California Halibut (*Paralichthys californicus*)

Certification Units Covered Under this Species:

- Central region, trawl
- Southern region trawl

Summary

California halibut are primarily located from Magdalena Bay in Baja California to Bodega Bay in California. The California population is divided into two stocks, a southern California stock and a central California stock. The southern stock is estimated to be depleted to about 14% of its unexploited spawning biomass level while the central stock is healthy and has been increasing since 1995. Shallow water embayments appear to be important nursery habitat for California halibut and populations may be limited by the amount of nursery habitat available. California halibut are managed by the California Fish and Game Commission and the California Department of Fish and Wildlife. Commercial fishing gears include trawl, gillnet and hook and line.

Strengths:

- Central California stock is healthy
- Recruitment is density-independent; MSY occurs at a low level
- Stock assessment completed in 2011; some data gaps are being filled and another assessment is planned in the next few years

Weaknesses:

- Southern California stock is depleted to 14% of its unexploited spawning biomass level
- No harvest control rules or reference points have been developed yet
- ETP bycatch in federal waters

History of the Fishery in California

Biology of the Species

California halibut (*Paralichthys californicus*) are flatfish from the family Pleuronectidae, or the “right eyed flounders.” Despite being from the family of right eyed flounders, about 40% of California halibut are actually left eyed (Love 2011). The body of the California halibut is oblong and compressed with a small head and large mouth with big teeth. A distinguishing characteristic of California halibut is the presence of a high arch in the lateral line located above the pectoral fin. The halibut is typically dark on the top, “eyed” side, and white on the bottom, “blind” side; they can also change the color and pattern of their top side to match their

surroundings. They reside primarily on soft bottoms such as sand or mud and have been found from the surf zone out to 281 m of depth. However, halibut are most common from the surf zone out to 60 m of depth (Love 2011). [From CDFG 2004]: California halibut are ambush predators. Adult halibut feed primarily on Pacific sardine, northern anchovy, squid, and other nearshore fish species that swim in the water column. Small juvenile halibut in bays primarily eat crustaceans, including copepods and amphipods. At 2.5 in., they are large enough to eat small fish. As juvenile halibut increase in size, the percentage of fish in their diet increases. California halibut appear to have a cycle of abundance of approximately 20 years that is tied to environmental conditions (Maunder et al. 2011).

[From Maunder et al. 2011]: California halibut range from Magdalena Bay, Baja California (Gilbert and Scofield 1898), to the Quillayute River in Washington (Pattie and Baker 1969), however is most common from Bodega Bay south. Fish in central California tend to be larger at a given age than fish in southern California. Large adult fish inhabit deeper water (Sunada 1985), outer banks, and islands (Wallace 1990), except during the peak spawning season (April - May) when they move inshore to spawn (Clark 1931). California halibut are batch spawners, with a typical 5-year old fish releasing about 300,000 eggs at a time, although the number of eggs released is dependent on the size of the fish (Lavenberg 1986). [From CDFG 2004]: Halibut have a relatively short free-drifting larval stage (less than 30 days), transforming and settling to the bottom at a small size (about 0.3 to 0.5 in.). Newly settled and larger juvenile halibut are frequently taken in un-vegetated shallow-water embayments and infrequently on the open coast, suggesting that embayments are important nursery habitats. The overall decline in halibut landings corresponds to a decline in shallow water habitats in southern California associated with dredging and filling of bays and wetlands.

There are sex-specific differences in age, size, maturity, and distribution. California halibut females live longer, grow larger, mature later and appear to be more common or more easily captured than males. Females live to 30 years of age and males to 23 years of age. Maximum length of female halibut (which are larger than males after 3-4 years of age) is 152 cm and male halibut is 108.5 cm. Length at 50% maturity is 47.1 cm for females or 4-5 years of age and 22.7 cm for males or 2-3 years of age. Sampling halibut with various fishing gears suggests females are in greater abundance and/or more vulnerable to capture than males (Reed and MacCall 1988, Sunada et al. 1990, Pattison and McAllister 1990), although one study did find a greater percentage of males captured using a smaller than normal trawl net (MacNair 2001). Additionally, the female to male sex ratio appears higher in inshore areas compared to offshore areas (Sunada et al. 1990). The 2011 stock assessment (Maunder et al. 2011) concluded that it is likely males have a higher natural mortality rate than females, there are spatial or depth differences in the distribution of males and females, and males and females have different vulnerabilities to the various fishing methods.

Commercial Fishery

[From Maunder et al. 2011]: California halibut is an important target species for both recreational and commercial fisheries. The commercial fisheries have caught California halibut using trawl, set gillnets, and hook-and-line. Bottom gillnets historically accounted for a significant portion of the catch, but their use has declined due to the banning of this gear in several areas along the California coast. Trawl and bottom gillnets are the primary gears used in southern California, while mostly trawl and hook-and-line gear are used in central California (Figures 1 and 2). In southern California, there is also a live halibut fishery which has been active since 1990; live fish fetch a higher price than fresh dead fish (CDFW 2013). The commercial catch has shown three

large peaks in the 1910s, 1940s, and the 1960s (Figure 3). Prior to 1960, the commercial catch landed north of Point Conception (San Francisco and Monterey port areas) was only a small portion of the total commercial catch. However, it increased in the late 1960s and by the mid 1980s the catch landed north of Point Conception was about 40% of the total commercial catch. Revenue peaked in the late 1980s and again in the late 1990s at close to $4 million (Figure 4).

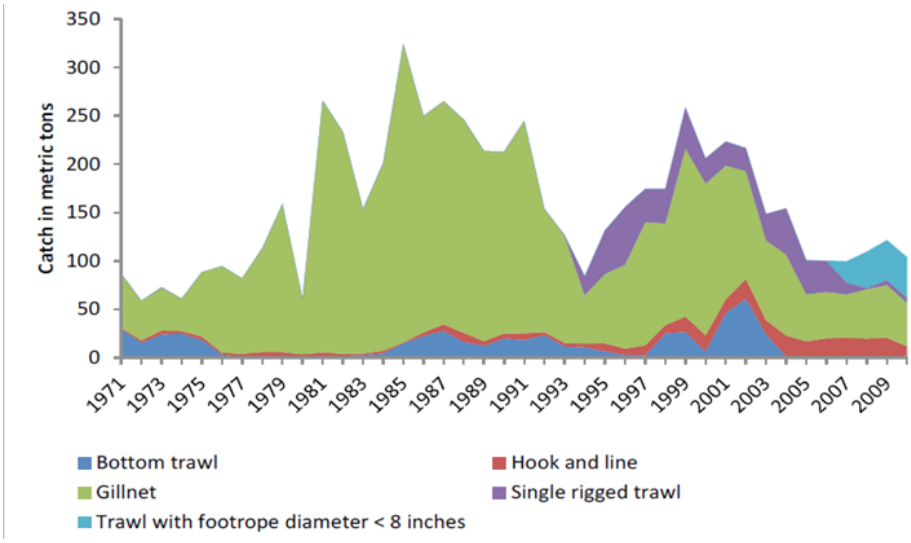

Figure 1. Commercial catch south of Point Conception in metric tons by gear type (Maunder et al. 2011).

