampier Archipelago
47. Direction Island, 7 miles NE of Onslow
48. Dirk Hartog Island, adjacent to Shark Bay
49. Dixon Island, off Port Samson
52. Dongara



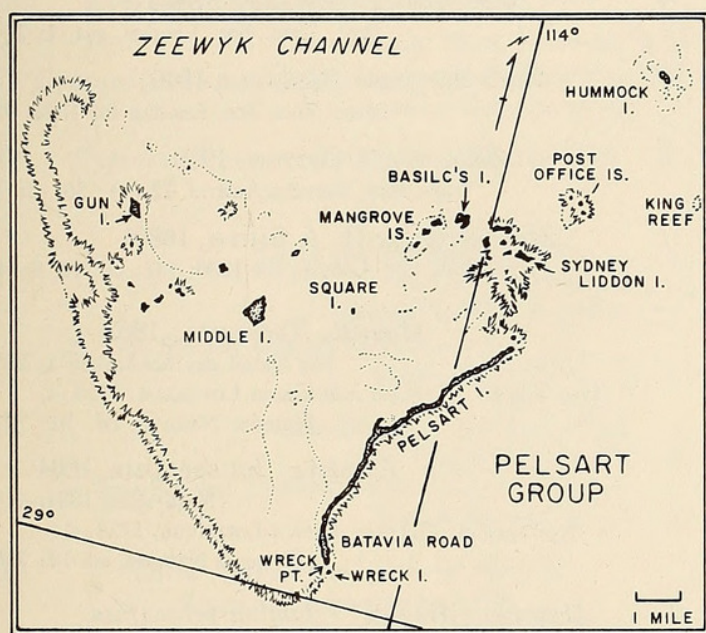
53. Dongara, Leander Reef
Dongara, Turtle Dove Shoal - see 156
54. Dorre Island, S of Bernier Island, Shark Bay
57. Eagle Nest Island, Abrolhos Islands
58. Eagle Nest Island (south island), Abrolhos Islands
59. Enderby Island, Dampier Archipelago

- 59a. Esperance, South Australia
60. Exmouth Gulf
61. Fremantle
- 61a. Fremantle, off entrance to Swan River in 30 feet, on sponge
62. Far Eastern Islands (3), Abrolhos Islands



- 62a. False Entrance, 12 miles SSE of Steep Point, outer Denham peninsula
63. Flat Reef, west end of West Wallabi Island, Abrolhos Islands
64. "Five Mile Beach," 5 miles S of Vlaming Head, N. W. Cape
65. Garden Island
66. Geelvink Channel, Abrolhos Islands
67. Geographie Bay
68. Geraldton
69. Glenroy Station, 10 miles S of Onslow
71. Good Friday Bay, N of Rat Island, Abrolhos Islands
- 71a. Green Head, approximately 140 miles N of Perth
- 71b. Grindal Island, near Port Lincoln, South Australia
72. Gun Island, Abrolhos Islands
75. Helsinki (Finn) Island, Abrolhos Islands
76. Hopetown Beach, south coast of West Australia
78. Jurien Bay, N of Hill River, 75 miles S of Dongara
79. Jurien Bay, 3 miles off North Head
80. King Sound
81. King Sound, Disaster Bay
82. King Sound, Dugong Bay
83. Koks Island, off N tip of Bernier Island, Shark Bay
85. Lancelin Island, adjacent to Cervantes Island
86. Learmouth, 30 miles S of Vlaming Head in Exmouth Gulf
87. Ledge Point, 80 miles N of Perth (30 fathoms)
88. Leighton Beach, adjacent to Perth
89. Leo's Island (Anttila), Abrolhos Islands
90. Little Italy Island, Abrolhos Islands
91. Little North Island, Abrolhos Islands
92. Little White Island, Abrolhos Islands
93. Locker Island, 30 miles SW of Onslow
94. Long Island, 32 miles W of Onslow
95. Ludlow, 8 miles N of Busselton

97. Mandurah, approximately 35 miles S of Fremantle
98. Maud's Landing, approximately 135 miles N of Carnarvon
99. Middle Channel, Abrolhos Islands
100. Middle Island, Abrolhos Islands
101. Moore River, approximately 55 miles N of Perth
102. Ningaloo Woolshed, 200 miles N of Carnarvon
103. Nickol Bay, 25 miles S of Roebourne
104. North Island, Wallabi Group, Abrolhos Islands
- 104a. North Island, Wallabi Group, SW Bank
105. Norwegian Bay, Whaling Station N of Point Cloates
106. North West Cape
107. Quondong, 35 miles N of Broome



108. Onslow
109. Onslow, 10 miles south of -
110. Passage Island, Abrolhos Islands
111. Pelsart Island, Abrolhos Islands
112. Pender Bay, approximately 150 miles N of Broome
113. Pender Bay, Bell Point
114. Point Locker, 50 miles S of Onslow
115. Point Murrat, Exmouth Gulf
116. Point Samson, 9 miles N of Roebourne
117. Point Cloates, 75 miles S of Vlaming Head Light, N. W. Cape
- 117a. Port Darwin
118. Port Denison Beach, 15 miles SW of Dongara
119. Port Hedland
120. Port Lincoln, South Australia
121. Price Point, 40 miles N of Broome
- 121a. Quindalup, Geographe Bay
124. Quondong, 35 miles N of Broome
125. Quobba Point, 40 miles N of Carnarvon
126. Port Hedland, Finicane Island, ¼ mile off-shore
130. Rat Island, Abrolhos Islands
131. Rottneest Island, 12 miles NW of Fremantle
132. Rottneest Island, 5 miles NW of -, in 75 fathoms
133. Rottneest Island, Bathurst Point
134. Rottneest Island, Ricey Beach
135. Round Island, 2 miles E of Long Island

136. Roebourne, Tonymia
137. Roebuck Bay, Middle Bank
140. Sandy Island (north), Abrolhos Islands
141. Sandy Island (south), Abrolhos Islands
142. Shark Bay
143. Shark Bay, False Entrance
144. Shark Bay, South Passage
145. Sorrento Beach (Sorrento Reef)
146. Sydney Liddon Island, Abrolhos Islands
147. Snag Island, 100 miles S of Geraldton
150. Tautibiddi Well, approximately 10 miles S of Vlaming Head, N. W. Cape
151. Taylor's Island, 20 miles S of Port Lincoln, South Australia
152. "The Flats," oceanward, S of Pelsart Island, in 35 fathoms, Abrolhos Islands
153. Thevenard Island, 15 miles NW of Onslow
154. Thompson's Bay, NW side of Rottneest Island
155. Torloise Island, 15 miles W of Onslow
156. Turtle Dove Reef-Shoal, 37 miles WSW of Dongara
157. Twin Island, 9 miles ENE of Onslow
159. Vlaming Head, North West Cape
160. Vlaming Head, North West Cape, 4 miles SW of -
162. Wallabi Island (east), Abrolhos Islands
163. Wallabi Island (west), south side, Abrolhos Islands
164. Wedge Island, near Port Lincoln, South Australia
165. West Bank, 6 miles WNW of North Island, Abrolhos Islands
166. West Lewis Island, Dampier Archipelago
167. White Island, Abrolhos Islands
168. Windy Harbor, Cape D'Entrecasteaux, SW Australia
169. Woodcock Island, Abrolhos Islands
170. Wooded Island, Abrolhos Islands
171. Wreck Point, W-end of Pelsart Island, Abrolhos Islands
172. Woodman's Point, 11 miles S of Fremantle
175. Yallingup, approximately 157 miles S of Fremantle
176. Yardie Creek, approximately 7 miles S of Vlaming Head, N. W. Cape
177. Yardie Creek, 11 miles S of N. W. Cape
178. Yardie Creek, 20 miles S of N. W. Cape
180. Zeewyk Channel, Abrolhos Islands

INDEX OF SPECIES

<i>adusta</i>	220	<i>chinensis</i>	221, 232
<i>angustata</i>	229	<i>cicercula</i>	219, 227
<i>annulus</i>	219, 227	<i>citrinicolor</i>	219, 228
<i>arabica</i>	218, 226	<i>clandestina</i>	220, 221, 230
<i>argus</i>	219, 226	<i>comptoni</i>	226
<i>asellus</i>	220, 230	<i>continens</i>	220, 229
<i>bicolor</i>	229	<i>contraria</i>	220, 229
<i>bizonata</i>	221, 231	<i>coxi</i>	220, 229
<i>blacsa</i>	220, 230	<i>crakei</i>	221, 230, 231
<i>brevidentata</i>	221, 232	<i>cribraria</i>	221, 232
<i>brunnescens</i>	218, 226	<i>cylindrica</i>	220, 230
<i>cameroni</i>	221, 232	<i>dampierensis</i>	221, 231
<i>caputserpentis</i>	219, 228	<i>decipiens</i>	218, 225
<i>carneola</i>	219, 227	<i>diversa</i>	220, 228
<i>catei</i>	213, 218, 221	<i>dorsalis</i>	220, 229
<i>caurica</i>	220, 230	<i>eglantina</i>	218, 226
<i>cernica</i>	219, 228	<i>episema</i>	224

