

**A STUDY OF THE ENEWETAK
TROCHUS RESOURCE**

**with Recommendations for Management
and Marketing**

Flinn Curren

**A Project of the
Pacific Island Network
University of Hawaii Sea Grant College Program
School of Ocean and Earth Science and Technology**

and the

**Enewetak Ujelang Local Government Council
of the Republic of the Marshall Islands**

July 1993

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by

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**A study funded by the Pacific Island Network, and the Enewetak/Ujelang Local
Government Council, Republic of the Marshall Islands**

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Finally, I would like to thank my family for their support during this project.

Report Summary and Recommendations

Trochus (Trochus niloticus) resources on Enewetak Atoll, Republic of the Marshall Islands (RMI) were surveyed in July and August, 1992. *Trochus* numbers appeared to be fewer than previously reported (Wright and Gillett 1989). Samples of shells, rejected by buyers, were measured and potential reasons for their rejection were noted. Samples of live shells were also measured and inspected. An opinion survey was presented to atoll residents concerning forms of trochus resource management. Shell and meat samples from three locations were sent for radionuclide testing to the Nationwide Radiological Survey in Majuro, RMI. A list (not exhaustive) of potential trochus shell buyers was compiled using firms noted by Pacific Island governments. Two potential trochus meat buyers were identified, although no buyers for trochus opercula were located.

The following recommendations are suggested for management and utilization of trochus resources of Enewetak Atoll:

1. The Enewetak/Ujelang Local Government Council (LGC) should establish trochus sanctuaries to encourage natural reseeding of the reefs, and take steps to protect trochus in those places before trochus season and until trochus shells are sold.
2. The LGC uses some method to establish trochus harvest quotas for limiting the total amount of trochus taken each season. This limit should be appropriate for the current trochus resources of the island. The quota recommended by Wright and Gillett (1989), 100 tons/year, is a level of harvest for the trochus stocks as measured by this study.
3. The council needs to keep accurate trochus harvest records on the actual amount of trochus shell sold for each season. Knowing the size of trochus harvests is very important in order to adjust future harvest sizes. The harvest size can then be changed depending on the abundance of trochus on the reefs.
4. Small and large size shell limits should be made for live harvested trochus. The recommended size limits are 10.6 cm (3 in.) for the smallest size of trochus taken, and 14.2 cm (4 in.) for the largest size of trochus taken.
5. Paid workers should be hired by the council to work prior to and during each trochus season to implement trochus management. These workers would perform the following tasks:
 - a. Monitor the trochus resource with line transects at fixed locations and possibly conduct some tag/recapture efforts prior to and during trochus seasons.

- b. Patrol trochus sanctuaries to discourage poaching.
 - c. Inspect live trochus for undersized and oversized shells and confiscate undersized and oversized trochus animals and return them to the reef.
 - d. Inspect trochus for undersized and oversized shells before sales, and confiscate undersized and oversized shells.
 - e. Monitor sales of shells to buyers in order to determine total size of harvest.
6. The LGC should encourage a larger number of trochus buyers to foster competition between buyers and thus promote higher prices paid to fishermen.
7. The LGC should not promote export marketing of trochus meat until a proper analysis of meat handling costs, shipping costs and costs of adequate ice making and freezing facilities are taken into consideration.

Project Background

In 1992, the Enewetak/Ujelang Local Government Council approached the Marshall Islands Marine Resources Authority (MIMRA) concerning a perceived decrease of trochus on the reefs of the atoll. A request for trochus surveys and marketing proposals was made to the Pacific Island Network (PIN), an organization operating through the University of Hawaii Sea Grant College Program under the U.S. Department of Interior. Following approval of funding by PIN and the Enewetak/Ujelang Local Government Council, fieldwork was carried out on Enewetak from August 2 through September 1, 1992 (Figure 1).

History of Trochus Exploitation on Enewetak

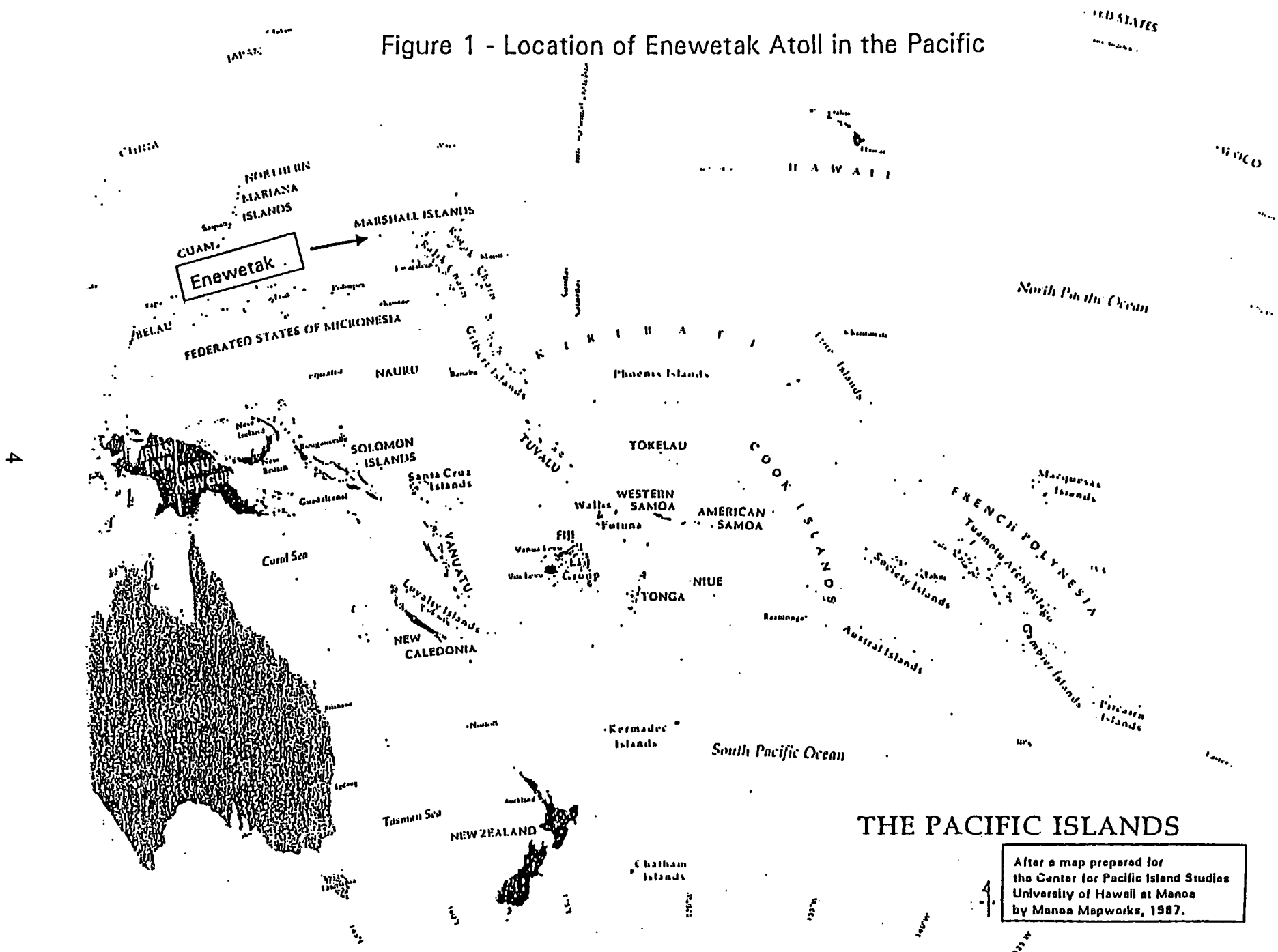
Trochus was introduced to the Marshall Islands in the 1930s by the Japanese. In 1947, the people of Enewetak atoll (dri-Enewetak) were relocated to Ujelang atoll by United States authorities wishing to use Enewetak as an area for nuclear testing. Following extensive testing and cleanup efforts, the atoll was returned to the original inhabitants in 1980 (Kiste 1987). In the intervening years, the exploitation of trochus resources was minimal.

In 1987, the first harvest of trochus for trochus shell occurred and trochus shells so plentiful they were harvested off the tops of the reef flats with rakes (Davor Pevec, pers. comm.). During the trochus season, the people of Enewetak atoll commonly camp for weeks on other islands in the atoll. Figures for the 1987 and 1988 harvests, obtained from the Acting Mayor of Enewetak in 1989 and supported by a Majuro trochus buyer, differ greatly from official figures of the RMI Division of Revenue and Taxation, Ministry of Finance (Wright and Gillett 1989). The exact amount of the 1990 season is unknown, but probably exceeded 100 tons. Harvest information is summarized in Table 1.

Table 1. Enewetak Trochus Harvests

	Amount Harvested (short tons)	Buyer Price (U.S. \$/pound)	Landed Value (U.S. \$)
1987	100 (est.)	\$0.40-\$0.60	\$100,000
1988	150 (est.)	Not Known	Not Known
1989	Not Known	Not Known	Not Known
1990	100+	\$1.50-\$2.25	Not Known
1991	none	-	-
1992	none	-	-

Figure 1 - Location of Enewetak Atoll in the Pacific



THE PACIFIC ISLANDS

After a map prepared for the Center for Pacific Island Studies University of Hawaii at Manoa by Manoa Mapworks, 1987.

Project Fieldwork

Twelve transect surveys were made during the current study, at sites located in Figure 2. A 100-meter nylon transect line was marked at 1-meter intervals using a plastic label machine (Dymomarker brand). The transect line was stretched along the surface of the bottom. Orientation of the line was parallel to the reef edge except in channels between islands where the line was placed parallel to the channel sides. The line was held tied on both ends, and secured in the middle by occasionally looping the line around a piece of rock or coral. Divers using masks, snorkels, and fins looked for trochus in a 2-meter-wide band on each side of the transect line. This made the total transect area 400 m². Trochus size and location were noted using pencils on mylar paper mounted on clipboards.

