



The Commonwealth of the Northern Mariana Islands Fishing Community Profile: 2017 Update

Adam L. Ayers



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Pacific Islands Fisheries Science Center

NOAA Technical Memorandum NMFS-PIFSC-66
<https://doi.org/V5/10.7289/TM-PIFSC-66>

January 2018

The Commonwealth of the Northern Mariana Islands Fishing Community Profile: 2017 Update

Adam L. Ayers

Pacific Islands Fisheries Science Center
National Marine Fisheries Service
1845 Wasp Boulevard
Honolulu, Hawaii 96818

NOAA Technical Memorandum NMFS-PIFSC-66

January 2018



U.S. Department of Commerce
Wilbur L. Ross, Jr., Secretary

National Oceanic and Atmospheric Administration
Benjamin Friedman, Acting NOAA Administrator

National Marine Fisheries Service
Chris Oliver, Assistant Administrator for Fisheries

Recommended citation:

Ayers, Adam L. 2018. The Commonwealth of the Northern Mariana Islands Fishing Community Profile: 2017 Update. NOAA Tech. Memo. NMFS-PIFSC-66 57 p.

Copies of this report are available from:

Science Operations Division
Pacific Islands Fisheries Science Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
1845 Wasp Boulevard, Building #176
Honolulu, Hawaii 96818

Or online at:

<https://www.pifsc.noaa.gov/library/>

Cover: Photo courtesy of Adam L. Ayers

Executive Summary

This NOAA Technical Memorandum represents a 2017 update to the Commonwealth of the Northern Mariana Islands as a Fishing Community published by Allen and Amesbury in 2012.

This fishing community profile update aspires to provide a comprehensive view of the Commonwealth of the Northern Mariana Islands (CNMI) as a fishing community. The report begins by presenting recent social, economic, and tourism information gathered by the Government Accountability Office (GAO) and the Marianas Visitors Authority in the CNMI. These data are followed by data on four key topics that emerged from interviews conducted by the author in 2016 with the CNMI fishing community. Next, findings from low income fish consumption in 2015 are presented, aggregated at the island level. These data provide the only current estimates of fish consumption on Tinian and Rota. The report concludes by presenting some additional empirical information that supplements the primary data gathered in the profile.

A mixed method research approach guided data collection and analysis. Archival data on employment and labor participation in the CNMI from 2001-2015 are analyzed to add context to the CNMI fishing community. In addition to these sources, changes in the CNMI economy were described that may affect fishing communities. These changes include the new casino development on Saipan and recent trends in visitor arrivals. The author also conducted and analyzed 26 in-person interviews with fishers and other members of the CNMI fishing community on the islands of Saipan, Tinian, and Rota. Low-income fish consumption data from 2015 were compiled for all inhabited islands in the CNMI, which represent the only source of data for this population in the CNMI. Twenty-five years of CNMI fisheries data are presented to show trends in landings and market prices. Updates on fishing infrastructure and fishing related industries are also provided.

The CNMI visitor industry has received larger numbers of visitors since 2011, with more visitors coming from China and Korea, and fewer visitors from Japan over the past decade. The CNMI economy is increasingly reliant on tourism, with a large growth in private investment to build a casino in Garapan, Saipan after gambling was legalized there in 2014. The controversial casino development project contributed to increased employment on Saipan after ten years of decline and has lured experienced employees away from local businesses with better paying jobs. The Saipan casino project has also led to increased rents, caused apartment shortages around Garapan, and is expected to change the character of the island.

Economic issues were most frequently identified during interviews as important issues affecting CNMI fishing communities. Fishers on Saipan and Tinian in particular cited difficulty selling their fish and reported high fuel and oil prices, high maintenance costs for fishing vessels, reduced quality and availability of fishing tackle, and a nearly fourfold increase in the price of bait over a two-year period. Twenty-five years of commercial receipt data gathered by the CNMI Division of Fisheries and Wildlife and aggregated by the Western Pacific Fisheries Information Network (WPacFIN) reinforced what fishers reported during interviews. WPacFIN data reveal that in nominal terms, mean prices of fish sold in the CNMI have been static from 1990 to 2015. When adjusted for inflation, the mean price per pound for commercial marine species sold in the CNMI has actually declined by 17% since 1990. Further declines in allowable foreign worker

visas may adversely affect the existing commercial fishing and seafood industry on Saipan, which is primarily staffed by foreign workers.

The Nutrition Assistance Program low-income fish sales are a novel data source that can help characterize fish consumption for some of the most vulnerable communities in the CNMI. Nutrition Assistance Data from 2015 demonstrate that the scale of sales on Saipan far exceeds Tinian and Rota. This dataset also signals the impact that a natural disaster may have on the availability of fish for a vulnerable population. Nutrition Assistance Program recipients on Saipan were unable to purchase a large amount of local seafood using program coupons following the landfall of the destructive Typhoon Soudelor. Despite the significant damages to Saipan and disruption to local seafood markets, Tinian and Rota were largely spared from damages. Nutrition Assistance Program recipients there were able to purchase local fish using their coupons.

Fish and fishing are an important part of culture and a reliable source of local food for CNMI fishing communities. However, interview data indicate that opportunities to make a living from fishing remain elusive. Without significant population growth, a considerable increase in tourism, or a government subsidy, it is unlikely that demand for local fish and associated fish-related businesses will support increased commercial fishing and seafood opportunities in the CNMI.

Table of Contents

Executive Summary	iii
Table of Contents	v
List of Acronyms	vii
List of Tables	viii
List of Figures	ix
Introduction	1
Changes in the CNMI Economy 2012–2017	4
Population and Demographics	4
Economics and Employment	4
Labor Force	5
Employment	5
Fair Labor Standards Act	6
Foreign Workers and the Consolidated Natural Resources Act of 2008	6
Impacts on CNMI Fishing	7
Employment rates by island	9
Status of Casino Development	9
Saipan	9
Tinian	10
Tourism	11
Economic Outlook for the CNMI	11
2015 Typhoon Soudelor and Associated Impacts	12
CNMI Fisheries	12
Importance of CNMI fisheries	12
Saipan Fish Markets and Vendors	12
Location and Longevity of Saipan Fish Markets and Vendors	13
Labor Sources	13
Scale of Operations, Gear, and Market Demand	14
Typhoon Soudelor	14
Seasonal Variability and Species Abundance	14
Fishing Tackle Shops	15
Small Boat Fleet	15
Status of Fishing Infrastructure	15
Saipan	15

Tinian	15
Rota	15
Current Fisheries Governance Institutions.....	16
Changes in Fisheries Governance Institutions	16
National Marine Sanctuary Nomination	17
Interviews with CNMI Fishers.....	17
Overview and Methodology	17
Economic Issues.....	18
Role of Government, Institutions, and Military Impacts	20
Fisheries and Resource Trends	22
Social and Educational Issues	24
CNMI Nutrition Assistance Program.....	24
2011 Survey of CNMI Small Boat Fishers	32
Marianas Trench National Monument Research	32
Results of a Survey of CNMI and Guam Residents on the Marianas Trench Marine National Monument	32
Equity and Access in Marine Protected Areas: The History and Future of ‘Traditional Indigenous Fishing’ in the Marianas Trench Marine National Monument	32
Traditional Fishing Patterns in the Marianas Trench Marine National Monument.....	33
Exploring Public knowledge, Attitudes, and Perceptions of the Marianas Trench Marine National Monument	33
Updated Fisheries Data	34
Creel Surveys	34
Conclusion	38
The Casino Legalization on Saipan and Increased Private Fixed Investment	39
Increased Uncertainty over CW-1 Workers.....	39
Increases in the CNMI Minimum Wage.....	39
Increases in Visitor Arrivals	39
Typhoon Soudelor Impacts Saipan Fishing Communities.....	39
Economic Challenges Facing Commercial Fishers in the CNMI.....	40
Acknowledgements	42
References	43

List of Acronyms

CNMI	Commonwealth of the Northern Mariana Islands
CPUE	Catch Per Unit Effort
CW-1	CNMI-Only transitional worker
GAO	Government Accountability Office
GDP	Gross Domestic Product
NOAA	National Oceanic and Atmospheric Administration
MSA	Magnuson-Stevens Act
WPRFMC	Western Pacific Regional Fishery Management Council

List of Tables

Table 1. 2000 and 2010 U.S. Census population for the Commonwealth of the Northern Mariana Islands, separated by island.....	4
Table 2. Gross Domestic Product for the CNMI from 2007 to 2015 (in millions of dollars).....	5
Table 3. U.S. Homeland Security limits on CW-1 visas for the CNMI (2011 to 2017).....	6
Table 4. Labor participation rates and unemployment rates for the islands of Saipan, Tinian, and Rota in 2010.	9
Table 5. Saipan fish markets and vendors and location.....	13
Table 6 Economic themes emerging from 26 semi-structured interviews conducted with CNMI fishers on the islands of Saipan ($N = 9$), Tinian ($N = 6$), and Rota ($N = 11$)..	19
Table 7 Governance, military impacts in CNMI fisheries emerging from 26 semi-structured interviews conducted with CNMI fishers on the islands of Saipan ($N = 9$), Tinian ($N = 6$), and Rota ($N = 11$).....	21
Table 8. Fisheries and resource trends emerging from 26 semi-structured interviews conducted with CNMI fishers on the islands of Saipan ($N = 9$), Tinian ($N = 6$), and Rota ($N = 11$).....	23
Table 9. Social and educational issues emerging from 26 semi-structured interviews conducted with CNMI fishers on the islands of Saipan ($N = 9$), Tinian ($N = 6$), and Rota ($N = 11$).....	24
Table 10. Average number of Nutrition Assistance Program cases by island(2011-2016).....	25
Table 11. Average number of Nutrition Assistance Program recipients by island (2011-2016)...	25

List of Figures

Figure 1. Map of the CNMI archipelago	3
Figure 2. Foreign, domestic, and total employment in the CNMI from fiscal years 2001 to 2015. Source: GAO analysis of CNMI tax data (GAO, 2017).	8
Figure 3. Site of the Imperial Pacific Hotel and Casino in 2013 and 2016.....	10
Figure 4. CNMI visitor arrivals by country and overall total, from 2006 to 2016.....	11
Figure 5. Top ten species by pounds sold by participating CNMI Nutrition Assistance Program vendors in 2015.....	27
Figure 6. Top ten species by pounds sold by participating CNMI Nutrition Assistance Program vendors in 2015.....	28
Figure 7. Top ten species by pounds sold by Nutrition Assistance Program vendors on Saipan in 2015.....	29
Figure 8. Top ten species by pounds sold by Nutrition Assistance Program vendors on Tinian in 2015.....	30
Figure 9. Top ten species by pounds sold by Nutrition Assistance Program vendors on Rota in 2015.....	31
Figure 10. Shore-based survey sites for Saipan creel surveys.....	35
Figure 11. Estimated yearly commercial landings in the CNMI from 1990 to 2015.....	36
Figure 12. Estimated mean price per pound of commercial marine species sold in the CNMI from 1990 to 2015.....	38

Introduction

The Mariana archipelago is located in the Western Pacific and is comprised of 15 islands. It is separated politically into two entities: the Commonwealth of the Northern Mariana Islands (CNMI) and the Territory of Guam. The 14 islands of the CNMI stretch from 14° to 21° north latitude and between 144° to 147° east longitude (see Fig. 1). Guam is the largest and southernmost island in the archipelago, followed by Saipan. Guam is politically separate from the CNMI and thus is not included or analyzed in this profile update. For information on Guam as a fishing community, reference Allen and Bartram (2008).

All CNMI residents live on the southern islands of Saipan, Tinian, and Rota, and approximately 90% of the total population lives on Saipan. The islands north of Anatahan were inhabited as recently as 1990s, but according to the 2010 Census, there are currently no full-time residents.

The Magnuson-Stevens Fishery Conservation and Management Act (2007) authorizes the National Marine Fisheries Service and the 8 regional fishery management councils to manage U.S. fisheries in federal waters (*Magnuson-Stevens Fishery Conservation and Management Act*, 2007). The Magnuson-Stevens Act (MSA) contains 10 national standards, and National Standard 8 specifically addresses fishing communities:

Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and the rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (1) provide for the sustained participation of such communities; and (2) to the extent practicable, minimize adverse economic impacts on such communities (MSA Section 600.345 (a)(8))...The term “fishing community” means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community. A fishing community is a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or subsistence fishing or on directly related fisheries-dependent services and industries (for example, boatyards, ice suppliers, tackle shops) (MSA Section 8(3)).

The Magnuson-Stevens Act, along with the National Environmental Policy Act (*National Environmental Policy Act*, 1970) and Executive Order 12898 on Environmental Justice (Clinton, 1994), provides a formal justification for examining the socioeconomic impacts of regulatory actions on fishing communities. In the late 1990s, the National Marine Fisheries led a national approach to draft and maintain fishing community profiles at the appropriate regional or geographic scale. In the Pacific Islands Region, fishing communities are defined at the island level, based on a decision made by the Western Pacific Regional Fishery Management Council (WPRFMC). In 1999, the National Marine Fisheries Service approved amendments to Fishery Management Plans for American Samoa, The Commonwealth of the Northern Mariana Islands, and Guam allowing each of the island territories to be defined as distinct fishing communities (Fisheries Off West Coast States and in the Western Pacific, 1999). Fishing community profiles are intended to provide periodic assessments of fishing engagement and describe the socioeconomic characteristics of regional fishing communities.

Fishing community profiles have been published for the CNMI (Allen and Amesbury, 2012), American Samoa (Levine and Allen, 2009), and Guam (Allen and Bartram, 2008).

As originally envisioned, fishing community profiles were intended to be updated every 5 years. American Samoa has been updated (Grace-McCaskey, 2015), but to date, Guam has not. This report is intended as a 2017 update to the 2012 Commonwealth of the Northern Mariana Islands as a Fishing Community (Allen and Amesbury, 2012). Since this report is an update of the original fishing community profile, it focuses on fisheries and socioeconomic trends since 2012. For historical information on fishing and its sociocultural importance for fishing communities dating back 3,500 years, please refer to Allen and Amesbury (2012).

This fishing community profile update begins by describing changes in the CNMI economy since the last fishing community profile in 2012 and their effects on CNMI fisheries, fishing infrastructure, and fishing related industries. Next, detailed results are presented from 26 semi-structured interviews of CNMI fishers conducted by the author in 2016. After that, CNMI Nutrition Assistance Program data from 2015 is presented, which provide some insight into one recent year of low income fish consumption at the island level (Saipan, Tinian, and Rota). The Nutrition Assistance Program data are followed by some results from recent research on CNMI small boat fisheries and sociocultural and governance research conducted since the establishment of the Marianas Trench Marine National Monument. The report concludes with some updated CNMI fisheries data gathered via CNMI Division of Fisheries and Wildlife. Lastly, notable findings and changes since the 2012 profile was published are highlighted in a short conclusion.

To examine changes that occurred in CNMI fishing communities since 2012, a mixed-method research approach (Maxwell and Loomis, 2003) was used. Mixed-method research approaches allow researchers to overcome the weaknesses associated with merely one method of inquiry and draw on insights gained from both quantitative and qualitative approaches (Johnson and Onwuegbuzie, 2004). Drawing on multiple data sources and methodological approaches also helps improve the credibility of research findings and generate greater understanding of complex phenomena. In this fishing community profile update, primary research is reported, and analyses of multiple secondary data sets are presented. Primary data collection included qualitatively-oriented, semi-structured interviews of CNMI fishers and participant observation of Division of Fisheries and Wildlife employees. Secondary data collection entailed analysis of archival data sources and a quantitative analysis of several fisheries datasets. Combining these disparate approaches and datasets provided increased confidence in research findings. The metadata associated with this project can be referenced on the web (PIFSC, 2017).

