Descriptive Assessment of Contemporary Small-Scale and Traditional Fisheries in the Western Pacific

- Final Report -

Celebrating the Lunar Festival on Guam in 2011

Prepared for the

Pelagic Fisheries Research Program

Joint Institute of Marine and Atmospheric Research,
School of Ocean and Earth Science and Technology,
University of Hawai‘i at Mānoa

by

Impact Assessment, Inc.
Pacific Islands Office

Edward Glazier, Ph.D., Principal Investigator
Leila Madge, Ph.D., Ethnographer and Lead Author

May 2012

Table of Contents

Descriptive Assessment of Contemporary Small-Scale and Traditional Fisheries in the Western Pacific

- Executive Summary -

Project Goal and Rationale

The overarching goal of this project was to collect, analyze, and report on existing and new information regarding small-scale and traditional fishing fleets and activities across the Pacific Island region of Hawai'i, Guam, CNMI, and American Samoa. The impetus and rationale for examining small-scale and traditional fishing relates to: (1) a potential future need to determine Total Allowable Catch (TAC) for fleets and/or fishing activities that have not been the subject of formal data collection programs; and (2) ongoing management objectives that accommodate the continuation of small-scale and traditional fishing practices for personal consumption and cultural benefits throughout the Western Pacific Region. The resulting report provides fishery managers with the empirical information needed to appropriately characterize, define, and manage "traditional" and "small-scale" fishing fleets in the region. The effort also serves to complement conceptual models, other related research efforts, and policy discussions with basic description of fleets whose participants are oriented primarily toward localized small-scale commercial, artisanal, and/or consumption-oriented fishing activity.

Research Methods

Research methods involved a combination of archival and secondary data research, key person interviews, and basic field observation. Description of these activities involved the following:

- Archival and secondary data research entailed the compilation/review of: (1) relevant fishery reports, commercial landings and permit/license data, vessel registry records, and other fishery data sources; and (2) pertinent archeological, historical and anthropological works on social and cultural practices in the region.

- Key person interviews were conducted with regional data managers and knowledgeable persons active in local government and village leadership positions and fishing organizations and/or engaged in harvest and distribution of catch.

- Field observation focused on enumerating, characterizing, and mapping the distribution of small-scale and traditional fishing operations and assessing supporting infrastructure.

The objectives of research were to understand: 1) the social, cultural, and economic influences that have been at play in the islands of the Western Pacific as they relate to fishing, fish sharing, and fishing eating practices; and (2) the nature, extent, level of participation and production, and distribution of contemporary small-scale and traditional fishing activities across the region.

Research Questions

The primary research queries include the following topics:

- Characterization of the small-vessel fleet in terms of vessel size and number;
- Demographics and employment of participants;
- Purpose or motive of fishing activities;
- Fishing mode and target species;
- Destination or use of landed species;
- Social and cultural importance of fishing, fish sharing, and fish eating;
- Current and potential challenges and opportunities facing the small-vessel fleet; and
- Availability and perceived validity of current data collecting efforts as they relate to small-scale traditional fishing fleets.

Summary of Descriptive Findings in American Samoa, CNMI, and Guam

Characterization and Enumeration of Small Vessel Fleet

Small-scale small-vessel fishing in Guam is conducted primarily from vessels ranging from 15 to 33 feet in length overall (LOA). The majority of vessels are trailered to launch sites. Two public marinas also provide berths. Fishing typically occurs in half-day to day trips. In CNMI, small-scale fishing is conducted primarily from outboard powered skiffs ranging from 12 to 24 feet LOA. As in Guam, the majority of vessels are trailered to launch sites. In Guam and CNMI, charter fleets of small-vessels serve visitors.

In American Samoa, bi-hull *alia* vessels ranging from 28 to 38 feet LOA and trailered mono-hulls less than 30 feet LOA, both powered by outboard engines, are commonly used for small-scale fishing. Fishing trips range from half-day to three days. Bi-hull alia vessels are commonly moored at marinas or within reef areas. Fishing is also occasionally conducted from yachts and jet skis in Guam, and outrigger canoes in American Samoa. CNMI and American Samoa also have a fleet of medium to large (40’ to 70’ LOA) mono-hull vessels that long-line for bottom and pelagic fish, respectively.

In the Marianas, pelagic, reef and bottom fish, in that order of predominance, comprise the majority of landings for small-scale/small-vessel fishing. Bottom and reef fish are targeted by hook-and-line and pelagic (tuna and non-tuna PMUS) species by troll and hand line. Spear fishing is also conducted, with the assistance of boats. In American Samoa, pelagic and bottom fish comprise the primary landings and are targeted by troll, long-line, and hook-and-line. Throughout the Western Pacific, inshore fishing is also conducted often without the use of a boat, and consists mostly of nearshore casting, netting, and spear fishing.

Small-vessel fleet and their fishing trips cannot be easily distinguished as recreational, subsistence-oriented or commercial, either in terms of motives or outcomes. Fisheries managers use a variety of different terms when discussing small-vessel operators, such as "full-time," "part-time," and "active." The most salient defining characteristics within the small-vessel fleet involve: occupational opportunities and employment needs; fishing strategy and scheduling; and fishing equipment.

For the purpose of this report, "full-time" fishermen are those having no other means of and/or a need for employment versus "part-time" fishermen, who have other means of employment. These two types of small-vessel-based fishing activity correlate with socio-cultural and demographic attributes. In Guam, CNMI, and American Samoa, full-time fishing is conducted primarily by non-indigenous minorities. Full-time fishermen in Guam, CNMI, and American Samoa are primarily from the Federated States of Micronesian (FSM), the Philippines and FSM, and Independent Samoa and Tonga, respectively. In contrast, indigenous local residents, by virtue of employment opportunities in either the private or public sector, fish on a part-time basis. The latter are often characterized as "opportunistic" in terms of their fishing patterns: they concentrate their fishing when weather is favorable and jobs and time permit; and tailor their effort, methods, and target species in relation to "what is biting." If fish are not biting, fishermen often report staying out on the water for enjoyment. As a whole, the latter group is fairly affluent and has an extensive investment in fishing vessel and gear (VHF radios, depth finders, and GPS).

The existence of seafood distribution venues and the ability to sell fish at a competitive price is a crucial aspect of maintaining the fishing practices of both "part-time" and "full-time" fleet in the Marianas and American Samoa. Part-time fishermen frequently sell fish to recoup fishing costs. Fishermen sell catch from dockside, roadside coolers, smaller non-specialized stores for home consumption and/or restaurant use, and door-to-door.

The part-time fleet outnumbers the full-time fleet in the region, except in the outlying Manu'a islands of American Samoa. The total number of small-vessels in Guam has remained fairly constant over the past decade. The number and activity of charter vessels has, however, decreased due to the decline in number of Asian tourists. The total number of small-scale/small vessels in American Samoa declined over the past decade, supplanted by medium and large long-lining mono-hull vessels. A tsunami in 2009, moreover, destroyed over 80 percent of the active alia fleet on Tutuila Island. In CNMI, declines in the tourist-based economy and government layoffs are currently impacting the size and avidity of the small-vessel fleet.

Summary Table 1 below summarizes, by location, the small-scale/small-vessel fleet, water access infrastructure, and seafood distribution locations. U. S. Census figures for Year 2010 are provided for comparative purposes.

Summary Table 1. Characterization of Small Vessel Fleet Size and Support Infrastructure: 2010-2011

Country (2010 Census Population)		Fleet Size (Estimated)	Water Access Infrastructure*	Seafood Distribution **
Guam (159,358)		• 350 part-time • 11 full-time • 12 charter	• 3 marinas • 8 boat ramps	• 5 fish stores • 1 fishing cooperative • 1 weekly fish market
CNMI (53,883)	Saipan	• 60 part-time • 34 full-time • 3 charter	• 2 marinas • 6 boat ramps	• 1 fish store • 7 roadside vendors
	Tinian	• 14-17 part-time • 1-3 full-time • 6-7 charter	• 1 marina • 1 boat ramp	--
	Rota	• 13 part-time • 2 full-time • 6-8 charter	• 2 marinas • 2 boat ramps	--
American Samoa (55,519)	Tutuila	• 12-15 part-time • 7 full-time	• 2 marinas • 3 boat ramps	• 2 fish stores • 1 road side vendor
	Aunu'u	• 2 part-time	• 1 marina • 1 boat ramp	--
	Ofu	• 2 full-time	• 1 marina • 1 boat ramp	--
	Ta'u	• 4 full-time	• 2 marinas • 2 boat ramps	--

* Includes only marinas open to public use. Marina infrastructure varies considerably in terms of facilities and size. Our designation includes, at minimum, presence of breakwater and/or mooring locations. ** Includes brick-and-mortar stores and established roadside vendors. Small-scale boat-based fishermen also report selling to restaurants, general stores, door-to-door, and from roadside coolers.

Social and Cultural Importance

Archeological remains and early written records provide evidence of a long history of fishing, fish sharing, and fish eating by inhabitants of the Western Pacific Islands. There has also, however, been a long history of impacts to practices of fishing and fish eating. Colonization, foreign occupation, and westernization have led to the destruction or displacement of fishing practices and fish eating preferences. In addition, the growth of wage labor and increase in imported foods has led to an attenuation of dependence on local marine resources and the development of new eating habits. The introduction of aluminum dinghies, outboard motors, and modern gear has affected fishing practices (in particular, fishing ranges and frequency) and distribution patterns, as fishermen have to recoup the costs of fuel and engine maintenance by selling fish. The wide-spread use of refrigeration has allowed fishermen to fish in accordance with weather and work schedules and then store for future family and community events. In addition, government programs and funding for boat building, FAD programs, and acquisition of new fishing and fish-handling skills have supported the development of small-scale fishing for commercial purposes. As a result of a myriad of influences, "traditional" fishing has come to be defined by the social and cultural purposes of fishing, the occasions when fish are consumed, and

the social networks through which fish are distributed rather than the technique by which fish are caught, the ways they are prepared, or the fish species.

Key findings regarding the current social and cultural importance of small-scale fishing include, but are not limited to, the following:

- Small-vessel operators customarily provide fish to immediate family and friends for major life-cycle events, religious occasions, and community events. Fishermen not only contribute to events they host and attend, but, through families and friends, to other events and communities. Not only consumed at such events, fish is often distributed to attendees to take home (either cooked, in the case of the Marianas, or uncooked, in the case of American Samoa).

- In addition to being part of life-cycle celebrations, religious occasions, and community events, locally caught fish is often sold to finance gifts that are part of the celebrations of life-cycle rituals.

- Due to the market availability of seafood and other foodstuffs and frequent occurrence of social events which call for food, the current distribution of locally caught fish for cultural events is largely provided "out of courtesy" and with an emphasis on continuing traditions.

- Preferences for types, origin, and quantity of fish for cultural events have changed through time. In Guam, a customary preference for reef fish is being partially supplanted by large tunas and bottom fish, due to the growth of tournament fishing and a decline in nearshore marine resources. In American Samoa, a customary preference for certain cuts of fish is being supplanted by an emphasis on quantity of fish. In addition, if fish cannot be caught by a family member or friend(s) of the family, fish procured from long-line vessels and canned fish are equally acceptable.

- Non-indigenous persons and operators of charter vessels frequently participate in traditional networks of seafood distribution for both special occasions and more daily food requirements. Charter and tournament fishing play in an integral role in maintaining the small-scale fishing fleet and fishing activities. Charter fishing provides a means to recoup costs and catch frequently enters into important customary channels of seafood distribution. Tournament fishing promotes an interest in fishing at a time when intergenerational transmission of fishing customs is waning.

- Non-indigenous resident persons (for example, full-time fishermen from Philippines, FSM, and Tonga, as well as part-time fishermen from Japan, the United States, Australia, and New Zealand) play an important part in promoting small-vessel pelagic fishing activities and supplying pelagic fish for important cultural events through market and non-market means.

- Due to lower availability of reasonably priced store-bought goods and lower rates of employment and wage labor, residents in the outlying islands in the CNMI and American Samoa archipelago engage more in fishing, as well as subsistence gardening and animal husbandry, than do their urban counterparts.

Summary Table 2 below depicts the primary life-cycle events and holidays for which fish is distributed and consumed.

Summary Table 2. Primary life cycle events and holidays

Place	Occasion
Guam and CNMI	• Baptism; Confirmation; Wedding; Family *Novena*; Birthday; Final Day of Funereal Rosary; Village (Church) Fiesta; and Family Return from Abroad • Lent; All Soul's Day; Thanksgiving; Immaculate Conception; Christmas; New Years; and Three Kings Day
American Samoa	• Wedding; Funeral; Significant Birthday; Anniversary; Induction of Chief; Dedication of New Home; and Visitor(s) from Afar • Sunday; Christmas; and White Sunday

Current Challenges

Literature review, key respondent interviews, and fieldwork observation reveal several challenges facing the small-vessel fleets in the Western Pacific; these include, but are not limited to, fuel prices, infrastructure, market competition, and manpower.

Fuel prices. Part-time fishermen report the following changes in fishing behavior due to increases in fuel prices: (1) fishing less frequently, but for longer hours; (2) increased sharing of vessels and trip costs; (3) increasing percentage of catch sold; (4) targeting pelagic fish only during seasonal runs; and (5) increased targeting of bottom fish. Full-time fishermen in the Marianas report: (1) high turnover rates for high-liner participants; (2) decreases in size of vessels; and (3) increases in use of fuel efficient engines.

Infrastructure. In Guam, the utility of a number of water access points is currently limited by: highway construction, ramp size or condition, prevailing weather conditions, and/or location on/or near military closures. In addition, the loss of FADs is requiring fishermen to travel farther at a time when fuel prices are high.

In American Samoa, a 2009 tsunami resulted in infrastructure damage to launch ramps, floating docks, and a processing plant, as well as damage to the small-vessel fleet. Repair of damaged infrastructure, vessels, and gear is ongoing.

Market Competition. The ability to maintain small-scale/small-vessel fishing activities, especially in light of increases in fuel prices, depends largely on opportunities to sell fish at a fair market price. The availability of B-grade transshipped catch in the Marianas, and incidental catch by large long-line and purse seine fleet in American Samoa has depressed the market price of local catch relative to operational costs. Also, supplanted demand was once partly filled by

small-vessel operators. In addition, fresh bottom fish and reef fish are transported by plane on a regular basis from FSM to Guam, and by plane and ferry from Western Samoa to American Samoa.

In American Samoa, incidental and imported catch enter into seafood distribution channels not only through sale (to general stores, fast food outlets, and restaurants) but through multiple acts of gift-giving and sharing. Currently in American Samoa, fresh locally caught pelagic species inhabit a niche market of highly priced and high quality fish. In Guam and CNMI, the sale of locally caught fish is supported by the use of food stamps.

Manpower/crew. Due to more lucrative employment opportunities available to American Samoans at home or abroad, the majority of crew are foreign. Boats frequently sit idle when crew returns home: reportedly, crew members are quick to switch boats if working conditions are deemed unsatisfactory. Notably, after the 2009 tsunami, employment opportunities in the construction industry increased drawing away persons who had in the past participated in the commercial fishing industry. The dearth of small vessel fishing has resulted in lack of supply of fresh pelagic catch to the local market.

Challenges and Opportunities

Guam

The current expansion of military presence in Guam will reportedly result in: an increase in restricted zones and times of fishing (due to increases in military exercises and warfare danger zones); and an increase demand on limited infrastructure. Currently, existing military training areas to the south of the island are, reportedly, forcing more frequent area closures, requiring fishermen to make large and costly detours to access fishing grounds. The military expansion will likely also impact the marine environment due to dredging for expansion of military facilities and/or increased testing of weaponry. An estimated population increase of 25 percent (40,000 persons) on Guam will likely impact fish resources and market demand in various, as yet unanticipated ways. Fisheries managers note that some indigenous and resident fishermen hope that demand and profitability of small-scale fishing will increase.

CNMI

Changes in immigration law to comply with the U. S. Immigration and National Act and other U. S. immigration laws could impact the ability of immigrants to remain in the country: these individuals comprise the majority of the full-time fleet. In addition, new rules regarding foreign investment will be implemented in 2014, which are likely to affect foreign investment in tourism and other industries. The potential will then arise for long-term and significant impacts to the overall economy of CNMI, and the concomitant demand for locally caught seafood, in specific.

American Samoa

Changes in levels of U. S. government aid or business at local tuna canneries, two major drivers of the American Samoa economy, could alter fishing practices and patterns, encouraging increased small-scale fishing (for subsistence and/or local sale) or result in a large outmigration.

Current development plans are underway in Tutuila Island and the Manu'a Island group to develop the small-vessel fleet for participation in a high-valued fresh tuna export market. Significant challenges, however, remain, including upgrading equipment, fishing and fish-handling skills to assure a steady supply of high-quality fish, and ensuring a timely and cost-effective means of transporting catch to export markets.

Data Gaps

Fisheries data collection efforts and resulting interpretation differ between inlands in the Western Pacific region. In addition, data collecting and processing systems have been and continue to be improved. Fisheries managers in Guam, CNMI, and American Samoa report the following data gaps germane to the current research needs of assessing small-scale, small-vessel-based traditional fisheries: (1) incomplete samplings of certain areas; for example, on outlying islands, less commonly used launch sites, on military recreational facilities, and on certain days, i.e., Sundays ; (2) lack of compliance by fish vendors; (3) lack of or sporadic collection and/or tracking of the distribution of catch for sale or home use; and (4) incomplete listing of species on trip tickets or incorrect identification of species by vendors.

Current Status and Future Challenges

Our research suggests the ongoing importance of small-scale fishing in Guam, CNMI, and American Samoa. Small-scale/small-vessel fishing operations currently provide important source of protein for everyday consumption, as well as food for important life-cycle rituals, holidays, and community events. The catch is distributed through extensive social networks. Moreover, the importance of small-scale fishing to Western Pacific islands is likely to continue, as nearshore resources are depleted in many areas and/or closed to fishing.

Small-scale fishermen, however, face significant challenges related to increasing costs of boat-based fishing and the ability to recoup costs in light of market competition, limited seafood distribution infrastructure, and declines in demand for charter fishing services. Subsidization of fuel, loans for fuel-efficient engines, maintenance and expansion of FAD programs, and establishment of fish markets or cooperatives to facilitate direct sales by fishermen are a few possible means of supporting small-scale/small-vessel fishing in Pacific Island regions of Guam, CNMI, and American Samoa.

Descriptive Assessment of Contemporary Small-Scale and Traditional Fisheries in the Western Pacific

1.0 Purpose of Study

Introduction. As detailed in our original research proposal, the primary goal of the proposed project is to "locate," in a single report and database, relevant summary information and descriptive analysis of contemporary small-scale and traditional fishing fleets active in Hawai'i, Guam, Commonwealth of Northern Marianas Islands (CNMI), and American Samoa.

The principal field objectives involved: visits to centers of government and fishing harbors in each of the archipelagos as needed to gather relevant information from knowledgeable persons, and to generate first-hand information as needed regarding the number and spatial distribution of vessels/fishing operations that may potentially be classified as small-scale: (a) commercial, (b) artisanal, or (c) subsistence/consumption-oriented in nature. To this end, two field trips were made to Guam and Commonwealth of Northern Mariana Islands between November 28 and December 5, 2010 and January 18 and February 2, 2011. One field trip was made to American Samoa between July 29th and August 8th A total of 62 interviews were conducted: 18 in Guam, 27 in Saipan, Tinian and Rota (CNMI), and 17 in Tutuila Island, American Samoa. Key respondents in American Samoa could also speak with confidence about fishing practices in Aunu'u and Manua'a Islands.

In Guam and CNMI, interviews were conducted one-on-one and in small focus groups with fishermen, seafood distributors, mayors, cultural practitioners/indigenous rights activists, and regional specialists. Interviews were also conducted with persons active in fisheries management including: Western Pacific Fisheries Management Council - Advisory Panel Members for the Marianas Archipelago, President and Board Members of the Guam Fishermen's Cooperative Association, (former and current) Director of Division of Fish and Wildlife in Saipan, and Outreach Coordinator for the Pacific Fisheries Management Council in Guam. In American Samoa, interviews were conducted primarily on a one-on-one basis with fishery managers and data base experts, fishermen, seafood distributors, and a cannery manager.

The assessment component of this project focuses on how these fleets and activities vary in terms of: (a) manner, purpose, and extent of involvement in the sale of seafood, (b) nature and extent of involvement in fishing for primarily consumptive purposes (where those purposes include reciprocal sharing and giving, and other non-commercial modes of and motivations for distribution of seafood products), and (c) nature and extent of involvement in fishing for mixed commercial and non-commercial purposes. Additional archival information and interviews with regional specialists in historical and cultural affairs have been utilized to describe: (changing) patterns of fishing activities and fish consumption vis-à-vis others opportunities for economic activities and life pathways amongst various ethnic groups at certain points in history and the current cultural significance of fishing activities and fish eating patterns to local residents.

The resulting information, as contained in this report, provides the Council with the empirical information needed to appropriately characterize, define, and manage "traditional" and "small-scale" fishing fleets in each geographic and/or culture area in the islands of the Western and Central Pacific. The effort serves to complement conceptual models, other related research efforts, and policy discussions with basic description of fleets whose participants are oriented primarily toward localized small-scale commercial, artisanal, and/or consumption oriented fishing activity.

The report is organized into two parallel parts. Part One focuses on the Mariana Islands – Guam and CNMI – and Part Two focuses on American Samoa. Each part begins with a historical overview the purpose of which is to provide: 1) a context to understanding the social, cultural, and economic influences at play in the region in general, and 2) a description of changing fishing practices and fish eating habits. Next follows a discussion of data collection efforts to date and current problems of gaps as reported by local fishery managers. Section Three provides the land location of significant small boat based activity – boat ramps, marinas, and primary centers of locally caught seafood sales. Photographs are provided, as well as a description of water access points and related marine infrastructure. Sections Four and Five enumerate and characterize the current status of the small-vessel fleet and seafood distribution patterns and sales outlets. Section Five provides a discussion of current eating customs and as they relate to patterns of fishing and seafood distribution. Each part concludes with a summation of the opportunities and challenges that the small-vessel fleet faces.

1.1 Geographic and Cultural Overview of Guam and the CNMI

The island of Guam is located in the western Pacific Ocean at 13° 28' 0" N / 144° 46' 59" E. It is the largest and southernmost of a group of fifteen islands which comprise the Mariana archipelago. The archipelago encompasses a land area of 184 square miles (477 sq km), with an accompanying coastline of 921 miles (1,482 km). Much of the island of Guam is fringed by coral reef lying 20-700 yards offshore. The northern and northeastern coastline is characterized by steep cliffs rising from the sea. The southwest half of the island, in contrast, has protected bays. Approximately seven miles south are the deep waters of the Marianas Trench.

The geographic coordinates of the islands comprising the Commonwealth of the Northern Mariana Islands extend from 20° 32' 46.24" N / 144° 53' 36.64 E at the northernmost island, Farallon de Pajaros to 14° 19' 40.81" N / 145° 26' 37.85" E at Songsong on Rota, the southernmost island of the chain. The west coasts of Tinian and Saipan are characterized by reef enclosed lagoons of varying widths. Elsewhere steep cliffs arise from the sea allowing limited access into fringing reefs.

