Studies on East Australian Cowries

BY

MARIA SCHILDER

AND

FRANZ ALFRED SCHILDER

University of Halle, German Democratic Republic

DURING THESE LAST YEARS we have examined 8300 cowrie shells coming from 170 localities in the area between Cooktown, Kenn Reef (SCHILDER, 1966) and Sydney: this multitude of cowries with exact locality data allows a special study on the cowrie fauna of East Australia in the true sense, as we have excluded the Torres Straits, southern New South Wales, and the Lord Howe Islands.

The investigated area comprises the areas QUE 47q, 47c, 47b and the northern half of 47s in SCHILDER, 1965, page 175.

We are much indebted to the following malacologists some of whom presented or lent us large series of cowries collected in restricted localities: W. O. Cernohorsky, Vatukoula (Fiji), Miss D. Constantine, Cowes (Victoria), *C. Coucom, Yeppoon (Queensland), R. J. Griffiths, Port Macquarie (New South Wales), Mrs. E. D. Harton, Coff's Harbour (N. S. W.), *W. Hart-Smith, North Sydney (N. S. W.), *G. Houston, Mackay (Qld.), *W. Krause, Avoca Beach (N. S. W.), *Mrs. M. Lee, Maroochydore (Qld.), *Mrs. K. M. Matcott, Dromana (Victoria), *A. Schelechoff, Brisbane (Qld.), S. R. Shadlow, Mermaid Beach (Qld.), R. Summers, Petaluma (California), *Mrs. E. Tautorat, Hayman Island (Qld.), *K. Uetz, Vienna (Austria). Collectors distinguished with an asterisk (*) have supplied us with the ten local sets each exceeding 250 shells which will be treated in Table 3.

Total Frequency of Species

Table 1 comprises the following columns:

1 = total number of examined specimens coming from East Australia;

2 = number of specimens represented in 10 large sets from restricted localities, each set including at least 250 shells;

3 = name of genus and species (or prospecies) according to SCHILDER, 1967 [1];

---

[1] The generic name Cribraria JOUSSEAUME, 1884 is preoccupied by

4 = column 1 (East Australia) expressed in per cent of the total 8300;

5 = column 2 (10 large sets) expressed in per cent of the total 5936.

In columns indicating the percentage of shells, i. e. in the columns 4 and 5 of Table 1 and in all columns of Tables 3 to 6

the figure 0 indicates "less than $\frac{1}{2}\%$,"

the sign – indicates total absence, and

figures printed in **boldface italics** indicate "characteristic species," i. e. the most common species the total number of which just exceeds 50% of the collected specimens.

The six "characteristic species," i. e. the most frequent species the total number of which just exceeds 50% of all East Australian cowries collected, are identical with those represented in the total of the 10 largest sets, and even the percentage of specimens is very similar: their percentage among the total of 8300 shells (67 species) and among the 10 sets containing 5936 shells (63 species) is illustrated in Table 2.

Though this conformity may be explained by the great influence of the 10 sets over the total (of which the sets constitute 72%), the Table 2 shows that the sum of the 10 sets can be considered as a good representative of the East Australian cowrie fauna.

Frequency in Different Localities

The 10 large sets each exceeding 250 specimens seem to represent random samples from restricted localities. The

---

Cribraria GMELIN, 1792 and PERSOON, 1794; though the latter genus is now considered to belong to plants (Myxomycetes), its members often have been treated as animals ("Mycetozoa") before 1884 so that STRAND, 1929 (Acta Univ. Latviensis 20: 8) was correct to rename the cowrie genus by the name Cribrarula (see International Rules of Zoological Nomenclature, 1958, art. 2 b).

