The Economic Gains from Reallocating Specific Saltwater Fisheries

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Executive Summary

Allocation arrangements between recreational and commercial fisheries have a large influence on the jobs, income and net values generated by each fishery. Previous changes to fisheries such as coho and halibut have provided increased value and jobs in the Pacfic region, for example. However, formal allocation studies are needed to properly manage any public resource, especially fisheries, but very few are available for most key fisheries. Using economic contributions estimates and the few fisheries valuation studies available, this simple, preliminary analysis suggests that there are potential gains to be made by increasing the recreational allocation for specific species. Additional studies are needed to accurately quantify potential benefits/costs and to gauge how allocation changes could increase economic value and affect regional economies.

A range of estimated economic returns are presented:

Recreational fisheries:
- *Lower estimates: assume impacts are only created by trip costs. Spending on durable goods such as boats are excluded.*
- *Upper estimates: includes all spending on durables.*

Commercial fisheries:
- *Lower estimates: based on landed value only.*
- *Upper estimates: includes the value added as the product moves from the harvester to the final consumer.*

Key Results[1]:

- **Economic Contributions of Current Allocation:** For many key fisheries, recreational fishing produces larger contributions to the U.S. economy than commercial fishing. Simple assessments of three fisheries were conducted. These jobs-based estimates include jobs directly employed in the recreational and commercial industries as well as jobs in supporting sectors including the commercial industry's processing, wholesale, distribution, retail, restaurant and other related sectors. In each case, our estimates suggest that current economic contributions of the recreational sector are larger than those of the commercial sector:

✓ **Summer Flounder in the Mid-Atlantic:** Recreational angler spending supported 4,084 to 25,450 jobs in 2011, compared to 1,201 to 4,665 jobs supported by commercial production.

✓ **Red Snapper in the Gulf of Mexico:** Recreational angler spending supported 730 to 2,601 jobs in 2011, compared to 432 to 1,677 jobs supported by commercial production.

[1] These estimates represent total economic impacts, which include direct, indirect, and induced effects of recreational and commercial fishing.

- ✓ **Pacific Halibut from California to Washington:** Recreational angler spending supported 475 to 1,415 jobs in 2011, compared to 298 to 1,158 jobs supported by commercial production.

- **Economic Value[2]:** Economic valuation studies are the preferred method for allocating public resources such as fisheries. Valuation research has been conducted for two of the three species examined here to investigate the economic efficiency of current allocations. The findings of both studies suggest that economic benefits to society can be increased by allocating a greater share of harvest to the recreational sector in the relevant fishery:

    - ✓ **Summer Flounder in the Mid-Atlantic:** Gentner et al. (2010) estimated larger marginal benefits for recreational fishing ($1.51 to $13.21 per pound) compared to commercial fishing ($1.21 per pound) based on 2005-2007 stock levels (see Appendix for source calculations).

    - ✓ **Red Snapper in the Gulf of Mexico:** Agar and Carter (2012) estimated larger marginal benefits for recreational fishing ($8.26 to $25.04 per pound) compared to commercial fishing ($2.65 to $3.23 per pound) based on 2012 stock levels. (see Appendix for source calculations).

Limitations and Assumptions:

Several simplifying assumptions were made in this preliminary look into the potential returns from reallocating fisheries. Additional in-depth research is needed to accurately quantify the effects from these issues. Limitations and assumptions all considered, the points raised here do not take away from the broader message that current allocations are likely not economically maximized and that scientific in-depth investigations are needed to better allocate U.S. fisheries.

- A primary limitation in this analysis: The precise increases in recreational fishing participation resulting from reallocations are unknown. It is assumed here that anglers will meet the increased harvest limit by taking more trips, which matches trends seen previously, such as in the Atlantic striped bass fishery. In reality, more anglers may enter the sport, or anglers in general may fish more due to greater fish availability, or anglers simply may not fish enough to meet the additional supply. The available data do not report how anglers will react in each fishery. This key fact must be further investigated by neutral sources using appropriate scientific techniques.

[2] Economic value is a measure of the net economic benefits gained by society from a resource (Edwards, 1990). A fishery allocation maximizes economic value where the marginal benefits are equal for the commercial and recreational sector (Agar & Carter, 2012). While value allows one to gauge total economic benefit, impact analyses are needed to examine the distributional effects of an allocation change.

