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Preliminary catches of hammerhead sharks in the U.S. Atlantic, Gulf of Mexico, and Caribbean

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ABSTRACT

This document presents commercial landings and recreational catch estimates of hammerhead sharks (*Sphyrna lewini, S. mokarran, S. zygaena, and Sphyrna* spp.) in the U.S. Atlantic and Gulf of Mexico coasts for 1981-2020. Commercial dead discards from the pelagic longline fishery are also presented along with Mexican landings from the Gulf of Mexico and available landings from Puerto Rico and the U.S. Virgin Islands. Information on the geographical distribution of both commercial landings and recreational catches is presented along with gear-specific information of commercial landings and information on recreational catches by fishing mode and fishing area. Length composition information from recreational sources is also presented.

KEYWORDS

Catch, Landings, Discards, Commercial fishing, Long lining, Shark fisheries, Bycatch, Observer programs, Hammerhead sharks, Sphyrna lewini, S. mokarran, S. zygaena

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1. Background

Preliminary commercial and recreational catch series are presented in preparation for the SEDAR 77 Data Workshop. Mexican landings from the Gulf of Mexico and available landings from Puerto Rico are also presented. Information on the geographical distribution (state of landing) and gear-specific information of commercial landings (by major gear groups), as well as recreational catches by state, fishing mode, and fishing area is presented. Length-frequency distributions from several recreational sources are also compiled and analyzed.

2. Catch streams

2.1. Commercial landings

U.S. commercial landings in weight were available for the period 1991-2020. These data were gathered from two different sources over the time series. Commercial landings for 1991-2013 come from the FINS database, which includes Atlantic Coastal Cooperative Statistics Program (ACCSP) and Gulf Fisheries Information Network (GulfFIN) landings, from the Atlantic and Gulf of Mexico regions, respectively. Landings for 2014-2020 come from the NOAA Fisheries Highly Migratory Species commercial landings (eDealer) database.

In addition to the above databases, landings for Puerto Rico and the U.S. Virgin Islands were also gathered from the Accumulated Landings System (ALS) database for 1987-2011 and the Caribbean Commercial Vessel Logbook database for 2012-2020. Mexican landings of hammerhead sharks in the Gulf of Mexico were reconstructed based on a near-census of landings at fishing camps in the states of Tamaulipas, Veracruz, Tabasco, and Campeche conducted during approximately one year from November 1993 to December 1994 (see section below).

Reported landings of unclassified sharks were apportioned to scalloped, great, smooth, and unclassified hammerheads based on year, state, gear, and area fished whenever possible; year, state and gear; year and state; or only state depending on availability. Unclassified hammerheads were then apportioned to the different species (scalloped, great, or smooth hammerhead) based on the proportions of these three species in the FINS database during 1991-2020 (the average proportion for the entire period was used because proportions fluctuated widely from year to year and some years had no observations). For gear-specific landings, unclassified hammerheads were apportioned to the different species based on the average proportions of the three species in the main gears (bottom longlines, gillnets, and lines) during the same period.

Commercial landings in numbers were calculated by dividing annual landings in weight by average weights from the Southeast Gillnet Observer Program (GNOP) and the Reef Fish and Shark Bottom Longline Observer Programs (collectively referred to as BLLOP

hereforth) as appropriate. All weights from the GNOP and BLLOP were predicted from fork length measurements taken by observers in gillnet and longline fisheries, respectively, using a weight-length regression. Since there were no observations of sharks caught on hook and line/hand line fisheries, average weights for hook and line/hand lines were assumed equal to those from the bottom longline fishery.

Scalloped hammerhead, all regions—Total commercial landings of scalloped hammerhead sharks peaked during the early 1990s, remained below 100,000 pounds dressed weight (lb dw) after 2005, and below 40,000 lb dw after 2012 (**Table 1; Figure 1, top**). Commercial landings by gear were dominated by longlines when accounting for both unclassified sharks apportioned to the three hammerhead species and unclassified hammerheads *and* unclassified hammerheads apportioned to the three hammerhead species (**Table 1; Figure 1, bottom**).

Commercial landings by gear from FINS for 1991-2020 (accounting only for unclassified sharks apportioned to be scalloped hammerheads) were dominated by longlines (60%) and gillnets (26%), with hook & line accounting for 10% of the total (**Figure 2, top**). The relative importance of longlines and gillnets alternated through time but was generally higher for longlines (**Figure 2, bottom**).

Landings by state were dominated by Florida (62%; 29% on the west coast, 33% on the east coast), followed by North Carolina (21%) and Louisiana (13%) (**Figure 3, top**), with Florida dominating through time during most of 1991-2015 and North Carolina and Louisiana becoming more important thereafter (**Figure 3, bottom**).

Average weights were available for 2002-2020 from the GNOP and for 1993-2020 from the BLLOP. For the GNOP, the average weight for 1981-2001 was taken as the mean for the entire time series of data (2002-2020); for the BLLOP, the average weight for 1981-1992 was taken as the average for the entire time series of data (1993-2020) owing to high interannual variability in average weights in both cases. Individual weights were obtained from individual fork lengths using the sex-specific weight-to-length regressions given in SEDAR 77-DW03.

Tables 1 and 2 show commercial landings by gear, dead discard estimates from the pelagic longline fishery, total catch, and total combined landings (not disaggregated into the three main gear types) in weight (lb dw) and numbers, respectively.

Scalloped hammerhead GOM—Total commercial landings of scalloped hammerhead sharks in the Gulf of Mexico peaked at 63,000 lb dw during the mid-2000s, but remained below that level for the rest of the entire time series (**Table 3; Figure 4, top**). Commercial landings by gear were dominated by longlines and hand lines when accounting for both unclassified sharks apportioned to the three hammerhead species and unclassified hammerheads *and* unclassified hammerheads apportioned to the three hammerhead species (**Table 3; Figure 4, bottom**).

Commercial landings by gear from FINS for 1991-2020 (accounting only for unclassified sharks apportioned to be GOM scalloped hammerheads) were dominated by longlines (76%) and hand lines (23%), with gillnets accounting for less than 1% (**Figure 5, top**). Longlines

were the dominant gear in all years except for 2018 and 2020 when hand lines had a higher contribution (**Figure 5, bottom**).

Landings by state were dominated by Florida (66%), followed by Louisiana (30%) and Alabama to a lesser extent (4%) (**Figure 6, top**), with Florida dominating throughout the entire time series with the exception of higher landings in Louisiana in 2018 and 2020 (**Figure 6, bottom**).

Average weights were available for 2002-2020 from the GNOP and for 1994-2020 from the BLLOP. For the GNOP, the average weight for 1981-2001 was taken as the mean for the entire time series of data (2002-2020); for the BLLOP, the average weight for 1981-1993 was taken as the average for the entire time series of data (1994-2020) owing to high interannual variability in average weights in both cases. Individual weights were obtained from individual fork lengths using the sex-specific weight-to-length regressions given in SEDAR 77-DW03 (for GOM and ATL combined).

Tables 3 and 4 show commercial landings by gear, dead discard estimates from the pelagic longline fishery, total catch, and total combined landings (not disaggregated into the three main gear types) in weight (lb dw) and numbers, respectively.

Scalloped hammerhead ATL—Total commercial landings of scalloped hammerhead sharks in the Atlantic peaked at over 460,000 lb dw in the mid-1990s, but remained below 41,000 lb dw after 1996 (**Table 5; Figure 7, top**). Commercial landings by gear were dominated by longlines when accounting for both unclassified sharks apportioned to the three hammerhead species and unclassified hammerheads *and* unclassified hammerheads apportioned to the three hammerhead species (**Table 5; Figure 7, bottom**).

Commercial landings by gear from FINS for 1991-2020 (accounting only for unclassified sharks apportioned to be ATL scalloped hammerheads) were almost equally represented by longlines (46%) and gillnets (47%), with hook and line accounting for the remaining 7% (**Figure 8, top**). Longlines and gillnets alternated in importance throughout the time series (**Figure 8, bottom**).

Landings by state were dominated by Florida (59%) and North Carolina (39%) (**Figure 9, top**), with Florida being the main state of landings in most years up to 2015 after which North Carolina became the main sate of landings (**Figure 9, bottom**).

Average weights were available for 2002-2020 from the GNOP and for 1993-2020 from the BLLOP. For the GNOP, the average weight for 1981-2001 was taken as the mean for the entire time series of data (2002-2020); for the BLLOP, the average weight for 1981-1992 was taken as the average for the entire time series of data (1993-2020) owing to high interannual variability in average weights in both cases. Individual weights were obtained from individual fork lengths using the sex-specific weight-to-length regressions given in SEDAR 77-DW03 (for GOM and ATL combined).

Tables 5 and 6 show commercial landings by gear, dead discard estimates from the pelagic longline fishery, total catch, and total combined landings (not disaggregated into the three main gear types) in weight (lb dw) and numbers, respectively.

Great hammerhead—Total commercial landings of great hammerheads peaked at over 400,000 lb dw in the mid-1990s, but remained at less than 85,000 lb dw since 1997 (**Table 7; Figure 10, top**). Commercial landings by gear were dominated by longlines when accounting for both unclassified sharks apportioned to the three hammerhead species and unclassified hammerheads *and* unclassified hammerheads apportioned to the three hammerhead species (**Table 7; Figure 10, bottom**).

Commercial landings by gear from the ACCSP for 1991-2020 (accounting only for unclassified sharks apportioned to be great hammerheads) were dominated by longlines (57%), followed by gillnets (42%), with hook and line making up the remaining 1% (**Figure 11, top**). The relative importance of longlines and gillnets varied slightly through time (**Figure 11, bottom**).

Landings by state were dominated by Florida (50%; 42% on the west coast, 8% on the east coast), closely followed by North Carolina (40%), with some landings from Alabama (7%) (**Figure 12, top**). Alabama accounted for all landings in 2005-2011 and Florida and North Carolina consistently dominated the landings since 2012 (**Figure 12, bottom**).

Average weights were only available for 2002, 2003, and 2020 from the GNOP and for 1993-2020 from the BLLOP. For the GNOP, the average weight for all remaining years was taken as the average of the three available years (2002, 2003, 2020); for the BLLOP, the average weight for 1981-1992 was taken as the average for the entire time series of data (1993-2020) owing to high interannual variability in average weights. Individual weights were obtained from individual fork lengths using the sex-specific weight-to-length regressions given in SEDAR 77-DW03.

Tables 7 and 8 show commercial landings by gear, dead discard estimates from the pelagic longline fishery, total catch, and total combined landings (not disaggregated into the three main gear types) in weight (lb dw) and numbers, respectively.

Smooth hammerhead—Total commercial landings of smooth hammerheads reached a peak of over 100,000 lb dw in the mid-1990s but otherwise never exceeded 23,000 lb dw during the entire time series and were almost negligible since 2013 (**Table 9; Figure 13, top**). Commercial landings by gear were dominated by longlines until the mid-2000s, followed by unclassified gear for a few years, and by gillnets and pelagic longlines in the last decade when accounting for both unclassified sharks apportioned to the three hammerhead species and unclassified hammerheads *and* unclassified hammerheads apportioned to the three hammerhead species (**Table 9; Figure 13, bottom**).

Almost half of all commercial landings from FINS for 1991-2020 (accounting only for unclassified sharks apportioned to be smooth hammerheads) were not identified to gear, gillnets made up the majority of the identified gears (41%), followed by longlines (5%) (**Figure**

14, top). The majority of unidentified gear occurred in 2009 and 2010, after which gillnets were generally the most dominant gear (**Figure 14, bottom**).

All landings occurred in the Atlantic, with New York (52%), Virginia (23%), and North Carolina (18%) being the main states of landing (**Figure 15, top**). New York landings dominated in 2009-2011, Virginia landings in 2012, and North Carolina landings in 2013-2014 and since 2016 (**Figure 15, bottom**).

There were very few available average weights: for 2009 and 2010 from the GNOP and for 1994, 1995, 1997, 2000, 2002, 2005, 2008, 2010, and 2018 from the BLLOP, but sample sizes were very low for most years. For the GNOP, the average weight for all remaining years was taken as the average of the two available years (2009-2010); for the BLLOP, the average weight for 1981-1993 and all other years without samples was taken as the average of the years with samples (1994, 1995, 1997, 2000, 2002, 2005, 2008, 2010, and 2018). Individual weights were obtained from individual fork lengths using a weight-to-length regression for sexes combined given in Coelho et al. (2011).

Tables 9 and 10 show commercial landings by gear, dead discard estimates from the pelagic longline fishery, total catch, and total combined landings (not disaggregated into the three main gear types) in weight (lb dw) and numbers, respectively.

2.2. Mexican landings

An intensive monitoring of the artisanal shark fisheries in the coastal waters of the Mexican Gulf of Mexico was carried out from November 1993 to December 1994 with the aim of characterizing the shark fisheries prosecuted in the region (Castillo et al., 1998). Twelve of the most important fishing ports from the States of Tamaulipas, Veracruz, Tabasco and Campeche were sampled on a daily basis (**Figure 16**). The shark fishing operations of 901 artisanal boats were monitored. Most of the sampled boats (97%) were small boats ("pangas") with fiberglass and wood hulls, 7.5–10.0 m long and 1.0–2.5 m wide, with an outboard motor and an operational range of 1–3 days, whereas the remaining 3% were larger boats with hulls of wood and metal, > 10 m long and >2.6 m wide, with an inboard motor and an operational range of 4–15 days. The two types of boats combined accounted for 9964 trips, with Campeche having the highest number of boats, fishing trips, and shark landings overall. Biological information collected included length, sex, and reproductive stage of individual animals. It must be noted that in some of the sites visited sampling was not systematic throughout the year owing to logistic and funding issues.

The Castillo et al. (1998) study thus provided a snapshot of the landings, sex, and lengths of sharks captured in four of the six Mexican states in the GOM for one year spanning 1993-1994. Based on this information it was possible to reconstruct the catches of the different hammerhead shark species using the following procedure. First, the proportion that hammerhead shark species made up of the total sharks landed was computed for each of the four states sampled (**Figure 17**). Second, for each species of hammerhead represented in the landings (i.e., scalloped and great hammerhead) length-frequency distributions (cm TL) by

sex by state were computed (**Figures 18, 19**) and the proportion of landings <150 cm TL were assigned to a "*cazones*" category and those >=150 cm TL to a "*tiburones*" category. These two categories are those reported in the Mexican official fishery statistics from Conapesca available for the period 1976-2018 (J.L. Castillo, pers. comm. to EC). We then calculated the percentage of "cazones" and "tiburones" for sexes combined as a weighted average (weighted by sample size for each sex) for each state (**Figures 18, 19**). Third, for each species, we took the landings of "cazones" and "tiburones" reported for each state by Conapesca (**Table 11**) and multiplied it by the proportion that scalloped and great hammerhead make up of the entire catches (step 1) and by the proportion of "cazones" and "tiburones" attributed to each species (step 2) to obtain the total estimated number of hammerheads of each species caught in each state (**Table 12**; **Figure 20**). This assumed that the species composition of the landings observed in 1993-1994 remained the same throughout the entire time series. Fourth, these total estimated landings could further be disaggregated into gear-specific landings for each state by assigning landings to three major gear types (longlines, nets, and hook and line) based on gear composition observed by state. Gear-specific landings by state were then added to provide total landings by gear type (**Table 13**; **Figures 21, 22**).

An additional source of information on Mexican shark landings was also examined. This sample, based in part on Pérez-Jiménez and Méndez-Loeza (2015), monitored the small-scale artisanal shark gillnet fishery in the states of Tabasco and Campeche during 2011-2016. Sex-specific length information was also available from this sample. The proportion that hammerhead shark species (scalloped and great hammerheads) made up of the total sharks landed was only available for the state of Campeche. As above, length-frequency distributions (cm TL) by sex by state were computed (**Figures 23, 24**) and the proportion of landings <150 cm TL assigned to the "cazones" category and those >=150 cm TL to the "tiburones" category. The percentage of "cazones" and "tiburones" for sexes combined was computed as a weighted average (weighted by sample size for each sex). For the state of Campeche we took the landings of "cazones" and "tiburones" reported for that state by Conapesca and multiplied it by the proportion that scalloped and great hammerheads make up of the entire shark catches and by the proportion of "cazones" and "tiburones" attributed to each species to obtain the total estimated number of hammerheads of each species caught in Campeche. We compared these estimates for the period 2011-2016 to those derived from the Castillo et al. (1998) study (**Figures 25, 26**).

2.3. Puerto Rico/U.S. Virgin Islands landings

There were no commercial landings of hammerhead sharks from Puerto Rico (PR) or the U.S. Virgin Islands (USVI) reported in the FINS or eDealer databases. The Caribbean Commercial Vessel Logbook database included some reports, but of very small magnitude. For scalloped hammerhead in PR, weights ranged from 14 to 116 lb dw during 2012-2020 and in the USVI, weights were less than 1 lb dw. For great hammerhead in PR, weights ranged from 81 to 676 lb dw during 2012-2020, and in the USVI, from 57 to 662 lb dw. Additional information obtained from the Accumulated Landings System (ALS) database showed that most sharks in PR are reported as unclassified and those reported as "hammerhead" never exceeded 80 lb whole weight (ww) in any year during 1987-2011. **Figure 27** shows the landings of scalloped

and great hammerheads after apportioning the unclassified sharks to the different hammerhead species and then apportioning the unclassified hammerheads to scalloped or great hammerhead. Scalloped hammerhead landings ranged from 31 to 323 lb dw during 1987-2011 and great hammerhead landings ranged from 261 to 2,694 lb dw during the same period.

These low reported landings reflect the fact that few longliners dock and offload in PR ports and that they do not fish in more coastal waters (R. Espinoza, Conservación Conciencia, pers. comm. to EC). As part of a Shark Research and Conservation Program Conservación Conciencia has been conducting fishery-dependent surveys at fishing ports and villages from 2019 to 2021 as well as fishery-independent surveys since 2017 with the aim to characterize Puerto Rico's shark fishery through a marine conservation agreement with PR fishers who report and provide details on their catch. Scalloped hammerheads were the second most observed species during fishery-dependent surveys conducted from February 2019-August 2021 (n = 46; all immature) and only 10 (90% immature) great hammerheads were observed. While this information may become important in future stock assessments, there are currently no data/estimates of coastal shark landings in PR that could be used to raise these observations to total estimates of hammerhead sharks landed.

2.4 Pelagic longline dead discards and live post-release mortality

Dead discard estimates of scalloped, great, and smooth hammerhead sharks in the pelagic longline fishery (based on the Pelagic Longline Observer Program and fishing effort reported in pelagic longline logbooks) were obtained from ICCAT Task 1 statistics (**Figures 1, 4, and 7 top panels**). Estimates of animals released alive were not available. To convert weights into numbers, average weights were obtained from fork lengths reported in the Pelagic Longline Observer Program for 1992-2017. Average weight for all remaining years was taken as the average for the entire time series of data available (1992-2017). Individual weights were obtained from individual fork lengths using the sex-specific weight-to-length regressions given in SEDAR 77-DW03.

2.5 Recreational catches

Recreational catches of hammerhead sharks reported herein are the sum of estimates from the Marine Recreational Information Program (MRIP), the Southeast Region Headboat Survey (SRHS) operated by the SEFSC Beaufort Laboratory, and the Texas Parks and Wildlife Department (TPWD) Survey. There were no hammerhead sharks reported from the Louisiana Creel survey and only insignificant amounts in the Large Pelagic Survey (LPS). The MRIP estimates include Access Point Angler Intercept Survey (APAIS) and Fishing Effort Survey (FES) calibrations. Annual recreational catch estimates of hammerhead sharks were computed as the sum of type A (number of fish killed or kept seen by the interviewer), type B1 (number of fish killed or kept reported to the interviewer by the angler), and type B2 (number of fish released alive reported by the fisher) estimated to have died (since no formal estimates of post-release mortality were yet available, an arbitrary rate of 10% was preliminarily applied to all species). MRIP catches are reported in both numbers and weight for types A and B1, but only in numbers for type B2. SRHS catch estimates for types A and B1 are also provided in both

numbers and weight, but B2 estimates are not available. TPWD catch estimates for types A and B1 are only provided in numbers and B2 estimates are not available. Annual weight estimates for MRIP type B2 were computed by multiplying B2 catches in numbers by an average weight obtained from MRIP AB1 catches.

To account for sharks identified only as Sphyrnidae or *Sphyrna* spp., unclassified sphyrnid sharks were allocated to each of the three hammerhead species (*S. lewini*, *S. mokarran* or *S. zygaena*) based on the annual contribution of these three species and the bonnethead shark (*Sphyrna tiburo*) to the sphyrnid shark catch. On average throughout the time series (1981-2020) bonnethead, scalloped hammerhead, great hammerhead, and smooth hammerhead sharks accounted for 82%, 7%, 9%, and 2% of sphyrnid AB1 catches and 83%, 5%, 9%, and 3% of sphyrnid B2 catches, respectively.

Also, to account for the large interannual variability in recreational catch estimates, the A+B1 and B2 catch series were smoothed using a three-year moving geometric average (as most recently done for SEDAR 65 [SEDAR 2020]) (**Figures 28-32**).

Scalloped hammerhead, all regions—The vast majority of scalloped hammerhead catches were reported in MRIP. Catches were highest at the beginning of the time series and showed a decreasing trend punctuated by some peaks, notably in 1993 for the AB1 series (**Table 14**; **Figure 28**).

Most AB1 catches by state corresponded to the southeast region in the Atlantic with Florida-East coast (45%), Georgia (17%), and South Carolina (13%) accounting for 75% of all scalloped hammerhead catches (**Figure 33, top**). By fishing mode, most AB1 catches were from shore (48%) and by private boats (47%), with charter boats and headboats contributing very little (**Figure 33, middle**). By fishing area, most AB1 catches occurred less than 3 miles from shore (45%) and in inshore waters (37%), with the remaining 18% of catches occurring in waters over three and less than 10 miles from shore (**Figure 33, bottom**).

Scalloped hammerhead GOM—The vast majority of scalloped hammerhead catches were reported in MRIP. Catches showed a decreasing trend punctuated by some peaks, notably in 1985 for the AB1 series (**Table 15**; **Figure 29**).

Most AB1 catches by state corresponded to Florida-West coast (43%), Mississippi (38%), Alabama (10%), and Texas (9%) (**Figure 34, top**). By fishing mode, most AB1 catches were from private boats (72%) and from shore (19%), with charter boats and headboats contributing the remaining 9% (**Figure 34, middle**). By fishing area, most AB1 catches occurred in waters over three and less than 10 miles from shore (54%) with catches in less than 3 miles from shore and in inshore waters accounting for 40% of the total catches (**Figure 34, bottom**).

Scalloped hammerhead ATL—Almost all scalloped hammerhead catches were reported in MRIP. Catches showed a decreasing trend punctuated by some peaks, notably in 1982 and 1993 for the AB1 series (**Table 16**; **Figure 30**).

Most AB1 catches by state corresponded to Florida-East coast (58%), Georgia (22%), South Carolina (17%), and North Carolina (3%) (**Figure 35, top**). By fishing mode, most AB1 catches were from shore (57%) and from private boats (39%), with charter boats contributing the remaining 4% (**Figure 35, middle**). By fishing area, most AB1 catches occurred in waters less than 3 miles from shore (55%) and in inshore waters (39%), with catches in waters over three miles from shore accounting for 6% of the total (**Figure 35, bottom**).

Great hammerhead—The vast majority of great hammerhead catches were reported in MRIP. Catches showed a decreasing trend punctuated by some peaks, notably in 1982 and 1991 for the AB1 series (**Table 17**; **Figure 31**).

Most AB1 catches by state corresponded to the southeast region with Florida-East coast (53%) and Florida-West coast (34%) accounting for 87% of all great hammerhead catches, followed by Louisiana (5%), and Georgia and South Carolina (3% each) (**Figure 36, top**). By fishing mode, almost all AB1 catches were from shore (76%) and by private boats (32%), with charter boats and headboats contributing only 2% (**Figure 36, middle**). By fishing area, most AB1 catches occurred less than 3 miles from shore (48%) and in inshore waters (28%), with the remaining catches occurring in waters over three and less than 10 miles from shore (21%) or in waters over 10 miles from shore (3%) (**Figure 36, bottom**).

Smooth hammerhead—Almost all smooth hammerhead catches were reported in MRIP. Catches showed a generally decreasing trend punctuated by a very large peak in 1991 for the AB1 series (**Table 18**; **Figure 32**).

Most AB1 catches by state corresponded to the southeast region with Florida-East coast (51%) and Florida-West coast (16%) accounting for 67% of all smooth hammerhead catches, followed by Georgia (17%), South Carolina (10%), and Maryland (6%) (**Figure 37, top**). By fishing mode, almost all AB1 catches were from shore (60%) and by private boats (38%), with charter boats and headboats contributing only 2% (**Figure 37, middle**). By fishing area, most AB1 catches occurred less than 3 miles from shore (53%) and in inshore waters (27%), with the remaining catches occurring in waters over three and less than 10 miles from shore (20%) (**Figure 37, bottom**).

2.6 Recreational length compositions

Scalloped hammerhead, all regions—Lengths of scalloped hammerheads were available from the MRIP (cm FL; n=227) and the SRHS (mm TL; n=63). Total lengths in the SRHS were converted to fork lengths with the equation for combined sexes given in SEDAR 77-DW03. Length-frequency distributions show that more immature than mature sharks are caught based on the median sizes at maturity for males and females listed in the SEDAR 77 Stock ID report (146 cm FL for males; 179 cm FL for females) (**Figure 38, top**). The mean fork length from MRIP (113.9 cm) was not significantly larger than that from SRHS (106.0 cm) (Welch two sample t-test data: $t = 0.9490$, df = 134.38, $P = 0.344$; **Figure 38, bottom**).

There were significant differences in the size of scalloped hammerheads caught by fishing mode (Anova: $F = 44.13$, df = 3, $P = 2.0E-16$), with sharks caught from private boats and shore being significantly smaller than those caught by charter boats or headboats (pairwise comparisons using t test with pooled SD: Shore – Cbt, $P = 3.1E-14$; Shore – Hbt, $P = 0.0017$; Shore – Pri, $P = 0.25$; Cbt – Hbt, $P = 4.1E-08$; **Figure 39**). Similarly, there were significant differences in the size of scalloped hammerheads caught by fishing area (Anova: $F = 21.61$, df = 5, $P = 2.0E-16$), with scalloped hammerheads caught inshore being significantly smaller than those caught in all other areas, except the ocean (≤ 10 miles) (pairwise comparisons using t test with pooled SD: Inshore – Hbt, $P = 0.034$; Inshore – Ocean (≤ 3 mi), $P = 7.9E-14$; Inshore – Ocean (>3 mi), $P = 4.6E-09$; Inshore – Ocean (>10 mi), $P = 5.0E-15$; Inshore – Ocean (<= 10 mi), $P = 0.785$; **Figure 40**). There were also significant differences in the size of scalloped hammerheads among states, but sample sizes for some states were very low (Anova: $F = 7.36$, df = 12, $P = 9.68E-12$).

Scalloped hammerhead GOM—Lengths of GOM scalloped hammerheads were available from the MRIP (cm FL; n=53) and the SRHS (mm TL; n=59). Total lengths in the SRHS were converted to fork lengths with the equation for combined sexes given in SEDAR 77-DW03 for scalloped hammerheads (GOM and ATL combined). Length-frequency distributions show that more immature than mature sharks are caught based on the median sizes at maturity for males and females listed in the SEDAR 77 Stock ID report (142 cm FL for males; 180 cm FL for females) (**Figure 41, top**). The mean fork length from MRIP (114.5 cm) was not significantly larger than that from SRHS (109.1 cm) (Welch two sample t-test data: $t = 0.415$, df = 89.715, $P = 0.679$; **Figure 41, bottom**).

There were significant differences in the size of GOM scalloped hammerheads caught by fishing mode (Anova: $F = 5.099$, df = 3, $P = 0.0024$), with sharks caught from private boats and shore being significantly smaller than those caught by charter boats (pairwise comparisons using t test with pooled SD: Shore – Cbt, $P = 0.0299$; Private – Cbt, $P = 0.0093$; Shore – Hbt, $P = 0.2133$; Shore – Pri, $P = 0.3158$; Cbt – Hbt, $P = 0.0650$; **Figure 42**). Similarly, there were significant differences in the size of GOM scalloped hammerheads caught by fishing area (Anova: $F = 11.7$, df = 5, $P = 5.12E-9$), with scalloped hammerheads caught in the ocean (>10 miles) being significantly larger than those caught in all other areas (pairwise comparisons using t test with pooled SD: Ocean (>10 mi) – Hbt, P = 8.5E-08; Ocean (>10 mi) – Inshore, P = 8.5E-08; Ocean (>10 mi) – Ocean (>3 mi), P = 1.1E-06; Ocean (>10 mi) – Ocean (<= 10 mi), P = 9.8E-07; **Figure 43**). There were also significant differences in the size of GOM scalloped hammerheads among states, but sample sizes for some states were very low (Anova: F = 2.377, df = 6, P = 0.0342).

Scalloped hammerhead ATL—Lengths of ATL scalloped hammerheads were available from the MRIP (cm FL; n=174) while very few were available from the SRHS (mm TL; n=4). Total lengths in the SRHS were converted to fork lengths with the equation for combined sexes given in SEDAR 77-DW03 for scalloped hammerheads (GOM and ATL combined). Length-frequency distributions show that more immature than mature sharks are caught in the MRIP based on the median sizes at maturity for males and females listed in the SEDAR 77 Stock ID report (157 cm FL for males; 178 cm FL for females) (**Figure 44, top**). The mean fork length

from MRIP (113.7 cm) was significantly larger than that from SRHS (59.8 cm) (Welch two sample t-test data: $t = 8.026$, df = 24.931, $P = 2.26E-08$; **Figure 44, bottom**).

There were significant differences in the size of ATL scalloped hammerheads caught by fishing mode (Anova: $F = 46.57$, df = 3, $P < 2.0E-16$), with sharks caught in charter boats being significantly larger than those caught in the other modes (pairwise comparisons using t test with pooled SD: Cbt – Hbt, $P = 0.00034$; Cbt – Private, $P < 2E-16$; Cbt – Shore, $P = 6.7E-14$; **Figure 45**). Similarly, there were significant differences in the size of ATL scalloped hammerheads caught by fishing area (Anova: $F = 27.93$, df = 3, $P = 8.55E-15$), with scalloped hammerheads caught in inshore waters and by headboats being significantly smaller than those caught in the ocean (<= 3 mi) and ocean (> 3 mi) (pairwise comparisons using t test with pooled SD: Ocean (<=3 mi) – Inshore, P = 1.7E-13; Ocean (>3 mi) – Inshore, P = 8.3E-10; **Figure 46**). There were also significant differences in the size of ATL scalloped hammerheads among states, but sample sizes for some states were very low (Anova: F = 15.4, df = 5, P = 1.66E-12).

Great hammerhead—Lengths of great hammerheads were available from the MRIP (cm FL; n=89) while very few were available from the SRHS (mm TL; n=8). Total lengths in the SRHS were converted to fork lengths with the equation for combined sexes given in SEDAR 77-DW03. Length-frequency distributions show that more immature than mature sharks are caught based on the median sizes at maturity for males and females listed in the SEDAR 77 Stock ID report (197 cm FL for males; 199 cm FL for females) **(Figure 47, top**). The mean fork length from MRIP (129.5 cm) was similar to that from SRHS (135.8 cm) (Welch two sample t-test data: $t = -0.3318$, df = 10.823, $P = 0.746$; **Figure 47, bottom**).

There were significant differences in the size of great hammerheads caught by fishing mode (Anova: $F = 4.951$, df = 3, $P = 0.0031$), with sharks caught from private boats and shore being significantly smaller than those caught by charter boats (pairwise comparisons using t test with pooled SD: Private – Cbt, $P = 0.0492$; Shore – Cbt, $P = 0.0017$;Private – Hbt, $P = 0.657$; Shore – Hbt, $P = 0.463$; **Figure 48**). Similarly, there were significant differences in the size of great hammerheads caught by fishing area (Anova: $F = 5.462$, df = 5, $P = 0.0002$), with great hammerheads caught inshore being significantly smaller than those caught in all other areas, except the Ocean (<=10 miles) and Headboats (pairwise comparisons using t test with pooled SD: Inshore – Ocean (<= 3 mi), $P = 0.0123$; Inshore – Ocean (> 10 mi), $P = 0.0009$; Inshore – Ocean (>3 mi), $P = 0.0022$; Inshore – Ocean (<=10 mi), $P = 0.392$; Inshore – Headboat, $P = 0.444$; **Figure 49**). There were no significant differences in the size of great hammerheads among states, but sample sizes for some states were very low (Anova: $F = 1.26$, df = 12, $P = 0.258$).

Smooth hammerhead—Lengths of smooth hammerheads were only available from the MRIP (cm FL; n=47). The length-frequency distribution shows that most sharks caught were immature based on median sizes at maturity for males and females given in Stevens (1984) (255 cm TL for males; 265 cm TL for females; when transformed into fork lengths using the regression equation FL=12.72+0.84TL from Coelho et al. (2011) they become 227 cm FL for males and 235 cm FL for females) (**Figure 50, top**). The mean fork length from MRIP was 128.9 cm TL.

There were no significant differences in the size of smooth hammerheads caught by fishing mode (Anova: F = 0.38, df = 3, P =0.768; **Figure 51**). Similarly, there were no significant differences in the size of smooth hammerheads caught by fishing area (Anova: F = 0.516, df = 5, P = 0.673; **Figure 52**). There were significant differences in the size of smooth hammerheads among states, but sample sizes for some states were very low (Anova: F = 11.75, df = 5, P = 5.73E-07).

2.7 Combined commercial and recreational catches

Scalloped hammerhead—Total catches of scalloped hammerheads in weight peaked during the early 1990s and showed a decreasing trend thereafter. Recreational catches were the most important, but their proportional importance decreased in particular in the last decade (**Figure 53**).

Scalloped hammerhead GOM—Total catches of GOM scalloped hammerheads in weight peaked in the mid-1980s as a result of a peak in recreational catches and showed a generally decreasing trend thereafter. The proportional importance of recreational catches decreased since approximately the 2000s (**Figure 54**).

Scalloped hammerhead ATL—Total catches of ATL scalloped hammerheads in weight showed a peak in the mid-1990s as a result of a respective peak in recreational catches and showed a generally decreasing trend thereafter. The proportional importance of recreational catches only decreased in the last decade (**Figure 55**).

Great hammerhead—Total catches of great hammerheads in weight were dominated by large recreational catches in the early 1980s and rapidly decreased thereafter, stabilizing to low levels since the late 1990s, after which commercial catches proportionally exceeded recreational catches (**Figure 56**).

Smooth hammerhead—Total catches of smooth hammerheads in weight were overwhelmingly dominated by recreational catches until the late 1990s, after which both commercial and recreational catches were of very small magnitude (**Figure 57**).

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Table 1. Commercial landings of scalloped hammerhead sharks in weight (lb dw), 1981-2020.

Year	Total Bottom longline landings	Total Gillnet landings	Total hook and line + hand line landings	Pelagic longline dead discards	Total commercial catch	Total combined commercial landings
1981	0	0	0	0	0	
1982	0	0	0	0	0	
1983	0	0	0	0	0	
1984	0	0	0	0	0	
1985	0	0	0	0	0	
1986	0	0	0	0	0	
1987	0	0	0	84513	84513	
1988	0	0	0	275099	275099	
1989	0	0	0	127729	127729	
1990	0	0	0	163350	163350	
1991	30108	57790	121	111360	199378	145492
1992	180277	30679	912	405737	617604	263080
1993	244812	7527	1597	44761	298696	301105
1994	394713	3668	43129	46221	487731	494393
1995	169120	1305	10393	89767	270585	205458
1996	86414	7258	10758	15546	119976	121820
1997	32557	1968	235	48258	83017	43778
1998	16763	3069	1272	47384	68488	34133
1999	18118	541	9704	40433	68796	34018
2000	2659	32	388	46364	49442	23355
2001	8715	377	1182	55740	66014	50624
2002	13689	671	2759	0	17119	67579
2003	58285	933	726	0	59944	79476
2004	48865	553	2690	0	52108	67591
2005	24623	78	2346	0	27046	103343
2006	35206	1011	216	0	36432	89870
2007	9704	12	83	96855	106654	31086
2008	22133	2503	789	63284	88709	32574
2009	56997	3395	13711	51367	125470	79741
2010	30791	3343	1825	2401	38359	42504
2011	47136	2552	1404	4092	55183	57567
2012	44152	4854	9490	1900	60395	58501
2013	17474	11244	1989	3240	33947	30954
2014	21918	7624	409	34086	64037	29951
2015	13504	5912	70	31145	50632	19487
2016	10641	10964	17225	52595	91425	38830
2017	12031	4890	3147	80614	100683	20068
2018	10173	4344	17713	22552	54782	32230
2019	4405	4167	205	10805	19582	8777
2020	4067	8535	3172	66025	81799	15774

Table 2. Commercial landings of scalloped hammerhead sharks in numbers, 1981-2020.

