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A Survey of the Number of Anglers and of Their Fishing Effort and Expenditures in the Coastal Recreational Fishery of Florida

by

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THE MARINE LABORATORY

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FOREWORD

FLORIDA has approximately 7,000 miles of sea coast line and produces a greater variety of salt water products, such as game, bait and food fish and shellfish, than any other state in the country. In 1956, the total commercial catch was more than 200,000,000 pounds, with a value to the fishermen of about $26,000,000. All things considered, the total value of the commercial fishery is at least three times this figure. Approximately 17,000 persons were engaged in producing, wholesaling, processing and distributing this catch.

This report shows that anglers fishing in salt and brackish water spend directly and indirectly more than $200,000,000 on their fishing each year. About 1,000 charter and party boats and 500 fishing camps cater to these anglers. Thousands of private boats are also used, while fishing from bridges, piers, jetties and shoreline is a popular pastime for a substantial number of anglers.

The total combined value of both commercial and game fish in Florida waters is probably at least $300,000,000.

The State Board of Conservation is charged with the supervision, conservation and development of this important industry. In order to carry out these responsibilities, it is necessary to engage in research whereby accurate information is gained upon which may be based sound methods of scientific management and control such as those which have long existed in other states with salt water fisheries of lesser magnitude.

The result of all research conducted by the State will be published for the information and benefit of all concerned. It is hoped that this will lead to more intelligent appreciation of the State's salt water resources as well as to the adoption of sound conservation measures, and to willing cooperation in their enforcement.

Additional copies for fishermen, schools, wild-life clubs, civic groups and individuals may be obtained from the Director, State Board of Conservation, Tallahassee, Florida.

A list of publications in this series appears at the end of this book.

A Survey of the Number of Anglers and of Their Fishing Effort and Expenditures in the Coastal Recreational Fishery of Florida

SUMMARY

1. An estimated 34 per cent of Florida residents fished in salt or brackish water during 1955, and almost seven per cent owned one or more boats.

2. During 1955, 762 charter boats made 95,000 trips in Florida waters. The number of fisherman-days on charter boats was about 381,000. About 89 per cent of this activity took place in southeast Florida.

3. A total of 164 party boats made about 33,000 trips during the year. About 459,000 fisherman-days are involved in this method of fishing. About 66 per cent of it represents visitors. More than half of this type of fishing occurred in southeast Florida.

4. An estimated total of 558 fishing camps around the state catered to salt and brackish water anglers. Anglers in rented skiffs fished about 1,500,000 fisherman-days. About 33 per cent of this activity is attributed to visitors to the state and more than 40 per cent of it took place in southwest Florida.

5. A total of about 569,000 fisherman-days were spent on the 23 paid piers around the state.

6. Fishing from 226 bridges, free piers and jetties accounted for about 5,600,000 fisherman-days. About 39 per cent of this activity was done by visitors and 40 per cent of the total activity took place in southeast Florida.

7. Daylight shorefishing accounted for 267,000 fisherman-days; 37 per cent of this activity was by visitors. No data were obtained on night shorefishing.

8. Private boat fishing accounted for about 10,589,000 fisherman-days. About 14 per cent of this activity is attributed to visitors.

9. Summing up the various categories listed above, a total of about 20 million fisherman-days were spent in all types of recreational salt and brackish water fishing in Florida during the study period.

10. Anglers' expenditures during 1955, directly in the pursuit of, or indirectly due to salt and brackish water fishing, are categorized. The total expenditures on items normally incurred daily were estimated at about $135 million for the year, tackle at $6 million, motors at $3 million, boat and boating accessories at $18 million, miscellaneous items at $15 million, and fishing trip travel at $20 million. These expenditures relating to fishing totalled almost $200 million. It was estimated that visiting anglers spent a further $61 million on items not directly related to fishing. A portion of this total might be attributed to the attraction of the fishery.

11. It is emphasized that the $198 million in expenditures does not represent the "value" of the game fishery to the state. Such "value" would be less than the figure for expenditures, since only a portion of these expenditures enriches the state's economy. With additional information, presently unavailable, calculations could be made to arrive at a value figure.

A Survey of the Number of Anglers and of Their Fishing Effort and Expenditures in the Coastal Recreational Fishery of Florida

by ROBERT W. ELLIS, ALBERT ROSEN, and
ALAN W. MOFFETT

INTRODUCTION

It is now apparent that the salt and brackish water game fisheries are among Florida's greatest assets both economically and recreationally. It is further evident that their importance is increasing year by year. Because of this, the fisheries now deserve far more attention than they formerly received in scientific research and in management practices based on this research.

The present study was initiated first, to determine the importance of this fishery to the economy of the state, second, to focus public attention on its importance, and finally, to obtain information which will later aid in the formulation of wise management laws.

While basic data are available on most of the other important industries of the state, including the commercial fishery, such data on the game fisheries are almost completely lacking. As a result of this, some management laws currently in effect may not provide adequate protection to the game fish resources, while others may be unnecessary.

The waters under the jurisdiction of the State Board of Conservation, together with the coastal waters of the Everglades National Park, were those studied during this survey. These waters include coastal waters, tidewater areas of rivers, bays, harbors, inlets and parts of the Intercoastal Waterway. The areas studied in this survey are thus brackish to almost fresh waters, as well as waters of relatively high salinity.

COLLECTION OF DATA

The purposes of the survey were:

1. To determine the number of resident anglers who fish in Florida's salt and brackish waters.
2. To determine the amount of time spent by resident and visiting anglers engaged in such fishing.
3. To determine the amount of money spent by anglers which can be attributed to the pursuit or attraction of the salt and brackish water recreational fisheries.

Since it was not possible to satisfy all the above purposes using the same survey procedures, a variety of procedures were used. A discussion of the procedures and results concerned with the problem of estimating the number of anglers is presented separately from the discussion and results concerned with the other two purposes.

NUMBER OF ANGLERS

The money and manpower available for the survey did not permit an area or stratified random sample to be drawn from the entire residential population of the state. It was possible, however, to conduct a telephone survey. According to the Southern Bell Telephone Company, about 66 per

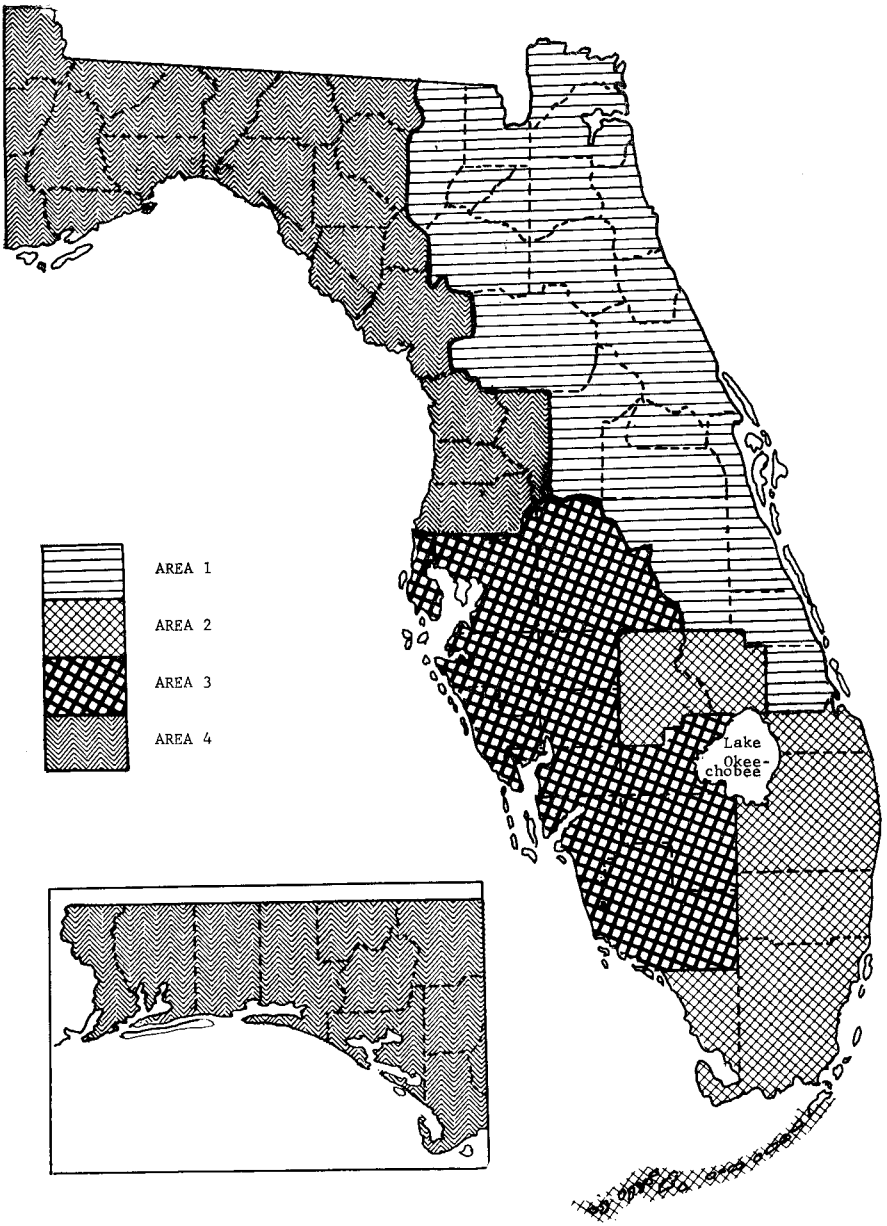

FIGURE 1. Area breakdown used in tabulating data.

cent of the residents of the state live in homes provided with a telephone. It was felt, therefore, that information could be obtained from those persons which would reflect the characteristics of the total resident population. It was realized that persons not owning telephones may show characteristics different from those who do, and care was therefore taken in projecting results, obtained by sampling telephone owners, to the entire population.

The primary purposes of the telephone survey were to determine the percentages and numbers of persons in the resident population who fish in fresh and salt water and to determine the number of privately owned boats among the resident population. Particulars of the survey techniques used in determining the number of anglers are shown in Appendix I.

Telephone calls were made to 1,383 households, which contained 4,551 persons. The percentages of fishermen and boat owners in the entire sample, by area and in inland and coastal sections are shown in Table 1. The area breakdowns used are shown in Figure 1.

About 42 per cent of the persons in the sample reportedly fished in Florida at least once during 1955. Only in the southwest coastal and in the northwest inland areas did the percentage of fishermen differ from that in the entire sample by more than four percentage points. As expected, coastal samples contained a low percentage of exclusively fresh water fishermen, and inland samples a low percentage of exclusively salt water fishermen. About eight per cent of the total sample fished exclusively in fresh water and about 13 per cent exclusively in salt water. The percentages of persons who fished at some time in salt water ranged from a low of about eight per cent in the southeast inland area to a high of 50 per cent in the northwest inland area, with a total sample average of about 34 per cent. Table 1 also shows that about 56 per cent of the households sampled contained salt water anglers.

About 22 per cent of the households, or about seven per cent of the persons, owned one or more boats.

The Florida resident population in 1955 was estimated at 3,688,000 (Bureau of Business Research, University of Miami, 1955). Using this population figure and the telephone survey results (Table 1), the numbers of fresh and salt water anglers in the resident population has been estimated at 1,538,000 during 1956 (Figure 2). This total includes 291,000 who fished exclusively in fresh water, 487,000 who fished exclusively in salt or brackish water and 760,000 who fished in both fresh and salt water. The total number of persons who fished in salt and brackish water was 1,247,000. These projections were based on the characteristics of a sample of only telephone subscribers, 66 per cent of the population. It was assumed that the non-telephone owners fished in the same proportion as those with telephones. This may not be true; however, it probably would not greatly affect the above results.

These estimates of the numbers of fishermen might appear to some readers to be higher than would be expected. For example, the Crossley report (U. S. Fish and Wildlife Service, 1955) estimates that, in the South Atlantic area, 19.6 per cent of the population (12 years and older) fished in

TABLE 1

Percentages of fresh and salt water fishermen and boat owners in the sample of telephone subscribers.

