2000 ANNUAL FISHERIES REPORT

EVERGLADES NATIONAL PARK

December, 2001

Thomas W. Schmidt, Jason Osborne, and John Kalafarski

with significant contributions by

Gabe Delgado and Mario Alvarado

South Florida Natural Resources Center
Everglades National Park
40001 State Road 9336
Homestead, FL 33034
WEB SITE- http://www.nps.gov/ever/current/report.htm

INTRODUCTION

National Park Service (NPS) management policies state that recreational fishing is permitted in parks when it is authorized by federal law or is not specifically prohibited, and is in accordance with applicable federal/state laws and regulations. However, the NPS may restrict fishing activities whenever necessary to achieve management objectives. NPS goals and management objectives are based on the preservation of diversity and ecological integrity of fish populations. When harvest is permitted, in no case should it be allowed to reduce the reproductive potential of the population or to radically alter its natural (unfished) age structure. Fishing activity and harvest of sportfish from Everglades National Park (ENP) have been monitored nearly continuously since 1958. The objectives of fisheries monitoring in the park are to estimate catch rates (cpue), relative abundance, age structure, total harvest, and boating and fishing activity.

This monitoring program was initiated because of concern over increased fishing pressure resulting from the construction of a highway, marina facilities, and an access canal to Whitewater Bay in 1958. The first ten years of the park's fishery monitoring program (1958-1969) were conducted through the University of Miami's Institute of Marine Science and were directed at evaluating only the sport fishery. Under this program, measures of catch and cpue were made only from those fishermen operating out of Flamingo. This data covered a large part of the fishery, but missed two other major areas: eastern Florida Bay and the lower 10,000 Islands.

In 1965, a permitting system was established for commercial fishermen operating in ENP. These fisheries included commercial hook & line (primarily spotted seatrout), netting (mullet and pompano), stone crab trapping, and professional guides. Until 1972, this catch data consisted of monthly total harvest, by species, for each fisherman. The harvest reports did not include any measure of fishing effort or specific area of harvest, so it was not possible to monitor populations by ecosystem or management unit, or to evaluate the degree to which fishermen complied with reporting requirements.

In 1972, the NPS expanded the monitoring program to include daily trip ticket reports from commercial permit holders and developed censusing techniques to evaluate total parkwide sport fishing and commercial effort. The primary emphasis of the expanded monitoring was to improve the precision of the catch rate and total fishing effort estimates for both sport and commercial fisheries (Davis 1979a). In 1974, fish size data was added to the information recorded and, in 1980, Chokoloskee-Everglades City boat ramp counts were added on a routine basis.

In 1978, a second detailed account of the park's fishery database was completed in response to sport fishermen and guide complaints of declining stocks. The results of this assessment were incorporated into a document for public review concerning alternative fishery management options for ENP (Davis 1979b). This assessment summarized the estimated total harvest of fish from park waters by species, by area, and fishermen type from 1973-1977; however, no detailed analysis of catch rate response to changes in effort or to environmental factors were made. Insufficient fish length data also were available in 1979 to evaluate such important parameters as age structure, mortality rates, and response to changes in fishing effort and harvest.

During the late 1980’s, Virtual Population Analysis (VPA) cohort stock assessments for the park's major fish species, based on a 10-year collection (1974-1984) of 40,000 fish length measurements, were conducted. VPA's are statistical models which use catch data to produce relative estimates of how many fish of a given species exist or how many of a particular age class are surviving to become spawners. Park stock assessments included total mortality estimates, age structure, and a yield-per-recruit analysis for the three most commonly caught sportfish: spotted seatrout, red drum, and gray snapper (Tilmant et al. 1986, Rutherford et al. 1989a, 1989b). This review concluded that environmental factors might explain as much of the variability in fish abundance as does fishing pressure.

Stock assessments, status and trend reports, and fisheries presentations for the period 1994-99 are briefly discussed in previous (1995-99) annual fisheries reports. For year 2000, project personnel participated in several scientific and management meetings, and stock evaluations/assessments. Oral, and poster presentations on long-term results covering the period of 1985-1998, were made at the 53 rd Gulf and

Caribbean Fisheries Institute meeting in Biloxi, MS (Delgado et al. 2000), and the Gulf of Mexico Symposium in Mobile, AL, respectively. In the spring of 2000 a series of Park guide fisheries management workshops dealing with the status of snook populations were held, one in Everglades City and the other in Key Largo. Principal topics covered included causes of short-term changes in catch rates of snook and snook/red drum differences in catch- rates associated with live bait and artificial bait use in Park coastal waters. No significant differences in catch rates were found for snook/red drum in the bait analysis.

An analysis of the fisheries database was undertaken as part of request from the National Marine Fisheries Service (NMFS) in St. Petersburg to document the abundance of the smalltooth sawfish in SW Florida. It was found that in the vicinity of the park's coastal waters, this area serves as the last U.S. stronghold for the species, and based on a NMFS status review, the species will be recommended for inclusion as a candidate species covered by the Endangered Species Act. Smalltooth sawfish tagging studies have been implemented in park waters to monitor their movement and abundance.

Conceptual models for various coastal CERP (Comprehensive Everglades Restoration Project) projects identified interactions between ecosystem dynamics and higher trophic levels in Florida Bay, focusing, in part, on adult spotted seatrout and snook catch rates. Various Federal/State interagency meeting participants identified draft ecological performance measures as indicators of ecosystem restoration. Documentation sheets on snook and spotted seatrout CPUE were developed for performance measures and will be considered in the CERP evaluation /decision making process.

A poster on the evaluation of recent trends in the recreational sport and guided fisheries of Florida Bay was also presented at the Greater Everglades Ecosystem Restoration Science Conference, Naples, FL, with an abstract published in the proceedings. Creel data from 1998-1999, was provided to the Florida Marine Research Institute (FMRI) (St. Petersburg) to generate stock assessments and status and trends reports for snook, spotted seatrout, and red drum. The Gulf of Mexico (GOM) Fishery Management Council's red drum stock assessment meeting in Miami was attended to re-evaluate NMFS data to determine the red drum stock status in the GOM. A Gulf States Marine Fisheries Commission (GSMFC) database management/data entry training session was attended in St. Petersburg, FL. An assessment of Florida Bay fisheries for 1998 was made and incorporated into a chapter for a Park report on the Status of Florida Bay.

Other project related activities for the lead author included providing assistance in the development of a Fishery Management Plan (FMP) for Biscayne National Park and the development of Dry Tortugas National Park General Management Plan. A final site characterization report with emphasis on fisheries in the Dry Tortugas region was drafted. .
A health advisory remains in effect for six species of marine fish found in northern Florida Bay. The average mercury level of spotted seatrout, gafftopsail catfish, crevalle jack, ladyfish, and bluefish is in excess of the state limit for human consumption.

This is the sixth fisheries report produced since 1990. Due to severe personnel shortages, only basic data collection activities were maintained from 1991-1994 by port samplers at Flamingo and Everglades City. During a temporary personnel shortage in the Fall of 2000, other ENP science personnel conducted surveys at Flamingo. This report includes a description of the fishery, relative abundance, and average size of the four major catch species in 2000, as well as comparisons with previous years. In addition, estimated total catch/harvest, effort, and boating activity are included, as well as environmental effects on cpue from 1985-2000.

METHODS

Methods (data collection/recording format) employed to obtain sport fishing monitoring and boating activity data in ENP have been previously presented by Higman (1967), Davis and Thue (1979) and Tilmant et al. (1986), and are briefly discussed below.

Recreational fishermen are interviewed at boat launch sites (Flamingo and Chokoloskee/Everglades City) upon completion of their trip every weekend. Data recorded includes area fished (Figure 1), fish kept and

released, effort (in angler-hours), species preference, angler residence, and fish lengths. Professional guides were required to obtain an annual permit from the park and report their monthly catch and effort on a per trip basis via logbooks supplied with the permit. Prior to 1980, reporting was voluntary. Reporting compliance of the guide fishermen is determined from recorded field observations by park rangers and by port samplers at the boat launch sites. Since the elimination of commercial fishing in ENP in 1985, only recreational guided and non-guided recreational anglers are permitted to fish within park waters.

Daily estimates of the total number of fishing boats operating in park waters were made by regressing the daily counts of empty trailers at Flamingo against a known number of boats fishing the same day. Aerial surveys were used to determine the correlation of boat trailers at the Flamingo launch ramp to the total number and distribution of boats within the park. Over 243 flights were conducted using randomly selected weekdays and weekends stratified by month for three sample periods (July 1972 to May 1975; October 1977 to October 1978; and October 1983 to October 1984). Highly significant linear relationships between the number of trailers at Flamingo and total boats observed in the park were obtained during each sampling period. The accuracy of the aerial observers was about 94% (152 known patrol boats on the water, 143 sighted). No significant differences were found among the regression statistics for the three survey periods and therefore all the data were pooled to strengthen the expansion estimates ($r=0.84$, $N=243$, $p<0.01$) (Tilmant et al. 1986). There was no significant difference in the boat count-trailer count regression between weekdays and weekends. The percentage of recreational boats actually fishing was determined from boater interviews.

Flamingo is by far the greatest single access point to Florida Bay and has been used by 50-60% of the total anglers. During 1972-1974 and 1981-1984, additional interviews were obtained at ramp sites along the Florida Keys. However, no significant differences were found in the catch composition or catch rate of these anglers when compared to those anglers fishing the same areas interviewed at Flamingo (Tilmant et al. 1986). Catch data from Area 6 is entirely from Chokoloskee/Everglades City interviews.

Estimates of total recreational catch and harvest of individual fish species for the non-guided fishery were determined by applying the recorded mean catch (or harvest) of that species per successful trip to the estimated total number of fishing trips successful for that species. The estimated total number of recreational fishing trips for a species was determined by applying the proportion of recreational boats, contacted by interviewers, that were successful for the species to the estimated total recreational boats determined by the ramp boat-trailer count. Statistical differences were found between Everglades City (Area 6) and Flamingo (Areas 1-5); therefore, total estimated catch and harvest computations were made separately for the Everglades City and Florida Bay regions and then added to obtain parkwide estimates (Tilmant et al. 1986).

Estimates of total harvest for the guide fishery were obtained by dividing the reported harvest by the estimated percent reporting compliance of guides known to be fishing. Not all guides reported their catch as required; therefore, a reporting compliance adjustment was necessary. The estimate of reporting compliance as determined through independent field observations of fishing activities was about 29% in 2000.

The mean annual catch rates (CPUE) and harvest rates (HPUE) were calculated after Malvestuto (1983). Only those anglers successful in catching a species were used to calculate a catch or harvest rate to avoid bias in the possible change in the proportion of effort applicable to a species each year.

Statistical procedures used in previous years included tests for the assumptions of normality (Kolmogorov-Smirnov test) and homogeneity (Bartlett's Box F). When these assumptions were met a parametric one-way ANOVA or t-test was used to test differences in catch rate by fishery and area. If conditions of homogeneity or normality were not met after transformations, a non-parametric Kruskal-Wallis test was used instead of the ANOVA. After significance was determined ($p<0.05$), a Student-Newman-Keuls test or Dunn's multiple comparison test was used to identify particular differences.

Fish lengths taken from sport (non-guided) anglers in 2000 were analyzed to determine if there were differences among fishing areas and seasons. When the assumption of homogeneity of variances (Levene's

test) was met, a parametric one-way ANOVA (f) or a Student's t-test (t) was used to test differences in mean harvest length by area and season. If conditions of homogeneity were not met, a non-parametric Kruskal-Wallis test (X^2) was used in place of the ANOVA and a correction for non-homogenous variances was made for the t-test. If a significant difference was detected for an ANOVA ($p<0.05$), Tukey's multiple comparison test was used to test for particular differences.

RESULTS

All of the non-guided angler catch data for Florida Bay and the immediately adjacent waters (Cape Sable, Whitewater Bay, and Shark River area, hereafter referred to as Florida Bay) has come from interviews conducted at the Flamingo boat ramps. All of the non-guided catch data for Everglades City (Lostman's River to the northwestern boundary of the park near Chokoloskee) has come from interviews conducted at the Everglades City-Chokoloskee boat ramps and marinas.

During 2000, 3487 boaters were interviewed at Flamingo. Ninety-six percent of these boaters were involved in sportfishing activity. Only 4.9% of the anglers did not catch fish.

At Everglades City, 2638 boaters were interviewed. Ninety-three percent of the total boats interviewed were fishing. Only 4% of the fishermen did not catch fish.

Description of the Fishery (2000)

Most (78.9%) of the anglers fishing out of Flamingo were south Florida residents (Dade County to Ft. Lauderdale, excluding local residents); 1.4% were local residents (Florida City, Flamingo, and the Florida Keys); 17.2% were from the rest of Florida. Only 1.9% of the anglers came from out of state.

At Everglades City, most (77.5%) of the anglers were Florida residents other than south Florida and local residents. South Florida accounted for 7.2% of the anglers, while 14% were local (Chokoloskee/Everglades City) residents, and 1.3% came from out of state.

An estimated 27,846 fishing trips, 64,764 anglers, and 28,890 boats made up the boating and fishing activity in Florida Bay. Of these fishing trips, 12.1% were interviewed at the Flamingo boat ramps. The average trip lasted 7.37 hours with an average fishing time of 5.6 hours and an average of 2.33 anglers on board.

Most anglers interviewed at Flamingo (66%) did not try to catch any one specific kind of fish. Red drum were the most popular fish, sought by 10.3% of the fishermen; snook were sought by 9.7% of the fishermen. The next three species preferred were spotted seatrout (9%), tarpon (1.8%), and gray snapper (1%). More than 58% of the fishing parties interviewed reported catching spotted seatrout. The next four species most commonly caught were gray snapper (28%), red drum (27.3%), snook (20.5%), and tarpon (4.5%).

At Everglades City, an estimated 16,201 fishing trips, 38,392 anglers, and 17,387 boats made up the boating and fishing activity. Of these fishing trips, 15.2% were interviewed at the Everglades City boat ramps. The average trip lasted 7.62 hours with an average fishing time of 6 hours and an average of 2.31 anglers on board.

Most anglers interviewed at Everglades City (56.1%) did not try to catch any particular kind of fish. Snook was by far the most popular fish, sought by 30.1% of the fishermen. The next three species preferred were spotted seatrout (7.5%), red drum (3%), and tarpon (1.1%). More than 43.5% of the fishing parties interviewed reported catching snook. The next four species most commonly caught were spotted seatrout (42.9%), red drum (23.2%), gray snapper (24.6%), and tarpon (2.3%).

An estimated total of 46,277 fishing trips were reported in park waters during 2000. This represents a slight increase from the 43,994 fishing trips in 1999. The overall trend in recreational fishing boats since 1972 shows high values in 1973-75, with lows in 1979-80, and a rebound in the mid-80's to the second highest value in 1989 (Figure 2). A decline during 1992 is attributed to the impacts of Hurricane Andrew; the park was closed from September through December. There had been an increasing trend since 1995 with the highest number of fishing boats recorded in ENP during 1997 with a slight declines in 1998 and 1999 (Figure 2). The recreational fishing effort (total estimated angler-hours) has followed this trend as well (Figure 3).

Relative Abundance (CPUE and HPUE)

Catch rate is a function of the number of fish caught per unit of time or effort expended. The number of fish caught for each hour of fishing is used as an index of the abundance of the fish. The 2000 mean catch (CPUE) and harvest rates (HPUE) for the 11 major species of the recreational (non-guided) fishery in Florida Bay (Areas 1-5) and all of ENP (Areas 1-6) are given in Table 1. Table 2 gives the mean catch and harvest rates of the six major species caught by guided anglers in Florida Bay (Areas 1-5) and all of ENP (Areas 1-6). The relationships of 2000 non-guided catch and harvest rates to past years are presented in Figures 5-6 for the four major species (snook, spotted seatrout, gray snapper, and red drum). The relationships of 2000 guided catch and harvest rates to past years are presented in Figures 7-8.

Estimated Total Catch and Harvest

The catches of the interviewed anglers and the reported catches of the guide fishermen are only samples of the total park harvest. Catch rates calculated from interviews are multiplied by the estimated total number of boats fishing for a particular species to yield estimates of total non-guided catch and harvest. For the guided fishery, the total number of fish reported caught/harvested is divided by the percent guide compliance to yield the estimated total catch/harvest by species. The 2000 estimated total non-guided and guided catch/harvest is shown in Table 3. The relationships of 2000 catch and harvest to previous years are shown in Figures 9-10.

Recent Trends (Florida Bay and Parkwide as noted)

Overall, 2000 annual guide and non-guided successful catch rates for snook, gray snapper, spotted seatrout, and red drum were nearly as high or higher than recent years. Annual harvest rates for the four major species had decreased steadily since the mid- to late-1980's, but seem to be holding steady in recent years. Catch rates may be used as an index of abundance and are directly related to environmental factors, but not directly affected by fishing regulations, while harvest rates most certainly are.

Snook

The popularity of snook has increased dramatically in recent years. Nearly 41% of licensed anglers in Florida have snook stamps (Muller and Murphy, 1999). The percentage of fishing parties catching snook in Florida Bay increased from 9% in 1985 to nearly 27% in 1994, but has suffered a slight decrease in the proceeding years falling to 20.5% in 2000 (Figure 4).

Catch/Harvest Rates:

Harvest rates for both sport and guide fishermen in Florida Bay have been relatively stable since 1980 (Figures 5, 6, and 7). Guide catch rates had been declining since 1992-1993, but showed a rebound in 1999 (Figure 7). However, sport catch rates in Florida Bay have shown a cyclical trend every four years (Figure 5). There was a low in cpue in 1980 that increased to a high in 1984. Catch rate then decreased to 0.171 fish per angler-hour in 1988, only to increase to another high in 1992 of 0.326 fish per angler-hour. Another low was reached in 1997 (0.217 fish per angler-hour); catch rate started to increase yet again in 1998 with a value of 0.229 fish per angler-hour. The trend continued in 2000 with another high of 0.2968 fish per angler-hour. These trends are corroborated by stock assessments conducted by FMRI (St. Petersburg) using state and federal recreational fishery statistics (Muller and Murphy, 1999). The increases may reflect stock recruitment of small juvenile snook, which were released in prior years because of size restrictions and were recruited to the fishery four years later; that is the time needed for snook to recruit to the park fishery (Thue et al, 1982). Snook are a relatively non-migratory, inshore species that will make localized movements between estuaries as juveniles and move to nearby offshore areas as adults for spawning. Recruitment may have also been enhanced by increased rainfall and/or runoff.

In a collaborative project with FMRI (Marathon), the monthly mean catch rates from 1985-1998 for each individual area (Areas 1-6 separately) were analyzed using non-parametric trend analysis to detect long-term changes in the catch rate of snook. Snook cpue showed no significant trends in Area 1 and Area 4; however, there were significant increasing trends in Area 3, Area 5, and Area 6. No analysis was done for Area 2 because of insufficient data.

