Sphyrna lewini (Scalloped Hammerhead Shark)

Family: Sphyrnidae (Hammerhead Sharks)
Order: Carcharhiniformes (Ground Sharks)
Class: Chondrichthyes (Cartilaginous Fish)

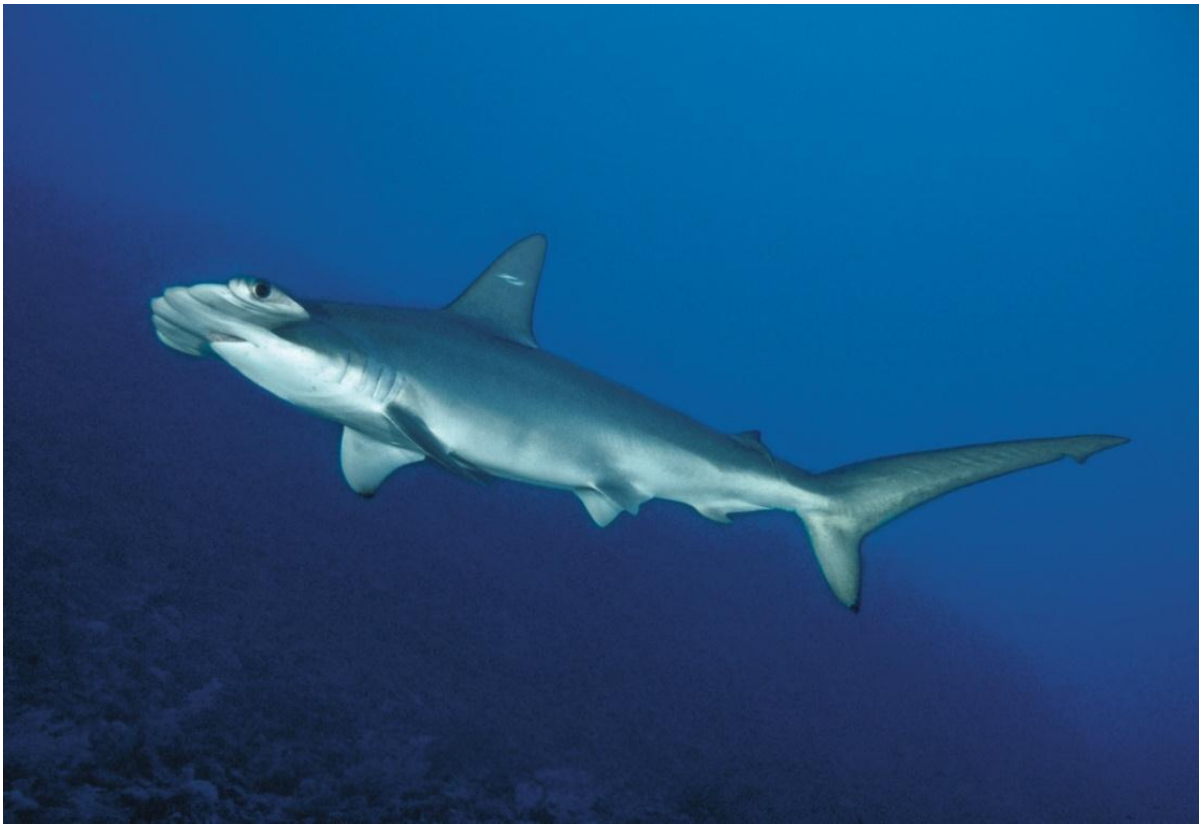

Fig. 1. Scalloped hammerhead shark, *Sphyrna lewini.*

[http://www.newswise.com/images/uploads/2012/03/26/Slewini_Copyright_SOSF_PeterVerhoog_receivedMarch20_2012.jpg, downloaded 27 March 2015]

TRAITS. *Sphyrna* (latin for hammer) describes the flattened head of the species which extends laterally; eyes and nostrils occurring on outermost ends (Wikipedia, 2015) and back of head tapering into streamlined body (Fig. 1). Species distinguished by deep indentation/notch directly in centre of head, with two or three more indentations or scallops on either side of the central indentation (Fig. 2). Mouth is broadly arched (Fig. 2) in comparison to other hammerheads (Bester, 2015). Teeth are small and triangular with slightly serrated cusps fixed on large bases. Teeth on lower jaw are more erect and slender in comparison to upper teeth (Bester, 2015). First dorsal fin (on the back) is large and slightly curved in comparison to the second dorsal fin (significantly smaller) and the pelvic fins are relatively straight in comparison to the deeply notched anal fin (Miller et al., 2013). Skin colour ranges from brownish-grey to bronze or olive-colour, darkest on back and gradually fades into pale yellow/white underside. Juveniles possess a dark colouration on pectoral, lower caudal (tail fin) and second dorsal fin tips whereas adults possess dusky pectoral fins (Bester, 2015). Skin covered in placoid scales (dermal denticles), which are thin and tooth-like, with several grooves through which water is channelled, reducing drag. This species is small in comparison to great and smooth hammerheads (Wikipedia, 2015). Total length (TL) (Fig. 3) displays slight variations according to geographic location of observed sharks.

