

Status of Recreational Saltwater Fishing in Florida: Characterization of License Sales, Participation, and Fishing Effort

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Abstract.—Saltwater recreational fishing in Florida generates an estimated US\$16.7 billion annually in revenue. With sustained increases in Florida's human population and tourism through 2008, which has continued in recent years, monitoring and managing recreational saltwater fisheries have become essential for sustainable management of the state's natural resources. Florida's recreational saltwater fishery is among the largest in the country, with an estimated 27% of all saltwater fishing trips taken in the United States and more than 40% of all trips taken in the southeastern region of the country originating from Florida. This paper evaluates multiple indices of fishing pressure and highlights some of the important trends in Florida's recreational fishery. Indices of recreational fishing effort and participation from recreational survey data indicate that fishing pressure has increased significantly in Florida since 1998. The average number of saltwater recreational fishing licenses sold in Florida has also significantly increased since 1989, which is the first year recreational fishing licenses were required in the state. Results of this analysis indicate that increasing trends in fishing pressure in Florida have been sustained over recent years. These increasing trends appear to be driven to large extent by fishing pressure of anglers fishing on private recreational fishing vessels. This continued growth may present challenges for management of saltwater recreational fisheries into the future.

Introduction

With more than 1,300 mi of coastline, Florida supports one of the largest recreational saltwater fisheries in the country. The numbers of recreational anglers and the number of days anglers spend saltwater fishing is greater in Florida than any other state in United States. More than 1 million recreational licenses that include saltwater fishing privileges are sold annually in the state (GSMFC 2009). According to the most recent available data by the National Marine Manufacturer's Association, Florida has the highest number of registered recreational vessels in the nation (NMMA 2007). Nationally, saltwater recreational anglers spent an esti-

mated \$31.4 billion during 2006, and the highest angler expenditures in the country were in Florida where anglers spent \$16.7 billion (Gentner and Steinback 2008). Saltwater recreational fishing is an important component of Florida's tourism economy. National surveys of saltwater fishing indicate that 35–50% of saltwater anglers in Florida are nonresidents (USFWS 2006; NMFS 2008), and tourism to the state continued to steadily increase through 2008 (Visit-Florida 2008). The majority of anglers obtaining nonresident licenses reside in states east of the Mississippi River, primarily in southern states such as Georgia and Alabama (Florida Fish and Wildlife Conservation Commission, unpublished data).

Historic increases in recreational fishing

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effort in Florida have necessitated regulatory measures to preserve the viability of recreational fishing and the resources that support those fisheries. During the 1950s, the commercial sale of a popular sport fish, common snook *Centropomus undecimalis*, was banned in Florida, and this protection was thought to be sufficient for preventing overharvest at the time. However, Florida experienced rapid population growth in the 1960s and 1970s, and it became increasingly evident that recreational harvest was impacting the size and age structure of the stock, even in the absence of commercial fishing (Bruger and Haddad 1986). The recreational fishery for snook is now tightly regulated with closed seasons, minimum and maximum size limits, and daily bag limits, which have allowed the stock to recover, and today, snook supports one of the most popular recreational fisheries in the state. However, fishing mortality continues to exceed current management targets (Taylor et al. 2001; Muller and Taylor 2006), and understanding recent trends in recreational fishing pressure will be important for managing this sustainable fishery into the future.

Historic increases in recreational fishing effort have also impacted offshore fisheries. A survey of offshore fishing in Florida in the early 1960s cited sharp gains in resident and tourist populations, coupled with rapid technological advances, for the increased exploitation of reef fishes (Moe 1963). For some of the most economically important reef fish in Florida, the recreational harvest today constitutes 50% or more of the total combined commercial and recreational harvest (based on official state and federal fisheries landings data; see also Coleman et al. 2004).

Long-term sustainability of inshore and offshore fisheries requires management that is informed by changing trends in recreational fishing pressure. The objective of this paper is to characterize recent trends in participation and effort in Florida's recreational saltwater fishery over the past two decades. For this analysis, indices of recreational saltwater fishing participation and effort in Florida, including license sales, vessel registrations, and saltwater fishing surveys, were used to evaluate the status and trends of the recreational saltwater fishery.

Data and Methods

The data examined in this report have largely been obtained through publicly available online sources and from the Florida Fish and Wildlife Conservation Commission (FWC). Records obtained on recreational saltwater fishing and for-hire license sales in Florida have been provided by the FWC Office of Licensing and Permitting, which has maintained this database since the inception of recreational saltwater licensing in 1989. There are numerous license options available to resident and nonresident saltwater anglers, and for this analysis, we include all hunting and fishing license types that include saltwater fishing privileges (see http://my-fwc.com/License/LicPermit_RecreationalHF.htm for a list of license types). License sales are separated by the state's fiscal year that begins July 1. Throughout this report, fiscal years are reported as a single year for simplicity. As an example, fiscal year (FY) 1989–1990 is shown as FY 1989.

