

F-8. U.S. Virgin Islands Recreational Fishery Assessment Project:
Study 1. Activity Patterns in U.S. Virgin Islands recreational fisheries.
Job 3. Survey of Fishing Tournaments

**Survey of Fishing Tournaments in the U.S. Virgin Islands,
October 1, 2000 to September 30, 2005**

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SUMMARY

The Division of Fish and Wildlife conducted a recreational fisheries assessment project in the US Virgin Islands (USVI) during the 5-year period between October 1, 2000 and September 30, 2005. Studies included 1) a telephone survey of boat-based angling, 2) interviews and logbook records of recreational fishers, 3) intercept surveys of shoreline recreational fishers, 4) a survey of recreational fishers to determine impacts of national monument expansion on St. Croix, 5) collection of pertinent bibliographic materials, and 6) sampling from sportfishing tournaments. Results from studies 1-4 are presented elsewhere. This report summarizes information collected from organized USVI sportfishing tournaments. A bibliography of relevant literature is also appended.

Five types of USVI sportfishing tournaments were distinguished: shore-based handline, boat-based handline, offshore coastal pelagic, offshore pelagic, and marlin. The numbers and types of fishing tournaments differed between the islands of St. Thomas and St. Croix and results are given separately for each island. Available results from all tournament types are presented. However, sampling effort was focused to offshore pelagic tournaments and these results are emphasized.

On St. Thomas, effort and landings data were collected at 25 offshore pelagic tournaments. A total of 643 fish (3,494.3 kg) and representing 16 species were recorded. Landings were dominated by dolphin (35.5 % by number, 47.5 % by weight), barracuda (22.3 % by number, 13.0 % by weight) and wahoo (15.3 % by number, 22.8 % by weight). Average catch rate at tournaments was 3.1 ± 1.6 kg per boat-hour. A greater number, weight and diversity of coastal pelagics were landed in St. Thomas tournaments than in St. Croix tournaments.

On St. Croix, effort and landings data were collected at 29 offshore pelagic tournaments. In total, 889 fish weighing 7,244.7 kg and representing 9 species were recorded. Landings were dominated by dolphin (52.5 % by number, 48.4 % by weight) and wahoo (43.2 % by number, 48.0 % by weight). Average catch rate at tournaments was 2.2 ± 1.1 kg per boat-hour. Together, dolphin and wahoo contributed more to St. Croix tournament landings (95.7 % by number, 96.4 % by weight) than to St. Thomas tournaments (50.7 % by number, 70.3 % by weight).

Overall, dolphin and wahoo were the two most important species in USVI offshore recreational tournament landings, together accounting for 76.9 % by number and 87.9 % by weight of all fish landed. For this reason, biostatistical data for dolphin and wahoo were evaluated in greater detail. Length-weight relationships for dolphin and wahoo were examined and results are presented. Seasonal (intra-annual) variation was evident in landings on both islands. Significant inter-annual variation was observed for average landing size of dolphin and wahoo. Catch rate and total landings also varied substantially among years for dolphin and wahoo. However, when these results were compared to historic data, no consistent long-term trends in average capture size were observed for either dolphin or wahoo. Limitations of the data are discussed and recommendations are made to improve monitoring of the USVI recreational fishery.

INTRODUCTION

Recreational fishing is of tremendous importance in the United States Virgin Islands (USVI). Fishing is a popular recreational past time for a great many USVI residents (CFMC 1985). Telephone surveys suggest that as much as 10 % of the population participates in recreational fishing (Jennings 1992, ECC 2002, Mateo 2004). In addition, recreational fishing is an important attraction for tourists, providing the resource base for a modest charter boat fishery (Garcia-Molinar et al. 2002). Seasonally, a large number of recreational vessels arrive in St. Thomas from the southeastern U.S., Puerto Rico, and adjacent Caribbean nations to fish for blue marlin (*Makaira nigricans*) or to participate in billfish tournaments for blue marlin (Friedlander 1995).

Different segments within the USVI recreational fishery have been classified according to the method of fishing (Olsen and Wood 1983). The recreational hook and line fishery is often further subdivided, at least to some extent, by the fish species-groups which are sought by anglers. Adams (1996) and Mateo (2000) divided the recreational line fishery into three sectors that they termed the offshore, inshore and reef fish fisheries. These three fisheries sectors target pelagic, coastal pelagic, and demersal fish species-groups, respectively.

Anglers in the offshore recreational fishery sector pursue open-water or pelagic species. Among these fishes, the most popular are billfishes of the family Istiophoridae (see Brandon 1989, Friedlander 1995). Other pelagic species taken by recreational fishers include dolphinfish or “dolphin” (*Coryphaena hippurus*, Coryphaenidae), wahoo (*Acanthocybium solandri*, Scombridae), and various other scombrids such as king mackerel or “kingfish” (*Scomberomorus cavalla*), yellowfin tuna (*Thunnus albacares*), blackfin tuna (*Thunnus atlanticus*), and skipjack tuna (*Katsuwonus pelamis*). Many previous DFW studies emphasized the billfish fishery (e.g. Brandon 1985, Friedlander 1995, Adams 1996). The present study (study period 2000-05) focuses on the importance of non-billfish species to the recreational anglers of the offshore fishery. A forthcoming DFW study will provide an updated assessment of the USVI billfish fishery (K.R. Uwate, pers. com.).

The inshore recreational fishery sector of the USVI targets a fish species-group which is more strongly associated with waters of the insular shelf or shelf margin and less frequently encountered in open pelagic habitat (Adams 1996). Fishes of this species-group are termed coastal pelagics (Olsen and Wood 1983). Although the exact species composition of the group may overlap with pelagics or with reef fishes, and the term is rather inconsistently applied by different authors (e.g. Clavijo et al. 1980, Adams 1996, Mahon 1996), the following fishes have been considered among the most important coastal pelagics landed by USVI inshore recreational fishers: great barracuda or “barracuda” (*Sphyraena barracuda*, Sphyraenidae), cero mackerel (*Scomberomorus regalis*, Scombridae), little tunny or “bonito” (*E. alletteratus*), and numerous jack species (Carangidae) including crevalle jack (*Caranx hippos*), bar jack (*C. ruber*), blue runner (*C. crysos*), and horse-eye jack (*C. latus*).

The third sector of the USVI recreational hook and line fishery targets demersal or bottom-associated fish species. This species-group has been termed “Reef Fish” and it encompasses a

very great deal of taxonomic and ecological diversity. Adams (1996) provided the most comprehensive list to date of reef fish species harvested by USVI recreational fishers on St. Thomas and St. Croix, although he gave no quantitative information. Adams (1996) and Mateo (2000) also provided information on shoreline angler behavior. Recreational anglers report a preference for snappers (Lutjanidae) and groupers (Serranidae) (Jennings 1992, ECC 2002). Fishes from several additional families are also reportedly taken in quantity including grunts (Haemulidae), triggerfishes (Balistidae), squirrelfishes (Holocentridae), and jacks (Carangidae) (Olsen and Wood 1983). Despite previous efforts, however, landing of reef fishes by USVI recreational fishers still remains poorly documented and largely unquantified.

The Division of Fish and Wildlife (DFW), Department of Planning and Natural Resources (DPNR), initiated a Recreational Fisheries Assessment Project in 1983 (Brandon 1989). Four DFW reports (Brandon 1985, Tobias 1991, Adams 1996, Mateo 2000) summarize results from almost two decades of work assessing the USVI recreational fishery. This project is also known as the Recreational Port Sampling Program, or RecPort for short. In this report, we summarize DFW activities conducted under RecPort during the five year period from October 1 of 2000 to September 30 of 2005 for F-8, Study 1 - Activity Patterns in U.S. Virgin Islands recreational fisheries, Job 3 - Survey of Fishing Tournaments

Results obtained from sportfishing tournaments are summarized and discussed. We identify limitations of the study and make recommendations to improve monitoring of the USVI recreational fishery.

MATERIALS AND METHODS

Sampling from Sportfishing Tournaments

Organized sportfishing tournaments represent brief episodes of concentrated fishing activity that occur within narrowly defined time periods. When tournaments are surveyed through direct interviews of vessel captains (or anglers) in conjunction with port-based sampling of landings, they offer a unique opportunity to collect large amounts of uniform and accurate information on recreational catch and effort (e.g. Beardsley 1989, Friedlander and Contillo 1994, Adams 1996). During this granting period, we studied the harvest activities of USVI recreational fishers by sampling from sportfishing tournaments.

The Golden Hook Fishing Club (GHFC) organized most of the fishing tournaments held on St. Croix. On St. Thomas, most tournaments were organized by the Virgin Islands Game Fishing Club (VIGFC) or the Frenchtown Community. Approximately two inter-island tournaments per year were jointly organized by GHFC and VIGFC. DFW staff participated in fishing tournaments as assistant weigh-masters. This role enabled staff to collect biostatistical measurements for all fish brought to the weigh station, and to interview most of the participating vessel captains. It was observed that some fish were not presented at the weigh station, either because of small size or because they were ineligible for awards based upon tournament rules. This may have caused an under-representation of some species in the following datasets and

probably caused an underestimation of catch rates. We make note where we believe this bias to be substantial.

All fish specimens that were brought to the weigh station were included in tournament samples. Fish were identified to species-level with few exceptions. For pelagic and coastal pelagic species, use of local common names (see Introduction) was used in preference to FAO or AFS names (e.g. Carter 2002). Biostatistical measurements (length and weight) were taken for all fish. For pelagic and coastal pelagic species, length was determined with tape measure (curved fork length, FL) to the nearest mm and weight was determined on hanging scale, usually to the nearest 0.1 pound (St. Croix) or 0.05 pound (St. Thomas). For smaller fish specimens landed in shore-based handline tournaments, weight was determined on a top-loading scale to the nearest 0.1 ounce, and FL (or TL when appropriate) was measured to the nearest mm on a measuring board or with a ruler. Weights were converted to kilograms (or grams) and lengths were converted to centimeters for the purposes of this report [conversion: 2.2046 lbs. = 1.00 kg].

During the 5-year study period, DFW attended 78 sportfishing tournaments in the USVI, 43 on St. Thomas (Table 1) and 35 on St. Croix (Table 2). Complete or near-complete data for effort and catch were available from a lesser number of these tournaments: 25 tournaments on St. Thomas and 29 on St. Croix. Five different types of USVI sportfishing tournaments were distinguished based upon fishing gears allowed, seaward area of fishing (i.e. shoreline, bottom fishing, offshore), and target species-group (see Figure 1). The number of samples obtained from each type of tournament is shown by island in Table 3.

Captains of participating vessels were interviewed to obtain trip information. Data were recorded onto standardized trip interview forms (Appendix 1 and 2). Information was obtained for vessel size, number of anglers, number of lines fished, actual hours fished, and trip duration. Landings data were recorded on the same form. No data were collected on fishing method (trolling, drifting) or type of bait (artificial, natural). We attempted to interview all captains at each tournament, whether directly at the weigh station or through subsequent follow-up telephone calls.

During interviews, captains were also asked to identify the area(s) that they fished and any visitation of fish aggregation devices (FADs). Captains were shown a reference map of areas for either St. Thomas (Figure 2) or St. Croix (Figure 3). The St. Croix map also showed location of FADs (see Figure 3), however the number and spatial distribution of FADs varied during the course of this study.

Data Analysis

Raw tournament data were entered into a standardized data spreadsheet in Microsoft Excel. Descriptive summaries were prepared for each tournament day (descriptive statistics, histogram analyses, etc.) and were archived in DFW files. Tournament data from St. Thomas and St. Croix were treated independently. Catch rate (catch per unit effort, or CPUE) at offshore tournaments was calculated as kg per boat-hour, and it was obtained by dividing the total weight of landings

by the total number of boat-hours fished for each tournament day. For handline tournaments, catch rate was calculated as the number of fish per angler-hour.

Statistical analyses were performed using Statistica (Statsoft, Inc.). Inter-annual variation in size was examined by a non-parametric test: Kruskal-Wallis ANOVA by ranks. Significant findings were examined further using Multiple Comparisons Z' Value test with independent grouping (a post-hoc non-parametric test). Tests were run using log-transformed data for weight (kg). Data were pooled by species on an annual basis using fiscal year (FY) rather than calendar year. Note that for some other datasets, results are reported collectively based upon the fiscal year due to grant requirements (the relation of tournament date to fiscal year is shown in Tables 1 and 2).

Length-weight relations were explored using linear regression on Log-transformed data following the approach of Rivera and Appeldoorn (2000). This model assumes that length and weight are related as follows:

$$W = aL^b$$

where W = weight in kg, L = length (FL) in cm, and *a* and *b* are species-specific constants.

Data for fishing area were obtained from vessel captains in reference to DFW maps of six zones surrounding St. Croix (areas 1 to 6). These data were treated in two ways. First, area visitation frequency was calculated by tabulating the number of vessels which visited each area on each tournament day. Second, "area boat-hours" was estimated by multiplying fishing effort (boat-hours) by percentage of time in an area. Boat-hours were reported by captains. Percentage of time spent within each area was calculated by assuming that an equal period of time was spent in each area visited (i.e. equal-weighting). For example, a vessel which visited a single area spent 100 % of boat-hours in that area, but a vessel which visited two areas spent 50 % of boat-hours in the first area and 50 % in the second area. Average values for area visitation frequency and area boat-hours were calculated on an annual basis. Unfortunately, time constraints imposed upon the authors precluded an analysis of FAD visitation. However, we noted that a fishers' choice of fishing area and the location of FADs were often related.

For comparisons to historic information, data were taken from previous DFW reports (Tobias 1991, Adams 1996, Mateo 2000). Historic landings data were converted to metric units and fishing effort was converted to appropriate units where necessary.

RESULTS

Shore-Based Handline Tournaments

Multi-year samples were obtained from three shore-based handline tournaments. Two were held on St. Thomas and one on St. Croix. Results from each are presented separately below.

On St. Thomas, the July Kids Open Handline Tournament was sampled for three consecutive years (2003, 2004 and 2005). These tournaments were held at Offshore Marine's dock. Participants used handlines only. Results are shown in Table 4. On average, 145 anglers fished for 4 hours and caught 0.90 fish per angler-hour (range 0.61 to 1.34). Average weight was

approximately 53 g per fish. Anglers landed a wide diversity of fish species. Of the 62 species observed across years (cumulative number of species), an average of 33 species were caught per tournament. Yellowtail snapper (*Ocyurus chrysurus*), haemulids (especially tomtate, *Haemulon aurolineatum*), and squirrelfishes of the genus *Holocentrus* predominated in landings. Fish were small in size, being comprised mostly of juveniles or sub-adults (Table 4).

On St. Thomas, the Boy Scouts Handline Tournament was sampled in 2004 and 2005. These tournaments were held at American Yacht Harbor's dock in Red Hook. Participants used only handlines. Results are shown in Table 5. For the two years, 227 and 189 anglers fished for 4 and 3.5 hours and landed 0.06 and 0.18 fish per angler-hour, for 2004 and 2005 respectively. Average weight of fish was 194.5 and 92.9 g respectively for 2004 and 2005. Of the 21 species observed, 12 fish species were caught in 2004 and 18 species were caught in 2005. A large number of unidentified crabs (25) were also landed. Catch was dominated by tomtate (*H. aurolineatum*), gray snapper (*Lutjanus griseus*), and cottonwick (*H. melanurum*). Most of the fish were juveniles or sub-adults (Table 5).

On St. Croix, a single shore-based handline tournament for children is held each year on the Christiansted waterfront. Results from the GHFC Kids Handline Tournament are shown (Table 6) for four years (2002, 2003, 2004 and 2005) [data for the 2001 Vitelcellular Handline Tournament are reported in Mateo 2001]. On average, 181 anglers fished for 2 hours and landed 0.36 fish per angler-hour. Average capture size was 49 g. Of the 38 fish species observed among years (cumulative total), an average of 16 species were landed per tournament. French grunts (*H. flavolineatum*) and *Holocentrus* spp. dominated landings. Fish were small in size, being comprised mostly of juveniles or sub-adults. A large number of invertebrates were also landed (Table 6).

Boat-Based Handline Tournaments

A single boat-based handline tournament is held each year in the USVI. The Mother's Day Handline Tournament is a female-only tournament which occurs on St. Thomas. No equivalent tournament occurs in the St. Croix district. Data were available for two years (2003 and 2005) from the Mother's Day tournament (Table 7). For the two years, 21 or 15 anglers fished from 8 or 5 boats for 6.1 or 4.6 hours. Catch rate was 4.6 fish per angler-hour (3.2 kg per boat-hour) in 2003 and 4.5 fish per angler-hour (3.4 kg per boat-hour) in 2005. Average capture size was 0.26 kg. Of 26 fish species recorded during the two years, 20 were landed in 2003 and 16 in 2005. Landings were predominated by coney (*Cephalopholis fulva*), red hind (*Epinephelus guttatus*), and squirrelfishes (*Holocentrus* spp.). Landings also included a substantial number of two lutjanid species – silk snapper, *L. vivanus*, and vermilion snapper, *Rhomboplites aurorubens* – which are generally considered deepwater fishes (e.g. Clavijo et al. 1980).

