

# Economic Impact Analysis of Recreational Fishing on Florida Reefs



## NOAA TECHNICAL MEMORANDUM CRCP 41

NOAA Coral Reef Conservation Program

Silver Spring, MD

May 2021



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United States  
Department of Commerce

National Oceanic and  
Atmospheric Administration

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Gina Raimondo  
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K. Wallmo, S. Lovell, K. Gregg, and M. Allen

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## **SUGGESTED CITATION**

Wallmo, K., Lovell, S., Gregg, K., and Allen, M. 2021. Economic Impact Analysis of Recreational Fishing on Florida Reefs. NOAA National Ocean Service, National Coral Reef Conservation Program. NOAA Technical Memorandum CRCP 41. Silver Spring, MD. 11 pp. doi: <https://doi.org/10.25923/rsgj-ta64>.

## **ACKNOWLEDGEMENTS**

The authors would like to acknowledge the NOAA Coral Reef Conservation Program, the Florida Department of Environmental Protection, the Florida Fish and Wildlife Commission, and the government of Martin County, Florida for their generous funding and support of this project. Kurtis Gregg of NOAA Fisheries provided valuable expertise and assistance with categorizing a long list of recreational fishing target species generated from the NOAA Fisheries Marine Recreational Fishing Expenditure Survey.

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## Executive Summary

This report documents the economic impacts to county and state-level Florida economies generated from recreational fishing trips on Southeast Florida's reefs. Impacts to the Southeast Florida counties of Martin, Palm Beach, Broward, Miami-Dade, Monroe and the state of Florida are included in this report. The economic impacts of reef-related diving and snorkeling were also estimated and are reported in a companion report. Economic impacts of expenditures on reef-related recreational fishing trips were calculated by adjusting NOAA Fisheries' most recent economic impact estimates for Florida. All impacts were estimated using Input-Output models generated from IMPLAN (Impact Analysis for Planning) software (MIG Inc. 2011). Metrics for assessing the impacts to a region's economy include:

- Output: the gross value of sales by regional businesses affected by an activity
- Labor income: personal income (wages and salaries) and proprietors' income (income from self-employment)
- Value-added: the contribution made to the gross domestic product (GDP) in a region
- Employment: full-time and part-time jobs supported by an activity

Trip based expenditures on reef-related recreational fishing in Southeast Florida support approximately 3,787 jobs and generate economic output of \$384 million. The economic impacts of reef-related recreational fishing were highest for Monroe county, with \$173 million generated in output and 1,677 jobs supported, followed by Palm Beach (\$80 million output, 803 jobs). Broward (\$44 million output, 442 jobs) and Miami Dade (\$44 million output, 440 jobs) were nearly identical, and Martin had the lowest impacts (\$28 million output, 286 jobs).

It is acknowledged that the current study does not replicate any earlier study (Bell et al. 1998; Johns et al. 2001; Johns 2004) and as such, the estimates provided here should not be viewed as updates to previous estimates. Previous studies captured economic impacts of a broad set of beach and coastal recreation that were not necessarily directly associated with coral reefs. This study is, by design, narrowly focused on the trip based expenditures of recreational fishing

and their associated economic impacts to regional economies. It does not include durable good expenditures for items used on multiple fishing trips (such as boat purchases, rods and reels, tackle, etc.). Due to these differences, as well as differences in survey design, sampling procedures, and earlier and later standard conventions associated with IMPLAN software, there may be divergences in impact estimates among different studies.



## **Section I. Introduction**

In 2014 The Florida Department of Environmental Protection (FDEP) Coral Reef Conservation Program (CRCP) launched its largest endeavor to date – the Our Florida Reefs (OFR) community planning process for Southeast Florida’s reefs. This initiative is led by FDEP CRCP and hosted by the Southeast Florida Coral Reef Initiative (SEFCRI), and brings together the community of local residents, reef users, business owners, visitors and the broader public in Miami-Dade, Broward, Palm Beach, and Martin counties to discuss the future of reefs in this region. The need for updated economic impact and value information for Southeast Florida’s reefs was identified as a priority need during early phases of community planning.

This report is a companion to a second report on the economic impacts of Southeast Florida reefs associated with scuba diving and snorkeling (Wallmo et al. 2021). The reefs in the study area are located offshore of Broward, Martin, Miami-Dade, Monroe, and Palm Beach counties (Figure 1). The companion study focuses on the economic impacts of scuba diving and snorkeling on Southeast Florida reefs based on a survey that asked Florida residents and visitors about their diving and snorkeling trips to reefs in the five Florida counties. In contrast, this report modifies existing economic impacts for Florida that were estimated using data previously collected in a national survey conducted by NOAA Fisheries, the National Marine Recreational Fishing Expenditure Survey (Lovell et al. 2020). It should be noted that in previous studies the term “reef-related impacts” may refer to a broader suite of activities than those specified in this study or its companion study (see the companion study for a review of previous studies on the economic impacts of Florida’s coral reefs).