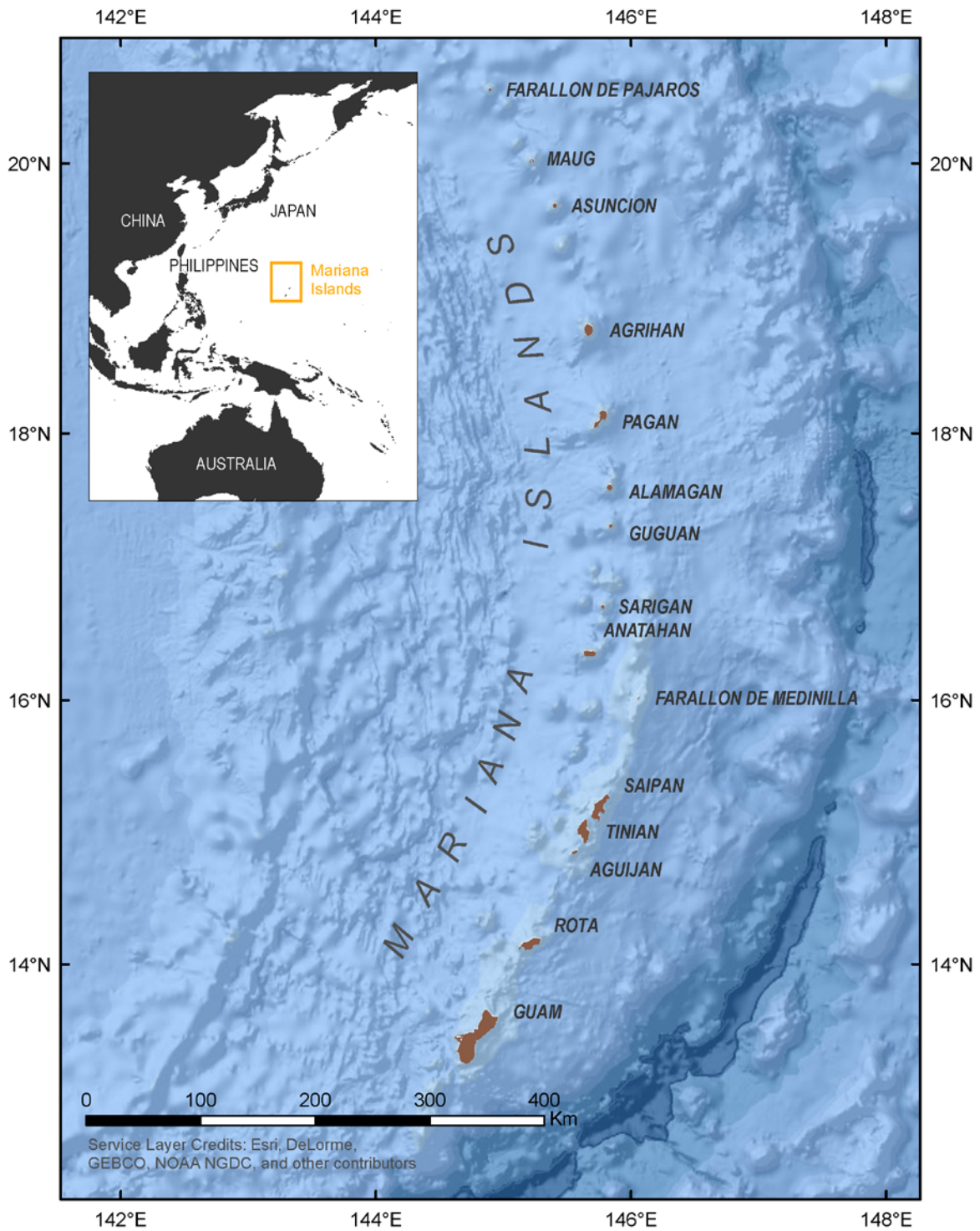


Figure 1. Map of the CNMI archipelago.¹

¹ Source: Tomoko Acoba, Ecosystem Sciences Division, NOAA Pacific Islands Fisheries Science Center.

Changes in the CNMI Economy 2012–2017

Population and Demographics

The most-up-to-date population data for the CNMI are the 2010 Census since census information for the CNMI is only updated once every 10 years. Thus, population data remain unchanged from the numbers reported in Allen and Amesbury (2012). The 2010 Census reported 53,883 people living in Commonwealth of the Northern Mariana Islands in 2010, a decrease of 15,338 persons since 2000. Population counts for the three main islands of Saipan, Tinian, and Rota are presented below in Table 1.

Table 1. 2000 and 2010 U.S. Census population for the Commonwealth of the Northern Mariana Islands, separated by island.

Island	2000	2010	2000-2010 change	2000-2010 percent change
Saipan	62,392	48,220	-14,172	-22.7
Tinian	3,540	3,136	-404	-11.4
Rota	3,283	2,527	-756	-23.0
Northern Islands	6	0	-6	-100.0
Total	69,221	53,883	-15,338	-22.2

A majority of the CNMI population lives in Saipan, where the population density is 1,050 per square mile. For context, the population density on Saipan is greater than the average population density of the entire United States (87) or the Territory of Guam (759) (U.S. Census Bureau, 2015), but less than Hawai‘i’s most densely populated island of Oahu (1,586) (Hawaii DBEDT, 2015). Saipan exhibited a population decrease of 14,172 persons from 2000 to 2010. Much of this decrease can presumably be attributed to the closures of the garment manufacturing factories, the last of which closed in 2009. The garment industry closure was addressed in the first CNMI Fishing Community Profile (Allen and Amesbury, 2012). Although population declines were observed on all three populated islands between 2000 and 2010, the CNMI population is expected to increase by approximately 7% between 2010 and 2020 (U.S. Census Bureau, 2015).

Economics and Employment

Gross Domestic Product is the value of all goods and services produced in an area in a given year. Table 2 presents a summary of GDP from 2007 to 2015. Data from 2016 were not yet available. These data were compiled from a 2017 Government Accountability Office (GAO) report (GAO 2017). The GAO was required to provide recurrent updates on the effects of a 2007 U.S. law which required the CNMI to gradually raise its minimum wage to the prevailing minimum wage rate in the U.S. The GAO was also asked to review the transition to U.S. federal immigration regulations, which have been gradually implemented since 2008. To measure the effect of these two large changes to the CNMI economy, the GAO examined the effects on the CNMI labor market, including foreign workers, employment, and foreign investment. CNMI tax data were the major source of data used by the GAO to conduct their analysis.

Table 2. Gross Domestic Product for the CNMI from 2007 to 2015 (in millions of dollars).

	2007	2008	2009	2010	2011	2012	2013	2014	2015
GDP	938	939	795	799	733	751	780	836	922
Personal Consumption Expenditures	480	504	431	442	451	469	486	539	545
Private Fixed Investment	79	83	85	77	74	79	90	142	227
Net exports of goods and services	47	29	-47	-70	-132	-98	-109	-159	-197
Government Consumption expenditures and gross investment	332	324	327	349	340	301	312	314	347

Source: USGAO analysis of CNMI tax data (2017).

GDP increased for the fourth consecutive year in 2015, approaching levels prior to the closure of the Saipan garment manufacturing factories and the 2008 global recession. Personal consumption expenditures also rose over the past four years. Much of the increase in GDP appears related to growth in Private Fixed Investment (see Table 2). This refers to investment in fixed capital or replacement of depreciated fixed capital. The greatest increase in Private Fixed Investment occurred in 2014 and 2015, following passage of CNMI legislation legalizing construction of a large gambling casino on the island of Saipan. Net exports of goods and services in the CNMI have been negative since 2008. The CNMI trade deficit appears to have initiated when the last garment manufacturing factories closed in 2009. Government consumption expenditures and gross investment have remained relatively static throughout the time period.

Labor Force

Employment

In 2016, there were an estimated 14,657 domestic workers employed and 2,386 domestic workers unemployed in the CNMI. Domestic workers are defined as naturalized citizens or persons born in the CNMI, the United States, its territories, such as Guam, American Samoa, or from states with a compact of free association, such as Federated States of Micronesia, Republic of Palau, or the Republic of the Marshall Islands (GAO, 2017, p. 34). The unemployment rate for domestic workers in the CNMI is estimated to be 14%, but 20% for individuals born in the CNMI (GAO, 2017 p. 34). This unemployment rate is nearly four times greater than that of the United States as a whole at the end of 2016 (4.7%) and is nearly four times higher than Palau (4.2%, 2005 estimate), but is lower than the estimated 2010 unemployment rates for the Federated States of Micronesia (collectively, Yap, Chuuk, Pohnpei, and Kosrae: 16.2%) and the Republic of the Marshall Islands (36%, 2006 estimate) (Central Intelligence Agency, 2017).

Fair Labor Standards Act

In 2007, The United States government required Saipan to gradually conform to U.S. Federal minimum wage regulations. Over an 11-year period, the CNMI minimum wage is intended to incrementally increase from \$3.05 until it eventually reaches the U.S. minimum wage of \$7.25 in 2018. At this time, minimum wage increases have not resulted in increased unemployment as posited in Allen and Amesbury (2012, p.77). A recently conducted GAO analysis found that most CNMI workers were already making the minimum wage (GAO, 2017 p. 20). However, foreign workers were the exception; approximately 72% were paid the minimum wage or less in 2014 (GAO, 2017 p. 20).

Foreign Workers and the Consolidated Natural Resources Act of 2008

The U.S. Congress passed the Consolidated Natural Resources Act of 2008, designed to gradually transition the CNMI immigration system to U.S. Federal immigration standards, which include processing fees, interview requirements, set interview wait times, differing processing times for certain countries, and removal of sponsorship/bonding requirements (U.S. GAO, 2008 p. 51). The purpose of the Consolidated Natural Resources Act was to raise CNMI border and security standards to be consistent with those used in the United States while also minimizing any potential economic disturbances. The Act mandated a reduction in the allowable number of CW-1 visas each year until they reach zero by the end of 2019 (USCIS 2017). The original deadline for eliminating any CW-1 visas was December 31, 2014 (Allen and Amesbury, 2012 p. 47), but this date has been extended several times. Table 3 presents numerical limits for allowable CW-1 worker visas in the CNMI. These limits are set by the U.S. Department of Homeland Security.

Table 3. U.S. Homeland Security limits on CW-1 visas for the CNMI (2011 to 2017).

Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018
Number of allowable CW-1 permits/visas	22,417	22,416	15,000	14,000	13,999	12,999	12,998	9,998

Source: (GAO, 2017).

The number of allowable contract worker permits decreased from 22,417 in 2011 to 12,998 in 2017. The cap was further reduced to 9,998 in November 2017 for fiscal year 2018. Despite the large decrease in 2018, there has been no change to the eventual reduction to zero contract workers mandated by the Consolidated Natural Resources Act of 2008. Without foreign workers (45% of all workers in the CNMI in 2015), the CNMI economy would lose an estimated 26 to 62% of productivity (GAO, 2017). Labor uncertainty may also jeopardize development projects in the CNMI due to the large amount of significant skilled labor needed to complete them. The USCIS suggests changes may occur under the current U.S. administration (USCIS, 2017).

Impacts on CNMI Fishing

The number of allowable contract worker visas is important for Saipan and is relevant to fisheries for a few reasons. For one, the forthcoming Imperial Pacific Resort and Hotel requires a large number of workers to build their integrated casino, resort, and hotel, as mandated by their agreement with the CNMI government. The Imperial Pacific Resort and Hotel is a new casino resort on Saipan that was approved after gambling was legalized on Saipan in 2014 (Erediano, 2014). It has fueled a large increase in private fixed investment and bolstered GDP after years of declines (see Table 2). Imperial Pacific was not allowed to use an existing building for their casino, requiring the Hong Kong-based company to build a new 2,000-room casino resort from the ground up. This type of large scale construction requires a significantly skilled labor force that does not exist in the CNMI; therefore, labor was imported, primarily from China. Importing hundreds or thousands of temporary workers to build the casino is exactly the type of skilled labor shortage that the CW-1 permit system was designed to address.

In 2016 however, the CNMI had already reached their CW-1 cap and the casino still required skilled construction laborers, which likely drove the casino contracting company to hire illegal workers. In April 2017, The Federal Bureau of Investigation arrested a contractor in charge of building the Imperial Pacific casino resort after an illegal construction worker died on the job site (Campbell and Farrell, 2017). The investigation determined that nearly 400 workers were working on the casino illegally, without CW-1 visas (Limtiaco, 2017). Furthermore, since the total number of CW-1 visas is capped, importing more skilled labor essentially takes CW-1 slots away from other industries, such as fishing. Suddenly, the CNMI commercial fisheries sector, largely staffed by CW-1 workers, was in jeopardy (Rhodes et al., 2011). Many CNMI residents, such as those working in fisheries, have been working with CW-1 permits (now visas under the U.S. immigration system) for many years, have raised families in the CNMI, pay taxes without receiving benefits, and are *de facto* CNMI residents.

How do casino gambling and contract worker permits/visas connect to fishing and fishing communities in the CNMI? Nearly the entire commercial fishing and seafood industry in Saipan is staffed by contract workers from the Philippines (Rhodes et al., 2011). These fishers and fish vendors have settled in Saipan and many have children that were born there and are educated in Saipan schools. As mentioned in the previous paragraph, the CW status of many of these fishers was in question due to the labor demands of the casino and the reductions in allowable CW-1 visas. If the CW-1 program were terminated, the commercial fisheries and seafood sector would cease to operate as it currently exists. Given the relatively fixed or flat average commercial fish prices in the CNMI (see Fig. 6), commercial fishing in the CNMI operates under very tight margins and is heavily reliant on less expensive foreign labor that may receive subsidized housing and other amenities from their employers to make up for lower wages. In contrast, non-CW-1 highliners in the fishery receive just half their total personal income from selling fish (Hospital and Beavers, 2014 p. 27), which highlights the difficulty CNMI residents face when trying to make a living as a commercial fisher in the CNMI.

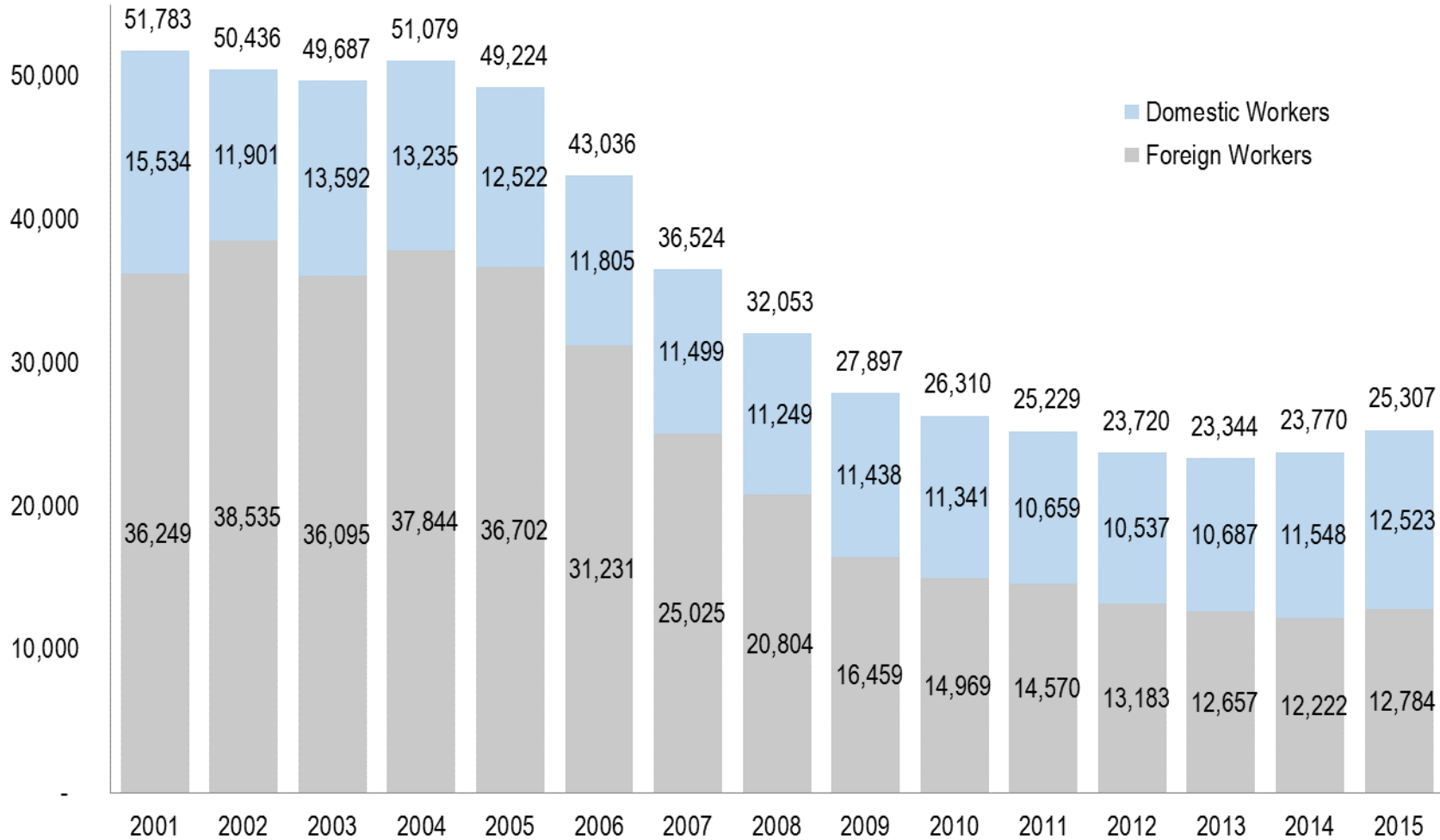


Figure 2. Foreign, domestic, and total employment in the CNMI from fiscal years 2001 to 2015.

