SABLEFISH

Anoplopoma fimbria

Sometimes known as Black Cod

SUMMARY

Sablefish is a moderately growing, long-lived species that is found in deep waters of the Pacific Ocean, from northern Alaska to Baja California. Sablefish abundance is currently at a moderate level. Abundance depends heavily on annual recruitment, which may be affected by environmental conditions like water temperature, currents and food availability. In Alaska, Sablefish are caught primarily by longlines, while bottom trawls are used more on the West Coast. Trawls are significantly more damaging to seafloor ecosystems and result in greater bycatch of immature and non-target fish. Management of Sablefish is good overall, with implementation of a quota share system in which fishers own a share of the total allowed catch and are allowed to fish at anytime within the season. This allows fishermen the time to target areas with lower bycatch. Sablefish are one of the most valuable fisheries in Alaska and on the West Coast. Chef Barton Seaver describes Sablefish as “Soft, sweet, with a buttery rich flake, this fish is one of the finest in the sea. Great for roasting, sautéing, or poaching, best cooked well done.”

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LIFE HISTORY

Core Points (only one selection allowed)

If a value for intrinsic rate of increase (‘r’) is known, assign the score below based on this value. If no $r$-value is available, assign the score below for the correct age at 50% maturity for females if specified, or for the correct value of growth rate (‘k’). If no estimates of $r$, age at 50% maturity, or $k$ are available, assign the score below based on maximum age.

1.00  Intrinsic rate of increase <0.05; OR age at 50% maturity >10 years; OR growth rate <0.15; OR maximum age >30 years.

2.00  Intrinsic rate of increase = 0.05-0.15; OR age at 50% maturity = 5-10 years; OR a growth rate = 0.16–0.30; OR maximum age = 11-30 years.

An estimate of intrinsic rate of increase (r) was not available. The Von Bertalanffy growth rate (k) value for female Sablefish is 0.246 and 0.298 for males (PFMC 2006), which are moderate growth rates. In Alaska, 50% of male Sablefish are mature at 5 years of age; females mature slightly later, with fifty percent mature by 6.5 years (Hanselman et al. 2010). Sablefish have a long life span, with the oldest recorded being 113 years and fish over 40 years old are regularly caught (King and McFarlane 2003).

3.00  Intrinsic rate of increase >0.16; OR age at 50% maturity = 1-5 years; OR growth rate >0.30; OR maximum age <11 years.

Points of Adjustment (multiple selections allowed)

-0.25  Species has special behaviors that make it especially vulnerable to fishing pressure (e.g., spawning aggregations; site fidelity; segregation by sex; migratory bottlenecks; unusual attraction to gear; etc.).

-0.25  Species has a strategy for sexual development that makes it especially vulnerable to fishing pressure (e.g., age at 50% maturity >20 years; sequential hermaphrodites; extremely low fecundity).

-0.25  Species has a small or restricted range (e.g., endemism; numerous evolutionarily significant units; restricted to one coastline; e.g., American lobster; striped bass; endemic reef fishes).

Sablefish are found in the Northeast Pacific Ocean, ranging from the Bering Sea to Northern Mexico (Sigler et al. 2003). We consider this to be a medium-size range, thus, no points were subtracted.
Species exhibits high natural population variability driven by broad-scale environmental change (e.g., El Nino; decadal oscillations).

The numbers of juvenile Sablefish that survive and recruit into the “fished” population appear to be influenced by environmental conditions. Diet and growth of Sablefish larvae and juveniles have been indirectly related to El Nino events (ENSO) for the southern range of the population (Schirripa and Colbert 2006; Sogard 2011). Some ENSO events cause the California Current, which runs in a southerly direction, to slacken. This decreases coastal upwelling on the West Coast of the U.S., leaving the juvenile Sablefish with less nutritious and smaller versions of the zooplankton they eat (Schirripa and Colbert 2006; Grover and Olla 1987). These environmental conditions have been related to several years of poor recruitment.

Warm water temperature and a northerly direction of winter ocean currents have been linked to above average recruitments for the Alaska Sablefish population (Sigler et al. 2001). For example, the largest year classes of Alaskan Sablefish (1977-1978 and 1980-1981) were found following the 1976/1977 regime shift when the population size of Sablefish was low. That Sablefish can produce large year classes even when the spawning stock is less abundant shows that Sablefish can take advantage of favorable environmental conditions (Sigler et al. 2001).