Early Inhabitants

Archeological remains in the Marianas date the earliest human habitation from 3,500 and 3,000 years ago. Archeological remains of pottery and shell ornaments suggest the inhabitants came from that part of the Indo-Pacific region now called the Philippines. Current theories posit resource competition as the primary reason for voluntary and involuntary migration (Russell

1998). Evidence from the climatic record as well as archeological remains suggest continuing waves of immigration, the establishment of more permanent settlements over time, and interisland travel within the Marianas.

Archeological research at earliest inhabited beachside sites have revealed marine shells ornaments, shell implements, and various fishing equipment including hooks, gorges, fishing spear point, sinkers, lures, and shanks made from shell, stones, fish and human bones (Amesbury 1986). The variety of fishing equipment and fish species suggest that early inhabitants employed sophisticated fishing methods and were skilled at targeting a variety of difficult to procure resources (Amesbury and Hunter-Anderson 2008). Sites from all of the four major Mariana Islands—Guam, Saipan, Tinian, and Rota – have fish remains from assorted pelagic species, as well as reef and bottom fish and turtle, dating from the earliest periods of human habitation. (See Amesbury and Hunter-Anderson 2008 for a complete description of pelagic fish and gear remains and locations.) Moreover, a lack of archeological evidence of mammalian food species suggests that the earliest inhabitants of the Mariana Islands were heavily dependent on the sea for food resources.

1.2 Traditional Fishing Practices in the Region

From the mid 1500's, vessels voyaging the Pacific from the Americas to Asia stopped in Guam and Rota to re-provision. In trade for fish, rice, and coconuts, they gave indigenous inhabitants iron, which was reportedly much sought after for fish hooks. These early trading trips gave rise to the first written reports on the lifestyles of indigenous inhabitants in general and fishing practices and fish eating patterns more specifically. Records suggest that early Western explorers were astounded by the fishing and boat handling skills of the inhabitants who trolled from sailing canoes in open oceans for flying fish, marlin, mahimahi, and skipjack (Driver 1989). Early records also offered enticing details about the customs they saw including: giving fish to the dying, offering fishing gear in religious feasts, paying fish as recompense for a crime, and observing various taboo regarding fishing. On a more prosaic level, they reported that fish was commonly eaten raw, cooked and salted.

In 1668, a permanent Western presence, in the form of a Catholic mission, was established, initiating a period of dramatic change to Chamorro traditional society, cultural, and lifestyle practices. From the late 17th century to early 18th century, the indigenous peoples Chamorro experienced a process of colonization, Christianization, and enculturation to a hybrid of Spanish, Philippine and Mexican customs. Within a century, violence and disease resulted in the decimation of the indigenous population, by an estimated 90% to some 4,000 persons. Through time, the remaining Chamorro intermarried with Filipinos, Mexicans, Spaniards and other foreigners to create a mestizo population (Russell 1998). A program of resettlement, whereby the majority of indigenous peoples within the Marianas Islands were moved into mission villages in Guam, destroyed a system of traditional resource rights and connections with marine resources. To prevent resettlement, the canoes of native Chamorro were also systematically destroyed. The knowledge and skill to construct canoes and fish in open seas, as well as the ability to dive and swim were largely lost under the period of Spanish colonization. Fishing effort became limited to lagoon and reefs areas and the species found within those areas. New eating habits were consequently developed.

Jesuit priests introduced cattle, horses, pigs, maize, and slew of vegetables and fruits (sweet potato, squash, and pumpkin) along with new tools and knowledge of agriculture. Maize eventually supplanted rice as a staple crop, beef and pork, took the place of pelagic species, as festal foods. Eventually Chamorro would become known for their ranching and agricultural skills rather than fishing prowess (Russell 1998).

In the early 1800's, the Marianas became increasingly important to two other groups – whalers from United States and Carolinians from Pacific Islands to the south. Whalers frequently stopped at Apra Harbor and Umatac, in Guam to re-provision with food, water, and firewood. (Amesbury et al. 1986). Carolinians from southern islands conducted trading trips for iron, copper, cloth, and tobacco – items which were held in high prestige (D'Arcy 2006; Bowers 2001). In return for trade goods, Carolinians provided Spanish with inter-island transport to conduct their government and religious affairs. They also transported pork and beef that were raised and processed in Tinian (Amesbury and Hunter-Anderson 2008).

Through the transport services they provided to the Spanish colonizers, Carolinian canoe traders familiarized themselves with the resources of the Marianas. When typhoons hit their home islands in 1810, Carolinians traveled in canoes to Saipan to gather food, eventually settling in Saipan's Garapan area, which offered sheltered lagoon waters for fishing and wetlands for taro cultivation much like their home islands. After 1815, Carolinian refugees came in waves after a succession of natural disasters of typhoon and tsunami. In the latter half of the century, Chamorro were also allowed to (re) establish settlements in Saipan and Rota.

In 1898, with the end of the Spanish-American War, the Marianas islands were politically divided. Guam became an American possession; the rest of the archipelago was administered by a succession of power first Germany, followed by Japan and then United States. The presence of the US military in Guam for the turn of the century set the stage for another series of social and cultural changes. Dependence on marine resources was attenuated by a growth of wage labor and increase in imported food; in addition, military service increasingly became a means by which Chamorro emigrated.

Reports left by American government administrators in the early 1900s detailed various fishing methods including hook and line, net, trap, and hand. The fruit of *Barringtonia asiatica* was also used to stupefy reef fish (Amesbury and Hunter-Anderson 2008). Nets in particular were highly varied; the length, construction, and names of nets differing depending on target species. Many forms of net fishing were done as a group activity. In the 1930's and 1940's new gear and modern materials were introduced, such as swimming goggles for spear fishing and manufactured hooks and cotton line for hook and line fishing. Written references suggest fishing was largely limited to inshore lagoon and near shore areas. The lack of references to offshore fishing suggests the open water fishing occurred infrequently if at all (Amesbury et al. 1986).

Annual reports under the military government had little mention of offshore fishing until 1934 when an off shore fishing school was established to supply local fish and decrease the amounts of imported fish. According to archival research by Amesbury and Hunter-Anderson (2008: 83), 12 men from each village were called to attend the school to learn how to operate power boats

and other offshore fishing equipment. Apparently the school was not very successful, as annual reports after 1937 made no further references to either the school or offshore fishing operations.

Under German rule, the islands of Northern Marianas were gradually repopulated by a steady migration of Chamorro from Guam and of Carolinians to outer islands. Under Japanese occupation (1914-44), the Northern Marianas underwent marked economic development, based primarily on a new plantation economy of sugar. With Japanese government subsidies, manufacturing and transport infrastructure and services blossomed. Sugar refineries, roads and ports were constructed and regular shipping services connected the Northern Marianas with Japan and other parts of the Japanese Micronesian Empire, Palau, Yap, Chuuk, Pohnpei, and Jaluit, in the Marshall Islands. As Bowers (2001: xiii) writes "Saipan, Tinian and Rota were prosperous, if tiny, cogs in the Japanese economy."

Large-scale fishing operations were conducted in waters off Saipan and Tinian but neither Carolinians nor Chamorro were largely if at all involved in the commercial fishing fleet. Bowers (2001:203) notes that 609 persons, primarily Okinawans from Japan, were employed, 35 powered and 64 non-powered vessels were operated, and 12 factories were in operation in 1936. The commercial fishing fleet targeted skipjack which was dried into fish flakes and exported to Japan. Okinawan fishermen also provided fish for the local market (see also Russell 2009).

In the new plantation economy, Carolinians and Chamorro leased land to Japanese for development into sugar plantation. According to Bowers (2001:97), 85-90% of the natives on Saipan and Rota rented parts of land for varying amounts of time (5-20 years). Chamorro also found work in a wage based economy and were gradually drawn away from a lifestyle of subsistence agriculture and fishing. The native community became increasingly dependent on trade goods from Japan and as a resulted developed new eating practices and preferences. The en masse migration of Japanese laborers to work the plantations also brought a dramatic reconfiguration of the social landscape; Chamorro and Carolinians were rendered a minority population (Spoehr 2000).

Under Japanese occupation, traditional fishing practices underwent considerable change for Carolinians in Saipan. Loss of timber, due to the clearly of land for sugar, and prohibitions against inter-island canoe travel resulted in the eventual disappearance of canoe-making and navigation skills and offshore fishing practices. (D'Arcy 2006; Spoehr 2000). The Carolinian social institution of the community canoe house (*ut*) also disintegrated (Bowers 2001).

The Pacific War years brought hardships to the native communities throughout the Marianas Islands. During the 2 ½ years of Japanese occupation (1941-4), native Guamanian lost the employment opportunities they had enjoyed when under the United State military rule. Residents were moved from the eastern shores of Guam, due to air raids and naval bombardment, and the northern end, due to the establishment of military facilities (Sanchez 1998). They returned to the farms and oceans growing agricultural products or fishing under or for Japanese troops. They were, however, prohibited from fishing for themselves so fishing was done only "secretly at night by torch and hand, machete, or spear" (Amesbury et al. 1986:20).

1.3 Postwar Economic Changes

Immediately after the war, fishing patterns in both Northern Marianas and Guam were affected by lack of resources in near shore waters (due to overfishing and destructive fishing methods utilized during war years), lack of boats and fishing gear (again due to war time destruction), and ecological damage due to wide-scale dumping of military equipment. US fisheries biologists in charge of surveying the status of fisheries in Guam also noted that Guamanians preferred to be employed by the American military rather than work in fishing. Lack of capital for attaining the necessary fishing accoutrements as well as the lack of shore side infrastructure, particularly processing, storage and transportation, served as additional deterrents (Amesbury et al.1986). The small amount of fishing that was undertaken was done so predominantly by net, most notably in the southern villages of Merizo and Umatac. According to regular reporting by the US Naval Government, between 1946-50, 1-5 % of adult Chamorro men were earning a living partly through fishing; little information, however, is provided regarding the method of take or species. (Amesbury and Hunter-Anderson 1989: 85).

After World War II, Guam underwent considerable transformation in relation to the composition of population, extent of infrastructure, standard of living, spread of money economy, and availability of consumer goods. As Guam was consolidated as a military base, federal appropriations for reconstruction and improvements flowed into Guam to the tune of millions of dollars and Guam experienced an influx of military personnel, families, and support staff from mainland US. Other nationals, particularly Filipinos, were also brought in to help in construction. The passage of the Organic Act in 1950, whereby Guamanians became US citizens, increased emigration. The majority of the Chamorro population that remained was supported by wages from military activities and public service, or owned local businesses. Efforts to encourage agriculture as a primary form of employment were largely unsuccessful due to competition from wage economy, shortage of labor, loss of stock, and pest problems. Although the US military attempted to encourage the development of an indigenous inshore commercial fishery, postwar fishing was primarily non-commercial activities, geared at home and community consumption, and not enough to meet local demands. (Sanchez 1998). Aspirations born of increased education levels also turned local residents away from viewing fishing and farming as occupations.

As was the case for Guamanian residents, World War II brought a loss of material possessions (including boats and fishing gear) and destruction of the environment (due to invasive pests, plantation practices, military activities) to Northern Mariana residents. In the two decades following the end of World War II, the residents of Northern Marianas, however, were in many ways experiencing the opposite trends from that of their neighbors to the south in Guam. War brought an end to a Japanese colonial economy of high wages and availability of imported goods. War and subsequent US occupation demanded that Chamorro and Carolinians learn a new language and value system and adapt to new form of government. The US Department of the Navy, which took over governing the northern Marianas, attempted to encourage both agriculture and fishing. Assistance was provided in the form of community farms to teach farming techniques and equipment, livestock and plants to improve agriculture for community self-sufficiency. (Spoehr 2000). Typical type of farming activities included the cultivation of sweet potatoes, bananas, plantains, yams, beans, eggplant, onions, tomatoes, manioc,

watermelons, cantaloupes, chili peppers and animal husbandry of pigs, chicken, and cows. Spoehr (2000) notes, however, that under the Japanese occupation, many local residents had developed a preference for imported foods that differed from that of the food that was typically grown. And although suitable as a part-time activity, farming was not considered by Chamorro to be a suitable occupation or profession. Chamorros in northern Mariana, like their Guam counterparts, were drawn to white collar or skilled wage labor. Uncertainties regarding private land ownership served as a deterrent for many to return to farming land (Spoehr 2000).

In the late 1940's, under the aegis of the Navy, a fishing cooperative, the Saipan Fishing Company, was created to target skipjack and tuna in the offshore waters, much as the Okinawa fishermen had so successfully done. Carolinians were hired due to their reputation for fishing outside of the reef. The venture, however, was short lived. The Carolinians were faced with a myriad of problems involving the lack of experience in offshore fishing, maintaining equipment, and handling money; there was also not a large enough local demand nor ability to access a larger (export) market (Amesbury and Hunter-Anderson 2008). In addition, the Carolinian way of life centered more on subsistence living and community sharing rather than wage work (Spoehr 2000).

Writing in 1950, Spoehr observed that fishing by both Chamorros and Carolinians in Saipan took place in lagoons and margins of reefs (at Obyan and Laulau). The primary methods included: spear, circular throw net, long narrow drag net *chinchulu*, weirs (*gigao*), and hand gathering (of lobster). Net fishing was a group activity involving 10-15 young men, guided by an older fishermen. Carolinians also used small outrigger canoes for hook and line fishing within lagoon and were also skilled at swimming and diving for fish at the outer margins of the reef. Whereas Chamorro fished largely for their own families and to a lesser extent to sell to others, Carolinians were observed to be more avid fishermen. They fished from one to four times a week, preferred a fish diet (over that of beef or pork), shared their catch widely with kin, and also sold excess, outside of their own community groups. With departure of the Navy run government from Saipan in 1962, there was a need for residents to take over their local governing. Many educated and ambitious Chamorros thus found opportunities for high paid wage work. Chamorro reportedly dependent on Carolinians for fish after the repatriation of Okinawas.

In short, in the decade following World War II/Pacific Asia war, the majority of fishing taking place in the Marianas was focused on the inshore and near-shore and was conducted primarily for subsistence purposes. Although the establishment of a postwar wage economy led many Chamorro away from fishing to other occupational aspirations, it also eventually provided residents with the economic means to purchase boats and other deep sea fishing equipment necessary for offshore fishing for subsistence and avocational purposes. The establishment of an Economic Loan Fund in CNMI gave persons the economic means to purchase boats. Gradually, as one respondent put it, the reputation of who were the fishermen changed – Chamorro became the boat based offshore fishermen and the Carolinians retained their reputation as skilled spear fishermen and swimmers who fished the near shore waters.

Beginning in the late 1960's in Guam and in the 1970's in CNMI, the tourism industry became an economic driver. The growth of tourism in Guam further propelled migration flows. Wage workers from the Philippines, other Asian and Pacific Island countries were drawn to or brought

in to work in construction and service industries associated with the growth of tourism. Exodus of Guamanians continued as the emergent tourists industry increased land values giving Guamanians a new wealth with which to leave Guam. 1980 census data revealed that an estimated 40% of Guamanians resided abroad and at home they were also outnumbered. (Underwood 1985:173). A major Chamorro diaspora was established in California.

In 1976, the northern Marianas gained the status of a commonwealth nation to United States, and henceforth became the Commonwealth of Northern Marianas Islands. As a US affiliated nation, CNMI assumed a legislative democracy ruled by US law; as a commonwealth it was also granted local control of immigration, wages and customs. The two factors – stability and flexibility – were appealing to foreign investors and led to an expansion of the economy and population. Exemptions in duty, tariff quotas and minimum wage requirements led to the development of a garment industry employing foreign labor.

In the late 1970's the Japanese tourism industry also discovered in northern Marianas a naturally beautiful location, with a compelling historical narrative, in close proximity to Asia. As of the early 1980's the number of annual visitors was some eight times that of the resident local population. In 1980's, under Japanese development capital, a major construction in tourist related facilities – hotels, restaurants, and golf courses, boomed. (Russell 1998). The tourist industry contributed economically to all three islands of Saipan, Tinian and Roto. From 1988 to 1996, tourism was the Commonwealth's largest income source (WPRFMC 2008: 35).

In both Guam and CNMI, the growth of tourism, led to the development of a charter industry and supported the expansion of a small-vessel fleet which fished for enjoyment, subsistence purposes and economic gain. In CNMI the garment industry also brought workers from fish eating (as well as fishing) nations thus spurring an increase in demand. Respondents in Guam and CNMI reported that the growth of tourism increased fish demand, selling opportunities, and markets. Respondents in CNMI report that it was not uncommon for incoming fishermen to be met at the water front by prospective buyers. The resulting seafood demand further increased offshore boat-based fishing by providing the economic means for vessel, gear and technology purchases. Boat ownership and offshore fishing expanded and fishing technology improved. GPS gradually took the place of navigating by landmarks and electric reels replaced hand lines. After many years of hiatus, the residents of Guam and CNMI rediscovered the skills and pleasures of pelagic fishing.

Increased tourist demand also spurred the creation of a larger vessel fleet. In CNMI, a long-line fleet of larger vessels (55-85') targeting bottom fish and pelagic species was developed to meet tourist demand; the majority of the fleet was owned by Japanese investors and employed nationals. In the 1990s, the local small-vessel fleet supplied only a small part of the total seafood demand in the 1990s. Imports also accounted for a growing part of the supply.

Concern about unfair labor practices and duty free sales to US led changes in laws that gave CNMI a unique advantage in garment manufacturing; companies soon left country. The Asian financial crisis in the 1990s led to a severe contraction of the tourist based economy (see Miller 2001 for figures on changes in gross revenues, wages and salaries paid etc). The contraction led to the loss of major airline services to Japan and Korea and to the closure of many hotels and

restaurants that served Japanese tourists. Other hotels weathered the downturn and turned to catering other clientele. As of 2010, CNMI is negotiating a changing tourist market from that predominated by Japanese to one showing an increasing numbers of Koreans, Chinese and Russian tourists. It is not yet clear how the changing client base will affect the long term economic prospects for CNMI or demand for fish.

In Guam, military downsizing impacted the size of the population and the robustness of the economy. Resulting high rates of unemployment in 2000 appear to have impacted fishing activities. In 1999, the number of troll trips began to decline due: a decline in charter business; a (continuing) local economic recession; and increase in operation and maintenance expenditures vis-à-vis fishing income.

A Defunct Japanese Tourist Hotel, Saipan

2.0 Overview of Data Collection Efforts

2.1 Guam

Currently there is no licensing, permitting, or sales reporting requirements for any fishing sector by Government of Guam (Allen and Bartram 2008). The Western Pacific Pelagic Fishery Management Plan governs long-line fishing, conducted by a large vessel fleet, in the Guam EEZ. Three types of information are currently collected on a voluntary basis in Guam: landside/dockside creel surveys, commercial receipt program of dealer surveys, and voluntary fishery data collection program. The Guam Division of Aquatic and Wildlife Resources (DAWR) has conducted dockside/landside CREEL census and dealer surveys since 1970s. To fill information gaps the Voluntary Fishery Data Collection Program was established in 2004. This program includes questions regarding the disposition of catch (for sale or home and community use). The Guam Fishermen's Cooperative Association (GFCA) conducts the program with technical assistance from the Western Pacific Fisheries Information Network (WesPacFIN), which developed and funded the survey process, and DAWR, which provides supervision, work space and equipment, and archives data, amongst other things.

DAWR provides annual reports on both commercial catch and total landings. Creel survey data is run through an annual expansion to produce annual estimations of catch and effort by species; estimations of fleet size are reached through the use of a boat estimator model. Commercial revenues are estimated by utilizing as percent coverage expansion factor from data collected from the principle fish wholesaler in Guam. Time series from 1982-2008 detail, in various permutations by species group, species and by charter and non-charter, annual estimated total landings, estimated number of trolling boats, troll trips, troll hours, trip length, and trolling CPUE. Time Series from 1980 through 2008 detail annual estimated commercial landings; annual estimated inflation-adjusted commercial revenues, average prices and revenue per trolling trip.

In 2011, fishery managers expressed concerns regarding inadequate creel sampling size and lack of representation of certain area/launch sites, gear types, and types of fishermen. Significant data gaps exist for spear-fishing and netting activities, for non-GFCA members and for the fishing activities from recreational facilities operated for military personnel (Allen and Bartram 2008, WPRFMC 2009). Fishery managers also reported lack of compliance by commercial vendors. Many years of data collecting have fewer than three commercial vendors, thus obviating reporting abilities. To overcome lack of compliance, DAWR actively undertakes outreach with commercial vendors and fishermen for increased participation. In addition, GFCA is involved in education and outreach and providing incentives for participation Voluntary Fishery Data Collection Program, by weighing and cleaning all catch of the participants.

The Department of Public Safety maintains a data base of vessel registration detailing owner's residence and size of vessel. Reportedly weaknesses in this data base include non-compliance with re-registering vessels when sold.

2.2 Commonwealth of the Northern Mariana Islands

There are currently no requirements for commercial fishing vessel, operator, or crew licenses for inshore or offshore waters of CNMI. All data collection efforts are on a voluntary basis.

The Division of Fish and Wildlife (DFW) has collected data on fleet size and commercial landings (as reported by seafood buyers) since the late 1970s. Collection efforts were systematized and extended in 1982 to include data on landings, effort, and gear type. (CIC Research Inc. 1983). Data collected since 1983 is considered comparable. Data on landings made in derbies has been kept since 1985. Non-commercial (subsistence/recreational fishing) has been subject to limited monitoring since 1984. Beginning in 2000 an offshore daytime creel survey program was initiated to assess catch for all vessels. Dealers currently complete an invoice each time they purchase fish from fisherman; invoice information includes: the buyer and seller names, weight, price per pound and value of catch (by species or species group).

Currently annual reports provide information on commercial catch (but not total landings). Time series from 1983 through 2008 details annual commercial landings total and by species; number of boats making commercial landings; number of trips with any pelagic catch; inflation-adjusted average prices, revenues; inflation adjusted revenue per trip; and trolling catch rate (pounds per trip by species).

In 2011, fisheries managers noted concerns regarding incomplete participation (by vendors); incomplete listing of species (especially of bottom fish and reef species) on fish tickets; incorrect identification of species; and incomplete coverage of northern Mariana Islands. In regards to the lattermost point, data collection efforts in CNMI are confined to Saipan; landings and revenue are inflated by 30% to represent CNMI as a whole. Data collection efforts for Rota reportedly stopped in 2009. Staff within the Department of Fish and Wildlife in Tinian report that the lack of data collecting due to understaffing. In addition, the data base does not include information on catch that is kept for non-commercial use (recreational or subsistence purposes).

The CNMI Safety Boating Office maintains a data base of vessel registrations, which includes information on vessel size and primary use, for example, commercial passengers, commercial fishing, and personal use. According to Division of Fish and Wildlife staff, the current database cross references vessels and category (as commercial or recreational etc.) and thus allows one to trace how a particular vessel has changed both its catch record and type of activities over time. Data base limitations reportedly include: lack of renewal on the part of owners, lack of updating of databases, and inconsistent or inaccurate registration of vessel type. In order to facilitate the usefulness of vessel registration information, the Division of Fish and Wildlife has ongoing efforts to remove duplicate and out of date records from the database.

2.3 Location and Characterization of Boat-Based Fishing Access Points

Maps 1-3 depicts the location of marinas and launch ramps points for small-vessels, as well as primary locations of locally caught seafood sales, in Guam, Saipan, Tinian and Rota. Tables 1 and 2 provide latitude and longitude coordinates for the access points. Select photos have also been included to suggest the variety and status of access infrastructure in the region. The information was compiled to assist: 1) in assessing the size and character of the small-vessel fleet and the associated infrastructure and 2) in locating centers of activity on the land side.

