

REVIEW OF SELECTED CALIFORNIA FISHERIES FOR 2012: COASTAL PELAGIC FINFISH, MARKET SQUID, PACIFIC HERRING, GROUND FISH, HIGHLY MIGRATORY SPECIES, WHITE SEABASS, PACIFIC HALIBUT, RED SEA URCHIN, AND SEA CUCUMBER

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

Marine Region
4665 Lampson Ave. Suite C
Los Alamitos, CA 90720
Dianna.Porzio@wildlife.ca.gov

SUMMARY

In 2012, commercial fisheries landed an estimated 162,290 metric tons (t) of fish and invertebrates from California ocean waters (fig. 1). This represents a decrease of 12% from the 184,825 t landed in 2011, 18% from the 197,956 t landed in 2010, and a 36% decline from the peak landings of 252,568 t observed in 2000. The preliminary ex-vessel economic value of commercial landings in 2012 was \$236.1 million, once again increasing 19% from the nearly \$198 million generated in 2011, and \$175 million in 2010.

Coastal pelagic species made up three of the top five volume fisheries in 2012. California market squid was once again the largest volume, and second highest value fishery in the state with over 97,077 t landed with an ex-vessel value of approximately \$68.3 million. Although there was a 20% decrease in landings from 2011 (121,556 t), the fishery was closed for a third year in a row because landings were once again projected to reach the seasonal catch limit of 107,048 t. The Pacific sardine fishery has long been one of the largest in the state. In 2012 it was the second largest in volume and eighth largest in value, landing 23,037 t worth \$5.1 million. This was a 17% decrease from 2011 (27,714 t). Landings of sardine have steadily increased in the Pacific Northwest and Canada since the recent expansion of the sardine fishery in 1999. Combined landings of Pacific sardine for California, Oregon, and Washington totaled 101,551 t, a 117% increase from the 46,745.5 t landed in 2011. The recommended HG for 2012 season was 109,409 t based on a biomass estimate of 988,385 t. Although the HG was not met, the fishery was temporarily closed during the second allocation period (1 July–14 September) which only lasted 54 days. Pacific mackerel was the fifth largest volume fishery with 3,485 t landed, increasing 157% from 2011 (1,357 t). Northern anchovy registered a slight increase, while jack mackerel registered a slight decrease in landings totals.

Dungeness crab was California's third largest volume fishery with 11,696 t landed, an increase from 9,344 t landed in 2011, but it emerged as the highest valued fishery in the state with an ex-vessel value of over \$85.6 million, increasing from \$51.5 million in 2011.

Red sea urchin was California's fourth largest volume fishery with 5,153 t landed, and the state's sixth largest value fishery worth \$8.3 million. The proportion of yearly statewide catch was 77% in the south and 23% in the north. From 2003–07, the southern fishery has averaged 87% of the yearly statewide catch, but in the most recent five years (2008–12), average catch was 71%. An increase in the north and decrease in the south in recent years may be attributed to the addition of new active divers entering the northern fishery, and divers in the southern fishery participating in more lucrative dive fisheries such as sea cucumber. Sea urchin permit renewals totaled 305 in the 2012 season, and has been consistently near 300 since dropping from 340 in 2004 with a steady decline toward the "capacity goal" of 300 set by regulation in the early 1990s.

Fishing effort in California for Pacific herring in 2012 continued at reduced levels when compared to historic benchmarks. The fishery was closed during the 2009–10 season to allow for stock recovery after the fishery experienced one of the lowest landings in its 35 year history. During the 2012 sac roe season (January 2012–March 2012), the San Francisco Bay fleet landed 1,482.3 t, 94.6% of their 2011 landings (1,566.7 t) and 88.5% of the 1,673.8 t quota. Due to a decrease in base price, the statewide ex-vessel value of the herring sac roe fishery fell from \$885,951 in 2011 to \$493,468 in 2012. The San Francisco Bay herring eggs-on-kelp fishery landed 0 t during the 2012 season and has been inactive since the fishery closure in 2009–10. The commercial herring fishery is closely regulated through a catch-quota system to provide for adequate protection and utilization of the herring resource. The California Department of Fish and Wildlife (Department) conducts annual assessments of the spawning herring population in San Francisco Bay as part of its ongoing monitoring and management of the fishery. The spawning biomass estimate for the 2012 season in San Francisco Bay is 55,324 t, a 6.4% increase over last season's estimate of 51,785 t. This is the third consecutive year of increased biomass since the historic low of 4,394 t during the 2009–10 season when the fishery was closed for the first time ever by the California Fish and Game Commission (Commission).

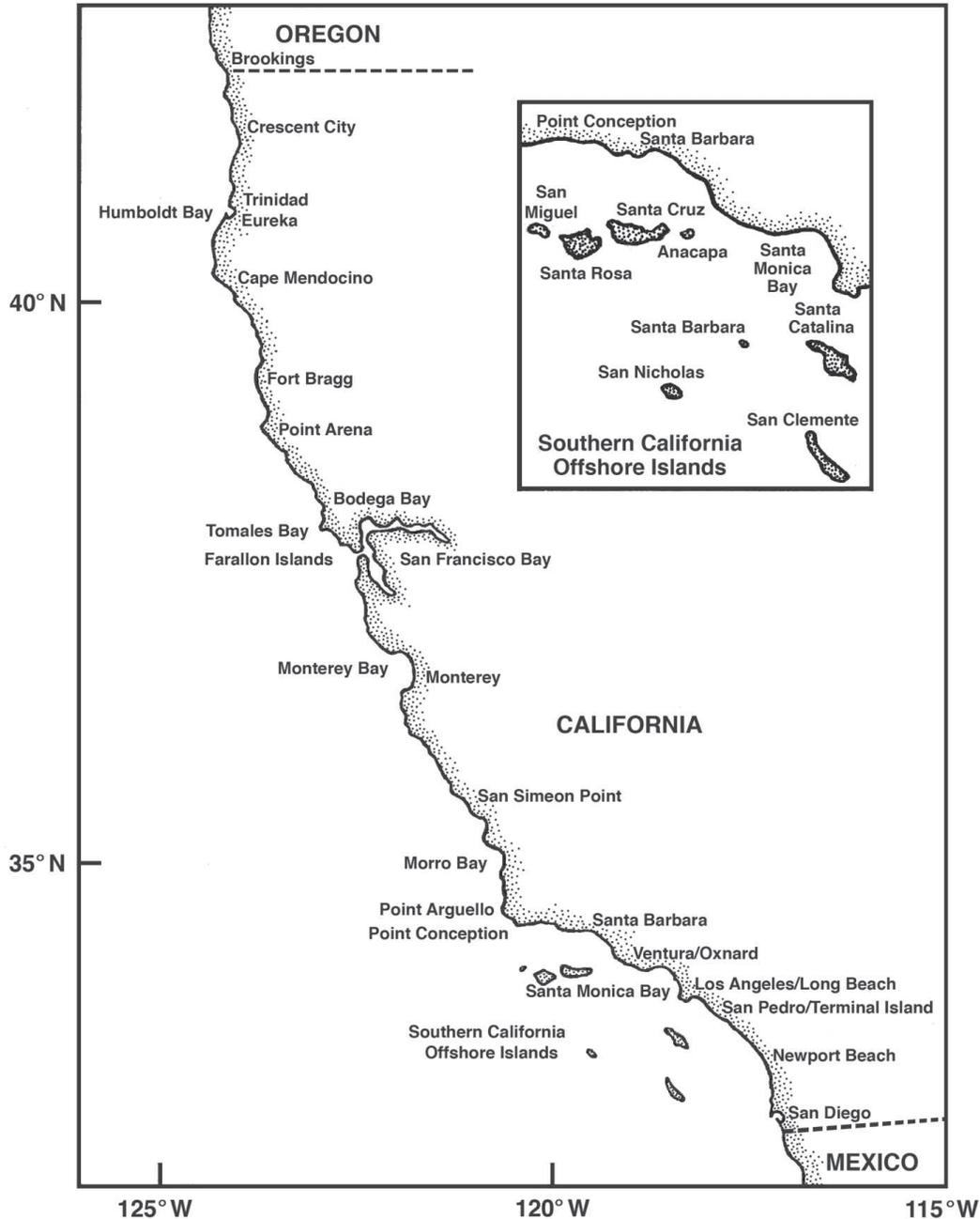


Figure 1. California ports and fishing areas.

More than 90 species of bottom-dwelling marine finfish are included in the federally-managed groundfish fishery. These groundfish species are distributed between 39 federal “management units”, consisting of species or species groups, to help facilitate management measures that balance biological and economical goals. In 2012, California’s commercial groundfish landings totaled 6,085 t, with an estimated ex-vessel value of \$17.8 million dollars. This represents a 14% decline in landings (7,113 t) and a 28% decline in ex-vessel value (\$24.6 million) compared to 2011. In 2012, California recre-

ational anglers participated in an estimated 867,000 trips targeting groundfish which represents a 4% increase from 2011 (830,000 trips). An estimated 1,656 t of groundfish were taken by the recreational fishery in 2012, a 4% increase from 2011 (1,534 t).

In Highly Migratory Species fisheries (HMS), the federal Shark Conservation Act of 2010 was signed into law January 4, 2011, specifying that no shark is to be landed without fins being naturally attached. Additionally, California passed AB 376—a bill banning the possession and sale of shark fins, beginning January 1, 2012.

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
2011	27,714	2,601	1,357	80	0		1,566	121,556	154,874
2012	23,037	2,488	3,485	145	0		1,482	97,078	127,715

Data Source: Commercial Fisheries Information System (CFIS)

While shark fisheries in California are still legal, and those possessing the proper license or permit are allowed to retain shark fins under California law, sales and distribution are prohibited.

In addition to being a popular sport fish, white seabass is also targeted by a commercial fishery. The commercial white seabass fishery landed 171 t in 2012, a 31% decrease from the 2011 total of 247 t. The total ex-vessel value in 2012 was \$1,365,758, approximately 16% less than in 2011. The estimate of recreational take decreased by 13% to 107 t in 2012 from the previous year's total of 123 t. The combined commercial and recreational catch for 2012 was 278 t. In the 2011–12 fishing season, which runs from September 1 through August 31 the following year, the total recreational and commercial harvest was 302 t, 55% of the allowable catch which is set at 540 t.

Pacific halibut is a desirable commercial and recreational target species ranging from the Bering Sea in Alaska to central California. The entire North Pacific halibut resource is internationally managed through the Halibut Treaty (Treaty) between the United States

and Canada. The International Pacific Halibut Commission (IPHC) was established to conduct research and management activities in the waters of the parties to the Treaty. In California, both the commercial and recreational Pacific halibut fisheries have experienced large fluctuations in catch over the last century. The Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS) are authorized by the Treaty to manage Pacific halibut in what is known as "Area 2A" which includes the waters off of the three West Coast states (Washington, Oregon, and California). The IPHC annually allocates a portion of the harvestable Pacific halibut to Area 2A, which the Council divides among the tribal, commercial, and recreational fisheries through a Catch Sharing Plan (CSP). From 2000–12 the directed commercial fishery in California averaged landings of 0.08 t net weight per year. Trace amounts of Pacific halibut were landed in California from the directed commercial fishery during 2012. Estimated recreational catch of Pacific halibut in California during 2012 was 11.7 t net weight. Recent

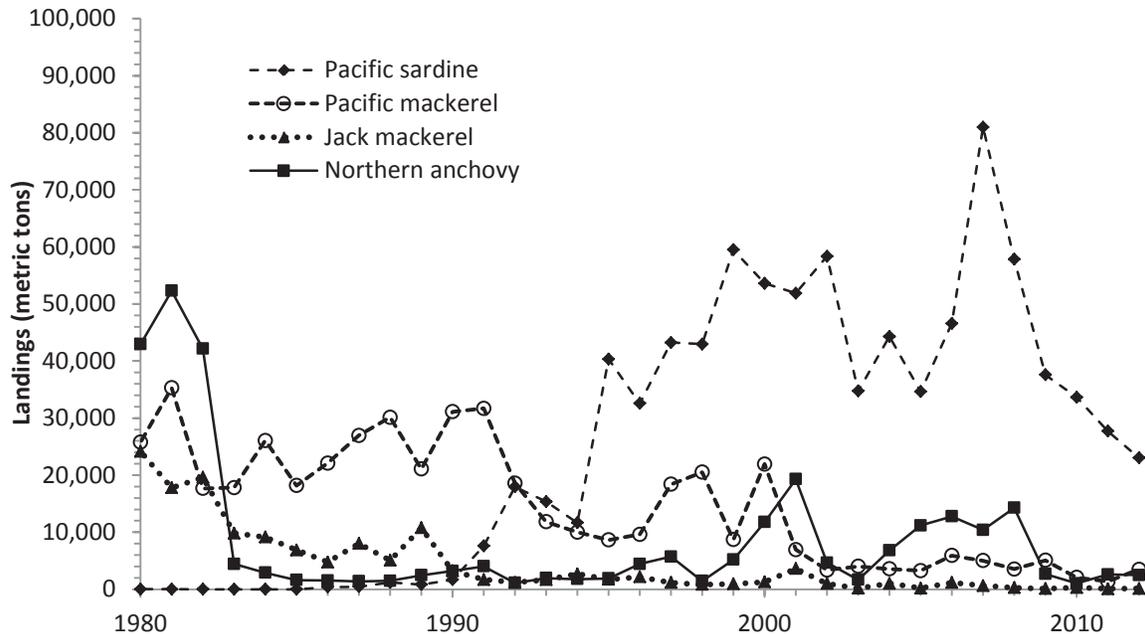


Figure 2. California commercial landings of Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), and northern anchovy (*Engraulis mordax*), 1980–2012.

catches have exceeded the recreational catch quota set by the IPHC by an average of 7.4 t and the highest recent catch occurred in 2009 when an estimated 15.8 t were caught. It is not known whether increased catch reflects an increase in Pacific halibut abundance, angler interest, or effort due to limited angler opportunities in the recreational salmon and groundfish fisheries. The 2012 Pacific halibut stock assessment indicated that biomass was stable, although less than previously thought. The 2012 stock biomass is above the harvest policy threshold precautionary level, but is approximately 33,566 t, or 28% less than was estimated in the 2011 assessment.