Offshore Coastal Pelagic Tournaments

Only one USVI sportfishing event was classified as an offshore coastal pelagic tournament – the annual Bastille Day Kingfish Tournament held on St. Thomas. It is presently the largest annual

fishing tournament held in the USVI, attracting approximately 250 anglers and 75 boats per year. Results from the Bastille Day tournament for five consecutive years (2001 to 2005) are shown in Table 8. Tournament officials recognize only seven species as valid tournament entries. Therefore, the actual quantity and diversity of fishers' landings is likely to exceed those observed at the weigh station. Nonetheless, comparisons across years are probably valid when circumscribed to the seven tournament species. During the five years, an average of 258 anglers fished from 73 boats and landed an average of 192 fish in total (645 kg). Landings were dominated by barracuda and kingfish in all years, and also by bonito in 2003. Average catch rate was 0.12 fish per angler-hour (1.47 kilograms per boat-hour) and was relatively constant across years (Table 8).

Offshore Pelagic Tournaments

The majority of DFW sampling effort was directed towards the offshore pelagic category of fishing tournaments (Table 3) and includes the annual father's day fishing tournament. Landings from St. Thomas offshore pelagic tournaments are summarized in Table 9. A total of 641 fish (3,494.4 kg) from 16 species were recorded (FY03, FY04 and FY05 combined). More detailed information on the landings from each St. Thomas offshore pelagic tournament is presented in Appendix 3. Landings from St. Croix offshore pelagic tournaments are summarized in Table 10. A total of 889 fish (7,253.6 kg) from 9 species were recorded (FY01 to FY05 combined). More detailed information on the landings from each St. Croix offshore pelagic tournament is presented in Appendix 4.

Species composition of tournament landings differed between islands (compare Tables 9 and 10). St. Croix landings were dominated by dolphin (52.8 %) and wahoo (42.9 %), with the remaining seven other species collectively accounting for only 4.3 % of landings by number. In contrast, St. Thomas landings were comprised of greater fish diversity (16 species). Dolphin and wahoo were of lesser importance (35.4 % and 15.3 % respectively) and barracuda were of greater importance (22.3 %). The remaining 13 species, which included many coastal pelagic species, collectively accounted for 27.0 % by number of landings in St. Thomas offshore pelagic tournaments.

Fishing effort at offshore pelagic tournaments was slightly greater in St. Thomas tournaments than St. Croix tournaments. There were an average of 12.9 boats that participated in St. Thomas tournaments (range 5 to 27) and 11.4 boats in St. Croix tournaments (range 7 to 20). However, fishing effort was highly variable within and among years at St. Thomas tournaments (Figure 4A) and at St. Croix tournaments (Figure 4B). A more detailed break-down of average fishing effort and associated tournament attributes was tabulated on an annual basis for St. Croix offshore pelagic tournaments (Table 11).

The average catch rate (\pm st. dev.) observed in St. Thomas offshore pelagic tournaments over three years was 3.07 ± 1.57 kg per boat-hour. For St. Croix tournaments, the average catch rate was 2.16 ± 1.12 kg per boat-hour over a five year period. Catch rates were seen to be highly variable within and among years. This variability is evident in time-series plots of catch rates for St. Thomas (Figure 5A) and for St. Croix (Figure 5B). The highest catch rate observed during

the entire study period was 7.1 kg per boat-hour, which occurred at the St. Thomas Dolphin Derby on April 4, 2004.

Information on the spatial distribution of fishing effort was analyzed only for St. Croix offshore pelagic tournaments - insufficient data were available from St. Thomas tournaments for inclusion in this analysis. Results are shown in Figure 6 and Table 13. Estimates for area visitation frequency were comparable to those estimated for area boat-hours (Table 13). By rank order, fishing effort was distributed among areas as follows:

Area 4 > Area 5 > Area 6 \approx Area 1 > Area 2 \approx Area 3

During the five year period, two areas saw increased visitation/effort (Areas 1 and 4), one saw declining visitation/effort (Area 5), and three showed no consistent trends (Area 2, 3, 6), as shown in Table 13.

Marlin Tournaments

Compared to previous RecPort (F-8) study periods, little information was collected from marlin tournaments during FY01-FY05. Some data were available for the single annual marlin tournament held on St. Croix each year – the Golden Hook Challenge. This marlin tournament is a relatively small event which attracts about 40 anglers (8 boats) per year. Unlike many St. Thomas marlin tournaments, most participants in the GH Challenge are fishing club members operating locally-registered vessels. Tournament organizers encourage catch and release (or tag and release) billfishing. Points are awarded only for blue marlin, and boated (killed) fish brought to the weigh-in must exceed minimum size (400 lbs.) or the angler is penalized tournament points. Thus, the two-day tournament had no formal weigh station, and biostatistical data for the other species caught during the tournament were not collected. Results from the GH Challenge from 2001 to 2005 are presented in Table 12. On average, 8.2 boats fished for 8.5 hours and caught 0.0321 blue marlin per boat-hour. A total of 21 blue marlin were caught during the five-year period and all were released.

During this reporting period, assistance was occasionally provided to the Virgin Islands Game Fishing Club's various marlin fishing tournaments. When there were insufficient numbers of certified observers, staff assisted as observers on tournament registered vessels. Since these were marlin fishing tournaments, few fish were landed, and only estimates were made of fish sizes and weights (fish were not landed). VIGFC compiles billfish tournament data and submitted these data to NOAA Fisheries. They have also been requested to provide DFW with copies of the submitted data. However, to-date, no data files have been provided.

Characteristics of Fish Harvested in Offshore Pelagic Tournaments

Dolphin and wahoo were the predominant species landed in USVI offshore recreational tournaments. Barracuda were also of importance in St. Thomas tournaments (above). Therefore, more detailed analyses of landings were made for these three species. Small sample sizes precluded analyses of biostatistical data for the remaining 14 species.

For St. Thomas, information for the weight distribution of the three primary harvest species was available for three consecutive years (2003 to 2005). These data are shown for dolphin (Figure 7), for wahoo (Figure 8), and for barracuda (Figure 9). This size variation among years was significant for dolphin (Kruskal-Wallis test: $H_{2,227} = 10.55$, $p = 0.0051$). Dolphin size in FY03 was significantly larger than in FY04 ($p < 0.001$). Size of wahoo also varied significantly among years (KW: $H_{2,98} = 24.80$, $p < 0.001$). Wahoo size in FY05 was significantly larger than in FY04 ($p < 0.001$). Observed inter-annual variation in size of barracuda was not significant (KW: $H_{2,143} = 3.303$, $p = 0.1918$).

For St. Croix, information for the weight distribution of the two primary harvest species was available for five consecutive years (2001 to 2005). These data are shown for dolphin (Figure 10) and for wahoo (Figure 11). A comparison of average landing weight for dolphin showed significant inter-annual variation (KW: $H_{4,467} = 33.77$, $p < 0.001$). Dolphin observed in FY03 were significantly larger than those in FY05, and dolphin observed in FY04 were significantly smaller than those in FY02, FY03, and FY05 ($p < 0.001$). Wahoo average size also showed significant inter-annual variation (KW: $H_{4,384} = 48.32$, $p < 0.001$). Wahoo size in FY02 was significantly larger than in all other years (FY01, FY03, FY04 and FY05; $p < 0.001$).

It was hypothesized that big cash-prize tournaments, which attract the largest number of participants each year (i.e. the effort “spikes” shown in Figure 4), might introduce a size bias into landings data. These anglers may be less inclined to bring small fish to the weigh station than anglers participating in regular fishing club tournaments who are awarded series points for all dolphin and wahoo landed. To determine if tournament award structure (cash-prize vs. club points) introduced a size bias, we compared five years of landings data from the St. Croix Wahoo Wind-Up to the GHFC Wahoo Series Finale. These annual tournaments are generally held within two weeks of one another (average separation of 16.8 days during the five year period). Using a paired sample t -test, no significant differences were observed between tournament pairs for average weight of wahoo landed ($t = -0.491$, $p = 0.65$) or for average number of wahoo landed ($t = -0.844$, $p = 0.46$). Thus, there was no evidence that tournament award structure introduced a size bias into the landings data.

The length-weight relationships of dolphin and wahoo were examined in greater detail. Results are shown for dolphin (Figure 12A) and wahoo (Figure 12B). Data from St. Thomas and St. Croix were qualitatively similar (see Figure 12). Whether datasets were pooled or tested independently, they yielded similar estimates of parameters a and b for length-weight relationships for either dolphin or wahoo (Table 14).

Historic trends in landings of dolphin and wahoo were compiled from previous RecPort (F-8) studies and compared to our findings in this study. These data are shown for dolphin (Figure 13A) and wahoo (Figure 13B). Dolphin showed no clear trends over time. For wahoo, there was some indication of decline in average size for the last two sampling years (2004 and 2005). However, re-examination of wahoo size-frequency distributions (Figure 11) for these years suggests that there was an influx of smaller fish (< 4 kg) rather than a disappearance of larger individuals (> 10 kg) from the population.

DISCUSSION

Pelagics

Dolphin and wahoo are two of the most important species for USVI recreational fishers. This fact may have been previously overshadowed by the greater emphasis that earlier studies placed on the USVI billfish fishery (Brandon 1989, Friedlander and Contillo 1994, Friedlander 1995). Based upon logbooks and interviews, Adams (1996) and Mateo (2000), reported that dolphin and wahoo were among the most frequently harvested non-billfish species in the USVI recreational fishery. An opinion survey of recreational fishing club members also indicated that anglers prefer to fish for these two species (Messineo and Uwate 2004). Our results show that dolphin and wahoo were the dominant species landed in USVI offshore sportfishing tournaments.

Dolphin and wahoo are considered to be migratory pelagic species. In the USVI, dolphin are reported to have two seasonal abundance peaks, with a major “run” in the spring and a secondary peak in the fall (Olsen and Wood 1983). Wahoo show a single peak in fall/winter (Olsen and Wood 1983, Adams 1996). In our datasets, intra-annual variation was evident in catch rates (e.g. Figure 5). The timing of peak dolphin and wahoo landings was also roughly coincident with reported seasonal peaks (e.g. Appendix 3 and 4). However, seasonality could not be studied in detail due to the limited temporal distribution of sampling dates.

Our results represent some of the most detailed biostatistical information presently available on dolphin and wahoo landings for the USVI. This provides an opportunity to examine the dataset for temporal trends. Capture size of dolphin and wahoo varied significantly among years, and catch rates also varied substantially. This implies that both the size structure and abundance of local dolphin and wahoo populations fluctuated among years. The source of inter-annual variation is not known. Inter-annual fluctuations in landings of dolphin (Mahon and Oxenford 1999) and wahoo (Luckhurst and Trott 2000) are well known from elsewhere in the Caribbean region.

Despite the foregoing evidence for changes in dolphin and wahoo populations among years, our comparisons to historic USVI data give no evidence of declining trends over longer time periods. Neither average capture size (over a ~ 20 year period) nor catch rate (over a 5 year period) showed a clear tendency towards an increase or decrease (e.g. Figure 13A and 13B). Thus, there is presently no obvious indication of an impact by local fisheries to these populations. However, a more thorough assessment (e.g. yield per recruit analyses) would be required to verify the status of USVI dolphin and wahoo stocks. Given the migratory nature of these fish, which traverse national and international waters, there is need for a precautionary, multi-national approach to their management (e.g. Mahon and Oxenford 1999).

Dolphin harvest makes a small but significant contribution to fisheries throughout the Caribbean and Lesser Antilles (Mahon 1999). Oxenford and Hunte (1986a,b) suggested that two western Atlantic dolphin stocks straddle the USVI. They postulated that the two annual abundance peaks correspond to the arrival of two different dolphin stocks in the Virgin Islands. However, more recent data from Puerto Rico (Rivera and Appeldoorn 2000) imply that dolphin have a more complicated stock structure. Harvest of wahoo also forms an important component of many

Caribbean fisheries but less information is available regarding wahoo stock structure, migratory patterns or inter-annual variability in abundance (Mahon 1996). Some recent genetic evidence (Garber et al. 2005) indicates that western Atlantic wahoo populations are widely distributed with little sub-structuring.

USVI commercial fishers also harvest dolphin and wahoo, however the combined contribution of these two species to total annual commercial harvests appears to be small - less than 5 % of reported commercial landings (Valle-Esquivel and Diaz 2003). Olsen and Wood (1983) noted that the proportion of pelagics and coastal pelagics harvested by USVI recreational fishers (28.1 %) is greater than that of commercial fishers (9.8 %). The reported USVI commercial harvest was approximately 37,000 lbs/year for dolphin and 14,000 lbs/yr for wahoo during the late 1990's with most of the landings (> 90 %) from St. Croix (Tobias et al. 2000). Dolphin and wahoo may thus contribute more to USVI recreational harvests than to commercial harvests - a situation unlike most Caribbean states (Mahon 1999), but similar to that reported for the fishery of the U.S. mainland (e.g. Mazurek 2004). However, direct comparisons between commercial and recreational harvests are compromised by the lack of information for total landings by the latter group. This deserves greater attention in future studies.

Although seemingly unrelated, observed declines in USVI reef fish resources (e.g. Jeffrey et al. 2005) may ultimately lead to a greater utilization of pelagic stocks such as dolphin and wahoo. In other Caribbean locales, limiting reef fish resources have forced commercial fisheries to target pelagic stocks (e.g. dolphin and flying fish in Barbados; Mahon et al. 1982). In Bermuda, the commercial fishery shifted from reef fish to pelagics (Luckhurst and Trott 2000) as a consequence of management action to eliminate fish traps (Luckhurst and Ward 1996). Quinn (2005) evaluated results from sportfishing tournaments and suggested that Jamaican fishers (who primarily target reef fish) should shift to a pelagic fishery in order to alleviate the now notoriously overfished conditions of reef ecosystems found there. In the USVI, observed declines in reef fish stocks have prompted resource managers to actively encourage commercial fishers to shift their fishing effort towards seasonally abundant stocks (i.e. dolphin, wahoo, and tuna) through the development of a FAD program (W. Tobias, pers. com.). If USVI reef fish stocks should continue to decline, it can be predicted that commercial effort will progressively shift towards pelagic resources. Resource managers must be cognizant of the potential for conflict between commercial and recreational user-groups over a shared, and presumably finite, resource.

Coastal Pelagics

Coastal pelagic species were also an important component of offshore fishing tournament landings. Coastal pelagics were more prevalent and more diverse in St. Thomas tournament landings than in those of St. Croix, as observed previously (Adams 1996, Mateo 200). This inter-island difference is explicable, at least in part, by differences in bathymetry and geology of the islands. Fishers on St. Thomas have to travel further to reach the drop off than their counterparts on St. Croix (Adams 1996) and thus expend more of their fishing effort over insular shelf waters. However, the popularity of the Bastille Day Tournaments also suggests that many St. Thomas anglers prefer to fish for coastal pelagics.

Barracuda were the second most abundant species in St. Thomas tournament landings but they were relatively rare in St. Croix landings. In contrast, previous studies showed barracuda among the more common species in St. Croix recreational catches (Adams 1996). From 1996 to 2000, barracuda was the sixth most important species (by weight) in non-tournament, offshore recreational landings (Mateo 2000). The authors believe that the observed decline in barracuda catch frequency in St. Croix tournaments is due to angler behavior (i.e. by not bringing barracuda to the weigh station) rather than to an actual decline in stock abundance (W. Toller, pers. obs.). No significant changes in barracuda size were seen among years in St. Thomas tournament landings.

Reef Fish

Results from handline tournaments offered little insight into the recreational harvest of reef fishes. The spatial distribution of fishing effort at shoreline tournaments was extremely limited. It is doubtful that these results can be extrapolated to non-tournament shoreline fishing activity patterns of USVI recreational anglers because their activities are much more spatially diffused (Mateo 2000). Landings from shoreline tournaments were characterized by a large number of fish species, most of which were juveniles or subadults. This suggests that the waterfront areas where tournaments were held are nursery habitats, and that sampling tournament landings will provide little valuable information regarding the size distribution of the greater population. Further, the small numbers of individuals observed per fish species will make statistical inferences weak. In sum, it is doubtful that shoreline tournament data will be useful for assessing trends in stock abundance. This topic is addressed further below (see Recommendations).

Observations on Angler Activities

Sportfishing tournaments have increased in frequency on St. Croix. During the present five year study period, there were 35 tournaments or approximately seven tournaments per year. In contrast, Adams reported only four organized tournaments held between 1991 and 1995 on St. Croix, and Mateo (2000) recorded only ten tournaments from 1996 to 2000. Despite increased frequency, however, tournament participation has remained relatively constant during the present study period, and appears to be largely unchanged from previous reports during the 1990s (Adams 1996, Mateo 2000).

