

CHARACTERISTICS OF THE SPORTFISHERY  
IN THE TEN THOUSAND ISLANDS AREA  
OF FLORIDA  
FROM JUNE 1, 1971 - JUNE 30, 1974

MARCO APPLIED MARINE ECOLOGY STATION  
MARCO ISLAND, FLORIDA  
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## Introduction

It has been well established that sport fishing is and will continue to be an extremely valuable outdoor recreational activity in the United States. It has been estimated that in 1970, 9,460,000 anglers spent \$1,224,705,000 and 113,694,000 angler days in salt water fishing efforts (Stroud, 1972). Along the Gulf Coast, an estimated 2,272,000 anglers fished 35,624,000 fishing days in 1970 (Stroud, op. cit.). McQuigg (cited in Lindall, 1971) estimated 31 percent of Florida's visitors came for the fishing, contributing \$1.7 billion to the state's \$5.5 billion tourist industry. A 1955 telephone survey (Ellis, Rosen and Moffett, 1958) determined that Florida saltwater fishermen accounted for \$198 million in expenditures (\$133 million for residents and \$65 million for seasonal visitors). By contrast, Lindall (op. cit.) calculated that in 1970 the south Florida sport fishery was responsible for \$575 million from tourists alone. It can be seen from these data that sport fishing is an important part of the south Florida economy. The national survey of fishing and hunting (1972) presents a figure of \$178.10 for the average annual expenditure for the saltwater fisherman along the Gulf Coast in 1970. This observation would serve for the Ten Thousand Islands area of southwest Florida.

In 1969 in a Marketing Research Survey conducted by the Deltona sales department, over 70% of Marco Island property owners indicated that their principal outdoor recreation preference was fishing. As the population of this area continues to grow, the demand on the fishery resource is bound to increase. Because of the impact of inshore fishing on the abundance of fish and hence the availability of fish to the recreational fisherman, it seems to be justified to seek a more thorough knowledge of the fisherman as well as the fish he wants to catch.

In May of 1971, the Deltona Corporation through the facilities of the Marco Applied Marine Ecology Station, undertook the task of establishing baseline data on the sport fishery catch and effort through a creel census program. The program was designed to measure certain characteristics of the anglers and the fish they caught so that comparisons might be made in the future as the population and fishing pressure in the study area increased. The data collection and analysis program was designed with the assistance of Mr. James B. Higman, Rosenstiel School of Marine and Atmospheric Sciences of the University of Miami, director of a similar study in the Everglades National Park. The design of the program also made available information which allows some immediate conclusions and observations to be made on the sport fishery in the Ten Thousand Islands area.

## Methods and Materials

The program is based on the statistical assumption that catch and effort data obtained from a sample of the fishing population are representative of the total fisherman population. To try to fulfill this basic assumption, it must be insured that the sample is obtained in a random manner with respect to time and area and that the sample is of sufficient size to include representatives of all kinds of fishermen (Higman, 1971).

### Sample Area.

The census area established was that area south of Rookery Bay extending to Lostmans River. From this geographical unit five fishing areas were created (Figure 1). These areas are characterized by the letters A through E. A brief description of each area follows:

Area A - The area south of a line from Rookery Bay to Little Marco Pass including Little Marco Pass, to a line projected west from and including S.R. 92 on Marco Island, to its junction with U.S. 41. The area encompasses approximately 17,050 acres of land and 11,900 acres of water.

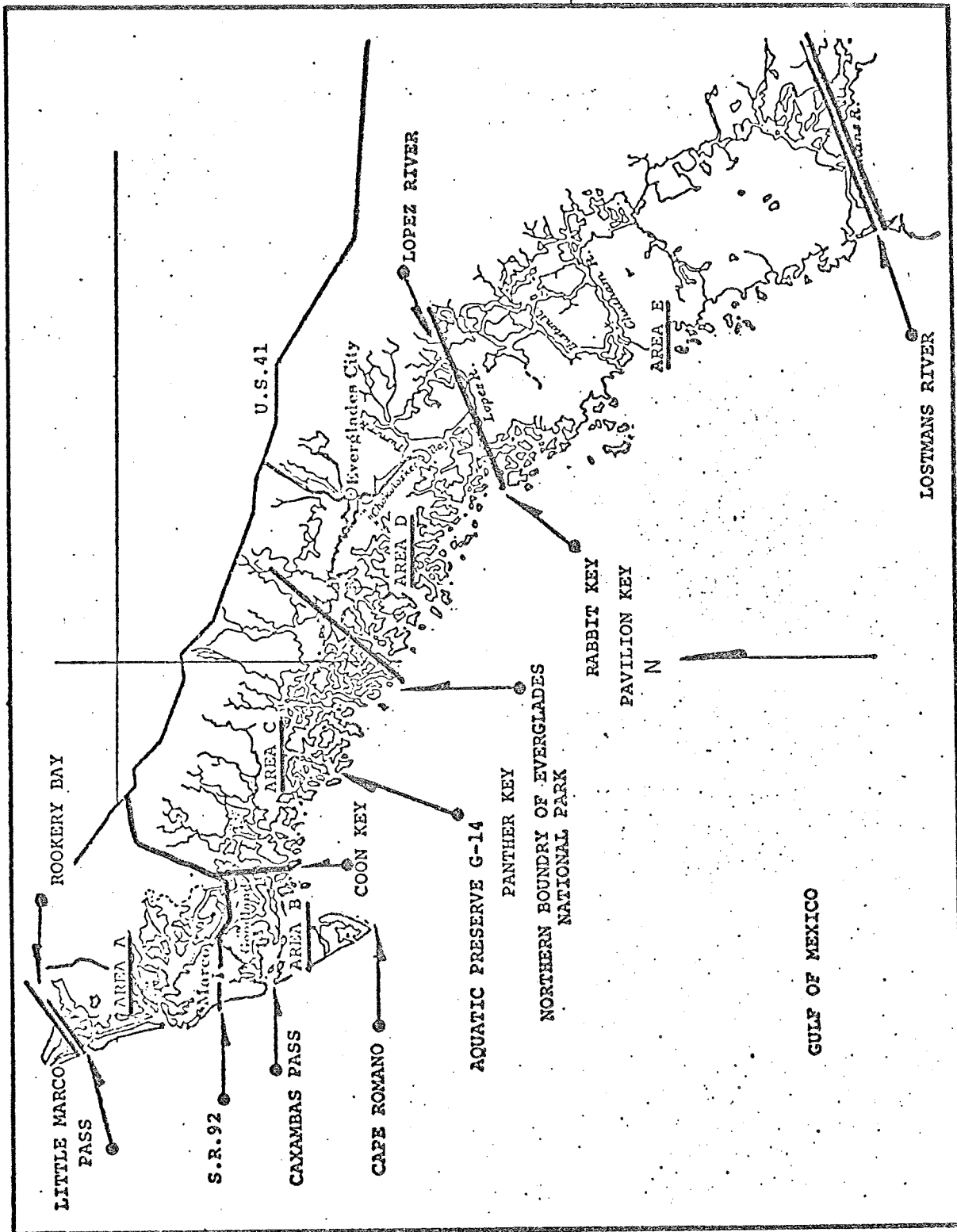


FIGURE 1. AREA MAP SHOWING AREAS AND KEY POINTS

Area B.- The area south of S.R. 92 to Aquatic Preserve G-14, including Caxambas, Goodland, Cape Romano and two sand lump islands south of the Cape, made up of approximately 6,700 acres of land and 20,000 acres of water.

Area C - All areas in Aquatic Preserve G-14, south to the northern boundaries of the Everglades National Park, including The State Park at Royal Palm Hammock, made up of approximately 32,700 acres of land and 24,000 acres of water.

Area D - All areas south of the northern boundaries of the Everglades National Park to a line extending north-east from Rabbit Key along the south shore of the Lopez River, comprising approximately 26,600 acres of land and 19,200 acres of water.

Area E - All areas from a line extending west from the south shore of the Lopez River to Rabbit Key, south to the southern shore of Lostmans River and encompassing approximately 66,100 acres of land and 43,300 acres of water.

A supplementary description of areas appears in APPENDIX 1. This includes a physical description as well as population estimates and a list of access points for the shore fisherman.

Fisherman interviews were conducted on 10 to 12 randomly selected days during each month. Two men covered designated zones by land and obtained the data by personal interviews as the fisherman came ashore.

Higman (1966) found significant variety in the skills among the fishing population, therefore the data were recorded with respect to five areas and four different fisherman methods.

#### Explanation of Methods.

Method 1, weekend - included those private fishing parties using boats during the weekend sampling.

Method 2, charter/guide - included those fishing parties which had hired a professional guide for his equipment (boat, gear, etc.) and knowledge of the area and fish habits.

Method 3, weekday - included those private fishing parties using boats during the weekday sampling.

Method 4, bridge and bank - included all shore fishermen.

A copy of the interview form is included as FIGURE 2. To insure valid results and standardization of data between interviewers, certain methods for the interview were practiced. The following is a brief summary of these methods.

1. Interviewers were familiar with the species caught and the local fishing areas.
2. Information on interviews was obtained voluntarily from the fishermen. Interviews resulting in information suspected to be in error by the interviewer were discarded.
3. Interview information from guide or charter boat was only reported as catch and effort for this method kept information on income and success of individuals confidential.
4. There was no hint of law enforcement attached in any manner to interviews. Some catches may have contained undersized fish or were over maximum bag limits; the fact that these catches were in violation of the law was ignored by the interviewer.
5. Interview forms were checked for accuracy and completeness usually on the same day, but not by the original interviewer.



6. When no fish were caught, a regular interview form was completed and the number "30" placed in the species column. In this way the fishing effort represented by "no catch" interviews could be included in the sample effort.
7. A table of random numbers was used to determine the interview dates and the percentage of interviewing effort to be used at the particular sites throughout the month. This procedure was carefully followed to avoid bias in the data collection.
8. In order to insure the largest sample size, and because a fisherman may have fished in one or several areas other than that of his access point, most sampling was done at major access points. The procedures for sample size of interviews were based on probabilities resulting from analysis of sport fish data from the Everglades National Park (Higman, op. cit.).

FIGURE 2  
 CENSUS INTERVIEW FORM  
FISHING SURVEY  
 HARCO APPLIED ECOLOGY STATION

DEVELOPMENT NUMBER                      EXAMPLE: 01                      2 POS.    

DATE OF INTERVIEW                      EXAMPLE: MO DY YR                      6 POS.    

WEEKEND                      = 1) )  
CHARTER OR GUIDE                      = 2) )  
WEEKDAY                      = 3) )                      = 1 POS.       
BANK OR PIER                      = 4) )

NUMBER OF PEOPLE FISHING IN PARTY                      1 POS.    

IS FISHERMAN FLORIDA RESIDENT                      Y = YES    N = NO                      1 POS.    

DISTANCE TRAVELED TO FISH (NEAREST MILE)                      EXAMPLE: 001 = 1 MILE                      3 POS.    