Commercial harvesting of warty sea cucumber and giant red sea cucumber has increased dramatically in California over the last decade in response to growing foreign demand from Chinese and Korean based markets. In 2012, there were 83 dive and 16 trawl permits issued, with dive landings reaching 123 t with an ex-vessel value worth \$1.2 million. This was a 50% reduction in landings when compared to 2011 (247 t), despite the fact that the average price reached a record high of \$8.50/kg (\$3.85/lb) in 2012. In 2011, the fishery set an all-time record ex-vessel value of \$2.2 million. The 2012 dive landings were the lowest since 2005 when most of the fishery began to sell their product in a cut/processed state. Although the dive fishery mostly targets warty sea cucumber, dive landings of giant red sea cucumber reached a record high in 2012 of 23 t, which comprised 19% of all dive landings. In 2012, trawl landings reached 89 t with an ex-vessel value of \$728,469, a

37% reduction in landings when compared to the 142 t landed in 2011, valued at a record high of \$1.2 million (ex-vessel).

Coastal Pelagic Finfish

Managed jointly by the Pacific Fishery Management Council (PFMC) and the National Marine Fisheries Service (NMFS) under the Coastal Pelagic Species Fisheries Management Plan (CPS FMP), Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), jack mackerel (*Trachurus symmetricus*), and northern anchovy (*Engraulis mordax*) form a finfish complex known as the Coastal Pelagic Species (CPS). These fisheries bring millions of dollars in revenue to the economy every year. In 2012, total commercial landings for these species equaled 26,805 t (table 1), with a combined ex-vessel value of over \$6.4 million. When compared to landings in 2011, 2012 saw a 15.5% and 0.3% decrease in volume and value, respectively. Once again, the Pacific sardine fishery was the largest of these four in 2012, comprising 85.9% of the total volume and 80% of the total value.

Pacific Sardine. The Pacific sardine fishery in California has long been one of the largest in the state. In 2012 it was the second largest in volume and eighth largest in value, landing 23,037 t worth \$5.1 million. This was a 17% decrease from 2011 (27,714 t). Commercial landings of sardine averaged 44,990 t over the twelve-year period from 2001–12 (fig. 2). Nearly all (95.8%) of California's 2012 sardine catch was landed in Los Angeles (77.4%, 17,838 t) and Monterey (18.4%, 4,241.4 t) port areas (table 2).

TABLE 2
 Landings (metric tons) of Pacific sardine (*Sardinops sagax*) and Pacific mackerel (*Scomber japonicus*) at California port areas in 2012.

Area	Pacific sardine		Pacific mackerel	
	Landings	% Total	Landings	% Total
Monterey	4,241.4	18.4	100.2	2.9
Santa Barbara	962.2	4.2	53.2	1.5
Los Angeles	17,838.0	77.4	3,331.8	95.6
Total	23,041.6	100	3,485.2	100

*Los Angeles totals include Oceanside/SoCal landings

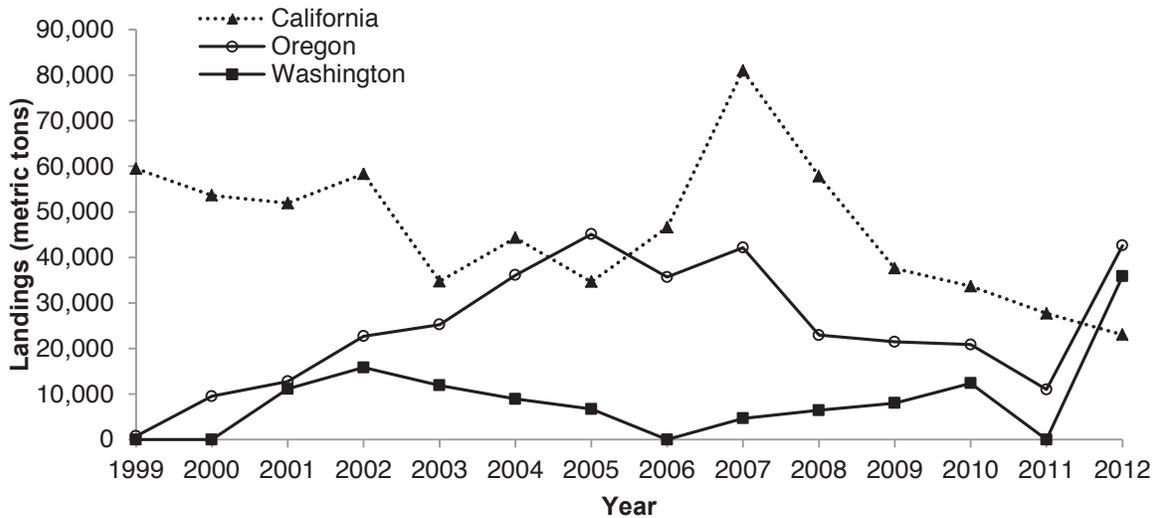


Figure 3. Commercial landings of Pacific sardine (*Sardinops sagax*) in California, Oregon, and Washington, 1999–2012.

Landings of sardine have steadily increased in the Pacific Northwest and Canada since the recent expansion of the sardine fishery in 1999. While the fishery ranges from Baja California, Mexico, north to British Columbia, Canada, the majority of landings have occurred in southern California and northern Baja California since the 1980s. Combined landings of Pacific sardine for California, Oregon, and Washington totaled 101,551 t, a 117% increase from the 46,745.5 t landed in 2011 (fig. 3). 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 2012 season was 109,409 t based on a biomass estimate of 988,385 t. The Pacific sardine HG was apportioned coast-wide through the year with a 35% allocation of the annual HG 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.

The U.S. West Coast fisheries harvested a large portion (93%) of the HG, same as the previous year (93%). The 1st allocation period (1 Jan–30 June) lasted through

the entire allocation period, 181 days. The 2nd period (1 July–14 September) lasted 54 days; the fishery was officially closed on August 23rd. The 3rd allocation period (15 September–31 December) also lasted the entire allocation period, 107 days.

Oregon landings appeared to be leveling off since 2008, but experienced a large jump in 2012. Landings totaled 42,618 t, an increase from 2011 (11,023 t). In 2012, Oregon exported 218 t of sardine product worth \$324,809.

Washington landings totaled 35,891.5 t in 2012, after landing no Pacific sardine in 2011. They exported 76,986.3 t of sardine product to 32 countries, totaling \$63.9 million in revenue.

The recreational Pacific sardine catch as sampled from the California Recreational Fisheries Survey (CRFS) was 62 t (854,000 fish), much larger than the 22 t (469,000 fish) in 2011 (82% increase, in number of fish). The majority (91%) of the fish landed were from man-made structures, such as piers.

Pacific Mackerel. In 2012, landings of Pacific mackerel jumped 157% from 2011. Landings in California totaled 3,485 t (table 1, fig. 2), generating \$872,820 in ex-vessel revenue. Industry exported 660.5 t of mack-



Figure 4. California commercial market squid (*Loligo (Doryteuthis) opalescens*) landings, 1981–2012.

rel product, mainly for human consumption, valued at nearly \$604,250, to 13 countries. The Philippines (234.4 t), Australia (113.1 t), and Egypt (94 t) received over 66% of this product.

Oregon reported 1,779 t of Pacific mackerel landed for 2012, with an ex-vessel value of \$171,178. This is a 253% increase from the 2011 catch of 7 t. For Washington in 2012, 691.6 t were landed with an ex-vessel value of \$159,487, the first landings of mackerel since 2005. Exports showed that 165.6 t were exported to three countries, valued at \$189,275. Washington landings of Pacific mackerel have been typically low, with the greatest landings having occurred in 2012.

At the start of the 2012–13 season, which runs from 1 July to 30 June the following year, the PMFC set the HG at 30,386 t, with a 10,128 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.

The 2012 recreational Pacific mackerel catch as sampled from CRFS was 144 t (847,000 fish), a 13% (24% by number of fish) decrease from 2011. A total of 33,000 fish were reported landed on CPFVs.

Jack Mackerel. Representing 0.5% of the total catch of federally managed CPS finfish landings in California for 2012, jack mackerel has long been the smallest of these federally managed fisheries. Landings of jack mack-

rel totaled 145 t last year, with an ex-vessel revenue of just \$28,230 for California. Landings in Oregon jumped dramatically with 95 t landed in 2012, bringing an ex-vessel value of \$5,383. Washington reported no landings of jack mackerel during 2012.

The 2012 recreational jack mackerel catch as sampled from CRFS was 5 t (28,000 fish), a 0.17% (54% by fish) decrease from 2011. A total of 11,000 fish were landed on CPFVs.

Northern Anchovy. Composed of three stocks, southern, central and northern, the northern anchovy have been a part of California’s fisheries since the early 1900s. While studies of scale deposits on the sea floor suggest that their abundance has historically been quite large, current landings are moderate at best. Only occasionally landed in Oregon and Washington, the California fishery is harvested from the central stock which ranges from San Francisco to northern Baja California. Now used for animal food, live bait, and human consumption, anchovy was used mainly in a reduction industry to produce oil and fish meal in the 1900s. During periods of low sardine abundance, anchovy landings increased, hitting a peak in the mid-1970s at over 100,000 t.

Landings of northern anchovy in California for 2012 amounted to 2,488 t with an ex-vessel value of nearly \$371,150 (table 1). This is a 4% decrease from 2011 land-

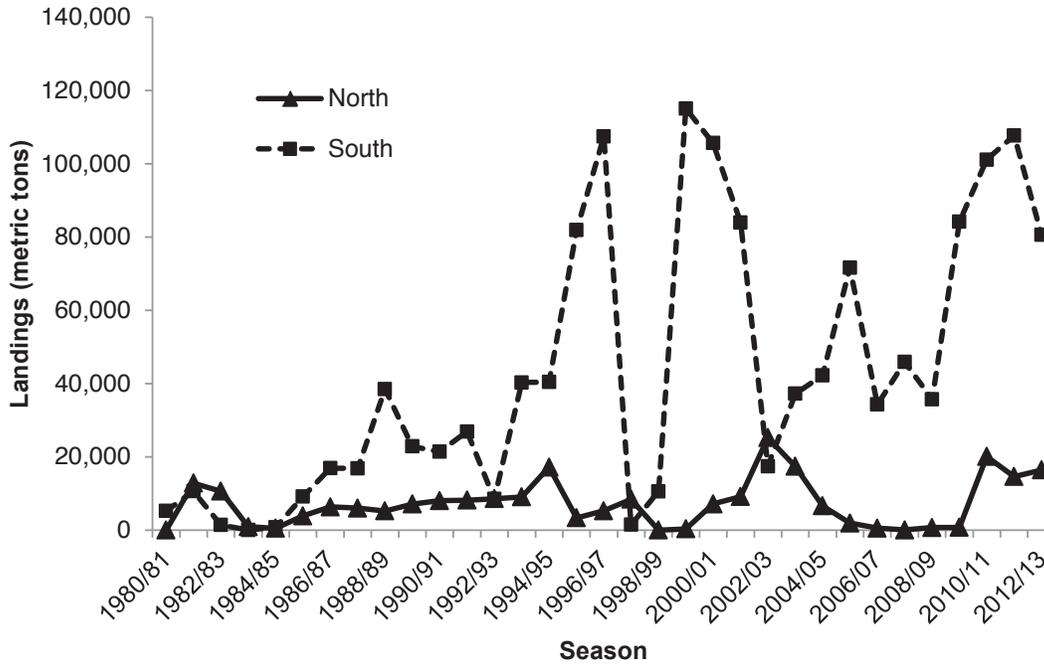


Figure 5. Comparison of market squid (*Loligo (Doryteuthis) opalescens*) landings for northern and southern fisheries by fishing season (1 April–31 March), from 1980/81 to 2012/13 seasons.

ings (2,601 t). Exports of northern anchovy product from California totaled 177.6 t for an export value of \$849,594. Six countries received anchovy product from California; South Korea received the majority at 65%.

Both Oregon and Washington reported no northern anchovy landings for 2012, although Washington exported 11.7 tons of preserved northern anchovy product worth \$54,859.

California Market Squid

In 2012, market squid (*Loligo (Doryteuthis) opalescens*) continued to dominate commercial landings of marine species in California, contributing about 61% of the total tonnage and 28% of total ex-vessel value of all species landed. Landings of market squid in 2012 decreased 20% compared to 2011 landings, from 121,558 t to 97,076 t (fig. 4). Ex-vessel value remained relatively stable, only slightly declining from \$68.5 million in 2011 to \$68.3 million in 2012. California fish businesses exported 84,832 t of market squid to 45 countries for a value of \$121 million in 2012. The majority (90%) was shipped to just four countries but most (72%) went to China.

For the third season in a row, 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 t. Accordingly, the Department of Fish and Wildlife (Department) closed the fishery on 21 November 2012, with a total of 95,243 t landed for the open portion of the 2012/13 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 use as live bait. Permits are valid for the management season, from 1 April to 31 March the following year. In 2012, there were 77 market squid vessel (purse seine), 36 light boat (attracting), and 42 brail (or dip net) permits issued. Of the 77 vessel permits, 77 vessels were active in the fishery with 54 vessels contributing 95% of the landings. Other fishery control rules include a seasonal 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 southern California landings (fig. 5). Of note is the increase in landings for Monterey, which has seen over 14,000 t in each of the last three 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, largely to supply recreational fishing in southern California and logbooks are voluntary so total catch is unknown. The live bait fishery is likely a low-volume, high-value endeavor, as recreational anglers are willing to pay up to \$60 for a “scoop” of live squid.