Year	Total Bottom longline landings	Total Gillnet landings	Total hook and line + hand line landings	Pelagic longline dead discards	Total commercial catch	Total combined commercial landings
1981	0	0	0	0	0	
1982	0	0	0	0	0	
1983	0	0	0	0	0	
1984	0	0	0	0	0	
1985	0	0	0	0	0	
1986	0	0	0	0	0	
1987	0	0	0	1201	1201	
1988	0	0	0	3909	3909	
1989	0	0	0	1815	1815	
1990	0	0	0	2321	2321	
1991	340	1716	1	1583	3640	2381
1992	2036	911	10	7839	10797	4305
1993	2765	224	18	536	3542	4927
1994	3672	109	401	695	4877	7005
1995	1440	39	89	803	2370	2720
1996	851	216	106	339	1511	1802
1997	488	58	4	680	1230	872
1998	184	91	14	376	665	546
1999	168	16	90	505	779	481
2000	2659	1	388	434	3481	23355
2001	118	11	16	1154	1300	944
2002	148	158	30	0	336	1399
2003	813	6	10	0	830	708
2004	747	7	41	0	796	958
2005	291	9	28	0	328	2222
2006	529	39	3	0	571	1937
2007	211	3	2	1345	1561	1233
2008	447	20	16	1269	1753	379
2009	594	279	143	1313	2328	1475
2010	353	281	21	55	711	858
2011	429	112	13	57	611	867
2012	393	312	84	30	820	914
2013	167	2419	19	68	2673	566
2014	294	1186	5	506	1991	740
2015	116	420	1	372	909	299
2016	107	1331	173	770	2381	721
2017	115	45	30	1287	1476	188
2018	116	688	202	0	1006	684
2019	47	417	2	0	466	169
2020	55	361	43	0	458	323

Table 3. Commercial landings of GOM scalloped hammerhead sharks in weight (lb dw), 1981-2020.

Year	Total Bottom longline landings	Total Gillnet landings	Total hook and line + hand line landings	Pelagic longline dead discards	Total commercial catch	Total combined commercial landings
1981	0	0	0	0	0	
1982	0	0	0	0	0	
1983	0	0	0	0	0	
1984	0	0	0	0	0	
1985	0	0	0	0	0	
1986	0	0	0	0	0	
1987	0	0	0	6496	6496	
1988	0	0	0	20239	20239	
1989	0	0	0	13441	13441	
1990	0	0	0	19083	19083	
1991	1080	0	0	8821	9901	2292
1992	106	2	875	0	983	620
1993	138	0	492	0	630	456
1994	10083	4	30561	0	40648	27332
1995	22713	2	1573	2292	26580	30506
1996	26613	14	7549	1519	35696	40839
1997	4197	0	116	1598	5911	7533
1998	1176	0	106	223	1505	8184
1999	1221	0	1	610	1832	6956
2000	181	0	127	14236	14544	12963
2001	1564	0	0	3641	5205	17787
2002	4727	0	0	0	4727	36360
2003	20491	0	678	0	21169	34445
2004	23236	25	446	0	23707	36395
2005	6537	0	0	0	6537	62954
2006	17901	1	0	0	17902	50205
2007	4583	0	0	2013	6596	15818
2008	12561	0	372	13995	26928	18511
2009	31279	0	2854	5784	39917	42293
2010	13676	0	290	149	14115	18054
2011	27310	0	575	2301	30185	33818
2012	32875	82	5827	386	39171	37870
2013	1101	0	0	1315	2416	1101
2014	5152	67	80	14028	19327	5299
2015	6220	0	70	4353	10643	6290
2016	9368	65	17068	10937	37438	26501
2017	12002	0	3147	378	15527	15149
2018	8719	0	17584	1346	27649	26303
2019	2554	0	0	832	3385	2554
2020	868	0	2882	0	3750	3750

Table 4. Commercial landings of GOM scalloped hammerhead sharks in numbers, 1981-2020.

Year	Total Bottom longline landings	Total Gillnet landings	Total hook and line + hand line landings	Pelagic longline dead discards	Total commercial catch	Total combined commercial landings
1981	0	0	0	0	0	
1982	0	0	0	0	0	
1983	0	0	0	0	0	
1984	0	0	0	0	0	
1985	0	0	0	0	0	
1986	0	0	0	0	0	
1987	0	0	0	92	92	
1988	0	0	0	288	288	
1989	0	0	0	191	191	
1990	0	0	0	271	271	
1991	13	0	0	125	138	39
1992	1	0	10	0	12	11
1993	2	0	6	0	8	8
1994	85	0	256	0	341	357
1995	207	0	14	20	242	426
1996	248	0	70	33	352	580
1997	104	0	3	23	129	203
1998	18	0	2	2	21	165
1999	53	0	0	8	60	245
2000	2	0	2	133	137	221
2001	23	0	0	75	99	353
2002	64	0	0	0	64	936
2003	207	0	7	0	214	274
2004	301	0	6	0	307	476
2005	38	0	0	0	38	699
2006	350	0	0	0	350	1298
2007	119	0	0	0	119	734
2008	254	0	8	281	542	215
2009	333	0	30	148	511	797
2010	171	0	4	3	179	394
2011	229	0	5	32	266	476
2012	311	5	55	6	378	625
2013	11	0	0	27	38	21
2014	107	10	2	208	327	194
2015	64	0	1	52	117	113
2016	109	8	198	160	475	561
2017	120	0	32	6	158	145
2018	118	0	238	0	356	656
2019	27	0	0	0	27	49
2020	10	0	34	0	44	69

Table 5. Commercial landings of ATL scalloped hammerhead sharks in weight (lb dw), 1981-2020.

Year	Total Bottom longline landings	Total Gillnet landings	Total hook and line + hand line landings	Pelagic longline dead discards	Total commercial catch	Total combined commercial landings
1981	0	0	0	0	0	
1982	0	0	0	0	0	
1983	0	0	0	0	0	
1984	0	0	0	0	0	
1985	0	0	0	0	0	
1986	0	0	0	0	0	
1987	0	0	0	84365	84365	
1988	0	0	0	274617	274617	
1989	0	0	0	127505	127505	
1990	0	0	0	163064	163064	
1991	45366	58817	98	111165	215445	143041
1992	284465	31204	73	405737	721478	262662
1993	386304	7660	915	44761	439640	300913
1994	602962	3694	11626	46221	664502	463823
1995	221268	1313	7189	89767	319536	170962
1996	82803	7251	2956	15519	108529	75472
1997	42949	2003	101	48174	93226	35252
1998	24100	3123	945	47302	75470	24856
1999	26150	551	7825	40363	74887	26137
2000	3833	33	216	46283	50365	8626
2001	11002	377	953	55642	67976	30558
2002	13049	681	2225	0	15955	26572
2003	51149	950	72	0	52170	40491
2004	29925	327	2100	0	32351	26242
2005	25704	78	2170	0	27952	31805
2006	19505	1023	174	0	20701	32828
2007	6022	12	67	96686	102787	13116
2008	9628	2548	354	63284	75813	11542
2009	26946	3455	8895	51367	90663	31693
2010	20987	3402	1252	2396	28037	22002
2011	16220	2577	696	4085	23578	20120
2012	2783	4125	3778	1897	12583	19533
2013	0	11251	1989	3234	16474	29854
2014	16766	7557	329	34086	58738	24652
2015	7284	5912	0	31145	44342	13197
2016	1273	10899	157	52595	64924	12329
2017	29	4890	0	80614	85533	4919
2018	1454	4344	129	22552	28479	5927
2019	1852	4167	205	9825	16049	6224
2020	3199	8535	290	66025	78049	12024

Table 6. Commercial landings of ATL scalloped hammerhead sharks in numbers, 1981-2020.

Year	Total Bottom longline landings	Total Gillnet landings	Total hook and line + hand line landings	Pelagic longline dead discards	Total commercial catch	Total combined commercial landings
1981	0	0	0	0	0	
1982	0	0	0	0	0	
1983	0	0	0	0	0	
1984	0	0	0	0	0	
1985	0	0	0	0	0	
1986	0	0	0	0	0	
1987	0	0	0	1199	1199	
1988	0	0	0	3903	3903	
1989	0	0	0	1812	1812	
1990	0	0	0	2317	2317	
1991	446	1747	1	1580	3773	2111
1992	2794	927	1	7839	11560	3877
1993	3794	228	9	536	4566	4442
1994	5663	110	109	695	6577	6620
1995	1864	39	61	803	2767	2244
1996	843	215	30	338	1427	1145
1997	377	59	1	679	1117	478
1998	226	93	9	375	703	354
1999	233	16	70	504	822	358
2000	38	1	2	433	474	127
2001	103	11	9	1152	1275	434
2002	180	160	31	0	370	691
2003	618	6	1	0	625	344
2004	472	4	33	0	509	377
2005	376	9	32	0	417	827
2006	163	39	1	0	204	451
2007	90	3	1	1343	1436	366
2008	95	21	3	1269	1388	103
2009	220	284	73	1313	1889	471
2010	184	286	11	55	536	349
2011	168	113	7	57	346	338
2012	21	265	29	30	346	269
2013	0	2421	18	68	2507	532
2014	184	1176	4	506	1868	504
2015	55	420	0	372	847	180
2016	11	1323	1	770	2105	200
2017	0	45	0	1287	1331	40
2018	13	688	1	0	703	103
2019	22	417	2	0	442	133
2020	45	361	4	0	410	254

Table 7. Commercial landings of great hammerhead sharks in weight (lb dw), 1981-2020.

Year	Total Bottom longline landings	Total Gillnet landings	Total hook and line + hand line landings	Pelagic longline dead discards	Total commercial catch	Total combined commercial landings
1981	0	0	0	0	0	
1982	0	0	0	0	0	
1983	0	0	0	0	0	
1984	0	0	0	0	0	
1985	0	0	0	0	0	
1986	0	0	0	0	0	
1987	0	0	0	4981	4981	
1988	0	0	0	16212	16212	
1989	0	0	0	7527	7527	
1990	0	0	0	9627	9627	
1991	40584	123025	18	6563	170189	120373
1992	242975	65310	117	21665	330067	217640
1993	329974	16023	204	7157	353357	249108
1994	532021	7808	5509	5686	551024	409017
1995	227952	2779	1328	546	232604	169978
1996	116474	15452	1374	916	134217	100783
1997	43882	4189	30	2844	50945	36218
1998	22594	6534	162	2793	32083	28239
1999	24421	1152	1240	2383	29195	28143
2000	3583	68	50	2732	6434	19322
2001	10534	83	151	3285	14053	40858
2002	15481	1169	352	0	17002	53985
2003	77262	1944	93	0	79299	64938
2004	65528	781	166	0	66474	54407
2005	33432	110	116	0	33658	84531
2006	49305	2153	28	0	51486	76204
2007	13105	29	12	5708	18854	25769
2008	30011	5329	101	44	35485	27128
2009	78470	7227	1752	118	87566	67617
2010	48724	7116	252	141	56233	42426
2011	48729	3011	179	241	52161	37701
2012	8197	6073	1179	112	15560	13213
2013	22621	5546	512	191	28870	28449
2014	34499	6728	2094	5422	48744	43321
2015	40695	15695	13941	4554	74885	70331
2016	15549	20080	15198	2218	53045	50827
2017	20306	15160	966	1449	37881	36432
2018	29252	23493	1612	688	55045	54357
2019	31217	26309	1223.91	0	58750	58750
2020	10110	27727	409	0	38246	38282

Table 8. Commercial landings of great hammerhead sharks in numbers, 1981-2020.

Year	Total Bottom longline landings	Total Gillnet landings	Total hook and line + hand line landings	Pelagic longline dead discards	Total commercial catch	Total combined commercial landings
1981	0	0	0	0	0	
1982	0	0	0	0	0	
1983	0	0	0	0	0	
1984	0	0	0	0	0	
1985	0	0	0	0	0	
1986	0	0	0	0	0	
1987	0	0	0	38	38	
1988	0	0	0	122	122	
1989	0	0	0	57	57	
1990	0	0	0	73	73	
1991	240	1179	0	49	1468	880
1992	1436	626	1	254	2316	1591
1993	1950	154	1	41	2146	1821
1994	2818	75	29	24	2946	2791
1995	1905	27	11	3	1946	1518
1996	987	148	12	11	1158	906
1997	324	40	0	24	388	302
1998	166	63	1	16	246	235
1999	161	11	8	17	197	220
2000	16	1	0	21	38	117
2001	54	1	1	31	86	274
2002	107	17	2	0	126	504
2003	531	14	1	0	545	450
2004	463	7	1	0	471	442
2005	132	1	0	0	133	473
2006	289	21	0	0	310	554
2007	94	0	0	18	112	211
2008	186	51	1	0	238	204
2009	469	69	10	1	550	498
2010	275	68	1	1	346	301
2011	283	29	1	3	315	272
2012	48	58	7	1	115	96
2013	117	53	3	2	175	191
2014	172	64	10	65	311	284
2015	226	150	77	39	492	495
2016	81	192	79	16	369	343
2017	129	145	6	16	297	278
2018	186	225	10	0	421	415
2019	188	252	7	0	447	434
2020	49	274	2	0	325	248

Table 9. Commercial landings of smooth hammerhead sharks in weight (lb dw), 1981-2020.

Year	Total Bottom longline landings	Total Gillnet landings	Total unknown gear	Pelagic longline dead discards	Total commercial catch	Total combined commercial landings
1981	0	0	0	0	0	
1982	0	0	0	0	0	
1983	0	0	0	0	0	
1984	0	0	0	0	0	
1985	0	0	0	0	0	
1986	0	0	0	0	0	
1987	0	0	0	1800	1800	
1988	0	0	0	5858	5858	
1989	0	0	0	2720	2720	
1990	0	0	0	3479	3479	
1991	204	7326	0	2371	9902	31456
1992	1214	3889	0	4329	9432	56873
1993	1649	954	0	668	3271	65096
1994	2658	465	2	220	3345	106883
1995	1139	165	0	742	2047	44418
1996	582	920	0	331	1834	26336
1997	219	249	0	1028	1496	9464
1998	113	389	0	1009	1511	7379
1999	122	69	0	861	1052	7354
2000	18	4	0	987	1009	5049
2001	53	5	0	1187	1245	10677
2002	77	148	0	0	225	14186
2003	386	116	0	0	502	16969
2004	327	139	0	0	466	14309
2005	166	7	0	0	172	22080
2006	237	128	0	0	365	19645
2007	65	2	0	2063	2129	6712
2008	507	317	0	63	887	7400
2009	384	565	2540	43	3531	20268
2010	207	424	5607	51	6289	14793
2011	242	179	65	87	573	9861
2012	41	4141	70	40	4293	7204
2013	0	179	0	69	248	260
2014	312	257	32	58	659	601
2015	264	40	0	562	866	304
2016	0	125	0	1385	1510	125
2017	0	1127	0	6446	7573	1193
2018	0	530	0	286	816	530
2019	0	13	0	1306	1319	40
2020	0	0	0	361	361	0

Table 10. Commercial landings of smooth hammerhead sharks in numbers, 1981-2020.

Year	Total Bottom longline landings	Total Gillnet landings	Total unknown gear	Pelagic longline dead discards	Total commercial catch	Total combined commercial landings
1981	0	0	0	0	0	
1982	0	0	0	0	0	
1983	0	0	0	0	0	
1984	0	0	0	0	0	
1985	0	0	0	0	0	
1986	0	0	0	0	0	
1987	0	0	0	76	76	
1988	0	0	0	76	76	
1989	0	0	0	76	76	
1990	0	0	0	76	76	
1991	3	621	0	76	700	708
1992	16	330	0	77	423	1280
1993	21	81	0	76	179	1466
1994	37	39	0	76	153	2581
1995	11	14	0	72	97	760
1996	8	78	0	307	392	593
1997	18	21	0	76	115	782
1998	1	33	0	39	74	166
1999	2	6	0	76	84	166
2000	1	0	0	76	78	314
2001	1	0	0	76	77	240
2002	35	13	0	95	142	2021
2003	5	10	0	66	81	382
2004	4	12	0	99	115	322
2005	2	1	0	44	46	476
2006	3	11	0	64	78	442
2007	1	0	0	47	48	151
2008	2	27	0	76	106	67
2009	5	34	33	106	178	432
2010	1	62	33	76	172	165
2011	3	15	1	32	52	222
2012	1	351	1	76	429	162
2013	0	15	0	20	35	6
2014	4	22	0	76	103	14
2015	3	3	0	76	83	7
2016	0	11	0	34	45	3
2017	0	96	0	44	139	27
2018	0	45	0	76	121	33
2019	0	1	0	76	77	1
2020	0	0	0	76	76	0

Table 11. Mexican landings of "cazones " (sharks less than 150 cm TL) and "tiburones" (sharks greater than 150 cm TL) by state reported by Conapesca (tons ww).

	Landings of cazones				Landings of tiburones			
Year	Tamaulipas	Veracruz	Tabasco	Campeche	Tamaulipas	Veracruz	Tabasco	Campeche
1976	266	474	169	627	75	234	92	468
1977	575	654	189	544	155	190	358	817
1978	439	358	204	377	133	667	309	1037
1979	733	627	228	429	203	738	193	640
1980	889	706	274	491	371	1351	182	391
1981	2486	1036	407	441	703	3676	181	758
1982	1044	1309	392	847	286	3461	148	706
1983	1019	1493	311	2013	423	2719	374	1741
1984	1291	2433	500	2005	466	3133	397	1839
1985	1479	1144	442	1582	378	1239	414	1249
1986	1382	991	438	1174	372	1935	812	1754
1987	1583	777	467	1390	494	1425	669	2671
1988	1744	838	477	1363	631	2283	372	2573
1989	1917	1254	410	1128	573	1617	252	1400
1990	2352	1254	667	1209	666	1823	380	2022
1991	1692	1137	802	1003	551	1670	400	1802
1992	1907	1135	678	2414	622	1823	482	2163
1993	2154	1464	571	1745	593	1731	326	1785
1994	2052	1266	489	1273	707	1685	438	1808
1995	1655	1162	449	1115	1136	1683	325	1543
1996	1775	1355	515	1066	1044	2047	328	1637
1997	825	1739	331	489	697	2381	148	615
1998	1229	972	421	821	981	1519	136	641
1999	882	736	419	738	784	1414	188	483
2000	928	532	372	851	729	1652	199	519
2001	973	653	357	901	814	1738	147	548
2002	1156	586	344	757	698	1314	101	398
2003	1036	389	360	778	751	974	226	277
2004	1325	354	254	824	776	933	165	200
2005	676	23	1243	309	220	336	593	229
2006	618	400	316	432	562	1155	227	140
2007	624	631	321	405	775	842	236	101
2008	698	286	309	379	647	503	310	118
2009	847	336	266	542	520	505	208	140
2010	1256	351	260	507	807	550	307	260
2011	774	153	197	329	531	282	605	105
2012	883	224	113	409	507	545	449	148
2013	1060	344	138	269	1060	344	138	269
2014	911	392	133	345	654	652	727	291
2015	1058	621	141	391	662	904	841	318
2016	1297	861	159	435	874	1405	756	1375
2017	1775	838	215	344	1046	2209	739	163
2018	2131	974	230	312	1912	1990	751	215

Table 12. Estimated Mexican landings of scalloped and great hammerheads by state (lb dw).

	Scalloped hammerhead landings				Great hammerhead landings			
Year	Tamaulipas	Veracruz	Tabasco	Campeche	Tamaulipas	Veracruz	Tabasco	Campeche
1976	45408	11841	55386	26946	4803	3562	974	10556
1977	98119	15818	64931	25701	10294	4806	1413	12719
1978	74988	10862	69177	20471	8041	3093	1427	12894
1979	125109	17340	75529	20244	13190	5063	1402	9993
1980	152388	21560	90182	21240	17545	6128	1622	8479
1981	424387	38264	132910	21375	44915	10382	2295	11140
1982	178174	43715	127703	36818	18748	12146	2177	14899
1983	174660	45053	104323	87859	20083	12846	2053	35956
1984	220916	68339	165327	88103	24577	19869	3041	36722
1985	252271	31217	146888	68374	26222	9150	2769	27224
1986	235824	30414	150268	55413	24736	8633	3253	27369
1987	270478	23486	157911	68965	29175	6693	3219	37554
1988	298441	28249	157643	67365	33219	7831	2893	36425
1989	327415	35232	134706	51630	35018	10242	2401	23825
1990	401517	36038	218793	58283	42505	10411	3867	30054
1991	289222	32742	262409	49056	31469	9454	4578	26012
1992	325979	33295	223523	105786	35480	9565	4053	43770
1993	367627	40518	187310	77720	38717	11829	3312	33558
1994	350962	35774	162273	59555	38646	10383	3038	28864
1995	286023	33369	148094	51934	38186	9642	2691	24929
1996	305849	39242	169338	50566	38792	11313	3030	25236
1997	143263	49400	108101	22428	20657	14317	1868	10399
1998	213119	28348	136881	35443	30061	8157	2309	14066
1999	153365	22498	136848	31333	22566	6393	2365	11837
2000	160862	18727	121874	35917	22553	5138	2141	13320
2001	168922	21852	116444	38019	24263	6069	1998	14090
2002	199284	18649	111727	31590	25488	5244	1874	11297
2003	179254	12778	118334	31720	24399	3565	2114	10467
2004	228292	11810	83556	33068	28916	3282	1498	10276
2005	115551	1845	406385	13271	12571	439	7061	5188
2006	107526	13739	104207	17535	15968	3792	1892	5692
2007	109656	17839	105919	16268	18698	5177	1929	5074
2008	121509	8560	102930	15357	18187	2446	1962	4952
2009	146060	9721	87916	21799	18782	2803	1614	6833
2010	216778	10243	87149	21120	28296	2947	1709	7509
2011	133764	4630	70397	13345	17855	1319	1767	4321
2012	152084	7296	41576	16689	19145	2040	1143	5523
2013	184933	9275	45964	11946	28580	2728	875	5120
2014	157592	11587	51261	15016	21376	3322	1597	6098
2015	182511	17851	55168	16952	23615	5157	1783	6809
2016	224067	25344	59956	24628	29724	7274	1766	16423
2017	305859	27960	77752	14254	38817	7770	2029	4979
2018	370638	30237	82713	13308	54741	8558	2120	5098

Table 13. Estimated Mexican landings of scalloped and great hammerheads by major gear type (lb dw).

	Scalloped hammerhead landings by gear			Great hammerhead landings by gear		
Year	Longlines	Nets	Lines	Longlines	Nets	Lines
1976	53650	79756	6176	3751	14663	1481
1977	63181	132424	8964	5207	21734	2291
1978	61723	106680	7095	4028	19844	1583
1979	70765	157048	10408	5349	21705	2594
1980	84416	188218	12736	6314	24198	3262
1981	127923	463111	25902	10684	51354	6694
1982	129164	236590	20656	11034	31704	5232
1983	124504	267029	20362	12301	53083	5553
1984	183601	329285	29800	17920	58199	8089
1985	142512	336371	19868	10322	50172	4872
1986	141427	311219	19273	10348	49047	4596
1987	145756	356519	18565	9613	62696	4333
1988	148473	382614	20612	10171	65197	4999
1989	133213	393180	22589	10878	54719	5889
1990	196146	491174	27310	12728	67592	6518
1991	222432	386344	24653	12168	53975	5370
1992	207713	456088	24782	12663	74491	5714
1993	180446	465987	26743	13210	67537	6669
1994	155289	429069	24207	11835	62883	6212
1995	141378	356681	21361	10879	58624	5946
1996	160236	380629	24131	12293	59564	6514
1997	115268	187265	20660	12075	29109	6056
1998	125899	270243	17650	8867	40869	4857
1999	120759	208859	14426	7418	32012	3730
2000	108671	215546	13162	6466	33348	3338
2001	107299	223858	14080	7045	35615	3760
2002	100679	246707	13863	6325	33982	3597
2003	101542	228634	11910	5355	32200	2989
2004	76638	268152	11938	4792	35933	3248
2005	296766	224606	15680	6863	17292	1104
2006	88314	144903	9790	4842	20091	2411
2007	91901	146763	11019	5846	21978	3054
2008	83715	155939	8703	4060	21325	2162
2009	75296	180948	9253	4099	23613	2319
2010	75480	248534	11275	4615	32751	3096
2011	57497	157653	6987	3121	20357	1785
2012	39393	170886	7366	3160	22582	2109
2013	43015	200191	8911	3680	30574	3050
2014	48762	177721	8973	4481	25232	2681
2015	56195	204805	11482	5944	27995	3425
2016	66445	252734	14816	7917	42715	4556
2017	79236	328353	18236	8291	39894	5410
2018	84550	391598	20748	9414	54222	6881

Table 14. Recreational catches (A, B1, and B2) of scalloped hammerheads in all regions by survey in numbers (without smoothing).

Year	MRIP A	MRIP B1	SRHS AB1	TPWD AB1	AB1 from unclassified sphyrnids	Total AB1	MRIP B2	B2 from unclassified sphyrnids	Total B2
1981	20594	6031				26625	31755	500003	531758
1982	39739				18334	58073	69361	22717	92078
1983	1268			298	238	1804	37964	2016	39980
1984	167	10243		168	1717	12296			
1985	20282	7410		80	2238	30011	46966	4143	51110
1986		1908	18	292	368	2585			
1987	2952		26			2978	2096	40	2136
1988	2667	1553	112	265		4598	1188	197	1385
1989	8714	939	17	154		9824	5676	1227	6902
1990	14347		74	370	1947	16738	17308	5874	23182
1991	1861		2	64	240	2167			
1992	22098		136	34	1009	23277	30608	6982	37590
1993	13586	47175	46	107		60914	125344	18769	144113
1994	1345		92	539	285	2261	8906	2957	11864
1995	2227		92	0	671	2990	1188	422	1610
1996	2479		49	194	53	2775			
1997	1792	3749	42	151	26	5760	10645	1004	11649
1998	1843		51	434		2328	10897	305	11202
1999	2011	163	20	88	1	2283	163	5	169
2000	7593	1170	24	246	1371	10403	2352	159	2511
2001	1563	122	31	366		2082	30814	589	31403
2002	932		16	168	79	1195	8942	264	9206
2003	9211		25	78		9314	8901	2767	11668
2004	789		26	61		876	16241	799	17039
2005	16073		26	90	1084	17273	31690	2915	34605
2006	382		19	71	7	479	2660	340	3000
2007	1283		55	36	14	1387	39868	660	40528
2008			2	114		116	7361	762	8123
2009	1380		17	88		1485	17973	1914	19887
2010	13		51	92		156	3953	1718	5671
2011	437		22			459	6943	248	7191
2012	102		24			126	17711	1764	19475
2013	1652		37	36		1725	7833	775	8609
2014	11118		14	65		11197	18030	1388	19417
2015			5	23		28	2083	645	2728
2016			2	20		22	1296	150	1447
2017			3	55		58	7755	2048	9802
2018			8	22		30	1978	58	2036
2019			4			4	4838	272	5110
2020			1			1	3732	732	4465

Table 15. Recreational catches (A, B1, and B2) of GOM scalloped hammerheads by survey in numbers (without smoothing).

Year	MRIP A	MRIP B1	SRHS AB1	TPWD AB1	AB1 from unclassified sphyrnids	Total AB1	MRIP B2	B2 from unclassified sphyrnids	Total B2
1981		6031				6031			
1982	673					673	2443	1900	4343
1983	1268			298	136	1702	98	14	112
1984	167	10243		168	1319	11897			
1985	19588	6657		80	3525	29849	41314	14931	56244
1986		1297	18	292		1607			
1987	78		20			98			
1988	2667	28	112	265	266	3338	1054		1054
1989	3199		17	154	715	4085	2247	686	2933
1990			74	370	4	448			
1991			2	64		66			
1992	448		132	34	108	723			
1993	4041		46	107	153	4347			
1994	11		92	539	26	668			
1995			92		1	93	1188	73	1261
1996			49	194		243			
1997	36		41	151		228			
1998	982		50	434	819	2285			
1999			20	88		108			
2000	13		24	246		283	699	6	705
2001	26		31	366		423	972	27	999
2002	105		16	168		289	5184	278	5462
2003	3549		25	78		3652	986	142	1128
2004	115		26	61		202	1890	52	1942
2005			26	90		116	1519	123	1641
2006			19	71		90			
2007			55	36		91			
2008			1	114		115			
2009			17	88		105			
2010			51	92		143	2313	278	2590
2011			22			22	1983	280	2264
2012			24			24			
2013	380		36	36		452	574	20	594
2014			14	65		79	714	44	757
2015			5	23		28	662	22	683
2016			2	20		22			
2017			3	55		58	4725	367	5092
2018			8	22		30			
2019			3			3			
2020			1			1			

Table 16. Recreational catches (A, B1, and B2) of ATL scalloped hammerheads by survey in numbers (without smoothing).

Year	MRIP A	MRIP B1	SRHS AB1	TPWD AB1	AB1 from unclassified sphyrnids	Total AB1	MRIP B2	B2 from unclassified sphyrnids	Total B2
1981	20594					20594	31755	24025	55780
1982	39066				24278	63345	66918	28155	95073
1983							37865	4107	41972
1984									
1985	695	754			12	1460	5653	72	5725
1986		610				610			
1987	2874	0	6			2880	2096	56	2152
1988		1525				1525	133	30	163
1989	5514	939				6454	3429	4462	7891
1990	14347				2830	17178	17308	15070	32378
1991	1861				74	1934			
1992	21649		4		1010	22663	30608	13323	43932
1993	9544	47175				56720	125344	11468	136813
1994	1334				188	1522	8906	7080	15987
1995	2227				1166	3394			
1996	2479				31	2510			
1997	1756	3749	1			5506	10645	1288	11933
1998	861		1			862	10897	130	11028
1999	2011	163			1	2175	163	1	165
2000	7580	1170			4	8753	1654	140	1794
2001	1537	122				1659	29842	391	30234
2002	828				89	917	3758	118	3876
2003	5662				0	5662	7915	3352	11267
2004	674				0	674	14351	834	15184
2005	16073				1555	17628	30172	2425	32596
2006	382				7	389	2660	338	2999
2007	1283				19	1302	39868	333	40201
2008			1			1	7361	804	8165
2009	1380					1380	17973	2167	20140
2010	13					13	1640	1100	2740
2011	437					437	4960	156	5116
2012	102					102	17711	1441	19152
2013	1273		1			1274	7260	727	7987
2014	11118					11118	17316	1677	18993
2015							1421	909	2331
2016							1296	148	1444
2017							3029	1481	4510
2018							1978	110	2088
2019			1			1	4838	219	5057
2020							3732	226	3959

Table 17. Recreational catches (A, B1, and B2) of great hammerheads by survey in numbers (without smoothing).

Year	MRIP A	MRIP B1	SRHS AB1	TPWD AB1	AB1 from unclassified sphyrnids	Total AB1	MRIP B2	B2 from unclassified sphyrnids	Total B2
1981							19751	310997	330748
1982	32347	73148			48672	154168	27900	9138	37038
1983	5297	20427			3906	29630	356428	18929	375357
1984	7569	54033		33	10008	71643	99223	20860	120084
1985	779	57953		14	4734	63480	6541	577	7119
1986	467	43859	65	262	7408	52062	77377	33854	111232
1987	4834	3000	26	178		8038	17129	327	17456
1988	22925	346	47			23318	20006	3325	23331
1989	3250		48	51		3349	6926	1497	8423
1990	95	1402	19	296	238	2051	27938	9481	37418
1991	1423	69073	9	101	8802	79408	536	231	767
1992	9900	5307	45	455	712	16418	29431	6713	36144
1993			77	54		131	39980	5986	45966
1994	5971		34		864	6869	5666	1881	7548
1995		5951	58		1740	7749	31595	11232	42828
1996	8165	3606	36		229	12037	74338	5097	79435
1997	484		12		2	498	280	26	306
1998	539		10	62		611	19176	536	19712
1999	153		7	82		242	25	1	26
2000	1881		4		286	2171	230	16	245
2001	3739		9	46		3794	29961	572	30533
2002			4			4	1380	41	1421
2003	26		7			33	27	8	36
2004			9			9	2214	109	2323
2005			10	45	4	59	54	5	59
2006	25		11	47	1	84	2983	381	3363
2007	875		8	60	9	952	57	1	58
2008			13			13	236	24	260
2009			13	115		128	6841	728	7570
2010			3			3	17	7	24
2011	98		8			106			
2012		38	6			44	2962	295	3257
2013			7			7			
2014			2			2	582	45	627
2015			1	49		50	2289	709	2999
2016			2			2	8292	962	9254
2017							2616	691	3307
2018							1082	32	1114
2019			1			1	1217	68	1285
2020			5			5	1196	235	1431

Table 18. Recreational catches (A, B1, and B2) of smooth hammerheads by survey in numbers (without smoothing).

