

# Halibut Prohibited Species in the BSAI Groundfish FMP and Regulations

## Discussion Paper

*Prepared for*

## North Pacific Fishery Management Council

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# 1 Introduction

The purpose of this report<sup>1</sup> is to:

- 1) document the history of halibut Prohibited Species Catch (PSC) limits and apportionments through the Fishery Management Plan (FMP) and regulatory process;
- 2) document the regulatory authority for each of the elements contained in the current halibut PSC apportionment system; and
- 3) describe the process that is required to change any of the various elements of the current apportionment system.

Table 1 provides a summary of the chronology of amendments to the Bering Sea and Aleutian Island groundfish FMP to manage halibut bycatch. This is followed by a more detailed history in Section 2. Section 3 looks at halibut PSCs from the perspective of the current PSC Specifications Tables and describes the basic origin of the each of the elements. Section 4 describes the differences between Plan Amendments, Regulatory Amendments, and the Annual Specifications Process and then goes on to describe the process that would be required to change each of the halibut related elements in the PSC Specifications Tables.

**Table 1. Chronology of amendments to the BSAI groundfish FMP to manage halibut bycatch**

Effective Date	Amendment	Management Action
1981	FMP	Prohibited retention of salmon, steelhead trout, and halibut. And created the Winter Halibut Savings Area. The FMP continued the halibut retention prohibitions that were already imposed by the pre-Magnusen Act management.
1983	3	Required that the bycatch rate of halibut and other prohibited species in the foreign trawl fishery be reduced by 10 percent per year over a five-year period.
1983	7	Specified that upon reaching a limit of 105 metric tons (mt) of halibut bycatch during June 1 through November 31, foreign longlining would be prohibited landward of the 500-m isobath in the Winter Halibut Savings Area for the remainder of Dec 1-May 31 period.
1987	10	Established a limit of 828,000 halibut for the joint venture bottom trawl fishery for yellowfin sole and other flatfish (YFS/OFF fishery). All fishing in Zone 1 by the joint venture fishery was required to cease once the limit was reached.
1989	12a	Established a 4,400 mt primary halibut PSC limit and a 5,333 mt secondary limit were established for specified BSAI trawl fisheries. When the primary limit was reached, Zones 1 and 2H were closed to directed fishing for specified groundfish species by vessels using non-pelagic trawl gear. All fishing in Zone 1 by the joint venture fishery was required to cease once this limit was reached.
1991	16	Specified the fisheries to which the primary PSC limit applied to four domestic bottom trawl fisheries—rock sole, Greenland turbot/sablefish, yellowfin sole/other flatfish, and "other species"—and a joint venture bottom trawl fishery for flatfish; authorized seasonal apportionment of the halibut PSC limits for any of the aforementioned BSAI fisheries; and established a vessel incentive program which allows NMFS to penalize vessels with bycatch rates exceeding predetermined standards.

<sup>1</sup> This report is a consultant work product. The consultant has made significant effort to ensure that all information in the report is correct. Any errors contained in the report are the responsibility of the consultant.

## Halibut Prohibited Species in the BSAI Groundfish FMP and Regulations

Effective Date	Amendment	Management Action
1991	16a	Authorized the NMFS Regional Director to temporarily close limited areas in-season due to high PSC rates for halibut and other prohibited species (“hotspot authority”).
1992	19	Reduced the secondary halibut PSC limit for BSAI trawl gear from 5,333 mt to 5,033 mt, but retained the primary halibut PSC limit at 4,400 mt; established a separate 750 mt halibut PSC limit for BSAI fixed gear (non-trawl) fisheries; and established FMP authority to develop and implement regulatory amendments that allow for time/area closures to reduce prohibited species bycatch rates (revised hotspot authority).
1993	21	Established halibut PSC limits in terms of halibut mortality rather than halibut bycatch; established halibut PSC limits for trawl and non-trawl fisheries in regulations rather than in the FMP to allow for changes in PSC limits through a regulatory amendment process rather than an FMP amendment; and established FMP authority to annually apportion the non-trawl halibut PSC limit among fisheries and seasons as bycatch allowances. Consistent with the Amendment 21 requirement to convert PSC limit from catch limits to mortality limits, regulations established a 3,775 mt secondary halibut PSC limit for trawl gear fisheries for groundfish in the BSAI. A 900 mt halibut PSC limit was established for non-trawl fisheries.
1994	24	Split the Pacific cod TAC among trawl and non-trawl harvesters and authorized the seasonal apportionment of the Pacific cod hook-and-line halibut PSC allowance, creating three four-month seasons.
1994	25	Eliminated the primary halibut PSC limit.
1999	39	Established the Multispecies CDQ Program along with a pro-rata share of the PSC limits. The CDE program allocated 7.5 percent of all BSAI groundfish TACs not already covered by a CDQ program to CDQ communities.
1999	57	Reduced the halibut PSC limit for trawl fisheries by 100 mt to 3,675 mt.
2000	61	Established halibut and crab PSC sideboard limits for AFA catcher vessels and AFA catcher/processors operating in the BSAI pollock fishery.
2008	80	Established a halibut PSC limit for the non-AFA trawl catcher/processor (Amendment 80) sector of 2,525 mt in 2008, 2,475 mt in 2009, 2,425 mt in 2010, 2,375 mt in 2011 and 2,325 mt in 2012 and thereafter. Established an 875 mt PSC limit halibut for the trawl limited access sector.
2007	85	Divided the halibut PSC amount apportioned to hook-and-line Pacific cod between hook-and-line catcher/processors and hook-and-line catcher vessels.

## 2 Regulatory History of Halibut PSCs

This section provides details of the specific management measures that deal with halibut bycatch management. The summary starts with a brief summary of management of halibut bycatch in the groundfish fisheries before the BSAI FMP was implemented. It then works through the various FMP amendments that had a direct bearing on halibut PSC management. It should be noted that this summary does not distinguish between the FMP Amendment and the regulatory language that implemented the amendment.

### 2.1 Halibut Bycatch Management Prior to MFCMA

With few commercial fisheries in existence in the North Pacific prior to the 1920s, discarding was not an important management issue (Alverson et al. 1994). Bycatch was first recognized in the North Pacific in the 1923 United States–Canada Fisheries Halibut Convention. However, even though the Convention recognized the existence of incidental catches of halibut in other fisheries, it did little to discourage their harvest. Not until after the commercial halibut fishery expanded and the International Fish Commission (later renamed the International Pacific Halibut Commission (IPHC)) was granted the authority to regulate these fisheries by the 1930 U.S.–Canada Convention did the first of what could be referred to as bycatch regulations appear. In particular, during the late 1940s and 1950s, regulations were introduced in response to specific concerns involving halibut bycatch, including prohibitions on the use of nets of any kind to harvest halibut, the retention of halibut taken by bottom trawl gear on an incidental basis, and the harvesting of halibut in certain areas. In addition, the first minimum mesh-size limits were introduced in trawl fisheries in 1948 (Alverson et al. 1994).

Beginning in 1964, a series of bilateral agreements between the U.S. and Japan and between the U.S. and the Soviet Union became the basis for fishing and bycatch management in the North Pacific. In 1973, the IPHC proposed to its member governments that trawling be prohibited in certain areas of the Bering Sea when the incidence of halibut was high (Skud 1977). The Pacific halibut stock had declined throughout the 1960s, and the intent of these closures was to reduce bycatch and rebuild the Pacific halibut resource (Witherell and Pautzke 1997). Japan responded by voluntarily refraining from trawling in certain areas within the eastern Bering Sea from December 1, 1973 through November 31, 1974 in an effort to reduce the bycatch of halibut. In 1975, bilateral agreements established the Winter Halibut Savings Area (WHSA) in which trawling was prohibited by all vessels from December through March, and a large zone between long. 170° W and 175° W closed to trawling by Japanese vessels (Witherell and Pautzke 1997).

Of relevance is that time/area closures were mainly used to control halibut bycatch prior to implementation of the BSAI groundfish FMP. Limits on the amount of halibut caught as bycatch were not part of the measures employed, probably because of the lack of a comprehensive observer program, which is needed to monitor compliance. In 1963, the first fishery observers were used in North Pacific fisheries. These observers, originating from the United States and the IPHC, were placed onboard Japanese trawlers in the Gulf of Alaska in order to monitor halibut discards (Alverson et al. 1994). However, observer coverage was limited, and managing bycatch with limits would have been impractical at that time.

## 2.2 Halibut Bycatch Management after MFCMA

Following the enactment of the Fishery Conservation and Management Act in 1976 (later renamed the Magnuson-Stevens Fishery Conservation and Management Act [MFCMA]), one of the tasks required of each regional fishery council was the preparation of FMPs for all fisheries within a council's jurisdiction which require management. Preparation of the BSAI groundfish FMP was quickly initiated following MFCMA implementation, and the FMP was effective on January 1, 1982. The initial BSAI groundfish FMP incorporated many of the time and area closures developed during earlier bilateral negotiations and International North Pacific Fisheries Commission agreements (Witherell and Pautzke 1997).

The BSAI groundfish FMP has been amended by the Council several times. The following sections discuss the amendments related to halibut bycatch management.

### 2.2.1 BSAI FMP Amendment 3

Reducing bycatch rates of halibut and other prohibited species in the foreign trawl fisheries was a primary focus of Amendment 3. Implemented in 1983, the amendment required that the bycatch rate of halibut and other prohibited species in the foreign trawl fishery be reduced by 10 percent per year over a five-year period, thereby achieving a 50 percent reduction from 1982 to 1986. Although a 50 percent reduction is a significant decrease, even greater reductions were discussed but not accepted by the Council, apparently because requiring a greater rate reduction would be too difficult to achieve and would have overly restricted foreign trawling.

The amendment specified target bycatch rates to be achieved by the foreign trawl fishery each year. Application of these target rates to the foreign allocations of groundfish (referred to as the Total Allowance Level of Foreign Fishing or TALFF) produced a *de facto* PSC limit within which the vessels from each nation were to fish. If a PSC limit was reached before a nation's groundfish allocation was caught, the NMFS Alaska Regional Director (RD) was required to close the entire BSAI management area to trawling by vessels of the affected nation. The RD was empowered to grant exemptions for continued fishing to selected elements of a national fleet based on the following considerations:

- (1) the risk of biological harm to prohibited species stocks and of socioeconomic harm to authorized prohibited species users posed by continued trawling by the selected elements;
- (2) the extent to which the selected elements have avoided incidental prohibited species catches up to that point in the fishing year;
- (3) the confidence of the RD in the accuracy of the estimates of prohibited species catches by the selected elements up to that point in the fishing year;
- (4) whether observer coverage of the selected elements is sufficient to assure adherence to the prescribed conditions, and to alert the RD to increases in the elements' prohibited species catch; and
- (5) the enforcement record of owners and operators of vessels included in the selected elements, and the confidence of the RD that adherence to prescribed conditions can be assured in light of available enforcement resources.

As an added incentive to reduce bycatch, the Council recommended that the Secretary of State consider the efforts of each nation to achieve these reductions when supplemental foreign groundfish allocations were awarded during the fishing year. Amendment 3 was successful at achieving its goal of reducing bycatch in the foreign trawl fisheries. Actual bycatch rates were lower than the targeted



bycatch rates for the 1982–1986 period. A part of this reduction is attributable to decreases in the TALFF. Moreover, the reduced halibut bycatch of the foreign fleet was offset by growing bycatch levels in the joint venture fisheries.

### **2.2.2 BSAI FMP Amendment 7**

Implemented in 1983, Amendment 7 eased a depth restriction on the foreign longline fishery conducted in the WHSA. Prior to implementation of the BSAI groundfish FMP, foreign longliners fished without depth restriction in the area closure. A provision of the FMP required longliners to remain seaward of the 500-m isobath during December 1 through May 31 to avoid concentrations of juvenile halibut. Amendment 7 specified that upon reaching a limit of 105 mt of halibut bycatch during June 1 through November 31, foreign longlining would be prohibited landward of the 500-m isobath in the WHSA for the remainder of December 1-May 31 period.

Amendment 7 was significant because it represented one of the first uses of a limit as a tool for bycatch management. The limit of 105 mt represented 75 percent of the average foreign longline halibut bycatch during 1978-1981. This amount was believed to adequately protect juvenile halibut from excessive bycatch and at the same time allow the foreign fishery to catch their groundfish allocation.

It is difficult to determine the effectiveness of Amendment 7. The amendment served as a trigger, closing a portion of the WHSA to longline fishing at a predetermined level of bycatch. Fishing could continue outside the area, however, so bycatch was not limited but continued to accumulate. Halibut bycatch in the foreign longline fishery increased markedly, from an average of 141 mt during 1978–1981 to an average of 735 mt during 1984–1987 (Williams et al. 1989). Closure of the WHSA probably shifted the fishery to areas where juvenile halibut were less likely to be caught, either due to lower concentrations of juveniles or greater concentrations of larger halibut. However, NMFS observer data indicated no perceptible change in the average weight of halibut between 1978–1981 and 1984–1987 (3.6 kg versus 3.5 kg), which suggests that the foreign longline fishery continued to catch halibut of similar size after Amendment 7 was enacted (Williams et al. 1989). Thus, the measure appears largely ineffective in protecting juvenile halibut from excessive bycatch in the foreign longline fishery. Nevertheless, Amendment 7 probably constrained bycatch taken in the WHSA at a level below what otherwise may have been taken.

### **2.2.3 BSAI FMP Amendment 10**

Amendment 10, which was implemented in 1987, included specific limits for the bycatch of halibut, red king crab, and Tanner crab for the joint venture bottom trawl fishery for yellowfin sole (*Limanda aspera*) and other flatfish, termed the YFS/OFF fishery. The amendment specified a PSC limit of 828,000 halibut within the BSAI region for this fishery, which corresponds roughly to 1,880 mt. All fishing in Zone 1 by the joint venture fishery was required to cease once this limit was reached. Fishing could continue outside this closed area, however.

The limit was determined by subtracting the bycatch mortality expected to be caught in non-joint venture YFS/OFF fisheries in 1987 from the average bycatch mortality of 3,100 mt taken by all non-halibut fisheries during 1982–1986. This procedure resulted in a halibut PSC limit which was not a constraint, considering that estimated bycatch mortality in YFS/OFF fishery was 266,000 fish in 1985 and 354,000 fish in 1986 (through September). In the proposed rule filed to implement Amendment 10, NMFS acknowledged this fact:

It is intended primarily as an upper limit, which if achieved, would result in closure of an area (Zone 1) that is known to contain a high abundance of juvenile halibut. Given

the expected bycatch of halibut in the [domestic] and foreign groundfish fisheries and the crab pot fisheries, this prohibited species catch limit is intended to ensure that the total halibut bycatch from all fisheries in the BSAI area does not exceed recent historical levels.

Amendment 10 was not approved by the Secretary of Commerce prior to the 1987 fishing year, so the Council recommended to the Secretary that initial management authority for 1987 be provided through an Emergency Rule (ER). The proposed ER contained the same bycatch provisions for halibut and crab as Amendment 10. However, the halibut provisions were deleted by NMFS during a review of the proposed ER because it was believed that emergency conditions did not exist.

