



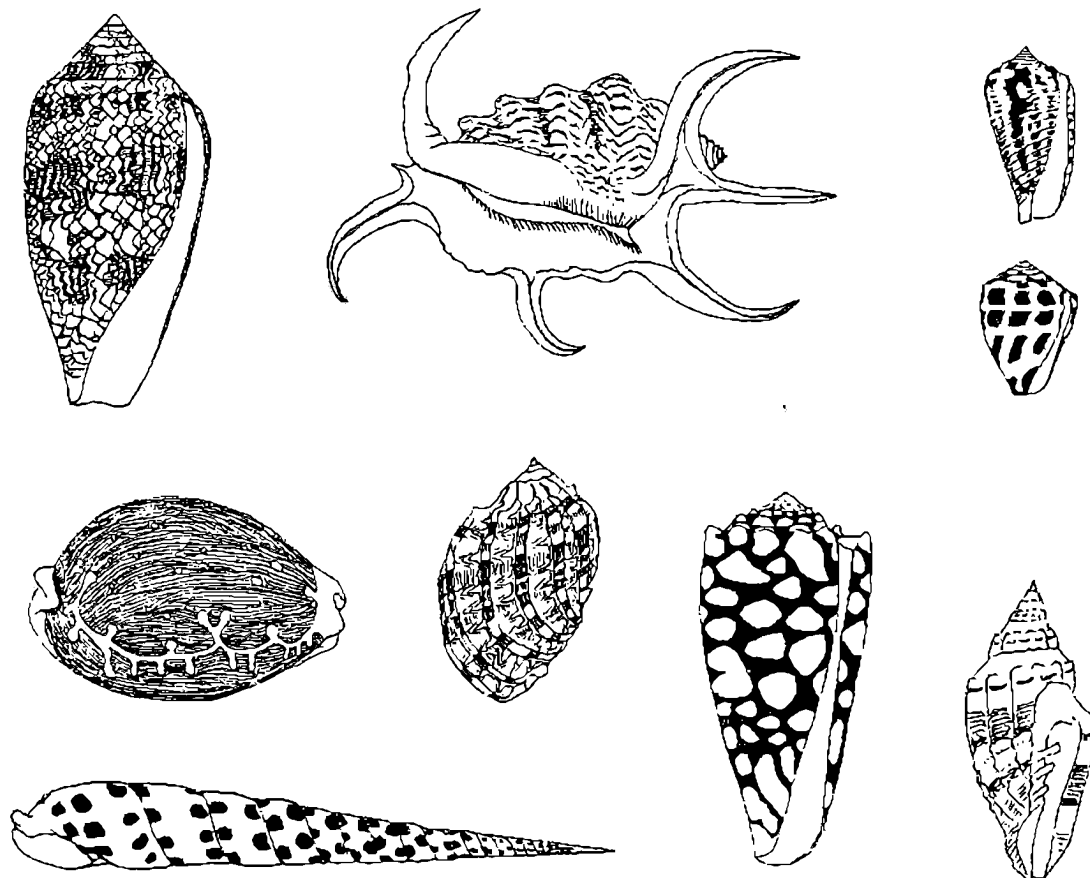
SOUTH PACIFIC COMMISSION

## THE SPECIMEN SHELL RESOURCES OF TUVALU

Report prepared for the South Pacific Commission  
and the Government of Tuvalu

by

Brian J. Parkinson  
Conchologist



South Pacific Commission  
Noumea, New Caledonia

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## 1. INTRODUCTION

### 1.1 General

This assessment of the shell resources of Tuvalu was undertaken in response to a request from the Tuvalu Government for advice on the possibility of establishing a small-scale specimen shell industry in Tuvalu.

The six-week study (15 November - 16 December 1983) was carried out by consultant conchologist Mr B. Parkinson, who worked closely with officials from two Divisions of the Ministry of Commerce and Natural Resources, Fisheries and Handicrafts, throughout the study period.

The specific terms of reference for the survey were as follows:

1. To carry out a survey to identify, quantify and assess the shell resources of Tuvalu.
2. To report on the potential for development of a small-scale shell industry in Tuvalu.
3. To advise on suitable collection techniques and methods of shell preparation.
4. To identify and advise on possible marketing problems.
5. To advise on options for the promotion of a shell industry in Tuvalu, with recommendations for Government action.
6. To prepare a commercial catalogue of specimen shells found in Tuvalu.

While in Tuvalu, Mr Parkinson was asked if he could further advise on the possibility of introducing trochus (Trochus niloticus) to Tuvalu, both as a potential revenue earner and an additional food source for the people of Tuvalu. This topic is the subject of a separate report.

### 1.2 Specific Areas of Interest

A number of specific problems and queries were raised by officials with respect to existing exploitation of the shell resources of Tuvalu.

#### (i) Necklace shells

Money cowries and land shells are used to make necklaces in Tuvalu. There are potential overseas markets for the product, but will the resources of these shells support increased exploitation?

(ii) Pearl shells

These are in considerable demand for manufacturing artifacts such as pearl shell fishing lures. Most of the shell comes from Nukulaelae Island. What is the potential yield? Are existing conservation measures appropriate - if not how can they be improved? Could the stock be enhanced? Could pearl shell be imported at significantly lower prices?

(iii) Shells for sale to visitors/tourists

The Handicraft centre has a stock of large cowries and similar shells with a value based on appearance more than rarity. Sales have been slow and recommendations are required on pricing.

(iv) Shells for collectors and dealers

Occasionally, high value shells such as golden cowries are found. People are generally aware of the value of such shells and send them to relatives overseas to be sold. Are there significant resources of medium value shells which could be sold to dealers? Advice on markets, marketing and pricing is required.

(v) Species requiring protection

In some countries, species such as Charonia tritonis are protected. Should this be the case in Tuvalu?

(vi) New methods of collection

At present shells are collected by walking on the reef or diving. Can nets or dredges be expected to produce worthwhile returns?

(vii) Processing and handling shells

What is the most appropriate method of cleaning the shells? What causes the staining sometimes experienced at present? What is the correct way of recording collection details for rare shells? What quality standards should be applied with respect to damaged or immature shells?

## 2. SURVEY RESULTS

### 2.1 General

To verify the abundance and availability of shells popular with collectors that are to be found in Tuvalu, two atolls were visited by the consultant during the period 15 November to 16 December. Thirty-seven stations were inspected during this period, with the following results.

<u>Survey area</u>	<u>No. of Stations surveyed</u>	<u>No. of shell species recorded</u>
1. NUKUFETAU (Figure 1)	14	97
2. FUNAFUTI (Figure 3)	23	76

A total of 119 specimen shell species were recorded from 14 families commonly sought by collectors. Table 1 details the number of species recorded by family group.

Table 1. Distribution of species recorded by families

Group	Number of species found
Mitres (F. Mitridae/Costellariidae)	26
Cones (F. Conidae)	20
Cowries (F. Cypraeidae)	18
Augers (F. Terebridae)	15
Ceriths (F. Cerithidae)	15
Strombs (F. Strombidae)	8
Tritons (F. Cymatidae)	6
Drupes (F. Thaididae)	4
Trochus (F. Trochidae)	2
Harps (F. Harpidae)	1
Vases (F. Vasidae)	1
Olives (F. Olividae)	1
Dog Whelks (F. Nassariidae)	1
Murex (F. Muricidae)	1
<u>Total</u>	<u>119</u>

## CONUS

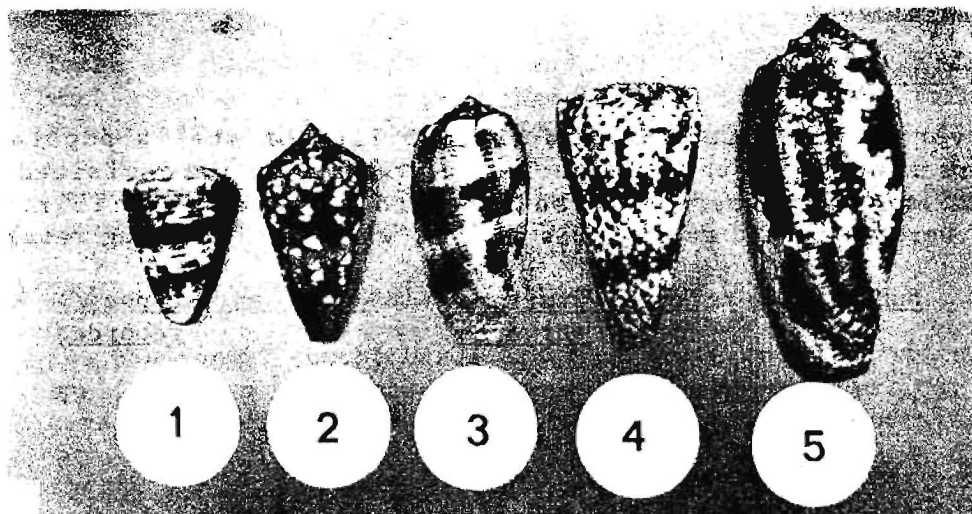


PLATE 1

Cone shells are found in a variety of Tuvaluan habitats.  
 (left to right: *Conus tessulatus*, *C. ammiralis*, *C. tulipa*, *C. imperialis*,  
*C. geographus*)

## CYPRAEA

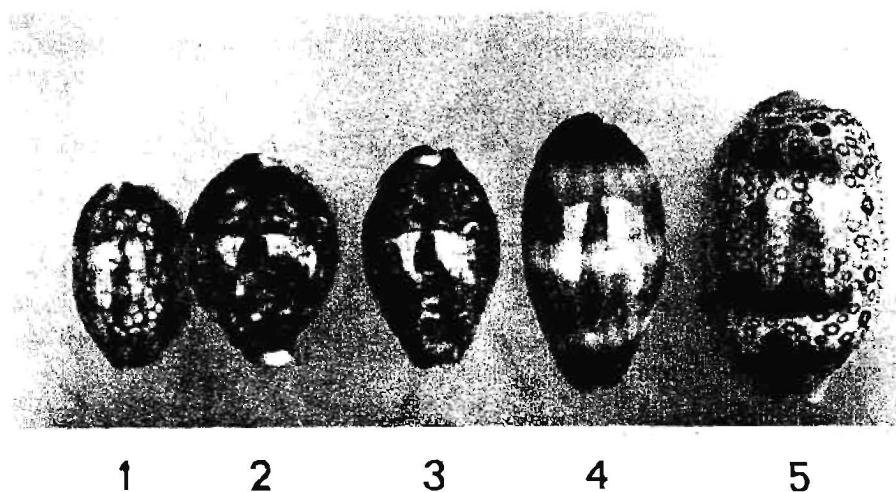


PLATE 2

Cypraea are most easily collected on reefs at night.  
 (left to right: *Cypraea scurra*, *C. tigris*, *C. mappa*, *C. talpa*, *C. argus*)

## MITRA

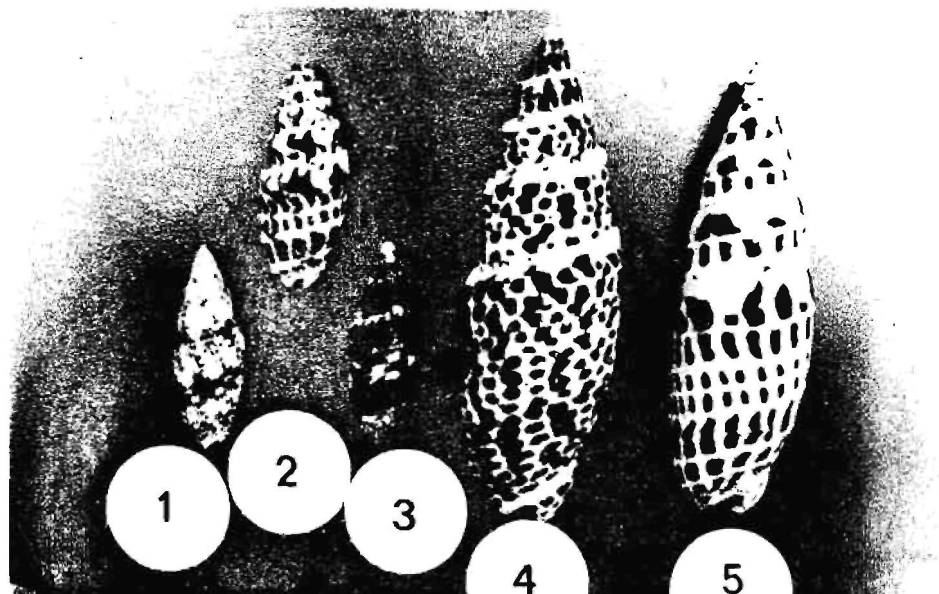


PLATE 3

A few of the sand-dwelling mitres of Tuvalu which are popular with collectors.  
 (left to right: *Mitra papilio*, *M. stictica*, *M. imperialus*, *M. papalis*, *M. mitra*)

