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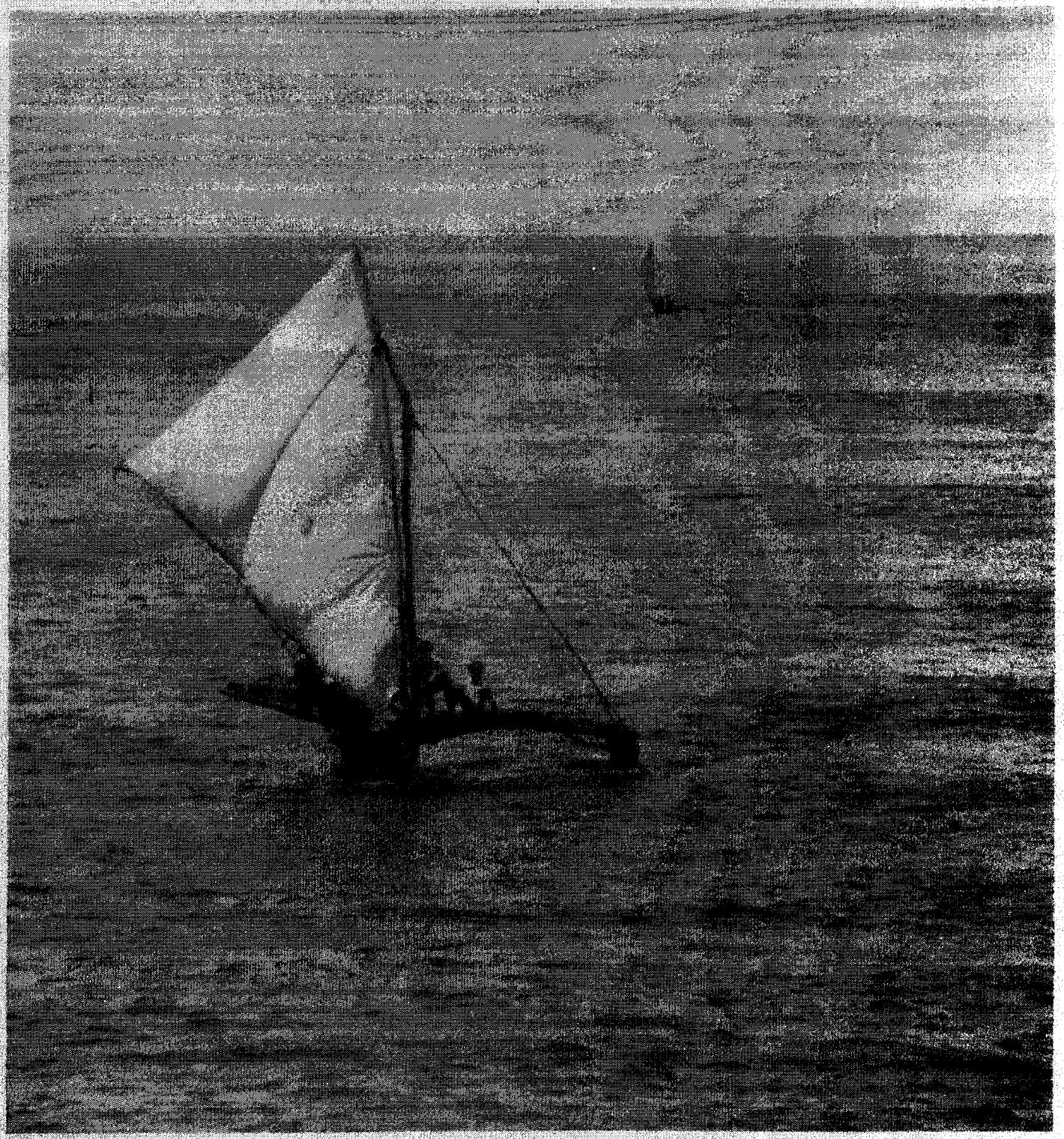

MICRONESIAN NAVIGATION, ISLAND EMPIRES AND TRADITIONAL CONCEPTS OF OWNERSHIP OF THE SEA

Pacific Islands

CONGRESS OF MICRONESIA

MICRONESIAN NAVIGATION, ISLAND EMPIRES AND TRADITIONAL CONCEPTS OF OWNERSHIP OF THE SEA

by

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Fifth Congress of Micronesia
Saipan, Mariana Islands

January 14, 1974

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CHAPTER I

INTRODUCTION

Near anarchy prevails on the high seas is about the only thing which the countries participating in the coming United Nations Law of the Sea Conference can readily agree upon. No generally accepted system of order exists. Each country is dealing with the sea in a way consistent with its perception of its own national interests. Developing coastal countries, lacking the technology to exploit distant seas, generally perceive their national interests to include merely reserving extensive control over their coastal waters in order to prevent misuse and exploitation of resources by the maritime powers. Most Latin American countries, for example, view an assertion of jurisdiction over a very broad area of their adjacent sea as a vital ingredient of national policy. Many island nations perceive asserting jurisdiction over all waters within straight baselines connecting their outermost islands as essential to preservation of their national identity. The interests of the maritime powers however, are much more complex. While they may wish to reserve certain rights in their own coastal waters, they also wish to exploit the coastal waters of other nations.

The United Nations Law of the Sea Conference is faced with a myriad of conflicting positions based on national interests. Those positions must be pared down into some workable scheme for management of the sea. In order to achieve agreement among the nations of the world, some interests must be sacrificed. In determining which must give way, no doubt those of powerful nations and blocks of nations will carry disproportionate weight. But it is hoped that the bargaining strength of the participants will not be the only

criterion for determining which concerns will be protected in a law of the sea treaty, and which discarded. It is hoped that the various interests will be evaluated on the basis of some objective standard and only the more worthy retained.

There are essentially three reasons why we feel that Micronesia should be permitted to assert extensive jurisdiction to all waters within straight baselines connecting her outermost islands. First of all, we feel that island nations should be entitled to the same sort of surface continuity which continental nations enjoy. Continental nations are viewed as one large community comprised of small communities of people linked together by history, ethnic background, economic and social ties, and political structure. Island nations are the same. They are simply communities joined by various forms of binding ties. The only difference is that water separates the clusters of people from each other instead of land. We agree that most of the earth's ocean area should be equitably shared by all nations. We do not agree however that the ocean area between islands of an island nation should be so apportioned. The territory of a nation should be the portion of the surface of the earth which it occupies, regardless of whether that surface area consists of sea or land.

Secondly, nations comprised if small islands should be, of anything, entitled to greater jurisdiction over the sea than continental nations. Small islands such as those found in Micronesia are virtually barren of land-based resources. Farm lands, forests, and mineral wealth are practically nonexistent. The only resources for small islands are found in the sea. Island nations should not be shortchanged in the distribution of the earth's

resources simply because of an accident of geography. If island nations are required to share the resources of the sea between their islands then continental nations should share their land-based resources. Alternatively, if continental nations are permitted exclusive jurisdiction over their land-based resources then fairness dictates that island nations be granted exclusive jurisdiction over the resources of the sea between their islands. The ratio of land to water in island nations comprised of small islands is usually quite great. Opponents of granting jurisdiction to broad areas of the sea to island nations argue that those with a small land area should be granted jurisdiction over a proportionately small sea area. We however, feel that fairness requires the opposite. Precisely because small islands have been denied land-based resources they deserve greater rights to the resources of the sea.

The other reason we believe that Micronesia should be permitted to exercise jurisdiction over the sea between the islands is based upon the way Micronesians relate to their sea. Micronesians feel toward their sea the way inhabitants of continental nations feel toward their land. Micronesians own the sea. They own it because they live in it. They own it because until this century they have been the only people to use it for purposes other than transit. They own it because they have sailed it for thousands of years. They own it because they learned how to tame it and cope with its awesome power before anyone else did. They own it because they are totally dependent upon it for survival - both the subsistence form of survival of days past and the more materialistic form of the uncertain future. They own it because over the centuries they have devised a system for defining and allocating rights in the sea and for passing those rights on from one generation to the next.

This paper considers the relationship of Micronesians to their sea in three respects: (1) Navigation, (2) traditional island empires in Micronesia, and (3) traditional concepts of ownership of the sea. The first part of the paper deals with navigation. Substantial detail about navigation is included in an attempt to convince the reader that the skill and technology existed in prehistoric times to permit extensive inter-island contact. The second part of the paper is a discussion of political entities and empires in existence prior to the arrival of Europeans. It is included to correct what we feel is a distorted view of traditional political unity in Micronesia. Many people think of Micronesia as having been a very fragmented area united for the first time during colonization by Europeans. Our oral histories however, indicate that large empires of varying dimensions grew and receded in a sort of ebb and flow of political influence over the centuries. The third part of the paper discusses traditional Micronesian ideas of ownership of the sea.

CHAPTER II

MICRONESIAN NAVIGATION

> "Yet before long they will leave again on another trip, and another and another. Puluwat is a good island. It is a good place to be born, to grow strong, and even to die. Yet to discover its essence one cannot look only to the land. The land is only the backdrop and the place of preparation. Without its sailing canoes and seafaring men Puluwat would have no past and no future. So with every voyage, and only through each voyage, its worth is renewed and its destiny fulfilled." (Gladwin, T. 1970:64)[1]

> "All over Oceania a wandering spirit persists to this day. The approach to voyaging of Rafe and other present-day Tikopians, of Tevake, Hipour, and Iotiebata, shows that confidence at sea has in no way abated. There is no element of 'conquering' the ocean in their attitude. Untold generations have studied the sea's moods, so that the navigators' knowledge, even when residual, has made it for them a familiar and friendly place. They are as much at ease and at home with the aquatic environment as the Australian Aboriginal is with his inland ecosystem." (Lewis, D. 1972: 277)

To understand Micronesia, and particularly to understand the relationship of its inhabitants to the sea, one must understand a little of its navigation. For unless it is realized that travel between distant islands was common, safe, and relatively easy centuries before the arrival of Westerners, talk of cultural cohesiveness, political unions among islands, and concepts of ownership of the sea seem like fairy tales--the product of vivid imaginations.

Information about Micronesian navigation was gathered from essentially two sources: Published material,[2] and interviews with persons knowledgeable in the art of navigation.

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1. Excerpts from East is a Big Bird by Thomas Gladwin, Cambridge, Mass.: Harvard University Press, c. 1970 by the President and Fellows of Harvard College, reprinted by permission of the author and publisher.

2 Alkire, W. H. 1965; Alkire, W. H. 1970; Davenport, W. 1960; Gladwin, T. 1970; Goodenough, W. H. 1953; Hall, H. U. 1919; Laubenfels, M. W. de 1950; Lewis, D. 1971; Lewis, D. 1972; Riesenberg, S. H. 1972; Sharp, A. 1957; Sharp, A. 1964.

A review of the published materials available to us yielded two books which contain accurate detailed descriptions of the voyaging traditions of Oceania and of the methods of navigation. The first, which was relied upon most heavily is Thomas Gladwin's East is a Big Bird. It is a facinating detailed description of how Central Carolinians voyage from island to island often hundreds of miles distant, safely and with comparative ease. The second, entitled We, the Navigators, by David Lewis, is a review of the navigational traditions of the entire Pacific region with emphasis on Micronesia. Information gathered from published materials was verified and supplemented by personal interviews with approximately 100 informants including the navigator, Ikuliman, whom Gladwin describes simply as "the greatest living navigator and canoe-builder," (Gladwin, T. 1970: 21) and Tawaru, a navigation instructor on Ulul in the Namonuito Atoll of Truk District.

There are a number of distinct navigation traditions in Micronesia. Most of the published materials including the books by Gladwin and Lewis describe the system in use in the Central Caroline Islands and therefore unless otherwise specified the descriptions of methods of navigation in this paper will be in reference to the Central Carolinian system. In many respects this is a good choice. A single cultural group, which we are calling Central Carolinian, occupies all of Truk District, the outer islands of Yap District, the islands in Palau District south of Angaur and parts of the Mariana Islands District. The navigation system described in this paper is used throughout this area with some local variation. In addition to being very widely used, the Central Carolinian system seems to be representative of other Micronesian systems of navigation judging from the fragmentary information of those systems obtained in preparation of this paper.

Canoes

An understanding of the technology of navigation logically begins with the canoe, for it is the sailing canoe in combination with the skill of the navigator which permits seafaring Micronesians to roam the Pacific freely. To begin with, the term "canoe" is misleading, if one envisions a tiny, fragile craft. Seagoing, sailing canoes are tough and versatile, fully capable of absorbing the pounding of a storm at sea. Hulls are constructed of several pieces of timber, commonly breadfruit wood, lashed together with rope made of coconut fiber, and the seams plugged with coconut husk shavings and filled with caulking usually made of sap from the breadfruit tree. The single outrigger consists of large timbers lashed across and perpendicular to the hull on the end of which is a wooden float running parallel to the hull. Contemporary Micronesian sailing canoes range from 25 to 50 feet in length. In centuries past, the goliaths of the Micronesian craft were the Marshallese canoes, some more than a hundred feet in length and carrying 40 to 50 people. (Lewis, D. 1972: 277) And canoes of nearly that size are said to have been used in Palau District during the early part of this century. Lewis reports that the largest of the Carolinian canoes were approximately 65 feet in length and held 20 to 25 people. (Lewis, D. 1972: 274) Our informants however said that paddling canoes holding 40 to 50 people were used in the Truk Lagoon and sailing canoes of a similar size in the Mortlock Islands.

Sailing canoes are extremely versatile. For example, in contrast to Western sailboats, virtually all rigging on sailing canoes is adjustable, increasing the flexibility of the vessel and permitting full sail under conditions where it would otherwise not be possible. (Gladwin, T. 1970: 92)

The adjustments in rigging for tacking also demonstrate the versatility of the craft. The outrigger of a sailing canoe always faces the windward side and acts as a counterweight to the force of the wind on the sail. As a consequence, tacking must be done so that the outrigger again faces the windward side after the canoe has changed direction. This is done by physically moving the entire rigging including the sail from one end of the canoe to the other so that what was previously the bow becomes the stern. The rigging is so well designed that this entire process can be completed in about one minute. (Gladwin, T. 1970: 103)

Average speeds of Micronesian sailing canoes are unknown. The only published information available applies to Carolinian canoes averaging about 26 feet in length. These canoes are rigged with a very small sail, apparently to assure that they do not reach speeds which would subject them to hazardous stress beyond the limits for which they are designed. Tests by Gladwin on such canoes in a light but steady wind resulted in an average speed of about 6 knots. Other tests were run with the canoe at various angles to the wind and speeds ranging from 5.2 knots were recorded. In addition, the average speed was calculated on two inter-island trips of 40 to 100 miles respectively, which were made ordinary conditions including normal delays and diversions. On these trips the average speed was 4.5 knots. (Gladwin, T. 1970: 90) The fastest measured speed reported to us by our informants came from the Mortlock Islands. On a timed trip in 1967 between Moch and Satawan using a canoe 40 feet in length with 70 square feet of sail, a speed of 13 knots was recorded.

It is impossible to estimate the number of canoes still in use in Micronesia. Again the only published information available comes from Gladwin. In the spring of 1967, when he did field work on Puluwat Atoll in the Central Carolines, there were 61 paddling canoes, 14 combination paddling-sailing canoes, and 19 large sailing canoes. (Gladwin, T. 1970: 67-70) The total carrying capacity of the canoes then on Puluwat exceeded its population of about 400 persons. (Gladwin, T. 1970: 65) Though Puluwat has retained its seafaring and canoe building traditions to a greater extent than many other islands, it is by no means unique. Canoes are still used on most islands in Micronesia and on many islands they are still the principal means of transportation.

Range of Travel

Throughout Micronesia we requested information about the range of travel of Micronesians in prehistoric times. From interviews we gained a picture of the Micronesian universe--that is, the area of the Pacific known to Micronesians collectively before the arrival of Europeans. Of course fiction is often difficult to separate from fact. Interspersed with descriptions of places to which Micronesians actually sailed are legends of travel to mythical islands and information of distant lands obtained from foreigners, including early European adventurers. In order to determine the actual range of travel we were quite conservative and selective in evaluating the reliability of data among Micronesian islanders.

In gathering information for this paper, it quickly became apparent that the extent of travel of the people of an island is closely related to the island's size and other physical characteristics. Inhabitants of high islands traveled much less extensively, and after the arrival of Europeans, more readily abandoned their sailing skills than did low islanders. The reasons for this are obvious. High islands have greater land area, a larger population, greater supplies of food, better protection against natural disasters and invasion, and their inhabitants have less need to travel for trade and social intercourse than do low islanders. Long distance travel and sailing skills are thus much less of a necessity for survival on high islands.

The Marshallese in prehistoric times travelled east to the Hawaiian Islands south to the Gilbert Islands, west to at least Ponape, and north to the Marshallese island of Wake. The people of Ponape District traveled among the

islands within their district, and to the nearby Marshallese Island to the east and the Truk Lagoon to the west.

Central Carolinians ranged all over the central and western Pacific. To the east they traveled at least as far as Johnston Island which they called "Ochonetip" and possibly as far as Hawaii. To the south they traveled to the atoll of Kapingamarangi, to New Guinea, and in addition probably to Samoa. The Central Carolinians regularly traveled west to the Philippines on both accidental and intentional voyages and to the north at least as far as the northernmost island of the Mariana Islands.

Inhabitants of the Palau Island complex apparently traveled only as far as Yap island to the north and New Guinea to the south. And the people of the Yap Island complex traveled at least as far as the Marshall Islands to the east, the Philippines to the west, and New Guinea to the south. Trips were made north to the Mariana Islands and there is some indication that unintentional round trip voyages to Okinawa and Japan were made by the Yapese prior to the arrival of the Spanish and at least one such voyage is known to have occurred during the German administration of the islands.

Thus the prehistoric known collectively to Micronesians universe was bounded by the Hawaiian Islands to the east, Wake Island and possibly Okinawa or Japan to the north, the Philippines to the west, and New Guinea, Samoa and the Gilbert Islands to the south.[3]

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3. Information given us by informants is partially corroborated by information contained in reports of the early explorers, missionaries, and colonizers. To cite but a few, Sherman Pompey, David Lewis, and E Cockrum citing other sources report: Micronesians voyaged to the

Philippines, Mariana Islands, and the Dismark Archipelago near New Guinea (Pompey S.L. 1971: 71); Carolinian contact with the Mariana Islands was temporarily stopped in 1668 with the Spanish conquest and not reinstated until 1788 by a Carolinian by the name of Luyto from Lamotrek in what is now Yap district (Pompey S.L. 1971: 73); people from Puluwat made voyages to the Marshall Islands, Faraulep, Woleai, Yap, and the Mariana Islands (Pompey S.L. 1971: 13); trade existed between Lamotrek, Satawal, Pulusuk, Puluwat, Truk, Ifalik, Woleai, and Faraulep; and Lamotrek chants refer to travel to Ponape and the Ralik chain in the Marshalls (Pompey S.L. 1971: 15); Woleai people traded regularly with Guam and visited Truk, Nukuoro, and Lukunor (Pompey S.L. 1971: 15); Faraulep had extensive trade with Sonsorol, Pul, Merir, Palau, Yap, Mokil, Kusaie, the Ratik chain of the Marshall Islands, Guam, and Saipan (Pompey S.L. 1971: 16); Ulithians frequently traveled to Guam (Pompey S.L. 1971: 17); a Puluwat canoe was in Truk in 1915 at a time when the German governor needed to communicate with Ponape and so the canoe carried the message to Ponape 300 miles to the east and returned with the reply in a matter of days (Lewis D. 1972: 53,54); the 465 mile journey from Pulusuk to isolated Kapingamarangi was frequently sailed (Lewis D. 1972: 59); a large canoe carrying 24 men and women traveled from Faraulep to Guam in 1721 (Lewis D. 1972: 273); accidental round trip voyages from the vicinity of Yap to the Philippines were a common occurrence, some people having made the trip five times or more (Lewis D. 1972: 286); after the advent of the Spanish administration in the Philippines, there were a large number of recorded voyages of Carolinians to the Philippines and returning to their home islands in 1696, two such canoes arrived in Mindenao with an offer to initiate regular trading contact with the Spanish. (Cockrum E.E. 1970: 14).

