SURVEY OF THE FISHERIES OF THE FORMER JAPANESE MANDATED ISLANDS

FISHERY LEAFLET 273
FISH AND WILDLIFE SERVICE
UNITED STATES DEPARTMENT OF INTERIOR

FOREWORD

This survey of the fisheries of the former Japanese mandated islands of the Pacific Ocean was a part of the general economic survey undertaken by the Pacific Ocean Division of the United States Commercial Company, Reconstruction Finance Corporation, at the request of the Navy Department.

Shortly after the close of hostilities in the Pacific, the Navy recognized that its responsibility for administering the Marianas, Carolines, and Marshalls, extended beyond the mere establishment of law and order, or even the physical rehabilitation of war-torn areas. By and large, the Micronesians were not enemy aliens, but rather innocent bystanders who had suffered heavy losses in life and property through no fault of their own. For the most part, they were eager to adopt the American way of life, including radios, movies, motor boats and vehicles.

Viewed in the cold light of economic realism, it is obvious that the majority of these rosy dreams are impossible of fulfillment. The hard fact is that in the end, their relative prosperity depends on the movement of their own materials or products to world markets, with an accompanying return flow of goods and manufactured articles. Otherwise, we must assume that the native population will be kept in much the same status as the bison of Yellowstone Park.

The foremost question then is what natural resources exist for home consumption and for export. It was to answer this question, so long shrouded in secrecy by the Japanese, that the Economic Survey was undertaken.

Originally, it was intended that all reports of survey specialists would be published in a single coordinated series, with a general introduction to provide the background material for all. That plan having been abandoned, it was necessary to add some general information to the Fisheries report. Also, it has not been possible to incorporate in this report the data on local fisheries of Truk, Ponape, and the Marshall Islands, collected by economists assigned to those areas.

In order that the results of the fisheries survey might be made available to the public at the earliest moment, a condensed version was published by the Fish and Wildlife Service under the title "Fishery Resources of Micronesia", Fishery Leaflet No. 239, May, 1947. The present paper now supersedes Fishery Leaflet 239, and contains all of the data on which the condensed version was based.

It is a pleasure to acknowledge indebtedness for many services rendered by personnel of the U. S. Commercial Company, Economic Survey, and Naval Military Government in Washington and the field, and by the Director and staff of the Bernice P. Bishop Museum in Honolulu.

Last, but not least, the author wishes to congratulate himself for having as assistant, Mr. Anthony Aki, of Honolulu, master swimmer, diver, and throw-net fisherman, who not only did an excellent job of field collecting, but also accomplished wonders with limited galley equipment.

TABLE OF CONTENTS

TABLE OF CONTENTS

ILLUSTRATIONS (Continued)

MAPS

TABLES

Figure

Figure

United States Department of the Interior, J. A. Krug, Secretary
Fish and Wildlife Service, Albert M. Day, Director

Fishery Leaflet 273

Washington 25, D. C. October 1947

SURVEY OF THE FISHERIES OF THE FORMER JAPANESE MANDATED ISLANDS

By Robert O. Smith
Aquatic Biologist, Office of Foreign Activities,
Fish and Wildlife Service.

INTRODUCTION

A. GENERAL DESCRIPTION OF THE AREA

In evaluating the fisheries resources of the former Japanese Mandated Islands of Micronesia, two facts must be kept in mind. The first is that a relatively small amount of land (902.5 sq. mi.) is widely distributed over a considerable area of the central north Pacific Ocean. The second fact is that we are dealing here with a total native population of only 70,000 people. On a comparative scale, the land area is 3/4 that of Rhode Island and the total native population is about 1/4 that of Honolulu. Only by constantly keeping these two facts in mind can we maintain a realistic approach to the problems involved.

The Japanese mandate comprised all of the Marshall, Caroline, and Mariana Islands, with the exception of Guam, which had, of course, been United States Territory under the jurisdiction of a naval governor since the Spanish-American war. These island groups contain more than 2,100 islands and islets of varying sizes, extending over a total area of ocean approximately the size of the United States (see General Map). The native population is not distributed evenly throughout this area, but tends to concentrate at a few points.

We must also avoid a tendency to confuse the Japanese exploitation of the commercial fisheries with the subsistence fishing of the native population. Except in a very few places (Palaus, Saipan, Truk, Ponape) where there was a large Japanese commercial fishery from which small amounts of surplus catch were funneled off to the natives, the basic pattern of native subsistence fishing remains approximately the same now as it did prior to the Japanese mandate. Neither the Spanish nor the German regimes, which preceded the Japanese, could profitably use in their economy the fishery products from Micronesia, and so made no effort to exploit them. Exports were limited to small amounts of trochus, pearl, and tortoise shells.

Under Japanese mandate the decade from 1920 to 1930 was one of general inquiry to determine the kinds of marine resources present. Actual production for export to Japan was negligible. Beginning with 1930, the tonnage exported to Japan increased steadily until halted by the imminence of war. Highest production of bonito was apparently in 1937, when over 75,000,000 pounds were produced. Insofar as the abundance of fish is

concerned, there is reason to believe that production had not reached a maximum. Exported processed food products consisted chiefly of dried bonito, dried tuna, canned fish, and trepang, amounting altogether in 1937 to slightly over 6,000 metric tons. Compared with total production in the Japanese Empire, fisheries products from the mandated area were valued at less than two percent.

The natives had little part in this developing industry. Okinawan fishermen manned the fishing vessels and Japanese operated processing plants and facilities on shore. There is no record of a native crew being permitted to operate a Japanese fishing vessel in the offshore fishery. After the outbreak of war the natives were not allowed to go outside the lagoons.

However, the important place of sea foods in the native diet can scarcely be over-emphasized. It is the beef and pork of Micronesia. Even at the highest levels of meat production which existed prior to the war, fish was the main protein, eaten at least once daily, generally oftener. Chicken and pig, though fairly abundant were mostly eaten at feasts. Shortages brought on by the war, mainly Japanese inability to replenish their own supplies, have now reduced the live stock to so low a number that in most places, even feasts depend largely on sea food.

It is not surprising that this should be so, for normally fish and shell-fish are easily taken on the flat, shallow reefs along shore; on the barrier and fringing reefs around the islands, and in the lagoons of atolls. The supply has always been available in return for a few hours of pleasant recreation, needs no cultivation, and is even frequently eaten raw, eliminating the labor of preparation.

This happy condition has been badly affected by war. Native canoes were destroyed by Japanese to prevent escape or contact with United States forces. Almost every family formerly had one canoe, often more. Without water transportation, fishing is limited to the shoreline, where the catch is mostly small immature fish and shell fish. The greatest shortage is in the Palaus, where only 80 canoes were left out of 1500.

A second and equally serious shortage exists in fishing supplies, and this is universal in the ex-mandate. Formerly, large quantities of Japanese hooks, feather lures, jigs, nets, seine twine and fish line were obtainable. Stocks on hand have been exhausted and American supplies have been slow in coming.

The third factor limiting native subsistence fishing is reduction of fish and shell fish on inshore reefs by Japanese dynamiting. Many Japanese garrisons found it necessary to procure sea food to offset food shortages when their supply lines were cut. The most efficient method of capture for them was use of explosives. Though no permanent damage should result, temporary fish and shell fish shortages exist which are aggravated by the shortages of vessels and supplies mentioned above.

Another point worthy of mention is that except in the Palaus, various species of fish are poisonous in varying degrees from slightly to deadly. Natives, of course, know the edible quality of each fish in their home waters, and fish poisonings more severe than moderate gastric disturbances are rare.

B. SCOPE AND METHODS OF THE SURVEY.

The primary purpose of the Economic Survey was to promote the welfare of the native population. The Survey was expected to establish a factual background for use by administrative officers.

In order to accomplish this, the study of fishery resources was divided into two

concerned, there is reason to believe that production had not reached a maximum. Exported processed food products consisted chiefly of dried bonito, dried tuna, canned fish, and trepang, amounting altogether in 1937 to slightly over 6,000 metric tons. Compared with total production in the Japanese Empire, fisheries products from the mandated area were valued at less than two percent.

The natives had little part in this developing industry. Okinawan fishermen manned the fishing vessels and Japanese operated processing plants and facilities on shore. There is no record of a native crew being permitted to operate a Japanese fishing vessel in the offshore fishery. After the outbreak of war the natives were not allowed to go outside the lagoons.

However, the important place of sea foods in the native diet can scarcely be over-emphasized. It is the beef and pork of Micronesia. Even at the highest levels of meat production which existed prior to the war, fish was the main protein, eaten at least once daily, generally oftener. Chicken and pig, though fairly abundant were mostly eaten at feasts. Shortages brought on by the war, mainly Japanese inability to replenish their own supplies, have now reduced the live stock to so low a number that in most places, even feasts depend largely on sea food.

It is not surprising that this should be so, for normally fish and shell-fish are easily taken on the flat, shallow reefs along shore; on the barrier and fringing reefs around the islands, and in the lagoons of atolls. The supply has always been available in return for a few hours of pleasant recreation, needs no cultivation, and is even frequently eaten raw, eliminating the labor of preparation.

This happy condition has been badly affected by war. Native canoes were destroyed by Japanese to prevent escape or contact with United States forces. Almost every family formerly had one canoe, often more. Without water transportation, fishing is limited to the shoreline, where the catch is mostly small immature fish and shell fish. The greatest shortage is in the Palaus, where only 80 canoes were left out of 1500.

A second and equally serious shortage exists in fishing supplies, and this is universal in the ex-mandate. Formerly, large quantities of Japanese hooks, feather lures, jigs, nets, seine twine and fish line were obtainable. Stocks on hand have been exhausted and American supplies have been slow in coming.

The third factor limiting native subsistence fishing is reduction of fish and shell fish on inshore reefs by Japanese dynamiting. Many Japanese garrisons found it necessary to procure sea food to offset food shortages when their supply lines were cut. The most efficient method of capture for them was use of explosives. Though no permanent damage should result, temporary fish and shell fish shortages exist which are aggravated by the shortages of vessels and supplies mentioned above.

Another point worthy of mention is that except in the Palaus, various species of fish are poisonous in varying degrees from slightly to deadly. Natives, of course, know the edible quality of each fish in their home waters, and fish poisonings more severe than moderate gastric disturbances are rare.

B. SCOPE AND METHODS OF THE SURVEY.

The primary purpose of the Economic Survey was to promote the welfare of the native population. The Survey was expected to establish a factual background for use by administrative officers.

In order to accomplish this, the study of fishery resources was divided into two

main categories, the first consisting of what may be called day to day, or subsistence fishing, mainly carried on inside the barrier reefs; while the second is offshore, or commercial fishing, of a magnitude much greater than required for the support of the local population. For its full development, this type of fishing demands an investment in vessels, equipment, and shore facilities far beyond the means of the natives to provide, consequently less time was devoted to it during the survey. Emphasis has been placed on describing local conditions at each island visited, the most abundant kinds of sea-food and sea-products present, the boats and fishing gear owned, and the mehtods used in subsistence fishing. Shortages in food, equipment and supplies have been noted with recommendations. Suggestions have been made for conservation measures as seemed to be required in the light of present knowledge.

Field work extended over the period May 2-August 31, 1946. Unless otherwise indicated, all dates or references to time should be understood to fall within the above limits.

An LCI (Landing Craft Infantry No. 983) was made available by the Navy for transportation of the Survey party, and this was used between Pearl Harbor and Truk, via Eniwetok, on the outgoing trip, and inbound from Truk to Kwajalein, via Kapingamarangi, Nukuoro, Ponape, Kusaie, Jaluit, Ailinglaplap, Majuro and Likiep. Elsewhere, travel was by Naval Air Transport Service. Points reached, and dates of arrival and departure, are shown on the general map facing page 1. In the Field Survey section, local charts are marked to show the localities examined and fishing methods used.

Since much of the travel between islands and island groups was by plane, fishing equipment was limited to hand lines, feather lures, spoons, spears and throw-nets, with a total weight of 80 pounds. This gear was satisfactory, as the natives had seines for use at the relatively few places such fishing was possible.

At each point visited, information on the fisheries was collected in two ways: by interviews with fishermen, chiefs, scribes, and any other persons having a knowledge of local conditions, past and present; and by examination of as many fishing localities as time permitted. Where stops were of only two days duration, one was spent ashore holding conferences and examining fishing gear, while the other was devoted to fishing.

Barrier and fringing reefs on the seaward side, and reefs on the lagoon side of islands were examined by diving; on shallow flats, throw-nets and hand picking were used; battle lanterns were used under water at night for examining both reefs and flats in depths not over two fathoms; trolling was done in lagoons, passes, and just outside the breakers of barrier and fringing reefs. Local transportation usually was by out-rigger canoe, with fishermen as guides and assistants.