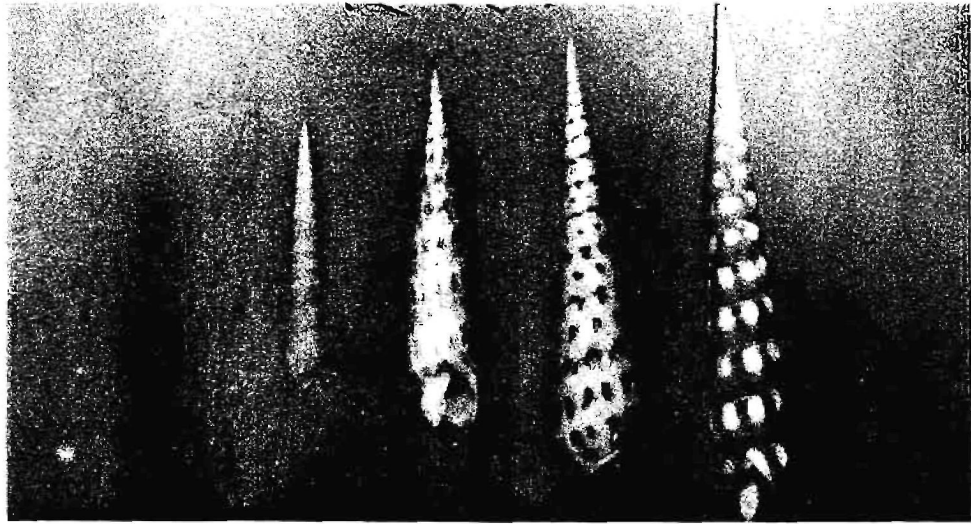
## OLIVA



PLATE 4

This attractive pale golden form of *Oliva miniacea* is the sole Tuvaluan olive.

## TEREBRA



1

2

3

4

## PLATE 5

Terebras are a sand-dwelling family which are in increasing demand from collectors.  
(left to right: *Terebra cingulifera*, *T. dimidiata*, *T. areolata*, *T. guttata*)

## 2.2 Summary of Individual Site Surveys

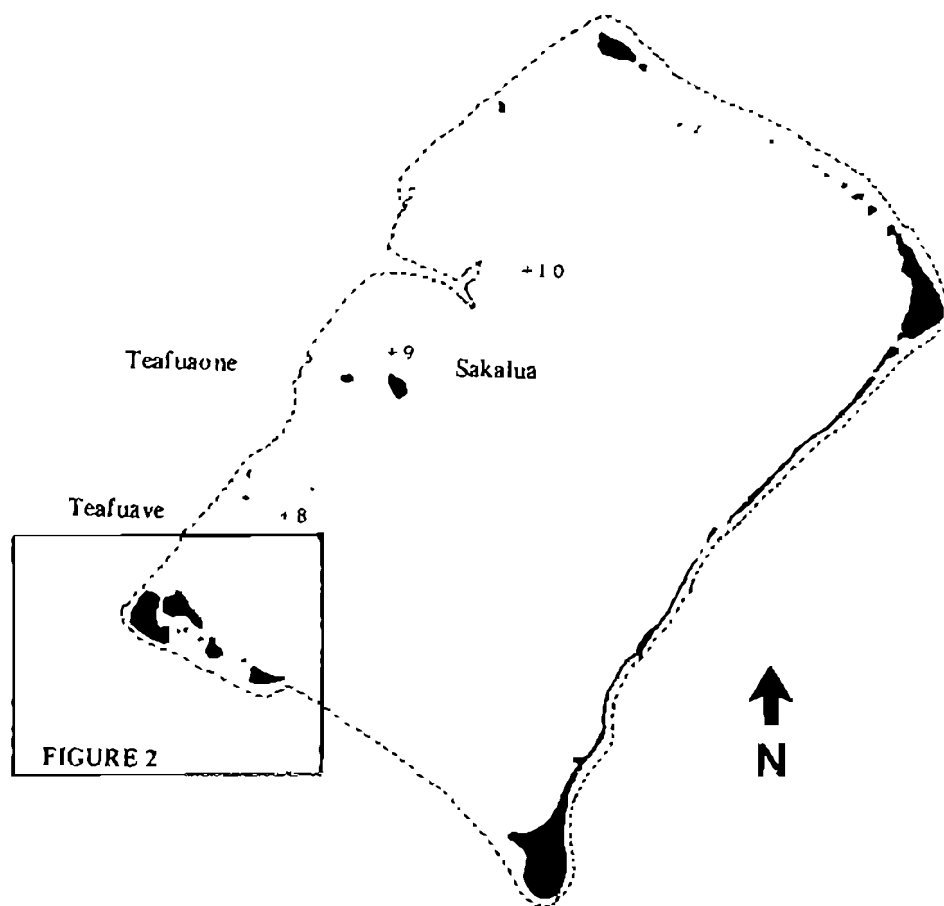
Brief field notes for each station including habitat description and major shell groups recorded are given below and a complete list of species recorded is incorporated in the catalogue of Tuvalu shells given in Appendix 1.

### 2.2.1 NOKUFETAU ATOLL

- Station 1      North of Saveve Island. November 18. 1600 - 1710 hrs.  
Flat area of white sand with scattered large coral boulders.  
1 - 2 m.  
Divers - Parkinson.  
Terebra, Mitra, Cymatium, Conus, Strombus, Cypraea.
- Station 2      North-east of Saveve Island. November 18. 1845 - 1930 hrs.  
Large flat area of dead coral with scattered patches of  
white coral sand. 1 - 3 m.  
Divers - Parkinson, Batty.  
Cypraea, Cerithium, Strombus, Terebra, Conus.
- Station 3      Passage between Saveve and Moturoto Islands. November 19.  
1550 - 1645 hrs. Large flat area of white coronous sand with  
a few isolated large coral boulders. 1- 3 m.  
Divers - Parkinson, Selu Luni.
- Station 4      Passage between Saveve and Moturoto Islands. November 19.  
1745 - 1910 hrs. Large flat area of white coronous sand  
with a few isolated large coral boulders. 1 - 3 m.  
Divers - Parkinson, Chapman.  
Mitra, Terebra, Strombus, Cymatium, Cerithium, Vasum,  
Conus.
- Station 5      North-east of Saveve Island. November 20. 1605 - 1750 hrs.  
Large area of dead flat coral with scattered patches of  
white coral sand. 2 - 5 m.  
Divers - Parkinson, Batty.  
Cypraea, Cerithium, Strombus, Bursa, Mitra, Terebra, Conus.
- Station 6      North-east of Saveve Island. November 21. 0820 - 1010 hrs.  
Outer edge of reef. Areas of live coral intersected with  
gullies of white coronous sand. 1 - 10 m.  
Divers - Parkinson, Selu Luni.  
Cypraea, Cerithium, Terebra, Conus, Strombus.
- Station 7      North-east of Motumua Island. November 21. 1350 - 1425 hrs.  
Area of white coronous sand and coral rubble. 1 - 4 m.  
Divers - Parkinson, Selu Luni.  
Lambis, Cypraea, Terebra, Cymatium, Trochus, Conus.

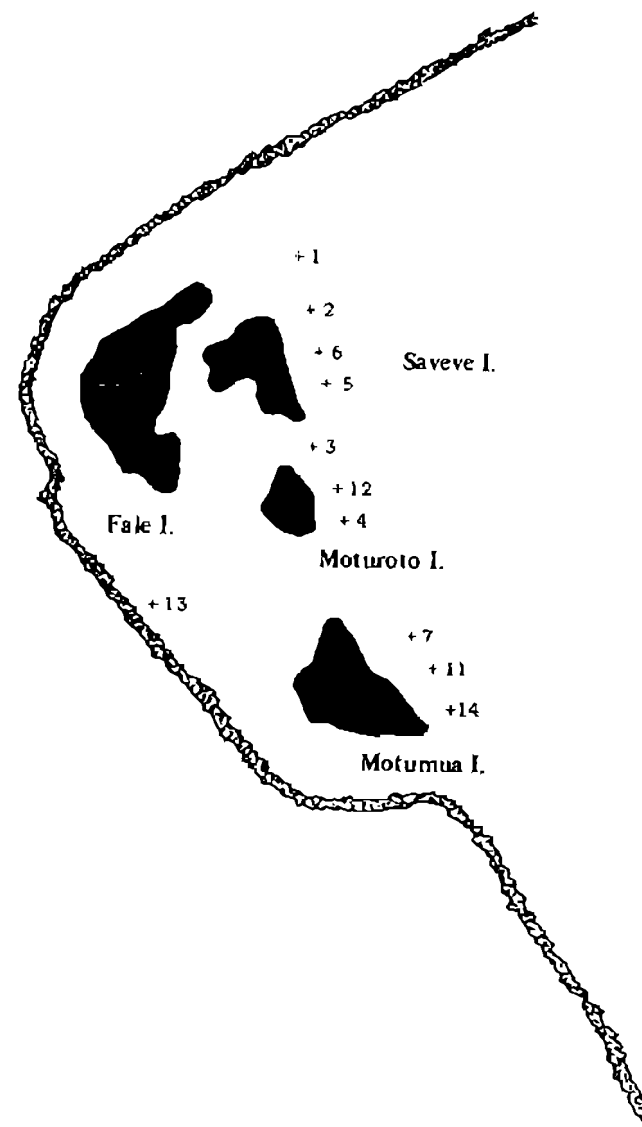
- Station 8      East of Teafuave Island. November 22. 0910 - 0940 hrs.  
White sand and minor rubble on edge of steep white coronous  
sand slope. 1 - 8 m.  
Divers - Parkinson, Batty, Selu Luni.
- Station 9      North of Sakalua Island. November 22. 1000 - 1035 hrs.  
White sand slope edging stand of live coral. 1 - 10 m.  
Divers - Parkinson, Batty, Selu Luni.  
Mitra, Cerithium, Cypraea.
- Station 10     1 km north-east of Sakalua Island. November 22.  
1050 - 1145 hrs.  
Large stand of living coral edged by areas of white coral  
sand and rubble. 1 - 7 m.  
Divers - Parkinson, Batty, Selu Luni.  
Cypraea, Cymatium, Terebra, Mitra.
- Station 11     North of Motumua Island. November 22. 1215 - 1300 hrs.  
Area of white coronous sand and rubble. 1 - 5 m.  
Divers - Parkinson, Batty, Selu Luni.  
Cypraea, Terebra, Drupa, Conus, Engina, Strombus, Conus,  
Cymatium.
- Station 12     North-east of Moturoto Island. November 23.  
1845 - 1930 hrs. Large flat area of white coronous  
sand with patches of rubble. 1 - 2 m.  
Divers - Parkinson, Selu Luni.  
Mitra, Conus, Terebra.
- Station 13     Outer edge of barrier reef south-west of Fale Island.  
November 23. 0910 - 1015 hrs.  
Flat area of dead coral flat on edge of reef drop-off. 1 m.  
Divers - Parkinson, Selu Luni.
- Station 14     East of southern tip of Motumua Island. November 23.  
1045 - 1130 hrs. Sand flat at outer edge of reef. 1 - 8 m.  
Divers - Parkinson, Selu Luni.  
Cypraea, Drupa, Bursa, Terebra, Conus.

FIGURE 1: NUKUFETAU ATOLL.



+ = Station No.

FIGURE 2: NUKUFETAU.

