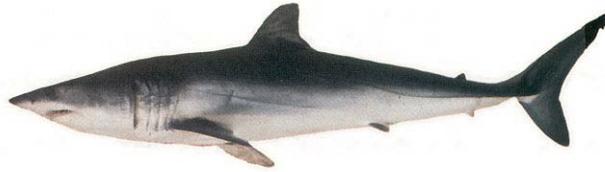


15. SHORTFIN MAKO SHARK



Shortfin Mako Shark, *Isurus oxyrinchus*

Credit: DFG

Overview of the Fishery

The “peregrine falcon” of sharks, the shortfin mako, *Isurus oxyrinchus*, may be the fastest swimming of all sharks. Sometimes referred to as “bonito shark”, it is a spectacular fighter when hooked and much sought-after by sportsmen worldwide. Immortalized by the writings of Earnest Hemingway and Zane Grey, mako shark have posed an angling challenge to dedicated big game fishermen since the early 1900s. A close relative, the longfin mako shark (*Isurus paucus*), does not occur off California.

In California, the commercial exploitation of the mako shark did not begin until the 1970s. Rapidly expanding consumer demand for shark meat as a nutritious and tasty alternative to red meat and other seafoods fueled the expansion of a shark fishery. During the late 1970s a drift gillnet fishery targeting swordfish, *Xiphias gladius*, and common thresher shark, *Alopias vulpinus*, developed off southern California. Mako shark were a bycatch of that fishery. An experimental directed fishery for mako shark using drift longline gear was authorized by the Fish and Game Commission (Commission) in 1988. This gear proved very efficient at catching mako shark. The Commission chose not to renew this controversial experimental fishery in 1992.



A shortfin mako shark taken on hook-and-line fishing gear.

Credit: CDFG

Today, mako sharks are commercially harvested by drift gillnet, hook-and-line and harpoon fishing gears. Most of the mako shark harvest is taken incidentally by the drift gillnet fishery targeting thresher sharks and swordfish. Annual landings have fluctuated from a high of 612,000 pounds (278 metric tons) in 1987 to 69,000 pounds (31 metric tons) in 2006 (Figure 15.1). A general decline in landings has occurred since the late 1990s.

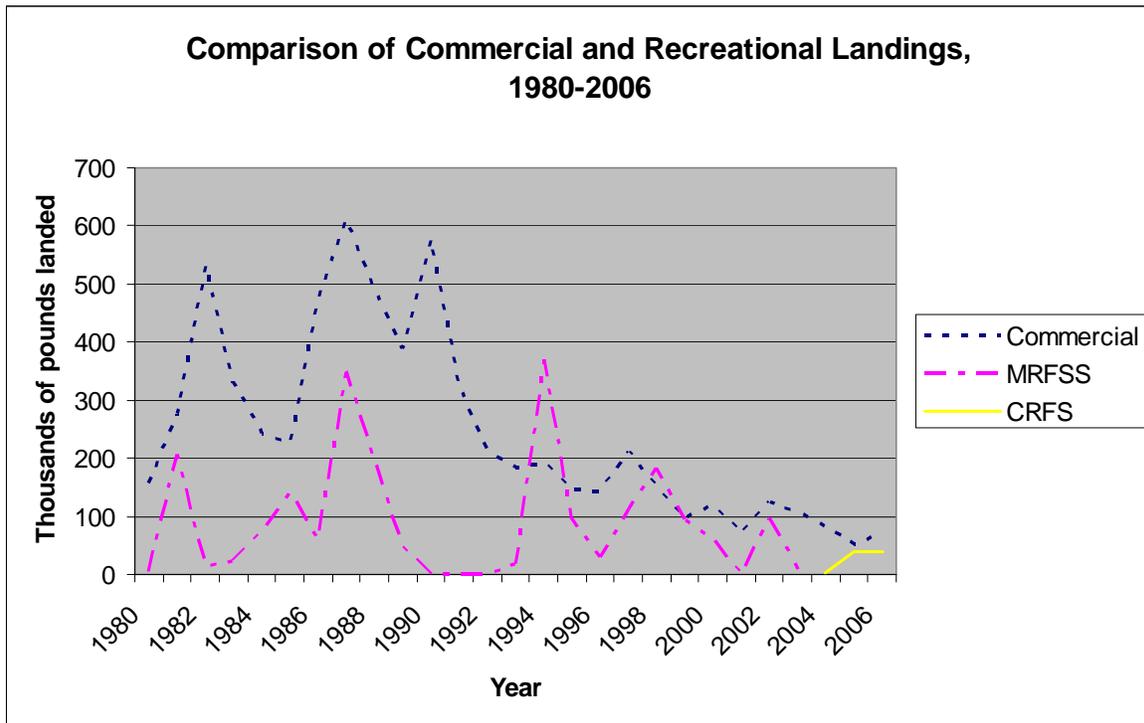


Figure 15.1. Landed weights of shortfin mako shark for commercial and recreational harvest from 1980-2006. Data source: CDFG commercial landing receipt data, recreational estimates derived from the MRFSS 1980-2003, and from the CRFS 2004-2006.

