

REVIEW OF SELECTED CALIFORNIA FISHERIES FOR 2010: COASTAL PELAGIC FINFISH, MARKET SQUID, OCEAN SALMON, GROUND FISH, HIGHLY MIGRATORY SPECIES, DUNGENESS CRAB, SPINY LOBSTER, SPOT PRAWN, KELLET'S WHELK, AND WHITE SEABASS

CALIFORNIA DEPARTMENT OF FISH AND GAME

Marine Region
8604 La Jolla Shores Drive
La Jolla, CA 92037
DSweetnam@dfg.ca.gov

SUMMARY

In 2010, commercial fisheries landed an estimated 197,956 metric tons (t) of fish and invertebrates from California ocean waters (fig. 1). This represents an increase of 23% from the 160,615 t landed in, and a nearly 22% decline from the peak landings of 252,568 t observed in 2000. The preliminary ex-vessel economic value of commercial landings in 2010 was nearly \$175 million, an increase of 56% from the \$112 million in 2009.

California market squid once again emerged as the largest volume and highest value fishery in the state with over nearly 130,000 t landed and an ex-vessel value of approximately \$73.8 million, a 30% increase from the \$56.9 million of 2009. Such increases can be attributed to favorable environmental conditions.

Pacific sardine landings experienced a 10% decrease in volume during 2010. This was largely due to a more restrictive harvest guideline (HG) based on declining stock abundance. Similar to 2008, the fishery exhibited the characteristics of a "derby." Other coastal pelagic finfish that also experienced a drop in landings were Pacific mackerel and northern anchovy. Jack mackerel, on the other hand, registered an increase in landings.

In 2010, 9,960 t of commercial groundfish were landed in California, a slight decrease over 2009 landings. However, the ex-vessel value of the fishery of \$20.8 million saw an increase over 2009 values.

In terms of highly migratory species, 367 t of swordfish with an ex-vessel value of \$2.2 million were landed in 2010, a 10% decline from landings in 2009 of 407 t. Albacore was the most abundant tuna caught in California waters, as well as along the West Coast. Commercial landings totaled 11,855 t with an ex-vessel value \$1.8 million. Recreational albacore landings in California from Commercial Passenger Fishing Vessels (CPFV) totaled 33,679 fish.

Dungeness crab landings more than doubled in 2010 compared to 2009, and remained one of the more valuable state fisheries with an ex-vessel value of \$34.2 million. Concerns regarding increased effort in the fishery have prompted strong support for a statewide, tiered trap limit program. As of May 2011, legislation is pending on creation of a trap limit program.

A total of 319 t, the California spiny lobster (*Panulirus interruptus*) was commercially landed in 2010. While substantially lower than the recent peak of 403 t in 2006, the 2010 landing total continues a trend of 300 t, or more, lobsters landed per calendar year since 2000. The 2010 ex-vessel value of the lobster fishery was a record \$11.13 million.

Spot prawn landings in 2010 were 110 t, a 14% decrease from 2009 although market demand was high. The decrease in landings is most likely due to the poor weather and sea conditions that characterized 2010.

Kellett's whelk supports a growing commercial fishery, but is not important recreationally with 67.5 t landed in 2010 with an ex-vessel value of \$117,000. The California Fish and Game Commission (Commission) has identified Kellett's whelk as an emerging fishery because both landings and the number of participants in this fishery have increased dramatically since 1993.

White seabass is the target of both a commercial and recreational fishery. The commercial white seabass fishery landed 243 t in 2010, a 39% increase from the 2009 total of 175 t, while the recreational take increased by 56% to 121 t in 2010 from the previous year's total of 77 t. The commercial ex-vessel value in 2010 was \$1,528,913.

In 2010, the Commission undertook nine rule-making actions that addressed marine and anadromous species. The Commission adopted changes to commercial or sport fishing regulations that include Central Valley and ocean salmon, rock crab, lobster hoop net, and herring. The Department also began implementing an Automated License Data System which allows for the purchase of commercial and recreational fishing licenses online. It also creates a customer information database that satisfies the federal mandate of establishing a National Saltwater Angler Registry.

On 15 December 2010 the Commission adopted regulations to create a suite of marine protected areas (MPAs) in southern California from Point Conception to the California/Mexico border. Developed under the Marine Life Protection Act planning process, the network of 49 MPAs and 3 special closures (including 13 MPAs and 3 special closures previously established at

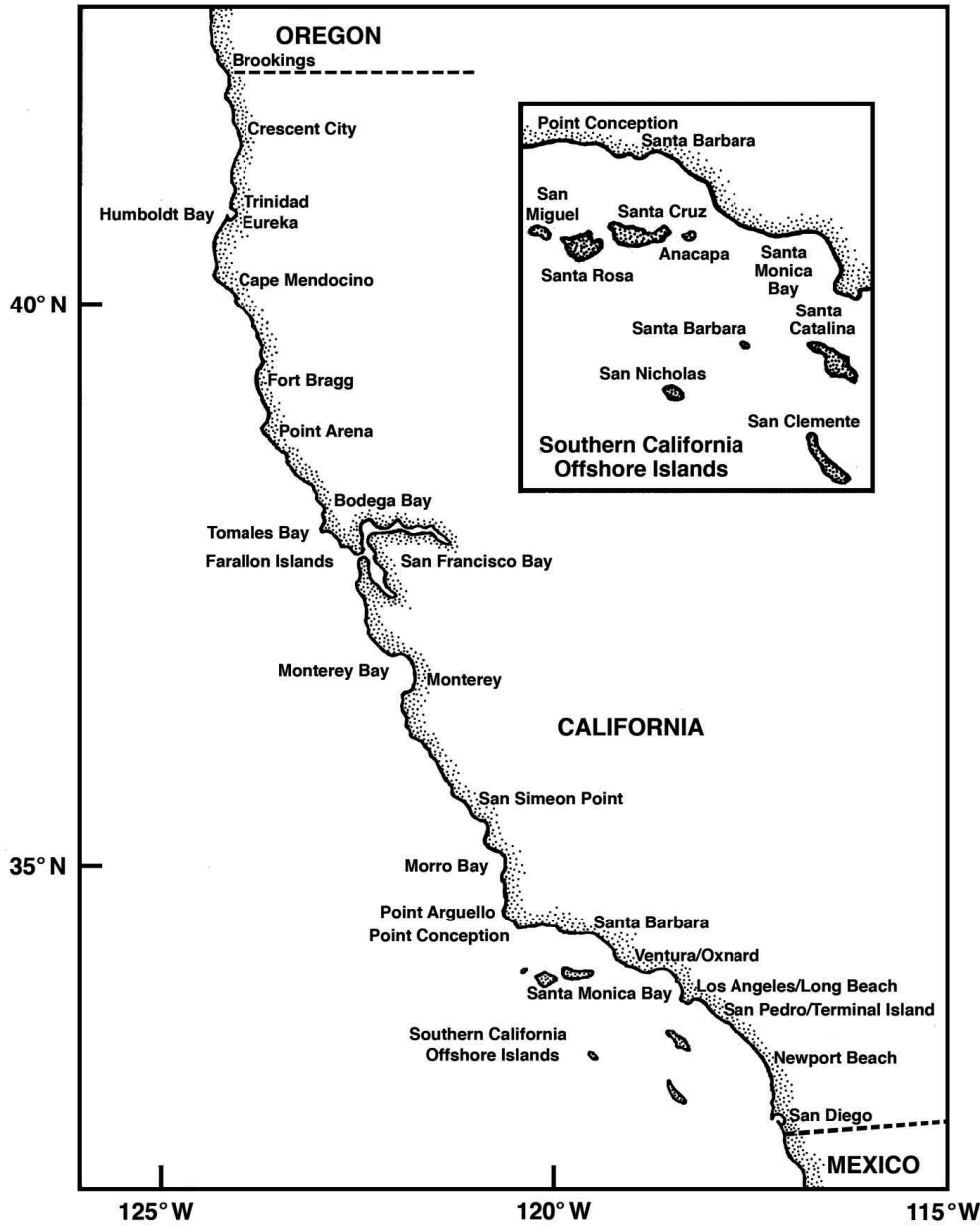


Figure 1. California ports and fishing areas.

the northern Channel Islands) covers approximately 354 square miles of state waters and represents approximately 15% of the region. These new MPAs will go into effect on 1 October 2011.

Coastal Pelagic Finfish

Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), and northern anchovy (*Engraulis mordax*) form a finfish complex known as coastal pelagic species (CPS). These species are jointly managed by the Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS). In 2010, total commercial

landings for these species equaled 37,050 t (table 1), and was worth nearly \$5.2 million in ex-vessel value. Compared to landings in 2009, this represents an 18% and 25% decrease in quantity and value, respectively. Once again Pacific sardine ranks as the largest fishery among these four species, contributing 91% of the combined quantity and 82% of the combined value.

Pacific Sardine. In 2010, the total tonnage of Pacific sardine landed, 33,658 t, was 10% lower than in 2009 (37,578 t). California landings of Pacific sardine generated an ex-vessel value of approximately \$4.3 million. Commercial landings of sardine averaged 48,050 t over the ten-year period from 2001–2010 (fig. 2). Nearly all

TABLE 1
 Landings of Coastal Pelagic Species in California (metric tons)

Year	Pacific sardine	Northern anchovy	Pacific mackerel	Jack mackerel	Unspecified mackerel	Pacific herring	Herring roe	Market squid	Total
1977	2	101,132	3,316	47,615		5,286		12,811	170,163
1978	1	11,439	8,241	34,349	48	4,473		17,145	75,696
1979	51	48,880	22,404	21,548	301	4,257		19,982	117,424
1980	21	42,946	25,739	24,181	56	8,061		15,385	116,389
1981	34	52,308	35,257	17,778	132	5,961		23,510	134,980
1982	2	42,150	17,667	19,618	18,398	10,604		16,308	124,747
1983	1	4,427	17,812	9,829	23,659	8,024		1,824	65,576
1984	1	2,889	26,043	9,149	18,038	3,847		564	60,532
1985	6	1,626	18,149	6,876	19,624	7,984		10,275	64,540
1986	388	1,535	22,095	4,777	25,995	7,658		21,278	83,727
1987	439	1,390	26,941	8,020	19,783	8,420		19,984	84,978
1988	1,188	1,478	30,127	5,068	20,736	8,641		37,233	104,471
1989	837	2,449	21,067	10,746	26,661	9,296		40,893	111,950
1990	1,664	3,208	31,077	3,223	9,039	7,436		28,447	84,094
1991	7,587	4,014	31,680	1,693	339	7,347		37,389	90,048
1992	17,950	1,124	18,574	1,209	3	6,319		13,110	58,289
1993	15,346	1,958	11,798	1,673		3,846	0	42,722	77,345
1994	11,644	1,789	10,008	2,704	0	77	2,874	55,508	84,603
1995	40,328	1,886	8,625	1,728		3	4,664	72,433	129,667
1996	32,559	4,421	9,597	2,178	4	249	5,162	80,784	134,954
1997	43,246	5,718	18,398	1,160	1	0	9,147	70,387	148,057
1998	42,956	1,457	20,515	824		0	2,009	2,895	70,656
1999	59,493	5,179	8,688	953	0		2,279	91,950	168,542
2000	53,612	11,754	21,916	1,269	0	26	3,450	118,816	210,843
2001	51,894	19,277	6,925	3,624	1	0	2,768	86,385	170,873
2002	58,354	4,643	3,367	1,006	2	0	3,324	72,920	143,615
2003	34,732	1,676	3,999	156	0	34	1,808	45,061	87,467
2004	44,305	6,793	3,570	1,027	0	60	1,581	41,026	98,362
2005	34,633	11,182	3,244	199		219	136	58,391	108,005
2006	46,577	12,791	5,891	1,167	0	37	694	49,159	116,316
2007	80,981	10,390	5,018	630	1	336	261	49,474	147,091
2008	57,806	14,285	3,530	274	0	131	626	38,101	114,754
2009	37,578	2,668	5,079	119	1	74	460	92,338	138,317
2010	33,658	1,026	2,056	310	0			129,904	166,954

Data Source: Commercial Fisheries Information System (CFIS)

(96%) of California's 2010 sardine catch was landed in Los Angeles (83%, 27,809 t) and Monterey (13%, 4,305 t) port areas (table 2).

The Pacific sardine fishery ranges from British Columbia, Canada, southward to Baja California, Mexico (BCM). Since the resurgence of sardines in the 1980s, the majority of landings have occurred in southern California and northern Baja California. However, since the expansion of the sardine fishery in 1999, landings have steadily increased in the Pacific Northwest and Canada. The combined landings of Pacific sardine for California, Oregon, and Washington totaled 66,920 t, a slight decrease from the 67,050 t landed in 2009. The Pacific sardine harvest guideline (HG) for each calendar year is determined from the previous year's stock biomass estimate (of ≥1-year-old fish on 1 July) in U.S. and Mexican waters. The recommended HG for the 2010 season was 67,039 t based on a biomass estimate of 702,204 t. The Pacific sardine HG was apportioned coastwide through the year with 35% allocated from 1 January through 30 June, 40% plus any portion not harvested allocated from

1 July through 15 September, and the last 25%, plus any portion not harvested from the first two allocations, released on 15 September.

In 2010, U.S. West Coast fisheries harvested nearly all (99.8%) of the HG, same as the previous year (100%). The 1st allocation (Jan 1–June 30) lasted 163 days. This was markedly longer than the 2nd (July 1–Sept 14) and 3rd (Sept 15–Dec 31) allocations which lasted 22 and 10 days, respectively. Increased fishing efforts, such as multiple landings per day, were observed during all allocation periods. During the 2nd and 3rd allocations, fishing effort continued during weekends, a period normally not fished. Since the 2008 reduction in the HG, the fishery has become a “derby,” resulting in early closures of each allocation period. The directed Pacific sardine fishery was officially closed by the NMFS on September 24, 2010.