Frequency of Travel

The frequency of travel between islands in days past is impossible to determine now. However, a glimpse at one island which still maintains its seafaring tradition may be helpful. Gladwin reported that on Puluwat during the 16 months from January, 1966, through April, 1967, the 15 largest sailing canoes made a total of 73 trips to other islands for an average of about five per canoe, each lasting two weeks or more. Twelve of those trips were to Satawal, a distance of 130 miles; five to Truk, a distance of 150 miles; 22 were to Pikelot, a distance of 100 miles; 14 to Ulul, a distance of 80 miles. In addition, every week or two a canoe sailed to nearby Pulap and Tamatam and trips to Pulusuk were very common. (Gladwin T. 1970: 39)

There is no doubt that Micronesians' navigational skills and voyaging traditions have suffered a decline in this century. The number of canoes has declined as has their size. There are now fewer navigators than in the past and the need to travel by canoe has lessened. In addition, the population of Micronesia has drastically declined since the arrival of Westerners and their diseases.. And yet, one small atoll with a population of under 400 persons which has the benefit of regular service by field trip ships generated 73 major voyages by sailing canoe in little more than a year. In earlier centuries when the population was larger and entirely dependent on canoe travel, the amount of inter-island travel must have been truly staggering.

General Description

As Gladwin pointed out in discussing Puluwat navigation (Gladwin T. 1970: 144), the various navigational systems used in Micronesia are essentially dead reckoning systems requiring knowledge of direction and distance traveled to ascertain position. Direction is determined by the use of the sun, moon, stars, known constant swell and wave patterns, currents, and trade winds. Distance traveled is estimated by the navigator through knowledge of the capability of his canoe, wind speed, currents, and the degree of turbulence of the sea.

There are three fairly distinct phases involved in reaching a landfall using a dead reckoning system. The first involves setting a course which is anticipated to reach the destination given the known characteristics of the sea between the point of departure and the point of arrival. The second is maintaining the course and a continous estimate of position. The third is to locate the island once the canoe has arrived in the general vicinity. (Gladwin T. 1970: 147)

Course settings to various islands are thought of and spoken of in terms of the stars, sun, and moon. And yet, most voyages begin at midday when the sun is at its zenith and the moon and stars are not visible. Initial headings are thus generally set in reference to fixed points on the island of departure. By prior experience and training, the navigator will know the general direction of his intended travel and once at sea will verify the accuracy of his heading by backsighting and lining up certain permanent features of the island of departure. (Gladwin T. 1970: 165)

Maintenance of a course is done by use of the stars and moon at night, the sun during the early morning and late afternoon, and also by reference to certain features of the sea. For example, in various parts of the ocean there are constant swells which always travel in a certain direction and which can be used to maintain and confirm the accuracy of a course.

Finally, Micronesian navigators have developed various methods to locate an island once the canoe has reached the general vicinity. Actually sighting the island is the final step in this process, but techniques are also available for finding an island beyond the range of sight. These techniques involve knowledge of birds flying out from land, various currents, wave patterns caused by disturbance of the motion of the sea by the protusion of the island, nearby submerged reefs which may point the way to the island, and the use of a zigzag pattern of sailing to assure that the island is not inadvertently passed.

The remainder of this chapter will involve a more thorough discussion of the various elements of navigation involved in each of the phases of the dead recknoning system.

Star Navigation

Stars are used throughout Micronesia as the primary navigational tool for establishing and maintaining a course. (Lewis D. 1972: 194) The various navigational traditions within Micronesia each had its own system for using stars. Here we will discuss only the Central Carolinian star system, as described by Gladwin (Gladwin T. 1970: 147-154) and varified by various navigators including Ikeuluman and Tawaru.

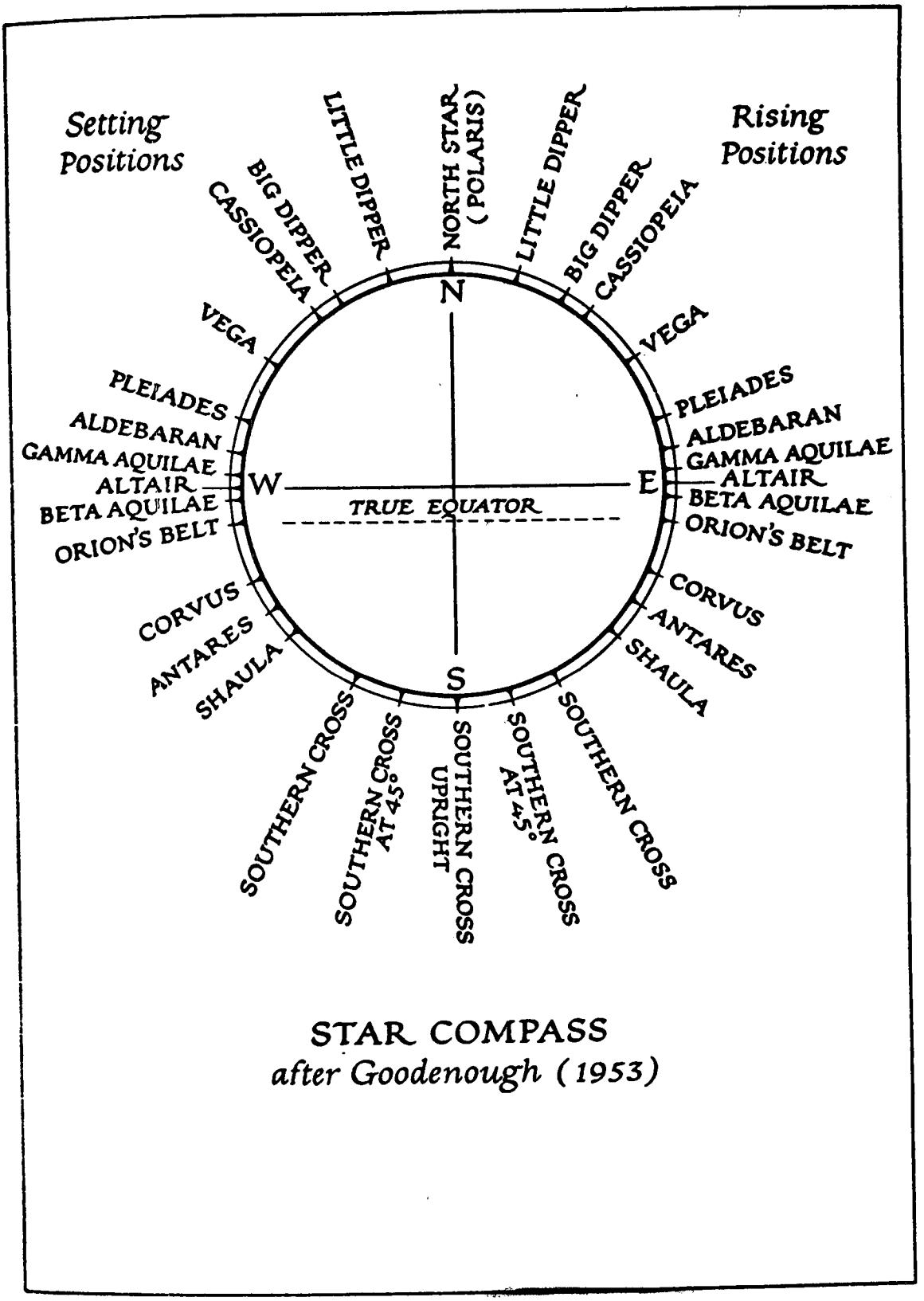
Stars rise in the east and set in the west. At or near the equator stars appear to rise vertically in the sky, travel in a straight line parallel to the equator across the sky, and set the same number of degrees above or below the equator, as they arose. This characteristic appearance of vertical ascent and descent of stars is relied upon by Carolinian navigators in formulation of their system of navigation by stars.

The cardial star in the Puluwat version of the system is Altair, the "Big Bird." Altair rises in the east and sets in the west, in each case about seven degrees north of the equator. The path of Altair forms an axis roughly through the Truk lagoon, Puluwat, Satawal, Lamotrek, Elato, Ifalik, and Woleai. Altair forms the east-west axis in what Central Carolinian navigators conceive of as a huge stellar compass. The north-south axis is an imaginary line connecting Polaris (the North Star) and the Southern Cross. Each quadrant has eight points of directions defined by primary stars and thus the whole compass has a total of thirty-two points, coincidentally the same number of points as on a traditional mariner's compass. The star compass is roughly symmetrical so that any given point in a quadrant has an opposite point 180 degrees away in the opposite quadrant. This characteristic

facilitates describing and memorizing courses to and from islands in terms of an imaginary straight line connecting two points on the compass and intersecting the two islands.

The points on the eastern half of the compass are the points where particular stars rise and the points on the western half are the points where those same stars set. The rising and setting of the primary stars on the compass form a path across the heavens. Other stars are known to follow that same path. For example, the east-west axis of the star compass is the path of Altair. Procyon and Bellatrix are two other stars which are known by navigators to follow that same path. Thus when the primary star is out of position for a bearing one of the other stars which follows the same path may be in position, and can be used to establish the bearing, as if it were the primary star.

Although the points on the compass are symmetrical, they are not evenly spaced. On either side of the east-west axis are a number of stars clustered very closely together. Stars on either side of the north-south axis are spaced much farther apart. Thus when traveling in an easterly or westerly direction, the system is very discriminative; that is, a change in heading to the next star to the north or south involves a very small change in direction. Conversely, when traveling in a northerly or southerly direction, a change in heading to the next star results in a substantial change in direction. This characteristic is practical in that the range of navigation of the Carolinians is a narrow band of sea strung out in an east-west direction. Except for voyages to the Marianas, most long runs are in an easterly or westerly direction. It is only logical that the finer discriminations in the system would be made in the directions most commonly traveled.



STAR COMPASS

after Goodenough (1953)

Etak

As mentioned earlier, a navigator, through his training and experience, acquires a highly developed sense of distance traveled. There is no mystery in this. The navigator simply becomes extremely sensitive to wind speed, currents, waves, and the multitude of other variables which affect the speed of a canoe and through these acute observations is able to judge speed and distance traveled with a high degree of accuracy.

"Etak" is the unit of measurement by which a navigator conceptualizes and verbalizes distance traveled. [4] Etak is a conceptual tool rather than a fixed unit of measurement. The number of etak between any two islands is determined by using a reference island. The seaway between each pair of islands has one or more commonly used reference islands. The different schools of navigation may use different reference islands and on a particular journey more than one reference island may be used by a navigator. The reference island is ideally located at the midway point of the journey and off to one side or the other about 50 miles. Of course, geography is such that not every seaway has an ideally situated etak reference island, in which case an island which most closely approximates the ideal is used.

The navigator will know what star the reference island lies under from both the island of departure and the island of destination. Visualize a long pointer swiveling on the reference island with one end attached to a canoe. At the beginning of the journey, the pointer would be aimed toward the star under which the reference island lay at the island of departure. As the canoe proceeds

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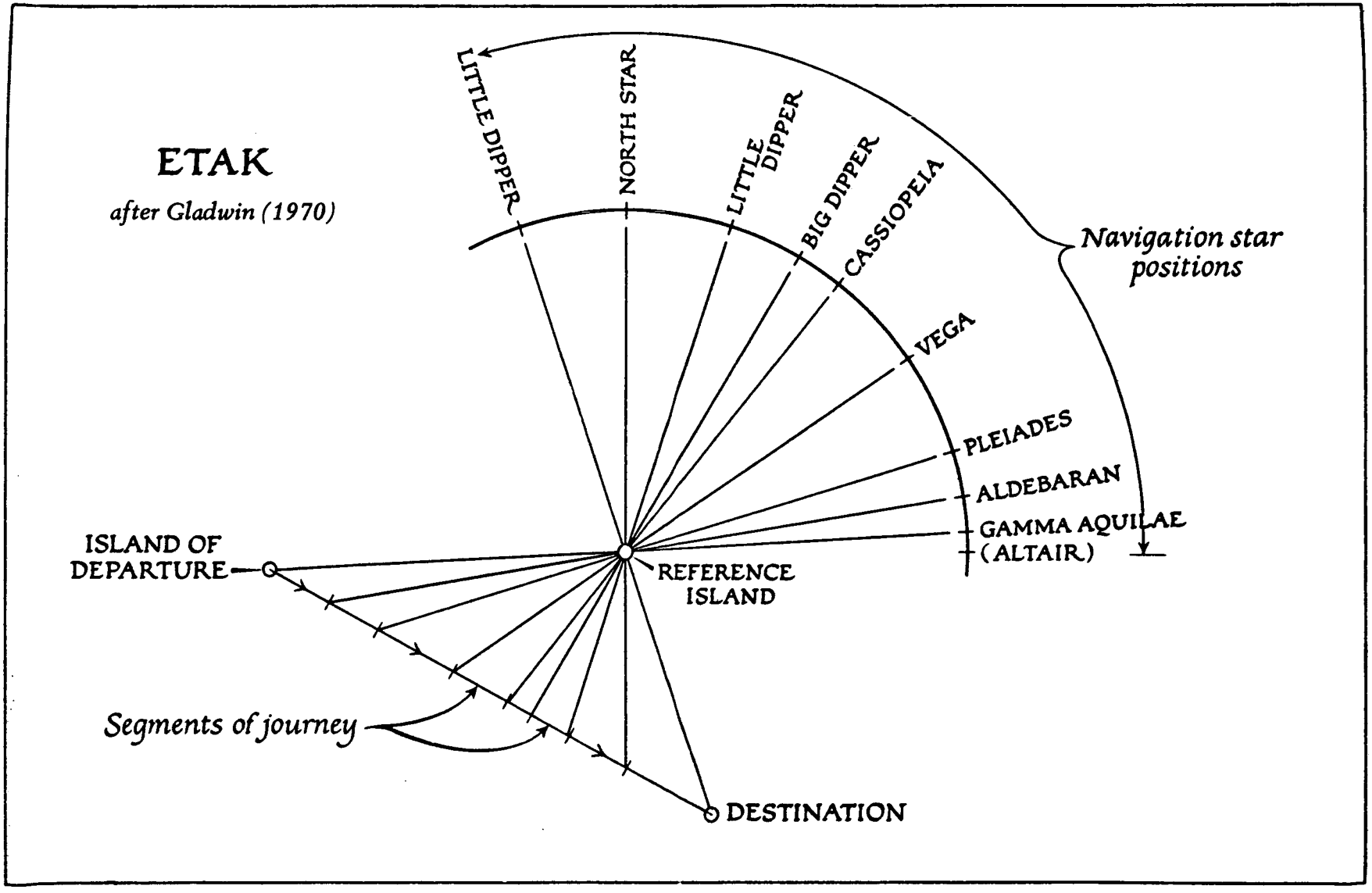
4. For a more complete discussion of "etak" see Gladwin, T. 1970: 182-189, which in conjunction with interviews with navigators was used as the basis for this section.


ETAK
after Gladwin (1970)
LITTLE DIPPER
NORTH STAR
LITTLE DIPPER
BIG DIPPER
CASSIOPEIA
VEGA
PLEIADES
ALDEBARAN
GAMMA AQUILAE
(ALTAIR)
Navigation star positions
ISLAND OF DEPARTURE
REFERENCE ISLAND
Segments of journey
DESTINATION

toward its goal the pointer would move from compass star to compass star so that at the termination of the journey the pointer would be aimed toward the star under which the reference island lay at the island of destination.

Even though it is never visible, the reference island can always be located mentally by the navigator through his highly developed ability to estimate distance traveled. Each time his mental image of the location of the reference island passes under a new compass star, another segment of the journey, called etak, is completed. The length of an etak varies in absolute terms depending upon the location of the reference island and upon the distribution of points on the star compass.[5]

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5. Carolinian navigators do not think in terms of pointers nor even in terms of moving canoes and stationary islands. Gladwin describes their thought process as follows:

"Picture yourself on a Puluwat canoe at night. The weather is clear, the stars are out, but no land is in sight. The canoe is a familiar little world. Men sit about, talk, perhaps move around a little within their microcosm. On either side of the canoe water streams past, a line of turbulence and bubbles merging into a wake and disappearing in the darkness. Overhead there are stars, immovable, immutable. They swing in their paths across and out of the sky but invariably come up again in the same places. You may travel for days on the canoe but the stars will not go away or change their positions aside from their nightly trajectories from horizon to horizon. Hours go by, miles of water have flowed past. Yet the canoe is still underneath and the stars are still above. Back along the wake, however, the island you left falls farther and farther behind, while the one toward which you are heading is hopefully drawing closer. You can see neither of them, but you know this is happening. You know too that there are islands on either side of you, some near, some far, some ahead, some behind. Everything passes by the little canoe--everything except the stars by night and the sun in the day.

"We can call this a figure of literary style, a canoe pictured pushing through the sea with everything moving past it except the stars poised overhead. For the Puluwat navigator it is not a matter of style. It is a convenient way to organize the information he has available in order to make his navigational judgments readily and without confusion. This picture he uses of the world around him is real and complete. All the islands which he knows are in it, and all the stars, especially the navigation stars and the places of their rising and setting. Because the latter are fixed, in his picture the islands move past the star positions, under them and backward relative to the canoe as it sails along. The navigator cannot see the islands but he has learned where they are and how to keep their locations and relations in his mind. Ask him where an island is and he will point to it at once, probably with considerable accuracy.

"It should be added, however, that the canoe is not at all times conceived as fixed while all else moves by... As long as the canoe is on course heading along the seaways toward its destination it is conceptually immobile. However, if it moves off course to one side, as in a storm or to chase a school of fish, the canoe is seen to move and the movement of the islands ceases--or more properly becomes temporarily irrelevant. Once the fish have been caught or the storm is over the navigator searches out his course and heads off again toward his destination. As soon as he gets under way on a proper heading the picture begins to move again, and the islands once again slide by under the stars in the unchanging heavens."
(Gladwin T. 1970: 182:183)

Navigating while Tacking

So far we have discussed navigating under circumstances where the canoe could be sailed downwind straight toward its target. Different problems of navigation are encountered when the destination lies upwind from the point of departure. To cope with these problems Micronesian sailors, many centuries ago, mastered techniques of navigating while tacking. Tacking upwind is simply sailing a zigzag pattern as far into the wind as possible.[6] The trade winds blow from east to west in Micronesia. If a navigator desires to travel so as to reach an island east of his islands of departure, he must zigzag to the northeast and southeast. The problem is to maintain his course to the east while making the long zigzags.

The method used by Central Carolinians to navigate while sailing directly upwind involves the use of the star compass. Imagine the island of destination being due east of the island of departure under the star Altair. The third star to the south is Corvus and the third star to the north is Pleiades. Visualize two gigantic pointers:

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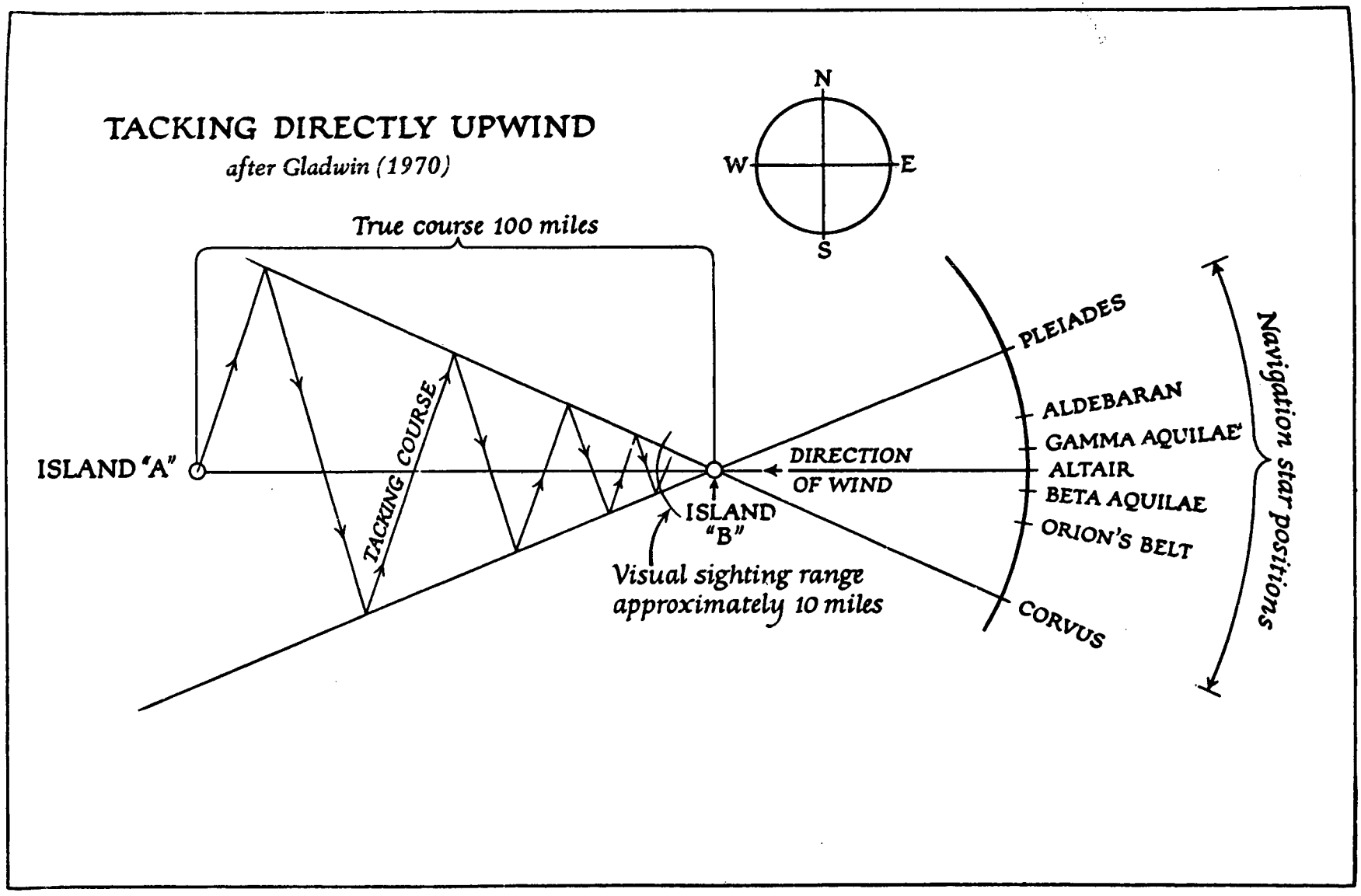
6. For a more complete discussion of tacking upwind, see Gladwin, T. 1970: 189-192, which in conjunction with interviews with navigator was used as the basis for this section.