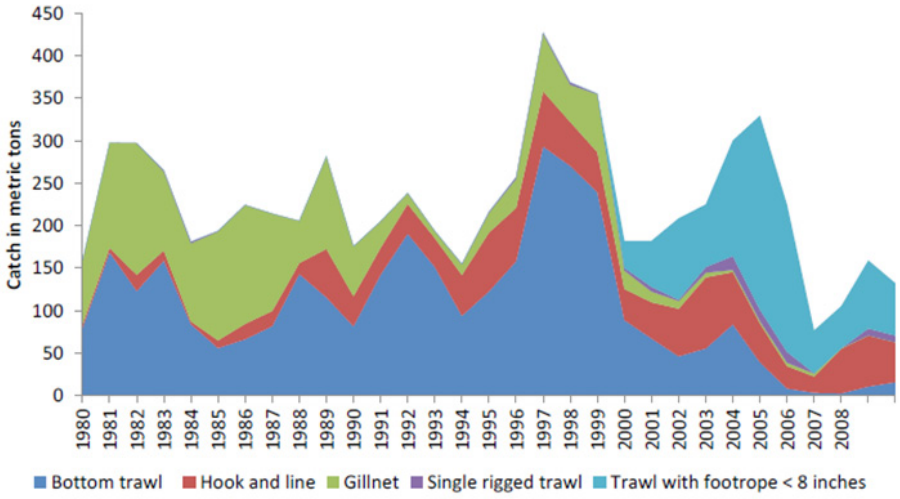

Figure 2. Commercial catch north of Point Conception in metric tons by gear type (Maunder et al. 2011).

[From CDFG 2003]: The decline in commercial California halibut landings after 1919 (Figure 3) is attributed to increased fishing pressure during World War I and to subsequent overfishing. Fishing restraints during World War II may have allowed halibut stocks to increase, resulting in peak landings in the late 1940s, followed by low catches in the 1950s. Warm waters during El Niño years in the late 1950s were followed by increased landings through the mid-1960s. Thereafter, annual landings decreased again to a historical low of 128.5 mt in 1970; after 1970

landings gradually increased. Since 1980, landings have averaged a little more than 500 mt annually.

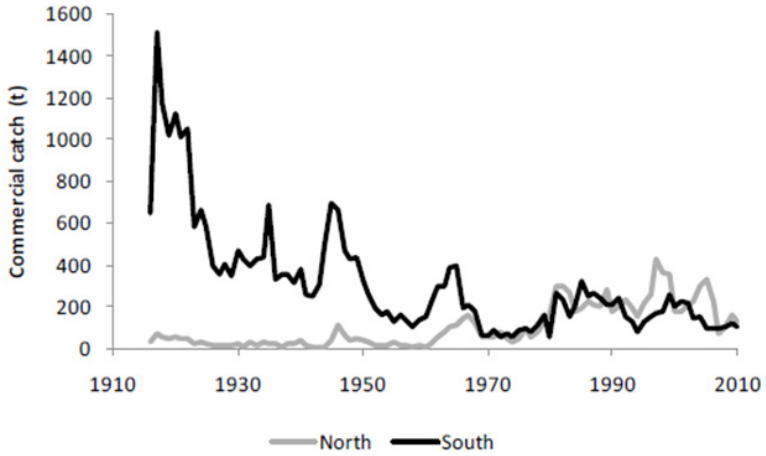

Figure 3. Commercial catch over the last 100 years north and south of Point Conception (Maunder et al. 2011).

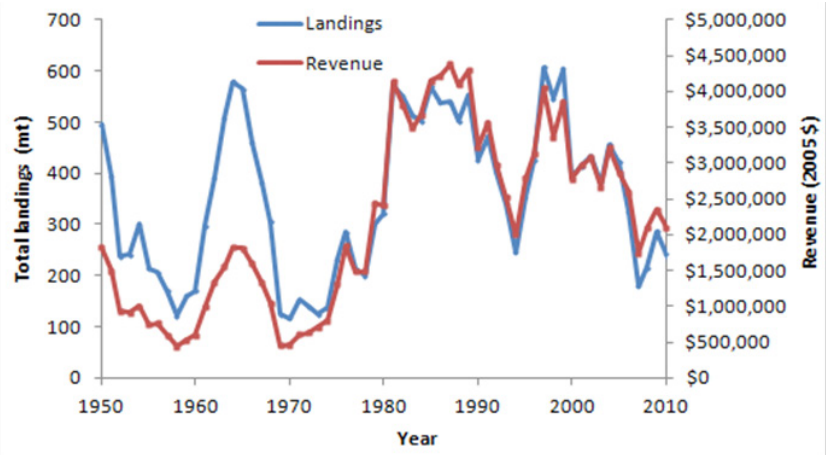

Figure 4. Total landings and revenue from California halibut from 1950 – 2010 (data from Center for the Blue Economy).

Recreational Fishery

Recreational anglers target California halibut from shore, private and rental skiffs, and CPFVs using hook and-line gear. Some catch also occurs from scuba divers and free divers using spear guns or pole spears. The recreational fishery is open year round, although California halibut are usually only available seasonally when they move inshore to spawn (Maunder et al. 2011). The daily bag and possession limit is three fish north of Point Sur, Monterey County and five fish south of Point Sur. The minimum size limit is 22 inches total length. From 1980 to 2004, the method for estimating recreational catch was the Marine Recreational Fisheries Statistical Survey (MRFSS). After 2004, the California Recreational Fishing Survey (CRFS) was used to estimate recreational catch. Because these two data sets use different survey methods for collecting data, the data sets are not comparable (CDFW 2013). While the data from MRFSS and CRFS are not comparable, there were several peaks (1982, 1995, 2002, and 2008) in recreational halibut catch (CDFW 2013; Figure 5 & 6).

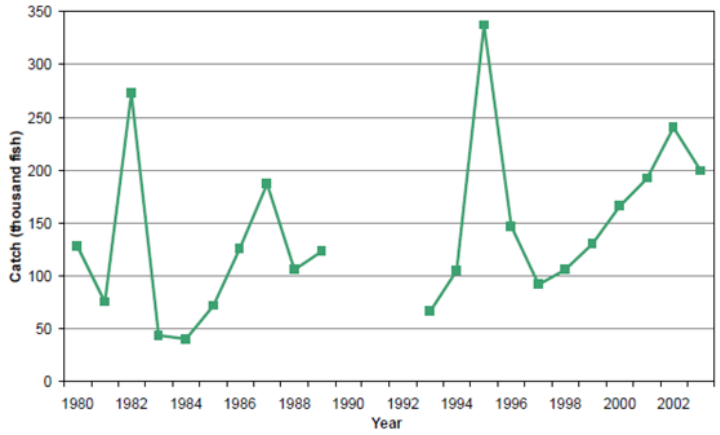

Figure 5. California halibut recreational catch, 1980-2003 (from CDFW 2013). Data source: MRFSS data, all fishing modes and gear types combined. Data for 1990-1992 are not available.