ESTIMATED VALUE OF TACKLE (WHOLE DOLLAR)                      EXAMPLE: 001 = \$1                      3 POS.    

TOTAL HOURS IN FISHING TRIP                      EXAMPLE: 01 = 1 HR.                      2 POS.    

AREA WHERE FISH WERE CAUGHT (SEE CHART)                      1 POS.    

FISHING PREFERENCE: NONE = (00) IF YES, WHAT SPECIES?                      2 POS.       
 EXAMPLE: 16 = JACK

NOTE: SEE CHART BELOW FOR SPECIES CODES.

11. REDFISH
12. SEA TROUT
13. SNAPPER
14. SNOOK
15. CATFISH

16. JACK
17. SPAN. MACKEREL
18. SHEEPHEAD
19. TARPON
20. LADYFISH
21. GRUNTS

22. DRUM
23. FLOUNDER
24. BLUE CRAB
25. MISC.
30. NO CATCH

	SPECIES	NUMBER
<u>NUMBER OF THIS SPECIES CAUGHT</u>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>
<u>NUMBER OF THIS SPECIES RELEASED</u>	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>

## Boat Counts

Over a three year period from June of 1971 to July of 1974, aerial boat counts were conducted 7 days a month. Each month's count was representative of a day of the week, i.e., one Monday, one Tuesday, one Wednesday, etc. The counts covered the same area as did the census interviews, from the Rookery Bay area and Little Marco Pass to the north, to Lostmans River to the south. The flight began at Marco and headed north to Rookery Bay, at this point the flight turned south and covered the inland bays adjacent to Marco. Turning more easterly towards Everglades City, the flight continued over all inland bays in the Ten Thousand Islands to Lostmans River. The flight then turned southwestward down the river and at the Gulf of Mexico headed north again to cover the exterior islands of the area. Flying to Cape Romano over Gullivan Bay and back to Marco Island completed the survey (FIGURE 3). Flight time was approximately one hour and flights were conducted at approximately one thousand feet for optimum visibility. A total of 252 counts were flown, usually between the hours of 1000 and 1400 hours. During the flight, boats were plotted with grease pencil on a National Ocean Survey Nautical Chart 642-SC covered with clear acetate. Large cruising yachts, sailboats and commercial traffic were not included in the charting as these were obviously not sport fishing craft. Upon return, overlays were made on

tracing paper. Counts were taken from these tracings and listed by area. The tracings were then stored for compilation at a later date. The aerial boat counts were supplemented by surface boat counts to further establish the number of boats actually fishing. Surface boat counts were separated into two categories: sport-fishing boats and non-fishing boats. Commercial fishing boats, large cruising yachts and sailboats were not included in surface counts. Boats actually fishing vs. boats not fishing were compared. Fishing boats were determined to be 91% of all boats plotted from a series of 27 surface counts in the entire study area. The aerial count was totaled for each area and the .91 figure was applied to the aerial boat count to determine the actual number of boats that were fishing.

#### Derivation of Results

Interview forms were sent to the Deltona Corporation's computer center and the information was compiled and stored in the computer on a monthly basis. Fifteen monthly reports from August of 1971 through October of 1972 were compiled in a computer print-out. The catch composition by area and by method was computed for total catch and individual species. Total hours fished, total number of fishermen, and fish caught per man hour were also calculated. Included in the tabulated results were the percentage of Florida residents interviewed and the total catch by species for all areas and methods.

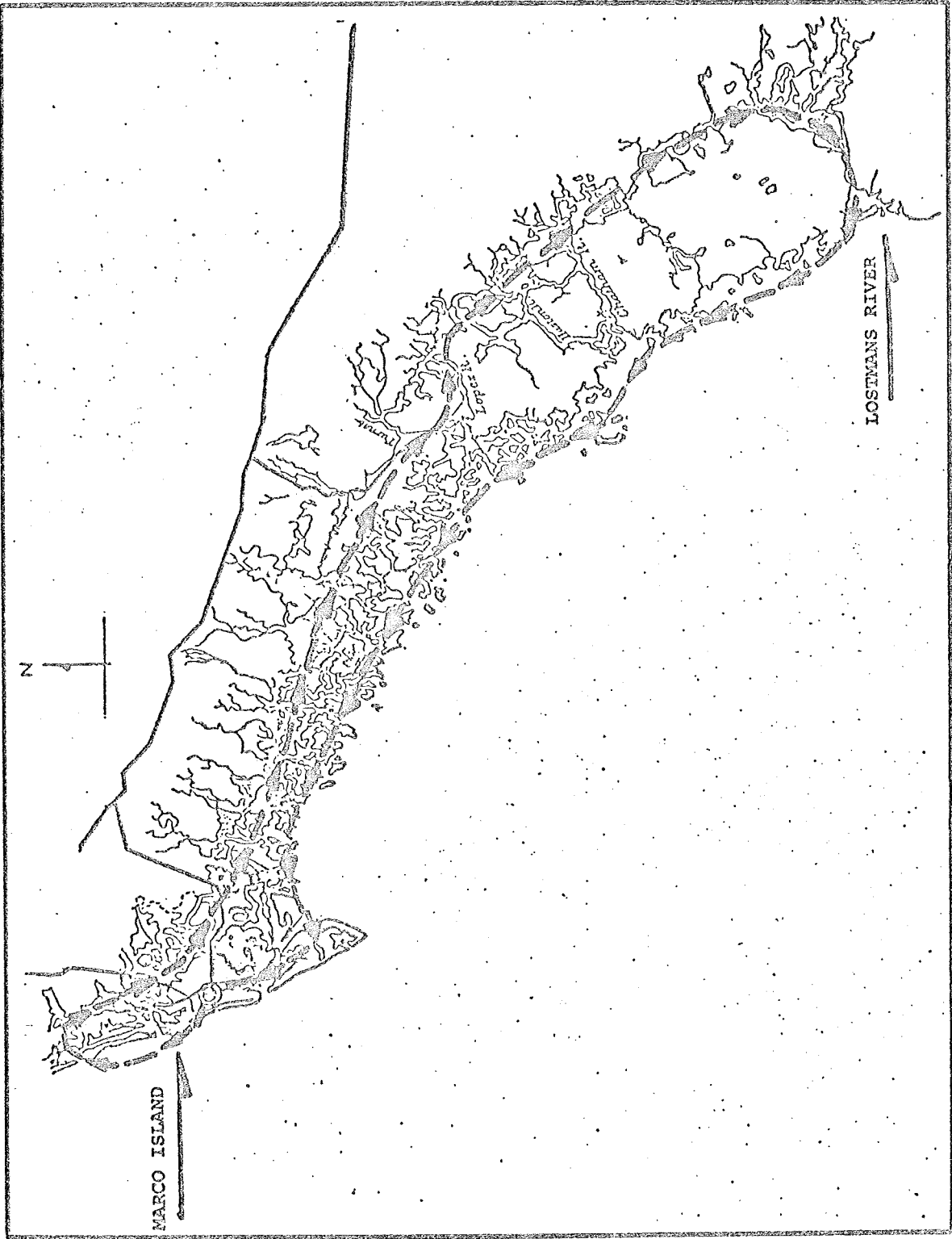


FIGURE 3. AERIAL BOAT COUNT FLIGHT PATH

The catch/effort was computed for area, method, and species, using the formula:

$$\sum \frac{C_i}{F_i}$$

C = catch (the number of fish caught, includes released and kept)

F = effort (the number of fisherman hours)

i = the sum of all observations (interviews) within an area, method or species

Projection for total number of fishing boats from the aerial sample was achieved by the following:

(Aerial sample  $\div$  7) D x .91 = calculated fishing boat total for month

Aerial sample = boat count total for an area (determined by aerial count)

.91 = actual percentage of fishing boats established by surface counts

D = the number of days per month

7 = number of aerial counts per month.

In order to expand the data to allow a projection for total boat fishing pressure within the area, several assumptions are necessary:

- 1) That the survey data were representative of a non-biased random sample of all boat fishing categories.
- 2) That the fishing conditions remained consistent in all areas throughout the survey.

- 3) That the proportions of fishermen within each category remained constant.
- 4) That the aerial counts accounted for all boats fishing within the area for each flight day and that fishermen went out only once per day.
- 5) That the bridge and bank category had no effect on the total fishing pressure by the other methods within the study area.

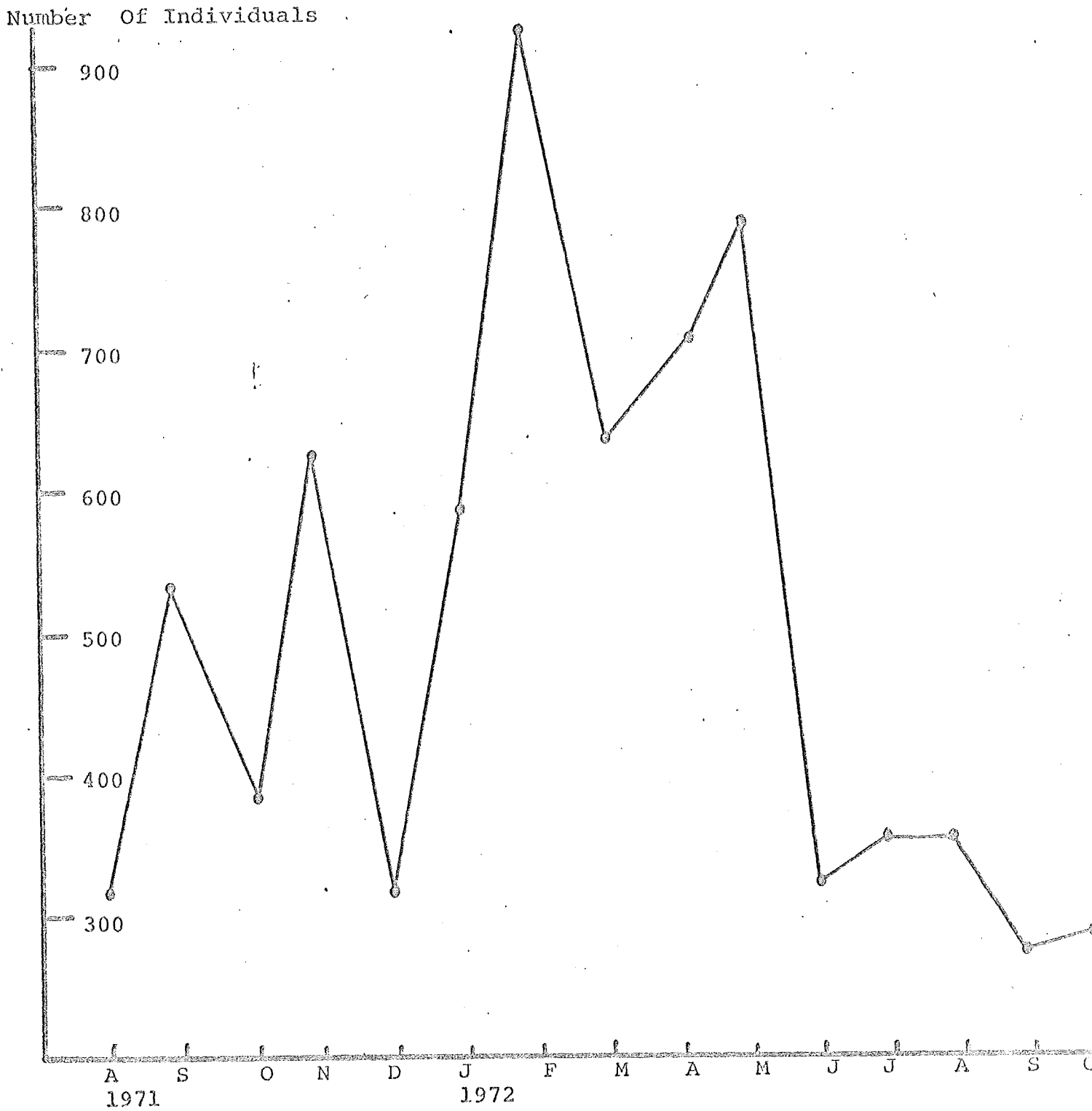
The assumptions, as stated, are intended to provide proper perspective for the projected estimation of total fishing pressure based on the survey boat data for the 36 month period.

