# Hammerhead Sharks Guild

**Bonnethead** *Sphyrna tiburo*
**Carolina Hammerhead** *Sphyrna gilberti*
**Scalloped Hammerhead** *Sphyrna lewini*

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DESCRIPTION

## Taxonomy and Basic Description

The bonnethead, scalloped, and Carolina hammerhead sharks are members of the family Sphyrnidae and reside in the genus *Sphyrna* (9 species). They have a distinct head, known as a cephalofoil, which is laterally expanded and dorso-ventrally flattened.


Bonnethead Shark

The bonnethead is a relatively small shark reaching a maximum reported total length (TL) of 150 cm (59 in.) (Compango 1984). Its head is semicircular in outline. Among sharks in general, they are considered rapidly maturing with females reaching maturity around 6 years of age (106 cm or 42 in. TL) and males reaching maturity around 4 years of age (80 cm or 31 in. TL) (Frazier 2013). Bonnetheads are placentally viviparous and have a 5 month gestation period with parturition occurring in September. The short gestation period and month of parturition are both unique amongsharks inhabiting coastal waters of the US. Mature bonnetheads reproduce annually with an average litter size of 8-9 pups (Frazier 2013). The maximum observed age for bonnetheads is 18 years old (Frazier 2013)


Scalloped/Carolina Hammerhead Shark

The scalloped hammerhead is a large hammerhead reaching a maximum reported size of 430 cm (169 in.) TL, although total lengths of 360 cm (142 in.) are more common. The head has a median notch at its center and a slight arch that is more prominent in young of the year and juveniles. They are relatively slow to mature with males maturing at around 10 years of age (180 cm or 71 in. TL) and females

maturing around 15 years old (250 cm or 98 in. TL) (Branstetter 1987). Scalloped hammerheads are placentally viviparous with a 9 to 12 month gestation period and parturition occurring in late spring. Reported litter sizes range from 12-41 pups with an annual reproductive cycle. The maximum reported age for scalloped hammerheads is 30.5 years old (Piercy et al. 2007).

The Carolina hammerhead has only recently been described (Quattro et al. 2013). It is morphologically similar to the scalloped hammerhead, with x-ray counts of pre-caudal vertebrae being the only conclusive characteristic. Carolina hammerheads have less than 92 pre-caudal vertebrae (range of 83-91) while scalloped hammerheads have greater than 91 pre-caudal vertebrae (range of 92-99). Although some external morphological features differ on average between the two species, their ranges overlap, so there is currently no definitive field method of distinguishing one species from the other. Instead, either genetic analysis or x-ray pre-caudal vertebrae counts are required. The Carolina hammerhead was described based on neonate and juvenile stages, and no data are available regarding life history and ecology. Life history characteristics are thought to be similar to the scalloped hammerhead, but it is likely that existing knowledge of scalloped hammerhead life history included mixed information from both species.

**Status**

The status of the bonnethead in the US Atlantic Ocean is currently considered not overfished with no overfishing occurring. However, the Gulf of Mexico (GOM) and US Atlantic (Atlantic) populations are likely separate stocks (SEDAR 34), although they have been assessed as a single population, which may confound the assessment results. The International Union for Conservation of Nature (IUCN) Red List currently considers the bonnethead as a “Least Concern” species, although this assessment is based on GOM life history characteristics that suggest bonnethead are rapidly maturing and highly fecund. Recent work for the Atlantic suggests that bonnethead in this region are slower growing, slower to mature, produce fewer pups and reach a greater maximum age (Frazier 2013). These life history differences could cause large differences in fecundity between regions. As such, populations in the Atlantic should be monitored closely until region-specific assessments can be conducted. Data from the South Carolina Department of Natural Resources (SCDNR) gillnet survey suggest a general increase in bonnethead abundance since the survey began (Figure 1).

Since there are no data available for proportions of scalloped hammerhead and Carolina hammerhead catch in fishery dependent and fishery independent data, their status is currently indistinguishable. The current combined status is considered to be overfished with overfishing occurring in the US Atlantic Ocean (Hayes et al. 2009). A recent petition to list the scalloped hammerhead as an endangered species was found to not have merit in the Northwestern Atlantic Ocean and Gulf of Mexico. However, the National Marine Fisheries Service did find populations

