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Development and Evolution of the Alaska Halibut and Sablefish Fisheries

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Abstract

This Technical Memo describes and analyzes the evolution of the Alaska region Pacific halibut (*Hippoglossus stenolepis*) and sablefish (*Anoplopoma fimbria*) fisheries over the past 125 years. The development of these fisheries spans seven eras, each characterized by unique opportunities, challenges, and management innovations. The figures presented herein illustrate how these fish populations and fisheries have fluctuated in response to historical events that include the amount of fishing but also other aspects that have affected the fisheries.

The halibut fishery has been managed under science-based catch limits since the early 20th century (Thompson 1975; Bell 1981). Although stock levels and catches had declined in the 1960s and early 1970s, both recovered quickly following closure of the United States Exclusive Economic Zone to foreign fishing in 1976. During this time, exvessel prices were strong, but the season length was increasingly shortened to prevent overharvests. In 1975, the halibut season still lasted about 125 days; by 1980, the number and fishing power of active fishing vessels had greatly increased and the season had been reduced to about 25 days, yet harvests remained high at nearly 80 million pounds (IPHC 1990). By the late 1980s, thousands of halibut vessels raced one another in a 2-3 day derby. Similarly, the sablefish season off West Yakutat dropped from 200 days in 1984 to 50 days in 1985 and continued to drop to 10 days in 1994.

This extreme "race to fish" greatly reduced product quality, decreased vessel safety, and regularly resulted in excess harvests. There was broad consensus that change was needed, but there was little consensus about how best to change the regulation and management of the fishery. Top concerns of fishermen and managers included safety at sea, low exvessel prices, escalating operating costs, reigning in the number of vessels in the fishery, lengthening the season, and increasing management precision (Sigler and Lunsford 2001).

When individual fishing quota (IFQ) based management was first proposed for the halibut and sablefish fisheries in the late 1980s, there was considerable opposition from some fishermen (Pautzke and Oliver 1997) but other fishermen acknowledged that a change in management was needed for the fisheries to remain sustainable. Nevertheless, as the race-for-fish intensified in both fisheries, and after numerous public meetings and extensive analysis of alternatives, the North Pacific Fishery Management Council approved the Alaska halibut and sablefish IFQ program in late 1991 for initial implementation at the start of 1995. The program was intended to increase manageability of these fisheries and reduce the likelihood of overharvests while

minimizing disruptive changes to the composition of the fishing fleet, allowing for an orderly consolidation of fishing capacity, maintaining a broad and heterogeneous distribution of quota share ownership, and preserving the owner-operator character of the fishery (Pautzke and Oliver 1997).

Designing, adopting, and implementing a catch share program is challenging and frequently controversial even though catch share programs are widely recognized as an effective approach to limit a fishery from being overfished (Costello et al. 2008; Grimm et al. 2012; Melnychuk et al. 2016). Program outcomes depend on the interplay between program design features and factors outside of management control. External market forces, externally driven variations in stock abundance and distribution, unexpected interpretations of the regulations, and unintended consequences—spillovers—affect program success and broader impacts. The Alaska halibut and sablefish IFQ program has been in operation for 22 years. In its design, policymakers took into consideration elements and outcomes of other IFQ programs from around the world. This foresight and planning have made the Alaska halibut and sablefish IFQ program more successful than some other catch share programs. Nevertheless, while the program has increased ex-vessel prices for halibut (Herrmann and Criddle 2006) and sablefish (Fell and Haynie 2011; Warpinski et al. 2016), it has redistributed value from processors to harvesters (Matulich and Clark 2003; Hackett et al 2005; Herrmann and Criddle 2006), and it has been cited as a contributing factor to the decline of remote fishery-dependent communities (Carothers 2008). The Alaska halibut and sablefish IFQ program has been repeatedly amended to remedy unanticipated and unintended outcomes and to address evolving social concerns. The outcomes of this program and its evolution provide lessons for the development and design of new IFQ programs for fisheries off Alaska, elsewhere in the United States and beyond.

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Introduction

The Pacific halibut (*Hippoglossus stenolepis*) and sablefish (*Anoplopoma fimbria)* fisheries off British Columbia and Alaska are often held up as examples of how fishery resources overfished under derby-style exploitation can be rebuilt as high-value sustainable fisheries. Together, for 2017, the halibut and sablefish fisheries accounted for little more than two percent of landings (by weight) of the fisheries off Alaska but represented nearly 12 percent of total harvested value. Halibut and sablefish are managed under separate authorities. The halibut fishery is managed under a bilateral treaty between the United States and Canada, and the International Pacific Halibut Commission (IPHC) conducts research and makes area harvest recommendations (McCaughran and Hoag 1992). Under the Northern Pacific Halibut Act of 1982 (Public Law 97-176), the North Pacific Fishery Management Council (NPFMC) is authorized to develop regulations that are in addition to, but not in conflict with, the regulations adopted by the IPHC. The NPFMC develops limited entry regulations and allocations for Alaska portions of the commercial and charter halibut fishery as well as the regulations for subsistence use. The National Marine Fisheries Service (NMFS) is responsible for developing, implementing, and enforcing regulations pertaining to the management of halibut fisheries within the United States territorial seas and Exclusive Economic Zone. The State of Alaska participates in management through representation on the NPFMC and the Alaska Department of Fish and Game (ADF&G) issues sport fishing and guide licenses, monitors and reports on sport and subsistence harvests, and assists federal agencies with the preparation of regulatory analyses.

The NPFMC and the Secretary of Commerce manage sablefish in federal waters off Alaska. Annual allocations of the sablefish total allowable catch (TAC) among gear groups (longline, pot, and trawl) have been ongoing since the 1980s. Sablefish has also been taken as bycatch, particularly in trawl fisheries. There is little recreational or subsistence fishing for sablefish. Sablefish are typically landed at shoreside plants or at floating processors in nearshore Alaskan waters, but a portion of the TAC is harvested and processed offshore by catcher processors (NPFMC 1989). Management of the domestic fishery has always been under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and subject to the NPFMC process. Sablefish TACs and allocations thereof are recommended annually by the NPFMC's Plan Teams and by the NPFMC for approval by the Secretary of Commerce.

NMFS manages sablefish from three nautical miles to the 200 nautical mile limit of the United States Exclusive Economic Zone. A small portion of the sablefish fishery (out to three miles from the shoreline) is managed by the ADF&G under regulations and guidelines established by the Alaska Board of Fisheries. Some sablefish fisheries within state waters have been placed under limited entry permit (LEP) programs by the Alaska Commercial Fisheries Entry Commission. Other sablefish fisheries occurring in state waters remain open access, although IFQ permit holders who participate in these open access state fisheries must record their landings under the sablefish individual fishing quota (IFQ) program, and any harvest is subtracted from their IFQ accounts.

Pacific halibut are a large bottom-dwelling long-lived species. They are harvested commercially using demersal longline gear at depths from 90 to 2,000 feet. Demersal longlines consist of gangions, leaders with baited hooks, attached to a weighted mainline deployed against the seafloor (Figure 1).

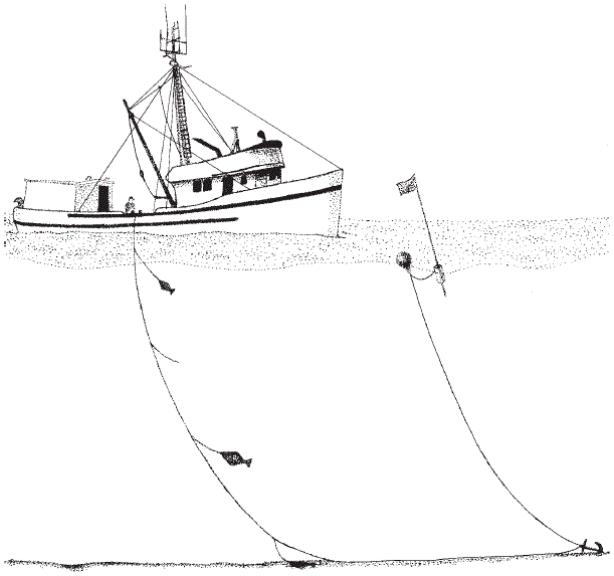

Figure 1. Diagram of a vessel retrieving a longline (IPHC).

Sablefish, also known as blackcod, is a soft-textured buttery-flavored fish found at depths from 450 to 6,000 feet in the North Pacific Ocean. While sablefish are found from Baja California to western Japan, they are most abundant off the coast of British Columbia and Alaska. They are a long-lived demersal (bottom-dwelling) species fished with demersal long-line gear similar to halibut gear, but are also fished with baited pots (traps), and trawls. The sablefish fishery is typically farther offshore and in deeper water than the halibut fishery and occurs outside the

prime season for halibut. Sablefish average monthly harvests (percentage of total landings) are higher early in the season than are average monthly harvests of halibut; halibut monthly harvest peaks in June and remain high through August and September (NOAA 2012).

Halibut

Halibut catches have fluctuated dramatically over the past 125 years (Figure 2). As the fleet became more mechanized and more efficient at finding halibut, it became increasingly clear that the fleet had the potential to deplete the halibut stock unless catch was limited through effective management. As IPHC and academic researchers worked to understand the biology and population dynamics of the stock, managers worked to develop accurate and timely catch accounting measures and harvest controls. Establishment of a 200-mile Fisheries Conservation Zone (Public Law 94-265) off the United States coastline in 1976 and implementation of the halibut and sablefish IFQ program in 1995 (NPFMC 1992b) are watershed events that shaped the modern history of this fishery.

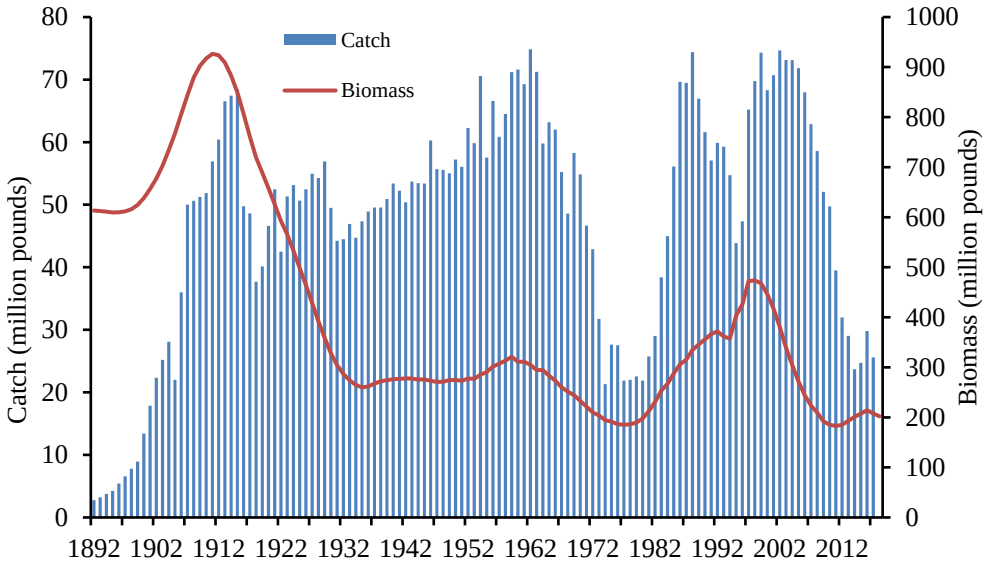

Figure 2. Total commercial catch and biomass (million pounds) of halibut, 1892 through 2017.

Fishermen based in the Pacific Northwest, British Columbia, and Alaska had high catches of halibut over 100 years ago (between 1911 and 1915) with average landings of 64.3 million pounds (Bell 1981; Figure 2). Between 1985 and 2010, halibut removals for the Pacific Coast were above the 100-year average at 63.5 million pounds and removals peaked in 2004 at 74.6 million pounds (Figure 2). Since 2004, halibut removals have declined substantially because of management measures intended to address concerns about declines in exploitable biomass. In

2017, halibut allocations were reduced to 31.4 million pounds. This was less than one-half of the removals taken in 2002 (IPHC Annual report 2016).

The estimated biomass of halibut peaked in 1911, fell to low levels in the 1970s, climbed during the 1980s and 1990s, and declined from 1999 through 2010. Data from 2014 suggest that the population numbers have begun to level out. However, over the past four decades, the average size-at-age of halibut has declined (IPHC 2016 p. 68). For example, in 1997, a typical 14-year-old halibut weighed 55 pounds, while the same age halibut in 2014 averaged only 25 pounds.

In addition to the commercial catch, the halibut resource has four competing uses: subsistence (personal use); non-guided and guided (charter) sport fishing; bycatch- from other fisheries; and wastage—the mortality (dead loss) of undersize halibut discarded by the commercial halibut and sablefish fisheries. Figure 3 shows changes in the distribution of total fishing mortality across these categories through time.

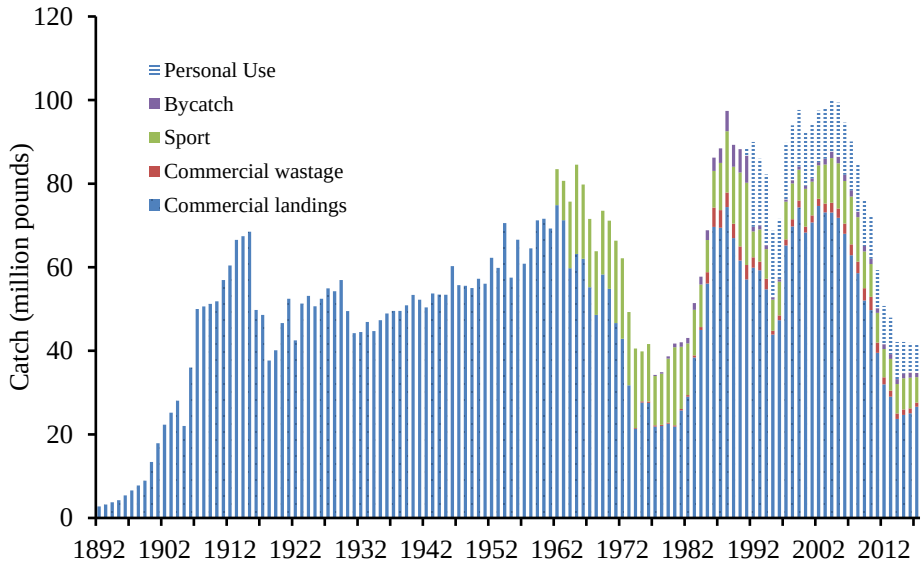

Figure 3. Total commercial catch (million pounds) by different sectors, 1892-2016.

The halibut IFQ fishery faces different management challenges in each area. For example, in Southeast Alaska, halibut fishermen catch a large amount of rockfish as bycatch in which effects there their population levels. Rockfish that are released have poor survival because of the barotrauma they incur on being brought to the surface. In the Gulf of Alaska (GOA), depredation by sperm whales and killer whales has become an increasing challenge for longline vessels. In the Bering Sea, catches of legal size halibut (32 inches or greater) are constrained by disproportionate numbers of undersized halibut.

Sablefish

The sablefish fishery developed as a secondary activity for United States and Canadian halibut fishermen. The fishery started in waters off Washington and British Columbia and, by the 1920s, extended along the Pacific coast from Northern California to Kodiak (Hanselman et al. 2016). In contrast to the halibut fishery, until 1978, the sablefish fishery was prosecuted almost entirely by foreign fishing vessels (Berger et al. 1986). The first domestic commercial landings in Alaska from this fishery were in 1958.

In 1964, Japanese longliners began targeted sablefish operations in the Eastern Bering Sea (EBS) and the fishery expanded rapidly with catches peaking at almost 52 million pounds by 1966. In addition, sablefish bycatch in other foreign fisheries off Alaska reportedly averaged 9.4 million pounds. Most of these sablefish harvests were from the eastern Being Sea until 1968, when Japanese harvesters switched their focus to the GOA. In the GOA, sablefish catches increased rapidly as the Japanese longline fishery expanded, peaking at 145 million pounds in 1972 (Figure 4). Catches in the Aleutian Islands (AI) region remained at low levels with Japan harvesting the largest portion of the sablefish catch in this area. Heavy fishing by foreign vessels during the 1970s led to a substantial population decline. Limits were put on the expanding Japanese trawl fisheries inside the 12-mile United States territorial seas to stem excessive catches, but those limits did not apply outside United States waters and the Japanese continued to expand their longline fleet outside territorial waters in the AI region and in the Western GOA and Central GOA (Sonu 2014). With implementation of the FCMA, fishery managers gained authority to establish and enforce catch limits throughout the 200-mile FCZ off Alaska, which sharply reduced foreign catches (Figure 4).

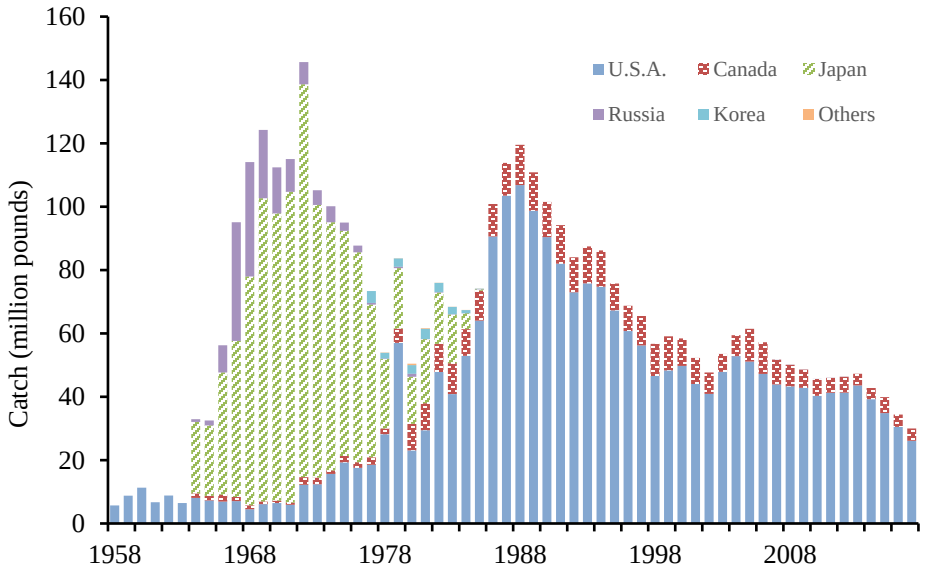

Figure 4. Foreign and domestic catches (million pounds) of sablefish, 1958-2017.

Catches in the sablefish fishery peaked at 117 million pounds in 1972 with a large proportion being caught by large trawl vessels; by 1978, catches had dropped to 20.1 million pounds (Figure 5).

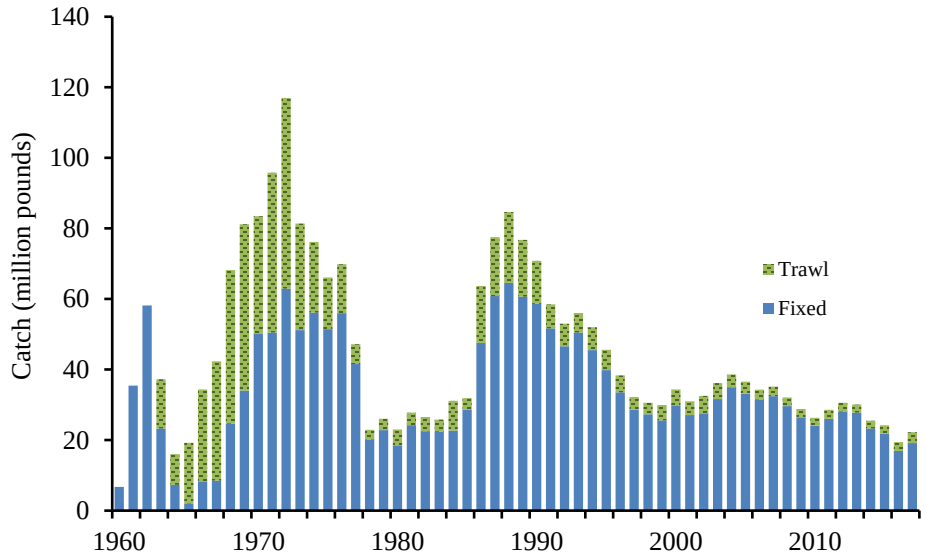

Figure 5. Total commercial trawl and fixed gear catches (million pounds) of sablefish, 1960-2017.

While a substantial proportion of sablefish was harvested by trawlers in the early history of the fishery, since Americanization in the 1970s, most of the TAC has been caught with hook-and-line or pot gear.

Between 1960 and 1994, the sablefish TAC averaged 52.7 million pounds. Since 1995, when the sablefish fishery became an IFQ fishery, the TAC has averaged 31.4 million pounds. While

biomass and catch fluctuated over this time (Figure 6), the overall trend shows declining biomass and catch so that by 2017, the total catch for sablefish off Alaska had declined to 22.5 million pounds (NOAA 2017, Hanselman (2016a). In keeping with harvest control rules established in groundfish Fishery Management Plans (FMPs) for the GOA and the Eastern Bering Sea and Aleutian Islands (BSAI) regions, the overfishing limit (OFL) and acceptable biological catch (ABC) limits are proportionate to biomass and act as upper-bound limits for the TAC. The decline in sablefish biomass has levelled off in recent years, but commercial catches have continued to decline, in part due to underharvesting in the western GOA and AI regions (Figure 6).

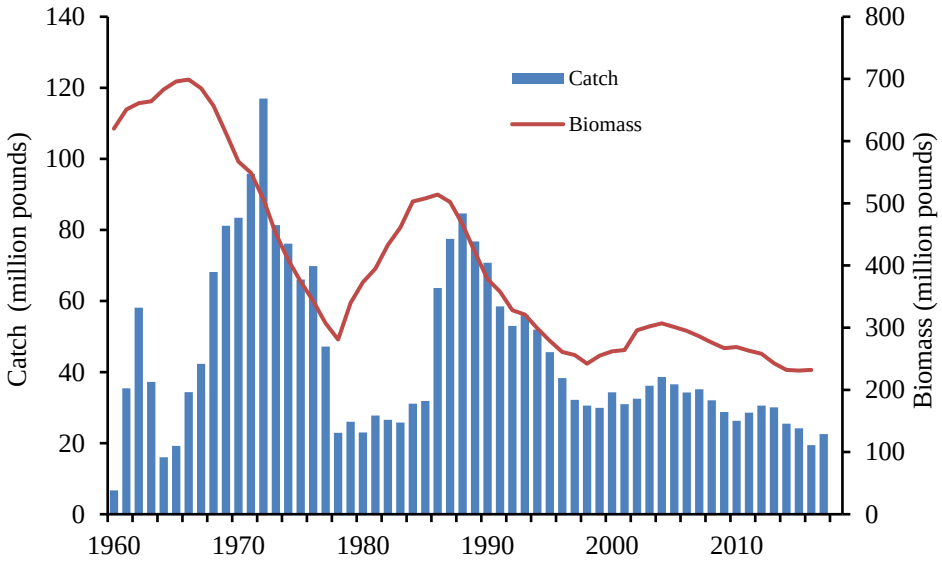

Figure 6. Total commercial catch and biomass (million pounds) of sablefish, 1960-2017.

Sablefish biomass has fluctuated substantially over the past six decades (Figure 6). Biomass peaked in 1965 through 1967, collapsed through the 1970s, remained at very low levels from 1978 through 1985, and recovered during the late 1980s before declining and remaining low ever since. Hanselman (2016a) has correlated historic trends in sablefish biomass with variations in average wintertime sea surface temperatures in the central North Pacific, finding that colder than average oceanic conditions correlate with above average recruitment events for sablefish. Recent research also suggests that sablefish recruitment is increased under ocean conditions that lead to summertime warm nearshore currents (Yasumiishi 2016). This is similar to ideal conditions for high productivity of pink salmon.

The sablefish IFQ fishery faces unique management challenges in each management area. In the EBS, killer whales depredation of fish on longline gear has been a problem since the beginning of the longline surveys. This depredation has expanded into the AI and Western GOA areas. Sperm whale depredation has mainly been a problem in Eastern GOA but has started to be more of a problem in the Central GOA and occasionally in the Western GOA (Hanselman et al 2014). Due to the increase in sperm whale and killer whale depredation, the NPFMC has relaxed restrictions that had limited the use of pot gear by IFQ permit holders. In addition, sablefish stock assessments now account for whale depredation (Hanselman et al 2016).

1. 1880 through 1929: the Dawn of Halibut and Sablefish Fisheries in the Northeast Pacific

Halibut has been an important cultural and historical food source for indigenous inhabitants of the Pacific coast of North America. Even before commencement of commercial fisheries in the late 1800s, halibut was an important subsistence food fishery for the indigenous people who caught halibut from large canoes using hook and line methods (Newell 1994). It is estimated that the combined subsistence harvests of halibut exceeded 500,000 pounds per year in the late 1880s (NRC 1999a). In 1888, following commercial depletion of Atlantic halibut (*H. hippoglossus*) stocks, the west coast halibut resource began to attract fishermen and boats from the east coast of the United States, leading to development of the commercial fishery for Pacific halibut (Thompson and Freeman1930; Bay-Hansen 1991). The commercial fishery intensified and expanded in the 1890s when transcontinental railroads reached Seattle and Vancouver (Thomson 1975). Total commercial landings increased steadily over the next 27 years; in 1889, landings were over 1.8 million pounds, by 1904, they reached 28.8 million pounds, and in 1915, landings surpassed 68.5 pounds (Thompson and Freeman1930; Figure 7).