### Results and Discussion

The major factor in the consideration of sport-fishing within southwestern Florida is the aspect of seasonality in the fishing pressure exerted upon the available resources. While fishing is a major year-round recreational activity in the area, the influx of part-time residents and tourists during the winter season, November through April, adds a significant increase to the total fishing activity. FIGURE 4 indicates the increase in total numbers of fishermen within the study area, as derived from the survey interviews as the interview effort remained constant.

FIGURE 4

TOTAL FISHERMEN INTERVIEWED - ALL AREAS AND ALL METHODS





The following is a summary of the number of interviews by area. The order of the areas by decreasing number of interviews is A, B, D, E, C.

AREA	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>Total</u>
Number of Interviews	1259	626	199	569	461	3114
% of Total	40.4	20.1	6.4	18.3	14.8	

The northermost part of the study zone, Area A (FIGURE 1), contains the highest concentration of permanent and seasonal residents and the largest number of access points (APPENDIX 2). This area also attracts a large number of seasonal and weekend vacationers due to the accessibility of recreational facilities. Area B, directly adjacent to Area A, contains major portions of the uncompleted parts of the Marco Island development, the village of Goodland, and the northern portions of the preserved areas to the south of Marco Island. Area B was second in number of interviews, probably due to its proximity to the inhabited portions of the Marco development. There are numerous shore points and several bridges available for the bridge and bank fishermen within both of these areas (APPENDIX 2).

TABLE 1 presents the total number of fishermen by area. It can be seen that a similarity exists between the number of interviews per area and the total number of fishermen interviewed per area. This similarity in distribution of fishing pressure can be attributed to a narrow range in the average sizes of fishing parties which varied from 2.23 fishermen in Area A to 2.64 fishermen in Area E.

A summary of the interviews by method presented below indicates the order of the methods in decreasing magnitude to be bridge and bank, charter/guide, weekday and weekend.

<u>METHOD</u>	<u>Bridge &amp; Bank</u>	<u>Charter- Guide</u>	<u>Weekday</u>	<u>Weekend</u>
Number of Interviews	1201	821	607	485
% of Total	38.6	26.4	19.5	15.6

The bridge and bank category dominated the sample due to the large number of access points available to the shore fisherman throughout the study area (APPENDIX 2) and the visibility and accessibility to the interviewer of fishermen using this method. The charter/guide method was the second major source of interviews. These were sampled in conjunction with the return of the guide boats to the marinas. The regularity in schedules and the concentration of these boats permitted the interviewers to maintain regular monitoring of their results.

Weekday and weekend categories proved the most difficult to sample. A survey of Marco Island residents by the Deltona Corporation indicated that sport fishing was one of the reasons for their purchase of island property. In a canal-type development, the resident utilizing a personal boat from his dock in back of his house is usually not accessible or visible to the interviewer. An attempt was made to increase the resident sample using voluntary cooperative interview forms filled out by fishing residents. The response proved very low and the attempt was abandoned. The lower percentages of interviews for these two methods was probably attributed more to these limitations rather than the total number of private boat fishermen.

The importance of the seasonal fisherman to the total fishing effort of the study area is indicated in the percentages of Florida residents interviewed during the survey (TABLE 1). It can be seen that the proportion of Florida residents to total interviews decreased sharply during the period December to April 1971, indicating the influx of winter visitors. While all methods show variability in the percentage of Florida residents to some extent, FIGURE 5 illustrates that seasonality is best reflected in the weekday method.

TABLE 1

TOTAL NO. FISHERMEN/AREA ALL METHODS  
(INTERVIEWED)

MONTH	A	B	C	D	E	TOTAL	% OF FLA. RESIDENTS
AUG 71	132	107	19	52	0	310	75.39
SEP 71	157	124	55	175	13	524	79.58
Oct 71	70	43	46	163	58	380	83.68
NOV 71	197	118	58	185	51	609	59.18
DEC 71	131	69	20	59	25	304	45.33
JAN 72	163	94	51	119	130	557	33.68
FEB 72	256	186	98	230	131	901	37.29
MAR 72	237	117	32	149	86	621	32.64
APR 72	272	119	29	106	169	695	49.49
MAY 72	354	157	57	28	183	779	61.97
JUN 72	160	51	8	28	74	321	60.12
JUL 72	200	81	4	41	38	364	62.63
AUG 72	203	99	13	19	129	463	57.60
SEP 72	145	36	12	8	72	273	59.71
OCT 72	142	47	6	24	58	277	54.50
TOTAL	2819	1448	508	1386	1217	7378	62.50

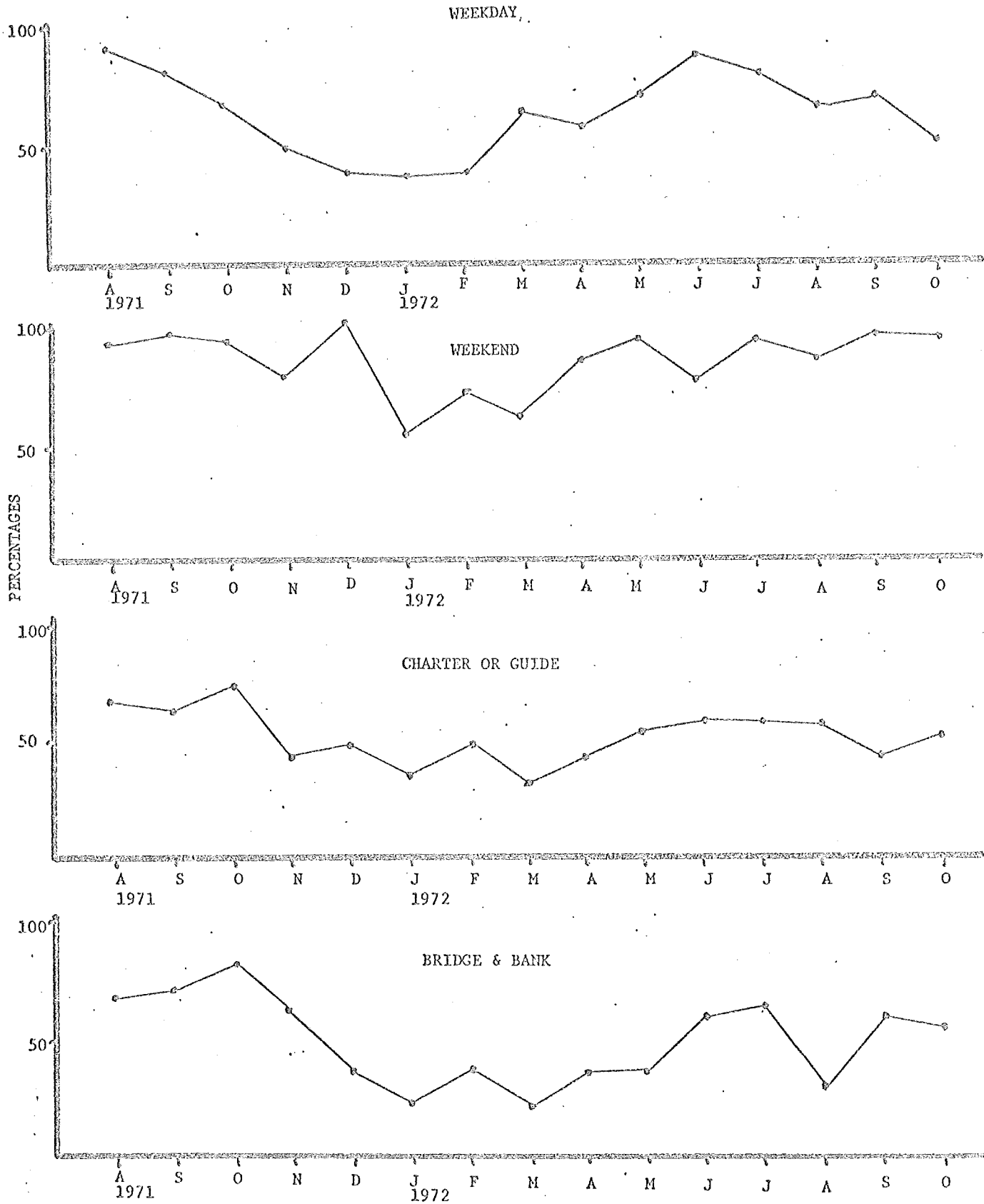
The weekend method did not indicate the seasonal appearance of out-of-state residents as well as the other methods. This method reflected the pressure of in-state residents who come to the area on a regular basis to utilize the fishing resources. The majority of these fishermen resided within several hours driving time of the survey area.

The charter/guide category is based on the more affluent fisherman, who prefers to utilize the guide's equipment, knowledge of the area, and fishing technique. In general, these individuals are not local residents. The percentage of Florida residents utilizing this method did reflect seasonality, but to a lesser degree than the weekday method.

The bridge and bank method exhibited the greatest variability in percentage of Florida residents interviewed in the study. Seasonality is clearly evident in this category; an unusually low value of 28.57% Florida residents was derived from the August 1972 data.

FIGURE 5

PERCENTAGE OF FISHERMEN INTERVIEWED WHO WERE FLORIDA RESIDENTS



The total catch rate (fishes/hour) for all methods and areas as derived from the interviews are presented in FIGURE 6. The lower values found during March - June possibly reflect the seasonal winds, which increase the turbulence and turbidity in the waters of the inshore areas.

FIGURE 7 presents the catch rate data derived from interviews for each method. The order in decreasing magnitude was found to be charter/guide (1.33 fishes/hour), weekday (1.20 fishes/hour), weekend (0.82 fishes/hour) and bridge and bank (0.75 fishes/hour) (TABLE 2).

The charter/guide method would be expected to produce consistently high catch rates since these people represent the professional fishermen. These fishermen possess the equipment and knowledge to best exploit the areas' fishing potential and their business is dependent upon client satisfaction with fishing results.