Maximum recorded sizes for males range from 219-340cm TL; maturity size ranging from 140-198cm TL. Females are larger than males with maximum recorded sizes ranging from 296-346cm TL; maturity size ranging from 210-250cm TL. Newborns range from 31-57cm TL (IUCN, 2015). Originally named *Zygaena lewini* (Bester, 2015).

DISTRIBUTION. Species is circumglobal (distributed around the world within a range of latitudes) favouring coastal, warm and tropical seas (IUCN, 2015) (Fig. 4). Recorded in the western Atlantic Ocean, where it ranges from the northeast coast of the United States to Brazil; eastern Atlantic where it ranges from the Mediterranean to Namibia; Indian Ocean where it ranges from South Africa to Pakistan; western Pacific, where it ranges from Japan to New Caledonia; and in the eastern Pacific Ocean, where it ranges from southern California to Ecuador (Miller et al., 2013). Species listed as native to Trinidad and Tobago (IUCN, 2015).

HABITAT AND ACTIVITY. Central refuging recorded for species (dispersal of groups from a fixed point to another location, after which they return to the original fixed point); refuge area typically inshore with some offshore excursions into pelagic environments mostly at dusk. Central location inshore preferred due to reduced currents; minimising energy costs and vantage location for foraging excursions into open waters (Ketchum et al., 2014). Wolf Island study indicated daily activity was generally confined to hot spots inshore (south east of the island) despite the amount of space available around the rest of the island. Activity space was independent of seasonal change but depended on individual variability in behaviour and possible diet specializations. The up-current habitat near Wolf Island was favoured while refuging at day and night as it receives a steady flux of plankton and by extension planktivorous pelagic and reef fishes creating an abundant food source for apex predators as opposed to the down-current habitat (avoided throughout the year) being sheltered from the wind with slow current; flux of plankton therefore considerably slower. Conversely offshore habitats are characterized by increased current velocities; non-ideal for refuging (Ketchum et al., 2014).

Depth preference changes due to seasonal temperatures in water column around Wolf Island. Species spend more time at shallower depths (<20m) during warm season (December-June) as opposed to the cold season (July-November) diving to deeper depths (>30m). Depths near upper layers of the thermocline preferred; plankton and planktonivirous fish abundant at these depths. It has also been suggested that this tropical species needs to remain in warmer inshore waters to regulate body temperature. Temperature changes also function as a navigation mechanism for hammerheads returning to refuges (Ketchum et al., 2014). Schools of neonates/juveniles are constrained to coastal pupping areas for approximately two years (refuge from predation) after which they join adult habitats. Aggressive adult aggregations have been recorded in the Gulf of California; females outweighing males and competing for centre positions; observed offshore and near islands (Miller et al., 2013).

FOOD AND FEEDING. Study in Hawaii revealed that neonates/juveniles feed opportunistically on available prey. Diet included a mixture of crustacean and teleost (bony fish) prey. Gobies were noted as the most important teleost group, and another important component belonged to Alpheidae. The neonates (with unhealed umbilical scars) observed had empty stomachs, which may indicate that they do not feed or are unsuccessful in capturing prey. It was noted that while juveniles foraged all day, peak hours occurred at night. No difference was found in feeding habits between male and female juveniles. However, it was observed that the amount of food varied with years and seasons; linked to significant variations in number of pups annually. Variation in number of pups along with variation in prey populations means foraging is more successful in some years than others,

leading to an increased survival rate during those years (Bush, 2003). Conversely, adults tend to forage on mesopelagic fish and squids; stingrays are favoured in some areas (IUCN, 2015).

REPRODUCTION. Age of maturity differs by region. No link between parturition (birth) and region; parturition appears to be seasonal, with abundance peaking between May and July (Miller et al., 2013). Females bear a single functional ovary (right); ovum (egg) development takes approximately 10 months with ova reaching a maximum diameter of 4-5 cm. The number of oocytes in the ovarium can be as many as 40-50 per female. This species is viviparous with a yolk-sac placenta and a gestation period of 9-12 months. Females move inshore to give birth and can birth in the range of 12-38 live pups (IUCN, 2015).

BEHAVIOUR. Adults and neonates/juveniles display different behavioural patterns. Adults have been observed independently, in a pair or in small aggregations (majority females) (Bester, 2015). Signs of aggression noted amongst these female aggregations include headshaking, corkscrew swimming and bumping into each other (Bester, 2015). Neonates/juveniles are typically observed in larger aggregations (inshore) when compared to adults. Sexual segregation occurs during the lifespan of this species (Bester, 2015). Females observed in offshore waters at younger ages and smaller sizes when compared to males (IUCN, 2015). Adult females remain loyal to nursery areas annually, however DNA evidence indicates that males engage in oceanic migrations (Miller et al., 2013). This species habitually visits cleaning stations at inshore refuge sites to be cleaned by reef fishes (parasites are removed from the body as well as mouths) after foraging in offshore waters (Ketchum et al., 2014).