Table 1

1	2	3	4	5
		Mauritia		
3	2	*mappa* (LINNAEUS, 1758)	0	0
275	230	*eglantina* (DUCLOS, 1833)	3	4
242	115	*arabica* (LINNAEUS, 1758)	3	2
4	3	*mauritiana* (LINNAEUS, 1758)	0	0
6	2	*scurra* (GMELIN, 1791)	0	0
		Talparia		
20	19	*talpa* (LINNAEUS, 1758)	0	0
		Cypraea		
13	12	*tigris* LINNAEUS, 1758	0	0
		Lyncina		
11	8	*argus* (LINNAEUS, 1758)	0	0
224	173	*lynx* (LINNAEUS, 1758)	3	3
278	216	*vitellus* (LINNAEUS, 1758)	3	4
197	164	*carneola* (LINNAEUS, 1758)	2	3
		Chelycypraea		
1	–	*testudinaria* (LINNAEUS, 1758)	0	–
		Luria		
81	72	*isabella* (LINNAEUS, 1758)	1	1
		Pustularia		
1	–	*mariae* SCHILDER, 1927	0	–
20	20	*globulus* (LINNAEUS, 1758)	0	0
30	29	*margarita* (DILLWYN, 1817)	0	1
81	78	*cicercula* (LINNAEUS, 1758)	1	1
35	1	*bistrinotata* SCHILDER & SCHILDER, 1937	0	0
		Monetaria		
385	281	*annulus* (LINNAEUS, 1758)	*5*	*5*
214	200	*moneta* (LINNAEUS, 1758)	3	4
		Erosaria		
242	199	*labrolineata* (GASKOIN, 1849)	3	4
15	11	*tomlini* SCHILDER, 1930	0	0
13	8	*helvola* (LINNAEUS, 1758)	0	0
346	270	*caputserpentis* (LINNAEUS, 1758)	*4*	*5*
7	4	*poraria* (LINNAEUS, 1758)	0	0
568	444	*erosa* (LINNAEUS, 1758)	7	*8*
2	2	*miliaris* (GMELIN, 1791)	0	0
12	7	*eburnea* (BARNES, 1824)	0	0
		Staphylaea		
173	147	*staphylaea* (LINNAEUS, 1758)	2	3
78	71	*limacina* (LAMARCK, 1810)	1	1
		Nuclearia		
83	73	*nucleus* (LINNAEUS, 1758)	1	1
		Schilderia		
4	4	*moretonensis* SCHILDER, 1965	0	0
1	1	*queenslandica* SCHILDER, 1966	0	0
		Umbilia		
5	1	*hesitata* (IREDALE, 1916)	0	0
		Erronea		
25	6	*walkeri* (SOWERBY, 1832)	0	0
5	–	*pyriformis* (GRAY, 1824)	0	–
10	10	*coucomi* SCHILDER, 1964	0	0
1117	658	*xanthodon* (SOWERBY, 1832)	*13*	*11*
161	104	*subviridis* (REEVE, 1835)	2	2

1	2	3	4	5
		Erronea (continued)		
1	–	*ovum* (GMELIN, 1791)	0	–
1157	747	*errones* (LINNAEUS, 1758)	*14*	*12*
64	29	*cylindrica* (BORN, 1778)	1	0
251	208	*caurica* (LINNAEUS, 1758)	3	4
218	137	*listeri* (GRAY, 1824)	3	2
		Notadusta		
16	4	*punctata* (LINNAEUS, 1771)	0	0
2	1	*martini* (SCHEPMAN, 1907)	0	0
1	1	*hartsmithi* SCHILDER, 1967	0	0
		Palmadusta		
57	35	*asellus* (LINNAEUS, 1758)	1	1
195	166	*clandestina* (LINNAEUS, 1767)	2	3
6	1	*saulae* (GASKOIN, 1843)	0	0
2	1	*contaminata* (SOWERBY, 1832)	0	0
47	34	*humphreysii* (GRAY, 1825)	1	1
3	2	*ziczac* (LINNAEUS, 1758)	0	0
		Purpuradusta		
727	534	*gracilis* (GASKOIN, 1849)	*9*	*9*
28	24	*hammondae* (IREDALE, 1939)	0	0
29	17	*minoridens* (MELVILL, 1901)	0	0
8	3	*microdon* (GRAY, 1828)	0	0
		Blasicrura		
52	27	*quadrimaculata* (GRAY, 1824)	1	0
138	128	*pallidula* (GASKOIN, 1849)	2	2
25	19	*teres* (GMELIN, 1791)	0	0
		Bistolida		
31	12	*kieneri* (HIDALGO, 1906)	0	0
64	45	*hirundo* (LINNAEUS, 1758)	1	1
5	2	*ursellus* (GMELIN, 1791)	0	0
144	90	*stolida* (LINNAEUS, 1758)	2	2
		Ovatipsa		
6	4	*chinensis* (GMELIN, 1791)	0	0
		Cribrarula		
32	19	*cribraria* (LINNAEUS, 1758)	0	0
3	1	*catholicorum* SCHILDER & SCHILDER, 1938	0	0

Table 2

most frequent species	total	10 sets
Erronea		
errones (LINNAEUS, 1758)	14%	12%
xanthodon (SOWERBY, 1832)	13%	11%
Purpuradusta		
gracilis (GASKOIN, 1849)	9%	9%
Erosaria		
erosa (LINNAEUS, 1758)	7%	8%
Monetaria		
annulus (LINNAEUS, 1758)	5%	5%
Erosaria		
caputserpentis (LINNAEUS, 1758)	4%	5%
sum of six species	52%	50%

localities have been arranged from North to South and are designated by the letters Q to Z as follows:

Q = Holborn Island (*leg.* Coucom, 1965) : 528 shells;

R = Hayman Island (*leg.* Uetz, 1959 and Tautorat, 1963) : 731 shells;

S = Penrith Island (*leg.* Houston, 1962) : 472 shells (see SCHILDER & HOUSTON, 1964) ;

T = Middle Island (*leg.* Coucom, 1964 and 1965) : 399 shells;

U = Humpy Island (*leg.* Coucom, 1963 and 1964) : 664 shells;

V = One Tree Island (*leg.* Coucom, 1966) : 1155 shells (see COUCOM & SCHILDER, 1967) ;

W = Maroochydore (*leg.* Lee, 1963) : 453 shells;

X = Mooloolaba (*leg.* Matcott, 1963) : 349 shells;

Y = Moreton Bay (*leg.* Schelechoff, mostly 1964) : 930 shells;

Z = Avoca Beach (*leg.* Krause, 1962-1966) and Sydney area (*leg.* Hart-Smith, 1966) : 255 shells.

The locality Q is situated North off Bowen; R is the northern border of the Whitsunday Group North of Mackay, S is its southern border; T and U are in the Keppel Bay off Yeppoon rather close to the coast (both are reefs bordering the Great Keppel Island in the North and the South, only 10 km apart), whereas V is 70 km off Cape Capricorn in the Barrier Reef; W and X represent practically the same beach South-East of Gympie; Y refers chiefly to the West coast of Stradbroke Island; Z comprises several beaches North of Sydney from Norah Heads to Port Jackson.

Table 3 shows the similarities and the differences be-

Table 3

species	Q	R	S	T	U	V	W	X	Y	Z
Mauritia										
eglantina (DUCLOS, 1833)	3	*12*	*12*	2	2	4	–	1	0	–
arabica (LINNAEUS, 1758)	0	1	–	4	3	5	1	1	1	1
Lyncina										
lynx (LINNAEUS, 1758)	1	*12*	*10*	–	–	3	–	0	0	0
vitellus (LINNAEUS, 1758)	2	*10*	4	–	–	5	1	1	0	*17*
carneola (LINNAEUS, 1758)	9	1	0	–	–	7	1	1	1	1
Luria										
isabella (LINNAEUS, 1758)	6	3	–	–	0	1	–	–	0	–
Pustularia										
margarita (DILLWYN, 1817)	5	1	–	–	–	–	–	–	–	–
cicercula (LINNAEUS, 1758)	8	4	–	–	0	0	–	–	–	–
Monetaria										
annulus (LINNAEUS, 1758)	1	9	9	2	–	8	2	1	5	4
moneta (LINNAEUS, 1758)	0	0	7	–	–	7	2	4	4	7
Erosaria										
labrolineata (GASKOIN, 1849)	*11*	1	–	–	0	4	4	–	6	5
caputserpentis (LINNAEUS, 1758)	0	1	5	0	–	7	9	7	3	29
erosa (LINNAEUS, 1758)	6	8	*10*	2	4	7	6	5	*12*	*16*
Staphylaea										
staphylaea (LINNAEUS, 1758)	0	1	–	–	0	2	3	4	*10*	–
limacina (LAMARCK, 1810)	0	1	–	–	–	0	0	0	6	–
Nuclearia										
nucleus (LINNAEUS, 1758)	*11*	1	–	–	–	1	–	–	0	–
Erronea										
xanthodon (SOWERBY, 1832)	–	–	–	*34*	*45*	0	*21*	*19*	5	3
subviridis (REEVE, 1835)	–	1	–	1	6	–	1	1	5	1
errones (LINNAEUS, 1758)	5	*11*	*26*	*40*	*27*	8	5	2	6	1
caurica (LINNAEUS, 1758)	3	4	4	1	4	7	1	0	2	2
listeri (GRAY, 1824)	0	0	0	–	–	9	2	3	1	1
Palmadusta										
clandestina (LINNAEUS, 1767)	0	1	5	–	0	3	6	5	3	6
humphreysii (GRAY, 1825)	–	1	–	–	–	0	4	2	0	0
Purpuradusta										
gracilis (GASKOIN, 1849)	5	2	6	13	7	0	*21*	*31*	*16*	4
Blasicrura										
quadrimaculata (GRAY, 1824)	4	1	–	–	–	–	–	–	–	–
pallidula (GASKOIN, 1849)	6	3	0	–	–	6	–	–	–	–
Bistolida										
stolida (LINNAEUS, 1758)	2	1	–	1	1	0	7	9	–	–

tween the cowrie faunas collected at these 10 localities Q to Z. The figures indicate the percentage of species in each set. To facilitate comparison of the sets, the number of species has been restricted to 27 so that all rare species not exceeding 3% in any set have been omitted; but in the recorded species all data have been indicated even if the figures do not reach 4%; of course, the sums of these 10 columns never equal 100%. The figures for the "characteristic species" have been printed in boldface italics.