<i>erosa</i>	219, 220, 228	<i>pardalis</i>	218, 226
<i>errones</i>	220, 229	<i>perconfusa</i>	218, 225
<i>facifer</i>	220, 229	<i>piperita</i>	220, 229
<i>fallax</i>	221, 232	<i>poraria</i>	219, 228
<i>felina</i>	220, 230	<i>pulicaria</i>	220, 229
<i>fimbriata</i>	221, 231	<i>purissima</i>	220, 228
<i>fluctuans</i>	221	<i>pyriformis</i>	220, 229
<i>friendii</i>	212, 213, 214	<i>quadrifaculata</i>	221, 231
	218, 222, 223, 224	<i>reevei</i>	213, 219, 226, 227
<i>gedlingae</i>	219, 227	<i>reticulum</i>	219, 228
<i>globulus</i>	219, 227	<i>rhinoceros</i>	221
<i>gracilis</i>	221, 231	<i>rhomboides</i>	219, 227
<i>hammondae</i>	221, 231	<i>rosselli</i>	213, 218, 225
<i>helvola</i>	219, 228	<i>rumphii</i>	219, 227
<i>hilda</i>	221, 231	<i>saulae</i>	212, 221, 230, 231
<i>hirundo</i>	221, 232	<i>siasiensis</i>	230, 231
<i>histrio</i>	218, 226, 228	<i>simulans</i>	221, 231
<i>isabella</i>	219, 227	<i>smithi</i>	220, 229
<i>jeaniana</i>	218, 222, 223	<i>sorrentensis</i>	224
<i>kenyonae</i>	219, 228	<i>sowerbyana</i>	220, 230
<i>kieneri</i>	221, 231	<i>staphylaea</i>	220, 229
<i>labrolineata</i>	219, 228	<i>stolida</i>	221, 232
<i>leviathan</i>	212, 219, 227	<i>subviridis</i>	220, 229
<i>limacina</i>	220, 229	<i>talpa</i>	218, 226
<i>listeri</i>	220	<i>teres</i>	221, 231
<i>lurida</i>	219	<i>thatcheri</i>	224
<i>lutea</i>	221, 231	<i>thersites</i>	222, 223
<i>lynx</i>	218, 219, 226	<i>thiclei</i>	221, 231
<i>maculifera</i>	226	<i>tigris</i>	219, 226
<i>marginata</i>	213, 218, 224, 225	<i>turdus</i>	220, 228
<i>mauritiana</i>	218	<i>ursellus</i>	221, 232
<i>media</i>	218	<i>vanelli</i>	219, 226
<i>melvilli</i>	220, 230	<i>venusta</i>	213, 218, 223, 224
<i>miliaris</i>	220, 228	<i>vercoi</i>	213, 214, 222, 223
<i>moneta</i>	219, 227	<i>viridicolor</i>	219, 228
<i>nucleus</i>	220, 229	<i>vitellus</i>	219, 226
<i>nugata</i>	230	<i>walkeri</i>	220, 229
<i>onyx</i>	220	<i>westralis</i>	218, 226, 228
<i>ovum</i>	220, 229	<i>whitworthi</i>	221, 232
<i>pallidula</i>	221, 231	<i>ziczac</i>	221, 231

SYSTEMATIC LIST

CYPRAEIDAE FLEMING, 1828

Hist. Brit. Anim., 330 (em.) (Edinburgh)

CYPRAEORBINAE SCHILDER, 1939

Arch. Molluskenk. 71: 165

Bernayini SCHILDER, 1927

Arch. Naturgesch. 91/A 10: 88

Bernaya JOUSSEAUME, 1884

(Naturaliste 1884: 414, nom. nud.)

Bull. Soc. Zool. France 9: 88; 1884

(Bernaya) JOUSSEAUME, 1884

> Type species: *Cypraca media* DESHAYES, 1835 <

Descr. coq. foss. envir. Paris 2, 723, 95: 37 - 38

1. *Bernaya (Bernaya) catei* SCHILDER, 1963

The Veliger 5 (4): 127

Zoila JOUSSEAUME, 1884

(Naturaliste 1884: 414, nom. nud.)

Bull. Soc. Zool. France 9: 89; 1884

> Type species: *Cypraca friendii* GRAY, 1831 <2. *Zoila friendii friendii* (GRAY, 1831)

Zool. Misc. 1: 35

3. *Zoila friendii jeaniana* CATE, subspec. nov.4. *Zoila venusta* (SOWERBY, 1846)

Proc. Linn. Soc. London, prt. 1: 314

5. *Zoila marginata* (GASKOIN, 1849)

Proc. Zool. Soc. London for 1848: 91

6. *Zoila rosselli* COTTON, 1948

Trans. Roy. Soc. So. Austral. 72 (1): 30; plt. 1

7. *Zoila decipiens* (E. A. SMITH, 1880)

Proc. Zool. Soc. London for 1880: 482; plt. 48, fig. 8

Mauritia TROSCHER, 1863

Das Gebiß der Schnecken 1: 205

> Type Species: *Cypraca mauritiana* LINNAEUS, 1758 <

Systema Naturae, ed. 10: 721

(Arabica) JOUSSEAUME, 1884

Naturaliste 1884: 414

> Type species: *Cypraca arabica* LINNAEUS, 1758 <

Systema Naturae, ed. 10: 718

8. *Mauritia (Arabica) eglantina perconfusa*

IREDALE, 1935

Austral. Zoologist 8 (2): 108

9. *Mauritia (Arabica) arabica brunnescens* CATE, 1964

The Veliger 7 (1): 24; plt. 5, figs. 3a, 3b

10. *Mauritia (Arabica) histrio westralis* (IREDALE, 1935)

Austral. Zoologist 8 (2): 108

Talparia TROSCHER, 1863

Das Gebiß der Schnecken 1: 204

> Type Species: *Cypraca talpa* LINNAEUS, 1758 <11. *Talparia talpa talpa* (LINNAEUS, 1758)

Systema Naturae, ed. 10: 720

Cypraca LINNAEUS, 1758

Systema Naturae, ed. 10: 718

(em.) MONTFORT, P. DENYS DE, 1810

Conchyl. Syst. 2: 630

> Type Species: *Cypraca tigris* LINNAEUS, 1758 <

(Cypraca) LINNAEUS, 1758

12. *Cypraca (Cypraca) tigris pardalis* SHAW, 1795

Vivar. Natur. Misc. 6: plt. 193

- (*Lyncina*) TROSCHEL, 1863
Das Gebiß der Schnecken 1: 205
> Type Species: *Cypraea lynx* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 721
13. *Cypraea (Lyncina) argus argus* LINNAEUS, 1758
Systema Naturae, ed. 10: 719
14. *Cypraea (Lyncina) lynx vanelli* LINNAEUS, 1758
Systema Naturae, ed. 10: 720
15. *Cypraea (Lyncina) vitellus vitellus* LINNAEUS, 1758
Systema Naturae, ed. 10: 721
16. *Cypraea (Lyncina) reevei* SOWERBY, 1832
Conch. Illustr. (London) fig. 52
17. *Cypraea (Lyncina) carneola carneola* LINNAEUS, 1758
Systema Naturae, ed. 10: 719
18. *Cypraea (Lyncina) leviathan gedlingae* CATE,
subspec. nov.
- Luria* JOUSSEAUME, 1884
Bull. Soc. Zool. France 9: 92
(Naturaliste 1884: 414, *nom. nud.*)
> Type Species: *Cypraea lurida* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 720
- (*Basilitronea*) IREDALE, 1930
Mem. Queensld. Mus. 10 (1): 83
> Type Species: *Cypraea isabella* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 722
19. *Luria (Basilitronea) isabella rumphii*
SCHILDER & SCHILDER, 1938
Proc. Malacol. Soc. London 23 (3-4): 177
- NARIINA SCHILDER, 1932
Foss. Cat. 1: Animalia, pars 55, Cypraeacea. 149
- (*Pustulariini* SCHILDER, 1932)
Foss. Cat. 1: Animalia, pars 55, Cypraeacea. 149
- Pustularia* SWAINSON, 1840
LARDNER's Encycl., p. 324
- (*Pustularia*) SWAINSON, 1840
LARDNER's Encycl., p. 324
> Type Species: *Cypraea cicercula* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 725
20. *Pustularia (Pustularia) cicercula cicercula*
(LINNAEUS, 1758)
Systema Naturae, ed. 10: 725
21. *Pustularia (Pustularia) globulus globulus*
(LINNAEUS, 1758)
Systema Naturae, ed. 10: 725
- Nariini SCHILDER, 1932
Foss. Cat. 1: Animalia, pars 55, Cypraeacea: 159
- Monetaria* TROSCHEL, 1863
Das Gebiß der Schnecken 1: 205
> Type Species: *Cypraea moneta* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 723
- (*Ornamentaria*) SCHILDER &
SCHILDER, 1936
Proc. Zool. Soc. London 1936: 1120
> Type Species: *Cypraea annulus* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 723
22. *Monetaria (Ornamentaria) annulus annulus*
(LINNAEUS, 1758)
Systema Naturae, ed. 10: 723
- (*Monetaria*) TROSCHEL, 1863
Das Gebiß der Schnecken 1: 205
23. *Monetaria (Monetaria) moneta rhomboides*
SCHILDER & SCHILDER, 1933
Zool. Meded. Leiden 16: 163
- Erosaria* TROSCHEL, 1863
Das Gebiß der Schnecken 1: 205
> Type Species: *Cypraea erosa* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 723
- (*Ravitrona*) IREDALE, 1930
Mem. Queensld. Mus. 10 (1): 82
> Type Species: *Cypraea caputserpentis* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 720
24. *Erosaria (Ravitrona) labrolineata labrolineata*
(GASKOIN, 1849)
Proc. Zool. Soc. London for 1848: 97
25. *Erosaria (Ravitrona) cernica viridicolor* (CATE, 1962)
The Veliger 4 (4): 175; plt. 40, figs. 1-9
26. *Erosaria (Ravitrona) helvola citrinicolor*
IREDALE, 1935
Austral. Zoologist 8 (2): 116
27. *Erosaria (Ravitrona) caputserpentis reticulum*
(GMELIN, 1791)
Systema Naturae, ed. 13: 3407
28. *Erosaria (Ravitrona) caputserpentis kenyonae*
SCHILDER & SCHILDER, 1938
Proc. Malac. Soc. London 23 (3): 136
ibid. 3: 77, fig. 2
- (*Erosaria*) TROSCHEL, 1863
Das Gebiß der Schnecken 1: 205
> Type Species: *Cypraea erosa* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 723
29. *Erosaria (Erosaria) poraria poraria*
(LINNAEUS, 1758)
Systema Naturae, ed. 10: 724