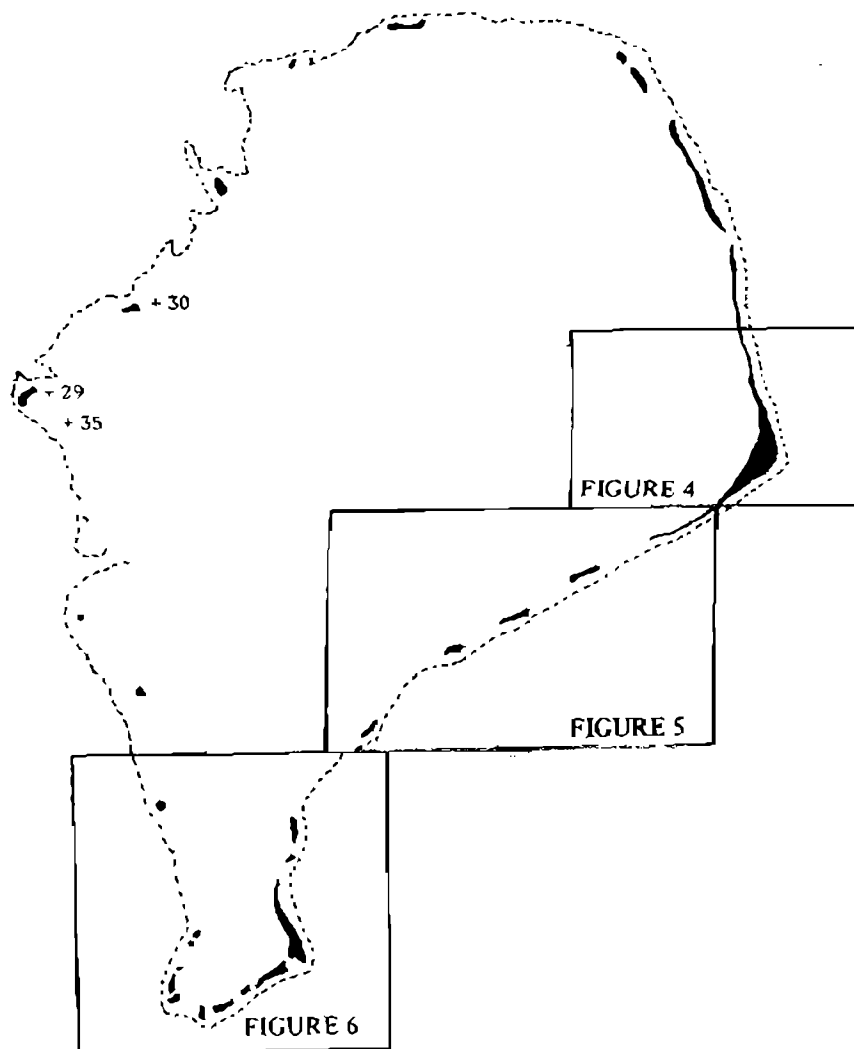


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2.2.2 FUNAFUTI ATOLL

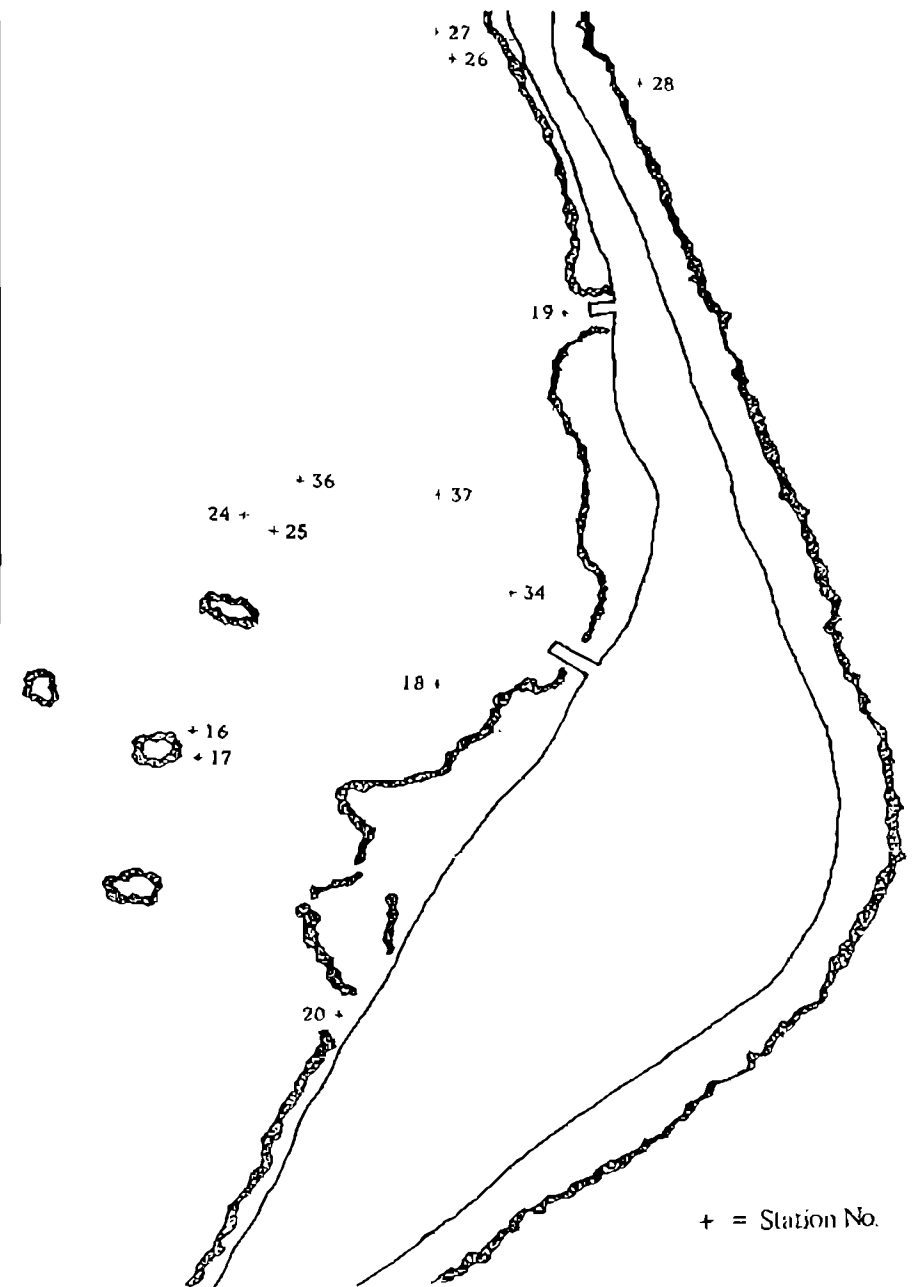
- Station 15      150 m north-west of Funangongo Island. November 26.  
1920 ~ 1955 hrs. White coronous sand and coral rubble  
with patches of living coral. 1 - 5 m.  
Divers ~ Parkinson, Batty.  
Conus, Strombus, Nassarius, Cypraea.
- Station 16      Te akau Asano Reef, Funafuti Lagoon. November 29.  
1420 ~ 1510 hrs. Fine white coronous sand flat at bottom  
of coral pinnacle. 10 - 25 m.  
Divers - Parkinson.  
Cerithium, Nassarius.
- Station 17      Te akau Asano Reef, Funafuti Lagoon. November 29.  
1850 ~ 1935 hrs. Fine white coronous sand flat at bottom  
of coral pinnacle. 10 - 25 m.  
Divers ~ Parkinson, McQuarrie.  
Cerithium, Conus, Trochus, Cypraea.
- Station 18      2 km west of town jetty. November 29. 2010 ~ 2035 hrs.  
White coronous sand flats edging extensive stand of living  
coral. 1 - 5 m.  
Divers - Parkinson, J. Rogers.  
Cerithium, Conus, Astraea.
- Station 19      Main wharf Funafuti Island. December 2.  
Area of small sand hummocks sloping down from area of  
dead eroded reef. 2 ~ 3 m.  
Divers - Parkinson, McQuarrie.  
Cerithium, Conus, Mitra, Terebra, Nassarius.
- Station 20      500 m out from town jetty. December 3. 1435 - 1540 hrs.  
White coronous sand flat. 1 - 10 m.  
Divers - Parkinson, McQuarrie.  
Cerithium, Mitra, Conus, Strombus.
- Station 21      100 m west of south point of Funafuti. December 5.  
1510 - 1615 hrs. White coronous sand slope with patches  
of living coral. 10 - 20 m.  
Divers - Parkinson.  
Conus, Cerithium, Terebra.
- Station 22      100 m west of Fatato Island. December 6. 0945 - 1020 hrs.  
White coronous sand slope with patches of living coral.  
Divers - Parkinson, J. Huckin.  
Conus, Cerithium, Terebra, Nassarius.
- Station 23      100 m west of Funangongo Island. December 6.  
1905 - 1940 hrs. Large area of dead eroded coral rock.  
2 - 10 m.  
Divers - Parkinson, McQuarrie.  
Conus, Mitra, Strombus.

FIGURE 3: FUNAFUTI ATOLL.



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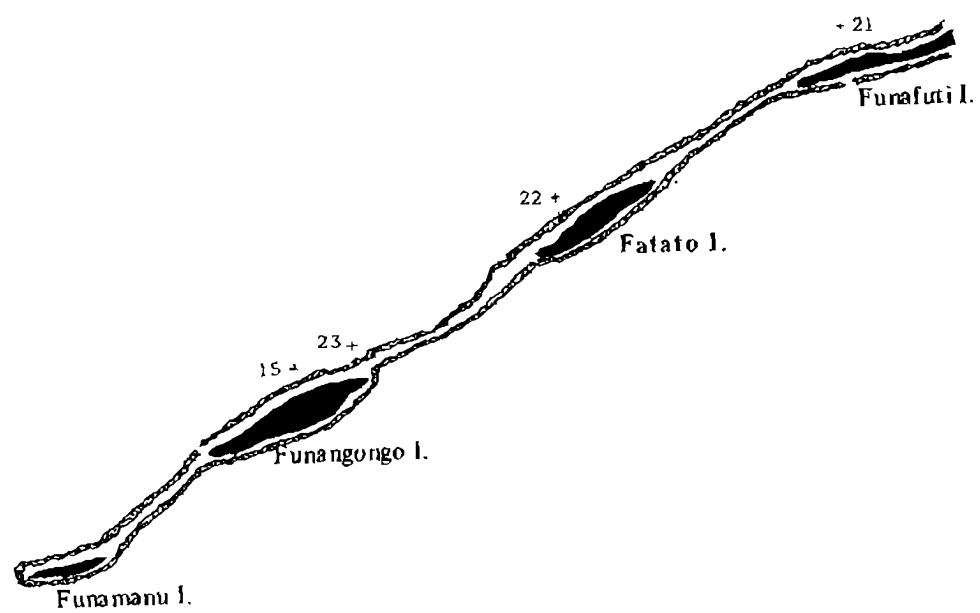
FIGURE 4: FUNAFUTI ISLAND.



+ = Station No.

