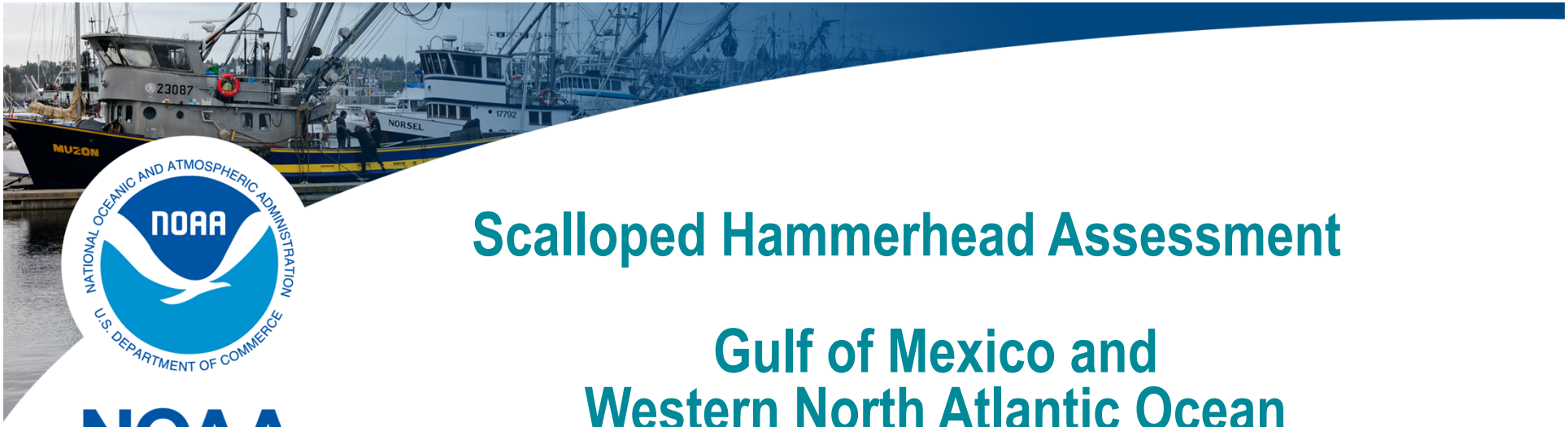


NOAA FISHERIES

SEFSC

Scalloped Hammerhead Assessment

Gulf of Mexico and Western North Atlantic Ocean

Data Inputs - Catch

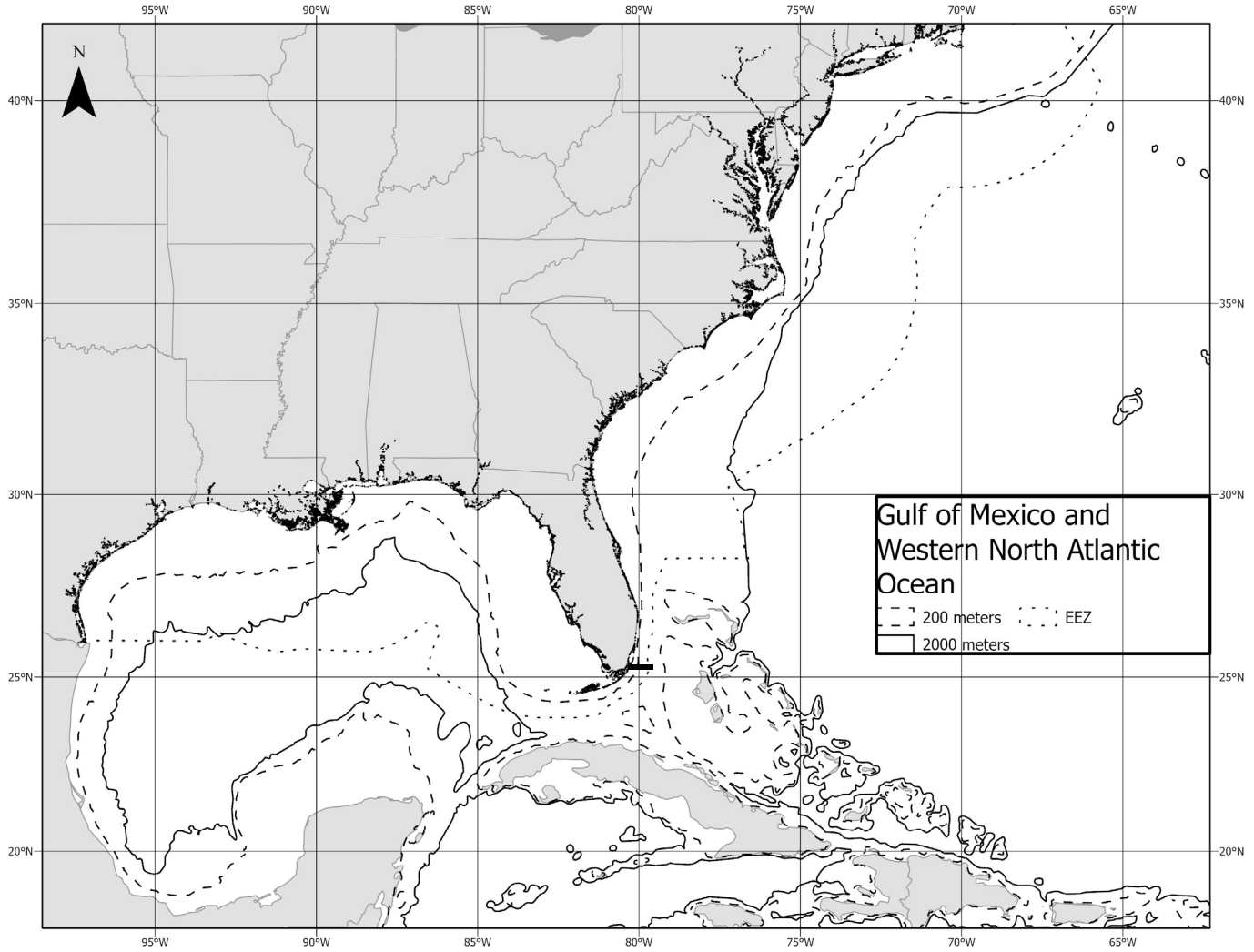
SEDAR 77 (Review Workshop)

August 28 – September 1, 2023

Outline

- Scalloped Hammerhead Assessment – Data Process
  - Gulf of Mexico and Western North Atlantic Ocean
- Data Process Presentations
  - Catches
    - Post-Release Mortality Rates
- Data Process Final Report
  - Discussion and decisions

Gulf of Mexico and Western North Atlantic Ocean



Data Process Final Report Discussion and Decisions

SEDAR

Southeast Data, Assessment, and Review

SEDAR 77

HMS Hammerhead Sharks

Data Workshop Final Report

April 2022

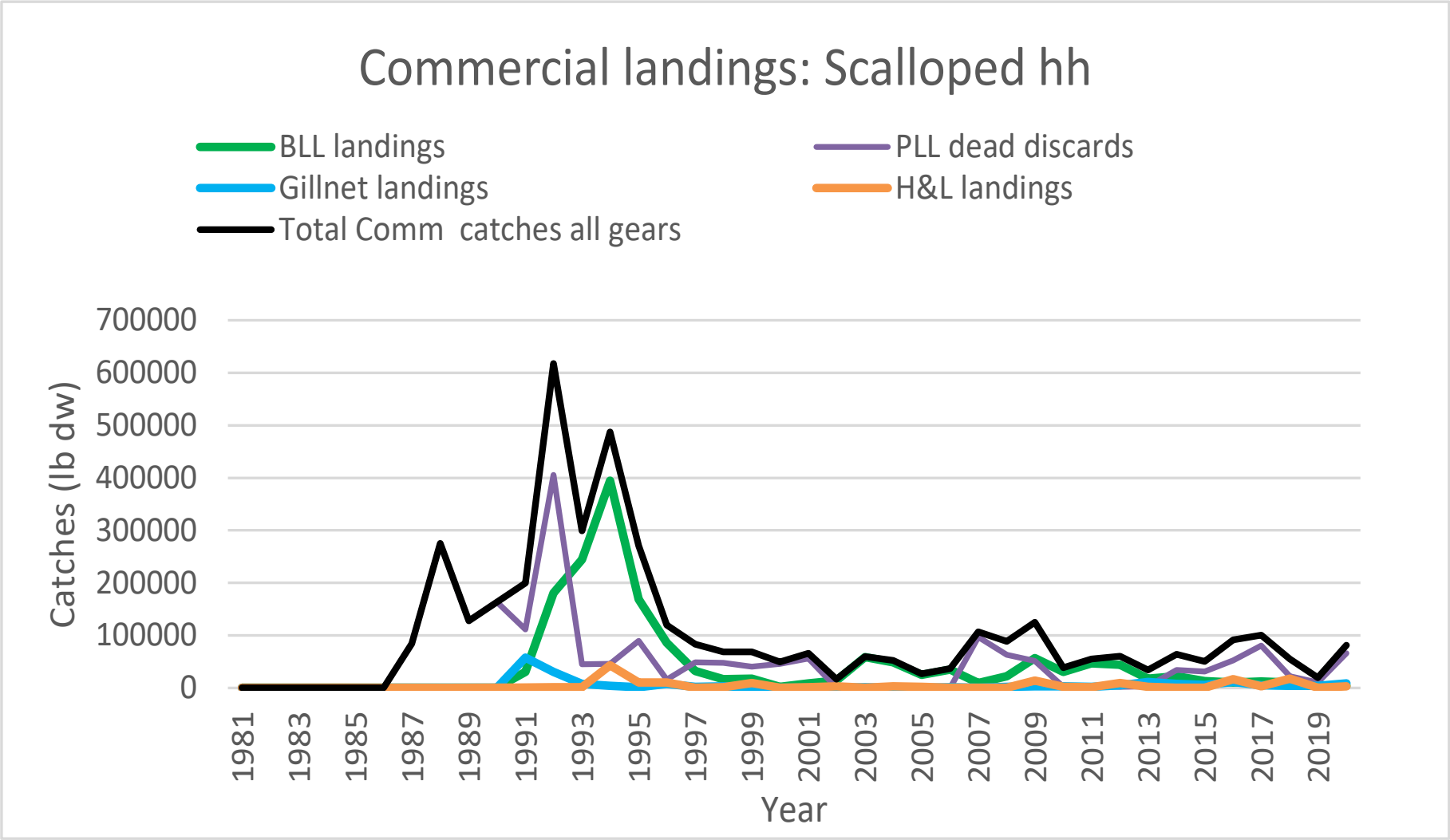
SEDAR
4055 Faber Place Drive, Suite 201
North Charleston, SC 29405