The steady increase of sardines landed in Oregon since 1999 may have leveled off in the last 3 years (fig. 3). Oregon landings of sardine totaled 20,852 t in 2010, a slight decrease from 2009 (21,481 t). In 2010, Oregon

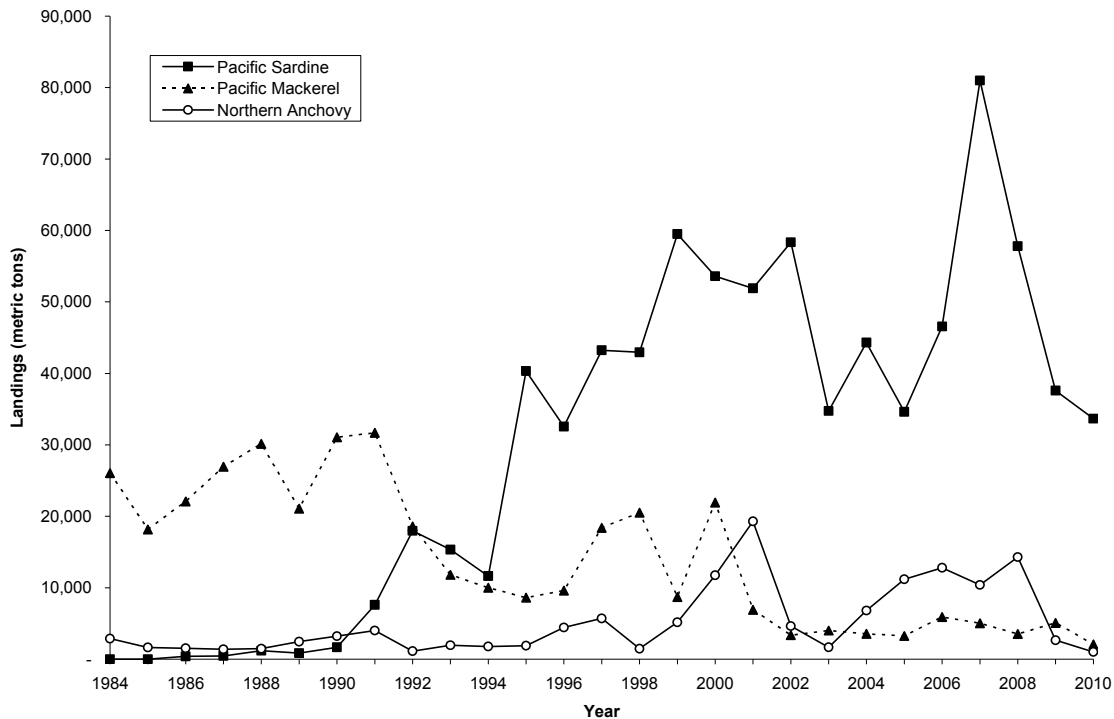


Figure 2. California commercial landings of Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), and northern anchovy (*Engraulis mordax*), 1984–2010.

exported 646 t of sardine product worth a little over \$555,000.

Washington landings of Pacific sardine totaled 12,381 t in 2010, an increase of 54% from 2009 (8,026 t). Washington exported more sardine (35,764 t) than was landed; the product was most likely sardine landed in Oregon or the previous year.

In November 2010, the Council adopted a HG of 50,526 t for the 2011 Pacific sardine fishery based on a biomass estimate of 537,173 t and the harvest control rule in the Coastal Pelagic Species Fishery Management Plan (CPS FMP). This HG would be a 30% reduction from that of 2010. It would also incorporate a 4,200 t set-aside allocated for dedicated Pacific sardine research activities in 2011.

The 2010 recreational Pacific sardine catch as sampled from the California Recreational Fisheries Survey (CRFS) was 50 t (886,000 fish), similar to that of 2009 (20% increase, by number of fish). The majority of the fish landed were from man-made structures, such as piers.

Pacific Mackerel. In 2010, 2,056 t of Pacific mackerel were landed in California (table 1, fig. 2). The majority of landings were made in southern California port areas (table 2). The total ex-vessel value generated for Pacific mackerel in 2010 was \$410,800. Industry exported 552 t of mackerel product, valued at nearly \$5,877,000, to 15 countries. Egypt (168 t), Peru (88 t), and Jamaica (72 t) received over 59% of this product.

TABLE 2
 Landings (metric tons) of Pacific sardine (*Sardinops sagax*) and Pacific mackerel (*Scomber japonicus*) at California port areas in 2010.

Area	Pacific sardine		Pacific mackerel	
	Landings	% Total	Landings	% Total
Monterey	4,305	12.8	0.0	0.0
Santa Barbara	1,524	4.5	9.4	0.5
Los Angeles	27,809	82.7	2,045.2	99.5
Total	33,638	100	2,054.6	100

Oregon reported 49 t of Pacific mackerel landed there in 2010 for a total ex-vessel value of \$2,872. This is slightly less than the 2009 catch of 53 t. No landings of mackerel have been reported in Washington since 2005. Washington landings of Pacific mackerel are typically low, with the greatest landings occurring in 2001 (371 t).

Similar to sardines, the majority of Pacific mackerel landings occur in southern California and Ensenada, BCM. In the U.S., the fishing season for Pacific mackerel is 1 July to 30 June the following year. At the start of the 2010–2011 season, based on an estimated biomass of 282,049 t, the PMFC set the HG at 11,000 t, with a 3,000 t set-aside for incidental landings in other fisheries. Landings above the HG would be constrained by an incidental catch rate of 45% by weight when landed with other CPS.

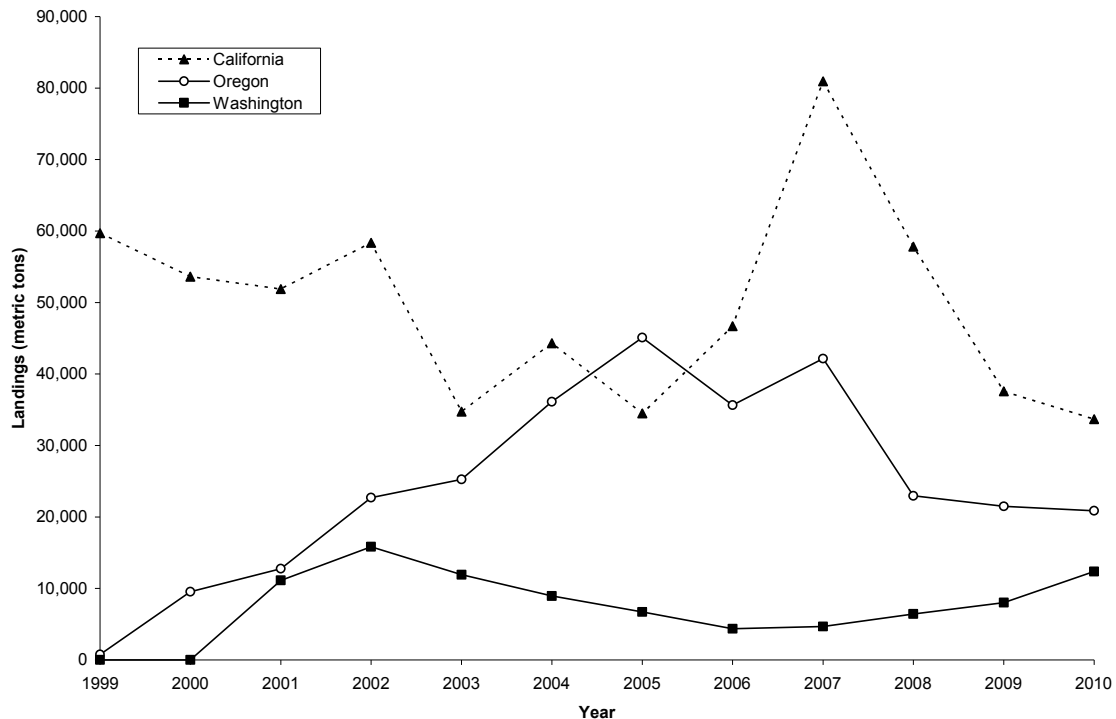


Figure 3. Commercial landings of Pacific sardine (*Sardinops sagax*) in California, Oregon, and Washington, 1999–2010.

The 2010 recreational Pacific mackerel catch as sampled from CRFS was 233 t (1,168,000 fish), a 97% (77%, by number of fish) increase from 2009. A total of 27,205 fish were reported landed on CPFVs.

Jack Mackerel. In 2010, jack mackerel landings represented less than 1% of the total catch of federally managed CPS finfish in California with 310 t landed. The ex-vessel revenue for jack mackerel was \$62,355 for California. Landings in Oregon continue to be low with 3 t landed in 2010 (no ex-vessel value). Washington reported no landings of jack mackerel during 2010.

The 2010 recreational jack mackerel catch as sampled from CRFS was 17 t (276,000 fish), a 325% (500%, by number of fish) increase from 2009. A total of 2,017 fish were landed on CPFVs.

Northern Anchovy. Landings of northern anchovy in California have been reported since 1916. Historically, anchovy was reduced to oil or fish meal and the fishery was modest compared to Pacific sardine and Pacific mackerel. However, periods of low sardine abundance saw increased anchovy landings. Peak landings were seen in the early to mid 1970s with total annual harvest exceeding 100,000 t at times. Presently, landings of northern anchovy are modest, averaging about 8,500 t per year over the last 10 years (fig. 2). The vast majority of northern anchovy are landed in California, with occasional landings in Oregon and Washington. Anchovy are currently used for human consumption, animal food, live bait, and reduction.

Three stocks of northern anchovy are identified: northern, central and southern. California fishery harvests are taken from the central stock which ranges from northern Baja to San Francisco. Studies of scale deposits on the sea floor suggest that anchovy abundance can be quite high at times. Currently, northern anchovy are a monitored species under the CPS FMP.

California landings of northern anchovy in 2010 amounted to 1,026 t with an ex-vessel value of nearly \$462,700 (table 1). This is a 62% decrease from 2009 landings (2,668 t). Exports of northern anchovy product from California totaled 11 t for an export value of \$68,877. Three countries received anchovy product from California; Taiwan received the majority at 91%.

For 2010, Oregon reported landings totaling 138 t with an ex-vessel value of \$31,869. No exports of northern anchovy were reported. Washington reported no landings of anchovy for 2010.

Pacific Bonito. From 2001 to 2010, annual Pacific bonito (*Sarda chiliensis lineolata*) landings averaged 607 t, a small percentage of the total CPS quantity landed in California. In 2010, landings decreased drastically from last year's high of 2,133 t to 18 t. The landings generated an ex-vessel value of \$14,373. No landings of Pacific bonito were reported from Oregon or Washington in 2010. The California recreational catch for Pacific bonito in 2010 was 81 t (78,000 fish), a 45% decrease from 2009. A total of 38,528 fish were landed on CPFVs.

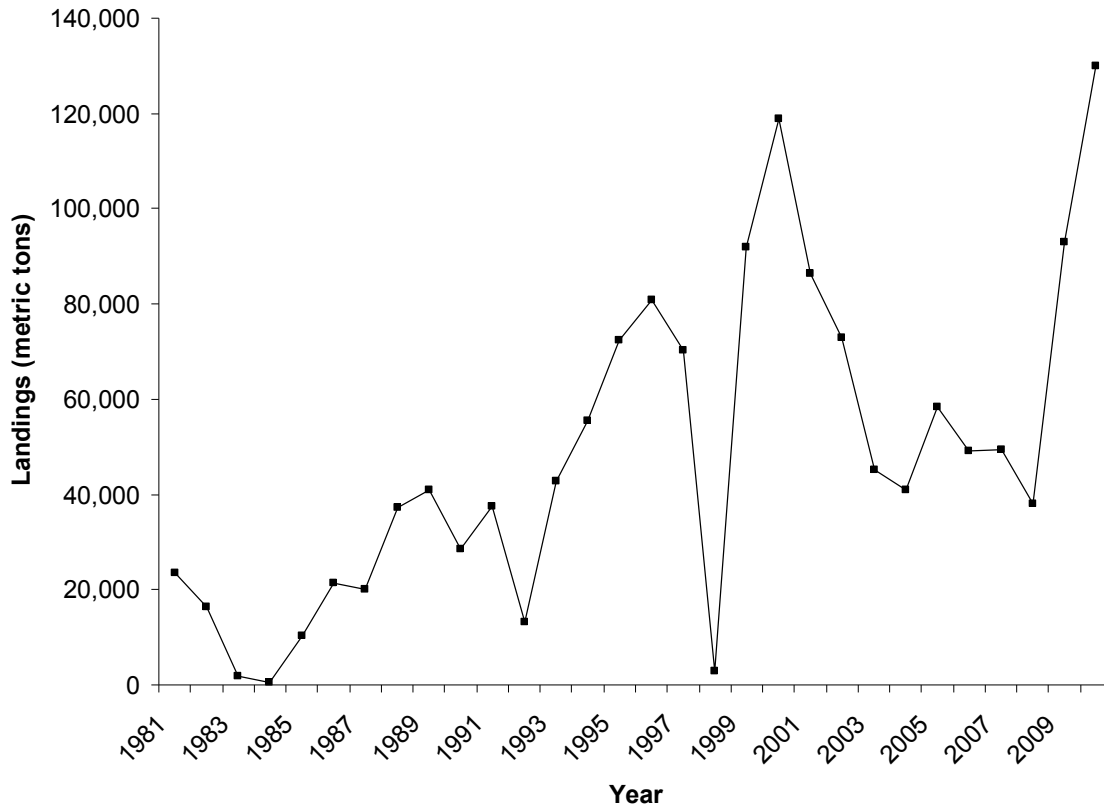


Figure 4. California commercial market squid (*Loligo opalescens*) landings, 1981-2010.

California Market Squid

In 2010, market squid, *Doryteuthis opalescens*, (formerly *Loligo opalescens*) dominated commercial landings of marine species in California, contributing about 66% of the total tonnage and 41% of total ex-vessel value of all species landed. Landings of market squid in 2010 increased 45% of 2009 landings, from 93,106 t to 129,904 t (fig. 4). Ex-vessel value increased 30% from \$56.9 million in 2009 to \$73.8 million in 2010. California fish businesses exported 92,559 t of market squid to 42 countries for a value of \$107 million in 2010. The majority (90%) was shipped to just five countries but most (76%) went to China.

For the first time since the inception of the Market Squid Fishery Management Plan in 2005, market squid landings were projected to reach the seasonal catch limit of 107,048 metric tons (t). Accordingly, the Department of Fish and Game (Department) closed the fishery on 17 December 2010 for a total of 119,482 t landed for the open portion of the 2010/2011 season.