APPLIED ECOLOGY. This species is targeted and susceptible to by-catch both inshore and offshore (artisanal and industrial fishing) internationally (Miller et al., 2013). Global population declines estimated as 50-90% reduction within 32 years – due to over-fishing and finning. Intense fishing pressures together with the slow growth rate of this species (generation time greater than 15 years) has resulted in this species being endangered globally (IUCN, 2015).

REFERENCES

Bester, C. (2015). Ichthyology at the Florida Museum of Natural History. Scalloped Hammerhead. http://www.flmnh.ufl.edu/fish/Gallery/Descript/Schammer/ScallopedHammerhead.html, accessed 19 March 2015.

Bush, A. (2003). Diet and Diel Feeding Periodicity of Juvenile Scalloped Hammerhead Sharks, *Sphyrna lewini*, in Ka¯ne'ohe Bay, O¯ 'ahu, Hawai'i. *Environmental Biology of Fishes* **67**: 1–11, 2003. Accessed 24 March 2015.

IUCN (2015). Red List of Threatened Species. Sphyrna lewini. http://www.iucnredlist.org/details/39385/0, accessed 19 March 2015.

Ketchum, J.T., Hearn, A., Klimely, P,A., Espinoza, E., Peñaherrera, C., Largier, J.L. (2014). Seasonal changes in movements and habitat preferences of the scalloped hammerhead shark (*Sphyrna lewini)* while refuging near an oceanic island. Mar Biol (2014) **161:**755–767. Accessed 27 March 2015.

Miller, M. H., Dr. Carlson, J., Cooper, P., Dr. Kobayashi, D., Nammack, M. And Wilson, J. (March 2013) National Marine Fisheries Service; National Oceanic and Atmospheric Administration. Status Review Report: Scalloped Hammerhead Shark (*Sphyrna lewini)*, accessed 19 March 2015.

Wikipedia, (2015). Scalloped hammerhead. http://en.wikipedia.org/wiki/Scalloped_hammerhead, accessed 19 March 2015.

Author: Charissa Harewood

Posted online: 2015

Fig. 2. Distinct indentations ("scallops") on head and broadly arched mouth.

[http://pixshark.com/sphyrnidae.htm, downloaded 20 March 2015]

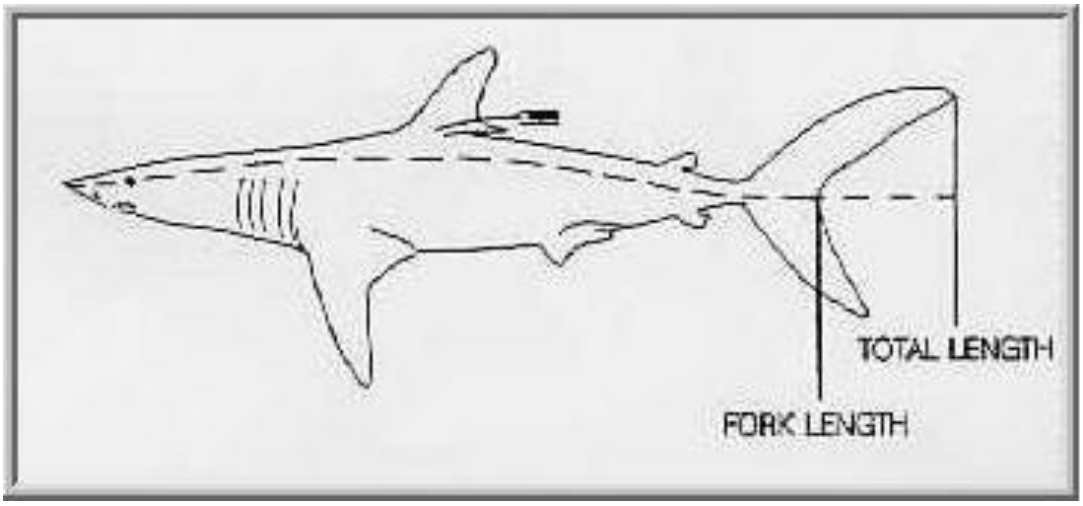

Fig. 3. Measurements used in recording shark size.

[http://nefsc.noaa.gov/nefsc/Narragansett/sharks/lw/fork.html, downloaded 20 March 2015]

Fig. 4. *Sphyrna lewini* geographic distribution.

[http://maps.iucnredlist.org/map.html?id=39385, downloaded 20 March 2015]