One running in a northwest-southeast direction beginning at Corvus, intersecting the island of destination and extending north of, and past the island of departure; the other running in a southwest-northeast direction beginning at Pleiades, intersecting the island of destination and extending south of, and past the island of departure. The two pointers would form a huge "X" with the island of destination at the vertex and the eastern tips of the "X" pointing toward the two stars; Corvus to the south and Pleiades to the north. The island of departure would be located somewhere halfway between the tips of the "X" pointing toward the west.

To maintain a course due east, the canoe would leave the island of departure and sail as hard into the wind as possible to the north until it reached the pointer aimed in a southeasterly direction toward the star Corvus. A determination as to when the canoe reached the pointer would be made by the navigator based on the mentally conceived changing relationship of the canoe and the island of destination. The navigator would visualize the island moving under the stars from Altair to Beta Aquilae to Orion's Belt, and finally to Corvus. When the navigator determined that Corvus had been reached--in our example when the canoe had reached the pointer aimed at Corvus--the navigator would reverse direction, sailing as hard into the wind to the southeast as possible. When the canoe reached the pointer aimed in a northeasterly direction toward Pleiades, the navigator would again change direction. This process would be repeated until the island of destination had been sighted.

Following this method, the length of each tack becomes progressively shorter as the canoe approaches the island of destination. At the end of the trip the canoe is making relatively short tight tacks. The chance for navigational error while tacking is great. However, the increased risk of navigational error is offset by the zigzag pattern. This pattern is in effect a search pattern permitting the navigator to achieve landfall even if there is substantial cumulative error in judging the length of the tacks. (Gladwin T. 1970: 195)


TACKING DIRECTLY UPWIND
after Gladwin (1970)
N
W
E
S
True course 100 miles
ISLAND "A"
TACKING COURSE
DIRECTION
OF WIND
ISLAND
"B"
Visual sighting range
approximately 10 miles
PLEIADES
ALDEBARAN
GAMMA AQUILAE
ALTAIR
BETA AQUILAE
ORION'S BELT
CORVUS
Navigation star positions

Lateral Drift and Coping with Storms

As we have mentioned before, dead reckoning requires knowledge of direction and distance traveled to determine position. We also noted that navigators acquire a very acute sense of distance traveled by becoming hypersensitive to the many forces propelling the canoe through the sea. Many of those forces propel the vessel toward its goal. But some propel the canoe laterally, such as drift which results from winds and currents. In order to maintain the desired course, these variables must be accurately estimated and allowance made.

When navigators recite star courses between pairs of islands, they normally give the true bearing, yet often the true bearing is not used in navigation. The reason is that allowance must be made for currents. Navigators know the prevailing currents within the range of their canoes and will choose a bearing which will compensate for those currents. (Gladwin T. 1970: 161) In area where currents are variable, the navigator will normally backsight landmarks on the island of departure and thereby estimate drift caused by currents and compensate for it. (Lewis D. 1972: 108-109)

When the wind is before the beam a canoe will be propelled both forward and laterally. The motion is much like a car out of control on a slippery surface. The direction actually traveled is somewhat different from the direction in which the vehicle is pointed. Allowance must be made for this lateral drift if the canoe is to reach its desired destination. The degree of lateral wind drift is a product of the wind and is determined by, among other things, the characteristics of the canoe, angle into the wind which the vessel is sailing, and steepness of waves. (Lewis D. 1972: 116) A good

navigator is intimately familiar with the characteristics of his vessel, and can observe the other variables, and thereby estimate lateral wind drift quite accurately. In addition, the wake produced by the motion of the vessel through the water is a very accurate indicator of the degree of lateral drift. The wake will point in the direction the canoe is actually traveling rather than the direction the bow is pointing. (Lewis D. 1972: 116) Thus aiming a canoe so that is wake is aligned with the desired star course will automatically compensate for wind drift.

Violent storms are of course a particular hazard in dead reckoning navigation. They are not only an awesome threat to a small canoe, but can grossly affect a navigator's estimate of position. Strong winds and big waves move the canoe in ways which are difficult to judge at a time when stars normally not visible. And yet this problem can easily be overemphasized. High seas, storms, and rough weather are largely seasonal phenomena. The late fall and winter months bring rough seas and navigators do not sail during these months. Most sailing is done in spring and summer when seas are calm. In addition, Micronesian sailors have developed an elaborate system for weather forcasting making use of the stars, sun, clouds, and wind. Thus the primary method for coping with storms is simply to avoid sailing in rough weather.

Canoes are less vulnerable in a storm at sea than one migh think. The timbers of a canoe are bound together by coconut fiber rope. The seams are intentionally made somewhat loose to give them flexibility when subjected to extreme stress. Canoes are buoyant and will not sink and

virtually every part of the canoe is repairable at sea. Extra rope is carried on voyages and standardized techniques for improvising and repairing damaged parts of the canoe must be learned by apprentice navigators.

During a relatively mild storm the sail area can be reduced and the journey continued. In more severe weather, the sail and rigging can be lowered and lashed down. In such a case the navigator and crew would simply ride out the storm while attempting to maintain a rough estimate of position by observation of the wind and waves. During a really serious storm or typhoon, the sail and rigging would be lashed down and the canoe inverted. The crew would then ride out the storm either by clinging to the canoe with their heads above water or by crawling into the inverted vessel and breathing air in the air pocket of the hull.

In all but the most extreme weather, the navigator can maintain a rough estimate of his position by observation of the storm. After the storm is spent, if his position is in doubt he will attempt to locate familiar phenomena such as an island, submerged reef, or a sea mark to reorient himself.

Waves and Swells

Above, we spoke of waves and currents as a navigation problem. But to the extent which they form predictable and identifiable patterns, they can be an aid to navigation as well.

The Marshallese, long ago, became avid students of wave and swell patterns, eventually devising an ingenious system for navigating, by using them to point toward land. Waves, or more properly swells, move in four different directions in the Marshall Islands. The biggest and most noticeable swell moves from east to west and is called "rilib" in Marshallese. Opposing rilib is a swell called "raelib" which travels in the opposite direction, but which is much weaker. There is also a relatively weak swell which moves from north to south and another which moves from south to north. Rilib is a big powerful swell, largely unobstructed, rolling across the Pacific from the east. When it encounters an atoll in the Marshalls a number of noticeable changes occur. First there is a rebound effect. As the rolling sea collides with the immobile atoll, a counterswell is created which rolls back toward the east. This rebound effect can be felt for up to 50 miles east of the island. (Lewis D. 1972: 195) Also, the portions of rilib to the north and south of the land encountered bend and wrap around the atoll. At the same time raelib, the swell from the west, is hitting the opposite side of the atoll, also causing a rebound effect and also wrapping itself around the atoll.

A vessel sailing toward the west first notices the rebound of rilib. The navigator knows that land is near, but does not know whether he is to the north or south of it because the rebound swell is running parallel to

rilib. If the navigator continues sailing to the west, he will eventually encounter the lead edge of raelib which is called "jurrinokamie". The navigator may then simply turn in the direction indicated and sail parallel to jurrinokamie confident that he will soon see land.

The portions of rilib and raelib which do not actually encounter land, bend or refract around the atoll to form an "X" called "bot" to the north and south. The angle at which the two crosspieces of the bot intersect varies with the distance of that particular bot from the atoll. Thus the navigator can sail onto the bot and actually estimate the distance he is from land by the configuration of the bot. The navigator may then turn and follow a path of bot, called "ōkar," to the island. (Lewis D. 1972: 193-201)[7]

Carolinians and other Micronesian navigators use predictable swells in quite a different manner. Carolinians regard swell patterns as permanent characteristics of the sea. They identify three distinct swells. The most apparent is the big wave from the east under the star Altair. This is described as short, steep, and very distinct. Another strong swell comes from the northeast under the star Vega. It is a long swelling wave. The third is from the southeast under Antares and is very weak and often difficult to observe. (Lewis D. 1972: 90-92; Gladwin T. 1970: 170-171)

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7. A note on Marshallese teaching methods. Swell patterns are felt more than they are seen. To learn the swells, an apprentice navigator is taken out to sea and made to float in the water for long periods of time to learn the feel of the waves. (Kahn, E. J. 1965: 136) He learns to associate the feeling of the swells on his body with the feeling of the slap and roll of a canoe at sea and in time learns the navigational significance of those sensations.

Both the Marshallese and the Carolinians distinguish swells by their feel instead of their visual properties but the Carolinians use swells to steer a course while the Marshallese use them to locate land. Since the direction of the roll of a swell is constant and since swells occur with great frequency, they are an ideal tool for steering. Swells which are either perpendicular or parallel to the heading of the canoe are better for steering than are swells diagonal to the heading. If a canoe is sailing perpendicularly into a swell the bow rises, levels off, and then descends into the trough between the crests. The moment at which the crest of the swell has passed the center of gravity of the vessel is quite apparent, for that is when the canoe begins its plunge. If the canoe is at a slight angle to the swell, the outrigger float will either lead or follow the hull of the canoe across the crest causing a slight but easily discernible roll. A heading can therefore be maintained by aiming at the appropriate swell.

The same principles apply if the canoe is running parallel to the swell. Depending upon the direction of approach of the swell, either the hull or outrigger first rises as the swell begins its passage beneath the canoe. When the crest passes the center of gravity, the canoe descends into the trough. If the canoe is at a slight angle to the swell, a rolling affect will be noticeable. Thus, when the canoe is sailing either nearly perpendicular or nearly parallel to a swell, a navigator can maintain a very accurate heading without reference to celestial phenomena. However, when the canoe is heading at an obtuse angle into the swell, minute discriminations of direction become much harder to make and the method of steering is less accurate. (Gladwin T. 1970: 177-178)

Sea Marks

Most people conceive of the sea as an immense, featureless, inhospitable expanse of water. A Micronesian seaman views it quite differently. He views the sea in the Central and Western Pacific as a complex network of seaways connecting pairs of island dotted with unmistakable, permanent indicators of location which we are here calling seamarks.

The seabed around Micronesia contains a range of mountains rising thousands of feet toward the surface of the ocean, in appearance similar to mountain ranges on continental land masses absent the vegetation. The largest of these mountains pierce the surface of the sea to form the high islands in the Marianas, Yap, Palau, the Truk Lagoon, Ponape, and Kusaie. Those which reach within a few hundred feet of the surface are capable of sustaining coral growth. For some, the coral growth over the ages has penetrated the surface to form atolls and low islands. For others, the coral growth is entirely below the surface forming submerged reefs generally 10 to 20 fathoms (60 to 120 feet) in depth. (Gladwin T. 170: 162) A glimpse at a navigation chart of Micronesia will show that these submerged reefs are scattered in large numbers throughout this part of the Pacific. Many are shallow enough so that the coral is visible. Others, somewhat deeper, cause a distinct and beautiful change in the color of the water from deep blue to various shades of green. All, including those at fairly great depths, are readily seen and felt by the peculiar way in which their existence disturbs the otherwise patterned motion of the sea. Their permanence and visibility make them extremely useful as seamarks. Navigators know all of the reefs in this

region by name, location, and shape. A navigator who has become lost in a storm can quickly regain his course by spotting one of those reefs and sailing its edges long enough to determine its identity, and therefore, its location.

There are many other permanent features of the sea which have been identified by navigators. Some seem quite plausible to the untutored, others less so. All are taken quite seriously by navigators and are required learning for apprentices.

The motion of the sea involves an incredible expenditure of energy. Tides, and winds, and storms, and a multitude of other forces cause this motion, sometimes in harmony with other forces, sometimes in opposition. The result is extreme turbulence. Occasionally persistent currents and tradewinds and the geography of an area conspire to form an enduring unique pattern of turbulence (or absence of turbulence) which is easily identifiable and can be used as a seamark. For example, all across Micronesia navigators reported to us the existence of permanent whirlpools which tell the navigator his location. Also, force and counterforce sometimes work against each other to form a relatively calm area of sea where driftwood tends to collect. These places too are permanent,known, named, and indicate exact position. In addition, the turbulence of the sea sometimes causes very distinct waves to form and remain permanently in a general area. These too are used as seamarks.

Sea life is another kind of seamark. Navigators from various sailing traditions told us of named areas all over the Pacific where specific types of sea life or birds can consistently be found. Many of these are varieties of fish commonly found in lagoons rather than the deep ocean. Others are migratory sea life such as whales, sharks, and turtles. Gladwin (1970), Lewis

(1972), and Riesenberg (1972) among others, have reported the use of sea life as seamarks, though with some degree of skepticism as to their actual utility in navigation. In the Central Carolines the phenomenon is spoken of in terms of inventories of sea life which can be found on certain seaways between islands or under certain stars. For example, from Puluwat to the Truk Lagoon under Altair the inventory is: "A whirlpool over Uranie Bank; a white-tailed tropic bird, alone; a frigate bird, alone; another white-tailed tropic bird, also alone (but he has a different specific name in the sea life inventory); a large shark; a single white tern". (Gladwin T. 1970: 205)

Seamarks apparently serve to confirm a position calculated by other means and to reorient a navigator slightly or grossly off course. The existence of seamarks seems to give navigators unconditioned confidence in their navigation system for they know that even if they are completely disoriented because of a storm they can determine their position by the chance location of a familiar seamark. This confidence is fed by the immense number of seamarks know to navigators. To give an idea of the number and wide dispersal of seamarks, the following is a partial list of those reported to us by navigators in three of the districts. For the sake of brevity, submerged reefs are not included in this list.

Reported in the Marshall Islands:

1. Tokomule - driftwood - 150 miles south of Mili Atoll;

2. Limerwitip - distinctive turbulent area about 12 miles long - 200 miles east of Utirik Atoll;

3. Joiiaenkan - distinctive waves from the northeast - about 450 miles north of Eniwetok Atoll;

4. Lijinmaj, Jomaj and Lijinmaloklok - turtles - midway between Kusaie and Namorik Atoll;

5. Jirurulon - whale - 125 miles south of Ebon;

6. Aeboj - fresh water spring - 225 miles southwest of Ebon Atoll;

7. Jere Ak eo - frigate bird - 200 miles northwest of Bikini Atoll; and

8. Ak Leotutu - frigate bird - 325 miles northeast of Taongi Atoll.

Reported in Truk District:

1. Ekunungah - frigate bird - 300 miles south of Kapingamarangi Atoll;

2. Limiror - whirlpool - midway between Nukuoro Atoll and the Mortlock Islands;

3. Naukinom - particular type of fish - 125 miles north of the Hall Islands;

4. Aferochrock - black birds - 200 miles north of Namonuito Atoll;

5. Newounwa - calm area of sea where driftwood collects - 250 miles north of the Hall Islands;

6. Tipapa - some reported this seamark as the Los Jardines Islands, others as a stingray in mid ocean - about 875 miles north of Namonuito Atoll;

7. Tipipi - some reported this as an island about 100 miles southeast of the Los Jardines Islands, others reported it as an area where drift wood collects - about 750 miles north of Namonuito Atoll;

8. Etino - whale - about 150 miles northwest of Pikelot on seaway to Guam; and

9. Ikepuech - particular type of fish - about 300 miles northwest of Pikelot on seaway to Guam.

Reported in Yap District:

1. Ichol - particular type of fish - 400 miles west of Angaur Island;

2. Igbuech - particular type of fish - 400 miles west of Kayangel Island;

3. Wolcha - particular type of turtle - 275 miles west of Babelthuap;

4. Yomei - particular type of fish - 250 miles northwest of Kayangel Island;

5. Wolros - particular type of turtle - 150 miles west of Kayangel Island;

6. Buei - particular type of fish - 125 miles northwest of Kayangel Island;

7. Sugmog - particular type of bird - 90 miles southwest of Yap Island;

8. Lebuarug - particular type of bird - 50 miles southeast of Yap;

9. Mualfel - particular type of fish - 50 miles northeast of Yap;

10. Yugoiumar - particular type of fish - between Ulithi Atoll and Fais Island;

11. Matalfalhatol - particular type of bird - 100 miles southeast of Ulithi Atoll;

12. Urua - particular type of bird - 100 miles east of Ulithi;

13. Lisagor - particular type of bird - 150 miles southeast of Ulithi Atoll;

14. Sugyaf - particular type of bird - 200 miles southeast of Ulithi Atoll;

15. Ilessuyer - particular type of bird - 50 miles southwest of Faraulep Atoll;

16. Fariap - stingray - 50 miles north of Woleai Atoll;

17. Ruruyol - particular type of bird - 150 miles south of Guam;

18. Luyol - shark - 75 miles southeast of Gaferut Island;

19. Litataporou - particular type of bird - 200 miles southeast of Guam;

20. Liwawachollug - particular type of bird - 175 miles north of Satawal Island;

21. Liyelpiy - particular type of turtle - 75 miles southeast of Pulusuk;

22. Ilias - particular type of fish - 50 miles east of Puluwat;

23. Fuchimtiu - whirlpool - 100 miles east of Puluwat;

24. Lalpou - stingray - 125 miles southeast of Pulusuk;

25. Igfich - particular type of fish - 75 miles west of Pulusuk;

26. Falpugilyow - particular type of bird - 40 miles south of Faraulep Atoll;

27. Igble - particular type of fish - 75 miles south of Faraulep.

The seamarks recorded here are a small portion of those reported to us and but a tiny fraction of those known to navigators. The question of whether some of the apparently less plausible types of seamarks really exist must be left to others to resolve. All we can say is that the most experienced and skilled observers of this part of the Pacific Ocean, Micronesian navigators, take the existence of such phenomena completely seriously.

Expanded Target

The navigator must be certain he will reach his goal. Because of the many forces tending to draw the canoe off course, even the best navigators do not always achieve visual landfall using a star heading. Other methods must therefore be available to bring the vessel to within sight of land.

High islands are relatively easy to locate because they are visible at great distances from land. Ponape, for example, can be seen at a distance of about 60 miles on a clear day;[7] Kusaie at about 55 miles; Truk and Saipan, 45 miles; and Guam, about 40 miles. Thus when sailing to Ponape, the width of the target within which the navigator must reach to make a visual landfall is about 120 miles plus the width of the island. This provides a substantial margin of error.

But most islands in Micronesia are low islands, visible a meager ten to twelve miles out to sea. The effective visual target for a low island therefore is only 20 to 24 miles plus the width of the island. On a long trip even a slight miscalculation can result in a canoe missing a target that small.