The weekday method was found to be somewhat lower in total catch rate than charter/guide. The weekday fishermen generally are full-time or seasonal residents with a better working knowledge of the areas' fishing potential than the average weekend visitor. Many fishermen of this category prefer to fish only during this period to avoid weekend congestion.

FIGURE 6  
CATCH RATE PER UNIT OF EFFORT  
(DERIVED FROM INTERVIEW DATA)

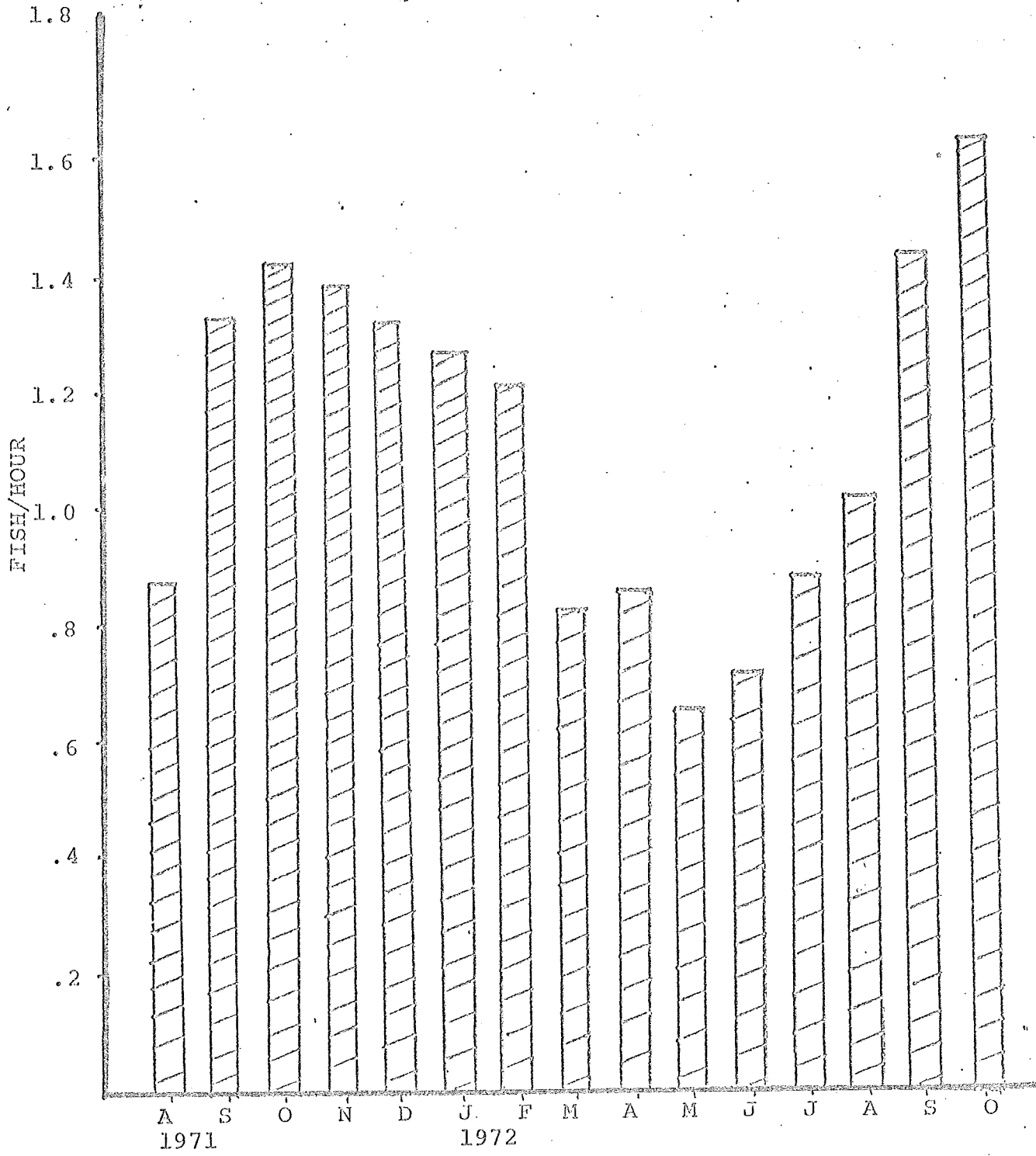
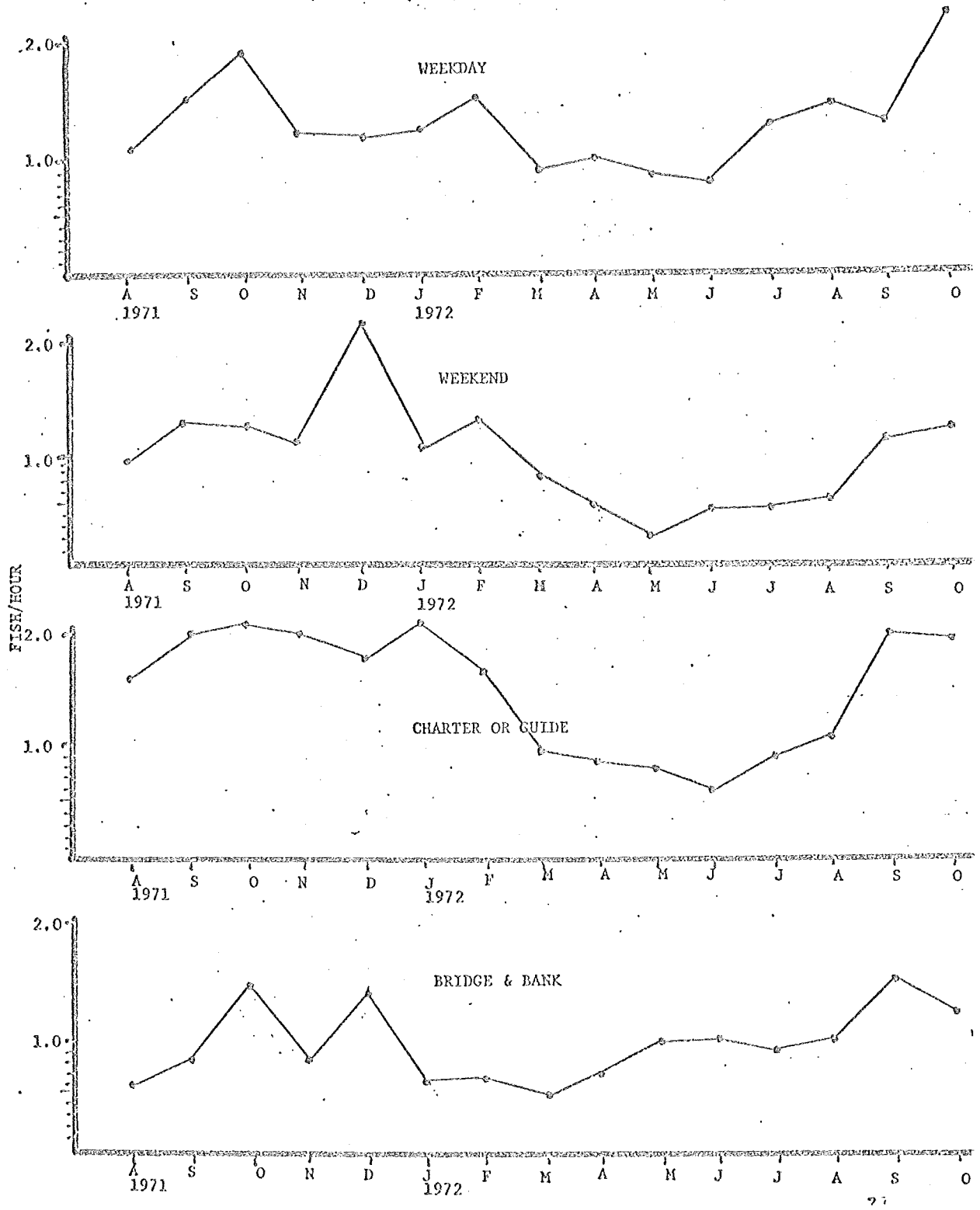




FIGURE 7  
 CATCH RATE BY METHOD OF FISHING  
 (DERIVED FROM INTERVIEW DATA)



The weekend and bridge and bank catch rates also reflect the abilities of the individuals who utilized these methods. In general, these fishermen were less familiar with the area and the successful methods used locally and they were, to some degree, dependant upon the fish coming to them.

It can be noted from TABLE 2 that area C was found to produce the highest mean catch rate, 1.29 fishes/hour, and received the lowest total pressure (3593 fisherman/hours). This area was most successfully fished by the weekday and charter/guide methods. Area C includes the largely wilderness areas of Aquatic Preserve G-14 and the northern portion of Everglades National Park and produced the highest catch rate for the survey, 2.12 fishes/hour for the weekday category and an unusually high value for the weekend category, 1.69 fishes/hour. The area was also heavily utilized by the charter fishermen (3002 hours) though with a lower rate of success (1.23 fishes/hour). The higher success rates for the two private boat categories were the result of interviews with the relatively few experienced private fishermen who were familiar with the unmarked channels and passes of Area C. These anglers would be expected to produce higher catch rates due to greater skill.

Areas D and E produced catch rates of 1.23 and 1.20 fishes per hour, respectively. Area D produced the highest catch rate for the charter/guide method (1.55 fishes/hour). The weekday method produced equal catch rates (1.24 fishes/hour) in both areas, while the pressure in Area E was more than double that of Area D. Area E received the greatest fishing pressure of the charter/guide method, 3077 fisherman-hours.

Areas A and B received 54.5% of the total fishing pressure (fisherman-hours) of the survey. Area A alone received 33.5% of the total fishing effort surveyed and produced the lowest catch/effort ratio. Area B received the second greatest amount of fishing pressure and produced a catch/effort intermediate between the lowest, Area A, and the highest, Area C. Area A and B received 54.2% and 31.4%, respectively of the total Bridge and Bank fishing effort. Area A also received 37.1% of the weekend category. The concentration of these less successful categories in the two northern parts of the study is reflected in the low total catch rates of these areas.

TABLE 2

SUMMARY OF THE INTERVIEW CATCH RATE DATA  
(FISHES/HOUR) FOR EACH AREA BY METHOD

	A		B		C		D		E		METHOD SUMMARY	
	Fish Hrs.	F/H	Fish Hrs.	F/H	Fish Hrs.	F/H	Fish Hrs.	F/H	Fish Hrs.	F/H	Fish Hrs.	F/H
Charter/Guide	3229	2472 1.31	3673	2847 1.29	3678	3002 1.23	3031	2472 1.55	4051	3077 1.32	18462	13870 1.33
Weekday	2256	2580 0.87	1386	748 1.85	392	185 2.12	1422	1141 1.25	3297	2629 1.25	9753	7283 1.20
Weekend	1521	2950 0.52	1359	1614 0.84	524	310 1.69	1789	1606 1.11	1328	1472 0.90	6521	7952 0.82
Bridge & Bank	3229	4629 0.70	2389	2683 0.89	48	96 0.50	746	1143 0.65	*	*	6412	8551 0.75
Area Summary	10235	12631 0.82	8807	7892 1.12	4642	3593 1.29	7716	6265 1.23	8748	7274 1.20	10148	37656 1.07

\* - No Bridge and Bank fishing access points in Area E.