Year	MRIP A	MRIP B1	SRHS AB1	TPWD AB1	AB1 from unclassified sphyrnids	Total AB1	MRIP B2	B2 from unclassified sphyrnids	Total B2
1981							3358	52877	56235
1982	6788				3132	9920			
1983	238				36	274			
1984							21189	4455	25644
1985									
1986	649		18		111	778	6863	3003	9866
1987	1819		7			1826	58448	1117	59565
1988	6716		9			6725	9858	1638	11496
1989	236	2493				2729	9	2	11
1990	243	49	6		39	337	3686	1251	4937
1991	39284	69073	13		4899	113269	2654	1144	3798
1992	3380		8		154	3541	8907	2032	10939
1993	14481		13			14494	41821	6262	48083
1994	3054		12		441	3508	9955	3305	13261
1995	1520		8		442	1971	25943	9223	35166
1996	996	492	1		29	1519	188	13	201
1997	1870	722	3		12	2607	1500	141	1641
1998	3020					3020			
1999			1			1	1854	61	1916
2000			2			2			
2001	1645					1645			
2002			2			2			
2003			1			1			
2004									
2005									
2006			2			2			
2007							6341	105	6446
2008									
2009									
2010									
2011									
2012									
2013	1678					1678	781	77	
2014									
2015							1189	368	1557
2016									
2017									
2018							9		9
2019							503	28	531
2020							366	72	438

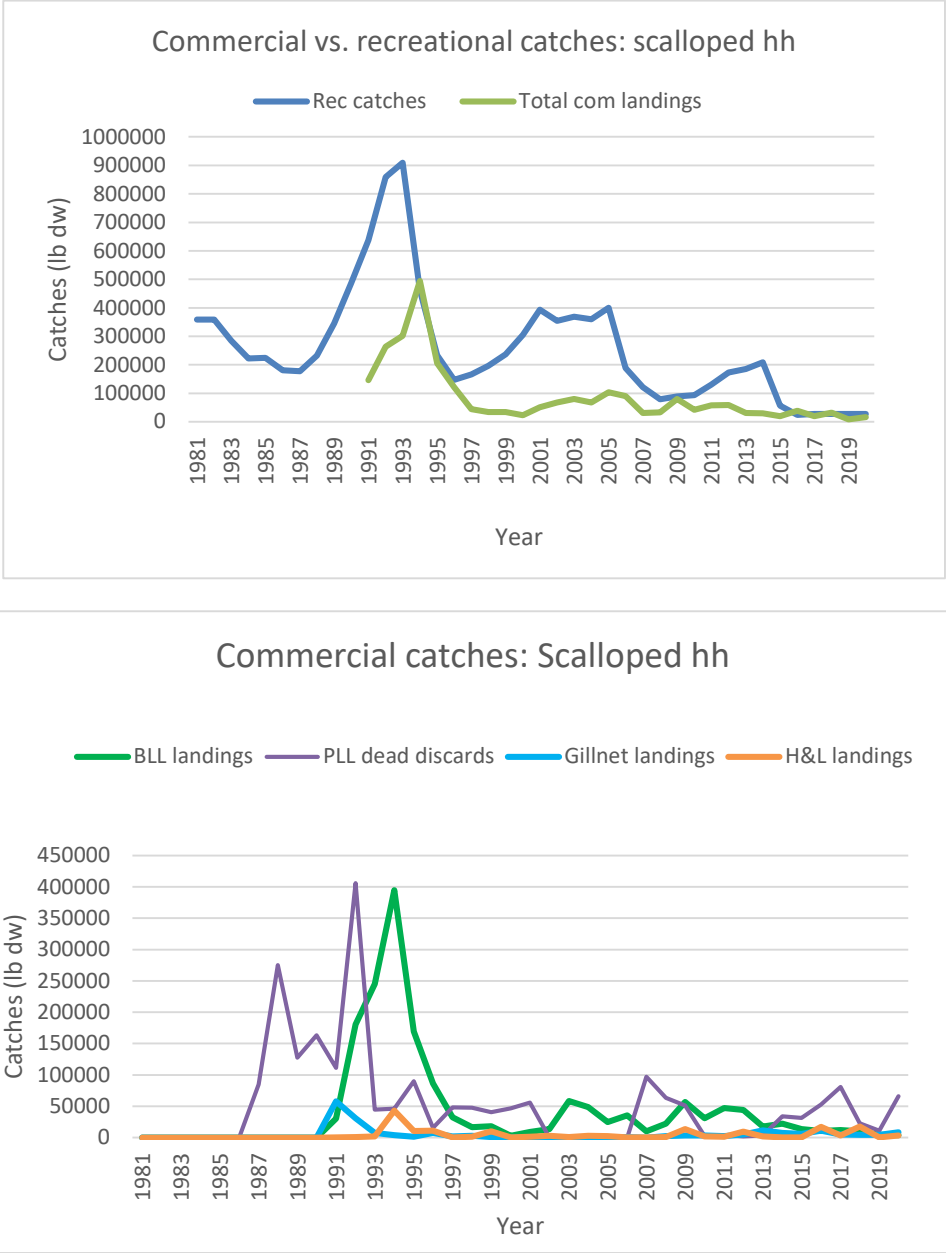
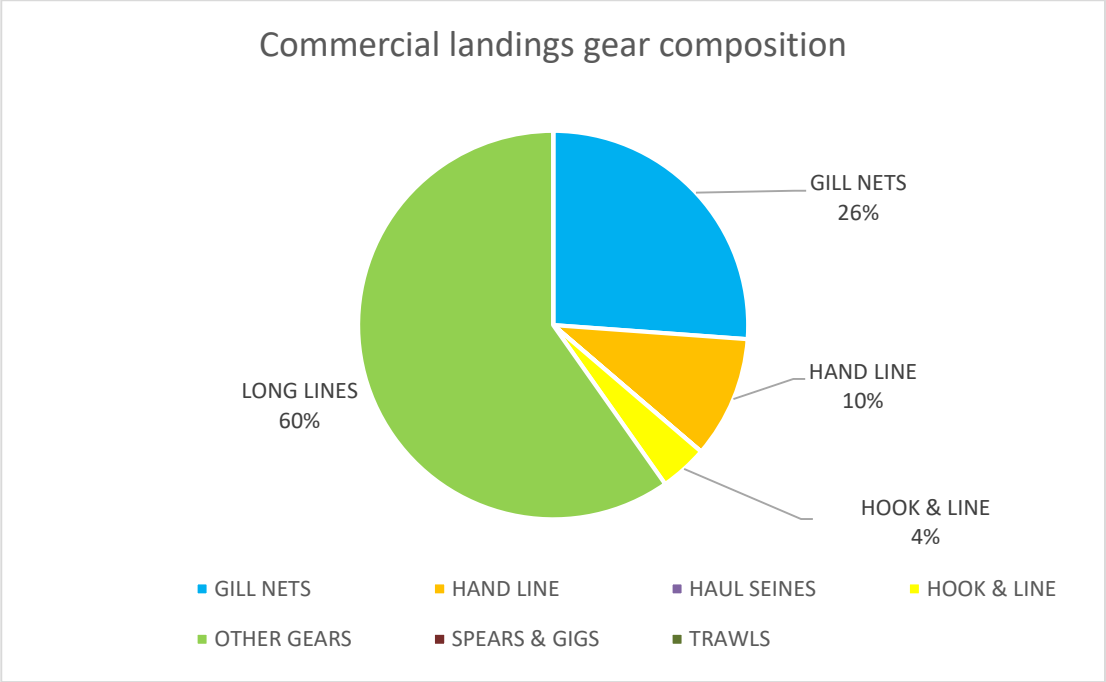


Figure 1. Total commercial landings of scalloped hammerhead compared to smoothed recreational catches (A+B1; lb dw), 1981-2020 (top) and landings by gear, including dead discards from the pelagic longline fishery (bottom). BLL=bottom longline; PLL=pelagic longline; H&L=hook and line.



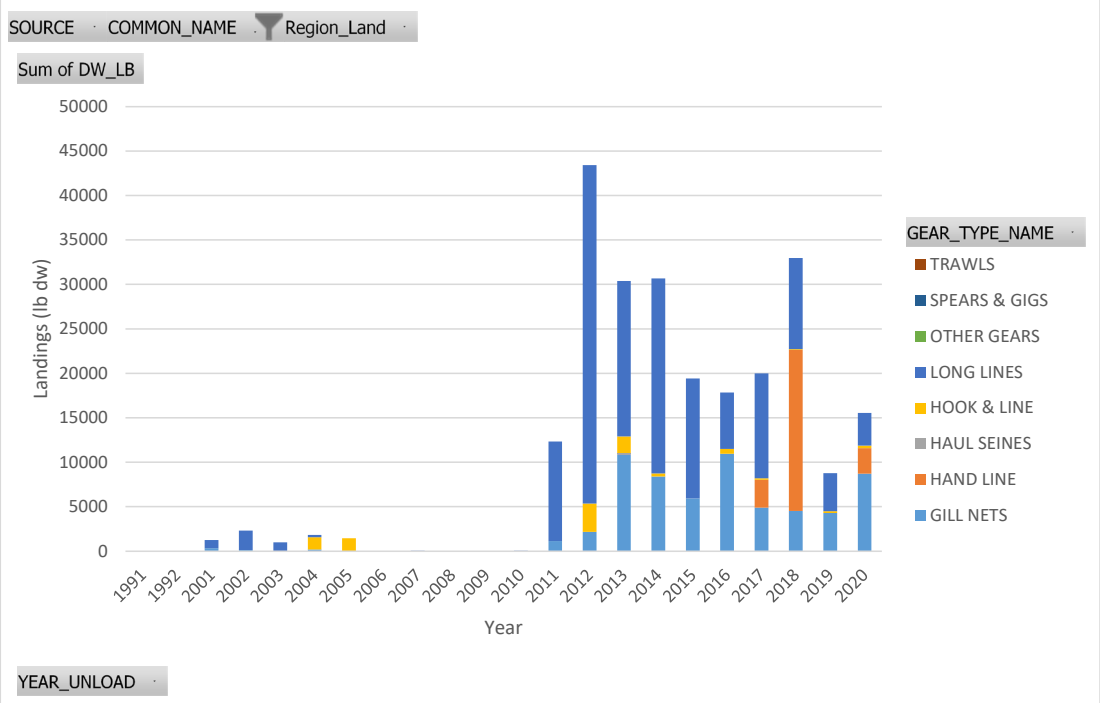
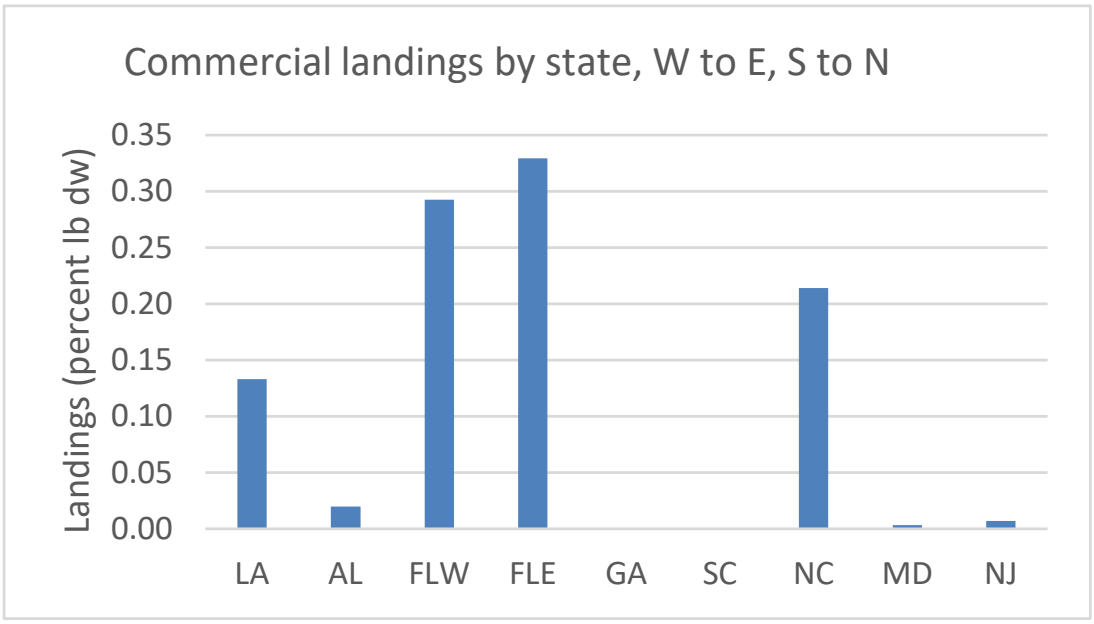


Figure 2. Commercial landings (lb dw) of scalloped hammerheads by gear type from FINS for 1991-2020. Top panel: relative contribution for the entire time period; bottom panel: annual composition of the main gears by year.



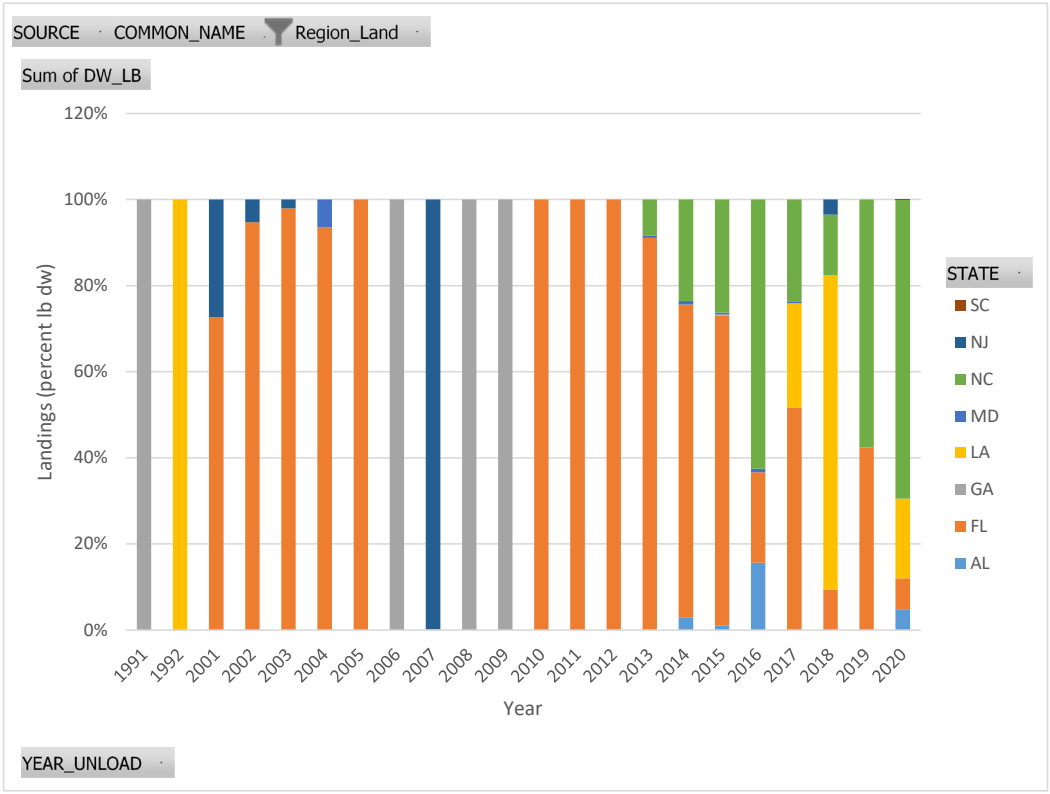
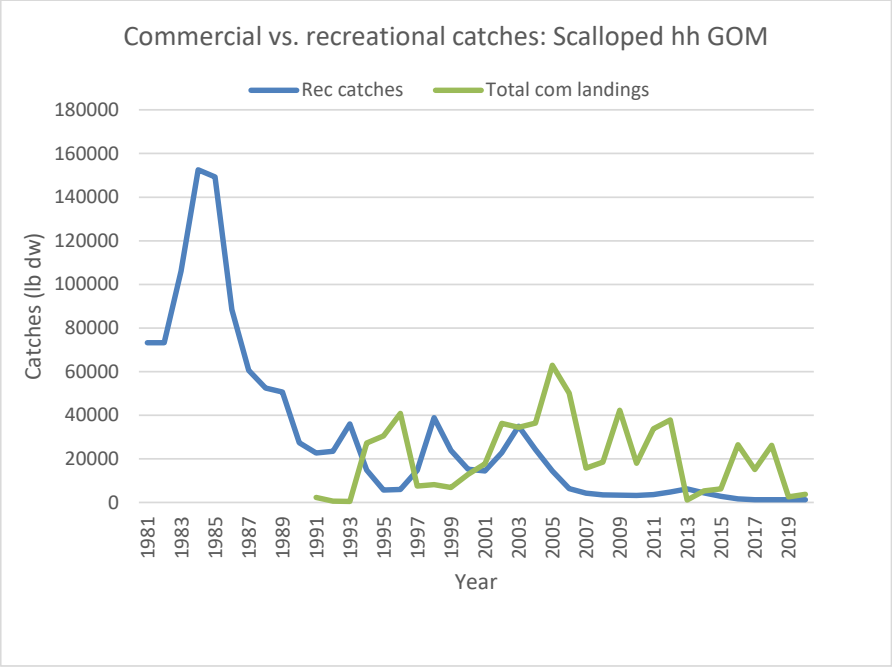


Figure 3. Commercial landings (lb dw) of scalloped hammerheads by state of landing from FINS for 1991-2020. Top panel: relative contribution for the entire time period; bottom panel: composition of states by year.



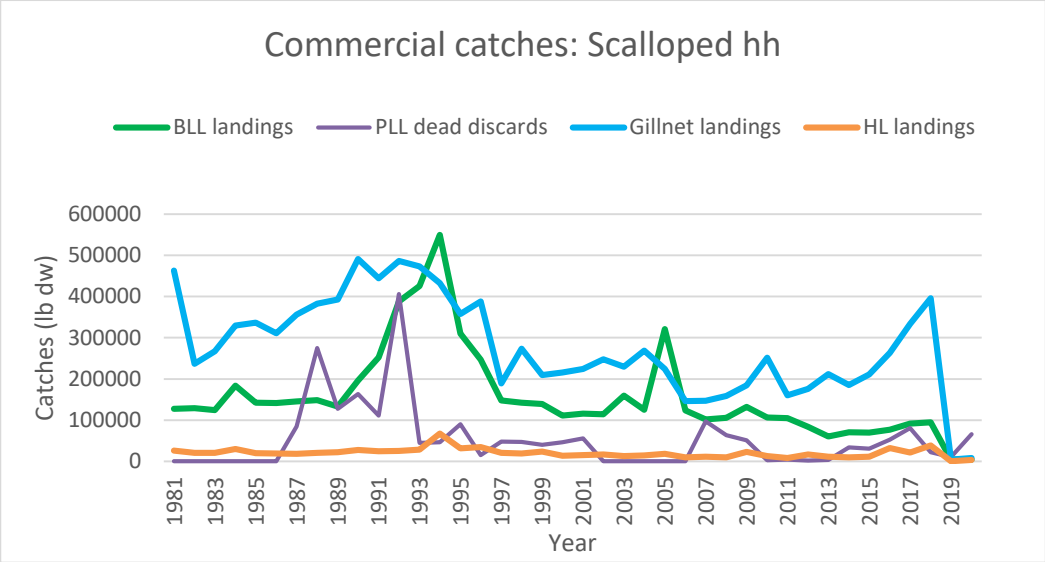
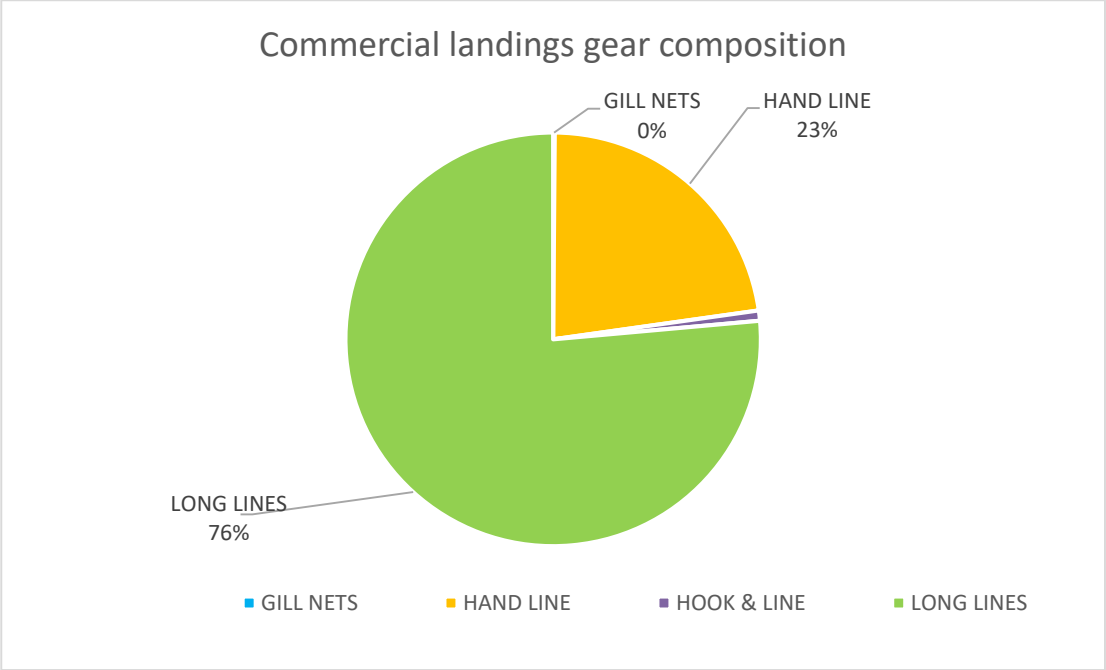


Figure 4. Total commercial landings of GOM scalloped hammerhead compared to smoothed recreational catches (A+B1; lb dw), 1981-2020 (top) and landings by gear, including dead discards from the pelagic longline fishery (bottom). BLL=bottom longline; PLL=pelagic longline; HL=hand line.



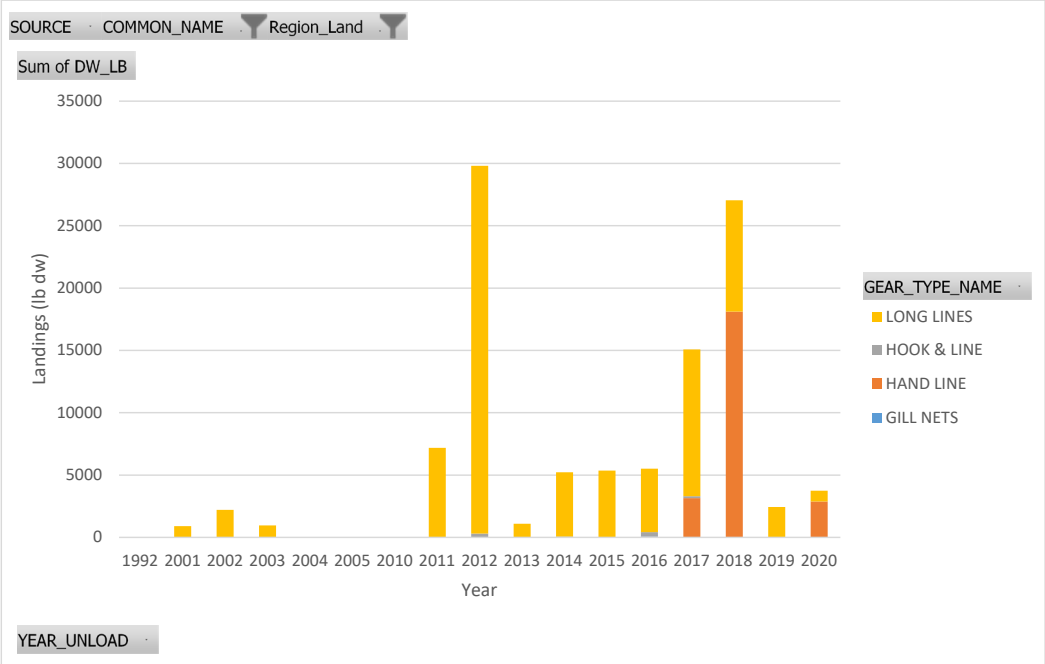


Figure 5. Commercial landings (lb dw) of scalloped hammerheads in the GOM by gear type from FINS for 1991-2020. Top panel: relative contribution for the entire time period; bottom panel: annual composition of the main gears by year.

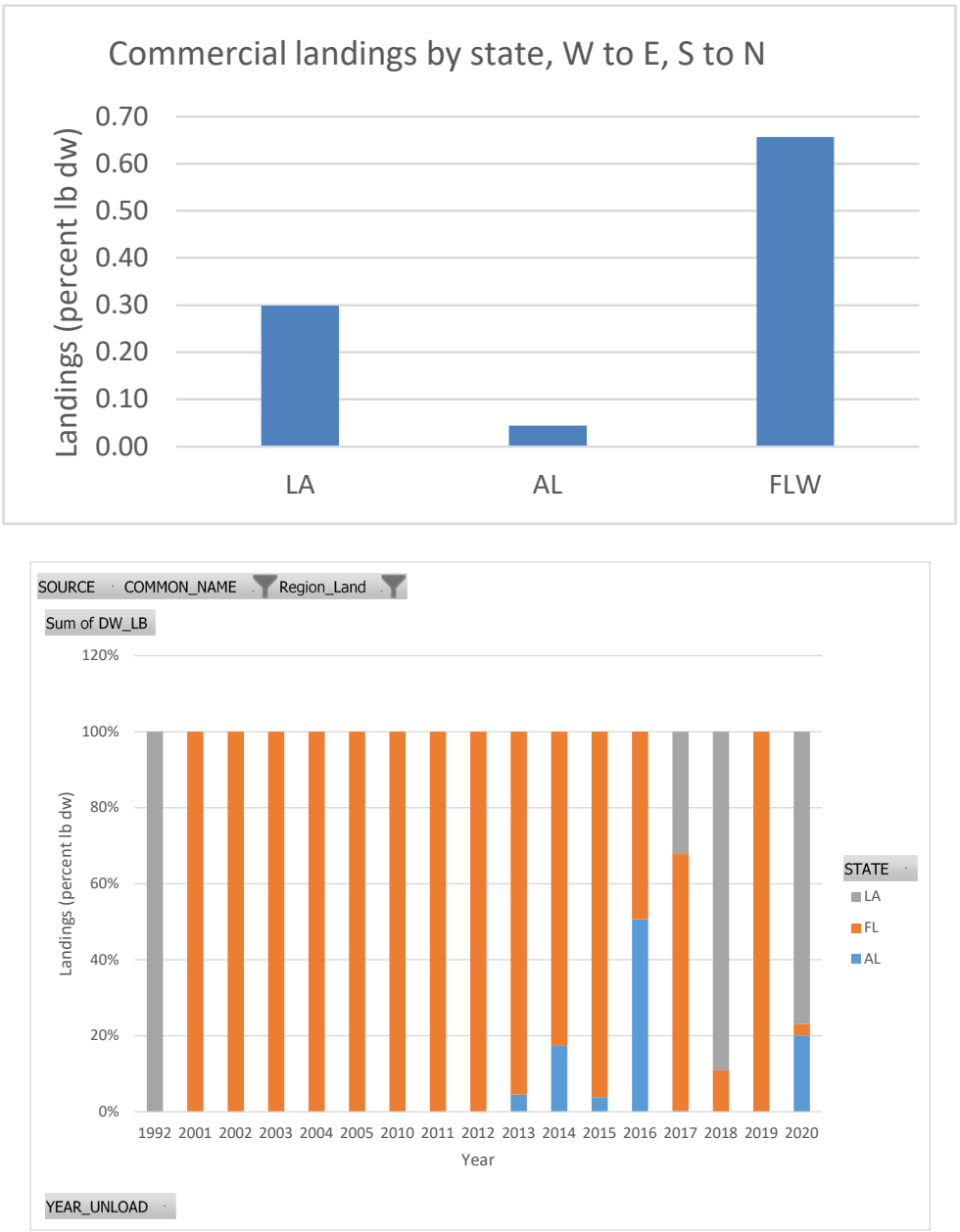
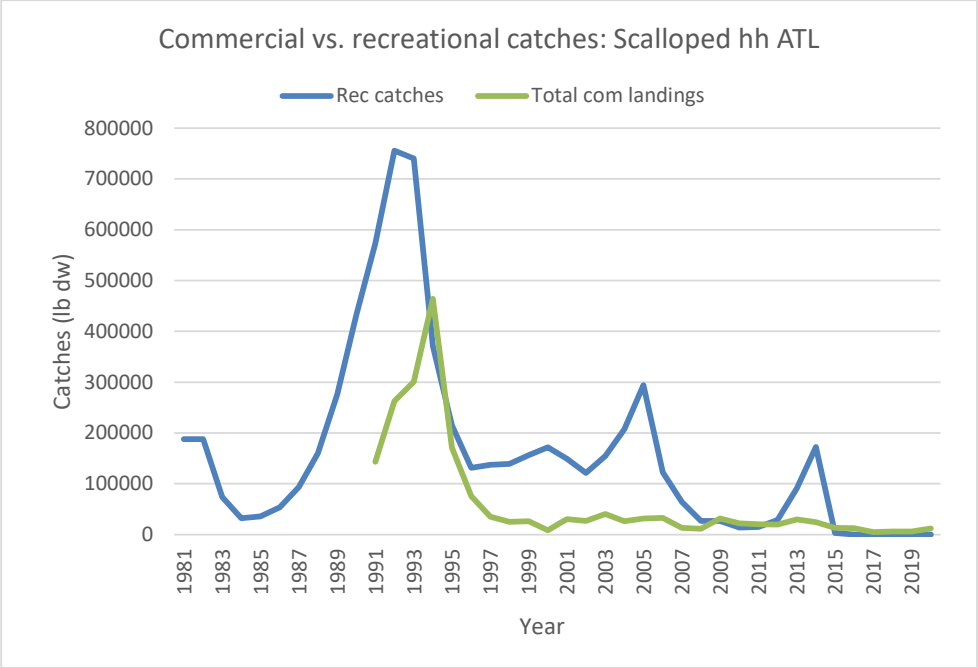


Figure 6. Commercial landings (lb dw) of scalloped hammerheads in the GOM by state of landing from FINS for 1991-2020. Top panel: relative contribution for the entire time period; bottom panel: composition of states by year.



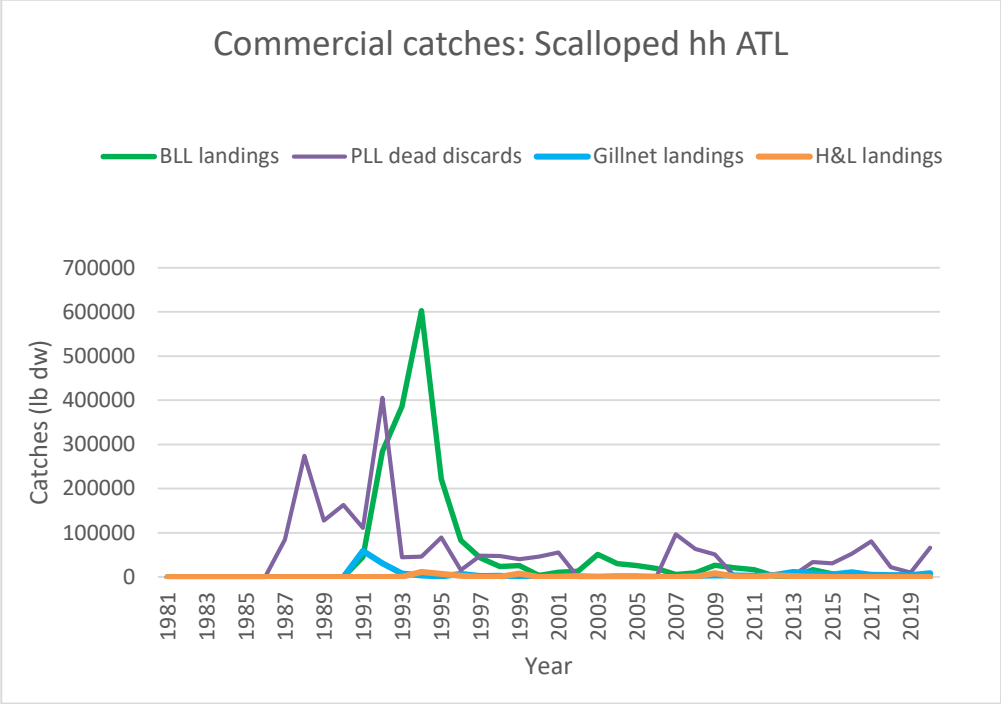
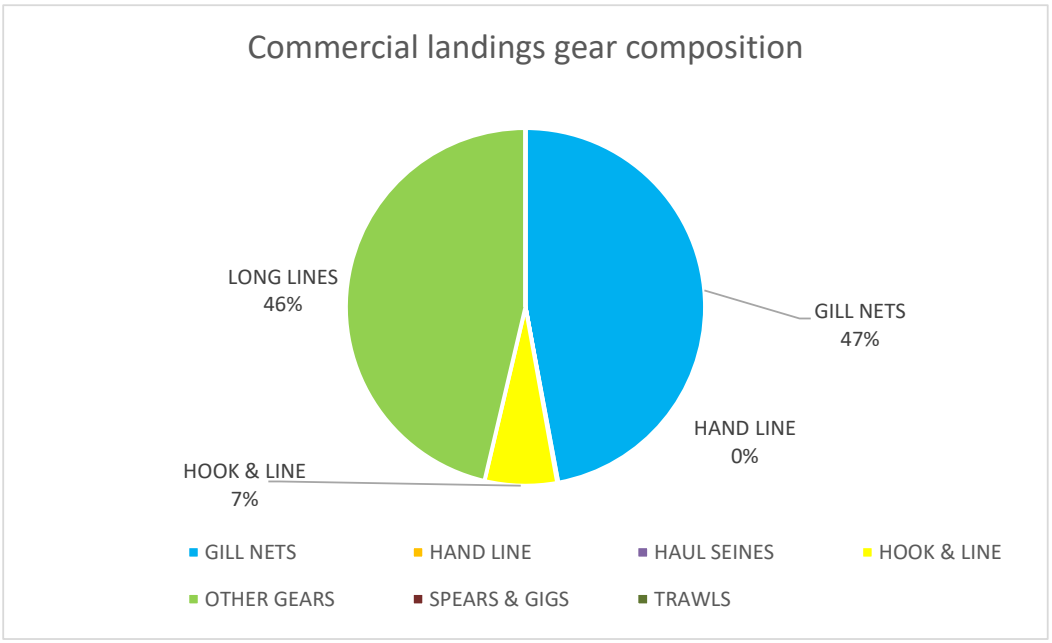


Figure 7. Total commercial landings of ATL scalloped hammerhead compared to smoothed recreational catches (A+B1; lb dw), 1981-2020 (top) and landings by gear, including dead discards from the pelagic longline fishery (bottom). BLL=bottom longline; PLL=pelagic longline; H&L=hook and line.



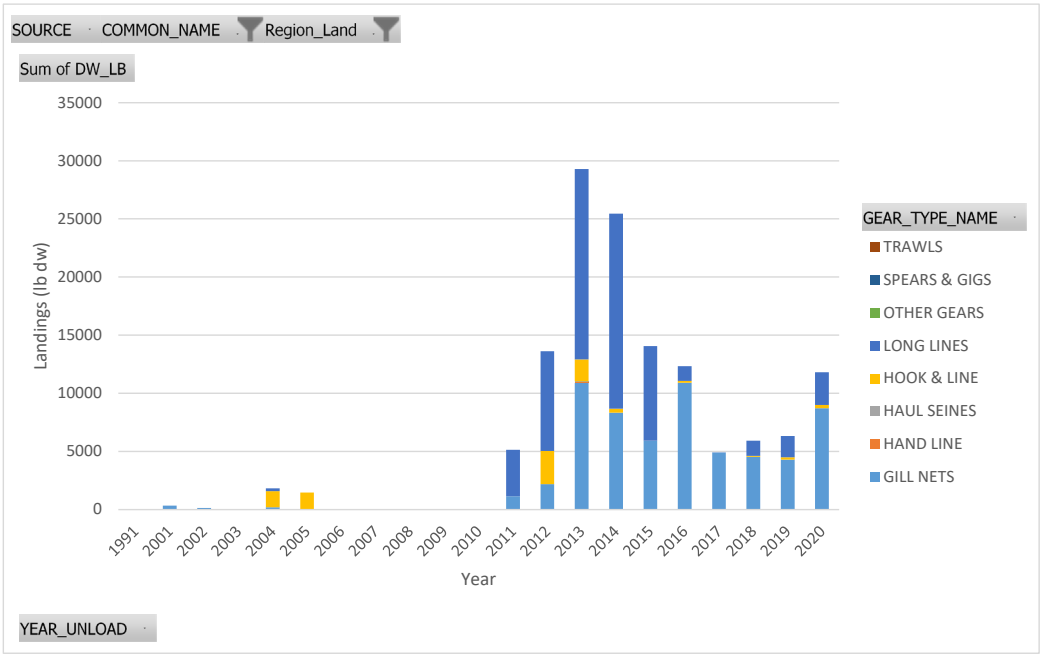


Figure 8. Commercial landings (lb dw) of scalloped hammerheads in the ATL by gear type from FINS for 1991-2020. Top panel: relative contribution for the entire time period; bottom panel: annual composition of the main gears by year.

