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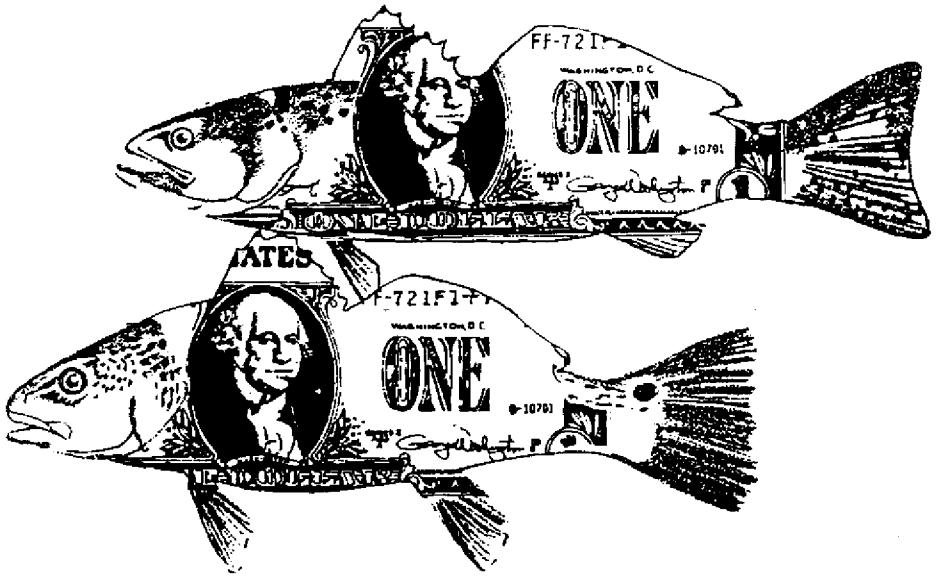
Current and Projected Tourist Demand for Saltwater Recreational Fisheries in Florida

Frederick W. Bell



Florida Department of Natural Resources

Florida Sea Grant College Program

FLORIDA SEA GRANT COLLEGE PROGRAM

Funded by Florida Saltwater Fishing License Revenues

This report is a companion publication to SGR-112, "A Regional Analysis of Current and Future Florida Resident Participation in Marine Recreational Fishing."

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by

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EXECUTIVE SUMMARY

1. A face-to-face sample survey of 3,900 tourists visiting Florida between August 1991 and February 1992 was conducted. About one half of the sample arrived by air and the balance by auto. The sample was stratified on the basis of tourist arrival activity targets by regions of the State of Florida. A survey instrument was developed to obtain behavioral information about that segment of the general tourist population engaging in saltwater recreational fishing while in Florida;

2. It was found that about 16.5% of the general tourist population engaged in saltwater fishing sometime in the last year. This annual participation rate is generally in agreement with two independent recent studies conducted by Bell (1990) (1992);

3. An analysis of participation in saltwater recreational fisheries by tourists revealed higher participation rates among males; non-whites; those arriving by auto; those exposed to fishing as a child and those making more trips to Florida per year than those with opposite demographic characteristics. Also participation rises with age, but declines after age 60. Finally, higher income tourists have a lower participation rate than those with relatively lower income. These results were derived from an estimated participation function that can be used to measure changes in the existing participation rate of 16.5 percent due to demographic shifts in the characteristics of future tourists visiting Florida;

4. In 1991, 17,996,112 tourists (18 year and older) visited the State of Florida with about 16.5 percent or slightly under 3 million participating in saltwater recreational fishing. While in Florida during a one year period, the median days fished was 4 for the typical tourist saltwater angler yielding slightly under 11.9 million days fished for this segment of Florida tourist;

5. Tourist saltwater anglers spend $110 per day for lodging, food, rentals, bait and other items and services related to fishing and when multiplied by total days yielded an expenditure figure (i.e., retail and service sales) of $1.306 billion dollars in 1991;

6. Such saltwater tourist spending of $1.306 billion was estimated to support 23,518 retail and service jobs and wages of approximately $235 million in 1991;

7. The spending activity of saltwater anglers was estimated to have generated about $62 million in revenue to the State of Florida alone in the form of sales, gasoline and corporate income tax in 1991;

8. Projections were made for fishing effort or anglers days and associated economic activity for tourist saltwater anglers over the 1991-2010 period. This was accomplished by first projecting the total tourist population and the participation rate for that segment of this population that are saltwater anglers. The total tourist population was projected by the use of standard economic variables such as changes in income and population in the U.S. while the participation rate for tourist saltwater anglers was projected by using forecasts of changes in age; racial composition; tourist arrival mode and income. Participation in saltwater recreational fishing was projected to rise by almost 1 percentage point due to the aging of the population; a shift to a higher percent nonwhite and a higher percent arriving by auto as opposed to air despite rising affluence which tends to depress the participation rate;

9. Tourist saltwater anglers are expected to nearly double over the next two decades rising to nearly 6 million by the year 2010. Days fished and expenditures are also expected to double over this period reaching 23.8 million angler days and over $2.6 billion (1991 prices) given that the fishery resource allows such expansion by not having negative feedbacks on demand (e.g., declining catch rates);

10. From the sample, it was estimated that up to 37.2 percent of tourist saltwater anglers who legally should purchase the relatively new saltwater fishing license are not, due to ignorance of the law or an attempt to avoid the cost. With complete compliance, fishing license revenue might be increased by $4.7 million from the presently collected $4.6 million from nonresidents for a total of $9.2 million in the 1990-91 fiscal year. In addition, a second aspect of under collection is that this study estimates about 1 million nonresidents <u>with only partial compliance</u> that should purchase a saltwater fishing license compared to 267,000 that actually did;

11. Using the threshold theory of the influence of catch rates on angler demand, it is estimated that the economic projections of saltwater tourist anglers demand may be sustained for another decade or slightly more for targeted species and well beyond 2010 for non-targeted species. The threshold theory is that there is a minimum acceptable catch rate per day for all species before the angler will not fish in Florida. Existing catch rates are well above this threshold;

12. Those that do not engage in saltwater fishing while in Florida say lack of time and generally no interest are main reasons for lack of participation. Lack of equipment was also given as a reason;

13. Nine of ten tourist saltwater anglers do not come to Florida primarily to fish indicating this is a discretionary activity while a tourist;

14. For those tourist saltwater anglers that primarily came to Florida to fish, catch rates per day were a small factor in the total recreational experience which supports both the threshold and recreation specialization hypothesis;

15. Only 26 percent of tourist saltwater anglers were satisfied with the current rate structure of the saltwater fishing license, but nearly half had no knowledge of the rate structure;

16. Most tourist saltwater anglers fish in only one county while in Florida;

17. Nearly one-third of tourist saltwater anglers catch and release fish primarily because of fishery regulations;

18. Saltwater anglers arriving in Florida are less sensitive to national recessions.

19. Tourist are overwhelmingly finfish fisherman who target small game and bottom fish. However, two-thirds of the tourists have no particular species they want to catch, but are more concerned with the total recreational experience while fishing.

CHAPTER 1

INTRODUCTION

The central purpose of this report is to estimate the current and projected demand by tourists visiting Florida for saltwater recreational fisheries. This report is both an update of the Bell et al (1982) study conducted in 1981 and an extension of this work to a forecast of the demand pressures likely to occur on Florida's coastal fisheries. Such fishing pressure has caused concern for the fishery resource and the commercial and recreational fishing industries that depend on this resource. According to NOAA (1991):

> "The combined long term potential yield (LTPY) for southeast Atlantic, Gulf of Mexico and Caribbean living marine resources is estimated at 1.4 million tons . . . recent catches have run about 77 percent of LTPY. Atlantic swordfish and bluefin tuna, many southeast Atlantic snappers and groupers ... have been overutilized and some stocks are at historically low levels. ... The recreationally and commercially important coastal pelagic species (e.g., mackerels, dolphin fish, and cobia) yield only about 53% of their estimated aggregate LTPY as a result of overutilization. ... " (p. 9)

In 1981, Bell et al (1982) reported that 9.67 percent of all tourists over 18 years of age participated in saltwater recreational fishing in Florida over the last 12 months. This translated into 3 million tourist anglers expending 16.4 million saltwater fishing days in Florida over a decade ago. A decade ago, approximately three-quarters of a billion dollars was directly spent by saltwater tourist anglers in Florida, not including durable goods such as boats and motors. Almost 23,000

jobs at the retail level were directly tied to nondurable expenditures in 1981 according to Bell et al (1982). These historical figures are driven by independent estimates by the Florida Division of Tourism of the number of visitors arriving in Florida. Some felt that because of flaws in statistical design the number of tourists was considerably overestimated, perhaps by 50 percent.[1] Because of these difficulties, the reader is warned against historical comparison of newly developed data in this report with the 1980-81 study. This study will be forward looking in terms of the growth in tourist angler demand over the next two decades from a 1991 base year. Also, this report will be restricted to the primary economic imapct of tourist anglers. The multiplier impact (i.e., indirect) is beyond the scope of this report.

Despite the economic size of the tourist segment of the recreational fishing industry in Florida, not enough is known about the critical variables that influence participation in saltwater angling. It is hypothesized that the saltwater angling participation rate for tourists visiting Florida can be explained by socioeconomic characteristics (e.g., age). Such a participation function can be used to project the number of

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[1]Using the old statistical technique, it was estimated that 32.5 million tourists visited Florida in 1980 while the revised series reports only 20 million tourists for that year. The fundamental reason for the erroneously high tourist estimate in the early 1980's was a flaw in the auto traffic count procedure. Thus, the Bell et al (1982) should be reduced by one-third. In addition, a new interpretation of visitors reported by the Florida Division of Tourism may reduce estimated tourist anglers even more. This will be discussed in Chapter 4.

tourist saltwater anglers and days fished by modes to the year 2010 plus evaluate the implications for fishery management (e.g., bag limits, closures, etc.). Such forecasts will enable us to project State revenue from the sale of saltwater fishing licenses to nonresidents (tourists) so as to enhance planning for fishery programs. In conducting this analysis, an independent check on the degree of compliance with the requirements that certain individuals from out-of-state purchase a saltwater fishing license will also be made. The purpose here is to identify lost revenue due to lack of enforcement and/or lack of knowledge of the license requirement by the tourist. Fishing license revenue is important to the enhancement of fishery stocks (e.g., hatcheries, artificial wetlands, etc.) and the support of the Florida Marine Patrol.

CHAPTER 2

THE SAMPLE SURVEY

A survey instrument was designed to obtain demographic characteristics of tourist saltwater anglers and non-anglers plus additional information on fishing habits, expenditures and attitudes of those identifying themselves as anglers. The survey instrument is Appendix A of this report.

Using the survey instrument, information was collected through a face-to-face interview with Florida visitors, traveling by automobile and by air, as they exited the state at primary departure points. The survey was conducted between August 1991 and February 1992 by Bordner Research, Inc. via a subcontract from Florida State University. Interviews of air travelers were conducted at gateside departure lounges for non-stop commercial flights leaving Florida at the locations indicated in Table 2.1. This table indicates that 1,871 interviews (i.e., contacts) were made at 13 airports throughout the State of Florida. Interviews of auto travelers were conducted on interstate highways and other highways leading out of Florida. Selection of automobiles were based upon those vehicles with out-of-state license plates. Auto tourists were interviewed at rest stops on interstates and by actually stopping traffic and selecting out nonresident vehicles on all other roads. As indicated in Table 2.1, 2,029 auto passengers were interviewed. All interviews were conducted in a random manner with individual 18 years or older. Younger

Table 2.1

Tourist Sample by Air/Auto and Locations Compared to Target Percentages, 1991

Location	Sample Size	Percent	Target Percent	
			Air %	Air/Auto %
Airport		**Air**		
Total	1,871	100.0	48.0	48.0
1. Orlando	504	26.9		26.8
2. Miami	459	26.9		26.8
3. Tampa	243	13.0		13.0
4. Ft. Lauderdale	213	11.4		11.6
5. Palm Beach	151	8.1		8.1
6. Ft. Myers	124	6.6		6.6
7. Jacksonville	53	2.8		2.8
8. Sarasota	49	2.6		2.6
9. Daytona Beach	28	1.5		1.5
10. Melbourne	19	1.0		1.0
11. Pensacola	17	.9		.9
12. Tallahassee	8	.4		.5
13. Panama City	4	.2		.2
		Auto	Auto %	
Total	2,029	100	52.0	52.0
1. I-95	849	41.8		41.0
2. I-75	646	31.8		32.0
3. I-10	331	16.3		17.0
4. US 231, 301	203	10.0		10.0

Source: Department of Economics, Florida State University

individuals are unlikely to possess the information called for by the survey instrument (e.g., income, spending per day, locations, etc.). Quotas or targets at each interview site are statistically weighted according to traffic volume at these airports and highways. The targets were provided by the Florida Division of Tourism. These targets are expressed as percentages in the far right hand column of Table 2.1. The air and auto samples match these targets almost exactly so the sample, although random, is spatially stratified. Altogether, 3,901 persons were interviewed using the survey instrument in Appendix A. However, before the empirical results are discussed, the nature of the saltwater recreation participation must be examined.

CHAPTER 3

PARTICIPATION BY TOURISTS IN SALTWATER RECREATIONAL FISHERIES

The participation rate is defined as the percent of the tourist population that participated in a recreational activity such as saltwater fishing during a specified time period. As the time period is lengthened, the participation rate usually increases. For the individuals interviewed in the tourist survey, the participation rate in recreational saltwater fishing in Florida was as follows:

Time Period	Participation Rate
Lifetime	35.4%
Last 12 Months[1]	16.5%
This Trip (Last 10 days)	6.4%

The above information illustrates the temporal nature of participation rates as was hypothesized. This study is concerned with saltwater recreational fishing on an annual basis or over the last 12 months. Of note, only 6.4 percent of the tourists fished on the trip to Florida for which the interview was conducted; however, these same tourists averaged 2.62 trips to

[1]The question involving participation over the last twelve months was inadvertently omitted from the survey instrument for approximately the first half of the survey. Fortunately, this problem was corrected for the last 2000 interviews which was enough to establish a participation rate. Appendix B indicates no statistical difference between the samples with and without this question. The interested reader should review this appendix.

Florida over the last 12 months. For most tourists, saltwater fishing is somewhat of an optional recreational activity. This will be discussed in greater detail below.

The literature for participation rates for tourists in Florida is somewhat limited to many of the author's own studies as follows:

	Study	Saltwater Recreational Participation Rates (last 12 mohths)
1.	Bell et al (1982)	9.67%(1981-2)
2.	Bell (1990) (Boat only)	12.7%(1990)
3.	Bell (1990) (Nonboat only)	11.7%(1990)
4.	Bell (1992)	15.8%(1989-90)

Except for the 1982 study, all participation rates are double digit. There would seem to be a tendency for the participation to increase over time (i.e., still a 12 month recall) when comparing the 1981 study with this study and the 1992 study cited above.

The 12-month recreational saltwater participation rate is hypothesized to be a function of demographic and cultural variables. Such explanatory variables were divided into two classes after extensive statistical testing of their influence on the participation rate. The first group were those variables that were statistically significant at the 30 percent level and possessed the hypothesized sign. The second group was composed of such variables that were hypothesized to have some influence

on participation but failed on statistical grounds and/or lacked the anticipated sign. The following participation equation was hypothesized for recreational saltwater fishing in Florida (i.e., participation depends on the variables on the right hand side of the equation):

(1) $PrP = f(AGE, AGE^2, SEX, RACE, VISIT, INC, EXPER, TRIPS)$

where PrP = Probability of participation over the last 12 months, 1 = participated, 0 = not participated;

AGE = Age of respondent (years);

SEX = 1 = Male; 0 = Female respondent;

RACE = 1 = White; 0 = Nonwhite respondent;

VISITOR = 1 = Air visitor, 0 = Auto visitor respondent;

INC = Household income of respondent;

EXPER = 1 = Respondent taken fishing as a child (experience), 0 = Not taken fishing as a child;

TRIPS = Number of trips to Florida in last 12 months.

