

16 California Halibut, *Paralichthys californicus*



California halibut, *Paralichthys californicus*. Photo credit: O Horning, CDFW.

History of the Fishery

California halibut, *Paralichthys californicus*, is an important flatfish species to the commercial fisheries in central and southern California. The highest recorded annual landings from California waters were an estimated 3.5 million pounds (1588 metric tons) in 1917. This was followed by another high year of 2.7 million pounds (1225 metric tons) in 1918. Following the high of 1917, the fishery was subject to increasing exploitation. In the years following World War I, the overall volume of landings decreased, possibly a result of increased fishing pressure. Annual landings declined sharply until 1926 and more gradually to a low in 1942 at 0.57 million pounds (258 metric tons). The fishery rebounded during and after World War II (1944 to 1949). From 1942 to 2011, the annual landings average was 780,000 pounds (354 metric tons) with six peaks: 1945 (1.6 million pounds; 717 metric tons), 1946 (1.7 million pounds; 762 metric tons), 1981 and 1985 (1.3 million pounds; 572 metric tons), 1997 (1.3 million pounds; 603 metric tons), and 1999 (1.3 million pounds; 594 metric tons) (Figure 16-1).

The commercial fishery may occur statewide and was historically centered off southern California ports, and the waters of northern Baja California, Mexico. Catch from Mexican waters peaked in 1916 at an estimated 2.5 million pounds (1134 metric tons). Landings from Mexican waters were variable, but steadily decreased after a high in 1925 of 1.5 million pounds (694 metric tons). In recent history, landings have shifted to central California, with the majority of landings occurring in the San Francisco port area. The majority of fishing in southern California occurs in the legislatively-defined California Halibut Trawl Grounds (CHTG) and over shallow, sandy habitat around the Channel Islands.

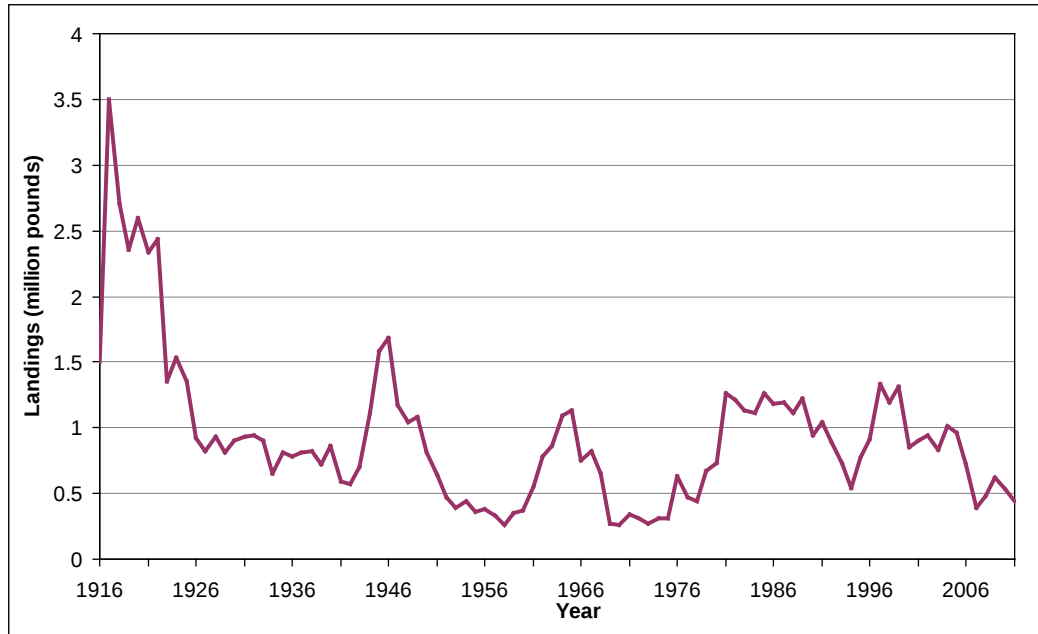


Figure 16-1. California halibut commercial landings, 1916-2011. Data source: California Department of Fish and Wildlife (Department) catch bulletins (1916-1983) and Commercial Fisheries Information System (CFIS) data (1984-2011), all gear types combined.

The three principle commercial gears used to catch California halibut are otter trawl, set gill net, and hook-and-line. The trawl fishery began in 1876 with the introduction of the paranzella net in the San Francisco Bay area. This early trawl net was towed by two sail boats. Eventually wind-powered vessels were replaced by steam, then combustion engines. The two-vessel method of towing a net remained until the 1940s, when single vessels began towing and hauling their own nets. The current California halibut trawl fleet ranges from small (29 feet; 9 meters) to larger (71 feet; 22 meters) vessels with a typical crew size ranging from one to three.