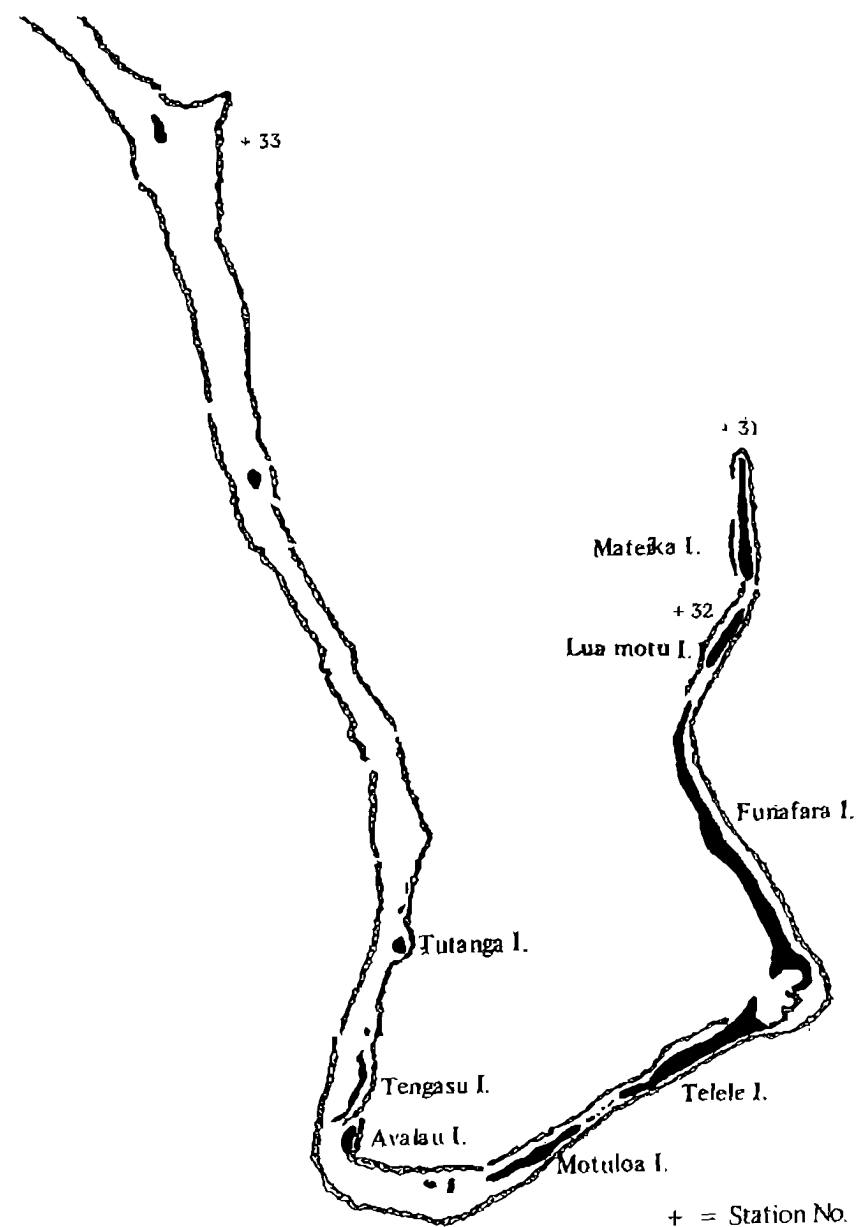
- Station 24      Te akau Kalea Reef. December 7. 1010 - 1105 hrs.  
Large coral outcrop dropping off onto white coronous sand flats. 5 - 20 m.  
Divers - Parkinson, A. Huckin.  
Conus, Lambis, Cerithium, Strombus, Mitra.
- Station 25      Te akau Kalea Reef. December 7. 1110 - 1155 hrs.  
Large coral outcrop dropping off onto white coronous sand flats.  
Divers - Parkinson, J. Huckin.  
Conus, Lambis, Cerithium.
- Station 26      Off wreck of 'Van Camp'. December 10. 1010 - 1055 hrs.  
Gently shelving white coronous sand slope at base of large area of dead eroded coral rock. 5 - 10 m.  
Divers - Parkinson, A. Huckin.  
Mitra, Cerithium, Nassarius.
- Station 27      Off wreck of 'Van Camp'. December 10. 1100 - 1140 hrs.  
Gently shelving white coronous sand slope at base of large area of dead eroded coral rock. 5 - 10 m.  
Divers - Parkinson, J. Huckin.  
Cerithium.
- Station 28      Drop-off of outer barrier reef, opposite end of air field.  
December 11.  
Steeply sloping coral cliff with much rubble. 1 - 15 m.  
Divers - Parkinson.  
Conus, Cypraea.
- Station 29      East of Tepuke Island. December 12.  
Thin layer of white coronous sand on bed of living coral.  
5 - 20 m.  
Divers - Parkinson, A. Huckin.  
Mitra, Terebra, Conus, Strombus.
- Station 30      East of Tepuke Island. December 12. 1340 - 1415 hrs.  
Sand flats at bottom of sloping patches of live coral.  
10 - 20 m.  
Divers - Parkinson, J. Huckin.  
Mitra, Terebra, Conus, Strombus.
- Station 31      Te Afualiku Island. December 12. 1110 - 1145 hrs.  
Fine white sand flats with isolated patches of live coral at base of steep coral cliff. 2 - 20 m.  
Divers - Parkinson, A. Huckin.  
Terebra, Conus, Strombus, Cerithium.
- Station 32      100 m east of Lua motu Island. December 13.  
Flat white coronous sand plain with minor rubble - visibility poor. 5 - 7 m.  
Divers - Parkinson, J. Huckin.  
Terebra, Cerithium.

FIGURE 5: FUNAFUTI ATOLL.



+ = Station No.

FIGURE 6: FUNAFUTI ATOLL.



+ = Station No.

- Station 33      East of Fuagea Island. December 13. 1310 - 1345 hrs.  
White coronous sand plain gently sloping between edge of reef and drop-off. 3 m. Tiger shark caused dive to be discontinued. 8 - 10 m.  
Divers - Parkinson, J. Huckin.  
Terebra, Strombus, Cerithium.
- Station 34      Off Vaiaku township jetty. December 13. 1920 - 2010 hrs.  
White coronous sand flats with some sea grass and rubble. 2 - 4 m.  
Divers - Parkinson, McQuarrie.  
Oliva, Conus, Terebra.
- Station 35      East of Tepuke Island. December 14. 1130 - 1220 hrs.  
Gently shelving white coronous sand slope with isolated patches of live coral. 5 - 15 m.  
Divers - Parkinson, Batty, A. Huckin.  
Terebra, Cerithium, Strombus, Conus.
- Station 36      Te akau Asano Reef. December 15. 1020 - 1105 hrs.  
Coral pinnacle rising out of white coronous sand flats. 3 - 25 m.  
Divers - Parkinson, Batty, J. Huckin.  
Mitra, Cypraea, Cerithium.
- Station 37      Ulu Bunga Tafaulia Reef. December 15. 1120 - 1150 hrs.  
White coronous sand plain with isolated patches of live coral. 8 - 15 m.  
Divers - Parkinson, A. Huckin.  
Cerithium, Conus.

### 3. DISCUSSION

#### 3.1 Tuvalu's Shell Resources

The seashell fauna of Tuvalu, being that of a coral atoll, is not as rich or as varied as that of nearby countries such as Fiji and Vanuatu, which are comprised chiefly of volcanic high islands. In addition certain families such as the volutes (Volutidae spp), are not found in Tuvalu, and others like the olives (Olividae spp), murex (Muricidae spp), and harps (Harpidae spp), although well represented elsewhere, have only one or two species at the most in Tuvalu. The olives are represented only by a pale golden form of Oliva miniacea, and Oliva carneola, O. oliva and other olives common elsewhere are absent from the country.

Other abundant species such as the common spider shell (Lambis lambis) are also absent from Tuvalu and seem to be replaced here by the giant spider shell (Lambis truncata) which was present at most locations dived and is a common item of food.

This paucity of some families is compensated for in Tuvalu by the fact that certain groups of shells that are popular with collectors are found in good numbers. There are, for example, over 25 species of cowries and although some of these seem to be rarer here than in other parts of the Pacific, the Tuvaluan shells are more colourful than those coming from the Philippines, Papua New Guinea and other parts of the Pacific. The Cypraea helvola and Cypraea chinensis collected on Nukufetau during this study were exceptionally bright and this point could perhaps be made when a catalogue is issued.

Some families including the ceriths (Cerithidae spp), are well represented in Tuvalu, seemingly filling here the ecological niches occupied by species like the olives (Olividae spp) elsewhere in the Pacific.

A point of interest is that several ceriths as well as species from other families were first described from shells collected in Tuvalu by the Royal Society of London's Expedition which came to Tuvalu three times between 1896 and 1898. One of the shells which was collected then by dredging near Funafuti in depths over 100 metres was called Murex funafutiensis and if this is a valid species it could be used as a logo for the intended business.

The Royal Society published a type list of the shells that were found in Tuvalu, and the more important of these are listed in Appendix 2. In addition, the Fisheries Department produced a list of the shells of Tuvalu in 1976 (Appendix 3), and many species new to Tuvalu were discovered during the present survey.

Although only two atolls were surveyed during this consultancy, 60 new species records for Tuvalu were made. If so many new shells can be located in such a short time, this would point to the presence of many as yet unrecorded species, which will be found should more extensive surveys be carried out, particularly in the islands of the southern group and preferably with SCUBA if that should prove possible.

Also, as the shell fauna is usually similar in adjacent geographically related areas, it may be worth checking whether marine faunal studies have been carried out by the French authorities in neighbouring Wallis and Futuna, as this will give an indication of what might be found here in Tuvalu.

A composite list of the shells found in previous lists, which could be verified, and those resulting from the present survey is presented in Appendix 1, in the form of a sample catalogue for future use.

### 3.2 Harvesting

Only a few Tuvaluans are aware of the value of the shells which are to be found in the country apart from reports of the golden cowries (Cypraea aurantium) which have been found in recent years in Nukulaelae, and which seem to have been somewhat exaggerated. The only shells which are now collected in any numbers are those which are gathered by village women for food. Some of these are of value, particularly the giant spider shell (Lambis truncata), choice specimens of which fetch up to \$20.00, as they are popular collector's shells. Lying around the villages on Funafuti and Nukufetau the broken remains of dozens of these shells can be found.

Other smaller species are now completely overlooked, but many of these are of value and a booklet in Tuvaluan similar to the sample attached as Appendix 4 should be issued, as this points out to village people the value of the shells in their waters. This booklet also emphasises the steps that must be taken to preserve the value of the shells once collected, as well as the best way of handling and packaging the shells for transport to a marketing centre.

Many of the rarer species are more easily found in deeper water and more sophisticated techniques are thus necessary for their collection. These are discussed briefly here:

#### (1) Scuba

This equipment has been used successfully by local divers in both Papua New Guinea and in Solomon Islands to collect shells of considerable value. However the expense and sophistication of the equipment would probably limit its use to the Maritime Training School on Funafuti, whose trainees may be interested in pursuing this possible source of revenue.

#### (2) Netting

Another collection method which could possibly be used in Tuvalu is netting (Fig. 7). This technique is widely used in the Philippines where it is now the chief method used in collecting all of the rarer shells except for the golden cowrie (Cypraea aurantium). The nets are set out permanently in areas of dead coral rubble and checked every morning about dawn. No baits are used and the shells are entangled in the fine monofilament net as they wander about the ocean bottom at night.

FIGURE 7: NETS USED TO TRAP SHELLS.