Fishing revenue from the 2006 commercial harvest of shortfin mako shark was about \$79,000 (ex-vessel 2006 dollars). The contribution to total business output, for the State, from this 2006 commercial harvest is estimated to be \$151,000. Likewise, total employment and wages from shortfin mako shark is estimated to be the equivalent of 3 jobs and \$70,000, respectively.

California recreational fishermen began targeting mako shark in the 1980s. Statistically estimated catch weights of sport caught mako shark shows a trend very close to that of commercial landings (Figure 15.1). Peak periods occurred in 1987 with 348,000 pounds (158 metric tons) landed and in 1994 with 370,000 pounds (168 metric tons) landed. Statewide sport catch estimates from the Marine Recreational Fisheries Statistics Survey (MRFSS) show annual catch numbers reached a high in 1987, with almost 22,000 mako taken (Figure 15.2). Another peak

was observed in the mid-1990s. Since then the catch numbers have fluctuated a great deal. Estimates from the California Recreational Fisheries Survey (CRFS) were 6,000 sharks taken in 2006, down from the 15,000 taken in 2005. Annual catch numbers from commercial passenger fishing vessel (CPFV) logs describe a similar, though smaller trend (Figure 15.2). Presently, CPFVs schedule shark trips at most southern California ports. Shark fishing tournaments that target mako shark are prestigious events that draw as much attention as marlin fishing tournaments. There is currently no minimum size limit for mako shark.

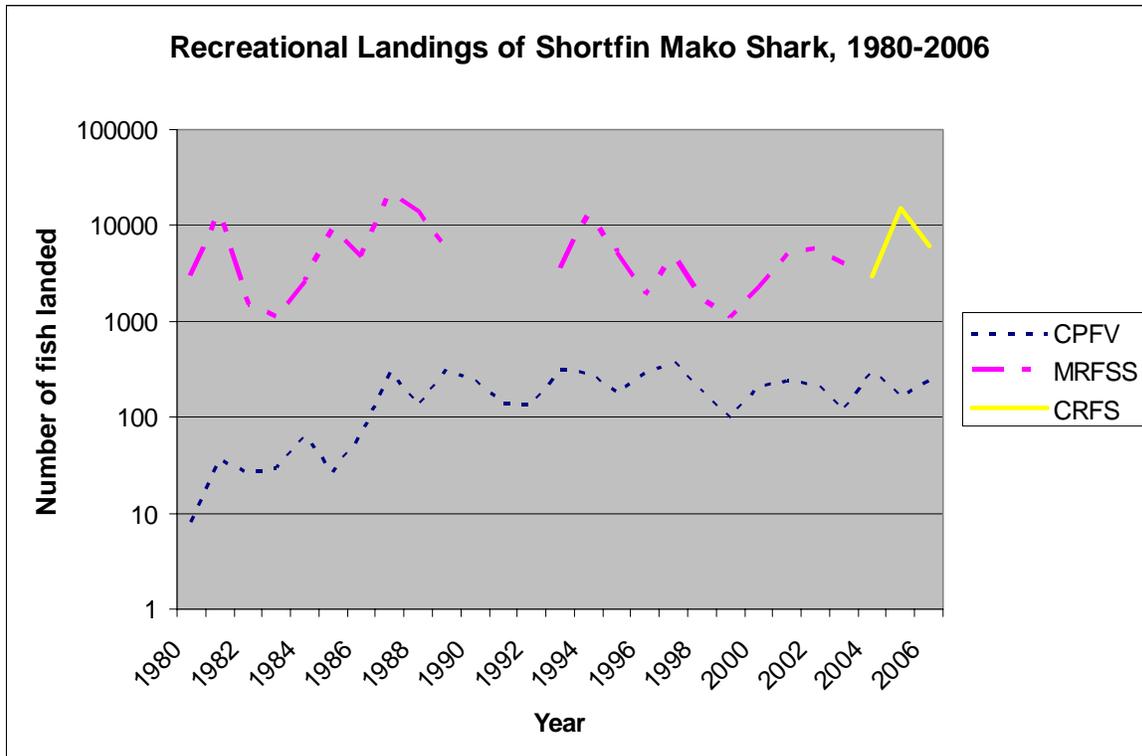


Figure 15.2. Recreational catch (numbers of fish) for shortfin mako shark from 1980-2006. CPFV log totals are a dotted line, estimates derived from the MRFSS are a dashed line, and estimates derived from the CRFS are a solid line.