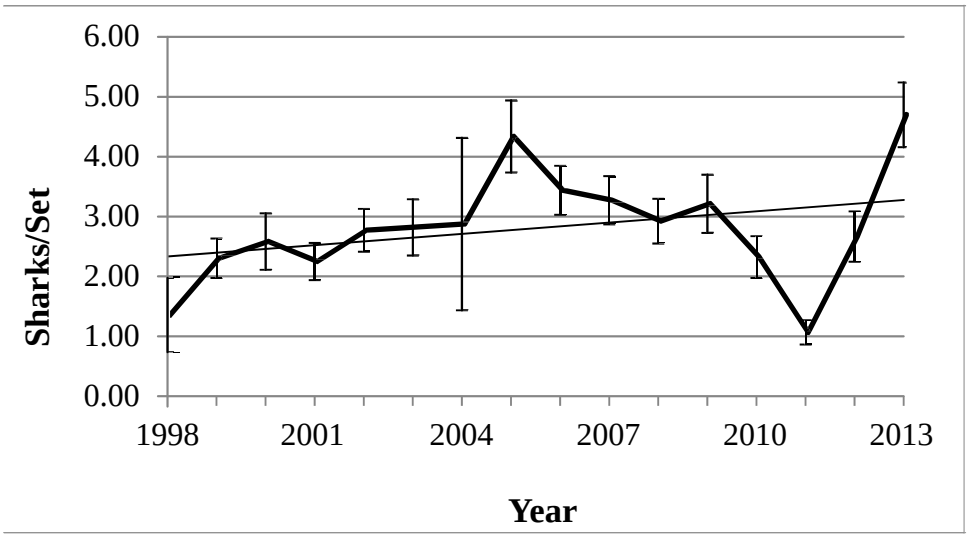


**Figure 1.** Catch per unit effort of bonnetheads (sharks per set) from 1998 to 2013 in the South Carolina Cooperative Atlantic States Shark Pupping and Nursery Habitat gillnet survey. Standard error is denoted by error bars.

in the eastern Atlantic Ocean and eastern Pacific Ocean were at high risk of extinction (NMFS 2013). The IUCN Red List currently considers the Northwest and Western Central Atlantic subpopulations to be endangered. Data from the SCDNR shark gillnet survey suggest an increase in abundance of scalloped/Carolina hammerhead sharks in SC waters (Figure 2), although only young of the year sharks are encountered in this survey.

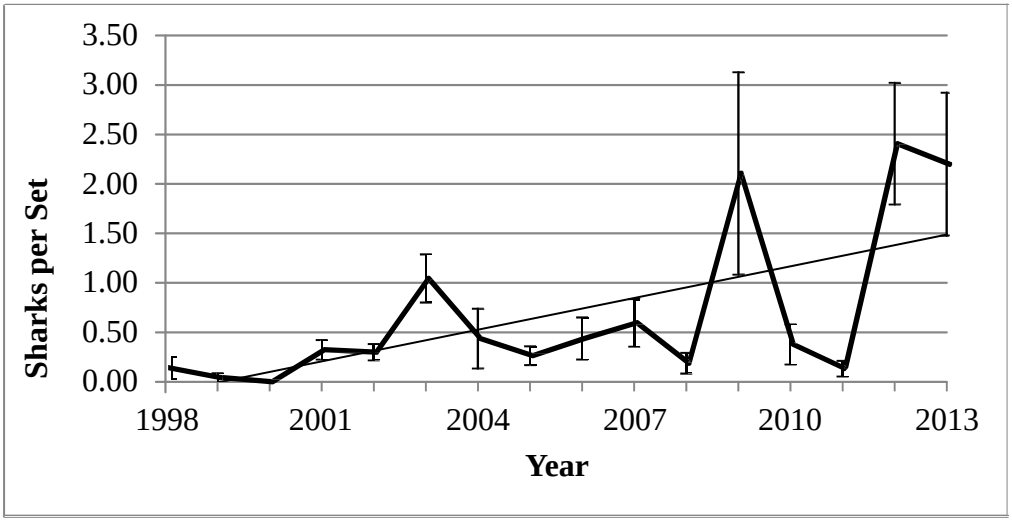


**Figure 2.** Catch per unit effort of scalloped/Carolina hammerheads (sharks per set) from 1998 to 2013 in the South Carolina Cooperative Atlantic States Shark Pupping and Nursery Habitat gillnet survey. Standard error is denoted by error bars.

## POPULATION SIZE AND DISTRIBUTION

Bonnetheads are distributed in coastal and estuarine waters from North Carolina south through the Gulf of Mexico, Caribbean, and to Brazil. Within South Carolina waters, bonnetheads are found in high to moderate salinity estuarine waters (17-34 ppt) in the late spring through early fall (Ulrich et al. 2007). Females and males are spatially segregated with females found primarily in estuarine waters, and males mostly found in coastal waters. A high degree of site fidelity by female bonnetheads has been observed through tagging studies, with individuals returning to the same estuary year after year (Driggers et al. 2013). This observed site fidelity could lead to localized exploitation of bonnetheads, resulting in a potential loss of genetic diversity.

Scalloped hammerheads are globally distributed in coastal warm temperate and tropical seas. Genetic evidence indicates 6 distinct population segments (Northwest Atlantic & Gulf of Mexico, Central & Southwest Atlantic, Eastern Atlantic, Indo-West Pacific, Central Pacific, and Eastern Pacific). Within South Carolina waters, adult and juvenile scalloped hammerheads are found primarily in coastal waters with estuaries, in particular Bulls Bay, serving as primary nursery areas for young of the year scalloped hammerheads.

Little to no information is available for Carolina hammerhead distribution; however, the species has been detected in waters off Brazil as well as the eastern Indian Ocean (Pinhal et al. 2012). Within SC waters, the Carolina hammerhead likely has an overlapping distribution with scalloped hammerheads, and SC estuarine waters function as important nursery areas for both species.