Data on vessel registrations were provided by the Florida Department of Highway Safety and Motor Vehicles and obtained from the department's Web site (FLHSMV 2009). Vessel registration data are broken down into categories by vessel length. Size categories for vessels less than 12 ft, 12–15 ft, and 16–25 ft were analyzed as provided, while all size categories greater than 25 ft were combined into one category. Additionally, the category for canoes was not included in the analysis. Vessel registrations are reported in fiscal years (July 1–June 30) up to 1999–2000 and reported as calendar years beginning in 2000, due to change in registration requirements (B. Walden, Florida Department of Highway Safety and Motor Vehicles, personal communication).

Estimates of angler participation and fishing effort were obtained through two federal surveys, including the Marine Recreational Fisheries Statistics Survey (MRFSS) and the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. The National Marine Fisheries Service has generated estimates of recreational fishing participation and fishing effort through the MRFSS in Florida annually since 1980 (NMFS 2008). The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (referred to as the National Survey

in this report) has been conducted once every 5 years since 1955 by the U.S. Fish and Wildlife Service of the Department of the Interior and the U.S. Census Bureau of the Department of Commerce (USFWS 2007). Due to changes in survey methodologies over time, the U.S. Fish and Wildlife Service does not recommend using estimates from earlier surveys in a time series with estimates from 1991 forward; therefore, we only use the most recent National Survey estimates. The National Survey provides a snapshot of the relative participation and effort in Florida compared to the rest of the nation. The MRFSS estimates recreational saltwater participation and fishing effort annually and uses different methods than the National Survey; therefore, estimates from the two surveys are not directly comparable. Point estimates from each survey method presented in this analysis are only intended to demonstrate the range of available estimates and compare trends within each survey. We make no inferences about which estimate is more or less accurate.

The metrics used in this paper measure the change in means of saltwater fishing and for-hire license sales, vessel registration, participation, and fishing effort data between 5-year time periods (1988–1992, 1993–1998, 1998–2002, and 2003–2007). Saltwater fishing licenses and for-hire licenses were not required in FY 1988; therefore, data analyzed during the first time period for these data sets only include FY 1989 to FY 1992. An *F*-test was initially performed to determine equality of variance. A one-tailed Student's *t*-test was performed to compare means of grouped years, and the significance is reported by *P*-values ($\alpha = 0.05$). *P*-values less than or equal to 0.05 are considered significant (denoted by * throughout), and *P*-values greater than 0.05 are considered not significant (ns). Additionally, a linear regression analysis was performed on annual data over the past 20 years for the three major recreational saltwater indices: fishing license sales, the number of participants, and the number fishing trips.

Results

Recreational Saltwater Fishing Licenses Sales

Since 1998, more than 1 million saltwater fishing licenses have been sold annually in Flori-

da. Overall, there has been an average 1% annual increase in saltwater fishing license sales in Florida since FY 2002. During every time period from 1989–1992 through 2003–2007, there was a significant increase in the average numbers of licenses sold (Figure 1). Nonresident licenses account for approximately 40% of new license sales.

Many saltwater anglers in Florida are exempt from the requirement to purchase a saltwater fishing license, including residents fishing from shore (this exemption was removed in 2009 after this analysis was complete), residents over the age of 65, and any angler less than 16 years of age. According to data collected during 2007, only 38% of nonresident anglers fishing from shore and 77% of nonresident anglers fishing from private boats reported to have a valid Florida saltwater fishing license (Florida Fish and Wildlife Conservation Commission, unpublished data). While some license exemptions do apply to nonresidents (anglers under 16 years of age and fishing from a licensed fishing pier), it is likely that noncompliance with fishing license requirements is also a factor. For Florida residents, 28% of anglers fishing from shore and 80% of anglers fishing from private boats reported having a valid state saltwater fishing license, and additional exemptions that apply only to resident anglers may explain a greater portion of unlicensed anglers in these categories. We estimate that approximately half of all saltwater anglers in Florida were licensed during 2006, based on National Survey angler participation estimates and Florida saltwater fishing license sales.