The figures entered in Table 3 seem to be rather haphazard as in most sets different cowries are the most frequent species. However, there are some cases of surprising regional regularity: thus, for instance, some species (*Mauritia arabica, Monetaria annulus, Erosaria erosa, Erronea caurica*) seem to be equally distributed in East Australia; other species (*M. eglantina, Lyncina lynx, Pustularia margarita + cicercula, Nuclearia nucleus, Erronea errones, Blasicrura quadrimaculata*) occur chiefly in the northern localities, two species (*Erronea xanthodon, Purpuradusta gracilis*) prefer the central area, while other species (*Erosaria caputserpentis, Staphylaea staphylaea, S. limacina*) become more frequent in the South; *Lyncina vitellus* and *Erosaria labrolineata* could be classified as bicentric. However, these conclusions obtained from 10 populations only seem to be premature.

At any rate, there is some similarity among adjacent localities; in T and U *Erronea xanthodon* and *E. errones* are prevalent, in W and X *Purpuradusta gracilis* and *E. xanthodon*, and even in R and S *E. errones, Mauritia eglantina, Lyncina lynx*.

The southernmost area Z with predominance of *Erosaria caputserpentis* (race *caputanguis* PHILIPPI), *Lyncina vitellus* and *E. erosa* (race *pulchella* COEN) seems to be very different from the other East Australian areas: the cowrie fauna is poor, as the other tropical species become rare and the South Australian species usually do not extend as far as the Sydney area; besides, we have observed that an unusually large percentage of beach shells is not fully grown so that unfavorable conditions may cause the premature death of the animals.

Frequency in Split Populations

The significance of the local differences illustrated by Table 3 may be checked by splitting some sets into two natural halves:

The set U (Humpy Island) is composed of two collections made in two subsequent years: 1963 (292 mostly fresh shells) and 1964 (372 mostly beach shells). The percentage of specimens collected in 1963 vs. those collected in 1964 (1963 : 1964) is illustrated in Table 4:

The figures exceeding 3% are very similar in both years, and the total absence of rare species in one year is only accidental; the 3 most frequent species are identical.

Table 4

U [Humpy Island]		
Mauritia		
eglantina (DUCLOS, 1833)	3 :	1
arabica (LINNAEUS, 1758)	4 :	2
Luria		
isabella (LINNAEUS, 1758)	0 :	–
Pustularia		
cicercula (LINNAEUS, 1758)	– :	0
bistrinotata SCHILDER & SCHILDER, 1937	0 :	–
Erosaria		
labrolineata (GASKOIN, 1849)	0 :	–
erosa (LINNAEUS, 1758)	5 :	4
Staphylaea		
staphylaea (LINNAEUS, 1758)	– :	0
Erronea		
xanthodon (SOWERBY, 1832)	*46* :	*45*
subviridis (REEVE, 1835)	5 :	7
errones (LINNAEUS, 1758)	*26* :	*27*
cylindrica (BORN, 1778)	– :	0
caurica (LINNAEUS, 1758)	4 :	4
Palmadusta		
clandestina (LINNAEUS, 1767)	– :	0
Purpuradusta		
gracilis (GASKOIN, 1849)	6 :	8
Bistolida		
hirundo (LINNAEUS, 1758)	0 :	–
stolida (LINNAEUS, 1758)	– :	1
Cribrarula		
cribraria (LINNAEUS, 1758)	– :	0

Both collections practically correspond each to the other.

The figures of collecting set T (Middle Island) in 1964 (295 shells) and in 1965 (104 shells) are illustrated in Table 5 in the same way:

Table 5

T [Middle Island]		
Mauritia		
eglantina (DUCLOS, 1833)	2 :	–
arabica (LINNAEUS, 1758)	6 :	–
Monetaria		
annulus (LINNAEUS, 1758)	1 :	2
Erosaria		
caputserpentis (LINNAEUS, 1758)	– :	1
erosa (LINNAEUS, 1758)	2 :	2
Erronea		
xanthodon (SOWERBY, 1832)	*34* :	*35*
subviridis (REEVE, 1835)	– :	3
errones (LINNAEUS, 1758)	*44* :	*32*
caurica (LINNAEUS, 1758)	1 :	–
Purpuradusta		
gracilis (GASKOIN, 1849)	10 :	22
Bistolida		
stolida (LINNAEUS, 1758)	– :	3

Probably on account of the rather small number of shells collected in 1965, there is a less evident correspondence, as even the most common species is different (*Erronea errones* : *E. xanthodon*), and *Mauritia arabica*, represented by 6% in 1964, was totally absent in 1965, while *E. subviridis* and *Bistolida stolida* were represented by 3% in 1965 only.