Additional information was obtained from the area economists of the survey, who made intensive studies of limited portions of the ex-mandate.

Because of the extensive collections of marine organisms already made by Operation Crossroads, and others, museum collecting was omitted from the agenda of this survey, but it could not have been done anyway without curtailing more important phases of the program. An unsuccessful attempt was made to bring back some specimens in a home-type quick freezer.

ITINERARY

May, 1946

2 1200 Left Pearl Harbor on LCI (L) 983
12 Arrived Eniwetok, Northwest Marshalls
17 Left Eniwetok (LCI)
22 Arrived Truk, Central Carolines

June

5 Truk to Guam (by air - R5D)
7 Guam to Saipan by air (Marianas)
7 To Tinian by boat
8-9 On Tinian (Marianas)
10 Tinian to Saipan by boat
11-18 Saipan (Marianas)
19 Saipan to Guam by air
20-28 Guam (Marianas)
28 Guam to Rota by air
29-30 On Rota (Marianas)

July

1-3 On Rota (Marianas)
4-5 Guam awaiting transportation to Palaus
5 Guam to Pelelieu by air
6-26 Palaus and Kayangel Ids. (Western Carolines)
27 Pelelieu to Guam by air
29 Guam to Truk by air
30-31 Truk (Central Carolines)

August

1-2 Truk
2 Truk to Kapingamarangi by LCI
4-5 Kapingamarangi (LCI) (Southeastern Carolines)
6 Nukuoro (LCI)
8-13 Ponape LCI (Eastern Carolines)
16-17 Kwajalein to refuel (LCI) (Central Marshalls)
19-21 Kusaie (Eastern Carolines) (LCI)
23-24 Jaluit (Southern Marshalls) (LCI)
25-26 Ailinglaplap (Southern Marshalls) (LCI)
27-28 Majuro (Southern Marshalls) (LCI)
29-30 Likiep (East Central Marshalls) (LCI)
31 Kwajalein (LCI) Arrived 1000
31 Left Kwajalein by NATS for Honolulu 2300
31 Arrived Honolulu 1300

PART I FIELD SURVEYS BY ISLAND GROUPS

I. THE MARSHALL ISLANDS
RALIK CHAIN

A. ENIWETOK ATOLL (Population 139 - 1946)
(May 14-18)

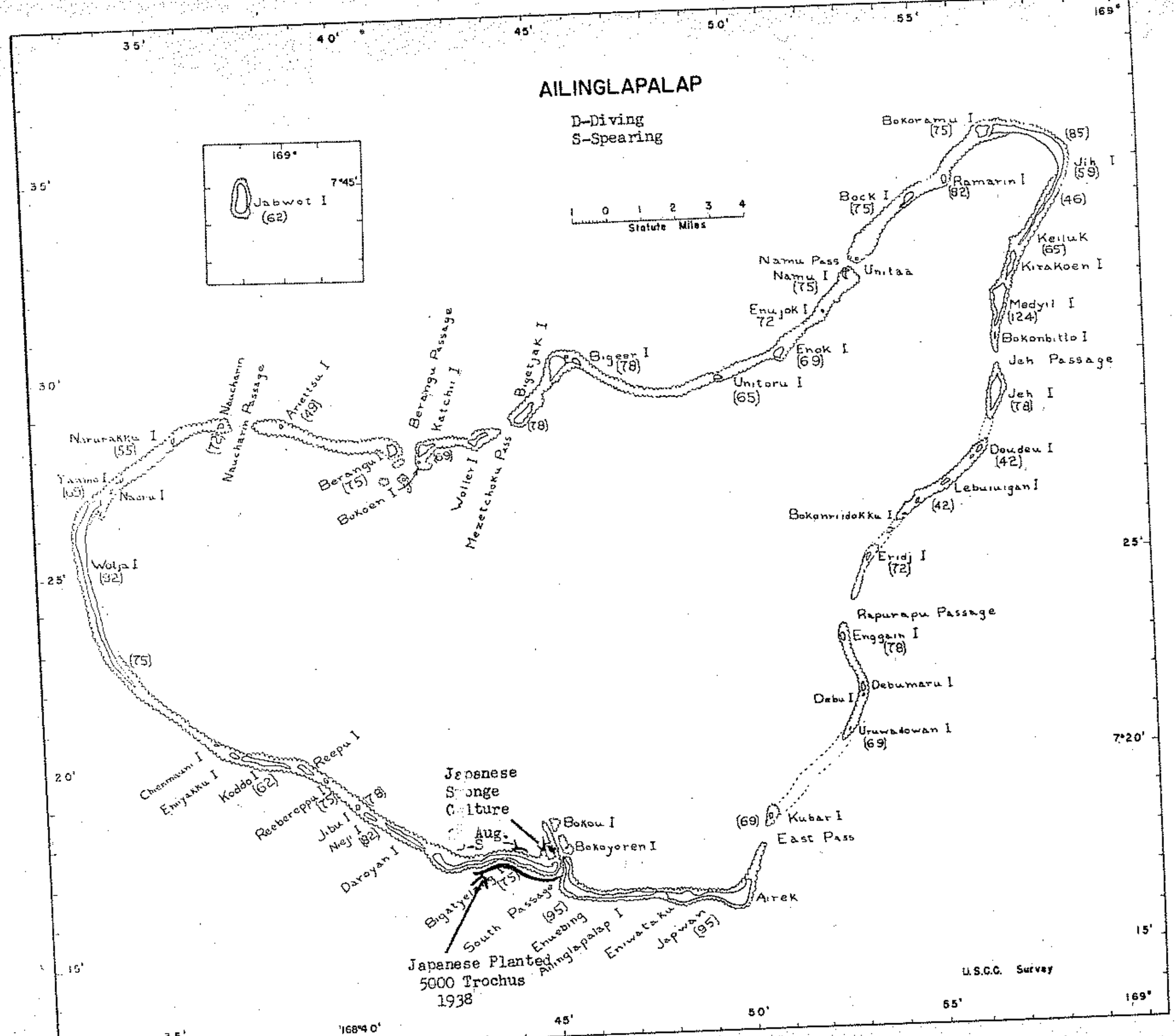
There was no opportunity to troll offshore during the stay at Eniwetok, and in any case it is believed that the status of offshore fisheries will have been determined very thoroughly by the fishery scientists attached to Operations Crossroads. Both reef and inshore fishes were very abundant throughout the atoll, so that the small number of natives were not likely to exhaust the supply with the methods of fishing available to them. As an example of the abundance of fish generally present, 81 goatfish (Mulloidichthys auriflamma Forskal) were taken with one cast of the 14-foot radius throw net. These weighed approximately half a pound each. On another throw with the 12-foot radius net, threadfish (Polydactylus sexfilis) and four mullet (Mugil cephalus) were taken. These catches were made on the seaward side of Igurin Island, between the fringing reef and shore, in depths of one to two feet. Small black-tipped sand sharks (Eulamia melanopterus), two to five feet in length, were common in shallow water. Also abundant were small orange-striped crabs (Grapsus grapsus tenuicrustatus). These crabs were boiled and eaten by the Marshallese. From the number of empty shells observed, it is evident that the spiny lobster or crawfish (Panulirus marginatus Quoy & Gaimard) is abundant in the area.

On account of the coral heads, beach seining would be impossible. There were places, however, where a type of surround net could be used. On the lagoon side of Japtan Island there was a fairly flat coral ledge, suitable for throw-netting (Fig. 1), but too rough for beach seining.

There were no edible seaweeds (Codium sp.; Gracilaria sp.; Laurencia sp.) on either Japtan or Igurin Islands. A few small bait fish, an anchovy of the kind called "nehu" in Hawaii (Anchoviella purpureus), were seen around the islands, but not in sufficient quantity to supply a commercial fishery. In place of these, the very abundant small goatfish could be used.

Several species of small decorative shells were common in shallow water under rocks along the shores of all of those islands of the atoll. The commonest ones were the "monkey face" (Cypraea moneta). The "gold ringer" (Pustularia annulus) and the "strawberry" or "bleeding heart" (Pustularia (Erosaria) Helvola). Several species of cowries, particularly the tiger shell (Cypraea tigris) and Cypraea caputserpentis were abundant on the ocean side of the reefs. The small shells mentioned provide an income to the natives, who make them into necklaces, bracelets, and head bands for sale to military and civilian personnel; the prices charged by the natives range from a dollar, for a necklace made of the monkey face, to $2.00 for one of gold ringer, and $5.00 for one of the bleeding heart or strawberry. The tiger cowrie shells are generally sold for 25 cents each.

All of the natives were concentrated on Aomon Island. Subsequently, they were moved away as a safety precaution in preparation for the first test of the atomic bomb. Two species of the giant clam (Tridacna gigas and Tridacna elongata) are abundant and are eaten by the natives--usually raw, but sometimes made into chowder. In addition to the species already mentioned, the natives obtain and eat in quantity rudderfish (Kyphosus sp.), several species of goat-fish (Mulloidichthys sp.) and (Pseudupeneus sp.), trigger fish (Balistes & Balistapus sp.), surgeon fish (Hepatus sp.), and octopi (Polypus sp.).


AILINGLAPALAP
D-Diving
S-Spearing
Statute Miles
Jabwot I
(62)
Bokoramu I
(75)
Ramarin I
(82)
Jih I
(59)
Bock I
(75)
Keiluk
(65)
Kirakoen I
Namu Pass
Namu I
(75)
Unitaa
Enujok I
72
Medyil I
(124)
Bokonbitlo I
Jah Passage
Enok I
(69)
Unitoru I
(65)
Bigeer I
(78)
Bigetjak I
Jeh I
(78)
Doudeu I
(42)
Lebuwigan I
Bokonridokku I
Eridj I
(72)
Rapurapu Passage
Enggain I
(78)
Debumaru I
Debu I
Uruwadowan I
(69)
Kubar I
East Pass
Airek
Japwan
(95)
Eniwataku
Ailinglapalap I
Enuebing
South Passage
Bigatyelang
Japanese Planted
5000 Trochus
1938
Japanese
Sponge
Culture
Aug.
Bokou I
Bokoyoren I
Darayan I
Neji I
(82)
Jibu I
Reeberappu I
(75)
Reepu I
Koddo I
(62)
Emyakku I
Chenmuun I
Wolja I
(92)
Yanimo I
Naoru I
Niruraakku I
(55)
Nauchorin
Nauchorin Passage
Arietsu I
(49)
Berangu I
(75)
Bukoen I
Berangu Passage
Katchu I
Wollej I
Mezetchoku Pass
U.S.C.G. Survey

At the eastern end of Piiraai Island there is a native coral stone semi-circular fish trap into which the natives drive schools of goat-fish and other small species.

In view of the abundance of fish and shell fish around Eniwetok, it seems unnecessary to recommend any change or attempted improvement in native fishing methods, as they are able to supply subsistence needs by only an hour or so of fishing per day. Several of the natives were given an opportunity to use the sling type spear of Hawaiian design and also our large throw nets, but other than the novelty of it, they did not appear to be interested. Their own spears are homemade, without barbs, and are set in a wood handle, the overall length of spear and handle being between six and seven feet. They do not have throw nets. Fish hooks were very scarce.

B. KWAJALEIN (Population 751 - 1946)
(August 16-17)

The islands of this low and sandy atoll resemble Eniwetok very much in having an abundance of fish on both the lagoon and seaward in shallow waters. Small goat-fish (Pseudupeneus) up to eight inches and striped surgeon fish (Hepatus triostegus), about seven inches long, are very abundant and easily taken with throw nets. Outside the reef, crevalle (Caranx sp.), up to ten pounds, are also quite common, but wild. They could be taken by trolling or handlining just outside the breakers. At the time of the survey, there was not even subsistence fishing to any extent, for very few natives were left in the vicinity of Kwajalein because of the atomic bomb experiments. Most of those left are employed by, and receive subsistence from, the Navy, and do not fish for a living.

