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Economic Impact of the Recreational Fisheries on Local County Economies in Greater Farallones National Marine Sanctuary 2010, 2011 and 2012

U.S. Department of Commerce
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Economic Impact of the Recreational Fisheries on Local County Economies in the Greater Farallones National Marine Sanctuary 2010, 2011 and 2012

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Abstract

This report estimates the economic impacts/contributions of recreational fishing within the Greater Farallones National Marine Sanctuary (GFNMS). The methodology applies the IMPLAN input-output model to estimates of total annual expenditures derived by taking estimates of person-days by mode of access (e.g. shore, private/rental boat and commercial passenger fishing vessels) from the State of California's Recreational Fishing Statistics Program and multiplying by NOAA's National Marine Fisheries Service's (NMFS or NOAA Fisheries) expenditure profiles by mode of access. The IMPLAN model is then used to calculate output, income, value- added and employment for the collection of five counties (study area) where most of the economic impact takes place. Economic impacts/contributions are estimated for 2010, 2011, 2012 and the three-year average. Expenditure impacts/contributions are estimated separately for trip expenditures and durable good expenditures. Trip expenditure impacts are appropriate for analyzing regulations or other policy/management alternatives that involve small or marginal changes in fishing effort. This report also presents the trends in person–days of recreational fishing by mode from 2004 through 2012.

The three-year average for 2010 to 2012 finds the total economic impacts/contributions from recreational fishing in GFNMS to be $28.4 million in output, $17.5 million in value-added, $10.3 million in income and roughly 200 jobs. During the study period, 2010 saw the lowest levels of output, value added, income and jobs from all marine recreational fishing. In total GFNMS accounted for 11.2% of the total person-days of marine recreational fishing from California Districts 4 and 5 and 2.0% of the entire State of California's total recreational fishing effort on average each year. Recreational shore fishing accounted for an average of 5.1% of person-days, 24.7% of private/rental boat person-days, and 52.8% of commercial fishing passenger boats person-days of all the person-days in Districts 4 and 5. Shore fishing in GFNMS accounted for 1.0%, private/rental boat fishing for 5.3% and commercial passenger fishing vessels for 5.4% of the total State of California's fishing effort by mode of access.

Key Words

Economic impact, income, jobs, California, recreational fishing, Greater Farallones, output, value-added, person-days.

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Chapter 1 Introduction

This report is part of the Socioeconomic Research & Monitoring Program for Greater Farallones National Marine Sanctuary (GFNMS). Socioeconomic priorities were established for all West Coast Region (WCR) sanctuaries in the "*Office of National Marine Sanctuaries West Coast Region Socioeconomic Plan FY2013 – FY2014* (Office of National Marine Sanctuaries, 2012)". This report also supports a "national" Office of National Marine Sanctuaries (ONMS) priority to document the connection between the national marine sanctuary resource uses and local, regional and national economies.

Sources of Information and Estimation of Effort

This report addresses magnitude of recreational fishing in GFNMS and the resulting economic impacts/contributions from 2010-2012. The data used to estimate the number of recreational fishing person-days in GFNMS comes from the California Department of Fish and Wildlife (CDFW). The data are available from the Pacific RecFIN public site or via written request to the CDFW. Data presented in this report are from years 2004-2012, and the economic analysis is for years 2010 -2012. The RecFIN data are used to show trends in the number of recreational fishing person-days within the sanctuary by resident and non-resident status.

To obtain estimates of recreational shore fishing within GFNMS, data sent to ONMS from CDFW was used to determine if an access point is within the sanctuary. The data from CDFW contained GIS layers with the California Recreational Fishing Survey (CRFS) district and site locations of man-made structures and beach/bank sites. If an access point was in the sanctuary or within a 1.25 mile buffer of the sanctuary's border, then the location was considered to be in GFNMS.

For boat modes, the amount of fishing effort that takes place in national marine sanctuaries is based on the best overlay of CDFW 10-minute by 10-minute blocks on sanctuary boundaries. See Chen, Leeworthy and Schwarzmann (2015) for detailed methods of estimation.

The next step is to determine what counties should be included in the GFNMS study area. If the sanctuary was adjacent to the full coastal boundary of a county it was included in the study area. Then data from the American Community Survey (U.S. Department of Commerce, Bureau of the Census) was used to determine the percentage of workers from neighboring counties that worked within the coastal counties. If more than 1 percent of workers in a non-adjacent county worked in an adjacent coastal county, the non-adjacent county was included in the study area. This was done to account for the majority of multiplier impacts from spending in local area counties.

The study area counties for the GFNMS are listed in Table 1.1 below. Figure 1.1 presents the map of the study area and fishing block IDs that are included in the study area. Additionally, the CDFW districts are also presented on the map. CDFW districts are

used to geographically identify different regions along the coast. A more detailed description of this process can be found in Chen, Leeworthy and Schwarzmann (2015).

Table 1.1 The GFNMS Study Area

County	***Coastal***
Contra Costa	Non-Coastal
Solano	Non-Coastal
Marin	Coastal
Mendocino	Coastal
San Francisco	Coastal
Sonoma	Coastal

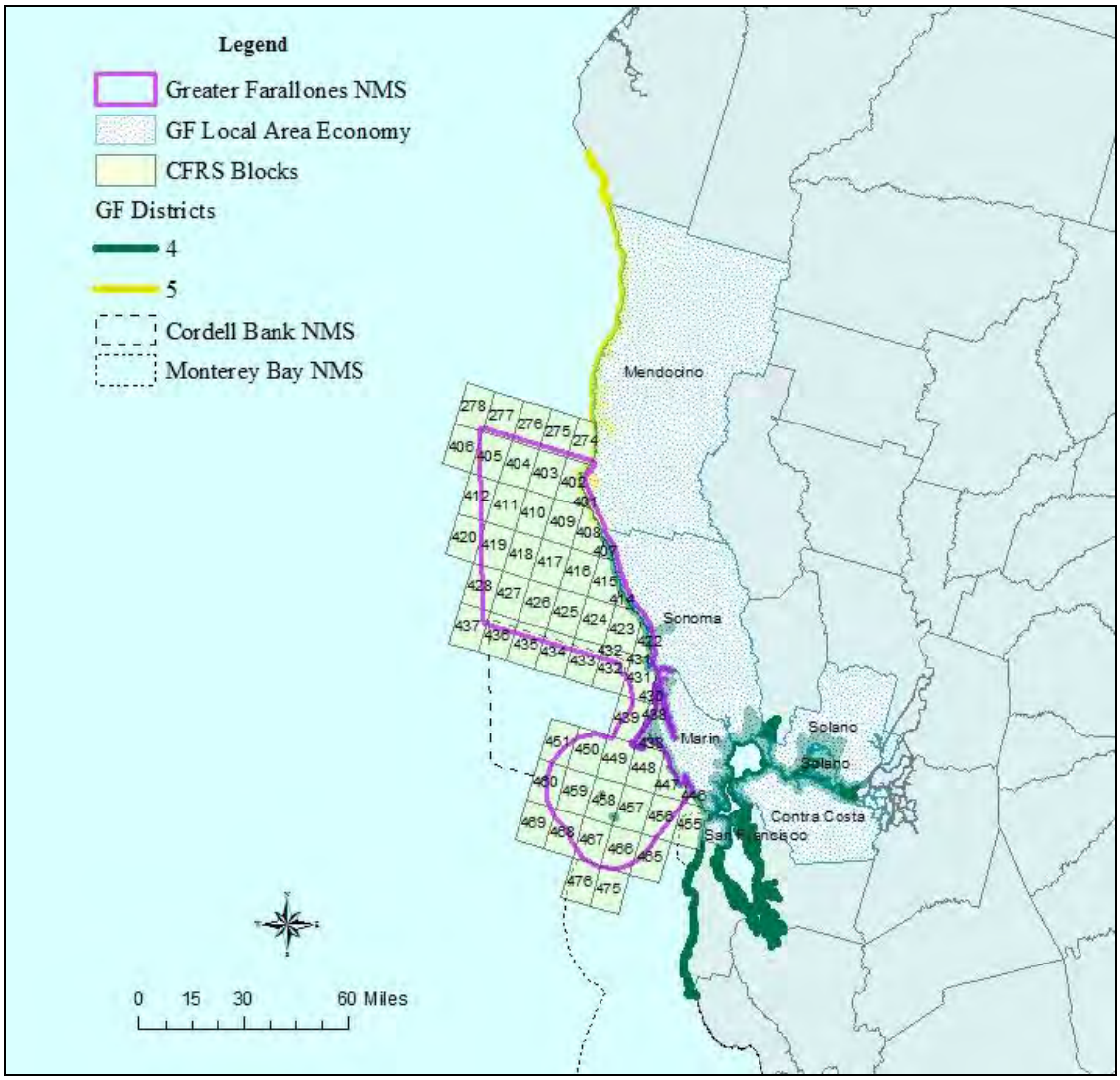

Figure 1.1 GFNMS Study Area Map

If a person lives within the study area they were considered a resident of the GFNMS. If the resident lived outside of one of the five counties in the study area then they were considered a non-resident.

