NATIVE FISHING RIGHTS AND LIMITED ENTRY IN THE CNMI

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AND LIMITED ENTRY
IN THE CNMI

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Introduction

In 1988 the Western Pacific Regional Fishery Management Council (WPRFMC) determined that a limited entry program containing a system of preferential access rights reserved for native fishermen of the Commonwealth of the Northern Mariana Islands (CNMI) would be permitted under the Magnuson Fishery Conservation and Management Act of 1976, as amended (WPRFMC 1988:1). The Magnuson Act requires that there be an historical basis to support any system of preferential access rights. In order to meet the relevant criteria of the Act, the Council contracted with Micronesian Archaeological Research Services (MARS) to pursue two sets of tasks: (1) to collect, catalog, and authenticate evidence which could provide a basis for giving preferential treatment or privileged status to fishermen who are descendants of the original inhabitants of the CNMI and (2) to explore the advantages and disadvantages of limited entry compared to more traditional management measures.

In pursuing the first set of tasks, the major emphasis of the project has been on the accumulation and evaluation of existing evidence (archaeological, ethnological, historical) for preferential fishing rights for the indigenous peoples of the CNMI. In spite of Johannes' (1988:10) judgement that in the Marianas "any form of limited entry for the purpose of fisheries management would have to be formulated without reference to local tradition," we were able to find local traditions regarding the CNMI pelagic and bottomfish fisheries. This study focused on evidence regarding the offshore and deep sea species listed in Appendix A. These species include certain snappers, groupers, tunas, mahimahi, billfishes, jacks, sharks, crustaceans, and precious corals. Because of the extreme depth, there has been no historic deep sea crustacean or deep sea precious coral fishery in the federal waters of the CNMI; therefore our work focused on the pelagic and bottomfish species within the EEZ (Exclusive Economic Zone), a band of ocean extending from 3 to 200 miles wide surrounding the archipelago of the CNMI.

Four general areas of evidence were taken into consideration, to establish that

1) there was and is a set of historical fishing practices for the species identified in Appendix A in the areas now encompassed by federal waters in the CNMI;

2) there was and is a dependence by native people of the CNMI (or at least a significantly identifiable portion thereof) on the fish, crustaceans, and precious corals identified in Appendix A;

3) at least some dimension of the indigenous cultures of the CNMI has in the past reflected and still reflects cultural, social, and religious values, traditions, and practices derived or based upon the fisheries for the species listed in Appendix A; and

4) there is present participation by native fishermen in the CNMI (together with non-native fishermen) in the fisheries of the species listed in Appendix A in the aforesaid areas.

For evidence areas 1-3, archival sources and archaeological reports in the libraries of the Univ. of Guam, the Trust Territory Transition Office, the

Hawaii State Library, the National Marine Fisheries Service, and the B.P. Bishop Museum were consulted. Sources were reviewed for relevant content, and an annotated bibliography was produced. There was no discontinuity in the historical documentation of offshore fisheries use; all historical periods were covered by the sources reviewed. In addition to archival sources, aged knowledgeable persons were consulted with respect to evidence area 3, and interviews with active fishermen were conducted regarding evidence area 4.

In pursuing the second set of tasks, **limited entry** was defined as a means of reducing total fishing effort in a fishery by restricting the number of fishermen (or fishing vessels) which participate in the fishery. The attitudes of active fishermen and fisheries management professionals regarding the effectiveness and desirability of various forms of limited entry for the offshore resource species in Appendix A were solicited through individual and group interviews in Rota, Tinian, and Saipan during the period March-May 1989. In addition to interviews, our library research produced written sources which provide a short-term historical perspective on contemporary attitudes toward limited entry. An evaluation of limited entry as a management option for the CNMI by a professional fisheries biologist with expertise in the Mariana Islands has also been prepared and is presented below.

The organization of the report is as follows. Following a brief discussion of Marianas geography to set the stage for a review of offshore fishing, there is an overview of the prehistory and history of the Mariana Islands which after 1898 follows a different trajectory from Guam mainly due to a difference in colonial administration. Next, the facts gathered for the four evidence areas are presented, with interpretive and evaluative comments. Here we briefly answer the questions posed in each evidence area. Following the information in the four evidence areas is a presentation of the attitudes toward limited entry gathered by interviews with CNMI fisheries management professionals and fishermen. This is followed by the evaluative report on limited entry by the fisheries biologist. Appendices A and B and an annotated bibliography conclude the report.

Geographic Background

The prehistoric and historic fishing practices of the indigenous peoples of the CNMI are more easily contemplated when their geographic circumstances are considered. The islands of the Mariana archipelago are located between 13 and 20 degrees north latitude just west of the Marianas Trench, which marks the active subduction zone between the Philippine and Pacific tectonic plates. The islands are distributed along two north-south trending arcs (Figure 1). A third, similarly trending submerged mountain chain, indicated only by reefs and banks, occurs 150-200 miles to the west of the two island arcs (Figure 2).

The northern arc is made up of steeply sloping islands of recent volcanic origin (at least four contain active volcanoes) while those of the southern arc are predominantly large raised platforms of coralline limestone on much older volcanic bases, probably dating to the late Eocene (Tracey et al. 1964; Cloud et al. 1956). Prevailing winds are northeasterly, becoming variable during the summer months from the influence of the Asian monsoon. Thus waters on the eastern side of the archipelago tend to be rough except from about July through September. Waters in the lee of the larger islands tend to be calmer throughout the year.

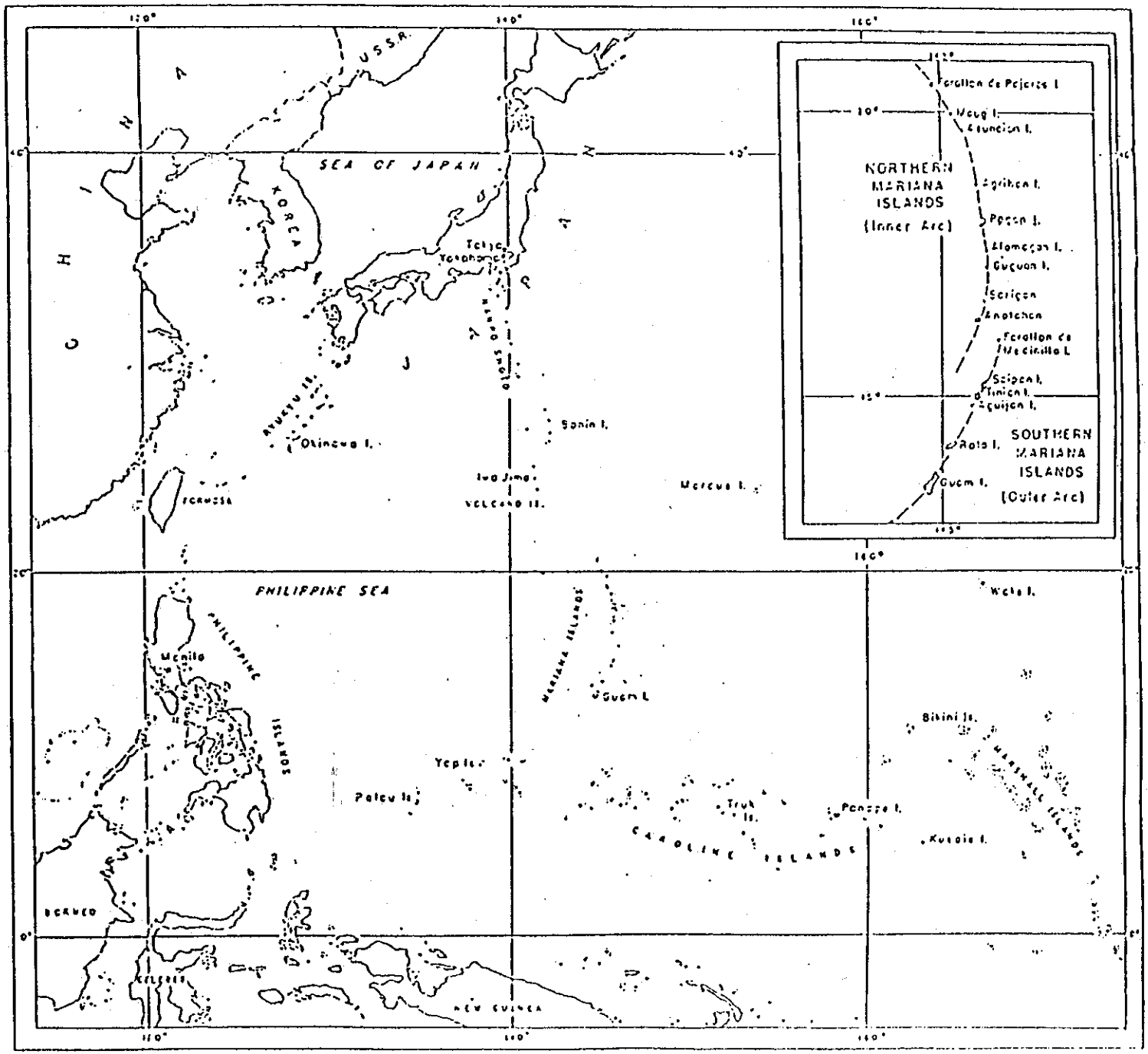


Figure 1. Location map of Mariana Islands in the western Pacific Ocean; inset shows northern and southern arcs (after Corwin et al. 1957:Fig.2)

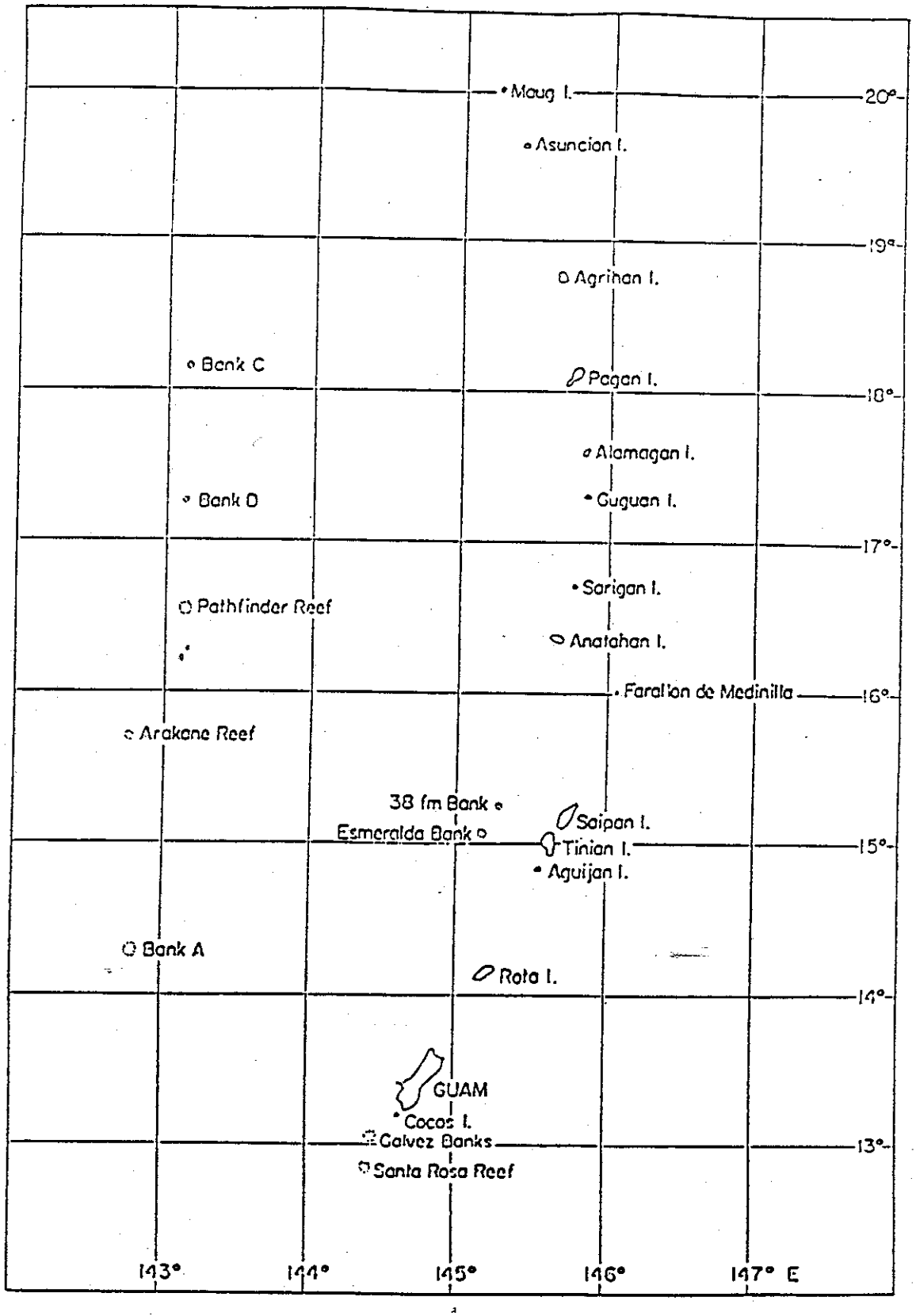


Figure 2. Mariana Islands and some offshore reefs and banks to the west (after Polovina et al. 1985:Fig.1)

The smaller northern arc islands have pockets and restricted areas of nitrogen-rich soil which under favorable rainfall conditions can produce bumper crops of cultigens. The larger southern arc islands have considerably more extensive areas of arable land as well as limestone forests containing lumber and other resources not found in the volcanic islands to the north. While enjoying more rainfall, the southern islands are also less vulnerable to storm damage, and even from the most destructive storms some parts of these islands are usually spared. It is this contrast in agricultural potential and the "subsistence security" it offers which may have determined that prehistoric human populations were more numerous in the south, in spite of relatively accessible fishing grounds in the north.

Air temperatures rarely exceed 90 degrees F. nor drop below 70 degrees F., while annual rainfall decreases northward in the CNMI, from approximately 100 inches in Rota to about 70 inches at the extreme northern end of the Marianas chain. Tropical storms and typhoons are not uncommon, bringing a significant proportion of the annual rainfall. Since there is much variability in the frequency and occurrence of storms, there is much variation in annual rainfall from year to year. These uncertainties and a sometimes pronounced winter-spring dry season combine to make human existence on these islands, particularly with a pre-industrial (non-metal and non-fossil fuel based) technology, not as "easy" as first might be thought, in spite of the Marianas' tropical setting.

The beaches and reefs of the large CNMI islands (Rota, Tinian, and Saipan) of the southern arc are, "at places, bordered by fringing reef or erosional bench platforms of various widths and origins...True reefs have developed by direct organic accretion by corals, calcareous algae, and other reef-associated organisms. On Saipan and Tinian offshore barrier reefs with shallow lagoons are developed along parts of their western coasts" (Eldredge and Randall 1980:1). Possibly because of relatively recent uplift, Rota has no similar development of low energy lagoonal settings on its western side. Numerous pinnacles of Holocene limestone emerge several feet above the water along much of this shoreline, seaward of the narrow sandy beaches.

The islands of the northern arc also have no extensive fringing reef platforms; usually the complex shorelines of these volcanic peaks drop steeply into the sea (for example, see Corwin et al. 1957), and any flat coastal land is composed of volcanic sands or boulders. Numerous species of reef and bottomfish live in the northern island waters, and species normally found far offshore in the southern Marianas can occur very close inshore.

In addition to the fringing reefs associated with the larger islands and the coral communities forming on the steeper submerged slopes of the northern islands, offshore sea mounts, pinnacles, and banks occur in the Marianas region. Some of these are several miles from the major islands, such as those lying 150-200 miles to the west (see Figure 2). There are also closer isolated areas of partially submerged reefs, such as those between Guam and Saipan. These shallow areas within the deeper sea attract a wide range of bottomfish. Another source of pelagic and bottomfish within the ocean are the floating logs on and around which tend to aggregate a variety of large fish species.

The above geographic facts illuminate the picture of the kinds of indigenous fishing possible in the CNMI, under pre-European Oceanic technologies (i.e., lacking iron and fossil fuels). Pursuit of reef fish inside lagoons and

just outside fringing reefs would be possible using weirs, traps, spears, nets, and hook and line from paddling canoes. Fishing in the deeper waters at some distance beyond wide fringing reefs, for instance at relatively remote sea mounts and pinnacles and for trolling, would require the use of sailing canoes and various hook and line and dip net techniques. While regular seasonal and irregular storms can affect reef fish abundance and variety, the large number of techniques which can be practiced in inshore settings assure that some catch is more likely than no catch at all. In contrast, successful deep sea fishing from canoes at some distance from shore is considerably constrained by sea and weather conditions.

Temporal and spatial patterns of pelagic and bottomfish occurrence would have played a role in determining when and with what technical devices these fish were exploited. For example, mahimahi begin to run in the southern Marianas in November and December (Amesbury et al. 1986:86), when the sea is not necessarily calm. Also, even though the tradewinds abate during the early summer when these fish may be taken, summer is also the season when tropical storms are most likely. Given the need to minimize the danger and difficulties of ocean fishing under these conditions, Marianas fishermen may have had to miss part of the run, or only fish in the lee sides of the islands at this time. Also, given the fact that pelagic and bottomfish are very unevenly distributed within the vast ocean, intimate geographic knowledge of the location of sea mounts, pinnacles, and reefs and fish migration routes as well as knowledge of the likely occurrence and patterns of movement of floating logs with associated fish would have been essential. In sum, sound biological and geographical knowledge based on familiarity with the region, and proven techniques and equipment, including navigational ability, which minimized the inherent danger to the fisherman while also maximizing the predictability of fish location probably characterized successful Marianas offshore fishing in prehistoric times.

When we consider the alternative, inshore fishing in lagoons and in other coastal settings, which can be practiced with less danger, fewer seasonal constraints, and more predictability, it becomes interesting to explain the development of indigenous offshore fishing practices, particularly on the larger islands of the southern arc. However, a comprehensive answer to such a question is beyond the scope of this report and discussion will be limited to relevant portions.

Prehistoric and Historic Overview

Prehistoric human settlement in the Marianas apparently began some three thousand years ago (see Athens 1986 and Bonhomme and Craib 1987 for a recent assessment). The earliest archaeological evidence in the CNMI comes from excavations at the Laulau Bay site in Saipan (Marck 1978, 1980; Bonhomme and Craib 1987). Marck obtained radiocarbon dates on charcoal from early cultural deposits said to represent an earth oven at Laulau (Marck 1978:63). The calibrated age ranges of these dates would be 1380 to 830 B.C. and 1375 to 825 B.C. (see also Athens 1986:14). At the Muchon (also spelled Mochong) site in Rota, an early date on a charcoal sample from occupation midden has a calibrated age range of 1010 to 425 B.C. (Takayama and Intoh 1976:21, cited in Athens 1986:14). Butler (1988:Table 5-1) recently radiocarbon-dated a small piece of wood charcoal from a buried pit feature at another northeast coastal site in Rota, Teteto-Guata, yielding a calendar date range of 910-410 B.C.. On the basis

of these limited finds, the first human inhabitants were present in the CNMI by the late 2nd millennium B.C..

The earliest archaeological deposits in the Marianas have been referred to the Pre-latte Period or Phase (Spoehr 1957). They have been found only in sandy coastal settings and have mainly been found buried beneath later prehistoric occupation layers. Pre-latte deposits are usually small in areal extent at sites where they have been found, in comparison with the areally more extensive, more abundant, and better known sites of the Latte Phase (Spoehr 1957). According to Spoehr (1957), the Latte Phase began about A.D. 800 and continued until the major cultural disruptions of the late 17th Century. Two major differences in the technologies of the Pre-latte and Latte Phases are the dominance of Marianas Plain Ware in the ceramic assesmblages and the presence of latte stones, megaliths thought to have served as building posts, in the latter phase. The Pre-latte Phase is characterized by the dominance of Marianas Red Ware and the absence of latte stones. Other differences between the two occupational phases could be listed but the most important for the purpose here is the relatively common occurrence in coastal Latte Phase deposits of pelagic fish remains and of remnants of the technology used in obtaining these species. The specific evidence for this generality will be considered later in the report.

In fact a very limited amount of information bearing on the question of prehistoric offshore fishing is available in reports of excavations in Pre-latte and Latte Phase sites in the Marianas. It should be noted, however, that throughout the prehistoric period of some three thousand years, the economy of these islands developed in the absence of commercial activities; that is, it was completely subsistence-oriented. Thus the archaeological remains of the prehistoric Mariana Islands adaptive system reflect human cultural responses to a very different set of constraints and opportunities than are operative today. Further, the beginning of the end of this non-commercial cultural system can be attributed to Spanish colonization of the Marianas in the late 1600s and lasting until just before the turn of the 20th Century, when the United States took over Guam and Germany purchased the Marianas north of Guam.

European contact with these islands, destined to comprise the CNMI some three quarters of a century later, had begun with the explorer-adventurers such as Magellan, Legaspi, Loaisa, van Noort, van Spilbergen, and Dampier (extensive references to the original voyages and to secondary sources on these and other early expeditions can be found in Lessa 1975 and Hezel 1983). By 1565 Legaspi had formally claimed the Marianas for Spain but it was not until late in the following century that a colony was established in the islands. During the second half of the 17th Century, Spanish Catholic lay and professional religous arrived in modest numbers, bent on converting the indigenous population to Christianity. In 1668 Spanish military forces were sent to protect the colony and its religious representatives (see, for example, Corte 1875; Thompson 1945; Carano and Sanchez 1964).

One of the most far-reaching effects of European colonization of the Mariana archipelago was a disastrous decline in the number of native Chamorros, from an estimated 40,000 persons in the late 17th Century to approximately 1,500 persons a hundred years later (Underwood 1973:Tables 1, 2). A significant part of the decline was from Spanish military attacks on native villages in Guam, Rota, Tinian, and Saipan, as well as "round-ups" of the residents of "Gani," the name of the smaller islands to the north of Saipan (Hezel 1986:13), who, along

with Guam's indigenous residents, were forced to settle in a few parish villages on Guam. These harsh measures resulted in Chamorro flight from the European attacks and by several battles of resistance which however ultimately failed. By the turn of the 18th Century most of the survivors had been removed to Guam except the few who had escaped capture in Rota, a few more living in a missionary outpost in Saipan (finally closed in 1730), and probably some holdouts in the far northern islands of Gani (Hezel 1986:34, 31).

These tumultuous events seriously disturbed the native land tenure, farming, and fishing systems which had evolved over the millennia to suit the individual island habitats and social conditions. The Spanish "reduction" of the Marianas peoples (a policy whereby the indigenes were "reduced" to a few population clusters centered on a parish church in order that they might be more effectively instructed in the Catholic faith) caused severe economic hardship that was to last for many years. Contributing in a synergistic fashion to the demise of the native population were several epidemics of newly-introduced diseases such as measles and influenza, to which the native Chamorros had no resistance, like their counterparts elsewhere in the Pacific and in California when confronted by these European scourges (Underwood 1973:16-18).

Once the defeated Chamorros had been forcibly concentrated in village parishes on Guam, the Spanish continued to destroy their ocean-going canoes (see, for example, Garcia 1985:165, 272, 285, 303) which had been known to the Europeans as "flying *proa*" or "*prau*." While these actions effectively put an end to regular inter-island travel, they may not have suppressed it completely (see discussion of F. Garcia's [1985] history of Guam in the late 17th Century). Some large sailing canoes apparently still existed for Crozet (1783:204-211) to observe in 1772 (however, see Haddon and Hornell [1975:417] who believe Crozet's published description [1783] was cribbed from Dampier's observations of 1686 [Dampier 1906, Vol. 1:308-311] -- including repeating Dampier's error of saying the outrigger and curved side of the hull were on the lee side). Whether the loss of so many sailing canoes during the early Spanish colonial era had put an end by Crozet's time to pelagic fishing from canoes as well as to regular inter-island canoe travel by the Chamorros is not known. It can be surmised, however, that with the systematic destruction of both ocean-going canoes and of the large men's houses in which they had been maintained on shore, previous patterns of access to and use of the open ocean were significantly different after this time.

During the late 18th and ensuing 19th centuries, the Marianas population recovered by fits and starts, still coping with epidemics, typhoons, earthquakes, and food shortages. European scientific exploratory voyages, for example, by Freycinet (1824), Dumont d'Urville (1828, 1835), Duperry (1826), Kotzebue (1821), and Lutke (1835), were undertaken in the Pacific and often included stops in the Marianas. The published journals, reports, and atlases resulting from these trips provide many ethnographic details of island life. As we have suggested, however, indigenous lifeways in the Marianas had changed by the time these European scientific observers arrived to record them. For example, cattle had been introduced and grazed freely in Tinian and Saipan and in parts of Guam, and Sambar deer from the Philippines roamed the larger Mariana islands (Eldredge 1988:135). These large mammals as well as domestic pigs, also introduced by the Spanish and many of which eventually became feral, may have damaged traditional gardens and other unprotected resource-gathering areas. More to the point, the introduced domestic and wild animals became a reliable

land-based protein supply that had not been available prehistorically nor were they as difficult nor as dangerous to procure as pelagic or bottomfish. Thus a colonial-era shift away from the use of offshore species in light of more easily procured land animals can be anticipated. Other factors possibly contributing to a decline in offshore fishing during early historic times were the introduction of labor-intensive crops such as corn and wet rice and their associated work schedules which may have conflicted with offshore fishing.

The Re-Entry of the Carolinians

It was also during this time that people from the central Carolines, in what are now Yap and Truk States of the Federated States of Micronesia (Figure 3), were encouraged by the Spanish government to settle on Saipan, Tinian, and Rota as well as in Guam (Underwood 1973:22-24, 29-30; Hezel 1983:106). These people came to the Marianas with a well-developed sea-faring tradition and at the time claimed to have been making regular trading voyages from the Carolines prior to the coming of the white men. "[H]aving been witnesses themselves of their cruelty" (Kotzebue [1821], quoted in Hezel [1983:103]), the Carolinians had understandably ceased these voyages. But once assured of their safety under the protection of the Spanish governor, the Carolinians resumed their Marianas trips and came to live in small settlements on the larger islands. In return for permission to occupy permanent Marianas settlements, the Carolinians were employed by the Spanish to carry messages throughout the archipelago, as well as to convey farm products such as jerked beef to Guam (Hezel 1983:105, 107; Gomez 1885:27). Figure 4 depicts some Carolinian sailing canoes off Tinian during this period. In contrast to the less fortunate Chamorros, the Carolinians maintained their ocean-going sailing tradition in their home islands well into the 20th Century (Alkire 1965, 1978; Gladwin 1970; Lewis 1978; Thomas 1987).

20th Century Colonial Powers in the CNMI

In 1899 the German empire acquired the Marianas by purchase from Spain (except Guam, which had been taken by the Americans the year before as a spoil of the Spanish-American War). Shortly thereafter an account of the history and general ethnography of the archipelago was compiled by the Saipan District Captain Georg Fritz (1986). He states that in 1880 the Spanish prohibited the Carolinians from sailing among the Mariana Islands after some canoes had been wrecked at sea (Fritz 1986:24). However, Gomez (1885:27) reports that shortly after this, 100 Carolinians were living on Pagan producing (coconut?) oil and salted pork, presumably some of which was exported. In any case, this late 19th Century prohibition appears to mark the end of regular use of sea-going canoes within the Marianas by Carolinians. However, they continued to live in small enclaves in these islands and to sail in their own canoes to and from the central Carolines. During the German administration, Fritz (1986:43) reports, Carolinians sometimes went to Aguigan from Saipan to dive for trepang (sea cucumber) for sale to the Japanese, who were the only merchants. In what sailing craft such diving trips were made is not indicated but apparently the German administration did not prohibit the use of sailing canoes in the Mariana Islands north of Guam.