For-Hire Vessel License Sales

A state for-hire license is required for any vessel or captain to carry paying passengers for the purpose of recreational fishing in Florida. For-hire license sales began to sharply increase in FY1996, and since that time, license sales have increased on average 5% per year. Figure 2 shows the percent change in 5-year averages for for-hire license sales by vessel type. Licenses for vessels to carry up to four customers (small vessels) account for more than 60% of all for-hire licenses, and average sales for this category have significantly increased during each 5-year time period on record. Average

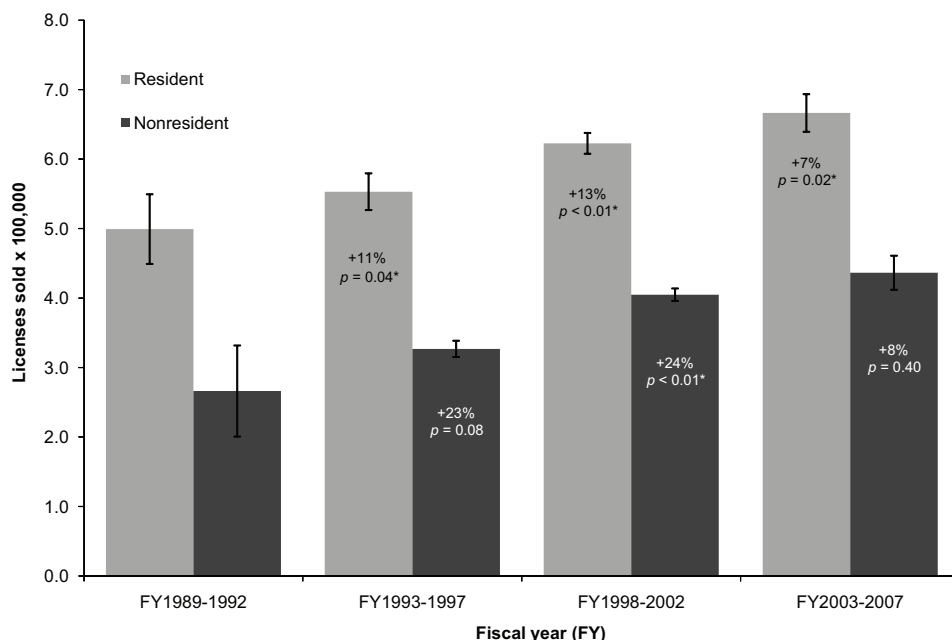


Figure 1.—Five-year averages for the numbers of recreational saltwater fishing licenses sold in Florida (in 100,000s) since fiscal year 1989–1990 (July 1–June 30). Percent changes are given for each time period compared to the previous 5-year time-period and values for $p \leq 0.05$ are considered significant. Data source: Florida Fish and Wildlife Conservation Commission, Department of Licensing and Permitting.

sales for licenses to carry up to 10 customers (medium vessels), and more than 10 customers (large vessels) show no apparent trend.

Recreational Vessel Registration

The number of registered recreational vessels in Florida, which includes vessels used for pleasure in both saltwater and freshwater, has steadily increased since the mid-1990s. In 2007, there were 991,680 recreational vessels registered in Florida, which was more than any other state in the United States (NMMA 2007). We compared vessel registration data from Florida over the past 20 years. Vessels between 12 and 25 ft accounted for 4% of all registered recreational vessels on average since FY 1998. Vessels greater than 25 ft were combined into one category for this analysis, and the category for canoes was omitted due to the relatively low number of registrations. The average number of recreational vessel registrations increased significantly during each 5-year time period for every vessel size category, with the exception of

vessels between 12 and 15 ft, which showed a weak decreasing trend (Figure 3).

Participation

The saltwater recreational fishing license does not provide a complete count of the total number of participants in the recreational fishery. Total saltwater angler participation estimates are provided by the MRFSS annually and by the National Survey once every 5 years. Since 1991, the National Survey has estimated participation in Florida once every 5 years using consistent methods. Participation estimates range from 1.5 million in 1995 to 2.4 million in 2000. The National Survey estimated 2.0 million saltwater anglers fished in Florida during 2005, which was an 18% decrease from the 2001 estimate (USFWS 2007). Because the survey is conducted only once every 5 years, we could not evaluate whether changes in point estimates between 5-year time periods were significant. It should also be noted that the National Survey estimates participation for the entire state, whereas the MRFSS generates sepa-