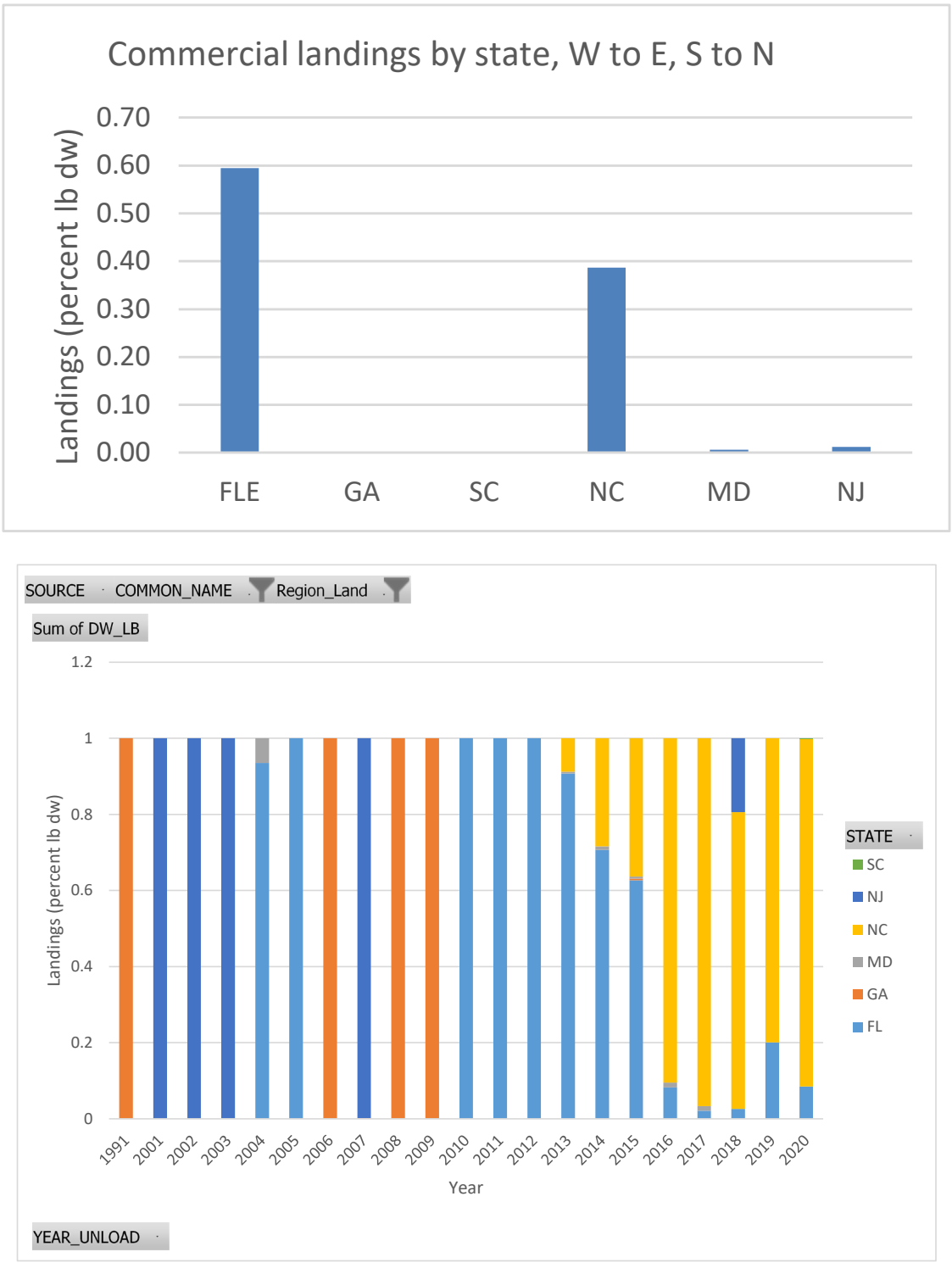
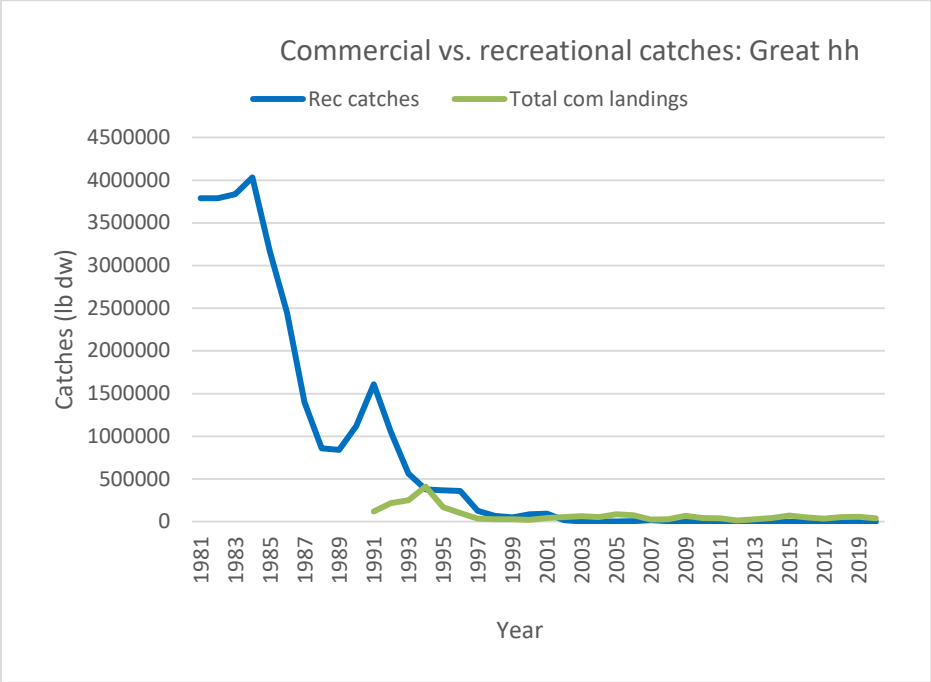


Figure 9. Commercial landings (lb dw) of scalloped hammerheads in the ATL by state of landing from FINS for 1991-2020. Top panel: relative contribution for the entire time period; bottom panel: composition of states by year.



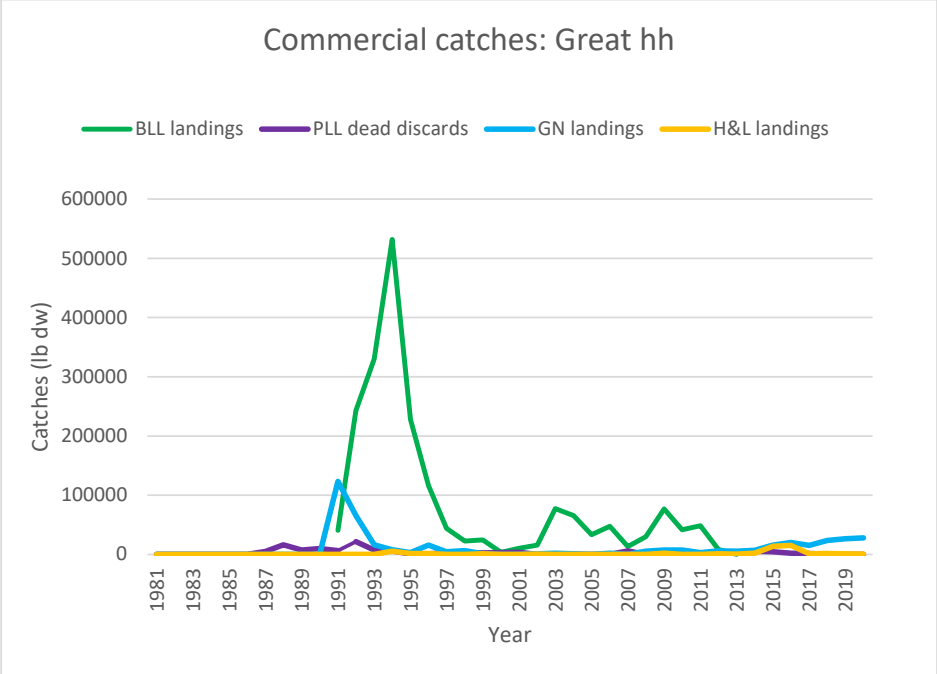


Figure 10. Total commercial landings of great hammerhead compared to smoothed recreational catches (A+B1; lb dw), 1981-2020 (top) and landings by gear, including dead discards from the pelagic longline fishery (bottom). BLL=bottom longline; PLL=pelagic longline; GN=gillnets; H&L=hook and line.

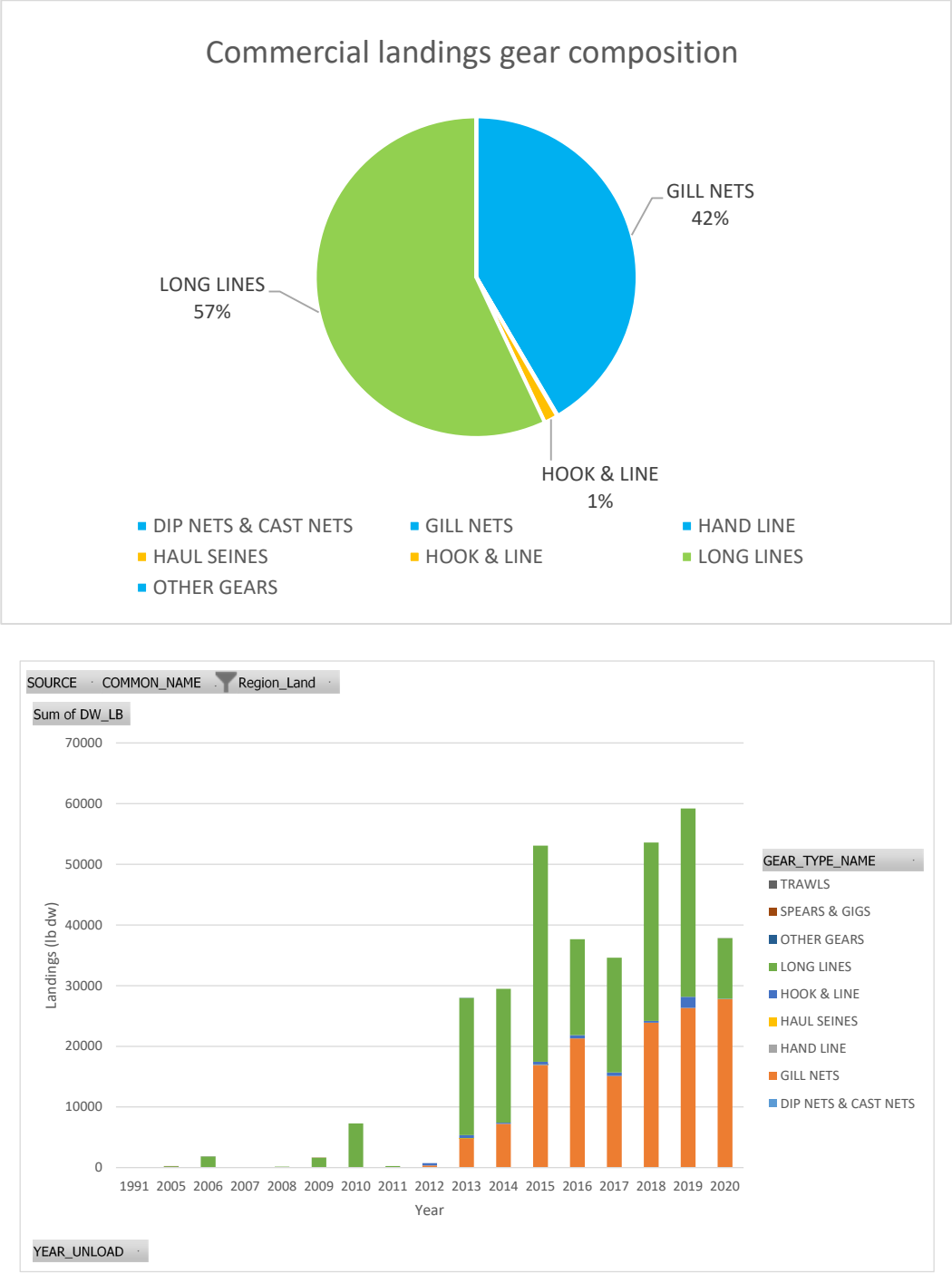


Figure 11. Commercial landings (lb dw) of great hammerheads by gear type from FINS for 1991-2020. Top panel: relative contribution for the entire time period; bottom panel: annual composition of the main gears by year.

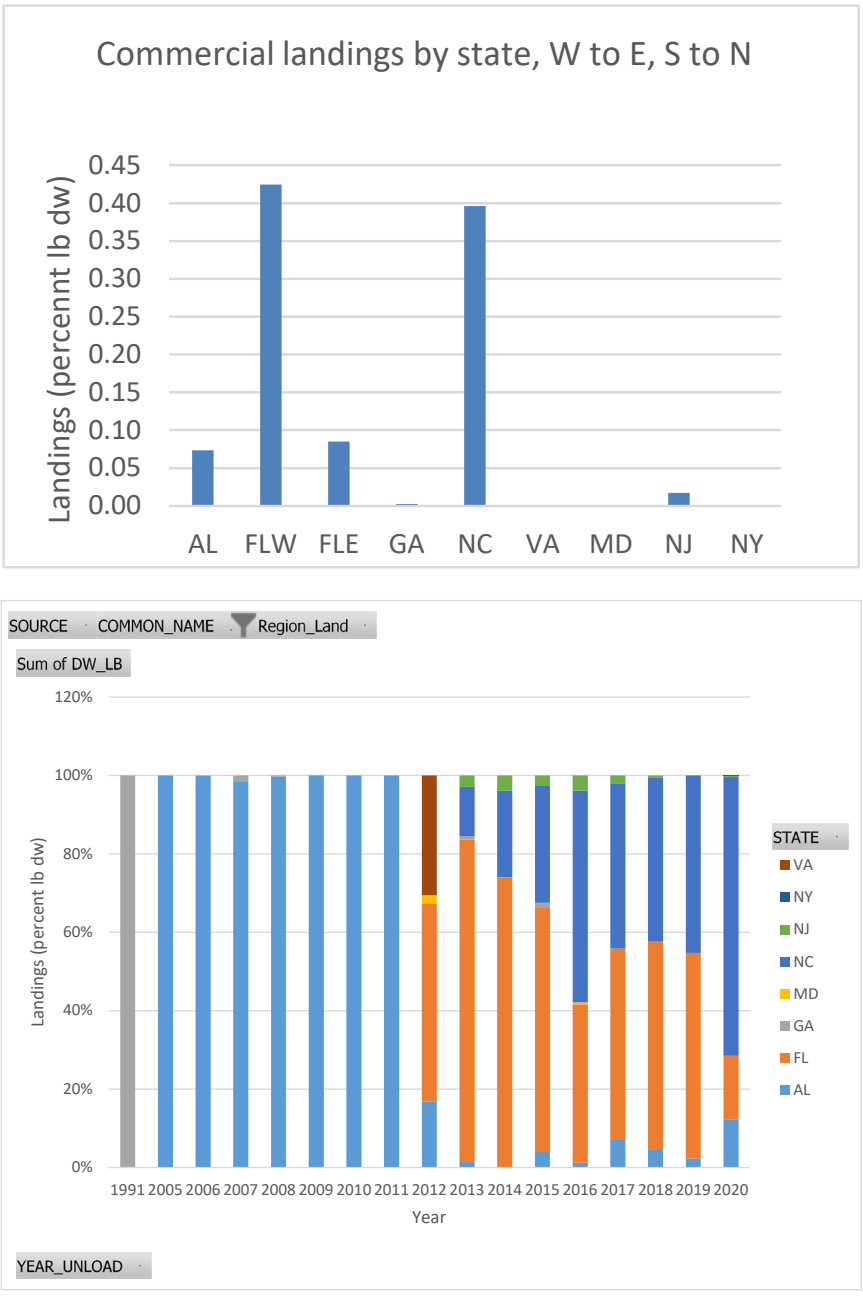
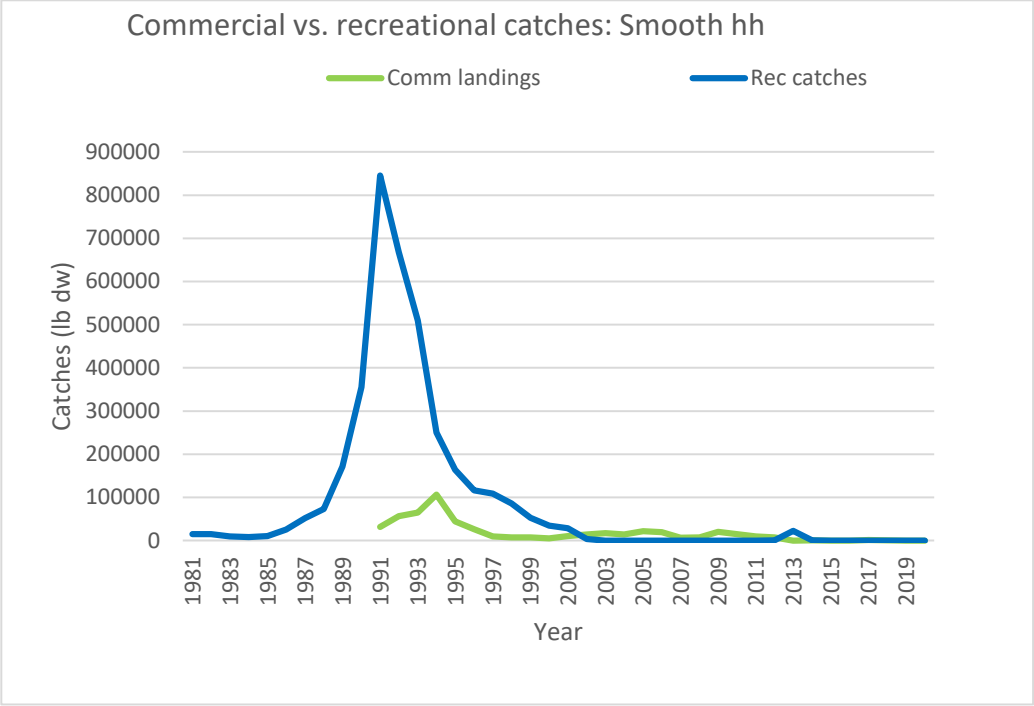


Figure 12. Commercial landings (lb dw) of great hammerheads by state of landing from FINS for 1991-2020.Top panel: relative contribution for the entire time period; bottom panel: composition of states by year.



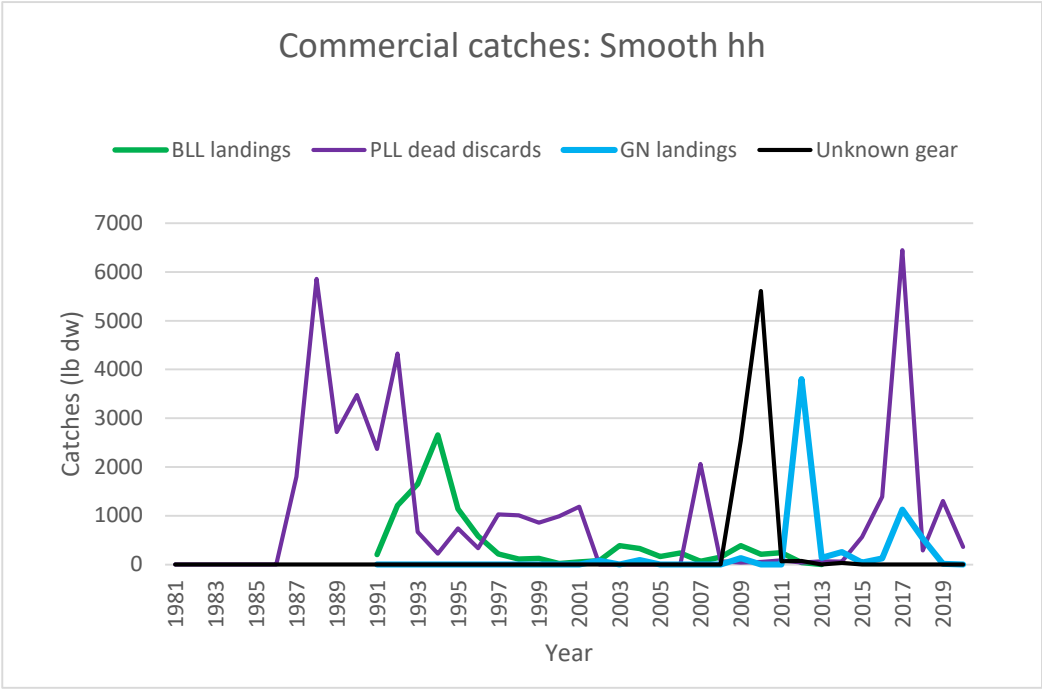


Figure 13. Total commercial landings of smooth hammerhead compared to smoothed recreational catches (A+B1; lb dw), 1981-2020 (top) and landings by gear, including dead discards from the pelagic longline fishery (bottom). BLL=bottom longline; PLL=pelagic longline; GN=gillnets.

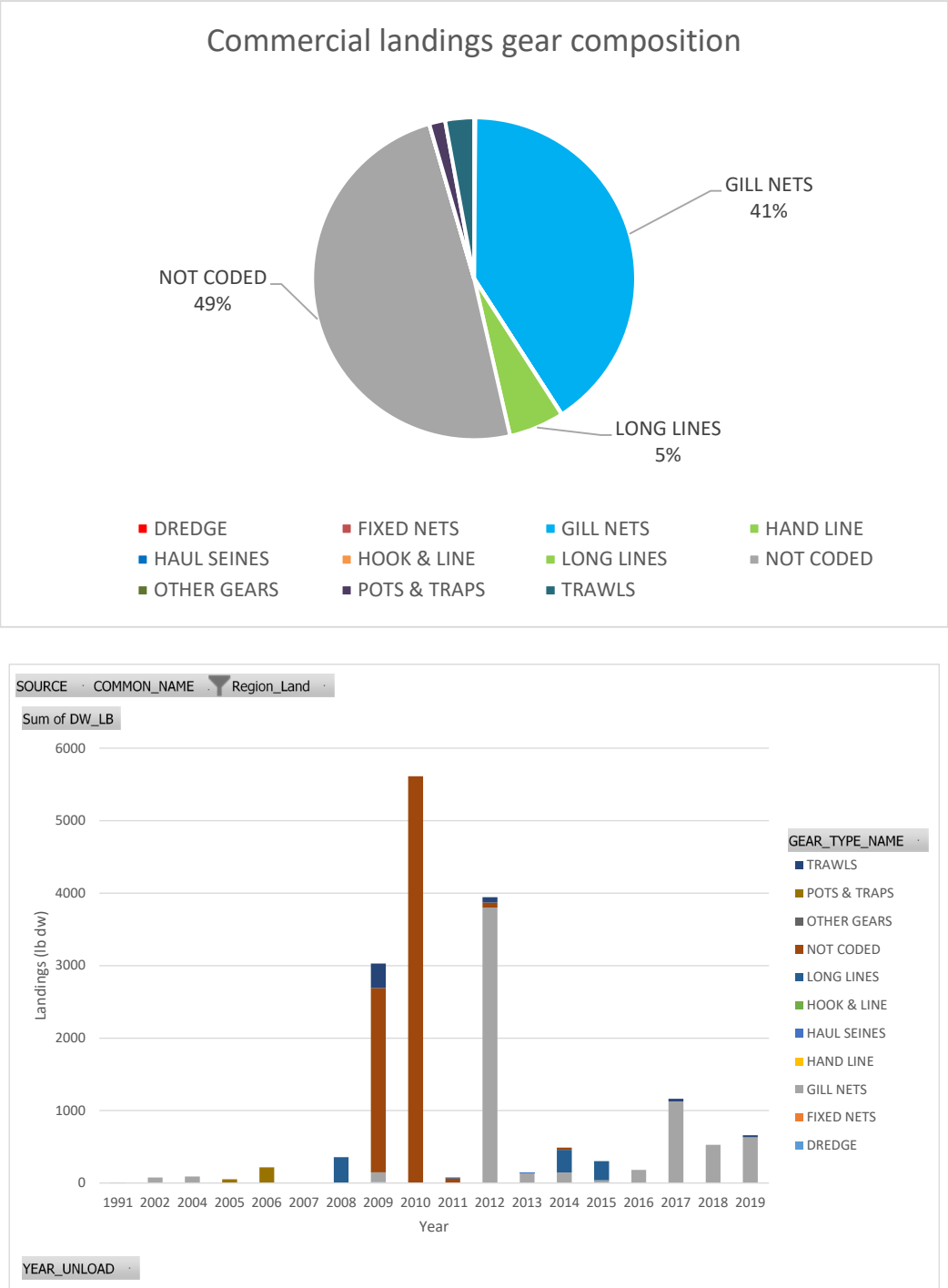


Figure 14. Commercial landings (lb dw) of smooth hammerheads by gear type from FINS for 1991-2020. Top panel: relative contribution for the entire time period; bottom panel: annual composition of the main gears by year.

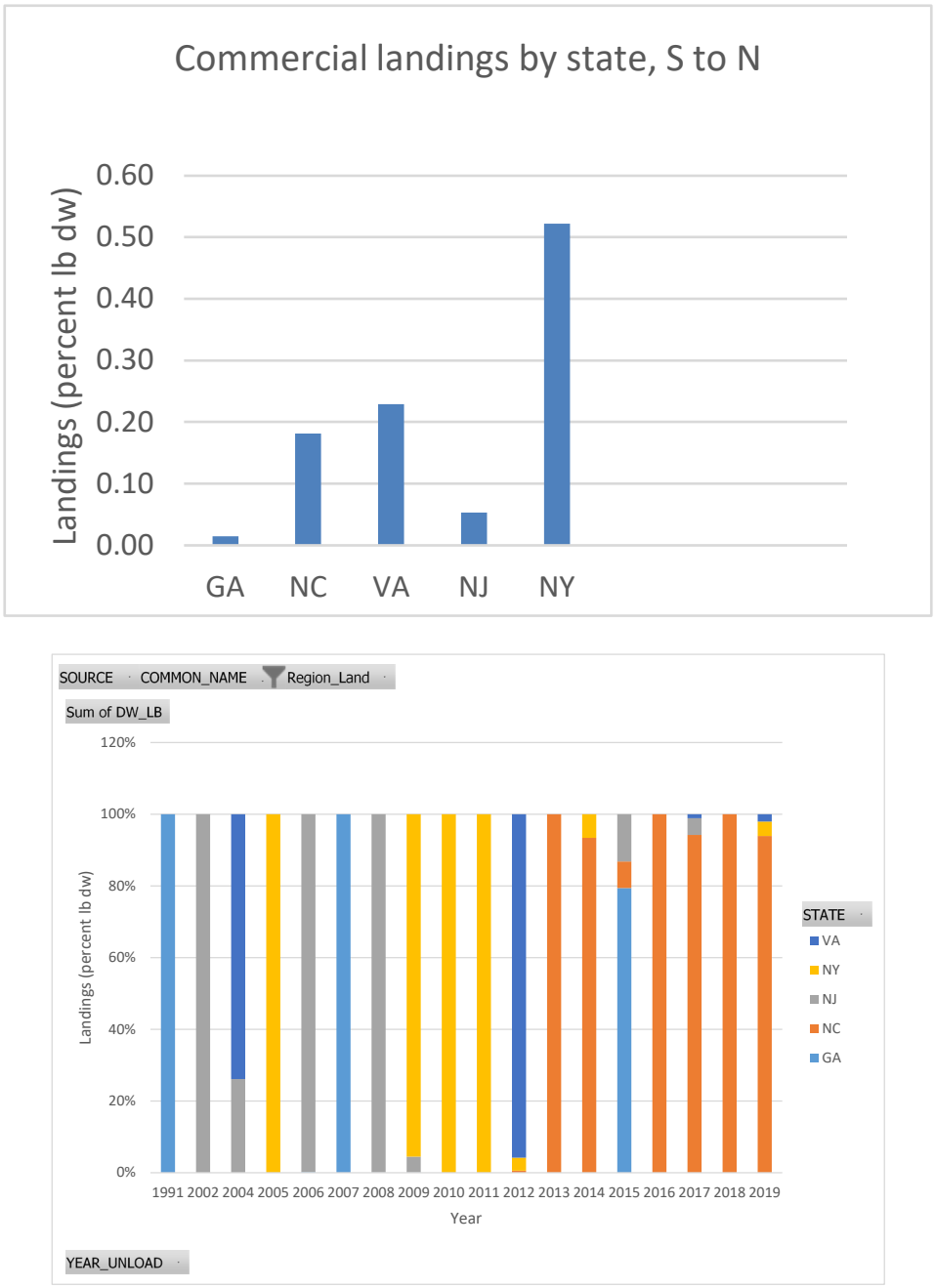
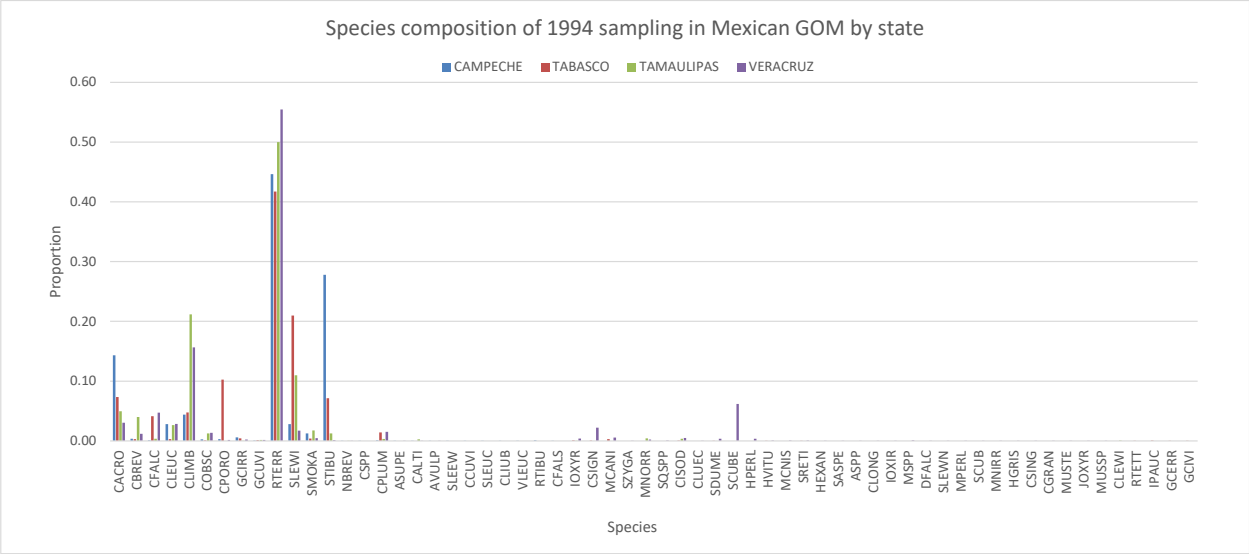


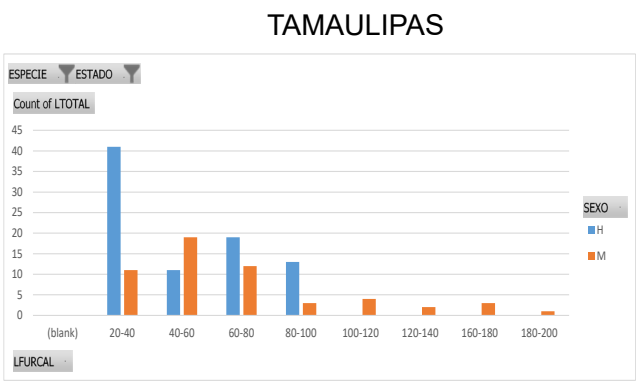
Figure 15. Commercial landings (lb dw) of smooth hammerheads by state of landing from FINS for 1991-2020.Top panel: relative contribution for the entire time period; bottom panel: composition of states by year.

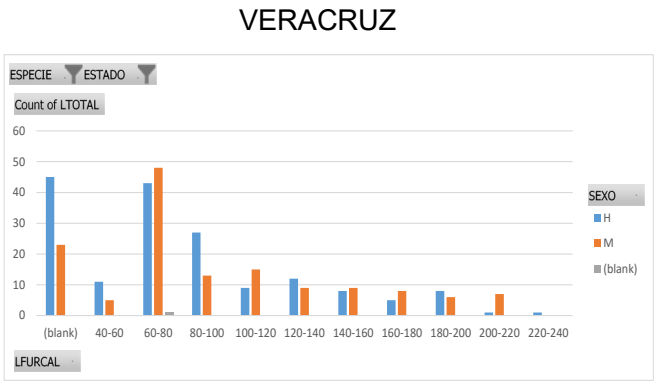
Figure 16. Map of the Gulf of Mexico showing the Mexican states of Tamaulipas, Veracruz, Tabasco, and Campeche sampled during the 1993-1994 Castillo et al. (1998) monitoring study.

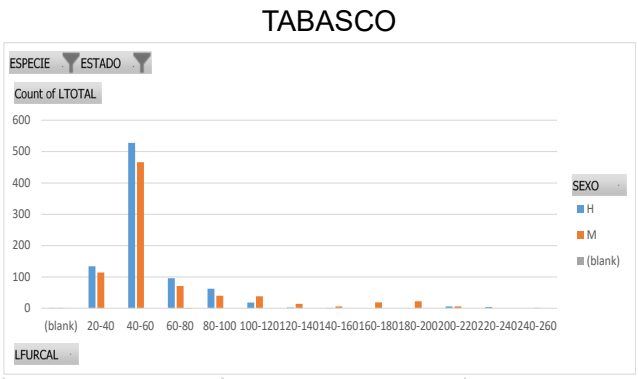


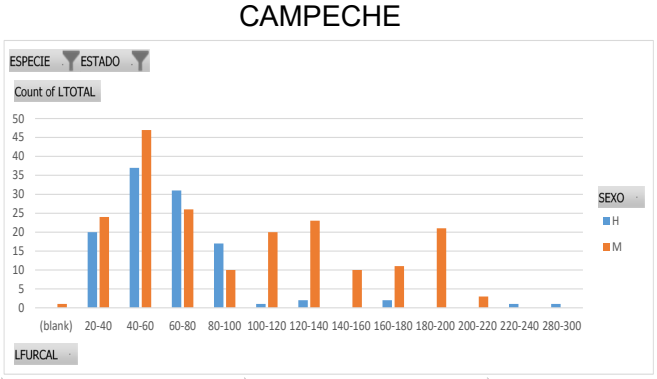
	TAMAULIPAS	VERACRUZ	TABASCO	CAMPECHE	ALL
SLEWI	0.110	0.017	0.210	0.028	0.054
SMOKA	0.017	0.005	0.004	0.012	0.009
SZYGA	0	3.64511E-05	0	0	1E-05

Figure 17. Species composition of sharks landed in Tamaulipas, Veracruz, Tabasco, and Campeche observed in the 1993-1994 Castillo et al. (1998) monitoring study. The table shows scalloped hammerheads (SLEWI) were the main hammerhead species landed in each state, with smooth hammerhead (SZYGA) landings being negligible.



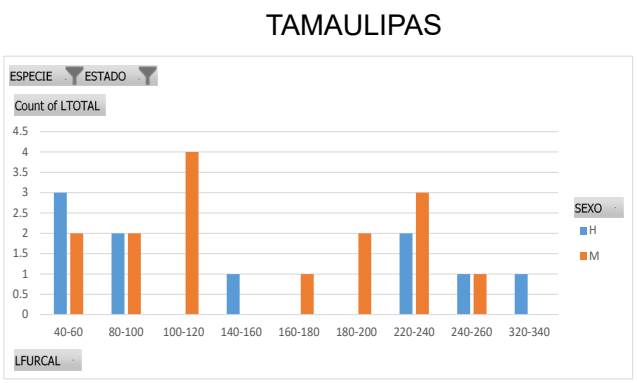


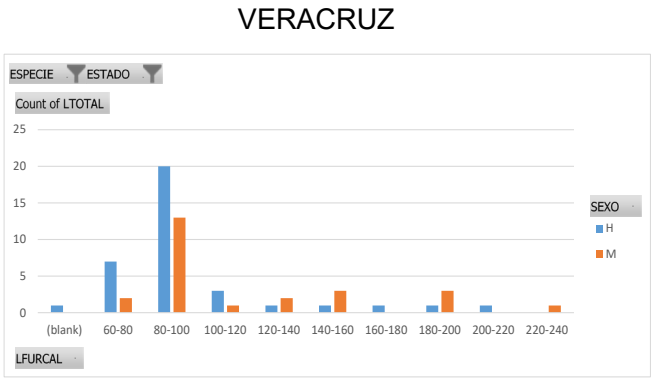


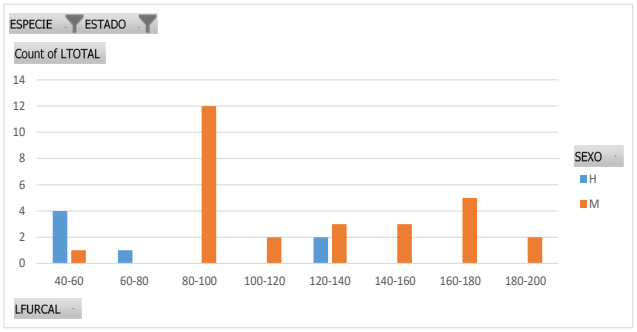


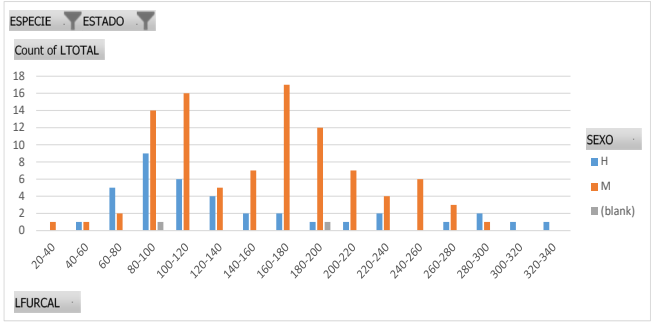
	ALL both sexes		TAM both sexes		VER both sexes		TAB both sexes		CAM both sexes	
% Cazon	0.94		0.97		0.85		0.96		0.87	
% Tiburon	0.06		0.03		0.15		0.04		0.13	

Figure 18. Length-frequency distributions of scalloped hammerheads by sex and state observed in the 1993-1994 Castillo et al. (1998) monitoring study. The table shows the proportion of scalloped hammerhead landings that were <150 cm TL ("cazones") and >=150 cm TL ("tiburones") for sexes combined computed as a weighted average (weighted by sample size for each sex). Most animals observed were immature and assigned to the "cazones" category.