C. AILINGLAPALAP ATOLL (Population about 1200 - 1946)
(August 25-26)

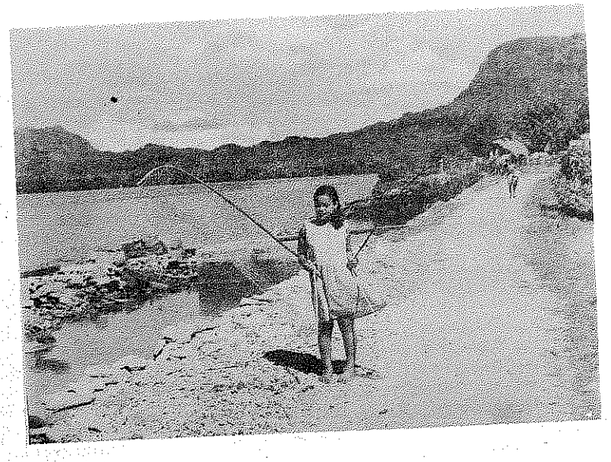
Pigatyelang Island. The reef on the lagoon side is very rough, with many caverns, and drops abruptly to three or four fathoms. Outside of the reef a few coral heads extend from the bottom to within a fathom of the surface. Within this area reef-fishes are very abundant, although wild and difficult to get close enough to for spearing. Among the commonest species are red and blue parrot fish (Callyodon sp.), several species of surgeon fish (Hepatus sp.), butterfly fish (Chaetodon sp.), and Moorish idols (Zanclus canescens). There were also many small giant clams up to 12 inches. Sea cucumbers (Holothuria) were rare. The natives stated that the Japanese looked into the possibility of producing trepang (dried sea cucumbers), but found that the supply of sea cucumbers was not sufficient to warrant it. The Japanese planted 5,000 trochus shells on the outside reef on the seaward side in 1938. The planting was done by Okinawan fishermen who came one day, planted the shells, and left immediately. The shells were dumped over the side of the boat and none has been harvested (to September, 1946) by the natives, as there has been no market for them during the war years. Trochus shells (Trochus niloticus) are not used for food by the natives, consequently almost the total number planted should be available, plus the natural increase since 1938. These shells should not be harvested until June 1947, when all of the shells of good quality over three inches in diameter should be harvested.

Since there are around 1,200 people on these islands and only a few pigs and chickens, the inhabitants must depend largely on fishing for their protein food. The men go fishing practically every day. They formerly had throw nets, but due to the war these are now worn out, and there is no twine for replacement. The natives depend mainly on spears and on collecting small giant clams (Tridacna) and other shell fish. For the entire population there are only two short seines of about two inch square mesh, and an average of one fish hook for ten men. Turtles are quite rare here and are only a minor item in the diet. Although most of the fishing is done by men, the women sometimes use small hand nets (Fig. 2) to catch small fish on the reef. The natives formerly used feather lures for trolling from

their canoes outside the reef, but at the present time they have so few hooks that this is out of the question. They need feather lures, spoons, hooks of all sizes, lead to make sinkers, leader wire, swivels, fishing twine for hand lines, seine twine for making nets and for knitting throw nets; also canvas and miscellaneous marine hardware for their sailing canoes.

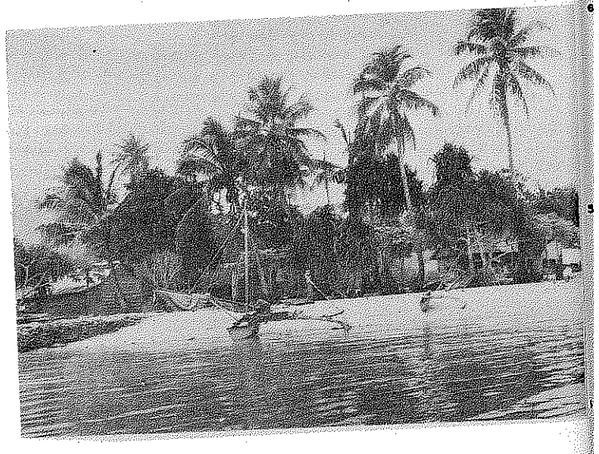
During the Japanese occupation, sampans operated from Ailinglapalap and obtained enough dried bonito for limited export, as well as supplying the Japanese garrison and local population with fresh fish. The sampans belonged to an Okinawan fishing company.

The Japanese undertook sponge culture in 1937-38, a description of which will be found in the section on Fisheries (Part III-IVB).



Left, Fig. 2.. Kusaie. Hand Net used by women. August 1946.

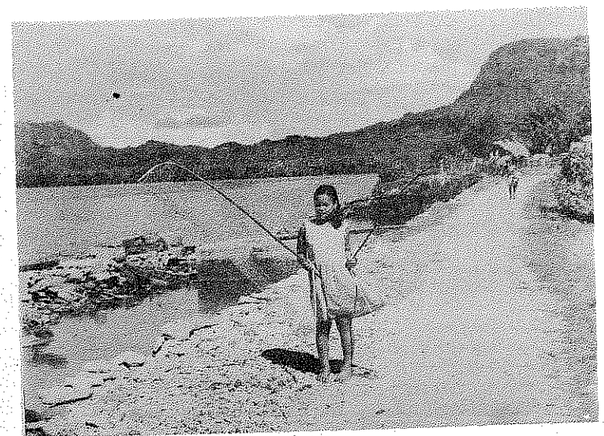
Right, Fig. 3.. Jaluit. Paddling and sailing canoes. August 1946.



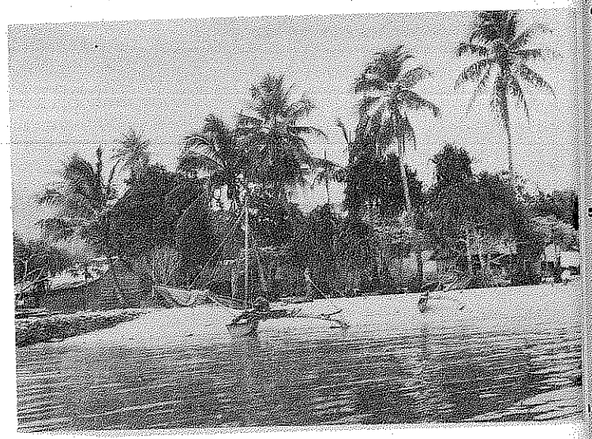
their canoes outside the reef, but at the present time they have so few hooks that this is out of the question. They need feather lures, spoons, hooks of all sizes, lead to make sinkers, leader wire, swivels, fishing twine for hand lines, seine twine for making nets and for knitting throw nets; also canvas and miscellaneous marine hardware for their sailing canoes.

During the Japanese occupation, sampans operated from Ailinglapalap and obtained enough dried bonito for limited export, as well as supplying the Japanese garrison and local population with fresh fish. The sampans belonged to an Okinawan fishing company.

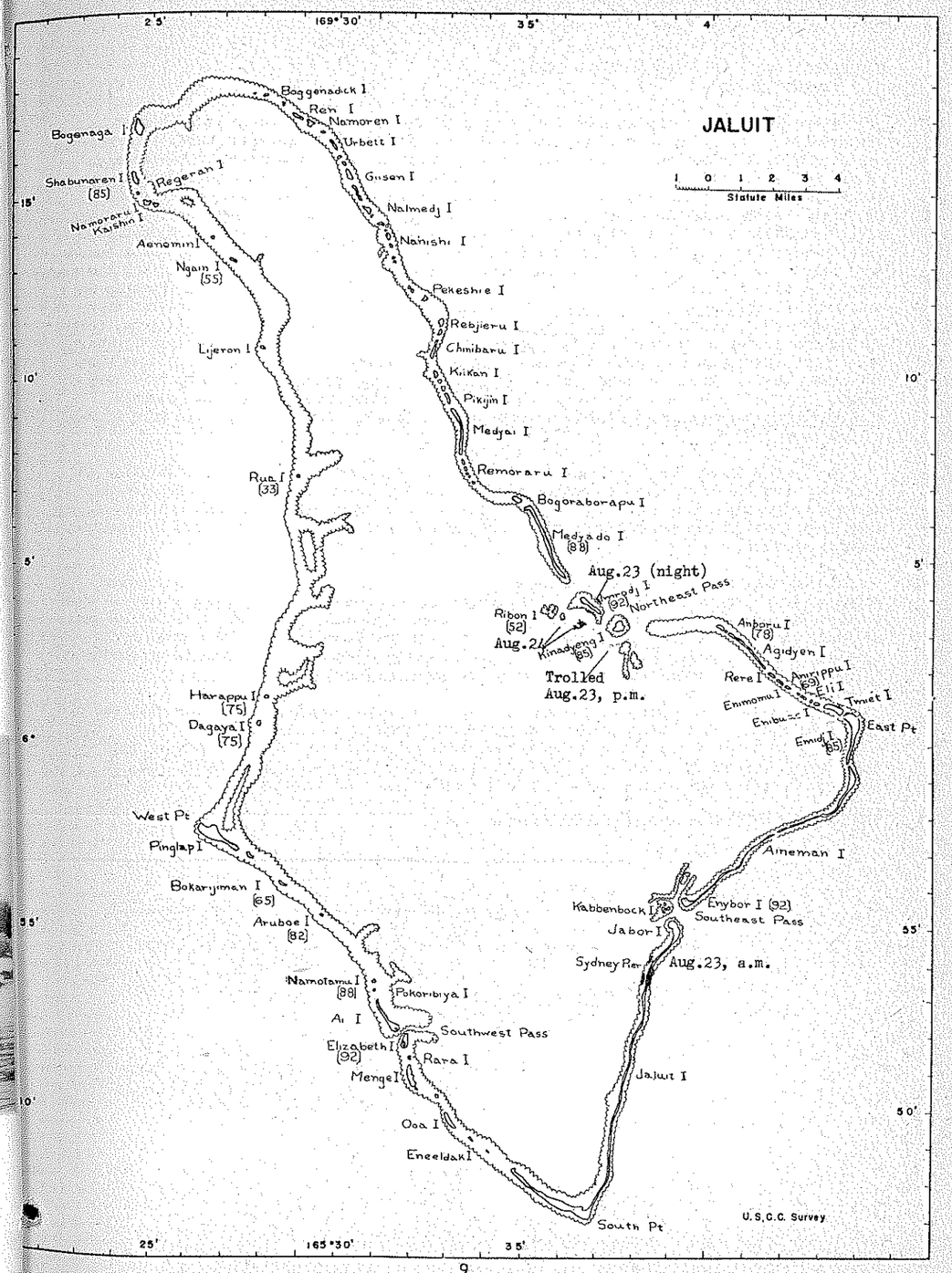
The Japanese undertook sponge culture in 1937-38, a description of which will be found in the section on Fisheries (Part III-IVB).



Left, Fig. 2.. Kusaie. Hand Net used by women. August 1946.



Right, Fig. 3.. Jaluit. Paddling and sailing canoes. August 1946.



D. JALUIT ATOLL (Population 777 - 1946)
(August 23-24)

These are flat, sandy islands (Fig. 3), usually narrow and with no barrier reef on the outside. The fringing reef is about 200 feet offshore at high water mark. The seaward beach on Jaluit Island is fairly flat, slightly sloping, and has many small shells such as monkey face and gold ringers. The only sea cucumbers were small black ones (Actinopyga sp.), found ranging in length from two to six inches. On account of the strong surf it was impossible to examine the outer reef. On the lagoon side there was rough coral lava-like reef, extending from shore out approximately 75 feet where the shelf dropped abruptly to five or more fathoms. On the lagoon side mullet and goat fish were abundant, and a number were taken with the throw net. The mullet were approximately eight inches long and the goat-fish from six to nine inches. Other very abundant species were surgeon fish (Hepatus sp.), trigger fish (Balistes and Balistapus) of several species, and a variety of parrot fish (Callyodon sp.), damsel fish (Abudefduf sp.), several species of wrasse (Thalassoma, Coris sp.) and a number of butterfly fish (Chaetodon sp.). Of shell fish, giant clams (Tridacna sp.) up to 12 inches were observed--none larger; the natives stated that large ones were not taken there. Small trochus shells (Trochus niloticus) under three inches were very common, but no large ones were seen. There were also many clusters of small mussels (Brachidontes cerebristriatus)not over one inch in length, on the rocks which were exposed at low tide.

At Imrodj Island the species of fish and shell fish were the same as at Jaluit. An hour was spent trolling from an outboard boat in the northeast pass near Imrodj Island, using a brass spoon and a red and white feather. No strikes were obtained, but many flying fish from 4 to 10 inches in length were seen, and it was apparent that larger fish were feeding on them.

On the lagoon side of Imrodj Island to the northwest is a reef just barely under water at low tide, which has a large population of the giant clam (Tridacna crocea). This species is very abundant and is used by the natives for food. They are collected by hand, by means of a screw driver or a bar of steel to pry the animals out of the coral rock. One fish abundant here, a brown spotted grouper (Serranus sp.), is considered poisonous by the natives, although not deadly so; it is sometimes eaten.

The natives lack almost all kinds of fishing supplies and are especially desirous of obtaining hooks, hand lines, steel rods for making spears, spoons and feather jigs. They formerly had throw nets, but these have been worn out, and they have no twine or lead to knit more. Due to the poor soil, food is not abundant. The main protein is fish, in addition to which the natives have only a few chickens. Fortunately, sea food is very abundant and easily obtained, and with a little assistance in securing fishing supplies the natives should not require much outside help.