During the course of the study, St. Croix recreational fishers altered their pattern of visitation to fishing areas. Notably, tournament fishing trips to Area 5 decreased (see Figure 3). This was likely to be a consequence of recent expansion of Buck Island National Monument, which prohibited fishing within the formerly popular “cows mouth” area and former location of FAD A (Toller 2003). Angler’s choices to utilize other St. Croix fishing grounds may also have been influenced by new FAD deployments during the study period (W. Tobias, pers. com.). Regardless of motivation, however, patterns of area usage clearly deviated from previous RecPort (F-8) study periods. Adams (1996) estimated that, during 1991-95, more than 90 % of

St. Croix's fishing effort occurred off the northeast coast in areas 4, 5 and 6. Mateo (2000) reported that 80 % of fishing effort was expended in areas 4 and 5 during 1996 to 2000, with 51 % occurring exclusively in area 5. Current activity patterns (from this study) indicate approximately 60% of offshore fishing effort concentrated in areas 4 and 5, with ~26 % directed exclusively towards area 5.

DATA LIMITATIONS AND RECOMMENDATIONS

The generality of conclusions drawn from the present work must be circumscribed by the small population of recreational fishers from whom samples were obtained. Almost all information was collected from anglers at recreational fishing tournaments. Data from this sub-population are unlikely to be representative of the entire USVI recreational fishery because: 1) many USVI recreational anglers do not participate in sportfishing tournaments, 2) fishing gears/methods at tournaments do not include many of the common gears/methods used by recreational fishers, and 3) the annual distribution of sampling dates is restricted to only scheduled tournament days.

Our conclusions are further limited because of the unequal distribution of sampling among recreational fishing sectors. Samples were obtained almost exclusively from offshore (= pelagic species-group) or inshore (= coastal pelagic species-group) recreational fishing sectors. Few quality data were collected on the harvest by the Reef Fish recreational sector. This prevents us from gauging the relative importance of fish species caught by different recreational fisheries sectors. For example, ECC (2002) reported that snappers (reef fish family) were the most preferred fish type by USVI recreational fishers, ranking higher than dolphin (a pelagic fish). Olsen and Wood (1983) also attempted to rank the relative importance of fish families. During previous RecPort (F-8) study periods (e.g. Adams 1996, Mateo 2000), the scope of sampling strategy was more diverse and more equally distributed among fisheries sectors, including shoreline intercept surveys and logbooks programs. The current RecPort program should be re-evaluated and sampling effort should be redistributed to obtain adequate information from each recreational fishery sector.

There is also concern that adequate standards of data collection must be maintained. In some cases, datasets from fishing tournaments were incomplete and species identifications were dubious. Between islands, there was a tendency for data-collection activities to depart from a uniform protocol. The end result has been a general diminution in the quality and comparability of obtained datasets. This trend is reflective of reduced funding (or level funding despite increased costs), and high personnel turnover. Deliberate steps should be taken to reverse this pattern, which may require seeking additional funding to augment local capacity for monitoring and assessing the recreational fishery. Alternatively, capacity may be strengthened by establishing long-term collaborative efforts with other agencies.

Recommendations

- 1) Management agencies would benefit greatly from a clearer definition of *recreational angler*, and improvement of the infrastructure necessary to manage and track recreational fishing

activities. Revision of USVI territorial fishing regulations should include a nominal licensing system which will enable improved quantification of recreational fishing activities. Such a system is being implemented in Puerto Rico (C. Lilyestrom, pers. com.).

2) High priority should be given to the monitoring of recreational harvesting of reef fish resources, including locally-popular invertebrates such as lobster, conch, and whelk. Future studies should encompass fishers using a greater diversity of fishing methods and gear types such as snorkeling, diving, spear, snare, and cast nets.

3) Monitoring of recreational fisheries should be expanded beyond tournament-based sampling. Other offshore and inshore recreational fisheries segments require better representation in sampling efforts such as charter boat operators and private recreational fishers. More quantitative information is needed to assess recreational harvests of some pelagic species (e.g. tunas) and most coastal pelagic species. Biostatistical information should be collected and qualified by port sampling agents.

4) Establishment of minimum harvest sizes should be encouraged by DFW through educational “ethical angling” programs and continued involvement in Fishing Club activities. Recently, GHFC voluntarily implemented minimum size restrictions in tournaments. This trend should be encouraged and supported.

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Table 1. St. Thomas sportfishing tournaments attended, FY01 to FY05.

Fiscal Year	Calendar Year	Date(s)	Tournament Name	Gear	Area	Fish Comp
FY01	2000	Nov 12	Wahoo (Wind-Up)*	G	OF	P
	2001	Feb 25	Sweetheart's (=Couple's)*	G	OF	P
		Apr 8	Dolphin (Derby)*	G	OF	P
		May 6	Mother's Day*	HL	BT	R
		Jun 11	Father's Day*	G	OF	P
		Jul 4	July Kids Open*	HL	SH	R
		Jul 16	Bastille Day [†]	G	OF	CP/P
		Aug 5	Vitelcellular Boy Scouts*	HL	SH	R
		Sep 1-2	Offshore Four*	G	OF	P
		Dec 2	Wahoo Wind-Up*	G	OF	P
FY02	2002	Feb 24	Couple's*	G	OF	P
		Apr 21	Dolphin (Derby)*	G	OF	P
		May 5	Mother's Day*	HL	BT	R
		Jun 9	Father's Day*	G	OF	P
		Jun 21-23	June Moon*	G	OF	P
		Jul 4	July Kids Open*	HL	SH	R
		c. 14 Jul	Bastille Day [†]	G	OF	CP/P
		Aug 18	Boy Scouts*	HL	SH	R
		Nov 17	Wahoo Wind-Up	G	OF	P
		FY03	2003	Mar 2	Couple's	G
Apr 27	Dolphin Derby			G	OF	P
May 4	Mother's Day			HL	BT	R
Jun 8	Father's Day			G	OF	P
Jul 4	July Kid's Open			HL	SH	R
Jul 13	Bastille Day [†]			G	OF	CP/P
Nov 9	Wahoo Wind-Up			G	OF	P
FY04	2004	Feb 22	Couple's	G	OF	P
		Apr 4	Dolphin Derby	G	OF	P
		Jun 7	Father's Day	G	OF	P
		Jul 4	July Kid's Open	HL	SH	R
		Jul 11	Bastille Day [†]	G	OF	CP/P
		Aug 29	Boy Scouts	HL	SH	R
FY05	2005	Nov 7	Wahoo Wind-Up	G	OF	P
		Feb 13	Couple's	G	OF	P
		Apr 24	Dolphin Derby	G	OF	P
		May 22	Mother's Day	HL	BT	R
		Jun 5	Father's Day	G	OF	P
		Jun 26	June Moon	G	OF	P

Table 1. St. Thomas sportfishing tournaments attended, FY01 to FY05 (continued).

Fiscal Year	Calendar Year	Date(s)	Tournament Name	Gear	Area	Fish Comp
		Jul 3	July Kids Open	HL	SH	R
		Jul 10	Bastille Day [†]	G	OF	CP/P
		Jul 15-17	July Open Billfish*	G	OF	M
		Aug 14	Boy Scouts	HL	SH	R
		Aug 15,20	USVI Open Atl Blue Marlin*	G	OF	M

Abbreviations used are as follows: for fishing gears, G = General hook and line, HL = Handline only; for area of fishing, SH = shoreline (without boat), BT = bottom fishing from boat, OF = offshore from boat; for composition of fish species, R = reef or bottom-associated fishes, P = pelagic species, CP/P = coastal pelagic and pelagic species, M = marlin.

Asterisks (*) indicate missing tournaments datasets.

Partial data ([†]) was obtained for Bastille Day tournaments from tournament organizers (no trip information, no length measurements).

Table 2. St. Croix sportfishing tournaments attended, FY01 to FY05.

Fiscal Year	Calendar Year	Date(s)	Tournament Name	Gear	Area	Fish Comp
FY01	2000	Nov 18-19	GHFC Wahoo	G	OF	P
	2001	Mar 4	GHFC Dolphin	G	OF	P
Jun 2-3		GHFC Guys/Gals Shootout	G	OF	P	
Aug 19		Vitelcellular Boy Scouts ¹	HL	SH	R	
Sep 16-17		GHFC Marlin ²	G	OF	M	
Nov 17-18		GHFC Wahoo	G	OF	P	
FY02	2002	Dec 9	Wahoo Wind-Up	G	OF	P
		Feb 23	GHFC Dolphin	G	OF	P
		Apr 21	Offshore Marine Dolphin Derby	G	OF	P
		Jun 8-9	GHFC Guy/Gal Reel Challenge	G	OF	P
		Aug 11	GHFC Kids Hand-line Tournament	HL	SH	R
FY03	2003	Oct 19-20	GHFC Challenge ²	G	OF	M
		Nov 17	Wahoo Wind-up	G	OF	P
		Nov 30-Dec 1	GHFC Wahoo	G	OF	P
		Mar 9	GHFC Dolphin	G	OF	P
		Apr 27	Offshore Marine Dolphin Derby	G	OF	P
FY04	2004	May 17-18	GHFC Guy/Gal Reel Challenge	G	OF	P
		Aug 3	GHFC Kids Hand-line Tournament	HL	SH	R
		Sep 6-7	GHFC Challenge ²	G	OF	M
		Nov 9	Wahoo Wind-Up	G	OF	P
		Nov 22-23	GHFC Series Finale	G	OF	P
FY05	2005	Feb 29	GHFC Dolphin	G	OF	P
		Apr 4	Offshore Marine Dolphin Derby	G	OF	P
		May 29-30	VIGFC Memorial Day Weekend	G	OF	P
		Jun 26-27	GHFC Challenge ²	G	OF	M
		Aug 8	GHFC Kids Hand-line Tournament	HL	SH	R
FY05	2005	Sep 25-26	GHFC Guy/Gal Reel Challenge	G	OF	P
		Nov 7	Wahoo Wind-Up	G	OF	P
		Dec 4-5	GHFC Series Finale	G	OF	P
		Feb 20	GHFC Dolphin	G	OF	P
		Apr 24	Dolphin Derby	G	OF	P
FY05	2005	May 28-29	VIGFC Memorial Day Weekend	G	OF	P
		Jun 18-19	GHFC Challenge ²	G	OF	M

Table 2. St. Croix sportfishing tournaments attended, FY01 to FY05 (continued)

Fiscal Year	Calendar Year	Date(s)	Tournament Name	Gear	Area	Fish Comp
		Aug 7	GHFC Kids Hand-line Tournament	HL	SH	R
		Sep 17-18	GHFC Guy/Gal Reel Challenge	G	OF	P

Abbreviations used are as follows: for fishing gears, G = General hook and line, HL = Handline only; for area of fishing, SH = shoreline (without boat), BT = bottom fishing from boat, OF = offshore from boat; for composition of fish species, R = reef or bottom-associated fishes, P = pelagic species, CP/P = coastal pelagic and pelagic species, M = marlin.

¹ Data reported in Mateo (2001).

² Partial data on marlin tournaments supplied by GHFC.

Table 3. Sampling distribution among five types of USVI tournaments, FY01 to FY05.

Tournament Type	St. Thomas		St. Croix	
	Total No. Attended*	No. with Data†	Total No. Attended*	No. with Data†
Shore-Based Handline	9	5	5	4
Boat-Based Handline	4	2	-	-
Offshore Coastal Pelagic	5	5	-	-
Offshore Pelagic	23	13	25	25
Marlin	2	-	5‡	-‡
Total	43	25	35	29

* DFW attended all St. Croix and St. Thomas fishing tournaments (excluding marlin tournaments) during the five-year period.

† Excluded tournament datasets were either lacking essential information or missing altogether.

‡ Currently, USVI marlin tournaments are tag and release events. This precludes collection of biostatistical data from landings. However, some qualitative data for effort were collected from five St. Croix tournaments. Comparable data have been requested from the Virgin Islands Game Fishing Club which organizes the marlin tournaments on St. Thomas and submitted marlin tournament data to NOAA Fisheries.

Table 4. Landings from the July Kids Open Handline Tournament, St. Thomas.

Species	Common Name	2003		Year 2004		2005		Total No. Fish
		No.	Wt.	No.	Wt.	No.	Wt.	
<i>Landings</i>								
<i>Acanthurus chirurgus</i>	doctorfish	5	594	38	3760	-	-	43
<i>Acanthurus coeruleus</i>	blue tang	-	-	5	567	-	-	5
<i>Apogon</i> sp.	cardinalfish, unid.	1	45	-	-	-	-	1
<i>Bothus lunatus</i>	peacock flounder	1	41	-	-	-	-	1
<i>Caranx latus</i>	Horse-eye jack	-	-	23	449	-	-	23
<i>Caranx crysos</i>	blue runner	3	921	-	-	-	-	3
<i>Caranx ruber</i>	bar jack	1	9	-	-	-	-	1
<i>Trachinotus goodei</i>	palometa	-	-	-	-	1	463	1
carangid sp.	jack, unid.	1	14	2	36	2	191	5
gerreid sp.	mojarra, unid.	-	-	2	204	-	-	2
<i>Haemulon aurolineatum</i>	tomtate	7	268	70	1905	182	5203	259
<i>Haemulon carbonarium</i>	smallmouth grunt	1	41	-	-	1	32	2
<i>Haemulon chrysargyreum</i>	caesar grunt	-	-	-	-	1	91	1
<i>Haemulon flavolineatum</i>	french grunt	26	871	20	789	22	644	68
<i>Haemulon melanurum</i>	cottonwick	43	1429	7	109	-	-	50
<i>Haemulon sciurus</i>	bluestriped grunt	8	590	7	943	5	163	20
<i>Myripristis jacobus</i>	blackbar soldierfish	-	-	-	-	2	159	2
<i>Holocentrus</i> spp.	squirrelfish, unid.	105	6527	147	6096	115	5897	367
holocentrid sp.	soldierfish, unid.	1	50	-	-	-	-	1
<i>Halichoeres garnoti</i>	yellowhead wrasse	1	77	-	-	-	-	1
<i>Halichoeres pictus</i>	rainbow wrasse	4	181	-	-	-	-	4
<i>Halichoeres radiatus</i>	puddingwife	-	-	1	73	-	-	1
<i>Halichoeres</i> sp.	wrasse spp.	-	-	-	-	1	104	1
<i>Xyrichtys novacula</i>	pearly razorfish	-	-	2	54	-	-	2
<i>Xyrichtys</i> sp.	razorfish, unid.	-	-	-	-	1	5	1
<i>Labrisomus nuchipinnis</i>	hairy blenny	3	141	4	122	8	159	15
<i>Lutjanus analis</i>	mutton snapper	-	-	1	798	-	-	1
<i>Lutjanus apodus</i>	schoolmaster	5	889	10	1116	1	345	16
<i>Lutjanus griseus</i>	gray snapper	-	-	1	91	-	-	1
<i>Lutjanus jocu</i>	dog snapper	-	-	-	-	1	104	1
<i>Lutjanus synagris</i>	lane snapper	5	263	21	1293	41	2817	67
<i>Lutjanus</i> sp.	"mangrove" snapper	3	340	-	-	-	-	3
<i>Ocyurus chrysurus</i>	yellowtail snapper	120	4491	203	8714	41	2921	364
<i>Echidna catenata</i>	chain moray	1	109	-	-	-	-	1
<i>Gymnothorax moringa</i>	spotted moray	1	803	-	-	-	-	1
<i>Lactophrys bicaudalis</i>	spotted trunkfish	1	259	-	-	-	-	1
<i>Lactophrys triqueter</i>	smooth trunkfish	-	-	-	-	1	277	1
<i>Abudefduf saxatilis</i>	sergeant major	5	386	1	77	3	113	9
<i>Stegastes adustus</i>	dusky damselfish	6	172	3	86	4	268	13
pomacentrid sp.	damselfish, unid.	-	-	2	54	-	-	2
<i>Sparisoma chrysopterum</i>	redtail parrotfish	3	449	3	186	2	1084	8
<i>Sparisoma viride</i>	stoplight parrotfish	3	1157	-	-	1	168	4
scarid sp.	parrotfish, unid.	-	-	2	363	-	-	2
<i>Calamus</i> sp.	porgy, unid.	1	254	-	-	-	-	1
<i>Cephalopholis cruentatus</i>	grasby	7	989	4	599	3	445	14
<i>Cephalopholis fulva</i>	coney	4	535	-	-	-	-	4
<i>Epinephelus adscensionis</i>	rock hind	1	95	-	-	-	-	1
<i>Epinephelus guttatus</i>	red hind	1	272	-	-	8	336	9
<i>Epinephelus striatus</i>	Nassau grouper	-	-	4	798	-	0	4
<i>Hypoplectrus aberrans</i>	yellowbelly hamlet	1	14	-	-	-	-	1
<i>Hypoplectrus chlorurus</i>	yellowtail hamlet	1	27	-	-	-	-	1
<i>Hypoplectrus guttavarius</i>	shy hamlet	1	18	-	-	-	-	1
<i>Hypoplectrus nigricans</i>	black hamlet	19	562	-	-	1	45	20
<i>Hypoplectrus puella</i>	barred hamlet	16	268	9	1492	2	36	27
<i>Hypoplectrus</i> sp.	hamlet, unid.	-	-	7	154	2	50	9
<i>Sphyræna barracuda</i>	great barracuda	-	-	-	-	1	558	1
<i>Synodus intermedius</i>	sand diver	1	68	-	-	-	-	1
synodontid sp.	lizardfish, unid.	3	86	-	-	1	18	4
<i>Sphoeroides</i> sp.	pufferfish, unid.	3	395	-	-	-	-	3

Table 4. Continued.