30. *Erosaria (Erosaria) erosa purissima*
(VREDENBURG, 1919)
Journ. Asiat. Soc. Bengal 15: 143
31. *Erosaria (Erosaria) miliaris diversa* (KENYON, 1902)
Journ. Conch. 10: 184
32. *Erosaria (Erosaria) turdus turdus* (LAMARCK, 1810)
Ann. Mus. Hist. Nat. Paris 6: 74
- Staphylaea* JOUSSEAUME, 1884
Naturaliste 1884: 415
- (*Staphylaea*) JOUSSEAUME, 1884
> Type Species: *Cypraea staphylaea* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 725
33. *Staphylaea (Staphylaea) staphylaea staphylaea*
(LINNAEUS, 1758)
Systema Naturae, ed. 10: 725
34. *Staphylaea (Staphylaea) limacina facifer*
(IREDALE, 1935)
Austral. Zool. 8 (2): 119; plt. 8, fig. 6
- (*Nuclearia*) JOUSSEAUME, 1884
Bull. Soc. Zool. France 9: 98
(Naturaliste 1884: 415, nom. nud.)
> Type Species: *Cypraea nucleus* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 724
35. *Staphylaea (Nuclearia) nucleus nucleus*
(LINNAEUS, 1758)
Systema Naturae, ed. 10: 724
- Notocypraea* SCHILDER, 1927
Arch. Naturgesch. 91/A 10: 110
> Type species: *Cypraea piperita* GRAY, 1825 <
Zool. Journ. 1: 498 (SOLANDER MS)
- (*Guttacypraea*) IREDALE, 1935
Austral. Zool. 8 (2): 134
> Type species: *Cypraea pulicaria* REEVE, 1846 <
Conch. Icon. sp. 84, plt. 17, f. 84
36. *Notocypraea (Guttacypraea) pulicaria* (REEVE, 1846)
Conch. Icon. 3: *Cypraea*, fig. 84
- (*Notocypraea*) SCHILDER, 1927
> Type species: *Cypraea piperita* GRAY, 1825 <
Zool. Journ. 1: 498 (SOLANDER MS)
37. *Notocypraea (Notocypraea) piperita* (GRAY, 1825)
Zool. Journ. 1: 498 (SOLANDER MS)
- CYPRAEVULINAE SCHILDER, 1930
Proc. Malacol. Soc. London 19: 120
- Erroneini SCHILDER, 1927
Arch. Naturgesch. 91/A 10: 109
- Erronea* TROSCHER, 1863
Das Gebiß der Schnecken 1: 205
> Type Species: *Cypraea errones* LINNAEUS, 1758 <
- (*Adusta*) JOUSSEAUME, 1884
Naturaliste 1884: 414
> Type Species: *Cypraea adusta* LAMARCK, 1810 <
Ann. Mus. Hist. Nat. 16: 92
= *Cypraea onyx* LINNAEUS, 1758
Systema Naturae, ed. 10: 722
38. *Erronea (Adusta) subviridis dorsalis*
SCHILDER & SCHILDER, 1938
Proc. Malacol. Soc. London 23 (3): 149
39. *Erronea (Adusta) pyriformis smithi* (SOWERBY, 1881)
Proc. Zool. Soc. London for 1881: 638
40. *Erronea (Adusta) walkeri continens* (IREDALE, 1935)
Austral. Zoologist 8 (2): 127
- (*Erronea*) TROSCHER, 1863
Das Gebiß der Schnecken 1: 205
> Type Species: *Cypraea errones* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 723
41. *Erronea (Erronea) ovum ovum* (GMELIN, 1791)
Systema Naturae, ed. 13: 3412
42. *Erronea (Erronea) errones coxi* (BRAZIER, 1872)
Proc. Zool. Soc. London for 1872: 617
43. *Erronea (Erronea) cylindrica sowerbyana*
SCHILDER, 1932
Foss. Cat. 1: Animalia, pars 55, Cypraeacea, 192
44. *Erronea (Erronea) caurica blaesa* IREDALE, 1939
Austral. Zoologist 9 (3): 322
- (*Melicerona*) IREDALE, 1930
Mem. Queensld. Mus. 10 (1): 83
> Type Species: *Cypraea listeri* GRAY, 1824 <
Zool. Journ. 1: 384
= *Cypraea felina* GMELIN, 1791
Systema Naturae, ed. 13: 3412
45. *Erronea (Melicerona) felina melvilli* (HIDALGO, 1906)
Mem. Acad. Cienc. Madrid 25: 180
- Palmadusta* IREDALE, 1930
Mem. Queensld. Mus. 10 (1): 82
- (*Palmadusta*) IREDALE, 1930
> Type species: *Cypraea clandestina* LINNAEUS, 1767 <
Systema Naturae, ed. 12: 1177
46. *Palmadusta (Palmadusta) asellus asellus*
(LINNAEUS, 1758)
Systema Naturae, ed. 10: 722

47. *Palmadusta (Palmadusta) clandestina clandestina*
(LINNAEUS, 1767)
Systema Naturae, ed. 12: 1177
48. *Palmadusta (Palmadusta) saulae crakei* CATE,
subspec. nov.
49. *Palmadusta (Palmadusta) lutea bizonata*
IREDALE, 1935
Austral. Zoologist 8 (2): 126
50. *Palmadusta (Palmadusta) ziczac ziczac*
(LINNAEUS, 1758)
Systema Naturae, ed. 10: 722

(*Purpuradusta*) SCHILDER, 1939
Arch. Molluskenk. 71: 165
> Type Species: *Cypraea fimbriata* GMELIN, 1791 <
Systema Naturae, ed. 13: 3420
51. *Palmadusta (Purpuradusta) gracilis hilda*
(IREDALE, 1939)
Austral. Zoologist 9 (3): 312
52. *Palmadusta (Purpuradusta) fimbriata fimbriata*
(GMELIN, 1791)
Systema Naturae, ed. 13: 3420
53. *Palmadusta (Purpuradusta) hammondae dampierensis*
SCHILDER & CERNOHORSKY, 1965
The Veliger 7 (4): 225; plt. 29, figs. 1, 2

Bistolida COSSMANN, 1920
Rev. Crit. Paléozool. 24: 83
> Type Species: *Cypraea stolidia* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 724

(*Blasicrura*) IREDALE, 1930
Mem. Queensld. Mus. 10 (1): 84
> Type Species: *Cypraea rhinoceros* SOUVERBIE, 1865 <
Journ. Conchyl. 13: 156; plt. 511
= *Cypraea pallidula* GASKOIN, 1849
Proc. Zool. Soc. London for 1848: 97 (Mar. '49)
54. *Bistolida (Blasicrura) quadrimaculata thielei*
SCHILDER & SCHILDER, 1938
Proc. Malacol. Soc. London 23 (3): 164
55. *Bistolida (Blasicrura) pallidula simulans*
SCHILDER & SCHILDER, 1940
Arch. Molluskenk. 72: 42
56. *Bistolida (Blasicrura) teres teres* (GMELIN, 1791)
Systema Naturae, ed. 13: 3405

(*Derstolida*) IREDALE, 1935
Austral. Zoologist 8 (2): 121
> Type species: *Derstolida fluctuans* IREDALE, 1935 <
Austral. Zoologist 8 (2): 121
= *Cypraea brevidentata* SOWERBY, 1870
Thesaur. Conch. (4): 11; fig. 325
57. *Bistolida (Derstolida) kieneri kieneri* (HIDALGO, 1906)
Mem. Acad. Cienc. Madrid 25: 177
58. *Bistolida (Derstolida) hirundo cameroni*
(IREDALE, 1939)
Austral. Zool. 9 (3): 314; plt. 28, figs. 29-31
59. *Bistolida (Derstolida) ursellus ursellus* (GMELIN, 1791)
Systema Naturae, ed. 13: 3411

(*Bistolida*) COSSMANN, 1920
Rev. Crit. Paléozool. 24: 83
> Type Species: *Cypraea stolidia* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 724
60. *Bistolida (Bistolida) stolidia stolidia* (LINNAEUS, 1758)
Systema Naturae, ed. 10: 724
61. *Bistolida (Bistolida) brevidentata* (SOWERBY, 1870)
Thes. Conch. 4 (30): 11; plt. 30, figs. 325-326

Cribrarula STRAND, 1929
Acta Univ. Latv. 20: 8
Syn.: *Cribraria* JOUSSEAUME, 1884 (twice preoccupied)
Bull. Soc. Zool. France 9: 94
> Type Species: *Cypraea cribraria* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 723

(*Ovatipsa*) IREDALE, 1931
Rec. Austral. Mus. 18 (4): 219
> Type Species: *Cypraea chinensis* GMELIN, 1791 <
Systema Naturae, ed. 13: 3421
62. *Cribrarula (Ovatipsa) chinensis whitworthi*
(CATE, 1964)
The Veliger 7 (1): 20; plt. 5, figs. 2a, 2b

(*Cribrarula*) STRAND, 1929
> Type species: *Cypraea cribraria* LINNAEUS, 1758 <
Systema Naturae, ed. 10: 723
63. *Cribrarula (Cribrarula) cribraria fallax*
(E. A. SMITH, 1881)
Ann. Mag. Nat. Hist., ser. 5, 8: 441

DISCUSSION OF THE SPECIES

1. *Bernaya (Bernaya) catei* SCHILDER, 1963
(Plate 21, Figure 1)

Locality: 163

(75.7 49.4 39.8 23 17)

CATE (1964, p. 21, no. 41)

This is a unique specimen, collected by a crayfisherman during the autumn of 1960, on a western beach of West Wallabi Island, Houtman Abrolhos Islands. The holotype is no. 12756 in the California Academy of Sciences, Department of Geology Type collection.

2. *Zoila friendii friendii* (GRAY, 1831)
(Plate 24, Figure 12)

Localities: 18, 19, 25a, 28, 31, 35, 38, 54, 61a, 65, 83, 95, 98, 99, 118, 121a, 142, 143, 145, 172
(66.7 35.3 27.3 22 6)

CATE (1964, p. 23, no. 47)

A specimen was collected in 10 feet of water on brown sponge, $\frac{3}{4}$ mile off Sorrento Beach (145); collectors: B. R. Wilson and R. W. George; January 10, 1962; Cate coll. no. C 3404.

Four animals (2 of them subadult) were collected in 12 feet of water, living on orange sponge and *Pinna* shells; Cockburn, off Woodmans Point on the *Parmelia* Bank; collector: N. Mills, St. James Park, West Australia; February 1964; Cate coll. no. C 3405.