After an incident that demonstrated the aggressive nature of the gray reef shark *Carcharhinus amblyrhynchos* at Enewetak, the surveyors decided to conduct transect surveys on the reef top and among patch reefs in the lagoon. While some people may actively fish the outer reef slopes for trochus, it is suspected that this is done during low tide, when the reef top is a potential refuge.

Table 2 shows the results of the transect surveys. It should be noted that each transect shows a high level of variation within the transect. This variability is common for trochus transect surveys (Preston in prep.). This is due to both the high variability of the coral reef structure, and the patchiness of trochus within trochus habitats. An actual estimate of trochus (which is correct 95% of the time) for an area can be taken as the average number ± 2 times the standard deviation. Combining the data in spatially different ways can lower the standard deviation to a certain degree. For the transect data, areas of 2 m², 4 m², 10 m², 20 m², and 40 m² were considered. As a result, the estimate of the total number of trochus in an area has a high statistical uncertainty using the transect survey method.

Figure 2 - Trochus Transect Survey Sites

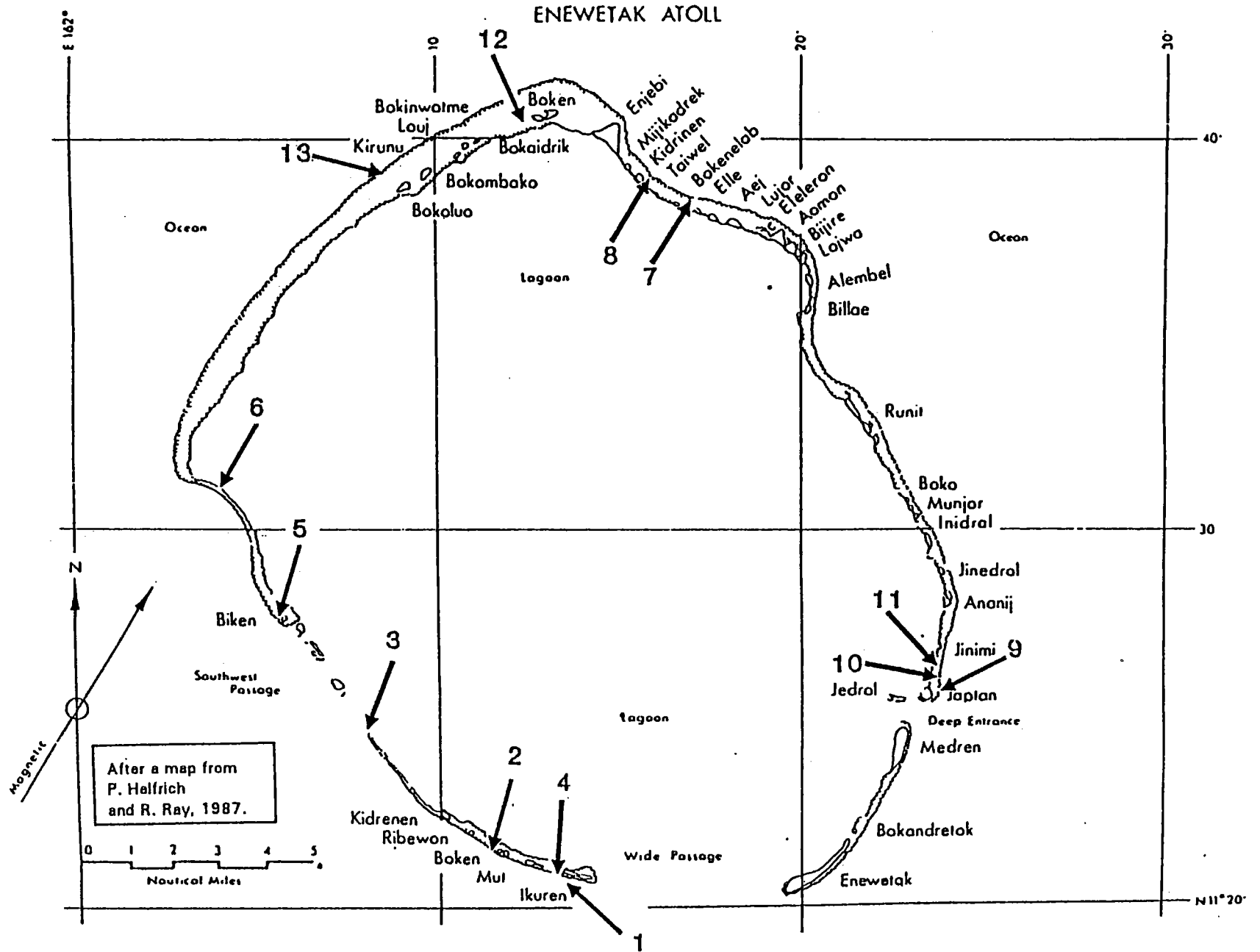


Table 2. Transect Survey Results, Calculated Using 40 m² Area Subsamples

Transect Number	Total No. Trochus in 400 m ²	Est. No. Trochus per Hectare ¹	Transect Number	Total No. Trochus in 400 m ²	Est. No. Trochus per Hectare ¹
1	5	125 ± 335	8	3	75 ± 229
2	7	175 ± 320	9	2	50 ± 100
3	0	0 ± 0	10	1	25 ± 150
4	10	250 ± 707	11	2	50 ± 200
5	4	100 ± 317	12	56	1400 ± 1806
6	5	125 ± 403	13	0	0 ± 0
7	2	50 ± 200			

¹ 1 hectare = 2.47 acres

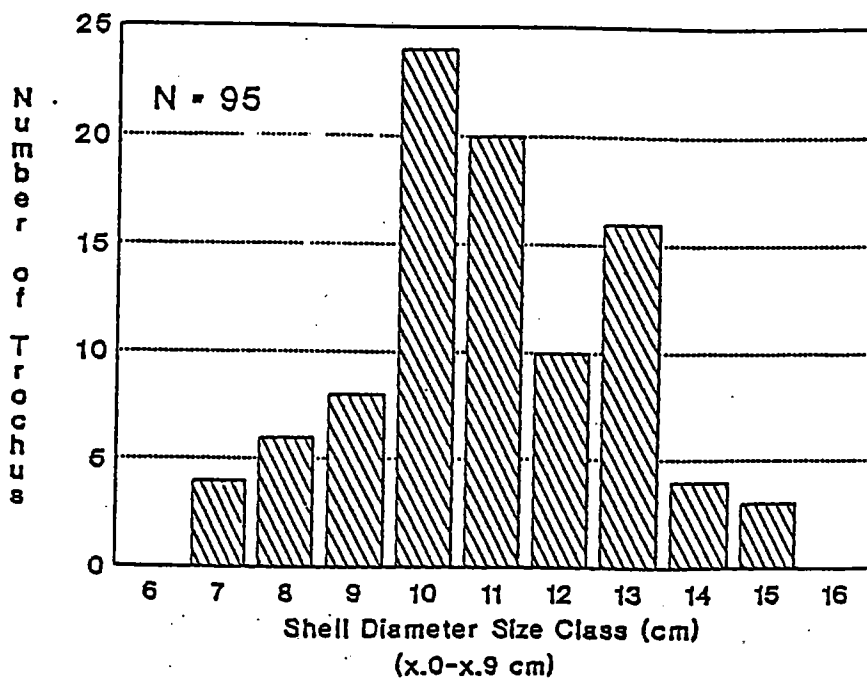
Despite the high uncertainty of exact estimates of trochus in an area, the transect surveys may be useful for trochus resource managers. Permanent transects that are sampled several times before and after seasons over a period of years can show resource trends. These records (without mathematical manipulations) are easily understood by both trochus fishermen and politicians. Trochus transect survey records can also present a stronger case than fading memories for trochus resource management.

More accurate estimates of the total trochus population can be obtained by using mark-recapture methods (Krebs 1989 p. 16). A study using this method for trochus work found that it is possible to get good estimates of the total number of trochus, but the study can best be done while a trochus harvest is underway (Nash et al. 1992). The authors concluded that short transect surveys using fixed transect positions will probably be necessary to estimate advance quotas for a season. Monitoring the harvest for mark-returns will help ensure that the transects have not grossly overestimated the total trochus population.

The size frequency of trochus from transect surveys is noted in Figure 3. The smaller size classes of trochus were not detected due to immature trochus spending much of their time hidden in coral rubble and, thus, not easily detected by the methods used in our transects. The population has many larger-sized shells, which undoubtedly aids in the recruitment of juvenile trochus on the reef. The number of eggs produced by female trochus increases exponentially with shell diameter (Heslinga 1981). As a result, the larger-sized shells are producing more eggs and sperm than the smaller shells. This is very important for trochus management, and is often used to justify larger (upper) size limits.

Presently, the population has a large proportion of larger shells, which will help ensure good juvenile trochus recruitment in Enewetak. If widespread harvesting of smaller-sized trochus occurs over a long time, the number of trochus reaching the larger sizes will be less. The proportion of larger-sized trochus would eventually decrease due to deaths of the older trochus.

Figure 3 - Length Frequency of Enewetak Trochus--August 1992



There are several piles of shells on Enewetak Island rejected by buyers during seasons prior to the fieldwork. Almost all rejected shells were larger than 4 inches base diameter (as shown in Figure 4). Live trochus shells were also examined, again with most defects noted in shells larger than 4 inches diameter (Figure 5). Defects noted by dri-Enewetak project workers were primarily small holes, with only a few shells showing blistering. Burrowing polychaete worms were thought to be the cause of the holes.