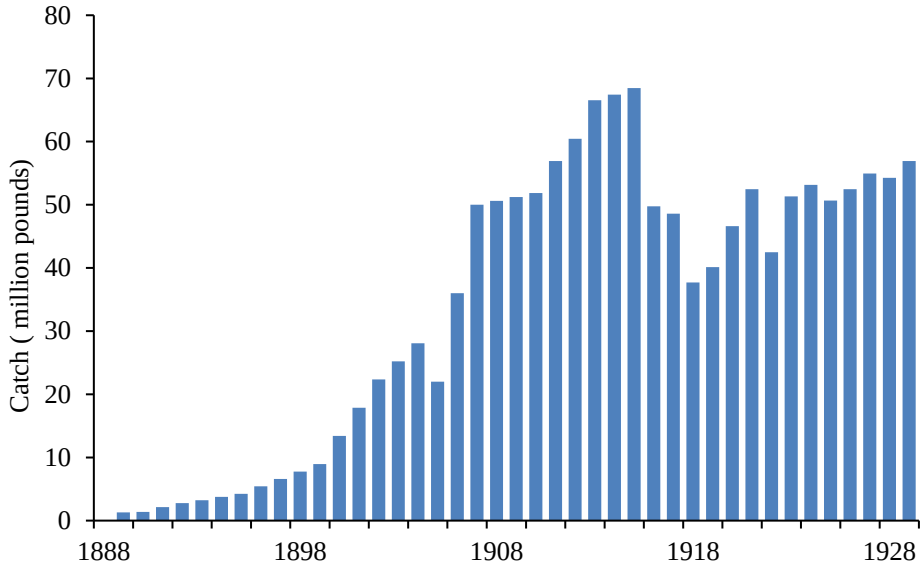

Figure 7. Commercial catch (million pounds) of Pacific halibut, 1888 through 1929.

A noticeable decline in halibut stocks in near-shore fishing grounds was first observed in 1910. This observation led the industry to lobby the United States and Canadian governments to enact conservation measure to protect the halibut stock (Clark 2003). The main areas fished for halibut in the 1880s were waters off Oregon, Washington, and California (Area 1 in Figure 8) and waters off British Columbia and Southeast Alaska (Area 2 in Figure 8). By 1921, diesel-powered vessels and mechanical devices for retrieving longline gear (Thompson and Freeman 1930) allowed the fishery to expand westwards across the GOA and into the EBS (Figure 8) (Thompson and Bell 1934; Thomson 1975). Total landings peaked at 68.5 million pounds in 1914 and 1915, followed by reduced harvests despite ever-increasing effort, suggesting that the fishery had begun to be overfished (Thomson 1975; Clark 2003).

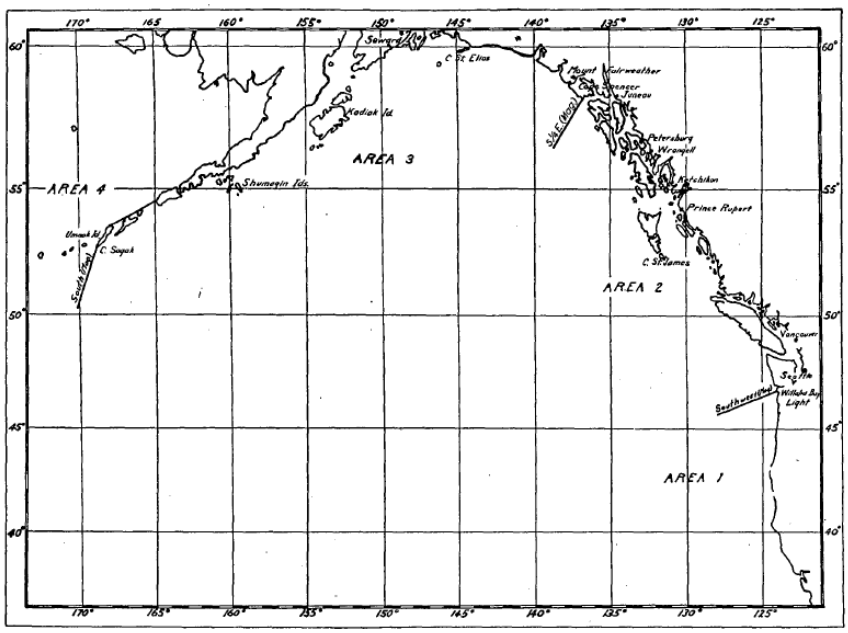

Figure 8. Map of the northeast Pacific coast showing early division into halibut regulatory areas.

The Pacific Halibut Treaty of 1923 and founding of the IPHC

The United States and Canada signed the Halibut Treaty of 1923 to address concerns about the conservation of Pacific halibut. This treaty established the International Fishery Commission (later renamed the International Pacific Halibut Commission, IPHC). The IPHC was tasked with investigating the halibut resource and recommending conservation measures (NRC 1999a). The Pacific Halibut Treaty was the first treaty to be concluded for the conservation of depleted deep-sea fisheries (IPHC 2003).

The IPHC hired William F. Thompson to lead research needed to fulfill its mission to develop science-based catch limits and catch accounting (Bell 1981). Within a few years, Thompson initiated a large and varied program of field studies on halibut life history and compiled large amounts of data on fishing effort and catches (Thomson 1975, Clark 2003). One of the earliest conservation actions was instigation of a winter closure to protect spawning halibut. In 1930, Thompson recommended that the IPHC be granted authority to mandate catch reporting by management area and to specify catch limits in order to start rebuilding halibut stocks (Clark 2003). That authority was granted and, in 1932, the IPHC began setting annual harvest quotas. The IPHC was empowered to divide the fishery into management areas, to regulate the licensing and departure of vessels, to collect catch and effort statistics, and to regulate the types of gear

that could be used in the halibut fishery (Wilen 1998). The IPHC also had the authority to close grounds populated with small immature halibut (Bell 1981).

Under Thompson, the IPHC staff developed methods to standardize landings records to better monitor catch and to ensure that the records would be comparable across management areas. Thompson started measuring halibut fishing effort in 1916, developing time series records of the number of dories, number of men and the amount of gear used each year. The IPHC adopted an 1,800-foot, six-line skate of gear as an initial standard unit for measurement of fishing effort. In 1940, this was revised to a standard of 120 hooks per skate (with 13-foot spacing) (Skud and Hamley 1978). The standard skate was subsequently revised to 1,800 feet of mainline with 100 hooks spaced at 18-foot intervals.

The weight of halibut caught per unit of effort (WPUE), an indicator of abundance, is calculated by taking the sum of the catch (in net pounds) of halibut per standardized skate of longline gear per standardized soak time of at least five hours (IPHC 2012). The WPUE is used to compare catch rates between years in the annual IPHC setline survey and to compare with catch rates in the directed commercial fishery to identify temporal trends for the stock as a whole and across regulatory areas (IPHC 2016). Figure 9 shows a marked decrease in WPUE from 280 pounds-per-skate-soak in 1907 to 55 pounds-per-skate-soak in 1929, an 80 percent decrease. This reduction in WPUE suggested that despite steady catches, fishing pressure was reducing halibut abundance.

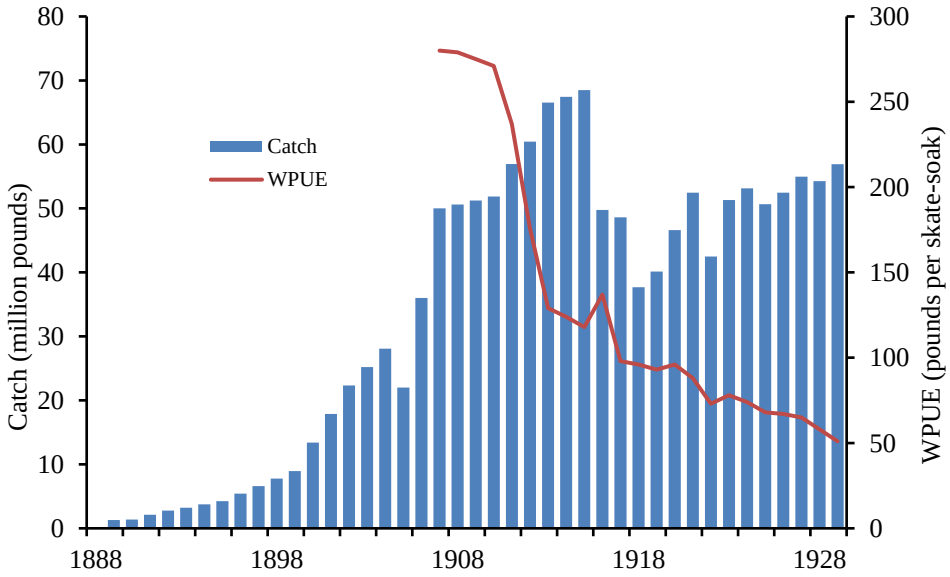

Figure 9. Commercial catch (million pounds) and WPUE (pounds per skate-soak) of Pacific halibut, 1888-1929.

Sablefish fisheries in the 1920s

The sablefish fishery developed as a secondary activity for the halibut fishermen in the United States and Canada. The initial fishery started in Washington and British Columbia and by the 1920s had extended along the Pacific coast from northern California to Kodiak (Hanselman et al. 2016). Compared to the halibut fishery, the sablefish fishery occurs in deeper-water, with fishing concentrated at depths from 1,200 to 3,000 feet, typically farther offshore and primarily outside the peak season for halibut. A small domestic market for sablefish developed during this period.

2. 1929 through 1944: the Advent of Science-Based Management of Halibut and Sablefish Fisheries

From 1929 through 1944, halibut stocks recovered from 25 pounds per skate-soak to 110 pounds per skate-soak (Figure 10). The recovery was attributed to effective science-based management and accepted as evidence that while excessive fishing effort could deplete a stock, sound science-based management could restore and maintain a healthy stock and support a substantial and sustainable fishery (Thomson 1975; Desharnais 2001; Clark 2003).

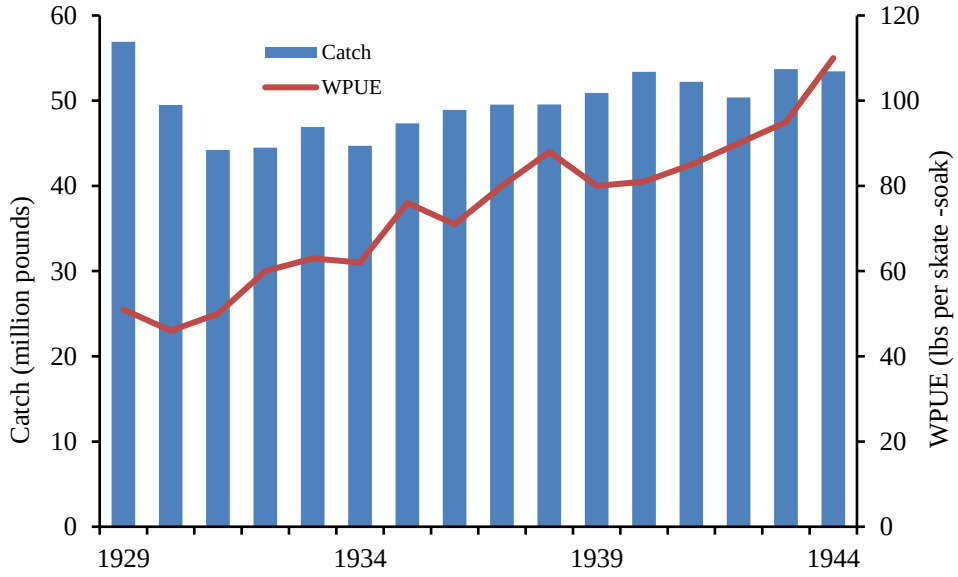

Figure 10. Commercial catch (million pounds) and WPUE (pounds per skate-soak) of Pacific halibut, 1929 through 1944

Between 1934 and 1944, Thompson's analysis of WPUE was used to drive catch limit recommendations. These recommendations are considered to be among the earliest examples of science-based management, in that they were derived from a population model that was used to

investigate the dynamics of the stock, the effects of fishing the stock, and the effect of regulations on the fishery (Clark 2003). Figure 10 indicates that catch also increased during this period, suggesting that fishing was becoming more efficient, in part, because the stock was increasing. In retrospect, it is apparent that natural fluctuations in productivity also contributed to the recovery (Burkenroad 1948, Clark and Hare 2002). Another factor on the stock rebound was that the fishery pressure was lower during World War II, because of the resources (vessels and personal) that went to the war.

In the 1930s, the Pacific halibut fishing grounds were divided into 30 statistical areas (Figure 11) to better track trends in catches across the biogeographic distribution of the stock (Thompson and Bell 1934).

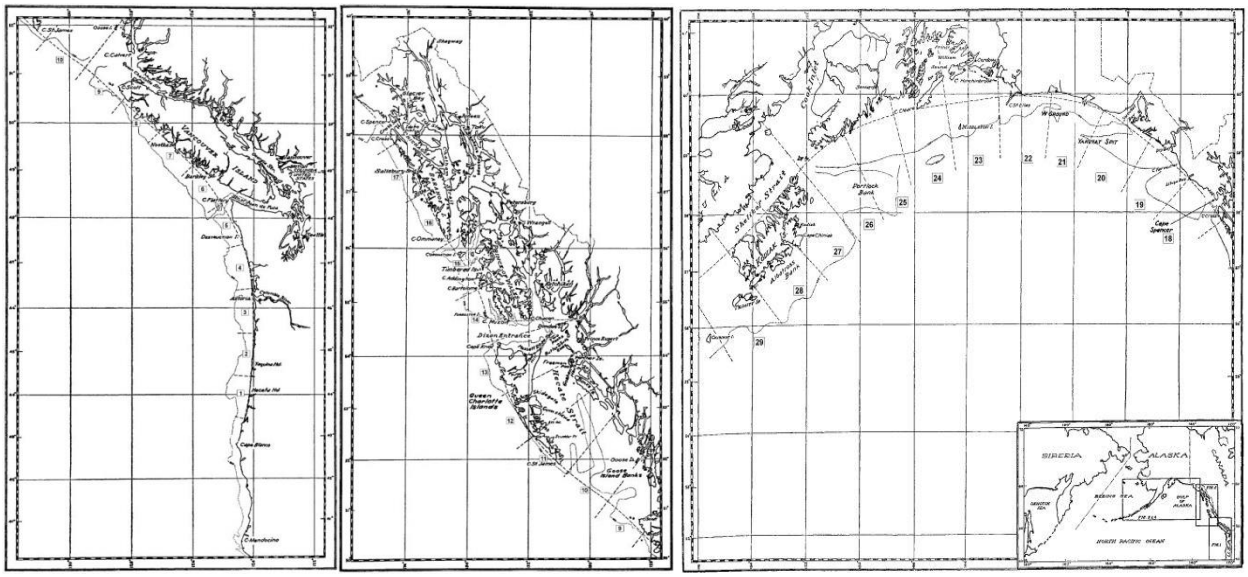

Figure 11. IPHC Statistical Areas in Northern British Columbia, Southeast Alaska, and the GOA, 1931.

The halibut commercial fishery was becoming a part-time fishery for many vessels as early as the 1930s. In the 1930s and 1940s, small salmon gillnetters and trollers entered the fishery targeting halibut just before and after the salmon season (Thomson 1975; Hartley and Fina 2001). Bycatch of halibut in trawl fisheries rose to about 800,000 pounds in 1943 (Thomson 1975). Removals between 1929 and 1944 held steady at about 50 million pounds, with a majority of catches coming from the GOA (40 percent), followed by British Columbia (30 percent), and Southeast Alaska (16 percent).

From 1929 through 1944, the sablefish fishery remained relatively small, and was almost exclusively a United States and Canadian fishery annual catch averaged around 3.7 million

pounds, mostly taken near established fishing ports (Hanselman et al. 2016), but this fleet also retained up to one pound of halibut for every seven pounds of sablefish (Thomson 1975).

World War II and the Alaska halibut fishery

WWII disrupted many of the fishing activities in Alaska, including the commercial halibut fishery. Thomson (1975) notes that the Department of Navy relaxation of layover requirements for halibut fishing vessels led to a shift in deliveries to remote ports nearer to the fishing grounds and an acceleration of harvests that made the fishery less manageable. In 1942, two halibut vessels were commandeered by the Navy and credited with sinking a Japanese submarine. The submarine was first sighted in Dixon Entrance in June 1942 by a Royal Canadian Air Force bomber, which dropped a 250- pound anti-submarine bomb. The submarine disappeared for a few days but was sighted two days later by two halibut vessels, the *F/V McLane* and the *F/V Formost.* During the ensuing 10-hour chase, the two fishing vessels dropped depth charges and were narrowly missed by a least one torpedo. The torpedo crossed the bow of the *F/V McLane* as it was backing away from the *F/V Formost*, which it had been following. Afterwards, both vessels dropped depth charges and the *F/V Formost* rammed the submarine. Sinking of the submarine was credited to both vessels (Chandonnet 2008).

3. 1945 through 1960, Halibut and Sablefish Fisheries in a Golden Age

Following the end of World War II, halibut WPUE and commercial removals steadily increased, peaking at 72 million pounds in 1960 (Figure 12).

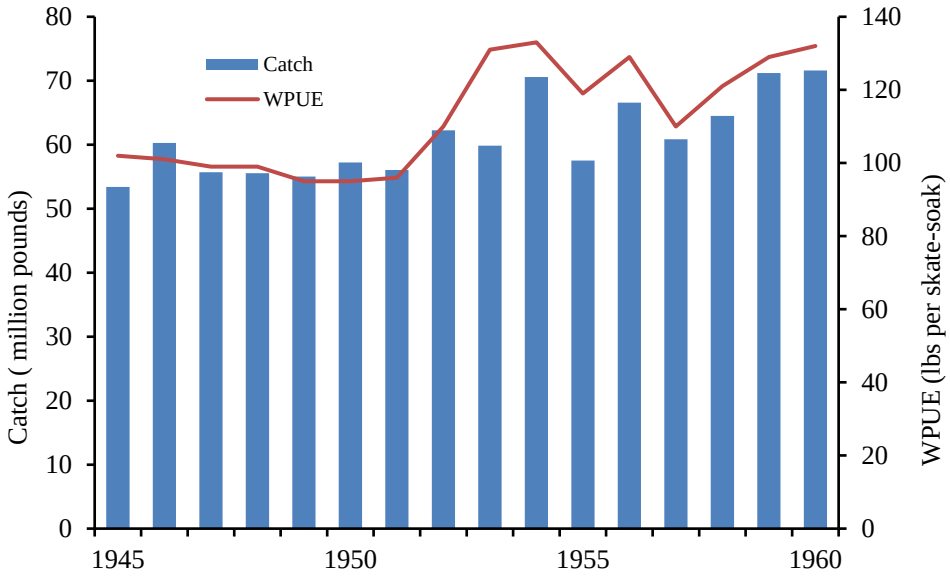

Figure 12. Commercial catch (million pounds) and WPUE (pounds per skate-soak) of Pacific halibut, 1945 through 1960.

As the halibut stock continued to improve, new vessels were attracted to the fishery. Many of these vessels came from the salmon fleet and usually fished in May and June before focusing on salmon during July and August. As a result, fishing effort increased during those months and the fishing season for halibut became ever shorter. In addition, the Canadian government subsidized vessel replacements, increasing fishing power and further exacerbating harvest capacity (Bell 1970). By 1953, the halibut season in the GOA had been reduced to 52 days; by 1954 in British Columbia and southeastern Alaska, the open season was reduced to 21 days (IPHC 1987). In their detailed monograph on the halibut fishery, Crutchfield and Zellner (1962) expressed concern that rising fleet capacity would dissipate economic value and push the fishery into an unmanageably short race-for fish. Similarly, Comitini and Huang (1967) found evidence of economic decline in the halibut fishery, an indication that the fishery was not sustainable as a social-ecological system. However, because WPUE continued to increase, rising nearly 22 percent during this period (Figure 12), the IPHC was unconcerned (Desharnais 2001), interpreting the increase as evidence of effective science-based management. During this period, the majority of the halibut were caught in the GOA (Area 3A; 38 percent), followed by British Columbia (Area 2B; 30 percent), and Southeast Alaska (Area 2C; 17 percent).

In the late 1950s, Japanese and other distant water fleets began to harvest pollock, flatfish, and Pacific ocean perch from the EBS and GOA. Over the next two decades, the global marine fisheries increased 300 percent. Fishing off the coast of Alaska by Japanese and other distant

waters fleets dramatically increased (Bailey 1992). As they did so, halibut and sablefish bycatch rapidly increased (Thomson 1975; Hoag and French 1976; Sullivan 1994; Hanselman et al. 2016).

4. 1961 through 1976: Unconstrained Foreign Fishing and Burgeoning Domestic Capacity in the Halibut and Sablefish Fisheries in the Northeast Pacific

By the 1960s, halibut stocks were thought to be in decline, leading the IPHC to reduce catch limits (Bell 1970). However, because halibut prices continued to increase, more small vessels were attracted to this fishery from the salmon fishery, which had begun to transition from open access to limited entry (Hartley and Fina 2001). Commercial halibut landings dropped substantially between 1961 and 1976 from about 70 million pounds to 27 million pounds (Figure 13). In 1961, IPHC began to estimate halibut bycatch in fisheries for other species; bycatch mortality is estimated to have averaged 14.83 million pounds per year during this decade. During this same period, WPUE declined 56 percent, from 127 pounds per skate-soak to 55 pounds per skate-soak (Figure 13).

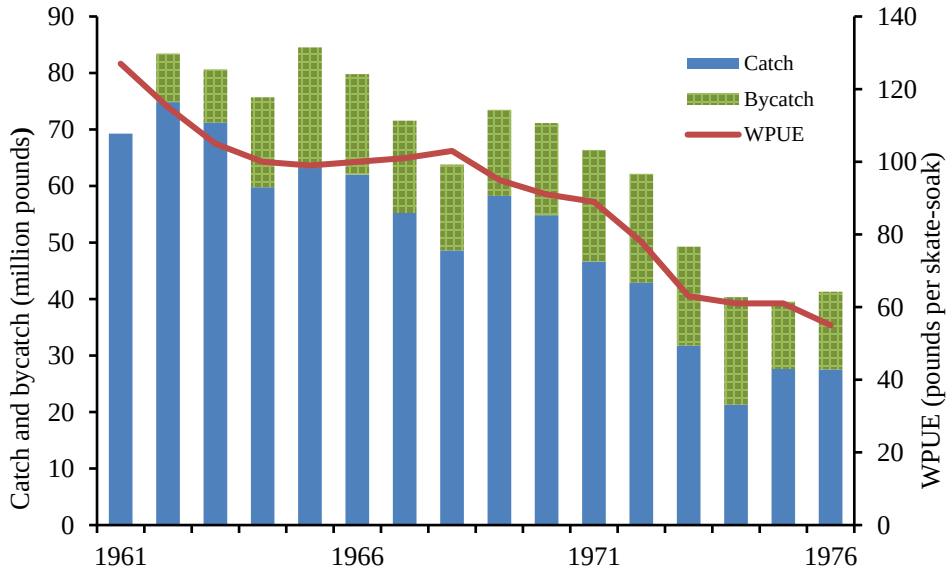

Figure 13. Commercial catch and bycatch (million pounds), and WPUE (pounds per skate-soak) of halibut, 1961-1976.

The IPHC was in a careful balancing act in regulating the halibut fishery, they wanted to achieve the maximum sustainable yield – but at the same time, the IPHC realized that abruptly changing

the season length would burden the fleet (Wilen 1998). Consequently, the IPHC chose to lower the quota slowly in an attempt to balance the two goals (Wilen and Homans 1998). Domestic sablefish catches increased from 1964 through 1972 in response to reductions in foreign fishing (Figure 14).

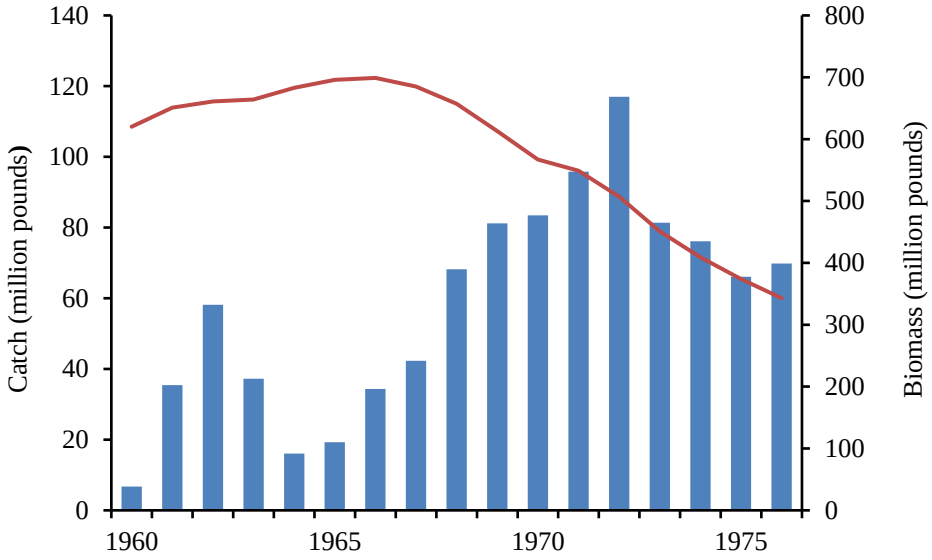

Figure 14. Catch and biomass (million pounds) of sablefish, 1961 through 1976.