The use of PSC limits to control crab and halibut bycatch caused the participating joint venture companies to cooperate in a manner not seen before. Concerned that uncontrolled fishing could cause excessively high bycatch rates and result in reaching PSC limits early in the year, thereby closing the YFS/OFF fishery before the available groundfish had been harvested, the U.S. companies developed a plan which would give an incentive to each vessel to fish at a lower bycatch rate than might otherwise occur. The plan was implemented by NMFS through the foreign-processor permit and involved daily monitoring of halibut and crab bycatch rates. Average rates (number of halibut or crab per mt of groundfish) were calculated by zone for each fishing company at 20 percent increments of the PSC limit. Should a company's average bycatch rate exceed 1.5 times the industry average, the foreign processing ship was barred from receiving deliveries from U.S. catcher vessels for 10 days. Should the bycatch rate exceed two times the industry average, foreign processing ships were required to discontinue receiving fish in that zone for the remainder of the year. Thus, the plan penalized the foreign processor for the actions of the U.S. fishing vessel. Since the processor could monitor the catch of each vessel delivering a codend, vessels with excessively high bycatch rates could be instructed to change to cleaner fishing techniques before too much crab or halibut accumulated.

Joint venture fishermen were able to keep their halibut bycatch within the Amendment 10 limits, which suggests the limits were higher than needed. Perhaps more importantly, the limit did not apply to important sources of halibut bycatch in the BSAI groundfish fisheries.

## **2.2.4 BSAI FMP Amendment 12a**

The Council intended that Amendment 10 expire at the end of 1988 due to uncertainty about fluctuations in population levels of prohibited species and development of domestic groundfish fisheries. Concern about continued crab and halibut bycatch prompted the Council to develop more comprehensive controls to replace those that were set to expire. The use of PSC limits in Amendment 10 carried over into the development of Amendment 12a, which was implemented in 1989.

Amendment 12a established halibut, king crab, and Tanner crab PSC limits for the fully domestic and joint-venture bottom trawl fisheries for groundfish. A 4,400 mt primary halibut PSC limit and a 5,333 mt secondary limit were established for specified BSAI trawl fisheries. When the primary limit was reached, Zones 1 and 2H were closed to directed fishing for specified groundfish species by vessels using non-pelagic trawl gear. When the secondary limit was reached, the entire BSAI was closed to directed trawl fishing for specified groundfish species. The intent was to reduce halibut bycatch rates experienced by the trawl fisheries without prohibiting the groundfish trawl fisheries' access to the entire BSAI groundfish resource.

The PSC limit was subdivided and apportioned to four specific fisheries: (1) joint venture flatfish fishery; (2) joint venture fishery for other species (principally pollock and Pacific cod); (3) fully domestic flatfish fishery; and (4) fully domestic fishery for other species (principally pollock and Pacific

cod). The limit for each fishery was based on the amount of halibut bycatch anticipated to be taken by each fishery as a relative portion of the total limit.

A central assumption of Amendment 12a was that the fishing fleet would reduce its bycatch rate as the PSC limit was approached, thus enabling a maximum amount of groundfish to be harvested within the constraints of the PSC limit. This would minimize the impacts on groundfish fishery revenue, yet yield benefits to the directed fisheries for halibut. In fact, the groundfish fleet exhibited the opposite behavior: as the halibut PSC limit was approached, bycatch rates increased as each vessel harvested groundfish as rapidly as possible before the limit was reached. What may have been advantageous for the groundfish fleet as a whole was not in the best interests of the individual vessel. Consequently, fishery closures caused by PSC limits were common in 1989 and 1990.

### **2.2.5 BSAI FMP Amendment 16**

Amendment 16 was the next step in the evolution of halibut bycatch management in the BSAI. Amendment 12a expired at the end of 1990, so new measures were developed by the Council and implemented in 1991 as Amendment 16. The new amendment contained several provisions related to halibut bycatch:

- (1) maintenance of the 5,333 mt secondary halibut PSC limit established in Amendment 12a, and restructuring of the applicable fisheries to four domestic bottom trawl fisheries—rock sole, Greenland turbot/sablefish, yellowfin sole/other flatfish, and "other species"—and a joint venture bottom trawl fishery for flatfish;
- (2) seasonal apportionment of the halibut PSC limits for any of the aforementioned BSAI trawl fisheries;
- (3) a vessel incentive program which allows NMFS to penalize vessels with bycatch rates exceeding predetermined standards; and
- (4) a requirement that groundfish pots have biodegradable panels and halibut excluder devices.

The vessel incentive program consisted of a post-season comparison of a vessel's halibut bycatch rate over a moving four-week period against a predetermined standard. Civil penalties (fines) were issued to vessels that exceeded seasonal fixed bycatch rate standards for halibut and crab taken in specified target fisheries. The vessel incentive program was implemented in May 1991.

Ultimately, the Council decided against allocating any groundfish to joint ventures in 1991, so the halibut PSC limit was apportioned to the four domestic trawl fisheries. The fisheries proved difficult to manage within the limits, and two of the four fisheries substantially exceeded their limits. The 5,333 mt limit was exceeded by 816 mt, or 15 percent.

### **2.2.6 BSAI Amendment 16a**

A set of additional measures was developed by the Council in 1990, but not included in Amendment 16 because there was insufficient time to consider them adequately. Implemented in 1991, the additional measures were known as Amendment 16a, and they included authority for the NMFS Alaska Regional Director to temporarily close limited areas in-season due to high bycatch rates for halibut and other prohibited species (termed "hotspot authority").

### 2.2.7 BSAI Amendment 19

Amendment 19, implemented in 1992, was initiated to further address bycatch issues raised under Amendment 16 and 16a. The purpose of this amendment was to control and reduce halibut bycatch mortality in the Alaska groundfish fisheries in response to the international, social, and economic conflicts between U.S. and Canadian halibut fishermen and U.S. groundfish fishermen that take halibut as bycatch.

Amendments 19 established three FMP amendment management measures: 1) reduce the secondary halibut PSC limit established for BSAI trawl gear from 5,333 mt to 5,033 mt, but retain the primary halibut PSC limit at 4,400 mt; 2) establish a separate 750 mt halibut PSC limit for BSAI fixed gear (non-trawl) fisheries in 1992; and 3) establish FMP authority to develop and implement regulatory amendments that allow for time/area closures to reduce prohibited species bycatch rates (revised hotspot authority). In addition, the following amendments to current regulations were adopted:

- (1) revise BSAI fishery definitions for purposes of monitoring fishery specific bycatch allowances and assigning vessels to fisheries for purposes of the vessel incentive program;
- (2) revise the management of BSAI trawl fishery categories for prohibited species catch accounting;
- (3) expand the vessel incentive program to address halibut bycatch rates in all trawl fisheries;
- (4) delay the season opening date of the BSAI and GOA groundfish trawl fisheries to January 20 of each fishing year to reduce salmon and halibut bycatch rates;
- (5) further delay the season opening date of the GOA trawl rockfish fishery to the Monday closest to July 1 to reduce halibut and Chinook salmon bycatch rates; and
- (6) change directed fishing standards to further limit halibut bycatch associated with bottom trawl fisheries.

Since Amendment 19 was approved, bycatch of halibut and crab has been controlled to stay within PSC limits. These limits have been apportioned among different trawl fisheries in the BSAI, and fisheries have been closed when their respective apportionments/seasonal allowances were reached. Catch of groundfish (particularly flatfish) has been foregone due to these restrictions. Few vessels have been cited for violations of the vessel incentive program.

### 2.2.8 BSAI Amendment 21

The purpose of Amendment 21, which was implemented in 1993, was to control halibut bycatch in groundfish fisheries. Halibut PSC limits for trawl and non-trawl gear fisheries that were established for 1992 under Amendment 19 were scheduled to expire at the end of 1992. Without further regulatory action, no halibut bycatch restrictions would be in effect for BSAI non-trawl fisheries in 1993 and beyond, and the secondary halibut PSC limit for trawl gear fisheries would revert to the 1991 level of 5,333 mt.

In addition, two other problems were addressed in Amendment 21. First, the trawl PSC limit was previously established in terms of bycatch, not bycatch mortality. Therefore, it did not address directly the management goal of controlling bycatch mortality and limited the methods available to fishermen to meet that goal. Second, the PSC limits could only be changed with a FMP amendment. This can be a cumbersome and lengthy process and may prevent timely and efficient changes to the PSC limits as the biological, economic, and social factors that determine the appropriate PSC limits change. Amendment 21 established halibut PSC limits in terms of halibut mortality rather than total halibut bycatch; established halibut PSC limits for trawl and non-trawl fisheries in regulations rather than in

the FMP to allow for changes in PSC limits through a regulatory amendment process rather than an FMP amendment; and established FMP authority to annually apportion the non-trawl halibut PSC limit among fisheries and seasons as bycatch allowances. This authority would be similar to FMP provisions for annual specification of allowances of PSC limits among trawl fisheries.

Regulations promulgated under Sec. 675.21 authorized the apportionment of the trawl halibut PSC limit into bycatch allowances for seven fishery categories: midwater pollock, Greenland turbot/arrowtooth flounder/sablefish, rock sole/other flatfish, yellowfin sole, rockfish, Pacific cod, and bottom pollock/Atka mackerel/"other species" (these would later be expanded to eight fishery categories: midwater pollock, flatfish, yellowfin sole, rock sole/flathead sole/"other flatfish", Greenland turbot/arrowtooth flounder/sablefish, rockfish, Pacific cod, and pollock/Atka mackerel/"other species"). Seasonal apportionments were established among these fisheries. In addition, regulations at Sec. 675.21 authorized the apportionment of the non-trawl halibut PSC limit among three fishery categories: Pacific cod hook-and-line fishery, groundfish pot gear fishery, and other non-trawl fisheries (these would later be expanded to six fishery categories: Pacific cod hook-and-line catcher vessel, Pacific cod hook-and-line catcher/processor, sablefish hook-and-line, groundfish pot gear, groundfish jig gear, and other non-trawl fishery categories). However, Amendment 21 allowed some non-trawl fisheries (e.g., pot gear) to be exempt from the non-trawl halibut bycatch restrictions because the fisheries use selective gear types that experience low halibut bycatch mortality (in 1995, the Council recommended that jig gear and the sablefish IFQ hook-and-line gear fishery also be exempted).

Consistent with the Amendment 21 requirement to convert PSC limit from catch limits to mortality limits, regulations established a 3,775 mt secondary halibut PSC limit for trawl gear fisheries for groundfish in the BSAI. A 900 mt halibut PSC limit was established for non-trawl fisheries. Since the amendment was approved, halibut PSC limits have not been exceeded. Further, fishermen have developed ways to reduce halibut mortality (e.g., careful release, deck sorting) to better achieve Optimum Yield (OY) in the groundfish fisheries.

### **2.2.9 BSAI Amendment 24**

The effective date of implementation of Amendment 24 was 1994. The amendment authorized the explicit allocation of BSAI Pacific cod among vessels using trawl, hook-and-line or pot gear, and jig gear through 1996. In addition, the amendment authorized the seasonal apportionment of the Pacific cod TAC for hook-and-line and pot gear and the Pacific cod hook-and-line halibut PSC allowance, creating three four-month seasons.

### **2.2.10 BSAI Amendment 25**

Implemented in 1994, Amendment 25 eliminated the primary halibut PSC limit established under Amendment 12a. The small difference between the primary and secondary limits made it difficult for NMFS to monitor the primary limit in a manner to allow closures before the secondary limit was reached; therefore, most trawl closures ensuing from bycatch restrictions were implemented under the secondary limit. At this point, the effectiveness of a primary PSC limit to reduce halibut bycatch came into question. NMFS was finding that initial closure of Bycatch Limitation Zones actually often increased bycatch rates by forcing fisheries to move to areas with lower groundfish catch per unit effort and higher halibut bycatch rates.

Amendment 25 was proposed to respond to concerns about the usefulness of the primary PSC limit and its potential for exacerbating halibut bycatch rates in the BSAI trawl groundfish fisheries. The intent was to eliminate the primary PSC limit and use only the secondary (overall) halibut PSC limit established for the BSAI trawl fisheries. This action was necessary to promote the management and



conservation of halibut and other fish resources as specified in the objectives of the MFCMA and the FMPs, and to better meet the original intent of Amendment 12a.

### **2.2.11 BSAI Amendment 39**

The effective date of implementation of Amendment 39 was January 1999, except for some parts, which became effective January 2000. Among other actions, Amendment 39 established the Multispecies CDQ Program in which 7.5 percent of all BSAI groundfish TACs not already covered by a CDQ program, along with a pro-rata share of the PSC limits, are allocated to CDQ communities.

### **2.2.12 BSAI Amendment 57**

Amendment 57, which was approved by the NPFMC 1998, but not fully implemented by final rule until May 2000, prohibited the use of non-pelagic trawl gear when participating in directed fishing for the BSAI pollock. The definition of a pelagic trawl is relatively complex, whereas non-pelagic trawls are all other trawls not meeting the pelagic trawl definition. Amendment 57 also reduced the halibut PSC limit for trawl gear fisheries for groundfish in the BSAI by 100 mt to 3,675 mt in recognition that non-pelagic trawls would no longer be used in directed fishing operation for pollock.

It should be noted that direct fishing for pollock is defined in terms of the percentage of pollock that is on board relative to the basis species. The basis species is the species that has been retained in amounts greater than any other species. If a vessel's retained pollock is greater than 20 percent of the basis species then it is determined to have been engaged in directed fishing for pollock.

### **2.2.13 BSAI Amendment 61**

Amendment 61 implemented the American Fisheries Act (AFA) of 1999 for 2001 and beyond. The amendment was implemented via two emergency rules: (1) AFA permit requirements published on January 5, 2000, with an effective date of December 30, 1999, and (2) all other provisions of the AFA published on January 28, 2000 with an effective date of January 21, 2000.

In addition to implementing other AFA provisions, Amendment 61 established halibut and crab PSC sideboard limits for AFA catcher vessels and AFA catcher/processors operating in the BSAI pollock fishery. To protect the interests of other fishermen and processors that did not benefit directly from the AFA, these sideboards restrict the ability of AFA vessels to participate in directed fisheries for non-pollock groundfish species. The PSC sideboard limits are managed through directed fishing closures in the groundfish fisheries for which the PSC sideboard limit applies.

For each halibut or crab PSC limit specified for catcher/processors in the BSAI, the Regional Administrator will establish an annual listed AFA catcher/processor PSC limit equal to the estimated aggregate 1995–1997 PSC bycatch of that species by catcher/processor listed in paragraphs 208(e)(1) through (20) and 209 of the AFA while engaged in directed fishing for species other than pollock divided by the aggregate PSC limit of that species for catcher/processors from 1995–1997 multiplied by the PSC limit of that species available to catcher/processors in the year in which the harvest limit will be in effect.

The AFA catcher vessel PSC limit for halibut in the BSAI and GOA, and each crab species in the BSAI for which a trawl PSC limit has been established, will be a portion of the PSC limit equal to the ratio of aggregate retained groundfish catch by AFA catcher vessels in each PSC target category from 1995–1997 relative to the retained catch of all vessels in that fishery from 1995–1997.