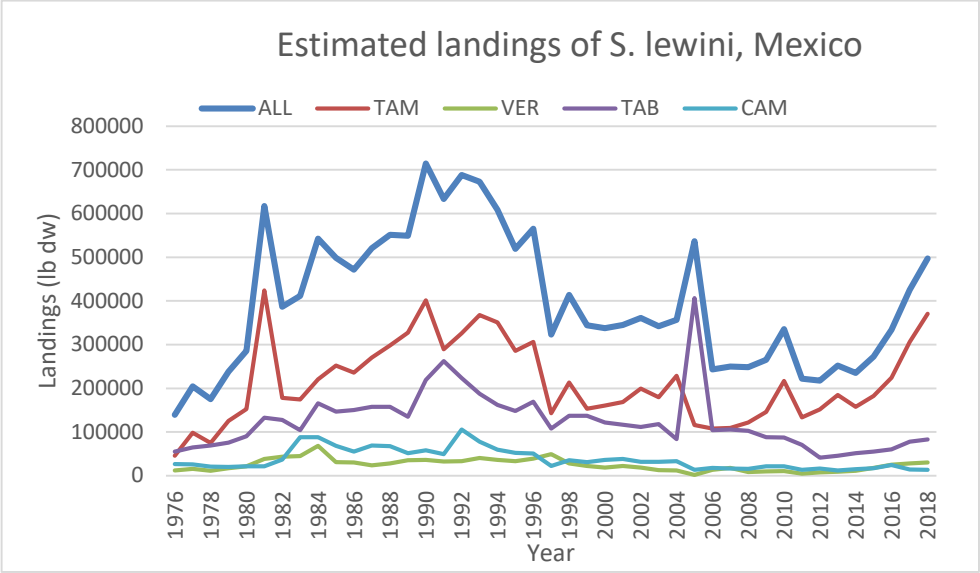






	ALL both sexes	TAM both sexes	VER both sexes	TAB both sexes	CAM both sexes
% Cazon	0.66	0.56	0.88	0.80	0.54
% Tiburon	0.34	0.44	0.12	0.20	0.46

Figure 19. Length-frequency distributions of great hammerheads by sex and state observed in the 1993-1994 Castillo et al. (1998) monitoring study. The table shows the proportion of great hammerhead landings that were <150 cm TL ("cazones") and >=150 cm TL ("tiburones") for sexes combined computed as a weighted average (weighted by sample size for each sex). Although a larger proportion of animals observed were assigned to the "tiburones" category, most animals were immature.



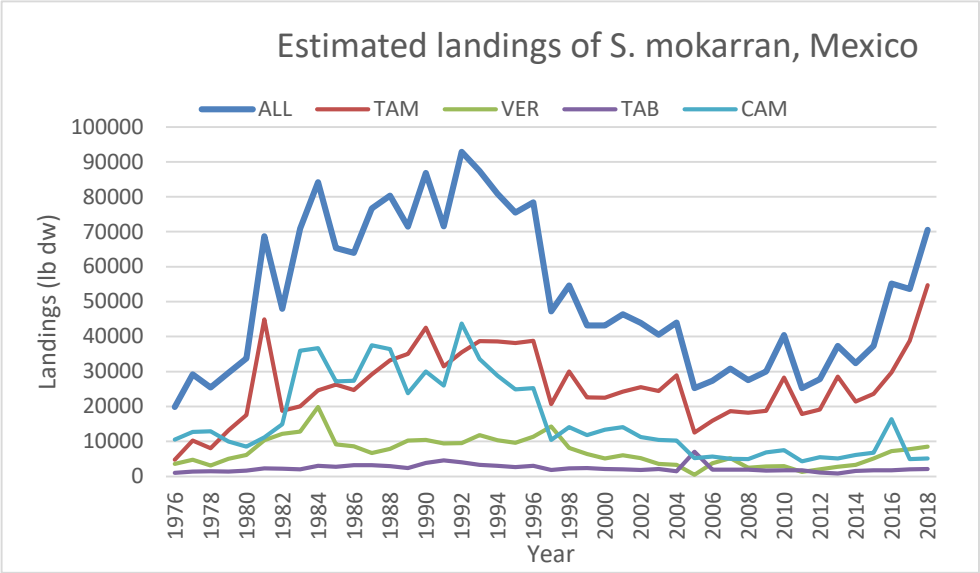
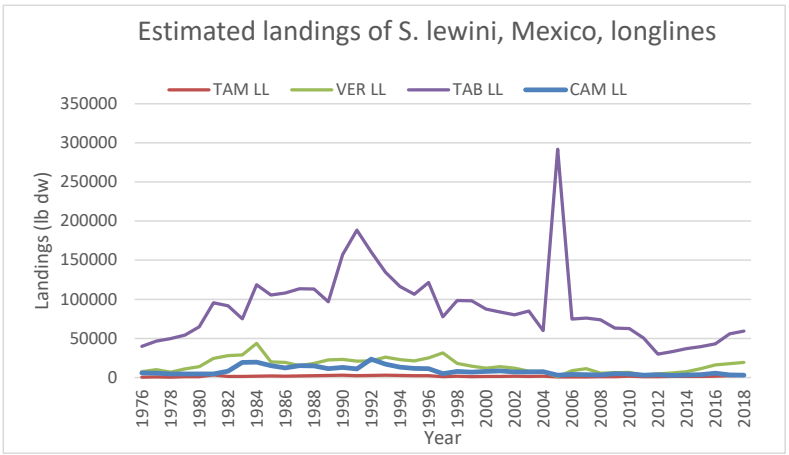
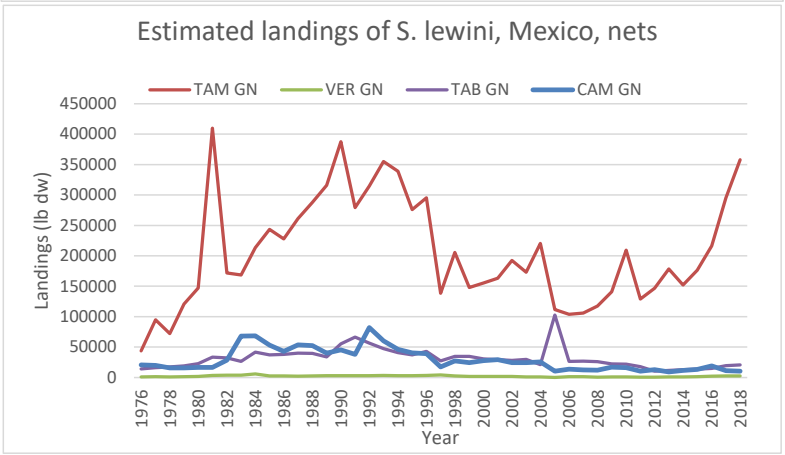
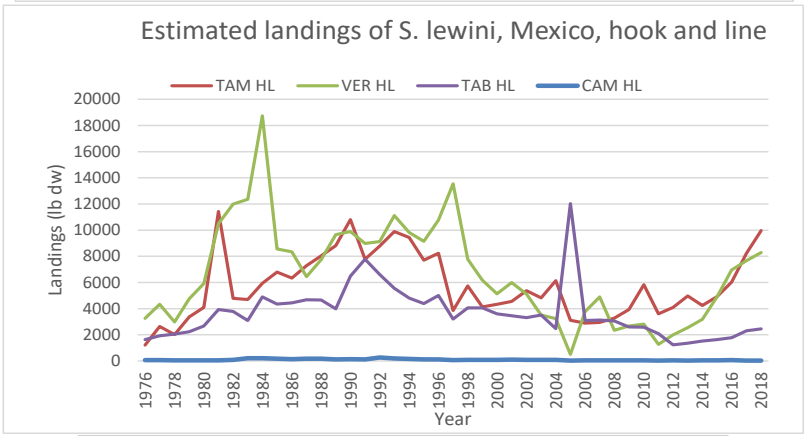


Figure 20. Estimated landings of scalloped hammerhead (top) and great hammerhead (bottom) by state. Landings of "cazones" (<150 cm TL) and "tiburones" (>=150 cm TL) by state reported by Conapesca were multiplied by the proportion that scalloped and great hammerheads make up of the entire catches and by the proportion of "cazones" and "tiburones" attributed to each species to obtain total estimates.

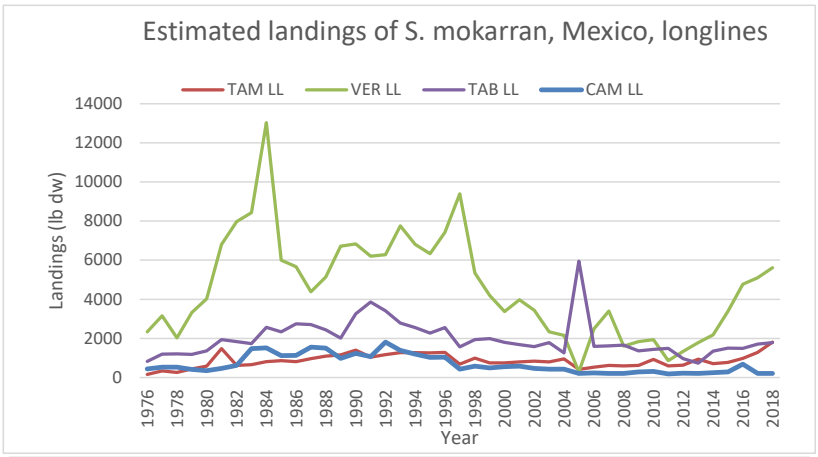


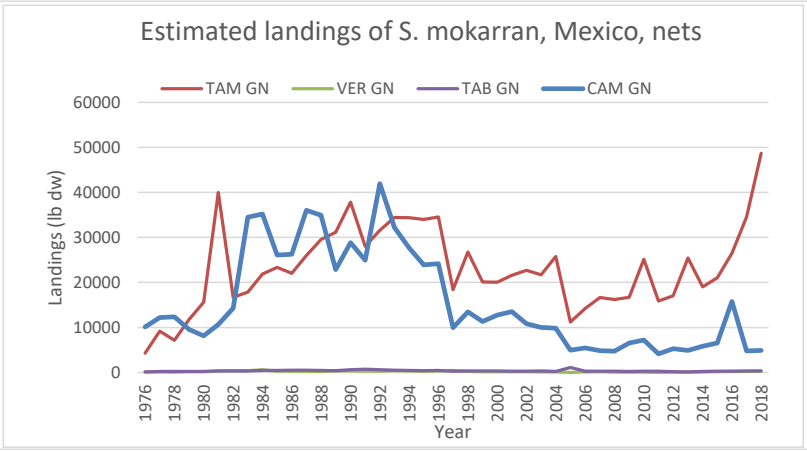


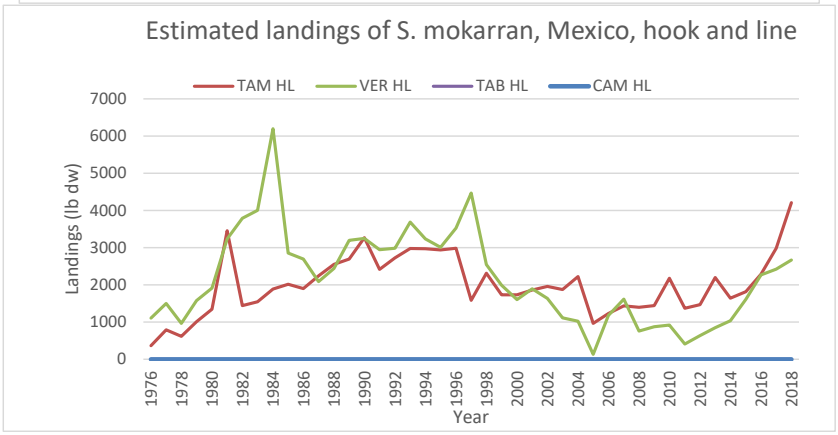


	TAM	VER	TAB	CAM
LONGLINES	0.01	0.64	0.72	0.22
NETS	0.97	0.09	0.25	0.78
HOOK&LINE	0.03	0.27	0.03	0.00

Figure 21. Estimated landings of scalloped hammerheads by gear and state. The table shows the percentage composition of gears that scalloped hammerheads were caught by state.



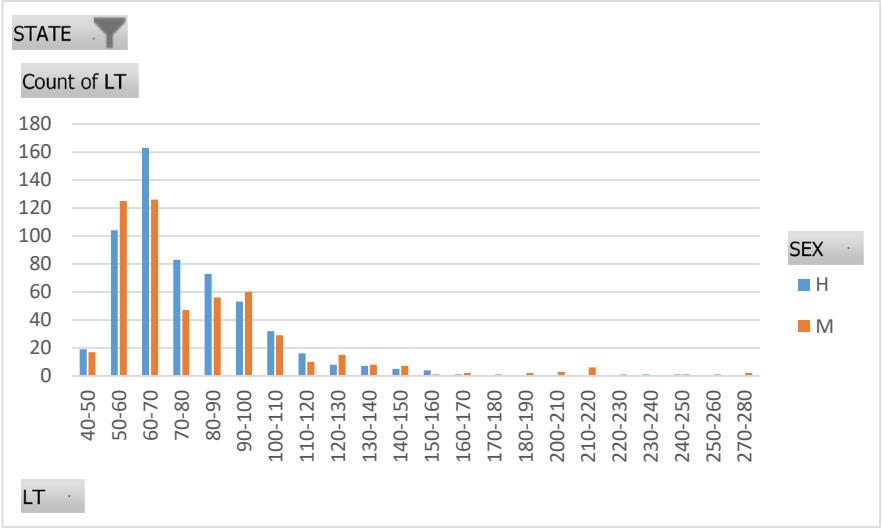




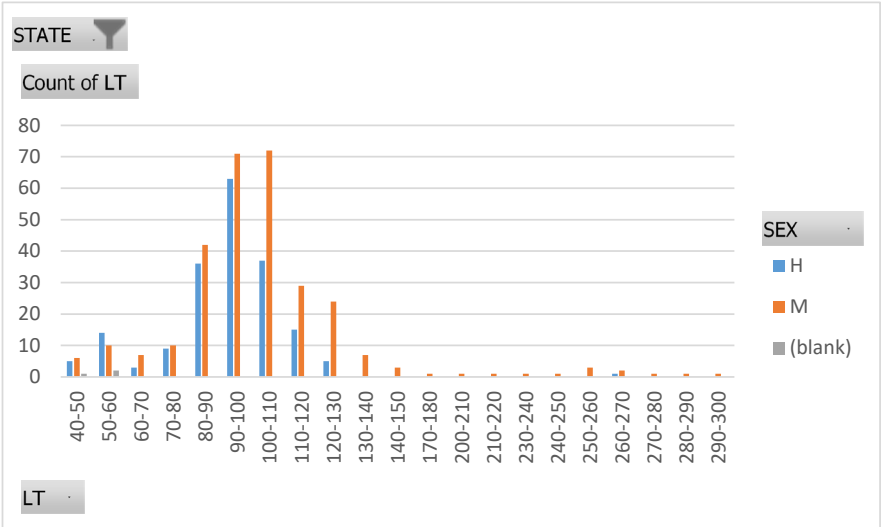
	TAM	VER	TAB	CAM
LONGLINES	0.03	0.66	0.84	0.04
NETS	0.89	0.03	0.16	0.96
HOOK&LINE	0.08	0.31	0.00	0.00

Figure 22. Estimated landings of great hammerheads by gear and state. The table shows the percentage composition of gears that great hammerheads were caught by state.

TABASCO

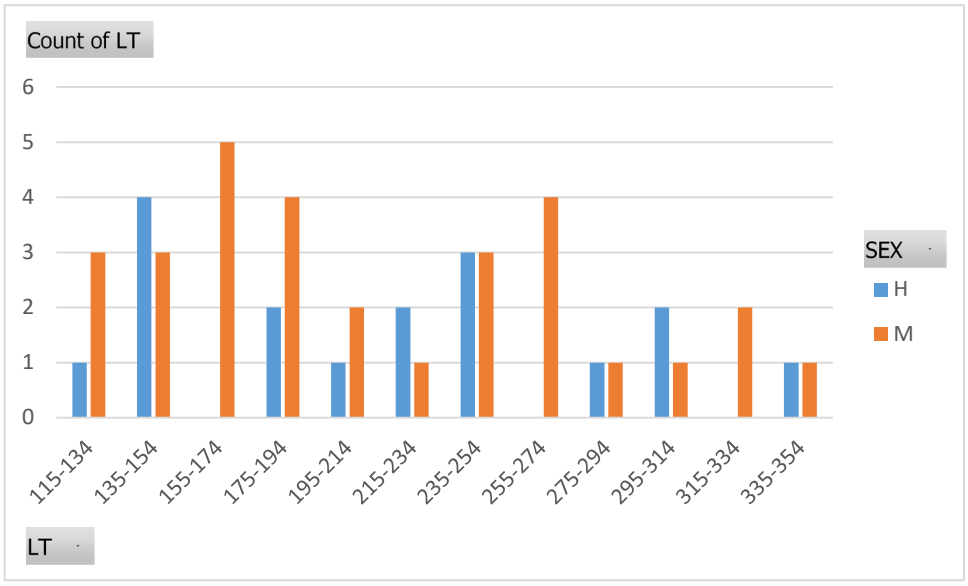


CAMPECHE



	All states		TAB		CAM	
	Females	Males	Females	Males	Females	Males
Immature	757	786	570	517	187	282
Mature	1	28	0	3	1	12
% Immature	1.00	0.97	1.00	0.99	0.99	0.96

Figure 23. Length-frequency distributions of scalloped hammerheads by sex for the states of Tabasco and Campeche observed in 2011-2016 from Pérez-Jiménez (pers. comm. to EC). The table shows that almost all scalloped hammerheads caught were immature.



	CAM	
	Females	Males
Immature	13	18
Mature	4	12
% Immature	0.76	0.60

Figure 24. Length-frequency distributions of great hammerheads by sex for the state of Campeche observed in 2011-2016 from Pérez-Jiménez (pers. comm. to EC). The table shows the proportion of immature vs. mature great hammerheads.

		CAM
% SHH		0.052
% GHH		0.005

	ALL both sexes		TAB both sexes		CAM both sexes	
% Cazon	0.97		0.98		0.97	
% Tiburon	0.03		0.02		0.03	

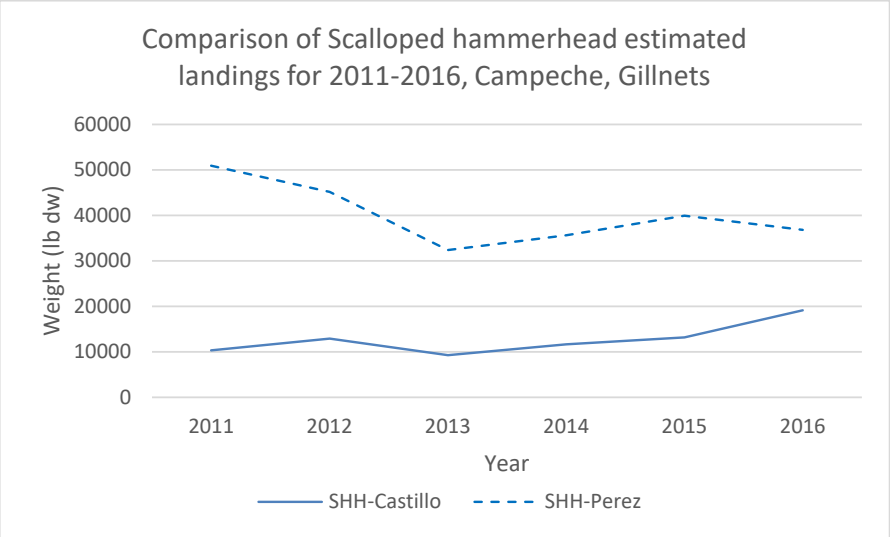


Figure 25. The top table shows the percent contribution of scalloped hammerheads to the total observed shark landings in the state of Campeche. The bottom table shows the proportion of scalloped hammerhead landings that were <150 cm TL ("cazones") and >=150 cm TL ("tiburones") for sexes combined computed as a weighted average (weighted by sample size for each sex). The figure shows the estimated scalloped hammerhead landings in gillnets in Campeche for 2011-2016 obtained with the Pérez-Jiménez data compared to those estimated with the Castillo et al. (1998) data.

		CAM
% SHH		0.052
% GHH		0.005

	CAM both sexes	
% Cazon	0.23	
% Tiburon	0.77	

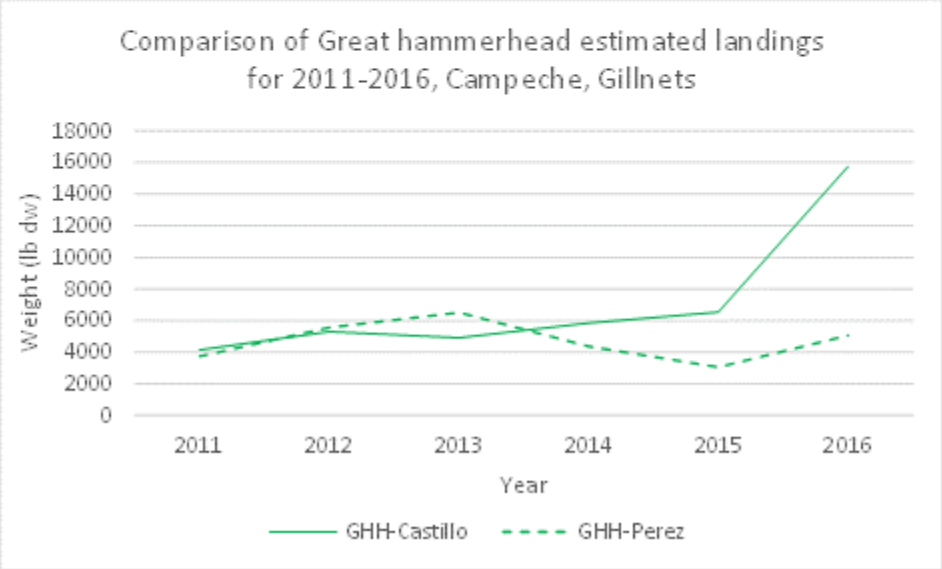


Figure 26. The top table shows the percent contribution of great hammerheads to the total observed shark landings in the state of Campeche. The bottom table shows the proportion of great hammerhead landings that were <150 cm TL ("cazones") and >=150 cm TL ("tiburones") for sexes combined computed as a weighted average (weighted by sample size for each sex). The figure shows the estimated great hammerhead landings in gillnets in Campeche for 2011-2016 obtained with the Pérez-Jiménez data compared to those estimated with the Castillo et al. (1998) data.

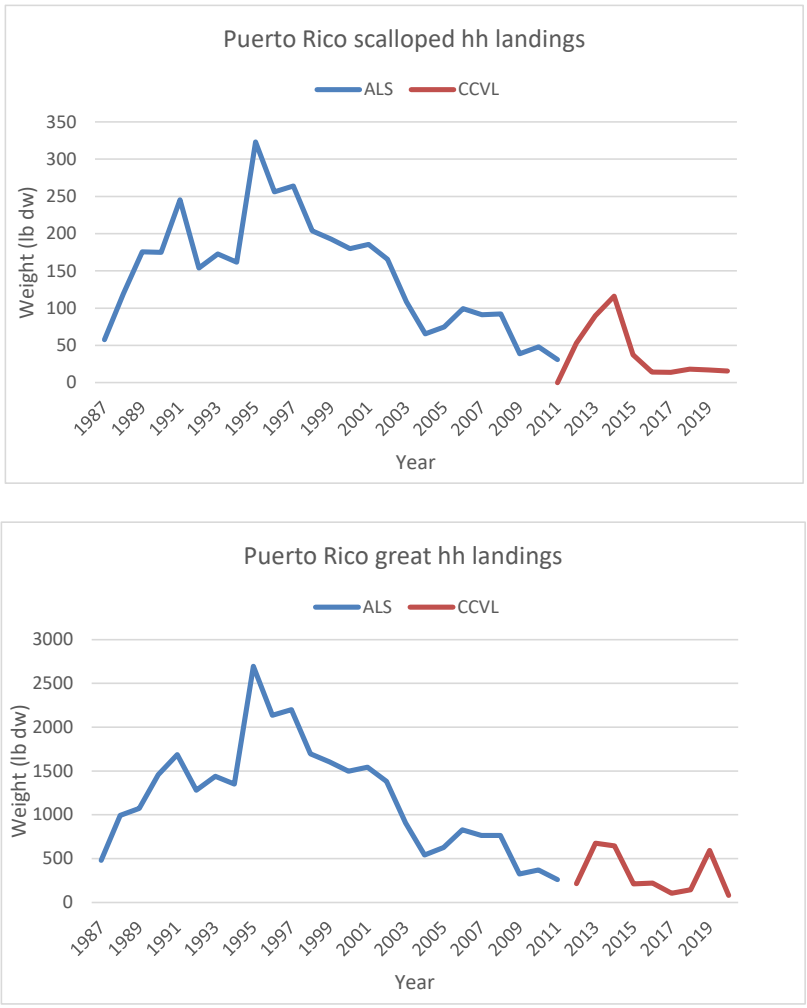


Figure 27. Landings of scalloped (top) and great (bottom) hammerheads from the Caribbean Commercial Vessel Logbook (CCVL) in 2011-2020 and from the Accumulated Landings System (ALS) for 1987-2011.

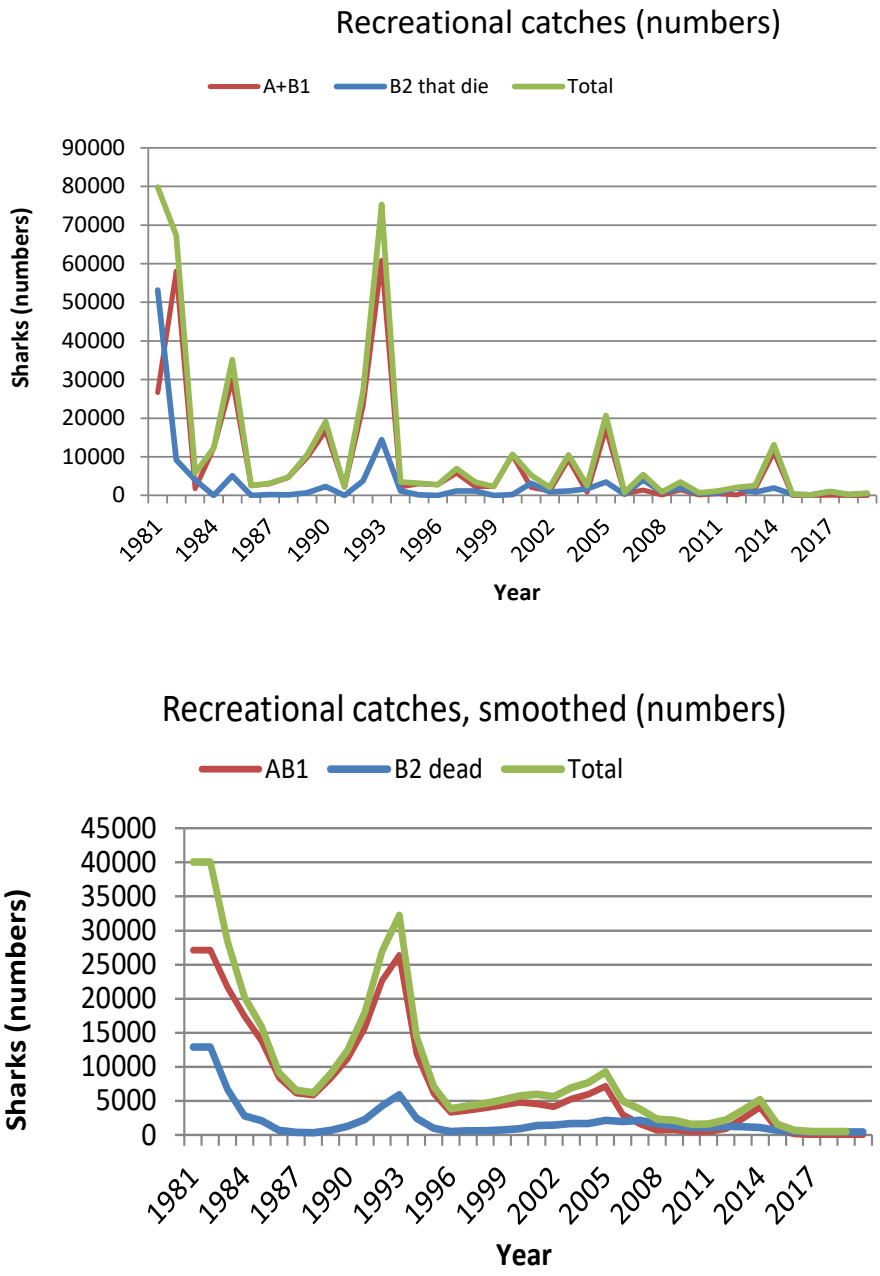


Figure 28. Recreational catches in numbers (AB1 and B2s that die assuming an arbitrary post-release mortality rate of 10%) of scalloped hammerheads (all regions) before (top) and after smoothing (bottom) using a three-year moving geometric average.

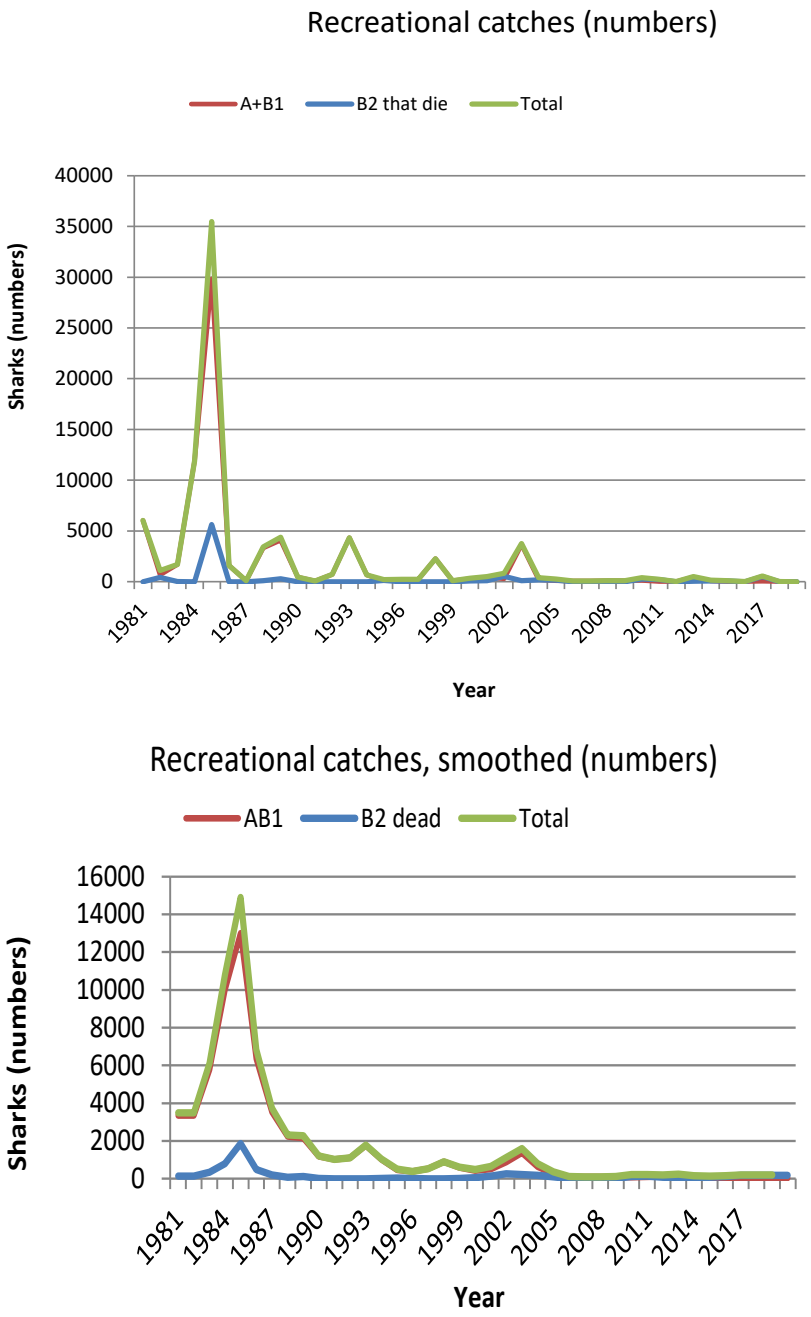


Figure 29. Recreational catches in numbers (AB1 and B2s that die assuming an arbitrary post-release mortality rate of 10%) of scalloped hammerheads in the GOM before (top) and after smoothing (bottom) using a three-year moving geometric average.

