YEAR 2001 ANNUAL FISHERIES REPORT

EVERGLADES NATIONAL PARK

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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 ramps 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 may 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 1994-2000 are briefly discussed in previous (1995-00) annual fisheries reports. For year 2001, project personnel participated in several scientific and management meetings, and stock evaluations/assessments. Based on poster presentations on long-term fishery trends covering the period of 1985-1998, made at the 53 rd Gulf and Caribbean Fisheries Institute meeting in Biloxi, Ms., a paper entitled " Long-term trends in the recreational catch of snook (*Centropomus undecimalis*) and spotted seatrout *(Cynoscion nebulosus) in* Everglades National Park" was drafted for publication in cooperation with FMRI, Marathon, FL. (Delgado et al., in prep.). Other snook overfishing concerns along Florida's west coast resulted in a series of FWCC snook management workshops during the summer of 2001, which were held from Naples to St. Petersburg. Emphasis was on the status of snook populations, and the development of proposed new rules for the west coast of Florida based partially on the analysis of the Park's fisheries database. Other on-going snook issues 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. Although no significant differences in catch rates were found for snook/red drum in the bait analysis, the Park did provide support for snook bag reductions and seasonal closures as proposed by FWCC.

Creel data from the 2001 survey 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. A poster on the diet of snook and red drum collected during the 2000 recreational sport and guided fisheries survey of Florida Bay was presented at the April Florida Bay Science Conference, Key Largo, FL (Schmidt et al., 2001), which resulted in a final report entitled "Diet of red drum (*Scienops ocellatus*) and common snook (*Centropomus undecimalis)* in Florida Bay and adjacent waters" (Koenig et al. 2001). At the same conference a paper was co-authored along with fisheries scientists from NOAA, USGS, and FFWCC on the abundance of fishes and macro-invertebrates in Florida Bay (Johnson et

al., 2001). The Park's sportfish database was used to evaluate adult fish populations in Florida Bay, and linked to environmental parameters such as rainfall and upland well levels.

An analysis of the fisheries database was undertaken as part of a request from NMFS Protected Fisheries Division, (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 report (Status Review of smalltooth sawfish, *Pristis pectinata*) 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. The sawfish database was also provided to J. Seitz of the Collier County Dept. of Natural Resources to further document recent occurrences of sawfish along the southwest coast of Florida. The long-term creel database was also analyzed as requested by the NMFS, Miami, for the occurrence of yellowtail snapper in Florida Bay.

Continuing conceptual model development for various coastal CERP (Comprehensive Everglades Restoration Project) projects identified interactions between ecosystem dynamics and higher trophic levels in Florida Bay and adjacent marine waters, focusing, in part, on adult spotted seatrout and snook catch rates. Various Fed/State interagency meeting participants identified draft ecological performance measures as indicators of ecosystem restoration. Snook and spotted seatrout CPUE are under development as performance measures for both the Florida Bay/Florida Keys and Southwest Florida Feasibility studies and, along with other recreationally important species, will be considered in the CERP evaluation /decision making process.

Other project related activities in support of other South Florida National Parks for the lead author included providing assistance in the development of draft fisheries desired future conditions (DCF) for Biscayne National Park (BNP), and providing scientific input and review for the assessment of their recreational and commercial fisheries in a final report entitled "Site characterization for BNP: assessment of fisheries resources and habitats" (Ault et al., 2001a). These activities are part of an ongoing process to develop a Fishery Management Plan (FMP) with the State of Florida (FWCC) for BNP. At Dry Tortugas National Park (DRTO) the lead author was an invited workshop participant and fisheries reviewer in the development of Dry Tortugas National Park General Management Plan, and Visitor Experience and Resource Protection (VERP), a plan to address visitor use and carrying capacity. As a first step, key fishery species, fisheries indicators and standards of resource conditions were proposed and developed to serve as part of a future plan to monitor impacted and non-impacted visitor use areas within the boundaries of DRTO. In addition, a final report on baseline multispecies coral reef fish stock assessments for DRTO and the Dry Tortugas region was co-authored (Ault et al. 2001b) which described pristine to near-pristine conditions potentially threatened by over-fishing and habitat degradation.

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 seventh 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. This report includes a description of the fishery, relative abundance, and average size of the four major catch species in 2001, 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 1985-2001.

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 39% in 2001.

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 2001 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) was used to test differences in mean harvest length by area and season. 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 2001, 3731 boaters were interviewed at Flamingo. Over 99% of these boaters were involved in sportfishing activity. Only 4.45% of the anglers did not catch fish.

At Everglades City, 2264 boaters were interviewed. Ninety-three percent of the total boats interviewed were fishing. Only 5.93% of the fishermen did not catch fish.

Description of the Fishery (2001)

Most (85.5%) of the anglers fishing out of Flamingo were south Florida residents (Dade County to Ft. Lauderdale, excluding local residents); 1.9% were local residents (Florida City, Flamingo, and the Florida Keys); 11.6% were Florida residents from the rest of Florida. Only 1.05% of the anglers came from out of state.

Most (80.7%) of the anglers fishing out of Everglades City were Florida residents, excluding south Florida and local residents. South Florida accounted for 5.8% of the anglers, while 12.3% were local (Chokoloskee/Everglades City) residents and 1.1% came from out of state.

An estimated 31,557 fishing trips, 73,210 anglers, and 31,779 boats made up the boating and fishing activity in Florida Bay. Of these fishing trips, 11.7% were interviewed at the Flamingo boat ramps. The average trip lasted 6.97 hours with an average fishing time of 5.85 hours and an average of 2.32 anglers on board.

Most anglers interviewed at Flamingo (62.6%) did not try to catch any one specific kind of fish. Snook were the most popular fish, sought by 11.3% of the fishermen; red drum were sought by 11.1% of the fishermen. The next three species preferred were spotted seatrout (9.5%), tarpon (1.5%), and gray snapper (1.2%). Approximately 55% of the fishing parties interviewed reported catching spotted seatrout. The next four species most commonly caught were red drum (34.3%), gray snapper (33%), snook (28.1%), and tarpon (4.4%).

At Everglades City, an estimated 17,509 fishing trips, 43,541 anglers, and 18,807 boats made

up the boating and fishing activity. Of these fishing trips, 12% were interviewed at the Everglades City boat ramps. The average trip lasted 7.26 hours with an average fishing time of 5.77 hours and an average of 2.32 anglers on board.

Most anglers interviewed at Everglades City (58.7%) did not try to catch any particular kind of fish. Snook was by far the most popular fish, sought by 29.8% of the fishermen. The next three species that were preferred by anglers were spotted seatrout (6%), red drum (2.5%), and tarpon (1%). More than 44.9% of the fishing parties interviewed reported catching snook. The next four species most commonly caught were spotted seatrout (36.8%), red drum (26.7%), gray snapper (21.2%), and tarpon (2.5%).

An estimated total of 49,066 fishing trips were reported in park waters during 2001. This represents a marked increase from the 44,047 fishing trips in 2000. This year's number of fishing trips is the highest ever recorded in ENP, which is not only alarming, but is suggestive about the impact that fishing activity has on the health of fishery. The overall trend in recreational fishing trips since 1972 shows high values in 1973-75, with lows in 1979-80, and a rebound in the mid-80's to the third 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 was an increasing trend from 1993 until 1997, which had the second highest number of fishing trips recorded in ENP. The number of fishing trips generally stayed the same between 1998 and 2000, but showed a large increase in 2001 (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 2001 mean catch (CPUE) and harvest rates (HPUE) for the 11 major species of the recreational (non-guided) fishery in Florida Bay (Areas 1-5), Everglades City (Area 6), 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), Everglades City (Area 6), and all of ENP (Areas 1-6). The relationships of 2001 non-guided catch and harvest rates to past years are presented in Figures 5-6 for the four major species (snook, red drum, spotted seatrout, and gray snapper). The relationships of 2001 guided catch and harvest rates to past years are presented in Figures 7-8 for six major species (snook, red drum, spotted seatrout, gray snapper, tarpon, and bonefish).

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 2001 estimated total non-guided and guided catch/harvest is shown in Table 3. The relationships of 2001 catch and harvest to previous years are shown in Figures 9-10.

Recent Trends (Florida Bay, Everglades City, and Parkwide as noted)

Overall, 2001 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 been decreasing steadily since the middle 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 they are 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 through 2000 (Figure 4). The percentage of fishing parties catching snook has increased to an all-time high of 28.1% in 2001. The percentage of fishing parties catching snook in Everglades City (Area 6) since 1995 has decreased to a low of 36% in 1998 and increased to an all-time high of 44.9% in 2001 (Figure 4a).

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 1993, but showed a rebound in 1999 (Figure 7). Following a decrease in guide catch rate for snook in 2000, there was an increase in 2001 to nearly the same catch rates seen in 1995. However, sport catch rates in Florida Bay have shown a cyclical trend every eight years (Figure 5). There was a low in catch rates 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), then 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 and followed by a slight decrease in 2001. According to this trend in snook catch rates for the last 21 years, there will presumably be two more years of slightly declining catch rates before beginning an upward trend for the next four years, commencing with another peak in 2008.

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 (catch rates) showed no significant trends in Area 1 and Area 4; however, there were significant increasing trends in Area 3, Area 5, and Area 6. The cause of the increases is yet to be determined, but changing environmental parameters and fishing effort will be investigated. No analysis was done for Area 2 because of insufficient data.

Estimated Total Catch & Harvest:
Despite regulations, sport fishermen harvest in Florida Bay (Areas 1-5) had not been reduced until 1998 (Figure 9). Estimated total catch and harvest declined in 1999 as well, but increased in 2000 and 2001 (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). An analysis of total catch and harvest for Area 6 (Figure 9a) and Areas 1-6 (Figure 9B) in the most recent years (1998-2001) has shown a general increase in total catch and stable numbers in total harvest for snook. Further analysis is forthcoming in future annual reports to include Area 6 snook. Guided anglers' total 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.

Red Drum
The percentage of fishing parties 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). Although the percentage of anglers catching red drum decreased in proceeding years to 27.2% in 2000, it increased to over 34% in 2001. The percentage of fishing parties catching red drum in Everglades City (Area 6) was gradually declining between 1996 (a high of 36%) and 2000 (a low of 24.6%), followed by a slight increase to 26.7% in 2001 (Figure 4a).

Catch/Harvest Rates:
Red drum harvest rates for sport fishermen in Florida Bay (Figures 5) and in all of ENP (Figure 6) have remained quite stable beginning in 1989 when bag limits of 1 fish per person were imposed. Guide harvest rates in Florida Bay also have been 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 three years from .370 fish per angler-hour in 1999 to 0.328 fish per angler-hour in 2001 (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 the years between 1985 and 1995, although the catch rates have been increasing slightly since a marked decline 1998 (Figure 7). Concurrently, guide harvest rates have been slightly declining since 1998 (Figure 7).

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 (catch rates) 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 was a large decrease in catch rate in 1998, a leveling off in 1999 (29,678 fish) and 2000 (29,180 fish), and a marked increase to 43,656 fish in 2001 (Figure 9). The same trend for estimated harvest rates show this pattern in 1998-2001 (Figure 9). Total harvest of red drum in Florida Bay by guide fishermen has also shown a slow, but steady increasing trend since 1990, except for a decline in 2001 (Figure 10). The estimated total catch rates for guides increased from 1990 until 1997 and have gradually declined since then (Figure 10). An analysis of the total catch of red drum by non-guided anglers at Everglades City (Area 6) showed a gradual decrease in 1998-2000, followed by a significant increase in 2001 (Figure 9a). The harvest rates follow these trends as well, but remain relatively stable. For the entire ENP (Areas 1-6), similar trends in the total catch and harvest of red drum between 1998 and 2001 were seen (Figure 9b). Further analysis is forthcoming in future annual reports to include Area 6 red drum.

Spotted Seatrout
The percentage of fishing parties interviewed at Flamingo (Areas 1-5) catching seatrout declined slightly from 1985-1989, but increased sharply to a 14 year high in 1992 of almost 65% (Figure 4). Since then, the percentage of anglers catching seatrout declined to a 14 year low in 1996 of 39% (Figure 4). The trend had been increasing since 1996 with seatrout caught by over 58% of the anglers in 2000, until a slight decrease to 55% in 2001 (Figure 4). The percentage of fishing parties interview at Everglades City (Area 6) that were catching spotted seatrout since 1995 has not shown a trend and ranges between 30% and 42.9% (Figure 4a). 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 Florida Bay (Figure 5) and in all of ENP (Figure 6). However, guide harvest rates have been gradually decreasing since 1982; yet, guide catch rates have been fluctuating over the same time period (Figure 7). The catch rate of sport fishermen in Florida Bay has also fluctuated throughout the period of record, while harvest rates have leveled off since 1995 (Figure 5). The catch rate of seatrout in all of ENP has been relatively stable since 1990 (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 (catch rates) showed no significant trends in Area 1 and Area 3; however, there were significant declining trends in Area 4, Area 5, and Area 6. The cause of these declines is yet to be determined, but changing environmental parameters and fishing effort will be investigated. No analysis was done for Area 2 because of insufficient data.

Estimated Total Catch & Harvest:
Annual estimated total harvest data from non-guided fishermen in Florida Bay suggests that seatrout harvest decreased steadily from 1989 to 1996 (Figure 9). Since in 1997, the total number of fish harvested has remained relatively stable. There has been an upward trend in the estimated catch since a low in 1996 (Figure 9). The estimated total catch and harvest for Everglades City (Area 6) and all of ENP (Areas1-6) between 1998 and 2001 show gradual increases until 2001, with slight decreases in 2001 (Figures 9a+9b). Further analysis will be done for Area 6 total catch and harvest for spotted seatrout. Estimated total harvest from guide fishermen in Florida Bay had been very stable from 1990-1995, but experienced an all time low in 1996. Since 1996, seatrout total harvest rebounded to 16,002 fish in 2000, but suffered in 2001 by harvesting only 8894 seatrout (Figure 10). Meanwhile, the estimated total catch of seatrout by guided fishermen had shown an increasing trend since 1990 (excluding 1996), with an all time high of 103,098 fish in 2000 (Figure 10). However, the 2001 estimated total harvest (65,994 fish) showed marked decline from the 2000 numbers.

Gray Snapper
The percentage of fishing parties 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 has been increasing from 29% in 1997 to nearly 38% in 1999. In 2000 there was an all time low of 27.9% of fishing

parties catching gray snapper, but rebounded to 33% in 2001 (Figure 4). The percentages of fishing parties interviewed at Everglades City (Area 6) that were catching gray snapper have remained stable since 1995 (Figure 4a).

Catch/Harvest Rates:
In general, sport and guide harvest rates in Florida Bay (areas 1-5) for gray snapper have shown steady declines since 1980 (Figures 5 and 7). Sport and guide catch rates have been fluctuating through the period of record, however catch rates have been lower for the most recent years (Figures 5, 6, and 7). After a steady decline from 1992 to 1998, the sport catch rate jumped to 0.892 fish per angler-hour in Florida Bay in 1999 (Figure 5). During 1988-1992, the increase in catch rate, and a lack of an increase in harvest rate of sport anglers, may reflect good recruitment of small juvenile fish to the stock. Perhaps the large increase in catch rate in 1999 is also related to good recruitment.

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 (catch rates) 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 total harvest is probably due to regulations imposed on the fishery in 1988 and 1990 when the legal minimum size was increased from 6" 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). The estimated total catch and harvest of gray snapper in Everglades City (Area 6) showed a marked decrease from 1998 to 1999, however have increased over the past two years (Figure 9a). In contrast, estimated total catch and harvest throughout all ENP (Areas 1-6) decreased from 1998 to 2000, but slightly increased in 2001 (Figure 9b). Further analysis of Area 6 catch and harvest data for gray snapper will be discussed in future annual reports.

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 (catch rates) 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 2001 is given in Table 3.

Fish Lengths (2001)

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 a difference in mean length among the six areas (df=486, f=2.988, p=0.011) (Figure 11). A Tukey's multiple comparison test showed that significantly longer snook were harvested in Area 1 compared to both Areas 5 and 6 (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=486, f=3.624, p=0.058) (Figure 12). These results are consistent with an analysis of 1998 snook lengths.

A parkwide seasonal comparison of snook lengths for 2001, showed that there was a significant difference among the four seasons (df=486, f=3.074, p<0.03) (Figure 13). In 2001, 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=233, f=4.051, p<0.01) (Figure 14). 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=252, f=1.94, p=0.124) (Figure 15). These results are consistent with those obtained from an analysis of 1998 snook lengths.