Set V (One Tree Island) is composed of two parts, both collected in August 1966; we received 648 fine shells, mostly collected alive, and 507 badly worn beach specimens. As emphasized in a previous paper (COUCOM & SCHILDER, 1967) these faunas are very different (see Table 6: the first figure indicates per cent of the fresh specimens, the second figure those of the beach shells).

Here not a single species is "characteristic" in both parts: all species which must be classified as characteristic among the fresh shells are less frequent to rare among the beach shells, and *vice versa*, and even one characteristic beach shell (*Erosaria labrolineata*) is totally absent from among the fresh specimens. These numerical differences point to great ecological differences between the habitat of the live taken specimens and that of the dead shells washed ashore.

Discussion of Frequency

The total frequency of East Australian cowries indicated by Table 1 can be regarded as genuine to a certain extent, though intensive trawling in deep waters may prove some very rare species to be less uncommon.

However, the frequency of species in each set cannot be taken for granted as genuine though in some sets it may be so, especially in sets composed of beach shells only (U 1964, W, X, Z). In other cases the percentage of species may be greatly influenced by the accidental conditions of the area searched by the collector. For investigations on Penrith Island (SCHILDER & HOUSTON, 1964) and on One Tree Island (COUCOM & SCHILDER, 1967) have shown that each cowrie species prefers certain tidal zones or even restricted places on the shore, and it is mere chance from which place the collector gets his set of living cowries, whereas dead shells washed ashore come from various zones and thus seem to represent the average fauna in a better way.

These facts confirm the studies on populations of living and fossil cowries published 25 years ago (SCHILDER, 1942).

The Size of the Shells

The length of cowrie shells is a character influenced by individual, sexual, ecological, and geographical factors; the average length of specimens composing a local popu-

Table 6

V [One Tree Island]		
Mauritia		
eglantina (DUCLOS, 1833)	2 :	7
arabica (LINNAEUS, 1758)	2 :	7
Talparia		
talpa (LINNAEUS, 1758)	– :	1
Cypraea		
tigris LINNAEUS, 1758	0 :	–
Lyncina		
lynx (LINNAEUS, 1758)	3 :	2
vitellus (LINNAEUS, 1758)	4 :	7
carneola (LINNAEUS, 1758)	3 :	*12*
Luria		
isabella (LINNAEUS, 1758)	– :	3
Pustularia		
cicercula (LINNAEUS, 1758)	– :	0
Monetaria		
annulus (LINNAEUS, 1758)	*12* :	2
moneta (LINNAEUS, 1758)	*12* :	1
Erosaria		
labrolineata (GASKOIN, 1849)	– :	*10*
helvola (LINNAEUS, 1758)	– :	1
caputserpentis (LINNAEUS, 1758)	3 :	*11*
poraria (LINNAEUS, 1758)	0 :	0
erosa (LINNAEUS, 1758)	4 :	*9*
Staphylaea		
staphylaea (LINNAEUS, 1758)	3 :	0
limacina (LAMARCK, 1810)	1 :	–
Nuclearia		
nucleus (LINNAEUS, 1758)	– :	1
Erronea		
xanthodon (SOWERBY, 1832)	– :	0
errones (LINNAEUS, 1758)	*13* :	2
caurica (LINNAEUS, 1758)	*10* :	2
listeri (GRAY, 1824)	*16* :	1
Notadusta		
punctata (LINNAEUS, 1771)	– :	0
Palmadusta		
asellus (LINNAEUS, 1758)	0 :	1
clandestina (LINNAEUS, 1767)	6 :	–
humphreysii (GRAY, 1825)	– :	0
Purpuradusta		
gracilis (GASKOIN, 1849)	0 :	1
minoridens (MELVILL, 1901)	0 :	0
Blasicrura		
pallidula (GASKOIN, 1849)	1 :	*12*
teres (GMELIN, 1791)	– :	2
Bistolida		
hirundo (LINNAEUS, 1758)	– :	1
stolida (LINNAEUS, 1758)	0 :	–
Ovatipsa		
chinensis (GMELIN, 1791)	– :	0
Cribrarula		
cribraria (LINNAEUS, 1758)	1 :	0
catholicorum SCHILDER & SCHILDER, 1938	0 :	–

lation depends on its environment, but the average length of the sum of all populations living in larger areas evidently points to geographical characters.