Source: GAO analysis of CNMI tax data (GAO, 2017).

Total employment and foreign employment peaked in the early 2000s and declined each year from 2004 to 2013, although domestic employment declined less than foreign employment. Foreign workers as a percent of total employment peaked in 2002 (76%) and have generally been declining since 2005. Prior to the Consolidated Natural Resources Act of 2008, a GAO analysis found four primary types of temporary worker permits: those working for the CNMI government, those with permission to work temporarily, a category for religious missionaries, and another for nonresident workers. Although it cannot be confirmed at this time, some of these special categories may still exist which could account for differences between numerical limits reported in Table 3 and numbers reported in Figure 2. As a result of mandated reductions in CW-1 worker permits, in 2015, the percentage of foreign workers in the workforce (51%) was nearly equal to the percentage of domestic workers. Domestic workers peaked in 2001 and generally declined from 2004 to 2013, before increasing again in 2014 and 2015. Observed employment increases in 2014 and 2015 are presumably jobs directly or indirectly related to the Best Sunshine Live temporary casino and the construction of the Imperial Pacific Resort in Garapan, Saipan (Cohen, 2017).

Employment rates by island

Table 4. Labor participation rates and unemployment rates for the islands of Saipan, Tinian, and Rota in 2010.

Island	Labor participation rate	Unemployment rate
Saipan	72%	12%
Tinian	81%	8%
Rota	76%	7%

Source: U.S. Census 2010.

Data sourced from the 2017 GAO report do not separate unemployment rates by island, so the 2010 U.S. Census is the only data source for island-level unemployment (see Table 4). The labor force participation rate is the percentage of civilians 16 and older who are employed or looking for work. These data do not include active military or the noninstitutional population, which is defined as those serving time in U.S. correctional facilities, mental health facilities, or in residential homes for the aged.

Status of Casino Development

Saipan

Saipan citizens voted against legalization of gambling twice on separate ballot referendums (in 1979 and 2007). As recently as 2007, 58% of voters voted against a referendum to legalize gambling. Therefore, the presence of a large casino and gambling on Saipan are controversial issues. Despite citizen opposition, the CNMI legislature legalized gambling casinos in Saipan in 2014 (Erediano, 2014). The controversial measure has injected a large amount of private fixed investment through construction and related industries (see Table 2). This is leading to higher rents around the casino site and will permanently change the character of Garapan through loss of local-style businesses, entry of higher-end businesses catering to gambling visitors, and significant architectural changes for the most densely populated area of Saipan (See Fig. 3). But

once it is open, the Imperial Pacific Resort is projected to add jobs, and it has already substantially contributed to the CNMI economy (See Table 2, Fig. 2).

The projected social and ecological impacts of increased development on Saipan fisheries are unclear and difficult to predict. Some individuals interviewed felt that the new casino could boost demand for local fisheries, particularly species favored by Chinese nationals who are providing most of the construction labor and most of the expected clientele of the casino itself. These species include parrotfish, lobsters, and tunas. Others felt that any increases in demand would primarily be met through more imports of seafood from foreign sources, whether from within Micronesia or elsewhere.



Figure 3. Site of the Imperial Pacific Hotel and Casino in 2013 and 2016.

Source: (GAO, 2017 p. 31).

As of June 2017, the Best Sunshine Limited ‘temporary’ casino is the only casino in operation on Saipan and in the CNMI. Best Sunshine Limited is a subsidiary business of the parent company Imperial Pacific International, based in Hong Kong. Most revenue collected at the Best Sunshine Limited is derived from credit-based betting. Per table revenues for V.I.P. gambling tables in 2016 at the Best Sunshine Limited far exceeded those in the world’s largest gambling hub of Macau, which has drawn the attention of mainstream media outlets and U.S. federal regulators (Wei and Campbell, 2016; Campbell and Wei, 2017). The opening of the permanent casino, Imperial Pacific Resort and Casino, has been delayed several times due to weather, environmental, and labor issues, but finally opened for gambling activities in July 2017.

Tinian

The Tinian Dynasty Hotel and Casino closed in September 2015, after receiving a \$75 million fine for violating U.S. Treasury Department Title 31 money laundering regulations. The Tinian Dynasty Casino employed nearly 700 foreign workers, all of whom have since left the CNMI. According to fieldwork interviews with Tinian fishers, the Tinian Dynasty purchased local seafood, keeping some fishers fully employed. The Tinian Dynasty property is currently boarded up and vacant. The U.S. government is requiring whichever company that purchases the property to pay the Tinian Dynasty’s \$75 million fine, which acts as a *de facto* lien against the property.

This *de facto* lien may be preventing investors from purchasing, refurbishing, reopening, or redeveloping the property (Villahermosa, 2016).

Meanwhile, Bridge Investment Group is awaiting approval to begin building the Tinian Ocean View Resort and Casino in Tinian land fronting the harbor.

Tourism

With the closure of the last garment manufacturing factories in 2009, tourism became the primary economic driver in the CNMI. Although total visitors have declined from their late 1990s peak, they have increased since 2011 (see Fig. 4). Numbers of tourists from Japan continue to decline, but have been offset in recent years by more Chinese and Korean visitor arrivals. In Figure 4, ‘All other countries’ include visitor arrivals from Guam, United States, Philippines, Russia, Taiwan, Hong Kong, and ‘Other.’

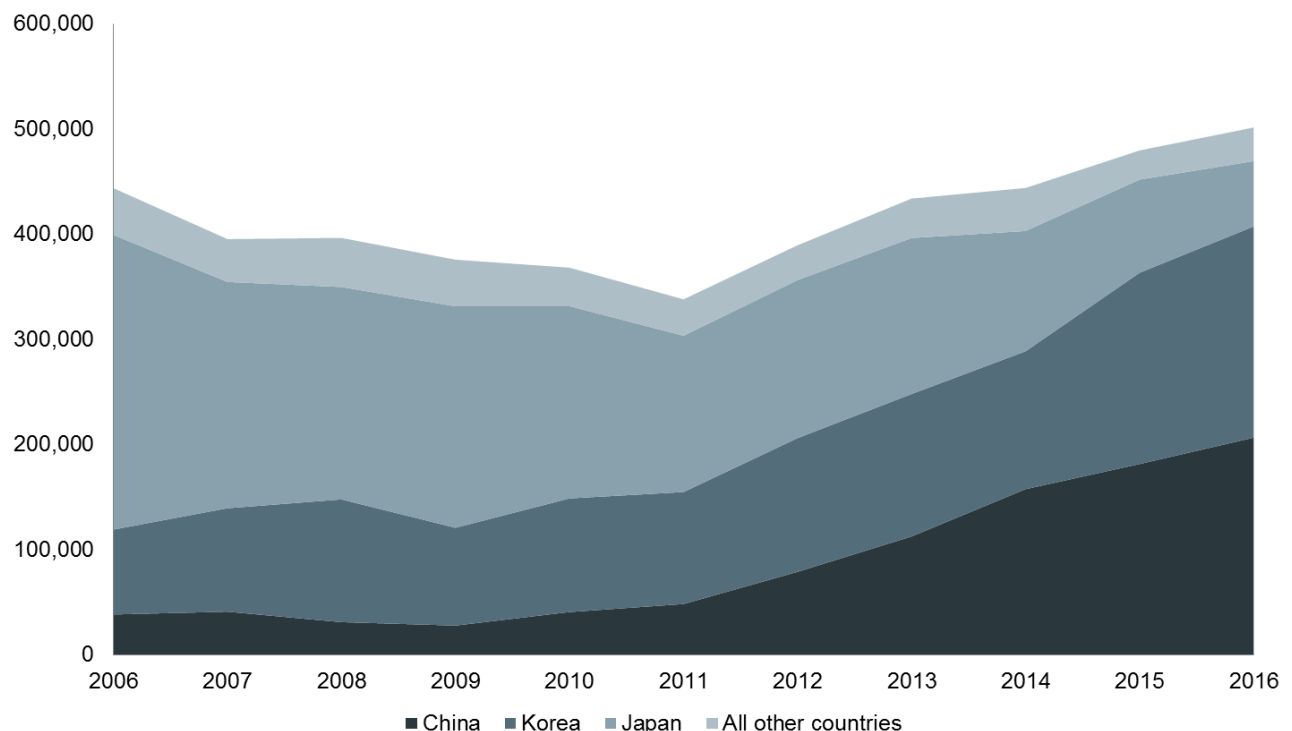


Figure 4. CNMI visitor arrivals by country and overall total from 2006 to 2016.

Source: Marianas Visitor's Authority visitor-arrival data.

Economic Outlook for the CNMI

Increases in visitor arrivals plus casino-related construction and jobs have fueled a positive outlook for the CNMI economy (Ruane, 2015). Growth in GDP, fueled by private fixed investment, is currently driving casino development projects and buoying the CNMI economy. However, as described above in the status of casino development section, this growth and private investment may become tenuous with increased U.S. Federal government scrutiny of casino-related labor violations and banking transactions (Campbell and Wei, 2017).

2015 Typhoon Soudelor and Associated Impacts

Typhoon Soudelor made landfall in Saipan on August 2, 2015, causing widespread destruction. The Soudelor storm strengthened rapidly prior to landfall, and wind gusts may have been much higher than the reported 105 mph. The typhoon shut down the power grid on Saipan, the water system, and destroyed 384 homes. That same day, U.S. President Barack Obama declared the island a disaster area. Many Saipan residents were without running water for weeks and without electricity for a month or longer.

The typhoon affected fishing communities in several ways. First, rainfall from the storm washed a large amount of sediment from upland areas into nearshore waters, which disrupted some fishing and diving activities. Second, in the weeks after the storm, Saipan residents waited in lines for six hours or longer to purchase a maximum of \$50 of gasoline. Gasoline rationing likely inhibited boat-based fishing trips. Third, the lack of running water and electricity complicated ice making, a necessity for preserving daily catch for sale or even home consumption on an island with a mean daily high temperature of 84 degrees Fahrenheit. The lack of ice forced most commercial fish vendors to close for several weeks. Many fish vendors explained that they had to get ice shipped in from Tinian by boat, which is three miles south of Saipan. Some estimates of collective impacts of Typhoon Soudelor on Saipan fish sales are evidenced in Figure 5 (page 27).

CNMI Fisheries

Importance of CNMI fisheries

As is the case with most Pacific Islands, fish and fishing are an important component of food security, cultural perpetuation, and social solidarity for many CNMI residents (Allen and Amesbury, 2012; Hospital and Beavers, 2014). Commercial fishing is not economically viable for most fishers given that the local price per pound for most species has remained relatively fixed (in nominal terms) for the past 25 years (see Figure 12). When corrected for inflation, fish prices have actually decreased from 1990 to 2015 (see Figure 12, page 37). The increasing costs of fishing gear, tackle, boats and maintenance, and gasoline further reduce the ability of CNMI fishers to make a living fishing (Hospital and Beavers, 2014). (For more up to date qualitative information related to this, see Table 6, 'Markets'.)

Like other CNMI industries, the majority of commercial fishing is located on Saipan. There, locally-owned fish markets and vendors employ foreign contract workers that primarily target coral reef, bottomfish, and pelagic species (Rhodes et al., 2011 p. 41). Other fishers may sell a portion of their catch for partial income, to recuperate costs, or for commercial income when opportunities are available (Hospital and Beavers, 2014). A survey of 112 boat-based fishers across the CNMI revealed that highliners only derived about half of their personal income from selling their catch (Hospital and Beavers, 2014 p. 26).

Saipan Fish Markets and Vendors

Rhodes et al. (2011 p. 113) estimated that 50 full-time workers are employed in the local commercial fishing and seafood industry on Saipan and nearly all of them are low paid, non-resident (CW-1) laborers. The fishers primarily receive monetary catch-based incentives as part

of their compensation. The following section provides a 2017 update to this assessment. Below is a short inventory of fish markets and vendors located on the island of Saipan along with some basic information on market supply, consumer demand, targeted species, and issues impacting fish markets.

This information was gathered by the author during short, informal interviews conducted during fieldwork on Saipan in June and September 2016. Over two trips to the CNMI, visits were made to nine Saipan fish markets and vendors in June 2016 (see Table 5). Visits typically lasted 5 to 30 minutes. During the visits, informal, open-ended, unstructured conversations were initiated regarding the state and structure of the fishing business in Saipan. Three of the businesses could not be interviewed. Some key themes gathered from these informal conversations are presented in the aggregate below.

Table 5. Saipan fish markets and vendors and location.

Market/Vendor	Village Location
Asin's Fish Market	San Vicente
Arianne Fish Mart	Garapan
Daystar Fish Store	Chalan Laulau
DJ Fish Market	Susupe
JOH Fish Market	San Vicente
Marianas Fishing	Garapan
M&M Fish Mart	Garapan
MJ Roadside Vendor	Susupe
Serebu Fish Mart	Tanapag
WJC Market and Mart	San Vicente

Location and Longevity of Saipan Fish Markets and Vendors

Saipan fish markets are typically locally owned, and many have been in operation for 10 years or longer. About one third of these businesses is 'mobile' and operates from a cart or trailer in a semi-permanent location. The other two-thirds are 'brick and mortar' stores operating from a traditional storefront. Because of the casino development in Garapan, the nearby brick and mortar stores are experiencing increased rents. Although most of the fish markets or vendors retain brick and mortar locations, they still sell their fish out of ice-filled coolers like the mobile vendors.

Labor Sources

One to four employees typically staff Saipan fish markets and vendors. Among these employees, there are often two to three full-time fishers that supply fish specifically to those vendors. These employed fishers are often family members or close friends of the vendor and receive subsidized housing or utilities along with their working arrangement. Nearly all these employees are CW-1 workers from the Philippines. Therefore, the cap on CW-1 workers is an issue for many of the fish markets and vendors.

Other local and non-resident fishers that sell their catch freely among vendors do so based on working relationships, which may become strained or severed following unfavorable business

transactions. However, it may be difficult for local and non-resident fishers to compete with fishers directly employed by vendors who receive subsidized housing and utilities and may be extended family of vendor owners or operators. Some of the businesses also reported difficulty in attracting and hiring local residents at the contract worker wage rates. Local residents would either be hired without a housing/utility subsidy or do not need one, making it more cost effective for employers to hire CW-1 fishers, particularly those that are family members. The inability to hire local workers and the uncertainty over the CW-1 cap thus results in a precarious labor situation for the Saipan commercial fishing and seafood industry.