Much has been written about these shells, including the broad forms occurring in southwestern Australia east of Cape Leeuwin. However, it is interesting to note that HEDLEY (1916) did not mention this species while listing the mollusks of Western Australia.

In recent years a concerted effort has been made to ascertain the exact number of cypraeid species now living in the West Australian coastal waters. Concurrently, a study of the ranges of their occurrence has been carried on as well. Pertinent to this report has been the consideration of this particular species and its development and living aspects, as we were able to find them. It was noted that *Zoila friendii* and its variations (excluding the subspecies *Z. f. thersites* (GASKOIN, 1849) and its color variant named *contraria* by IREDALE in 1935, appears to range from Esperance, in southwest Australia, northward along the west coast to an obscure point to the north of Sorrento Beach.

It should be noted that the largest specimens of *Zoila friendii friendii* (Cate coll. no. C 3404: 99.5 51.5 38.3 28 7) seem to be found in shallow water (10 feet) about $\frac{3}{4}$ mile offshore at Sorrento Beach. The specimens exhibit no hint of change in shell form at this locality where the species approaches the northern end of its range. Shells here possess the typical rudimentary abapical columellar teeth, which are large and stubby.

Recent discovery has brought to light a new cowrie form living in the deep waters west of Shark Bay. In 1965 the brothers William and Wilfred Poole, fishing out of Fremantle, were trawling in the area west of the Dorre-Bernier-Koks Island chain (25° 00' S Long.; 113° 08' E Lat.), approximately 40 miles west of Carnarvon. Along with the outer peninsula of Denham Sound and Dirk Hartog Island, these islands form the western perimeter of Shark Bay. It is said the Poole brothers found 10 shells in about 60 fathoms of water. It is further believed other specimens have since been taken from this area. WILSON

& SUMMERS (1966) list specimens as having been taken "off Geraldton," and from False Entrance (False Entrance is 12 miles south of Steep Point, which marks the southern shoreline of South Passage; South Passage is the waterway separating the mainland and Dirk Hartog Island).

On examination, the Dorre-Bernier-Koks Island shells appear to be morphologically distinct from those found at Sorrento Beach. I have compared them with 31 shells in my collection, among which are specimens representing most of the known localities for this species on the southwest coast and east into South Australia. In addition, I was able to examine the shells in both the South Australian Museum, Adelaide, and the West Australian Museum, Perth. Except for the obvious morphological change as observed in the South Australian *Zoila friendii vercoi* (Plate 23, Figure 11), the species elsewhere was noteworthy for its normally uniform shell shape and apertural count and arrangement. Even so, despite this broader shell growth in the south coast shells, they are all typical *Z. f. friendii* in general overall shape and dentition.

The Dorre-Bernier-Koks Island shells, on the other hand, are not typical, in my opinion. I have examined 6 of these shells and find them to be distinctly different from any other allopatric form in the *Zoila friendii* species complex. The differences will be discussed further in the following subspecies.

3. *Zoila friendii jeaniana* CATE, subsp. nov.
(Plate 24, Figure 13)

Localities: 62a, 68, 71a, 83

Shell large, strong, lightweight, humped, globular-ovate; base sloping inward from outer margins; lip base flat, columellar base perceptibly convex; terminals prominent, thin-sided, sharply edged, and more thickly and roundly formed in front; margins acutely angled, only thinly caloused, vertically broad, with granular texture; aperture straight, curving abruptly left adapically; teeth numerous, medium in length, strong, well defined, particularly on abaxial margin of fossula; fossula deep, without denticles, milk-white in color; primary shell color on dorsum light grey, with approximately three narrow white transverse bands, all of which can be seen through an irregular outer layer of light chestnut-brown, which becomes an irregular, darker color immediately above the lateral margin; broad margins are off-white, with faint touches of beige, loosely marked otherwise with large, dark brown spots; base dark chestnut-brown, with same coloring extending over half the length of teeth and interstices; other half of teeth and interstices off-white.

Zoila friendii jeaniana differs from *Z. f. friendii* (GRAY, 1831) in being a shorter, broader, more humped, more globular-ovate shell; in having a full complement of

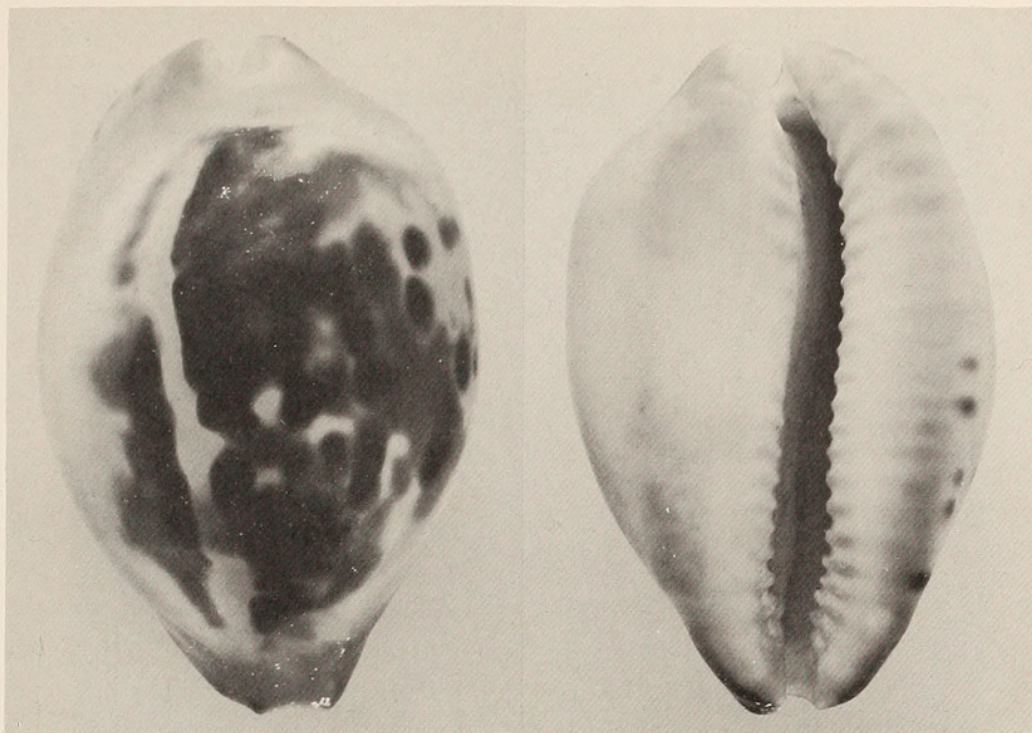


Figure 1
Bernaya catei SCHILDER, 1963 (holotype) x 1

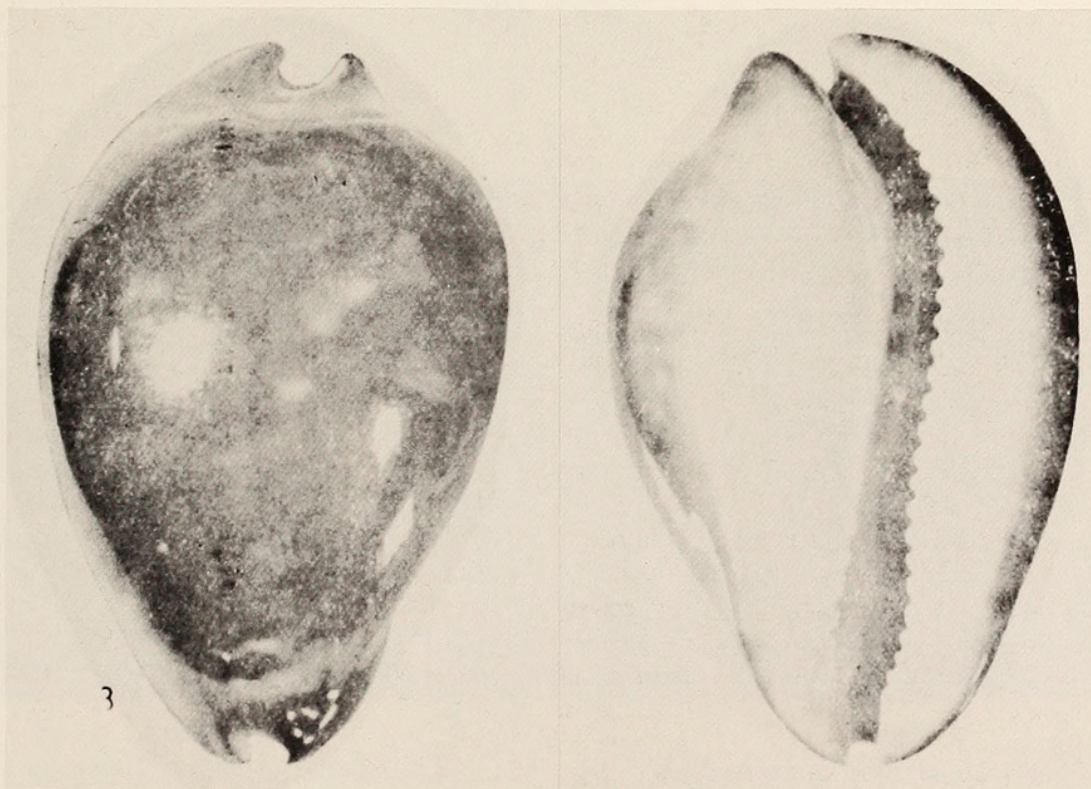
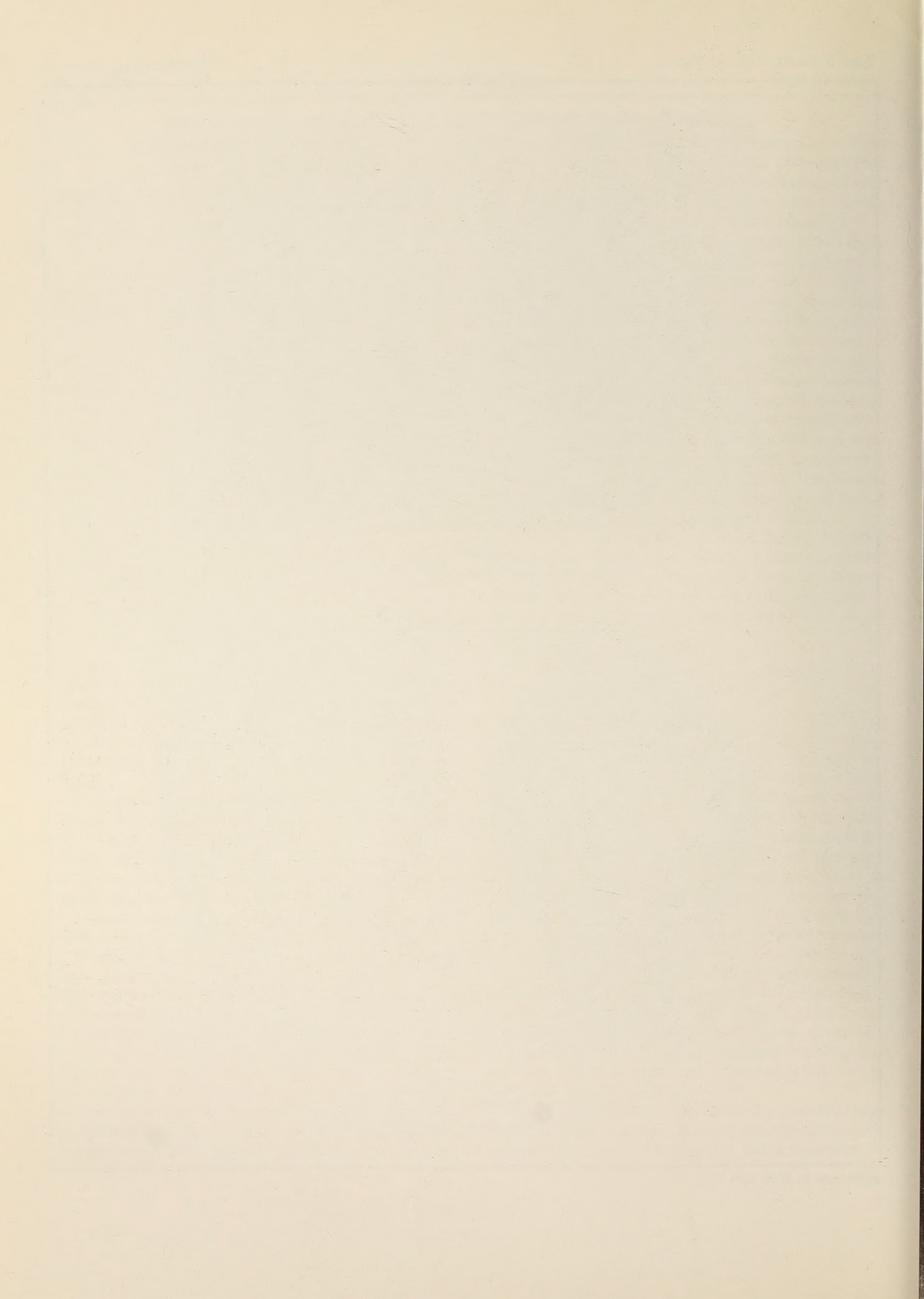