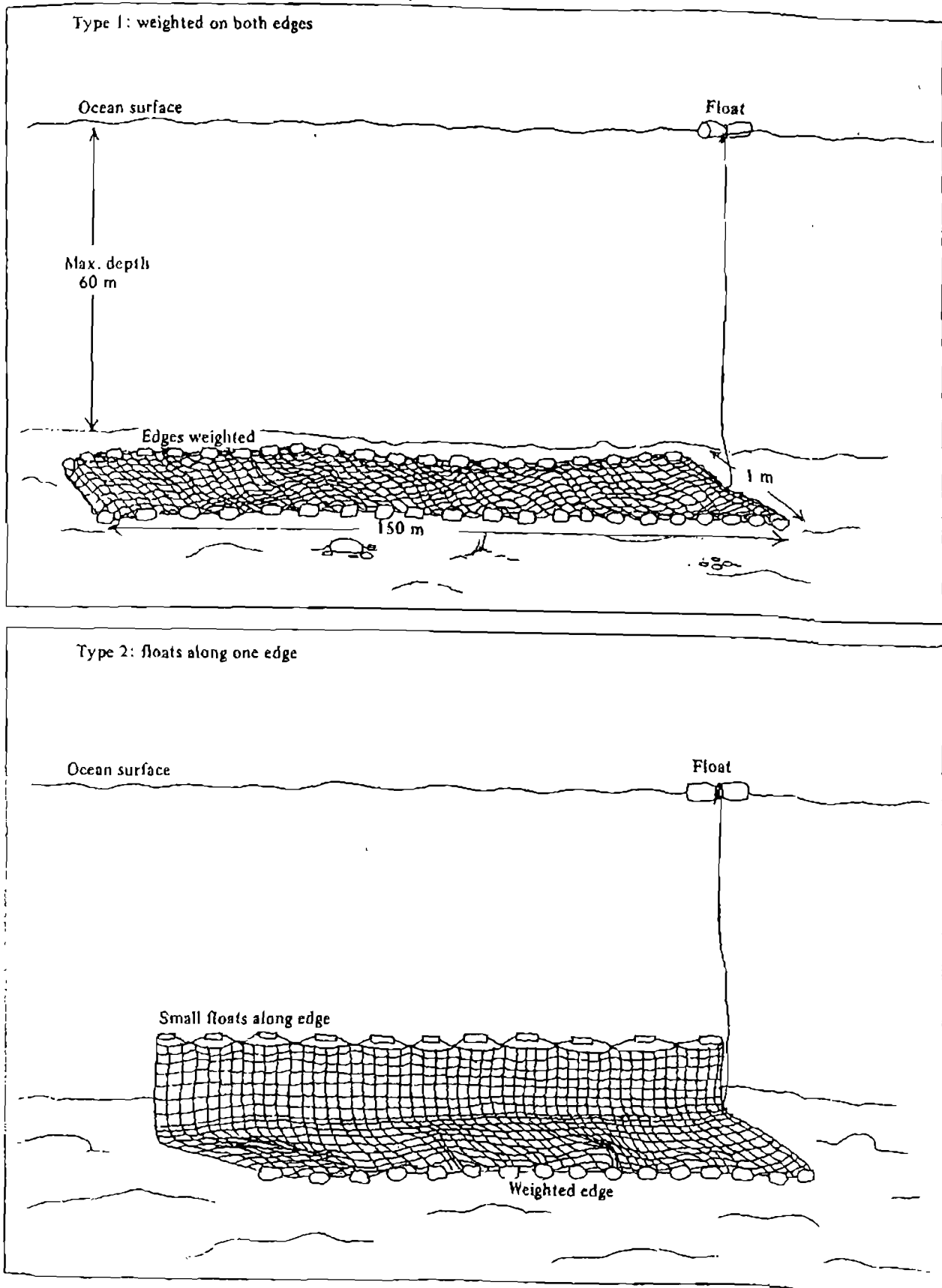
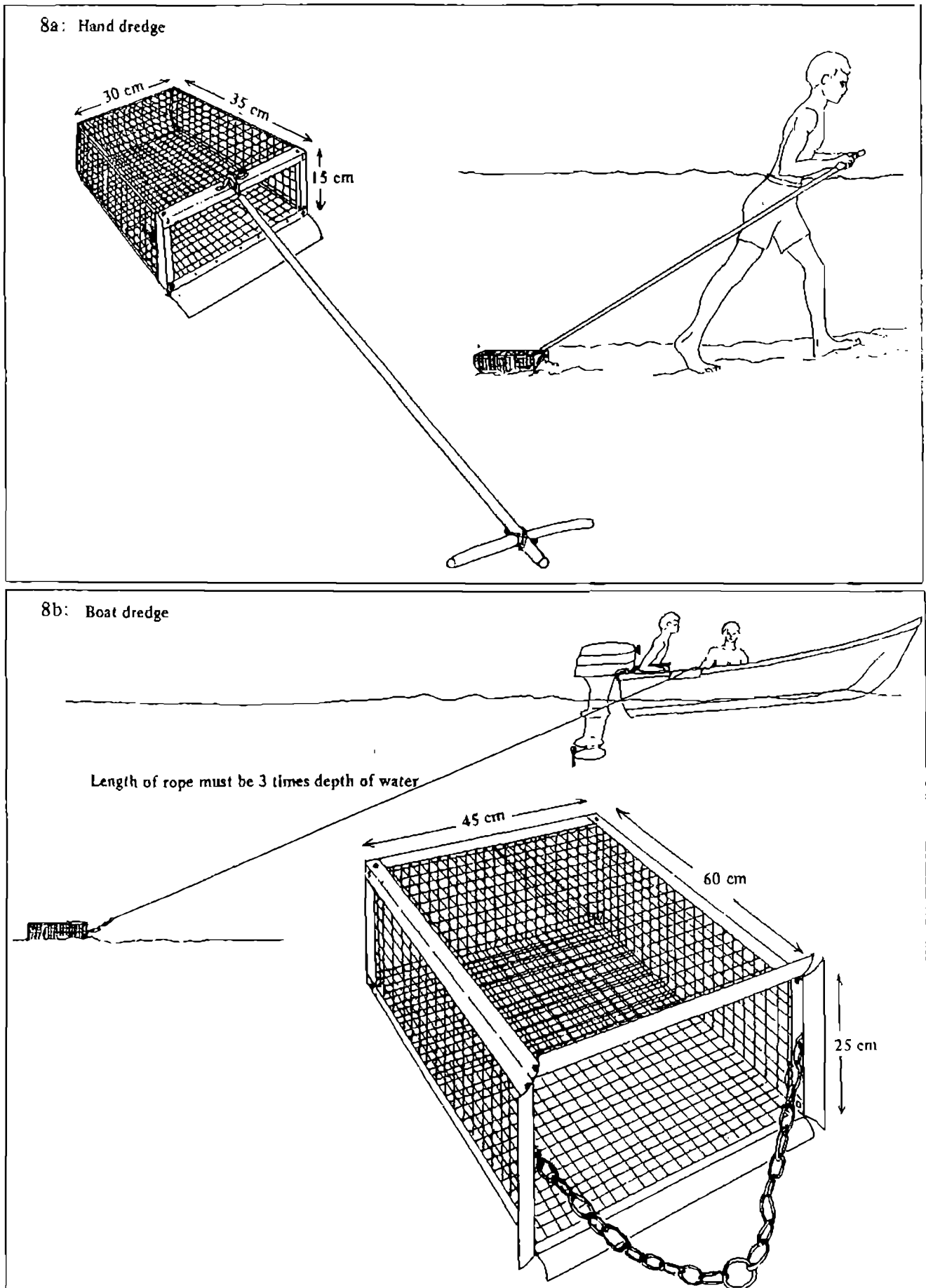


FIGURE 8: DREDGES FOR COLLECTING SHELLS.



### (3) Dredging

Shell collectors in many areas collect shells by the use of dredges. Two designs are illustrated in this report (Fig. 8). The hand dredge is towed along in shallow water behind a wading swimmer (Fig. 8a), and the boat dredge is pulled along behind a boat working at a very low speed (1-2 knots) and can be used effectively only in areas free of rubble (Fig. 8b).

### (4) Trapping

This method of collecting shells has already been used in Tuvalu by a local fisherman, Mr Misi Alotu, with some success. It consists of a basket baited with pieces of fish which is left on the bottom for a period of up to 30 minutes after which it is raised. As the only shell which is readily caught by this method is the olive, and there is only one species of this family in Tuvalu, promotion for its use would depend on more and rarer species of olive being discovered in these waters.

## 3.3 Conservation

If a shell industry is to be of long-term benefit to Tuvalu, conservation aspects must be rigidly adhered to. In the handbook which has been prepared for village collectors (Appendix 4), simple conservation measures have been outlined. The main precautions are the following:

1. Only perfect adult specimens should be collected. Juveniles or shells with breaks or perforations should not be touched as they are of little value, and they serve as a breeding stock.
2. Coral should not be destroyed by collectors. Often in their hurry to collect shells, people smash the coral in which the shell is found. Usually with a little care, the shell can be extracted with the minimum of damage to its habitat.
3. All boulders should be replaced in their original positions. Leaving coral boulders overturned with their undersides exposed to the sunlight means that both their eggs and their food supply are destroyed, as these delicate organisms are very sensitive to ultra-violet light.
4. All shells that are unsuitable for sale should be replaced in their original habitat. All sand dwelling species such as augers, olives, strombs or cerithids should be returned to sand, not left on the reef, and coral dwellers should be left in their correct habitat. Damaged specimens are quite capable of having perfect young as damage is the result of environmental pressures.

### 3.4 Marketing

Tuvalu, due to its isolation, has virtually no tourism and therefore local sales would depend on the few travellers who come to Tuvalu on commercial or official business.

Fiji with its very large number of tourists would provide an outlet for many of the larger and more colourful shells such as Lambis truncata, Murex ramosus and Cassis cornuta, all of which are to be found in Tuvalu. Fiji could also be a market for souvenir packs of Tuvaluan shells. If packs are made up of about ten of the commoner Tuvaluan shell species, this should prove an outlet for the more easily found types of shells. Packs of ten different mitres and ten different augers sold well in Papua New Guinea and should also sell well in Fiji, Hawaii, and other places if they have good locality data.

Locality data is also very important when shells are being sold to the more advanced collector. Such details as the scientific name, the place and date of collection, the collector, and the type of habitat in which it was found should be given. Two types of locality data slips that are commonly used by collectors are illustrated in Appendix 5, and either of these are acceptable.

Accurate identification of shells as to species is also essential and a reasonable library of books on shells such as those listed in Appendix 6 should be kept to facilitate this. The listed texts would be adequate for the identification of most of the species that are commonly found in Tuvalu. Other material that needs to be identified can be sent to the malacological departments of various museums which are usually very helpful in identifying specimens. Two museums which specialise in Pacific material are the Auckland Institute and Museum, Private Bag, Auckland, New Zealand, and the Australian Museum, College St., Sydney, N.S.W., Australia.

The maintenance of quality standards is also very important in the marketing of shells, and if only perfect shells are collected by villagers this also serves as a conservation measure, as then those shells with breaks or scars caused by predators can continue to function as breeding stock.

There are various magazines which cater to shell collectors and once a business is established an advertising campaign should be carried out in some of these. The magazines with the widest circulation are the Hawaiian Shell News, the Australian Shell News, and the Italian publication 'La Conchiglia'. There is also a publication which lists the shell dealers, shell magazines and shell clubs throughout the world. The catalogue of Tuvaluan shells once prepared, should be circulated to the more important of these potential outlets.

#### 4. RECOMMENDATIONS

The information gained during this survey indicates the potential for at least a small-scale specimen shell industry in Tuvalu, and the following recommendations have been formulated to promote such development.

1. That a Shell Depot be set up for the buying and marketing of sea shells, with control vested in either the Fisheries Division or the Handicrafts Division.
2. That a person or persons be trained in the identification and grading of sea shells and that during this initial training period stocks of shells be accumulated so that a catalogue can be produced.
3. That when a catalogue of sea shells of Tuvalu is produced, advertisements be placed in suitable magazines and that copies of the catalogue be circulated to possible outlets in Fiji, Australia, Hawaii and elsewhere.
4. That once a decision is made on the establishment of a shell business, appropriate literature be distributed to interested persons or village groups pointing out to them the value of the shells in their area and potential for marketing.
5. That if possible further collecting be carried out, particularly in deeper water, and in the southern islands of Tuvalu, to supplement shell resources already known to exist in the country and to further increase revenue opportunities.
6. That no restriction need be put on the collection of 'mesa' shells (Melampus flavus) as present populations of the shell can support the cottage industry now operating.

#### 5. ACKNOWLEDGEMENTS

I would like to thank Mr Michael Batty of the Fisheries Division and Mr Jonathan Gaunt of the Handicrafts Division for their help in arranging the logistics of the consultancy.

I would also like to thank Mr Batty, Mr Peter McQuarrie, Mr Selu Lini, and Andrew and Jeremy Huckin who acted as back-up divers during the diving inspections of the stations.

I am also grateful to Mr McQuarrie, Mr and Mrs Chris Rogers, and Mr Misi Alotu for allowing me to inspect their private collections of Tuvaluan shells.

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APPENDIX 1CATALOGUE OF THE SEA SHELLS OF TUVALU

This list is compiled from three sources. These are those shells collected by the Royal Society of London's Expedition of 1896-8, the 1976 Fisheries Report with subsequent additions by Mr P. McQuarrie and Mr J. Gaunt, and shells recorded for the first time by the consultant (asterisked).

