GUAM: CHANGING PATTERNS OF COASTAL AND MARINE EXPLOITATION

Jane Jennison-Nolan
Department of Anthropology/Geography
University of Guam

Sea Grant Publication UGSG 79-12

UNIVERSITY OF GUAM MARINE LABORATORY

Technical Report No. 59

November 1979

This work is a result of research sponsored by NOAA Office of Sea Grant, Department of Commerce under Grants Nos. 04-4-158-4 and 04-5-158-45 to the University of Guam. The U. S. Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon.

GUAM: CHANGING PATTERNS OF COASTAL AND MARINE EXPLOITATION

Jane Jennison-Nolan
Department of Anthropology/Geography
University of Guam

Sea Grant Publication UGSG 79-12

University of Guam Marine Laboratory

Technical Report No. 59

November 1979

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGMENTS

An unpayable debt of gratitude is owed to the man whose project this originally was--the late Dr. Walter Scott Wilson, Professor and Chairman, Department of Anthropology, University of Guam. Whatever is of merit in this paper is to his credit alone.

I am indebted also to many informants, some of them my students, whose cooperation and patience facilitated the research task and whose specialized knowledge was indispensable.

To my colleagues at the University of Guam, Drs. Lynn, Haverlandt, and Callaghan, a special thanks for helpful criticism and support.

I. OBJECTIVES OF THE STUDY

Marine resources have traditionally been of great economic significance to the people of Guam even though the island is characterized as a high island rather than an atoll and its subsistence base in the past was agriculture rather than fishing. Marine-related activites have been an aspect of people's lives directly or indirectly since Guam was first inhabited. Today the quantity and quality of some of these resources and activities are threatened. Many practices, some traditional and some born of these modern times, are destructive of marine resources. In the meantime, the population rises inexorably, the economy diversifies, and as a result new demands and new stresses are placed upon the marine environment.

Before it can be decided what constitutes a proper balance among sometimes oppositional alternatives, and before programs and plans can be designed around such a balance concept, there is a need for information. The purpose of this study is to provide some data on the beliefs, attitudes, and practices of the people of Guam in relation to the shores and waters of Guam from pre-contact times to the 1970's. The goals of this study are to understand, explain, and predict the beliefs, attitudes, and practices of the people of Guam which directly and indirectly have affected or may affect the exploitation of the island's marine and shoreline environments. In addition, some portions of this paper may serve as baseline data when related research is done in the future.

II. DATA COLLECTION

The information presented in this paper has been gathered by means of three principal methods. Part III, Prehistoric Guam to the End of Spanish Rule, is the result of a literature survey which focused mainly on fishing, canoe building, and the influences concerning these activities. Part IV, Guam before World War II, is also based primarily upon pertinent literature sources. Part V, Contemporary Coastal and Marine Activities, is founded upon some literature review, but the primary technique was that of anthropological field methods of participant observation and utilization of key informants. Part VI, Survey Questionnaire Analysis, is the result of sociological survey methodology in which an interview questionnaire was administered to a sample population of Guam residents. This section is augmented by literature sources and anthropological field methods.

For purposes of clarity, it should be noted that references to the present shall mean no later than the end of 1977 when data collection was concluded.

III. PREHISTORIC GUAM TO THE END OF SPANISH RULE

Settlement of Guam and the Way of Life

Archaeological evidence, even when complemented by early chronicles, fails to provide us with detailed knowledge of Guam's prehistoric period. It is nevertheless possible to reconstruct some aspects of the pre-contact way of life experienced by the Chamorros, as they came to be called by the Spaniards.

Radiocarbon dating procedures indicate that some of the Mariana Islands, including Saipan and Tinian to the north of Guam, were inhabited as early as 1527 B.C. ± 200 (1). Thompson, who probably based her conclusion on the foregoing C-14 finding, stated "Historical, ethnographic, and archaeological evidence indicates that the aborigines of the Marianas arrived more than 3,500 years ago" (2, p. 54). The islands were peopled by seafarers who, because of linguistic, cultural, and physical links, are believed to have originated in the mainland of Asia and then migrated through the Philippine and Western Caroline islands, and perhaps Japan, before reaching the Marianas archipelago.

No definitive statements can be made concerning the number or effects of possible later migrations to the Marianas in the prehistoric period, but it is likely there were accidental voyages to the island group over the centuries. It can be stated that those who settled on Guam brought with them the knowledge of pottery making, rice cultivation, fishing techniques, and canoe building. The ancient Chamorros were horticulturists; they gathered food as well; they were expert fisherfolk; and they knew well how to make sea craft that would take them safely beyond their home island for trading. Later, when land-dwelling warm-blooded mammals were introduced, the Chamorros were also hunters, but until then their protein sources were mainly aquatic animals such as river eels and lagoon and ocean creatures.

On Guam, the pre-contract Chamorro settlements were located in coastal areas or near their garden plots in the fertile river valleys of the volcanic southern part of the island. The staple foods were rice, which was grown in the lowlands, and other starches which included taro, yam, and breadfruit. Coconut was also abundant. Thus, unlike the atoll dweller, the people of Guam were favoured by more variety in their plant foods, and agriculture formed the basis of their economy. Douglas Oliver has noted that atoll dwellers were generally better at fishing than high islanders because well developed fishing skills and techniques become much more a matter of survival on an atoll where soils are infertile and plant foods scarce (3). While the Chamorros did supplement a predominantly vegetable diet with fish and other seafoods rather than the other way around, and while they may even have been predominantly "land-oriented," popular notions about "island living" notwithstanding, the technologies and talents developed in connection with marine exploitation evidence impressive adaptability.

These adaptations concern canoe building and fishing techniques for the most part, but it should also be noted that chroniclers of the Spanish period recorded their awe of the exceptional swimming capabilities of Chamorros. Most striking, however, were the canoes the Chamorros built. Nothing else in the early chronicles of Chamorro culture received the attention to detail that was paid to the swift, well built, and, to the European, altogether unusual sailing vessels they found in use on Guam.

Canoes

Most of the information now available concerns the attributes of the seagoing single outrigger canoe that utilized a lateen sail of palm matting; little has been recorded of the galaide, or inshore canoe, which may not have been indigenous to Guam by the time mentions were made of them in accounts by Careri in 1696, Anson in 1748, Crozet in 1772, and Freycinet in 1829 (4). In 1521 Pigafetta, Magellan's chronicler, was the first to describe the offshore canoe, but the most detailed description is that of Anson, quoted extensively in Canoes of Oceania and exerpted below (4, p. 413).

> . . . their flying proas, which have been for ages the only vessels used by them, are so singular and extraordinary an invention that it would do honor to any nation, however dexterous and acute . . . if we examine the uncommon simplicity and ingenuity of its fabric and contrivance, or the extraordinary velocity with which it moves, we shall in each of these articles, find it worthy of our admiration and meriting a place amongst the mechanical productions of the most civilized nations . . . .
>
> The construction of this proa is a direct contradiction to the practice of all the rest of mankind. For as the rest of the world make the head of their vessles different from the stern, but the two sides alike; the proa, on the contrary, has her head and stern exactly alike, but her two sides are very different; the side intended to be always the lee side is flat, and the windward side is made rounding in the manner of other vessels: And, to prevent her oversetting, which from her small breadth and the straight run of her leeward side would, without this precaution, infallibly happen, there is a frame laid out from her to windward, to the end of which is fastened a log, fashioned into the shape of a small boat . . . .
>
> . . . When [the proa] alters her tack, they bear away a little to bring her stern up to the wind, then by easing the halyard and raising the yard and carrying the heel of it . . . they fix it in the opposite socket . . . whilst the boom at the same time . . . [is shifted] into a contrary situation to what it had been before, and that which was the stern of the proa now becomes the head, and she is trimmed on the other tack.

Accounts of canoe size and manner of construction vary according to the writer and over the years; however, the hull was generally narrow with a beam not exceeding two feet and a length ranging from approxi-

mately 26 to 40 feet. Some hulls consisted of one piece of tree trunk, typically breadfruit tree; others were made of two pieces joined end to end, and still other hulls were formed by side planking above a rounded keel. Anson noted that no iron was used (4).

The manufacture of these fine sailing canoes was monopolized by the noble caste (Matua) who were also the deep-sea fishermen, the sailors, traders, and manufacturers of tortoise shell money (2, 5). As Spanish influence increased, many cultural traits extant at the time of contact began to change or disappear altogether. Canoe making was one victim of this process.

According to Haddon and Hornell, "After Crozet [leader of a 1772 French expedition] we lose sight of these magnificent sea craft" (4, p. 418). Canoes continued to be used on Guam into the 20th century, but the design of the 19th century canoes has been identified as Carolinian and Philippine, the latter being a large double outrigger type better adapted for carrying cargo (4). The canoes of this century and the late 19th century were no longer ocean-going craft; Thompson refers to the type as "a crude inshore canoe" (6, p. 112).

The survival of fishing practices fared somewhat better than the body of knowledge encompassing canoe making. This is not very surprising, considering the unprecedented social upheaval the Chamorro experienced. The colonial and christianizing influence of the Spaniards completed the breakdown of the traditional caste system in which both activities were allocated to those in the highest ranks of the social hierarchy, but the need for food is a far more fundamental need than any need to preserve tradition, and so fishing activities persisted while the art of canoe making did not. Moreover, the demise of the canoe is directly related to the decimation of the Chamorro population and to Spanish policy: epidemics, typhoons, and particularly the intermittent but fierce warfare between Chamorros and Spaniards reduced an estimated 50,000 to 100,000 population to approximately 1,500 by 1783. In order to control the rebellious Chamorros, the Spanish authorities had concentrated the inhabitants of the Marianas in six church villages on Guam by 1700 (5). Thus, one of the major functions of the sea-going canoe, that of trade, became obsolete when there was no one left on other islands to trade with, except for a few holdouts on Rota who were left to themselves. The colonial government policies fostered land-oriented activities and altitudes: the laws of the Indies' obliged people to live in villages and forbade them to change dwellings; municipal work groups were organized to labour on public projects designated by each village magistrate; the people were obliged to contribute to support of the church; a property-owning class emerged, descendants of the noble caste, with families controlling land parcels sometimes as large as 1,500 hectares; and the centuries since subjugation of the Chamorros are marked by repeated but never completely successful efforts to foster agriculture on a large scale.

Fish and the Economy

Subsistence level food production was the pre-contact pattern and it persisted for centuries, until a wage-based economic system reached

full bloom after World War II. Fishing, as one aspect of the Chamorro adaptation to their environment, was not lost entirely, but the techniques and equipment, perhaps even the kinds of fish preferred as food, have undergone modification over time.

Archaeological sites in the Marianas have yielded a variety of artifacts connected with fishing activities. Sinkers, lures, hooks, spinners and gorges were some of the implements used in ancient times. Grooved spool-shaped lures made, according to Bengt, of "some kind of stalactite," have been discovered (7, p. 152). A right-angled gorge of mussel shell, with a notch at the angle for attachment of the line, was also used in pre-contact times. Bengt speculates it may have been used for catching flying fish. Pearl-shell U-shaped hooks with grooved shanks for line attachment have been excavated, but archaeological sites have not yielded turtle-shell hooks which were said to be in use in reports by both Urdaneta, writing in the first half of the 1,500s, and Freycinet, who arrived at Guam in 1819 (7, 5). Fish bone barbs were attached to spears, as was human bone, and such spears were probably used in fishing and warfare.

Spanish chronicles provide additional data to supplement the archaeological record concerning exploitation and utilization of marine resources. Shells of various kinds, including trumpet shells, were used or sounded in connection with the funerals of ancient Chamorros. The catafalque was decorated with shells and other adornments, and fishhooks were sometimes buried with or near the deceased (8).

Early Spanish accounts tell of bare-handed fishing, usually in connection with stories of swimming feats. The division of labour in fishing activities was, in pre-contact times, according to sex and caste: men did the fishing, but only men of the noble caste could do the deep-fishing; low caste men were restricted to eel fishing in rivers with wood-tipped spears. During the Spanish era the caste system disappeared and, as the art of making seagoing canoes faded from practice, so did deep-sea fishing. In this period also, both sexes fished, but Thompson speculates that it was the men who made the nets used in lagoon fishing (6). Nets are depicted in artists' drawings of early Chamorros and it is therefore probable that some net fishing was done in pre-contact times; however, talaya, the Chamorro word for throw net, is so closely related to the Spanish for throw net (tarraya) that it is believed to have been introduced.