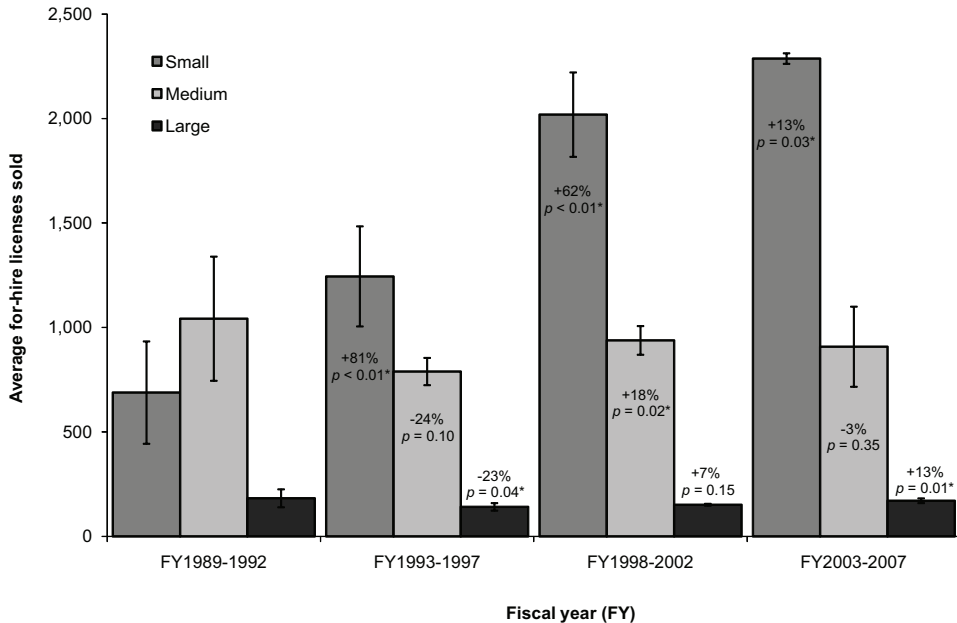


Figure 2.—Five-year averages for the numbers of for-hire vessel licenses sold in Florida by license category since fiscal year 1989–1990 (July 1–June 30). Percent changes are given for each time-period compared to the previous 5-year time period, and values for $p \leq 0.05$ are considered significant. Small capacity vessels are permitted to carry up to four passengers, medium capacity vessels are permitted to carry up to 10 passengers, and large capacity vessels are permitted to carry more than 10 passengers. Data source: Florida Fish and Wildlife Conservation Commission, Office of Licensing and Permitting.

rate estimates for the east and west coasts of the state. Average MRFSS participation estimates for the west coast of Florida during 1998–2002 increased 47% ($p = 0.015^*$) compared to the previous 5 years (1993–1997) and remained stable after that time period (Figure 4). Average participation estimates on Florida's east coast did not change significantly during the time periods examined (Figure 4).

In 2007, the MRFSS estimated 7.26 million saltwater anglers fished on the east and west coasts of Florida, which was the highest saltwater fishing participation estimate to date. Trends in the estimated number of saltwater anglers have increased significantly over the past two decades (Figure 5). Average participation estimates for resident anglers remained relatively constant through 1998–2002 and increased 29% in 2003–2007 ($p = 0.004^*$). Nonresident anglers increased 39% ($p = 0.03^*$) during 1998–2002 and remained constant thereafter (Figure 5).

Both the MRFSS and the National Survey participation estimates demonstrate the importance of saltwater recreational fishing to the state of Florida. For instance, in 2005, the MRFSS estimated that 34% of the total number of saltwater anglers of all Atlantic and Gulf of Mexico states (excluding Texas) fished in Florida. Likewise, the 2006 National Survey estimated that 26% of total recreational saltwater participation in the United States during 2005 occurred in Florida. (USFWS 2007).

Effort

The 2006 National Survey indicates that approximately 48% of all saltwater angler trips in the southeastern United States and 27% of all trips in the United States were taken in Florida (USFWS 2007). Estimates of effort in Florida ranged from a low of 21.5 million angler-days in 1996 to a high of 30.1 million angler-days in 2001. The National Survey effort estimates for