The prices quoted are within the range being asked by dealers as of December 1983. These will be determined by supply and demand, and in the cases where I consider these prices to be unrealistic I have adjusted them accordingly.

<u>SPECIES</u>	<u>PRICE RANGE (\$US)</u>
CASSIS	
cornuta	7.50-15.00
ponderosa*	1.00- 1.50
rufa	8.00-15.00
vibex	3.00- 5.00
CERITHIUM	
aluco	0.50- 1.00
alveolus	1.00- 2.00
articulatus*	0.50- 0.75
atromarginatum	1.00- 2.00
brevis	0.50- 0.75
citrinum	1.00- 2.00
columna	0.30- 0.50
echinatum	0.20- 0.30
elegantissimum	1.00- 2.00
fasciatus*	0.50- 0.75
impendens	1.00- 2.00
moniliferum	0.50- 0.75
nodulosum	0.75- 1.00
oceanicum	1.00- 2.00
pfeifferi*	1.00- 2.00
pharos	1.00- 1.50
rostratum	1.00- 2.00
salebrosum*	0.50- 1.00
sinensis	0.25- 0.50
spiculum	0.30- 0.50
strictum	1.00- 2.00
zebrum	1.00- 2.50

SPECIESPRICE RANGE (\$US)

## CONUS

ammiralis*	10.00-20.00
arenatus	0.40-0.75
aulicus	5.00-10.00
auricomus*	3.50-5.00
cactus	0.30-0.50
chaldeus*	0.75-1.00
coronatus	0.30-0.50
distan*	1.00-2.00
ebraeus	0.50-1.00
eburneus	0.50-0.75
episcopus*	1.00-2.50
flavidus	0.50-1.00
geographus	1.50-3.00
glans	1.50-2.50
imperialus*	3.50-4.00
leopardus*	1.50-3.00
litteratus	1.50-3.00
lividus	0.50-1.00
marmoreus	2.00-3.00
miles	0.50-1.00
miliaris	0.50-0.75
musicus*	0.50-1.00
nussatela	2.50-3.50
pulicarius	0.75-1.00
rattus	0.50-1.00
retifer	7.50-10.00
sponsalis*	0.50-0.75
striatus	1.50-2.00
tenuistriatus	15.00-20.00
tessulatus*	1.50-4.00
tulipa	2.50-3.00
vexillum	1.50-4.00
vitulinus	1.00-1.50

## CYMATIUM

aquatile*	3.50-5.00
articulatus*	3.00-5.00
distortio annu*	1.00-3.00
fasciatus*	3.00-5.00
Gemmatum	1.50-2.50
maculosum	3.50-5.00
muricinum	1.00-2.50
nicobaricum	1.50-2.50
pilaere	1.00-1.50
rubeculum*	1.50-2.50
seriale	3.50-5.00
sinensis*	2.50-3.50
tritonis	20.00-75.00

<u>SPECIES</u>	<u>PRICE RANGE (\$US)</u>
<b>CYPRAEA</b>	
annulus	0.10- 0.20
arabica	0.35- 0.75
argus	2.00- 5.00
aurantium	200.00-500.00
beckii	20.00-40.00
bistrinotata	1.50- 5.00
caputserpentis	0.25- 0.35
carneola	0.75- 1.50
childreni	7.50-20.00
chinensis*	0.75- 3.50
cicercula	1.50- 5.00
clandestina	0.50- 1.50
cribraria	2.00- 5.00
depressa	1.00- 2.00
eglantina	0.75- 1.00
erosa	0.25- 1.00
errones*	0.25- 1.00
felina*	0.75- 1.50
fimbriata	1.00- 1.50
goodalli	20.00-40.00
gracilis	0.75- 1.00
helvola	0.50- 1.50
isabella	0.30- 0.50
labrolineata	0.50- 1.00
lynx	0.50- 1.00
maculifera	1.00- 2.00
mappa	2.50- 5.00
mauritiana	1.00- 2.00
moneta	0.10- 0.20
nucleus	0.50- 1.00
poraria	0.50- 1.00
scurra	2.00- 4.00
serrulifera	0.50- 1.00
staphylea	0.50- 1.00
talpa	1.00- 2.50
teres	0.75- 1.00
testudinaria	3.00- 5.00
tigris	0.50- 1.00
ventriculus	6.00-10.00
vitellus	0.50- 1.00
ziczac	0.75- 1.00
<b>CADUCIFER</b>	
truncata*	5.00- 7.50
<b>DRUPA</b>	
grossularia*	0.25- 0.50
morum	0.25- 0.75
ricina	0.25- 0.50
rubusidaeus*	0.25- 0.75

<u>SPECIES</u>	<u>PRICE RANGE (\$US)</u>
ENGINEA	
mendicaria	0.25- 0.75
HARPA	
amouretta	0.50- 1.50
IMPAGES	
hectica	2.00- 3.00
LAMBIS	
chiragra	3.00- 7.50
crocata	2.50- 5.00
truncata	7.50-20.00
MITRA AND COSTELLARIA	
acuminata	1.00- 2.00
acupictum*	10.00-12.50
chrysalis	1.00- 1.50
clathrus*	0.75- 1.50
contracta*	4.00- 6.00
cucumerina	0.50- 1.00
dactylus*	0.75- 1.25
eremitarum	0.75- 1.00
exasparatum*	0.75- 1.00
ferruginea	0.75- 1.50
fusca*	6.00-10.00
granatina*	1.00- 3.00
imperialus*	2.50- 4.00
litterata	0.75- 1.00
mitra	1.50- 2.00
nucea*	1.25- 2.50
olivaeformis*	0.50- 1.00
pacificum*	1.00- 2.00
papalis	2.50- 4.00
papilio*	1.50- 2.50
paupercula	0.50- 0.75
pelliserpentis	2.00- 3.00
punctata*	0.50- 1.00
retusa*	0.75- 1.00
rugosum*	0.50- 2.75
stictica	0.50- 1.50
turrigerum*	1.50- 2.50
verrucosa*	1.50- 2.00
MUREX	
adusta	1.00- 2.00
ramosus	3.00-15.00
NAUTILUS	
pompilius	5.00- 7.00

<u>SPECIES</u>	<u>PRICE RANGE (\$US)</u>
OLIVA	
miniacea	0.75- 4.50
STROMBUS	
fragilis*	7.50-10.00
gibberulus	0.35- 0.75
labiatus*	0.50- 1.00
lentiginosus*	3.00- 5.00
luhuanus	0.10- 0.25
microurceus*	2.50- 3.50
TEREBELLUM	
terebellum*	1.00- 3.00
TEREBRA	
affinis	0.50- 1.00
archimedis*	1.50- 3.00
argus*	0.75- 3.50
cingulifera*	1.50- 4.00
crenulata	1.00- 2.50
crenulata fimbriata*	2.00- 3.50
dimidiata	1.00- 2.50
kilburni*	3.50- 5.00
maculata	0.50- 2.50
paucistriata*	2.50- 3.50
rugosum*	0.50- 2.75
stictica	5.00- 7.50
subulata	2.00- 2.50
textilis*	3.00- 5.00
THAIS	
aculeata	0.50- 0.75
tuberosa*	0.50- 1.00
TROCHUS	
pyramis*	1.50- 2.50
sarcellus	1.00- 2.00
verrucosus*	1.50- 2.50
TURBO	
argyrostomus	0.50- 1.00
bruneus	1.00- 1.50
petholatus	1.50- 3.00
setosus	1.00- 1.50

APPENDIX 2

Amended list of shells collected at Funafuti Atoll, Tuvalu, by the Royal Society of London's Expedition to Funafuti Atoll of 1896-98. Synonyms are given where appropriate.

Cassis	cornuta vibex
Cerithium	asperum = C. zebrum breve var. ellicensis = C. brevis citrinum columna echinatum elegantissimum sp. nov.* impedens sp. nov. maculosum = C. atromarginatum nodulosum obeliscus = C. sinensis obeliscus var. cedo-nulli = C. sinensis oceanicum sp. nov. pharos piperitum = C. alveolus rostratum spiculum sp. nov. strictum sp. nov. variegatum = C. moniliferus zebrum
Conus	auratus = C. aulicus capitaneus catus ceylonensis** flavidus geographus hebraeus = C. ebraeus litteratus lividus nussatela pulicarius rattus striatus tessulatus tulipa vexillum vitulinus

- Cymatium chlorostomum = C. nicobaricum  
 digitale = C. serriale  
 distortio anus  
 gemmatum  
 maculosum  
 pileare  
 critonis  
 tuberosum = C. muricinum
- Cypraea annulus  
 arabica  
 argus  
 caputserpentis  
 carneola  
 carneola propinqua = C. carneola  
 childreni  
 cicercula  
 clandestina  
 cribraria  
 erosa  
 fimbriata  
 goodalli  
 helvola  
 isabella  
 lynx  
 macula = C. gracilis  
 mappa  
 mauritiana  
 moneta  
 nucleus  
 poraria  
 reticulata = C. maculifera  
 scurra  
 talpa  
 testudinaria  
 tigris  
 vitellus
- Harpa gracilis = H. amouretta  
 minor = H. amouretta
- Mitra acuminata  
 astricta = M. pelliserpentis astricta  
 brunnea\*\*  
 chrysalis  
 cucumerina  
 episcopalis = M. mitra  
 ferruginea  
 flammea var. histrix\*\*  
 limbifera\*\*  
 litterata  
 paupercula  
 pontificalis = M. stictica  
 tabanula var. caledonicus = M. chrysalis  
 virgata\*\*

Murex	adusta funafutiensis sp. nov. radula sp. nov. ramosus
Olivia	guttata = O. annulata*** irisans var. erthrostoma = O. miniacea
Strombus	dentatus var. rugosus = S. erythrinus rugosus flodridus = S. mutabilis gibberulus haemastoma lentignosus luhuanus samar = S. dentatus terebellatus
Terebra	affinis crenulata dimidiata maculata subulata tigrina = T. felina
Trochus	atropurpureus fastigiatus obeliscus = T. pyramis tubiferus

\* This is a species that was first described from Funafuti Atoll, Tuvalu. This is of doubtful validity.

\*\* A few names particularly in the Mitridae are dubious, but synonyms are not available.

\*\*\* It seems unlikely that this species occurs in Tuvalu.

APPENDIX 3

SHELLS OF TUVALU - LISTED IN FISHERIES REPORT OF 1976  
WITH ADDITIONS BY McQUARRIE AND GAUNT

Cassis	cornuta
	rufa
Cerithium	asperum (F) = C. zebrum
	brevis (F)
	echinatum (F)
	nodulosum (F)
Charonia	tritoniis
	pileare (F)
Conus	arenatus
	aulicus (F)
	catus (F)
	coronatus
	ebræus
	eburneus
	glans (F)
	leopardus
	litteratus
	lividus (F)
	marmoreus *
	miles (F)
	miliaris (F)
	pulicarius
	rattus (F)
	retifer (F)
	striatus
	tenuistratus (F)
Cypraea	tulipa (F)
	vexillum (F)
	annulus
	arabica
	argus
	aurantium
	beckii
	bistrinotata
	caputserpentis
	carneola
	childreni
	cicercula
	clandestina
	cribraria

Cypraea (continued)	depressa
	eglantina
	fimbriata
	goodalli
	gracilis
	helvola
	isabella
	labrolineata
	lynx
	maculifera
	mappa
	mauritiana
	moneta
	nucleus
	poraria
	scurra
	staphylea
	serrulifera
	talpa
	teres
	testudinaria
Drupa	tigris
	ventriculus
	vitellus
Drupa	morum (F)
	ricina (F)
Harpa	amouretta (F)
Impages	hectica
Lambis	arthritica = L. chiragra
	chiragra
	crocata
	lambis (F) *
	truncata
Mitra	eremitarum
	mitra
	papalis (C)
	stictica
Nautilus	pompilius (G)
Nerita	plicata (F)
	polita (F)

Oliva	textilina = O. miniacea
Peristernia	nassatula (F)
Planaxis	sulcatus
Strigatella	litterata (F) paupercula (F)
Strombus	gibberulus luhuanus mutabilis
Terebra	crenulata (F) maculata (F) subulata (F)
Thais	aculeata
Trochus	sarcellus
Turbo	argyrostomus (F) bruneus (F) petholatus (F) setosus (F)
Vasum	turbinellus (F)

SOURCES: Hedley, McQuarrie, Fisheries Report 1976, and Gaunt.