Occasionally El Nino events result in a reverse condition than the one described, where the California current strengthens and Sablefish recruitment is high on the West Coast. At these instances there is also evidence of greater migration of Alaskan Sablefish to the West Coast fishery (Kimura et al. 1998).

Species does not have special behaviors that increase ease or population consequences of capture OR has special behaviors that make it less vulnerable to fishing pressure (e.g., species is widely dispersed during spawning).

Species has a strategy for sexual development that makes it especially resilient to fishing pressure (e.g., age at 50% maturity <1 year; extremely high fecundity).

Sablefish can produce many eggs (i.e., high fecundity), producing 107 eggs per gram of body weight. As Sablefish increase with size/age they are able to produce more eggs. For example, an average sized fish (3.7kg) will produce 395,900 eggs and a large 14 kg fish can produce over 1.5 million eggs. (Hunter et al. 1989).

Species is distributed over a very wide range (e.g., throughout an entire hemisphere or ocean basin; e.g., swordfish; tuna; Patagonian toothfish).

Species does not exhibit high natural population variability driven by broad-scale environmental change (e.g., El Nino; decadal oscillations).

2.00 Points for Life History
ABUNDANCE

Core Points (only one selection allowed)

Compared to natural or un-fished level, the species population is:

1.00 Low: Abundance or biomass is <75% of BMSY or similar proxy (e.g., spawning potential ratio).

2.00 Medium: Abundance or biomass is 75-125% of BMSY or similar proxy; OR population is approaching or recovering from an overfished condition; OR adequate information on abundance or biomass is not available.

In the U.S., roughly three-quarters of Sablefish are caught from Alaska with the remaining one-quarter caught from the West Coast. Canada also operates a Sablefish fishery with most fish sold domestically or to Japan. For Sablefish in Alaska, the Biomass of Maximum Sustainable Yield (BMSY) is defined as 35% of the unfished population. Currently the Alaskan population is predicted to be 106% of the BMSY so it is considered healthy (Hanselman et al. 2010). On the West Coast Bmsy is defined as 40% of the unfished biomass. The West Coast population is at an estimated 86% of that target. However, the overfishing benchmark is 25% of unfished biomass, so this population size can still be considered moderate (Schirripa 2007).

3.00 High: Abundance or biomass is >125% of BMSY or similar proxy.

Points of Adjustment (multiple selections allowed)

-0.25 The population is declining over a generational time scale (as indicated by biomass estimates or standardized CPUE).

In Alaska, the Sablefish fishery expanded due to the Japanese initialing fishing in the U.S. Heavy fishing pressure followed in the 1970s causing a decline in abundance from the all time peak in 1972. Catches in the 1970s were restricted due to the adoption of the Magnuson-Stevens Act. Strong recruitment in the late 1970s allowed the population to recover and abundance reached a second peak in 1988 (about 70% of 1972 levels) (Hanselman et al. 2010). As the strong year classes died off, however, abundance decreased again. More recently, there were strong year classes in both 1997 and 2000 that increased the spawning biomass (amount of reproductive-aged fish). In 2009 those classes were predicted to comprise 10% and 24% of the spawning biomass respectively, (Hanselman et al. 2010). Since 2000 there has not been a single large year class so the population is declining. It is projected that the population will decline slowly until there are strong year classes to rebuild the fishery. The long-term abundance trend in Alaska will remain variable. On the West Coast the Sablefish population is decreasing on a generational timescale. The only significant year classes in the past twenty years were in 1999 and 2000.
Age, size or sex distribution is skewed relative to the natural condition (e.g., truncated size/age structure or anomalous sex distribution).

The age/size distribution of the West Coast Sablefish population has shifted slightly due to poor recruitment within the last ten years (Schirripa 2007). The Alaskan population structure has broadened for the same reason (Hanselman et al 2010). However, Sablefish are naturally characterized by periodic strong year classes and are capable of taking advantage of favorable environmental conditions when they occur (Sigler et al. 2003). Because age/size distribution is currently skewed, points are subtracted.

Species is listed as "overfished" OR species is listed as "depleted", "endangered", or "threatened" by recognized national or international bodies.

Current levels of abundance are likely to jeopardize the availability of food for other species or cause substantial change in the structure of the associated food web.

The population is increasing over a generational time scale (as indicated by biomass estimates or standardized CPUE).