To estimate the economic impacts/contributions on the local counties of GFNMS CDFW data from years 2010-2012 was used in conjunction with Angler Expenditure Profiles developed by the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) (Lovell et al., 2013).

The IMPLAN model was used to estimate the market economic impacts/contributions of recreational fishing to the GFNMS study area. IMPLAN is an input-output model developed to estimate the impacts of changes in a specified region (Day, 2011). The 2009 IMPLAN data set was used to estimate the economic recreational fishing impacts/contributions. These economic estimates take into account recreational fin-fishing and recreational invertebrate fishing.

The economic estimates in this report include both the direct and indirect impacts of recreational fishermen's expenditures throughout the economy. The direct effect considers the initial expenditures made by fishermen. The indirect effect considers the initial expenditures' backward linkages in other industries; the flow of spending is traced back through the supply chain. They are called indirect effects because spending by fishermen is stimulating increased production in other industries within the study area. Lastly, induced effects account for increased employee income, and consequently employee spending, resulting from the directly and indirectly affected industries within the study area (Day, 2011). The addition of the indirect and induced impacts is what is generally referred to as the "multiplier" impacts. The break-out of these impacts is not presented here. For those details, see Chen, Leeworthy and Schwarzmann (2015).

Chapter 2 focuses on trends in person-days of recreational fishing within the sanctuary. There are three types of fishing that were analyzed; shore-mode fishing, private/rental boat and commercial passenger fishing vessels. It is customary to group together private boats and rental boats, both the State of California CDFW and NOAA Fisheries analyze these two forms of boating as a unit. Shore fishing is defined as fishing accessed on beaches, banks and man-made structures. Private boats are defined as boats belonging to an individual not for rent or with paying passengers. Rental boats are defined as a boat that is rented without crew or a guide. The last section of Chapter 2 reviews Commercial Passenger Fishing Vessels (CPFV). There are two types of boats that fall into the CPFV category. The first is a charter boat, which is operating under charter for a specified price, time, etc. It usually means the boat is closed to anyone not in the group hiring the charter boat. The second type, a party boat, is a boat on which fishing space and privilege are provided for a fee per angler and are often referred to as head-boats (RecFIN, 2014). The terminology to describe person-days and mode of access is presented in Table 1.2.

Table 1.2 Definition of Key Terms (adapted from RecFin, 2014)

Term	Definition
Person-Days	The number of days (not trips) a person fishes
Shore Fishing	Fishing accessed on beaches, banks and man-made structures.
Private-Rental Boat Fishing	Private boats are defined as belonging to an individual not for rent or with paying passengers. Rental boats are defined as a boat that is rented without crew or a guide.
Commercial Passenger Vehicle Fishing (CPFV)	There are two categories. The first is a charter boat, operating under charter for a specified price, time, etc. A party boat, is a boat on which fishing space and privilege are provided for a fee per angler.

Chapter 3 presents and discusses expenditure profiles of recreational anglers in California. NOAA produces estimates of expenditures by person-day based on the three types of recreational fishing and resident status. In addition, the annual expenditures on durable goods are also estimated and discussed by each mode.

Chapter 4 presents the results of the IMPLAN model. These results include total output, value added, income and employment (measured in number of full and part-time jobs) resulting from recreational fishing in the sanctuary. Results are estimated by mode for each year from 2010-2012 and a three-year average.

Chapter 5 presents a summary and conclusions.

Chapter 2 Recreational Fishing Person-days

Shore Angler Person-days

Person-days are defined as the number of days a person fishes. If a person takes a one week trip and fishes for five days, then that would be counted as five person-days. Raw survey data was extrapolated from the CDFW, RecFIN website and used to make population estimates of person-days in GFNMS. A more detailed explanation of the process can be found in Chen, Leeworthy and Schwarzmann (2015). The person-day trends account for recreational fin-fishing from 2004 through 2012, but beginning in 2010 through 2012 the CRFS data includes invertebrate recreational fishing person-day effort too.

Figure 2.1 presents the number of person-days of recreational shore fishing in the sanctuary from 2004 to 2012. From 2004 to 2012 the number of person-days varied with significant ups and downs reaching a low point in 2011. Person-days were highest in 2005, and have seen a significant increase from 2010 to 2012 exceeding the level achieved in all years except 2005.

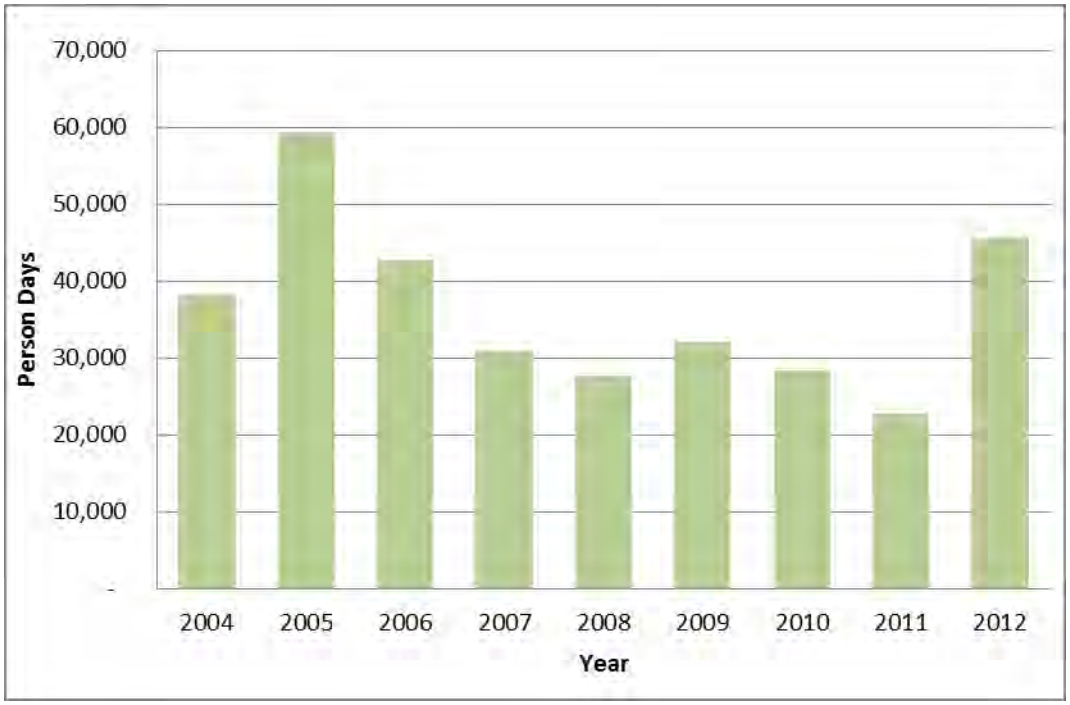

Figure 2.1 GFNMS Shore Fishing Person-days

Most of those accessing the shore for recreational fishing are residents of the study area. From 2010 to 2012, between 74.5 to 82.5% of total shore anglers were residents (Figure 2.2).