This function was estimated using linear ordinary least-squares (OLS) and logit forms of the equation. Some explanation of the signs of the variables is needed. It is hypothesized that age has a parabolic relation to many outdoor recreational activities in terms of participation (i.e., people do not fish intensively earlier in their lives or later in their lives, but have maximum participation somewhat in between). This empirical relation was found in the Bell (1992) study for saltwater tourist anglers. Males (SEX) were hypothesized to have a higher angler participation rate while the relation to RACE was not known a

priori. Visitors by air were thought to have a lower participation rate than those arriving by auto since the latter group can more easily transport fishing equipment and boats and can easily economize on fishing mode (i.e., air visitors would have to rent cars, etc.). A negative relation between angler participation and INC would characterize this activity as an inferior good. Early exposure (EXPER) to fishing by adults is hypothesized to have a significantly positive impact on angler participation. Another aspect of exposure is the number of trips taken to Florida over the last 12 months. In this case, individuals are likely to get more exposure (TRIPS) to coastal fishery resources.

The results of the analyses are shown in Table 3.1. As hypothesized, there is a parabolic relation between angler participation and age in both the OLS and logit models. Tourists have an average age of 49 years in the sample. According to the logit model, the participation rate is below 13 percent for those under 30 years of age and those over 87 years of age. Maximum tourist angler participation (18.86 percent) takes place at 60 years of age. For the Florida tourist population, saltwater recreational fishing would appear to be a senior citizen activity. An aging U.S. population might increase the demand for saltwater fishing in Florida. This topic will be discussed in Chapter 5. As the SEX variable indicates, saltwater angling is preferred by males as opposed to females. This is not an astounding revelation, but it is always reassuring to have

Table 3.1

Estimated Recreational Saltwater Fisheries Participation Function for Florida Tourists Using A Linear OLS and Logit Functions, 1991-92

(Participation or PrP = Dependent Variable)

(t-values in parentheses)[1]

Variable	Linear OLS	Logit
Constant	-.12527 (-1.353)	-4.6753* (-5.579)
AGE	.007024*** (1.822)	.0589*** (1.735)
AGE^2	-.000060026*** (-1.562)	-.00049*** (-1.453)
SEX	.0518** (2.813)	.5450* (3.069)
RACE	-.04214 (-1.337)	-.3394 (-1.334)
VISITOR	-.0651* (-3.766)	-.5163* (-3.543)
INC^2	-.00424 (-1.050)	-.03455 (-1.016)
EXPER	.1906* (11.040)	1.9676* (9.784)
TRIP	.01534* (8.131)	.08498* (6.456)
N	1947	1947
Adj R^2	.113	N/A
X^2	N/A	231.44

[1]*, **, *** are statistically significant at 1, 5, and 10 percent level respectively.

[2]The addition of INC^2 did not reveal a parabolic relationship as with age. Thus, this variable was dropped from the equation.

statistical confirmation. Of particular significance, non-whites (RACE) have a somewhat higher participation rate than whites although the statistical relationship is not very strong. Air visitors (VISITOR) have a lower saltwater angling rate than auto visitors. In this case, the variable, VISITOR, is statistically significant at the 1 percent level. Although statistically weak, INC was inversely related to participation indicating that this activity is an inferior good. Bell (1992) confirmed this conclusion in an earlier study. Green (1984) found that income elasticities for tourists engaging in saltwater fishing were either zero or negative. Thus, increasing affluence will have little if not a negative influence on saltwater angling in Florida by tourists. According to the USDOC (1991), saltwater fishing trips along the East and Gulf coasts of the U.S. have declined by 2 million over the 1982-1991 period which is consistent with the inferior good hypothesis. As might be expected, early introduction to fishing (EXPER) as a child or teenager had a decidedly positive influence on participation. The early rural society was probably more conducive to early age exposure to recreational fishing. Now, nearly 70 percent of the U.S. population live in urban areas and state fishery agencies nationwide have few community-based (urban/suburban) fishing programs. See Sports Fishing Institute (1991). One hypothesis is that the EXPER variable will decline in the future as the U.S. population becomes even more urbanized. This could also raise important policy issues such as the lack of widespread use of a

publicly managed resource. Finally, more trips (TRIPS) to Florida, as hypothesized, increases saltwater angler participation rate due, presumably, to frequent exposure to coastal fishery resources. In the Bell et al (1982) study, the average tourist made 1.37 trips to Florida in 1980-81. However, the median number of visits to Florida was one in 1980-81 and remained the same in the Bell (1992) study and also in this study. A decade later, the tourist to Florida made an average number of trips of 1.6 in the Bell (1992) study and 2.62 in this study. Given the statistical variability in this average (plus only three points in time), no definite conclusion can be reached as to whether tourists are making more trips to Florida over time. Some of this variability is due to sample outliers. This will be discussed in more detail in Chapter 4. Also, trips are not correlated with income in the sample used in this study so no projections can be made based upon income. Thus, there is no basis for projecting a change in the number of trips and hence the participation rate due to this variable.

Finally, the low adjusted R^2 is cause for concern in the OLS version of the participation function. However, R^2's are usually low for cross-sectional models. In Bell's 1989-90 study (1992), R^2's were even lower for recreational fishing and beach participation functions than that shown in Table 3.1. In addition, the linear OLS equation is theoretically inferior to the logit equation which has a high χ^2 and is statistically significant (for the entire logit equation) at the five percent

level. Also, there was no high multicollinearity among the independent variables that might lead to statistical problems. In a 1987 article, Bell and Leeworthy found a marina participation function (linear OLS) to have an adjusted R^2 of .16. These findings are typical of the literature.

CHAPTER 4

ECONOMIC IMPACT OF TOURIST RECREATIONAL SALTWATER FISHING IN FLORIDA, 1991

Once the 12-month participation rate has been analyzed, this study can turn to its use in estimating the economic impact of tourist saltwater anglers for the study year, 1991. The participation rate can be applied to the number of tourists visiting Florida to obtain an estimate of the number of tourist saltwater anglers. The Florida Division of Tourism reports the number of tourists visiting Florida during a calendar year. What the Division is counting is closer to the number of visits. In our tourist sampling, we found that visitors average 2.6 visits per year, but this average is heavily dominated by extreme outliers since the median and mode are unity. To deal with this problem, we computed a new mean between unity (i.e., one trip to Florida) and the 95 percentile, thereby eliminating extreme outliers. The new mean was 1.9. This will be used in the rest of this report in conjunction with the interpretation that the Division is reporting the number of visits. Thus, to obtain the number of visitors, the Division's tourist figures were divided by 1.9. Consider Table 4.1. In 1991, it is estimated that nearly 3 million tourist saltwater anglers fished in Florida.[1] The reader should be cautioned that the participation rate and

[1]The reader should note that all tables involve rounding and thus diverge in some cases with exact computer computations. For example, the participation rate was rounded in Table 4.1 so the number of anglers may appear slightly in error since it was generated by the computer without rounding.

Table 4.1

Estimated Number of Tourist Saltwater Recreational Fishermen, Days Fished and Total Direct Expenditures in Florida, 1991

Tourist Population 18 Years and Over[1]		Tourist Participation Rate		Total Tourist Fishermen
17,996,112	X	.1649	=	2,967,559
Median Days Fished Per Year Days[2]		**Total Tourist**		**Total Angler Days**
4	X	2,967,559	=	11,870,236
Median Daily Expenditures in Florida		**Total Angler Days**		**Total Direct Expenditures**
$110	X	11,870,236	=	$1.306 Billion

[1]34,192,612 visits divided by 1.9 visits per person in a 12 month period. See text for a discussion.

[2]In Bell et al (1982), the average and median days fished per year was about 4 days. The reader is free to change this figure if he feels it will increase (or decrease) over time.

the estimated number of tourist visits are subject to sampling variability. In 1987, the USDOC/NOAA/NMFS (1991) reported 2.7 million nonresidents engaging in saltwater angling in Florida. It would appear that our 1991 estimate is certainly consistent with the earlier estimate reported independently by the NMFS.[2] To obtain the number of fishing days, we must know the number of days fished over the last 12 months by tourist anglers. Bell (1992) found that the angler averages 7.8 fishing days per year while a tourist in Florida, but the median was only 4 days.[3] The median number of fishing days was selected since it is a better measure of central tendency (i.e., not influenced by outliers) and is more conservative. A fishing day is considered to be any time spent fishing within a 24-hour calendar day. Some have suggested that the number of fishing days per trip may be increasing over time. Using the three different studies, this hypothesis is not confirmed. Bell et al (1982) found an average of 4 days fishing per trip compared to 4.9 in Bell (1992). In this study, the average number of fishing days per trip was but 2.8. There is simply no basis for projecting a changing days per trip. An estimated 11.9 million fishing days were spent by tourist saltwater anglers as shown in Table 4.1. In 1990, Bell (1992) reported an average daily expenditure of $113.50 with a

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[2]NMFS reports nonresidents 16 years and older so the numbers are not directly comparable, but reasonably close given that the lower number is for 1987.

[3]The survey instrument used in this study obtained days fished per trip, but not per year. Tourist anglers averaged 2.8 days fished per trip with a median of 2.0 days fished per trip.

median of $100. The same expenditure question asked in 1991 using the survey instrument in Appendix A revealed a mean of $110 which was very close to the earlier study, so $110 was used as the daily expenditure estimate.

Most of the tourists came to Florida for many reasons including saltwater fishing which, in most cases, was not the main purpose of the visit. See Chapter 6. Some would argue that only the marginal cost of saltwater recreational fishing should be attributable to a fishing day such as boat rentals or bait. Just because the recreational fishing activity does not dominate a typical trip to Florida, it does not mean that a few days are not allocated in advance for this activity, thereby increasing the days spent in Florida. In addition, if one fishing day out of a 20 day visit to Florida is experienced, why should not <u>all</u> cost for that day be attributed to the attraction of the fishery resource? The survey instrument (Appendix A, question 21) clearly asks for expenditure <u>while saltwater fishing</u> including lodging and food on a daily basis. To allocate such cost items to Disney World, for example, while fishing would be strange indeed. The recreational trip to Florida is a composite good and without additional surveys, the author chose equal treatment of the saltwater fishing activity. When $110 per day is multiplied by the estimated number of days, a total direct expenditure by tourists related to saltwater fishing was approximately $1.306 billion in 1991 as shown in Table 4.1.

It was assumed that the distribution of expenditures per day has not changed since the detailed study conducted by Bell et al (1982), especially with respect to large categories of expenditures.[4] Because the survey instrument in Appendix A covered so many topics, it was not possible to obtain additional details on expenditures without considerably lengthening the interview. This was not done because respondents get impatient with long interviews plus budget constraints limited the length of the size of the questionnaire. The estimated distribution of saltwater angler expenditures for 1991 are shown in Table 4.2 This distribution of expenditures is important since it is an intermediate step in deriving an estimate of employment and wages supported by these expenditures.

[4]To check on the distribution of expenditures, the 1985 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (Florida) was consulted. Nonresident spending categories in 1985 were in agreement with the Bell et al (1982) study. For example, food and lodging constituted 44 percent of total expenditures in USFWS (1985) and 45.4 percent in the earlier Bell et al (1992) study.

Table 4.2

Estimated Tourist Expenditures on Saltwater Recreational Fishing by Category in Florida, 1991

Category		Percent Distribution[1]	Amount
1.	Food and Drink	23.4%	305,508,960
2.	Lodging	22.0%	287,230,650
3.	Charter and Party Boats	13.7%	178,866,360
4.	Boat Fuel	10.0%	130,559,390
5.	Boat and Motor Maintenance	7.9%	103,141,920
6.	All Other Including Gasoline for Auto	23.0%	300,286,590
		100.0%	$1,305,593,900[2]

[1]Taken from Bell et al (1982)

[2]Taken from Table 4.1

The Censuses of Retail Trade (1987) and Services (1987) published by the U.S. Department of Commerce (Florida Report) report sales and employment by industry categories. Such data were used to derive sales to employment ratios and wages to sale ratios for the categories shown in Table 4.3. These ratios are about as close as one can come for each of the expenditure categories so estimated employment and wages can be estimated as follows:

$$E_i = EXP_i / (S/E)_i$$

$$W_i = EXP_i / (S/W)_i$$

Table 4.3

Sales to Employment Ratios and Sales to Wages Ratios for Selected Sectors Related to Spending by Saltwater Tourist Anglers in Florida

Sector	SIC[1]	Sales to Employment Ratio[2]	Sales to Wages Ratio[3]
1. Food and Drink	58	$29,805.40	3.8806
2. Lodging	70	43,521.50	3.7969
3. Charter and Party Boats	79	59,648.60	4.2192
4. Boat Fuel	554	176,471.20	16.2472
5. Boat and Motor Maintenance	555	230,628.90	10.3415
6. All Other Including Gasoline for Auto	53, 54 592, 5941	120,975.40	9.9755

[1]Standard Industrial Classification (SIC) selected for expenditure category.

[2]Sales updated by appropriate component of CPI from Census of Retail Trade (1987) and Services (1987) to 1991 values.

[3]Ratios from 1987 Censuses of Retail Trade and Services.

where

E_i = estimated employment in i'th expenditure sector;

EXP_i = expenditures (i.e., retail sales) in i'th sector;

$(S/E)_i$ = sales to employment ratio in i'th sector. See Table 4.3;

W_i = wages in i'th sector;

$(S/W)_i$ = sales to wages ratio in i'th sector. See Table 4.3.

Table 4.4 shows the estimated employment and wages supported by the 1991 expenditures in Florida made by tourist saltwater anglers. It is estimated that over 23,500 jobs are directly related to tourist spending attracted by saltwater fisheries or about .4 percent of Florida's employment in 1991. It must be remembered that the Florida resident component of recreational saltwater fishing is not included; therefore, the entire fishery resource undoubtedly supports additional jobs (i.e., employees). As might be expected with tourists, most of the jobs are found in the eating and drinking and lodging industries. In fact, 72 percent of the total estimated jobs are generated by these industries. In any event, there are a sizable number of employees that derive their livelihood from tourist use of the saltwater fishery resource.

The final economic impact to be considered here is the state taxes generated from tourist saltwater angler spending. Regions such as counties and cities do impose differential bed taxes; local option sales and gasoline taxes and differential property taxes. The small size of the sample in this study makes it

Table 4.4

Estimated Employment and Wages in Florida
Supported by Spending by Tourist
Saltwater Anglers, 1991

Category	Employment[1]	Wages[1]
1. Food and Drink	10,250	$78,727,253
2. Lodging	6,600	75,648,726
3. Charter and Party Boats	2,998	42,393,430
4. Boat Fuel	740	8,035,811
5. Boat and Motor Maintenance	448	99,736
6. All Other Including Gasoline for Auto	2,482	30,102,411
Total	23,518	$235,007,360

[1]Table 4.2 divided by Table 4.3; also, see text.

impossible to say anything statistically meaningful by county so local tax impacts will not be considered here. However, three state taxes will be considered here and these are uniform throughout the State of Florida. These taxes are as follows: (1) sales; (2) gasoline and (3) corporate profits. Such taxes were generated by applying appropriate ratios to estimated expenditures by tourist saltwater anglers. The explanation of how each tax was calculated is shown in the footnotes to Table 4.5. The reader may easily change any assumption used in the footnotes to derive a new estimated tax. In 1991, it is estimated that the following state revenues were generated as a result of tourist saltwater angler spending in Florida:

Sales Tax	$43,848,370
Gasoline Tax	12,331,721
Corporate Profit Tax	3,169,943
Total Tax	$61,976,353

It is estimated that almost $62 million are generated in state taxes from tourist spending related to the saltwater fishery resource. Some may want to use this figure to obtain more state spending on conservation and other fishery programs. However, the reader should be cautioned that such tourist spending could be diverted to other recreational pursuits in Florida such as hunting or freshwater fishing if the marine fishery resource vanished. There would, of course, be a lost recreational value that cannot be replaced. Such tax figures should be carefully used for policy making since they are gross of government

Table 4.5

Estimated State Tax Revenue from Tourist Saltwater Recreational Fishing in Florida, 1991

Expenditure Categories	Sales Tax	Gasoline Tax	Corporate Profit Tax[9]
1. Food and Drink	$18,941,558[1]	N/A	$ 437,183
2. Lodging	$16,372,146[2]	N/A	$ 600,958
3. Charter and Party Boats	N/A[3]	N/A	$ 490,988
4. Boat Fuel	N/A[4]	$ 8,188,395[7]	$ 673,295
5. Boat and Motor Maintenance	$ 1,237,702[5]	N/A	$ 177,765
6. All Others	$ 7,296,964[6]	$ 4,143,326[8]	$ 789,754
TOTAL	$43,848,370	$12,331,721	$3,169,943

[1]Assumes 10 percent for drink subject to 18 percent tax and that 73 percent of category is purchased in restaurants. Let S=sales, therefore .062S.