Agana Boat Basin, Guam

Marina and Ramp Locations: Guam

In general, access to shoreline and nearshore and offshore waters are limited by: military closures; private land ownership; marine reserves or conservation areas; and topographical features (such as cliffs). A number of the current ramps and marinas are not frequently used due to: locations on/or near military defense sites, limited ramp size, prevailing weather conditions, or recent highway construction.

The three most widely used access points for small-vessels are Agana Boat Basin (Hagatna), Agat Marina, and Merizo Pier. Agana Boat Basin is the primary launch site for fishing on the central and northern coasts and banks. Agana Boat Basin has two ramps, four docks, ample parking for vehicles and traitors, and water (for cleaning boats). Fuel and ice can also be purchased at the Guam Fishermen's Cooperative Association. An estimated thirty fishing boats and the majority of charter operations moor here. Agat Marina and Merizo boat ramp provide convenient access to southern fishing grounds. An estimated 50 fishing boats and three charter operations are docked at Agat Marina. Agat Marina has ample parking space and a restaurant. Merizo Pier allows temporary docking and has limited parking. Facilities include restrooms and

water (for cleaning boats). Search and rescue operations are located in Agana Boat Basin and Agat Marina.

Merizo Beach Park and Pier

Three ramps are used primarily by small-vessels targeting mackerel in nearshore areas: they are located in Umatac Bay, Achang Bay, and Frank Perez Park. Umatac Bay launch site has parking facilies and water. Problems with silt reportedly limit use-ability by small-vessels. Anchang Bay has one ramp. Limited parking is available on roadside; there are no other amenities. It is also commonly used by mackerel fishermen. Frank Perez Park has one boat ramp, which allows access for boats 10-12 feet in length. A natural channel does allow access to waters beyond the reef but few fishermen reportedly travel outside of the reef to offshore waters due to the limited size of their vessels.

There are two launch ramps on the windward (east) side of the island in Talofo and Inarajan that provide offshore access to boats. Ylig boat ramp in Tafolo has customarily been used by offshore fishermen from eastern and southern villages targeting primarily reef and shallow water bottom fish and secondarily pelagic species. In calm weather conditions, as many as ten trailered vessels have been observed using this ramp (WPRFMC 2010). The ramp is scheduled to be eliminated in 2010-11 due to a highway widening project. Inarajan Boat Ramp in Acyfayan Bay was opened in 2006. The facility is susceptible to damage by surf and reportedly is not heavily used (WPRFMC 2009).

Anchang Bay Ramp, Guam

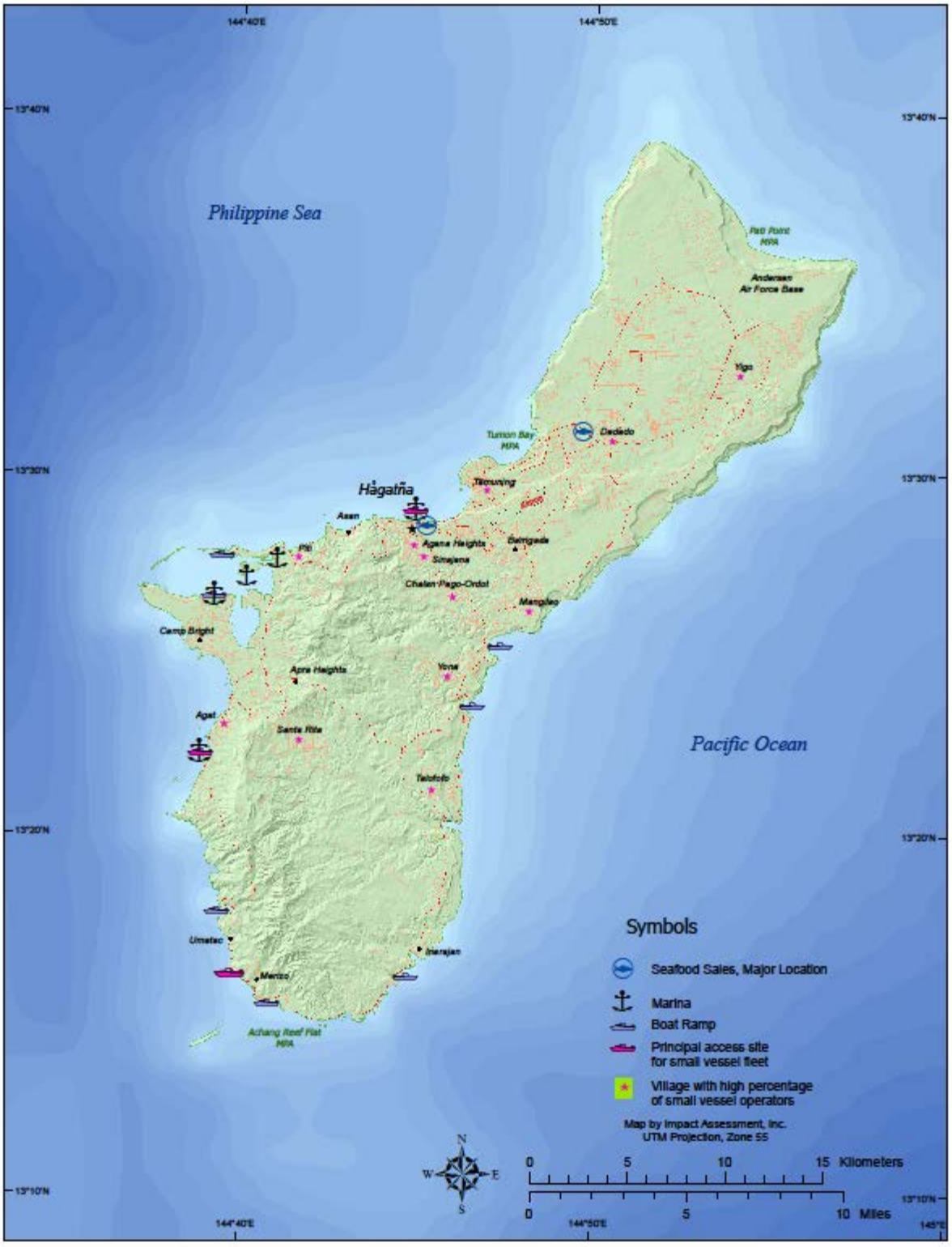
Three facilities are located in the weather protected area of Apra Harbor: Seaplane Ramp, Sumay Cove Marina, and Aqua Marine World. Seaplane Ramp has one ramp and ample parking. There are no other facilities. Only one trailer was observed during a field site visit. Seaplane Ramp is in area managed by the Port Authority and is currently defined as a "surface danger zone." Recent regulations associated with Homeland Security have reportedly restricted access. Nearby Sumay Cove is located on a naval station as such is accessible only by military personnel. Aqua Marine World has mixed use mooring and docks and is used by sailboats, fishermen, and private charter fishing vessels, and dive boat operators as well as other tourist operations. It does not have a boat ramp.

Inshore waters can also be accessed, with appropriate permission, through private properties. Depending on the presence of lagoon channels, off shores waters can also be accessed off private properties. In addition, vessel operators commonly anchor boats, during fair weather, in various locations within the reef.

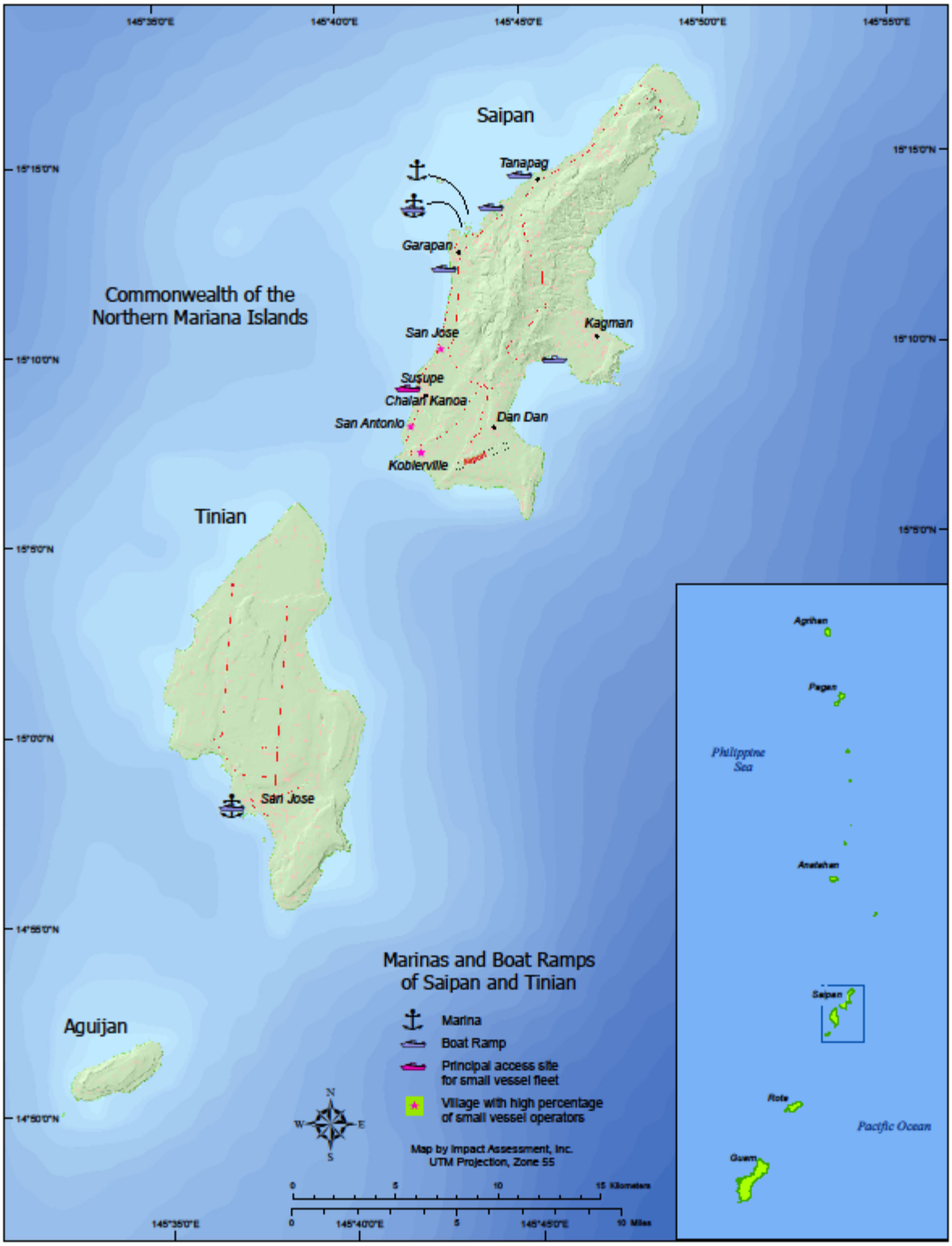
Table 1. Launch Ramp and Marina Locations: Guam

Access Point/Marina	Location (latitude/longitude)
Agana Boat Basin (Hagatna)	N 13° 28.649' E 144° 44.997'
Seaplane Ramp	N 13° 27.817' E 144° 39.621'
Aqua Marina World (aka Gerberville or Harbor Refuge)	N 13° 27.545' E 144° 41.028'
Marianas (private) Yacht Club	N 13° 27' 14,03" E 144° 40' 22.17"
Sumay Cove (military) Marina/Ramp	N 13° 26' 18.32'' E 144° 39' 15.19"
Agat Marina	N 13° 22.177' E 144° 39.063'
Umatac Bay	N 13° 17.926' E 144° 39.789'
Merizo Beach Park and Pier	N 13° 16.074' E 144° 39.901'
Anchang Bay	N 13° 15.371' E 144° 41.061'
Acyfan Bay (Inarajan)	N 13° 16.090' E 144° 44.373'
Ylig Bay	N 13° 23.605' E 144° 46.222'
Frank Perez Park	N 13° 25' 26.19" E 144° 47' 07.95"

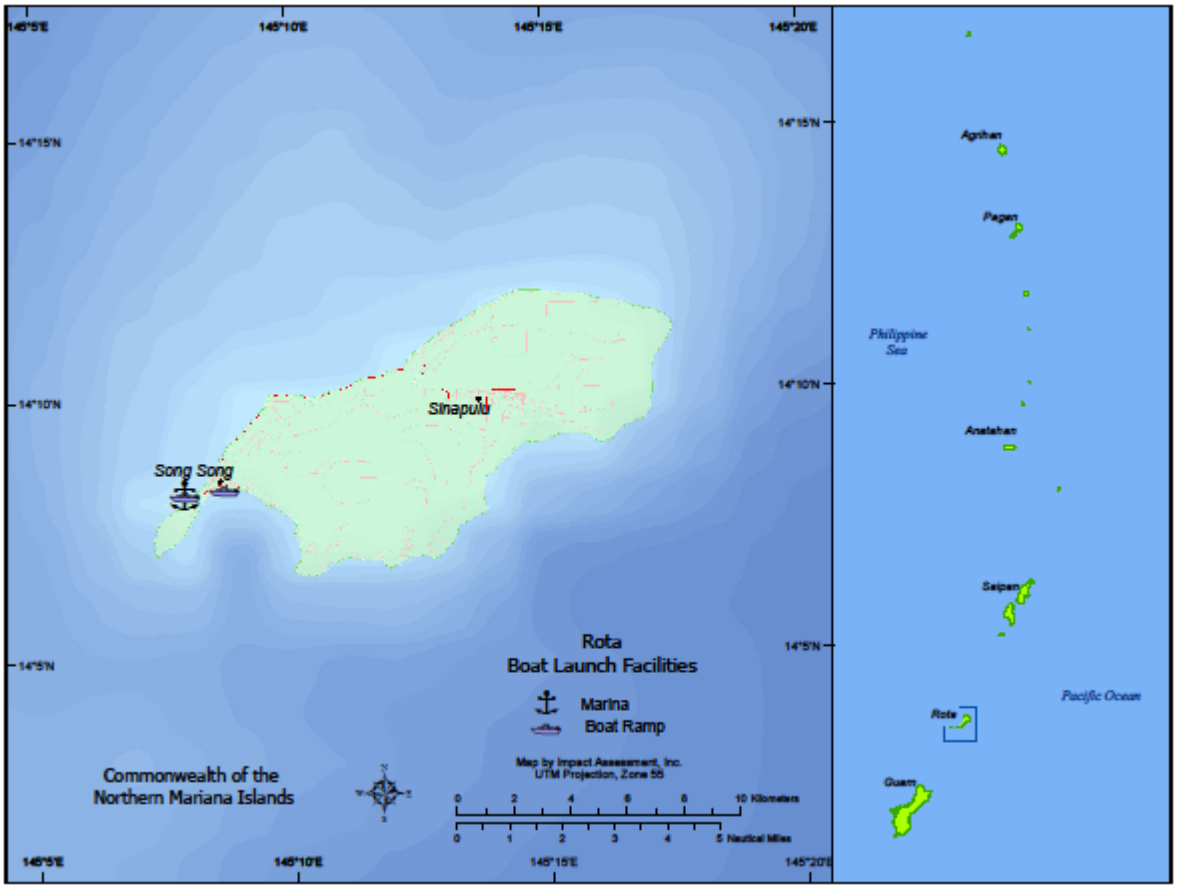
Umatac Bay, Guam



Map 1. Marinas, Boat Ramps, and Centers of Seafood Sales: Guam



Map 2. Marinas and Boat Ramps of Saipan and Tinian



Map 3. Marinas and Boat Ramps of Rota

Marina and Ramp Locations: Commonwealth of Northern Mariana Islands

Sugar Dock and Fishing Base are the most popular launch sites in Saipan for both fulltime and parttime fishermen. Sugar Dock lies in close proximity to a majority of the commercial fishing community. It is an area of high use by swimmers, shore net fishermen and tourists undergoing scuba training. Limited road side parking is available; the dock is currently under repair. A roof area providing sink and picnicking facilities are located nearby. Fishermen have reported that a lighted channel would be beneficial (Miller 2001).

Fish base is located in close proximity to fish vendors and the tourist center. It has one launch ramp and ample parking for trucks and trailers. Fifteen trailers were observed during a field visit. There are no other facilities.

Sugar Dock Ramp, Saipan

Smiling Cove Marina is the primary docking area for small-vessels in Saipan. It is used by a variety of types of vessels including, fishing vessels, sail boats and charter operations. It has floating dock space for over 60 vessels and is capable of accommodating vessels up to 60 feet in length. There is one launching ramp; launching is reportedly difficult during low tide. It has ample paved parking and a fish weighing station, commonly used during derbies.

The nearby Outer Basin is primarily utilized by large commercial vessels, the ferry, and tourist operations that provide dive boats and tour charters. The Outer Basin does not have a launch ramp.

Long-Line Vessel, Sight-Seeing Charter, and Banana Boat at the Outer Marina

Division of Fish and Wildlife Beach and Tanapag ramps are reportedly infrequently used. Both offer parking (on grass and/or gravel). There are, however, no other facilities and no trailers were observed during field visits. The latter is used by dive operators.

LauLau is on the eastern side of the island and has poor/rough road access. It is used primarily by fishermen with small-vessels (12'-15') targeting reef fish by diving and bottom fish for subsistence purposes. A natural channel permits access beyond the reef. Pelagic fish reportedly swim very close to the reef on the eastside, weather and sea conditions permitting, small-vessel fishermen will also target pelagic species. An estimated 20 boats are launched periodically from this location.

Tinian

Water access for boats is limited in both Tinian and Rota due to a coastal topography of high cliffs and narrow or non-existent reef areas. Launch and docking facilities are located on the west side of Tinian. Both are protected by a breakwall. Ample parking is available.

The current launching and marina facilities appear sufficient for the current needs of the fleet.

Tinian Dock for Small Vessels

Rota

Rota has one marina located on the west side of the island. The marina has dock space that can accommodate up to 15 boats. Launch ramps are located on both west side at the marina and on the east side. Although launching is equally easy on both sides, exiting the channel on the west

side is reportedly difficult. As such launching on the east leeside is reportedly preferred by many.

Westside Marina and Launch, Rota

Table 2. Launch Ramp and Marina Locations: CNMI

Access Point/Marina	**Location (latitude/longitude)**
Sugar Dock (Saipan)	N 15° 09.086' E 145° 42.019'
Fishing Base (Saipan)	N 15° 12.129' E 145° 42.982'
Smiling Cove Marina (Saipan)	N 15° 13.005' E 145° 43.338'
Outer Basin (Saipan)	N 15° 13.227' E 145° 43.499'
DFW Beach Public Boat Ramp (Saipan)	N 15° 13.638' E 145° 44.377'
Tanapag Ramp (Saipan)	N 15° 14.525' E- 145° 45.233'
LauLau (Saipan)	N 15° 09' 47.68" E- 145° 45' 44.44"
Marina/Ramp (Tinian)	N 14° 58' 02.03" E 145° 37' 05.94"
Westside Marina/Ramp (Rota)	N 14° 18' 04.97" E 145° 08' 00.14"
Eastside Ramp (Rota)	N 14° 08' 21.59" E 145° 08' 37.36"

3.0 Current Status of the Small-Vessel Fleet

Fishery managers in Guam and CNMI distinguish between two types of fishermen and fishing activity: fulltime fishermen (independent operators, owner-operators, or employees) that fish to sell catch and part time fishermen who either have other forms of employment or are retired that fish for recreational-subsistence purposes and also strive to recoup fishing and maintenance costs. That is, the difference between the types varies largely in terms of primary motivation and other occupational opportunities or employment needs. Research shows that these two types of boat-based fishing activity correlate with socio-cultural and demographic attributes. In both Guam and the Commonwealth of Northern Mariana Islands, fulltime commercial fishing is primarily conducted by ethnic non-indigenous minorities, although ethnic non-indigenous minorities do also fish for subsistence purposes. Indigenous local residents, in contrast, are largely employed in either the private or public sector, and fish at various levels of avidity and as time and money permit. They also on occasion sell fish. As whole that latter group is fairly affluent, has an extensive investment in his fishing vessel and gear (Rubinstein 2001).

3.1 Guam

According to the Guam Pelagic Plan Team Draft Report 2009, an estimated 368 boats were involved in open ocean fisheries in 2009; the vast majority were under 33 feet in length and were trailered. These participation figures represent a significant decline from a high of 469 boats in 1998 and a 4 % decrease from 2008 figures. Of these, approximately 200 boats are reportedly owned by members of the Guam Fishermen's Cooperative Association.

In 2009, an estimated twice as many landings came from boat based methods rather than shore based methods. Moreover, boat based fishing is responsible for an estimated 90% of commercial take. Bottom fish and pelagic fish are the common target species groups for boat based fishermen but reef species are also targeted by boat based methods of bottom fishing, spear/scuba, spear/snorkel, gillnet, trolling, roughly in that order of prevalence. (WPRFMC 2011a). The primary pelagic target species are mahimahi, wahoo, skipjack, yellowfin and Pacific blue marlin. Annual landings have varied considerably due to variations in participation and effort and weather related factors, in particular typhoons.

Trolling is also engaged in occasionally from sail boats and jet skis but neither are considered in current data collecting efforts conducted by DAWR, or in this report, as fishing is not reportedly a major purpose of their trips nor is their effort considered significant to warrant data collection.

Full-time Commercial Fleet

Based on estimates from respondent fishermen, fisheries managers and seafood distributors, there are approximately ten commercial vessels operated on a fulltime basis by immigrants from Chuuk and one vessel operated and owned by a local Chamorro resident.

Fisheries managers report that the immigrant operated commercial fleet targeting pelagic species has developed within approximately the past five years. The immigrant population reportedly

operate different types of fishing vessels, utilize different fishing techniques, target different species and also distribute to different markets. The fleet target primarily skipjack by hand-line. They fish from vessels ranging from 16 to 20 feet in length equipped with low maintenance fuel efficient outboard engines. Vessel are trailered and launched from Agat Marina and Agana Boat Basin. Catch is delivered to immigrant owned fish stores located primarily in the Dededo region and sold from coolers at flea markets and in various villages. Vessel are reportedly operated in groups with crews of up to three. In addition to currently targeting pelagic fish for commercial reasons, immigrant fishermen also actively conduct a boat-based night fishery (spearfishing) targeting reef fish (parrotfish and unicorn fish) to sell in local markets.

Local indigenous participation in fulltime commercial fishing has declined from a reported estimated six to eight vessels over the past five years to the current level of one as a result of aging and retirement or procurement of more lucrative employment.

The remaining Chamorro fulltime fisherman trolls for pelagic species with rod and reel from a 33 foot boat which he moors in Agat or at the dock in Merizo. Three to four days a week he fishes for commercial purposes focusing his effort on the south and east side of the coast (where pelagic species tend to be close to the shore). He primarily fishes from inshore to ten miles out and trolls for pelagic species when in season and bottom fish at other times Depending on prices and the amount of time he has to devote to selling fish, he sells his catch to individual stores and restaurants or the Guam's Fisherman's Cooperative. On weekends, he conducts charter operations to supplement his commercial fishing income.

Charter Fleet

There are estimated 12 charter vessels in Guam currently; some operators own more than one vessel. Charter vessels average 27 feet in length (WPRFMC 2009). The sport-fishing charter industry targets primarily pelagic species and secondarily bottom fish (deep and shallow water) in half day trips. Charter operators reportedly differ in terms of their target species and client. Some operators offer combinations trips of trolling for pelagic species and bottom fishing while others prefer to specialize in trolling for pelagic species. One operator also conducts tag and release of marlin.