For estimating the economic impact of recreational fishing, we limited this to years 2010, 2011, and 2012 and then report the three-year average. Table 2.1 reports the person-days

for shore mode access for the three years and the average and the proportion of all shore mode person-days in Districts 4 & 5 that took place in GFNMS. Overall person-days of shore fishing has increased over the three-year period. The proportion of shore mode person-days in Districts 4 & 5 accounted for in GFNMS varied from a low of 5.7% in 2010 to a high of 7.2% in 2012 with a three-year average of 5.1%.

Table 2.1 GFNMS Shore Fishing Person-days in Districts 4 and 5 by Resident Status

Year	Resident	Non-Resident	Total
2010	22,126	6,201	28,327
% in GFNMS[1]			5.7%
2011	18,757	3,960	22,718
% in GFNMS[2]			3.1%
2012	34,089	11,656	45,744
% in GFNMS[3]			7.2%
Average	24,991	7,272	32,263
% in GFNMS[4]			5.1%

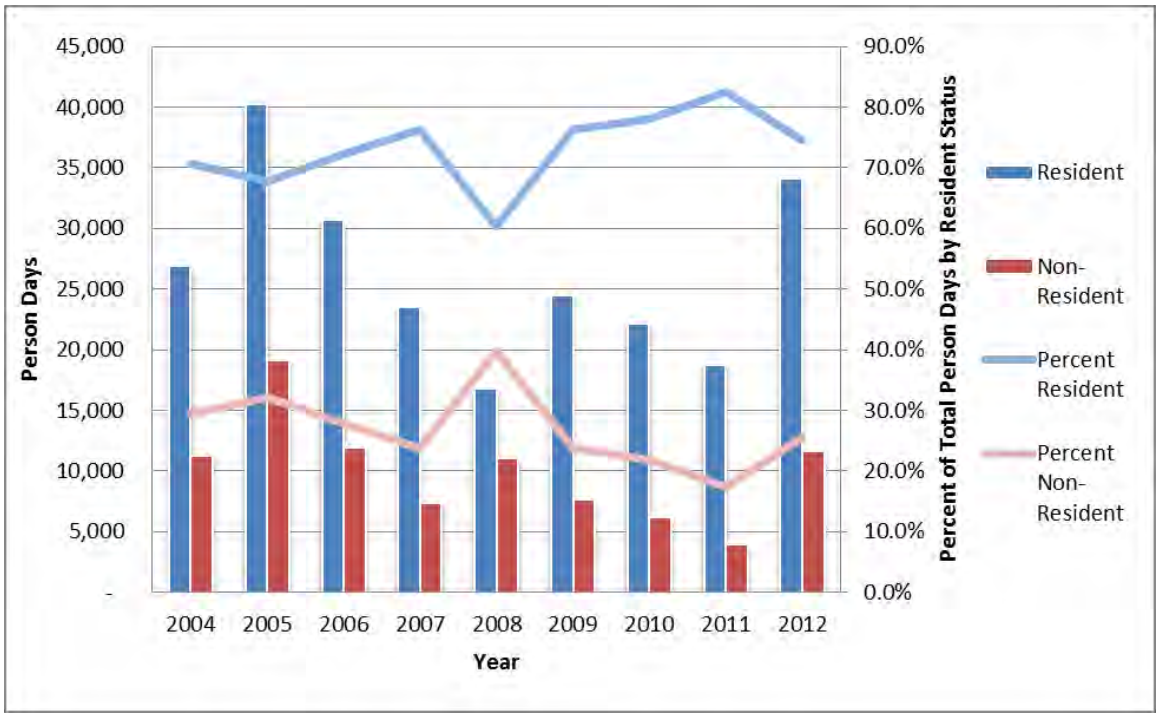

Figure 2.2 GFNMS Shore Fishing Person-days by Resident Status

[1] This is the 2010 number of total shore mode person-days in Districts 4 and 5. The value is 499,019 person-days.
[2] This is the 2011 number of total shore mode person-days in Districts 4 and 5. The value is 743,020 person-days.
[3] This is the 2012 number of total shore mode person-days in Districts 4 and 5. The value is 638,703 person-days.
[4] This is the average number of total shore mode person-days in years 2010, 2011 and 2012 in Districts 4 and 5. The value is 629,914 person-days.

Private/rental Boat Person-days

As previously discussed private boats are defined as boats belonging to an individual not for rent or with paying passengers. A rental boat is defined as a boat that is rented without crew or a guide. With the exception of 2004, private/rental boat person-days, takes the shape of 'U' from 2005 through 2012, with the minimum number of person-days having occurred in 2008. Figure 2.3 shows the number of person-days from 2004 to 2012.

From 2010 to 2012, residents accounted for between 52.3 to 59.8% of total private/rental boat trips in GFNMS (Figure 2.4). The three-year average was 54.5%.

For the three years 2010 to 2012, person-days of private/rental boat fishing in GFNMS as a proportion of Districts 4 and 5 total person-days ranged from a low of 20.0% in 2011 to a high of 30.6% in 2012 with a three-year average of 24.7% (Table 2.2).