Scale of Operations, Gear, and Market Demand

Fishers employed by Saipan fish markets and vendors primarily target pelagic, bottomfish, and coral reef species from small boats under 25 ft. in length. These boats use trolling gear for pelagic species or pullers/electric reels for targeting deep bottomfish. Although boats are still used to target coral reef species or crustaceans, such as lobster, the reef fish market is supplied primarily by shore-based night spearfishing effort. Consumer demand is reportedly greatest for pelagic and coral reef species. At fish markets and with vendors, parrotfish are among the most frequently requested coral reef species and yellowfin tuna the most popular pelagic species. Increased visitor arrivals heighten demand for yellowfin tuna, lobster, and parrotfish.

Typhoon Soudelor

Typhoon Soudelor severely impacted Saipan fish markets. Saipan was without electricity for several weeks, and many fish markets and vendors were forced to close for 3 weeks or longer, as ice could only be obtained via boat from Tinian to the south. Some of the businesses reported that revenue has not yet recovered to pre-Soudelor levels. Another business shared a perception that the storm had lingering environmental impacts, reporting that the Saipan lagoon has not been as productive since the typhoon hit, due to increased sedimentation on the reefs. Figure 5 displays some estimates of the monetary impacts of Typhoon Soudelor on Saipan.

Seasonal Variability and Species Abundance

Seasonal variability coupled with species abundance was an issue that emerged from these informal interviews. One employee explained that in previous years fish were plentiful, and seasonal variability among species was regular and predictable. Yet in recent years, this predictability has changed. One employee posited that environmental changes, whether due to El Niño or climate change, have altered the months when certain species are caught. For example, mahimahi is typically caught in February/March, but in 2016, none were caught until April/May. Also, there were no atulai (*Selar crumenophthalmus*, big eye scad) runs in 2015. Atulai, small, schooling pelagic fish typically targeted with surround nets, are culturally important in the CNMI and elsewhere in the Pacific (Vaughan and Ayers, 2016). Another respondent reported that their divers had to travel farther away to the Northern Islands and Rota, to the south, to find and spear certain parrotfish species that are in high demand on Saipan.

Fishing Tackle Shops

Currently, CNMI has three tackle stores, and all are located on Saipan. Collectively, the stores stock fishing gear for trolling, bottomfishing, shoreline casting, and spearfishing. Lessons, tours, and charters are available through some stores for both beginner and advanced fishers/divers.

Small Boat Fleet

An updated assessment on the number of active fishing vessels by island is currently unavailable. For information from the 2012 assessment, please refer to Allen and Amesbury (2012) and Impact Assessment, Inc. (2012).

Status of Fishing Infrastructure

Saipan

Saipan fishers explained that their boat ramps and docks needed repairs or upgrades. Sugar Dock, a public boat ramp in southern Saipan, has large cracked and broken concrete slabs along the dock, causing instability (Todino, 2016). Sugar Dock is a multi-use area with limited parking for boat trailers. Sugar Dock is heavily used recreationally by swimmers, divers, and net fishers, along with commercial fishers launching small vessels (Impact Assessment, Inc. 2012 p. 18).

Another highly used dock and launch facility, Smiling Cove Marina, is in better shape. Smiling Cove Marina is the main docking area for small vessels on Saipan and the Outer Basin or Outer Cove used mainly by large commercial vessels, tour boat operators, and charters. There is no launch ramp at the Outer Cove. Fishers proclaimed a need for fueling facilities at both Smiling Cove and Sugar Dock. Garapan Fishing Base, often referred to as 'Fishing Base', is receiving paved parking spaces for boat trailers (DLNR, 2017). Several Saipan fishers also requested a launch ramp on the east side of Saipan (LaoLao Bay), where none currently exists. Boats launch illegally from the beach on the east side and must navigate a narrow pass in the reef to access offshore waters. Despite significant impacts to many homes and business, Typhoon Soudelor largely spared boat ramps and docks on Saipan.

Tinian

Individuals the author interviewed on Tinian did not comment on boat launch facilities there, but there were several comments regarding the lack of lighted channel markers at the entrance to Tinian Harbor. Tinian Harbor has approximately a dozen slips for small vessels and a deep harbor (Tinian Harbor) for larger draft vessels. Lighted channel markers would allow fishers to depart earlier for fishing trips and allow them to return to port after dark safely.

Rota

Rota has two boat launch facilities, one at West Harbor just outside Songsong village and another at East Harbor. West Harbor has 16 22' boat slips and substantial parking (DCM 2015). East Harbor on the southeastern part of the island has a launch ramp, some parking, and a picnic area. Rota fishers interviewed by the author mentioned that the lack of a boat ramp on the northern part of the island hinders fishing access. A boat ramp on the northern portion of Rota

would allow fishers to more easily access remote fishing areas there and on the east side. Others explained that the current boat ramps, although relatively new, were too steep making backing down and launching trailered vessels difficult.

Current Fisheries Governance Institutions

The CNMI employs a number of input and output controls and technical measures to govern fishing effort. Input controls include restrictions on the types of gear fishers are allowed to use. The CNMI prohibits the use of several types of nets, including drag nets, trap nets, surround nets, and gill nets. Destructive fishing gear, such as explosives, is also prohibited, as are poisons, electric shock devices, and the use of scuba tanks while spearfishing. Output restrictions govern what fishers may do with their catch. An example of an output control in the CNMI is a ban on the commercial sale or export of marine aquarium fish. Technical measures can entail spatial management such as an area closure or by specifying fishing seasons.

There are five marine protected areas in the CNMI, including three on Saipan (Bird Island Sanctuary, Mañagaha Marine Conservation Area, and Forbidden Island Sanctuary), one on Tinian (Tinian Marine Reserve), and one on Rota (Sasanhaya Bay Fish Reserve). There are two species specific MPAs, one protecting trochus at Lighthouse Reef and the other protecting sea cucumbers in LaoLao Bay. Currently, there is also a temporary moratorium on the take of any sea cucumbers or trochus in the CNMI. The CNMI allows several methods of fishing, including throw-net or cast-net, hand reel, rod and reel, spearfishing, gleaning, trolling, bottomfishing, and cliff fishing (CNMI Division of Fish and Wildlife 2017). For more information, visit the CNMI Division of Fish and Wildlife website on fishing regulations: <http://www.cnmi-dfw.com/fishing-rules.php>.

Changes in Fisheries Governance Institutions

In 2013, the U.S. Congress passed Public Law 113-34, which conveyed submerged lands from the shoreline out to three miles to the CNMI government, bringing parity with other U.S. insular areas. Public Law 113-34 withheld areas immediately offshore of some Northern islands, which were later conveyed to the CNMI by the Department of the Interior via the Territorial Submerged Lands Act (USFWS 2017). Other than transfer of submerged lands, nearshore fisheries governance institutions remain relatively unchanged since 2012.

Between 2011 and 2014, the U.S. Fish and Wildlife Service conducted public scoping meetings and visitor center working group listening sessions on the Marianas Trench Marine National Monument (USFWS 2014). The draft Marianas Trench Marine National Monument management plan and environmental assessment are undergoing internal review by NOAA and the USFWS. Plans are underway to share the draft plan with the public in early 2018.

Although not changes in governance institutions per se, the Hawai'i Longline Association has negotiated with the CNMI government to purchase 1,000 metric tons of their bigeye tuna quota each year since 2013. These agreements allow the Hawai'i longline fleet to continue fishing for bigeye tuna after their bigeye quota has been caught. In return for their quota, the Hawai'i Longline Association deposits a negotiated sum of money into a Western Pacific Sustainable

Fisheries Fund, which funds local fisheries infrastructure, training, and loan programs in the CNMI.

One of the potential changes being considered by the U.S. government involves the nomination of the Marianas Trench Marine National Monument as a National Marine Sanctuary. The details of this nomination will be discussed below.

National Marine Sanctuary Nomination

Two non-profit groups, The Pew Charitable Trusts and Friends of the Mariana's Trench, nominated The Marianas Trench Marine National Monument for consideration as a National Marine Sanctuary in December 2016. NOAA approved the Marianas Trench Marine National Monument application in March 2017 (NOAA ONMS 2017), and their application was added to the inventory of potential sanctuaries under consideration. However, adding the Marianas Trench to the inventory of potential marine sanctuaries does not ensure that it will become a marine sanctuary. The marine sanctuary process requires a public review conducted by the NOAA Office of National Marine Sanctuaries, with several layers of public participation and comment. This process may take several years before a conclusion is reached.

Interviews with CNMI Fishers

Overview and Methodology

In September 2016, the author conducted 26 semi-structured interviews of fishers, resource managers, environmental consultants, and government employees on the islands of Saipan, Tinian, and Rota. These interviews were conducted to assess changes in the CNMI fishing community since the last fishing community profile was published. Fishers were identified through a network sampling approach (Noy, 2008). First, key informants were identified during an initial scoping trip to Saipan and Guam in June 2016. Next, these individuals were contacted via email and telephone during a gap between the initial scoping trip in June and the second trip for fieldwork in September 2016. After the author built rapport with a few individuals on Saipan, Tinian, and Rota, they suggested other individuals in their network that should be contacted and interviewed. During fieldwork in September 2016, the author conducted 9 interviews on Saipan, 6 interviews on Tinian, and 11 interviews on Rota. The semi-structured interviews were conducted in English because of language barriers – many CNMI residents are bilingual and speak Chamorro, Carolinian, or Tagalog in addition to English. All interviewees were semi-structured. An interview guide was followed that asked about the following broad themes based upon issues identified during previous research conducted by Allen and Amesbury (2012). These broad themes included:

- Fishing trends: targeted species, dependency for subsistence/income, market demand
- Development: Saipan Casino
- Weather/climate/natural disasters/tourism: impacts on jobs, income, fishing
- Marianas Trench Marine National Monument
- Demographic change, in-out migration
- Potential military impacts
- Infrastructure

- Other

Although focus was placed on general themes, new conversational threads were encouraged if they emerged during interviews.

Permission was given by interview respondents to audio record their interviews. Detailed notes were also taken while conducting the interviews. Interview notes were analyzed by organizing or binning comments by themes using a grounded theory approach (Strauss and Corbin, 1990), and the recorded interviews were referenced for clarification when needed. All data were reported in the aggregate at the island level; no quotes or themes were attributed to any one person. Initially, comments were coded into specific themes that were later binned into more general categories using qualitative data analysis methods described by Miles and Huberman (1994). A total of 166 distinct thematic comments were separated into 15 specific categories that were finally binned into four general categories: ‘Economic Issues’; ‘Role of Government, Institutions, and Military Impacts’; ‘Fisheries and Resource Trends’; and ‘Social and Educational Issues’.

Findings of the qualitative data analysis of 26 interviews are presented below. These data are summarized in Tables 6–9.

Economic Issues

Table 6 presents qualitative interview data categorized into the general category titled ‘Economic Issues.’ There were 70 comments binned into this general category which was further separated into more specific categories, including ‘Markets’ (33 comments), ‘Development and Tourism impacts’ (17 comments), ‘Fishing costs’ (14 comments), and the ‘CNMI Economy’ (6 comments). Table 6 – Table 9 also separate interview themes by island to display island-level variation in the individuals reporting these issues.

In general, ‘Economic Issues’ were more frequently mentioned by fishers interviewed on Tinian and Saipan (33 and 28 comments, respectively) than fishers interviewed on Rota (just 9 total comments). Markets were the most frequently mentioned subtheme under Economic Issues by fishers on Tinian (17 comments) and Saipan (13 comments). This may suggest that fishers interviewed from Tinian and Saipan are more interested in commercial fishing opportunities than those interviewed living on Rota. After Markets, the next most frequently mentioned sub-theme was ‘Development and Tourism Impacts’ (17 comments). Saipan fishers interviewed mentioned this theme eight times and Tinian fishers nine times, but it was not mentioned by fishers on Rota. This absence of comments by fishers interviewed on Rota suggests that it is not impacted by Development and Tourism like Saipan and Tinian. The fishers interviewed on Tinian and Rota were more likely to mention fishing costs than their Saipan counterparts. Saipan is the only island with tackle shops in the CNMI, which makes acquiring tackle more difficult and expensive for Tinian and Rota fishers. Although the fishers interviewed on Tinian and Rota were more likely to mention fishing costs, Saipan fishers were more likely to mention the ‘CNMI Economy’ as an issue affecting CNMI fishing communities (5 of 6 total comments were mentioned by Saipan fishers).

Table 6.. Economic themes emerging from 26 semi-structured interviews conducted with CNMI fishers on the islands of Saipan (N = 9), Tinian (N = 6), and Rota (N = 11).

Interview Themes with Coding Examples	Total Comments by Island		
	Saipan	Tinian	Rota
Economic Issues (70 comments)	28	33	9
• <i>Markets</i> (33 comments)	13	17	3
- Tinian, Saipan boats fishing commercially in Rota; Rota fishers sell fish upon request;			
- Value and supply chains, ethnic preferences for different fish;			
- Most fish in local stores are imported; there were more fish markets in the 1990s;			
- Lack of markets for fish;			
- Need government assistance to market fish;			
- Filipino fishers flooding fish markets;			
- Only one fishing tackle store in Saipan;			
- Tinian Dynasty supported local fishers,			
• <i>Development and Tourism impacts</i> (17 comments)	8	9	0
- More pollution in the Saipan lagoon;			
- More pollution in the water;			
- Expecting increased demand for fish with Saipan Casino development;			
- Many people getting in the water, stepping on corals;			
- Chinese visitors increasing;			
- Tourists want fresh fish;			
- Hotels purchase fish from fish markets.			
• <i>Fishing costs</i> (14 comments)	2	7	5
- Costly, poorly made fishing gear (6);			
- High fuel and oil costs (2)			
- Bait costs increased threefold;			
- Difficult to order tackle from Honolulu;			
- Bottomfishing is expensive;			
- Difficult to cover fishing expenses;			
- Need to lower import tax on fishing tackle.			
• <i>CNMI Economy</i> (6 comments)	5	0	1
- No professional boat mechanics in the CNMI;			
- Fishing increased after garment factories closed;			
- Increase in fishing charters;			
- Small community limits commercial opportunities.			

Role of Government, Institutions, and Military Impacts

The ‘Role of Government, Institutions, and Military Impacts’ was the second most frequently mentioned thematic category. The CNMI interview respondents referenced this theme in 62 comments. The majority of the comments were made by Tinian fishers (28 total comments) and Saipan fishers (26 comments). Rota fishers that were interviewed referenced this theme in only 8 comments. A more detailed breakdown of subthemes is presented below in Table 7.

Under the larger umbrella theme of ‘Role of Government, Institutions, and Military Impacts’, the subtheme ‘Regulations/Enforcement’ was most frequently mentioned by interviewees. Respondents from all islands made comments pertaining to this theme, highlighting the importance of fishing regulations and enforcement across the CNMI. ‘Potential Military Impacts’ was the second most frequently mentioned thematic issue (13 comments) and was almost exclusive to Tinian interview respondents. They alluded to potential military impacts in 11 comments, versus just two by Saipan fishers and none by those interviewed on Rota. Tinian has increasingly been used as a training area for the U.S. military which often restricts coastal access and even boat-based access at certain times of the year (the U.S. military gives advance notice to local residents prior to closing any areas). Tinian fishers reported being affected through closures of certain favorable shoreline casting areas and preferred trolling areas.

‘Illegal Fishing’ and ‘Infrastructure Needs’ were each mentioned ten times. Although fishers from each island mentioned aspects of ‘Illegal Fishing’, Tinian fishers mentioned it most often (6 comments), with most of those comments referencing illegal Saipan-based commercial scuba spearfishing activity occurring around Tinian. Scuba spearfishing is illegal around the CNMI. In terms of ‘Infrastructure Needs’, Saipan fishers interviewed were more likely to request fuel facilities at the public boat docks, whereas Tinian fishers referenced lights for channel markers. Fishers interviewed on Saipan and Rota both mentioned the need for boat ramps in the more remote island areas to save fuel costs. Rota respondents also requested Fish Aggregating Devices (FADs) that were closer to shore to reduce the cost of targeting pelagic species. This was also referenced in the last assessment of social and economic characteristics of small boat fishing in the CNMI (Hospital and Beavers, 2014).