Charter operators cater primarily to two different clientele: Asian tourists and US military personnel. Charter effort has fluctuated with the status of the primarily Asian tourist industry (WPRFMC 2009). As a result of a decline in tourism from the mid 1990s, many charter operators charter once to twice a week and then supplement their income by part time commercial fishing. Currently a number of charter vessels are for sale due to declines in the tourism as a result of wide spread economic recession.

Korean Tourists Board a Charter Vessel at Agat Marina

Part-time Commercial/Subsistence Fleet

In contrast to Chuukese boat-based fishermen, the indigenous Chamorro vessel owners and operators can be characterized as "opportunistic" in their fishing activities: they concentrate their fishing when weather is favorable and their jobs and time permit, and tailor their effort, methods, and target species in relationship to "what is biting." The term "weekend warrior" is frequently used in reference to fishermen who are employed in salaried positions during the work week and fish on weekends. Their trips tend to be multispecies; a typical pattern of fishing involves trolling in early hours of 5:30-9:30, turning to bottom fishing midday, and then resuming trolling late afternoon when pelagic fish species tend to start feeding again. If fish are not biting, fishermen often report staying out on the water for enjoyment. Fishermen also often fish in accordance with cultural and social events and will target those species that their wives request for (extended) family members or family and community occasions.

The primary method of pelagic fishing is trolling with hook and line; a handful of younger fishermen also spear fish for tuna, a method which was reportedly adopted from the mainland. The part time fleet fish up 40 miles off shore. There boats are commonly well equipped with VHF radios, depth finders, and GPS. Respondents also report a history of fishing various methods and also owning multiple boats of various sizes and types.

Typical "Weekend Warrior" Making a Co-op Delivery

Members of the fishing cooperative report that the avidity level of part time boat-based fishermen relate primarily to occupation, years of boat ownership, cost of boat, and age of fishermen. Cooperative members generally are employed fulltime or are retired. That is, they do not depend on fishing as their sole form of income and much like farming and animal husbandry undertake it for the purpose of home consumption and/or supplemental income. Reportedly occupations such as police and firemen afford fishermen the flexibility to take off from work and thus allow for consistent fishing activities. Recent boat owners are also reportedly more motivated to fish and sell fish in order to pay off boat loans. Two respondents reported fishing up to four days a week and every weekend throughout the year, respectively, when they first purchased their boats. Both reported considerably less effort since paying down or off their loans. Part time fishermen, regardless of avidity level, tend to fish with a "double mindset;" for the boat and for the home and report selling fish that the family-like less (such as *bonita* "skipjack" rather than the more favored *mahimahi* or *wahoo*). Most cooperative members strive to just "breaking even."

Current (high) fuel prices are reportedly influencing fishing patterns in two ways. Respondents observed that high fuel prices are deterring some fishermen from fishing as frequently whereas others who continue to fish are fishing longer and for more fish. One fishermen observed that 10 years ago, it would take the "first three fish" to recoup fuel costs, whereas currently due to increases in fuel prices, one must catch six to seven to cover costs.

Analysis of catch and price data suggest that despite relative decline in price of pelagic catch vis-à-vis operation and maintenance costs of vessels, trolling effort has not declined substantially.

Fisheries manageries suggest that in so far as fish sales are not the primary source of income, for either non-charter or charter vessels, fish price does not affect effort (WPRFMC 2009).

Military Fleet

There are reportedly ten vessels available for rental to the military personnel as part of a program of morale boosting. Military personnel also frequently patronize local charter operators. Little is currently know about the fishing effort or ultimate use of catch by military personnel.

Derby Fishing

In 1995 the first annual Guam Marianas International Fishing Derby was held. The boat derby commonly attracts 60-80 vessels (with three to four fishermen per boat) and participants come from Micronesia, Saipan, Tinian and Rota. The appeal of derby fishing lies in the opportunity it provides fishermen to network, share stories ("talk story") and win prize money. Bragging rights are also earned by the fisherman who lands a "big one."

3.2 Commonwealth of Northern Mariana Islands

Saipan

As of 2010-1, fisheries managers estimate the active small boat fleet at approximately 100 vessels. Fulltime commercial fishing is primarily conducted by ethnic non-indigenous minorities. Filipino residents, who have recently been displaced from the construction industry with the demise of the tourism boom, fish primarily as independent owners and/or operators. Recent immigrants from the Federated State of Micronesia are primarily employed for wages. Chamarros and Carolinians, in contrast, currently fish for recreational and subsistence purposes, selling catch primarily to recoup costs.
Of the 100 vessels, the majority (sixty), range from 15 to 22 feet in length and are trailered. Fishing effort is primarily focused within a twenty mile radius on day trips with two fishermen on board. The current vessel size has remained fairly consistent over the past two decades and relates to operational costs and local demand for and pricing of catch. As one longtime fishery manager observed, "there is no need for a larger vessel." Handlines, hand reels and electric reels are common for small scale fishing operations.

Of these sixty vessels, approximately ten are fished by foreigners who serve as employees to boat owners and ten are fished by residents of Saipan who are employed as independent operators. Fisheries managers report that the creation of an employment system, wherein a fishing vessel is operated by salaried crew or an independent operator, is relatively new, having developed within the last ten years. Vessel owners typically own two to three vessels and will either pay in cash or as a cut of the catch; the latter reportedly provides motivation to increase catch. Vessel owners provide fuel and gear. Vessels operated by employed fishermen typically fish on a daily basis, as weather permits.

The remaining forty vessels are owner operated and are fished on a part time basis, two to three times a week, often on weekends. Part time fishermen can be further subdivided into those who

are motivated by economic reasons and those who fish more for recreational/subsistence reasons. The former, estimated to be 25 in number, have other part time/ irregular employment and need additional income whereas the latter, estimated to be 15 in number, are unemployed and/or retired. The two types, however, often overlap in so far as both will sell fish and keep fish to eat; the percentages, however, differ. An estimated five vessel owner-operators are considered "pescadors" a term used to refer to fishermen who provide fish for important community and familial events; especially important are those dedicated to the ten annual celebrations of patron saints. *Pescadors* will customarily provide 100-200 lbs of reef fish for cooked dishes and pelagic species for *kelaguen* (a raw fish dish) for community and family celebrations.

Fulltime Commercial Fisherman, Saipan

Of the one hundred active fleet, approximately thirty range from 23 to 30 feet in length. Of these thirty, ten are fulltime commercial fishermen, ten are part-time "commercial" fishermen and ten

are part time "recreational and subsistence" fishermen. Operators of larger vessels reportedly target primarily pelagic species and occasionally will target bottom or reef fish.

In 2010, a fishery manager estimated only four commercial vessels over 35 feet in length that were active. Larger vessels fish primarily within a 100 mile radius, making trips from three to five days in length. An estimated 40% of landings is pelagic species and 60% is bottom fish. The vessels are owner operated and carry three to six member crews; all of whom are residents. The crew are all fulltime fishermen although on occasion the vessels (and crew) will fish for special social and cultural events such as weddings, funerals and fiestas.

Increase in fuel prices and low market price has had three impacts on the fleet. Data shows a general decline in boat and trips numbers, landings since 2001 as well as a high turn over rate for highliner participants (WPRFMC 2008, WPRFMC 2011a).
Fisheries managers report that the commercial vessels have reportedly gradually decreased in size even within the smallest range. In the 1980s and early 1990's boats were reportedly commonly 17-24' in length; currently boats are more commonly 14- 17 feet in length. Smaller size coupled with the use of efficient two stroke or four stroke engines have allowed operators to continue profitability in the face of increased fuel prices. The number and avidity of part-time weekend fishermen has also reportedly declined due to increased fuel prices. When fishermen do fish they reportedly sell more to cover fuel costs.

Charter Fishing

As of 2010, there were an estimated three charter boats that catered to the tourist industries conducting half and full day trips. All of the vessels were greater than 35 feet in length. Declines in tourism and increases in costs of fuel have led to a decline in the number and activity of charter vessels. In 1991 there were 27 active charter operations; in 2004 there were 12 active operations (Chapman 2004). Currently the three remaining charter vessels are reportedly "barely making it."

Derby Fishing

The first boat based fishing tournament in Saipan was held in 1985. Currently there are two big tournaments held annually by the Saipan's Fisherman's Association. The tournaments, held in March and July, are two day affairs.

Participation has ranged from a low of 50 vessels to a high of 100. Recently, an average of 70 boats has participated. The size of participating vessels reportedly range from 13 to 45 feet in length and all types of fishermen participate from those considered recreational, subsistence to fulltime commercial fishermen (employed immigrants, independent operators and owner operators). Fishermen travel from Guam to participate (just as vessels from Saipan commonly travel to Guam to participate in their derby). Size of boat permitting, four fishermen usually fish per boat.

Recently prize money has totaled $20,000. In addition to a chance of winning, participants are reportedly drawn to the camaraderie of the event and banquet that then concludes the derby. The derby draws a large crowd of spectators and represents an economic boost to the fishing community.

Tinian. Estimations of current fleet size range from 15 to 20 vessels. The majority of vessels is reportedly 12 to 27 feet in length, outfitted with outboards, and trailered to access points. An estimated one to three fishermen consistently fish throughout the week, with the primary intent of selling their catch. Boat based fishermen target bottom fish (groupers and snappers) by hook and line and pelagic species (yellowfin, mahi, wahoo and skipjack) by troll. Respondents suggest that fishing and eating of fish is more habitual, rather than geared toward a particular event.

Fishermen will frequently sell fish to cover fuel costs. And increasing fuel prices have reportedly led to decline in number of active fishermen.

Six to seven boats serve tourist clientele, conducting primarily dive trips and secondarily, charters for trolling, one to two times a month. Charter boats are reportedly owned by non-local residents and target tourists from their country of origin, Japan, China and Korea. Charter trips serve primarily as photo opportunities for clients rather than fishing trips per se, and as such charter boats do not land much catch.

In season, pelagic species run close enough to shore to permit shore hook and line fishing. There are an estimated three locations where cliff fishing for mahimahi occurs. Spear fishing is also a common fishing method. Due to limited lagoon area on Tinian, net casting is not a popular method of fishing. Tinian has not held a boat fishing derby for an estimated ten years.

Rota. Fishermen currently employ a small-vessel ranging from 14 to 18 feet in length. Vessels are trailered to launch sites. Approximately 13 are fished primarily on weekends. Two fishermen reportedly fish more frequently with the intent of selling catch. There is reportedly only one fishing vessel which has a more fuel efficient four-stroke engine.

There are currently three to four businesses that own a total of six to eight boats which serve tourist. They are used for both dive and fishing operations. In addition, there is one 45 foot boat which is used primarily to transport construction materials from Guam but will also be used occasionally for fishing.

Fishermen target bottom fish (both shallow and deep water species), which are available all year around, and pelagic species when in season. Fishing grounds for skip jack are reportedly eight miles distance and for wahoo and mahimahi two miles distance. Spear fishing, from shore and/or boat, and net casting are also common fishing methods. Fishery specialists suggest that due to the small size of the vessels within the fleet, most fishermen chose their target before initiating their trip.

The numbers and activity of fishermen has declined due to increased fuel prices. Fishermen will only pursue pelagic species “when they are biting;” reportedly word spreads quickly in the close community. Family members also often contribute money to purchase fuel for a fishing trip and make requests for certain kinds of fish.

Rota holds one fishing derby in celebration of the saint of their island, San Francisco. The derby is held in October. When prize money has been generous, up to 40 boats have participated with some coming from Saipan, Tinian and Guam.

4.0 Seafood Consumption Patterns and Distribution Channels

Traditional practices regarding collective fishing, fish sharing, and ritual and celebratory cycles as well as customary food preferences have undergone significant changes in the Marianas Islands under the influence of Spanish colonization, American governance, and Japanese occupation. In Saipan, a hybrid Carolinian and Chamarro culture has developed between what were once distinct cultural ways and social system. And as a result of Christian influence, immigrants from the Philippines and Federated States of Micronesia observe similar kinds of lifecycle and religious events that often call for fish.

Celebratory Consumption

Chamorro respondents paint a picture of communal eating that is of high frequency and quantity. Under the influence of Spanish occupation, there has been a wide spread acceptance of church rituals amongst Chamorro and as such there is a close relationship between familial life, life cycle rituals, and church occasions. Baptism, confirmation, weddings, family *novenas*, birthdays, and the final day of funeral rosaries are all occasions for a *gupot* (feast). The *gupot* is an occasion for the display of family prestige and status; families are obligated to attend and will often send a representative if obligations conflict. A characteristic feature of the *gupot* is a system of social reciprocity and gift giving of food, service, or money (*chenchule'*). Records are kept of who gives what in order to ensure future reciprocity (see Spoehr 2000). The *guput* not only requires certain kind of food is also requires large quantities as it is customary for people to carry home plates for eating the next day (called *balutan*).

Communal eating does not limited to celebration of church focused life cycle rituals they also include major holidays and village fiestas. In Guam, each month also sees from one to four village fiestas in celebration of the village's patron saint for a total of 32 fiestas annually. Secular reasons for gathering, such as the return of family from abroad or Superbowl Sunday are also frequently the occasions for a feast. The catching of fish can itself become the occasion for a feast. A highly valued reef fish or snapper will invariably call for a family gathering whereas a large tuna may bring together the family for a barbecue. The common practice of sharing food is known as *patte.*

Typically foods of Spanish influences beef, pork, chicken, rice, and tortillas "are the backbones" of the feast (Spoehr 2000). Fish, in contrast, often, according to fishermen, performs the role of centerpiece. Certain types of occasions call for different kinds of fish. The cultural preference has long been for reef fish; parrot fish, orange emperor, unicorn fish have been favorites for festivals and life cycle events. As one respondent noted, " the "oohing and ahhing is only for reef fish." The young generation have grown accustomed to large tuna and deep bottom fish such as *onaga* ("snapper"). According to one local historian and avid fisherman, the preference for larger pelagic species has developed with the establishment and growth of competitive derby fishing. Pelagic fish is also currently a common eaten during Lent; Catholic practitioners will often abstain from eating fish for the whole forty days or on Fridays. Lent occurs after the *mahimahi* season and fishermen reportedly freeze their catch in advance for consumption during Lent.

Explaining their yearly round of business, the president of the fishermen's cooperative in Guam notes the following holidays usually record an increase in fish sales: Halloween, All Soul's Day, Thanksgiving, Immaculate Conception (12/8), Christmas, New Year's and Three Kings (1/6) constitute the seven major holidays in Fall and Winter. In Spring, Valentine's Day in February, Lent in April and May "the season of graduations" also give rise to increased business. Increased fish sales in summer correlate with Liberation Day (July 21st); summer is also a popular time for weddings. All of these occasions see a spike in business due to the necessity and/or appreciation fish to mark or celebrate these occasions.

Guests with special talents or occupations are frequently depended on for providing certain food items or services to the *gupot.* Fishermen report on timing fishing trips and distributing catch to fulfill *gupot* expectations that extent through a wide social network. One longtime and older fishermen estimated that he shares his catch with ten family members on a consistent basis; he observes that he always has "someone in need [because they have a social occasion] to give." From these ten persons, his catch radiates out to countless others in family parties and village fiestas. Fishermen not only contribute to their own village fiestas but through kin, who reside in other villages, to other fiestas and communities.

Fishermen note that because there are fewer fishermen, remaining fishermen have a large responsibility that is not always easily fulfilled. The number of possible occasions and expectedness of delivering fish, the *pescador* (a term used to refer to fishermen provide fish for important community and familial events) does not necessarily have fish to provide much less sell. In Guam, the co-op can act as a safety net when one does not have luck. Although fresh fish is preferred, fishermen also frequently talked about the big freezers they have at home which help ensure a ready supply for giving or everyday home consumption. Depending on whether it is a family occasion which they are invited to or communal gathering that relatives need to be able to provide for, fishermen (or their wives) will either prepare the dish (in the former case) or just give the fish (in the latter case). In addition to being part of life cycle celebrations, religious occasions, and community events, locally caught fish is often sold to finance gifts that are part of the celebrations of life cycle rituals (Amesbury and Hunter-Anderson 2008).

Everyday Consumption

Notwithstanding special familial and community events, fish is also a favored food for everyday consumption. Results of three surveys conducted in Guam in 2001, 2002, and 2005 suggest high frequencies of local seafood consumption and high rates of sharing local catch. In 2002, as part of a risk assessment for PCB (polychlorinated biphenyls), seafood consumptions surveys were conducted in the communities of Piti, Agat and Santa Rita (communities in proximity to the specific nearshore locations of PCB concern). The surveys explored types, amounts, and source of fish consumed within households. Respondents ate fish 2-3 times a week with an average portion size of 8.9 ounces. 50% of respondents responded that they catch fish themselves or receive fish from household members, family or friend. 25% responded that they purchase fish from the fisherman's co-op, roadside vendors or flea market (that may or may not be caught locally) (QMark 2002; 411). Of the respondents who fished, 81% noted that their primary purpose of fishing was household consumption (81%); 11% noting giving to family and friends; and 3% note to sell. Allowing for multiple responses, 97% of those survey reported fishing for

household consumption; 84% to give to family and friends; 11% to sell; and 21% for recreation (catch and release). (QMark 2002: 413).

Research conducted in 2001 and 2005, also in Guam, noted consistently high patterns of and high values placed on sharing catch, primarily with family and friends. Rubinstein (2001) report that 96% of fishermen surveyed regularly share fish with relatives and/or friends. Beukering et al. (2007), report that of the households surveyed, respondents reported that 38% of all household fish consumed was caught by self, immediate or extended family, or friend.

The outlying islands of Rota and Tinian maintain a high rate of subsistence agricultural, fishing and animal husbandry practices. Residents typically raise goats, chickens, pigs and cows as well a grow taro and sweet potato as well a fish. Village stores tend to carry limited goods – snacks, drinks (alcoholic and not) rice, eggs, bacon; prices, due to transportation costs, are high. One respondent in Rota reported that her son spear fishes three to four times a week, supplying the family fish. She and her husband fish for pelagic species once to twice a year, in season.

Retaining and Celebrating Traditional Fishing Practices and Consumption

The current importance of fishing within the Marianas Islands is often referenced in terms of its cultural rather than commercial significance. Respondents frequently point to a variegated history of fishing by inhabitants of the islands, a history of (often violent) cultural oppression, and a current cultural identity that depends in part on maintaining, if not recouping, practices of the past. A (new) paradigm of ecosystem management has also led to a renewed interest in traditional resource use practices, which in turn is being used to promote cultural knowledge and practices and indigenous language use.

Respondents of Chamorro, Carolinian and Chuuk ethnicity all spoke of the importance of retaining cultural identity through fishing and fish eating as well as generational differences in fish eating preferences. According to one Chuukese seafood retailer in Guam, his generation would be happy to eat fish for breakfast, lunch and dinner but his children's generation are turning to Mc Donald's. He is proud that his store "keeps Chuukese eating their own food." According to one local historian, the Chamarros have a "desperate desire to re-establish their Pacific-ness … and fishing is an important part of it." To this end, respondents in Guam frequently noted that "without the co-op, fishing would be gone." Carolinians respondents in Saipan detailed ongoing efforts to maintain and re-introduce traditional method of fishing, sharing, preparing and storing fish along with boat building and navigation.

Celebrating the Lunar Festival on Guam in 2011

D'Arcy (2006) notes that the desire to revive traditional knowledge of ocean-going vessels spread throughout Pacific Island region in 1960s and 1970's. The desire amongst Chamorro to maintain a cultural identity is currently reflected in the promotion of the *Gupot Peskadot* "Fishermen's Festival" and The Lunar Festival. The festivals feature traditional warrior dances, music, and local crafts. Traditional foods centering around pelagic fish are cooked in a traditional earth stove. Currently there is also a historic revitalization of indigenous fish names, fishing practices, and ocean going vessels. In 2008, the Guam Tourism Education Council sponsored historians and master carvers from Chuuk to join hands to build a traditional ongoing *proa* as a way to reconnect native residents of Guam with their traditions and accomplishments as masters of the sea. Programs such as this are a way to bring together different ethnic groups together to celebrate a commonality at a time when current migration patterns can create conflicts over resources.

This revitalization has spread out to the Chamorro diaspora. Below is a reconstruction of a Chamorro traditional ocean going vessel *Sakman* built by Chamorro who reside in San Diego and displayed at Maritime Museum special exhibition of "tall ships."

Reconstruction of an Ancient Chamorro *Sakman*: San Diego, California

Research has also been conducted on the cultural transmission of traditional fishing methods in the Mariana Islands. According to Kerr (2011) many fishing techniques in the latter half of the 20th century are similar to those of the past. Of 51 different fishing techniques commonly used in the latter half of the century, almost 80% (40) have been utilized since prehistoric times. In addition, 45% (23)of historical used methods are currently used. Table 1 below provides a list of historical boat-based methods and their location of use, that involved boats. Those techniques in bold face are still in use.

Table 3. Historic and Contemporary Boat-based Fishing Methods

Method	Description	Location of Use
Batangga	Trolling method utilizing a lure	Reef edge/slope, channels, lagoons
Chenchulu	Seine method utilizing long net, once encircled fish were speared	Reef flats, shallow lagoons
Floating Dropline	Baited hook and line method with attached gourd used for deep water fishing	Offshore and lagoon
Lagua Hachuman	Conical net method, fish are attracted with bait	Reef slope
Lulai	Night fishing by moonlight, usually with hook and line	Reef edge/flats, channels
Mackerel Fishing	Multiple hook and hand line method, fish are attracted with lights	Reef slope
Poio	Chumming method utilizing large conical net	Reef slope, lagoon
Shallow Bottom Fishing	Baited hook and pole or hand line method	Reef slope
tethering	Decoy method utilizing a live parrotfish.	Reef flat/edge, channels
Torch and Spear	Lighting method to attract fish during new moon	Reef flat
Trolling	Hook and line method utilizing lure or bait	Reef slope, off shore

Selling Seafood

Catch is not only given and received through extensive social networks, fish is bought and sold through various outlets. Arguably the buying and selling of fish is crucial part of maintaining fish eating and fishing practices in both Guam and CNMI.

Currently the primary channels through which (small) boat-based catch is bought and sold are: the Guam Fishermen's Cooperative Association and privately owned and operated general grocery or specialized fish stores, and at flea markets. Individual fishermen also sell catch through door-to-door sales, to neighbors and acquaintances, from coolers at flea markets, and directly to restaurants.

Individual sales to restaurants, door-to-door, and to stores have reportedly declined over the past 20-30 years with the availability of B grade transshipped catch and the development of the cooperative and other fish markets. B grade transshipped tuna now fill restaurant's demand for high grade pelagic species, at competitive prices and available on a consistent basis supplanting what was once a demand filled by small-vessel fishermen.

Changes in rules regarding the government food services have also affected demand for local catch. Prior to 2002, all food services provided by government agencies (for example, prisons, government hospitals and public schools) were required to use locally caught fish. In 2002, the government privatized food provisioning services leading the way for cheaper foreign fish to enter through private contractors. This has led to the eventual loss of business for local vendors and an apparent decease in commercial sales of locally caught fish (WPRFMC 2009).