<i>Landings</i>							
clupeid or atherinid sp.	fry, unid.	1	5	-	-	-	1
fish sp.	fish, unid.	-	-	1	50	-	1
belonid sp.	needlefish, unid.	-	-	-	-	1	458
		<hr/>		<hr/>		<hr/>	
<i>Totals</i>							
Total Number of Fish		424		600		455	1479
Total Weight of Fish (g)		24,703		30,981		23,152	78,835
Total Number of Fish Species		41		28		29	62
<i>Effort and Catch Rate</i>							
Number of Anglers		173		112		150	
Hours Fished		4		4		4	
Number of Fish per Angler-Hour		0.61		1.34		0.76	

Table 5. Landings from the Boys Scouts Handline Tournament, St. Thomas.

Species	Common Name	Year		Total No. Fish	
		2004 No. Wt. (g)	2005 No. Wt. (g)		
Landings					
carangid sp.	jack, unid.	-	-	2 213	2
<i>Diodon hystrix</i>	Porcupinefish	2	3488	1 2064	3
gerreid sp.	mojarra, unid.	2	708	1 18	3
<i>Haemulon aurolineatum</i>	tomtate	14	445	18 413	32
<i>Haemulon chrysargyreum</i>	caesar grunt	-	-	1 9	1
<i>Haemulon flavolineatum</i>	french grunt	1	32	4 73	5
<i>Haemulon melanurum</i>	cottonwick	-	-	21 435	21
<i>Haemulon sciurus</i>	bluestriped grunt	4	408	2 122	6
<i>Myripristis jacobus</i>	blackbar soldierfish	-	-	1 50	1
holocentrid sp.	squirrelfish, unid.	-	-	1 41	1
<i>Xyrichtys</i> sp.	razorfish, unid.	-	-	1 23	1
<i>Labrisomus nuchipinnis</i>	hairy blenny	-	-	2 68	2
<i>Lutjanus apodus</i>	schoolmaster	1	186	- -	1
<i>Lutjanus griseus</i>	gray snapper	4	694	20 2046	24
<i>Lutjanus mahogoni</i>	mahogany snapper	2	127	1 23	3
<i>Lutjanus synagris</i>	lane snapper	-	-	11 1098	11
<i>Ocyurus chrysurus</i>	yellowtail snapper	2	50	10 299	12
muraenid sp.	moray, unid.	5	1166	- -	5
<i>Sphyraena barracuda</i>	great barracuda	3	1415	5 1914	8
<i>Sphoeroides testudineus</i>	checkered puffer	17	2368	- -	17
<i>Sphoeroides</i> sp.	pufferfish, unid.	-	-	17 2141	17
Landings - Invertebrates					
"crab"	crab, unid.	25	1070	- -	25
Totals – Fish Only					
Total Number of Fish		57		119	176
Total Weight of Fish (g)		11,086		11,050	22,136
Total Number of Fish Species		12		18	21
Effort and Catch Rate					
Number of Anglers		227		189	
Hours Fished		4		3.5	
Number of Fish per Angler-Hour		0.06		0.18	

Table 6. Landings from the Kids Handline Tournament, St. Croix.

Species	Common Name	Year								Total No. Fish
		2002		2003		2004		2005		
		No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	
Landings - Fish										
<i>Bothus lunatus</i>	peacock flounder	-	-	1	43	-	-	-	-	1
<i>Caranx crysos</i>	blue runner	-	-	-	-	8	1068	-	-	8
<i>Caranx latus</i>	horse-eye jack	6	234	3	128	-	-	-	-	9
<i>Eucinostomus jonesi</i>	slender mojarra	-	-	-	-	1	27	1	75	2
gobiid sp.	goby, unid.	13	489	-	-	-	-	-	-	13
<i>Haemulon aurolineatum</i>	tomtate	-	-	-	-	5	191	2	55	7
<i>Haemulon carbonarium</i>	smallmouth grunt	1	7	-	-	-	-	-	-	1
<i>Haemulon chrysargyreum</i>	caesar grunt	1	43	1	60	-	-	9	432	11
<i>Haemulon flavolineatum</i>	french grunt	75	2728	46	1889	29	845	83	2779	233
<i>Haemulon plumieri</i>	white grunt	-	-	-	-	-	-	1	52	1
<i>Holocentrus adcnensionis</i>	squirrelfish	-	-	42	2256	18	1000	-	-	60
<i>Holocentrus rufus</i>	longspine squirrelfish	-	-	8	460	-	-	-	-	8
<i>Holocentrus</i> spp.	squirrelfish, unid.	39	2430	-	-	-	-	30	1486	69
<i>Myripristis jacobus</i>	blackbar soldierfish	-	-	-	-	2	145	1	93	3
<i>Neoniphon marianus</i>	longjaw squirrelfish	-	-	-	-	1	32	-	-	1
<i>Halichoeres bivivittatus</i>	slippery dick	6	269	4	193	-	-	2	75	12
<i>Halichoeres</i> sp.	wrasse, unid.	-	-	-	-	-	-	1	48	1
<i>Labrisomus nuchipinnis</i>	hairy blenny	-	-	2	88	1	27	2	61	5
labrisomid sp.	blenny, unid.	-	-	1	31	-	-	-	-	1
<i>Lutjanus apodus</i>	schoolmaster	-	-	-	-	-	-	4	500	4
<i>Lutjanus mahogoni</i>	mahogany snapper	-	-	-	-	-	-	1	91	1
<i>Lutjanus synagris</i>	lane snapper	-	-	-	-	-	-	1	34	1
<i>Ocyurus chrysurus</i>	yellowtail snapper	2	49	1	14	1	41	3	75	7
<i>Gymnothorax funebris</i>	green moray	4	510	-	-	-	-	-	-	4
<i>Gymnothorax moringa</i>	spotted moray	-	-	2	210	1	64	-	-	3
<i>Gymnothorax vicinus</i>	purplemouth moray	1	43	1	17	3	145	1	14	6
<i>Echidna catenata</i>	chain moray	-	-	-	-	2	118	-	-	2
<i>Acanthostracion quadricornis</i>	scrawled trunkfish	1	680	-	-	-	-	-	-	1
<i>Abudefduf saxatilis</i>	sergeant major	4	326	-	-	-	-	1	61	5
<i>Stegastes dorsopunicans</i>	dusky damselfish	-	-	-	-	1	9	-	-	1
<i>Stegastes leucosticus</i>	beaugregory	-	-	-	-	-	-	1	30	1
<i>Sparisoma aurofrenatum</i>	redband parrotfish	1	85	-	-	-	-	-	-	1
<i>Sparisoma chrysopterygum</i>	redtail parrotfish	-	-	-	-	-	-	1	211	1
<i>Cephalopholis cruentatus</i>	grasby	-	-	-	-	-	-	1	125	1
<i>Epinephelus guttatus</i>	red hind	-	-	-	-	-	-	4	57	4
<i>Scorpaena plumieri</i>	spotted scorpionfish	1	71	1	116	-	-	-	-	2
<i>Sphaeroides testudineus</i>	checkered puffer	-	-	1	196	1	255	1	175	3
synodontid sp.	lizardfish, unid.	-	-	1	20	-	-	-	-	1
Landings - Invertebrates										
<i>Hermodice carunculata</i>	bearded fireworm	11	120	2	31	7	64	2	7	22
<i>Clappa</i> sp.	crab, unid.	-	-	1	25	-	-	-	-	1
<i>Mithrax</i> sp.	crab, unid.	-	-	-	-	-	-	1	23	1
"crab"	crab, unid.	-	-	1	9	-	-	-	-	1
Totals – Fish Only										
Total Number of Fish		155		115		74		151		495
Total Weight of Fish (g)		7,965		5,722		3,968		6,529		24,184
Total Number of Fish Species		14		15		14		21		38
Effort and Catch Rate										
Number of Anglers		157		205		200		160		
Hours Fished		2		2		2		2		
Number of Fish per Angler-Hour		0.49		0.28		0.19		0.47		

Table 7. Landings from the Mother's Day Tournament, St. Thomas.

Species	Common Name	Year		Total No. Fish
		2003 No. Wt. (kg)	2005 No. Wt. (kg)	
Landings				
<i>Balistes vetula</i>	queen triggerfish	32 29.7	5 3.8	37
<i>Remora remora</i>	remora	- -	1 0.4	1
<i>Chaetodipterus faber</i>	atlantic spadefish	3 4.3	- -	3
<i>Haemulon aurolineatum</i>	tomtate	- -	16 2.3	16
<i>Haemulon flavolineatum</i>	french grunt	- -	1 0.2	1
<i>Haemulon melanurum</i>	cottonwick	12 1.5	- -	12
<i>Haemulon plumieri</i>	white grunt	2 0.3	5 0.5	7
<i>Haemulon sciurus</i>	bluestriped grunt	5 1.0	- -	5
<i>Holocentrus</i> spp.	squirrelfish, unid.	120 18.8	70 13.7	190
<i>Halichoeres radiatus</i>	puddingwife	1 1.0	1 0.2	2
<i>Halichoeres maculipinna</i>	clown wrasse	1 0.2	- -	1
<i>Lutjanus analis</i>	mutton snapper	1 0.2	- -	1
<i>Lutjanus jocu</i>	dog snapper	- -	1 1.7	1
<i>Lutjanus synagris</i>	lane snapper	1 0.3	10 3.0	11
<i>Lutjanus vivanus</i>	silk snapper	- -	76 16.7	76
<i>Ocyurus chrysurus</i>	yellowtail snapper	17 3.0	5 1.6	22
<i>Rhomboplites aurorubens</i>	vermillion snapper	113 18.7	- -	113
<i>Malacanthus plumieri</i>	sand tilefish	- -	1 0.2	1
<i>Acanthostracion quadricornis</i>	scrawled cowfish	1 1.1	- -	1
<i>Pomacanthus arcuatus</i>	gray angelfish	1 1.1	- -	1
<i>Priacanthus arenatus</i>	bigeye	21 10.2	- -	21
<i>Calamus</i> sp.	porgy, unid.	8 2.3	4 1.2	12
<i>Cephalopholis cruentatus</i>	grasby	15 2.4	50 10.9	65
<i>Cephalopholis fulva</i>	coney	130 29.3	45 12.7	175
<i>Epinephelus adscensionis</i>	rock hind	27 7.4	- -	27
<i>Epinephelus guttatus</i>	red hind	75 25.5	22 9.5	97
Totals				
Total Number of Fish		586	313	899
Total Weight of Fish (kg)		158.3	78.6	236.9
Total Number of Fish Species		20	16	26
Effort and Catch Rate				
Number of Anglers		21	15	
Number of Boats		8	5	
Hours Fished (Average per Boat)		6.1	4.6	
Number of Fish per Angler-Hour		4.6	4.5	
Kilograms of Fish per Boat-Hour		3.2	3.4	

Table 8. Landings from the Bastille Day Tournament, St. Thomas.

		2001	2002	Year 2003	2004	2005	Total No./Wt.
<i>Landings*</i>							
Barracuda (Great)	No.	62	63	70	69	91	355
<i>Sphyraena barracuda</i>	Wt.	260.0	257.6	285.2	276.1	376.9	1455.9
Kingfish (King Mackerel)	No.	47	36	27	42	78	230
<i>Scomberomorus cavalla</i>	Wt.	226.3	204.0	154.0	172.3	319.0	1075.6
Bonito (Little Tunny)	No.	7	46	114	2	25	194
<i>Euthynnus alletteratus</i>	Wt.	8.6	61.6	139.4	2.7	35.3	247.6
Mackerel (Cero)	No.	19	17	21	20	15	92
<i>Scomberomorus regalis</i>	Wt.	22.7	20.7	28.3	21.8	21.9	115.4
Jack (Crevalle/Horse-Eye)	No.	19	5	12	10	12	58
<i>Caranx hippos / C. latus</i>	Wt.	59.4	17.6	31.7	30.7	38.9	178.3
Tuna (Blackfin)	No.	5	5	8	3	4	25
<i>Thunnus atlanticus</i>	Wt.	27.5	27.2	41.5	13.8	31.9	142.0
Dolphin	No.	3	-	-	1	1	5
<i>Coryphaena hippurus</i>	Wt.	5.8	-	-	2.6	1.3	9.7
<i>Totals</i>							
Total Number		162	172	252	147	226	959
Total Weight (kg)		610.3	588.7	680.1	520.1	825.3	3224.5
<i>Effort and Catch Rate</i>							
Number of Anglers		275	253	266	246	352	
Number of Boats		77	71	73	68	75	
Hours Fished**		6	6	6	6	6	
Number of Fish per Angler-Hour		0.10	0.11	0.16	0.10	0.11	
Kilograms per Boat-Hour		1.32	1.38	1.55	1.27	1.83	

Weight is reported in kilograms. Results were provided to DFW by tournament officials. No trip information was collected from anglers at this tournament.

* Only seven species (listed in this table) are recognized by tournament officials. Data for other species were not recorded.

** Based upon tournament rules, hours fished was estimated at 6 hours and assumed to be constant across all five years.

Table 9. Summary of landings from St. Thomas offshore pelagic tournaments.

Species	FY03				FY04				FY05				Total No.	Total Wt.
	Total No.	Total Wt.	Avg. Wt.	Avg. FL	Total No.	Total Wt.	Avg. Wt.	Avg. FL	Total No.	Total Wt.	Avg. Wt.	Avg. FL		
Dolphin	30	257.0	8.6	100.2	176	1229.8	7.0	98.4	22	172.9	7.9	94.9	228	1659.7
Barracuda	54	169.7	3.1	79.7	33	109.2	3.3	80.2	56	175.0	3.1	78.9	143	453.9
Wahoo	21	186.6	8.9	113.9	62	406.0	6.5	100.4	15	204.2	13.6	128.9	98	796.8
Kingfish	23	128.7	5.6	86.4	9	53.5	5.9	84.8	20	122.2	6.1	86.6	52	304.4
Bonito (Little Tunny)	20	24.0	1.2	43.7	-	-	-	-	18	16.6	0.9	40.7	38	40.6
Horse-Eye Jack	10 ¹	34.7	3.5	61.0	2	5.9	2.9	55.0	13	39.8	3.0	57.0	25	80.4
Cero Mackerel	12	17.2	1.4	53.8	3	8.8	2.9	67.1	5	5.9	1.2	52.6	20	31.9
Spanish Mackerel*	-	-	-	-	1	3.7	3.7	77.0	6	12.2	2.0	61.0	7	15.9
Blackfin Tuna	1	4.4	4.4	62.0	4	8.1	2.0	46.8	8 ²	30.3	3.8	57.4	13	42.8
Yellowfin Tuna	1	4.3	4.3	61.0	-	-	-	-	4	28.4	7.1	74.0	5	32.7
Skipjack Tuna	1	3.4	3.1	56.0	2	5.5	2.8	52.6	1	3.8	3.8	59.0	4	12.7
Amberjack, unid. [†]	-	-	-	-	-	-	-	-	3	7.1	2.4	53.8	3	7.1
Blue Runner	-	-	-	-	3	4.7	1.6	46.0	-	-	-	-	3	4.7
Bar Jack	1	1.3	1.3	44.9	-	-	-	-	-	-	-	-	1	1.3
Mutton Snapper	-	-	-	-	1	5.0	5.0	67.8	-	-	-	-	1	5.0
Rainbow Runner	-	-	-	-	1	1.3	1.3	47.0	-	-	-	-	1	1.3
Yellow Jack	1	3.1	3.1	59.2	-	-	-	-	-	-	-	-	1	3.1
Totals	175	834.4			297	1841.5			171	818.4			643	3494.3

Weight (Wt.) is reported in kilograms and curved fork length (FL) reported in centimeters.

* Landings of seven "Spanish mackerel" (*Scomberomorus maculatus*) were recorded on data forms from St. Thomas tournaments in FY04 and FY05. Based upon the known distribution of *S. maculatus* (see Carter 2002), we assume these were misidentified specimens of cero mackerel, *Scomberomorus regalis*.

[†] Two similar species of amberjack occur in the USVI – the greater amberjack, *Seriola dumerili*, and the almaco jack, *S. rivoliana* (Clavijo et al. 1980) however no distinction was made on the datasheets.

¹ One horse-eye jack (3.9 kg) in FY03 was excluded from this table because no length measurement was obtained.

² Four blackfin tuna (25.9 kg) in FY05 were excluded because length measurements were not obtained.

Table 10. Summary of landings from St. Croix offshore pelagic tournaments.