[2]All items subject to 6 percent tax or .0575 (i.3., S includes taxes so adjustment downward was made.

[3]No tax on this service

[4]See gas tax column

[5]Assumes 20 percent parts; 80 percent labor or .012S

[6]Assumes 22 percent of this category gasoline and rest not gas, but only 52 percent goods subject to tax or .0243S

[7]Divide boat fuel sales by $1.148 per gallon and multiply by $.072/gal or (S/1.148)/.072)

[8]Assume 22 percent gasoline and use footnote 7

[9]5.5 percent of profit less $5000 exemption; profit to sales ratio by category: 1:.0318; 2:.0465; 3:.0610; 4:.1146; 5:.0383; 6:.0584 times .045 to adjust for exemption.

services (e.g., state roads) needed to support tourists while in Florida. Now, let us turn to the future of tourist saltwater angling in Florida, which is the subject of the next chapter.

CHAPTER 5

PROJECTED RECREATION FISHING EFFORT AND ECONOMIC ACTIVITY TO THE YEAR 2010 OF TOURIST SALTWATER ANGLERS IN FLORIDA

While the last chapter looked at the present, it is the purpose of this chapter to look into the future. This chapter will forecast future fishing activity by tourist anglers and corresponding economic benefits associated with fishing activity. Such a forecast will only be of use if valid assumptions about the fishing resource are employed. Being a finite, but renewable resource, projected increases in fishing effort might result in declining catch rates per angler. This was always thought to be a deterrent to anglers; however, Bell (1989, 1992) has cast some doubt on a continuous relation between recreational fishery demand and catch rates. Indeed, even those employing continuous models have had mixed and possibly disappointing results. For example, Green (1984) focused particularly on a sample of tourists visiting Florida over the 1980-81 period. Thus, Green's study is relevant to the thrust of this report. For tourists, Green found that saltwater days fished per trip would increase by 1 percent if the success rate (i.e., catch per day) increased by 10 percent. If anything, tourist saltwater fishing behavior was inelastically related to the success rate and therefore resource scarcity. Green states, "This study gives evidence that short-run economic repercussions on the tourist industry from any reasonable change in commercial/sport fishing effort may not be large" (p. 133).

In a study of Florida residents, Glasure (1987) states that the statistical results are not strong enough to assert with confidence that a resident fisherman's decision to fish longer at a site is influenced by the aggregate success rate (i.e., catch per day). Thus, Green (1984) and Glasure (1987) find little support for the hypothesized negative effect on tourism or even resident angling in Florida of physical measures of resource scarcity (i.e., stock abundance).

Then again, at the individual species level, Green (1989) found that the red drum catch is an important variable in the decision to fish for the species in the Gulf of Mexico. The success rate elasticity is slightly above one, implying that a ten percent increase in expected catch by target anglers would be expected to raise red drum effort (i.e., demand) more than ten percent. Similarly, Leeworthy (1990) states "The most important finding in this study is that the number of recreational king mackerel trips in the Gulf of Mexico region responds to king mackerel catch rates in a highly elastic manner" (p. 63). The success elasticity for king mackerel was estimated at 1.96 by Leeworthy. The variety of species in Florida may allow for a high degree of substitution which would reinforce the aggregate impacts found by Green (1984) and Glasure (1987).

Because of the relatively small sample of tourist saltwater anglers in this study, a species level of analysis will not be possible. The catch per day will consist of all species. In making the projections, three assumptions will be employed:

1. Catch per day will remain constant throughout the projection period;
2. The number of fish will remain constant throughout the projection period, but the catch per day will fall;
3. The number of fish will decline by 1 percent per year because of overfishing throughout the projection period resulting in a more rapid fall than in 2 (above) in catch per day.[1]
4. There are no crowding externalities.

Any demand projections for recreational fish should consider the interaction of such projections with supply of the fishery resource. This will be considered in some detail below.

Projecting Demand by Tourist Saltwater Anglers

Demand for recreation is usually defined in terms of angler days in the case of fisheries. In chapter 4, the number of angler days was derived in the following manner:

$$PrP_t \times T_t \times (D/T)_t = (TSAD)_t \quad (1)$$

where

PrP_t = participation rate in year t;

T_t = number of tourists 18 years and older in year t;

$(D/T)_t$ = number of angler days per tourist/year in year t;

$(TSAD)_t$ = tourist saltwater angler days in year t.

[1]A one percent decline in the number of fish was arbitrarily chosen for modeling purposes. The reader may use his or her own rate of decline and determine its impact.

To project $(TSAD)_t$, we must first project the three variables in equation (1) or PrP_t; T_t and $(D/T)_t$. To simplify the projections, $(D/T)_t$ will be fixed at 4 days per year. As discussed in Chapter 4, there is some evidence that (D/T) has increased over the last decade. The participation function developed in chapter 4 can be used to project PrP_t, but T_t must be projected independently. T_t will be considered first.

The Florida tourist series or T_t is separated into air and auto arrivals. The historical series is over the 1976-1990 period. The average annual growth rate for auto arrivals was 8.3 percent per year. For both auto and air arrivals, these growth rates are very high and have sustained a rapid growth rate in the Florida economy.

Of particular interest, the projected annual growth rates in tourism over the 1991-2010 period are about one third for air (4.3 percent per year) and about the same for auto (4.7 percent per year) than those rates of growth observed over the 1976-1990 historical period. These projections were prepared by the Florida Joint Legislative Management Committee. The projection equations are as follows:

$$\text{Air Arrivals} = f(\overset{+}{PYPC};\ \overset{-}{EXR};\ \overset{-}{TCAIR};\ \overset{-}{TCCAR};\ \overset{+}{U.S.\ POP}) \qquad (2)$$

$$\text{Auto Arrivals} = f(\overset{+}{PYPC};\ \overset{-}{TCCAR};\ \overset{+}{TCAIR}) \qquad (3)$$

where

PYPC = U.S. real personal income per capita;

EXR = Exchange rate (i.e., value of the U.S. dollar relative to other currencies);

TCAIR = Travel cost by air;

TCCAR = Travel cost by car;

U.S.POP = U.S. population.

The hypothesized signs of the variables are given above the variable designation. Some signs are fairly obvious, but selected ones need some explanation. For example, as the value of the U.S. dollar (EXR) appreciates relative to other major currencies, air travelers would tend to visit overseas rather than Florida. A rise in personal income per capita in the U.S. (PYPC), as expected, is a positive influence on both domestic and foreign air and auto arrivals to Florida. In the air arrival equation, the travel cost by air and auto are hypothesized to both have an inverse relation to the number of tourists arriving by air. The former cost (TCAIR) is viewed as travel cost from home to a site in Florida (e.g., Disney World) where TCCAR is viewed as a form of on-site cost. Since gasoline is the major cost of travel by auto, it is viewed as travel cost rather than on-site cost although much of the driving may take place in a very large state such as Florida. Finally, it is hypothesized that air travel is a close substitute for auto travel; therefore, the sign on TCAIR is positive in the auto arrival function. That is, if air fares decline, tourists switch from time consuming auto visits to air visits. But, the relationship is not symmetrical since air travelers do not perceive a visit to Florida by auto to be a close substitute, especially in light of

the distances encountered (e.g., nearly 5 percent of all tourists come from Michigan). Finally, certain dummy variables such as the Eastern Airline strike or Gulf War were omitted from the theoretical discussion even though the statistical equations were adjusted for these irregular events.

Of particular significance, the projected growth in Florida tourism shown in Table 5.1 will be slower than the historical period because of the projection in the independent variables, especially real personal income per capita, which is projected to grow at a slower rate than during the historical period. The same is true for U.S. population over the projection period. Notice that there are no supply constraints or resource scarcity effects built into the forecasting equations. Thus, state forecasters are assuming an infinite supply (i.e., qualitatively and quantitatively) of natural resources (e.g., fish, beaches, etc.) to accommodate growth over the projection period. For a more detailed discussion of the statistical equations used to project T_t in Table 5.1 (i.e., total tourist arrivals), see Bell (1992). What is important is that the projection of T_t be obtained. This leaves only PrP_t in equation (2) so that tourist saltwater angler days may be projected.

In Chapter 4, the participation function for tourist saltwater anglers in Florida was discussed. Table 5.2 shows the logit participation function taken from Table 3.1 in Chapter

Table 5.1

Florida Tourist Arrivals: History and Forecast to 2010

	Air Arrivals			Auto Arrivals			Total Arrivals	
	(000s)	% Chg	% Total	(000s)	% Chg	% Total	(000s)	% Chg
1976	6,990	NA	42.3%	9,528	NA	57.7%	16.517	NA
1977	7,484	7.1%	44.4%	9,373	-1.6%	55.6%	16,856	2.1%
1978	9,068	21.2%	47.2%	10,143	8.2%	52.8%	19,210	14.0%
1979	10,563	16.5%	50.6%	10,326	1.8%	49.4%	20,889	8.7%
1980	9,312	-11.8%	46.6%	10,671	3.3%	53.4%	19,982	-4.3%
1981	10,407	11.8%	49.1%	10,794	1.2%	50.9%	21,201	6.1%
1982	11,049	6.2%	48.0%	11,979	11.0%	52.0%	23,028	8.6%
1983	10,329	-6.5%	43.5%	13,442	12.2%	56.5%	23,772	3.2%
1984	12,714	23.1%	46.6%	14,596	8.6%	53.4%	27,310	14.9%
1985	13,064	2.8%	45.4%	15,739	7.8%	54.6%	28,803	5.5%
1986	14,770	13.1%	46.7%	16,842	7.0%	53.3%	31,612	9.8%
1987	16,597	12.4%	48.5%	17,646	4.8%	51.5%	34,243	8.3%
1988	18,080	8.9%	49.2%	18,705	6.0%	50.8%	36,785	7.4%
1989	18,161	0.4%	46.8%	20,674	10.5%	53.2%	38,835	5.6%
1990	20,867	14.9%	50.4%	20,556	-0.6%	49.6%	41,423*	6.7%
Begins forecast period:								
1991	19,738	-5.4%	48.9%	20,643	0.4%	51.1%	40,381	-2.5%
1992	20,646	4.6%	49.0%	21,494	4.1%	51.0%	42,140	4.4%
1993	21,651	4.9%	49.0%	22,564	5.0%	51.0%	44,214	4.9%
1994	22,672	4.7%	48.9%	23,671	4.9%	51.1%	46,342	4.8%
1995	23,570	4.0%	48.9%	24,659	4.2%	51.1%	48,228	4.1%
1996	24,395	3.5%	48.8%	25,574	3.7%	51.2%	49,970	3.6%
1997	25,245	3.5%	48.8%	26,498	3.6%	51.2%	51,743	3.5%
1998	26,101	3.4%	48.8%	27,426	3.5%	51.2%	53,527	3.4%
1999	26,963	3.3%	48.7%	28,368	3.4%	51.3%	55,331	3.4%
2000	27,833	3.2%	48.7%	29,304	3.3%	51.3%	57,137	3.3%
2001	28,682	3.1%	48.7%	30,265	3.3%	51.3%	58,947	3.2%
2002	29,460	2.7%	48.5%	31,252	3.3%	51.5%	60,712	3.0%
2003	30,219	2.6%	48.4%	32,263	3.2%	51.6%	62,482	2.9%
2004	30,968	2.5%	48.2%	33,296	3.2%	51.8%	64,264	2.9%
2005	31,714	2.4%	48.0%	34,352	3.2%	52.0%	66,066	2.8%
2010	N/A	N/A	N/A	N/A	N/A	N/A	76,390**	3.1%

*84.675 percent 18 years and over.
**projected using average projection over 2000-2005.
Source: Florida Economic Consensus Estimating Conference (September 1991).

Table 5.2

Projections of Tourist Saltwater Fishing Participation Rate

PrP = -4.3205 + .058914(AGE) - .00049005(AGE2) + .54496(SEX) - .33944(RACE) - .51634(VISIT) - .034547(INC) + 1.9676(EXPER) + .084980(TRIPS)

	Participation Estimates & Visitation Projections[1]	Year	Rate	AGE	AGE2	SEX	RACE	VISIT	INC	EXP	TRIPS
BASE	5,637,792	1991	16.49%	48.85	2592.40	0.734	0.930	0.397	7.210	0.628	2.638
AGE	7,063,258	1995	17.30%	49.82	2592.40	0.734	0.930	0.397	7.210	0.628	2.638
	8,698,063	2000	17.98%	50.62	2592.40	0.734	0.930	0.397	7.210	0.628	2.638
	10,406,370	2005	18.60%	51.33	2592.40	0.734	0.930	0.397	7.210	0.628	2.638
	12,483,156	2010	19.30%	52.10	2592.40	0.734	0.930	0.397	7.210	0.628	2.638
AGE2	6,591,691	1995	16.14%	48.85	2644.25	0.734	0.930	0.397	7.210	0.628	2.638
	7,674,527	2000	15.86%	48.85	2686.56	0.734	0.930	0.397	7.210	0.628	2.638
	8,737,102	2005	15.62%	48.85	2724.17	0.734	0.930	0.397	7.210	0.628	2.638
	9,932,902	2010	15.36%	48.85	2765.03	0.734	0.930	0.397	7.210	0.628	2.638
AGE + AGE2	6,916,065	1995	16.94%	49.82	2644.25	0.734	0.930	0.397	7.210	0.628	2.638
	8,373,728	2000	17.31%	50.62	2686.56	0.734	0.930	0.397	7.210	0.628	2.638
	9,870,455	2005	17.64%	51.33	2724.17	0.734	0.930	0.397	7.210	0.628	2.638
	11,652,974	2010	18.02%	52.10	2765.03	0.734	0.930	0.397	7.210	0.628	2.638
RACE	6,749,344	1995	16.53%	48.85	2592.40	0.734	0.922	0.397	7.210	0.628	2.638
	8,014,942	2000	16.57%	48.85	2592.40	0.734	0.913	0.397	7.210	0.628	2.638
	9,289,063	2005	16.60%	48.85	2592.40	0.734	0.905	0.397	7.210	0.628	2.638
	10,765,440	2010	16.64%	48.85	2592.40	0.734	0.897	0.397	7.210	0.628	2.638
AIRAUTO	6,767,959	1995	16.57%	48.85	2592.40	0.734	0.930	0.385	7.210	0.628	2.638
	8,022,168	2000	16.58%	48.85	2592.40	0.734	0.930	0.385	7.210	0.628	2.638
	9,298,824	2005	16.62%	48.85	2592.40	0.734	0.930	0.385	7.210	0.628	2.638
	10,778,183	2010	16.66%	48.85	2592.40	0.734	0.930	0.385	7.210	0.628	2.638

(Table 5.2, Continued)

PrP = -4.3205 + .058914(AGE) - .00049005(AGE2) + .54496(SEX) - .33944(RACE) - .51634(VISIT) - .034547(INC) + 1.9676(EXPER) + .084980(TRIPS)

	Participation Estimates & Visitation Projections[1]	Year	Rate	AGE	AGE2	SEX	RACE	VISIT	INC	EXP	TRIPS
HHINCOME	6,637,261	1995	16.25%	48.85	2592.40	0.734	0.930	0.397	7.708	0.628	2.638
	7,767,374	2000	16.05%	48.85	2592.40	0.734	0.930	0.397	8.132	0.628	2.638
	8,865,333	2005	15.85%	48.85	2592.40	0.734	0.930	0.397	8.579	0.628	2.638
	10,110,871	2010	15.63%	48.85	2592.40	0.734	0.930	0.397	9.051	0.628	2.638
All Variables	6,869,066	1995	16.82%	49.82	2644.25	0.734	0.922	0.385	7.708	0.628	2.638
	8,239,994	2000	17.03%	50.62	2686.56	0.734	0.913	0.383	8.132	0.628	2.638
	9,635,914	2005	17.23%	51.33	2724.17	0.734	0.905	0.378	8.579	0.628	2.638
	11,278,162	2010	17.44%	52.10	2765.03	0.734	0.897	0.372	9.051	0.628	2.638

[1] This table shows the projected number of visits or visitations undeflated by the 1.9 visits per year as discussed in Chapter 4. To obtain the number of individual tourists, divide the first column by 1.9.