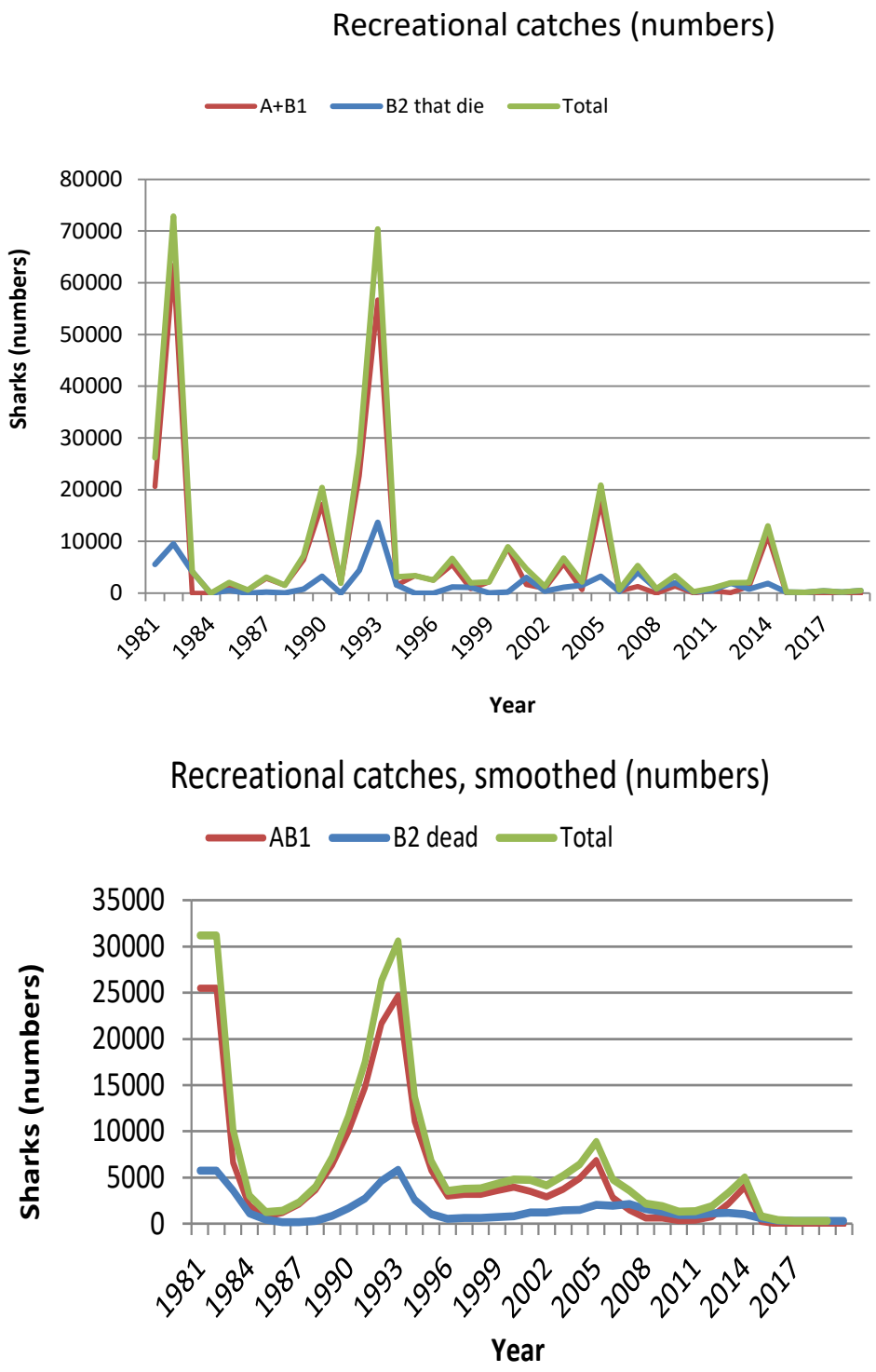


Figure 30. Recreational catches in numbers (AB1 and B2s that die assuming an arbitrary post-release mortality rate of 10%) of scalloped hammerheads in the ATL before (top) and after smoothing (bottom) using a three-year moving geometric average.

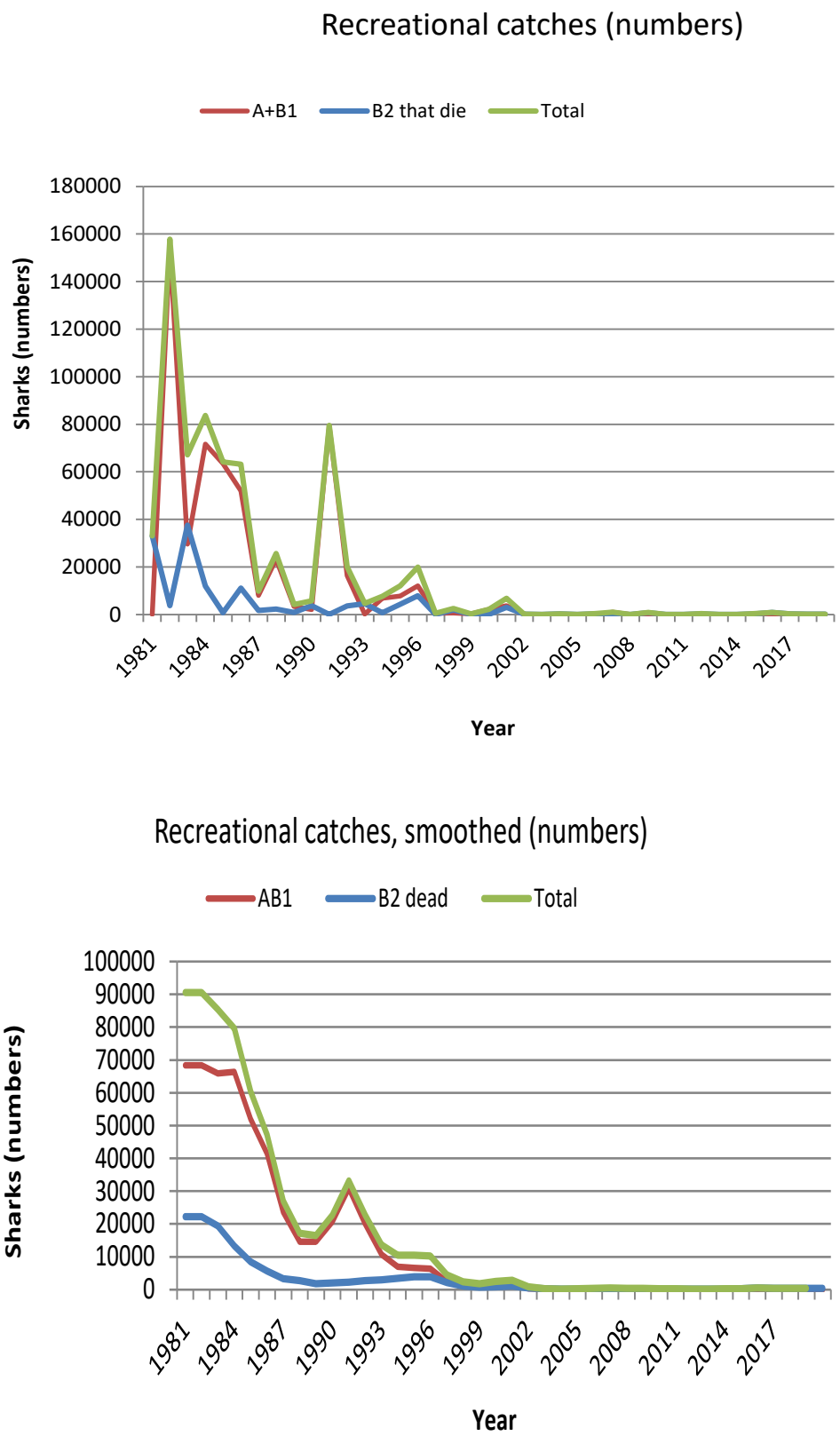


Figure 31. Recreational catches in numbers (AB1 and B2s that die assuming an arbitrary post-release mortality rate of 10%) of great hammerheads before (top) and after smoothing (bottom) using a three-year moving geometric average.

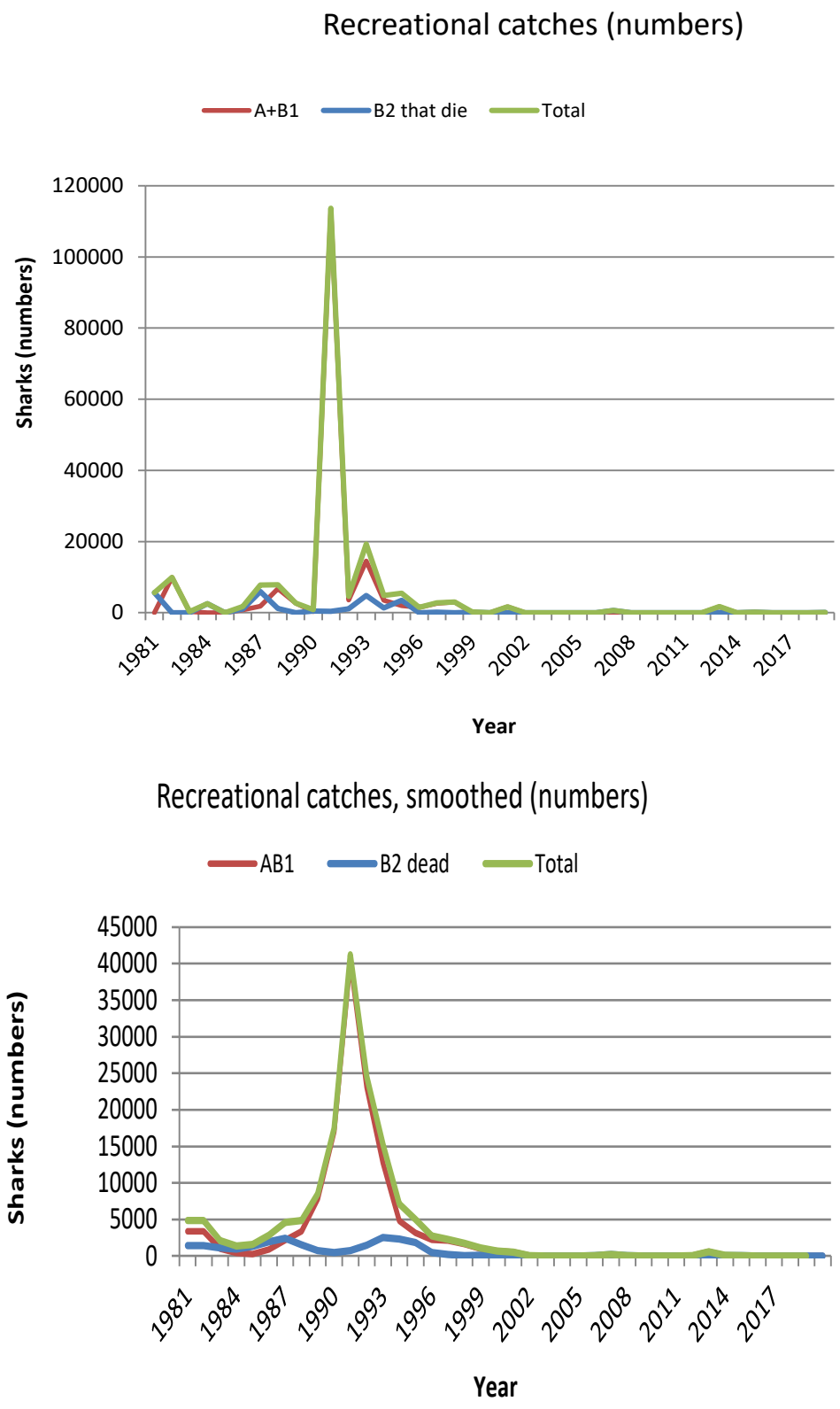


Figure 32. Recreational catches in numbers (AB1 and B2s that die assuming an arbitrary post-release mortality rate of 10%) of smooth hammerheads before (top) and after smoothing (bottom) using a three-year moving geometric average.

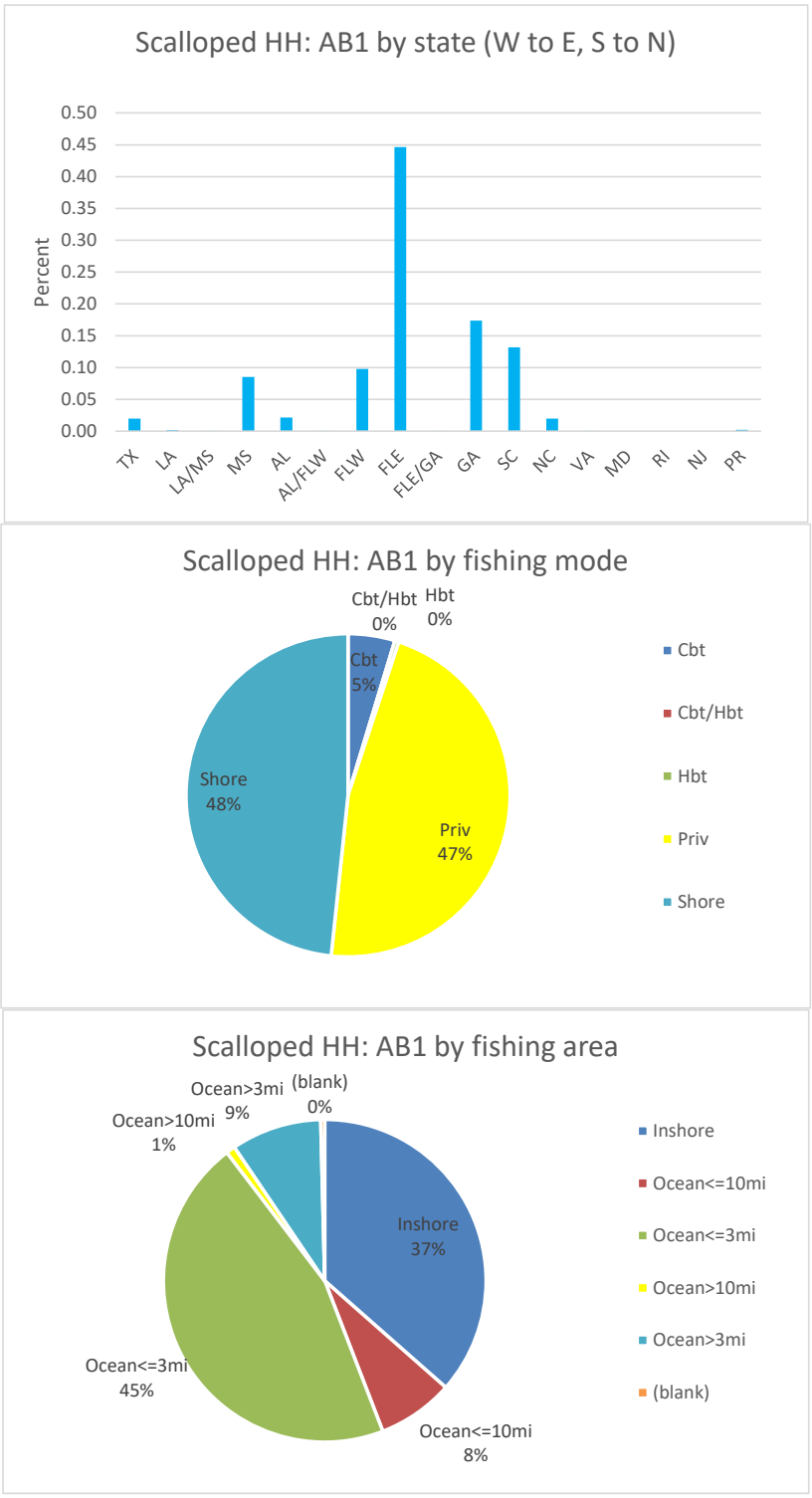


Figure 33. Recreational catches (AB1, numbers) of scalloped hammerhead by state (top), fishing mode (middle), and fishing area (bottom), 1981-2020. Note: "Blank" fishing area indicates catches reported in the Southeast Region Headboat Survey (SRHS).

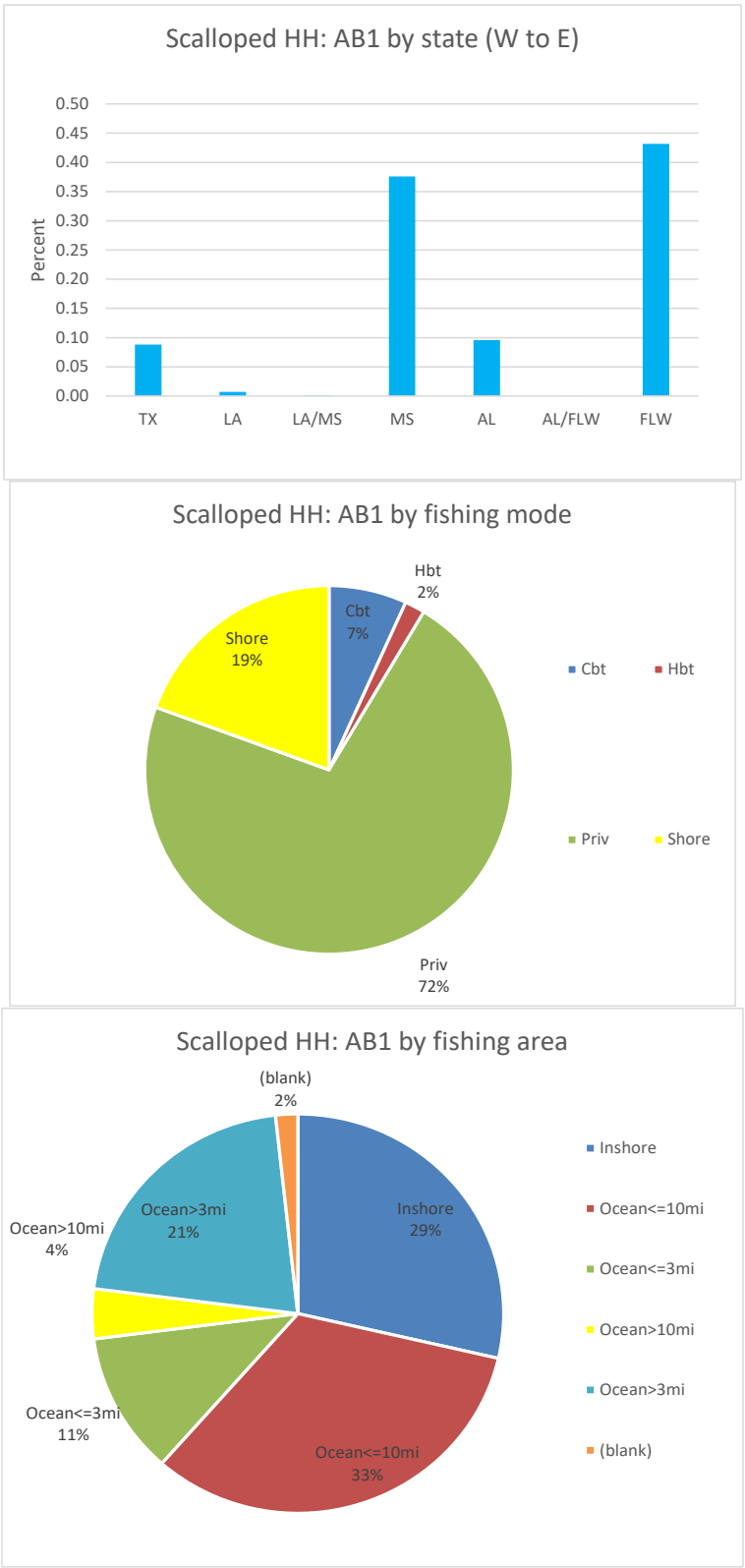


Figure 34. Recreational catches (AB1, numbers) of scalloped hammerhead in the GOM by state (top), fishing mode (middle), and fishing area (bottom), 1981-2020. Note: "Blank" fishing area indicates catches reported in the Southeast Region Headboat Survey (SRHS).

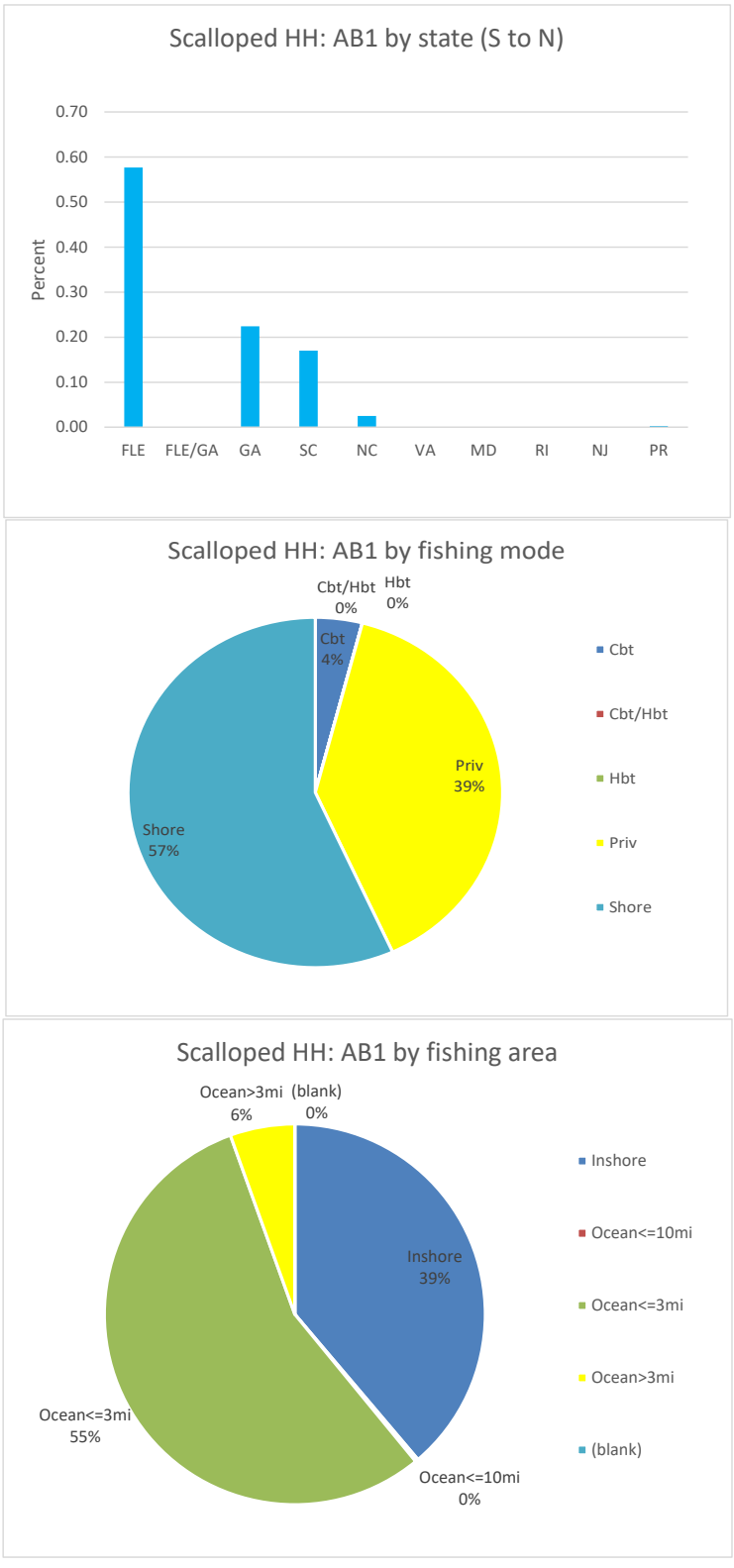


Figure 35. Recreational catches (AB1, numbers) of scalloped hammerhead in the ATL by state (top), fishing mode (middle), and fishing area (bottom), 1981-2020. Note: "Blank" fishing area indicates catches reported in the Southeast Region Headboat Survey (SRHS).

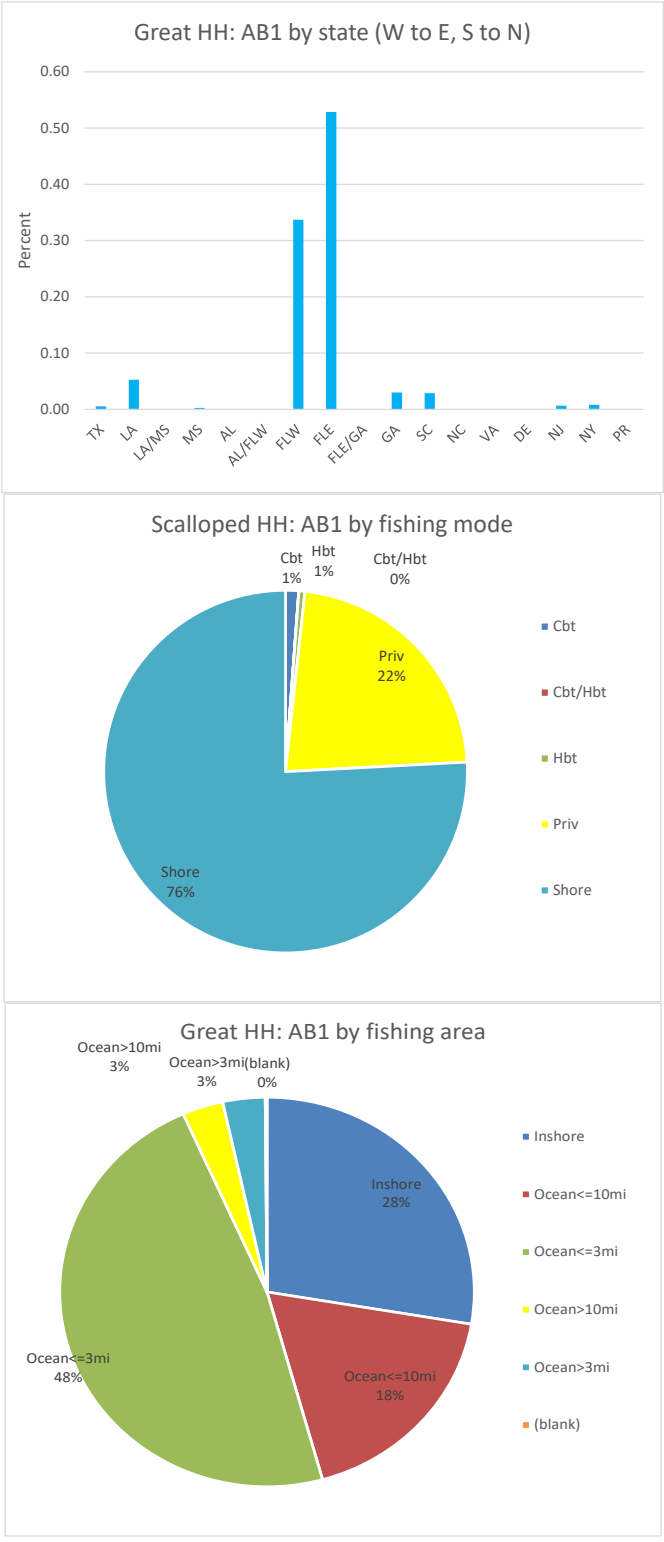
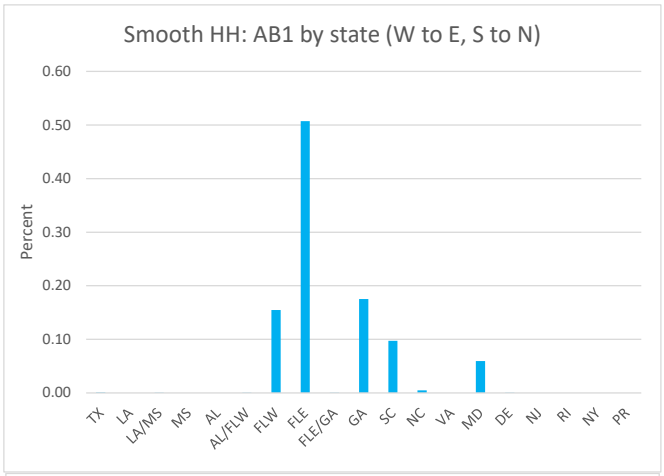
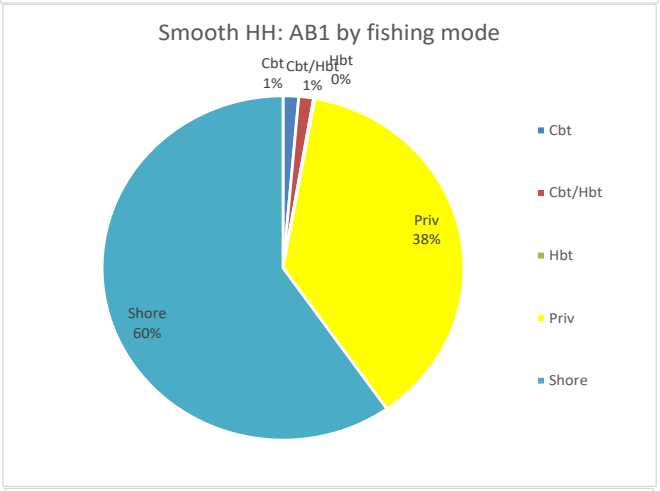


Figure 36. Recreational catches (AB1, numbers) of great hammerhead by state (top), fishing mode (middle), and fishing area (bottom), 1981-2020. Note: "Blank" fishing area indicates catches reported in the Southeast Region Headboat Survey (SRHS).





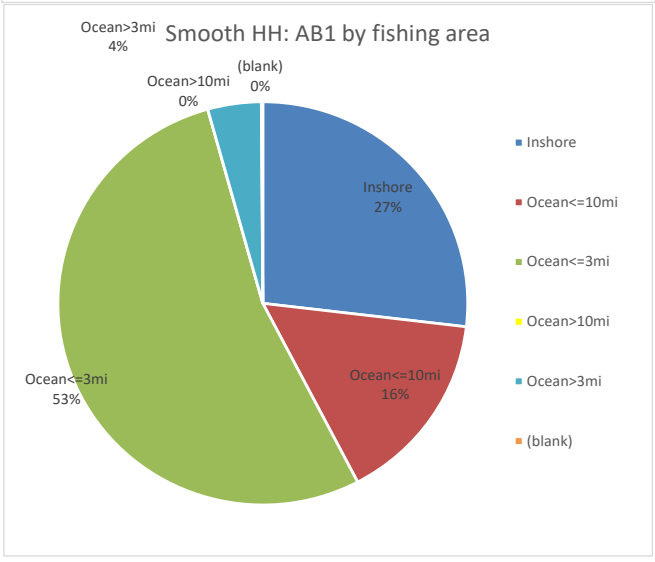


Figure 37. Recreational catches (AB1, numbers) of smooth hammerhead by state (top), fishing mode (middle), and fishing area (bottom), 1981-2020. Note: "Blank" fishing area indicates catches reported in the Southeast Region Headboat Survey (SRHS).

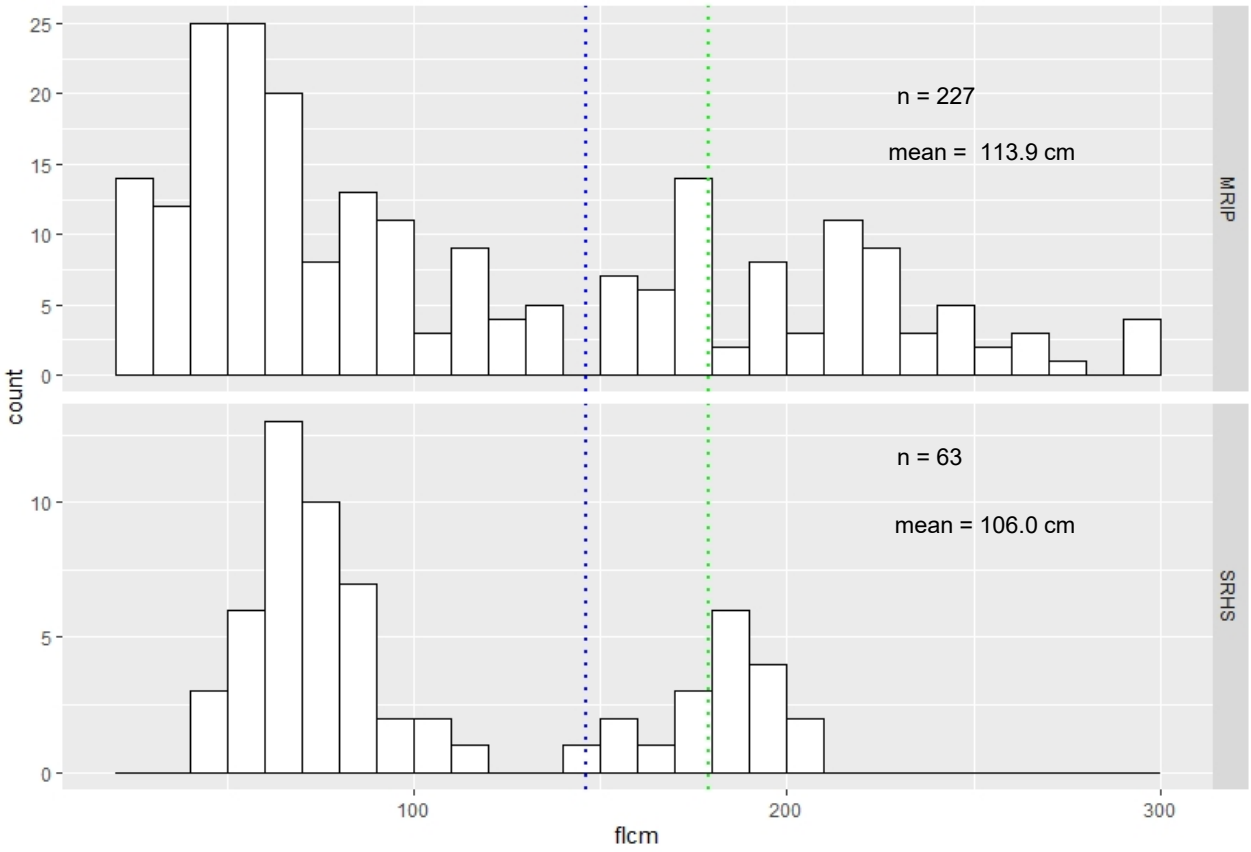


Figure 38. Length-frequency histograms of scalloped hammerheads in all regions caught in the MRIP and SRHS recreational surveys (top panel) and boxplot of fork length by survey (bottom panel). The dotted blue and green lines denote the median length at maturity for males and females, respectively. MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

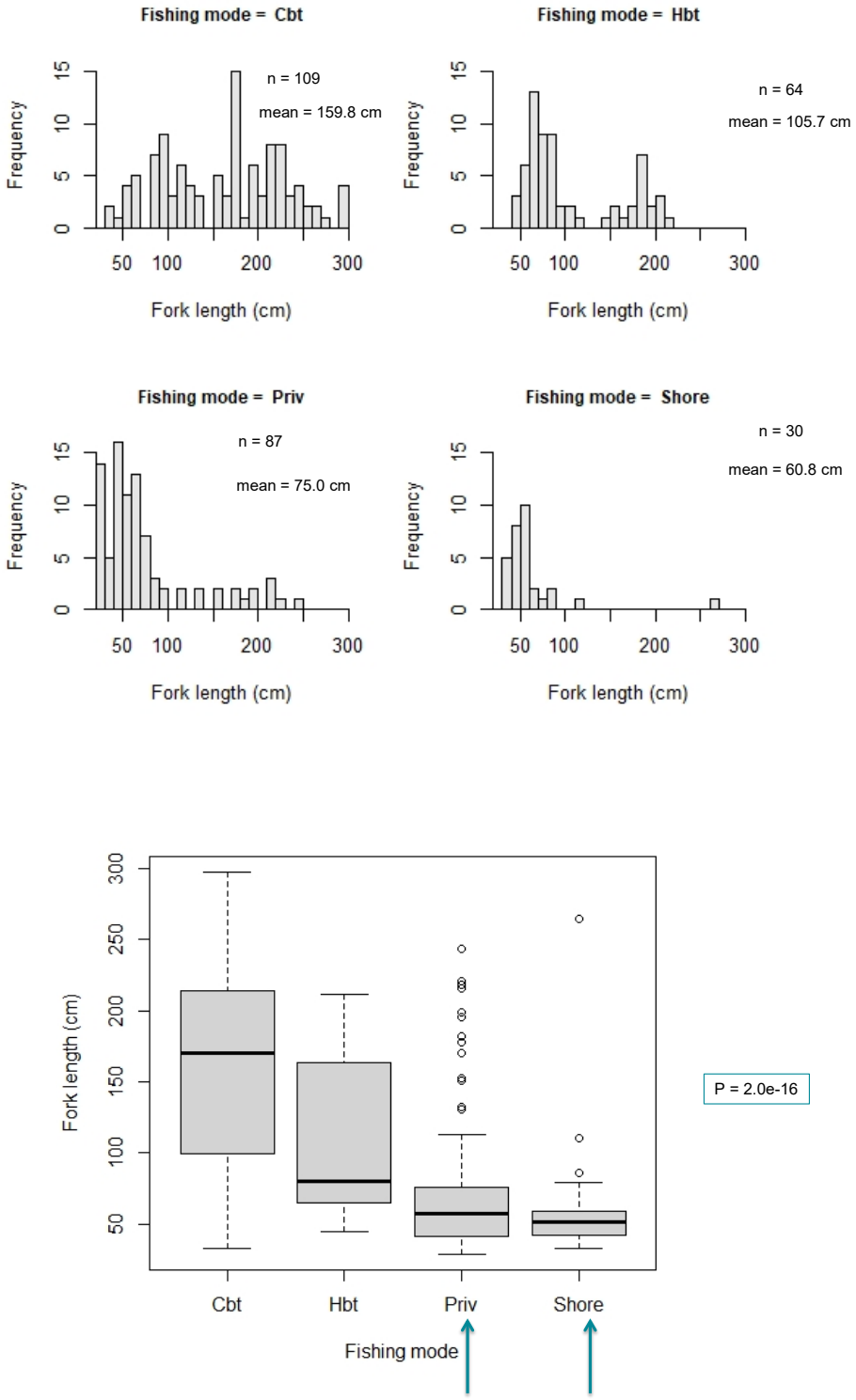


Figure 39. Length-frequency histograms of scalloped hammerheads, in all regions, caught in the MRIP and SRHS recreational surveys by fishing mode (top panel) and boxplot of fork length by fishing mode (bottom panel). MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