KEY : (F) Funafuti, (G) Nukulaelae

\* The presence of this species in Tuvalu needs verification.

APPENDIX 4

Extension booklet draft

COLLECTING SHELLS AS A BUSINESS

Further copies of this booklet  
may be obtained by writing to:

The Handicrafts Officer  
Vaiaku  
FUNAFUTI  
Tuvalu

### COLLECTING SHELLS AS A BUSINESS

People from all over the world collect sea shells. They collect them in their own countries but find it difficult to get shells from other places, so they buy them from dealers.

Some people are interested in shell collecting as a hobby, others study shells as a science, while other people like the attractive ornaments and jewellery made from shells.

Dealers are interested in shells from Tuvalu as we are lucky in having plenty of unusual and beautiful shells.

The government is trying to encourage Tuvaluans to collect shells for sale overseas, and this booklet is written to let you know something about the business and how it works.

The Handicrafts Division has an officer stationed in Funafuti and that officer is experienced in the identification and marketing of shells, and can be contacted at this address:

The Handicrafts Officer  
Vaiaaku  
FUNAFUTI  
Tuvalu

Also there are a number of private firms in Fiji dealing in shells and their addresses are available from the Handicrafts Officer.

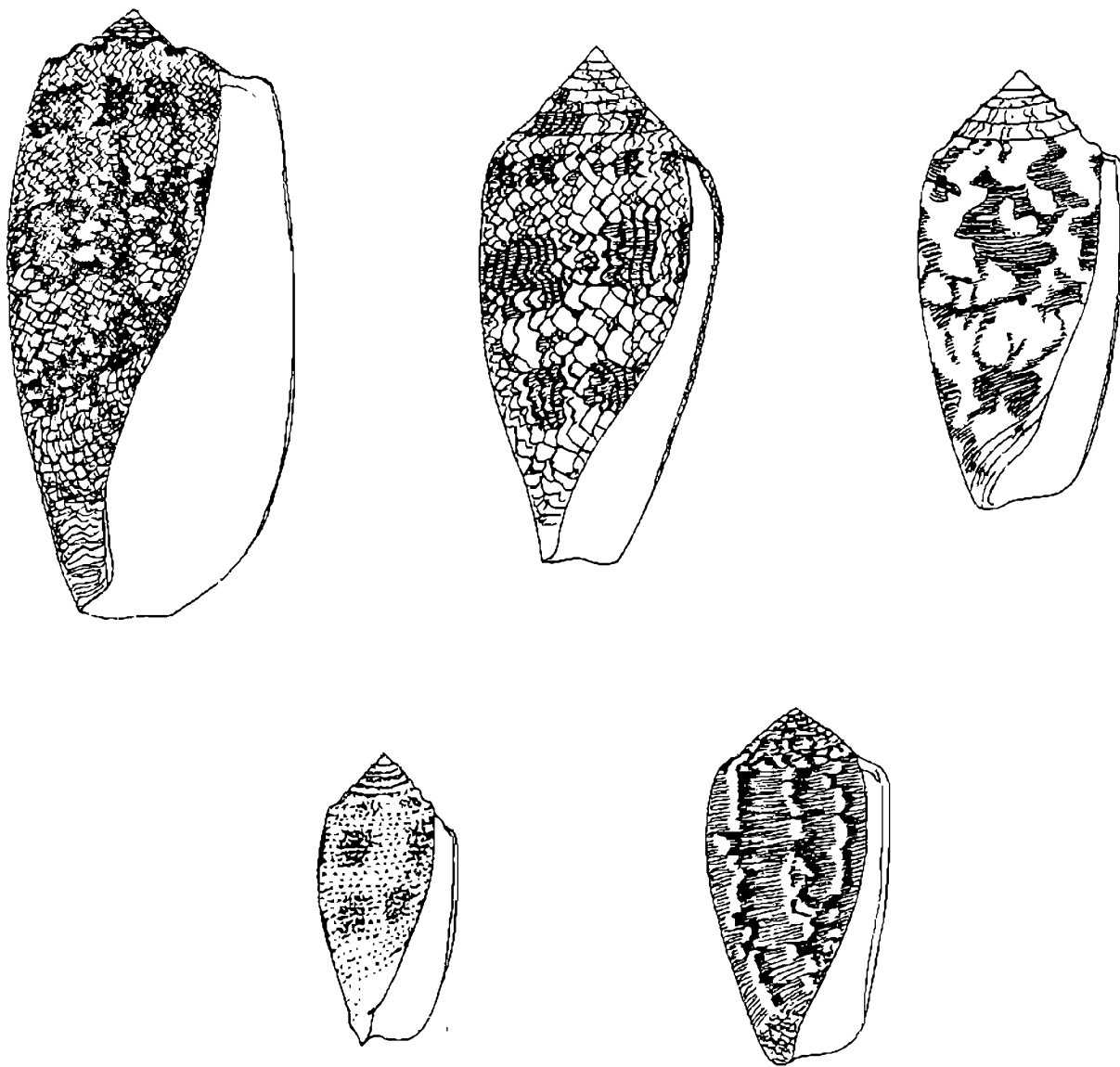
### COLLECTING SHELLS

Shells may be found in many places - on reefs, under stone and coral, in sand, mud and grass, or by diving and swimming along the edges of the reef. Most people from Tuvalu know the places where shells are to be found, particularly the women who collect shells for food.

When you collect shells it is a good idea to put the shells in a cloth or plastic bag tied around your waist.

Take extra care when collecting cone shells (see picture) as some of these are very poisonous and people have died from their sting. When you find one put it immediately into your bag and do not hold it in your hand. Always hold it at the shoulder - the widest section - but remember cone shells can sting even when held like this. Ensure that children never play with cone shells.

Some shells are very valuable and others have little or no value. At first you will find it hard to know which are the most valuable shells but after you sell some you will soon learn.



Cone shells

These shells are dangerous.



These shells are chipped and broken. They are worthless, and should be thrown back into the sea.



These shells are good. They should be cleaned and packed carefully, and then mailed to the Handicrafts Officer.

### CLEANING SHELLS

Very young shells or old shells which have bad marks, are broken, or are covered with coral growths have no value. Leave those in the sea.

Some shells have a skin over the outside of the shell. This can be cleaned away properly when the shells arrive at the shell depot in Funafuti.

When you scrape this skin off with a knife, sometimes the shell is scratched and the lip broken.

Shells found "dead" on the beach are usually worthless, but some have a small value.

Shell dealers and collectors prefer to buy shells which have been caught alive and these bring the best prices. However, they do not want the animal which lives in the shell because it stinks when it dies. So we must clean and remove the meat from inside the shell.

For people in the village the best and easiest way is to place the shells in the sand and let them stink or rot away. Ants will also help by eating the meat. When the animal has rotted away, wash the shells thoroughly. If there is no more smell, the shells are clean inside.

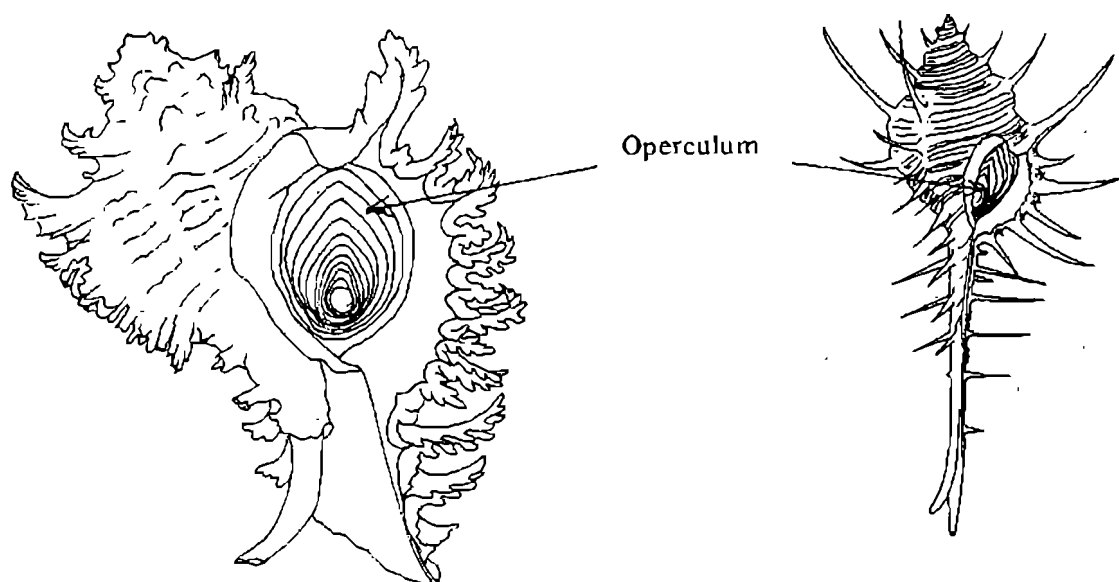
This method of cleaning out the animal sounds very easy but care must be taken while the meat is rotting. Some shells like cowries and olives are very shiny on the outside and the colour and shine is spoiled if the dirty water from the rotting animal runs over the shell. The best way is to fill a box with sand and stand the shell up in the sand. Strong sunlight also spoils the shine and colour of shells so the box of sand should be placed under the house or in shade. Cover the shells or dogs will try to eat the stinking meat and some shells may be broken.

If you want to clean the shells quickly they can be boiled in water and the animal dug out with pins and pieces of wire, but be careful or the mouth or lip of the shell will be chipped or broken and the shell will drop in value.

When boiling shells be careful to put them in cold water, and then bring to the boil. Shells can crack if put directly into hot water.

Some shells have a door (called the operculum). These should be kept with the shell it belongs to as it increases the value. Doors on some shells are hard and shiny like the pretty "cat's eye", while others are thin and tough like plastic or leather, but all should be kept to get the best price.

Shells should not be kept in tins or metal containers as rust marks on shells cannot be removed, and this will often make a shell worthless.



Murex shells

Keep the operculum or door of all Murex shells.

PACKAGING AND SENDING SHELLS TO DEPOT IN FUNAFUTI

When the shells are ready for sending to Funafuti be careful how you pack them. If they break they will not be worth anything and the time taken in collecting and cleaning will have been wasted.

Wrap each shell carefully in soft paper or dry banana leaves inside a strong carton or box.

If the shipment is by airfreight, use a strong but light-weight carton or the cost of freight will be too much. When the shells are sent by ship the box should be stronger as the weight is not so important.

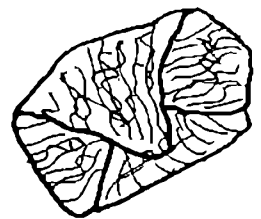
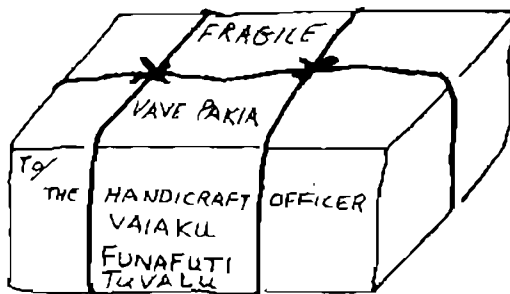
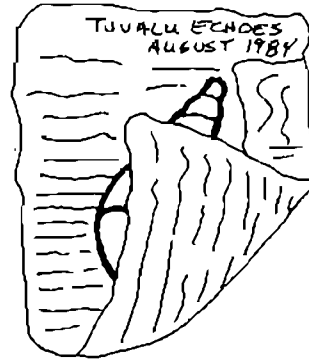
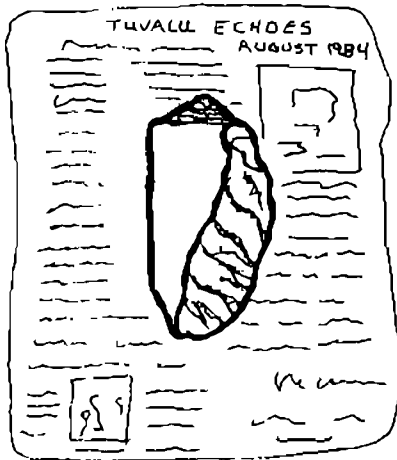
If you find a rare shell that is worth a lot of money, it is better to send it separately in a small well-packed parcel by airmail.