Various prohibitions on bottom trawling within state waters have been in effect since 1915 with some exceptions, one of these being the CHTG. Created in 1971, the CHTG by definition encompass an area 1 to 3 nautical miles (1.8 to 5.6 kilometers) from shore between Point Arguello (Santa Barbara County) and Point Mugu (Ventura County). The CHTG are closed to trawling from March 15 through June 15, and are subject to special trawl gear restrictions. In addition to the seasonal closure and gear restrictions, several areas within the CHTG are permanently closed to trawling. In 2004, Senate Bill 1459 prohibited trawling in all State waters except those in the CHTG. Within the CHTG, vessels are required to use "Light Touch Trawl Gear" with a minimum cod-end mesh size of 7.5 inches (19 centimeters) (Title 14 CCR §124(b)). A California Halibut Bottom Trawl Vessel Permit (CHBTVP) issued by the Department is required to target California halibut with trawl gear and to fish in the CHTG. Fishermen with a federal groundfish trawl permit who do not have a CHBTVP may land up to 150 pounds (68 kilograms) of California halibut caught during a groundfish trip in federal waters.

As a result of Senate Bill 1459, trawl fishing in Monterey Bay, which is entirely within state waters, was prohibited. This area, particularly the northern section, was historically trawled for at least 75 years, and the new closure has been enforced since 2006.

Gill net or entangling nets were introduced in the mid 1880s for use statewide. Since introduction of these nets, regulations for their use have gone through several changes including bans, ban overrides with limited use, and area or depth closures. As of 1989, gill nets used for California halibut must have a minimum mesh size of 8.5 inches (21.6 millimeters). In 1994, legislation was enacted prohibiting gill net use within 3 nautical miles (5.56 kilometers) of shore south of Point Conception, and within 1 nautical mile (1.8 kilometers) from shore or 420 feet (128 meters) around the Channel Islands. A limited entry General Gill/Trammel Net Permit is required for this fishery.

The gill net fishery from Point Reyes to Point Arguello, in waters 360 feet (110 meters) or less, was closed beginning in 2000 as an emergency measure to protect seabirds and marine mammals. This emergency closure was enacted through a series of smaller closures. Two closures prohibited the use of gill nets in less than 360 feet (110 meters) from Point Reyes (Marin County) to Yankee Point (Monterey County). The other closure was from Point Sal (Santa Barbara County) to Point Arguello. A third closure was enacted to close the entire area between Point Reyes to Point Arguello. The closure from Point Reyes to Point Arguello became permanent in 2002.

Hook-and-line gear, when compared to the other two principle gears, historically comprised a minor portion of the commercial fishery. Hook-and-line landing trends have been relatively stable, with a slight increase in the past 20 years (Figure 16-2). During this period, hook-and-line gear averaged less than 20 percent of total commercial California halibut landings. A majority of these landings occur in the San Francisco Bay fishery. The commercial hook-and-line fishery is nonrestrictive, meaning that no special permits are required.

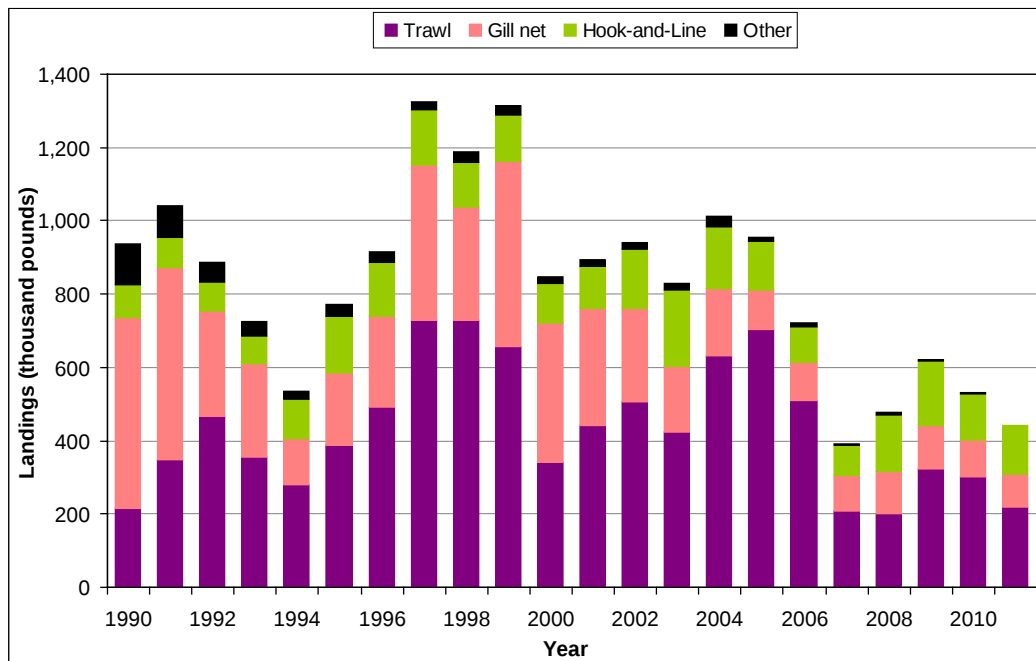


Figure 16-2. California halibut commercial landings by gear type, 1990-2011. Data source: CFIS data.