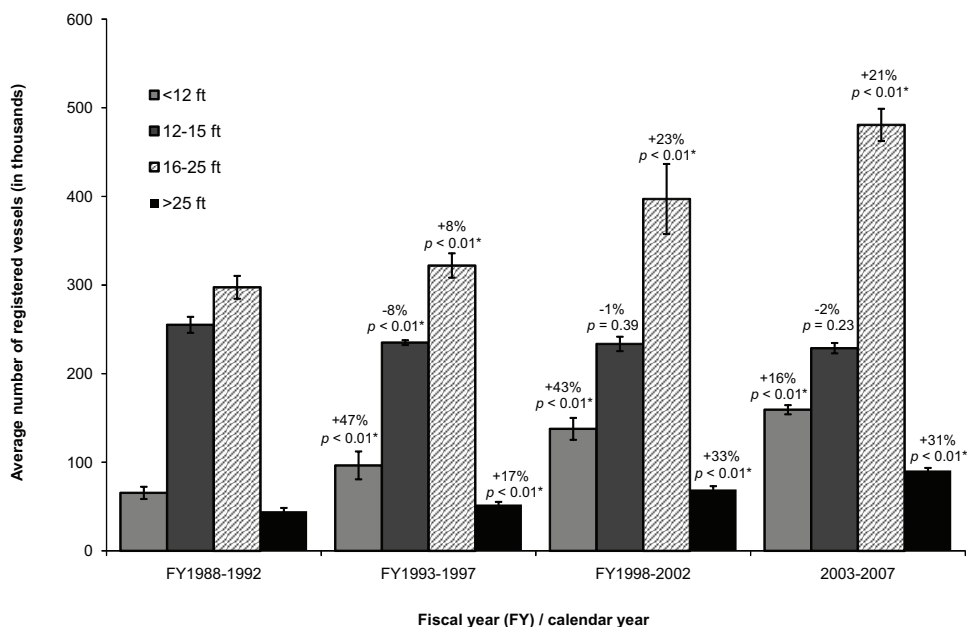


Figure 3.—Five-year averages for the number of registered recreational vessels in Florida since fiscal year 1988 by vessel size category. Percent changes are given for each time period compared to the previous 5-year time period, and values for $p \leq 0.05$ are considered significant. Vessels size categories larger than 25 ft have been combined, and the category for canoes was omitted. Registered vessels include all vessels registered in Florida solely for recreational use in saltwater and/or freshwater and are not limited to vessels used for recreational fishing. State vessel registration requirements changed from fiscal years (July 1–June 30) to calendar years in 2000. Data source: Florida Department of Highway Safety and Motor Vehicles.

Florida are within range of MRFSS effort estimates for the years 1991, 1996, 2001, and 2006, varying from a low of 22.9 million angler-days in 1996 to a high of 29.3 million angler-days in 2006 (NMFS 2008). In the most recent 2006 National Survey, estimated effort was 23% lower than that estimated by the 2001 National Survey; however, we cannot speculate whether this is indicative of a significant trend or due to variance between two point estimates. Average annual effort estimates from the MRFSS since 1988 for each 5-year time-period remained stable through 2002 and increased significantly during the most recent 2003–2007 time period (Figure 6). Approximately 56% of saltwater fishing trips in Florida take place on the west coast and effort on the west coast increased 16% during 2003–2007, though the significance of this trend was very weak ($p = 0.045^*$). Effort on the east coast increased significantly (19%; $p = 0.034^*$) during the 2003–2007 time period (Figure 6).

Over the past 10 years, anglers fishing from private recreational vessels have accounted for more than half of all saltwater fishing trips in Florida. During the most recent time period (2003–2007), 55% of angler trips took place on private recreational vessels, 43% took place from shore, and less than 3% took place from for-hire vessels (professional charter and guide vessels). Fishing effort from private recreational vessels remained stable until the 2003–2007 time period when effort statewide increased significantly by 24% ($p = 0.007^*$; Figure 7). The average estimated number of angler trips taken from shore varied without trend across all time periods, and for-hire angler trips have fluctuated around low levels (Figure 7).

The three major indices of recreational saltwater fishing pressure, including license sales, angler participation, and fishing effort, show an increasing trend over the past 20 years (Figure 8). Linear regression analyses for all three indices show upward and positive trends but with