Data Process Final Report Commercial Landings All Regions

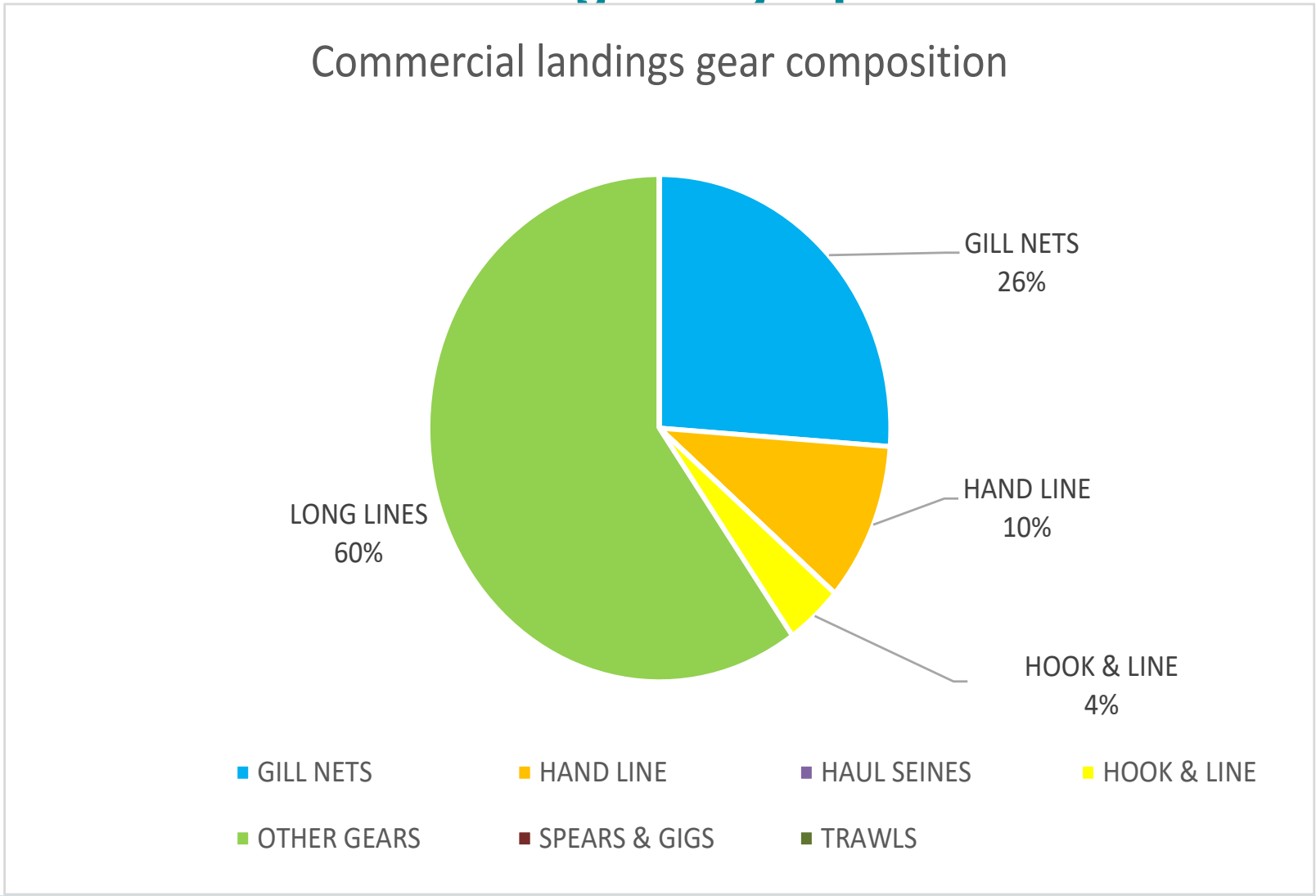
- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *All regions*

- Total commercial landings of scalloped hammerheads (with added pelagic longline dead discards; see section below) peaked during the early to mid-1990s and decreased thereafter generally remaining below 100,000 pounds dressed weight (lb dw) after 1996 (**Figure 1**).
-
- 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**).

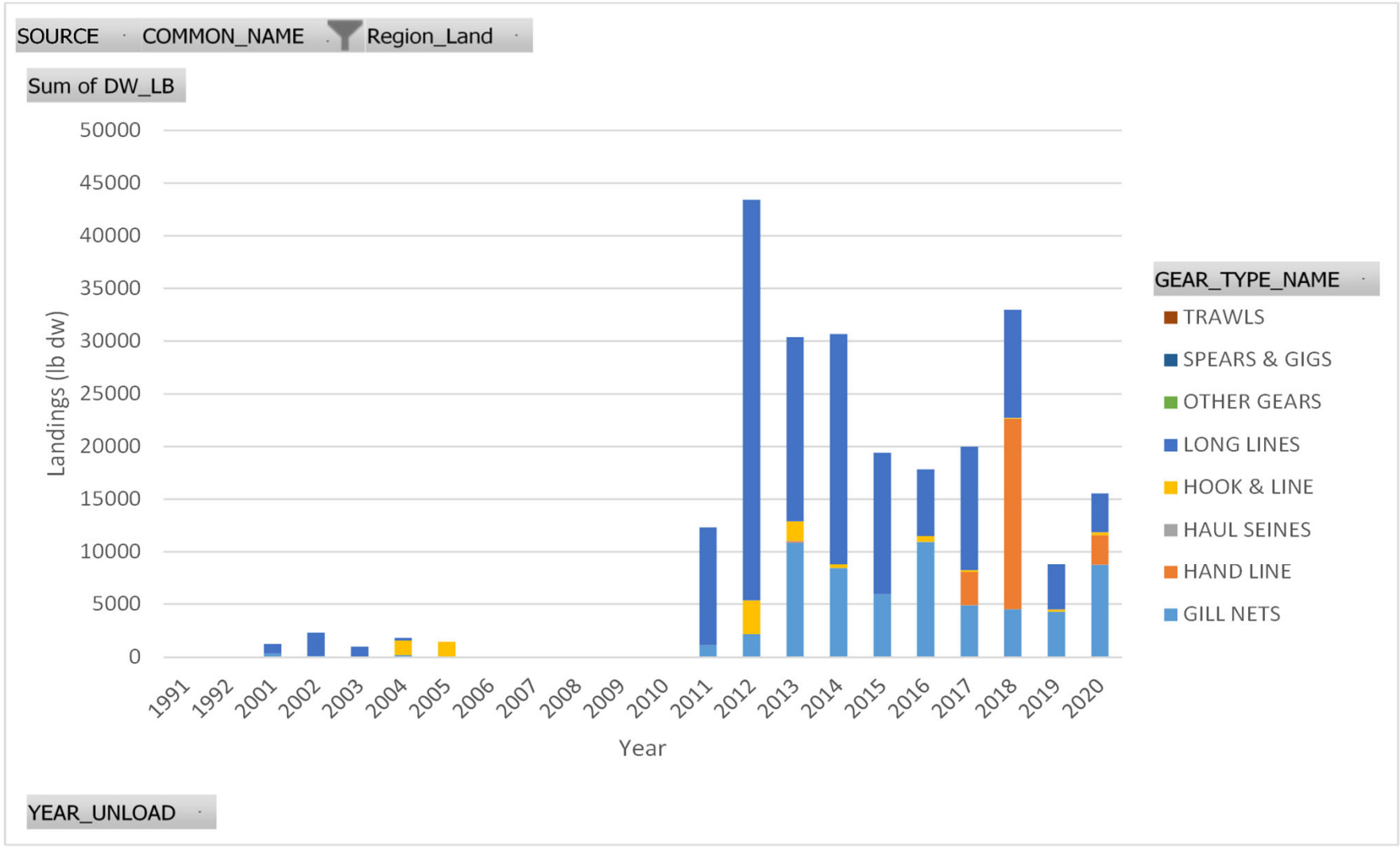
Data Process Final Report (Fig. 1)
Commercial Landings – By Species and Stock