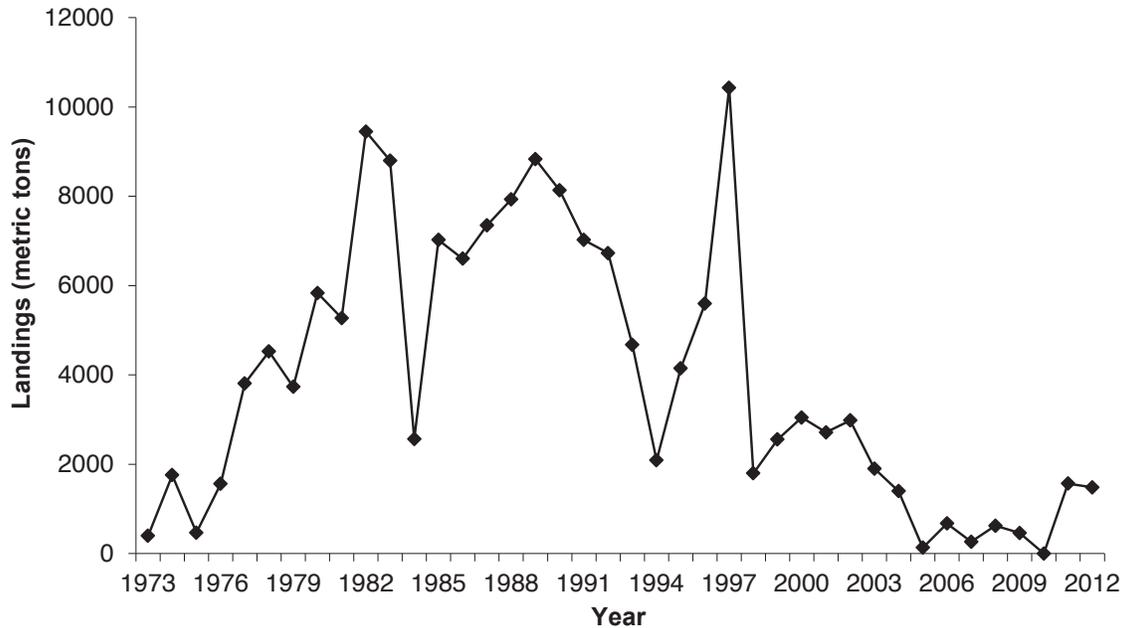


Figure 6. San Francisco Bay commercial Pacific herring (*Clupea pallasii*) sac roe landings, 1972–2012.

Pacific Herring

Fishing effort in California for Pacific herring (*Clupea pallasii*) in 2012 continued at reduced levels when compared to historic benchmarks. The fishery was closed during the 2009–10 season to allow for stock recovery. During the 2012 sac roe season (January 2012–March 2012), the San Francisco Bay fleet landed 1,482.3 t, 94.6% of their 2011 landings (1,566.7 t) (fig. 6) and 88.5% of the 1,673.8 t quota. There was no fishing effort in Tomales Bay, Humboldt Bay, or Crescent City Harbor during the 2012 season. It should be noted that no commercial fishery has taken place in Tomales Bay since 2007, since 2005 in Humboldt Bay, and since 2002 in Crescent City Harbor.

The forecast base price for roe herring is a good indicator of the economic status of the fishery and determines whether fishermen will participate in the fishery. Ex-vessel prices for roe herring are set using a base price with an additional roe percentage point bonus. The base price is set per short ton of roe herring with a minimum roe percentage of 10%. Roe herring that are landed which exceed the minimum roe recovery level are given a bonus for each percentage point exceeding 10%. Ex-vessel prices in the herring sac roe fishery can vary greatly based on roe recovery rates. The 2012 base price for roe herring with 10% or greater roe recovery was \$200/st landed, with an additional \$20 paid for each percentage point above the 10% baseline. The average roe count for the 2012 season was 15.1% resulting in an ex-vessel value of \$302/st. Due to a decrease in base price, the statewide ex-vessel value of the herring sac roe fishery fell from \$885,951 in 2011 to \$493,468 in 2012.

The San Francisco Bay herring eggs-on-kelp fishery landed 0 t during the 2012 season and has been inactive since the fishery closure in 2009–10. Price paid for eggs-on-kelp typically ranges from \$6–18 per pound depending on the quality of the product.

During the 2012 season the California Department of Fish and Wildlife (Department) conducted spawn deposition surveys in San Francisco Bay to estimate the spawning biomass of the herring stock. The spawning biomass estimate for San Francisco Bay is 55,324 t, a 6.4% increase over last season’s estimate of 51,785 t. This is the third consecutive year of increased biomass since the historic low of 4,394 t during the 2009–10 season. The average biomass for San Francisco Bay 1979–2012 equals 46,458 t. No spawning biomass estimates were made for Tomales Bay, Humboldt Bay, or Crescent City in 2012.

The commercial herring fishery is closely regulated through a catch-quota system to provide for adequate protection and utilization of the herring resource. The Department conducts annual assessments of the spawning herring population in San Francisco Bay as part of its ongoing monitoring and management of the fishery. The Department also examines age structure, growth and general condition, biological aspects of the catch, and environmental conditions. These data serve as the basis for establishing fishing quotas for the following season. The quota range is based on the determination of the Department’s assessment of the stock status and utilizing the best science available. The best available science includes, but is not limited to, recent fishery-independent field surveys, commercial catch and age

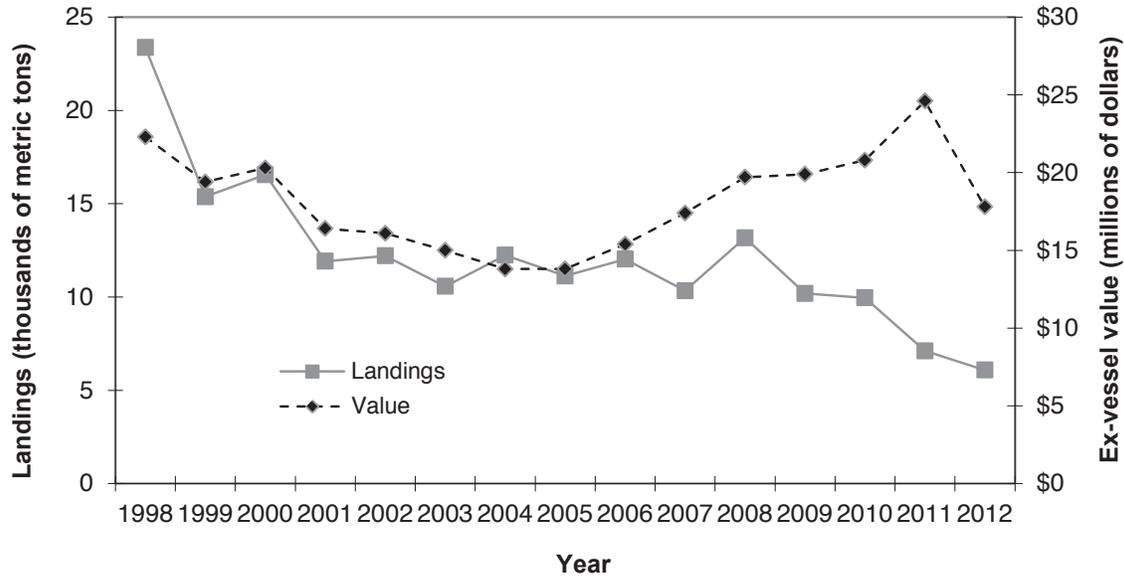


Figure 7. California landings of total groundfish by all gears, 1998–2012.

composition analysis, and environmental data. Quota recommendations for San Francisco Bay are primarily based on the most recent assessments by the Department of the size of the spawning population of herring in San Francisco Bay. The recommendation also takes into account additional data collected each season, including ocean and bay conditions, growth rates of herring, strength of individual year-classes, and predicted size of incoming year-classes (i.e., recruitment).

In response to poor recruitment, indication of population stress, and/or unfavorable oceanographic conditions, harvest percentages in recent years have been set at or below 10%. Since the 2003–04 season, harvest targets have allowed over 90% of the spawning biomass to return to the ocean, after spawning in the bay. The Department and the Director’s Herring Advisory Committee (composed of fishing industry representatives) recommended a no fishery option for the 2009–10 season, when the herring spawning biomass in 2008–09 fell to a new low of 4,394.4 t. The Commission adopted this recommendation and no commercial fishery was held in San Francisco Bay for the 2009–10 season. Since the fishery reopened during the 2010–11 season, the Department has recommended harvest rates at 5% or less of the spawning biomass. Based on accepted fishery management principles, these harvest rates are conservative and represent a precautionary approach to safeguard the population as forage and to provide a robust reproductive base to allow for continued stock rebuilding.

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. These groundfish species are distributed between 39 federal “management units”, consisting of species or species groups, to help facilitate management measures that balance biological and economical goals.

Commercial Fishery. In 2012, California’s commercial groundfish landings totaled 6,085 t, with an estimated ex-vessel value of \$17.8 million dollars. This represents a decline in both landings (14%; 7,113 t) and ex-vessel value (28%; \$24.6 million) compared to 2011. During the last decade, groundfish landings have declined by 50% (7,113 t in 2012 versus 12,207 t in 2002); yet the ex-vessel value has increased nearly 11% (\$16.1 million in 2002 versus \$17.8 million dollars in 2012). Although annual landings have declined over the past years, the fishery experienced an increase in value over the past decade (fig. 7). The area from the California/Oregon border to the Monterey Bay port complex accounted for 73% (4,421 t) of the groundfish landed in California and 54% of the ex-vessel value (\$9.6 million). In the groundfish fishery the majority of landings by weight comes from trawl gear (71%), followed by hook and line and trap gear (29%), yet the majority of trips are made with hook and line and trap gear (89%). Trawl gear is used to a lesser extent (9%), with gill net and seine gear comprising the remainder. Dover sole, sablefish, the thornyhead complex (*Sebastolobus altivelis* and *S. alascanus*) and chilipeper rockfish (*Sebastes goodei*) continued to domi-

TABLE 3
 California commercial groundfish landings (in metric tons) and ex-vessel value in 2012 with comparisons to 2011.
 The top species by weight for the Flatfishes and Rockfishes are represented in the table.

	2012		2011		% change from 2011 (t)	% change from 2011 (\$)
	Harvest (t)	Value (\$)	Harvest (t)	Value (\$)		
Flatfishes						
Dover sole	2,099	\$1,895,274	2,412	\$2,264,815	-13	-16
Petrale sole	222	\$697,323	174	\$536,140	28	30
Arrowtooth flounder	99	\$23,752	86	\$53,534	15	-56
Rex Sole	47	\$40,490	68	\$115,136	-31	-65
English sole	23	\$20,987	19	\$17,301	21	21
Sand sole	17	\$48,701	13	\$55,414	31	-12
Other flatfishes	10	\$22,724	13	\$35,332	-23	-36
Total Flatfishes	2,517	\$2,749,251	2486	\$2,948,794	-10	-11
Rockfishes						
Chilipepper	236	\$362,174	293	\$413,006	-19	-12
Blackgill rockfish	127	\$369,358	126	\$359,333	1	3
Group slope rockfish	102	\$152,643	59	\$85,126	73	79
Brown rockfish	26	\$363,624	29	\$383,712	-10	-5
Black rockfish	24	\$105,557	27	\$111,303	-11	-5
Gopher rockfish	23	\$370,588	30	\$462,849	-23	-20
Vermilion rockfish	17	\$103,475	17	\$102,968	0	1
Other rockfishes	88	\$694,500	67	\$650,810	31	7
Overfished species						
Bocaccio	12.34	\$28,625	7.56	\$18,373	63	56
Canary rockfish	0.56	\$818	0.33	\$473	70	73
Cowcod	0.08	\$98	0.01	\$19	700	416
Darkblotched rockfish	6.5	\$9,725	3.38	\$6,617	92	47
Pacific ocean perch	0.07	\$71	0.07	\$73	0	-3
Yelloweye rockfish	0	\$12	0	\$16	0	-25
Total Rockfishes	663	\$2,516,817	647	\$2,594,678	0	-1
Roundfishes						
Sablefish	1,623	\$8,996,968	2,407	\$15,159,279	-33	-41
Lingcod	48	\$208,341	33	\$148,329	45	40
Cabezon	30	\$362,457	32	\$387,731	-6	-7
Kelp greenling	5	\$68,821	2	\$29,171	150	136
Pacific whiting	4	\$11,830	5	\$14,419	-20	-18
Total Roundfishes	1,710	\$9,648,417	2,479	\$15,738,929	-31	-39
Scorpionfish, California	4	\$41,671	5	\$38,537	20	8
Sharks & Skates	182	\$160,833	176	\$140,376	3	15
Thornyheads	909	\$2,634,386	922	\$3,086,208	-1	-15
Other Groundfish	99	\$52,604	87	\$41,030	14	28
Total Groundfish	6,084	\$17,848,430	7,113	\$24,717,430	-14	-28

Data Source: CFIS (CMASTR) Extraction Date: 05-29-2013

nate as the top five species in 2012 with 2,099 t, 1,623 t, 499 t, 409 t and 236 t landed, respectively. These five species comprised 80% of the total groundfish landings. The amount of total groundfish landed in 2012 was mostly comprised of flatfishes (41%), followed by roundfishes (28%), and rockfishes (26%). The majority of rockfish was comprised of the thornyhead complex (58%). The “other” groundfish species category was comprised of grenadier (*Macrouridae*) which accounted for 99 t (table 3). The highest volume rockfish was chilipepper with landings of 236 t an ex-vessel value of \$362,174. Unlike 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 (*S. auriculatus*) and grass rockfish (*S. rastrelliger*) earned a combined ex-vessel value

of \$969,338 with landings of 23 t, 26 t and 12 t respectively. Over the last decade, management measures such as limiting access and restricting landings have been used to protect vulnerable nearshore rockfish stocks. These measures, combined with the live fish market, help contribute to the high market value of the nearshore fishery. For nearshore species with 2012 landings in excess of two metric tons, grass rockfish was valued at approximately \$20,250/t followed by black-and-yellow rockfish (*S. chrysomelas*) with an approximate value of \$16,300/t and gopher rockfish worth approximately \$15,600/t. By contrast, chilipepper rockfish (a non-nearshore rockfish) was valued at approximately \$1,500/t.