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7. The formula for a visual landfall is: Square root of the height of the island plus the square root of the height of the observer multiplied times 1.5 equals the distance from the island in miles (Gatty, H. 1943: 82)

The habits of homing birds provide a greatly expanded target for low islands. Certain species of birds are land based and fly out in a straight line from their island at dawn and return directly to land at dusk to roost. (Lewis D. 1972: 163) The habit of direct flight to and from land at dawn and dusk is relied upon with complete confidence by navigators. Probably the most common such birds in Micronesia are the white terns and noddies, each of which can be found in numbers about 20-25 miles from land. Somewhat less common is the booby with normal range of between 30-50 miles. (Lewis D. 1972: 163) Small numbers of boobies range out even more than 50 miles from their island. On trips between the Central Carolines and Guam, Lewis, himself, spotted boobies about 60 miles from Guam and 70 miles from Gaferut, respectively. (Lewis D. 1972: 167) Boobies are particularly helpful to navigators because they have a habit of flying around a canoe at dusk drawing attention to themselves before beginning the return journey to their island. (Gladwin T. 1970: 197) Less common of the homing birds are the sooty tern and the very dramatic frigate bird. The sooty tern has about the same range and characteristics as the noddy and white tern. Frigates are homing birds and their range is greater than that of the other homing birds but they are not so useful in achieving landfall as other homing birds because they tend to roam about high in the sky and the direction of their flight is not necessarily an indication of the direction of land. Both Lewis and Gladwin give the normal range of frigate birds at 75 miles. (Lewis D. 1972: 168) (Gladwin T. 1970: 197) Lewis however reports seeing a frigate bird 150 miles from land (Lewis D. 1972: 171) and our informants gave 150 miles as the maximum range for the bird.

Navigators are normally very cautious when approaching an island. Great care must be taken to avoid overshooting their goal. If during the day birds are sighted but land is not yet visible, the navigator can judge his approximate distance from the island by the type and number of birds present. At dusk, if he has not yet spotted the island, he will carefully watch the direction of flight of the homing birds and sail in that direction for a short while and then lower his sail for the night. At dawn, if the island is still not visible, he will again carefully watch the line of flight of the homing birds and sail in that direction until the island comes into view.

The abundance, immense size and wide dispersal of submerged reefs make them extremely useful in expanding the target which the navigator must hit in order to reach his destination. Experienced navigators are very familiar with the shape and appearance of submerged reefs all across the expanse of sea which they sail. Submerged reefs are thus the equivalent of road signs, telling the navigator precisely where he is and unambiguously pointing the way to land. Where appropriately situated, submerged reefs also serve as backstops to inform the navigator when he has overshot his destination. (Gladwin T. 1970: 163)

Interruptions in normal swell patterns caused by an island or atoll are also used to expand the navigator's target. Skill in recognizing subtle changes in swells caused by their collision with land is more highly developed in the Marshall Islands then elsewhere in Micronesia. However, even Central Carolinians use this technique to some degree. For example,

the navigator Ikuliman told us that on his voyage from Puluwat to Guam in 1972 he became aware that Guam was near before it came into view by the feel of the waves. Since Guam is visible about 40 miles out to sea, Ikuliman's skill in recognizing disturbances of swell patterns caused by an island is quite highly developed.

So far, we have considered only the expanded target of a single island. But in actuality, the overlapping expanded targets of neighboring islands frequently combine to form a mammouth screen which even under the most unfortunate of circumstances could not be missed by an able navigator. One such area extends north and south from Magur to Pulusuk, a distance of 150 miles with only one relatively small gap. Another such area runs east and west from Gaferut to Pisaras, a distance of 300 miles. (Gladwin T. 1970: 199) Such screens serve as a safety factor assuring the navigator that the chance of becoming irretrievably lost is indeed remote.

Navigation Training

A navigator is one of the most respected and highly skilled members of the traditional Micronesian community. In part, this is because a very limited number of people have the ability and perseverance to complete navigation training. Because of its difficulty, Gladwin reports that few people engage in navigation training on Puluwat, and of those who do, less than half complete it. (Gladwin T. 1970: 128)

Much of the instruction occurs on land, often in the canoe houses where several apprentices may gather with a master navigator. Great volumes of information must be memorized. Star courses are the most fundamental element of the system. An apprentice must learn the star courses to and from every pair of islands which he might conceivably be called upon to navigate. This includes all combinations of islands between which voyages are ordinarily made and many which have not been made in a long, long time. As an indication of the number of combinations, the contemporary repertoire of voyages for Puluwat navigators includes 26 different islands and atolls. Theoretically at least, a navigator might be called upon to sail between any combination of these 26 islands and atolls. Also, navigators know sailing directions to such important islands as Kusaie, Ponape, Kapingamarangi, New Guinea, Palau, Guam, and Saipan even though these voyages are seldom, if ever, made.

In addition to star courses, navigators must know a great deal of other information about voyages between both frequently and infrequently traveled pairs of islands. Included here are sea marks, sea life inventories, currents, waves, swells, and information about passes

into the reefs of atolls, and the proper means of entry. Also, a great deal of basic general information about currents, swells, waves, weather forecasting, distance measurement, lateral drift, navigation while tacking at various angles, and navigating in storms must be learned. It is no wonder that few succeed at learning this great body of knowledge.

Chants

Navigation information must be retained by the navigator with complete accuracy for his life and the lives of his crew depend upon it. Since writing was unknown to Micronesians before the arrival of Westerners, other means had to be devised to record and pass on navigational and other important knowledge. In most of Micronesia, chants served this purpose. Through chants a great amount of knowledge could be compacted into a few words easily memorized because of their rhythmic and verse-like qualities.

Chants are an extremely good way to ensure that knowledge is passed on to succeeding generations with little or no distortion. One who hears and passes on a story or legend, transmits his recollection of the substance of the story or legend. One who hears and passes on a chant memorizes the specific words of the chant and is not likely to substitute other words, because substitutions would interrupt the rhythm.

Detailed navigational information is on the order of a trade or professional secret and accordingly it is very difficult to obtain. We tried a number of times to record a navigational chant to use as an example--to give an idea of the flavor and spirit of the navigation tradition. Each time we failed. Finally the navigator, Tawaru on Ulul consented to let us record part of a chant, though it is not a true navigation chant in that it does not contain detailed navigation information.

Not only was a chant of any sort difficult to obtain, but the problem of translation proved almost insurmountable. Many hours were spent in translating this short chant from the specialized language of navigators to

ordinary Trukese and then into crude English. Originally we had wanted to take the crude English version and have that converted into poetic English in such a way that the spirit of the English version would correspond to the spirit of the original version. However, our abilities were not equal to the task and so what follows is a literal translation of the chant.

CHANT OF OLAP

Ready is the voyage
of a new navigator
from the Sea of Unanu
to convey offerings and tribute
for our lives

And ready is he
Rongherik to sail
he examines the crew
a reckless man
a self-controlled man
a persevering diver
a man of many manual skills
a diviner
to sail to Tawairek [8]gap
and back
just to fetch a special fish trap [9]

8. The name of a channel at Ngatik Island.
9. A fish trap characteristic of Kusaie Island.

And once again
a fleet is launched
by Poluelap at Tawaruk[10]
to sail the sea of Fayu
he caresses his mast in prayer
and touches it with humility
in reverence he wraps it with leaves
and to the voyagers he commands
"blow the trumpet
and pray for a quick voyage
lest too soon we crave
the warmth of land"

Set the course to the star Uun[11]
so as to meet Peechau Paurech [12]
drinking the waters of Tawaut[13]
and, to the star Saropol[14]
to collect shells off the rock of Aittenimwar[15]

10. Channel at Unanu.
11. The star Aldebaron.
12. A shark used as a seamark.
13. Channel at East Fayu.
14. The star Corvus.
15. A large rock in Tawaut channel.

The islands of Weito[16]
are off the bow
but to the west
under the star Saropol
is the land of ghosts[17]
we are frightened
as we see the inhabitants of the land of ghosts
true to their reputation
even when swimming
dressed
prepared for war

And there is Melakule [18]
churning the water at the pass of Uluppi[19]
set a course straight to the north
and we will meet
the dolphin Uruha
and the whale Purusa
accompanying a school of skipjack

16. Namonuito Atoll.
17. Puluwat Atoll.
18. A fish used as a seamark.
19. Another name for Pulap.

Menina[20] is there
and Rota is here
we set our course to the north star
which will guide us to the pass
of Tawenior [21]
where we will lower our sail awhile
and drink the water of Lemosor[22]

We let islands pass
because we have seen
the great fish Pupulapalap
belonging to Rewon[23]
Its tail is Fais
Its head is Magur
its dorsal fin is Olimarao
the fish of Fayu

20. A place in the Philippines thought to be Manila.
21. Pass at Saipan.
22. A water hole on Saipan.
23. A general reference to the Mariana Islands and the sea northward.

We set our course to Tanup[24]
and following it we reach Wenimong[25]
we stare at the stars in the east
beckoning us home
yet to the west we know
calling us to adventure
is Ulithi Atoll
and still further west
the bay of Menina.

24. The Southern Cross constellation.

25. Lamotrek Atoll.

Conclusion

Though much navigation information has no doubt been lost through the decline of the art in recent years, sufficient knowledge of the systems remain to demonstrate their sophistication and success. Gladwin and Lewis, the two non-Micronesians who have studied Central Carolinian navigation in depth, attest to its quality. Lewis writes that "when the methods of indigenous navigation are tested at sea they are shown to be remarkably efficient and practical". (Lewis, D. 1972: 308) And in discussing a voyage between Saipan and the Central Carolines he notes that "the extraordinary precision of his landfall on Pikelot 450 miles south of Saipan...is a tribute not only to Hipour's proficiency but to the inherent validity of the system he was using (Lewis, D. 1972: 66) In assessing the Carolinian system, Gladwin states that "for a dead reckoning system of navigation it is very accurate. Most landfalls are made visually and the navigator expects to complete every voyage in this fashion unless a storm intervenes". (Gladwin T. 1970: 202)

The true test of the quality of the system rests in its ability to guide people to their desired location consistently, safely and with ease. Judged by those standards the Central Carolinian system seems highly successful Puluwat, a cluster of low islands inhabited by 400 persons, is the only place for which data is available. As mentioned earlier, Gladwin reported 73 major inter-island trips made by 15 canoes during a 16 month period in 1966 and 1967. The longest of those voyages was about 150 miles and the shortest about 15 miles. Each was made without mishap. In fact, on Puluwat no canoe voyage has resulted in death since 1945 when a canoe vanished at sea during a typhoon. (Gladwin T. 1970: 63) Assuming the number of voyages for the period during

which Gladwin collected information is about average, Puluwat navigators had made more than 1150 major inter-island canoe trips without a fatality between 1945 and 1967. From this we can conclude that short and medium range trips place no strain on the capabilities of the Carolinian system. But what of longer voyages?

Long distance voyages are no longer commonly made anywhere in Micronesia. Until a few years ago, it seemed that the ability to make long journeys by canoe might be completely lost through disuse. However, a resurgence now seems to be occurring sparked by pride in the tradition and fostered by competition among navigators. Apparently the first of these was inspired by David Lewis in preparation of his book We, the Navigators so often referred to in this paper. The voyage took place on a western style sailing vessel under the command of the navigator, Hipour from Puluwat. The journey was round trip from Puluwat to Saipan via Pikelot, a total distance of 1165 miles. Trips from the Central Carolines to the Marianas are particularly good examples of the validity of the system because they necessarily involve crossing a several hundred mile stretch of sea without an island or reef as a visual guide. This trip was made in 1969. The last time it had been made previously was apparently in 1905. Though Hipour, the navigator, had never made the trip, and though he was in command of a totally unfamiliar vessel, the voyage was made without difficulty. (Lewis D. 1972: 32)

Pride and competition are major elements of the navigation tradition. In 1970, the year following the Hipour and Lewis voyage, two navigator brothers on Satawal, named Repunglug and Repunglap, responded to the challenge

and made the roundtrip from Satawal to Saipan in a traditional 26-foot canoe. The brothers had been taught the navigation directions by their father thirty years earlier, though he, himself, had never made the trip. The trip was completed without mishap. (Lewis D. 1972: 279-280) In the early summer of 1973, another voyage was made from Satawal to Saipan and back, this time involving two canoes.

In May of 1972, the navigator Ikuliman made a 500 mile trip from Puluwat to Guam. While in Truk, we interviewed Ikuliman and another crew member about the details of the voyage. The seven day trip was made in a 27 or 28 foot Puluwat canoe with a crew of six in addition to the navigator. The first stage of the trip was to Pikelot, and from there to Guam, an interrupted distance of 400 miles. Provisions included some cooked food, preserved breadfruit, coconuts, and five gallons of water. The path or seaway followed is called "Metau Pengek." The two major seamarks were encountered as expected. The first, about one-third of the distance from Pikelot to Guam is called "Etino" and is a huge whale. The other seamark was also encountered where expected, about two-thirds of the distance between Pikelot and Guam. It is called "Ikepuech" and consists of a four-foot-long parrot fish.

Since Guam is a big island visible for about 40 miles out to sea on a clear day, there was no particular risk of missing the landfall. Ikuliman did tell us however that he became aware that they were near Guam before it came into view by the feel of the waves. From the feel of the waves he knew not only its presence, but also which direction to sail to reach the island. This particular trip had not been made in this century. Ikuliman acquired the

navigational information for the journey through chants memorized many years earlier, when he was a young man.

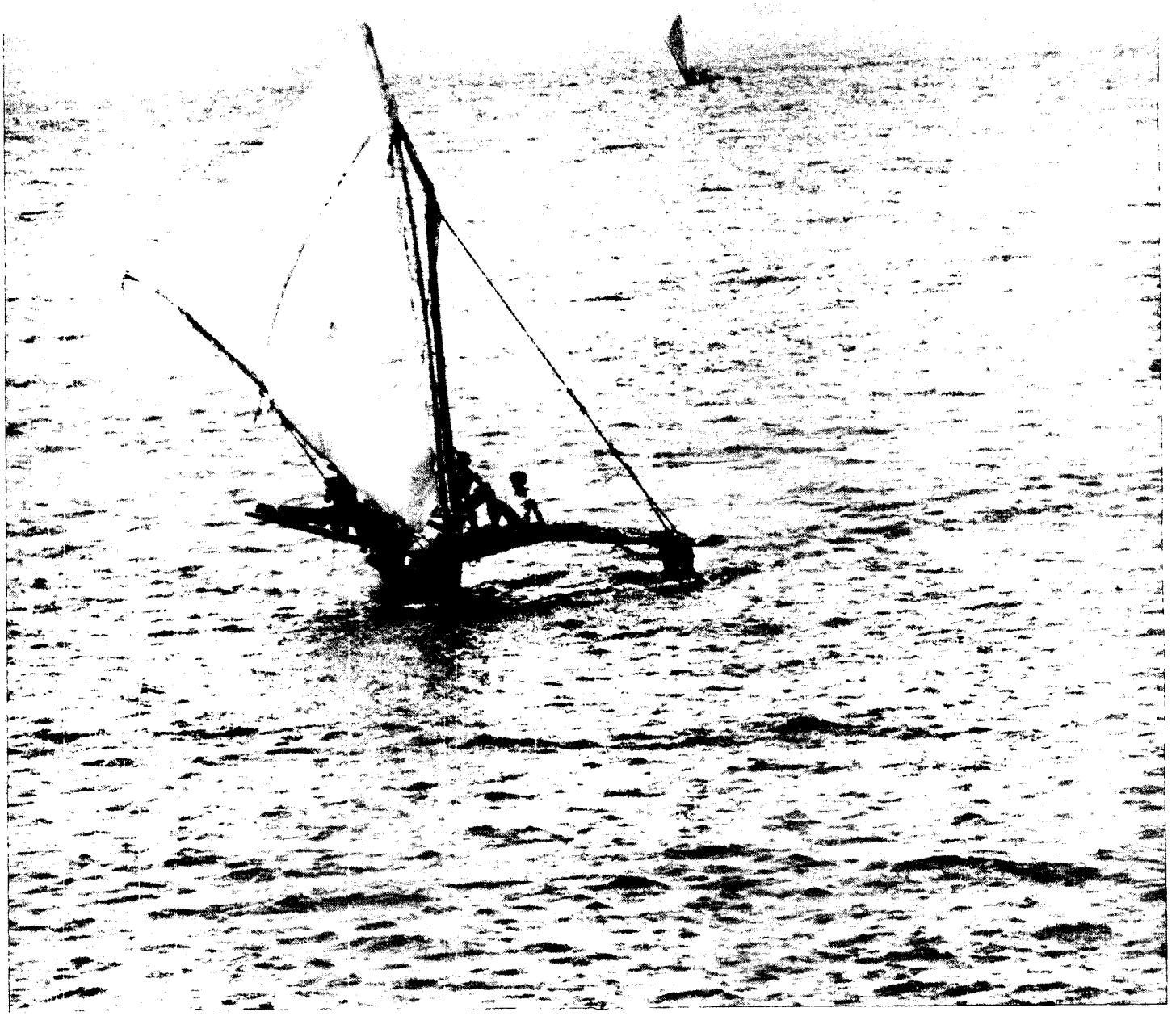
The object of this paper is to argue two premises related to our contention that Micronesia should be permitted extensive jurisdiction over all waters between her islands. First, the prehistoric political unity was much more pervasive than is commonly thought; and second, variously defined collective units of Micronesians traditionally own the sea between and around their islands in much the same way as they own land. The purpose of this chapter is to convince the reader that Micronesian navigation systems, using the Central Carolinian system as the primary example, were capable of maintaining extensive, regular inter-island contact all over Micronesia sufficient to permit vast island empires and to justify claims of ownership of the sea.

Removing a traditional 26' sailing canoe from a canoe house on Ulul.

Dragging the canoe to the shore preparatory to launching.

Same canoe prior to rigging. The light colored lines on the face of the hull are seams where individual boards are stitched together with coconut fiber rope.

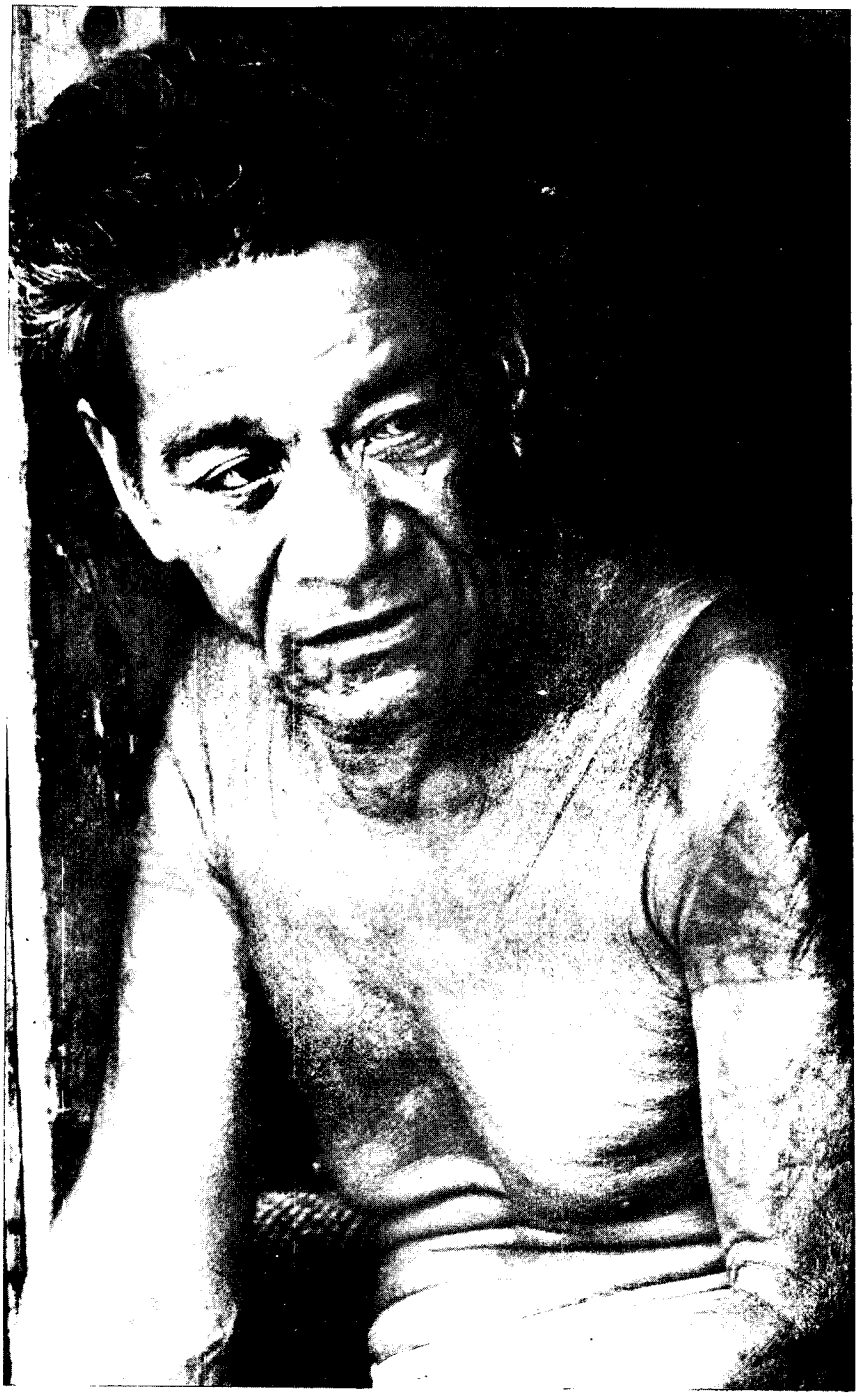
A somewhat smaller canoe being rigged for sailing.