		AREA 1*		AREA 2*		AREA 3*		AREA 4*		State total
		Coastal	Inland	Coastal	Inland	Coastal	Inland	Coastal	Inland	
Persons who go fishing		44.3	43.0	42.4	41.5	30.1	44.3	44.8	53.9	41.7
Those who fished in	Fresh water only	5.3	17.3	3.3	34.0	7.8	18.5	1.4	3.6	7.9
	Salt water only	16.8	1.0	26.1	0.9	10.1	7.6	11.7	0	13.2
	Both fresh & salt water	22.2	24.7	13.0	6.6	12.2	18.2	31.7	50.3	20.6
Households containing one or more salt water fishermen		58.2	34.8	61.3	17.3	41.2	37.4	84.3	80.3	55.6
Persons who go salt water fishing		39.0	25.7	39.1	7.5	22.3	25.8	43.4	50.3	33.8
Households with one or more boats		31.6	26.4	18.0	4.3	12.0	27.3	33.7	33.9	22.1
Persons who own one or more boats		10.5	9.9	5.3	1.0	3.4	8.5	9.4	10.6	6.7

*AREA 1—Northeast Florida
AREA 2—Southeast Florida
*AREA 3—Southwest Florida
AREA 4—Northwest Florida

fresh or salt water. The comparable figure obtained in this study was 42 per cent for Florida for the entire population. Among the factors influencing the great popularity of fishing in Florida are climate, length and nature of coastline and availability of fishing facilities. A further factor may be the attraction of Florida as a place to retire and many retired people are ardent fishermen. For these reasons, Florida is believed to have a considerably greater percentage of fishermen than neighboring states, and this is being confirmed by the preliminary results of a current survey being conducted by The Marine Laboratory of the University of Miami. In this study, about 1,100 names were selected at random from Florida street directories, and questionnaires were mailed to them. To date, replies have been received from about 70 per cent, and among these, 67.0 per cent reported that someone in their household fished in Florida's coastal waters during 1957. About 56 per cent of the households sampled in the telephone survey reported above contained salt water fishermen.

FISHING EFFORT

A. PROCEDURES

Sampling techniques, questionnaire formulation and other procedures used elsewhere were closely scrutinized to determine if any of these could be applied to the present study.

It was noted that other studies were characterized as having one of two distinctly different universes.* In some surveys, the universe consisted of all anglers participating in the fishery, while others used the number of man-days fished. Studies conducted by Calhoun (1950) and Pelgen (1955) in California and by Royall (1954) in Idaho are examples of the "angler-

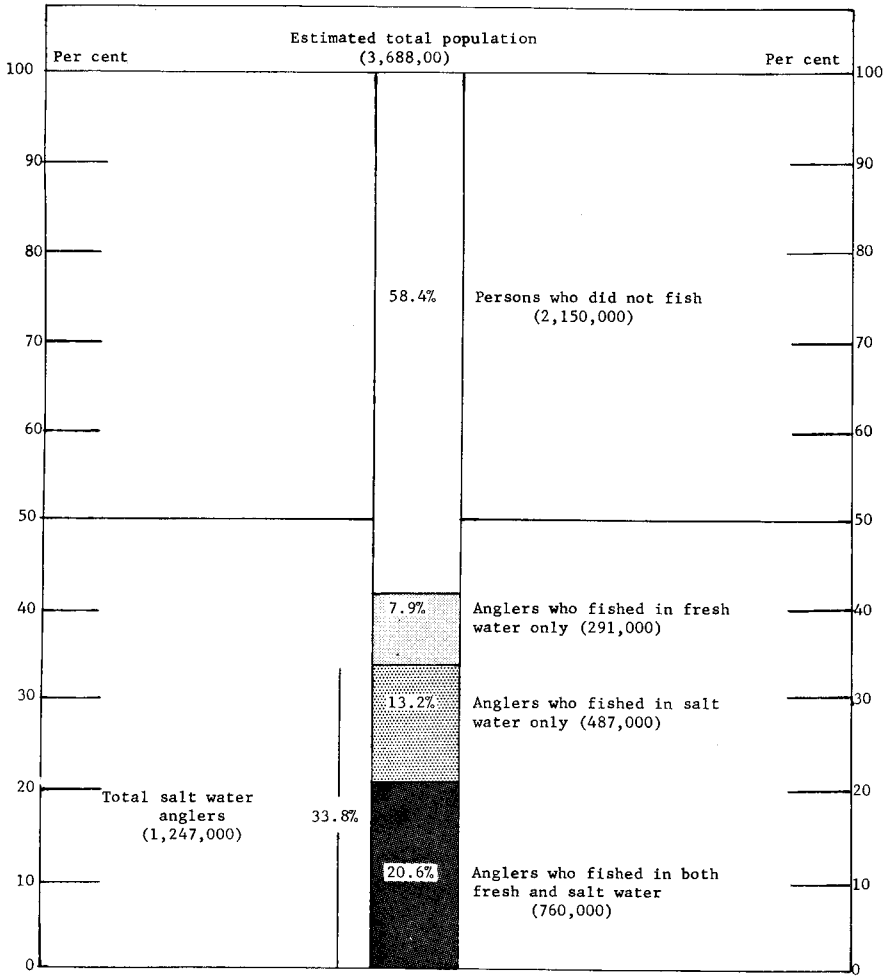

FIGURE 2. The fishing characteristics of Florida's resident population estimated from telephone survey data.

*"Universe" used throughout this text is a statistical term which refers to a population all of whose individuals or units belong to a precisely defined group.

type" universe. This technique is particularly suitable where anglers must purchase a license and when a list of the names and addresses of the licenses is accessible. Examples of the second general category, a "man-days' fished" universe, are studies by Buzzell and Walker (1954), Richards (personal correspondence), Younger and Zamos (1955), and most of the so-called "creel census" studies (Carlander, 1956).

When license lists are available, the first method seems most suitable. In the absence of license lists the second method is commonly used, but the angler-type universe was used in the national study conducted by the U. S. Fish and Wildlife Service (1955) despite the lack of complete license lists.

No survey technique reported in the literature was found to be applicable in its entirety to the Florida study, so techniques used elsewhere were adapted for certain segments of the present work.

The primary conditions influencing the choice of survey procedures were the amounts of money and manpower available for the study. Special conditions peculiar to the operation of the Florida fishery also played an important part and these conditions necessitated the use of unorthodox sampling procedures in some phases of the study. Some of these special conditions are as follows:

1. Large numbers of anglers are involved, both resident and tourist.

2. Angling is done along many thousands of miles of coastline, some parts accessible only by boat, and a variety of different types of fishing are used.

3. Seasonal differences in fishing activity between the northern and southern sections of the state are evident.

4. Basic tourist data, suitable for sampling controls, are lacking.

5. The collection of some survey data was necessarily done by State Board of Conservation agents and their part of the study was sometimes interrupted by enforcement and other duties. Thus a rigid sampling time schedule could not be maintained.

6. Although agents aiding in the survey had a wide knowledge of local fishing activities, they were for the most part untrained in survey techniques.

Since other researchers may be faced with similar problems in studies elsewhere, the authors feel that a more detailed discussion of factors influencing the selection of survey techniques in relation to the procedures used might be of interest. This is presented in Appendix II.

Due to the many different fishing methods used, not all salt and brackish water game fishing could readily be treated alike for survey purposes. There are two major categories into which fishing activities can be grouped. The first includes those requiring a hired operator who provides facilities and services, while no hired operator is required with the second group. The professional operators' knowledge and records can be utilized in the survey, but no such data are available for the methods grouped in the second category, so that different procedures must be used in the two cases.

Within the group using a hired operator, four clearly defined methods are recognized, based upon the type of facilities provided. These methods,

each of which has been treated separately, are as follows: Charter boat fishing, party boat fishing, boat rental (fishing camp) fishing, and paid pier fishing.

Methods with which no paid operator is involved also fall into four groups, each of which was likewise treated separately. These are as follows: Bridge, jetty and free pier fishing, shorefishing, private boat fishing, and spearfishing.

From operator-type methods, fishing effort information was obtained for 1955 and the data presented on these types apply to that year. The sampling methods used for the remaining types only provided data for 1956.

For some types of fishing estimates of fishing activity were compiled separately for each of four areas of the state shown in Figure 1.

The counties in Area 1 are Alachua, Baker, Bradford, Brevard, Clay, Columbia, Duval, Flagler, Indian River, Lake, Marion, Nassau, Orange, Osceola, Putnam, St. Johns, St. Lucie, Seminole, Union and Volusia.

The counties in Area 2 are Broward, Dade, Highlands, Martin, Monroe, Okeechobee and Palm Beach.

The counties in Area 3 are Charlotte, Collier, DeSoto, Glades, Hardee, Hendry, Hillsborough, Lee, Manatee, Pinellas, Polk and Sarasota.

The counties in Area 4 are Bay, Calhoun, Citrus, Dixie, Escambia, Franklin, Gadsden, Gilchrist, Gulf, Hamilton, Hernando, Holmes, Jackson, Jefferson, Lafayette, Leon, Levy, Liberty, Madison, Okaloosa, Pasco, Santa Rosa, Sumter, Suwannee, Taylor, Wakulla, Walton and Washington.

B. SAMPLING THEORY

Among several possible sampling techniques, a stratified random one was considered, but the conditions discussed earlier precluded its use except for the telephone survey. The sampling method used most frequently in the present study was a combination of two techniques, systematic and judgment. These methods were also used separately.

A systematic sample involves the adoption of rhythm in the selection of test units. For example, the inclusion of every fifth person or party would constitute a systematic form of selection. Judgment sampling is a form of non-probability selection of test items where a person familiar with conditions in the universe sets up what he believes is a representative sample. Judgment sometimes was used as a method of stratification. These techniques cannot be called random sampling, but it is believed that they provide acceptable gross estimates. Comparisons between the results obtained in this study and those of other studies are made later in this report. In general, the results are in fairly close agreement.

C. COLLECTION OF FIELD DATA

For the collection of field data, the coastal counties of the state were divided into 17 areas and one conservation agent was assigned to each. The agents had a great deal of local knowledge of fishing activity in their areas. Each agent prepared a list of fishing facilities and was responsible for the collection of almost all field data in their assigned area. Other agents and Marine Laboratory staff assisted in these duties from time to time.

Prior to the start of field operations, General Agents and agents assigned

to survey work were called together for a meeting. Instructions were given on the collection of data and the interviewing techniques. Practice interviews were made under supervision.

Agents were supplied with schedules instructing them where and when to make interviews and collect data. Completed interview forms were mailed weekly to the Laboratory. Close contact was maintained with the agents by personal visit and by correspondence.

Estimates of fishing effort are presented in different ways depending upon the most desirable wording of the questions asked to obtain the information. For charter-boat, party-boat and boat rental fishing methods, the terms "boat-trip," "man-trip" and "fisherman-trip" are used. The total number of boat-trips is the total of separate trips made by all boats by the methods of fishing concerned. The total number of man-trips is the total number of persons carried on all boat trips. This figure was obtained by multiplying the total number of boat trips by the average number of persons per trip. The total number of fisherman-trips is similar to man-trips, except that it includes only those persons who fished during the trip, and excludes non-fishermen accompanying anglers.

For the remaining fishing methods, "day" is synonymous with "trip."

The estimates presented in the later sections include some trips after which anglers sold fish caught and also a limited amount of hook and line commercial fishing. No separate estimate was obtained on these activities. Personal interviews with anglers were utilized to secure information on their expenditures.

D. RESULTS

As a preliminary to the collection of information, such as number of angler fishing days and the expenditures, it was necessary to compile data on the fishing facilities available throughout the state. Table 2 is a summary of such facilities in each county. The table shows that these are roughly proportional to the county population. Among the counties with the greatest numbers of fishing facilities are Duval, in northeast Florida, Palm Beach, Broward, Dade and Monroe in southeast Florida, Sarasota, Pinellas and Hillsborough in southwest Florida and Bay county in northwest Florida. These counties contain the largest population, including most of the larger coastal cities.

Descriptions of fishing methods, individual survey methods for the various categories of fishing and the results are given separately in the following sections. A study of angler expenditures is presented in a separate section. In most cases, data are presented for 1956; however, some information, including charter and party boat estimates, applies to 1955.

1. Charter Boat Fishing

This method concerns fishing from boats where the anglers pay a combined fee for the use of the boat and for the services of the captain, and usually a mate. Hook and line is normally the fishing method used, but spearfishing parties are occasionally taken out. No separate estimate has been obtained on that portion of the total activity devoted to spearfishing. Charter boats carry from one to eight persons and make half or whole day

trips. The charter fee ranges from about $20-80 per day, a charge which may sometimes be shared by a group of anglers. These boats troll, drift or "still-fish" from close inshore to several miles offshore. Tackle and bait are usually furnished free.

The number of charter boats operating around Florida's coast varies seasonally. Some captains fish the waters of other states during the summer. Figure 3 shows the estimated maximum number of charter boats operating in each coastal county.

TABLE 2

Coastal county data including estimated 1955 populations* and numbers of charter and party boats, fishing camps, paid piers, bridges, free piers and jetties and pleasure boats licensed by the State Board of Conservation.