4.[2]. The following variables in the participation functions were forecasted using these sources:

YEAR	AGE	RACE	VISIT	INC*	
1991 (Base)	48.85	.930	.397	$32,100	(7.210)
1995	49.82	.922	.385	37,080	(7.708)
2000	50.62	.913	.383	41,320	(8.132)
2005	51.33	.905	.378	45,790	(8.579)
2010	52.10	.897	.372	50,510	(9.051)
Source	U.S. Stat. abstract (1991)	U.S. Stat. abstract (1991)	Table 5.1	DRI (1991)	

*Income interval on questionnaire given in parentheses. See appendix A.

All other variables were held constant at the sample mean value over the projection period in the participation function. It is not anticipated that more women will become avid fisherpersons so SEX was held constant. One might anticipate that EXPER (i.e., taken fishing as a child) may actually decline, but it was felt that a separate study would be needed to see if EXPER was inversely related to the degree of urbanization as discussed as a working hypothesis in Chapter 4. Finally, TRIPS was held

[2]The logit equation was used for forecasting since the participation rate can only be between zero and unity which is not true of the OLS version. Also, the intercept term on the logit equation is different in Table 5.2 than Table 3.1. This adjustment was made so the equation would perfectly predict the sample PrP of 16.49% of the base year.

constant since there was only slight evidence that tourists are making more trips to Florida.

Table 5.2 is set up to show the partial influence of each projected variable on the participation rate and the net effect of all four variables on that rate at 5 year intervals over the 1991-2010 period. AGE; RACE and VISIT will each contribute to increasing the participation rate. That is, an aging U.S. population with proportionately more nonwhite and a tendency to use the auto relative to air arrival in Florida will increase the participation rate. For example, the average age of tourists visiting Florida is expected to increase from 48.85 in 1991 to 52.10 in 2010. AGE is parabolically related to participation and since the participation rate reaches its maximum at around 60 years of age, the rate of participation by tourist saltwater anglers increases from 16.49 to 18.02 percent over the 1991-2010 projection period as shown in Table 5.2 As discussed in Chapter 4, saltwater recreational fishing appears to be an inferior good since the participation rate is inversely related to household income or INC. Also, see Green (1984) who reached the same conclusion regarding income. The projected increase in real INC will decrease the participation rate from 16.49 to 15.63 percent over the 1991-2010 period holding all other factors constant. Of some note, the participation rate was not statistically different for foreign as opposed to U.S. citizens visiting Florida. The net change in the participation rate can be broken down as follows (1991-2010):

	Net Change in PrP:	+ .99%
1.	Aging of the Population:	+1.53%
2.	Increasing Percent Nonwhite:	+ .15%
3.	Increasing Percent Arriving by Auto to Florida:	+ .17%
4.	Increasing Real Household Income:	- .86%

Thus, the dominant factor in increasing the participation rate by nearly 1 percent point is the aging of the U.S. population.

The combined effect of increasing tourism (Table 5.1) and a rising participation rate (Table 5.2) will increase the number of tourist saltwater anglers from 3.0 to almost nearly 6 million over the 1991-2010 period. Note that visits have been converted to visitors by dividing by 1.6.

Table 5.3 shows a steady increase in recreational demand expressed as saltwater fishing days. Assuming catch per day remains constant, saltwater angler days are projected to expand from 11.9 million to 23.75 million over the 1991-2010 period. Some may maintain that such increases in demand cannot be sustained since there may be a feedback relation between deteriorating supply and projected demand. This is a critical issue that will be addressed the end of this chapter.

Table 5.3

Estimated and Projected Number of Participants, Recreational Days and Gross Expenditures by Tourists on Saltwater Recreational Fishing in Florida, 1991-2010

Year	Total Tourist Population Over 18	X	Participation Rate	=	Total Tourist Fishermen
1991	17,996,112	X	.1649	=	2,967,559
1995	21,493,189	X	.1682	=	3,615,154
2000	25,463,555	X	.1703	=	4,336,443
2005	29,442,835	X	.1723	=	5,073,001
2010	34,043,807	X	.1744	=	5,937,240

	Median Days Fished Per Year	X	Tourist Fisherman	=	Total Angler Days
1991	4.0	X	2,967,559	=	11,870,236
1995	4.0	X	3,615,154	=	14,460,616
2000	4.0	X	4,336,443	=	17,345,772
2005	4.0	X	5,073,001	=	20,292,004
2010	4.0	X	5,937,240	=	23,748,960

	Daily Expenditures in Florida	X	Total Angler Days	=	Total Expenditures
1991	$110.00	X	11,870,236	=	$1,305,726,000
1995	$110.00	X	14,460,616	=	$1,590,667,800
2000	$110.00	X	17,345,772	=	$1,908,034,900
2005	$110.00	X	20,292,004	=	$2,232,120,400
2010	$110.00	X	23,748,960	=	$2,612,385,600

Projecting Economic Activity Associated with Tourist Saltwater Recreational Fishing

Table 5.3 not only contains projected tourists saltwater angler days (i.e., recreational demand), but projected expenditures in 1991 dollars. Bell et al (1982) showed a dailyexpenditure of about $80 for tourist anglers in 1980 expressed in 1991 prices. In the 1991 sample, household income was not correlated with daily expenditures (i.e., not statistically significant relation). To be conservative, the real level of daily expenditures was held constant over the period of projection at $110 as is shown in Table 5.3. Combined with the projected number of days, it is estimated that expenditures by tourists on saltwater recreational fisheries will rise from $1.306 billion to $2.613 billion over the 1991-2010 period expressed in 1991 dollars, a 100 percent increase.

Assuming that these projected aggregate expenditures are distributed in the same manner as in 1991, each category of expenditures may also be projected over the 1991-2010 period as demonstrated in Table 5.4. There is no reason to believe that this distribution will change radically over the projection period. Table 5.4 is also a transition table in projecting employment and wages.

Table 5.5 shows the projected employment associated with each expenditure category in Table 5.4. As discussed in Chapter 4, employment was derived by use of a sales to employment ratio for 1991. One may hypothesize that real sales (i.e., sales expressed in 1991 dollars) per employee may be expected to rise

Table 5.4

Projection of the Distribution of Tourist Saltwater Fishing Recreational Expenditures (Sales)

Sales Category		Year 1991	1995	2000	2005	2010
1. Food and Drink	23.4%	$305,508,970	$372,231,060	$446,520,950	$522,165,090	$611,157,680
2. Lodging	22.0%	$287,230,650	$349,960,830	$419,806,030	$49,092,444	$574,592,680
3. Charter and Party Boats	13.7%	$178,866,360	$217,930,150	$261,424,660	$305,712,040	$357,814,540
4. Boat Fuel	10.0%	$130,559,390	$159,073,110	$190,820,920	$223,147,470	$261,178,490
5. Boat and Motor Maintenance	7.9%	$103,141,920	$125,667,750	$150,748,530	$176,286,510	$206,331,010
6. All Other	23.0%	$300,286,590	$365,868,140	$438,888,120	$513,239,190	$600,710,530
TOTALS	100.0%	$1,305,593,900	$1,590,731,100	$1,908,209,200	$2,231,474,700	$2,611,784,900

Table 5.5

Employment Projections Related to Tourist Saltwater Angling Expenditures

Category	Year 1991	1995	2000	2005	2010
1. Food and Drink	10,250	12,489	14,981	17,519	20,505
2. Lodging	6,600	8,041	9,646	11,280	13,203
3. Charter and Party Boats	2,998	3,654	4,383	9,738	11,398
4. Boat Fuel	740	902	1,081	1,265	1,480
5. Boat and Motor Maintenance	447	545	654	764	895
6. All Other	2,482	3,024	3,628	4,243	4,966
TOTALS	23,518	28,654	34,373	40,196	47,046

due to technological change, thereby damping the growth in employment. The historical record may be of some help in this respect. The 1987 and 1977 Censuses of Retail Trade and Services indicated upon analyses that there was little change in the real sales to employment ratio over this 10 year period for the sectors (i.e., SIC's) in Table 5.5. This is consistent with the observation that technology which displaces labor is very slow or non-existent in the service and retail sectors (i.e., motels have not become automated over the years). Yet, technological changes could be a factor in the future, but they are not possible to predict. Therefore, the employment projections could be upward biased. The reader should keep this point in mind when analyzing or citing Table 5.5. Employment is projected to rise from 23.5 thousand jobs to just over 47 thousand over the 1991-2010 period.

Table 5.6 is based upon Table 5.4 and the sales to wages ratios. Such ratios did not change much over the 1977-1987 period. The same ratios used in Chapter 4 to estimate wages was used over the projection period. There is a theoretical basis for the constancy of such ratios which is explained in the footnote below.[3] Total wages are projected to increase from $.235 billion to $.467 billion over 1991-2010 projection period as is shown in Table 5.6.

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[3]The reciprocal of the sales to wages ratio might be regarded as a production output elasticity. If the production function is of the Cobb-Douglas variety, such elasticities (i.e., for labor) will be constant. Thus, there is some theoretical justification for the constancy assumption; however, a statistical test is well beyond the scope of this paper

Table 5.6

Wages Projection Related to Tourist Saltwater Angling Expenditures

Year						
	Category	1991	1995	2000	2005	2010
1.	Food and Drink	$ 78,727,250	$ 95,921,007	$115,064,926	$134,557,823	$154,332,616
2.	Lodging	$ 75,648,726	$ 92,170,146	$110,565,468	$129,296,121	$151,332,058
3.	Charter and Party Boats	$42,393,430	$51,652,008	$ 61,960,718	$ 72,457,347	$ 84,806,252
4.	Boat Fuel	$ 8,035,808	$ 9,790,801	$11,744,849	$13,734,518	$16,075,293
5.	Boat and Motor Maintenance	$ 99,736	$121,518	$145,771	$170,465	$199,517
6.	All Other	$30,102,410	$36,676,672	$43,996,604	$51,449,971	$ 60,218,589
	TOTALS	$235,007,362	$286,332,154	$343,478,336	$401,666,245	$466,964,327

Tables 5.7 through 5.10 show the projected state taxes based upon the forecasted increase in spending. The projection assumes that 1991 tax structure explained in Table 4.5 will remain in effect. To say the least, this is a questionable assumption. But, such an assumption is infinitely better than predicting the behavior of the legislative and executive branches of government. Total state taxes (i.e., sales, gasoline and corporate income) are expected to increase as follows:

1991 $59.37 million

1995 $72.31 million

2000 $86.74 million

2005 $101.42 million

2010 $118.74 million

Over the 1991-2010 period, state taxes from tourist saltwater angler expenditures is expected to rise by 100 percent.

Finally, Table 5.11 shows the percentage distribution of angler days by mode from the sample of fishermen collected in this study. Shore based facilities may or may not be sufficient for the expansion of pier/dock/bridge recreational fishing, for example. Over 50 percent of the tourist demand will be concentrated on some type of shore fishing assuming, of course, that the 1991 distribution of fishing effort by mode holds for the projection period. Nearly 25 percent of tourist demand or angler days is for private boats that require boat ramps and/or marinas. Potentially, Table 5.11 has a number of policy

Table 5.7

Projected State Tax Collected in 1995
from Tourist Saltwater Recreational Fishing in Florida

Expenditure Categories	Sales	Gasoline	Corporate
1. Food and Drink	$23,078,326	N/A	$532,663
2. Lodging	$19,947,767	N/A	$732,206
3. Charter and Party Boats	N/A	N/A	$598,218
4. Boat Fuel	N/A	$9,976,711	$820,340
5. Boat and Motor Maintenance	$1,508,013	N/A	$216,588
6. All Others	$8,890,596	$5,048,215	$962,233
TOTAL	$53,424,702	$15,024,925	$3,862,248

Table 5.8

Projected State Tax Collected in 2000
from Tourist Saltwater Recreational Fishing in Florida

Expenditure Categories	Sales	Gasoline	Corporate
1. Food and Drink	$27,684,299	N/A	$638,972
2. Lodging	$23,928,944	M/A	$878,339
3. Charter and Party Boats	N/A	N/A	$717,605
4. Boat Fuel	N/A	N/A	$984,069
5. Boat and Motor Maintenance	$1,808,982	$11,967,863	$259,815
6. All Others	$10,664,981	$ 6,055,738	$1,154,276
TOTAL	$ 64,087,206	$18,023,601	$4,633,076

Table 5.9

Projected State Tax Collected in 2005
from Tourist Saltwater Recreational Fishing in Florida

Expenditure Categories	Sales	Gasoline	Corporate
1. Food and Drink	$32,374,235	N/A	$747,218
2. Lodging	$27,982,693	N/A	$1,027,137
3. Charter and Party Boats	N/A	N/A	$839,179
4. Boat Fuel	N/A	$13,995,312	$1,150,772
5. Boat and Motor Maintenance	$2,115,438	N/A	$303,830
6. All Others	$12,471,712	$7,081,628	$1,349,819
TOTAL	$74,944,078	$21,076,940	$5,417,955

Table 5.10

Projected State Tax Collected in 2010
from Tourist Saltwater Recreational Fishing in Florida

Expenditure Categories	Sales	Gasoline	Corporate
1. Food and Drink	$35,891,776	N/A	$874,567
2. Lodging	$32,751,784	M/A	$1,202,192
3. Charter and Party Boats	N/A	N/A	$982,200
4. Boat Fuel	N/A	$16,380,533	$1,346,897
5. Boat and Motor Maintenance	$2,475,972	N/A	$355,612
6. All Others	$14,597,266	$8,288,550	$1,579,869
TOTAL	$87,716,798	$24,669,083	$6,341,337

Table 5.11

Projected Distribution of Total Tourist Angler Days by Mode

Mode Category		Year 1991	1995	2000	2005	2010
1. Party Boat	8.1%	961,392	1,171,356	1,405,136	1,643,187	1,923,224
2. Charter Boat	11.6%	1,376,808	1,677,498	2,012,293	2,353,192	2,754,246
3. Private Boat	24.9%	2,955,390	3,600,837	4,319,492	5,051,247	5,912,131
4. Pier/Dock/ Bridge	36.5%	4,332,198	5,278,335	6,331,785	7,404,439	8,666,377
5. Beach/Bank	18.9%	2,243,247	2,733,165	3,278,650	3,834,079	4,487,522
TOTALS	100.0%	11,869,035	14,461,191	17,347,356	20,286,134	23,743,500

implications especially in the area of needed facilities and/or structures.