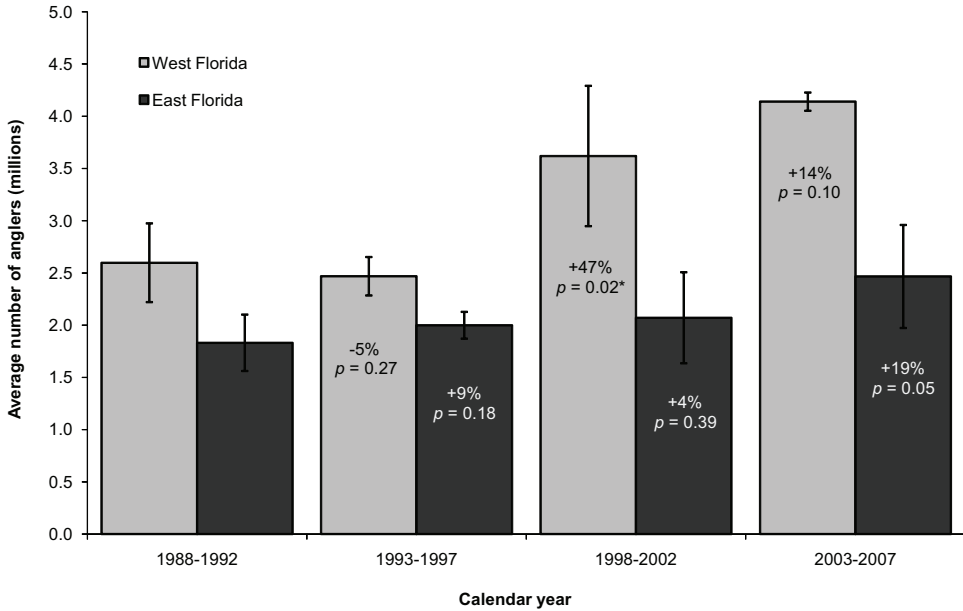


Figure 4.—Five-year averages of annual participation estimates (numbers of saltwater anglers in millions) for resident and nonresident saltwater anglers in Florida. Percent changes are given for each time period compared to the previous 5-year time-period and values of $p \leq 0.05$ are considered significant. Data source: NMFS 2008.

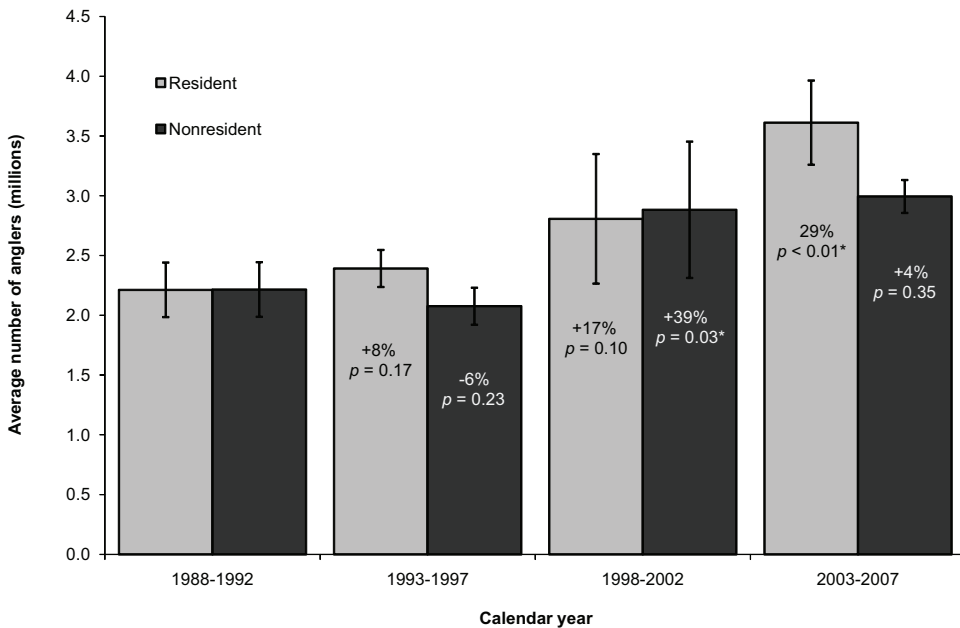


Figure 5.—Five-year averages of annual participation estimates (numbers of saltwater anglers in millions) for the west coast of Florida and the east coast of Florida. Percent changes are given for each time period compared to the previous 5-year time-period and values of $p \leq 0.05$ are considered significant. Data source: NMFS 2008.