Figure 4 - Reject Trochus Shell Size Classes

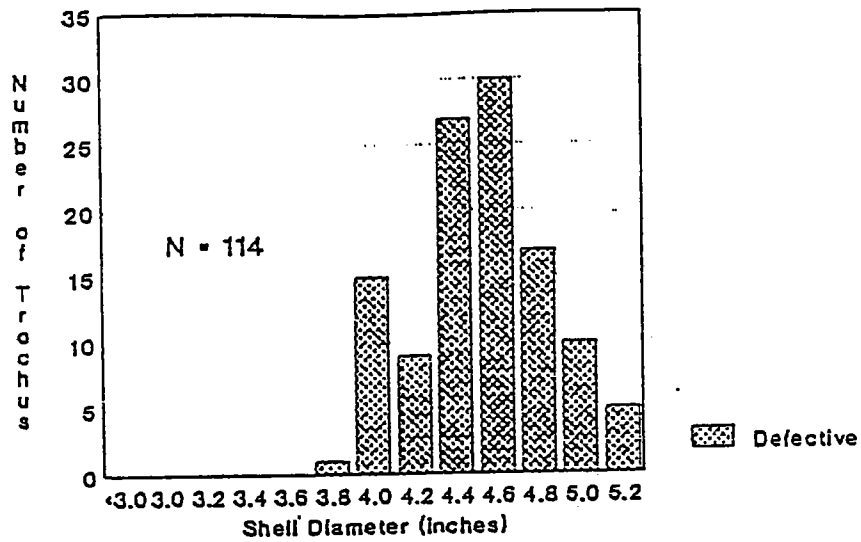
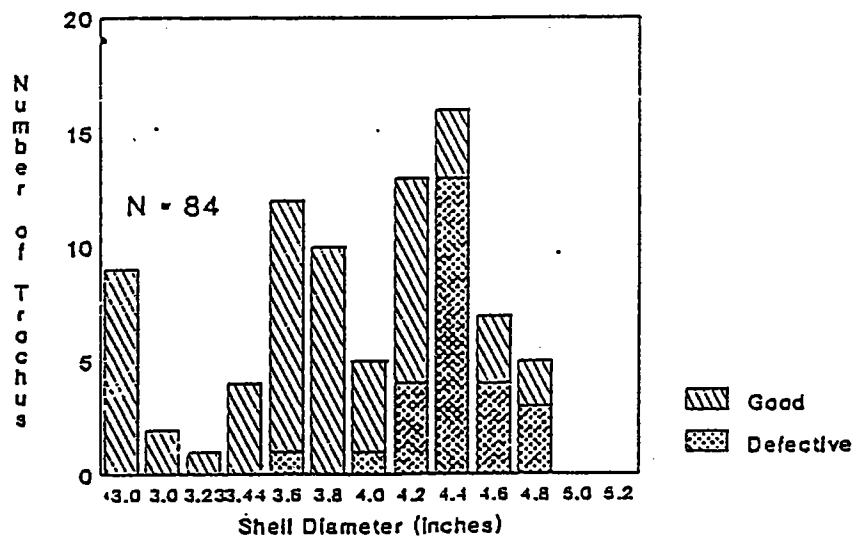
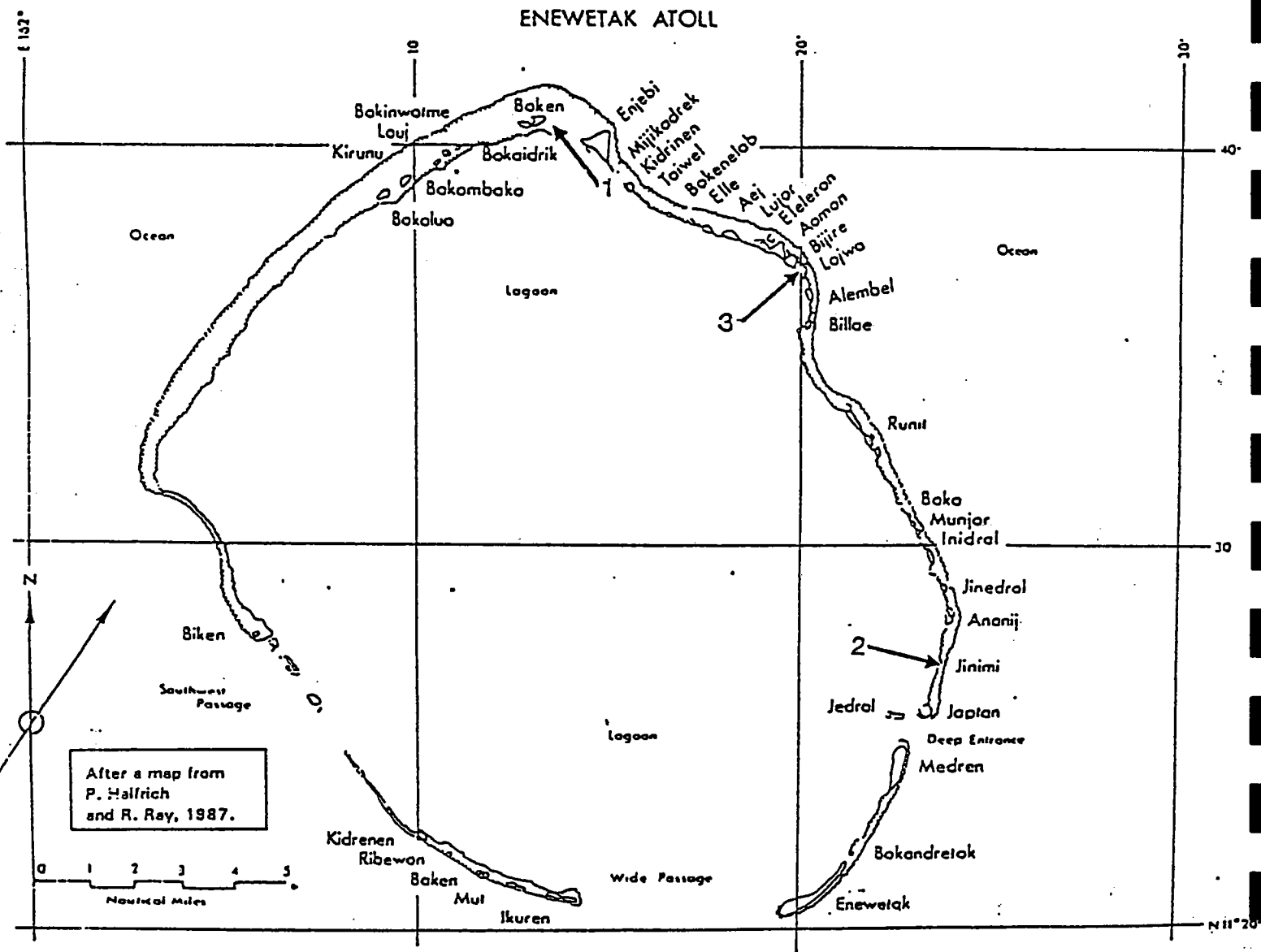


Figure 5 - Live Trochus Shell Classes Showing Defects



Because Enewetak was the site of 43 nuclear weapon tests by the U.S. (Helfrich and Ray 1987), it was decided to test both shell and meat for radioactivity. Live trochus were gathered from three locations around the lagoon (Figure 6). Samples of shell, meat, and viscera were brought for analysis to the Nationwide Radiological Study of the Republic of the Marshall Islands. Results of the sample analysis are shown in Appendix 1. None of the shell or meat samples exceeded World Health Organization guidelines for contaminated foods moving in international trade (for one year following nuclear accidents).

Figure 6 - Sites of Trochus Samples For Radionuclide Testing



Trochus Biology

Trochus snails have separate sexes but are indistinguishable from external characteristics. The male/female ratio appears to be 50:50. While the animals may become sexually mature at about 6 cm (2.4 in.), the gonads are very small and do not produce significant amounts of eggs or sperm. At 8 cm (3.1 in.) the gonads are about 2.3 times larger than the 6 cm animals.

The larger trochus make many more eggs and sperm than the smaller sizes. Setting an upper size limit for trochus helps increase the number of eggs available to reseed the reef. Shell processors do not like the larger-sized trochus (due to sponge and worm holes in the shell). Thus, larger size limits also help increase the value of the harvest shell due to fewer rejected shells.

Trochus reproduce by external fertilization, pushing eggs and sperm into the water. Spawning appears to be started by the males. The sperm disperses, forming a milky cloud in the water. Eggs are extruded in strings of mucus, which tend to hold them together as they sink in the water. In one experiment, the number of eggs released in a single spawning by one trochus was measured at over 3,000,000, but in natural conditions few of the eggs survive to become adults.

The fertilized eggs develop into free-swimming trochophore larvae about 12 hours after spawning. At 22 hours the animals have changed into veliger larvae, still free-swimming, but with a small shell. At 2.5 days, the larvae are testing the bottom by crawling and swimming. At about 3.5 days most larvae have changed shape, losing their ability to swim (Heslinga and Hillmann 1981). The planktonic (floating and swimming) stage of the trochus help spread the animals to new areas.

Because of the relatively short time spent by trochus larvae drifting in the ocean, juvenile trochus settle relatively close to where the parent trochus spawned. Therefore, many islands have established trochus sanctuaries where people are not allowed to fish for trochus. As a result, the trochus in the sanctuaries grow large and are able to produce many more eggs. The young trochus larvae drift out of the sanctuary into other areas where they settle and grow to harvest size.

There is considerable difference in growth rates of trochus reported from different areas of the Pacific, probably due to differences in water temperature and amount of food. It appears to take between two and a half to three years for most trochus to reach the spawning size of 80 cm (about 3 in.). As a result, the effects of an over harvest or catastrophe may not be detected for at least three years after the event.

Table 3 - Shell Diameter and Age of Trochus¹

Age (Years)	Diameter (mm)	Diameter (inches)
1	20-55	0.8-2.2
2	35-83	1.4-3.3
3	50-102	2.0-4.0
4	60-110	2.4-4.3
5	71-115	2.8-4.5
6	82-120	3.2-4.7
7	87-129	3.4-5.1
8	95-132	3.7-5.2

¹Source: Bour 1990.

The slower growth rates reported above were from a section in the Great Barrier Reef that shows lower water temperatures in the winter. Without any tag/recapture experiments and careful shell measurements, it is a fair assumption that three years are needed for trochus to grow to harvest size (3 inches diameter) on Enewetak.

Trochus Management

Trochus management in the Pacific takes many forms and reflects the goals of the people in different places. These methods range from no active management to highly developed systems involving much work on the part of government marine resources or fisheries personnel.