Concepts of land ownership and beliefs regarding the supernatural also influenced fishing on Guam. Each district was headed by a chief who controlled the manner in which the land in his district was used. He also controlled access to his district: outsiders needed his permission to enter. As result, fishing, farming, plant gathering, and hunting, even in Spanish times, tended to be confined to a group's own district. Reinforcing this custom was the post-contact emergence of a belief in supernatural beings called taotaomona, the ghosts of ancestors who guarded each district. These ghosts may have been thought of as more than just ancestors, however, for one authority reported that they "...were formerly magas (chiefs) of the various localities" (G. Hornbostel,

quoted in 6, p. 99). When entering someone else's district, whether for fishing, chopping wood, hunting, gathering, or anything else, certain behaviors were required vis a vis that district's taotaomona, (no singing for example), but of utmost importance was the need to request the taotaomona's permission. Because the taotaomona were thought of as headless men with supernatural strengths who haunted and prowled about a district, this would have tended to discourage people from trespassing lands not considered as belonging to their own group. The combined impact of land ownership concepts and taotaomona beliefs was to restrict fishing pressures to the waters adjacent to each group's own district. This is conservative of natural resources in that it levels, to a degree, the islandwide fishing impact instead of allowing fishing to take place in the best, or preferred, areas. Another effect would have been to foster and reinforce cooperative attitudes within districts, especially among relatives. More will be said about these practices later.

Little is known about the kinds of fish the Chamorros preferred to eat. We can infer that the pre-contact peoples thought large fish from beyond the reef were desirable because canoes were used for deep-sea fishing and because the size of some of the hooks and other devices found at archaeological sites is inappropriate to small, lagoon fish. One clue to the Chamorro appetite in the Spanish period, after the seagoing canoes were no longer made, comes from the record left by Crozet in 1772. The sailors from his ship spent some time fishing on the island and caught eel, mullet, goby, and carp, among other types, but chiefly freshwater fish. They discovered that ", . . the natives would not eat them. They preferred saltwater fish . . . " (5, p. 112). Thus we may infer that, given the choice between riverine sources and reef fish, that being the only saltwater alternative to deep water fish, the reef fish must have been preferred. One wonders too if freshwater fish might have been rejected as "low caste" food. It can only be presumed that various available shells and shellfish such as Trochus, lobster, and crab might also have been eaten. Additional comments about eating preferences will be made in Parts V and VI, which deal with contemporary Guam.

At various times throughout the Spanish period, the Chamorro population was permitted to trade fish and agricultural items with visiting whalers, galleons, and other vessles; however, when the governors from time to time monopolized such trade, the effect was to depress the level of fishing pressures to a subsistence level, as it had been before the Spaniards arrived. A recurrent theme in the Guam economy has been a shortage of natural resources and a consequent difficulty in achieving economic independence. During the six-year governorship of Villalobos, beginning in 1828, some efforts were made to improve economic conditions on the island. Among several innovations attempted by Villalobos was the commercial exploitation of marine products such as tortoise shell, mother-of-pearl, and beche de mer for exportation. The record does not indicate the exact fate of this venture, but de la Corte, writing some 40 years after the time of Villalobos, noted that "The Marianas produce neither tortoise shell, turtle, mother-of-pearl shell, pearl oysters nor any other valuable sea products" (9, p. 62).

De la Corte, who was governor for 11 years beginning in 1835, also provides us with some detail on fishing methods and thereby additional information on diet. He mentions seasons for manahac (young rabbitfish; May, June, and July when the moon is on the wane), tiao (juvenile goatfish; April to August), and atuli (mackerel, or bigeyed scad; during the moons of June through August), but provides little concerning methods of fishing for these small fish. An ingenious practice de la Corte regarded as ancient, which was no longer done on Guam but instead on Rota, was the method for catching achuman (mackerel scad). Exerpted below is de la Corte's account of the technique for catching achuman (9, p. 61).

> Daily the fishermen went out in a canoe to a certain place and fed the fishes on grated coconut, contained in the conical half of a coconut shell, which was tightly fastened, like the lid of a censer, by means of three cords passed through holes in its rim, to a large round stone; when this stone with its coconut shell helmet was lowered over the side, the grated coconut . . . floated out of the top and was eaten . . . by the fishes who appeared regularly to be fed. In from one to three months time, a great number of them had gathered together. Then the fishermen used the stone-and-coconut 'censer' as weight for a deep bagnet, suspended from a hoop six feet in diameter, into which, as soon as it was lowered, the achuman crowded in search of their usual food. By slowly raising the net until it was close to the surface, great quantities of fish were secured.

Like Villalobos before him, de la Corte attempted to improve economic conditions and foster surplus farming. And, like Villalobos, he failed. The islanders kept to their traditional ways. There was virtually no specialization of labour beyond age and sex: "Every man is everything and no man is anything . . . each one plants whatever he is going to eat . . . makes his own house and clothing, raises his own animals or hunts and fishes those he needs . . . " (5, p. 156).

Summary

Although the foregoing has not been and attempt to present a full description of Guam's past, even this limited focus on marine-related activities and attitudes affords a glimpse of some dominant cultural patterns. What people do or believe is related one to the other as well as to other aspects of their culture. The Chamorro, or Guamanian, pattern demonstrates a linkage among social and political organizations, tradition, innovation, belief systems, and economic organization. Perhaps above all in terms of importance in binding it all together has been the iron thread of adaptability. Foreign influence had a profound, even devastating, effect on the indigenous population, but they accommodated change, borrowed and reinterpreted customs, and even managed to preserve some ancient patterns in the process.

By the end of the Spanish period, the people of Guam still spoke Chamorro, their ancient language, although now it was considerably expanded with words borrowed from other languages, principally Spanish. The economy was organized as it had been for centuries--on subsistence agriculture supplemented by fishing and other activities. While the peso was available as a form of exchange, the ancient system of barter, oceangoing canoe was lost, but undoubtedly ancient fishing knowledge and practices survived.

The next section continues the focus on marine-related activities and attitudes into the 20th century.

IV. GUAM BEFORE WORLD WAR II

Prewar Economy and Fishing

In 1898, Guam was ceded by Spain to the United States and, except for the period of Japanese occupation during World War II, has remained under the American flag ever since. For the first 50 years as a U. S. possession, the island was under military rule, and until 1963 a security clearance was required for entry to Guam. By act of the U. S. Congress, Guamanians became citizens of the United States in 1950. In that same year local civilian government was established (the Government of Guam), and ultimate authority was transferred from the Navy Department to the Department of Interior.

Under naval rule the economy began to change, at first gradually but gathering momentum with the passing years. Some military policies fostered development of a money economy; some did not. Among the former was employment by the Navy. By 1911, one-fourth of the employable Guamanian men worked for the Navy (6). There were not enough jobs for everyone, however, and Guam's economy continued to be based in extended family subsistence patterns through the Second World War and for a short time thereafter. It is the purpose of this section to examine only one of these subsistence patterns: fishing.

The best account concerning fishing in the prewar period is to be found in Laura Thompson's Guam and Its People (6). The fieldwork upon which this book is based was accomplished in the late 1930s. In that the data is available in one contemporary source, the following will merely summarize Thompson's descriptions. In addition, summary and interpretive comments will be offered concerning Jesus Barcinas' 1938-1939 diary notes which constitute Appendix 2 of Thompson's book.

It was Thompson's opinion that most of the basic fishing techniques in practice on prewar Guam were probably based on ancient prototypes. There can be no doubt that use of hook and line is such an example. The materials of which hooks and lines were made were of course different from the natural products used by the prehistoric Chamorros, but the concept remained the same in principle. Hand fishing, done mainly by women in prewar Guam, is another instance of a fishing techniques with a long past. Still another such technique was the use nets in fishing, except that the nets were no longer made of natural fibers.

Although women engaged in clam digging, spear fishing, using a casting rod, and hand fishing, whereby fish were driven into holes in shallow tidepools by beating the water and were then grabbed in their retreats, men continued to play the principal role in fishing activities just as they had for centuries. Various kinds of net fishing and the use of fish traps were two techniques managed by men. In the thirties, two inshore canoes were used to place a net around a school of fish sighted by a master fishermen in a third canoe. As the ends of the net were drawn together to form the circle, small boys beat the water with

hands and sticks to "herd" the fish into the net enclosure. A fourth canoe was reserved for holding the fish speared by the fishermen. When this sort of fishing was carried out by a single family group of male relatives, the catch was distributed among family members or occasionally some part was given to or bartered with other villagers, but it was rarely sold. When lagoon net fiching was done by those who made their living by fishing, the group was likely to be based in the vicinity of Agana but to fish anywhere the fishing might be good. Also, a portion of the catch would be paid to the owners of the canoes and nets if the group had to borrow them, and the rest of the catch was sold commercially in Agana. (Figure 1 is a general locator map for place names used in this paper.)

In Merizo on the southwest coast of Guam where Thompson did her field research, manahac and atuli runs were occasions for men, women, and children to participate in the netting. It should be noted that, contrary to de la Corte's designation of manahac season cited in Part III, Thompson identified the last quarter of the first moon in April and October as the times for manahac.

Another type of fishing net used in prewar Guam was the cast, or throw, net. This type of net was used inside the reef for catching small fish.

Fish weirs and traps were in use before the war and were a licensed activity, there being 35 weir licenses issued in 1940. This is a rather passive form of fishing: once the traps were constructed inside the reef, only a daily trip to empty the catch was required.

Night spearfishing by torchlights made of coconut spathes, especially from November through January, was also reported by Thompson. Her elderly informant remembered that coconut spathes, in addition to dried coconut leaves and swordgrass, were also used in the past.

Two methods of stupefying fish were again practiced during the American period after having been prohibited in Spanish times, indicating origins distant in time. The fruit of a beach strand tree known as puting (Barringtonia asiatica) has a narcotic effect, as does balate hinate (sea slug) when rubbed between the palms of one's hands with sand and then thrown into a shallow pool.

Jesus Barcinas was a Merizo teacher, a councilman in the Guam Congress, a farmer, and an expert fisherman. His diary mentions several kinds of fishing forms: seine dragging for manahac; cast net for atuli; hook and line at night for sagsag (squirrelfish); fish weirs in the Merizo lagoon; night fishing with kerosene-filled bamboo lengths for light if one could afford to buy kerosene and coconut spathes if not; and women digging for clams. He observed that while nearly all the men of the village fished, the older men fished with spears and throw nets but the younger men typically used poles and lines. He also indicated that the best catches were with poles.

Repeatedly throughout the diary mention is made of fishermen from other villages, particularly Agana. As the weeks went by in the spring

Figure 1. General Site Locator Map: Bay, Beaches, Points, and Other Coastal Features.

of 1939, and as the expected manahac season approached, again and again entries noted that the Agana fishermen were "still here," "still fishing", that the Agana fishermen had returned, or that Umatac fishermen had come to Merizo to fish. At one point he wrote "A local [Merizo] fisherman asked me if it is proper for the fishermen from Agana to fish in Merizo. He seems to dislike the presence of the strangers" (6. p. 323). One wonders if perhaps this statement expresses an attitude that is a survival from a time when it was unquestionably beyond the bounds of propriety to fish in a district not one's own.

Another diary entry regarding the blowing of a conch shell to alert the village to a fire seems to recall the ancient practice, mentioned earlier, of sounding a trumpet shell for a Chamorro funeral.

Despite centuries of colonization and alien domination, there appear to have been many cultural practices during the prewar years in Guam that were reminiscent of very old customs. Not surprising is that old ways of doing things assumed more or less different forms through time and that contact with still another culture group, this time the Americans, required of the Guamanians still more demonstrations of their adaptability.

