

Negaprion brevirostris (Lemon Shark)

Family: Carcharhinidae (Requiem Sharks)

Order: Carcharhiniformes (Ground Sharks)

Class: Chondrichthyes (Cartilaginous Fish)

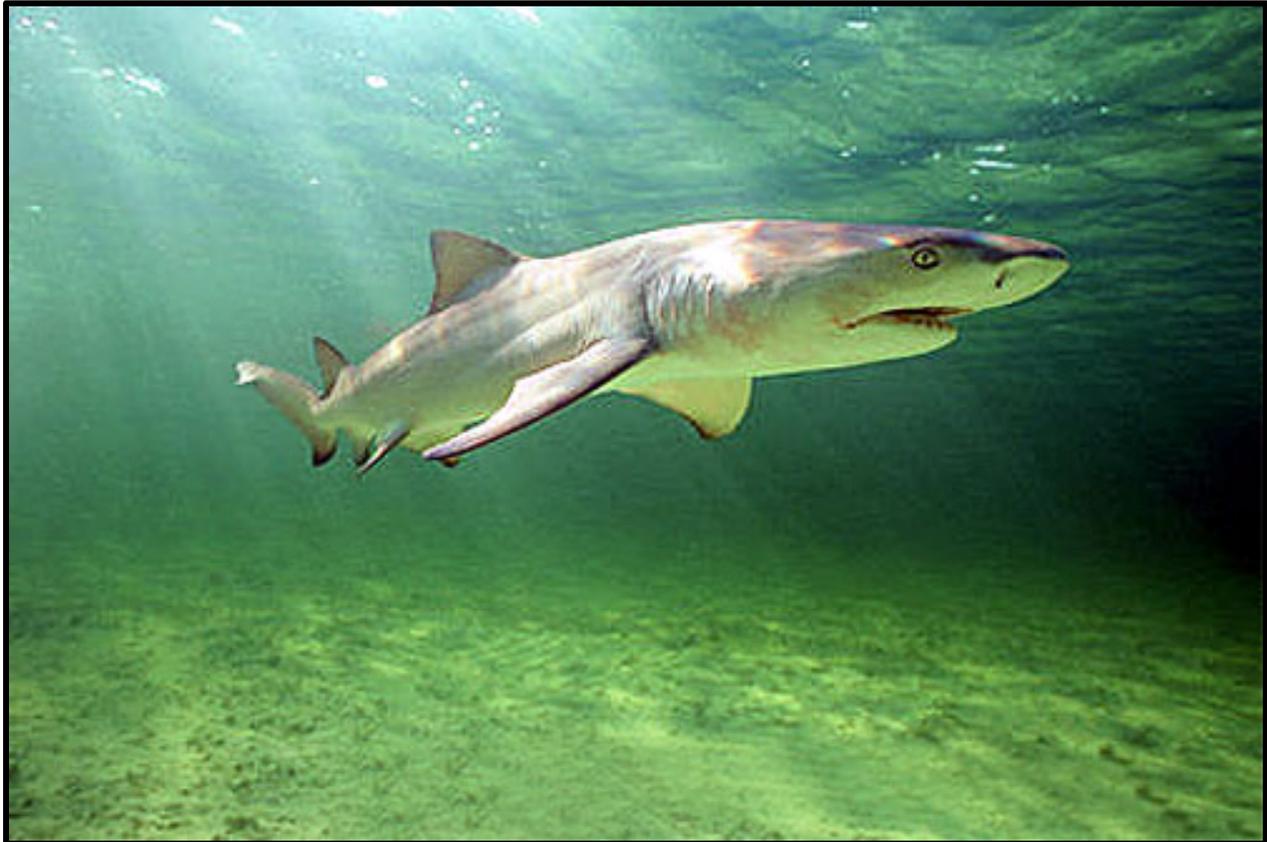


Fig. 1. Lemon shark, *Negaprion brevirostris*.