Before deciding on any particular management plan for trochus, it is worth considering the goals of the community and community leaders. Potential goals of trochus management (or lack of management) might be:

1. To take as much trochus off the reef as possible for short term financial gain and not be concerned about future harvests (possible longer-term financial gain).
2. To allow trochus to reproduce a few times when young to help future harvests.
3. To save stocks of larger trochus to help future harvests.
4. To ensure that everyone has equal access to the money made by harvesting trochus.

5. To allow individuals to earn enough money for a specific personal or community project.
6. Others

The following are some of the trochus management methods used in the Pacific.

Lower Size Limits: Most places have a lower size limit that is determined by the size of shell sought after by the buyers. Often this is a 2½ inch minimum size. At this size, most trochus have not reached sexual maturity and cannot produce eggs or sperm. If one goal is to let the young trochus reproduce before they are harvested, a 3 inch minimum size limit is often required. Most places in the Pacific have a lower size limit of about 3 inches.

Upper Size Limits: Many countries in the Pacific now have upper size limits for trochus harvests. Shells larger than a certain size cannot be taken by the fishermen. There are two goals of upper size limits: One is to eliminate waste due to the larger shells being defective. Defective shells (due to worm holes or blisters) are often not bought by trochus buyers, because they cannot make good buttons or jewelry from bad shells. The second goal of an upper size limit is to preserve larger trochus for the reproduction of future harvests.

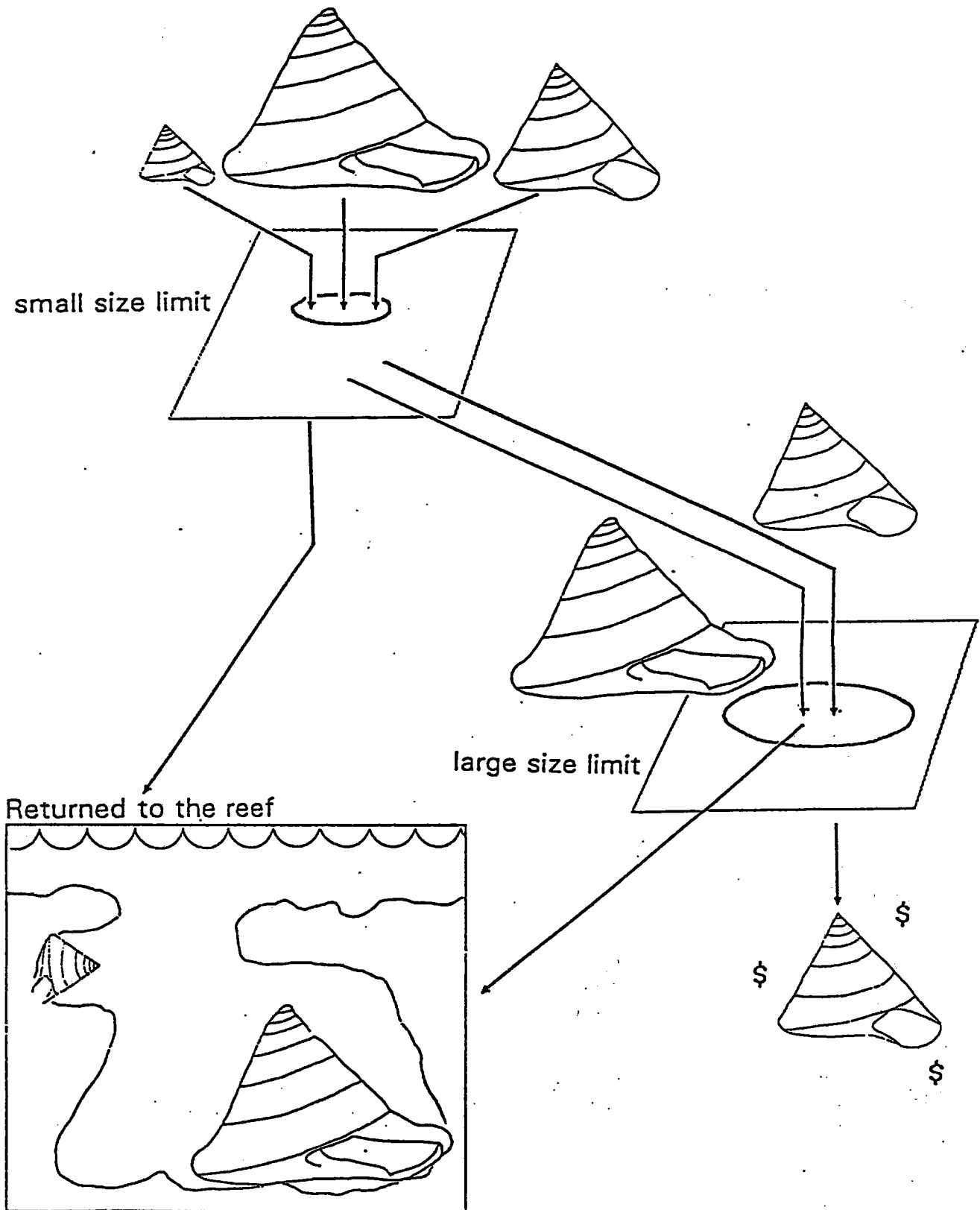
During the season, fishermen are sometimes given measuring boards with holes the same size as upper and lower size limits. The fishermen can use the boards in the field to measure trochus to make sure that the shells are legal size (Figure 7).

Because the goal of size limits is to save live trochus of particular sizes, enforcement of size limits is usually done both during the collection season and when the shell is given to the buyers by the fishermen. Government inspection of live shells ensures that undersized and oversized trochus can be returned to the reef to continue to grow and reproduce. Shells should also be inspected at the time of sale, and undersized and oversized trochus shells taken away. This ensures that the fishermen learn they will not benefit from "poaching" illegally-sized shells. Money from confiscated shells could go to the government to help pay the costs of inspection.

Sanctuaries: Trochus sanctuaries are areas where no trochus fishing can take place. Because the trochus in the sanctuary grow to a large size, they are able to produce large amounts of eggs and sperm that combine to develop into juvenile trochus on other parts of the reef. Sanctuaries can also be good sources of large trochus for use in transplanting to new places (such as Ujelang). Good trochus sanctuaries have the following characteristics:

1. They are good habitats for trochus and many trochus live there.

Figure 7 - Trochus Measuring Boards



2. They are well marked so that fishermen can determine where the sanctuary begins and ends. Edges of sanctuaries may be islands, channels, shipwrecks, etc. Piles of rocks with sticks or flags are not effective markers, as they are easily torn down or moved.
3. Sanctuaries are respected by fishermen because they know and appreciate the value of the sanctuary to future harvests. If the sanctuaries are not respected, the government must guard them during trochus seasons.

Quotas: Trochus resource managers often try to set quotas for each harvest. Adjusting the amount of trochus taken in a season can, for example, help maintain good numbers of trochus on the reef. Adjusting a quota can also make up for seasons shortened due to bad weather.

The quota amount can be determined in several ways. One way is for a resource manager to make an estimate, based on his/her experience with the fishery, previous harvests, and a personal opinion of the general health of the resource. This method depends on the experience of the manager and his/her knowledge about the resource and its response to previous harvests.

Another way of determining a quota is to obtain an estimate for the total population of trochus, deciding on what fraction of the population is to be harvested, and calculating a quota. Determining the fraction of the population for harvesting is also a subjective decision, although other biological factors can be considered.

There are several ways of achieving a seasonal quota, including changing the length of the season and having an individual transferable license/quota system. Changing the length of the season is the easier method of reaching a quota. Based on previous harvest records, the trochus managers set a length of season. This, of course, assumes that compared to past harvests, people will be fishing with the same energy, weather conditions will be the same, and that trochus will be as easy to find as they were before. It is important to monitor the harvest to determine the total amount of shells harvested. Monitoring allows managers to determine if the quota is reached or exceeded, and provides them with a basis for setting a quota in future years.

In situations where the community wants to ensure that everyone has access to money from the season, a system of individual quotas can be made. This limits each trochus fisherman (or holder of a "license") to a given amount of trochus each season. Often, the individual quotas/licenses can be transferable by selling or giving them to other people. If the trochus resource manager knows how many licenses there are, and the quota for the harvest, a certain amount of trochus can be collected for each license.

Initial quotas recommended by Wright and Gillett (1988) for Enewetak were 100 tons per year. Judging from the size of the atoll, the size frequency of Enewetak trochus, and past surveys, 100 tons per year appears to be a reasonable level of harvesting (if the resource is monitored). In order to accurately estimate the abundance of the Enewetak trochus resource, mark-recapture estimates or changes in size class proportions would need to be done immediately prior to and during a trochus harvest.

Opinion Survey of Enewetak Residents on Trochus Management Techniques

An opinion survey concerning trochus management was formulated and presented to groups of people for their responses. The goals of the survey were:

1. To provide a basis for public education and discussion concerning different trochus management options.
2. To provide the investigator with information concerning attitudes and opinions of the Enewetak people about trochus management. Specifically, the following information was sought:
 - a. possible methods for limiting trochus harvests in a given year,
 - b. acceptable ways to ensure a large breeding population of trochus for future recruitment, and
 - c. acceptable ways to pay for the costs of trochus management

A pre-survey talk and list of questions were formulated with every effort made to avoid leading questions. The talk and questions were translated into Marshallese and printed on forms. Most survey responses were gathered by assembling groups of people in one place. Forms and pencils were passed out, and one project worker read the talk and then went through the questions with the group.

The respondents posed many questions that were answered by the project worker. Most people were able to fill out the questionnaire unassisted, but help was given to those individuals who were having difficulty completing the survey or who requested help. Survey data was entered and tabulated on a computer using Epi Info v.5 software.

Because all of the project workers were male, it was difficult to obtain responses from Enewetak women. If surveys were to be conducted in the future, it is suggested that female project workers help to elicit responses from female interviewees.