V. CONTEMPORARY COASTAL AND MARINE ACTIVITIES

Present day fishing activities encompass almost all available natural sites, ranging from river shrimping to reef net-fishing to deep-water fishing. Each contemporary fishing activity has, generally, a traditional predecessor. Not only do the types of fishing reflect traditional activities, but the techniques of today reflect earlier traditional techniques. The pago bark line of the past has become the nylon line of today, and the proa has been replaced by an outboard motorboat; but the manner in which the line and the boat and other tools and tackle of fishing are used is often still very traditional.

Net Fishing

While today's net-fishing techniques reflect traditional techniques, the nets themselves are made of modern materials. Several generations ago fibers from dried pago bark and from pineapple leaves were used to weave nets. Now, it is an impractical activity to make nets locally; relatively inexpensive nets which can be made to last a long time are available from Japan or the Philippines. But nets must always be maintained in a state of good repair, and this means that the knowledge of weaving principles continues on Guam. Net making, however, is still done by a very few older fisherman, who use nylon thread instead of traditional materials because nylon is easier and faster to work with. But even with the use of nylon it may still take two to three weeks' work to make a net.

There are four generally used types of nets on Guam: the lagua (a surround net or "pocket seine"), the tekin (a gill net), the talaya (a throw net), and the chinchulo (a drag seine). Each fisherman appears to favor one or two types and generally to restrict his use to his favorite types.

The lagua, or surround net, is a large net approximately 200 feet long and five feet deep. Its use requires a minimum of six people. Mesh openings in the net are about one-half inch, but the center pocket has smaller openings. Weights are located along the bottom of the net and floats are attached at the top. Floats are typically styrofoam, but sometimes pago wood is used. To begin the fishing operations, the net is set in a wide semi-circle with the pocket in the center of the curve. Two persons position the net by slowly feeding it off two tire inner tubes, upon each of which half of the net has been placed. They then station themselves at each end of the open net and the others in the group form an arc in front of the open side and drive the fish toward the pocket by shouting and beating the water with their hands or sticks or palm fronds as they move toward the net. At the same time, the two stationed at the open ends of the net move toward each other, gradually closing the net to form a circle. After the circle is closed the net is constricted slowly as the fish are driven into the center pocket. The pocket is then lifted and the catch is dumped into a con-

tainer. This is essentially the same technique as described by Thompson, except that she labeled the method as seine dragging (6).

The lagua is used to catch a variety of fish such as: mackerel (atuli), parrotfish, surgeonfish, needlefish, jacks, goatfish (especially tiao, the young goatfish), mullet, rabbitfish, snapper, squirrelfish, and flounder (tampat).

The lagua, because of its size, is used when the weather is calm and typically at low tide. It is normally used at night (but may also be used in daytime) and is usually used only during certain seasons such as when tiao, juvenile rabbitfish (manahac), and juvenile skipjack (ii) are running. Informants were not in agreement as to how the fish are located when using the lagua at night. Typically, a light is not used lest the fish see the fishermen and disappear; however, some indicated that the net was positioned after the master fisherman had decided where the fish were (in the dark), and others said the net was placed simply at random in the hopes that luck would play a role and fish would be caught. If it is tiao (goatfish) the fishermen are after, then the net is more likely to be used at night and the placement of it to be haphazard; if it is manahac, then it is done during the day and the fish can be seen.

The lagua is ordinarily used for schools of smaller reef fish. A typical catch of tiao taken after about 15 "runs" of the net is about 40 pounds, though when the manahac are running an afternoon's catch may be as much as 500 pounds (10). Thus the lagua can, during certain seasons when the fish are running, yield substantial quantities of fish.

A specific form of lagua use is known as "gadi," which refers to nighttime use of the lagua and involves 20-30 persons (or "as many who want to come," in the words of one informant). The technique and conditions are as above, but the difference seems to lie partly in the involvement of more people and partly in that the ambience seems rather more festive. Still, the primary activity is fishing, and each one who assists is given a share of the catch, after the net has received its share.

One informant speculated that gadi was very popular among the youth of previous generations (a fact attested to by his grandparents) for the reason that it afforded young people an opportunity to spend time together after dark without the rigid chaperoning required in other settings. Now, with less dependence on subsistence activities combined with different cultural standards regarding courtship, one might expect to see less of this type of fishing, or perhaps fewer numbers of young people involved. But the activity persists--perhaps because it is so much fun.

The tekin is a gill net which is usually of rather heavy nylon mesh and varies is length from 50 to 100 feet and in depth from five to ten feet. Like the lagua it is weighted at the bottom and has styrofoam or pago bark floats to keep the top edge at the surface. Mesh size varies from one-quarter inch to two or three inches. These nets are used in

deeper water, such as on the outside of the reef at points where there are channels. They are usually set at high tide to catch the fish as they exit from the lagoon area when the tide turns.

The net may be arranged with the ends in curlicues so that fish which reach the ends, i.e., the wrong part of the net as far as the fisherman is concerned, will be turned back again toward the middle of the net. An equally imaginative technique is to arrange the middle, or center, of the net in a zig-zag fashion in order to confuse the fish and induce them to stay in that part of the net by increasing the possibilities for them to get caught in the net.

The tekin may be left in position overnight or it may be set for a much shorter time--one and one-half to two hours. The fisherman may walk slowly up and down the net taking fish out as he goes, if the net is set in relatively shallow water. This prevents larger fish from attacking the small trapped fish and damaging the net.

Tekin fishing can be done during the day or night. If done in daylight hours, it can be accomplished by one person, but if done at night the fisherman usually has help. A sandy bottom makes the operation more convenient, but is not considered an absolute necessity. Since it is typically used in water that is deeper than the conditions for lagua use, the risk of tearing the net on jagged corals is diminished.

Fish caught with the gill net include adult mullet (laiguan), squirrelfish (suksuk), white snapper (mafute), red snapper (tagafi), goatfish (salmonetijos), jack (tarakitijos), surgeonfish (kechu) rabbitfish (hiting) and silver perch (guaguas). If three nets are used, 50-55 pounds is a good catch, and if as many as seven nets are used, 90 pounds represents a good tekin catch.

Gill nets have been much criticized by both fishermen and government. If the mesh size is so small that immature fish are caught, there is concern that the lagoon population will diminish. This is, in fact, what many believe has happened--fishermen and government alike. In addition, there seems to be some scientific basis for this concern. Research done in the Merizo lagoon revealed high fish counts for juvenile reef fish in that area, which suggests the possibility that lagoons serve as nurseries for many species of fish (11). The law states that mesh size must be no smaller than one inch so that juvenile fish may escape and survive to reproduce. One exception to this is that during manahac season smaller mesh size may be used. The other exception is for casting nets because the impact of the talaya is considered insignificant and because the fishing done with this net occurs close to shore.

The throw net, talaya, is used by a single individual. The diameter of the net varies somewhat, but typically it is 20 to 24 feet wide. Mesh size also varies--from one-half inch to one and three-quarters inches. Such a net may last six or seven years, perhaps longer, and maintenance is virtually zero unless it is used in rocky areas, but typically these areas are avoided in favour of sandy bottoms.

When the tide is on its way in is considered the best time to go castnet fishing; second choice is when the tide has turned and is on its way out. It is a daytime fishing method because one needs to see the fish before making the decision to throw the net. One informant explained that he liked bright sunny days for talaya fishing and that it was disadvantageous if the weather were partially cloudy or if a rainshower were approaching from one direction while full sun still shone in the other. If either of the last two conditions exist, there is more likelihood the fisherman can be seen by the fish. Calm water also allows the fish a chance to see the fishermen, but rough days are bad for the fishermen because he needs to be able to see the fish. So "in-between" surface conditions are considered ideal.

Timing the throw is the crucial aspect of using the castnet. There are probably a variety of intuitive judgments which enter into what culminates in the moment of decision, but in the objective sense the net should fly just as a wave (or wavelet) is breaking over the fish and they are unable to see or have the opportunity to escape. This kind of fishing is hard work and requires much patience. The net is heavy, with lead weights all along the perimeter, and most of this weight is borne on one arm as the fisherman stands ready to cast again when the moment is right. In the old days, the fiber nets may have been heavier, especially once they were thrown the first time and became wet, but the stone weights of yesterday may have weighed as much as the lead weights of today. The nylon thread used today weighs very little, whether it is the first throw or the tenth.

As with the lagua and tekin, a variety of fish is caught with the talaya. These include rabbitifsh, parrotfish, white snapper, surgeonfish, mullet, jack, goatfish, rudderfish, and mackerel. A catch of 75 pounds in less than on hour would be considered a good one.

Use of the talaya is one way to catch atuli (bigeyed scad mackerel), but netting for atuli is a regulated activity in two bays of southern Guam: Inarajan and Agfayan bays. Without a Department of Agriculture permit, atuli netting is prohibited in those places. Issuance of a permit carries certain restrictions: only one permit is issued per day and it is valid for only one day. Regulation Number 30 of the Division of Fish and Wildlife, Department of Agriculture, Government of Guam, is designed to preserve tradition. The regulation stipulates that such fishing is to be done according to the old Chamorro custom of involving the community in the atuli fishing and of sharing the catch with the community.

The chinchulo, or drag seine, is a two-person net with mesh size a little smaller than the gill net. It is typically opened in the lagoon and then, with one person at each end, it is dragged to the shore. The catch, therefore, consists typically of the smaller varieties of reef fish that would be found in relatively shallow water.

Pole and Deep-Sea Fishing

Virtually any location on Guam is a good place for using a fishing pole, but certain times of the day are considered better than others,

depending on the tide cycle. The consensus is that the midpoint between low and high tides is the best time when pole fishing from shore or reef.

In Agana, at the boat basin, it used to be possible to use nets during manahac runs, but now nets are prohibited except for very early morning hours when no one wants to be fishing there anyway. Barring net fishermen has led to many complaints and at least one altercation in which the police were involved and arrests were made (12). So it is the fishing rod that is, de facto, the sole fishing method used in that location. During manahac runs the water is teeming with fish and the banks are teeming with people, which leads now and then to confusion and tangled lines, but there seems to be enough for everybody. The small fish come streaming into the channel in the morning to seek protection from their predators under boats and around pilings and floating walkways. At evening time, the process is reversed. The fishermen are waiting for them with baited hooks, the bait being almost anything. Wads of bread are used as well as pieces of paper, surgical rubber, manahac pieces (they are cannibalistic), and manufactured items such as plastic strips and lures.

Some of the catch is for eating but the mackerel also make good bait for catching their predators, the skipjack, tuna, and barracuda. While the manahac run, then, there are actually two kinds of pole fishing taking place at the boat basin: the manahac fishing as well as the larger fish angling which is done by those who have already caught enough manahac to use as bait for the manahac predators. The latter group locate themselves further away from land toward where the boat channel deepens and widens to the sea.

Deep-water high speed trolling and bottom fishing are done on the leeward side of the island, from Merizo north to Ritidian Point; the Pacific Ocean side of Guam is rarely fished outside the protected bays and lagoons. Relatively few people fish in blue water even on the protected side, despite usually favourable conditions and the presence of good food fish and prized gamefish such as blue marlin. It is expensive both to buy and maintain a boat, and the poles and other equipment for deep-sea fishing are relatively more expensive than inshore equipment of the same kind.

In an effort to obtain a general impression of the "typical" pole, reel and test line used for different kinds of fish and fishing situations, marine supply store personnel were asked about the kinds of equipment sold. Table 1 represents what may be considered typical equipment used in different fishing situations. The consensus of opinion among the people who sell fishing equipment is that sport fishing is rare on Guam, that the equipment used is overpowered for the fishing done so that it becomes a matter of "just reeling it in."

Spearfishing

Another fishing method that has a long history is spearfishing. Sometimes this activity is carried out as an adjunct to another method,

TABLE 1

Fishing Equipment Used, According to Location and Fish Size

Type of Fish	Rod and Reel Type	Weight of Line	Where Used
Very small fish, e.g. the 2" ii (jack)	7' pole 302° reel	Up to 15 lb.	Close to or from shore
Med. size, up to 10 lb. (skipjack, mackerel)	8½' pole 306° reel	Up to 25 lb.	Inside reef toward breakers
Med.-lge, but less than 30 lb. (surgeonfish, grouper)	9-10' pole 486° reel	30 lb.	On reef for casting into deep water
Large/50 lb. (tuna, wahoo, barracuda, mahi-mahi)	11-12' pole 488° reel	50-60 lb.	On reef casting to deeper water or offshore boat

as in spearing fish inside fishing nets instead of picking them up bare-handed. In other instances, spearfishing does not accompany another techniques.