Age, size or sex distribution is functionally normal.

Species is close to virgin biomass.

Current levels of abundance provide adequate food for other predators or are not known to affect the structure of the associated food web.

1.50 Points for Abundance
HABITAT QUALITY AND FISHING GEAR IMPACTS

Core Points (only one selection allowed)

Select the option that most accurately describes the effect of the fishing method upon the habitat that it affects

1.00 The fishing method causes great damage to physical and biogenic habitats (e.g., cyanide; blasting; bottom trawling; dredging).

2.00 The fishing method does moderate damage to physical and biogenic habitats (e.g., bottom gillnets; traps and pots; bottom longlines).

Sablefish are caught primarily by bottom longlines but are also caught in the trawl fishery and in traps. Longlines and traps are also known as “fixed gear” because they are not dragged behind a boat (trawling). They are considered to be minimally destructive forms of fishing though there has been little research investigating the affect of longline gear on bottom habitat. Bottom trawling can be highly destructive to deep sea ecosystems; it destroys coral, reduces species richness, decreases nutrients and oxygen to the sediment, decreases microbial activity, and clears away feeding and sheltering sites for marine life among other issues (Morgan and Chuenpagdee 2003).

In the Gulf of Alaska, where most Sablefish are caught, the vast majority of Sablefish catches are allocated to the longline fishery (80% in the western and central Gulf of Alaska and 95% in the Eastern Gulf of Alaska), with the remainder of the total allowable catch allocated to the trawl fishery. All Alaskan Sablefish caught by trawl vessels are caught as bycatch in other fisheries as there is no directed Sablefish trawl fishery. In the eastern Bering Sea, 50% of the catches are allocated to fixed gear fisheries (including longline) and 50% to trawl fisheries. The majority of the Aleutian Islands quota is allocated to fixed gear fisheries (75%), with the remaining portion of the quota allocated to the trawl fishery (Hanselman et al. 2010). On the West Coast, trawls are responsible for a greater proportion of the catch (60%) with the remainder going to traps and longlines (Schirripa 2007). Because most Sablefish are caught by bottom longlines, a score of 2 was chosen.

3.00 The fishing method does little damage to physical or biogenic habitats (e.g., hand picking; hand raking; hook and line; pelagic long lines; mid-water trawl or gillnet; purse seines).

Points of Adjustment (multiple selections allowed)

-0.25 Habitat for this species is so compromised from non-fishery impacts that the ability of the habitat to support this species is substantially reduced (e.g., dams; pollution; coastal development).
Critical habitat areas (e.g., spawning areas) for this species are not protected by management using time/area closures, marine reserves, etc.

No efforts are being made to minimize damage from existing gear types OR new or modified gear is increasing habitat damage (e.g., fitting trawls with roller rigs or rockhopping gear; more robust gear for deep-sea fisheries).

If gear impacts are substantial, resilience of affected habitats is very slow (e.g., deep water corals; rocky bottoms).

Habitat for this species remains robust and viable and is capable of supporting this species.

Sablefish inhabit deep waters on the continental slope and are typically found at depths greater than 200 meters. They also often use gullies and deep fjords as habitat for younger fish. Observation data from a submersible show Sablefish swim close to the seafloor. Spawning occurs higher in the water column at depths of 300 to 500 meters (McFarlane and Nagata 1988, NMFS 2004). Juveniles will spend their first years in relatively shallow nearshore areas (NMFS 2004).

Although there has been little research investigating the affect of longline gear on bottom habitat, the impacts are assumed to be minimal. However, research on habitat effects of fishing is in its early stages and the condition of Sablefish habitat is unknown, so no points are added.

Critical habitat areas (e.g., spawning areas) for this species are protected by management using time/area closures, marine reserves, etc.

The Pacific Coast groundfish fishery management plan describes some recent positive management work on the West Coast. They have delineated essential groundfish habitat, partitioned the area into 35 unique bottom habitats and started to assess each habitat’s sensitivity to various forms of fishing (PFMC 2005). This allows the Pacific Fishery Management Council to better determine which areas to allow trawling. Spawning areas have not been protected because they are not known and Sablefish may spawn throughout their range.

Gear innovations are being implemented over a majority of the fishing area to minimize damage from gear types OR no innovations necessary because gear effects are minimal.

If gear impacts are substantial, resilience of affected habitats is fast (e.g., mud or sandy bottoms) OR gear effects are minimal.