Overfished rockfish species landings, which account for less than 1% of the total landings in 2012, increased in 2012 compared to 2011 (20 t versus 11 t). In both years

TABLE 4
California recreational groundfish landings (A+B1) greater than 5 metric tons in 2012 with 2011 comparisons.

	2012 Harvest (t)	2011 Harvest (t)	% Change from 2011
Lingcod	281	230	22
Vermilion rockfish	220	195	13
Black rockfish	210	178	18
Bocaccio	125	103	21
CA scorpionfish	116	100	5
Copper rockfish	80	67	19
Brown rockfish	70	86	-19
Pacific sanddab	66	81	-19
Yellowtail rockfish	53	46	15
Gopher rockfish	52	72	-28
Blue rockfish	52	62	-16
Cabezon	43	40	8
Leopard shark	35	25	40
Olive rockfish	32	24	33
Starry rockfish	23	24	-4
Grass rockfish	21	11	90
Kelp rockfish	19	18	6
Greenspotted rockfish	18	18	0
Flag rockfish	14	9	56
China rockfish	14	15	-7
Canary rockfish	13	16	-19
Kelp greenling	13	23	-43
Treefish	11	12	-12
Speckled rockfish	10	8	25
Chilipepper	8	5	60
Quillback	6	4	50
Honeycomb rockfish	6	10	-40
Rosy rockfish	6	7	-14
Other rockfishes	38	45	-14
Total Groundfish	1,656	1,534	8

Angler Trips

Bottomfish Effort	867,096	830,058	4
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Rockfish species of concern including yelloweye rockfish (1.6 t), cowcod (0.8 t) are included in the "Other" category. (A1+B1)—Fish caught and either identified or not available for identification.

Data source: RecFIN Date Extracted: 6-4-2013

the predominant species was bocaccio rockfish (*S. paucispinis*), which accounted for 60% and 73% of the total overfished species landings in 2012 and 2011, respectively. Overfished species landings have been greatly reduced from previous years due to management measures designed to protect these species.

Recreational Fishery. The Recreational Fisheries Information Network (RecFIN) Program houses recreational data from California, Oregon, and Washington. California data, available from 1980 to the present, represent 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 operated from 1980 to 2003, and the California Recreational Fishery Survey (CRFS) initiated by the Department of Fish and Wildlife in 2004. CRFS data queried through RecFIN indicates that in 2012,

California anglers participated in an estimated 867,000 trips targeting groundfish which represents a 4% increase from 2011 (830,000 trips). The predominant gear type used in the California recreational groundfish fishery is hook and line.

An estimated 1,656 t of groundfish were taken by the recreational fishery in 2012 (table 4), a 4% increase from 2011 (1,534 t). The top five species were: lingcod, vermilion and black rockfishes (*S. miniatus* and *S. melanops*), bocaccio rockfish, and California scorpionfish (*Scorpaena guttata*) accounting for approximately 57% of the total groundfish estimated catch by weight. The same five species dominated catches in 2011, but accounted for only 53% of the total weight. In 2012, 43% of the groundfish catch occurred in southern California (south of Point Conception) and California scorpionfish and vermilion rockfish dominated the catch. Central California (Point Conception to Cape Mendocino) accounted for 47% of the total catch and was dominated by lingcod. Lastly, northern California (Point Mendocino to the California-Oregon border) accounted for 10% of the estimated catch, with black rockfish comprising the majority of rockfish taken.

Trawl Rationalization. In 2011, a new federal program was implemented for the West Coast Groundfish Trawl fleet which changed how fish were harvested in California. This is one of the most complex "catch share" programs in the nation, encompassing 21 species and three species complexes. Under the Individual Fishing Quota (IFQ) program (also known as trawl rationalization), quota for species or species groups are issued to individual limited entry trawl permit holders instead of to the fleet as a whole. This allows individuals to harvest quota at their discretion, eliminating a derby style fishery. Among other benefits, the IFQ program will ideally improve individual accountability, increase the profitability of the fishery, promote efficiency of the fleet, and reduce regulatory discards. Under this program, individuals are responsible for covering both catches and discards with quota. As such, it is their responsibility to ensure they have the correct amount of quota to cover both target and incidentally caught species before fishing. While quotas may be leased or bartered, a provision was made prohibiting the sale of quota shares until 2013 so that participants could become familiar with the new program (selling of quota shares has been delayed and is expected to resume in 2014). Another provision of trawl rationalization allows IFQ vessels to use non-trawl gears or fixed gear (e.g. hook and line or trap) to harvest their quota. This provision is known as gear switching and is primarily used to harvest sablefish and to a much lesser extent blackgill rockfish (*S. melanostomus*).

Trawl Rationalization in California. California groundfish landings and ex-vessel value from the limited

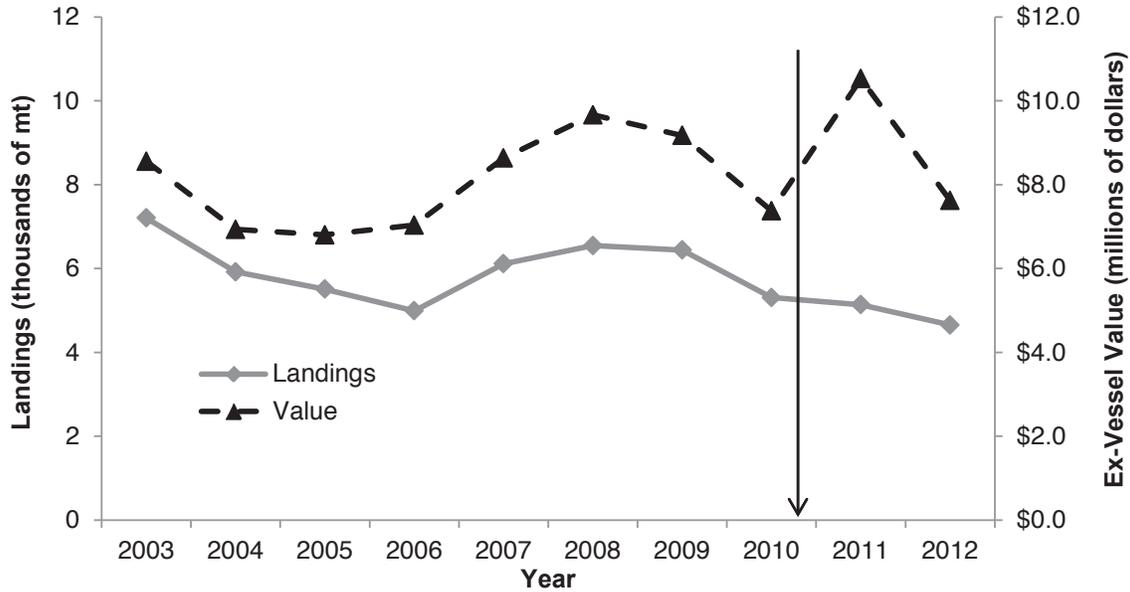


Figure 8. California landings of the limited entry trawl fleet, 2003–2012. The arrow indicates when the trawl rationalization program was implemented.

entry trawl fleet (2003 through 2010) and the rationalized trawl fishery (2011 and 2012) are shown in Figure 8. To identify early trends in the fishery as a result of the program, landings from pre- and post-rationalization (2009 through 2012) were compared. Landings of Pacific whiting (*Merluccius productus*) varied substantially between the two years before and after the program began. A total of 4,219 t were landed in the two year period prior to implementation of the program, compared with only 8 t landed in the years following the start of the IFQ fishery; as a result Pacific whiting was excluded from this analysis (Pacific whiting has a more northern distribution and it is likely that program participants fishing off California traded their shares of Pacific whiting for a more lucrative species such as sablefish). The average annual landings in the IFQ fishery decreased by 17% from 2009–10 (pre-rationalization) to 4,896 t for 2011–12 (post-rationalization). However, in spite of a depressed sablefish market starting in late 2011 and continuing through 2012, ex-vessel value increased 10% (\$9.1 million) post-program implementation, compared to \$8.3 million dollars in 2009–10.

Total encounters (landings plus discards) of overfished rockfish species have declined since the fishery was rationalized, decreasing from 51 t (2009) and 19 t (2010), to 8 t (2011) and 16 t (2012). Bocaccio rockfish accounted for 62% and 56% of the total overfished rockfish species encounters in 2011 and 2012, respectively.

Since rationalization, the Eureka and Fort Bragg port complexes continue to have the highest annual landings, accounting for 66% of annual California IFQ landings. While the program has had marginal effects on some

port complexes, differential effects on annual landings are most apparent between the Crescent City and Morro Bay port complexes. Prior to implementation of the program, the Crescent City port complex contributed nearly 11% to annual landings, which has decreased by 6% post-rationalization.

Conversely, prior to the IFQ program the Morro Bay port complex had relatively few landings accounting for roughly 1% of annual landings, and since rationalization landings to the Morro Bay port complex have increased—contributing 14% to annual landings, largely due to the sablefish fishery.

Trawl Rationalization and the Sablefish Fishery. The sablefish fishery is the most important groundfish fishery in California, and as a result, it is also the most important species in the IFQ fishery. Prior to trawl rationalization, landings of trawl caught sablefish were 850 t (2009) and 710 t (2010), with an ex-vessel value of \$3.3 million and \$3.0 million dollars, respectively. Under the IFQ program, sablefish is now caught with a variety of gear (trawl and fixed gear, including hook and line and trap). In 2011, 1,069 t of sablefish were landed, with an ex-vessel value of \$5.9 million dollars; 732 t were landed in 2012 with an ex-vessel value of \$3.0 million dollars. It should be noted that the decrease in landings and ex-vessel value seen in 2012 is due to depressed sablefish market conditions, which began in late 2011, continuing through 2012. The average price per pound increased from \$1.88 in 2009 and 2010 to \$2.34 in 2011 and 2012. Of the IFQ vessels harvesting sablefish quota in 2012, roughly 41% utilized fixed gear (gear switching), with 13 out of 15 vessels using only fixed gear to land sablefish;

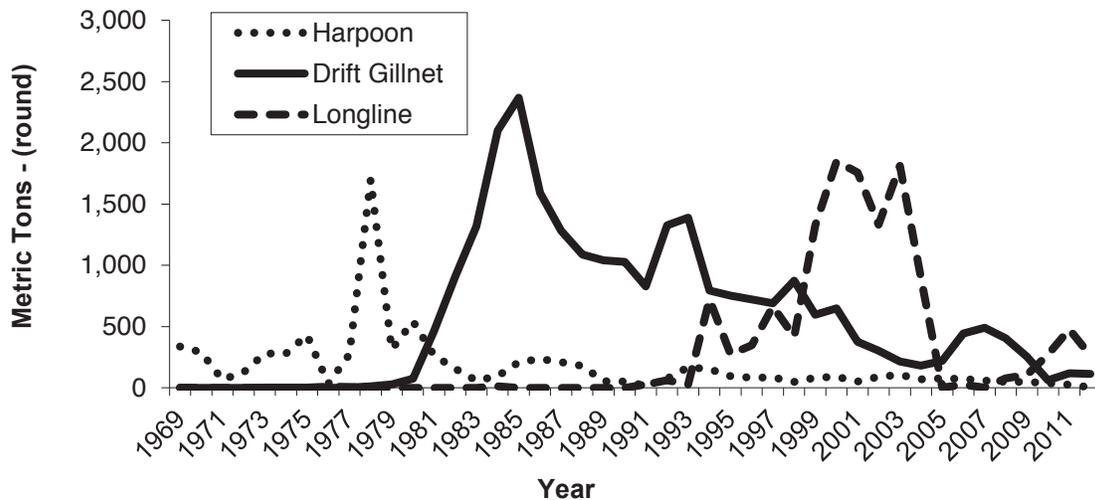


Figure 9. California commercial swordfish (*Xiphias gladius*) landings by gear type.

the other two vessels used a combination of both trawl and fixed gear. Vessels that “gear switched” primarily used trap gear which had the highest price per pound of all gear types in 2012, averaging \$2.26 dollars. By contrast, in 2011 approximately the same percentage of IFQ vessels utilized fixed gear, however, earned less, averaging \$2.44/lb opposed to those made by trawl gear (approximately \$2.90 per pound).

Although data are preliminary and may be subject to change, data from 2011 and 2012 indicate some positive benefits as a result of trawl rationalization, the full impact of which may not be fully realized for several more years.

Highly Migratory Species

Swordfish. Swordfish (*Xiphias gladius*) is the most valuable highly migratory species (HMS) taken off California in both price-per-kilogram and total revenue; most landings take place in California. In 2012, 397 t of swordfish with an ex-vessel value of \$3.4 million were landed on the West Coast, a 36% decline from landings in 2011 of 619 t. For 2012, 6% were taken by harpoon gear, 28% were taken by drift gill net gear, and 66% were taken by hook and line gears (mostly Hawaiian vessels fishing outside the United States Exclusive Economic Zone [EEZ]). Harpoon and drift gill net landings of swordfish on the West Coast take place entirely within California as Washington does not authorize drift gill net gear, and Oregon discontinued a drift gill net permit program in 2009. Commercial swordfish landings have been affected dramatically by the changes in fishing gear used and management measures implemented over the decades. As shown in Figure 9, the 1970s were dominated by harpoon, the 1980s and 1990s by drift gill net gear, and the 2000s by longline gear. Longline gear landings for the last few years, however, have been made by vessels permitted by the Hawaiian longline fishery;

longline is not an approved gear for swordfish off the West Coast. Revenues for swordfish peaked in 2000 at \$11.7 million and have varied with management measures and gear type. Generally, annual revenues have averaged about \$800,000 for harpoon since starting in the 1970s, \$2.9 million for drift gill net since in the 1980s, and \$2.2 million for longline since the 1990s (fig. 10).