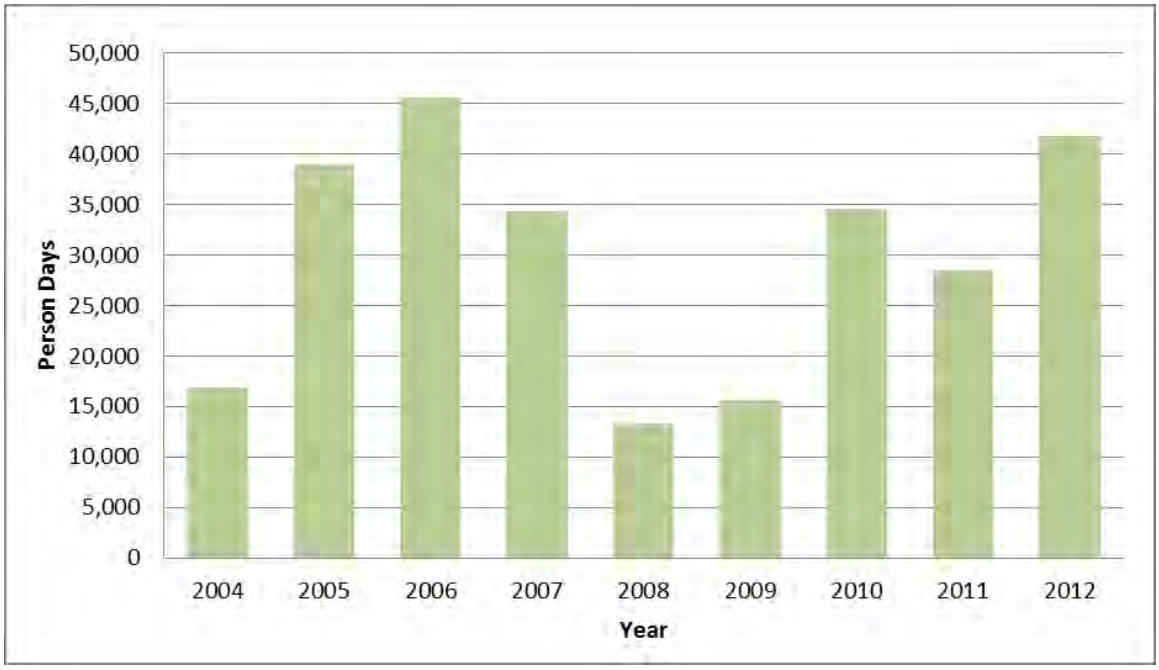

Figure 2.3 GFNMS Private/rental Boat Fishing Person-days

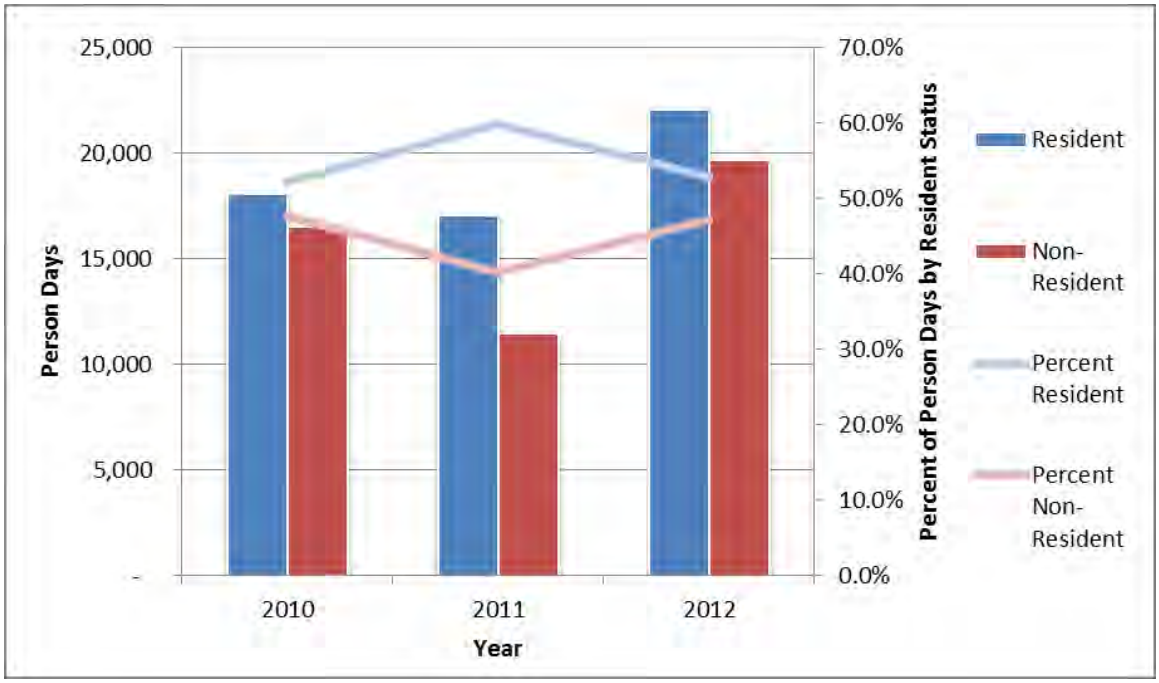

Figure 2.4 GFNMS Private/rental Boat Fishing Person-days by Resident Status

Table 2.2 GFNMS Private/rental Boat Fishing Person-days in District 4 and 5 by Resident Status

Year	Resident	Non-Resident	Total
2010	18,107	16,531	34,638
% in GFNMS[5]			23.7%
2011	17,071	11,457	28,528
% in GFNMS[6]			20.0%
2012	22,073	19,722	41,795
% in GFNMS[7]			30.6%
Average	19,084	15,903	34,987
% in GFNMS[8]			24.7%

Commercial Passenger Fishing Vessels – Person-days

From 2004 through 2005 the number of CPFV fishing person-days were increasing then began to decline reaching a low in 2009, but from 2009 through 2012 the number of person-days has been increasing exceeding the 2007 level in 2012 (Figure 2.5).

[5] This is the 2010 number of total private/rental boating person-days in Districts 4 and 5. The value is 146,380 person-days.
[6] This is the 2011 number of total private/rental boating person-days in Districts 4 and 5. The value is 142,590 person-days.
[7] This is the 2012 number of total private/rental boating person-days in Districts 4 and 5. The value is 136,551 person-days.
[8] This is the average number of total private/rental boating person-days in years 2010, 2011 and 2012 in Districts 4 and 5. The value is 141,841 person-days.

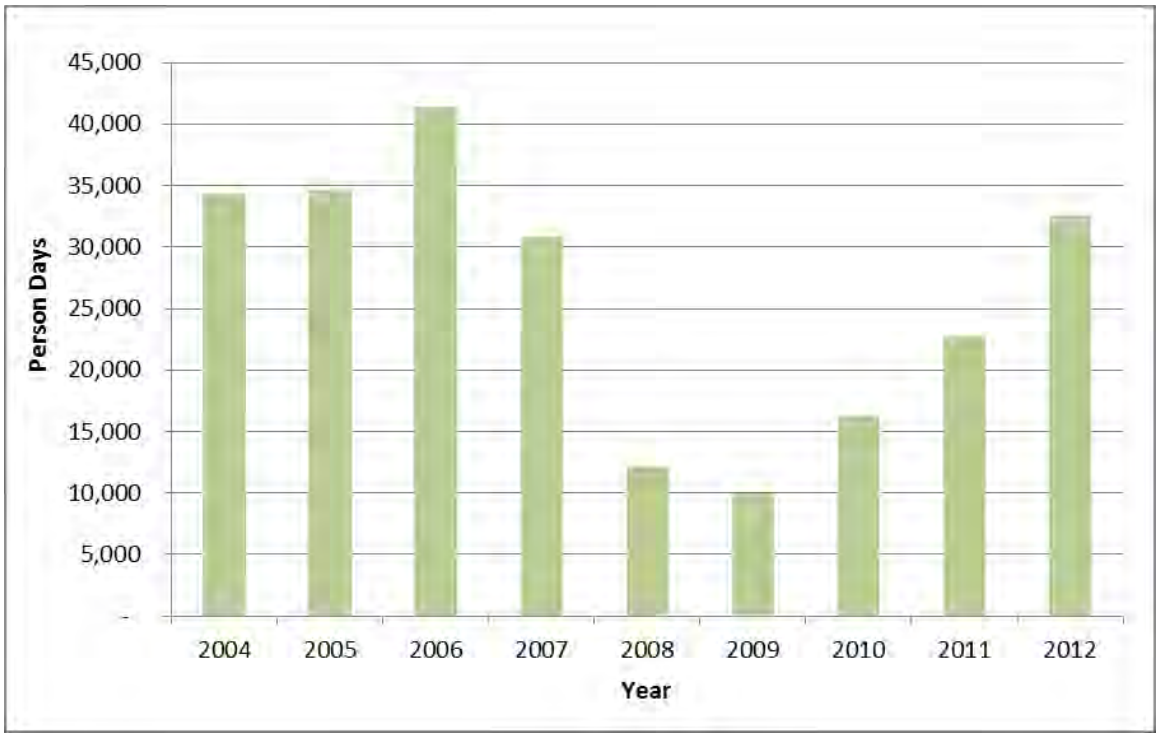

Figure 2.5 GFNMS CPFV Fishing Person-days

CPFV is the only mode of recreational fishing in Greater Farallones National Marine Sanctuary that non-residents participated in at greater numbers than residents. The difference in total person-days between residents and non-residents has been increasing for the study period (2010 through 2012). From 2010 to 20102, non-residents accounted for between 62.6 and 80% of private/rental boat person-days in GFNMS, with the three-year average of 73.5% (Figure 2.6)

For the three years 2010 to 2012, person-days of CPFV in GFNMS as a proportion of Districts 4 and 5 total person-days ranged from a low of 36.8% in 2010 to a high of 67.1% in 2012 with a three-year average of 52.8% (Table 2.3).