Estimated Total Catch & Harvest:

Despite the two fish per person bag limit, 26" minimum size limit, closed season during June, July, and August for breeding, and closed season from 15 December through 31 January due to the fish's sensitivity

to cold water temperatures, sport fishermen harvest had not been reduced until 1998 (Figure 9). Estimated catch and harvest declined in 1999 as well, but increased in 2000 (Figure 9). Yet more fishermen are targeting the species than ever before; this would indicate that the Florida Bay stocks might have been overfished in the recent past (Muller and Murphy, 1999). Guided anglers' catch and harvest had been increasing since 1990, but dropped after an all-time high in 1995 (Figure 10). Guided catch and harvest has been somewhat stable in recent years.

Gray Snapper

The percentage of anglers reporting catches of gray snapper in Florida Bay has remained relatively stable from 1985-2000 (Figure 4). The large decline seen in 1991 was probably due to new regulations that established the minimum size at 10" with a bag limit of five fish per person. Recently, the percentage of anglers catching gray snapper had been increasing from 29% in 1997 to nearly 38% in 1999, but then in 2000 there was a decrease to 27.9%.

Catch/Harvest Rates:

In general, sport and guide harvest rates for gray snapper in Florida Bay have shown steady declines since 1980 (Figures 5, 6, and 7). On the other hand, sport catch rates have been relatively steady; although, there were slight declines during the middle to late 1990's. However, sport cpue jumped to 0.892 fish per angler-hour in Florida Bay in 1999 (Figure 5), which is the highest value since 1992. During 1988-1992, the increase in catch rate, but not harvest rate of sport anglers may reflect good recruitment of small juvenile fish to the stock. Perhaps the large cpue increase in 1999 is also related to good recruitment. The decline in harvest and catch rates in Florida Bay in 2000 seem to be mimicking the 1992-3 information, suggesting that next year's harvest and catch rates will follow that declining trend and will be at another low as in 1994.

In a collaborative project with FMRI (Marathon), the monthly mean catch rates from 1985-1998 for each individual area (Areas 1-6 separately) were analyzed using non-parametric trend analysis to detect long-term changes in the catch rate of gray snapper. There were no significant long-term trends in gray snapper cpue in any of the areas.

Estimated Total Catch & Harvest:

During the 1990's, the annual guide and non-guided estimated total catch and harvest for gray snapper has dropped as low or lower than anytime during the previous record (Figures 9 and 10). While the estimated catch of sport anglers experienced large increases from 1997-1999, there was a marked decline in 2000 (Figure 9). The low harvest in the 1990's was probably due to regulations imposed on the fishery in 1988 and 1990 when the legal minimum size was increased from to 8" and then to 10" with a bag limit of 5 fish per person. However, harvest rates since 1991 have remained relatively stable (Figure 9).

Spotted Seatrout

The percentage of fishing parties catching seatrout in Florida Bay declined steadily from 1985-1989, but increased sharply to a 14 year high in 1992 of almost 61% (Figure 4). Since then, the percentage of anglers catching seatrout declined to a 14 year low in 1996 of 39% (Figure 4). The trend has been increasing since 1996 with seatrout caught by over 58% of the anglers in 2000 (Figure 4). Fishing regulations may have affected angler strategy as the declining trend in seatrout is associated with increases in red drum and snook. Fishermen may have switched their targeting preference to the latter two species when their numbers increased after changes in regulations.

Catch/Harvest Rates:

Sport fishermen harvest rates for seatrout have been holding steady since 1990 in ENP (Figures 5 and 6). However, guide harvest rates have been almost halved since 1989; yet, guide catch rates have increased over the same time period to 1.88 fish per angler-hour in 2000 (Figure 7). The catch rate of sport fishermen in Florida Bay has also shown an increasing trend since 1994 to an all time high of 1.06 fish per angler-hour in 2000 (Figure 5). The catch rate in all of ENP has been stable since 1993 (Figure 6). The lack of increase in harvest rate associated with an increase in catch rate may be due to state regulations imposed on the fishery in 1989 which raised the legal size limit from 12" to 14", and then for the south Florida

populations to 15" in 1996. These regulations were meant to reduce harvest to achieve the Florida Marine Fisheries Commission's (FMFC) spawning potential ratio (SPR) objective of 35%. The SPR is the ratio of the spawning stock biomass of the exploited fish population to the spawning stock biomass of the same population in an unfished condition.

In a collaborative project with FMRI (Marathon), the monthly mean catch rates from 1985-1998 for each individual area (Areas 1-6 separately) were analyzed using non-parametric trend analysis to detect long-term changes in the catch rate of spotted seatrout. Seatrout cpue showed no significant trends in Area 1 and Area 3; however, there were significant declining trends in Area 4, Area 5, and Area 6. No analysis was done for Area 2 because of insufficient data.

Estimated Total Catch & Harvest:
Annual estimated total harvest data from non-guided fishermen suggests that seatrout harvest has decreased steadily since 1989, while there has been an upward trend in the estimated catch since a low in 1996 (Figure 9). Estimated harvest from guide fishermen had been very stable from 1990-1995, but experienced an all time low in 1996 with a rebound to 16,002 fish in 2000 (Figure 10). Meanwhile, the estimated catch of seatrout by guided fishermen has shown an increasing trend since 1990 (excluding 1996), with an all time high of 103,098 in 2000 (Figure 10). The reduction in harvest with a concurrent increase in catch for both sport and guided anglers may be due to the rise in catch-and-release practices by fishermen.

Red Drum
The percentage of boats catching red drum in Florida Bay decreased dramatically from 33% in 1985 to 17% in 1988 when the fishery was closed due to overexploitation (Figure 4). When harvest was reopened, the percentage of anglers catching the species increased steadily to a 14 year high in 1997 of 36% (Figure 4). The percentage of anglers catching red drum has decreased in proceeding years to 27.2% in 2000.

Catch/Harvest Rates:
Red drum harvest rates for sport fishermen in Florida Bay have remained quite stable beginning in 1989 when bag limits of 1 fish per person were imposed (Figures 5 and 6). Guide harvest rates also seem to be quite stable since the 1988 closure (Figure 7). Increased size limits (12" to 18") and a closed season imposed on the fishery in September 1985 probably accounted for the large declines in harvest rates after 1985; however, the sharp decline during 1985 suggests the possibility of overharvest or poor recruitment (Figures 5 and 7). Meanwhile, sport fishermen catch rates in Florida Bay had been increasing since an all time low of 0.290 fish per angler-hour in 1994 to 0.384 fish per angler-hour in 1998. There has been a slight decrease in the past two years from .370 fish per angler-hour in 1999 to 0.356 fish per angler-hour in 2000 (Figure 5). Since the fishery recovered faster than anticipated, the FMFC allowed year-round fishing in 1996, which may explain the higher catch rates in the late 1990's. However, it should be noted that guide catch rates have shown a steady declining trend in 1985-1997, although the catch rates have been increasing slightly since a marked decline 1998 (Figure 7). Concurrently, in 1998-2000, the harvest rates for guides have been declining.

In a collaborative project with FMRI (Marathon), the monthly mean catch rates from 1985-1998 for each individual area (Areas 1-6 separately) were analyzed using non-parametric trend analysis to detect long-term changes in the catch rate of red drum. There were no significant long-term trends in red drum cpue in any of the areas.

Estimated Total Catch & Harvest:
Annual estimated total catch data from non-guided fishermen suggests that red drum catches had been steadily increasing from 1988 until 1997 (Figure 9). Since 1997, there were large drops in catch rates in 1998 and 1999, while catch rates have leveled off at 29,180 fish in 2000. Estimated harvest rates have also shown this drop in 1998-2000. Harvest from guide fishermen has also shown a slow, but steady increasing trend since 1990 (Figure 10). However, the estimated catch rates for guides in Florida Bay have remained steady since 1997, when fishermen were allowed to fish year round again (Figure 10).

Tarpon & Bonefish

The professional guide fishery is largely directed at a few highly prized gamefish species. Two of these species, tarpon and bonefish, are of little food value and are not sought by the majority of the non-guided anglers. They are the trophy species of the guide fishery. Since harvest of tarpon only occurs for the purposes of mounting the catch, catch rate is more indicative of the stock than harvest rate. The catch rate of tarpon rebounded in 1983, from a low in 1982, but experienced a slow decline in the mid-1980's reaching another low in 1987 (Figure 8). The cpue of tarpon increased to an all-time high of 0.254 fish per angler-hour in 1995 and then leveling off around a somewhat lower cpue of approximately 0.20 fish per angler-hour in the following years (Figure 8).

Like tarpon, bonefish are not harvested unless the angler desires to mount the catch. Bonefish catch rates show an almost cyclic trend since 1980, with a low value in 1983, steadily increasing through the late 1980's, reaching another low in 1992 (Figure 8). Guide catch rates for bonefish reached another high in 1994 only to decline again for the period of 1995-2000 with catch rates reaching an all-time low in 2000 (Figure 8). Nearly all bonefish are caught in Area 2 and are released when caught; therefore, it is highly unlikely that fishing mortality has played any significant role in determining bonefish stock abundance. The estimated total annual catch of tarpon and bonefish for guided anglers in 2000 is given in Table 3.

Fish Lengths (2000)

Snook

A comparison of mean harvested snook length in Areas 1, 3, 4, 5, and 6 (Area 2 was not included in the analysis due to insufficient data) showed that there was no difference in mean length among the five areas ($df=425$, $f=1.38$, $p>0.24$) (Figure 11). The lengths for Areas 1-5 were pooled together to determine if there was a difference in the length of snook harvested in Florida Bay versus Everglades City (Area 6). There was no difference in mean snook length between Florida Bay and Everglades City ($df=425$, $f=2.212$, $p=0.138$) (Figure 12). These results are consistent with the analysis of 1998 snook lengths.

A parkwide seasonal comparison of snook lengths for 2000, showed that there was a significant difference among the four seasons ($df=425$, $f=5.875$, $p=0.001$) (Figure 13). In 2000, snook that were harvested in the fall were significantly larger than in any other season, while those in 1999 and 1998 were significantly larger in the summer. Winter 1999 recorded the second largest harvested snook, while the summer of 2000 had the second largest harvested snook for that year.

In 2000, a comparison of snook lengths from Florida Bay only (Areas 1-5) showed that there was a significant difference in the length of harvested fish among the four seasons ($df=155$, $f=4.154$, $p=0.007$) (Figure 14). Snook harvested in Florida Bay were significantly larger in the fall than any other season. However, we found that there was not a significant difference in the length of harvested snook among the four seasons in (Area 6) Everglades City ($df=269$, $f=2.29$, $p=0.079$) (Figure 15). These results are consistent with those obtained from the analysis of 1998 snook lengths.

Gray Snapper

In 2000, there was a significant difference in the lengths of harvested gray snapper among the six areas of ENP ($df=470$, $f=7.22$, $p<0.0001$) (Figure 11). The fish harvested in Area 2 seemed to be much larger than snapper in other areas (Figure 11). The lengths for Areas 1-5 were pooled together to determine if there was a difference in the length of gray snapper harvested in Florida Bay versus Everglades City (Area 6). The fish harvested in Florida Bay were significantly larger ($df=470$, $f=14.55$, $p<0.001$) than those harvested in Everglades City (Figure 12). These results are consistent with the analysis of 1998 gray snapper lengths.

There was not a significant difference in the size of gray snapper harvested parkwide among the four seasons in 2000 ($df=470$, $f=1.84$, $p<0.139$) (Figure 13). Similarly, gray snapper lengths in Florida Bay only (Areas 1-5) were not significantly different among the four seasons ($df=229$, $f=0.808$, $p=0.491$) (Figure 14). In both cases, harvested gray snapper were slightly larger during the summer than those harvested during the rest of the year (Figures 13-14). Harvested gray snapper in Everglades City (Area 6) similarly showed no significant seasonal differences in length during 2000 ($df=240$, $f=1.802$, $p=0.148$) (Figure 15). However, gray snapper harvested in Area 6 during 1998 were significantly larger during the fall and summer.

Spotted Seatrout
There was no difference in the mean length of harvested spotted seatrout among the six areas of ENP (df=1737, *f=1.131*, p=0.342) (Figure 11). Similarly, when the lengths for Areas 1-5 were pooled together to determine if there was a difference in the length of spotted seatrout harvested in Florida Bay (Areas 1-5) versus Everglades City (Area 6) during 2000, no significant differences were found (df=1,737, t=1.839, p=0.175) (Figure 12). However, Florida Bay seatrout were significantly larger in 1998. The large sample size in 1998 was the reason there was a significant difference even though the lengths from the two areas were practically identical.

There was a significant difference in the mean length of spotted seatrout harvested parkwide among the four seasons in 2000 (df=1,737, f=22.42, p<0.0001) with spring and summer having larger fish than fall and winter (Figure 13). A seasonal comparison of spotted seatrout lengths harvested only in Florida Bay (Areas 1-5) showed that fish harvested during the fall were significantly smaller (df=427, f=7.67, p<0.0001) than those harvested during the rest of 2000 (Figure 14). In recent years, we have found that in the winters of 1998 and 1999 fishermen had harvested significantly smaller seatrout in Areas 1-5.

There was also a significant difference in the size of spotted seatrout harvested in Everglades City (Area 6) during the four seasons of 2000 (df=1,309, f=14.55, p<0.0001) (Figure 15). As in 1999, the 2000 harvested trout were significantly the largest in the spring, followed by those in the summer having the second highest values.

Red Drum
There was a significant difference in the mean lengths of red drum harvested among the six areas of ENP during 2000 (df=446, f=2.42, p<0.04) (Figure 11). Red drum harvested from Area 2 were much larger than the red drum taken from the other areas (Figure 11). The lengths for Areas 1-5 were pooled together to determine if there was a difference in the length of red drum harvested in Florida Bay versus Everglades City (Area 6). There was no difference in the size of red drum harvested in Florida Bay or in Everglades City (df=446, f=2.48, p>0.116) (Figure 12). These results are consistent with those obtained from the analysis of 1998 red drum lengths.

A seasonal comparison of red drum lengths parkwide showed that fish harvested in fall 2000 are significantly larger than those harvested in winter, spring, and summer (df=446, f=2.93, p=0.033) (Figure 13). While the red drum harvested in Florida Bay only (Areas 1-5) during the summer of 1999 were significantly larger than those harvested during the rest of the year, in 2000 there were no significant seasonal differences (df=213, f=1.59, p=0.192) in lengths of red drum harvested (Figure 14). Red drum harvested in Everglades City (Area 6) during the spring were significantly smaller than those harvested in any other season (df=232, f=2.85, p<0.04) (Figure 15).

Environmental Relationships
Catch rates are directly related to environmental factors such as rainfall, water level, and salinity. The catch rates for sport (non-guided) fishermen were correlated with rainfall, water level, and salinity from 1985-2000 (Figures 16-19). Total annual rainfall from 1985-2000 was compiled and averaged from five stations within or near ENP (Flamingo, Royal Palm, Everglades City, Tamiami Ranger Station, and Tavernier. Butternut Key has replaced Tavernier since 1997, and Everglades City was omitted from total rainfall averages for 1999 due to a lack of sufficient data). Water level data from 1985-2000 was obtained from well P-37 in western Taylor Slough. Salinity data from 1985-2000 was obtained from three stations in northern Florida Bay (Butternut Key, Taylor River, and Trout Cove).

Snook
The declines in snook stocks from 1985-1988 and from 1993-1997 may have been due to low rainfall and water levels in the upper marsh regions. For Areas 1-5 combined, there was not a significant correlation between water levels recorded and catch rates from 1985-2000 (r=0.318, N=16, p>0.230); this same result was obtained last year as well when 1985-1999 was analyzed. However, in a separate analysis for the GCFI conference meeting (Delgado et al. 2000), when water levels versus snook cpue were analyzed by individual fishing areas, significant increasing trends were found in area 3 (Cape Sable and the western

edge of Florida Bay), area 5 (Shark River), and area 6 (the lower 10,000 Islands). These increases were significantly related to increases in water levels recorded near the Barron River and in the upper marsh area (P-33) in Shark Slough.

Although, no statistically significant correlation was found, the trends seen in Figure 16 suggest that, overall, a period of generally high salinity (r=-0.193, N=16, p=0.473) leads to a decline in the abundance of snook. Field studies on snook habitat have shown that the greatest number of juveniles are consistently found in shallow, well protected, back-water areas of estuaries that are influenced by freshwater runoff (Fore and Schmidt 1974; McMichael et al. 1987). In addition, no significant correlation was found between rainfall and catch rates (r=0.148, N=16, p=0.585).

Gray Snapper

Overall (1985-2000), a positive (r=0.529, N=16, p=0.035) relationship was found between catch rates of gray snapper and mean annual salinities found in northern Florida Bay (Figure 17), suggesting that periods of high salinity may lead to increased abundance of gray snapper. Average annual water levels recorded at P-37 were significantly inversely related to gray snapper catch rates during the same year (r=-0.633, N=16, p=0.008), indicating that during periods of reduced water levels in upper Taylor Slough abundance of gray snapper increased. Rainfall was not significantly correlated with gray snapper catch rates (r=-0.326, N=16, p=0.217). Similar correlation results were obtained last year when 1985-1999 data were analyzed. This leads to the theory that increases in gray snapper abundance may be related to low yearly rainfall in the ENP area and periods of high salinities in Florida Bay. A series of low rainfall years from 1985-1990 resulted in increased hypersaline conditions in Florida Bay. Rutherford et al. (1983) reported larger fish in areas of higher salinity. Thus, if during low rainfall years, sub-adult fish remain in Florida Bay longer under high salinity conditions, then gray snapper abundance (catch rates) should increase and the fish would become increasingly available to the angler. During the 1993-1995 period, water levels/rainfall increased, especially from Tropical Storm Gordon in November 1994, resulting in salinity reductions in northern Florida Bay with a notable decrease in gray snapper catch rates (Figure 17).

Spotted Seatrout

For Areas 1-5, as salinity increased to a high in 1990, seatrout catch rates increased, and as salinities dropped in the proceeding years, 1992-1993, catch rates also decreased (Figure 18). However, there seems to be an inverse relationship between trout catch rates and salinities since 1993. There was no statistically significant relationship between the two variables from 1985-2000 (r=0.149, N=16, p=0.582). Rainfall and water levels also had no correlation with seatrout cpue (r=-0.019, N=16, p=0.944 and r=-0.088, N=16, p=0.747, respectively). These are the same results as last year when environmental parameters were correlated with cpue from 1985-1999. This relationship was also supported when using separate fishing areas (as discussed above for snook- see Delgado et al. 2000) in the analysis. Areas 1 and 3 showed non-significant declining trends when analyzed on a monthly basis (1985-98), whereas Areas 4 (Whitewater Bay) and Areas 5 and 6, showed significant declining trends. These declining trends are supported by significant negative relationships found between mean monthly catch rates and water levels. However, recent studies have suggested that increased rainfall/water levels improve recruitment through increased growth and survival of larvae and juveniles (Thayer et al. 1998). Presumably an increase in coastal rainfall (and thus lower salinities) results in an increase in larval recruitment and/or juvenile survival (Rutherford et al. 1989a).

Red Drum

The reduced abundance of red drum during the late 1980's may have been due to a combination of prior intense fishing pressure and increased rainfall. Previous studies (Higman, 1967) have shown that low rainfall may lead to an increase in the abundance of juvenile red drum. However, no statistically significant relationships were found between red drum catch rates and any of the environmental variables from 1985-2000 just as there were no significant correlations last year when only 1985-1999 data were analyzed (Figure 19).