California halibut is a valuable fish, sold fresh whole or as fillets to fish markets and local restaurants, or in some cases, in live condition. Prior to 1990, California halibut supplied a fresh/dead market. In 1990, one fish receiver began buying and selling live California halibut. After a few years, other markets began requesting that fishermen land their catch in live condition. Live California halibut fetch a higher price, thus changing fishing habits and increasing the value of each fish caught (Figure 16-3). Fish buyers, primarily from the Los Angeles area, would travel as far north as Moss Landing (Monterey County) to buy trawl-caught, live California halibut. Since the closure of Monterey Bay to trawling in 2006, the live California halibut industry primarily occurs in the Santa Barbara/Ventura port complex. Short trawl tow times and a large mesh size codend help ensure that California halibut can be caught and landed live. Set gill net and hook-and-line are other gears used in the live California halibut fishery.

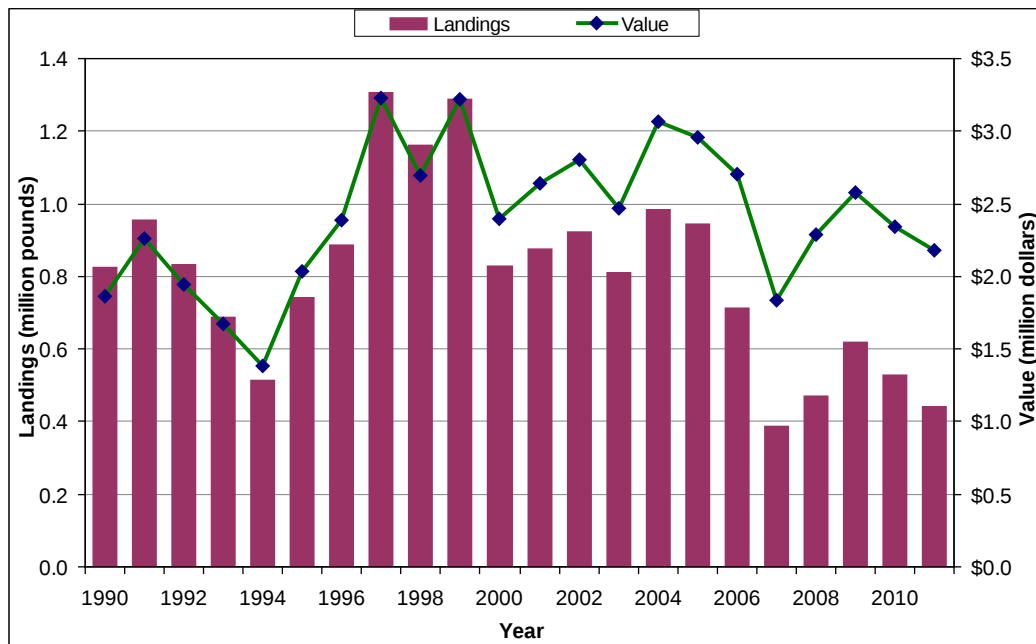


Figure 16-3. California halibut commercial landings and value, 1990-2011. Data source: CFIS data, all gear types combined.

The commercial California halibut minimum size limit is 22 inches (56 centimeters) total length (TL), established in 1979. Prior to that there was a minimum weight limit of 4 pounds (1.8 kilograms) in the round, established in 1915. This was changed in 1931 to 3.5 pounds (1.6 kilograms) for dressed, head-on fish or 3 pounds (1.4 kilograms) for dressed, head-off fish.

California halibut serve as an important game fish for recreational anglers. Recreationally, California halibut are typically caught using hook-and-line gear (troll or drift/mooch) or by spear. California halibut are mostly taken from vessels, with some fish caught from piers or taken from sandy beaches.

Estimates of recreational catch were generated by the Marine Recreational Fisheries Statistics Survey (MRFSS) from 1981 to 1989 and from 1993 to 2003. From 2004 to the present, catch estimates are produced by the California Recreational Fisheries Survey (CRFS), which benefits from an improved sampling design. Both surveys rely on an angler-intercept method to determine species composition and catch rates, coupled with a telephone survey to estimate fishing effort. Though similar methodology in general was used for each, the two sampling designs are sufficiently different that catch estimates generated from MRFSS and CRFS are not considered comparable and will be provided in separate graphs and tables below.