Saipan interview respondents most frequently referenced the ‘Data Issues’ theme (7/8 total comments). Many of these comments alluded to the creel survey data expansion process that is used to develop annual catch limits in the CNMI. Since WPacFIN does not generate catch estimates for Tinian or Rota, the output of Saipan creel surveys are referred to as ‘CNMI landings’, even though the estimates are only meant to be for Saipan (Hospital, 2015).

Comments by the Nutrition Assistance Program address issues related to expansion of the program, vendor certification, and federal takeover and conversion to the Supplementary Nutrition Assistance Program, which could limit the ability to support local food and fisheries production. The interviewees implied that programmatic guidelines for the Federal Supplementary Nutrition Assistance Program may reduce their flexibility to provide local food and fish across the CNMI. More stringent Federal guidelines may not allow the CNMI Nutrition Assistance Program to continue supporting the purchase local food and fisheries at current levels.

Table 7. Governance, military impacts in CNMI fisheries emerging from 26 semi-structured interviews conducted with CNMI fishers on the islands of Saipan (N = 9), Tinian (N = 6), and Rota (N = 11).

Interview Themes with Coding Examples	Total Comments by Island		
	Saipan	Tinian	Rota
Role of Government, Institutions, and Military Impacts (62 comments)	26	28	8
<ul style="list-style-type: none"> • <i>Regulations/Enforcement</i> (17 comments) <ul style="list-style-type: none"> - Department of Lands and Natural Resources not patrolling in Rota (2); - A lot of fishers feel threatened, under attack (2); - Positive influence of WESPAC in the region (2); - Division of Fish and Wildlife not equipped for boat enforcement; - CNMI fisheries lack enforcement, but is improving; - Enforcement is a challenge in Tinian; - Seeing results from scuba spear ban; - Need government assistance to support fisheries as economic development on Tinian and Rota; - Low capacity for enforcement. 	6	8	3
<ul style="list-style-type: none"> • <i>Potential Military Impacts</i> (13 comments) <ul style="list-style-type: none"> - Military exercises make east side of Tinian off limits to fishing (2); - Once, while fishing, military told me to stay away; - Military buffer zone between Saipan and Farallon; - Military exercises can limit trolling; - Military keep to themselves, don't spend money on Tinian; - Unexploded ordinances south of Tinian; - Two thirds of the land is already gone in Tinian; - Military has no respect when they are out in the field. 	2	11	0
<ul style="list-style-type: none"> • <i>Illegal Fishing</i> (10 comments) <ul style="list-style-type: none"> - Tinian is overfished by Saipan-based commercial fishers that scuba spearfish in Tinian (5); - Assume scuba spearfishing happens off of Rota, why else would they stay out all night; - Locals killing the reef by using plant-based poison to stun and capture fish; - Filipino contract workers scuba spearfishing on Rota; - So many divers shoot small fish; - Contract workers sell poisonous fish. 	2	6	2

Interview Themes with Coding Examples	Total Comments by Island		
	Saipan	Tinian	Rota
<ul style="list-style-type: none"> • <i>Infrastructure needs</i> (10 comments) <ul style="list-style-type: none"> - Need boat ramp, dedicated pathway through reef on East side of Saipan (2); - Not enough FADs, need more FADs closer to shore; - Rota boat ramps are too steep; - Lack of boat access/ramps on north end of Rota; - Tuna quota money can be used for infrastructure; - Need fuel docks at Smiling Cove and Sugar Dock; - Tinian needs a good ice maker; - Need a marker for spawning grounds on Tinian. 	5	2	3
<ul style="list-style-type: none"> • <i>Data Issues</i> (8 comments) <ul style="list-style-type: none"> - Need coordinates, bathymetry from NOAA cruises; - Houk's Food Stamps paper did not account for the death of a spearfishing highliner; - No Creel survey data from Tinian and Rota; - Very little data on Tinian spearfishing effort, catch; - What about data from the recent squid shrimp study; - Not enough data to make decisions on ACLs across the CNMI, all data are from Saipan. 	7	1	0
<ul style="list-style-type: none"> • <i>Nutrition Assistance Program</i> (4 comments) <ul style="list-style-type: none"> - Federally-managed Supplementary Nutrition Assistance Program Pilot could hurt local food production; - About 2700 households are currently under block grants; - Looking to increase numbers receiving assistance to 7000; - Need to certify vendors. 	4	0	0

Fisheries and Resource Trends

Table 8 displays the general theme 'Fisheries and Resource Trends.' Under this general theme, the most frequently mentioned subthemes were 'Resource Depletion', 'Fishing Trends', and 'Weather/Climate, Natural Disasters.'

Fishers interviewed mentioned the subtheme 'Resource Depletion' nearly equally, but a greater proportion of comments came from Tinian fishers. Many of the comments addressed specific issues like invasive species, and nearly all mentioned some aspect of resource depletion. Fishers that were interviewed regarding 'Fishing Trends', stated that more remote areas were more productive, identified the need for research to identify spawning areas, and mentioned the desire to move nearshore marine protected areas around. Although some of these comments dealt with governance aspects, the comment made about *Gadi* (a communal fishing practice using coconut leaves attached to a rope or vine to chase seasonal fish into the trap) stressed that this communal fishing activity no longer occurs on Saipan. This practice is different than surround net fishing with a monofilament net, which requires a permit.

Table 8. Fisheries and resource trends emerging from 26 semi-structured interviews conducted with CNMI fishers on the islands of Saipan (N = 9), Tinian (N = 6), and Rota (N = 11).

Interview Themes with Coding Examples	Total Comments by Island		
	Saipan	Tinian	Rota
Fisheries and Resource Trends (28 comments)	13	9	7
• <i>Resource Depletion</i> (13 comments)	4	5	5
- Extensive damage to Tatsu Pavillion area on Rota (2);			
- No seasonal atulai or rabbitfish runs on Tinian anymore (2);			
- Rota fisheries can sustain the island, but not with outsiders coming to fish;			
- Never see flathead fish anymore;			
- Bottomfishing not as good as it used to be on Rota;			
- More resource exploitation on Saipan;			
- More fish in the 1990s in Saipan than now;			
- Fish not there during productive moon phases anymore;			
- Reduction in Catch per Unit Effort when spearfishing around Tinian;			
- Lionfish around Tinian marina;			
- Last productive atulai season on Tinian was 2012/2013;			
- Unprecedented invasive species on Tinian in past couple years.			
• <i>Fishing Trends</i> (11 comments)	5	4	2
- Lots of fisherwomen on Saipan, more fisherwomen since 2000, they cast off the reef, octopus fishing, talaya net fishing;			
- <i>Gadi</i> (communal net fishing) does not happen anymore on Saipan;			
- Fishing is much harder now on Tinian;			
- Goat Island is a very productive area;			
- Need to move marine protected areas around;			
- Good trolling and diving on the east side of Saipan;			
- Need NGO help;			
- Need to identify spawning grounds;			
- Spearfishing allows you to choose your catch;			
- Need to take your boat to secluded spots.			
• <i>Weather/Climate, Natural Disasters</i> (4 comments)	4	0	0
- Fished every night after the Typhoon – people were hungry;			
- No electricity, so not enough ice after the Typhoon;			
- Generator-powered ice machine allowed him to keep fishing, preserve his catch after the Typhoon;			
- Fuel shortage after the Typhoon.			

Social and Educational Issues

Table 9 displays the general theme ‘Social and Educational Issues.’ Six comments referenced this theme.

Saipan interview respondents contributed most of the comments under the ‘Social and Educational Issues’ theme (5/6 total comments). Two of the three ‘Education’ comments alluded to the need for an ocean science school curriculum starting at a younger age. The ‘Collective Action’ comments revealed the desire to train more fishers to work together. One comment was made suggesting communal net fishing would be one way to get Saipan community members to fish together again, for both social and cultural reasons.

Table 9. Social and educational issues emerging from 26 semi-structured interviews conducted with CNMI fishers on the islands of Saipan (N = 9), Tinian (N = 6), and Rota (N = 11).

Interview Themes with Coding Examples	Total Comments by Island		
	Saipan	Tinian	Rota
Social and Educational Issues (6 comments)	5	0	1
• <i>Education</i> (3 comments)	2	0	1
- Young ones not interested in the ocean or fishing anymore, need more ocean science education starting at a younger age;			
- Spend a lot of time volunteering in the community;			
- Need ocean curriculum starting in the early grades.			
• <i>Collective Action</i> (3 comments)	3	0	0
- Fishers need to work together;			
- Need to train more fishers;			
- No more community fishing. Used to happen a lot. Need to do more communal net fishing on Saipan.			

CNMI Nutrition Assistance Program

The Nutrition Assistance Program is sometimes referred to as the Food Stamp program for the CNMI. This program supports CNMI residents who are U.S. citizens, U.S. Nationals, or U.S. permanent residents living in households where a sum of total available household resources or assets are less than \$2,000 and are also subject to monthly gross income limits. The Nutrition Assistance Program sets aside 30% of local coupons for food and products grown, caught, or produced in the CNMI. Local fish and fish products may be purchased with local coupons. There are 27 vendors or stores selling local fish or fish products on Saipan that accept Nutrition Assistance program coupons. Five vendors each accept local coupons on Tinian and Rota. The author met with CNMI Nutrition Assistance Program managers in 2016, and they agreed to share some recent data with the Pacific Islands Fisheries Science Center. The Nutrition Assistance Program mailed photocopied reimbursement data received from CNMI fish vendors from 2011-2016 to the Pacific Islands Fisheries Science Center. The author and two other Ecosystem

Science Division staff at the Pacific Islands Fisheries Science Center were able to manually enter one year of data (2015) into a database. The author analyzed these data and created Figures 5-9 using R Statistical Software.

The Nutrition Assistance Program data sheets are used as monthly reimbursement receipts and were not intended to track catch or seafood preferences. Further, there may be some inconsistency in reporting species names or naming management unit species (in other words, ‘bottomfish’ instead of a specific bottomfish species). Yet in the absence of any data on fish consumption and purchases made by low income residents in the CNMI, the Nutrition Assistance Program data sheets provide some estimates for this population in 2015, aggregated at the island level.

In the Nutrition Assistance Program, ‘cases’ are analogous to households, while ‘recipients’ count the number of individuals that benefit from the program. Table 10 displays data on Nutrition Assistance Program cases or households served by island from 2011 to 2016.

Table 10. Average number of Nutrition Assistance Program cases by island (2011-2016).

	2011	2012	2013	2014	2015	2016
Northern Islands	5	5	3	5	5	4
Tinian	155	141	147	141	176	191
Rota	105	120	114	113	128	113
Saipan	3,372	3,369	3,120	2,808	2,576	2,355
Totals	3,636	3,635	3,383	3,067	2,884	2,663

About 90% of all cases are on the island of Saipan. The number of cases on Saipan has decreased each year since 2011, while Tinian and Rota have exhibited greater variability in their number of Nutrition Assistance Program cases. Although there are currently no permanent residents in the Northern Islands, the former full-time inhabitants (now part-time or less) retain their ‘Northern Islands’ residence classification, hence their inclusion as the first row in Table 10 and Table 11. Table 11 displays the average number of Nutrition Assistance Program recipients (individuals receiving Nutrition Assistance Program assistance) by island from 2011 to 2016.

Table 11. Average number of Nutrition Assistance Program recipients by island (2011-2016).

	2011	2012	2013	2014	2015	2016
Northern Islands	12	12	6	9	9	9
Tinian	389	366	359	350	468	454
Rota	316	354	327	316	326	266
Saipan	9,042	9,077	8,434	7,683	7,125	6,551
Totals	9,759	9,809	9,126	8,358	7,928	7,280

The total number of Nutrition Assistance Program recipients decreased significantly from a peak of 9,809 in 2012, to 7,280 in 2016. Much of this decline was on Saipan. Rota residents have exhibited more variability in number of recipients receiving assistance. The number of recipients receiving assistance on Tinian increased in 2015 and 2016, relative to previous years. The

increase in recipients on Tinian could be attributed to the closure of the Tinian Dynasty Hotel and Casino, which employed some locals. It is likely that the increase in private fixed investment in Saipan starting in 2014 may be responsible for declines in recipients on Saipan.

Figure 5 – Figure 9 are based on 2015 Nutrition Assistance Program vendor reimbursement receipts. The vendors must submit monthly invoices to the Nutrition Assistance Program. These monthly invoices include pounds sold by species type, the price per pound, and total amount (in dollars) for each species per month. Participating vendors were located on Saipan, Tinian, and Rota. Following months of contact and two in-person meetings, the Nutrition Assistance Program photocopied every monthly invoice from 2011 to 2015 and airmailed them to the Pacific Islands Fisheries Science Center in Honolulu. An Ecosystem Sciences Division employee designed a database to store the data, noting the complexity of fish names reported in multiple languages, common names, and even slang names for certain fish like “wonder woman” for monchong (sickle pomfret, *Taractichthys steindachneri*). It took approximately six months for the author and two Ecosystem Sciences Division staff members at the Pacific Islands Fisheries Science Center working off and on to enter all the data for just one year. These data from 2015, presented here, can provide some insight into local fish consumption for nearly 8,000 of the poorest citizens in the CNMI.

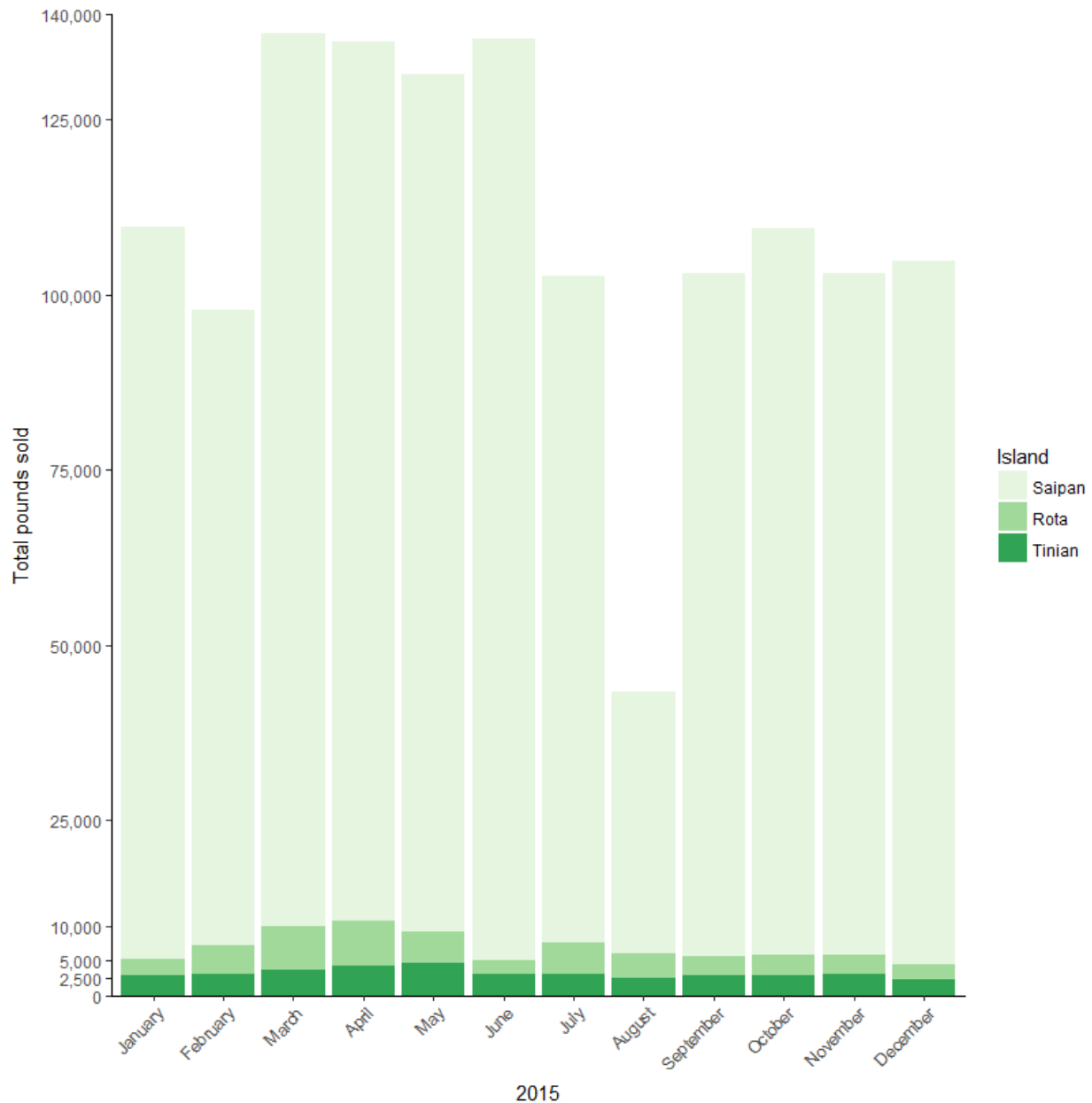


Figure 5. Pounds sold to Nutrition Assistance Program recipients each month in 2015 on the islands of Saipan, Rota, and Tinian.