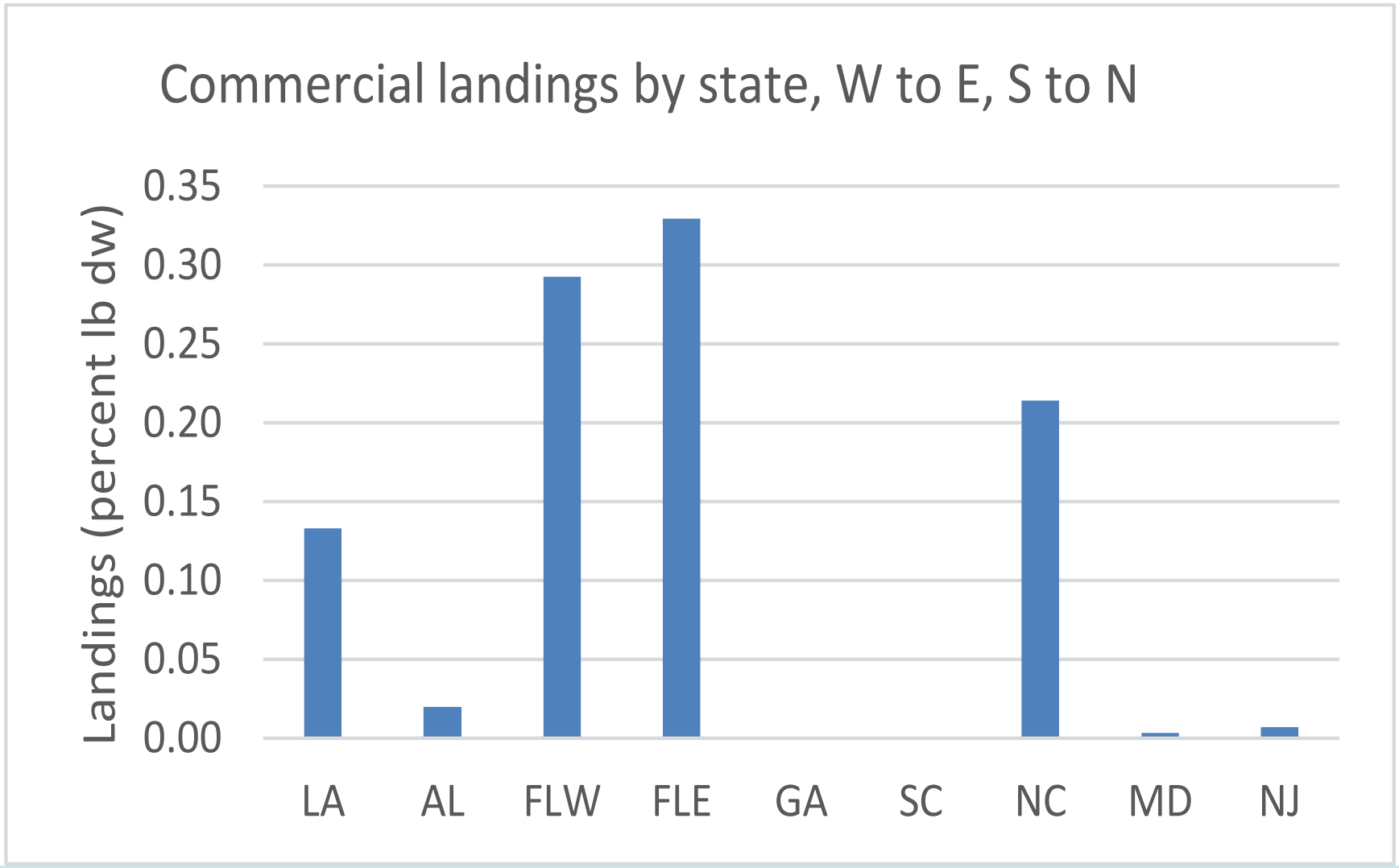
Data Process Final Report (Fig. 2)
Commercial Landings – By Species and Stock



Data Process Final Report (Fig. 2)
Commercial Landings – By Species and Stock



Data Process Final Report (Fig. 3)
Commercial Landings – By Species and Stock

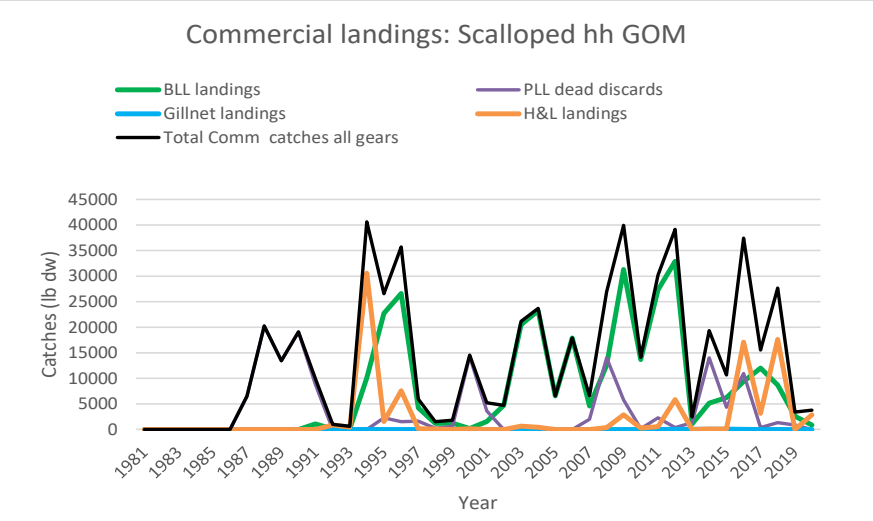


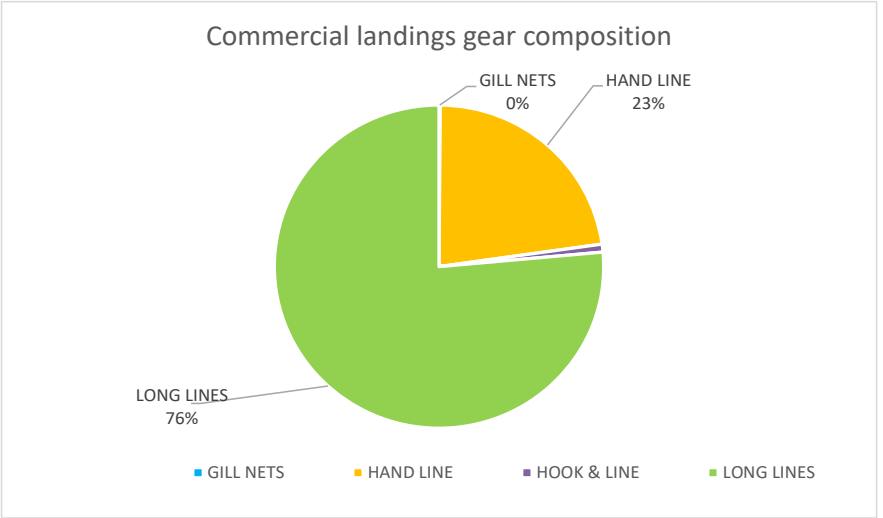
Data Process Final Report Commercial Landings Gulf of Mexico Region

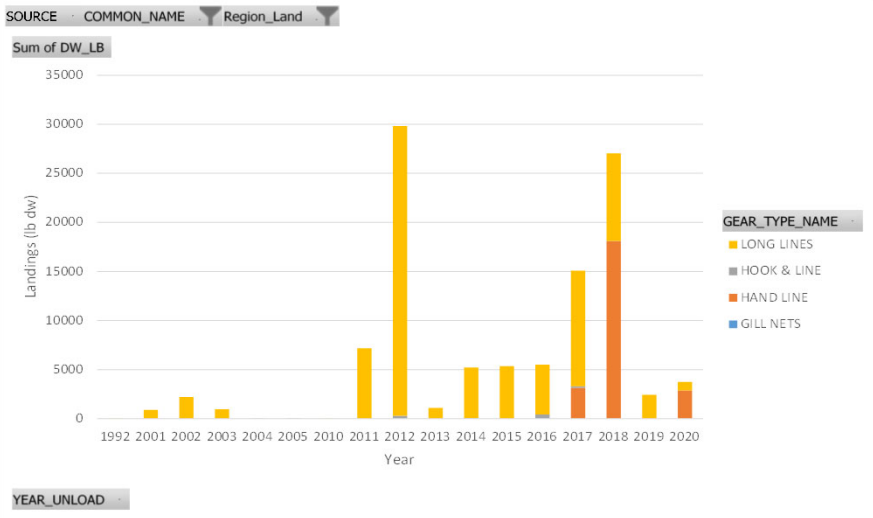
- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *GOM*