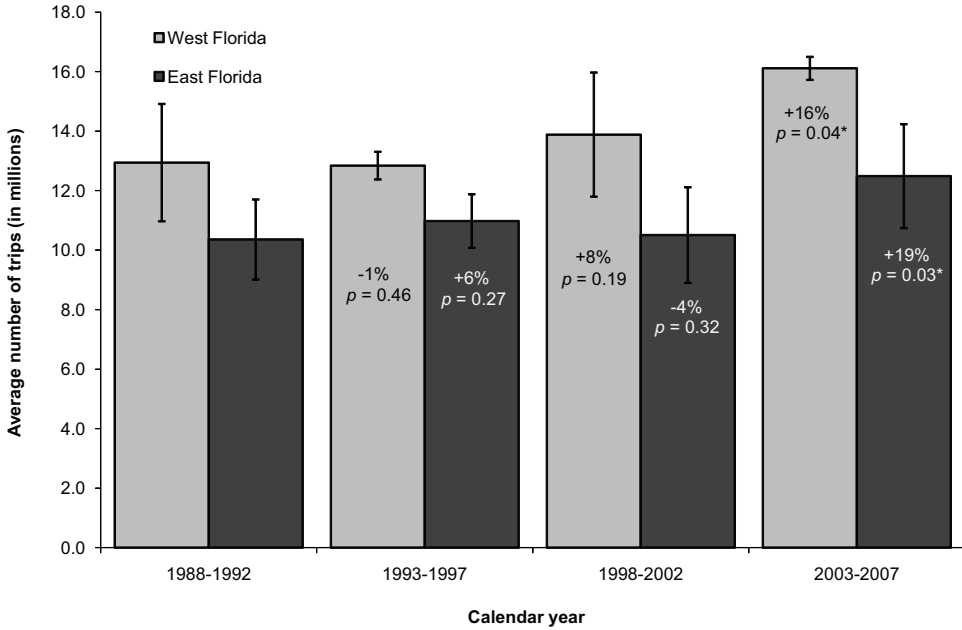


Figure 6.—Five-year averages of annual effort estimates (numbers of saltwater fishing trips in millions) for the west coast of Florida and the east coast of Florida. Percent changes are given for each time period compared to the previous 5-year time-period, and values of $p \leq 0.05$ are considered significant. Data source: NMFS 2008.

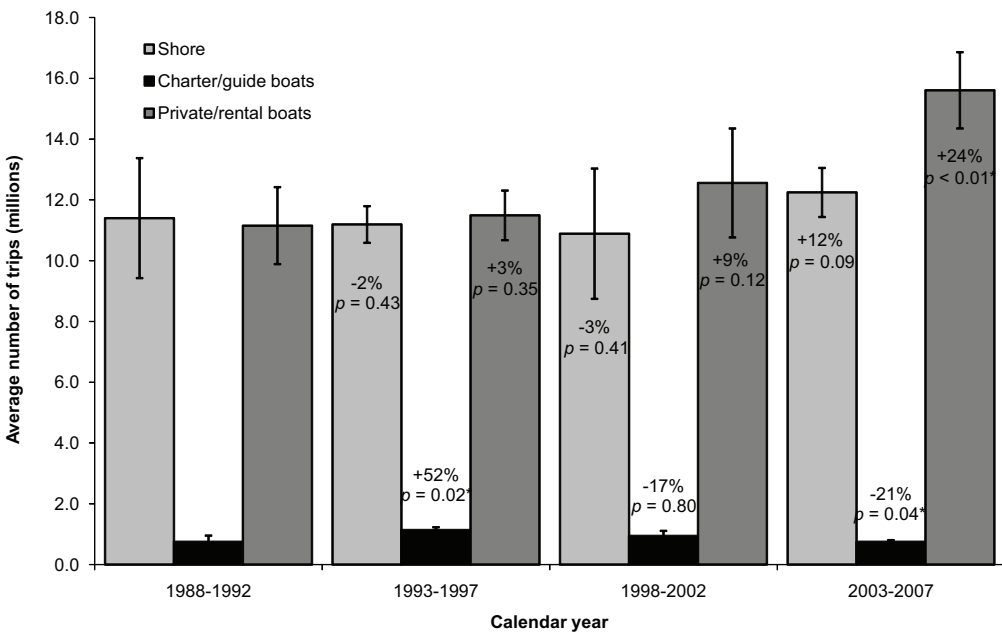


Figure 7.—Five-year averages of annual effort estimates (numbers of saltwater fishing trips in millions) statewide in Florida by recreational fishing mode (shore-based fishing, charter/guide boat fishing, or private/rental boat fishing). Percent changes are given for each time period compared to the previous 5-year time period, and values of $p \leq 0.05$ are considered significant. Data source: NMFS 2008.