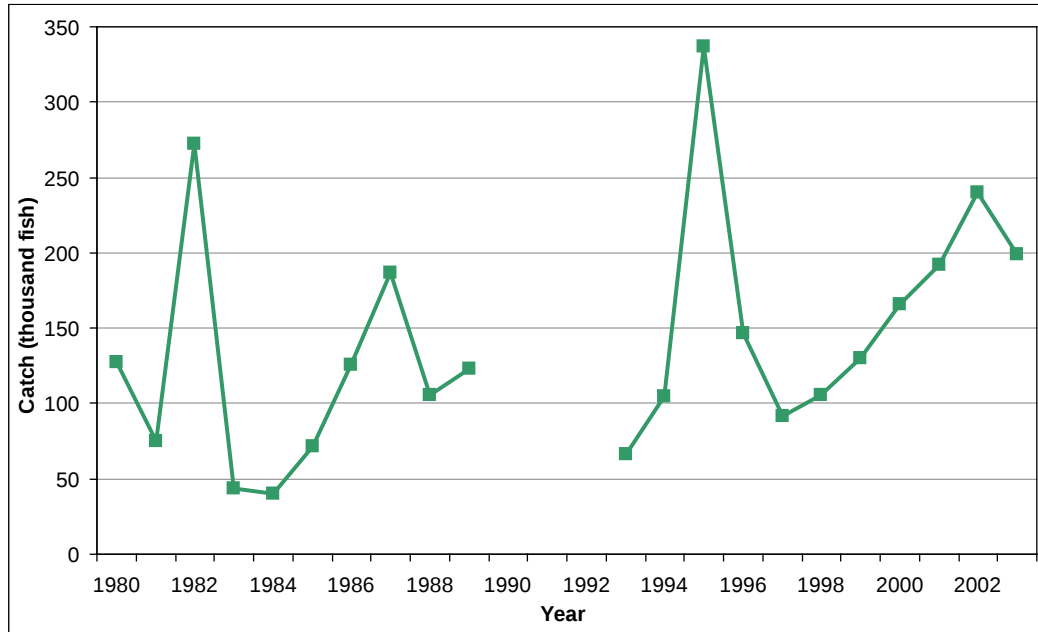


Figure 16-4. California halibut recreational catch, 1980-2003. Data source: MRFSS data, all fishing modes and gear types combined. Data for 1990-1992 are not available.

Since 2004, the recreational catch of California halibut has been sampled and the total catch estimated through CRFS (Figure 16-5). The CRFS program samples California halibut caught from private/rental boats, commercial passenger fishing vessels (CPFVs), public piers, and sandy beaches. While the data from MRFSS and CRFS are not comparable, there were several peaks (1982, 1995, 2002, and 2008) in recreational halibut catch. These peaks are possibly due to successful recruitment events resulting from prior El Niño events which provide favorable conditions by keeping larvae near shore where they can settle out. The success of the 2008 fishing season was likely the result of a large year class moving through the San Francisco Bay fishery. These fish were most likely spawned during the 2002-03 El Niño. The 2008 season was also closed to ocean salmon fishing, causing recreational fishermen to target other species, mostly halibut. The decline in the recreational catch since 2008 may have been due to a reduction of individuals from the 2005 year class and poor recruitment conditions since 2003.



Figure 16-5. California halibut recreational catch, 2004-2011. Data source: CRFS data, all fishing modes and gear types combined.

Since 1936, CPFV operators have been required by law to submit accurate logs of their fishing activity, providing an important source of recreational data. The CPFV logbook dataset is one of the Department's most comprehensive datasets documenting recreational California halibut catch. During World War II, many CPFVs were put into military service, thus no logs were submitted or recorded during this period.

There are two major peaks in the CPFV fishery for California halibut with the first occurring in 1948 (143,462 fish) and second in 1964 (141,465 fish) (Figure 16-6). Following World War II, fishing operations resumed at normal capacity with recreational anglers taking up to 10 fish per day with no minimum size. This level of take contributed to record total landings recorded in the 1948 season. However, due to the high level of take, total catch following 1948 decreased significantly. Several restrictions, including reducing the bag limit to two fish and establishing a temporary minimum size limit of 22 inches TL (56 centimeters), coupled with good recruitment, resulted in an increase in catch. In 1963 the California halibut bag limit was increased to five fish and the minimum size limit was lifted. The CPFV fishery peaked again in 1964. After the peak in 1964, the total number of fish landed decreased sharply, most likely due to reasons leading to the previous decline and has remained relatively stable for the past four decades. In 2008, the number of California halibut landed by the CPFV fleet increased, mostly due to an excellent fishing season in San Francisco Bay. The San Francisco Bay CPFV fleet also had excellent fishing in 1995 and 2003 (Figure 16-7). As an indicator of the fishery, these three peaks correspond to the three most recent peaks in successful recruitment events for 1- and 2-year old California halibut in San Francisco Bay, with an appropriate lag time for fish to reach minimum legal size (Figure 16-8).