Commercial fishing for market squid is limited by fishery control rules set forth in the Market Squid Fishery Management Plan. Vessels are required to have a permit to possess or land over 1.8 t of squid, except when fishing for them to use as live bait. Permits are valid for the management season, from 1 April to 31 March the

following year. In 2010, there were 83 market squid vessel (purse seine), 60 light boat (attracting), and 26 brail (or dip net) permits issued. Of the 83 vessel permits, 73 vessels were active in the fishery with 56 vessels contributing 95% of the landings. Other fishery control rules include an annual catch limit, weekend closures, spatial closures, and lighting restrictions.

Although the fishery has its historical origins in Monterey Bay, the fishery has been dominated by the southern California landings (fig. 5). Of note is the increase in landings for Monterey, which has seen less than 1,000 t in four of the last 5 seasons.

Market squid live less than a year and have been found in nearshore waters of the eastern Pacific Ocean from Baja California to the Gulf of Alaska. The population appears to fluctuate widely in abundance in response to short-term oceanographic events, like the El Niño Southern Oscillation. Ecologically, they are considered important as forage for other species, including predatory fishes, marine mammals, and seabirds.

A live bait fishery exists for market squid; however, the amount of market squid harvested and the value of the fishery is largely unknown, as there are no permitting and reporting requirements. The live bait fishery is likely a low-volume, high-value endeavor, as recreational anglers are willing to pay up to \$85 for a “scoop” of live squid.

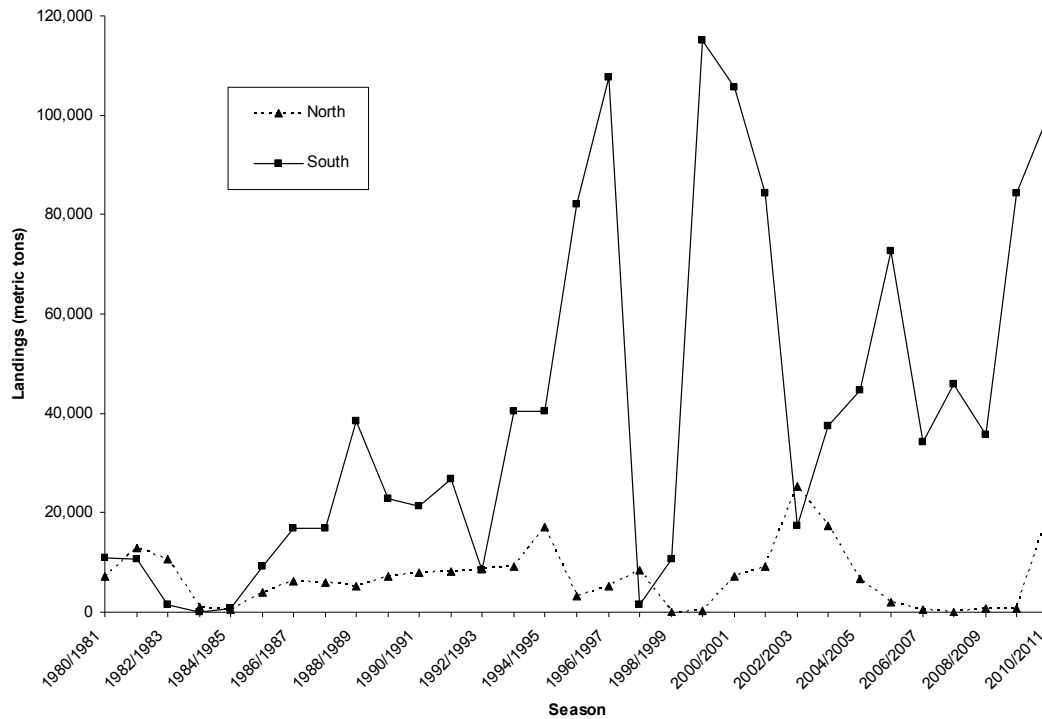


Figure 5. Comparison of market squid landings for northern and southern fisheries by fishing season (1 April–31 March), from 1980–81 to 2010–11 seasons.

Ocean Salmon

Ocean salmon fisheries in California primarily target Chinook salmon (*Oncorhynchus tshawytscha*). The retention of coho salmon (*O. kisutch*) has been prohibited in the commercial and recreational fisheries since 1993 and 1996, respectively. Pink salmon (*O. gorbuscha*) are taken occasionally in the fisheries, usually in odd years. Each season, the Council and the Commission regulate California’s ocean salmon fisheries to meet the conservation objectives for Klamath River fall Chinook and Sacramento River fall Chinook (SRFC) stocks as described in the Salmon Fishery Management Plan (FMP). In addition, the fisheries must meet the NMFS Endangered Species Act (ESA) consultation standards for listed stocks, including Sacramento River winter Chinook (endangered), Central Valley spring Chinook (threatened), California coastal Chinook (threatened), Central California coast coho (endangered), and Southern Oregon/Northern California coho stocks (threatened).

In 2010, California ocean salmon fisheries were constrained to satisfy both NMFS and the Council’s guidance to target the upper end of the FMP conservation goal range of 122,000–180,000 hatchery and natural adult SRFC spawners. In 2009, SRFC failed to meet its conservation goal for the third consecutive year, thereby triggering an Overfishing Concern under the terms of the FMP. SRFC generally contribute 80–90% of California’s ocean salmon landings.

In 2010, the commercial ocean salmon fishery was opened for the first time since 2007. The commercial season was open for 8 days in July from Horse Mountain to the U.S. Mexico border. Additionally the Fort Bragg area had two quota fisheries, one at the end of July (18,000 Chinook quota) and one in August (9,375 Chinook quota), for a season total of 70 days (days open in each of four management areas combined).

An estimated 15,100 Chinook salmon (103 t) were landed during the 2010 commercial season (fig. 6). The average weight per fish was 6.85 kg (15.10 lbs). The average price was \$12.00/kg (\$5.50/lb), the highest nominal price on record. The total ex-vessel value of the fishery in 2010 was estimated to be \$1.2 million. Total commercial effort was estimated to be 2,000 days fished in 2010. The Fort Bragg quota fisheries did not reach the quota allotments and remained open for the entire length of the fishery.

In 2010, the recreational fishing season increased significantly compared to the 10 day fishery in 2009, for a season total of 500 days (days open in each of four management areas combined). An estimated 14,700 Chinook were landed in 2010 compared to 700 salmon in 2009 (fig. 7). There were an estimated 48,800 angler days in 2010 compared to 5,400 angler days in 2009. The bag and possession limit was two salmon per day of any species except coho, and anglers were required to use no more than two single-point, single-shank barb-

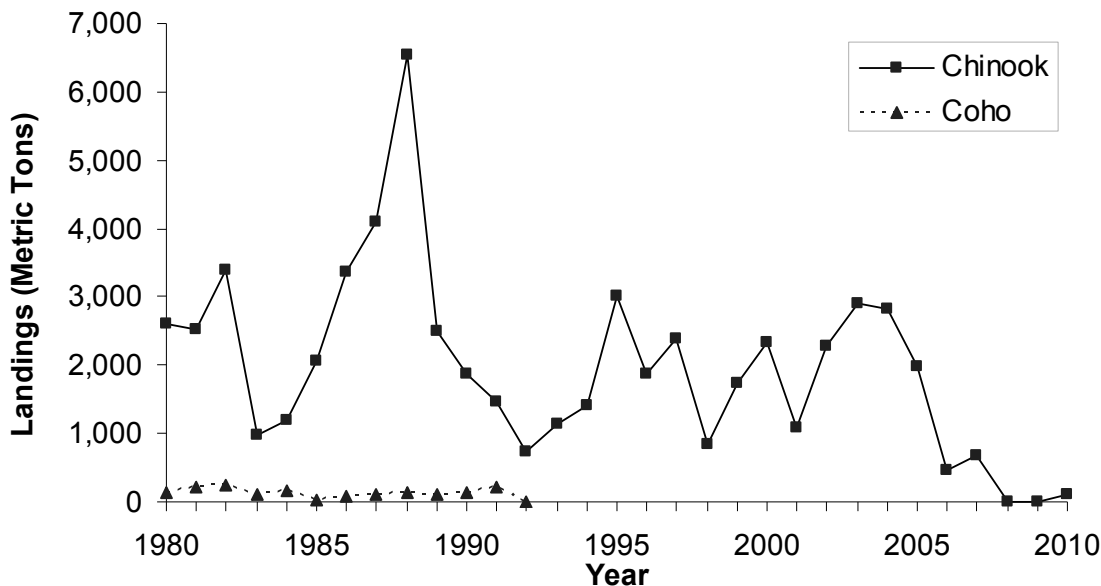


Figure 6. California commercial landings of Chinook (*Oncorhynchus tshawytscha*) and coho (*O. kisutch*) salmon, 1980–2010.

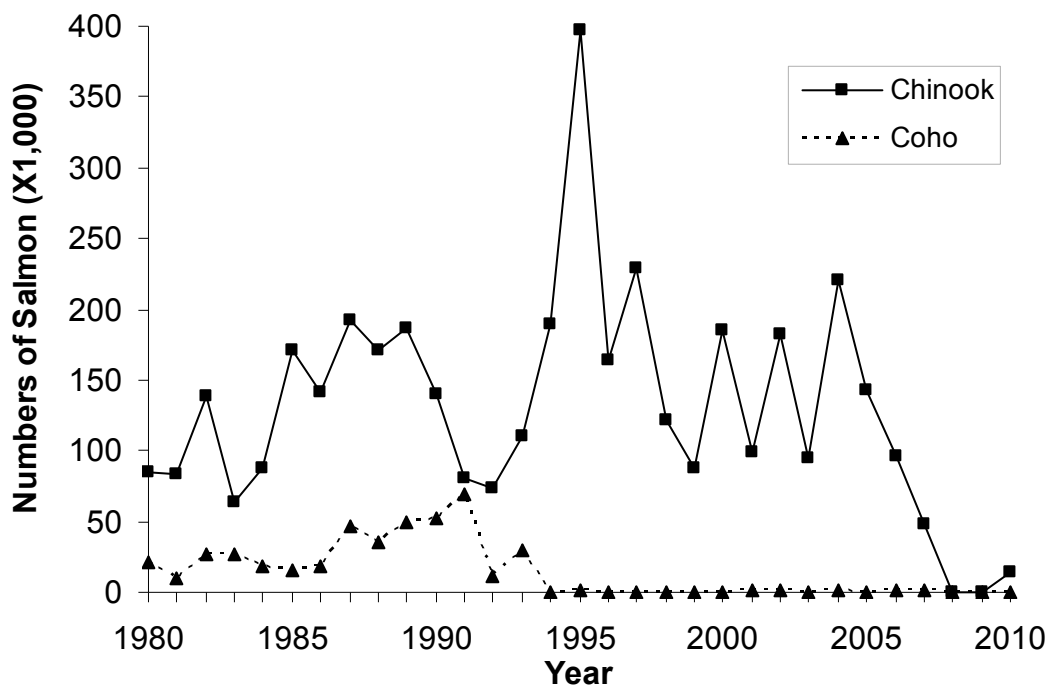


Figure 7. California recreational landings of Chinook and coho salmon, 1980–2010.

less hooks when fishing for salmon. The minimum size limit was 20 inches (508 mm) total length (TL) in April and increased to 24 inches (610 mm) TL in May, to protect the generally smaller-sized endangered winter run Chinook. Approximately 200 coho were landed illegally during 2010, presumably by anglers who misidentified their salmon as Chinook.

In fall 2010, SRFC met the lower range of the conservation goal of 122,000–180,000 hatchery and natural adult spawners for the first time since 2006. Nearly

125,400 SRFC adults returned to spawn in the Sacramento River basin. A total of 27,500 jacks (age-2 fish) returned. Based on these data, the Sacramento Index of ocean abundance forecast for 2011 is 729,900 SRFC, without any additional ocean or in-river fishing.

In April 2011, the Council and Commission approved substantial recreational and commercial salmon fisheries off California and southern Oregon. The SRFC conservation goal, and the 2011 NMFS guidance to target the upper end of the conservation goal, is satisfied

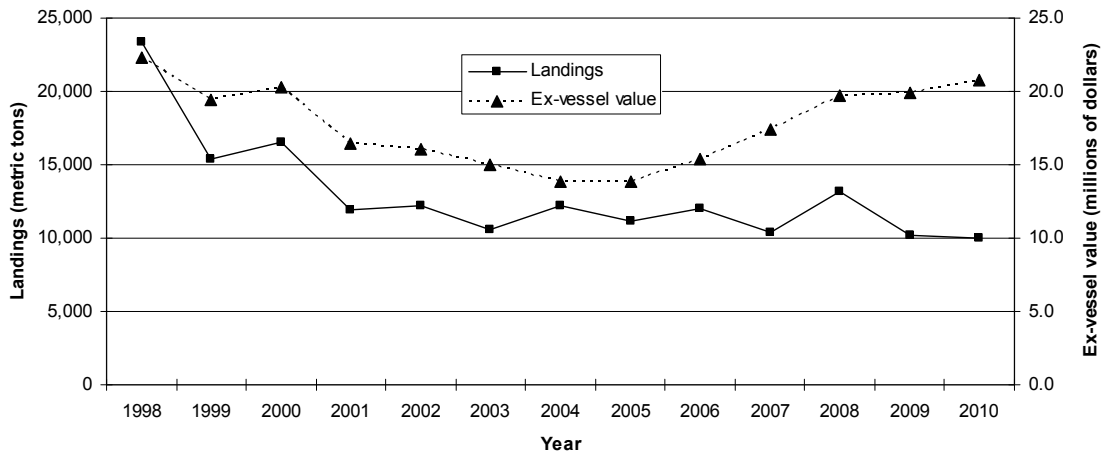


Figure 8. California commercial landings of total groundfish by all gears, 1998–2010.

by the adopted season structures. For more information on the 2011 fisheries, see the Council’s Web site (www.pccouncil.org) “Preseason Report III, Analysis of Council Adopted Management Measures for 2011 Ocean Salmon Fisheries,” which was compiled by the Council’s Salmon Technical Team and Council staff.

Groundfish

More than 90 species of bottom-dwelling marine finfish are included in the federally-managed groundfish fishery. The species that comprise the groundfish fishery are diverse and complex; their primary distributions range from nearshore depths to deep offshore habitats. “Groundfish” species include all rockfishes in the Scorpaenidae family, flatfishes such as Dover sole (*Microstomus pacificus*) and petrale sole (*Eopsetta jordani*), roundfishes such as sablefish (*Anoplopoma fimbria*) and lingcod (*Ophiodon elongatus*), and various sharks and skates. Of the 90+ groundfish species, approximately 50 are consistently harvested and require management measures that balance biological and economical goals.