### 2.2.14 BSAI Amendment 80

Implemented for the 2008 fishing year, Amendment 80 allocates non-pollock groundfish in the BSAI among trawl sectors and creates a limited access privilege program to facilitate the formation of harvesting cooperatives in the non-American Fisheries Act (non-AFA) trawl catcher/processor sector. Under Amendment 80, NMFS allocates the Amendment 80 species available for harvest, and crab and halibut prohibited species catches to two defined groups of trawl fishery participants: (1) the non-AFA trawl catcher/processor (Amendment 80) sector (hereafter referred to as AM80-CPs); and (2) the BSAI trawl limited access sector, which is comprised of AFA catcher/processors (AFA-CPs), AFA catcher vessels (AFA-CVs), and non-AFA (Non-AFA-CVs).

The halibut PSC limit for the AM80-CPs is 2,525 mt in 2008, 2,475 mt in 2009, 2,425 mt in 2010, 2,375 mt in 2011 and 2,325 mt in 2012 and thereafter. As indicated, a portion of the annual halibut PSC limit available for use by the Amendment 80 sector would be reduced over time and a portion of this limit would not be assigned for use. This unassigned halibut is “left in the water” and may contribute to the overall halibut biomass available for future recruitment or harvest.

Each Amendment 80 cooperative receives an annual cooperative quota with an exclusive limit on the amount of crab and halibut prohibited species catches that it can use while harvesting in the BSAI. This halibut and crab prohibited species catch cooperative quota is assigned to a cooperative proportional to the amount of Amendment 80 quota share held by the members. Once prohibited species catch is assigned to a cooperative it may be used while fishing for any groundfish species in the BSAI. Prohibited species catch assigned to a cooperative is not subject to seasonal apportionment.

With respect to the BSAI trawl limited access sector, Amendment 80 modifies the calculation of AFA sideboard limits for Amendment 80 species and crab and halibut PSC limits necessary to allow the efficient operation of AFA vessels. The halibut PSC limit for the BSAI trawl limited access sector is a fixed amount of 875 mt. This amount is deemed necessary to support all halibut PSC needs for harvest of pollock, Amendment 80 species, and non-Amendment 80 species (e.g., Alaska plaice). The 875 mt PSC limit is further apportioned in the annual harvest specifications process among the following fisheries: (1) Pacific cod, (2) yellowfin sole, (3) rock sole/other flatfish/flathead sole, (4) turbot/arrowtooth/sablefish, (5) rockfish, and (6) pollock/Atka mackerel/other fisheries. The portion of the halibut PSC limit assigned to the BSAI trawl limited access sector is subject to seasonal apportionment and the Regional Director of NMFS may make in-season adjustment to the PSC limit splits between AM80-CPs and the Trawl Limited Access fishery if it appears they would otherwise go un-used.<sup>2</sup>

Amendment 80 also modified allocations of the PSC limits made to the CDQ Program as prohibited species quota (PSQ) reserves. In 2008 and 2009, 276 mt of the halibut PSC limit for trawl gear fisheries was set as PSQ reserves. In 2010 and thereafter it is the PSQ reserve is 326 mt. For non-trawl fisheries, 7.5 percent, or 67 mt, of the non-Trawl halibut PSC limit is assigned as CDQ PSQ reserves.

### 2.2.15 BSAI Amendment 85

Amendment 85, which was approved in 2007 and first used for Annual Specifications in 2008 fishing year, modifies the apportionment of the Pacific cod TAC among specific sectors as shown in Table 2 on the following page.

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<sup>2</sup> On September 16, 2010, the Regional Director of NMFS adjusted the halibut and crab PSC limits for the trawl fisheries. An additional 340 mt of halibut PSC and 290,000 crabs of Zone 1C bairdi tanner crab PSC, 880,000 crabs of Zone 2C bairdi tanner crab PSC, and 48,000 crabs of Zone 1 red king crab PSC were assigned to the AM80CPs from the trawl limited access fishery. This re-apportionment is reflected in the final version of Table 8A on the NMFS-AKR web page.

Amendment 85 also

- 1) removes Pacific cod sideboards for AFA Trawl CP—they are provided actual allocation separate from AM80-CPs;
- 2) re-specifies seasonal apportionments of the Pacific cod among sectors;
- 3) streamlines the process of rolling over unused Pacific cod;
- 4) divides the halibut PSC amounts apportioned to hook-and-line Pacific cod sectors between hook-and-line catcher/processors and hook-and-line catcher vessels;

**Table 2. Pacific Cod TAC Apportionments under Amendment 85**

Sector	Percent of PCOD TAC	Percent of PCOD TAC
CDQ Percent of TAC	10.70	10.70
Non-CDQ Percent of TAC	89.30	89.30
<b>Non-CDQ Sectors</b>	<b>Percent of Non-CDQ PCOD TAC</b>	<b>Percent of PCOD TAC</b>
Jig Vessels	1.40	1.25
Hook & Line & Pot CVs < 60'	2.00	1.79
Hook & Line CVs ≥ 60'	0.20	0.18
Hook & Line CPs	48.70	43.49
Pot CVs ≥ 60'	8.40	7.50
Pot CPs	1.50	1.34
AFA Trawl CPs	2.30	2.05
Non AFA Trawl CPs	13.40	11.97
Trawl CVs	22.10	19.74

It should be noted that Amendment 61 established halibut and crab PSC sideboard limits for AFA-CVs and AFA-CPs operating in the BSAI pollock fishery. While the overall PSC sideboards for the AFA-CPs are not increased by Amendment 85, but a portion of the PSC sideboards are set aside as an explicit allocation for use in this sector's Pacific cod directed fishery. To continue protection of the Non-AFA-CVs, Amendment 85 continues the Pacific cod sideboards and the halibut and crab PSC sideboards for AFA-CVs.



### 3 FMP Basis of Halibut PSC Specifications

In this section, specific elements of NMFS Annual Specifications for halibut PSC limits are identified and linked back to their source in the BSAI Groundfish FMP.

Table 3 shows the 2012 apportionment of Halibut PSC to gear groups (non-trawl and trawl), CDQs, and sectors (Amendment 80 and trawl limited access). The 900 mt non-trawl PSC limit—established in regulation under Amendment 21 in 1991—is reduced by 68 mt to 832 mt. The 67.5 mt reduction is allocated to the non-trawl CDQ fishery established under Amendment 39 in 1999.

The second section of Table 3 shows the division of the 3,675 mt total trawl PSC limit that was originally established under Amendment 57 implemented in 1999. The 3,675 limit represented a 100 mt reduction from previous limits and corresponded to the Amendment’s prohibition of targeting pollock with bottom trawl gear. The trawl PSC limit is subdivided between non-CDQ fisheries (3,349 mt) and CDQ fisheries (326 mt). The CDQ pollock fishery was originally established under Amendment 18, while non-pollock CDQ fisheries were established in 1999 under Amendment 39.

Amendment 80 (implemented for fishing year 2008) phased in a reduced usage of overall 3,675 trawl PSC limit for halibut mortality. The trawl PSC limit is divided between the trawl CDQ PSQ, the AM80-CPs, and the remaining limited access trawl fleet—including AFA-CVs, AFA-CPs and Non-AFA-CVs. In 2008 the AM80-CPs were allocated 2,525 mt and the limit access trawlers received 875 mt. In 2008 and 2009 the AM80-CP PSC limit was reduced by 50 mt each year to 2,475 mt and 2,425 mt respectively. In 2010, an additional 50m was moved from apportionment to the “unallocated Amendment 80 reduction.” In 2012 the AM80-CPs are apportioned 2,325 mt.

**Table 3. Apportionment of Halibut PSC Limits to Gear Groups, CDQs and Sectors – 2012**

Halibut Mortality Limits (MT)	Total non-trawl PSC		Non-trawl PSC Remaining after CDQ PSQ <sup>1</sup>	Total trawl PSC	Trawl CDQ PSQ reserve <sup>2</sup>	Trawl PSC Remaining after CDQ PSQ	Amendment 80 sector	BSAI trawl limited access fishery <sup>3</sup>	Amendment 80 based reductions (unallocated)
		900	67.5	832.5	3,675	326	3,349	2,325	875

Table Notes:

<sup>1</sup> Section 679.21(e)(3)(i)(A)(2) allocates 326 mt of the trawl halibut mortality limit and § 679.21(e)(4)(i)(A) allocates 7.5 percent, or 67 mt of the non-trawl halibut mortality limit as the PSQ reserve for use by the groundfish CDQ program.

<sup>3</sup> The BSAI trawl limited access fishery includes all AFA CVs and CP, and all other trawl CVs that hold LLPs. Source: Adapted by Northern Economics from Table 8A "Groundfish Harvest Specification Tables." (NMFS-AKR, 2012)

Table 4 below shows the 2012 apportionment to target fisheries of the 875 mt PSC limit for trawlers operating under limited access. The apportionments can vary from year to year and are set in the annual specification process.

For fisheries in Table 4 where the PSC limit is set to zero (Rock Sole/flathead sole/other flatfish, and Turbot/arrowtooth/sablefish), NMFS-AKR prohibits directed fishing<sup>3</sup> for these targets in the Spec’s

<sup>3</sup> Directed fishing is a relatively complex concept. For example, a prohibition on directed fishing for rock sole, means that affected vessels may not retain more than the Maximum Retainable Allowance (MRA) of rock sole while fishing in other target fisheries. The MRA for rock sole is 35 percent while vessels are engaged in flatfish fisheries (except turbot), and 20 percent when vessels are engaged in pollock, Pacific cod or Atka mackerel target fisheries. The rock sole MRA ranges from 1 – 15 percent in turbot, sablefish and rockfish fisheries.

Process. If a PSC limit for yellowfin sole, rockfish or Pacific cod is reached, then NMFS-AKR will issue an in-season closure order that prohibits limited access trawl vessels from engaging in directed fishing for the target species in question.

The PSC apportionment for Pollock/Atka mackerel/other species is handled somewhat differently. First, directed fishing for “other species” is prohibited at the start of the year within the Spec’s Process. During the year, all halibut caught in limited access trawl target fisheries for pollock and Atka mackerel accumulate into the “Pollock/Atka mackerel/other species” allowance. However, if the 250 mt PSC limit is attained NMFS-AKR does not issue any closure orders, and vessels can continue to be allowed to engage in directed fishing for pollock, Atka mackerel. This is in part explained by the fact that the apportionment as originally developed was intended to preclude the further use of **non-pelagic** trawl gear for vessels engaged in directed fishing for pollock. However, since the use of non-pelagic trawl gear for any vessel engaged in directed fishing for pollock was prohibited under Amendment 57 in 2000, the binding nature of the PSC apportionment to this fishery category has been moot.

**Table 4. Apportionment of Halibut PSC Limits for Trawl Limited Access<sup>1</sup> Harvesters – 2012**

Total Halibut PSC Mortality	Yellowfin Sole	Rock Sole/ flathead sole/ other flatfish <sup>2</sup>	Turbot/ arrowtooth/ sablefish <sup>3</sup>	Rockfish (04/15 - 12/31)	Pacific cod	Pollock/ Atka mackerel/ other species <sup>4</sup>
<b>Metric Tons of Halibut Mortality</b>						
875	167	0	0	5	453	250

Table Notes:

<sup>1</sup> The BSAI trawl limited access fishery includes all AFA CVs and CP, and all other trawl CVs that hold LLPs.

<sup>2</sup> “Other flatfish” for PSC monitoring includes all flatfish species, except for halibut (a prohibited species), flathead sole, Greenland turbot, rock sole, yellowfin sole, Kamchatka flounder and arrowtooth flounder.

<sup>3</sup> Arrowtooth flounder for PSC monitoring includes Kamchatka flounder.

<sup>4</sup> “Pollock” as used in “Other species” for PSC monitoring includes sculpins, sharks, skates, and octopuses. Source: Adapted by Northern Economics from Table 8C “Groundfish Harvest Specification Tables.” (NMFS-AKR, 2012)

Table 5 shows the apportionment of halibut PSC limits between cooperatives for trawl CPs authorized to form Cooperatives under Amendment 80. Each cooperative is allocated a percentage of the Amendment 80 total based on the target catch history of the cooperative member vessels. The apportionments can change from year-to-year with changes in cooperative membership.

**Table 5. Apportionment of Halibut PSC Limits for Amendment 80 Cooperatives – 2012**

	Amendment 80 Sector Total	Alaska Seafood Cooperative	Alaska Groundfish Cooperative
<b>Halibut Mortality (MT)</b>	2,325	1,609	716

Source: Adapted by Northern Economics from Table 8E “Groundfish Harvest Specification Tables.” (NMFS-AKR, 2012)

Table 6 is adapted from NMFS Table 8D and shows the apportionment of halibut PSC limits among CPs and CVs for non-trawl harvesters. The split between CP and CVs for Pacific cod is derived from Amendment 85 implemented in 2007. The apportionment of Halibut between trawl and non-trawl harvesters is based on Amendment 24, which in 1994 implemented the split of the Pacific cod TAC between the two gear types. The seasonal apportionment of the non-trawl PSC limits also derives from Amendment 24, as does the split of the non-trawl halibut PSC limit between Pacific cod fisheries and all other target fisheries. Unused seasonal apportionments roll-over to subsequent seasons.

**Table 6. Apportionment of Halibut PSC Limits among Non-Trawl Harvesters and Seasons– 2012**

		Total	Non-trawl CPs	Non Trawl CVs
<b>All Non-Trawl</b>	<b>Season</b>	<b>833</b>	Not fully apportioned between CPs/CVs	
<b>Pacific Cod</b>	<b>Total</b>	<b>775</b>	<b>760</b>	<b>15</b>
	01/01 - 06/10	465	455	10
	06/10 - 08/15	193	190	3
	08/15 - 12/31	117	115	2
<b>All Other Targets</b>	05/01 - 12/31	<b>58</b>	Not apportioned between CPs/CVs	

Note: Groundfish pot and jig harvesters are exempt from halibut PSC limits, and are participants in the Sablefish hook and line IFQ fishery.

Source: Adapted by Northern Economics from Table 8D "Groundfish Harvest Specification Tables." (NMFS-AKR, 2012)

Table 7 shows the mortality rates that are currently used to calculate halibut mortality by sector and gear group. PSC limits were converted from catch to estimated mortality under Amendment 21. Mortality rates are recalculated every two years based on observer data.

**Table 7. Halibut Mortality Rates by Target Fishery for Gear Groups and Sectors – 2012**

Target Fishery	Trawl		Hook and Line		Pot	
	Non-CDQ	CDQ	Non-CDQ	CDQ	Non-CDQ	CDQ
Pacific cod	71	90	10	10	8	8
Greenland turbot	67	88	11	4	-	-
Rockfish	81	84	9	-	-	-
Sablefish	75	-	-	-	-	32
Other species <sup>1</sup>	71	-	10	-	8	-
Arrowtooth flounder <sup>2</sup>	76	-	-	-	-	-
Atka mackerel	76	85	-	-	-	-
Flathead sole	74	84	-	-	-	-
Non-pelagic pollock	73	85	-	-	-	-
Pelagic pollock	89	90	-	-	-	-
Other flatfish <sup>3</sup>	72	-	-	-	-	-
Rock sole	82	87	-	-	-	-
Yellowfin sole	81	85	-	-	-	-

Table Notes

<sup>1</sup> "Other species" for PSC monitoring includes sculpins, sharks, skates, and octopuses.