Catch from the charter fleet is also distributed in various ways including: serving fish to clientele (frequently as *sashimi*); retaining fish for home or community consumption; or selling fish to the cooperative. Charter operators do not give catch to tourists since it is understood that they generally do not have the facilities to store or prepare fish. In contrast, military personnel are reportedly offer their catch either to keep for consumption or to sell to the cooperative.

Fish landed at tournaments is often sold to spectators or the cooperative to defray the costs of the entry fee ($200-300). Tournaments landings are also often consumed at family gatherings, which are commonly schedules in August during the derby season.

4.1 Guam

Fishermen's Cooperative Association

The Guam's Fishermen's Cooperative Association was established in 1976 to market the catch of local fishermen. Fishermen who utilize the cooperative report saving the time it would take to negotiate prices with individual stores and deliver catch to disparate locations. The Guam Fishermen's Cooperative is the primary buyer to and channel through which indigenous Chamorro reportedly sell their catch. The cooperative also donates fish to school festivals, community events and fund raising events. The cooperative reports gross earnings of approximately $2,000,000 (for 2010) and $1,900,000 (for 2009). In 2001, the cooperative finalized a 65 year lease for a larger space and is currently planning for a new and large building.

The coop currently has a membership of approximately. An estimated 25% (some 50 fishermen) reportedly sell fish to the coop on a regular basis. Although not all cooperative members are boat-based fishermen, shore-based fishing reportedly rarely results in enough catch for selling.

In addition to buying catch, the cooperative offers members discounts on fuel, ice and fish purchases. In 2011, members saved 60 cents per gallon of gas, 75 cents off per bag of ice and 10-15% off fish purchases. Members report purchasing fish at the cooperative when they come to the shore empty handed.

Fishermen are permitted to carry balance on all coop purchases. Accounts receivable for 2010 were over $200,000 (10% of gross earnings). In short, the cooperative offers substantial benefits to boat-based fishermen regardless of their avidity levels. The cooperative has variously been described as "safety net" for fishermen; an "extension of a cultural tradition of bartering;" and " a social welfare system." Respondents commonly opined that without the cooperative, small-vessel fishing would have disappeared in Guam.

Benefits notwithstanding, respondents report that selling to the cooperative does have some disadvantages: comparatively low prices and highly variable compensation. Respondents report that a typical price to the fisherman for *mahimahi* is $2.00 per pound (whole) at the coop versus $3.00 per pound (whole) at a grocery store; in turn, the cooperative will often charge $7-9.00 per pound (filleted) to customers. That is, for fishermen that are motivated by profit, the cooperative is not competitive. In addition, cooperative pricing can vary dramatically, for example for 75 cents per pound when the pelagic species is in season and abundant versus $2.00 when less abundant.

Seafood Display at the Guam Fishermen's Cooperative Association

As of 2010, the president of the cooperative estimates that 95% of their sales are retail and their current customer base is predominantly Chamorro. The coop currently only has one retail establishment (a restaurant) to which they supply a small amount of pelagic fish. An estimated 90% of the fish the cooperative sells is local (with the predominant exception being salmon); almost 100% is from boat based fishing. Of the local fish in which the cooperative deals, 70% is pelagic species caught by trolling and 30% is reef and bottom fish caught by bottom or spear-fishing.

The composition of clientele and fish sales represents a change from the past (1990's) when the cooperative sold extensively to restaurants, which served an Asian customer base, and the government, for consumption in prisons and schools. The majority of their product (70%) was locally caught reef fish. One of the current missions of the coop is to promote the consumption of pelagic species in light of current pressures on near shore species and current environmental problems in the near shore habitat. The co-op promotes pelagic species such as marlin, mahi-mahi and wahoo over reef fish by showing how they can be prepared to replace "a featured dish" at important cultural gatherings and made into an appealing raw fish appetizer (*kelaguen*) for daily consumption.

Brick-and-Mortar Stores

There are an estimated five stores, specializing in fish, operated by and serving the immigrant community. They sell reef, bottom and pelagic fish (skipjack, yellowtail, *mahimahi* and wahoo). Reef fish is primarily imported, flown in three-four times a week from the Federated States of

Micronesia (FSM); pelagic and bottom fish are locally caught. Reef fish is reportedly imported to appeal to the taste of the immigrant population and because of their abundance in the waters off FSM. Two store operators interviewed reported purchasing pelagic species from six and ten immigrant operated vessels, respectively. According to one longtime store owner/operator, locally caught pelagic species appeared approximately four years ago and there is a growing competition in the number of buyers in the past couple of years. Local catch now constitutes the majority of his pelagic supply. He prefers buying locally caught fish as he can avoid shipping costs. Buyers report paying fishermen from $2.00 to $2.25 per lb depending on seasonal abundance; pelagic fish is sold for approximately $3.50 per pound.

Stores sell primarily to persons from Chuuk and Palau and to less extent the Filipino and Chamarro community. One owner estimates that 60% of his customers are from FSM, 20% from the Philippines; and the remaining 20% are Chamorro.

FSM Immigrant Operated Fish Store

In addition to the supply of locally caught pelagic species, B-grade long-line tuna (ie, that which is not of the grade suitable for the primarily Asian export market) caught by large, often foreign, vessels can be purchased. One business provides delivery services to supermarkets and restaurants and a trailer outlet for smaller restaurant establishments to purchase fresh and frozen

filleted pelagic catch. The trailer does not, however, have consumer clientele; the operator suggests that the lack of acceptance of food stamps may serve as a deterrent.

At the time of fieldwork, yellowfin tuna and marlin were being sold fresh and frozen for $4.95 and $4 per pound, respectively. The long-line catch reportedly currently competes against the local commercial fleet and may be one factor in the decline of the indigenous fulltime commercial fleet (see also Allen and Bartram 2008).

Selling at the Flea Market

4.2 Commonwealth of Northern Marianas Islands

Saipan

Fulltime commercial fishermen sell primarily through or to vendors. In contrast, part time fishermen prefer to sell to restaurants or to individuals in order to cut out the middle man and receive higher prices. Vendors sell only whole fish and as such large pelagic species such as marlin and yellowtail are difficult to sell. Fishermen reportedly tend to subdivide and distribute large pelagic species among family rather than sell to vendors. Catch from charter operations is reportedly served to guests or kept by operators and crew for home consumption. Fish landed at tournaments is commonly distributed amongst crew to be consumed at home or sold. A portion is also kept for the tournament banquet. Catch is also frequently donated to an elder center.

The volunteer data base collection system records thirty seafood purchasers (including fish markets, general stores, restaurants, hotels and government agencies) operating in Saipan in 2009

(WPRFMC 2011a). Of these only seven roadside vendors and one brick and mortar store are reportedly active. Fisheries managers report that the system of seafood distribution has undergone significant changes in the past decade due to the establishment of large seafood vendors. In contrast to individual fishermen/vendors, who only market their own catch, large vendors typically own and operate a number of vessels and purchase catch from independent fishermen to sell. Large vendors offer a wide selection of fish from 10-15 coolers, rather then the typical two to three coolers of the individual fisherman. Currently competition between vendors is reportedly depressing prices.

Fisheries managers also report that the number of (fulltime or part time) commercial fishermen and seafood purchasers as well as total commercial landings has decreased over the long term in response to downturns in the domestic economy. Pelagic participation peaked in mid 80's, and then grew again in mid 1990s and dropped again in early 2000s (WPRFMC 2008).

Straight from the Fisherman, Saipan CNMI

Fish vendors report that demand spikes at the beginning of the month when food stamps are distributed, on pay days (alternating Fridays for government and private sector employees), and Fridays through Sundays. Vendors also report increased demand during Lent; much of the population, regardless of ethnicity, are Catholic and follow traditional Lent practices of giving up meat. Demand also increases when the weather is poor perhaps due to the fact that recreational/subsistence fishermen may not venture out under poor conditions.

Currently the average price per pound to the fishermen is $2.50 for reef fish, from $3 to $4 for bottom fish; pelagic fish vary with seasonal and weather related abundance from 75 cents to $2.00.

Fish Vendor Saipan, CNMI 2011

Tinian

There are three restaurants and two stores in Tinian that purchase fish. Fishermen will also sell house-to-house and commonly have an established clientele. The going selling price is $2.50 to $3.00 per pound. The selling opportunities are reportedly limited primarily by demand as local residents either engage in subsistence fishing practices or cannot afford the going market rate. Three operators of larger vessels (17-20 feet) will occasionally deliver fish for sale to Saipan, when seasonal pelagic species appear in Tinian waters first. The difference in going market prices, however, reportedly serves as deterrent to selling in Saipan.

Previous attempts to support fishing efforts through consignment selling (to Guam) and a fishermen's market have been unsuccessful. The former, although offering a higher market price, was reportedly not received well by fishermen because of their need to recoup operation costs quickly.

Rota

Fishermen sell catch to three restaurants that currently serve the community and to neighbors and friends within the community (door to door or from a cooler on the roadside). One general store in downtown Rota sells fish caught by a family member, who fishes specifically to sell. Three restaurants reportedly closed in 2009 due to lack of business.

Due to the increase in fuel prices, fishermen who need to sell their catch will often check demand with local restaurants. The market price is approximately $3 per pound due to current fuel prices. One active fisherman reports the desire to create an export market for Guam, where he hopes there would be enough demand and a high enough price. The market in Saipan is generally perceived to have too much competition.

5.0 Current Challenges Facing the Small-Vessel Fleet

Participants in the small-vessel fleet report facing significant challenges in relation to fuel costs, fish prices, seafood distribution, and inadequate infrastructure.

Fuel Costs and Fish Prices

Since 2005, an increase in fuel prices has reportedly led to gradual declines in the size of vessel and avidity of fishermen. Fuel efficient four stroke engines have been available for approximately eight to ten years. Fishermen with four strike engines have a comparative cost advantage in undertaking the fuel intensive trolling method required of pelagic fishing. Their high price, however, makes them beyond reach for many fishermen. In addition, loans are reportedly hard to obtain to cover the investment costs. Due to the cost of fuel, non-fulltime commercial fishermen are reportedly only venturing out to fish when schools appear. Otherwise, many fishermen will target bottom fish. Families will often also reportedly contribute money to covering fuel costs and fish cooperatively. Increases in fuel prices have reportedly resulted in increase sales by fishermen to the Guam's Fishermen Association Coop to recoup costs.

High fuel costs impact trolling for pelagic species in particular. Depending on distance to fishing grounds, trolling can typically use twice as much fuel as bottom fishing. Fisheries managers in both Guam and CNMI note that the market prices of pelagic species has not kept up with cost of living or fishing expenses. 28 years of data collection in Guam reveals dramatic and consistent downward trend in average prices for pelagic species from an inflation adjusted price of $7.00 per pound to the current $2.00 per pound (WRFMC 2010b). In CNMI fish prices have been generally declining from what had been a steady state of $2.00-$2.50 per pound between 1992 and 2004. Fisheries managers in CNMI note that the primary target species of skipjack regularly floods the market causing declines in prices to a little as 75 cents per pound. Data on annual (inflation adjusted) revenues have also shown declines. The impact of high fuel prices and low market prices has led to a decline in the number of boats participating in the commercial sector in CNMI (WRFMC 2010b). In both Guam and CNMI, locally caught pelagic fish has to compete with filleted product supplied by the long-line fleet to restaurants and supermarkets.

In CNMI, an economic recession is impacting fishing activities. Fishing avidity and market prices were both being affected by government austerity measures, involving pay cuts and furloughs, and an ongoing decline in the tourism industry in CNMI. The former was a common topic of discussion amongst respondents because of the recent and significant challenges it was posing. The impact of austerity measures was perceived to be possibly twofold. The decrease in government employment was reportedly encouraging people to look at (other) ways to earn and save money, including fishing for home consumption and sales. High fuel prices, however, were serving an impediment to fishing.

Seafood Distribution

Fishermen in Saipan, Tinian and Rota noted challenges arising primarily from low market prices and lack of local demand. A 2001 study of the development potential of CNMI's domestic fisheries report challenges that are still germane today. Miller (2001) notes that the local market was severely impacted by declines in the local manufacturing and tourist industries. Moreover, the development of an export based small-vessel fishery was unlikely due to lack of cost competitiveness.

Competition between vendors is reportedly exacerbating declines in prices offered fishermen leading to a decline in the number of part time commercial fishermen. Fisheries managers and fishermen note that a cooperative, such as found in Guam, could benefit fishermen and consumers. A cooperative could provide the facilities and proper handling standards to process fish and as such may provide fishermen with an outlet for larger pelagic fish. Currently vendors only sell whole fish and such prefer smaller pelagic that can fit into coolers. In addition, fishermen and managers alike note that a cooperative structure might support the more casual or weekend fishermen by assuring purchase of catch at an established price.

Fishermen in Rota and Tinian noted a lack of local demand to support consistent sale of catch. Cold storage, processing, and transport facilities were reportedly required and desired to support the creation an export market.

In Guam, the president of GFCA and one local fulltime commercial fishermen report challenges arising from competition with low priced B grade long-line tuna (see also Allen and Bartam 2008).

Marine Infrastructure

Small-vessel fishermen in Guam reported inadequate infrastructure in relationship to water access points and Fish Attracting Devices (FADs). A number of ramps/access points are not commonly used by the local small-vessel fleet due to sedimentation problems, Homeland Security restrictions, and restricted access for military members only. Fishermen report that currently there are only "three functioning" ramps/marinas utilized by small-vessel fleet that targets offshore pelagic species. None of these are on the east side of the island which offers good offshore, albeit weather restricted, fishing grounds.

The numbers of FADs deployed in waters offshore Guam have varied over the last ten years. (See Chapman 2004 for full history and numbers associated with FAD programs on Guam and CNMI.) In Guam, 15-20 were reportedly deployed in the mid 2000s, none in 2007, and two to six in 2008 (Chapman 2004, WPRFMC 2010b). At the time of the fieldwork, there were an estimated four; 14 is considered to be full deployment. In 2010, DAWR received five more systems that are ready to deploy providing acceptable weather conditions. The loss of FADs reportedly requires fishermen to travel farther to access banks north and south of Guam, some 20 miles from Agana Harbor, at a time when fuel prices are high.

Infrastructure challenges in CNMI primarily relate to boat ramp access. Two of the most heavily used boats ramp are difficult to use during low tide. In addition, fishermen reported the need for a light channel at the most heavily used ramp at Sugar Dock (Miller 2001). Ten Fads were deployed in offshore waters of CNMI in 2000-2001; by 2004, only three were remaining (Chapman 2004). Although the current number of FADS was not surmised during fieldwork, fishermen in Saipan and Tinian reported the need for additional FADs.

Other challenges raised by respondents included increased predation by sharks and lack of intergenerational transmission of fishing skills and interests. Increased conflicts with sharks were reportedly interfering with trolling activities and causing loss of catch and gear in Guam. Sharks are a particular problem in the popular outer banks, such as Rota Banks (Allen and Bartram 2008). Respondents in both Guam and Saipan noted the difficulty of maintaining fishing traditions due to declines in family size, increases in fishing costs, changes in employment aspirations, and changing interests of children. Respondents pointed to the number of the unused vessels that dot the landscape as a sad reminder of the loss of fishing within the community.

Reported future challenges for the Marianas involve increases in: military presence, marine protected areas, other fishery regulations as well as changes in immigration and investment laws. The planned military build-up in Guam will reportedly result in: increased zones and times of restricted fishing (due to increases in military exercises and warfare danger zones) and increased demand on limited infrastructure (in particular as Agana Boat Basin). Currently existing military training areas to the south of the island are reportedly more frequently being closed, which require fishermen to take large and costly detours to access fishing. The military expansion will likely also impact the marine environment due to dredging for expansion of military facilities and/or increased testing of weaponry.

A military buildup currently underway will resulted in an estimated relocation of up to 40,000 persons (a 25% increase of the total island population) as military personnel and dependents, service staff, and construction workers relocate to Guam (WPRFMC 2011b). As part of the military expansion, an estimated 10-15,000 construction workers will be brought from other Asian nations, such as the Philippines and Federated States of Micronesia, amongst others. Coming from fish eating and fishing countries, these nationals will likely impact resources, market demand in various, as yet unanticipated ways. Fisheries managers note that some indigenous and resident fishermen hope that demand and profitability of boat based pelagic fishing will increase. Others share concerns about the robustness of near shore resources.

Currently there are five near shore marine preserves in Guam, three in Saipan, and one in both Rota and Tinian. Both countries have pledged to establish additional marine protected areas under the Micronesia Challenge. Additional spatial closures will likely impact shore and near shore users, rather than offshore fishermen. The closures could, however, indirectly impact boat-based fishing activity by displacement of effort and/or increased market demand for fish. Other proposed regulations that could impact the small-vessel fleet include: restrictions on the use of scuba gear for fishing, new permit regulations for participation in the commercial bottom fish fishery, and prohibitions on the sale of marlin.

A reported challenge for the Northern Marianas relates to a future change in status of many recent immigrants under the Compact of Free Association. Persons without professional status or skills may no longer be able to enter the country and those in the country may have to leave. Change in immigration law could have impacts on the size of the commercial fleet, which is comprised currently primarily of immigrant fishermen. New rules regarding foreign investment will also be implemented in 2014; these are likely to affect foreign investment in tourism and other industries with possible long term and significant impacts to the economy of CNMI.

6.0 Traditional Fishing Practices in American Samoa

Geographic Overview. The Samoan archipelago lies approximately halfway between Hawaii and New Zealand at 14° S and between 168° and 173° W. Seven islands make up the territory of American Samoa: Tutuila; Aunuʻu; The Manuʻa group consisting of Taʻū, Ofu, and Olosega Islands; Rose; and Swains Island. The islands contain 76.1 square miles of land. Tutuila Island is the largest containing approximately 70% of the total land area; it is home to 90% of the population. Aunu'u is located .25 miles of the eastern shore of Tutuila. Manu'a, Rose and Swain Islands lie 60 and 120 miles east and 200 miles north, respectively from Tutuila.

Of volcanic origin, the islands in this chain are all similar in topography: low, coastal areas with sand beaches and steep highland ridges. Nearly all of the coastlines are fringed by coral reefs with narrow reef flats. Water depths of 1000 meters lie within one-half to five nautical miles from shoreline (Fenner et al. 2008).

Early Inhabitants. It is commonly believed that the earliest settlers to arrive in the Samoan archipelago were Polynesian explorers, making landfall as early as 1000 BC. Shell, coral, and obsidian flake cutting and carving tools, shell jewelry, bone needles and tattooing chisels, and a variety of lures, fishhooks and net sinkers have been found in archeological sites in Samoa (Holmes and Holmes 1992). Archeological evidence from two of the earliest sites of habitation on Of'u and Tutuila dated fishhooks made from Turbo shell at approximately 500-200 BC (Armstrong et al. 2011). In addition to archeological evidence suggesting reliance on fish species, early inhabitants likely used sea turtle, pig and other medium size birds and mammals as food sources (Hunt and Kirch 1988).

6.1 Traditional Fishing Practices in the Samoan Region

First explorer to visit American Samoa was in 1768; missionaries settled in American Samoa from the 1830s. Explorers in the late 1700s as well as missionaries throughout the 1800s noted a variety of different types of nets, wiers, and fish hooks were a staple tool in everyday fishing. Short nets with pegged float lines and stone sinker lines were used for everyday method of family fishing called *tu ava ava*. Two persons would hold the net across a small channel while a third dove down to secure the weighted lines; other family members would splashed about, beating the water so that the fish were driven into the awaiting net (Herdrich and Armstrong 2008). O'Meara (1990:87) describes the traditional net fishing technique known as *'upega* that was conducted with canoes in the shallow inshore:

> At low tide a half dozen men set a V-shaped net in a shallow area on the inland side of the reef and then drive the small reef fish into the net where they become entangled. The men propel themselves through the water with an alternating frog kick still clothed in their *lāvalava*…Once the drive is completed in one area, they untie their canoes from the nearby coral heads and paddle to another area where they repeat the process.

Stone weirs were typically erected at the mouth of the bay or lagoon. Fishermen stood at the mouth of the weir with hand nets and caught fish as the tide came out or receded. Impermanent weirs made of coconut or banana leaves were also commonly used (Herdrich and Armstrong 2008). Early records suggest prohibitions regarding clothing and body posture, and rituals of preparatory prayer and chanting surrounded some fishing activities (Herdrich and Armstrong 2008).

Some of the most complete descriptions of fishing practices were recorded by Augustin Kramer who resided in Samoa in the late 1890's. Describing the offshore targeting of bonita (skipjack or *atu* in Samoan, Kramer wrote that they used "very neat and fast canoes" constructed of overlapping planks and propelled with three paddles. According to Kramer, bonito fishing was considered "the most elegant sport on Samoa" (1995: 225); special shells decorated the bow and stern, some being family heirlooms that had passed through generations of boats. Possession of a bonito canoe was a sign of high status, mainly because it was a sport that required great strength and endurance of the crew (Krämer 1995:300).

By the turn of the 19th century, Germany, Great Britain, New Zealand and United States all laid claim to islands in Samoa either for their agricultural resources or as a strategic military location. Long term residence of Westerners coupled with administrative programs led to a more systematic documentation of fishing practices and an understanding of the social and cultural system which surrounded the use, preparation, and distribution of land and marine resources. In traditional Samoan society, fishing was undertaken both by individuals and also groups to feed one's family and serve the community as a whole. Resources were shared by members of an extended family (*aiga*) as directed by its titled chief (*matai*). Each member of the *aiga* had responsibilities of service; untitled persons performed labor services in fields or in the water procuring food to sustain the family, maintain friendly relationships, and also to contribute to important village ceremonies and cultural events. Labor service was also the way to improve one's own status and ultimately achieve one's own position as chief. Chiefs planned and directed what was to be produced and how it was to be distributed.

As in other Pacific archipelagos, the division of labor between men and women existed (and still largely exists) in American Samoa. Researchers report that women gathered (and still gather) shellfish, seaweed, octopus, and small fish on the reef and along the shoreline. Women historically did not use large nets; instead, they used sticks, baskets (*'enu* and *ola*), and traps (*fanga fa'atau tu'u'u*). Men employed large nets, fish baskets, and spears. Men were permitted to hunt turtles, while women were not. Dangerous marine life, such as moray eels and large crabs, were caught by men. Only men fished offshore for high prestige seafood such as bonito and shark, using boats (Herdrich and Armstrong 2008). Men were also tasked with butchering the other high status protein source of pig (Bindon 1988).

The production, preparation, and distribution of all foods expressed and reinforced gender and social status (Bindon 1988). The status of the fishermen determined the fishing techniques (Severance and Franco 1989). Generally the *matai*, or "titled men" or "men of some means" had enough wealth to own nets or outriggers. *Matai* often trolled the reef during the predawn hours of calm seas. In contrast, untitled men fished with other methods. Conversely, the skilled fishermen, like the skill gardener and canoe builder was recognized for his talents and it was through these various talents that the village as a whole gained social status (Armstrong et al. 2011). The three most culturally and ceremonial species were skipjack, shark and trevali – all of

which were targeted from the *va'a alo* paddling boat. Catch of high status offshore species, as well land food, were cut and distributed according status (Severance and Franco 1989).

In a 1989 study, Severance and Franco analyze common Samoan proverbial expressions involving references to offshore fishing and the offshore pelagic species of bonita, billfish, and shark, amongst others. Proverbs involving the making of fish hooks for targeting bonita; hook and line fishing from canoes; and locating offshore fish were used to express important cultural values and appropriate social behaviors such as partnership, solidarity, perseverance, amongst others. Severance and Franco (1989:14) write "For centuries these fish… not only provided food for nutritional purposes, they provided analogies for oratorical purposes."