Red Drum

There was a significant difference in the mean lengths of red drum harvested among the six areas of ENP during 2001 (df=652, f=13.973, p<0.0001) (Figure 11). On average, using a Tukey's multiple comparison test, red drum harvested from Area 1 were significantly longer than the red drum taken from other areas of the Park (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 (Area 1-5) versus Everglades City (Area 6). Indeed, there was a significant difference in the

length of red drum harvested in Florida Bay versus Everglades City (df=652, f=5.039, p<0.03) (Figure 12). These results are inconsistent with those obtained from an analysis of 1998 red drum lengths.

A seasonal comparison of red drum lengths parkwide (Areas 1-6) showed that there was a significant difference in the length of red drum in 2001 (df=652, f=3.983, p<0.01) (Figure 13). The length of red drum harvested in Florida Bay only (Areas 1-5) showed significant seasonal differences (df=375, f=4.791, p=0.003) (Figure 14). Similarly, red drum harvested in Everglades City (Area 6) also showed a significant difference among seasons (df=276, f=2.876, p<0.04) (Figure 15).

Spotted Seatrout

In 2001, there was a significant difference in the mean length of harvested spotted seatrout among the six areas of ENP (df=1303, f=5.275, p<0.0001) (Figure 11). Using a Tukey's multiple comparison test, it was shown that significantly longer seatrout were harvested in Area 1 compared to both Areas 5 and 6 (areas 2 and 4 did not have an ample amount of samples to be considered for this analysis) (Figure 11). 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 2001, there were significant differences (df=1,303, f=11.03, p=0.001) (Figure 12). In addition, there was a significant difference in the mean length of spotted seatrout harvested parkwide (Areas 1-6) among the four seasons in 2001 (df=1,303, f=3.024, p<0.0001) (Figure 13).

A seasonal comparison of spotted seatrout harvested only in Florida Bay (Areas 1-5) showed that there was a significant difference in the length of seatrout harvested among the four seasons of the year (df=247, f=2.831, p<0.04) (Figure 14). In contrast, there was not a significant difference found in the length of spotted seatrout harvested in Everglades City (Area 6) during the four seasons of 2001 (df=1,055, f=0.757, p=0.519) (Figure 15).

Gray Snapper

In 2001, there was a significant difference in the lengths of harvested gray snapper among the six areas of ENP (df=433, f=21.71, p<0.0001) (Figure 11). The gray snapper that were harvested in Area 2 were significantly longer than ones harvested from Areas 4, 5, and 6 (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), and, indeed there was a significant difference (df=433, f=71.145, p<0.0001) (Figure 12). These results are consistent with an analysis of 1998 gray snapper lengths.

There was a significant difference in the size of gray snapper harvested parkwide (Areas 1-6) among the four seasons in 2001 (df=433, f=6.728, p<0.0001) (Figure 13). Similarly, gray snapper lengths in Florida Bay only (Areas 1-5) were significantly different among the four seasons (df=152, f=9.508, p<0.0001) (Figure 14). However, harvested gray snapper in

Everglades City (Area 6) showed no significant seasonal differences in length during 2001 (df=280, f=1.983, p=0.117) (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 1985-2001 (Figures 16-19). Total annual rainfall from 1985-2001 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). Water level data from 1985-2001 was obtained from well P-37 in western Taylor Slough. Salinity data from 1985-2001 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 (Figure 16). There was not a significant correlation between water levels recorded and catch rates from 1985-2001 (r=0.307, N=17, p=0.230); this same result was obtained last year as well when 1985-2000 was analyzed. Although, no statistically significant correlation was found, the trends seen in Figure 16 suggest that a period of generally high salinity (r=-0.213, N=17, p=0.411) 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=0.170, N=17, p=0.514).

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 1985-2001 just as there were no significant correlations last year when only 1985-2000 was analyzed (Figure 19). There was no statistically significant relationship between the red drum catch rates and salinities from 1985-2001 (r=0.318, N=17, p=0.213). Rainfall and water levels also had no correlation with red drum cpue (r=-0.307, N=17, p=0.231 and r=-0.184, N=17, p=0.479, respectively).

Spotted Seatrout

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 salinites since 1993. There

was no statistically significant relationship between the two variables from 1985-2001 ($r=0.158$, $N=17$, $p=0.544$). Rainfall and water levels also had no correlation with seatrout cpue ($r=-0.049$, $N=17$, $p=0.851$ and $r=-0.087$, $N=17$, $p=0.741$, respectively). These are the same results as last year when environmental parameters were correlated with cpue from 1985-2000. 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).

Gray Snapper

Overall (1985-2001), a positive ($r=0.527$, $N=17$, $p=0.03$) 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 years ($r=-0.578$, $N=17$, $p<0.02$), indicating that during periods of reduced water levels in the upper Taylor Slough abundance of gray snapper increased. Rainfall was not significantly correlated with gray snapper catch rates ($r=-0.359$, $N=17$, $p=0.157$). Similar correlation results were obtained last year when 1985-2000 was 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).

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 total 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 a low of 26,775 angler-hours in 1985 to an all time high of 129,910 angler-hours in 2001 (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 another all time high of 25,887 fish in 2001 (Figure 20) representing more than a 70% increase in the number of fish caught. This was due to the concurrent increase in effort.

While the effort placed on snook stock remained relatively the same for 1999 and 2000 (80,235 man hours and 80, 587 man hours, respectively), 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 2001 ($r=0.919$, $N=17$, $p<0.0001$) (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 a fairly high annual 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.

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 an all time high of 159,144 angler-hours in 2001 (Figure 20), which represents an increase over 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 ($r=0.845$, $N=17$, $p<0.0001$) was found between yearly effort from 1985-2001 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. In 2001, the estimated catch of red drum again increased from the 2000 number of fish (29,180) to 43,656 fish in 2001. However, since there was more effort in 2001, the estimated total catch of red drum was expected to increase also.

Spotted Seatrout

The correlation of yearly estimated effort with estimated catch was linear and significant ($r=0.817$, $N=17$, $p<0.0001$) (Figure 20). Total estimated effort for spotted seatrout ranged from a record high of 249,199 angler-hours in 2001 to a low of 147,882 angler-hours in 1995 (Figure 20). In conjunction with the increased effort on spotted seatrout from 2000 to 2001, the estimated total catch decreased by about 10,000 fish. This type of trend indicates that yearly fishing effort may have impacted the fishery. However, these numbers represent only one to two years of data, and the fishery should be able to rebound. We will closely review this trend in next annual report.

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 barely 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. In 2001, the estimated catch of gray snapper and the annual estimated effort both increased. The annual estimated total catch of gray snapper was linearly correlated with the estimated total effort placed on the fishery between 1985-2001 ($r=0.636$, $N=17$, $p<0.01$), suggesting that the maximum potential catch of gray snapper in Florida Bay has not been reached (Figure 20).

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, jewfish, and sheepshead (2) incorporating the fisheries database into the park's GIS system for spatially oriented ecological applications, (3) develop a new fishery data management handbook, and (4) 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 delayed due to funding constraints during 2001, and will be the focus of a resource monitoring plan for 2002.

Several collaborative, ongoing studies are underway with Fed/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. 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 were presented at the Florida Bay Science Conference. A paper was co-authored along with fisheries scientists from NOAA, USGS, and FFWCC on the abundance of fishes and macro-invertebrates in Florida Bay (Johnson et al. 2001). Adult fish populations in Florida Bay were linked to environmental parameters such as rainfall and upland well levels. In addition, the analysis/stock assessment of the Florida Bay sportfish database from 1985-98 for snook, spotted seatrout, gray snapper, and red drum, resulted in a publication in the proceedings of the Gulf and Caribbean Fisheries

Institute during 2001 (Schmidt et al. 2001).

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 presented at the Annual Meeting of the American Fisheries Society, Phoenix, AZ.. 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 June, 2001, at St. Thomas, U.S. Virgin Islands. Funding issues and priorities addressed included: NMFS/NPS surveys, night fishing pilot study results, 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.

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Table 1. Recreational catch/harvest rates (fish per angler-hour) of non-guided (sport) anglers in Everglades National Park, 2001.

Non-Guide Anglers (Areas 1-5)				
Species	**CPUE** ±**95% Conf. Interval**	**HPUE** ±**95% Conf. Interval**	**Sample Size *** CPUE/HPUE	
Snook	0.2797± 0.0231	0.1202 ± 0.0113	1154	276
Red Drum	0.3277 ± 0.0261	0.1182 ± 0.0051	1,338	664
Spotted Seatrout	0.8395 ± 0.0505	0.2836 ± 0.0145	2,085	1,145
Gray Snapper	0.5808 ± 0.0492	0.3458 ± 0.0276	1,255	586
Tarpon	0.1647 ± 0.0235	N/A	178	0
Black Drum	0.2716 ± 0.0469	0.1975 ± 0.0343	234	161
Sheepshead	0.2487 ± 0.0311	0.1524 ± 0.0190	281	174
Spanish Mackerel	0.3314 ± 0.1054	0.2233 ± 0.0602	124	90
Grouper	0.2438 ± 0.1003	0.0816 ± 0.0136	123	30
Ladyfish	0.4492 ± 0.0390	0.1971 ± 0.1347	1,740	17
Crevalle Jack	0.4259 ± 0.0241	0.1750 ± 0.0461	2,347	81
Non-Guide Anglers (Areas 1-6)				
Species	**CPUE** ±**95% Conf. Interval**	**HPUE** ±**95% Conf. Interval**	**Sample Size *** CPUE/HPUE	
Snook	0.3304 ± 0.0210	0.1163 ± 0.0086	1,987	481
Red Drum	0.2956 ± 0.0206	0.1142 ± 0.0043	1,832	949
Spotted Seatrout	0.7827 ± 0.0421	0.2823 ± 0.0130	2,810	1,617
Gray Snapper	0.5717 ± 0.0437	0.3253 ± 0.0239	1,665	746
Tarpon	0.1615 ± 0.0207	N/A	217	0
Black Drum	0.2538 ± 0.0413	0.1847 ± 0.0307	270	186
Sheepshead	0.2455 ± 0.0275	0.1428 ± 0.0151	427	244
Spanish Mackerel	0.2657 ± 0.0622	0.1890 ± 0.0358	236	176
Grouper	0.2505 ± 0.0805	0.0803 ± 0.0118	175	37
Ladyfish	0.4906 ± 0.0347	0.3923 ± 0.2369	2,501	53
Crevalle Jack	0.4366 ± 0.0219	0.1758 ± 0.0390	3,321	104

Table 1 (cont.)

Non-Guide Anglers (Area 6)				
Species	**CPUE** ±**95% Conf. Interval**	**HPUE** ±**95% Conf. Interval**	**Sample Size *** CPUE/HPUE	
Snook	0.4006± 0.0382	0.1110 ± 0.0132	833	205
Red Drum	0.2087 ± 0.0278	0.1050 ± 0.0081	494	285
Spotted Seatrout	0.6193 ± 0.0733	0.2791 ± 0.0275	725	472
Gray Snapper	0.5437 ± 0.0935	0.2502 ± 0.0445	410	160
Tarpon	0.1469 ± 0.0410	N/A	39	0
Black Drum	0.1378 ± 0.0420	0.1027 ± 0.0492	36	25
Sheepshead	0.2394 ± 0.0540	0.1189 ± 0.0226	146	70
Spanish Mackerel	0.1930 ± 0.0572	0.1532 ± 0.0364	112	86
Grouper	0.1325 ± 0.4877	0.0749 ± 0.0243	52	7
Ladyfish	0.5853 ± 0.0704	0.4845 ± 0.3406	761	36
Crevalle Jack	0.4621 ± 0.0468	0.1788 ± 0.0708	974	23

* Number of fishing parties.

Table 2. Average recreational catch/harvest rates (fish per angler-hour) of guided anglers in Everglades National Park, 2001.

Guide Anglers (Areas 1-5)				
Species	**CPUE** ±**95% Conf. Interval**	**HPUE** ±**95% Conf. Interval**	**Sample Size *** CPUE/HPUE	
Snook	0.3408 ± 0.0263	0.1132 ± 0.011	1,137	335
Red Drum	0.4593 ± 0.0397	0.1122 ± 0.0055	1,296	475
Spotted Seatrout	1.6579 ± 0.0859	0.3901 ± 0.0202	1,553	610
Gray Snapper	1.5431 ± 0.1341	0.5505 ± 0.0421	506	304
Tarpon	0.183 ± 0.0143	N/A	402	0
Bonefish	0.2508 ± 0.0463	N/A	152	0
Guide Anglers (Areas 1-6)				
Species	**CPUE** ±**95% Conf. Interval**	**HPUE** ±**95% Conf. Interval**	**Sample Size *** CPUE/HPUE	
Snook	0.5301 ± 0.0277	0.1311 ± 0.0068	2,326	772
Red Drum	0.4708 ± 0.0286	0.1227 ± 0.0041	2,116	951
Spotted Seatrout	1.6297 ± 0.0708	0.4614 ± 0.0182	2,193	1,036
Gray Snapper	1.3957 ± 0.1072	0.5068 ± 0.0351	672	408
Tarpon	0.1751 ± 0.0122	N/A	573	0
Bonefish	0.2508 ± 0.0463	N/A	152	0

Guide Anglers (Areas 6)				
Species	**CPUE** ±**95% Conf. Interval**	**HPUE** ±**95% Conf. Interval**	**Sample Size *** CPUE/HPUE	
Snook	0.711 ± 0.0456	0.1448 ± 0.0082	1,189	437
Red Drum	0.4889 ± 0.0388	0.1332 ± 0.0058	820	476
Spotted Seatrout	1.5613 ± 0.1244	0.5635 ± 0.0309	640	426
Gray Snapper	0.9462 ± 0.1241	0.3789 ± 0.0553	166	104
Tarpon	0.1566 ± 0.0233	N/A	171	0
Bonefish	N/A	N/A	0	0

* Number of fishing parties.

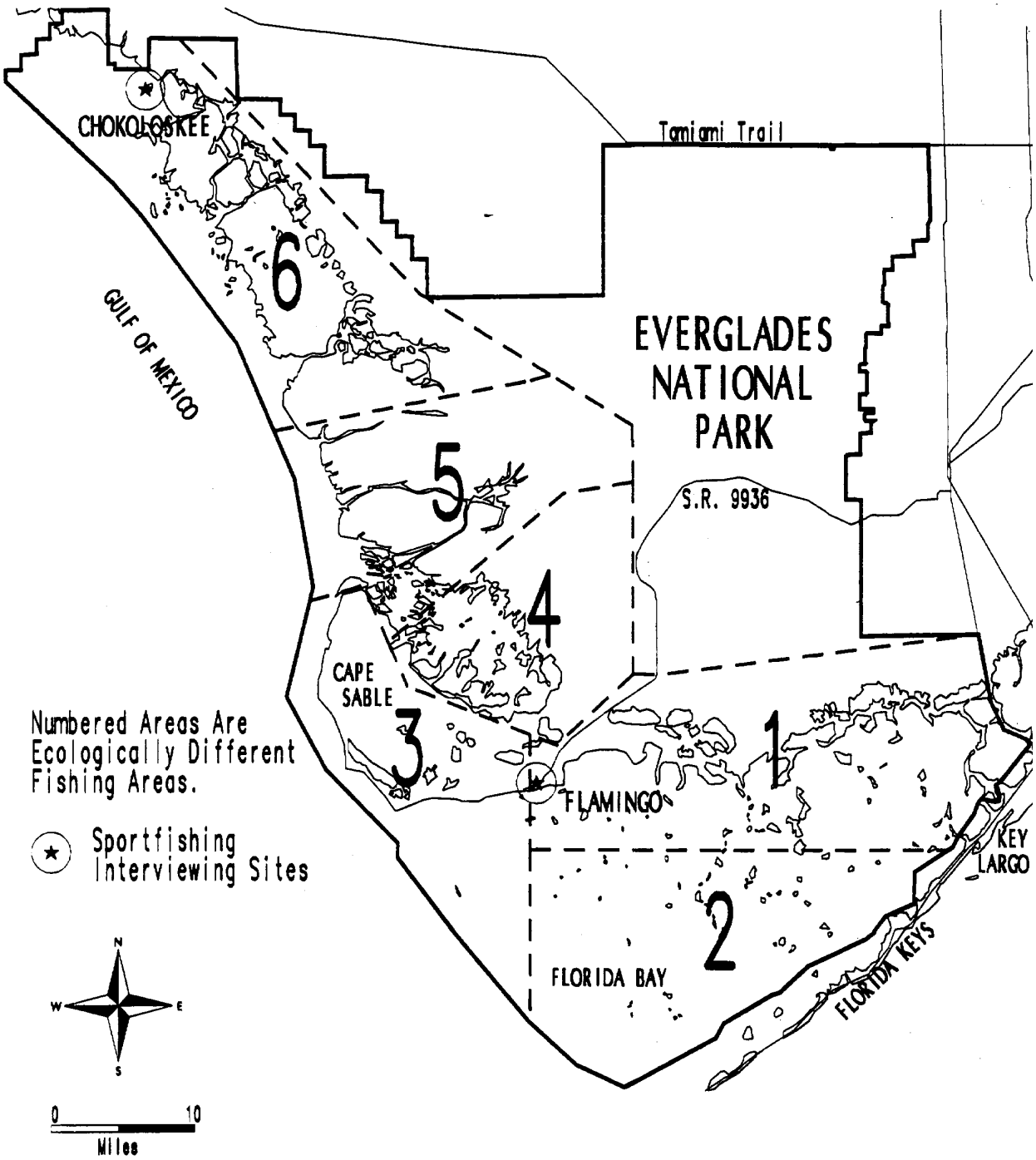
Table 3. Total estimated catch and harvest by recreational anglers from Everglades National Park, 2001.

