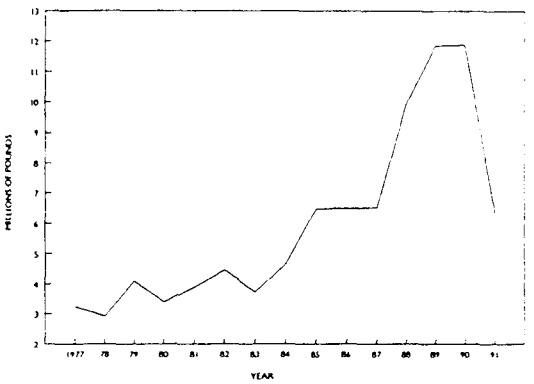


California commercial landings of thornyheads, 1977-1991.

THORNYHEADS

History of the Fishery

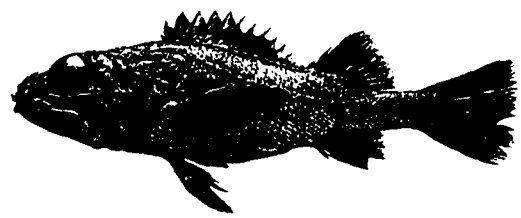
The two species of thornyheads (genus *Sebastolobus*) in California waters are most abundant at depths where Dover sole and sablefish live. Shortspine thornyhead (*S. alascanus*) are taken by the commercial fishery at depths as shallow as 600 feet, and it is likely that thornyhead landings were predominately shortspine during the early years when the fishery operated in relatively shallow water. Longspine thornyhead (*S. altivelis*) were probably not landed in large quantities until later when the fishery expanded into deeper water. Although there are consistent differences between the two species, distinguishing between them can be difficult under field conditions. Landings and other data for each species may, therefore, be less reliable than data for thornyheads as a group.

From 1953 to 1969 total thornyhead landings in California ranged from just over 3,000 pounds to 900,000 pounds. Thornyheads became common as incidental catch when California trawlers began fishing intensively for Dover sole in the early 1970's. In 1970, total thornyhead landings in California exceeded one million pounds for the first time and averaged 2.8 million pounds per year from 1970 to 1979. Thornyhead landings increased to an average of six million pounds per year from 1980 to 1989.

Thornyheads were originally marketed as a rockfish product (usually fillets) in domestic markets. Increased landings during the 1980's were the result of increased prices and demand for thornyheads, primarily as a headed and gutted product exported to Japan. Changes in species composition and markets for thornyheads occurred during the late 1980's as the fishery moved into deeper water to harvest longspine thornyheads. As export markets developed, prices paid to fishermen more than doubled from $0.17 to $0.40 per pound (all prices and revenues in 1989-equivalent dollars). Gross revenues for thornyheads landed in California rose from $576,000 in 1980 to $5,425,000 in 1990 as the result of increased prices and landings. The relative value of thornyheads in the groundfish fishery also increased during that time. Revenues from thornyheads were only 12 percent of total revenues for the deepwater fishery (thornyheads, sablefish, and Dover sole) during 1980, but increased to 39 percent by 1990.

Fishing for thornyheads is typically by bottom trawl and longline gear in relatively deep water (1,800 to 3,000 feet) on sand or fine sediment. Fishermen report that there are areas where shortspine and longspine thornyheads are found together and other areas where longspine thornyhead predominate. Most of the thornyheads landed in California are taken in the Eureka, Fort Bragg, and Morro Bay areas. Few thornyheads are taken south of Point Conception. With the 4.5-inch mesh in cod ends currently used in the commercial trawl fishery, thornyheads become vulnerable to bottom trawls at about five to seven inches in length and at an age of about eight to nine years. Thornyheads are seldom taken by gill nets or in the recreational fishery because of the depths at which they live.

Thornyheads are managed by the Pacific Fishery Management Council under the Groundfish Management Plan. Shortspine and longspine thornyheads are managed as a group because of difficulties in separating the two species during fishing and in the landings. Catch quotas for thornyheads were first used in the fishery during 1990.



Shortspined thornyhead, *Sebastolobus alascanus*.