6.2 Changing Fish Distribution and Food Eating Patterns

As traditional fishing and fish eating practices were being recorded in the late 19th century, they were also undergoing change. Even prior to 1950, fishing practices and fish eating patterns were being influenced by western customs, especially in regards to food. Bindon (1988) notes that by the 1880s, tinned meats and fish and flour were being adopted by Samoans. By the 1930s, there was a noted increased reliance on imported foods partly attributed by observers to increases in population density (Armstrong et al. 2011). Historical records report that canned salmon and sardines were distributed at a funeral in the mid-1930's.

The pace of economic development differed between the eastern and western islands of the archipelago largely due to their historical association with different Western countries and resulting different political status. Western Samoa was granted independence from New Zealand in 1962; it would later change its name to Samoa. As an "unincorporated" and "unorganized" territory of the United States, American Samoa has benefitted from development aid from the US government and citizens enjoy the opportunities of emigration to the United States. The division between American Samoa and (Western) Samoa is essentially political and economic. (Western) Samoa, largely untouched by rapid economic development, has an economy largely based on subsistence agriculture and fishing and dependent on remittances from abroad. Residents continue to be culturally, commercially and through kin relationships connected and frequently commute between the two islands.

World War II brought rapid economic development to American Samoa as Pago Pago became an active military facility. The war years brought, albeit momentarily, troops, cash, and employment opportunities for many American Samoans. Traditional subsistence practices were abandoned by many in lieu of employment and importation of foods, such as canned meats and fish, flour, sugar and even bananas, normally locally grown, increased because local production was insufficient (Bindon 1988). Offshore fishing was also banned during the war years (Severance and Franco 1989).

With the relocation of the military at the end of the war, the wage based economy largely disappeared and a recession ensued. Seemingly unwilling to return to a subsistence lifestyle, some 10% of the population emigrated between 1951 and 1956 (Bindon 1988). A second, more long lasting wave of economic development began in the 1960s with the establishment of the tuna canning industry.

The introduction of aluminium dinghies and outboard motors, as well as modern gear, dramatically changed fishing practices in many Pacific Island countries (Chapman 2004). Outboard motors allowed fishermen to fish farther offshore. But more importantly, distribution patterns changed as fishermen had to recoup the costs of fuel and engine maintenance by selling fish. A 1968 study revealed that fishermen were selling fish (wholesale) to merchants, (retail) at a market while also continuing to give fish to chiefs and ministers as well as hospitals (Bindon 1988). Some areas and some traditional practices, however continued, unaltered; for example, hand line fishing from canoes in reef areas. In addition, residents in outlying islands of Manu'a continued utilizing the traditional paddle boat *va'a alo* for fishing to skipjack into the early 1970's.

The 1960s also witnessed a growing dependence on supermarkets and on imported food for everyday food needs on Tutuila Island. Even traditional staples such as taro and banana had to be imported. The decline in subsistence activities and ascendency of wage labor attenuated the power of the chiefs and his power was traditionally based on his control of family agricultural land. In terms of fishing practices, the authority of the fishing specialist *tautai* decreased with the development of new fishing technologies that required less cooperation (Dye and Graham 2004). Fishermen also planned fishing activities less under the chiefly direction and more by the fishermen's understanding of family and village obligations (Severance and Franco 1989). As Dye and Graham (2004) note canned and frozen food stuffs became understood as prestigious items, due to their association with cash economy, and thus were deemed as appropriate if not preferred for important cultural events, such as weddings and funerals. Even though population increased, total and per capita catch records in the shoreline largely subsistence fishery, showed steady declines suggesting an increased availability of imported fish and changes in food preferences (Fenner et al 2008,Sabater and Carroll 2009).

Canned Fish Stocked at Local Grocery Store, Tutuila Island

Bindon (1988) explores how the change from a subsistence economy to wage labor affected dietary patterns in the mid 1970s and early 1980s. Dietary surveys suggested that families adopted two different adaptive strategies to food procurement as wage labor and education system drew men, women, and children from traditional patterns of subsistence production. As Bindon (1988:67) notes, in some families "the plantation becomes smaller, fishing activities are foregone, and reef gathering becomes an infrequent source of food." In these families, imported foods predominate; imported starches such as rice replace taro and imported flesh foods replace the preferred traditional fresh foods of fish and pork. The choice of which imported flesh food – chicken, beef, pork – was to be consumed was based largely on economics. That is, the more reasonably priced food often won out. Bindon (1988:74) writes of economic calculation of time in a wage economy: "If a Samoan makes a habit of fishing, he must enjoy the process for its intrinsic value, not for the production of flesh foods for his family."

A second strategy to food procurement involved families recruiting young adults, often from Independent Samoa or Tonga, to help maintain plantations. These families were more likely to continue to consume substantial amounts of the traditional food items of taro, banana, yam, coconut and breadfruit. In areas where wage labor was less available, such as in Manu'a island, subsistence production in general and fishing in specific also remained largely unchanged.

Surveys of dietary practices also suggested that many families continued Sunday traditions of communal gatherings and the traditional gender division of labor whereby men provided fish and prepared the meals in the traditional *umu* oven. The choice for traditional ceremonial meals, such as wedding feasts and inductions of *matai* (chiefs) still often required taro, roast pig and fish as these maintained their importance as prestige foods and also called forth traditional notions surrounding status and gender. By the 1970s and 1980s, however, food for these events were more likely purchased, often in government supported markets, rather than raised by the family. Bindon (1988) notes that a preference for traditional foods was expressed in many families by under-consuming during the week followed by feasting on Sunday.

Studies conducted in the 1990s suggested that traditional status fish of *atu* (skipjack) was still part of marking important cultural events and that fishermen were still engaging in important traditional forms of resource distribution. Interviews conducted with 60 fishermen in 26 villages in American Samoa found that 35% of the respondents sold less than half of their catch, 42% of the respondents contributing fish to important family events (such as weddings, funerals and inductions of chiefs) as *fa'alavelave*, and 32 % respondents reported offering unsold catch as *fesoasoani* " assistance" to kinsmen. On average respondents reported contributing catch to village meetings 22 times, providing fish as *fa'alavelave* three times. (See work done by Severance et al. in 1999, as reported in URS Corporation 2001).

The size of the fishing fleet as well as the ability of fishermen to continue maintain traditional forms of resource distribution have been impacted a series of development projects. As one respondent noted, there have been a number of "booms" in response to the availability of funding for boat investments; "busts" have often followed as fish prices drop in response to increase supplies or exports markets feel to meet expectations of profit margins.

6.3 The History of Fisheries Development Projects

Throughout the Pacific Islands, countries and territories began developing their fisheries with an eye to commercial participation in the 1960s and 1970s (see Chapman 2004). To this end, fisheries data collection efforts were initiated in the early 1970s. Boat building projects; FAD deployment programs; training material and instruction in navigation, marine electronics, outboard engine repair, new fishing technologies; and low income loan incentives were all in time also established. (See TEC Inc. 2007 for a full history of the development projects as well as an overview of the various challenges faced.)

The first fleet development project directed toward boat building was initiated under the American Samoa Office of Economic Opportunity in 1972. Twenty three wooden dories were built and made available under a low interest loans. The majority of these vessels engaged in a shallow reef bottom fishery on Tutuila Island (Levine and Allen 2009).

In the 1980's, a larger more powerful fleet of catamaran vessels, called *alia*, developed under the influence of fishermen from Independent Samoa. Measuring 28 to 32 feet in length and designed to be light and fast, the vessel permitted expansion into more distant fisheries (Preston et al. 1987). The vessels, first made in plywood and later in aluminium, were fished with a crew of two to four in half to full day trips. In the 1980's as part of fisheries development programs occurring throughout the Pacific Islands, fishermen were also trained in new fishing and handling methods for deepwater snapper and skipjack tuna; FAD programs were established to facilitate fishing, and fish markets and ice facilities were funded to support the these development initiatives (Chapman 2004, Preston et al 1987).

Operators of the *alia* primarily conducted hand lining for bottomfish and trolling for pelagic species of skipjack and yellowfin. Bottomfish, which comprised the majority of the catch, for much of the 1980s was for a brief while exported to Hawai'i by air and marketed by fishermen at a local fish market, in Fagatogo. Subsidization of the fisheries during the 1980's led to an expansion of the fleet; throughout the 1980s the fleet ranged from 60-80 vessels. Problems with local competition from the by catch from cannery vessels, lower than anticipated prices in the export market, and the occasional delays and refusals to pay by the Hawai'i fish auction eventually led to a attrition of the fleet and shift from bottom fishing to the trolling and long lining of pelagic species (Itano 1996). The bottom fish fishery was also challenged by competition from imports from Tonga and Independent Samoa and limited habitat and resources (Craig et al. 1993). Hurricanes in 1987, 1990, and 1991 also struck American Samoa damaging both vessels and infrastructure (Chapman 2004, Levine and Allen 2009).

The next major changes to commercial fishing began to take place in the mid 1990's when the *alia* fleet switched to a long-line method, also under the influence of fishermen from Independent Samoans who had moved to American Samoa to avail themselves of the proximity of the canneries. The long-line fishery subsequently developed in American Samoa in response to the desire to target the larger pelagic species of albacore that was valued by canneries. The method also reversed declines in CPUE that were taking place in the troll fishery and fishermen found that they could save considerably on gas consumption. The early small-vessels that long-

lined set lines with 350 hooks and provided power by hand (WPRFMC 2010b). Vessels were fished on multiday trips and largely crewed by residents of Independent Samoa.

Mono-hull Long-,Line Vessel, Pago Pago, American Samoa

By 2000, the long-line became the predominant method for targeting pelagic species commercially. Albacore was sold locally to canneries and other pelagic species filled domestic demand through sale (at stores and restaurants), donation to cultural events, and home consumption (WPRFMC 2011b). Trolling retained its popularity primarily amongst fishermen who fished part time and in competitions. The majority of the catch was retained for home and community consumption. Although locally caught pelagic species was an insignificant part of the cannery market in comparison to the volumes of catch from US purse seiners and foreign long-liners plying international waters, they exceeded the local sales of either the bottom fish or shoreline fisheries (Craig et al. 1993, URS Corporation 2001).

In the latter half of the 1990s, vessels also changed - *alia* sizes increased from 32 to 38 feet in length and mono-hull vessels also appeared. Changes in the size and shapes of vessels reportedly resulted from the higher valued cannery market; small *alias* did not have the deck space to handle fish properly for the canneries.

The first large longline mono-hull to arrive in American Samoa measured a length of 89 feet and fished with a crew of seven on journeys up to three or four weeks (Levine and Allen 2009). With a capacity of some 44 tons and mechanically powered reels with tens of mile of monofilament and 1000 hooks, the vessel was truly a commercial fishing vessel and it set the standard for other fishery participants. Capital investment, however, proved an obstacle to high rates of participation by American Samoans. In 2002, only one-third of the long-line permits issued to vessels over 50’ in length were owned by American Samoans (WPRFMC 2010b). By

the mid 2000s mono-hull vessels predominated and as one fishery manager described “the era of the *alia”* ends.

A Field of Unused *Alia* Vessels

In the early 2000’s, the government of American Samoa identified the importance of pelagic fisheries due to limitations on reef and bottomfish species; increased population pressures; and costs of imported food. Economic development plans in the early and mid 2000s have identified the following high priority needs: the building of a fish processing facility for long-line (by)catch that is not bought by canneries, a fishermen’s market to support the small-vessel fleet, and small boat marina with berthing and boat servicing areas (TEC, Inc. 2007).

7.0 Overview of Databases and Data Collection Efforts

Collection of fisheries information was first instituted in American Samoa in 1972. The types, means and extent of information collected has evolved over the past 40 years and today includes six separate programs overseen by the American Samoa Department of Marine and Wildlife Resources (DMWR) and the National Marine Fisheries Service (NMFS). (See American Samoa Department of Marine and Wildlife Resources and the Western Pacific Fisheries Information Network 2010 for a detailed discussion of the history of data collection efforts and current data collecting procedures.) DMWR in coordination with the Western Pacific Fisheries Information Network provide data base figures and interpretations in annual reports. Report content focuses on fishing effort, landings and price in various time series (depending on starting point of different collection programs); not all data collected at the local effort are included in annual reports, for example,(changes in) channels of distribution.

Of particular relevance to the small-vessel fleet are the boat based dockside creel surveys and commercial receipt program. DMWR has conducted surveys of offshore commercial boat based activity since 1982; commencing in 1986, creel survey data was collected for all types of catch – commercial, recreational and subsistence – for both Tutuila and Manu'a Islands. Currently surveys are taken three times a week, two weekdays and one Saturday or holiday per week. Information that is gathered includes: fishing gear and method; home residence and area fished; species type, weight and count; disposition of catch (for sale or home consumption); trip time and total hours fished, and price per pound. All creel surveys involve randomization of data and as such do not fully cover all effort; estimations of total and commercial landings are calculated through expansion methods. The primary survey route is from Pago Pago to Faga'alu. Other common areas where boats will land outside of the survey route, such as Fagasa and Asili are reportedly covered on a opportunistic basis. Beginning in 1996 and systematized since 2000, catch and effort data has been collected for long-line fishermen through a self-reporting logbook system.

The Cannery Purchase Program has been in existence for several decades and collects information of foreign and domestic owned vessels. Beginning in 1990, data collection efforts were extended to cover restaurants, stores, and roadside vendors through the Commercial Purchase Program. These sale outlets are as mandated by law required to provide trip ticket data by the 16th of every month. In 2001, the Cannery Purchase Program began to collect data on the percentage of catch that is sold to canneries, on the local market, and remains unsold.

During 2011, fishery managers expressed concerns regarding incomplete data collection coverage for small-vessel fishing, outside of Tutuila Islands, and recreational fishing effort. Currently data collection efforts do not include Aunu'u Island, where in some years the number of active vessels exceed those of Tutuila Island. In addition, collection efforts for the Manu'a Islands have little oversight, causing fisheries managers concern regarding reliability. Due to anticipated development of fisheries in Manu'a Islands, discussed later, fisheries managers are concerned that current collection efforts will not be adequate. In 2009 DMWR was coordinating with recreational fishermen, through the sport club, to provide catch data. The Department was particularly concerned that effort for Sundays be captured. Efforts for cooperation were way

sided by the 2009 tsunami and have not been resumed. Commercial receipt data collection system also suffers from incomplete compliance.

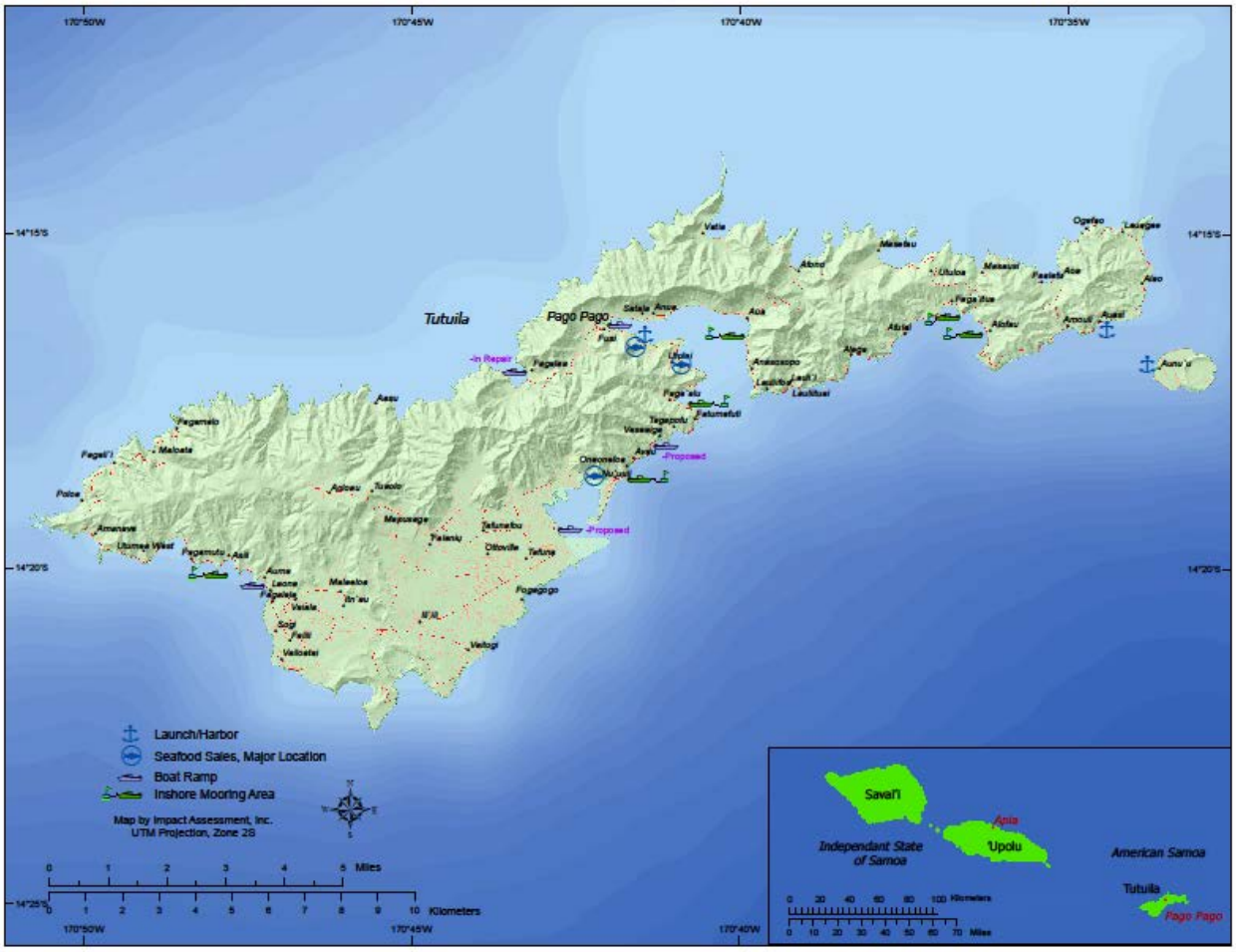
Fisheries managers report problems with under-reportage of catch. To this end, managers note that successes in achieving compliance have resulted from creating exceptional rapport and utilizing networks of friendship within the fishing community. To increase ease of collecting data, DMWR has been pivotal in the opening of a new fish market in July 2011. The market provides ice, cleaning facilities, and display sinks for use by the small-vessel fleet.

The Department of Public Safety maintains registration records for all motorized vessels. DMWR has sporadically taken inventory of all vessels throughout the island. Fisheries managers report the difficulty of maintaining a record or accurately gauging the activity of all vessels due the number of small-vessels, of uncertain condition, dispersed throughout the island.

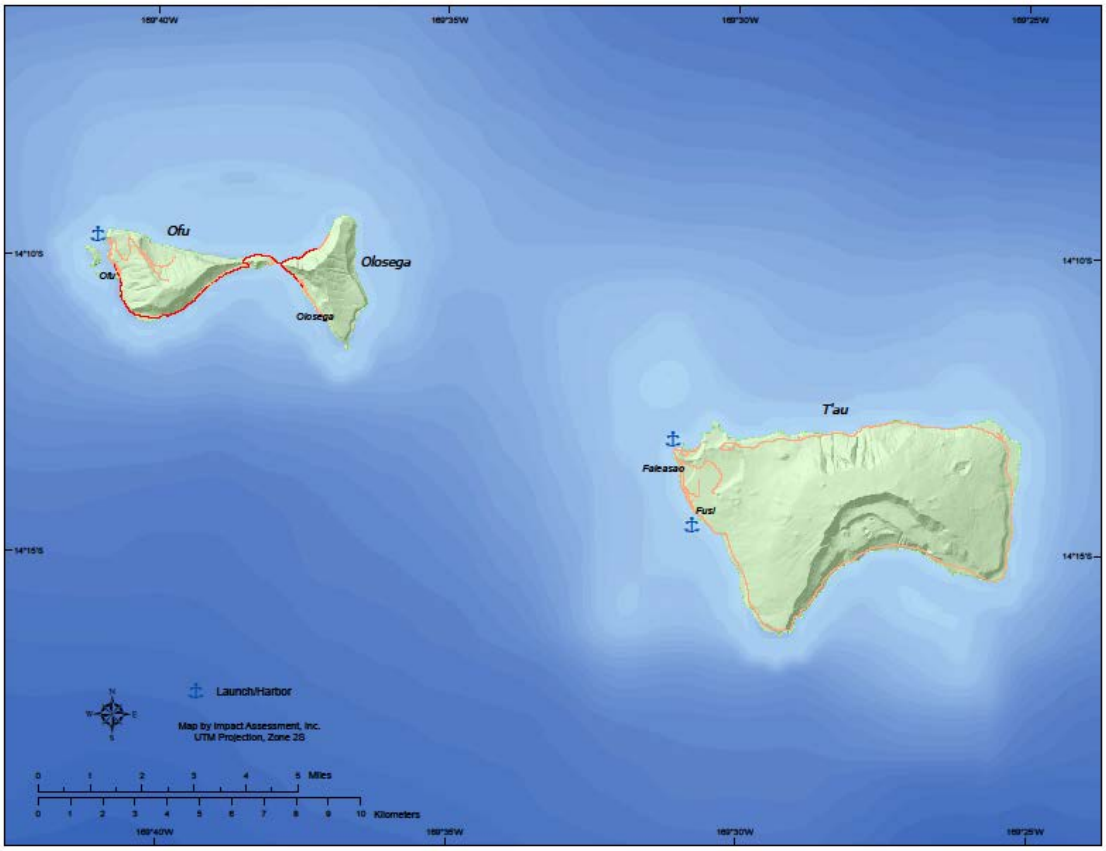
8. 0 Location and Characterization of Small-Vessel Access Points: American Samoa

Maps 4 and 5 below depict the location of access points, marinas, and common mooring sites for small-vessel fishing in the islands of Tutuila, Aun'u, Ofu, and Ta'u, American Samoa. Tables 3 and 4 below provide latitude and longitude coordinates for the access infrastructure. Select photos have also been included to suggest the variety and status of infrastructure in the region. The information was compiled to assist in: (1) assessing the size and character of the small-vessel fleet and the associated infrastructure, and (2) locating centers of activity on the land side.

In 2009, a tsunami destroyed important infrastructure as well as a significant percentage of the small-vessel fleet. The following discussion details the state of current infrastructure as well as ongoing repair efforts and future development plans.



Map 4. Marinas, Boat Ramps, and Centers of Seafood Sales: Tutuila and Aunu'u Islands



Map 5. Marinas and Boat Ramps: Manua'a Islands

8.1 Small-Vessel Infrastructure: Tutuila and 'Aunu'u Islands

Currently the public ramps utilized by the commercial, subsistence and sports fishing fleet are located in Fagatogo (within Pago Pago harbor), Au'asi (on the south east of the island), and Fagasa Bay (on the north side).

Fagatogo is the primary access point for banks and FADs located on the south side of the island. Proximal fishing grounds, popular amongst recreational and subsistence fishermen are located approximately three nautical miles south and six nautical miles southwest, from the marina/launch ramp in Fagatogo. Three FADs are currently located on the south side of the island eight, ten, and sixteen miles, south, southwest and southeast, respectively, of Pago Pago harbor. More distant grounds, favored by more avid and commercial fishermen in favorable weather conditions, are located in banks to the northeast and southeast of the harbor 30-40 miles offshore.