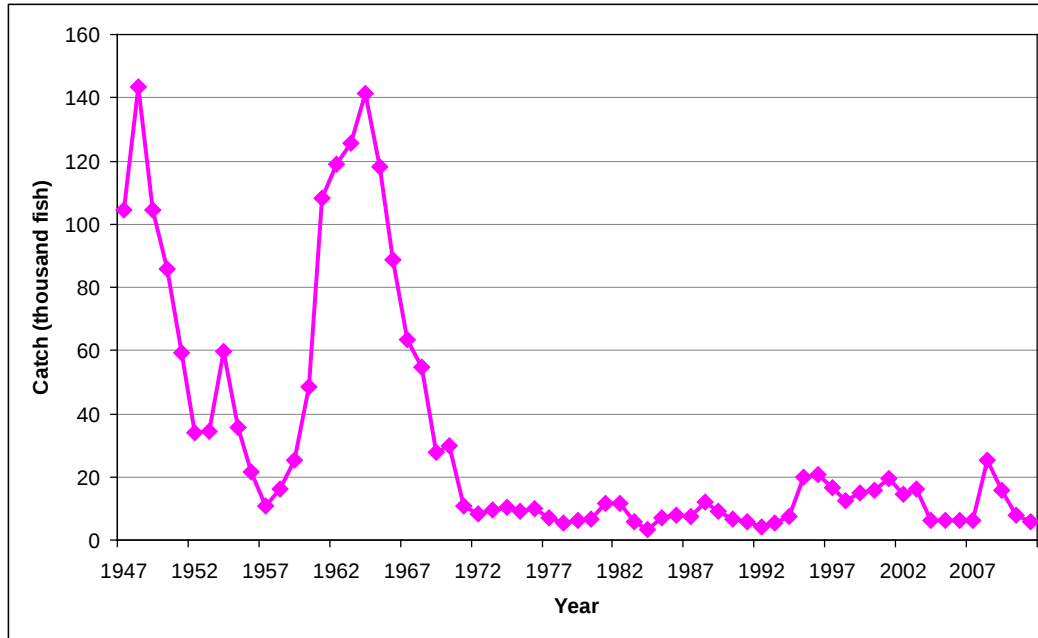


Figure 16-6. California halibut CPFV catch, 1947-2011. Data source Department catch bulletins (1947-1986) and CPFV logbook data (1987-2011).

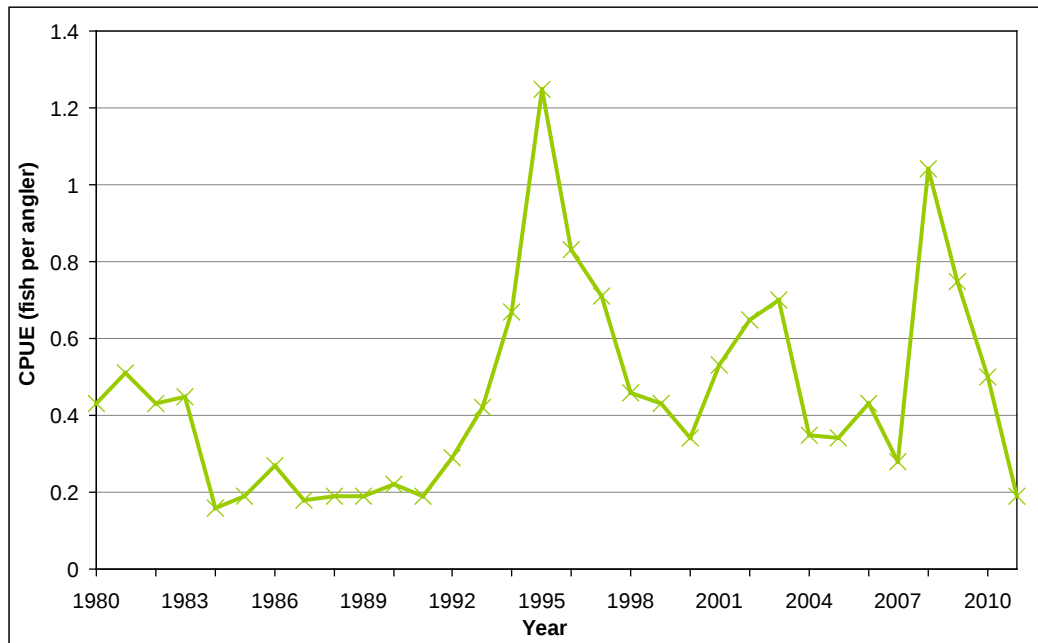


Figure 16-7. California halibut recreational catch per unit effort in San Francisco Bay, 1980-2011. Data source: CPFV logbook data.

The recreational minimum size limit is 22 inches TL (56 centimeters). This basic regulation has been in effect since 1971. When filleted at sea, California halibut fillets must be cut lengthwise and be at least 16.75 inches (42.5 centimeters) long. The recreational season is open year round, with a daily bag/possession limit of three

California halibut north of Point Sur (Monterey County) and five California halibut south of Point Sur.