Non-Guide Anglers						
Species	**Florida Bay**		**Everglades City**		**Florida Bay & Everglades City**	
	Catch	**Harvest**	**Catch**	**Harvest**	**Catch**	**Harvest**
Snook	25,887	2,791	39,706	2,831	65,593	5,622
Red Drum	43,656	7,868	14,246	4,003	57,902	11,871
Spotted Seatrout	162,801	30,609	48,871	13,499	211,672	44,108
Gray Snapper	70,964	20,330	25,174	5,197	96,138	25,527
Tarpon	2,305	0	1,071	0	3,376	0
Black Drum	7,684	4,181	195	75	7,879	4,256
Sheepshead	11,542	4,434	3,953	1,119	15,495	5,553
Spanish Mackerel	4,053	2,526	2,987	1,650	7,040	4,176
Grouper	2,668	291	1,303	59	3,971	350
Ladyfish	74,068	373	44,176	1,348	118,244	1,721
Crevalle Jack	97,724	1,799	43,685	439	141,409	2,238
Other species	109,058	4,623	51,342	5,197	160,400	9,820
Total	612,410	79,825	276,709	35,417	889,119	115,242

Guide Anglers						
Species	**Florida Bay**		**Everglades City**		**Florida Bay & Everglades City**	
	Catch	**Harvest**	**Catch**	**Harvest**	**Catch**	**Harvest**
Snook	10,446	1,303	21,951	1,955	32,404	3,211
Red Drum	16,131	2,039	10,154	2,049	26,285	4,088
Spotted Seatrout	65,994	8,894	22,090	7,203	88,114	16,098
Gray Snapper	17,543	5,601	3,220	1,214	20,762	6,815
Tarpon	1,945	0	719	0	2,674	0
Bonefish	713	0	0	0	713	0
Other Species	41,931	4,898	13,267	2,219	55,324	7,125
Total	154,702	22,735	71,400	14,640	226,277	37,386

Fig. 1:

ECOLOGICALLY DIFFERENT FISHING AREAS EVERGLADES NATIONAL PARK



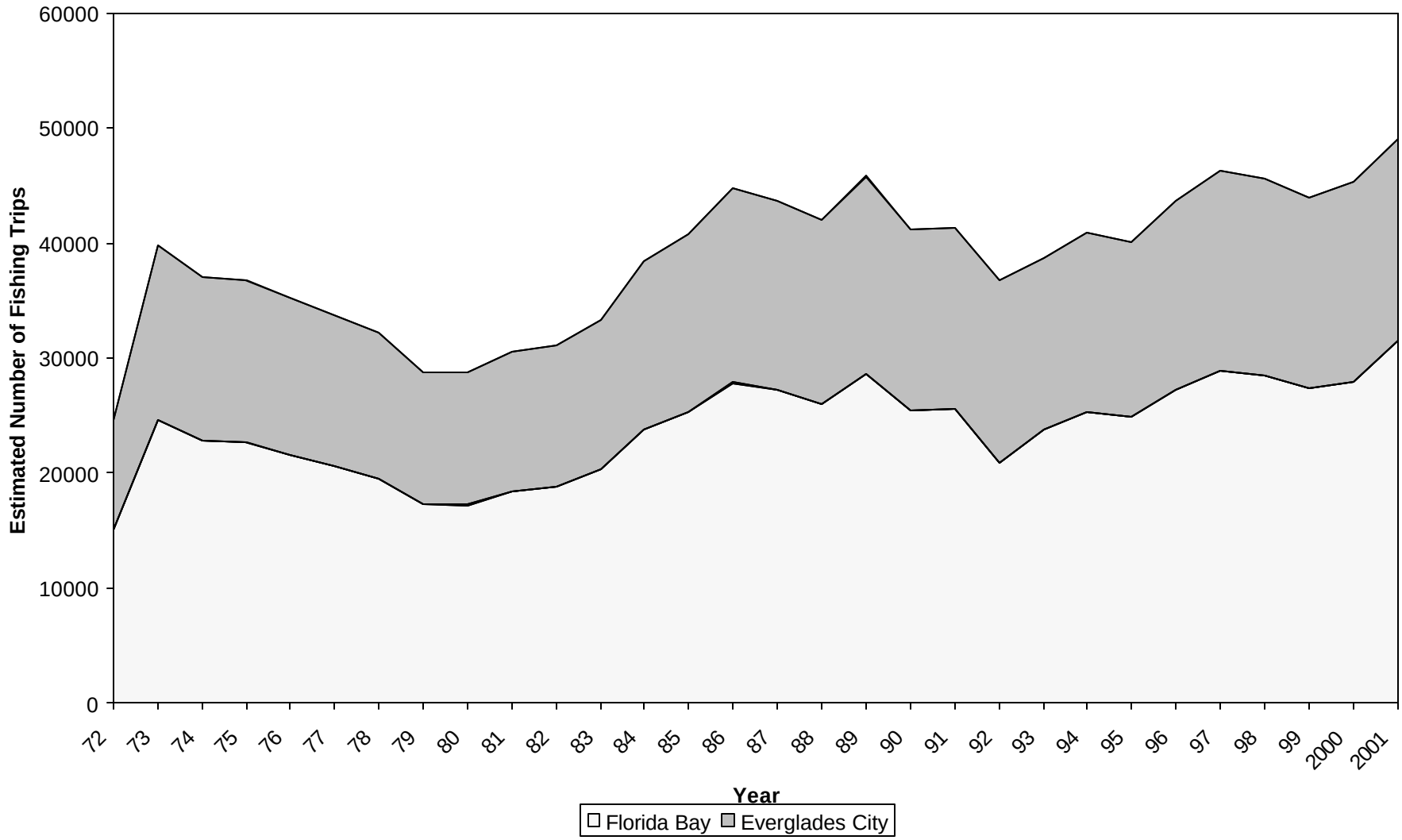


Figure 2. Estimated number of non-guided fishing trips within Everglades National Park, 1972-2001.

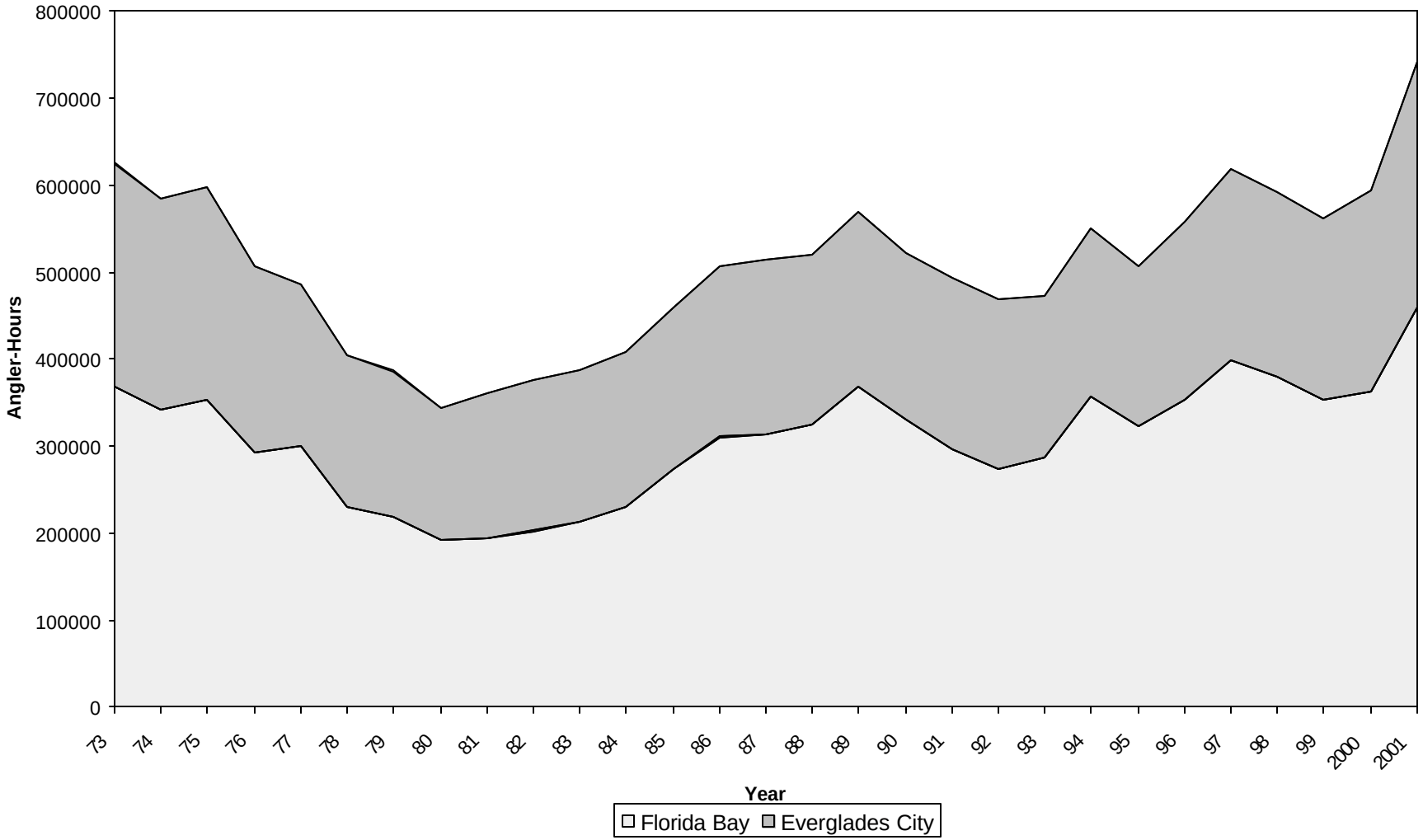


Figure 3. Estimated total effort (angler-hours) of non-guided fishermen within Everglades National Park, 1973-2001.

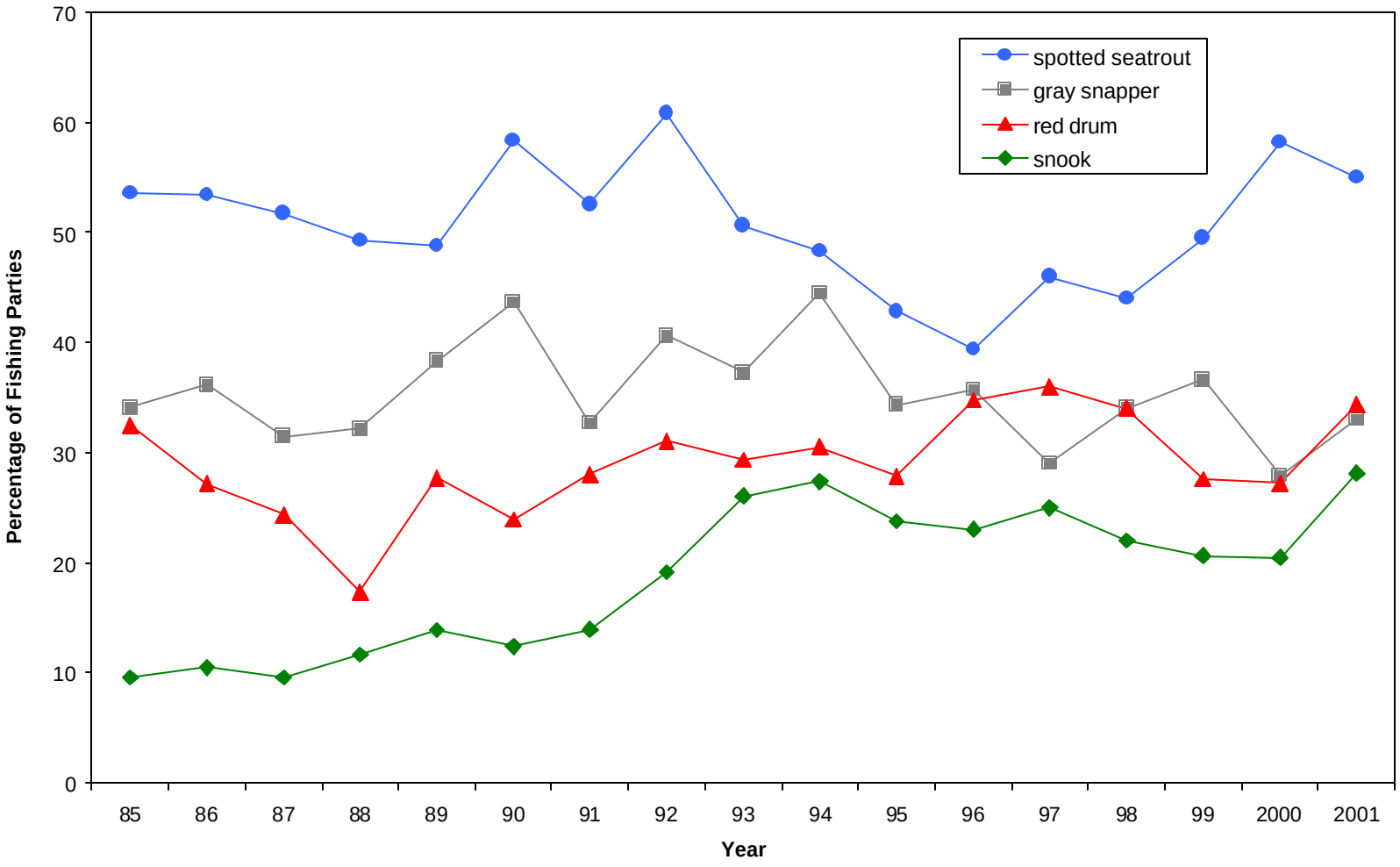


Figure 4. Percentage of fishing parties interviewed at Flamingo (Areas 1 to 5) catching spotted seatrout, gray snapper, red drum, and snook from 1985-2001.