During the interview period August 1971 to October 1972, a total of 40,148 fishes creeled were recorded in the study area by the interviewers. The five major species recorded were spotted seatrout (Cynoscion nebulosus), gray snapper (Lutjanus griseus), red drum (Sciaenops ocellata), sheepshead (Archosargus probatocephalus) and snook (Centropomus undecimalis). These species represented 76.53% of the total fishes examined in this survey (TABLE 3). FIGURE 8 presents the catch rates for these species as derived from the interview data.

Spotted Seatrout - A member of the drum family (Sciaenidae), spotted seatrout is considered an excellent game and food fish. The major portion of the catch, 80.53%, was taken in the period November - May (TABLE 3). Higman (op. cit.) found a similar distribution in seatrout catches in the southern portion of Everglades National Park. Stewart (1961) noted little movement of spotted seatrout from out of the near shore areas, an observation confirmed by Moe (1972). Klima and Tabb (1959) listed penaeid shrimp and various fishes as major seatrout food items. Stewart (op. cit.) also stated little diurnal influence on seatrout feeding, though sudden cold temperature did reduce the catches within Everglades National Park for a short period in 1960. The highest numbers in the Ten Thousand Islands were recorded in January, February and March, a total of 4046 fish.

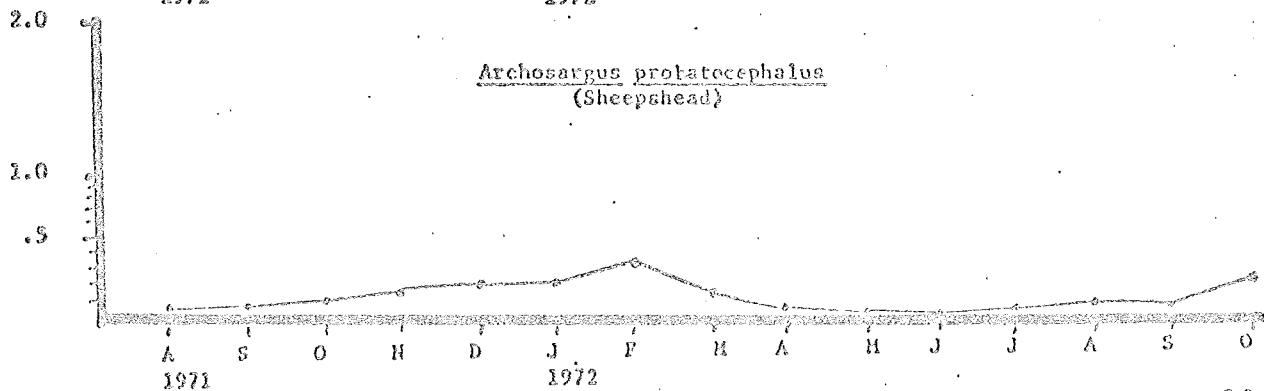
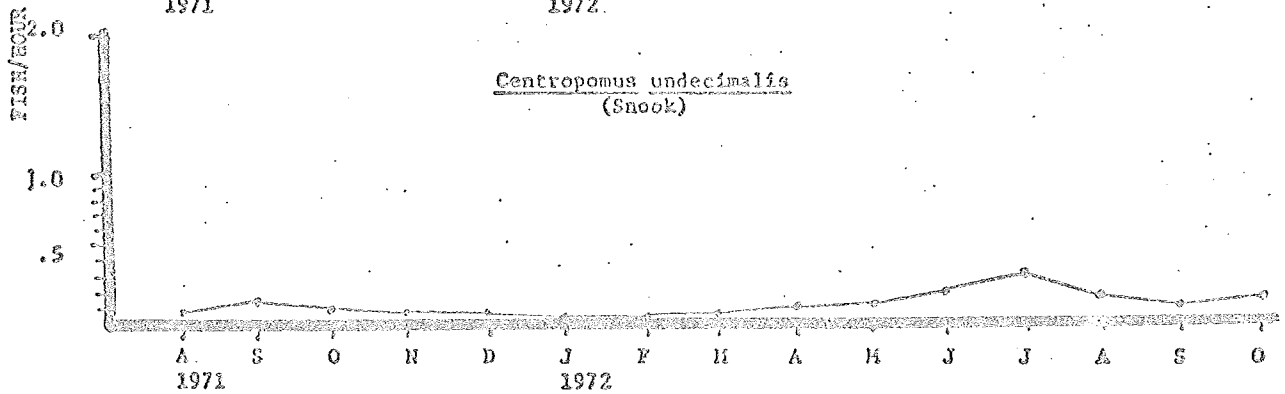
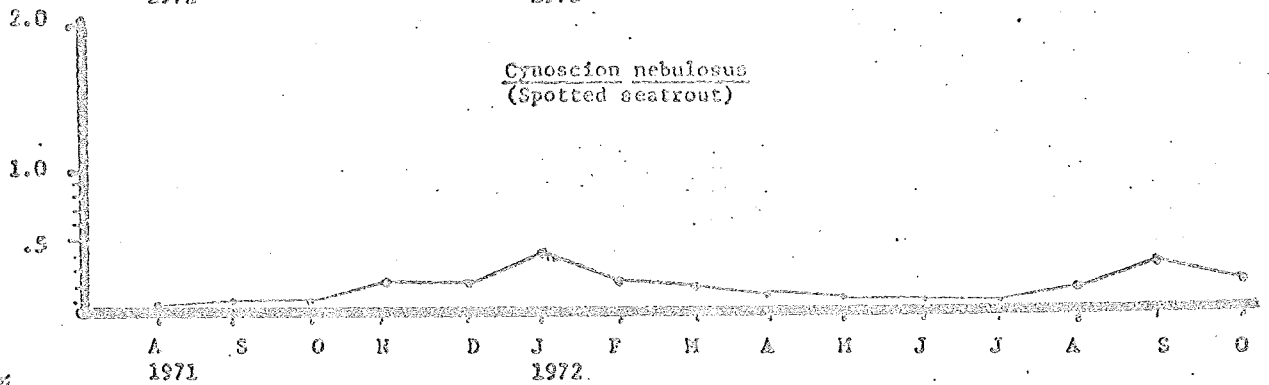
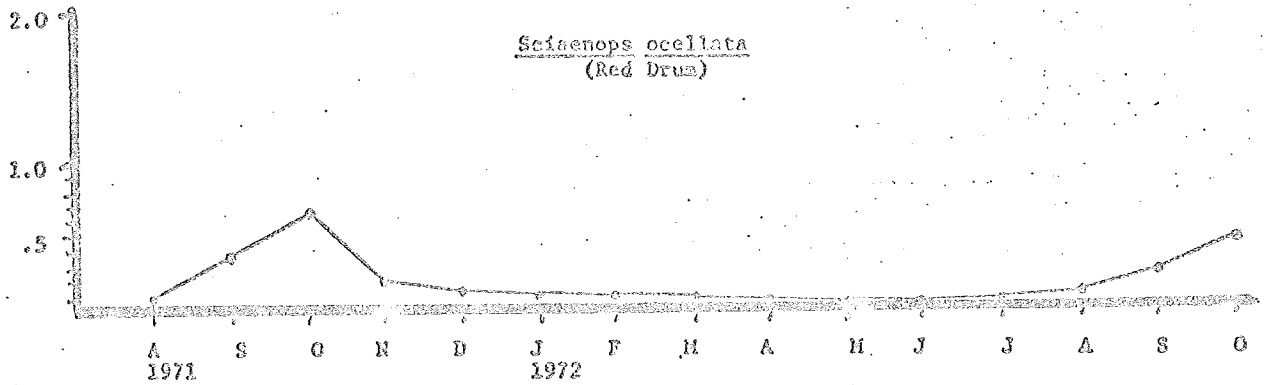
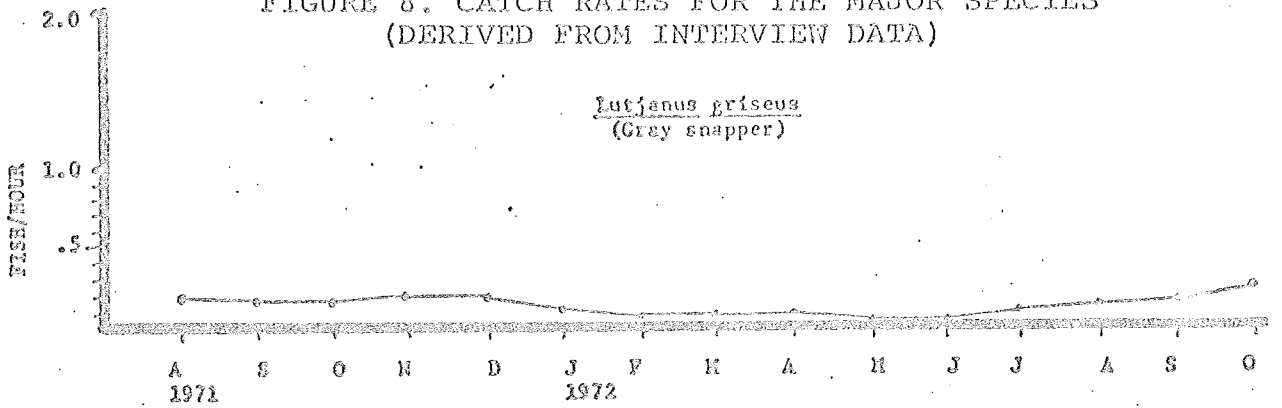
TABLE 3

The Monthly Sample Catches of the Major Species Recorded  
in the Ten Thousand Island Area, August 1971 - October 1972

	Spotted Seatrout	Gray Snapper	Red Drum	Sheeps- head	Snook
1971 Aug.	66	393	151	53	286
Sept.	182	469	1008	213	591
Oct.	136	374	1319	255	372
Nov.	774	820	668	595	424
Dec.	453	394	223	393	132
1972 Jan.	1116	476	265	820	101
Feb.	2098	424	279	1483	136
Mar.	832	282	203	600	148
April.	614	440	265	345	406
May	623	327	217	191	691
June	145	71	56	60	456
July	137	201	74	95	696
Aug.	272	456	284	240	355
Sept.	423	322	282	149	104
Oct.	<u>213</u>	<u>452</u>	<u>577</u>	<u>332</u>	<u>146</u>
	8084	5901	5871	5824	5044
	(20.14)	(14.70)	(14.62)	(14.51)	(12.56)

( ) - Indicates % of Total Creel

FIGURE 8. CATCH RATES FOR THE MAJOR SPECIES  
(DERIVED FROM INTERVIEW DATA)



Gray Snapper (called mangrove snapper locally) - The most popular and most common member of the snapper family (Lutjanidae) taken by sportfishermen along Florida's southwest coast, gray snapper is an excellent food and sport fish. The catch data (TABLE 3) show a single peak (820 fish) in November 1971 and lows in June (71 fish) and July (201 fish) 1972. Higman (op. cit.) found highest gray snapper catches to the south to occur in the late summer. It is probable that the low snapper catches in early summer found by this survey are attributable to a shift in local fishing pressure to snook during that species spawning season.