Commercial Fishery. In 2010, 9,960 t of commercial groundfish were landed in California with an estimated ex-vessel value of \$20.8 million. Compared to the 2009 fishing year, this was an overall decline of 3% of the landings (10,191 t) and a 4% increase of the ex-vessel value (\$19.9 million). During the last decade, the volume of landed groundfish has declined by 45% when the current 2010 landings are compared to the 2000 landings (16,561 t). Conversely, the ex-vessel value of the groundfish fishery experienced some downward fluctuation but continued to increase in total value despite lower landings (fig. 8). The area from the California/Oregon border to the Monterey Bay port complex accounted for 85% (8,503 t) of the groundfish landed in California and 63% of the ex-vessel value (\$13.3 million). The groundfish fishery primarily operates using

trawl gear, accounting for 77% of the landings, followed by hook-and-line and trap gear (23%). Gill net and seining gear comprise the remainder. Dover sole (2,622 t), sablefish (2,449 t), Pacific whiting (*Merluccius productus*) (2,427 t), and the thornyhead complex—*Sebastolobus altivelis* (552 t) and *Sebastolobus alascanus* (474 t)—continued to dominate as the top five species landed in 2010. These five species comprised 85% of the total groundfish landings. Collectively, the flatfishes accounted for 31%, roundfishes 50%, the thornyhead complex 10% and rockfishes 8% of the total landed groundfish. The “other” groundfish species category is 99.9% comprised of grenadier (*Macrouridae*) which accounted for 95 t (table 3). Contrary to high-volume high-priced species such as sablefish, nearshore rockfishes are generally a low-volume high-priced commodity in California—gopher rockfish (*Sebastes carnatus*), brown rockfish (*Sebastes auriculatus*) and grass rockfish (*Sebastes rastrelliger*) earned a combined ex-vessel value of \$991,697, and 28 t, 27 t and 12 t were landed respectively. The highest volume rockfish was chilipepper (*Sebastes goodei*) with 342 t landed and an ex-vessel value of \$457,029. Over the last decade, management measures such as limiting access and restricting landings have been used to protect vulnerable nearshore rockfish stocks. This limitation on the fishery, in addition to the live fish market that developed in the late 1980s and continues to thrive today, contributes to the high market value of the nearshore fishery. In 2010, grass rockfish earned an average of \$19,341/t followed by China rockfish (\$16,274/t) and gopher rockfish (\$14,618/t). By contrast, chilipepper earned an average of \$1,903/t.

Overfished rockfish species accounted for less than 1% (32 t) of the total landings in 2010 which is less than 2009 when 1% (57 t) were taken; the predominant species taken was widow rockfish (*Sebastes entomelas*) in both years.

TABLE 3
 California commercial groundfish landings (in metric tons) and ex-vessel value in 2010 with comparisons to 2009.
 The top five species by weight for the Flatfishes and Rockfishes are represented in the table.

	2010		2009		% change from 2009 (t)	% change from 2009 (\$)
	Harvest (t)	Value (\$)	Harvest (t)	Value (\$)		
Flatfishes						
Dover sole	2,622	\$1,798,113	3,167	\$2,571,883	-17	-30
Petrale sole	213	\$557,412	532	\$1,146,206	-60	-51
Arrowtooth flounder	68	\$14,921	45	\$10,132	51	47
Sanddabs	56	\$91,722	107	\$115,136	-48	-20
Rex sole	55	\$43,385	107	\$84,897	-49	-49
English sole	24	\$21,091	73	\$55,414	-67	-62
Other flatfishes	33	\$60,601	37	\$54,239	-11	12
Total Flatfishes	3,071	\$2,587,246	4,069	\$4,037,907	-25	-36
Rockfishes						
Chilipepper	342	\$457,029	241	\$329,784	42	39
Blackgill rockfish	96	\$247,963	95	\$257,122	1	-4
Group slope rockfish	78	\$108,166	75	\$102,651	4	5
Splitnose rockfish	64	\$48,403	57	\$46,065	12	5
Black rockfish	53	\$219,347	94	\$398,010	-44	-45
Gopher rockfish	28	\$412,792	24	\$372,535	17	11
Other rockfishes	88	\$982,306	143	\$1,164,564	-38	-16
Overfished species						
Bocaccio	4	\$9,299	6	\$15,476	-33	-40
Canary rockfish	0.44	\$637	1.1	\$1,437	-60	-56
Cowcod	0.03	\$132	0.06	\$588	-50	-78
Darkblotched rockfish	17	\$21,750	46	\$59,366	-63	-63
Pacific ocean perch	0.04	\$47	0.78	\$771	-95	-94
Widow rockfish	10	\$8,937	4.04	\$6,288	148	42
Yelloweye rockfish	0	\$8	0.04	\$303	—	—
Total Rockfishes	781	\$2,516,817	787	\$2,754,961	-1	-9
Roundfishes						
Sablefish	2,449	\$11,501,299	2,249	9,782,141	9	18
Pacific whiting	2,427	\$694,248	1,792	206,193	35	237
Lingcod	47	\$173,276	57	187,842	-18	-8
Cabezon	23	\$266,032	18	231,421	28	15
Kelp greenling	2	\$22,154	1	19,973	100	11
Total Roundfishes	4,947	\$12,657,009	4,117	\$10,427,570	20	21
Scorpionfish, California	3	\$26,734	3	\$29,669	0	-10
Sharks & Skates	35	\$28,834	117	\$83,478	-70	-65
Thornyheads	1,026	\$2,957,617	1,027	\$2,612,205	0	13
Other Groundfish	95	\$44,453	71	\$29,474	34	51
Total Groundfish	9,960	\$20,818,711	10,191	\$19,975,264	-2	1

Data Source: CFIS (CMASTR) Extraction Date: 05-12-2011

Recreational Fishery. The Recreational Fisheries Information Network (RecFIN) Program houses recreational data from California, Oregon, and Washington. The California data, available from 1980 to the present, provide the best available information regarding recreational catch off California. RecFIN incorporates data from two recreational fishery sampling programs: the Marine Recreational Fisheries Statistical Survey (MRFSS), which sampled catch from 1980 to 2003; and the CRFS, initiated by the Department in 2004. Due to modifications in sampling protocols and differences in data estimation procedures, these two surveys are not directly comparable to each other. Information from CRFS indicates that in 2010, California anglers targeting groundfish participated in an estimated 1,074,000 angler trips. This is a 6% increase from 2009 (1,005,000

angler trips) and a 26% increase from 2008 (805,000 angler trips). The recreational groundfish fishery in California is predominantly a hook and line fishery with little being taken by spear.

An estimated 1,067 t of groundfish were taken by the recreational fishery in 2010 (table 4), a 15% decrease from 2009 (1,250 t) but an 11% increase from 2008 (945 t). The top five species were: black and vermilion rockfishes, lingcod, and gopher and brown rockfishes, accounting for approximately 51% of the total groundfish estimated catch by weight. The same five species dominated catches in 2009, accounting for 49% of the total weight. In 2010, 33% of the groundfish effort occurred in southern California (south of Point Conception), with California scorpionfish (*Scorpaena guttata*) and Pacific sanddab (*Citharichthys sordidus*) dominating

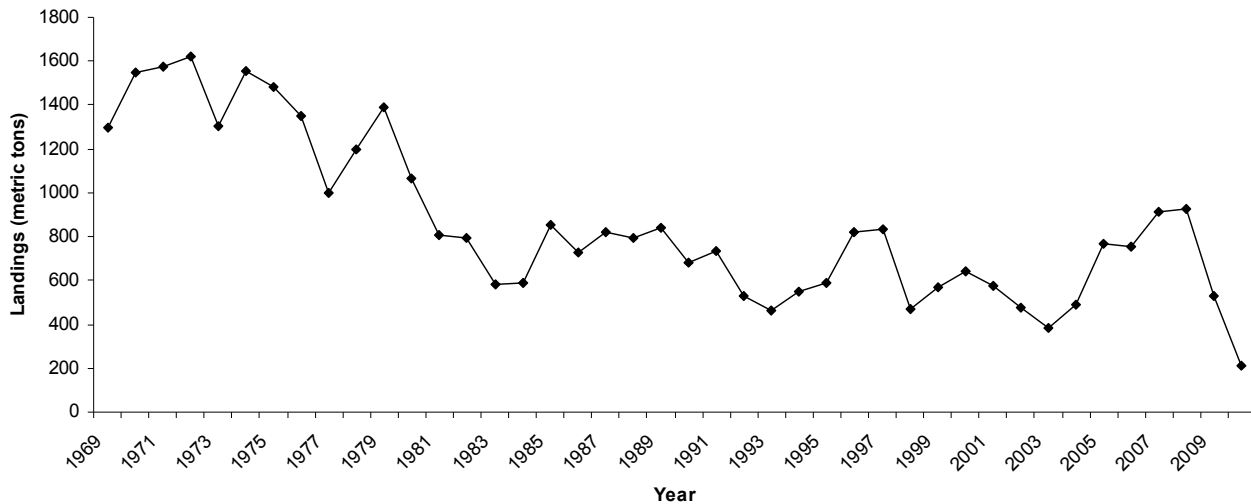


Figure 9. California commercial landings of petrale sole (*Eopsetta jordani*) by all gears, 1969–2010.

TABLE 4
California recreational groundfish landings (A+B1) greater than 5 metric tons in 2010 with 2009 comparisons

	2010 Harvest (t)	2009 Harvest (t)	% Change from 2009
Black rockfish	180	243	-26
Vermilion rockfish	139	130	7
Lingcod	94	128	-27
Gopher rockfish	76	57	33
Brown rockfish	69	60	15
CA scorpionfish	63	66	-5
Bocaccio	57	46	24
Copper rockfish	48	60	-20
Blue rockfish	46	45	2
Pacific sanddab	43	28	54
Leopard shark	35	35	0
Yellowtail rockfish	24	49	-51
Cabazon	24	32	-25
CA sheephead	20	32	-38
Starry rockfish	19	24	-21
China rockfish	17	20	-15
Canary rockfish	13	15	-13
Olive rockfish	12	24	-50
Greenspotted rockfish	11	15	-27
Black-and-yellow rockfish	11	12	-8
Kelp greenling	10	15	-33
Speckled rockfish	7	7	0
Kelp rockfish	6	4	50
Grass rockfish	6	9	-33
Other rockfishes	30	41	-27
Total Groundfish	1,067	1,250	-15
Angler Trips			
Bottomfish Effort	1,074,000	1,005,000	5

Rockfish species of concern including yelloweye rockfish (1.3 t), cowcod (0.03 t) are included in the “Other” category.

Data source: RecFIN Date Extracted: 6-3-2011

the catch. Central California (Point Conception to Cape Mendocino) accounted for 50% of the total groundfish effort and was dominated by vermilion, gopher and brown rockfishes. Lastly, northern California (Point

Mendocino to the California Oregon border) accounted for 18% of the estimated catch; the majority was black rockfish followed by moderate amounts of lingcod and vermilion rockfish.

Petrale Sole Fishery. Petrale sole is a larger flatfish and among the most valuable commercial flatfish found throughout the state of California. Petrale sole landings have been documented in California as far back as the late 1800s but were only officially recorded by the Department since 1969 (fig. 9). Over the last decade, petrale sole had an average ex-vessel value of \$1.3 million annually followed by a drop in 2010 (due to regulation changes—see below) with an ex-vessel value of \$557,411. It is primarily a trawl-caught species and the fishery is characterized by a strong winter and summer seasonality. During winter months, petrale sole aggregate in deep water for spawning and the trawl fleet harvests greater volume with less catch of associated groundfish species (such as chilipepper). Conversely, during spring and summer petrale sole are found in shallower water spread out over the continental shelf where they are harvested with a large mixture of slope rockfish species. It is commonly caught with sablefish, Dover sole and other flatfishes throughout the year.

In the recreational fishery, petrale sole is not a targeted species but is taken while prosecuting other species. An evaluation of both MRFSS and CRFS data suggests that since 1980 estimated annual recreational catch of petrale sole averaged 43 t.

Petrale Sole Stock Assessment and Management. Because of the economic and biological importance of petrale sole, periodic stock assessments are conducted. In 2009, the Council adopted a new full stock assessment for the stock along the Pacific West Coast of Washington, Oregon and California. The assessment indicated the stock

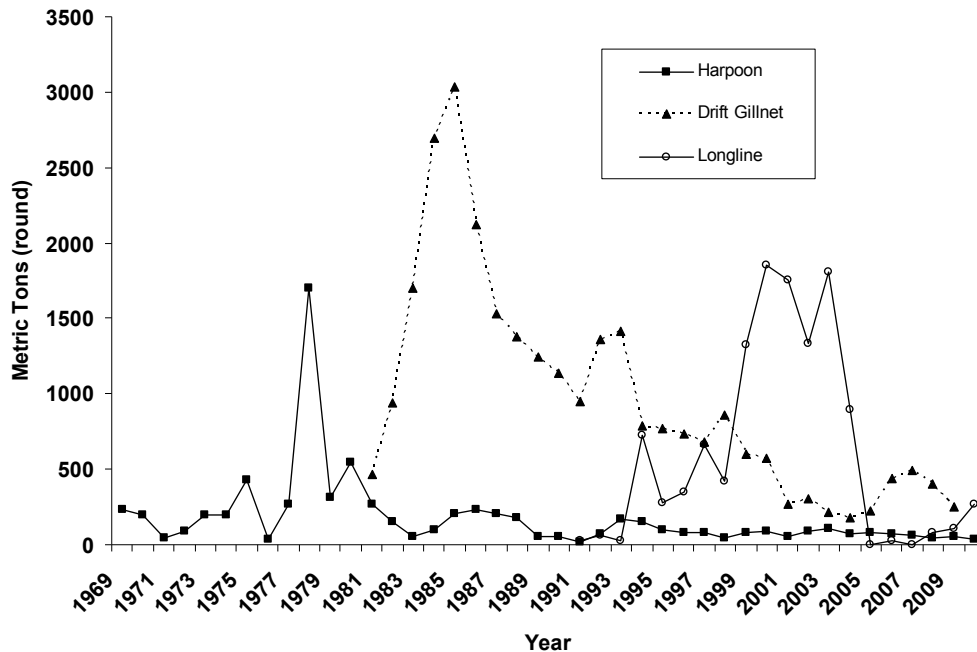


Figure 10. California landings (round weight) of swordfish by gear type 1969–2010.

was at 11.6% of its unfished biomass and officially “overfished” (under the NMFS newly revised threshold reference point for flatfish at 12.5% of unfished biomass.) This prompted the Council to recommend immediate action to decrease the fishing pressure on petrale sole in the 2010 season by limiting access to winter fishing grounds and reducing trip limits. These restrictions led to the 60% decrease in petrale sole landings and 51% decrease in ex-vessel value from 2009 to 2010. To offset this lost opportunity, the Council also recommended increased harvest amounts for other species of healthy groundfish such as sablefish, longspine and shortspine thornyheads, slope rockfishes and Dover sole. Stocks declared overfished have been given a standard of 10 years to rebuild and require strict management measures in both state and federal waters, including strict annual catch limits. Because petrale sole grow quickly and reach maturity at a young age the recommended management changes lead to a projection of petrale sole to be rebuilt by 2016, well within the 10 year goal. In addition, the NMFS implemented the Shorebased Individual Fishing Quota program in early 2011, which is expected to keep landings of petrale sole (and all other groundfish trawl species) within the trawl allocation limits that have been established.