## HABITAT AND NATURAL COMMUNITY REQUIREMENTS

In SC bonnetheads are commonly found on sandy and muddy bottoms in shallow estuarine and coastal waters, often aggregating in areas associated with oyster reefs or along sandy beach fronts. These areas are important foraging areas since the primary component of bonnetheads diet is blue crabs.

Adult and juvenile scalloped hammerheads prefer coastal and oceanic waters. However, they may make limited movements into the mouths of sounds and estuaries. Young of the year scalloped hammerheads are found in high salinity estuaries in areas with depths ranging from 1 to 10 m (3-33 ft.). They are often found over muddy bottoms in areas with high concentrations of prey items. Limited data suggest that young of the year scalloped hammerheads forage on invertebrates (e.g. shrimp) and teleosts (e.g. menhaden and mullet).

No data are available regarding habitat requirements of Carolina hammerheads. It is thought their habitat requirements are likely similar to scalloped hammerheads.

## CHALLENGES

The bonnethead is regularly captured as by-catch in commercial shrimp trawls, likely leading to a large source of mortality. Additionally, bonnethead are increasingly being targeted by recreational anglers and fishing guides as a sport fish. While the majority of these interactions are catch and release, some are harvested for consumption. The effects of increases in fishing pressure are unknown as limited data exist for catch and release mortality of bonnetheads. The capture of bonnetheads in August and September could have negative consequences for pregnant females with near full-term pups, as the stress of capture could lead to premature birth.

The scalloped hammerhead is facing severe population declines worldwide, and is considered at risk for extinction in multiple distinct population segments. Multiple fishery independent surveys have reported large declines in abundance of scalloped hammerheads within the western North Atlantic and Gulf of Mexico segment, with some publications documenting declines of up to 90% (Baum et al. 2003), although these drastic results have been disputed (Burgess et al. 2005). Complicating matters is that an unknown portion of these declines are likely Carolina hammerheads. Scalloped hammerheads experience significant mortality in commercial fisheries, primarily bottom and pelagic longlines. Recently, the National Marine Fisheries Service reduced commercial quotas as well as increased recreational size limits; however, scalloped hammerheads may continue to have high mortality within these fisheries as they have a high hooking mortality. There are no estimates of natural or catch and release mortality of young of the year scalloped hammerheads in the estuaries. Their natural mortality is thought to be relatively high, given the large brood sizes of female scalloped hammerheads.

## CONSERVATION ACCOMPLISHMENTS

No conservation accomplishments specific to this species are reported.

## CONSERVATION RECOMMENDATIONS

- Continue to monitor stock statuses of hammerhead sharks within SC waters through fishery-independent methods, primarily COASTSPAN, the Adult Red Drum and Coastal Sharks longline survey, and Trammel Survey (bonnetheads).
- Determine composition of scalloped and Carolina hammerheads utilizing SC estuaries as a primary nursery.
- Determine effective population sizes of scalloped and Carolina hammerheads.
- Examine diet of scalloped and Carolina hammerheads to determine if resource partitioning is occurring or if species are competing over resources.
- Investigate post release mortality of bonnethead sharks captured in the recreational fishery.
- Investigate genetic variation of bonnethead sharks to determine if observed site fidelity has led to genetic structure.
- Determine fine-scale movements of bonnetheads within South Carolina estuaries to investigate movement within individual estuaries.

- Investigate ecological processes that could have led to speciation in the scalloped and
- Carolina hammerheads.
- Improve the public's understanding of the importance of sharks in the ecosystem through outreach activities such as school programs, providing story opportunities for media, and educational brochures.
- The primary action at the State level to insure that overfishing is eliminated is law enforcement partnering to insure adequate compliance with regulatory actions
- implemented through the Federal management plan and subsequent amendments.

## MEASURES OF SUCCESS

One of the most important measures moving forward will be determining the stock status of the population of bonnetheads residing in the US Atlantic. Within SC waters, tagging studies have documented that bonnetheads have a high degree of site fidelity. It will be important to document fine-scale movement within these systems as well as examine genetics to determine if populations are at risk for localized exploitation and loss of genetic variation. Success criteria would be an increase in our knowledge of utilization of habitat within South Carolina estuaries as well as knowledge of the genetic structure of this species.

Regional management efforts to maintain healthy, sustainable populations of hammerheads will require active participation from South Carolina due to its importance as primary and secondary nursery habitat for hammerhead sharks. Expanding our knowledge of the importance of SC waters for hammerhead sharks is of the utmost importance. Currently, the only documented nursery area for Carolina hammerhead sharks resides in SC (Bulls Bay). Moving forward, it will be important to document the relative importance of SC waters for the scalloped and Carolina hammerheads as well as the ecological processes that define these two species. A measure of success would be to increase our understanding of the relationship between these two species, and to determine the relative importance of SC waters to these species. An integral component of measuring success will be the continued monitoring of SC sharks through fishery-independent surveys. The ultimate measure of success will be a stock status determination of not overfished with no overfishing occurring for all hammerhead sharks. Until then, particular attention should be paid to hammerhead sharks within SC waters.

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