Small Vessel Marina, Fagatogo, American Samoa

Located within Fagatogo is a small-vessel infrastructure comprised of floating docks, loading ramps, pier, and launch ramp. The shore-side support facilities for small-vessels are minimal. The marina does not provide fuel or ice facilities; these can be procured adjacent to the marina in an independently run gas station and grocery store. Samoa Fish Processing recently built ice facilities for the small-vessel commercial fleet. There is no boat building facility, although one company has a slipway and does maintenance work on vessels from 10-50 meters in length (Chapman 2004). At the west end of Fagatogo, the launch ramp provides ample parking and areas where one can work on vessels. Fagatogo also has a pier for the large long-line fleet, government vessels, and yachts.

Launch Site, with Parking and Vessel Repair Area: Fagatogo, American Samoa

Facilities in Au'asi harbor include: a boat ramp, pier, ample parking, and primitive bathroom. A nearby grocery store sells ice. The Au'asi harbor serves as the major water access point for boat transport between Tutuila and Aunu'u Islands.

The Fagasa Bay facilities are limited to a launch ramp. The north side of the island is favored for fishing when southeast winds prevail. The ramp reportedly has a difficult entry and also necessitates that one tow one's boat over a steep mountain pass.

In addition to commonly used public ramps, there are private ramps in Faga'alau, Aua, and Faga'itua. The private ramp in Faga'alua was quite heavily utilized by recreational fishermen while the Pago Pago harbor facilities were under repair. The degree of use of the latter two ramps was not ascertainable. Currently, there are plans to build public ramps in Faga'alua and Nu'uli's Industrial Park. Currently there are no ramps on the west side; fishery managers report that community members have expressed the need for ramp in the Leone/Asili region.

Outside of the harbors and marinas in Fagatogo and 'Aunu'u, fishermen commonly moor vessels in near shore protected areas, near their residence. Moored vessels and/or mooring buoys were observed in the following locations: Faga'itua, Alofau, Aua, Faga'alu, and Asili. In addition. Asili, Fanga'alu Bay, Fagasa Bay, and Au'asi Harbor offer areas for mooring when fishermen encounter bad weather or are fishing in areas distant from Pago Pago Harbor.

Ausia Harbor, Tutuila Island, American Samoa

Small-vessel marine infrastructure located in Pago Pago harbor and Faga'alu Bay received major damage during the 2009 tsunami. Launch ramps, floating docks, and processing plant, which was being built to fillet and pack by-catch for local sale and export, were destroyed or damaged. Repairs to the launch ramps took approximately one year to complete during which time, some vessels utilized a private ramp in Faga'alu Bay. Although repaired, the boat ramp at Fagasa Bay was inaccessible due to road construction at the time of the fieldwork. Amanave, Asili and Leone, on the west side of the island received heavy damaged in 2009 and the hulls of vessels were observed on the beaches during the fieldwork period.

Moored troll *alia* vessel: Aua

Table 3. Launch Ramp, Marina, and Inshore Mooring Locations: Tutuila and Aunu'u Islands

Access Points	Location (latitude/longitude)
Inshore mooring area	S 14°16' 30.7" W 170° 39' 52.6"
Inshore mooring area	S 14°16' 05.3" W 170° 36' 47.8"
Inshore mooring area	S 14° 16' 22.7" W 170° 36' 17.2"
Harbor (with breakwater and dock) and launch ramp	S 14° 16' 16.4" W 170° 34' 23.1"
Public Launch ramp (in repair)	S 14° 17' 17.5" W 170° 43' 27.1"
Marina (with floating docks) and launch ramp	S 14° 16' 23.9" W 170° 41' 59.6"
Inshore mooring area	S 14° 17' 32.7" W 170° 40' 55.1"
Proposed site of public launch ramp	S 14° 18' 06.0" W 170° 41' 19.1"
Inshore mooring area	S 14° 18' 39.5" W 170° 41' 52.8"
Proposed site of public launch ramp	S 14° 19' 23.3" W 170° 42' 50.3"
Harbor (with break wall and dock) and launch ramp	S 14° 17' W 170° 33'39"
Public launch ramp	S 14° 20' 10.8" W 170° 47' 15.4"
Inshore mooring area	S 14° 19' 51.7" W 170° 47' 44.8"

8.2 Small-Vessel Infrastructure: Ofu and Ta'u Islands

The island of Ofu has one marina with breakwater, pier and public launch ramp. The island of Ta'u has two marinas with launch ramps, on the northwest and west sides of the island. Ramps provide ready access to popular grounds on the westside of Ta'u and along to the south of Ofu in close proximity to the islands.

Currently ice and fuel facilities are being developed in both Ta'u and Ofu and are scheduled to be in use by late summer 2011. Marine infrastructure on Manu'a islands were not impacted by the 2009 tsunami.

Table 4. Launch Ramp and Marina Locations: Manua'a Islands

Access Points	Location (Latitude/Longitude)
Harbor and Public Launch Ramp	S 14° 13'15.56" W169° 30'54"
Harbor and Public Launch Ramp and Proposed Site of Ice and Fuel Facilities	S 14°14'24" W169° 30' 38"
Harbor and Public Launch Ramp and Proposed Site of Ice and Fuel Facilities	S 14° 9'48.6" W169° 40' 51.17"

8.3 Characterization of the Small-Vessel Fleet

The number of small-vessels actively fishing was substantially impacted by a 2009 tsunami; the tsunami destroyed a sizable percentage of the small-vessel fleet as well as important infrastructure. The current enumeration and characterization of the fleet takes in consideration the extent of damage; ongoing efforts to and challenges of repairing, building, and replacing impacted vessels and infrastructure; and likely long term perspectives for the fleet.

Fishery managers define "active" as fishing once to twice a week. As such, in 2008, data collection efforts report 57 active vessels: 51 vessels were home ported in Tutuila Island and six in the Manu'a Islands (American Samoa Department of Marine and Wildlife Resources and the Western Pacific Fisheries Information Network 2010).

Fisheries managers report that the current small-vessel fleet is considerably smaller. The 2008 figures include 27 large vessels (greater than 50 feet). Between 2009 and 2011, two large vessels, involved in the bottom fish fishery for the export market ceased operations. Fishery managers also report significant tsunami related damage to moored vessels and infrastructure; loss of gear due to tsunami also impacted fishing activity. Over 30 small-vessels, pursuing a mix of commercial, subsistence, and recreational fishing, both in long-line and troll, were damaged in Tutuila Island and four on Aunu'u Island; an estimated half of these were active. An estimated half of the active *alias* have not yet returned to fishing, as well two to four large (greater than 50 feet) long-liners. Fisheries managers note that increased employment in the construction, as part of FEMA assisted post-tsunami building, have provided some fishermen with work opportunities. For the present, this may be keeping some fishermen from resuming fishing activities while it also provides the necessary monies for repairing damaged vessels and replacing lost gear.

It should be noted, that the bulk of fishing is conducted by *alias* and mono-hulls that are moored. In contrast, sports fishing vessels used for recreational and subsistence purposes are trailered.

Thus a higher percentage of active commercial and subsistence *alia* fishing vessels were damaged by the tsunami than sports fishing vessels. In addition to boat-based fishing activities, the tsunami also affected shore-based fishing. Fisheries managers report that the Environment Protection Agency warned of health hazards of consuming fish and people were in general afraid to approach the shore. Reportedly, boat based fishermen did not resume fishing activities for some four months and residents did not resume shore-based fishing activities for approximately six months after the tsunami. Staff at DMWR resumed creel surveys as fishermen returned to fishing and their own damaged vehicles were repaired. Tsunami relief, in the form of readymade food, canned goods and water, reportedly came quickly, thus potentially reducing the need for subsistence fishing.

At the time of fieldwork in the spring of 2011, the active commercial orientated fleet was comprised of 16 active vessels: eight located in Tutuila Island, two in Aunu'u Island, two in Ofu Island, and four in Ta'u Island. Within the Tutuila based small-vessel fleet, one long-line vessel is used to target the pelagic species of albacore and big eye; one is engaged solely for trolling for pelagic species; three vessels are fished in combination of bottom fish and trolling; and two vessels are utilized for spear fishing. With the exception of the one long-line vessel that delivers catch to the cannery marker, the remaining vessels fish for the local market.

Most small-vessels do not carry large quantities of ice for fish storage due to limited capacity and safety issues. Fish is typically stored in coolers. Long-line fishing, combination troll and bottom fishing, and troll only fishing typically occurs on day or overnight trips within 20 miles of shore with crews of two to three. Spear fishing is commonly undertaken from 10 pm until early morning. Vessels conducting spear fishing operations typically carry four to eight fishermen. Two methods of remuneration are common in the spear fishing fishery. Fishermen pay the boat owner for the use of the vessel, split operating costs and market their own fish. Or the boat owners will provide the vessel, fuel and gear for a percentage of the catch, typically 35-40%; the boat owner will also market the catch and pay the fishermen accordingly.

***Alia* Long-Liner and Troller in Pago Pago**

Vessel operators based in Aunu'u Islands currently fish on weekends primarily for bottom fish; they reportedly use their vessels extensively for transportation between Ausi Harbor in the southeast of Tutuila Island and Aunu'u harbor during weekdays. The Manu'a based fleet engage in a combination of bottom fishing, trolling and spear fishing. No long lining is currently conducted by Manu'a based vessels.

Currently, small-vessel owners and operators note difficulties finding crew, decreases in cannery prices offered for albacore, and increases in fuel prices as deterrents. Reportedly increasingly stringent rules regarding immigration have resulted in problems hiring crew from Independent Samoan. In addition, other employment opportunities often compete with those within fishing. Notably, after the 2009 tsunami, employment opportunities in the construction industry increased drawing away persons who had in the past participated in the commercial fishing industry.

As discussed in greater detail later, the size of the small-vessel fleet has also long been significantly impacted by the availability of inexpensive by catch, or miscellaneous catch, from the large vessel long-line and purse seine fleet. Fish also makes it way to American Samoa from Independent Samoa. Brought over both by ferry and plane, the fish makes it ways into the market for sale and supports important cultural events.

As the fleet recovers from tsunami damages and also responds to challenging market conditions, in both the local and cannery market, the size and types of vessels and methods of fishing will likely change. At the time of this report, boat owners have not received any aid to repair the damage to vessels. Some fishermen are slowly repairing boats whereas others will probably never. Time, adequate funds, and appropriate market conditions could see many of the damaged or previously unused *alia* resume fishing activities for subsistence or commercial purposes. Made of aluminium, the *alia* is considered to be a durable vessel that can be repaired, as long as major damage to the hull has not occurred. Replacement hulls, however, are costly Currently fishermen are reportedly switching to small (less than 25') mono-hulls as they reportedly cheaper than *alias* and require fewer crew members. In addition, fishermen who are entering the fishery (for a combination of subsistence and commercial motives) are engaging in trolling rather than long lining. Although fuel expenses for trolling are comparatively high, the initial investments for equipment are lower.

Two fisheries development projects are underway that could impact the size of the small-vessel fleet. Fishery managers report an expectation of increased numbers of active fishing boats in Manu'a due to the current development of ice and fuel facilities on both Ta'u and Ofu Islands. Currently there are up to three inactive but operable vessels in Ofu and four in Ta'u and additional *alias* have been recently purchased by residents of the islands. Reportedly the active fleet could increase from six to 17. Due to the abundance of resources and closeness of pelagic fishing grounds, high fuel prices have a lesser impact on fishing profitability in the area. Currently the creation of cooperative to facilitate marketing is being considered.

Samoa Tuna Processors, the successor to Chicken of the Sea, which closed doors in 2009, is working to develop a high grade fresh tuna export business that may also create opportunities for

the small-vessel fleet and help maximize returns for participating fishermen. Currently the company is conducting a trial run delivery of locally caught tuna flown to Los Angeles. Product manager at Samoa Tuna Processing estimates a time frame of 16-18 months for a small-vessel fleet to be established. Fishermen will have to be trained and equipment will need to be updated to ensure quantity, quality, and size of catch. (Editor's note: for export, fish must weigh a minimum of 18.5 kilograms.) The product manager identifies the high-grade export market as an opportunity for operators to upgrade the small-vessel fleet. Vessels in the 40-foot range would be better able to extend their range and take full advantage of fishing grounds that are available to vessels under 50 feet in length.

In support of the small-vessel fleet, Samoa Tuna Processors have built ice facilities. Dock facilities, appropriate for delivery of fish by small craft, and a new land based blast freezing facility are also under development. In concert with other organizations, Samoa Tuna Processors are conducting initial classes on proper fish handling and safety at sea. Initial interest on the part of fishermen is reportedly good.

8.4 Subsistence Fleet

A variety of different kinds of vessels are used for subsistence fishing including: outrigger canoes, skiffs with outboards, mono hull vessels with twin engines, and *alia*. The comprehensive enumeration of the subsistence fleet is impossible save, as one respondent put it, "knocking on every house door." Rough estimates provided by a long time avid boat based fishermen of fleet composition pre tsunami are 60% *alia,* 20% single hull twin engines and 20% skiff with outboard. Outrigger canoes are infrequently used today; they are primarily suited for near shore bottom fishing in shallow areas. *Alia* are generally favored for their stability and affordability. Two stroke engines predominate in the fleet; the more fuel efficient four stroke engines cost approximately $10,000 and are beyond the means of most.

Avid subsistence fishermen report that weather, moon phase, cultural events, and work obligations are important factors in determining the timing of fishing activities as well as the target species; as such frequency varies considerably depending on the interrelation of factors. Fishermen with government, rather than private sector, employment reported having great flexibility and time to engage on fishing. Samoans customarily fish on Saturday for Sunday fish. When in engaging in subsistence/recreational fishing, fishermen will often split fuel costs or in a more lose fashion contribute what they can for the fishing trip.

It should be noted that most subsistence fishing, both historically and currently, has not taken place offshore (Levine and Allen 2009). The predominant methods of subsistence fishing, such as hand line, net and spear fishing, are conducted from the shore and do not require the use of a vessel. In addition, as researchers of the past and fisheries managers now note, the process of westernization has resulted in a heavy reliance on stores to fill food needs. Declines in fishing effort indicate that the general population is no longer dependent on fishing (Sabater and Carroll 2009). As such, much fishing, as one respondent noted, "has really become a hobby;" albeit one that an avid fishermen might partake in one to three times a week.

The possible exception to declines in the importance and frequency of subsistence fishing activity lies in the communities on Manu'a Island. According to Levine and Allen (2009), transportation and demographic factors have encouraged the continuation of subsistence practices and dependence on near shore marine resources.

Outrigger Canoe in the Village of Onenoa, Tutuila Island

8.5 Sport and Tournament Fishing

In addition to the *alia* fleet that fishes for commercial sale, subsistence use and communal sharing, respondents identify a sport fishing fleet. The sport fishing fleet (and sport fishing) versus the subsistence fleet (and subsistence fishing) is typically defined by respondents in terms of vessel type rather than ways by which fish is distributed or even the fishermen. Sport fishing vessels are typically mono-hull, trailered vessels with outboard or inboard engines. Sport fishermen, much like subsistence fishermen, are generally employed and fish on weekends and/or for tournaments. They will consume their share of the catch, as well share their catch with community; they will also reportedly offer their vessels (and services) as quasi-charter operators. Another identifying factor in sport fishing is the fishing method.

Tournament fishing began in 1974 with the establishment of the American Samoa Game Fishing Association. Between 1974 and 1998, a total of 64 tournaments were held, with an annual average of two to three. Tournaments typically drew 7-14 boats, both skiffs and *alias*, and 55-75 fishermen (Craig et al. 1993). Participation waned in the late 1990s and fisheries managers relate low levels of participation to the expansion of the commercial fleet and ascendency of long lining (WPRFMC 2010b).

"Sport Fishing" Vessels, Pago Pago, American Samoa

Currently tournament and sport fishing is promoted by the Pago Pago Game Fishing Association, which was established in 2003. The association holds one four-day tournament a year and many single day, single species contests yearly. The four day event is in April or May, usually following a game tournament held in Apia, Independent Samoa. All fishing is conducted following international game fishing association (IGFA) rules, which define acceptable gear and fishing practices. For example, line strength may not exceed 120 pounds and fishermen must reel in their own fish. The association also promotes tag and release activities.

The association has hosted up to 22 boats (26-28' in length) and an estimated 80 to 100 participants, both foreign and local. The tournament has reportedly received increased interest from sports fishermen from Australia and New Zealand. The economic recession and lack of sponsorship, however, have led to recent declines in tournament participation.

The association has 65 members of which an estimated 50% are Samoan. The fleet is estimated to be 12-13 in number; eight to nine are owned by non-Samoan residents who work in canneries, construction or other businesses and four Samoans. Of the total membership, an estimated 12-15 are active – fishing a couple of times a month. The majority, however, only fish "as members"- that is, following IGFA rules - during an annual four day tournament. *Alias* vessels do not participate in the club or tournaments as the customary fishing methods do not conform to IGFA rules. There are some members who fish their boats in different ways – conforming to IGFA rules during tournaments and their own style other times. Members report being motivated by peer recognition; the association provides scrimshaw plaques honoring category winners that are very popular amongst members.

Pago Pago Fishing Association Member Displays Memorial Plaque

8.6 Charter Fishing Fleet

There is no specialized fishing charter fleet in American Samoa. The lack of a specialized fish charter business relates in part to a lack of tourism economy. Chartering for fishing is reportedly conducted primarily as a non-specialized business on an opportunistic basis and largely without proper paper work. Two businesses offer fishing charter services but the majority of their charter activities are non-fishing related, for example, providing boats for government or private water based studies or transportation to other islands. One such business, which does have registered chartered vessel and licensed skipper, has three vessels and averages two fishing trips a month. Vessel operators will often casually fish, that is, throw over a line, when conducting non-fishing charters.

Currently two charter businesses would like to develop fishing and diving industry in the area. One business owner describes the resources and fishing conditions as highly favorable with a growing reputation among sport fisherman in New Zealand and Australia. Investment cost related to financing the acquisition of equipment, conducting marketing, and providing staff currently are an obstacle to developing the fishing charter industry. A new cooperative market, where catch could be sold to offset charter costs and/or to reinvest in development of a charter business, reportedly may offset some of the financial challenges.

9.0 Seafood Consumption Patterns and Distribution Channels in American Samoa

Traditional practices of collective fishing and of fish distribution as well as cultural food preferences have undergone change in American Samoa as a result of the establishment of a wage based economy, presence of tuna canning industry, and introduction of Western foods.

Fish is commonly consumed for Sunday Brunch and important social and cultural events such as weddings, funerals, major birthdays (such as 75th) and anniversaries (30 or 40th), bestowment of chief titles, dedications of new homes, and visits from those who have traveled from afar (*malaga*). Church related events such Christmas and White Sunday – a Samoan church event which celebrates childhood and children - also commonly call for feasting on a variety of foods, including fish. Large gatherings often conclude with, attendees receiving cooked fish to take home as leftovers or as a whole uncooked fish. Contributions to family and community gatherings depends on what foods, items or services one can provide including, contributing woven mats, bread fruit, taro, or fish or the building of the traditional *umu*.oven.

Respondents who fish for "recreational" or "subsistence" purposes report following "the Samoan way" and frequently providing fish in celebration of various important social and cultural events (*fa'alavelave*) as well as distributing catch to pastors, chiefs, relative and friends. The widespread use of refrigeration allows fishermen to fish in accordance with weather and work schedules and then store fish for family events. Respondents report that contributions for social and cultural events are frequently given without solicitation. One "overhears that a friend may need fish for an event and then will feel obligated to provide some." Current distribution of fish for cultural purposes is also largely done "out of courtesy" rather than with the intent of "supplying fish" in lieu of a larger market of seafood distribution.

One avid fisherman estimated contributing to 72 "events" annually from offering sashimi to friends and villagers that are having guests from off island to providing large fish for large family events. Customary distributions to pastors and chiefs can involve many fish as in any one village, there are often multiple pastors and many chiefs.

Respondents also note changes in food preferences and ways of procuring food. Although traditional cultural preferences would be for a large pelagic species that could be ceremonially distributed in accordance with social status, the current overriding sentiment expressed by fishermen is that one "gives whatever one can" as long as it is the "biggest and best" one has. Notions of quantity reportedly have supplanted those of types of cut. As one respondent noted, giving only the head of fish might be perceived as stingy. If fish cannot be caught, fish procured from long-line vessels and canned fish are equally acceptable. In addition, fish may be sold to procure cash that can be used to fulfill obligations to serve one's family (URS Corporation 2001).

Although the older generation consider fish a part of every meal, chicken and pork are increasingly consumed. Visits to restaurants and catering have replaced to some degree and on some occasions the making of feasts. McDonalds and Pizza Hut reportedly are increasingly common venues for school graduations. Store catering of non-fish items will often take place for village council meetings rather than calling on young men within the village to fish.

Part time fishermen (who are otherwise employed) estimated that they do not sell their fish 90% of the time due to the abundance of important social and family events. A possible exception is if a fisherman has caught an overabundance and they are approached by restaurant buyer upon their return to the dock. Monetary exchange tend to be nominal in this case rather than a per pound price; money is used as a way to offset fuel, ice, or food costs for the trip. Avid recreational fishermen also note that they do not sell fish because they do not have the time. Some fishermen expressed the hope that the establishment of the new fish market would facilitate the selling of fish and thus recouping of costs.

Owners of the charter business typically distribute fish employees as well as friends. On average, employees take yellowfin, marlin, wahoo, or masi home twice a month. Catch is cut, filleted and ice at work. The fish is distributed as employees head home for the day and in this way the catch is distributed to the villages of Laulii, Pago Pago, Faga'alu, Vaitogi, Vailoatai, and Tafuna. Currently owners of the charter business do not sell any catch from fishing charters or sport fishing trips. The development of the new fish market, however, is seen as a possible way to create income to reinvest in what they hope can be a growing business.

Fish caught in tournaments is also distributed in various channels. Participants keep their catch if is not in a prize category, or is in a category that has already been won. Fish that officially enter the tournament is given to charities and public institutions, such as a home for senior citizens, the hospital and the correctional facility. It is also given to the various business sponsors of the event, who distribute the catch as they see fit and in some cases amongst employees. Fish will also find its way to any number of individuals, such as custom officers or security personnel, who facilitate the event. Finally, catch is prepared and eaten through the four days of the tournament at various parties and banquets.

When not given away, locally caught fish is commonly sold in village stores, to restaurants, or simply from coolers on the side of the road.

Selling Fish from Roadside Coolers

There are two major brick-and-mortar fish markets on Tutuila Island that specialize in locally caught fish. One longtime market, located in Utulie Beach (near Fagatogo) currently only sells locally caught reef and bottom fish. They no longer sell locally caught fresh yellowfin or skipjack because "there are no fishermen." The pelagic fish used in making a favorite Samoan raw fish dish of *oka* is made primarily from by-catch (TEF, Inc. 2007)

Local Fish Market

In the spring of 2011, a new fish market in Fagatogo Square opened. Concerned with increasing health standards and facilitating the collection of data, the DMWR is currently assisting in the operating and funding of the facility. The Department hopes that the fishing community will create a cooperative to take over the facility and also promote the marketing of local catch. The Department offers tables for fish display for $3 and also assists fishermen by providing free ice.