Figure 6. California halibut recreational catch, 2004-2011 (from CDFW 2013). Data source: CRFS data, all fishing modes and gear types combined.

MSC Principle 1: Resource Sustainability

*Sustainability of Target Stock

There is no fishery management plan and no management or biological reference points for California halibut. Catch is controlled by limited-entry permits, minimum size, gear, and area restrictions. A stock assessment was completed in 2011 (Maunder et al. 2011) and separated the California halibut population into two stocks: southern California and central California. In southern California, the stock is estimated to be depleted to about 14% of its unexploited spawning biomass level (Figure 7) as a result of low recruitment levels since 1999; recruitment is linked to environmental conditions and the availability of suitable shallow water habitats for juvenile halibut (CDFW 2013). Environmental conditions have been poor over the last decade in southern California, and there has been a decline in shallow water habitats associated with the dredging and filling of bays and wetlands. In central California, the population is healthy and has been increasing since 1995 (Figure 8). The increase in abundance in central California is due to large recruitments, which appear to occur in cyclic patterns. The magnitude of the cycles increased after 1990 (Figure 9).

*For California's Sustainable Seafood Program, this category must score an 80 or higher during an MSC assessment.

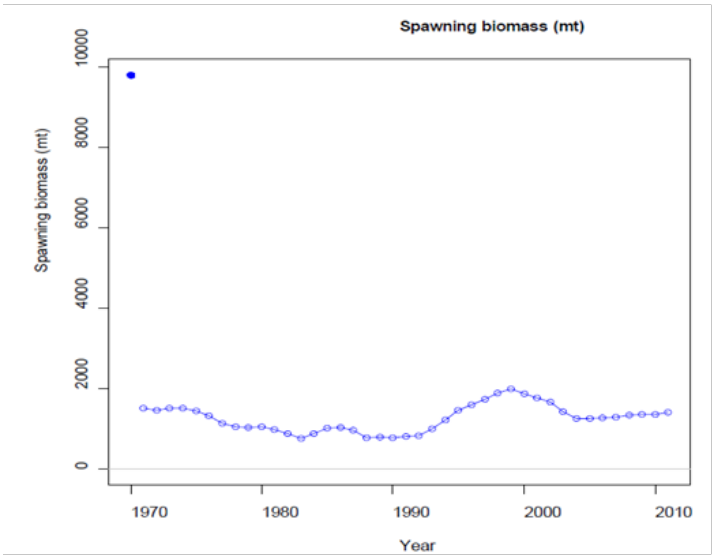

Figure 7. Estimated spawning biomass of California halibut for southern California through the start of 2011 (from Maunder et al. 2011).

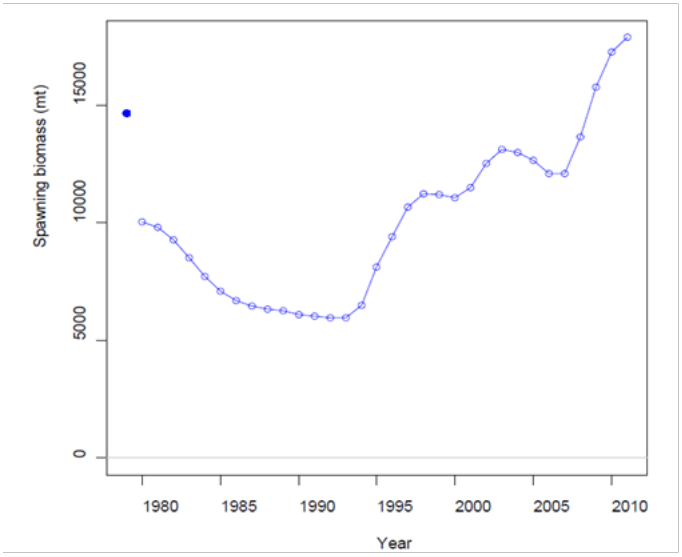

Figure 8. Estimated spawning biomass for central California (from Maunder et al. 2011).

Maximum sustainable yield (MSY) for California halibut is estimated to occur at a very low fraction of the unexploited spawning biomass (7% -12%) (Maunder et al. 2011); this is because recruitment is assumed to be independent of stock density[1] and environmentally driven. El Niño events appear to induce favorable conditions for recruitment by decreasing hypoxic conditions in shallow embayments (Hughes et al. 2012) and keeping halibut fry in the nearshore habitat, allowing them the opportunity to settle out (T. Tanaka, personal communication, 2013). Fishing is not considered to be a major factor controlling recruitment. Because recruitment is independent of stock density, the calculated MSY is not appropriate; instead, the stock assessment suggested using an MSY of 25% as a proxy (Maunder et al. 2011).

The stock assessment stated that despite the resilience of flatfish and the fact that California halibut have sustained high exploitation rates for several decades, uncertainty in the biological

[1]Appendix B of the stock assessment states that reliable data to estimate steepness [a measure of the stock-recruitment relationship] is essentially arbitrary since there are no reliable data available to estimate this parameter. More data is needed to accurately quantify the stock-recruitment relationship.

and fishing processes and the recent series of low recruitments in southern California indicate that management action may be needed to reduce the risk of fishery collapse in southern California (Maunder et al. 2011). To address some of the deficiencies in the stock assessment model, the peer review panel for the stock assessment recommended that DFW increase gender-specific sampling of the fished population, continue ageing studies, divide southern California into smaller sampling regions to increase precision in analysis, and examine the possible link between the north and south through larval abundance (MacCall et al. 2011, CDFW 2013).

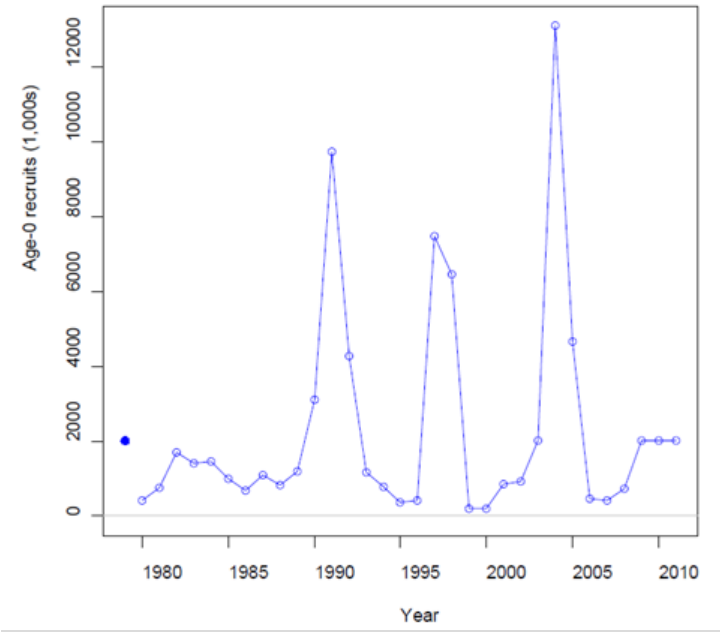

Figure 9. Estimated recruitment for central California (from Maunder et al. 2011).