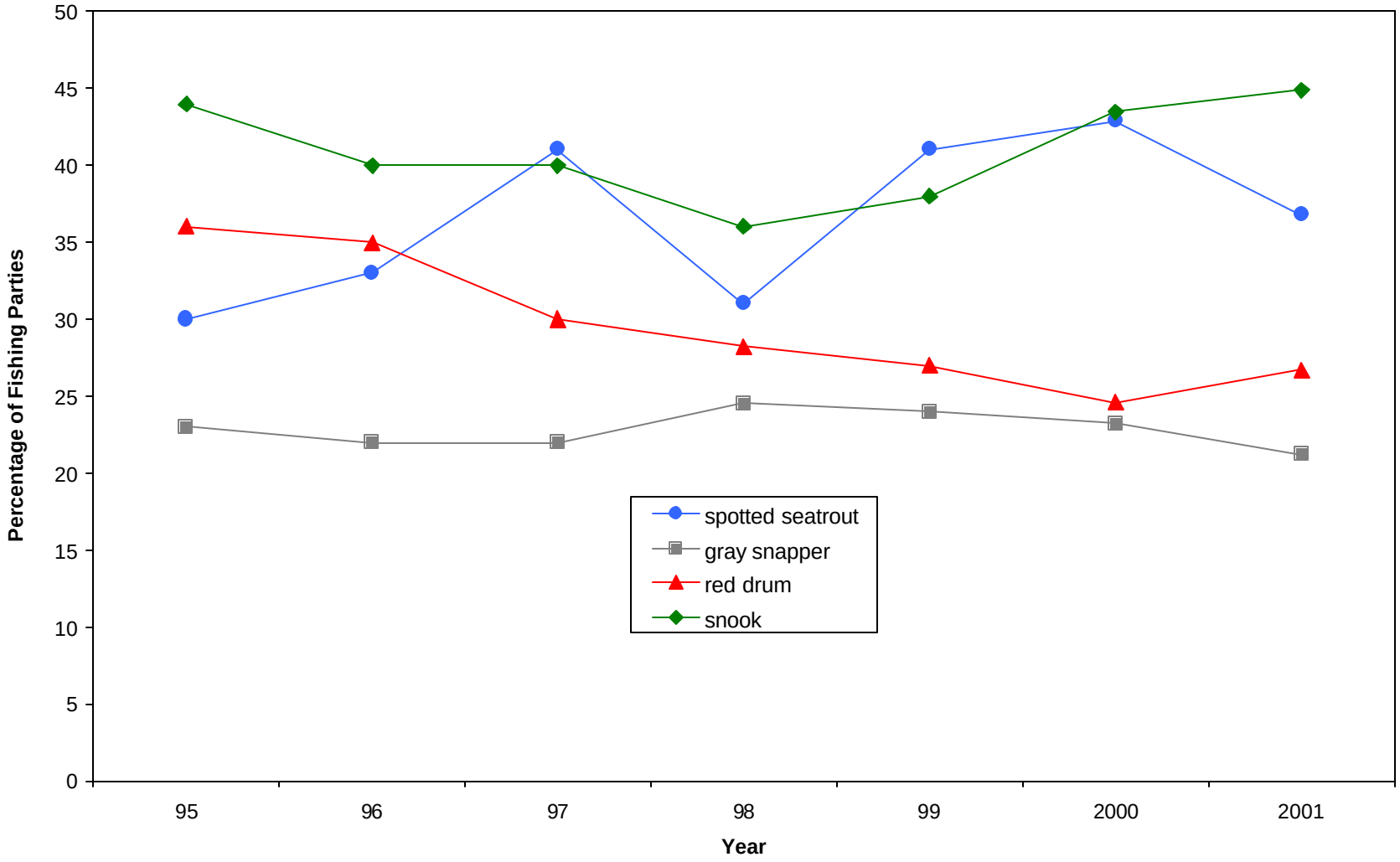
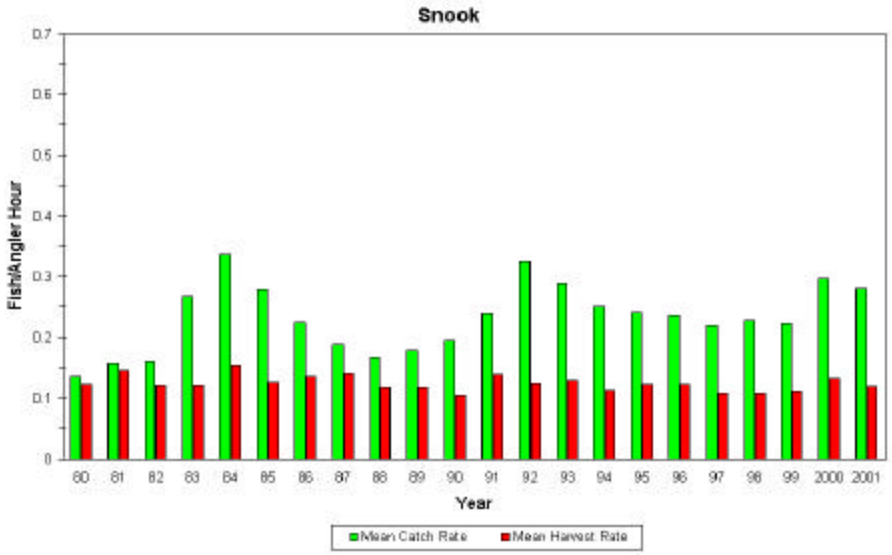
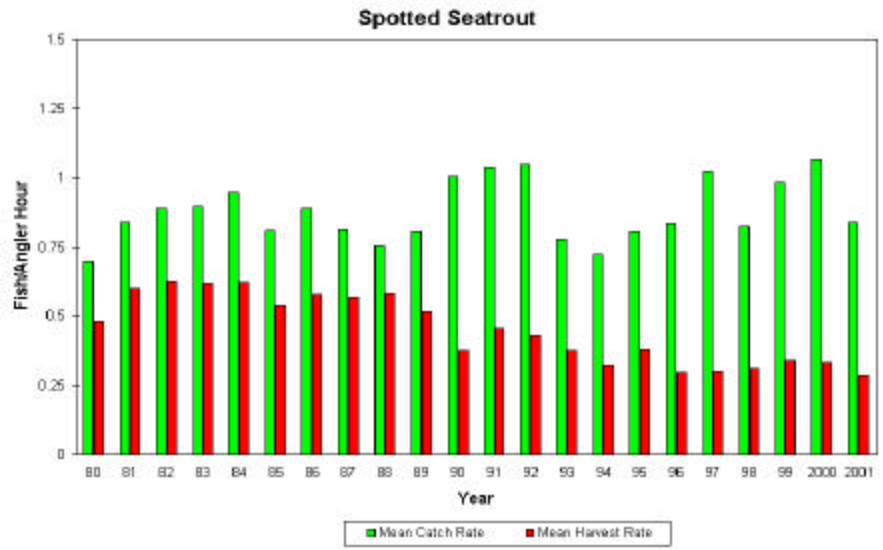
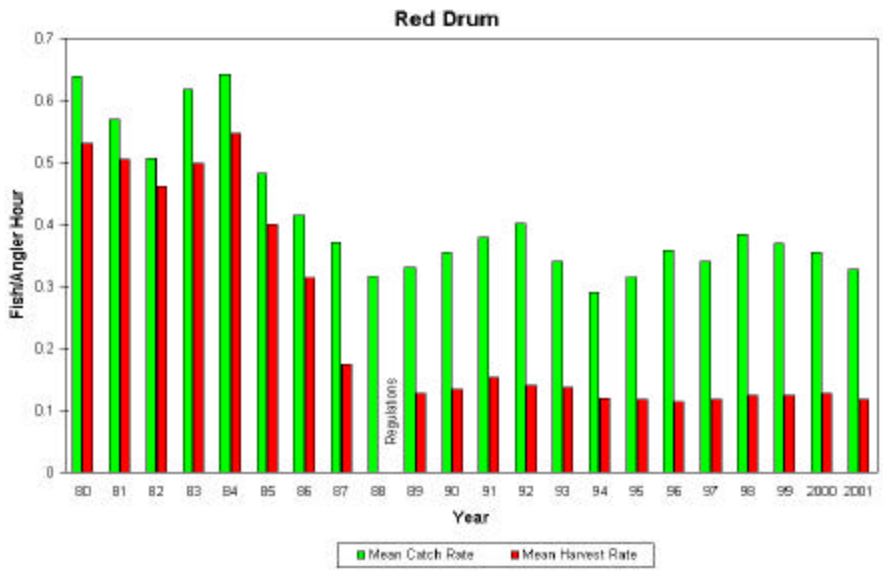


Figure 4a. Percentage of fishing parties interviewed at Everglades City (Area 6) catching spotted seatrout, gray snapper, red drum, and snook from 1995-2001.







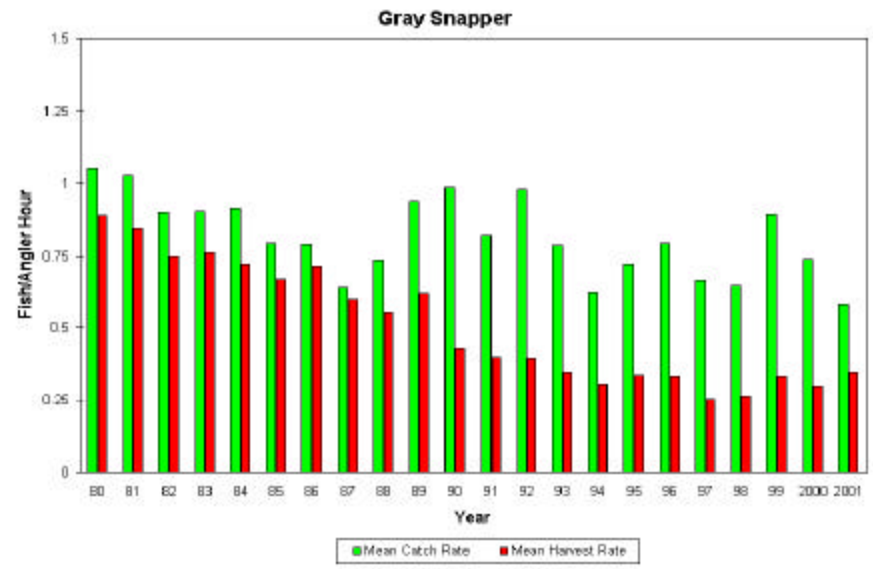


Figure 5. Recreational non-guided (sport) catch and harvest rates for the four major species of gamefish in Florida Bay, Everglades National Park (Areas 1-5), 1980-2001.

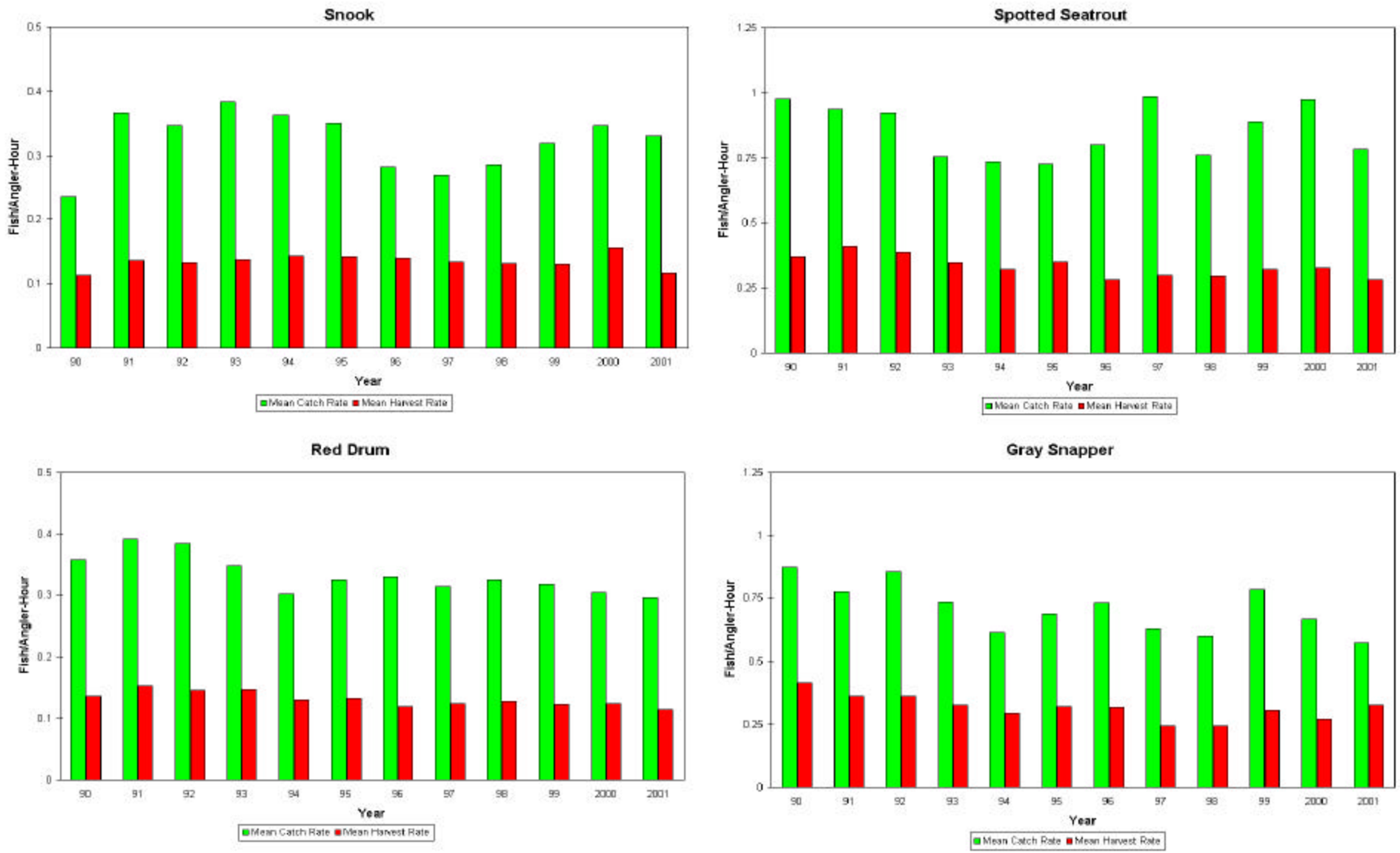


Figure 6. Recreational non-guided (sport) catch and harvest rates for the four major species of gamefish in Everglades National Park (Areas 1-6), 1990-2001.

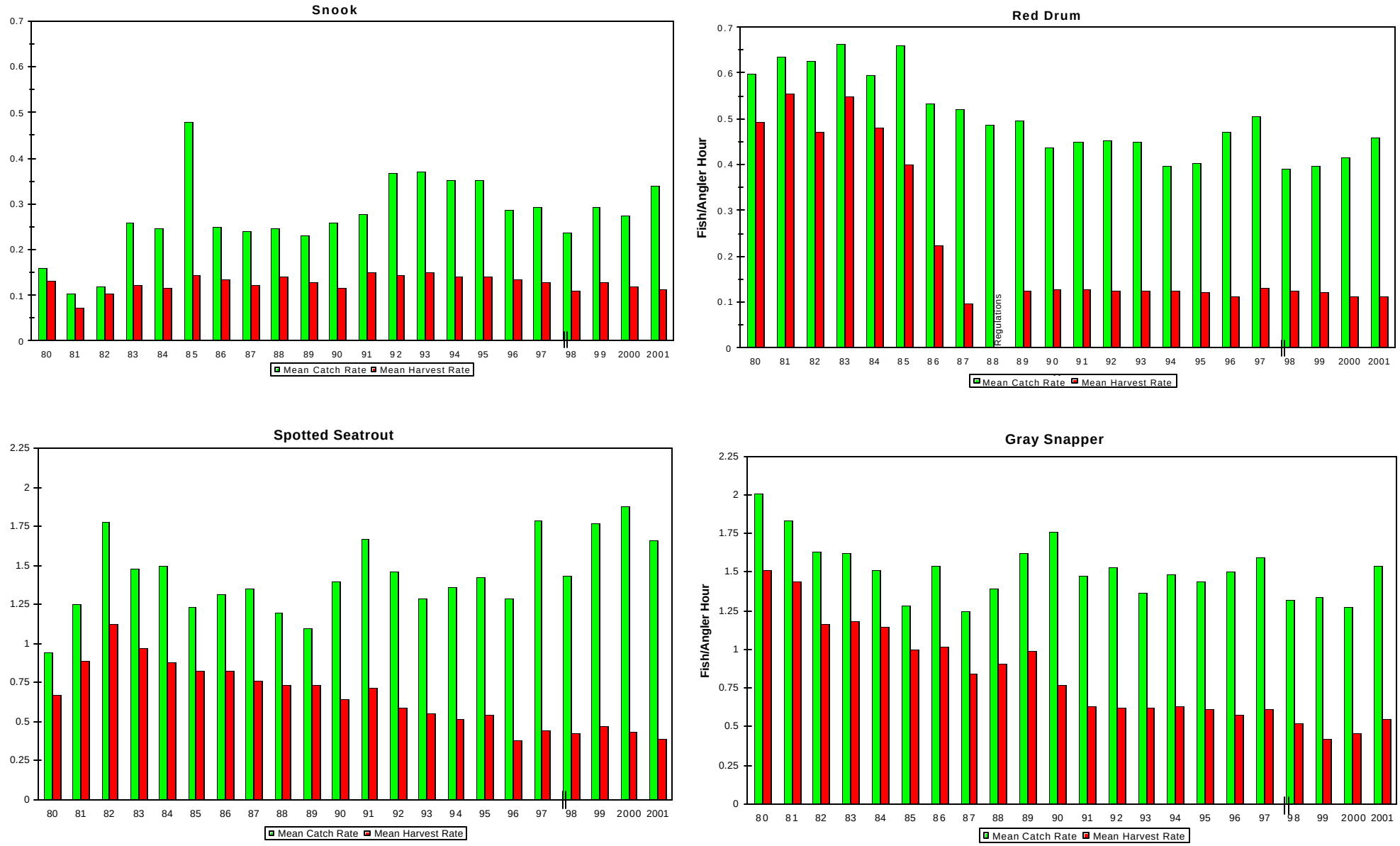


Figure 7. Recreational guide catch/harvest rates for the four major gamefish species in Florida Bay (Areas 1-5), 1980-2001.