Also during this period, shore-based trawlers began to target sablefish, catching an average of 15 million pounds per year between 1964 and 1972 (Figure 15; Hanselman et al. 2016).

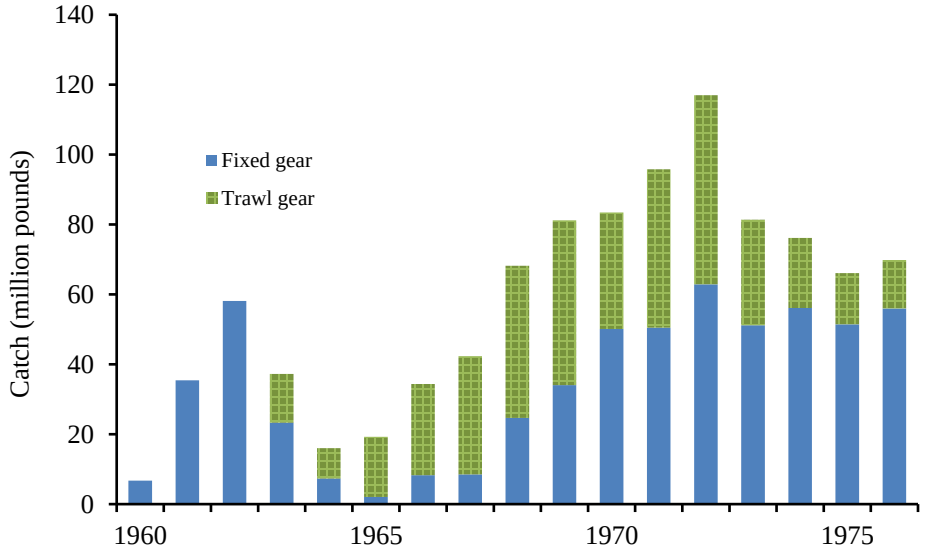

Figure 15. Sablefish catch (million pounds) in fixed gear and trawl fisheries, 1960 through 1976.

Between 1960 and 1976, a large portion of the sablefish TAC was caught as bycatch by trawlers fishing in United States territorial seas off Alaska. This caused a decline of catch available for the directed sablefish fishery during this period.

5. 1976 through 1991: Halibut and Sablefish Fisheries under Extended Jurisdiction

In 1976, President Gerald Ford signed the Fisheries Conservation and Management Act (Public Law 94-265), now known as the Magnuson-Stevens Fishery Conservation and Management Act or MSA (Public Law 109-479). This extended the United States marine waters jurisdiction from the state waters boundary of three nautical miles offshore to 200 nautical miles off the United States coast. Fisheries management in the United States is an amalgam of overlapping authority of federal and state governments, international treaties, interstate compacts, and tribal agreements (Criddle 2008). State fisheries management agencies regulate marine fish populations in state waters within three miles of shore[1] as well as in lakes and rivers abutting state lands. The United States Fish and Wildlife Service manages fish species in lakes and rivers encompassed by federal land. NMFS has jurisdiction for fish and shellfish from the edge of state waters to the outer boundary of the EEZ. The MSA created a co-management structure wherein eight regional fishery management councils (RFMCs) represent public interests in recommending the design and modification of FMPs for fisheries within their region. These RFMCs include representatives nominated by the governors of each state in the region and are appointed by the Secretary of Commerce (NPFMC 2012), providing an avenue for representation of state interests in adjacent federal fisheries. RFMC members are intended to represent all stakeholders and include personnel from state fishery management agencies, the public, commercial and recreational fishing interests, non-governmental organizations, academic institutions, consumers, and other stakeholders. Because Pacific halibut are subject to a treaty between the United States and Canada, authority for management of the halibut stock through limits on allowable levels of fishing mortality resides with the IPHC, which includes equal representation from the United States and Canada.

[1] Except in the Gulf of Mexico where some state waters extend to 3 leagues (approximately 9.2 miles).

Halibut and sablefish fisheries management under the MSA

Enactment of the MSA did not replace the Halibut Treaty; it expanded the geographic area subject to IPHC jurisdiction to more fully encompass the halibut population. The IPHC continues to be responsible for biological aspects of management, including stock assessments, regulations, and annual catch limit (harvest) specifications. Until 1979, Canadian and United States fishermen had full access to the fishery. In 1979, Canada and the United States signed a protocol extending the IPHC management and, starting in 1981, confining halibut fishermen to their own EEZs (Cook and Copes 1987).

In the late 1980s, the IPHC restructured its management map, consolidating the 30 statistical areas into 10 management areas (Figure 16). The IPHC uses logbooks, State of Alaska fish landing tickets, and biological samplers to collect data on the Pacific halibut resource. The IPHC also shares an electronic landings reporting system with NMFS and the State of Alaska that provides near-real time data on commercial landings. The State of Alaska collects and shares data on sport and subsistence catches of halibut.

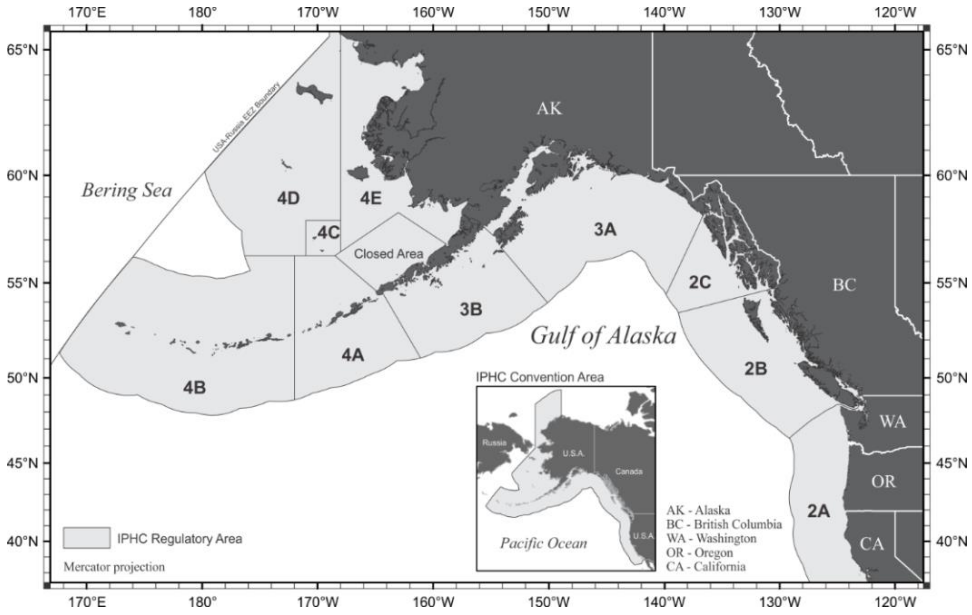

Figure 16. IPHC Regulatory Areas. (Source: IPHC).

Pursuant to its responsibility under the FCMA, the NPFMC drafted FMPs for groundfish of the GOA (1976) and for the BSAI (1979)[2]. These FMPs include sablefish and designate six sablefish

[2] FMPs are subject to periodic review and revision; the current BSAI groundfish FMP is (NPFMC 2017a), the current GOA groundfish FMP is (NPFMC 2017b).

management regions (EBS, AI, Western GOA, Central GOA, West Yakutat, and Southeast Outside) for sablefish fisheries off Alaska (Figure 17).

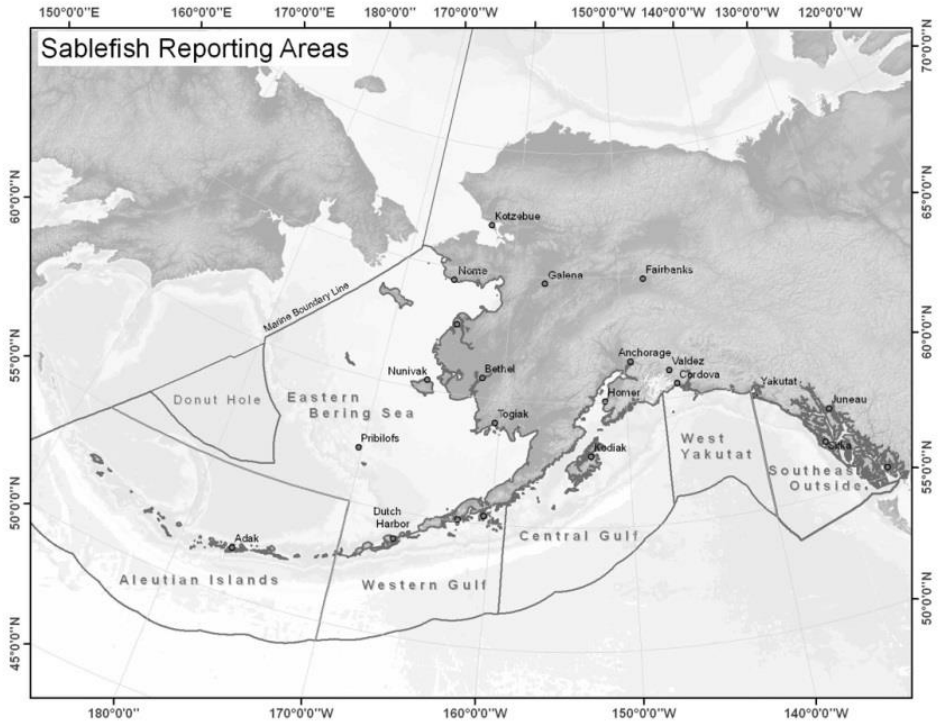

Figure 17. Sablefish reporting areas and quota share area designations. (Source: NMFS).

Halibut and sablefish fisheries under the MSA

From 1976 through 1994, the halibut and sablefish fisheries remained open access to United States fishermen, meaning that any federally permitted fishing vessel could fish for these species. Because of open access, these stocks were subjected to localized depletion and general overfishing (Hanselman et al. 2016). Particularly so after 1980, when Bering Sea crab stocks were overharvested and larger crab vessels entered the halibut and sablefish fisheries (IPHC 1987). Whenever other fisheries (such as salmon) had a decline in their target stock, the halibut fishery seem to be an easy fishery to add to their season (Hartley and Fina 2001). This led to additional vessels fishing for halibut each season. However, in the wake of the MSA, halibut biomass began to increase (Figure 2) and so did WPUE (Figure 18). Pressure from the added vessels did not immediately affect catch rates.

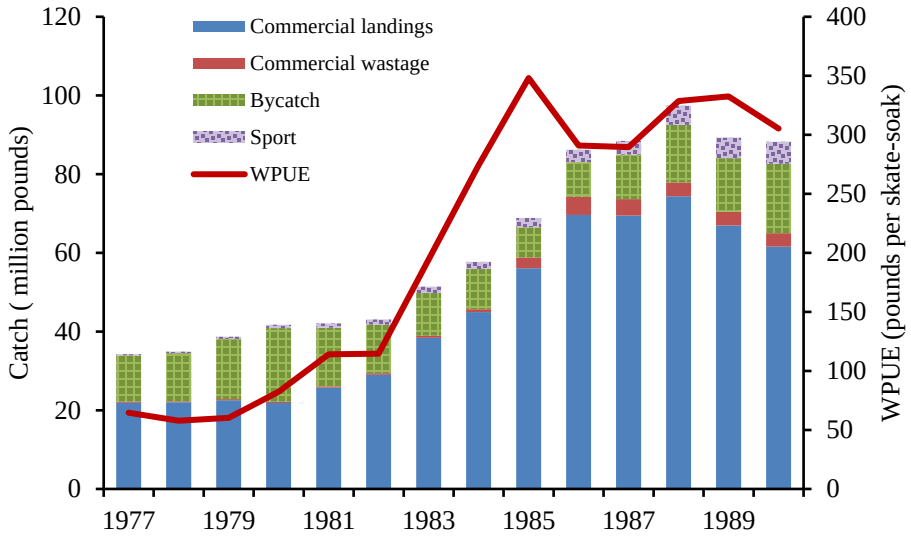

Figure 18. Catches (million pounds) and WPUE (pounds per skate-soak) of halibut, 1977 through 1990.

Commercial landings rose from 22 million pounds in 1977 to 74 million pounds in 1988 (Figure 18). During this time, the management agencies also began to pay closer attention to halibut mortality outside of the directed fishery. During this period, bycatch[3] averaged 12.9 million pounds per year, sport catches averaged 2.3 million pounds per year, and commercial wastage (predominately the mortality of undersized halibut discarded at sea) averaged about 1.8 million pounds per year (Figure 18). During this same period, halibut WPUE rapidly increased to 350 pounds per skate-soak and then dropped to 300 pounds per skate-soak (Figure 18). Once again, most of the halibut was caught in the eastern and central GOA (Area 3A; 42 percent) followed by British Columbia (Area 2B; 18 percent), the EBS (Area 4; 15 percent) and Southeast Alaska (Area 2C; 13 percent).

The sablefish fishery also increased its catch between 1977 and 1990 (Figure 19), with United States fishing vessels displacing foreign fishing vessels (Hanselman et al. 2016). Foreign fisheries caught between 17.5 million pounds and 28.6 million pounds of sablefish per year from

[3] Under the groundfish FMPs for the GOA and BSAI, bycatch, the incidental catch of halibut in non-target fisheries, is categorized as prohibited species catch. That designation means that bycatch of halibut cannot be retained and provides a basis for establishment of prohibited species caps that, if exceeded, can close fisheries that are unable to avoid halibut bycatch. For simplicity, throughout this document, the generic term “bycatch” will be used in lieu of “incidental catch” or “prohibited species catch”.

1977 through 1983; thereafter, foreign catches declined and ceased altogether in 1987 (Hanselman et al. 2016). Meanwhile domestic catch rapidly increased to a record harvest of 82.9 million pounds in 1988 before declining. Most of the sablefish catch was in the GOA where longliners harvested just over 64.5 million pounds of the 85 million pounds caught in 1988.

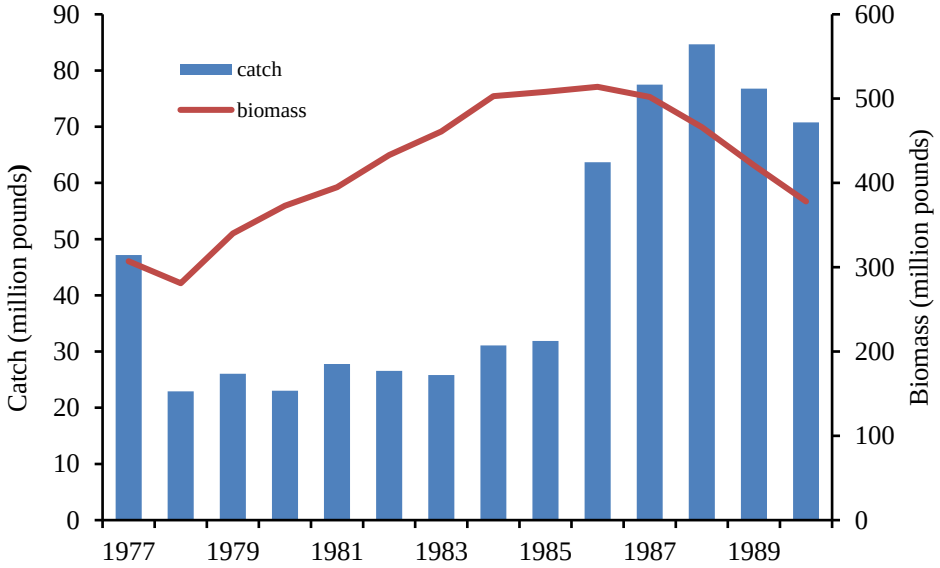

Figure 19. Catch and biomass (million pounds) of sablefish, 1977-1990.

Domestic capacity in the sablefish fishery increased rapidly during this period. Between 1981 and 1988, there was a tenfold increase in vessels over 50 feet in length and a 14-fold increase in smaller vessels engaged in the sablefish fishery (Hanselman et al. 2016).

Transition to IFQs for sablefish and halibut

During the late 1970s, the NPFMC began exploring ways to implement a limited entry program for the halibut fishery off Alaska. Those initial efforts were derailed over uncertainty about the roles of the IPHC and NPFMC in management of the halibut fishery (Pautzke and Oliver 1997). The ambiguity was resolved by the 1979 Protocol to the Convention and the Northern Pacific Halibut Act of 1982 (McCaughran and Hoag 1982). The protocol reaffirmed IPHC authority over stock assessment and annual catch limits but allowed each nation to impose additional regulations (McCaughran and Hoag 1982). The Northern Pacific Halibut Act, specifically delegated authority for allocation and management of the fishery to the NPFMC (Public Law 97-176). With its new authority, the NPFMC voted to implement a three-year moratorium on entry to the halibut fishery. The proposed rule was published in the *Federal Register* on February 3, 1983 (48 FR4861). Based, in part, on an unfavorable review by the Office of Management and

Budget (OMB), the Secretary of Commerce rejected the moratorium. The OMB argued that a moratorium, *per se*, would not end the race for fish and thus fail to achieve long-term benefits that could be achieved through establishment of an IFQ (Richards and Gorham 1986). The OMB's findings and recommendation echoed theoretical analyses (Moloney and Pearse 1979; Wilen 1979; Pearse 1980; Stollery 1986) and empirical reviews (Muse and Schelle 1989; Terry 1993).

The problems that led to the development of the 1983 halibut fishery moratorium proposal continued to worsen through the 1980s. Barriers to entry in the halibut fishery were low. The season was very short (in some areas as little as three to four days; Figure 20) and halibut fishing required little unique skill or knowledge. As soon as the sablefish fishery was fully domesticated, the longline fleet asked the NPFMC to revisit a moratorium coupled with a limited entry system (Pautzke and Oliver 1997). Initial discussions focused on the sablefish fishery and did not include a parallel proposal for the halibut fishery. The NPFMC considered a variety of input controls (e.g., license limitations, gear restrictions) as well as allocated quotas. Because almost any vessel could be used as a platform for halibut fishing, including open skiffs, sport charter vessels, salmon troll, gillnet, and purse seine vessels, traditional halibut schooners, and repurposed crabbers, anyone could purchase a few skates of longline gear and join the fleet. By the mid-1980s, the halibut and sablefish fisheries were both characterized by overcapacity, validating concerns expressed by Crutchfield and Zellner (1962) and Comitini and Huang (1967), among others. During this time, the fishery included about 3,500 halibut vessels and 1,800 sablefish vessels, and the season had decreased from months in the 1970s to mere days for halibut and mere weeks for sablefish (Figure 20).

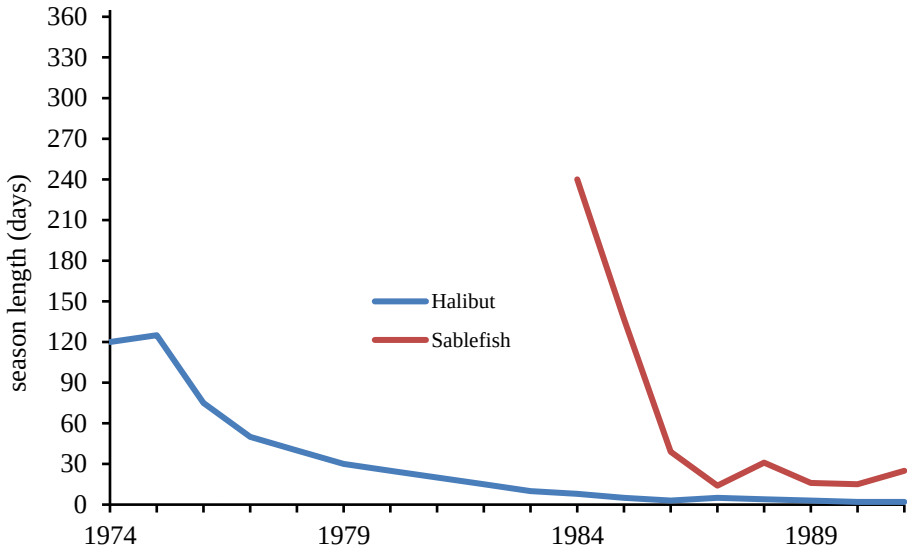

Figure 20. Season length (days) in the halibut sablefish fishery, 1974 through 1991.

Both fisheries were experiencing high bycatch, lost gear, grounds congestion, compressed seasons, and high discard mortalities (Pautzke and Oliver 1997). In addition, a high incidence of death and injury could be attributed to the derby style fishery (Hughes and Woodley 2007).

It was apparent to fishermen that some flavor of limited entry permit (LEP) program or IFQ program would eventually be recommended by the NPFMC and approved by the Secretary of Commerce. Fishermen widely expected that, like Alaska's LEP programs, these LEPs or IFQs would be awarded free to recipients based on their documented engagement in the fishery and that they would be awarded in perpetuity as transferable usufructs which would create windfall gains that could be realized on sale (Newell et al. 2007). These anticipated features attracted new fishery entrants and induced longtime participants to delay retirement and created a clear economic incentive for fishermen to "fish for catch history" (Anderson and Hill 1990). In the years leading up to adoption of the IFQ program, some participating vessels incurred operating costs and amortized fixed costs in excess of their annual earnings in the halibut fishery but continued to fish to demonstrate engagement in the fishery and to acquire catch history (Criddle 1994).

While rejection of the proposed moratorium was a setback, by 1985, the NPFMC was exploring implementation of a LEP program for sablefish in the GOA (NPFMC 1985). The NPFMC also established ad hoc committees to explore strategies for limiting entry to the halibut fishery. Among other measures, the NPFMC considered limiting access in portions of the Bering Sea

around the Pribilof Islands to provide economic opportunity to island residents. The NPFMC examined additional alternatives in draft environmental assessments for limited access in halibut (NPFMC 1987) and sablefish (NPFMC 1989). In 1990, the NPFMC initiated an analysis of alternatives for management of both fisheries with a moratorium on entry to be followed by implementation of a license limitation or IFQ program. That analysis developed into an Environmental Impact Statement of proposed amendments to the BSAI (Amendment 15) and GOA (Amendment 20) groundfish FMPs for the IFQ management alternative for fixed gear sablefish and halibut fisheries (NPFMC 1991a,b,c;1992a,b).

Stakeholders were concerned that a moratorium coupled with LEPs or IFQs would: lead to consolidation and a reduction in seasonal crew and skipper positions, thus harming fishing communities; constitute a "give-away" of public resources and create a closed class of privileged constituents who would gain undue economic power; create unfair "windfall" gains for recipients who had established long catch histories in the halibut and sablefish fisheries;[4] and, be difficult to enforce and that LEP or QS recipients would have an incentive to high-grade and under-report their catches. Proponents argued that beneficial impacts would include: improved safety at sea; an extended fishing season; increased availability of fresh fish and increased product quality; increased ex-vessel value to fishermen; reduced capitalization and surplus capacity; and greater economic self-determination for fishermen. To a greater or lesser extent, all of these concerns and beneficial impacts have been validated in the ensuing years.

By 1991, the NPFMC settled on a recommendation for the implementation of an IFQ program for both sablefish and halibut. The NPFMC passed this recommendation on a seven to four vote. The preferred alternative included many previously untested design features intended to allow for needed consolidation without loss of essential social characteristics of the fishery (Cotter 2011). Following this action, the NPFMC formed an agency advisory committee that consisted of representatives of the Alaska Commercial Fisheries Entry Commission, which had experience designing and implementing limited entry fisheries for salmon, herring, and miscellaneous species in state waters, the NMFS, which had statutory authority for management and enforcement of the fisheries, and the ADF&G which had dockside sampling capacity and

[4] At this time, the MSA prohibited auctioning of limited access permits or fishing quota, thereby ensuring that any LEP or IFQ program would create windfall gains for initial recipients.

experience collecting fish ticket data on ex-vessel transactions. The NPFMC also formed an industry advisory committee. These two committees looked at different IFQ implementation options, one committee from the perspective of biologists and professional managers and the other from the perspective of industry. Both committees met periodically to exchange ideas of what the fishermen wanted and what the agency representatives believed to be feasible. The advisory committee process worked out detailed plans for an electronic ledger reporting system involving both harvesters and processors, which would deduct landings from individual quota share accounts in real time and guard against overages and underreporting (Cotter 2011).

Based on analyses reported in the final environmental impact statement in 1992 (NPFMC 1992b), the new IFQ program was expected to distribute fishing over an 8-month season, allowing fishermen to harvest their individual quotas at opportune times when they were assured of high ex-vessel prices, low opportunity costs, and increased profits. It was also expected that the IFQ program would reduce the need for search-and rescue-operations; reduce gear conflict and congestion on the grounds, thereby reducing gear loss and ghost fishing mortality; and allow vessels fishing both sablefish and halibut IFQ to retain target and bycatch species, thereby reducing discard mortality of both species. Those who held the IFQ could determine where and when to fish, how much gear to deploy, and scale their overall investment in harvesting capacity to match their IFQ holdings.