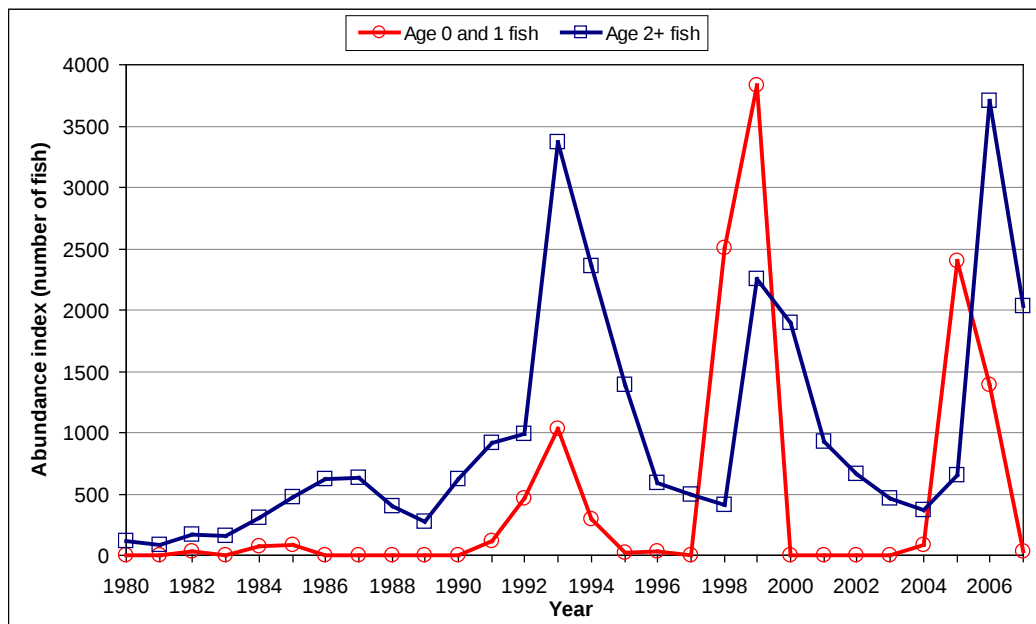


Figure 16-8. California halibut abundance index (number of fish) from San Francisco Bay, 1980-2007. Data source: Department Bay Study data, 1980-2007. Data are composed of summed regional totals that are averaged over the index period (February-October).

Status of Biological Knowledge

Adult California halibut may be found in shallow, sandy nearshore habitats on the west coast of North America from Almejas Bay, Baja California, Mexico to the Quillayute River, Washington, with the species most common south of Bodega Bay. California halibut may be caught in water depths out to 300 feet (91 meters), but are more common in depths less than 100 feet (30 meters). Individual fish can grow up to 5 feet (1.5 meters) in total length and weigh as much as 72 pounds (33 kilograms). The current recreational record is 67 pounds (30 kilograms). California halibut are sexually dimorphic with females growing at a faster rate than males and attaining a larger maximum size. Based on an extensive study conducted in southern California, males mature between 1 and 3 years of age, or 7.5 inches (19 centimeters) and 12.6 inches (32 centimeters), respectively. Females mature between 2 and 7 years of age with 50 percent of females maturing at 4 years. Corresponding lengths at maturity for females begin at 14 inches (36 centimeters), with 100 percent being mature at 23 inches (59 centimeters). California halibut have been aged up to 30 years using otoliths. Ageing of otoliths continues at present by Department staff, and individuals greater than 15 years of age are rare in the sampled catch. The majority of California halibut aged from fishery sampling by the Department have been in the 5- to 8-year old range; this is true for historic samples from the late 1980s as well as those aged from 2007 to 2011.

California halibut fecundity is considered high with mature female California halibut producing up to one million eggs per spawning event. Spawning occurs year round, but based on larval presence in the water column, major spawning events typically occur mid-winter (January/February), summer (June/July), and fall (September/October). As a broadcast spawner, eggs and larvae are subject to direction and intensity of ocean currents. While in the drifting state (around 30 days), larvae tend to be concentrated in the upper 100 feet (30 meters) of the water column. Larval or juvenile California halibut will settle out along the open coast, but survival rate is better in protected bays and estuaries. El Niño events provide better conditions for recruitment by promoting conditions which keep eggs and larvae closer to shore where they may settle out. Annual recruitment to the fishery is dependent upon environmental conditions and is independent of overall stock size.

Several tagging studies have been completed documenting California halibut movement. These studies tagged California halibut from Tomales Bay, central California to Bahía Sebastian Viscaíno, Baja California, Mexico, with the majority of tagging effort in central and southern California. Studies indicate that California halibut tend to not travel great distances, since many tag recoveries were in the same geographic location of capture. For those California halibut that moved, most moved in a southerly direction, especially smaller fish. Some studies indicated that larger fish moved north. California halibut that traveled north tended to do so faster and swam further. In general there has been a direct relationship between total length and movement distance with larger fish traveling greater distances.

California halibut are predatory fish eaters, often hiding themselves such that only the eyes and outline of the fish are visible. Juvenile California halibut eat mostly small crustaceans and some finfish. As California halibut grow, larger finfish, such as Pacific sardine and northern anchovy, and market squid become the dominant food items.

Status of the Population

In 2011, the Department, through the use of a private contractor, completed the first statewide stock assessment of California halibut with separate assessments for areas north and south of Point Conception. The period assessed was 1971-2010. An independent peer review panel concluded that the documents were acceptable, but required additional sampling information before the next assessment. It was suggested that the Department increase gender-specific sampling of the fished population, continue ageing studies, divide southern California into smaller sampling regions to increase precision in analysis, and examine the possible link between the north and south through larval abundance. In addition to the peer review, Department staff conducted an evaluation of the stock assessment using methods learned at a Sea Grant-sponsored workshop in 2008 to evaluate data-poor fisheries. None of the Department's findings countered the results of the stock assessment.