Evaluation against MSC Component 1.1: Sustainability of Target Stock

Performance Indicator	Rating	Justification
1.1.1 Stock Status		The central stock is healthy according to the recent stock assessment
		The southern stock is depleted to 14% of its unexploited spawning biomass. It also has low recruitment and more information is needed to inform the stock-recruit relationship
1.1.2 Reference Points		No biological reference points have been established, although an initial stock assessment has been completed.
1.1.3 Stock rebuilding		This may be triggered for the southern stock

Harvest Strategy (Management)

California halibut is managed by the state of California in both state waters (0-3 nm from shore) and federal waters (3 – 200 nm). The California Fish and Game Commission adopts regulations for management of the fishery and the California Fish and Wildlife Department (DFW) enforces and implements the regulations. No stock status reference points have been developed for California halibut. The estimated maximum sustainable yield (MSY) from the recent stock assessment is inappropriate as a reference point because of the assumption that recruitment is not density dependent; this causes the spawning stock biomass associated with MSY to occur at a high depletion level (7-12% of the unexploited stock biomass). The stock assessment suggested using an MSY of 25% as a proxy (Maunder et al. 2011). Minimum size limits (22" minimum), gear restrictions, area restrictions and seasonal closures are used to control catch. California halibut are taken by trawl, gillnet, and hook and line. DFW has taken action to control excess capacity in the California halibut gillnet and trawl fisheries by issuing no new permits for these fisheries. However participation in the California halibut hook-and-line fishery is open-access.

[NWFSC 2010]: Vessels that participate in the California halibut trawl sector can belong to the state trawl fleet, the federal limited entry (LE) trawl fleet or both. Trawl vessels that target California halibut in both state and federal waters need to have a California Halibut Bottom Trawl Vessel Permit (CHBTVP), participate in a vessel monitoring system and maintain logbooks. Trawling within state waters for California halibut is restricted to the California Halibut Trawl Grounds (CHTG), which encompass the area between Point Arguello and Point Mugu in waters greater than one nautical mile from shore. The CHTG are closed from March 15 to June 15 to protect spawning fish, require a minimum mesh size of 19 cm (7½ in) for the cod end, and the use of "light touch" trawl gear (since 2009). Light touch trawl gear includes the following requirements to reduce impact to bottom habitat:

- Each trawl net shall have a headrope not exceeding 27.4 m (90 ft) in length.
- The thickness of the webbing of any portion of the trawl net shall not exceed 7 mm (0.27 in) in diameter.
- Each trawl door shall not exceed 227 kg (500 lb) in weight.
- Any chain attached to the footrope shall not exceed 6.3 mm (0.25 in) in diameter of the link material.
- The trawl shall have no rollers or bobbins on any part of the net or footrope. Rollers or bobbins are devices made of wood, steel, rubber, plastic, or other hard material that encircle the trawl footrope.

State trawl vessels also have a 227 kg (500 lb) possession limit on the incidental take of fish other than California halibut. Federal LE trawl vessels targeting California halibut need to have both a limited-entry federal groundfish permit and a state CHBTVP to land more than 68 kg (150 lbs) of halibut (per trip). Federal LE vessels are also subject to federal groundfish regulations, depth-based area closures, gear restrictions, and trip limits for groundfish. Enforcement of fishing regulations is conducted in state waters by CDFW's Law Enforcement Division and in federal waters by NOAA's Office of Law Enforcement. Additionally tools such as port sampling, logbooks, and observer coverage are used to monitor catch and ensure vessels have the correct permits for the catch they are landing. Violators are prosecuted under the law. There is

no evidence of systemic non-compliance.

California halibut in Mexico are managed by the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA). There are no specific regulations pertaining to California halibut, so fisheries are virtually unregulated (SAGARPA 2010), and the status of the California halibut population in this region has not been evaluated.

Evaluation against MSC Component 1.2: Harvest Strategy

Performance Indicators	Rating	Justification
1.2.1 Harvest Strategy		Stock assessment, landings data, and tools to limit catch are present; however no reference points or harvest control rules are in place.
1.2.2 Harvest Control Rules and Tools		No harvest control rules, but tools to limit catch.
1.2.3 Information/Monitoring		Fisheries dependent and independent data are available; however data is limited on gender-specific mortality, stock structure, and the stock-recruit relationship.
1.2.4 Assessment of Stock Status		Stock assessment in 2011; another is planned

MSC Principle 2: Environment

Retained Catch

Bottom trawl

[All data from NWFSC 2012]: Data on retained catch from the California halibut trawl fishery is available from observer coverage and landings receipts in both federal and state waters. Observer coverage varies widely from year to year. In the state trawl fishery, observer coverage has ranged from 1% to 14% from 2003 to 2011. In the federal trawl fishery, observer coverage ranged from 6% to 25% from 2003 to 2010; however as of 2011 the federal California halibut trawl fishery falls under the IFQ groundfish regulations and observer coverage increased to 99%.

The primary species (besides California halibut) retained in the federal trawl fishery (≥ 3% of total catch) between 2008 to 2011 included sand sole and starry flounder (Table 1). Other retained species (< 3% of total catch) included Petrale sole (rebuilding), Curlfin turbot, English sole, Rex sole, Rock sole, Soupfin shark, Hornyhead turbot, octopus, and white croaker (Appendix B). The primary species retained in the state trawl fishery (≥ 3% of total catch) during the same time period was starry flounder. Other retained species (< 3% of total catch) included Sand sole, Hornyhead turbot, octopus, shrimp, and white sea bass (Appendix A). All primary retained species are managed under the federal groundfish FMP.

Table 1. Observer data on retained catch on trawl vessels targeting California halibut from 2008 to 2011 (NWFSC 2012; only catch that is ≥ 3% of total catch is shown in this table).