Effort-Catch Relationships

It is not always sufficient to know if catch rates are declining to determine if a fishery is in trouble. If both catch and catch rates are in decline, then there is a need to assess the amount of effort being placed on the

fishery. In Figure 20, estimated total catch and estimated total effort of the four major species are correlated to determine if fishing effort impacted the stock.

Snook

Annual fishing effort of sport anglers catching snook in Florida Bay ranged from a low of 26,775 angler-hours in 1985 to a high of 107,825 angler-hours in 1997 (Figure 20). The total estimated catch of snook from the sport fishery in Florida Bay increased from a low of 6,538 fish in 1986 to a high of 22,581 fish in 1994 (Figure 20) representing a 70% increase in the number of fish caught. This was due to the concurrent increase in effort. However, the estimated number of snook caught in 2000 was 17,267 fish, which was an increase from the 1998 and 1999 numbers (14,641 and 14,093 fish, respectively). While the effort placed on snook stock remained relatively the same for 1999 and 2000, the catch numbers from 1999 to 2000 increased, indicating that more snook were caught per unit effort in 2000. Despite this, the annual estimated total catch of snook for the sport fishery was highly correlated with the estimated total effort placed on the stock between 1985 and 2000 ($r=0.895$, $N=16$, $p<0.0001$) (Figure 20). Total catch appeared to increase linearly over the entire range of annual effort, suggesting that current catches do not greatly impact the Florida Bay stock and that additional increases in catch may be possible. However, it should be noted again that snook catches decreased dramatically in 1998 and 1999 after five years of good catches and all-time high in effort in 1997. During 1998, state regulations were revised to prevent further overfishing by increasing the minimum size from 24" to 26" and prohibiting the possession of snook over 34" while maintaining a two fish bag limit.

Gray Snapper

Annual estimated effort for the non-guided gray snapper fishery ranged from a high of 168,239 angler-hours in 1994 to a low of 96,311 angler-hours in 1985 (Figure 20). The yearly catches of gray snapper were lowest in 1987 (58,401), 1985 (61,859), and 2000 (63,873) and highest in 1989 (123,707) and 1990 (122,327) (Figure 20). While effort slightly increased from 138,807 angler-hours in 1998 to 140,705 angler-hours in 1999, the catch increased quite dramatically during the same time span from 77,267 fish in 1998 to 96,641 fish in 1999 (this is the third highest value during the period of record). Initially this indicates a good recruitment class in 1999, but the low estimated catch in 2000 suggests the contrary. The low estimated catch of snapper in 2000 is partially due to the lowest estimated effort (109,571 man-hours) since 1987. The annual estimated total catch of gray snapper was linearly correlated with the estimated total effort placed on the fishery between 1985-2000 ($r=0.732$, $N=16$, $p=0.001$), suggesting that the maximum potential catch of gray snapper in Florida Bay has not been reached (Figure 20).

Spotted Seatrout

Total estimated effort for spotted seatrout ranged from a high of 221,864 angler-hours in 2000 to a low of 147,882 angler-hours in 1995 (Figure 20). In conjunction with these high effort numbers in 2000, estimated catches of seatrout were also the highest they have been during the period of record (172,966 fish). The correlation of yearly estimated effort with estimated catch was linear and significant ($r=0.843$, $N=16$, $p=0.0001$) (Figure 20). There was no decrease in total catch with increasing effort, indicating that yearly fishing effort did not severely impact the fishery.

Red Drum

The total estimated recreational fishing effort for red drum in Florida Bay ranged from a low of 58,093 angler-hours 1988 to a high of 154,227 angler-hours in 1997 (Figure 20), which represents an increase of about 2.5 times the fishing effort in 1988. Estimated effort dropped in 1998, 1999, and 2000, while the estimated catches of red drum concurrently decreased also. A statistically significant linear relationship ($r=0.819$, $N=16$, $p<0.0001$) was found between yearly effort from 1985-2000 and the resultant catch, suggesting that the increase in fishing effort did not greatly impact the catch of red drum in the sport fishery (Figure 20). It should be noted that red drum catch decreased dramatically in 1999 to 29,678 fish after three years (1996-1998) of very good catches due to high fishing effort. However, in 2000, the estimated catch of red drum leveled off at 29,180 fish.

FUTURE WORK/MEETING RESULTS

While the current sportfish monitoring project is evaluating various aspects of catch/harvest rates, total estimated catch/harvest, and fishing/boating activity, additional areas of work are underway or are needed. These include: (1) updated in-house and FMRI stock assessments on major game fish species including snook, red and black drum, goliath grouper, and sheepshead, (2) a collaborative study with FSU focusing on the diet and age/growth rates of snook and red drum; ENP has collected 244 snook and 380 red drum to date for the study-see below, (3) incorporating the fisheries database into the park's GIS system for spatially oriented ecological applications, (4) develop a new fishery data management handbook, and (5) as a result of increased computing power, a minor adjustment to catch and harvest rates will be done (catch and harvest rates will be calculated by fishing area, not interview location). A pilot creel census program at Dry Tortugas National Park was initiated from August to November 2000, and will be the focus of a future report.

As a result of updating the fisheries database for the park's ORACLE database, it was determined that commercial/guide data from 1972-1985 needed to be re-entered to correct previously computerized catch data errors. This was completed by FMRI (St. Petersburg) with coordination by D.Tidwell, ORACLE database manager

Several collaborative studies are underway with Federal/State fishery resource agencies. In a collaborative effort with the NMFS, SEFC, Miami, FL, the sport database in ACCESS was provided to fisheries personnel to analyze and synthesize with existing fisheries and environmental databases in order to develop statistical models relating species abundance to environmental conditions and different water management scenarios. This effort is part of the Interagency Florida Bay Strategic Science Plan's successful restoration of Florida Bay using the Higher Trophic Levels science program. FMRI (Marathon) and project personnel are working together on an evaluation of the spatial, temporal, and environmental factors that affect sport fishing for snook and spotted seatrout. The park's sport database was analyzed using non-parametric trend analysis and correlation analysis to detect long term changes in catch rate by individual fishing area. Some of the preliminary results from this study were presented earlier in this report. A collaborative study with Florida State University, NMFS, and FMRI (St Petersburg) on snook and red drum diets, age and growth, and size structure for Florida Bay has been underway since mid-1999. Collections of snook and red drum from the Flamingo ramp intercept surveys were completed during the summer of 2000, and a final report is forthcoming. A presentation of the data is planned for the spring 2001 Florida Bay Science Conference.

The National Marine Fisheries Service, Gulf States Marine Fisheries Commission, FMRI, and the NPS (ENP) worked cooperatively to develop the Gulf Charter Boat Survey Research Program. The Program is developing methods for more efficient data collection and more precise estimation of fishing effort by charter (guide) boat anglers. The program consists of two surveys - a telephone survey of charter boat operators and a logbook survey. Surveys began in September 1997 and continued through August 1998. An evaluation of the program was scheduled for completion during July 1999. A summary report is currently under peer review. In addition, FWC field intercept surveys continue to provide information for hire and private anglers to estimate angler catch using the existing NMFS estimates. Guide parties fishing in park waters during the week have been interviewed at Chokoloskee to obtain information on their catch and fish measurements.

As a committee member, the semi-annual Fisheries Information Network (FIN), Recreational Information Network (RECFIN), Commercial Information Network (ComFin), and Biological/Environmental Work Group meetings were attended in Atlanta, GA in April and Austin, TX, June 2000. Funding issues and priorities addressed included: NMFS/NPS surveys, night fishing pilot study, tournament fishing, getting better data for stock assessments using a recreational biological samples (otolith) sorting center, establishing a central Gulf data processing center in Mississippi, metadata development, and acquiring funding for Gulf-wide data collection, processing, and dissemination.

ACKNOWLEDGMENTS

We appreciate the assistance from the Flamingo Rangers who provided trailer counts and compliance checks. We would like to acknowledge Farada Nagel of the Chief Rangers Office for her help in processing the guide permits. We thank Joe O'Hop and Robert Muller, FMRI (St Petersburg) for coordinating the 1999-2000 catch and length data entry. We are grateful for the continued assistance provided by Alejandro Acosta and Rod Bertelesen of FMRI (Marathon) for their work on trend analyses. We thank Chris Greene a temporary South Florida Natural Resources Center (SFNRC-ENP) fisheries technician for collecting creel data at both DRTO and at Flamingo, during personnel lapses. Lastly, we are grateful to Kevin Kotun of the SFNRC-ENP for providing the 2000 salinity, rainfall, and water level data; and Darrel Tidwell for coordinating the 1972-1985 guide and commercial data entry with FMRI.

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Table 1. Recreational catch/harvest rates (fish per angler-hour) of non-guided (sport) anglers in Everglades National Park, 2000.

Non-Guide Anglers (Areas 1-5)				
Species	**CPUE ±95% Conf. Interval**	**HPUE ±95% Conf. Interval**	**Sample Size *** CPUE/HPUE	
Snook	0.2968± 0.0279	0.1321 ± 0.0152	787	222
Red Drum	0.3562 ± 0.0303	0.1277 ± 0.0062	976	511
Spotted Seatrout	1.0625 ± 0.0629	0.3312 ± 0.0181	2,012	1,190
Gray Snapper	0.7383 ± 0.0572	0.2976 ± 0.0286	952	452
Tarpon	0.1578 ± 0.0311	N/A	159	0
Black Drum	0.2448 ± 0.0472	0.1656 ± 0.0294	173	108
Sheepshead	0.3711 ± 0.0834	0.1943 ± 0.0360	211	124
Spanish Mackerel	0.4570 ± 0.1479	0.3484 ± 0.1092	113	85
Grouper	0.1974 ± 0.0344	0.1345 ± 0.0904	158	17
Ladyfish	0.5680 ± 0.0370	0.2584 ± 0.1256	1,560	47
Crevalle Jack	0.5684 ± 0.0336	0.1964 ± 0.0475	2,282	116
Non-Guide Anglers (Areas 1-6)				
Species	**CPUE ±95% Conf. Interval**	**HPUE ±95% Conf. Interval**	**Sample Size *** CPUE/HPUE	
Snook	0.3471 ± 0.0217	0.1559 ± 0.0160	1,741	466
Red Drum	0.3046 ± 0.0221	0.1238 ± 0.0060	1,474	774
Spotted Seatrout	0.9740 ± 0.0489	0.3261 ± 0.0147	3,002	1,823
Gray Snapper	0.6655 ± 0.0433	0.2707 ± 0.0225	1,526	625
Tarpon	0.1675 ± 0.0283	N/A	206	0
Black Drum	0.2244 ± 0.0390	0.1621 ± 0.0254	220	141
Sheepshead	0.3523 ± 0.0607	0.2201 ± 0.0371	370	197
Spanish Mackerel	0.3455 ± 0.0884	0.2742 ± 0.0619	237	181
Grouper	0.1807 ± 0.0229	0.1688 ± 0.0787	307	27
Ladyfish	0.5475 ± 0.0329	0.2776 ± 0.0903	2,488	91
Crevalle Jack	0.5318 ± 0.0252	0.1903 ± 0.0376	3,494	154

* Number of fishing parties.

Table 2. Recreational catch/harvest rates (fish per angler-hour) of guided anglers in Everglades National Park, 2000.

Guide Anglers (Areas 1-5)				
Species	**CPUE ±95% Conf. Interval**	**HPUE ±95% Conf. Interval**	**Sample Size *** CPUE/HPUE	
Snook	0.2731 ± 0.0217	0.119 ± 0.0101	860	319
Red Drum	0.4149 ± 0.0318	0.1124 ± 0.0075	1,165	464
Spotted Seatrout	1.8756 ± 0.097	0.4326 ± 0.0196	1,588	704
Gray Snapper	1.2721 ± 0.1241	0.4598 ± 0.0537	407	190
Tarpon	0.21 ± 0.0418	0.1667	393	1
Bonefish	0.2308 ± 0.0327	N/A	174	0
Guide Anglers (Areas 1-6)				
Species	**CPUE ±95% Conf. Interval**	**HPUE ±95% Conf. Interval**	**Sample Size *** CPUE/HPUE	
Snook	0.4737 ± 0.0263	0.1283 ± 0.0068	1,868	694
Red Drum	0.4153 ± 0.0232	0.1196 ± 0.0053	1,828	838
Spotted Seatrout	1.835 ± 0.077	0.5029 ± 0.0186	2,239	1,193
Gray Snapper	1.2045 ± 0.0953	0.4108 ± 0.0516	584	287
Tarpon	0.1927 ± 0.0322	0.1667	518	1
Bonefish	0.2308 ± 0.0329	N/A	174	0

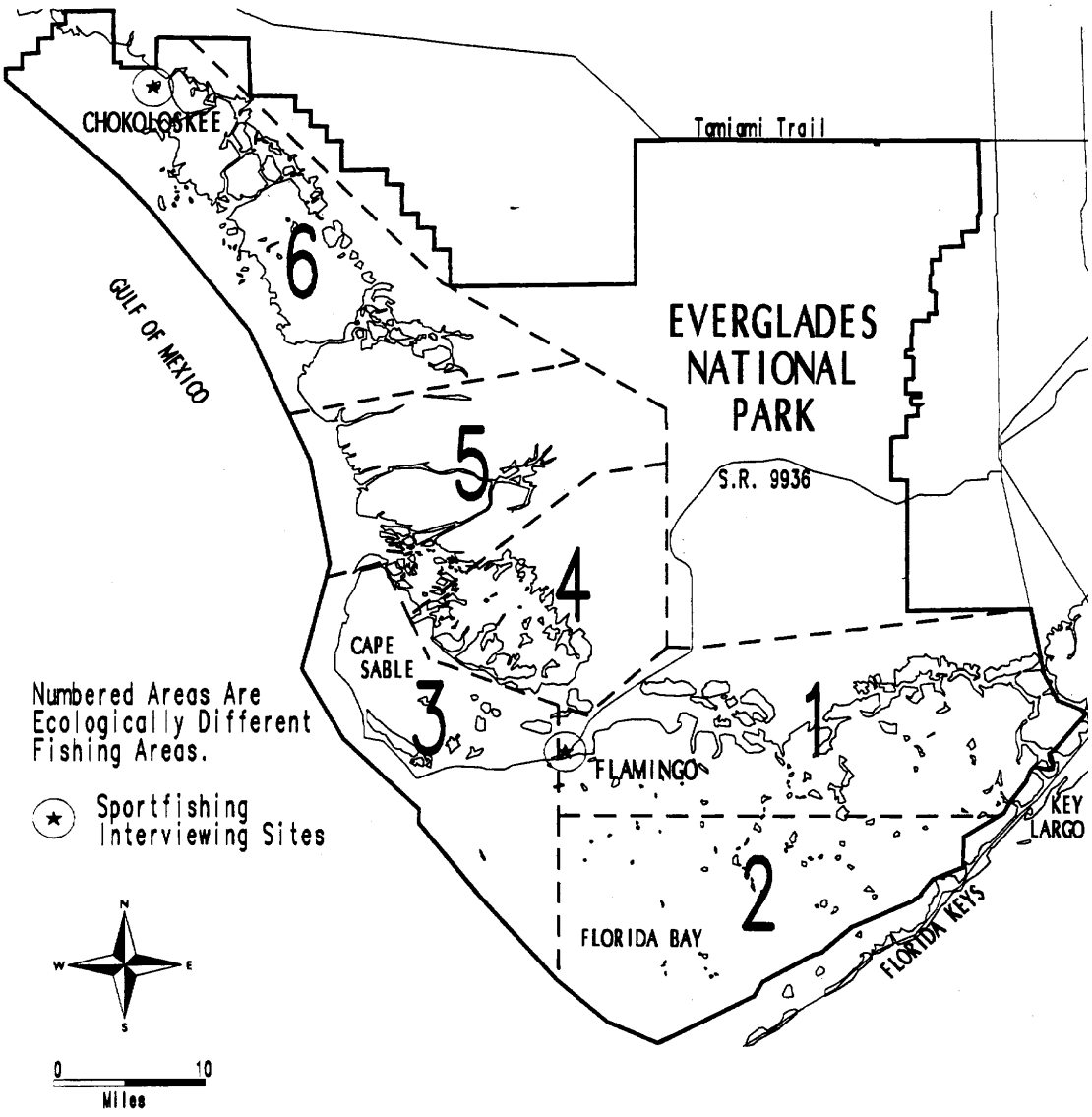
* Number of fishing parties.

Table 3. Total estimated catch and harvest by recreational anglers from Everglades National Park, 2000.

Non-Guide Anglers				
	Florida Bay		Florida Bay & Everglades City	
Species	Catch	Harvest	Catch	Harvest
Snook	17,267	2,585	52,132	5,163
Red Drum	29,180	5,444	37,534	8,162
Spotted Seatrout	172,966	32,829	231,277	48,670
Gray Snapper	63,873	12,871	88,570	15,620
Tarpon	1,914	0	2,733	0
Black Drum	4,403	1,769	4,767	2,147
Sheepshead	6,307	2,035	10,569	3,525
Spanish Mackerel	4,538	2,655	6,872	4,440
Grouper	3,483	210	4,879	335
Ladyfish	84,416	1,151	122,819	2,061
Crevalle Jack	117,536	1,897	167,922	2,400
Other species	86,122	4,349	131,754	11,747
Total	592,005	67,795	861,828	104,270
Guide Anglers				
	Florida Bay		Florida Bay & Everglades City	
Species	Catch	Harvest	Catch	Harvest
Snook	8,848	1,864	34,098	4,199
Red Drum	17,267	2,711	28,013	5,039
Spotted Seatrout	103,098	16,002	140,182	29,533
Gray Snapper	16,531	3,662	22,494	4,774
Tarpon	2,652	3	3,345	3
Bonefish	1,024	0	1,024	0
Other Species	71,081	8,126	90,727	10,688
Total	220,500	32,369	319,884	54,236

Fig. 1:

ECOLOGICALLY DIFFERENT FISHING AREAS EVERGLADES NATIONAL PARK



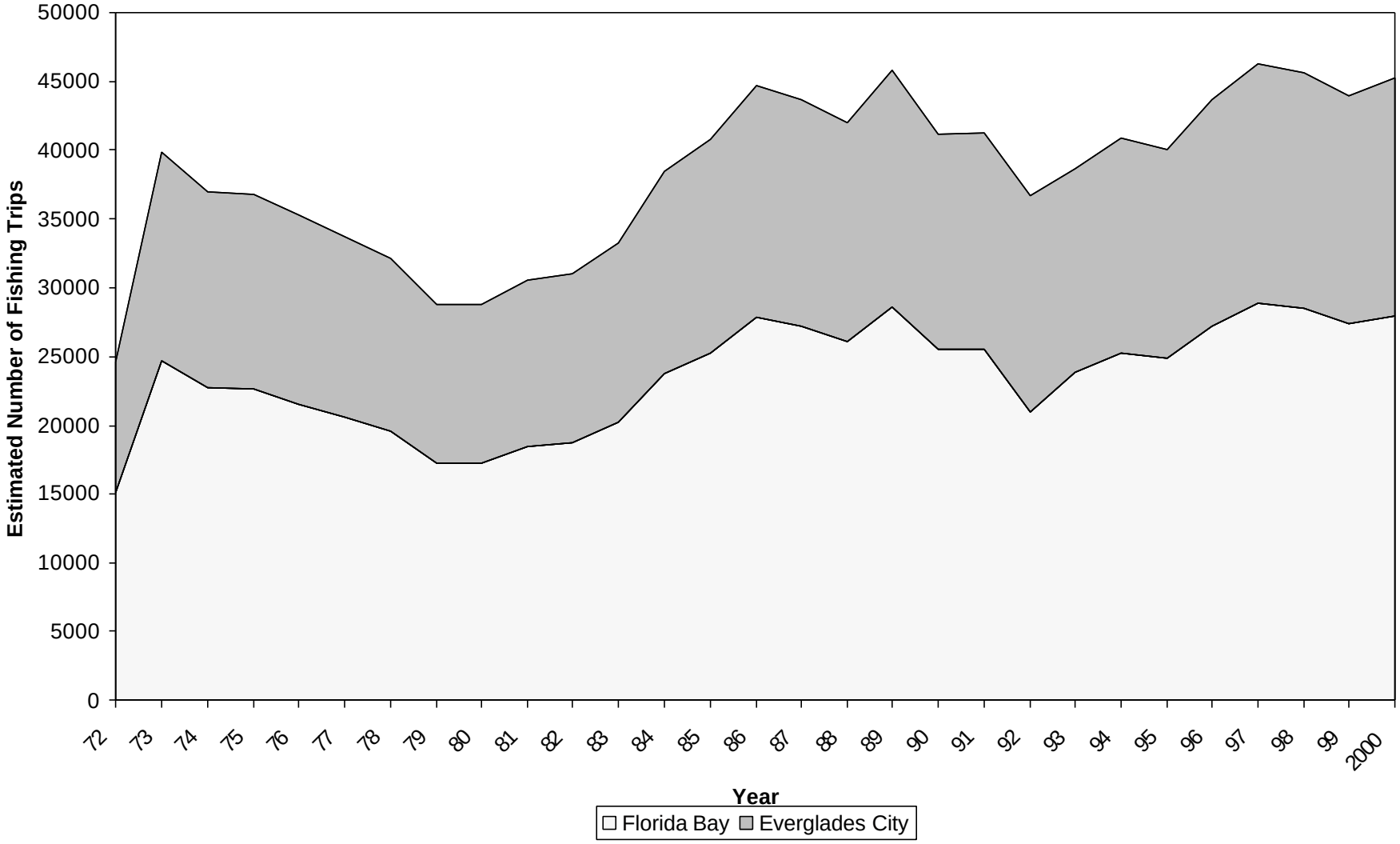


Figure 2. Estimated number of fishing boats within Everglades National Park, 1972-2000.