In 1992 the NPFMC submitted a detailed environmental impact statement and its preferred alternative for a comprehensive halibut and sablefish IFQ program and FMP amendments for the sablefish fisheries (Hartley and Fina 2001). NMFS then prepared a proposed rule for Secretarial approval of the Alaska Halibut and Sablefish IFQ program and authorization to publish the plan in the Federal Register (NPFMC 1992). Following public comment and publication of a Final Rule with final implementing regulations, NMFS opened an application period in January 1994; in January 1995, the halibut and sablefish IFQ program was approved for implementation.

6. 1991 through 1994: the Final Years of Open Access in the Halibut and Sablefish Fisheries off Alaska

The period from 1991 through 1994 was very unsettled. While the NPFMC moved forward with design of the halibut and sablefish IFQ program and development of an implementation plan, litigation over aspects of the plan and especially over qualification criteria (e.g., Black 1996)

created uncertainty about whether the IFQ program would be upheld by the courts and whether the NPFMC's preferred alternative would be implemented as intended. In addition to challenges in federal court, there were concerns that IFQ program might not apply in state waters (Alaska Department of Law 1995). Ultimately, the IFQ program for halibut was upheld as applicable to commercial catches in state waters under authority of the Halibut Treaty. In contrast, sablefish in state waters are a state fishery and are covered under state LEPs rather than federal IFQs.

By 1990, the Canadian government realized that their economic return from the fishery were not as large as they could have been; their solution was to transform the halibut fishery from a competitive fishery to a cooperative fishery (Munro et al. 2009). Canada felt that effective economic resource management would be possible once the fleet was rationalized. They determined that inframarginal rents (returns to fishing effort) accrue to more efficient vessel operators in the fishery (Cook 1990). The implementation of the Canadian halibut individual vessel quota (IVQ) program in 1992 resulted in substantial ex-vessel price increases for Canadian fishermen (Casey et al. 1995; Herrmann 1996; Herrmann 2000). Canadians received a $2 price premium for deliveries outside of the short season fished off Alaska and because they delivered their catch to wholesalers and custom processors (Herrmann 2000). Although there were many arguments in favor of IFQs, it was primarily the increase in Canadian ex-vessel prices that won over fishermen. These developments changed some of the negative feelings about IFQs for the halibut fishermen off Alaska. However, fishermen who failed to meet the qualification criteria or had only caught small amounts of halibut and sablefish during the qualifying years adamantly opposed implementation of the program (Knapp 1996).

During this period, commercial halibut landings held steady at about 54 million pounds. Bycatch was reduced in response to changes in the BSAI and GOA groundfish FMPs and subsistence (personal use) fisheries expanded in 1992 (Figure 21).

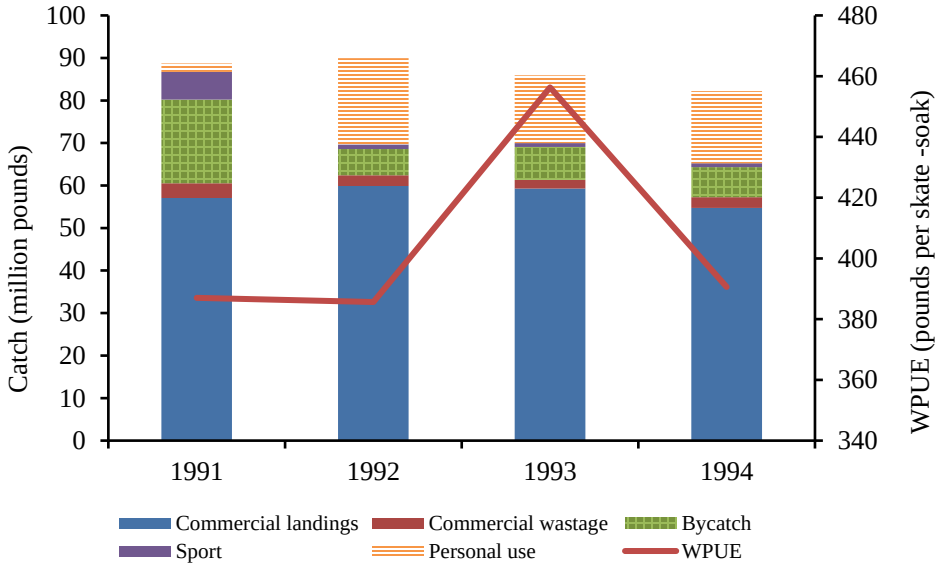

Figure 21. WPUE (pounds per skate-soak) and catches (million pounds) of halibut by sector, 1991 through 1994.

The IPHC setline survey WPUE for halibut, used to estimate the coastwide stock distribution among regulatory areas, held steady at nearly 400 pounds per skate-soak, substantially greater than in the preceding decades. During this period, commercial catches of halibut were primarily from the GOA (Area 3A; 40 percent) followed by the EBS (Area 4; 19 percent), and Southeast Alaska (Area 2C; 15 percent), with smaller catches from the U.S. Pacific Northwest (Area 2A; 13 percent), and British Columbia (Area 2B; 12 percent).

As in the halibut fishery when large numbers of vessels entered the sablefish fishery managers controlled total catch by reducing season length. The last year-round opening for sablefish in the GOA was in 1983; by 1994, the fixed gear sablefish fleet totaled about 1,000 vessels and season length had collapsed to 10 days, warranting the label “derby” fishery (Hanselman et al. 2016). Catches in the sablefish fishery declined from 1991 through 1994, a 12 percent decrease in total catch (Figure 22). Sablefish biomass decreased 16.5 percent over this same period due to the pressure of other fishing vessels entering the fishery (Figure 22).

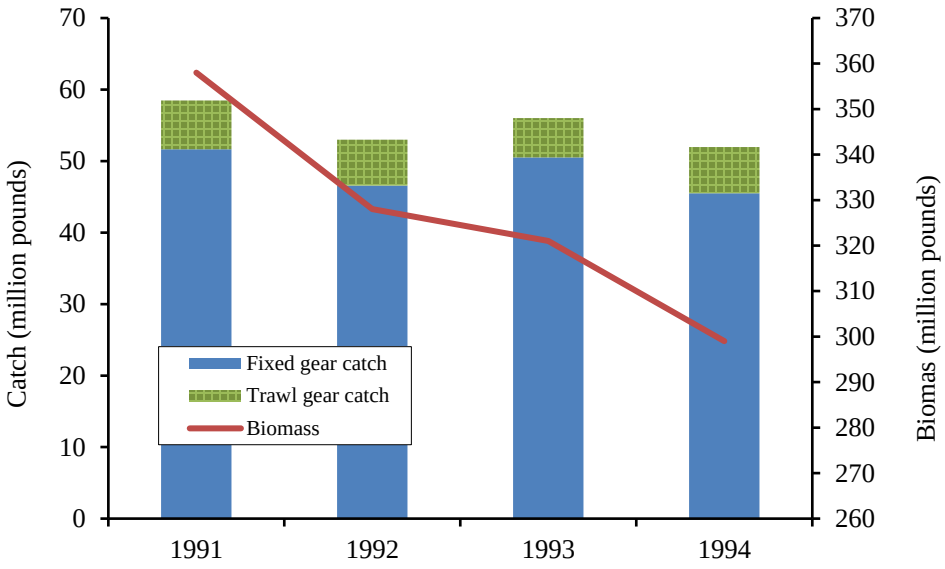

Figure 22. Catch and biomass (million pounds) of sablefish, 1991 through 1994.

From 1991, about 90 percent of the sablefish commercial catch has been taken with fixed gear; the remaining 10 percent has been taken with trawl gear (Figure 22).

7. 1995 through 2017: Individual Fishing Quotas in the Alaska Region Halibut and Sablefish Fisheries

When IFQ-based management was proposed for the halibut and sablefish fisheries, there was considerable opposition from the fishermen (Pautzke and Oliver 1997). Between 1980 and 1990 the race-for-fish intensified in both fisheries, and after many public meetings and extensive analysis of alternatives, the NPFMC approved the Alaska halibut and sablefish IFQ program in late 1991 for initial implementation at the start of 1995. The program was intended to increase manageability of these fisheries and reduce overharvests while minimizing disruptive changes to the composition of the fishing fleet, allowing for an orderly consolidation of fishing capacity, and preserving the owner operator character of the fishery (Pautzke and Oliver 1997).

The outcome of program implementation depends on factors outside of management control as well as program design features. External forcing factors that affected the halibut and sablefish IFQ programs include external market forces, externally driven variations in stock abundance and distribution, unexpected interpretation of the regulations, unintended consequences—spillovers, as well as effects of program success and broader impacts.

Features of the Alaska Halibut and Sablefish IFQ Program

QS in these fisheries were assigned initially to vessel owners and leaseholders who made at least one landing in the years from 1988 through 1990 (NPFMC 1992b). The QS were defined as perpetual entitlements that can be freely transferred, subject to a few limitations, as gifts or voluntary market transactions. With few exceptions, only natural persons can hold halibut QS and those persons must be aboard the vessel while their QS are being fished. Rules on ownership and owner-on-board provisions are less restrictive for sablefish QS. Each season, the NMFS Alaska Regional Office assigns quota to QS holders by multiplying the percentage of quota share they own in each management area by the annual harvest limit set for the commercial fishery in that management area.

Although halibut and sablefish are fished in a similar manner and most of the year in overlapping areas and at overlapping depths, they are completely different fisheries that are managed under one IFQ program. Halibut and sablefish have different markets and undergo different processing procedures. Before IFQs, halibut were sold into wholesale markets as a headed-and-gutted frozen product; following IFQ implementation halibut have been almost entirely marketed as a high quality fresh product supplied throughout most of the year (Matulich and Clark 2003; Hackett et al. 2005; Herrmann and Criddle 2006). In contrast, for the most part, sablefish continue to be marketed as a frozen product exported to Japan (Squires et al. 1988; Hastie 1989; Matulich and Clark 2003; Fell et al. 2011; Warpinski et al. 2016). Because of these differences, parts of this report are specific to halibut or sablefish with no analogy for the other species. The fisheries share similar management regimes but often have unique management challenges.

The Nature of QS and IFQ

Under MSA section 303A, limited access privileges such as QS and associated IFQ may be "revoked, limited, or modified at any time" without "right of compensation to the holder" and do not "create any right, title, or interest in or to any fish before the fish is harvested". That is, halibut and sablefish QS holders are granted a conditional usufruct, a privilege to participate in these fisheries under a system that allows management flexibility to respond to science-based population analysis and allows participants flexibility in when and where they fish (Gharrett 2012).

QS in the halibut and sablefish fisheries are assigned to specific management regions to reflect biological distribution of the stocks and to forestall localized depletion. For halibut, QS is stratified corresponding to the eight IPHC management areas (2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E) off Alaska (Figure 16). For sablefish, QS is stratified corresponding to the six NMFS management areas (Southeast Alaska, West Yakutat, Central GOA, Western GOA, EBS, and AI) off Alaska (Figure 17).

Two types of fishing vessels have participated in the halibut and sablefish fisheries: freezer longliners (CPs) and catcher vessels (CVs). CPs are generally large vessels that make lengthy trips and freeze their catch on the grounds, offloading on shore, or at sea to foreign trampers (sablefish). CVs, which may be from ten to over 100 feet in length overall, deliver their catch to shoreside plants or at-sea processors. Such deliveries are of chilled or iced fish. The halibut IFQ program designated one QS use category for CPs and three QS use categories for CVs based on the length overall of the vessel on which qualifying landings were made (Table 1). This was done primarily to maintain the profile of the fleet, particularly to protect owners of smaller vessels from domination by the more affluent owners of larger vessels. (Dawson 2005).

Table 1. Halibut IFQ program QS use categories.

Use Category	Initial Specification*	Amended Specification*
A shares	Any CP	Any CP
B shares	CV > 60'	Any CV
C shares	35' < CV ≤ 60'	CV ≤ 60'
D shares	CV ≤ 35'	CV ≤ 35'

* Length categories are denoted as length overall in feet (').

The initial restrictions on vessel length were amended in 1996 to allow category B quota to be fished on smaller vessels. (See Appendix 1 for a listing of amendments to the Alaska Halibut and Sablefish IFQ Program.)

The sablefish IFQ program designated one category of CP QS and two categories of CV QS based on vessel size (Table 2).

Table 2. Sablefish IFQ program QS use categories.

Use Category	Initial Specification*	Amended Specification*
A shares	Any CP	Any CP
B shares	CV > 60'	Any CV
C shares	CV ≤ 60'	CV ≤ 60'

* Length categories are denoted as length overall in feet (').

After program implementation, QS holders petitioned the NPFMC to relax some restrictions on sizes of vessels eligible to fish IFQ of various CV categories. In January 1996, the NPFMC approved a "fish down" amendment that allows CV QS to be used on vessels of the same vessel size category or smaller. The NPFMC did this to increase accessibility of additional QS, and make the fishery more economical, for small boat owners and users. The amendment allowed the use of larger vessel category QS on smaller vessels, except in the Southeast area where "fish down" of category B (larger than 60 feet) QS is allowed only for QS blocks equivalent to less than 5,000 pounds (based upon 1996 quotas). This amendment became effective August 16, 1996 (50 CFR 679.40). A later amendment removed the Southeast fish down restriction to provide greater operational flexibility and harvest efficiency (72 FR 44795, August 9, 2007).

A change proposed to the NPFMC and subsequently implemented in 2007 allows IFQ derived from category D QS to be fished on category C vessels in Areas 3B and 4C, an action also known as "fish up". These areas are located in the western GOA and the AI; this measure was approved by the Secretary of Commerce to address increased concern regarding vessel safety for very small boat operations in remote Western Alaska areas, and to ensure that as much of the TAC could be harvested as possible (72 FR 44795, August 9, 2007).

To determine how many pounds of fish a QS holder may harvest during each year's fishing season (i.e., the person's annual IFQ), the NMFS Restricted Access Management (RAM) division, first establishes the QS pool (QSP) for each of the seven QS categories in each of the eight halibut regulatory areas and six sablefish regulatory areas. The QSP is the sum of all the QS units that have been issued in a given area for each species that may result in QS for the upcoming year. RAM calculates the QSP annually (on or about January 31). The QSP may vary slightly from year to year due to appeals, administrative adjustments, and civil penalties.

After fisheries managers determine the annual IFQ TAC, annual permit amounts for the *i*-th IFQ permit holder are calculated as the product of their QS holdings, the TAC, and the QSP:

$$IFQ_i = QS_i \div QSP \times TAC.$$

This equation yields the number of pounds of IFQ that the *i*-th QS holder may harvest during that year. Those IFQ allocations are adjusted upwards or downwards to account for overages or underages in that QS holder's landings relative to their IFQ the previous year. Thus, the ratio of QS to IFQ varies by year and area. Annual variations in an individual's IFQ are driven primarily

by their decisions to purchase or sell QS and by variations in the TAC. Landings are monitored and debited against their IFQ.

Eligibility for an initial distribution of QS

Eligibility for the *de gratis* initial allocation of QS is one of the more controversial parts of IFQ program implementation (NRC 1999a). Goals the NPFMC had for eligibility for the IFQ program were to credit both historic participation and current fishery dependence; and protect the capital investment made by vessel owners that participated before the IFQ program (Pautzke and Oliver 1997).

The program restricted initial issuance of halibut and sablefish QS to persons who, during 1988, 1989 or 1990 owned or leased vessels with the appropriate species' landings. Owners were required to be United States citizens and the vessel had to have been documented or registered as a vessel of the United States when qualifying landings were made. Initial QS amounts were based on the sum of each qualifying applicant's best five of six years landings for sablefish, or of seven years for halibut. This computation rewarded longevity and dependence on the fishery, while accommodating temporary disruptions in or absences from the fishery. In this manner, eligibility criteria attempt to maintain the pre-program structure and constituent dependence on the halibut and sablefish fisheries. Although there was some discussion (among policy makers) about including hired masters and crew in the initial allocation, skipper and crew shares were not included in the alternatives evaluated in the environmental assessment or regulatory impact reviews (NPFMC 1992).

Implementation and the Application Process

In preparation for the initial allocation of QS, RAM developed an official record of all halibut and sablefish landings, vessel owners, permit holders, and other relevant information, for the qualification (1988 through 1990) and QS determination (1984 through 1990) years. The official record was used to estimate how much QS would be issued to each eligible person.

Each person who appeared eligible under the official record was mailed a Request for Application (RFA), a pre-requisite to an application that allowed NMFS to unequivocally identify each potential applicant and collect some qualification information and current contact information. Persons who returned timely RFAs were sent an application packet and form with a

copy of their official record. RFA and application forms also were available by request. Applicants could agree to the official record or make a contrary claim (Gharrett 2012).
Despite clearly specified qualifying years, a long delay occurred between NPFMC action in 1991 and the publication of the final rule in late 1993. The program was further delayed for regulatory development, until the 1994 application period and start of fishing in 1995. This led to additional entrants who hoped that final implementation would modify the qualifying years. These "left outs" launched unsuccessful political and legal campaigns to overturn the program, particularly the qualification criteria (Gharrett 2012).
Applications were mailed to 8,000 potentially eligible fishermen. These resulted in issuance of QS to about 5,000 halibut fishermen and about 1,200 sablefish fishermen. About 1,800 applications were denied in all or in part. Of these, ten percent were appealed, leading to 11 court cases, eight for NMFS (Gharrett 2012). Applications for initial issuance of QS were received and processed by RAM. The application deadline was July 1994, and most applications were received in 1994. Issuance of QS to eligible applicants began in November of 1994.

Computation and issuance of QS

Information used to calculate the initial allocation was drawn from State of Alaska fish tickets, which record legal deliveries of fish to processors, and NMFS weekly production (processor) reports for fish processed at sea. Near the end of 1994, NMFS allocated the first halibut and sablefish QS. By 1995, most of the eligible applicants had received their allocations, although some allocations continued over time as appeals were resolved. Each successful applicant was issued a number of QS commensurate with the sum of their best five years of eligible landings history (pounds) with which they were credited. In general, a person who fished only one year would get 20 percent of their average landings, a person who fished two years would get 40 percent, and so on, up to a person who fished all of the qualifying years, who would get an average of the entire five (or six) years (NOAA 1994). Over 5,500 individuals received some quota share, but a large concentration went to a few hundred QS holders. (NOAA 2007)

The Appeals Process

Applicants challenging the official eligibility record were provided a single period in which to provide evidence to support claims. Denied claims could be appealed to the National Appeals Office (NAO, formerly Office of Administrative Appeals) which adjudicates all appeals. Most common for initial QS allocation were appeals for basic eligibility, vessel ownership/lease

conflicts, and untimely applications. NAO decisions are subject to reconsideration requested by any party, and to the NMFS Alaska Regional Administrator's review. Administrative due process ends when the agency reaches "final agency action"; thereafter, an applicant may file in federal district court.

QS Transfers and Excessive Share Caps

QS transfers started shortly after NMFS made the initial QS allocations. Some of the QS transfers were to persons who were entering the fishery for the first time; other transfers were to persons who had received initial allocations and who were adjusting their QS holdings (NOAA 1994). To receive any QS by transfer, a person must have been an initial recipient of QS or have at least 150 days of experience as a crewmember of any United States fishery. The program includes additional restrictions on purchases of CV QS by corporations, partnerships, or other business entities: only corporations, partnerships, or other business entities that were initial QS recipients may purchase more CV QS (See 50 CFR 679.41(g)). An exception to these rules occurs when an individual QS holder transfers his or her own initially-received QS to his or her own solely owned corporation (see 50 CFR 679.42 (j) and CFR 679.41 (g)(3)).
Another entity that can acquire some types of QS is a non-profit community quota entity (CQE) approved by NMFS to purchase QS for the benefit of one or more of 46 eligible GOA communities (initially there were 42 with 4 additional communities added). IFQ owned by a CQE can only be leased to residents of the community in whose benefit the QS is held (CFR 679.41(d)).

Limits on Acquisition of Excessive Shares

In developing the halibut and sablefish IFQ program, the NPFMC introduced excessive use caps to ensure that halibut and sablefish QS ownership would not become concentrated. The halibut and sablefish IFQ program was intended to lead to some consolidation. However, the NPFMC was concerned that too much consolidation could result in loss of crew jobs, concentrate revenues in few coastal communities, and create enough market power for QS holders to undermine processing and support industries. The NPFMC expected that the consolidation would allow a smaller number of vessels to fish longer seasons and to enjoy improved safety, lessened competition on the fishing grounds, less fishing gear deployed, and less bycatch, discard, and

waste; and as a result, enhance the profitability of the individual fishery operations (NPFMC 1991).

Excessive share caps limit the amount of QS any person may hold, including QS held by a person directly, and QS attributed to that person through their ownership of a QS holding-entity such as a corporation or partnership. Excessive share caps were intended to constrain the extent and nature of QS consolidation. In the Alaska Halibut and Sablefish IFQ Program, excessive share caps include limits on the amount of QS that can be fished on a vessel or amount of QS a person could hold in a specific area, limits on the number of blocks of blocked-quota a person may hold, and limit the vessel size and operational categories on which QS may be fished. Initial QS recipients whose shares exceeded these restrictions were grandfathered in at their initial holding levels but precluded from accumulating more QS. Use caps are calculated by adding up all of the QS or IFQ held by a person and their percentage of direct or indirect ownership in any entity that holds QS or IFQ. This is called the "individual and collective" computations of caps. As an example, for an individual who holds 100 pounds of IFQ and has a five percent interest in a company that holds 100 pounds of IFQ, the amount of IFQ that person would be considered to hold for use cap calculation is 100 pounds (their personal holdings) plus five pounds (five percent of 100 pounds) from their ownership in that company (NOAA 2014).

Initially, halibut QS caps were expressed in percentages of the annual QS pool for each management area, but in June 1996, the NPFMC approved an FMP amendment that increased the combined total holding caps for halibut in Areas 4A, 4B, 4C, 4D, and 4E from 0.5 percent to 1.5 percent. These percentages were applied to the halibut QS pool in 1996 to establish a set number of QS units that would be used as a yearly cap. This allowed better planning and avoided a ratcheting up of QS holdings over time, and avoided cap overages in years in which QS pool sizes decreased from prior years.

Sablefish QS excessive share caps were set at one percent in each management area. Persons or entities that received more than one percent of the QS at initial allocation were grandfathered in but precluded from increasing their QS holdings in management areas where they already held one percent or more of the QS.

NMFS monitors the accumulation limits for excessive shares during the transfer application review and approval process. QS holding entities must annually disclose ownership/membership to support cap computations. Table 3 shows the QSP sizes that in turn govern QS caps.

Table 3. Halibut QS use caps, 2017 (QS units)

Species	Area	Cap (percent)	Size of Relevant (QSPs) (pounds)	Cap (QSPs) (pounds)
Halibut	2C	1%	59,979,977	599,799
	2C, 3A, 3B	0.5%	300,564,647	1,502,823
	4A, B, C, E	1.5%	33,002,937	495,044
Sablefish	SE QSP	1%	68,848,467	688,485
	GOA and BS/AL Region	1%	322,972,132	3,229,721

a. Vessel IFQ caps are calculated on the IFQ TACs only; CDQ (Community Development Quota) TACs are not included in the calculation of the QSP.
b. Halibut weights are in net (headed and gutted) pounds; sablefish weights are in round pounds.
c. Five halibut and 23 sablefish QS holders were grandfathered to hold more QS then the cap allowed.

The amount of annual IFQ in pounds that may be fished from any given vessel is limited to a small percentage of TAC, for any area or set of areas. This provision, together with the vessel category restrictions, was adopted to ensure that the number of vessels engaged in each fishing area would not fall below one hundred (Table 4).

Table 4. Vessel use caps, 2017 (pounds)

Species	Area	Cap (percent)	Annual IFQ TAC (pounds)	Vessel Use Cap (pounds)[a]
Halibut	2C	1%	4,212,000	42,120
	All areas	0.5%	18,295,400	91,477
Sablefish	SE	1%	5,745,188	57,452
	All areas	1%	22,577,309	225,773

a. Vessel use cap pounds are net weight for halibut and round weight for sablefish.

Table 4 shows that no vessel can be used to fish more than one percent of the halibut TAC for Area 2C; for 2017 that limit was 42,120 net pounds. Similarly, a vessel fishing sablefish IFQ in Southeast Alaska would be limited to no more than 57,452 round pounds.

Blocked QS

The Alaska Halibut and Sablefish IFQ Program includes a provision under which some QS was issued as indivisible blocks as another means of reducing entry barriers for new fishermen and smaller owner-operators in the fishery. Blocked QS may not be subdivided or consolidated upon transfer. In addition, the NPFMC placed limits on the number of blocks of QS that any one person may hold in any area. QS was "blocked" if, at initial issuance, the award yielded less than 20,000 IFQ pounds in 1994 equivalent pounds. The 20,000 pounds is actually a hypothetical IFQ based on 1994 TACs and the amount of the QS in the QS pool on October 17, 1994. The sablefish QS equivalent calculated for blocking limits varies in each area as TACs and the amount of QS in the QS pools changes.