Species	FY01				FY02				FY03				FY04				FY05				Total No.	Total Wt.
	Total No.	Total Wt.	Avg. Wt.	Avg. FL	Total No.	Total Wt.	Avg. Wt.	Avg. FL	Total No.	Total Wt.	Avg. Wt.	Avg. FL	Total No.	Total Wt.	Avg. Wt.	Avg. FL	Total No.	Total Wt.	Avg. Wt.	Avg. FL		
Dolphin	49	367.7	7.5	97.0	77 ⁶	595.6	7.7	90.4	62	563.1	9.1	102.3	99	616.0	6.2	90.2	180	1367.6	7.6	86.4	467	3510.0
Wahoo	40 ¹	322.6	8.3	113.8	53	699.5	13.3	128.5	66	616.5	9.3	113.8	97	828.5	8.3	110.7	128	1009.6	7.9	108.2	384	3476.7
Kingfish	5 ²	30.8	6.2	34.5	2	10.7	5.4	88.1	1	9.9	9.9	101.1	-	-	-	-	1	5.1	5.1	87.0	9	56.5
Blackfin Tuna	- ³	-	-	-	-	-	-	-	2	9.8	4.9	63.3	1	2.3	2.3	49.5	5	10.0	2.0	47.9	8	22.1
Yellowfin Tuna	-	-	-	-	-	-	-	-	-	-	-	-	1 ⁷	1.9	1.9	47.0	6	124.1	20.7	110.0	7	126
Skipjack Tuna	1 ⁴	9.7	9.7	54.4	1	10.4	10.4	78.2	-	-	-	-	4	15.0	3.7	56.7	-	-	-	-	6	35.1
Barracuda	- ⁵	-	-	-	2	3.9	2.0	66.5	-	-	-	-	-	-	-	-	3	5.5	1.8	65.8	5	9.4
Yellowtail Snapper	-	-	-	-	-	-	-	-	-	-	-	-	1	1.4	1.4	46.9	1	2.0	2.0	55.5	2	3.4
Horse-Eye Jack	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5.5	5.5	72.0	1	5.5
Totals	95	730.8			135	1320.1			131	1199.3			203	1465.1			325	2529.4			889	7244.7

Weight (Wt.) is reported in kilograms and curved fork length (FL) is reported in centimeters.

The following fish were excluded from this table and further analyses because length measurements were not obtained:

¹ One wahoo (2.7 kg) in FY01.

² One kingfish (3.6 kg) in FY01.

³ One blackfin tuna (4.4 kg) in FY01.

⁴ One skipjack tuna (5.2 kg) in FY01.

⁵ Eight barracuda (16.3 kg) in FY01.

⁶ One dolphin (4.5 kg) in FY02.

⁷ One yellowfin tuna (18.4 kg) in FY04.

Table 11. Characteristics of St. Croix offshore pelagic tournaments*, FY01 to FY05.

	Fiscal Year					5 Yr. Avg.
	2001	2002	2003	2004	2005	
No. of Tournament-Days [†] /Year	5	7	7	9	9	7.4
Average No. Boats/Tournament-Day	9.4	11.1	12.6	11.3	11.7	11.4
Average No. Anglers/Tournament-Day	26.0 [‡]	41.6	48.7	46.8	41.4	42.1
Mean Boat Size (length in feet)	32.8	34.1	33.0	32.8	32.4	33.0
No. Anglers/Boat (avg.)	2.7	3.7	3.8	4.1	3.6	3.7
No. Lines/Boat (avg.)	3.2	4.0	4.5	4.6	4.4	4.3
No. Hours/Boat/Tournament-Day (avg.)	8.6	7.9	8.5	7.9	7.9	8.1

* Marlin tournaments not included.

† St. Croix has about two 2-day tournaments each year. Each tournament day was treated independently for these calculations.

‡ Insufficient trip information was obtained for number of anglers for some tournaments in FY01 leading to underestimates of actual fishing effort.

Table 12. St. Croix marlin tournaments*, FY01 to FY05.

	Fiscal Year				
	2001	2002	2003	2004	2005
Number of Hours Fished/Day [†]	8	8	8	9	9.5
Total Number of Boats	8	6	11	8	8
Total Number of Boat-Hours	128	96	176	144	152
Number of Blue Marlin Caught	4	3	3	4	7
Number of Blue Marlin Released	4	3	3	4	7
Catch Rate (No. of Blue Marlin/Boat-Hour)	0.031	0.031	0.017	0.028	0.049
Number of Boat-Hours to Catch a Marlin [‡]	32.0	32.0	58.7	36.0	20.6

* Very few trip interviews of vessel captains were obtained from St. Croix marlin tournaments. Information on fishing effort and landings are collective estimates based upon information supplied by the Golden Hook Fishing Club.

[†] All five St. Croix marlin tournaments were 2-day tournaments.

[‡] The average number of hours to catch a blue marlin was calculated as 1/(catch rate).

Table 13. Distribution of fishing effort among areas in St. Croix offshore pelagic tournaments, FY01 to FY05.

	Area Fished											
	Area 1		Area 2		Area 3		Area 4		Area 5		Area 6	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Area Visitation Freq.												
FY01	1	2.2	4	8.7	4	8.7	14	30.4	22	47.8	1	2.2
FY02	9	11.0	3	3.7	4	4.9	20	24.4	29	35.4	17	20.7
FY03	27	18.4	25	17.0	13	8.8	27	18.4	27	18.4	28	19.0
FY04	19	19.0	12	12.0	7	7.0	35	35.0	13	13.0	14	14.0
FY05	37	19.3	13	6.8	17	8.9	59	30.7	38	19.8	28	14.6
Average	18.6	14.0	11.4	9.6	9.0	7.7	31.0	27.8	25.8	26.9	17.6	14.1
St.Dev.	14.2	7.4	8.8	5.1	5.8	1.7	17.5	6.5	9.2	14.4	11.2	7.3
Area Boat-Hours												
FY01	4.5	1.3	19.7	5.8	28.7	8.5	99.7	29.6	180.0	53.4	4.5	1.3
FY02	32.0	9.4	5.3	1.5	25.0	7.4	96.9	28.5	122.5	36.0	58.4	17.2
FY03	94.6	17.9	82.3	15.6	35.0	6.6	140.9	26.7	83.6	15.8	91.9	17.4
FY04	96.1	17.0	52.5	9.3	34.1	6.0	272.2	48.2	49.5	8.8	60.5	10.7
FY05	145.7	19.6	34.2	4.6	45.5	6.1	303.5	40.8	132.1	17.8	82.3	11.1
Average	74.6	13.1	38.8	7.4	33.6	6.9	182.6	34.8	113.5	26.4	59.5	11.5
St.Dev.	56.2	7.6	30.0	5.4	7.8	1.0	98.2	9.3	49.6	18.2	33.9	6.5

Table 14. Parameters of the length-weight relationship for dolphin and wahoo, FY01 to FY05.

Analysis	Model Parameters as Determined from Regression			
	n	b	Log a	r ²
Dolphin				
This Study				
St. Croix only*	466	2.86	-4.82	0.94
St. Thomas only	277	2.87	-4.83	0.93
Combined Islands	743	2.86	-4.82	0.93
Previous studies				
Rivera and Appeldoorn (2000)	170	2.78	-4.42	0.98
Froese and Pauly (2003)	n/a	2.83	-3.79	n/a
Wahoo				
This Study				
St. Croix only*	377	3.24	-5.74	0.95
St. Thomas only	96	3.30	-5.86	0.96
Combined Islands	473	3.26	-5.78	0.95
Previous Studies				
Beerkircher (2005)‡	164	3.24	-5.69	0.84
Froese and Pauly (2003)	n/a	3.19	-5.99	n/a

Parameters a and b were estimated for the exponential model $W = aL^b$ where W is weight in kg and L is fork length in cm. Values reported in this study were determined by linear regression on Log-transformed data for L and W.

* For St. Croix data, 1 dolphin and 7 wahoo were excluded from L-W analysis because either length data were missing (FY01) or erroneous (i.e. extreme outliers; 3 fish from FY01), or because fish had been gutted prior to weighing.

† Values from Froese and Pauly (2003) were ln-transformed.

‡ Values reported in Beerkircher were Log₁₀-transformed.

Figure 1. Classification of USVI sportfishing tournaments. Sampling from offshore pelagic tournaments (highlighted in blue) was emphasized during the present five year study period.

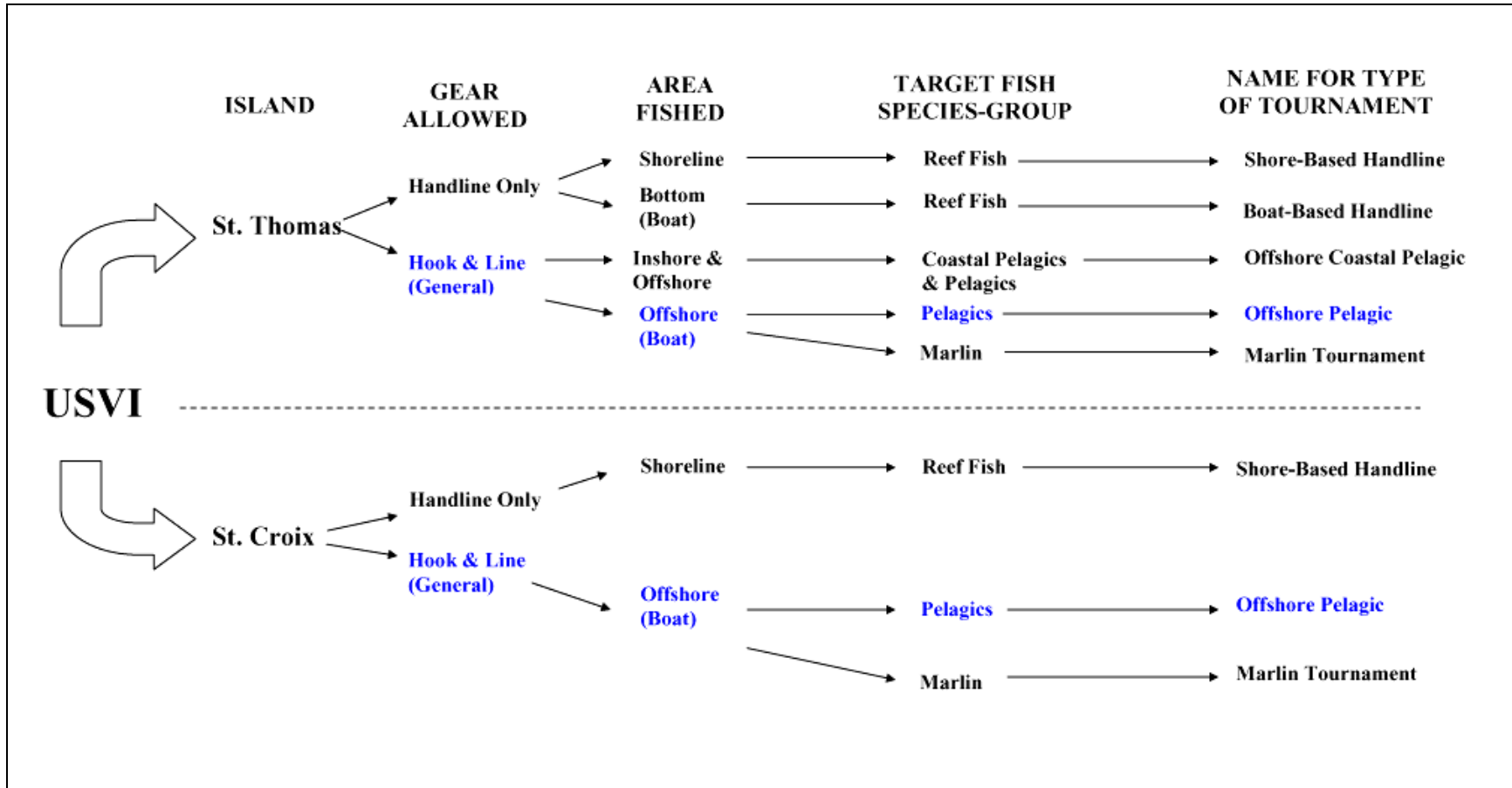


Figure 2. Area map used for St. Thomas sportfishing tournaments.

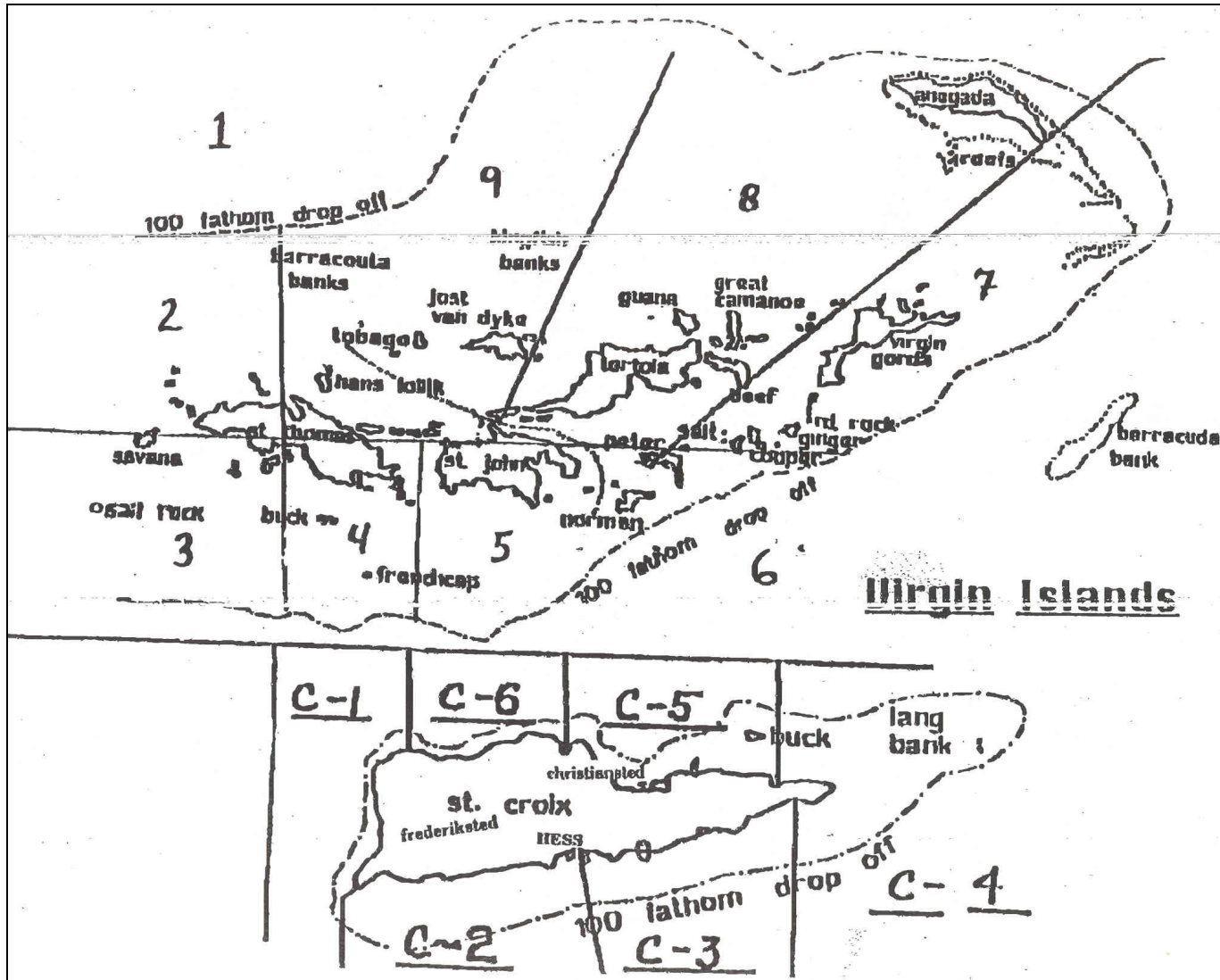


Figure 3. Area map used for St. Croix sportfishing tournaments. Approximate location of Fish Aggregation Devices (FADs) are shown (yellow circles) with letter code names.