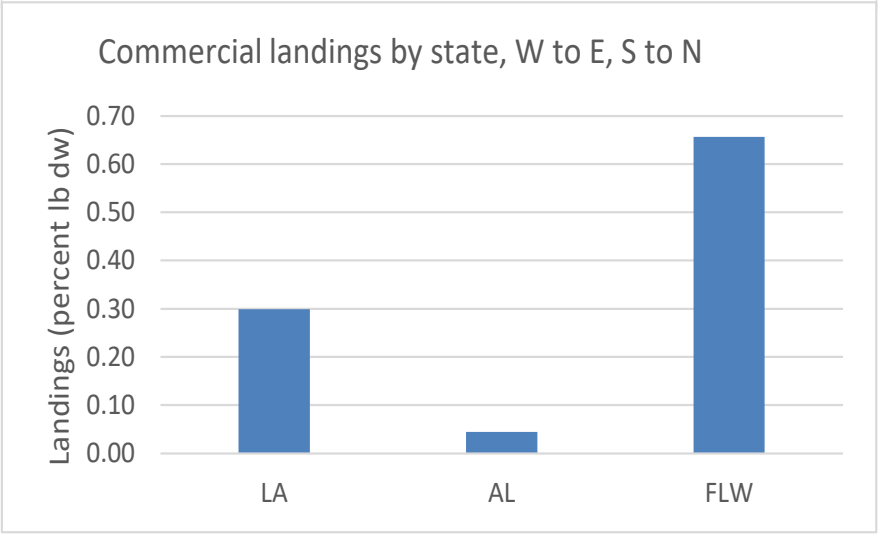
- Total commercial landings of scalloped hammerheads in the Gulf of Mexico (with added pelagic longline dead discards; see section below) were rather choppy throughout the time series but never exceeded 41,000 lb dw (**Figure 4**).
-
- Commercial landings by gear from FINS for 1991-2020 (accounting only 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**).

Data Process Final Report (Figs 4 - 6)
Commercial Landings – By Species and Stock







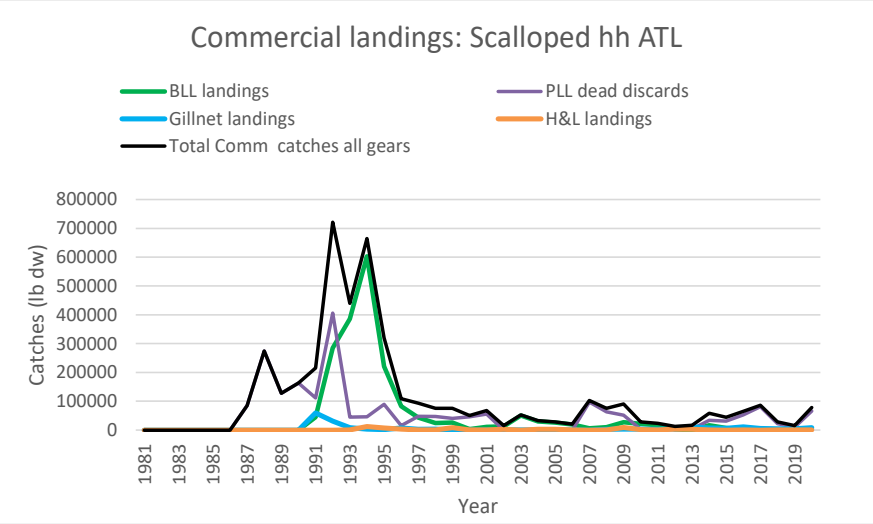


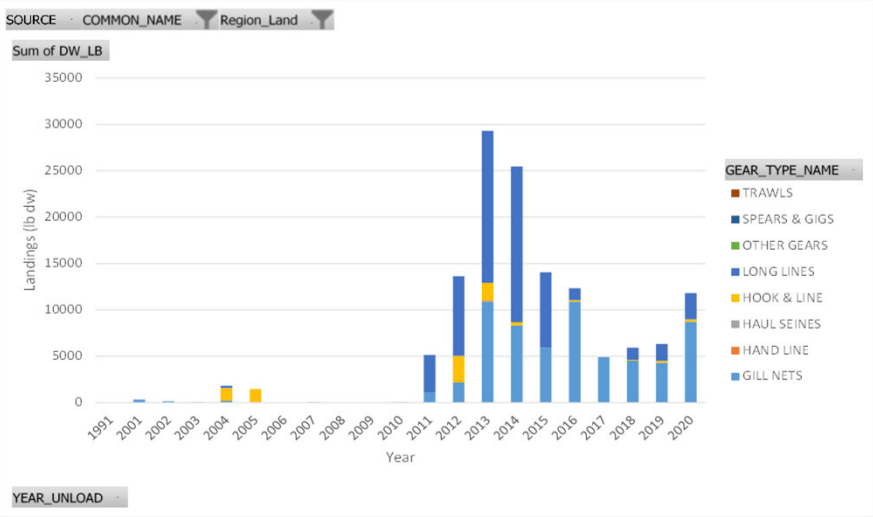
Data Process Final Report Commercial Landings Atlantic Region

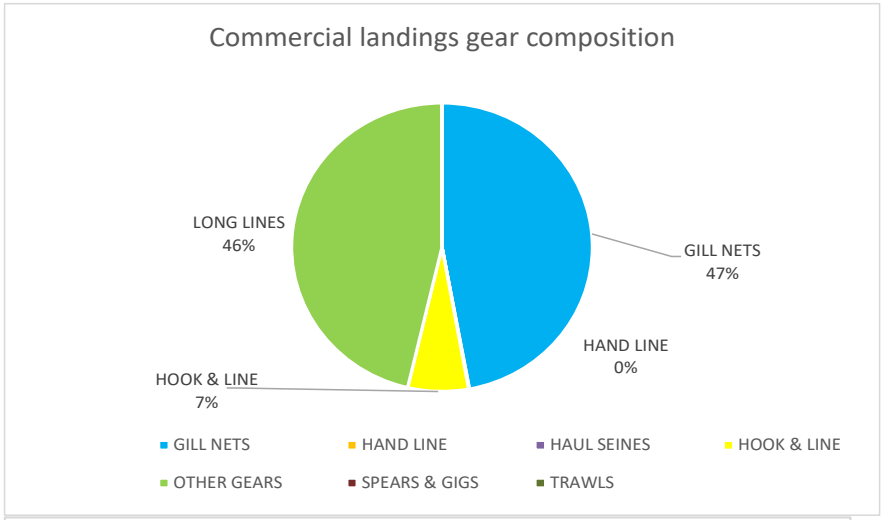
- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *ATL*
- Total commercial landings of scalloped hammerheads (with added pelagic longline dead discards; see section below) peaked during the early to mid-1990s and decreased thereafter generally remaining below 100,000 pounds dressed weight (lb dw) after 1996 (**Figure 7**).
-
- 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**).

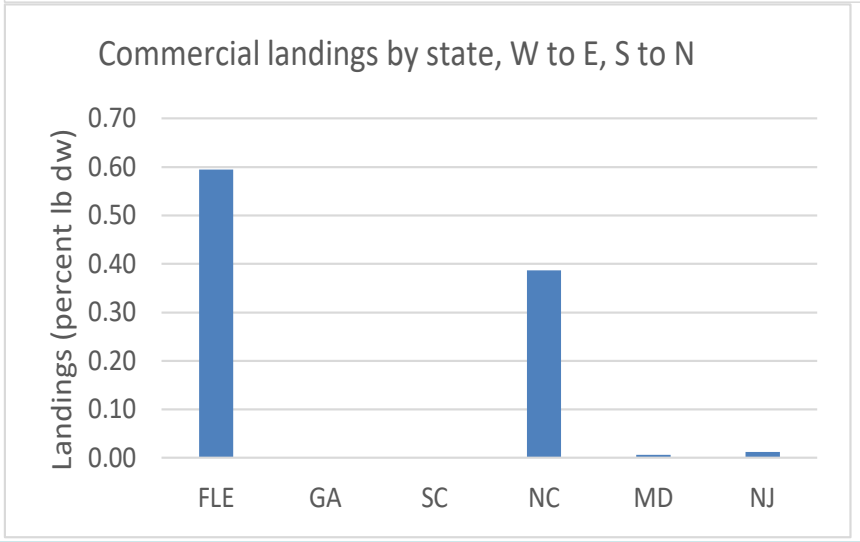
- Landings by state were dominated by Florida (59%) and North Carolina (39%) (**Figure 9, top**), with Florida being the main state of landings in most years up to 2015 after which North Carolina became the main sate of landings (**Figure 9, bottom**).