Red Drum (locally known as redfish) - Another of the drum family, red drum are prized as food and game fish. The catch data for this species (TABLE 3) indicate that 67.0% of the total catch was recorded during the months of September, October and November. Higman (op. cit.) found southern catch peaks in the winter months. Yokel (1966) presents evidence that would indicate major spawning activity for southern Florida populations to occur in September and October. Yokel (op. cit.) suggests that the colder water temperatures concentrate the fish in deep holes and channels where they become more susceptible to angling activity and he found that the crabs dominate the stomach contents of adult fish. Moe (op. cit.) states that Florida red drum show no significant migratory activity.



Sheepshead - This member of the porgy family (Sparidae) is considered of food importance and is found within the reaches of the inshore habitat of the Ten Thousand Islands throughout the year. The catch data indicate 72.73% of sheepshead recorded were taken during the period November - April, coincident with the increased winter season fishing pressure. Moe (op. cit.) states that southwest Florida populations indicate only random movement. Courtney and Kinch (1974) state that greatest concentrations of sheepshead were observed on near-shore artificial reefs off Marco Island during the winter and early spring. Major catches, 39.54% of the total creel, were made in January and February (TABLE 3).

Snook - The snook is probably the most popular of the sport fishes along the southwest coast of Florida. Snook are found in the inshore and near offshore areas of the region at all times of the year, but spawning activity brings large concentrations of adults into the passes and inlets along the Gulf during the late spring and early summer. Studies have indicated that this concentration is limited to local populations though the fish will wander throughout the inshore habitat (Marshall, 1958; Volpe, 1959). Fore (1973) in an

intensive study of the Ten Thousand Island vicinity snook population found adult snook to prefer fishes and crustaceans (crabs and shrimps) as food material. Fore (op. cit.) set the local spawning season as May - November. The catch data indicate this with 51.63% of the catch being recorded during the period April - August 1972 (TABLE 3).

APPENDIX 3 contains further discussion of the major sportfish species of the Ten Thousand Island area.

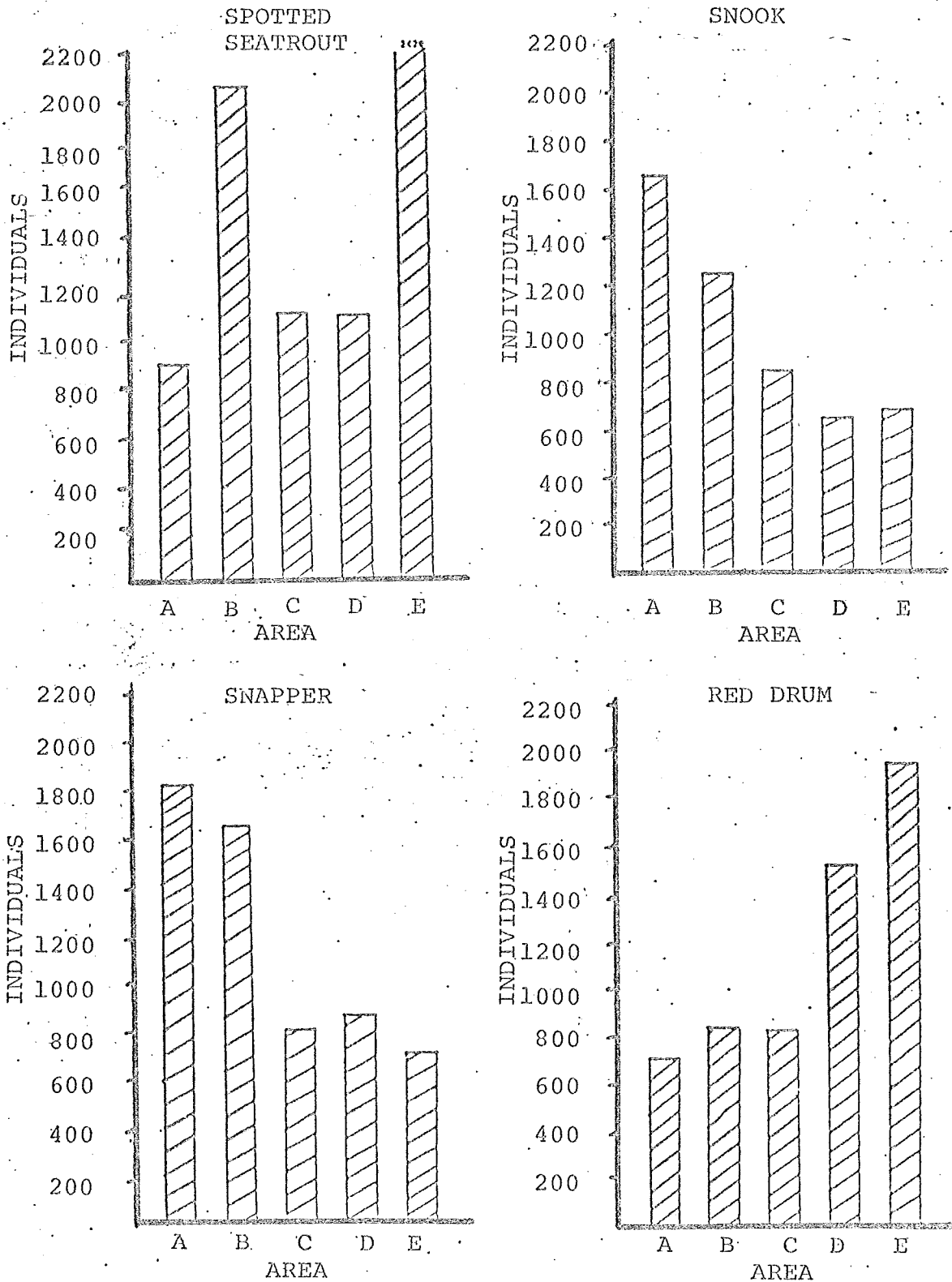
In FIGURE 9 the catches of four major species are presented by area. The major factors determining catch rate for each species were the differences in the fishing methods and in the habitat of each area. The majority of seatrout were taken in areas B and E. These areas contained most of the shallow grass flats of the study area which are preferred by seatrout (Klima and Tabb, op. cit.). The large number of snook taken in areas A and B were due to the number of deep holes in these areas which are intensively fished for this species during the spawning period. The presence of deeper water would also favorably influence winter catches of seatrout. More red drum were taken in the southern portions of the study area, D and E, more probably for reasons of fisherman preference and bait (more artificial lures are used) than occurrence in those areas. Areas A and B, which

possessed the greatest number of access points for the Bridge and Bank fishermen, also produced the largest proportion of the snapper. Areas D and E produced the 54.1% of the total sheepshead catch. The habitat favored by both snapper and sheepshead are submerged tree limbs, piling, etc., readily available to the shore fishermen. Sheepshead prefer to feed on fouling organisms and will readily take cut bait. Snappers appear to seek shelter from predation and will take cut or live bait. The concentration of preferable habitat would encourage a large snapper and sheepshead creel for the shore fishermen (M. A. Roessler, personal communication). The high proportion of sheepshead caught in the southern areas may be the result of other factors, bait or habitat differences.

FIGURE 9

A COMPARISON OF  
THE CATCH OF MAJOR SPECIES

BY AREA



## Projected Aerial Boat Counts

TABLE 4 presents the projected total number of boats fishing in the survey area during the 36 months of the aerial counts, July 1971 - June 1974. These totals are projection figures based on application of the formula presented in the methods section to daily flights. Since these counts do not take into account multiple trips by the same fishermen or fishing boats that were on the water earlier or later in the day, the projected totals presented in TABLE 4 and graphically in FIGURE 10 are low estimates for the actual number of boats. The increased boating activity in winter is readily evident in the figure.

In Area A, the area of the highest human population, boat traffic totaled 22,079 boats, the highest of the survey areas. The boats in this area were found to be predominately from the Marco Island - Isle of Capri area and to a lesser extent from Naples to the north. The major concentrations of boats were in the "Snook Hole" along markers 2 - 4 off New Pass, along Big Marco Pass, and at the southern tip of Little Marco Island in Hurricane Pass.

Area B exhibited considerably less boat traffic than area A. The projected total 15,696 boats was found to be the lowest of all survey areas. Marco Island boats have been noted as the major source of traffic in this area. The greatest concentrations of boats were found along Caxambas Pass and just inside the northern portion of Kice Island.

Area C, which includes Collier Seminole State Park, Aquatic Preserve G-14 and Remuda Ranch, was projected to contain 16,358 boats during the survey period. Boats entering this area originate from Marco Island to the north, Collier Seminole State Park, Remuda Ranch and Everglades City to the south. The numerous mangrove-lined tidal rivers and bays of this area have been noted for their fishing potential, but due to numerous shoals, shallow bays, and bars, only guides or experienced residents generally fished this area. The major boat concentrations in Area C were found along Panther Key, adjacent to the Gulf of Mexico.

Area D, which includes the populations of Everglades City and Chokoloskee Island, received nearly all its traffic from these villages. A total of 20,285 boats were projected

within this area during the survey interval, which compares closely with the 22,079 figure for area A. The numerous mangrove islands and tidal creeks offer habitat similar in character to the adjacent area C. The major concentrations of traffic are found among the border mangrove islands of Chokoloskee Bay, along Indian Key and in Chokoloskee and Rabbit Key passes.

In area E, the southernmost area of the survey, the projected total was 16,376 boats. The majority of this area is well removed from shore access points, therefore the major users were experienced local boatmen and guides. The principal concentrations of boats were found along Pavilion and Little Pavilion Keys and at Chatham bend at the mouth of the Chatham River.