Coastal County	Est. Pop. 1955 in '000's	No. Charter Boats	No. Party Boats	No. Paid Piers	No. Fishing Camps	No. Bridges, Free Piers & Jetties	No. Lic. Pleasure Boats
Nassau	16	0	0	1	11	1½	3
Duval	366	0	2	3	40	9½	41
St. Johns	30	2	2	1	14	7	8
Flagler	5	0	0	1	3	1	1
Volusia	105	17	0	1	9	9	71
Brevard	42	4	3	1	15	15	45
Indian River	15	0	0	3	3	3	60
St. Lucie	27	3	0	0	8	8	66
Martin	10	26	0	0	13	6	213
Palm Beach	161	68	8	0	13	17	432
Broward	168	100	10	2	12	12	465
Dade	703	182	38	2	27	27	1,415
Monroe	43	119	20	0	46	40	96
Collier	12	20	0	0	14	2	79
Lee	33	25	1	1	36	7	241
Charlotte	5	5	0	0	12	7	42
Sarasota	39	15	3	0	22	9	494
Manatee	46	9	3	0	26	7½	201
Pinellas	316	36	15	0	27	9	270
Hillsborough	202	2	2	0	48	7½	357
Pasco	27	0	0	0	5	2	39
Hernando	8	1	0	1	2	0	3
Citrus	7	39	2	0	2	0	46
Levy	12	18	1	0	12	6	13
Dixie	4	0	14	0	6	0	7
Taylor	15	0	0	0	16	0	2
Jefferson	12	0	0	0	0	0	0
Wakulla	6	17	3	0	11	0	4
Franklin	6	14	3	2	10	7	17
Gulf	10	0	0	0	1	2	6
Bay	65	33	18	2	15	15	43
Walton	17	0	0	0	9	8	0
Okaloosa	40	7	12	1	7	8	20
Santa Rosa	23	0	1	0	9	3	34
Escambia	142	0	3	1	14	7	91
Totals	2,738	762	164	23	518	263	4,925

*Bureau of Business Research, University of Miami, 1955.

Although most coastal counties had one or more charter boats, the numbers varied widely by areas. These are located primarily in three general regions: Martin, Palm Beach, Broward, Dade and Monroe counties on the lower East Coast; Collier, Lee and Pinellas counties on the lower West Coast, and Citrus and Bay counties on middle and upper West Coasts. Dade County, with 182 boats, has the greatest number in the state.

Conservation agents interviewed 188 charter boat captains, about 25 per cent of the total fleet. Data were obtained on the estimated number of

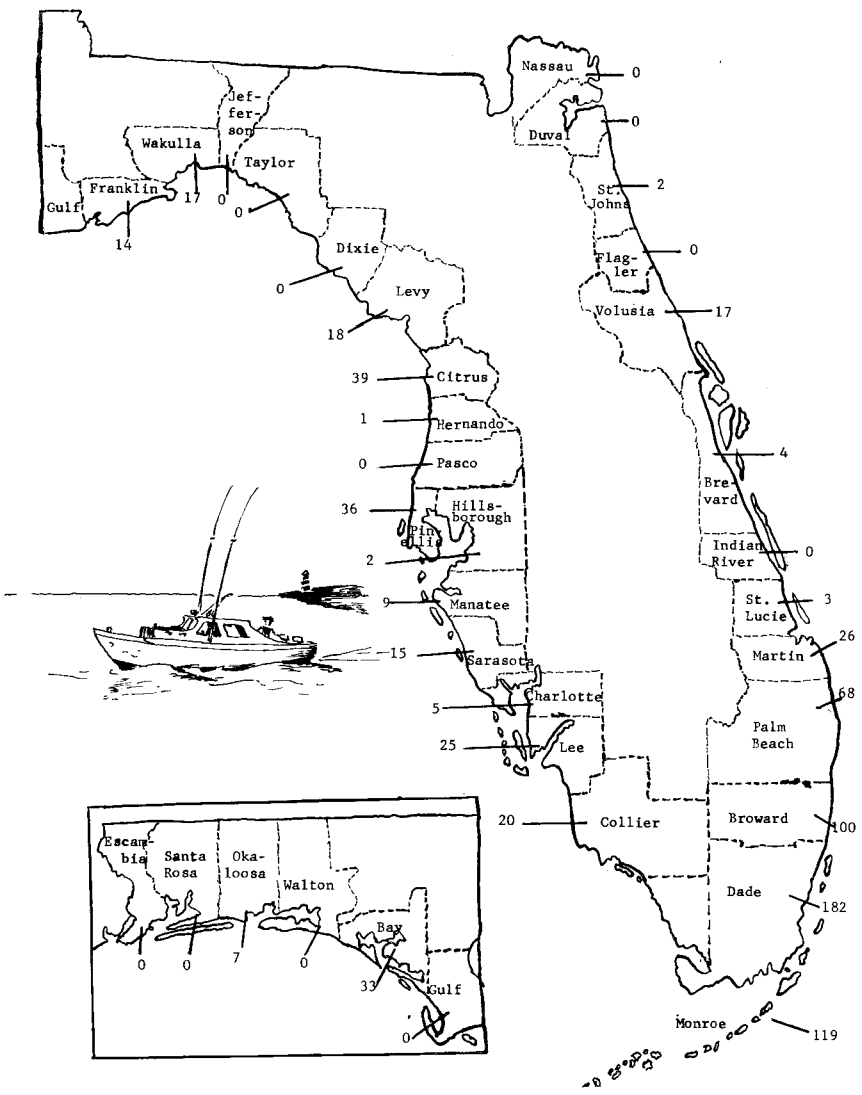

FIGURE 3. Numbers of charter boats operating from each coastal county of the state.

trips made during 1955 and the average numbers of fishermen and non-fishermen on each trip. Estimates of state-wide activity were obtained by projecting the average activity and number of anglers per boat to the total boats in the fleet.

Table 3 shows that 762 charter boats made about 95,000 trips during the year and carried over 449,000 persons, among whom 381,358 were fishermen. About two thirds of the trips were made in the southeast section of the state.

Only a few charter boats operated in northeast Florida, these boats fished a greater average number of days and carried more anglers per trip than those elsewhere. The large number of boats in southeast Florida is associated with the availability there of the popular offshore game fishes, including sailfish and dolphin, (Ellis, 1957).

TABLE 3

The number of boats, numbers of interviews, average number of trips per boat, total number of man trips and average duration of trips concerned with the charter boat fishery in each of the four subdivisions of the state.

	AREA* 1	AREA* 2	AREA* 3	AREA* 4	STATE TOTAL
PART I. AGENTS' ESTIMATES					
Total no. of charter boats	26	495	112	129	762
PART II. OPERATOR INTERVIEW DATA					
No. of captains interviewed	8	96	36	48	188
Percentage of total in sample	31	19	32	37	25
Av. no. of trips per boat per yr.	161.7	129.3	113.4	108.8	
Av. no. of fishermen per trip	6.9	3.9	4.0	3.7	
Av. no. of non-fishermen per trip	0	1.0	0.1	0.2	
Total no. of trips	4,204	64,004	12,701	14,035	94,944
Total no. of man trips	29,008	313,620	52,074	54,736	449,438
Total no. of fisherman trips	29,008	247,616	50,804	51,930	381,358
PART III. FISHERMEN INTERVIEW DATA					
No. of parties interviewed	17	282	23	101	423
Av. duration of trip in hours	6.8	5.8	7.6	7.9	6.1

*AREA 1—Northeast Florida
AREA 2—Southeast Florida
*AREA 3—Southwest Florida
AREA 4—Northwest Florida

2. Party Boat Fishing

The operation of this method is similar to that of charter boat fishing, with the exceptions that the size of the fishing group is larger; party boats usually differ in size and shape from charter boats, and only still and drift fishing methods are used. Anglers on party boats usually pay an individual fee or "head" charge of about $5 and these boats are therefore sometimes called "head" boats. Coral reefs are favored fishing locations for these vessels. Figure 4 shows the number of such boats operating from each coastal county.

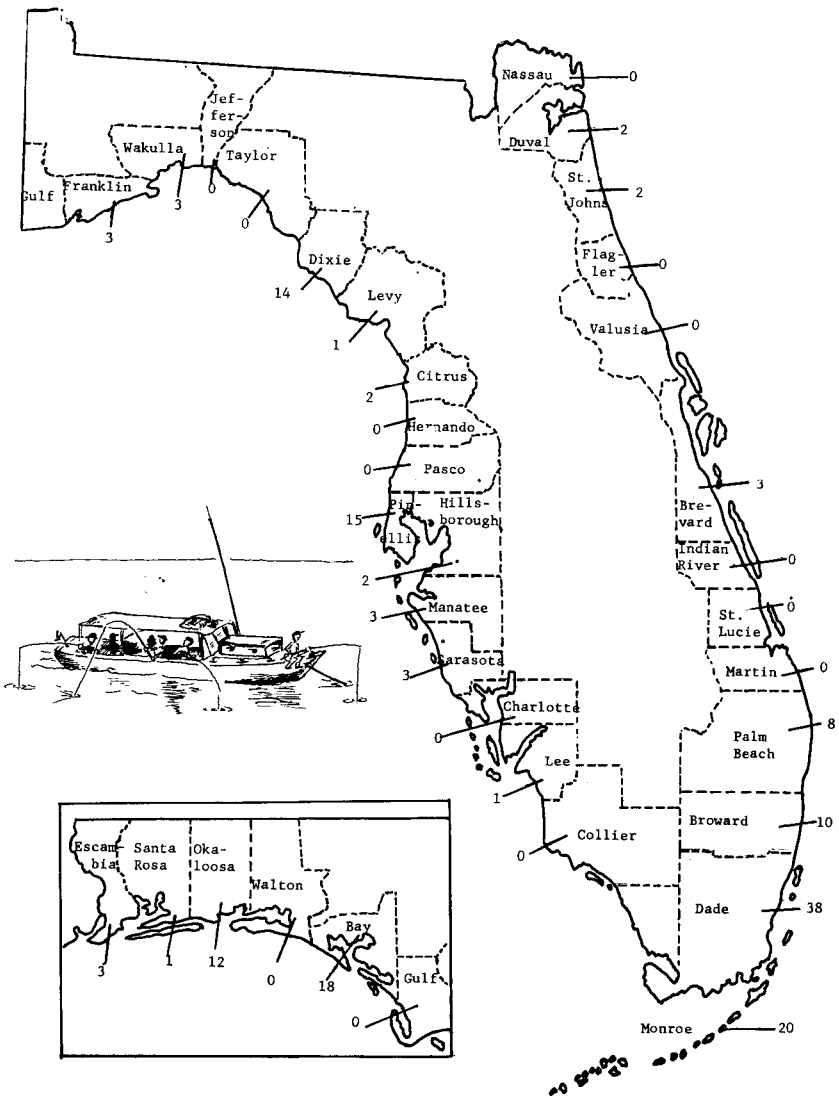

FIGURE 4. Numbers of party boats operating from each coastal county of the state.

Party boats are distributed around the entire Florida coastline. However, about 78 per cent of the total party boats in the state occur in the following seven counties: Broward, Dade, Monroe, Pinellas, Dixie, Bay and Okaloosa. Dade County, with 38 boats, has the greatest number of party boats in the state.

Conservation agents were asked to obtain data from as many party boat captains as possible. Fifty captains, or 30 per cent of the state total, provided estimates of both the number of trips made during 1955 and of the number of anglers per trip. The total number of man trips was computed by projection. Table 4 shows that the boats in southeast Florida fished a greater number of days than those in other parts of the state. Only a few boats operated in northeast Florida.

The 164 party boats in the state made about 33,000 trips during the year. A total of 474,000 man trips were made, among which 458,000 were fisherman trips.

TABLE 4

The number of boats, numbers of interviews, average number of trips per boat, total number of man trips and average duration of trips concerned with the party boat fishery in each of four subdivisions of the state.

	AREA* 1	AREA* 2	AREA* 3	AREA* 4	STATE TOTAL
PART I. AGENTS' ESTIMATES					
Total no. of party boats	7	76	24	57	164
PART II. OPERATOR INTERVIEW DATA					
No. of captains interviewed	3	14	15	16	50
Percentage of total in sample	43	18	62	35	30
Av. no. of trips per boat per yr.	152.0	275.6	200.6	115.8	
Av. no. of fishermen per trip	12.0	11.8	18.1	16.9	
Av. no. of non-fishermen per trip	0.7	0.5	0.7	0.1	
Total no. of trips	1,064	20,946	4,814	6,601	33,425
Total no. of man trips	13,513	257,636	90,985	112,217	474,351
Total no. of fisherman trips	12,768	247,163	87,133	111,557	458,621
PART III. FISHERMEN INTERVIEW DATA					
No. of parties interviewed	19	102	44	122	287
Av. duration of trip in hours	9.8	5.6	6.7	11.4	7.8

*AREA 1—Northeast Florida
AREA 2—Southeast Florida
*AREA 3—Southwest Florida
AREA 4—Northwest Florida

3. Boat Rental (Fishing Camp) Fishing

This method of fishing is carried on from establishments where skiffs can be rented. Such places are usually called fishing camps or boat liveries. Hook and line is the usual technique employed although the estimate of total man-trips includes a limited amount of spearfishing, for which no separate estimate is available.