Data Process Final Report (Figs 7 - 9)
Commercial Landings – By Species and Stock









Data Process Final Report Recommendations Commercial Landings

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Discussion and decisions*
- Although recreational catch statistics are available since 1981, commercial landings by species only start in 1991. Based on previous input from the commercial shark fishing industry provided for SEDAR 65, there was very little commercial shark fishing effort in the early 1980s so it was proposed that to reconstruct the commercial landings series back to 1981, a linear decrease from the average of the first three years of data (1991-1993) be assumed from 1990 back to 1981. This back-calculation methodology should also be applied to the discard series available.
- ***Decision:* Assume a linear increase of landings from 0 in 1981 to 90% of the mean of 1991-1993 in 1990 to represent growing market for shark products. Apply this increase to the three fleets considered for each stock (longlines, gillnets, and hook and line/unknown gear)**.

Data Process Final Report Recommendations Commercial Dead and Live Discards

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Discussion and decisions*
- ***Decision:** Include the number of reported logbook hooks/sets, number of observed hooks/sets, number of observed positive hooks/sets, and number of animals caught in the Tables if they are available.*
- ***Decision:** Back-calculate dead and live discards to 1981 for the southeast bottom longlines and southeast gillnets (1993 – 2019 for southeast bottom longlines; 1998-2019 for southeast gillnets). Assume a linear increase in discards from 0 in 1981 to 90% of the mean of the entire time series in the year preceding the first year of bycatch estimates for southeast bottom longlines and southeast gillnets to parallel the approach used for back-calculating landings.*
- ***Decision**: Back-calculate dead and live discards to 1981 for northeast gillnets. The average discard ratio for the entire time series (1995-2019 for northeast gillnets) across all strata (grand mean) for live and dead discards by number and weight were applied to the annual total landings for the Mid-Atlantic statistical areas identified in the dealer database for northeast gillnets.*
- ***Decision:** Use the delta-lognormal method to replace the ratio method for southeast bottom longline and southeast gillnet discard estimates.*
- ***Decision:** Include the dead and live discard estimates obtained with the delta-lognormal method and the grand mean CPUE in the base run for southeast bottom longline and southeast gillnet; include the dead and live discard estimates obtained with the ratio method and the grand mean CPUE in the base run for northeast gillnet. Use the estimated lower 95%CI and upper 95%CI in low and high catch sensitivity scenarios, respectively.*

Data Process Final Report
Commercial Dead and Live Discards

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Shark bottom longline for areas combined*
- Yearly calculated dead discards of scalloped hammerhead sharks for the shark bottom longline fishery were generally a few hundred during 1993 to the mid-2000s except for a peak in 1996 and were about 100 after 2007 (**Table 5**).
- Yearly observed dead discards of scalloped hammerhead sharks for the shark research bottom longline fishery (2008-2019) were small and were less than 10 after 2011 (**Table 6**).
- Yearly calculated live discards of scalloped hammerhead sharks for the shark bottom longline fishery were a few hundred during 1993 to the mid-2000s except for a peak in 1996 and were about 100 after 2006 (**Table 7**).
- Yearly observed live discards of scalloped hammerhead sharks for the shark research bottom longline fishery (2008-2019) were less than 50 (**Table 8**).

Data Process Final Report
Commercial Dead and Live Discards

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Shark bottom longline for the Atlantic*
- Yearly calculated dead discards of scalloped hammerhead sharks for the shark bottom longline fishery were generally a couple of hundred during 1993 to the mid-2000s and below 100 after 2006 (**Table 9**).
- Yearly observed dead discards of scalloped hammerhead sharks for the shark research bottom longline fishery (2008-2019) were small and were less than 5 after 2011 (**Table 10**).
- Yearly calculated live discards of scalloped hammerhead sharks for the shark bottom longline fishery were generally a couple of hundred during 1993 to the mid-2000s and less than 100 after 2006 (**Table 11**).
- Yearly observed live discards of scalloped hammerhead sharks for the shark research bottom longline fishery (2008-2019) were less than 20 (**Table 12**).

Data Process Final Report
Commercial Dead and Live Discards

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Shark bottom longline for the Gulf of Mexico*
- Yearly calculated dead discards of scalloped hammerhead sharks for the shark bottom longline fishery were generally a couple of hundred during 1993 to the mid-2000s with peaks in 1995 and 1996 and were less than 100 after 2007 (**Table 13**).
- Yearly observed dead discards of scalloped hammerhead sharks for the shark research bottom longline fishery (2008-2019) were small and were less than 10 after 2011 (**Table 14**).
- Yearly calculated live discards of scalloped hammerhead sharks for the shark bottom longline fishery were a couple of hundred during 1993 to the mid-2000s with peaks in 1995 and 1996 and were less than 100 after 2006 (**Table 15**).
- Yearly observed live discards of scalloped hammerhead sharks for the shark research bottom longline fishery (2008-2019) were less than 30 (**Table 16**).

Data Process Final Report
Commercial Dead and Live Discards

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *US southeast commercial gillnet for areas combined*
- Yearly calculated dead discards of scalloped hammerhead sharks for the US southeast commercial gillnet fishery (1998-2019) ranged from 183 to 504 (**Table 19**).

- Yearly calculated live discards of scalloped hammerhead sharks for the US southeast commercial gillnet fishery (1998-2019) ranged from 75 to 208 (**Table 20**).

Data Process Final Report
Commercial Dead and Live Discards

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *US southeast commercial gillnet for the Atlantic*
- Yearly calculated dead discards of scalloped hammerhead sharks for the US southeast commercial gillnet fishery (1998-2019) ranged from 173 to 459 (**Table 21**).

- Yearly calculated live discards of scalloped hammerhead sharks for the US southeast commercial gillnet fishery (1998-2019) ranged from 75 to 200 (**Table 22**).

Data Process Final Report
Commercial Dead and Live Discards

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *US southeast commercial gillnet for the Gulf of Mexico*
- Yearly calculated dead discards of scalloped hammerhead sharks for the US southeast commercial gillnet fishery (1998-2019) ranged from 9 to 120 (**Table 23**).

- Yearly calculated live discards of scalloped hammerhead sharks for the US southeast commercial gillnet fishery (1998-2019) ranged from 1 to 12 (**Table 24**).

Data Process Final Report
Commercial Dead and Live Discards

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *US northeast commercial gillnet for the Mid-Atlantic*
- Yearly back-calculated dead discards of scalloped hammerhead sharks for the US northeast commercial gillnet fishery (1981-1994) ranged from 4 to 110 and yearly calculated dead discards of scalloped hammerhead sharks for the US northeast commercial gillnet fishery (1995-2019) ranged from 70 to 618 (**Table 25**).

- Yearly back-calculated live discards of scalloped hammerhead sharks for the US northeast commercial gillnet fishery (1981-1994) ranged from 3 to 86 and yearly calculated dead discards of scalloped hammerhead sharks for the US northeast commercial gillnet fishery (1995-2019) ranged from 55 to 483 (**Table 25**).

Data Process Final Report Recommendations Commercial PRM

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Discussion and decisions*
- ***Decision:*** ***Use a PRLDM mortality rate of 69.15% as the best estimate of PRLDM for scalloped hammerheads released alive from commercial bottom longline gear.***
- ***Decision:*** ***Use a 95% CI of 66.79 – 75.19% PRLDM as the minimum and maximum estimate of PRLDM for scalloped hammerheads released alive from commercial bottom longline gear.***
- ***Decision:*** ***Use PRLDM rates obtained for hammerheads captured with bottom longline gear as the best available estimates of PRLDM for hammerheads captured in commercial gillnet gear.***

Data Process Final Report Recommendations Commercial Catches PRM

- Great Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Discussion and decisions*
- ***Decision: Use a PRLDM rate of 81.41% for great hammerheads released alive from commercial bottom longline gear.***
- ***Decision: Use a 95% CI of 77.05 – 85.93% PRLDM as the minimum and maximum estimate of PRLDM for great hammerheads released alive from commercial bottom longline gear.***

Data Process Final Report Recommendations Commercial Catches PRM

- Smooth Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Discussion and decisions*
- ***Decision:*** ***Use PRLDM rates obtained for scalloped hammerheads captured with bottom longline gear as the best available estimates of PRLDM for smooth hammerheads captured with both bottom longline gear and commercial gillnet gear.***

Data Process Final Report Recommendations
Catches – Mexico and Puerto Rico

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Discussion and decisions*
- ***Decision:* Include the reconstructed Mexican landings based on one year of data from Castillo et al. (1998) in a high catch sensitivity scenario only; exclude from the base run.**
- ***Decision:* Although the magnitude is almost insignificant, do not include Puerto Rico and U.S. Virgin Islands landings in the base run; include them only in a high catch sensitivity scenario**

Data Process Final Report Recommendations Pelagic Longline Dead and Live Discards

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Discussion and decisions*
- ***Decision:*** ***There are no uncertainty estimates associated with published ICCAT pelagic longline dead discards and no live discard estimates. CVs are calculated by area/quarter but not overall, and are not included in the Task 1 data reported to ICCAT. The DW panel recommended using ICCAT pelagic longline dead discards in the base run (and low catch and high catch scenarios).***
- ***Decision:*** ***Assume a linear increase in discards from 0 in 1981 to 83.4% of the mean of the entire time series in the year preceding the first year of bycatch estimates (1987) to parallel the approach used for back-calculating landings and other commercial discard series***