Table 2.3 GFNMS CPFV Person-days in Districts 4 and 5 by Resident Status

Year	Resident	Non-Resident	Total
2010	6,098	10,206	16,304
% in GFNMS[9]			36.8%
2011	6,333	16,427	22,760
% in GFNMS[10]			53.2%
2012	6,518	26,071	32,589
% in GFNMS[11]			67.1%
Average	6,316	17,568	23,884
% in GFNMS[12]			52.8%

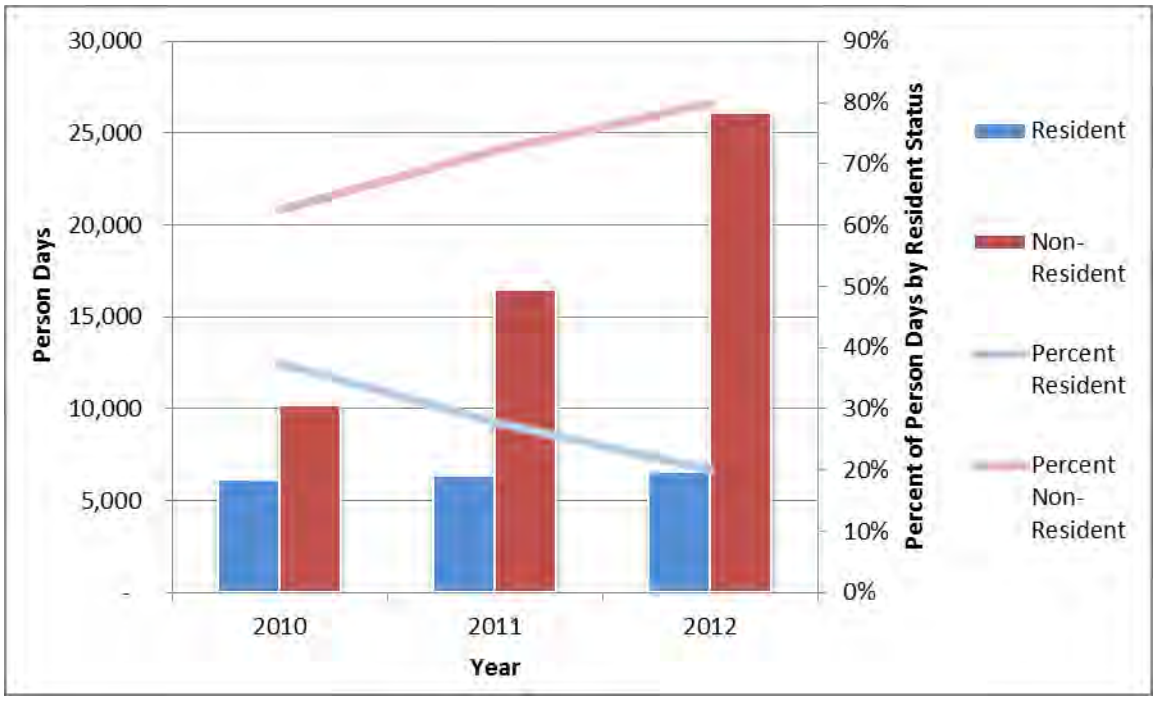

Figure 2.6 GFNMS CPFV Fishing Person-days by Resident Status

[9] This is the 2010 number of total CPFV person-days in Districts 4 and 5. The value is 44,352 person-days.
[10] This is the 2011 number of total CPFV person-days in Districts 4 and 5. The value is 42,762 person-days.
[11] This is the 2012 number of total CPFV person-days in Districts 4 and 5. The value is 48,545 person-days.
[12] This is the average number of total CPFV person-days in years 2010, 2011 and 2012 in Districts 4 and 5. The value is 45,220 person-days.

Summary

On average one tenth of total recreational fishing person-days that occurred in the GFNMS Districts (4 and 5) occurred within the sanctuary. This varied significantly by mode of fishing ranging from a low of 5.1% for shore fishing to a high of 52.8% for CPFV fishing. The three-year average for person-days across all modes was more than 91 thousand (Table 2.4).

Table 2.4 GFNMS Total Recreational Person-Days in Districts 4 and 5 by Fishing Mode and Year

Mode	2010	2011	2012	Average
Shore	28,327	22,718	45,744	32,263
% in GFNMS[13]	5.7%	3.1%	7.2%	5.1%
Private/rental Boating	34,638	28,528	41,795	34,987
% in GFNMS[14]	23.7%	20.0%	30.6%	24.7%
CPFV	16,304	22,760	32,589	23,884
% in GFNMS[15]	36.8%	53.2%	67.1%	52.8%
Total of All Modes	79,268	74,006	120,129	91,134
% in GFNMS[16]	11.5%	8.0%	14.6%	11.2%

[13]The 2010 number of total shore mode person-days in Districts 4 and 5 is 499,019, 2011 had 743,020 person-days, 2012 had 638,703 person-days, and the average number across the study period of 2010 through 2012 is 629,914 person-days.

[14]The 2010 number of total private/rentalperson-days in Districts 4 and 5 is 146,380, 2011 had 142,590 person-days, 2012 had 136,551 person-days, and the average number across the study period of 2010 through 2012 is 141,841 person-days.

[15]The 2010 number of total CPFV person-days in Districts 4 and 5 is 44,352, 2011 had 42,762 person-days, 2012 had 48,545 person-days, and the average number across the study period of 2010 through 2012 is 45,220 person-days.

[16]The 2010 number of total recreational fishing person-days in Districts 4 and 5 is 689,751, 2011 had 928,373 person-days, 2012 had 823,799 person-days, and the average number across the study period of 2010 through 2012 is 813,974 person-days.

Chapter 3 Recreational Fishing Expenditures

Total expenditures were estimated using the Angler Expenditure Profiles developed by NOAA Fisheries (Lovell et al., 2013). This is based on survey data collected by NOAA from anglers and is completed approximately every five years. The latest year Angler Expenditure Profiles were completed was 2011 and those estimates are used here. Total expenditures are estimated by fishing mode and residential status for years 2010, 2011, and 2012, plus the three-year average. In addition, estimates are made separately for trip-related expenditures and durable goods expenditures. Trip-related expenditures are made by fishing mode, while durable goods expenditures are made across all modes. Durable good expenditures are only estimated for residents, since non-residents are not likely to have made purchases within the GFNMS study area. Total expenditures are equal to person-days multiplied by expenditure per person-day and are converted to 2014 dollars for all years using the consumer price index (CPI). Gasoline expenditures were converted to 2014 dollars using the gasoline adjustment factor provided by the CPI to account for the increased volatility of prices relative to other goods and services (see Chen, Leeworthy and Schwarzmann 2015).

Table 3.1 shows how the percentage of trip-related expenditure by type has variation in both mode and residential status. For example, the percentage spent on auto-fuel by residential status does not vary much, but across modes of fishing the variation is greater. Shore fishermen spend a higher percentage of their total expenditures on auto fuel when compared to those who are using CPFVs. In regards to food purchases, residents spend a larger portion of their expenditures on grocery store purchases regardless of the mode of fishing. Alternatively, non-residents are spending a larger portion of their expenditures on food from restaurants when compared to residents of the sanctuary.

Table 3.1 Percent of Trip-related Expenditure by Fishing Mode

	Resident			Non-Resident		
	Shore	Private/Rental	CPFV	Shore	Private/Rental	CPFV
Auto Fuel	28.8%	23.8%	12.7%	30.0%	27.5%	13.4%
Auto Rental	-	-	0.3%	1.8%	6.9%	7.4%
Bait	18.8%	13.6%	2.2%	8.8%	5.2%	0.6%
Boat Fuel	-	28.5%	-	-	10.3%	-
Boat Rental	-	0.7%	-	-	1.2%	-
Charter Fees	-	-	51.3%	-	-	35.9%
Crew Tips	-		8.0%	-	-	3.5%
Fish Processing	-	-	0.1%	-	-	0.0%
Food from Grocery Stores	29.1%	16.9%	8.3%	14.2%	11.0%	6.8%
Food from Restaurants	9.9%	6.6%	7.9%	17.2%	11.3%	7.3%
Gifts & Souvenirs	1.6%	0.2%	0.9%	9.6%	2.3%	7.9%
Ice	2.4%	3.0%	1.1%	2.4%	1.5%	0.5%
Lodging	5.5%	1.4%	2.2%	14.6%	10.4%	8.8%
Parking & Site Access	3.7%	5.0%	1.9%	0.7%	1.8%	2.4%
Public Transportation	0.0%	0.0%	0.0%	0.9%	10.5%	4.5%
Tournament Fees	0.1%	0.3%	2.1%	0.1%	0.1%	0.5%

Shore Angler Trip-related Expenditures

Over the three-year period from 2010 to 2012, residents accounted for between 76.8 and 84.3% of all trip-related spending by those who access GFNMS via shore modes of fishing. This is due mostly to the fact that residents account for a greater number of person-days of shore fishing. However, non-residents had higher total trip-related expenditures for shore fishing for auto rental, gifts & souvenirs and public transportation. Residents tend to spend a higher percentage of trip-related expenditures on food from grocery stores (29.6%) than non-residents (14.4%), while non-residents spend a larger portion of trip-related expenditure on food from restaurants (17.5%) than residents (10%) (Table 3.2).