Revenue from the Sale of Saltwater Fishing Licenses

In general, tourists must purchase saltwater fishing licenses to fish in Florida. However, there are a few exceptions. For example, a party or charter boat operator might purchase a saltwater fishing license running from $350 to $950 per year depending on the number of customers. Tourists fishing from such boats need not buy a license. Many charter boats may avoid this cost by requiring their tourist customers to have saltwater licenses. For purposes of illustration, it will be assumed that any tourist using only a charter and/or party boat was exempt from buying a saltwater fishing license. In this study, fishing piers are lumped with docks and bridges. It shall be assumed that the upward bias for party and charter boats (i.e., all these vessels buy a vessel saltwater license) is offset by not including tourist fishing off licensed piers (i.e., downward bias). As tourists were leaving Florida, they were asked whether they purchased a saltwater fishing license. The purpose of the question was to determine approximately what percent of tourists avoided the purchase of a license when they should have purchased one. Avoidance includes a lack of knowledge to full knowledge that a law is being violated. The results of the analysis were as follows:

Total Tourist Saltwater Fishermen:	250	(100.0%)
1. Purchased a saltwater fishing license	90	(36.0%)
2. Fished only on a charter and/or party boat and no license	67	(26.8%)
3. Did not purchase a fishing license and were not in category 2 above -- Possible number avoiding saltwater fishing license	93	(37.2%)

Given the very few exemptions from purchasing a saltwater fishing license for tourists, the 36 percent who actually purchased such a license seems unusually low. Eliminating all tourists using only party and/or charter boats, we still have a little over 37 percent of tourists that engaged in license purchase avoidance.

In the 1990-91 fiscal year, the Florida Department of Natural Resources reported the following nonresident saltwater anglers purchasing various kinds of saltwater licenses:

Kind of License	Number of Anglers	Cost Per License	Revenue Collected
1 year	88,990	$30	$2,669,700
7 day	101,505	$15	1,522,575
3 day	76,185	$5	380,925
TOTAL	266,680		$4,573,200

Such data are of additional interest compared with the information gathered in this study. Let us first consider the license avoidance factor discussed above. Assume that the kinds of licenses will continue to be purchased in about the same pattern shown by the actual reported data above. These data

represent partial compliance since the sample in this study plus common sense tells us that those tourists who should purchase a saltwater fishing license do not always comply with the law for a variety of reasons (See chapter 7). If 37.2 percent of tourists do not comply, then under total compliance revenue would increase by about 103 percent (i.e., 73.2% ÷ 36%) to $9,299,570. Total compliance is seldom seen in human behavior, but it could be estimated that the State of Florida has potentially lost $4,726,070 in saltwater fishing license revenues during the 1990-91 fiscal year.

Of perhaps greater concern, there is a large discrepancy between the number of tourist saltwater anglers estimated in this study and the number actually purchasing saltwater fishing licenses. In 1991, it was estimated that 2,967,559 tourist saltwater anglers visited the State of Florida. Those potentially buying saltwater fishing licenses can be broken down as follows:

Total saltwater angler tourists	2,967,559
Less 26.8% exempt (i.e., party and charter)	795,306
Equals anglers legally obligated to purchase a license (Total Compliance)	2,172,253
Less 37.2% of anglers in license avoidance category	1,103,932
Equals anglers purchasing a license (Partial Compliance)	1,068,320

Thus, a fairly astounding conclusion is reached. Estimated tourist saltwater fishing license sales in this study are 4 times larger than actual license sales even after making the above

adjustments (i.e., 1,068,320 ÷ 266,680). It would appear that vast numbers of tourists are simply not purchasing licenses. In 1987, the NMFS (1991) reported about 2.7 million nonresidents fishing in Florida. This figure is in general agreement with the estimated number of anglers in this report which reinforces the conclusion regarding large noncompliance. Table 5.12 shows the saltwater fishing license revenue under the partial and total compliance scenarios using the actual reported data and then the data generated completely from this study. Simple projections are also made based upon the projected number of anglers in Table 5.12.

Can the Projections Be Sustained?

Some may ask whether the projections of recreational demand for tourist saltwater anglers are sustainable especially in the light of many overfished species. This is where the three assumptions discussed at the beginning of this chapter may play a critical role. It is important that the tourist recreational fishermen be divided into two groups (i.e., targeting and non-targeting) for sustainability analyses.

With regard to saltwater recreational fisheries, it is important that we know some other aspects of angling such as the percent of tourists that target their species. Targeting may be an aspect of avidity toward recreational fishing. A working hypothesis is that targeting a species makes the angler more sensitive to physical measures of resource scarcity such as catch per unit of fishing effort. From the sample of tourist saltwater anglers, only 36.8 percent had a principal target species. There

Table 5.12

Projected Saltwater Fishing License Revenue in Florida, 1991-2010

Actual Reported Revenue

	Year				
	1991	1995	2000	2005	2010
Partial Compliance	$4,573,200	$5,571,971	$6,684,025	$7,816,351	$9,148,492
1 year (58.4%)	$2,670,749	$3,254,031	$3,903,471	$4,564,749	$5,342,719
7 day (33.3%)	$1,522,876	$1,855,466	$2,225,780	$2,602,845	$3,046,448
3 day (8.3%)	$379,576	$462,474	$554,774	$648,757	$759,325
Total Compliance	$9,299,570	$11,330,564	$13,591,918	$15,894,495	$18,603,394
1 year (58.4%)	$5,430,949	$6,617,049	$7,937,680	$9,282,385	$10,864,382
7 day (33.3%)	$3,096,757	$3,773,078	$4,526,109	$5,292,867	$6,194,930
3 day (8.3%)	$771,864	$940,437	$1,128,129	$1,319,243	$1,544,082

Computed Revenue

	1991	1995	2000	2005	2010
Partial Compliance	$18,319,856	$22,320,849	$26,775,645	$31,311,647	$36,648,092
1 year (58.4%)	$10,698,796	$13,035,376	$15,636,977	$31,311,647	$36,648,092
7 day (33.3%)	$ 6,100,512	$ 7,432,843	$ 8,916,289	$10,426,778	$12,203,815
3 day (8.3%)	$1,520,548	$1,852,630	$2,222,379	$2,598,867	$3,041,792
Total Compliance	$37,250,377	$45,385,730	$ 54,443,816	$ 63,667,023	$ 74,517,794
1 year (58.4%)	$21,754,220	$26,505,266	$31,795,189	$37,181,542	$43,518,392
7 day (33.3%)	$12,404,376	$15,113,448	$18,129,790	$21,201,118	$24,814,425
3 day (8.3%)	$3,091,781	$3,767,016	$4,518,837	$5,284,3630	$ 6,184,977

is a counter hypothesis known as recreation specialization. This hypothesis holds that the more specialized the angler is regarding preference for a particular species, techniques and settings, the more importance is placed on the entire fishing experience and less on the catch itself. (See SFI, 1991). McConnell (1990, unpublished) states "Florida is similar to Georgia in the large proportion of saltwater anglers who do not target a species. For the decade, Florida had the largest percentage of anglers not targeting species (62%) of any southeastern state. Like Georgia, this percentage grew during the decade, from 55 percent in the first half to 66 percent in the latter half. The rise came at the expense of the big game and bottomfish targets" (p. 6). In contrast to popular belief, the survey in this study revealed that tourist saltwater angler targeted small game and bottomfish (e.g., snapper, groupers, black drum) and such species as swordfish and sailfish were seldom mentioned. For the anglers in the sample, they reported mean and median catch of targeted species per day of 5.2 and 2.0 respectively with the former more in agreement with overall catch rates in Florida of 4.5. (See Bell, 1992). For those that did not target species, they catch a mean and median per day of 8.6 and 5 respectively. Even those that may not achieve their targets do, on average, land fish.

To examine sustainability, a question was asked [Bell (1992)] as to the minimum number of fish one would consider per

day before he or she would quit fishing in Florida. For the two groups of tourist anglers, the following answers were given:

Kind of Angler	Catch Per Day [1]	Minimum Acceptable [2]	Surplus or Deficit
Target Species	(1)	(2)	(1) - (2)
(a) Mean	5.2	1.23	+3.97
(b) Median	2.0	1.00	+1.00
Nontarget Species			
(a) Mean	8.6	5.00	+3.60
(b) Median	5.0	4.00	+1.00

[1]Sample used in this study
[2]Bell (1992)

It is quite clear that minimum acceptable or threshold catch per day is well below the actual catch using the mean and median measure of central tendency. The evidence above would appear to indicate that physical indicators of resource scarcity (i.e., low catch per day) in saltwater recreational fishing in Florida by tourists has not declined to a point where catch rates are unacceptably low. At the very aggregate level, it would appear that catch rates are not yet a factor in deterring tourist anglers from Florida waters. The impact on residents may be entirely different and should be studied. This does not mean that concern should not be given for the biological status of the stock. Note that those who target their species have a much lower tolerance threshold than those who do not target their species which would appear to lend validity to the recreational specialization hypothesis discussed above.

The threshold concept may be used to analyze the sustainability of the projection in the following manner. Let

$$C/FD = \text{catch per fishing day} \quad (4)$$

where

C = total number of fish available to tourists[4]

FD = total tourist saltwater fishing days

One can assume that C/FD is either a constant or declines over time. In the former case, this should have no effect upon the projections since catch rates for targeted and nontargeted species are well above the threshold where tourists no longer will come to Florida for fishing. Since FD is projected to increase, C may also increase in the same proportion. This may be facilitated through biological engineering such as hatchery operations; habitat improvement; closed fishing areas and seasons; creation of artificial habitats; and alterations in the food chain. Expanding C is not costless, but the projections provide an economic measure of the benefits of such biological engineering programs to compare to their costs. This is a very practical use of the projections of economic variables made in this chapter.

The second scenario of a declining C/FD is probably more likely although Bell (1992) has observed no time trend in this

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[4]Allocation of any given species is made between commercial and recreational user of the resource usually on the basis of historical share. We are implicitly assuming that shares of the recreational catch will be split on the basis for historical share going to tourists as opposed to residents. As long as both groups have about the same growth in demand, the model will not be impacted.

variable over the 1979-1990 period on the West Coast of Florida. The East Coast of Florida exhibits a statistically significant downward time trend in C/FD over the same period. Two assumptions may be made: (1) C remains constant and (2) C declines because of overfishing at an average rate per year of 1 percent.[5] FD's have been independently projected to increase so C/FD will decline more rapidly in (2) as compared to (1). Remember that fishermen who target their catch have a lower threshold (i.e., recreation specialization hypothesis) of tolerance to declining C/FD than those that do not target their species. Consider Graph 5.1. With C held constant at the 1991 level, the projected increase in DF for those that target their species (i.e., 36.8 percent of total demand) indicates that not until the year 2033 will C/DF equal or cross the threshold. Graph 5.2 also holds the catch, or C, constant for those not targeting their species. Because of the higher threshold, the sustainability of the DF projections can only maintain itself until the year 2006 as indicated on the graph.

Figures 5.3 and 5.4 both embody a declining catch at 1 percent per year for those that target and those that do not target respectively. Figure 5.3 indicates sustainability of the projections for the group that targets due again to the low threshold. A declining catch changes the day of reckoning by moving it 11 years closer (i.e., compare Graphs 5.2 and 5.3).

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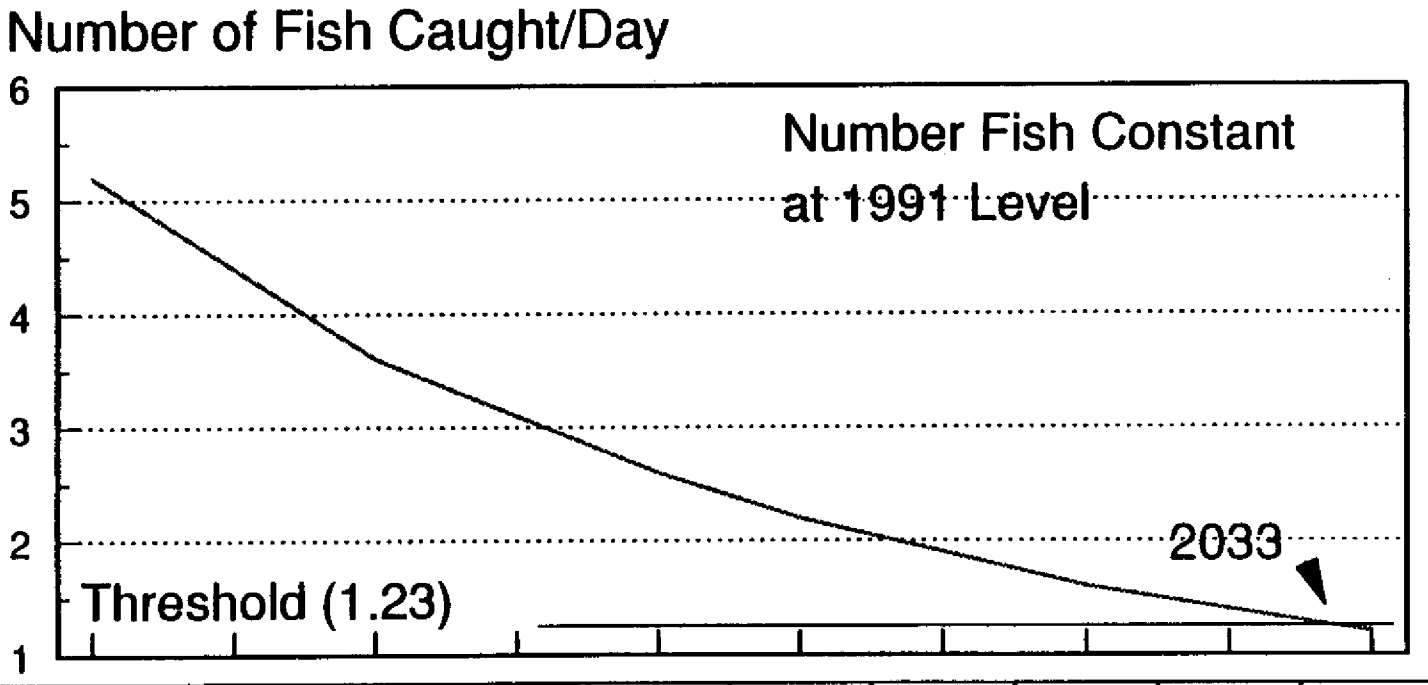
[5]The model is structured so any rate in resource decline may be used. This would be a question for biological expertise. The 1 percent is merely illustrative.