From two to about 100 skiffs may be available for rental at fishing camps. The rental fees range from $1 to about $10. Outboards are usually

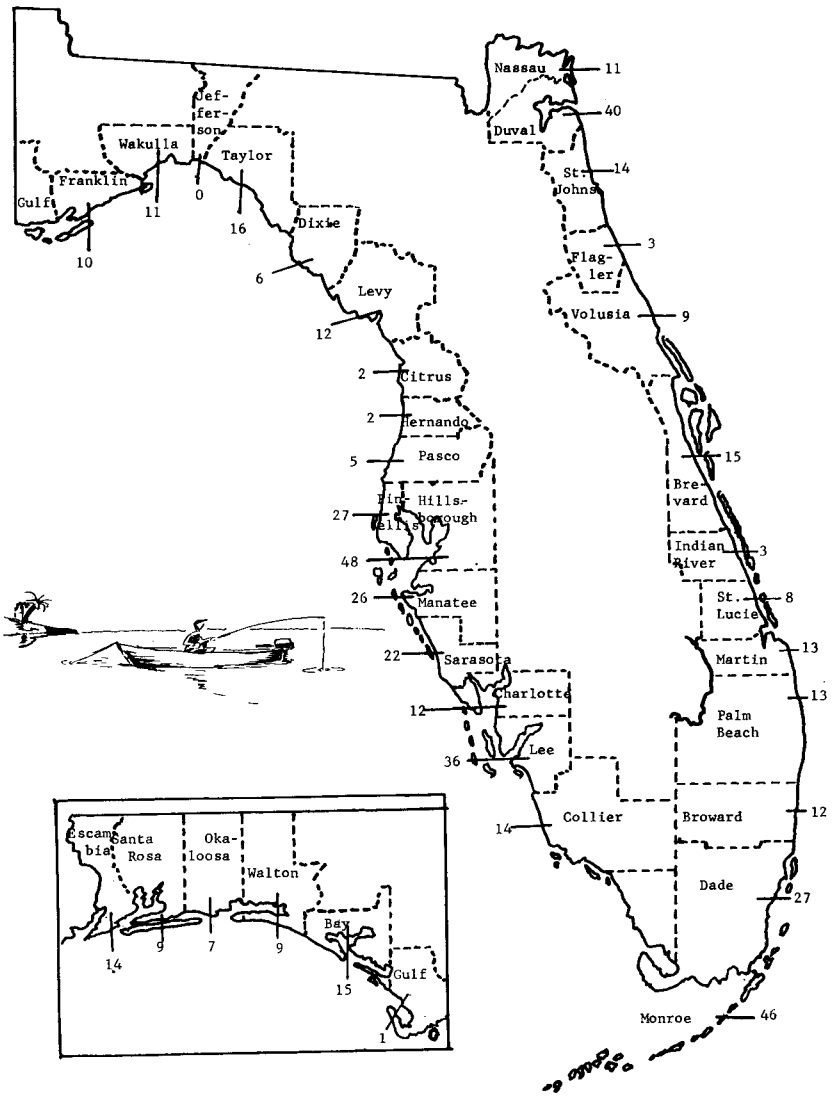

FIGURE 5. Numbers of fishing camps operating in each coastal county of the state.

available for hire, although many anglers supply their own. Fishing tackle, bait, food, drink, sleeping accomodations and the services of experienced guides may also be available.

Skiffs may be rented for whole days, half days or on an hourly basis, depending upon the policy of the operator.

Figure 5 shows the numbers of fishing camps catering to salt and brackish water anglers around the state.

Every coastal county, except Jefferson, had one or more fishing camps. The frequency of camps per county roughly paralleled the county population. (Table 2.) Hillsborough County, with 48 camps, had the greatest number in the state.

Two methods were used to measure the total number of man-trips from fishing camps during the year. The first consisted of interviewing as many fishing camp operators as possible, and asking them for the numbers of daily rentals of their boats during 1955. This information was obtained from 317 coastal fishing camp operators, who comprised 57 per cent of the total number.

The second method consisted of distributing log books to operators willing to cooperate. The numbers of rentals each day during 1956 were entered in the books and completed sheets were returned to the laboratory monthly. By this method, information was received from about eight per cent of the total operators.

Table 5 shows the results of interviews and other data concerned with boat rental fishing. Due to the small size of the sample the log book data were only presented for the entire state and not on an area basis.

Operator interview data yielded an estimate of 597,000 rentals, while an estimate of 702,000 rentals was obtained from log book data. Part of this difference is due to the fact that operators estimated activity during 1955, while the log books measured rentals during 1956. Fishing activity probably follows population and other business trends, and 1956 rentals should be greater than those in 1955. It is likely that the percentage increase between the two would be at least as great as the rate of population increase in Florida, namely about six per cent. National trend data on the increased availablity of leisure time suggests that a six per cent increase in fishing activity between 1955 and 1956 is minimal. However, the difference between the two estimates, about 17 per cent, seems greater than could be explained by an increase in activity. The following circumstances probably affected this: the operator interview method depended upon recall of rentals during the preceding twelve months period. Only a few of the operators kept records, and for the remainder the estimate was rough. The sample was large and was believed to be reasonably representative. In the opinion of the survey agents, who were often familiar with the operators' businesses, the estimates of numbers of rentals often appeared to be low.

Only a small sample of operators kept log books. The entries were normally made at the time that the boats were rented, hence the data are believed to be reliable for the operators concerned. However, it is possible

TABLE 5

Data concerned with the boat rental fishery in each of four subdivisions of the state including number of fishing camps and boats, numbers of interviews, average number of rentals per camp, total number of man trips and average duration of trips.

	AREA* 1	AREA* 2	AREA* 3	AREA* 4	STATE TOTAL
	PART I. AGENTS' ESTIMATES				
A. Total no. of fishing camps	143	111	185	119	558
	PART II. OPERATOR INTERVIEW DATA				
B. No. of camps in sample	66	66	108	77	317
C. Percentage of total in sample	46	60	58	65	57
D. Av. no. of rental boats per camp	12.3	11.0	11.5	9.6	
E. Estimated total no. of rental boats A (D)	1,759	1,221	2,130	1,142	6,252
F. Av. no. of rentals per camp	1,055.0	925.6	1,332.7	814.8	
G. Estimated total no. of rentals A (E)	150,865	102,737	246,548	96,966	597,116
Per cent of total rentals	25.3	17.2	41.3	16.2	100.0
	PART III. OPERATOR LOG BOOK DATA				
H. No. of monthly log sheets					514
I. Percentage in sample of total camp months					7.7
J. Av. no. of rentals per camp per year					1,258.8
K. Total no. of rentals A (J)					702,410
L. Per cent of total rentals	25.3	17.2	41.3	16.2	100.0
	PART IV. FISHERMEN INTERVIEW DATA				
M. No. of parties interviewed	88	113	289	172	662
N. Av. no. of fishermen per trip	2.0	2.5	2.3	2.4	
O. Av. no. non-fishermen per trip	0	0	0.2	0	
P. Av. duration of trip in hours	6.1	5.8	6.0	7.1	
	PART V. ESTIMATES BASED ON ABOVE				
Estimated total no. of rentals combined data	164,288	111,776	268,321	105,378	
Total no. of man trips	328,780	279,398	670,880	252,629	1,531,687
Total no. of fisherman trips	328,780	279,398	617,210	252,629	1,478,017

*AREA 1—Northeast Florida
AREA 2—Southeast Florida
*AREA 3—Southwest Florida
AREA 4—Northwest Florida

that only operators with better-than-average businesses agreed to keep records. Therefore, the projected estimate of total activity from these data may be an overestimate of the overall activity.

It appears that the best possible estimate of total activity, and one accurate enough for the purposes of this survey, will be that obtained by averaging the estimates of the two methods. The activity by area has been derived by prorating this average according to the estimates obtained by area in the operator interview survey. These estimates are shown in Table 5. This shows that anglers on rented skiffs fished about 1.5 million man trips during the year. Approximately 42 per cent of this activity took place in southwest Florida, northeast Florida being the area next in importance with about 22 per cent of the total activity.

4. Paid Pier Fishing

This method includes all non-boat, hook and line fishing from piers where a charge is made for fishing privileges. These piers have usually been constructed for fishing purposes and are owned and operated by city or county authorities, by private individuals or by corporations. The admission charge for fishermen is usually about 50 cents. Spectators may be allowed on the pier for a lower charge. Bait, tackle and other items can usually be purchased at the pier.

Interviews were obtained from all pier operators who were able and willing to cooperate, namely 12 out of a state total of 23. Data were obtained on the number of fishermen during 1955. Some operators were required to keep records for city or county purposes and these records aided in obtaining an accurate estimate of paid admissions. The total number of man-days of fishing was calculated by projecting the average activity. No breakdown was made for activity by area due to the small number of paid piers in the state.

Table 6 shows that during the year about 876,000 man days were spent on paid piers throughout the state; 569,000 of these days were spent by fishermen.

TABLE 6

Total number of paid piers, number of interviews, average number of fishermen and non-fishermen per pier and total number of man days fishing on paid piers.

	STATE TOTAL
Total number of paid piers in state	23
Number of paid piers in sample	12
Percentage of total in sample	52
Average number of fishermen per pier	24,760
Average number of non-fishermen per pier	13,322
Total man days on piers	875,886
Total fisherman days on piers	569,480

5. Bridge, Free Pier and Jetty Fishing

This category includes all non-boat, hook and line fishing from bridges,

jetties and free piers in the survey area. A few sections of seawall which had similar characteristics to jetties were also included. These locations have the features in common of being public places where no charge is made for fishing, where fishermen are usually concentrated in a small area. Bridges and jetties where public fishing is not permitted and locations where no fishing takes place for other reasons have been excluded from this study.

Instantaneous hourly counts were made of fishermen at the locations in this category, partly according to a systematic time of day and day of the month schedule. Other counts were made when survey personnel passed the locations on other duties. The numbers of counts made are shown in Table 7.

In computing number of man-days of fishing, controls were applied to reduce certain possible sources of bias. These controls are listed below.

a.) Separate computations were made for each coastal county.

b.) Consideration was given to possible seasonal bias by treating the data separately for four quarters of the year.

c.) Consideration was given to differences in fishing activity between weekends and holidays on one hand and weekdays on the other hand by computing fishing pressure during each separately.

TABLE 7

Data on bridge, free pier and jetty fishing in each of four subdivisions of the state, including number of these locations, number of counts, number and average duration of fisherman days and number of interviews.

	AREA 1[1]	AREA 2[1]	AREA 3[1]	AREA 4[1]	STATE TOTAL
	PART I. AGENTS' ESTIMATES				
No. of bridges, bridge groups, jetties and free piers[2]	54	67	53	52	226
	PART II. HOURLY COUNT DATA				
No. of counts made	5,798	7,679	3,738	4,133	21,348
Estimated total no. of fisherman days	1,158,498	2,201,065	1,441,501	799,035	5,600,099
	PART III. FISHERMEN INTERVIEW DATA				
Av. duration of fisherman day in hours	5.6	4.1	4.4	4.1	4.7
No. of interviews[3]	784	475	862	456	2,577

[1]AREA 1—Northeast Florida
AREA 2—Southeast Florida
AREA 3—Southwest Florida
AREA 4—Northwest Florida

[2]In some cases adjacent bridges were grouped together for checking purposes. Therefore these totals differ from the ones shown in Table 2.

[3]Includes interviews of paid pier fishermen which were grouped with this category because of similarities in the method of fishing.

d.) To reduce time of day bias, four time groupings during the day were computed separately.

The results of studies of this type of fishing are shown in Table 7. Since paid pier fishing resembles this type in most ways, the angler interview data from both types were pooled.

Anglers on 226 bridges, jetties and free piers fished about 5.6 million days during the year (Table 7). This estimate was derived from more than 21,000 counts. Almost 40 per cent of the total pressure associated with this kind of fishing took place in Area 2, (the lower east coast), despite the fact that this area contained less than 30 per cent of the locations surveyed.

The extensive bridge fishing in southeast Florida is associated both with the large resident and tourist populations in the area and also with the abundance of mackerel in the winter around the bridges and jetties.

6. Shorefishing

Included in the shorefishing category are the kinds of fishing usually called surf-casting, bank-fishing and wading. Also included is fishing from private jetties, some sea walls, causeway fills and similar locations. Unlike the locations discussed in the previous category, shorefishing locations are places where fishermen tend to be dispersed.

Much of Florida's shoreline is unsuitable for this kind of fishing due partly to the presence of extensive mangrove areas. Only a limited amount of the remaining shoreline is frequented by anglers.

From preliminary observations and enquiries, it appeared that shorefishing, as defined above, was of lesser importance than the methods previously mentioned. The time allocated for the collection of shorefishing data was therefore less than for other methods.

The areas where shorefishing does take place were divided into counting units. Although these units varied in size the largest was limited to an area which could readily be checked for numbers of fishermen from boats or automobiles during the daylight hours of one day. Preliminary planning called for periodic counts to be made of fishermen by airplane as well as from boats and automobiles. Aerial surveys were later withdrawn when the Conservation Department plane was diverted to other duties.

All counts were made systematically by conservation agents. The counts were made only during daylight hours, since no practical method could be devised for counting after dark and an estimate is thus not available of shorefishing activity at night. However, night shorefishing activity is believed to be small.

The method used to compute the number of shorefishermen-days was similar to that used in computing bridge fishermen-days described earlier. The only differences between the two methods were the following:

1. For shorefishing, a breakdown by coastal county was felt to be unnecessary due to the similarity of conditions in adjoining counties. The area breakdown used was that shown in Figure 2.