<sup>2</sup> Arrowtooth flounder for PSC monitoring includes Kamchatka flounder.

<sup>3</sup> "Other flatfish" for PSC monitoring includes all flatfish species, except for halibut (a prohibited species), flathead sole, Greenland turbot, rock sole, yellowfin sole, Kamchatka flounder and arrowtooth flounder.

Source: Adapted by Northern Economics from Table 9 "Groundfish Harvest Specification Tables." (NMFS-AKR, 2012)

## 4 A Discussion of the Process for Changing PSC Limit in the BSAI

This section summarizes the process by which PSC limits can be changed in the BSAI.<sup>4</sup> In general changes to the PSCs can be made through either:

- 1) An FMP Amendment—An FMP amendment will be necessary if the modification requires that a change be made to any part of the language of the FMP. In almost all cases, an FMP amendment will require additional changes to regulations.
- 2) A Regulatory Amendment—A regulatory amendment will be necessary if the change requires that a change be made to any part of the regulation. Almost all FMP amendments will also require a regulatory amendment.
- 3) The Annual Specification Process (Spec’s Process)—TACs are set in this “Rulemaking” Procedure. It is less time consuming than a Regulatory Amendment in part because it doesn’t require preparation of a “Regulatory Impact Review” and in part because the modifications are procedural updates of previously specified information.

Whether or not a change of a particular element of Halibut PSC limits in the BSAI will require an FMP amendment, a regulatory amendment, or can be changed in the Spec’s Process, will depend on the specific modification:

- If: 1) the element in question is not directly in the FMP language, 2) the element cannot be calculated from other elements or formulae in the FMP, and 3) the FMP provides the authority to NMFS to make the change, then an FMP Amendment is not generally required—a Regulatory Amendment would probably be sufficient.
- If authority to specify the element has been specifically identified as part of the Spec’s Process, then the element can be changed through the Spec’s Process and the Regulatory Amendment updating the Annual Specification.
- If neither of the previous two conditions is met, then the change to the element will almost certainly require an FMP Amendment.

### Changing Overall Halibut PSC Limits

Table 3 above reproduced these overall halibut PSC limits for 2012 from Table 8 on the NMFS-AKR web page (NMFS-AKR, 2012). The Non-trawl PSC Total is 900 mt, 7.5 percent (67.5 mt) of which is set aside as CDQ PSQ, and the remainder is apportioned to the other non-trawl fisheries.

To determine whether the 900 mt can be changed without an FMP Amendment, we searched the BSAI FMP (NMFS-AKR, 2011) for references to this element (noting that all of the sections of the FMP that contain applicable to halibut PSC limit or the setting of such limits has been excerpted into Section 4.1 below.) The following language was found in Section 3.6.2.1.4:

*Annual BSAI-wide Pacific halibut bycatch mortality limits for trawl and non-trawl gear fisheries will be established in regulations and may be amended by regulatory amendment.*

The FMP language very clearly gives authority to change the limit for non-trawl fisheries through a regulatory amendment. The FMP also does not make specific reference to a non-trawl portion of the CDQ PSQ. The FMP does however specify (in Section 3.7.4.6) that the total CDQ PSQ (i.e. non-trawl

<sup>4</sup> It should be noted that, for the GOA Groundfish FMP, the Council appears to have rejected the annual groundfish harvest specification process as the mechanism for revising GOA halibut PSC limits. Instead the Council is considering an FMP Amendment that will follow the process used in the BSAI.

CDQ PSQ + trawl CDQ PSQ) shall be set at 393 mt in 2010 and all years thereafter. The specific percentage of the non-trawl Halibut PSQ is only specified in regulation, and apparently could be altered through a regulatory amendment.

In theory, the non-trawl CDQ PSQ could be set as high as 393 mt without an FMP amendment. However, because this would effectively eliminate the trawl CDQ fishery, and would not meet other criteria for setting halibut PSC limit specified in FMP Section 3.6.2.1.4, such a large change would undoubtedly require an FMP Amendment.

Changing the trawl halibut PSC limits for the non-CDQ fisheries could **not** be accomplished without an FMP amendment. This is because the FMP language implementing Amendment 80 (see Section 3.7.5.2.1) specifies that that, in 2012 and all years thereafter, the halibut PSC limit for AM80-CPs shall be at 2,325, and the halibut PSC limit for the BSAI trawl limited access fishery shall be 875 mt.

### **Changing Apportionment of Trawl Halibut PSC Limits by Fishery**

The apportionments of the 2012 trawl halibut PSC limits among various trawl limited access fisheries and among A80 cooperatives are shown in Table 4 and Table 5 respectively. The percentage splits of the trawl limited access PSC limits to various target fisheries such as pollock, Pacific cod, and yellowfin sole are determined in the Annual Specification Process once TACs levels are determined. In setting apportionment to each target fishery group, NMFS and the Council also take into consideration of the recommendations of industry representatives. Changing the non-binding nature of the Pollock/Atka Mackerel/Other Species apportionment for the limited access trawl vessels would most likely require a full regulatory amendment.

Similarly, the apportionment of the A80 trawl halibut PSC limits among cooperatives is determined by NMFS in the Annual Specification process based on the proportion of Cooperative Quota (CQ) for each Amendment 80 species held by each cooperative and the historical PSC mortality rates for each Amendment 80 species during the QS history years (1998-2004).

### **Changing Seasonal and Fishery Apportionments of Non-Trawl Halibut PSC Limits**

As shown Table 6 above (adapted from NMFS Table 8D) the apportionment of halibut PSC limits among CPs and CVs by season in Pacific cod fishery and for all harvesters using non-trawl gear to target other species.

Section 3.6.2.3.2 of the FMP specifically deals with apportionments and seasonal allocations of halibut PSC limits for trawl and non-trawl fisheries in the BSAI.

“Apportionments of PSC limits to target fishery categories established in Section 3.6.2.3.1 and seasonal allocations of those apportionments may be determined annually by the Secretary of Commerce, after consultation with the Council, using the following procedure...”

For non-trawl fisheries it is clear that the Annual Specification Process can be used make changes to the seasonal allocations and to the apportionment between the Pacific Cod fishery and other non-trawl targets.

## 4.1 Excerpted Sections of the BSAI Groundfish FMP Containing Language or Reference to Halibut PSC Limits

Sections of the BSAI FMP (NMFS-AKR, 2011) relevant to halibut PSC limits are included in the text boxes below.

### 3.6.1 Prohibited Species

Pacific halibut, Pacific herring, Pacific salmon and steelhead, king crab, and Tanner crab are prohibited species and must be avoided while fishing for groundfish and must be returned to the sea with a minimum of injury except when their retention is required or authorized by other applicable law.

Groundfish species and species groups under this FMP for which the TAC has been achieved shall be treated in the same manner as prohibited species.

*...Text has been excluded...*

### 3.6.2 Prohibited Species Catch Limits

When a target fishery, as specified in regulations implementing the FMP, attains a prohibited species catch (PSC) limit apportionment or seasonal allocation as described in the FMP (Section 3.6.2) and specified in regulation implementing the FMP, the bycatch zone(s) or management area(s) to which the PSC limit apportionment or seasonal allocation applies (described in Section 3.6.2.2) will be closed to that target fishery (or components thereof) for the remainder of the year or season, whichever is applicable. The procedure for apportioning PSC limits described in Section 3.6.2.3 does not apply to PSC assigned to the CDQ Program (Section 3.7.4), to a non-AFA trawl catcher/processor cooperative (Section 3.7.5), or to the BS Chinook salmon PSC limit (Section 3.6.2.1.6).

#### 3.6.2.1 Individual Species Limits

The following species have PSC limits specified either in the FMP or in regulations implementing the FMP: red king crab, *Chionoecetes bairdi*, *C. opilio*, Pacific halibut, Pacific herring, Chinook salmon, and other salmon.

*...Text has been excluded...*

#### 3.6.2.1.4 Pacific Halibut

Annual BSAI-wide Pacific halibut bycatch mortality limits for trawl and non-trawl gear fisheries will be established in regulations and may be amended by regulatory amendment. When initiating a regulatory amendment to change a halibut bycatch mortality limit, the Secretary, after consultation with the Council, will consider information that includes:

1. estimated change in halibut biomass and stock condition;
2. potential impacts on halibut stocks and fisheries;
3. potential impacts on groundfish fisheries;
4. estimated bycatch mortality during prior years;
5. expected halibut bycatch mortality;
6. methods available to reduce halibut bycatch mortality;
7. the cost of reducing halibut bycatch mortality; and
8. other biological and socioeconomic factors that affect the appropriateness of a specific bycatch mortality limit in terms of FMP objectives.

...Text has been excluded ...

#### 3.6.2.3 Apportionment of Prohibited Species Catch Limits

This section describes the procedure for apportioning PSC limits. This procedure does not apply to PSC assigned to the CDQ Program (Section 3.7.4), to a non-AFA trawl catcher/processor cooperative (Section 3.7.5), or to the BS Chinook salmon PSC limit (Section 3.6.2.1.6).

##### 3.6.2.3.1 Target Fishery Categories

Trawl fisheries: The Pacific halibut PSC limit for trawl gear and the PSC limits for *C. bairdi* crab, *C. opilio* crab, red king crab, and herring apply to trawl fisheries for groundfish that are categorized by target species or species groups.

Non-trawl fisheries: The Pacific halibut PSC limit for non-trawl gear applies to non-trawl groundfish fisheries that may be categorized by target species or species groups, gear type, and area.

Fishery categories will be implemented by regulations that implement the goals and objectives of the FMP, the Magnuson-Stevens Act, and other applicable law. Fishery categories will remain in effect unless amended by regulations implementing the FMP. When recommending a regulatory amendment to revise fishery categories, the Council will consider the best information available on whether recommended fishery categories would best optimize groundfish harvests under the PSC limits established under Section 3.6.2.



### 3.6.2.3.2 Apportionments and Seasonal Allocations

Apportionments of PSC limits to target fishery categories established in Section 3.6.2.3.1 and seasonal allocations of those apportionments may be determined annually by the Secretary of Commerce, after consultation with the Council, using the following procedure:

1. Prior to the October Council meeting. The Plan Team will provide the Council the best available information on estimated prohibited species bycatch and mortality rates in the target groundfish fisheries, and estimates of seasonal and annual bycatch rates and amounts.
2. October Council meeting. While recommending proposed groundfish harvest levels under Section 3.2.2, the Council will also review the need to control the bycatch of prohibited species and will recommend appropriate apportionments of PSC limits to fishery categories as bycatch allowances. Fishery bycatch allowances are intended to optimize total groundfish harvest under established PSC limits, taking into consideration the anticipated amounts of incidental catch of prohibited species in each fishery category. The Council may recommend exempting specified non-trawl fishery categories from the non-trawl halibut bycatch mortality limit restrictions after considering the same factors (1) through (8) set forth under Section 3.6.2.1.4. The Council will also review the need for seasonal apportionments of fishery bycatch allowances.

The Council will consider the best available information when recommending fishery apportionments of PSC limits and seasonal allocation of those apportionments. Types of information that the Council will consider relevant to seasonal allocation of fishery bycatch quotas include:

- a. seasonal distribution of prohibited species;
  - b. seasonal distribution of target groundfish species relative to prohibited species distribution;
  - c. expected prohibited species bycatch needs on a seasonal basis relevant to changes in prohibited species biomass and expected catches of target groundfish species;
  - d. expected bycatch rates on a seasonal basis;
  - e. expected changes in directed groundfish fishing seasons;
  - f. expected start of fishing effort; and
  - g. economic effects of establishing seasonal halibut allocations on segments of the target groundfish industry.
3. As soon as practicable after the Council's October meeting, the Secretary will publish the Council's recommendations as a notice in the Federal Register. Information on which the recommendations are based will also be published in the Federal Register or otherwise made available by the Council. Public comments will be invited by means specified in regulations implementing the FMP.
  4. Prior to the December Council meeting. The Plan Team will prepare for the Council a final SAFE report under Section 3.2.3.1.2 which provides the best available information on estimated prohibited species bycatch rates in the target groundfish fisheries, recommendations for halibut PSC limits and apportionments thereof among the target fisheries and gear types, and also may include an economic analysis of effects of the apportionments.



5. December Council meeting. While recommending final groundfish harvest levels, the Council reviews public comments, takes public testimony, and makes final decisions on apportionments of PSC limits among fisheries and seasons, using the factors (a) through (g) set forth under (2) above. The Council also makes final decisions on the exemption of any non-trawl fishery category from halibut bycatch mortality restrictions using the factors (1) through (8) set forth under Section 3.6.2.1.4.
6. As soon as practicable after the Council's December meeting, the Secretary will publish the Council's final decisions as a notice in the Federal Register. Information on which the final recommendations are based will also be published in the Federal Register or otherwise made available by the Council.

### **3.7.4 Community Development Quota Multispecies Fishery**

*...Text has been excluded...*

#### **3.7.4.6 Prohibited Species Allocations**

The following allocations of the PSC limits will be made to the CDQ Program:

Halibut:	In 2008 and 2009, 343 mt of mortality. In 2010 and thereafter, 393 mt of mortality.
Crab:	10.7 percent of each crab PSC limit in the BSAI.
Chinook salmon:	7.5 percent of the Chinook salmon PSC limit in the AI. For either Bering Sea Chinook salmon PSC limit established at Section 3.6.2.1.6, 9.3% of the A season apportionment and 5.5% of the B season apportionment.
Non-Chinook salmon:	10.7 percent of the non-Chinook salmon PSC limit in the BSAI.

**3.7.5 Amendment 80**

...Text has been excluded...

**3.7.5.2 PSC Allowance for the Non-AFA Trawl Catcher Processor Sector and the CDQ Program**

**3.7.5.2.1 Allocation Formula**

The trawl PSC limit for halibut, Zone 1 red king crab, *C. opilio* crab PSC (COBLZ), Zone 1 *C. bairdi* crab PSC, and Zone 2 *C. bairdi* crab PSC is apportioned between the non-AFA trawl CP and the BSAI trawl limited access sector as follows:

Sector	Year after implementation.	Halibut PSC limit in the BSAI (mt)	Zone 1 Red king crab PSC limit...	<i>C. opilio</i> crab PSC limit (COBLZ)...	Zone 1 <i>C. bairdi</i> crab PSC limit...	Zone 2 <i>C. bairdi</i> crab PSC limit...
			as a percentage of the total BSAI trawl PSC limit after allocation as PSQ			
Amendment 80 sector	Year 1	2,525 mt	62.48	61.44	52.64	29.59
	Year 2	2,475 mt	59.36	58.37	50.01	28.11
	Year 3	2,425 mt	56.23	55.30	47.38	26.63
	Year 4	2,375 mt	53.11	52.22	44.74	25.15
	Year 5 and all future years	2,325 mt	49.98	49.15	42.11	23.67
BSAI trawl limited access	All years	875 mt	30.58	32.14	46.99	46.81

**3.7.5.3 Rollover of ITAC, PSC, and ICA**

**3.7.5.3.1 Target species ITAC, ICA, and PSC rollover:**

1. Any un-harvested portion of the yellowfin sole, rock sole, flathead sole, Atka mackerel, Aleutian Islands Pacific ocean perch, and Pacific cod ITAC or ICA or unused portion of PSC in the BSAI trawl limited access fishery that is projected to remain unused may be rolled over to non-AFA trawl catcher/processor cooperatives. The distribution of any rollover to a cooperative shall be proportional to the amount of CQ initially issued to that cooperative for that year.
2. Any rollover of halibut PSC to non-AFA Trawl CP cooperatives shall be discounted by 5%. Once the initial allocation has been determined, the non-AFA trawl CP cooperatives may re-allocate the PSC among the target species.
3. NMFS shall evaluate the possibility of rolling over unused ITAC, ICA, or PSC as it deems appropriate. In making its determination, NMFS shall consider current catch and PSC usage, historic catch and PSC usage, harvest capacity and stated harvest intent, as well as other relevant information.