The 2015 Nutrition Assistance Program vendor invoices presented in Figure 5 yield a few important findings. First, the scale of sales on Saipan far exceeds the sales of Tinian and Rota combined. Second, the figure shows how a natural disaster (Typhoon Soudelor) can impact fish consumption and markets in the CNMI. Typhoon Soudelor made landfall on Saipan late on Sunday, August 2, and in the early hours on Monday, August 3. The storm knocked out electricity on Saipan for several weeks and caused fuel and water rationing for most of the month of August. As a result, a significant amount of fish was not purchased through the Nutrition Assistance Program from Saipan commercial vendors in August 2015. Currently, data are unavailable to assess how August 2015 compares to other years. Despite the lack of Nutrition Assistance Program sales in August 2015, fishing still took place during the Soudelor blackout,

and there is evidence that sales occurred door to door within villages and through family networks. There are no estimates available for how much fish was caught and sold informally in the month following Soudelor’s landfall.

Despite widespread damage and extended impacts on the island of Saipan, Tinian and Rota were spared from any major impacts, and Nutrition Assistance Program purchases through local fish vendors were not disrupted on those islands. Figure 5 shows how a natural disaster may impact local fish consumption at finer scales (one island was significantly impacted, the other two were not), particularly for a vulnerable segment of the CNMI population. In 2015, 27 Saipan vendors or stores participated in the Nutrition Assistance program, with five participating vendors each on Tinian and Rota.

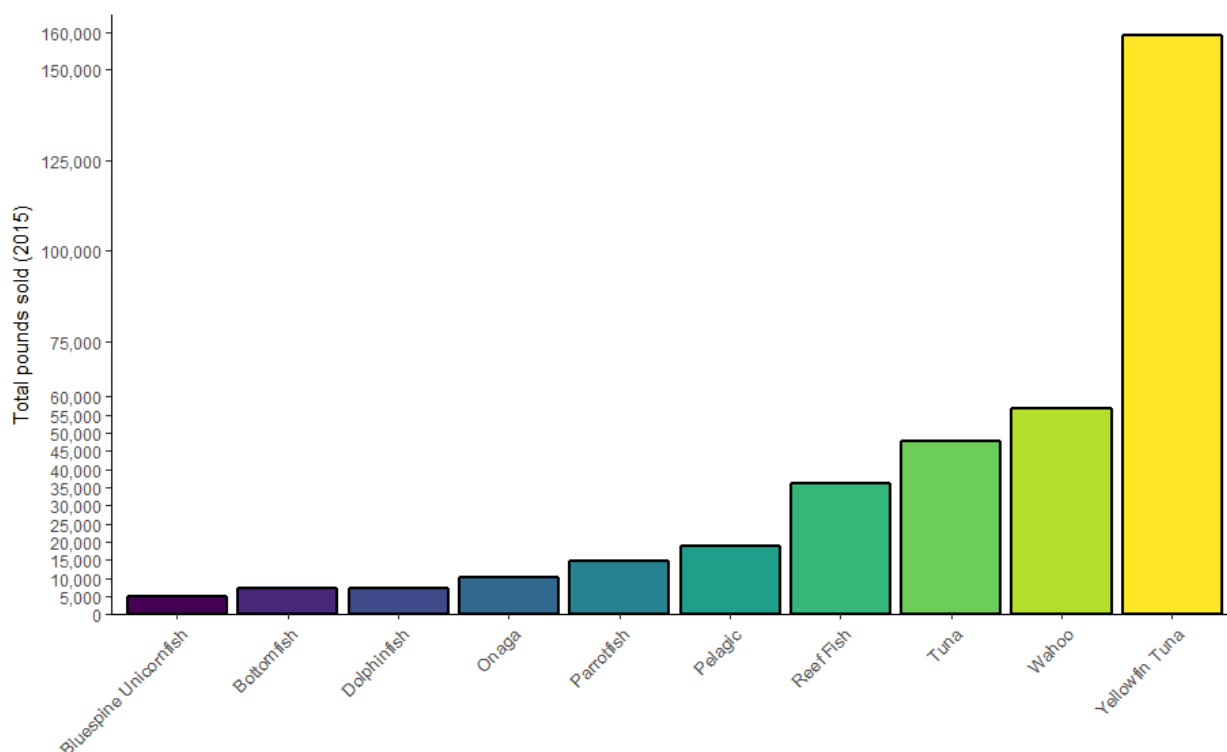


Figure 6. Top ten species by pounds sold by participating CNMI Nutrition Assistance Program vendors in 2015.

Figure 6 provides data on the preferences of Nutrition Assistance Program recipients. The fish names reported in the figure reflect common names used by CNMI fish vendors to describe their fish sales, which may be different than names used in other regions of the U.S. or globally. Five of the top 10 species by total pounds sold were pelagic management unit species, 3 out of 10 were coral reef management unit species, and 2 out of 10 were bottomfish management unit species. Figure 6 also illustrates the inconsistencies in reporting across Nutrition Assistance Program vendors. Some merely listed ‘Pelagic’ or ‘Reef Fish’ for their sales, without any indication as to which type or types of pelagic species they sold. ‘Tuna’ is another example of this type of aggregation. ‘Tuna’ could describe skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), kawakawa (*Euthynnus affinis*), or even dogtooth tuna (*Gymnosarda unicolor*), which is often referred to as “white tuna” though it is not a tuna species. The Nutrition

Assistance Program is reliant on market workers to correctly identify the fish they sell, which demonstrates one flaw in the dataset. Nevertheless, these data still provide insight into the species most frequently purchased by Nutrition Assistance Program recipients. Figure 7 – Figure 9 present island level variation in Nutrition Assistance Program fish sales.

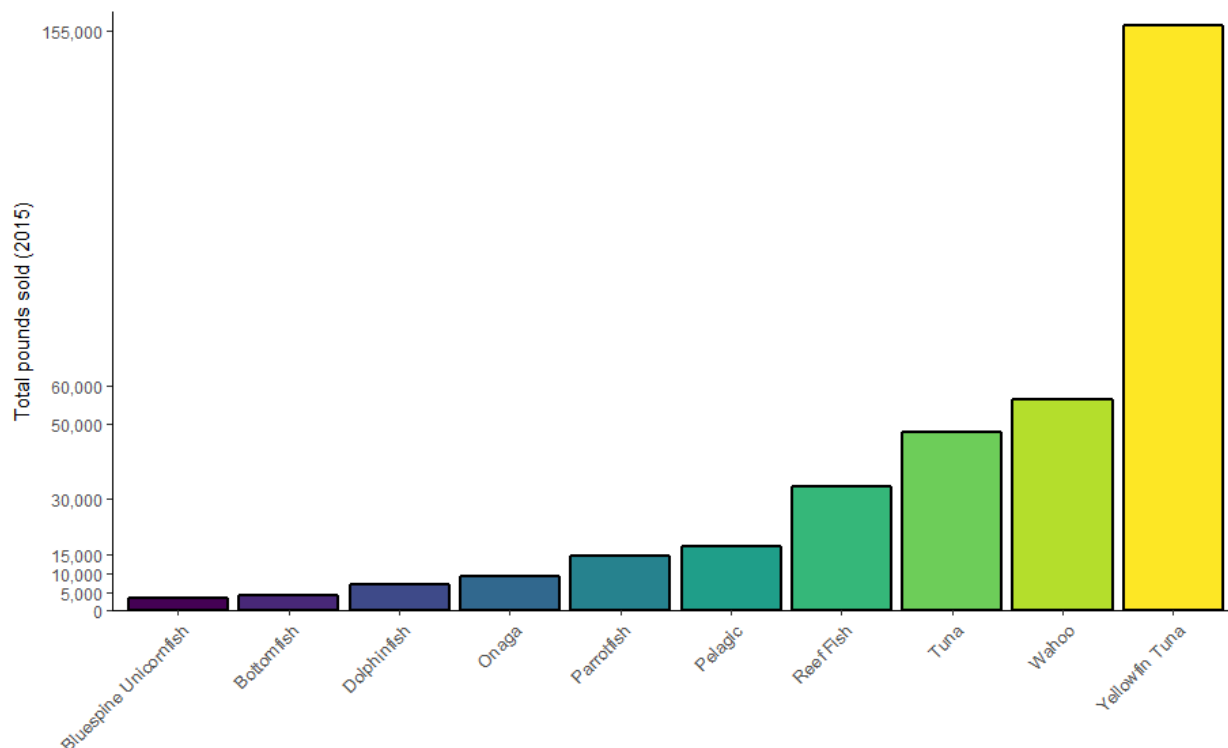


Figure 7. Top ten species by pounds sold by Nutrition Assistance Program vendors on Saipan in 2015.

The top 10 species for Saipan displayed in Figure 7 are in the same order as those reported in Figure 6, with slightly fewer pounds sold for some categories, such as yellowfin tuna. Figure 9 shows the scale of fish consumption in Saipan versus the less populated islands of Tinian and Rota. Figure 8 displays the top 10 species by total pounds sold on Tinian to Nutrition Assistance Program vendors in 2015.

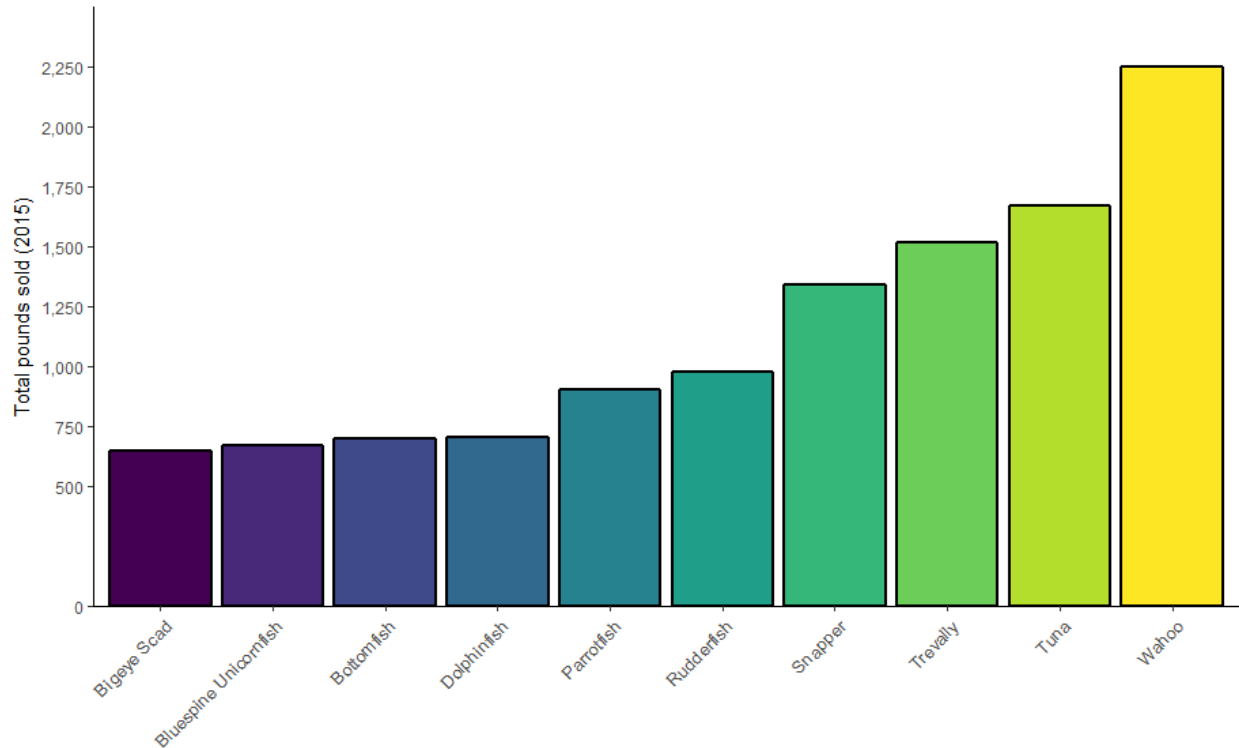


Figure 8. Top ten species by pounds sold by Nutrition Assistance Program vendors on Tinian in 2015.

Nutrition Assistance Program sales in 2015 on Tinian draw attention to island-level differences in market availability and recipient preferences across the CNMI (see Figure 8). Tinian has a much smaller population than Saipan. Although wahoo and tuna ranked first and second in the list of top 10 species sold in terms of total pounds, just three of the 10 species sold on Tinian were pelagic management unit species. Further, four species were coral reef species, along with one schooling coastal pelagic (bigeye scad) that seasonally schools in bays and nearshore areas. Two of the 10 species were bottomfish (snapper and ‘bottomfish’). Without further inquiry, more explanation of local market availability and recipient preferences cannot be disentangled.

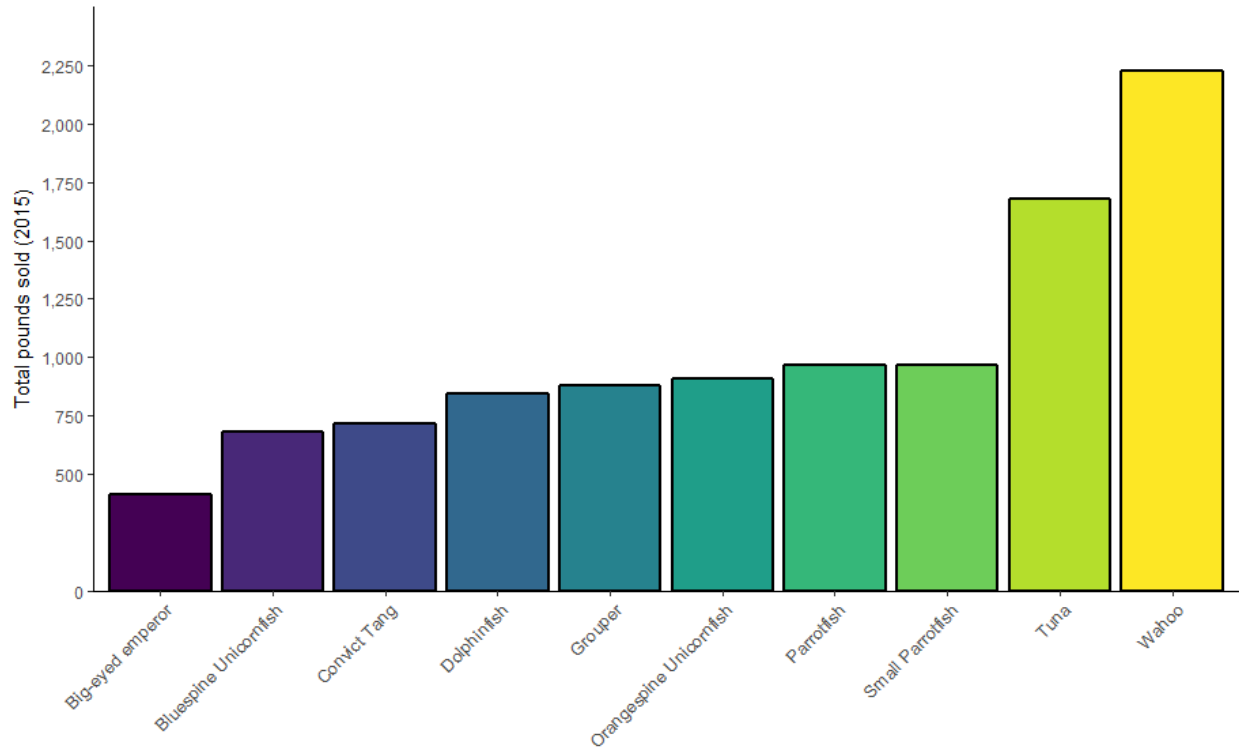


Figure 9. Top ten species by pounds sold by Nutrition Assistance Program vendors on Rota in 2015.