Sablefish are found in a variety of habitats throughout their range (Lunsford and Rutecki 2010). Some of these habitats such as muddy or sandy ocean bottom are moderately resilient to the fishing methods used. However bottom trawling can destroy corals and other living structure that are categorically not resilient. Additionally, we know very little
about the effects of fishing on spawning areas and the habitat of juvenile Sablefish (Hanselman et al. 2008), so no points are added

2.25 Points for Habitat Quality and Fishing Gear Impacts

MANAGEMENT

Core Points (only one selection allowed)

Select the option that most accurately describes the current management of the fisheries of this species.

1.00 Regulations are ineffective (e.g., illegal fishing or overfishing is occurring) OR the fishery is unregulated (i.e., no control rules are in effect).

2.00 Management measures are in place over a major portion over the species' range but implementation has not met conservation goals OR management measures are in place but have not been in place long enough to determine if they are likely to achieve conservation and sustainability goals.

3.00 Substantial management measures are in place over a large portion of the species range and have demonstrated success in achieving conservation and sustainability goals.

Following overexploitation of Sablefish by foreign vessels in the 1960s and early 1970s, Sablefish are now tightly managed by U.S. state and federal agencies. The fisheries are managed by the North Pacific Fishery Management Council (NPFMC) in the Gulf of Alaska, Aleutian Islands, and eastern Bering Sea, the Alaskan Department of Fish and Game in Alaskan waters less than three miles from the coast, and the Pacific Fishery Management Council along the West Coast (PFMC). The vast majority of Sablefish are caught in federal waters off Alaska.

Fishery managers for Sablefish in Alaska have a history of proactive management. When abundance declined in the 1970s, they implemented substantial restrictions on the total allowable catch (Sigler et al. 2003). At one point the fishing season was reduced to just days. Fishery managers now determine the level of allowable catch that will most likely avoid the low levels of abundance seen in 1979 (NMFS 2004).

In 1995 in Alaskan federal waters, an Individual Fishery Quota (IFQ) system was implemented for fixed gear fisheries. Under this system individuals holding a quota share receive an annual allocation for a portion of the total allowable Sablefish catch, which
they can then choose to keep or sell. The IFQ program has demonstrated a number of improvements in the fishery including an increased economic efficiencies, reduced bycatch, increased safety, reduced gear conflicts, reduced fishing mortality from lost gear, increased product quality, reduced competition for fishing grounds, and an increase in the catch rate by 1.8 times (NMFS 2004). With the switch to the quota share system, the age of fish caught increased, leaving immature fish to grow and spawn and increased the spawning potential of the population (Sigler and Lunsford 2001).

The Alaska Department of Fish and Game manages a small percentage of the overall Alaskan Sablefish catch. Stock management is controlled through an Equal Quota Share program similar to the federal IFQ program but these quotas are non-transferable.

On the West Coast, Sablefish are managed as a part of a combined groundfish fishery. The fishery is controlled by seasons, cumulative landing limits and closed areas for protected species, as well as a recently implemented IFQ system for the trawl fishery. This IFQ system has been developed in response to the view that the past management systems were economically unsustainable and did not provide enough personal accountably of bycatch (PFMC 2010). As of January of 2011, trawl fisherman needed to show an IFQ permit in order to fish.

**Points of Adjustment (multiple selections allowed)**

-0.25 There is inadequate scientific monitoring of stock status, catch or fishing effort.

-0.25 Management does not explicitly address fishery effects on habitat, food webs, and ecosystems.

-0.25 This species is overfished and no recovery plan or an ineffective recovery plan is in place.

-0.25 Management has failed to reduce excess capacity in this fishery or implements subsidies that result in excess capacity in this fishery.

+0.25 There is adequate scientific monitoring, analysis and interpretation of stock status, catch and fishing effort.

In Alaska, data on fisheries catches and discards are collected and recorded in logbooks (required for all vessels larger than 60 feet) and by observers working with the Alaska Fisheries Science Center. The largest of the fishing vessels (over 125 feet in length) are required by fishery managers to have observer coverage 100% of the time; smaller vessels (60 to 125 feet) must carry observers 30% of the time. Smaller vessels do not have these requirements but voluntary use of logbooks on these vessels is regular and growing (Hanselman et al. 2010). In addition, data on catch, effort, age, length, weight, and maturity have been collected annually since 1978 during longline surveys and triennially (or biennially) since 1979 during trawl surveys.
Along the West Coast, observer coverage is 100% within the newly established groundfish trawl IFQ program. In the fixed gear Sablefish fishery, approximately 40 observers from the Pacific States Marine Fisheries Commission are employed and vessels are randomly selected to have coverage during the Sablefish season (WCGOP 2006). When selected, boats are required to carry an observer. Triennial trawl surveys are also conducted along the West Coast.