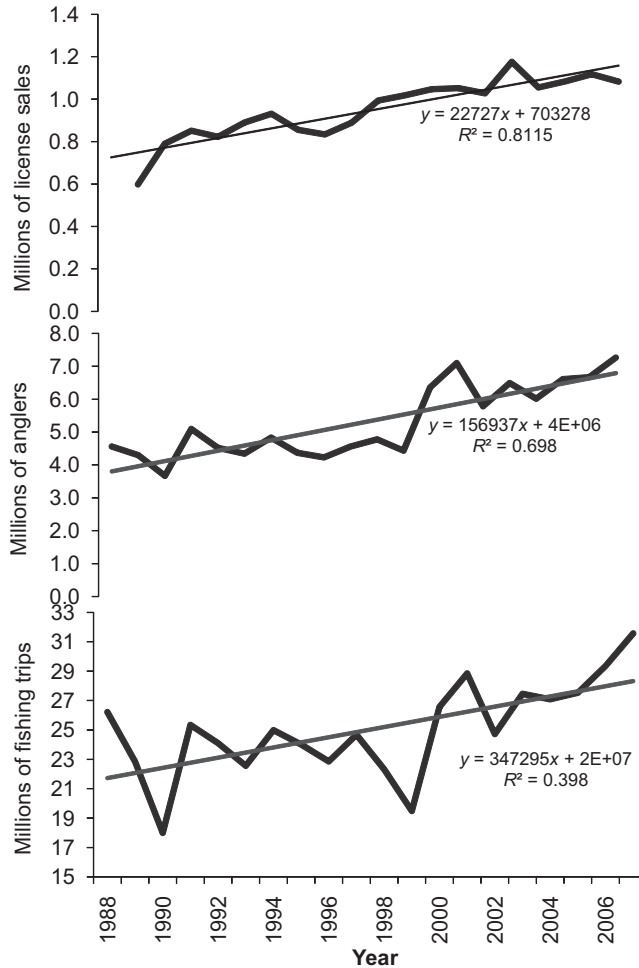


Figure 8.—Regression analysis for three major indices of recreational saltwater fishing pressure in Florida. Top figure: annual numbers of saltwater fishing license sales in Florida (in millions). Middle figure: annual estimated participation (in millions of anglers) in Florida. Bottom figure: annual estimated effort (in millions of angler trips) in Florida. Data source: Florida Fish and Wildlife Conservation Commission, Department of Licensing and Permitting (top figure) and NMFS 2008 (middle and bottom figures).

differing strength. License sales have increased steadily ($R^2 = 0.812$) while trends in angler participation ($R^2 = 0.698$) and the number of fishing trips ($R^2 = 0.398$) have been more variable. Five-year averages indicate that participation and effort have increased markedly since 1998.

Discussion

Measurements of overall recreational saltwater fishing pressure in Florida include license sales, vessel registrations, angler participation, and

fishing effort. Overall trends in these indices have been increasing steadily over the past 20 years, particularly since 1999 for participation and effort (Figure 8). Of these indices, fishing effort is the most direct measurement of saltwater fishing pressure. The significant increase in recreational saltwater fishing effort in recent years is apparently driven by fishing effort from private recreational boats. Effort estimates from MRFSS indicate that the numbers of angler trips from private boats has increased significantly over the past 20 years, whereas shore-based an-

gler trips and trips from for-hire vessels have remained relatively stable over time. Another indicator of private boat effort is saltwater recreational fishing license sales, since the majority of anglers fishing on private/rental boats are required to obtain a saltwater fishing license. Any angler fishing from a licensed for-hire vessel is not required to purchase an individual fishing license, and resident anglers fishing from shore were also not required to purchase a license at the time of this analysis. Therefore, it is assumed that a large portion of resident license sales are for the purpose of fishing from private recreational vessels, and resident license sales have steadily increased over the past 20 years. Over the same 20-year time series, there was also a steady and significant increase in the number of registered recreational vessels, particularly within the 16–25-ft size category. All of these indices point to an increasing level of recreational fishing effort that is taking place particularly from private boats.

Many of Florida's most highly sought after saltwater finfish are facing the prospect of increasing fishing pressure, and future fisheries management strategies will have to take this into consideration. This is particularly important as new regulatory systems are implemented that require annual catch limits (ACL) for all federally managed species such as snappers and groupers (MSRA 2006). This system will require that the total ACL for a given species be allocated proportionally to commercial and recreational sectors. The prospect of increasing recreational fishing pressure, particularly from private boats, may present challenges for maintaining harvest at the established ACL levels. Additionally, displaced recreational fishing effort could shift pressure to inshore fisheries managed by the state as federal regulations to implement the ACL management system change.

The trends in fishing pressure indices demonstrated in this paper characterize the relative size and increasing impact of Florida's recreational fishery. Researchers and fisheries managers will need access to quality data that are timely, reasonably precise, and useful on the appropriate scales to successfully manage Florida's fisheries into the future. Of foremost concern is establishing more precise methods to account for and survey Florida's saltwater anglers, preferably through a more complete

licensing or registry database (i.e., ensuring all anglers are licensed or registered). Important also to a state as large and diverse as Florida is the geographic distribution of fishing effort, which is currently only known on a very coarse scale (statewide or east coast versus west coast). Information on a finer spatial scale is essential for understanding the regional impacts of recreational fishing throughout the state, particularly for detecting any behavioral shifts, including targeted species and waters fished.

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