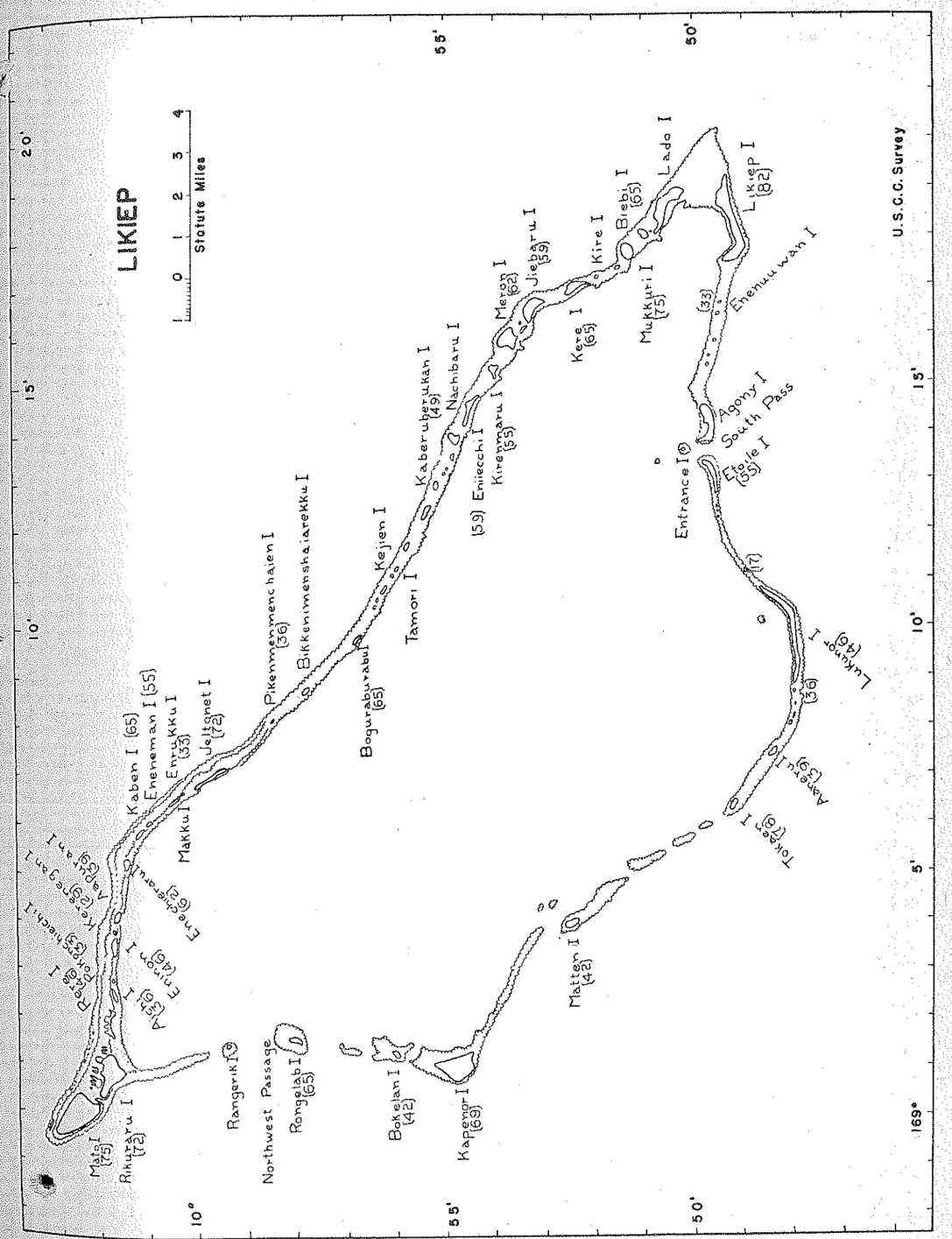
D. JALUIT ATOLL (Population 777 - 1946)
(August 23-24)

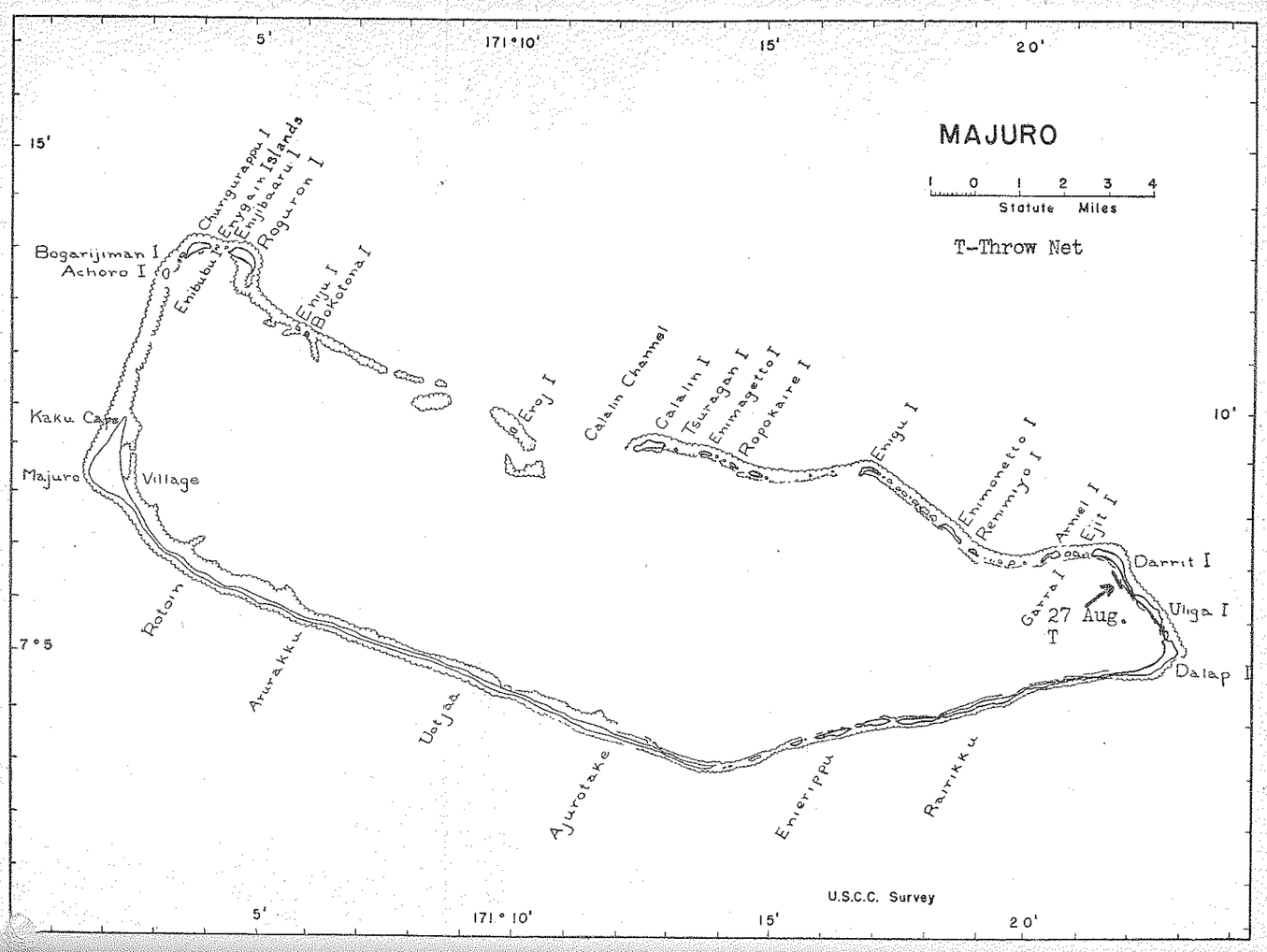
These are flat, sandy islands (Fig. 3), usually narrow and with no barrier reef on the outside. The fringing reef is about 200 feet offshore at high water mark. The seaward beach on Jaluit Island is fairly flat, slightly sloping, and has many small shells such as monkey face and gold ringers. The only sea cucumbers were small black ones (Actinopyga sp.), found ranging in length from two to six inches. On account of the strong surf it was impossible to examine the outer reef. On the lagoon side there was rough coral lava-like reef, extending from shore out approximately 75 feet where the shelf dropped abruptly to five or more fathoms. On the lagoon side mullet and goat fish were abundant, and a number were taken with the throw net. The mullet were approximately eight inches long and the goat-fish from six to nine inches. Other very abundant species were surgeon fish (Hepatus sp.), trigger fish (Balistes and Balistapus) of several species, and a variety of parrot fish (Callyodon sp.), damsel fish (Abudefduf sp.), several species of wrasse (Thalassoma, Coris sp.) and a number of butterfly fish (Chaetodon sp.). Of shell fish, giant clams (Tridacna sp.) up to 12 inches were observed--none larger; the natives stated that large ones were not taken there. Small trochus shells (Trochus niloticus) under three inches were very common, but no large ones were seen. There were also many clusters of small mussels (Brachidontes cerebristriatus)not over one inch in length, on the rocks which were exposed at low tide.

At Imrodj Island the species of fish and shell fish were the same as at Jaluit. An hour was spent trolling from an outboard boat in the northeast pass near Imrodj Island, using a brass spoon and a red and white feather. No strikes were obtained, but many flying fish from 4 to 10 inches in length were seen, and it was apparent that larger fish were feeding on them.

On the lagoon side of Imrodj Island to the northwest is a reef just barely under water at low tide, which has a large population of the giant clam (Tridacna crocea). This species is very abundant and is used by the natives for food. They are collected by hand, by means of a screw driver or a bar of steel to pry the animals out of the coral rock. One fish abundant here, a brown spotted grouper (Serranus sp.), is considered poisonous by the natives, although not deadly so; it is sometimes eaten.

The natives lack almost all kinds of fishing supplies and are especially desirous of obtaining hooks, hand lines, steel rods for making spears, spoons and feather jigs. They formerly had throw nets, but these have been worn out, and they have no twine or lead to knit more. Due to the poor soil, food is not abundant. The main protein is fish, in addition to which the natives have only a few chickens. Fortunately, sea food is very abundant and easily obtained, and with a little assistance in securing fishing supplies the natives should not require much outside help.




MAJURO
1 0 1 2 3 4
Statute Miles
T-Throw Net
5'
171°10'
15'
20'
15'
10'
7°5
Churugappu I
Enygain Islands
Enijibaaru I
Roguron I
Bogarijiman I
Achoro I
Enibaku I
Enyju I
Bokotona I
Kaku Cape
Majuro
Village
Eroj I
Calalin Channel
Calalin I
Tsuragan I
Enimagetto I
Ropokaire I
Engu I
Enimonetto I
Remmiyo I
Aniel I
Ejit I
Darrit I
Garra I
27 Aug.
T
Uliga I
Dalap I
Rotoin
Arurakku
Ustja
Ajurotake
Enierippu
Rairikku
U.S.C.C. Survey

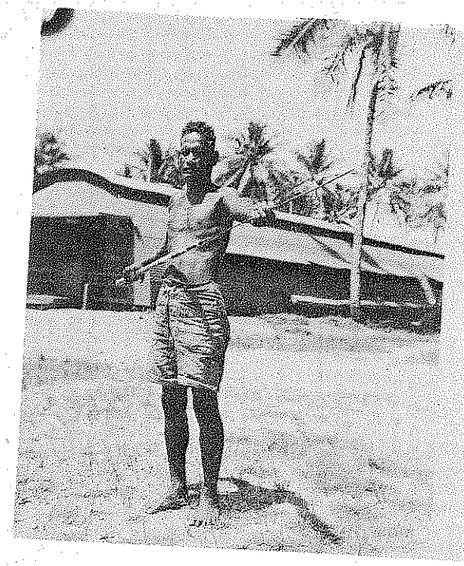


Fig. 4... Majuro. Short Spear.
August 1946.

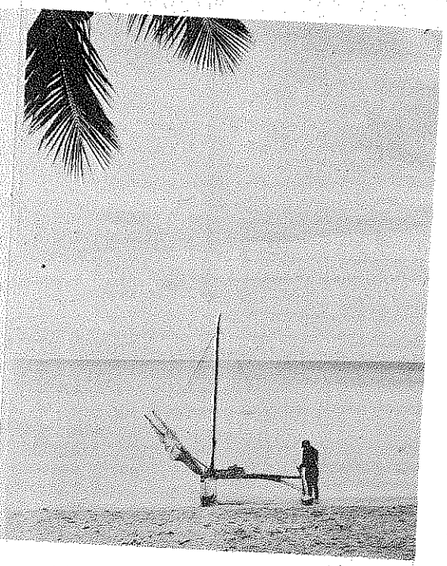


Fig. 5... Jaluit. Sailing Canoe.
August 1946.