- When anglers take more trips in a given year, their durable goods expenditures are not likely to increase at a constant rate. We do not know to what extent anglers would spend more on durable goods if fishing opportunities increased or if different species were targeted. In the absence of necessary data, we have chosen to exclude this spending category from the lower bound estimates which assume that spending on durable goods will remain flat regardless of the additional days fished by anglers. Upper bound estimates assume durable goods spending would increase at a constant rate. Research is needed to look at the relationship between participation and durable goods spending.
- Anglers who pursue different species in different locations are likely to have different spending habits (i.e., the average angler may spend more or less pursuing a given species compared to another species). We are able to capture this variation to a degree by considering differences within each fishery regarding the proportion of trips by mode (for-hire, private boat, shore), which leads to different trip spending profiles per fishery. However, based on limited available data, we have assumed that all anglers have the same durable goods expenditures (per trip), and that regional location (e.g., Gulf of Mexico, Atlantic, etc.) does not play a factor in per trip spending by mode.
- The assumption is made that the impacts per landed dollar of fish handled by the commercial sector do not vary across fisheries. Most likely, differences do exist based on each species handling needs and the market's preferences regarding how each species is processed and consumed.

Results Overview

The economic contributions of commercial fishing are driven by the harvest and sale of fish, which cycles through specific value-added sectors of the U.S. economy (processors, distributors, retailers, restaurants, etc.), each providing a greater level of economic returns. Recreational fishing contributions are driven by angler trip expenditures (e.g., food, lodging) and durable goods purchases (e.g., fishing equipment) which also cycle through the economy, though among different sectors, generating economic benefits.

In this report, we have presented economic estimates that cover a range of values for each species examined[3]. This has been done for both recreational and commercial estimates to convey the uncertainty inherent in these simple results. For example, although durable goods spending (tackle, boats, other equipment) by anglers makes up 81% of expenditures for recreational marine fishing, we do not know what portion of these expenditures represent sunk

[3] See Appendix for details about how upper and lower bounds were chosen for the ranges of estimates presented.

costs (meaning they will not change if anglers' fish less or pursue different species). Similarly, there is uncertainty with commercial estimates. For example, we do not have data on the total amount of final sales for fish products for specific species. We use landed revenue data as a starting point to estimate this value, but must make assumptions about how much value is added from the sale at the harbor to the sale to the consumer, and this value added multiplier would likely vary between species to an unknown degree.

For the three species examined in this study, recreational contributions per pound of additional fish harvested vary to a large degree. This is to be expected since the number and type of trips taken to harvest a given quantity of fish differs by species. Contributions of commercial fishing also vary across species based on changing supply versus demand relationships and capital/fixed spending requirements. The variation in the estimates presented here is based on differences in price per landed pound for different species. Regardless of species, economic contributions of recreational fishing appear to be larger than commercial contributions on a per pound basis (Table 1).

Table 1. Estimated Total US Economic Contributions per Additional Pound Harvested in Domestic Waters

	Jobs per thousand lbs	GDP per lb	Output per lb
Summer Flounder:			
Recreational Trip Spending	0.685 to 4.267	$57.8 to $342.3	$112.2 to $660.4
Commercial Sales	0.076 to 0.293	$2.6 to $10.3	$5.1 to $19.7
Red Snapper:			
Recreational Trip Spending	0.159 to 0.565	$13.4 to $45.7	$23.7 to $85.9
Commercial Sales	0.121 to 0.470	$4.2 to $16.4	$8.1 to $31.6
Pacific Halibut:			
Recreational Trip Spending	1.022 to 3.043	$85.8 to $246.3	$148.8 to $458.1
Commercial Sales	0.200 to 0.777	$7.0 to $27.2	$13.5 to $52.2

The economic estimates presented here are based on estimates taken from the Fisheries Economics of the United States, 2011 report (NMFS, 2012). For consistency, all economic, harvest, and recreational trip numbers are based on 2011 data, the most recent year a complete set of data needed for this analysis was available. Economic contributions by species were estimated by multiplying the per pound contributions by total harvest. Details of the methodology are presented in the Appendix.

Summer Flounder in the Atlantic

Summer flounder is a very popular species among Atlantic recreational anglers. In 2011 anglers took an estimated 4.52 million trips in pursuit of summer flounder in the Atlantic. These trips accounted for 11.4% of all angler trips in the Atlantic. In the mid-Atlantic states alone, anglers pursuing summer flounder took 4.15 million trips, representing 26% of all angler trips in this region[4] (NMFS MRIP, 2014). These recreational anglers harvested 5.96 million pounds of summer flounder in 2011 (NMFS, 2014a). In terms of total economic contributions to the U.S. economy, our results suggest that recreational fishing for summer flounder is larger than commercial fishing for the same species, supporting an estimated 4,084 to 25,450 U.S. jobs in 2011, vs 1,201 to 4,665 for commercial (Table 2).