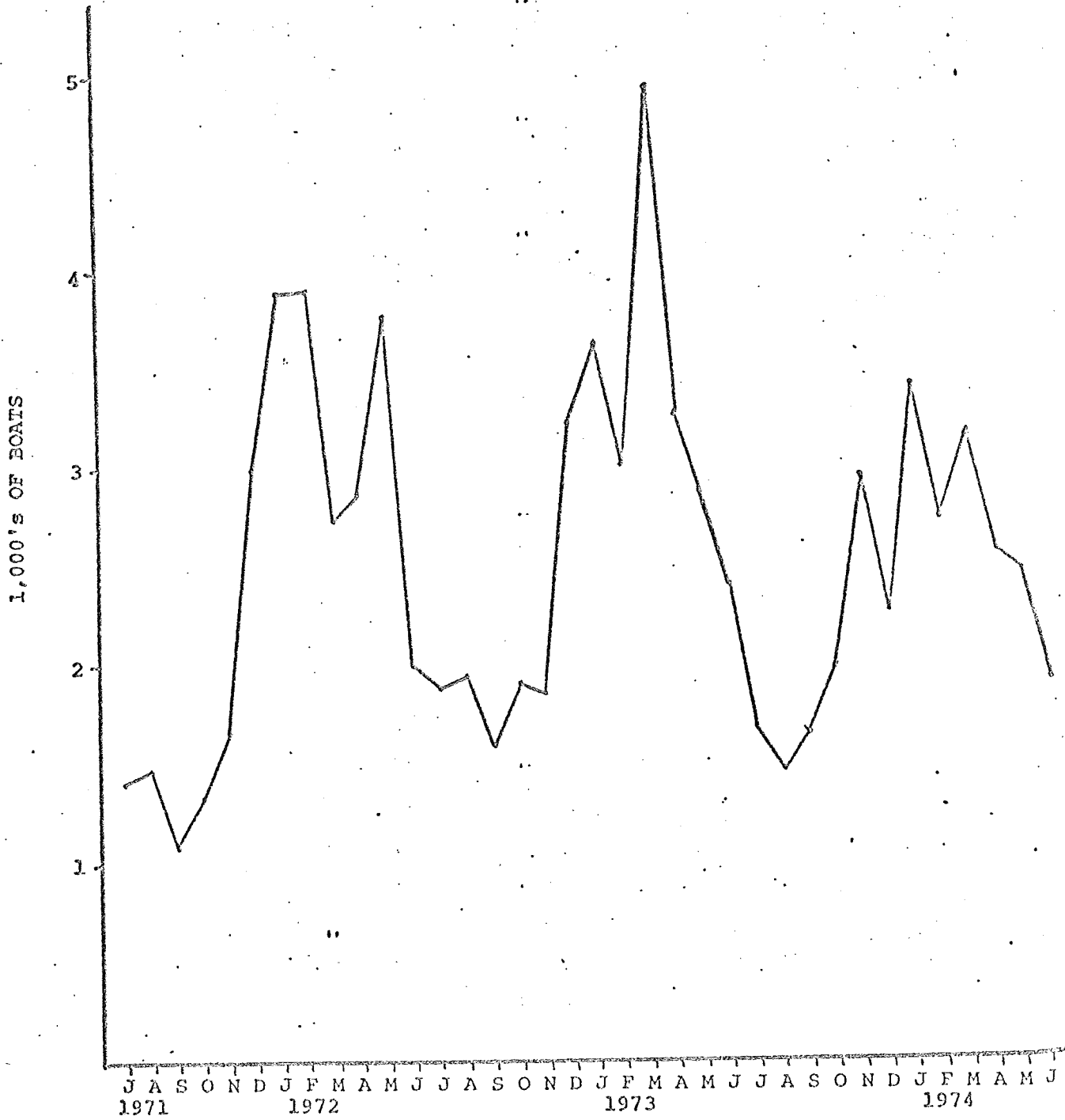
TABLE 4

Calculated Total Numbers of Boats by Area  
as Determined by Aerial Count

MONTH	A	B	C	D	E
JUL 71	363	172	249	319	331
AUG 71	441	156	253	222	390
SEP 71	300	98	285	261	210
OCT 71	312	109	339	238	289
NOV 71	468	238	300	324	382
DEC 71	488	316	608	924	636
JAN 72	858	378	870	1034	679
FEB 72	1034	378	807	932	663
MAR 72	647	281	663	597	448
APR 72	593	448	589	488	586
MAY 72	694	757	624	815	885
JUN 72	449	452	448	269	378
JUL 72	331	343	308	355	480
AUG 72	386	257	324	491	363
SEP 72	390	300	265	347	269
OCT 72	499	328	289	464	386
NOV 72	499	367	355	409	308
DEC 72	737	624	579	745	562
JAN 73	827	437	776	885	628
FEB 73	718	437	698	686	398
MAR 73	1568	702	791	1295	542
APR 73	827	339	522	819	523
MAY 73	780	484	398	678	593
JUN 73	643	706	211	328	523
JUL 73	499	328	207	347	339
AUG 73	347	2506	222	417	289
SEP 73	382	203	265	413	292
OCT 73	433	289	289	499	432
NOV 73	733	339	585	749	491
DEC 73	523	359	518	518	327
JAN 74	948	343	733	963	464
FEB 74	581	346	538	741	554
MAR 74	1100	538	514	674	425
APR 74	523	425	433	585	597
MAY 74	710	511	312	534	445
JUN 74	445	402	191	460	277
TOTALS	22,079	15,696	16,358	20,825	16,376



FIGURE 10  
CALCULATED TOTAL NUMBERS OF BOATS IN THE SURVEY AREA



Calculations of Total Fishing Effort  
and Catch

The bridge and bank fishermen have been shown to be a significant portion on the sport fishery, but a feasible method of estimating total pressure was not available to this survey. The aerial counts due to restriction as to time of day and the inability to account for multiple trips can be seen as presenting a low estimate of total boats fishing within the area. Therefore, the projections presented can be considered low estimates for the total sport-fishing pressure of the Ten Thousand Islands area.

Total Boat Fishermen - The total projected number of boats for the survey interval (TABLE 4) multiplied by the average number of fishermen/boat as determined by interviews result in

34511 boats x 2.767 fishermen/boat = 95,492 boat fishermen  
for August 1971 -  
October 1972  
(Interview Interval)

and

91335 boats x 2.767 fishermen/boat = 252,724 boat fishermen  
for July 1971 -  
June 1974.  
(Aerial Count Interval)

Total Boat Catch - A total of 5290 boat fishermen interviewed caught 33,746 fishes during the period August 1971 - October 1972. The interview effort resulted in a 5.54% sample of the total estimated boat fishermen population of that period. Expansion to a 100% sample would provide an estimate for the total boat fishermen catch for the 15 months. Therefore 95,492 boat fishermen would catch 609,134 fishes.

The survey sample is calculated to be 2.09% of the estimated number of boat fishermen for the period July 1971 - June 1974. Expanding a (2.09) sample of 33,746 fishes to 100% results in a total of 1,614,641 fishes taken by boat fishermen during the three years of the survey.

TABLE 5 represents the expansion of the interview catch data of major species for the boat fishing methods.

TABLE 5

Estimate of Total Boat Catch for Five  
Major Species from Interview Data

<u>Species</u>	<u>August 1971 - October 1972 (interview sample)</u>	<u>August 1971 - October 1972 (estimated total)</u>	<u>July 1971 - June 1974 (estimated total)</u>
Seatrout	7,852	141,732	375,694
Snapper	4,910	88,281	234,928
Red Drum	5,206	93,971	249,091
Sheepshead	4,185	75,542	200,239
Snook	4,518	81,552	216,172

A distribution of fishing pressure is presented below based upon the projected boat totals and the interview catch data.

<u>Area</u>	<u>Water Acreage</u>	<u>Boats/acre</u> (36 month survey period)	<u>Fishes/hour</u>
A	11,900	1.85	0.82
B	20,000	0.78	1.12
C	24,000	0.68	1.29
D	19,200	1.06	1.23
E	43,300	0.38	1.20

Area A exhibited the greatest density in boats/acre and also produced the lowest catch rate of the survey area (0.82 fishes/hour). This area is under the greatest fishing pressure of the survey and since area A also contains the highest population it is probable that if overfishing of particular fish stocks does occur it will probably happen in this area first.

Caillouet and Higman (1973) state that a statistical analysis of the sport-fishery of Everglades National Park at Flamingo indicated an insufficient number of fishing parties were available to provide the proper numbers of interviews necessary to establish changes in the stocks of particular species as the result of fishing effort. It was stated that only moderately large (0.20) degrees of precision, measured as the reciprocal of the variance of a mean, could be attained from their sample at the 90% confidence level.

TABLE 6 is a comparison of the data of Flamingo fishermen (South) and Ten Thousand Island boat fishermen (North) with respect to the precision attained for each category of fishermen for gray snapper, spotted seatrout and red drum.

TABLE 6

Attained relative precision at the 90% level of confidence and based on the average number of interviews per month, during a 109 month period for Flamingo (South) and a 15 month period for the Ten Thousand Islands (North).

(adapted from Caillouet and Higman, 1973)

<u>Fisherman Type</u>	<u>No. of Interviews per Month</u>		<u>Attained Relative Precision</u>		
	<u>Range</u>	<u>Average</u>	<u>Gray Snapper</u>	<u>Spotted Seatrout</u>	<u>Red Drum</u>
Weekend (South)	7-202	67	0.36	0.39	0.49
(North)	1-70	32	0.68	0.66	0.90
Charter (South)	4-79	16	0.54	0.70	0.70
(North)	14-112	54	0.18	0.37	0.37
Weekday (South)	2-70	30	0.56	0.57	0.64
(North)	19-91	40	0.47	0.48	0.65

The higher percentages of relative precision for the North/weekend and South/charter categories indicate that the North weekend fishermen are more consistent in their ability than the South weekend fishermen and that the Flamingo charter fleet is more consistent than its Northern counterpart (M. A. Roessler, personal communication).

Caillouet and Higman (op. cit.) found the levels of precision of the Flamingo data within the range necessary to derive a reliable estimate of the total annual catch and effort, and to monitor trends in the annual catch rate of three major species. Since precision levels in two categories of Ten Thousand Islands fishermen are less than those of the Flamingo area these data are of greater precision, i. e., lower variability. These values may be considered valid estimates of the catch rates for the charter/guide and weekday fishermen. Caillouet and Higman, (op. cit.) stated that the range in catch/effort over an annual cycle is no greater than that within a month. Therefore the total interview sample size for the weekend category can be taken to be sufficiently large to reduce the standard error and produce a valid annual estimate for the method.

## CONCLUSIONS

Based on the limitation and assumptions stated before, it was calculated that approximately 250,000 boat fishermen caught over 1½ million fish during the three year period. The fishermen success was determined to be a little over one fish per hour of fishing. Five species made up more than 75% of the catch.

Eighty-two percent of those fishermen stating a species preference stated that they wanted to catch snook. Half of the anglers had no preference.

The survey area contains approximately 118,000 acres of water of an average depth of 5 feet or less. The Highest daily boat count during the three year interval was 347 throughout the entire study area. This would indicate an area of over 300 acres for each boat that utilized the area during the period of the aerial counts. Even though this is undoubtedly a low estimate of total boats fishing and even if we assume that fishing pressure will not be distributed to all areas equally, it can be seen that considerable water remains available to absorb anticipated future fishing pressure increases.

However, fishermen tend to congregate, especially in the passes and at several well publicized fishing spots. As boat traffic and other water activities increase there will be an added disturbance factor which will cause a decrease in the success at those particular sites. There is already some evidence of this in the passes near Marco Island on weekends and holidays.

The purpose of this survey was to establish an estimate for the total sportfishing catch and effort within the Ten Thousand Islands area. The value of a survey of this type is in its quality as baseline data for future studies to quantify the effects of development or other changes with respect to catch rates, composition and differences in the fishing pressure.