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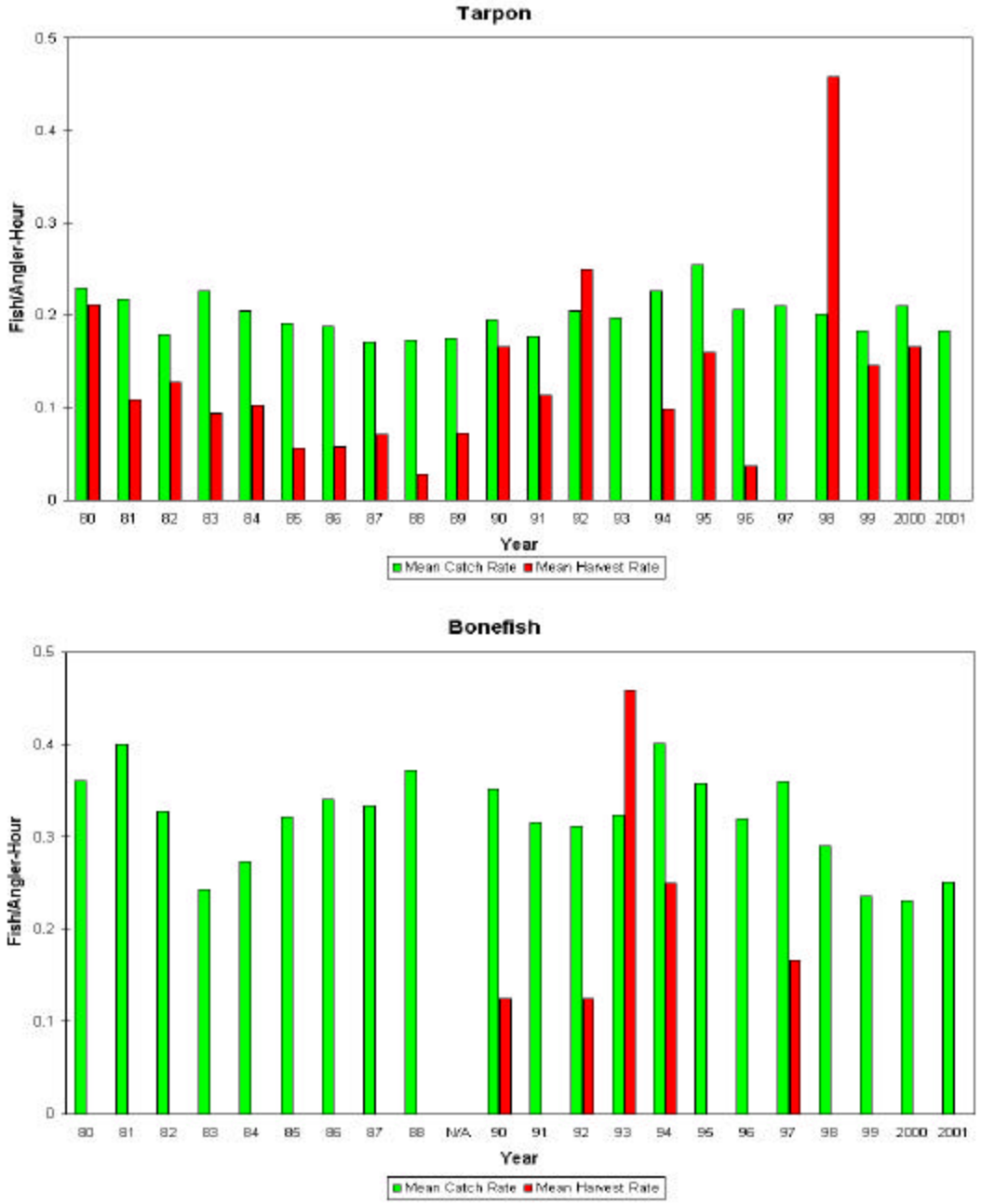


Figure 8. Recreational guide catch and harvest rates for tarpon and bonefish in Florida Bay (Areas 1-5) 1980-2001.

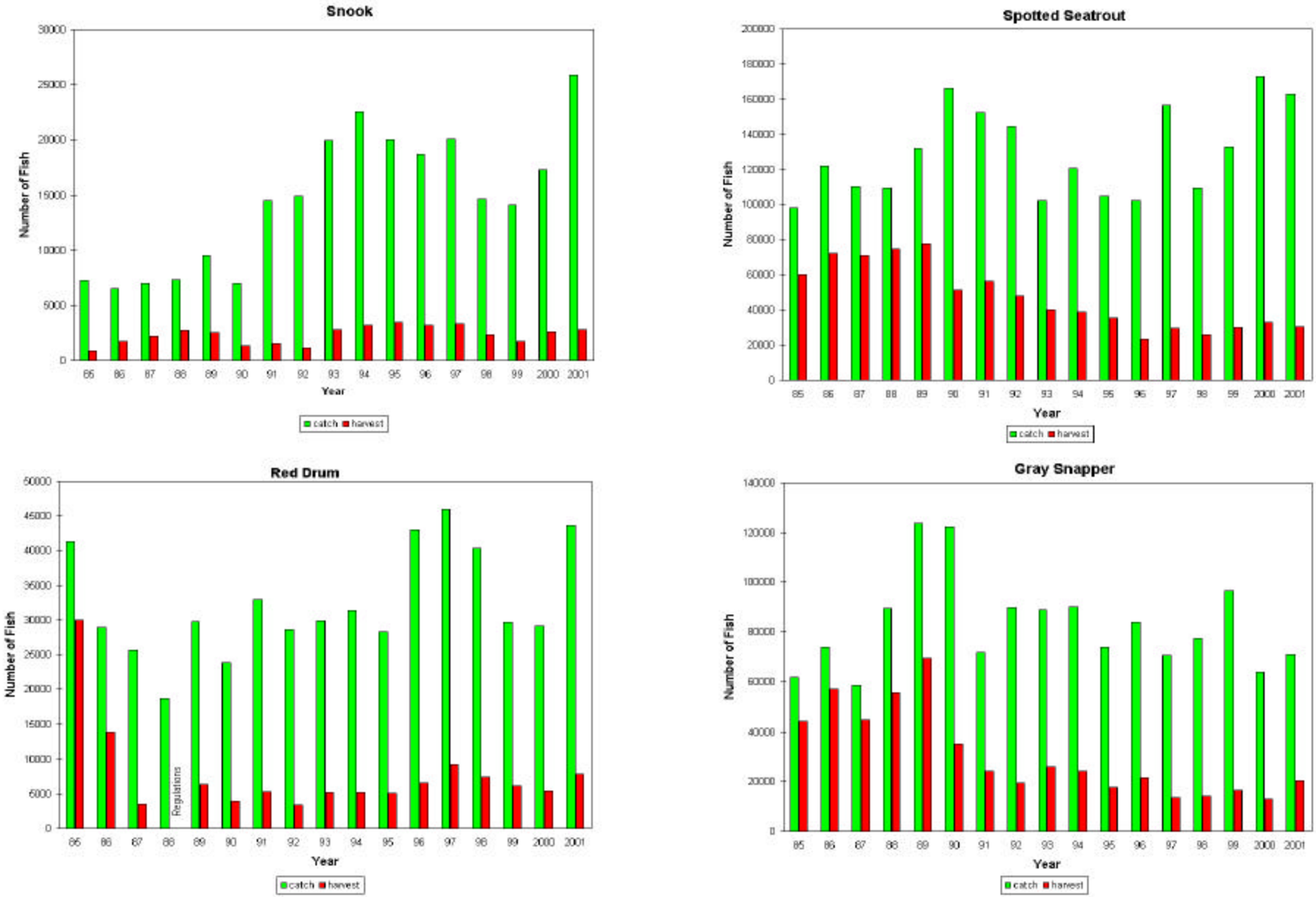
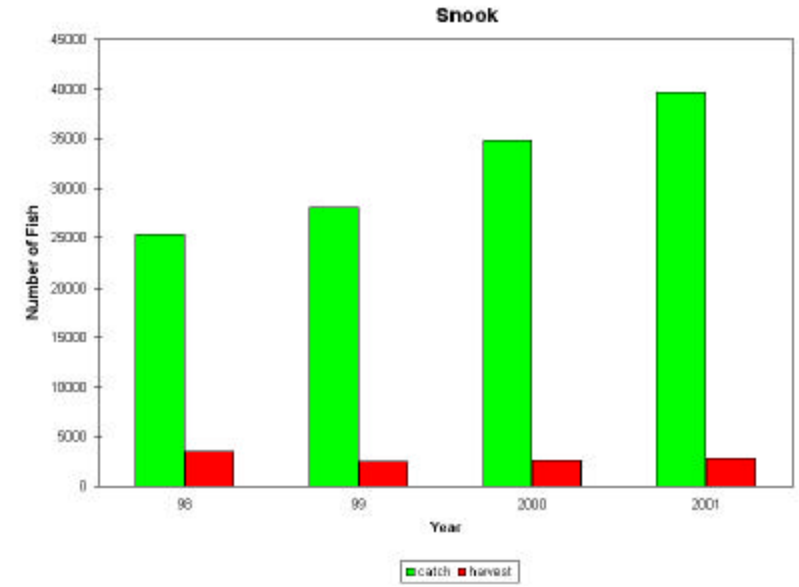
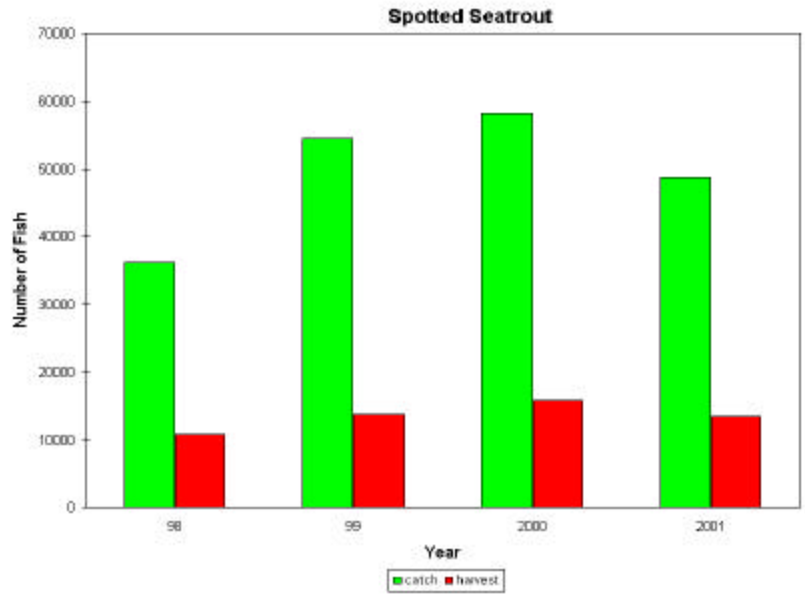
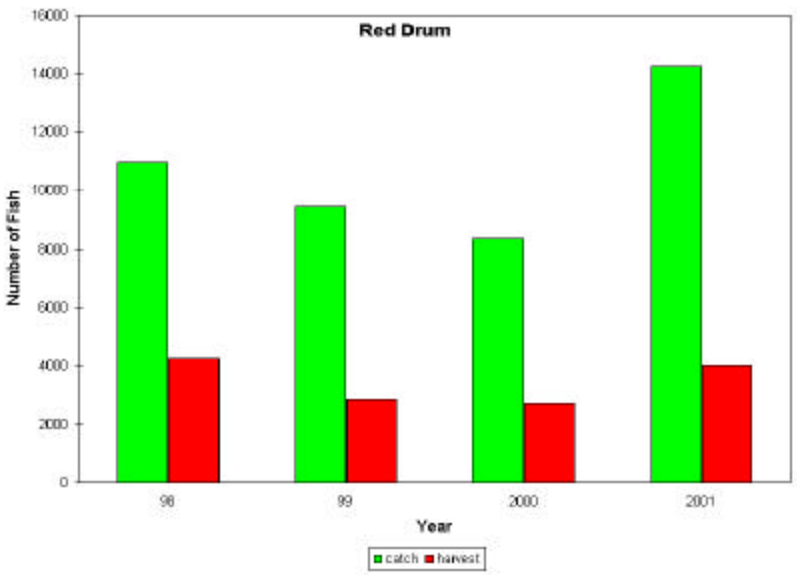


Figure 9. Estimated total catch and harvest for the four major species of gamefish by non-guided (sport) anglers in Florida Bay (Areas 1-5), 1985-2001.







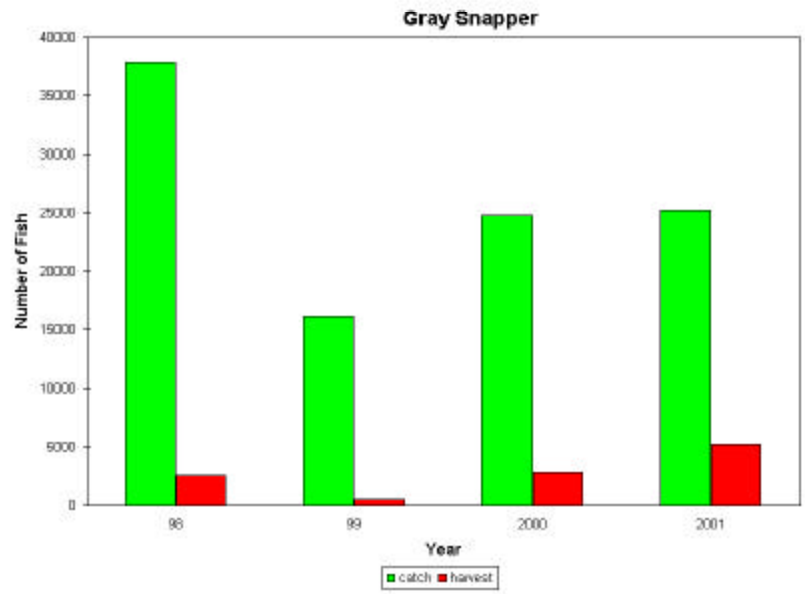


Figure 9a. Estimated total catch and harvest for the four major species of gamefish by non-guided (sport) anglers in Everglades City (Area 6), 1998-2001.

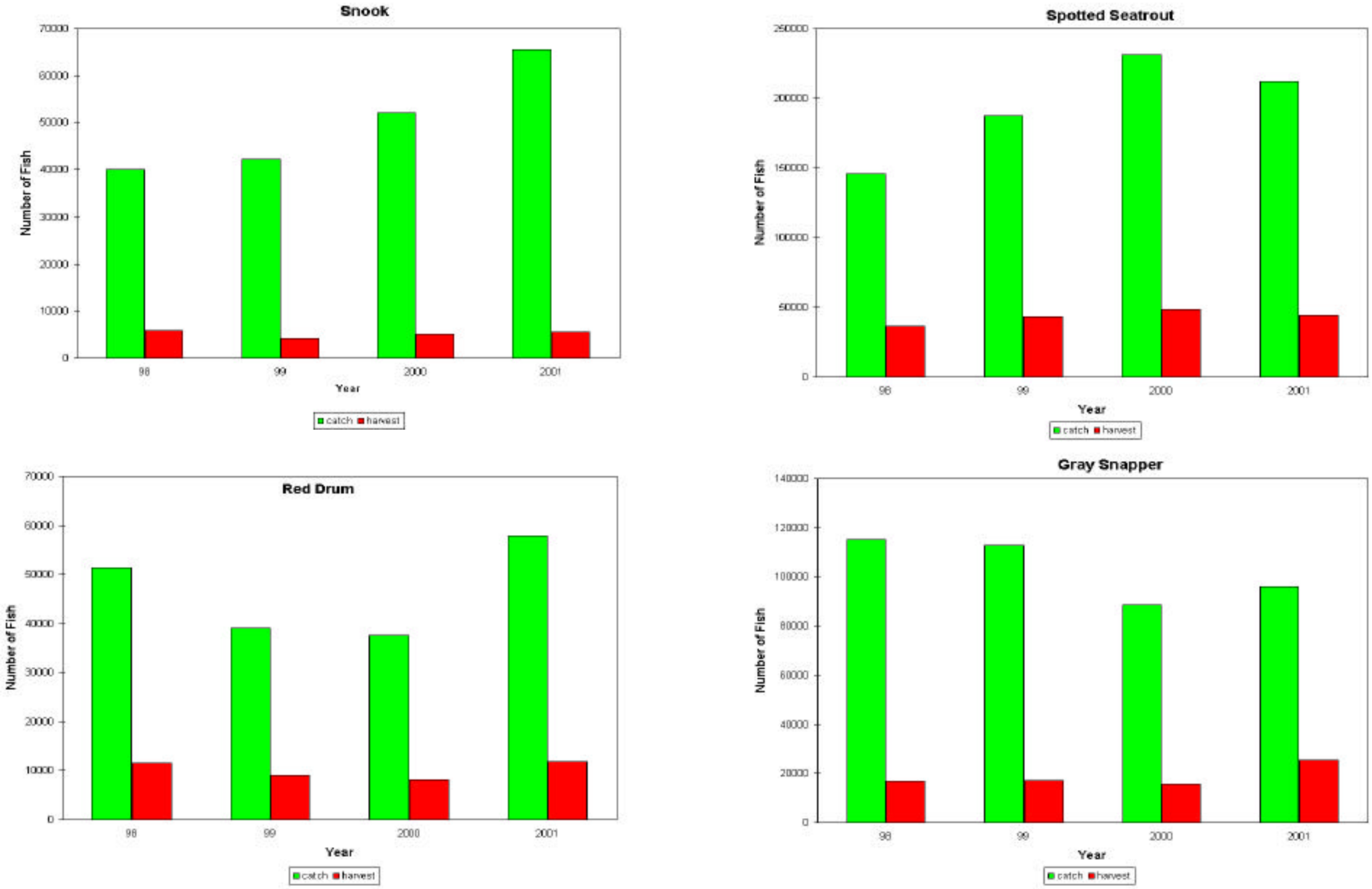


Figure 9b. Estimated total catch and harvest for the four major species of gamefish by non-guided (sport) anglers in Florida Bay and Everglades City (Areas 1-6), 1998-2001.