Table 3.2 Shore Angler Annual Trip-related Expenditures, 2010-2012 (2014 Dollars)

	2010		***2011***		***2012***	
Shore	*Resident*	*Non-Resident*	*Resident*	*Non-Resident*	*Resident*	*Non-Resident*
Auto Fuel	$446,038	$114,748	$378,138	$73,285	$687,204	$215,690
Auto Rental	$0	$7,213	$0	$4,606	$0	$13,557
Bait	$308,591	$35,604	$261,613	$22,739	$475,441	$66,924
Fish Processing	$0	$0	$0	$0	$0	$0
Food from Grocery Stores	$477,977	$57,569	$405,213	$36,767	$736,410	$108,212
Food from Restaurants	$161,899	$69,765	$137,253	$44,556	$249,435	$131,136
Gifts & Souvenirs	$26,671	$39,079	$22,611	$24,958	$41,092	$73,456
Ice	$40,007	$9,573	$33,917	$6,114	$61,638	$17,994
Lodging	$90,074	$59,405	$76,362	$37,939	$138,775	$111,663
Parking & Site Access	$60,127	$2,688	$50,974	$1,717	$92,637	$5,053
Public Transportation	$0	$3,475	$0	$2,219	$0	$6,532
Tournament Fees	$2,106	$393	$1,785	$251	$3,244	$739
Total	$1,613,489	$399,514	$1,367,866	$255,151	$2,485,876	$750,957

Private/rental Boat Trip-related Expenditures

GFNMS is the only California national marine sanctuary where non-residents spent more on private/rental boat fishing than residents. Over the three-year study period, non-residents accounted for between 51.2 and 58.2% of trip-related expenditures for those who accessed the GFNMS via private/rental boats for fishing. However, residents had higher expenditures for bait, boat fuel, food from grocery stores, ice, parking & site access, and tournament fees (Table 3.3)

Table 3.3 Private/rental Boat Annual Trip-related Expenditures, 2010-2012 (2014 Dollars)

	2010		***2011***		***2012***	
Private/rental	*Resident*	*Non-Resident*	*Resident*	*Non-Resident*	*Resident*	*Non-Resident*
Auto Fuel	$532,659	$867,951	$502,184	$601,557	$649,323	$1,035,510
Auto Rental	$766	$231,079	$722	$160,155	$934	$275,689
Bait	$322,431	$174,271	$303,983	$120,782	$393,050	$207,913
Boat Fuel	$636,231	$325,502	$599,830	$225,598	$775,580	$388,341
Boat Rental	$17,041	$40,727	$16,066	$28,227	$20,773	$48,590
Charter Fees	$0	$0	$0	$0	$0	$0
Fish Processing	$0	$0	$0	$0	$0	$0
Food from Grocery Stores	$401,890	$367,769	$378,895	$254,891	$489,912	$438,766
Food from Restaurants	$156,237	$380,529	$147,298	$263,735	$190,457	$453,990
Gifts & Souvenirs	$4,212	$78,133	$3,971	$54,152	$5,135	$93,217
Ice	$70,651	$50,516	$66,609	$35,011	$86,126	$60,268
Lodging	$33,890	$347,842	$31,951	$241,080	$41,312	$414,993
Parking & Site Access	$117,752	$59,430	$111,015	$41,190	$143,543	$70,903
Public Transportation	$0	$351,863	$0	$243,867	$0	$419,789
Tournament Fees	$7,276	$4,370	$6,859	$3,029	$8,869	$5,213
Trip Total	$2,301,037	$3,279,983	$2,169,383	$2,273,274	$2,805,014	$3,913,182

Commercial Passenger Fishing Vessels Trip-related Expenditures

Like private/rental boat modes of fishing, non-residents who accessed GFNMS via CPFV had higher trip-related expenditures than residents. Over the three-year 2010 to 2012 period, non-residents accounted for between 76 and 88% of all trip-related expenditures. However, residents had higher trip-related expenditures for tournament fees.

CPFV trip-related expenditures are the only profiles with charter fees and crew tips. Although non-residents spend more total on charter fees, residents are spending more than 52% of their CPFV trip-related expenditures on charter fees compared to 36% for non-residents. Residents spend roughly 8% of their total expenditures on crew tips compared to less than 4% of non-residents. Non-residents expenditures are approximately 26 to 63 times more on gifts and souvenirs than residents each year. Further they are spending 12 to 29 times more on lodging than residents (Table 3.4).

Table 3.4 CPFV Annual Trip-related Expenditures, 2010-2012 (2014 Dollars)

	2010		2011		2012	
CPFV	Resident	Non-Resident	Resident	Non-Resident	Resident	Non-Resident
Auto Fuel	$168,260	$540,561	$174,735	$870,074	$179,847	$1,380,844
Auto Rental	$4,062	$316,207	$4,219	$508,957	$4,342	$807,738
Bait	$31,143	$23,850	$32,342	$38,389	$33,288	$60,925
Charter Fees	$720,748	$1,540,457	$748,484	$2,479,471	$770,384	$3,935,035
Crew Tips	$112,516	$151,952	$116,846	$244,577	$120,265	$388,155
Fish Processing	$709	$1,187	$737	$1,911	$758	$3,032
Food from Grocery Stores	$116,707	$291,601	$121,198	$469,352	$124,745	$744,883
Food from Restaurants	$110,453	$312,430	$114,703	$502,877	$118,059	$798,089
Gifts & Souvenirs	$12,896	$338,007	$13,392	$544,045	$13,784	$863,425
Ice	$14,766	$22,987	$15,334	$36,999	$15,783	$58,720
Lodging	$30,563	$375,239	$31,739	$603,974	$32,668	$958,534
Parking & Site Access	$26,501	$102,632	$27,521	$165,194	$28,326	$262,170
Public Transportation	$0	$193,609	$0	$311,627	$0	$494,567
Tournament Fees	$30,176	$21,908	$31,337	$35,262	$32,254	$55,963
Trip Total	$1,379,501	$4,232,628	$1,432,588	$6,812,708	$1,474,503	$10,812,082

Durable Good Expenditures

Durable good expenditures are only calculated for residents of the study area, since non-residents are not likely to have made these kinds of purchases in the GFNMS study area. NMFS calculates the mean durable expenditures for all modes by participant. When estimating durable good expenditures they are not disaggregated by fishing mode, but presented as the expenditure value for all modes. We converted the mean durable good expenditures by participant to durable good expenditures by person-days. See Chen, Leeworthy and Schwarzmann (2015) for detailed methods of this approach.

Total durable good expenditures were higher in 2010 and 2012 when compared to 2011. This is because there were more person-days of fishing in 2010 and 2012 than 2011. The highest spending categories were for rods & reels, durable tackle and boat storage. See Table 3.5 for a more detailed breakdown of durable goods for the study period.