Figure 2
Zoila episema IREDALE, 1939 (holotype) x 1
= *Zoila venusta* (SOWERBY, 1846)



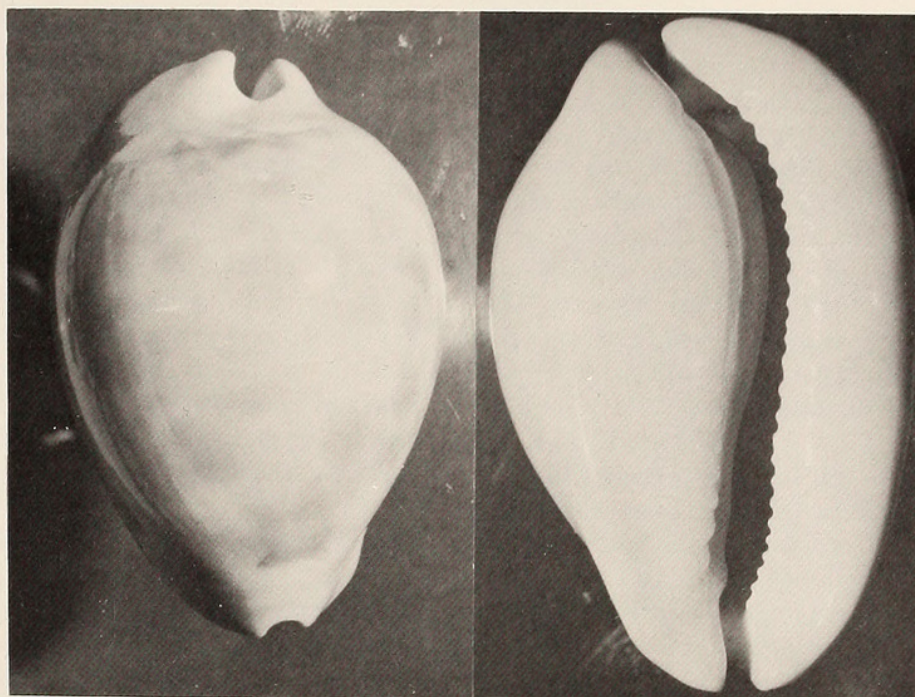


Figure 3
Zoila venusta (SOWERBY, 1846) x 1
(Color Variant)

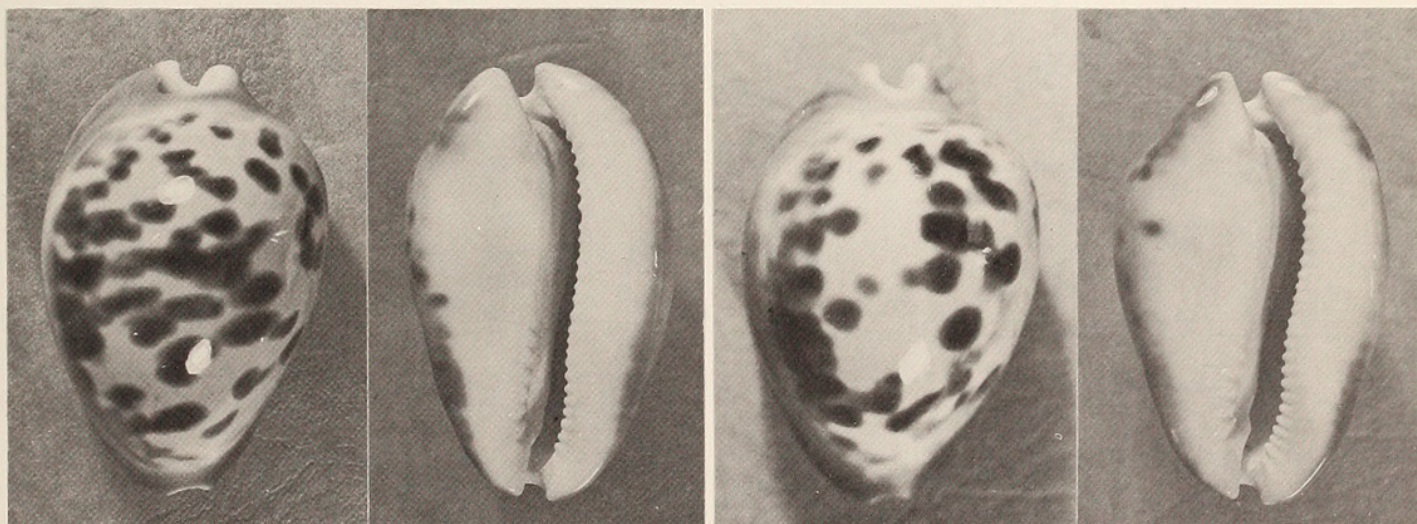
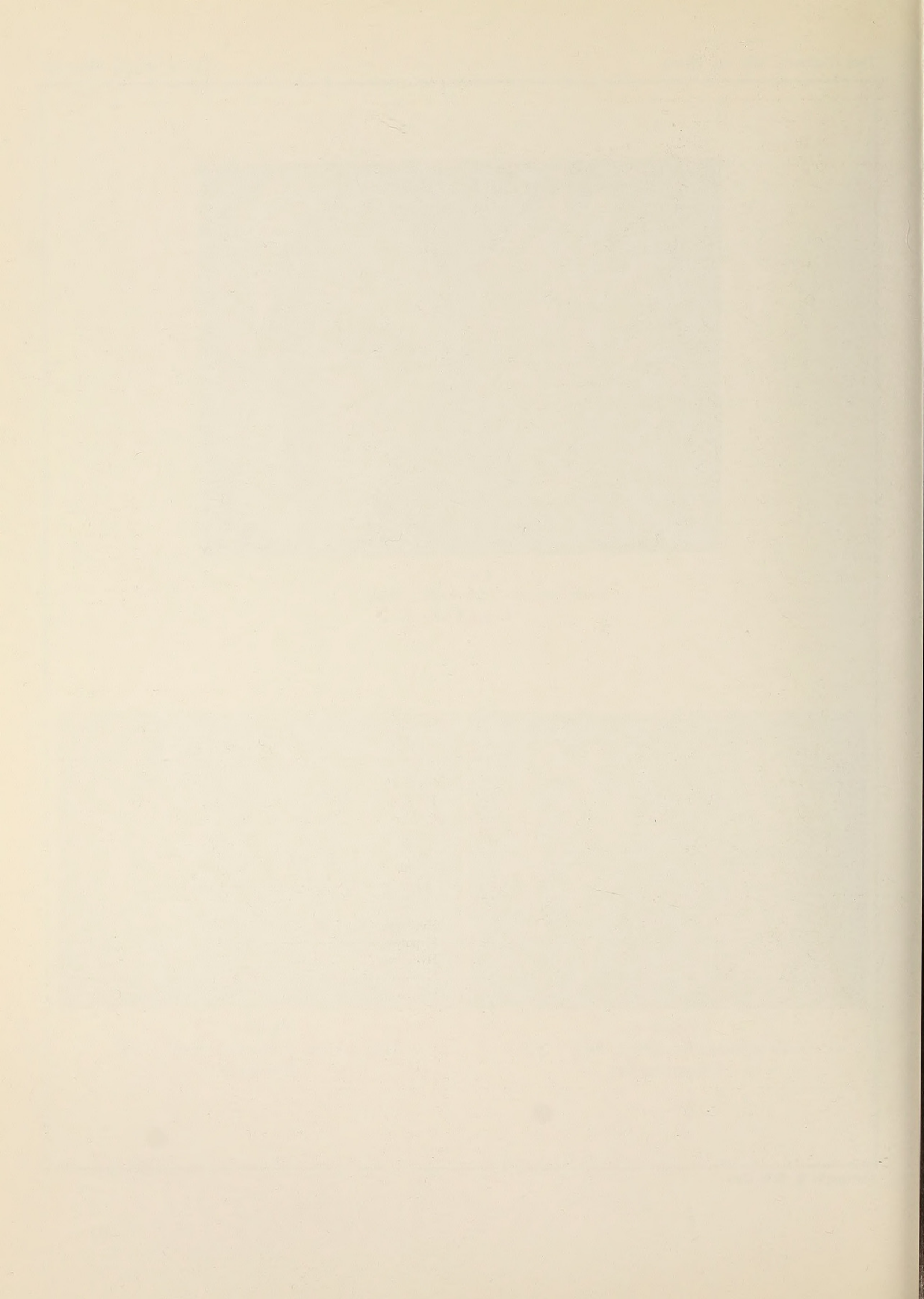