Figure 9 further indicates island-level variation in market availability and Nutrition Assistance Program recipient preferences. In 2015, wahoo and tuna were again ranked first and second in terms of pounds sold at participating Nutrition Assistance Program vendors on the island of Rota. However, small parrotfish and parrotfish ranked third and fourth in pounds sold, respectively. Additionally, six of the top 10 species were coral reef species, and just two of the 10 were bottomfish. These data perhaps indicate local preferences for coral reef fish or market availability of pelagic species on Rota.

2011 Survey of CNMI Small Boat Fishers

Although some findings from the 2011 survey were reported by Allen and Amesbury (2012), most of these data were incomplete and preliminary at that time. Thus, some highlights relevant to fishing communities are presented below. PIFSC researchers surveyed 112 small boat fishers on the islands of Saipan, Tinian, and Rota in 2011 (Hospital and Beavers, 2014). They found that trolling was the most popular gear type, followed by bottomfishing and boat-based spearfishing. FADs provided important fishing spots for trolling fishers, 71% of whom had fished around FADs in the past year. Nearly three-quarters of those interviewed (74%) had sold some of their catch during the past year, despite deriving little income from those sales. This behavior demonstrates the importance of expense fishing or selling some of their catch commercially to recuperate fishing expenses.

Interview respondents also reported consuming or giving away between 22% and 66% of their catch, highlighting the importance of CNMI fisheries in contributing to food security and fulfilling social and cultural obligations through customary exchange. The diverse post-harvest catch distribution is indicative of the difficulty in classifying CNMI fishers and the blurry distinction between commercial and non-commercial fishing trips. To further illustrate this point, CNMI fishers defined themselves in a variety of ways including subsistence, recreational expense, cultural, and commercial. As is the case in many Pacific Island fisheries, these lines are blurred and may vary depending on the trip, the time of year, their personal economic situation, or other social and cultural factors. For more detailed information on the 2011 survey of CNMI small boat fishers, please reference Hospital and Beavers Hospital and Beavers (2014).

Marianas Trench National Monument Research

Pacific Islands Fisheries Science Center economics and human dimensions researchers have published four articles since the last CNMI fishing community profile. Below, a short, annotated bibliography of these studies is presented along with some information on the potential National Marine Sanctuary status for the Marianas Trench Marine National Monument.

Results of a Survey of CNMI and Guam Residents on the Marianas Trench Marine National Monument

The Marianas Trench Marine National Monument was established by Presidential Proclamation 8335 in January 2009, by President George W. Bush. Kotowicz and Allen (2015) surveyed CNMI and Guam residents in 2012 regarding their knowledge of the Marianas Trench Marine National Monument. More CNMI inhabitants were aware of the designation than Guam residents. Although many residents were unaware of the monument designation, most of those interviewed supported its establishment once it was explained to them.

Equity and Access in Marine Protected Areas: The History and Future of ‘Traditional Indigenous Fishing’ in the Marianas Trench Marine National Monument

Richmond and Kotowicz (2015) used oral history methods to interview CNMI and Guam residents in 2011 and 2012. The authors conducted interviews to identify some social and equity

issues related to the siting of large marine protected areas such as the Marianas Trench Marine National Monument. Some fishers felt alienated by the top-down designation process. The monument regulations preventing the commercial sale of any fish caught within the Monument inadvertently disadvantaged indigenous Chamorro and Carolinian residents since those groups were more likely to: 1) fish in the area and 2) sell some of their catch to help pay for high trip costs. Although these fishing trips were rare, the authors also described the cultural importance of such trips to these groups.

Traditional Fishing Patterns in the Marianas Trench Marine National Monument

Kotowicz and Richmond (2013) used oral history interview methods during fieldwork conducted in 2011 and 2012 to examine traditional fishing patterns in the Marianas Trench Marine National Monument. The authors documented oral history accounts of 139 trips over 70 years, from 1939 to 2009, with an average of 3.8 trips per year. Many of the trips mixed subsistence activities, customary exchange, some commercial sales, sport fishing, and other sales outside of formal markets. Before the Monument was established, some commercial activities allowed fishers to recover costs and expenses related to the long trips. Even though indigenous fishing is still allowed in the Monument, Kotowicz and Richmond (2013) found that high trip costs and prohibition of cost recovery have severely restricted trips since establishment of the Monument.

Exploring Public knowledge, Attitudes, and Perceptions of the Marianas Trench Marine National Monument

In 2012, Kotowicz, Richmond, and Hospital (2017) conducted telephone surveys of 500 residents of Guam and the CNMI ($n = 1000$) regarding the recent establishment of the Marianas Trench Marine National Monument. One of the most significant findings was that most residents were unaware of the new designation. There were significant differences between fishing households and non-fishing households. Fishing households were less likely to support the monument designation and were more likely to question the designation process.

Updated Fisheries Data

Creel Surveys

The following section provides a synopsis of Saipan creel survey methods compiled by Oram et al. (2011). The Division of Fish and Wildlife is mandated to provide and enforce regulations that govern hunting, fishing, harvesting, and taking of species, as well as human behavior and activities in protected and conservation areas in the CNMI. The Division of Fish and Wildlife also gathers information on commercial and recreational fishing in the CNMI to provide data for fisheries management. Both commercial and non-commercial fisheries are surveyed for number caught, species of fish, length and weight measurements, as well as the locations, dates, and times that fish were caught.

To assess shore- and boat-based fisheries, the Division of Fish and Wildlife conducts creel surveys. Creel surveys are the major source of fisheries data in the CNMI. Two types of creel surveys are conducted: shore-based surveys assess catch of coral reef management unit species, and boat-based surveys assess coral reef, pelagic, and bottomfish management unit species. For the shore-based surveys, the CNMI Division of Fish and Wildlife employees survey fishers using a stratified, randomized research design to obtain an island-wide, expanded estimate of landings and maximum sustainable yield. The results of Saipan creel surveys are placed in an expansion algorithm to derive estimates for total landings for the entire CNMI. For more information on the expansion justification, see Hospital (2015).

Each day is divided into four 6-hour time shifts, for example, 12:01 am to 6:00 am, 6:01 am to 12:00 pm, etc. Time shifts are also separated among weekdays, holidays, and weekends to ensure each time shift is randomly surveyed. Although survey times are randomly determined, each 6-hour time shift is worked at least four times a quarter. It takes 2 hours to survey the entire west coast of Saipan (see Figure 10). Surveys are broken into two parts: participation counts and interviews.



Participation counts note every fisher seen in each zone plus the type of gear being used. Interviews are more detailed. If someone is counted during a participation survey and is still fishing when the surveyor drives back through the area a few hours later, then they are typically interviewed. During interviews, the surveyor takes note of the weather and surf conditions, the zone, and the fisher's ethnicity. They may record the length, weight, and type of fish caught, the percentage kept or sold, and the number of gears used. According to a ten-year average of the shore-based creel survey data (2006-2016), the top three coral reef fish families in terms of proportion of catch were surgeonfish, rabbitfish, and jacks (WPRFMC 2017 p. 41). Common gear types noted during creel surveys include hook and line (90% of fishing activities noted during creel surveys), spearfishing, and throw-net or cast-net (Hospital 2015 p. 19; WPRFMC 2017 p. 43). However, Hospital (2015) notes that certain target species or fishing types may not be easily intercepted using the current creel survey design; more survey days – or nights for nighttime spearfishing – may be needed to improve catch estimates.

Boat-based creel surveys employ a similar random methodology, but only survey fishers in three areas: Smiling Cove, Sugar Dock, and Fishing Base. Boat-based surveyors ask fishers what they caught, how long they fished, and how often they go fishing. They may also measure or estimate

the length and weight of fish. They expand the gathered data to create estimated landings by gear type. On average, from 2005 to 2015, Division of Fish and Wildlife employees completed 68 sample days, recorded 614 boat-based trips, and completed 242 catch interviews. According to a ten-year average (2006-2016) of 12 managed species complexes, the top three complexes by weight caught from boats were bottomfish or bottomfish management unit species, emperors, and atulai. From a ten-year average (2006-2016) of total estimated effort (in gear-hours) employed from boats, the three most frequently used gear types were atulai gear, hook and line, and spearfishing gear (WPRFMC 2017 p. 43). For more information on shore- and boat-based catch statistics, gear types, and catch per unit effort, reference the 2016 Mariana Archipelago SAFE Report (2017).

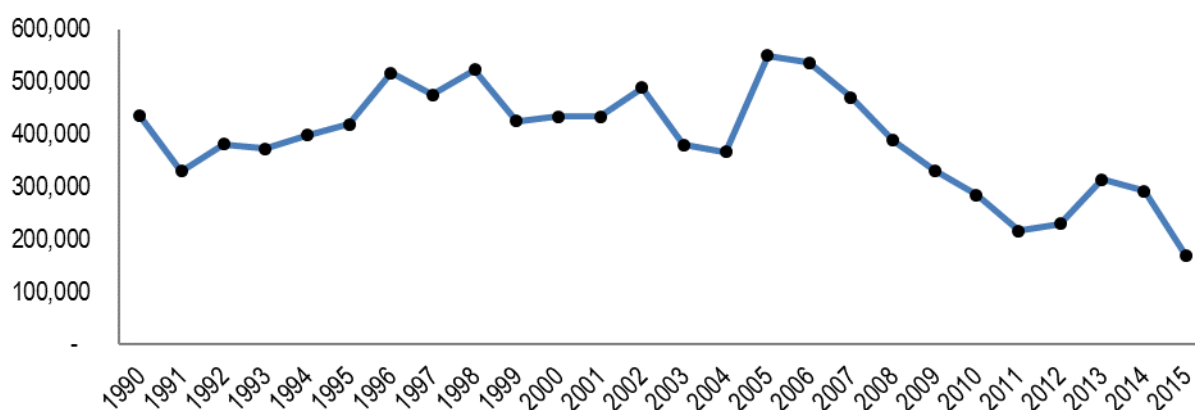


Figure 11. Estimated yearly commercial landings in the CNMI from 1990 to 2015.

Source: CNMI Division of Fish and Wildlife commercial purchase receipt data aggregated by WPacFIN.²

Commercial sales receipts data from participating CNMI seafood retailers are also gathered by the Division of Fish and Wildlife. The caveats to the dealer invoicing approach include dependence on the dealers to voluntarily participate, identify fish correctly, and fill out forms accurately. There is limited contact with the commercial fishers other than through creel surveys (Lowe et al. 2016). There are also limits to the types of information that can be collected on the dealer invoice forms. The dealer invoice data can be used to generate estimates for yearly commercial landings, which are reported in Figure 11.

Estimated yearly commercial landings in the CNMI have declined from a peak of more than 500,000 lbs in 2005, to less than 200,000 lbs in 2015 (see Figure 11). The CNMI lost nearly 15% of its population between 2000 and 2010 census counts, which likely affected aggregate market demand (see Table 1). Likewise, total employment in the CNMI dropped by about 50% between 2005 and 2015, representing a loss of about 25,000 workers (see Fig. 2). Nearly all workforce attrition was limited to foreign CW-1 workers, many of whom left the CNMI. Loss of 25,000 workers would also affect overall market demand.

² https://www.pifsc.noaa.gov/wpacfin/cnmi/Pages/cnmi_data_2.php

A few research articles have also reported signs of decreased abundance of targeted coral reef species. These articles cited increased harvesting of juvenile fish species (Zeller et al., 2007); fourfold decreases in catch per unit effort, and a 39 to 73% decline in reef fish landings since the 1950s (Cuetos-Bueno and Houk, 2015). During semi-structured interviews (Table 8), fishers questioned whether Cuetos-Bueno and Houk's data had accounted for the loss of a large portion of coral reef fisheries landings after a spearfishing highliner passed away. Without landings by this individual, a large number of reef fish no longer reached markets. According to these fishers, the lack of catch was wrongly misinterpreted as a decline in the fishery. Other potential causes for the drop in coral reef landings could include the implementation of scuba spearfishing and net restrictions. Aside from these potential causal mechanisms, the CNMI Division of Fisheries and Wildlife emphasized that total coral reef fishing effort has decreased, particularly among the fishers employed by vendors.

Catch per unit of effort (CPUE) data from the CNMI Division of Fisheries and Wildlife and the Western Pacific Fisheries Information Network is available for pelagic, bottomfish, and coral reef management unit species, but is based upon creel survey expansion calculations. Although biomass, fish length, and CPUE data are presented in Annual Stock Assessment and Fishery Evaluation Reports (WPRFMC 2017), due to the creel survey expansion process, time series trends for CPUE are not easily discernible, particularly for coral reef species.

Bottomfish effort data are more easily interpreted. According to recent bottomfish stock assessment for the Marianas Archipelago, CNMI bottomfish stock assessment and CPUE data exhibit inter-annual fluctuations. However, these fluctuations occur around a long-term mean of 98/lb landed per trip from 1983 to 2005 (Yau et al., 2016 p. 12). From 2013 data, the authors concluded that bottomfish stocks were healthy around the CNMI, estimating just a 2.5% risk of overfishing (Yau et al., 2016 p. 16). Furthermore, the authors concluded that overfishing did not occur from 1983 to 2013 (Ibid). Given the currently available data, disentangling the complex social, economic, and ecological processes that mediate yearly CNMI commercial fish landings remains an elusive undertaking.

The dealer invoicing data can also be used to estimate the mean price per pound sold of commercial marine species in the CNMI. Figure 12 presents a 25-year time series (1990-2015) of estimated mean price per pound for commercial marine species sold in the CNMI.

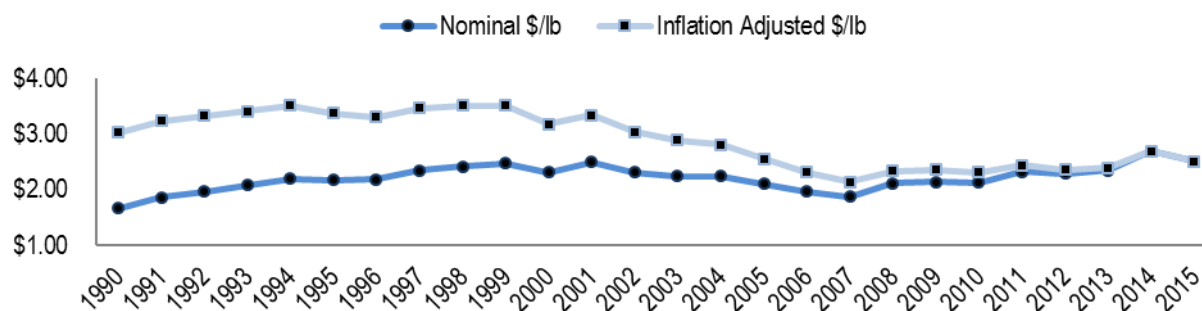


Figure 12. Estimated mean price per pound of commercial marine species sold in the CNMI from 1990 to 2015.