2. Due to the size of the shore checking units, hourly counts were im-

possible; thus, time of day was not used as a control factor.

An estimated total of about 267,000 man-days were spent in this activity during daylight hours throughout the state (Table 8). Approximately half of the total effort expended on this kind of fishing took place in southeast Florida.

7. Private Boat Fishing

This category comprises all recreational fishing from privately owned boats. Public hire boats (charter, party and rental boats) and commercial fishing boats were excluded from this category.

When counting from the airplane had to be abandoned the revised procedure called for finding out the total number of privately owned boats in the state, the percentage of the above which were used for salt water recreational fishing, and the average number of days fished by each in salt water.

Only a small percentage of privately owned boats in the state are required to be licensed or documented, thus no complete list of boats was available. Two sources of data were used to obtain estimates of the numbers of boats. These were as follows:

(a) *Boating Industry and U. S. Coast Guard Data*

According to these sources the number of privately owned pleasure boats over 16 feet or five tons throughout the country was 297,000 on January 1, 1957, of which Florida's share was 26,014, or 6.56 per cent of the national total. Boating trade sources estimate the total number of all sizes of private boats throughout the country to be 5,971,000. These sources further allow an estimate that Florida's percentage of the national total is about the same as for the registered boats, namely 6.56 per cent, or 392,000 boats.

TABLE 8

Data on shorefishing in each of four subdivisions of the state including number of areas sampled, number of counts, number and average duration of fisherman days and number of interviews.

	AREA[1] 1	AREA[1] 2	AREA[1] 3	AREA[1] 4	STATE TOTAL
	PART I. AGENTS' ESTIMATES				
No. of shore areas	20	20	15	20	75
	PART II. DAILY COUNT DATA				
No. of counts made	58	34	101	54	247
Estimated total no. of fisherman days	81,157	125,901	27,318	32,364	266,740
	PART III. FISHERMEN INTERVIEW DATA				
Av. duration of fisherman day in hours	5.1	5.9	4.5	6.1	5.2
No. of interviews[2]	159	63	263	154	639

[1]AREA 1—Northeast Florida
AREA 2—Southeast Florida
[1]AREA 3—Southwest Florida
AREA 4—Northwest Florida
[2]Includes only daylight hours, no estimate available for hours of darkness.

The reliability of the above estimates for non-registered boats is not known. Due to Florida's long coastline and to the great popularity of salt water fishing in this state, the ratio of large (registered) boats to the total of all sizes might be expected to be greater for Florida than for the country as a whole. Thus the estimate presented above of the total numbers of boats in Florida and based upon the national percentage of large boats is likely to be an overestimate of the true quantity.

(b) *Telephone Survey Data*

One of the purposes of the telephone survey (discussed earlier) was to determine the number of Florida residents who owned boats in 1956. The sample was drawn only from telephone owners (two thirds of the total resident population). The frequency of boat ownership in the sample was 6.7 per cent (Table 1). A projection of this frequency to the entire resident population might be biased if differences exist between telephone and non-telephone owners. Non-telephone owners belong partly to two groups, namely, recent arrivals and members of low income groups. In both of these groups the frequency of boat ownership might be expected to be lower than for telephone owners. No quantitative data are available to substantiate this assumption and for the purposes of this analysis it will be assumed that the frequency of boat ownership among non-telephone owners is half of that by telephone owners. This is probably a low estimate.

It is estimated that 160,000 telephone owners owned boats in 1956 (Table 9). The remaining third of the population had a "boat-owning frequency" of 3.35 per cent, and of this group about 40,000 will have owned boats. The total number of residents who owned boats was therefore about 200,000.

Data were also obtained from part of the telephone sample on persons owning more than one boat. Fifty-four persons in the sample owned a total of 65 boats. If this rate were true for the entire population, 200,000 persons would have owned about 241,000 boats in 1956. The estimate derived from the telephone survey method is believed to be closer to the true figure than the one derived from national boating information. It has been explained that the latter is likely to be an overestimate.

8. Fishing Pressure

Data discussed in the previous section show that about 200,000 residents of Florida owned one or more boats in 1956. Those persons may, however, use their boats for purposes other than fishing. For example, five per cent of boat owners in the sample reported that they did not go fishing during the twelve months prior to contact, and eight per cent of those who fished reportedly did not use their boats for fishing. The remainder, amounting to 175,000 persons, used their boats for fishing.

Among those boat owners who went fishing, 18 per cent fished exclusively in fresh water. The remaining 144,000 persons fished either exclusively in salt water or in both salt and fresh water. It was further determined that these persons used their boats for fishing an average of 26.8 days during the year. The total number of days on which residents used their boats for salt and brackish water fishing was therefore 144,000 times 26.8, or

3,859,000. On the basis of the interview program this activity accounts for about 86 per cent of the total; the remaining 14 per cent or 628,000 days consisted of non-resident boat fishing activity. The average number of fishermen on each boat trip was 2.36. The total number of fisherman-days was, therefore, 9,107,000 for residents and 1,483,000 for non-residents, with a grand total of 10,590,000 fisherman-days.

Table 9 summarizes the calculations used in computing the fishing pressure expended in this category.

Due to differences in number of telephone calls made per area and to the absence of data on non-resident private boat fishing by area, no reliable estimate of private boat fishing activity by area could be made.

9. Spearfishing

A description of the techniques used by spearfishermen and other particulars of spearfishing in the Florida Keys area are reported by Murdoch (1957). Because many people believe that irresponsible spearing is harmful to the stocks of fish, this sport has been considerably restricted by legislative action in Florida, but it still continues to be a popular pastime in unrestricted areas.

A minor part of the fishing effort attributed to other kinds of fishing should correctly have been attributed to spearfishing. For example, charter and party boat captains and fishing camp operators sometimes provide facilities for spearfishermen. Similarly, spears were used during a small part

TABLE 9

Summary of steps used in deriving the number of resident and non-resident fishing days on private boats. (Including percentages of boat owners and of those who fish in salt water, total number of boats, average number of days fished, ratio of resident to non-resident activity, average number of fishermen per trip and average duration of fisherman day.)

Percentage of telephone owners who own a boat[1]	6.7
Number of telephone owners who own a boat	160,000
Percentage of non-telephone owners who own a boat[2]	3.35
Number of non-telephone owners who own a boat	40,000
Total number of boat owners in resident population	200,000
Percentage of boat owners who fished[1]	95.
Number of boat owners who fished	190,000
Percentage of fishermen boat owners who used boat for fishing[1]	92.
Number of fishermen boat owners who used boat for fishing	175,000
Percentage of above who fished in salt water[1]	82.
Number of above who fished in salt water	144,000
Average number of days boat used for fishing[1]	26.8
Total number of resident boat fishing days	2,859,000
Ratio of resident to non-resident boat days[3]	86:14
Total number of non-resident boat fishing days	628,000
Average number of fishermen per boat day[3]	2.36
Total number of resident fisherman days	9,107,000
Total number of non-resident fisherman days	1,482,000
Total fisherman days	10,589,000
Average duration of fisherman day in hours	6.60

[1]Telephone survey data
[2]See text page 26 (Section 7. Private Boat Fishing)
[3]Direct interview data

of the total private boat fishing activity. No separate estimate is available of the portion of these activities attributable to spearfishing.

Murdoch (1957) estimated that about 5,700 man days were spent on spearfishing in the Florida Keys during the period August 1, 1955 and July 31, 1956. At this time the Florida Keys area was probably the most popular spearfishing area in the state and a significant percentage of the total statewide activity took place there. It seems likely, therefore, that the statewide spearfishing activity is considerably less than that of any of the other fishing methods discussed earlier. The total expenditures attributable to this pastime are also likely to be small compared with those of the other fishing methods.

10. Summary of all Kinds of Fishing

Resident anglers fished a total of about 14 million days and non-resi-

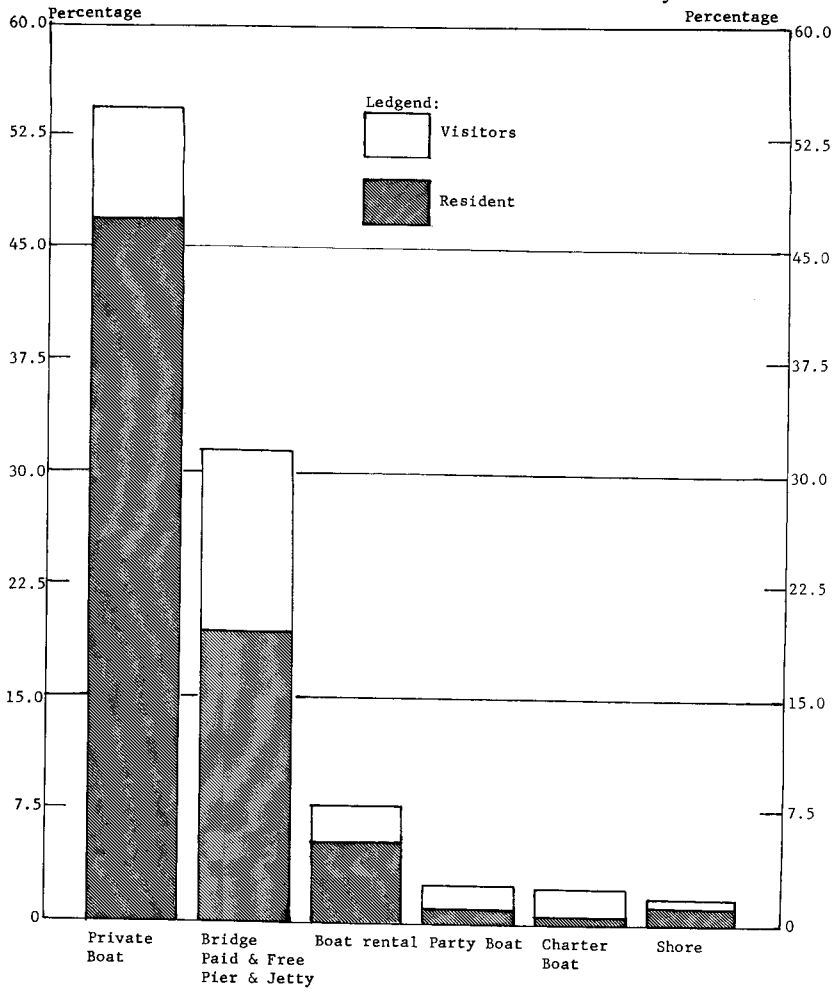

FIGURE 6. Percentages of resident and tourist man days fished by kinds of fishing, 1955-1957.

dents about five million days during the study period, with a a grand total of about 19.5 million fishermen for all anglers (Table 10). Nearly 55 per cent of the fishing effort is attributed to private boat fishing and 86 per cent of the effort by this kind of fishing was by residents (Table 10 and Figure 6). Bridge, jetty and pier fishing was next in importance, accounting for about 31 per cent of the total effort. About 61 per cent of this effort was done by residents. The third most important kind of fishing is boat rental fishing which accounts for about seven per cent of the effort, about two thirds of which was by residents. Private boat fishing, bridge, pier and jetty fishing and boat rental fishing together account for 94 per cent of the fishing effort. Charter and party boat fishing each accounted for less than three per cent of the effort. These kinds were the only ones where the participation of non-residents was greater than that of residents. About 89 per cent of the charter boat fishing days and about 66 per cent of the party boat fishing days were by non-residents.

Charter, party boat, boat rental, bridge, jetty and free pier fishing were computed separately for each of four areas. The relative activity by area is shown in Figure 7, together with coastal population data for 1955. About 38 per cent of the activity took place in southeast Florida. Southwest Florida, with 27 per cent, contained the next largest amount of fishing. Figure 7 also shows an apparent relationship between fishing activity and coastal population. Data shown in Figure 7 exclude private boat and paid pier fishing. Since together these represented more than half of the fishing effort, Figure 7 may not exactly indicate the relative importance of all effort in each of the four areas of the state.

EXPENDITURES

Expenditures in Florida of fishermen for supplies and other services include tackle, bait, food, lodging, charter fees, head charges, boat landing fees, etc. Techniques used in other studies for estimating such expenditures

TABLE 10

Total fisherman days by each kind of fishing by residents and non-residents and ratios of resident to non-resident activity based upon numbers of interviews.

Kind of fishing	Total days fishing in '000s	Number resident interviewers	Number non-resident interviews	Percentage of Residents	Percentage of non-residents	Number of resident fishing days in '000s	Number of non-resident fishing days in '000s
Charter boat[1]	449	48	375	11	89	49	400
Party boat[1]	474	99	188	34	66	161	313
Boat rental[1]	1,532	441	221	67	33	1,026	506
Bridge, pier and jetty[2]	6,169	1,572	1,005	61	39	3,763	2,406
Shore	267	401	238	63	37	168	99
Private boat	10,589	466	74	86	14	9,107	1,482
TOTAL	19,480	3,027	2,101			14,274	5,206

[1]Includes non-fishermen accompanying anglers.
[2]Includes paid pier fishing.

were modified for use in the present problem. No agreement exists among workers in these fields on precisely how to compute anglers' expenditures nor on which types of expenditures can reasonably be attributed to the pursuit or attraction of fishing. Expenditures which we believe to be appropriate have been categorized and reported separately, together with particulars of all items included in the categories. Readers will thus be able to reduce the grand total of expenditures by those of any category which they may consider to be unjustified.