Blocks cannot be broken up for transfer but must be sold or transferred to another person as an integral unit. Consolidation is constrained by limits on the number of blocks that can be held: a person can hold a maximum of two blocks in an area and a person with two blocks cannot hold any unblocked QS for the same area. The initial regulations allowed persons to combine, or "sweep-up," more than two blocks of halibut QS if their combined total weight was less than 3,000 pounds of IFQ. In April 1996, the NPFMC approved an amendment that increased the sweep-up limit for blocked halibut IFQ to 5,000 pounds. This regulation is now incorporated into 50 CFR 679.41(e). The 5,000 pounds of hypothetical halibut IFQ was based on 1996 TACs and the QS pool as of January 31, 1996. The regulation translates the rule into a specific amount of QS units for each management area effective December 31, 1996. In 2009, the limit on the number of blocks for the halibut changed from two to three blocks; sablefish block limits were not changed (50 CFR 679.42). When these blocking categories are combined with the vessel use and area categories, there are 96 management categories for halibut QS and 60 management categories for sablefish QS.

Transferability

The NPFMC included features in the halibut and sablefish IFQ program that were intended to preserve the owner-operator character of the fishery and to limit the extent of corporate participation and development of a rentier ownership. As noted above, only initial recipients and United States citizens with at least 150 days of crew experience aboard a United States commercial fishing vessel are eligible to acquire QS by transfer. Persons wishing to transfer QS must submit a notarized transfer application to NMFS. Applications received by the agency are reviewed to ensure that the recipient is eligible to receive QS and that the additional QS being transferred will not result in excessive shares. In addition to information that establishes the recipient's eligibility, transfer applications include the transfer price, financing, and brokerage fees. In addition, the transfer application asks about reasons for the transfer, relationship between parties, and how the QS/IFQ was located. That information provides the basis of reports on, for example, locational and demographic shifts in QS holdings. Quota shares can be sold with or without IFQ derived therefrom and with adjustments from prior year QS use. However, while leasing—the temporary use of IFQ—is allowed for CP (A) shares, it is strictly limited for CV QS.

Leasing

To help ensure the owner-operator character of the halibut and sablefish fisheries, the NPFMC established the requirement that QS holders be aboard the vessel during harvest and offloading of IFQ species. While CP (category A) QS are fully leasable, with few exceptions, leasing of CV QS is prohibited. Leasing provides new entrants with the opportunity to participate in the fishery without need to purchase QS, which can be more than an order of magnitude more expensive than the corresponding IFQ. However, the absentee owners of QS could extract a substantial share of the net earnings of lessees (Pinkerton and Edwards 2009; Szymkowiak and Himes Cornell 2015). In addition, if the IFQ lease is tied to lease of the QS holder's vessel, the QS holder may underinvest in safety equipment and vessel maintenance (Szymkowiak and Himes Cornell 2015).

During the first three program years (1995, 1996, and 1997), holders of CV QS could lease out up to 10 percent of their QS in each area. This was meant to provide operational flexibility, for example, for temporary medical needs, or to allow for mop-up of small amounts of IFQ remaining near the end of the season. However, these regulations expired on January 2, 1998. In 1995, the NPFMC also approved an amendment that authorized immediate transfer of QS to a surviving spouse with leasing privileges for a period of up to three years. This was intended to provide heirs with an opportunity to receive rental income from their inheritance as they consider disposition of their QS. The NPFMC is considering changes to this provision to define heirs as immediate family members of the deceased QS holder (NPFMC 2018). This proposed change is intended to clarify which individuals may receive QS and lease IFQ for three years after a QS holder death.

In addition, in most management areas, the IFQ program allows initial issuees and corporations that were initial recipients of IFQ to use hired masters to fish CV IFQ, but those hired masters must own at least 20 percent of the vessel used to fish the IFQ. The exceptions are strict prohibitions against the use of hired masters for halibut CV IFQ in Area 2C and sablefish CV IFQ in SE, where the initial issuees may only use hired masters for A shares (NOAA 2012).

In addition to the lease provisions for initial recipients and heirs, the NPFMC has amended the halibut and sablefish IFQ program to allow CV QS holders to lease IFQ in case of emergency medical conditions or military call-up. Emergency medical transfers (72 FR 44795, August 9, 2007) allow CV QS holders to lease out their QS when they are unable to fish due to their own

emergency medical needs of those of immediate family members who require their constant care. Use of emergency medical transfer provisions are limited to no more than two instances in five years for same medical condition(s). Military transfer provisions (73 FR 28733, May 19, 2008) allow members of the military reserve or National Guard to lease out their QS when mobilized. In addition, the NPFMC provided for leasing as a part of the Community Quota Entity (CQE; 69 FR 23681, April 30, 2004) program intended to address concerns about declining local engagement (fewer boats operating from their ports, fewer deliveries to local processors, declining QS ownership among community residents, and fewer community residents employed as crew) in the halibut and sablefish fisheries. CQEs are allowed to purchase QS for lease to community residents.

Cost Recovery

Fees

No special taxes or fees existed to cover the cost of developing and administrating the IFQ programs before the IFQ program was implemented in 1995. In 1996, the MSA was revised to allow QS holders to be taxed at up to three percent of the ex-vessel value of their landings to offset the actual costs of management and enforcement of the IFQ program and, if requested by the NPFMC, to finance a loan program for QS purchases (MSA section 304(d)(2)(B)). The cost recovery program was implemented in 2000.

The cost recovery fees are used to cover all incremental management expenditures related to administration and enforcement of the IFQ fishery, including labor, travel, transportation, printing contracts/training, supplies as well as equipment, rent, and utilities. Actual expenses for a federal fiscal year are summed across NMFS offices, the IPHC, and ADF&G. Expenses are reimbursable only for costs that would not exist but for IFQ management. Details regarding expenditures and fee collections are available in NMFS reports to the fleet and online (NOAA 2017f). In most cases, the fees that have been collected over the history of this program have been three percent or less. Agency expenses have remained low relative to fishery value, ranging from one to three percent of the annual ex-vessel value of the IFQ halibut or sablefish (NOAA 2012). This program demonstrates that implementation and ongoing management and enforcement can relieve taxpayers of the burden of managing catch share programs. The cost recovery fee is based on “standard” ex-vessel prices, which are calculated by NOAA fisheries

from shoreside processor registered buyer's annual value and volume reports; holders of CV IFQ may challenge the standard prices applied to their landings, but the burden of proof of value received lies with permit holders.

Loan Program

Under the MSA, cost recovery funds can be used to support loans to assist entry level and small-vessel fishermen, and refinance QS. NMFS Financial Services Division administers these loans, which are long term, low interest loans that may finance up to 80 percent of quota value.

Monitoring, Data Collection, and Enforcement

Enforcement is one of the most important conditions for a successful fishery and typically works best for fisheries that occur in areas that are well defined and remote (Squires et al.1995). Most IFQ programs incorporate substantial enforcement effort such as physical dockside checks during offloadings, at-sea boardings and inspections, and may include human observers or cameras onboard fishing vessels (Soliman 2014a). Monitoring for the halibut and sablefish IFQ fisheries includes real-time and post-transaction auditing of all landings. Buyers of IFQ halibut or sablefish must be registered with NMFS and must have a current annual license. All landings if IFQ halibut and sablefish are recorded using an electronic reporting tool, to provide real-time accounting and accountability. The electronic reporting system started as a simple electronic card-swipe data collection system but has evolved into a detailed real-time internet-based electronic reporting system, built and supported by NOAA Fisheries, the IPHC, and the ADF&G. Overall compliance in the halibut and sablefish fisheries is considered to be good due, in part, to close cooperation with the United States Coast Guard (USCG), the NMFS Office of Law Enforcement, and the Alaska State Troopers and Alaska Fish and Wildlife (Marvelle 2018).

Prior Notice of Landing and Landing Restrictions

Halibut and sablefish IFQ landings are not restricted to specific United States ports, but only three Canadian ports are authorized to receive landings from vessels operating in the halibut and sablefish IFQ program. Vessel operators making landings outside of Alaska must complete additional reports that enable enforcement to track landings and fishery offloads. QS holders or their hired masters must "hail in" at least three hours in advance of the landing IFQ halibut or sablefish and landings must commence no later than 18 hours after they hail in. This "prior notice of landing" requirement provides time for NMFS, the USCG, IPHC, and ADF&G

personnel to deploy to sample logbook and biological data for selected landings. Offloads may commence only between 6:00 am and 6:00 pm. Catches are electronically logged against the QS holders IFQ based on landings reports submitted by registered buyers that receive their landings. To help preclude under-reporting, all IFQ fish must be offloaded from the harvesting vessel at the time any IFQ fish is offloaded; all fish must be weighed and reported. Thereafter, fish may be reloaded back onto the harvesting vessel for delivery elsewhere or for use as "take home fish" or as crew payment.

Overage and Underage Provisions

For fishermen, precisely matching actual catch with available IFQ is challenging because large numbers of fish are caught each time they deploy their gear and the weight of those fish vary. Thus, in most years, fishermen land slightly less or slightly more than their available IFQ, which is characteristic of most fisheries managed under IFQ or other types of catch shares. There are three basic approaches to addressing the tendency towards moderate mismatch between actual landings and available IFQ. New Zealand and some other jurisdictions rely on a system of Pigouvian taxes (deemed values) under which the entire value of excess harvests is taxed away (Annala 1996; Dewees 1998; Holland and Herrera 2006; Townsend 2010). A second approach, popular in multispecies ITQ fisheries is the development of spot markets for electronic trades to lease small amounts of IFQ needed to cover overages (Squires et al. 1998, Branch and Hilborn 2008, Toft et al. 2011). The third approach, which is applied in the halibut and sablefish IFQ fishery, is to allow small overages and underages to be carried over between years. Here as in many other fisheries, civil penalties are assessed for excessive overages (62 FR 26246 May 13 1997). The line between administrative adjustments and civil penalties is 10 percent of account pounds remaining at the start of the trip in which an overage occurs. In many (but not all) cases, overages and underages are carried into the next year where they result in adjustments to IFQ account allocations. To prevent large allocation shifts between years, carryover adjustments from underages are limited to a small percentage of each person's start year IFQ account (limited to 10% of last trip). Adjustments for overages are fully deducted from the following year IFQ. Adjustments: "follow the QS" by affecting the year-end remaining balance of the IFQ user and apply to the next year's starting account of the person who, at that time, is holding the QS for which resulting IFQ was under- or over-fished the prior year.

Limited administrative adjustments were advocated by industry as well as the IPHC and NMFS management and enforcement, to allow for imprecision in at-sea harvest estimation without causing large shifts of TAC among years; to help achieve optimum yield while minimizing mortality from undesired practices that guarantee fishermen would harvest their full annual allocations, such as discard of overages; provide some business flexibility in use of annual IFQ over more than one year; and to help avoid violations. This process, combined with the flexibility to accomplish QS transfers with or without the full complement of annual IFQ from those QS, created a highly complex transfer and account management system but has achieved its management goals and proven highly popular with constituents and beneficial to the resource as well as managers, law enforcement, and stakeholders. Concerns about how carryover provisions as relate to annual catch limits (ACLs) established under the MSA are under discussion within NMFS.

Persons fishing IFQ allocations must retain sablefish and legal-sized halibut caught during a trip to the extent that anyone on board the vessel has access to unused IFQ allocation of the appropriate type. Common IFQ violations have included fishing in closed areas, fishing without the IFQ permit holder onboard, logbook discrepancy or violations, overages, fishing without IFQ permits, retention of undersized fish, and making landings without prior notice or at an undesignated port (NOAA 2012). NOAA IFQ enforcement activities include a partnership between the NMFS Enforcement officers and the Alaska State Department of Public Safety through a joint enforcement agreement. The United States CG also plays an enforcement role at sea.

Monitoring, auditing, and enforcement of catch share programs is labor intensive and the available resources are often overestimated. For catch share programs, accountability and enforceability from harvester through wholesaler enables interception of unlawful product. Real-time debiting of catches against annual catch entitlements reduces the frequency of overages and ensures that overages are detected when they occur. Deemed value systems, spot markets, or provisions for deducting overages from future annual catch entitlements help fishermen deal with occasional unintentional overages and allow enforcement to focus on egregious violations (Sanchirico et al. 2006). Enforcement is included in the cost recovery and is one of the largest expenses for the fishery.

Vessel Monitoring System (VMS)

Vessels participating in the halibut and sablefish fisheries are not required to operate vessel monitoring system (VMS) satellite transceivers except in the AI region where VMS is required for all groundfish vessels. In the Eastern Bering Sea (IPHC Area 4), vessels can use VMS in lieu of the IFQ vessel clearance requirement (an alternative to a scheduled port visit prior to commencement of fishing). In 2011, 268 commercial fishing vessels used a VMS satellite transceiver in Alaska. The near real-time tracking capabilities of the VMS assist in ensuring compliance in the IFQ halibut and sablefish fisheries. Among other things, the use of VMS on vessels allows IFQ fishermen to fish multiple regulatory areas on a single trip. VMS greatly facilitates enforcement of open and closed areas in Area 4.

Observer Coverage

In 2010, the NPFMC imposed a 1.25 percent tax on ex-vessel revenues to support the observer program. This set the stage for expanding observer coverage to smaller vessels and fisheries that had been partially covered. Contract employees of the North Pacific Fishery Observer Program do not play an enforcement role; rather, they take biological samples of the catch, track bycatch, and collect other data for fishery managers and scientists. The observer can report violations which leads to enforcement action but this is not their primary role.

Beginning in 2016, the program was expanded to include deployment of observers in the halibut longline fleet and on sablefish fishing boats that are less than 60 feet. Sablefish vessels over 125 feet will be required to have 100 percent observer coverage, those between 60 feet and 125 feet will be required to have 30 percent coverage. Under authority of the revised Observer Program, NOAA Fisheries will have greater control over when and where observers are deployed; fishermen will incur the costs of this expensive monitoring system and their flexibility in trip planning will be circumscribed. The revised program will expand observer coverage into currently unobserved components of the fisheries (NOAA 2017).

Electronic monitoring in 2018

NOAA (2017c) describes a new electronic monitoring (EM) program for the small-boat fixed gear (pot and longline) fleet as an alternative to onboard observers. The EM program uses video cameras to monitor catches and discards. EM has been motivated as less costly than an onboard observer program and as an option for smaller CVs that are unable to accommodate an onboard observer (NOAA 2017d).

Electronic IFQ Landing Reports

Since the start of the IFQ program, registered buyers have been required to report IFQ landings using electronic reporting (ER) tools to provide real-time accounting. Electronic reports must be submitted within specific interval following the offload and before the vessel leaves the landing location (Gharrett 2012). The first ER system involved magnetically encoded cards and reporting of IFQ species only. After about 6 years, an internet-based system with full-screen editing was introduced and remains in use for just a few small operations today. That system has been largely replaced by the Interagency Electronic Reporting System (IERS also known as eLandings) (and its components, tLandings and seaLandings) was developed to report commercial fishing landings in Alaska and/or production data for groundfish. This system was developed as a collaborative effort of the ADF&G, the IPHC, and NOAA Fisheries. The system currently is the main system for reporting IFQ and Western Alaska Community Development Quota (CDQ) halibut and sablefish.

The electronic landings reports are submitted by shore-based registered buyers and mothership processors; most CPs are registered buyers and submit electronic landings reports for fish processed at sea. When the product is ready for shipment, registered buyers must complete a Product Transfer Report. A Departure Report is required for vessels crossing the seaward EEZ boundary or entering Canadian waters. Transshipment reports document transshipment of processed product transferred at sea. To support computation of standard ex-vessel prices used in the cost recovery program, registered buyers operating as shoreside processors must submit annual Value/Volume Fee Reports of pounds of IFQ fish purchased and value paid to harvesters for those fish, by species, month, and port (or port group).

Registered Buyers

All IFQ registered buyers must report landings of IFQ halibut and sablefish. They must obtain a permit for each CP, mothership, stationary floating processor, and land-based facility at which IFQ fish or CDQ halibut will be received. Many registered buyers hold more than one permit. RAM issued 169 permits in 2017. Sixty-seven percent of permit holders reported landings in 2017 compared with 72 percent in 2016.

Halibut and sablefish fisheries, 1995 through 2017

From 1995 through 2017, the Alaska halibut commercial landing overall average was 53.15 million pounds. However, landings peaked at nearly 75 million pounds in 2002 before collapsing to less than 24 million pounds in 2014 (Figure 23). Over this same period, commercial wastage averaged 1.9 million pounds, bycatch averaged 8.6 million pounds, subsistence and personal use averaged 11.4 million pounds, and sport fishing averaged 1.1 million pounds. WPUE peaked at 307 pounds per skate-soak in 1997, five years ahead of the peak in commercial landings and dropped to 156 pounds per skate-soak in 2013 (Figure 23). During this period, commercial catches of halibut were primarily from area 3A (36 percent) and Area 4 (19.4 percent); areas 3B and 2B each accounted for about 15 percent of the total; the balance of catch (13 percent) came from area 2C.

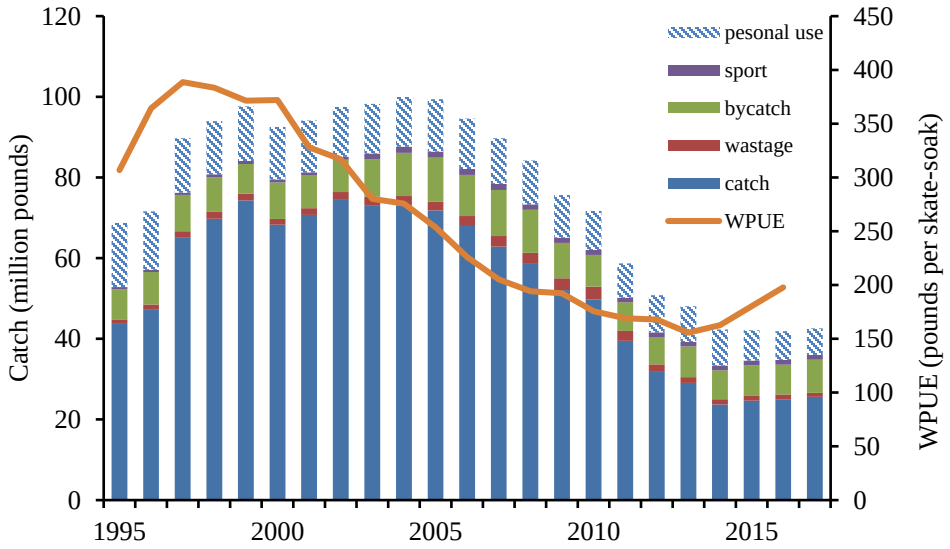

Figure 23. WPUE (pounds per skate-soak) and catches (million pounds) of halibut by category, 1995-2017.

Sablefish catch dropped from over 45 million pounds in 1995 to less than 20 million pounds in 2016 and 2017 (Figure 24). Over this same period, biomass fluctuated between 307 million pounds and 232 million pounds (Figure 24). Catches have declined more rapidly than biomass because the harvest control rule applied to sablefish sets TAC more conservatively when biomass declines, reducing the amount of fish available for harvest.

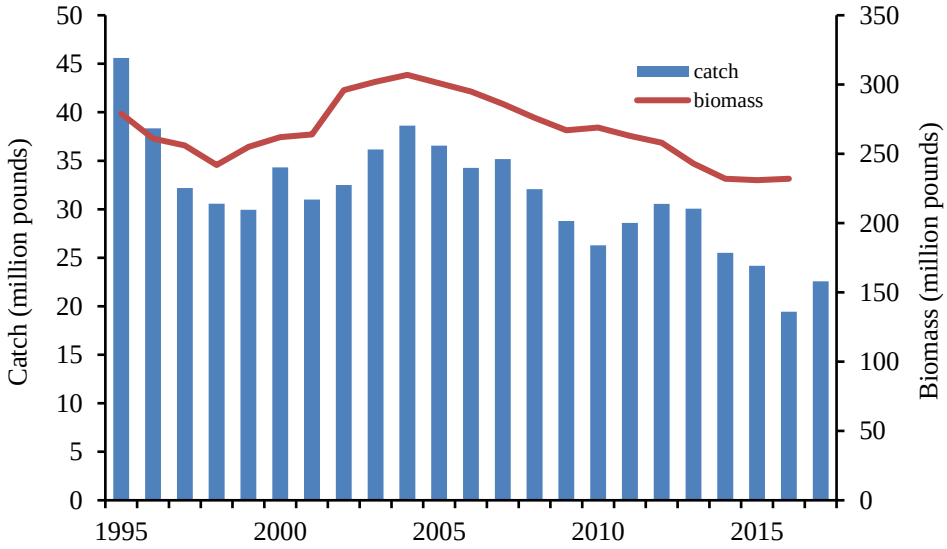

Figure 24. Biomass and catch (million pounds) of sablefish, 1995-2017.

An emerging problem over recent decades for the sablefish fishery is depredation of hooked sablefish by sperm whales and killer whales s. Killer whale depredation of sablefish was first recorded by observers in 1995; depredation by sperm whales was first noted in 2001 (Peterson et al. 2014; Straley et al. 2015; Peterson and Hanselman 2017).

Biological variability in the abundance and size of halibut

Development and improvement of halibut stock assessment models is a primary focus of IPHC research. The models underpin the design of harvest control rules used to set annual catch limits across management areas. The harvest control rules are designed to react conservatively to changes in coastwide biomass and variations in the biogeographic distribution of the stock and are intended to provide mangers with the means of influencing the trajectory of biomass through time. Recent declines in halibut WPUE (Figure 23) reflect trends in halibut biomass (Figure 24) and trends in halibut size at age (Figure 25 and Figure 26). Changes in halibut growth at individual and population scales have led to reductions in the halibut IFQ TAC, and to particularly precipitous decreases in the Area 2C TAC. Recent increases in WPUE (Figure 23) and biomass (Figure 24) have led to a three percent increase in the 2016 TAC relative to 2015 TAC and a five percent increase in the 2017 TAC relative to 2016 TAC (IPHC 2016).

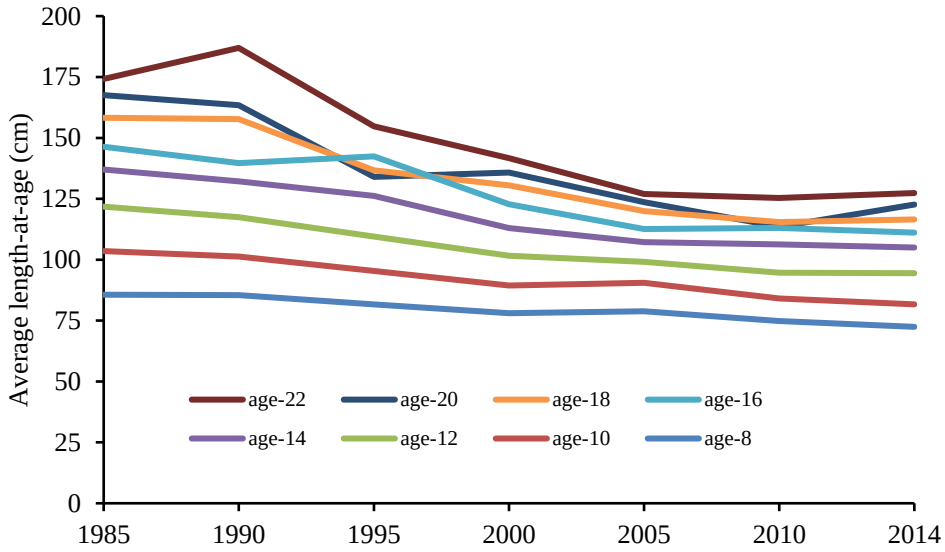

Figure 25. Average length-at-age (cm) for female halibut, 1985 through 2014 (Martell et al 2015).

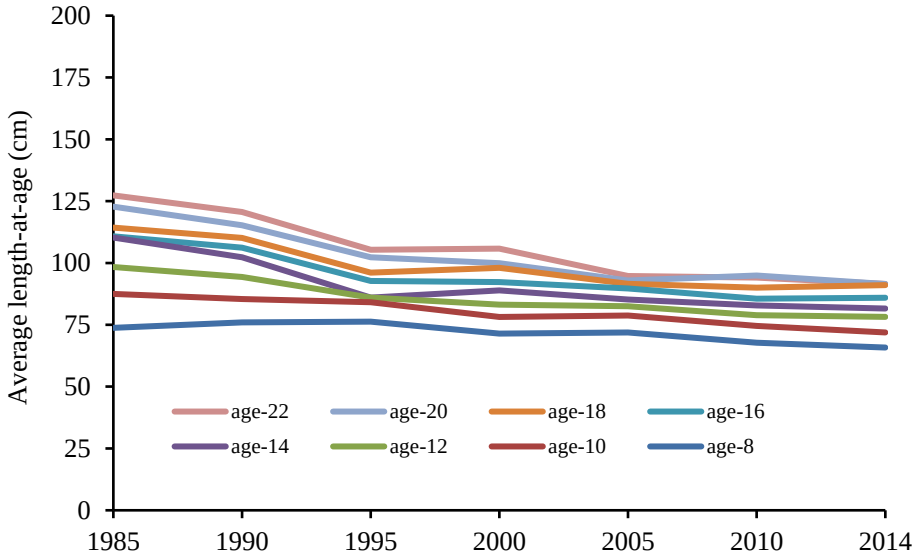

Figure 26. Average length-at-age (cm) for male halibut, 1985 through 2014 (Martell et al 2015).