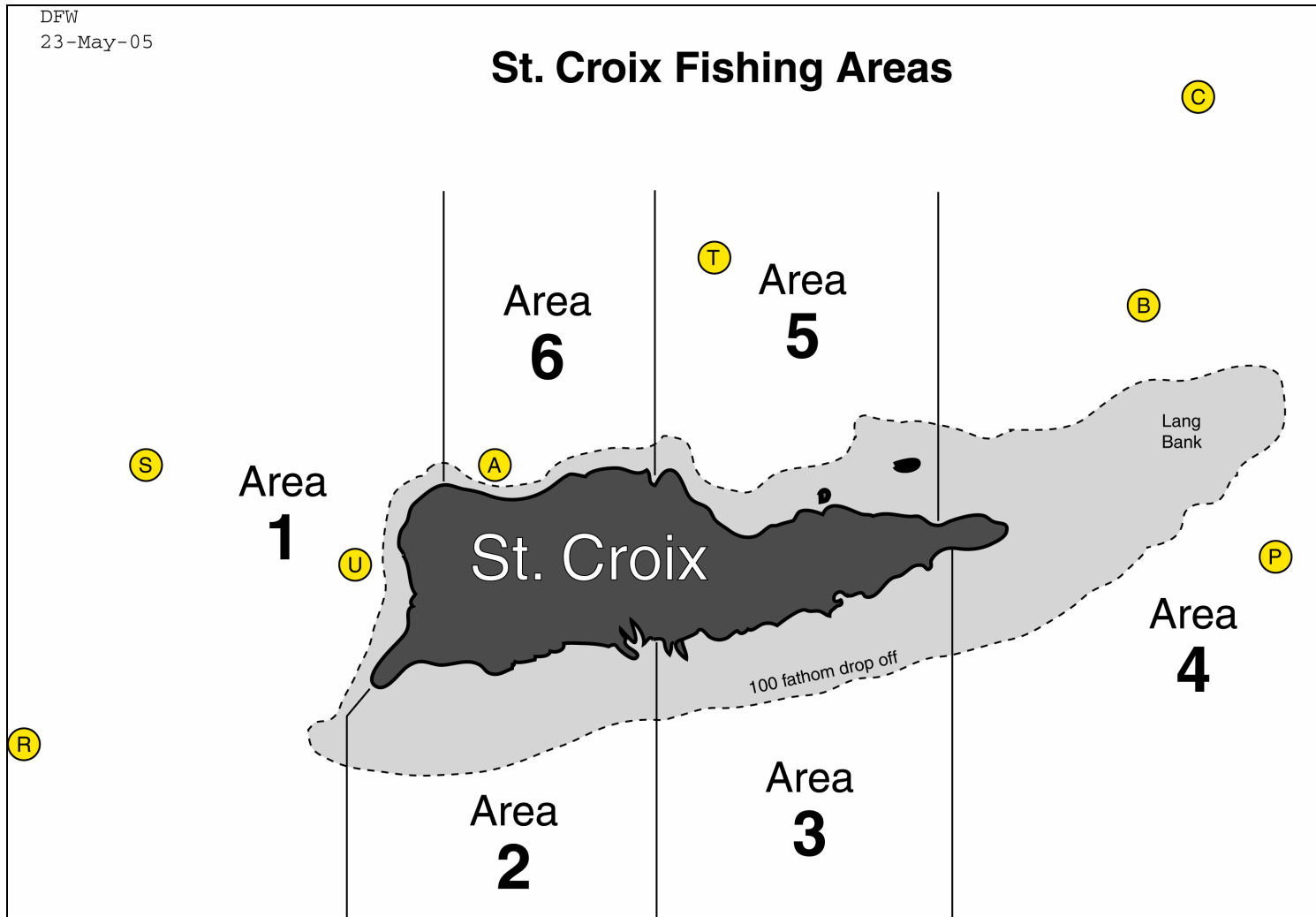


Figure 4. Fishing effort (number of boats and number of anglers) at offshore pelagic tournaments, FY01 to FY05. **A.** St. Thomas and **B.** St. Croix

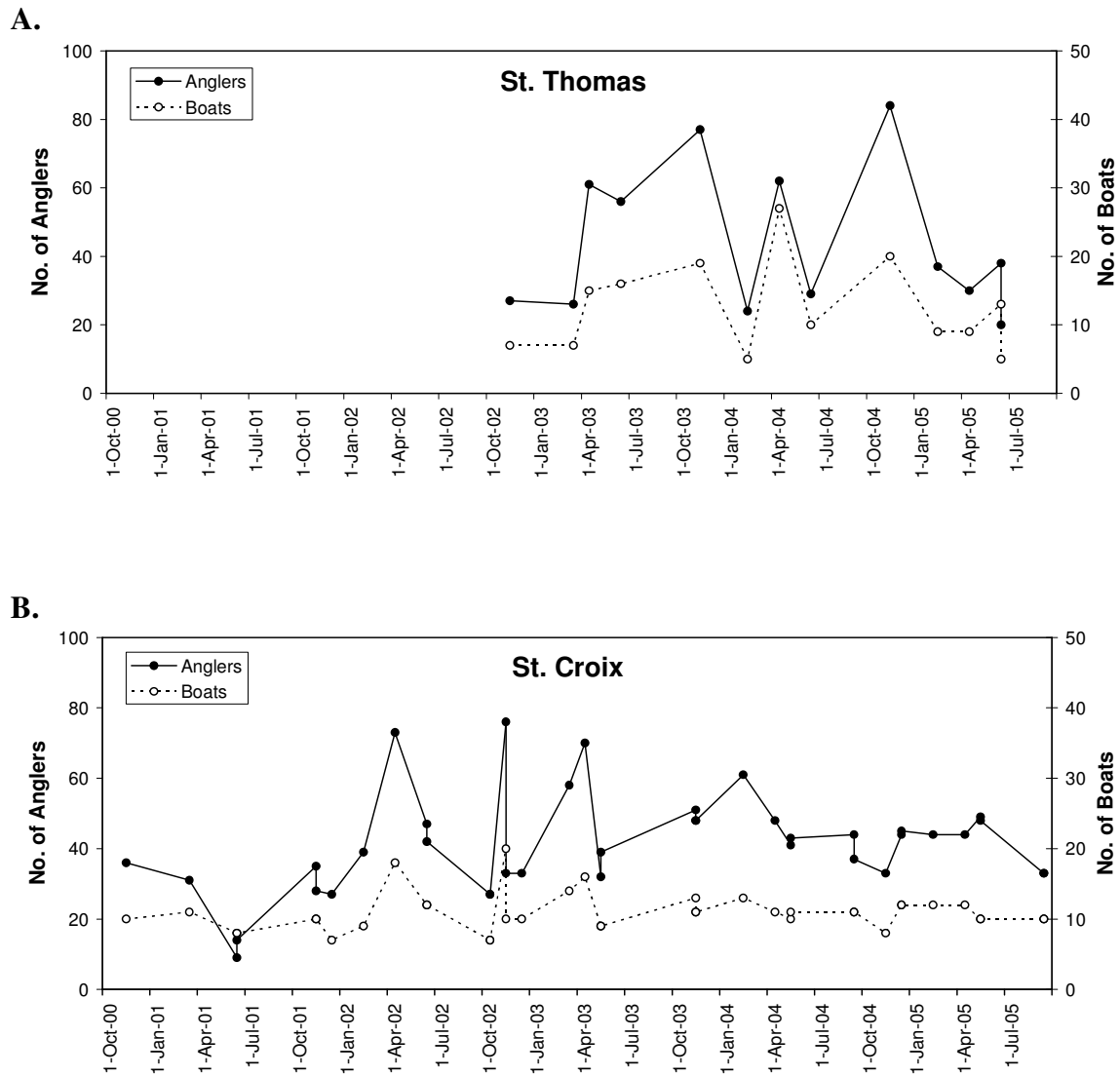
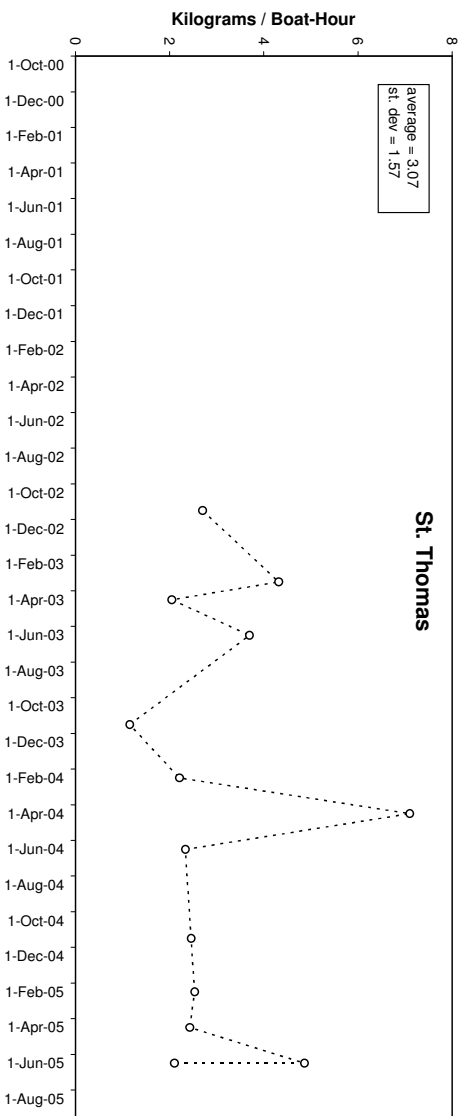


Figure 5. Catch rates at offshore pelagic tournaments, FY01 to FY05. **A.** St. Thomas and **B.** St. Croix.

A.



B.

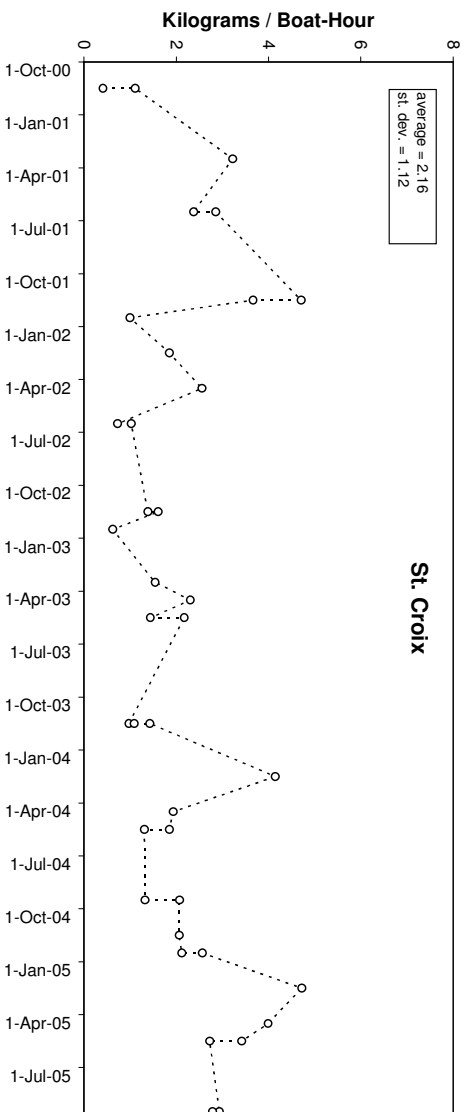


Figure 6. Distribution of fishing effort among areas in St. Croix tournaments, FY01 to FY05. Map (lower inset) shows St. Croix areas.

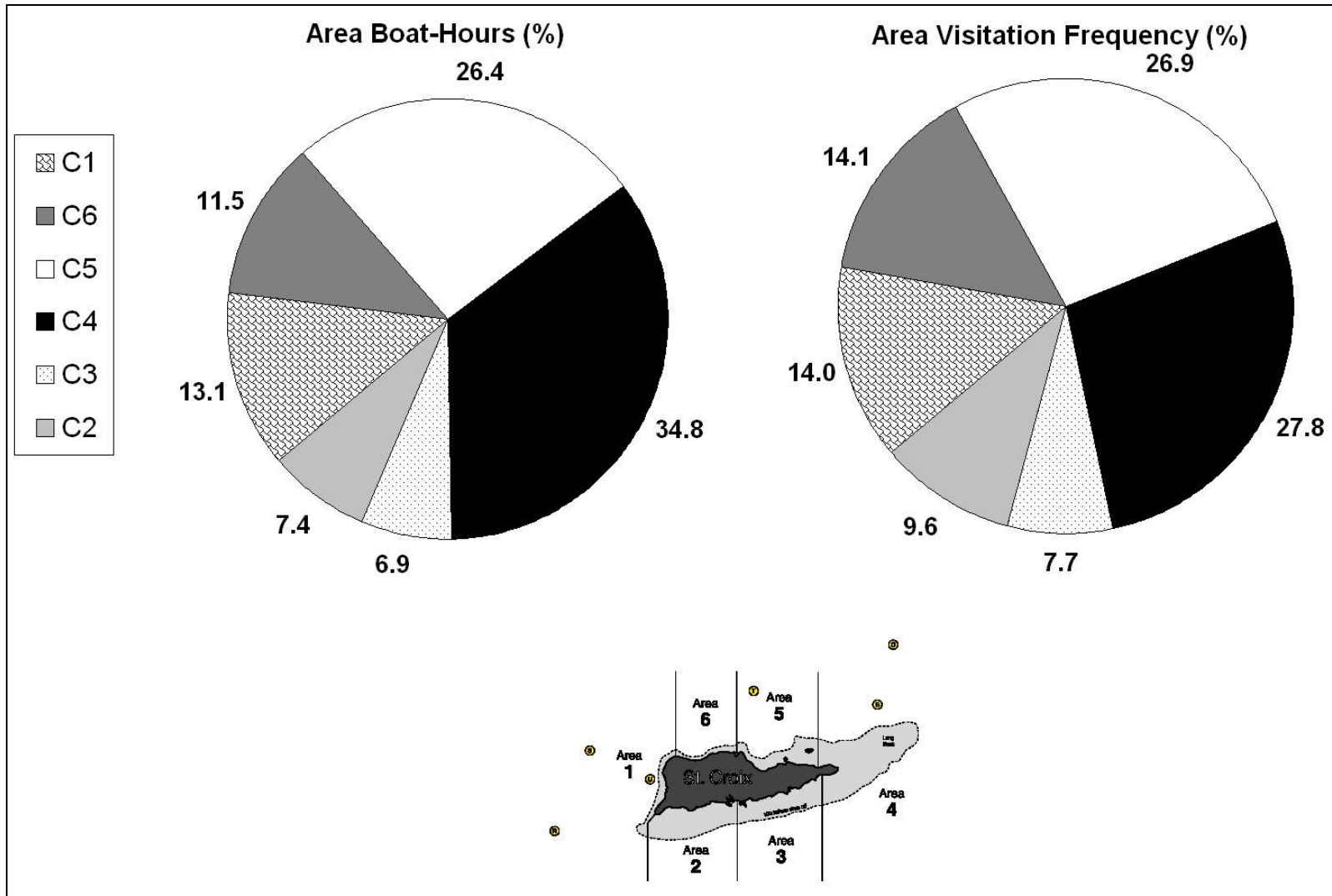


Figure 7. Weight distribution of dolphin landed in St. Thomas offshore pelagic tournaments, FY03 to FY05.

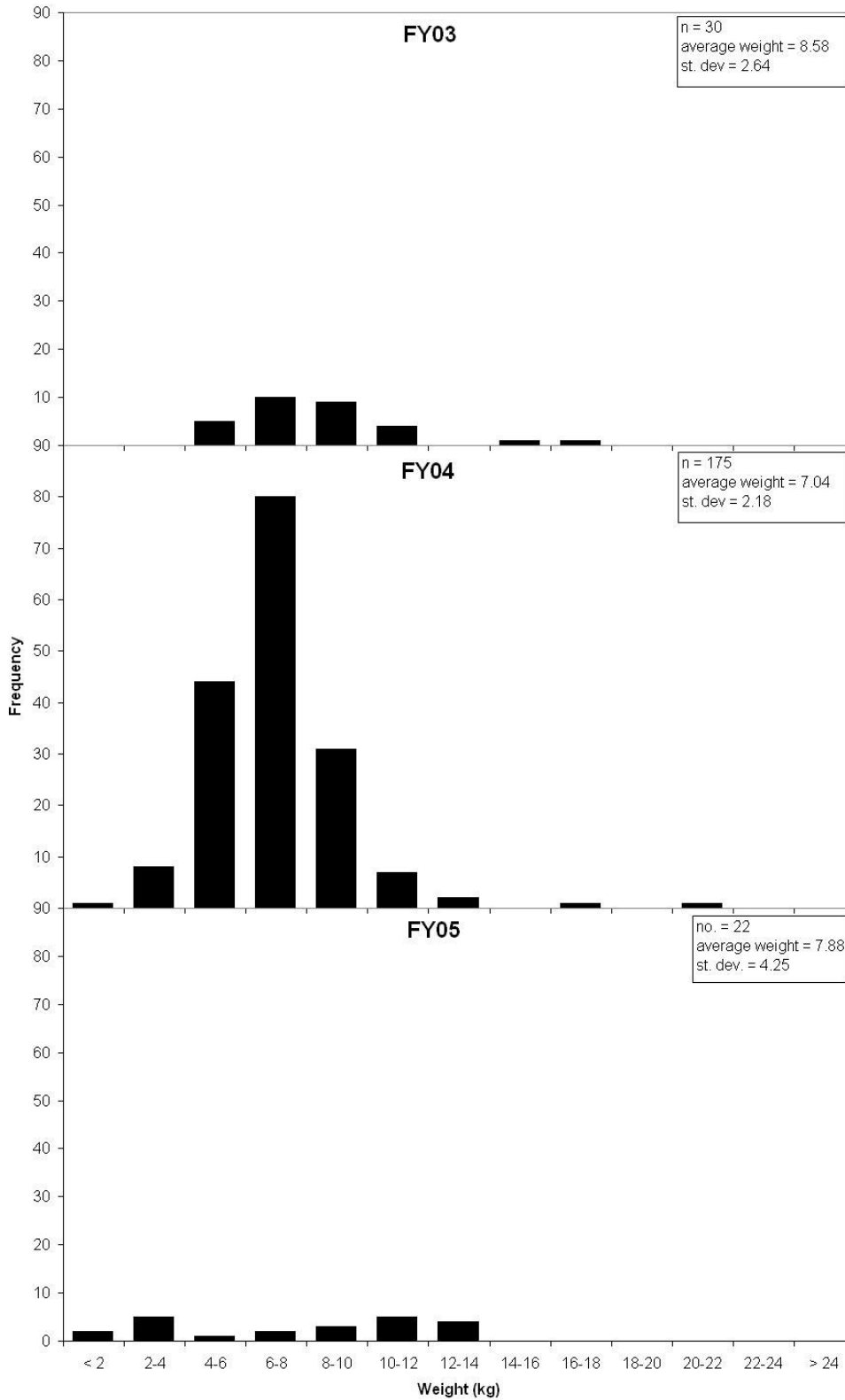


Figure 8. Weight distribution of wahoo landed in St. Thomas offshore pelagic tournaments, FY03 to FY05.