Status of Biological Knowledge

Thornyheads belong to the same family (Scorpaenidae) as the rockfishes (*Sebastes* spp.) but are distinguished from them in having more dorsal and head spines, in losing their swim bladder at the time they settle to the bottom, and in spawning gelatinous egg masses. Shortspine thornyheads grow to larger size and are found in shallower water than longspine thornyheads. The adults of both species are major components of the assemblage of fishes of the continental slope where they co-occur over a broad depth range of 1,600 to 4,900 feet. Both

species have special enzymatic adaptations which allow metabolic activity despite the high pressure and low temperature at the depths where they live.

Shortspine thornyhead are found at depths of about 100 to over 5,000 feet along the west coast of North America from northern Baja California to the Bering Sea and across the north Pacific to the coast of Japan. It is not known if separate stocks exist. Off California, shortspine thornyhead spawn during late winter and early spring. Males off Alaska may spawn at about 6.5 inches in length (estimated age 5). About half of all females off California are sexually mature at 8.25 inches in length (estimated age 13) and almost all are sexually mature at 13.5 inches (estimated age 28). Estimates of ages are based on counts of growth rings in thin-sectioned otoliths. This approach has not yet been validated for either species of thornyhead, so all ages must be regarded as estimates. A female may release as many as 400,000 eggs annually in gelatinous egg masses that float to the surface. Larvae free themselves from the egg when about 0.25 inch in length and transform to juvenile fish at about 0.75 inch. Larvae and young juveniles are pelagic for 14 to 15 months and settle to the bottom when about one inch long during January to June of the year after they hatch. Juveniles settle in shallow water along the upper boundary of their habitat and move to deeper water as they grow. They spend the rest of their lives closely associated with the bottom.

Shortspine thornyheads can grow to 30 inches and may be quite long-lived. It is particularly difficult to determine the age of older individuals, but recent estimates indicate that the maximum age of shortspine thornyheads off California may be in excess of 100 years.

Shortspine thornyheads in Alaska are known to eat crustaceans, crabs, worms, clams, octopus, sea cucumbers, and fish. Longspine thornyheads feed primarily on polychaetes and small crustaceans.

Longspine thornyheads are found from Cape San Lucas, Baja California to the Aleutian Islands in water from about 1,000 to over 5,000 feet deep. It is not known if separate stocks exist.

Like shortspine thornyheads, longspine thornyheads spawn in the late winter and early spring. Half of the females are sexually mature at about 7.5 inches in length (estimated age 14) and most are mature at 8.75 inches (estimated age 18). A female may produce as many as 100,000 eggs annually, which, like the eggs of the shortspine thornyhead, are released in gelatinous egg masses that float to the surface. Two to four batches of eggs may be spawned each year. Larval fish are pelagic after hatching and transform into juveniles during July to December. Young juveniles are pelagic for as long as 20 months and begin settling to the ocean bottom when about two inches long. Settling starts during the summer of the year after they hatch. Juvenile longspine thornyheads settle on deeper bottoms than do shortspine thornyheads, with newly settled juveniles occupying a broad range of depths from approximately 1,600 to 4,000 feet. There does not appear to be a tendency for individuals to move deeper as they grow. Longspine thornyheads grow to a maximum length of 15 inches. Their maximum age is probably at least 45 years.

Status of Population

Recent estimates from research trawl survey data indicate that total biomass of thornyheads off California north of Point Conception is between 34,100 and 151,800 tons. Most of the total biomass (14,400 to 101,200 tons) probably consists of longspine thornyheads. The extent to which fishing has reduced abundance of thornyheads is not known since no information about historical biomass levels is available.

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References

Best, E.A. 1964. Spawning of longspine channel rockfish, *Sebastolobus altivelis* Gilbert. Calif. Fish and Game. 50:265-267.

Jacobson. L.D. 1991. Thornyheads - stock assessment for 1991. Pages C1-C67 *in* Status of the Pacific coast groundfish fishery through 1991 and acceptable biological catches for 1992, Stock assessment and fishery evaluation. Pacific Fishery Management Council, Portland, OR.

Moser, H.G. 1974. Development and distribution of larvae and juveniles of *Sebastolobus* (Pisces; Family Scorpaenidae). Fish. Bull., U.S. 72:865-884.

Pearcy, W.G. 1962. Egg masses and early developmental stages of the scorpaenid fish, *Sebastolobus*. J. Fish. Res. Board Can. 19:1169-1173.

Wakefield, W.W. 1990. Patterns in the distribution of demersal fishes on the upper continental slope off central California with studies on the role of ontogenetic vertical migration in particle flux. Ph.D. dissertation. University of California, San Diego. 281 p.