Both canoes under sail on a calm day.

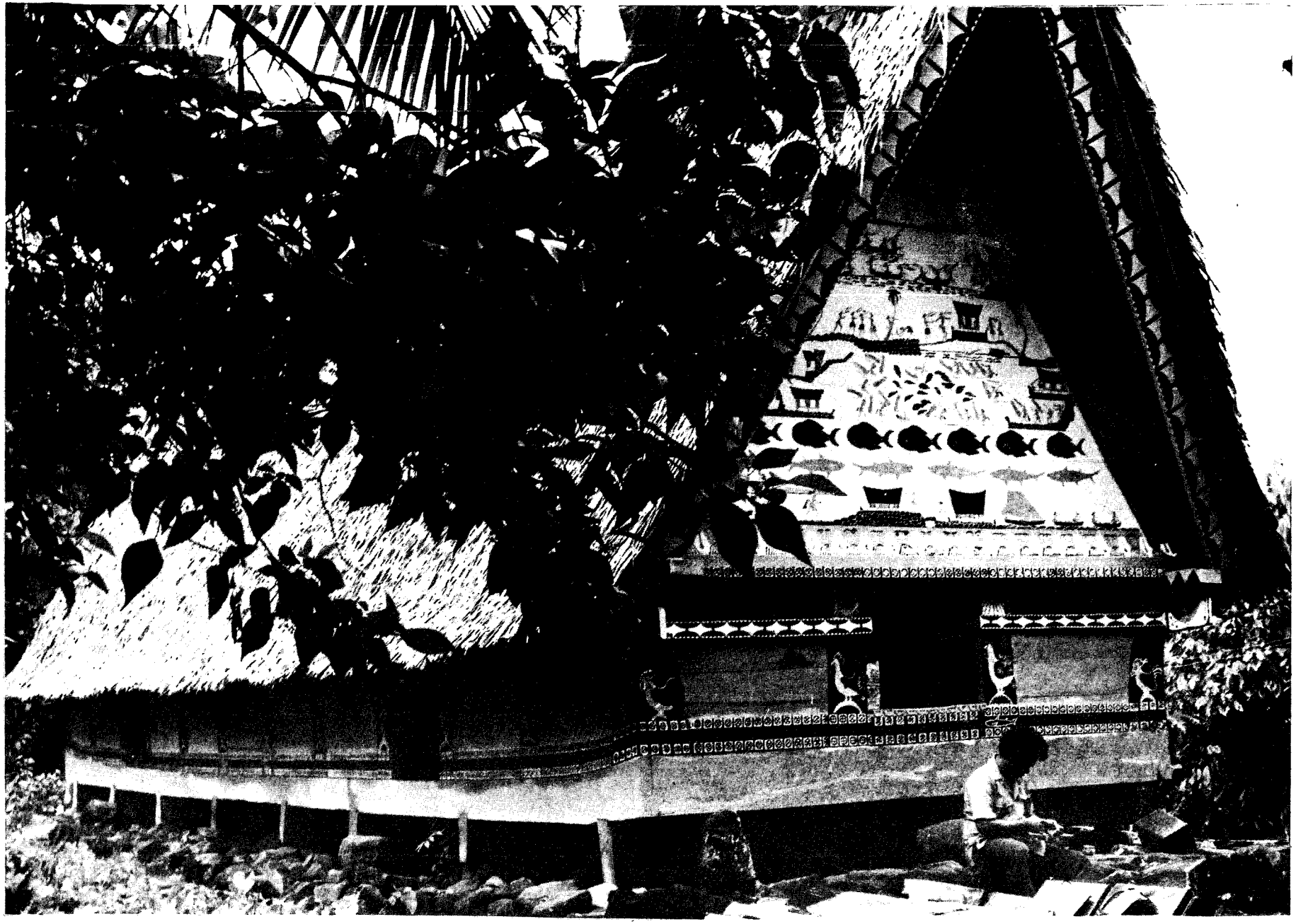
Mathias Lorsemal and Urfil, two informants from Ulithi Atoll.

The navigator Ikuliman.



The navigator Tawara.

Raphael Uag curator of the Yap museum.



A traditional men's house on Babelthuap.

CHAPTER III

PREHISTORIC POLITICAL ENTITIES

"When a Puluwatan speaks of the ocean the words he uses refer not to an amorphous expanse of water but rather to the assemblage of seaways which lie between the various islands. Together these seaways constitute the ocean he knows and understands. Seen in this way Puluwat ceases to be a solitary spot of dry land; it takes its place in a familiar constellation of islands linked together by pathways on the ocean. . .historically it was essential that Puluwat be a part of this larger island world. It would never have developed as it has if it stood alone. . .dozens of islands stretched over a thousand miles of ocean from Yap on the west to Truk and the islands beyond on the east have been linked by their seafaring men and their sailing canoes into a network of social, economic, and often political ties without which they probably could not have survived, much less evolved the complex and secure way of life they now enjoy. The opportunity to exchange people, goods, and information permits these tiny communities to survive disasters, notably typhoons, to draw from a pool of ideas and innovations larger than just their own, to integrate when useful into larger political groupings, and to extend the range of choice in marriage beyond the limited number of unrelated partners available on one's own island." (Gladwin T. 1970: 34-35)

The arrival of Westerners in Micronesia brought about radical change. The major initial effects were political and religious subjugation and epidemics caused by western diseases for which Micronesians had no natural immunity. The epidemics brought mass death, reducing the population to a small fraction of what it had been previously. For example, the Spanish began to colonize the Marianas about 1600 A.D. Between disease and the overzealous missionary efforts of the Spanish, the population was reduced to 1/20th its former size within a few years and by the end of the century, almost entirely eliminated. (Oliver,D.L.1951: 236) By 1880, 60 years after the first continous contact with Westerners

on Ponape, the population was reduced to 13% of its former size, and to 17% on Kusaie at about the same time. In a single year, 1853, it is reported the smallpox killed 3000 people on Ponape Island. (Karig, W. 1948: 93) No reliable estimates are available as to the population of Micronesia prior to the arrival of the Spanish, but is certainly must have been many times the present population of about 100,000. The Mariana Islands alone, excluding Guam, was said to have a population of between 35-50,000, (Oliver, D.L. 1951: 234) (Cockrum,E.E. 1970: 36-38) (Vayda, Andrew P. 1968: 383), and Yap Island about 50,000. Our informants told us that the single atoll of Majuro was also estimated to have had about 50,000 inhabitants.

Prehistoric[26] Political Entities

Given a large population and regular contact between islands made possible by the various highly successful navigation systems, large political entities were a fairly natural consequence. Little research has been done on the prehistoric political structure of Micronesia judging from a review of the written materials available to us. [27] We therefore had to look to the oral history of Micronesia for information, much of which is contained in chants.

Our very brief review of oral history in each of the districts of Micronesia indicates a relatively stable prehistoric political structure consisting of several large political entities. This political structure apparently lasted relatively intact for a long period of time, perhaps many centuries. This comment is made with certain reservations. Our review of oral history was superficial in the sense that it touched upon only the principal political units, those which knowledgeable informants volunteered most readily. We were unable to discover exactly how stable and unified those entities were, or to what extent periods of consolidation of island empires were followed by periods of fragmentation. Empires capture the imagination and arouse feelings of pride. Knowledge was rather readily available about the peaks of political consolidation but not of the valleys.

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26. The term prehistoric is here used to refer to the period prior to the arrival of the first western explorers.

27. See the bibliography for materials consulted.

The Palau Islands, by which we mean the small complex of islands between Angaur and Kayangel in Palau District seem to have always been a distinct political entity, neither dominated by nor dominating other islands in the area. The language is quite distinct as is the culture. Their navigation system was somewhat less sophisticated than that of other areas, and Palauans traveled less extensively. Their bountiful high islands permitted them to be a more provincial people. Though sustained contact existed between Palau and Yap 300 miles to the northeast, apparently no political union ever developed.

It appears as if the Marshall Islands too was always a distinct political entity, though a few informants did indicate a belief in political union between the Marshalls and islands to the west. However, in contrast to Palau, the separate prehistoric political identity of the Marshalls could not have been based on limited contact with other islands. The Marshallese were a great seafaring people who journeyed to Hawaii to the east and throughout the Carolines to the west.

Given the present day social, cultural, and political make-up of Micronesia, the conclusion that the Marshall Islands and the Palau Islands were separate political entities is not at all surprising. What is startling is the very strong evidence that all of the rest of the Micronesian Islands were united into a single political entity in prehistoric times. This empire embraced all of the Mariana Islands including Guam, all of what is now Yap District, all of the islands in Palau District south of Angaur, and all of the islands of both Truk and Ponape Districts. The focal

point and center of the empire seems to have been Kusaie with the islands of Ponape, Moen, Yap, Guam, and Tinian playing very important roles. The old name for Kusaie used throughout the area of the empire was "Kachau" (some pronounce it "Katau"). We have therefore chosen to call the empire the Kachau Empire. The central figures in the empire are said to be a series of chiefs of the islands called "Soukachau" who resided on Kachau and a series of great navigators, called "Poluelap" who consolidated the empire and ruled the seas. The force which bound the empire together apparently was not openly coercive. Instead, there seems to have been a voluntary association of islands, to some degree or other giving allegiance to a single sovereign.

Determining the time period during which the empire existed in extremely difficult and problematical. The only indication is that the ancient mysterious stone city of Nan Madol on Ponape is mentioned frequently in the legends and chants about the empire. Three anthropologists from the Smithsonian Institute carbon-dated some material at Nan Madol in 1963, and concluded that the site had been occupied between the 12th and 13th centuries. How many years or centuries before that time it had been occupied is unknown. (Kahn,E.J. 1965: 152) Since the Kachau Empire is associated with Nan Madol, we can assume that it too existed at least during those centuries. Legends indicate that the empire had declined and become fragmented by the time the Spanish arrived in number, about 1600 A.D.

Details about the empire and evidence of its existence is contained in legends and chants throughout the area. There are 50 inhabited low islands, high islands, and atolls within the area included in the empire. We were able to obtain information [28] about legends on 48 of those 50. Of the 48 about which we have information, a substantial part or all of the inhabitants of 39 of the islands belong to cultures whose traditions include detailed consistent legends about the Kachau Empire. By that we mean that the people of Truk District, the outer islands of Yap, the southwest islands of Palau District, and portions of the populations of Saipan and the northern Marianas have almost identical legends about the Kachau Empire. Of the nine remaining islands, six (Ponape, Pingelap,

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28. We were unable to interview informants on all atolls and islands in the empire. However, we were able to interview informants from what we consider to be a good cross section of those islands including the Sonsorol Islands, Yap, Saipan, Ulithi, Satawal, Puluwat, Ulul, the Truk Lagoon, Mortlock Islands, Kapingamarangi, and Ponape. From our informants we sought information about legends on their island of residence, plus neighboring islands with which close cultural ties are shared. Using this method we feel we were able to accumulate reliable information about 48 of the 50 inhabited islands or atolls in the empire. The two about which we were unable to obtain information are Kusaie and Nukuoro. Of course, our failure to interview informants from Kusaie was particularly unfortunate because of the significance of that island to the empire.

Mokil, Pakin, Ngatik, and Yap) belong to cultural traditions which include legends about major elements of the Kachau Empire, though not all of the major elements. The remaining three, the Chamorro islands of Tinian and Rota [29] and the Polynesian island of Kapingamarangi apparently have no legends about the empire.

Of the six inhabited islands which have legends containing major elements of the empire story, five (Ponape, Pingelap, Mokil, Pakin, and Ngatik) are in Ponape District and share a fairly similar cultural tradition. That tradition has legends about the great navigator-chiefs whose title was Poluelap (called "Pali" on the island of Ponape and "Paluelap" in the outer islands) very similar to those in other parts of the empire. Also, there is a legendary God figure called "Dau Katau" whose history and functions are somewhat similar to those of Soukachau. However, even the best informed Ponapeans seem to have only sketchy knowledge of their past and were unable to provide us with much detail.

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29. In one sense, drawing any conclusions, either supporting or contradicting evidence of the empire, from informants in the Marianas is misleading. A combination of Spanish soldiers and disease had reduced the population of the Marianas (excluding Guam) to 234 people by 1753. (Cockrum, E.E. 1970: 37) Widespread intermarriage and the influence of the dominant Spanish served to eliminate knowledge and practice of their former traditions by the few remaining Chamorros. Thus, the Chamorros are unable to provide us with any clues as to the prehistoric political structure of the Marianas. Carolinians from the outer islands of Yap migrated to the Marianas to fill the void left by the decimated Chamorros. Though most of the inhabited islands of the Marianas have detailed legends of the Kachau Empire entirely consistent with those found elsewhere, they were apparently introduced by the Carolinians when they migrated to the Marianas and are therefore of outer island Yapese rather than prehistoric Chamorro origin.

The other island is Yap. The Yapese have detailed, consistent legends about the origin and exploits of the navigators called Poluelap. Yapese tradition is also rich in lore about an empire which included all of the Kachau Empire and, in addition, at least the Marshall Islands. (Pompey, S.L 1971: 75) The island of Kachau (Kusaie) played an important role in the empire. According to our Yapese informants. the empire included a tribute system by which tribute originated in the Marshalls and was transported from island to island eventually ending in Yap. Remnants of this tribute system survived into modern times. Significantly, the Yapese do not identify their island as the center of the empire, but merely as an important island and a recipient of tribute from other islands. It seems likely, though not certain, that the empire of Yapese legend and the Kachau Empire are one and the same, simply ethnocentrically viewed. Alternatively, during the decline of the Kachau Empire it is possible that there was a shift in the power center to Yap or that the empire had a very loosely federated structure so that there were several power centers including Yap, Kachau, and possibly Ponape and the Truk Lagoon.

A Mystery

Near extinction, intermarriage with foreign people, and drastic cultural change have buried the history of the prehistoric inhabitants of the Mariana Islands in obscurity. In 1600 when the Spanish arrived in numbers, the Mariana Islands, including Guam, had a population of between 70,000 and 100,000 people. (Oliver,D.L. 1951: 234) By 1784, only 1,583 of their descendents survived. (Cockrum,E.E. 1970: 37) The few remaining intermarried principally with Spanish and Filipinos to form what is today called the Chamorros. Knowledge of the history and culture of the prehistoric inhabitants is so totally lost that the term, Chamorro, used to refer to them is actually a Spanish word. By all accounts, the prehistoric population of the Marianas was culturally and linguistically distinct from the people of the Caroline Islands. And yet the major islands of the Marianas bear names said to be of Central Carolinian origin rather than of ancient Chamorro or Spanish origin.

Carolinian legends describe the discovery and naming of the islands in the Marianas in ancient times long before the arrival of Westerners. For example, Saipan comes from the Carolinian words "Sei pon" literally meaning "empty voyage" because the island was found to be uninhabited when discovered. Tinian is derived from the words "chuni ol" the meaning of which has to do with the fact that the view of the sun was obstructed when the island was first sighted by Carolinians. Rota comes from the Central Carolinian word "luta" meaning "further up" referring to the fact that Rota island is to the north of Guam. Legend says that when Guam was

first spotted by Central Carolinians the navigator sighted the island through a part of the outrigger of the canoe, called an "amw". The island appeared to touch the amw. The Central Carolinian word for touch is "ku" and therefore the island was named "ku amw". Chamorros with whom we spoke had no explanation for the meaning of the names in their own language and generally agreed that they were of Carolinian origin. [30]

Early Spanish writings indicate that the names were used by Westerners from the beginning of European exploration of the area. A history of early exploration of the Pacific published by the American Geographical Society reprints early Spanish maps including one which gives the name of Saipan island as "Saepan". (Friis, R. 1967: Plate 20) This map is undated but was clearly made before 1700 because it identifies the Mariana Islands as the "Ladrones" rather than by their present name which was adopted in the late 1600's by the Spanish. (Van Loon H.W. 1940:79-80 also del Valle, Teresa M. 1969: 8-9) Also, a history of the Mariana Islands based on early Spanish records identifies the local names for the four islands we are using as examples as "Guan", "Zarpana" or "Rota", "Tinian" and "Sey-pan" or "Saypan". (Teresa del Valle M. 1969: 8-9) And finally a Spanish map dated 1648 which is reprinted in a recent publication identifies Saipan as "Sepan". (Maling P.B. 1969: 27).

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30. One knowledgeable informant, Father Arnold Bendowske, however argued that at least the name Guam was of Chamorro origin. He said that the original name was "Guahan" a shortened form of the Chamorro words "Gua ha hanon" meaning aplace where there is water".

The islands of the Marianas were heavily populated when the Spanish arrived. Presumably the Spanish adopted the names of the islands from the names used by the local inhabitants. If that is true, the local inhabitants, though apparently quite distinct culturally from the Central Carolinians, must have used Central Carolinian names to refer to their own islands. The reason for this is a tantalizing mystery, but one which seems to indicate that a very close relationship of some sort existed between the Central Carolines and the Marianas in prehistoric times, a conclusion which in turn tends to support legends of a vast empire.

Content of Legends

The legends about the Kachau Empire are highly detailed, internally consistent, and seemingly endless. The cultural tradition with the greatest detail about the empire is the one we have been referring to as Central Carolinian, meaning the cultures of the inhabitants of Truk District, the outer islands of Yap, the southwest islands of Palau, and the portion of the population of the Marianas commonly referred to as Carolinian.

Much of the history of the Kachau Empire is preserved in the Central Carolinian Chant of Orofes. The Chant of Orofes identifies two men as the founders of the Kachau Empire. Their names are Poluelap and Soukachau. Quite probably these names are actually titles for a long succession of great rulers called Poluelap and Soukachau. Soukachau was the ruler of the islands and lived on the island of Kachau, which today is called Kusaie. Poluelap was a great navigator who ruled the sea and lived much of the time near Nan Madol on Ponape. The first Poluelap and Soukachau were considered part God and part human. The power center of the empire was Kachau, where Soukachau lived. The administrative center was apparently Moen Island in the Truk Lagoon where Souworiras administered the empire for Soukachau. The chief on Ponape was "Soufonape," who some say was the maternal uncle and therefore a higher chief than Soukachau. Others say that he was simply another important chief under Soukachau and Souworiras. Most informants identified Soufonape as another title for the Ponapean chiefs called "Saudeleur" who

ruled Nan Madol.

Sounukuor was the chief of Nukuoro and Kapingamarangi; Soukuop ruled Uman; Soùfa ruled Fefan; Soumwar ruled Udot; Soutonap ruled Tol; Soufananu ruled Fananu; Soupuluwat ruled Puluwat; Sousatawan ruled Satawan; Souwap ruled Yap; Souchiniol ruled Tinian; and Soukuam ruled Guam. These were considered the most important islands in the empire and their chiefs ruled lesser nearby islands as well.

Central Carolinians identify "Souratak" as the chief of the Marshall Islands. Some say he was a subordinate of Soukachau, others said that he was not and that the Marshall Islands was completely independent of the Empire.