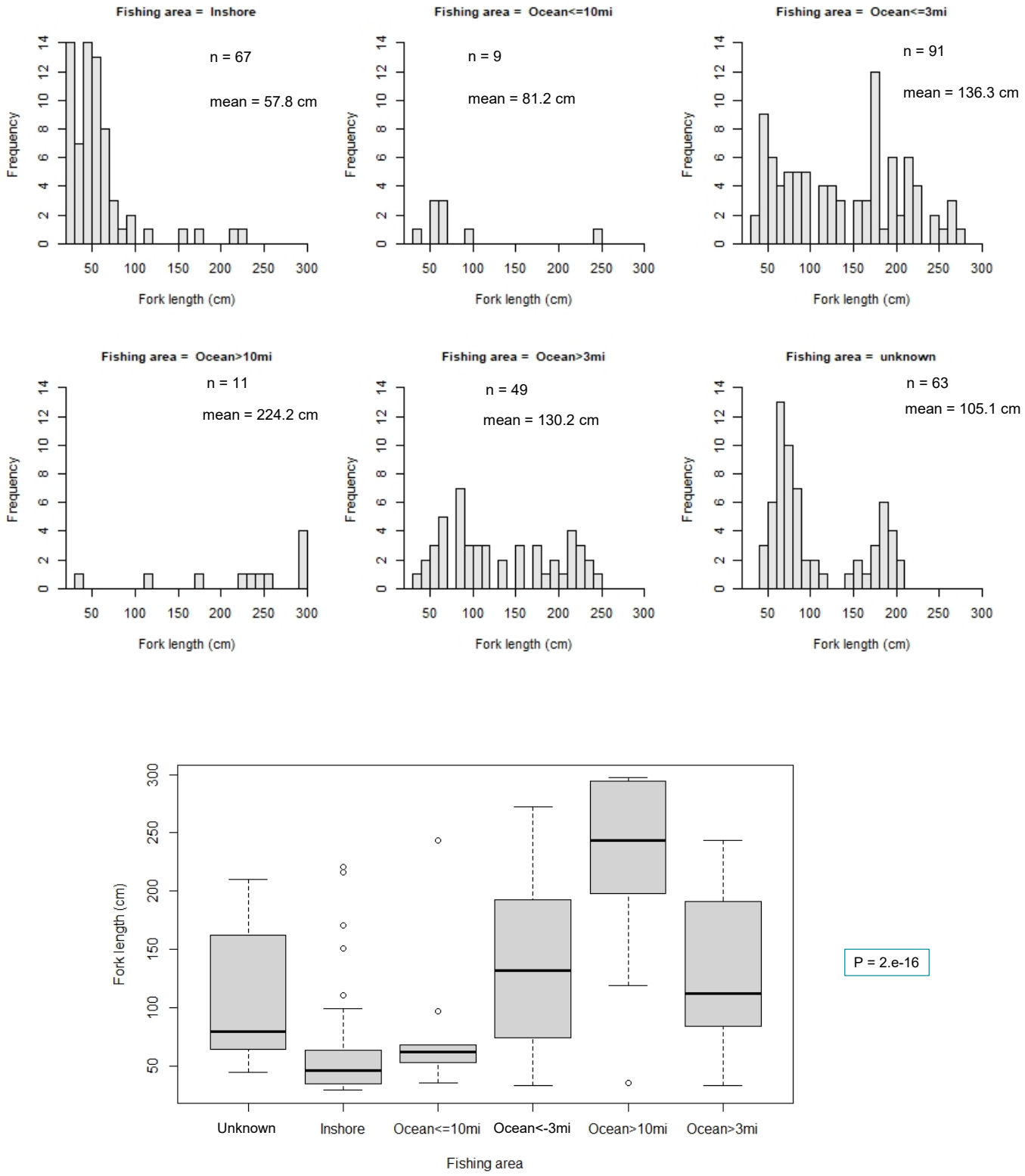


Figure 40. Length-frequency histograms of scalloped hammerheads in all regions caught in the MRIP and SRHS recreational surveys by fishing area (top panel) and boxplot of fork length by fishing area (bottom panel). Unknown fishing area denotes lengths from the SRHS. MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

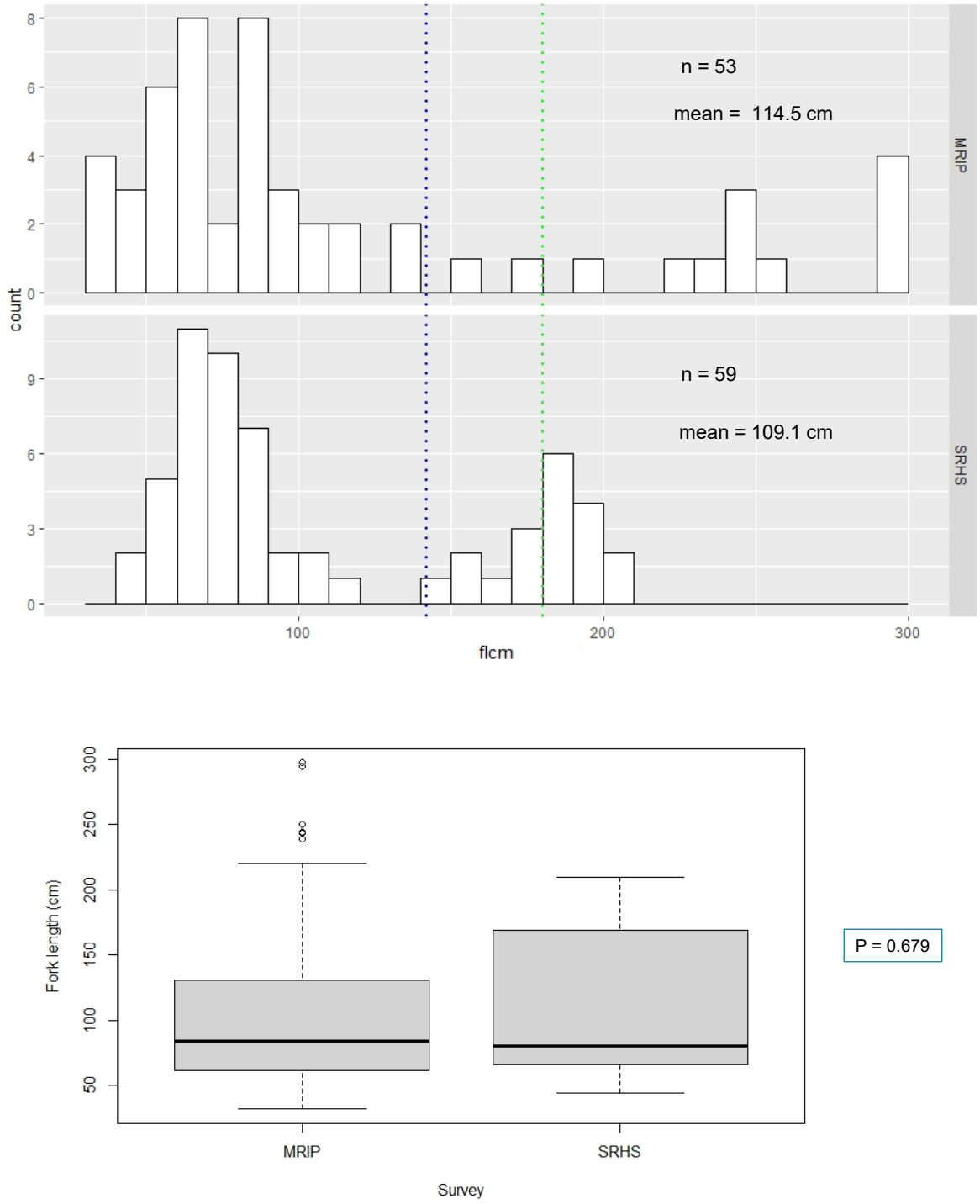


Figure 41. Length-frequency histograms of GOM scalloped hammerheads caught in the MRIP and SRHS recreational surveys (top panel) and boxplot of fork length by survey (bottom panel). The dotted blue and green lines denote the median length at maturity for males and females, respectively. MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

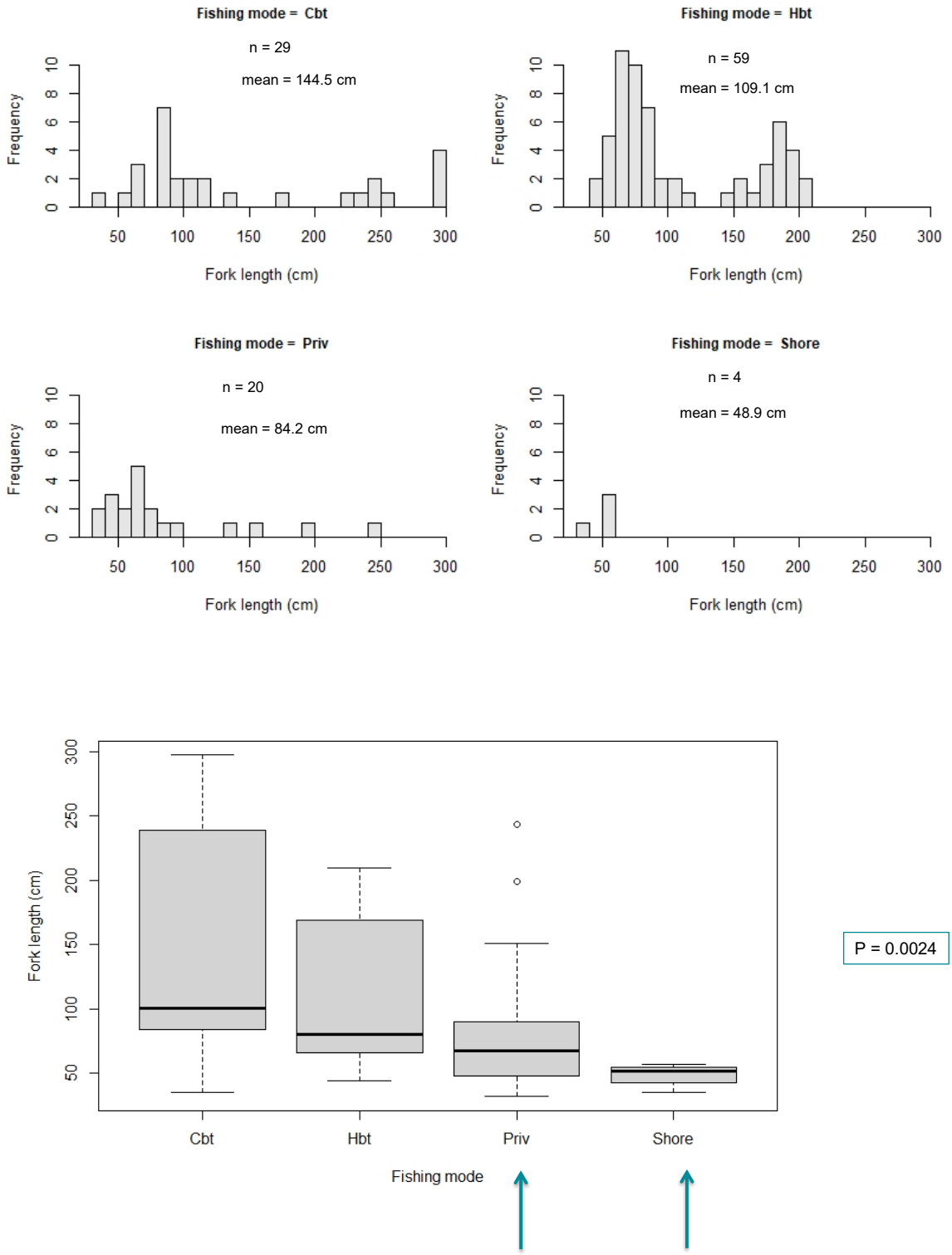


Figure 42. Length-frequency histograms of GOM scalloped hammerheads caught in the MRIP and SRHS recreational surveys by fishing mode (top panel) and boxplot of fork length by fishing mode (bottom panel). MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

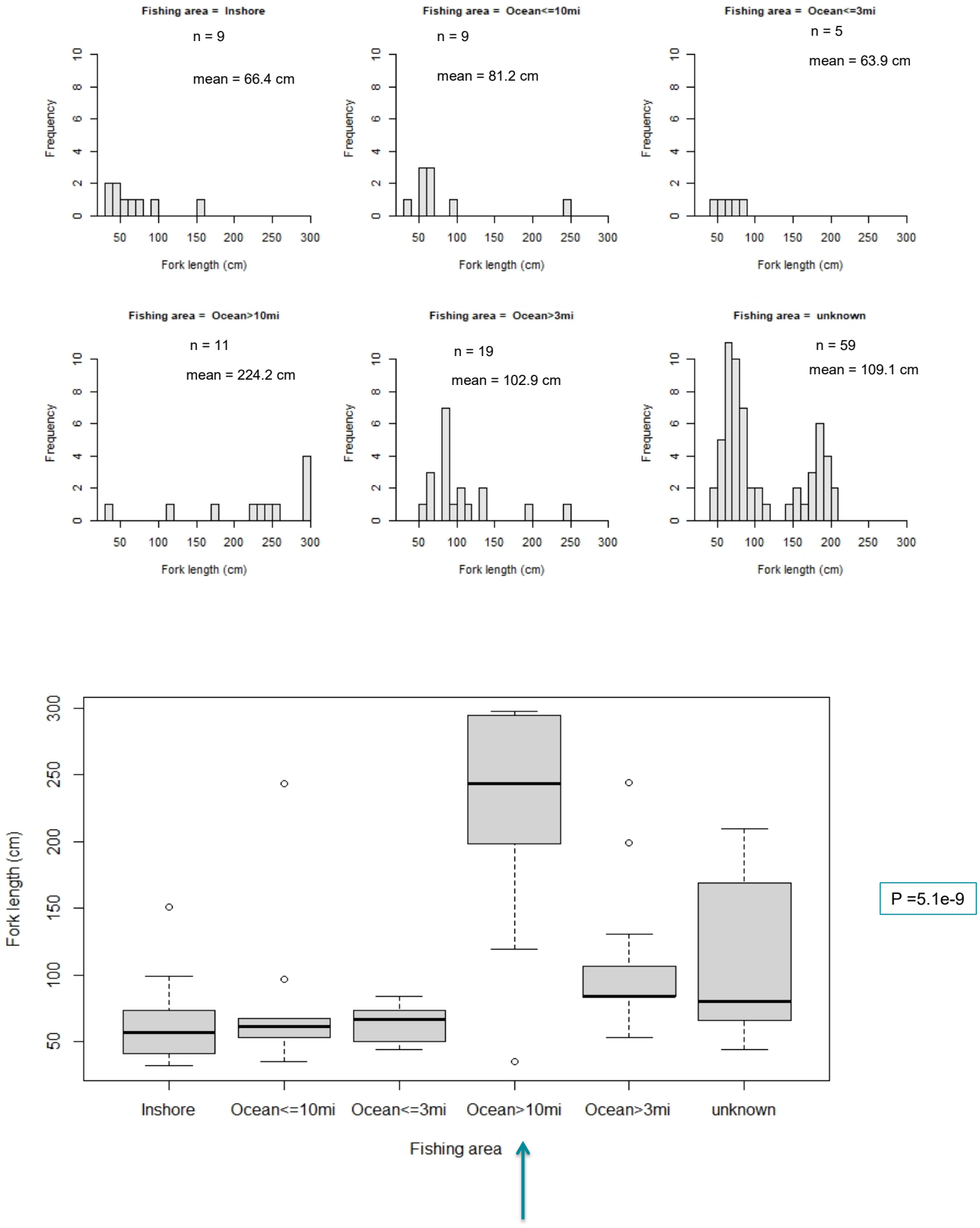


Figure 43. Length-frequency histograms of GOM scalloped hammerheads caught in the MRIP and SRHS recreational surveys by fishing area (top panel) and boxplot of fork length by fishing area (bottom panel). Unknown fishing area denotes lengths from the SRHS. MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

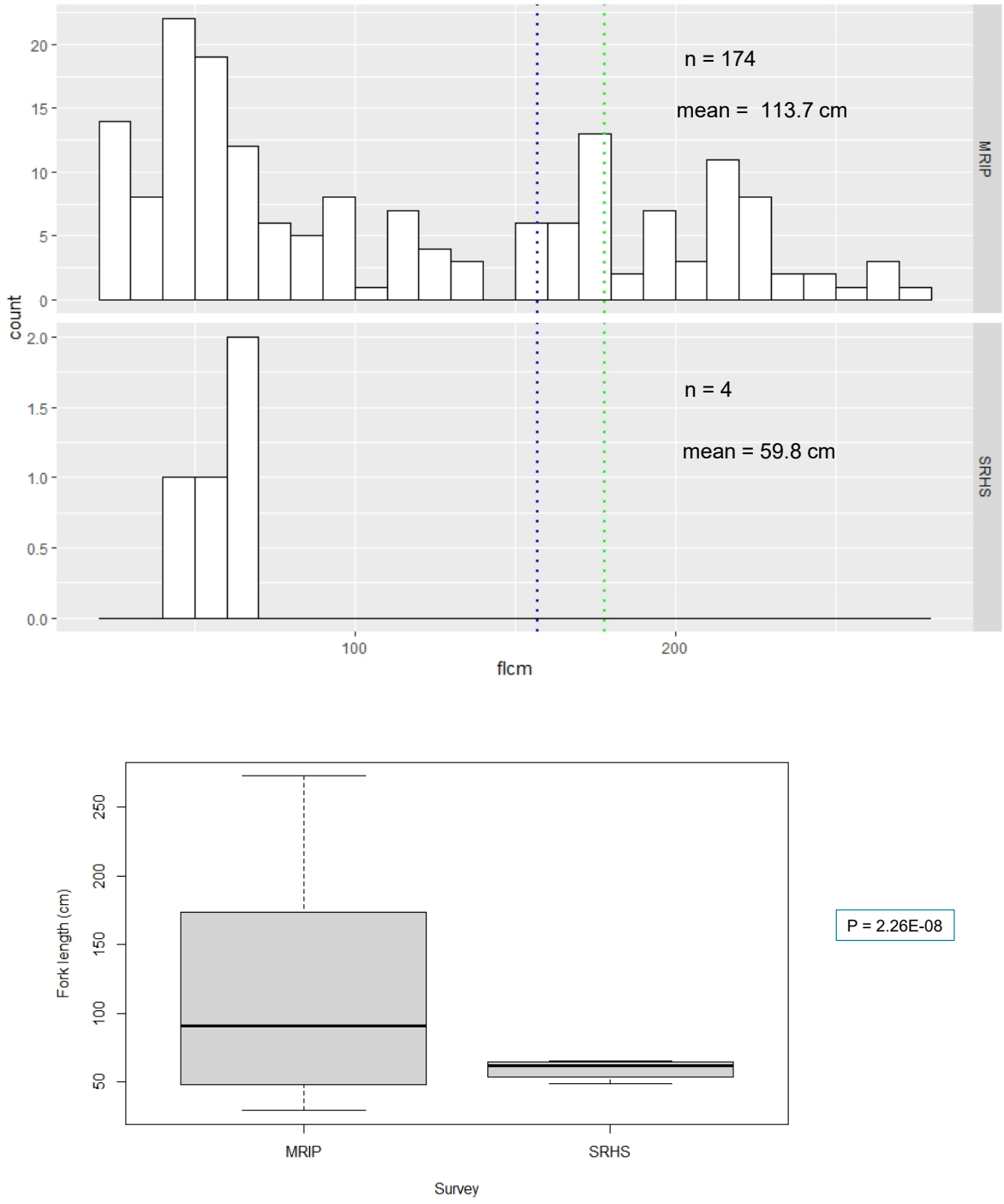


Figure 44. Length-frequency histograms of ATL scalloped hammerheads caught in the MRIP and SRHS recreational surveys (top panel) and boxplot of fork length by survey (bottom panel). The dotted blue and green lines denote the median length at maturity for males and females, respectively. MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

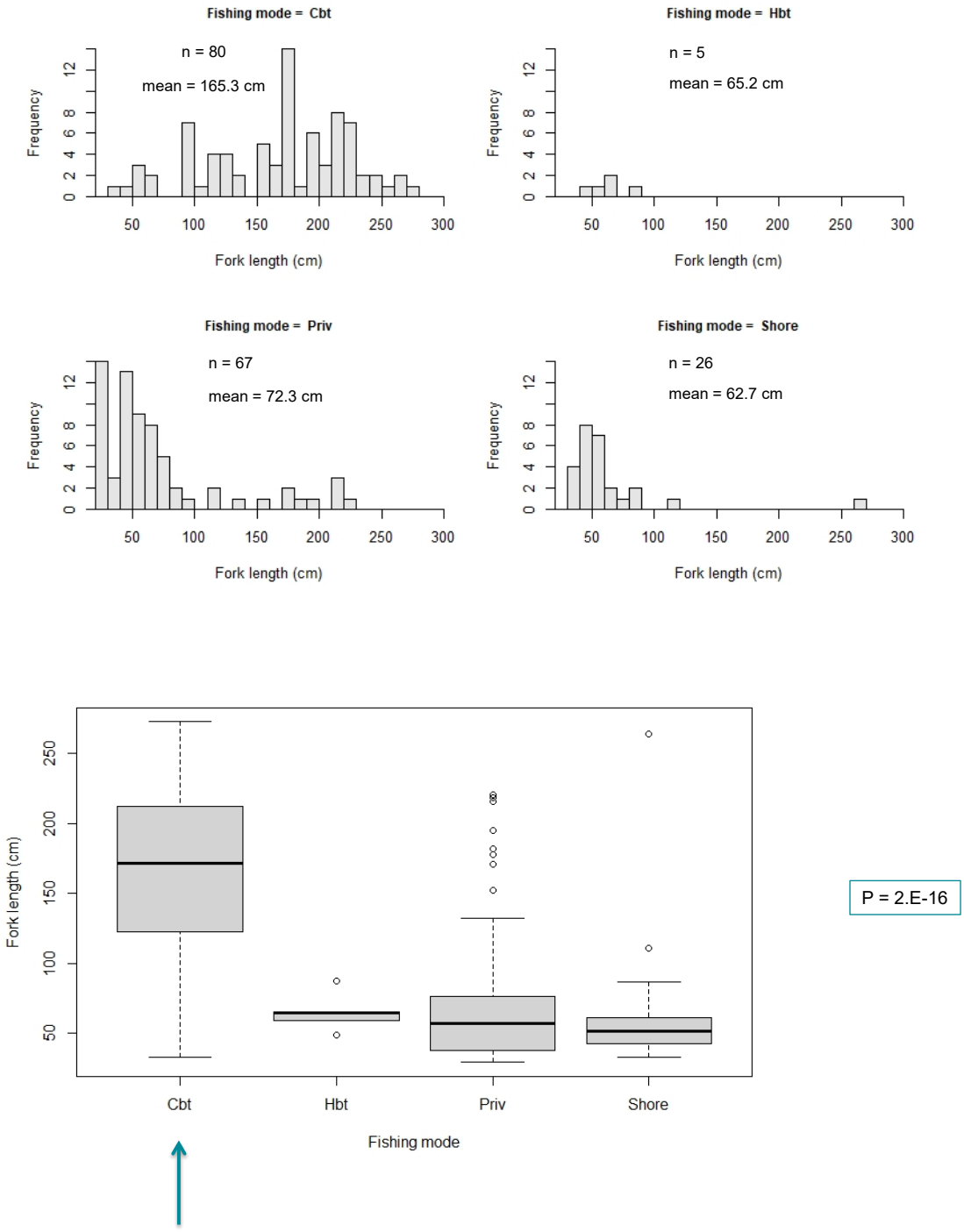


Figure 45. Length-frequency histograms of ATL scalloped hammerheads caught in the MRIP and SRHS recreational surveys by fishing mode (top panel) and boxplot of fork length by fishing mode (bottom panel). MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

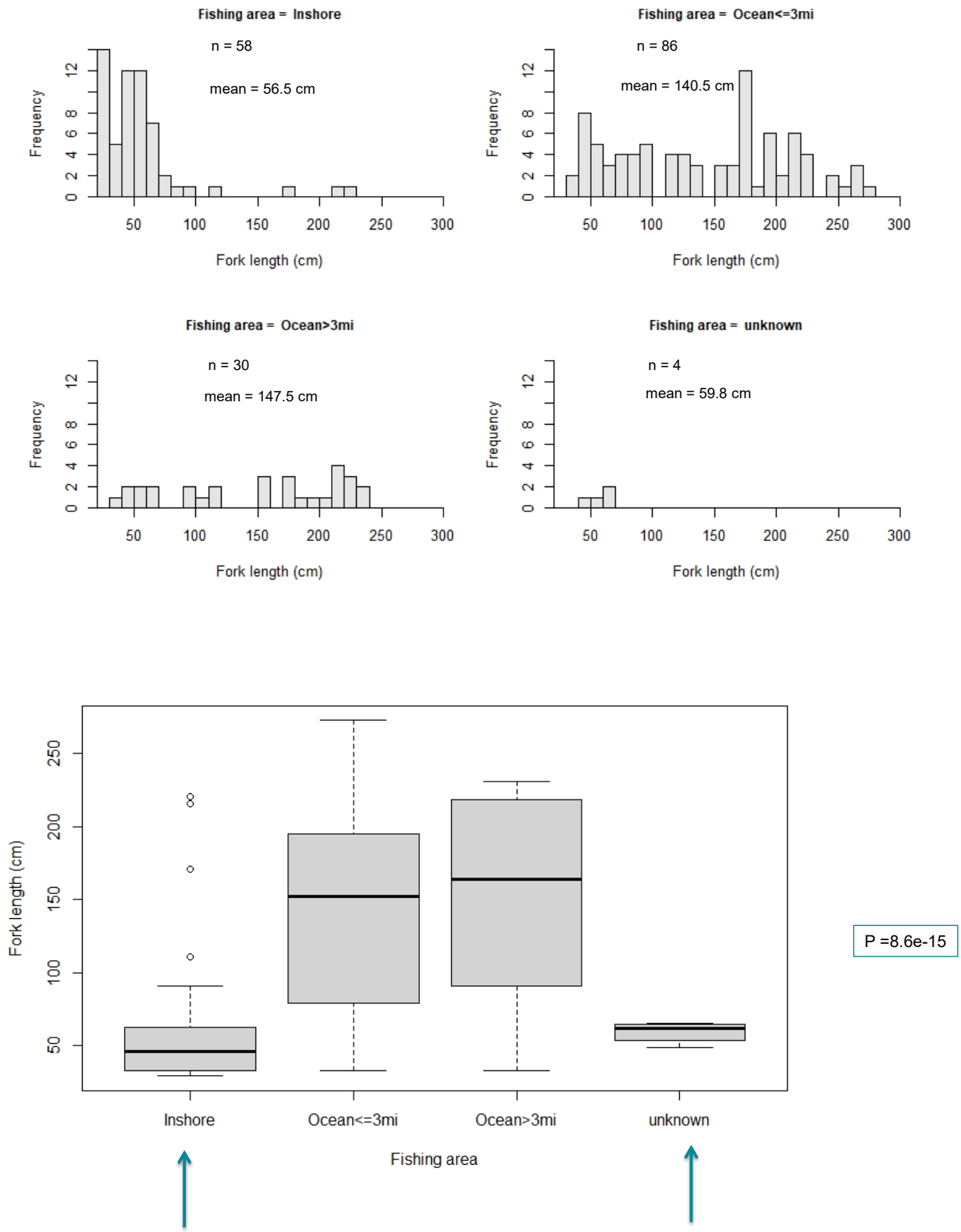


Figure 46. Length-frequency histograms of ATL scalloped hammerheads caught in the MRIP and SRHS recreational surveys by fishing area (top panel) and boxplot of fork length by fishing area (bottom panel). Unknown fishing area denotes lengths from the SRHS. MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

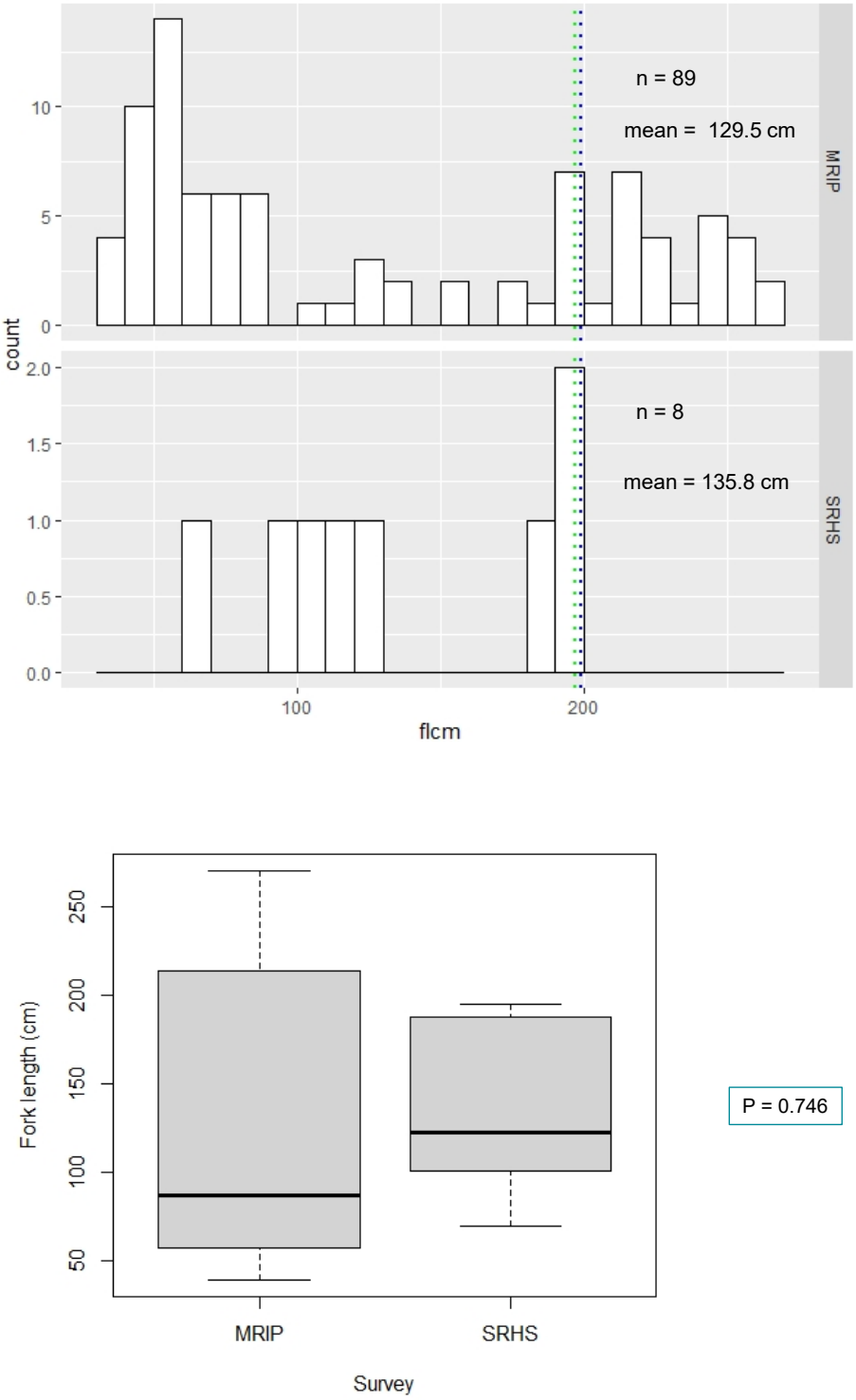


Figure 47. Length-frequency histograms of great hammerheads caught in the MRIP and SRHS recreational surveys (top panel) and boxplot of fork length by survey (bottom panel). The dotted blue and green lines denote the median length at maturity for males and females, respectively. MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

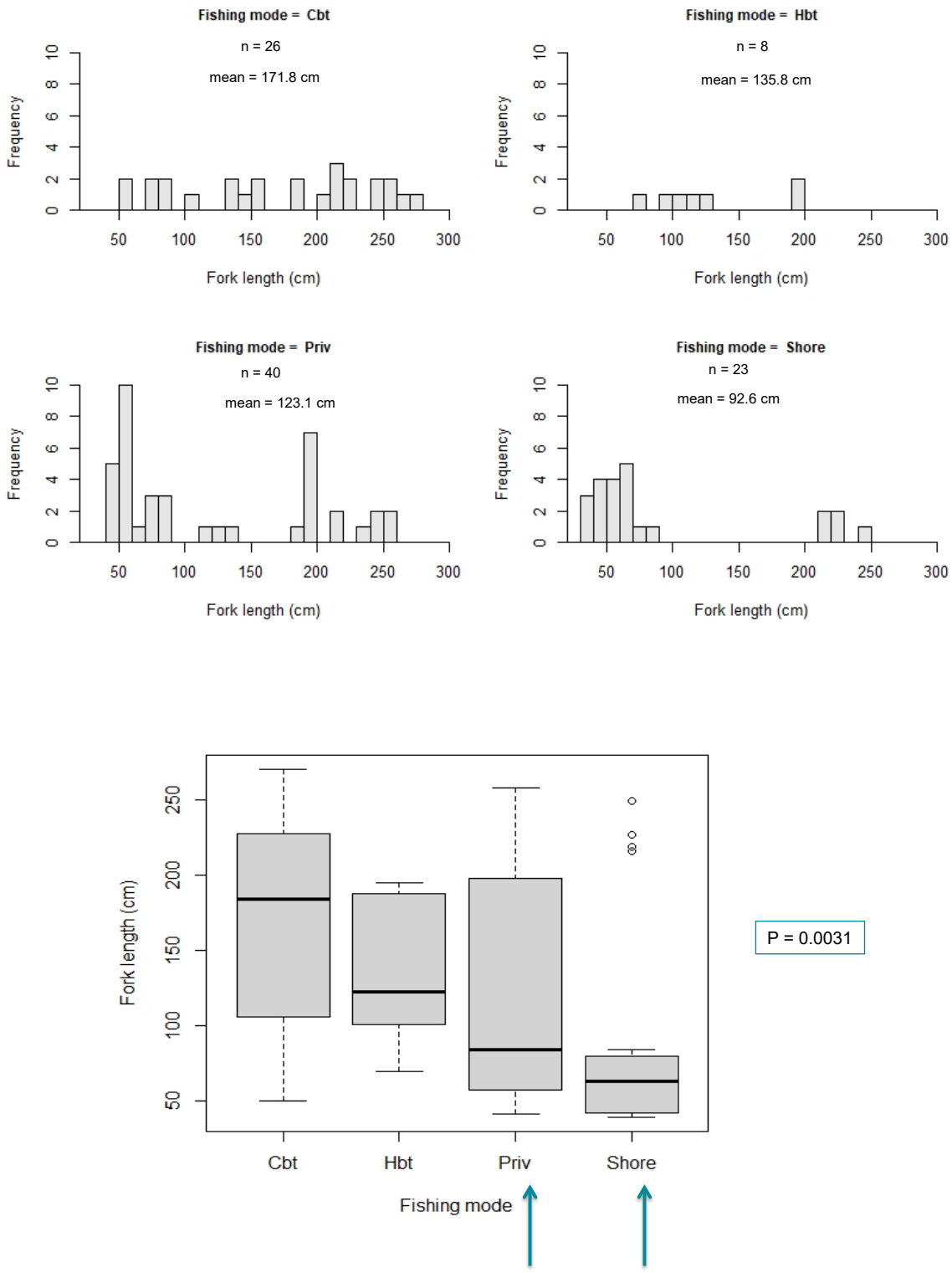


Figure 48. Length-frequency histograms of great hammerheads caught in the MRIP and SRHS recreational surveys by fishing mode (top panel) and boxplot of fork length by fishing mode (bottom panel). MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