Two basic types of spears are in general use: the commercially manufactured speargun, of which there are several types, and the home-made, traditional handspear. A very effective homemade speargun is also seen occasionally, and especially coveted by avid spear fishermen is this type of speargun which has been made in Palau or after Palauan design.

Spearfishing is done both inside and outside the reef, and during daylight hours as well as at night. It is considered easier and therefor better to go at night when the fish are sleeping--it then becomes more a matter of finding their sleeping holes and crevices rather than trying to hit an unpredictably moving target which has more opportunity for evasive action as is the case during the day. Night spearfishing has a Chamorro designation--sulu, an indication that the custom is old. Before the days of underwater flashlights, light was provided by dried palm frond torches.

Spearfishing is quite popular in Guam waters but, like talaya fishfing, the individual impact is not very great; however, there are a great many more spear fishermen than castnetters. Also, a wider variety of fish end up on the point of a spear than in the mesh of a castnet. The spear fisherman may find skipjack, barracuda, grouper, squirrelfish, surgeonfish, snapper, parrotfish, wrasse, dogtooth tuna, turtle, eel, octopus, sea cucumber, sea urchin (these last two are considered inedible by many Guamanians) -- or in other words, virtually anything that lives at depths at which the human being can go with a scuba tank strapped on the back. That is not to say, however, that spearfishing is done only with scuba; much of it is done inside the reef, just over the reef, and there are some who free dive and fish to 60 feet or more.

Traps/Fish Weirs

While the principles in catching fish by means of lagoon traps have likely undergone no change over a very long time, both the materials used and attitudes toward them have. Although weirs may vary in complexity, the description below concerns a less complex weir type. The design of the trap is relatively simple. The trap portion of the apparatus is constructed of wire and its dimensions are approximately six feet by six feet and seven to eight feet high Extending at angles up to a distance of 150 feet from the trap itself are two "wings," set at approximately 90 degrees to each other and made of chicken wire supported by stakes. (Only the stakes protrude from the water, which is mystifying to one who does not know their purpose.) Bisecting the right angle formed by the wings is a third chicken wire stake arm called a "leader." This and the wings funnel fish movements along their length into the trap.

The trap, or fish weir, is an intensive fishing method: it operates 24 hours a day every day. For this reason there are now stringent regulations governing their use. Regulation Number 12310, Division of

Fish and Wildlife, Government of Guam, states the following: no wing may exceed 150 feet; no leader may exceed 250 feet; the wire mesh may not be less than one inch square; the trap must be located 100 feet or more from high water mark; traps may not be within 150 feet of any boat channel, within 600 feet of any sewage outlet, or within 200 feet of the weir belonging to another person. Further, an owner may not leave his weir unattended for 15 days or more.

While there are no regulations concerning the amount of fish that can be caught in this manner, all weirs must be licensed. Permits for their use are issued on the approval of the Director of Agriculture, Government of Guam. One individual may have no more than 3 weirs--a main and two auxiliaries.

At present there are only 15 permits issued; 13 are for weirs in Merizo and the others are for Piti (Polaris Point). In the recent past permits were also issued for weirs located at Pago and Togcha bays, and near Cabras Island, but these areas are now closed. The number of weir permits remains constant from year to year, or, if fewer applications are made than in the previous year, then the lower number becomes the new maximum number of permits available. In this way, it is expected that the use of lagoon fish traps will eventually disappear.

Hand Fishing

Fishing bare-handed was an activity that impressed early visitors to Guam some 300 years ago, and although it is by no means a popular method today it is occasionally seen and remains in the cultural inventory of fishing methods. It is not only Guamanians who fish in this manner on Guam; Micronesians from the Trust Territory of the Pacific who live on Guam are known to use this method sometimes. To hand fish, one simply reaches into holes in tidal pools on the reef flat, but to do so carries some risk because sometimes the occupants of these holes are harmful creatures such as sea urchins, stonefish, and eels. The Chamorro term for this fising style is lalago, and it is believed to be a technique used typically by women.

Shells and Shellfish

While a variety of edible shells and shellfish exist in the waters of Guam, and undoubtedly have existed for a very long time in these waters, there is a dearth of data describing how they were collected in the past. The assumption has been made that such items constituted food sources in the past, just as they do today. It seems that no potential food source is ignored by all segments of the population however much ingenuity is required to make it edible. One certainty is that regulations pertaining to the collection of such foods is the result of population increase and culture change.

An example of such regulations are those concerning the collecting of crab, lobster, and Trochus niloticus. No crab may be taken if it is less than three inches across the back; no lobster less than a pound may be taken, nor can a female lobster with eggs be taken during the

months of May, June and July. During the commercial season for Trochus in May through July, a license is required, collectors must go beyond the reef to gather them, and none smaller than four inches may be taken. The amount allowed is set by the Director of Agriculture, Government of Guam, before each season begins. For household consumption there are other regulations concerning Trochus: a maximum of 50 pounds per person per day is allowed, of which only 10 pounds may be less than two inches in diameter (13).

Crab may be found most anywhere and there are several varieties. Lobster may sometimes be found in Apra Harbour, and they are also caught at NCS Beach, Tarague Beach, and Togcha Bay. The mangrove crab can be caught by hand, although it is risky, and they are also lured into traps with bait. Lobster are speared or caught by hand, both of which typically involve diving. Trochus gathering requires diving also.

Clams, although no longer plentiful, may be gathered at Ylig River just south of the village of Yona, at Cocos Island, and at Alupang Island at the north end of Tumon Bay. Informants remember that before World War II, clams were plentiful, especially at the mouth of the Sasa River in Piti village. The beds are still there but there are no clams. It appears they all died at the same time but the reason is obscured.

Strombus luhuanus, known in Chamorro as dogas, is considered a delicacy by many Guamanians. Two sites at which these shells are collected are Apra Harbor and the Agat village coastline. The shells are scrubbed vigourously in a bucketful of seawater several times right at the beach where they are collected. Then they are taken home and boiled in coconut milk. This causes the animal to protrude from the shell just enough so that it can be extracted all in one piece and eaten whole.

Efogmo

Very small (one inch-size) reef fish of assorted species are known collectively in Chamorro as fogmo and to catch these fish is called efogmo. A kerosene can that has been pierced with enough holes so that water will drain out rapidly when filled is carried to coral areas inside the reef where it is placed underwater and filled with pieces of coral that are broken off larger pieces. The fisherman then raises the can and shakes it vigourously, causing the fogmo to fall to the bottom of the can from their hiding places in the coral as the water runs out the holes. The little reef fish are salted and enjoyed as a delicacy.

This practice is obviously destructive of both coral and tiny fish and has considerable harmful potential. The extent to which this occurs is unknown. Also unknown is whether or not this practice is a survival of some earlier method that pre-dates kerosene cans.

Mantis Shrimp Fishing

In the mixing zone between lagoon seawater and river water in Merizo the fisherman looks along the sandy bottom for low mounds which have a small (one inch or less) hole at the top. This is the home of

the mantis shrimp, a creature which may be as large as a six-pound lobster but which is soft-shelled.

The device used for snaring the mantis shrimp is a Philippine introduction according to my Guamanian informant. It consists of a three-foot length of lightweight wood about as big around as a man's finger; attached to one end is a wire which runs halfway up the stick, and to the other is a rubber strip (cut from a tire) which runs halfway down the stick. The free ends of the rubber and the wire are joined together and attached to a small two and a half inch wood catch-piece which is carved roughly in the shape of a blunt unbarbed hook. There is a notch cut in the stick near the end opposite the rubber strip into which the catch-piece fits. The catch-piece is held in this notch by a metal ring which slides up to hold the catch-piece in place. Extending downward from the ring is a bait hook.

The snare is cocked by pulling the catch-piece down to the notch. This stretches the rubber, creating tension, and it creates an equal amount of slack in the wire. The slack wire is formed into a circle. Then, when the metal ring is pushed up the stick to secure the catch-piece in the notch, the bait hook on the ring is directly above the loop formed in the slack wire.

To set the snare, the shrimp hole is enlarged by hand to a diameter of about three inches and then the stick snare is placed in the hole by leaning it against the upper rim. Part of the stick will protrude from the water when it has been set. The fisherman can set several snares at one time for they do not have to be tended. When the shrimp takes the bait, it triggers the device and in the process of getting caught it causes the stick to stand upright. Thus, the fisherman needs only to glance at his sticks to know which ones have caught a shrimp.

Octopus Fishing

Although octopus fishing has already been mentioned in passing under the spearfishing portion, there is another method for catching octopus that is very clever, probably quite old, and it is illegal. It is done nevertheless.

The technique, traditionally a woman's fishing method, involves capitalizing on the toxic reaction the octopus, and fish as well, have to the balate hinate, or sea slug. The sea slug is rubbed with sand between the palms of the hands and then thrown or placed in the water. This stupefies the reef fish in the tidal pool or the octopus in his hole, and it is then a simple matter to collect them by hand. The octopus is not hard to locate--it leave a distinctive trail if one knows what to look for, and the immediate vicinity of its home is usually littered with remnants of past meals.

Another octopus-fishing technique is used in conjunction with the spear and a popular ingredient in many Guamanian foods. Fishermen have discovered that the octopus does not like chili peppers. When chilis are mashed and introduced in the octopus hole or crevice, the octopus

leaves immediately--which is when the fisherman must be quite ready with his spear lest he miss his fleeting opportunity. It is unknown how old this technique is, but it cannot pre-date contact with the Western world because the chili pepper is an autochthonous plant of the Americas, not Guam, and was introduced to the island at some time during the Spanish period.

Catching Flying Fish

More than a fair amount of dexterity, timing, and coordination among participants is required to catch the flying fish. This is typically a nighttime activity which requires a motorboat and a minimum of two, but ideally three, people. The sea must also be calm. While one person steers the boat, another scans the water with a light for signs of flying fish. If there is a third person, his or her responsibility is to be ready with the dip net pole; otherwise, one person must manage both light and net. When a fish is sighted, the pilot alters course accordingly. If all goes well, boat and fish converge, and for the few moments that the fish rests on the surface when a flight has ended, the net person has enough light and opportunity to scoop it up with the pole.

Fishing for flying fish is not a very profitable activity considering the amount of time spent and the expenditure of fuel required. Fishermen seldom go out for the sole purpose of catching flying fish; it is more often something that is done when fishermen are already out in a motorboat for some other purpose.

Illegal Fishing Practices

Some of the practices now placed beyond the limits of legality are undoubtedly of ancient origin. These include poisoning fish by means of derris root and puting as well as the aforementioned use of the sea slug in fishing for octopus. Other illegal practices are closely related in principle, but the materials are modern. These include the use of chlorine bleach and pesticides to poison fish, and explosives.

Both derris and puting stun the fish so that they can easily be gathered by hand. Derris root is pounded at the edge of a tidal pool and water is periodically sloshed on the pounding rock to wash the pulp into the pool. Or the juice of the root may be squeezed into a container, mixed with water, and then put in the pool. In the case of puting, Barringtonia asiatica, the pods of the tree are mashed and the pulp is placed in the tidal pool.

The use of chemicals and explosives in fishing is regarded as worse than the above because both destroy virtually all life in the affected area rather than fish only. The chances of recovery for such an area are remote in time. Bleach may be placed in a sack which is attached to the fisherman's leg so that as he walks around in the water he disperses the bleach. Or a net may be set in a large circle and a 50-pound box of bleach powder is spread within the perimeter. Explosives may be bought, they may be stolen, or fishermen may attempt to recover explosives from unexploded World War II ordnance they happen upon, a less than

common experience about five years ago. Several people have died in attempts to recover the explosives inside bombs and other weapons. The explosive is typically packed in a baby food jar with mud or clay and equipped with a fuse and a blasting cap. Or the jar may be wired to a six-volt battery for electrical detonation.