The primary goals of this report are to provide estimates of the economic impacts of “reef-related recreational fishing” (where the primary caught or targeted species is a reef-related species), on local county economies of Martin, Broward, Palm Beach, Miami-Dade, and Monroe, and for the Florida state economy. The total economic impacts of reef-related recreational fishing is measured by the contribution that reef-related expenditures make to

output (sometimes referred to as sales), income, and employment in a given county or the state of Florida. Figure 1 shows the counties included in the analysis.



Figure 1. Florida counties (highlighted in yellow) included in the Economic Impact Analysis

## Section II. Methods

The economic impacts associated with Southeast Florida reef-related recreational fishing were based on data and analysis from NOAA Fisheries' National Marine Recreational Fishing Expenditure Survey (NMRFES) and NOAA Fisheries' Marine Recreation Information Program (MRIP). For a full description of the NMRFES' development, sampling, and implementation, see Lovell et al. (2020). The NMRFES is conducted every 3-5 years in all coastal states across the U.S. and consists of two parts; one part focuses on trip-related expenditures and a second part focuses on durable goods. The trip expenditure portion of the NMRFES was conducted in 2016 for states along the Gulf coast (Alabama, Louisiana, Mississippi, Louisiana, and Texas as well as in California, Oregon, Washington and Alaska). The remainder of the coastal states were surveyed in 2017. The target population consisted of marine recreational anglers, 16 years of age and older, who fished during the calendar year (either 2016 or 2017) of the survey in that state.

The Access Point Angler Intercept Survey (APAIS) is one of several complementary marine recreational fishing surveys conducted by NOAA Fisheries as part of the MRIP. The APAIS is an ongoing in-person survey of anglers intercepted at public fishing sites across a state. Some of the information collected from anglers as part of the APAIS includes target species, mode of fishing (shore, private boat, charter), and the species of fish caught and released on the current fishing trip. The APAIS sample divides Florida into East Florida, which is considered part of the NMFS' South Atlantic Region, and West Florida, which is considered part of the NMFS' Gulf of Mexico Region. This separation of the state is maintained throughout the NMRFES analysis to keep consistent with MRIP/APAIS methods.

In 2016, the NMRFES was conducted in Florida by adding a series of expenditure questions to the end of the regular APAIS interview.<sup>1</sup> Interviewers asked anglers about their fishing related expenditures on their current trip (e.g. the one being intercepted). Anglers reported their

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<sup>1</sup> For more information on data APAIS collection protocols see <https://www.fisheries.noaa.gov/topic/recreational-fishing-data>).

expenditures on auto fuel, auto rental, public transportation (airfare, bus, taxi, subway, ferry), lodging, food (from grocery stores and from restaurants), bait, ice, boat fuel, guide fees, tips to crew, fish processing, and gifts or souvenirs. Anglers were also asked to estimate the proportion of their total expenditure that was spent in Florida. For non-Florida residents, some of the expenditures might have occurred outside the state; only the percentage of expenditures spent in Florida were included in the analysis. The number of add-on surveys completed in East Florida was 5,854 (80% response rate); for West Florida, it was 16,121 (84%).

As reported in Lovell et al. (2020), the NMRFES data was used to calculate average trip expenditures by expenditure category and fishing mode for all states. Average trip expenditures for each category and by mode (shore, private boat, charter) were estimated separately for East Florida and West Florida to be consistent with the estimation and reporting of the number of angler trips by MRIP (Steinback 1999). The average total trip expenditure by mode was calculated as the sum of the averages of each individual expenditure category. The average total trip expenditure by mode was then multiplied by the annual total number of angler trips in each mode to arrive at total trip expenditures for a state (and separately for East Florida and West Florida). As only anglers over 16 were interviewed for the NMRFES add-on questions and thus reflected in average trip expenditures, total expenditures were multiplied by the percentage of adult trips by mode (Lovell et al. 2020) so as not to overestimate the expenditures.

Trip expenditures were used to estimate economic impacts based on state specific input-output (I/O) models created by NOAA Fisheries using IMPLAN (Impact Analysis for Planning) software (Lovell et al. 2020). Each category of expenditure from the NMRFES is matched with a corresponding industry or retail sector in IMPLAN. Angler expenditure categories were allocated to IMPLAN sectors as described in Lovell et al. (2020). IMPLAN provides users with pre-constructed social accounting matrices that account for all dollar flows between different sectors of an economy (Mulkey and Hodges 2000). Using these matrices, the I/O model traces the way dollars spent on activities associated with recreational fishing are re-spent in different

sectors of the economy, generating waves of economic activity, referred to as economic multipliers. National industry data and state-level economic data then generate a series of multipliers, which in turn estimate the total economic impacts of marine recreational fishing trips.