		% of total catch (% retained)			
Trawl Sector	**Species**	**2011***	**2010***	**2009***	**2008***
Federal Trawl	California halibut	12.3% (100%)	22.1% (97%)	14.5% (93%)	16.4% (73%)
	Sand sole	5.1% (99%)	1.9% (88%)	0.75% (89%)	0.3% (93%)
	Starry flounder	3.1% (96%)	3.5% (90%)	1.2% (82%)	1.9% (93%)
State Trawl	California halibut	24.4% (93%)	19.7% (87%)	40.7% (96%)	20.0% (79%)
	Starry flounder	3.0% (60%)	1.5% (99%)	1.9% (100%)	2.0% (76%)

*Observer coverage: Federal trawl: 2011 = 99%, 2010 = unknown, 2009 = 6%, 2008 = 25%; State trawl: 2011 = 14%, 2010 = 4%, 2009 = 1%, 2008 = 5%

Evaluation against MSC Component 2.1: Retained Catch

Performance Indicators	Rating	Justification
2.1.1 Outcome		None of the primary retained species are depleted and catch levels are relatively low; most retained species are managed under the PFMC Groundfish FMP
2.1.2 Management		Most of the retained catch falls under the PFMC Groundfish FMP. Area and seasonal closures, gear restrictions, and limited entry permits also help manage incidental catch.
2.1.3 Information		Observer coverage is good in the federal fishery; low in the state fishery. Landing receipts should also be available. Information on retained species is fairly comprehensive.

Bycatch

Bottom trawl

[All data from NWFSC 2012]: Data on bycatch from the California halibut trawl fishery is available from observer coverage and logbooks in both federal and state waters. As described above, observer coverage varies widely from year to year. The primary species discarded as

bycatch in both the federal and the state trawl fishery (≥ 3% of total catch) from 2008 to 2011 were Dungeness crab, unidentified jellyfish, bat ray and big skate (Table 2). Other bycatch species (< 3% of total catch) in both the federal and state trawl fishery include Petrale sole, California scorpionfish, California skate, Curlfin turbot, English sole, Leopard shark, Lingcod, Longnose skate, Pacific sanddab, Rex sole, Rock sole, Soupfin shark, Spiny dogfish shark, Spotted ratfish, American shad, Armored box crab, Barred sand bass, Brown smoothhound shark, Common thresher shark, Spider crab, Fantail Sole, Giant sea bass, Graceful crab, Longspine combfish, Northern anchovy, Pacific angel shark, Pacific electric ray, Pacific staghorn sculpin, Red rock crab, Sevengill shark, Sheep crab, Shovelnose guitarfish, Sixgill shark, Specklefin midshipman, squid, Starry skate, Swell shark, Thornback skate, White croaker, and Yellow rock crab (Appendix B). Many of the bycatch species are managed under FMPs or by the State; however several species are not actively managed such as many of the sharks, rays and invertebrates (jellyfish, octopus, and some crab species). A bycatch study by DFW (CDFG 2008) in the CHTG (southern CA trawl fishery) reported that 94% of discards by weight during experimental tows were released alive; the report acknowledged though that the high discard survival rate may not be accurate because tows during their study were 30 minutes in length while typical tow times are 60 to 90 minutes in length. In general though, tows are shorter in duration in the southern trawl fishery compared to the central trawl fishery because the southern fishery supplies a live halibut market while the central fishery supplies a fresh dead fillet market. This would likely result in a higher rate of live discards in the southern California fishery compared to the central California fishery (T. Tanaka, personal communication).

Table 2. Observer data on bycatch on trawl vessels targeting California halibut from 2008 to 2011 (NWFSC 2012; only catch that is ≥ 3% of total catch is shown in the table).

		% of total catch (% discarded)			
Trawl Sector	**Species**	**2011***	**2010***	**2009***	**2008***
Federal Trawl	Dungeness crab	52.8% (100%)	37.8% (100%)	44.8% (100%)	10.8% (100%)
	Jellyfish	15.3% (100%)	11.1% (100%)	32.4% (100%)	48.2% (100%)
	Bat ray	3.0% (100%)	1.0% (100%)	1.4% (100%)	9.4% (100%)
	Big skate	3.7% (88%)	5.0% (100%)	1.7% (85%)	4.3% (100%)
State Trawl	Dungeness crab	18.6% (100%)	49.7% (100%)	No catch	41.1% (100%)
	Jellyfish	11.5% (100%)	5.9% (100%)	No catch	10.2% (100%)
	Bat ray	17.4% (100%)	7.6% (100%)	3.7% (70%)	2.2% (98%)
	Big skate	10.9% (95%)	2.0% (100%)	8.0% (100%)	3.2% (100%)

*Observer coverage: Federal trawl: 2011 = 99%, 2010 = unknown, 2009 = 6%, 2008 = 25%; State trawl: 2011 = 14%, 2010 = 4%, 2009 = 1%, 2008 = 5%

Evaluation against MSC Component 2.2: Bycatch

Performance Indicators	Rating	Justification
2.2.1 Outcome		In the central region, more information is needed on bycatch mortality
		In the southern region, most bycatch species are released alive; the fishery likely does not pose a serious risk to bycatch species.
2.2.2 Management		Area and seasonal closures, gear restrictions, and a limited entry permit system help manage bycatch. Dungeness crab and big skate are managed fisheries.
2.2.3 Information		Observer coverage is good in the federal fishery; lower in the state fishery. Logbook data should also be available. Information on bycatch species appears to be comprehensive

*Endangered, Threatened, & Protected Species

Bottom trawl

Data on ETP bycatch from the California halibut trawl fishery is available from the West Coast Groundfish Observer Program (WCGOP). Bycatch of ETP species include green sturgeon (Al-Humaidhi et al. 2012a), Chinook salmon, and Coho salmon (Al-Humaidhi et al. 2012b). Green sturgeon bycatch is considered a large problem in the California halibut trawl fishery; this fishery is the primary source of mortality for green sturgeon along the U.S. west coast (Al-Humaidhi et al. 2012). Publicly available data on estimated catch of green sturgeon and salmon is available from 2002 to 2010, although some years there was very low or no observer coverage.

Bycatch estimates are calculated by computing ETP bycatch ratios (observed ETP catch / retained weight of California halibut); the bycatch ratio is then multiplied by the entire fleet's landed catch of California halibut to estimate total ETP bycatch. When there is low observer coverage, this can provide a misleading estimate of ETP bycatch. Factors to consider when looking at bycatch estimates from federal and state California halibut trawl sectors include: 1) observer coverage is higher on federal trawl vessels than state trawl vessels (Table 3), 2) bycatch estimates for federal trawl vessels use tows targeting California halibut and tows targeting flatfish in general (Al-Humaidhi et al. 2012), whereas bycatch estimates for state trawl vessels only use tows targeting California halibut, and 3) federal trawl vessels target halibut across a greater area than state trawl vessels.

*For California's Sustainable Seafood Program, this category must score an 80 or higher during an MSC assessment.

Table 3. Estimated bycatch of ETP species on federal and state trawl vessels targeting California halibut from 2006 – 2010 (Al-Humaidhi et al. 2012a & 2012b). Dashed lines (-) indicate no observer coverage.