MARIA SCHILDER (1967) has computed and tabulated the average length of the cowrie species and its "usual variation," i. e. the limits of $\frac{2}{3}$ of specimens approaching the median. These standard figures concerning shells coming from the whole range of distribution of each species have been repeated with regard to East Australian species in column 3 of Table 7.

Table 7 contains the following 5 columns:

1 = number of East Australian populations containing more than 10 specimens of the species, plus 1 if the sum of single specimens coming from other localities exceeds 10;

2 = name of the species (see column 3 of Table 1);

3 = lower limit, median, and upper limit of "usual variation" in length (in mm) of the species in its whole range (M. SCHILDER, 1967).

4 = the same for East Australian shells, expressed by the mean of the populations the number of which is indicated in column 1;

5 = tendency and mathematical significance of differences in median length of the species generally (column 3) and that of East Australian shells (column 4) : small letters indicate that the East Australian shells are smaller, CAPITALS indicate that they are larger than the shells coming from everywhere; the probability of the difference has been classified in four degrees:

a, A = both medians are within the range of usual variation of the other column (e. g. Mauritia eglantina): the difference is probably caused by chance;

b, B = one median only is within this range, the other is outside the other range (e. g. Luria isabella): the difference may be real;

c, C = both medians are outside the range of the other column, but the ranges themselves cross each other (e. g. Monetaria annulus): the difference is significant;

d, D = the ranges of variation indicated in column 3 and 4 exclude each other (e. g. Purpuradusta minoridens): the difference is very significant.

Table 7

1	2	3	4	5
Mauritia				
7	eglantina	44.51.58	45.49.54	a
4	arabica	37.44.56	55.59.64	C
Talparia				
1	talpa	52.62.72	52.61.71	a

1	2	3	4	5
Cypraea				
1	tigris	67.81.103	73.89.95	A
Lyncina				
1	argus	59.70.83	69.77.84	A
5	lynx	30.35.41	37.41.45	B
6	vitellus	36.44.54	41.48.52	A
4	carneola	24.28.34	32.38.45	C
Luria				
4	isabella	20.25.29	24.30.34	B
Pustularia				
1	globulus	12.16.19	17.19.20	B
1	margarita	11.12.15	13.17.19	C
2	cicercula	14.16.19	16.17.19	A
2	bistrinotata	13.15.18	15.17.18	A
Monetaria				
10	annulus	16.19.22	21.24.26	C
6	moneta	16.20.25	23.25.27	C
Erosaria				
7	labrolineata	12.14.18	18.20.23	C
1	tomlini	12.18.24	19.26.29	C
1	helvola	17.20.23	19.23.27	A
10	caputserpentis	25.29.32	29.31.34	A
13	erosa	25.30.35	29.33.38	A
1	eburnea	33.38.44	35.37.40	a
Staphylaea				
5	staphylaea	11.15.19	17.19.22	B
2	limacina	19.24.28	23.26.30	A
Nuclearia				
2	nucleus	16.19.23	22.23.25	B
Erronea				
1	walkeri	20.23.28	22.26.28	A
14	xanthodon	23.26.29	23.26.29	.
3	subviridis	26.30.35	26.30.34	.
17	errones	19.23.28	22.26.29	A
3	cylindrica	24.28.33	24.27.31	a
8	caurica	29.35.41	35.39.42	A
4	listeri	12.15.18	17.19.21	C
Notadusta				
1	punctata	9.11.14	10.13.15	A
Palmadusta				
2	asellus	13.15.17	15.17.21	A
7	clandestina	11.14.17	14.16.17	A
2	lutea	12.15.19	15.16.17	A
Purpuradusta				
12	gracilis	14.16.19	15.17.19	A
1	hammondae	12.14.15	13.14.16	=
2	minoridens	7. 8. 9	10.11.12	D
Blasicrura				
2	quadrimaculata	17.20.23	19.20.22	=
4	pallidula	15.16.19	17.20.22	B
2	teres	21.24.29	26.30.34	C
Bistolida				
1	kieneri	11.13.18	12.14.16	A
2	hirundo	12.15.17	15.17.19	A
4	stolida	21.24.29	21.22.26	a
Cribrarula				
1	cribraria	17.21.26	20.22.25	A

The frequency of differences entered in column 5 of Table 7 is in 43 species as follows (*Erronea xanthodon* and *E. subviridis* must be omitted, as the former is totally restricted to East Australia and most typical *E. subviridis* (s. str.) examined also came from this region only):

d	c	b	a	=	A	B	C	D	
—	—	—	5	2	20	6	9	1	species.