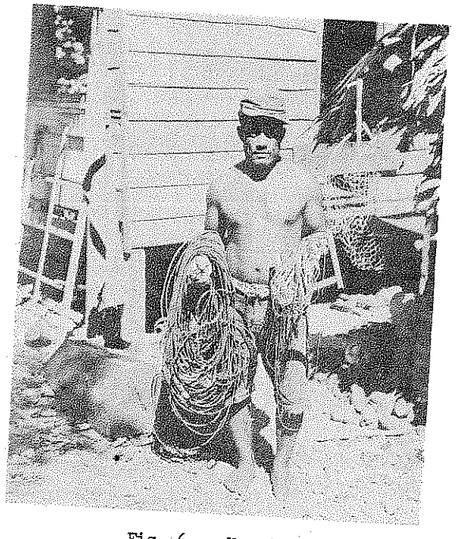


Fig. 6... Kusaie.
Trolling (Heavy) and Still-fishing lines.
August 1946.

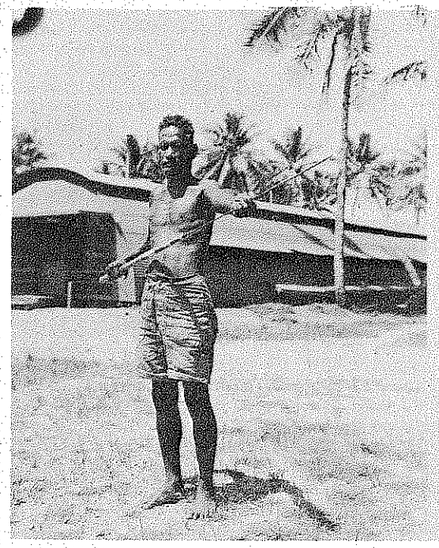


Fig. 4... Majuro. Short Spear.
August 1946.

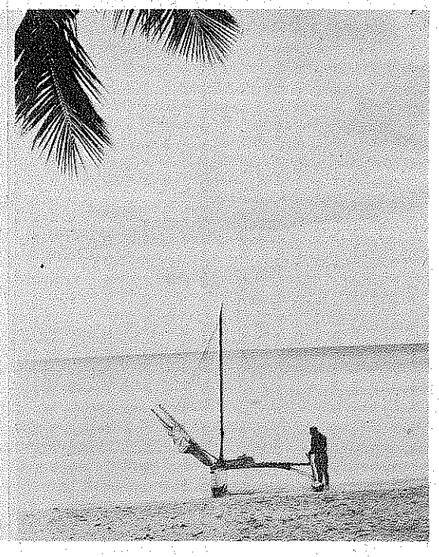


Fig. 5... Jaluit. Sailing Canoe.
August 1946.

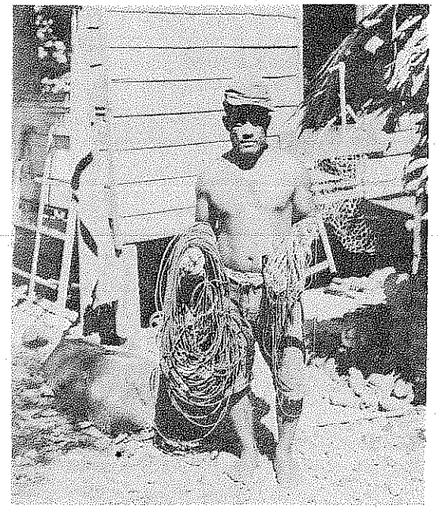


Fig. 6... Kusaie.
Trolling (Heavy) and Still-fishing lines.
August 1946.

However, most of the fish are taken by hand lining, using hooks with very short shank. Native needs were principally for fishing lines for hand lining, leader wire, swivels, and enough seine twine to make additional throw nets, of which a few are left, but most have been worn out. They have a few seines of the type known as surround net, but no twine or netting to replace them. Their spears are short, having a wood shaft about four feet long and a point of 3/8 inch round steel rod two feet long, with a plain point, no barb and not very sharp (Fig. 4). They also pound or mash black sea cucumbers to use as a fish poison. This is the only area visited where sea cucumbers were regarded as poisonous, although Thompson (Guam Recorder, May 1941, p. 81) reports that on Guam it was an old practice to use sea cucumbers as fish poison. They are, of course, not eaten by the natives.

Their traps are approximately two by two by four feet and are made of hardwood strips.

The Japanese had no fishing boats located at Majuro, nor did they plant trochus, pearl oysters, or sponges here. However, there does not appear to be any reason why trochus shells could not be introduced on the outside reef.

Except for the necessary fishing supplies, as mentioned above, the natives are well provided with means of obtaining fishery products, and it does not seem necessary to make any recommendations for improvements in methods. The Japanese did not find it profitable to locate sampans here for the purpose of catching bonito or other offshore fishes.

The Marshallese sailing outrigger canoes are specially noteworthy and indicated the highest ability in both design and workmanship of any of the island groups visited (Fig.5). These canoes range in length from 20 to 35 feet. One canoe of approximately 35 feet which was examined had a draft of 30 inches, a beam of 24 inches, and was capable of carrying about 15 persons. These canoes have a heavy keel piece, usually of breadfruit, with planking of one inch strakes, 12 to 14 inches wide, and up to 20 feet in length. The strakes are tied to each other and to the keel by hand-woven coconut twine (sennit). The mast supporting the lateen sail may be set at either end of the boat, which, being double ended, makes it possible to sail always with the outrigger on the windward side. These canoes are very fast and will sail within about two points of the wind. The natives do some trolling with these canoes, but depend mostly on spears and throw nets for catching fish.

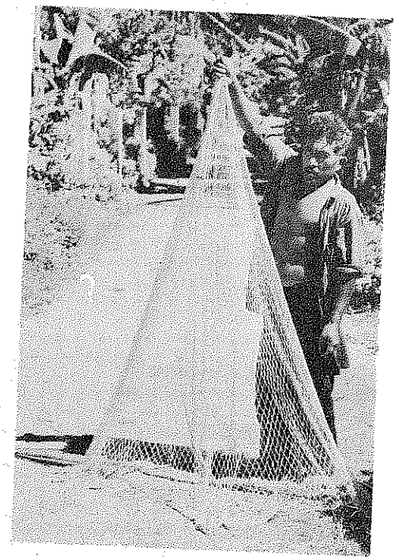


Fig. 7... Kusaie.
Throw Net.
August 1946.

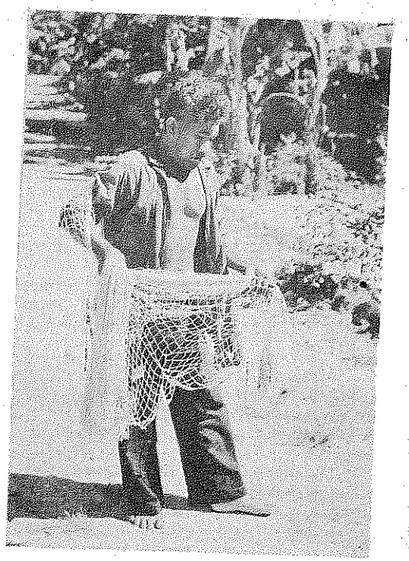


Fig. 8... Kusaie.
Method of holding
throw-net.
August 1946.

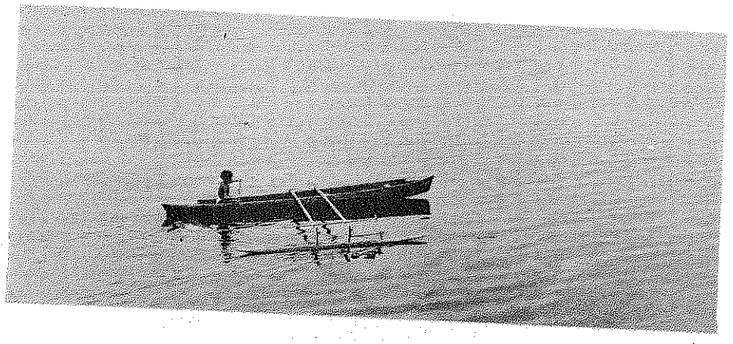


Fig. 9... Kusaie. Paddling Canoe. August 1946.

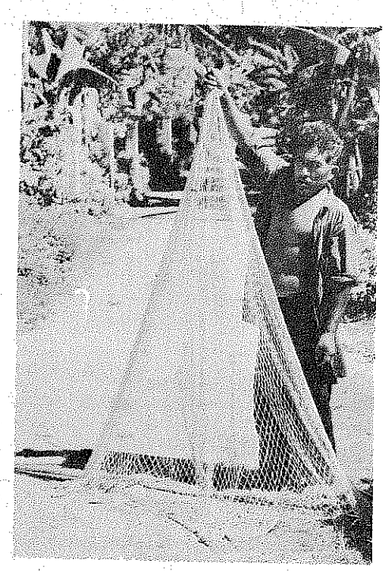


Fig. 7... Kusaie.
Throw Net.
August 1946.

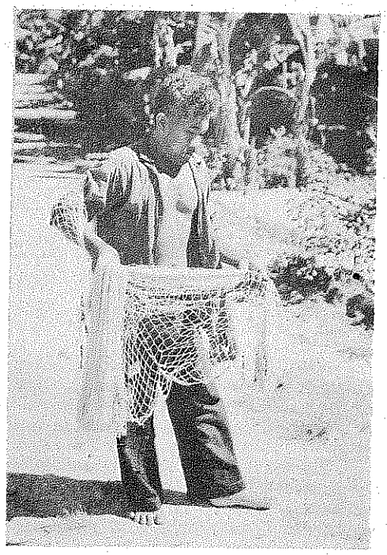


Fig. 8... Kusaie.
Method of holding
throw-net.
August 1946.

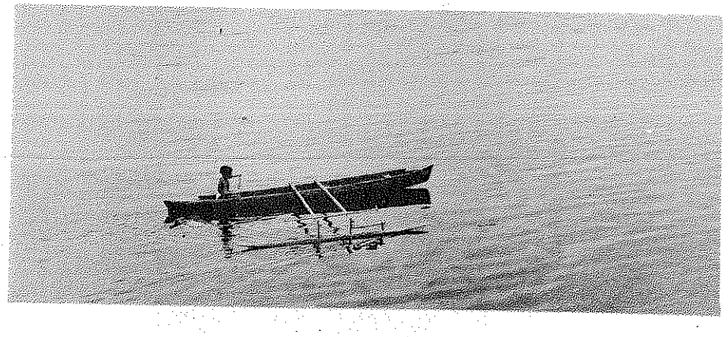
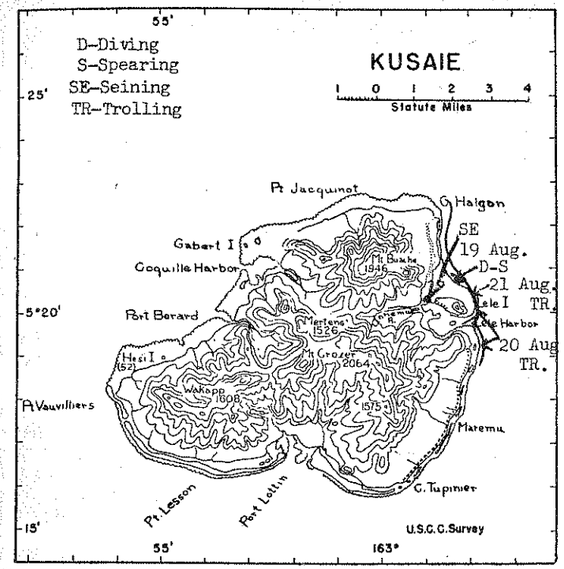


Fig. 9... Kusaie. Paddling Canoe. August 1946.



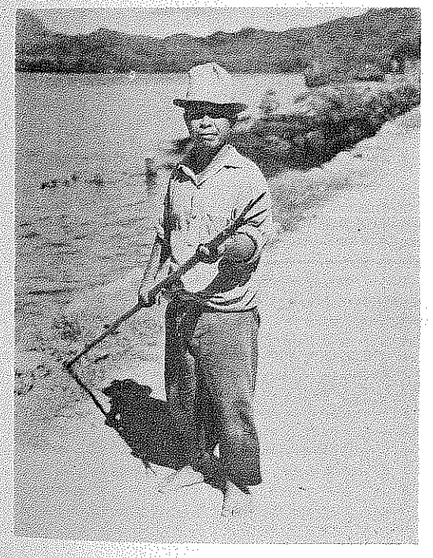


Fig. 10... Kusaie.
4-prong Spear. August 1946.