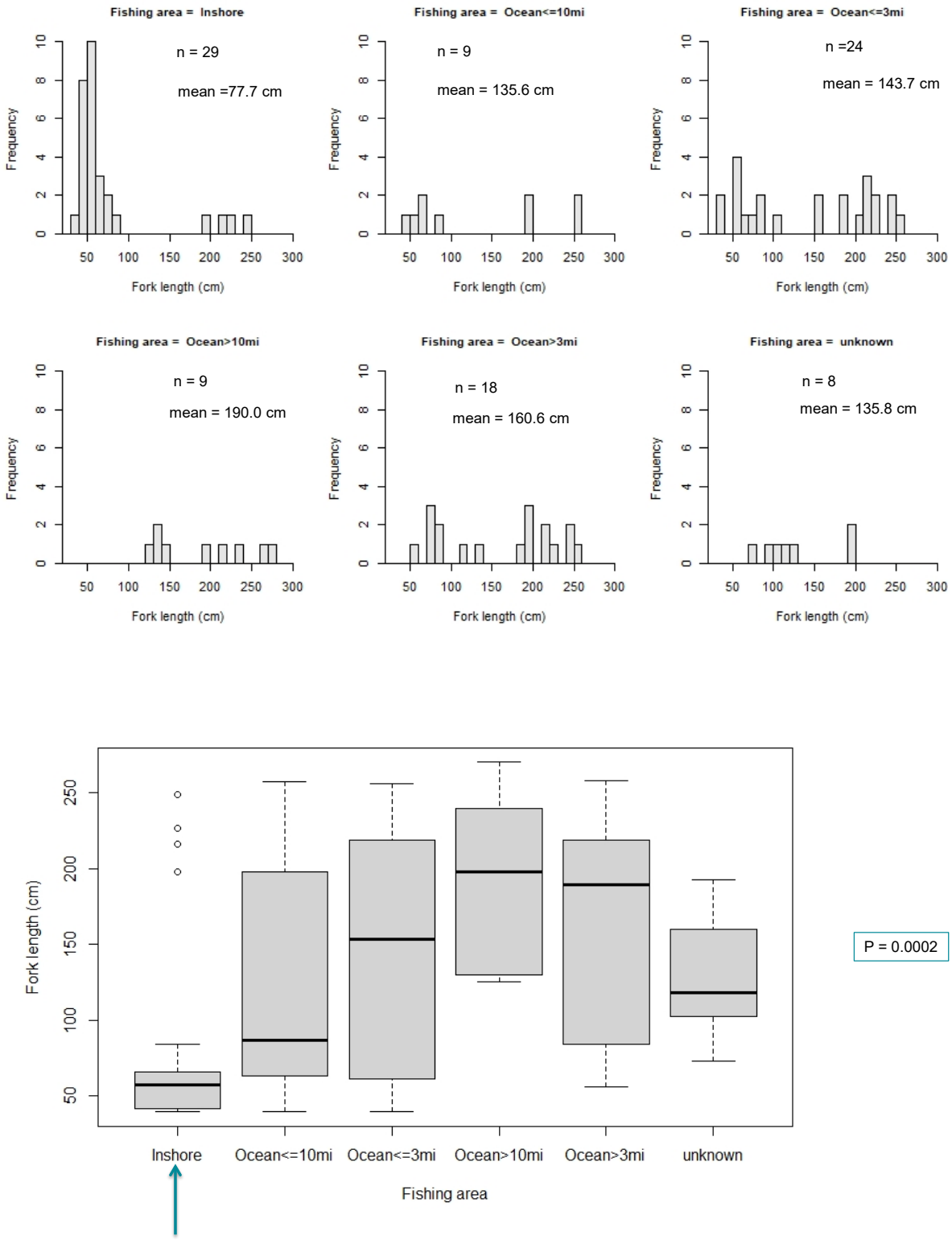


Figure 49. Length-frequency histograms of great hammerheads caught in the MRIP and SRHS recreational surveys by fishing area (top panel) and boxplot of fork length by fishing area (bottom panel). Unknown fishing area denotes lengths from the SRHS. MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

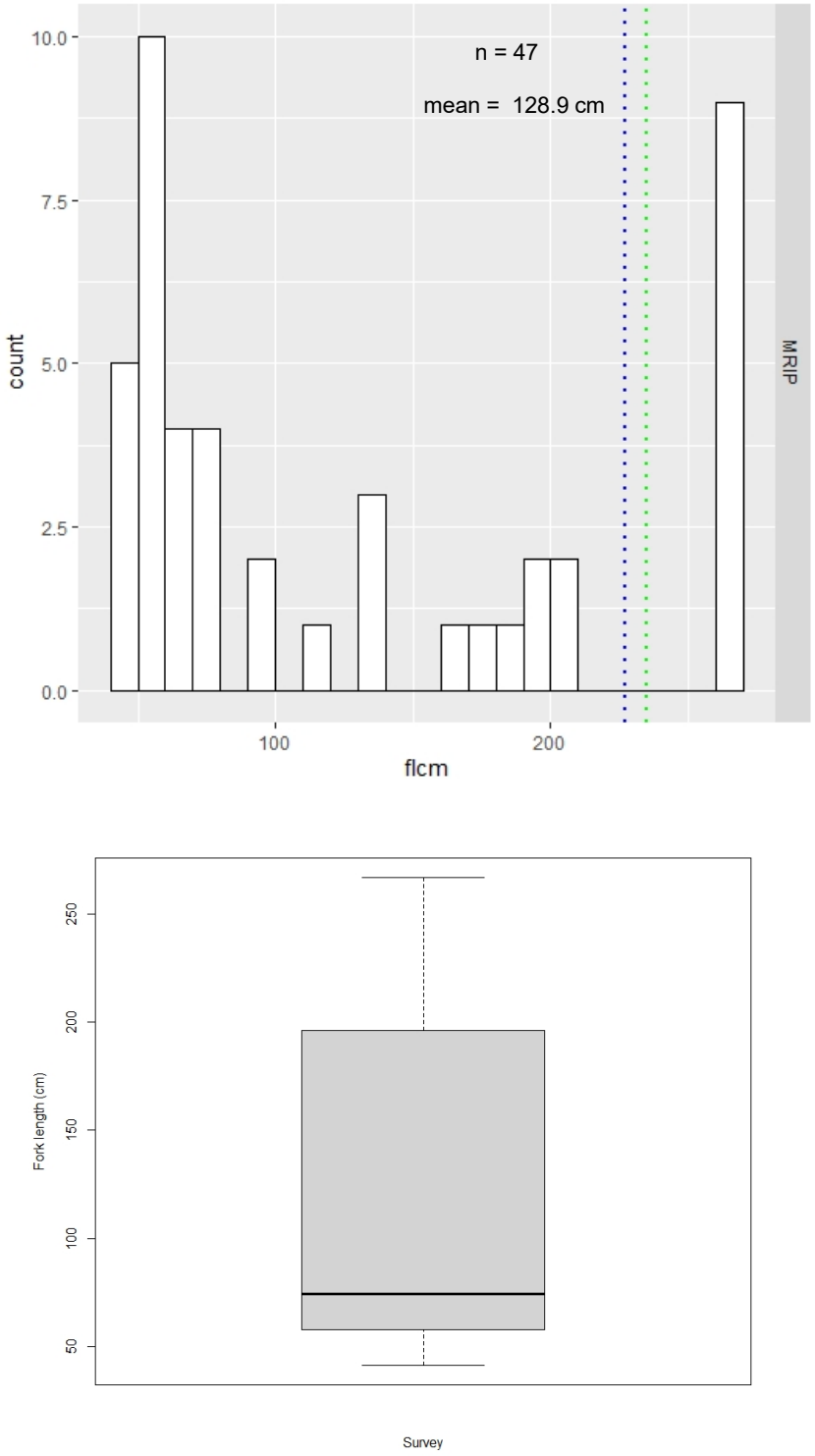


Figure 50. Length-frequency histograms of smooth hammerheads caught in the MRIP recreational surveys (top panel) and boxplot of fork length (bottom panel). The dotted blue and green lines denote the median length at maturity for males and females, respectively. MRIP= Marine Recreational Information Program (MRIP). SRHS=Southeast Region Headboat Survey.

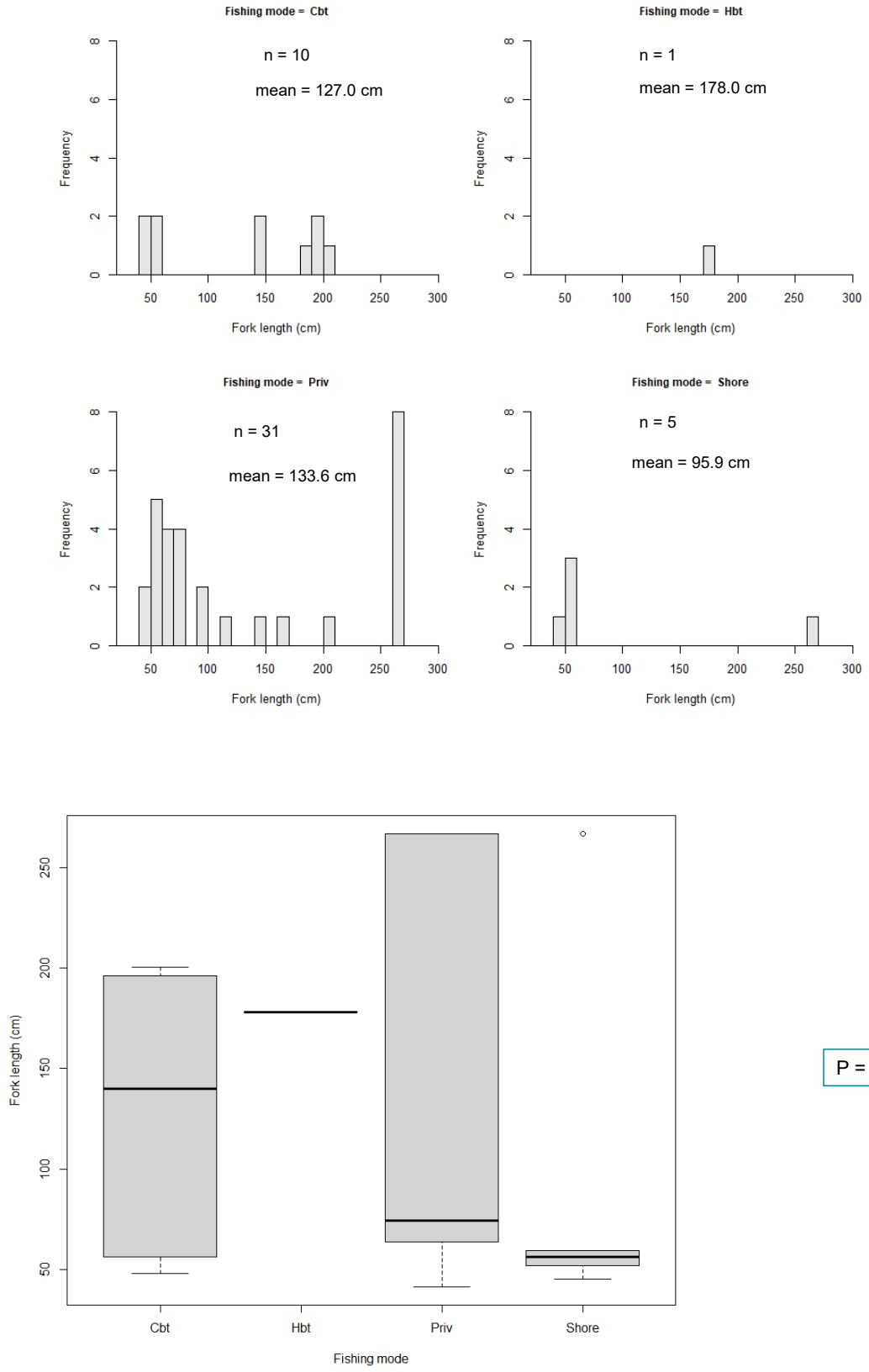


Figure 51. Length-frequency histograms of smooth hammerheads caught in the MRIP recreational survey by fishing mode (top panel) and boxplot of fork length by fishing mode (bottom panel). MRIP= Marine Recreational Information Program (MRIP).

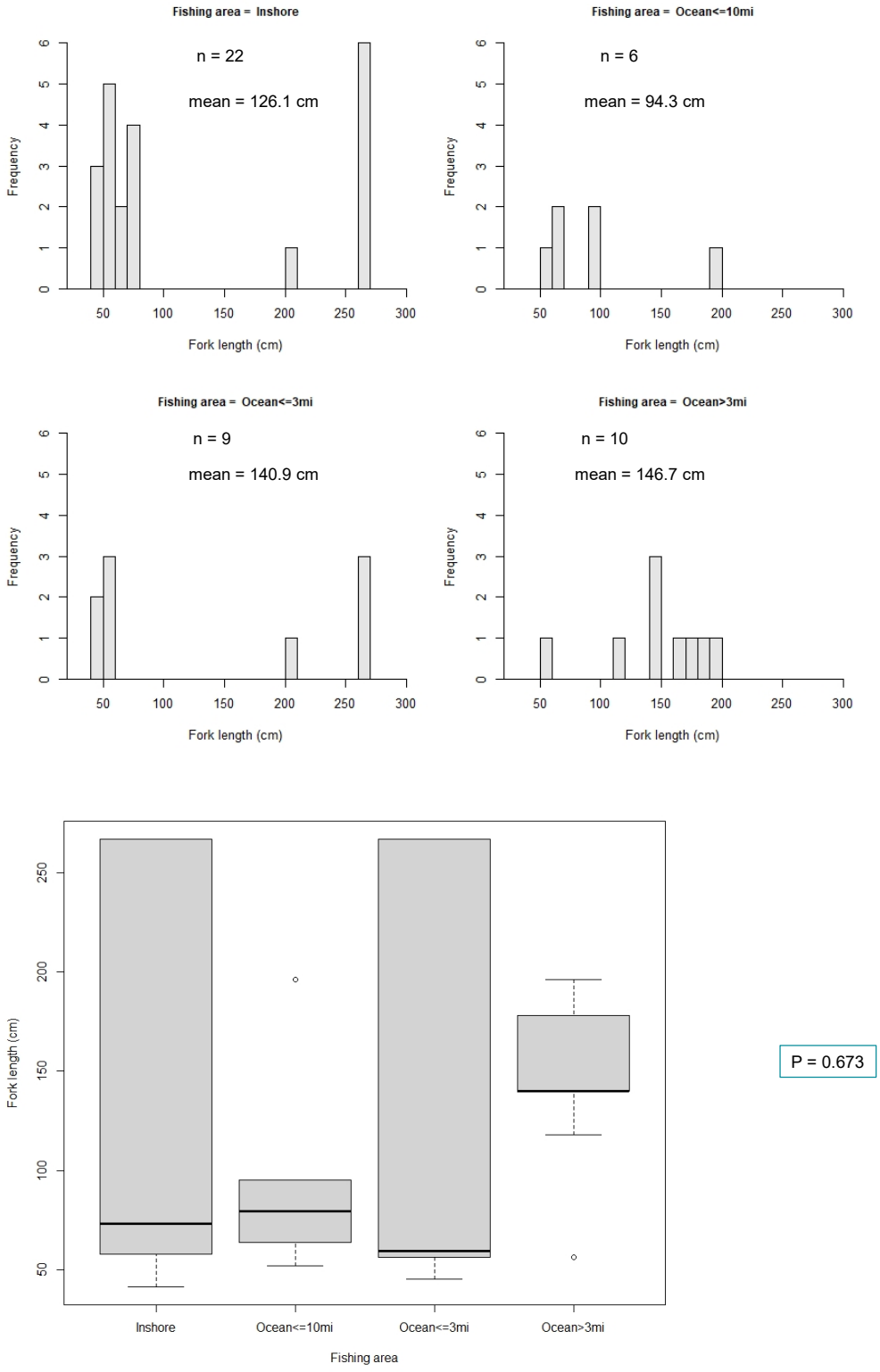


Figure 52. Length-frequency histograms of smooth hammerheads caught in the MRIP recreational survey by fishing area (top panel) and boxplot of fork length by fishing area (bottom panel). MRIP= Marine Recreational Information Program (MRIP).

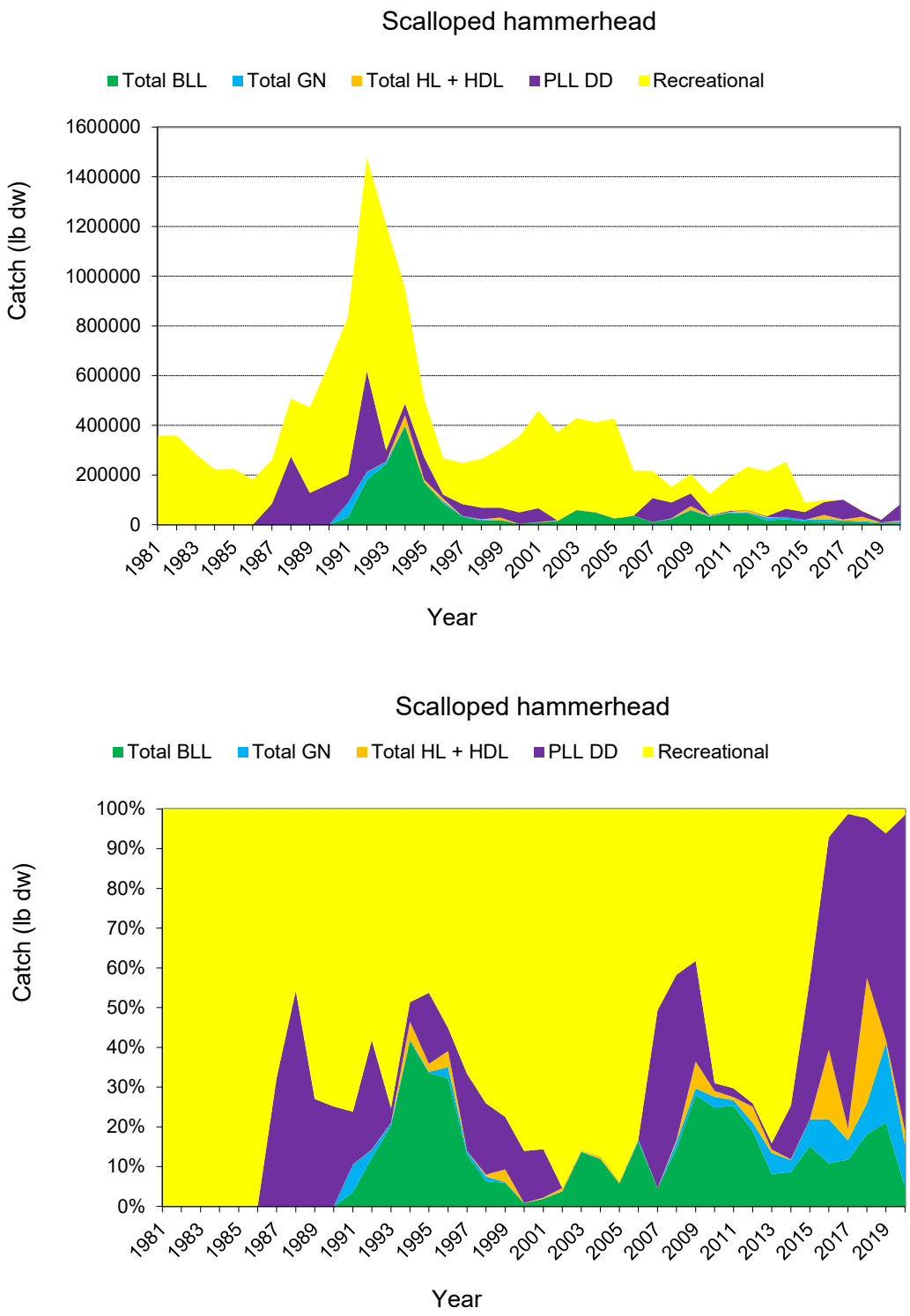


Figure 53. Commercial and (smoothed) recreational catches of scalloped hammerheads in weight (lb dw), 1981-2020. Top panel: stacked catches by year; bottom panel: proportions by year.

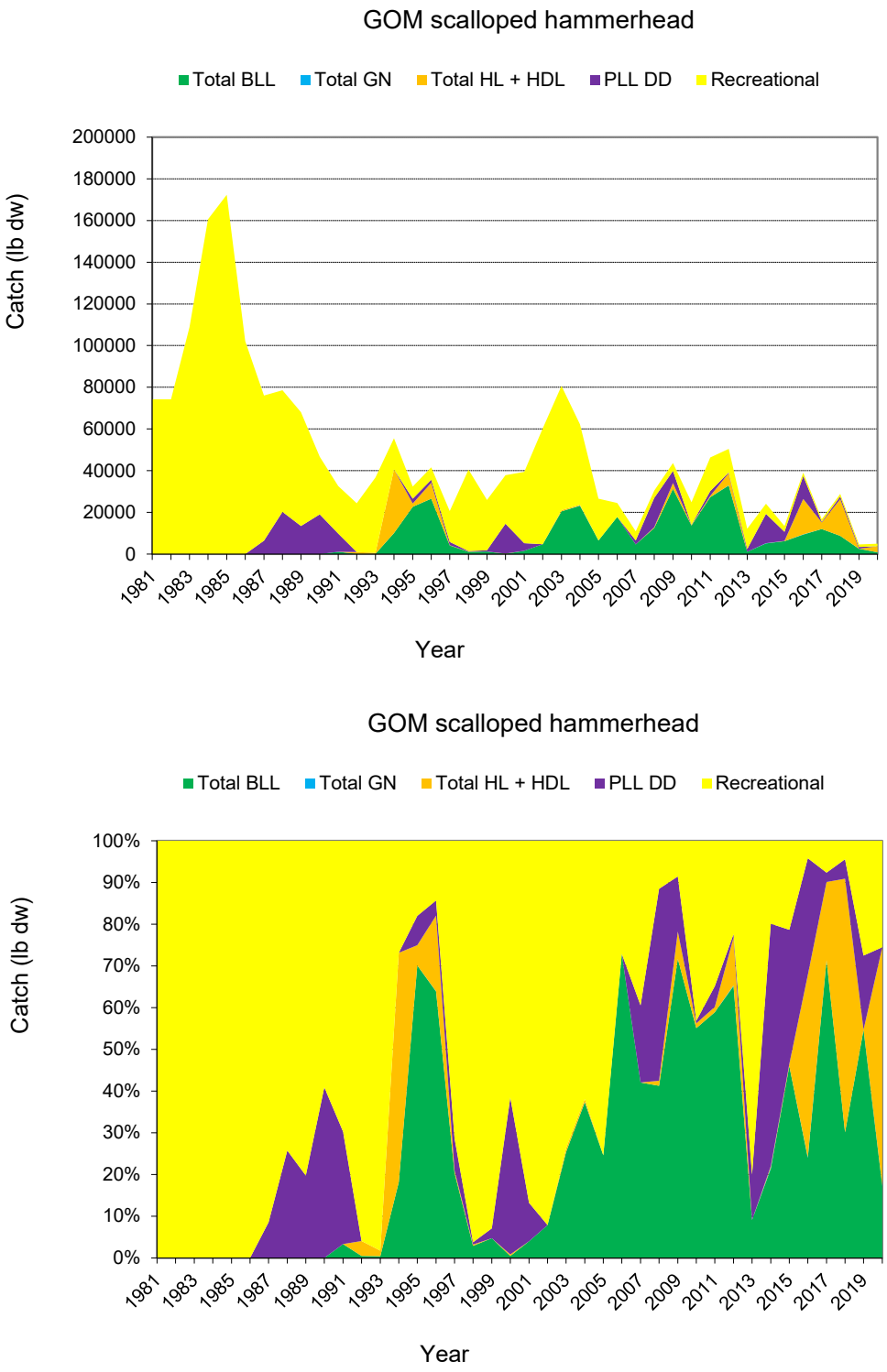


Figure 54. Commercial and (smoothed) recreational catches of GOM scalloped hammerheads in weight (lb dw), 1981-2020. Top panel: stacked catches by year; bottom panel: proportions by year.

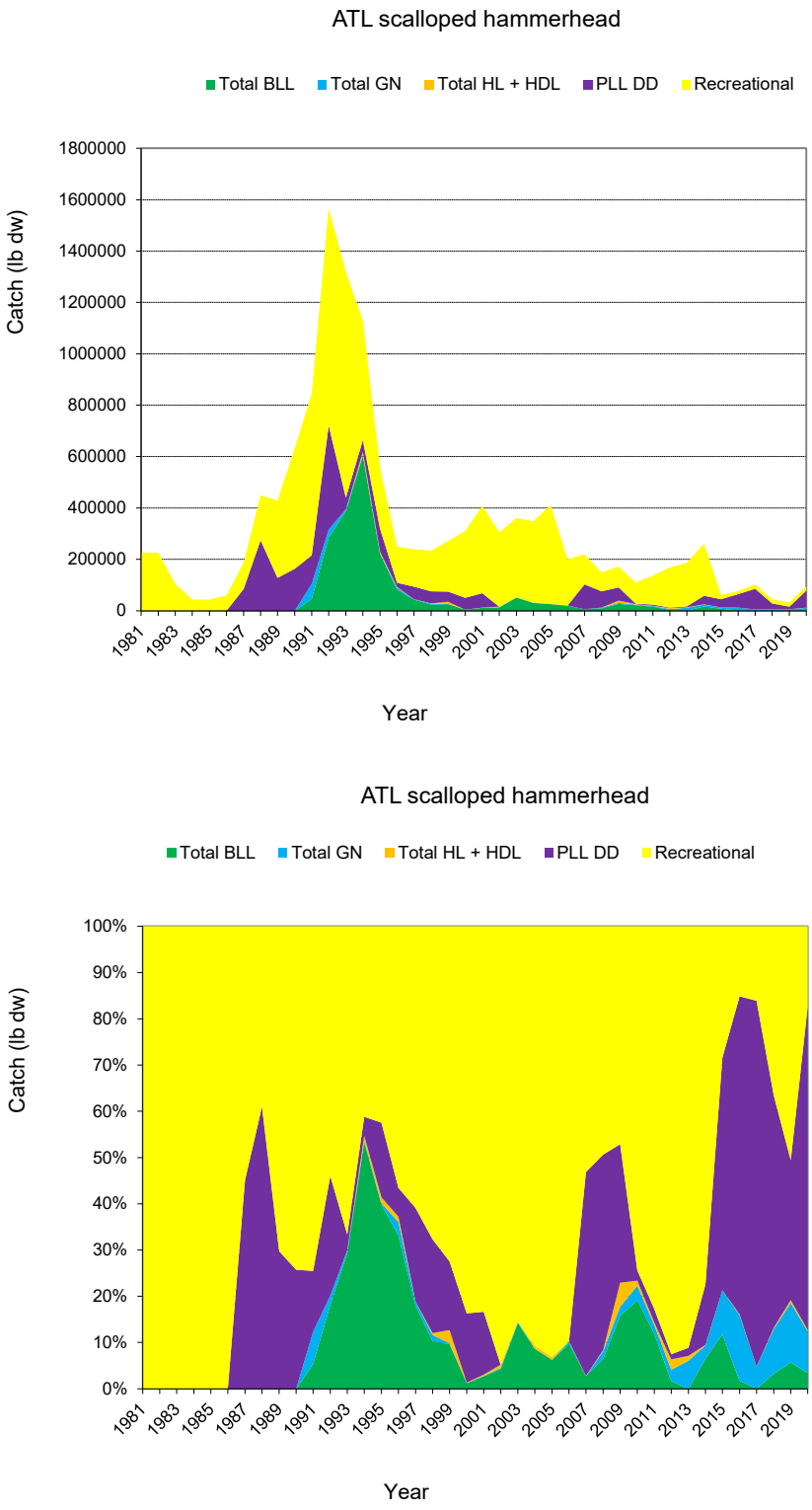


Figure 55. Commercial and (smoothed) recreational catches of ATL scalloped hammerheads in weight (lb dw), 1981-2020. Top panel: stacked catches by year; bottom panel: proportions by year.

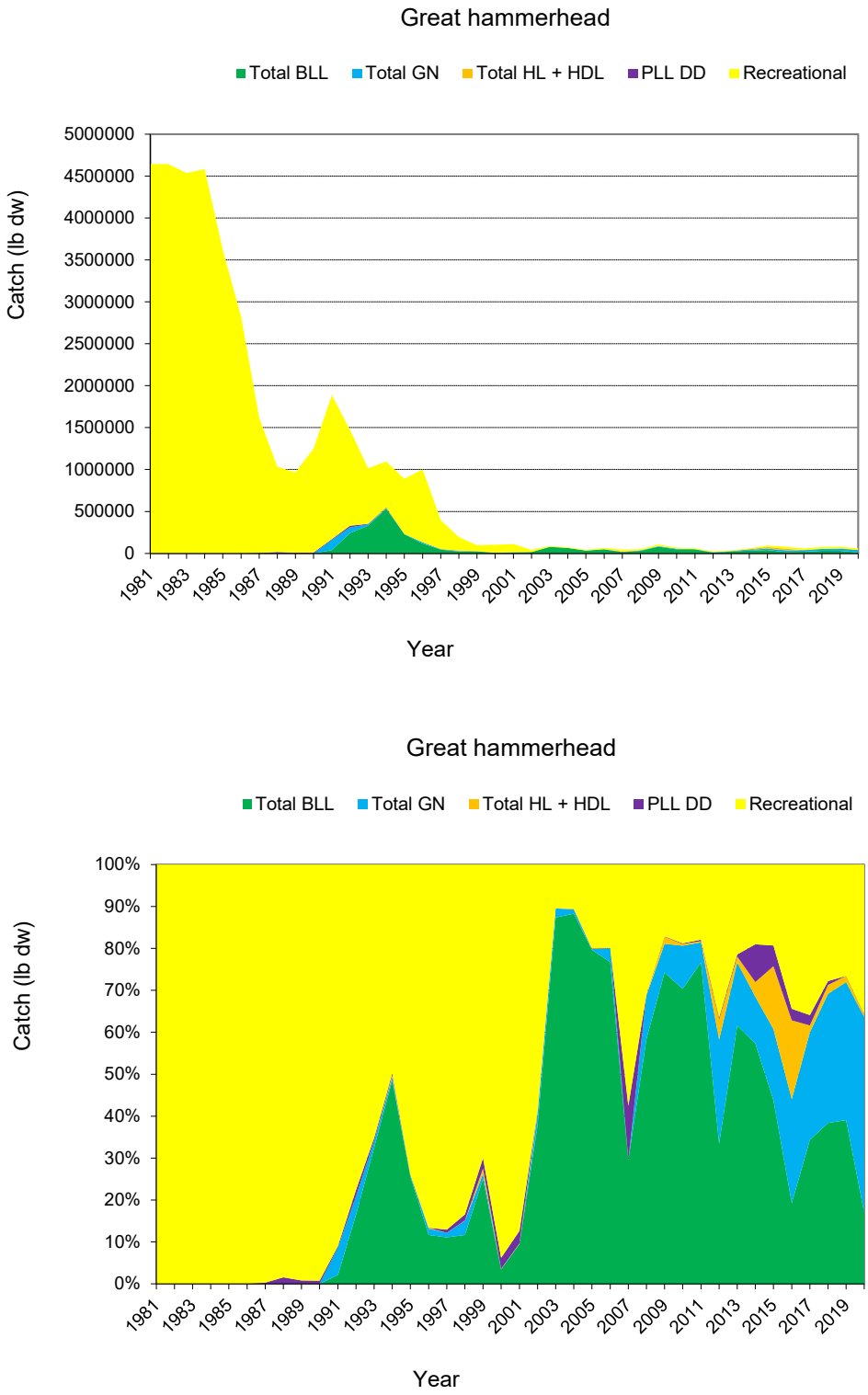


Figure 56. Commercial and (smoothed) recreational catches of great hammerheads in weight (lb dw), 1981-2020. Top panel: stacked catches by year; bottom panel: proportions by year.

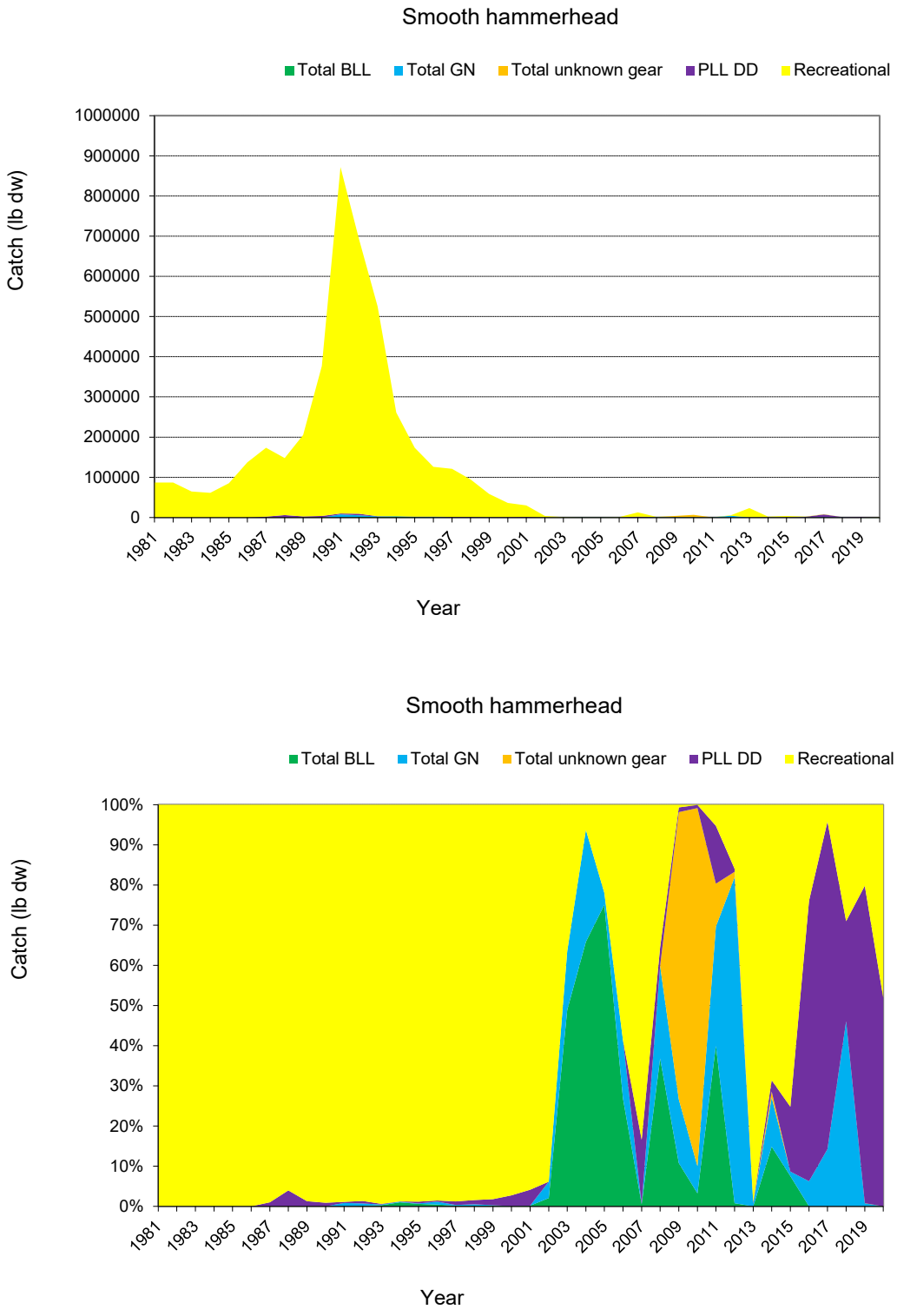


Figure 57. Commercial and (smoothed) recreational catches of smooth hammerheads in weight (lb dw), 1981-2020. Top panel: stacked catches by year; bottom panel: proportions by year.