The Japanese seized the German Marianas in 1914 and remained in control until the Americans captured the islands in the World War II battles of 1944. During the Japanese civil administration, a huge influx of immigrants, most from Okinawa but also including Japanese from the home islands and Koreans numbered

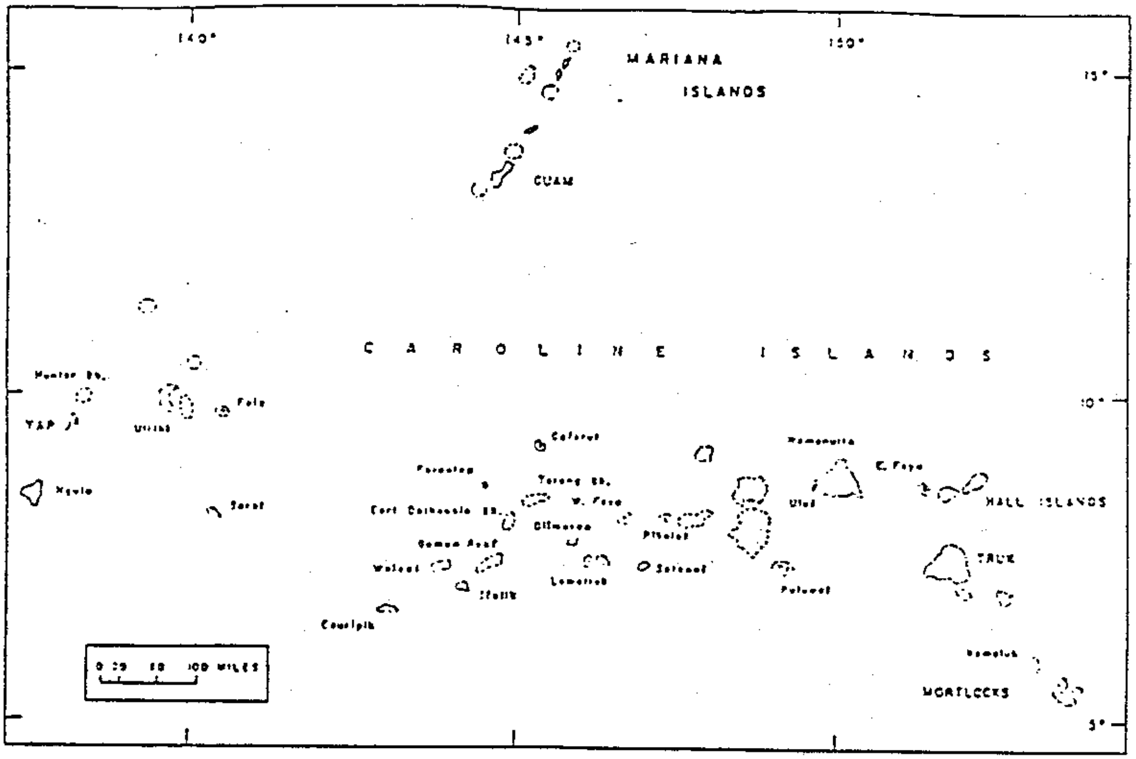


Figure 3. Location of the Mariana Islands with respect to the Carolines (after Barratt 1988a:Fig.1)

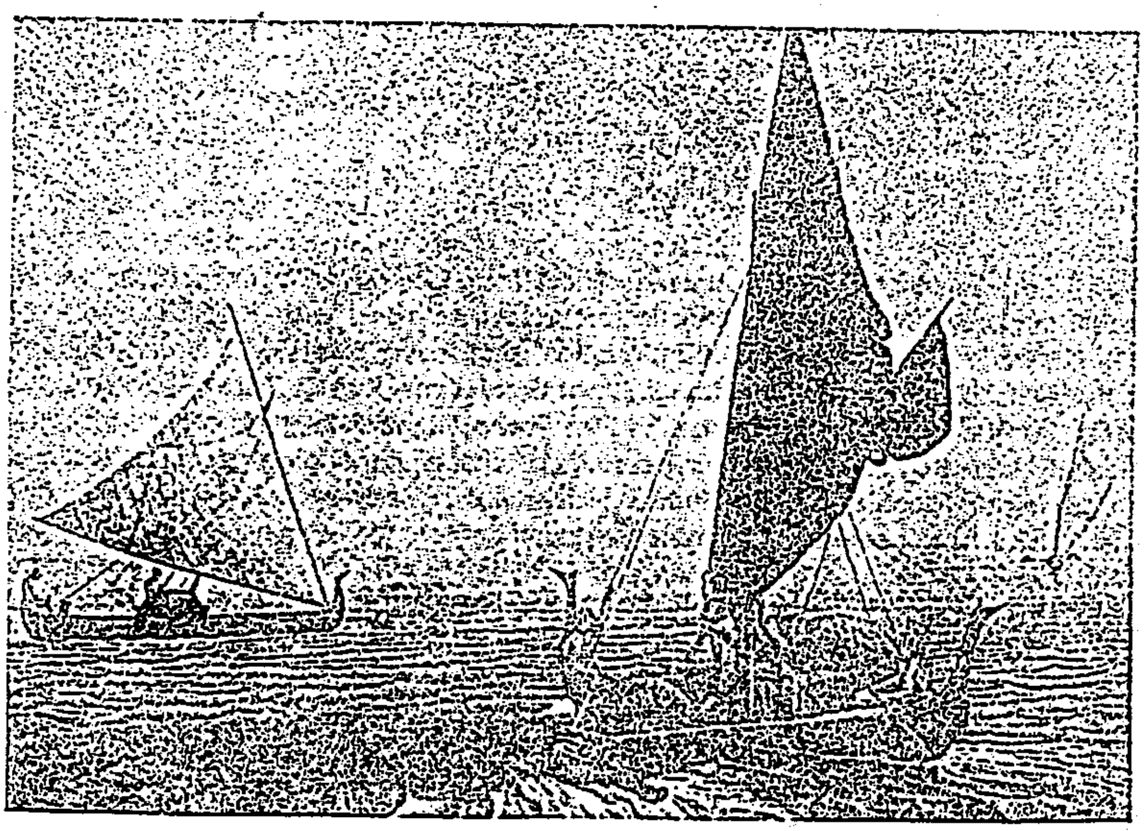


Figure 4. Carolinian sailing canoes off Tinian, ca. 1800 (after Barratt 1988a:Fig.2, a reproduction of a painting in Freycinet's Atlas of 1825)

in the tens of thousands. They came to Rota, Tinian, and Saipan to participate in various commercial enterprises including sugar cane farming and offshore fishing for export and local consumption (Nishi 1968; Peattie 1988). The immigrant population increased almost twelvefold from 1924-1937, finally surpassing the native Mariana population in 1935 (Nishi 1968:Table 7).

The indigenous people of the islands, classified in the Japanese hierarchical social system as third-class citizens, participated little in the economic system driven by large monetary and labor subsidies from Japan. For example, they were not involved in the commercial offshore fishing industry except as local consumers of the catch which was mostly exported to Japan. Wages were very low but so were prices; nonetheless native ownership of an ocean-going boat was not feasible and thus during this time no direct exploitation of offshore species could have taken place. It is said that during Japanese times local people in Saipan acquired a distinct preference for Japanese-style *sashimi* (bite-size pieces of sliced raw fish filet of the larger offshore species, especially tuna, eaten with hot mustard paste), a preference which persists today in contrast to other islands in the CNMI where tuna sashimi is not especially esteemed.

World War II and the Modern Era

Just prior to and during World War II, the Japanese administration prepared for war. After a string of Japanese victories early in the Pacific war, the Allies were able to cripple Japanese supply lines and thus prevent ultimately effective defensive fortifications to be built in the Marianas, although many troops were present on the eve of the Allied attacks on Saipan, Tinian, and Guam in 1944 (see Crowl 1960; Russell 1984). The war-time conditions in the CNMI precluded any native fishing expeditions by boat; it was a time of deprivation and stress for all the island residents. According to Richards (1957:523), "The extensive pre-war fishing industry and its facilities on Saipan were entirely destroyed as a result of the war. One of the last acts of the Japanese before the invasion was the scuttling of the fishing fleet." However, the U.S. Naval Government (n.d.) indicates that the destruction of the fleet occurred during the invasion (see below).

In post-war times, the American naval administration (1945-1947) then the United Nations mandated Trust Territory civil government leading to Commonwealth status with the United States in 1978 (the effective date of the CNMI Constitution), oversaw the demise of the offshore fishery as a successful commercial endeavor. This seems to have been due to the absence of the formerly large Japanese market and the lack of skilled Okinawan laborers (who had been repatriated immediately after World War II), as well the cessation of significant financial, technical, and administrative support which had been supplied by the Japanese colonial government (see Nishi 1968).

During the period 1944-1945 some pelagic fishing was undertaken under the direct sponsorship of the Navy, by captive Okinawans in order to supply the many prisoners of war as well as civilians without other means for obtaining food (Richards 1957:307-309, 527). Following the re-establishment of a fishing industry using military equipment, although much reduced from the Japanese times, attempts were made to interest private fishing companies to begin operations in Saipan. None considered it economically feasible considering problems with supplies, security restrictions on the movement of persons, and

lack of adequate market once the Japanese internees had been repatriated (Richards 1957:524-525). Approximate monthly catches (principally bonito) at Saipan during the wartime period ranged from 1,387 pounds in September 1944 to 370,523 pounds in July 1945 (Richards 1957:527). The largest catches occurred May through August 1945.

Under the American civilian government, subsistence fishing once again became the main type of fishing pursued by the indigenous people of the Marianas even when boats could be purchased. Spoehr (1954:161) writes that in 1946, when all the Okinawan commercial fishermen had been repatriated, the Saipanese Carolinians joined a government-sponsored deep-sea fishing cooperative. This was the Saipan Fishing Association named in the annual reports on the Trust Territory (U.S. Government) for 1948-1951. It had essentially failed by 1950; the reasons were speculated upon by Spoehr to include very small catches and much spoilage; lack of mechanical competence to maintain the old, reconditioned military equipment including cold storage facilities; lack of management expertise; and lack of adequate market (Guam had been the presumed market but proved to be inaccessible).

CNMI regulations for the taking of fish and game were promulgated in 1986. In the Regulations, no license is required for taking fin fishes with rod and reel, line tackle, or spear while the use of nets for fishing is controlled by licensure (see Part 4, Sections 1 and 3). Foreign commercial fishing vessels, purse seiners and long-liners, presently fish in the tropical northern Pacific in the vicinity of the CNMI. In recent years boats from Guam have been fishing in waters of the CNMI EEZ, and sport fishing for bottomfish at sea mounts and for pelagic fish in the open ocean (trolling) is increasing as a tourist amusement provided by the Saipan hotels.

The Four Evidence Areas

Evidence Area 1: that there was and is a set of historical fishing practices for the species listed in Appendix A.

Nature of the Evidence. Evidence for historical fishing practices in regard to the species listed in Appendix A is of three general types: historic documents which describe such practices, ethnographic studies containing information about customary fishing among the indigenous peoples of the Marianas, and archaeological reports from which inferences about fishing practices can be made. The types of archival sources consulted include eye-witness reports; second-hand reports of eye-witness accounts; ethnographic accounts and lists of linguistic forms indicating familiarity with offshore fish and fishing practices; archaeological excavation reports describing prehistoric fish remains and fishing gear; and synthetic summaries of fishing practices and their associated technologies such as fish hooks and ocean-going canoes by anthropologists, historians, and other scholars. Government reports from the various colonial regimes were also consulted for information on the participation of native peoples in the offshore fisheries of the CNMI.

The evidence gathered in this study generally supports the proposition that there was and is a set of historical fishing practices for the species in Appendix A (exceptions listed below) but it was rarely possible definitely to establish specific fishing practices separately for each species. Also it was not possible definitely to establish whether each species was taken beyond three

miles from the island coastlines although species in the following families historically have been taken in offshore waters of the CNMI: Acanthocybiidae, Thunnidae, Katsuwonidae, Carangidae, Epinephelidae, Lutjanidae, Nemipteridae, Lethrinidae, Coridae, and Labridae. Mahimahi (*Coryphaena hippurus*) and marlin (*Makaira nigricans*) were definitely taken. No evidence was found regarding historical fishing practices in the EEZ for *Corallium* spp., *Gerardia* spp., *Lepidisis olapa*, *Acanella* sp., *Panilirus* spp., *Heterocarpus* sp., or *Scyllarides* sp..

In many of the sources consulted, the evidence is inferential rather than direct. This is well exemplified in the case of archaeological reports wherein the data are subject to conflicting interpretations. Mainly this is due to a lack of precise understanding by archaeologists of the formation processes of the archaeological record and of the precise effects these processes exert on the spatial distribution of artifacts and food refuse in prehistoric sites. Also making for ambiguity in the interpretation of archaeological finds is that excavation and analytical techniques vary in their quality and comprehensiveness from project to project; some classes of information bearing on prehistoric fishing practices or fish consumption patterns may not be recovered at a given site due to the kinds of excavation and/or analytical strategies employed by the archaeologist.

Another problem encountered is incomplete or no reporting of faunal remains by archaeologists; rarely are fish remains comprehensively described or even minimally classified as to families represented. Even when fishing gear such as shell fish hooks is reported from a site, overall size and other physical attributes are not always given. In such cases it is not possible to infer the size of the fish sought with such gear. Taking into account a variety of ethnographic evidence from the tropical Pacific and the biological habits of tropical marine fishes, Davidson and Leach (in Butler 1988,337-343) have suggested the most likely catching methods associated with particular fish families. They proposed that the demersal baited hook, pelagic lures, and harpoons were the principal methods of catching fish from the families with species listed in Appendix A.

In the case of eye-witness accounts, the credibility of the observer may be an issue; ambiguity and misunderstanding are often factors in cross-cultural accounts, for example, due to the European observer's unfamiliarity with native Micronesian cultural practices or with local fish species. Thus, misidentification of species can occur in these descriptions, and/or the non-native eye-witness might have misinterpreted certain customary practices relating to fishing. In general, relatively less reliance should be placed on the observations of untrained observers such as missionaries,' adventurers,' and travelers' accounts and more on those of professional ethnographers and natural scientists, allowing for individual variations in the observer's natural sensitivity to and interest in the material. In the case of the Juan Pobre account of 1602 (Driver 1989), due to the archaic writing style, it is not always clear who had made the original observation reported, the lay brother Juan Pobre or the Spaniard Sancho.

Unfortunately for this project, professional observations on customary fishing practices in the Marianas did not begin until after considerable disruption of the indigenous Chamorro culture. Even in these later works, a writer might freely quote or discuss the observations of another writer on the

same subject in such a way that it is not possible to discern who actually made the original observation. In one case, an author had borrowed from the writings of another so precisely as to have repeated the first writer's mistake regarding placement of the canoe outrigger.

During the 20th Century, we have few actual ethnographic studies but some compilations from which fishing practices can be inferred. A considerable amount of ethnographic material was collected and described by Hornbostel (1921-24; see Thompson 1932), mainly for Rota, Saipan, and Guam, during the Japanese occupation of the Marianas (1914-1944). Also during this time a few Japanese ethnographers came to Micronesia, along with other scientists, to evaluate the area's resources and economic potential. Recently some of the Japanese ethnographic reports have been translated but remain unpublished at the Bishop Museum in Honolulu. We reviewed the relevant translations at the Museum, finding only the paper by I. Yawata (1930) to directly pertain to the Marianas, and the paper by H. Hijikata (1941) to indirectly pertain to our subject, as he studied fishing methods in Satawal. It will be seen that the Japanese nationals and foreign immigrants such as Okinawans and Koreans, performed the bulk of the offshore fishing during the first three decades of this century, although there is evidence of native participation as well.

Our interviews and sea-side encounters with CNMI fishermen in the islands of Rota, Tinian, and Saipan helped to document present offshore fishing techniques as well as those of the past which are known but little used (see Photos 4-21).

The evidence presented below has been organized as follows. First the archaeological site report data are presented, with interpretive commentary. In these discussions references are made to the pertinent ethnographic and ethnological literature. A review of the historical documentation of European observers is then presented. For the Spanish Period (1521-1899) the documentary evidence has been subdivided into reports which directly pertain to pelagic fishing and those which indirectly do so. For the ensuing colonial eras (German, Japanese, American) the direct and indirect evidence is considered together.

Prehistoric Archaeological Evidence

Introduction

The CNMI archaeological record of some three thousand years of human occupation yields two general categories of data which can be used as a basis of inference about the practice of prehistoric fishing: the physical remains of marine fish, primarily certain skeletal parts, and fishing gear such as hooks, gorges, and harpoon heads.

An additional category of archaeological data, just now becoming available, derives from the chemical isotopic analysis of human skeletal material. These analyses can provide clues about prehistoric diet of the individuals whose bones are analyzed, particularly about the relative dependence upon marine resources from lagoonal or pelagic environments (DeNiro 1985; van der Merwe 1982; Walker and DeNiro 1986). Chemical isotopic analytical techniqes in archaeology are very new; therefore only recent studies contain this kind of data. Human skeletal remains from CNMI archaeological sites are among the few which have been

subjected to these analyses, specifically, skeletal material from sites in Rota and Saipan (Hanson 1989:33-44).

Archaeological fish remains are often imprecise indicators of the exact species taken by prehistoric fishermen. This is because the fish bones found in archaeological deposits are not distinctive at the species level; more often only the family or subfamily can be known for certain; occasionally a particular bone can be identified to genus; and with some exceptions, it is virtually impossible to distinguish among several species of a particular genus on the basis of bone morphology alone.

Generally, fishing gear is better-reported than are fish remains in the archaeological reports we consulted for this project, although there is a recent trend toward more comprehensive description of fish remains. We have confined our research to a consideration of those items which most likely reflect exclusively the taking of pelagic or bottomfish but it should be kept in mind that some gear, such as certain hooks and gorges, could have been used in the inshore areas as well, and that some species normally found in offshore habitats also frequent inshore settings and could have been taken there.

Fish Remains in Archaeological Sites

Fish remains reported from archaeological excavations are generally confined to the vertebrae and the denser head and mouth parts, particularly of the Scaridae (Fleming 1986). Differential preservation of the more durable parts of the scarid skeleton may account for their relatively common occurrence in archaeological assemblages in many Pacific islands including the CNMI. While acknowledging this possibility, Fleming (1986) nevertheless argues that these reef fish are very abundant and easily caught and therefore were frequently consumed by Pacific islanders, in contrast with the more prestigious but less common pelagic and bottomfish.

Other factors influencing the occurrence of pelagic and bottomfish remains in archaeological sites are geographic. For example, in parts of islands with no shallow lagoonal development, such as the southwest coast of Rota, pelagic fishing is the only type which can be pursued from sites along this coast. Also it should be remembered in the absence of a wide fringing or barrier reef, it is not necessary to sail even a mile offshore to obtain large fish. As will be seen below, numerous pelagic fish remains have been found in archaeological sites off the southwestern coast of Rota. Little archaeological work has been conducted in the islands of the Mariana archipelago north of Saipan but it can be anticipated that pelagic and bottomfish forms will be found, as the waters surrounding most of these volcanic islands are relatively deep. Just about the only way to obtain fish in these high energy coastal habitats is by free-diving and with the use of boats.

From archaeological fish bone assemblages often only the relative size of the vertebrae can be used to infer whether a larger form such as a pelagic fish or a bottomfish is represented. However, marlin have a distinctive vertebral form, and at the Objan site in Saipan, some of these distinctive bones were found by Spoehr (1957:164, cited by Davidson and Leach 1988:351). Other marlin or swordfish vertebrae have been reported from five prehistoric occupation sites on the northern coast of Rota--the Mochong site and four sites in the Rota Airport Road project area (Davidson and Leach in Butler 1988:Tables 15-9, -10, -

11). Also from these sites Davidson and Leach (in Butler 1988:343, Table 15-9) report the remains of mahimahi and other pelagic fish of the following families and family-pairs: Acanthocybiidae, Thunnidae, Katsuwonidae, Carangidae, and Thunnidae/Katsuwonidae as well as the following bottomfish families: Epinephelidae, Lutjanidae, Nemipteridae, Lethrinidae, Coridae, and Coridae/Labridae.

Elsewhere on Rota at the late Latte Phase Alaguan site on the southeast coast, Craib (1988:47) found that "Fishbone comprises the bulk of the bone sample, encompassing many genera of fish, including large pelagic varieties." Craib's preliminary report does not specify which genera are represented nor in what numerical proportions.

On the southeast coast of Saipan at the Laulau Bay site, Marck (1978:60-61) found mostly scarid bones but one tooth, possibly from the dogtooth tuna (*Gymnosarda unicolor*) was identified in association with an earth oven deposit.

In the Northern Mariana Island of Pagan, Egami and Saito (1973:Table 1) excavated fishbones from a Latte site, including vertebrae of bonito or tuna, sailfish, and *Lethrinus* sp., and one mandible from *Sphyraena* sp. among other bones of reef fish.

Davidson and Leach (in Butler 1988:351), citing a personal communication from an A. Piper, indicate that remains of marlin and mahimahi were found in an (unspecified) archaeological context on Tinian.

One bone fragment (out of forty-five fragments) of a pelagic form, possibly tuna family, recently was recovered by Butler (personal communication) in prehistoric deposits at several sites on the west coast of Saipan (Butler and De Fant 1989).

Fishing Gear

In Marianas artifactual assemblages fishing gear is overwhelmingly fragmentary; whole items are seldom found (see for example Figure 5). In part this is due to quick decomposition in the moist ground of the materials used, such as wood and turtle shell, but it is probably also due to the fact that many of a site's archaeologically retrieved items are discards — broken or worn-out pieces of equipment which have been disposed of along with other refuse. As noted above, items of highly perishable organic materials cannot survive long in the ground under tropical island conditions. The apparent non-survival of turtle shell is particularly unfortunate, as trolling lure barbs were apparently made of this material. In sum, the artifactual assemblage found by the archaeologist at a given location usually does not represent the full range of items used by the people who once occupied that site. Pompeii-like conditions of preservation and completeness at an archaeological site are exceedingly rare.

Granted the above truths, we considered the following items of fishing gear to indicate the practice of offshore fishing:

1. bone "spear points," or "harpoon heads." These items indicate the taking of large pelagic fish such as mahimahi (*Coryphaena hippurus*) and marlin (e.g., *Makaira nigricans*). As pointed out by Davidson and Leach (in Butler 1988:340), marlin "are known to bask on the surface, and can then be approached and

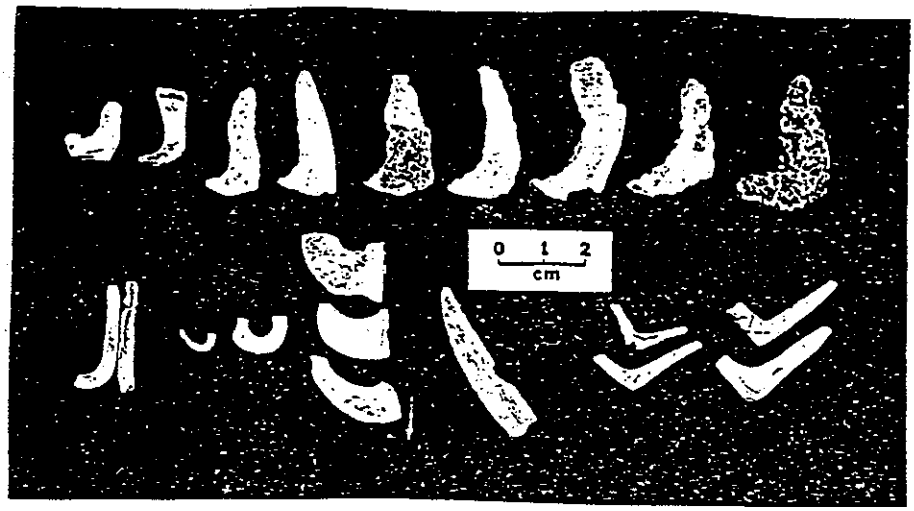
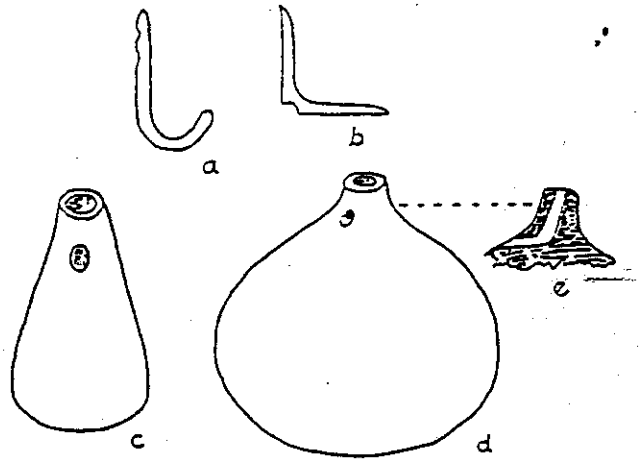


Figure 5. Archaeological specimens from the Tarague site, Guam; *Isognomon* shell fishhooks, blanks, gorges (after Amesbury et al. 1986:33)



Fishing implements. *a*, fishhook. *b*, fish gorge found with burial 30 inches below surface, Taga, Tinian. *c*, fishing stone of type 3, limestone: height, 2 2/5 inches; maximum diameter, 1 2/3 inches; diameter of top opening, 2 1/5 inches. *d*, fishing stone of type 2, limestone, Saipan: height, 3 inches; maximum diameter, 3/8 inch. *e*, cross-section of top of *d*.

Figure 6. Drawings of fishing implements from the Marianas; a,b: shell fishhook, shell gorge; c,d: fishing stones with hole drilled in top for line (after Thompson 1932:Fig.21)

harpooned" (citing Tinker 1978:331, 333; Gosline and Brock 1960:261-265). This technique could have been practiced from a large canoe; without the noise and odor of a boat engine, approaching a large basking fish without startling it may have been fairly easy, although killing and landing a large specimen must have required the utmost skill and courage.

According to Reinman (1967:121-123), the fish spear is very common in Oceania including Micronesia, generally used along the shore and in shallow water but also from canoes and when diving into deeper water. Citing Anell (1955:29), Reinman (1967:123) states that "garfish" are taken by spearing in Micronesia. Spoehr (1957:160, 164-165 reports spear points from the Laulau site on Saipan, and Thompson (1932:52, Plate 11) reports fragments of three bone "spearheads" from prehistoric occupation sites collected by Hornbostel in the 1920s although no site provenience is given.

Craib and Ward (1988:78) report four probable spear points from the Mochong site, Rota, and they remark on similarities to specimens retrieved in Guam at the Pagat site by Craib (1986). At the Alaguan site in Rota, Craib (1988:43) found "two bone points, used on composite trolling lures" and a single bone spear point.

Egami and Saito (1973:212, Plate XIII) report a barbed spearhead of bone, which could have been a harpoon head, from Regusa, a late Latte Phase site on Pagan.

Marck (1978:33) reports that two bone harpoon heads were reocvered from the Laulau Bay site on Saipan. The author suggested that the part of the site where these items and other fishing gear were found had been "the site of or immediately adjacent to a canoe house or other place where fishing activities were characteristically organized" (Marck 1978:33, 35).

2. **gorges.** Two types are known, straight and bent at an angle, generally a right or obtuse angle with one leg longer than the other. The ends are pointed and the line was attached to the center. A right-angle gorge is illustrated in Figure 6, found in a Latte site on Tinian.

Materials used include wood, mussel, pearl, and turtle shell, pandanus thorns, fishbone, and animal teeth. According to Anell (1955, cited in Reinman 1967:131), gorges in Micronesia are commonly used with coconut shell floats or short hibiscus wood sticks, weighted on one end, in order to catch flying fish, which in turn are used as bait for larger fish (such as mahimahi) caught by trolling. The gorge may also be trolled baited or unbaited behind a moving canoe; again the most frequently sought fish with this implement is the flying fish, the bent form of gorge being used.

Reinman (1967:131) states that within Oceania, gorge trolling is only found in Micronesia. Annell (1955:152) states that in the Marianas the gorge was made of mussel shell (cf. Reinman 1967:131, cited above). The presence of gorges in an archaeological assemblage may indicate the taking of large pelagic fish because of the association of gorges with obtaining flying fish for bait. The taking of flying fish by gorge trolling would have been followed on the same trip by trolling for pelagic fish using the fresh bait. Other techniques of taking flying fish, such as seasonal hand-netting from a moving canoe at night under torch light would have resulted in larger quantities at a time, but on

these occasions, the fish would be consumed directly and/or preserved.

Craib and Ward (1988:74) report eight *Isognomon* shell gorges from upper levels at the Mochong site in Rota, commenting on their absence in lower, earlier levels at the site. Thirteen gorges as well as nine worked pieces which appear to be the debris from manufacture of hooks, gorges, or lures of *Isognomon* were found by Butler (1988:291-292) in Rota at the Airport Road sites.

3. **compound spinner hooks.** Compound spinner hooks consist of a shank resembling a fish's body or head and a pointed hook attached by lashing to the shank. According to Reinman (1967:138), these devices are used without bait and are trolled behind a moving canoe. Figure 7 shows drawings of examples of these hooks, from Guam and Satawal.

By their shape and color, they resemble a small fish and serve as a lure. This is the primary device for taking "bonito," which includes at least the skipjack tuna/bonita (*Katswonus pelamis*) listed in Appendix A. According to Reinman (1967:166, citing Thompson 1932, no page number given), "apparently a single specimen of a composite hook shank" was found by Hornbostel. This item may be one which was found on the surface in Guam; according to Thompson (1932:46), it was "composed of calcareous material, with two knobs at one extremity for attaching the line and two grooves at the other for securing the hook." This item is illustrated in Photo 1.

Craib and Ward (1988:74) report six items interpreted as bone barbs from compound spinner hooks from the Mochong site in Rota. They also note the presence of bone barbs at an archaeological site on Pagan (Craib and Ward 1988:74 citing Egami and Saito 1973) and at sites in Guam (citing Reinman 1977; Ray 1981; Craib 1986). Egami and Saito (1973:211) report the bone barbs as composite fish hook points.

4. **sinkers.** Stone sinkers (*poio* in Chamorro) were used in connection with *hachuman* fishing, a specialized chumming technique for *Decapterus* (opelu) dwelling at over 50 ft depth, done over a series of days in late summer from a paddling canoe (see Thompson 1932:47-48; Amesbury et al. 1986:8-10). Although this species is not listed in Appendix A, the *poio* fishing technique indicates native Chamorro use of the open sea for to fish at some distance from land, presumably over seamounts; see the 19th Century description in this report. Archaeological specimens of *poio*-type sinkers are reported by Thompson (1932:47 from Saipan, Table 1 from southern Marianas). The *poio* device from Rota is illustrated in Photo 2, from the Hornbostel collection at the Bishop Museum, Honolulu. Also illustrated are a grooved stone sinker from Rota (Photo 3), also from the Hornbostel collection, and drawings of fishing stones with holes drilled in the hollow top from Saipan (Figure 6). According to his notes, Hornbostel (1921-24) was not always able to purchase the indigenous artifacts still in the possession of, and often still in use by, Chamorro and Carolinian families in the southern Marianas where he worked. In such cases his wife Gertrude made ink drawings of the items, and sometimes watercolor illustrations.