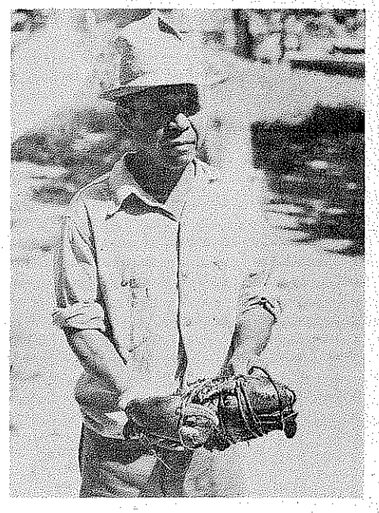


Fig. 11... Kusaie.
Samoan Crab (Scylla serrata).
August 1946.

II. THE CAROLINE ISLANDS

A. KUSAIE ISLAND (Population 1555 - 1946)
(August 18-21)

In contrast to the low islands in the Marshall Group, Kusaie is one of the high islands. The native population is about 1,550.

At the present time the reef fishes are somewhat depleted, due to the fact that toward the end of the war the Japanese dynamited extensively inside and outside the reef for the purpose of obtaining food. In view of the depleted population of fishes on the easily accessible reefs, it is necessary for the natives to use as food a good many small size fish from three to six inches, and it seems likely that as long as this is necessary, the recovery of the fish population on the reefs will be delayed. It will probably be two or three years before there is a near normal population of such fish as goat-fish, crevalle, mullet, groupers, and surgeon fish. Even with the dynamiting, however, the abundance of reef fishes is considerably greater than at Truk.

The natives have only paddling canoes (Fig. 9); none is equipped with sail, and the size ranges from 12 to 25 feet. Most canoes are hollowed out from breadfruit logs, but four other kinds are sometimes used. For a 16-foot canoe construction time is approximately three days for six men. The usual method of building is for the prospective owner to get some of his friends to help him, which is also true of Ponape. A number of canoes are being built at the present time and there is no shortage of transportation.

Fishing methods include hook and line (Fig. 6), feather jigs for trolling, spears, throw nets (Figs. 7 and 8), and surround nets. Spears are mostly made with four points (Fig. 10), with a single barb on each, point constructed of quarter inch steel rod about eight inches long and set into a wood handle about six feet long.

The Japanese had a processing plant, including refrigeration, for making bonito sticks, which were exported to Japan. The industry was in the hands of Japanese and Okinawans. No native fishermen were employed. Some trepang was also produced and exported.

The natives catch and use spiny lobsters (Panulirus) (Fig. 27), and Samoan crabs (Scylla serrata) (Fig. 11). Mullets up to twenty inches in length are fairly abundant just off the mangrove swamps, but difficult to catch. There is no commercial trochus, as the Japanese did not plant any here. A small species of no value is present, as well as the rough type of cat-eye (Turba intercostalis), some with fair color.

We explored approximately half a mile of the outside reef about three miles north of the harbor entrance. Fish were not very abundant and half an hour of work for three divers produced only four fish. Five native divers were able to get only two spiny lobsters, approximately 12 inches long in an hour of diving. Such fish as are present are very wild and immediately go to deep water when any divers get near them. There is no barrier reef at Kusaie, the fringing reef being only from a few yards to a quarter of a mile off the beach, which is generally sandy. The slope is gradual from the reef out, the depth of water approximately 400 yards off the reef being only two to two and a half fathoms.

In view of the scarcity and wildness of fish, most of the natives carry bundles of Derris elliptica roots in their canoes to use as fish poison. The roots are pulverized in the bottom of the boat and than dumped over in partially closed areas, where they bring up many small fish. As far as we were able to find, Barringtonia (Barringtonia asiatica) nuts are not used, although the natives were familiar with them.

II. THE CAROLINE ISLANDS

A. KUSAIE ISLAND (Population 1555 - 1946)
(August 18-21)

In contrast to the low islands in the Marshall Group, Kusaie is one of the high islands. The native population is about 1,550.

At the present time the reef fishes are somewhat depleted, due to the fact that toward the end of the war the Japanese dynamited extensively inside and outside the reef for the purpose of obtaining food. In view of the depleted population of fishes on the easily accessible reefs, it is necessary for the natives to use as food a good many small size fish from three to six inches, and it seems likely that as long as this is necessary, the recovery of the fish population on the reefs will be delayed. It will probably be two or three years before there is a near normal population of such fish as goat-fish, crevalle, mullet, groupers, and surgeon fish. Even with the dynamiting, however, the abundance of reef fishes is considerably greater than at Truk.

The natives have only paddling canoes (Fig. 9); none is equipped with sail, and the size ranges from 12 to 25 feet. Most canoes are hollowed out from breadfruit logs, but four other kinds are sometimes used. For a 16-foot canoe construction time is approximately three days for six men. The usual method of building is for the prospective owner to get some of his friends to help him, which is also true of Ponape. A number of canoes are being built at the present time and there is no shortage of transportation.

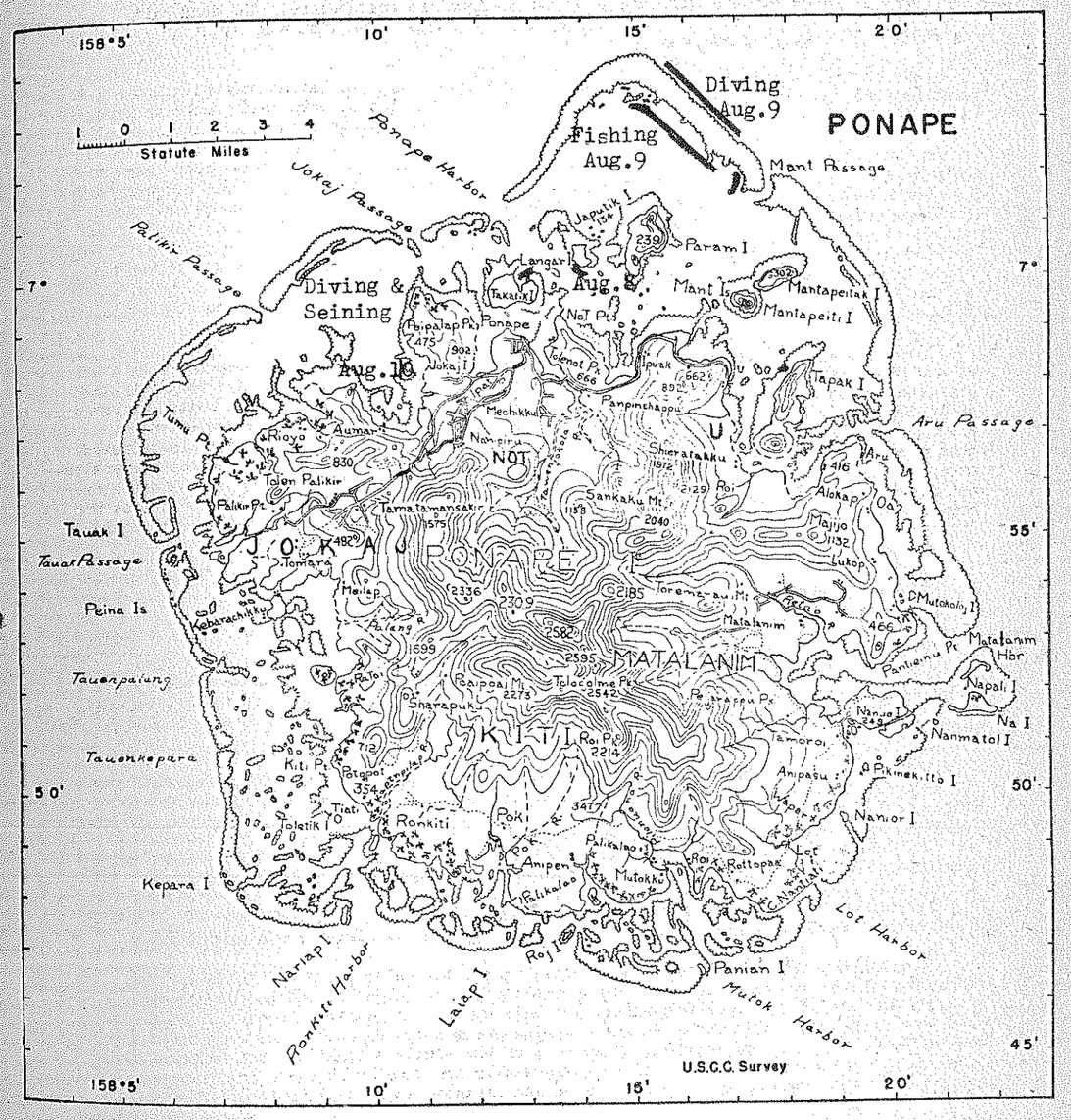
Fishing methods include hook and line (Fig. 6), feather jigs for trolling, spears, throw nets (Figs. 7 and 8), and surround nets. Spears are mostly made with four points (Fig. 10), with a single barb on each, point constructed of quarter inch steel rod about eight inches long and set into a wood handle about six feet long.

The Japanese had a processing plant, including refrigeration, for making bonito sticks, which were exported to Japan. The industry was in the hands of Japanese and Okinawans. No native fishermen were employed. Some trepang was also produced and exported.

The natives catch and use spiny lobsters (Panulirus) (Fig. 27), and Samoan crabs (Scylla serrata) (Fig. 11). Mullets up to twenty inches in length are fairly abundant just off the mangrove swamps, but difficult to catch. There is no commercial trochus, as the Japanese did not plant any here. A small species of no value is present, as well as the rough type of cat-eye (Turba intercostalis), some with fair color.

We explored approximately half a mile of the outside reef about three miles north of the harbor entrance. Fish were not very abundant and half an hour of work for three divers produced only four fish. Five native divers were able to get only two spiny lobsters, approximately 12 inches long in an hour of diving. Such fish as are present are very wild and immediately go to deep water when any divers get near them. There is no barrier reef at Kusaie, the fringing reef being only from a few yards to a quarter of a mile off the beach, which is generally sandy. The slope is gradual from the reef out, the depth of water approximately 400 yards off the reef being only two to two and a half fathoms.

In view of the scarcity and wildness of fish, most of the natives carry bundles of Derris elliptica roots in their canoes to use as fish poison. The roots are pulverized in the bottom of the boat and than dumped over in partially closed areas, where they bring up many small fish. As far as we were able to find, Barringtonia (Barringtonia asiatica) nuts are not used, although the natives were familiar with them.



It was reported to use that a sword fish (probably marlin), weighing approximately 240 pounds, was taken by still fishing on a hand line the week before. The dead bait used for this was a whole fish, weighing about two pounds. The fish was caught in approximately eight fathoms.

The natives are very short of hooks and lines, as they have had no communication with any sources of supply since February, 1946. They no longer make their hooks or lines according to their traditional customs and are completely dependent on manufactured supplies for their fishing. During our stay at Kusaie, we had a native fishing crew set a beach seine, and from a haul--which it took them about an hour and a half to make--they caught only a few small striped surgeon fish, approximately eight inches long. Their net originally surrounded several dozen large mullet, but all jumped out. We also spent several hours trolling outside the reef and found barracuda very abundant. Of those caught, the largest was 53 inches long and weighed 22 pounds. We also lost tackle twice on fish so large, that they broke the line. During our trolling we continually had overboard both a polished brass spoon (size #7) and a white Japanese feather type jig, which were operating side by side. We found here, as everywhere else, that more strikes were obtained on the spoon than on the feather.

Since the natives do not have sailing canoes, nor any powered motor vessels, they are at a disadvantage in attempting to troll. The native fishermen at Kusaie are very intelligent and progressive and would very much like to obtain small powered fishing boats, around 30 to 40 feet in length, with small diesel engines similar to the Japanese semi-diesel which power all Japanese sampans. These would be suitable for trolling, and it is believed that a considerable quantity of fish could be taken by the natives without outside assistance--except that there are at present no refrigeration facilities at Kusaie, and excess catch over and above what could be consumed by the population within twenty-four hours could not be preserved. Methods of salting could be developed in lieu of refrigeration, but storage would still be a problem. Salt of the proper kind would have to be shipped in.

B. PONAPE ISLAND (Population 5662-1946)
(August 8-13)

Ponape was the third most important Japanese fishing center with shore facilities, including refrigeration. All of these have been completely destroyed. At the present time there are two Japanese sampans, 35 to 40 feet long, still in operation. These are powered with the Japanese single cylinder, semi-diesel engine which must be started with a blow torch.

Being a high island, Ponape has an ample supply of hardwood trees for the construction of canoes and there does not appear to be a great shortage of these craft at the present time. A number of new ones are being built. The cost of a 12-foot canoe is around $12.00.

The chief methods of fishing used by the natives are: spears, hand lines, nets, small hand nets used by women, and the hand picking of small shell fish along the reefs.

Sea cucumbers are abundant around Ponape and a small sample was processed into trepang to determine whether or not it was of the quality desired for export to China and Japan.