*...Text has been excluded...*

### **3.7.5.5.1 Cooperative Formation**

*...Text has been excluded...*

*Cooperative quota (CQ) allocations.*

Each cooperative will receive an amount of yellowfin sole, rock sole, flathead sole, Atka mackerel, Aleutian Islands Pacific ocean perch, and Pacific cod ITAC equal to the sum of the QS held by the members of a cooperative divided by the total QS held by all persons and multiplied by the ITAC assigned to the non-AFA trawl catcher/processor sector for that year.

1. The cooperative will receive an amount of crab and halibut PSC based on:
2. The amount of PSC assigned to the non-AFA trawl catcher/processor sector in a year is based on:
  - the amount of PSC that has historically been used during the target fishery for each Amendment 80 species from 1998-2004.
  - The amount of PSC assigned to a cooperative is based on the proportion of CQ for each species held by the cooperative.
3. Once PSC is assigned to a cooperative it may be used while fishing for any groundfish species in the BSAI. PSC assigned to a cooperative is not subject to seasonal apportionment.

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# A Quantitative Examination of Halibut Mortality in BSAI Groundfish Fisheries

**Discussion Paper**

*Prepared for*

**North Pacific Fishery Management Council**

**May 2012**

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# 1 Introduction

The purpose of this report is to provide information regarding the bycatch of Halibut Prohibited Species Cap (PSC) in the Bering Sea Aleutian Islands (BSAI) from 2003–2011. The information presented is based on Catch Accounting System (CAS) data provided by AKFIN to Northern Economics at the request of the North Pacific Fishery Management Council (NPFMC) on April 20, 2012. The data show monthly totals of catch and halibut PSC by groundfish target fisheries by three-digit management zone and sector. The data also include estimates of the wholesale product value generated by the retained groundfish—these are estimates based on Commercial Operator Annual Reports (COAR) data and weekly or daily production reports submitted by processors. In general the data as provided did not as differentiate between Community Development Quota (CDQ) harvests and non-CDQ harvests. A second data feed was provided that enabled calculation of whether halibut mortality limits have been reached and these data did differentiate between CDQ and non-CDQ harvests. The discussions of the tables and figures that follow will note whether CDQ harvests are included.

## Sector Definitions Used in this Report

In order to facilitate a detailed examination of the differences in catch and bycatch rates, the data were provided at a relatively high level of detail with respect to sectors. The data include the following sectors:

- A80-CPs: These are non-American Fisheries Act (AFA) trawl catcher processors (CPs). With passage of the Amendment 80 they were allowed to form cooperatives. The data for pre-2008 years include all non-AFA trawl CPs regardless of whether they qualified to participate in the BSAI under A80.
- AFA-CPs: These are trawl CPs that are allowed to fish for pollock in the BSAI under AFA.
- AFA-MCVs: These are trawl catcher vessels (CVs) that are allowed to fish for pollock in the BSAI under AFA that deliver their fish to motherships or to CPs. Note that there may be some AFA-MCVs that also deliver to shore plants—their landings in these cases are not counted among landings for AFA-MCVs.
- AFA-CVs: These are trawl CVs that are allowed to fish for pollock in the BSAI under AFA that deliver their fish to shore plants. Note that there may be some AFA-CVs that on occasion deliver to motherships or to CPs—their landings in these cases are counted as AFA-MCVs landings.
- TRW-MCVs: These are non-AFA CVs that deliver their fish to motherships, floating processors or to CPs. Note that there may be some TRW-MCVs that deliver to shore plants—their landings in these cases are not counted among the TRW-MCVs.
- TRW-CVs: These are non-AFA CVs that deliver their fish to shore plants. Note that there may be some TRW-CVs that deliver to motherships or to CPs—their landings in these cases are counted as TRW-MCV landings.
- LGL-CPs: These are CPs that use longline gear. Some of these vessels may on occasion use pot gear—their landings in these cases are not counted among the LGL-CPs.
- LGL-CVs: These are CVs that use longline gear and deliver their harvests to shore plants. Some of these vessels have on occasion used pot gear or have delivered their catch to motherships or floating processors—their landings in these cases are not counted among the LGL-CVs.

- LGL-MCVs: These are CVs that use longline gear and deliver their harvests to motherships or floating processors. Some of these vessels have on occasion used pot gear or have delivered their catch to shore plants—their landings in these cases are not counted among the LGL-MCVs.
- POT-CPs: These are CPs that use pot gear. Some of these vessels may on occasion use longline gear—their landings in these cases are not counted among the POT-CPs.
- POT-CVs: These CVs use pot gear and deliver their harvests to shore plants. Some of these vessels have on occasion used longline gear or have delivered their catch to motherships or floating processors—their landings in these cases are not counted among the POT-CVs.
- POT-MCVs: These CVs use longline gear and deliver their harvests to motherships or floating processors. Some of these vessels have on occasion used longline gear or have delivered their catch to shore plants—their landings in these cases are not counted among the POT-MCVs.

In many cases throughout this report the data are aggregated to include multiple sectors. For example, the report summarizes catch and bycatch of the BSAI Trawl Limited Access sector. In this case the report aggregates data from AFA-CPs, AFA-MCVs, AFA-CVs, TRW-CVs, and TRW-MCVs. When aggregations of multiple sectors are used, the report will specifically indicate the included sectors.

### **Road Map to Remaining Sections of this Report**

- Section 2 contains a brief summary or closure summary due to halibut PSC Limits
- Section 3 contains an overview of historical bycatch amounts relative to current PSC limits
- Section 4 contain summaries of halibut bycatch mortality in by sector in BSAI target fisheries for pollock, Pacific cod and yellowfin sole, as well as a summary of halibut bycatch mortality in fisheries prosecuted by the Amendment 80 CPs.

## 2 Halibut Related Closures from 2000 – 2011 in the BSAI

This section provides a summary of halibut related in-season closures to directed fishing for groundfish species in the BSAI from 2000 – 2011. The summary is based on a spreadsheet developed by Northern Economics that captures in-season closure data from the Status of Fisheries section of NMFS-AKR web page at <http://www.fakr.noaa.gov/sustainablefisheries/default.htm>.

**Table 1. Directed Fishing Closures Resulting from Halibut PSC in the BSAI, 2000–2011**

Gear	Sector	Area	FMP Sub-Area	Species Code	Constraint Type	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011			
						Number of Halibut Related Directed Fishing Closures														
HAL	CPs	BSAI	ALL	PCOD	Constraint		1													
	CVs < 60 ft	BSAI	ALL	PCOD	Constraint		1													
	CVs >= 60 ft	BSAI	ALL	PCOD	Constraint		1													
<b>HAL Total</b>							<b>3</b>													
Trawl	All	BSAI	ALL	AKPL	Constraint			1		1		1								
					Seasonal			2			2	2	3							
				FSOL	Constraint							1	1	1						
					Seasonal							1	2	2	3					
				OFLT	Constraint							1		1						
					Seasonal							1	2	2	3					
				RSOL	Constraint				1	1	1	1	1		1					
					Seasonal				2	2	2	1		2	2	3				
				YSOL	Constraint									1			1			
					Seasonal											2	1			
								Not Listed								2	1			
					CPs	BSAI	ALL	PCOD	Constraint			1	1		1	2				
									Not Listed							1				
					CVs	BSAI	ALL	PCOD	Constraint			1	1		1	2	1			
					Not Listed							1								
A80 LA	AI	ALL	TURB	Constraint												1				
				Constraint												1				
	BS	ALL	TURB	Constraint												1				
				Constraint												1				
	BSAI	ALL	ARTH	Constraint													1			
				Constraint														1		
				Constraint											1				1	
				Constraint											1				1	
				Seasonal													1			
				Constraint												1				
BSAI TLA	AI	Central	POP	Not Listed													1			
				Not Listed													1			
				Not Listed														1		
				Not Listed														1		
BS	ALL	TURB	Not Listed														1			
			Not Listed														1			
BSAI	ALL	AKPL	Not Listed														1			
			Not Listed														1			
			Not Listed														1			
			Not Listed														1			
<b>Trawl Total</b>						<b>3</b>	<b>5</b>	<b>11</b>	<b>8</b>	<b>6</b>	<b>12</b>	<b>20</b>	<b>15</b>	<b>5</b>	<b>6</b>	<b>3</b>	<b>9</b>			
<b>Grand Total</b>						<b>3</b>	<b>8</b>	<b>11</b>	<b>8</b>	<b>6</b>	<b>12</b>	<b>20</b>	<b>15</b>	<b>5</b>	<b>6</b>	<b>3</b>	<b>9</b>			

Notes: "A80 LA" is the Amendment 80 Limited Access Fleet; "BSAI TLA" is the BSAI Trawl Limited Access Fleet.

### 3 Historical Bycatch Amounts Relative to Current PSC Limits

In this section, current specifications for halibut PSC limits are identified, along with apportionments to sectors within the baseline limits. The limits are shown in Table 2–Table 4. Following this we summarize halibut PSC totals for various sectors and fisheries for the years 2003–2011.

Table 2 shows the 2012 apportionment of Halibut PSC to gear groups (non-trawl and trawl), CDQs, and sectors (Amendment 80 and trawl limited access). The Non-trawl PSC limit is 900 metric tons (mt) of which 67 mt are apportioned to non-trawl CDQs. The second section of Table 2 shows the division of the 3,675 mt total trawl PSC limit. The trawl PSC limit is subdivided between non-CDQ trawl fisheries (3,349 mt) and CDQ trawl fisheries (326 mt). The third section of the table shows the division of the non-CDQ trawl PSC limit. Amendment 80 (implemented for fishing year 2008) phased in a reduced usage of overall 3,675 mt trawl PSC limit for halibut mortality. The 3,349 mt of halibut PSC remaining for the non-CDQ trawl fisheries is apportioned between the A80-CPs, and the BSAI Trawl Limited Access Sector—comprising AFA CV & CP plus all non-AFA trawl CVs. The final component is the unallocated 150 mt of PSC that was built into Amendment 80.

**Table 2. Apportionment of Halibut PSC Limits to Gear Groups, CDQs and Sectors - 2012**

Halibut Mortality Limits (MT)	Non-trawl PSC			Trawl PSC			Amendment 80 sector	BSAI trawl limited access fishery	Amendment 80 based reductions (unallocated)
	Total non-trawl PSC	Non-trawl CDQ PSQ	Non-trawl PSC Remaining after CDQ PSQ	Total trawl PSC	Trawl CDQ PSQ reserve	Trawl PSC Remaining after CDQ PSQ			
	900	67	833	3,675	326	3,349	2,325	875	150

Source: Adapted by Northern Economics from Table 8A "Groundfish Harvest Specification Tables." (NMFS AKR, 2012)

Table 3 is adapted from NMFS Table 8D and shows the apportionment of the non-trawl halibut PSC limit. It should be noted that vessels using pot or jig gear are exempt from PSC limits, as are vessels fishing in the sablefish Individual Fishing Quota (IFQ) fishery. The apportionment for the Pacific cod fishery is split between CVs and CPs and by season—760 mt are allocated to the hook and line CPs and the remaining 15 mt are allocated to CVs. There are also three seasonal apportionments with 60 percent allocated to the Jan 1–June 10 season. A total of 58 mt of halibut PSC are apportioned for use in all other non-trawl targets (e.g. Greenland turbot, rockfish), but these are not apportioned between CPs and CVs or by seasons. These apportionments have been stable since 2008 and implementation of the Amendment 85.

**Table 3. Apportionment of Halibut PSC Limits among Non-Trawl Harvesters and Seasons– 2012**

		Total	Non-trawl CPs	Non Trawl CVs
<b>All Non-Trawl</b>	<b>Season</b>	<b>833</b>	Not fully apportioned between CPs/CVs	
<b>Pacific Cod</b>	<b>Total</b>	<b>775</b>	<b>760</b>	<b>15</b>
	01/01 - 06/10	465	455	10
	06/10 - 08/15	193	190	3
	08/15 - 12/31	117	115	2
<b>All Other Targets</b>	05/01 - 12/31	<b>58</b>	Not apportioned between CPs/CVs	

Note: Groundfish pot and jig harvesters are exempt from halibut PSC limits, as are participants in the Sablefish hook and line IFQ fishery.

Source: Adapted by Northern Economics from Table 8D "Groundfish Harvest Specification Tables." (NMFS AKR, 2012)

Table 4 below shows the 2012 apportionment to target fisheries of the 875 mt PSC limit for trawlers operating under limited access. The apportionment can vary from year to year and is set in the annual specification process. The PSC limits shown in Table 4 are all binding constraints with the exception of the 250 mt apportionment for Pollock/Atka mackerel, and Other Species. If the halibut PSC in fisheries for pollock, Atka mackerel or for “Other Species” reaches the PSC Limit (250 mt in 2012), then technically, directed fishing for pollock with non-pelagic gear is prohibited. However, directed fishing for pollock with non-pelagic gear at all-times was prohibited under Amendment 57, which was fully implemented in 2000. In effect, the PSC limit for pollock, Atka mackerel or “Other Species” is non-binding and its attainment does not cause NMFS to issue any closures to directed fishing.

**Table 4. Apportionment of Halibut PSC Limits for Trawl Limited Access Harvesters–2012**

Total Halibut PSC Mortality	Yellowfin Sole	Rock Sole/ flathead sole/ other flatfish <sup>1</sup>	Turbot/ arrowtooth/ sablefish <sup>2</sup>	Rockfish (04/15 - 12/31)	Pacific cod	Pollock/ Atka mackerel/ other species <sup>3</sup>
<b>Metric Tons of Halibut Mortality</b>						
875	167	0	0	5	453	250

Table Notes:

<sup>2</sup> “Other flatfish” for PSC monitoring includes all flatfish species, except for halibut (a prohibited species), flathead sole, Greenland turbot, rock sole, yellowfin sole, Kamchatka flounder and arrowtooth flounder.

<sup>3</sup> Arrowtooth flounder for PSC monitoring includes Kamchatka flounder.

<sup>4</sup> “Other species” for PSC monitoring includes sculpins, sharks, skates, and octopuses.