## Acknowledgements

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APPENDICES

## APPENDIX 1

### Physical Description of Fishing Areas.

Areas A and B are partially developed with permanent populations for Marco Island of 4000, Isle of Capri with 650, and Goodland, on the southeastern tip of Marco, with 600. These areas have some bulkheaded canals with light concentrations of boat traffic in channels, and less sheet water flow from the mainland, as a result of channelization, than the three more southerly areas.

Area C is aquatic preserve G-14, and irregular mangrove coastal lagoon. (Price, 1954) A group of about 95 people constitute the only permanent residents at Royal Palm Hammock on U.S. 41 and Remuda Ranch Resort.

Area D is similar topographically to Area C with the exception of Everglades City with a population of 550 and Chokoloskee Island with 200. These two communities are surrounded by Everglades National Park.

Area E is entirely within Everglades National Park and has been described as a great mangrove barrier ridge. (Price, 1954). There are no permanent residents in this section.

The population figures are estimates based on personal observations of each individual area and conversation with various area authorities. There were no accurate individual census figures available for these areas.

APPENDIX 2

PRIMARY BRIDGE AND BANK SPORT FISHING AREAS - MARCO ISLAND AREA  
AREAS A & B

1. Marco River Toll Bridge

Location: Via SR 951, connecting mainland to Marco Island (central Northeast section).

Access: From Naples U.S. 41 - most roads on Island connect with 951 or Collier Boulevard.

Shoreline: Causeway at both North and South ends of bridge with lighted fishing catwalks extending from both sides to the center span supports.

Water: North shore has turtle grass beds on west side and coarse sand on east side with outlet of canal connecting McIlvaine Bay and Marco River - South shore has sand bottom on west side and coarse sand on east side with adjacent waterway entrance.

2. Isles of Capri, Vanderbilt Point

Location: Extreme western tip of Isles of Capri.

Access: From SR 951 to Isle of Capri Road continue until dead end and turn right on West Pelican to end of road.

Shoreline: Entire area bulkheaded with vertical concrete seawall.

Water: North side has shallow sloping sand bottom with small patches of grass dropping off to a channel depth of six to ten feet. South side is Marco River with abrupt drop-off to twenty-six feet in some spots with a well washed, coarse sandy bottom. There is a rough chop when winds are over twenty miles an hour from the West or Northwest through Coconut Pass.

3. North Marco Beach

Location: Actually the area might better be called West Beach, as this is the direction the area faces. It is the northern most point of the Gulf facing beach.

Access: From Collier Boulevard, turn North on Tigertail Court, left on Hernando Drive to Gulf.

Shoreline: This is a crescent shaped, gently sloping beach with a salt water pond behind it, and a meandering non-navigable tidal creek opening into Clam Bay.

Water: The entire area is shoal depth with large areas appearing at low tide, with an irregular deeper cut of water well off the beach. This entire area is fine beach sand with occasional pieces of driftwood and small patches of algae close inshore.

4. Caxambas Pass

Location: North Shore of Caxambas Pass south end of Marco Island.

Access: On Marco Island, from SR 92 turn south on Collier Boulevard to curve where south Collier Boulevard turns east.

Shoreline: Wide, fine white sand beach with an almost straight shoreline for three quarters of a mile.

Water: Sharp drop-off from eight to sixteen feet with hard sand bottom. Water usually has strong tidal current. Small grass bed at extreme western end close to beginning of seawall.

5. McIlvaine Canal

Location: Alongside SR 951 from bridge across McIlvaine Bay to Marco Toll Bridge.

Access: From U.S. 41 south on SR 951 to McIlvaine Bay.  
From Marco Island on SR 951 across toll bridge.

Shoreline: This canal was dug as source of fill for adjacent roadbed and edges are of soft peat and decaying mangrove roots.

Water: Straight drop-off to depths from six feet to fourteen feet. Rough, irregular bottom with many snags.

6. Old Caxambas Village

Location: North shore of Caxambas Bay, southeastern end of Marco Island.

Access: From SR 92 turn south on South Barfield Drive, turn left on Inlet Drive to Bay.

Shoreline: Bulkheaded with concrete seawall and oyster-shell on Bay side.

Water: Drops quickly from twelve to sixteen feet, with mixed sand, shell, and marl bottom. Strong tidal flow through this deep, natural channel.

7. Goodland Bridge

Location: Connecting southeastern end of Marco Island with mainland.

Access: From U.S. 41 south on SR 92 to bridge.

Shoreline: Causeway on east end of bridge with parking area. Fishing catwalks on both sides of this hand-operated swing bridge. A new high-level bridge is under construction north of the present bridge.

Water: Varies from exposed tidal flats to deep water under swing span with several small meandering shallow channels bisecting fishing area. Bottom varies from washed coarse sand to soft mud.

8. Location: All waterfront canal lots on Marco Island.

Access: Most roads adjacent to canals.

Shoreline: Vertical seawall.

Water: Berm slope of 1:3 at zero foot MLW from seawall to center of canal, which varies from 6 feet to 25 feet depending on the distance into the canal system, and the type of canal. Current flow in some parts of the interior canal system reaches 2 feet per second.



AREA C

Collier Seminole State Park

Location: Launch area at Royal Palm Hammock.

Access: U.S. 41 towards Miami.

AREAS D AND E

Location: All bridges on U.S. 41 up to SR 29 to Everglades City.

In Everglades City, the Barron River Bridge and all access points to the river.

South to Chokoloskee Causeway including all of Chokoloskee Island.

Access: U.S. 41 towards Miami, south on U.S. 29 to Chokoloskee Island.

### APPENDIX 3

The Marco Applied Marine Ecology Station has identified over two hundred species of fishes in the water surrounding Marco Island. The following list is of those fishes that have been found to make up the majority caught by the fishermen in the census area. All listed fishes are caught year-round in the area. Seasonal notation indicates that period when catch rates were highest. The method listed is the one which was commonly employed to catch the species. Bait listings are also generally intended to indicate most popular types. "Jigs" referred to as artificial bait are painted, molded, lead heads, generally on a 2/0 or a 3/0 hook with feathers, bucktail or nylon streamers. Common and scientific names from American Fisheries Society Special Publication No. 6.

#### Snook - Centropomus undecimalis

Size: Average spawning 15 pounds, average year-round 4 pounds.

Habitat: Inshore = deep holes, spawning.  
Around obstructions and along mangrove shores.

Season: Spawning May thru July - other year-round.

Method: Casting, spinning, trolling, still.

Bait: Plugs, spoons, jigs, live bait, cut bait.

Tackle: 10 to 50 pounds.

#### Tarpon - Megalops atlantica

Size: 5 pounds to 100 pounds.

Habitat: Inshore-summer deeper channels.  
Winter: under overhanging trees.

Season: Year-round - best- summer months.

Method: Casting, spinning, trolling, still.

Bait: Plugs, spoons, jigs, live bait, cut bait,  
mullet, catfish, sand perch.

Tackle: 10 to 60 pounds.

Red Drum - Redfish - Sciaenops ocellata

Size: Average 3 pounds.

Habitat: Inshore - around obstructions, hard bottom channels.

Season: Winter run cooler months - year-round.

Method: Casting, spinning, trolling, still.

Bait: Artificial spoons, plugs, jigs, live bait, shrimp, minnows.

Tackle: 10 to 30 pounds.

Spotted Seatrout - Cynoscion nebulosus

Size: Average 1 - 2 pounds.

Habitat: Inshore grass flats, shallow passes.

Season: Best in winter months.

Method: Casting, spinning, bottom or still.

Bait: Jigs, popping corks, live bait, shrimp, minnows.

Tackle: 10 to 20 pounds.

Gray Snapper - Mangrove Snapper - Lutjanus griseus

Size: Average 3/4 pound.

Habitat: Common throughout inshore.

Season: Year-round.

Method: Casting, spinning, bottom or still.

Bait: Plugs, jigs, almost any live or cut bait.

Tackle: 10 to 20 pounds.

Sheepshead - Archosargus probatocephalus

Size: Average 2 pounds.

Habitat: Inshore, obstructions, edge of channels.

Season: Year-round.

Method: Casting, spinning, bottoms or still.

Bait: Jigs, live, small shrimp or cut bait.

Tackle: 10 to 20 pounds.

Black Drum - Pogonias cromis

Size: Average 10 pounds.

Habitat: Inshore bays, channels.

Season: Year-round.

Method: Casting, spinning, trolling, bottom or still.

Bait: Spoons, jigs, plugs, live or cut bait.

Tackle: 10 to 60 pounds.

Gulf Flounder - Paralichthys albigutta

Size: Average 1 pound.

Habitat: Inshore, offshore, bays, channels, flats.

Season: Year-round.

Method: Casting, spinning, bottom or still.

Bait: Artificial, jigs, live bait, cut bait.

Tackle: 10 to 20 pounds.

Spanish Mackerel - Scomberomorus maculatus

Size: Average 1 pound.

Habitat: Inshore, offshore, rivers, bays, channels.

Season: Year-round, fall and spring run.

Method: Trolling, casting, spinning.

Bait: Artificial spoons, jigs, live bait.

Tackle: 10 to 40 pounds.

Sea Catfish - Arius felis

Size: Average 1 pound.

Habitat: All over.

Season: Year-round.

Method: All, but seldom trolling.

Bait: Almost any live or cut bait; occasionally jigs.

Tackle: 10 to 20 pounds.

Crevalle Jack - Caranx hippos

Size: Average 2 pounds.

Habitat: All over.

Season: Year-round.

Method: All.

Bait: Any artificial, live or cut bait.

Tackle: 10 to 40 pounds.

Ladyfish - Elops saurus

Size: 1 pound.

Habitat: All over.

Season: Year-round.

Method: All.

Bait: Any artificial, live or cut bait.

Tackle: 10 to 20 pounds.

White Grunt - Haemulon plumieri

Size: Average 3/4 pound.

Habitat: All over - favor reef areas.

Season: Year-round.

Method: Spinning or casting.

Bait: Any small live or cut bait.

Tackle: 10 to 20 pounds.

APPENDIX 4

The commonly used live baits in the Ten Thousand Island area for inshore fishing were found to be the following:

Pinfish	<u>Lagodon rhomboides</u>
Grunt	<u>Haemulon spp.</u>
Sea catfish	<u>Arius felis</u>
Ladyfish	<u>Elops saurus</u>
Striped mullet	<u>Mugil cephalus</u>
Fantail mullet (*silver mullet)	<u>Mugil trichodon</u>
Scaled sardines (*pilchard)	<u>Harengula pensacolae</u>
Silver jenny (*mutton minnow)	<u>Eucinostomus gula</u>
Crevalle jack	<u>Caranx hippos</u>
Lane snapper	<u>Lutjanus synagris</u>
Gray snapper (*mangrove snapper)	<u>Lutjanus griseus</u>
Sand perch	<u>Diplectrum formosum</u>
Pink shrimp	<u>Penaeus duorarum</u>
Brown shrimp	<u>Penaeus aztecus</u>
Fiddler crab	<u>Uca spp.</u>

\* local common name