The Division of Fish and Wildlife, under the local Department of Agriculture, is charged with enforcing all fish and wildlife laws, but these activities are difficult to apprehend. Typically, the illegal deeds occur at night, but perhaps more significant in accounting for why these activities continue is that there are only five conservation officers. Although they are uniformed, armed, conscientious, and well-trained, they are too few in number to meet all the responsibilities they are charged with--they are Fish and Wildlife Officers and their duties therefore concern both marine and terrestrial fauna.

Other Harmful Practices

There are many activities on Guam which directly or indirectly damage or threaten to damage the coastal and marine environments. Most of these have been discussed elsewhere in comprehensive fashion and no attempt will be made here to do more than mention briefly what they are.

One land problem that affects the marine environment is erosion. Although erosion problems have plagued Guam for centuries as the result of burning off vegetation for agricultural and hunting purposes, some sources of erosion are the result of cultural change. A prime example is the grading and clearing of land for residential and commercial developments. The results have been disastrous in some instances. Extensive destruction of marine fauna caused by heavy siltation carried by rivers into bays and lagoons has occurred and is likely to reoccur because the government has not sought to restrict these activities to the dry season months when siltation would be minimized.

Other activities harmful to the marine environment include littering and water pollution. In some places on the island, littering is of the paper and drink-can variety that thoughtless people leave behind or toss out of car windows. Other littering is in the form of dumped refrigerators and washing machines; even abandoned cars are found on the beach. The water is polluted directly by sewage from human waste, agricultural and industrial wastes, and various toxic materials. Decreased salinity levels result from excessive freshwater intrusions in bays and lagoons, and, in the case of power generation, heated water from government-owned power plants is discharged directly into lagoon areas resulting in thermal pollution.

Boats and Other Recreation

Under section 8995.3 of the Government Code of Guam all vessels using the waters of the Territory of Guam must be numbered and registered with the Department of Public Safety of the Government of Guam. Certain vessels, such as vessels documented under federal law, are exempted by federal law from numbering and registering with local

authorities. Thus the local numbering system would encompass the majority of the "pleasure" boats in use on the island.

According to the records of the Department of Public Safety, there are, as of November 1977, 959 registered boat numbers outstanding; however, this number does not represent accurately the number of actual boats in use on Guam. Certificates must be renewed only every three years and thus there are some vessels which are no longer in use or which have been destroyed, but which have not been reported to the Department of Public Safety. The certificates for these boats would still be outstanding, according to government records, unless the owner had reported the matter to the Department of Public Safety (in which case the number for the abandoned or destroyed boat would be assigned to a new boat). Additionally, there are numbers which have expired but which are still "outstanding" and have not yet been cancelled by the government. All these factors mean that the figure of 959 registered boats (or 9.6 boats per thousand population) is not accurate and that it overrepresents whatever the actual number is. There was no readily available data as to size or type of boats registered.

An estimate of the number of sailboats is possible, but not of powerboats. There are two yacht clubs on Guam, both located in Apra Harbour. The military club, located at the entrance to inner Apra Harbour accounts for approximately 30 sailboats ranging in size from small dinghies to cruising yachts of more than 40 feet. On the opposite side of Apra near the base of the Glass Breakwater is the civilian club which was first organized in 1969 with 47 members. The membership is now three times what it was eight years ago, and the number of boats owned by this group is approximately 90. In addition, the number of sailboats owned by other individuals is about 10.

There are several places where boats may be moored or berthed, but none meets the needs of boat owners when a typhoon hits the island. Even tropical storm conditions claim a yearly toll in damage and costs to the boat-owning community.

Ocean going craft are once again being made on Guam, but not of the ancient Chamorro canoe variety: there are two persons in the business of making boats. There are also several dealers and repair businesses. It is also possible to rent boats by the hour or day. The rates and type of craft vary according to purpose: a four-hour fishing charter for four persons can cost $95; a glass-bottom ride to Cocos Island from Merizo is about $5 for adults, half that for children; for water skiing or diving, the cost is $25 per hour (14).

Scuba diving has become the principal water sport on Guam in the years since about 1968. There are several dive shops (usually boating and fishing equipment is also sold) and many qualified instructors who are in some cases employed by the shops. One such business instructs and certifies at least 250 to 300 new divers per year. Although some of these divers leave Guam within a year or two, there is an obviously growing number of persons in the diving community.

Shell collecting is not as easy to assess as diving is. There are shops that sell shell gift items (not typically made on Guam). The tourists at the Tumon Bay hotels pick up shells from the beach and water, take them to their rooms, and discover the next morning that the odor is overpowering (because the animal inside the shell has died). For every beach hotel, personnel say they throw away a few hundred shells in a year's time. The non-tourists as well can seldom resist the temptation to pick up a pretty shell, whether they are collectors or not.

Perhaps the most telling impression about Guam's shells comes from the elderly people who have lived here all their lives. They all agree that there aren't as many as there used to be--and the time they are referring to is not long ago. Most, when pressed to indicate when it was there were shells "everywhere," associate the time of plentiful shells with a time when fish were also more plentiful--that is, before World War II.

Attitudes and Summary

A community poll was taken on a variety of issues concerning the people of Guam in November 1975, and among the areas covered were attitudes regarding development of Guam's coastline. Fifty-seven percent of the respondents (N=3,762) responded "yes" to the following question: "Guam's coastline, particularly its beaches, are a limited natural resource. Do you agree that along the coastline business and industrial development should be strictly limited?" When the same question was asked regarding residential development, 59 percent responded yes (15).

This appears to be a conservative attitude. Because of the manner in which the study was conducted, one can generalize from these results and say that the people of Guam advocate a conservative ideal in regard to natural coastal resources. But attitudes and behaviors are two different things, or to put it another way, a belief in a conservation ethic may be widely advocated in theory but that does not necessarily mean the ideal will be demonstrated in practice.

Wise usage of coastal and marine resources is not fully demonstrated on Guam, even though it may be a cultural ideal. The long period of subsistence background fostered behaviors that would not, in the future, be conservative of natural resources. For a very long time it was possible for people to go help themselves to whatever they needed from the land and the sea without any concern over whether or not things would replenish themselves--and without danger of depleting or significantly damaging those resources. The rural economy and the small population did not place undue strains on resources, on the things people need, value, and use.

What we see in contemporary Guam is a number of unconservative practices that have carried over in somewhat altered forms from times gone by, only now the population is more than 100,000 and climbing steadily, the economic system is wage-based and shares many characteristics with highly industrialized nations, and the government itself seems unable to exert the controls necessary even to maintain what we have now.

In the next section, a different approach to behaviors and attitudes is employed. In that portion we will examine the results of a questionnaire in which residents of Guam reported their own activities and opinions in regard to the island's coastal and marine environments.

VI. SURVEY QUESTIONNAIRE ANALYSIS

This section presents an analysis of the responses to 127 "Shore and Water" questionnaires administered randomly to a sub-sample of 302 households that were part of an unrelated household survey concluded in 1975. Random methods of selection were employed in drawing the original sample of 700 householders in all areas of the island, excluding military bases. Efforts were made to stratify the sample so that the number of questionnaire interviews conducted in each village was proportinal to the percent of the total population represented by each village. Table 2 shows village population figures and the distribution of the sub-sample.

Because all respondents in the sub-sample were also administered the household survey, a spot-check comparison between the two samples to determine representativeness of the sub-sample was possible. While some discrepancies do appear, they are considered inconsequential; in matters concerning general demographic data such as sex, age, income, occupation, employer, education, and birthplace, the sub-sample is representative. (See Appendix A.)

The Shore and Waters Questionnaire (Appendix B) is both a behavioral and an attitudinal instrument, but primarily the former. The questions will be analyzed in the order in which they were asked; however, some items are omitted from the discussion for the following reasons:

1. Weaknesses not discovered in pre-testing the instrument become apparent later when the survey was completed; some items simply were non-productive for the nature of information sought.

2. There are instances where the number of responses was either so small, or zero, that no valid conclusions can be stated. Wherever possible, alternate sources of needed information have been consulted and then incorporated into this portion of the text and identified as such.

Fish Consumption

The first few questions dealt with habits and preferences concerning consumption of fish in order to examine the significance and dimensions of seafood in people's lives. When asked "How often do you and your family eat fish?" respondents indicated a wide range of incidence--from more than once a day to never; however, 79% reported a frequency of from four to twelve times a month. No appreciable departure from this rate was shown in a cross tabulation according to place of birth (Guam-born versus other), but in two other cross-tabulations suggestions of variation between groups emerged. Among those born before 1930, 75% reported eating fish in the same frequency categories as above, but among the younger respondents (born 1930 or later) there were 85.4% of

TABLE 2

Village and Sample Population (In Number and Percent)

Village	Total* Population	% of Total Population	Sample Population	% of Total Population
Agana	2119	3.3	6	4.7
Agana Heights	2737	4.2	5	3.9
Agat	4270	6.6	22	17.3
Asan	2094	3.2	5	3.9
Barrigada	5251	8.1	8	6.3
Chalan Pago/Ordot	2931	4.5	3	2.4
Dededo	9083	14.1	15	11.9
Inarajan	1897	3.0	4	3.1
Mangilao	3228	5.0	6	4.7
Merizo	1529	2.0	2	1.6
MM/Toto/Maite	4031	6.2	9	7.1
Piti	1284	2.0	2	1.6
Santa Rita	2604	4.0	4	3.1
Sinajana	3506	5.4	4	3.1
Talofofo	1935	3.0	1	.8
Tamuning	9983	15.4	17	13.4
Umatac	813	1.3	1	.8
Yigo	2786	4.3	10	7.9
Yona	2599	4.0	3	2.4
TOTAL	64680	100.0	127	100.0

*Source: (16)

the respondents in those categories. Thus, greater numbers of those aged 45 and under when the survey was taken were eating fish with a frequency of at least four to twelve times a month. An even greater difference in this frequency category is seen between men and women: a surprising 90% of the women were in this category in contrast to 73% of the men.

Following the question on how often fish was eaten, respondents were asked how often they would like to eat fish. The data for the 121 respondents who answered both questions were analyzed to determine the number who preferred to eat fish less often, more often, or to remain at the same consumption level. On an overall basis, 16 respondents (13%) indicated a desire to eat fish less often, 68 respondents (56%) indicated a desire to increase their fish consumption frequency, and 37 respondents (31%) wanted to continue at the same frequency level. This is not very revealing of the dimensions of these responses: questions arise such as:

1. What are the average eating levels and preference levels?

2. Where, in terms of frequency range, do most of the cases fall?

3. Is there any relationship between how often people eat fish and how often they would like to eat fish?

4. Is the data for these 121 respondents statistically significant?

Table 3 shows the mean, median, and mode for fish eating and desired fish-eating in terms of times per month for the sample population. Be-

TABLE 3

Mean, Median, and Mode for Actual and Preferred Fish-eating Levels

(In Times per Month)

	Mean	Median	Mode
Eating level	14.6	8	8
Preference level	7.8	12	30

cause of extensive deviations in the responses (the range was zero to 45 times per month), the mean, which is highly sensitive to extremes, is the least significant of these figures in this case. The median and mode are more revealing. The median figures indicate that while half the sample population eats fish either more often or less often than eight times per month, half would like to eat fish more often than twelve times per month while the remaining half would like to eat fish less often than that.

While eight times per month was the most commonly reported level of fish eating, the most frequently mentioned level for preferred fish eating was thirty times per month, or daily.

A standard deviation was calculated for both means to determine the range of eating and preference frequencies that would describe most of the cases. The standard deviation for the mean eating level was 12.5; therefore, 68.3% of the respondents said they ate fish two to twenty-seven times per month, a not surprising or impressive figure. For the preferred frequency mean, the standard deviation was 6.5, which means that most of the respondents (68.5%) reported they would like to eat fish somewhere in the range of one to fourteen times per month. Most of the rest of those who do not fall within this preference range can be accounted for by the singularly high number of respondents who reported a desire to eat fish daily (see mode above). The large standard deviations for both means are a reflection of considerable variation in frequencies of actual and desired fish consumption.