Summer Flounder Allocation:

- 2011 Recreational Harvest: 5.96 million pounds (NMFS, 2014a)
- 2011 Commercial Harvest: 15.90 million pounds (NMFS, 2014b)

Table 2. Estimated Total US Economic Contributions for Summer Flounder Harvested Domestically in the Atlantic in 2011

		Total		
	Jobs per thousand lbs	Jobs[5]	GDP ($millions)	Output ($millions)
Recreational	0.685 to 4.267	4,084 to 25,450	$344.7 to $2,041.6	$669.0 to $3,938.8
Commercial	0.076 to 0.293	1,201 to 4,665	$42.0 to $163.0	$80.8 to $313.6
Total		5,285 to 30,115	$386.7 to $2,204.7	$749.8 to $4,252.4

NOAA recently undertook an investigation aimed at gauging the economic efficiency of current summer flounder commercial/recreational allocations (Gentner et al., 2010). They estimated marginal benefits for the commercial and recreational sector based on data collected between 2005 and 2007. The estimated recreational marginal benefit ($1.51 to $13.21 per pound) was found to be larger than the estimated commercial marginal benefit ($1.21 per pound). These results suggest that greater economic efficiency can be achieved by allocating a larger share of harvest to the recreational sector, thereby increasing total economic value to society.

[4] Mid-Atlantic states include Delaware, Maryland, New Jersey, New York, and Virginia.

[5] The jobs estimate for commercial fishing is greater than the known number of permit holders for summer flounder in the Atlantic (912 permit holders in 2013; NOAA, 2015). This is to be expected since these estimates include both full and part-time jobs for all economic activity from the harvest of fish to the purchase by the consumer.

Red Snapper in the Gulf of Mexico

Red Snapper in the Gulf of Mexico is especially popular among anglers harvesting fish, with an estimated 4.60 million pounds harvested by anglers in 2011 (NOAA, 2014). These results suggest that economic contributions from recreational anglers pursuing red snapper in the Gulf in 2011 are larger than those from commercial fishing for most economic measures (Table 3).

Red Snapper Allocation:

- 2011 Recreational Harvest: 4.60 million pounds (NOAA, 2014)
- 2011 Commercial Harvest: 3.57 million pounds (NMFS, 2014b)

Table 3. Estimated Total US Economic Contributions for Red Snapper Harvested Domestically in the Gulf of Mexico in 2011[6]

		Total		
	Jobs per thousand lbs	Jobs[7]	GDP ($millions)	Output ($millions)
Recreational	0.159 to 0.565	730 to 2,601	$61.6 to $210.1	$109.1 to $395.4
Commercial	0.121 to 0.470	432 to 1,677	$15.1 to $58.6	$29.0 to $112.8
Total		1,162 to 4,278	$76.7 to $268.8	$138.2 to $508.2

In 2012, the Gulf of Mexico Fishery Management Council requested an investigation of the economic efficiency of the current red snapper commercial/recreational allocation. To this end, Agar and Carter (2012) estimated the economic benefit of an additional pound of red snapper harvested in commercial and recreational sectors[8]. Over a range of estimates of net benefits, they found the lowest recreational estimate to be larger than the highest commercial estimate (Table 4). These results suggest that greater economic efficiency could be achieved by increasing the share of the red snapper harvest that is allocated to the recreational sector.

[6] Trip estimates were not available for Texas (only harvest estimates) so Alabama and Louisiana were used as proxies for harvest per trip in Texas. In this way we estimated the number of trips Texas anglers took to pursue red snapper in 2011.

[7] The jobs estimate for commercial fishing is greater than the known number of permit holders for red snapper in the Gulf (384 permit holders in February of 2015; GMFM, 2015). This is expected since these estimates include both full and part-time jobs for all economic activity from the harvest of fish to the purchase by the consumer.

[8] The expected net benefit to an individual is conveyed by the price s/he would be willing to pay to harvest an additional pound of fish (Agar & Carter, 2012, p. 6).