In East Australia no cowrie species is really smaller than in other regions, and 5 species only are possibly smaller; most species are distinctly larger, 16 species even more or less significantly larger than usual. This fact may be caused by the general tendency in many cowrie species to grow larger in peripheral regions than in the central areas (SCHILDER, 1961, GRIFFITHS, 1964), especially in colder zones (SCHILDER, 1964).

The Size in Different Populations

Table 8 shows the following columns:

1 = the name of the species represented by a sufficient number of shells in at least 2 localities;

2 = the median length and the usual variation of East Australian specimens as indicated in column 4 of Table 7;

Q to Z = the 10 sets enumerated in Table 3; each of these 10 columns shows the median length of the shells collected in the set and the letter indicating the significance of differences as explained above (Table 7, column 5), but here comparing the local sizes with those observed in East Australia generally (column 2).

The mean of negative and positive differences between the local sizes of various species and those in the whole region of East Australia shows that several populations (S, W, Y, Z) are typical; in R, V, X, and especially in Q (Holborne Island) the shells are rather small, while they are rather large in T (Middle Island) and very large in U (Humpy Island). However, in each locality the cowrie species differ much in relative size: so, for instance, in U (Humpy Island) *Mauritia eglantina* and *M. arabica* are very large, but *Erronea subviridis* is rather small, and in X (Mooloolaba) *Erosaria caputserpentis* is small, but *Erronea errones* is very large.

The divisible sets T, U, and V treated above in Tables 4 to 6 show interesting differences between the parts. Table 9 enumerates species represented in sufficient numbers in both parts indicated in the 3 headlines, and shows the median and the usual variation in each part, followed by the letter indicating the significance of the difference of the first column if compared with the second.

Table 9

U [Humpy Island]	1963	1964	
Erosaria			
erosa (LINNAEUS, 1758)	34.36.38	33.34.40	A
Erronea			
xanthodon (SOWERBY, 1832)	25.28.30	25.28.30	=
subviridis (REEVE, 1835)	27.29.31	25.28.29	A
errones (LINNAEUS, 1758)	26.28.31	25.28.31	=
caurica (LINNAEUS, 1758)	40.43.48	37.41.47	A
Purpuradusta			
gracilis (GASKOIN, 1849)	17.18.20	18.19.20	a
T [Middle Island]	**1964**	**1965**	
Erronea			
xanthodon (SOWERBY, 1832)	24.26.29	23.25.29	A
errones (LINNAEUS, 1758)	26.28.30	23.26.29	A
Purpuradusta			
gracilis (GASKOIN, 1849)	17.18.19	15.17.18	A
V [One Tree Island]	**living**	**beach**	
Mauritia			
eglantina (DUCLOS, 1833)	46.53.58	41.46.52	B
arabica (LINNAEUS, 1758)	52.56.62	44.48.54	C
Lyncina			
vitellus (LINNAEUS, 1758)	37.39.44	36.42.50	a
carneola (LINNAEUS, 1758)	33.35.40	29.34.39	A
Erosaria			
caputserpentis (LINNAEUS, 1758)	32.34.36	28.31.34	B
erosa (LINNAEUS, 1758)	34.36.38	26.31.34	C
Erronea			
errones (LINNAEUS, 1758)	22.25.27	21.24.27	A
caurica (LINNAEUS, 1758)	36.38.41	37.40.43	a

The letters indicating the differences show that in Humpy Island (U) the length of species is practically identical in the two subsequent years, while in Middle Island (T) the fresh specimens of 1964 are altogether slightly larger than in 1965, and in One Tree Island (V) the live collected specimens of many species are distinctly larger than the beach shells, but only 2 species are possibly smaller (see COUCOM & SCHILDER, 1967)! One will observe that this sequence agrees with that of differences in frequency of species in these sets (see Tables 4 to 6).

Results

Our extensive studies in East Australian cowries show that both the relative frequency of species and the average size of shells in this region can be approximately estimated by the mean of 10 sets of at least 250 shells, the sets being collected in different parts of the region with partly different environments. Several widely distributed species evidently differ in frequency in East Australia from that

