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SURVEY OF TROCHUS REEFS IN THE CENTRAL AND SOUTHERN  
GROUPS OF THE NEW HEBRIDES

by

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7 July - 21 July, 1959

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At the request of the Condominium of the New Hebrides, a survey of trochus reefs was carried out from 7 to 21 July 1959, in order to determine whether trochus fishing, closed early in 1958, could be re-opened.

The survey was carried out in two parts, the first covering the central group, the second the southern group of islands. The following islands were visited for the purpose of obtaining estimates of trochus populations: Mai, due north of Vate, Kulivu of Maskelyne in the Maskelyne Group, south-east of Malekula, Tutuba, south-east of Espiritu Santo and Aneytium, the southernmost inhabited island of the New Hebrides archipelago.

For the purpose of this survey the Condominium Administration chartered the "Concorde", which was put at my disposal.

The most generous cooperation was received from all persons concerned directly or indirectly with my survey and I particularly wish to record my appreciation of the welcome extended by both Resident Commissioners and their staffs, by the Director of Agriculture, M. Dercle, who accompanied me on my field trips, by the Resident Agents of the districts visited and by the officers and crew of the "Concorde".

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General

Although the period of time allotted for this field survey was very short, the facilities available made it possible to gather some interesting material and to draw some conclusions on the present state of trochus reefs in the parts of the archipelago visited.

The reefs were roughly sampled by a team of three to six divers on each of the areas checked. All the trochus found, including dead shells, were taken, measured and returned to the reef. In addition, whenever possible, a search of the boulder and slab area on the reef table was carried out at low tide in an attempt to discover juvenile specimens.

Measurements were taken across the base of the shell, along the greatest diameter. A transparent plastic ruler was used which made it possible to appreciate diameters to the nearest millimetre.

In most cases, a large proportion of shells 80 to 120 millimetres in diameter was noted. On the other hand, the almost complete absence of shells

under 60 millimetres was also evident. The results obtained are given here in the form of tables for each reef visited.

#### Mai Island

The reef visited is situated at the South West tip of the island and was previously considered as a good shelling ground by local divers. Six divers were first employed to recover all the shells they could find in an area about 50 m. x 25 m., which extended from the edge of the reef table into depths of 5 to 6 metres. In one hour's time 59 trochus were recovered (Table I). Later, a strip of reef, about 10 metres wide extending for about 200 metres along the edge of the reef table was fished for two hours, at low tide, while a brief search of the reef table was conducted. The reef edge produced 67 trochus (Table II), but no shells were found on the reef top.

TABLE I.

Diameter in mm.	No. of shells taken	Actual measurement in mm.
60 to 70	1	65
71 to 80	5	72, 75, 75, 80, 80
81 to 90	16	81, 81, 81, 82, 82, 83, 84, 84, 84, 84, 85, 86, 87, 88, 89, 90
91 to 100	10	92, 92, 93, 93, 94, 95, 98, 98, 100, 100
101 to 110	14	102, 102, 102, 102, 103, 105, 105, 106, 106, 107, 107, 107, 107, 109
111 to 120	8	112, 115, 117, 117, 118, 118, 120, 120
121 to 130	4	121, 124, 125, 126
131 to 140	1	140
Total :		59

TABLE II.

Diameter in mm.	No. of shells taken	Actual measurement in mm.
71 to 80	3	74, 80, 80
81 to 90	15	81, 82, 83, 83, 83, 86, 87, 87, 87, 88, 88, 90, 90, 90, 90
91 to 100	11	92, 94, 95, 95, 95, 95, 97, 98, 98, 99, 100
100 to 110	10	101, 105, 108, 109, 109, 109, 109, 110, 110, 110
111 to 120	7	112, 112, 113, 113, 115, 117, 117
121 to 130	12	121, 122, 122, 122, 122, 123, 123, 125 (dead), 125, 127, 128, 130
131 to 140	8	131, 131, 132, 132, 133, 134, 135, 137
141 to 150	1	141
Total :		67

Kulivu or Maskelyne Island

The west side of the pass  $\pm$  1 mile south of the village of Belong was worked for a distance of about 600 metres; the strip covered was approximately 5 metres wide; four divers were employed in this area for one hour. Twentyfive trochus were recovered (Table III). The divers appeared to consider this quite a normal take and stated that all along the outside edge of the reef the density of trochus was about the same.