Place your name and address inside the carton or box so that the staff at the Depot in Funafuti can send the money to you as soon as the box of shells is received and the contents sorted and valued.

Fill the box with shells so they do not move about. A loosely packed box will cause many to break.

Mark the box with the address as follows:

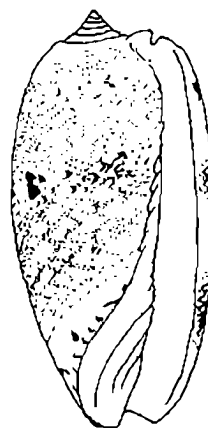
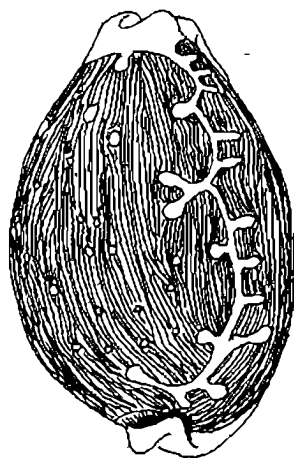
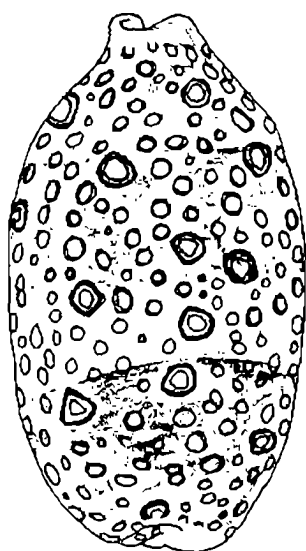
The Handicrafts Officer  
Vaiaku  
FUNAFUTI  
Tuvalu



Fill the mouth of the shell with paper. Wrap in newspaper. Pack carefully into a strong box.  
Fasten the box well. Write the address clearly on the box.

THESE NINE POINTS ARE IMPORTANT

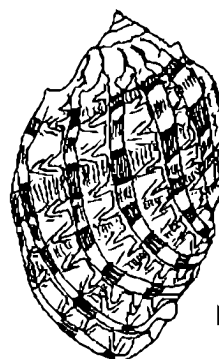
1. Cowries and olive shells must have a good shine and colour.
2. Cone shells must have a clean and straight lip or mouth. If the lip is chipped the values are low. Some are worthless.
3. Terebra shells or augers have a long sharp apex or point. Take care not to break this fine point.
4. All shells will spoil if left in the sun.
5. Only keep good clean shells. Throw the young and old marked ones back into the sea as breeding stock. Old shells found on the beach are no good.
6. Do not be disappointed if some shells are not worth much. The size of the shell is not always the best guide to value. Some very small shells like the smaller cowries and cones are worth much more than some very large and pretty shells. The value depends on the number of shells of that kind found in various parts of the world. Also remember that the freight costs of sending large and heavy shells is much higher than the charges for small shells.
7. Shells collected and used for food may have value as an ornament or for making jewellery after the animal has been removed and eaten. Usually these shells are common and not worth much each but a bagful could be sent by ship to Funafuti and return a profit to the village collectors.
8. Remove all the dead animal from the shell before sending to Funafuti.
9. Address the carton or box properly and do not forget to write your name and address and place inside the package.



Olive shells

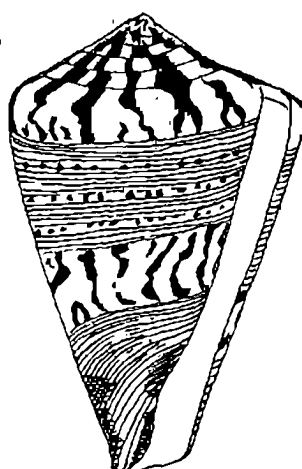
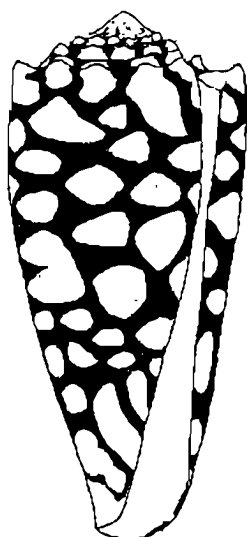


Cowrie shells



Harp shell

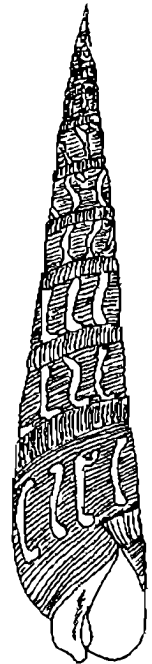
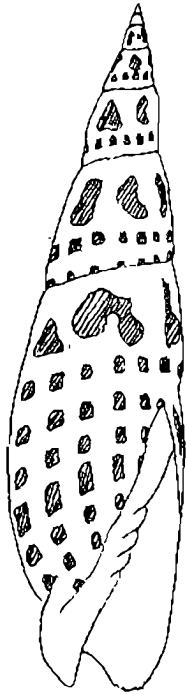
Do not spoil the shine and colour of these shells.



Cone shells



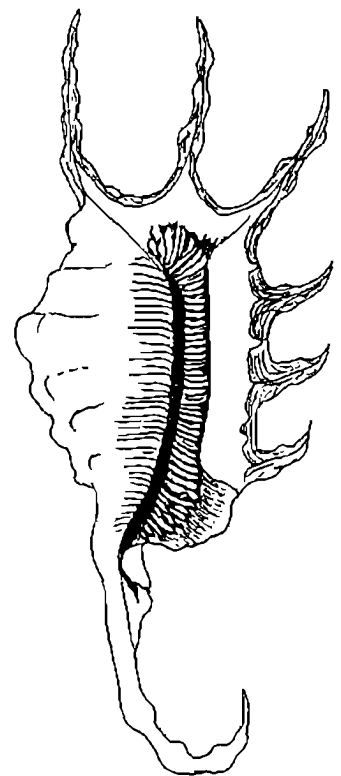
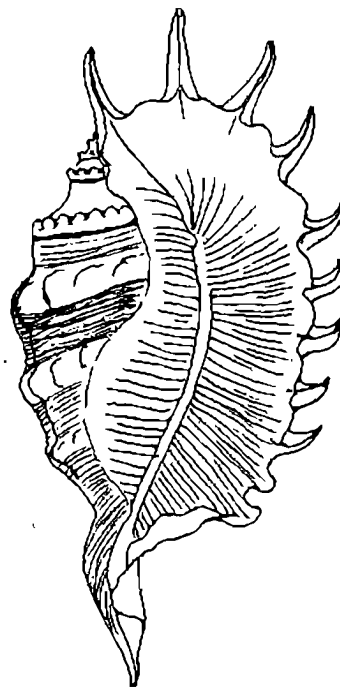
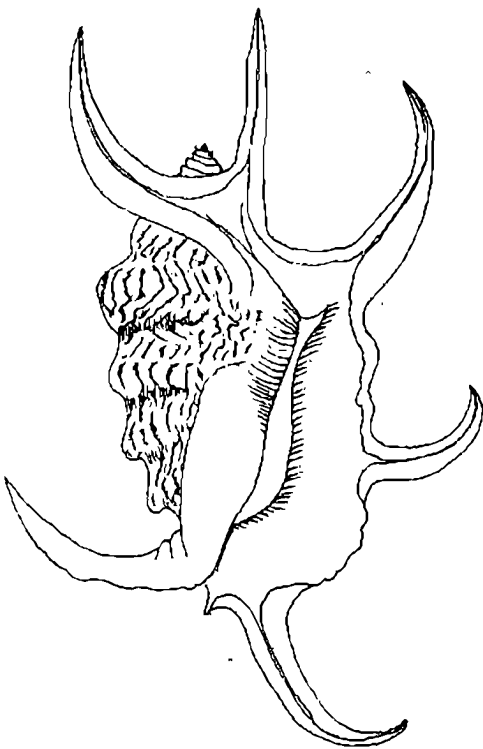
Do not break or chip the mouth of this kind of shell.



Mitre shells

Terebra shells

Be careful with this kind of shell; do not break the sharp point or spire.



Spider shells

Do not break the legs or points of this kind of shell.

## CONSERVATION

When a new business is started it is very important that much thought is given to ensure that a profit will be made. It is just as important to make sure that a profit will continue to be made in the years ahead.

CONSERVATION - is the term used to describe a careful control of the resource - the animals, birds or plants that are being used to make the business. In this case the resource is SHELLS. If pretty coral pieces are also used they must be considered also.

The shallow waters around Tuvalu have plenty of shells. If they are collected carefully and only a few at a time, they will continue to breed and there will always be plenty of shells.

If people become greedy and collect and sell all the shells they find on the reefs and beaches there will be none left to breed and some kinds of shells will disappear altogether.

The word CONSERVATION means many more things and is a wide and difficult subject and science. In simple talk it means the careful control of the harvesting of an animal or tree or plant so that some remain to continue to grow and breed.

We must think of our children and grandchildren and do our best to make sure that there will be shells for them to eat and trade and sell.

If the following rules are kept we are on the right road in helping with the conservation of shells:

1. Only keep good shells. If they have broken lips or spires and if their surface is covered with too much coral, leave them in the sea to breed. They have no value.
2. Do not throw these spoiled shells away on the dry sand or in the bush where they will die. Put them back in the sea.
3. Very young or small shells should also be left in the sea.
4. All stones and pieces of coral which are lifted to find shells should be turned back again the way they were. Shells feed on tiny animals and plants which live on the underside of stones away from bright light, and these will die if stones are not replaced. Also, many shells lay their eggs underneath stones - these will also be destroyed.
5. A good method of controlled collecting is to search on one part of the reef, then leave a part of the reef alone, then search on another part. The shells that are left behind will breed and spread on to the reef that has been collected. This is the best way of collecting pretty pieces of coral if coral collecting is part of the new business.
6. Only collect the shells you know have a value. Then clean them carefully and do not waste them.

THINK CAREFULLY ABOUT THESE THINGS, AND IF YOU ARE CAREFUL ABOUT HOW YOU COLLECT THERE WILL ALWAYS BE SHELLS IN THE SEA IN YOUR AREA.

APPENDIX 5SAMPLES OF SHELL DATA SLIPS

Type 1.        Species.....  
                  Collected by .....  
                  on ..... at .....  
                  Habitat.....

Supplied by: Handicrafts Division,  
 Vaiaku, Funafuti, TUVALU, via FIJI.

Type 2.        Species.....  
                  Collected by .....  
                  on ..... at .....

HABITAT:	DEPTH:
White coronous sand	1 - 5 m
Live coral reef	5 - 10 m
Coral rubble	10 - 20 m
Sea grass flats	over 20 m

Supplied by: Handicrafts Division,  
 Vaiaku, Funafuti, TUVALU, via FIJI.

APPENDIX 6BASIC LIST OF SHELL BOOKS FOR PROJECT

Cernohorsky, W.O. (1971) Marine Shells of the Pacific (Vol. 1). Sydney: Pacific Publications.

Cernohorsky, W.O. (1972) Marine Shells of the Pacific (Vol. 2). Sydney: Pacific Publications.

Cernohorsky, W.O. (1981) Tropical Pacific Marine Shells. Sydney: Pacific Publications.

Hinton, A. (1976) Shells of New Guinea and the Central Indo-Pacific. Port Moresby: Robert Brown and Associates.

Pechar, P. and Parkinson, B. (1980) Mitre Shells from the Pacific and Indian Oceans. Port Moresby: Robert Brown and Associates.

Taylor, J. and Walls, J.C. (1975) Cowries. Neptune: T.F.H. Publications.

Walls, J.C. (1979) Cones. A Synopsis of the living Conidae. Neptune: T.F.H. Publications.

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