Graph 5.1

Projected Recreational Fishing Levels Relative to Angler Threshold* - Target Fish Species

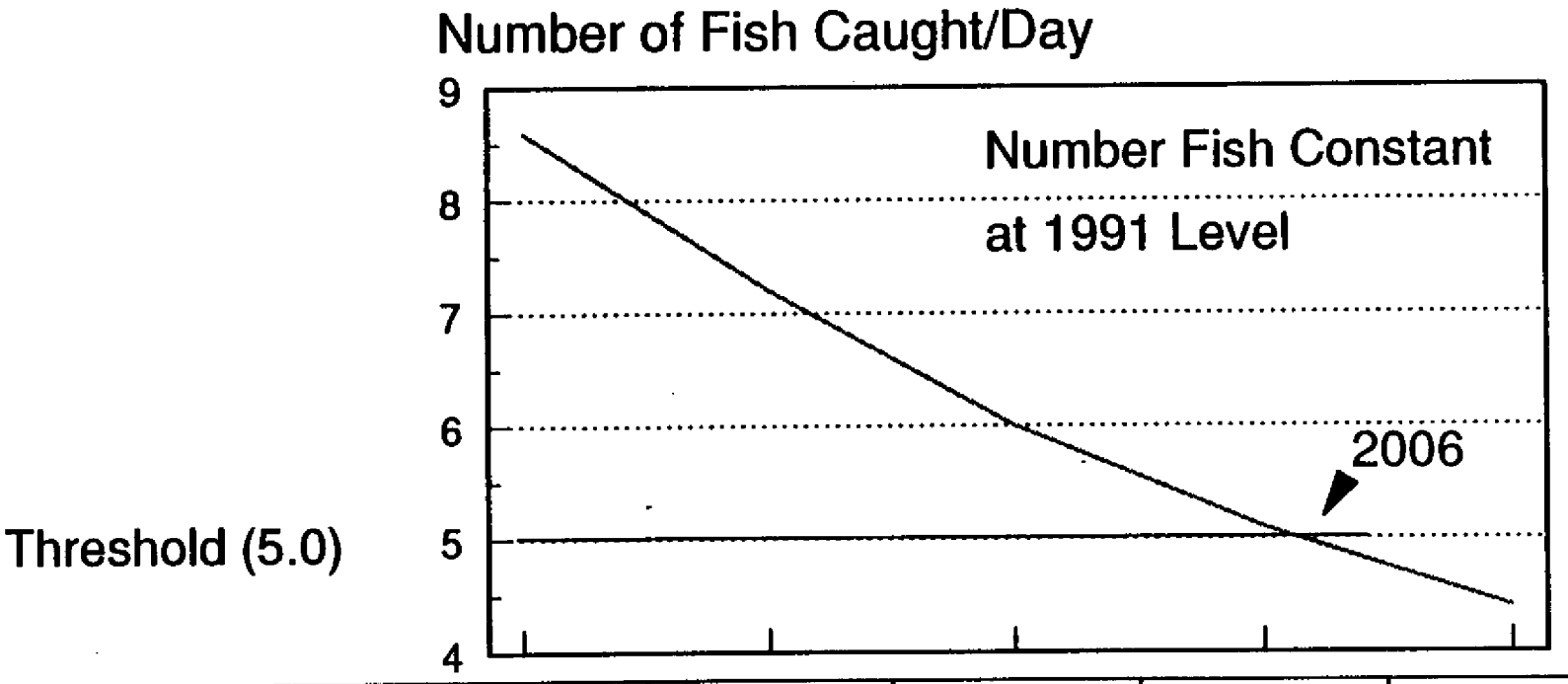


Year	1991	1995	2000	2005	2010	2015	2020	2025	2030	2035
Catch/Day ——	5.2	4.4	3.6	3.1	2.6	2.2	1.9	1.6	1.4	1.2

36.8% Target Species*

Graph 5.2

Projected Recreational Fishing Levels Relative to Angler Threshold* - No Target Fish Species

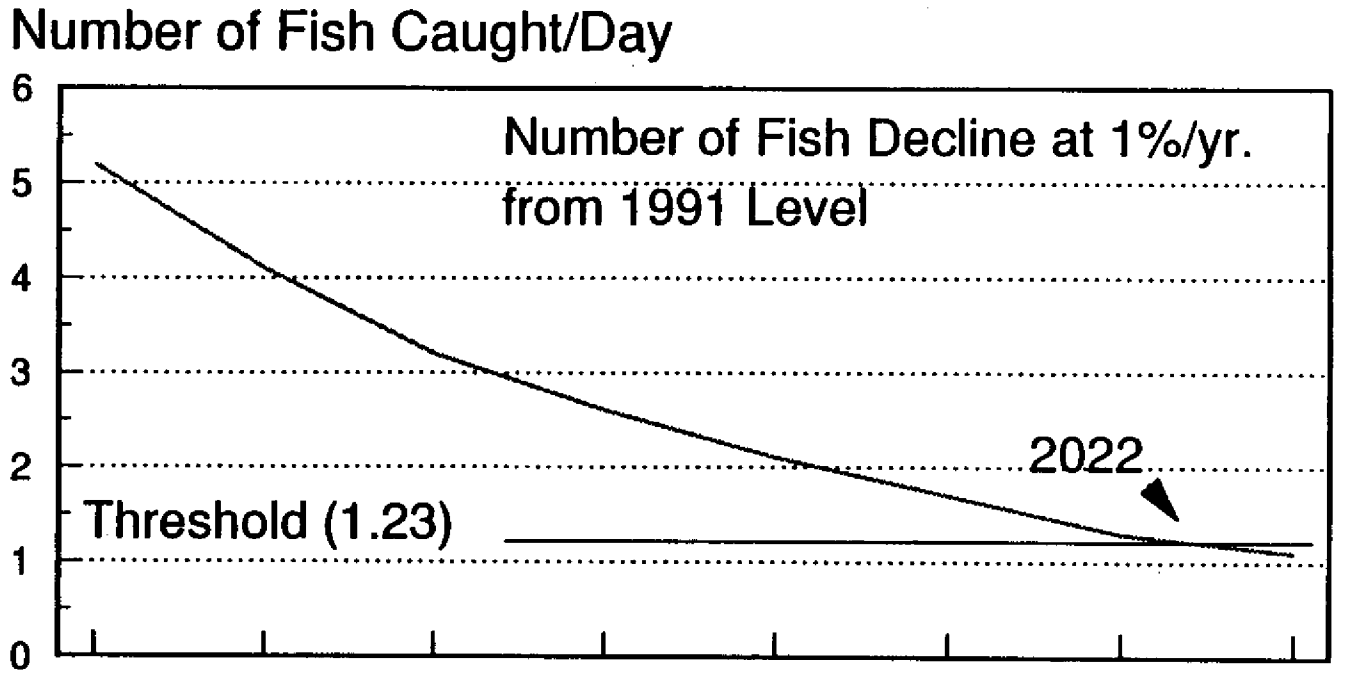


Year	1991	1995	2000	2005	2010
Catch/Day ——	8.6	7.2	6.0	5.1	4.4

63.2% No Target Species*

Graph 5.3

Projected Recreational Fishing Levels Relative to Angler Threshold* - Target Fish Species

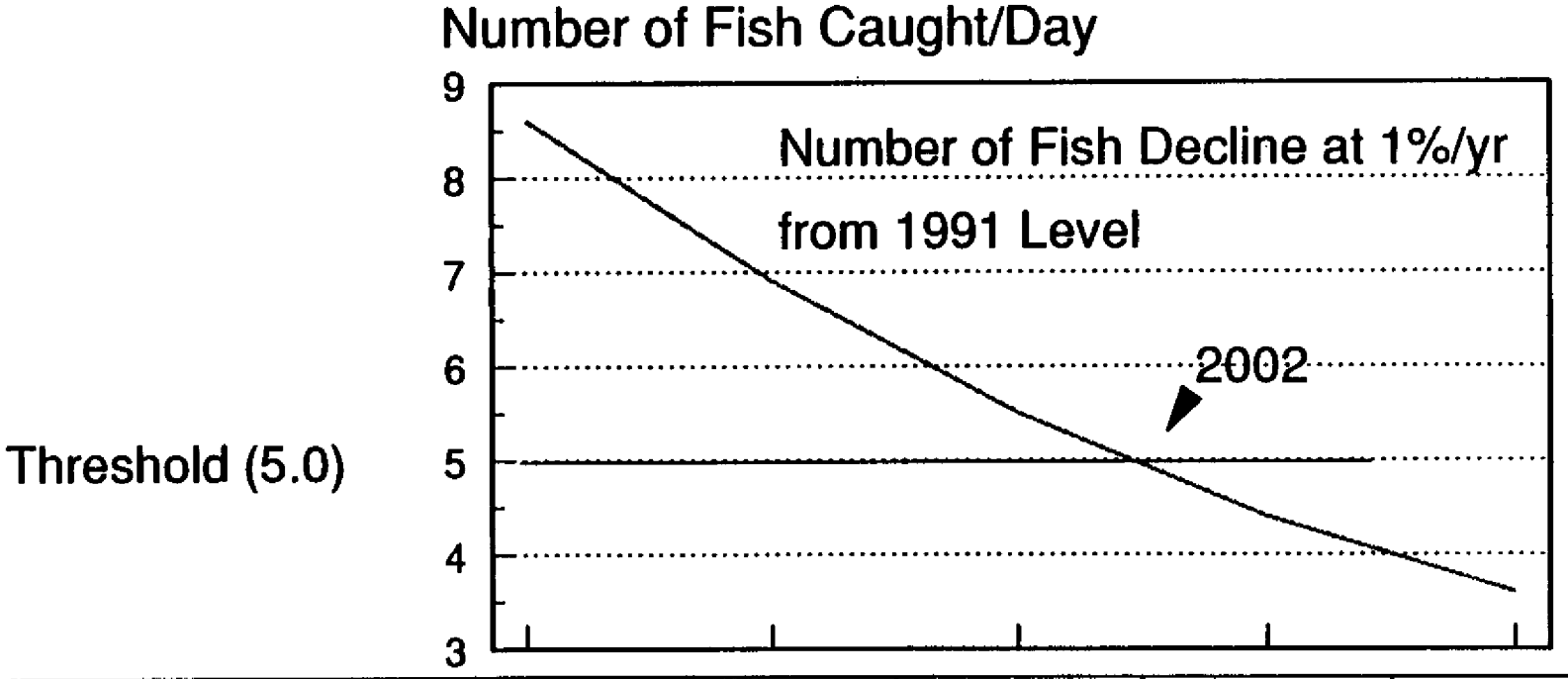


Year	1991	1995	2000	2005	2010	2015	2020	2025
Catch/Day ——	5.2	4.1	3.2	2.6	2.1	1.7	1.3	1.1

36.8% Target Species*

Graph 5.4

Projected Recreational Fishing Levels Relative to Angler Threshold* - No Target Fish Species



Year	1991	1995	2000	2005	2010
Catch/Day ——	8.6	6.9	5.5	4.4	3.6

63.2% No Target Species*

Finally, the nontarget group shows a day of reckoning in the year 2002 with the 1 percent/year declining catch assumption (See Graph 5.4). To the author's knowledge, this particular type of analysis has not been used before. The threshold approach originated with Bell (1992). It is suggested here that demand for recreational days may not decline in a continuous, but discrete manner once a threshold is reached. A more sophisticated approach would be to integrate a distribution of thresholds into the analysis. Demand would decline somewhat when the upper tail of the distribution is reached (i.e., high threshold relative to the mean or median). What can be concluded about sustainability? Graphs 5.1 - 5.4 indicate that the fishing effort (FD) and economic projections are sustainable (i.e., not impacted by a negative feedback) to possibly the year 2002 or about the next decade. It must be remembered that the projections are illustrative only. No definite conclusions can be reached without biological estimates of the response of the fish catch to fishing effort or days. This was well beyond the scope of this study. However, the study does provide a model to evaluate alternative catch-fishing effort scenarios.

CHAPTER 6

IMPORTANT FACTORS CONNECTED WITH TOURIST SALTWATER ANGLERS

Introduction

This chapter will deal with a diversity of issues and factors examined in the sample survey of tourist saltwater anglers in Florida. Some of these factors will be extensions of previously discussed topics while others will be completely new.

More on Participation

In Chapter 4, it was pointed out 35.4 percent of all the tourists interviewed (N=3,901) at one time or another engaged in saltwater recreational fishing. Conversely, nearly two-thirds of the tourists visiting Florida have never participated. The survey questioned why these individuals never participated in this form of recreation with the following results:

Reason Not Participated		Percent		
		1st	2nd	3rd
1.	No Interest	61.1	4.6	0
2.	No Time	32.5	52.1	9.8
3.	No Equipment	1.3	23.9	73.2
4.	All Other	5.1	19.4	17.0

Respondents were asked to give more than one reason, if applicable, for not engaging in recreational fishing. "No interest" and "no time" dominated the first response which does

not provide too much insight into a lack of participation. The participation function does indicate which factors are negative influences on participation such as sex (i.e., female) and arriving by air (See Chapter 4). Apparently, people cannot articulate why they shun participation in saltwater fishing even though the statistical participation function does reveal demographic factors. Of interest, many tourists mentioned lack of equipment as a reason for not fishing. Those tourists arriving by air would have a baggage constraint. The easy availability of equipment rentals might increase participation. Therefore, this answer might also explain the lower participation rate for air as opposed to auto arriving tourists.

An attempt was made to get information on whether those tourists that did fish regarded it as the main or secondary reason for a visit to Florida, with the following results:

Reason for Visit to Florida	Percent
1. Primarily fishing	11.2
2. Secondary to other recreation and/or visiting friends	74.8
3. A whim or impulse	14.0

It would appear that one in ten tourists actually make saltwater fishing a prime motive for visiting Florida. Apparently, this recreational activity is just one of many attracting visitors to Florida. A deeper analysis revealed that one in five tourists who targeted their species as opposed to one in twenty who did

not target a species answered that fishing was a primary reason for a visit to Florida. This is a consistent answer with the hypothesis of higher avidity among those targeting species.

For those that primarily came to Florida to fish, the respondent was asked the principal reason for this decision with the following results:

Primary Reason		Percent
1.	Best place to relax while fishing	17.9
2.	Can be outdoors all year around	14.3
3.	Near vacation home and/or friends	14.3
4.	Can catch species of interest	14.3
5.	Good variety of fishing experiences	10.7
6.	Other	28.4

The answers are not surprising, especially with the higher concentration of those that target their species among those indicating that saltwater fishing is their main reason for visiting Florida. That is, only 7.1 percent of the respondents mentioned success or catch rates (i.e., included in other category). Most fishermen gave answers consistent with the recreation specialization hypothesis discussed in Chapter 5. For tourists, the evidence seems to indicate that high or even medium catch rates per day are not a critical aspect in recreational demand.

Opinions of the Present Saltwater Fishing License

In 1980-81, Bell et al (1982) found that only 52.4 percent of the tourist saltwater fishermen were willing to pay $10.50 for

a saltwater fishing license. In 1989, the Florida State Legislature enacted a saltwater fishing license discussed in Chapter 5. The survey asked the following: Compared to fishing license fees charged in your state, and if not your state, other states, what is your opinion regarding the saltwater fishing license fees charged by the State of Florida? The following results were obtained from those respondents who fished:

Category	Percent Responding
Much too high	16.0
Too high	10.4
About right	25.6
Too low	.4
Have no knowledge of fees	30.4
Do not know	17.2

About 1 out of 4 fishermen felt the current rate structure for saltwater fishing licenses was either too or much too high. Twenty-six percent were satisfied with the current rate structure. Of particular interest, almost half of the respondents did not know that a fishing license may be required and/or were unfamiliar with the rate structure. Such findings are consistent with the license avoidance discussed in Chapter 5. More discussion of this issue will be presented in Chapter 7 dealing with policy implications.

Respondents were asked to indicate how much they would be willing to pay for the right to fish per day. Individuals were told to assume no saltwater fishing license existed. The answer

to this question is usually interpreted as the value of the recreational experience by economists. The tourist saltwater angler was willing to pay $6.20 per day for the right to fish. See Mitchell and Carson (1989) for a greater discussion of this topic.

Geographical Distribution of Fishing Effort

The sample of tourist saltwater anglers is just too small to do any meaningful regional estimation. For the aggregate sample, some tentative regional propensities can be studied that will be useful. They are as follows:

1. Of those tourists interviewed who fished on the Atlantic Ocean side of Florida, 98.1 percent of the days fished were in one particular coastal county. Thus, the fishing experience for tourists takes place in one county, which is probably that county chosen for a vacation and/or a visit with friends;
2. Of those tourists fishing on the Gulf of Mexico side of Florida, 97.6 percent of the days fished were in one county;
3. Two thirds of the tourist saltwater angler days were spent on the Atlantic Ocean while only one-third were spent on the Gulf of Mexico side. Although subject to sampling variability discussed above, this finding is consistent with the overwhelming flow of tourists (i.e., See Chapter

2) down the East Coast of Florida. Bell (1992) has indicated no fall in catch per trip on the West Coast of Florida, but a steady decline of the catch rate on the East Coast of Florida possibly due to more fishing effort and/or habitat destruction on the latter coast.