[<http://www.flmnh.ufl.edu/fish/education/sharkkey/lemonshark.html>, downloaded 12 November 2012]

TRAITS. *Negaprion brevirostris* is known as the lemon shark or less popularly as the requiem shark. It gets its name from its yellow/brown or olive grey coloured body. It also has a light yellow coloration on its underside. The lemon shark has a large, stocky body, a rounded nose and two dorsal fins. The back margins of the pelvic fin are faintly curved in and the margin on the outside of the pectoral fin is somewhat turned in. Both fins are indistinctly hemispherical. According to Morgan (2012), lemon sharks are one of the world's biggest sharks and can reach a maximum length of 318-343 cm. The growth rate of these sharks is 0.54 cm/year and pups are 60-65 cm at birth (Morgan, 2012).

ECOLOGY. The lemon shark inhabits shallow water around coral reefs and mangroves, on sand or mud bottoms, saline creeks, enclosed lagoons and estuaries. Lemon sharks can enter freshwater but do not go far up rivers. They sometimes venture into open oceans, to depths of up to 90 m (IUCN, 2009).

SOCIAL ORGANIZATION. According to Guttridge et al. (2009), lemon sharks have been studied in small groups and exhibit social behaviours for instance “follow” and “circle”. Some functions for the loose aggregation of these sharks include communication, courtship, predatory behaviour, and protection for the group (Guttridge et al., 2009). It was found that the sharks prefer to be in groups rather than by itself and they aggregate with their conspecifics (members of the same species). Juveniles tend to cluster with individuals of approximately similar size and adults exhibit the same behaviour. Juveniles cluster together as a way to lessen the risk of predation or to forage more efficiently. Young sharks inhabit around mangrove peripheries and sand flats performing mobile social behaviours indicative of schooling fish (Guttridge et al., 2009).

ACTIVITY. These sharks occupy a relatively restricted activity space, hence showing a home ranging pattern. The space requirement of a lemon shark and its resultant home range increases as it ages. Juveniles occupy the nursery zone, characterized by shallow water and sub-adults as well as mature sharks inhabit deeper water. As lemon sharks age, they select habitats of larger area until maturity is reached. Thereafter, they spend much time on the reef and possibly undergo long migrations. Adults are often found in deep waters of reefs and probably undergo long migrations, while juveniles are strongly site attached to flats and shallow passes in close proximity to mangrove islands (Gruber et. al, 1988).

FEEDING. It was observed that lemon sharks direct schools of fish alongside the shoreline in order to eat them. This is known as cooperative foraging (Motta & Wilga, 2001). Feeding is asynchronous, intermittent and the sharks exhibit no pattern of periodicity. The ration of the lemon shark is approximated at 1.5-2.1% of their body weight/day, which is intermediate in comparison to estimates for other species of sharks and low when compared to teleosts (bony fish) (Wetherbee et al., 1990). Lemon sharks feed opportunistically. This nature of feeding is suggested by alterations in diet with size, time of year and territory. These sharks inhabit shallow bays and lagoons during the first few years of life and appear to stray little from these habitats. As they grow, they move off the flats into deeper water, increasing home range, variety of habitats and prey encountered. The diversity of the diet also increases as elasmobranchs, adult jacks and lobster become increasingly important (Wetherbee et al., 1990). Actual increase in feeding activity by the lemon shark may be masked by crepuscular feeding habits, or by opportunistic feeding throughout the day or night. The feeding schedule appears to be characterized by small attacks, followed by longer periods of digestion, with little or no feeding in the interim (Wetherbee et al., 1990).

The majority of the lemon shark’s stomach contents was composed of teleosts. This indicates that teleosts make up the majority of the shark’s diet. In a study conducted by Wetherbee et al., 1990, non- teleosts (marine mammals and elasmobranchs), formed about 10% of the diet of young lemon sharks but appear to be more important in other species. In another study, marine mammal flesh was not found in the stomach of lemon sharks, but was present in the stomachs of other sharks. It was also found that elasmobranchs composed approximately 7%

of the diet of larger lemon sharks. Plant material was found in the stomachs but this may be due to the shark's benthic feeding habits, ingested by accident (Wetherbee et al., 1990). Under normal conditions, this shark is cannibalistic since small lemon sharks were found in the stomachs of larger ones at several locations off the Bahamas and Florida Keys. Pregnant sharks are thought to cease feeding when they are in nursery areas, as a protection measure for the young. However, this theory is doubted since a full term pregnant lemon was caught and its stomach contained a small sharpnose shark (Wetherbee et al., 1990). A meal is completely evacuated from the stomachs 25-41 hours after eating. Slow rates of digestion and consumption may limit growth in lemon sharks as well as other elasmobranchs (Wetherbee et al., 1990).