Numerical responses were recorded, assuming 30 days in a month, four weeks per month, and 52 weeks per year. If a question requested a numerical answer, and the respondent's answer was not translatable into numbers, the response was not tabulated in the analysis.

Appendix 2 consists of survey forms in both Marshallese and English, and tabulated results. Many of the responses were more uniform than expected. This might be due to one or more of the following reasons: a) most of the surveys were conducted in a group situation, respondents may have quickly reached consensus on the answers to enter; b) the workers conducting the survey may have presented the questionnaire indicating a preferred answer; c) the community may wish to have additional trochus management in comparison to the present "no management" status, and individually agreed to much of the management options presented.

The survey served as a starting basis for discussion of trochus management, although it is greatly different from the Micronesian style of discussions, which continue until a consensus is reached. Some respondents were hesitant to answer questions in case they might change their minds later. Another respondent commented that it would be better to allow more time for the survey, so that people could discuss the survey questions in greater detail.

Trochus Marketing and Recommendations

Marketing Goals for Enewetak Trochus Products:

Improve quality of shell product

1. Initiate and enforce upper as well as lower size limits for shells.
2. Have fishermen and their families thoroughly clean the shells and remove the coralline algae covering.
3. Inspect shells prior to buying to ensure correct sizing and clean shells.

Increase competition of buyers for harvest

The Enewetak/Ujelang Local Government Council (E/U LGC) should try to recruit more buyers for trochus shell by:

1. Directly contacting trochus shell buyers in the Pacific from the list in Appendix 3.
2. Advertising the availability of shells through a regional magazine such as Pacific Islands Monthly. (Cost for a small classified advertisement is AUS\$1 per word.)
3. If trochus shell buying is to be conducted in Enewetak, off-island buyers should be connected with local middlemen.

The E/U LGC should also consider having an auction for trochus shell in Majuro. The advantages to this method are:

1. The harvest can be divided into container-loads (15 tons) which would encourage small as well as large buyers to enter the bid process.
2. Majuro has a competitive position when considering shipping routes. Thus, a large number of potential buyers have direct shipping access to Enewetak trochus shells.
3. Buyers would have easier access to inspecting shells before bidding than if buying is done on Enewetak.

Increase competition of buyers for harvest (cont.):

Disadvantages to having an auction for trochus shell are:

- 1. Persons previously acting as buying agents for foreign trochus buyers would not be able to participate in the buying in the same manner.**
- 2. Fishermen would have to wait until after the auction to collect money for the shell.**
- 3. The E/U LGC would have to pay for transportation from Enewetak to Majuro, stevedoring and warehouse space in Majuro, and supervision of the auction and container loading. This money could be taken out of shell receipts before payment to fishermen.**
- 4. The E/U LGC may decide that some (or all) of the bids are too low, and choose to have another auction or sale. This would further delay payment to fishermen.**

The E/U LGC should also consider test marketing of trochus meat in Okinawa or other markets, assuming that adequate facilities and supervision are available during a harvest in order to ensure a quality product. Two firms listed in the marketing Appendix 3 have indicated interest in buying frozen meat. However, care must be taken to properly handle the meat if Enewetak/Ujelang people wish to harvest trochus meat as an export commodity. People should be especially careful to avoid discolored trochus meat (turning from cream-colored to brown) that indicates poor handling of the product.

Trochus meat should be gathered from live animals, and the radula, esophagus and viscera removed. The meat should then be placed immediately in an ice water slurry to rapidly chill the meat. Some further processing (such as cooking) may be desired by some buyers. As soon after processing as possible, the meat should be rapidly frozen and ice glazed. The trochus meat must be then shipped frozen to Majuro and stored in a freezer before air freight forwarding to the buyers. Producing a consistently high quality product should be a prime goal of any trochus meat marketing.

It is obvious that trochus meat marketing will be a challenging endeavor. Negotiations with potential buyers and providing arrangements for shipping would probably be better accomplished in Majuro, preferably by someone having fluency in Japanese or access to a good translator.

The E/U LGC should also pursue marketing trochus opercula, the horny plate forming the "door" to the shell. This product is used in traditional Chinese medicine, and is easily shipped by insured mail or air freight to the buyers without refrigeration or special handling. Samples of trochus opercula were given on two occasions to Mr. Li Qiping, Ambassador for the People's Republic of China to the FSM, but to date, he has been unable to locate information on potential buyers.

Observations on trochus marketing

The marketing of trochus shells from the Pacific is generally influenced by three factors: 1) trochus buttons (and shells) are a commodity market and subject to supply and demand factors like other items; 2) in general, most localities export unprocessed trochus shell rather than partially processed button blanks or completely processed buttons; and 3) most trochus-producing localities have limited competition between trochus buyers.

The fact that trochus is a commodity subject to price fluctuations is not immediately obvious to people living on relatively isolated Pacific islands. Like other articles of trade, the price of trochus is dependent on many factors. Trochus prices are influenced by the amount and quality of available shell (supply) and by changing fashions and substitution of other substances for button making, and trochus shell speculation (demand). Furthermore, trade is conducted world-wide, making it more difficult to assess trochus market conditions, particularly from the relatively isolated islands of the Pacific.

Trochus shell is also substituted by other substances as button material. As in the past, plastic buttons (some having 2% trochus shell powder) offer inexpensive substitutes for trochus buttons. These may even be color back buttons, showing trochus shell markings on the button backs. Buttons on finished clothing are not identified as being trochus products; many consumers may be unaware of (or not care about) the source of button material. There is also an increase in marketing of "rainforest-friendly" ivory nut buttons, a natural product substitute for trochus buttons. In addition, some people may mistakenly think that trochus is an endangered species, despite the fact in many places it is a highly managed and abundant species.

Most trochus shell is exported from the Pacific region as whole shell. Presently, only French Polynesia, Vanuatu, Solomon Islands, and the Federated States of Micronesia offer local processing of shell into button blanks or buttons. While some of these localities have export restrictions on unprocessed shells (Solomon Islands), in other cases the local processor is only able to obtain a small fraction of the total shell harvest. As a result, Pacific trochus fishermen sell primarily to exporters, often through local middle-men.

In Micronesia, trochus shell is usually bought through local purchasers funded by Japanese and Korean companies (with the exception of shell bought directly for processing in Pohnpei). In some localities, only one local buyer purchases shell. This may be a reflection of the high esteem, and political and financial power, of the local buyer, who is often a major politician or store owner on the island.

In addition to direct buying of shell, trochus "jobbers" (brokers) also take and fill orders for trochus on demand.

While fishermen are happy to sell trochus shells to a single buyer, an increase in the number of buyers may result in a higher landed value, especially if there is limited collusion

between buyers. In Pohnpei, for example, the entrance of a local processor as a buyer of shell happened at the same time as a jump in the price of shell from \$0.45-0.50 to \$0.70-0.75 per pound. While the price increase may have been due to external market forces, other locations in the Pacific did not show a 50% price increase at that time.

The lack of competition between trochus buyers is a perception held by many resource managers in the Pacific (A. Taura pers. comm. 1992). This opinion is based on the differing prices for shell from different places, and the lack of knowledge concerning existing world market prices.

Regional agencies such as the South Pacific Commission, Forum Fisheries Agency, or UN/FAO INFOFISH have done little in terms of gathering market prices and quantities sold in the Pacific. Publication of quarterly trochus product prices for locations around the Pacific would be very useful, both to trochus managers and fishermen. By comparing local prices to prices elsewhere in the Pacific, it would be easier to determine if fair prices are given to the fishermen.

An attempt was made in the course of this study to locate as many trochus buyers as possible (Appendix 3). In the future, regional agencies could also distribute information concerning recent purchasers of trochus shell, so that fishermen and local buyers might have access to a wider choice of buyers. A simple approach would be to hire a person in each country to report quarterly concerning trochus sales. This information could be easily distributed by organizations such as Pacific Islands Marine Resources Information System (PIMRIS).

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Appendix 1

Radionuclide Measurements of Enewetak Trochus Shell and Meat

Live trochus were gathered from three sites in Enewetak Atoll. Because the nuclear weapons testing occurred in the northern and northeastern portions of the lagoon, two of the samples were made in these areas. The third location, Jimini, is close to Enewetak Island, where the people monitoring the tests reside.

For each location, trochus meat and viscera were extracted from the shell using a modified bedspring. Meat and viscera were separated and frozen. Shells were buried in sand for several days, then thoroughly rinsed to remove any remaining meat from the shell. Samples were delivered to the Republic of the Marshall Islands Nationwide Radiological Study, where the sample analysis was performed. Radioactivity was reported in Becquerels per kilogram (Bq/kg). A Bq/kg is defined as one atomic disintegration per second per kilogram of sample material (wet weight for meat).

World Health Organization (WHO) lists the following guidelines for contaminated foods in international trade:

Cesium ¹³⁷	1000 Bq/kg
Cobalt ⁶⁰	1000 Bq/kg ¹
Americium ²⁴¹	10 Bq/kg
Plutonium ²³⁸	10 Bq/kg ¹
Plutonium ^{239,240}	10 Bq/kg

¹These figures are thought by Dr. Steve Simon (RMI Nationwide Radiological Survey) as being representative of safe levels, although not specifically listed as such in the WHO guidelines.

The following numbers are the result of analysis of the trochus samples by the Nationwide Radiological Survey. It should be noted that viscera samples for all three sites were prepared and packaged with the meat and shell samples. However, for unknown reasons the RMI Nationwide Radiological Survey did not receive all of the gut samples, as noted in the tables below.

The results of the analysis are as follows (S. Simon, pers. comm.):

None of the meat samples or shell samples exceeded the WHO guidelines. While shell samples were closer to the guidelines, they are not consumed as food. Inhalation of dust from trochus shells being ground or polished could be a health problem. Standard inhalation protection masks would protect workers' lungs from fine dust. With this protection, inhalation of plutonium in the dust is not likely to be a health issue.