Figure 4
Zoila venusta (SOWERBY, 1846) x $\frac{1}{2}$
Geographe Bay

Figure 5
Zoila venusta (SOWERBY, 1846) x $\frac{2}{3}$
Binningup



teeth on both lip and columella; in having broad off-white lateral margins with large brown spots; in having, in some specimens, an abruptly curved adapical terminal opening; in having an unusual color pattern in the dorsal nacre.

Zoila friendii jeaniana differs from *Z. friendii thesites* (GASKOIN, 1849), a subspecies restricted almost entirely to South Australia, by a more pyriform, globular-ovate shell; by the base and part of the teeth being all brown; by the broad off-white spotted margins; and by the more numerous teeth on the apertural edges.

The holotype will be deposited in the West Australian Museum, where it will bear the catalogue number WAM 1320-67. This new form of *Zoila friendii* has been named in honor of Mrs. Jean Cate, Los Angeles, whose contributions to malacology and its literature are well known.

A further consideration of consequence is a geographical separation between the living areas of the new form and the nominate species, *Zoila friendii friendii* from Sorrento Beach of approximately 500 miles. It seems probable that somewhere between these two localities there may be an overlapping in the ranges of the two subspecies. This possibility can be seen in the specimen listed

as hypotype no. 5 (85.8 52.0 43.0 31 29) from Green Head, which is about 100 miles north of Sorrento Beach. It possesses some morphological affinity to *Z. f. friendii*, yet at the same time displaying more of the shell characters of *Z. f. jeaniana*, suggesting that the Green Head area could be the point of change in the species.

The specimen from Green Head seems to be analogous to the pale color forms of *Zoila venusta* and *Z. friendii thesites* (the color form of the latter subspecies known as "*Z. contraria*" IREDALE, 1935). The pale form of *Z. f. jeaniana* is a pale off-white with pale beige, irregular markings, shading to a more intense pale orange color on either side of both terminals; the base is milk-white, and the teeth are numerous.

Since having completed this report 3 additional specimens have come to hand; one was trawled in deep water off Quobba Point. Jack Allen, a fisherman, of Babbage Island off Carnarvon, was the collector (June 1967), and the specimen was a gift to me from Mr. George Barker of Geraldton. This shell (68.5 45.5 38.3 32 27), Cate coll. no. C 3504, will be identified as hypotype no. 2. The other two animals were trawled at 30 fathoms, 4 miles west of Quobba Point, July 1, 1967 (collector not deter-

Table 1

Measurements (in millimeters) and other data, for comparison								
Species	Length	Width	Height	Lip Teeth	Col. Teeth	Locality	Specimen Ident.	Disposition of Shells
<i>Zoila friendii jeaniana</i>								
subspec. nov.	75.7	50.0	40.7	33	29	83	Holotype	West Australian Museum no. WAM 1320-67
	75.6	50.5	41.4	32	17+	83	Paratype 1	Ned Harrold coll., Perth
(subadult)	67.4	45.3	39.0	28	26	83	Paratype 2	Anthony Kalnins, Mayfields, W. A.
	73.1	47.6	39.0	28	22	83	Paratype 3	Theodore Gurr, Carlisle, W. A.
	69.3	45.2	36.1	28	21	83	Paratype 4	Theodore Gurr, Carlisle, W. A.
	85.8	52.0	43.0	31	29	71a	Hypotype 1	Ned Harrold, Victoria Park, W. A.
<i>Zoila friendii friendii</i>								
	99.3	51.6	38.3	27	7	145	Hypotype 1	Cate coll. no. C 3404
	70.9	41.0	34.0	27	7	172	Hypotype 2	Cate coll. no. C 3497
	72.4	37.4	29.5	21	6	172	Hypotype 3	Cate coll. no. C 3497
	73.8	38.6	31.1	25	8	61a	Hypotype 4	Cate coll. no. C 1712
	73.4	38.0	31.0	27	7	61a	Hypotype 5	Cate coll. no. C 1712
	80.0	40.0	31.0	25	7	121a	Hypotype 6	Cate coll. no. C 3498
	78.9	41.8	34.5	27	12	95	Hypotype 7	Cate coll. no. C 1711
	68.5	36.0	28.6	24	11	95	Hypotype 8	Cate coll. no. C 1711
	92.6	49.9	37.0	30	10	25a	Hypotype 9	Cate coll. no. C 3499
	78.0	41.0	32.8	25	9	25a	Hypotype 10	Cate coll. no. C 3499
<i>Zoila friendii vercoi</i>								
	83.3	53.1	39.0	26	10	2a	Hypotype 1	Cate coll. no. C 1706
	76.8	49.2	35.4	24	9	59a	Hypotype 2	Cate coll. no. C 3500
	73.8	44.0	34.3	22	5	59a	Hypotype 3	Cate coll. no. C 3501

mined). These are from the Ned Harrold collection, Victoria Park, West Australia. They are the hypotypes no. 3 (68.0 46.8 35.7 29 27) and no. 4 (63.9 42.0 33.1 33 26).

The 9 shells of this new taxon that I have seen give a convincing indication that it should be considered a distinct species rather than only a subspecies; but until we know more about the animal's soft parts and radula and its still unknown habitat and geographical distribution, it seems best to take a conservative approach and consider it a subspecies of *Zoila friendii*.

4. *Zoila venusta* (SOWERBY, 1846)
(Plate 21 Figure 2 to Plate 23, Figure 10)

Syn.: *C. venusta* var. SOWERBY, 1846 = *Cypraea thatcheri* COX, 1869

Z. episema IREDALE, 1939

Z. sorrentensis SCHILDER, 1963

Localities: 14, 18, 20, 36, 39, 40, 42, 52, 65, 67, 71, 78, 79, 88, 97, 101, 145, 154, 163
(77.7 49.5 21.7 25 9)

CATE (1964, p. 22, no. 42)

Three specimens were found in 8 to 30 feet of water at Sorrento Beach (145), living on green algae under reef ledges, by N. Mills, St. James Park, West Australia in March 1963; Cate coll. no. C 3409. Another specimen, Cate coll. no. C 3410, was removed from a crayfish pot set in 19 fathoms, 5 miles west of Rat Island (130) by Joseph Burton, Geraldton, in August 1964. Still another specimen, Cate coll. no. C 3406, was collected by fisherman Gordon McAulley, Geraldton, in January 1965 from a crayfish pot set in 28 fathoms about 22 miles west of Dongara (52). Two specimens were collected in 20 feet of water with SCUBA gear, 12 miles south of Mandurah (97) in 1961; Cate coll. no. C 3408. One animal was found living in a marine cave at 10 fathoms off Binningup (20) in January 1964; ex. Edward Nickles, Mandurah; Cate coll. no. 3194. Yet another animal was found on the ceiling in a limestone cave in 30 feet of water at Rottnest Island (131), adjacent to the wreck of the ship *Macedon*; kelp and other seaweed was present; the collector was William Hill, Rottnest Island; October 1963; Cate coll. no. C 3023.

In CATE (1962), after examination of many specimens of *Zoila venusta*, and observing the gradual change in shell size and structure throughout its range, I was convinced that there was but one species involved, but with different local ecological variations to be seen at progressive localities. Shells in my collection, and those recently seen in the South Australian Museum, the West Australian Museum, and in numerous private collections (one of which contained approximately 40 specimens from the Sorrento Beach-Reef area!) in West Australia, appear

very definitely to have close affinity, all seeming to possess a common species character. The morphological change commences immediately, starting at Geographe Bay (see Plate 22, Figure 4), becoming obvious in the area of Binningup (Plate 22, Figure 5), then Mandurah (Plate 23, Figure 6), Rottnest Island (Plate 23, Figure 7), and attaining the greatest change in the waters just north of Fremantle, Sorrento Beach (Plate 23, Figure 8) to Jurien Bay (Plate 23, Figure 9), then receding back to "normal" size and shape at Dongara, Geraldton, Abrolhos Islands (Plate 23, Figure 10), and north to the Dampier Islands.

The point of recession from the Sorrento Beach-Reef area variation seems to commence in the waters of Jurien Bay, and noticeably so at Dongara. It is true, the shells from north of Geraldton appear more bulbous, darker in color, and with a pinched, often-times narrower base and aperture (see Plate 23, Figure 10). It would seem that none of the various changes in the shell, including the pale pinkish-beige to off-white variants (Plate 22, Figure 3) collected at Cervantes Island and Geographe Bay, are sufficient to justify considering them as more than localized variants. This appears to be particularly true because of the continuous range of the species, with no distinct natural barriers to interbreeding.