Eastern Pacific Ocean swordfish populations are healthy; according to recent stock assessments, biomass levels are above the levels necessary to achieve maximum sustainable yield and the stock is in good condition. However, in recent years, West Coast swordfish landings continue to decline. In 2011 the NOAA Fisheries Southwest Fisheries Science Center (SWFSC) sponsored a workshop entitled “Working Towards Sustainability” as a means of enhancing the economic viability of the swordfish fishery. The Pacific Fisheries Management Council (PFMC) directed the Highly Migratory Species Management Team (HMSMT) to analyze all new information presented in the workshop to determine if changes can be made to the swordfish fishery, especially in terms of a modification of the borders or closure dates of the Pacific Leatherback Sea Turtle Conservation Area (PLCA). This conservation area, initiated in 2001, closed the drift gill net fishery to an area off central California to mid-Oregon August 15–October 31, at a time when leatherback sea turtles commonly feed in that area, coinciding with historical swordfish drift gill net fishing. New information, such as determination of sea turtle critical habitat, migration patterns, and vertical distribution may inform such a decision.

Recreationally caught swordfish are uncommon along the West Coast. Since 2003, swordfish have only been documented in the recreational catch in state fishing and federal fishing surveys in California in 2007; none were recorded in 2012 from either recreational Commercial

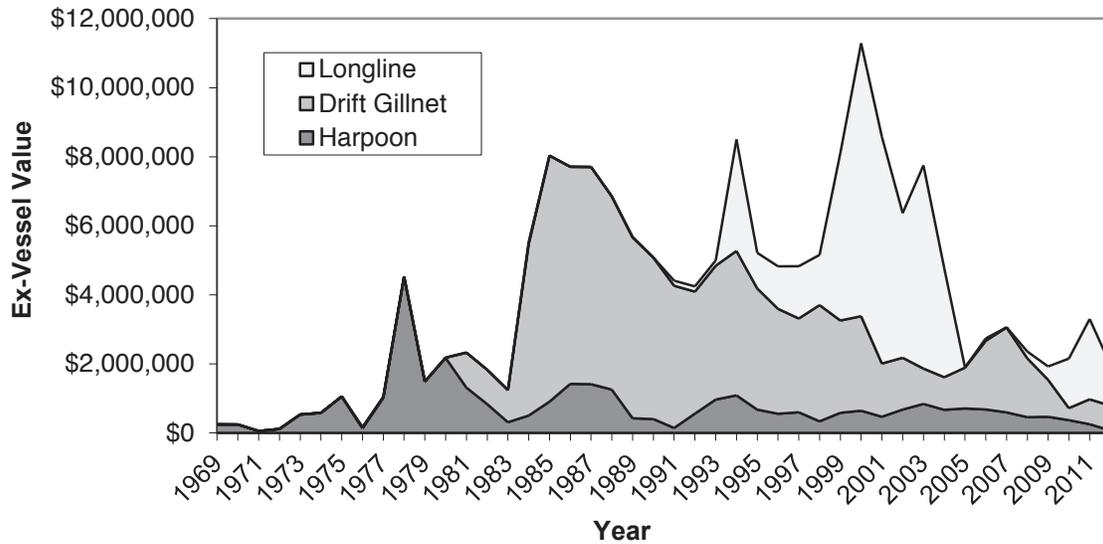


Figure 10. California commercial swordfish (*Xiphias gladius*) revenue by gear type.

Passenger Fishing Vessel (CPFV) logs or RecFIN data. California RecFIN data for 2012 comes from the California Recreational Fisheries Survey (CRFS), and represents observed and angler reported landed catch for private boats in all waters off California. All CPFV and CRFS data are from California waters only.

Albacore. Albacore (*Thunnus alalunga*) is the most 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 round haul gear. Along the West Coast 13,852 t were landed commercially in 2012, an increase of 26% coastwide from 10,964 t landed in 2011. California landings increased slightly to 611 t from 570 t in 2012. In 2012 the ex-vessel value in California was \$2.1 million with a price of \$3.70/kg (\$3,700/t), about thirty cents higher than the coastwide average. Washington landed 63% of West Coast albacore with 8,757 t, its only HMS landed, while Oregon landed 32% with 4,484 t. About 58 t of fresh and frozen albacore were exported from the West Coast to Canada, Japan and Thailand; 80% was exported from Washington. Albacore makes up 96% of all HMS commercially landed on the West Coast.

Recreational Commercial Passenger Fishing Vessel (CPFV) logs reported anglers taking 4,338 albacore in 2012 in California waters. RecFIN estimates indicate that anglers caught about 32,000 albacore off California, out of 150,000 caught coastwide, by private and rental boats.

Yellowfin tuna. Commercial landings of yellowfin tuna (*Thunnus albacares*) have continued to decline over 2009's low of 45 t to less than 2 t landed in 2012 (only

7 t total in the last three years), with an ex-vessel value of \$13,245; however, the price was \$8.49/kg presumably because of scarcity (\$1.11/kg in 2009, when 45 t were landed). All yellowfin was landed in California; the majority by longline gear. About 8 t of fresh yellowfin was exported to Mexico and Thailand. Recreational CPFV logbooks reported anglers caught 4,338 yellowfin tuna off California in 2012, more than six times as much as taken in 2011 (681 fish). CRFS reported an estimated 1,027 yellowfin tuna taken by private and rental boaters in 2012, while none were reported in 2011.

Skipjack tuna. There was 1 t of skipjack tuna (*Katsuwonus pelamis*) in each of the past two years; there have not been commercial landings over 10 t since 2006 (48 t). No skipjack tuna was estimated caught in the last three years in shore or private boat modes off California, although California CPFV logs reported 66 fish taken in California waters. This is a 70% decrease from 2011, when nearly 222 skipjack were taken by CPFVs in California.

Bluefin tuna. Commercial landings of bluefin tuna (*Thunnus thynnus*) declined in 2012 to 43 t landed in California. Landings in 2011 had increased to 118 t from only 1 t the previous year. Ex-vessel price increased slightly to \$2.24/kg in 2010, from 2.09/kg in 2011. The majority of the landings were taken in purse seine gear for the last two years (83 to 86%). Two tons of frozen bluefin tuna was exported to Canada in 2011; there were no exports in 2012. CRFS estimates sport anglers took only 10 bluefin tuna in 2012 off California by private boaters, whereas in 2011, 30 were estimated landed. CPFV logs report about 5,627 bluefin taken in 2012, almost twice as much as in 2011, when anglers took 2,743 fish in California waters.

Common thresher shark. Common thresher shark (*Alopias vulpinus*) is the most common and most valuable shark taken in HMS commercial fisheries off California. As in 2011, 95% of commercially-caught thresher shark was taken in gill net fisheries in 2012. Landings of common thresher shark declined by 10% from 64 t in 2011, to 63 t in 2012. Ex-vessel value was \$112,000 at an average of \$2.90/kg dressed weight (\$1.32/lb), decreasing from \$2.35/kg (\$1.07/lb) in 2011. California CPFV logs reported 37 threshers caught in 2012. CRFS landings, the majority of which come from private boats, estimate anglers landed about 372 thresher sharks in California in 2012.

Shortfin mako shark. Shortfin mako shark (*Isurus oxyrinchus*) is the second most common commercially landed shark in California HMS fisheries, 64% of which was taken by gill net gear in 2012, with 36% taken by hook and line gear, much of which was Hawaiian long-liner landing on the West Coast. Mako shark landings increased 37% from 2011 landings of 19 t to 26 t in 2012. Ex-vessel revenue was \$49,761, with an average price of \$2.79/kg (\$0.88/lb) dressed weight, a slight decrease from \$2.86/kg (\$0.90/lb) in 2011. CPFV logs reported 139 mako sharks taken in 2012, almost three times the amount taken in 2011. CRFS reported an estimated 648 taken by private vessels in 2012, about twice as much as the previous year.

Dorado (dolphinfish). All commercial landings of dorado (*Coryphaena hippurus*) occurred in California on the West Coast of the U.S. Commercial landings of dorado increased to 10 t in 2012, more than three times the amount landed in 2011 (3.2 t). The ex-vessel revenue was \$35,643, at \$3.52/kg, 3% higher than 2011's price of \$3.42/kg, but 46% less than 2009's high of \$6.27/kg. CPFV logs also recorded an increase in landings in 2012, with 6,337 fish landed, 38 times the previous year, when anglers took 166 fish. CRFS reported an estimated 8,785 dorado taken by private vessels in U.S. waters.

HMS Management. The federal Shark Conservation Act of 2010 was signed into law January 4, 2011, specifying that no shark is to be landed without fins being naturally attached. Additionally, California passed AB 376—a bill banning the possession and sale of shark fins, beginning January 1, 2012. While shark fisheries in California are still legal, and those possessing the proper license or permit are allowed to retain shark fins under California law, sales and distribution are prohibited. Restaurants and retailers were allowed to sell stock on hand as of the implementation until July 1, 2013. There is also an exception for taxidermy.

The Pacific Fishery Management Council (PFMC) made recommendations to international regional management organizations on bluefin tuna overfishing, supporting existing management measures but strength-

ening them to reduce the take of juvenile fish by other countries; additional domestic measures were not considered necessary because of the negligible impact of U.S. fisheries. The Council tasked the HMSMT to begin developing recommendations for an albacore precautionary management framework in case of future poor assessments, for recommendations at the international level. The Council also made recommendations to U.S./Canada Albacore Treaty fishing regime negotiations, and in 2012, supported the U.S. industry in suspending of reciprocal access privileges to each other's waters until investigation of economic and landings data was completed.

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 171 t in 2012 (fig. 11), a 31% decrease from the 2011 total of 247 t. In 2012, the average ex-vessel value paid by dealers was \$3.61/lb. The total ex-vessel value in 2012 was \$1,365,758, approximately 16% less than in 2011. Estimates of recreational take for 2012 are generated from the California Recreational Fisheries Survey (CRFS) for the private boat and shore-based modes and from Commercial Passenger Fishing Vessel (CPFV) logbook data. The estimate of recreational take decreased by 13% to 107 t in 2012 from the previous year's total of 123 t. The recreational catch estimates prior to 2004 are from a different survey and are not directly comparable to the estimates from the CRFS. However, historical trends in the recreational catch of white seabass can be determined from CPFV logbook data (fig. 12). The combined commercial and recreational catch for 2012 was 278 t.

Commercial and recreational fisheries for white seabass in California have existed since the 1890s. Historically, commercial landings have fluctuated widely, including landings of white seabass taken in Mexican waters by California commercial fishermen. In 1959, the white seabass commercial take in Mexican waters made up 1% of California's white seabass annual landings, while in 1981, it reached 89% of the total annual catch. 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 (approximate latitude 38.0°N) to Point Arguello (approximate latitude

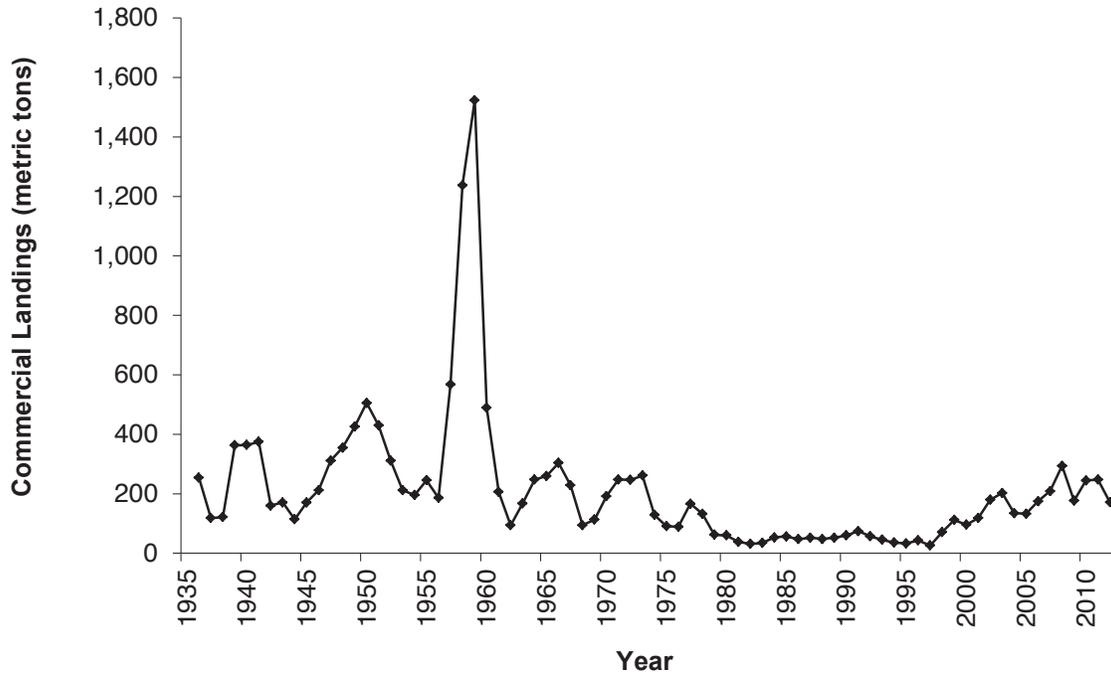


Figure 11. California commercial white seabass (*Atractoscion nobilis*) landings, 1936–2012.