The effects of angler spending can be classified as direct, indirect, and induced. Direct effects occur when anglers spend money at retail and service oriented businesses. Indirect effects occur when these retail and service sectors in turn purchase business supplies from wholesale trade businesses and manufacturers, and pay operating expenditures. These secondary industries then purchase additional supplies and this cycle of industry to industry purchasing continues until all indirect effects are derived from outside the region of interest (Steinback, Gentner, and Castle 2004). Induced effects occur when employees in the direct and indirect sectors make purchases from retailers and service establishments in the normal course of household consumption. The summation of the direct, indirect, and induced multiplier effects represent the total economic impacts generated from expenditures on an activity (Lovell et al. 2020).

The objective of the reef-related recreational fishing analysis in this report was to estimate the economic impacts from reef-related fishing trips on a subset of Florida counties. The year of analysis chosen was 2016. First, the total number of all recreational fishing trips in 2016 for Martin, Palm Beach, Broward, Miami-Dade and Monroe counties was obtained from NOAA's Marine Recreational Information Program (MRIP). All counties used in this analysis are in East Florida, except Monroe, which is included with West Florida. Table 1 shows the total number of angler-trips by fishing mode for each county. For reference, Table 1 also provides the average total trip expenditure by mode for either East Florida or West Florida (Lovell et al. 2002).

**Table 1. Mean trip expenditures and number of angler-trips for all recreational fishing in Broward, Martin, Miami Dade, Monroe, and Palm Beach Counties**

Fishing Mode	Mean Trip Expenditures	Number of Angler Trips by County				
		Broward Trips	Martin Trips	Miami Dade Trips	Monroe Trips	Palm Beach Trips
Shore	EFL: \$27 WFL: \$44	1,290,255	467,874	395,593	1,201,552	1,755,663
Charter boat (for-hire)	EFL: \$244 WFL: \$345	18,333	10,764	30,914	215,064	48,343
Private/rental boat	EFL: \$43 WFL: \$50	302,767	317,674	841,189	1,287,848	828,018

The second step in the analysis was to identify reef-related species. To determine which trips were targeting reef-related species found in Southeast Florida, reef species were identified from the master list of species used in the APAIS. Each species from the master list was classified as R (reef fish), O (opportunistic reef user that can be targeted by fishing over reefs), D (deep-water reef fish), or N (not a reef fish). Classification was done by Kurtis Gregg, a NOAA Fisheries biologist in Southeast Florida and reviewed by biologists working for the state of Florida.

The third step was to take the 2016 trip-level data from MRIP’s APAIS survey (e.g. the target species questions and observed/reported catch) and classify each interviewed trip as a reef-fish trip if the angler reported catching or targeting one or more of these reef species. The percentage of reef-fish trips out of all fishing trips for each county for 2016 was calculated. Table 2 shows the multipliers for each county (e.g. the percentage of trips targeting and/or catching a reef species). Note that all percentages shown in Table 2 are weighted using the survey weights from the APAIS.

**Table 2. Percent of angler trips targeting or catching a reef species\* in waters off of Broward, Martin, Miami-Dade, Monroe, and Palm-Beach Counties**

	<b>Broward</b>	<b>Martin</b>	<b>Miami-Dade</b>	<b>Monroe</b>	<b>Palm Beach</b>	<b>State of Florida</b>
Percent of trips targeting reef species	29.0	72.5	36.4	34.4	52.0	43.5
Percent of trips catching reef species	68.2	74.6	63.2	61.6	61.4	64.2
Percent of trips targeting or catching reef species (Economic Impact Multiplier)	74.8	91.6	76.9	68.4	76.0	76.3

\*Reef species were identified by Kurtis Gregg, NOAA Fisheries Ecologist, from a master list of all caught and/or targeted species in each of the five counties.

The final step in the analysis was to estimate county-level economic impacts using information on average trip expenditures for EFL and WFL by mode, the number of trips in each county by mode, the percentage of reef-related trips in the county across all modes, and impact multipliers from NOAA Fisheries’ existing I/O models for East Florida and West Florida. For all counties except Monroe, the total number of trips in the county by mode (for all fish species) was multiplied by the average total trip expenditure for East Florida (in each mode) to get total expenditures by mode by county. The same process was done for Monroe County, but using the average trip expenditures for West Florida.

The total expenditures by mode for each of the counties were then multiplied by four impact multipliers (e.g. jobs/\$ of expenditure, \$ output/\$ expenditure, \$income/\$ expenditure, and \$ value-added/\$ expenditure), as derived from the existing East Florida and West Florida I/O models, to arrive at total impacts per county for each of four impact types. For each county and for each of the four impact types, total county impacts were calculated by summing impacts over each of the three fishing modes. The total county impacts were then multiplied by the

percentage of reef-fish trips in each county (as shown in the last row of Table 2) to arrive at the results in Table 3. We sum the results over the 5 counties to get the total state-wide impacts.