I have examined the pale colored shell variants collected at Cervantes Island (1) and Geographe Bay (3), one of these 3 in my own collection (no. C 3502: 73.2 48.3 38.8 25 13) that was trawled in 40 fathoms of water in 1950 by an unidentified Dutch fisherman. Mr. A. R. Whitworth obtained this shell from Arthur Bassett of Denham, Shark Bay, in 1960. The Cervantes specimen is in the Ned Harrold collection, Victoria Park; the other 2 of the 3 specimens from Geographe Bay are in the George Barker collection, Geraldton, and the Trevor Sutcliffe collection (see SCHILDER, 1966), Mount Yokine, Western Australia.

5. *Zoila marginata* (GASKOIN, 1849)
(Plate 24, Figure 14)

Localities: 2a, 3, 8, 30a, 34a, 36, 52, 53, 57, 67, 68, 71, 71b, 78, 83, 89, 118, 147, 151, 152, 162, 163, 180
(51.8 31.0 24.9 27 22)

CATE (1964, p. 23, no. 49)

A specimen was removed from a crayfish pot set at 28 fathoms 7 miles south of Long Island (94), ex Max Cramer, Geraldton; October 1953; Cate coll. no. C 2516. Another animal was removed from a crayfish pot set in 22 fathoms off Dongara (52) in September 1963. The collector was fisherman F. I. "Sonny" Healy, Dongara and the shell is in his collection. Still another specimen was found in a crayfish pot that had been set in 20 fathoms off Leander Reef (53), WSW of Dongara, collected by fisherman Edward Seabrook, Fisheries Department, Perth.

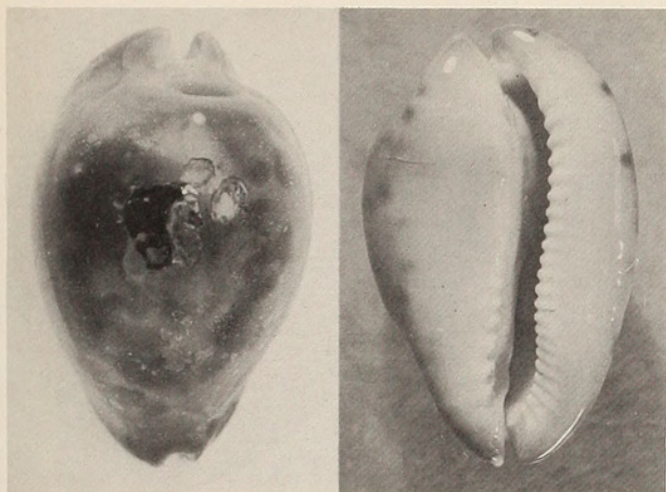


Figure 6
Zoila venusta (SOWERBY, 1846) $\times \frac{2}{3}$
Mandurah

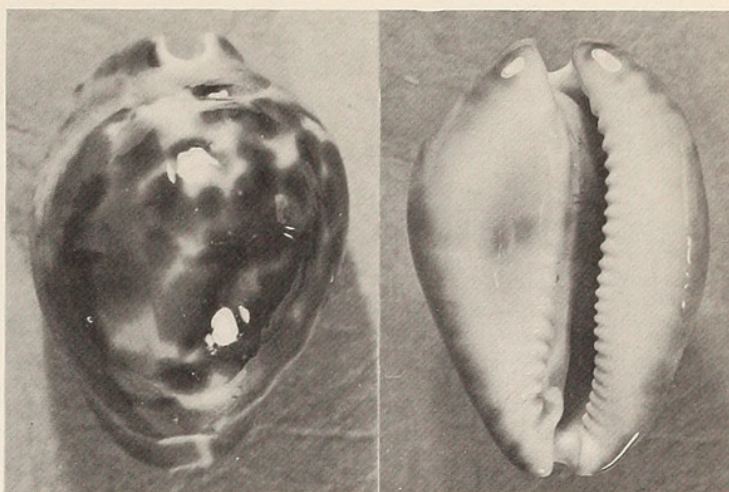


Figure 7
Zoila venusta (SOWERBY, 1846) $\times \frac{2}{3}$
Rottneest Island

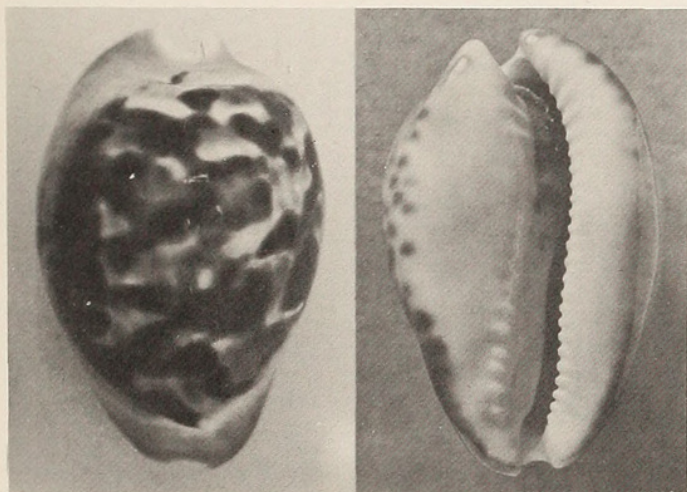


Figure 8
Zoila venusta (SOWERBY, 1846) $\times \frac{2}{3}$
Sorrento Reef

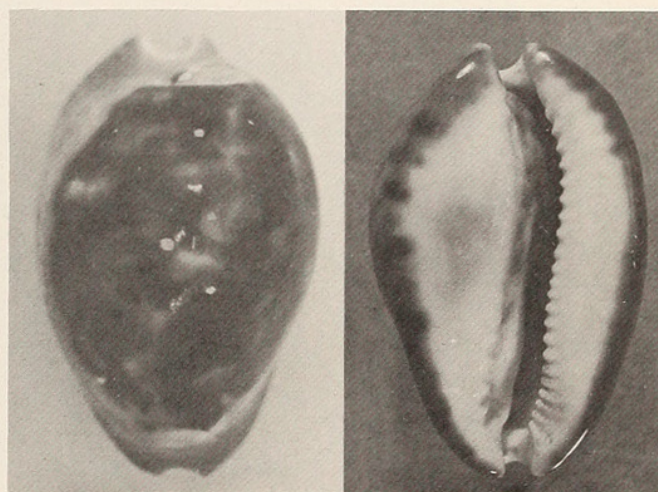


Figure 9
Zoila venusta (SOWERBY, 1846) $\times \frac{2}{3}$
Jurien Bay

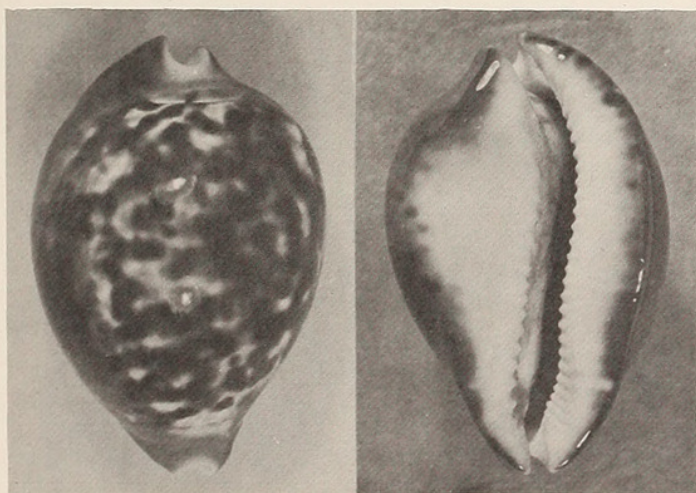


Figure 10
Zoila venusta (SOWERBY, 1846) $\times \frac{1}{2}$
Rat Island, Abrolhos

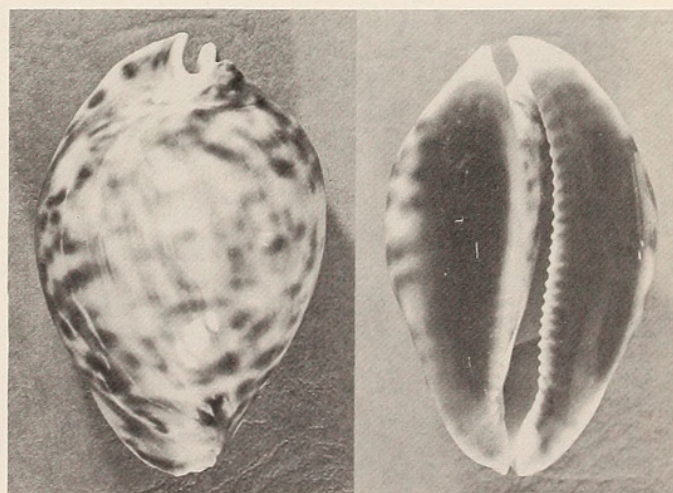
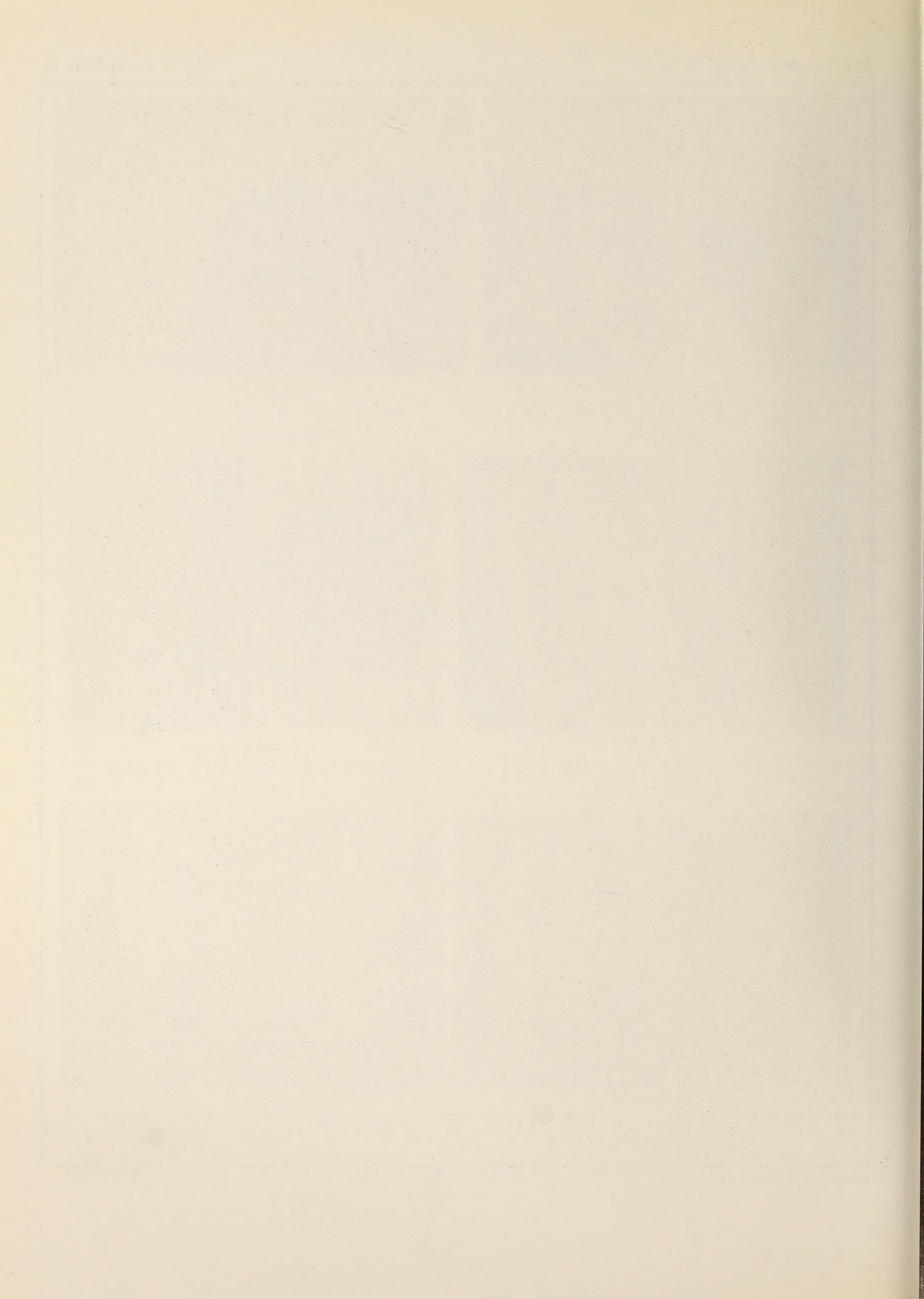