To determine whether or not there is any association between reported behaviors and reported attitudes regarding fish eating, a correlation coefficent was computed. This yielded a value of + .54559. Thus, the relationship between the two variables is a positive one and although it is not strong, it is significant at the 95% confidence level. There is, therefore, a statistically significant relationship between reported levels of fish consumption and desired levels of fish consumption, and this is true 95% of the time.

Fish Sources

Concerning the sources of fish (whether bought, self-caught, received as a gift from an individual, or any combination of these), 45% of the respondents reported the fish they eat was bought at a store and 39% reported a combination of sources. Few respondents (seven persons, six of whom are Guamanian) indicated their sole source of fish is to catch it themselves, but 44 persons, or 35%, said at least some of the fish they eat is self-caught, 33 of whom are Guamanian. Only 15% (28 persons) of the Guamanian group said their fish comes exclusively from a store.

Skipping for a moment to a related item in the questionnaire (number 14), the fisherman respondents were asked what they do with the fish they catch: eat it, sell it, give it away, or some combination of these. Most (46%) said they eat it themselves, but nearly as many (44%) said they eat some and give some away.

As expected, then, there is a great deal of sharing among the Guamanian group and the giving of fish occurs much less often among non-Guamanians. The Guamanians in the sample are the least likely to rely solely on commercial sources for the fish they eat.

What Fish are Eaten

Because of the ambiguous design of the question concerning kinds of fish eaten and whether eaten raw, fresh, or frozen, the results were

disappointing; however, a few conclusions can be drawn as follows:

1. Given the raw, fresh, and frozen alternatives, seafoods were reported eaten fresh most often. This includes deepwater fish such as tuna, grouper, and mahi-mahi; shallow water reef fish; lobster; crab; shells such as clam, oyster and Trochus; and milkfish, but Filipinos most often responded in the frozen category for milkfish.

2. Of the choices listed on the questionnaire, only shrimp was high (46%) in the frozen category.

3. Responses in the seaweed, eel, octopus, and squid categories were negligible.

4. There were frequent disparities between men and women in responses to the raw, fresh, and frozen categories. A possible explanation for this inconsistency may be that, since it is typically women who do the grocery shopping, they are more likely to know precisely whether the fish the household members consume has ever been frozen.

An economic study of factors affecting household fish consumption patterns has recently been concluded under the aegis of the Bureau of Planning, Government of Guam (17). Some of the findings offer additional insights into the kinds of fish consumed in Guam households. These findings are summarized below.

Callaghan found that, given the choice among fresh, frozen, canned, dried, and smoked types of fish, 81.4% of the respondents preferred fresh fish (N=1054). Milkfish was the most frequently bought fresh fish, followed in order by rabbitfish, mackerel, shrimp, snapper, surgeonfish, tuna, parrotfish, grouper, rudderfish, and jack/skipjack. Among Guamanians, the most frequently bought fresh fish was rabbitfish, followed by mackerel, and surgeonfish. Filipinos most frequently bought milkfish fresh, then shrimp, and mackerel.

In the frozen category, Callaghan's results were ranked as follows: 1. mackerel; 2. shrimp; 3. milkfish; 4. tuna. Ranking by ethnic group showed Guamanians bought mackerel most frequently, followed by rabbitfish, shrimp, and tuna. Filipino rankings were: 1. milkfish; 2. shrimp; 3. mackerel; 4 tuna.

Tuna fish was the most frequently bought canned fish. Ranked second through fifth were sardines, salmon, mackerel, and shellfish. The ranking of canned fish bought by Guamanians is as follows: sardines, tuna, salmon, mackerel, and clams. Among the Filipino population in the sample, the first four were the same as for Guamanians, but canned crab was fifth for that group.

Callaghan also asked what size fish was preferred. The responses are shown in Table 4.

TABLE 4

Fish Size Preference

Fish Size	Respondents' Preferences (In Percent)
less than 7"	19.3%
7 - 14"	59.8
more than 14"	14.4
no preference	6.5

SOURCE: (17)

The People Who Fish

In 49 of the 127 households surveyed, the respondent replied affirmatively when asked if anyone in that household goes fishing. Table 5 summarizes the characteristics of the 103 fishermen in those 49 households.

TABLE 5

Fishermen Characteristics

Characteristics	Number of Respondents	Percent
Birthplace:		
Guam	75	73%
Other	25	24
No response	3	3
TOTAL	103	100
Sex:		
Female	8	8
Male	95	92
TOTAL	103	100
Age:		
Born before 1930	29	28
Born 1930 or later	74	72
TOTAL	103	100

Because it was surprising to find that nearly three-quarters of those who fish were less than about 45 years of age when the questionnaires were administered, a hand tabulation of all questionnaires was done to determine a more precise impression of the age distribution of the 103 fishermen. The age range of those who fish was 54 years, the youngest being aged 10 and the most elderly being 64 years old. Figure 2 shows the ages of the 103 fishermen in five-year age groups. The distribution is a bimodal one with most fishermen in either the 15 through 19 or 50 through 54 age groups. The large number of relatively young fishermen can be explained by the fact that only 49 households account for 103 fishermen--fathers, and probably grandfathers, are taking their sons and grandsons fishing with them, thereby keeping alive old traditions in the same manner it has been done for generations.

Fishing Equipment

The most commonly owned piece of fishing equipment in these 49 households was the fishing pole--a total of 28 households owned 61 poles, at least 8 of which were homemade bamboo poles. This is not to say that most prefer pole fishing, or that most fishing was done with pole. Neither of these questions was asked concerning any of the types of fishing.

The second most commonly owned type of equipment was the fishing net. Thirty-nine nets were owned by 20 households for an average of two nets per net-owning household. Of these 39 nets, 21 were gill nets, 9 were casting nets, and 9 were type unspecified. All households owning nets were in the southern villages of Agat, Umatac, Merizo, and Inarajan.

Spears were another frequently owned fishing device: 7 households owned a total of 27 spears, most of them being the speargun type. Spearguns, along with poles, had a higher incidence of mentions among the non-Guamanian households than for Guamanians; among the latter group, nets and poles were the most frequently mentioned.

Only one respondent reported owning a fish trap, but it's type was not specified. None reported fishing by any of the illegal means, such as poison or dynamite.

Time Spent and Amount Caught

Most of the 49 fishermen respondents reported spending between one and five hours per week fishing, or that they went fishing once a week (41%); 39% said they fished from 6-15 hours per week. Thus, for some 80% of the fishing sub-sample, to fish is a regular, weekly, and frequently time-consuming activity. For four of the respondents (8%) fishing takes up more than 15 hours per week.

While it appears that some fishermen are rather successful, the mean number of pounds caught in a month by the 46 households which reported catching any fish was 72 pounds. It should be noted that none of those in the sample was a commercial fisherman; however, a high of 1,000 pounds was reported caught in a month. This was for a Guamanian household. The high for the non-Guamanian group was 500 pounds, which

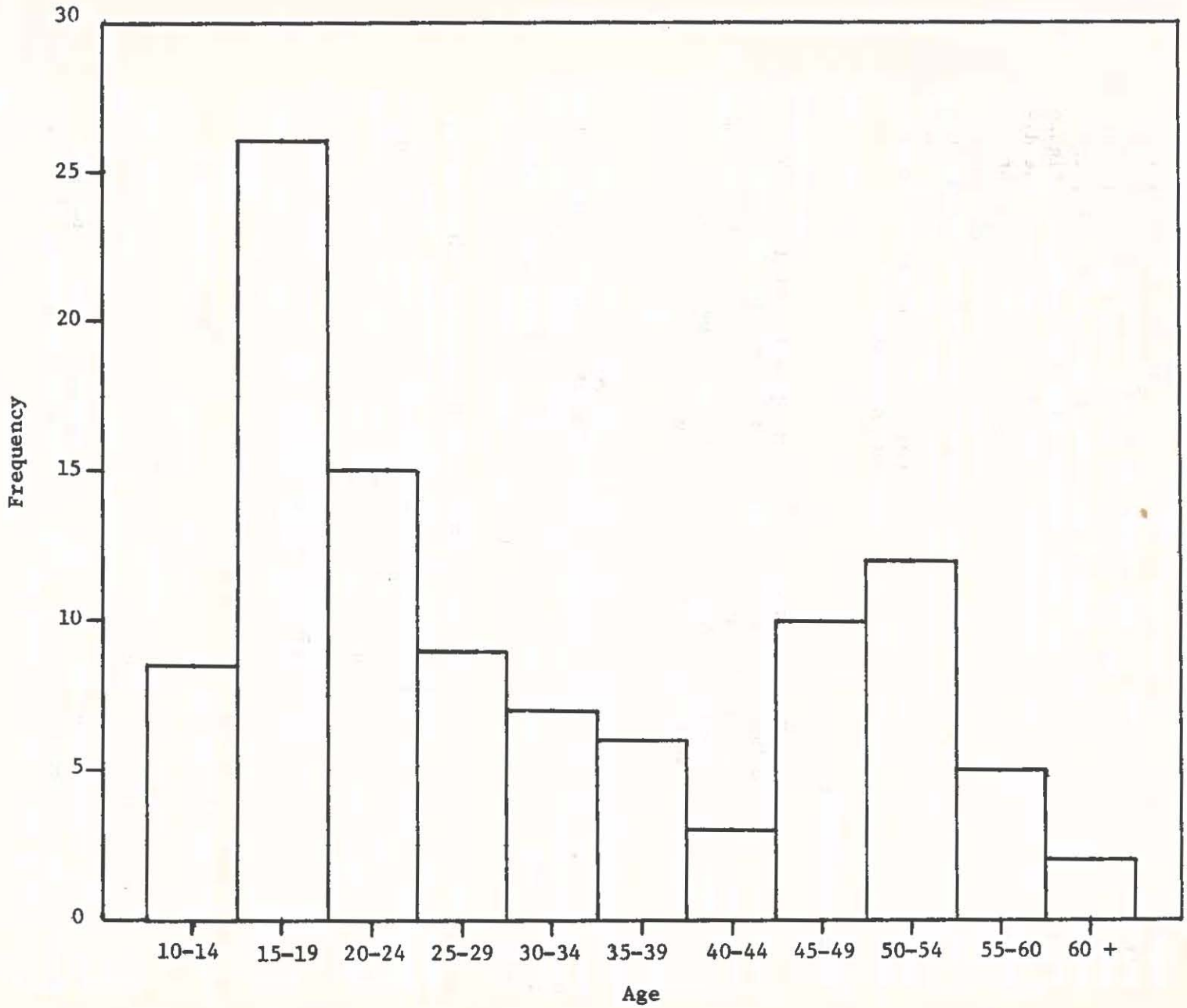

Figure 2. Number of Fishermen, by Age.

was reported by a respondent born in the Northern Marianas. The high for females who fished was 200 pounds. The low for the 46 who respondend to this question was two pounds in a month.

Fishing Locations

Twenty-two different fishing sites were named in response to the question, "Where do you do most of your fishing?" Two of these were non-specific ("offshore" or "southern part of the island"), but the rest were designated by village, bay, or other well-known place name. Agana received more mentions than any other location: 16 of the 49 households named Agana in response to this question. Agat and Merizo followed with six mentions each, and mentioned five times each were Inarajan and Pago Bay. Receiving three mentions each were Piti Bay, Asan, San Vitores (on Tumon Bay), Ritidian Point, and Umatac. The following locations were mentioned once or twice each: Naval Station (on Orote Peninsula), Cabras Island, Adelup Point, Tamuning, Double Reef, Tarague, Marbo Cave, Yona, Togcha Bay, Rizal Beach, the southern part of the island, and offshore.

Fishing locations within the respondents' villages of residence were named more often than any other single location. Eighty percent of those responding that they fish most often in their own villages were born on Guam (73% of the fisherman were Guam-born). Although remaining within the bounds of one's own district for fishing purposes was the custom in former times, it cannot be said definitely that these Guamanians fished in their own villages in order to conform to cultural expectations; there were no items in the questionnaire which probed reasons for fishing in some locations and not others and, in fact, most reported fishing in additional locations outside their village.