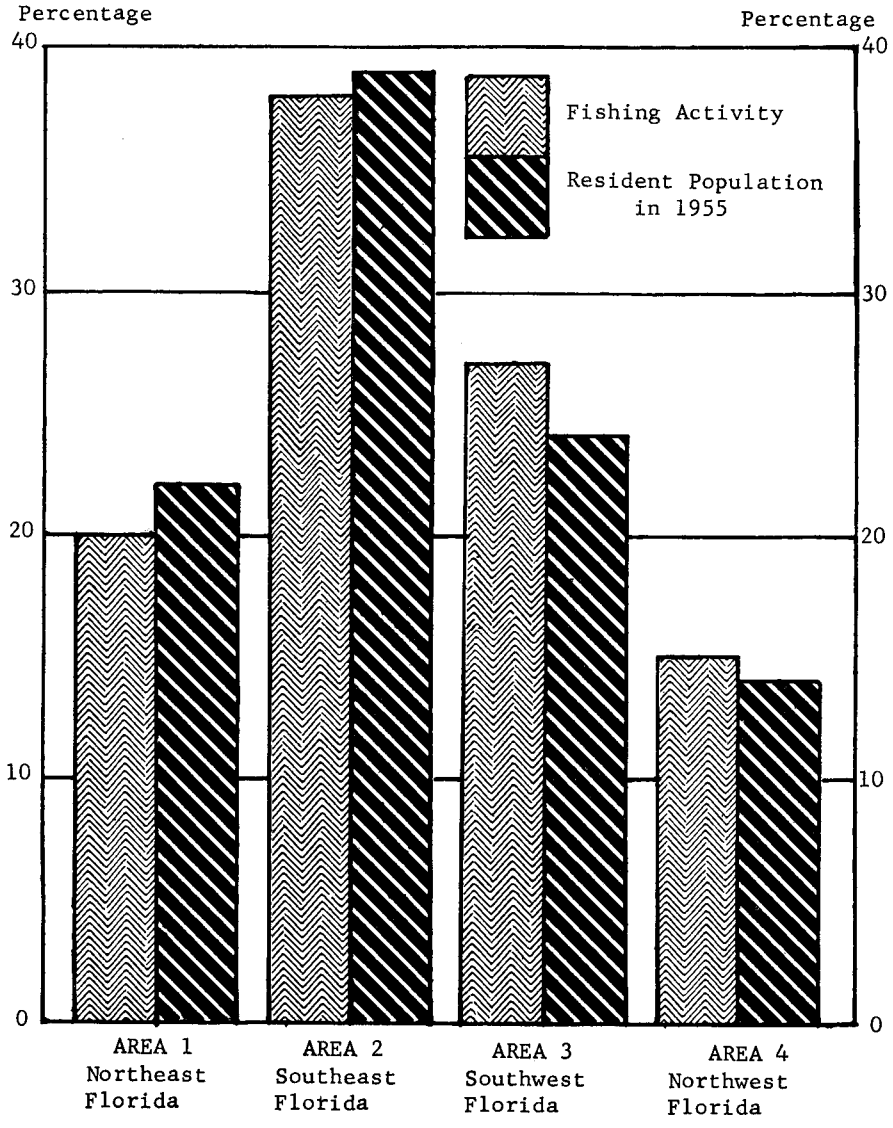

FIGURE 7. A comparison of fishing activity and resident population by area.

Information on expenditures was derived from interviews of angling parties or individuals while engaged in fishing or after completion of an angling trip. Other data were obtained from tackle and boating trade manufacturers and distributors.

The numbers of interviews made for each type of fishing is shown in Table 10. The number of interviews per type of fishing per area were considered to be too small to provide reliable estimates on an area basis; therefore, estimates were only made for the state as a whole.

For estimating "repetitive fishing expenditures," daily and trip mileage and miscellaneous trip expenditures, one member of the angling party was interviewed and asked to estimate the expenditures for the whole party. A "party" is defined as all the members of a group who travel together to and from the fishing area.

In order to determine the ratio of residents to non-residents concerned with each type of fishing, it was assumed that these two groups were interviewed in the ratio of their relative frequency of occurrence.

Expenditures relating to the pursuit or attraction of salt and brackish water recreational fishing were categorized as follows:

A. Repetitive fishing expenditures
B. Non-repetitive fishing expenditures
C. Expenditures not directly associated with fishing

A. REPETITIVE FISHING EXPENDITURES

For the purposes of this analysis the above phrase has been used to describe all expenditures which are encountered on all or most fishing trips, in contrast to expenditures on such items as tackle and boats which are seldom incurred. All data on repetitive fishing expenditures were collected on a daily trip basis. They are of the following types.

Food and drink, either bought especially for the fishing trip or purchased during the trip. Lodgings; applicable only to those persons who are staying away from home on the day of the fishing trip. Bait purchased for the trip. Terminal tackle lost during the trip; includes lures, sinkers, swivels, leaders and hooks. Fees, including pier charges, bridge tolls, parking charges, boat and equipment rental fees, charter and head charges, guide hire, boat launching and hoisting charges. Fuel for boats. Miscellaneous minor purchases, including knives, flashlights, mosquito repellent, etc.

It is generally agreed among workers in this field that all the items in this expenditure category listed above can reasonably be attributed to the recreational fishery.

Such expenditures would usually be made on the day of the trip or within the preceding few days. Also, the majority of them lie within narrow value limits known to the interviewer, and estimates given by the angler are therefore believed to be reliable.

The average trip expenditures per person on these items were computed for each major kind of fishing, and for residents and non-residents separately, (Table 11). The total expenditures on these items was then calculated for each category by multiplying the average costs by the total numbers of man trips within the category. These totals are shown in Table 11. The grand total of all these expeditures was $135 million.

TABLE 11

Repetitive fishing expenditures (see page 32 for items included), including average costs per day and total costs for residents and non-residents for each kind of fishing.

Kind of fishing	Residents			Non-Residents			
	Cost per day per fisherman in dollars	Total no. fisherman days in '000s	Total Expenditures in '000s of dollars	Cost per day per fisherman in dollars	Total no. fisherman days in '000s	Total Expenditures in '000s of dollars	Total Expenditures in '000s of dollars
Charter boat	16.69	49	817	21.83	400	8,732	9,549
Party boat	8.57	161	1,380	13.83	313	4,329	5,709
Boat rental	4.95	1,026	5,079	11.70	506	5,920	10,999
Bridge, jetty and pier	2.88	3,763	10,837	7.97	2,406	19,176	30,013
Shore	2.92	168	488	9.74	99	964	1,452
Private boat	6.74	9,107	61,381	10.96	1,482	16,243	77,624
TOTAL							135,346

Since fishing is believed to be the primary incentive for all persons using charter boat, party boat and fishing camp facilities, it was considered justifiable to include "non-fishermen" (i.e., people in the party who did not actually handle fishing gear) using those facilities in computing total expenditures. In computing the costs for other categories of fishing, non-fisherman days were excluded, since it was felt that fishing might not be the primary reason for the non-fisherman's presence.

B. NON-REPETITIVE FISHING EXPENDITURES

Expenditures in this category are those associated with fishing, but which are not incurred on every fishing trip, and are usually incurred only infrequently. For the purpose of this analysis, the following distinct types were recognized.

1. Tackle, including rods, reels, lines and tackle boxes
2. Outboard motors
3. Boats and boating accessories
4. Spearfishing equipment
5. Miscellaneous expenditures, of three types
   a) Associated equipment, including ice boxes, special clothing, camping equipment
   b) Literature, fishing club dues, contributions to conservation, tournament fees
   c) Fish mounting

The original intention was to obtain information on this category of expenditures from angler interviews. Test interviews suggested, however, that replies to questions on these expenditures were biased, consciously or unconsciously. Although asked for expenditures during the previous year, many anglers apparently reported their entire investment in tackle, etc. Buzzell and Walker (1954) also made this observation during their studies in Maryland. The already long interview would have to be further pro-

longed if reliable answers were to be obtained from those questions involving a 12-month recall period.

Then, the possibility of getting data from trade sources was explored and because of the availability of data on sales of tackle, motors, boats and boating accessories the interview data on these items were discarded. Interview data were, however, used with reservations for the three types of miscellaneous expenditures listed above. These are discussed later in this section.

1. Expenditures on fishing tackle

Trade sources estimate that anglers spent about $10 million on fishing tackle in Florida during 1955. This total includes tackle for both fresh and salt water use. A rough estimate of the portion attributable to salt water fishing can be obtained from the telephone survey data on relative numbers of fresh and salt water anglers. About 31.6 per cent resident anglers fished exclusively in salt water, 18.9 per cent exclusively in fresh water and the remainder, 49.5 per cent in both fresh and salt water.

It seems reasonable to assume that those anglers who fished in both fresh and salt water allocated their time between the two in about the same ratio as the number of exclusively salt water anglers to the number of exclusively fresh water anglers. Thus the percentage of the total tackle sales attributable to salt water fishing will be as follows:

$$31.6 + \left(\left(\frac{31.6}{31.6+18.9} \times 100 \right) (49.5) \right) = 62.6 \text{ per cent}$$

The $10 million includes purchases of fishing tackle by visitors, but no data are available on the fresh and salt water usage of these purchases. Visitors' purchases are, however, likely to be small, due to the fact that many visitors bring fishing equipment with them and many use facilities such as charter and party boats where tackle is usually supplied.

The total value of tackle, attributable to salt water recreational fishing, is therefore estimated to be 62.6 per cent of $10 million, or $6.26 million.

2. Expenditures on outboard motors

The research staff of the trade journal, "Outboard Magazine," estimated that 22,300 outboard motors were sold in Florida in 1955. These sales were valued at $6,629,000. National trend data indicated that fishing accounted for 65.5 per cent of all motor usage. While the fishing usage in Florida is likely to be higher than the national average, this national figure was used in the absence of a quantitative estimate from Florida. Thus, approximately $4,342,000 of outboard motor sales can be attributed to Florida fishing. If this figure is apportioned according to fresh and salt water use, as in the previous section, approximately $2.7 million can be attributed to salt water recreational fishing.

3. Boats and boating equipment sales

Boating trade sources reported that in 1955, Florida sales of boats and boating equipment amounted to about $43 million. This information is contained in a report prepared by Wilber (1956). This value cannot be attributed entirely to fishing, and many boats are used partly or entirely

for cruising and other purposes. Fishing usage of boats might be expected to resemble that of outboard motors. National trend data indicated that fishing accounted for 65.5 per cent of all motor usage. Thus 65.5 per cent of $43 million or about $28 million dollars of boat and boating equipment sales has been attributed to Florida fishing. If this figure is further apportioned according to fresh and salt water use, as in the two previous sections, approximately $17.7 million can be attributed to salt water recreational fishing.

4. Spearfishing equipment

The determination of expenditures on spearfishing equipment is complicated, since most special equipment used by spearfishermen, e.g., breathing equipment, masks, fins, etc., is also purchased and used by persons who never attempt to catch fish. The ratio of spearfishermen to other users of this equipment is not known. No estimate has therefore been presented on spearfishing equipment expenditures.

5. Miscellaneous non-repetitive expenditures associated with fishing

Due to the nature of these items, national or state sales data cannot be utilized to determine annual expenditures. Data from the interview program were used for this purpose. Some of the objections to the use of interview data in estimating non-repetitive fishing, discussed above, also apply to this category. It is believed, however, that recall estimates of expenditures in this category are likely to be more accurate than for those for tackle, boats and motor purchases, since many items in this category, such as literature and various fees, are incurred at least on a yearly basis.

TABLE 12

Expenditures on miscellaneous non-repetitive items associated with fishing (see this page for items included), including average costs per day and total costs for residents and non-residents and for each kind of fishing.

Kind of Fishing	Residents					Non-Residents				
	Av. cost per fm. in $	Av. no. of days fished	Av. cost per day per fm. in $	Total no. of days in '000s	Total expenditures in '000s of $	Av. cost per fm. in $	Av. no. of days fished	Av. cost per day per fm. in $	Total no. of days in '000s	Total expenditures in '000s of $
Charter boat	28.41	18	1.58	49	77	24.16	6	4.03	400	1,612
Party boat	21.72	25	0.87	161	140	10.70	6	1.78	313	557
Fishing camp	13.25	40	0.33	1,026	339	17.65	20	0.83	506	420
Bridge pier jetty	10.56	67	0.16	3,763	602	9.96	22	0.45	2,406	1,083
Shore	12.51	46	0.27	168	45	5.12	19	0.27	99	27
Private boat	21.91	27	0.81	9,107	7,377	35.52	15	2.37	1,482	3,512
										TOTAL

Charter boat	1,689
Party boat	697
Fishing camp	759
Bridge pier jetty	1,685
Shore	72
Private boat	10,889
TOTAL	15,791

Expenditures in this category were totaled, and the average by angler, (resident and non-resident) and by kind of fishing was calculated. The cost on a daily basis was computed by dividing the cost per angler by the average number of days fished during the year. Estimates of the total expenditures were obtained by multiplying the average cost per angler per day by the total number of man-days fished. Table 12 shows the results of these calculations. No reliable estimate was obtained of the average number of days fished by non-resident private boat fishermen. The average of the other fishing methods was, however, used in computing the expenditures in this category for these fishermen. The grand total of these expenditures was almost $16 million.