Figure 11
Zoila friendii vercoi SCHILDER, 1930 $\times \frac{1}{2}$
Albany, South Australia



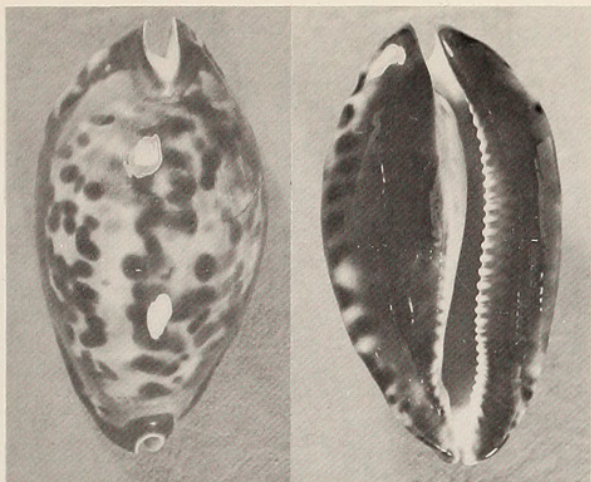


Figure 12
Zoila friendii friendii (GRAY, 1831) $\times \frac{1}{2}$
Geographe Bay

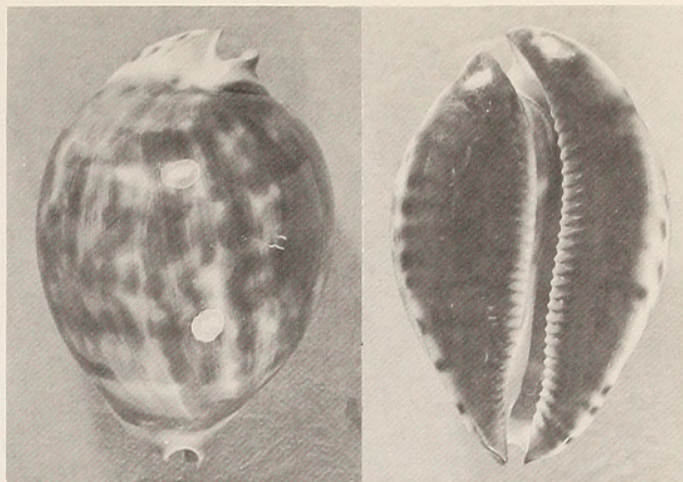


Figure 13
Zoila friendii jeaniana subsp. nov., $\times \frac{1}{2}$
Koks Island, West Australia

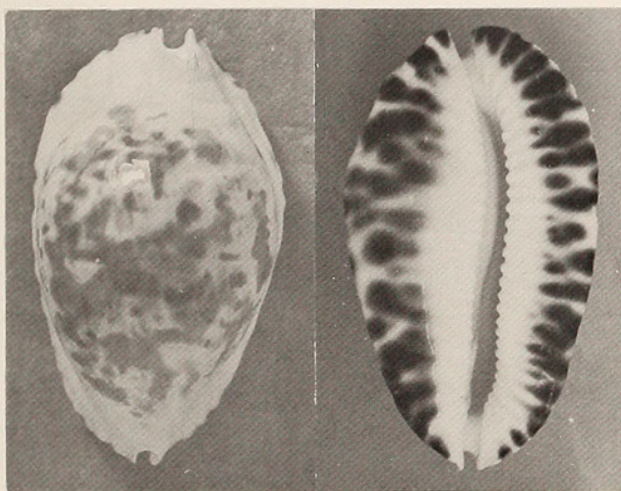


Figure 14
Zoila marginata (GASKOIN, 1849) $\times 1$
Long Island, Abrolhos

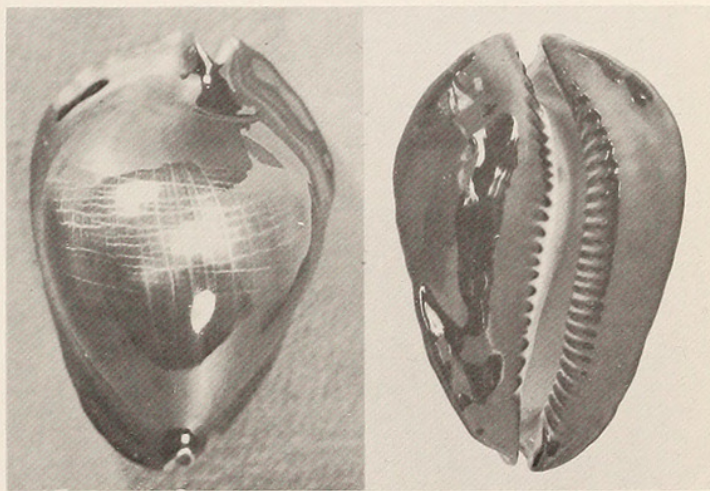


Figure 15
Zoila rosselli COTTON, 1948 $\times 1$
Rat Island, Abrolhos

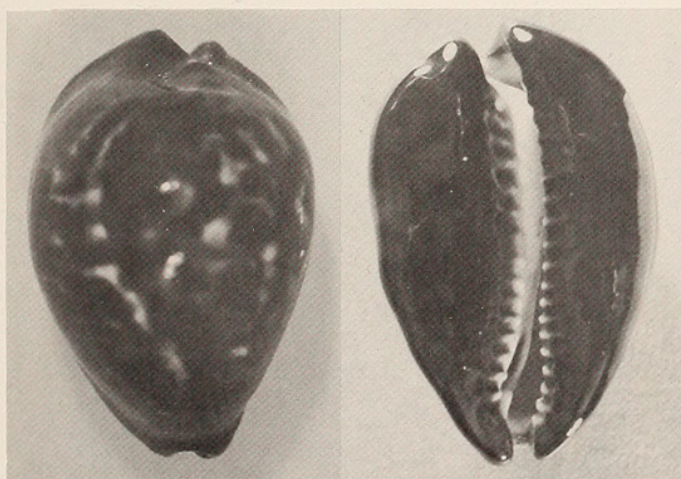


Figure 16
Zoila decipiens (E. A. SMITH, 1880) $\times 1$
Gourdon Bay, West Australia

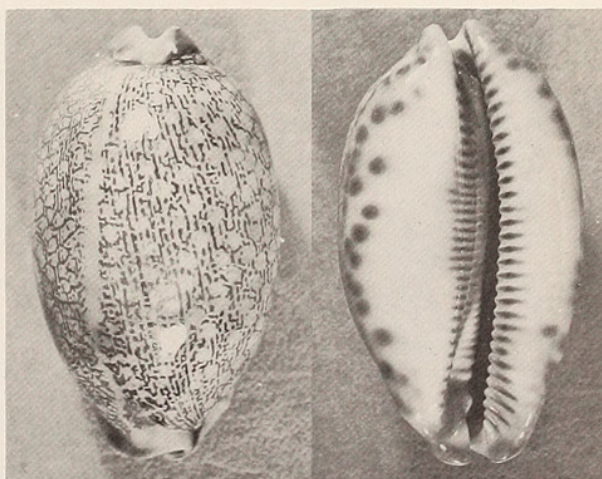


Figure 17
Mauritia eglantina perconfusa IREDALE, 1935 $\times \frac{2}{3}$
Roebuck Bay, West Australia





Cate, Crawford Neill. 1968. "Western Australian cowries. A second, revised and expanded report." *The veliger* 10, 212-232.

View This Item Online: <https://www.biodiversitylibrary.org/item/134168>

Permalink: <https://www.biodiversitylibrary.org/partpdf/93459>

Holding Institution

Smithsonian Libraries and Archives

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: In Copyright. Digitized with the permission of the rights holder.

Rights Holder: California Malacozoological Society

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://www.biodiversitylibrary.org/permissions/>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.