TABLE III.

Diameter in mm.	No. of shells taken	Actual measurement in mm.
81 to 90	4	86 (dead), 87, 88, 88
91 to 100	2	91, 92
101 to 110	2	108, 108
111 to 120	3	115, 116, 120
121 to 130	8	122 (dead), 122, 123, 126, 127, 129, 129, 130
131 to 140	6	132, 133, 134 (broken), 135, 136, 140

Total : 25

Fringing reef at Lamap, Malekula Island

Thirty to forty minutes were spent searching the reef at low tide; four juvenile shells were found.

TABLE IV.

Diameter in mm.	No. of shells taken	Actual measurement in mm.
10 to 20	2	17, 19
21 to 30	-	
31 to 40	2	36 (dead), 40 (dead)
Total :		4

Tutuba Island

The fringing reef of Tutuba Island was fished over a strip 20 m. wide by 200 m. long and 4 divers found 44 trochus in about one hour (Table V). Later the same divers worked a strip of fringing reef 100 m. x 20 m. and produced 11 trochus in half an hour (Table VI). A search of the reef was made at low tide over a surface of about 600 square metres. About ten persons participated in the search, and a total of 13 trochus was found (Table VII).

TABLE V

Diameter in mm.	No. of shells taken	Actual measurement in mm.
61 to 70	1	68
71 to 80	2	77, 78
81 to 90	7	82, 84, 86, 87, 88, 89, 90
91 to 100	7	91, 92, 93, 94, 95, 97, 97
101 to 110	11	102, 103, 103, 105, 105, 106, 106, 108, 108, 108, 110
111 to 120	16	111, 111, 111, 112, 112, 112, 112, 112, 112, 113, 115, 116, 117, 117, 117, 117
Total :		44

TABLE VI

80 to 90	1	89
91 to 100	1	93
101 to 110	4	101, 102, 103, 108
111 to 120	5	111, 114, 115, 116, 117
Total :		11

TABLE VII

Diameter in mm.	No. of shells taken	Actual measurement in mm.
21 to 30	1	21(dead)
31 to 40	-	
41 to 50	1	44
51 to 60	11	51, 51, 51, 51, 52, 53, 55, 55, 56, 57, 58
Total : 13		

Aneytium

A search of the submerged reef table on the south side of the pass opposite the Anelgauhat anchorage produced no trochus at all in an area of 30 x 30 m. The six divers then worked the breakers area on the south side of the pass in depths up to 8 m. and produced 15 trochus in 45 minutes (Table VIII). At the same time 11 green snail and 9 Trochus obeliscus were recovered.

A search of the fringing reef table, which lasted four hours, produced three juvenile shells, of which only one was alive (Table IX).

TABLE VIII

Diameter in mm.	No. of shells taken	Actual measurement in mm.
81 to 90	2	82, 84
91 to 100	1	99
101 to 110	7	101, 102 (dead), 104, 106, 108, 109, 109
111 to 120	3	111, 113, 115
121 to 130	1	124
131 to 140	1	135
Total : 15		

TABLE IX

10 to 20	1	15
21 to 30	1	25 (dead)
31 to 40	-	
41 to 50	1	45 (dead)
Total : 3		

### Discussion

The series of measurements set out above tend to show :

- (1) that the average <sup>age</sup> of the trochus population is high (98.91% over three years old);
- (2) that the proportion of young shells is extremely low (0.87% under three years old);
- (3) that the density of trochus on the reefs is noticeably low (the average take per diver/hour works out at slightly over 7 trochus, with extremes of 10.3 for Mai Island and 3.33 for Aneytium).