In exploring this issue with Guamanian informants, three kinds of attitudes were discerned. Some persons felt it definitely would be wrong to go to another village to fish, with the one qualification that during manahac season one may go anywhere. Others indicated no reservations regarding where to fish. A third sort of attitude, perhaps closely related to the first, is exemplified by one of my elderly cast and gill net informants. He gave the impression that he preferred fishing in his own village because it was more convenient than travelling to some other area. He also indicated that he knew his own area very well and was therefore more "comfortable" (his expression) in his own village. A third reason he gave was that his wife preferred to have him close to home when he went fishing alone; nevertheless, when his wife and other relatives accompanied him, he still fished only in his own village. While convenience and knowledge of an area are sound, unemotional reasons for fishing a home area, it also appears there may be a subjective element in preferring to fish in one's own village. This cannot be carried too far, however, because there are several villages that are not coastal villages, such as Dededo, Yigo, and Sinajana, and people who live in these villages do fish. But the fact remains that those in the sample reported the following behaviors:

1. As distance from home increased, reported use decreased.

Age

Figure 2. Number of Fishermen, by Age.

2. Two-thirds of the fishing locations where respondents said they did most of their fishing were less than five miles from their home villages.

3. Respondents reported that they most frequently fish in the same villages in which they live.

Another question regarding location asked whether fishing was done from public, military, or private land. While most reported that they fish exclusively from public land (69%), 22% said they fish at least some of the time from land they regard as private, and 10% (5 persons) indicated this category as the only area from which they fish. None of the place-names provided by the respondents themselves is privately-owned land. It appears it is not universally recognized the coastline is public land. It is likely the perception that one can fish from private land stems from the fact that, to fish from the shore or in the lagoons, it is often necessary to traverse private land--land that is sometimes posted with no trespassing signs. The individual who fishes virtually from his own back door or who must cross someone else's property, posted or not, to reach a fishing site could very well feel he is fishing from private land.

Boating

The next section of the questionnaire dealt with boating activities. Responses in this category were few or zero in regard to boat ownership, but more numerous concerning use of boats.

Almost a third of the 127 respondents said they sometimes use a boat. Typically, the boat belongs to someone else and it is used more frequently for passive recreation than for activities such as fishing, diving, or water-skiing. Motorboats, rather than sailboats, were reported as the most frequently used type of boat.

Collecting Marine Fauna

Collectors numbered 15, or 12% of the sample. Items collected include shells, corals, and fish, with shells being the item collected by most (12 persons). All except one reported their reason for collecting shells as "to keep" rather than sell; one reported collecting shells to eat, but the type was not specified.

Swimming and Picnicking

When asked "Do you ever go swimming," 61% of the 127 in the sample responded in the affirmative. Guamanians accounted for 74% of this group. Each of the swimmers was then asked whether they preferred the beach or a swimming pool: 91% of the overall sample said "beach." For the Guamanians this proportion was even higher--93%. Three-fourths of the respondents indicated they go to the beach for picnics or swimming. The mean frequency was twice a month, but some reported going as seldom as once a year and others as often as 60 times a year. Guamanians and non-Guamanians reported just about the same mean frequencies.

By far the most popular picnic/swimming locations were Tumon Bay sites (53 mentions), with Ipao beach receiving more mentions than any other single place along Tumon Bay. The Agat area, including Nimitz and Rizal beaches as well as the village coastline area between these beaches, was mentioned about half as often as the Tumon area, but ranked second nevertheless in number of mentions.

Just as some of the fishermen perceived land they fished from was private land, so too among the beach picnickers and swimmers there was a relatively high incidence (30%) of the same perception. The same explanation offered in the case of the fishermen's perceptions is considered as appropriate for this attitude among those who go to the beach for swimming and picnicking. With the idea in mind that certain coastal areas may be regarded as inaccessible, all respondents were asked if they are always able to get to any beach. Fifty-two percent responded no, the remainder were affirmative. While the reasons for the negative responses were not probed, thinking that some beach land is private land may be one such reason. Others have to do with the fact that some beach land is indeed inaccessible because of terrain, or because the beach area is on military land and therefore not open to all civilians.

Camping, Surfing, and Diving

Twelve persons reported camping on Guam in the year prior to administration of the questionnaire. Most of these camped twice in that time but two camped at least eight times in the previous year. The shore locations where campers said they go are as follows: Ipao Beach, Ritidian Point, Ipan Beach, Cetti Bay, and Nimitz Beach.

There were three surfers and five divers in the sample population. Because of the dearth of responses concerning where these activities take place, nothing can be said in this section on that matter. In regard to primary activity while diving, only one said he dived to spearfish; others engaged in photography, collecting marine life, or "just sightseeing."

Attitudes and Opinions

Every respondent was asked what sort of activities he or she would enjoy if it were possible to get to all of Guam's beaches easily--a somewhat loaded question; nevertheless, the responses to it do not seem to reflect a perception of this loading. Table 6 summarizes the responses given to this open-ended question.

TABLE 6

Beach Activity Preferences

Preferred Beach Activities Mentioned	Number of Times Mentioned
Shore and water sports, recreation	56
Family parties, meet friends	48
Picnic, sunbathe	35
Fish	27
Explore the shoreline	14
Collect shells	8
Observe sea life, photograph	6
Clean up litter, check on pollution	3
Hunt coconut crab	1

Another question in this section asked the respondents to make recommendations based on what they thought needed to be changed regarding Guam's shores and waters. The responses concerned facilities, activities, and policies. The most frequently mentioned category concerned the need for construction or improvement of beach structures and facilities such as picnic shelters, rest rooms, showers, lighting, lifeguard stations, and playgrounds--and the need for better maintenance of existing facilities. Respondents also expressed a desire for more beach areas to go to , where access is not difficult, and suggested that existing beaches and swimming areas should be improved by additional landscaping and dredging.

In regard to activities, a desire for organized beach and water-related sports was indicated. Some specified the government should foster such activities; others did not.

An interest in official policy was also shown. Here is where the effect of the question regarding beach access may have appeared, for a marked feeling that all beaches should be public (that is, neither hotel-only nor military-only) was apparent. References to existing laws as well as recommendations for new laws were made. In regard to matters of law, the general tone was either that more laws affecting Guam's marine environment were needed or that existing laws were being inadequately enforced. A few individuals mentioned specifically that both dogs and motor vehicles of any kind should be prohibited from all beaches.

The last item in the Shore and Waters Questionnaire was designed to probe respondents' perceptions of change, particularly those individuals born on Guam. Not a single Guamanian respondent indicated a perception that today's fishing techniques might in any way be similar to techniques of their parents' generation. Instead, a notion of cultural discontinuity seemed to pervade the responses. Those who answered the question see themselves as being too busy or not interested in beach

and water activities--this in spite of answers given earlier in the questionnaire which usually demonstrated quite the opposite, that at least some participation was going on, directly or indirectly, in Guam's shore and water environments. They perceive their parents generation as one which had more leisure time and as the one which fished, sometimes because they had to do so. They also tend to feel that "things were better in their day."

VII. CONCLUSIONS AND RECOMMENDATIONS

At a meeting in May 1973 of the South Pacific Commission in Noumea, it was recommended that a need be filled for baseline data showing existing situations in urban centers of the Pacific. It was further noted that there has been a dearth of Chamorro culture studies concerning the survival of the culture and its relationship to modern urban Guam.

This study has explored some of the practices, beliefs, and attitudes that have been associated through time with Guam's marine and coastal environment; it is not an exhaustive study. That remains to be done if a complete understanding of the ineraction between local culture and environment is to be approximated. An assumption made throughout the study is that cultural preservation and environmental preservation are equally desirable goals; the research has indicated that both culture and environment have undergone change through time in ways not always desirable and that the process of change, an inevitability in itself, can be expected to continue along a similar path to that of the past unless greater human control is exerted toward more favourable change.

In the midst of change, people have clung, perhaps tenuously in some instances, to tradition and this must be regarded as a very powerful force. But another powerful force is nature, and the slow, insidious process of its degradation can be noticed. The question is what to do about it and what to do about the preservation of a culture at the same time.

At the local level, other than existing means of protecting both the environment and the Guamanian cultural heritage should be explored. Some of the laws and regulations presently in effect are inadequately enforced because of a lack of manpower; some are alien to long-established cultural practices. The impact of some of these practices may be negligible and continue to be negligible--such as octopus fishing using balate hinate. Their impact should be measured and evaluated. A fishing license system under local village authority rather than the Government of Guam in Agana could offer more effective control over the fishing impact on each coastal village's marine environment, providing issuance was founded upon compatible socio-environmental principles and enforcement was regulated by those knowledgeable in both cultural and biological requirements.

In a time of population growth, increasing technological complexity, and intense concern for the environment, we need to explore means of accommodating those values and behaviors which a people holds in high esteem because such values and behaviors are surviving dimensions of a treasured heritage. The applicability to Guam of the spirit of those laws which protect certain traditional hunting and fishing practices of native Americans in Alaska, for example, should be investigated in this regard. It could be argued that the Guamanian people are also

native Americans; in what ways the native Guamanian should be treated differently from the native American should be questioned.

We need to know more about the tropical island ecosystem and what happens to it when increasing material demands are imposed upon it by a rapidly growing populace. There are no answers to some of the questions concerning the extent to which human organisms can exploit an environment and, at the same time, maintain an ecological balance. While the terms "pollution" and "exploitation" carry indeniably pejorative connotations for layman and scientist alike, an understanding of the implications of these terms beyond an emotional level is incomplete.

REFERENCES

1. Spoehr, A. 1957. Marianas prehistory. Fieldiana: Anthropoloy Papers No. 48. Chicago.

2. Thompson, L. 1969. The Secret of Culture, Nine Community Studies. Random House. New York.

3. Oliver, D. 1961. The Pacific Islands. Doubleday & Company, Inc. New York.

4. Haddon, A. C. and J. Hornell. 1975. Canoes of Oceania. Bishop Museum Press. Honolulu.

5. Carano, P. and P. C. Sanchez. 1964. A Complete History of Guam. Charles E. Tuttle Company. Tokyo.

6. Thompson, L. 1947. Guam and Its People. Greenwood Press. New York.

7. Bengt, A. 1955. Contributions to the History of Fishing in the Southern Seas. Almquist S. Wiksells Boktryekeri. Uppsala.

8. Garcia, F. 1683. Vida y martirio del Venerable Padre Diego Luis de Sanvitores. Madrid. In Guam Recorder. May 1937. Trans.: Margaret Higgins.

9. de la Corte y Ruano Calderon, F. 1870. A History of the Marianas. Trans.: Helen L. Paul and A. T. Perez.

10. McMakin, P. 1976. Fishing the Reef. Pacific Daily News.

11. Randall, R. H. 1975. Marine biological survey of the Cocos barrier reefs and enclosed lagoon. Univ. of Guam Mar. Lab. Tech. Rept. No. 17.

12. Pacific Daily News. 1977. Fishfight!

13. Division of Fish and Wildlife, Government of Guam. 1968. Regulations 27, 28, and 29.

14. Pacific Daily News. 1976. Boating fun but not cheap.

15. Community Survey. 1975a. Community Development Institute, University of Guam.

16. U. S. Bureau of the Census. 1970. Census of the population: 1970. U. S. Government Printing Office, Washington, D. C.

17. Callaghan, P. 1977. Some factors affecting household consumption of seafood and fish products on Guam. Bureau of Planning, Government of Guam. Tech. Rept. No. 77-3.