Source: CNMI Division of Fish and Wildlife commercial purchase receipt data aggregated by WPacFIN.³

Figure 12 displays both nominal \$/lb (the mean value of fish sold during a given year) and inflation adjusted \$/lb (the mean value of fish sold corrected for inflation, with a base year of 2015). Nominal values of fish should reflect and include yearly inflation, while inflation adjusted, or real values, will correct for the value of inflation, allowing a more accurate comparison among prices in a time series. The inflation adjusted \$/lb used in Figure 12 used 2015 dollars for the entire time series (1990-2015).

When examining trends in nominal price/lb over the time series, it is apparent that prices have remained relatively fixed for the past 25 years. However, after adjusting for inflation (with a base year of 2015), the estimated price per pound for commercial marine species declined over time in the CNMI. Prices influence participation in commercial fisheries and reduce cost recovery for part-time commercial fishers and fishers that opportunistically sell their catch to recoup their costs (otherwise known as expense fishing). Cost recovery is an important component of fishing in the CNMI, particularly for boat-based fishing. In a 2011 survey of 110 small boat fishers across the CNMI, Hospital and Beavers (2014 p. 24) found that 73.6% of all fishers surveyed sold at least some portion of their catch. As fuel, bait, and tackle costs continue to increase in the CNMI, the relatively flat fish prices may have an adverse effect on future fishing participation.

Conclusion

This 2017 update to the 2012 fishing community profile presents qualitative and quantitative data to assess how fisheries and socioeconomic trends are affecting the CNMI fishing community and included several additional data sources not available in the original profile. A 2017 GAO report described changes in the CNMI economy, including updated employment trends, including data on the number of CW-1 permits/visas and foreign workers. Findings from extensive fieldwork on Saipan, Tinian, and Rota generated new information and understanding of issues facing fishing communities. Based on semi-structured interviews with 26 fishers across three islands, issues facing the CNMI fishing communities may vary significantly by island. Informal interviews with fish markets, vendors, and fishers provided insight on the structure of commercial markets. The inclusion of Nutrition Assistance Program data, although from only

³ https://www.pifsc.noaa.gov/wpacfin/cnmi/Pages/cnmi_data_2.php

one year, demonstrated how fishing communities can be affected by events, such as natural disasters, and how these impacts to vulnerable populations can occur at finer scales. For example, fish purchases made with Nutrition Assistance Program coupons were heavily impacted from Typhoon Soudelor on Saipan, but not on Tinian or Rota. Below is a summary of notable findings or changes since the first CNMI fishing community profile was published.

The Casino Legalization on Saipan and Increased Private Fixed Investment

The Best Sunshine Limited built the Imperial Pacific Resort Hotel and Casino on Saipan. The casino has injected a large amount of private fixed investment in the CNMI. Along with increased tourism (which is perhaps casino-related), the casino development has increased employment on Saipan. It may also increase demand of certain pelagic species, such as tunas, coral reef species like parrotfish, and crustaceans (lobster). The casino development is also raising rents around Saipan, which may make it difficult for fish vendors to operate close to the center of Garapan.

Increased Uncertainty over CW-1 Workers

Foreign workers represent a large component of the CNMI economy. As the CNMI transitions to zero CW-1 worker permits (and a U.S. visa system) by 2019 and finishes its transition to a U.S. federal immigration system, the economy will be significantly impacted. The GAO stated that an absence of foreign workers would cost an estimated 26 to 62% of productivity for the CNMI (GAO, 2017). A loss of CW-1 workers would directly impact the Saipan commercial fishing industry. Most Saipan commercial fishing operations (about 50 workers currently) are staffed by longtime CW-1 workers (Rhodes et al., 2011). A significant reduction in allowable CW-1 worker visas would effectively eliminate this industry as it currently functions.

Increases in the CNMI Minimum Wage

Allen and Amesbury (2012) posited that increases in the minimum wage would negatively affect employment in the CNMI. As the CNMI transitions closer to the U.S. minimum wage of \$7.25 in 2018, there is no evidence to suggest that this transition is currently affecting employment in the CNMI.

Increases in Visitor Arrivals

Visitor arrivals to the CNMI have increased every year since 2011, with the largest growth in Korean and Chinese visitors. Visitors from Japan have decreased substantially. The CNMI has transitioned to a tourism-based economy. Maintaining a strong visitor industry will be increasingly important for the CNMI economy in future years.

Typhoon Soudelor Impacts Saipan Fishing Communities

Typhoon Soudelor significantly impacted Saipan in late summer 2015. Many residents were without electricity and running water for several weeks and faced long lines for rationed gasoline supplies. Nutrition Assistance Program data provided some evidence of how Typhoon Soudelor disrupted the fishing and seafood industry on Saipan. Soudelor made landfall on August 3, 2015, and Saipan fish markets sold significantly fewer pounds of local fish through coupon sales than

in July and September, the months before and after the storm. Nutrition Assistance Program Data from participating vendors on Tinian and Rota indicated no observable impacts on those islands. Typhoon Soudelor also showed the impacts of the storm on particularly vulnerable communities that possess fewer resources, earn less income, and qualify for CNMI government support.

Economic Challenges Facing Commercial Fishers in the CNMI

The average price per pound for CNMI fish (in nominal terms) has declined since 1990. While mean prices for CNMI fisheries remain flat (and decline after adjusting for inflation), fishers reported that fishing costs, particularly for bait, tackle, and fuel have significantly increased in recent years. According to the fishers interviewed, Economic issues were said to have the largest negative impact to CNMI fishing communities.

Acknowledgements

I would like to thank Karma Norman, Kirsten Leong, Justin Hospital, Sam Pooley, Mike Tenorio, and Jack Ogumoro for their thorough reviews and helpful comments prior to publication. I would also like to thank Justin Hospital and John Gourley for their assistance prior to and during fieldwork. Lastly, I would like to thank all of the fishers, business owners, and CNMI Division of Fish and Wildlife employees for sharing their time, perspectives, and information.

References

- Allen, S. D., and J. R. Amesbury. 2012. Commonwealth of the Northern Mariana Islands As a Fishing Community. Page 89. U.S. Department of Commerce, National Marine Fisheries Service, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-36, Honolulu, Hawai'i.
- Allen, S. D., and P. Bartram. 2008. Guam as a Fishing Community. Page 70. National Marine Fisheries Service, NOAA, Administrative Report H-08-01, Pacific Islands Fishery Science Center.
- Campbell, M., and G. Farrell. 2017, April 1. FBI Makes Arrest Related to Saipan Casino Construction. Bloomberg.com.
- Campbell, M., and D. Wei. 2017, April 9. Human Smuggling, Money Laundering Probes Surround Saipan Casino - Bloomberg. Bloomberg.com. online.
- Central Intelligence Agency. 2017. Republic of the Marshall Islands. Web. <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2129rank.html>.
- Clinton, W. J. 1994. Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Page 59 FR 7629.
- CNMI Division of Fish and Wildlife. 2017. Fishing Regulations Summary. <http://www.cnmi-dfw.com/fishing-rules.php>.
- Cohen, M. 2017. Saipan's \$7 Billion Integrated Resort Promise Starts With A Casino In A Shopping Mall. <http://www.forbes.com/sites/muhammadcohen/2015/08/14/saipans-7-billion-integrated-resort-promise-starts-with-a-casino-in-a-shopping-mall/>.
- Cuetos-Bueno, J., and P. Houk. 2015. Re-estimation and synthesis of coral-reef fishery landings in the Commonwealth of the Northern Mariana Islands since the 1950s suggests the decline of a common resource. *Reviews in Fish Biology and Fisheries* 25(1):179–194.
- DCM. 2015. Public Shoreline Access Guide for Saipan, Tinian, and Rota. Page 30.
- DLNR. 2017, June 8. Garapan Fishing Base set to break ground for paving| Saipan Tribune.
- Erediano, E. T. 2014, March 4. Senate approves Saipan casino bill. *Marianas Variety*. Saipan, MP.
- Fisheries Off West Coast States and in the Western Pacific. 1999. *Fisheries Off West Coast States and in the Western Pacific*. Federal Register 64(74):19067–19069.
- GAO. 2017. Commonwealth of the Northern Mariana Islands Implementation of Federal Minimum Wage and Immigration Laws. U.S. Governmental Accountability Office, Report to Congressional Addresses GAO-17-437, Washington, D.C.
- Grace-McCaskey, C. A. 2015. American Samoa Fishing Community Profile: 2013 Update. Page 39. National Marine Fisheries Service, NOAA, Administrative Report H-15-04, Pacific Islands Fisheries Science Center, Honolulu, Hawaii.
- Hawaii DBEDT. 2015. The State of Hawaii Data Book; a statistical abstract. Page 1142. Hawaii Department of Economic Development and Tourism. Research and Economic Analysis Division. Statistics and Data Support Branch., Honolulu, Hawaii.
- Hospital, J., and C. Beavers. 2014. Economic and Social Characteristics of Small Boat Fishing in the Commonwealth of the Northern Mariana Islands. Page 58. National Marine Fisheries Service, NOAA, Administrative Report H-14-02, Pacific Islands Fisheries Science Center, Honolulu, Hawaii.
- Hospital, S. B. 2015. Western Pacific Creel Survey Program Data Summary and Analysis Guam, the Commonwealth of the Northern Mariana Islands, and American Samoa. Page 194.

- Pacific Islands Fishery Science Center, Administrative Report H-15-06C, Honolulu, Hawai'i.
- Impact Assment, Inc. 2012. Descriptive Assessment of Contemporary Small-Scale and Traditional Fisheries in the Western Pacific. Page 91. Impact Assessment, Inc., Final Report, Pacific Islands Office, Honolulu, Hawaii.
- Johnson, R. B., and A. J. Onwuegbuzie. 2004. Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educational Researcher* 33(7):14–26.
- Kotowicz, D., and S. Allen. 2015. Results of a survey of CNMI and Guam residents on the Marianas Trench Marine National Monument. Page 55. DR-13-009.
- Kotowicz, D. M., L. Richmond, and J. Hospital. 2017. Exploring Public Knowledge, Attitudes, and Perceptions of the Marianas Trench Marine National Monument. *Coastal Management* 45(6):452–469.
- Kotowicz, D., and L. Richmond. 2013. Traditional Fishing Patterns in the Marianas Trench Marine National Monument. Page 54. National Marine Fisheries Service, NOAA, Administrative Report H-13-05, Pacific Islands Fisheries Science Center, Honolulu, Hawaii.
- Levine, A., and S. D. Allen. 2009. American Samoa as a fishing community. U.S. Department of Commerce, National Marine Fisheries Service, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-19, Pacific Islands Fisheries Science Center, Honolulu, Hawaii.
- Limtiaco, S. 2017, April 7. Hundreds of alleged visa, labor violations on Saipan. *Pacific Daily News*.
- Lowe, M. K., M. M. C. Quach, K. R. Brousseau, and A. S. Tomita. 2016. Fishery Statistics of the Western Pacific Volume 29. Page var. Pacific Islands Fishery Science Center, National Marine Fisheries Service, Administrative Report H-16-03, Honolulu, Hawai'i 96822-2396.
- Magnuson-Stevens Fishery Conservation and Management Act: As Amended Through January 12, 2007. 2007. . Pages 1801–1891 16 U.S.C.
- Maxwell, J. A., and D. M. Loomis. 2003. Mixed methods design: An alternative approach. *Handbook of mixed methods in social and behavioral research* 1:241–272.
- Miles, M., and A. Huberman. 1994. *Qualitative data analysis: An expanded sourcebook*, 2nd edition. Sage Publications, Thousand Oaks, CA.
- National Environmental Policy Act. 1970. . Page 42 U.S.C.
- NOAA ONMS. 2017. Sanctuary Nomination Process: Nominations. <https://nominate.noaa.gov/nominations/>.
- Noy, C. 2008. Sampling Knowledge: The Hermeneutics of Snowball Sampling in Qualitative Research. *International Journal of Social Research Methodology* 11(4):327–344.
- Oram, R., R. Roberto, M. Trianni, M. Quach, D. Hamm, and P. Tao. 2011, March. Saipan Boat-based Creel Survey Documentation.
- PIFSC. 2017. Fishing Community Profile: Commonwealth of the Northern Mariana Islands. InPort Data. <https://inport.nmfs.noaa.gov/inport/item/47536>.
- Rhodes, K. L., K. Warren-Rhodes, P. Houk, J. Cuetos-Bueno, and Q. Fong. 2011. An Interdisciplinary Study of Market Forces and Nearshore Fisheries Management in Micronesia. Page 120. The Nature Conservancy, Report No. 6/11, Asia Pacific Conservation Region Marine Program.

- Richmond, L., and D. Kotowicz. 2015. Equity and access in marine protected areas: The history and future of “traditional indigenous fishing” in the Marianas Trench Marine National Monument. *Applied Geography* 59:117–124.
- Ruane, M. C. 2015. First Hawaiian Bank Economic Forecast Guam-CNMI Edition. Page 10. First Hawaiian Bank.
- Strauss, A. L., and J. M. Corbin. 1990. *Basics of Qualitative Research: Grounded Theory Procedure and Techniques*. Sage, Newbury Park, London.
- Todino, J. 2016, September 26. Cracks, holes at Sugar Dock getting bigger. *Marianas Variety*.
- U.S. Census Bureau. 2015. Recent Population Trends for the U.S. Islands Areas: 2000-2010. U.S. Government Printing Office, P23-213, Washington, D.C.
- U.S. GAO. 2008. Commonwealth of the Northern Mariana Islands Managing Potential Economic Impact of Applying U.S. Immigration Law Requires Coordinated Federal Decisions and Additional Data. Page 126. U.S. Governmental Accountability Office, Report to Congressional Committees GAO-08-791.
- USCIS. 2017. CW-1: CNMI-Only Transitional Worker. <https://www.uscis.gov/working-united-states/temporary-workers/cw-1-cnmi-only-transitional-worker>.
- USFWS. 2014, September 5. Mariana Trench Monument Management Plan. https://www.fws.gov/refuge/Mariana_Trench_Marine_National_Monument/what_we_do/planning.html.
- USFWS. 2017. Marianas Trench Marine National Monument, Commonwealth of the Northern Mariana Islands; Completion of the Northern Islands Submerged Lands Transfer to the Commonwealth of the Northern Mariana Islands. *Federal Register* 82 FR 3349(FWS-R1-R-2016-N167 1265-0000-10135-S3):3349–3350.
- Vaughan, M. B., and A. L. Ayers. 2016. Customary Access: Sustaining Local Control of Fishing and Food on Kaua‘i’s North Shore. *Food, Culture & Society* 19(3):517–538.
- Villahermosa, C. A. E. 2016, December 16. \$75M fine deters new investors from taking over Tinian Dynasty, says Borja. *Marianas Variety*. Saipan, MP.
- Wei, D., and M. Campbell. 2016, November 13. Big Money, Big Questions at Trump Protege’s Remote Casino - Bloomberg. *Bloomberg.com*. online.
- WPRFMC. 2017. Annual Stock Assessment and Fishery Evaluation (SAFE) Report for the Mariana Archipelago Fishery Ecosystem Plan 2016. Page 241. Western Pacific Regional Fishery Management Council, Honolulu, Hawai‘i.
- Yau, A., M. Nadon, B. Richards, J. Brodziak, and E. Fletcher. 2016. Stock Assessment Updates of the Bottomfish Management Unit Species of American Samoa, the Commonwealth of the Northern Mariana Islands, and Guam in 2015 Using Data through 2013. Page 54. U.S. Department of Commerce, National Marine Fisheries Service, NOAA Technical Memorandum NOAA-TM-NMFS-PIFSC-51, Pacific Islands Fisheries Science Center, Honolulu, Hawaii.
- Zeller, D., S. Booth, G. Davis, and D. Pauly. 2007. Re-estimation of small-scale fishery catches for U.S. flag-associated island areas in the western Pacific: the last 50 years. *Fishery Bulletin* 105(2):266–277.