Time series observations based on data from the annual IPHC stock assessment surveys indicate substantial changes in halibut growth rates. There was an increase in halibut growth rates in the middle of this century, especially in Alaska. Over the past two decades, halibut growth rates have declined to levels not seen since the 1920s. The reasons for variation in halibut growth rates are not yet known but may be tied to fluctuations in abundance of other species, such as arrowtooth flounder, and the availability of food supply (Clark 1999; Criddle and Herrmann 2008; Sullivan 2017). Female and male halibut grow rapidly until the onset of sexual maturity, about age 10. Long-term average growth rates are about two inches per year for males and two-and-a-half

inches per year for females. Thereafter, females tend to grow even faster, while male growth generally slows down relative to that of females. Over the last decade, growth rates for these larger fish have been about one inch or less than one inch per year, meaning that in recent years, adult halibut are much smaller at any given age. Figure 25 shows that in 1985, average-sized female halibut at age 20 were 168 cm (66 inches) while in 2014, average-sized female halibut at the same age were only 123 cm (48 inches). Between 1985 and 2015, average-sized 20-year-old male halibut declined from 123 cm (48 inches) to 91 cm (36 inches); see Figure 26. This has contributed to the decline in biomass (Figure 24) and reductions in the IFQ TAC.
Because weight increases as a nonlinear (nearly quadratic) function of changes in length, weight-at-age has decreased even faster than length-at-age. Because catch limits are expressed in biomass, reductions in halibut growth rates lead to increases in the numbers of fish that need to be caught to reach the TAC. In addition, when combined with a 32-inch minimum size limit for commercial halibut, declines in halibut size-at-age increase regulatory discards and total discard mortality.

Community program: Western Alaska Community Development Quota Program, 1992 through 2017

The CDQ program was established to provide fishermen who resided in western Alaska with an opportunity to participate in the BSAI fisheries that had been foreclosed to them because of the high capital investment needed to enter the fishery (Ginter 1995, NRC 1999b, Strong and Criddle 2013). The 65 small villages eligible to participate in the CDQ Program are located within 50 nautical miles of the Bering Sea coast or on an island in the Bering Sea (Figure 27). Approximately 27,000, predominantly Alaska Natives, live in these communities. The communities have organized themselves as six 501(c)(3) non-profit corporations that manage and administer CDQ allocations, investments, and economic development projects. One CDQ group represents a single community (St. Paul, Pribilof Islands) and the remaining CDQ groups represent between six and 20 communities. Since implementation of the CDQ program, royalties from leasing quota to commercial partners and earnings based on those royalties have become one of the largest sources of non-governmental revenues in the CDQ communities (Northern Economics 2001, 2002; Criddle and Strong 2013)

Figure 27. Western Alaska CDQ communities and groups. (Source: NMFS)

When originally implemented in 1992 as part of the inshore /offshore allocation of pollock in the BSAI and as reauthorized in 1995 and 1997, the CDQ allocations only applied to pollock and the CDQ program was subject to a three-year review/sunset cycle (FR 1992, FR 1995, FR 1997, NRC 1999b). In 1998, the American Fisheries Act (AFA 1998) eliminated the sunset provision and increased the CDQ pollock allocation to ten percent of the BSAI TAC. The CDQ program was expanded to include allocations of ten percent or more of the annual total allowable catch for other BSAI groundfish species, sablefish, halibut, king and Tanner crab, as well as prohibited species catch limits under the 2006 MSFCMA reauthorization (NMFS 2007) as amended by the Coast Guard and Maritime Transportation Act of 2006. Setting aside TAC for CDQ reduces the amount of TAC available to other harvesters. In the case of halibut, CDQ allocations were awarded in the form of QS in IPHC Areas 4B, 4C, 4D, and 4E. Individuals who held QS in those areas before QS was awarded to the CDQ entities were offered compensation in the form of QS in Areas 2C, 3A, 3B, or 4A (50 CFR 679.41(j).) The compensation scheme increased the QSP in Areas 2C, 3A, 3B, and 4A, thereby reducing all future IFQ awards to QS holders in those regions. Allocation of sablefish QS to CDQs used similar mechanisms.

Changes to and Outcomes of the Alaska Halibut and Sablefish IFQ Program

Implementation of the IFQ program fundamentally reshaped the halibut and sablefish fisheries. Understanding program outcomes entails disentangling the effects of program features from the influence of other biological, economic, and social drivers. Moreover, it entails accounting for the influence of a nearly continuous stream of amendments to the program, amendments that began to be proposed even before the IFQ program was fully implemented. To address these proposals, the NPFMC established an annual review cycle and an industry workgroup to recommend which proposals to analyze (Pautzke and Oliver 1997).

Season length

In designing the halibut IFQ program, the NPFMC was anxious to replace the short derby season with an extended season. The NPFMC thought that an extended halibut season would increase the availability of fresh product and would lead to quality improvements, which would lead to higher ex-vessel prices. In addition, it was expected that a slower-paced fishery would be less likely to exceed the TAC and would have a positive effect on safety at sea (Hughes and Woodley 2007). Because of differences between markets for halibut and markets for sablefish, it was not expected that extended seasons would lead to increased market opportunity for sablefish, but it was anticipated that a slower paced sablefish fishery would lead to increased management precision and safety at sea. Figure 28 shows season length in the halibut fishery (1974-2017) and the sablefish fishery (1985-2017). In the 20 years leading to IFQ implementation, the halibut season length collapsed from 125 days to as little as two days in IPHC areas 2C and 3A. Similarly, in the ten years leading up to IFQ implementation in the sablefish fishery, season length fell from 240 days to ten days. Since IFQ implementation, season lengths have averaged 145 days in the halibut and sablefish fisheries, with landings distributed widely across the season (Figure 28). Thus, the program met the objective of extending fishing seasons for halibut and sablefish and reducing congestion on the fishing grounds. In their model of domestic and international trade flows, Herrmann and Criddle (2006) conclude that the transition from a short derby to an extended season resulted in statistically significant increases in U.S. wholesale and ex-vessel prices for halibut and concomitant statistically significant decreases in ex-vessel and export prices for Canadian halibut.

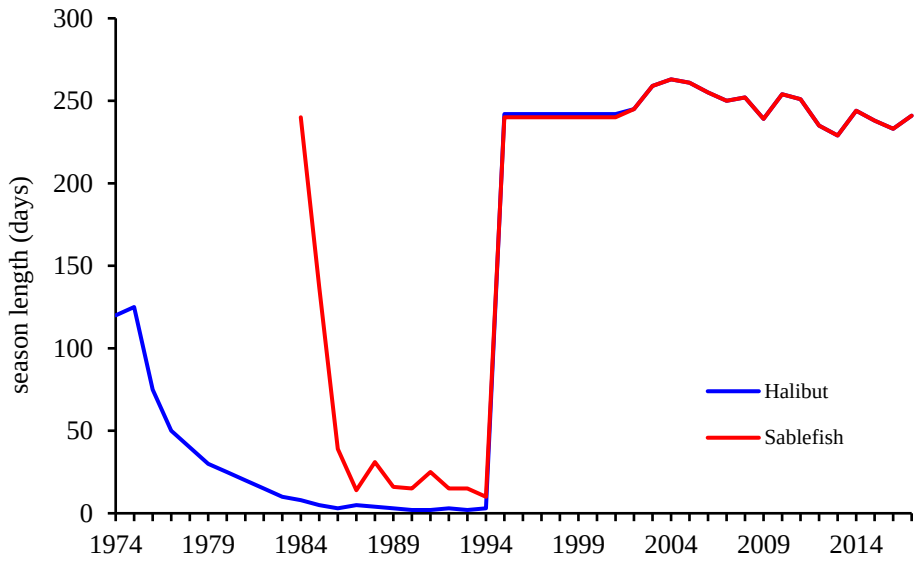

Figure 28. Season length (days) in the halibut (1974 through 2017) and sablefish (1985 through 2017) fisheries.

Economic Outcomes

Economic outcomes of IFQ program implementation include substantial increases in ex-vessel and wholesale prices for halibut (Matulich and Clark 2003; Herrmann and Criddle 2006) and sablefish (Fell and Haynie 2011; Warpinski et al. 2016) with a redistribution of economic rent in favor of fishermen (Matulich and Clark 2003; Hackett et al 2005; Herrmann and Criddle 2006). Because the program created QS that was perpetual and transferable and because QS was allocated *de gratis*, initial recipients received windfall gains that reflected the expected net present value of all future harvests associated with their allocation of QS (Newell et al. 2007). That is, the allocation of QS was an allocation of wealth equivalent to the opportunity cost of the derby. While the windfall gain to initial recipients greatly increased their wealth, those who acquire QS through market transactions will, on average, pay the expected net present value of all future harvests associated with any QS they purchase. The need to purchase QS increases the cost of entry. However, that cost can be recouped when the QS are later sold. A focus on the purchase price of QS has led some policymakers to express concerns that individuals with poor credit history and inadequate collateral may have difficulty qualifying for loans needed to finance the QS and other capital needed to engage in the halibut or sablefish fisheries. Fishing forms the economic base of many Alaskan communities. Consequently, changes in where vessels homeport, where they land their catches, and where fishermen and crew reside

have regional economic impacts (Seung 2015, 2016; Seung and Waters 2006). Relaxation of time constraints associated with the race-for-fish reduce the economic advantage of small remote ports and increase the advantage of larger ports that have multiple processors and competitive transportation infrastructure. Shifts in the geographic distribution of landings and residence of QS holders since implementation of the halibut and sablefish IFQ programs are described in NOAA (2007, 2010, and 2015) and Himes-Cornell and Hoelting (2015). Loss of landings reduces the viability of processing operations and vessel support services, and reduces landings tax payments that support local government. Outmigration of QS holders often leads to reductions in local spending and local employment, which lead to shrinkage of the local economy. Conversely, communities that experience increased landings and in-migration of QS holders experience economic growth. These economic outcomes engender social impacts (Carothers et al. 2010).

Safety at Sea

The number of fatalities in the Alaskan halibut and sablefish fleets has decreased significantly following IFQ implementation (Figure 29). Knapp (1999) reported on a survey of halibut QS holders. They indicated that implementation of the IFQ program led to improved safety in the fleet (Knapp 1999). Formal evaluation of vessel losses (Hughes and Woodley 2007) and fatalities (Lincoln et al. 2007) in these fisheries concluded that there were statistically significant reductions in the six years following IFQ implementation. However, fluctuations in the number and rate of fatalities from 1991 through 2015 highlight ongoing risks in these fisheries. Between 2001 and 2015, 15 commercial fishing fatalities were reported in the halibut/sablefish fisheries. Drowning was the leading cause of death following vessel disasters; severe weather contributed to all four of the fatal vessel disasters. Falling overboard contributed to four deaths during 2001-2015; all involved individuals were not wearing personal flotation devices (Lucas et al. 2013).

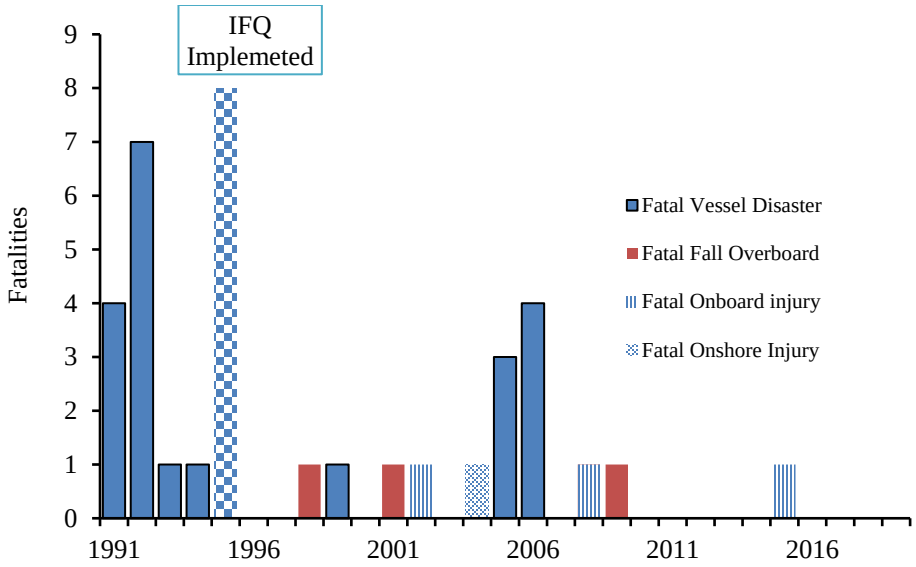

Figure 29. Fatalities at sea in the halibut and sablefish fisheries off Alaska, 1985 through 2016. (Hughes and Woodley 2007)

Social Outcomes

Concerns about long-term social changes attributable to implementation of the IFQ program have been voiced by fishery stakeholders. Specifically, stakeholders are concerned about: (1) financial barriers to entry; (2) the growth of *de facto* (and *de jure*) leasing and consequent dilution of owner-on-board requirements; (3) reduction in the number of crew positions; (4) changes in crew compensation, due to rental payments to QS holders; and (5) reductions in the amount of QS held by residents of some small rural communities. This latter issue is a particularly prominent component of discourse in small coastal communities in the Central GOA that depend on commercial fishing for their economic base (e.g., Carothers 2008, 2010; Carothers et al. 2010). The transfer of QS to persons outside a local area or a radical change in harvest and delivery patterns under the program might have harmful effects on some communities. Himes-Cornell and Kasperski (2016) show that the well-being and resilience for fishery-dependent communities in Alaska depends on the state of the available fish resources as well as the extent to which community residents are vested in the fishery through ownership of limited entry permits and QS.

Biological and Ecological Outcomes

Theoretical explorations of IFQ systems (e.g., Moloney and Pearse 1979; Pearse 1980; Wilen 1985; Scott 1988) anticipated that program implementation would effectively address the common pool dilemma (Schlager and Ostrom 1992), that QS-holders would recognize an individual interest in ensuring that the stock would be managed to maximize economic yield. However, Johnson and Libecap (1982), Boyce (1992), and NRC (1999a) countered that an entitlement to harvest a predetermined quantity of fish did not address externalities that arise from common ownership of the stock of fish with resulting stock externalities that could lead QS-holders to underinvest in actions needed to ensure stock productivity. Recent empirical analyses by, e.g., Costello et al. (2008) and Melnychuk et al. (2016), establish that sustainable fisheries are managed under governance and management systems that set conservative overall quotas and allot catch shares among fishermen. That is, they see little direct evidence of the stock externalities anticipated by Johnson and Libecap (1982) and Boyce (1992).

The halibut and sablefish IFQ fisheries satisfy the criteria set out in Melnychuk et al. (2016), with conservative overall TACs set based on well-established stock assessment models backed by regular fishery independent surveys, catch accounting measures are strong, and enforcement is effective. One of the principal biological and ecological outcomes of the halibut and sablefish IFQ programs is the elimination of overages (Figures 30 and 31). In years leading up to the implementation of IFQs, the halibut fishery overharvested the TAC in some areas up to 7.6 percent. Since implementation, the halibut fishery has averaged an under harvest of 6 percent (Figure 30)

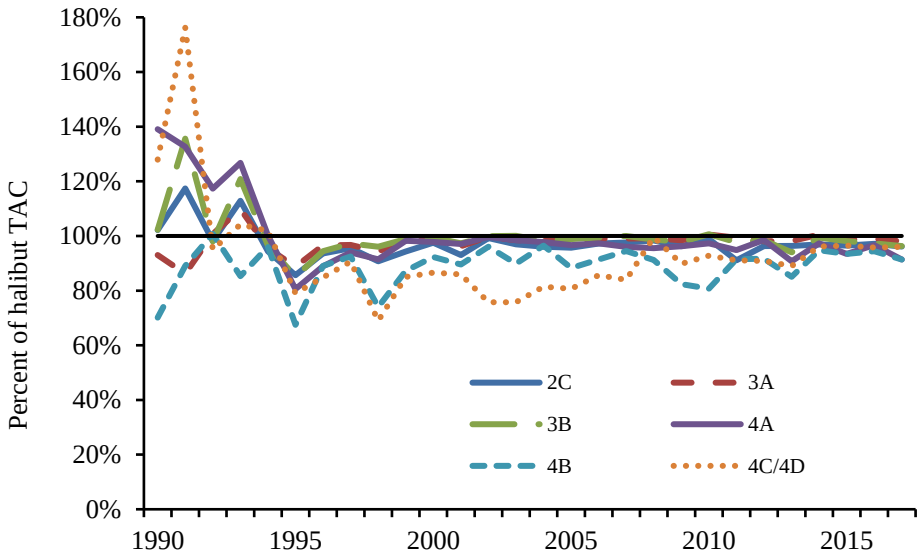

Figure 30. Percent overharvest or underharvest of halibut commercial TAC, 1990 through 2017.

In years leading up to the implementation of the IFQ program, the sablefish fishery overharvested the TAC in some areas by 27 percent. Since implementation, the sablefish fishery has averaged an underharvest of 17 percent (Figure 31).

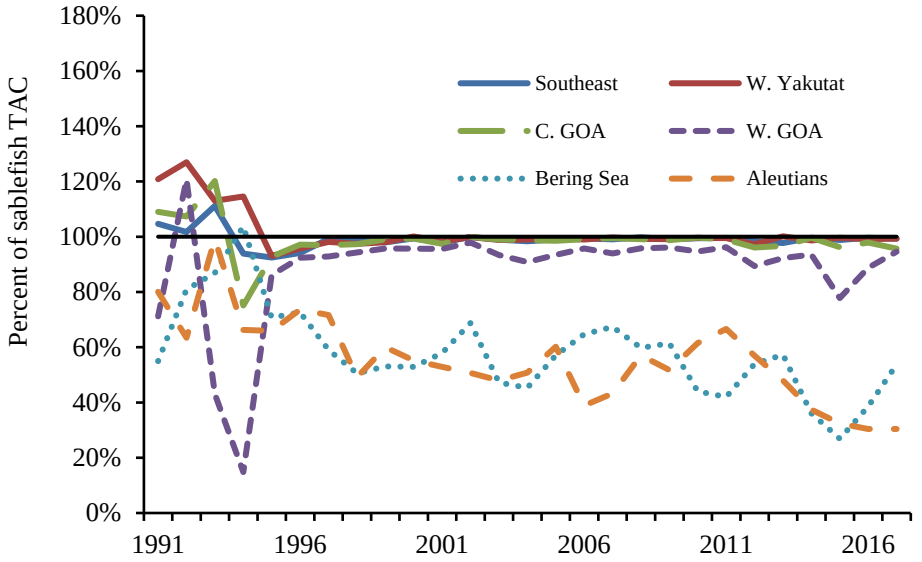

Figure 31. Percent overharvest or underharvest of sablefish TAC, 1991 through 2017.

Despite the abundant resources dedicated to assessment and management of halibut and sablefish stocks, as noted above (Figure 2 and Figure 6), biomass is near historic lows for both halibut and sablefish and halibut size at age is also nearing all-time lows. In addition, in looking at historical

surveys along with evidence in spawning from high-resolution tag data, Loher (2011) finds evidence to suggest that the fisheries closures are not long-enough to protect spawning halibut.

Whale Depredation

Killer whale depredation of hooked fish is most common in the BSAI, and Western GOA areas; it is rare in the Central GOA, and not yet observed in the West Yakutat and East Yakutat regions. Sperm whale depredation has been recorded by observers in the Central GOA, West Yakutat, and East Yakutat areas, but only infrequently in the Western GOA and has not yet been recorded in the BSAI (Peterson et al. 2014; Hanselman et al. 2016). In response to depredation of sablefish on longline gear, pot gear use has expanded in the BS and AI regions and is now permitted in portions of the GOA (81 FR 95435 2017). The use of pots for fishing sablefish is only possible on larger vessels, so there is concern that the smaller vessels (mainly in Southeast Alaska) will be disadvantaged by this ecologically driven shift to pot gear.

Dead loss, Bycatch, and Wastage

Dead loss (ghost-fishing) is the unintended fish mortality that occurs when fishing gear is lost or abandoned after having been deployed. Bycatch, also called incidental catch, is the unintended and incidental catch of halibut (sablefish) that occurs during fishing for other species. Wastage is the mortality of undersize (<32 inch) halibut discarded in the halibut directed fishery. Bycatch of sablefish can be similarly categorized. These artifacts of fishing have biological, ecological, economic, and social consequences.

Dead loss was first estimated by IPHC in 1985 with the highest level occurring 10 years before the IFQ program was implemented, an estimated average annual loss of 1.82 million pounds, with annual losses ranging from 3.2 million pounds in 1986 to 770 thousand pounds in 1993 (Figure 32). Commencement of the IFQ program in 1995 ended the race-for-fish, allowed the fleet more time to recover gear and to shift gear setting and hauling gear to times with expected favorable weather conditions (NOAA 2016a). Since implementation of the IFQ program, average annual dead loss has dropped to 180 thousand pounds (Figure 32). Sigler and Lunsford (2001) estimate that after implementation of IFQs, ghost-fishing losses in the sablefish fishery declined from an average of 3.2 percent of the TAC to less than 0.5 percent of the TAC.

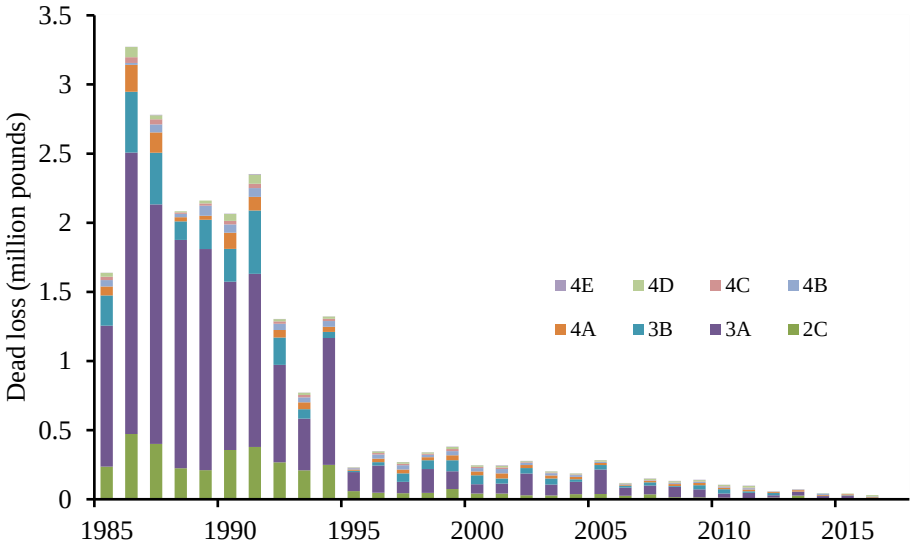

Figure 32. Halibut dead loss (million pounds) from lost or abandoned gear, 1985 through 2016.

Estimates of wastage, the discard mortality of undersized halibut in the halibut directed fishery, are represented in Figure 33. Wastage increases as a function of increases in halibut abundance, changes in halibut size-at-age, and fishing practices. For example, the elevated levels of wastage in the late 1980s through mid-1990s is an outcome of the derby fishery that led fishermen to fish near to port and to continue fishing on productive grounds even in the presence of large numbers of undersized halibut. Similarly, the increase of wastage between 1995 and 2010 can be related to the concomitant decline in size-at-age, while recent declines reflect major reductions in the TAC and increased effort by fishermen to avoid undersized halibut.

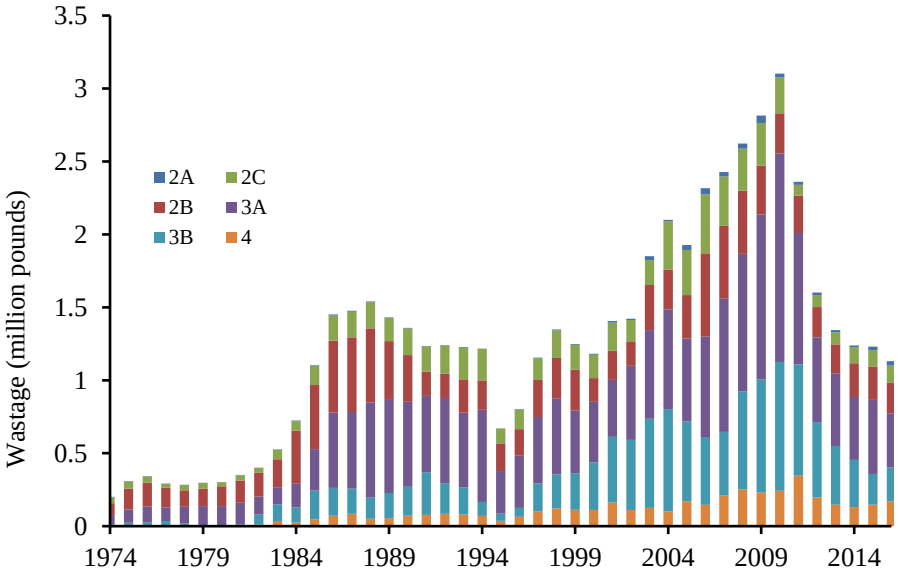

Figure 33. Total wastage (million pounds) of Pacific halibut, 1974 through 2016.