Status of the Biological Knowledge

The mako shark is a member of the Lamnidae family: a small group of large, fast-swimming sharks that includes the white shark, *Carcharodon carcharias*. These sharks have common adaptations for high-speed swimming: a conical snout, very large gills for efficient gas exchange, streamlined body and lunate tail shape. Mako shark possess an advanced endothermic circulatory system that keeps their swimming muscles warmer than the surrounding water. Reliably measured at swimming speeds over 35 mph, the mako shark is probably the fastest shark.

These adaptations for speed allow the mako shark to feed on other fast moving species such as tunas, swordfish, porpoise and other sharks. Fishery research off California suggests mako shark feed primarily during the day. They are opportunistic feeders and will eat whatever is abundant in their surroundings.

Mako shark are found around the world in warm and temperate seas, in the Pacific Ocean from the Columbia River mouth to Chile. Juvenile mako shark are common from the U.S.-Mexico border northward to Washington. Research suggests a nursery area exists off southern California, particularly south of Los Angeles to the U.S. border. Juvenile fish off southern California appear to be resident for two years after birth. Afterwards, they may move offshore or further south. Juveniles tagged off southern California have been recaptured as far north as Point Arena near Fort Bragg, and as far south as Acapulco, Mexico and westward to Hawaii.

They can grow to a length of almost 13-feet (4-meters) and a weight of 1,250-pounds (567-kilograms). Males mature at about 6.5-feet (2-meters) (7 to 9 years), while females mature at about 8.5-feet (2.6-meters) (19 to 21 years). Development of young embryos is ovoviviparous, producing eggs that are hatched within the body. Developed pups are known to prey upon less-well developed siblings in the mother's uterus. Litters are large, usually 8 to 10 pups; the pups are probably born at 27- to 28-inches (69- to 71-centimeters) in length. Growth is very rapid initially, increasing by about 15-inches (38-centimeters) the first year. Males and females grow at similar rates until about age 7 years, after which the relative growth of males declines compared to females. They are estimated to live to a maximum 29 years of age.



Fish and Game biologist holding a shortfin mako shark pup during a tagging research study.
Credit: DFG

Status of the Population

The population of shortfin mako shark off California is not being over-fished. Present fishery harvest levels are well below harvest guidelines imposed by NOAA Fisheries. There is some concern that fishing pressure may negatively affect sharks that have aggregated in pupping areas off southern California and northern Mexico. However, further investigation is needed to clarify this issue.

Management Considerations

A Highly Migratory Species Fishery Management Plan (HMS FMP) developed by the Pacific Fishery Management Council was adopted by the U.S. NOAA Fisheries in March of 2004. The plan provides a management framework for 13 species of tunas and sharks, including the shortfin mako, harvested within the 200-mile U.S. Exclusive Economic Zone (EEZ) and adjacent high seas waters off the contiguous West Coast states.

Adoption of the HMS FMP provides for implementation of new management and conservation tools, consolidation of existing state and federal regulations, and international agreements for HMS. The new conservation and management tools include harvest control rules for shortfin mako shark. Since basic population

dynamic parameters for mako shark are unknown, it is being managed with a precautionary harvest guideline of 330,700 pounds (150 metric tons).

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Further Reading

Bishop, S. D. H., M. P. Francis, C. Duffy, and C. Montgomery. 2006. Age, growth, mortality, longevity and natural mortality of the shortfin mako shark (*Isurus oxyrinchus*) in New Zealand waters. *Marine and Freshwater Research* 57(2, 10 Mar. 2006):143-154.

Cailliet, G. M. and D. W. Bedford. 1983. The biology of three pelagic sharks from California waters, and their emerging fisheries: a review. *Calif. Coop. Oceanic Fish. Invest. Rep.* 24:57-69.

Castro, J.I. 1983. *The sharks of North American waters*. Texas A & M University Press., 180 pp.

Hanan, D. A., D. B. Holts, and A. L. Coan, Jr. 1993. The California drift gillnet fishery for sharks and swordfish, 1981-1982 through 1990-91. *Calif. Dept. Fish Game, Fish Bull.* 175, 95 p.

O'Brien, J. W. and J. S. Sunada. 1994. A review of the Southern California drift longline fishery for sharks, 1988-1991. *Calif. Coop. Oceanic Fish. Invest. Rep.* 35:222-229.