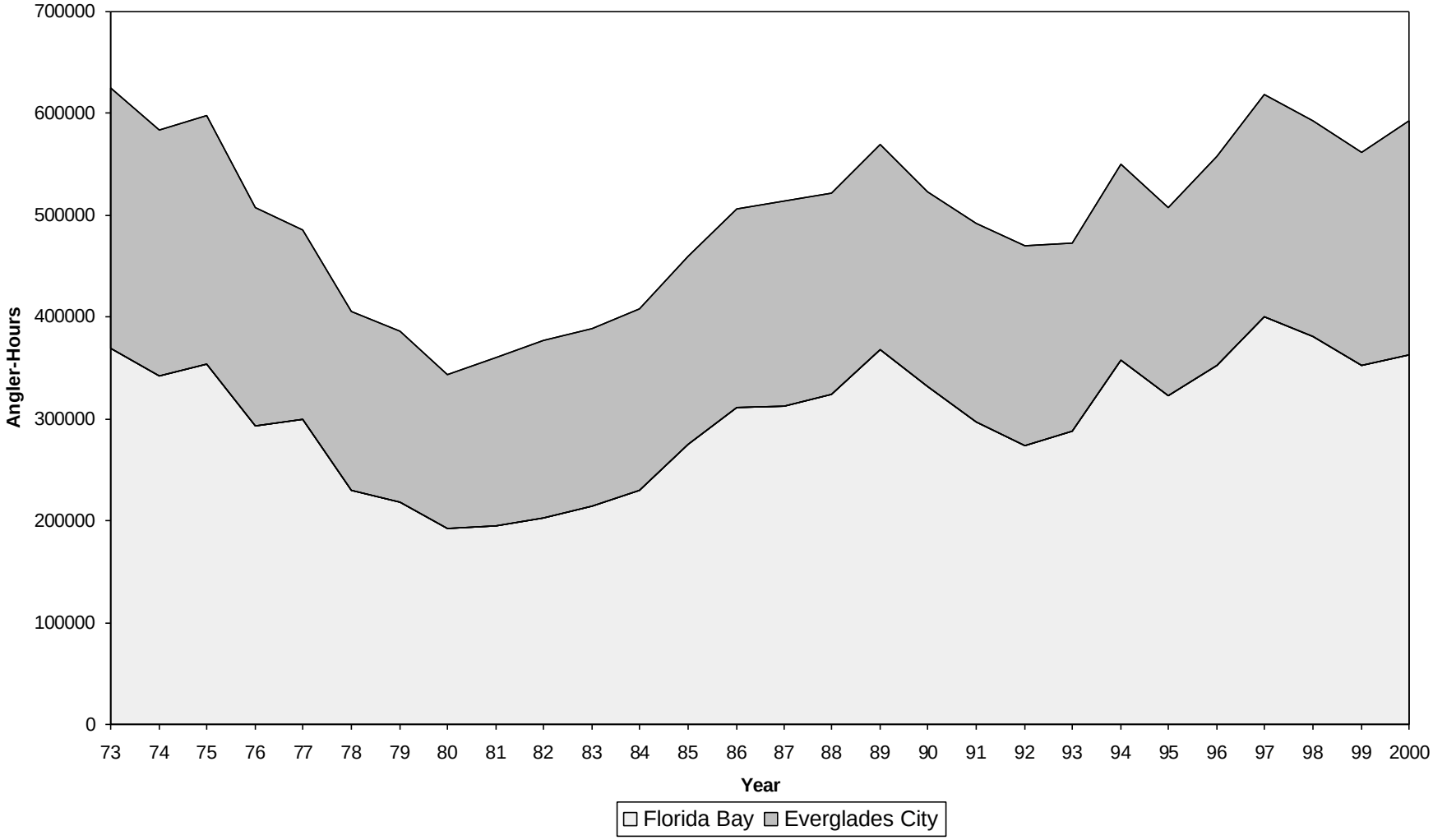


Figure 3. Estimated total effort (angler-hours) of non-guided fishermen within Everglades National Park, 1973-2000.

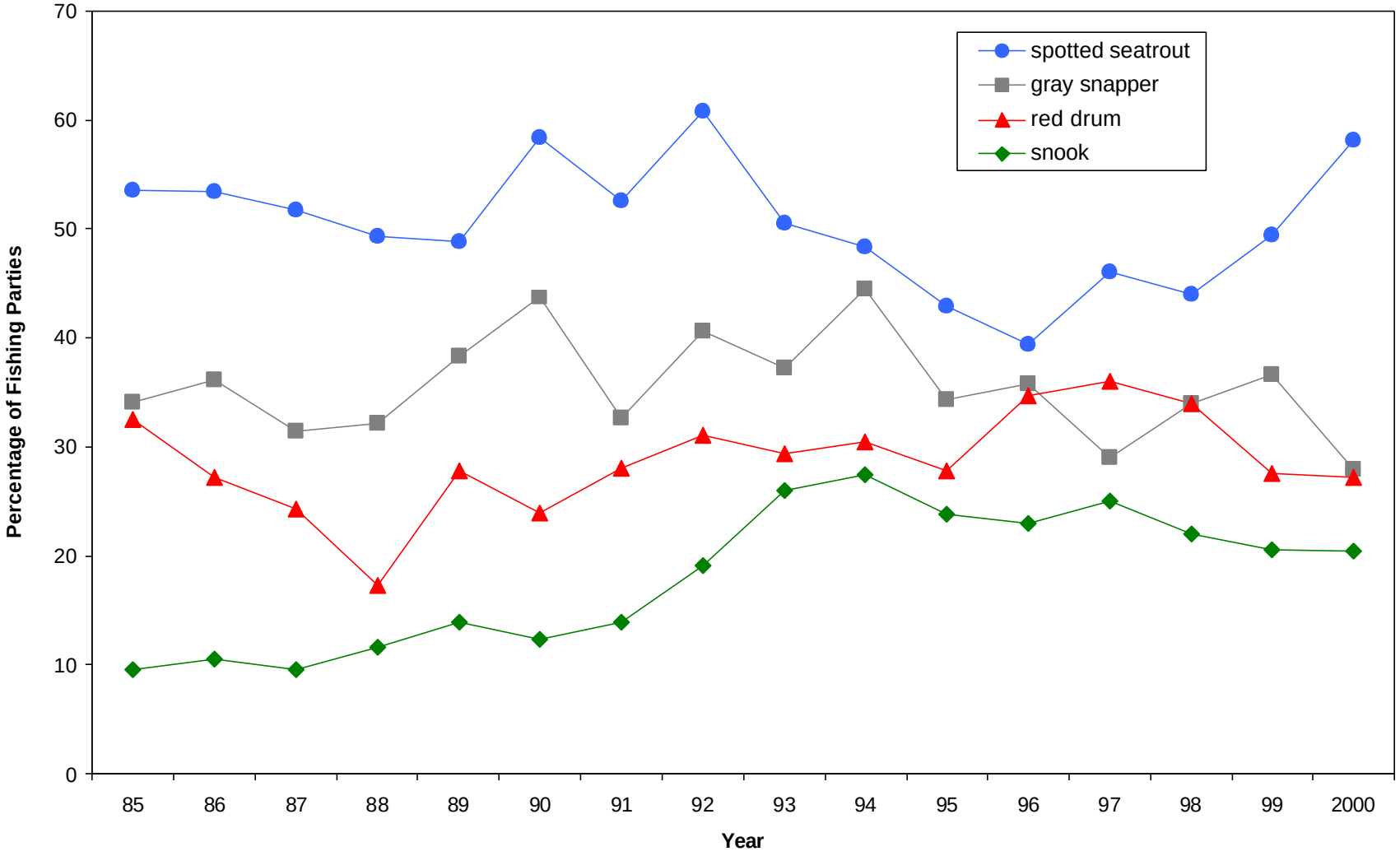
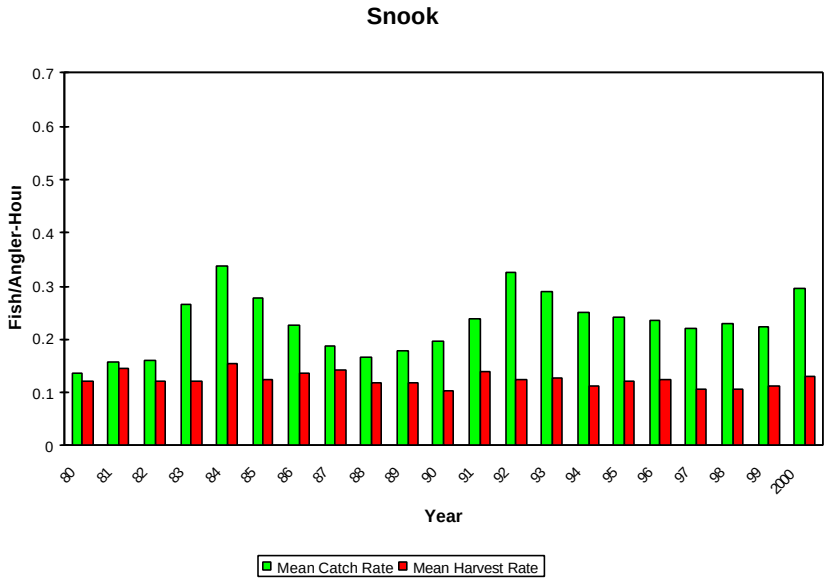
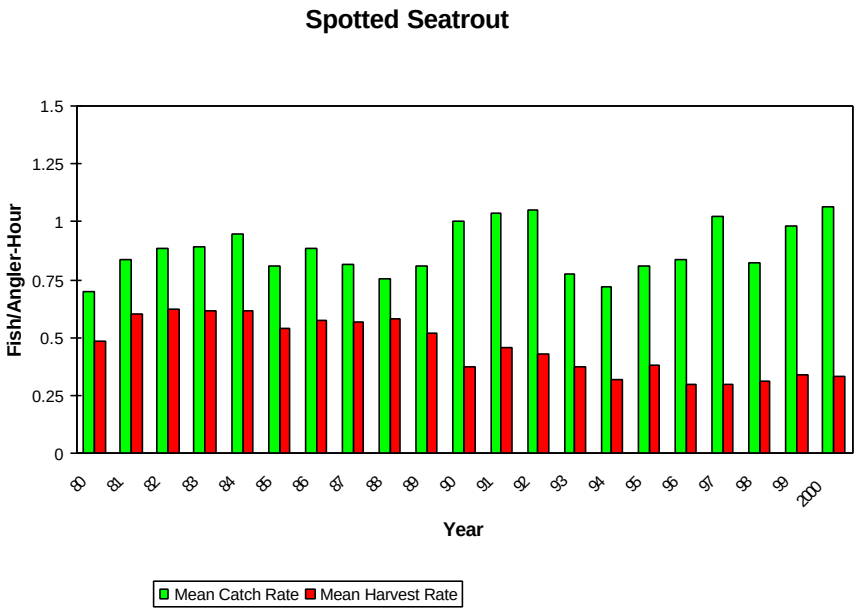
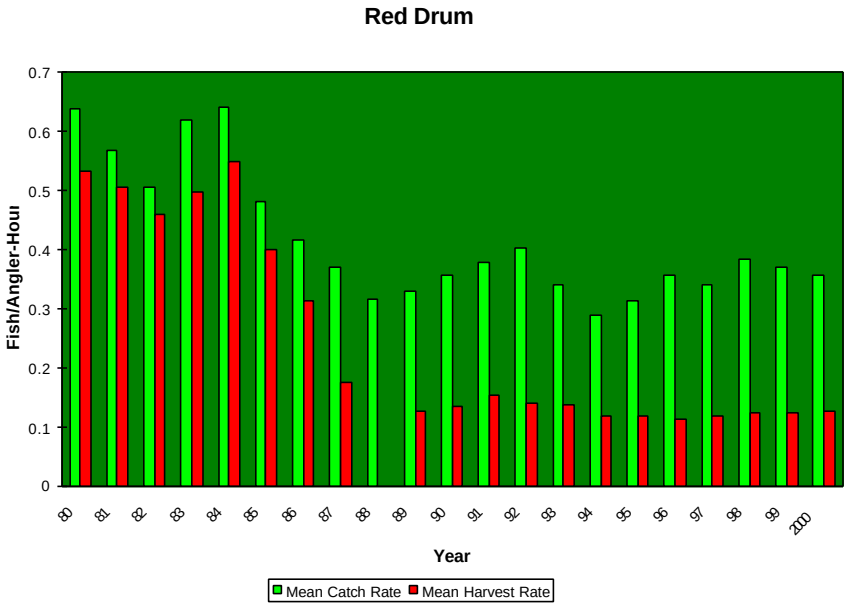


Figure 4. Percentage of fishing parties interviewed at Flamingo (Areas 1 to 5) catching spotted seatrout, gray snapper, red drum, and snook from 1985-2000.







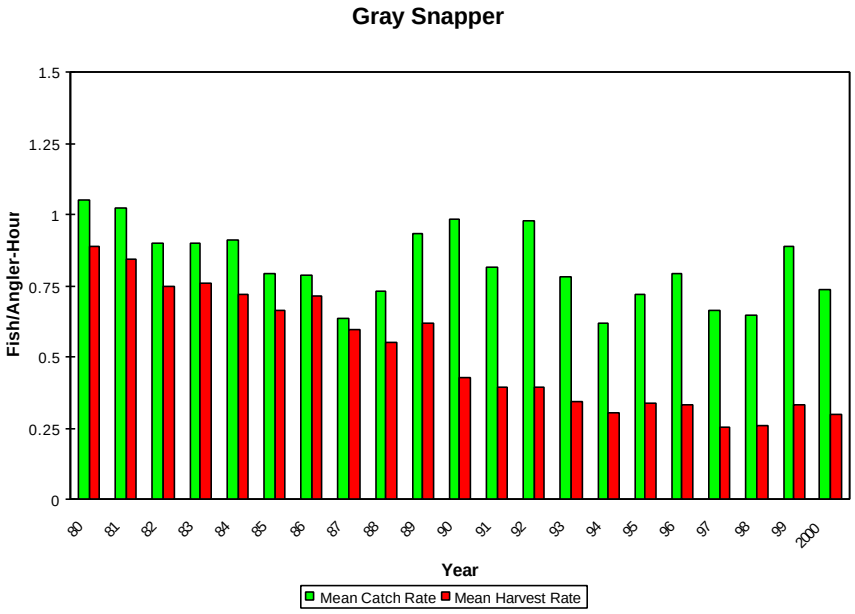


Figure 5. Recreational non-guided (sport) catch and harvest rates for the four major species of gamefish in Florida Bay, Everglades National Park (Areas 1-5), 1980-2000.