5. **wooden hooks.** According to Reinman (1967:138), large wooden hooks are used in Micronesia for taking sharks and *Ruvettus* and other deep-dwelling fish, several miles from shore. None was reported in the archaeological reports consulted for this project but it should be remembered that uncarbonized wood is seldom

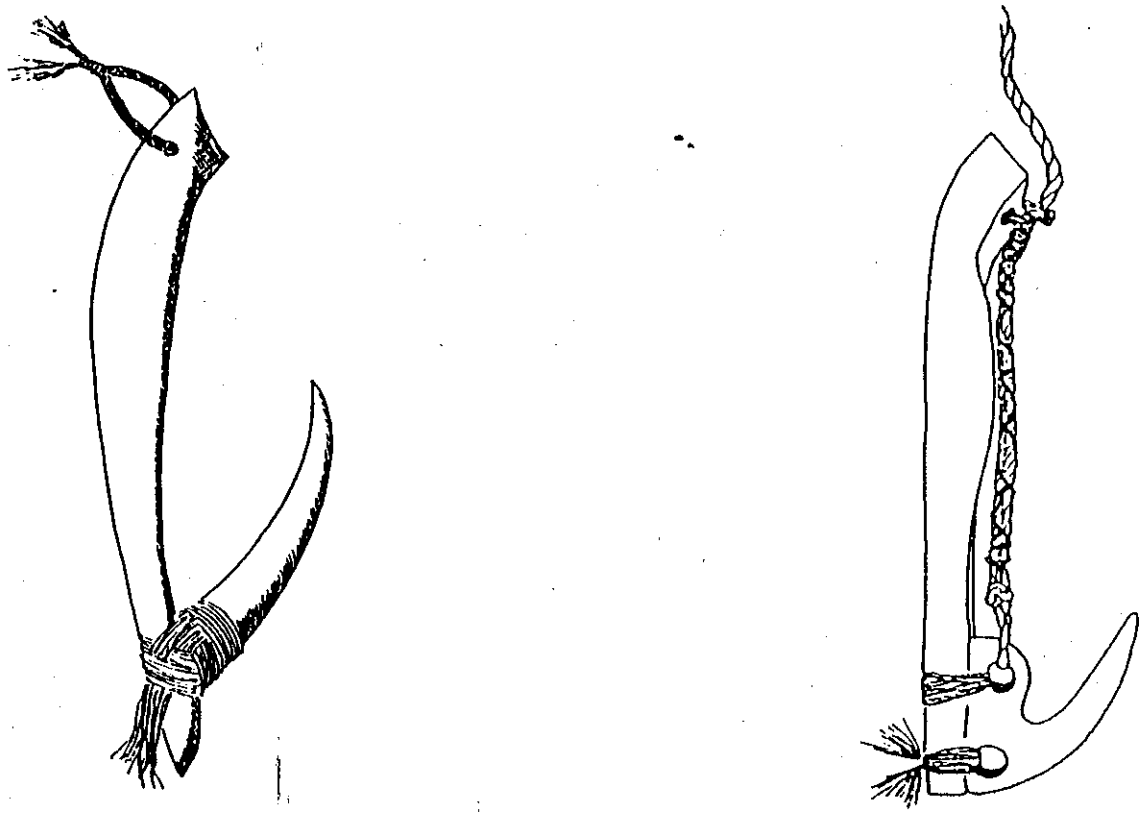


Figure 7. Drawings of composite hooks: l, from the Marianas (after Amesbury et al. 1986:Fig.1); r, from Satawal (after Gillett 1987:Fig.4)

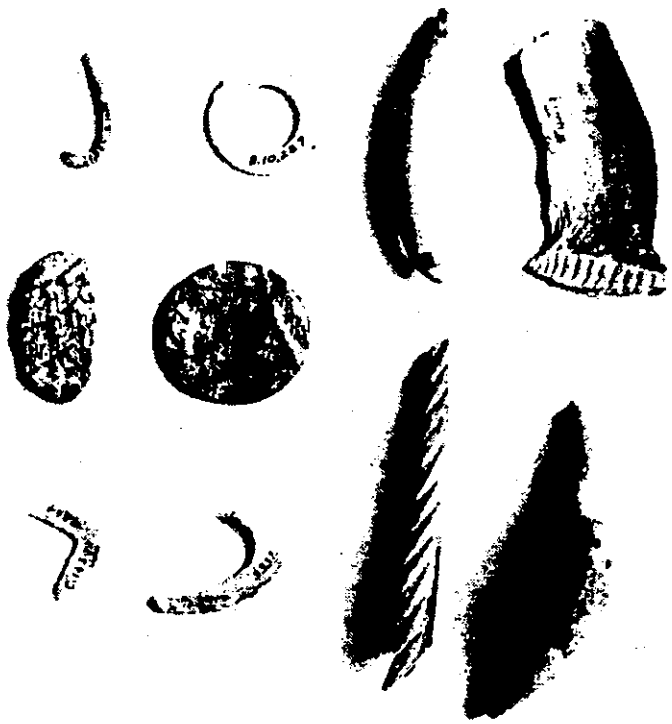


Photo 1. Shell and bone objects from Hornbostel Collection, Bishop Museum negative #18174; top row l-r: shell fishhook, shell ring, trolling hook shank, *Isognomon* shell knife; lower row l-r: shell gorge, shell hook, bone harpoon head or spear point, ornament

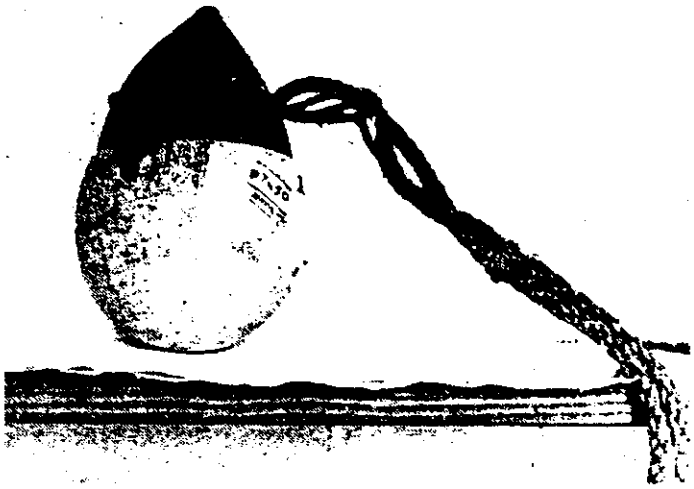


Photo 2. *achuman* (Decapterus, opelu) chumming device from Rota, called *poio*, made of limestone, coconut shell, coconut fiber cord; from Hornbostel Collection, Bishop Museum negative #18172

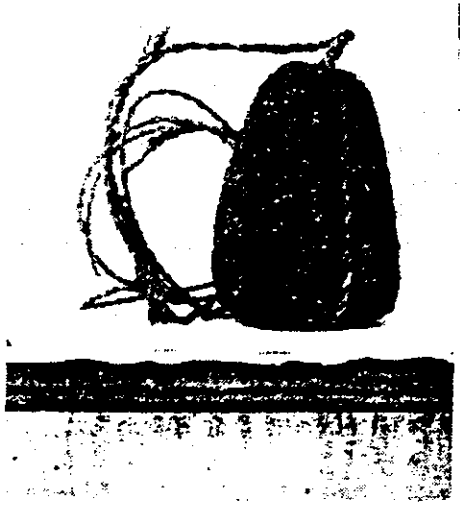


Photo 3. Stone sinker from Rota, Hornbostel Collection, Bishop Museum negative #18173

preserved in Marianas archaeological sites. It is possible that such wood items may be found in waterlogged depositional contexts in future.

Historic Evidence: Spanish Period

Sources Pertaining to Pelagic Fishing

Antonio Pigafetta--1521

Antonio Pigafetta (1969), Magellan's historian on the first expedition to circumnavigate the globe, recorded their "discovery" of the Mariana Islands in March 1521. Their stop at Guam was brief and hostile. The log of the pilot Albo (1971) shows that they arrived on March 6 and departed on March 9. The islanders entered Magellan's ships and stole from them. In particular, they stole a skiff from Magellan's ship. Magellan went ashore with 40 armed men, burned 40 or 50 houses and several boats, killed seven men, and recovered his skiff.

As Magellan's ships were leaving the island, the Chamorros followed them for a league in 100 or more boats. The islanders offered them fish, but instead threw stones. Pigafetta marveled at the skill with which the islanders maneuvered their boats.

In spite of the circumstances surrounding his visit, Pigafetta described the lives of the islanders. He observed that the people had flying fish and that the fish were caught from boats with hooks made of fishbone. He said, "The pastime of the men and women of that country and their sport is to go in their boats to catch those flying fish with hooks made of fishbones" (Pigafetta 1969:61).

The significance of Pigafetta's observation to this project is that flying fish are the main food of mahimahi (*Coryphaena hippurus*). This was demonstrated in a pelagic fish feeding study (Myers 1984:77,79) conducted on Guam from 1981 to 1983. Flying fishes (Exocoetidae) made up 74.5 percent by weight of the stomach contents of the mahimahi sampled. This means that it would be possible for a fisherman who was catching flying fish with a hook and line to also catch a mahimahi. We know from the following source that this was the case with the Chamorros of that time.

Fray Juan Pobre de Zamora--1602

Fray Juan Pobre de Zamora, a lay brother of the Franciscan order of Discalced Friars, was aboard a ship in the fleet which departed Acapulco, Mexico, on February 4, 1602 (Driver 1983). The fleet carried the new Governor of the Philippines, Don Pedro Bravo de Acuna. Governor de Acuna had learned in Acapulco of the shipwreck of the Santa Margarita at Rota a year earlier in February 1601, so he ordered the fleet to put in there where they recovered 21 survivors and an additional four from Guam.

Moved by a desire to see the people of Rota converted to Catholicism, Fray Juan Pobre and a companion jumped ship there. He remained on the island until October of that year when he departed on a Spanish ship bound for the Philippines.

While on Rota, Fray Juan Pobre was visited by a Spaniard named Sancho, one of three Spanish survivors of the **Santa Margarita** that had remained in the Marianas. Sancho lived on Guam as a servant to a Chamorro master. Islanders from Pago, Guam, brought Sancho to Tazga, Rota, where he visited for several days with Fray Juan Pobre and his companion. At the end of their visit, Fray Juan Pobre accompanied Sancho back to the village of Guaco, Rota, where he was to meet the villagers from Pago, Guam, who had brought him to Rota (Driver 1988). As the two slept at Guaco that night, Sancho was speared in the back. Nine or ten days later, in the month of August, Sancho died at the home of Fray Juan Pobre's master in Tazga.

As Chapter 70 of his account (Driver 1983), Fray Juan Pobre related what Sancho had told him concerning the customs of the people of the Marianas. Sancho told how the people fished for flying fish, mahimahi, billfish, and other large fish.

According to Sancho, the people of a village gathered as a group to fish for flying fish. They sailed out in their boats, each of which carried ten or twelve calabashes. Attached to each gourd was a thin cord with a two-pronged hook made of shell. One prong was baited with ***carne de cos*** (possibly *carne de coco* or coconut meat). The other prong was baited with a shrimp or small fish. All of the calabashes were put into the water at the same time. Each person watched his own, and when it wiggled, he knew he had hooked a flying fish. The fish were usually eight inches long but could be up to 16 inches. So many were caught that there was sufficient for everyone. Sancho compared the abundance of the catch to the sardine catch in Spain.

The first flying fish was eaten raw. The second was used to bait a large hook on a line which was cast over the stern of the boat. In this way the people caught many ***dorados*** (mahimahi), ***agujas paladares*** (possibly blue marlin), and other large fish. They did not eat shark, but were great enemies of it.

Sancho went on to relate a specific incident which illustrated many of the points he had mentioned before:

> My master, whom they called Sunama, went fishing far out to sea. After having eaten the first flying fish (***bolador***), and after having baited his hook with the second, as I described earlier, a very large blue marlin (***aguja paladar***) took the hook. His line was very thin and, as he did not want to break it, he hesitated to pull it in. Yet he was very anxious to land the fish; therefore, he very cautiously began playing and tiring it. This took a long time. Meanwhile, a large shark appeared and attacked the blue marlin in the midsection of its back. In order not to let go of his line, the *indio* allowed his boat to capsize. Then he tied the end of the line to the capsized ***funei***, followed the line through the water to the shark, and diverted him from his catch. Then he brought the blue marlin back to his boat, righted the craft, and sailed home, flying a woven mat as a banner from the masthead. Once ashore, he began to tell us what had happened and, like a person who believes he has accomplished a great feat, very proudly strutted pompously along the beach.

Sancho explained that when the people returned from fishing, they displayed a

banner symbolizing their catch. A large banner meant a large fish had been caught. He concluded his discussion of fishing by giving the Chamorro equivalents for his Spanish names of fish. We have added the English and scientific names.

Spanish	Chamorro	English	Scientific
bolador	*gaga*	flying fish	family Exocoetidae
dorado	*botague*	mahimahi	*Coryphaena hippurus*
aguja paladar	*batto*	blue marlin	*Makaira nigricans*

Sancho also said the people of the Marianas "use the same kinds of nets and fishing tricks that our people use and many more" (Driver 1983:207). He opined, "...these are the most skilled deepwater fishing people yet to have been discovered" (Driver 1983:208).

There are two things that should be noted about the translation of Fray Juan Pobre's writing. It was sometimes difficult for the translator to determine whether it was Fray Juan Pobre or Sancho speaking in Chapter 70. This was in part due to the fact that Fray Juan Pobre frequently spoke of himself in the third person (Driver 1983:205). The incident quoted above about Sancho's master fighting off a shark to land a billfish may actually have been about Fray Juan Pobre's master who was named Sunamo (Driver 1988:89) or Sunama (Driver 1988:91). If the incident involved Sancho's master in Pago, Guam, who was also referred to as Ama (Driver 1988:94), then both Sancho and Fray Juan Pobre had masters named Sunama. It may well be that the word "Sunama" was not a personal name, but a title meaning "Master." The Chamorro-English Dictionary (Topping et al. 1975) defines "ama" as "mistress, owner, boss." However, because of the ambiguity over who told the incident about his master, we do not know certainly whether the incident happened to a resident of Pago, Guam, or one of Tazga, Rota. In any case the incident is at least secondhand (if it was Fray Juan Pobre's master) or third hand (if it was Sancho's master).

The second thing to note regarding the translation of Fray Juan Pobre's account concerns the fish names. Dr. Steven S. Amesbury, who had provided scientific names for the fish mentioned in Driver (1983), translated ***aguja paladar*** as billfish and added that it was probably the blue marlin (***Makaira nigricans***) since that is the most commonly caught billfish in the Marianas. After the first use of the term, the translator added "possibly blue marlin" (Driver 1983:208) but in the paragraph quoted above concerning the billfish caught by Sunama, the translator used the unqualified "blue marlin" (Driver 1983:209). We do not know that the fish was a blue marlin, only that it was a billfish.

Louis de Freycinet--1819

The Freycinet Expedition which arrived at Guam March 17, 1819, was a French scientific expedition which included the zoologists Quoy and Gaimard, the botanist Charles Gaudichaud-Beaupre, and the artist and writer Arago. The expedition spent several months in the Marianas, visiting Tinian and Rota as well as Guam.

Freycinet provided a relatively detailed account of the Chamorro tools and techniques used for fishing. Those that pertain to pelagic fishing are discussed

here. A device called the *poio*, used when fishing for *atchoman* (*Decapterus*) was described (Freycinet 1824:436). The *poio* consisted of a hemispherical stone, flat on top and three and a half or four inches in diameter, and a half coconut shell similar in size to the stone with a small opening in the top. Cords went through holes in the stone and coconut shell to hold them together. A loop or handle was added through the two holes in the stone, and a cord was attached which was long enough to allow the device to descend eight fathoms where the *atchoman* were found. Chewed coconut meat was put into the hollow coconut shell, and the device was used to attract the fish toward the surface where they could be taken in a net. The *poio* device was described by Hornbostel (1921-24; 1931) and is illustrated in Photo 2.

The particular net used was also described (Freycinet 1824:437). It was called *lagoa atchoman*, and it was similar to the nets known in France by the names of *chaudiere* or *caudrette*. The net was in the shape of a large bag with a circular opening. It was nine feet in diameter and four and a half feet long. The circle was made of *lodogao* (*Clerodendrum inerme*) wood an inch thick. Four cords attached to the circle came together in the center where the line was attached which allowed the net to descend to the necessary depth. Drawings of both the *poio* and the *lagoa atchoman* are included in Freycinet (and in the Hornbostel Collection there is a photograph of a man standing by one of these large nets).

Freycinet (1824:440-441) described the *atchoman* fishing as follows: The *atchoman* were caught beyond the reefs, one-half league to five leagues from land. Closer to land, he said, one would have caught none or almost none. The fishing began in August and continued until October when the fish were full grown.

The fisherman filled a *poio* with the chewed pulp of a young coconut and lowered the device on a line to a depth of six to eight fathoms. The fisherman shook the line from time to time dispersing the coconut meat into the water. The *atchoman* came in great numbers to eat the coconut. When the *poio* was empty, the fisherman took it out, refilled it, and continued the operation until evening.

The following morning, the fisherman returned to the same spot, but this time he lowered the *poio* one or two feet less deep than the previous day. He did this each day for a month and a half or two months except when bad weather prevented him. By then the *atchoman* were coming almost to the surface. Ordinarily this fish was caught at a depth of one fathom.

The process did not need to take so long unless the fisherman wanted a very abundant harvest. If he did not begin the operation until September when the fish were full grown, 15 days of feeding would have been sufficient. In that case, instead of gradually shortening the cord by one or two feet, he shortened it more each day.

With the *poio* at a depth of one fathom and always in motion, the fisherman or his helpers put the large *caudrette* (*lagoa atchoman*) into the water and slid it carefully under the *poio*. The net was lifted slowly and gradually until the circle which surrounded the opening came to the top of the water. The men took the net out of the water and threw the fish into their boat.

Then they began the same maneuver again. They could obtain a second and third catch on the same day. The fish were taken to the women who dried them in the sun with salt.

The 1943 unedited translation done for the Yale University Human Relations Area Files mistakenly translates the French to say that the fisherman could obtain two or three fish on the same day. However the French word "*capture*" is better translated "catch" here. The fisherman was able to obtain a second or third catch, meaning a second or third netful.

Freycinet (1824:441) added that this productive fishing technique, to which the ancient people had devoted a certain number of hours each day, continued until the *atchoman* migrated. He said that it was by alignments taken from land that each boat fixed the limits of its fishing ground, although he added that at that time only the inhabitants of Rota followed this practice.

In the section concerning laws about fishing, Freycinet said that an *atchoman* fisherman would sometimes throw his *poio* into the water while crossing several fishing grounds. The fish would follow his canoe. When he arrived at his own ground, he would have a better catch. However, if the fisherman was caught doing this, he would receive the death penalty. This would seem to imply certain legal conventions had been developed by the Chamorro which pertained to offshore fishing.

It is interesting to note the distance at which this type of fishing took place: one-half league to five leagues from land. The league has varied with time and place from about 2.4 to 4.6 statute miles. Two sources (Marden 1986:576-577) dating to the late 1500s state that an English sea league contains 2500 fathoms and a Spanish sea league contains 2857 fathoms, and that a fathom is six feet. One of the sources added that a Portuguese sea league is the same as the Spanish. This means that the English sea league was 2.47 nautical miles, while the Iberian sea league was 2.82 nautical miles. Currently, a French league equals four kilometers (Chevalley and Chevalley 1966) or 2.16 nautical miles. Based even on the most conservative equivalent, five leagues was more than 10 nautical miles offshore.

Knudson (1987), who estimated five leagues at 15 statute miles, feels that distance is excessive because of the difficulty of placing a small boat in the same spot that far from shore each day. However, it would be possible to place the boat in the same spot each day even at that distance from the shore if the spot were over an offshore bank, and that may have been the case according to the following informant.

Richard K. Sakamoto (personal communication) reports that *Decapterus* sp. are found at offshore banks such as 11-mile Bank, Galvez Bank, and Santa Rosa Reef, as well as parts of the Guam reef system such as Double Reef. Sakamoto came to Guam in 1966 under a contract with the Division of Fish and Wildlife (now the Division of Aquatic and Wildlife Resources) to provide training in small boat fishing methods and to survey the waters around Guam for fishery resources. He recalls that some *Decapterus* were caught during the exploratory fishing phase which began in January 1967, and that a Chamorro speaker from Guam told him the local name for the fish is *achuman*. Sakamoto's impression, from talking with local fishermen, is that *achuman* used to be more abundant around Guam than they are now, although they still occur here and recently have been

caught at Double Reef by Sakamoto's friend Masao Tenbata. Sakamoto says that repeatedly chumming an area where *achuman* occur will cause the fish to regularly return to this area.

Freycinet's (1824:443) description of fishing for flying fish is very similar to that of Fray Juan Pobre more than 200 years earlier. One difference is that Freycinet said the hooks used were made of iron rather than shell which had been used in the past. He gave the Chamorro name ***kinatchit gomahga*** for the device used, which consisted of a main line held by small calabashes and to which were attached lateral lines at intervals of six to nine feet. The moving calabashes signaled the fisherman that a flying fish had been hooked, and he caught it from his boat.

Freycinet (1824:443) also described fishing for what he called in French *l'anaho* (*dorade*?). The addition of the word "*dorade*" in parentheses may mean that he was talking about mahimahi (*Coryphaena hippurus*). The content of his description also indicates that he was talking about mahimahi, because he said that it was caught using a recently killed flying fish.

Felipe de la Corte y Ruano Calderon --1855-1866

Felipe Maria de la Corte y Ruano Calderon was the governor of Guam from May 1855 to January 1866. He was one of three 19th-Century Spanish governors whom Carano and Sanchez (1964:141) found "stand out from the rest as having worked hard and well for the benefit of Guam." His administration consisted of a series of agricultural and economic experiments, and in his lengthy report, he concluded that the principal problem in Guam was poverty.

Concerning pelagic fishing, de la Corte (1970:143) made this statement: "In the contiguent seas there are considerable large fish, but as the natives never go to fish them beyond the reefs few fish are caught."

He did describe fishing within the reef for species available year round and for seasonal runs of fish. He also described fishing for ***adusman*** (Freycinet's ***atchoman***). He said that the fish are fattened by the flaked coconut every day for one to three months and then caught in the net as described by Freycinet.

With regard to the amount of fish caught in this way, de la Corte reported, "With this operation they sometimes catch more than a ton of fish a day, and repeat the fishing for a month, around August" (Corte 1970:145). However, he went on to say, "...only certain old men practice this, and I do not think anybody does so nowadays." This raises a question, then, as to whether or not de la Corte ever saw that amount of fish harvested first hand or was told that amount concerning fishing in the past.

De la Corte (1970:145) also said, "Sharks abound and another fish called ***rompecandados*** (padlock breaker) which is more voracious than the shark," but he did not mention that either was fished.

Concerning navigation, de la Corte (1970:146) remarked, "In spite of the fact that on their discovery these natives created a reputation as good navegators [*sic*], and notwithstanding the fact that they individually have a good disposition as sailors, they do not at present exercise it whatsoever, on

the island since there is no boat capable of making a trip even to the nearest route." He reported there were three or four boats or "whale hunters' canoes" used for transporting goods from the harbour to Agana or for carrying unmilled rice from Inarajan or Merizo at harvest time. He said the islanders used small canoes or "galquides" for fishing, but added, "...they are so small, they cannot be used for anything other than going between the reefs, and thus nobody fishes beyond them." He said that in 1863 there were only 24 of these small canoes and concluded, "Consequently, we can say there is no navegation [*sic*] of any kind on the island."

Francisco Olive y Garcia--1884-1887

Francisco Olive y Garcia was the Spanish governor of Guam for less than a year beginning in November 1884. His notes pertain to the years 1884-1887. The section of Olive's report concerning fish is so similar to de la Corte's, one is tempted to conclude that he copied it from the former governor.

Like de la Corte, he said, "There is an abundance of large flavorful fish, but very little is caught because the people do not venture beyond the reef" (Olive y Garcia 1984:34). He described the same seasonal runs and the *achuman* fishing. Ironically, he did not credit the Chamorros who had invented the *poio* with the intelligence to use it. He said, "...since this requires patience, care, and intelligence--generally lacking in the Chamorros--we believe this is practiced only by an occasional person, especially on the island of Rota" (Olive y Garcia 1984:34).

Historic Evidence: Spanish Period

Sources Indirectly Pertaining to Pelagic Fishing

Miguel Lopez de Legaspi--1565

Miguel Lopez de Legaspi was the Spaniard who formally claimed Guam as a possession of Spain on January 26, 1565. Like Magellan's visit in 1521, Legaspi's visit was brief and ended in hostility. The diary (Abella 1965) of an unnamed traveling companion of Legaspi said that the fleet sighted land on January 22, and the ships anchored at Guam on January 23. On board was Fray Andres de Urdaneta who had visited Guam briefly with the Loaisa expedition in 1526. The day the ships anchored, Urdaneta delighted the Chamorros by speaking a few words he remembered in their language. However two days later as the vessels attempted to refill their water supply at the mouth of a cove, the islanders showered them with rocks and slingstones. The hostilities culminated in the murder of a ship-boy who had fallen asleep on land and the retaliation on the part of the Spaniards by killing a number of islanders and burning some houses and canoes. The ships sailed from Guam on February 3, less than two weeks after their arrival.

The author of the diary described the canoes of the islanders and their ability to use them (Abella 1965:19).

> Their canoes are very neatly and well made, sewed together with cord, and finished with a white or orange-colored bitumen, in place of pitch. They are very light, and the natives sail in them with their lateen sails made of palm-mats, with so much swiftness

against the wind or with a side wind that it is a thing to marvel at, and according to the expert sailors of our fleet they had never seen a sailing craft as light as these before; they have no prow nor stern; the men steer the boat by simply turning the end of the lateen-sail, and no matter how fast the boat went forward it turned backward making of the prow the stern. Indeed it is interesting to see the speed with which they navigate and the ease with which they change direction.

The author said that many canoes met them with six to twelve or more islanders in each canoe about two leagues from land on the day they sighted the islands. Over 400 boats came out to trade with them the day they anchored, and a larger number came the following day.

In describing large houses that he said served as arsenals for every *barrio*, the author (Abella 1965:36) stated, "Also to be seen therein were several large *proas* said to be used for interisland travel and to carry heavy cargo. All of them have a counterbalancing frame on the windward side in proportion to the size of the *proa*. With them sailing is made very safely without any danger of oversetting to windward."

With regard to fishing, Legaspi's companion (Abella 1965:36) reported, "The *Indios* are provided with plenty of fish which they catch with hooks and nets of which they have a variety." He added that the Spaniards had even seen the islanders who traded with them dive into the water and catch fish with their bare hands.

Fray Antonio de los Angeles--1596-1597

Fray Antonio de los Angeles was aboard the galleon **San Pablo** which arrived in the Marianas in 1596 as it made the crossing from Acapulco to Manila (see Schurz 1939). In his religious zeal, Fray Antonio jumped ship. He and two other Spaniards who left the galleon in an attempt to bring him back were dispersed among three islands and remained in the Marianas until the following year when they were picked up by Don Lupe de Ulloa y Lemos and taken to the Philippines. There the friar prepared a report of what he had seen for the King of Spain, Philip II. His report was used in the account (Driver 1977) available to the authors of this paper.

Unfortunately we do not know from this account on which island or islands Fray Antonio stayed but what he said is general enough to apply to more than one island of the Marianas. According to Fray Antonio, the occupation of the islanders is fishing. This would seem obvious but it contrasts with statements made about the people of Guam at a later date. Fray Antonio (Driver 1977:21) said that the people "barter with fish on the islands where it is not available. In exchange, they return with whatever they need but do not have on their own island." This is difficult to understand, since it is hard to imagine an island in the vicinity where fish are not available but it is a reference to inter-island travel and trade. This could be an example of a foreigner not understanding what he observes but describing it in terms from his own culture. Inter-island exchanges of food stuffs are common in the Pacific Island cultures, as part of maintaining social and political relationships but have nothing to do with economic exchanges as these are understood in the West. Fray Antonio also mentioned what could have been the ritualistic eating of a raw fish (whether an

inshore or offshore species is not specified) by a person about to die and those present with him, and the offering of fishing nets and hooks to idols.

Francisco Garcia--1668-1681

Francisco Garcia's *Life and Martyrdom of the Venerable Father Diego Luis De Sanvitores* (1985) includes a history of Guam from 1668 to 1681. The year 1668 marked the first Spanish attempt at colonization of the Marianas. Father Sanvitores and four other Jesuit priests, as well as some lay assistants, established a Catholic mission in Agana. In addition there was established a military garrison consisting of a captain and 32 soldiers (Carano and Sanchez 1964:64).

After an initial period of apparent success in converting the islanders to Catholicism, the mission met with hostility. Open rebellion on the part of the islanders toward the Spanish began in 1670, and Father Sanvitores was killed in 1672. Intermittent warfare continued between the Spanish and the Chamorros until 1695. Garcia recorded the early years of the Spanish-Chamorro wars, and although he mentioned fish or fishing only incidentally, the events he recorded indicate the decline of pelagic fishing.

On May 17, 1672 (Garcia 1985:164-165), a group of soldiers led by Captain Juan de Santiago left Agana to search for the murderers of Sanvitores and to punish other villagers who had assisted them. In Tumon, they did not find Matapang, the principal murderer of Sanvitores, but they burned his house, as well as a dozen more, and destroyed several boats. Garcia noted that this was a form of punishment the natives used against each other.

When Juan Antonio de Salas became the governor of Guam in June 1678, he sacked and burned rebellious villages including Tarague, Tupalao, and Fuuna. In the village of Agofan (located between Piti and Sumay), the governor burned the homes of those who fled but spared the homes of those who remained in the village. Garcia (1985:269) noted that, "...this kind treatment was not sufficient to reassure the *Indios*," and a few days later, some villagers from Agofan departed Guam for the island of Rota. The governor was chagrined by this development and with a native canoe overtook one of the fleeing canoes and made prisoners of its occupants. Garcia (1985:270) added, "This affair made such an impression on the people that for a long while no boats passed along that side of the Island for fear of being seized by the Governor."

In the fall of that year, the same governor burned the villages of Picpuc and Talofofo "with all the goods contained therein, including more than twenty *bancas*" (Garcia 1985:272). The following year he burned the village of Janum, and Garcia (1985:285) related, "Fifty boats that were taken as spoils of war were given to the friendly *Indios*" (villagers from Nisihan who had blocked the port of Janum to prevent the escape of the Janum residents by sea).

In 1680, during the first of his three terms as governor, Jose de Quiroga went to Rota to round up fugitives who had fled from Guam. In Rota he burned some villages where the "malefactors" had been received, and he ordered more than 150 fugitives returned to Guam. He then began the relocation of the islanders into larger settlements more accessible to his administration and to the priests. Garcia (1985:298-299) reported that a furious typhoon on November 11, 1680, destroyed every native house and wooden structure on the island, as

well as nearly half the boats, but he added, "This storm served a useful purpose in destroying the houses of the *Indios*, thus facilitating the matter of gathering them into the larger villages."

Some consideration was given to the fishing industry in the relocation process, however (Garcia 1985:296-297). When Inapsan was selected as the site for a settlement in Guam, it was found that the river there did not have a good sand bar from which to launch boats, so a channel was made with some difficulty by breaking through the coral reef. Referring to Pago, Garcia (1985:297) said, "Here they established a large settlement, no less agreeable than the other (Inapsan), for it is served by a large river which cuts the village in two, and which has a mouth suitable for launching boats."

William Dampier--1686

William Dampier was a seaman aboard an English privateer commanded by Captain Swan which sighted Guam on May 20, 1686. In his narrative of their round-the-world voyage, Dampier (1937:196) said it was well for the captain that they sighted land when they did because the ship was almost out of provisions and, as they learned later, the crew had planned to kill and eat the captain and any others responsible for the voyage.

Before they had anchored at Guam on the night of May 21, they were met by a priest and three islanders who mistook them for Spaniards. The priest was detained aboard ship as a hostage, and the following morning the islanders were sent to the governor of Guam with letters from the priest and from Captain Swan requesting provisions. A cordial exchange of gifts and letters followed until Captain Swan released the priest on May 30 and sailed from Guam on June 2, 1686. Although a Spanish galleon arrived in sight of Guam while Swan was anchored there, there was no hostile action between the English and Spanish ships.

Dampier (1937:206-207) provided a lengthy description of the Chamorro "*proes*" (*proas*) and gave the following reason for his description. "I have been the more particular in describing these Boats, because I do believe, they sail the best of any Boats in the World."

Concerning the islanders' sailing ability, he said, "The Native Indians are no less dextrous in managing than in building these Boats. By report they will go from hence to another of the Ladrone Islands about 30 leagues off, and there do their Business, and return again in less than 12 Hours. I was told that one of these Boats was sent Express to Manila, which is above 400 Leagues, and performed the Voyage in four Days time" (Dampier 1937:207).

Captain Woodes Rogers--1710

Captain Woodes Rogers commanded the British privateer **Duke** which, accompanied by the **Dutchess**, left England on August 1, 1708. Their voyage around the world concluded on October 14, 1711, and Woodes Rogers published his journal in 1712.

The ships anchored at Guam on March 11, 1710, and departed ten days later on March 21, 1710. Captain Woodes Rogers used the same ploy which Captain Swan had used in 1686. Pretending to be Spanish, he invited two Spaniards aboard ship and detained one of them as a hostage while a letter was sent to the

governor demanding provisions. The governor accommodated them with an abundance of food, and their visit was entirely friendly.