The legendary Adam and Eve of the empire, named "Pomai" and "Noupfonu", are said to have come to Moen Island from Kachau (and probably the Marshall Islands before that) on a piece of driftwood. They had children and their descendents grew in number and fanned out to populate all of the islands in the empire. Noupfonu and Pomai founded the Sopunupi clan, the most important clan in Truk and the one of which Souworiras and the modern chiefs of Moen are members. The Central Carolinian name for the empire was "Machewan Sopunupi" which literally means the government of the clan of Sopunupi.

Poluelap,the man who consolidated the Kachau Empire on instruction of Soukachau, was the greatest of all navigators--the originator of the art and technology of navigation. His domain was the sea called "Matauei Rob" which included all of the ocean area known to Micronesians. Legends about Poluelap are even more widespread than those about Soukachau.

45 of the 48 islands about which we have information, have legends about Poluelap. Some are more detailed than others. None is inconsistent with other legends of Poluelap in a significant way. Informants in Yap provided us with great detail about the origin and history of Poluelap, and so the account which follows is a summary of that version.

A long time ago a human male named "Rigog" and a demigod female named "Lobirang" lived on Yap and had seven children. One of the children was a boy named "Yonglab". Yonglab grew and had children including a very favored daughter named "Liyomarer". It was Yonglab's practive to give Liyomarer the prized head of any turtle which came into his possession as a sign of his affection. On one occasion Liyomarer saw evidence that a turtle had been caught, but she had not received the head. She became angry and in her displeasure gathered the seeds of several kinds of trees and some sand in a half coconut shell and flew by magic to the east. At that time the people of Yap knew of no other islands. Liyomarer eventually arrived at a reef and poured out the sand and seeds and formed the atoll of Ulithi.

Later she had a son named Poluelap whom she instructed never to travel to the west because of her bitter feelings caused by her father's slight. But the boy was very energetic and curious and his curiosity led him to sail to the west on a driftwood log. When he arrived on Yap he tried to play with the other children but was ridiculed and beaten because he was a stranger. During the beatings he would call the name of his mother, Liyomarer. Eventually, Yonglab heard of the strange boy and

recognized the name that he called as that of his daughter.

Poluelap stayed on Yap for awhile and instructed the people about the geography of Micronesia and about navigation--knowledge which he had acquired from Liyomarer. He told the Yapese of the Palau Islands, the Mariana Islands, and all of the islands east at least as far as Kachau. Poluelap had the power of a demigod, power which he had inherited from his great grandmother, Lobirang. He spent his life developing tha art of navigation and sailing all over the central and western Pacific as far as New Guinea, the Philippines and possibly even to Japan and Okinawa. According to Yapese legend, Poluelap eventually moved to Ponape to live at a place called "Nam Ta", the description of which clearly identifies it as Nan Madol. Ponapean legend identifies Poluelap's residence as a small island just off Nan Madol called "Imuin Kiweri".

As mentioned earlier there are many legends about the Kachau Empire, Soukachau, and Poluelap. The ones briefly summarized here describe the structure of the empire and a little of the origin of the central figures. Others which we collected go more into the workings of the government at the island level and describe various rituals. In addition, we were told a great many seemingly unconnected stories about the exploits of leaders, warriors, and about voyages, etc., which are not related to the central purpose of this paper, and therefore not included.

CHAPTER IV

TRADITIONAL MICRONESIAN CONCEPTS OF OWNERSHIP OF THE SEA

When we first embarked on this effort to collect information about traditional ideas of ownership of the sea, we expected to find ownership concepts as diverse as the cultures of Micronesia. We assumed, for example, that the Marshall Islanders would have very different ideas about ownership of the sea than the Palauans. Instead, we found surprising uniformity. Out of the more than two hundred hours of interviews and discussions which were held, certain common principles evolved.

The principles of ownership are not principles in the western sense, however. Micronesians do not think of their sea in such terms. Instead, the principles of ownership seem to be pragmatic accommodations to competing interests among individuals and groups of people combined with a mutually understood but unspoken sense of fairness. Islanders need access to a steady supply of fish. They also desire to maintain relatively stable and harmonious inter-island relations. The ownership scheme which has evolved achieves both of these goals and many others, less obvious. The ownership of areas such as shallow reefs which contain high concentrations of desirable fish and are known to be bounded with precision and the identity of the owners is univerally agreed upon. These are places where excessive competition for fish could easily lead to conflict. Clearly defined ownership and equitable allocation of these fishing grounds decrease the chance for conflict and at the same time provide all islanders with access to food.

In the deep seas where fishing is less productive and 58 where the fish are more widely disbursed, the potential for competition and conflict is reduced permitting communal sharing of rights in these areas of the sea among the people of many islands.

The overriding principle for defining rights to the sea is that proximity determines ownership. That is, paramount rights in the sea and its resources generally belong to the nearest island or atoll. The lagoon area and sea near the shore are the exclusive property of the island or atoll. All Micronesians understand this principle as to their own island and respect it as to others. Islands also maintain exclusive rights in all known submerged reef areas. Each island and atoll has such a submerged reef area growing out from the sides of the seamount which forms its base. Some of these are very close to the shore, others extend out 30 miles or more. In addition, all over Micronesia there are submerged reefs capping seamounts just below the surface of the ocean. Many of these are more than 100 miles from the nearest dry land and some, such as those topping the chain of seamounts west of and parallel to the Marianas, are almost 200 miles from the nearest island. These reefs are all excellent fishing grounds. Each is named and exclusively owned by a particular family, clan, municipality, island, group of islands or atoll. Ownership rights in these reefs are apparently quite well respected and little poaching by Micronesians is believed to occur.

Viewed from the perspective of the island with dominant rights in an area, the degree of exclusiveness of rights in the sea declines as one moves outward from the island, except of course that submerged reef areas remain the

exclusive property of an island or atoll regardless of their distance from land. Again, this is not a principle which Micronesians readily articulate in discussing their ideas of ownership of the sea. Instead, it is the conclusion which one draws from observing Micronesian practice in respecting the rights of other islanders and in defining infringements to their own rights.

Ownership might best be described in terms of two zones of rights, with the criteria for defining the boundaries of the zones differing among the various cultural groups. As mentioned earlier, an island or atoll maintains exclusive rights in the zone immediately around it which includes the lagoon and nearby offshore area. The Marshallese conceive of this zone as extending as far out as a man can stand and fish; the Central Carolinians extend the inner zone to the pcint where the reef ecology gives way to deep sea species of fish; and the Yapese, Ponapeans and Palauans extend this zone out to some vaguely defined point beyond the barrier reef.

In the outer zone the island or atoll has the dominate rights, but those rights are not exclusive. The outer boundary of this zone is less well defined than is that of the zone in which the island maintains exclusive rights. Among the Central Carolinians the degree of rights within the nonexclusive zone seems to gradually fade as one moves outward toward the next island, until at some point the rights of the next island become primary. In Palau, the outer zone is said to extend out to the maximum range of homing birds, 75 to 150 miles in the case of frigate birds. In the Yap Island complex the situation is somewhat confusing. The Yapese thoroughly dominate the

Central Carolinians dwelling in the outer islands of Yap District. This dominance is a vestige of the influence of Yap stemming from the era of the Kachau Empire or possibly a more recent empire based on Yap. As a consequence, the Yapese consider their nonexclusive zone to include at least all of the sea around the outer islands of Yap District. The Central Carolinians occupying the outer islands of Yap District acquiesce to the dominance of the Yapese. However we were unable to determine whether the Central Carolinians recognize the rights of the Yapese as paramount to their own rights in the sea beyond their shores. The great distances between islands in Ponape District apparently precluded the necessity of formulating a boundary for the outer zone, for when asked, Ponapeans could not agree upon one. However, they do view the area to a great distance beyond the reefs as a nonexclusive zone owned by the nearest island.

In the Marshall Islands we received two explanations of their view of ownership of the sea beyond the exclusive zone. Some informants said that the dominate rights of an island or atoll extended out half way to the next island but that rights in the zone were freely shared with other Marshallese because of the homogeneousness of the culture. Other informants said that the nonexclusive zone consists of all of the sea area within the Marshall Islands beyond the exclusive zones of each island or atoll, and is the common property of all Marshallese. The outward boundary of the non-exclusive zone of the perimeter islands, those outermost islands beyond which no other Micronesian islands exist, is normally not defined. In most cases there is no land within hundreds of miles beyond the perimeter islands and

therefore no boundary definition is necessary.

In the nonexclusive zone, harmless transit is usually permitted as is incidental fishing. But the fish caught clearly are the property of the nearest island and are, in effect, a gift to the intruding islander who takes them. Various practices exist which affirm the superior rights of the nearest island. For example, if Micronesians are fishing for tuna within the sea considered owned by another island, they may catch excess fish and take them to the island in recognition of that island's ownership rights. Or sometimes an intruding fisherman might take all fish caught to the chief of an island to be commingled with fish caught by others and a portion returned to the intruder.

There is another dimension to Micronesian ideas of ownership of the sea which should be discussed. Viewed from the perspective of an islander intruding into the sea dominated by another island, the closer the proximity of the island of residence of the intruder and the closer his cultural affinity to the dominant cultural group of the area, the greater are his rights in the sea. Acts which would be considered infringements of an islands' rights if done by a stranger, may be tolerated when committed by a member of one's own cultural group residing on a nearby island. Thus the identity of the intruder, in part, defines the seriousness of the infringement. This aspect of ownership of the sea is related to the degree of rights of the dominant island in the nonexclusive zone. Rights in the nonexclusive zone are shared with other islanders. The closer the relationship of the intruding islander to the inhabitants of the dominant island, the greater his rights to share the benefits of that zone. And the converse is true as well.

The less closely related the intruder is to the people of the dominant island, the fewer his rights in the nonexclusive zone. This principle manifests itself in the attitude of Micronesians toward commercial fishing operations. For example, there have been instances in recent years where persons from one Micronesian cultural group have attempted deep sea commercial fishing in the offshore waters of another cultural group without the consent of the traditional leaders. In each case these attempts have been resisted sufficiently to force expulsion of the offending fisherman. This principle also accounts for the nearly universal outrage felt against foreign fishing ventures conducted anywhere within the Micronesian archipelago. The sense of infringement of rights is so great in the case of foreign fishermen that islanders often try to apprehend foreign fishing vessels with nothing more than a canoe or outboard motor boat and more than once have succeeded.

Miscellany

This section contains a miscellaneous collection of information related, in varying ways and degrees, to ownership of the sea. It is arranged by cultural group. Included are the names of our informants in each district, a statement of the ideas of ownership of the sea expressed by each major cultural group, and a summary statement of the range of navigation for each. Also included are examples of local names for seas and the names of some submerged reefs in the language of the people considered to own them.

Marshall Islands

In the Marshall Islands our primary sources of information were Iroij Legellan Kabua, Iroij (Senator) Amata Kabua, three other Iroij from the Kwajalein Atoll and Dr. Jack Tobin, an anthropologist who has worked in the Marshall Islands since the late 1940's.

As has been mentioned before, the Marshallese are a great seafaring people with a very sophisticated navigational system revolving around knowledge of the stars and of swell patterns in the sea. Prior to and during early western contact, they roamed the ocean in huge canoes up to 100 feet in length and carrying as many as 50 people. The range of their travel was vast. They had journeyed as far as the Hawaiian Islands to the east, at least to Ponape Island to the west, the Gilbert Islands to the south and beyond the Marshallese island of Enenkio (Wake Island) to the north.

Dr. Tobin's long experience in the Marshalls was particularly helpful to us in understanding the Marshallese concept of ownership of the sea. He explained that the land merges into the lagoon which in turn merges into the sea and it is all property to the Marshallese. No such concept as high seas exists. The sea of the Marshalls ends where that of the adjoining cultural groups begins. Exact boundary lines were never delineated because there was no need to do so. The Marshallese have been a very homogeneous people for many centuries, perhaps more homogeneous than any other cultural group in Micronesia. Individual and clan ownership includes the land, lagoon, and reef areas as far out as a man can stand and fish. Reef areas beyond where a man can stand and fish and also offshore submerged reefs are

the exclusive property of an island or atoll. Beyond the reef areas, ownership of the sea is shared among the Marshallese Islanders.

As did most Micronesians, the Marshallese had names for sections of territory consisting of islands, lagoons, reefs, and sea. A few will be given here for illustrative purposes. The territory around Mili, Knox, Arno, and Majuro Atolls is called "Ratak Rak". The remainder of the Ratak chain including Enenkio (Wake Island) is called "Ratak En". The territory around Ebon, Namorik, Jaluit, Kili, and half of Ailinglapalap is named "Rakinmeto". The general name for the rest of the Ralik chain is "Eninmeto". The sea area between the Ralik and Ratak chains is called "Lolelaplap" and all of the sea north of Bikini and Taongi Atolls is named "Joiiaenkan".

Ponape

In Ponape our informants were several traditional leaders from Ponape, Pingelap, Mokil, and Kapingamarangi (including the Nanmwarki of Madolenihmw Municipality), a number of district legislators and the District Administrator and his staff.

Prior to the arrival of Europeans the inhabitants of Ponape District did little traveling in comparison to the Marshallese or Central Carolinians. Like inhabitants of high islands elsewhere, the residents of Ponape island were particularly provincial. The traveling which did occur was largely confined to the district and probably the Truk Lagoon to the west and nearby Marshall Islands to the north and east. The people of Kusaie, Mokil, Pingelap, Pakin, and Ngatik apparently had fairly substantial contacts with the main island of Ponape. And legends indicate that the people of the district knew of most of the major islands in Micronesia, though this knowledge is likely to have resulted from other islanders traveling to Ponape District rather than the reverse.

Ponapean ideas of ownership of the sea readily fit the general framework of ownership discussed earlier in this chapter. Ownership of the lagoon areas, nearby shore areas, and submerged reefs wherever found is exclusive in a family, clan, municipality, or island and precisely bounded. Ownership of the remainder of the sea between and around the islands is shared with the greater rights vested in the people of the nearest island. Foreigners are considered to have no rights in the area except possibly that of transit. As is the case in every district of Micronesia, great outrage is felt toward foreign fishing vessels conducting commercial fishing operations anywhere

within the waters of the district.

Ponapeans consider the sea to be divided into two halves by a north-south axis intersecting Ponape Island. The waters to the east are called "Katau Peidak" and to the west, "Katau Peidi". Katau is the way Ponapeans say the prehistoric name for Kusaie Island which elsewhere is pronounced Kachau. Saudeleur, the title for the rulers of Ponape Island who occupied Nan Madol during the time of the Kachau Empire apparently exercised extensive control over the sea. The first fruits of foods produced both on land and at sea were given to Saudeleur to symbolize his authority over the land and sea. The Saudeleur not only received tribute from the people of Ponape island but also from most or all other islands in the district. After the overthrow of Saudeleur, Ponape Island divided into smaller kingdoms, the chiefs of which continue to exercise control over the sea as well as land.

Central Carolines

As we have mentioned many times before, the Trukese, outer island Yapese, Carolinians of the Marianas, and people of the southwest islands of Palau District share a common cultural heritage. We have been calling this heritage Central Carolinian. Not surprisingly, this common cultural heritage has resulted in common concepts of ownership of the sea.

Our principal informants in Truk were the navigators Ikuliman and Tawaru, Sia, Kintoky Joseph, the Mayor and Vice Mayor of Moen, the Chief Magistrate of Ulul, the Vice Speaker, Floor Leader, and several members of the Truk District Legislature, Dr. Frank Mahoney, an anthropologist who has spent a great deal of time in Truk, Opul, Sesi, Suda, Opun, Kior, Menio, and Riken. In the Mariana Islands we obtained most of our information from Oleingimwar, Jose Sablan and Father Arnold Bendowske. Our main informants from the outer islands of Yap were Mathias Lorsemal and Urfil from Ulithi and a number of people from Satawal. And from the southwest islands of Palau our informants were several members of the Palau District Legislature including the Chief of the Sonsorol Islands.

The range of navigation of the Central Carolinians is impressive: At least as far as Johnston Island to the east; the Philippines to the west; beyond the northern Mariana Islands to the north; and to New Guinea, Kapingamarangi, and possibly Samoa to the south. The navigation system which made such extensive travel possible was described in Chapter 2.

Among the Central Carolinians, ownership of property extends out from land to include the lagoons and all known submerged reefs regardless of their distance from land. Truk and Yap Districts are dotted with

many seamounts which are capped with reefs nearly reaching the surface of the ocean. Ownership of each of these reefs is very carefully defined and rights in them scrupulously respected. The following are examples of the ownership of submerged reefs in the areas dominated by the Central Carolinians.

In Truk district: About 75 miles south of Pulusuk is a shallow area named "Remanuou" (called Helene Shoal on most maps) which is owned by Pulusuk; Pulusuk also owns the "Rmanulong" which is called Lady Elgin Bank on maps; about 50 miles east of Puluwat is a reef called "Apinalei" belonging to Puluwat as does the reef "Chuat" (the Gray Feather Bank) northwest of Puluwat. In Yap District: About 50 miles east of Faraulep is a reef (called Tarang Bank on maps) which belongs to the people of Faraulep and is called "Chimuelwelpuguu"; Elato owns the reef "Ocheirukulong" located about 125 miles southwest of the island and called Ianth Shoal on maps; and the McLaughlin Bank located northwest of Ulul is called "Ochenimwar" by the Central Carolinians and is owned by Satawal. An example of the ownership of submerged reefs by the people of the southwest islands of Palau is the large reef located roughly midway between Angaur and the Sonsorol Islands. It is called "Osarichotiwapang" by the Sonsorial islanders and is shared by them with Angaur. The most distant submerged reefs considered owned by Micronesians are found in the Mariana Islands. Paralleling the chain of mountains forming the Marianas is another chain located about 200 miles to the west. None of these mountains break the surface of the ocean. Among them are many submerged reefs which are considered to be the property of the people of the Marianas. For example, about 175 miles west of Pagan are two reefs together called "Fanupweiletal" traditionally owned by the inhabitants of

Anatahan. About 150 miles west of Anatahan is Pathfinder Reef which, together with the reef to the north and the one to the east, is called "Ochensoufanachik" and owned by the Soufanachik clan. There are many reefs closer to land in the Marianas such as "Ochopengek" east of Saipan and "Maenmetin" north of Saipan. There are considered owned by a clan or island as well.

Property ownership of the Central Carolinians includes all of the sea between islands as well as the lagoon and submerged reef areas. As was found elsewhere, nonexclusive but paramount rights in deep sea areas are held by a single island or atoll and shared with other islanders. Foreigners are considered to have no rights in the sea except the right to transit.

The Central Carolinians have an elaborate system for naming seas. The traditional name for all of the sea known to the Central Carolinians prior to the arrival of Westerners is "Matauei Rob". One scheme for subdividing the sea involves the use of a north-south axis and an east-west axis intersecting on Puluwat like the axes of the star compass. The sea to the east of the north-south axis is called "Matauen Ta" and that to the west "Matauen Tol". The sea to the north of the east-west axis is called "Matauen Feng" and the sea to the south, "Nomuneor". Central Carolinian navigators and seamen think of the sea between pairs of islands as highways or seaways to be traveled by canoe. They have a name for each such seaway. For example, the seaway between Mukuoro and Lukunor is called "Matau Ropuak"; between Puluwat and the Truk Lagoon the seaway is called "Aruan" or "Yaruwal"; between Pik (called Pikelot on maps) and Guam the name of the seaway is "Matau Pengek"; and between the Philippines and Palau it is called "Taukeleta".

Mariana Islands

As usual, the situation in the Mariana Islands is more complex than in the other island groups. So far we have described the navigation system and ideas of ownership of the sea of the Carolinians in the Marianas, and ignored the numerically and politically dominant Chamorros. During the early years of colonization of the Marianas, the Spanish evacuated all inhabitants of what is now the Mariana Islands District to Guam, except for a few people who went unto hiding on Rota. As had been mentioned, disease and war reduced the Chamorro population from a prehistoric high of nearly 100,000 to a low of about 1600 people in 1784. (Cochrum, E. E. 1970: 36-38). Those remaining people intermarried with the Spanish and Filipinos on Guam to form the ancestors of the present day Chamorros. About 1805 a Central Carolinian chief by the name of Akurup led a large migration of Carolinians to the then uninhabited island of Saipan. Before settling Saipan, he stopped on Guam and there sought the consent of the Spanish Governor for the settlement. Permission was granted by means of a written document which was retained by the Carolinians until the invasion of Saipan in 1945, at which time it was lost or destroyed. About 1835, the Spanish sent a man named Sablan to be Governor of Saipan followed by gradual settlement of the island by the Chamorros. Near annihilation of the original Chamorro population, intermarriage, and the drastic social change brought about by evacuation of the islands virtually eliminated use of the traditional Chamorro ways. Presumably the culture of the Chamorros who resettled Saipan bore little resemblance to that of the original inhabitants. Lost in the shuffle were the old seafaring traditions of the original Chamorros. To

fill the void left by the disintegration of their culture, the Chamorros seem to have adopted the seafaring traditions of the Carolinians, including their ideas of ownership of the sea. Thus, attitudes toward ownership expressed by Chamorros in the Marianas are indistinguishable from those of the Central Carolinians.