The stock assessment concluded that the population estimate and status north of Point Conception was considered well above the biomass associated with maximum

sustainable yield. This high biomass may be associated with several recent recruitment events, especially in the San Francisco Bay area (Figure 16-8). Favorable environmental conditions, such as El Niño events, appear to be driving recruitment success and fishing was not thought to be a factor in controlling abundance.

South of Point Conception, the California halibut population was estimated to be depleted to 14 percent of historic levels, characterized by a lack of significant recruitment due to poor environmental conditions during the past decade, but population appears sustainable at current levels of harvest. In general flatfish are highly resilient marine finfish with high fecundity, and can respond relatively quickly to favorable environmental conditions with episodes of good recruitment. Southern California halibut stocks were considered depleted by the start of the evaluation period in 1971 due to sustained exploitation; furthermore, it was stated that the southern population was considered exploited since 1916. In response to the assessment, the California Fish and Game Commission (Commission) and the Department agreed that the best current course of action would be to increase monitoring of the fishery (both for catch level and total participation), investigate environmental bottlenecks, fill data gaps through fishery independent survey work, and to revisit the assessment process in 5 years. The assessment did not take into account any benefits from a recently-implemented series of marine protected areas (MPAs), especially those with California halibut habitat. The new southern California MPAs, adopted by the Commission in 2011 and effective January 1, 2012, account for 14 percent of soft bottom habitat within the depth range of California halibut in this region.

There have been limited studies attempting to identify the stock structure of California halibut through the use of genetic information and to evaluate if California halibut are subject to geographic boundaries such as Point Conception. Traditional logic dictates that the environment and fish populations north and south of Point Conception are different, and the contrary results from the recent stock assessments in these areas tend to support that. In addition, the average historical length of sampled California halibut is larger north of Point Conception, which may also indicate differences in population or differences in the level of exploitation. However, a recent study indicated that California halibut, genetically, may be one homogeneous population with migration occurring in a north to south direction. The study found that California halibut had no evidence of genetic differences north or south of Point Conception.

Management Considerations

California halibut has long been an important finfish species to the recreational and commercial fishing interests in California. Since the beginning of the fishery, the California halibut population has been subject to oscillations in abundance, but with a downward trend in southern California. This downward trend is related to poor recruitment coupled with a high exploitation rate. As cited in the 2011 stock assessment, in central California fishing is not a controlling factor, as opposed to environmental and habitat conditions. Since successful recruitment is linked to

environmental conditions along with the health and availability of suitable bay/estuary habitat, additional management attention should be paid to these relationships in southern California. It is unlikely that the trend in substantial loss of estuarine habitat over the last century in southern California can be reversed, but water quality improvements during the last four decades will help ensure that the remaining estuarine habitats are viable and productive. While environmental factors are considered in the assessment of any fished species, fishery management actions generally target the users of a resource, thus controlling take. No regulatory changes are suggested at this time, but future management strategies for consideration may include:

- Continue to monitor the fisheries and the status of the stock through sampling, life history, and ageing studies.
- Monitor new shallow, soft-bottom MPAs in southern California to determine if they are effective in protecting mature California halibut in localized areas.
- Increase consultation between Department environmental review and biological staff regarding proposed estuarine projects.
- Explore environmental bottlenecks that influence recruitment.
- Increase fishery-independent survey work to fill data gaps not addressed by fishery-dependent monitoring.

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Further Reading

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For more information on the California halibut stock assessment documents are available on the Department's web site at:

<http://www.wildlife.ca.gov/marine/sfmp/halibut-assessment.asp>.

California halibut commercial landings, 1916-2011.							
Year	Pounds	Year	Pounds	Year	Pounds	Year	Pounds
1916	1,500,000	1940	861,908	1964	1,092,068	1988	1,107,207
1917	3,500,000	1941	592,911	1965	1,128,348	1989	1,219,321
1918	2,708,514	1942	569,245	1966	749,555	1990	938,572
1919	2,362,520	1943	701,219	1967	824,919	1991	1,040,864
1920	2,602,043	1944	1,111,880	1968	649,425	1992	885,346
1921	2,340,428	1945	1,582,150	1969	272,331	1993	726,550
1922	2,437,966	1946	1,675,280	1970	256,398	1994	535,018
1923	1,347,243	1947	1,172,638	1971	336,416	1995	771,641
1924	1,528,399	1948	1,041,124	1972	309,003	1996	914,236
1925	1,352,248	1949	1,079,501	1973	272,466	1997	1,325,175
1926	916,794	1950	806,279	1974	306,290	1998	1,187,503
1927	818,517	1951	643,279	1975	307,785	1999	1,314,501
1928	932,289	1952	473,620	1976	627,574	2000	848,411
1929	811,427	1953	387,739	1977	467,862	2001	895,341
1930	896,062	1954	444,543	1978	441,440	2002	941,210
1931	929,306	1955	363,834	1979	665,546	2003	829,214
1932	939,001	1956	382,006	1980	726,852	2004	1,012,791
1933	904,829	1957	332,584	1981	1,262,265	2005	956,303
1934	648,516	1958	256,075	1982	1,214,375	2006	722,873
1935	810,291	1959	345,286	1983	1,130,363	2007	391,666
1936	776,634	1960	366,191	1984	1,107,019	2008	475,903
1937	812,365	1961	545,472	1985	1,255,966	2009	620,720
1938	822,447	1962	776,077	1986	1,184,296	2010	530,422
1939	722,084	1963	855,092	1987	1,188,596	2011	440,906

Data source: Department catch bulletins (1916-1979) and CFIS data (1980-2011), all gear types combined.