Data Process Final Report Recommendations Recreational Catches

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Discussion and decisions*
- ***Decision:* Apportion the AB1 and B2 unclassified sphyrnid sharks as follows: 1) for 1981-2000, use annual proportions based on A catches (observed by interviewer) and 2) for 2001-2020, use average proportion during 1981-2000 based on the A catches to account for management measures implemented**
-
- ***Decision:* Smooth the AB1 and B2 recreational catch series with a three-year geometric moving average**
- ***Decision:* Smooth individual years with noticeable peaks by setting them equal to the geometric mean of the 3 preceding and ensuing years (as available)**

Data Process Final Report Recommendations
Recreational Catches - RPM

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Discussion and decisions*
- ***Decision:*** ***Use the pooled PRLDM rate of 11.8% obtained from three directed electronic tagging studies of great hammerheads released alive from recreational gear as a minimum estimate of the PRLDM rate for hammerheads captured and released alive with recreational gear.***
- ***Decision:*** ***Use the PRLDM obtained from meta-analysis for pelagic sharks (26.8%, Musyl and Gilman 2019) as the best estimate of the PRLDM rate for hammerheads captured and released alive with recreational gear.***
- ***Decision:*** ***Use the 95% upper confidence interval (UCI) of PRLDM obtained from meta-analysis for pelagic sharks (36.0%, Musyl and Gilman 2019) as the maximum estimate of the PRLDM rate for hammerheads captured and released alive with recreational gear.***

Data Process Final Report Recommendations Recreational Catches – By Species and Stock

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *All regions*
- The vast majority of scalloped hammerhead catches were from MRIP. Catches were highest at the beginning of the time series and showed a decreasing trend punctuated by some peaks, notably in 1982 and 1993 for the AB1 series. Upon further examination, it was found that the A estimate for 1982 was influenced by a large value of 22,010 sharks for South Carolina (Wave 3, Private, Inland), which was based on one observed trip that harvested 20 sharks, all measuring only 11 inches. Since this was unrealistic, the recommendation was to remove this SC estimate entirely.

Data Process Final Report Recommendations Recreational Catches – By Species and Stock

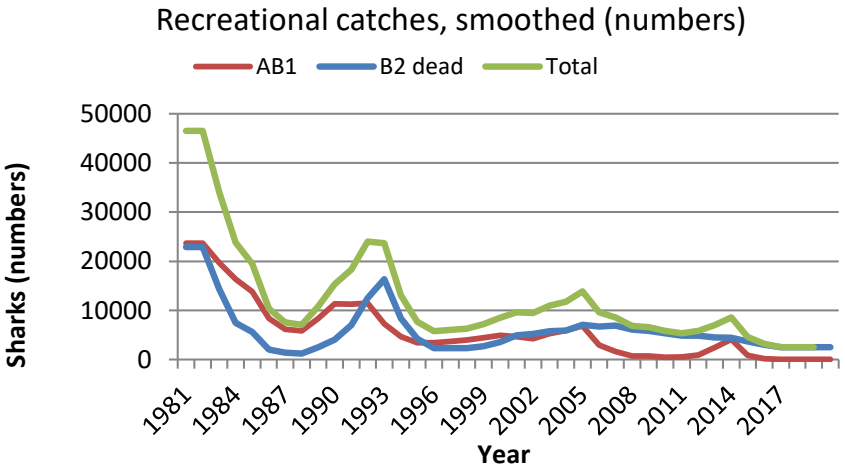
- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *All regions*
- ***Decision:* Remove the South Carolina A estimate of 22,010 sharks from the original A estimate of 39,739 for the 1982 AB1 estimate in numbers; smooth the 1993 AB1 estimate (in numbers and weight) by setting it equal to the geometric mean of the 3 preceding and ensuing years**

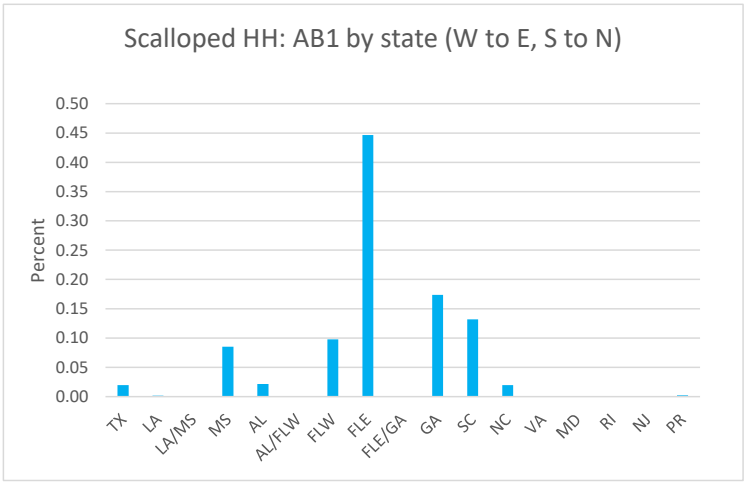
Data Process Final Report Recommendations Recreational Catches – By Species and Stock

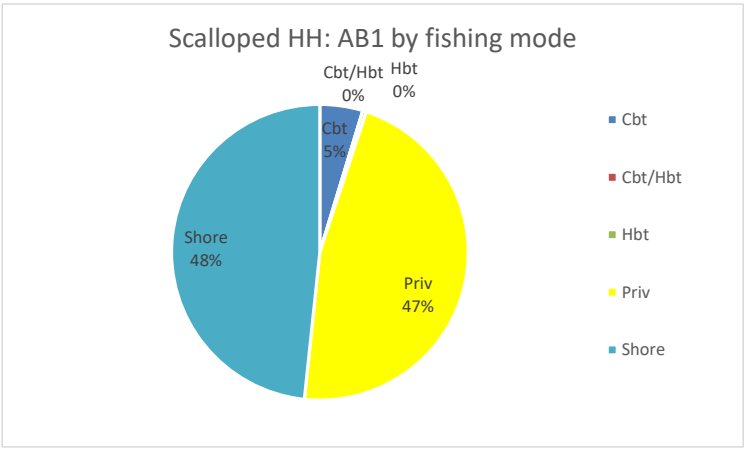
- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *All regions*
- Based on this the recommendation was to smooth the 1993 data point. **Figure 33** [their lower panel] shows the recreational catches after smoothing the individual points and the general smoothing and using the recommended post-release mortality rate of 26.81% .

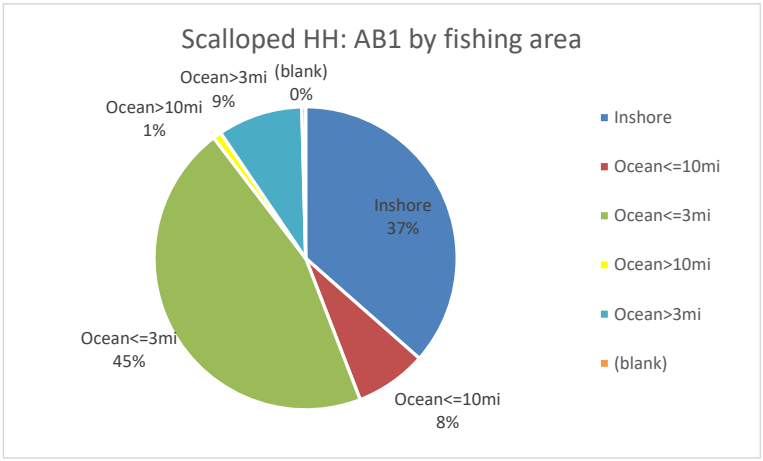
- Most AB1 catches by state corresponded to the southeast region in the Atlantic with Florida-East coast (45%), Georgia (17%), and South Carolina (13%) accounting for 75% of all scalloped hammerhead catches (**Figure 34, top**). By fishing mode, most AB1 catches were from shore (48%) and by private boats (47%), with charter boats and headboats contributing very little (**Figure 34, middle**). By fishing area, most AB1 catches occurred less than 3 miles from shore (45%) and in inshore waters (37%), with the remaining catches occurring in waters over three miles from shore (9%) or less than 10 miles from shore (8%; **Figure 34, bottom**).