		# of fish				
Trawl Sector	**Species**	**2010***	**2009***	**2008***	**2007***	**2006***
Federal Trawl	Green sturgeon	182†	150	188	104	786
	Chinook salmon	11†	0	79	125	107
	Coho salmon	0†	0	0	0	48
State Trawl	Green sturgeon	0	139†	0	0	-
	Chinook salmon	0	0	0	0	-
	Coho salmon	0	0	0	0	-

*Observer coverage: Federal trawl: 2010 = unknown, 2009 = 6%, 2008 = 25%, 2007 = 14%, 2006 = 12%; State trawl: 2010 = 4%, 2009 = 1%, 2008 = 5%, 2007 = 7%, 2006 = 0%
†Bycatch estimate is based on fewer than three observed vessels

Evaluation against MSC Component 2.3: Endangered, Threatened & Protected Species

Performance Indicators	Rating	Justification
2.3.1 Outcome		Green sturgeon bycatch is a problem; this fishing sector has the largest amount of green sturgeon bycatch along the West coast.
2.3.2 Management		Magnuson-Stevens Act, CEQA, Migratory Bird Act, Marine Mammal Protection Act, etc.
2.3.3 Information		WCGOP observer data, although observer coverage in the state trawl fishery is low.

Habitat

Bottom trawl

[CDFG 2008]: The CHTG is located in the Santa Barbara Channel (SBC) over a shallow, broad shelf with an average depth of 29 fathoms. The seafloor within the CHTG is comprised of approximately 86 percent soft substrate and 14 percent hard substrate. Logbook data indicates that trawlers generally avoid the hard substrate within the CHTG. Few studies on the impacts of bottom trawl gear to the seafloor habitat have been conducted off the west coast of the United States. Information prepared by the National Marine Fisheries Service (NMFS) indicates that

habitat impacts by bottom trawl gear in areas where California halibut trawling occurs have the lowest sensitivity classification for impacts to seafloor habitat by bottom trawl gears. Mean recovery time for trawl gear impacts in the CHTG is estimated by NMFS to be less than one year in the absence of continued fishing.

Evaluation against MSC Component 2.4: Habitat

Performance Indicators	Rating	Justification
2.4.1 Outcome		Habitat where trawling for California halibut occurs has a low sensitivity to impacts by bottom trawl gear according to NMFS
2.4.2 Management		Limited entry permits, gear restrictions, area closures and seasonal closures help limit habitat impacts
2.4.3 Information		It is unclear if the information available on habitat impacts is adequate to assess the risk posed

Ecosystem

[CDFG 2004]: California halibut are ambush predators. On the coast, adult halibut feed primarily on Pacific sardine, northern anchovy, squid, and other nearshore fish species that swim in the water column. Small juvenile halibut in bays primarily eat crustaceans, including copepods and amphipods. At 2.5 in., they are large enough to eat fish such as the gobies that are commonly found in bays. The percentage of fish in juvenile halibut diets increases as the halibut grows. Predators of juvenile halibut in the bays and estuaries include various shore birds and fishes (Haugen 1990). Adults may be preyed upon by Pacific angel shark, juvenile white sharks, Pacific electric eels, giant sea bass, and some marine mammals like the California sea lion and the bottlenose dolphin (Fitch and Lavenberg 1971).

[CDFG 2008]: There are no agreed upon quantitative measures of ecosystem health that can be specifically applied to this fishery. Current state and federal California halibut management measures were not implemented to specifically address ecosystem management, although the current management measures (season and area closures, gear restrictions, observer coverage, and limited entry program) may collectively foster a sustainable bottom trawl fishery and indirectly promote a healthy ecosystem by reducing potential fishery impacts on the system. Possible impacts that may occur are to corals and sea pens. At least four taxa of coral or coral like species occur in waters within and adjacent to the CHTG, and all but sea pens require hard substrate for attachment. Coral habitats are susceptible to damage from bottom trawling (Whitmire and Clarke 2007), however direct study of the areas impacted by the California halibut trawl fleet in the CHTG has not been done. While trawlers generally avoid hard substrate where corals are found and areas containing debris from former oil drilling operations, trawling does occur on soft substrates where sea pens occur.

Although not a fishery impact, the overall decline in halibut landings in southern California corresponds to a decline in shallow water habitats associated with the dredging and filling of bays and wetlands (CDFG 2004). The establishment of MPAs along the coast will provide protection of some of these shallow water habitats and could help increase juvenile halibut survival. For example, in southern California, MPAs account for 13.8% of soft bottom habitat within the appropriate depth range.

Evaluation against MSC Component 2.5: Ecosystem

Performance Indicators	Rating	Justification
2.5.1 Outcome		Likely does not cause irreversible harm to ecosystem, but no quantitative measures are available to assess
2.5.2 Management		No direct measures to address ecosystem health, however existing mgmt may indirectly benefit ecosystem health; MPAs will protect some juvenile habitat
2.5.3 Information		More information needed on the biology of CA halibut to understand ecosystem impacts

MSC Principle 3: Management System

Governance and Policy

This fishery is managed by the state of California; it is regulated by the California Fish and Game Commission (FGC) and managed by the California Department of Fish and Wildlife (DFW). It is subject to and managed under all relevant US federal laws as well as California state regulations pertaining to fisheries management, such as the Marine Life Management Act (MLMA). The MLMA lays out several goals and tools to promote sustainable fishing in California. The FGC meets at least ten times each year to publicly discuss various proposed regulations and holds subcommittee meetings and a variety of special meetings to obtain public input on a variety of regulatory items. Besides attending public meetings, the public can also submit written comments to the FGC and suggestions for management action or new regulations through the FGC's rule making process.

Evaluation against MSC Component 3.1: Governance and Policy

MSC Performance Indicators	Rating	Justification
3.1.1 Legal and/or Customary Framework		FGC and DFW manage the fishery within an effective framework for delivering sustainable fisheries
3.1.2 Consultation, Roles and responsibilities		Roles and responsibilities are clearly laid out; FGC meetings are open to the public and to public comments
3.1.3 Long-term Objectives		Marine Life Management Act
3.1.4 Incentives for Sustainable Fishing		Marine Life Management Act

Fishery Specific Management System

California halibut is managed by the state of California in both state waters (0-3 nm from shore) and federal waters (3 – 200 nm). The California Fish and Game Commission adopts regulations for management of the fishery and the California Fish and Wildlife Department (DFW) enforces and implements the regulations.

Vessels that participate in the California halibut trawl sector can belong to the state trawl fleet, the federal limited entry (LE) trawl fleet or both. Trawl vessels that target California halibut in both state and federal waters need to have a California Halibut Bottom Trawl Vessel Permit (CHBTVP), participate in a vessel monitoring system and maintain logbooks. Trawling within state waters for California halibut is restricted to the California Halibut Trawl Grounds (CHTG), which encompass the area between Point Arguello and Point Mugu in waters greater than one nautical mile from shore. The CHTG are closed from March 15 to June 15 to protect spawning fish, require a minimum mesh size of 19 cm (7½ in) for the cod end, and the use of "light touch" trawl gear (since 2009). Light touch trawl gear includes the following requirements to reduce impact to bottom habitat:

- Each trawl net shall have a headrope not exceeding 27.4 m (90 ft) in length.
- The thickness of the webbing of any portion of the trawl net shall not exceed 7 mm (0.27 in) in diameter.
- Each trawl door shall not exceed 227 kg (500 lb) in weight.
- Any chain attached to the footrope shall not exceed 6.3 mm (0.25 in) in diameter of the link material.
- The trawl shall have no rollers or bobbins on any part of the net or footrope. Rollers or bobbins are devices made of wood, steel, rubber, plastic, or other hard material that encircle the trawl footrope.