Catch and Release Behavior of Tourists

Catch and release programs are important to maintaining the fishery resource. Thus, a fish may be, in effect, reused or survive to help increase the resource through propagation. Such a program is a good example of one that will help maintain a consistent or increasing number of fish and is discussed under the sustainability of the angler day projection in Chapter 5. Tourists might be expected to release more fish since they are unlikely to fish for subsistence and/or have the means or time to process their catch in contrast to residents. Respondents were asked the following question: What percent of the time did you catch but release the fish you caught? They answered as follows:

Percent Caught, but Released	Percent of Respondents
Zero	30.8
Under 10%	14.8
11-25%	8.8
26-50%	10.0
51-75%	3.6
Over 75%	32.0

Nearly one-third of the tourist saltwater anglers released over 75 percent of their catch; however, nearly one-third did not release any of their catch. The other third was somewhere within these extremes.

What was the primary reason that tourist anglers engaged in catch and release while fishing in Florida? The following reasons were given:

Reason for Catch and Release Behavior	Percent Responded
1. Size limit violation	30.1
2. Undesirable species	23.1
3. To conserve species	16.8
4. Catch/release regulation	6.4
5. Had enough fish	2.3
6. Exceeded bag limit	1.7
7. Closed season on species	1.2
8. All other	18.4

Fishing regulations were a motivating factor in catch and release for 39.4 percent of the tourist anglers with size limitation the dominant regulation influencing motivation. Because many tourists are casual fishermen (i.e., only one in ten fishermen gave fishing as the primary reason to visit Florida), it is not unusual that 23.1 percent released fish because they are "undesirable." In many cases, fishermen do not know what they have caught or what to do with the fish if they decide to keep it. Of course, some fish, such as the saltwater catfish, are clearly not useful for anything by the recreational fisherman, except possibly the thrill of the catch.

The National Recession and Tourist Fishing

Another question that often arises is the influence of recessions on tourism in Florida. As indicated in Chapter 5 (Table 5.1), national recessions do have an overall negative impact on tourism to Florida. In 1991, tourism declined by 2.5 percent with the air arrivals accounting for all of this decline. 1991 was not only a year of recession, but contained the main months of the survey conducted as the basis of this report. So, the people surveyed were visiting Florida during a recession. The survey asked whether a national recession with high unemployment in your area would influence your coming to Florida to fish. Three out of four respondents said they would still come to Florida to fish under such recessionary conditions. Recessions hit air arrivals more than auto arrivals to Florida; therefore, recreational fishing by tourists in Florida is likely to be less sensitive to national economic downturns because of the higher tourist saltwater angler participation rate among those arriving by auto. Only 14.3 percent of the respondents felt a recession in their areas would deter them from fishing in Florida. Of particular interest, those fishing in Florida as tourists have a particularly long history of fishing in Florida. The saltwater fisherman tourist has been fishing in Florida for slightly over 13 years which would indicate an apparent satisfaction with fishing conditions in Florida. Bell et al (1982) found that a decade ago (1980-81) the typical tourist angler had been fishing over 8 years in Florida. In essence,

saltwater angling in Florida although not a primary reason for the trip would appear to be habitual among 16-17 percent of the tourists. The reader should remember that the response to the recession question may be biased since it was asked during a recession. That is, those tourists that stayed away from Florida (i.e., air visitors) during the recession could not be interviewed. Other information such as the higher participation rate in saltwater recreational fishing among auto arrivals and the number of years fishing in Florida by such tourists (i.e., habit effect), would lead to the tentative conclusion that saltwater angling by tourists is less sensitive to national recession than tourism in general (e.g., visits to Disney, etc.).

Species Targeted and Caught

Although this chapter has covered a lot of diverse information, it is appropriate that we look at the species targeted by tourist saltwater anglers and those caught by tourists having no targets. Tables 6.1 and 6.2 show the results.

Species targeted by tourists are largely small game or bottom fish except for possibly dolphins, shark and king mackerel, as shown in Table 6.1. In general, tourists who target these species are able to maintain catch rates per day for such species of 5.2 which is well above the critical threshold found in Bell (1992) of 1.23. See Chapter 5 for more discussion and analysis.

For those that do not target their species, Table 6.2 shows that about six of the targeted species appear on the top ten of

those tourists merely wanting to catch a fish. The saltwater catfish is second on the list of caught but not targeted fish. The high ranking of this less desirable species was also found by Bell et al (1992).

Finally, it was found that tourists are overwhelmingly finfish fishermen with only 6.4 percent purposely targeting shellfish. Yet, there is evidence of significant regional targeting of especially spiny lobster. Bertelsen and Hunt (1991) report that 66 percent of the recreational lobster fishermen (state residents only) come to the Florida Keys to fish for lobsters.

Among the tourists, those that target shellfish prefer the following species:

Species		Percent
1.	Spiny lobsters	43.8
2.	Stone crab	31.3
3.	Blue crab	12.5
4.	Calico scallops	6.3
5.	Shrimp	6.3

As expected, lobsters and stone crabs are the preferred shellfish by tourists.

Table 6.1

Of Those Respondents Having a Preference (Target) for Fish Caught
The First Species Ranking[1]

	Species	Percent Responded
1.	Grouper	14.1
2.	Dolphin	10.9
3.	Red Snapper	6.5
4.	Spotted Sea Trout	6.5
5.	Kingfish	5.4
6.	King Mackerel	5.4
7.	Snapper	4.3
8.	Shark	4.3
9.	Bluefish	3.3
10.	Sheepshead	3.3
11.	All others	36.0

[1]Mean fish caught per day: 5.2
Threshold fish caught per day from Bell (1992): 1.23 (target)

Table 6.2

Principal Species Caught: No Target

	Species	Percent Responded
1.	Grouper	6.4
2.	Saltwater Catfish	4.4
3.	Bluefish	4.4
4.	Dolphin	4.0
5.	Snapper	4.0
6.	King Mackerel	3.6
7.	Yellowtail Snapper	2.8
8.	Tuna/Mackerel	2.8
9.	Sea Bass	2.4
10.	Great Amberjack	2.4
11.	All others	63.4

[1]Mean fish caught per day: 8.6
Threshold fish caught per day from Bell (1992): 5.0 (non-target)

CHAPTER 7

SOME SUGGESTED POLICY IMPLICATIONS OF THIS STUDY

This study has concentrated on a broad variety of information dealing with tourist saltwater anglers. For effective fishery management, it is necessary that the Florida DNR and Marine Fisheries Commission know more about the tourist segment of the recreational fishing industry. Tourist spending in the state has and will continue to be the main engine of Florida's economy so regulation of the fishery resource is, in part, making economic policy as well as environmental protection.

In 1991, it was estimated that about 3 million tourists engaged in saltwater recreational fishing in Florida over a 12-month period. These tourists spent slightly under 11.9 million recreational days which represent a considerable amount of pressure on the fishery resource when combined with resident recreational fishing. By year 2010, tourist angling fishing effort is projected to increase by 100 percent over the 1991 base year. With a fixed or decreasing resource, some method such as bag limits will have to be introduced to ration the resource among the users. Bag limits are in use today. Given a fixed resource (i.e., number of fish), bag limits must decline over the next 20 years because of the projected expansion in angler days both by tourists (this study) and residents. Florida's resident population is expected to grow by 40 percent over the next 20 years so it is quite conceivable that tourists may be the more rapidly growing component of recreational saltwater fisheries

demand. See University of Florida (1991). The fishery resource may be rationed by price as well as bag limits. Already, tourists pay 50 percent more for a weekly fishing license than residents do for a 10-day license. Only 25 percent of the tourists felt the existing license fee was too high. There is an opportunity to use the fishing license for tourists as a rationing device. More study must be given the sensitivity of tourists to the fishing license fee structure. It may turn out that tourists are willing to pay more for a license yet not cutback their angling days. Price as a rationing device will be ineffective, but revenues from these fees will increase to help expand the fishery resource.

Fortunately, it would appear that Florida can sustain the expansion of fishing days for at least a decade using the threshold theory of the catch rate per day's impact on demand and the illustrative scenarios. Much more study needs to be given to the threshold hypothesis. Bell (1992) is the only one to have explored this thesis for tourist saltwater anglers in Florida. With further substantiation at possibly the species level, bag limits could be further reduced in cases where a resource needs to be rebuilt by reducing fishing effort. The results of this report lean in this direction especially if it is true for residents. Differential bag limits for tourists as opposed to residents would probably be unworkable from an enforcement point of view. Every effort should be made to expand the resource by hatchery operations; habitat enhancement; reduced bag limits,

etc. using license fee money generated by the users of the resource in the absence of substantial existence value of the fishery resource by the general public.[1]

With respect to the saltwater fishing license enacted in 1989, there are two fundamental policy issues raised by this study. First, possibly over 37 percent of the tourist saltwater anglers may not have bought a license yet were required to do so. There will always be those that knowingly violate the law, but the survey results may also lead one to believe that there is a general ignorance of the license requirement (i.e., in Chapter 6, nearly 50 percent could not answer a question about the license fee). If this be the case, the Florida DNR should review their means for informing tourists of this requirement including welcome stations, T.V. advertising and even billboard advertising along major tourist arteries. The agency may want to consider using more of its present saltwater fishing license revenue on communicating the license requirement to tourists. Second, there is an enormous difference between this study's estimate of the number of tourists that should be buying saltwater fishing licenses even under partial compliance (i.e., adjusting for license purchase avoidance) and the actual sales reported by the Florida DNR. While this study points to possibly 1 million tourists that should have bought saltwater fishing licenses in

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[1]Existence value is a dollar price tag placed upon resources (e.g., whales, manatees, etc.) by individuals characterized as the "general public", many of whom will never see or directly use the resource. This concept should be studied for Florida's fisheries.

1991, only about 267,000 were sold. This may be a combination of mass ignorance and/or nominal enforcement by the Florida Marine Patrol during the early years of this license. This is a grave policy issue since, if true, it represents a loss of millions of dollars in state revenue. As indicated in Chapter 5, other earlier studies have indicated nonresident saltwater anglers to be in the millions, yet less than 300,000 licenses were sold. Even with exemptions (e.g., party boats, etc.), it is not possible to reconcile such a discrepancy. It is suggested that an immediate study be started which would focus on this major discrepancy and the reasons surrounding it.

As the author sees it, the two fundamental policy issues flowing from this study are fishery management and the results of the saltwater fishing license enactment of 1989. Hopefully, this research will enable the Florida DNR and Marine Fisheries Commission to more effectively deal with the economic dimensions of fishery management and development.

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APPENDIX A

Survey Instrument

Interviewer (Initials) _____ (1-4)

Area Interviewed _____ (5-6)

Date Interviewed _____ (7-12)

Auto or Air Departure Auto ☐ Air ☐ (13)

SURVEY QUESTIONNAIRE
Saltwater Recreational Fishing
Visitors Survey
Florida Department of Natural Resources

Good AM/afternoon. We are talking to visitors today, that is folks who are in Florida and have their principal home in another state or country. We are trying to get an idea of the use of your time while in Florida.

1. What was the main purpose of your trip to Florida?
   (1) Vacation
   (2) Visit friends or relatives
   (3) Company or government business
   (4) Other (SPECIFY)
   _____

   ☐ (14)

2. How many days did you spend in Florida on this trip?

   ☐ (15-17)

3. In the last 12 months, how many trips (including this trip) did you make to Florida?

   ☐ (18-19)

4. Including yourself, how many people were in your party on this trip to Florida?

   ☐ (20-21)

5. What is your home city and state or country and your ZIP code? (22-41)

   City _____

   State ☐ (42-43)

   Country ☐ (44-46)

   ZIP ☐ (47-51)

To be sure we have a representative sample of the Florida Visitor population, I'd like to ask a few things about your background.

6. What year were you born?

   ☐ (52-55)

7. Sex M ☐ F ☐ (56)

8. Are you? White ☐ Black ☐ Oriental ☐ American Indian ☐ (57) Other ☐

9. Are you of Hispanic origin (Cuban, Mexican, Puerto Rican)?

Yes ☐ No ☐ (58)

10. What is your marital status? ☐ (59)

(1) Now married, except separated.
(2) Widowed.
(3) Divorced.
(4) Separated.
(5) Single.

11. In what general category does your total household income fall?

(1) Under $5,000
(2) $5,000 - under $10,000
(3) $10,000 - under $15,000
(4) $15,000 - under $20,000
(5) $20,000 - under $25,000
(6) $25,000 - under $30,000
(7) $30,000 - under $40,000
(8) $40,000 - under $50,000
(9) $50,000 - under $70,000
(10) $70,000 - under $90,000
(11) $90,000 or above

☐ (60)

12. What is the highest grade or year of school you completed?

(1) 8 or less years
(2) 9-11th grade
(3) High School graduate
(4) Business/Technical school
(5) Some college
(6) Completed college
(7) Graduate or professional school

☐ (61)

13. How many children under the age of 18 live with you?
If Zero, go to Q. 15 ☐ (62)

14. What is the age of each child? #1_____ #2_____ #3_____

#4_____ #5_____ #6_____ #7_____ #8_____ (63-77)

Concerning the time spent in Florida, I would like to finish this interview by obtaining some details on a particular outdoor recreational activity.

15. Have you ever engaged in saltwater fishing anytime in Florida?

Yes ☐ No ☐ (1)

If YES skip to Q.17, If NO Continue to Q.16 and Q.17 and Terminate.

16. Why have you never engaged in saltwater fishing while in Florida? (DO NOT READ CHOICES. SELECT THOSE THAT APPLY)

(1) No interest
(2) No money
(3) No time/opportunity
(4) poor health
(5) perceived low catch rates
(6) Too many regulations
(7) No equipment
(8) Congestion/crowding
(9) Other (specify) _____
(10) DK

☐☐☐☐ (2-9)

17. When you were a child or a teenager, did anyone take you saltwater fishing or freshwater fishing anywhere including Florida?

Yes ☐ No ☐ (10)

17(a) Have you engaged in saltwater recreational fishing in Florida in the last 12 months?

Yes ☐ No ☐ (10)

18. While you were in Florida on this trip, did you engage in saltwater recreational fishing at any time? (e.g., fishing on the ocean, gulf, coastal inlets, sounds, and bays)

Yes ☐ No ☐ (11)

If YES, continue, If NO, Terminate.

19. Of the _____ days (Q2) spent in Florida how many were spent on saltwater recreational fishing (count a fraction of a day as one day)?

☐ (12-14)

20. Considering the number of days spent saltwater fishing, would you indicate in which counties these days were spent and the mode of fishing. (Show map of Florida to help) (Attached to Survey)

Area Fished From	Days Fished	Mode: Boat Days			Non-Boat Days		
		Party*	Charter**	Private	Man-Made (Pier/ Dock/ Bridge	Natural (Beach/ Bank)	
Atlantic Coastal Counties							
1. _____	☐ =	☐ +	☐ +	☐ +	☐ +	☐	(15-28)
2. _____	☐ =	☐ +	☐ +	☐ +	☐ +	☐	(29-43)
3. _____	☐ =	☐ +	☐ +	☐ +	☐ +	☐	(44-57)
Estimate Percent of boat days spent beyond 3 miles from the Atlantic shore _____%						☐	(58-60)
Gulf Coast Counties							
1. _____	☐ =	☐ +	☐ +	☐ +	☐ +	☐	(61-74)
2. _____	☐ =	☐ +	☐ +	☐ +	☐ +	☐	(1-14)
3. _____	☐ =	☐ +	☐ +	☐ +	☐ +	☐	(15-28)
Total Must Add to Q.19 and all rows must add across.	☐						
Estimate Percent of boat days spent beyond 12 miles from the Gulf shore _____%						☐	(29-31)

*Boats carrying a large number of people (10 or more) from the public for general fishing

**Boats carrying a small number of people (under 10) who usually know each other for specific fishing.

21. On average, what were your daily expenditures while saltwater recreational fishing in Florida including lodging, food and drink, local travel, bait, guides, boat rentals and licenses.