The governor also presented them with a "flying *proa*" which Woodes Rogers described in his diary (Rogers 1928:268-269). He took the boat back to London, thinking "it might be worth fitting up to put in the Canal in St. James's Park for a Curiosity, since we have none like it in this Part of the World."

George Anson--1742

George Anson left England on September 18, 1740 with a six-vessel squadron intent on assaulting the Spanish sea towns of South America and the South Seas and seizing the Manila galleon off Acapulco (Barratt 1988b). The voyage proved to be extremely costly in ships and lives but Anson did indeed seize the treasure galleon **Nuestra Senora de Covadonga** off the Philippines in June 1743 before returning to England one year later. He had lost all the ships except the **Centurion** and more than 1300 men.

When the **Centurion** anchored on Tinian August 27, 1742, Anson found no permanent population because the Chamorros had been moved to Guam. Instead he encountered a party of 25 to 35 people, Chamorros under the command of a Spanish sargeant, who had come from Guam to kill and cure beef for the garrison in Guam and for the galleon which would stop on her way from Acapulco to Manila. After an eventful two-month stay, the **Centurion** departed Tinian on October 21, 1742.

Anson, as well as a number of his junior officers, described the Chamorro *proa* (see Figure 8). These descriptions and drawings are among the last in history. Haddon and Hornell (1975) have summarized the main features of the "flying *proa*" on the basis of the firsthand accounts.

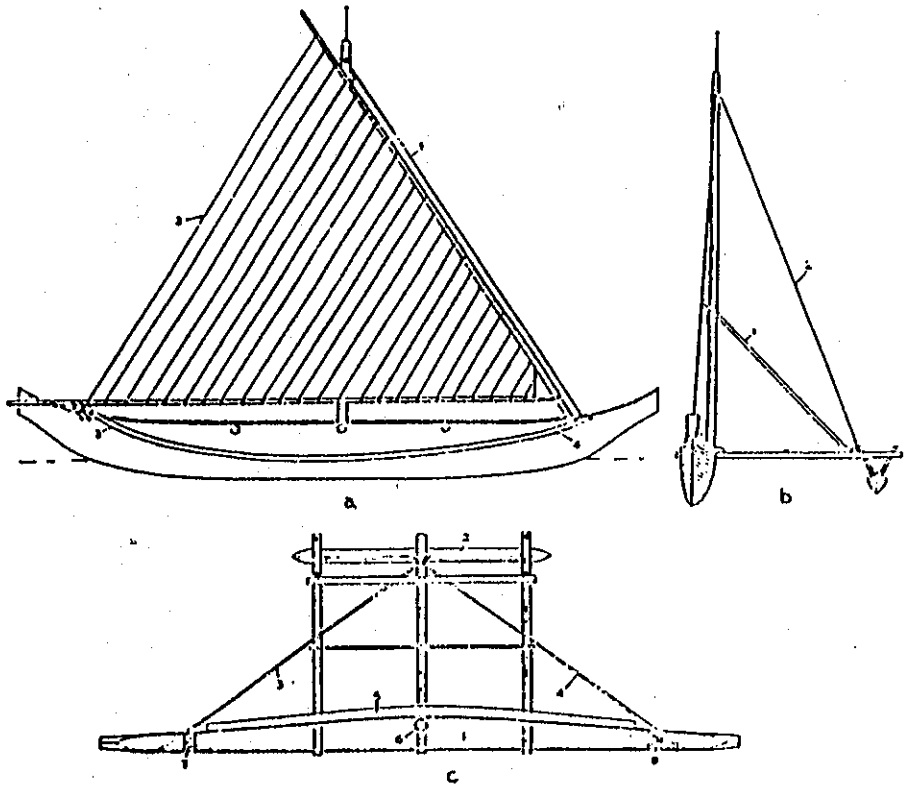
Captain Crozet--1772

Captain Crozet became the leader of a French expedition sent to explore the South Seas when the original leader, Marion du Fresne, was eaten by cannibals in New Zealand (Crozet 1891:54). The Crozet expedition anchored at Guam on September 27, 1772, and did not depart until November 19, 1772. They were so well received by Governor Tobias that Crozet considered Guam a "terrestrial paradise" (Crozet 1891:82).

While Crozet's sailors convalesced on Guam, they amused themselves by fishing for freshwater fishes in the rivers (Crozet 1891:91). These Crozet considered excellent but he said that the islanders did not eat them because they preferred saltwater fish. He noted that some of the saltwater fish are very "unwholesome" but he added that the islanders knew which were unwholesome. It is possible Crozet was referring to ciguatera fish poisoning.

Crozet (1891:94-96) included a detailed description of the Chamorro *proas*, which he prefaced with this evaluation:

> In acquiring new knowledge by their contact with civilization, the islanders have at the same time preserved perfectly the art of making canoes received from their forefathers. In this respect they had nothing new to learn. It is quite certain that the invention of the form of their craft would do honour to any boatbuilder amongst



"Flying proa" of the Marianas Islands. *a*, view from leeward with sail set: 1, one of two stays supporting mast, the other hidden behind sail; 2, matting sail; 3, 4, running stays. *b*, head view, outrigger to windward: 1, mast shore; 2, shroud. *c*, plan: 1, proa; 2, "boat" at end of outrigger frame; 3, 4, braces from the ends to steady frame; 5, thin plank placed to windward to prevent slipping of water, to serve as seat for native who bales, and sometimes as rest for goods transported; 6, part of middle outrigger boom on which mast is fixed; 7, 8, horseshoe sockets, in one of which yard is lodged according to tack

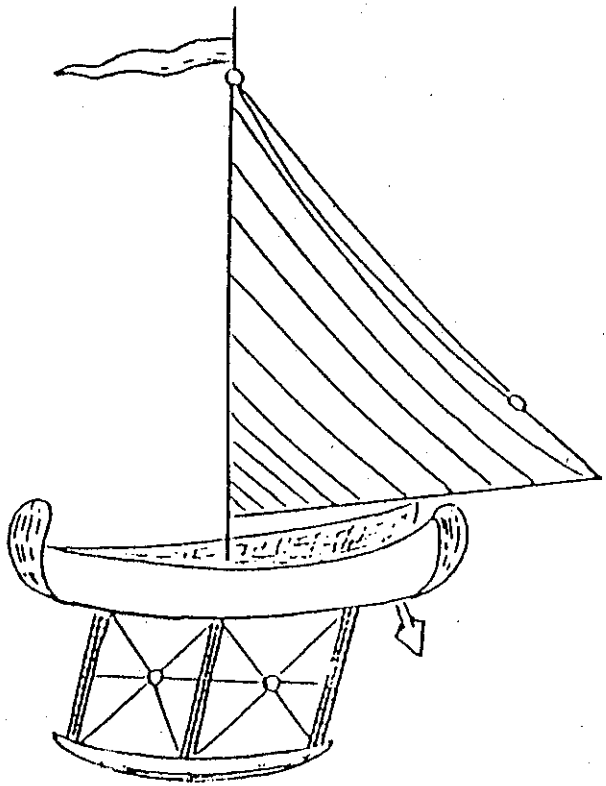


Figure 8. 18th Century drawings of Mariana Islands "flying *proa*," note banner atop mast in sketch on r (after Haddon and Hornell 1975:Figs.300, 301)

the most advanced maritime people. This form has not been copied from any model, for it differs from all those which have been given to sea-going vessels by any of the known peoples in different parts of the world.

Haddon and Hornell (1975:417) noted that Crozet was the last voyager to describe the Chamorros' "flying *proa*" but they questioned his description because it "coincides so closely with that of Dampier that it is impossible to resist the conclusion that Crozet had Dampier's account before him as he wrote and that he based his own almost entirely upon it." As proof of their conclusion, they cited the fact that Crozet repeated the unaccountable error of Dampier in saying that the outrigger was on the lee side of the boat, rather than the windward side as correctly reported by Pigafetta (1969), Anson (Barratt 1988b), and Rogers (1928).

A footnote to Crozet (1891:96) added by the translator H. Ling Roth says that Dumont D'Urville (1830-33) wrote that at the time of his first visit to the Mariana Islands in May 1828, the islanders were no longer able to make these canoes and instead used similar ones from the Carolines. This statement was confirmed to Roth in August 1888 by Vice-Admiral E. Paris, who had been a midshipman with D'Urville.

Whalers--1800s

British and American whaling ships working in the Pacific made stops on Guam after each whaling season to rest and obtain fresh provisions. De la Corte (1970:67-68) reported visits by "30 or more ships a year for a 30 year period" beginning around 1823. According to Thomas McGrath, S.J., an expert on early whaling in the Pacific at the Univ. of Guam's Micronesian Area Research Center, the logs of the whaling ships in this region contain no reference to native fishing.

Evidence Area 2: that there was and is a dependence by native people of the CNMI (or at least a significantly identifiable portion thereof) on the fish, crustaceans, and precious corals identified in Appendix A. We found no evidence for the exploitation of the deep water crustaceans or precious corals so the focus is on pelagic and bottomfish here.

Nature of the Evidence Essentially the same archival sources as consulted in Evidence Area 1 contain what evidence there is for a history of dependence upon pelagic and bottomfish. The same interpretive cautions apply. In addition to these sources, government annual reports related to the amount of fish produced and by whom were consulted and relevant results have been tabulated for this report. Interviews with fishermen who had fished in Saipan, Tinian, Rota, Pagan and Anatahan also provide evidence of such a dependence and contempory use of offshore species. The relevant information from interviews overlaps greatly with that of Evidence Areas 3 and 4, and will not be repeated here.

Regarding the dependence of native peoples on offshore species during prehistoric times and the Spanish era (ca. 1521-1899), see the discussion in Evidence Area 1. Here we begin with the German Period, when more systematic accounts of economic conditions in the islands were written.

Historic Evidence: German Period

Georg Fritz--1899-1907

Georg Fritz spent eight years on Saipan as the District Officer of the German Mariana Islands from 1899 to 1907. In addition to acting as a capable administrator, Fritz wrote a history and ethnography of the Chamorro people entitled *Die Chamorro* which was published in 1904 in the German journal *Ethnologisches Notizblatt*. The English translation by Elfriede Craddock affords us a look at the customs of the turn-of-the-century Chamorros and, to a lesser extent, the Carolinians of the Northern Marianas.

One criticism of this work raised by Scott Russell (Fritz 1986:vii) is that Fritz's habit of mixing the accounts of early European observers, particularly Le Gobien, with his own observations makes it difficult to determine if Fritz is reporting precontact or contemporaneous customs. However, this criticism does not appear to apply to what Fritz wrote about fishing, because he said that the Chamorros did not fish outside the reef and that it was only in Rota that the ancient types of fishing were preserved (Fritz 1986:43-44):

> Naturally, fishing provides the main source of food for the island inhabitants. However, fishing takes place only inside the reef. Only the Carolinians sometimes go on the high seas to visit Aguigan 25 sea miles from Saipan and dive for trepang *balete* which they sell to the Japanese. They also catch turtle *hagan* and utilize weir traps inside the reef, a fishing technique not practiced by the Chamorros.

Fritz described the use of nets and other methods of fishing within the reef. Although he said the Carolinians made trips to Aguigan, it does not sound as if they were engaged in offshore fishing.

Fritz wrote that two ancient types of fishing had been preserved on Rota. These were the use of the hemispherical stone and half coconut shell used to fish for *atchuman* and the use of a lure fish used to fish for *lagua* (parrotfish). Both of these methods were earlier described by Freycinet (1824).

Two details about the *atchuman* fishing were added by Fritz (1986:44). He said that the coconut shell was fastened to the stone with gum from the sap of the breadfruit tree. He also wrote that the fisherman might catch the fish with hook and line, as well as with the *lagua* net described by Freycinet, after attracting the fish with the ground coconut meat.

By Fritz's time, the Chamorros no longer built or sailed the inter-island outrigger sailing canoes. Fritz (1986:45) wrote,

> With the demise of the brave (Chamorro) nation, these ocean craft disappeared. Only the Carolinians who migrated to the Marianas in the 19th Century, whose canoes and sails had the same form and construction as the canoes from the Marianas, resumed the traffic between Guam, Rota, Tinian and Saipan. (These voyages were stopped as a result of Spanish) [*sic*] government policy because of a few accidents. The last *sagman* is supposed to have arrived in Guam from Saipan in 1892.

He added that the Chamorros used the smaller outrigger canoes called *galaide* only within the reef.

Historic Evidence: Japanese Period

Ethnographers

The Japanese ethnographic descriptions of native peoples of the Marianas is essentially nil, from the sources we were able to consult (e.g. B.P. Bishop Museum 1988; Eldredge 1977). Part of the reason for such a dearth of ethnographic works, particularly with regard to fishing, seems to be that the Japanese colonial government focused narrowly but intensively on commercial development of the pelagic fishery, especially in Saipan. Scientific fisheries research was directed toward this end, rather than toward documenting traditional lifeways of the native peoples. Only for some of the more remote islands of the Carolines is there any record of systematic ethnographic description or ethnological studies (e.g. Hijikata 1941; Yawata 1930). Yawata's essay (1930) reviewed the topic of "fish-shaped fish hooks" in the Micronesian region; a small mention of the Marianas was made as follows. "Mr. Shizuo Matsuoka has shown hooks that were used by the 'Chammorro' tribe. The hooks have slightly flat shanks of red-colored shell (*Spondylus*?) with tortoise shell points... A small knob protrudes from the lash of the point. A hole is drilled in the point to fasten it by cord to the shank. A line is tied around a groove made in the upper part of the shank" (Yawata 1930:9, trans.; emphasis and parentheses added). That the author put the use of these hooks in the past tense probably indicates that they were formerly used but were not at the time of Matsuoka's report.

Japanese Government

During most years of the 1920s and some years of the 1930s, the South Seas Bureau produced an "Annual Report to the League of Nations on the Administration of the South Sea Islands under Japanese Mandate". The islands under Japanese mandate included the Northern Marianas, the Carolines, and the Marshalls. All of the reports contain information about fishing; however, only the reports made during the 1920s have the information divided by island. The reports made during the 1930s give statistics on fishing for all the Japanese mandated islands combined.

Table 1 presents the information on the quantity and value of fish caught off Saipan during the 1920s. By 1926, tuna (bonito and tunny) accounted for more than 90 percent of the total quantity and value of fish caught. No information about the race of the fishermen is available with regard to these statistics. However, the reports state that there was no discrimination by race in the granting of permission to fish and that locally recognized fishermen were allowed to continue to fish without permission (1926:63).

In 1916 Regulations for Fishing Industry in the South Sea Islands were promulgated. In these regulations it was provided that as a rule persons desiring to engage in the industry should obtain permission from the authorities but fishermen recognized by local usage were allowed to continue their business without it. It was stated that with regard to acquisition of the right of fishing, no discrimination was to be made between natives, Japanese and

Table 1. Quantity and Value of Fish Caught Off Saipan During the 1920s. (Quantity is given in kilograms for every year except 1923 when it is given in *Kwan*. Value is given in *Yen*.)

		YEAR						
NAME	AMOUNTS	1923	1924	1925	1926	1927	1928	1929
Bonito*	Quantity	750	9,097	14,805	44,843			
	Value	2,250	6,065	6,348	17,937			
Mackerel	Quantity	5	45	787	690			
	Value	14	30	210	369			
Tunny	Quantity	334	1,537	1,402	2,314			
	Value	888	1,025	749	1,235			
Horse Mackerel	Quantity	495	570	2,610	1,481			
	Value	990	304	1,392	665			
Gray Mullet	Quantity	76	16	127	150			
	Value	152	15	46	80			
Shark	Quantity	26	1,522	1,023	2,348			
	Value	26	324	273	313			
Other	Quantity	3,560						
	Value	5,357						
Mackerel -like	Quantity		352	386				
	Value		234	228				
Sawara	Quantity				94			
	Value				51			
Fish	Quantity					34,~~377~~	25,417	46,417
	Value					13,167	21,029	16,833

* Scientific names provided by Dr. Steven S. Amesbury, UOG Marine Laboratory, Mangilao, Guam, are as follows:

Bonito = skipjack tuna, ***Katsuwonus pelamis***.
Tunny = tuna, probably yellowfin tuna, the most common tuna in the Marianas, ***Thunnus albacares***.
Mullet = family Mugilidae.
Sharks comprise more than one family.
It is difficult to say what was meant by the common name mackerel, particularly since it was used three times (mackerel, horse mackerel, and mackerel-like fish.)
Sawara = not known.

foreigners, all persons who have obtained permission being free to engage in that business.

The 1930 report (p.82) gives 23 as the number of persons on Saipan engaged in fishing with permission, and the type of fishing is listed as miscellaneous fishing as opposed to fishing with fixed nets, artificial rearing of fish, collecting of tortoise shells, collecting of nilotic-top shells, or collecting of sea-slugs. The report does not give a racial breakdown of the fishermen.

Evidence that some natives were involved in the fishing industry is found in the statistics on subsidies granted to encourage fishing (Table 2.) In 1922 the Director of the South Seas Bureau was empowered to grant subsidies for expenses needed for purchasing fishing implements or boats, for engaging the service of technical experts, and for the manufacture of marine products. The statistics on subsidies granted are not divided by islands; they are for all the Japanese mandated islands together. They are divided by race however. Japanese fishermen received more than 80 percent of the money granted each year.

In evaluating Japanese fishery developments in Micronesia during the period of the Japanese Mandate, Nishi (1968:12) concluded, "Commercial fisheries were Japanese enterprises whereas the American aim is to train Micronesians to develop their own commercial fisheries."

Citing Bowers (1953), Orbach (1980:15) states, "All of the labor for these industries, however, was imported from Japan and Okinawa." The industries referred to are fishing and sugar production.

H.G. Hornbostel--1931

In an article published in the ***Guam Recorder*** in 1931, H. G. Hornbostel confirmed that the fishing stone, the ***poio*** originally described by Freycinet (1824:436), was still in use on the island of Rota. Hornbostel's description of ***achuman*** fishing varied little from Freycinet's. Hornbostel's article verifies Fritz's statement that this ancient type of fishing was preserved on Rota.

Historic Evidence: American Period

U.S. Naval Military Government--1944-1947

The U.S. Naval Military Government which administered Saipan and Tinian at the end of World War II reported that Saipan's fishing fleet of 12 vessels had been destroyed by the invasion (Military Government n.d.:126):

> Saipan's fishing industry, which before the war brought in 25 tons a day during the season, was completely wrecked by the invasion. Fishing boats were riddled, and sank in the shallow waters of the lagoon, or were beached to be destroyed by fire...Japanese sampans, damaged and sunk by fire and shells, had to be patched under water; raised to the surface, and hauled ashore by a bulldozer to be rebuilt in the Fishing Base boatyard.

That the Military Government itself was responsible for the destruction of some of the sampans is seen in a statement made by Embree (1946:15): "This officer (the officer in charge of fishing) did a valiant job in persuading the

Table 2. Subsidies Granted to Encourage Fishing in the Japanese Mandated Islands (the Northern Marianas, Carolines and Marshalls) During the 1920s.

	Persons		
Year	Nationality	Number	Amount (*Yen*)
1923	Japanese	9	4,750
	Natives	3	512
1924	Japanese	12	5,090
	Natives	5	715
1925	Japanese	9	5,019
	Natives	1	375
1926	Japanese	9	4,348
	Natives	6	816
1927	Japanese	7	4,155
	Natives	5	590
1928	Japanese	4	4,112
	Natives	-0-	-0-
1929	Japanese	7	3,844
	Natives	3	600

military to stop destroying sampans and allow fishermen to go to sea in order to help out the local food supply."

The Military Government (n.d.:129) operated a Fishing Base on Saipan about 200 yards south of Garapan Pier. Okinawan fishermen were among those who labored in the bonito fishery (p.131). When bonito and mackerel were not running, reef fish taken by net supplemented the catch (p.37). Reef fish were also caught on a subsistence level by "Kanaka" spear fishermen (p.132).

The word "Kanaka" in this report probably means Carolinian, since another report (Embree 1946) from the same time period names the races present on Saipan as Japanese, Koreans, Chamorros, and Kanaka. The Carolinians were the most numerous islanders, apart from Chamorros, on Saipan.

Only Japanese and Koreans remained on Tinian during the period of the Military Government. The Chamorros were moved to Saipan (Embree 1946).

Trust Territory of the Pacific Islands--1947-1976

Each year from 1948 through 1988, the U.S. government has produced an *Annual Report to the United Nations on the Administration of the Trust Territory of the Pacific Islands*. From 1948 through 1951 the report was prepared by the Department of the Navy; in 1952 and 1953 it was prepared by the Department of the Interior; and since then it has been prepared by the Department of State.

In 1975 the voters of the Northern Marianas chose to join the United States as a commonwealth (U.S. Government 1975:6), and in March 1976 the U.S. Congress and the President approved the Marianas Commonwealth Covenant (U.S. Government 1976:7,20). The Government of the Northern Mariana Islands was separated administratively from the Trust Territory Government effective April 1, 1976 (U.S. Government 1977:1,14), and the new Northern Marianas Commonwealth government was installed January 9, 1978 as Dr. Carlos S. Camacho took office as the first governor of the CNMI (U.S. Government 1978:5). However the Trust Territory reports continued to include information on the CNMI.

The available information on quantity and value of fish caught is presented in Table 3. The 1977 report (p.58) divides the catch into tunas and reef fishes (280,261 lbs.) supplied to local and Guam markets and sharks (119,420 lbs.) exported to Korea. The 1978 report (p.70) and the 1981 report (p.89) describe the catch as tunas, wahoo, mahimahi, billfishes, and reef and bottom fishes. The 1986 report (p.82) provides the following breakdown for the total landing: 56 percent pelagics, 32 percent reef fish, and 8 percent bottom fish. (There is no explanation for the remaining four percent.)

Important developments with regard to fishing in the Northern Marianas which were recorded in the Trust Territory reports are as follows. Fishing was always acknowledged as an important source of food, however it was found to take place mainly on a subsistence level. The reports for 1948 through 1951 (1948:93; 1949:XV; 1950:73; 1951:92) name the Saipan Fishing Association, which had three to five vessels, as the only or the largest commercial fishing company in the Trust Territory. The company was not mentioned after 1951, and its apparent demise may account for the drop in total fish catch for subsequent years seen in Table 3. The total catch was not as high as it was in 1948 and 1949 again until 1970 if the statistics in Table 3 are accurate. The 1951

Table 3. Quantity and Value of Fish Caught Off the Northern Marianas from 1948 to the Present. (Quantity is given in pounds. Value is given in dollars.)

Fiscal Year (Ended June 30)	Island*	<<<<< Tuna >>>>> Quantity	Value	<< Other Fish >> Quantity	Value	<<< All Fish >>> Quantity	Value
1948	Saipan					138,642	27,258
1949	Saipan					100,000	18,000
1950-1956		No statistics for Northern Marianas in reports.					
1957	Saipan	5,360	2,144	10,748	4,299	16,108	6,443
1958	Rota			10,400	3,120	10,400	3,120
	Saipan	5,000	2,100	6,000	2,500	11,000	4,600
1959	Rota			26,000	7,800	26,000	7,800
	Saipan	2,000	500	376	130	2,376	630
1960	Rota	1,000	300	12,600	2,520	13,600	2,820
	Saipan	510	164	25,514	9,547	26,024	9,711
1961	Rota					27,000	9,250
	Saipan					35,440	10,632
1962	Rota					10,000	3,150
	Saipan					87,279	20,709
1963	Marianas					56,423	12,047
1964	Marianas					31,386	15,416
1965	Marianas					29,869	7,620
1966	Marianas					58,800	15,640
1967	Marianas					52,000	11,345
1968	Marianas					36,000	7,589
1969	Marianas					19,625	4,970
1970	Marianas					110,445	28,600
1971	Marianas					104,389	40,758
1972	Marianas					87,000	51,330
1973-1975		No statistics for Northern Marianas in reports.					
1976	Marianas					61,639	44,111
1977	Marianas					399,681	
1978	CNMI					62,804	48,566
1979-1980		No statistics for Northern Marianas in reports.					
1981	CNMI					241,421	337,989
1982-1984		No statistics for Northern Marianas in reports.					
1985	CNMI					400,847	538,796
1986	CNMI					419,500	582,872
1987-88		No statistics for Northern Marianas in reports.					

* The heading used in the Trust Territory reports is "District." Saipan District is all of the Northern Marianas. However, there is reason to think that Island is what was meant, because some reports list Rota and Saipan separately. Later reports give the totals for the Mariana Islands, however what is meant is Northern Marianas, because Guam was not a part of the Trust Territory.

report (p.36) states that power boats had been supplied to Tinian during that fiscal year, so that the people there could do supplemental fishing beyond the reefs.

In 1957 (p.61) it was reported that a young man, who had attended a fisheries training course in Noumea, New Caledonia, had started a small-scale deep sea fishing project. The rehabilitation of a 62-foot sampan had enabled him to demonstrate the techniques of deep sea fishing, and the first month's catch had amounted to an estimated 5,000 pounds. This venture was not mentioned in subsequent reports. However the reports for 1957 through 1959 record separate figures for tuna caught off Saipan (see Table 3), which probably reflect this renewed interest in pelagic fishing.

The 1977 report (p.58) relates that the Trust Territory Government had deployed a 26-ton fiberglass reinforced plastic vessel to the Government of the Northern Mariana Islands. The vessel was charterted to a local fishing company which operated it for one year. The report states that production was low due to lack of skill in pole-and-line fishing. However Table 3 shows a large increase in the total catch for 1977. It may be that variations on Table 3 reflect actual increases and decreases in catch, or it may be that they reflect changes in the way the catch was estimated.

In 1978 (p.70) it was reported that three sport fishing boats began operation catering to the Japanese tourists and that one charter boat was proving the potential of big game sport fishing, particularly for blue marlin. The same year the Pacific Tuna Development Foundation (PTDF) approved two fishery projects for the Northern Marianas for fiscal year 1979 to assist local fishermen in harvesting big eye scad, ***Trachurops crumenopthalus***, bottom fish, and the deepwater shrimps, ***Heterocarpus ensifer*** and ***H. laevigatus***, which the Townsend Cromwell, a National Marine Fisheries Service research vessel, had found in the outlying banks of the Northern Marianas in May 1978. The report added that floating devices would be placed around Saipan, Tinian, and Rota to aggregate schools of tuna in order to increase the productivity of local fishermen.

During fiscal year 1981 (p.89) three large commercial vessels were added to the Northern Marianas fishing fleet, making a total of 130 skiffs and eight large vessels, 30 to 80 feet, and the CNMI was building a fishery complex in Garapan, Saipan. The F/V **Typhoon** from Honolulu conducted two fishing surveys which located deepwater shrimps (***Heterocarpus ensifer***, ***H. laevigatus***, ***H. dorsalis***) around Saipan and Tinian. And the CNMI was awarded $50,000 from the PTDF for a feasibility study on small scale shark fishery.

During FY 1983 (pp.55-56) a Sport Fishery Program was initiated, and the Fishery Data Program continued. Work was undertaken on Saipan, Rota, Sariguan, and Pagan, and a 27-foot work boat had been purchased which would enable fishery personnel to expand their work to some off-shore banks, as well as Tinian, Anatahan, and Farallon de Medinilla.

The 1984 report (p.67) characterized fishing in the CNMI as largely a semi-subsistence activity supplemented by three or four small scale commercial operations. There were estimated to be about 150 sport boats supporting semi-subsistence fishing and about seven 32 to 40-foot boats supporting the commercial operations. Although most families were reported to engage in the

semi-subsistence fishing from time to time, full-time fishermen were estimated at 35 to 50 persons.

By 1986 (p.82) there were 238 vessels on Saipan, Tinian, and Rota. The report states, "Most of these vessels are smaller skiffs which engage in trolling and bottom fishing." The local commercial fish landings during FY 1986 of 419,500 pounds represented a 15 percent increase over the previous year's total.

CNMI Government--1978 to the Present

The *Commonwealth of the Northern Mariana Islands Fisheries Development Plan* (n.d.:8) gives the domestic fish catch for four years (1975 through 1978). During that four-year period, reef fish accounted for 19.8 percent of the total catch, while offshore fishing produced 80.2 percent of the total. The reef fish catch averaged 15,626 pounds per year valued at $10,938 and the offshore fish catch averaged 63,120 pounds per year valued at $44,184. (These figures for value given in Table 1 do not exactly match the figures given on page ix, and neither set of figures adds up to the total value given.)

The CNMI Division of Fish and Wildlife has produced a *Five-Year Progress Report for Fiscal Years 1983-1987*, however this report contains no information on fish or fishing.

Additional Sources

The *Report on the Social, Cultural, and Economic Aspects of Fishery Development in the Commonwealth of the Northern Mariana Islands* (Orbach 1980) was based on one and one-half months field work in the Northern Marianas in 1980. The purpose of the project was to define the human aspects of the fisheries in the CNMI, as opposed to the marine biological aspects. Questions concentrated on were "who participates in fishing, in what manner, for what reasons, under what circumstances, and with what consequences" (Orbach 1980:3).

The study found that as of January 1980 there were approximately 70 full-time commercial fishermen in the CNMI and 90 to 100 part-time commercial fishermen. The fishermen were mostly Chamorro and Carolinian, and there were differences in fishing patterns between the two ethnic groups. Most of the full-time commercial small boat fishermen were Chamorro: 26 out of 32 on Saipan and all of the full-time commercial small boat fishermen on Tinian and Rota. Most of the part-time commercial fishermen were also Chamorro: 46 out of 67 on Saipan and all of the part-time commercial fishermen on Tinian and Rota.

Carolinians were found to be the primary participants in fishing ventures involving larger craft of over 50 feet. Orbach (1980:34) states, "As a group, they (Carolinians) have a consistent and virtually exclusive history since World War II of forming crews for fishing enterprises involving larger craft...The crew of the single active domestic large boat fishing operation on Saipan is exclusively Carolinian." This boat was the *Olwol*, a 72-foot vessel operated by the Carolinian company Marianas Fishing Inc. and run and crewed by Carolinians.

The Chamorro fishermen were characterized as "individualists." Orbach (1980:32) found no "fishing communities" among the Chamorros. That is there was no residential community with occupational homogeneity. There was also no

"family tradition" in fulltime commercial fishing. All of the Chamorro fishermen interviewed were the only members of their immediate families engaged in commercial fishing. Many of the Carolinian fishermen, however, did have other members of their family engaged in commercial fishing at one time. Also the Carolinian fishermen exhibited certain common residence patterns although this was probably due to a history of ethnic Carolinian enclaves in certain villages. Orbach concluded that Carolinian tradition and family and community structure appear to have supported their participation in offshore fishing (Orbach 1980:65).

The *Annual Report for the 1988 Pelagic Fisheries of the Commonwealth of the Northern Mariana Islands* (Hamm et al. 1989a) presents the commercial landings data collected by the CNMI Division of Fish and Wildlife from 1979 through 1988. Creel survey data are not included in the report. The 1988 domestic commercial landings of pelagic species equaled 267,619 pounds, an amount almost as high as that of the peak year, 1984. The value of the pelagic fish landings for 1988 ($327,260) was an all-time high. Detailed information on catch, effort, species composition, etc. for the ten years is included in the tables (Appendix A) and figures (Appendix B) of the report.