Based on observations in British Columbia (IPHC Area 2B), where 100 percent of catches are monitored, it is estimated that wastage represents 18 percent of total fishing mortality (IPHC 2015). In contrast to the halibut fishery, the sablefish fishery is not subject to minimum size limits and there is little discard of small fish.

Time series observations of halibut bycatch mortality and sablefish bycatch mortality are represented in Figures 34 and 35. Prior to the introduction of IFQs, regulatory requirements forced the discard of most incidental catches of halibut in the sablefish fishery and most incidental catches of sablefish in the halibut fishery. Under the halibut and sablefish IFQ program, fishermen in each fishery could hold QS in the other fishery. That is, a sablefish fisherman who holds unused halibut IFQ corresponding to the size-category of their sablefish boat can retain incidental catches of legal-sized halibut and vice versa. Halibut and sablefish bycatch in other fisheries has become an increasingly important concern as reductions in halibut and sablefish TACs have not led to proportional reductions in bycatch caps. Nevertheless, as a result of declining abundance and bycatch reductions measures implemented by some sectors, the halibut bycatch mortality has declined since the early 1990s.

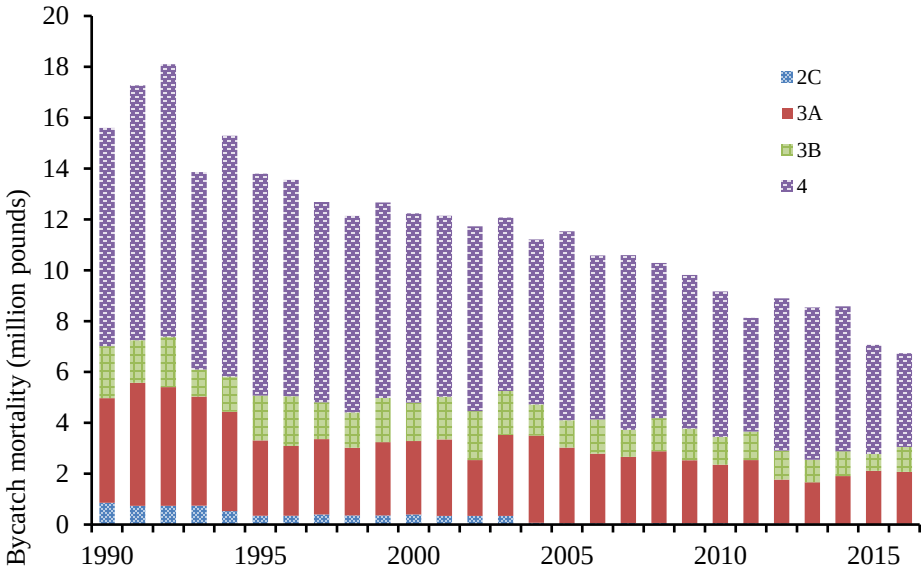

Figure 34. Bycatch mortality (million pounds) of Pacific halibut, 1990 through 2016.

Most of the halibut bycatch occurs in the high-volume trawl fisheries for Pacific cod, pollock, and yellowfin sole. In 2016, the BSAI trawl and fixed gear bycatch cap was 5.8 million pounds, a 23 percent reduction from the cap in effect during the preceding 19 years.

Bycatch in the sablefish fishery was 58.6 million pounds in 1991, with 57.6 million pounds retained and 688,000 pounds discarded (Figure 35). In 2016, sablefish bycatch had declined to 21.8 million pounds retained and 2.3 million pounds discarded (Figure 35). Sablefish bycatch is primarily encountered in fisheries for pollock, Pacific cod, Atka mackerel, rock sole, Greenland turbot, and arrowtooth flounder (Hanselman et al. 2016).

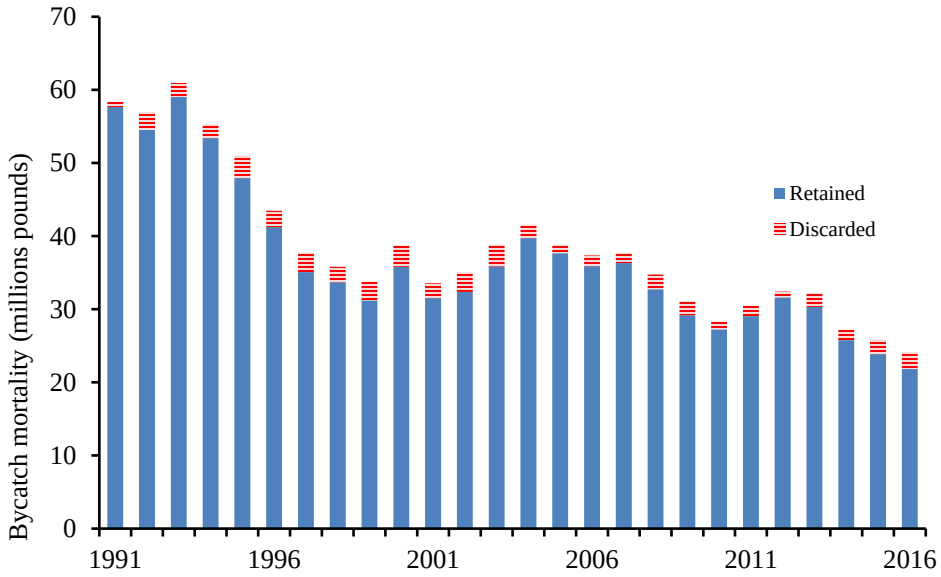

Figure 35. Bycatch mortality (million pounds) of sablefish, 1991 through 2016.

Changes in owner-operator provisions

In structuring the IFQ program, the NPFMC included design elements intended to favor a Jeffersonian ideal of small-scale owner-operators. The owner-on-board provisions were intended to prevent the emergence of a class of absentee owners able to extract rent from lessees contracted to do the actual fishing. However, those provisions created hardships for individuals temporarily unable to engage in the fishery due to unforeseen health problems, vessel losses, etc. In addition, the provisions effectively limited ownership to real persons, precluding communities or non-governmental organizations from acquiring quota shares. From shortly after implementation of the IFQ program, the NPFMC received requests to loosen these restrictions.

Hired Masters and Owner on Board

In addition to general transferring the QS holdings a QS holder can in some instances engage a hired master to fish their IFQ. As previously discussed, the IFQ program was designed to require QS holders to be on board the harvesting vessel, with the exception of CP (A) shares, which may

be leased without restriction (Pautzke and Oliver 1997). IFQ use was restricted to maintain a predominantly owner-operated fishery. While the program allowed for continuation of pre-existing business arrangements, such as company-owned vessels using hired masters, it was expected that eventually the CV sector would be composed exclusively of individual QS/IFQ holders directly engaged in the fishery (NMFS 2014).

In 1999 the hired master regulations were amended (64 FR 24960 June 9. 1999), requiring QS holders to demonstrate that they hold at least 20 percent ownership interest in the vessel that would be fished. Use of hired masters has proven controversial, and NMFS has seen some evidence of surreptitious leasing, such as QS holders failing to disclose that they hold less than a 20 percent ownership in the vessel used for fishing their IFQ or through entering into temporary purchases of vessel ownership interests to create the appearance of meeting the ownership requirements. Contrary to the intent that hired master provisions would serve as a temporary bridge during initial years of the IFQ Program (Pautzke and Oliver 1997) hired masters have come to be widely used throughout the first 22 years of the program.

In 2002, the IFQ program was amended (67 FR 20915) to modify the hired master provision to allow QS-holders to meet ownership requirements through an ownership interest in a corporation or other non-individual entity. **In 2007, the NPFMC amended the IFQ program (72 FR 44795 August 7, 2007)**(Check) to require QS-holders to present formal government issued documents to show that they have 20 percent ownership in the vessel before they were permitted to employ a hired master. In 2014, the NPFMC changed the vessel ownership requirement to a minimum of 12 months prior to applying to use a hired master and to prohibit use of a hired master for recently transferred QS (79 FR 9995 February 24, 2014). This rule was intended to eliminate a loophole that had allowed short-term ownership transfers to legitimize lease arrangements. This amendment was introduced to address anecdotal concerns that aging QS-holders were extracting 65 to 75 percent of the profit of the catch while the crew does the work (van der Voo 2016). The regulations provide for temporary exemptions to the vessel ownership requirements for vessels that are lost or which need extensive repairs.

In addition, in 2014, the NPFMC approved an amendment to prohibit use of hired masters to fish category B, category C, and use category D halibut CV QS and all sablefish CV QS transferred after February 12, 2010 (70 FR 43679 2014a). That action was challenged in 2016 and overturned in federal court (C14-5685 BHS;

https://www.scribd.com/document/331762061/Order-in-hired-skippers-case). The court order changed the action date to December 2014 for halibut, leaving the February 2010 action date in place for sablefish (Seafood news Dec 6, 2016).

The percent of IFQ caught by hired masters has fluctuated over the past 22 years (Figure 36).

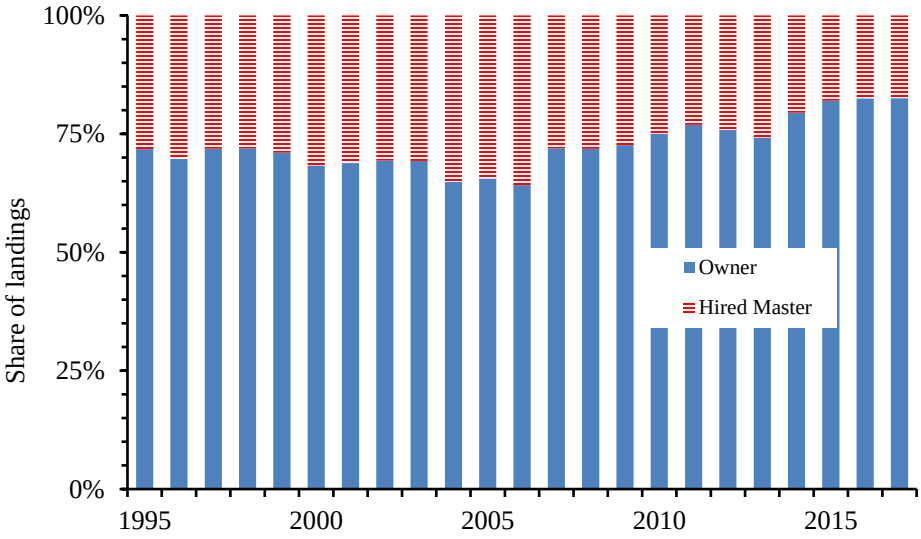

Figure 36. Share (percent) of halibut landed by QS owners and hired masters, 1995 through 2017.

Hired masters landed 6.4 million pounds of halibut in 2016, which represents over 37 percent of CV halibut IFQ landings (Figure 37).

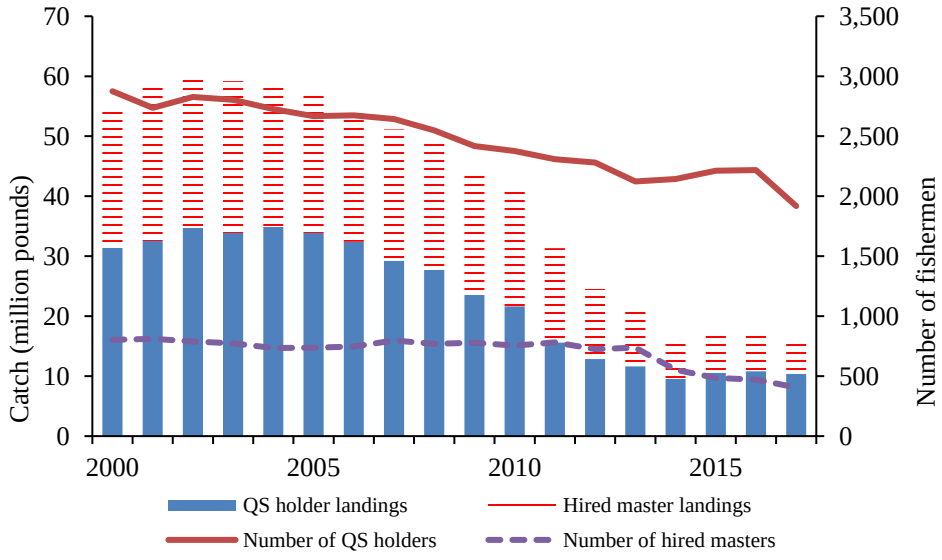

Figure 37. Catch (million pounds) by QS owners and hired masters and numbers of owners and hired masters for the halibut fishery, 2000 through 2017.

The use of hired masters has been more extensive in the sablefish fishery than it has been in the halibut fishery (Figure 38). Hired masters landed 9.7 million pounds of sablefish, which represents over 51 percent of total CV sablefish IFQ landings (Figure 39).

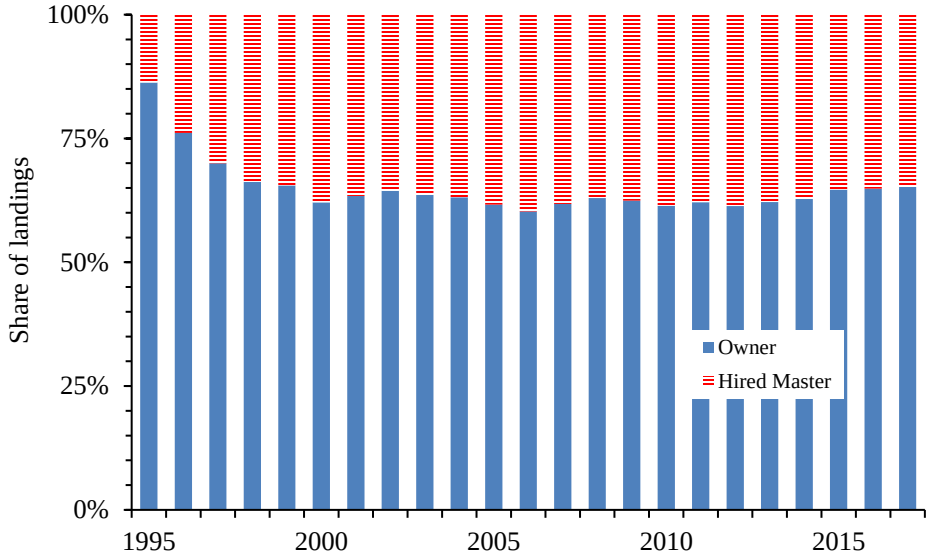

Figure 38. Share (percent) of sablefish landed by QS owners and hired masters, 1995 through 2017.

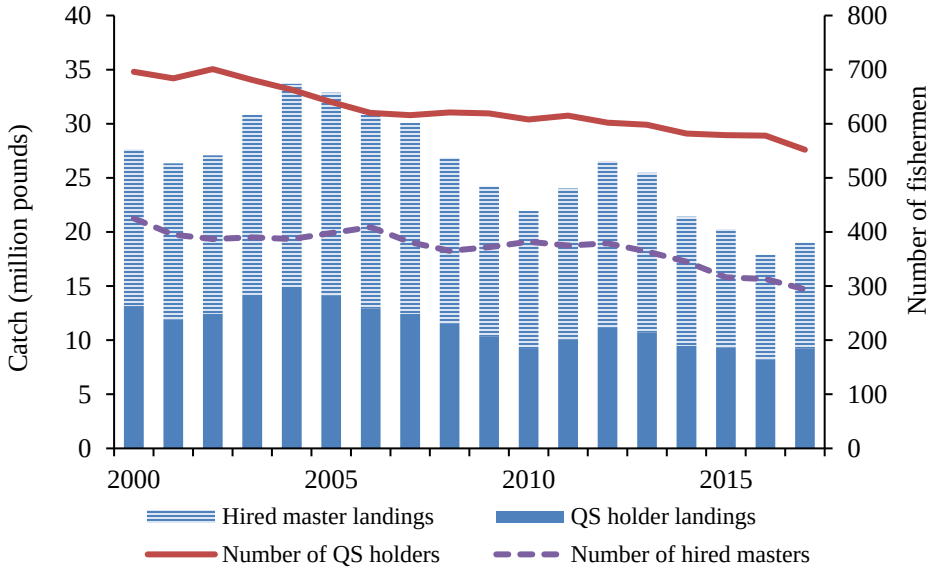

Figure 39. Catch (million pounds) by QS owners and hired masters and numbers of owners and hired masters for the sablefish fishery, 2000 through 2017. (Source: RAM 2017)

Szymkowiak and Felthoven (2016) found that hired masters based in the Seattle region are more likely to eventually move into owner-operator status than are hired masters based in Alaska. Halibut and sablefish boats based in Seattle have a network that helps the hired skippers acquire quota. This system is not as well established among fishing vessels based in Alaska where

fishermen in small communities may not have the resources to support loans for hired skippers to buy into the fishery.

As the use of hired masters has become increasingly restricted, it is anticipated that emergency medical transfers will become the primary mechanism to evade owner-on-board requirements. However, emergency medical transfers currently account for less than five percent of total leasing in the halibut fishery. As initial issues retire and as program restrictions become more binding, it is anticipated that the use of hired masters will decline.

Emergency medical transfers

The amount of IFQ leased out under emergency medical transfers is shown in Figure 40. Total poundage transferred averaged about 450 thousand pounds of halibut IFQ and 320 thousand pounds of sablefish IFQ from 2008 through 2015 but more than doubled between 2015 and 2017 (Figure 40). The recent increase in emergency medical transfers may reflect stricter regulation other provisions for use of hired masters.

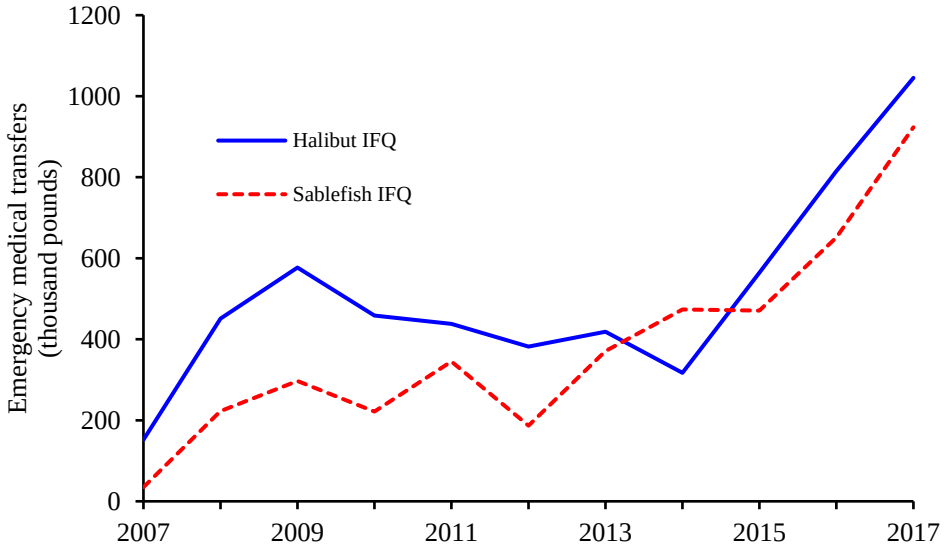

Figure 40. Emergency medical transfers (thousand pounds) in the halibut and sablefish fisheries, 2007 through 2017.

The importance of emergency medical transfers and the magnitude of recent trends in their use can be better appreciated when viewed as percentages the declining TAC for halibut sablefish. Since their introduction in 2007, emergency medical transfers have come to represent over six percent of the halibut TAC and just under five percent of the sablefish TAC (Figure 41).

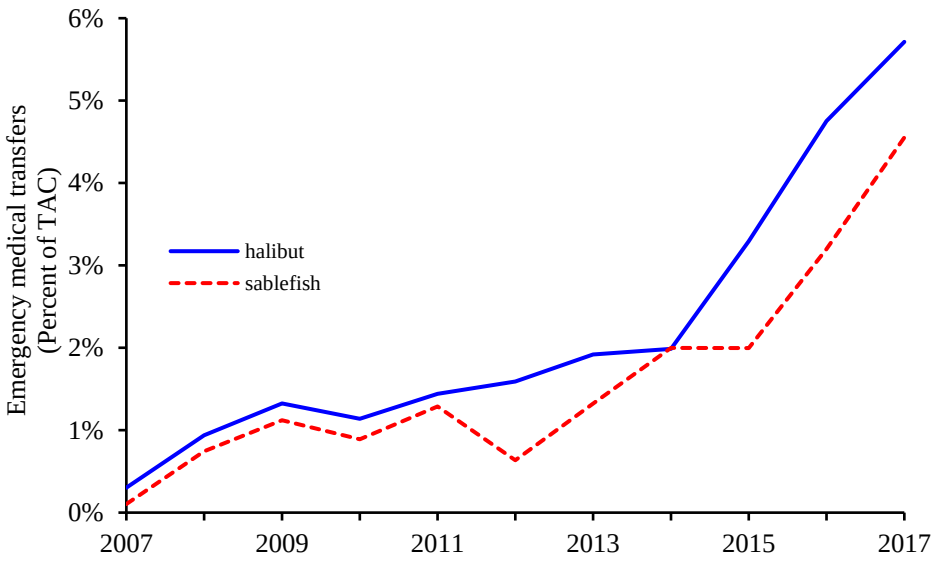

Figure 41. Percentages of halibut and sablefish TAC assigned to emergency medical transfers, 2007 through 2017.

Military transfers

There have only been a few applications of the military transfer provision. As with all other temporary or permanent transfer requests, NMFS reviews all applications and approves or denies transfers in accordance with program regulations.

Community Quota Entity Program

Several years after implementation of the halibut and sablefish IFQ program, smaller GOA communities noticed a significant decline in their engagement in these fisheries—fewer boats operating from their ports, few deliveries to local processors, fewer QS held by community residents, and fewer community residents employed as crew. In contrast, some communities appeared to have benefited from the increased engagement in the IFQ fisheries. Although this outcome had been anticipated (NPFMC 1991a), the magnitude of the shifts and extent of dissatisfaction with the shifts led the NPFMC to amend the ownership requirements of the IFQ program to allow certain GOA communities to form non-profit entities (Community Quota Entities; CQEs) to purchase QS for lease to community residents (69 FR 23681, April 30, 2004). Initially, only 42 GOA coastal communities were eligible for CQE quota. Since then, the NPFMC approved three additional communities to be added (78 FR 33243 June 4, 2013) to make the total 46 communities. Other communities are being considered for addition to the CQE

program. To ensure compliance with program requirements, CQE entities are required to submit annual activity reports.

Since implementation in 2004, the CQE program has been broadened to include additional types of fishing permits. Under the charter halibut limited access program, eligible CQEs may request community charter halibut permits (CHPs) for use in Southeast Alaska or South-central Alaska). The CQE selects charter operators to use its community CHPs but retains ownership of the CHPs themselves. Vessels operating under a Community CHP need not be based within the CQE community but are subject to all applicable fishing regulations and must either begin or end their fishing trips within the community designated on the permit. In Southeast Alaska (IPHC Area 2C), there are 20 CQE CHP communities and 14 in the central GOA (IPHC Area 3A). While the intent of the CQE program was to increase resilience of small coastal communities, it has had little success in stemming declines in their engagement with the halibut and sablefish IFQ fisheries (Himes-Cornell and Kasperski 2016). To date, only four CQEs have purchased halibut or sablefish QS; 20 CQEs hold CHPs (NOAA 2017).

Pot longlining for sablefish in Bering Sea

The NPFMC had initially banned longlining pot gear for targeting sablefish because of potential for gear conflict with the halibut fisheries, but in April 1996, the NPFMC approved a regulatory amendment to allow the use of pot longlines for sablefish in the BSAI (Pautzke and Oliver 1997). Support for expanding the allowance of pot gear to additional areas has increased in reaction to the increased level of depredation by Sperm whale on hooked sablefish in the GOA and depredation by killer whale in the BSAI. The whale depredation has caused significant economic loss and damaged gear as well as reduced catch (NPFMC 2012; Peterson et al. 2014; Straley et al. 2015; Peterson and Hanselman 2017). In May 2015, the NPFMC approved the use of pot gear in the GOA and Southeast Alaska regions; the regulation went into effect in 2017. In Southeast Alaska, sablefish longlines are permitted fewer pots than in the GOA, AI, and EBS regions out of concern that allowing larger numbers of pots per longline might lead to elimination of the small boat fleet that currently fish using regular longline gear.

Sport Fisheries

The charter and self-guided sport fisheries for halibut have continued to evolve since implementation of the IFQ program. These changes have been driven by increases in tourism and a lack of effective individual or collective limits to sport catches of halibut, which led to a reduction in commercial TAC (Criddle 2004b). The NPFMC acted to stem the ongoing reallocation to the charter sector through tightened restrictions on charter harvests in Southeast Alaska and the Central GOA, intended to hold the charter sector to within its annual allocations, which had been exceeded by a combined 3.7 million pounds from 2004 to 2010 (Figures 42 and 43). In 2011, the NPFMC established the Charter Halibut Limited Access Program. This created a new Charter Halibut Permits (CHPs) for operators in the charter halibut fishery in regulatory Southeast Alaska (IPHC Area 2C) and the Central GOA (IPHC Area 3A). Charter vessels that operate in these areas must have a valid CHP during each charter fishing trip. CHPs must be endorsed with the appropriate regulatory area and number of anglers (NOAA 2017). Since implementation, the charter halibut allocation has not been exceeded in Southeast Alaska (Figure 42); the allocation in the Central GOA continued to be exceeded until additional management measures were brought to bear in 2013 (Figure 43) (Meyers 2017).