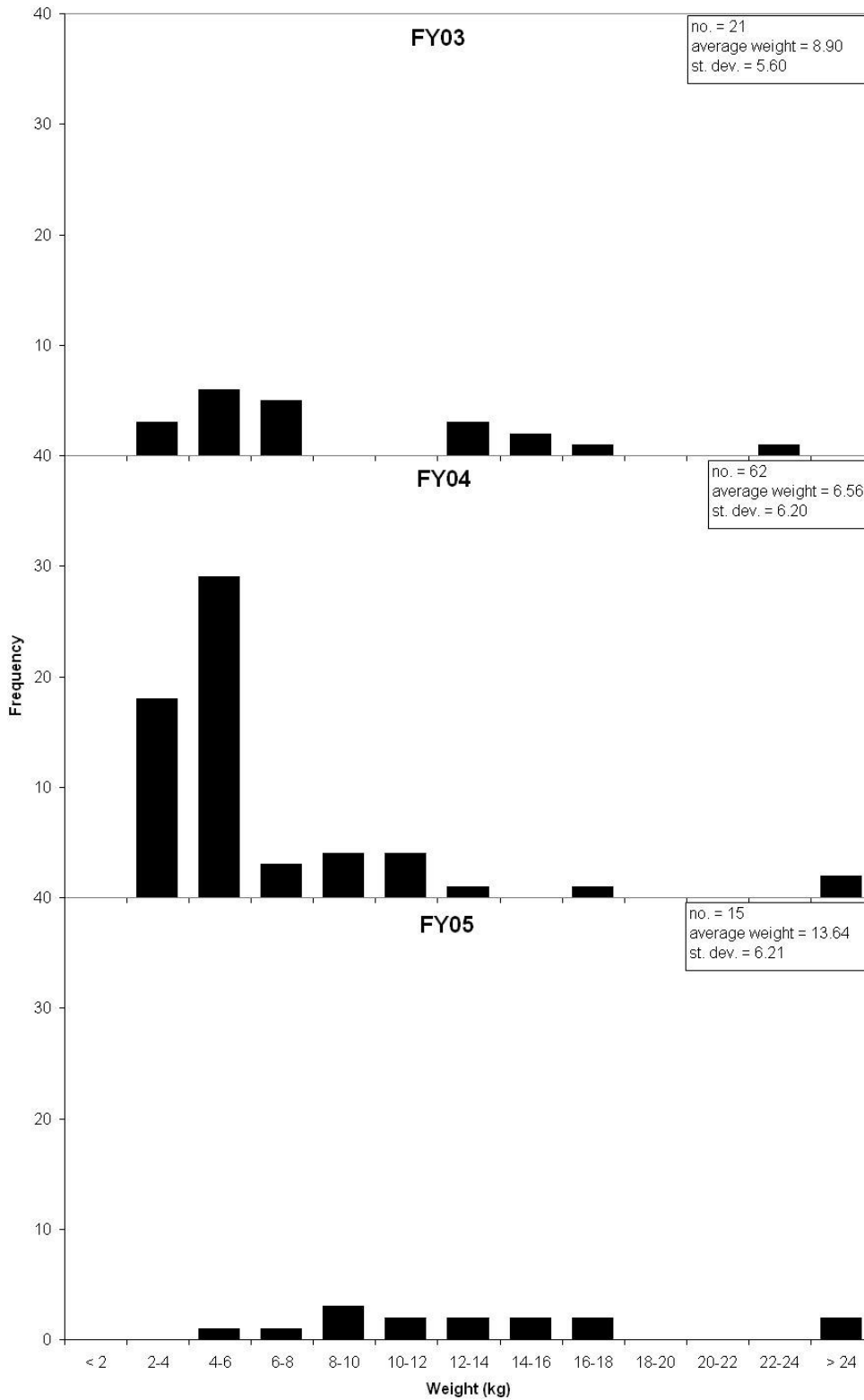


Figure 9. Weight distribution of barracuda landed in St. Thomas offshore pelagic tournaments, FY03 to FY05.

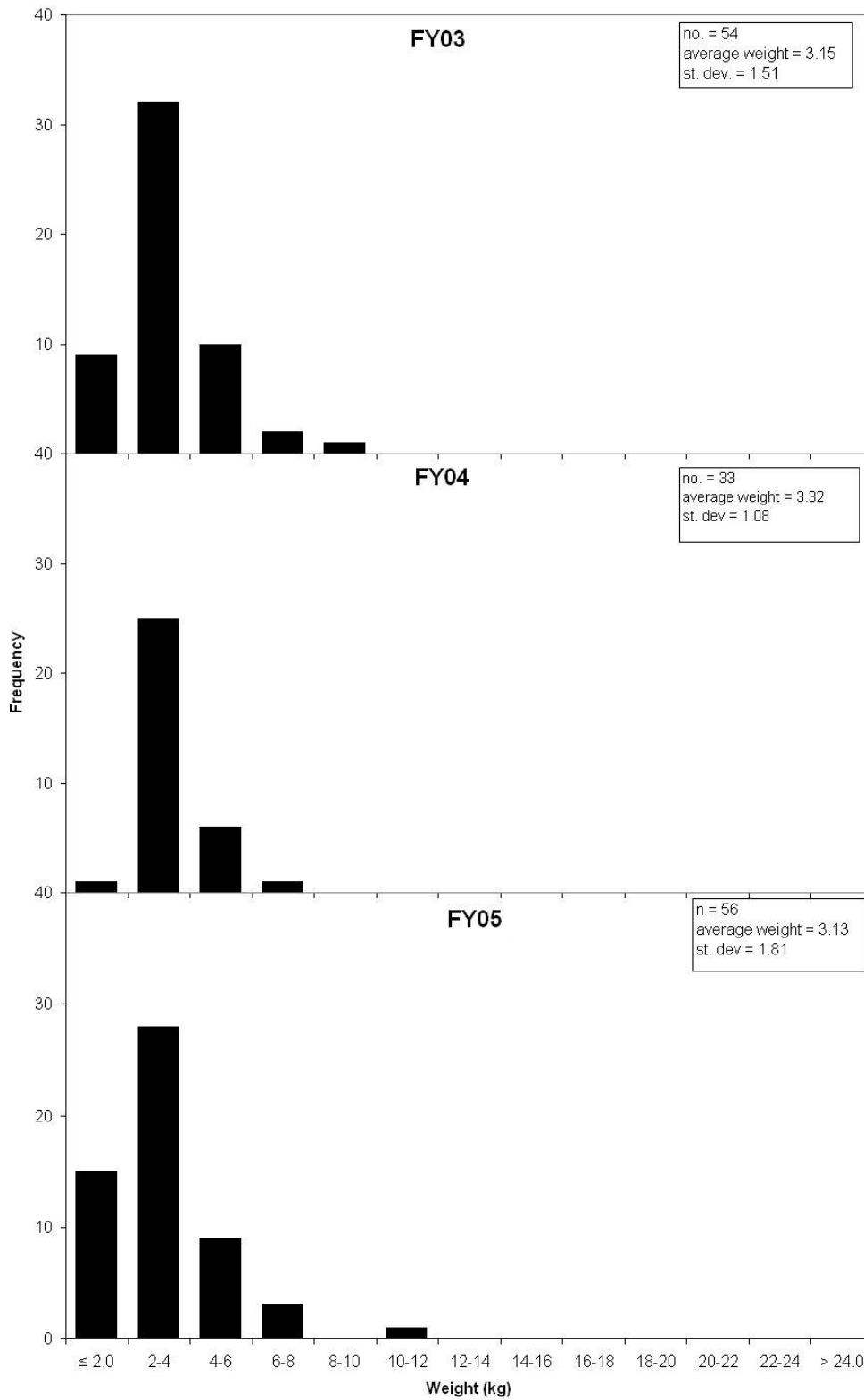


Figure 10. Weight distribution of dolphin landed in St. Croix offshore pelagic tournaments, FY01 to FY05.

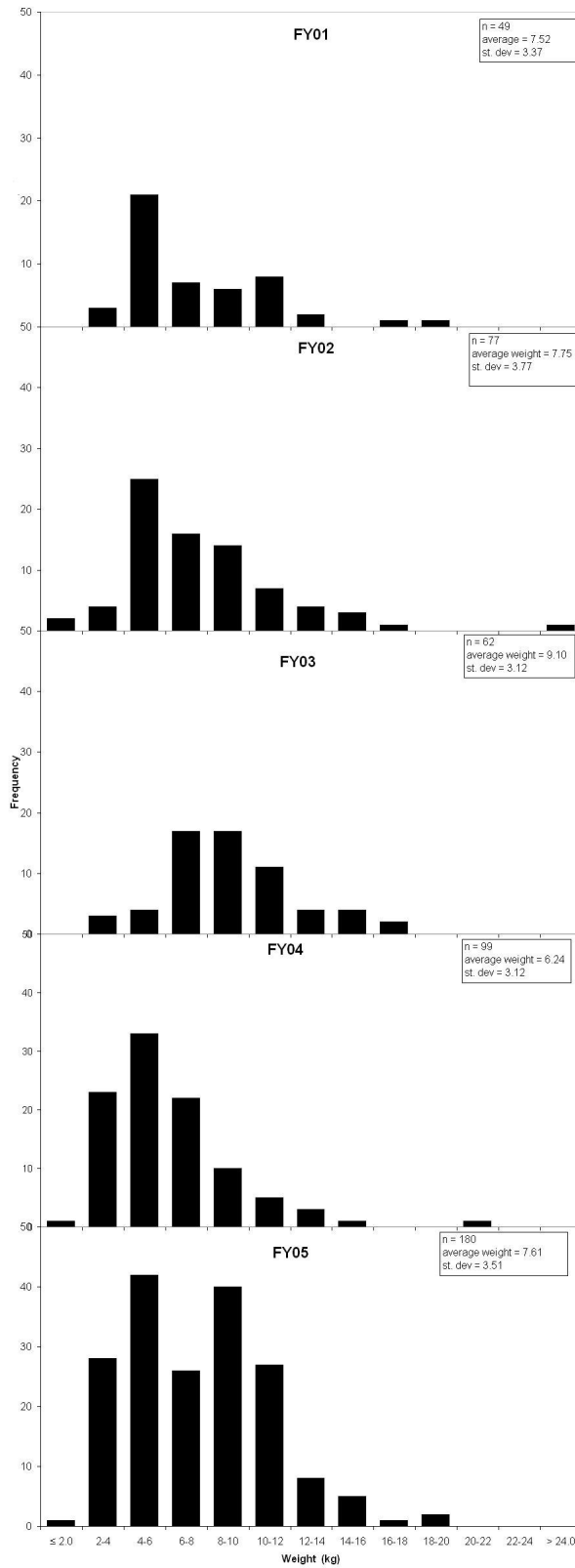


Figure 11. Weight distribution of wahoo landed in St. Croix offshore pelagic tournaments, FY01 to FY05.

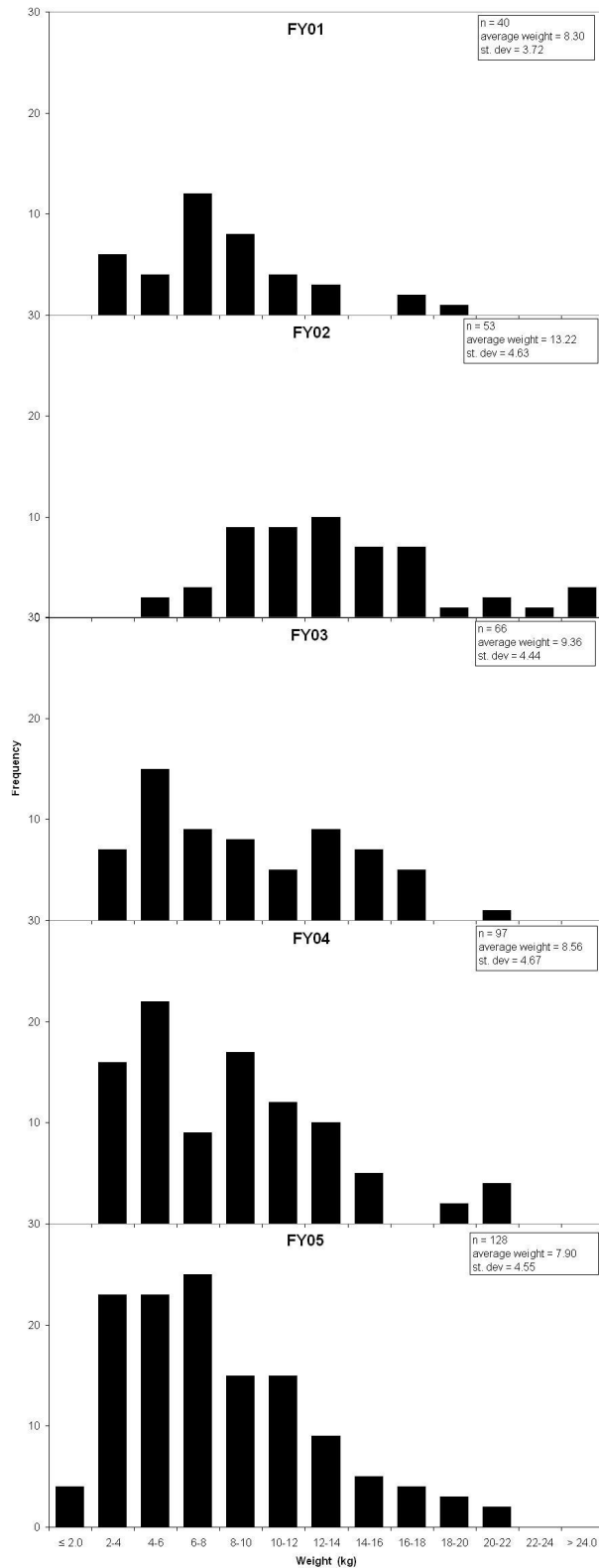
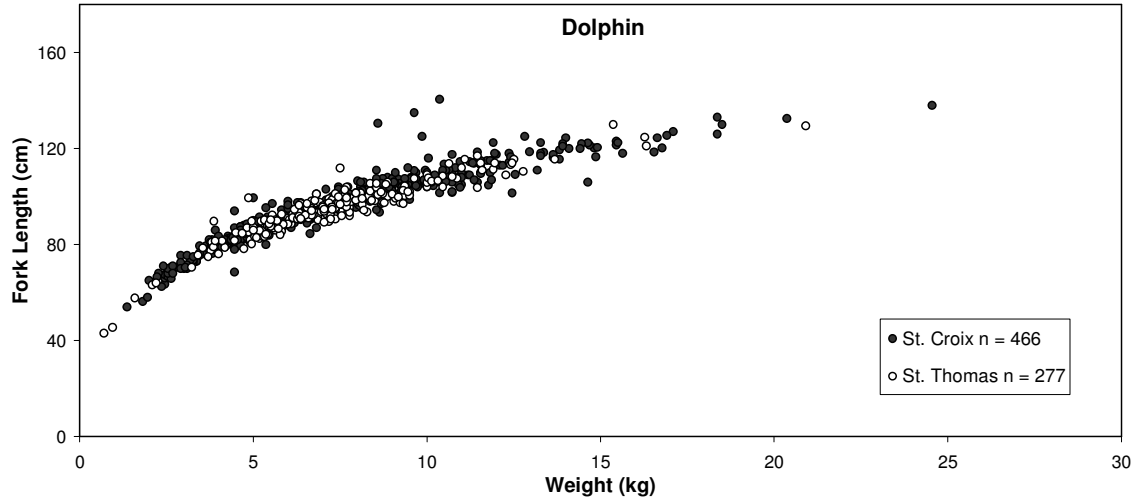


Figure 12. Length-weight relationships for the two predominant fish species landed in USVI offshore pelagic tournaments, FY01 to FY05. **A.** Dolphin and **B.** Wahoo.

A.



B.