### **Section III. Results and Discussion**

The input-output models generate four different types of impacts for assessing the contributions to a region's economy from expenditures on fishing trips. The different measures are:

Output: the gross value of sales by regional businesses affected by an activity

Labor income: personal income (wages and salaries) and proprietors' income (income from self-employment)

Value-added: the contribution made to the gross domestic product in a region

Employment: full-time and part-time jobs supported

Employment impacts are measured in terms of number of jobs supported; all other metrics are measured in U.S. dollars. Additionally, the categories of impacts are not independent and it is important to note that adding them together would result in some double counting of impacts. This report presents the summation of direct, indirect, and induced impacts for each of the metrics above. A breakdown by each metric type can be obtained from the report authors.

The economic impacts generated from all marine recreational fishing (in parentheses) and reef-related recreational fishing are shown in Table 3. All economic impact estimates are reported in 2017 U.S. dollars (in keeping with the values reported in Lovell et al. (2020) from which these estimates were derived) with the exception of employment, which represents the number of jobs supported by the activity.



**Table 3. Economic impacts of reef-related recreational fishing to Broward, Martin, Miami Dade, Monroe, Palm Beach Counties and State of Florida economy**

<b>Impact Type</b>	<b>Broward</b>	<b>Martin</b>	<b>Miami Dade</b>	<b>Monroe</b>	<b>Palm Beach</b>	<b>State of Florida</b>
Employment (number of jobs)	442 (591)	286 (312)	440 (572)	1,677 (2,452)	803 (1,056)	3,787 (4,983)
Labor Income (In 1000s of dollars)	14,965 (20,006)	9,633 (10,517)	14,819 (19,271)	59,349 (86,767)	27,183 (35,767)	130,969 (172,328)
Value Added (In 1000s of dollars)	29,187 (39,021)	18,842 (20,570)	28,787 (37,434)	107,446 (157,085)	52,710 (69,356)	245,834 (323,466)
Output (In 1000s of dollars)	43,805 (58,562)	28,385 (30,988)	43,845 (57,016)	173,212 (253,234)	79,743 (104,926)	383,591 (504,726)

Impacts from all recreational fishing shown in parentheses.

### ***Caveats and Limitations***

As noted above, for recreational fishing the trip-level expenditures were used to calculate the economic impacts at both county and state levels. This is standard procedure for estimating county-level impacts, as it is reasonable to assume that trip-level purchases are made near/in the county the trip was taken in, specifically for the purpose of taking the trip. However, using only the trip-level estimates to calculate the state-level impacts implies that durable goods purchases such as rods, reels, boats, mooring or storage fees, electronic equipment, etc. are not captured in the recreational fishing impacts presented in this report. While this may bias the impact estimates downward, the approach is taken because NOAA Fisheries’ surveys on durable goods for marine fishing (separate surveys from the trip expenditure surveys) do not ask respondents specifically where they purchased an item **nor** whether they purchased the item *specifically for fishing on reefs in Southeast Florida*, and therefore it is not reasonable to attribute expenditures on durable goods solely or primarily to Southeast Florida reef-related fishing.

It is also important to note that the fishing trip mode data was incorporated into the recreational fishing economic impact models.<sup>2</sup> For recreational fishing this implies that the mode with the highest mean expenditures (for-hire) has a smaller overall impact due to fewer trips taken in that mode versus shore and private/rental boat modes. The shore and private/rental boat modes support more trips, though mean expenditures are lower for both modes. This is not a limitation of the recreational fishing impact estimates; rather, the approach improves the accuracy of the estimates. It is noted here because expenditures-by-mode were not used in calculating the reef-related diving and snorkeling impacts in the companion report.

#### **Section IV. Conclusions**

This economic impact analysis has estimated that expenditures associated with reef-related recreational fishing contributes to Florida's local economy. Using existing data from a nationwide survey of recreational fishing expenditures, the economic impacts from reef-related recreational fishing in Southeast Florida were estimated. State-level results show that expenditures on reef-related recreational fishing supports over 3,700 jobs and generates an overall economic output of nearly \$384 million. These results demonstrate that recreational fishing is an important ecosystem service provided by Southeast Florida's coral reefs.

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<sup>2</sup> Average expenditures of diving and snorkeling in the companion report were calculated as a simple average as opposed to averaging by trip mode. This may increase the impacts of diving and snorkeling slightly, however, of those reporting their trip mode only 10% took a trip from shore, which is likely to be the least expensive mode. This pattern is the opposite for recreational fishing, where the majority of trips are taken from the least expensive mode for most counties.

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