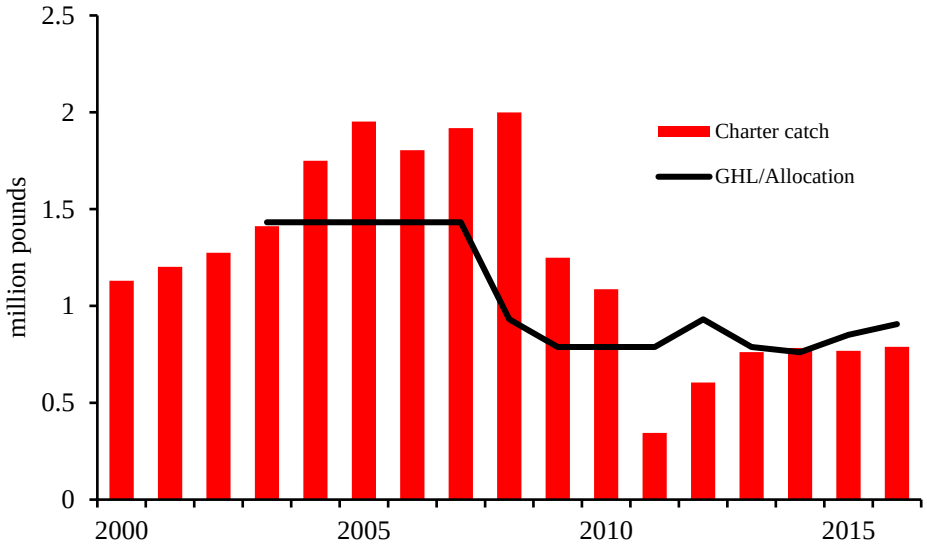

Figure 42. Charter halibut catches and GHL allocations (million pounds) in Southeast Alaska (IPHC Area 2C), 2000 through 2016.

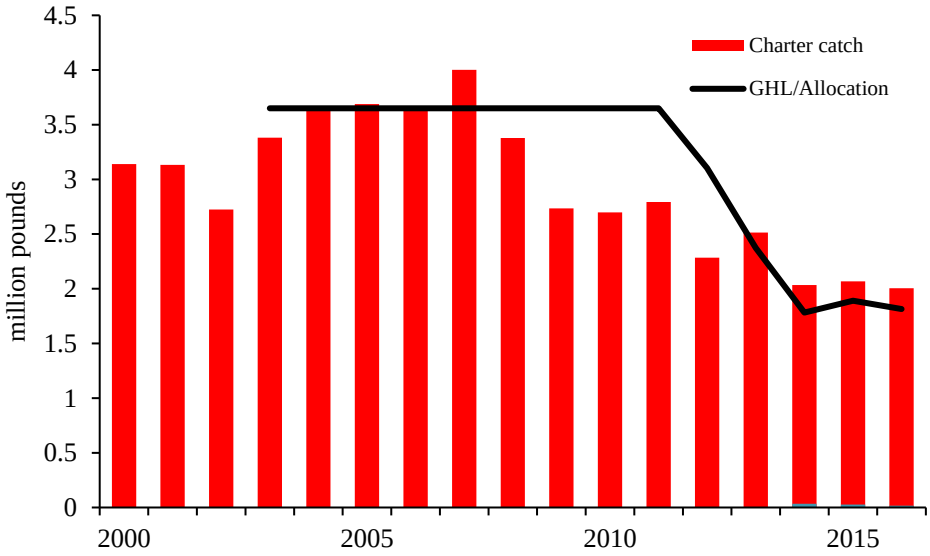

Figure 43. Charter halibut catches and GHL allocations (million pounds) in the Central GOA (IPHC Area 3A), 2000 through 2016.

The halibut charter sector sought relief from the impact of measures, such as reductions in daily bag and possession limits and size limits, adopted to hold catches to below the charter allocation. In response, the NPFMC developed regulation to allow CHP holders to purchase guided angler fish (GAF), i.e., lease IFQ, from QS holders. Charter operators with GAF can allow their clients to fish under the less restrictive self-guided angler bag, size, and possession limits (NOAA 2017). Szymkowiak and Himes Cornell (2015) anticipate that GAF will further inflate the price of halibut QS.

Discussion

The Pacific halibut fishery has an impressive130-year history of, largely, successful management of this transboundary stock. This unique Alaskan fishery stands out as lucrative and complex to manage. While the sablefish fishery has a much shorter history, it became an important fishery in the Alaska region beginning in 1976, when the United States Congress extended the American jurisdiction in marine waters from three to 200 nautical miles.

This chapter follows the historical development of these fisheries through seven eras. The figures show the fluctuation of the fisheries due to different historical events that include the amount of fishing but also other aspects that affect the fisheries. The MSA extended United States jurisdiction to encompass much of the geographic range of these stocks but did not prevent the

development of a race-for-fish that put the fisheries at biological and economic risk. Introduction of IFQs was intended to promote biological and economic sustainability. These fisheries were in poor health in the early 1990s, and a change in management structure was imperative to prevent overfishing and increase fishermen safety. The season had decreased from months in the 1970s to mere days (for halibut) or weeks (for sablefish). The halibut and sablefish fishermen were racing for increasingly smaller shares of the TAC; fish were worth less because they were landed in increasingly short seasons that precluded development of high-value fresh product markets; and the fisheries were becoming increasingly difficult to control (NOAA 1994; Criddle 1994). Both fisheries were experiencing high bycatch, lost gear, grounds congestion, compressed seasons, and high discard mortalities. (Pautzke and Oliver 1997).

While developing the policy for the IFQ program the NPFMC brought in specialists from New Zealand and Canada (regions where individual quota programs had been recently implemented). The consultant from New Zealand made it clear that many good things can come out of implementing an IFQ program, but that IFQ programs are not good for small boats (Behnken 2018). The NPFMC worked hard to add program elements to foster continuity in the composition of the fishing fleet and to prevent excessive consolidation and preserve the small-boat culture of these fisheries. This included owner- onboard requirements. The NPFMC also sought to preserve the nature and size of the fleet by setting caps on the amount of quota that can be held by a person or fished from a vessel and establishing transfer restrictions. The intent was to preclude large corporations from dominating the fishery as had occurred in the United States surf clam/ocean quahog IFQ (Weninger 1998; NRC 1999a) and in other IFQ fisheries, including in New Zealand and Canada.

In Alaska's halibut and sablefish IFQ program, QS are designated by specific vessel categories and regulatory areas. With six areas and three vessel categories for sablefish and eight areas and four vessel categories for halibut, that is, 50 different categories of QS, thereby limiting the extent of consolidation of the fleet and preventing the fishery from being fished from one vessel category, as anticipated by economic theory and as played out in other IFQ fisheries.

Maintaining diversity in the fleet with respect to vessel categories was a goal that was set by the NPFMC from the start of the program, a goal that has endured throughout the program's history. While flexibility has been introduced to address vessel safety concerns (in the Western GOA and AI) and to allow smaller vessels to fish QS designated for larger vessels, the flexibility was

designed to prevent additional consolidation. Moreover, after an initial flurry of consolidation, the fleet size has stabilized in each region at a similar level set in the initial policy design.
One of the unforeseen consequences and criticisms of the initial issuees' privileges was the use of hired masters. In most regulatory areas, the IFQ program allows initial issuees (and corporations that were initial recipients of QS) to use hired masters to fish their IFQ. Once the magnitude of the loophole this created became apparent the NPFMC set about establishing stricter limits on the use of hired masters (Behnken 2018). In 2014, the NPFMC implemented a hired master provision that prevents initial recipients from acquiring additional catcher vessel QS for utilizing a hired master to land the resultant IFQ. There will continue to be a lag in the transfer of catcher vessel QS to second-generation, (owner-on-board shareholders) because initial catcher vessel QS recipients can still use hired masters to land their IFQ from QS transferred prior to 2010.

The Alaska halibut and sablefish IFQ program has been cited as a contributing factor to the decline of remote fishery-dependent communities (Carothers 2008). The nearly simultaneous collapse of salmon prices has also been cited as a factor driving the decline of remote fishery-dependent communities. Beginning in the 1990s, processing capacity began to migrate to larger rural communities and to urban communities. Permit holders and QS also migrated to larger, urban cities with freight connections. The elements that promote social and economic well-being of viable fishery-dependent communities are difficult to implement, although the NPFMC did amend the ownership requirements of the IFQ program to allow certain GOA communities to form CQEs empowered to purchase QS for lease to community residents (69 FR 23681, April 30, 2004). The CQE program has not proven as successful as expected and as of 2017, only four of the 46 communities eligible had purchased QS.
Some of the NPFMC's other concerns about these fisheries were addressed through increased management precision and lengthening the overall fishing season. Increased management precision eliminated overharvest. Longer seasons contributed to safety-at-sea (Hughes and Woodley 2007) and improved fish quality (Terry 1993). In the sablefish fishery, IFQ management led to increased catch rates and decreased harvests of immature fish (Sigler 2001). While some processors lost revenues under the transformation to IFQs (Matulich and Clark

2003; Herrmann and Criddle 2006), Love (1995) argues that the change was needed to wrest monopsony power from the fish processors.

While the NPFMC was concerned about the economic viability of the halibut and sablefish fisheries, it did not set out to structure the program to maximize economic efficiency. Kailian (2015) estimates that social provisions in the Alaska halibut and sablefish IFQ program reduced the net economic benefits to QS holders by 25 percent in the halibut fishery and by nine percent in the sablefish fishery. This loss of economic efficiency is the cost of measures designed to retain the small-boat, owner-operator character of the fishery.

IFQs have contributed to increased management precision through accurate real-time monitoring of landings. Together with limits to allowable overages at the individual QS-holder level, there is little possibility of exceeding the TAC. Nevertheless, results in terms of biological sustainability have been mixed. Although the halibut and sablefish fisheries are among the most intensively studied in the world, stocks of both species have declined in recent years. The IPHC and NMFS have responded to these declines by introducing ever more sophisticated methods to assess stock abundance and demographic composition and to model stock dynamics (IPHC 2016; Hanselman 2016a). It is hoped that continued improvement of these models will add to the understanding of processes that govern the response of these stocks to changes in the environment and changes in fishing practices and fishing regulations, enabling more precise anticipation of how changes in the environmental conditions and social systems will affect stock trajectories.

In addition to biological sustainability, the sustainability of fishery social-ecological systems requires maintenance of conditions that promote the social and economic well-being of fishermen and their communities. Brinson and Thunberg (2016) compare 16 United States catch share programs in terms of common goals and expected impacts. The Alaska halibut and sablefish IFQ program rates high on their performance measures. Capacity, as measured by reductions in active vessels, has been reduced. Prices have improved, average revenue has increased, and season length has increased which has been an advantage for the economic performance of the fisheries. However, they note that some communities have seen reductions in their engagement in these fisheries.

The Alaska halibut and sablefish IFQ program is a unique program with harvesting privileges tightly regulated by the government to maintain the original character of the fishery. However, program features that limit the free working of the marketplace result in losses of economic

efficiency from the perspective of QS holders and lead to increased government administration and infrastructure costs (Smith 2000). As policymakers consider design features to achieve social goals, they should be aware that such features generally require expanded government oversight. In addition, when political influence is involved in developing new amendments, the result often does not maximize the economic benefits to society (Criddle 2004a). Fisheries are political arenas where power dynamics can and do affect policy choices.

The Alaska halibut and sablefish IFQ program is one of the largest and most successful of the United States catch share programs and has been successful in maintaining these fisheries for the past 22 years. Fisheries managers will continue to monitor and update regulations to keep the fishery healthy and economically profitable. The development of new IFQ programs can benefit from lessons learned in the development and evolution of the Alaska halibut and sablefish IFQ program. No two fisheries are the same, thus each IFQ program needs to be customized to reflect the unique biology and ecology of the managed stock as well as the unique social, economic, and political milieu. Perhaps one of the most important take-home lessons of the Alaska halibut and sablefish IFQ program is that program design and redesign are ongoing processes needed to reflect changes in the managed stock and in social objectives. The Alaska halibut and sablefish IFQ program is being continuously customized and molded to fulfilling the goals that it was originally set up to accomplish as well as to meet emerging goals.

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Appendix 1: Amendments to the Halibut and Sablefish IFQ Program, 1995 to present.

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species	gear	area	Reference
1995	Implemented IFQ program for halibut and sablefish fixed gear fisheries. Prohibited use of pot gear in GOA and prohibited use of longline pots in the BS	NA	All	All	All	All	50 CFR 679.41
1995	Restricted ownership of blocked (initial allocation <20,000 lbs.) QS to no more than two blocks. Allowed "sweep-up" of small blocks into blocks of up to 1,000 lbs. (halibut) or 3,000 lbs. (sablefish)	M	All	All	All	All	
1996	Eliminated 72-hour "fair start" (no fishing) requirement before the opening of the sablefish season	L	All	S	All	All	61 Fed. Reg. 18116
1996	Eased requirement that an IFQ holder remain onboard the vessel until the fish are offloaded	L	All	All	All	All	61 Fed. Reg. 18116
1996	Allowed transfer of QS/IFQ to surviving spouse of QS holder	L	All	All	All	All	61 Fed. Reg. 18116
1996	Eased restrictions on salmon fishermen making deliveries of IFQ to tenders	L	All	All	All	All	61 Fed. Reg. 18116
1996	Allowed IFQ shipment reports to be submitted up to one week after the shipment occurs	L	All	All	All	All	61 Fed. Reg. 18116
1996	Allowed CV IFQ to be "fished-down", fished on vessels in smaller than the designated QS vessel category	L	All	All	All	All, except 2C and SE for IFQs >5,000 lbs. or un-blocked QS	50 CFR 679.40
1996	Eased "sweep-up" limits to allow consolidation of small QS blocks of up to 3,000 lbs. (halibut) or 5,000 lbs. (sablefish) (based on 1996 QS pools and TACs)	L	All	All	All	All	61 Fed. Reg. 67962
1996	Added Akutan to CDQ communities	L	C	All	All	BSAI	61 Fed. Reg. 41744

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species	gear	area	Reference
1997	Required corporations and partnerships that hold QS to designate a "hired skipper" to harvest their 1997 IFQ; the QS holder must own all or part of the vessel on which the hired skipper will fish its IFQs	M	All	All	All	All	50 CFR 679. 689
1997	Allowed longline pot gear for sablefish in the Bering Sea, except in June	L	All	S	LP	BS	62 Fed. Reg. 43866
1997	Required 6-hour prior notice of landing if landing will take place either before or more than 2 hours after the date/time originally scheduled	M	All	All	All	All	62 Fed. Reg. 43866
1998	Prohibited leasing of catcher vessel IFQ	M	All	All	All	All	expired on January 2, 1998
1999	Required deployment of seabird avoidance devices to reduce bycatch	M	All	All	All	All	63 Fed. Reg. 11161
1999	Required corporations and partnerships that hold QS to designate a "hired skipper" to fish their IFQs and demonstrate that they hold at least a 20 percent ownership interest in the vessel upon which the hired skipper will fish; indirect ownership allowed with sufficient documentation	M	All	All	All	All	64 Fed. Reg. 24960
1999	Required that Registered Buyers report port codes for IFQ landings	M	All	All	All	All	63 Fed. Reg. 47348
1999	Changed logbook recordkeeping and reporting requirements (single, combined IFQ/ groundfish logbook)	L	All	All	All	All	64 Fed. Reg. 25478
1999	Established a title and lien registry (MSA)	N	All	All	All	All	64 Fed. Reg. 12925
1999	Revised IFQ overage to deduct overages of up to 10 percent from following year's IFQ account, with no penalty	L	All	All	All	All	62 Fed. Reg. 26246
1999	IFQ overage >10 percent is a violation	M	All	All	All	All	64 Fed. Reg. 30926
1999	Revised halibut CDQ fishing management starting in 1999	N	C	H	All	BSAI	64 Fed. Reg. 3877
2000	Required cost recovery fees up to 3 percent by January 31 of the following year (MSA)	M	I	All	All	All	65 Fed. Reg. 14919
2002	Extended surviving spouse allowance to designated beneficiary in the absence of a spouse	L	All	All	All	All	65 Fed. Reg. 78126.
2002	Increased QS use cap to 1.5 percent of all QS (in fixed 1996 QS units)	L	All	H	All	BSAI	66 Fed. Reg 41671

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species	gear	area	Reference
2002	Established a 2 percent standard deduction for ice and slime on unwashed IFQ species; established separate product codes	L	All	All	All	All	66 Fed. Reg. 41664
2002	Revised definition of "a change in the corporation or partnership" to specify when estates holding initial QS allocations must transfer QS to a qualified individual	M	All	All	All	All	66 Fed. Reg. 18672
2002	Allowed "indirect" ownership of a vessel by a QS holder who wishes to hire a skipper to fish their IFQ	L	All	All	All	All	67 Fed. Reg. 20915
2002	Required only sablefish QS/IFQ permit holders to follow Federal IFQ regulations in state waters	L	All	All	All	All	
2002	Defined "IFQ landing" to include "trailering" (removal from the water of a vessel that contains IFQ harvests)	M	All	All	All	All	
2002	Exempted lingcod fishermen using dinglebar gear from the 6-hour prior notice of landing and 12-hour landing window requirements if they hold halibut IFQ and land <500 lbs. of halibut bycatch along with their legal lingcod landings	L	All	All	All	All	67 FR 32084
2002	Specified which Registered Buyer is responsible for filing shipment reports for IFQ	M	All	All	All	All	67 Fed. Reg. 4100
2002	Allowed electronic appeal of Initial Administrative Determination	L	All	All	All	All	68 Fed. Reg. 28889
2003	Reduced 6-hour prior notice of landings to 3 hours; replace declaration of intent to land at a specific Registered Buyer with offload location	L/M	All	All	All	All	68 Fed. Reg. 10989
2003	Revised transfer report and replaced IFQ shipment report	L	All	All	All	All	68 Fed. Reg. 28889
2003	Replaced primary port clearance requirement for IFQ/CDQ halibut and IFQ sablefish fishing vessels leaving Alaska with verbal departure report	L	All	All	All	All	68 Fed. Reg. 3485
2003	Extended duration of Registered Buyer permit to 3 years	L	All	All	All	All	68 Fed. Reg. 71235
2003	Modified management of "other species" CDQ reserve	L	C	All	All	All	68 Fed. Reg. 60327
2003	Implemented a guideline harvest level (GHL) for sportfishing catches of halibut in Area 2C and Area 3A	M	ALL	H	ALL	2C/3A	68 Fed. Reg. 47256
2003	Increased Area 4E trip limit and modified the Area 4 Catch Sharing Plan to allow participants to harvest allocations of Area 4D halibut CDQ in Area 4E	L	C	H	All	All	68 Fed. Reg. 9902

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species	gear	area	Reference
2003	Exempted vessels carrying VMS transmitters from IPHC vessel clearance requirements	L	I	H	All	BSAI	68 Fed. Reg. 10989
2004	Allowed 42 designated GOA communities to form non-profit CQEs to purchase and hold QS	L	All	All	All	GOA	69 Fed. Reg. 23681
2004	Required CV operators to retain and land all demersal shelf rockfish caught while fishing for groundfish or IFQ halibut	M	I	H	All	GOA	69 Fed. Reg. 68095
2005	Allowed Area 4C halibut QS holders to harvest in either Area 4C or Area 4D	L	A	H	All	BSAI	70 Fed. Reg. 43328
2005	Prohibited halibut IFQ permit holders from fishing or anchoring in Sitka Pinnacles Marine Reserve	M	I	H	All	GOA	70 Fed. Reg.53312
2005	Simplified quota transfers, authorized vessels, and approval of alternative fishing plans	L	C	All	All	All	70 Fed. Reg. 62369
2006	Excluded certain tagged catch from deductions from accounts	L	A	All	All	All	71 Fed. Reg.36489
2006	Changed calculation of direct program costs under IFQ Cost Recovery Program	L	I	All	All	All	71 Fed. Reg.44231
2007	Prohibited additional harvest in state waters after IFQ permit holder caught all IFQs	M	I	S	All	All	72 Fed. Reg. 35747
2007	Allowed category B QS to be fished on vessels ≤ 60 feet LOA in Area 2C (halibut) and Southeast Outside (sablefish)	L	I	All	All	2C/SE	72 Fed. Reg. 44795
2007	Allowed category D QS to be fished on vessels ≤ 60 feet LOA in Areas 3B and 4C	L	I	H	All	3B/4C	72 Fed. Reg. 44795
2007	Allowed temporary IFQ transfers for medical reasons	L	I	All	All	All	72 Fed. Reg. 44795
2007	Required documentation of vessel ownership for use of hired skippers	M	I	All	All	All	72 Fed. Reg. 44795
2007	Replaced “card” with “hired master permit”	N	A	All	All	All	73 Fed. Reg. 28733
2008	Revised seabird avoidance requirements	M	A	All	Longlines	All	72 Fed. Reg.71601
2008	Allowed processing of non-IFQ groundfish species when halibut is processed on board	L	A	H	Longlines	All	72 Fed. Reg. 64034
2008	Allowed use of pot longlines in June	L	A	S	Pot Longlines	BS	72 Fed. Reg. 35393
2008	Allowed active duty members of National Guard and military reserves to temporarily transfer IFQs to other eligible permit holders	L	A	All	All	All	73 Fed. Reg. 28733
2008	Increased online security by removing permit numbers	N	A	All	All	All	73 Fed. Reg. 76136

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species	gear	area	Reference
2009	Relaxed seabird avoidance requirements	L	A	H	Longlines	4E	74 Fed. Reg. 13355
2009	Allowed: QS holder to hold three blocks; blocks > 20,000 lbs. to be divided into one 20,000 lb. block and remainder unblocked in Area 3B and 4A; increased sweep-up limit to 5,000 lbs. in Area 2C and 3A	L	A	H	All	2C, 3A, 3B, 4A	50 CFR 679.42
2009	Allowed Category D QS to be harvested on vessels ≥ 60 feet LOA ("fished up")	L	A	H	All	3B, 4C	74 Fed. Reg. 21194
2009	Allowed Category B QS to be harvested on any length CV ("fished down")	L	A	All	All	2C/SE	74 Fed. Reg. 21194
2010	Clarified owner-onboard requirement	L	I	All	All	All	
2010	Allowed CQEs to receive charter halibut limited access permits	L	I	H		2C/3A	74 Fed. Reg. 18178
2011	Allowed CQEs to receive non-trawl groundfish limited license permits (LLPs) endorsed for Pacific cod in the central or western GOA	L	A	H	ALL	GOA	76 Fed. Reg. 44155
2011	Implemented charter halibut limited access program (CHLAP)	M	I	H	S	2C.3A	76 Fed. Reg 54739
2012	Canceled inactive QS held by persons who never used IFQ in any regulatory area	M	I	All	All	All	77 Fed. Reg 29556
2012	Established observer coverage requirements	M	A	All	All	All	77 Fed. Reg. 70061
2012	Established a CQE Program in Area 4B	L	C	H	All	4B	77 Fed. Reg. 2038
2012	Allowed "fishing-up" in Area 4B	L	A	H	All	4B	77 Fed. Reg. 5473
2013	Allowed IFQs to be leased by charter sector; separate accountability	L	I	H	All	2C, 3A	79 Fed. Reg. 34251
2013	Allowed CQEs to purchase category D QS in Area 3A.	L	I	H	S	3A	78 Fed. Reg. 68390
2013	Added three communities to the list of CQE eligible communities	L	I	H	H	2C/3A	78 Fed. Reg. 33243
2014	Allowed category D QS to be fished on category C CVs in Area 4B	L	I	H	ALL	4B	76 Fed. Reg. 44699
2014	Required corporations and partnerships that hold QS to hold minimum of 20-percent ownership interest in vessel for at least 12 consecutive months prior to hiring a master; exempted initial recipients whose vessel has been totally lost or requires at least 60 days to be repaired	M	A	All	All	All	79 Fed. Reg. 9995
2014	Prohibited initial individual QS recipient to use a hired master to harvest CV IFQ they transferred after February 12, 2010	M	I	All	All	All	70 Fed. Reg. 43679

Effective	Description	Less/More Restrictive	IFQ/ CDQ	Species	gear	area	Reference
2014	Revised vessel use caps applicable to sablefish QS held by GOA CQEs	L	I	All	All	GOA	78 Fed. Reg. 33243
2015	Pacific Halibut Catch Sharing Plan for Areas 2C and 3A	M	I	H	All	2C/3A	78 Fed. Reg. 75844
2014	Extended CQE program to area 4B (halibut) and the AI area (sablefish); the community of Adak formed a CQE	M	I	H	ALL	4B	78 Fed. Reg. 68390
2017	Allowed use of longline pot gear for sablefish in the Western GOA	L	I	H	ALL	GOA	81 Fed. Reg. 95435
2018	Allow CDQ groups to lease IFQ halibut from 4b 4c and 4d in years of low halibut catch limits.	L	CDQ	H	ALL	4B,4C and,4D	83 Fed. Reg. 8028
	ANTISIPATED						
2019	Revised IFQ Medical Transfer Provision						
2019	Revised IFQ Beneficiary Designation						
2019	Allowed retention of halibut taken incidental to sablefish caught using pot gear						