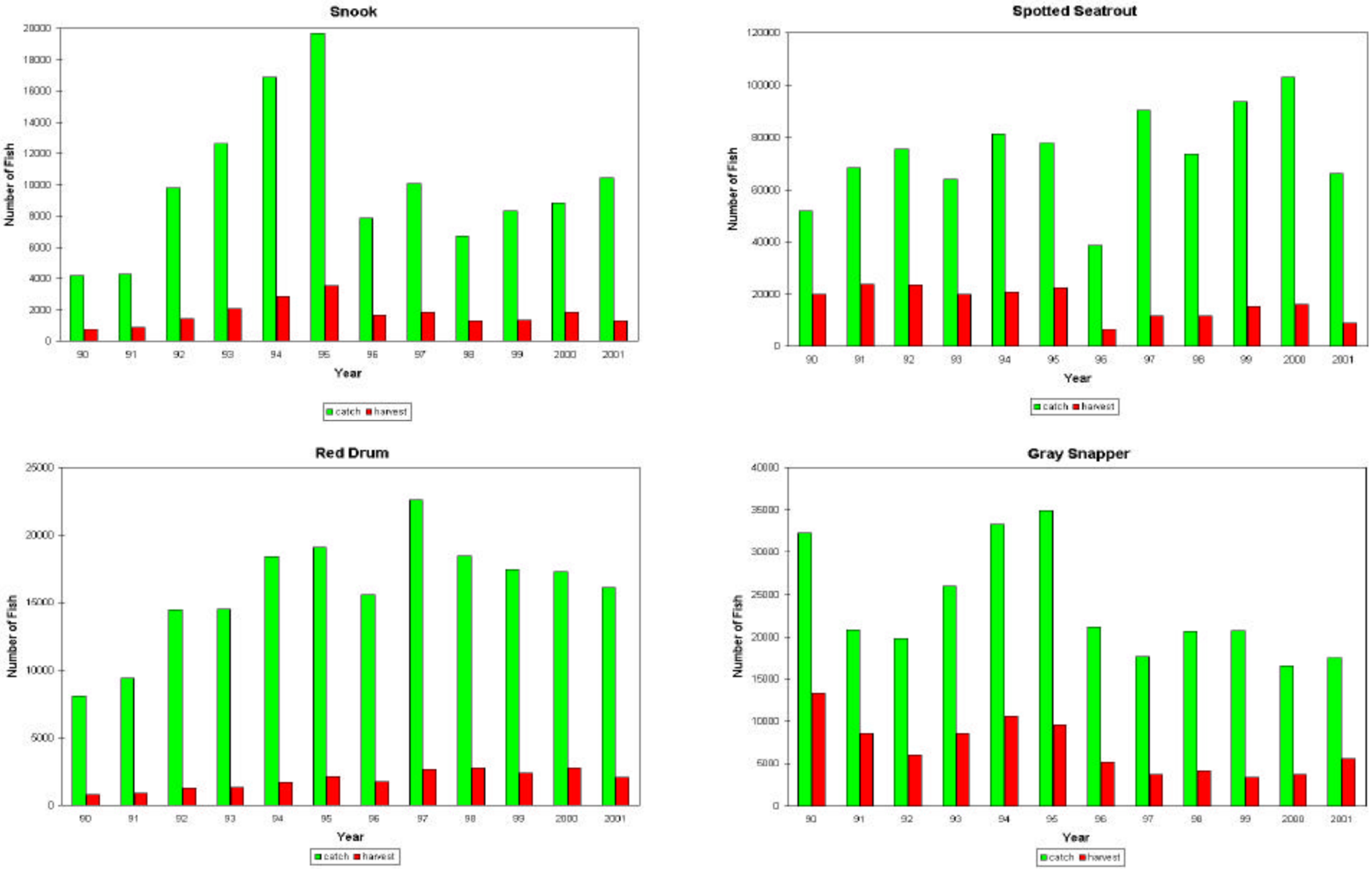


Figure 10. Estimated total catch and harvest of the four major species of gamefish by guided anglers in Florida Bay (Areas 1-5), 1990-2001.

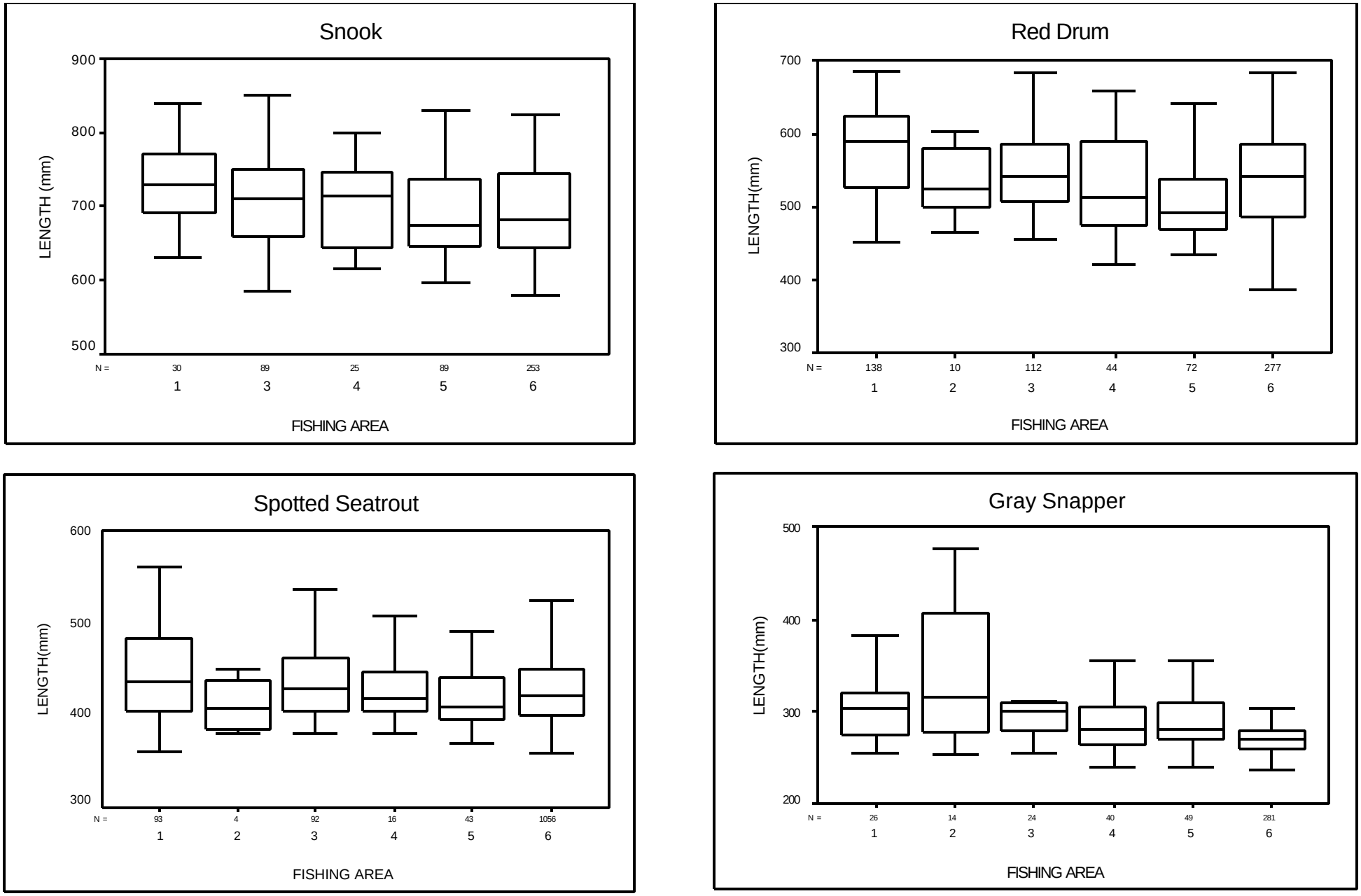


Figure 11. The lengths of the four major species of fish caught by recreational (non-guided) anglers in the six ecologically distinct fishing areas within Everglades National Park during 2001. The "box" represents the interquartile range; the horizontal line in the "box" represents the median; N represents the number of fish measured in each area.

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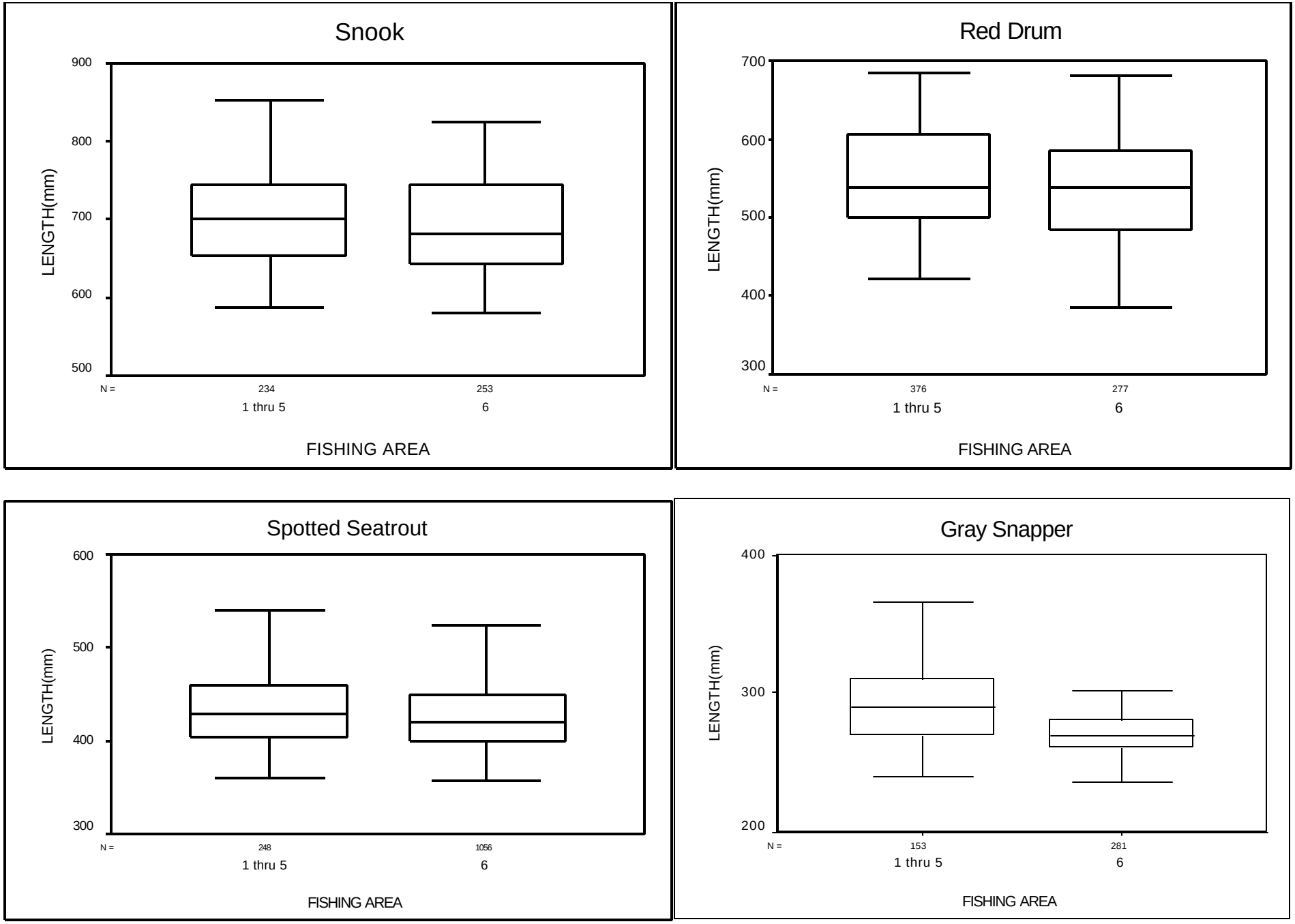


Figure 12. The lengths of the four major species of fish caught by recreational (non-guided) anglers in Florida Bay (Areas 1-5) and Everglades City (Area 6) within Everglades National Park during 2001. The "box" represents the interquartile range; the horizontal line in the "box" represents the median; N represents the number of fish measured in each area.

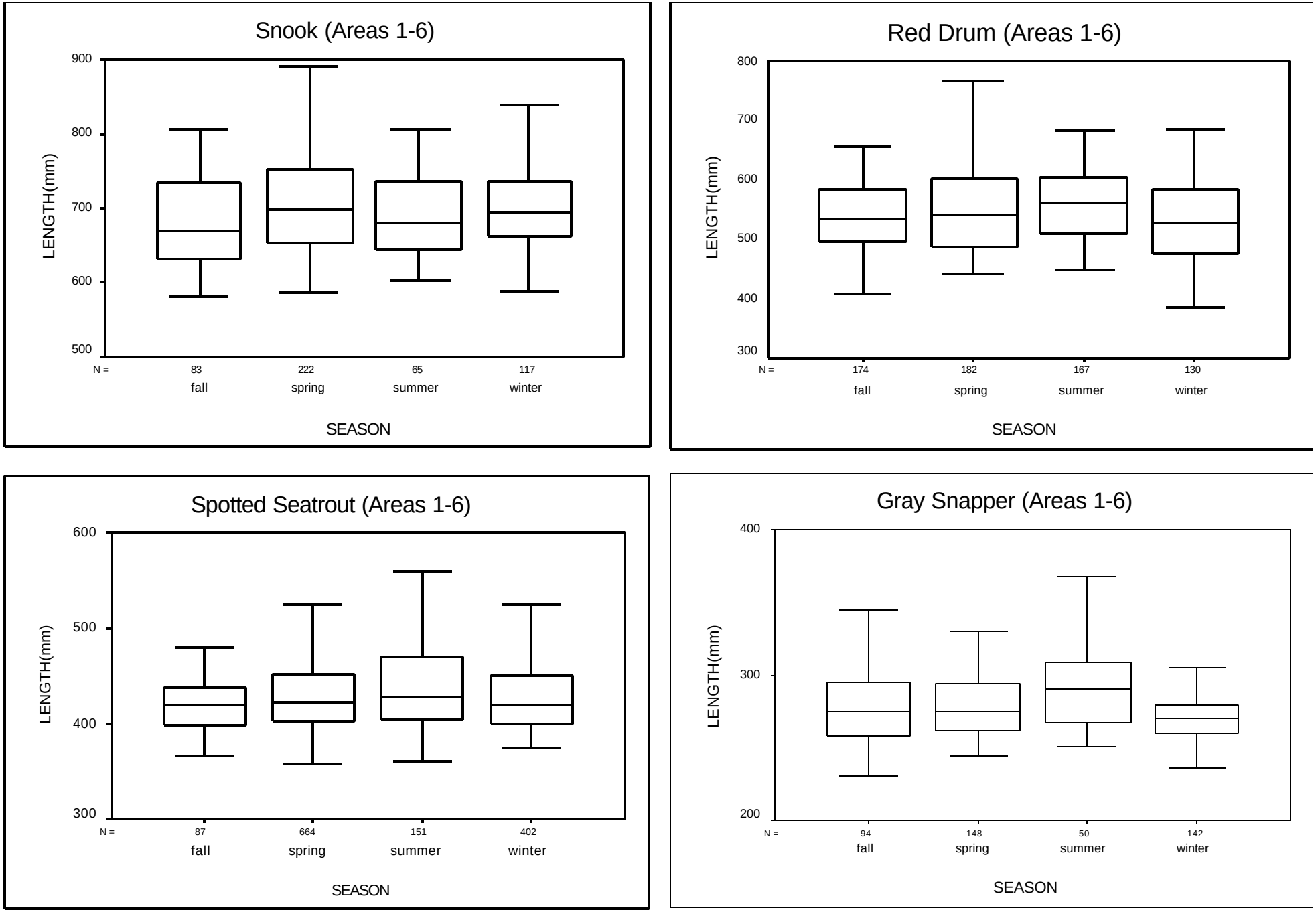


Figure 13. The lengths of the four major species of fish caught by recreational (non-guided) anglers in Everglades National Park during the fall, spring, summer, and winter of 2001. The "box" represents the interquartile range; the horizontal line in the "box" represents the median; N represents the number of fish measured in each area.