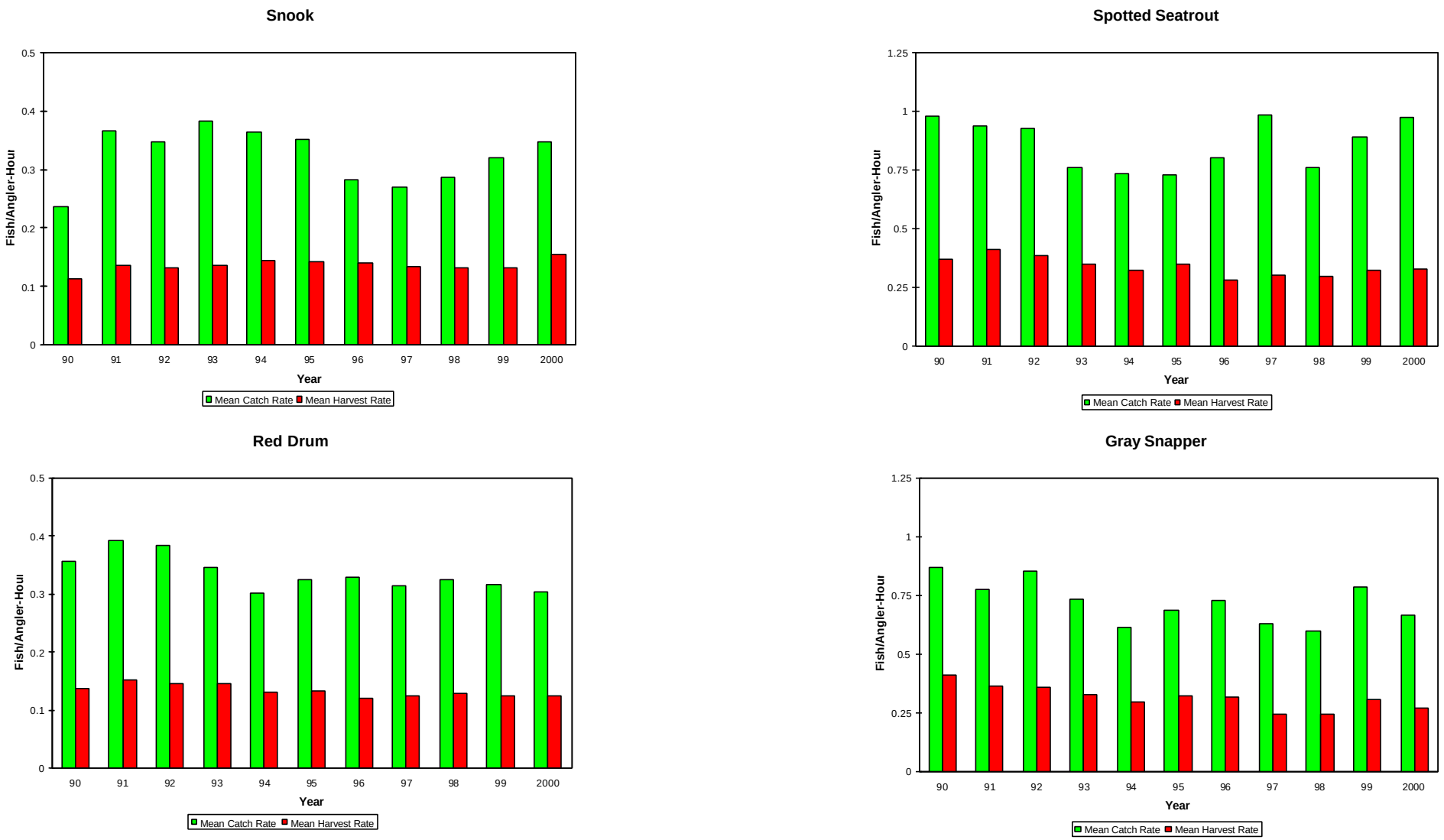


Figure 6. Recreational non-guided (sport) catch and harvest rates for the four major species of gamefish in Everglades National Park (Areas 1-6), 1990-2000.

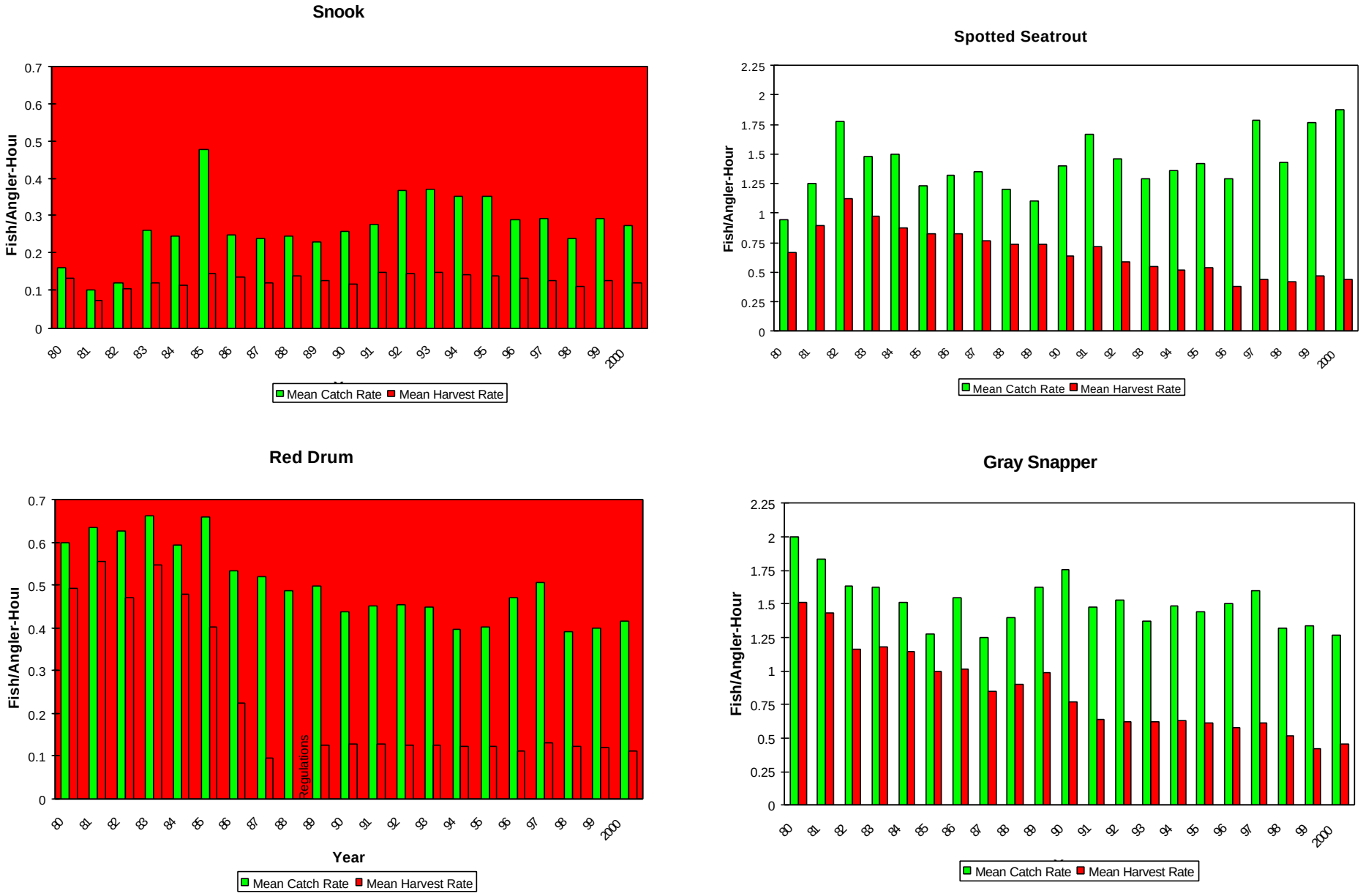


Figure 7. Recreational guide catch/harvest rates for the four major gamefish species in Florida Bay (Areas 1-5), 1980-2000.

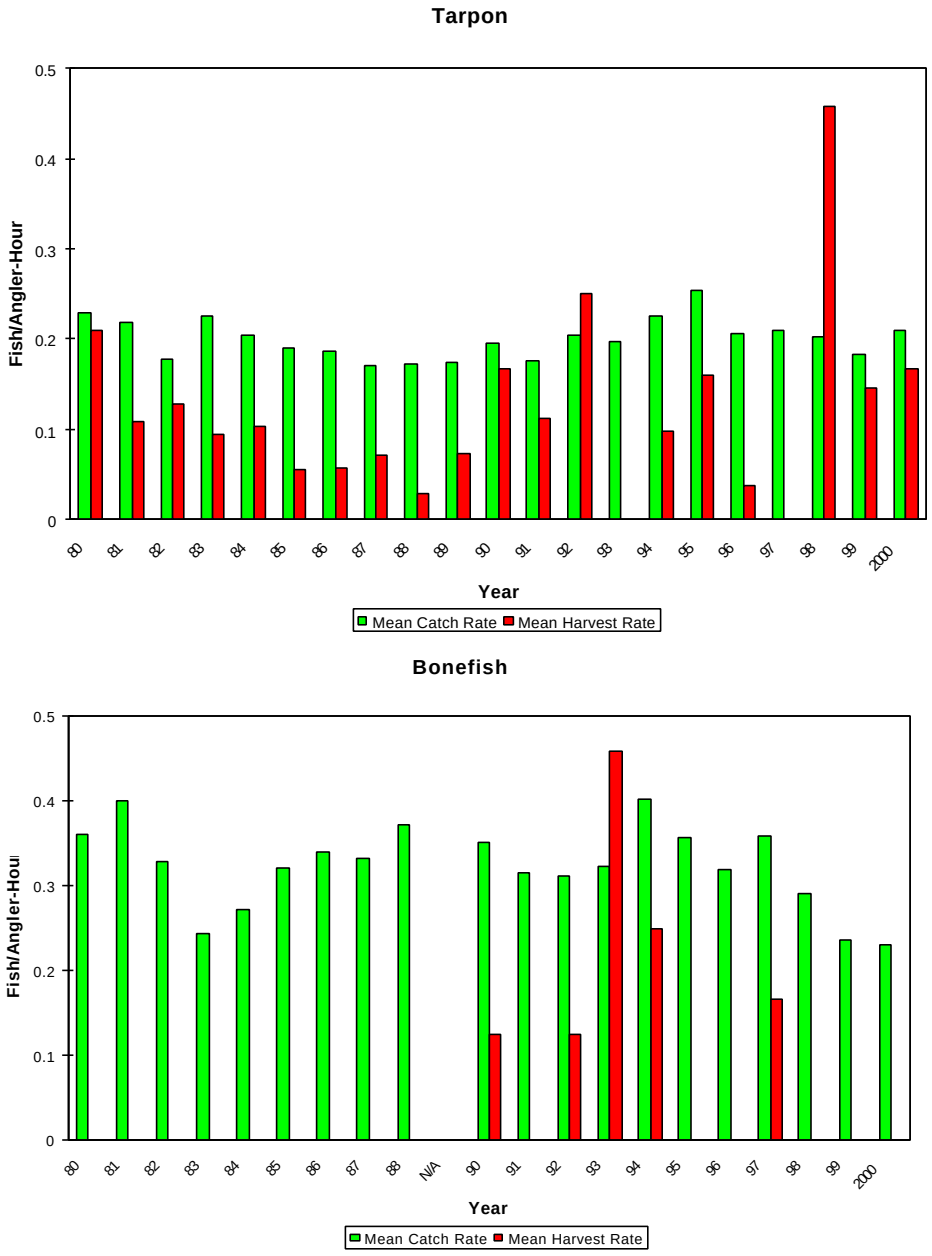


Figure 8. Recreational guide catch and harvest rates for tarpon and bonefish in Florida Bay (Areas 1-5) 1980-2000.

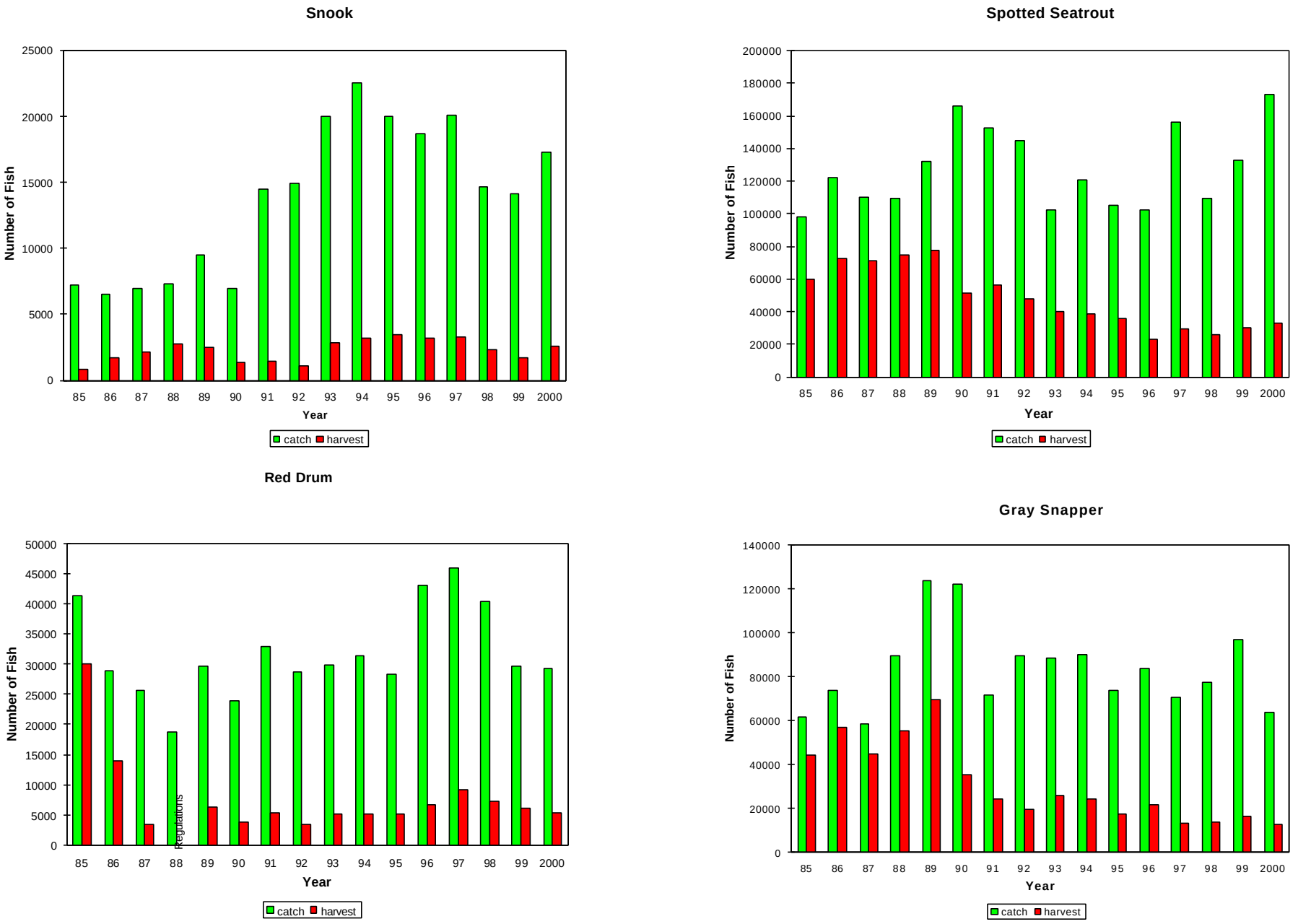
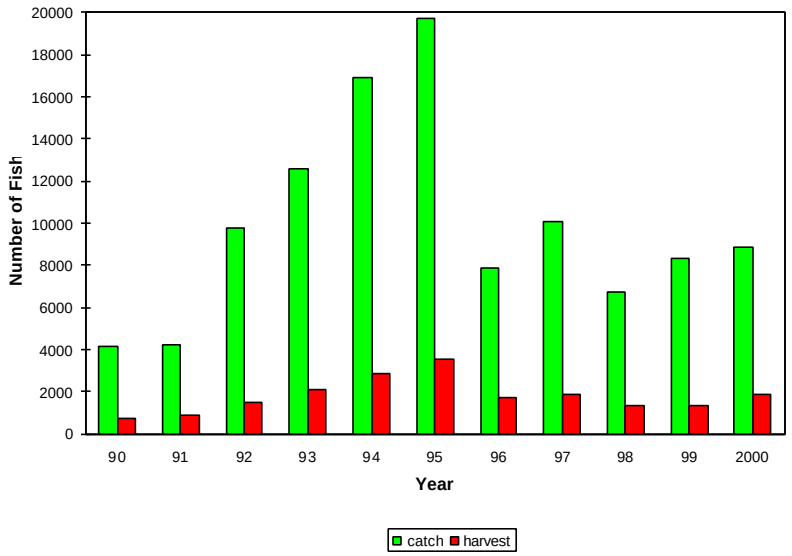
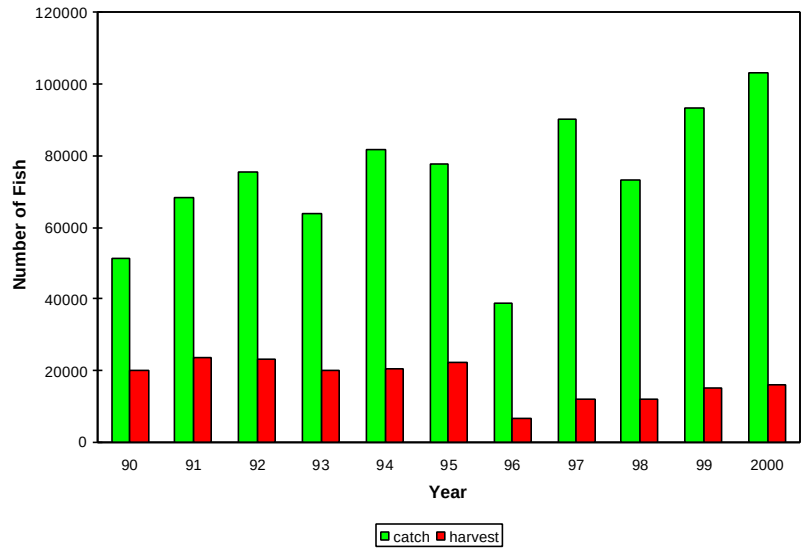
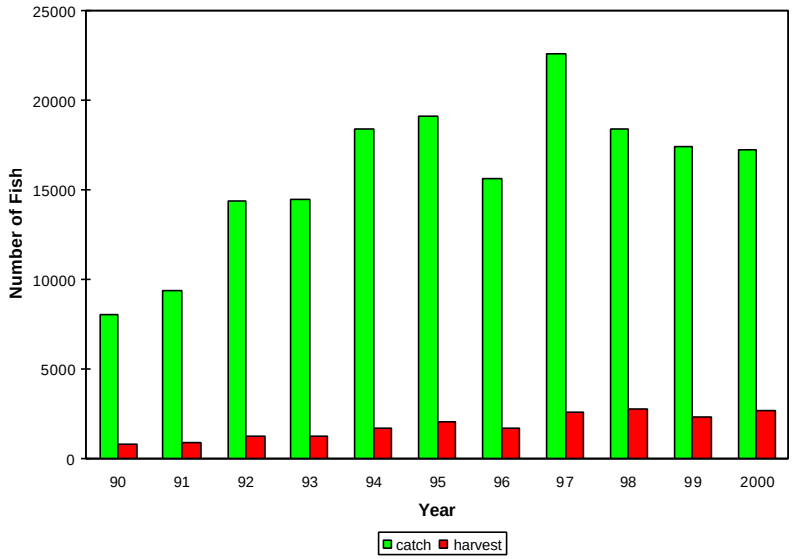


Figure 9. Estimated total catch and harvest for the four major species of gamefish by non-guided (sport) anglers in Florida Bay (Areas 1-5), 1985-2000.