Source: Adapted by Northern Economics from Table 8C “Groundfish Harvest Specification Tables.” (NMFS AKR, 2012)

Table 5 shows the five-year phase-in of additional reductions in halibut PSC limits for the A80-CPs. In 2008, the first year of operations under Amendment 80, A80-CPs were allocated 2,525 mt of halibut PSC. The apportionment is divided between individual A80 cooperatives and the A80 limited access fishery. The A80 limited access fishery is for A80-CPs that are not members of A80 cooperatives. In the first two years of the program (2008–2010) there were vessels in the A80 limited access fishery, but since 2011, all A80-CPs have been members of one of two A80 cooperatives.

**Table 5. Annual Reductions in PSC Limits for Amendment 80 CPs**

2008	2009	2010	2011	2012	2013 +
<b>Halibut Mortality PSC Limits (mt)</b>					
2,525	2,475	2,425	2,375	2,325	2,325

Source: Adapted by NEI from “Bering Sea and Aleutian Islands Groundfish Fishery Management Plan.” (NMFS AKR 2011).

Table 6 and Figure 1 show halibut mortality by major apportionment groups from 2003–2011. Between 2003 and 2007 total halibut mortality by the all groups was relatively flat ranging between 3,932–4,158 mt with an average of 4,036 mt. In 2008 there was a significant drop due primarily to reduced mortality by the A80-CPs. From 2008–2011 total annual halibut PSC mortality in all groups has averaged 3,452 mt. Since 2008 the A80 CPs have had an average mortality of 2,098 mt, while the BSAI Trawl Limited Access Fishery and the LGL CVs & CPs have had average annual halibut PSC mortality totals of 676 mt and 650 mt respectively.

It should be noted that the data presented in Table 6 with respect to halibut bycatch rates for the CDQ groups appears to be quite low given the amounts of harvests in CDQ target fisheries. For example, the bycatch rate in all CDQ flatfish fisheries from 2004–2011 is estimated in these data to

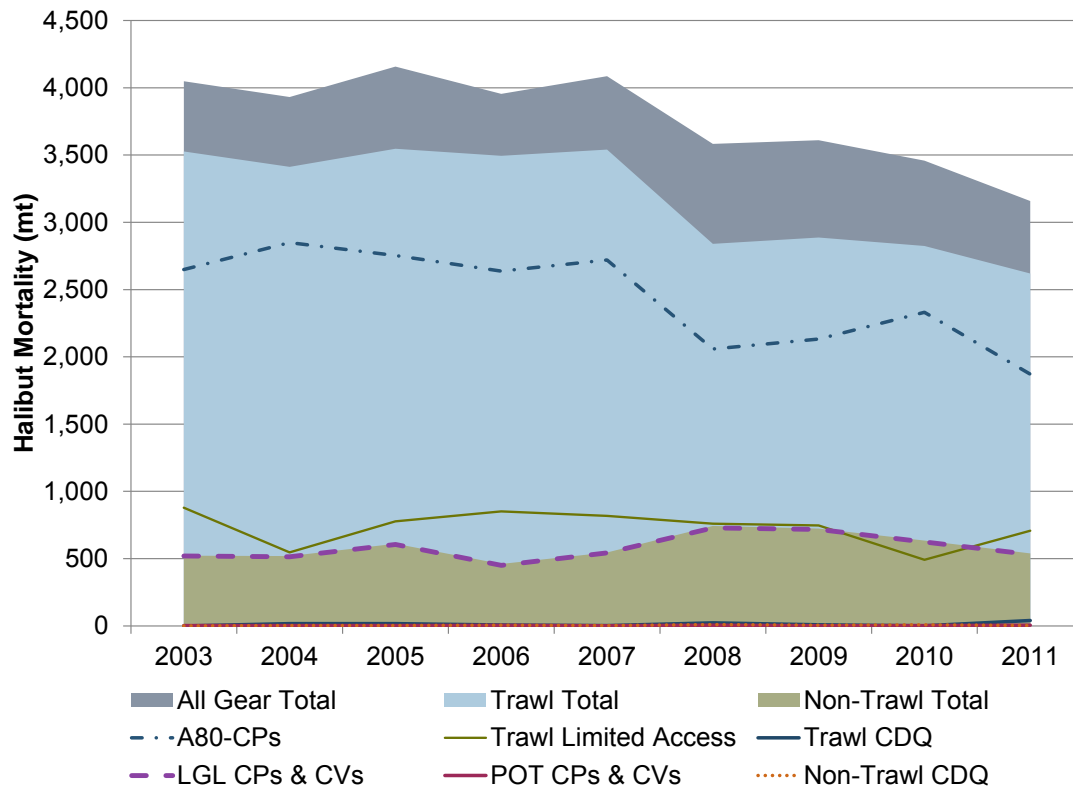
have been 0.02 percent, a level well below rates seen in the AFA pollock fisheries. These data may reflect actual bycatch rates, or they may reflect an issue with the CAS system. In any case, additional investigation into these rates will be undertaken. Also note that no other tables and figures in this report attempt to separate out CDQ bycatch from non-CDQ bycatch.

**Table 6. Total Halibut PSC Mortality by Major Apportionment Groups**

	2003	2004	2005	2006	2007	2008	2009	2010	2011
<b>Trawl Gear</b>	<b>Trawl Halibut PSC Mortality (mt)</b>								
A80-CPs	2,649	2,850	2,753	2,637	2,720	2,058	2,133	2,331	1,871
TRW Limited Access	878	546	778	851	817	759	747	492	708
Trawl CDQ	NA	16	16	7	3	23	8	1	40
<b>Trawl Total</b>	<b>3,527</b>	<b>3,412</b>	<b>3,547</b>	<b>3,494</b>	<b>3,541</b>	<b>2,840</b>	<b>2,887</b>	<b>2,824</b>	<b>2,619</b>
<b>Non-Trawl Gear</b>	<b>Non-Trawl Halibut PSC Mortality (mt)</b>								
LGL CPs & CVs	520	513	605	450	542	729	717	624	531
POT CPs & CVs	2	3	3	4	1	5	0	2	5
Non-Trawl CDQ	NA	3	3	6	3	9	6	8	3
<b>Non-Trawl Total</b>	<b>522</b>	<b>519</b>	<b>611</b>	<b>460</b>	<b>546</b>	<b>743</b>	<b>723</b>	<b>634</b>	<b>539</b>
<b>All Gear Total</b>	<b>4,049</b>	<b>3,931</b>	<b>4,158</b>	<b>3,955</b>	<b>4,086</b>	<b>3,583</b>	<b>3,610</b>	<b>3,458</b>	<b>3,158</b>

Source: Developed by Northern Economics based on CAS data from AKFIN.

**Figure 1. Halibut Mortality by Major Apportionment Groups, 2003–2011**



Note: The lines for halibut mortality of Pot CPs & CVs, Non-Trawl CDQ and Trawl CDQs are very close to zero and are difficult to discern from the horizontal axis. Also note that halibut mortality in Pot fisheries are exempt from halibut PSC limits.

Source: Developed by Northern Economics based on CAS data from AKFIN.

Information on this page and the next summarizes halibut PSC mortality in the context of PSC allowances for target fisheries that are currently in effect. Additional details for specific sectors and fisheries will be provided in Sections 3 and 4.

Table 7 summarizes halibut PSC mortality by trawl vessels that were not specifically qualified under Amendment 80. The largest portion of the halibut bycatch for these vessels now occurs in the pollock/Atka mackerel fisheries,<sup>1</sup> but prior to 2008 the majority of PSC catches occurred in target fisheries for Pacific cod.<sup>2</sup> Prior to 2008, trawl halibut PSC limits were not specifically set for the BSAI trawl limited access fishery.<sup>3</sup> After implementation of Amendment 80, the trawl halibut PSC limit was split between AM80-CPs and BSAI trawl limited access vessels. Since 2008, allowances to the “Rock Sole/flathead sole/other flatfish” fisheries and to the Arrowtooth/Kamchatka have been set at zero each year, while allowances to rockfish fisheries have been set at 5 mt or less.

Halibut PSC mortality in the “Rock Sole/flathead sole/other flatfish” fisheries has been greater than zero every year since 2008, in spite of the fact that NMFS AKR prohibits directed fishing for these species by vessels in the BSAI limited access fishery. This can be explained by noting that a vessel’s catch report for a given tow or for a given day may indicate that it was targeting a particular species, while directed fishing standards are calculated over a longer period—the entire trip for a CV, or the entire week for a CP. The longer period provides vessels a buffer with which they can get back into compliance with directed fishing standards, even if a single tow might have exceeded Maximum Retainable Allowance (MRA) rules.

**Table 7. Halibut PSC Mortality in the BSAI Trawl Limited Access Fisheries, 2003 - 2011**

	2003	2004	2005	2006	2007	2008	2009	2010	2011
<b>Halibut PSC Mortality (mt) in Trawl Limited Access Fisheries</b>									
Rock Sole/flathead sole/other flatfish	1	0	1	24	18	13	47	2	40
Arrowtooth/Kamchatka	0	0	0	0	0	0	0	0	3
Pollock/Atka mackerel/other species	74	90	111	118	285	294	416	206	324
Rockfish	0	1	0	0	0	2	2	0	4
Yellowfin Sole	2	4	16	93	58	157	99	27	93
Pacific Cod	801	452	650	616	456	293	183	257	244
<b>All Targets</b>	<b>878</b>	<b>546</b>	<b>778</b>	<b>851</b>	<b>817</b>	<b>759</b>	<b>747</b>	<b>492</b>	<b>708</b>

Source: Developed by Northern Economics based on CAS data from AKFIN.

Table 8 summarizes halibut PSC mortality of Amendment 80 vessels in target fisheries using pre-Amendment 80 definitions. After 2008, with implementation of Amendment 80, A80-CPs participating in cooperatives were not constrained by target fishery or seasonal allowances. As indicated earlier, all A80-CPs have participated in cooperatives since 2011. The significant decrease in halibut mortality in the target fisheries for Pacific cod beginning in 2008 can be at least partially explained by the reduced apportionment of the Pacific cod Initial Total Allowable Catch (ITAC) to all trawl fisheries under Amendment 85. According to industry sources, A80-CPs now see Pacific cod as a

<sup>1</sup> Harvest specifications prohibit BSAI trawl limited access vessels from participating in directed fishing for the “other species” part of this PSC allowance category.

<sup>2</sup> Under Amendment 85 there was a reallocation of the Pacific cod ITAC from trawl vessels to non-trawl vessels and this accounts for at least some of the reduction in halibut mortality in the the trawl limited access fishery after 2007.

<sup>3</sup> Prior to 2008 trawl halibut PSC allowances by target fishery were applied to all trawlers, except in Pacific cod fisheries where allowances were split between CVs and CPs.



constraining species, and are much less likely to participate in Pacific cod target fisheries—in effect A80-CPs try to avoid Pacific cod in much the same way they avoid halibut.

Overall, the A80-CPs have stayed well below their halibut PSC limits since operations under Amendment 80 began. As indicated in Section 2, there have been a few occasions when vessels operating in the A80 Limited Access Fishery have reached PSC limits in particular fisheries—in those cases NMFS made an in-season change precluding vessels from participating in directed fishing.

**Table 8. Halibut PSC Mortality by Amendment 80 Vessels and Target Fisheries, 2003 - 2011**

	2003	2004	2005	2006	2007	2008	2009	2010	2011
<b>Halibut PSC Mortality (mt) by A80 Vessels in Pre-A80 Target Fisheries Specifications</b>									
Rock Sole/flathead sole/other flatfish	1,178	1,033	1,090	1,147	1,357	887	753	1,096	540
Arrowtooth/Kamchatka	61	101	202	144	25	130	239	192	263
Pollock/Atka mackerel/other species	83	65	90	99	210	103	113	114	167
Rockfish	48	51	13	29	17	41	31	57	94
Yellowfin Sole	701	441	575	385	496	850	921	837	791
Pacific Cod	577	1,160	782	833	615	46	76	35	17
<b>All Targets</b>	<b>2,649</b>	<b>2,850</b>	<b>2,753</b>	<b>2,637</b>	<b>2,720</b>	<b>2,058</b>	<b>2,133</b>	<b>2,331</b>	<b>1,871</b>

Source: Developed by Northern Economics based on CAS data from AKFIN.

Table 9 shows the halibut PSC mortality by longline target fisheries as sectors defined by halibut PSC apportionments. The increase in halibut mortality in the non-trawl fisheries for Pacific cod beginning in 2008 can be at least partially explained by the increased apportionment of Pacific cod ITACs to non-trawl fisheries under Amendment 85. As seen in Table 9, the LGL-CPs have been well below their 760 mt mortality limit since 2008. Since 2009, LGL-CVs have used less than 17 percent of their 15 mt halibut mortality limit.

**Table 9. Halibut PSC Mortality in the BSAI Non-Trawl Fisheries, 2003 - 2011**

	2003	2004	2005	2006	2007	2008	2009	2010	2011
<b>Halibut PSC Mortality (mt) in Non-Trawl Non-Exempt Fisheries</b>									
Pacific Cod (LGL-CPs)	495	487	587	430	529	713	707	611	525
Pacific Cod (LGL-CVs)	2	5	6	3	5	12	2	2	1
Other Target Fisheries Total	<b>22</b>	<b>22</b>	<b>12</b>	<b>18</b>	<b>7</b>	<b>4</b>	<b>8</b>	<b>11</b>	<b>4</b>
<b>All Targets</b>	<b>520</b>	<b>513</b>	<b>605</b>	<b>450</b>	<b>541</b>	<b>729</b>	<b>716</b>	<b>624</b>	<b>531</b>

Source: Developed by Northern Economics based on CAS data from AKFIN.



## 4 Halibut Bycatch Mortality in Selected BSAI Target Fisheries

This section presents a series of tables and figures that show the sources of halibut bycatch in groundfish target fisheries by sector in the BSAI for the year 2003–2011. The summary is divided into selected target fisheries and regulatory sectors.

The tables and figures use data from AKFIN as described in the introduction. None of the tables and figures in Section 4 differentiates between CDQ and non-CDQ landings—CDQ groundfish landings and bycatch of halibut are included along with non-CDQ landings and bycatch.

Table 10 provides definitions and description of key variable used in the tables and figures.

**Table 10. Table Key—Definition of Table Sections**

Section Labels	Description	Unit
Halibut Mortality (MT)	The total halibut mortality for the target fishery for the time period	Metric tons
Groundfish Caught in Target Fishery (MT)	The total catch of the groundfish species in the target fishery for the time period	Metric tons
Halibut Bycatch Rate (%)	The total halibut bycatch mortality divided by the total groundfish harvest in the target fishery for the period.	Metric tons per metric ton
Wholesale Value in Target Fishery (\$ millions)	The total value of the groundfish species harvested in the targeted fishery for the period. These values have been normalized to eliminate the variance caused by price changes, exchange rate or product changes over time, and thus use the average value of production per ton of harvest in each target fishery from 2003–2010. Differential values/mt were estimated for various and for roe seasons, (January–March) and the rest of the year.	Nominal U.S. Dollars
Value per Mortality-Ton (\$ millions/Halibut MT)	The total wholesale value of production in the groundfish target fisheries divided by the total halibut bycatch mortality for the period. This value provides an indication of the amount of revenue harvesters and processor generate per ton of halibut bycatch mortality.	Nominal U.S. Dollars per metric ton

Note: Because the calculations of wholesale values are based on nine years of data, there are no issues of confidentiality. In other words, in all cases the number of processors contributing to an estimated value per ton of target catch met or exceeded the minimum number of processors required for release of the data.