Table 8

1	2	Q	R	S	T	U	V	W	X	Y	Z
Mauritia											
eglantina (Duclos, 1833)	45.49.54	48 a	47 a	49 =	.	67 D	47 a	.	.	.	.
arabica (Linnaeus, 1758)	55.59.64	.	.	.	63 B	67 D	50 c	.	.	.	.
Lyncina											
lynx (Linnaeus, 1758)	37.41.45	.	42 A	41 =	.	.	36 c	.	.	.	.
vitellus (Linnaeus, 1758)	41.48.52	.	50 A	48 =	.	.	40 c	.	.	.	49 A
carneola (Linnaeus, 1758)	32.38.45	34 a	.	.	.	.	35 a	.	.	43 A	.
Luria											
isabella (Linnaeus, 1758)	24.30.34	29 a	28 a	.	.	.	30 =	.	.	.	.
Monetaria											
annulus (Linnaeus, 1758)	21.24.26	.	20 c	24 =	.	.	23 a	.	.	24 =	25 A
moneta (Linnaeus, 1758)	23.25.27	.	.	25 =	.	.	26 A	○	.	26 A	23 a
Erosaria											
labrolineata (Gaskoin, 1849)	18.20.23	17 c	.	.	.	.	17 c	20 =	20 =	20 =	21 A
caputserpentis (Linnaeus, 1758)	29.31.34	.	.	31 =	.	.	32 A	30 a	28 b	31 =	32 A
erosa (Linnaeus, 1758)	29.33.38	28 b	33 =	33 =	.	36 A	33 =	33 =	32 a	34 A	33 =
Staphylaea											
staphylaea (Linnaeus, 1758)	17.19.22	.	.	.	.	.	22 A	19 =	18 a	19 =	.
Erronea											
xanthodon (Sowerby, 1832)	23.26.29	.	.	.	26 =	28 A	.	25 a	25 a	28 A	.
subviridis (Reeve, 1835)	26.30.34	.	.	.	.	28 a	.	.	.	31 A	.
errones (Linnaeus, 1758)	22.26.29	18 d	21 c	23 b	28 A	28 A	25 a	25 a	31 C	.	.
cylindrica (Born, 1778)	24.27.31	28 A	24 a	.	.	.	.	○	.	.	.
caurica (Linnaeus, 1758)	35.39.42	35 c	38 a	36 b	.	42 B	39 =	.	.	39 =	.
listeri (Gray, 1824)	17.19.21	.	.	.	.	.	18 a	20 A	.	.	.
Palmadusta											
clandestina (Linnaeus, 1767)	14.16.17	.	.	16 =	.	.	16 =	16 =	16 =	16 =	14 b
Purpuradusta											
gracilis (Gaskoin, 1849)	15.17.19	16 a	15 b	18 A	17 =	19 B	.	16 a	16 a	18 A	.
Blasicrura											
pallidula (Gaskoin, 1849)	17.20.22	18 a	18 a	.	.	.	22 A	○	.	.	.
Bistolida											
stolida (Linnaeus, 1758)	21.22.26	.	.	.	.	.	.	22 =	22 =		

in other regions, and the size of most species is larger in East Australia than in the tropics.

These 10 sets, however, differ each from the other both with regard to relative frequency of species and to average size of specimens; these differences seem to be partly caused by mere chance, but in both ways certain regional tendencies cannot be denied. There are similarities in adjacent localities and great differences between collections made in the same locality at different times or in different conditions.

These results seem to be rather poor and need confirmation by similar collections in other regions. Nevertheless, we think our provisional investigations worth publishing.

LITERATURE CITED

Coucom, Cedric, Franz Alfred Schilder & Maria Schilder
1967. The cowries of One Tree Island. Keppel Bay Tidings 6 (1): in press

Griffiths, R. John
1964. Size variation in *Cypraea xanthodon*. The Cowry 1 (6): 82 - 83 (18 January 1964)

Schilder, Franz Alfred
1942. Statistische Untersuchungen an Populationen. Arch. Molluskenk. 74 (4): 129 - 142 (15 July 1942)
1961. A statistical study in cowries: the size of *Mauritia arabica* (Linnaeus). The Veliger 4 (1): 15 - 17; 2 text figs. (1 July 1961)
1965. The geographical distribution of cowries (Mollusca: Gastropoda) The Veliger 7 (3): 171 - 183; 2 maps (1 January 1965)
1966. Cowries from the Kenn Reef. Keppel Bay Tidings 5 (3): 3 (December 1966)

Schilder, Franz Alfred & Maria Schilder
1964. Latitudinal differences in size of East Australian cowries. The Cowry 1 (7): 100 - 101 (1 November 1964)

Schilder, Franz Alfred, Maria Schilder & Garfield Houston
1964. The cowrie fauna of Penrith Island. The Veliger 6 (3): 155 - 161; 4 tables; 1 text fig. (1 January 1964)

Schilder, Maria
1967. Length, breadth, and dentition in living cowries. The Veliger 9 (4): 369 - 376; 1 diagram (1 April 1967)