California halibut commercial landings (pounds) and value, by gear type, 1990-2011.						
Year	Hook-and-Line	Trawl	Gill net	Other	Total	Total value
1990	87,162	216,168	520,906	114,336	938,572	\$1,867,389
1991	81,973	349,252	522,810	86,829	1,040,864	\$2,261,386
1992	78,891	465,015	287,638	53,802	885,346	\$1,941,747
1993	77,601	356,400	253,111	39,438	726,550	\$1,670,242
1994	108,415	279,137	126,313	21,153	535,018	\$1,386,484
1995	153,880	388,631	197,395	31,735	771,641	\$2,035,167
1996	145,748	491,859	248,138	28,491	914,236	\$2,383,535
1997	153,533	728,962	422,072	20,608	1,325,175	\$3,228,951
1998	123,326	728,225	308,649	27,303	1,187,503	\$2,692,093
1999	124,220	656,099	508,332	25,850	1,314,501	\$3,219,251
2000	108,730	339,843	380,971	18,867	848,411	\$2,396,974
2001	115,229	442,092	318,644	19,376	895,341	\$2,639,996
2002	160,950	506,572	255,420	18,268	941,210	\$2,800,037
2003	207,722	422,253	181,513	17,726	829,214	\$2,469,477
2004	170,099	631,475	182,849	28,368	1,012,791	\$3,067,213
2005	132,524	703,660	106,558	13,561	956,303	\$2,958,756
2006	97,875	510,044	103,392	11,562	722,873	\$2,700,874
2007	82,023	207,592	97,455	4,596	391,666	\$1,832,296
2008	156,307	202,691	112,000	4,905	475,903	\$2,286,311
2009	175,516	322,717	119,633	2,854	620,720	\$1,867,389
2010	126,681	301,803	98,612	3,326	530,422	\$2,261,386
2011	131,209	217,460	91,496	741	440,906	\$2,182,099

Data source: CFIS data.

California halibut recreational catch, 1980-2003					
Year	Number of fish	Year	Number of fish	Year	Number of fish
1980	126,652	1988	105,517	1996	146,921
1981	75,286	1989	123,249	1997	91,942
1982	272,473	1990	-----	1998	106,220
1983	44,224	1991	-----	1999	129,975
1984	39,922	1992	-----	2000	166,415

California halibut recreational catch, 1980-2003					
Year	Number of fish	Year	Number of fish	Year	Number of fish
1985	72,016	1993	66,145	2001	192,115
1986	125,715	1994	105,318	2002	239,865
1987	187,130	1995	337,231	2003	199,086

Data source: MRFSS data, all fishing modes and gear types combined. Data for 1990-1002 are not available.

California halibut recreational catch, 2004-2011.			
Year	Number of fish	Year	Number of fish
2004	45,962	2008	74,531
2005	49,225	2009	61,676
2006	48,575	2010	48,701
2007	35,378	2011	25,496

Data source: CRFS data, all fishing modes and gear types combined.

California halibut commercial passenger fishing vessel (CPFV) catch, 1947-2011.					
Year	Number of fish	Year	Number of fish	Year	Number of fish
1947	104,436	1969	27,634	1991	5,984
1948	143,462	1970	29,968	1992	4,343
1949	104,639	1971	10,598	1993	5,335
1950	85,935	1972	8,140	1994	7,528
1951	59,295	1973	9,622	1995	19,957
1952	34,158	1974	10,292	1996	20,619
1953	34,292	1975	9,118	1997	16,480
1954	59,674	1976	10,075	1998	12,332
1955	35,802	1977	6,982	1999	14,939
1956	21,661	1978	5,409	2000	15,854
1957	10,795	1979	6,329	2001	19,298
1958	16,192	1980	6,517	2002	14,668
1959	25,365	1981	11,440	2003	16,349
1960	48,310	1982	11,804	2004	6,115
1961	108,011	1983	5,682	2005	6,174

California halibut commercial passenger fishing vessel (CPFV) catch, 1947-2011.					
Year	Number of fish	Year	Number of fish	Year	Number of fish
1962	118,956	1984	3,209	2006	6,051
1963	125,669	1985	7,090	2007	6,026
1964	141,465	1986	7,848	2008	25,306
1965	118,213	1987	7,572	2009	15,715
1966	88,726	1988	12,001	2010	7,810
1967	63,582	1989	9,113	2011	5,679
1968	54,663	1990	6,678		

Data source: Department catch bulletins (1947-1986) and CPFV logbook data (1987-2011), all gear types combined.