### 4.1 Groundfish Harvests, Values and Halibut PSC in Pollock Target Fisheries

This section documents participation in the BSAI pollock target fisheries from 2003–2011 and summarizes catch, halibut bycatch and bycatch rates, as well as wholesale value and wholesale value generated per ton of halibut mortality. The section summarizes catch over several sectors of vessels. Similar sections for Pacific Cod, Atka mackerel, and Yellowfin sole are provided—all of these fisheries have significant participation by more than one sector.

Table 11 shows the number of unique harvesting vessels that participated in BSAI target fisheries for pollock by sector for the years 2003–2011.<sup>4</sup> This type of table is used throughout the analysis to determine whether data for a particular sector or fishery can be released in the report. NMFS

<sup>4</sup> Target fisheries are assigned by NMFS AKR to catch records “after the fact” based on the algorithms specific to each target fishery. In general, for a species to be called the “target,” catch of that species must be greater than any other species. The target fishery is important because it determines the “bin” into which halibut mortality accumulates.

guidelines on confidentiality require that at least three unique harvesting vessels (CVs or CPs) contribute to any catch or value number that is provided to the public. In Table 11 cells that are highlighted and shown in bolded text indicate that catch and value data are confidential.

In addition to the determination of confidentiality, Table 11 provides a useful summary of the size of the various fleets and their variability. The table can also be used as an indicator of participation trends in the fishery over time, particularly when catch data are confidential. As an example, Table 11 shows that there has been a large increase in the number of A80-CPs with catch reports assigned to pollock target fisheries since 2008.

**Table 11. Number of Unique Harvester Vessels in Pollock Target Fisheries by Sector, 2003–2011**

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Unique Number of Harvesting Vessels									
Sector	Pollock								
A80-CP	<b>2</b>	<b>2</b>	6	3	3	17	19	15	15
AFA-CP	16	17	16	16	17	16	14	14	15
AFA-CV	82	83	82	80	81	79	78	80	80
AFA-MCV	16	17	17	17	17	18	17	16	14
LGL-CP	-	<b>1</b>	<b>1</b>	<b>2</b>	-	<b>1</b>	-	-	<b>1</b>
TRW-CV	3	3	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>
TRW-MCV	<b>2</b>	<b>1</b>	-	-	-	-	-	-	-

Note: Shaded cells indicate that catch and value data are confidential and cannot be released.

Source: Developed by Northern Economics based on CAS data from AKFIN.

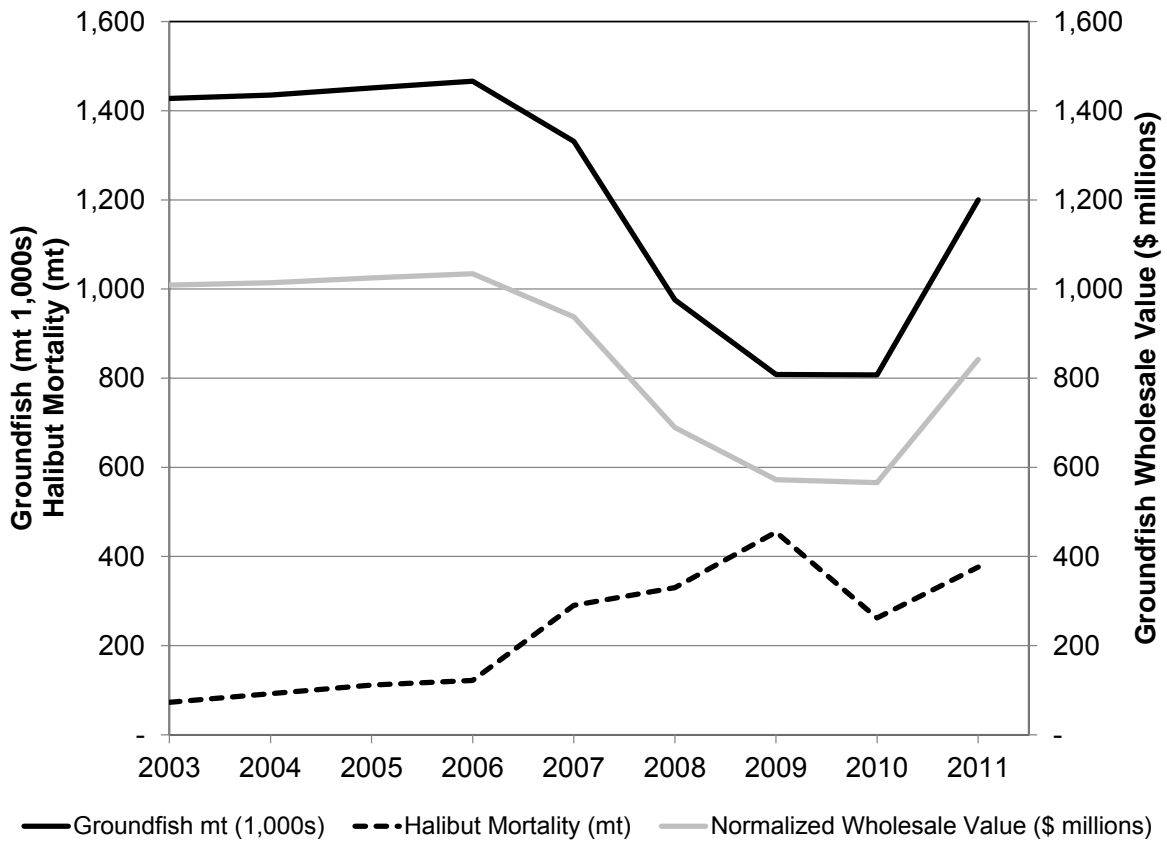
Figure 2 and Table 12 summarize groundfish harvests, wholesale values, and halibut mortality in BSAI pollock fisheries from 2003–2011. The data include harvests in CDQ fisheries. Similar tables and figures will be used for each target fishery or sector that is summarized. The table and figure include information from only the four sectors for which confidential data can be reported.

- Groundfish Caught in Pollock Target Fisheries:** As shown in Figure 2, total groundfish harvests in pollock target fisheries fell significantly beginning in 2007. As seen in Table 12, the three AFA sectors caught the vast majority of the groundfish harvested in pollock fisheries. However, there were also sufficient numbers of A80-CPs whose daily or weekly catch reports were assigned to the pollock target fisheries that they could be reported. While the A80-CPs target pollock harvests do not constitute large volumes relative to the AFA Sectors, the amount is clearly more important since implementation of Amendment 80.
- Halibut Mortality (MT):** Total halibut mortality in pollock target fisheries increased significantly in 2007 and has remained generally high since then. The increases have been seen in each of the four sectors included in Table 12.
- Halibut Bycatch Rate (%):** Halibut bycatch rates show the tons of halibut mortality per ton of groundfish in the target fishery. In general, rates in the pollock target fishery are very low, particularly for AFA harvesters. The highest rate for any AFA sector was 0.07 percent by AFA CPs in 2009. Rates of A80-CPS are at least an order of magnitude higher than AFA vessels. Figure 3 and Figure 4 provide additional information on halibut bycatch rates by sector.
- Wholesale Value in Pollock Target Fisheries (\$ millions):** Prior to 2008, the normalized annual wholesale value in the pollock target fisheries exceeded \$1 billion per year. Since 2008, with lower pollock harvests, normalized wholesale values are significantly lower (\$565.5 million in 2009). It should be noted that the estimates of wholesale value are normalized by using the

average value of products produced per ton of the groundfish target fishery over the entire period. In this way, differences due to inflation, changes in product prices, product mixes, and currency exchange are minimized.

- Value per MT of Mortality (\$ millions/Halibut mt):** This field shows the estimated wholesale value generated in the pollock fishery per ton of halibut mortality. The three AFA sectors all generate well over \$1 million of normalized wholesale revenue for each MT of halibut mortality. It should be noted that over this same period the normalized wholesale value of halibut and groundfish caught as bycatch in the directed halibut fishery in the BSAI was calculated at just over \$6,000 per ton. The average estimated wholesale value per ton of halibut mortality for A80-CPs from 2008–2011 was just under \$50,000. Figure 5 compares groundfish value per ton of halibut mortality by sectors super imposed on bar charts of halibut mortality.

**Figure 2. Harvest, Halibut Bycatch and Normalized Wholesale Value of Groundfish in Pollock Target Fisheries of Included Sectors, 2003 - 2011**



Note: Includes only harvests and values of sectors included in Table 12. Axes values are scaled so that the changes in the different variables are relative

Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

**Table 12. Groundfish and Halibut Harvests in Pollock Target Fisheries, 2003–2011**

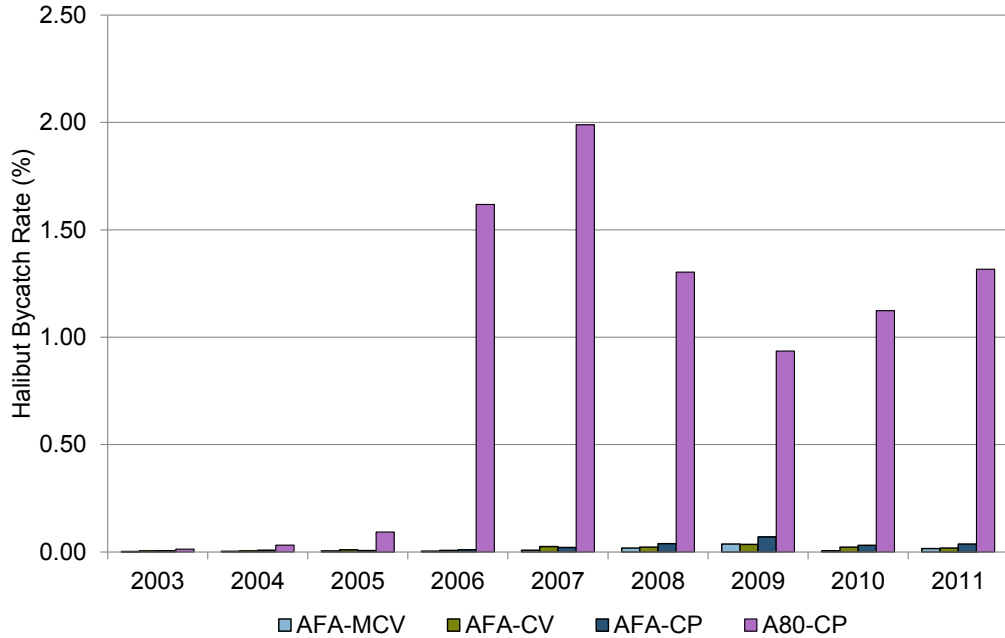
Sector	Year								
	2003	2004	2005	2006	2007	2008	2009	2010	2011
<b>Groundfish Caught in Pollock Target Fisheries (MT)</b>									
AFA-MCV	125,232	146,844	148,067	149,107	142,384	93,914	84,300	71,645	112,223
AFA-CV	645,056	632,263	645,162	647,083	571,502	429,340	356,070	356,683	524,317
AFA-CP	657,263	655,947	657,554	669,844	616,808	449,772	363,500	373,997	559,338
A80-CP	ND	ND	419	175	411	2,959	4,602	5,228	4,155
<b>Halibut Mortality (MT)</b>									
AFA-MCV	3.5	4.3	6.9	5.5	11.9	17.4	31.6	4.4	17.9
AFA-CV	30.7	31.5	62.6	49.3	142.0	98.2	125.1	81.0	97.4
AFA-CP	38.8	56.5	41.5	64.3	128.6	176.0	255.3	118.1	206.2
A80-CP	ND	ND	0.4	2.8	8.2	38.6	43.1	58.8	54.7
<b>Halibut Bycatch Rate (%)</b>									
AFA-MCV	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.01	0.02
AFA-CV	0.00	0.00	0.01	0.01	0.02	0.02	0.04	0.02	0.02
AFA-CP	0.01	0.01	0.01	0.01	0.02	0.04	0.07	0.03	0.04
A80-CP	ND	ND	0.09	1.62	1.99	1.30	0.94	1.12	1.32
<b>Wholesale Value in Pollock Target Fisheries (\$ millions)</b>									
AFA-MCV	80.5	94.7	95.3	96.0	91.9	61.8	54.8	46.2	71.5
AFA-CV	505.4	495.4	505.5	507.0	447.9	336.4	279.0	279.3	410.7
AFA-CP	422.9	423.9	423.8	431.2	397.6	289.5	236.0	237.1	357.8
A80-CP	ND	ND	0.2	0.1	0.3	1.7	2.6	2.9	2.4
<b>Value per Mortality-Ton (\$ millions/Halibut MT)</b>									
AFA-MCV	23.27	22.10	13.81	17.58	7.74	3.56	1.74	10.51	3.99
AFA-CV	16.48	15.74	8.07	10.28	3.15	3.43	2.23	3.45	4.21
AFA-CP	10.89	7.51	10.22	6.70	3.09	1.65	0.92	2.01	1.74
A80-CP	ND	ND	0.63	0.04	0.03	0.04	0.06	0.05	0.04

Note: Wholesale values per ton of groundfish harvested in the pollock fishery have been normalized to reduce the effects of due to inflation, exchange rates and other changes in market prices.

Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

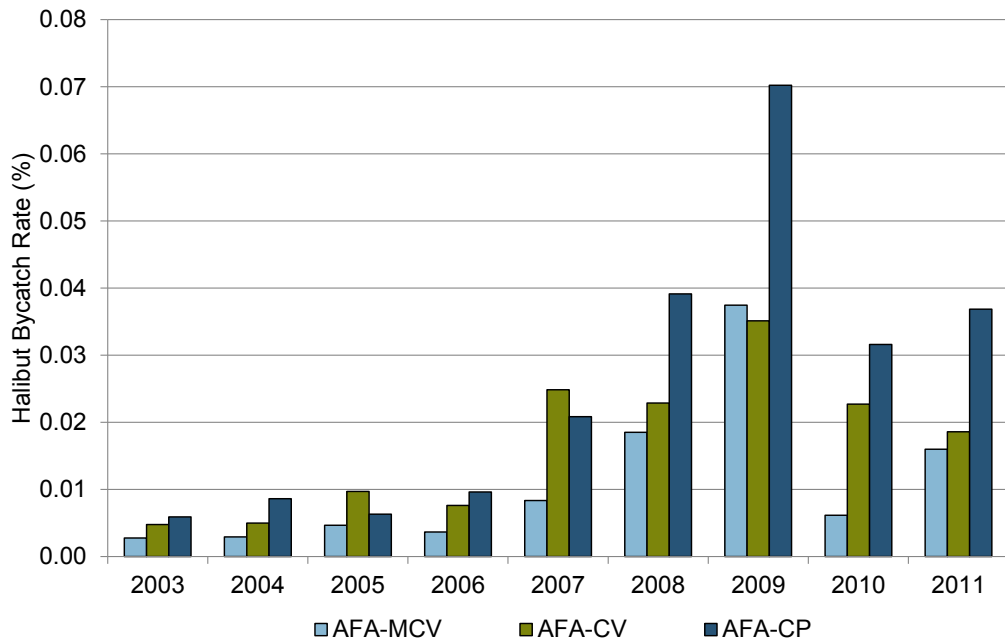
Figure 3 and Figure 4 show halibut bycatch rates in pollock target fisheries—Figure 3 includes A80-CPs, while Figure 4 only shows the bycatch by AFA harvesters. Both figures show the significant increases in halibut bycatch rates in pollock target fisheries.