Highly Migratory Species

Swordfish. Swordfish (*Xiphias gladius*) is the most valuable highly migratory species (HMS) taken in California, in both price-per-kilogram and total revenue; most landings take place in California. In 2010, 367 t of swordfish with an ex-vessel value of \$2.2 million were

landed in California, a 10% decline from landings in 2009 of 407 t. For 2010, 10% were taken by harpoon gear, 16% were taken by drift gill net gear, and 74% were taken by hook and line gears (mostly Hawaiian vessels fishing outside the Exclusive Economic Zone). Swordfish landings have been affected dramatically by the gear used and management measures implemented over the decades. The 1970s were dominated by harpoon, the 1980s and 1990s by drift gill net gear, and the 2000s by longline gear (fig. 10). Revenues for swordfish peaked in 2000 at \$11.3 million and have varied with management measure and gear type. Generally, annual revenues have averaged about \$800,000 for harpoon, \$3.2 million for drift gill net, and \$2.2 million for longline since the fisheries started (fig. 11).

In 2010, the Council decided to change regulations involving the possession and landing of incidentally caught swordfish in the deep-set tuna longline fishery off the West Coast. Formerly, only 10 swordfish were allowed to be retained; the regulation change would allow a 10 fish trip limit if fishing with J-hooks, a 25 fish trip limit if fishing with circle hooks, and no limit if the vessel were carrying an observer. These regulation changes are more consistent with those in the Hawaiian deep-set tuna fishery, and came into effect in April 2011.

Recreationally caught swordfish are an extremely rare occurrence along the West Coast. Since 2003, swordfish have only been caught recreationally in California in 2007; none were recorded in 2010.

Albacore. Albacore (*Thunnus alalunga*) is the most

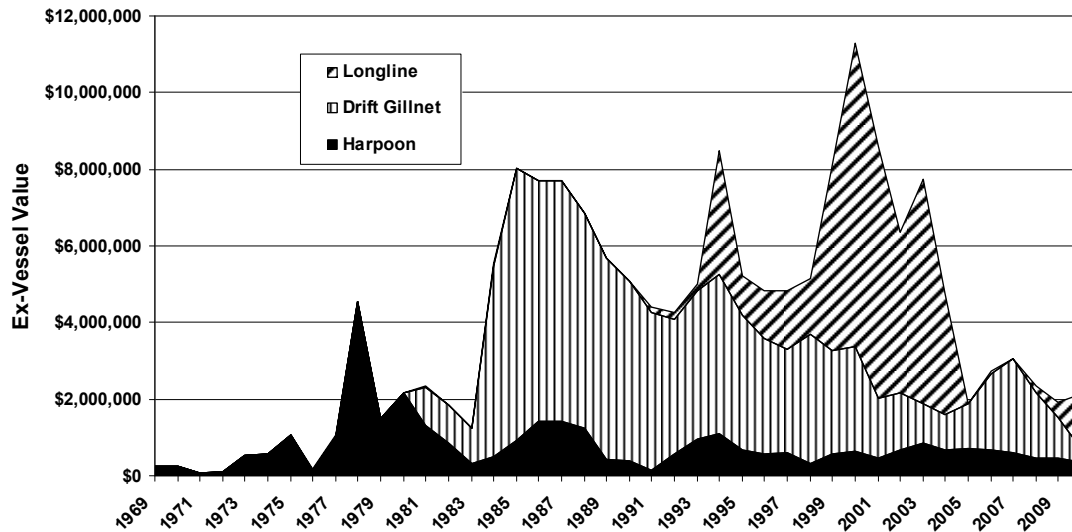


Figure 11. Annual ex-vessel revenue of CA swordfish by gear type 1969–2010.

abundant tuna caught in commercial fisheries and recreational fisheries in California and along the West Coast. In the commercial fishery albacore are caught primarily using hook and line gear (jigs, bait, or trolling), but they are also taken in drift gill nets or purse seines. Along the entire West Coast 11,855 t were landed in 2010, a decrease of 4% coastwide from 2009, when 12,307 t were landed. However, California landings nearly doubled from last year at 742 t. In 2010 the ex-vessel value in California was \$1.8 million with a price-per-kilogram of \$2.42/kg (\$1.10/lb), a few cents lower than the coastwide average. Albacore was the only HMS to be landed in Oregon (4,854 t) and Washington (6,259 t), although in volume it made up 90% of all HMS landed on the West Coast.

Estimates from RecFIN indicate that anglers landed about 10,000 albacore in California, out of 80,000 caught coastwide, mostly in the private/rental boat mode; 38,000 were taken in Oregon and 32,000 in Washington.

Yellowfin Tuna. Landings of yellowfin tuna (*Thunnus albacares*) declined further over 2009's low of 45 t to less than 1 ton landed in 2010, with an ex-vessel value of \$6,861; however the price-per-kilogram was \$9.04, presumably because of scarcity, as compared with \$1.11/kg in 2009. All yellowfin was landed in California by longline gear. About 18 t of fresh yellowtail was exported to Canada and Thailand. CPFV logbooks reported anglers caught 30,961 yellowfin tuna in 2010, with 85% of those fish taken in Mexican waters; this is a 64% drop from 87,064 fish reported in 2009.

Skipjack Tuna. Commercial landings of skipjack tuna (*Katsuwonus pelamis*) in 2010 cannot be reported due to confidentiality requirements and there were no exports. There were 5 t landed in 2009. No skipjack tuna were sampled in 2010 by RecFIN, although California

CPFV logs reported 318 fish taken, 98% of which were caught on trips to Mexican waters. This is a 96% drop from 2009, when nearly 7,000 skipjack were taken by CPFV anglers (78% from Mexico).

Bluefin Tuna. Commercial landings of bluefin tuna (*Thunnus thynnus*) also sharply declined in 2010 with only 1 t landed in California. Landings in 2009 had been a five year high at nearly 500 t coastwide (415 t in California and 75 t in Oregon). Ex-vessel price increased to \$4.38/kg in 2010, from 1.54/kg in 2009. Nearly all of bluefin caught in 2010 was taken in drift gill nets, in comparison to 2009, when most of the landings came from purse seine gear. Three tons of frozen bluefin tuna was exported to Canada. RecFIN estimates sport anglers took only 20 bluefin tuna in 2010, whereas in 2009 almost ten times as many were landed. CPFV logs report about 8,173 bluefin taken in 2010, with 95% of that occurring in Mexican waters, declining 32% from 2009, when anglers took 12,037 fish (78% from Mexican waters).

Common Thresher Shark. Common thresher shark (*Alopias vulpinus*) is the most common and most valuable shark taken in HMS fisheries. As in 2009, 90% of commercially-caught thresher shark was taken in gill net fisheries in 2010. Landings of common thresher shark declined by 11% from 107 t in 2009 to 95 t in 2010. Ex-vessel value was \$154,835 at an average of \$2.77/kilogram dressed weight (\$1.26/lb), decreasing from \$3.14/kg (\$1.43/lb) in 2009. California CPFV logs reported 70 threshers caught. RecFIN landings, which include private boats, estimate anglers landed about 1300 thresher sharks in California (less than 10 in Oregon); a decrease from the estimated 2000 last year.

Shortfin Mako Shark. Shortfin mako shark (*Isurus oxyrinchus*) is the second most common shark landed in California HMS fisheries; 87% of were taken by gill net

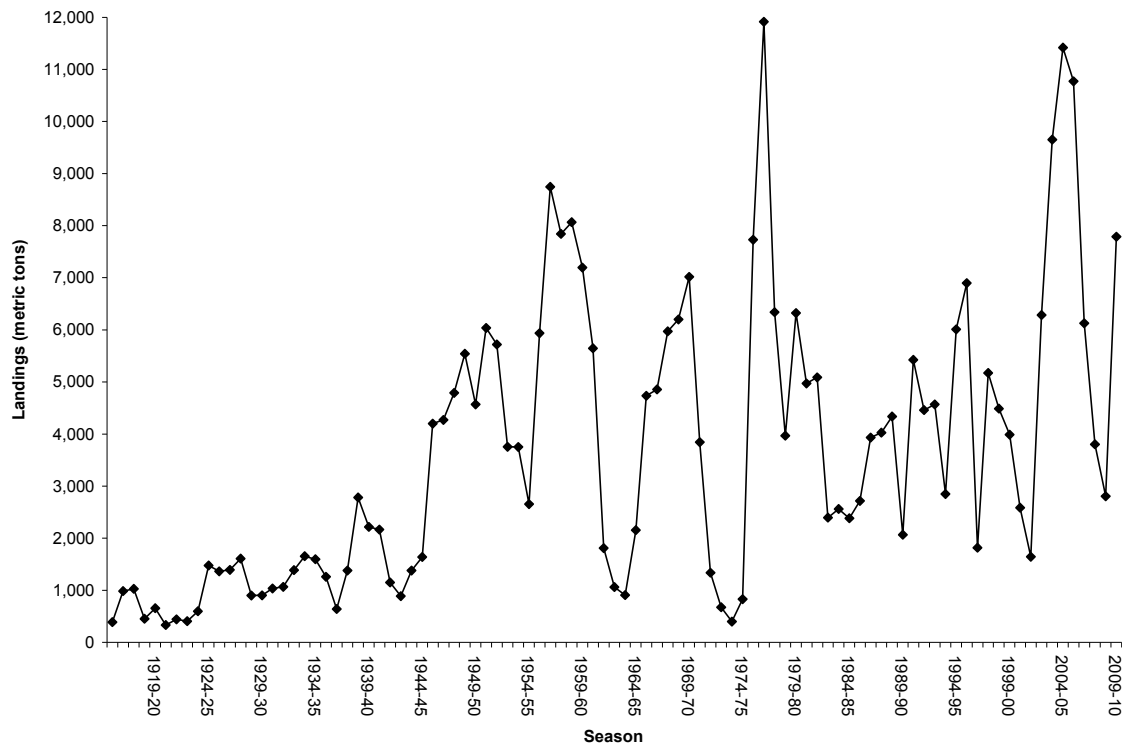


Figure 12. California commercial Dungeness crab (*Metacarcinus magister*) landings, 1915–16 to 2009–10.

gear in 2010, with 13% taken by hook and line gear. Mako shark landings decreased 29% from 2009’s landings of 30 t to 21 t in 2010. Ex-vessel revenue was \$35,565, with an average price-per-kilogram of \$2.44 (\$1.11/lb) dressed weight, a slight decrease from \$2.64/kg (\$1.20/lb) in 2009. CPFV logs reported 268 mako sharks taken in 2010, a decrease of 26% from 359 in 2009, while Rec-FIN estimated 361 taken by primarily private vessels.

Dorado (dolphinfish). Commercial landings of dorado (*Coryphaena hippurus*) increased to 3.7 t in 2010, more than five times the amount landed in 2009. The ex-vessel revenue was \$15,851, at \$4.73/kg, 24% less than 2009’s price-per-kilogram of \$6.25/kg. In contrast, CPFV logs recorded a decrease in landings in 2010, with 1,317 fish landed, only 7% of the previous year when anglers took 18,981 fish; 86% of dorado taken by CPFVs in 2010 were from Mexican waters.

HMS Management. In light of the Magnusson Act Reauthorization, the Council approved Amendment 2 to the Highly Migratory Species Fishery Management Plan (HMS FMP) on Annual Catch Limits for HMS. As part of this decision, management unit species were redefined as albacore tuna, bigeye tuna, skipjack tuna, bluefin tuna, yellowfin tuna, striped marlin, swordfish, blue shark, common thresher shark, shortfin mako shark and dorado. Bigeye thresher shark and pelagic thresher sharks were moved from management unit species to ecosystem component species, that is, species which are

occasionally incidentally caught, but either in limited amounts or seldom retained. These also included common mola, escolar, lancetfishes, louvar, pelagic stingray, and wahoo. The Council included language: 1) to apply the international exception to all management species (i.e., to be managed according to measures of international Regional Fishery Management Organizations); 2) on the need to coordinate with the Western Pacific Fishery Management Council as to lead roles for particular species; 3) that estimates of maximum sustainable yield (MSY) and optimum yield (OY) can be adjusted as new data become available, but in the interim will be used as currently described in the FMP.

Dungeness Crab

The fishery for Dungeness crab, *Metacarcinus magister*, (formerly *Cancer magister*) is highly cyclical and spans the West Coast of North America from Alaska to Point Conception, California. California commercial landings of Dungeness crab for the 2009–10 season totaled 7,789 t, more than double the catch of the 2008–09 season, and just above both the 10-season and 50-season moving averages of 6,288 t and 4,535 t, respectively (fig. 12). The 2009–10 season marked the beginning of an upturn in the catch cycle from a low of 2,807 t the previous season. The average price paid to fishermen was \$4.39/kg (\$1.99/lb) resulting in a total ex-vessel value of \$34.2 million. Value increased by 133% from the previous sea-

son, which was worth an estimated \$14.7 million. The rate of increase in landings and value over the previous season was relatively even between the two fishing regions of northern and central California. During the past decade, northern California landings have averaged three times the amount of central California catches, with the regional boundary at the Sonoma/Mendocino county line. Initial data from the first six weeks of the 2010–11 season ending on Dec 31, 2010, indicate a dramatic and unprecedented shift in catch to the central coast, with 6,145 t landed in central California out of a statewide total of 8,187 t, already exceeding the previous season's total catch.