Table 3.5 Durable Goods Expenditures, 2010-2012 (2014 Dollars)

	2010	*2011*	*2012*
Durable Tackle	$1,020,715	$928,854	$1,380,895
Rods & Reels	$1,368,623	$1,245,451	$1,851,570
Spearfishing Gear	$0	$0	$0
Binoculars	$41,225	$37,515	$55,772
Camping Equipment	$120,479	$109,636	$162,992
Clothing	$343,860	$312,914	$465,198
Club Dues	$65,619	$59,713	$88,774
License Fees	$359,200	$326,873	$485,951
Magazine Subscriptions	$57,310	$52,152	$77,533
Taxidermy	$14,168	$12,893	$19,167
New Boat Purchase	$392,329	$357,020	$530,770
Used Boat Purchase	$25,246	$22,974	$34,155
New Canoe Purchase	$11,824	$10,760	$15,997
Used Canoe Purchase	$0	$0	$0
New Accessory Purchase	$225,299	$205,023	$304,800
Used Accessory Purchase	$0	$0	$0
Boat Insurance	$243,195	$221,308	$329,011
Boat Maintenance	$507,694	$462,003	$686,845
Boat Registration	$63,382	$57,678	$85,747
Boat Storage	$887,773	$807,876	$1,201,041
Boat Purchase Fees	$15,659	$14,250	$21,185
New Vehicle Purchase	$349,612	$318,148	$472,980
Used Vehicle Purchase	$343,541	$312,623	$464,766
Vehicle Insurance	$258,534	$235,267	$349,763
Vehicle Maintenance	$89,054	$81,040	$120,479
Vehicle Registration	$81,704	$74,351	$110,535
Vehicle Purchase Fees	$56,564	$51,474	$76,524
New Home Purchase	$43,249	$39,357	$58,510
Second Home Property Taxes	$533	$485	$721
Total	$6,986,390	$6,357,637	$9,451,680

Summary

Trip-related Expenditures. Expenditures CPFV have been increasing from 2010 through 2012, while shore mode and private/rental boat expenditures declined from 2010 to 2011, but increased from 2011 to 2012. The total expenditures across all modes has steadily increased rising from more than $13.2 million in 2010 to $22.2 million in 2012 (Table 3.6). In each of the three years, CPFV fishing had the highest total trip-related expenditures. The three-year average, trip-related expenditures were $16.6 million.

Durable Good Expenditures. Total durable goods expenditures were slightly less than half total trip-related expenditures. Total durable good expenditures averaged $7.6 million across the study period (Table 3.7).

Total Expenditures. Total expenditures increased greatly from 2011 to 2012, rising from $20.2 million to $31.7 million. The three-year average was almost $24.2 million (Table 3.8). This information is used to estimate the economic impacts/contributions associated with recreational fishing in the GFNMS. The findings are presented in the following chapter.

Table 3.6 Trip-related Annual Expenditures by Mode of Access, 2010-2012 (2014 Dollars)

Mode of Access	2010	2011	2012	Average
Shore	$2,013,003	$1,623,017	$3,236,833	$2,290,951
Private/rental Boat	$5,581,020	$4,442,657	$6,718,196	$5,580,624
CPFV	$5,612,129	$8,245,296	$12,286,585	$8,714,670
Total	$13,206,152	$14,310,970	$22,241,613	$16,586,245

Table 3.7 Annual Durable Goods Expenditures by Mode of Access, 2010-2012 (2014 Dollars)

	2010	2011	2012	Average
Total	$6,986,390	$6,357,637	$9,451,680	$7,598,569

Table 3.8 Total Annual Expenditures by Expenditure Type, 2010-2012 (2014 Dollars)

Mode of Access	2010	2011	2012	Average
Trip-related	$13,206,152	$14,310,970	$22,241,613	$16,586,245
Durable Goods	$6,986,390	$6,357,637	$9,451,680	$7,598,569
Total	$20,192,542	$20,668,607	$31,693,293	$24,184,814

Chapter 4 Market Analysis of Recreational Fishing

Using the person-day estimates from Chapter 2 and the expenditures from Chapter 3, this data can be inputted to IMPLAN to estimate market benefits associated with recreational fishing in Greater Farallones National Marine Sanctuary by mode of fishing. First, it may be useful to discuss some IMPLAN terminology. Table 4.1 provides a more detailed explanation of the terminology used in this report, as defined by IMPLAN.

Table 4.1 IMPLAN Economic Indicators' Definitions

Indicator	*Definitions and Relationships*
Employment	Total annual average jobs. This includes self-employed and wage and salary employees, and all full-time, part-time and seasonal jobs, based on a count of full-time/part-time averages over twelve months
Labor Income	Defines the total value paid to local workers within a region. Labor income is the income source for induced household spending estimations. Labor Income = Employee Compensation + Proprietor Income
Value Added	Comprised of Labor Income, Indirect Business Taxes (IBT), and Other Property Type Income (OPTI), Value Added demonstrates an industry's value of production over the cost of its purchasing the goods and services required to make its products. Value Added is often referred to as Gross Regional Product (GRP). Value Added = Labor Income + IBT + OPTI
Output	The total value of an industry's production, comprised of the value of Intermediate Inputs and Value Added. In IMPLAN this is typically viewed as the value of a change in sales or the value of increased production. However, annual production is not always equal to annual sales. If production levels are higher than sales, surpluses become inventory. Because inventory does not drive additional impacts in the year it was produced, in IMPLAN Direct industry sales = Direct Output. Output = Intermediate Inputs + Value Added

Source: Day, 2011

Impacts are defined as direct, indirect or induced. In short, direct effects are those that occur within the sector of the expenditure. Indirect effects occur as a result of spending within the primary sector on goods and services from other sectors. Induced impacts result from the wage earners within the study area spending their money on goods and services within the region. The indirect plus induced make-up what is generally referred to as the "multiplier" effects. Table 4.2 explains these types of impacts in more detail.

Table 4.2 Impact Type Definitions

Type of Impact	*Definition*
Direct Effect	The effect of spending by recreational fishermen at each business they purchase goods or services from within the study area.
Indirect Effect	The result of a sector purchasing goods and services to produce their product from other industries located within the study area.
Induced Effect	Results from spending of employee wages that stem from both the direct and indirect effects within the study area.

Source: Day, 2011

Economic Impacts/Contributions

The economic impacts/contributions are limited to the study area defined by six local area counties (see Chapter 1). For each of the estimates of impacts/contributions on employment and income from recreational fishing in the GFNMS, we provide estimates of what proportion of the study area's total employment and income are accounted for by recreational fishing in the GFNMS. Because the study area is very large, recreational fishing accounts for only fractions of a percent of the total study area's economy, however in absolute dollars the impacts/contributions are significant. Table 4.3 provides the estimates of the Study area's employment and income for 2010 to 2012 and the three-year average.

The employment numbers presented here are the total full-time, part-time and seasonal jobs created each year within the study area. The percentages under Income and Employment are the percent of total income or employment that can be attributed to recreational fishing in the GFNMS study area (as defined in Table 1.1 and Figure 1.1).

Table 4.3 Employment and Income in GF study area

	2010	2011	2012	Average
Employment	1,850,224	1,878,828	1,931,879	1,886,977
Income	$174,428,279,000	$188,447,761,000	$201,264,536,000	$188,046,858,667

Source: Bureau of Economic Analysis

Total economic impacts/contributions steadily increased over the three-year period. In 2010, CPFV accounts for the largest impact on output to the economy. However, in 2011 and 2012 recreational shore fishing attributes the most to the economies output (of the three recreational fishing modes). This is the result of the higher person-days of shore fishing relative to the other modes of fishing. Tables 4.4 through 4.7 present the economic impacts/contributions of trip-related expenditures.

Table 4.4 2010 Trip-related Economic Impacts (2014 Dollars)[17]

2010				
	Output	Value Added	Income	Employment
Shore	$1,854,106	$1,203,757	$732,735	16
% of GF			0.0004%	0.001%
Private/rental	$4,907,460	$3,178,025	$1,946,869	42
% of GF			0.001%	0.002%
CPFV	$7,649,856	$4,793,412	$2,894,604	69
% of GF			0.002%	0.004%
Total	$14,411,422	$9,175,194	$5,574,208	127
% of GF			0.003%	0.007%

Table 4.5 2011 Trip-related Economic Impacts (2014 Dollars) [18]

2011				
	Output	Value Added	Income	Employment
Shore	$1,488,764	$967,580	$589,309	13
% of GF			0.0003%	0.001%
Private/rental	$3,881,837	$2,493,901	$1,527,945	32
% of GF			0.001%	0.002%
CPFV	$11,224,446	$7,031,828	$4,241,495	101
% of GF			0.002%	0.005%
Total	$16,595,047	$10,493,309	$6,358,749	146
% of GF			0.003%	0.008%

[17] % of GF is the percent Income or Employment in the Greater Farallones study area (as defined by Table 1.1) that can be attributed to recreational fishing in Greater Farallones National Marine Sanctuary.
[18] % of GF is the percent Income or Employment in the Greater Farallones study area (as defined by Table 1.1) that can be attributed to recreational fishing in Greater Farallones National Marine Sanctuary.