State trawl vessels also have a 227 kg (500 lb) possession limit on the incidental take of fish other than California halibut. Federal LE trawl vessels targeting California halibut need to have both a limited-entry federal groundfish permit and a state CHBTVP to land more than 68 kg (150 lbs) of halibut (per trip). Federal LE vessels are also subject to federal groundfish regulations, depth-based area closures, gear restrictions, and trip limits for groundfish. Enforcement of fishing regulations is conducted in state waters by CDFW's Law Enforcement Division and in federal waters by NOAA's Office of Law Enforcement. Additionally tools such as port sampling, logbooks, and observer coverage are used to monitor catch and ensure vessels have the correct permits for the catch they are landing. Violators are prosecuted under the law. There is no evidence of systemic non-compliance.

Evaluation against MSC Component 3.2: Fishery Specific Management System

Performance Indicators	Rating	Justification
3.2.1 Fishery Specific Objectives		No clear objectives outlined, no FMP; DFW does present a rationale to the FGC for current mgmt practices though
3.2.2 Decision-making Processes		DFW provides recommendations that are vetted through the FGC
3.2.3 Compliance & Enforcement		An enforcement system exists and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.
3.2.4 Research Plan		Annual research plans are developed by DFW but are internal; can be obtained if requested
3.2.5 Management Performance Evaluation		No fishery-specific mgmt objectives; there is an internal review of mgmt measures by DFW though. Stock assessment was externally reviewed; DFW is required to report to FGC on habitat impacts in CHTG.

California Specific Requirements

The California voluntary sustainable seafood program requires fisheries seeking certification to meet California specific standards in addition to the standards and requirements of the Marine Stewardship Council (MSC) sustainable fisheries certification program. These include:

1. Higher scores (80 instead of 60) for two performance indicators (PI) of the MSC program: "Stock Status" (PI 1.1.1) and "By-catch of Endangered, Threatened, or Protected (ETP) Species" (PI 2.3.1). These two PIs are highlighted in the report.

2. Additional independent scientific review: The OPC Science Advisory Team will be engaged in the certification process through early consultation in reviewing minimum eligibility criteria, and review of the MSC-required pre-assessments and full assessments. The reviews will be conducted in addition to MSC's peer review, thus bringing additional credibility, transparency, and independence to California's certification process.

3. Additional traceability components: The California program will develop a unique barcode for California certified sustainable fish. This barcode can be either scanned by a smart-phone or linked to a website that will reveal additional information about the fishery, and information about toxicity when available

Recommendations

This is a fishery where MPAs could benefit the stock by providing protection of shallow water habitat for juvenile halibut. Recruitment is linked to both environmental conditions and the

availability of suitable shallow water habitat for juvenile halibut; protection of shallow water habitat could help to increase juvenile halibut survival.

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Appendix A

MSC Assessment Tree			CA Halibut	
			Trawl	
Principle	**Component**	**Performance Indicator**	**Central**	**Southern**
Principle 1: Health of Fish Stock	Outcome	1.1.1: Stock status		
		1.1.2: Reference points		
		1.1.3: Stock rebuilding	*Did not assess*	*Did not assess*
	Harvest Strategy (Management)	1.2.1: Harvest strategy		
		1.2.2: Harvest control rules		
		1.2.3: Info/ monitoring		
		1.2.4: Stock assessment		
Principle 2: Impact on Ecosystem	Retained species	2.1.1: Status		
		2.1.2: Mgmt strategy		
		2.1.3: Information		
	By-catch species	2.2.1: Status		
		2.2.2: Mgmt strategy		
		2.2.3: Info		
	ETP species	2.3.1: Status		
		2.3.2: Mgmt strategy		
		2.3.3: Info		
	Habitats	2.4.1: Status		
		2.4.2: Mgmt strategy		
		2.4.3: Info		
	Ecosystem	2.5.1: Status		
		2.5.2: Mgmt strategy		
		2.5.3: Info		
Principle 3: Management System	Governance & Policy	3.1.1: Legal framework		
		3.1.2: Consultation, roles, and responsibilities		
		3.1.3: Long term objectives		
		3.1.4: Incentives for sustainable fishing		
	Fishery Specific Mgmt System	3.2.1: Fishery specific objectives		
		3.2.2: Decision making process		
		3.2.3: Compliance & enforcement		
		3.2.4: Research plan		
		3.2.5: Management performance evaluation		

Appendix B

Table 1. Observer data on retained species from trawl vessels targeting California halibut in 2010 and 2011 (NWFSC 2012). N/A refers to species that had ≥ 50% discarded (see Table 2 for this data).

		2011		2010	
Trawl sector	**Species**	**% of total catch (% retained)**	**Catch (mt)**	**% of total catch (% retained)**	**Catch (mt)**
Federal	California halibut	12.3% (100%)	11.73	22.1% (97%)	6.59
	Sand sole	5.1% (99%)	4.87	1.9% (88%)	0.58
	Starry flounder	3.1% (96%)	2.92	3.5% (90%)	1.04
	Skates, unidentified	0.4% (100%)	0.38	N/A	
	White sea bass	0.2% (95%)	0.16	0.1% (100%)	0.04
	English sole	0.1% (64%)	0.13	N/A	
	Soupfin shark	0.07% (96%)	0.07	0.5% (100%)	0.14
	Petrale sole*	0.07% (83%)	0.07	0.002% (90%)	0.04
	White croaker	0.06% (95%)	0.06	N/A	
	Rock sole	0.05% (97%)	0.05	1.7% (73%)	0.50
	Hornyhead turbot	0.05% (82%)	0.05	N/A	
	Octopus	0.01% (81%)	0.01	0.03% (100%)	0.01
State	California halibut	24.4% (93%)	13.39	19.7% (87%)	2.71
	Starry flounder	3.0% (60%)	1.67	1.5% (99%)	0.21
	Sand sole	1.0% (81%)	0.56	1.3% (97%)	0.18
	Flatfish, unidentified	0.4% (57%)	0.22	0.1% (61%)	0.02
	White sea bass	0.1% (92%)	0.06	0.2% (74%)	0.03
	Shrimp, unidentified	0.04% (80%)	0.02	0.4% (99%)	0.06
	Octopus	0.02% (54%)	0.01	N/A	
	Common thresher shark	N/A		0.07% (100%)	0.01
	Shark, unidentified	N/A		0.07% (100%)	0.01

*Rebuilding species

Table 2. Observer data on bycatch species from trawl vessels targeting California halibut in 2010 and 2011 (NWFSC 2012). N/A refers to species that had > 50% retained (see Table 1 for this data).