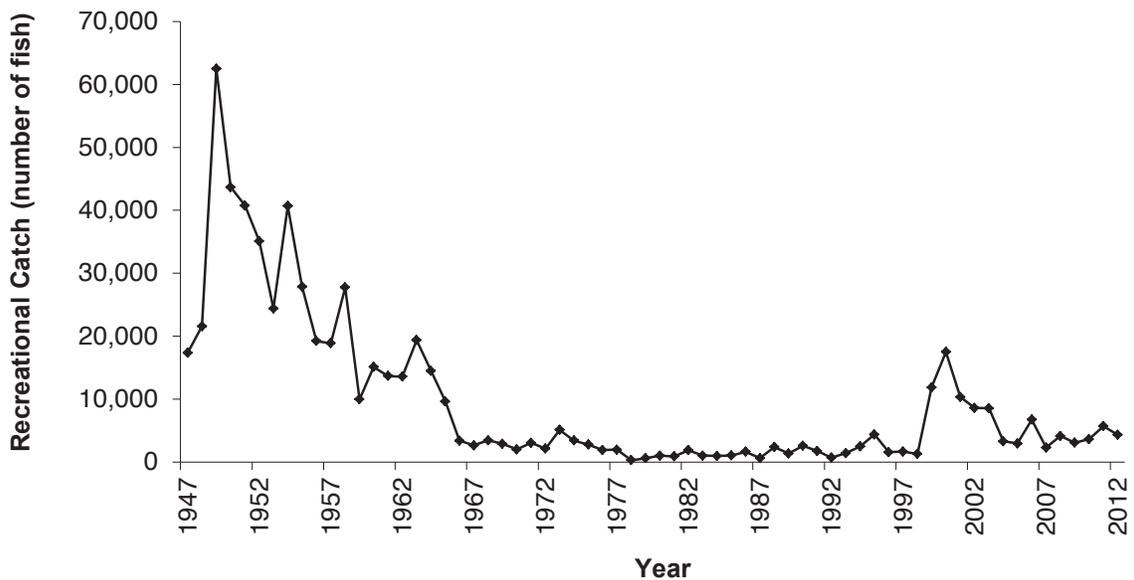


Figure 12. California recreational white seabass (*Atractoscion nobilis*) landings, from Commercial Passenger Fishing Vessel logbooks, 1947–2012.

34.6°N). Despite restrictions, most commercial white seabass landings are still taken with set and drift gill nets. In 2012, set and drift gill nets accounted for 62% of the commercial landings by weight, while hook and line vessels accounted for 38%. Almost half of these vessels, however, made less than three landings in 2012, indicating that the majority of hook and line vessels opportunistically catch white seabass when available along the coast. Much of the hook and line catch occurs within

Monterey Bay. The shift in catch distribution as evidenced by the increase in northern California landings (fig. 13) and, therefore, hook and line gear usage could be attributed to changes in oceanic conditions or distribution of forage fish.

The minimum legal size limit for white seabass in the commercial fishery is 28 inches (710 mm). The commercial fishery for white seabass is closed between Point Conception (approximate latitude 34.45°N) and

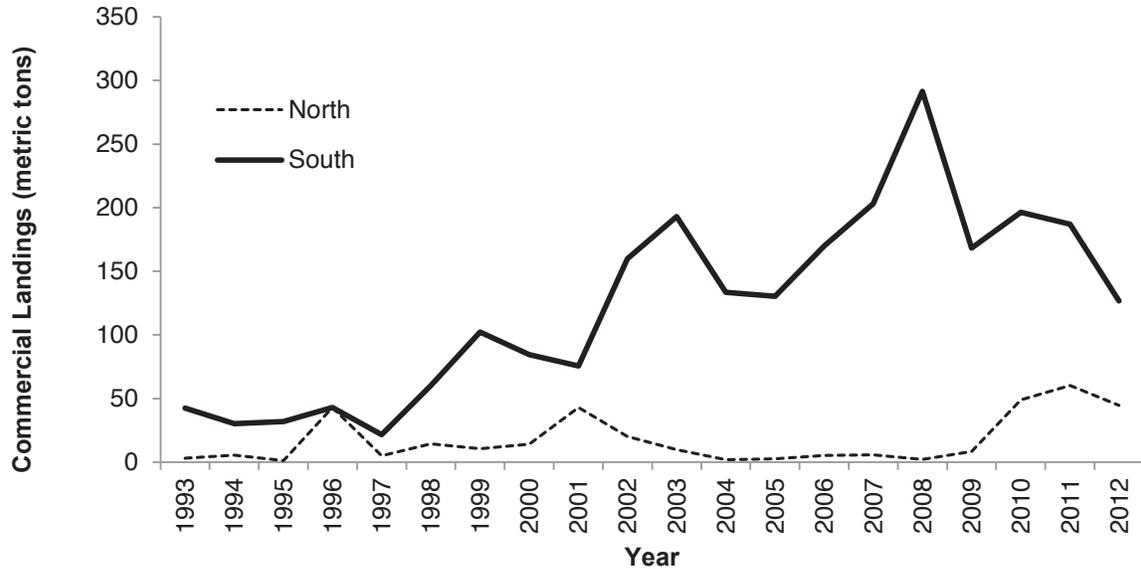


Figure 13. California commercial white seabass (*Atractoscion nobilis*) landings north and south of Pt. Arguello, 1993–2012.

the U.S./Mexico border from 15 March to 15 June, except one fish not less than 28 inches 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 2012, the average ex-vessel value paid by dealers was \$3.61/lb.

The recreational fishery for white seabass usually occurs almost entirely south of Point Arguello (approximate latitude 34.6°N). Typically, 95% to 99% of the catch is caught south of this point; however, starting in 2010, there has been an increase in catch in central and northern California. In 2012, only 81% of the catch occurred south of Point Arguello, while 19% occurred north of this point. The change in distribution of catch is attributed to an increase in the numbers of white seabass available within Monterey Bay. The fishery is open all year, but the majority of the recreational take occurs between March and September. The minimum legal size limit for white seabass in the recreational fishery is 28 inches (710 mm), and 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). The legislation was adopted to fund research into the artificial propagation of marine finfish species whose populations had become depleted. The ultimate goal of the legislation 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 species to focus on because of

the depressed condition of the stock at the time and its higher value to recreational and commercial fishermen.

The California Department of Fish and Wildlife (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), to 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 2012, 108,749 hatchery-raised white seabass were released, an increase of approximately 12% from last year's release of 97,444 fish. Since 1986, over 1.9 million white seabass, each implanted with a coded wire tag (CWT), have been released from the OREHP facilities.

Since the mid to 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. From 1988 to

2008, researchers conducted a standardized gill net sampling survey designed to capture 1- to 4-year-old juvenile white seabass in shallow waters off southern California. Initially, the survey focused on determining the distribution of young fish but switched in 1996 to look at recruitment of 1-year-old fish and recovery of tagged fish. The juvenile gill net sampling program was cut in 2009 due to limited funding availability; however, the Department was able to reinstitute sampling in 2012 in a limited capacity. 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, 1,416 hatchery-raised juvenile white seabass have been recovered in the juvenile gill net studies while 181 tagged adult white seabass (legal-size) have been recovered from the recreational and commercial fisheries. The results of both the juvenile and adult sampling programs will be used in evaluating the success of the OREHP. In addition to both juvenile and adult sampling programs aimed at determining survival rates and recruitment of hatchery raised white seabass, a stock assessment will be completed in 2014 and will be used as part of the program evaluation.

In 2006, the California Legislature passed SB 201 (Simitian) Marine Finfish Aquaculture, which amended the statute related to marine aquaculture [FGC §15000 et. seq.]. The statute requires the preparation of an enhancement plan for any recovery, restoration, or enhancement of native fish stock projects carried out under either a scientific collecting permit, research permit, or the OREHP [FGC §15400(b)(10)(c)]. Legislation also designates the Fish and Game Commission (Commission) the authority to approve an enhancement plan.

In June 2010, the Department submitted the White Seabass Enhancement Plan (WSEP) to the Commission, which it approved on 21 October 2011. 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. It also outlines methods on which to evaluate the OREHP and is designed to be flexible and adaptable to a wide range of future conditions. Minor changes can be made to the BMPs without the need to amend the WSEP by revising the other guidance documents for the OREHP. However, future research, environmental, biological, or economic changes of significance may create a need to amend the WSEP to ensure that the enhancement of white seabass is conducted in a responsible manner.

Since its inception, the OREHP has conducted

research designed to provide a new tool for resource management while preventing adverse impacts to the environment or the wild fisheries. In July 2012, the Department adopted the Initial Study and Negative Declaration for the OREHP per California Environmental Quality Act (CEQA) guidelines. The initial study indicated that the program does not have a significant impact on the environment.

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. The OY has never been reached since its implementation, but came close in the 2001–02 fishing season when combined landings reached 530 t. In the 2011–12 fishing season, the total recreational and commercial harvest was 302 t, 55% of the allowable catch.

Pacific Halibut

Pacific halibut (*Hippoglossus stenolepis*) is a desirable commercial and recreational target species ranging from the Bering Sea in Alaska to central California. The entire North Pacific halibut resource is internationally managed through the Halibut Treaty (Treaty) between the United States and Canada. The International Pacific Halibut Commission (IPHC) was established to conduct research and management activities in the waters of the parties to the Treaty. In California, both the commercial and recreational Pacific halibut fisheries have experienced large fluctuations in catch over the last century.

During the first half of the 20th century, a substantial commercial fishery for Pacific halibut existed in California. Landings data from 1916–60 (reported in the California Department of Fish and Game Fish Bulletin No. 74) show annual landings as high as 348 t net weight (fish are headed and gutted) occurring in 1934 (fig. 14). Despite the magnitude of Pacific halibut landings occurring in California during this time, the fishery was a minor portion of the overall fishery for Pacific halibut, with approximately 1% of Pacific coast commercial landings occurring in California, and the fishery was considered of minor importance to the state of California. Most of California's commercial Pacific halibut landings were made in Eureka, with smaller amounts in Fort Bragg and San Francisco; however, not all catch was by California vessels, nor was all the catch occurring in California waters. Point Arena (38°57.5'N lat) was considered the southern limit of the commercial fishing grounds. After 1945, regulations restricting the fishery

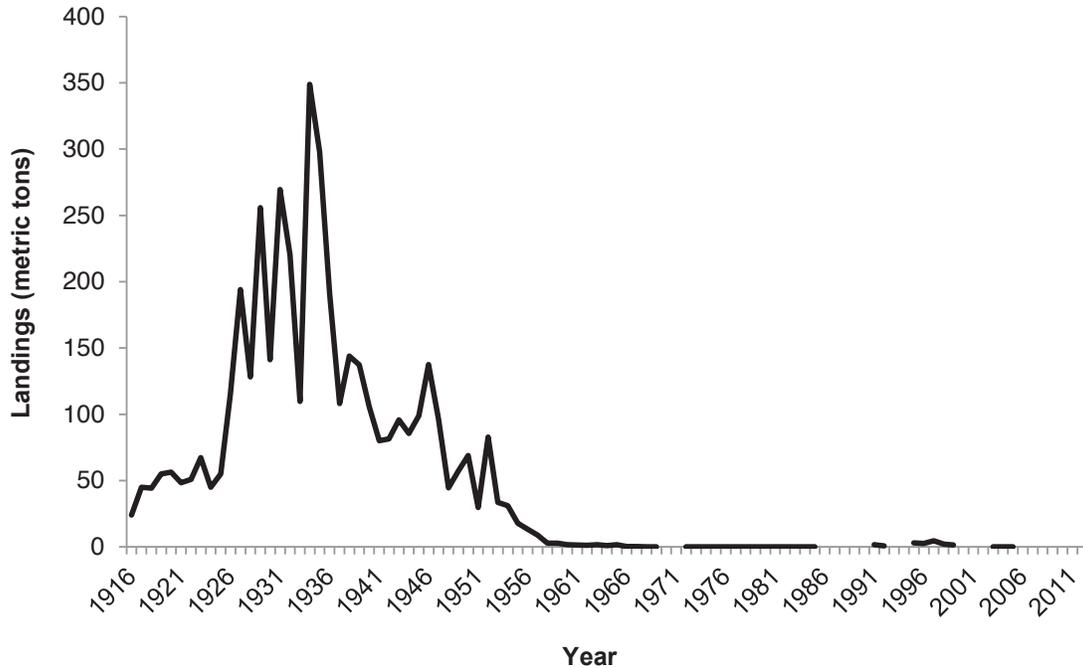


Figure 14. Annual commercial landings of Pacific halibut (*Hippoglossus stenolepis*) in California from 1916–2012. Missing data points are due to confidentiality concerns. Data from CDFW Fish Bulletin Number 74 and CFIS.

were implemented and landings in California experienced a drastic decrease.

The Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS) are authorized by the Treaty to manage Pacific halibut in what is known as “Area 2A” which includes the waters off of the three West Coast states (Washington, Oregon, and California). The IPHC annually allocates a portion of the harvestable Pacific halibut to Area 2A which the Council divides among the tribal, commercial, and recreational fisheries through a Catch Sharing Plan (CSP). California’s recreational subquota is within the South of Humboldt Mountain (SoH) subarea of Area 2A which includes southern Oregon and all of California. In 2012, the SoH subarea subquota was 2.75 t (fig. 15) or approximately 0.62% of the Area 2A Total Allowable Catch (TAC).

From 2000–12 the directed commercial fishery in California averaged landings of 0.08 t net weight per year. Trace amounts of Pacific halibut were landed in California from the directed commercial fishery during 2012. The directed commercial fishery for Pacific halibut in Area 2A is a derby fishery consisting of one-day open periods 10 hours in duration scheduled every other week by the IPHC, generally beginning in the second half of June. Due to the derby nature of the directed commercial fishery, in combination with a quota shared by all three West Coast states, the season generally consists of two to five 10 hour open periods per year. Commercial fishermen are required to obtain

an IPHC permit to participate in the directed fishery and are prevented from participating in any other Pacific halibut fishery for that year.

A coastwide Pacific halibut incidental allowance to the commercial salmon troll fishery is permitted but no legal landings in California have been made since the start of that fishery in 1995, primarily because the incidental fishery has reached its quota prior to the start of the commercial salmon fishery in California. Vessels choosing to operate in this fishery are also required to obtain an IPHC permit and are restricted from participating in any other Pacific halibut fishery for that year. Pacific halibut are also encountered as bycatch in other commercial fisheries, such as the groundfish trawl and Limited Entry longline sablefish fisheries, but they must be discarded.