In both fisheries, quantitative data from observers, logbooks, and surveys are used to calculate the following year’s allowed catch. The management plans also allow for midseason changes to the catch levels due to new scientific data.

+0.25 Management explicitly and effectively addresses fishery effects on habitat, food webs, and ecosystems.

The Alaskan stock assessment and fishery evaluation (SAFE) reports produced by NPFMC include a section on fishery effects on the ecosystem and the level of concern that they pose. Additionally, every five years NPFMC reviews the essential fish habitat demarcations and in the interim will solicit proposals on Habitat Areas of Particular Concern (HAPC) (NPFMC 2011). On the West Coast, HAPCs have also been identified and bottom trawling has been prohibited in areas not designated as essential fish habitat.

+0.25 This species is overfished and there is a recovery plan (including benchmarks, timetables and methods to evaluate success) in place that is showing signs of success OR recovery plan is not needed.

Sablefish are not classified as overfished by the National Marine Fisheries Service (NMFS FishWatch). In 2006 the Alaskan Sablefish fishery was certified by the Marine Stewardship Council as sustainable. Consequently, a recovery plan is not needed.

+0.25 Management has taken action to control excess capacity or reduce subsidies that result in excess capacity OR no measures are necessary because fishery is not overcapitalized.

Both American fisheries having now switched to primarily Individual Fishery Quota (IFQ) management systems show a commitment to proactive management and excess capacity reduction.

4.00 Points for Management
BYCATCH

Core Points (only one selection allowed)

Select the option that most accurately describes the current level of bycatch and the consequences that result from fishing this species. The term, "bycatch" used in this document excludes incidental catch of a species for which an adequate management framework exists. The terms, "endangered, threatened, or protected," used in this document refer to species status that is determined by national legislation such as the U.S. Endangered Species Act, the U.S. Marine Mammal Protection Act (or another nation's equivalent), the IUCN Red List, or a credible scientific body such as the American Fisheries Society.

1.00  Bycatch in this fishery is high (>100% of targeted landings), OR regularly includes a "threatened, endangered or protected species."

2.00  Bycatch in this fishery is moderate (10-99% of targeted landings) AND does not regularly include "threatened, endangered or protected species" OR level of bycatch is unknown.

   In Alaska, bycatch from 2004 to 2009 averaged 3.8% and 14.4% for the longline and trawl fisheries, respectively (Hanselman et al. 2010). Bycatch is higher in the West coast fishery, being 16.5% for the longline fishery and 47% for the combined groundfish trawl in 2005 (Hastie and Bellman 2006). In Alaska, the Sablefish longline fishery accounts for an average of 18% of all catches of Spiny Dogfish. Other shark species also have high percentages. As of 1997 an overfishing limit has been set for shark species. Bycatch of Grenadiers is highest in the Sablefish fishery, with 66% of catches taken in this fishery. Because there is no market for Grenadiers, catches of these species are discarded (Hanselman et al. 2010). There are no regulations in place to actively reduce bycatch of Grenadiers. Non-target species are set as bycatch at the start of the fishing year and maximum retainable allowances (MRAs) are set to limit their removals. MRAs are calculated as a percentage of the retained amount of species closed to directed fishing relative to the retained amount species open for directed fishing.

   In addition to fish, seabirds are also caught in the Sablefish longline fisheries. The birds are attracted to the bait when the lines are being set and can get hooked and drowned. In Alaska the Sablefish fishery accounted for 17% of the total seabird bycatch (Hanselman et al. 2010).

3.00  Bycatch in this fishery is low (<10% of targeted landings) and does not regularly include "threatened, endangered or protected species."

Points of Adjustment (multiple selections allowed)

-0.25  Bycatch in this fishery is a contributing factor to the decline of "threatened, endangered, or protected species" and no effective measures are being taken to reduce it.
Bycatch of targeted or non-targeted species (e.g., undersize individuals) in this fishery is high and no measures are being taken to reduce it.