The *Annual Report for the 1988 Bottomfish Fishery of the Commonwealth of the Northern Mariana Islands* (Hamm et al. 1989b) was based on the commercial landings data collected by the CNMI Division of Fish and Wildlife from 1979 through 1988. The report does not include analyses of the DFW's creel survey data. 1988 commercial landings of bottomfish equaled 37,850 pounds valued at $69,051.91. Both figures represent a slight decrease from 1987, but an increase over previous years. The tables (Appendix A) and figures (Appendix B) of the report present detailed information on the catch, effort, species composition, etc.

A recent paper written for the Western Pacific Regional Fishery Management Council by Kasaoka (1989) details the ethnic background and other information about small boat fishermen. On Saipan 34 fishermen were interviewed during 1988. Of those, 25 or about 74 percent were Chamorro. Four were Caucasian, two were Carolinian, one Palauan, one Filipino, and one Japanese. Thirty-three of the individuals were male and one was female. They ranged in age from 20 to 50. Fifteen considered themselves full-time commercial fishermen, while 19 did not. Seventeen of the individuals held other jobs at which they spent an average of 40 hours per week. The other 17 individuals did not hold other jobs. Thirty-three of the 34 people averaged 28 hours per week fishing. Thirty-three of the individuals had an average of nine years in commercial fishing.

***Evidence Area 3*: that at least some dimension of the indigenous cultures of the CNMI has in the past reflected and still reflects cultural, social, and religious values, traditions, and practices derived or based upon the fisheries for the species listed in Appendix A.**

Nature of the Evidence. Two sources of information regarding cultural values related to the species in Appendix A during this project, informal interviews with fishermen and historic and ethnographic accounts. We found no evidence in this area regarding deep water crustaceans or precious corals.

Ethnographic Information from Written Documents

The written documents consulted revealed divergence between Carolinian and Chamorro fishing practices related to differences in colonial experiences among the two groups.

Since the demise on Saipan of the *ut*, or men's house directly associated with the construction and maintenance of traditional canoes (these culturally important structures were all destroyed by the end of World War II), Carolinian customary behavior associated with fishing of any kind apparently has been and is characterized by informal sharing of the catch among fishermen and their relatives. A similar pattern of catch sharing among relatives was described by older Chamorros recalling their youth on Saipan and still prevails today throughout the islands.

For the early historic era Chamorro, ethnographic details are lacking, except for the Juan Pobre account (Driver 1989). According to this account from 1602 and from Legaspi's earlier expedition in 1565 (Burney 1803; Blair and Robertson 1903; Plaza 1973), prior to Spanish colonization, the Chamorro had seaside men's houses and canoe houses (see Craib's [1986:66-70] extensive discussion of early reports of these structures). Proceeding on a uniformitarian assumption, it is likely that, like other Micronesian peoples who used such structures, the Chamorro also practiced certain rituals and observed certain tabus with respect to fishing, such as male sexual abstinence prior to going out to sea, the recitation of special prayers and the use of special techniques of divination related to canoe travel and fishing success on the open sea. However, in the absence of eye-witness reports, the evidence for such practices is necessarily indirect and inferential. Nonetheless it is very unlikely that the prehistoric Chamorro differed from other Micronesian groups by lacking these widespread Oceanic characteristics.

Of direct observations of customary practices associated with offshore fishing, from the pre-Christian period when Chamorro culture was still intact (prior to the disruptions of the Spanish colonization), we have only Juan Pobre's description of a triumphant fisherman (and shark fighter) of Guam (Rota?) returning in his sailing canoe, flying a large woven banner announcing that his catch was big (Driver 1989:16). This account includes many details of prescriptive behavior on the part of the man and his family and friends, associated with the return of the fisherman and of the ritual butchering and preservation by salting of the large fish, evidently a marlin. It should be kept in mind that this incident may have taken place on the west coast of Rota or the east coast of Guam (at Pago) where there is little reef development and in the case of Rota a long archaeological record of pelagic fishing. Saipan's northwest coast, in contrast, has extensive lagoon development and as yet there is no archaeological evidence for pelagic fishing from sites adjacent to the lagoon. This points to the likelihood that local geographic variations strongly conditioned the fishing strategies undertaken by prehistoric Chamorro, just as the strategies and technology of fishermen today are influenced by such differences (see Knudson 1987 regarding Guam's "non-commercial" fishermen). This may help to explain the immediate post-war differential emphasis on fishing between Carolinian and Chamorro residents of Saipan, documented by Spoehr (1957) and discussed below.

The ethnographic record of the Carolinians is more comprehensive for being continuous than the Chamorro; however, documented details of offshore fishing mainly pertain to their ancestral islands rather than in the CNMI (see for example, Hijikata 1941; Gillett 1988). We can assume that the continuous sea-going tradition of the Carolinians, with its attendant technologies of pelagic and bottomfishing, was known to those who lived in the Marianas due to frequent contact with the home islands. A linguistic comparison of Carolinian fish names showed 58 folk taxa word correspondences between the dialects of Satawalese Carolinian and Saipanese Carolinian (Akimichi and Sauchomal 1982:29). The correspondence is approximately half that of the other Carolinian dialects and about the same as with Trukese. It should be kept in mind that because a significant portion of the knowledge necessary to fish successfully in the Carolines is specific to those waters, a strict application of a uniformitarian assumption to infer all the same fishing practices and customs were present in the Marianas is probably not warranted. Instead we can reasonably postulate that technical adjustments were made to suit variations in the local geographic conditions of the Mariana archipelago and its waters, assuming that sufficient motivation was present among the Saipan Carolinians to pursue the offshore species. It is realistic to expect that some behavioral changes occurred in response to the particular geographic, social, political, and economic contexts in which the Carolinians lived when in the Marianas.

One of the Carolinian traditions which was retained in the Marianas until the Second World War was the use of a large seaside men's house, known as the *ut*, a combination canoe shed and community meeting house (Spoehr 1957:327-331). Among other functions, the Carolinian *ut* served as a shelter for large canoes and fishing gear and as a place where these items could be repaired (Spoehr 1954:327-330). According to Spoehr (1954:327), there was one *ut* at Tanapag and four in Garapan, one for each ward-like district in which the Carolinian community was partitioned on Saipan. While Spoehr states these structures had disintegrated during Japanese times, our interviews indicated that they were still standing until just prior to the American invasion in 1944.

The pre-war presence of Carolinian *ut* on Saipan indicates that large canoes were once kept there, and Spoehr (1954:329) was told that formerly the school for young pilots was held in the *ut*. Hornbostel's notes (1921-24) contain photographs of a functioning *ut* on Saipan taken in the early 1920s. From this information and the fact that travel to the central Carolines was not prohibited, it may be inferred that Carolinian canoes had been used in the open ocean and, further, that trolling for pelagic fish was practiced from them, at least on long distance voyages if not also on deliberate fishing expeditions.

No archaeological excavations have been conducted at the sites of the defunct Carolinian *ut* on Saipan, which might yield evidence of the taking or the consumption of pelagic species. It should be noted that the western coast of Saipan was extensively damaged during the American invasion and after, when "clean-up" operations further destroyed much of the depositional integrity of the coastal zone, particularly in the Garapan area (see Russell 1984). Neither have there been excavations at the historically occupied sites of the Carolinian people in Tanapag or Garapan, which could yield information in this regard. Therefore the evidence for past pelagic fishing by Carolinians on the basis of the presence of *ut* is indirect at best.

The immediate post-war adaptations of the Carolinians of Saipan have been detailed by Spoehr (1954). Once the *ut* structures were gone along with their integrative social and political functions, male activities tended to become more individualized within the commercial economy. Fishing remained important for subsistence, and it became a source of money as the Carolinians moved into an empty economic niche opened by the removal of the Japanese fishing industry which had made some of the catch available locally. However, the emphasis in Saipan Carolinian fishing in the 1950s was on lagoon species taken by spears and nets, sometimes with the aid of small boats (Spoehr 1954:157-161).

Interview Information

Informal interviews were conducted on the islands of Rota, Tinian, and Saipan. Interviewees included fisheries management professionals, polititians, and local fishermen who have lived in the above islands and in Pagan, Alamagan, and Anatahan (see list below). The interviews revealed an almost complete lack of magic, ritual and customary belief related to offshore fishing among contemporary Chamorros and Carolinians in the CNMI. However, one Carolinian informant described in some detail the traditions associated with fishing and the use of the Carolinian *ut* on Saipan in the pre-war days (see below).

A strongly enduring cultural dimension related to offshore fishing revealed in the interviews is the high value placed on sharing of the catch, and the importance of gifts of fish to relatives and friends. Such gifts are not limited to offshore fish; often they are made up of reef fish. Sometimes pelagic or bottomfish are sold in order to earn money to buy gifts for friends and relatives on important religious (Catholic) occasions such as novenas, births and christenings, and other holidays. In the conduct of offshore fishing it was apparent that practical considerations were most important and that ritual abstentions, for example, or presecriptive avoidance of certain fish by certain categories of person, are not practiced. In Carolinian custom on Satawal, Ackimichi and Sauchomal (1982:28) state that there are rules and restrictions on words relating to eating, and that alternative terms for the same fish that follow "taboos and restrictions are seen exclusively as pertaining to those fish of major importance as food." Possibly if certain fish species or groups of fish species were not as important as food on Saipan, there would be a diminution or loss of customary behavior of this sort related to them.

According to **Ben Limes**, a Carolinian from Pulsuk, 64, in the pre-war days on Saipan the Carolinians had four *ut*, or canoe-men's houses, on Saipan. Their names were Tagu in Garapan; Sarau [barracuda] in Garapan, near where the present Shipashore Restaurant and Bar is located; Lugar; and Liger [butterfly fish], whose locations were not specified. The matrilineal clans were ranked within each *ut*, taking symbolic parts of the human body to signify their relative status, e.g., the head was high while the feet were low. During those times, certain magicians, called ***manarong***, had power and were able to communicate with certain fish, such as sharks and rays. These animals imparted the power to cure and to do harm to people. Canoes were associated with specific *ut*; sometimes four or five canoes would belong to one *ut*. These canoes were made on Saipan prior to the Japanese era (1914-1944). After this, the Carolinians brought canoes from the coral Caroline Islands. Ben mentioned the ***aruma*** plant, which grows on the beach, as one whose stem was used to make leader for trolling. We were unable to identify this plant. In Carolinian, ***salal*** is the term for bottom fishing and *lug* is the term for trolling (pulling something such as a lure

behind the canoe). For homemade lures both mahimahi and rainbow runner skin was used to tie them. Wahoo were caught early in the morning with lures from coconut leaves. For fast trolling, they used the sailing canoe.

Ben described the division of fish catches, including offshore species as follows. All the fish caught on an expedition were brought to the *ut*, and the highest ranking clan representatives would decide who will receive parts. These elders were aware of the particular circumstances of each family in the Carolinian community, for example, who was sick, who widowed, etc., and would decide accordingly. If all the fishermen who brought the catch were from the same *ut*, the fish would be divided so that the chief of each *ut* got some; the rest was divided according to families belonging the *ut*. The fishermen's wives would bring land food to the *ut*. Another mode of sharing the catch was for the fishermen to cook and eat some of the fish in the *ut* and "if anything was left," it was shared out to the old men of that *ut*. Fishermen had to fast before going on a fishing expedition, sleep in the *ut*, and not have sexual intercourse with their wives. Ben stated these customs ceased after the war.

According to Ben's younger relative, **Ramon Kapileo**, about 35, the leader of a fishing expedition was called *tam*, and the front part of the canoe was called *tem*. He stated that formerly sailing canoes offshore of Saipan used to troll for large fish such as wahoo, marlin, and yellowfin, and that the lures were made of bird feathers such as chickens and tropic birds, as well as with the leaves of young coconut. When Ramon was growing up on Saipan he recalls that the Carolinian men only went inshore fishing.

Evidence Area 4: that there is present participation by native fishermen in the CNMI (together with non-native fishermen) in the fisheries of the species listed in Appendix A.

Nature of the Evidence. The evidence consists of interviews and field observations performed during March and April 1989 and some contemporary literature, mostly government documents, from the past decade regarding offshore fishing in the CNMI. Interviewees included fisheries management professionals and local fishermen from the CNMI. The interviews revealed, through personal histories and specific fishing practices described, that presently there is participation in offshore fishing by native fishermen (together with non-native fishermen).

The following interview information has been arranged by island, beginning with Pagan. Informal interviews were conducted in Rota, Tinian, and Saipan and included persons with fishing experience on Pagan and Anatahan, in addition to those whose with fishing experience on Rota, Tinian and Saipan. Table 4 lists all persons interviewed for this project in the CNMI. Fish names used here are those used by the interviewees. Appendix B contains lists of fish names from Chamorro and Carolinian informants on Saipan, collected by David Aldan of the CNMI Fish and Wildlife Division, in addition to published sources.

Pagan

Four fishermen, names highlighted below, were interviewed on Saipan regarding fishing on Pagan; one also had experience on Alamagan. Since the volcanic eruption of Mt. Pagan on May 31, 1981, no one has resided on the island, at least officially. Prior to this, the island population had fluctuated

Table 4. List of Persons Interviewed Regarding Personal Fishing History and Attitudes toward Limited Entry. * indicates fisheries management personnel

Name	Age	Ethnic Group	Fished at	When
Marie I. Taitano	55	Carolinian	Alamagan, Pagan	1947-52
Peter Lisua	65	Carolinian	Pagan	1958-65
Ramon Kapileo	ca. 35	Carolinian	Saipan	entire life
Benedicto Taisacan	72	Carolinian	Anatahan	1953-present
Joseph Ogumoro	ca. 30	Carolinian	Anatahan	entire life
Ben Taitano	49	Chamorro	Pagan	1960-81
Daniel P. Castro	48	Chamorro	Pagan	1960-81
Arnold Palacios*	ca. 30	Chamorro	Saipan	n.d.
Gabriel P. Sablan	37	Chamorro	Saipan	entire life
Ben Limes	64	Carolinian	Pulsuk, Saipan	most of life
Tito Tilipao	51	Carolinian	Saipan, Agrighan	entire life
David Aldan*	ca. 35	Carolinian	Saipan	n.d.
Enos Ilo*	ca. 30	Carolinian	Saipan	n.d.
Richard Seman*	ca. 25	Carolinian/ Chamorro	Saipan	n.d.
Diego Benavente	29	Chamorro	Saipan	entire life
Louie Benavente	50	Chamorro	Saipan	1969-present
Jes Taitano	40	Chamorro	Saipan	1964-present
Ramon Benavente	56	Chamorro	Saipan	1946-1980
Juan Sablan Taitano	45	Chamorro	Saipan	1975-present
Jacinto Toman	34	Carolinian/ Okinawan	Saipan	1969-present
Joe Rosario	38	Chamorro	Saipan	1982-present
Herman Palacios	46	Chamorro	Saipan, northern is.	1964-present
Stanley Taisacan*	ca. 35	Chamorro	Rota	n.d.

Name	Age	Ethnic Group	Fished at	When
Isaac Calvo*	ca. 30	Chamorro	Rota	n.d.
Manases Barcinas*	ca. 40	Chamorro	Rota	n.d.
John Barcinas	55	Chamorro	Rota	n.d.
Felix Flawa*	ca. 50	Yapese	Rota	n.d.
Andy Santos	52	Chamorro	Rota	1965-present
Ramon Castro	72	Chamorro	Rota	1924-1970
Frank Toves	42	Chamorro	Rota	1965-present
Abe Charfauros	37	Chamorro	Rota	
Tony Borja*	34	Chamorro	Tinian	1967-present
Norman Palacios*	26	Chamorro	Tinian	1977-present
Jack Castro*	ca. 25	Chamorro	Tinian	n.d.
Henry Cabrera*	26	Chamorro	Tinian	1979-present
Ambrocio Ayuyu	65	Chamorro	Tinian	entire life
Richard Hofschneider	29	Chamorro	Tinian	entire life
Frank Dela Cruz	35	Chamorro	Tinian	entire life
Dave Evangelista	35	Chamorro	Tinian	entire life
Ray Dela Cruz	ca. 35	Chamorro	Tinian	entire life
Manuel Dela Cruz	68	Chamorro	Tinian	1946-1985
Joe Dela Cruz	29	Chamorro	Tinian	1986-present
Joe Atalig	41	Chamorro	Tinian	n.d.
Ignacio Quichocho	ca. 40	Chamorro	Tinian	n.d.
Edward Villagomez	35	Chamorro	Tinian	1959-present
Ray Aldan	32	Chamorro	Tinian	1960-present
Pedro Ayuyu	35	Chamorro	Tinian	1963-present
James Robert	41	Palauan	Tinian	1981-present
Mike Evangelista	31	Chamorro	Tinian	1976-present

Name	Age	Ethnic Group	Fished at	When
Joe Villagomez	41	Chamorro	Tinian	1975-present
Howard Macaranas	33	Chamorro	Tinian	1974-present
Edward S.N. Borja	29	Chamorro	Tinian	1976-present
Juan O. Barcinas	28	Chamorro	Tinian	1975-present
Silvester T. Cruz	55	Chamorro	Tinian	1961-present

from about 100 at the end of the Spanish era to 2,000 during the Japanese occupation to less than 100 at the time of the eruption. Pelagic fish obtained at no great distance from the island were an important food in the diet of these people.

Marie I. Taitano, a Carolinian aged 55, provided information on fishing at both Pagan and Alamagan (the small island to the south of Pagan). She lived for five years (1947-1952) on Alamagan and then moved to Pagan where she stayed for many more years before coming to Saipan. Her father taught her how to fish. Together they would paddle their canoe offshore to troll (note that this was a paddling canoe, not a sailing canoe). It was not necessary to go far out then, as pelagic fish swam close to the island. The night before a fishing trip, flying fish would be obtained for bait. They would catch these using a flashlight and a hand net (*lugar*). From U.S. Navy ships they had been able to obtain their flashlight, batteries, fish hooks, and monofilament line. Using the flying fish tied tail-first on six inch hooks, they were able to catch white tuna, mahimahi, wahoo, barracuda, yellowfin, and bonita. These are the fish names used by Ms. Taitano. She was the only female fisherman interviewed.

Peter Lisua, a Carolinian aged 65, lived on Pagan from 1958-1965. He described bottomfishing, called "up and down" fishing by CNMI residents. Flying fish were used for bait and a rock sinker (*alutung*) and #3 hooks were used to catch large groupers and snappers.

Ben Taitano, a Chamorro aged 49, lived on Pagan from 1960 to 1981. He was able to catch large skipjack from the shore at Unairikiki on the east side of the island. He found he was able to catch certain types of fish at particular spots around the island. He would troll with a paddling canoe early in the morning and catch wahoo and white tuna. For lures, young coconut leaves modified for use in a lure, were combined with purchased double hooks and lead heads. Mr. Taitano used to catch skipjack from pole and line from shore, as well as dive for fish. During this time, sharks were not a problem, pelagic fish were plentiful, and it was not necessary to venture far from shore.

Daniel Castro, a Chamorro aged 48, lived on Pagan from 1960-1981. His fishing experiences were similar to Ben Taitano's as they are about the same age and have spent much time together.

Anatahan

Two fishermen were interviewed on Saipan who have spent and do spend much of their time on Anatahan. About 50 people live on the island and depend on local fish for daily subsistence.

Benedicto Taisacan, a Carolinian aged 72, is the chief, first coming to the island in 1953 from Saipan. Ben used a boat for safety in fishing for pelagic fish, although they swam so close to the island that it was possible to obtain them using a spear gun with wooden handle and metal spear. He also bottomfished. Japanese hooks were purchased and lures were made from young white coconut leaves. Rocks were used for sinkers and were tied in a special manner so that once they were on the bottom, a jerk would release them. Each fish caught in this way required the use of a new rock. He caught onaga, snappers and groupers.

Joe Ogumoro is a young man who has lived most of his life on Anatahan. His fishing experience on the island is the same as his father-in-law, Benedicto Taisacan.

Saipan

Fifteen fishermen were interviewed on Saipan regarding fishing around their island. Some fish full-time to provide fish for their family and to sell to the hotels and stores. Others are weekend or after work and holiday fishermen who catch fish for family consumption, for friends and relatives, for a special occasion such as a party, or to earn extra money to cover a special need (such as a wedding or birthday gift). This latter pattern is similar to that of the contemporary "non-commercial" fishermen of Guam (Knudson 1987).

Trolling is slightly favored over bottomfishing among these fishermen. All agreed that the weather (sea and wind conditions) was the primary factor determining which type of fishing they would undertake. Bottomfishing is most successful in calm water conditions (summer) as this method depends on slowly drifting over a particular spot (a known location of a sea mount, special feeding grounds, etc.). Some fishermen will bottomfish in the morning and then troll in the late afternoon before returning. A variety of boats are used to catch fish but all are relatively small (12-25 ft) and usually have only one outboard engine. Many of the boats are homemade of wood, some are purchased, made of fiber glass. The homemade paddling canoe commonly was used until very recently for fishing trips not far offshore, and a few of these craft are still in use.

The fishermen stated that it is becoming increasingly necessary to go out farther and stay out longer to obtain their desired catch. The general opinion seems to be that the decreasing abundance of pelagic fish coincides with the arrival and continued presence of the purse-seiners. These large commercial vessels arrived in the early 1980s and are often visible from the shore.

The Saipan fishermen use a variety of lures to catch their fish. In years past they were all homemade (including the *bake* lure illustrated in Photos 8-13, 15-19) but now most are store-bought. As before, some use a combination of imported (e.g., old toothbrush handles) and local materials. For trolling, most favored a lure made with young coconut leaves. This seemed to be the most effective way to catch wahoo. Until a few years ago, the body of the lure, a lead head, was made by melting lead (acquired from the Navy) and shaping it by sand casting or pouring it into a large papaya stem mold. Nails were bent to form wahoo hooks. Today people buy ready made lead heads and attach the coconut leaves over the store-bought double hooks.

Chicken feathers were and still are popular for making lures. Different colors and sizes are used for different fish and at different times of day and night. Some say white feathers are most effective for night trolling. The lower part of the plant called *leerio* (*Crinum asiaticum*) is used to make lures too. The preparation of the *leerio* plant for making the *bake* lure is shown in Photos 15-19. The lower part of the stalk, just above the bulb is cut into ten inch lengths and further modified by trimming before being tied to the lure head. Fishermen also mentioned the use of flying fish, the skin of mahimahi, and pieces of skipjack in the making of lures. One fisherman, Jes Taitano, 40, uses steel wool for the head, attaches three hooks and adds chicken feathers,

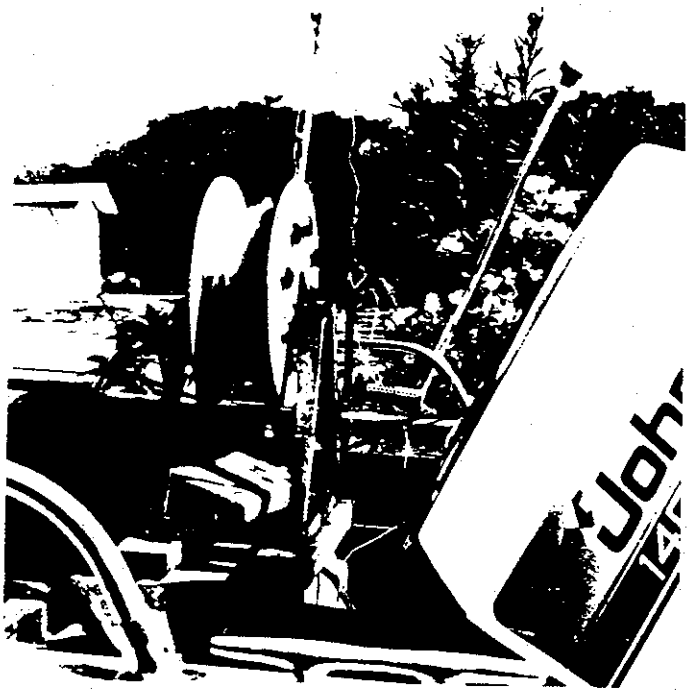


Photo 4. Homemade bottomfishing rig, Ray Dela Cruz fishing boat, Tinian

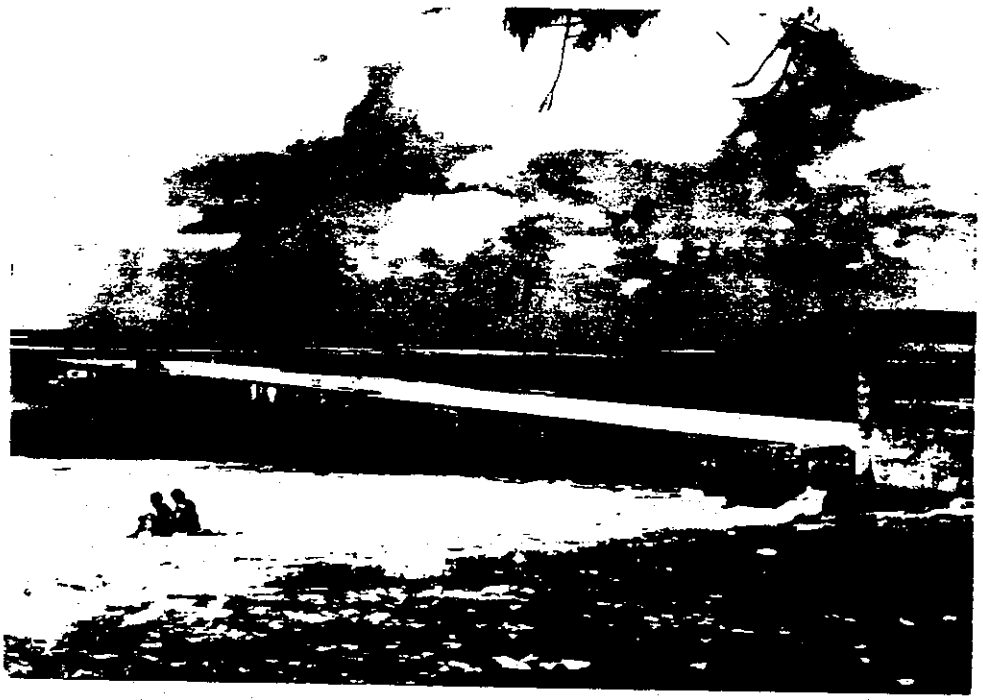


Photo 5. Sugar Dock, Saipan: launching site for offshore fishermen

Photo 6. Marlin caught between Tinian and Saipan, to be sold on Saipan

Photo 7. Some of the catch from one bottomfishing trip between Tinian and Saipan, to be sold on Saipan

ribbons, or plastic surveyor's tape. Some people use modern Kona heads with plastic skirts.

Using the above variety of trolling lures, the Saipan fishermen bring in white tuna, mahimahi, wahoo, barracuda, yellow fin, bonita, marlin, sailfish, tuna, skipjack tuna, and atulai.

For bottomfishing both homemade and store-bought lures are used. Onaga, white tuna, ehu, opakapaka, numerous snappers and mafuti are caught.

Most fishermen interviewed on Saipan learned their fishing skills from their fathers, and many of these skills have been passed down through the generations. An example of this is **Diego Benavente**, 29, who learned about fishing from his father, **Roman Benavente**, 56. Diego now runs Diego's Mart, which is one of Saipan's local fish stores. A fleet of three fiber glass boats ranging in size from 15-22 feet supply his business. He has noted a recent decline in the abundance of pelagic fish and blames this on the purse seiners.

Tinian

Twenty-three fishermen were interviewed on Tinian. Many of these people are full-time fishermen and their techniques have been passed from father to son. Compared to the other Mariana Islands, Tinian seems to have more people personally involved in fishing. Nearby to the south is Aguijan (Goat Island), which offers good fishing areas, and to the north there are rich feeding grounds between Saipan and Tinian. Offshore reefs and sea mounts are not too far away for day trips. Both bottomfishing and trolling are popular. Bottomfishing is preferred by many as it is cheaper (takes less gas than trolling), and the bottomfish, especially onaga, bring a higher price. Most fishermen use the traditional methods of fishing with homemade lures, etc., and feel they cannot compete with outsiders with expensive modern equipment such as electronic fish finders. Several Tinian fishermen have noticed that for the last five years or so fish have become less abundant. These fishermen say that sharks have become a problem due to the presence of large commercial fishing boats that dump trash fish overboard. Now sharks are apt to eat part of a fish that is being pulled in by a local fisherman, and it is no longer safe to keep one's fish cool in a net bag alongside the boat, as sharks are attracted to it. One fisherman, **Manuel Cruz**, 46, was out fishing one day recently in his 16 foot boat and found his boat surrounded by large sharks. This frightened him so that once ashore he sold his boat and has not gone fishing since.

After World War II fishermen used left-over Japanese boats and U.S. Navy boats for fishing. They also reported making boats out of roofing tin and wood. Today the boats are mostly purchased fiber glass craft. Many families use the boats only on week-ends to go to Saipan to buy food and other supplies because they are significantly cheaper there. Fishing is done both coming and going. Tinian fishermen sell much of their catch to the Saipan hotels.

Both homemade and modern lures are used for trolling. The young white coconut leaves are the favorite lure for catching wahoo. Photos 8-13 illustrate the making of this type of lure by **Manuel Dela Cruz**. Colored chicken feathers, wahoo skin, small fish, the *leerio* plant, and a plant larger than *leerio* called *piga-pilagi* in Chamorro, rubber octopus lures and vari-colored plastic squid skirts are used. Some fishermen still believe in the homemade lures and prefer

Photo 8. Manuel Dela Cruz preparing young coconut leaves for *bake* lure, Tinian

Photo 9. Mr. Dela Cruz wrapping young coconut leaves around metal head for *bake* lure, Tinian

Photo 10. Tying knot to thread to secure young coconut leaves to metal head for *bake* lure, Tinian

Photo 11. Attaching fishing line to double hook in *bake* lure, Tinian

Photo 12. Untrimmed *bake* lure with metal head and double hook in place, Tinian

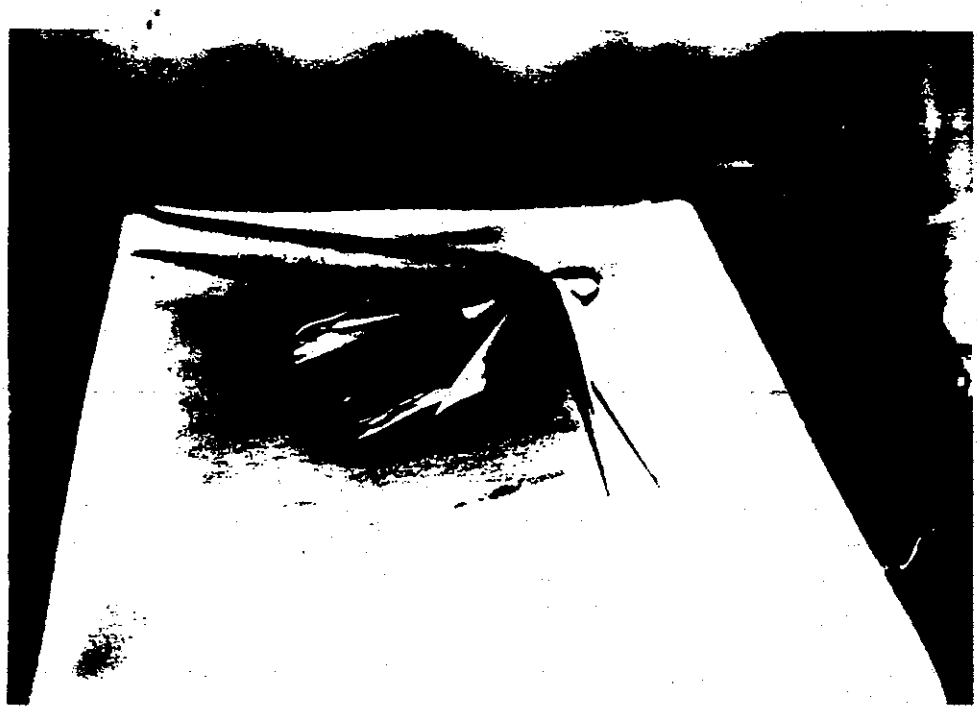


Photo 13. Finished *bake* lure, Tinian

them to store-bought ones. There are favorite spots to troll but birds are said to be a good indicator of schooling fish and what they are feeding on (information on which the fisherman can then design his lures). There is growing concern among the Tinian fishermen about alien workers killing off these sea birds and taking their eggs and small chicks from their nests.