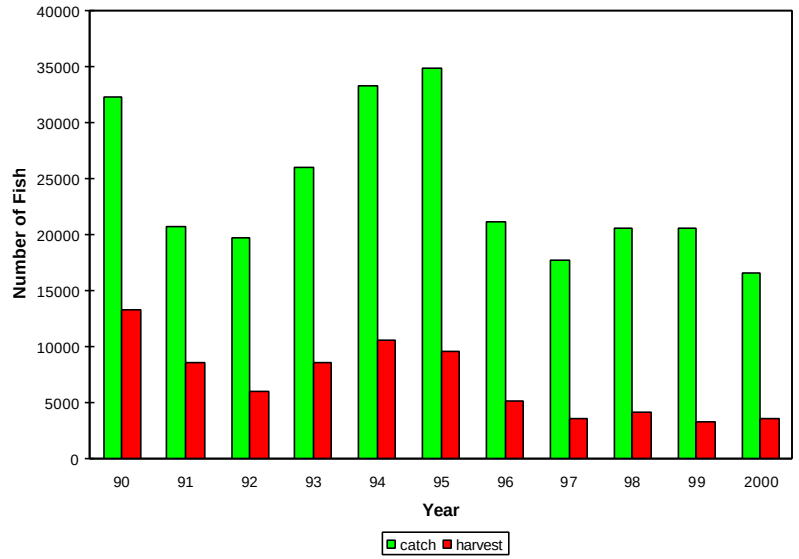
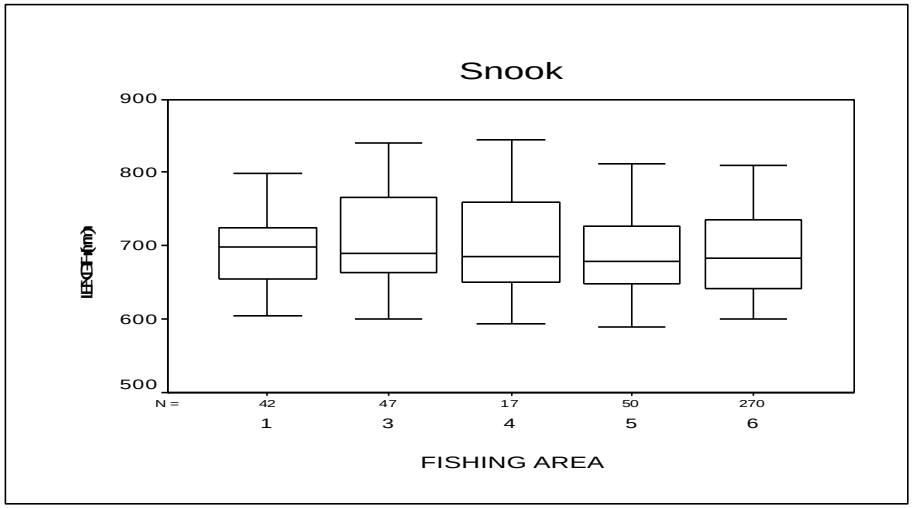
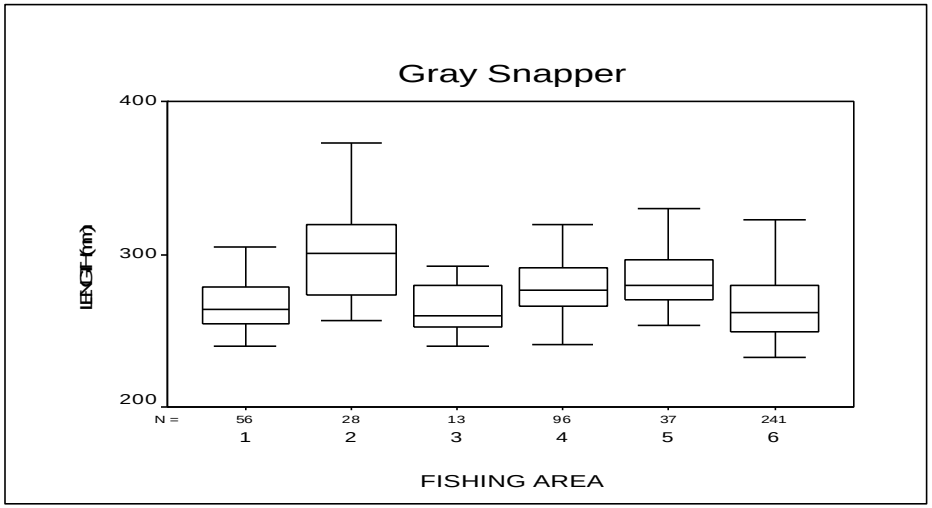
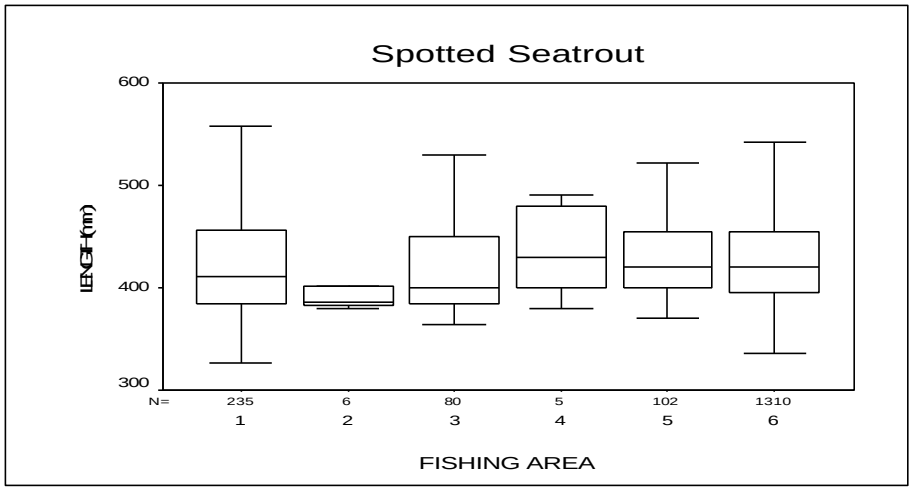


Figure 10. Estimated total catch and harvest of the four major species of gamefish by guided anglers in Florida Bay (Areas 1-5), 1990-2000.







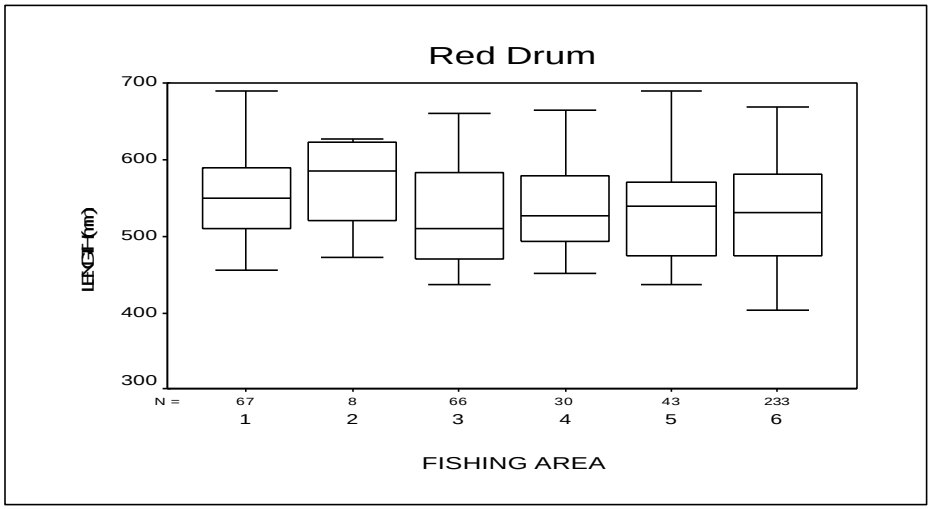
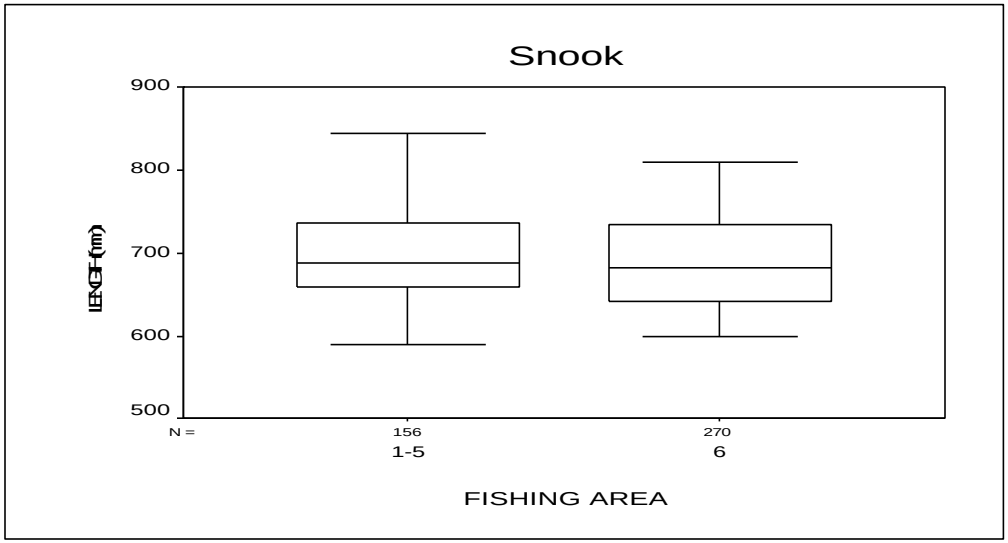
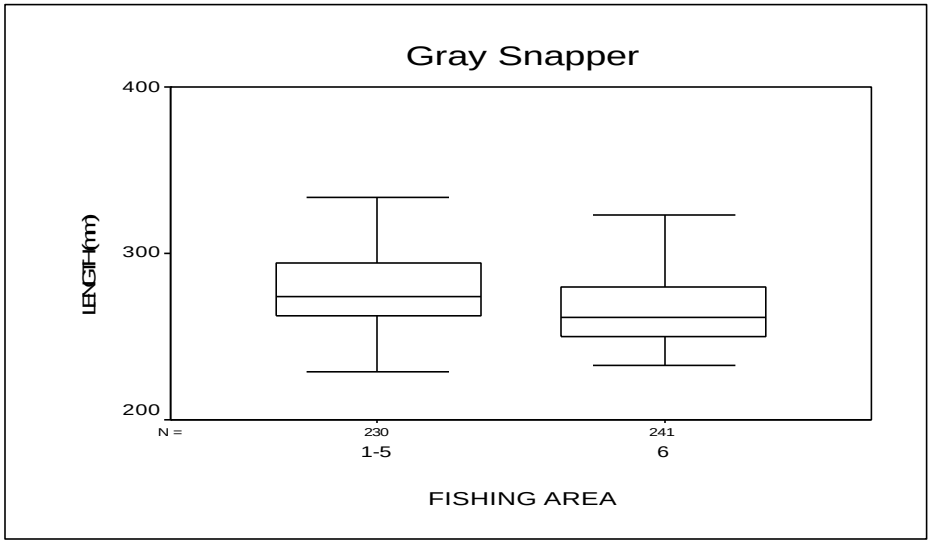
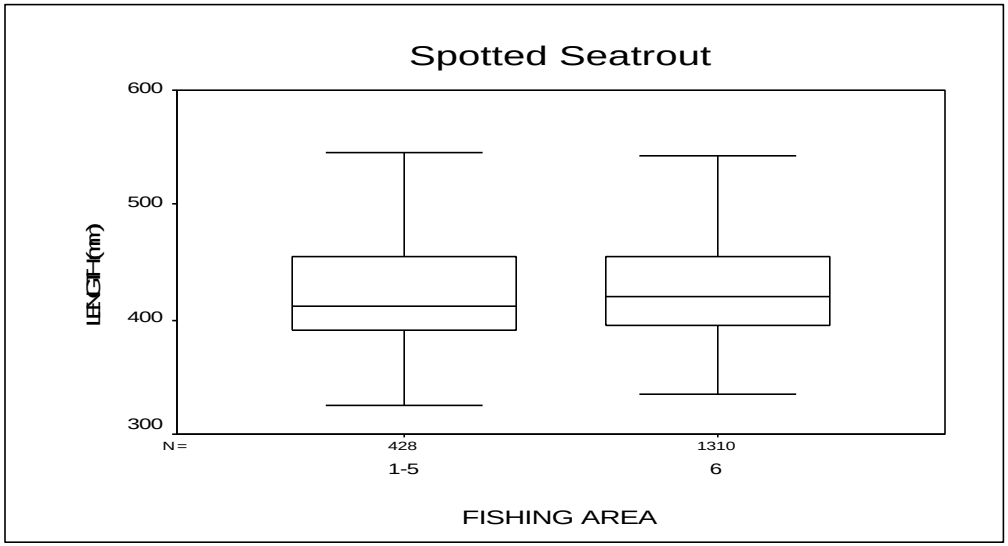


Figure 11. The lengths of the four major species of fish caught by recreational (non-guided) anglers in the six ecologically distinct fishing areas within Everglades National Park during 2000. The "box" represents the interquartile range; the horizontal line in the "box" represents the median; N represents the number of fish measured in each area.







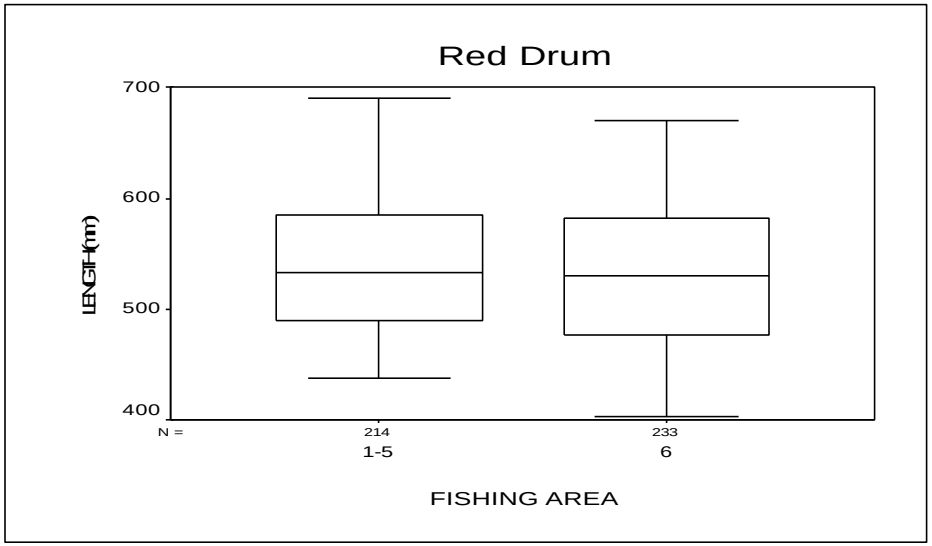
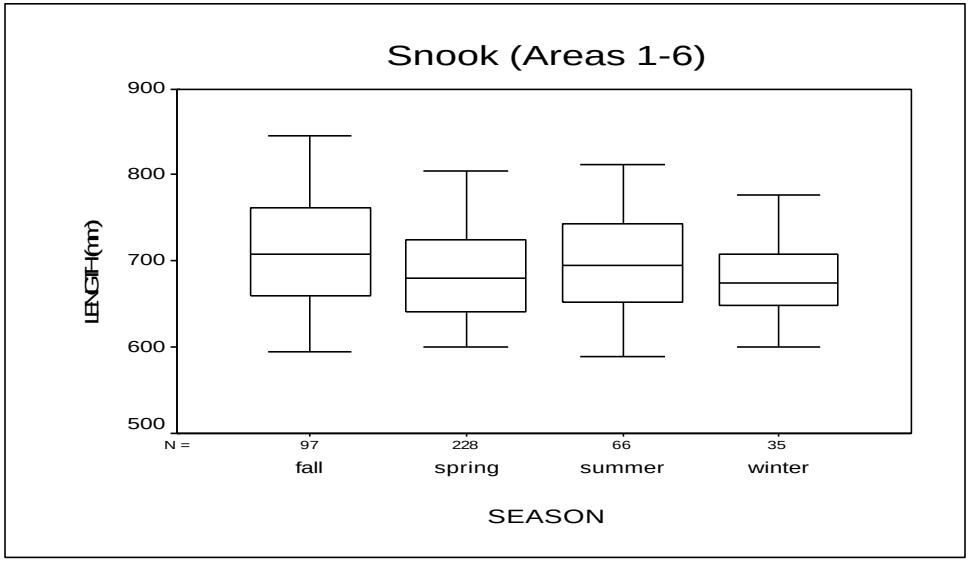
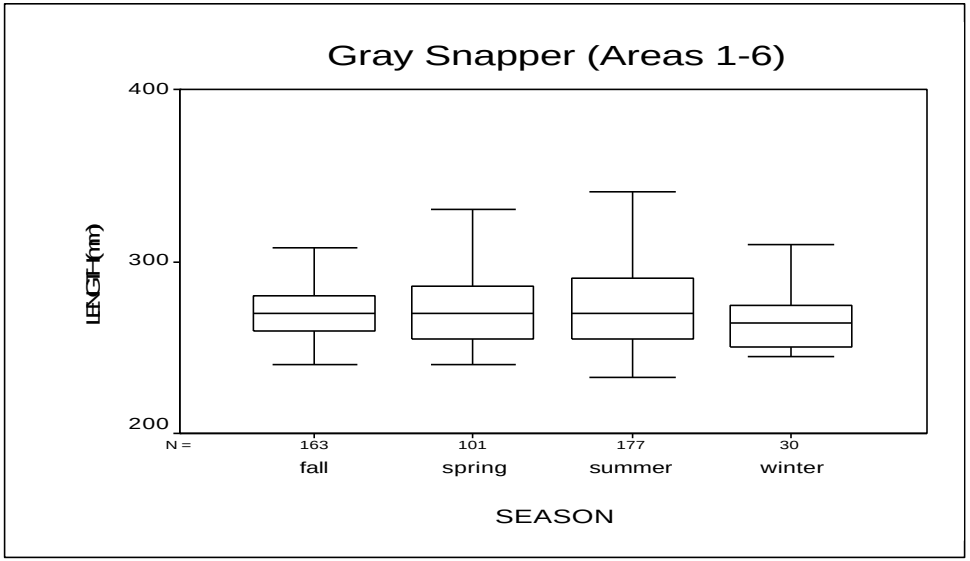
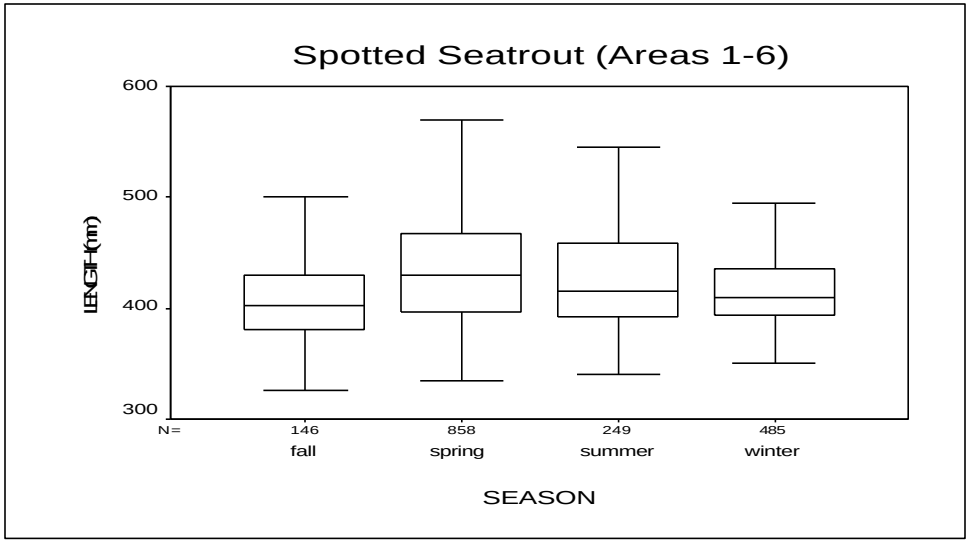


Figure 12. The lengths of the four major species of fish caught by recreational (non-guided) anglers in Florida Bay (Areas 1-5) and Everglades City (Area 6) within Everglades National Park during 2000. The "box" represents the interquartile range; the horizontal line in the "box" represents the median; N represents the number of fish measured in each area.