### Causes

While it is impossible to obtain definite proof of the causes which have led to this state of affairs, it is quite easy to build a theory based on known facts and supported by knowledge of trochus in nearby countries.

Three factors have probably contributed to the present scarcity of trochus on the reefs.

- (1) From the beginning until fishing was closed early in 1958, no legislation was drafted to protect trochus by establishing a size limit or a closed season. Any shell over 5 cm. was taken.
- (2) Apart from the small quantities gathered by the native population for food or to obtain a little money, fairly large-scale fishing expeditions were made by European traders employing hired divers. These traders, or at least some of them, had a theory that the reefs must be "cleaned" of wormy trochus to ensure a good "crop" the next year. This entails the removal of all wormy trochus (adults generally over 10 cm. in diameter).
- (3) From 1952 on, the rising prices of trochus shell brought about more intensive fishing activity (see statistics in Appendix I).

The three factors enumerated above would be sufficient to explain the present state of exhaustion of the reefs. I doubt that any epidemic should be blamed, as many Europeans claim. The export statistics set out in Appendix I would leave scarcely any room for such an explanation.

### Possible remedies

It seems necessary here to sketch briefly the process by which trochus reproduce, in order to make the problem more easily understandable.

Male female trochus become mature when they reach a diameter of about 6.5 cm. Female trochus release their eggs in the water a few at a time. Males eject sperm similarly. There is no well-defined spawning season and, since the eggs are fecundated while floating free, the fertilization rate is most probably



very low. In order to obtain a reasonable rate of reproduction, it is therefore essential to have large numbers of adults on the reefs, preferably in groups of high density rather than uniformly distributed.

As stated above, the density of the population on the reefs visited is low. In spite of the fact that the greater part of the population is over 8 cm. in diameter, and incontestably mature, this low density, coupled with the absence of any definite spawning season, will make the recovery extremely **slow**.

Theoretically, collecting all the trochus from the reefs surrounding an island and putting them all on one suitable patch of reef would improve matters considerably; however, I doubt if this would be successful in practice. The financial implications would be out of proportion with the results and an operation of this scope, covering the whole group, would take too long to be of any practical value.

At the present moment there is no steady market for trochus. The ban on fishing can be kept on without imposing undue hardship on the local population, and time is the only factor that will allow the trochus to recover to any extent.

### Conclusion

- I. The trochus reefs of the New Hebrides have been depleted to an alarming extent, probably due to :
  - (1) indiscriminate removal of trochus of all sizes;
  - (2) "cleaning" of the reefs by well-intentioned fishermen;
  - (3) over-fishing caused by the high prices between 1952 and 1958.
- II. The trochus population is so sparse now that, taking into account their particular mode of reproduction, natural recovery will be very slow.
- III. Maintaining the ban on trochus fishing is not likely to affect dramatically any part of the population.

### Recommendations

- I. Trochus fishing should be prohibited until such time as the reefs have been observed to be fully re-populated. An annual check of trochus reefs along the same lines as the present survey would help to determine when a more general survey is warranted.
  - II. Before trochus fishing is re-opened, some legislation will have to be enacted establishing a proper minimum legal size. It is suggested that a size of 10 cm. be adopted.
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TROCHUS EXPORTS  
IN METRIC TONS AND VALUE IN £ STERLING

YEAR :	1950	1951	1952	1953	1954	1955	1956	1957	1958 *
Tons	51.7	83.4	113.9	111.6	98.1	122.3	120.5	73.9	25.8
Value	£2,971	£7,038	£9,599	£9,510	£15,584	£29,902	£38,276	£22,807	£7,444

\* 1958 figures are the result of about  
two months' fishing, plus stocks left  
over from the preceding year.