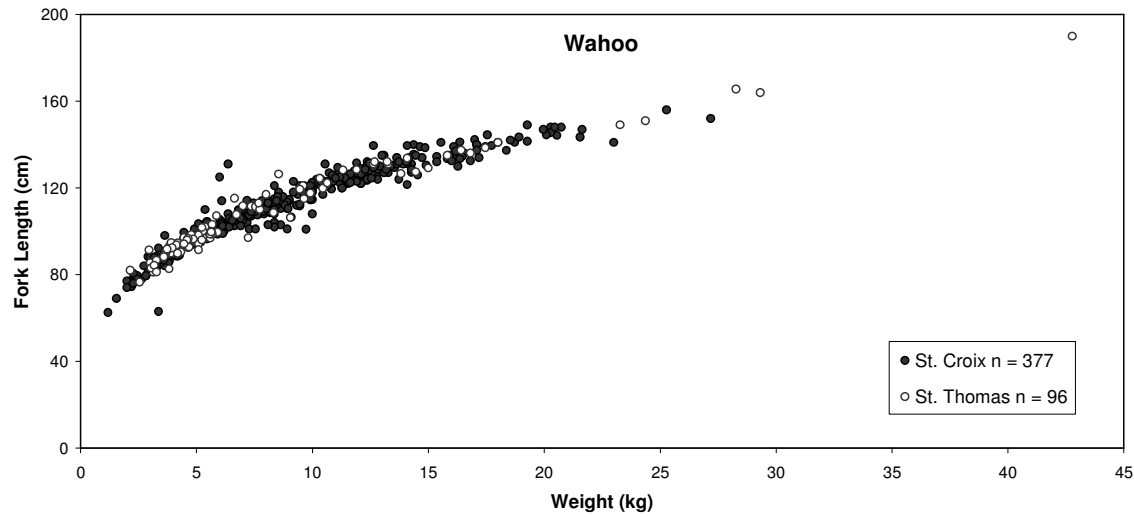
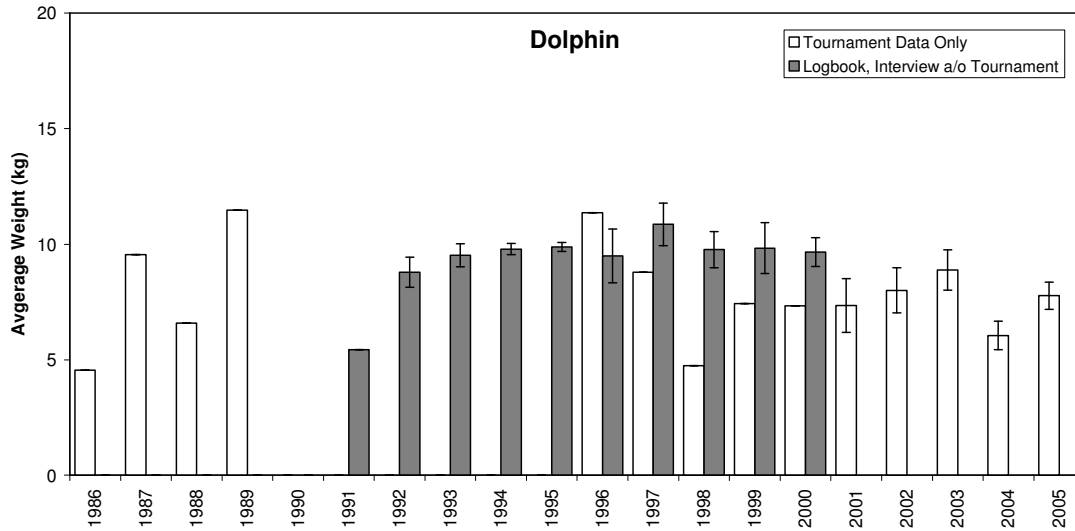
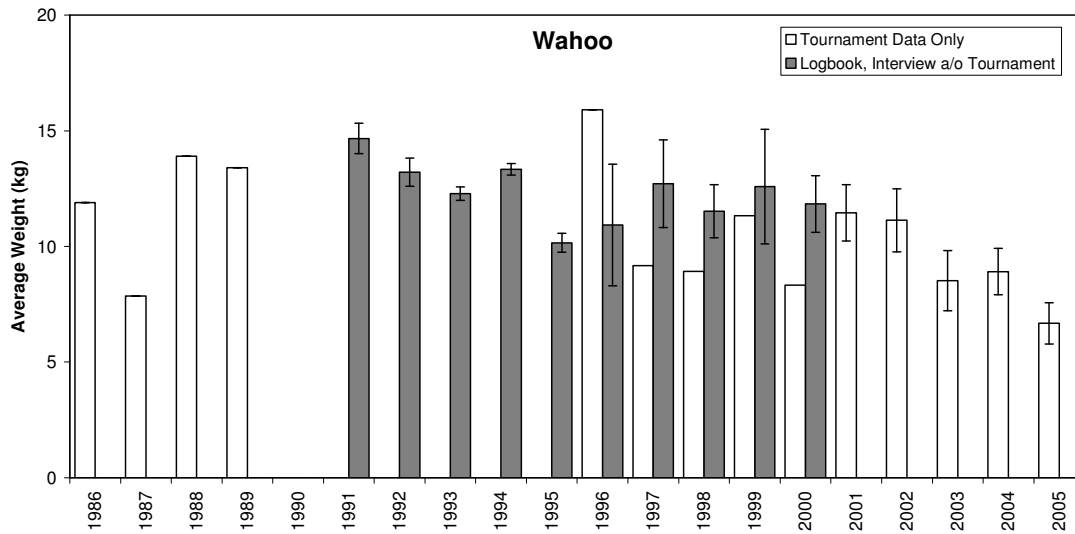


Figure 13. Long-term trends in average landing size of dolphin and wahoo by recreational fishers on St. Croix. **A. Dolphin** and **B. Wahoo**. Error bars show SEM. Data sources and time intervals were as follows: 1986 to 1990 (Tobias 1991); 1991 to 1995 (Adams 1996); 1996 to 2000 (Mateo 2000), 2001 to 2005 (the present study). Data from 1985 were excluded due to limited sample sizes.

A.



B.



Appendix 1. Trip information form used at St. Thomas sportfishing tournaments.

RECREATIONAL TOURNAMENT (S) EFFORT SHEET

Vessel Name	Boat Length	Area Fished	FAD #	# Lines	# Anglers	Hours Fished		

* Get list of registered boats and anglers from committee

Appendix 2. Trip information form used at St. Croix sportfishing tournaments.

SPORTFISHING TOURNAMENT DATA FORM
Division of Fish and Wildlife
U. S. Virgin Islands

**5th Annual Golden Hook Dolphin Tournament
Sunday, February 29th, 2004**

VESSEL INFORMATION

Vessel Name: _____ ID #: _____
Captain: _____ Vessel Length: _____
Home Port: _____ Number of anglers: _____

EFFORT INFORMATION

Actual hours fished: _____ Number of lines fished: _____
Area(s) fished: _____ FAD# _____ Trip Hours: _____

CATCH INFORMATION

	Species	Length (mm)	Weight (lbs)	Sex
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				

Total Number of Fish: _____ Total Weight (lbs): _____

Weigh-Master _____

Appendix 3. Detailed data for St. Thomas offshore pelagic tournaments, FY01 to FY05*.

Year	Date	Tournament Name	Total No.	Total No.	Total No.	Avg Boat	Total No.	Wahoo		Dolphin		Barracuda		Other		Total		CPUE
			of Boats	of Anglers	of Lines	Length (ft)	Boat-Hours	No.	Wt.(kg)	No.	Wt.(kg)	No.	Wt.(kg)	No.	Wt.(kg)	No.	Wt.(kg)	(kg/boat-hour)
2002	Nov. 17	Wahoo Wind-Up	7	27	31	ND	51.5	17	139.0	-	-	-	-	-	-	17	139.0	2.70
2003	Mar 2	Couple's	7	26	30	ND	37.5	2	36.5	4	32.2	9	29.5	11	63.7	26	161.8	4.32
2003	Apr 27	Dolphin Derby	15	61	57	ND	117.5	2	11.1	26	224.8	-	-	1	4.3	29	240.1	2.04
2003	Jun 8	Father's Day ¹	16	56	45	21.5	80.5	-	-	-	-	45	140.2	59	157.1	104	297.3	3.69
2003	Nov 9	Wahoo Wind-Up ²	19	77	45	34.4	176.3	15	182.0	1	20.9	-	-	-	-	16	202.8	1.15
2004	Feb 22	Couple's	5	24	24	24.6	26.8	-	-	2	15.6	9	32.5	3	11.0	14	59.1	2.21
2004	Apr 4	Dolphin Derby ³	27	62	64	32.3	201.1	47	224.0	173	1193.3	-	-	4	9.4	224	1426.7	7.09
2004	Jun 7	Father's Day ⁴	10	29	33	ND	65.5	-	-	-	-	24	76.7	19	76.1	43	152.8	2.33
2004	Nov 7	Wahoo Wind-Up ⁵	20	84	42	ND	77.8	14	191.0	-	-	-	-	-	-	14	191.0	2.46
2005	Feb 13	Couple's ⁶	9	37	36	33.8	45.0	-	-	8	23.1	4	10.8	29	80.0	41	113.9	2.53
2005	Apr 24	Dolphin Derby ⁷	9	30	32	30.5	61.7	-	-	14	149.8	-	-	-	-	14	149.8	2.43
2005	Jun 5	Father's Day	13	38	38	22.1	65.5	-	-	-	-	52	164.3	41	154.0	93	318.2	4.86
2005	Jun 26	June Moon	5	20	25	35.7	34.0	1	13.2	-	-	-	-	12	58.3	13	71.5	2.10
Total = 13 tournament			12.92	45.33	39.25	29.4	989.2	98	796.7	228	1659.7	143	454.0	179	613.8	648	3524.3	3.07

* Data from November 2000 to August 2002 not available.

¹ Trip information missing for two boats.

² Trip information missing for two boats and hours fished was missing for 10 boats.

³ Trip information missing for 13 boats.

⁴ Incomplete trip information for 6 boats.

⁵ Trip information missing for 10 boats.

⁶ Trip information was missing for 1 boat.

⁷ Trip information was missing for 2 boats.

ND = Not Determined. Average boat length was not calculated when information was obtained from ≤ 50 % of participating boats.

Appendix 4. Detailed data for St. Croix offshore pelagic tournaments, FY01 to FY05

Year	Date	Tournament Name	Total No. of Boats	Total No. of Anglers	Total No. of Lines	Avg Boat Length (ft)	Total No. Boat-Hours	Wahoo		Dolphin		Other		Total Landings		CPUE (kg/boat-hour)
								No.	Wt.(kg)	No.	Wt.(kg)	No.	Wt. (kg)	No.	Wt. (kg)	
2000	Nov 18	Day 1-GHFC Wahoo ¹	10	36	41	32.9	90.0	-	-	3	22.0	3	14.9	6	36.9	0.41
2000	Nov 19	Day 2-GHFC Wahoo ¹	10	40	43	32.9	90.0	6	40.3	4	34.8	10	24.6	20	99.7	1.11
2001	Mar 4	GHFC Dolphin ²	11	31	20	32.6	99.0	10	71.8	34	231.2	2	15.8	46	318.8	3.22
2001	Jun 2	Day 1-GHFC Guys/Gals Shootout ³	8	9	25	32.8	64.0	9	71.0	4	39.4	2	14.5	15	124.9	1.95
2001	Jun 3	Day 2-GHFC Guys/Gals Shootout ⁴	8	14	23	32.8	64.0	16	142.2	4	40.3	-	-	20	182.5	2.85
2001	Nov 17	Day 1-GHFC Wahoo ¹	10	35	31	33.5	70.0	22	324.6	1	4.5	-	-	23	329.1	4.70
2001	Nov 18	Day 2-GHFC Wahoo ⁵	10	28	26	33.5	70.0	20	256.4	-	-	-	-	20	256.4	3.66
2001	Dec 9	Wahoo Wind-up	7	27	29	38.0	56.0	4	51.1	1	4.5	-	-	5	55.6	0.99
2002	Feb 23	GHFC Dolphin	9	39	41	31.9	81.0	1	10.0	22	139.7	-	-	23	149.7	1.85
2002	Apr 21	Offshore Marine Dolphin Derby	18	73	80	34.2	153.0	1	7.6	45	358.6	-	-	46	366.2	2.39
2002	Jun 8	Day 1-GHFC Guy/Gal Reel Challenge	12	47	57	33.9	95.5	-	-	6	62.8	1	6.7	7	69.5	0.73
2002	Jun 9	Day 2-GHFC Guy/Gal Reel Challenge	12	42	57	33.9	96.0	5	49.8	3	30.0	4	18.3	12	98.2	1.02
2002	Nov 17	Wahoo Wind-up	20	76	87	32.8	183.0	22	243.6	-	-	2	9.8	24	253.4	1.38
2002	Nov 30	Day 1-GHFC Wahoo	10	33	46	31.4	89.0	12	142.8	-	-	-	-	12	142.8	1.60
2002	Dec 1	Day 2-GHFC Wahoo	10	33	46	31.4	89.5	2	23.9	2	31.9	-	-	4	55.8	0.62
2003	Mar 9	GHFC Dolphin	14	58	65	32.6	118.5	17	104.2	10	78.5	-	-	27	182.7	1.54
2003	Apr 27	Offshore Marine Dolphin Derby	16	70	69.5	35.6	132.5	2	9.1	33	296.1	-	-	35	305.2	2.30
2003	May 17	Day 1-GHFC Guy/Gal Reel Challenge	9	32	41	33.6	72.0	3	24.1	9	79.2	-	-	12	103.3	1.44
2003	May 18	Day 2-GHFC Guy/Gal Reel Challenge	9	39	41	33.6	72.0	8	68.9	8	77.4	1	9.9	17	156.1	2.17
2003	Nov 9	Wahoo Wind-Up	13	51	58	31.4	119.5	7	68.3	2	29.2	1	18.5	10	115.9	0.97
2003	Nov 22	Day 1-GHFC Series Finale	11	48	51	31.2	86.0	7	71.4	4	22.1	-	-	11	93.5	1.09
2003	Nov 23	Day 2-GHFC Series Finale	11	48	51	31.2	88.0	8	96.1	3	29.3	-	-	11	125.4	1.42
2004	Feb 4	GHFC Dolphin	13	61	61	31.8	100.5	14	100.8	53	315.4	-	-	67	416.2	4.14
2004	Apr 4	Offshore Marine Dolphin Derby	11	48	49	32.4	91.5	11	47.0	20	130.0	-	-	31	177.0	1.93
2004	May 29	Day 1-VIGFC Memorial Weekend	10	41	46	36.2	80.5	7	93.3	4	38.3	6	17.4	17	149.0	1.85
2004	May 30	Day 2-VIGFC Memorial Weekend	11	43	51	36.2	70.3	9	88.6	-	-	1	3.1	10	91.7	1.31
2004	Sep 25	Day 1-Guy/Gal Reel Challenge	11	44	51	32.3	88.0	13	78.8	10	37.3	-	-	23	116.1	1.32
2004	Sep 26	Day 2-Guy/Gal Reel Challenge	11	37	52	32.3	88.0	21	184.3	3	14.4	-	-	24	198.7	2.26
2004	Nov 7	Wahoo Wind-Up	8	33	36	33.4	65.6	8	92.7	3	18.3	1	24.3	12	135.3	2.06
2004	Dec 4	Day 1-GHFC Series Finale	12	44	54	30.6	95.0	15	137.8	9	58.2	1	5.1	25	201.1	2.12
2004	Dec 5	Day 2-GHFC Series Finale	12	45	54	30.6	95.5	14	173.0	9	58.1	5	13.5	28	244.6	2.56
2005	Feb 20	GHFC Dolphin	12	44	51	30.7	96.5	4	29.8	69	434.5	-	-	73	464.3	4.81
2005	Apr 24	Dolphin Derby	11	44	47	30.2	88.0	12	74.5	36	276.2	-	-	48	350.7	3.98
2005	May 28	Day 1-Memorial Day Weekend ⁴	15	49	71	34.9	114.3	12	92.6	28	288.9	4	9.0	44	390.5	3.42
2005	May 29	Day 2-Memorial Day Weekend ⁴	15	48	57	34.9	105.0	13	81.9	20	204.0	-	-	33	285.9	2.72
2005	Sep 17	Day 1-Guy/Gal Reel Challenge	10	33	45	33.1	80.0	20	155.9	1	3.8	4	74.7	25	234.4	2.93
2005	Sep 18	Day 2-Guy/Gal Reel Challenge	10	33	46	33.1	80.0	30	171.4	5	25.6	2	25.7	37	222.6	2.78
Total = 37 tournament days			11.4	42.1	48.6	33.0	3417.2	385	3479.5	468	3514.5	50	305.7	903	7299.7	2.15

¹ Information on boat length for one boat missing.

² Information on number of lines fished for six boats and number of anglers for one boat missing.

³ Trip information for 2 boats missing.

⁴ Trip information for 3 boats missing.

⁵ Information on number of lines fished for five boats and number of anglers for two boats missing