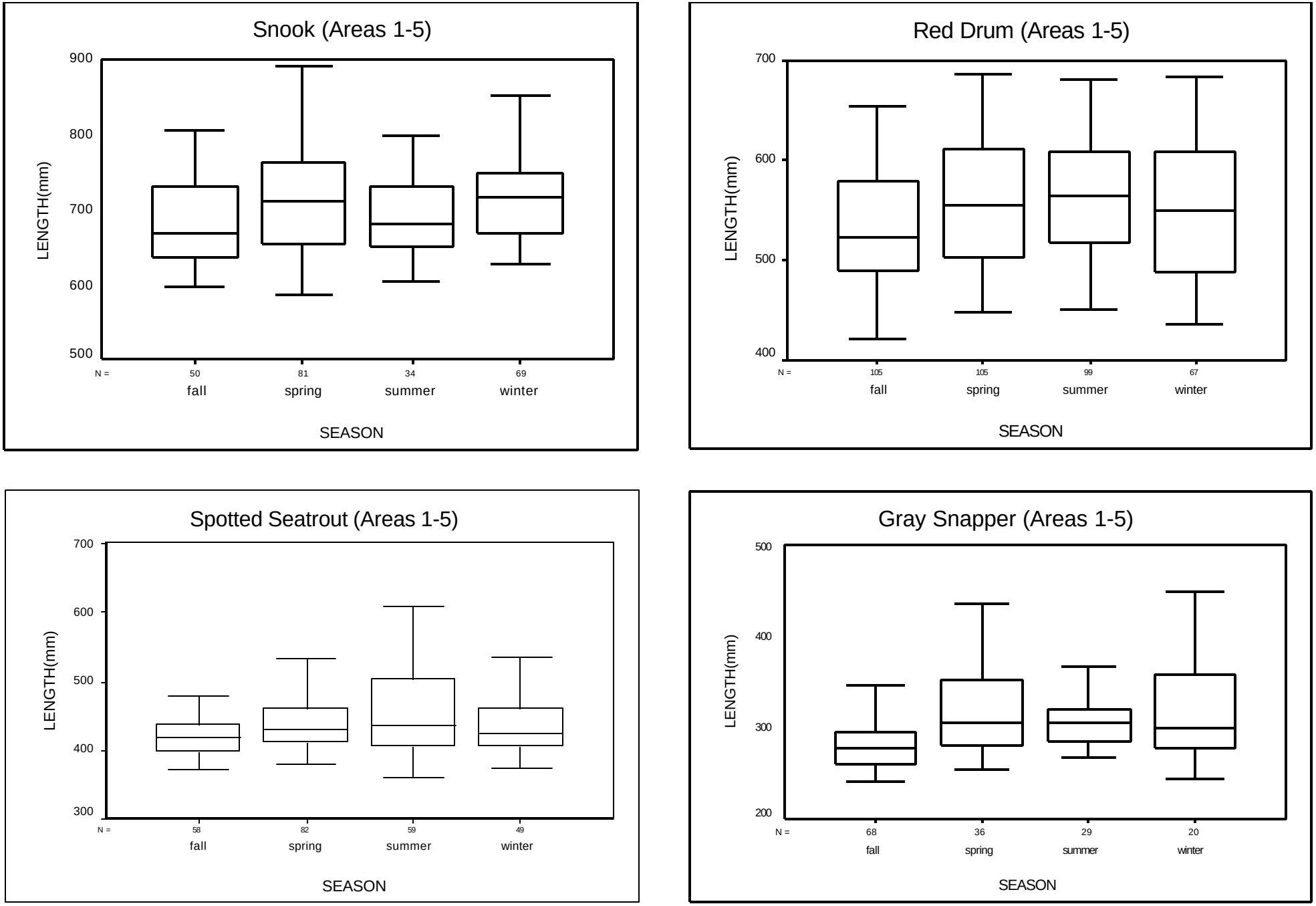
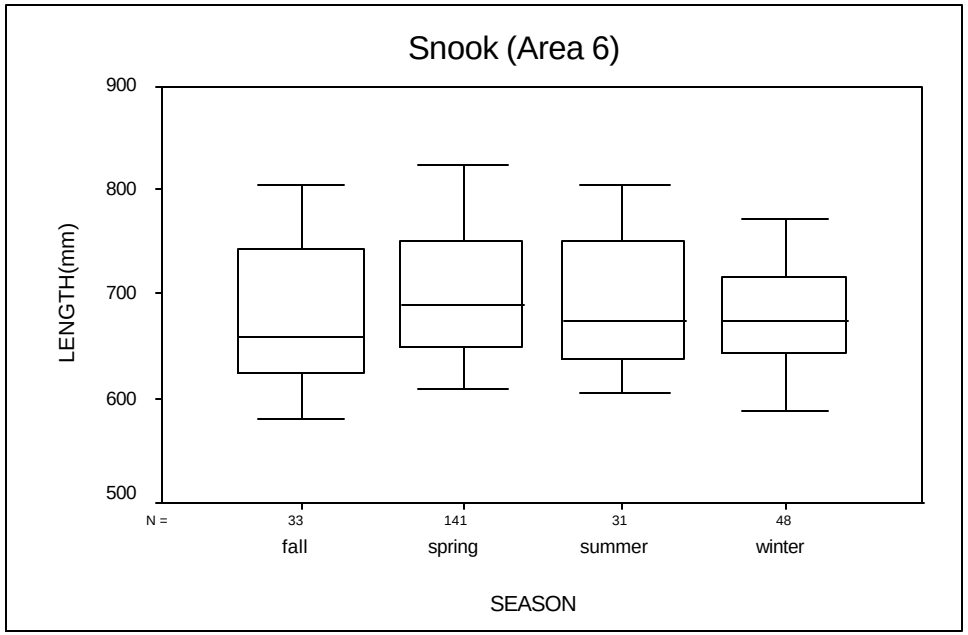
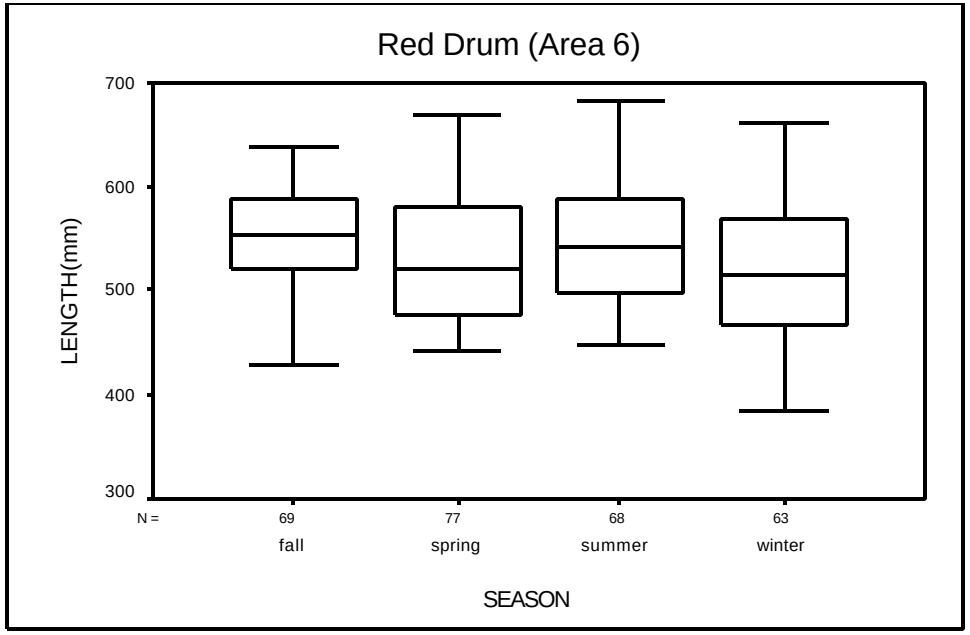
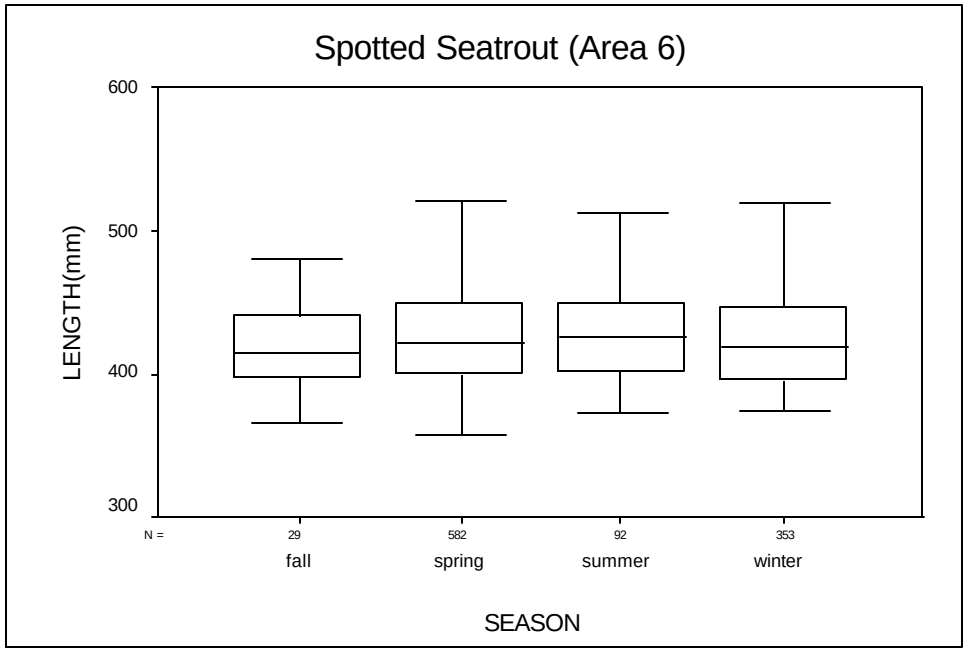


Figure 14. The lengths of the four major species of fish caught by recreational (non-guided) anglers in Florida Bay (Areas 1-5) during the fall, spring, summer, and winter of 2001. The "box" represents the interquartile range; the horizontal line in the "box" represents the median; N represents the number of fish measured in each area.







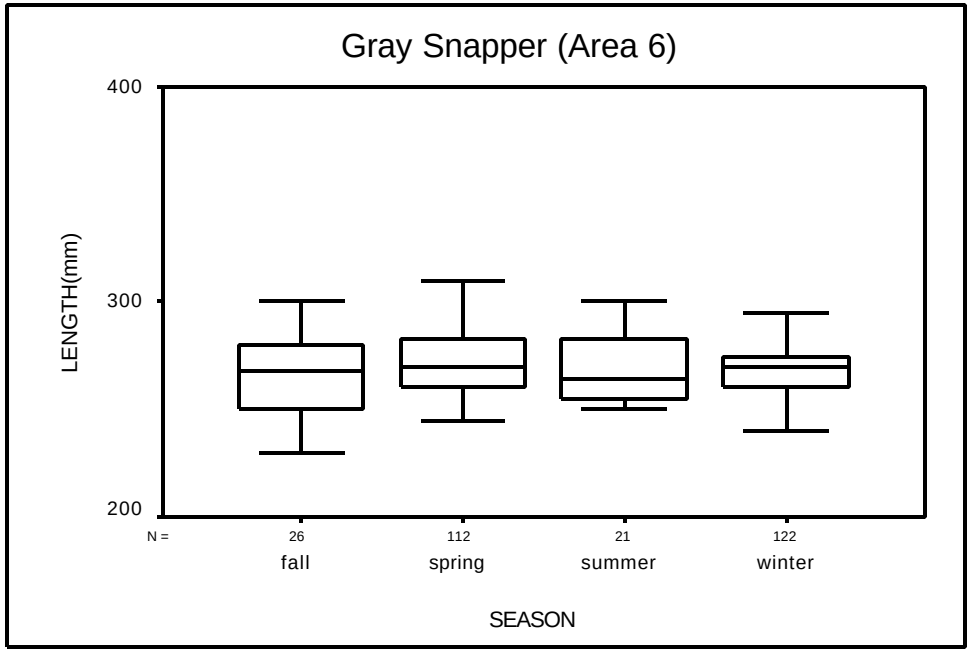


Figure 15. The lengths of the four major species of fish caught by recreational (non-guided) anglers in Everglades City (Area 6) during the fall, spring, summer, and winter of 2001. The "box" represents the interquartile range; the horizontal line in the "box" represents the median; N represents the number of fish measured in each area.

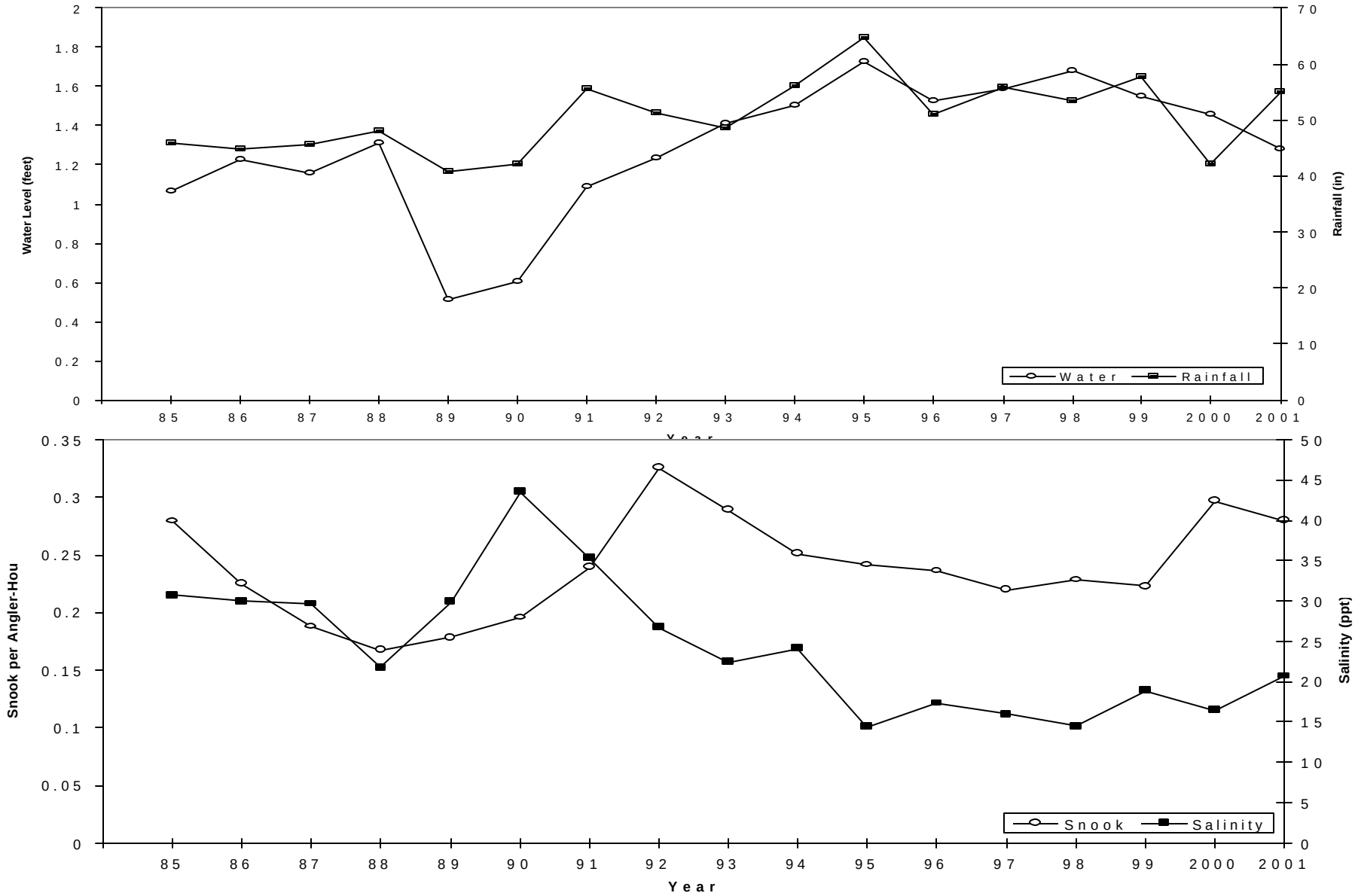


Figure 16. Average rainfall recorded at 5 stations in or near ENP, average water level at P-37 in Taylor Slough, average salinity at 3 stations in northern Florida Bay, and non-guide catch rates of Snook in Florida Bay (Areas 1-5) from 1985 to 2001.