6. Traveling on fishing trips

Authorities differ on the cost attributable to travel. It is difficult to set one reasonable rate which will simultaneously take into account bus, taxi, plane or train fares, or fuel, depreciation and license fees on a private automobile. Various rates have been suggested, and a rate of seven and one half cents per mile for resident travel seems to be fairly well agreed as reasonable. This rate was used in the present study. Depreciation and some other cost of non-resident's automobiles cannot be attributed to expenses in Florida, and a rate of three cents per mile was considered reasonable when evaluating their fuel and minor repairs, costs, or their cost for any other mode of travel.

Interviews of anglers yielded data on the distance traveled by angling parties from their home or lodgings to the fishing area on the day of the interview. The average daily round trip mileage per person was computed for residents and non-residents separately, and for different fishing methods separately. The total cost of fishing trip travel was calculated by multiplying the daily averages for residents at a rate of 7½ cents per mile by the total man-trips and at a rate of three cents per mile for non-residents. The average mileages traveled and the estimated costs of fishing trip travel are shown in Table 13. A total of about $20 million was spent on fishing trip travel.

C. EXPENDITURES NOT DIRECTLY ASSOCIATED WITH FISHING

It is recognized that some visitors to the state came primarily because of the attraction of coastal recreational fishing. Whether or not these people would have gone elsewhere if the fishing attraction did not exist is difficult to determine. The authors feel, however, that some of the non-fishing expenditures of these persons might reasonably be attributed to the attraction or pursuit of recreational fishing. Preliminary planning called for asking non-resident anglers whether or not fishing had influenced their decision to visit Florida. It was clear, however, that the answers were likely to be biased by the fact that a uniformed officer of a state conservation agency asked the questions. A different approach was therefore adopted. Expenditures in this category are of two kinds:

1. Trip travel costs
2. Miscellaneous trip expenditures on food, entertainment, sightseeing, etc.

TABLE 13

Expenditures on fishing trip travel including average miles traveled and total expenditures for residents and non-residents and for each kind of fishing.

Kind of fishing	Residents			Non-Residents			
	Average daily miles per fishm.	Total no. of fishermen days in '000s	Total expen. in $ at 7.5c per mile	Average daily miles per fishm.	Total no. of fishermen days in '000s	Total expen. in $ at 3c per mile	Total expen. in '000s of $
Charter boat	14	49	51	7	400	84	135
Party boat	42	161	508	10	313	94	602
Boat rental	24	1,026	1,847	16	506	243	2,090
Bridge, jetty and pier	23	3,763	6,491	17	2,406	1,227	7,718
Shore	21	168	265	14	99	42	307
Private boat	13	9,107	8,879	11	1,482	489	9,368
						TOTAL	20,220

1. Trip travel costs

Visitors to Florida, interviewed on fishing trips, were asked to state their place of residence in Florida. The round-trip mileage from the place of residence to the nearest point on the Florida border, by the most direct route, was computed. Information was also obtained on how long they intended to stay in Florida and on the number of persons in the party traveling together. The average mileage per person was calculated separately for each type of fishing. The average mileage was then prorated on a daily basis according to the average duration of visit in Florida. This daily mileage was next multiplied by the total days spent fishing by non-residents, and the cost of travel determined, using the three cents per mile rate. The results of these calculations are shown in Table 14. Kinds of fishing for which similar average mileages were obtained in the interview program were grouped. A total of $681,000 was spent on trip travel.

TABLE 14

Costs of non-resident travel in Florida other than fishing trip travel including average miles traveled and total expenditures on travel, by different kinds of fishing.

	Average mileage per person	Average duration of visit in days	Average miles on a daily basis	Total days fishing	Total expen. 3c per mile in '000s $
Charter boat Party boat Boat rental	163	21.1	7.7	1,219	282
Bridge, pier jetty and shore	175	48.8	3.6	2,505	270
Private boat	190	66.5	2.9	1,482	129
TOTAL					681

The inclusion of the above costs is based upon the following assumptions: First, a non-resident may have one or more attractions which motivates him to visit Florida and one of these attractions may be angling. Second, the time spent in the pursuit of fishing will be roughly proportional to the influence of fishing in the decision to make the trip.

2. Miscellaneous trip expenditures

The basis of inclusion of miscellaneous trip expenditures not directly associated with fishing, such as food, entertainment, sightseeing, etc., is similar to that quoted above for trip travel.

Data were obtained from non-resident angling parties on their actual and anticipated expenditures not directly associated with fishing but incurred on the day of the interview. The average of these expenditures per person was computed and multiplied by the total number of non-resident fishing days. The averages and totals of the above expenditures for each major kind of fishing are shown in Table 15. It is estimated that about $60 million was spent on miscellaneous trip expenditures.

TABLE 15

Miscellaneous trip expenditures (see this page for items included) for non-residents including average cost per day and total expenditures by different kinds of fishing.

	Average cost per person per day in $	Total days fished in '000s	Total expen. in '000s of $
Charter boat Party boat Boat rental	10.39	1,219	12,665
Bridge, pier, jetty and shore	10.75	2,505	26,929
Private boat	14.12	1,482	20,926
TOTAL			60,520

SUMMARY OF EXPENDITURES

A summary of the various types of expenditures is shown in Table 16. On supplies and services directly related to fishing, residents spent about $133 million and visitors about $65 million. The total of both groups was $198 million. (Table 16.)

A breakdown of the total directly related to fishing was made by kinds of fishing (Table 17). Private boat angling accounts for 49 per cent with bridge, pier and jetty fishing being responsible for an additional 20 per cent. Expenditures which could not be assigned amounted to about 13 per cent. These include the expenditures received through trade sources, such as boat and boating accessories, tackle and motor.

The comparison of days fished to expenditures by kinds of fishing shows a fairly close correlation for private boats and fishing camps (Figure 8). Bridge and pier angling, because of the relatively low cost per fishing day,

had nearly 32 per cent of the total fishing activity, but only accounted for 23 per cent of the total expenditures. Conversely, charter boats, due to the relatively high cost per fishing day, showed slightly less than two per cent of the total fishing days, yet over six per cent of the total expenditures. This is true to a lesser extent for party boats, with about two per cent of the fishing days and about four per cent of the expenditures.

The only recent studies on recreational fishing in Florida's coastal waters are those by the U. S. Fish and Wildlife Service in 1955 and 1956. A com-

TABLE 16

Residents and non-resident expenditures in each major category, total expenditures in each category and grand total of all expenditures.

Type of Expenditures	Resident expen. in '000s $	Non-resident expen. in '000s $	Total expen. in '000s $	Cumulative total expen. in '000s $
Repetitive fishing	79,982	55,634	135,346	135,346
Tackle*	6,260		6,260	141,606
Motor*	2,700		2,700	144,306
Boat and boating accessories*	17,700		17,700	162,006
Miscellaneous non-repetitive	8,580	7,211	15,791	177,797
Fishing trip travel	18,041	2,179	20,220	198,017
Totals	133,263	64,754	198,017	
Non-resident Expenditures not related to fishing				
Travel to Florida		681		
Other expenditures not directly related to fishing		60,520		
Total expenditures not directly related to fishing		61,201		
GRAND TOTAL OF ALL EXPENDITURES			259,216	

*Recent experiments on these items were estimated separately but probably represent a small percentage of the total.

TABLE 17

Total expenditures by category and by kinds of fishing.

Types of fishing	Expenditures in '000s of dollars					Per Cent
	Repetitive	Non-Repetitive	Travel	Others	Totals	
Charter boat	9,549	1,689	135		11,373	6
Party boat	5,709	697	602		7,008	4
Boat rental (fish camp)	10,999	759	2,090		13,848	7
Bridge, pier, jetty	30,013	1,685	7,718		39,416	20
Shore	1,452	72	307		1,831	1
Private boat	77,624	10,889	9,368		97,881	49
Other Exp. not assignable to types of fishing				26,660	29,660	13
GRAND TOTALS	135,346	15,791	20,220	26,660	198,017	100

parison between the results of the present study and that by the Fish and Wildlife Service (1956) cannot be readily made, since their study was concerned only with river, lagoon and waterways fishing in four counties on the upper east coast of Florida, and this area is not typical of the state as a whole. Average daily expenditures per angler obtained in the U. S. Fish and

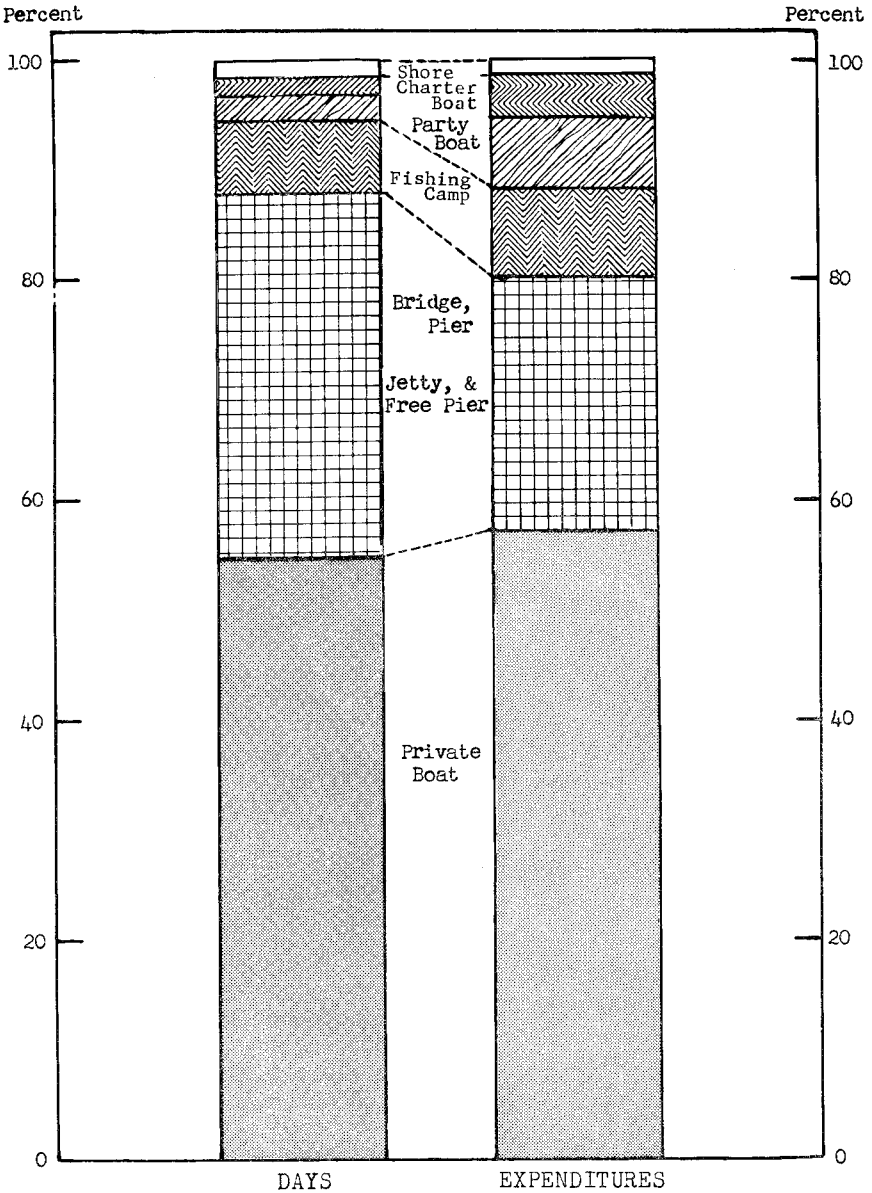

FIGURE 8. Percentages of total numbers of fishing days and total fisherman expenditures by kinds of fishing.

Wildlife Service's 1956 study were similar to those obtained in the present study's upper east coast interview data.

The survey conducted by Crossley S-D Surveys, Inc. (U. S. Fish and Wildlife Service, 1955) and hereafter called the Crossley survey, was concerned with fishing and hunting throughout the entire country. A comparison between the results of the Crossley study and the results quoted earlier is not very meaningful, since different techniques were used in the two studies. Furthermore, in the case of the Crossley study, the results of interviews in Florida are grouped with those of neighboring states, with totals and averages being quoted for the entire Atlantic and Gulf of Mexico area. The two studies further differed in that the Crossley survey only included persons twelve years old and over, while in this Florida study, age limitations were not considered. Furthermore, Crossley, unlike the Florida study, attributed expenditures to the region in which the anglers reside even though some of these expenditures may have been incurred in other regions.

