California's Living Marine Resources:
A Status Report

The Resources Agency
The California Department of Fish and Game

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Sablefish

History of the Fishery

The sablefish (*Anoplopoma fimbria*) resource off California has a lengthy history of commercial exploitation. Prior to 1935, landings averaged about 500 tons annually. By 1935, annual landings had risen to 1,400 tons at a time when sablefish livers, because of their high vitamin A content, commanded a higher price than the edible parts of the fish. Landings increased to over 3,000 tons in 1945 due to strong wartime market demand, then varied from approximately 770 to 2,200 tons per year until 1972. More intensive exploitation of sablefish began in 1972 with the development and widespread use of sablefish traps, which proved highly effective. Foreign fishing fleets from the U.S.S.R, Japan, and the Republic of Korea fished for sablefish off California from 1967 to 1979, catching relatively minor quantities in most years. However, in 1976 the Republic of Korea reported a catch of 9,500 tons off California. The establishment of the U.S. 200-mile fishery conservation zone in 1977 phased out foreign fishing in those waters; consequently Japan, the principal foreign market for sablefish, became increasingly reliant on imports of U.S.-caught sablefish. Japanese demand for sablefish helped drive California landings to a record high of 14,287 tons in 1979, followed by a market collapse the next year to just 5,141 tons.

The first commercial sablefish landing limits were imposed coastwide in 1982 by the Pacific Fishery Management Council. Prior to that time, market demand, not resource availability or quotas, was the dominant force controlling statewide sablefish landings. From 1982 to 1989, regulations constrained statewide sablefish landings to an average of approximately 6,175 tons. Annual coastwide landing quotas remained at 19,183 tons from 1982 to 1984, then gradually declined to 9,800 tons in 1990 as the stock was fished down to the recommended long-term target level. Between 1990 and 2000, the Allowable Biological Catch (ABC) was reduced slightly to 10,661 tons.

The economic importance of sablefish to California has increased considerably in recent years. In 1989, sablefish, worth $3.63 million, ranked fourth in ex-vessel value among groundfish species. Between 1990 and 1999, California landings had an average ex-vessel value of 5.1 million dollars. Sablefish are marketed commonly as "black cod" and smaller fish are often filleted and sold as "butterfish." The high oil content of the flesh produces an excellent smoked product, and most of the large individuals are sold domestically in this form. Sablefish are typically exported in frozen, dressed (headed-and-gutted) form. There is a large price difference with size.

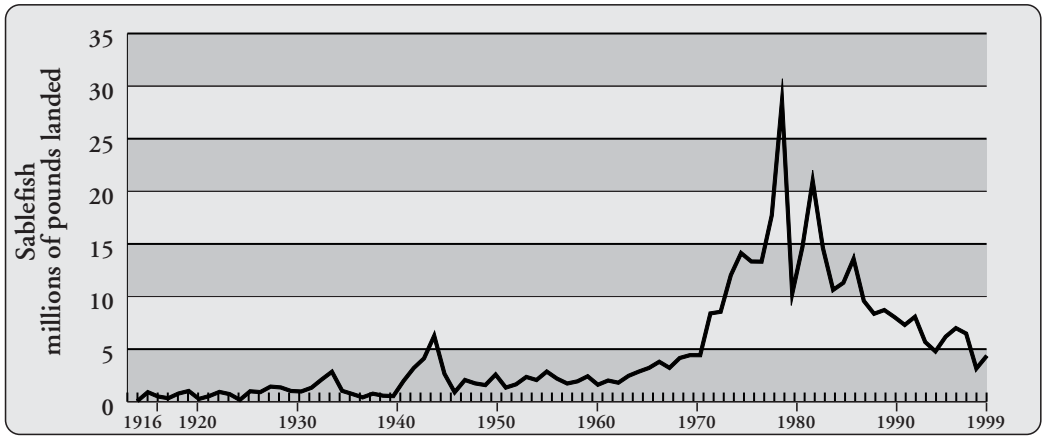
Sablefish, *Anonlopoma fimbra*
Credit: DFG

Sport utilization of sablefish is negligible, with rare instances of large catches when schools of small sablefish concentrate around public piers. The depth distribution of sablefish normally places them beyond most sport fishing activity.

Sablefish are captured commercially with longline, trap, bottom trawl, and gill net gears. Before 1943, sablefish were landed principally by small two- to three-man longline boats fishing deep for large sablefish for the smoked fish market. Catches by trawlers became significant in 1944. The distribution of landings among gear types has varied considerably over time, but bottom trawlers have accounted for about 70 percent of annual California landings in recent years. In recent years, a small number of sablefish have been caught in the recently developed live-fish fishery.