(32-34)

$ ☐

22. On your last day of saltwater fishing, how many individuals fished with you as a member of your party that are:

(a) Under 16 years of age? ☐ (35-36)

(b) 16 years or older? ☐ (37-38)

23. One aspect of the quality of saltwater recreational fishing is the number of fish (or shellfish) caught per day. We would like to know the following:

(a) Do you have target or preferred species which you fish?

Yes ☐ No ☐ (39)

If YES, continue, If NO skip to (d)

(b) Name top three preferred (targeted) species. Name: (1)_____(40-41) (2)_____(42-43) (3)_____(44-45)

(c) On average, how many of the target species did you catch per day?
(1) _____ (46-47) (2) _____ (48-49) (3)_____(50-51)

(d) On average how many of all fish did you usually catch per day?
#_____ (52-53)

(e) What was the principle species caught? Name:_____(54-55)

24. On this fishing trip to Florida, what percent of the time did you catch but release the fish you caught?

(1) zero
(2) under 10%; greater than zero
(3) 11-25%
(4) 26-50%
(5) 51-75%
(6) Over 75%

☐ **If zero, skip to Q.26** (56)

25. What is the primary reason (select one) that you engaged in catch and release fishing? (DO NOT READ CHOICES. SELECT ONE THAT APPLIES)

(1) exceeded bag limit
(2) size limit violations
(3) closed season on species
(4) catch and release regulations
(5) caught undesirable species
(6) had enough already
(7) to conserve the species
(8) other (specify) _____
(9) DK

[ ] (57)

26. Do you come to Florida to
(1) primarily fish
(2) vacation, visit friends or business with fishing of secondary importance
(3) fish, but only on a whim or impulse

[ ] (58)

If (2) or (3) skip to Q.29.

27. If you primarily come to Florida to fish, what is principal reason (select one) for this decision? (DO NOT READ CHOICES. SELECT ONE THAT APPLIES)

(1) consistent success in catch
(2) caught species in which I was interested
(3) reputation of the area
(4) available accommodations
(5) best place to relax and fish
(6) variety of fishing experience
(7) cost compared to other states
(8) the ability to be outdoors year around
(9) good support sources (boat ramps, bait and tackle shops)
(10) near vacation home or house of friends
(11) other (specify) _____
(12) DK

[ ] (59-60)

28. If a national recession with high unemployment in your area occurred, would you?

(1) still come to Florida to fish
(2) come to Florida, but not fish because it's too expensive
(3) come to Florida and primarily fish because it is less expensive
(4) reduce days fished in Florida
(5) not come to Florida

[ ] (61)

29. How many years ago did you start saltwater fishing in Florida?

YRS [ ]

(62-63)

30. Did you have a saltwater fishing license while in Florida? (64)

Yes ☐ No ☐ **If YES, Continue, If NO skip to Q.32**

31. What kind of Fishing License (Nonresidents) was bought? ☐ (65)
(1) 3-day - $5.00 plus service charge
(2) 7-day - $15.00 "
(3) 1-year - $30.00 "
(4) other: specify _____

32. Compared to fishing license fees charged in your state, and if not your state other states, what is your opinion regarding the saltwater fishing license fees charged by the State of Florida? ☐ (66)
(1) Much too high
(2) Too High
(3) About right
(4) Too low
(5) Have no knowledge of license fees in Florida
(6) DK

33. Assume that no saltwater fishing license existed. How much would you be willing to pay for the right to fish for one day. Stop me when the fee is too large for you to pay for such a right.

Interviewer: **Check Number just before the "stop" answer was given.**

☐ (67)
(1) 0-$2
(2) $3-$5
(3) $6-$10
(4) $11-$15
(5) $16-$20
(6) $21-$25
(7) $26-$35
(8) $36 or greater

34. Do you purposely try to catch shellfish (e.g., lobsters, scallops, crabs) as part of your recreational catch? (68)

Yes ☐ No ☐ **If YES, continue, If No Thank and Terminate**

35. What kind of shellfish do you catch? (69-70)

Name: _____

11. **In what general category does your total household income fall?**

(1) Under $5,000
(2) $5,000 - under $10,000
(3) $10,000 - under $15,000
(4) $15,000 - under $20,000
(5) $20,000 - under $25,000
(6) $25,000 - under $30,000
(7) $30,000 - under $40,000
(8) $40,000 - under $50,000
(9) $50,000 - under $70,000
(10) $70,000 - under $90,000
(11) $90,000 or above

APPENDIX B

Statistical Difference Between Tourist Samples

The purpose of this appendix is to test, if any, the statistical difference between tourists sampled from August through mid-October 1991 and those sampled between mid-October and the end of February 1992. The reason for this was that a question involving participation in recreational fishing over the last 12 months was inadvertently not ask the first 1,859 interviewees (August - mid-October), but was asked the last 1,947 interviewees (mid-October - February). The sampling was compressed into slightly less than 6 months so it is hypothesized that the socioeconomic characteristics; interviewee response to question and other related sample aspects were not statistically different from each other. If this hypothesis is confirmed, the use of the participation function which was based on the 1,947 observations will be reinforced and given greater credence.

Suppose that two random samples of N_1 and N_2 are drawn from a normal population whose standard deviations are equal ($\sigma_1 = \sigma_2$). Suppose further that these two samples have means and standard deviations given by $\bar{X}_1$, $\bar{X}_2$, and s_1, s_2 respectively. To test the hypothesis H_0 the samples come from the same population (i.e., $\mu_1 = \mu_2$ as well as $\sigma_1 = \sigma_2$), we use the t-score given by

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sigma \sqrt{1/N_1 + 1/N_2}} \qquad (1)$$

where

$$\sigma = \sqrt{\frac{N_1 s_1^2 + N_2 s_2^2}{N_1 + N_2 - 2}} \qquad (2)$$

The distribution of t is Student's distribution with $v = N_1+N_2-2$ degrees of freedom. This test holds for small ($N < 39$) and large samples ($N > 30$). See Spiegel (1961).

The second sample has been designated N_1 while the first is N_2. The results for the socioeconomic characteristics are shown in Table B.1. Except for "Children < 18 @ Home", N_2 was not statistically different from N_1 at the 5 percent level. Of special note, AGE; SEX; RACE and INC had very low t-values and were also significant socioeconomic variables in the empirical participation function in Table 3.1 of Chapter 3. Despite the temporal difference in sampling, there is really no statistical difference (at the 5 percent level) in the socioeconomic characteristics of the two groups of tourists sampled.

Table B.2 shows show mean responses to various questions asked tourists using the survey instrument in Appendix A. We did obtain for both samples the following participation rates for saltwater recreational fishing:

Participation Rate in Florida	Aug. - mid-Oct. (N_2)	Mid-Oct. Feb. (N_1)	t-value
Lifetime (VO29)	.374	.394	1.29
This Trip (VO35)	.061	.063	.50

Table B.1
TEST FOR STATISTICAL SIGNIFIGANCE BETWEEN RESPONSES FOR
SOCIOECONOMIC CHARACTERISTICS

VARIABLES/TITLES	N1	N2	N1+N2	MEAN1	MEAN2	SIGMA	T DENOM	T
V014 SEX	1947	1859	3806	0.734	0.718	0.446042	0.014463	1.106195
V015 RACE	1947	1859	3806	0.92	0.907	0.272728	0.008843	1.469942
V016 HISPANIC ORIGIN	1947	1859	3806	0.025	0.047	0.185957	0.006030	-3.64836
V017 MARITAL STATUS	1947	1859	3806	0.702	0.676	0.466503	0.015127	1.718726
V018 HOUSEHOLD INCOME	1947	1758	3705	7.21	7.165	2.335850	0.076850	0.585552
V019 EDUCATION	1947	1859	3806	4.658	4.677	1.562013	0.050652	-0.37510
V020 CHILDREN < 18 @ HOME	1947	1853	3800	0.485	0.546	0.885690	0.028744	-2.12215
V021 AGE 1ST CHILD < 18	450	576	1026	9.933	9.745	5.087464	0.320079	0.587354
V022 AGE 2ND CHILD < 18	220	311	531	8.709	8.701	4.314511	0.380090	0.021047
V023 AGE 3RD CHILD < 18	55	94	149	7.455	7.372	4.216008	0.715730	0.115965
V024 AGE 4TH CHILD < 18	14	22	36	6.286	6.318	3.842988	1.313847	-0.02435
V025 AGE 5TH CHILD < 18	9	11	20	5.667	5.091	4.684221	2.105400	0.273582
AGE	1947	1859	3806	48.846	48.007	14.51819	0.470787	1.782122

Table B.2
TEST OF STATISTICAL SIGNIFIGANCE BETWEEN SAMPLES FOR
INTERVIEWEE RESPONSES

VARIABLES/TITLES	N1	N2	N1+N2	MEAN1	MEAN2	SIGMA	T DENOM	T
V005 REASON FOR TRIP	1947	1859	3806	0.525	0.524	0.511997	0.016602	0.060231
V006 # DAYS IN FL	1947	1859	3806	8.861	8.136	14.09404	0.457032	1.586319
V007 TRIPS TO FL / 12 MOS.	1947	1859	3806	2.638	2.439	3.931982	0.127503	1.560737
V008 # IN TRIP PARTY	1947	1859	3806	2.319	2.367	1.798305	0.058314	-0.82312
V029 SALTWATER FISHED IN FL?	1947	1859	3806	0.394	0.374	0.477078	0.015470	1.292792
V030 1ST REASON NOT FISHED	1179	1276	2455	1.99	2.031	1.671271	0.067513	-0.60728
V031 2ND REASON NOT FISHED	152	79	231	4.349	4.051	2.217973	0.307628	0.968699
V032 3RD REASON NOT FISHED	27	14	41	6.593	5.857	1.474828	0.485721	1.515270
V033 4TH REASON NOT FISHED	1	4	5	7	7.5	1.154700	1.290994	-0.38729
V034 FISHED AS A CHILD	1947	1859	3806	0.628	0.608	0.489521	0.015873	1.259930
V035 SALTWATER FISHED THIS TRI	1947	1859	3806	1.063	1.061	0.246501	0.007993	0.500412
V036 DAYS FISHED THIS TRIP	122	125	247	4.459	3.496	4.805539	0.611583	1.574601
V038 DAYS IN 1ST AT CO.	76	53	129	5.457	3.642	6.073613	1.086919	1.669857
V039 DAYS IN PARTY BOAT	11	8	19	3.273	1.125	2.845087	1.321998	1.624812
V040 DAYS IN CHARTER BOAT	16	16	32	1.625	2.063	1.795930	0.634957	-0.68981
V041 DAYS IN PRIVATE BOAT	21	19	40	3.524	2.789	2.786786	0.882363	0.832990
V042 DAYS PIER/DOCK/BRIDGE	25	16	41	6.04	2.375	6.006946	1.923161	1.905716
V043 DAYS BEACH/BANK	23	4	27	5.609	1.75	5.514122	2.987200	1.291845
V058 % DAYS > 3 MILES	34	35	69	83.676	86.657	29.46238	7.094454	-0.42018
V060 DAYS IN 1ST GULF CO.	48	74	122	2.417	2.243	2.468239	0.457436	0.380380
V061 DAYS FISHED IN PARTY BOAT	4	16	20	1.25	1.25	0.592867	0.331423	0
V062 DAYS IN CHARTER BOAT	12	17	29	1.333	1.417	0.715570	0.269796	-0.31134
V063 DAYS IN PRIVATE BOAT	15	22	37	1.933	2.273	1.794128	0.600755	-0.56595
V064 DAYS PIER/DOCK/BRIDGE	18	24	42	2.889	2.667	3.516361	1.096418	0.202477
V065 DAYS BEACH/BANK	5	3	8	2.8	2.333	2.516772	1.837990	0.254081
V080 % BOAT DAYS > 12 MI.	20	30	50	83.1	92.5	24.07982	6.951246	-1.35227
V081 DAILY FISHING EXPEN	119	115	234	115.756	105.713	155.2755	20.30432	0.494623
V082 # < 16 YRS. IN PARTY	1843	1757	3600	0.015	0.022	0.200790	0.006694	-1.04556
V083 # > 16 YRS IN PARTY	122	125	247	6.689	3.68	13.80784	1.757274	1.712311
V084 HAVE PREFERRED SPECIES	122	125	247	1.672	1.584	0.485263	0.061757	1.424923
V085 1ST SPECIES PREF	40	52	92	39.225	40.192	20.89502	4.394456	-0.22004
V086 2ND SPECIE PREF	26	39	65	46.538	44.615	20.41168	5.167930	0.372102
V087 3RD SPECIE PREF	21	30	51	34.19	40.067	20.35963	5.792749	-1.01454
V091 # FISH CAUGHT / DAY	122	125	247	8.467	8.904	11.24382	1.430960	-0.30538
V093 % OF FISHED RELEASED	122	125	247	3.533	3.256	2.102400	0.267564	1.035263
V094 REASON FOR RELEASING	89	83	172	4.944	4.843	2.390003	0.364694	0.276944
V095 REASON CAME TO FL	122	125	247	2.057	1.984	0.499489	0.063568	1.148371
V096 REASON CHOOSE FL TO FISH	12	16	28	7.5	5.75	3.526662	1.346766	1.299408
V097 EFFECT OF RECESSION	12	16	28	2	1.688	1.621661	0.619282	0.503809
V098 # YRS SALTWATER FISH FL	122	125	247	12.648	13.688	12.08233	1.537674	-0.67634
V099 HAVE SW FISH LICENSE	122	125	247	1.615	1.656	0.484931	0.061715	-0.66433
V100 TYPE LICENSE BOUGHT	47	43	90	2.191	1.977	0.941925	0.198771	1.076612
V101 OPINION OF LICENSE FEES	122	125	247	3.634	3.92	1.729913	0.220159	-1.29905
V102 AMT PAY FOR 1 DAY	122	125	247	2.5	2.144	1.542022	0.196247	1.814035

As one can clearly see, the "lifetime" and "this trip" saltwater recreational fishing participain rates are virtually identical between the two sample groups. Thus, there is no real reason to conclude that the last 12 months participation rate would be any different between the samples. Of the 44 questions asked, the t-values were rarely statistically significant at even the 10 percent level as the reader can observe in Table B.2.

Of particular importance, EXPER (VO34); and TRIPS (V007) in Table B.2 were not statistically different at the 5 percent level in the two samples under question. Both varibles enter the participation equation in Table 3.1 in Chapter 3.

Lastly, Table B.3 contains only two variables which are related to location of interview (V002) and percent interviewed arriving by air (V004). There were 17 areas (i.e., airports and arteries) with a predetermined percentage distribution (See Table 2.1 in Chapter 2). The means in Table B.3 (i.e., 10.088 and 9.815) are the weighted average of this sampling distribution for the two samples in question, indicating no statistical difference at the 5 percent level for the place of interview. Finally, there was almost identical percentaghe of air visitors interviewed in the two samples (i.e., not statistically different at the 5 percent level).

The appendix has, we hope, added some confidence to use of the 1,947 observation sample to compute the participation rate equation. The results would seem to indicate little seasonal

Table B.3
TEST OF STATISTICAL SIGNIFIGANCE BETWEEN SAMPLES FOR
OTHER RELATED SAMPLE ASPECTS

VARIABLES/TITLES	N1	N2	N1+N2	MEAN1	MEAN2	SIGMA	T DENOM	T
V002 INTERVIEW AREA	1947	1859	3806	10.088	9.815	6.059539	0.196494	1.389348
V004 AIR/AUTO DEPART	1947	1859	3806	0.501	0.526	0.533410	0.017297	-1.44532

difference in Florida overall between August - mid-October and on until February in the sample.