A small recreational fishery targeting Pacific halibut existed in northern California prior to 2007, although only minimal amounts were caught. Since 2007, catches have increased and Pacific halibut is now actively targeted in northern California (north of Point Arena). Based on information from the California Department of Fish and Wildlife (CDFW), estimated recreational catch of Pacific halibut in California during 2012 was 11.7 t net weight (fig. 15). Recent catches have exceeded the recreational catch quota set by the IPHC by an average of 7.4 t and the highest recent catch occurred in 2009 when an estimated 15.8 t were caught. It is not known whether increased catch reflects an increase in Pacific halibut abundance, angler interest, or effort due to

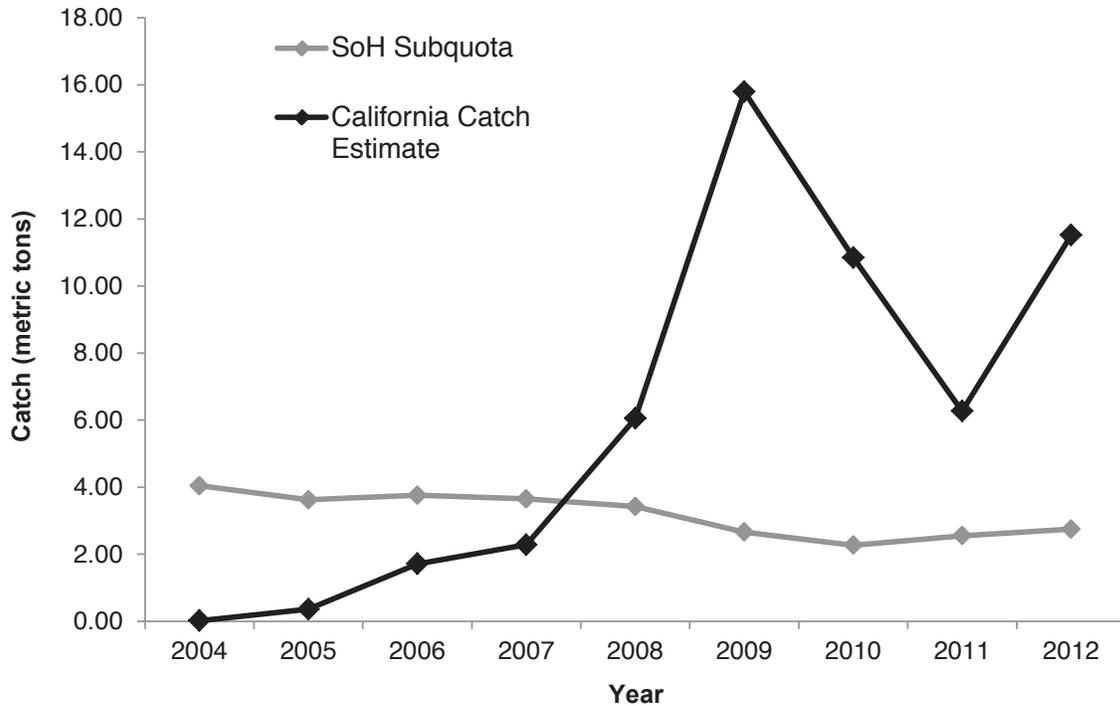


Figure 15. California Pacific halibut (*Hippoglossus stenolepis*) recreational catch and SoH subquota from 2004–2012. Catch estimates for 2012 are preliminary. Data from CRFS and CDFW.

limited angler opportunities in the recreational salmon and groundfish fisheries. Recreational regulations for Pacific halibut in California during 2012 provided for an open season from May 1 through October 31, with a one-fish bag and possession limit and no minimum size limit.

The IPHC is responsible for conducting the annual stock assessment, developing information on current management issues, and adding to the knowledge of the biology and life history of the Pacific halibut. According to the IPHC, Pacific halibut can live up to 55 years, and have been reported to reach 267 cm (9 ft) in length and up to 318 kg (900 lbs). Few males attain weights greater than 36 kg (80 lbs) and almost all fish over 45 kg (100 lbs) are females. Each year the IPHC surveys and assesses the North Pacific stock from the Bering Sea to the Oregon/California border, determines the available coastwide exploitable biomass, then allocates the available harvest among subareas in Alaska, Canada, Washington, Oregon, and California. The 2012 Pacific halibut stock assessment indicated that biomass was stable, although less than previously thought. The 2012 stock biomass is above the harvest policy threshold precautionary level, but is approximately 33,566 t, or 28% less than was estimated in the 2011 assessment.

In response to the recreational catches of Pacific halibut in the SoH subarea exceeding the SoH subarea subquota, the IPHC, NMFS, Council, and West Coast states began gathering information on Pacific halibut in

the SoH subarea. Specific objectives were to: develop a common understanding of Pacific halibut management and allocation history in California; develop methods to more accurately estimate the recreational catch in California; find alternative data sources to estimate abundance and distribution of Pacific halibut in California for use in stock assessments; collaborate and develop a range of management options to reduce the recreational catch in California; and explore the possibility of expanding the IPHC annual research survey into California waters. These efforts are ongoing, and already resulted in plans to extend the annual research survey into California waters for the first time in 2013. Future regulation changes to the Pacific halibut fishery in California may occur as more information on the Pacific halibut resource in the SoH subarea becomes available.

Red Sea Urchin

Statewide landings of red sea urchins (*Strongylocentrotus franciscanus*) in 2012 were estimated at 5,153 t, with an ex-vessel value of \$8.3 million (fig. 16). The catch represents a small decrease from 2011 landings of 5,270 t, but also represents a small increase in value from \$8.2 million, with little or no change in catch and value for both the northern and southern California regions.

In 2012, effort in the southern fishery was 8,210 landings and 2,451 landings in the northern fishery. The southern fishery over the last decade peaked in 2004 to 11,065 landings and dropped to a range of 7,600–9,500

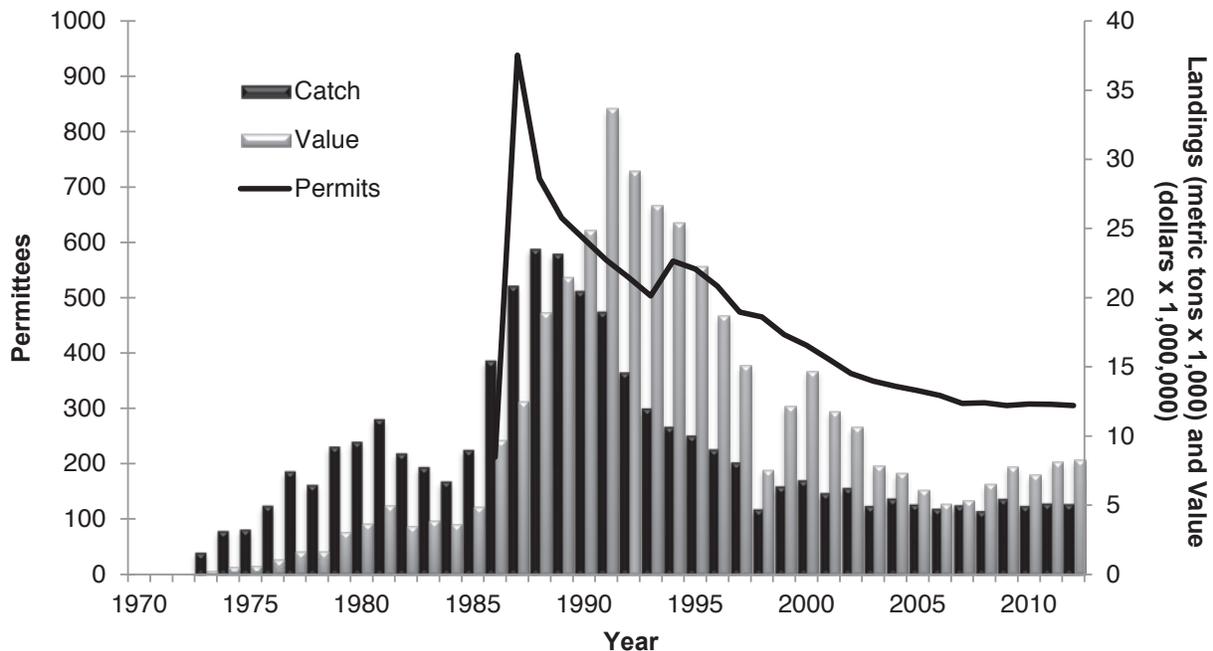


Figure 16. Catch, value, and number of permits for the California commercial red sea urchin (*Strongylocentrotus franciscanus*) fishery, 1970–2012.

annually over the next 8 years. The northern fishery effort in 2003 was 2,275 landings and declined to about 1,000–1,400 until 2008. From 2009–12, effort increased to 2,000–2,600 landings annually.

The proportion of yearly statewide catch was 77% in the south and 23% in the north. From 2003–07, the southern fishery has averaged 87% of the yearly statewide catch, but in the most recent five years (2008–12), average catch was 71%. An increase in the north and decrease in the south in recent years may be attributed to the addition of new active divers entering the northern fishery, and divers in the southern fishery participating in more lucrative dive fisheries such as sea cucumber. Many of the sea cucumber permit holders are also sea urchin divers, and recent increases in demand and value for sea cucumbers may be contributing to the shift.

For the last decade (2003–12), the average southern fishery catch was 4,029 t, and for the last two years was around 3,700 t. The Santa Barbara port continues to have the highest landings in the state, making up approximately 50% of the southern fishery landings in 2012 at 2,035 t, up from 1,835 t in 2011. Over the last decade a high percentage of the landings have originated in a few regions including the Channel Islands (mainly San Miguel and Santa Rosa Islands), San Diego, and San Clemente Island. In 2012, these regions continue to be the areas of concentration in the southern fishery.

A significant increase in the northern fishery catch occurred from 2008 at 1,201 t to 2009 at 1,802 t, and catch continues to stay near the 1,500 t level in 2012. This is up from previous years in the fishery where catch

was generally below 1,000 t and only 476 t in 2006. Fort Bragg port consistently has the highest northern fishery contribution at 68% in 2012 with 1,007 t, up slightly from 940 t in 2011.

The 5,207 t California sea urchin fishery yielded \$8.3 million ex-vessel in 2012, for an average of \$1.61/kg of landed urchin. This unit value was well below the highest average on record of \$2.36/kg in 1994, but similar to unit values since 2008. Over the last decade, unit value has averaged \$1.36/kg. When adjusted for inflation using the 2012 consumer price index figures, \$1.61/kg in 2012 is worth \$1.04 in 1994, a 56% drop in value to the fishermen. It should be noted that some buyers in southern California began writing lower estimated prices on the market receipt at the time of unloading starting in about 2003, which was a result of regulations requiring buyers to record a price paid at the time of landing. This was not necessarily the ultimate price since the actual price is not paid to the fishermen until the quality of the product is assessed. The effect is that price and value data are likely an underestimate of the actual price paid to fisherman for red sea urchins in southern California during this time period. The California Department of Fish and Wildlife (Department) is working with the industry to rectify this problem.

Sea urchin permit renewals totaled 305 in the 2012 season, and has been consistently near 300 since dropping from 340 in 2004 with a steady decline toward the “capacity goal” of 300 set by regulation in the early 1990s. In 2004, the California Sea Urchin Commission (CSUC) was formed, and operates under state law to

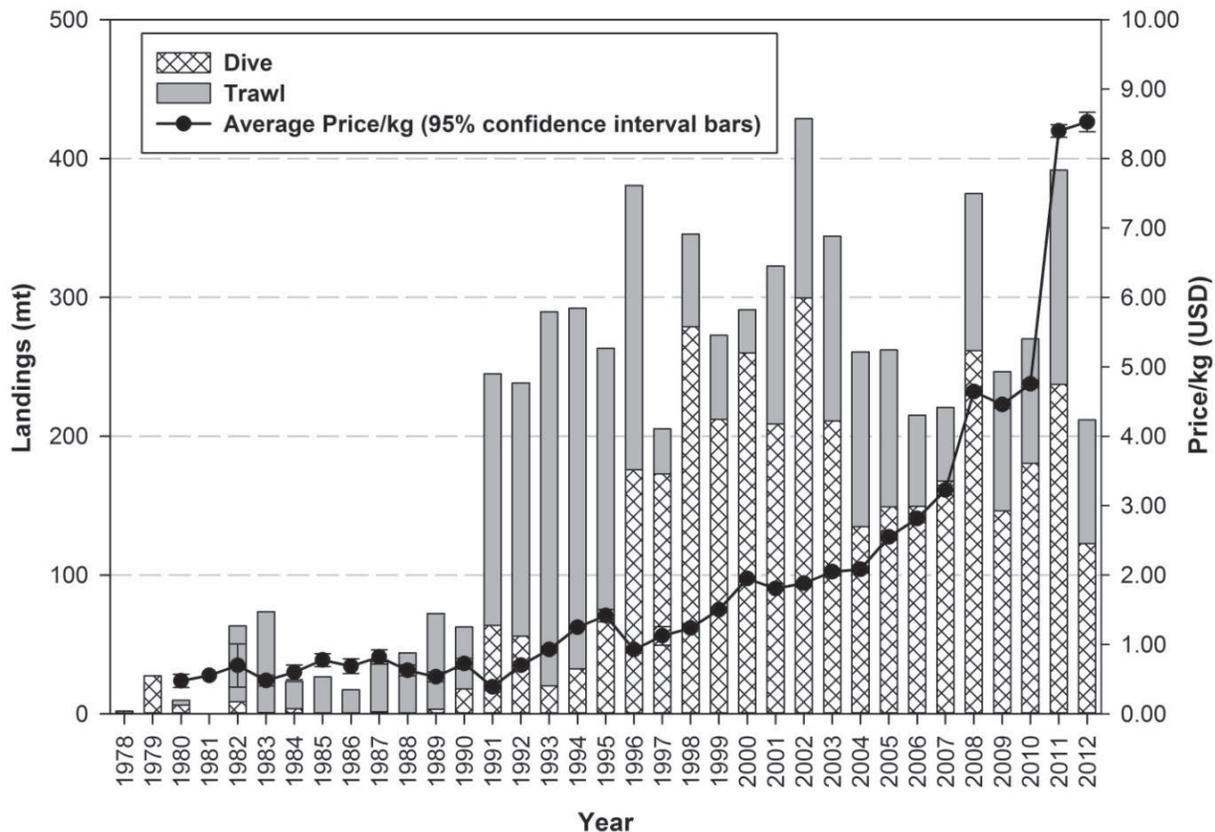


Figure 17. Commercial sea cucumber landings by dive and trawl fisheries from 1978–2012.

ensure a sustainable sea urchin resource and a reliable supply of quality seafood product for domestic consumption and export. The industry is currently working with the Fish and Game Commission and the Department to propose a regulatory package that includes a reduction in permit capacity goal, transferability, and the addition of fishing days.