Trawls and gill nets capture sablefish in mixed-species catches with a variety of other groundfishes, whereas longline and trap gears target on sablefish. Off California, most trawl-caught sablefish are taken in association with Dover sole and thornyheads in deep (1,200-4,200 feet) water. Longlines and traps are also fished at such depths for sablefish, but gill net-caught sablefish commonly are captured with rockfish at depths less than 900 feet.

Because of the immense fishing power of the West Coast groundfish fleet and a robust market demand, rather intensive management of sablefish became necessary in the 1980s to prevent overexploitation and to accomplish other management goals. Trip landing and frequency limits, a 22-inch minimum size limit, user-group allocations, as well as more commonly used quotas and gear restrictions, have been applied to the commercial sablefish fishery by the PFMC. Trip landing and frequency limits prevent early quota attainment, thereby reducing the discard of sablefish by-catch in non-directed fisheries and providing year-round availability of fresh sablefish to domestic consumers. The minimum size limit, implemented in 1983, prevents the excessive harvest of juvenile sablefish. Quota allocation distributes the harvest among user groups to achieve social and economic goals. Quotas and gear restrictions are designed to ensure the optimal long-term harvest of sablefish.



Commercial Landings 1916-1999, Sablefish
Data Source: DFG Catch Bulletins and commercial landing receipts.

The sablefish resource is unique among West Coast groundfishes, for the annual commercial catch quota has been allocated between trawl and non-trawl gears since 1986. Trawl/non-trawl allocations, based on historical shares and incidental catch requirements, have ranged from 58:42 to 52:48 during 1986 to 2000. Separate allocations are needed because trawl-landing restrictions put trawlers at a disadvantage with non-trawl fishermen when both groups compete for a joint quota. Most non-trawl fishermen land only sablefish; thus an unrestricted open fishery followed by a closure is acceptable to them. Quota allocation allows each group to use their optimal harvest strategy within regulatory constraints.

Status of Biological Knowledge

The geographic distribution of sablefish extends from the Asiatic coast of the Bering Sea to northern Baja California. Tagging studies by the National Marine Fisheries Service (NMFS), Department of Fisheries and Oceans-Canada, and the Alaska Department of Fish and Game indicated that adult sablefish are relatively sedentary, as most fish were recaptured within 50 nautical miles of release sites. However, some sablefish, particularly those tagged in southern California, have moved in excess of 1,000 nautical miles. Adult sablefish are found from less than 300 to more than 4,800 feet deep, but peak abundance off California is at about 1,200 to 1,800 feet. Length and age generally increase with depth.

The spawning season extends from October through February. A central California study determined that spawning occurs at depths greater than 2,700 feet. Initially, larval sablefish inhabit surface waters offshore; later they move into nearshore nursery areas. Juveniles aggregate in water depths of continental slope and abyssal areas. The diet of juvenile sablefish includes copepods, amphipods, euphausiids, fish eggs, and fish larvae. Adults eat euphausiids, tunicates, and fish.

Approximately 50 percent of female sablefish reach maturity at 23.6 inches long and six years of age off California. Females grow faster than males from age two and attain a larger maximum size. Sablefish may attain an age of over 50 years and reach a size of 47 inches and 126 pounds but are usually less than 30 inches and 25 pounds. Sablefish enter the trawl fishery as early as one year of age but are fully selected by trawl and nontrawl fisheries at ages four to six. Large, older fish are most selected by the trap and longline fisheries.

Sablefish are conventionally aged using the broken and burnt otolith method. There is very poor agreement among agers and therefore the estimated ages are questionable. This is in spite of a considerable amount of research on the problem.

Status of Population

For management purposes, a unit stock is assumed to exist in waters off California to the Canadian border. Considerable progress has been made in the 1980s towards understanding the dynamics, structure, and size of this stock. Two types of fisheries-independent surveys were conducted by the NMFS, triennial groundfish trawl surveys (initiated in 1977) from Monterey Bay to the Canadian border and biennial sablefish trap surveys in the INPFC Conception to Eureka areas (Mexican border to 43° 00' N latitude). In 1991, the biennial trap survey was discontinued due to a lack of funding. In addition, a systematic landings sampling program and trawl logbook data provided insight into catch-per-effort, and age- and length-composition trends. In general, these disparate data sets presented a somewhat equivocal picture of stock status in California waters.

Fisheries-independent and dependent studies have had conflicting results. Stock assessments have been hampered by the lack of reliable age data. In 1998, two independent stock assessments were performed which resulted in bio-

mass estimates ranging between 33,000 and 319,000 tons. Given the highly uncertain status of the population, it is unclear whether management has been too liberal or too conservative.

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