The Japanese had introduced trochus shells along the outer reefs and these are now abundant, as they were notharvested during the war years. About 10,000 had been brought in to U. S. Commercial Company headquarters for sale by various natives and most of them were over five inches in diameter at the base. These are mostly old shells and many of them were badly corroded. Approximately 50 percent of the shells brought in were rejected by U. S. C. C. It is believed that before these shells are finally rejected and disposed of samples should be forwarded to United States and Japanese shell dealers to determine whether

It was reported to use that a sword fish (probably marlin), weighing approximately 240 pounds, was taken by still fishing on a hand line the week before. The dead bait used for this was a whole fish, weighing about two pounds. The fish was caught in approximately eight fathoms.

The natives are very short of hooks and lines, as they have had no communication with any sources of supply since February, 1946. They no longer make their hooks or lines according to their traditional customs and are completely dependent on manufactured supplies for their fishing. During our stay at Kusaie, we had a native fishing crew set a beach seine, and from a haul--which it took them about an hour and a half to make--they caught only a few small striped surgeon fish, approximately eight inches long. Their net originally surrounded several dozen large mullet, but all jumped out. We also spent several hours trolling outside the reef and found barracuda very abundant. Of those caught, the largest was 53 inches long and weighed 22 pounds. We also lost tackle twice on fish so large, that they broke the line. During our trolling we continually had overboard both a polished brass spoon (size #7) and a white Japanese feather type jig, which were operating side by side. We found here, as everywhere else, that more strikes were obtained on the spoon than on the feather.

Since the natives do not have sailing canoes, nor any powered motor vessels, they are at a disadvantage in attempting to troll. The native fishermen at Kusaie are very intelligent and progressive and would very much like to obtain small powered fishing boats, around 30 to 40 feet in length, with small diesel engines similar to the Japanese semi-diesel which power all Japanese sampans. These would be suitable for trolling, and it is believed that a considerable quantity of fish could be taken by the natives without outside assistance--except that there are at present no refrigeration facilities at Kusaie, and excess catch over and above what could be consumed by the population within twenty-four hours could not be preserved. Methods of salting could be developed in lieu of refrigeration, but storage would still be a problem. Salt of the proper kind would have to be shipped in.

B. PONAPE ISLAND (Population 5662-1946)
(August 8-13)

Ponape was the third most important Japanese fishing center with shore facilities, including refrigeration. All of these have been completely destroyed. At the present time there are two Japanese sampans, 35 to 40 feet long, still in operation. These are powered with the Japanese single cylinder, semi-diesel engine which must be started with a blow torch.

Being a high island, Ponape has an ample supply of hardwood trees for the construction of canoes and there does not appear to be a great shortage of these craft at the present time. A number of new ones are being built. The cost of a 12-foot canoe is around $12.00.

The chief methods of fishing used by the natives are: spears, hand lines, nets, small hand nets used by women, and the hand picking of small shell fish along the reefs.

Sea cucumbers are abundant around Ponape and a small sample was processed into trepang to determine whether or not it was of the quality desired for export to China and Japan.

The Japanese had introduced trochus shells along the outer reefs and these are now abundant, as they were not harvested during the war years. About 10,000 had been brought in to U. S. Commercial Company headquarters for sale by various natives and most of them were over five inches in diameter at the base. These are mostly old shells and many of them were badly corroded. Approximately 50 percent of the shells brought in were rejected by U. S. C. C. It is believed that before these shells are finally rejected and disposed of samples should be forwarded to United States and Japanese shell dealers to determine whether

or not they have any commercial value. It is bad from a conservation standpoint, and discouraging to native fishermen, to discard so large a percentage of the trochus taken.

The black lip, or pearl oyster (Pinctada), is common in water from one to four fathoms deep, in the area between the fringing shore reef and the outer barrier reef. At the present time no use is being made of these shells. As the total quantity is not large, it is doubtful if it would pay to put them on the world market. They could, however, go into inter-island trade to be used as inlay in native handicrafts.

Cowrie shells (Cypraea tigris) are very abundant, particularly around Matalanim, and many hundreds are brought in by the natives for sale. The present price to the natives is three for ten cents. A large number of these shells are now being rejected because of a milky appearance of the shell, which is the result of improper drying. In order to retain the high natural polish they should be either buried in dry sand for a month or six weeks, or the animal inside them can be rotted out in sea water and then the shells dried in the shade. Usually the milky appearance which renders them unsuitable for trade purposes results from exposure to the sun and to fresh water.

Small giant clams (Tridacna) up to 12 inches are very common and are eaten in large quantity by the natives. As far as we were able to determine, there are no very large ones ranging up to three feet or more.

The barrier reef here is notable in being very wide, up to 150 yards, and also peculiar in dropping off abruptly on the lagoon side to four or five fathoms. Along this inside edge large parrot fish (Callyodon sp.) and crevalles (Caranx sp.) of 10 to 15 pounds weight are very common, but wild and difficult to catch as they immediately seek deep water when fishermen come around. Small mullet, up to 10 inches in length, are common in the shallow water on top of the reef. Also abundant are several species of goatfish (Pseudupeneus) around eight inches in length and occasional schools of large blue wrasse (Cheilinus sp.) weighing up to 30 pounds. As many as 17 of the latter have been taken in one haul of a homemade beach seine. This type of seine is set in a semicircle on a flat part of the barrier reef and then a number of fishermen splash and drive fish into the center pocket. Due to the roughness of the bottom, it is not possible to haul the seine as is done with most beach seines.

Along the outer edge of the barrier reef there are many rough cat-eye (Turbo) shells, some of which contain cat-eyes of fair quality. We did not see any of the smooth type, which are the most valuable.

The natives of Ponape do not use either stone fence traps or large traps of any kind. There are several bamboo fence traps which had been constructed by natives from Yap. We were unable to obtain any information as to the production obtained from these traps.

Hawksbill turtles are fairly common around Ponape and a number are taken annually. The price set by Military Government is 80 cents a kilogram for thin shell and $1.30 per kilogram for thick shell. The Japanese paid from ¥100.00 to ¥160.00 per kilogram. In computing the price, the whole shell is weighed. A large shell weighed approximately six kilograms. Turtles are taken mainly by spearing or are caught by hand, but a few are also taken by nets.

Under the Japanese the natives obtained some income from the preparation of trepang from sea cucumbers. The Japanese paid 30 sen (¥.30) per kilogram for fair quality, 45 sen (¥.45) per kilogram for good quality and 75 sen (¥.75) per kilogram for very good quality. The abundance of sea cucumbers warrants a resumption of this business, if markets can be found.

In general, the catch made with seines was very small and scarcely paid for the labor involved. For example, one set of the net brought the seven men who fished it

only four black surgeon fish, approximately seven inches long, and one large-eyed red squirrel fish (Myripristis sp.) eight inches long, although the time required to send the net was an hour and a half. In two hours of diving along the fringing reef inshore three divers obtained five black-lipped oysters of a diameter of six inches. One of them contained a tiny baroque pearl of no value. We also found large pinna shells of genus Atrina quite common. The adductor muscle is large and similar to that of the ocean scallop. However, it is not eaten by the natives although it has a very good flavor. One of these Atrina shells had six tiny black pearls, approximately 1/64 inch in diameter. We also found a number of sponges, which are native to the area and are used by the local population in place of towels after bathing. These sponges are of cylindrical shape, with a large central cavity. The outer walls are from 3/8 to 1/2 inch thick, with sections branching from the main stem approximately 12 to 14 inches in length. A sample of this sponge was brought back to determine whether or not it might have a commercial value. Since these sponges seem to grow very well, there should be no reason why the culture of more desirable species could not be undertaken.

Every native canoe carries several bunches of derris roots (Derris elliptica) to be used in poisoning fish. The natives pound the roots to a pulpy mass and then throw the whole thing into holes and caverns on the inside edge of the reef. This is a wasteful kind of fishing, as even very small fish are narcotized and are destroyed without being of any use, although at the present time the natives keep even small fish three to four inches long. While on the subject of poisons, it may be said that barringtonia (Barringtonia racemosa and asiatica) occurs at Ponape, but is not commonly used by the natives as a fish poison, although its use is known. Tephrosia (Tephrosia purpurea) also occurs here and its use as a fish poison is known to the natives, but they do not use it as they say it gives the fish a bad flavor.

It was surprising to find no native jigs made of pearl shell body with tortoise shell barbless point such as were common at Kapingamarangi and Nukuoro. It was stated that the Ponapeans did not make these and did no trolling until steel hooks were introduced by traders. The bonito fishing was carried on exclusively by Japanese and Okinawans. Even at present the outside trolling is done chiefly by natives from Yap using sailing canoes, or occasionally by paddling. The total catch by trolling is inconsequential, each boat getting only one or two fish per day. There is no processing of the catch, all being consumed fresh. The bonito (Katsuwonus pelamis) in this area run to about 15 pounds each.

With the exception of one native who, with his family, fishes for trochus and other shells, trepang, and turtles, there are very few of what might be called professional fishermen around Ponape. Almost all of the natives have canoes and fish for subsistence only, but much of their time is devoted to agriculture.

At the present time the fishing lines are mostly of sennit, woven by the men by rolling fibres of ripe coconut husks on their thighs. Hand net and seine twine is also made from this and ranges in size from approximately #15 to #40. The locally made spears either have a single simple barb on the end, made of quarter-inch steel rods two feet long, or may have three or four barbless points of 1/8 or 3/16 inch round rod. In either case the points are set into a wood shaft 5/8 inch in diameter and six to eight feet long.

The area in the vicinity of Ponape town is similar to Truk in that the Japanese were short of protein food towards the end and did much dynamiting of fish, mostly inside the outer reef and along the outside of the inner fringing reef. The fish population is therefore somewhat reduced, especially the smaller reef fishes. The larger fish, including the blue parrot fish (Callyodon sp.), crevalle (Caranx sp.), and mullet (Mugil cephalus), are very wild. The mullet here range in size up to 18 inches in length and two and a half pounds in weight. Shell fish of all kinds were also taken by the Japanese in large quantities as food. Even the black-lipped pearl oysters (Pinctada sp.), trochus (Trochus niloticus), and cat-eyes (Turbo sp.), as well as Cardium and Anadara, were eaten and are

only four black surgeon fish, approximately seven inches long, and one large-eyed red squirrel fish (Myripristis sp.) eight inches long, although the time required to send the net was an hour and a half. In two hours of diving along the fringing reef inshore three divers obtained five black-lipped oysters of a diameter of six inches. One of them contained a tiny baroque pearl of no value. We also found large pinna shells of genus Atrina quite common. The adductor muscle is large and similar to that of the ocean scallop. However, it is not eaten by the natives although it has a very good flavor. One of these Atrina shells had six tiny black pearls, approximately 1/64 inch in diameter. We also found a number of sponges, which are native to the area and are used by the local population in place of towels after bathing. These sponges are of cylindrical shape, with a large central cavity. The outer walls are from 3/8 to 1/2 inch thick, with sections branching from the main stem approximately 12 to 14 inches in length. A sample of this sponge was brought back to determine whether or not it might have a commercial value. Since these sponges seem to grow very well, there should be no reason why the culture of more desirable species could not be undertaken.

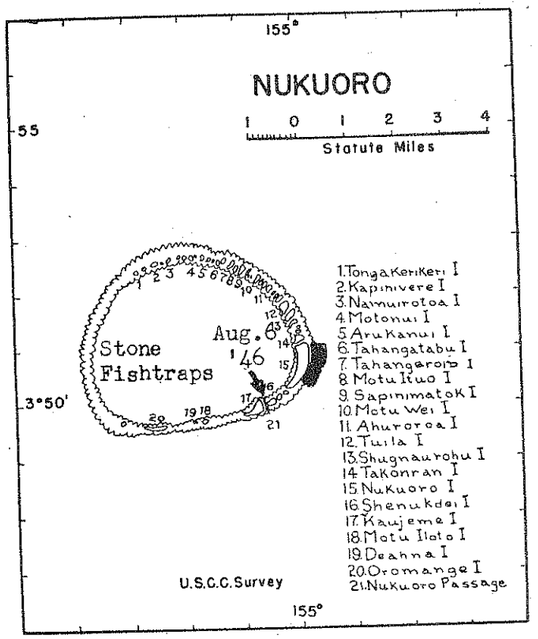
Every native canoe carries several bunches of derris roots (Derris elliptica) to be used in poisoning fish. The natives pound the roots to a pulpy mass and then throw the whole thing into holes and caverns on the inside edge of the reef. This is a wasteful kind of fishing, as even very small fish are narcotized and are destroyed without being of any use, although at the present time the natives keep even small fish three to four inches long. While on the subject of poisons, it may be said that barringtonia (Barringtonia racemosa and asiatica) occurs at Ponape, but is not commonly used by the natives as a fish poison, although its use is known. Tephrosia (Tephrosia purpurea) also occurs here and its use as a fish poison is known to the natives, but they do not use it as they say it gives the fish a bad flavor.