	<u>Cesium¹³⁷ (Bq/kg)¹</u>		
	Shells	Meat	Guts
Site 1	0.14	ND ²	no sample
Site 2	0.17	ND	ND
Site 3	0.32	ND	no sample

¹ The lower limit of detection is ~0.075 Bq/kg

² Non-detectable

	<u>Cobalt⁶⁰ (Bq/kg)³</u>		
	Shells	Meat	Guts
Site 1	ND	ND	No sample
Site 2	ND	ND	ND
Site 3	0.098	0.33	No sample

³The lower limit of detection is ~0.066 Bq/kg

Americium²⁴¹ (Bq/kg)⁴

	Shells	Meat	Guts
Site 1	ND	0.62	No sample
Site 2	ND	ND	ND
Site 3	ND	ND	No sample

⁴The lower limit of detection is ~0.27 Bq/kg

Plutonium²³⁸ (Bq/kg)

	Shells	Meat	Guts
Site 1	0.11	0.04	No sample
Site 2	0.15	0.04	0.19
Site 3	not done	0.04	No sample

Plutonium^{239,240} (Bq/kg)

	Shells	Meat	Guts
Site 1	0.59	0.74	No sample
Site 2	0.33	0.15	0.78
Site 3	Not done	0.63	No sample

Appendix 2

Results From Trochus Management Opinion Survey

Survey Response Frequencies

Note: Survey questions are paraphrased for brevity. (Survey questions in Marshallese and English languages follow this section of the appendix.) Percents reported are the percent of actual responses (not total respondents) for each question.

1a. Would you be in favor of shortening season if the last season were too long?

Response	Frequency	Percent
Yes	55	83.3
No	11	16.7
TOTAL	66	100.0

If you answered yes (in favor of shortening the season), what is the shortest preferable season?

Number of Days	Frequency	Percent
6	1	2.1
7	9	18.8
14	6	12.5
21	3	6.3
28	1	2.1
30	16	33.3
60	8	16.7
77	1	2.1
90	2	4.2
120	1	2.1
TOTAL	48	100.0

Mean = 32.94

Standard deviation = 25.85

1b. Would you be in favor of having two or more shorter seasons to make a quota?

Response	Frequency	Percent
Yes	47	66.2
No	24	33.8
TOTAL	71	100.0

If you answered yes, what is the shortest time for the seasons that you would like to see?

Note: Many respondents noted months desired for seasons.
Analysis assumes 30 days per month.

Number of Days	Frequency	Percent
3	1	3.7
7	1	3.7
14	4	14.8
21	1	3.7
30	11	40.7
60	6	22.2
90	2	7.4
150	1	3.7
TOTAL	27	100.0

Mean = 41.00
Standard deviation = 31.68

1c. Would you like to see a system of trochus fishing licenses and individual pound limits?

Response	Frequency	Percent
Yes	46	65.7
No	24	34.3
TOTAL	70	100.0

If you answered yes to a system of trochus fishing licenses and individual pound limits, how old would someone have to be to get a license?

Age	Frequency	Percent
3	1	3.7
10	1	3.7
16	2	7.4
17	2	7.4
18	13	48.1
20	4	14.8
21	1	3.7
24	1	3.7
25	2	7.4
TOTAL	27	100.0

Mean = 18.07
 Standard deviation = 4.20

If you answered yes, who would be eligible to have a license?

Sex	Frequency	Percent
Males Only	9	16.1
Females Only	2	3.6
Everybody	45	80.0
TOTAL	56	99.7

2a. Do you think it is a good idea to have a trochus small size limit?

Response	Frequency	Percent
Yes	52	82.5
No	11	17.5
TOTAL	63	100.0

If you answered yes, what do you think is a good small size limit?

Note: If a range was given in a response, the range was averaged.

Size (inches)	Frequency	Percent
2.0	2	4.9
2.3	1	2.4
2.5	19	46.3
3.0	15	36.6
3.5	1	2.4
3.8	1	2.4
4.0	2	4.9
TOTAL	41	100.0

Mean = 2.78

Standard deviation = 0.45

2b. Do you think it is good to have a trochus large size limit?

Response	Frequency	Percent
Yes	51	83.6
No	10	16.4
TOTAL	61	100.0

If you answered yes, what do you think is a good large size limit?

Size (Inches)	Frequency	Percent
2.5	1	2.8
3.0	3	8.3
3.5	10	27.8
3.8	2	5.6
4.0	14	38.9
4.3	1	2.8
4.5	2	5.6
5.0	3	8.3
TOTAL	36	100.0

Mean = 3.84
Standard deviation = 0.55

3a. Do you think that Enewetak should have trochus sanctuaries?

Response	Frequency	Percent
Yes	54	81.8
No	12	18.2
TOTAL	66	100.0

Will people respect the trochus sanctuaries by not fishing in them during the season?

Response	Frequency	Percent
Yes	42	68.9
No	19	31.1
TOTAL	61	100.0

If you answered no, what do you think could be done to keep the people out of the sanctuary?

Translations of the 12 responses were: "The Council should employ someone to guard the place," "Don't use the place," "It is good that we put the sanctuary in there," "The government should enforce the law," "Everyone," "It is all good," "Jail--put behind bars," "Make a mark there," "Make law for somebody not to touch," "Marks left there," "Put policeman," and "Yes, we should enforce it."

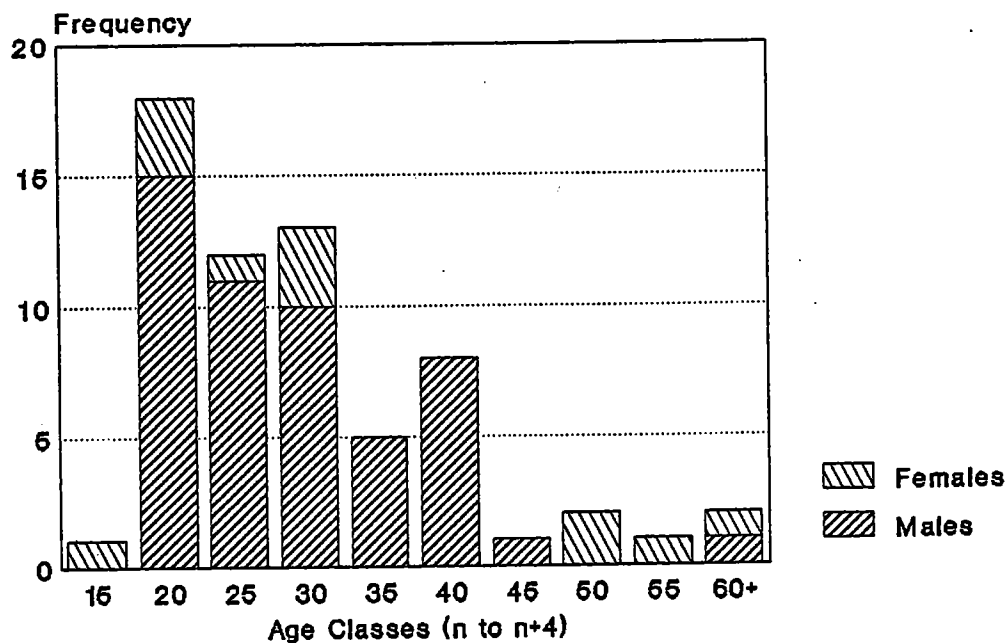
4. Should the atoll council confiscate undersized and oversized shell and sell to help pay for management activities?

Response	Frequency	Percent
Yes	46	66.7
N	23	33.3
TOTAL	69	100.0

If additional money for management is needed, should buyers be charged a set amount to pay for these costs?

Response	Frequency	Percent
Yes	50	72.5
No	19	27.5
TOTAL	69	100.0

Figure 8 - Frequency of Opinion Survey Respondents



Text of Survey (English)

Pre-Survey Talk

We are making a survey to find out what people think about the ways to wisely harvest the trochus resource of Enewetak Atoll. Before we ask for your ideas, we would first like to tell you some things about trochus.

To make baby trochus, the adult trochus do not lie down with one another. Instead they put sperm and eggs into the water. There needs to be enough trochus so that the male and female trochus are close enough together to fertilize the eggs. Each egg is about the size of this small dot →. If the trochus sperm meets a trochus egg, they combine to form a trochus larvae. This young trochus swims around in the water for a week or so. During this time it grows a small shell. Then it swims for a while and crawls around for a while looking for a place to stay. One trochus may make a million eggs, but maybe only one or so will live to grow up to a harvestable size. Many will be washed away or be eaten by fish.

When the young trochus stop swimming, they live on the top of the reef, hidden by the coral rocks. Both the young trochus and adult trochus eat small plants growing on the coral rock. When they are small, many trochus will be eaten by shrimp or crabs. Large storms such as typhoons can also kill the young trochus. It will take three or four years for a trochus to get to harvestable size. Because it takes so long, there is a delay in time of three or four years before people can start to see the effects of over-harvesting.

Trochus were not in Enewetak until brought here by Japanese people about 1939. During World War II, people probably did not take trochus, except to eat. After World War II, dri-Enewetak and dri-Enjebi were moved to Ujelang, and no-one harvested trochus. So when people started to harvest the trochus in 1987, there were plenty on the reef. Since then, there have been seasons in 1988, 1989, and 1990. People can see that there are fewer trochus than before.

In some places, people have taken too many trochus. As a result, their trochus harvest is very small. For example, Chuuk lagoon in the Federated States of Micronesia harvested less than 25 tons per year, even though the lagoon is much bigger than Enewetak.

There are several approaches to make sure that enough trochus are left to make baby trochus for future harvests. Some of the ways are: quotas (which are limits on the pounds of trochus taken), size limits, season length, and places where no trochus fishing takes place (sanctuaries). In this survey, we will be asking you about which approaches you think will work for Enewetak.

Survey Questionnaire

Please help us find out how you think trochus seasons can be improved. If you want to tell us how you think, but do not wish to write on the form, we will be happy to write on the form for you.

This survey shows new ideas about trochus. We want to find out what people first think about these ideas. We hope people will talk about these ideas. People may change their thoughts about these ideas before a public hearing is made.