Table 4. Estimated Net Benefit of an Additional Pound of Red Snapper Harvested in the Gulf of Mexico in 2012 (Agar & Carter, 2012)

	Marginal Willingness to Pay per lb	
Sector	low	high
Recreational	$8.26	$25.04
Commercial	$2.65	$3.23

Pacific Halibut off the Coasts of California, Oregon, and Washington

Harvest for Pacific halibut in area 2A (CA-OR-WA) is allocated between recreational, treaty tribal commercial, and non-treaty tribal commercial fishing (NOAA, 2013a). In 2011, commercial fishermen harvested the bulk of Pacific halibut in this region (1.49 million pounds), and recreational anglers harvested an estimated 465,021 pounds of Pacific halibut in 2011 (RECFIN, 2014). Our results suggest that the recreational fishery for Pacific halibut in this region contributes a larger amount to the U.S. economy than the commercial fishery, even with a substantially smaller share of the total harvest (Table 5).

Pacific Halibut Allocation:

- 2011 Recreational Harvest: 465,000 pounds (RECFIN, 2014)
- 2011 Commercial Harvest: 1.49 million pounds (NMFS, 2014b)
- Proposed Reallocation: 10% of total harvest: 195,532 pounds

Table 5. Estimated Total US Economic Contributions for Pacific Halibut Harvested Domestically from California, Oregon, and Washington in 2011

		Total		
	Jobs per thousand lbs	Jobs	GDP ($millions)	Output ($millions)
Recreational	1.022 to 3.043	475 to 1,415	$39.9 to $114.6	$69.2 to $213.0
Commercial	0.200 to 0.777	298 to 1,158	$10.4 to $40.5	$20.1 to $77.9
Total		774 to 2,573	$50.3 to $155.0	$89.3 to $290.9

Reallocating 10% of the commercial share to recreational fisheries has the potential to produce economic gains for regions with valuable recreational fishing resources, where the gain in jobs supported by the recreational sector would likely be substantially larger than the loss in jobs supported by the commercial sector (Table 6). It's important to note that we do not know how these changes would affect other economic sectors, and more detailed analyses would be required to examine the effects on particular regions of interest.

Table 6. Potential Estimated Change in US Economic Contributions with Pacific Halibut Reallocation of 195,532 pounds in California, Oregon, and Washington

	Jobs	GDP ($millions)	Output ($millions)
Recreational Trip Spending	200 to 595	$16.8 to $48.2	$29.1 to $89.6
Commercial Sales	-39 to -152	-$1.4 to -$5.3	-$2.6 to -$10.2

Conclusion

Allocation arrangements between commercial and recreational fisheries present many important considerations that require careful analysis. Recent studies suggest that economic efficiency can be increased by allocating a larger share to recreational anglers for summer flounder in the Atlantic and red snapper in the Gulf, and the data presented here show the same potential exists for summer flounder. Although the species-specific economic impact estimates presented here should not be used to decide which allocation scenarios will maximize public benefits, the results suggest that some coastal regions may see more gain than loss from allocating a larger share to recreational anglers for specific fisheries. More detailed studies are needed to accurately assess the costs/benefits for particular regions and the potential gains in economic value that can be made through reallocation.

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Appendix – Data Sources and Methods

The goals of this analysis were to (1) estimate the 2011 U.S. economic contributions for fishing three specific species, and (2) estimate the changes in economic contributions for a reallocation towards recreational fishing. The analysis presented here relied primarily on estimates of spending and economic contributions from the Fisheries Economics of the United States, 2011 report (NMFS, 2012). Economic contributions attributed to specific species were allocated based on landed revenue.

Commercial Contributions by Species:

To estimate the contributions of commercial fishing, we examined the relationship between total landed revenue and total final sales for US marine fishing. The economic estimates produced by NOAA suggest that final sales are approximately 3.9 times greater than landed revenue for domestic commercial fishing (Table A1). By applying this ratio in conjunction with the measured Keynesian multipliers, we estimated the upper bound for our by-species estimates (Table A2). The lower bound estimates assumed that final sales are equal to landed revenue for the selected species (Table A3). Data specific to high-value fisheries were not available, and future studies should look at the each species directly.