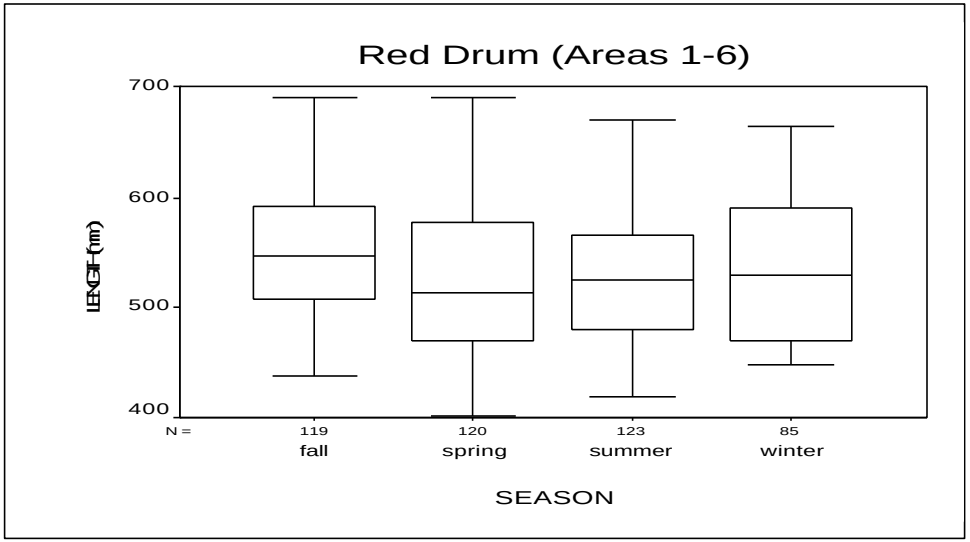
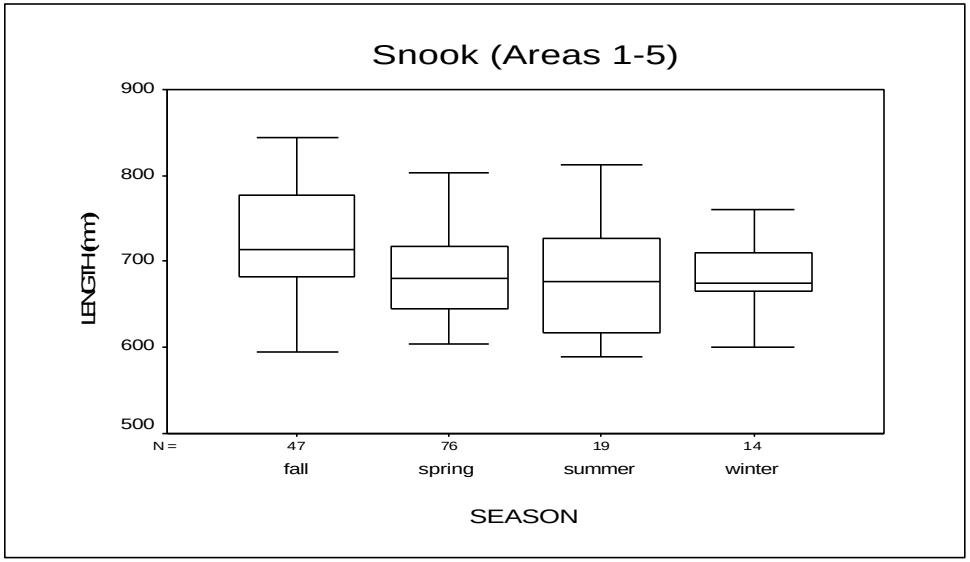
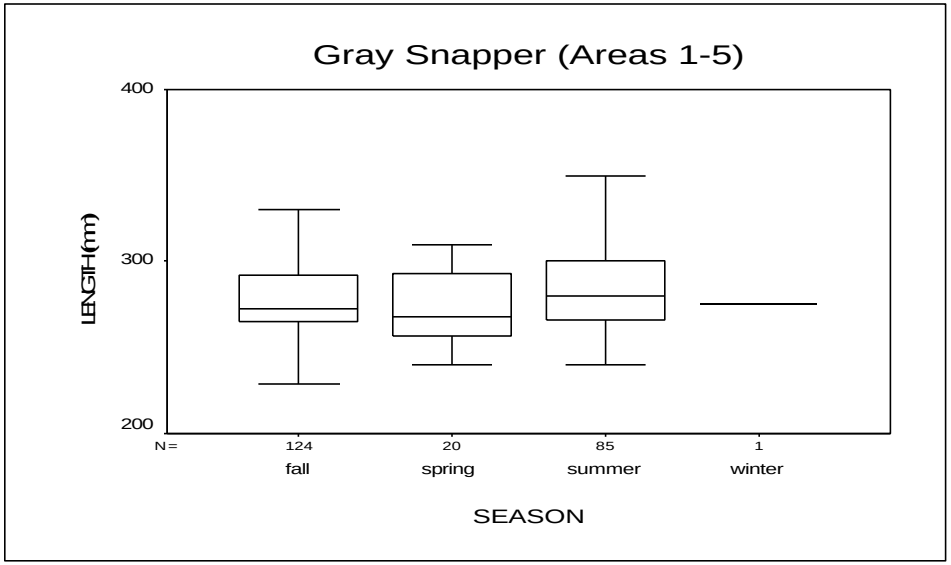
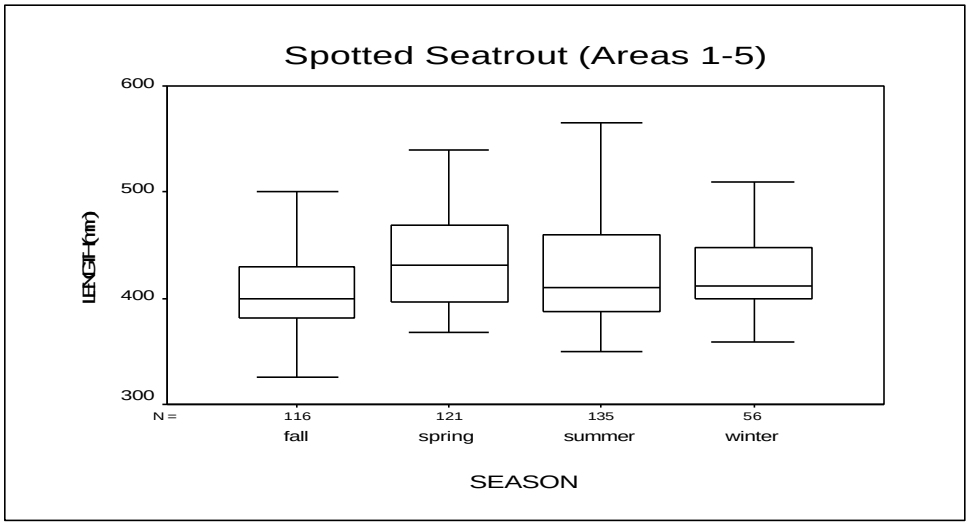


Figure 13._ The lengths of the four major species of fish caught by recreational (non-guided) anglers in Everglades National Park during the fall, spring, summer, and winter of 2000. The "box" represents the interquartile range; the horizontal line in the "box" represents the median; N represents the number of fish measured in each area.







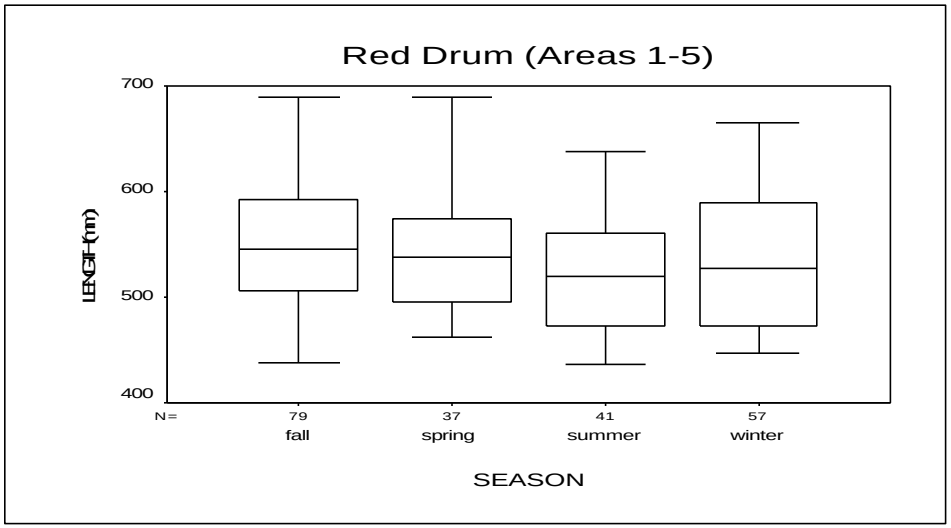
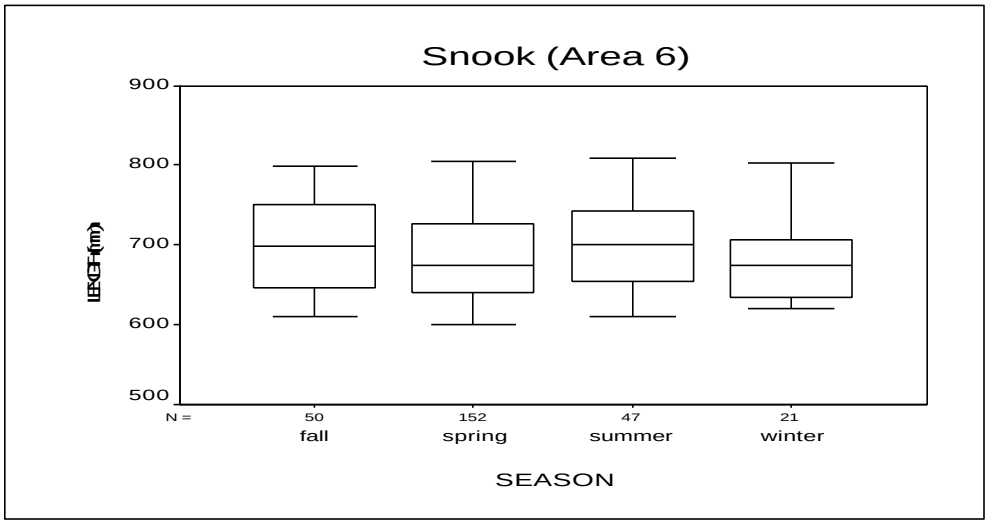
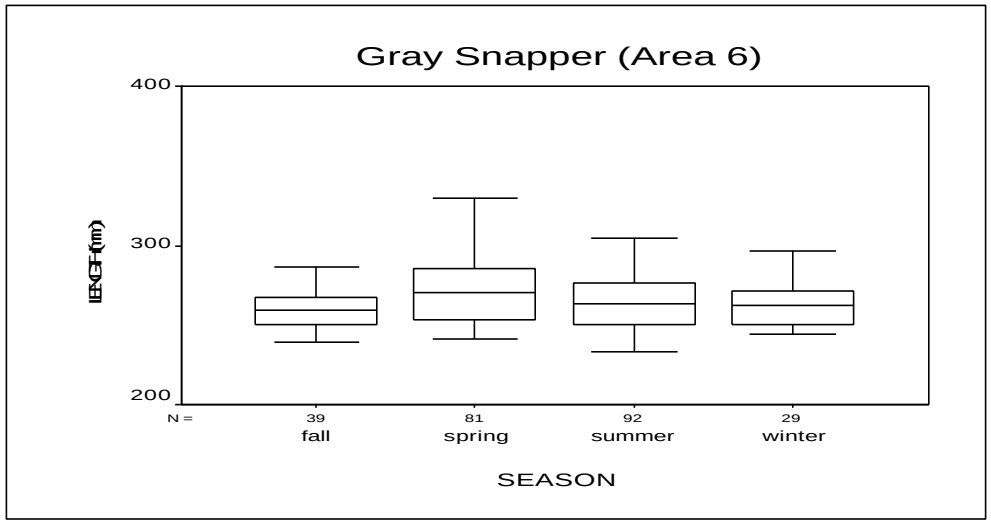
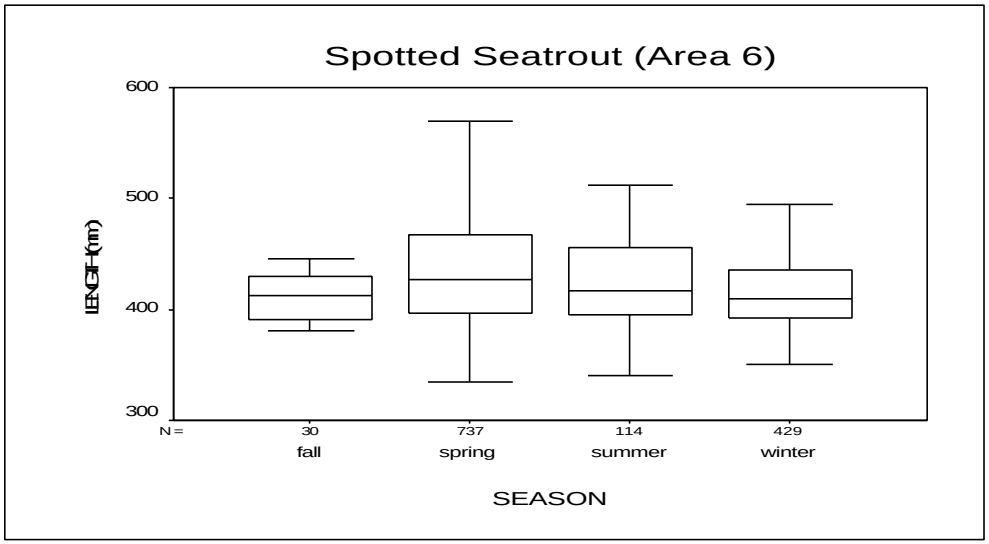


Figure 14. The lengths of the four major species of fish caught by recreational (non-guided) anglers in Florida Bay (Areas 1-5) during the fall, spring, summer, and winter of 2000. The "box" represents the interquartile range; the horizontal line in the "box" represents the median; N represents the number of fish measured in each area.







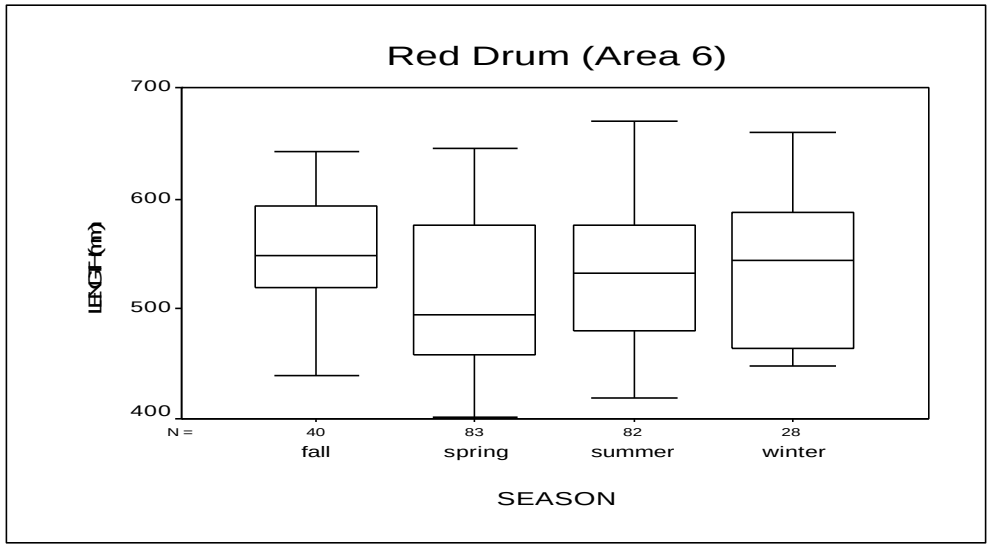


Figure 15. The lengths of the four major species of fish caught by recreational (non-guided) anglers in Everglades City (Area 6) during the fall, spring, summer, and winter of 2000. The "box" represents the interquartile range; the horizontal line in the "box" represents the median; N represents the number of fish measured in each area.

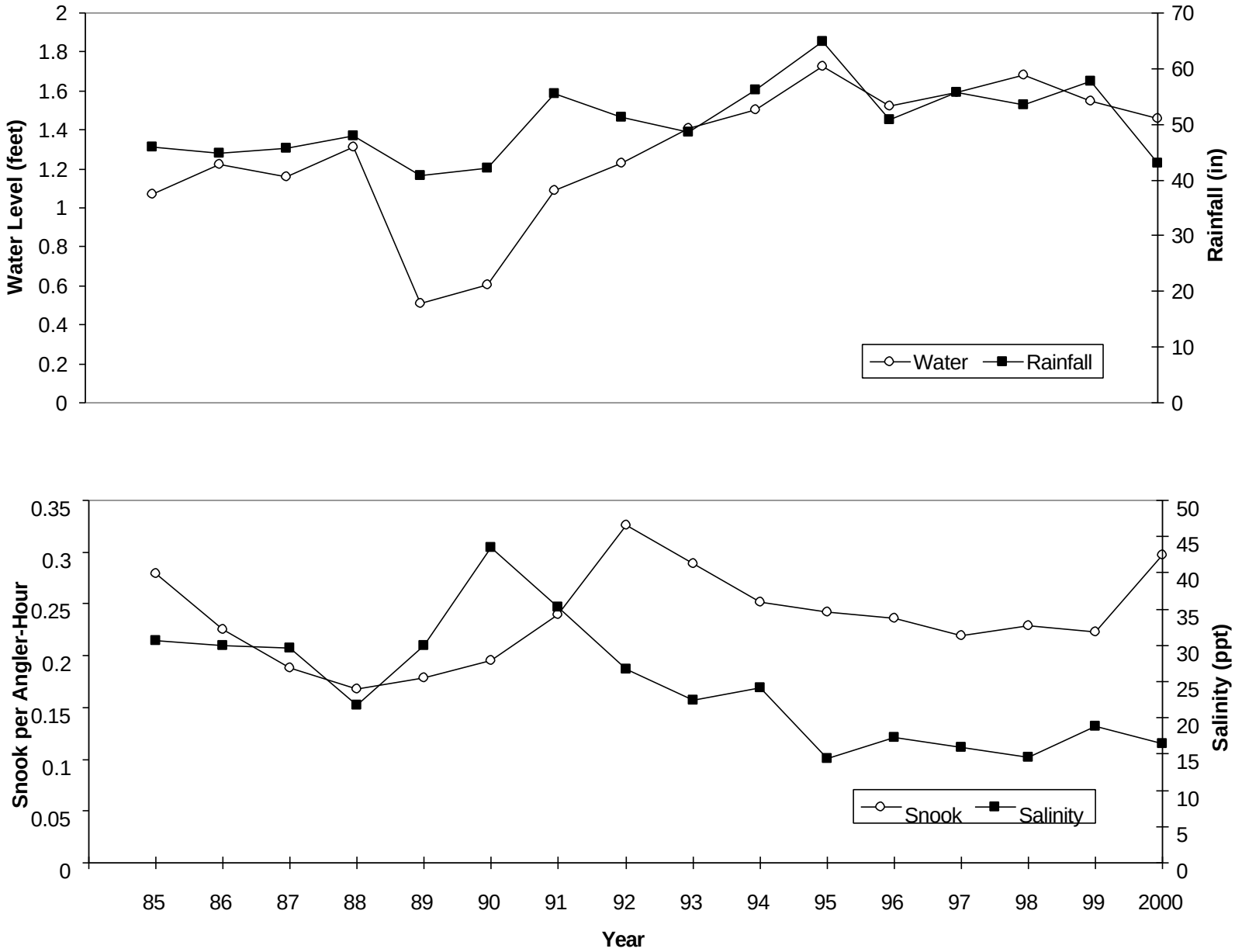


Figure 16. Average rainfall recorded at 5 stations in or near ENP, average water level at P-37 in Taylor Slough, average salinity at 3 stations in northern Florida Bay, and non-guide catch rates of snook in Florida Bay (Areas 1-5) from 1985-2000.