Data Process Final Report (Figs 33, 34)
Recreational Catches – By Species and Stock







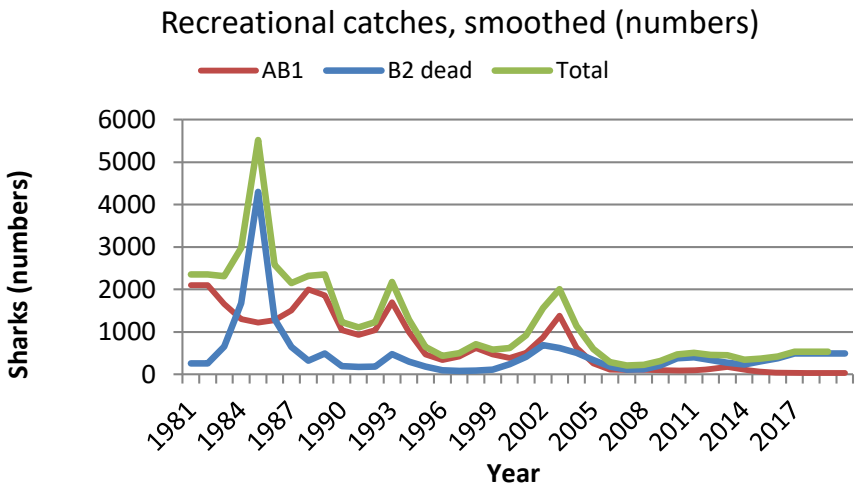


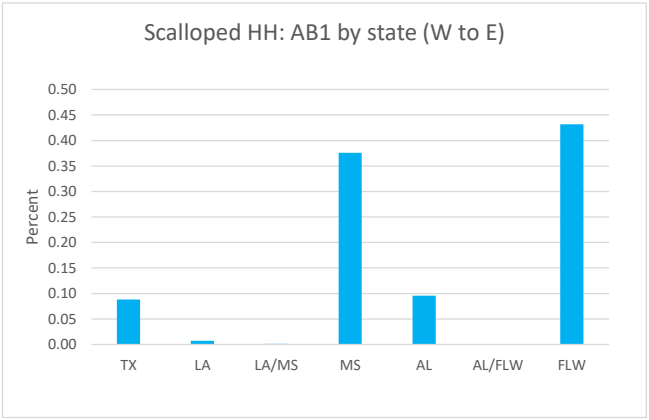
Data Process Final Report Recommendations Recreational Catches – By Species and Stock

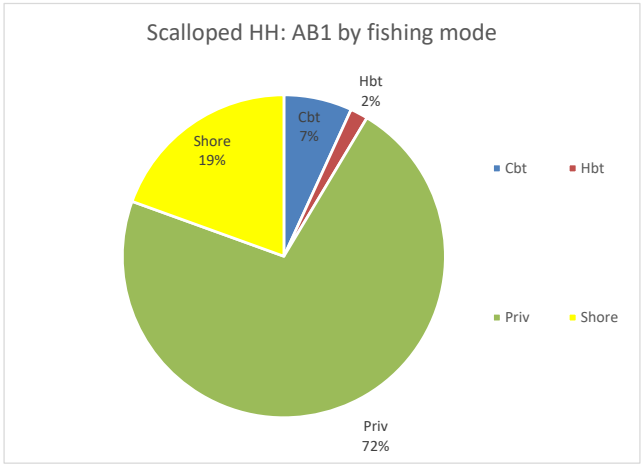
- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *GOM*
- Based on this the recommendation, **Figure 35** (their lower panel) shows the recreational catches after smoothing the individual points and the general smoothing and using the recommended post-release mortality rate of 26.81%.

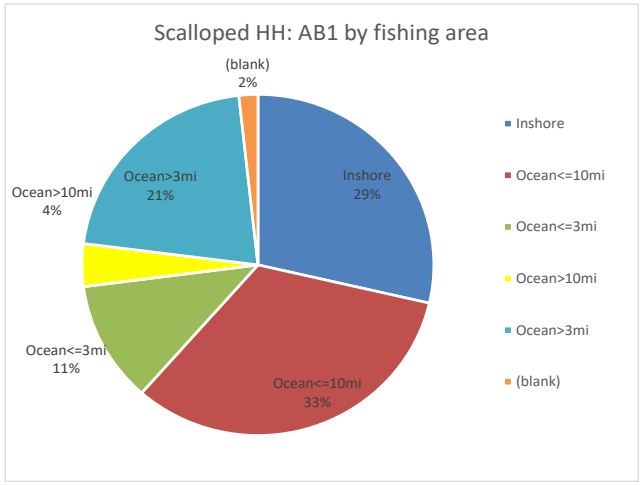
- Most AB1 catches by state corresponded to Florida-west coast (43%), Mississippi (38%), Alabama (10%), and Texas (9%) (**Figure 36, top**). By fishing mode, most AB1 catches were from private boats (72%) and from shore (19%), with charter boats and headboats contributing the remaining 9% (**Figure 36, middle**). By fishing area, most AB1 catches occurred in waters over three miles from shore (21%) and less than 10 miles from shore (33%) with catches in less than 3 miles from shore and in inshore waters accounting for 40% of the total catches (**Figure 36, bottom**).

Data Process Final Report (Figs 35, 36)
Recreational Catches – By Species and Stock









Data Process Final Report Recommendations Recreational Catches – By Species and Stock

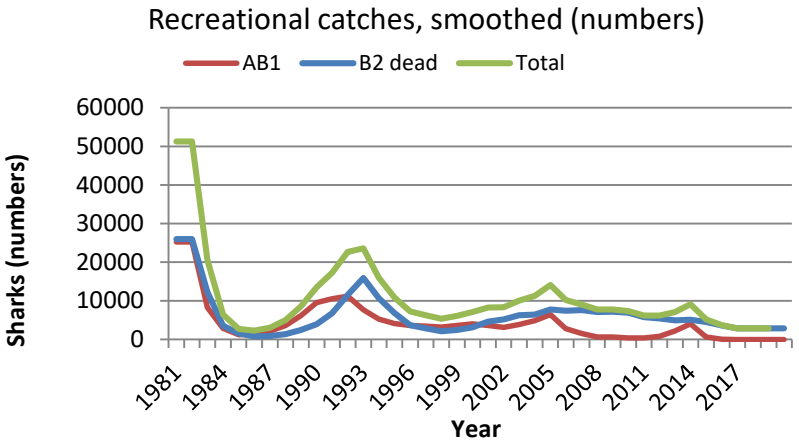
- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *ATL*
- ***Decision:*** ***Remove the South Carolina A estimate of 22,010 sharks from the original A estimate of 39,066 for the 1982 AB1 estimate in numbers; smooth the 1993 AB1 estimates (in numbers and weight) by setting them equal to the geometric mean of the 3 preceding and ensuing years***

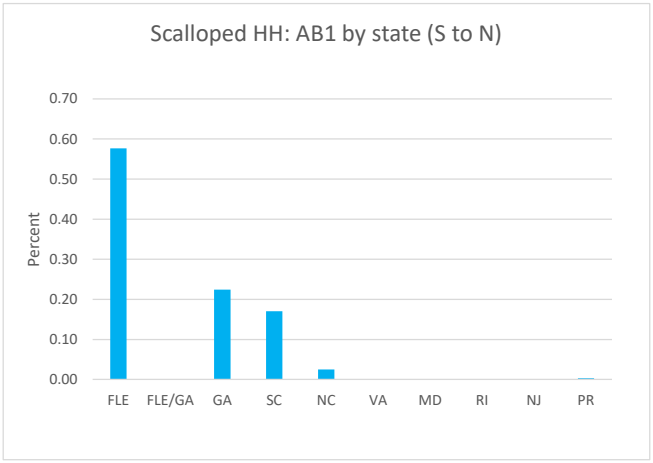
Data Process Final Report Recommendations Recreational Catches – By Species and Stock

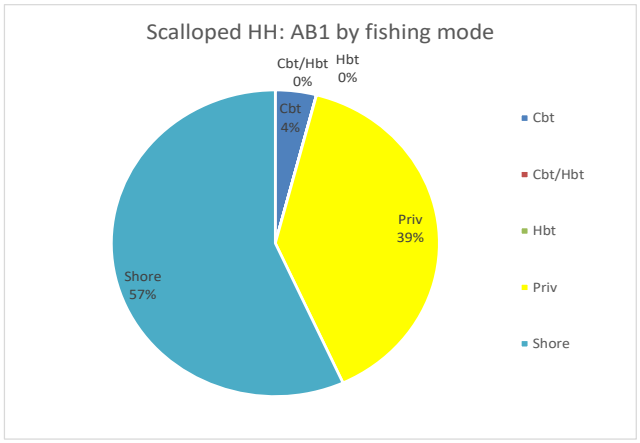
- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *All regions*
- Based on this the recommendation was to smooth the 1993 data point. **Figure 37** [their lower panel] shows the recreational catches after smoothing the individual points and the general smoothing and using the recommended post-release mortality rate of 26.81%.