Table A1. U.S 2011 Economic Contributions from Domestically Caught Commercial Seafood (NMFS, 2012)

	landed revenue	final sales (direct output)	Jobs	GDP	Output
Contributions	5,351,361,663	20,780,864,000	786,506	27,489,114,000	52,870,191,000
Multipliers		1.00	3.78E-05	1.32	2.54

Table A2. Upper Bound Commercial Contributions by Species

Fishery	landed revenue	final sales	Jobs	GDP	Output
Gulf red snapper	11,412,745	44,318,945	1,677	58,625,499	112,755,229
Pacific Halibut	7,880,922	30,603,868	1,158	40,483,073	77,861,650
Summer Flounder	31,739,737	123,254,454	4,665	163,042,101	313,581,115

Table A3. Lower Bound Commercial Contributions by Species

Fishery	landed revenue	final sales	Jobs	GDP	Output
Gulf red snapper	11,412,745	11,412,745	432	15,096,882	29,036,040
Pacific Halibut	7,880,922	7,880,922	298	10,424,955	20,050,459
Summer Flounder	31,739,737	31,739,737	1,201	41,985,610	80,751,501

Recreational Contributions by Species per pound:
Recreational economic contributions in 2011 were first allocated on a per-trip basis. Total estimated economic contributions of recreational marine fishing in 2011 (Table A4) were divided by the total number of trips to arrive at contributions per trip[9] (Table A5).

Table A4. U.S Economic Contributions of marine recreational fishing in 2011 (NMFS, 2012)

Type	Jobs	GDP	Output
For-Hire	17,980	$1,496,114,000	$2,469,877,000
Private Boat	25,875	$2,234,379,000	$4,428,470,000
Shore	22,554	$1,741,371,000	$3,413,178,000
Durable goods	297,523	$23,628,826,000	$45,531,495,000
Total	363,932	$29,100,690,000	$55,843,020,000

Table A5. Estimated U.S. Contributions per recreational trip

Type	Jobs	GDP	Output
For-Hire	0.00566	$470.62	$776.94
Private Boat	0.00073	$63.26	$125.38
Shore	0.00071	$54.94	$107.69
Durable	0.00424	$336.62	$648.65

Recreational contributions on a per pound basis were estimated separately for each species based on the average harvest per trip in 2011 (Table A5). Pacific halibut trip and harvest estimates were taken from the Recfin survey data (RECFIN, 2014). Summer flounder trip and harvest estimates were taken directly from the MRIP survey data (NMFS, 2014). Red snapper trips and harvest were taken from the MRIP survey for the states of Alabama, Louisiana, Mississippi, and Florida (west coast). Trip estimates were not readily available for Texas. Harvest estimates were available, and we assumed that the harvest per trip would be the same for Texas as for Alabama and Louisiana combined[10]. For those species where MRIP survey data were used (summer flounder and red snapper), only trips (and harvest) where the selected species was primarily pursued were included. This allowed for a more accurate estimation of the contributions associated with harvesting a particular species. This information was not available for Pacific halibut. This may lead to an underestimation of the current economic

[9] Total U.S. trips by mode in 2011 include For-hire: 3,179,000, Private boat: 35,321,000, and Shore: 31,694,000 (NMFS, 2012). Durable goods expenditures per trip were assumed equal for all trip types.

[10] The average harvest per trip for Alabama and Louisiana combined were used as a proxy for Texas harvest per trip. This could lead to an over or underestimation of Texas red snapper trips (and related impacts) if harvest per trip in Texas is significantly different from the other two states.

contribution of Pacific halibut. However, this underestimation is likely small since a given species is usually harvested by anglers primarily pursuing it.

Table A5. Harvest and Trips for the Three Selected Species

	Summer Flounder		Red Snapper		Pacific Halibut	
Mode	Trips	Harvest (lb)	Trips	Harvest (lb)	Trips	Harvest (lb)
For-Hire	75,048	239,633	56,610	815,674	63,564	141,211
Private Boat	3,554,994	5,068,634	245,884	2,338,904	158,152	323,809
Shore	889,413	39,016	0	0	0	0

Recreational Total Contributions by Species:

The 2011 harvest totals were used to estimate current economic contributions by species. For each species, economic contributions per pound were estimated by applying economic total contributions per trip (Table A4) to a weighted average of harvest per trip for each species (Table A5). Harvest levels (2011 and proposed change) were then multiplied by contributions per pound to estimate total 2011 contributions and potential change in economic contributions with reallocation.

Simplifying Assumptions:

Addressing these assumptions in future studies will increase the accuracy of any reallocation examinations:

- If recreational harvest limits are increased, then people will fish more to meet the new harvest level.
- Trip and durables spending will increase at the same rate for each additional estimated trip (as a result of reallocation).
- Durable goods spending per trip is assumed to be the same, regardless of species pursued.
- Average trip spending profiles do not vary by location or species pursued. These profiles do vary by fishing mode (for-hire, private, and shore), which leads to variation in per-trip spending profiles by species.
- Impacts per landed dollar from commercial fisheries do not vary by species.