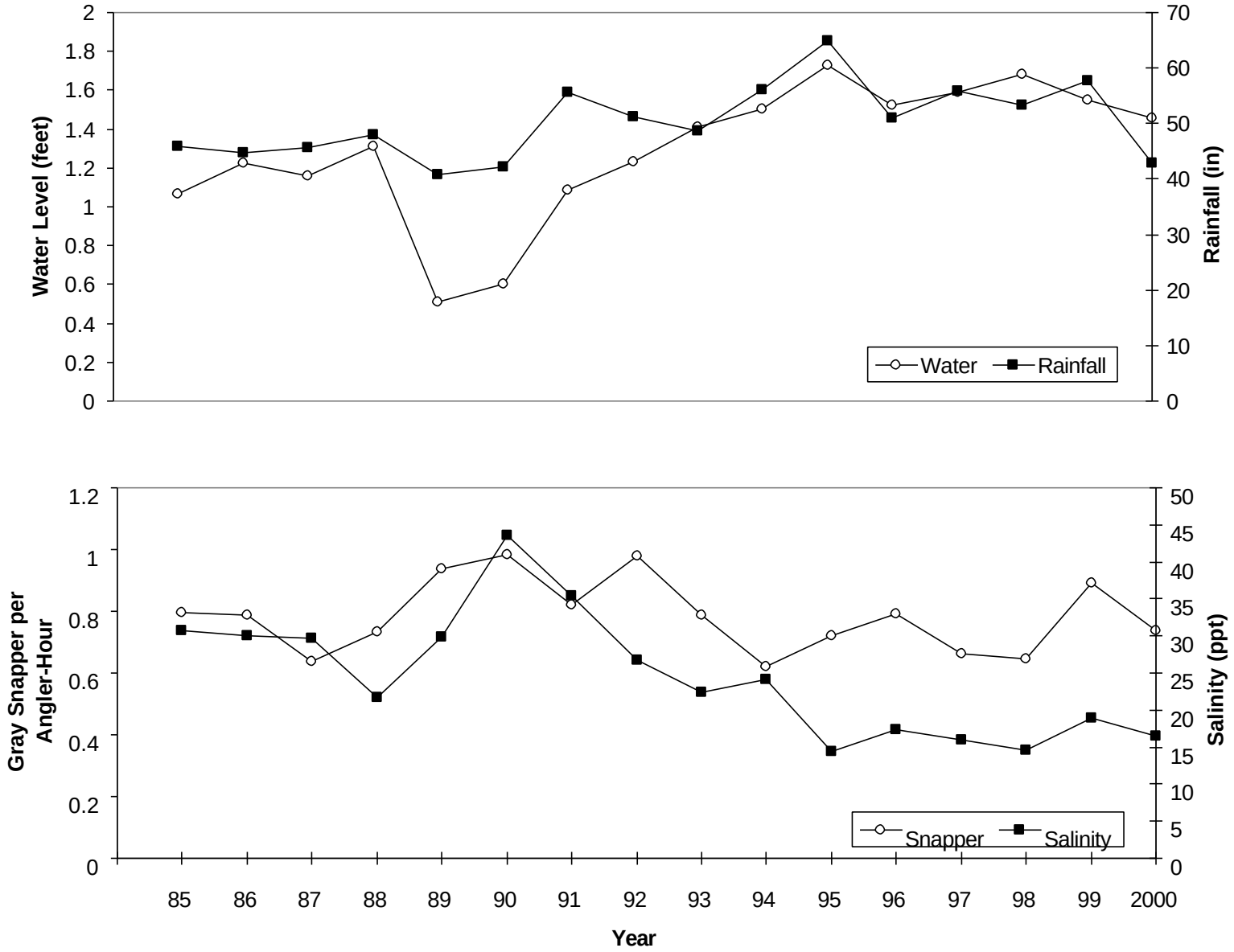


Figure 17. Average rainfall recorded at 5 stations in or near ENP, average water level at P-37 in Taylor Slough, average salinity at 3 stations in northern Florida Bay, and non-guide catch rates of gray snapper in Florida Bay (Areas 1-5) from 1985-2000.

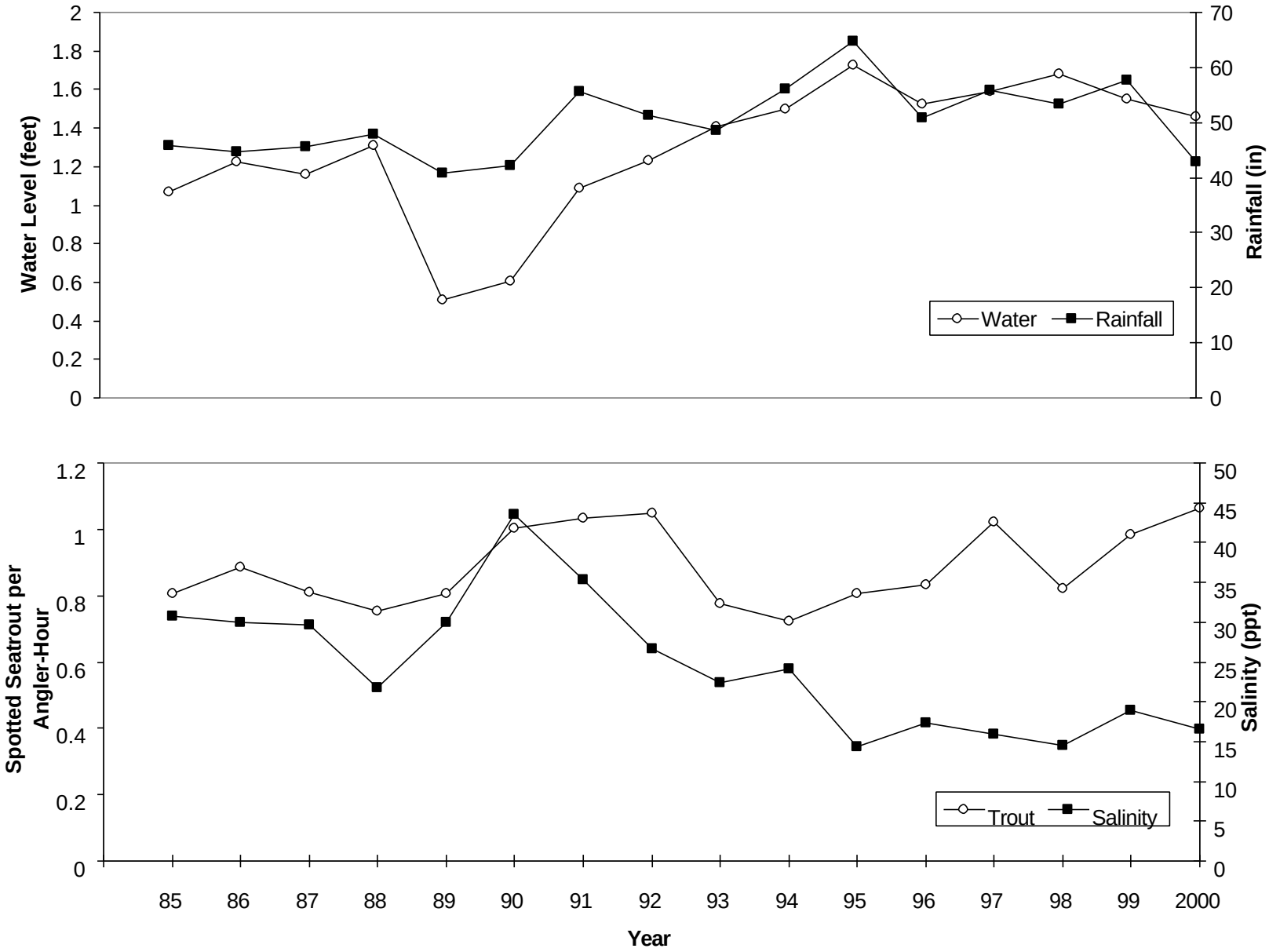


Figure 18. Average rainfall recorded at 5 stations in or near ENP, average water level at P-37 in Taylor Slough, average salinity at 3 stations in northern Florida Bay, and non-guide catch rates of spotted trout in Florida Bay (Areas 1-5) from 1985-2000.

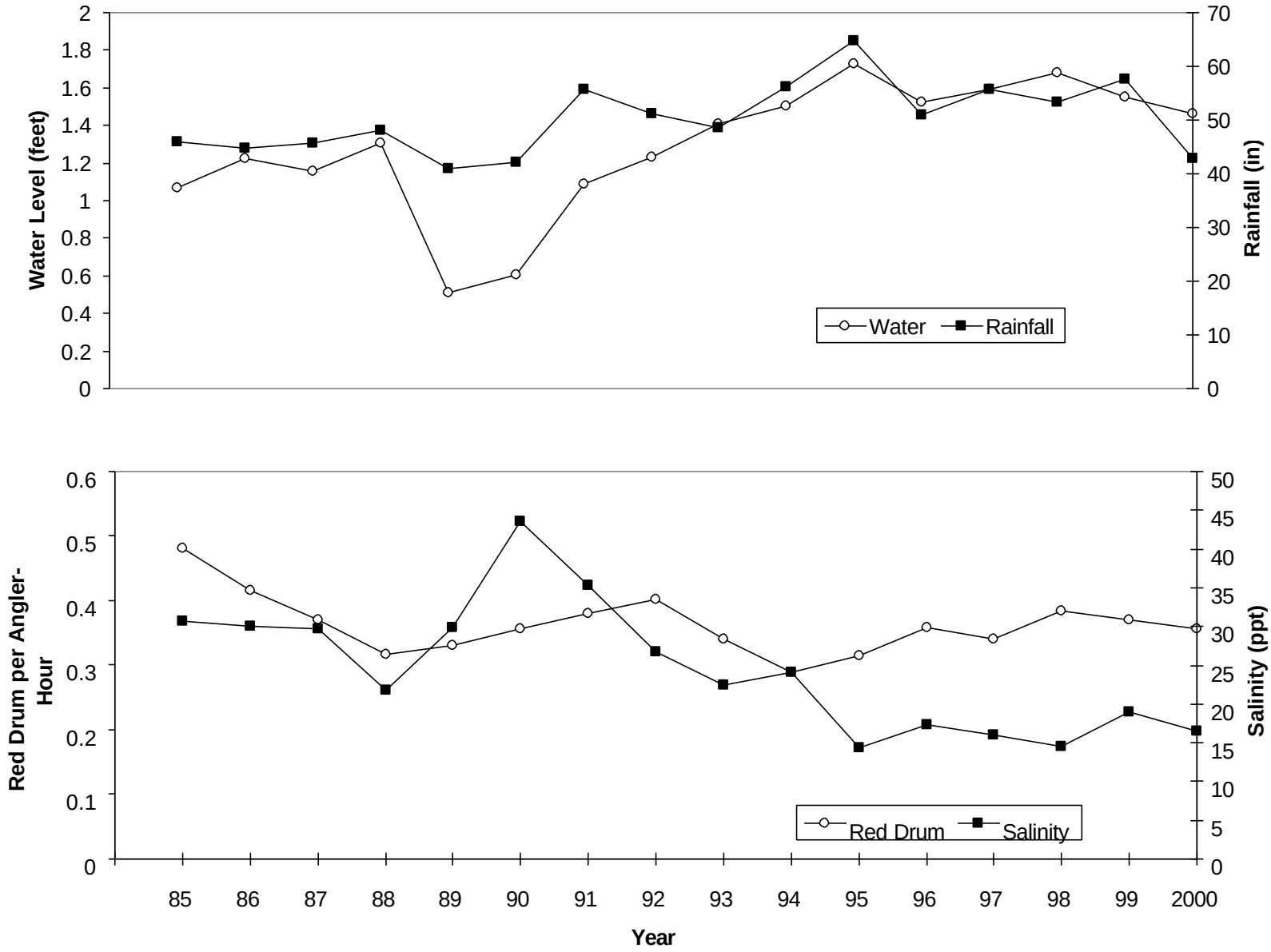
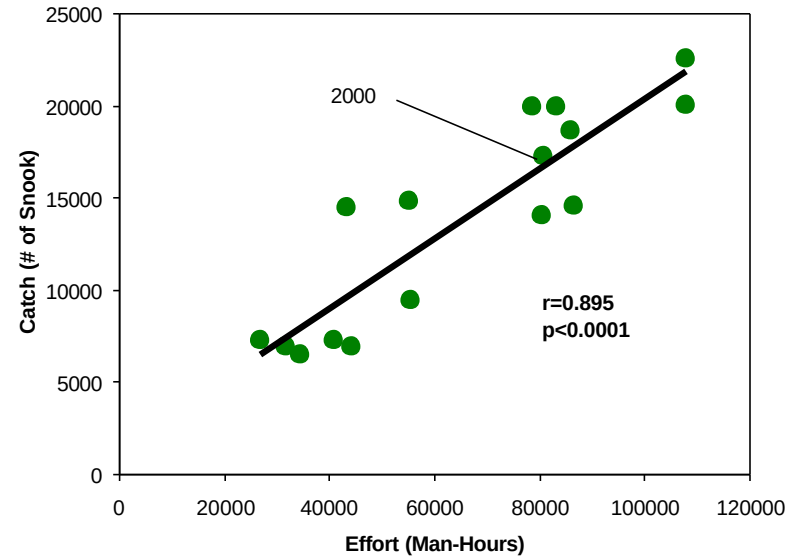
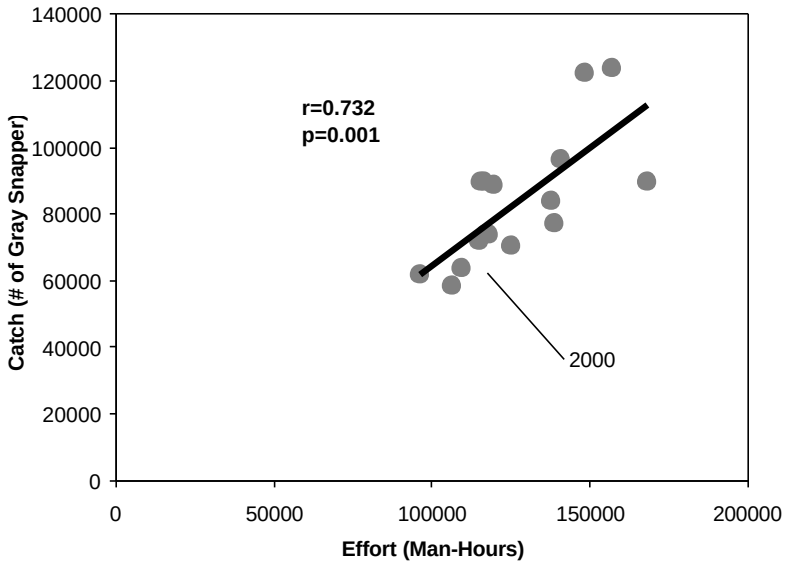
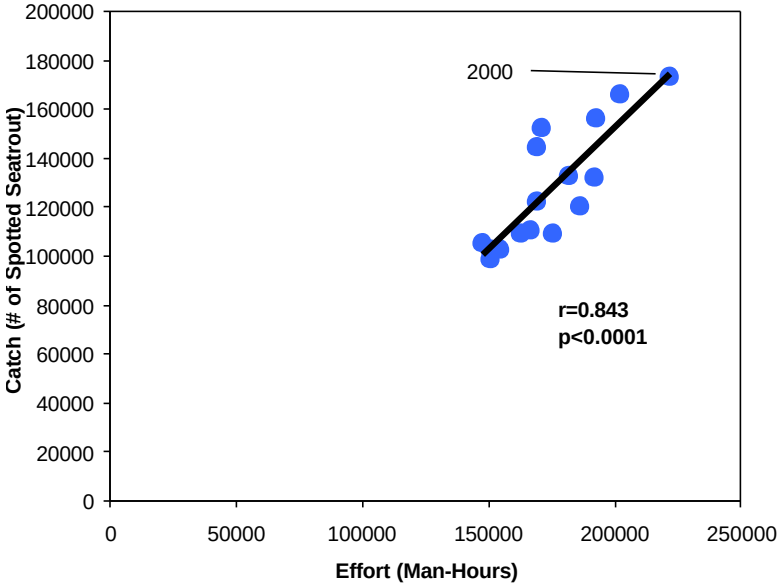


Figure 19. Average rainfall recorded at 5 stations in or near ENP, average water level at P-37 in Taylor Slough, average salinity at 3 stations in northern Florida Bay, and non-guide catch rates of red drum in Florida Bay (Areas 1-5) from 1985-2000.







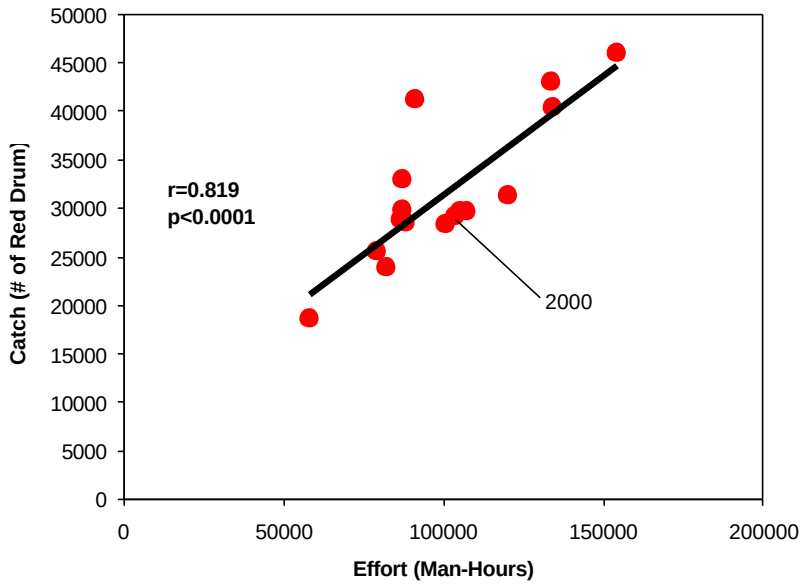


Figure 20. Correlation of total estimated catch and total estimated effort of non-guided (sport) anglers for snook, gray snapper, spotted seatrout, and red drum in Florida Bay (Areas 1-5), 1985-2000.