Rainbow runner, yellow fin tuna, skipjack tuna, white tuna, mahimahi, barracuda, dogfish tuna, and marlin are caught by the Tinian fishermen. Photos 6-7 show part of the catch of Ray Dela Cruz, who bottomfished and trolled from Tinian to Saipan when he caught the marlin and white tuna in the photographs. These fish are used for family consumption (fresh or frozen), given to friends and relatives, sold out of the home, and sold to markets and hotels on Saipan.

Mike Fitzgerald, a special consultant to the Mayor of Tinian, explained that when the mahimahi are running it is the first boats to return to shore that get the highest prices for their catch and have the best chance of selling them. When too many fish are caught some fishermen have to sell them at a very low price or give them away. Such is the character of a small fishery and limited market.

Bottomfishing on Tinian is most popular. Fishermen have their favorite spots and find them by lining up two or preferably three sites on land. The calmer the water the better, as they can stay over their fishing spot longer. Morning is usually the best time for bottom fishing according to our interviewees. **Ramon Dela Cruz**, about 35, for example, goes out in his 19-foot Boston whaler in good weather for both bottomfishing and trolling. He trolls with two rods and for bottomfishing he uses two drums, each with 1500 feet of hand line that is stowed in a laundry basket. Bicycle pedals are on each drum for reeling in the heavy line (Photo 4) which has 15-16 hooks on it and possibly as many fish. The bait used is cut-up junk fish obtained free from the tuna transshipment facility on Tinian. Ray learned about fishing from his father and grandfather. His brothers are also fishermen.

David Evangelista, 31, uses salt water shrimp, baby squid, crabs, live shell fish and tuna for bait. The tuna is cut up with skin still on, into different shapes to attract different fish. He uses as many as 20 hooks but usually 6-15. Heavy sinkers are used as they need to go down fast. Lead is best but sometimes a small bundle of rebars, approximately 8 inches long, is used. Adjustments for current, depth and wind strength are very important in bottomfishing according to David. He stated that some people chum in water 100 to 220 feet deep. They chop up fish parts and put them in a screen container. The valuable onaga are caught in at least 1000 feet of water. Hermit crabs and tuna skin are sometimes used for bait.

Onaga, grouper, opakapaka, mafuti skipjack, sugarmouth, amberjack, all snappers, jobfish and sometimes shark are caught bottomfishing from Tinian. The sharks are given to the few people who eat them, as there is no market for shark on the island or Saipan. Onaga are pulled up by hand by all fishermen interviewed except the Mayor, **Ignacio K. Quichocho**, whose boat has an electric reel.

Rota

Nine fishermen were interviewed on Rota. None is a full-time fisherman although some have been in the past. Interviewees stated that in the past, fishing was frequently done for subsistence but now many people prefer red meat and chicken. Among marine fish, people prefer reef fish to pelagic and bottomfish. Rota does not have a large number of fishermen but these few use a variety of techniques.

Ramon Castro, 72, told how during Japanese times and after the war, canoes were paddled about 100 feet out from the reef. Here, the fishmen trolled for soldierfish, round eye, round mouth saksak, sagmito, skipjack, *alamin* and reef silvermouth (*Aphareus furcatus*). For lures they used red and white thread, *leerio* and white coconut leaves. For bottom fishing, the sinker was a coral rock with a hole through the center. It was tied to the homemade fish line. The coral was a piece of thick branching coral called *chochu*, about two inches in diameter and three to four inches long. The string line was made from hibiscus fiber (*Hibiscus tileaceus*), called *pago* in Chamorro, made by rolling the fiber on the thigh. The claw of the hermit crab was the favored bait. Sea crab and octopus were also used. During the Japanese time they caught fish for home consumption and sold some to the Japanese. Mr. Castro has lived on Rota since was 7 years old. He is the oldest maker of breadfruit log canoes and a very experienced fisherman. Photo 14 shows Mr. Castro by a paddling canoe (*galaide*) he made for an exhibition a few years ago.

Felix Flawa, about 45, uses his two boats to catch bottomfish which he sells to the hotels on Saipan and to customers on Guam. He uses electric reels, electronic fish finders, and 30 foot sea anchors (to keep the boat stationary over fishing spots) in his commercial operation. Felix has a full-time government job and hires two captains to man his boats.

Francisco Toves, 42, learned fishing techniques from his father. They used to go night trolling and used the *leerio* plant for lures. Being white, it showed up in the dark water. They would take a 50 pound sack of this plant material already cut, for manufacturing the lures as needed through the night. Each lure was only good for one strike. They caught mahimahi, wahoo and barracuda. White coconut leaves were also used for lures.

For bottomfishing, Francisco used a hanger arrangement with swivels (bridle). He also used a line with a sinker at the end and a larger sinker about six feet away. In between the sinkers would be four hooks with different kinds of live bait. Both of these rigs would lie flat on the sea bottom. He would catch mafuti, samagas, fafue, matinah, onaga, pakapaka, amberjack, and red snapper. Most fish would be sold, a small amount saved for the family, and the red snapper always thrown back in as it might cause ciguatera poisoning.

Abraham Charfauros, 37, fished from a canoe and learned fishing techniques from old men when he came to Rota in 1969. To catch atulai he would go to a particular spot. Here he would shine a light into the water and then sprinkle a mixture of sand mixed with the blood of white tuna into the water. To catch achuman, a similar fish, he would sprinkle a mixture of ground coconut, meat from the stomach of a hermit crab, and rice into the water. These two methods would be used at night in calm water at a depth of 50-400 feet.

Photo 14. Ramon Castro with *galaide* (paddling canoe), Rota

Photo 15. Abe Charfauros preparing the *leerio* plant for making *bake* lure, Rota

Photo 16. Mr. Charfauros peeling and separating base of stalk of the *leerio* plant for making *bake* lure, Rota

Photo 17. Selecting pliable sections of *leerio* stalk for *bake* lure, Rota

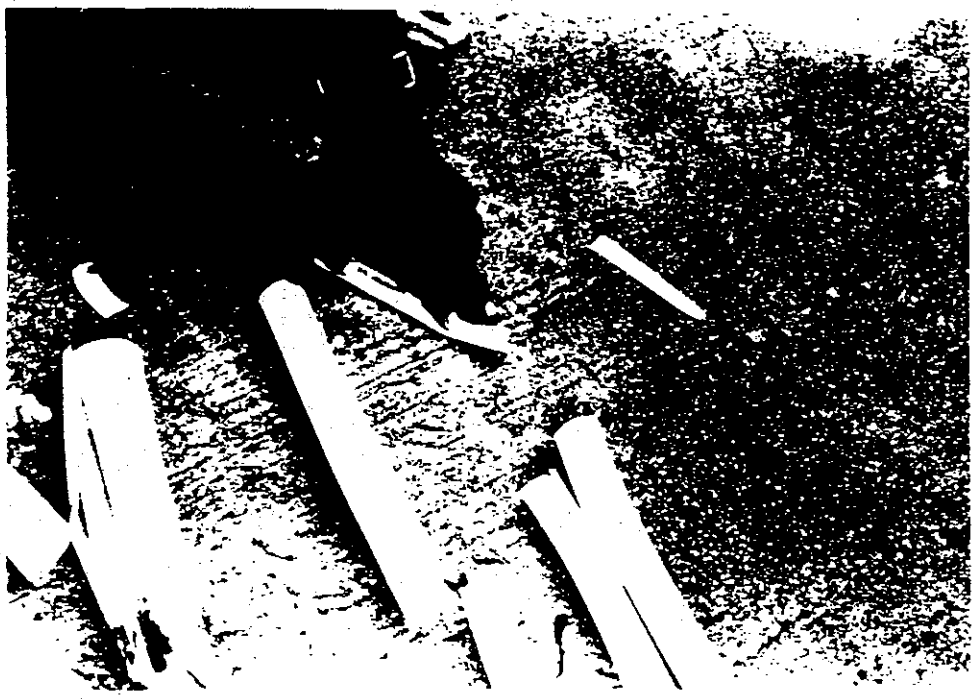


Photo 18. Trimming and shaping *leerio* stalk sections for making *bake* lure, Rota

Photo 19. Holding trimmed *leerio* in place around metal hook for making *bake* lure, Rota

Photo 20. Boat launching ramp, Rota

Photo 21. Small boat harbor, Rota

Juan Barcinas, about 35, trolls for tuna, wahoo, yellowfin, mahimahi, marlin and rainbow runner. He uses a simple hand line. He also catches onaga, silvermouth, yellowtail, snapper, flower snapper, ehu, skipjack, and giant grouper. He sells his catch to Saipan hotels.

Discussion

From an anthropological perspective, theory or the lack thereof plays an important role in the accuracy and comprehensiveness of interpretation of the facts derived from the written sources consulted during the project. Without an acceptable theory of human adaptation, we are left with common sense or *ad hoc* reasoning as to why a particular practice ever existed, ceased to exist, or continued. For example, the evidence developed during this project indicates an apparent tendency throughout prehistory and historic times for Mariana Island native groups to have relied more on inshore fish species than offshore ones, although the latter definitely were taken. It is evident that these people possessed the technical means to fish in both settings, namely ocean-going canoes and a variety of hooks, lures, and other suitable devices. It is also evident that offshore species have been and are socially important among native Mariana Islanders.

From a Western cultural perspective common sense might suggest that it was simply easier to obtain inshore species, and it probably was; yet this surmise does not explain why native Marianas people bothered to fish outside the reef at all. *Ad hoc* reasoning, again based on notions from Western culture, might produce the suggestion that native peoples fished outside the reef for variety, or for sport. Similarly it could be suggested that pursuing large fish was motivated by a desire for prestige. It may be true that people desire variety and sport and prestige but such theoretically unwarranted explanations are always limited by the facts at hand at the moment. For example, if it is found through more archaeological excavations that the native exploitation of offshore species increased over time, then by such reasoning one would have to explain why the desire for variety or sport or prestige did not manifest itself at once but rather apparently only gathered strength as the years passed by. Yet as pyschological characteristics of the human species, such desires are always present in human populations and thus are not expected to vary directionally through time. If the converse pattern were eventually documented, namely, that the taking of offshore species decreased through time, there would still be the problem of why psychological tendencies were differentially expressed as time passed on. Similarly, archaeological comparative studies may eventually establish that offshore species were exploited at different rates at different sites of the same time period; in fact such a complex pattern is beginning to emerge in the archaeology of the Marianas. If we grant its validity for the sake of argument, then the desire for variety/sport/prestige explanatory notion fails to account for this pattern of spatial variation in the taking of these species, again assuming such desires are always potential in human populations. To propose otherwise, that the differential expression of such desires just happens to coincide with temporal or spatial patterning in offshore species exploitation, is to strain even the most credulous.

On the other hand, an ecologically informed anthropological theory applied to these problems anticipates that, given the inarguable difficulties and expenses of offshore fishing, especially when inshore alternatives existed, there would be an increase in reliance on larger, deep water fish through time

only if and as the higher costs of obtaining the offshore forms were offset by significant benefits to certain sectors of society for which the possession and distribution of offshore fish were essential. Under this theory, once the conditions giving rise to a relatively high level of utilization of offshore species ceased to occur, namely when there was no longer a significant offsetting benefit for enduring the difficulties and expenses of offshore fishing, it should have ceased, other things equal (which they rarely are, but the qualification seems necessary here for the sake of demonstrating the point).

Conditions favoring the increased pursuit of offshore fish might include a rise in socio-political complexity linked to high human density and attendant competition for resources. As socio-political relations become more complex, they tend to be legitimized by prescriptive behavior such as obligatory food and wealth exchanges. Procurement of culturally defined "prestigious" pelagic fish can become essential in this context. According to this argument, pelagic fish would never be the primary source of marine protein and evidence for their capture for "prestige" purposes should correlate with later time periods when human population size had grown to some critical size threshold.

Spatial variations in archaeological fishbone assemblages which reflected the exploitation of offshore species at different places during the same time period might be explained as a function of an internally differentiated settlement system. For example, some sites may have been occupied only during certain seasons, such as leeward sites from which offshore fishing forays could be undertaken, especially during the calm months of the year. In contrast to the socio-political explanation, evidence for pelagic fishing should indicate more reliance on offshore species for "every day" consumption, and in this case there should be no correlation with larger population size or lateness in time.

Using as a guide a theoretical framework which can anticipate a range of variability in kinds of sites and in the differential use of a given site over time, one might perform a variety of analyses of archaeological fish bone assemblages, in which not only the presence or absence or relative numbers or weights of offshore fish remains could be meaningfully interpreted but other attributes of these assemblages, such as body size ranges, species diversity, or skeletal parts missing and represented, could be investigated and shown to be the expected outcomes of regular relationships among several causal variables. Appropriate analytical methods which would definitely distinguish between various causal factors such as socio-political versus geographic factors have not yet been developed. But at least we can anticipate these problems and work toward their solution. Ethnographic observations recorded in the past and made in the present can stimulate archaeological thinking about these topics.

Anthropological theory can generate expectations for the future as well as hypotheses about the past or about the "ethnographic present." The monetary economics of offshore fishing is but one aspect of an anthropological understanding of human behavioral regularities including attitudes. As with other systemic phenomena, cultural organization is not atomistic but reflects the sometimes complex linkages between the physical and social environments within which a cultural system and its human participants are embedded and have evolved.

As Knudson (1987) has shown, on Guam there are many factors constraining the participation by indigenous peoples in the commercial fishery, including

wage work and family strategies of economic risk-reduction (relative to benefits available) that require frequent participation in non-commercial, reciprocal exchanges involving fresh fish, as well as the relatively high costs of imported equipment and fuel. In Guam and in the CNMI, locally caught fish are often sold informally. The buyers are mainly friends, neighbors, and relatives, especially in the CNMI. This non-anonymous, very personal "market" tends to restrain the price asked and paid. We found that inshore species are preferred in reciprocal (non-commercial) exchanges involving other food stuffs such as meat and for general consumption in Guam, Tinian, and Rota (on Saipan offshore species consumed as sashimi are highly popular). In both these cultural contexts, offshore and inshore fishing tend to be undertaken on a part-time basis.

Summary Answers to the Questions Posed in the Four Evidence Areas

As noted in the Introduction, four general areas of evidence were to be taken into consideration. Here we briefly answer the questions posed by the four evidence areas as stated in WPRFMC (1988:1).

1) Was there and is there a set of historic fishing practices for the species identified in Appendix A in the areas now encompassed by federal waters in the CNMI?

According to an unbroken historical record, beginning with the earliest explorer and adventurer accounts of the late 16th and early 17th centuries through governor's reports and other official documents, as well as contemporary observations including interviews with fishermen and on-site visits to boat landing places, yes, there was and is a set of fishing practices in the islands of the CNMI by which native peoples (Chamorro and Carolinian) have successfully pursued offshore pelagic and bottomfish including at least some of the species listed in Appendix A.

In addition to the historical evidence, the prehistoric archaeological record clearly indicates the successful taking of pelagic forms since the Pre-Latte era which began ca. three millenia ago. Evidence from the prehistoric archaeological record attests that pelagic and bottomfish species continued to be utilized during the subsequent Latte era, which began ca. A.D. 800 and ended with Western colonial contact in the mid-to late 17th Century. The physical evidence for prehistoric utilization of pelagic and bottomfish species includes bone fragments of these animals found in food refuse middens, as well as stone and shell artifacts, part of the offshore fishing gear of the ancestors of the natives peoples of the Mariana Islands.

The earliest historic era documents indicate that pelagic and bottomfish were normally taken by native Marianas peoples, now called Chamorros, as part of a diverse subsistence economy which included hunting, gardening and inshore fishing and collecting. The native utilization of offshore fishes continued throughout the early historic period, until sailing canoes (an essential element in offshore fishing) were no longer available to them, sometime in the middle or late 18th Century. The CNMI Chamorros resumed offshore fishing in Rota, Tinian and Saipan when they once again had access to boats capable of going outside the reef, just after World War II. The Mariana Islands north of Saipan lack reef development and so pelagic and bottomfish species are accesible close to shore; therefore these forms have always been available to native peoples inhabiting these small islands, even without the use of sailing canoes.

The Carolinians of the central Caroline Islands, who have been in the Marianas at least since the Spanish period (and probably prehistorically although this has yet to be investigated archaeologically) have an unbroken historical record of building sailing canoes and using them in offshore fishing.

Today in the CNMI, trolling and bottomfishing are popular recreational activities, and, to a lesser extent, commercial activities of the Chamorro people of the CNMI. More importantly, these people fish for pelagic and bottomfish species to supplement their family subsistence, which is gained by a combination of small scale gardening and wage work. Recreational fishing in this context should not be understood to imply only for "sport," without any subsistence consequences.

2) Was there and is there a dependence by native people of the CNMI (or at least a significantly identifiable portion thereof) on the fish, crustaceans, and precious corals identified in Appendix A?

Yes, there was and is a dependence on several of the fish listed in Appendix A but precise measures of the degree of dependence is difficult, particularly for the earliest time periods. This is because of generally poor preservation of organic remains in the archaeological record and because of a lack of pertinent analyses in archaeological reports which might provide information on this subject. Relative to the traditional Chamorro lifestyle, however, the Carolinians probably depended more upon offshore species than did the ancestral Chamorros of the larger southern islands in the Marianas archipelago.

Under aboriginal conditions, that is, prior to European colonization of the native Marianas peoples, marine forms were the primary source of animal protein in the Mariana Islands, land mammals being small and rare. After the Spanish-enforced demise of the Chamorro sailing canoes after the mid-18th Century, native fishing for offshore species was no longer possible. However, large land mammals (pigs, cattle, deer) brought by the Europeans were a readily available alternative. Thus for a time the relative dependence by Chamorros on marine- vs. land-based protein sources may have changed due to the Spanish preventing offshore fishing while making available and encouraging the husbandry of newly introduced land animals. However, even with the availability of land mammals, inshore marine species continued to be harvested in traditional ways. The mid-20th Century saw the return of ocean-going craft to which Chamorros had access and simultaneously the resumption of offshore fishing by these peoples, in addition to fishing for inshore species.

In contrast to the Chamorros, the Carolinians residing in the Marianas historically have enjoyed more continuous access to offshore species, as they were permitted by the Spanish to retain their sailing canoes. During the German and Japanese eras there was a decrease in inter-island travel by Carolinians within the Marianas and between the Marianas and the central Carolines. Since the end of World War II, however, the Carolinians of Saipan have had access to ocean-going craft by which to pursue offshore bottomfish and pelagic species. Presently these forms are a significant part of the subsistence of Carolinian families, in addition to what is provided by gardening and wage work.

Traditional subsistence practices of the Chamorros and Marianas Carolinians apparently did not include the taking of deep water precious corals or crustaceans listed in Appendix A, nor are they a viable industry today.

3) Is there at least some dimension of the indigenous cultures of the CNMI which in the past reflected and still reflects cultural, social, and religious values, traditions, and practices derived or based upon the fisheries for the species listed in Appendix A?

Yes, there are at least three dimensions of the indigenous cultures of the CNMI which reflected and reflect such values, traditions and practices: patterns of distribution, linguistic forms, and native fishing technology. In the case of the Chamorros, we have early historic documentation of customs associated with the capture and sharing of offshore fish, which had religious aspects as well as social aspects. Certain linguistic terms for offshore species persist, indicating the cultural preservation of knowledge of these forms, although knowledge of reef forms is more detailed. Techniques of manufacture of homemade trolling lures using native plants are still widely known, and this type of lure is called by a local name. The custom of sharing one's catch, regardless of whether it is from inshore or offshore, with one's relatives and friends remains strong among the Chamorros and Carolinians today. Providing fish, whether caught or purchased, is a regular part of social obligations of both Chamorros and Carolinians in the CNMI. The Carolinians have a long cultural history of pelagic and bottomfish fishing from ocean-going canoes, preserved in their language as fish names (see Appendix B) and in certain customs and beliefs, which involve ritual dividing of the catch, obligatory reciprocal exchanges involving fish, and behavioral proscriptions for men and women to ensure successful fishing expeditions. While the post-war period has seen the decline of many traditional behaviors and beliefs among Carolinians on Saipan (as well as among Chamorros), the central Caroline Islands remain a reservoir of traditional knowledge and belief which continues to contribute to the preservation of Carolinian culture on Saipan. In addition, cultural interaction between the Carolinians and the Chamorros of the Marianas, including inter-marriage and the sharing of some customs, manifests the continuing evolution of pan-Oceanic culture. Part of this Pacific-wide cultural base includes the pursuit and utilization of offshore pelagic and bottomfish species which differs from other ethnic groups now present in the CNMI.

4) Is there present participation by native fishermen in the CNMI (together with non-native fishermen) in the fisheries of the species listed in Appendix A?

Yes, there is present participation by both Chamorro and Carolinian fishermen, along with non-native fishermen in the pelagic and bottomfish fisheries in the CNMI, as indicated in statistics provided by the government as well as by our interviews and observations while in the islands. There is no exploitation by these groups of deepsea crustaceans or corals.

Answers to the Questions, Who is a Native of the CNMI? and How Many Individuals Would be Affected by a Limited Entry System?

The following information is presented in an attempt to answer the questions, "Who is a native of the CNMI?" and "How many individuals would be affected by a limited entry system which gives preferential access rights to native fishermen of the CNMI?" These suggestions are based on MARS staff's

understanding of the issues involved. In a separate document we present a legal opinion by Dr. Maivan Lam, an attorney at the Univ. of Hawaii Law of the Sea Institute.

Since land acquisition in the CNMI is restricted to persons of Northern Marianas descent by the Constitution of the CNMI (Article XII, Section 1), the Constitution defines what is meant by a person of Northern Marianas descent (Article XII, Section 4), which is as follows:

> A person of Northern Marianas descent is a person who is a citizen or national of the United States and who is of at least one-quarter Northern Marianas Chamorro or Northern Marianas Carolinian blood or a combination thereof or an adopted child of a person of Northern Marianas descent if adopted while under the age of eighteen years. For purposes of determining Northern Marianas descent, a person shall be considered to be a full-blooded Northern Marianas Chamorro or Northern Marianas Carolinian if that person was born or domiciled in the Northern Mariana Islands by 1950 and was a citizen of the Trust Territory of the Pacific Islands before the termination of the Trusteeship with respect to the Commonwealth.

The 1980 census (U.S. Dept. of Commerce 1983) found the population of the CNMI to be 16,780. (See Table 5 for a breakdown of the population by island.) The report of the census partitions the CNMI population by sex, age, locality, etc. Although there was a question on the census about ethnicity, no ethnic breakdown was reported.

Another report (Northern Marianas Islands Commission on Federal Laws 1985:6) gives the following information about ethnic groups in the Northern Marianas:

> The principal ethnic groups in the Northern Marianas are the Chamorros and the Carolinians. (Both groups are considered to be Micronesian.) The Chamorro population is the larger of the two, although definitive statistics on the relative sizes of the groups do not appear to be available.

According to Mr. Samuel McPhetres of the Trust Territory of the Pacific Islands Office of Transition, Saipan, the unoffical breakdown of native races in the CNMI is approximately 75% Chamorro and 25% Carolinian. The 1990 census should record the percentages more accurately.

Consulting these documents has provided an indication of criteria which might be used in the definition of a CNMI "native" and how many people might be affected by the imposition of a limited entry program based on indigenous fishing rights. Final answers to these questions will have to be made after a more thorough analysis of all the issues involved.

Limited Entry Seen from a Variety of Perspectives

Limited entry is seen by fisheries professionals as one of a range of management options which are aimed at limiting effort in a given fishery. According to fisheries biologist S.S. Amesbury (personal communication 1988 and see below), the principal advantage of limited entry over other effort

Table 5. Islands of the Northern Marianas, Population, Area (after Northern Mariana Islands Commission on Federal Laws 1985:Table 1)

ISLANDS OF THE NORTHERN MARIANAS
(listed from north to south)

	Population	Area in square miles
Uracas (Farallon de Pajaros)	—	.79
Maug	—*	.81
Asuncion	—	2.82
Agrihan	32	18.29
Pagan	54**	18.65
Alamagan	18	4.35
Guguan	—	1.61
Sarigan	—*	1.93
Anatahan	—	12.48
Farallon de Medinilla	—***	.35
Saipan	14,549	47.46
Tinian	866	39.29
Agiguan	—	2.77
Rota	1,261	32.90
Total	16,780	184.51

Source: Population figures are from U.S. Bureau of the Census, 1980 Census of Population (PC80-1-A57A, 1982). Areas are from E. Bryan, Guide to Place Names in the Trust Territory of the Pacific Islands (1971).

*Section 2 of Article XIV of the Constitution of the Northern Mariana Islands requires that "[t]he islands of Sariguan [Sariçan] and Maug and other islands specified by law shall be maintained as uninhabited places and used only for the preservation of bird, fish, wildlife and plant species except that the legislature may substitute in place of Sariguan another island as well suited for that purpose."

**In May 1981 Mt. Pagan erupted, forcing evacuation of the 54 persons then residing on the island of Pagan. Pagan People Reach Safety, Pacific Daily News (Guam), May 18, 1981, at 1. Continued volcanic activity has prevented their return.

***Farallon de Medinilla, leased to the United States Government pursuant to sections 802 and 803 of the Covenant, is used by the Armed Forces as a bombing practice range.

limitation options is that it can "promote economically rational use of stocks" (see Samples and Sproul n.d.) by maximizing profits to the participants in the fishery and reducing the tendency of the fishery to become "overcapitalized." From this perspective, the principal disadvantage of limited entry is that it may exclude fishermen from the fishery who wish to participate and who would be able to under other management options. For example, based on the Polovina et al. (1985) study, a limited entry system to regulate stocks in the bottomfish fishery in the CNMI need not involve more than 15 boats. Since many more boats now participate, such a program would exclude a large proportion of the native fishermen. If the goal of the limited entry program is to maximize profits while maintaining the biological integrity of the fishery, it probably would work. However, if the goal is to maximize overall satisfaction among members of society, then such a program would probably fail for being so exclusive.

Recognizing this problem, economist P.A. Meyer (Meyer Resources, Inc. 1987) attempted to show the "non-market value" or "worth that the fishermen associate with their activity over and above dollars received or spent" in the Hawaiian "recreational" fisheries. He found Hawaiian fishermen's responses valued their recreational fisheries at $239 million from direct expenditures of $24 million (Meyer Resources, Inc. 1987:Tables 18, 20).

Another point that should be mentioned is that foreign and domestic purse seiners and gill netters, presently not prohibited from fishing within three miles of the island, could pose a serious threat to local offshore fishing. Ostensibly these boats are taking only unregulated tuna; however, it is clear that other species of fish and other marine life such as mammals and birds are casualties of the rather indiscriminate netting process. Particularly at risk from purse seining are the non-migratory species which are attracted to floating logs and other aggregating objects, as purse seiners target these devices in order to take tuna.

In addition to the practical problems of trying to catch only tuna when other species are in an aggregation, competitive maneuvers on the part of purse seiners would appear to threaten fish stocks. For example, floating logs may sometimes be removed by a ship in order to prevent competing ships in the area from capturing the associated fish aggregation, or one log might be removed to force fish to go to another one nearby for more convenient capture by one boat. Aside from the problem of mass wasting of marine wildlife not targeted yet still entrapped in the large gill nets ("walls of death" which can be 60 feet wide and 30-40 miles long), when these nets are lost or discarded at sea they still continue to entrap and kill indiscriminately (see Guam Coastal Management Program 1989:4).

It is apparent from these facts that gill netting and purse seining as practiced today could have a significant negative effect on the future ability of local fishermen to obtain a reasonable catch offshore. Fishermen also complain of the tuna transhipment facility on Tinian (Photos 22-23) as having attracted sharks in the offshore fishing grounds. This is a matter needing further empirical study throughout the Marianas.

We found that the assumption that fishermen will act to maximize profits when participating in a controlled fishery is at least questionable in the CNMI. Interviews with these fishermen indicate that their present motivation for fishing is not for maximal economic gain. Rather, the reasons people fish are

Photo 22. Mother ship between two large tuna transport ships, Tinian transshipment facility

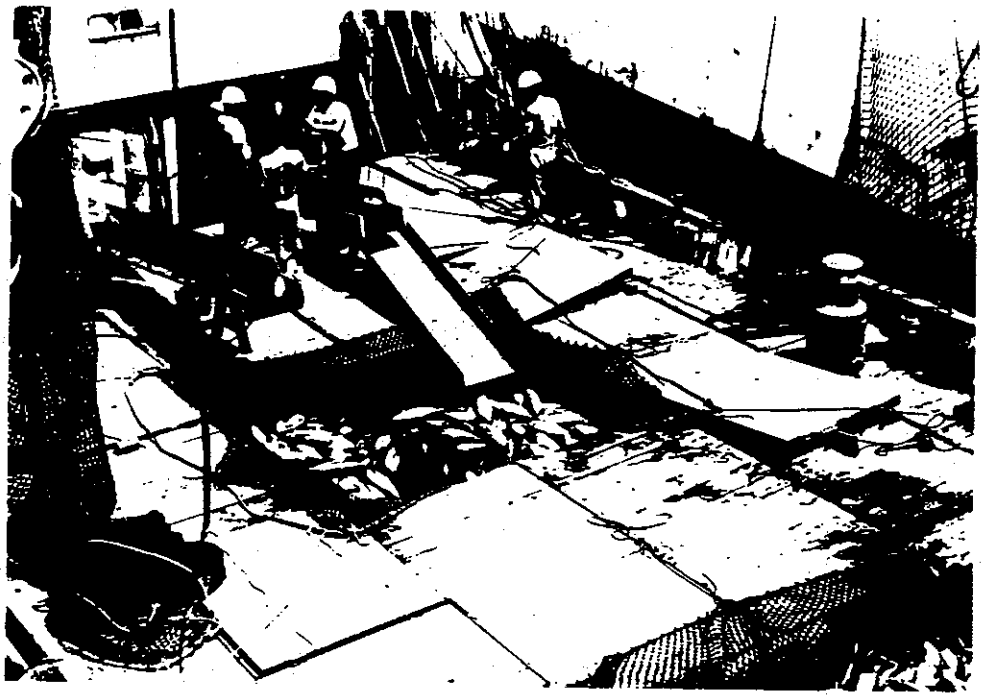


Photo 23. Mechanized operation on mother ship, transferring tuna frozen at sea via swing nets to larger ship, Tinian transshipment facility

complex and involve social and political relations. Fish from single catch episodes may be sold, given as gifts to relatives and friends, and bartered for other foods. An important cultural constraint on profit-making from fishing is the feeling that one should not charge as much as the traffic will bear because the customers are "people we know" and they are "poor like us."