Yap Island Complex

Our informants on the island of Yap were Judge Joseph Fanechoor, Fernando Falawaath, James Mangefel, Kenmed, and Raphael Uag the curator of the Yap Museum.

Indications are that the Yapese had a highly sophisticated navigation system. They traveled throughout Micronesia and to New Guinea, the Philippines, and possibly even Okinawa or Japan in prehistoric times. Like the inhabitants of other high islands, the Yapese abandoned their navigation tradition soon after the arrival of Europeans. Today there is little knowledge remaining of it.

Property ownership in Yap includes the lagoons and submerged reefs both near and far. For example, about 30 miles north of the Yap complex is a reef called "Sepin" owned by a particular municipality on Yap as is another reef located about half way between Yap and Sepin called "Faguruch". The deep sea area around the Yap Island complex and throughout the district is considered owned by the Yapese.

The Yapese also have an involved system for naming seas. For example, the sea north from Yap Island to Japan is "Mathow Won" and south between Yap and Palau is "Mathow Mal". Between Yap and Ulithi the sea is called "Mathow Marfach" and between Ulithi and Truk, "Capil Mogol".

Palau Island Complex

Our informants for the Palau Island complex itself were the high chiefs Reklai and Aibedul, the Speaker and members of the Palau District Legislature, the Ngiraikelau of Koror, Charlie Gibbons, the Mayor and Municipal Council of Koror, the Chief of Angaur, the Chief and Chief Magistrate of Airai Municipality, Lawrence Otaor and Santos Ngodrii.

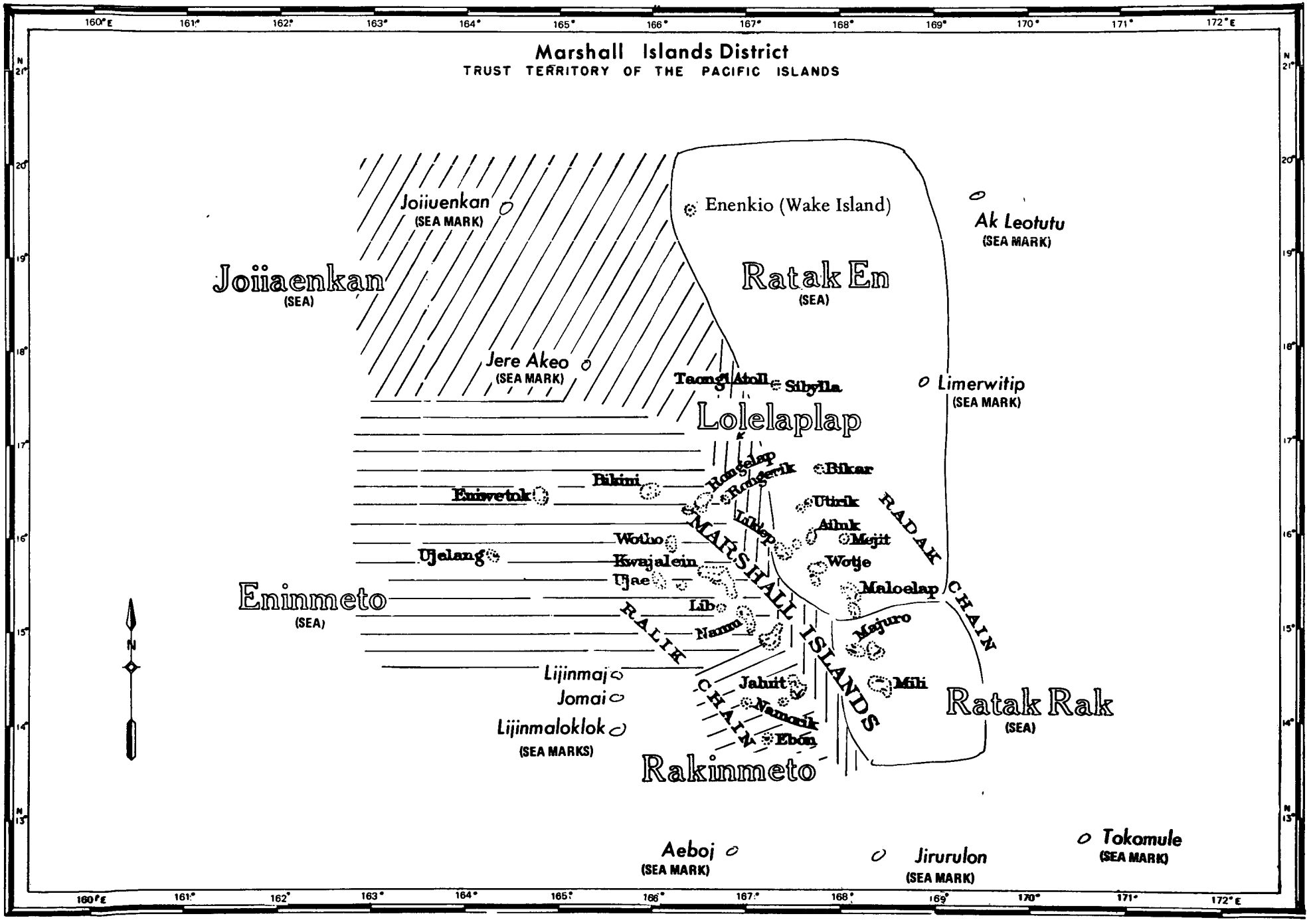
Palauans did not travel widely in prehistoric times. The only island beyond the Palau complex with which they had frequent contact was Yap. Their navigation system was apparently relatively simple. Their attitudes and ideas of ownership of the sea are greatly influenced by their comparative isolation.

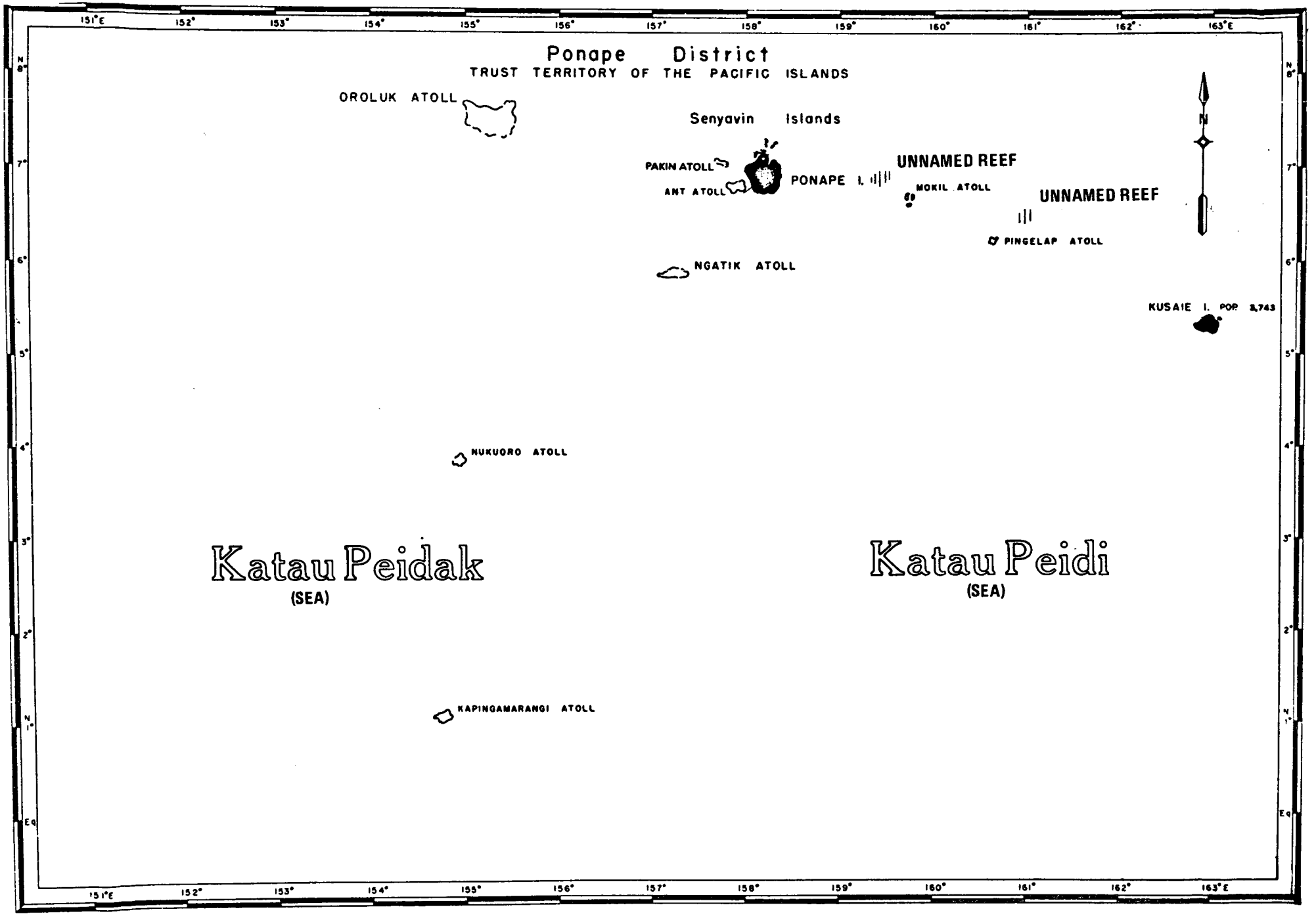
As with all other Micronesians, the lagoon areas and submerged reef areas are owned by a clan, village, municipality, or island. Examples of these include a number of reefs east of and beyond the barrier reef off Koror called "Uchelbeluu", "Youllukes", "Bluulukes", "Bablukes", "Ngetngod", and "Ngchesau". The most distant submerged reef is apparently the one located between Angaur and the Sonsorial Islands which is shared by both. This reef is about 75 miles south of Angaur and is called "Olimtemutel" by the Palauans. Velasco Reef north of Kayangel is named "Ongercoll" and owned by Kayangel.

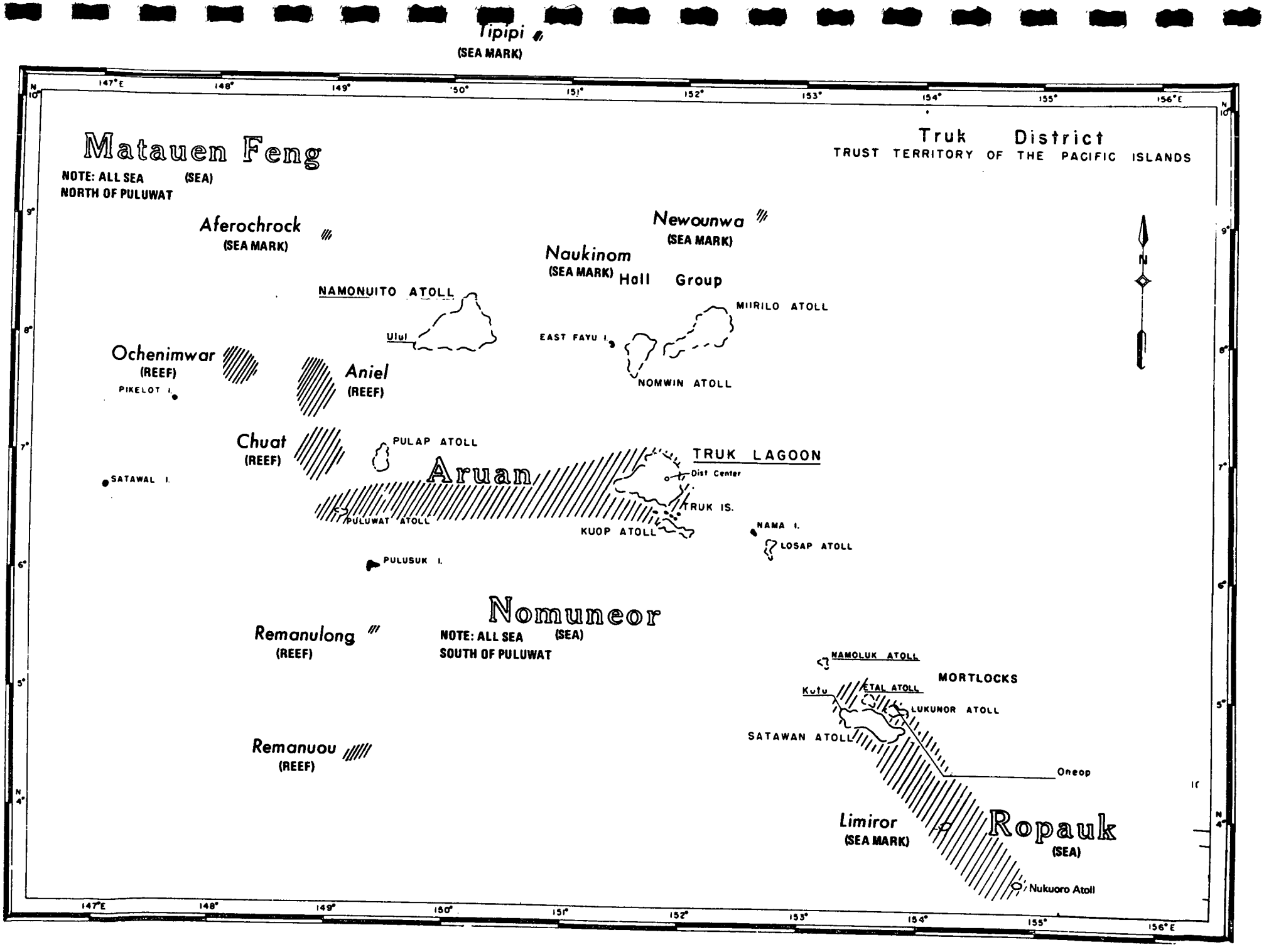
The Palauans regularly fished at fairly great distances from shore out beyond sight of land. The outer limits of their fishing was apparently the range of birds which they used to navigate back to the islands. The most common homing birds range out 30 to 50 miles and the less common frigate

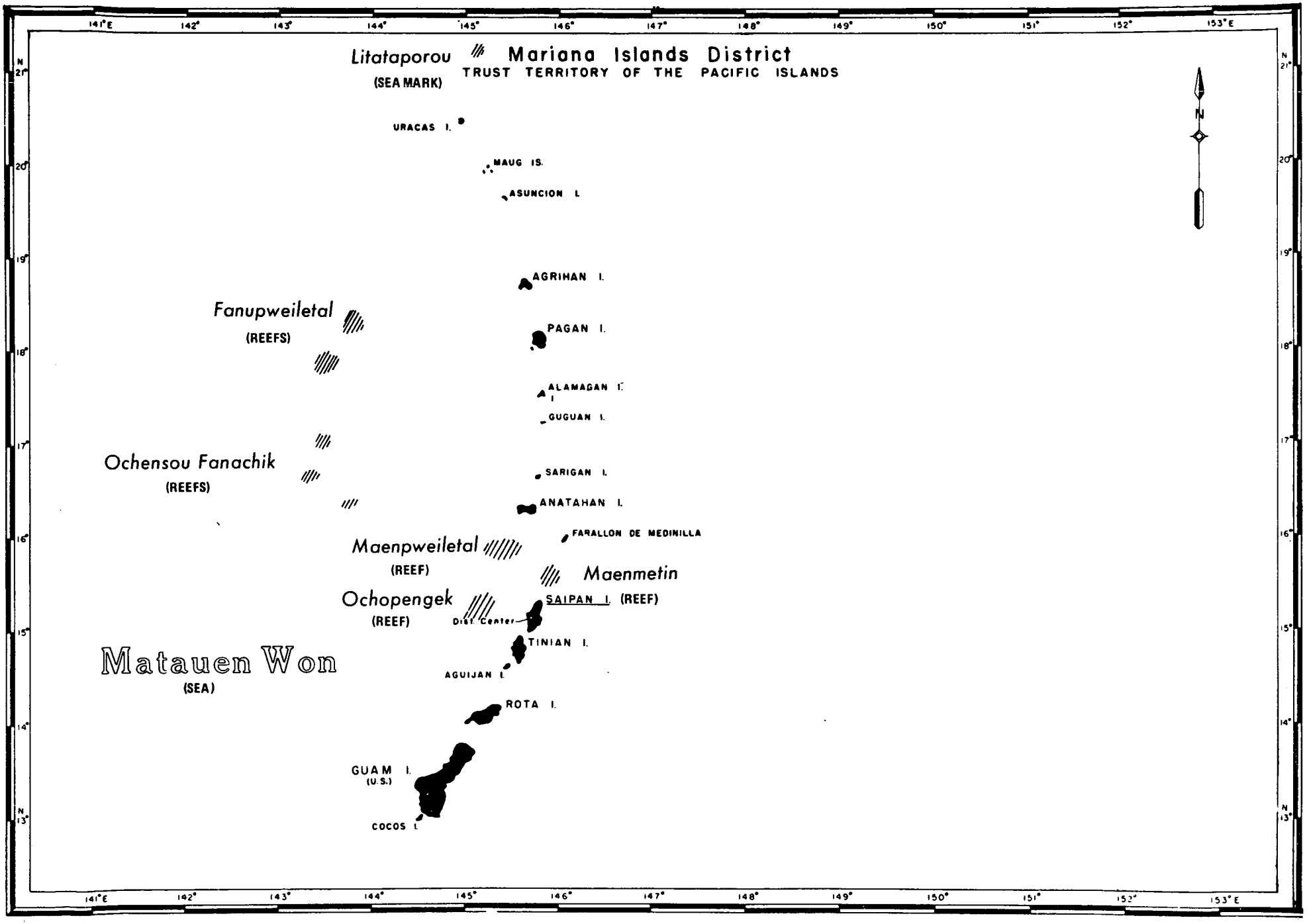
birds, 75 to 150 miles according to our informants. The Palauan sense of ownership of the sea is closely tied to the range of its fishermen. However ownership traditionally did not end at the outer limit of the range of fishermen. Instead it extended out to where Palauans perceived that fishing by others ceased to hold the potential to affect the supply of fish within the range of their fishermen. It is difficult to determine the outer limits of this idea of ownership. The major present day manifestation of it is the Palauan sense of anger over foreign commercial fishing in the area.

One interesting form of establishing possession over fishing grounds was told to us by several Palauan informants. The informants said that fish tend to congregate beneath floating driftwood. If a Palauan finds driftwood and wishes to assert possession over all fish around it, he simply makes a mark on the wood with his machete and other Palauans seeing this mark will respect his rights.