The only fulltime commercial fishermen that targets pelagic species sells catch at a variety of venues: independent stores, restaurants, and at his own roadside market. With the opening of the new fish market in Fagalogo, he has switched fish selling activities from the roadside to the fish market, when open. After hours and on weekends, he continues to sell at the roadside. Of the four venues, restaurants reportedly offer the best prices for catch. Catch that is not sold on the third is consumed by the family.

A Fisherman's Wife and Daughter Sell the Day's Catch at the New Fish Market, Fagatogo

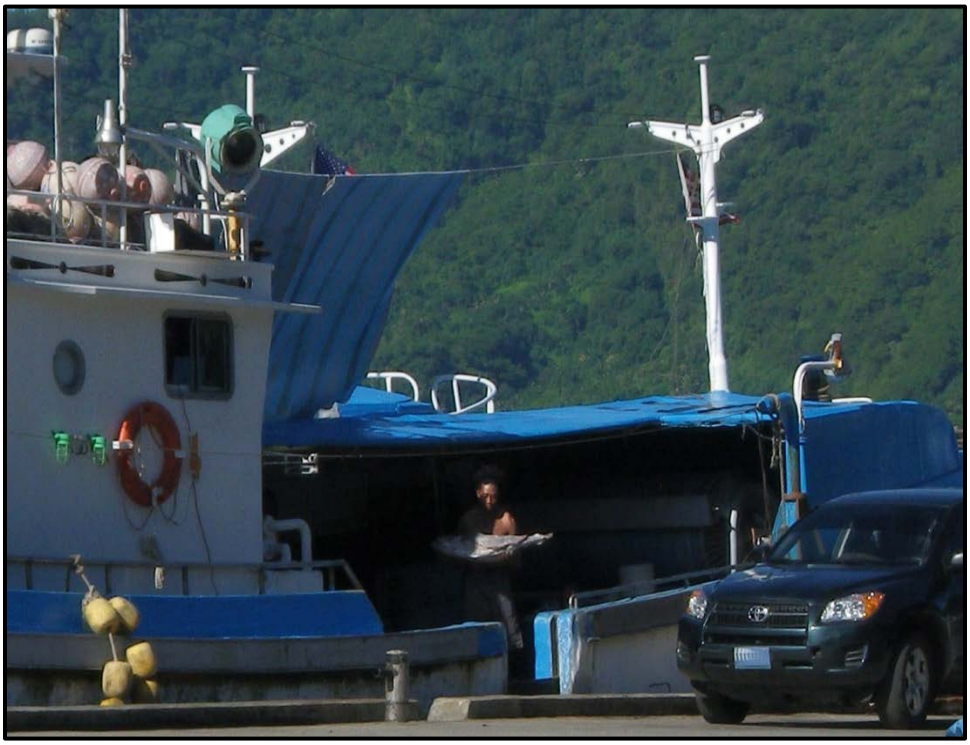
Other Sources of Seafood Distribution

The primary supply for fish consumed in American Samoa is "by-catch," also called miscellaneous catch, from the international Deepwater Fishing Fleet of long-liners and purse seiners as well as the locally owned and fished large long-line fleet. These vessels primarily fish for the cannery industry. The following are not accepted by canneries: blue marlin, illegal shark, and underweight/undersized species of bigeye, yellowfin, and albacore. Captains will reportedly distribute catch to crew and the catch will then enter local distribution channels through sale or giveaway. Local crew typically distributes the fish to family members and friends. Non-local crew typically barters or sells by-catch (TEC, Inc 2007).

The availability of by-catch is a longstanding practice; as one respondent explained, it is an "inherent way of the life." It benefits the community by providing an inexpensive supply of fish. In the late 1980's, by-catch was part of the school lunch program (TEC Inc. 2007). One respondent estimated that 90% of the restaurants, fast food venues, and stores rely on "black market" fish that come from the long-liner vessels. It also, however, depresses fish prices, making it difficult for fishermen to make a living.

Businesses have at various times entered as middle men buying from boats, at the canneries, for resale. For example, foreign business in the 1980s bought by catch for export; in additional, local truck distributors purchase by-catch from docked vessels in Fagatogo and then sell it in outlying villages. Local businesses have reportedly faced challenges, much like local fishermen, making a profit due to depressed prices; the former point to crew practices of underselling as the reason for depressed market prices.

A 2007 study report on the potential of developing fisheries and seafood marketing focused primarily on the marketing potential of by-catch for export to New Zealand and Australia, domestic use in the school lunch program, and as gifts for American Samoans visiting relatives off island (TEC Inc. 2007). In 2009 a processing plant was being developed in Fagatogo to process by-catch for the local marker and export. The tsunami, however, damaged the facilities and it is not currently being rebuilt.



Crew of Long-line Vessel Sells By-Catch at Dock

By-catch is currently used to supply fish for many traditional cultural events. The symbolic significance of catch, however, has reportedly changed. Social status of the recipient is less marked by designated fish parts, such as the head, but rather by the sheer amount. One respondent suggested that "there are no special parts" because the amount of catch is so great. It should also be noted that by-catch is frozen whole making it hard to cut up for distribution until after it is thawed.

In addition to the availability of by-catch, fish enters seafood distributions channels, both for sale and giveaway, from Independent Samoa. A weekly ferry and daily 40 minute flights link the two Samoas. Fish from Samoa is sold fresh in the large retail outlet in downtown Tafuna, smaller village stores, and along the roadside (even though the latter is reportedly illegal). It is transported by fishermen or sent to a local recipient for further sale. Imported fish from Samoa is primarily reef and bottom fish. As many residents in American Samoa hale from Western Samoa, it is not uncommon for a special family occasion such as wedding, funeral, and bestowment, to require a relative to delivery of cooler of fish from Samoa. Levine and Allen (2009) report that bottom fish imported from Samoa, primarily for cultural events, was valued at more than $40,000 in 2002.

The Ferry from Western Samoa Brings Family, Friends and Food

Another channel through which pelagic catch enters seafood distribution channels is through cannery purchase. Cannery employees can reportedly purchase whole fish, at the inexpensive prices of $1 per pound. The price represents a substantial discount from the major outlet supermarket in Samoa that sells processed, filleted pelagic species for $3-4 a pound. The cannery will cut but not fillet or gut the purchased fish. It is common for family members, friends or neighbors to ask employees to purchase cannery grade pelagic species for everyday eating and special social and cultural events. The cannery grade tuna also reportedly purchased and sent back to Western Samoa for important cultural events.

The quality of catch reportedly varies in relationship to distribution channel. Reportedly cannery tuna is iced in the boat or cannery for extend periods of time whereas fish transported from Samoa may not have been adequately iced. Currently fresh locally caught pelagic species inhabit a niche market of highly priced and high quality fish.

10.0 Current Challenges Facing the Small-Vessel Fleets

There has been a dramatic decline in the size of the small-vessel fleet, participating actively in commercial fishing, from approximately 30 to seven since the mid 2000s. Respondents noted that primary challenges to participation included: 1) rebuilding vessel, gear, and infrastructure damage from 2009 tsunami, 2) market competition from cannery by-catch and seafood importation from Western Samoa, and 3) hiring of crew.

Boat owners did not receive assistance from the Federal Emergency Management Agency (FEMA) for damage to fishing vessels. Currently Western Pacific Regional Fisheries Management Council, DMWR, and government officials working with the National Marine Fisheries Services are attempting to access funds to assist in rebuilding the damaged fleet. Banks do not currently offer loans for fishery investment. (See TEC, Inc 2007 for a detailed discussion of the current development limitations and proposed recommendations for improving opportunities for accessing capital). (Re) entry costs for long lining is particularly high due requirements for buoys, hooks and lines, all of which cost $1000s and frequently require replacement due to loss. Recent increases in fuel prices also pose a challenge, in particular for trolling.

Inexpensively priced by catch has been a long available within the seafood distribution system of American Samoa. Flash frozen by-catch, priced at approximately $1.00 per pound is available for purchase by individuals off long lining and purse seining vessels directly or from canneries through employees. Processed catch makes it way to general stores throughout the island. Restaurants, fast food outlets and stores all rely on this fish.

In addition, fresh, primarily bottom and reef, fish is brought in on a regular basis, by ferry and plane, from Western Samoa. As noted by Sabater and Tulafono (2011) data collected in 2004 showed that over half of the coolers entering from Independent Samoa by ferry were destined for sale and half of these contained bottomfish. According to fishery managers, a predominance of fresh fish on the market is from Western Samoa.

By-catch of primarily pelagic species and Western Samoan catch of bottom fish enter into seafood distribution channels not only through sale but through (multiple acts of) gift giving and sharing (WPRFMC 2010a). By-catch and imported fish substantially depress the price of fish on the local fresh market and have been a source of complaint by local fishermen (URS Corporation 2001). At the time of the fieldwork, cannery prices offered for albacore were also reportedly low.

Due to competing and more lucrative employment opportunities, in the government or overseas, commercial fishing is not a career opportunity for most American Samoans. The recent influx of disaster funding for reconstruction, after the tsunami 2009, reportedly continues to provide employment in the construction sector, keeping those who might otherwise participate in commercial fishing from resuming fishing. According to fisheries managers, the closure of Chicken of the Sea Samoa Packing plant in 2009 has not greatly affected participation in local fishing sector because workers who lost their jobs were “channeled into rebuilding from the earthquake.” Fishery managers note only two families who have entered commercial fishing due to loss of cannery jobs.

Due to more lucrative employment opportunities available to American Samoans at home or abroad, the majority of crew are foreign. West Samoans participate largely in pelagic and bottom fishing; Tongas are currently involved primarily in boat based spearfishing. As of 2007, the Guest Worker Program, through which foreign crew are hired, requires sponsors to provide assurances of housing and to cover medical costs and tax obligations (TEC, Inc. 1007). Boats frequently sit idle when crew return home and reportedly crew find it easy and are quick to switch boats if they find working conditions unsatisfactory. The dearth of small-vessel fishing has resulted in lack of supply to the local market. As one owner-operator of longstanding fish market noted in relationship to his inability to provide fresh yellowfin and skipjack, "there are no fishermen."

Sports fishermen note that the recreational fleet is limited due to economic factors, such as a low income levels and a cultural emphasis on sharing resources, which leaves little room to support boat-based fishing. Frequent demands for monetary donations to one's family and one's pastor as well as cultural events make saving or the accumulation of wealth difficult. The most currently available data on household spending, collected in 1995 calculated that 21% of household income was spent on donations to family and cultural events; including church related expenses, expenditures increase to 41% (Levine and Allen 2009; TEC, Inc. 2007). A fishery manager notes that although from a cultural perspective there is a need for fish contributions, only two families within his village currently can afford boats.

American Samoa is not a common tourist destination as such there is no specialized fishing charter sector (WPRFMC 2010b). Between 1998 and 2001, the average annual number of tourists was approximately 6,500; in 2005 the number grew to just over 7,000 (TEC, Inc 2007). Sport fishermen believe that American Samoan waters are suitable for the development of sport fishing tourism but note challenges of marketing and investing the gear and personnel to create business opportunities.

A 2007 study of the development potentials within the fishing and seafood marketing sector focused primarily on the use of by-catch for a high quality frozen export market. Challenges cited, also germane to the small fishing fleet included: volatility of the export market, low local market prices, inadequate and expensive air services, and obstacles to accessing capital (TEC, Inc. 2007). Current development plans are underway in Tutuila Island and Manu'a islands to develop the small-vessel fleet for participation in a high valued fresh tuna export market. Significant challenges, however, remain. The major challenges for development relate to upgrading fishing and fish handling skills and equipment, such as appropriate refrigeration facilities and hydraulic gear, to assure a steady supply of the quantity and quality of fish. Small-vessel operators will likely find handling requirements difficult due to limited deck size. To assure suitable grade for sale, fishermen have to head, gut, bleed and ice fish immediately. In addition, the weight of ice and insulated coolers is likely to affect the stability and safe handling of vessels. The development of the Manu'a Islands fleet, moreover, faces potential difficulties providing transport of catch to larger markets. There is a weekly ferry and daily air flights to Manu'a but weather can hinder services. Past attempts at fresh fish shipment by air to Hawaii were hindered by costs; fish grading, handling and air freight costs resulted in a profit margin similar to that of the local market for frozen product (TEC, Inc. 2007). Many of the challenges facing the small-vessel fleet outlined here applied in the 1980s and 1990s (Craig et al. 1993; Kasaoka 1989).

Currently neither fishing regulations nor conservation closures were cited as challenges. Respondents noted a favorable response to regulations, established in 2002, excluding large long-liners (over 50') from within 50 miles of the islands. Respondents noted that their preferred grounds for fishing were abundant in marine resources, they believed, because of these long-line regulations. In addition, the Western Pacific Regional Fishery Management Council is currently recommending that the harvest and participation requirements be amended for the long-line limited entry program so as to facilitate the participation of small (under 50 feet) vessels.

Existing marine protected closures in near shore waters are not in areas of boat based fishing for offshore species. The current MPAs, moreover, appear to have wide community acceptance as they are still under community control. The current Fagatele Bay closure, which does extend further offshore, does not reportedly affect fleet because their target species, of dogtooth tuna and trevalis, occur outside of the closure line where ocean depths increase. The recently established Rose Atoll Marine Sanctuary lies within 20 miles of the eastern end of current fishing grounds for the small-vessel fleet of Manu'a Islands. As such, the impact of the closure was spoken of in terms of future possible impact to as yet undeveloped fleet. Recent discussions regarding future Sanctuary were met with concern as the variously proposals contain popular fishing grounds for the small-vessel fleet.

Researchers note that fishing practices and patterns would likely alter if either of the two major pillars of the economy – federal aid from the US government or tuna industry – change. The true and long term impact of the closure of the Chicken of the Sea is not yet known as aid from the 2009 tsunami has assisted individual recipients and also resulted in increased employment in the construction sector. The "doomsday" scenario of a complete withdrawal of the tuna industry could encourage increased subsistence fishing, provide increased incentive for a local commercial fleet, or result in a large outmigration, as followed in the wake of the naval base closure and economic depression of the late 1940's and early 1950's (Bindon 1988, TEC, Inc. 2007).

References

Allen, S. and P. Bartram
2008 *Guam as a Fishing Community*. Pacific Islands Fisheries Science Center., National Marine Fisheries Service, NOAA, Honolulu HI 96822-2396. Pacific Islands Fisheries Science Center Administrative Report H-08-01.

American Samoa Department of Marine and Wildlife Resources and the Western Pacific Fisheries Information Network.
2010 *American 2008 Fisheries Statistics.* Available online at: http://www.pifsc.noaa.gov/wpacfin/pdf_file/a_vol25.pdf

Amesbury, J.R. and R.L. Hunter-Anderson
1989 *Native Fishing Rights and Limited Entry in Guam.* Prepared for the Western Pacific Regional Fishery Management Council, Honolulu. Micronesian Archeological Research Services, Guam.

2008 *An Analysis of Archeological and Historical Data on Fisheries for Pelagic Species in Guam and the Northern Mariana Islands.* Prepared for the Joint Institute for Marine and Atmospheric Research (JIMAR) and the National Oceanic and Atmospheric Administration (NOAA). Micronesian Archeological Research Services, Guam. Available online at: http://www.soest.hawaii.edu/PFRP/pdf/MARSreport.pdf

Amesbury, S. S., F. A. Cushing, and R. K. Sakamoto
1986 *Guide to Coastal Resources of Guam, Vol. 3 Fishing on Guam*. University of Guam Press.

Armstrong K, D. Herdrich, and A. Levine
2011 *Historic Fishing Methods in American Samoa*. U.S. Department of Commerce, NOAA Technical Memo., NOAA-TM-NMFS-PIFSC-24, Honolulu.

Beukering, P. van (ed.), W. Haider, M. England, H. Cesar, J. Sablan, S. Shjegstad, B. Beardmore, Y. Lui, and G.O. Garces
2007 *The economic value of Guam's coral reefs*. Technical Report No. 116, University of Guam Marine Laboratory.

Bindon, J.R.
1988 Taro or rice, plantation or market: Dietary choice in American Samoa. *Food and Foodways* 3:59-78.

Bowers, N. M.
2001 *Problems of Resettlement on Saipan, Tinian and Rota, Mariana Islands.* Occasional Historical Paper Series No. 7. CNMI Division of Historic Preservation.

Chapman, L.
2004 *Nearshore domestic fisheries development in Pacific Island countries and territories.* Secretariat of the Pacific Community.

CIC Research Inc.,
1983 *A Fishery Data Collection System: Saipan*. Prepared for National Marine Fisheries Service. Honolulu, HI. Available online at: http://www.pifsc.noaa.gov/adminrpts/1983/SWFC_Admin_Report_83-20C.pdf

Craig P., B. Ponwith, F. Aitaoto, and D. Hamm
1993 The commercial, subsistence, and recreational fisheries of American Samoa. *Marine Fisheries Review* 55:109-116.

D'Arcy, P.
2006 *The People of the Sea: Environment, Identity, and History in Oceania*. Honlulu: University of Hawai'i Press.

Driver, M. G.
1989 *Fray Juan Probre In the Marianas 1602.* Micronesian Area Research Center, University of Guam.

Dye T.S., and T.R. Graham
2004 *Review of archaeological and historical data concerning reef fishing in Hawaii and American Samoa*. T.S. Dye & Colleagues, Archaeologists, Inc., Honolulu.

Fenner, D, M. Speicher, and S. Gulick (coordinators)
2008 *The State of Coral Reef Ecosystems of American Samoa.* In: J.E. Waddell and A.M. Clarke (eds.), The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2008. NOAA Technical Memorandum NOS NCCOS 73. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. 569 pp. Available online at: http://ccma.nos.noaa.gov/ecosystems/coralreef/coral2008/pdf/AmSamoa.pdf

Hamm, D. C., M. C. Quach, K. R. Brousseau, and C. J. Graham.
2010 *Fisheries Statistics of the Western Pacific. Volume 25*. Pacific Islands Fisheries Science Center, National Marine Fisheries Service, NOAA, Honolulu, HI 96822-2396. Pacific Islands Fisheries Science Center Administrative Report H-10-03.

Herdrich, D. and K. Armstrong
2008 *Historic Fishing Methods in American Samoa.* Final report submitted to National Oceanic and Atmospheric Administration, Pacific Islands Fisheries Science Center. Honolulu.

Holmes, L. D. and E.R. Holmes
1992 *Samoan Village: Then and Now.* Fort Worth, Texas: Harcourt Brace Jovanovich College Publishers.

Hunt, T. and P. Kirch
1988 An archaeological survey of the Manu'a Islands, American Samoa. *Journal of the Polynesian Society* 97:153-183.

Itano, D. G.
1996 Development of Small-Scale Fisheries for Bottomfish in American Samoa (1961-1987). *SPC Fisheries Newsletter* 76:28-32.

Kasaoka, L.
1989 *Summary of small boat economic surveys from American Samoa, Guam and the Northern Marianas Islands*. NMFS Southwest Fisheries Center Administrative Report H-98-4C, Honolulu.

Kerr, A. M.
2011 *Fishing methods of the Mariana Islands, Micronesia*. University of Guam Marine Laboratory Technical Report. Prepared for Marine Laboratory University of Guam. Available online at: http://www.guammarinelab.com/publications/uogmltechrep132.pdf

Krämer, A.
1995 *The Samoan Islands: An Outline of a Monograph with Particular Consideration of German Samoa*, Volume II. Originally published in 1903. Honolulu: University of Hawai'i Press.

Levine, A. and S. Allen
2009 *American Samoa as a Fishing Community*. Pacific Islands Fisheries Science Center, NOAA Technical Memorandum NMFS-PIFSC-19, Honolulu.

Miller, S. A.
2001 *Economic Assessment of the Domestic Fisheries Development Potential of the Commonwealth of the Northern Mariana Islands.* Prepared National Marine Fisheries Service National Oceanic and Atmospheric Administration, Saltonstall-Kennedy Grant Program, Grant Number: NA 96FD0471

O'Meara, T.
1990 *Samoan Planters*: *Traditions and Economic Development in Polynesia.* Philadelphia: Holt, Rinehart, and Winston, Inc.

Preston, G.L, L.B. Chapman, P.D. Mead and P. Taumaia
1987 *Trolling Techniques for the Pacific Islands* South Pacific Commission

QMark Research and Polling
2002 *Navy Seafood Survey: Door-to-Door Surveys.*

Rubinstein, D.
2001 *A Sociocultural Study of Pelagic Fishing Activities in Guam.* Final Progress Report. University of Hawaii Joint Institute for Marine and Atmospheric Research, Pelagic Fisheries Research Program. Available online at: http://www.soest.hawaii.edu/PFRP

Russell, S.
2009 *Tuna Fishing on Saipan: A Look Back.* Journal of Micronesian Fishing. Fall 2009. Pacific Marine Resources Institute, Saipan.

Russell, S.
1998 *Tiempon I Manmofo'na: Ancient Chamorro Culture and History of the Northern Mariana Islands.* Micronesian Archaeological Survey Report No. 32. CNMI Division of Historic Preservation.

Sabater, M. and B. Carroll
2009 Trends in reef fish population and associated fishery after three millennia of resource utilization and a century of socio-economic changes in American Samoa. *Reviews in Fisheries Science* 17:318-335.

Sanchez, P. C.
1998 *Guahan Guam: The History of Our Island* Agana, Guam: Sanchez Publishing House.

Severance, C. and R. Franco
1989 *Justification and Design of Limited Entry Alternatives for the Offshore Fisheries of American Samoa and an Examination of Preferential Fishing Rights for Native People of American Samoa within in a Limited Entry Context.* Report to the Western Pacific Regional Fishery Management Council

Spoehr, A.
2000 *Saipan: The Ethnology of a War-Devastated Island.* CNMI Division of Historic Preservation.

TEC, Inc.
2007 *Review of the Fishery and Seafood Marketing Development Potentials for American Samoa*. Prepared for the Western Pacific Regional Fishery Management Council.

Underwood, R. A.
1985 "Excursions into Inauthenticity: The Chamorros of Guam. *Mobility and Identity in the Island Pacific.* Chapman, Murray and Philip S. Morrison (eds.). *In* Pacific Viewpoint. Volume 26: Number 1.

URS Corporation
2001 *Final Environmental Impact Statement: Fishery Management Plan Pelagic Fisheries of the Western Pacific Region.Chapter Three: Affected Environment.* Prepared for National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Available online at: http://www.fpir.noaa.gov/

Western Pacific Regional Fishery Management Council (WPRFMC)

2008 *Amendment 10 to the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region: Measure to Manage Bottomfish Fishing Around the Commonwealth of the Northern Mariana Islands.* Pacific Islands Regional Office, National Marine Fisheries Service, NOAA, Honolulu, HI. Available online at: http://www.wpcouncil.org/

2009 *2009 Pelagic Plan Report for Guam (Draft).* Not yet available online or published.

2010a *Amending the fishery ecosystem plans for the American Samoa Archipelago, the Hawaii Archipelago, the Marianas Archipelago, and Pacific Pelagics of the Western Pacific Region.*

2010b *Pelagic Fisheries of the Western Pacific Region 2008 Annual Report.* Available online at: http://www.wpcouncil.org/pelagic/Documents/

2011a *Mariana Archipelago Fishery Ecosystem Plan 2009 Annual Report.* Available online at: http://www.wpcouncil.org/documents/

2011b *Western Pacific Community Development Program Process, Amending the Fishery Ecosystem Plans for the American Samoa Archipelago, the Hawaii Archipelago, the Marianas Archipelago, and Pacific Pelagics of the Western Pacific Region*. Available online at: http://www.wpcouncil.org