Should limited entry be instituted, it is not clear why fishermen who do not now maximize profits when participating in uncontrolled fisheries, would change their behavior if this cultural constraint against maximizing profit still operated. On the other hand, an informal two-tier pricing system (a lower price for friends and relatives, a higher price for hotel buyers) might also continue under limited entry conditions. Profits from sales to hotel buyers might be increased (over those realized without limited entry) but not maximized, as long as two-tier pricing was practiced.

CNMI interviewees' opinions regarding limited entry in the pelagic and bottomfish fisheries have been informally tabulated in non-overlapping categories as follows. In the interviews, limited entry was explained as a management technique which would exclude certain persons from a fishery, in this case, non-native persons. However, it was not suggested that the number of eligible fishermen would be small relative to the number of native fishermen who would qualify.

Five strongly favored limited entry, expressing their preference that "island fish should be reserved for island people." This group of interviewees would exclude all but the indigenous populations from the fisheries. Thirty-three strongly favored the implementation of limited entry laws, reserving the fisheries for the residents of the CNMI only; under their preference, no "outsiders" and no tourist boats should be allowed. Three interviewees felt that limited entry was a good idea but that it should not be implemented now, only sometime in the future. They were not more specific about which groups of fishermen should be included and which excluded from the fisheries, except for the feeling that the large commercial operators such as long-liners, purse seiners, and gill netters were a potential or actual threat. Even some of the Guam commercial operations were cited as being a threat to the CNMI fisheries. Eight felt that the fisheries should be regulated through licensing and/or taxes on the catch, with higher fees paid by "outsiders" (i.e., non-residents of the CNMI). One person declined to give an opinion about limited entry, and two were opposed to it.

Additional information about CNMI fishermen's opinions regarding limited entry in the CNMI bottomfish fisheries was obtained when interviews were conducted in Saipan during the period May-July 1988, by a student at the Univ. of Guam Marine Laboratory under the supervision of S.S. Amesbury (pers. comm 1989). Most of the information in these interviews has been reported by Kasaoka (1989), and the ethnic composition, ages, and time fishing of the interviewee group has been noted above under the heading Additional Sources, Evidence Area 1. Approximately 3/4 of the group of interviewees (25 out of 34) identified themselves as Chamorro and 2 as Carolinian. Relevant here and not reported in the Kasaoka paper are responses to a question seeking opinion of a limited entry program for bottomfish fisheries in the CNMI. No mention was made of the basis on which such a limited entry program would be designed, such as native fishing rights. Thirty of the 34 interviewees answered this question. Most felt no license at all should be required of CNMI residents to bottomfish in the CNMI

EEZ. The major concern was foreign ships, "outsiders," "aliens" and big operations, particularly long-liners.

Following in Table 4 is a list of persons interviewed during March and April 1989, with fishing histories and experience in Pagan, Alamagan, Anatahan, Agrighan, Saipan, Rota, Tinian. They range in age from 25 to 72 years old.

In the next section of the report is an evaluation of limited entry as a management alternative, seen from the perspective of a fisheries biologist with expertise and extensive experience in the Mariana Islands fisheries. This evaluation will be seen to differ in outlook and overall conclusions to be drawn from the fishermen interview responses. It is included here because it was felt that informed opinion and scientifically reasoned arguments from the biological standpoint make an important contribution to overall planning and decision-making natural resource management.

EVALUATION OF LIMITED ENTRY AS A MANAGEMENT ALTERNATIVE FOR THE OFFSHORE FISHERIES OF THE CNMI

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INTRODUCTION

Limited entry or "access management" is a fishery management tool which operates by restricting the number of participants in a fishery. This tool can be employed to accomplish the following effects:

1) Limited entry can restrict the total fishing effort expended in a fishery if the amount of effort expended by permitted entrants is also controlled (by some means or another). Restriction of total fishing effort may be desirable to accomplish one or more of the following goals:

a) to reduce fishing mortality on a resource stock to prevent overfishing and stock decline;

b) to achieve the optimum effort level for harvesting MSY;

c) to reduce effort below that necessary to achieve MSY in order to achieve maximum economic yield;

d) to increase the profits of the participants in the fishery; e.g., halving the number of participant but allowing them to double their effort may increase the profits of these participants (while, of course, eliminating the participation and profit-making of the other half of the fishermen);

e) to eliminate a fishery which is deemed undesirable for some reason. This can be accomplished by making fishing permits non-renewable or non-transferrable or through scheduled retirement of permits.

2) Limited entry can be used to allocate fishing rights to some particular group of fishermen. This can be accomplished by establishing criteria for obtaining permits which favor certain groups. Among the reasons this might be done are the following:

a) to restrict the fishery to some sector, such as commercial, recreational, or subsistence;

b) to restrict the fishery to users of particular fishing methods;

c) to give preferential rights to fishermen with a history of past participation in the fishery;

d) to give preferential rights to a group with special cultural or economic ties to the fishery;

e) to restrict the fishery to the most productive or most efficient fishermen;

f) to maintain diversity in the fishery by allocating various proportions of the total number of permits to different categories of fishermen.

More than one of these objectives may be achieved in a given fishery by the proper design of the limited entry program.

Of course limited entry is not the only management approach that can be used to achieve the fishery objectives listed above; there are other ways to limit effort and there are other ways by which fishing rights can be allocated. Fishery management in any particular situation, then, requires that the objectives of the management effort be defined (and prioritized) and then that various management options be evaluated for their effectiveness in achieving the management objectives. Any management measures selected will have to be tailored to the specific problems to be solved.

In this paper, the advantages and disadvantages of limited entry will be evaluated for the offshore (EEZ) fisheries of the Commonwealth of the Northern Marianas.

The procedure which will be followed in this evauation is first to evaluate the present conditions of the fisheries in terms of biological, economic, and social factors. Then, some possible management objectives, based on consideration of current fishery conditions, will be proposed. Finally, limited entry will be evaluated vis-a-vis other management options with regard to their efficacy in achieving the management objectives.

OFFSHORE FISHERIES OF THE CNMI

There are essentially two offshore fisheries (fisheries that take place at least in part in the EEZ) in the waters of the CNMI: 1) pelagic trolling fisheries that target tunas, mahimahi, marlin, wahoo, and similar species and 2) bottomfish handline fisheries that target deep-dwelling snappers, groupers, jacks, and emperors. These fisheries are are, at least nominally, under the purview of the Western Pacific Regional Fishery Management Council, although there are significant issues of fishery jurisdiction that have not been resoved. The Western Pacific Council has also developed Fishery Management Plans (FMP's) for

two other offshore fisheries, precious corals and deep-water crustaceans (spiny and slipper lobsters), but offshore fisheries for these two groups do not currently exist in the CNMI. In the absence of fisheries for these latter two resource groups and in the absence of any data to indicate that harvestable stocks of these groups exist in the EEZ around the CNMI, there is no reasonable basis for evaluating any particular management regimes for them, and so they will not be considered further.

A survey of potentially harvestable stocks of Heterocarpus shrimps in CNMI waters was carried out by the National Marine Fisheries Service in 1982-1984 (Polovina et al., 1977). Results of this survey indicated that annual equilibrium yields of 133.8 metric tons of Heterocarpus could be harvested in CNMI waters. Despite this large potential, there are currently no deep-water shrimp harvesting operations in the CNMI. Should such fisheries develop, data collection efforts should be undertaken so that the fishery could be appropriately managed. At the present time there is little basis for evaluating management alternatives for this resource.

PELAGIC FISHERIES OF THE CNMI

The pelagic fishery is the most productive fishery in the CNMI. Virtually all the fishing is done by trolling (although ika-shibi techniques are used occasionally by a very few fishermen), and fishing takes place both within three miles from shore and beyond that. In addition, U.S. tuna seiners and some foreign vessels use Tinian in the CNMI as a transshipment point for tuna caught, presumably, in waters outside the EEZ of the CNMI.

Biological Condition of Pelagic Fish Stocks

The major species caught in the CNMI trolling fishery are yellowfin and skipjack tuna, mahimahi, wahoo, dogtooth tuna, and blue marlin. Species caught in significantly lesser amounts are barracuda, rainbow runner, and sharks. Sharks have little if any commercial value in the CNMI, although both barracuda and rainbow runner are sold and eaten.

The stocks of these species which are harvested by CNMI fishermen are presumably wide-ranging stocks, of which only a small proportion occur within the CNMI EEZ for only a part of their life history. Tagging studies have suggested that this presumption may not always be entirely the case for tunas, and there have been very few studies which would either confirm or deny this presumption for the other pelagic species under consideration. The best scientific information currently available, however, indicates that the proportion of the stock of

each of these pelagic species available for harvest by CNMI domestic fishermen is but a small part of the total stock. Therefore, any evaluation of the biological condition of pelagic fish stocks in the CNMI EEZ must be based on a consideration of the condition of the larger Pacific stocks of these species.

Blue Marlin

Dr. Robert Skillman has prepared a draft assessment of stocks of Pacific billfishes (Skillman, R. A. Status of Pacific Billfish Stocks, unpubl.). He concludes that Pacific blue marlin (which are considered in his analysis to belong to a single stock centered at the equator with seasonally varying poleward extensions) are currently being overfished, but he also suggests that the condition of this stock is improving. He estimates that the MSY for Pacific blue marlin is about 20,000 to 24,000 metric tons.

Offshore commercial fishery marketing data collected by the CNMI Division of Fish and Wildlife (DFW) indicate that from 1488 and 2123 pounds of locally caught marlin were marketed in 1985 and 1986, respectively. This amounts to about 0.004% of the MSY for the entire Pacific stock.

Mahimahi and Wahoo

The stock structure of mahimahi and wahoo in the Pacific is not known, and estimates of MSY for these species have not been made. Recorded annual Pacific harvest for mahimahi during the period 1982-1985 ranged from about 15,000 to 22,000 metric tons (Oceanic Institute, 1988); CNMI commercial sales of mahimahi in 1985 and 1986 were, respectively, 10,364 and 14,237 pounds, about 0.03% of the recorded Pacific-wide harvest.

Tunas

Yellowfin and skipjack tuna are the largest pelagic fish resources harvested in the western Pacific. The harvest of skipjack tuna in the central and western Pacific has risen over the last two decades, reaching approximately 600 thousand metric tons by the mid-80s. There is no indication that Pacific skipjack stocks are near full exploitation, although the growth of the western Pacific purse-seine fishery may change this assessment (Kleiber, 1987).

Western Pacific stocks of yellowfin tuna are also thought to be less than fully exploited, but the longline fisheries which harvest larger, deep-dwelling yellowfin are thought to be more mature than the purse-seine fisheries which harvest smaller, surface-dwelling fish (Au, 1987). Annual harvest of yellowfin tuna in the western Pacific has been around 175,000 to 210,000 metric tons from 1981 to 1985 (Au, 1987).

Commercial sales of locally caught skipjack tuna in the CNMI were 141,910 pounds in 1985 and 203,490 pounds in 1986 (Hamm and Quach, 1988), approximately 0.013% of the annual central and western Pacific catch. Commercial sales of yellowfin tuna for the same two years were 9,972 and 13,533 pounds respectively, approximately 0.003% of the annual western Pacific catch.

Because of the limited impact that the CMNI's domestic fisheries could conceivably have on the conditions of the stocks of these pelagic species, there seems to be no biological reason for imposing any restrictions on the harvest of these species by the CNMI's domestic fishermen.

Economic Condition of Fishery

The trolling fishery in the CNMI includes both commercial and recreational fishermen, and virtually all fishermen retain part of their catch for home consumption. Recreational fishermen usually sell some of their catch to defray trip expenses. A new and growing sector is commercial charterboat fishing.

Results of a recent survey of the economics of offshore fishing on Saipan were summarized by Kasaoka (1989). The survey included data from 34 offshore fishermen on Saipan for whom trolling for pelagic species (tuna as well as marlin, mahimahi, wahoo, and others) was the most important fishery. Among the findings were the following:

a) annual fixed costs per fisherman averaged $3,319;

b) annual operating costs per fisherman averaged $11,664;

c) annual revenue from fish sales per fisherman averaged $41,136.

These data suggest that the average offshore fisherman on Saipan makes $26,153 per year (not including vessel depreciation). If this is, in fact, the case, offshore fishing on Saipan appears to be a reasonably healthy industry.

Charterboat fishing is a growing activity on Saipan. This appears to be an economically viable industry as income is generated by charter fees paid by customers in addition to income from fish sales. Few data are currently available, however, on the economics of the charterboat industry in the CNMI.

Social Aspects of the Fishery

All sectors of the trolling fishery in the CNMI are open to any fisherman who can afford the costs of entering it. These

costs are quite variable, e.g., initial purchase costs for boats presently in the fishery range from $500 to $100,000, and so entry into the fishery is available to almost any potential fisherman in the CNMI.

Of the 34 respondents to the small boat economic survey in Saipan, 25 identified themselves as Chamorros, 4 as Caucasians, 2 as Carolinians, and 1 each as Filipino, Japanese, and Palauan (Kasaoka, 1989).

Existing Management Efforts

Saipan does not require a fishing license for any of its fisheries, and there are no fishing regulations in place which are applicable to the trolling fishery. A Preliminary Fishery Management Plan (PMP) for Pelagic Species in the Pacific was prepared by the National Marine Fisheries Service and went into effect in 1980. Foreign fishing for non-tuna pelagic species in the CNMI EEZ is regulated by this PMP, but it contains no regulations applicable to domestic trolling fisheries in the CNMI. The Fishery Management Plan (FMP) for pelagic species in the U.S. EEZ of the Western Pacific Region which was developed by the Western Pacific Regional Fishery Management Council and implemented by the U.S. Department of Commerce does not include management measures applicable in the CNMI EEZ.

The CNMI DFW collects data on the commercial fisheries through analysis of invoices from commercial fish dealers. These data are compiled and summarized by the WPACFIN program (Hamm and Quach, 1988).

Management Objectives for the CNMI Offshore Trolling Fishery

The CNMI adopted a Fisheries Development Plan in 1980 in which the following Policy and Goals were expressed:

Commonwealth Fishery Policy

It is the policy of the CNMI to conserve, manage and develop her fishery resource for the optimum benefit of her people.

Goal

The goal of this plan is to provide the vehicle by which rational development of the fishery resource is to be achieved in order that the people of the CNMI will realize the optimal benefits from the resource in terms of marine product imports displacement, employment and the making available of fresh, wholesome protein to the general

populace on a consistent basis.

The following management objectives are compatible with the CNMI's fishery policy and goal:

a) to the extent possible, maintain the abundance and availability of pelagic fish stocks throughout the archipelago;

b) to provide opportunities for productive and profitable commercial trolling fisheries;

c) to maintain opportunities for local fishermen to harvest fish for home consumption;

d) to enhance opportunities for recreational trolling fisheries;

e) to encourage and maintain charterboat fishing operations;

f) to the extent possible, improve the safety of small-boat fishing.

Evaluation of Limited Entry and Other Management Strategies for Offshore Trolling in the CNMI

The Pacific-wide stocks of yellowfin and skipjack tuna do not appear to be overharvested; however the development of purse-seining in the region could change that assessment. The Pacific stocks of blue marlin are perhaps at a level where substantial increases in harvesting effort might lead to stock declines. Little or no data are available for the stock condition of mahimahi, wahoo, and the other species taken by CNMI fishermen in the EEZ. However, the amount of these species taken by CNMI fishermen is so miniscule compared to Pacific-wide harvests, that even complete cessation of trolling in CNMI waters would have no measurable affect on the stock size of these species. There would, thus, seem to be little justification for any management measures whose only effect was limiting fishing effort by CNMI trolling fishermen. No such effort limitations are likely to improve the catches of CNMI fishermen or those of fishermen elsewhere.

Effort limitations could conceivably improve the economic return of the fishery if the restriction of effort led to a more efficient fishery with reduced operating costs, or if restrictions in effort led to lower total catch and a more than compensatory rise in fish prices. However, any improvement in catch rates as a result of restricting local fishing effort is unlikely to be measurable (if any improvement would occur at all).

The trolling fishery is open to anyone who chooses to and is financially able to acquire the necessary boat and gear. As no one is presently excluded from the fishery, there seems to be no need to establish preferential fishing rights for any individuals or groups. Allocation of fishing rights preferentially to one group of fishermen could only be accomplished by denying fishing rights to other groups.

There is no particular reason to expect that reduction of fishing effort, by whatever means, would improve the catch rate relative to the effort remaining, and so any denial of fishing rights to one group would not increase the catch rates of those permitted to remain in the fishery.

While the catch of local trollers probably has no measurable impact on the catch of purse-seiners and longliners, the converse may not be the case.

The purse-seiners (both U.S. and foreign) presumably do most of their fishing in equatorial waters, but they are not excluded by U.S. law from fishing in the EEZ around the CNMI, because the U.S. has no regulatory regime for purse-seine tuna fishing in the western Pacific. The U.S. fleet has been unwilling to report their fishing activities to the NMFS or to the Western Pacific Regional Fishery Management Council, and so there is no way to know exactly how purse-seine fishing is distributed within the region nor the exact composition of the catch. Surface-dwelling yellowfin and skipjack tuna make up the majority of the catch, and it seems that there is also some unquantified bycatch of other surface-dwelling pelagic species such as marlin and mahimahi. These are the same species harvested by CNMI trolling fishermen.

The forign longline fleets presumably fish in the waters of the FSM (in the case of the Japanese) or in international waters or the waters of Palau (in the case of the Taiwanese, who do not have current fishery agreements with the FSM; Williams, 1989). The Forum Fisheries Agency (FFA) accumulates and publishes data on the fishing activities of vessels permitted to fish in the EEZs of member nations, but as yet no studies have been carried out to determine whether these longline fleets have any effects on the local fisheries of the CNMI. A major target of the longliners is yellowfin tuna, but the stocks harvested are deeper-dwelling ones, and it is not clear how these deep stocks interact with surface schools of yellowfin. Bigeye tuna and marlin are also caught. Foreign longliners cannot legally fish in the CNMI EEZ without obtaining a permit from the NMFS, carrying an observer, and reporting their fishing activity and catch.

Although there is, at present, no domestic longlining in the waters of the CNMI, such a development could take place. This

would add a new sector to CNMI domestic fisheries and could spark additional controversy about the allocation of pelagic species among the various fishery sectors of the Commonwealth.

There is also growing concern about the potential impacts of drift gillnetting on the stocks of many pelagic species. There is very little known about the pelagic gillnet fisheries in this region, but what is known about this type of fishing in other parts of the Pacific appears to bode ill for other users of pelagic resources.

Conclusion

In summary, there seem to be no overriding reasons for instituting any management measures for the CNMI domestic trolling fishery at the present time.

There is need for much more data on the purse-seine, longline, and pelagic gillnet fisheries that operate in the region and their impacts on local trolling fisheries.

The Western Pacific Regional Fishery Management Council should continue to urge the U.S. purse-seine fleet to release information on its bycatch of pelagic management unit species to improve the data base for management of these species. Similarly, the Council should continue efforts to improve fishery surveillance and enforcement in the CNMI EEZ to ensure that foreign fleets are not fishing illegally in the CNMI EEZ.

It might be appropriate to restrict fishing by purse-seiners, pelagic gill netters, and forign longliners for the CNMI EEZ in order to protect local pelagic fisheries. None of these large-scale fisheries currently claim to operate in the CNMI EEZ and so would not be disadvantaged by such restrictions.

The development of domestic longlining in the waters of the CNMI, should it take place, would create a need for further evaluation of fishery interactions among local pelagic fishery sectors and perhaps a need for some means of allocating fishing opportunities among these groups. Heated controversy has arisen in Hawaii between longliners and other domestic pelagic fishermen, and such problems could spread to the CNMI. Efforts should begin forthwith to gather data on longline fisheries and their impacts on other pelagic fisheries so that appropriate management regimes can be developed should the need arise.

BOTTOMFISH FISHERIES IN THE CNMI

Bottomfish fishing is the second most important offshore fishing method used in the CNMI. Most of the bottomfishing takes

place around the islands of Saipan, Tinian, Aguijan, and Rota, but several larger boats have started fishing bottomfish in the waters around the islands north of Saipan in recent years.

Biological Condition of Bottomfish Stocks

Several species of deepwater snappers of the genera Pristipomoides, Etelis, and Aphareus as well as species of jacks (Caranx), groupers (Epinephelus), and emperors (Lethrinus) are the principal targets of the CNMI bottomfish fishery.

During 1982 to 1984, the NOAA ship Townsend Cromwell carried out an extensive survey of bottomfish stocks throughout the Marianas archipelago (Polovina et al., 1985). Analysis of the data from these cruises indicated a maximum sustainable yield (MSY) for bottomfish throughout the archipelago (and the western seamounts) of 109 mt/yr. They estimated bottomfish MSY for the CNMI to be 78.5 mt/yr.

Data collected by the CNMI DFW and compiled by the WPACFIN system for 1985 and 1986 indicate a commercial catch of 23439 and 16529 pounds (approximately 10.7 and 7.5 mt) respectively. Although this is well below the Polovina et al. estimate of the bottomfish MSY for the whole CNMI, it is approaching the MSY estimate for Saipan (13.4 mt) where 90% of the catch is landed (Hamm and Quach, 1988).

It appears that total bottomfish stocks in the CNMI are presently underutilized, but it may be that stocks around the southern inhabited islands are being harvested at rates that begin to approach MSY.

While little is known of larval life history, patterns of recruitment, and adult fish movements among pinnacles and slope habitats, it has been generally thought that overfishing can reduce bottomfish stocks in localized areas and that it may take some time for these areas to recover. This, in fact, appears to have happened at Haputo Pinnacle off the west coast of Guam (Ikehara, Kami, and Sakamoto, 1970).

Management of bottomfish in the southern islands of the CNMI may be needed to prevent fishing effort from exceeding that sufficient to harvest MSY. It would also be appropriate to redirected fishing effort away from heavily fished areas to less heavily fished ones. An important first step is to gather more complete data on all sectors of fishing (commercial, recreational, and subsistence) in the CNMI and more data on the distribution of catch and effort throughout the archipelago.

Economic Condition of Bottomfish Fishery

The study of the economics of CNMI offshore fishermen summarized by Kasaoka (1989) included bottomfish fishermen, but because almost all bottomfish fishermen also troll, it is difficult to analyze the economics of bottomfishing separately. It is likely the case, however, that the general economic health of the CNMI offshore fishery is also true for those who bottomfish.

The average price for fish reported in the small-boat economic survey was $1.41 per pound (Kasaoka, 1989). At this price the potential value of the bottomfish fishery throughout the entire CNMI archipelago would be approximately $243,503 per year.

Social Aspects of the Bottomfish Fishery

Bottomfishing is not practiced as widely as trolling in Saipan. Of the 34 respondents in the small-boat economic survey (Kasaoka, 1989), 22 indicated that they did some bottomfishing (and 30 indicated that they did some trolling). These 22 bottomfish fishermen averaged 22 trips per year while the 30 trollers averaged 101 trips per year.

Ethnic participation in the CNMI bottomfish fishery is probably similar to that of small-boat fishing in general, mostly Chamorros with smaller numbers of Caucasians, Carolinians, Filipinos, Japanese, and Palauans (Kasaoka, 1989).

Existing Management Efforts

The Western Pacific Fishery Management Council has prepared a Fishery Management Plan for Bottomfish in the Western Pacific Region. The Plan, however, does not include any management measures for bottomfish fishing in the EEZ of the CNMI.

Commercial data on the bottomfish fishery are gathered by the CNMI DFW through analysis of market receipts. These data are compiled and summarized by the WPACFIN program (Hamm and Quach, 1988).

Management Objectives for the CNMI Offshore Bottomfish Fishery

The fishery policy and goal of the CNMI set out in the Commonwealth of the Northern Marianas Fishery Development Plan are cited above. For bottomfisheries, appropriate management objectives would be the following:

a) to the extent possible, maintain the abundance and availability of bottomfish stocks in the archipelago;

b) to provide opportunities for productive and profitable commercial bottomfish fisheries;

c) to maintain opportunities for local fishermen to harvest bottomfish for home consumption;

d) to enhance opportunities for recreational bottomfish fishing;

e) to the extent possible, improve the safety of small-boat fishing.

Evaluation of Limited Entry and Other Management Strategies for Bottomfishing in the CNMI

Although the Polovina et al. (1985) estimate of the bottomfish MSY for the CNMI is much higher than the present annual commercial catch, there may be localized overharvesting around the southern islands. There is a need for more data on the bottomfish fishery in the CNMI to accurately assess the need for management in this fishery and to design an effective management program if one is required.

It is not too early, though, to begin consideration of possible management regimes for the fishery. Because of the geography of the archipelago, with the major inhabited islands to the south and a string of uninhabited or lightly inhabited islands to the north, it would be appropriate to divide the archipelago into two parts, as Hawaii has, for bottomfish management purposes.

Limited entry is a management tool that can be used to stabilize fishing effort at a level sufficient to harvest at MSY or at some lower level to improve the profitability of the fishery.

Polovina et al. (1985) estimated that small fishing vessels equipped with two electric or hydraulic reels and fishing 12 hours per day and 200 days per year could achieve average catch rates of 7.3 mt of bottomfish per year in the waters of the Marianas archipelago. Six boats of this type could harvest the MSY in the northern islands, and another five could harvest the MSY in the southern islands. At $1.41 per pound, each boat would harvest $22,644 worth of fish per year (which is slightly more than half the average estimated annual revenues reported in the small-boat economic survey; Kasaoka, 1989). If higher prices

could be realized for the fish the economics could, of course, be improved.

Allocating all the bottomfish in the waters of the southern islands to five boats would probably not be popular with those who harvest bottomfish for recreation and home consumption. It might be more feasible to do as Hawaii has done, establishing no access restrictions in the southern inhabited islands but instituting a limited entry scheme for the northern part of the archipelago. Whether this would be practical or not depends upon more complete information on the costs of fishing in the northern islands and upon developing more favorable marketing opportunities for bottomfish. If commercial bottomfish fishing were to be expanded in the northern islands it might help to reduce fishing pressures in the southern islands.

For the southern islands, where most of the bottomfishing is presently taking place, other management alternatives include catch limits, size limits, area restrictions, effort limitations, and taking no action.

Taking no action may not be wise in the long run: the commercial catch of bottomfish has grown from 5.3 mt in 1981 to 10.7 mt in 1985 (it dropped to 7.5 mt in 1986 but this may be only a temporary reduction). This is nearing the estimated MSY for the waters around Saipan (13.4 mt/year) and although some of the bottomfish landed on Saipan may have been taken elsewhere, there is probably also a considerable recreational and subsistence catch that is not recorded in the commercial statistics.

Catch limits allocated among the waters surrounding the various islands could be an effective management tool. This would require accurate and up-to-date monitoring of the bottomfish catch landed on each of the islands, which may constitute a considerable burden for the CNMI DWR. Two disadvantages of catch limits are these:

1) The burden of catch limits falls on the commercial fishermen who depend on large catches and continued freedom to fish to survive.

2) Catch limits encourage under-reporting of catch when fishermen realize that their future right to fish is being diminished by every fish reported. This may compromise the ability of DWR to gather accurate statistics.

Overfishing is frequently signalled by decreasing sizes of fish landed. Thus far, analysis of fish size frequency has not been carried out for the CNMI bottomfish fishery. Such an analysis could indicate the need for establishing minimum size limits for bottomfish. It would be difficult to enforce minimum

sizes for bottomfish caught by subsistence or recreational fishermen without a greatly expanded enforcement effort, but it would be relatively easy to establish minimum sizes for commercial sale and enforce these at the markets. This would discourage commercial fishing in areas where fish size had diminished. This is a management tool that would be easy to use and might well preclude the need for other management measures. Data on the size frequency of the various species of bottomfish need to be gathered and analyzed to evaluate minimum size limits as a management option for this fishery.

Area restrictions could be used to redirect effort away from overfished areas to areas with less fishing pressure. A possible approach would be to restrict larger boats and/or commercial boats from fishing in waters near the inhabited islands, preserving these areas for small-scale subsistence and recreational fishermen. This would entail a considerable enforcement burden to determine where fishermen were fishing, however. It would, of course, restrict opportunities for commercial bottomfish fishermen to make money, especially during times of bad weather when the more distant fishing grounds would be inaccessible. The MSY estimates of Polovina et al. provide a benchmark with which actual catches can be compared. Area closures could be instituted if the waters around particular islands appear to be overfished, i.e. if catches exceed MSY, if fish size-frequencies decline, and if catch rates drop.

Various possible effort limitations include gear restrictions, limits on landings per trip, and limited number of fishing trips per year. Certain types of gear, such as bottom trawls and set-nets are restricted in the EEZ by the Fishery Management Plan for Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region prepared by the Western Pacific Regional Fishery Management Council. Similar restrictions should be considered by the CNMI. Generally, effort restrictions work preferentially against the commercial fisherman who needs to be as efficient and productive as possible to survive economically. Restrictions on catch per trip and trips per year would probably be difficult to enforce.

Conclusion

In summary, the management alternatives that seem most appropriate for the CNMI bottomfish fishery at present are the following:

A) For the islands north of Saipan:

1) Set up data collection procedures for determining amounts and locations of bottomfish fishing effort, catch weight and composition, and size-frequencies of target species in the

northern islands.

2) Investigate options for commercial development of bottomfish fishery in northern island waters.

3) Begin design of limited entry program for commercial bottomfish fishery in the northern islands to be put in place as the commercial fishery develops.

B) For the southern islands:

1) Set up data collection procedures for the southern islands to determine locations and amounts of fishing effort, catch weight and composition, and size-frequencies of target species.