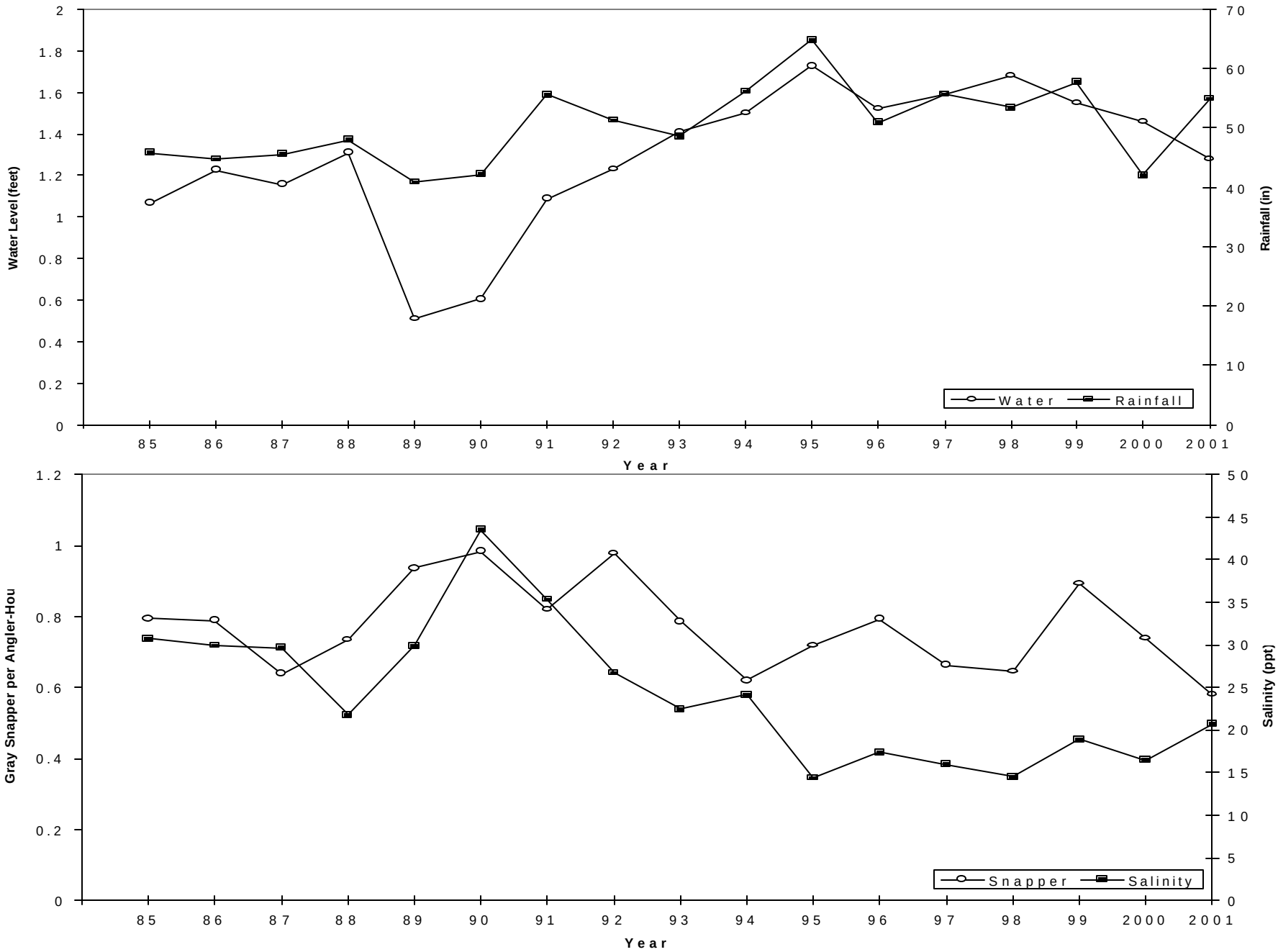


Figure 17. Average rainfall recorded at 5 stations in or near ENP, average water level at P-37 in Taylor Slough, average salinity at 3 stations in northern Florida Bay, and non-guide catch rates of Snapper in Florida Bay (Areas 1-5) from 1985 to 2001.

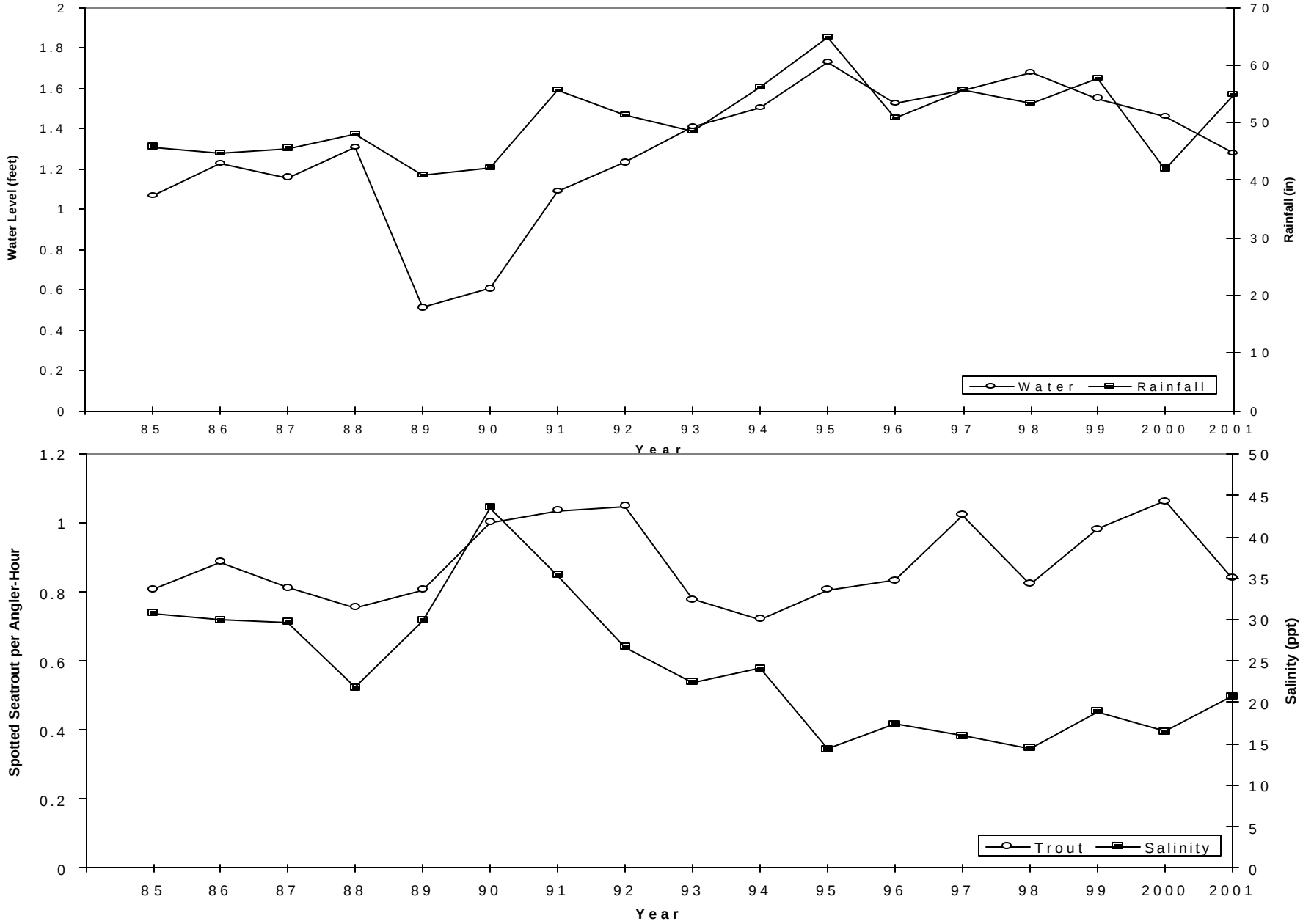


Figure 18. Average rainfall recorded at 5 stations in or near ENP, average water level at P-37 in Taylor Slough, average salinity at 3 stations in northern Florida Bay, and non-guide catch rates of Trout in Florida Bay (Areas 1-5) from 1985 to 2001.

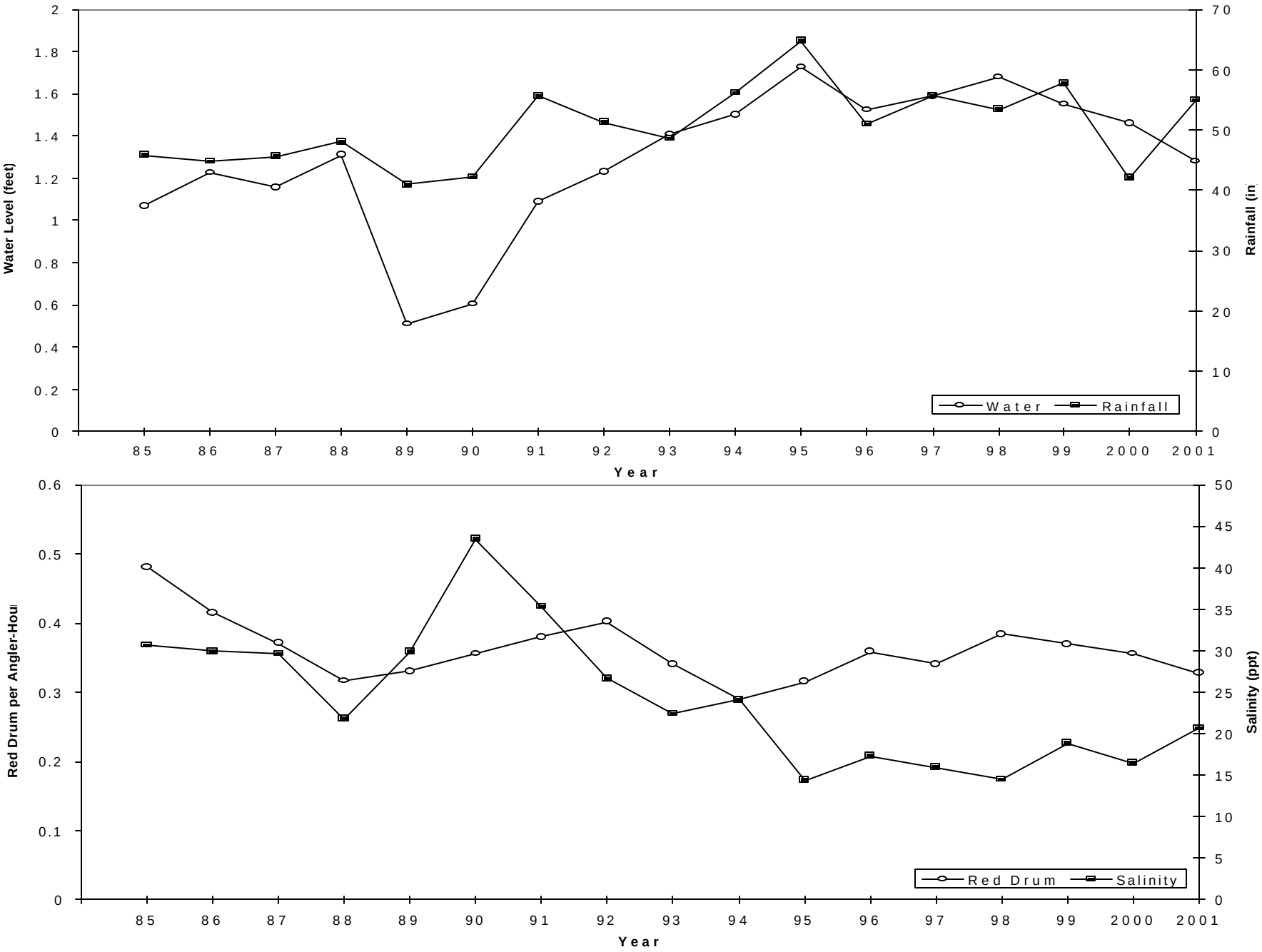


Figure 19. Average rainfall recorded at 5 stations in or near ENP, average water level at P-37 in Taylor Slough, average salinity at 3 stations in northern Florida Bay, and non-guide catch rates of Red Drum in Florida Bay (Areas 1-5) from 1985 to 2001.

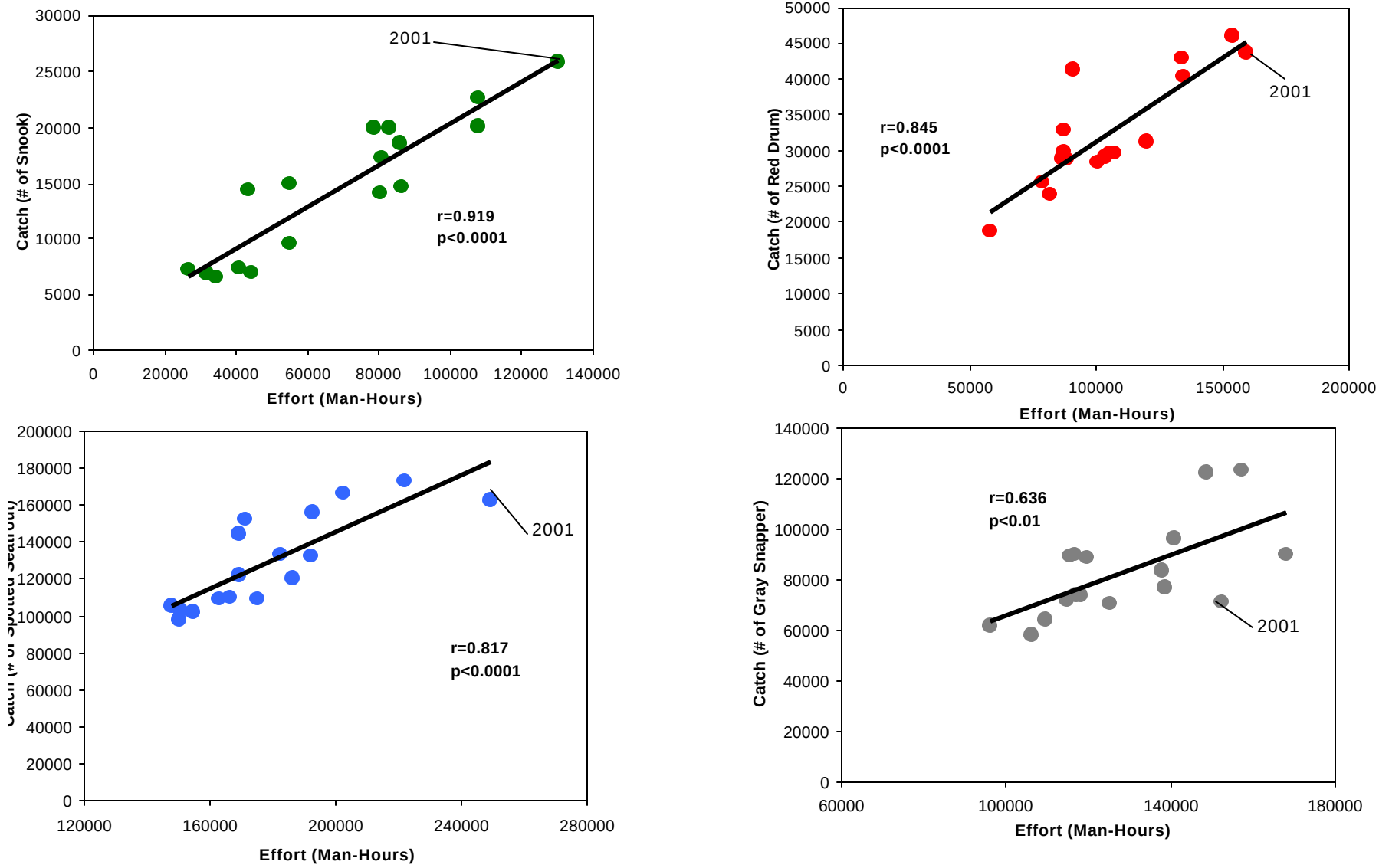


Figure 20. Correlation of total estimated catch and total estimated effort of non-guided (sport) anglers for snook, red drum, spotted seatrout, and gray snapper in Florida Bay (Areas 1-5), 1985-2001.

---End of Report---