Dungeness crab is one of California's largest and most valuable commercial fisheries, managed through the state legislature, and is also the basis of a robust sport fishery, managed through the Commission. The commercial fishery regulations are comprised of size, sex and seasonal restrictions, along with restricted access to the fishery. Only male crabs larger than 159 mm (6.25 in) carapace width are harvested commercially. The minimum size limit is designed to protect sexually mature male crabs from harvest for at least one season. This provision seems successful because studies have shown that, despite the presumption that nearly all legal sized male crabs are harvested each season, most sexually mature female crabs are fertilized each year. The central California season, south of the Mendocino/Sonoma County line, begins 15 November and ends 30 June. The northern California season, north of the line, conditionally begins on 1 December and ends 15 July. The timing of the seasons avoids the portion of the lifecycle when most crabs are molting or soft-shelled, and thus vulnerable to predation and handling mortality.

Mature males molt annually in the summer and then begin gaining weight in their new shells. The timing of this molt varies, but the 1 December fishery opening along most of the West Coast usually results in adequately filled out crab reaching the popular holiday markets. However, commencing in the 1995–96 season the state legislature authorized an industry-funded pre-season crab quality test to ensure crab are ready for harvest on the target opening date. The test is conducted in concert with tests in Washington and Oregon. The states then mutually agree, through the Tri-state Crab Committee, on whether to delay the opening of the season in order to let the crabs accumulate more body meat weight. Thus far, only the 2005–06 northern California season has been delayed via this process. The 2010–11 season was delayed unofficially until December 10, north of Sonoma County, by mutual agreement of fishermen and processors, but not by action of the state agencies. Central California coast crab typically molt earlier than northern crab, and the area is not included in the test-

ing procedure or subject to opening delays. In case of a northern season delay, "fair start" statutes mandate that anyone fishing in the central area must wait 30-days after the delayed northern season opener to fish in those northern waters.

The sport fishery is mainly controlled through size, season, and bag limit regulations. The minimum size for sport fishing is 146 mm (5.75 in) and, unlike the commercial fishery, the take is not legally limited to male crabs. The daily bag limit and possession limit is ten crabs. Sport fishers on CPFVs, a growing trend in the last decade, are generally subject to the same regulations, except that when fishing from Sonoma County and south, the bag limit is reduced to six and the size limit is 152 mm (6.0 in). In November 2009, the CRFS began sampling Dungeness crab sport fishing from shore and private, rental and CPFV vessels. CRFS estimated that for the 2009–10 recreational season, 365,000 Dungeness crabs were caught—mostly using vessels. This represents less than 250 t based on an estimated weight of 0.68 kg (1.5 lb) per crab, or about 3% of the commercial catch during this time period.

Of the approximately 585 vessels with a 2010 commercial Dungeness Crab Vessel Permit, 397 boats made at least one landing in the 2009–10 season. The Dungeness crab fishery can be characterized as a derby-type fishery where much of the total catch is caught in a relatively short period of time at the beginning of the season. For example, in the 2009–10 season, 80% of the statewide catch was landed by 1 January—only six weeks after the northern season opened in central California. There is no limit to the number of traps a vessel may fish or the frequency with which they are fished, and no reliable estimates of either effort level. As the groundfish industry has declined, larger multipurpose vessels have devoted more effort to Dungeness crab. According to a 2003 CalCOFI report based on a fisherman survey, there were at least 172,000 traps being fished in California during the 2001–2002 season. In Oregon's comparable Dungeness crab fishery, the estimated number of traps soared from 150,000 in 2002 to 200,000 in 2005 before implementation of a trap limit program. Complaints of overcrowded fishing grounds, in central California in particular, have escalated in recent years.

Concerns over effort in terms of crab traps, deployed in both central and northern California, led to multiple unsuccessful legislative attempts by California fishermen to create a trap limit program for their district. Failures to reform the fishery in the past were generally attributed to lack of agreement between fishermen in the two regions. In 2008, a small group of crab fishermen, with assistance from an environmental non-profit organization, prompted the passage of legislation which mandated the formation of a Dungeness Crab Task Force

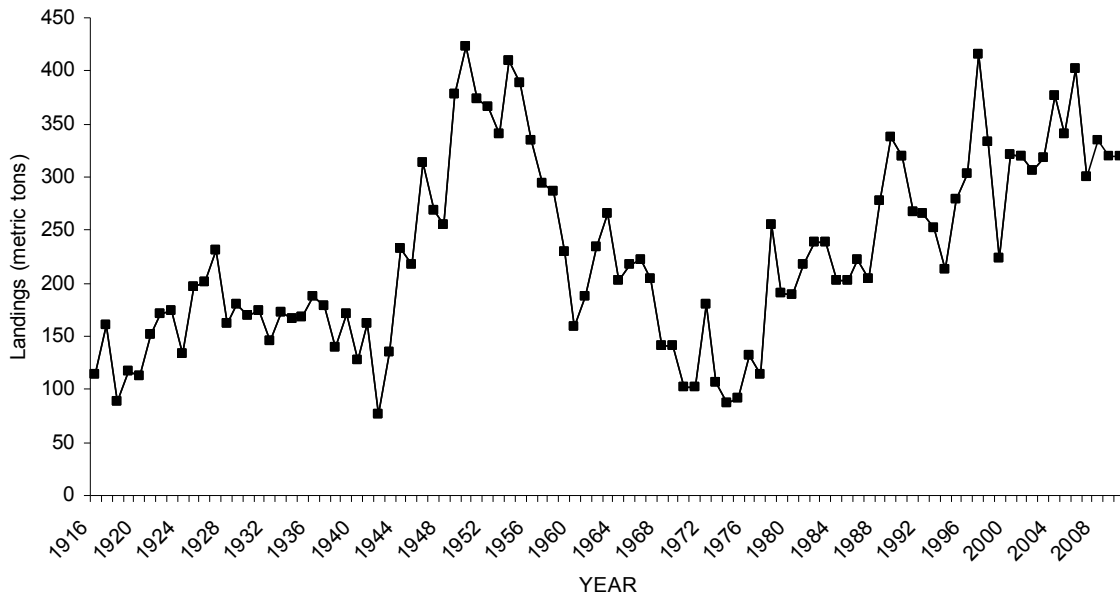


Figure 13. California commercial spiny lobster (*Panulirus interruptus*) landings by weight, 1916–2010.

(DCTF) comprised of commercial and sport fishing representatives along with non-governmental and government agency advisors. A total of 24 recommendations and five objectives were included in two final reports produced by the Task Force in January 2010. Recommendations included support for controlling total allowable commercial effort, defining latent permits, putting special restrictions on latent permits, defining vessel size expansion, preventing permit transfers to fish processors, continuing current management schemes (size, sex, season), and—most notably—a strong recommendation for an industry funded, statewide, tiered trap limit program. As of May 2011, a bill extending the existence of the DCTF and creating a trap limit program was moving forward through the legislative process.

California Spiny Lobster

A total of 319 t the California spiny lobster (*Panulirus interruptus*) was commercially landed in 2010, a 1 t less than in 2009 (fig. 13). While substantially lower than the recent peak of 403 t in 2006, the 2010 landing total continues a trend of 300 t, or more, lobsters landed per calendar year since 2000. The 2010 ex-vessel value of the lobster fishery was \$11.13 million, up from the \$7.89 million in 2009, and greatly surpassing the previous high of \$8.06 million set in 2006.

The commercial and recreational seasons for harvesting California spiny lobster begin in late September and extend to the middle of March. Essential commercial fishery information is collected using fishermen logbooks and dealer landing receipts. Logbooks record location and date of catch, number of traps pulled, and number of lobster kept and released. Landing receipts

record catch location, size of catch in pounds, and the price paid per pound. The recreational season is monitored through the use of a lobster report card introduced at the beginning of the 2008–09 recreational season and from data collected by California Recreational Fisheries Survey samplers.

The commercial lobster fishery is managed by a restricted access program. In 2010, there were 200 lobster operator permits and three-quarters of those permits are transferable. Since April 1, 2008, there have been no restrictions on the number of transferable permits that can be transferred. Seventeen permit transfers took place in calendar year 2010. In the 2009–10 season, the number of active fishermen numbered 152, almost equal to the 151 fishermen that were active during 2008–09.

Currently, there are no limits on the amount of lobster that permittees can land or the number of traps they can use. Traps are generally set along depth contours in the vicinity of kelp beds along the mainland and at all the Channel Islands. Typically, between 100 and 300 traps are set at a time although operators with larger boats or a crewmember may set more. Soak times in 2009–10 averaged three days. The total number of trap pulls in the 2009–10 season is estimated at 859,000 resulting in a catch of approximately 1.7 million lobsters, of which 28% were retained which translates to a preliminary landing weight of approximately 319 t. The landing weight of the 2008–09 season was higher than that of the 2009–10 season at 330 t.

The median ex-vessel price for the 2009–10 season was \$26.46/kg (\$12.00/lb). The median ex-vessel price for the 2010 calendar year, however, jumped to \$35.27/kg (\$16.00/lb) due to a dramatic increase in price paid

for lobster that began with the arrival of the 2010–11 season. The ex-vessel price ranged from \$17.64/kg (\$8.00/lb) to \$37.48/kg (\$17.00/lb) for the 2009–10 season and from \$17.64/kg (\$8.00/lb) to \$40.79/kg (\$18.50/lb) for the 2010 calendar year. The ex-vessel value of the 2009–10 lobster season was \$9 million. Point Loma landings had the highest ex-vessel value at \$1.39 million representing 15% of the total season value.

Recreational fishermen are allowed to catch lobster by hand when snorkeling or scuba diving, or by using baited hoop nets. Up to five baited hoop nets per person, with a maximum of ten hoop nets per boat, can be used. There is a daily bag and possession limit of seven lobsters per fisherman. In both the recreational fishery as well as the commercial fishery, lobsters must exceed a carapace length of 82.6 mm (3.25 in) to be kept. A 1992 Department creel survey involving four sites in San Diego and Ventura counties during the first two weekends of the season revealed that approximately 80% of the interviewed lobster fishermen used scuba gear to catch lobsters; 20% used hoop nets. A 2007 creel survey was conducted at the same 1992 survey sites during the first 10 weeks of the 2007–08 lobster season. Using data from the first two weekends, this creel survey found the opposite: approximately 80% of the fishermen used hoop nets while only 20% used scuba gear. Recent years have seen the introduction of a more efficient hoop net into the fishery which a Department study showed can catch 57% more lobster than a traditional hoop net with the same effort.

A lobster report card, which is issued for the calendar year like the annual fishing license, was introduced in fall 2008. Fisherman fishing for lobster are to record the time, location, gear, and retained catch, if any, by trip. There were approximately 27,500 cards sold in 2008, 31,000 cards sold in 2009, and 29,000 cards sold in 2010. These numbers estimate the potential extent of recreational fishery effort; however there is an additional and unquantified population of poachers retaining lobsters illegally. The return rate of cards has precipitously fallen—from 22% of 2008 cards, to 14% of 2009 cards, to 11% of 2010 cards. Due to low return rates of cards, certain assumptions are made by the Department and the true ratio of hoopnetters to divers remains unknown although some constants can be seen in the first few years of report card data. The % of returned report cards indicate that lobster fishing effort has remained at about 86%. The % of fishing trips that caught zero lobsters has remained fairly constant at 36–40%. The mean number of trips per card has fluctuated from 4.4 trips per card in 2008, to 5.3 trips per card in 2009, and 5.1 trips per card in 2010. Catch per trip and catch per card have remained constant. From 2008–2010, catch per trip only varied from 2.1 to 2.2 lobsters per trip. During the same

time period, catch per card has varied from 9.1 lobsters in 2008, to 11.6 lobsters in 2009, to 10.5 lobsters per card in 2010.

Department biologists extrapolated the available report card data to obtain estimates of the 24,000 lobster fishermen that actually fished in 2008, the 26,500 that fished in 2009, and the 25,000 that fished in 2010. An estimated 219,300 lobsters were retained in 2008, 308,400 in 2009, and 262,100 in 2010 by the recreational fishery. Department creel survey data indicates that a legal sized (83 mm) lobster weighs on average 0.59 kg (1.3 lbs), allowing a total retained weight of the recreational catch to be estimated. For 2008, total retained catch was estimated at 129 t (285,000 lbs), 2009 total retained catch was estimated at 182 t (401,000 lbs), and 2010 total retained catch was estimated at 155 t (341,000 lbs). The recreational fishery landed an amount of lobsters equal to 39% of commercial landings in 2008, 57% of the commercial total in 2009, and 49% of the commercial total in 2010. The establishment of the lobster report card has allowed the Department to estimate the size of the recreational fishery and to determine that it is indeed a significant portion of the total lobster harvest in California.

In 2009, spiny lobster were identified within the Department as a high-priority for the development of a fishery management plan (FMP). As an early part of the FMP process, a stock assessment was initiated. First, data sources were identified and evaluated for use in the effort. Since there is currently no fishery-independent index of abundance for spiny lobster north of the Mexican border that covers the full range of the stock, an effort was made to concentrate on data sets that cover the entire Southern California Bight. The Department digitized over 20 years of commercial logbook information as well as the newly introduced recreational lobster report cards. Data entry occurred in parallel with the stock assessment efforts that continue to this day. The assessment effort initially concentrated on the development of models and approaches that could provide reference points for the FMP, focusing primarily on using a surplus production model (ASPIC). Preliminary steps were also taken to develop size/age structure information for use in more sophisticated approaches. Ultimately, the ASPIC model failed with the datasets available. A model based on Beverton and Holt invariant methods, used to evaluate the Baja fishery, could provide valuable information and reference points, and will be evaluated in 2011.