Table 4.6 2012 Trip-related Economic Impacts (2014 Dollars) [19]

2012				
	Output	Value Added	Income	Employment
Shore	$2,991,282	$1,940,408	$1,180,592	26
% of GF			0.001%	0.001%
Private/rental	$6,003,056	$3,842,714	$2,352,551	49
% of GF			0.001%	0.003%
CPFV	$16,682,346	$10,450,663	$6,298,790	149
% of GF			0.003%	0.008%
Total	$25,676,684	$16,233,785	$9,831,933	225
% of GF			0.005%	0.012%

Table 4.7 Average Trip-related Economic Impacts from 2010-2012 (2014 Dollars) [20]

Average from 2010-2012				
	Output	Value Added	Income	Employment
Shore	$2,111,384	$1,370,582	$834,212	18
% of GF			0.0004%	0.001%
Private/rental	$4,930,784	$3,171,547	$1,942,455	41
% of GF			0.001%	0.002%
CPFV	$11,852,216	$7,425,301	$4,478,296	106
% of GF			0.002%	0.006%
Total	$18,894,384	$11,967,429	$7,254,963	166
% of GF			0.004%	0.009%

Economic Impacts/Contributions by Type of Expenditure

When analyzing the economic impacts/contributions of regulations and policy/management strategies, it is important to distinguish between trip-related expenditures and durable good expenditures, and their associated impacts/contributions on the local area economies. For small or marginal changes in fishing effort, it is not appropriate to include durable goods expenditures and their associated impacts on the local area economies. So here we provide a break-down of the economic impacts/contributions by these two types of expenditures. By normalizing these estimates by person-days of activity one can derive multipliers for regulatory or policy/management analyses (see Chen, Leeworthy and Schwarzmann, 2015).

Recreational fishing in GFNMS, on average, generated annual impacts/contributions of over $18.9 million in output, $12.0 million in value-added, more than $7.3 million in

[19] % of GF is the percent Income or Employment in the Greater Farallones study area (as defined by Table 1.1) that can be attributed to recreational fishing in Greater Farallones National Marine Sanctuary.
[20] % of GF is the percent Income or Employment in the Greater Farallones study area (as defined by Table 1.1) that can be attributed to recreational fishing in Greater Farallones National Marine Sanctuary.

income, and more than 160 full and part-time jobs from total trip-related expenditures (Table 4.8). When considering total expenditures (the sum of trip-related and durable expenditures), the output was $28.4 million on average for each year of the study period.

Table 4.8 Economic Impact of Annual Trip-related Expenditures, 2010-2012 (2014 Dollars) [21]

Measure	2010	2011	2012	Average
Output	$14,411,422	$16,595,047	$25,676,684	$18,894,384
Value Added	$9,175,194	$10,493,309	$16,233,785	$11,967,429
Labor Income	$5,574,208	$6,358,749	$9,831,933	$7,254,963
% of GF	0.003%	0.003%	0.005%	0.004%
Employment	127	146	225	166
% of GF	0.007%	0.008%	0.012%	0.009%

Table 4.9 Economic Impact of Annual Durable Goods Expenditures, 2010-2012 (2014 Dollars) [22]

Measure	2010	2011	2012	Average
Output	$8,759,830	$7,971,473	$11,850,915	$9,527,406
Value Added	$5,110,478	$4,650,552	$6,913,815	$5,558,282
Labor Income	$2,783,931	$2,533,386	$3,766,298	$3,027,872
% of GF	0.002%	0.001%	0.002%	0.002%
Employment	48	43	64	52
% of GF	0.003%	0.002%	0.003%	0.003%

[21] % of GF is the percent Income or Employment in the Greater Farallones study area (as defined by Table 1.1) that can be attributed to recreational fishing in Greater Farallones National Marine Sanctuary.
[22] % of GF is the percent Income or Employment in the Greater Farallones study area (as defined by Table 1.1) that can be attributed to recreational fishing in Greater Farallones National Marine Sanctuary.

Table 4.10 Economic Impact of Annual Total Expenditures, 2010-2012 (2014 Dollars) [23]

Measure	2010	2011	2012	Average
Output	$23,171,252	$24,566,520	$37,527,599	$28,421,790
Value Added	$14,285,672	$15,143,861	$23,147,600	$17,525,711
Labor Income	$8,358,139	$8,892,135	$13,598,231	$10,282,835
% of GF	0.005%	0.005%	0.007%	0.005%
Employment	174	189	289	217
% of GF	0.009%	0.010%	0.015%	0.012%

[23] % of GF is the percent Income or Employment in the Greater Farallones study area (as defined by Table 1.1) that can be attributed to recreational fishing in Greater Farallones National Marine Sanctuary.

Chapter 5 Conclusion

This report presents the results of the recreational fishing study completed for GFNMS from 2010 through 2012. In total GFNMS accounted for 11.2% of the total person-days of marine recreational fishing from Districts 4 and 5 and 2.0% of the entire State of California's total recreational fishing effort each year during the study period. Recreational shore fishing accounted for an average of 5.1% of person-days, 24.7% of private/rental boat person-days, and 52.8% of CPFV person-days of all the person-days in Districts 4 and 5. Shore fishing in GFNMS accounted for 1.0%, private/rental boat fishing accounted for 5.3% and commercial passenger fishing vessels accounted for 5.4% of the total State of California's fishing effort by mode of access.

Chapter 3 discussed expenditures. Fuel was one of the largest expenditure categories for anglers, regardless of their mode of fishing. If the angler was fishing using a private/rental boat, then fuel expenditures composed more than half of their total expenditures. Additionally, residents tended to spend a larger percentage of total expenditures on grocery store food when compared to non-residents. Residents had more total trip-related spending on shore fishing, but non-residents had higher trip-related expenditures for the private/rental boat and CPFV modes of fishing. In all modes of fishing, non-residents had higher trip-related expenditures for auto rental, public transportation, and for lodging and for gifts & souvenirs in the private/rental boat and CPFV modes of fishing. For durable goods purchases, the highest expenditures were for rods & reels, durable tackle and boat storage.

Lastly, Chapter 4 presented the economic impacts/contributions of recreational fishing in GFNMS. Although, employment and income compose a small percentage of total employment and income in the study area, recreational fishing in GFNMS still has a positive impact on the economy of the study area. On average, marine recreational fishing adds roughly $28.4 million in economic output; almost $17.5 million in value-added: nearly $10.3 million in income; and more than 200 full- and part-time jobs to the study area annually.

Glossary of Terms

(adapted from RecFin, 2014 and Day, 2011)

Commercial Passenger Fishing Vessel (CPFV) –There are two categories. The first is a charter boat, which operates under charter for a specified price, time, etc. A party boat is a boat on which fishing space and privilege are provided for a fee per angler.

Durable Goods –Goods that do not quickly wear out and typically last for a long period of time, such as a boat.

Employment –The total annual average jobs. This includes the self-employed in addition to wage and salary employees, and all full-time, part-time and seasonal jobs, based on a count of full-time and part-time job averages over twelve months.

Intermediate Inputs -Goods and service required to create a product.

Labor Income – Is equivalent to employee compensation + proprietor (business owner) income.

Output –The total value of an industry's production, comprised of the value of intermediate inputs and value added.

Person-Days –The number of days (not trips) a person fishes.

Private-Rental Fishing –A private boat is defined as belonging to an individual; it is neither for rent nor for transporting paying passengers. A rental boat is defined as a boat that is rented without crew or a guide; it does not transport paying passengers.

Shore Mode Fishing –Fishing accessed on beaches, banks and man-made structures.

Trip-Related Expenditures –Expenditures on goods and services for specific trip, such as food or live bait.

Value Added –Value added demonstrates an industry's value of production over the cost of the goods and services required to make its products. Value Added is often referred to as Gross Regional Product.

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