Marshall Islands District
TRUST TERRITORY OF THE PACIFIC ISLANDS
160° E
161°
162°
163°
164°
165°
166°
167°
168°
169°
170°
171°
172° E
N 21°
20°
19°
18°
17°
16°
15°
14°
N 13°
Joiiuenkan
(SEA MARK)
Joïiaenkan
(SEA)
Enenkio (Wake Island)
Ratak En
(SEA)
Ak Leotutu
(SEA MARK)
Jere Akeo
(SEA MARK)
Taongi Atoll
Sibylla
Limerwitip
(SEA MARK)
Lolelaplap
Rongelap
Rongerik
Bikar
Bikini
Eniwetok
Utirik
Ailuk
Mejit
Wotho
Ujelang
Kwajalein
Wotje
Ujae
Maloelap
Lib
Namu
Majuro
Mili
Jabat
Namorik
Ebon
Lijinmaj
Jomai
Lijinmaloklok
(SEA MARKS)
Eninmeto
(SEA)
Rakinmeto
MARSHALL ISLANDS
RADAK CHAIN
RALIK CHAIN
Ratak Rak
(SEA)
Aeboj
(SEA MARK)
Jirurulon
(SEA MARK)
Tokomule
(SEA MARK)
N


Ponape District
TRUST TERRITORY OF THE PACIFIC ISLANDS
OROLUK ATOLL
Senyavin Islands
PAKIN ATOLL
ANT ATOLL
PONAPE I.
UNNAMED REEF
MOKIL ATOLL
UNNAMED REEF
PINGELAP ATOLL
NGATIK ATOLL
KUSAIE I. POP. 3,743
NUKUORO ATOLL
Katau Peidak
(SEA)
Katau Peidi
(SEA)
KAPINGAMARANGI ATOLL
151°E
152°
153°
154°
155°
156°
157°
158°
159°
160°
161°
162°
163°E
N
8°
7°
6°
5°
4°
3°
2°
N
1°
Eq


Tipipi
(SEA MARK)
Truk District
TRUST TERRITORY OF THE PACIFIC ISLANDS
Matauen Feng
NOTE: ALL SEA (SEA)
NORTH OF PULUWAT
Aferochrock
(SEA MARK)
Newounwa
(SEA MARK)
Naukinom
(SEA MARK)
Hall Group
NAMONUITO ATOLL
Ulul
MIIRILO ATOLL
EAST FAYU I.
NOMWIN ATOLL
Ochenimwar
(REEF)
PIKELOT I.
Aniel
(REEF)
Chuat
(REEF)
PULAP ATOLL
SATAWAL I.
Aruan
TRUK LAGOON
Dist Center
TRUK IS.
PULUWAT ATOLL
KUOP ATOLL
NAMA I.
LOSAP ATOLL
PULUSUK I.
Nomuneor
NOTE: ALL SEA (SEA)
SOUTH OF PULUWAT
Remanulong
(REEF)
Remanuou
(REEF)
NAMOLUK ATOLL
MORTLOCKS
Kutu
ETAL ATOLL
LUKUNOR ATOLL
SATAWAN ATOLL
Oneop
Limiror
(SEA MARK)
Ropauk
(SEA)
Nukuoro Atoll
N
147°E
148°
149°
150°
151°
152°
153°
154°
155°
156°E
10°
9°
8°
7°
6°
5°
4°


Mariana Islands District
TRUST TERRITORY OF THE PACIFIC ISLANDS
Litataporou
(SEA MARK)
URACAS I.
MAUG IS.
ASUNCION I.
AGRIHAN I.
PAGAN I.
ALAMAGAN I.
GUGUAN I.
SARIGAN I.
ANATAHAN I.
FARALLON DE MEDINILLA
Fanupweiletal
(REEFS)
Ochensou Fanachik
(REEFS)
Maenpweiletal
(REEF)
Maenmetin
Ochopengek
(REEF)
SAIPAN I. (REEF)
Dist. Center
TINIAN I.
AGUIJAN I.
Matauen Won
(SEA)
ROTA I.
GUAM I.
(U.S.)
COCOS I.
N
141°E
142°
143°
144°
145°
146°
147°
148°
149°
150°
151°
152°
153°E
21°
20°
19°
18°
17°
16°
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14°
13°

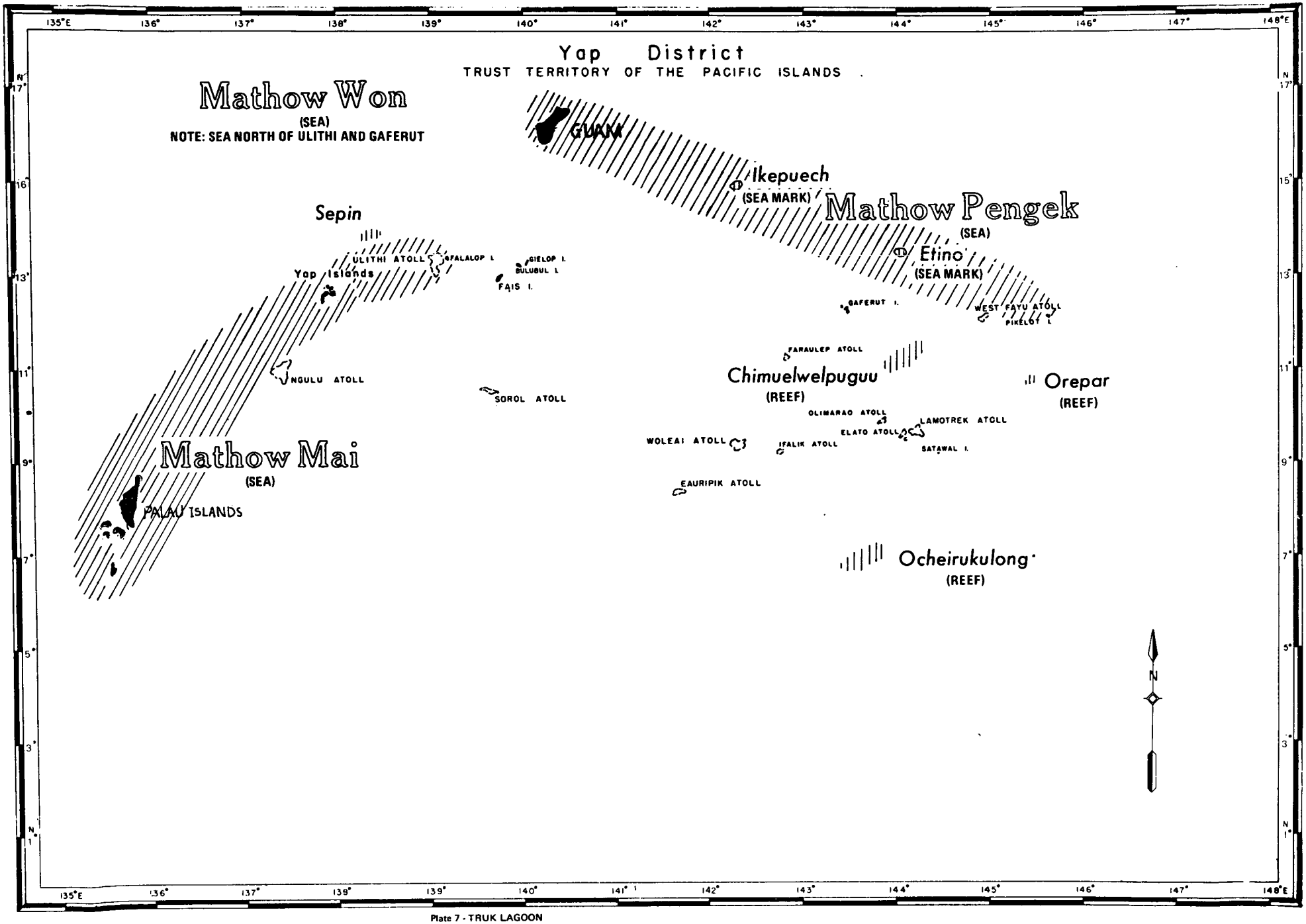
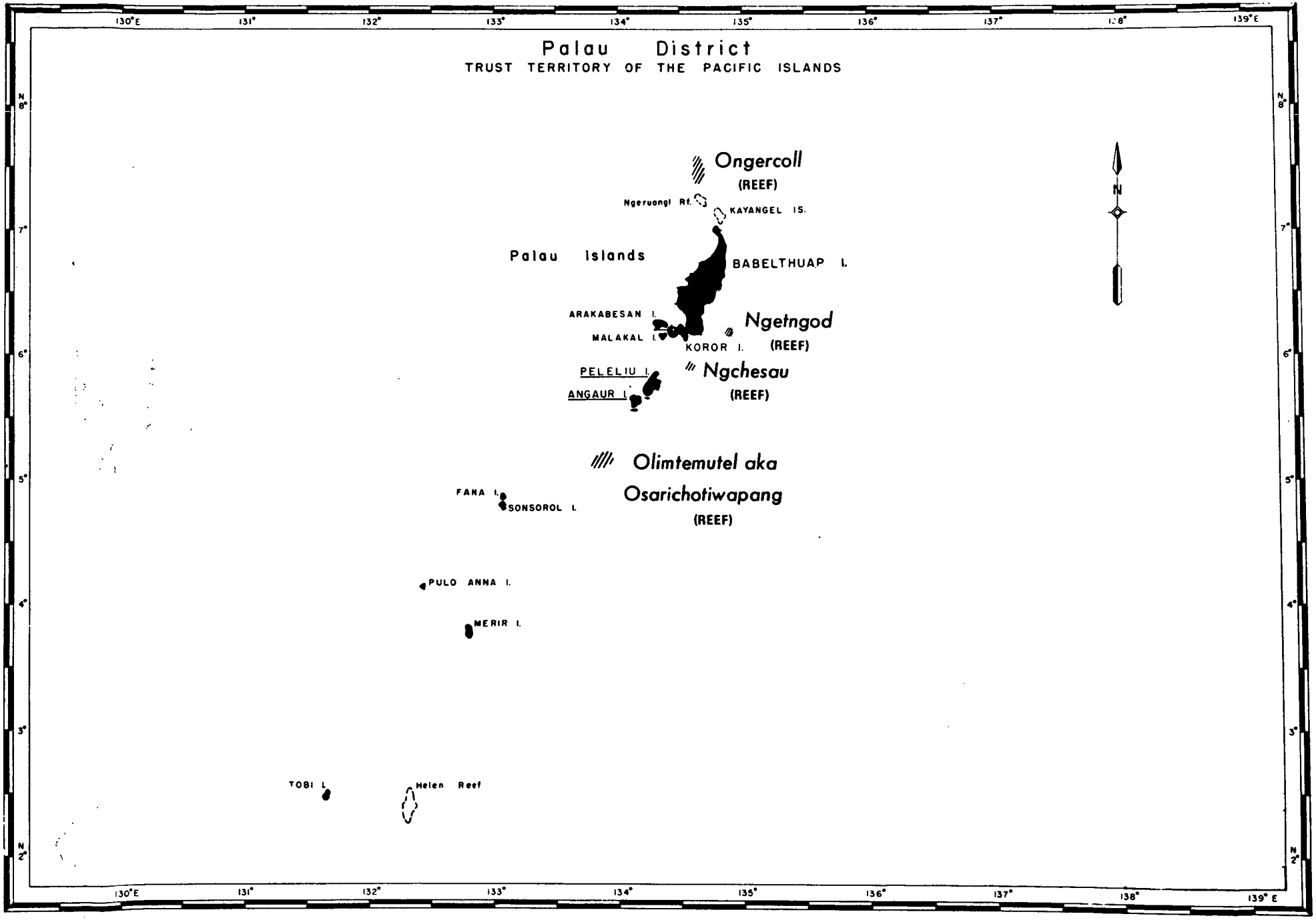


Plate 7 - TRUK LAGOON
Plate 8 - YAP district


Palau District
TRUST TERRITORY OF THE PACIFIC ISLANDS
130°E
131°
132°
133°
134°
135°
136°
137°
138°
139°E
N 8°
7°
6°
5°
4°
3°
N 2°
Ongercoll
(REEF)
Ngeruangl Rf.
KAYANGEL IS.
Palau Islands
BABELTHUAP I.
ARAKABESAN I.
MALAKAL I.
KOROR I.
Ngetngod
(REEF)
PELELIU I.
ANGAUR I.
Ngchesau
(REEF)
Olimtemutel aka
Osarichotiwapang
(REEF)
FANA I.
SONSOROL I.
PULO ANNA I.
MERIR I.
TOBI I.
Helen Reef
N
Tipapa
(SEA MARK)

Conclusion

Micronesians know that they own the sea surrounding their islands. To them any other conclusion is totally imcomprehensible. They own the sea because it is the part of the physical environment which dominates their lives. Nearly every aspect of life in Micronesia is significantly influenced or controlled by the sea. The geography of the islands accounts for the importance of the sea. Micronesia consists of about 2,200 islands with a total dry land area of 715 square miles. (Bryan E.H. 1971) The average size of an island is therefore less than one half of a square mile. Most islands in Micronesia are parts of atolls, narrow strips of land with the open sea pounding on one side and the calm waters of a lagoon lapping on the other. If one can not see both shores it is only because trees intervene. Such islands rarely rise more than a few feet above the surface of the ocean. There are no mountains or even hills. There are no rolling plains or forests. There are no rivers, lakes, streams, or pools. There are no game animals to hunt or trap. Breadfruit, pandanus, and coconut are the dominant flora; cats and dogs and rats and lizards--the dominant nonhuman fauna. Though essential, the land is tiny and relatively barren. It provides people with protection from the elements and a place to eat and sleep in comfort. But the real focus of life is on the sea. The sea provides food and tools and the medium to transport an islander from one cluster of humanity to another. As compared to the power and moods of the sea, the land is insignificant, humble, dull. The rhythm of life is dictated

by the sea. The turbulence of the sea tells people when they can travel and when they can't. It controls the habits of fish and the habits of the human seeking them. The sea sustains life with the food it provides, but also carries the potential to end it in the fury of one of its periodic rages. The sea challenges people, tests their character, provides life with drama and meaning.

The only way one can understand how a Micronesian feels about his sea is to adopt his perspective, to perceive life from his point of view. From that perspective the sea becomes property just like land. In collecting information for this paper, our questions at first caused confusion. There seemed to be no appropriate way to raise the issue of who owns the sea. Asking a Micronesian who owns the sea is like asking him who owns the lagoons or the land. Or like asking an inhabitant of a continental nation who owns the mountains, forests, deserts, lakes, or rivers. To a Micronesian the answer is obvious. A nation's territory is its surface habitat, and the sea is at least as important a part of a Micronesian's surface habitat as is the land.

In their minds, Micronesians see no logical distinction between continental nations and island nations in the allocation of the earth's resources. They can not understand the fairness of continental nations having rights in the resources of the sea of small island nations but islanders having no rights in the land based resources of continental nations. To understand the extreme resentment a Micronesian feels at foreigners taking large quantities of fish from his sea, one need only imagine how an American would feel if foreigners were freely drilling for oil in Texas, without permission and without the payment

of compensation. The territory and resources of continental nations are largely terrestrial. The territory and resources of small island nations are largely aquatic. Rights in both categories of surface area exist equally in the minds of men and should therefore be equally respected.

BIBLIOGRAPHY

Alkire, William H. (1965). Lamotrek Atoll and Inter Island Socioeconomic Ties. Illinois Studies in Anthropology, no. 5. Urbana and London: University of Illinois Press.

Alkire, William H. (1970). "Systems of Measurement on Woleai Atoll, Caroline Islands," Anthropos, 65.

Bascom, William R. (1965). Ponape: A Pacific Economy in Transition. Berkeley, Calif.: University of California Press.

Bloomster, Edgar L. (1940). Sailing and Small Craft Down the Ages. Annapolis, MD: U.S. Naval Institute.

Boyer, David S. (1967). "Micronesia: the Americanization of Eden," National Geographic Magazine, May 1967, pp. 702-744.

Brown, John Macmillan (1927). Peoples and Problems of the Pacific. London: T.F. Unwin, Ltd.

Bryan, E.H. (1971) Guide to Place Names in the Trust Territory of the Pacific Islands. Pacific Scientific Information Center, Honolulu, HI: Bishop Museum.

Carano, Paul and Pedro Sanchez (1964). The Complete History of Guam. Rutland, VT: C.E. Tuttle.

Chapman, Peter S. (1968). "Japanese Contributions to Micronesian Archaeology and Material Culture," in I. Yawata and Y. H. Sinoto, (eds), Prehistoric Culture in Oceania. Honolulu: Bishop Museum Press.

Christian, F. W. (1967). The Caroline Islands. London: Frank Cass and Co. Ltd.

Cockrum, Emmett Erston (1970). The Emergence of Modern Micronesia, Typescript thesis, University of Colorado.

Coulter, John Wesley (1957). The Pacific Dependencies of the United States. New York: MacMillan.

Dampier, Captain William (1703). A New Voyage Round the World, Vol. I. Printed for James Knapton at the Crown in St. Paul's Church.

Davenport, W. (1970). "Marshall Islands Navigational Charts." Imago Mundi, Vol. 15. New Haven, Connecticut.

Day, A. Grove (1964). They Peopled the Pacific. New York: Duell, Sloan, and Pearce.

Emory, Kenneth P. (1939). The Canoe Making Profession in Ancient Times. Honolulu: Bishop Museum Press.

Fischer, John L. (1954). Language and Folktale in Truk and Ponape. Typescript thesis, Harvard University.

Fischer, John L. (1957). The Eastern Carolines. New Haven, Conn.: Pacific Science Board.

Friis, Herman R. (1967). The Pacific Basin. New York: American Geographic Society.

Furness, William H. (1910). The Island of Stone Money. Philadephia: J.B. Lippincott Company.

Gatty, H. (1943). The Raft Book. New York: George Grady Press.

Gladwin, Thomas (1970). East is a Big Bird; Navigation and Logic on Puluwat Atoll. Cambridge, Mass.: Harvard University Press.

Goodenough, Ward H. (1953). Native Astronomy in the Central Carolines. Museum Monographs. Philadelphia: The University Museum, University of Pennsylvania.

Grey, Eve (1951). Legends of Micronesia. Saipan: T.T.P.I. Department of Education.

Hall, H. U. (1919). "A Marshall Islands Chart," Museum Journal, Vol. X, March-June 1919. University of Pennsylvania.

Heyerdahl, Thor (1952). American Indians in the Pacific. London: George Allen and Unwin, Ltd.

Kahn, E. J. (1965). Reporter in Micronesia. New York: W. W. Norton and Co., Inc.

Karig, Walter (1948). The Fortunate Islands. New York: Rinehart.

Krieger, Herbert William (1943). Island Peoples of the Western Pacific, Micronesia and Melanesia. Washington, D.C.: Smithsonian Institute.

Laubenfels, M. W. de (1950). "Native Navigators," Research Reviews, June 1950. Office of Naval Research.

Lewis, David (1971). "Expanding the Target in Indigenous Navigation," Journal of Pacific History, Vol. 6, 1971.

Lewis, David (1972) We, the Navigators. Honolulu: The University Press of Hawaii.

Linton, Ralph (1926). Ethnology of Polynesia and Micronesia. Chicago: Museum of Natural History.

Maling, Peter Bromley (1969). Early Charts of New Zealand. A. H & A. W. Reed.

Oliver, Douglas L. (1951). The Islanders. Cambridge, Mass.: Harvard University Press.

Pigafetta, Antonio (1969). The Voyage of Magellan. Englewood Cliffs, NJ: Prentice-Hall.

Poignant, Roslyn (1967). Oceanic Mythology. London: Hamlyn.

Pompey, Sherman Lee (1971). The Neglected Islands. Typescripts

Price, Willard (1936). Pacific Adventure. New York: Reynal and Hitchcock.

Riesenberg, Saul H. (1950). The General Position of Ponape in Oceania. Typescript thesis, University of California.

Riesenberg, Saul H. (1972). "The Organization of Navigational Knowledge on Puluwat," Journal of the Polynesian Society, Vol. 8, No. 1, March 1972.

Sharp, Andrew (1957). Ancient Voyager of the Pacific. Penguin Books.

Sharp, Andrew (1957). Ancient Voyager in Polynesia. Berkeley, Calif.: University of California Press.

Shorett, Alice (1970). Micronesian Backgrounds. Saipan: T.T.P.I. Department of Education.

Spoehr, Alexander (1957). Marianas Prehistory. Chicago: Chicago Natural History Museum.

Taylor, J. L. (1945). History of the Marianas. Saipan: Office of Education, Military Government Section.

Teresa del Valle, Maria (1969). The Importance of the Mariana Islands to Spain at the Beginning of the Nineteenth Century. Masters thesis, St. Louis University.

Tetans, Alfred (1958). Memoirs of Micronesia, 1862-1868. Stanford, Calif.: Stanford University Press.

Thompson, Laura (1932). Archaeology of the Marianas Islands. Honolulu: The Museum.

Thompson, Laura (1941). Guam and Its People. San Francisco: Institute of Public Relations.

Thompson, Laura (1945). Native Cultures of the Marianas Islands. Honolulu: The Museum.

Trumbull, Robert (1959). Paradise in Trust. New York: W. Sloane Associates.

Van Loon, Hendrik William (1940). The Story of the Pacific. New York: Harcourt, Brace and Company.

Vayda, Andrew P. (1968). Peoples and Cultures of the Pacific. New York: The Natural History Press.

Weins, Harold J. (1962). Pacific Island Bastions of the United States. Princeton, NJ: Van Nostrand.

Wenkans, Robert (1971). Micronesia: The Breadfruit Revolution. Honolulu: East-West Center Press.