1. In Enewetak, a quota of 100 tons trochus per year is set by law. This amount is good, as long as there was no over-harvesting or bad storms. However, the last season, more than 100 tons were harvested. How can the amount harvested be limited to 100 tons?

- a. One way to limit the harvest is to make the one season shorter. For example, the trochus season in Pohnpei has been as short as 8 hours. Shorter seasons will work only if people do not work harder to get trochus during the one season.

Say there is just one season per year. If too many trochus were harvested during the last season, would you be in favor of shortening the season to decrease the amount of trochus caught?

Yes _____ No _____

If you answered yes, what is the shortest time for one season per year that you would like to see?

- b. Another way to avoid exceeding the quota would be to have two or more shorter seasons. At the end of the first short season, people working for the atoll council would inspect and weigh the clean shell. Then they would write down the weight of trochus from each fisherman or family. The total weight of trochus shell would be added up, and a decision would be made about having another short season. If they decide on another short season, the new clean trochus would be weighed, and the total weight again added up. This process would continue until the quota was reached. There is a possibility that even with two or more smaller seasons, that the quota might be exceeded (depending on the amount of time for the last season in the year). This method will take time of council workers and cost money for some needed supplies.

Would you be in favor if having two or more shorter seasons per year to make a quota?

Yes _____ No _____

If you answered yes, what is the shortest time for the short seasons that you would like to see?

-
- c. Another way to meet the yearly quota would be to give a trochus fishing license to trochus fishermen. If the number of fishing licenses is known, a pound limit could be given for each license. The person who has this license would only be able to sell the pounds written on his license, which would be the same for everybody.

Would you like to see a system of trochus fishing licenses and individual pound limits?

Yes _____ No _____

If you answered yes, how old would someone have to be to get a license?

If you answered yes to the license and pound limits system, who would be eligible to have a license?

Males only _____ Females only _____ Everybody _____

2. In addition to setting trochus harvest quotas, many places also set size limitations on the trochus harvested. Trochus start to make eggs and sperm at about 2½ to 3 inches. A three inch smaller size limit is used in many places. A three inch smaller size limit means trochus smaller than 3 inches cannot be taken. An undersized trochus of 2 inches will grow to about 3 inches the next year, and be worth more money. People who buy the trochus do not like many of the larger sized trochus (larger than about 4 inches), because these trochus shells have holes and other problems. The larger trochus also make more eggs and sperm than the smaller trochus. It is important to keep the large trochus alive to make more trochus rather than killing them and throwing away the shell. In places where there are size limits, the governments sometimes give people measuring boards to help them see

if a trochus is legal or not. In Pohnpei, FSM, the government inspects the trochus while it is alive and returns the undersized and oversized trochus to the reef.

- a. Do you think it is good to have a small trochus size limit? This means trochus smaller than a certain size cannot be taken.

Yes _____ No _____

If you answered yes, what do you think is a good small size limit?

- b. Do you think having a trochus larger size limit is a good idea? This means that trochus larger than a certain size cannot be taken.

Yes _____ No _____

If you answered yes, what do you think is a good larger size limit?

3. Another important way to help keep the trochus resource strong is to have sanctuaries. A sanctuary is a place where no-one can fish during the trochus season. This place can be opened again to fishing after the trochus season or when the trochus are sold. A good trochus sanctuary has boundaries which are easy to see, has lots of trochus, and is placed so that the trochus babies will be spread to areas next to the sanctuary. Pohnpei Island has 5 sanctuaries. In some places, if people do not respect the law about trochus sanctuaries, the government places people in the sanctuary to guard it. In other places, the trochus fishermen tell people to get out of the sanctuaries. Having sanctuaries is a good way to make sure that there will be more baby trochus on the reef.

- a. Do you think that Enewetak should have trochus sanctuaries?

Yes _____ No _____

- b. Will people respect the trochus sanctuaries by not fishing in them during the season?

Yes _____ No _____

If you answered no, what do you think could be done to keep people out of the sanctuary?

4. Many of the methods we have talked about for keeping the trochus resource strong will need people to work by weighing trochus, keeping records on trochus and trochus fishermen, the materials (gas etc.) if surveys are made. These actions will need money in order to work.

Do you think the atoll council should take undersized and oversized trochus from the fishermen and sell these shells to help pay for trochus management activities?

Yes _____ No _____

If additional money is needed, do you think that charging buyers a set amount per ton of trochus should be used to help manage the trochus resource?

Yes _____ No _____

5. Please give us some information about yourself.

Last name _____

First Name _____

Age _____

Sex _____

Text of Survey (Marshallese)

Kem ij kamon juon ekkatak eo non bikot wewin ko im armij in Enewetak rej lemnak ejejet non kamon likadbolul ilo ailon in Enewetak. Mokta jen am kajitok ibam kin ta am lemnak, kem ij konan mokta jiron iok kin melesen likadbolul.

Non kamon ajri in likadbolul, rito in likadbolul rej jab papu iben dron. Ijelokin koman im kokra ko rej kadriojlok kij kab lep ko. Ej aikuj lon likadbolul ilo juon jikin bwe ren ebake dron nan an kij kab leb eo wemate dron. Lep ko rej dettair wot men in →. Im elane lip im kij in likadbolul rej wemate dron rej jino ajake joun likadbolul jidrik. Ilo ien in rej idrik wot rej bed wot iajet iomwon joun lok nan ruo wiik. Ilo torein rejino koman air nuknuk. Im jino beto betak non kabok jikin joke. Joun kokra emaron lik 1 million lep. Ijo wot ke emaron joun wot eritto lok nan size eo emon.

Elon wot renaj jako im men in mour ko ilojet rekani, im elap tata non eek ko ilojet. Likadbolul ko redrik rej bwijrak aer ao im bed ion bedbed iumwin wod ko. Likadbolul kilep im jidrik jimor rej bok aer mour jen ujouj jidrik ko ilo dreka im men in mour ko jet. Bareinwot ilo torein me rej drik wot, libonej ko ak baru ko ilojet rej kani likadbolul jirik kein. Enaj bok jilu lok non emen yio non an joun likadbolul tebar jonan en emman non wia kake. Kinke ebok 3-4 yio non lale jonan an rittolok, jejab maron lo jorren ko an rej walok jen taipun im kalikadbolul elap jen jonan.

Ekkar ejelok likadbolul ilo ailon in Enewetak mae ien eo dri Japan ear boktok non ailon in Enewetak ilo 1939. Ilo bata eo an lal in kein karu armij ro rar jab boke ijelokin wot nan mona. Elkin bata eo armij in Enewetak im Enjebi rar emakit lok non Ujelang, im ejelok joun ar koman likadbolul, mae 1987 kin menin ear koman bwe en kar lukun lon likadbolul ilo ailon in Enewetak ak ion bedbed. Jen ien in ear wor koman likadbolul ilo yio 1988, 1989 im 1990. Armij remaron in lo bwe rainin ebwe an ben lok koman likadbolul. Ilo jet jikin elap an armij koman likadbolul. Im ekkamon bwe en iet lok likadbolul ien ko tokelik. Ilo wanjonak ailon in Chuuk ilo FSM, ejjab lon likadbolul rej koman, edrik lok jen 25 tons ilo joun yio mene elap malo eo jen ailon in Enewetak.

Ewor jet wewin ko non lale bwe en lon wot likadbolul non tokelik. Im jet ian wewin ko: koman jonan baun ko jej boke ilo joun ien koman likadbolul, jonan size, koman kakole ko im jej jab maron koman likadbolul ie, im koman jonan ien non an armij ro boke. Ilo ekkatak in jenaj kajitok ibam kin jet wewin ko koj lemnak enaj emmon ak jermal non ailon in Enewetak.

**Lemnak Ko An Dri Enewetak Ilo
Ekatak Kin Kejeral Likadbolul**

Jouj im jiban kem ilo jet wewin ko im koj lemnek enaj koman bwe ilo joun ien likadbolul en emman lok. Ekatak in ej kwalok lemnek ko rekem kin kejeral likadbolul. Inem kem konan jela makta lemnek ko an armij kin lemnek in. Armij ro renaj kenan kin ta ko rej lemneki. Armij ro remaron ukot lemnek ko air makta jen kwelok eo an aolep armij. Elane koj konan jiron kem ak koj jab konan je ilo form in, kem kanuj in monono in je form in non iok.

1. Ilo Enewetak jonan eo im emoj karke ej 100 tons in likadbolul ilo joun yio ekkar non kakien eo an EULCG. Dreten in im ba kake emon, to in wot an jab lab boke im jab koman elkin an wor taipun. Ijo wotke ien ko lok ekkar lon lok jen 100 tons ear koman. Ekejkan bwe en jab lab lok jen 100 ton in likadbolul ak en bed wot ilo 100 tons.

- 1a. Joun wewin eo non koman jonan eo jej koman ilo joun ien, en jab aitok ak en joun ien eo ekadu. Non wanjonak, jonan eo ekadu tata im ear koman likadbolul ej 8 awa ilo ailon in Pohnpei. Kakadu ien enaj jeral elane armij rej jab kemat jonan ar maron in koman likadbolul.

Jen ba joun ien likadbolul ilo juon yio. Im elane ekar kainuj in lon likadbolul ear koman yio eo lok, en ke emmon ibam ne ekadu lok ien koman likadbolul non kaiet lok jonan likadbolul jej boke ilo joun ien?

Aet____ Jab____

Elane uak eo am aet, ien ta eo ekadu tata en koman likadbolul?

- 1b. Bar juon jokjok eo nan kadrik lok jonan eo emoj karoke nan boke nan koman ruo ak lon lok ien ko rekadu in likadbolul. Ilo jemlok in lok kalikadbolul eo edrik iman, ri-jerral ro an council rej aikuj etale im poun i likadbolul ko re-erre. Inem renaj je jonan poun ko an kajojo family im re-likadbolul naj kobaik aolep total im koman jemlok ko nan lale bar likadbolul ke ak jab. Elane rej lomnak in bar likadbolul ej aikuj bar koba aolep poun ko im total i. Jokjok in ej aikut wonmanlok wot mae ien eo jenaj tobar jonok eo koman ilo juon yio. Jet ien emaron laplok jonan eo ej koman ilo juon ak ruo ien ko ekadu, wewin in ej walok elane ear lap ien likadbolul ilo yio eo ej jemllok. Jokjok in enaj bok elap ien im jolok elap money nan kein jeral ko elap aikuji.