Spot Prawn

Preliminary 2010 spot prawn (*Pandalus platyceros*) landings were 110 t, a 14% decrease from 2009 (128 t) (fig. 14). Market demand for spot prawn is high, and

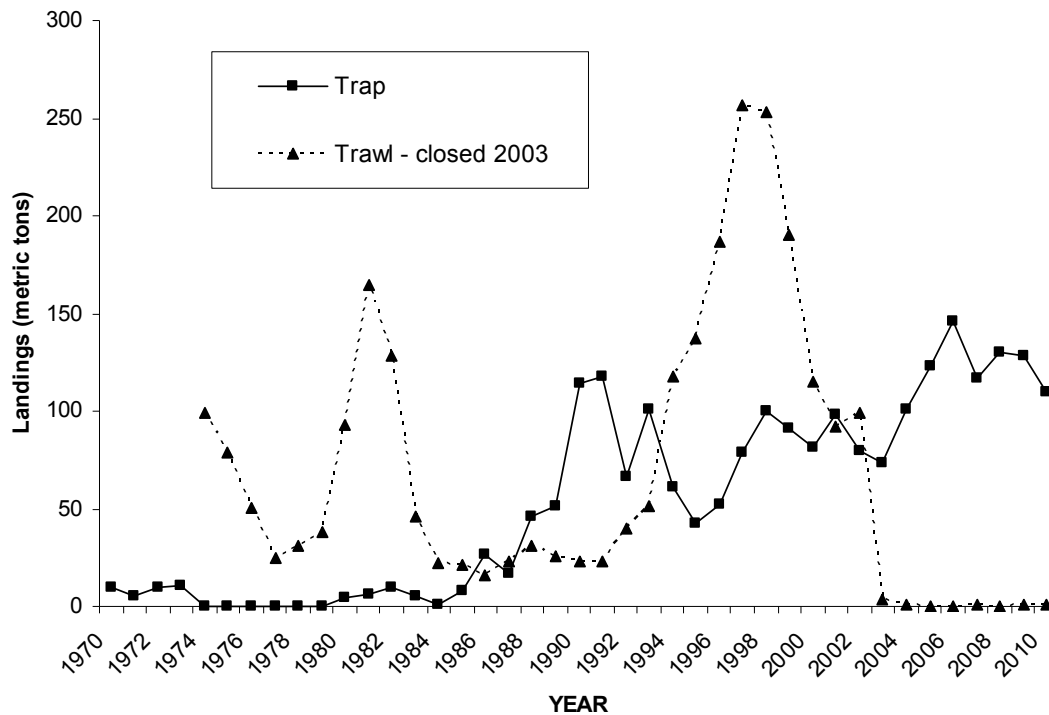


Figure 14. California spot prawn (*Pandalus platyceros*) landings, 1970–2010.

the decrease in landings is most likely due to the poor weather and sea conditions that characterized 2010. The spot prawn fishery originated in Monterey Bay as an incidental catch in octopus traps. In 1974, a trawl fishery targeting spot prawns developed off Santa Barbara. Until 2002, spot prawn were harvested by trawl and trap gear. In 2003, the use of trawl gear for the take of spot prawn was outlawed because of the bycatch of rockfish, particularly bocaccio, an overfished species. Consequently, 2003 spot prawn landings were the lowest since 1987 when trapping was just getting underway in southern California. The annual trap harvest has averaged 122 t since 2004, and appears to be sustainable.

Spot prawn is currently caught only with trap gear, although a small amount shows up as bycatch in the ridgeback prawn trawl fishery. Spot prawn traps are required to be made of mesh with a minimum inside measurement of 2.22 x 2.22 cm (7/8 x 7/8 in). The traps may not exceed 1.8 m (6 ft) in any dimension. The baited traps are fished in strings at depths of 174–302 m (95–165 fathoms) along submarine canyons or shelf breaks. Each string consists of a ground-line with anchors and a buoy at one or both ends, and 10 to 30 traps attached. No other species may be taken in a prawn trap, so all bycatch is returned to the water immediately. Fishermen are required to fill out a logbook.

A two-tiered restricted access trap vessel permit program was initiated in 2002. Tier 1 permittees may use no

more than 500 traps, unless fishing in state waters north of Point Arguello where they are only allowed the use of 300 traps. Tier 1 permits became transferable on April 1, 2005, and there are currently 17 vessels in Tier 1. The Tier 1 vessel permits are sold on the open market and are the highest priced permit in California fisheries. The Department receives a transfer fee of \$50.00 when a permit is transferred to the new vessel owner.

Tier 2 vessel permittees made a smaller number of qualifying trap landings, and are limited to an annual harvest quota of just over 2 t. Permittees may use no more than 150 traps and the permits are non-transferable. There are three Tier 2 vessels.

When the use of trawl gear for the take of spot prawn was prohibited, the Commission directed the Department to develop a conversion program for the trawl fleet. A conversion program went into effect in 2005, which allowed the owners of a dozen former spot prawn trawl vessels to purchase Tier 3 spot prawn trap vessel permits that year. Tier 3 permits have the same restrictions as Tier 1 permits with the major exception of the permits being non-transferable. Eight Tier 3 vessels remain. In 2010, the fee for the Tier 3 permit was \$1,269.00, whereas both Tier 1 and Tier 2 vessel permits were \$317. Permits must be renewed annually or they are lost.

In 2010, 19 trap permittees landed spot prawn. Four of the 19 permittees fished north of Point Conception, mainly in the vicinity of Monterey Bay Canyon. The remaining 15 vessels fished in southern California, fre-

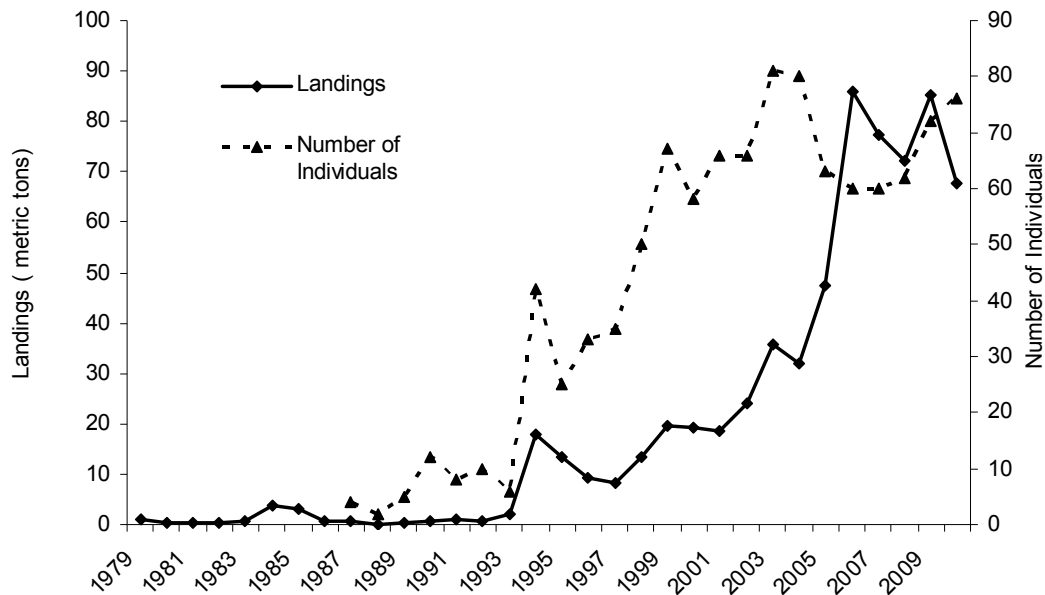


Figure 15. California commercial landings of Kellet's whelk (*Kelletia kelletii*), 1979–2010.

quently off one of the Channel Islands. This fishing pattern has been stable for the past five years.

Fifteen of the 17 Tier 1 trappers landed 86% of the catch, with each vessel landing an average of 6.3 t. All three Tier 2 fishermen fished, and only one of the Tier 3 permittees went fishing. The other seven Tier 3 permittees have not had the capital necessary to purchase a vessel more suitable for trapping, or the necessary traps and associated ground tackle. A 22.7 kg (50 lbs.) allowance of spot prawn while trawling for ridgeback prawn is still legal, but spot prawn may not be landed as bycatch when trawling for pink shrimp.

Almost all spot prawn harvested is sold live, with ex-vessel prices ranging from \$22 to \$31/kg (\$10.00 to \$14.00/lb). Fresh dead spot prawn generally sells for half the price of live. Most trap permittees have invested in live tanks and chillers on their vessels to keep the prawns in top condition for the live market. The trap fishery in southern California (south of Point Arguello) is closed from 1 November to 31 January to provide protection for ovigerous females. North of Point Arguello, the spot prawn trap season is closed from 1 May to 31 July, an accommodation to prevent serious fishing gear conflicts in the Monterey Bay area.

Kellet's Whelk

Kellet's whelk (*Kelletia kelletii*) supports a growing commercial fishery, but is not important recreationally. Commercial landings increased steadily from insignificant levels in the early 1990s to nearly 80 t in 2006 (fig. 15). During the most recent five years, catches have averaged 78.8 t. Landings in 2010 were 67.5 t with an ex-vessel value of \$117,000.

The Kellet's whelk is a large predatory gastropod in the family Buccinidae. Kellet's whelk shells can reach nearly 179 mm (7 inches) with conspicuous whorls, conchlike in appearance and tan to white or green coloration. Whelks inhabit subtidal rocky substrates from the intertidal to depths of 70 m. The historic distribution of whelks extends from Isla Asuncion in Baja California, Mexico to Point Conception north of Santa Barbara, California. In the 1980s whelk expanded their historic range when they were observed north of Point Conception in Monterey Bay, California.

Little is known about the population status of Kellet's whelk. Several subtidal monitoring programs quantify whelks since they are large conspicuous snails. One trend that has been quantified is that whelk in the historic portion of their range in the Southern California Bight are at higher densities than at the northern end of the new range north of Point Conception. One study found densities of adult whelk tenfold greater at sites south of Point Conception compared with newly inhabited sites north of Point Conception. Furthermore, sites to the north lack small whelks in some years suggesting there may be irregular recruitment.

The number of annual participants in the commercial fishery has fluctuated around seventy individuals during the past decade, following a steady increase in the 1990s. The average whelk in the fishery weighing 150 g, which equates to roughly 2.65 million whelk taken since 2006. Whelk are commercially caught in southern California incidentally in lobster and crab traps, and are also targeted with a small dive fishery. In 2010, the dive fishery landed just 1% of the catch. The peak year for the dive fishery was 2003 when the fishery landed 8.4 t, account-

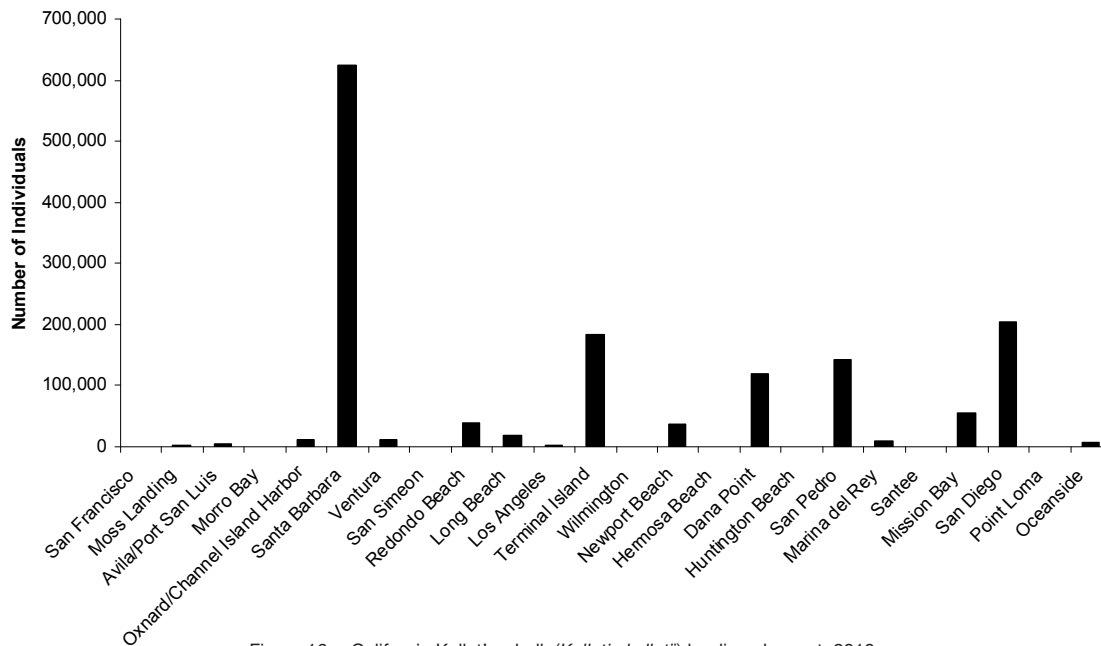


Figure 16. California Kellet's whelk (*Kelletia kelletii*) landings by port, 2010.

ing for 24% of the total catch. Since then, the dive fishery has decreased in importance, comprising only 3% of the total landings over the past five years. Whelk landings in the fishery are spread evenly across the 12 months of the year.

Whelk are taken in the southern California rock crab fishery which is open year round and the lobster fishery which is open from October to mid-March. Whelk may not be taken in the tidal invertebrate zone between the high tide mark and 1,000 feet beyond the low tide mark. In addition, commercial divers must hold a commercial dive permit and recreational divers must adhere to the distance restrictions while obeying a 35 whelk per day bag limit. Scientific collectors during the four year period from 2003–2006 took a total of 2,066 whelk.

Most whelk are landed in five ports in the Southern California Bight (fig. 16). The top port is Santa Barbara, followed by San Diego, Terminal Island, San Pedro and Dana Point. These top five ports account for 86% of the catch. Kellet's whelk are fished for human consumption and sold live in fresh fish markets. Ex-vessel value in the fishery closely tracks landings over time with the highest values during the years of the highest landings. The value of the fishery in 2010 was \$117,000 with the average of the last five years slightly higher at \$134,000.

Emerging Fishery Status. In April 2011, Kellet's whelk was named an emerging fishery by the Fish and Game Commission. A fishery can be designated as an emerging fishery as outlined in Fish and Game Code if the landings or the number of participants increases or if the gear efficiency increases such that "*the existing regulations are not sufficient to insure a stable, sustainable fishery.*"

Both landings and the number of participants in this fishery have increased dramatically since 1993. In addition, there is concern that the new transferability of the southern rock crab trap permits may also lead to an increase in Kellet's whelk landings. Furthermore, rock crab trap permits are relatively inexpensive (\$350) and transfer fees are \$1,000. However transferable permits on the open market can sell for more than 10 times this amount. Therefore, the whelk fishery was deemed to meet the conditions necessary for listing as an emerging fishery.