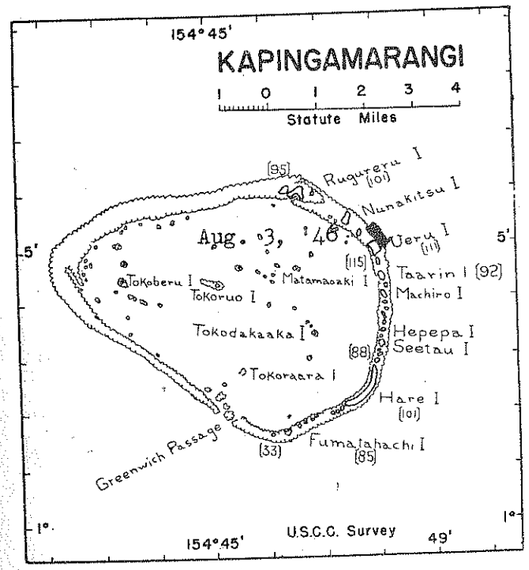
It was surprising to find no native jigs made of pearl shell body with tortoise shell barbless point such as were common at Kapingamarangi and Nukuoro. It was stated that the Ponapeans did not make these and did no trolling until steel hooks were introduced by traders. The bonito fishing was carried on exclusively by Japanese and Okinawans. Even at present the outside trolling is done chiefly by natives from Yap using sailing canoes, or occasionally by paddling. The total catch by trolling is inconsequential, each boat getting only one or two fish per day. There is no processing of the catch, all being consumed fresh. The bonito (Katsuwonus pelamis) in this area run to about 15 pounds each.

With the exception of one native who, with his family, fishes for trochus and other shells, trepang, and turtles, there are very few of what might be called professional fishermen around Ponape. Almost all of the natives have canoes and fish for subsistence only, but much of their time is devoted to agriculture.

At the present time the fishing lines are mostly of sennit, woven by the men by rolling fibres of ripe coconut husks on their thighs. Hand net and seine twine is also made from this and ranges in size from approximately #15 to #40. The locally made spears either have a single simple barb on the end, made of quarter-inch steel rods two feet long, or may have three or four barbless points of 1/8 or 3/16 inch round rod. In either case the points are set into a wood shaft 5/8 inch in diameter and six to eight feet long.

The area in the vicinity of Ponape town is similar to Truk in that the Japanese were short of protein food towards the end and did much dynamiting of fish, mostly inside the outer reef and along the outside of the inner fringing reef. The fish population is therefore somewhat reduced, especially the smaller reef fishes. The larger fish, including the blue parrot fish (Callyodon sp.), crevalle (Caranx sp.), and mullet (Mugil cephalus), are very wild. The mullet here range in size up to 18 inches in length and two and a half pounds in weight. Shell fish of all kinds were also taken by the Japanese in large quantities as food. Even the black-lipped pearl oysters (Pinctada sp.), trochus (Trochus niloticus), and cat-eyes (Turbo sp.), as well as Cardium and Anadara, were eaten and are





now much more scarce than formerly. We found no large trochus shells, even on the outer reef. According to our information, the area around Kiti and Matalanim was not greatly affected by the Japanese occupation and the supply of fish and shell fish was not greatly reduced there. This was due to the fact that the Japanese moved away from Kiti when the American bombing of the island started.

A few native nets are constructed entirely of local materials. One was four fathoms deep and 38 fathoms long. The mesh or bar is 2-3/4 inches square, made from sennit twine, about #60 size. Floats were made of hibiscus wood (kalau), 2-1/2 inches in diameter by 16 inches long, spaced 17 inches on the cork line. Leads are of Anadara shells, also spaced 17 inches apart. The net is used mainly for catching large blue parrot fish inside the outer reef.

The natives make a wide variety of handicraft articles from tortoise shell. For sale at the U.S.C.C. store were combs, belt buckles, wrist watch straps, and rings. The rings have silver or brass inlay. In general, these tortoise shell products were of very poor quality. The shell was not selected, in the first place, for attractive markings, nor was it well finished. Combs sell for 85 cents and a dollar and many have little other than curio value. The wrist watch bands sell for 75 cents and unfortunately do not fit all watches. The rings sell for a dollar. Proper design and finishing would greatly increase the attractivness and saleability of these articles. It was reported that the only material available to the natives for polishing tortoise shell articles is old Japanese tooth paste, which apparently is much coarser than ours. No machinery is available for cutting, grinding, orpolishing.

At the time of this survey the natives had no supply of the larger or smaller sizes of fish hooks; only a comparatively small stock of medium size hooks being on hand. There was no fish line at all, nor seine twine for making throw nets. Most of the throw nets which the natives had are now worn out.

Note on Fishing Vessels

The harbor at Ponape is littered with the hulls of Japanese sampans, ranging in size from 25 to 50 feet. All of these hulls, both in and out of the water, are beyond salvage. Two sampans about 45 feet long are now being operated by Military Government. One, which is assigned to a native sub-chief, is approximately 36 feet long and in very poor condition. Water transportation around Ponape is dependent on these three Japanese boats, although there is a limited amount of travel by native canoe. The Japanese boats are powered with one to three cylinder, two cycle, direct reversing, semi-diesel engine which is started with a blow torch and develops approximately 15 horsepower per cylinder at 600 R.P.M. This type of engine uses a very heavy diesel fuel and will not operate on American fuel of 50 cetane. The engine is of the straight drive type without reduction gear and has a simple clutch with throw-out or neutral, but no reverse. The propeller is about 24 inches in diameter, with a 20 inch pitch, and the usual speed is six to eight knots. The vibration is terrific.

C. NUKUORO ATOLL (Population 235 - 1946)
(August 6)

There is no barrier reef, the fringing reef extending from shore out approximately 150 yards. The edge of the reef drops abruptly to over six fathoms. There is about six to 12 inches of water over this reef at low tide. The reef, although flat, is extremely rough, having many scattered rocks up to three feet in diameter over it. Small shells used in handicraft, such as the so-called "monkey-face" and "gold ringers", are abundant. These are to be found under the rocks in approximately six inches of water. Small black sea cucumbers, six to eight inches long, were extremely abundant on this reef. We saw no yellow ones. It was reported that the spiny lobster (Panulirus) is very abundant on this

now much more scarce than formerly. We found no large trochus shells, even on the outer reef. According to our information, the area around Kiti and Matalanim was not greatly affected by the Japanese occupation and the supply of fish and shell fish was not greatly reduced there. This was due to the fact that the Japanese moved away from Kiti when the American bombing of the island started.

A few native nets are constructed entirely of local materials. One was four fathoms deep and 38 fathoms long. The mesh or bar is 2-3/4 inches square, made from sennit twine, about #60 size. Floats were made of hibiscus wood (kalau), 2-1/2 inches in diameter by 16 inches long, spaced 17 inches on the cork line. Leads are of Anadara shells, also spaced 17 inches apart. The net is used mainly for catching large blue parrot fish inside the outer reef.

The natives make a wide variety of handicraft articles from tortoise shell. For sale at the U.S.C.C. store were combs, belt buckles, wrist watch straps, and rings. The rings have silver or brass inlay. In general, these tortoise shell products were of very poor quality. The shell was not selected, in the first place, for attractive markings, nor was it well finished. Combs sell for 85 cents and a dollar and many have little other than curio value. The wrist watch bands sell for 75 cents and unfortunately do not fit all watches. The rings sell for a dollar. Proper design and finishing would greatly increase the attractivness and saleability of these articles. It was reported that the only material available to the natives for polishing tortoise shell articles is old Japanese tooth paste, which apparently is much coarser than ours. No machinery is available for cutting, grinding, orpolishing.

At the time of this survey the natives had no supply of the larger or smaller sizes of fish hooks; only a comparatively small stock of medium size hooks being on hand. There was no fish line at all, nor seine twine for making throw nets. Most of the throw nets which the natives had are now worn out.

Note on Fishing Vessels

The harbor at Ponape is littered with the hulls of Japanese sampans, ranging in size from 25 to 50 feet. All of these hulls, both in and out of the water, are beyond salvage. Two sampans about 45 feet long are now being operated by Military Government. One, which is assigned to a native sub-chief, is approximately 36 feet long and in very poor condition. Water transportation around Ponape is dependent on these three Japanese boats, although there is a limited amount of travel by native canoe. The Japanese boats are powered with one to three cylinder, two cycle, direct reversing, semi-diesel engine which is started with a blow torch and develops approximately 15 horsepower per cylinder at 600 R.P.M. This type of engine uses a very heavy diesel fuel and will not operate on American fuel of 50 cetane. The engine is of the straight drive type without reduction gear and has a simple clutch with throw-out or neutral, but no reverse. The propeller is about 24 inches in diameter, with a 20 inch pitch, and the usual speed is six to eight knots. The vibration is terrific.

C. NUKUORO ATOLL (Population 235 - 1946)
(August 6)

There is no barrier reef, the fringing reef extending from shore out approximately 150 yards. The edge of the reef drops abruptly to over six fathoms. There is about six to 12 inches of water over this reef at low tide. The reef, although flat, is extremely rough, having many scattered rocks up to three feet in diameter over it. Small shells used in handicraft, such as the so-called "monkey-face" and "gold ringers", are abundant. These are to be found under the rocks in approximately six inches of water. Small black sea cucumbers, six to eight inches long, were extremely abundant on this reef. We saw no yellow ones. It was reported that the spiny lobster (Panulirus) is very abundant on this

reef and we noted that the natives had a special instrument which consisted of a small sharp-pointed steel hook fastened in the end of a stick approximately 12 inches long which was used for jerking lobsters out of their holes in the rocks. They also make an unusual type of spear which consists of a light steel rod approximately 1/8 inch in diameter and three feet long, which is shot by means of a sling. The sling consists of two pieces of tire tube which are slipped over the thumb and forefinger of the left hand and the sling is used as boys use a slingshot.

Fish were very abundant along the outer edge of the reef in from one to two fathoms and were comparatively tame. Among the more abundant species were crevalle, goat fish, parrot fish and wrasse.

There are a few throw nets knit locally from twine previously furnished by the Military Government. The last supply of this was received in February 1946 and the number of throw nets available to the natives is still inadequate. Also there are several beach seines made of coconut fiber, which have a square mesh of approximately an inch and a quarter. The twine is very coarse and about the size of #40 cotton twine. They have some #40 twine which they use for trolling for skip jack, bonito, and albacore. Usually two or three fishermen go out together and one paddles or handles the sail while the others tend the lines. For bait they use a homemade jig, the body of which is cut from black-lipped pearl oyster shell, which is common. Ordinarily they use an American type steel hook, although if these are not available they make a barbless hook out of tortoise shell and tie it onto the pearl shell body. A strip of fish is put on the hook for bait. We saw several fishing canoes with one or two bonito, weighing from 15 to 25 pounds, which were caught with this type of gear. One native said they formerly used bamboo poles and fished in very much the same manner as the Japanese do and that four men sometimes brought in a hundred fish in a couple of hours. At the present time there is no bamboo left on the island for poles. It is not grown locally and should be furnished.

A few hawksbill turtles are taken, from which the tortoise shell is obtained for use in handicraft--most of it to make the centers of fans.

The natives here are very good fishermen and need little help other than to be furnished with such necessary supplies as fish hooks, bamboo poles, cotton seine twine ranging in size from #20 to #60, some bulk lead to be used in making leads on nets, and a few feather jigs and spoons to supplement their homemade articles. From the abundance of bonito seen here it is possible to assume that the natives could establish a small drying plant for the production of bonito sticks.

D. KAPINGAMARANGI ATOLL (Population 441 - 1946)
(August 3-5)

There is no barrier reef, the fringing reef being in most cases only a few yards from shore. The area from the reef to shore is of flat rock, comparatively smooth and with approximately six inches of water over it at low tide. Except for an occasional small white branching coral three or four inches high, the entire surface of the reef could be used for seining and is very well suited to throw-netting. An examination was made of this reef at night, at which time many large yellow sea cucumbers, from eight to fourteen inches long, and a few small black ones, four to six inches long, were observed. The quantity found, if present throughout the reef, is sufficient for limited production of trepang. The outer edge of the reef drops off sbruptly just beyond the surf. In this case the surf was too heavy for us to examine the fish population on the outside edge of the reef. On the occasion of our visit spiny lobsters (Panulirus sp.) were rare, only one being seen, although the natives report that many of them are found at times. We also saw quite a few surgeon fish (Hepatus sp.) mostly under six inches long. The fact that this section of the reef is opposite the native village of Souwou probably accounts for the small number of fish observed.