SEXUAL BEHAVIOUR. Lemon sharks reproduce in spring and summer and give birth in shallow nursery areas the next year, after a 10-12 month gestation period. Development in lemon sharks is viviparous, that is, females give birth to live free swimming pups (Morgan, 2012). Females produce 4-17 pups of 50-60 cm total length. Maturity is achieved at 225 cm (males) and 235 cm (females) (IUCN, 2009).

JUVENILE BEHAVIOUR. Temperature, bottom type, water depth and salinity affect their choice of habitat. This species of shark has haematological characteristics enabling it to respire and therefore survive in warm water. The juveniles use complex habitats as a means of avoiding predators, and avoid sea-grasses due to the elevated quantity of toxic epizooites located there. They also inhabit shallow water (Morrissey & Gruber, 1993), especially around mangroves where the roots offer a nursery, feeding ground and a refuge from predators (Edren & Gruber, 2005). Females return to their natal nursery to give birth. In order to do this, an animal ought to have homing systems. Juveniles revisit to their home range when displaced, suggesting elevated site loyalty and implying that they possess an instinctive capability to home (Edren & Gruber, 2005). Although the lemon shark is farsighted, juveniles have better visual acuity than adults. Juveniles do not instinctively recognize the sound of prey, but have to learn specific sounds associated with the availability of food. Thus, as their senses develop and prey abundance increases, juveniles feed on a more narrow range of prey, increasing their selectivity as they grow. However, it was found that the diet of lemon sharks become more diverse with age. So juveniles may lack the ability to catch a variety of prey or simply may not encounter that variety of prey in their nursery habitat (Wetherbee et al., 1990).

ANTIPREDATOR BEHAVIOUR. When a lemon shark feels threatened by a predator, for example a killer whale, or larger sharks, such as the hammerhead, it approaches the predator and swims in a tight circle, approximately six feet in diameter, around it. It moves frantically alongside the predator while rocking back and forth and moving its jaws up and down in a menacing manner. A more threatening behaviour is where the side fins are down, the back hunched and jaws are held wide open, revealing many rows of teeth. This behaviour is a form of communication with the predator, indicating "Keep away!" It contorts its body into a posture that makes it look larger and opens its mouth, exhibiting the weaponry it has in its biological arsenal (Klimley, 2003).

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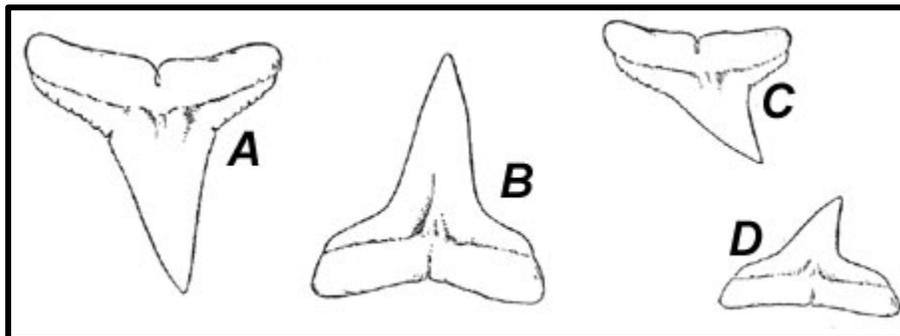


Fig. 2. Lemon shark dentition: A. 4th upper, B. 2nd lower, C. 10th upper, D. 10th lower tooth.

[<http://www.flmnh.ufl.edu/fish/Gallery/Descript/Lemonshark/Lemonshark.html>, downloaded 23 October 2012]



Fig. 3. The physical characteristics of the lemon shark, *Negaprion Brevirostris*.

[<http://www.flmnh.ufl.edu/fish/Gallery/Descript/Lemonshark/Lemonshark.html>, downloaded 23 October 2012]



Fig. 4. Larger sharks such as these schooling scalloped hammerheads (*Sphyrna lewini*) prey on small lemon sharks.

[<http://www.flmnh.ufl.edu/fish/Gallery/Descript/Lemonshark/Lemonshark.html>, downloaded 23 October 2012]