Despite these differences, a comparison between some figures in each study shows similarities. For example, the Crossley report quotes that, in the entire Atlantic and Gulf area, 3,420,000 salt water anglers (twelve years and older) fished 59,000,000 man days and spent $311,862,000. The average number of days fished per angler was 12, and the average annual expenditure was $91. The Florida study showed that 1,247,000 resident salt water anglers (all ages) fished about 14,000,000 man days and spent about $133,000,000, while the average number of man days fished per angler was slightly over 11, and the average annual expenditures was about $100. The slightly higher average expenditures estimated in the present study might be explained by the greater prevalence of more expensive types of fishing such as charter, party and private boat fishing as compared with neighboring states.

DISCUSSION

There has been no doubt for a great many years that the salt water recreational fishery of Florida is an immensely important asset of the state. The present study confirms this in a concrete way, and the findings that expenditures by sport anglers approached $200 million in 1955 helps to crystallize an already well known fact.

It cannot be too strongly emphasized that the figure of $200 million represents estimated expenditures on marine sport fishing and not the value of this industry. Expenditures can, with proper information available, lead to a reasonable estimate of the monetary "value" of sport fishing in Florida, but is not in itself, it is repeated, the measure of such a value.*

There is much uncertainty among economists as to the proper method of projecting expenditures, such as that estimated here, to "values." Depending on individual judgment the projection will vary greatly, but will prob-

*The magnitude of the study was not foreseen when it was commenced. Due to the volume of data, machine tabulating and processing methods were used. Funds available were not sufficient to enable these results to be grouped for statistical analyses. The merit of the survey could have been increased if statistical limits could be assigned to the results obtained, but this proved impracticable.

ably in all cases be less than the expenditure.

The fact that the economy of Florida retains only a portion of the money spent by anglers is an example of how differences in judgment on this projection will affect the result. For instance, a considerable portion of the anglers' gasoline expenditures is ultimately returned to Texas and Louisiana to cover production costs and the profits of the oil producer. Other expenditures, for items manufactured in Florida, would return a higher percentage to Florida, and it is difficult to separate and evaluate these amounts in a reasonable way.

Another factor which influences the determination of the value to the economy concerns the principle that money circulating through different levels of distribution generates new business. Figure 9 illustrates this point by showing some of the various channels of distribution involved in serving the anglers. For simplification, some levels such as jobbers, brokers, etc. have been excluded, although these levels may normally be involved. Excluded also is transportation, which affects several levels of distribution.

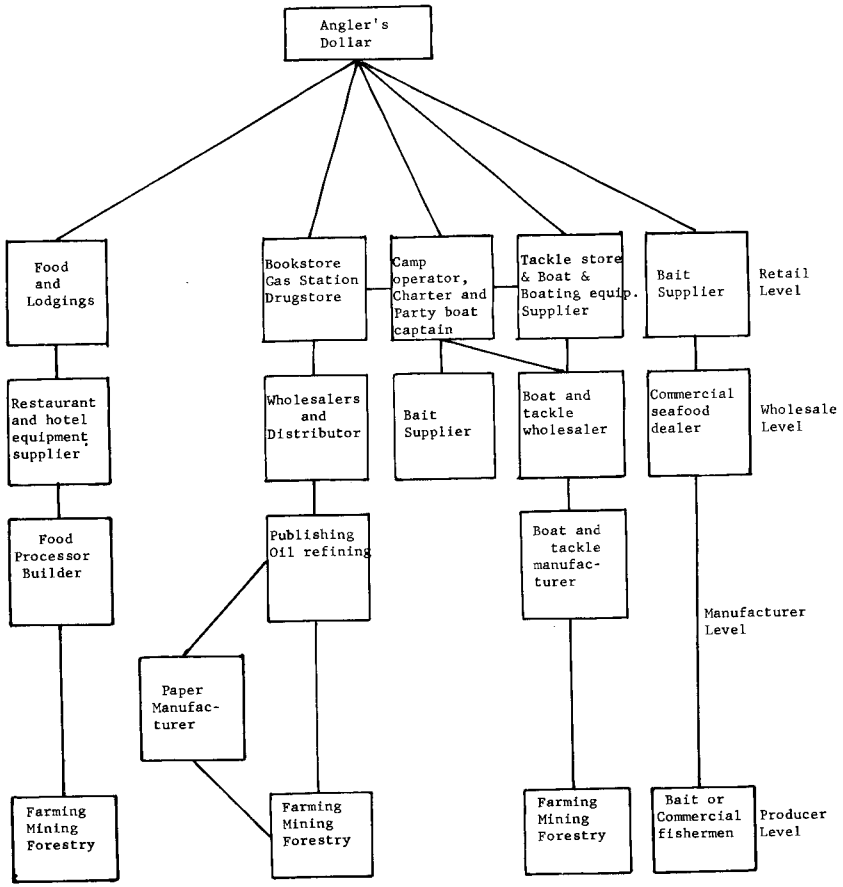

FIGURE 9. Some of the various channels of distribution and businesses involved in serving the angler.

Another factor which was not measured here, yet which affects the economic importance of the game fishery, is the influence that it exerts on the decision of many visitors to come to Florida. These visitors undoubtedly contribute to parts of the economy other than those directly associated with fishing.

It can be said that if fishing in Florida were unavailable, some or all of the money currently spent on this activity might be diverted to some other aspect of Florida's economy. It is impossible to make a reliable estimate of the extent to which this is true, but it is known that fishing has influenced some people to take up residence in the state and many visitors to spend their vacation here.

The determination of "real" value is thus not yet possible, and while it is known to be less than the $198 million dollars of the estimated expenditures, how much less cannot be calculated with the data at hand.

Because of the above facts, comparisons between the $198 million angler expenditures and the $30 million value of the commercial fishery in 1956 (Rosen, 1957) should not be made. The latter figure is an estimated "real value," the former is not. The $198 million spent by anglers is almost all at the retail level, while the $30 million commercial fishery value is at the producer level. Hence, while the value of the sport fishery will be less than $198 million, the value of the commercial fishery to the state is considerably greater than $30 million, due to the fact that the values of the processing and distributing aspects of this industry are not included in the total figure.

The resident population and business activity in Florida is increasing by at least six per cent from year to year. Purchases of private boats are increasing at an ever faster rate. Game fishing activity is likely to increase at about the same rate as the resident population, and perhaps even more rapidly. Concurrent with the increase in business activity is a trend towards the alteration and resulting destruction of the natural habitat of game species through dredging, filling and pollution. A further effect of land development schemes in some areas is that of closing off sections of the shoreline to fishing. Hence, this immensely important phase of Florida's economy is endangered by increasing fishing pressure and by the destruction of the natural habitat. To minimize this danger attention should be given to research on the biology of fish and on their environment, to produce information necessary for the formulation of wise management laws and practices.

APPENDIX I

Sampling Methods Used for Telephone Owners

DATA USED IN CONSTRUCTING THE TELEPHONE SAMPLE

City and county population totals from the 1950 census, together with county population estimates for 1955, were used in constructing the sample. A fishing activity index was prepared based upon the number of operators catering to fishermen in each coastal county, the relative numbers of registered private boats, or boats carried on trailers, and the numbers of fish-

ing bridges and piers. These indices were compared with 1955 population estimates for the same counties. This comparison suggested that fishing activity is roughly proportional to the resident population.

Regional differences, including proximity to the coast, were considered in constructing the sample because climatic and other factors cause variation in the fishing activity in different parts of the state. For similar reasons, city size was adopted as another control.

Florida's resident population increased by about 29 per cent between 1950 and 1955 (Miami Economic Research, 1955). The rate of increase was not the same in all parts of the state. This report also lists estimated county populations in 1955. No estimates are available of 1955 city populations.

It was assumed that the city population increases between 1950 and 1955 were proportional to the increase in the population of the county in which each city is located. While this assumption may not be true in all cases, any sampling errors caused by using it are small and unlikely to affect the reliability of the conclusions drawn from the sample.

THE UNIVERSE

The universe was defined as all those persons who have lived in Florida for six months or more during the past six months. Since this telephone survey was made towards the end of 1956, the usable calls were obtained from persons resident in the state during the latter part of 1955. The estimated resident population of Florida in 1955 was 3,580,000 (Miami Economic Research, 1955). Since the telephone was used to contact residents, and only about two thirds of the total population live in homes with a telephone, the sample was drawn from about 2,384,000 persons.

SIZE OF SAMPLE

The technique used in determining the number of calls required was taken from Brown (1949). To apply this technique a knowledge of the frequency of occurrence of the phenomenon to be measured (i.e., the number of salt water anglers) is required. Prior to this study no such information was available. From a knowledge of the fishing in the state, the frequency of occurrence of anglers in the state was believed to be about 20 per cent and the initial sample was set up on this basis. From studies in other fields estimates that with a 20 per cent frequency of occurrence of a phenomenon to be measured, 1082 calls are likely to yield estimates for the universe with a sampling error of plus or minus 2 per cent in nine out of ten cases. Preliminary sampling showed that the percentage of salt water anglers in the population was more than 30 per cent instead of the expected 20 per cent. To account for this, an upward adjustment to 1421 calls was made. According to Brown, this number is likely to yield results within the same limits of sampling error as was the original goal.

SAMPLING PROCEDURE

The state was first divided into four quadrants (Figure 1). The lines of division followed county boundaries. Each quadrant was further divided into a coastal strip and an inland section. County boundaries were again used when reasonable. Coastal counties which extended for a considerable

distance inland were divided according to the likely attraction of fresh or salt water fishing to the inhabitants. The next step was to list all cities, in the 1950 census, separately by the appropriate quadrant and inland or coastal. These cities were further categorized by one of four sizes by population; less than 500, 500-5,000, 5,000-25,000 and over 25,000.

For each quadrant, the percentage of the required sample was based upon the estimated 1955 populations in these quadrants.

Within each quadrant, the size of the sample was based upon the relative populations of all cities within each city size category in the coastal and inland sections. Table 18 shows the required sample sized by quadrant, coastal and inland. Each quadrant was next divided into three or four sub-areas, each containing several counties and coastal and inland cities and believed to be typical of the quadrant as a whole. One sub-area was selected at random from each quadrant and the majority of calls were made in these sub areas. Cities were chosen at random from sub-areas rather than from the entire quadrant, to reduce travelling time and cost. Due to the apparent relationship between fishing activity and population pointed out earlier, and to similarities in physical, climatic or other factors between counties in the same part of the state, bias caused by the use of this cluster sampling technique is likely to be minimal.

In the selected cities, telephone numbers were chosen systematically and persons at those numbers were contacted. In some selected cities, the number of usable calls were slightly more or less than the number required. However, no bias is believed to have been caused by differences between required and actual numbers of calls. Because the telephone was used to establish sample contacts, it was found convenient to use households, rather than individuals, as the sample units. Projections of the characteristics of the universe were, however, based upon those characteristics of all persons in all of the households contacted.

TABLE 18

Numbers of calls required and made in the telephone survey.

		Area 1*	Area 2*	Area 3*	Area 4*	Total
Coastal	Number required	243	370	254	109	976
	Number required	237	372	245	103	957
Inland	Number made	183	20	84	158	445
	Number made	182	23	99	122	426

*AREA 1—Northeast Florida
AREA 2—Southeast Florida
*AREA 3—Southwest Florida
AREA 4—Northwest Florida

APPENDIX II

Conditions Governing Choice of Sampling Procedures

If sampling techniques are carefully planned, the reliability of the results of wildlife surveys is roughly proportional to the money and manpower expended on the survey. Most researchers are likely to be faced with the situation that existed in this survey, namely, that of low budget and manpower availability and perhaps also of field personnel untrained in survey techniques.

In preliminary planning, two basic phases were considered. These were, first, whether to use an angler type universe or a man-day type, and secondly, whether to rely on direct observation or on recall in obtaining data. The absence of a salt water fishing license, together with the lack of a readily accessible list of names of both residents and tourists from which a sample could be drawn, was one of the factors influencing the selection of a man-day type universe. If a survey was conducted in an area where little or no tourist angling takes place, telephone subscribers, electricity consumers, automobile licensees or tax rolls might provide a suitable list of names and enable an angler type universe to be used.

The second phase, the use of recall or direct observation, was decided upon partly through desirability and partly through necessity. Among the two procedures, use of direct observation, e.g., counting of boats or fishermen, is likely to be more accurate than use of recall, such as asking a fisherman or captain how many days he had fished during the past year. For some kinds of activity, however, use of direct observation methods limits the number of samples which can be taken. For example, during the time taken to count charter boats operating in one area to obtain a precise measure of that day's activity, several captains could be interviewed, and recall estimates obtained of their activity during an entire year. Wherever it was found that fairly accurate projections could be made, the direct observation method was preferred. In cases where this was not feasible, recall was used.

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