		2011		2010	
Trawl sector	Species	% of total catch (% discarded)	Catch (mt)	% of total catch (% discarded)	Catch (mt)
Federal	Dungeness crab	52.8% (100%)	50.49	37.8% (100%)	11.26
	Jellyfish	15.3% (100%)	14.63	11.1% (100%)	3.31
	Bat ray	3.0% (100%)	2.88	1.0% (100%)	0.31
	Big skate	3.7% (88%)	3.57	5.0% (100%)	1.50
	Spiny dogfish shark	1.1% (100%)	1.02	0.6% (100%)	0.18
	California skate	0.8% (100%)	0.75	2.5% (100%)	0.74
	Curlfin turbot	0.5% (69%)	0.46	1.4% (100%)	0.43
	Pacific sanddab	0.3% (77%)	0.24	3.9% (100%)	1.17
	White croaker	N/A		1.6% (100%)	0.49
	Hornyhead turbot	N/A		0.9% (100%)	0.28
	English sole	N/A		0.9% (100%)	0.27
	Red Rock crab	0.2% (100%)	0.19	0.1% (100%)	0.03
	Brown Smoothhound shark	0.1% (100%)	0.12	0.2% (100%)	0.07
	Anchovy, unidentified	0.1% (100%)	0.12	0	0
	Shark, unidentified	0.09% (97%)	0.09	0.2% (100%)	0.07
	Leopard shark	0.09% (86%)	0.09	0.1% (100%)	0.03
	Green sturgeon	0.08% (100%)	0.08	0.07% (100%)	0.02
	Common thresher shark	0.08% (92%)	0.08	0	0
	Pacific electric ray	0.06% (100%)	0.06	0.03% (100%)	0.01
	American shad	0.05% (100%)	0.05	0.3% (100%)	0.08
	Sculpin, unidentified	0.03% (100%)	0.03	0.1% (100%)	0.04
	Thornback skate	0.03% (100%)	0.03	0.07% (100%)	0.02
	Spotted ratfish	0.02% (100%)	0.02	0.1% (100%)	0.04
	Croaker, unidentified	0.02% (100%)	0.02	0	0
	Sixgill shark	0.02% (100%)	0.02	0	0
	Striped bass	0.02% (100%)	0.02	0	0
	Lingcod	0.01% (88%)	0.01	0.3% (74%)	0.10
	Longnose skate	0.01% (97%)	0.01	0.03% (100%)	0.01
	Rex sole	0.01% (67%)	0.01	0.03% (100%)	0.01
	Chinook salmon	0.01% (100%)	0.01	0.0% (100%)	0.00
	White sturgeon	0.01% (100%)	0.01	0	0
	Starry skate	0.00% (100%)	0.00	0.3% (100%)	0.09
	Longspine combfish	0% (100%)	0.00	0.2% (100%)	0.05
State	Dungeness crab	18.6% (100%)	10.21	49.7% (100%)	6.83
	Jellyfish	11.5% (100%)	6.32	5.9% (100%)	0.81
	Bat ray	17.4% (100%)	9.51	7.6% (100%)	1.04
	Big skate	10.9% (95%)	5.99	2.0% (100%)	0.27
	California skate	1.7% (100%)	0.95	0.9% (100%)	0.13
	Leopard shark	1.6% (99%)	0.87	0.0% (100%)	0.00
	Graceful crab	1.3% (100%)	0.73	1.0% (100%)	0.14
	Skate, unidentified	0.9% (67%)	0.49	0.7% (100%)	0.09
	Brown Smoothhound shark	0.8% (100%)	0.45	0.07% (100%)	0.01
	Hornyhead turbot	0.7% (50%)	0.36	0.4% (100%)	0.05
	Shovelnose guitarfish	0.6% (100%)	0.33	1.2% (100%)	0.16
	White croaker	0.6% (100%)	0.33	0.2% (100%)	0.03
	Soupfin shark	0.5% (87%)	0.29	0	0
	English sole	0.4% (100%)	0.22	0.4% (100%)	0.05
	Pacific sanddab	0.4% (100%)	0.22	0.2% (100%)	0.03
	Shark, unidentified	0.3% (95%)	0.19	N/A	
	Sheep crab	0.2% (100%)	0.13	1.5% (100%)	0.21

		2011		2010	
Trawl sector	Species	% of total catch (% discarded)	Catch (mt)	% of total catch (% discarded)	Catch (mt)
	Thornback skate	0.2% (100%)	0.12	0.1% (100%)	0.02
	Pacific Angel shark	0.2% (100%)	0.11	0.6% (100%)	0.08
	Pacific Electric ray	0.2% (100%)	0.09	0.7% (100%)	0.09
	Spiny dogfish shark	0.1% (100%)	0.08	0.2% (100%)	0.03
	Longspine combfish	0.1% (100%)	0.08	0.1% (100%)	0.02
	Yellow Rock crab	0.1% (100%)	0.08	0.1% (100%)	0.02
	Fantail sole	0.1% (100%)	0.07	0.4% (100%)	0.05
	California scorpionfish	0.07% (100%)	0.04	0.1% (100%)	0.02
	Curlfin turbot	0.07% (100%)	0.04	N/A	
	Barred Sand bass	0.07% (100%)	0.04	0	0
	Armored Box crab	0.05% (100%)	0.03	0.2% (100%)	0.03
	Crab, unidentified	0.05% (53%)	0.03	0.1% (100%)	0.02
	Common thresher shark	0.05% (100%)	0.03	N/A	
	Lingcod	0.05% (100%)	0.03	0.0% (100%)	0.00
	Longnose skate	0.05% (100%)	0.03	0.0% (100%)	0.00
	Decorator crab	0.05% (100%)	0.03	0	0
	Sevengill shark	0.05% (100%)	0.03	0	0
	Red Rock crab	0.04% (100%)	0.02	0.8% (100%)	0.11
	Starry skate	0.04% (100%)	0.02	0.2% (100%)	0.03
	Green sturgeon		0.02	0	0
	Sculpin, unidentified	0.04% (100%)	0.02	0	0
	Spotted ratfish	0.02% (100%)	0.01	0.07% (100%)	0.01
	Swell shark	0.02% (100%)	0.01	0.07% (100%)	0.01
	Petrale sole*	0.02% (100%)	0.01	0.0% (100%)	0.00
	Rock sole	0.02% (88%)	0.01	0.0% (100%)	0.00
	American shad	0.02% (100%)	0.01	0.0% (100%)	0.00
	Giant sea bass	0.02% (100%)	0.01	0	0
	Northern anchovy	0.02% (100%)	0.01	0	0
	Pacific Staghorn sculpin	0.02% (100%)	0.01	0	0
	Specklefin midshipman	0.02% (100%)	0.01	0	0