APPENDIX A

APPENDIX A

TABLE 1

The Survey Population Demographic Data

Characteristics of Respondents	Number of Respondents	Percent of Total
Birthplace:		
Guam	88	69.3
Other	36	28.3
U.S.	(13)	
Philippines	(20)	
Trust Territory	(3)	
No Response	3	
TOTAL	127	100.0
Sex:		
Female	41	32.3
Male	86	67.7
TOTAL	127	100.0
Age:		
Born before 1930	71	55.9
Born 1930 or later	56	44.1
TOTAL	127	100.0
Occupation:		
Professional/managerial	19	15.0
Teacher	4	3.1
Sales/clerical	13	10.2
Transportation	7	5.5
Craftsman/foreman	25	19.7
Skilled labour	31	24.4
Laborer	2	1.6
Farmer	1	.8
Service worker	11	8.7
Household worker	0	-
No response	14	11.0
TOTAL	127	100.0
Employer:		
Self-employed	5	3.9
Retail	3	2.4
Wholesale	0	-
Manufacturing	2	1.6
Transportation	2	1.6
Tourism	1	.8
Construction	8	6.3
Finance	2	1.6
Hotel/restaurant	2	1.6

APPENDIX A. (Continued)

TABLE 1 (Cont'd)

Characteristics of Respondents	Number of Respondents	Percent of Hotel
Real estate	0	-
Agriculture	0	-
Public education	4	3.1
Private education	0	-
Government of Guam	38	29.8
Federal civil service	41	32.3
Military/military related	7	5.5
Other	2	1.6
No response	10	7.9
TOTAL	127	100.0

APPENDIX A (concluded)

TABLE 1 (concluded)

Characteristics of Respondents	Number of Respondents	Percent of Total
Education Completed:		
None	2	1.6
1st	2	1.6
2nd	1	.8
3rd	3	2.4
4th	5	3.8
5th	6	4.7
6th	9	7.0
7th	1	.8
8th	7	5.4
9th	7	5.4
10th	9	7.0
11th	1	.8
12th	32	25.1
13 years	5	3.8
14 years	9	7.0
15 years	1	.8
Bachelor degree	18	14.1
Bachelor + 1	2	1.6
MA	0	-
19 years	0	-
20 years	1	.8
Ph.D.	2	1.6
22 years	0	-
23 + years	1	.8
No response	4	3.1
TOTAL	127	100.0
Household Size:		
Mean	6.3	
Median	6.5	
Mode	6.0	

APPENDIX B

APPENDIX B

Sample#_____

Household
Number#_____

GUAM SHORE AND WATERS QUESTIONNAIRE

In addition to questions about the household, we are also interested in finding out how the people on Guam are using the shores and the waters of Guam.

1. How often do you and your family eat fish? (RECORD TIMES PER WEEK)

_____

2. How often would you like to eat fish? (RECORD TIMES PER WEEK)

_____

3. Where do the fish you eat come from? (CHECK ONE OR MORE)

[1] bought at store

[2] bought from an individual

[3] self-caught

[4] given by someone

4. What kind of seafood do you eat? (CHECK ONE OR MORE)

	Eat	Raw	Fresh	Frozen
large fish (such as grouper tuna, mahi-mahi)	[1]	[1]	[1]	[1]
reef fish	[2]	[2]	[2]	[2]
milkfish, (bangus, pond-raised)	[3]	[3]	[3]	[3]
lobster	[4]	[4]	[4]	[4]
crab	[5]	[5]	[5]	[5]
shrimp	[6]	[6]	[6]	[6]
shells, (clam, oyster, trochus, etc.)	[7]	[7]	[7]	[7]
Other_____	[8]	[3]	[8]	[8]

Which kind of seafood do you eat raw? (CHECK ABOVE)

Do you purchase_____fresh or frozen (CHECK ONE OR BOTH) (ASK FOR EACH KIND OF SEAFOOD EATEN)

5. Do you or any member of this household go fishing? (RECORD ANSWER)

Yes [1] (ASK FOLLOWING)

No [2] (SKIP TO QUESTION 15)

6. What is the sex and the age of the people who go fishing?

Male [1] Female [2] Age ___

Male [1] Female [2] Age ___

Male [1] Female [2] Age ___

Male [1] Female [2] Age ___

7. Do you own: (RECORD ANSWERS) How Many

fishing poles Yes [1] No [2] _____

fishing nets Yes [1] No [2] _____

(IF YES, DESCRIBE)_____

_____

_____

other fishing equipment - Yes [1] No [2]

(DESCRIBE)_____

_____

_____

8. How do you fish? (CHECK ONE OR MORE)

[1] with net, what kind?_____

[2] With pole

[1] from shore, pier, etc.

[2] from boat

[3] with spear (TYPE) [1] Speargun [2] Spear

[4] by trolling

[5] other (DESCRIBE)_____

_____

_____

9. How many hours per week do you think you spend fishing? (RECORD ANSWER)

_____

10. About how many pounds of fish would you say you catch in a month? (RECORD ANSWER)

_____

11. Where do you do most of your fishing? (RECORD PLACE-NAME)

_____

12. Do you fish from (CHECK APPROPRIATE BLANDS)

[1] public land	[2] military land	[3] private land
[1] shore/pier, etc.	[1] shore/pier, etc.	[1] shore/pier, etc.
[2] between shore and reef	[2] between shore and reef	[2] between shore and reef
[3] beyond the reef	[3] beyond the reef	[3] beyond the reef

13. From among the above, where do you go most often? (RECORD ANSWER)

_____

14. What do you do with the fish you catch? (CHECK ONE OR MORE)

[1] eat it

[2] sell it

[3] give it away

[4] other (DESCRIBE: E.G., "RELEASE IT")_____

15. Do you ever go boating? (RECORD ANSWER)

[1] (ASK FOLLOWING QUESTION)

[2] (SKIP TO QUESTION 24)

16. Do you have your own boat or go on someone else's boat? (CEHCK ONE OR BOTH)

[1] own [2] other

(IF OWN, ASK 17-19; IF OTHER, ASK 20-23; IF BOTH, ASK 19-23 INCLUSIVE)

17. How many boats do you own?_____(CHECK AND RECORD ANSWERS IN APPROPRIATE BLANKS)

_____motorboat (number owned)

_____overall length

Yes [1] No [2] inboard engine

Yes [1] No [2] outboard motor

____ horsepower

____ rowboat (number owned)

____ other (DESCRIBE) _____

____sailboat (number owned)

____overall length

Yes [1] No [2] auxiliary motor

(IF NO, OMIT FOLLOWING BLANKS)

Yes [1] No [2] inboard engine

Yes [1] No [2] outboard motor

____ horsepower

_____

_____

18. What do you use your boat for? (CHECK APPROPRIATE BLANKS)

[1] recreation

[2] fishing

[3] other (DESCRIBE)_____

_____

19. About how many hours per month would you say you use your boat? (RECORD ESTIMATES IN BOTH BLANKS)

_____now

_____last year

20. When you use someone else's boat, do you: (CHECK ONE OR MORE)

[1] rent it

[2] borrow it

[3] go along as a guest

21. What kind of boat do you use? (CHECK ONE)

[1] motorboat

[2] sailboat

[3] both

22. What do you use it for? (CHECK APPROPRIATE BLANKS)

[1] fishing

[2] diving

[3] water-skiing

[4] pleasure ride/sightseeing

[5] other (DESCRIBE)_____

_____

23. About how many hours per month do you make use of someone else's boat? (RECORD ANSWER)

_____hours per month

24. Do you or any member of your family have a collection of shells, coral, aquarium fish, or any thing else from the shores and waters of Guam? (RECORD ANSWER)

[1] Yes (ASK FOLLOWING QUESTION)

[2] No (SKIP TO QUESTION 30)

25. What do you collect? (CHECK, LEAVE BLANK OR NAME SPECIALTY AS APPROPRIATE)

	Collects	Various	or	Name (s) of Speacialty
Shells	[1]	[1]		_____
Coral	[2]	[2]		_____
Aquarium fish	[3]	[3]		_____
Other (DESCRIBE)	[4]	[4]		_____

_____

(IF SHELLS, ASK QUESTION 26; IF NOT SHELLS, SKIP TO QUES. 27)

26. Why do you collect shells? (CHECK APPROPRIATE BLANK)

[1] to keep for yourself

[2] to sell

[3] to eat their contents

[4] to give to friends

[5] other (DESCRIBE)_____

27. Where do you go to add to your collection? (CHECK APPROPRIATE BLANK)

[1] beaches

[2] inside the reef

[3] beyond the reef

[4] Other (DESCRIBE)_____

28. About how many shells (tropical fish, etc.) do you collect in a month? (RECORD NUMBER)

_____

29. About how much time per month do you think you spend on collecting? (RECORD ANSWER)

_____hours per month

30. Do you and your family go on picnics to the beach? (RECORD ANSWER)

Yes [1] (ASK FOLLOWING QUESTION)

No [2] (SKIP TO QUESTION 34)

31. How often do you go on beach picnics? (RECORD ANSWER)

_____times per month

32. Where do you go most often? (RECORD PLACE-NAME)

_____

33. Do you picnic on (CHECK ONE OR MORE)

[1] public beaches

[2] private beaches

[3] military beaches

[4] Other (DESCRIBE)_____

34. Do you and your family ever go swimming? (RECORD ANSWER)

Yes [1] (ASK FOLLOWING QUESTION)

No [2] (SKIP TO QUESTION 39)

35. How often do you go swimming? (RECORD ANSWER)

_____times per week

36. Which do you prefer? (CHECK ONE)

[1] beach [2] pool

37. What beaches have you used in the last year for picnicking and/or swimming: (LIST PLACES-NAMES)

_____

_____

_____

38. Which beach do you like best? (RECORD ANSWER)

_____Name

39. Do you ever go camping? (RECORD ANSWER)

Yes [1] (ASK FOLLOWING QUESTION)

No [2] (SKIP TO QUESTION 43)

40. How many times in the past year have you camped on Guam? (RECORD ANSWER)

_____number of camping trips

41. Where have you camped? (LIST PLACES-NAMES)

_____

_____

_____

_____

42. When you go camping, how much time do you usually spend away from where you live on each camping trip? (RECORD ANSWER)

_____number of nights

43. Do you go surfing?

Yes [1] (ASK FOLLOWING QUESTION)

No [2] (SKIP TO QUESTION 47)

44. Where do you go to surf? (LIST PLACE-NAMES)

_____

_____

_____

_____

45. Do you own a surfboard?

Yes [1] No [2]

46. About how many hours a month do you surf? (RECORD ANSWER)

_____hours per month

47. Do you scuba dive? (RECORD ANSWER)

Yes [1] (ASK FOLLOWING QUESTION)

No [2] (SKIP TO QUESTION 53)

48. How do you usually gain access to the diving area? (CHECK ONE)

[1] by land [2] by boat

49. Do you own scuba equipment? (RECORD ANSWER)

Yes [1] No [2]

50. How many hours a month do you usually spend diving? (RECORD ANSWER)

_____hours per month

51. What areas have you dived the past year? (LIST PLACE-NAMES OR GENERAL AREAS: IF THE LIST IS LONG, LIMIT TO THE 5 MOST DIVED PLACES)

_____

_____

_____

_____

_____

APPENDIX B (Continued)

52. What would you say is your primary activity while diving? (CHECK ONE)

[1] photography

[2] collecting of shells, coral, etc.

[3] spearfishing

[4] instructing other divers

[5] salvage activities

[6] just sightseeing

[7] other (DESCRIBE)_____

_____

53. Are you always able to get to any beach you would like to go to? (RECORD ANSWER)

Yes [1] No [2]

54. What kinds of things do you think you would like to do if it were possible to get to all of Guam's beaches easily?

(DESCRIBE)_____

_____

_____

_____

_____

55. Do you think there are any activities connected with Guam's shores and waters that need changing or more or less regulation? (DESCRIBE)

_____

_____

_____

_____

_____

APPENDIX B (Continued)

56. We've been talking about fishing and fish-eating, about picnicking, camping, swimming and boating, about collecting things, surfing and scuba diving. Considering your answers about these activities and thinking back now for a moment to the way your parents lived and how they might have done, or not done, some fo these things, do you think there are some differences between you and your parents? Did your parents do anything differently? What things did your parents do that you don't do? (DESCRIBE)

_____

_____

_____

_____

_____

_____

57. Finally, we have a few questions to classify the people we talk to.

Sex: Male [1] Female [2]

Where were your born?_____

(IF BORN ON GUAM, ASK:)

In what year? _____

(IF NOT BORN ON GUAM, ASK:)

In what year did you come to Guam?_____

Where was your father born? _____

Where was your mother born? _____

In what year did you move to this village? _____