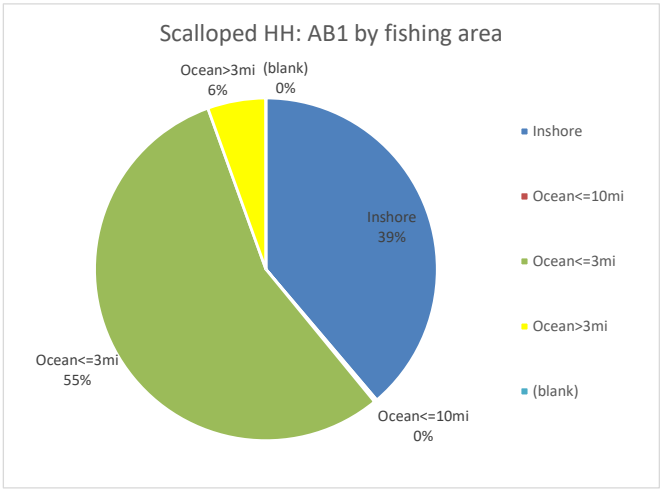
- Most AB1 catches by state corresponded to Florida-east coast (58%), Georgia (22%), South Carolina (17%), and North Carolina (3%) (**Figure 38, top**). By fishing mode, most AB1 catches were from shore (57%) and from private boats (39%), with charter boats contributing the remaining 4% (**Figure 38, 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 38, bottom**).

Data Process Final Report (Figs 37, 38)
Recreational Catches – By Species and Stock









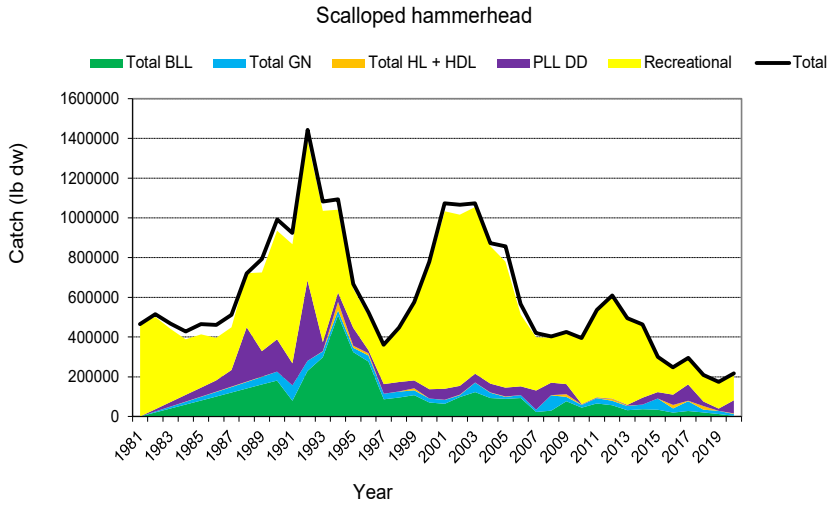
Data Process Final Report
Combined Commercial and Recreational Catches

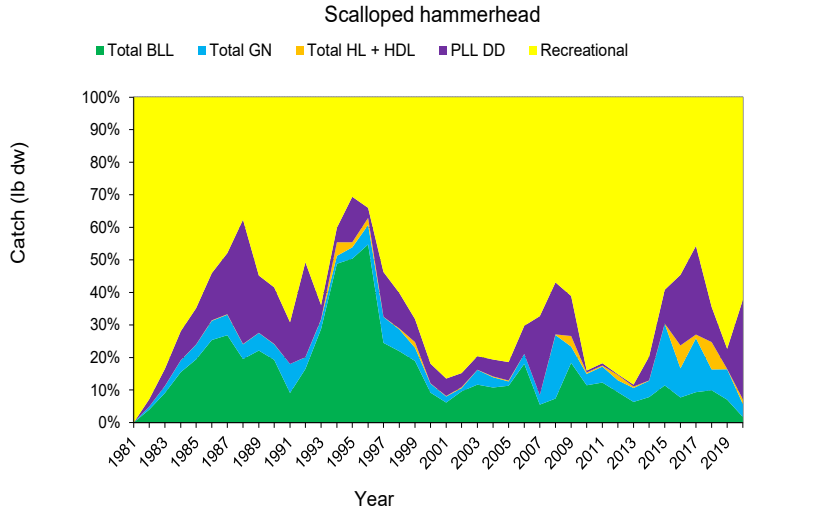
- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *All regions*
- Total catches of scalloped hammerheads in weight peaked during the early 1990s and again in the early 2000s and showed a decreasing trend thereafter. Recreational catches were generally the most important, except for years with higher commercial catches in the late 1980s and mid-1990s (**Figure 48**).

- **Tables 36** and **37** show commercial catches by gear, dead discard estimates from the pelagic longline (PLL) fishery, recreational catches (AB1, LPRM=Live post-release mortality=B2 dead), and total catch. Total catch was computed as the sum of recreational catches (AB1+LPRM) and the maximum of the sum of commercial catches by gear (bottom longline+gillnets+hand lines/hook and line+PLL discards) and the total combined commercial catches not disaggregated by gear, in weight (lb dw) and numbers, respectively.

Data Process Final Report (Fig. 48)
Combined Catches – By Species and Stock

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *All regions*





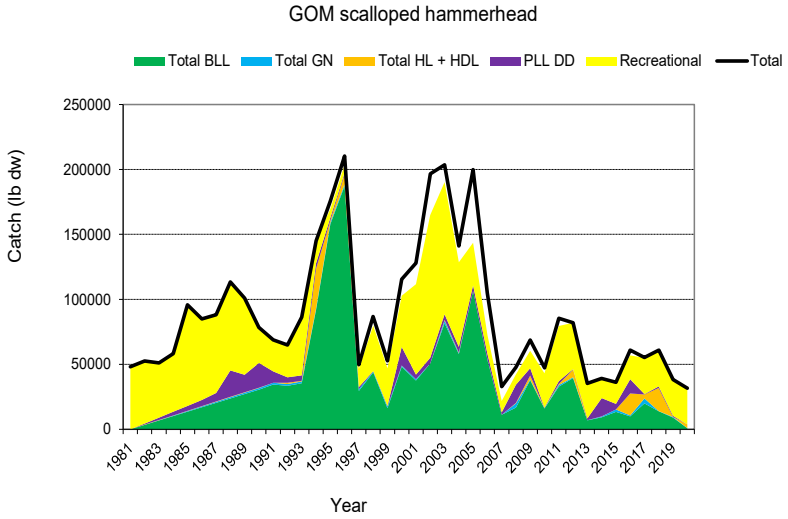
Data Process Final Report
Combined Commercial and Recreational Catches

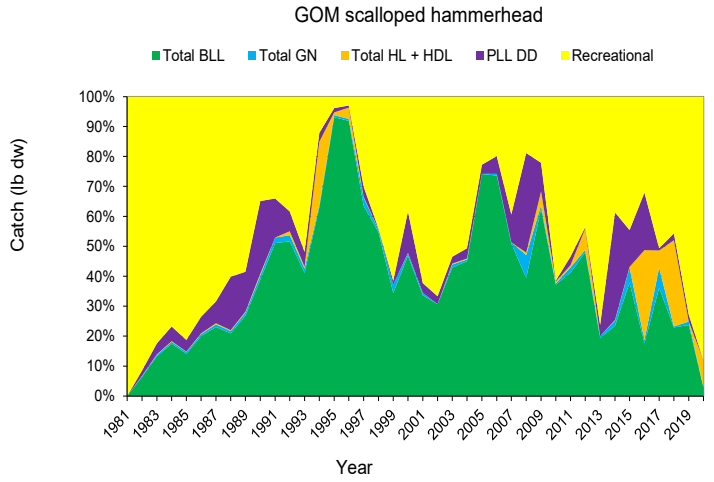
- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *GOM*
- Total catches of GOM scalloped hammerheads in weight peaked during the mid-1990s and again in the mid-2000s and showed a decreasing trend thereafter. Recreational catches were generally the most important, except for years with higher commercial catches in the mid-1990s, late 2000s, and mid-2010s (**Figure 49**).

- **Tables 38** and **39** show commercial catches by gear, dead discard estimates from the pelagic longline (PLL) fishery, recreational catches (A+B1, LPRM=Live post-release mortality), and total catch. Total catch was computed as the sum of recreational catches (AB1+LPRM) and the maximum of the sum of commercial catches by gear (bottom longline+gillnets+hand lines/hook and line+PLL discards) and the total combined commercial catches not disaggregated by gear, in weight (lb dw) and numbers, respectively.

Data Process Final Report (Fig. 49)
Combined Catches – By Species and Stock

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Gulf of Mexico region*





Data Process Final Report
Combined Commercial and Recreational Catches

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *ATL*
- Total catches of ATL scalloped hammerheads in weight generally mirrored those for the scalloped hammerheads for regions combined because catches in the Atlantic accounted for the majority of scalloped hammerhead catches (**Figure 50**).

- **Tables 40** and **41** show commercial catches by gear, dead discard estimates from the pelagic longline (PLL) fishery, recreational catches (AB1, LPRM=Live post-release mortality), and total catch. Total catch was computed as the sum of recreational catches (AB1+LPRM) and the maximum of the sum of commercial catches by gear (bottom longline+gillnets+hand lines/hook and line+PLL discards) and the total combined commercial catches not disaggregated by gear, in weight (lb dw) and numbers, respectively.

Data Process Final Report (Fig. 50)
Combined Catches – By Species and Stock

- Scalloped Hammerhead Assessment – Data Process
- Gulf of Mexico and Western North Atlantic Ocean
- *Atlantic region*