2) Use these data to determine extent to which harvest is approaching MSY for different island areas and to determine whether significant reductions in fish size has occurred.

3) Should data so indicate, establish minimum marketable sizes for target species.

4) Consider instituting area closures (or limiting catch from certain areas) if particular areas appear to be overharvested on the basis of the following criteria:

a) total catch exceeding estimated MSY,

b) significant reduction of fish size

c) significant reduction of catch rates

The initiative for these management measures should come from the CNMI and be supported by the Western Pacific Regional Fishery Management Council.

LITERATURE CITED

Au, D. W. 1987. Western Pacific yellowfin tuna fisheries: In: N. W. Bartoo (ed.) Tuna and billfish summaries of major stocks. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Center. Administrative Report LJ-87-26.

Hamm, D. C., and M. M. C. Quach. 1988. Fishery statistics of the western Pacific. Southwest Fisheries Center Administrative Report H-88-4.

Ikehara, I. I., H. T. Kami, and R. K. Sakamoto. 1970. Exploratory fishing survey of the inshore fisheries resources of Guam. Proc. of the 2nd CSK Symposium, Tokyo. pp. 425-437.

Kasaoka, L. D. 1989. Summary of small boat economic surveys from American Samoa, Guam and the Northern Mariana Islands. Southwest Fisheries Center Administrative Report H-89-? 29p + appendix

Kleiber, P. 1987. Central and western Pacific skipjack tuna. In: N. W. Bartoo (ed.) Tuna and billfish summaries of major stocks. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Center. Administrative Report LJ-87-26.

Oceanic Institute. 1988. Hawaiian mahimahi: current market analysis and marketing strategies for increased production. Oceanic Institute, Honolulu. 85p + appendices

Polovina, J. J., R. B. Moffitt, S. Ralston, and P. M. Shiota. 1985. Results of the resource assessment investigations of the Mariana archipelago. Southwest Fisheries Center Administrative Report H-85-7. 22p.

Williams, K. 1989. Guam fresh tuna longline transshipment study. Phase 1. Fishery description. Unpublished report to Guam Departmrnt of Commerce. 35p.

APPENDIX A

PELAGIC FMP SPECIES

GUAM/NORTHERN MARIANA ISLANDS	
POPULAR/COMMON NAME	SCIENTIFIC NAME
Blue marlin	Makaira nigricans
Striped marlin	Tetrapturus audax
Black marlin	Makaira indica
Broadbill swordfish	Xiphias gladius
Sailfish	Istiophorus platypterus
Spearfish	Tetrapturus angustirostris
Mahimahi	Coryphaena hippurus & C. equiselis
Tosuno/Ono/Wahoo	Acanthocybium solandri
Oceanic whitetip shark	Family Carcharhinidae
Tiger shark	Family Carcharhinidae
Silky shark	Family Carcharhinidae
Blacktip shark	Family Carcharhinidae
Galapagos shark	Family Carcharhinidae
Thresher shark	Family Alopiidae
Hammerhead shark	Family Sphyrnidae
Great white shark	Family Lamnidae (Isuridae)
Mako shark	Family Lamnidae (Isuridae)

CRUSTACEAN FMP SPECIES

GUAM/NORTHERN MARIANA ISLANDS	
POPULAR/COMMON NAME	SCIENTIFIC NAME
Spiny lobster	Panilirus spp.
Slipper lobster	Scyllarides sp.
Deep-water shrimp	Heterocarpus sp.

TUNA SPECIES

GUAM/NORTHERN MARIANA ISLANDS	
POPULAR/COMMON NAME	SCIENTIFIC NAME
Yellowfin tuna	Thunnus albacores
Bigeye tuna	Thunnus obesus
Albacore tuna	Thunnus alalunga
Skipjack tuna/bonita	Katsuwonus pelamis
Kawakawa/black skipjack tuna	Euthynnus affinis

ANNOTATED BIBLIOGRAPHY

Abella, Domingo

1965 "Legaspi Claims Marianas for Spanish Throne." Pacific Profile 3(1):18-20,34-36.
Abella's translation of a portion of the diary of an unnamed traveling companion of Legaspi. Records Legaspi's visit to Guam in 1565.

Akimichi, T. and S. Sauchomal

1982 Satawalese fish names. Micronesica 18(1):1-34.
Extensive list of Satawalese fish names with English common name and Latin binomial when available; most are reef forms but some pelagic and bottomfish are included.

Albo, Francisco

1971 "Derrotero del Viage de Fernando de Magallanes en demanda del Estrecho, desde el paraje del cavo de San Agustin (escrito por Francisco Albo)" in Coleccion De Documentos y Manuscriptos Compilados por Fernandez de Navarrete, Vol. 16, Museo Naval, Madrid. Nendeln, Liechtenstein.
The log of Magellan's pilot. Records Magellan's stop at Guam in 1521.

Aldan, D.T.

in prep Checklist of fishes in the Commonwealth of the Northern Mariana Islands.
Lists fish by family and genus and species, with Carolinian and Chamorro names (not differentiated by language), part of an on-going collection effort; pelagic and bottomfish are included.

Alkire, William

1965 Lamotrek Atoll and Inter-island Socioeconomic Ties. Illinois Studies in Anthropology 5. Univ. of Illinois Press, Urbana.
Describes Carolinian socio-political organization considered in its environmental context.

1978 Coral Islanders. AHM Publishing Corp., Arlinton Heights.
Descriptive summaries of indigenous societies on coral islands in the Pacific, including Micronesia.

Amesbury, S.S. and R. Myers

1982 Guide to the coastal resources of Guam: Vol.1, The fishes. Univ. of Guam Marine Laboratory Tech. Rept. 173.

Amesbury, S. S., F.A. Cushing, and R.K. Sakamoto

1986 Fishing on Guam. Univ. of Guam Marine Laboratory Contribution 225, Univ. of Guam Press, Mangilao.
Survey and summary of fishing on Guam, also historical review; many illustrations.

Anell, Bengt
1955 Contribution to the history of fishing in the southern seas. Stud. Ethnograph. Upsal. 9, 249 pp.

Anson, George
1748 A Voyage Around the World, in the Years MDCCXL, I, II, III, IV...by George Anson, Esq....Compiled from Papers and Other Materials...by Richard Walter. John and Paul Knapton:London.
Details of Anson's voyage, two month's stay on Tinian.

Athens, J.S.
1986 Archaeological Investigations at Taragüe Beach, Guam. Report prepared for Base Civil Engineering, 43rd Strategic Wing, Andersen AFB, Guam. J. Stephen Athens, Archaeological Consultant, Honolulu.
Extended discussion of problems with early radiocarbon and shell dates from Marianas archaeological sites.

Barcinas, P.R., M.J. Levin, and C.L. Naval (eds)
1988 Guam's people: A continuing heritage, A statistical profile of the Territory of Guam. Interagency Committee on Population, Government of Guam.

Barratt, Glynn
1988a Carolinian contacts with the Islands of the Marianas: The European Record., Micronesian Archaeological Survey Report 25, Saipan.
A history of Carolinians in the Mariana Islands, has historic illustrations showing sailing canoes.

1988b H.M.S. Centurion at Tinian, 1742: The Ethnographic and Historic Records. Micronesian Archaeological Survey Report 26, Saipan.
The account of Anson's stay on Tinian. Includes descriptions of the Chamorro "flying *proa*."

Bonhomme, T. and J. Craib
1987 Radiocarbon dates from Unai-Bapot, Saipan: Implications for the prehistory of the Mariana Islands. Journal of the Polynesian Society 96:95-106.
Critical discussion of radiocarbon and shell dates in Marianas.

Bowers, N.M.
1953 Problems of resettlement on Saipan, Tinian, and Rota, Mariana Islands. Univ. of Hawaii Extension Div., Honolulu.
Cited by Orbach (1980) this appears to be Bowers' Univ. of Michigan Ph.D. dissertation, which contains details of the pre-war and immediate post-war eras in the Marianas.

B.P. Bishop Museum
1988 Abstracts of translated Japanese articles: Anthropological research in Micronesia under the Japanese mandate 1908-1945.
Abstracts of journal articles and mss. in Japanese translated by Bishop Museum staff; contains some works touching on Micronesian fishing practices and equipment.

Burney, J.
1803 A chronological history of the discoveries in the south sea or Pacific Ocean, Vol.1. Da Capo Press, New York.

Blair, E. and J. Robertson
1903 Philippine Islands 1493-1803, Vol.2. Arthur H. Clark Co, Cleveland.

Butler, B.B. (ed)
1988 Archaeological Investigations on the North Coast of Rota, Mariana Islands. Southern Illinois Univ. at Carbondale, Center for Archaeological Investigations No. 8.
Professional report on several excavations on Rota; contains article by Davidson and Leach on prehistoric fishing techniques; presents evidence for pelagic fishing.

Carano, Paul and Pedro C. Sanchez
1964 A Complete History of Guam. Charles E. Tuttle Co., Rutland, Vermont.
Reviews the voyages to Guam and the governors of Guam, as well as the other events of Guam's history.

Chevalley, A. and M. Chevalley
1966 The Concise Oxford French Dictionary. Oxford University Press, London. First published in 1934.
Gives the length of a French sea league.

Cloud, P.E. Jr., R.G. Schmidt and H.W. Burke
1956 Geology of Saipan, Part 1: General Geology. Geological Survey Professional Paper 280-A. Washington, D.C.
Background for understanding environmental conditions in Marianas relevant to prehistoric cultural adaptations including offshore fishing.

Commonwealth of the Northern Mariana Islands
1980 Fisheries Development Plan--Fiscal Years 1981-1985.

Constitutional Convention
1986 Constitution of the Commonwealth of the Northern Mariana Islands. In CNMI Commonwealth Code, Volume 1, by Commonwealth Law Revision Commission.
This copy of the Constitution notes the Amendments made by the 1985 Constitutional Convention.

Corte y Ruano Calderon, Felipe de la
1970 Descriptive and Historical Report on the Mariana Islands.
(1875) Translation Courtesy of Mircronesian Area Research Center, University of Guam, Mangilao.
The report of the Spanish governor of Guam from 1855-1866.
Discusses fishing on Guam.

Corwin, G., L.D. Bonham, M.J. Terman, and G.W. Viele
1957 Military Geology of Pagan, Mariana Islands. Chief Engineer, U.S. Army Japan.
Background on physical environment of Pagan, some historical review of land and sea use for understanding prehistoric human adaptations there.

Craib, J.L.
1986 Casas de los antiguos: Social differentiation in protohistoric Chamorro society, Mariana Islands. Unpub. Master's thesis, Univ. of Sydney.

Craib, J.L. and G. Ward
1988 Archaeological investigations at Mochong, Rota, Mariana Islands. Unpub. report, CNMI Historic Preservation Office, Saipan.

Crowl, P.A.
1960 Campaign in the Marianas. Dept. of the Army, Washington, D.C.
Details of the U.S. military actions during World War II.

Crozet, Captain
1783 Crozet's Voyage to Tasmania, New Zealand, the Ladrone Islands, and the Philippines in the Years 1771-1772. Translated by H. Ling Roth. Truslove and Shirley, London.
The account of a French expedition that stopped on Guam in 1772. Contains the last description (though it may not be original) of the Chamorro sailing canoe.

Dampier, William
1906 A New Voyage Round the World. Adam and Charles Black, London.
The account of a seaman aboard a British privateer that stopped on Guam in 1686.
Describes the Chamorro *proa*.

Davidson, J. and F. Leach
1988 Fish bone. In B. Butler (ed) Archaeological Investigations on the North Coast of Rota, Mariana Islands. pp. 335-356. Southern Illinois Univ. at Carbondale, Center for Archaeological Investigations No. 8.
Presents results of prehistoric fish bone analysis from several sites in Rota, and discusses probable fishing techniques.

DeNiro, M.J.
1985 Postmortem preservation and alteration of in vivo bone collagen isotope ratios in relation to paleodietary reconstruction. Nature 317:806-809.
Discusses use of isotopic analysis on bone to infer diet.

Division of Fish and Wildlife (Guam)
1960-1965 Quarterly Progress Report. Department of Agriculture, Mangilao, Guam.
The reports of the early years of the Division.

Division of Fish and Wildlife (CNMI)
1987 Five-Year Progress Report for Fiscal Years 1983-1987. Department of Natural Resources, Commonwealth of Northern Marianas. Does not contain information on fish or fishing.

Driver, Marjorie
1977 The Account of a Discalced Friar's Stay in the Islands of the Ladrones. Guam Recorder. 7:19-21. An account based on a report by Fray Antonio de los Angeles concerning his stay in the Marianas 1596-97. Discusses fishing.

1983 Fray Juan Pobre de Zamora and His Account of the Mariana Islands. Journal of Pacific History. 18(3):198-216. Fray Juan Pobre's 1602 stay on Rota. Includes Sancho's discussion of fishing.

1988 Fray Juan Pobre de Zamora: Hitherto Unpublished Accounts of His Residence in the Mariana Islands. Journal of Pacific History. 23(1):86-94. Additional information on Juan Pobre's 1602 stay on Rota.

1989 Fray Juan Pobre in the Marianas, 1602. Micronesian Area Research Center, Univ. of Guam. Combines into one booklet the translations first published in 1983 and 1988, cited above.

Dumont D'Urville, J.S.C.
1835 Voyage pittoresque autour du monde, Vol.2. Tenre and Dupuy, Paris. Includes Dumont D'Urville's first visit to the Marianas in 1828.

Duperry, Isidore
1826 Voyage autour du monde, execute par ordre de roi, sur la corvette de Sa Majeste la Coquille, pendant les annees 1822, 1823, 1824 et 1825. (six vols., atlases). A. Bertrand, Paris. European traveler to western Pacific, describes lifeways of indigenous peoples.

Egami, T. and F. Saito
1973 Archaeological excavation on Pagan in the Mariana Islands. J. Anthrop.Soc. Nippon 81:203-226.

Elameto, J.M.
1975 Carolinian names of common fishes in Saipan, Mariana Islands. Micronesica 11(1):1-5. Alphabetical listing of Carolinian fish names with Latin binomial and English common name; mostly reef forms but some pelagic and bottomfish are included.

Eldredge, L.G. (comp.)
1977 Japanese translations available at the Micronesian Area Research Center. Univ. of Guam Marine Laboratory Tech. Rpt. 32.

1988 Case Studies of the impacts of introduced animal species on renewable resources in the U.S.-affiliated islands. In Barry C. Smith, ed., Topic reviews in insular resource development and management in the Pacific U.S.-affiliated islands. pp.118-146. Univ. of Guam Tech. Report 88.
Discussion of non-native plant and animal introduction into the Micronesian area.

Eldredge, L.G. and R.H. Randall
1980 Atlas of the Reefs and Beaches of Saipan, Tinian, and Rota. Marine Laboratory, Univ. of Guam.
Provides geological background on southern Mariana Islands related to fishing conditions.

Embree, John F.
1946 Military Government in Saipan and Tinian. Applied Anthropology 5(1):1-39.
An anthropologist's view of the Military Government.

Fleming, M.A.
1986 The Scaridae in Pacific prehistory. Unpub. Master's thesis, Otago Univ.
Analyses of prehistoric and ethnographic information on fishing in Pacific islands including the Marianas.

Freycinet, Louis de
1824 Voyage Autour du Monde. Pillet Aine, Paris. (We consulted also an unpublished translation by Sylvia Cheng, Micronesian Area Research Center, University of Guam, Mangilao.)
Contains a lengthy and detailed description of Chamorro fishing tools and techniques.

1943 Voyage Autour du Monde. Pillet Aine, Paris. Unedited translation, Yale University Human Relations Area Files, New Haven.
This translation contains an error in the quantity of the *atchoman* catch.

Fritz, Georg
1986 The Chamorro: A History and Ethnography of the Marianas. Translated by Elfriede Craddock. Edited by Scott Russell. Division of Historic Preservation, Saipan.
Written by the District Officer of the German Marianas in the early 1900s. Discusses fishing and navigation.

Funnel, William
1707 A Voyage Around the World. W. Botham for J. Knapton:London.
Details of visit to Marianas, drawing of sailing canoe.

Garcia, Francisco
1985 The Life and Martyrdom of the Venerable Father Diego Luis de Sanvitores. Translated by Margaret Higgens. Nieves M. Flores Memorial Library, Agana.
A history of the early years of the Spanish-Chamorro Wars. Contains references to the harsh treatment of the Chamorros by the Spanish.

Gillett, R.
1987 Traditional tuna fishing: A study at Satawal, Central Caroline Islands. Bishop Museum Bull. in Anthro. 1. Bishop Museum Press, Honolulu.

Gladwin, T.
1970 East is a Big Bird. Harvard Univ. Press, Cambridge.
Study of Puluwat (Central Carolines) canoe navigation.

Gomez, D.J.G.
1885 Las Islas Carolinas y las Marianas. La propaganda en ciencias, literatura y artes, Madrid.
Brief descriptions of Mariana Islands, Carolinians on Pagan.

Gosline, W.A. and V.E. Brock
1960 Handbook of the Hawaiian fishes. Univ. of Hawaii Press, Honolulu.
Catalog of fishes, cited in Davidson and Leach 1988.

Guam Coastal Management Program
1989 "Impact of drift gill-nets on marine resources," Man, land and sea, News of Guam and her ocean environment 1(5).

Haddon, A.C. and J. Hornell
1975 Canoes of Oceania. Bishop Museum Press, Honolulu.
Includes descriptions of the Chamorro sailing canoes and fishing gear.

Hamm, D.C., M.M.C. Quach, R. Tokunaga, and T. Donaldson
1989a Annual report for the 1988 pelagic fisheries of the Commonwealth of the Northern Mariana Islands. In draft of Second annual report for the fishery management plan for the pelagic fisheries of the western Pacific region covering 1988 and earlier years. pp.89-112.
Reports the status of the pelagic fisheries of the CNMI; indicates present participation in these fisheries.

Hamm, D.C., M.M.C. Quach, and T. Donaldson
1989b Annual report for the 1988 bottomfish fishery of the Commonwealth of the Northern Mariana Islands. Appendix 5 in draft of 1988 annual report: Bottomfish and seamount groundfish fisheries of the western Pacific region.
Reports the status of the bottomfish fisheries of the CNMI; it indicates present participation in these fisheries.

Hanson, D.B.
1989 Skeletal biology of prehistoric human mortuary remains from the Duty Free Site, Garapan Village, Saipan. Unpublished report prepared for the Duty Free Shoppers, Ltd., Saipan, and the CNMI Historic Preservation Office.
Chemical isotopic analyses of human bones from Rota for information on prehistoric diet.

Hezel, Francis X.
1983 First taint of civilization. Univ. of Hawaii Press, Honolulu.
Includes extensive bibliography and description of early encounters between native peoples of the Carolines and Europeans.

1986 Unpublished ms., files of the authors.
A early history of the Catholic Church in the Northern Mariana Islands; contains details on population size and economic activities of native peoples.

Hijikata, H.
1941 Fishing methods of Satawal Island. Jap. Jour. Anthrop. 56(6):310-326.
Details fishing techniques by Satawalese (Carolinians), including pelagic fishing.

Hornbostel, H. G.
1921-24 Unpublished field notes deposited with the Bernice P. Bishop Museum, Honolulu.
Includes photographs, drawings, maps, and notebooks on Mariana Islands lifeways in 1920s.

1931 Trained Fish and Stone Bait. Guam Recorder. 8(9):426-427.
A 20th century description of the *poio* and fishing for *achuman*.

Japanese Government (South Seas Bureau)
1923-1930, 1933, 1937 Annual Report to the League of Nations on the Administration of the South Sea Islands under Japanese Mandate.
Reports contain statistics on marine products harvested and grants given to fishermen.

Johannes, R.E.
1988 The role of marine resource tenure systems (TURFs) in sustainable nearshore marine reousrce development and management in U.S.-affiliated tropical Pacific islands. In (B.D. Smith, ed.) Topic reviews in insular resource development and management in the Pacific U.S.-affiliated islands. Univ. of Guam Marine Laboratory Tech. Rpt. 88, pp.1-28.
Author concludes that Mariana Islands traditional culture no longer intact enough to use as a basis for limited entry.

Kami, H.T., I.I. Ikehara, and F.P. DeLeon
1968 Check-List of Guam Fishes. Micronesica 4(1):94-130.
Provides Chamorro names for some of the species listed in Appendix A, this report.

Kami, H.T.
1971 Check-List of Guam Fishes, Supplement I. Micronesica 7(1-2):214-228. Provides Chamorro names for some of the species listed in Appendix A, this report.

1975 Check-List of Guam Fishes, Supplement II. Micronesica 11(1):114-121. Provides Chamorro names for some of the species listed in Appendix A, this report.

Kasaoka, L.D.
1989 Summary of Small Boat Economic Surveys from American Samoa, Guam and the Northern Mariana Islands. Southwest Fisheries Center Administrative Report H-89- .
Includes ethnic background of present day fishermen.

Knudson, K.E.
1987 Non-commercial Production and Distribution in the Guam Fishery. Contract WPC-0983, Western Pacific Regional Fishery Management Council, Honolulu.
Includes a brief history of fishing and provides data on Guam offshore fishing catch for one year, ethnic composition of fisheries, other information relevant to understanding Guam's non-commercial fishing.

Kotzebue, O. von
1821 A Voyage of Discovery into the South Sea and Beering's Straits...in the Years 1815-1818. 3 vols. Longman and Brown, London.
Some description of early 19th century native lifeways in the Caroline Islands.

Lessa, W.A.
1975 Drake's Island of Thieves. Univ. Press of Hawaii, Honolulu.
Extensive bibliography of early European explorations in western Pacific.

Lewis, D.
1972 We, the Navigators. Australian National Univ. Press, Canberra.
Description and study of Carolinian navigation.

Lutke, Frederic
1835 Voyage autour du monde, execute par ordre de Sa Majeste l'emperieur Nicolas Ier, sur la corvette le Seniavine, dans les annees 1826, 1827, 1828, et 1829. Part 2: Partie Historique, 2 vols. Firmin Didot:Paris (reprinted by Da Capo/Amsterdam: N. Israel).
Scientific voyage into the Pacific, some description of Caroline Island native lifeways.

Marck, J.C.
1978 Interim Report on the 1977 Laulau Excavation, Saipan, Northern Mariana Islands. Unpublised ms., files of the authors.
Preliminary assessment of archaeological finds from Laulau site, informal description of fish remains including pelagic forms.

1980 Saipan upper windward coast survey: Phase 1, Laulau Bay. Unpub. report prepared for the CNMI Historic Preservation Office, Saipan. Reports on radiocarbon dates of the Laulau site.

Marden, Luis
1986 "The First Landfall of Columbus." National Geographic. 170(5): 572-577.
Gives the length of English and Iberian sea leagues.

Meyer Resources, Inc.
1987 Report on resident fishing in the Hawaiian Islands. Developed for National Marine Fisheries Service, Honolulu. 74pp.
Study of fishing by native Hawaiians; provides methods of estimating "non-market value" of fisheries.

Military Government
n.d. Camp Susupe--A Photographic Record of the Operation of Military Government on Saipan. Compiled from Available Sources by Military Government Section, Navy Number 3245 FPO San Francisco.
Contains a section on fishing on Saipan just after WWII.

Myers, Robert F.
1984 Pelagic Fish Feeding Study. Aquatic and Wildlife Resources Division Annual Report--Fiscal Year 1984. Department of Agriculture, Mangilao, Guam.
Demonstrates that flying fish are the principal food of mahimahi.

Nishi, M.
1968 An evaluation of Japanese agricultural and fishery developments in Micronesia during the Japanese mandate, 1914-1941. Micronesica 4(1):1-18.
Gives data and historic background on fisheries during Japanese era, including CNMI.

Northern Marianas Islands Commission on Federal Laws
1985 Welcoming America's Newest Commonwealth: The Second Interim Report of the Northern Mariana Islands Commission on Federal Laws to the Congress of the United States.
Contains background information on the Northern Marianas including population statistics from the 1980 census.

Olive y Garcia, Francisco
1984 The Mariana Islands: 1884-1887. Translated and annotated by Marjorie G. Driver, Micronesian Area Research Center, University of Guam, Mangilao.
Section on fishing appears to be copied from de la Corte.

Orbach, M.K.
1980 Draft report on the social, cultural and economic aspects of fishery development in the CNMI. Center for Coastal Marine Studies, Univ. of Calif. at Santa Cruz. Unpub. report 58pp.
Review of post-war and contemporary (1980) conditions in CNMI relevant to fisheries development; shows different patterns of participation by Chamorros and Carolinians.

Peattie, M.R.
1988 Nanyo, The Rise and Fall of the Japanese in Micronesia 1885-1945. Univ. of Hawaii Press, Honolulu.
Historical economic and political analysis of conditions in Japan and in the mandated islands of Micronesia; good general background for the Japanese period.

Pigafetta, Antonio
1969 Magellan's Voyage: A Narrative Account of the First Circumnavigation. Vol. I translated and edited by R. A. Skelton. Yale University Press, New Haven.
Describes the events of Magellan's "discovery" of the Marianas in 1521 and the Chamorros they encountered.

Plaza, F.
1973 Latte of the Marianas. Guam Recorder 3(1), second series:6-9.

Ray, E.R.
1981 Material culture of prehistoric Tarague Beach, Guam. Unpub. Master's thesis, Arizona State Univ., Tempe.

Reinman, F.R.
1967 Fishing: An aspect of Oceanic economy: An archaeological approach. Fieldiana: Anthro. 56(2):102-208.

1977 An archaeological survey and preliminary test excavations on the island of Guam, Mariana Islands, 1965-1966. Misc. Pub. No. 1, Micronesian Area Research Center, Univ. of Guam.

Richards, D.E.
1957 U.S. naval administration of the Trust Territory of the Pacific Islands. 3 vols. U.S. Govt. Printing Office, Washington, D.C.
Details U.S. military administrative actions in immediate post-war years, including Mariana Islands; describes condition of the fisheries in the southern islands of the archipelago.

Rogers, Captain Woodes
1928 A Cruising Voyage Round the World. Longmans, Green and Co., New York.
Describes the Chamorro *proa* in 1710.

Russell, S .
1984 From Arabwal to Ashes. Micronesian Archaeological Survey Report 19, Saipan.
Brief pictorial history of U.S. invasion of Saipan in 1944; historic documents pertaining to native lifeways summarized.

Sakamoto, R.K.
1989 Personal communication. Interview March 1989.
Interview identifies *achuman* as *Decapterus* and reveals where the fish is found around Guam.

Samples, K.C. and J.T. Sproul
n.d. Potential gains in fleet profitability from limiting entry into the Northwestern Hawaiian Island commercial lobster trap fishery. Southwest Fisheries Center Admin. Rpt.H-87-17C. Honolulu.

Schurz, William L.
1939 The Manila Galleon. E.P. Dutton and Co., New York.
A detailed history of the Manila galleon, which made stops at Guam in the late 17th century.

Spoehr, Alexander
1954 Saipan, The Ethnology of a War-Devastated Island. Fieldiana: Anthropology 41. Chicago Natural History Museum, Chicago.
Detailed description of immediate post-war conditions of Chamorros and Carolinians living on Saipan; includes information on fishing by both groups.

1957 Marianas Prehistory: Archaeological Survey and Excavations on Saipan, Tinian, and Rota. Fieldiana: Anthropology 48. Chicago Natural History Museum, Chicago.
Standard reference on Mariana Islands archaeology; contains information on pelagic fishing gear found.

Takayama, J. and M. Intoh
1976 Archaeological Excavation of Latte Site (M-13), Rota, in the Marianas. Reports of Pacific Archaeological Survey 4. tokai Univ., Hiratsuka City, Japan
Site report containing description of items excavated pertaining to pelagic fishing on Rota.

Thomas, Stephen D.
1987 The Last Navigator. Henry Holt and Company, New York.
Personal account of young man's learning from master Carolinian navigator.

Thompson, Laura
1932 Archaeology of the Mariana Islands. Bernice P. Bishop Museum Bulletin 100, Kraus Reprint Co., New York.
Systematic presentation of the Hornbostel ethnographic and archaeological collection made in the 1920s in Rota, Tinian, Saipan, and Guam.

1945 The Native Culture of the Mariana Islands. Bernice P. Bishop Museum Bulletin 185, Honolulu.
Gives details of the lifeways of the Mariana Islands Chamorros, mainly reconstructed from earlier observations; details on fishing.

Tinker, S.W.
1978 Fishes of Hawaii. Hawaiian Service, Honolulu.
Descriptive catalog of fishes, cited in Davidson and Leach 1988.

Topping, Donald M., Pedro M. Ogo, and Bernadita C. Dungca
1975 Chamorro-English Dictionary. University of Hawaii Press, Honolulu. Used for translation.

Tracey, J.F., S.O. Schlanger, J.T. Stark, D.B. Doan, and H.G. May
1964 General Geology of Guam. Geological Survey Paper 403-A, Washington, D.C.
Provides general environmental background information on Mariana Islands, some relevant to offshore fishing.

U.S. Dept. of Commerce (Bureau of the Census)
1983 1980 Census of Population. Vol. 1--Characteristics of the Population, Chapter B--General Population Characteristics, Part 57A--Northern Mariana Islands.
The 1980 census of the Northern Marianas gives a breakdown of the population by age, sex, and locality, but not by race.

U.S. Government (Dept. of Navy, Dept. of Interior, State Department)
1948-1988 Annual Report to the United Nations on the Administration of the Trust Territory of the Pacific Islands. Prepared by the Dept. of Navy 1948-51, by the Dept. of Interior 1952-53, and by the State Dept. 1954 to present.
Includes fishery statistics and developments in the Trust Territory.

Underwood, Jane H.
1973 Population history of Guam: Context of Microevolution. Micronesica 9(1):11-44.
Discusses Chamorro and Carolinian population history reconstructed from old documents.

van der Merwe, N.J.
1982 Carbon isotopes, photosynthesis and archaeology.' Amer. Scient. 70:596-606.
Discusses theoretical background and new analytical techniques for inferring prehistoric diet from archaeological materials.

Walker, P.L. and N.J. DeNiro
1986 Stable nitrogen and carbon isotope ratios in bone collagen as indices of prehistoric dietary dependence on marine and terrestrial resources in southern California. Amer. Jour. Phys. Anthro. 71:51-61.
Example of the application of a new analytical technique for bone to infer prehistoric diet.

WPRFMC
1988 Request for proposal, Native fishing rights in Guam and the Commonwealth of the Northern Mariana Islands. Western Pacific Fishery Management Council, Honolulu.
Provides basis for present study.

Yawata, I.
1930 Fish-shaped fishhooks in Micronesia. Japan. Jour. Anthro. 45(4):151-163. translated ms, abstracted In Abstracts of translated Japanese articles: Anthropological research in Micronesia under the Japanese Mandate, 1908-1945. Dept. of Anthro., B.P. Bishop Museum, Honolulu.
Gives comparative data on Micronesian fishing lures.