Management Considerations. Although currently there are no management measures in place for Kellet's whelk, there are a number of options available for consideration. One possibility is size limits structured to allow for a number of spawning seasons prior to entry into the fishery. Implementation of size limits would require site-specific information about size-frequency distributions. Season closures could be established to avoid months when mating and spawning takes place to protect reproduction. Since the fishery operates during all months, biological spawning considerations could help guide season closures. Catch limits could be implemented in the fishery to conserve the resource and provide for a sustainable fishery. More work quantifying the density of whelks at numerous sites could be conducted to inform decisions about possible regulations. Finally, gear restrictions and or depth restrictions could be implemented in the fishery. Depth limits could be implemented to ban the catch of whelk in traps at certain depths providing a refuge in depth from fishing mortality. This approach is currently used in the recreational red abalone fishery in northern California where

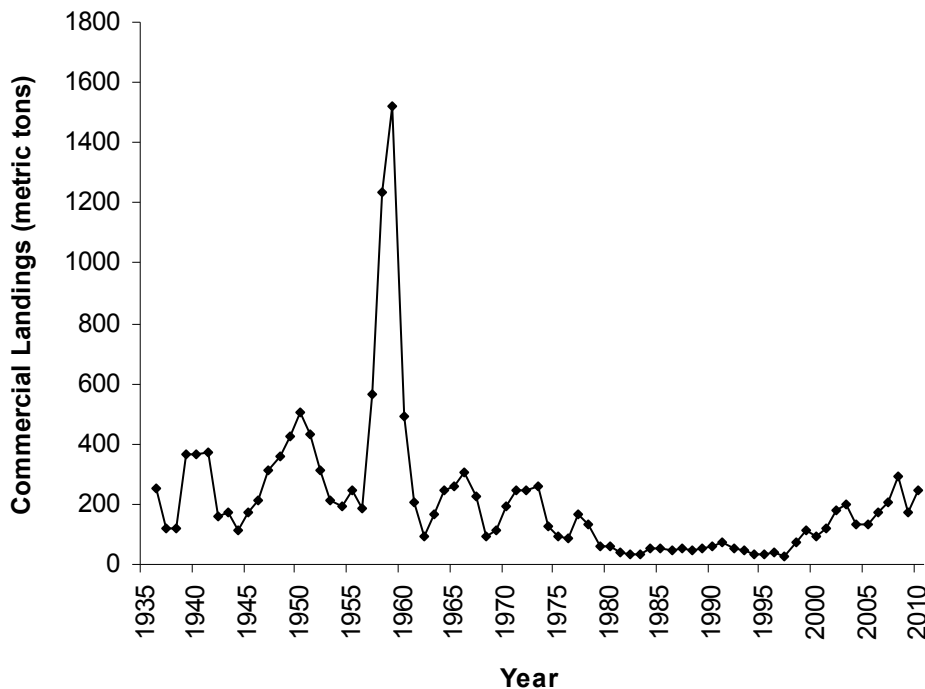


Figure 17. California commercial white seabass (*Atractoscion nobilis*) landings, 1935–2010.

only free divers are permitted to fish, which in effect excludes abalone in the deeper habitat from the fishery.

White Seabass

The white seabass (*Atractoscion nobilis*) is the largest member of the Sciaenid family found in California waters. In addition to being a popular sport fish, white seabass is also targeted by a commercial fishery. The commercial white seabass fishery landed 243 t in 2010 (fig. 17), a 39% increase from the 2009 total of 175 t. Estimates of recreational take for 2010 are generated from the CRFS for the private boat and shore-based modes. The estimate of recreational take increased by 56% to 121 t in 2010 from the previous year's total of 77 t. The recreational catch estimates prior to 2004 are from a different survey and are not directly comparable to the estimates from the CRFS (see Groundfish, Recreational Fishery, above). However, historical trends in the recreational catch of white seabass can be determined from CPFV logbook data (fig. 18). The combined commercial and recreational catch for 2010 was 364 t.

Commercial and recreational fisheries for white seabass in California have existed since the 1890s. Historically, commercial landings have fluctuated widely, including the landings of white seabass taken in Mexican waters by California commercial fishermen. In 1959, the white seabass commercial take in Mexican waters was 1% of California's white seabass annual landings, while in 1981, it reached 89% of the total annual catch (fig. 19). Since this time, the Mexican government has prohibited access permits to the U.S commercial fleet.

Beginning in 1994, the use of set and drift gill nets within 3 nautical miles of the mainland shore from Point Arguello to the U.S. Mexico border and in waters less than 70 fathoms or within 1 mile (whichever is less) of the Channel Islands was prohibited. In April 2002, the use of gill and trammel nets in depths of 60 fathoms or less was prohibited from Point Reyes to Point Arguello. Despite such restrictions, most commercial white seabass landings are still taken with set and drift gill nets. In 2010, set and drift gill nets accounted for 76% of the commercial landings by weight, while hook and line vessels accounted for 22%. Although the hook and line fishery, as well as trawl and other incidental gears (trap), continues to be a minor component of the commercial fishery, the number of hook-and-line vessels targeting white seabass has increased by 266% since 2008. Almost half of these vessels, however, made less than three landings in 2010, indicating that the majority of hook and line vessels opportunistically catch white seabass when available along the coast.

The minimum legal size limit for white seabass in the commercial and recreational fisheries is 710 mm (28 in.). The commercial fishery for white seabass is closed between Point Conception and the U.S. Mexico border from 15 March to 15 June, except one fish not less than 710 mm in total length may be taken, possessed, or sold by a vessel each day if taken incidental to gill and trammel net fishing operations. In 2010, the average ex-vessel value paid by dealers was \$2.76/lb. The total ex-vessel value in 2010 was \$1,528,913, approximately 76% more than in 2009.

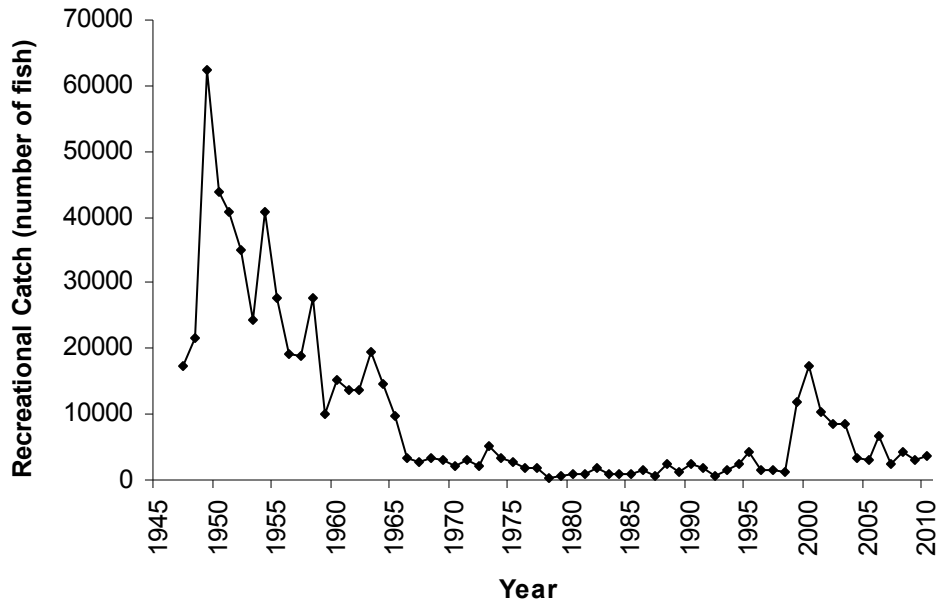


Figure 18. California recreational white seabass (*Atractoscion nobilis*) landings, from Commercial Passenger Fishing Vessel logbooks, 1947–2010.

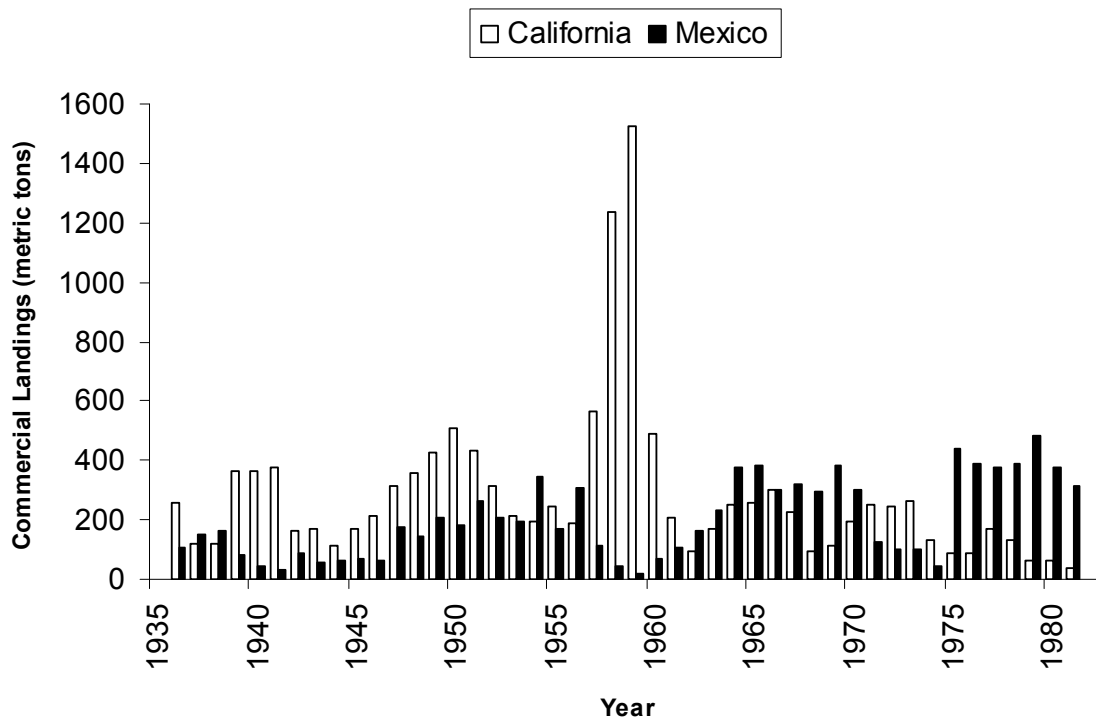


Figure 19. Comparison of landings of white seabass (*Atractoscion nobilis*) taken in California and Mexican waters by California commercial fishermen, 1936–1981.

The recreational fishery for white seabass occurs almost entirely south of Point Arguello. Typically, 95% to 99% of the catch is caught south of this point; however, in 2010, only 62% of the catch occurred south of Point Arguello, while 38% occurred within northern California. This increase of the northern catch is attributed to the high numbers of white seabass available within

Monterey Bay from August to October 2010. The fishery is open all year, but the majority of the recreational take occurs between March and September. The daily bag limit is three fish, except from 15 March through 15 June when the daily bag limit is one fish. Most fish are caught by hook and line anglers onboard CPFVs and private boats.

In 1982, the California Legislature established the Ocean Resources Enhancement and Hatchery Program (OREHP). This legislation was adopted to fund research into the artificial propagation of marine finfish species whose populations had become depleted. The ultimate goal is to enhance populations of marine finfish species important to California for their recreational and commercial fishing value. Initially, research was focused on California halibut and white seabass; however, white seabass was eventually chosen as the primary focus because of the depressed condition of the stock at the time and its higher value to recreational and commercial fishermen.

The Department manages the OREHP with the assistance of an advisory panel that consists of academic and management agency scientists, representatives of both commercial and recreational fishing groups, and the aquaculture industry. The program is funded through the sale of recreational and commercial marine enhancement stamps for all saltwater anglers south of Point Arguello. In 1995, the OREHP completed construction of the Leon Raymond Hubbard, Jr. Marine Fish Hatchery in Carlsbad, California. The primary function of the hatchery, which is operated by the Hubbs-SeaWorld Research Institute (HSWRI), is to provide juvenile white seabass, approximately 4 inches (100 mm) total length (TL), growout pens operated by volunteer fishermen and non-profit organizations. Currently, the hatchery and growout pens may release up to 350,000 juvenile white seabass per year.

There are 13 growout pens located in bays and marinas from Santa Barbara to San Diego in southern California. At the growout pens, juvenile white seabass are reared to 200–250 mm TL before they are released at or near the growout site. In 2010, 89,002 hatchery-raised white seabass were released, approximately 42% of last year's release of 152,658 fish. This decline in production was due to disease issues within the hatchery and growout facilities. Since 1986, over 1.7 million white seabass, each implanted with a coded wire tag (CWT), have been released from the OREHP facilities.

Since the mid-late 1980s, the OREHP has contracted with researchers to develop juvenile and adult sampling programs to assess the proportion of hatchery-raised fish to the wild population. In the late 1990s, HSWRI researchers developed a sampling program to recover

adult hatchery-raised white seabass from the commercial and recreational fisheries. The program, which is ongoing, is aimed at scanning white seabass for the presence of a CWT. Since the inception of both programs, 1,400 hatchery-raised juvenile white seabass have been recovered in the juvenile gill net studies while 171 tagged adult white seabass (legal-size) have been recovered from the recreational and commercial fisheries.

In June 2010, the Department submitted the White Seabass Enhancement Plan (WSEP) to the Commission, which it approved on 21 October 2010. The WSEP provides a framework for managing the OREHP in an environmentally sustainable manner and establishes best management practices (BMPs) for hatchery and growout operations, fish health, genetics, and benthic monitoring.

To manage the state's commercial and recreational fisheries for white seabass, the Commission adopted a White Seabass Fishery Management Plan (WSFMP) in 1996. To implement the WSFMP, the Commission adopted regulations in 2002 to establish a fishing season of September 1 through August 31 of the following year. The Commission also adopted an optimum yield (OY) in 2002. The OY is based on a maximum sustainable yield proxy of the unfished biomass and is currently set at 540 t (1.2 million pounds). The OY has never been reached since its implementation, but came close in the 2001–02 fishing season when combined landings reached 530 t (1,177,781 pounds). In the 2009–10 fishing season, the total recreational and commercial harvest was 305 t (678,262 pounds), 57% of the allowable catch.

Editor:

D. Sweetnam

Contributors:

K. Barsky, Spot prawn

T. Buck, Lobster

P. Kalvass, Dungeness crab

L. Laughlin, Highly migratory species

C. McKnight, Groundfish

B. Miller, Market squid

J. Phillips, Ocean salmon

L. Rogers-Bennett, Kelle's whelk

V. Taylor, White seabass

P. Ton, Coastal pelagic finfish