In 2012, 50% of the catch was taken by the 40 top divers, and 80% of the catch was taken by 85 divers. In the northern fishery, 11 of the 41 active divers took 50% of the catch. In the event of an improvement in worldwide urchin markets, the latent fishery capacity could activate and drive catches considerably higher than those under our present management scheme. The capacity goal issue has increased in urgency due to the aging of the sea urchin diver population with the average diver age over 50 years old, and most of the catch coming from the older divers. The issue of permit transferability is being debated more actively as older divers look to retirement and hope to sell their permit or pass it on to younger family members.

Sea Cucumber

Commercial harvesting of warty sea cucumber (*Parastichopus parvimensis*) and giant red sea cucumber (*P. californicus*) has increased dramatically in California over

the last decade in response to growing foreign demand from Chinese and Korean based markets. The giant red sea cucumber, also known as California sea cucumber, ranges from Alaska to Baja California, Mexico and mainly occurs in depths ranging from the low intertidal to 91 m (300 ft). Giant red sea cucumbers are primarily targeted by the trawl fishery in southern California and, to a limited extent, the dive fishery in northern California, with commercial dive landings recently increasing in southern California. Established dive fisheries targeting giant red sea cucumbers also exist in Washington and Alaska. The warty sea cucumber ranges from Monterey, California to Baja California, Mexico and is most commonly found in depths ranging from the low-intertidal to 30 m (90 ft). Due to the shallower distribution of the warty sea cucumber compared to the giant red, it is principally targeted by the dive fishery in southern California and Mexico.

The commercial and recreational take of sea cucumbers are managed by the California Fish and Game Commission. Starting in the 1992–93 commercial fishing season, a general “sea cucumber” permit was required to harvest sea cucumbers commercially. In order to qualify for this permit, individuals were required to meet a minimum landing requirement of “50 pounds” during a four year “window” period. In 1997, legislation

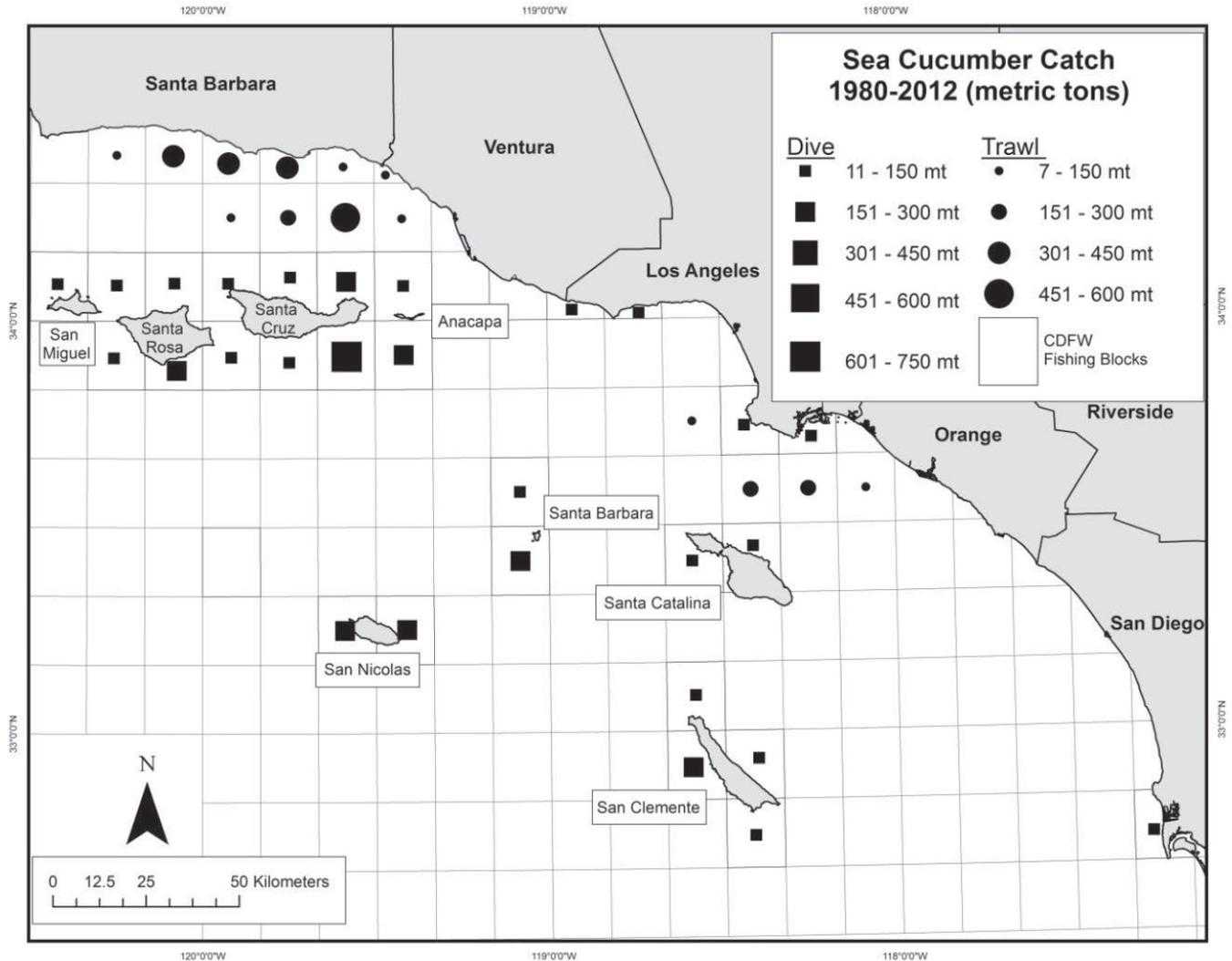


Figure 18. Commercial sea cucumber dive and trawl catch by origin (CDFW commercial fishing blocks) in southern California from 1980–2012. Commercial fishing blocks are approximately 256 km² (100 mile²).

was passed creating separate “sea cucumber trawl” and “sea cucumber dive” permits. Another major regulatory change to this fishery at this time was the capping of the total number of available permits based on the number that were issued during the 1997–98 permit year (116 dive; 36 trawl), and the meeting of a minimum landing requirement. The transferability of sea cucumber trawl and sea cucumber dive permits was also initiated by the 1997 legislation. This allows sea cucumber fishermen to transfer their permits by selling them to other qualified individuals. Sea cucumber trawl permits can be transferred as either a trawl or dive permit, but dive permits can only be transferred as dive permits. Sea cucumber dive and trawl fishermen are required to fill out a California Department of Fish and Wildlife (Department) logbook detailing their daily fishing activities. The sport take of sea cucumbers is minimal at this time, with regulations consisting of a daily bag limit of 35 individuals

that must be harvested by hand and greater than “1000 ft” from shore.

The sea cucumber fishery began in southern California in 1978, with divers targeting warty sea cucumber around Santa Catalina Island (fig. 17). In 1980, the trawl fishery began targeting giant red sea cucumber, and from 1980–94 trawl landings dominated sea cucumber landings, accounting for 84% over this period (fig. 17). In 1995, the average price per kilogram for sea cucumber reached a then all-time high of \$1.40/kg (\$0.64/lb), which led to increased dive effort starting in 1996. From 1996–12, the dive fishery has accounted for a majority of sea cucumber landings (67%), with most harvest occurring at offshore island locations (fig. 18). Most trawl catch occurs off the coast of Santa Barbara and Ventura counties, with minor landings originating off Los Angeles and Orange counties (fig. 18). Seasonally, dive landings generally peak from spring through early

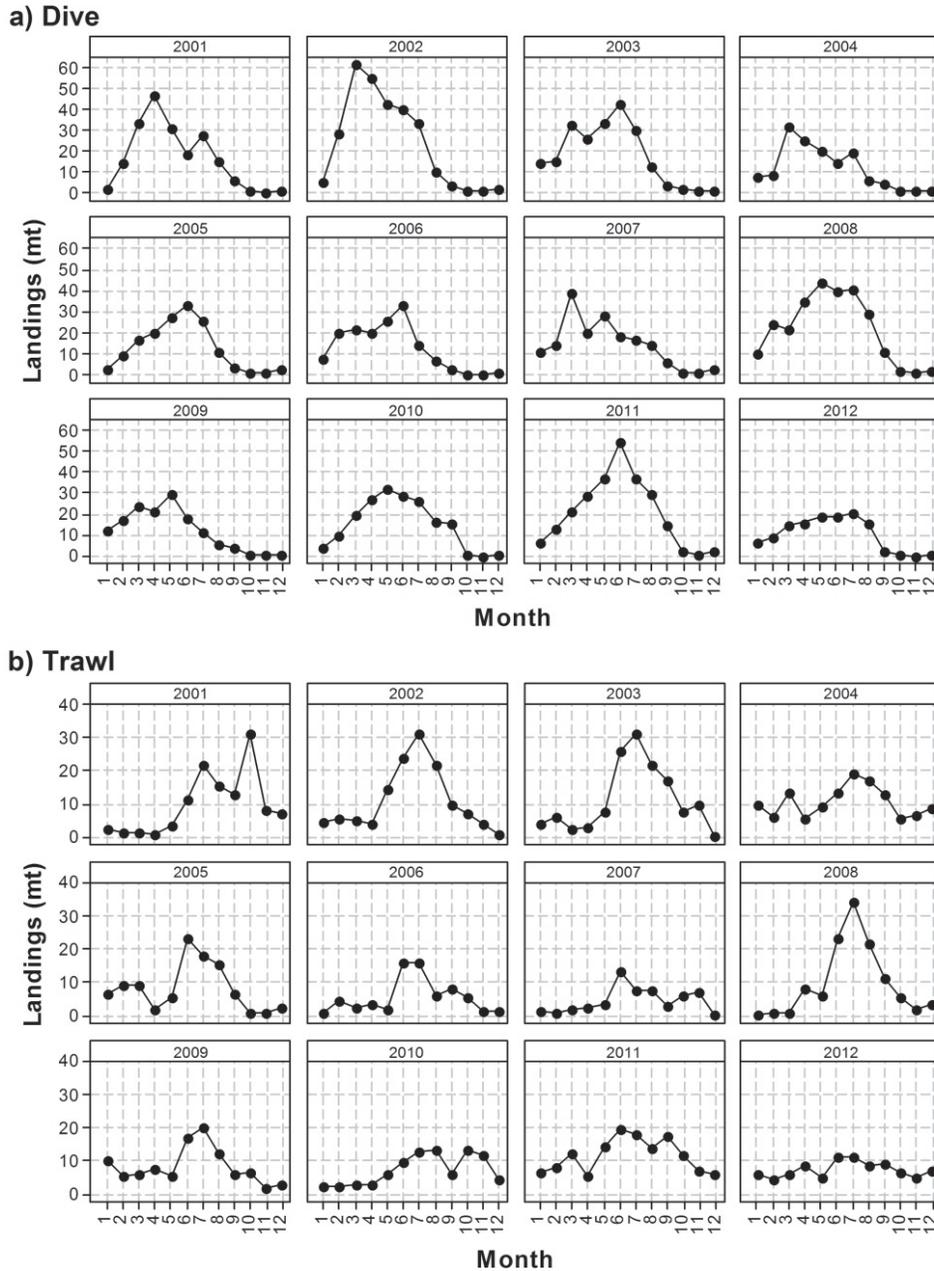


Figure 19. Total monthly commercial sea cucumber landings for a) Dive and b) Trawl fisheries from 2001–2012. Panel headings indicate the year.

summer between the months of April to June (fig. 19). There is a concern that because this is also the spawning period for warty sea cucumber, they may be more vulnerable to overharvesting at this time. Trawl landings for giant red sea cucumber generally peak later in the year between summer and fall, although it is not yet known whether this is the primary spawning period for this species (fig. 19).

In 2012, there were 83 dive and 16 trawl permits issued, with dive landings reaching 123 t with an ex-vessel value worth \$1.2 million. This was a 50% reduc-

tion in landings when compared to 2011 (247 t), despite the fact that the average price reached a record high of \$8.50/kg (\$3.85/lb) in 2012. In 2011, the fishery set an all-time record ex-vessel value of \$2.2 million. The 2012 dive landings were the lowest since 2005 when most of the fishery began to sell their product in a cut/processed state. Although the dive fishery mostly targets warty sea cucumber, dive landings of giant red sea cucumber reached a record high in 2012 of 23 t, which comprised 19% of all dive landings. In 2012, trawl landings reached 89 t with an ex-vessel value of \$728,469, a

37% reduction in landings when compared to the 142 t landed in 2011, valued at a record high of \$1.2 million (ex-vessel).

The limited understanding of the basic biology of warty and giant red sea cucumber presents various challenges in managing this growing fishery. The Department is currently concerned that some individuals are being harvested prior to reaching sexual maturity and that sexually mature individuals are being harvested during reproductive periods. In an effort to address these concerns, the Department is conducting seasonal dive surveys to determine how population densities change across seasons. Coupled with these dive surveys, individuals are also being collected to determine sex ratio, reproductive state, and size at first sexual maturity. Findings will inform key gaps in the basic biological understanding of our sea cucumber species while providing valuable information needed to explore potential management options.

Editor:

D. Porzio

Contributors:

E. Hellmers, Coastal Pelagic Species

C. Protasio, Market squid

R. Bartling, Pacific herring

A. Klein, Groundfish

L. Laughlin, Highly Migratory Species

K. Johnson, White seabass

M. Parker, Pacific halibut

D. Stein, Red sea urchin

C. Mireles, Sea cucumber