- 1b. Emon ke ibam non koman ruo ak elonlok ien likadbolul ko rekadu ilo juon yio. Ruo ien ko rekadu non koman jonan eo jej aikuj in koman ilo ien ne ekadu?

Aet____ Jab____

Elane uak eo am ej aet, ien ta eo ekadu im koj lemnak en koman ilo joun ien likadbolul?

- 1c. Bar juon wawein eo nan kotobar jonan ne ilo juon yio ej lelok license ko nan ri likadbolul ro. Im ne emoj ad jela kin license ko rar drijlok, enaj alikar jonan eo an juon license. Armij eo enaj wor an license emaron in wot wia kake jonan pound eo ilo license eo an im bareinwot ro jet.

Koknan ke wewin in en koman non aolepen ro im ewor air license im emoj kalikar jonan eo emaron in koman ilo license en an?

Aet____ Jab____

Elane uak eo am aet, jete an joun yio non an maron wor an license? _____

Elane uak eo am aet bwe jen lor wewin in, won ro im emaron in wor an license?

Emman Wot____ Kore Wot____ Aolep____

2. Ilo jet jikin likadbolul, rej kojberbal jonan eo emoj kareke ilo juon yio im barein wot size ko. Kinke likadbolul ej jino an neje ilo 2-1/2 inches lok non 3 inches. Jilu inches kileb lok jonak in ej jberbal non elon jikin ko. Im ruo inches likadbolul enaj drito lok non jilu inches ilo yio en tok joun. Im enaj lap lok wonen. Armij ro im rej wiaik likadbolul ko rej jab konan wiaik likadbolul ko rekilep, kinke likadbolul kein ewor ron im jorren ko jet ie. Likadbolul ko rekilep elap lok air neje jen likadbolul ko redrik. Ekainuj in aurok bwe likadbolul ko rekilep ren jab mij non air bar neje elan likadbolul. Ilo jikin ko im rej kejerbale size, kien eo ej lelok non kajojo armij kein jonak ko non bok size eo im emoj ba kake. Ilo Pohnpei im FSM kein eo ej etali aolep likadbolul ko im dri kalikadbolul rej boktoki, im elane enaj wor en ejab jetjet non size ko im ba kake naj bar kerole non ion bedbed.

- 2a. Koj lemnak emon ke koman jonok nan men ko redrik im jej buki?

Aet____ Jab____

Elane uak eo am aet, size ta eo ediktata im emon?

2b. Koj lemnak emon ke koman jonok nan men ko relap im jej buki?

Aet____ Jab____

Elane uak eo am aet, size ta eo elap im emon?

3. Wewin eo joun im elukun aurok non koman bwe en lon likadbolul ej kejenolok jet jikin ko im koman bwe en jab melim koman likadbolul ie. Jikin rot in ej jikin ko ejelok emaron kalikadbolul ilo ien likadbolul. Non koman bwe en emon jikin rot in ba kake ej aikuj wor jet kokole ko im ri koman likadbolul ren jab kebak tok. Juon jijkin tab rot in ej aikuj bed ijoko ebol likadbolul ie bwe ren lak lik men ko nejier ren tobal ak belok nan ijoko torerein. Ilo ailon in Pohnpei ewor lalim jikin ko ie im ejab melim an armij likadbolul ie mae joun ien ne enaj bar belok. Ilo jet jikin armij rej jab bokake kien rot kein im ej aikuj wor jet ro im rej lale jikin kein aolep ien. Ak ebar wor jet dri koman likadbolul rej jiron bar ro jet bwe ren jab kebak lok jikin ko im emoj kamoi. Wewin in ekamon bwe en wor likadbolul aolep ien ilo belakin malo eo molwon ailon eo. Jikin rot in ej aikuj in koman ilo jikin ko im ebol likadbolul ie. Bwe en emon an likadbolul ko neje im temon im worlok.

3a. Koj ke lemnak en wor jikin rot in im ba kake ilo ailon in Enewetak?

Aet____ Jab____

3b. Armij ren ke bokake kakien in im jab kalikadbolul ilo jikin rot in im ba kake ilo ien likadbolul ak mokta jen an bar belok bar likadbolul?

Aet____ Jab____

Elane uak eo am jab ta eo koj lemnake non kejbarok ak bobrae armij jen jikin kein im ba kake?

4. Wewin kein im jej kenan kake non koman bwe likadbolul eo en laplok ilo ailon in Enewetak jej aikuj jet armij ro im jermal ko air rej bauni likadbolul ko, im je ilo record ko im kein kamadmod ko jet, im elane enaj laplok jermal in likadbolul jenaj aikuj money non kokmanman lok jermal in likadbolul.

4a. Koj lemnak emon ke ne Council eboke size ko redrik ak size ko relap im remij non an koman an money non etale jermal kein an likadbolul?

Aet____ Jab____

- 4b. Im elane Council eo enaj aikuj money, koj lemnak emon ke ne Council enaj charge e aolep ro im rej wiaik likadbolul in jen armij in Enewetak, non jerbali jermal ko non wonmanlok ko an likadbolul?

Aet____ Jab____

Jouj im ba etam im melele ko jet kin kwe.

Etam Last Name_____

Etam First Name_____

Yio eo am _____

Man ak Kore _____

KOMOL KIN UAK KEIN AM ILO EKATAK IN

Appendix 3

Trochus Buyers Listing

Twenty-two inquiries about trochus buyers were sent by fax to Pacific Island government organizations or individuals dealing with trochus management. Six organizations answered with company names and contact information. Several factors might be responsible for the poor response rate. Some correspondents indicated that they had difficulty transmitting the information by fax to the numbers given. Members of other organizations may not have been able to respond by the requested deadline or had other work priorities.

Seventeen companies named by responding organizations were contacted by fax (where possible) or letter. The responses dealing with interest in buying trochus shell or trochus products are listed below (directly quoted). Companies that were not interested in buying trochus products were not included.

Some locally-based buyers of trochus were unwilling to give information concerning the off-island shell buyers, possibly to avoid local competition.

FEDERATED STATES OF MICRONESIA

AHPW, Inc. Phone: (691) 320-2508
P.O. Box 704 FAX: (691) 320-5375 or
Kolonia, Pohnpei (691) 320-2797
FM 96941
Federated States of Micronesia

Preferred size range of trochus shell (diameter of base of shell)

N/A

Minimum acceptable shipment weight

N/A

What time of year are shell shipments preferred?

N/A

Additional comments (Other trochus products purchased, etc):

Button blanks purchased.

FRENCH POLYNESIA

Danny Mahana
Mahana International Services
B.P. 2839
Papeete, Tahiti

Phone:
FAX: (689) 43 31 91

(689) 42 89 40

Preferred size range of trochus shell (diameter of base of shell)

7 to 9 cm

Minimum acceptable shipment weight

100 tons

What time of year are shell shipments preferred?

No preferred time of year, all year around is good.

Additional comments (Other trochus products purchased, etc):

I also sell black mother of pearl, green snail

Maohi Industries
P.O. Box 13503
Punaauia, Tahiti
French Polynesia

Phone: (689) 45 43 00
FAX: (689) 45 47 00

Preferred size range of trochus shell (diameter of base of shell)

From 8 cm thru 10 cm (3¼" thru 4")

Minimum acceptable shipment weight

5 m/t (5000 kg) (Advise for less qty.)

What time of year are shell shipments preferred?

Anytime and any quantity

Additional comments (Other trochus products purchased, etc):

Green snail shells, mother of pearl (white)

JAPAN

Urban Marine Co. Ltd.
1-12-20 Awaza Nishi-ku
Osaka, Japan

Preferred size range of trochus shell (diameter of base of shell)

2.5 inches and up

Minimum acceptable shipment weight

Over 5 MT per month

What time of year are shell shipments preferred?

Every month (We want to buy monthly base)

Additional comments (Other trochus products purchased, etc):

We want to buy deep sea shark liver oil.

NEW ZEALAND

Mr. William S. Sommerville
ASIL Group Limited
9th Floor World Trade Centre
173 Victoria Street
Wellington, New Zealand

Phone: (04) 385-4888
FAX: (04) 385-4728

Preferred size range of trochus shell (diameter of base of shell)

Minimum 9 cm

Minimum acceptable shipment weight

1000 kgs

What time of year are shell shipments preferred?

All year

Additional comments (Other trochus products purchased, etc):

Interested in purchasing trochus meat-cooked, cleaned and frozen. Must be processed and packed under hygienic conditions.

PHILIPPINES

**Lookwell Philippines Corporation
Mactan Export Processing Zone
Lapu Lapu City 6015
Philippines**

Preferred size range of trochus shell (diameter of base of shell)

Small — 3-3.4 inches

Medium — 3.5-3.7 inches

Large — 3.8-4.5 inches

Minimum acceptable shipment weight

14-17 metric tons (one container)

What time of year are shell shipments preferred?

anytime of year

Additional comments (Other trochus products purchased, etc):

Might purchase trochus button blanks in the future.

REPUBLIC OF CHINA (TAIWAN)

Jeffrey Chao
Young Sunlit Inc.
No. 78 Chunk King North Road Sec.4
Taipei (11161) Taiwan
R.O.C.

Phone: (886)(2) 811-7807 or
(886)(2) 811-7810 or
(886)(2) 812-8069
FAX: (886)(2) 811-2195

Preferred size range of trochus shell (diameter of base of shell)

Minimum diameter 3½" (10 cm)

Minimum acceptable shipment weight

5 metric tons

What time of year are shell shipments preferred?

All year round.

Additional comments (Other trochus products purchased, etc):

Button blanks, trochus shell scraps. Dried sea cucumber, black lip mother of pearl, and white lip mother of pearl.