Bycatch of this species (e.g., undersize individuals) in other fisheries is high OR bycatch of this species in other fisheries inhibits its recovery, and no measures are being taken to reduce it.

The continued removal of the bycatch species contributes to its decline.

Measures taken over a major portion of the species range have been shown to reduce bycatch of "threatened, endangered, or protected species" or bycatch rates are no longer deemed to affect the abundance of the "protected" bycatch species OR no measures needed because fishery is highly selective (e.g., harpoon; spear).

On the West Coast bycatch is a serious concern because the groundfish trawls often catch overfished and threatened species of fish, particularly Rockfish. Rockfish species have certain life history traits that cause them to be sensitive to overfishing, including late maturity and habitat fidelity. Additionally the mortality rate for landed Rockfish is nearly 100% (AMCC 2011). Among the overfished Rockfish species, the Boccacio Rockfish (*Sebastes paucispinus*) is critically endangered according to the IUCN red list (IUCN 2011).

The new IFQ program in the West Coast trawl fishery was created primarily as a bycatch minimization strategy. Trawling results in greater bycatch of immature and non-target fish than fixed gear fishing methods. Prior to this program trawl fishers had limits on the amount of certain fish species they could catch and keep. If they exceeded their limit, the fish was discarded. (The mortality rates of discarded fish are not well understood, however, it is generally acknowledged that because of increased contact with fishing gear, trawl-caught fish have an increased risk of mortality.) With the new IFQ program, presumably there should be less discarding of less-marketable or overfished groundfish, such as certain Rockfish species, because fishers will now be responsible for their total onboard catch including discards and not just their landings (PFMC 2010). Whether this management action will prove to be successful remains to be seen.

Bycatch of three species of seabirds is of particular concern due to their population status: the Short-tailed Albatross (*Phoebastria albatrus*) is classified as endangered under the U.S. Endangered Species Act and listed as vulnerable to extinction by the IUCN. The Black-footed Albatross (*Phoebastria nigripes*) is classified as endangered by the IUCN and the Laysan Albatross (*Phoebastria immutabilis*) has been recently downgraded from vulnerable to near-threatened (IUCN 2011). Since 2004 total seabird catch rates have decreased by 78% (Dietrich et al. 2009). Part of this success is due to the use of bycatch reduction measures including streamer lines. Streamer lines are lines with flags on them that can be deployed on one or both sides of the boat while the longlines are being set, in order to distract seabirds from the baited hooks. As of 2008 paired streamer lines are legally required on all vessels over 55 ft and one streamer line is required by vessels over 26 ft (NMFS 2008).
There is bycatch of targeted (e.g., undersize individuals) or non-targeted species in this fishery and measures (e.g., gear modifications) have been implemented that have been shown to reduce bycatch over a large portion of the species range OR no measures are needed because fishery is highly selective (e.g., harpoon; spear).

Since 1995, when Alaskan fishery managers implemented the Individual Fishery Quota (IFQ) management system, bycatch has decreased in the Sablefish longline fishery. Under the IFQ system, the fishery operates at a slower pace and fishers have an incentive to maximize the value of their catch. By increasing catch efficiency the number of hooks deployed in the fishery has declined, which also has the effect of lowering the amount of bycatch (Sigler et al. 2003).

Bycatch of this species in other fisheries is low OR bycatch of this species in other fisheries inhibits its recovery, but effective measures are being taken to reduce it over a large portion of the range.

Bycatch of Sablefish in other fisheries is low when compared with other groundfish species. In Alaska, part of the annual quota is devoted to retaining Sablefish as bycatch in trawl fisheries. The primary fisheries that incidentally catch Sablefish are the Rockfish trawls, which tend to retain most of their Sablefish as it is a higher valued species than the target species. A few other fisheries catch a significant amount of Sablefish and have a high discard rate of Sablefish: Gulf of Alaska deepwater Flatfish trawl (62.4%), Bering Sea and Aleutian Islands Pacific Cod trawl (44.2%) and Arrowtooth Flounder trawl (32.9%) (AMCC 2006). On the West Coast Sablefish are caught in a combined groundfish trawl fishery so this is not an issue.

The continued removal of the bycatch species in the targeted fishery has had or will likely have little or no impact on populations of the bycatch species OR there are no significant bycatch concerns because the fishery is highly selective (e.g., harpoon; spear).

2.75 Points for Bycatch
REFERENCES