**Figure 3. Halibut Bycatch Rates in Pollock Target Fisheries by Sector, 2003-2011**



Source:

**Figure 4. Halibut Bycatch Rates in Pollock Target Fisheries by AFA Sector, 2003-2011**



Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

In Figure 3, bycatch rates by A80-CPs are at least an order of magnitude higher than rates of AFA vessels, and thus the changes in bycatch rates of AFA vessels are overshadowed. The significant increase in the amount of pollock harvested by A80-CPs may be more a function of catch accounting and reporting than of a large increase in pollock targeting by these vessels. After implementation of AFA, only AFA qualified vessels were allowed to focus on pollock fisheries in the BSAI. In addition, since implementation of Amendment 57 in 1999, directed fishing for pollock with non-pelagic trawl gear has been prohibited. On the surface at least, it seems that there should be very little groundfish assigned to the pollock target fishery by A80-CPs because they use non-pelagic trawl gear in their fisheries for flatfish, rockfish, and Atka mackerel.

The key appears to be the changes to the MRA for pollock that were implemented as a regulatory amendment in July 2004, following the 2003 Council approval of Groundfish Retention Standards (GRS) under Amendment 79. The GRS was implemented in 2008. Under the rule change, the MRA for pollock is calculated at the time of the offload for non-AFA vessels. The rule allowed vessels to choose to retain greater amounts of pollock during a fishing trip as long as they were under the MRA at the time of the offload. As a consequence, it appears that the amount of catch that is assigned to pollock targets has increased.

Figure 4 includes only AFA-CPs, AFA-MCPs and AFA-CVs. In 2007, all three of these sectors experienced large increases in halibut bycatch rates—rates for AFA-MCVs and AFA-CPs more than doubled, while rates for AFA-CVs increased by more than 300 percent. Bycatch rates of AFA-CPs increased significantly in each of the next two years, before dropping back down in 2010 and 2011. While these bycatch rates are very low relative to bycatch rates seen in fisheries using non-pelagic trawls, the magnitude of the pollock fishery means that absolute levels of halibut mortality have increased significantly. (See Figure 2 and Table 12, as well as Figure 5.) From 2003–2006, annual halibut mortality by all AFA harvesters averaged 99 mt/year. From 2007–2011, annual halibut mortality by all AFA harvesters averaged 302 mt/year.

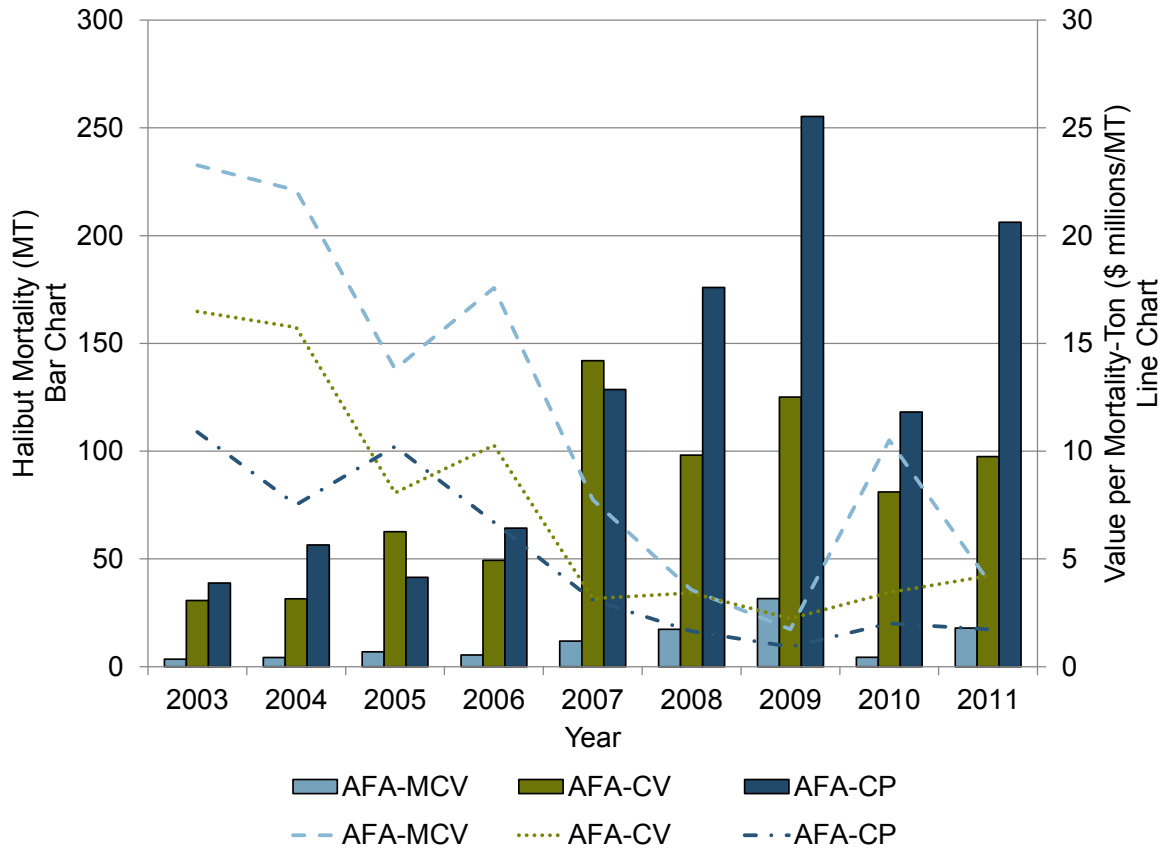
Figure 5 combines absolute levels of halibut mortality for AFA harvesters with the estimated wholesale value generated in the pollock fisheries per ton of halibut bycatch. The figure uses two vertical axes—the bars (halibut mortality) use the left axis, while the lines (value/ton) use the right axis. The numbers in the chart are also shown in Table 12. In 2003, the estimated wholesale value per ton of halibut mortality in the AFA pollock fishery ranged from \$10.9 million/ton in the AFA-CP fishery to \$23.3 million/ton in the AFA-MCV fishery. These are very large numbers relative to the \$11,515 of wholesale value per ton generated by BSAI processors in directed halibut target fisheries over the 2003–2011 period.<sup>5</sup> The groundfish wholesale value per ton halibut bycatch mortality in the AFA pollock fisheries has declined dramatically since 2003. The biggest declines were seen in 2007, but value per ton of halibut bycatch appears to have bottomed out in 2009. In that year, AFA-CVs generated \$2.2 million in wholesale value per ton of halibut bycatch, while AFA-MCVs and AFA-CPs generated \$1.7 and \$0.9 million respectively.

Nominally, the cause of the decline in value per bycatch ton is the combination of lower harvest levels in the pollock fisheries combined with higher bycatch rates. The decline in harvests is directly related to lower biomass levels, but the root cause of the increase in bycatch rates is not as easily determined.

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<sup>5</sup> This estimate is generated from data provided by AKFIN from COAR data and represents the average wholesale value per ton of halibut by BSAI processors from 2003–2011. The number translates to an average wholesale value per pound of \$5.22.

**Figure 5. Annual Halibut Mortality and Groundfish Wholesale Value per MT of Halibut in Pollock Target Fisheries, 2003-2011**



Note: Wholesale values per ton of groundfish harvested in the pollock fishery have been normalized to reduce the effects of due to inflation, exchange rates and other changes in market prices.

Source: Developed by Northern Economics based on CAS and COAR data from AKFIN



## 4.2 Pacific Cod

This section examines halibut bycatch in the Pacific Cod fisheries by harvesting vessel sector. The structure of the section is similar to the previous section that focused on the pollock fishery

An examination of halibut bycatch in target fisheries for Pacific cod in the BSAI is complicated by the fact that it is an important fishery for nearly every harvesting sector in the BSAI. As seen in Table 13, there are as many as twelve different sectors that reported landings in Pacific cod target fisheries, depending, of course, on how sectors are defined. Table 13 provides a very disaggregated look at participation in the Pacific cod target fishery. This table not only provides a look at participation, but also provides an indication of whether data can be released under confidentiality restrictions—the shaded cells with bolded text indicate data points that cannot be released without further aggregation. For some of the sectors listed in the table, aggregation with other sectors would not meaningfully change the results of the analysis. For example, AFA-MCVs can be aggregated with AFA-CVs to create a sector containing All AFA-CVs. The results should not change significantly, and several additional year of data AFA-MCV data can be included. Similarly, combining POT-CVs with POT-MCVs, LGL-CVs with LGL-MCVs and non-AFA TRW-CVs with non-AFA TRW-MCVs will streamline the analysis, even though some of these data could be released regardless. Unfortunately, however, there does not appear to be a way to aggregate AFA-CPs into another sector without causing some harm of the results. This is because AFA-CPs receive a separate allocation of the Pacific cod ITAC. Combining them with the AFA-CVs would obfuscate the impacts of AFA-CVs. For this reason, the remaining discussion of bycatch in the Pacific cod target fishery will exclude AFA-CPs.

**Table 13. Number of Unique Harvester Vessels in Pacific Cod Target Fisheries by Sector, 2003–2011**

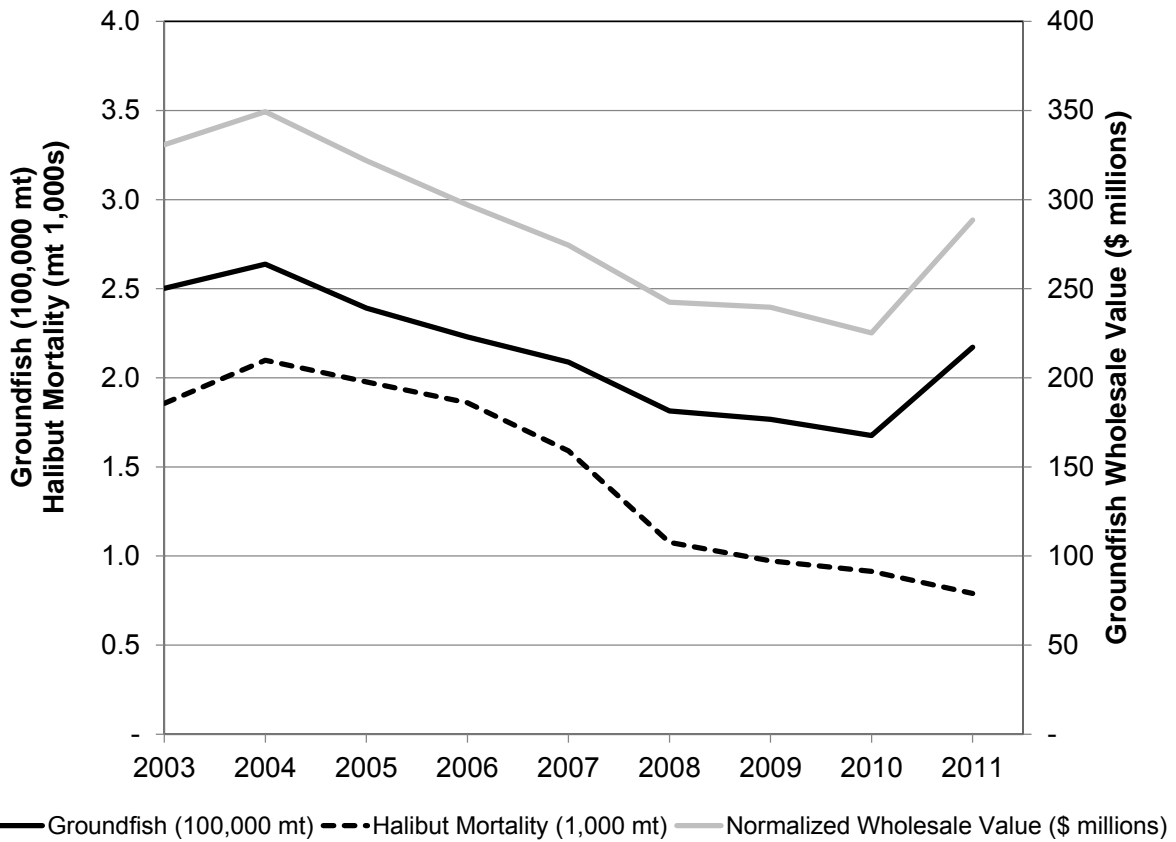
	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Unique Number of Harvesting Vessels								
Sector	Pacific Cod								
A80-CP	18	19	18	18	22	12	15	14	14
AFA-CP	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>
AFA-CV	59	59	49	44	45	48	37	33	35
AFA-MCV	3	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	5	<b>2</b>	3	7
TRW-CV	27	17	13	11	17	16	14	10	11
TRW-MCV	-	<b>2</b>	-	-	<b>2</b>	3	3	<b>2</b>	4
LGL-CP	39	39	39	39	37	39	38	36	31
LGL-CV	17	10	21	18	17	20	12	10	10
LGL-MCV	-	-	-	-	5	-	4	-	-
POT-CP	3	3	<b>2</b>	4	3	6	4	6	4
POT-CV	70	72	60	62	64	57	43	45	48
POT-MCV	-	-	-	4	4	5	-	-	-

Note: Sector definitions are provided

Source: Developed by Northern Economics based on CAS data from AKFIN

As seen in Figure 6, groundfish harvests in Pacific cod target fisheries for included sectors<sup>6</sup> have declined ever year from 2004–2010, as have normalized wholesale values of groundfish and halibut mortality. In 2011, groundfish harvests and wholesale value increased, but halibut mortality continued to decline. Since 2007, overall halibut mortality in the Pacific cod target fisheries has declined at a greater rate than groundfish harvests.

**Figure 6. Harvest, Halibut Bycatch and Normalized Wholesale Value of Groundfish in Pacific Cod Target Fisheries of Included Sectors, 2003 - 2011**



Note: Includes only harvests and values of sectors included in Table 14—i.e. AFA-CPs are not included. Axes values are scaled so that the changes in the different variables are relative.  
 Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

<sup>6</sup> In order to protect the confidentiality of data, groundfish harvests of the AFA-CP sector have not been included in Figure 6, nor are they included in Table 14.

Table 14 summarizes the groundfish harvests and halibut bycatch mortality in the Pacific cod target fisheries by sector from 2003–2011. The table contains the same five sections in the table used for the pollock target fisheries. The table does not include AFA-CPs because all of their data are considered confidential.

**Table 14. Halibut and Target Mortality and Value in Pacific Cod Target fisheries, 2003-2011**

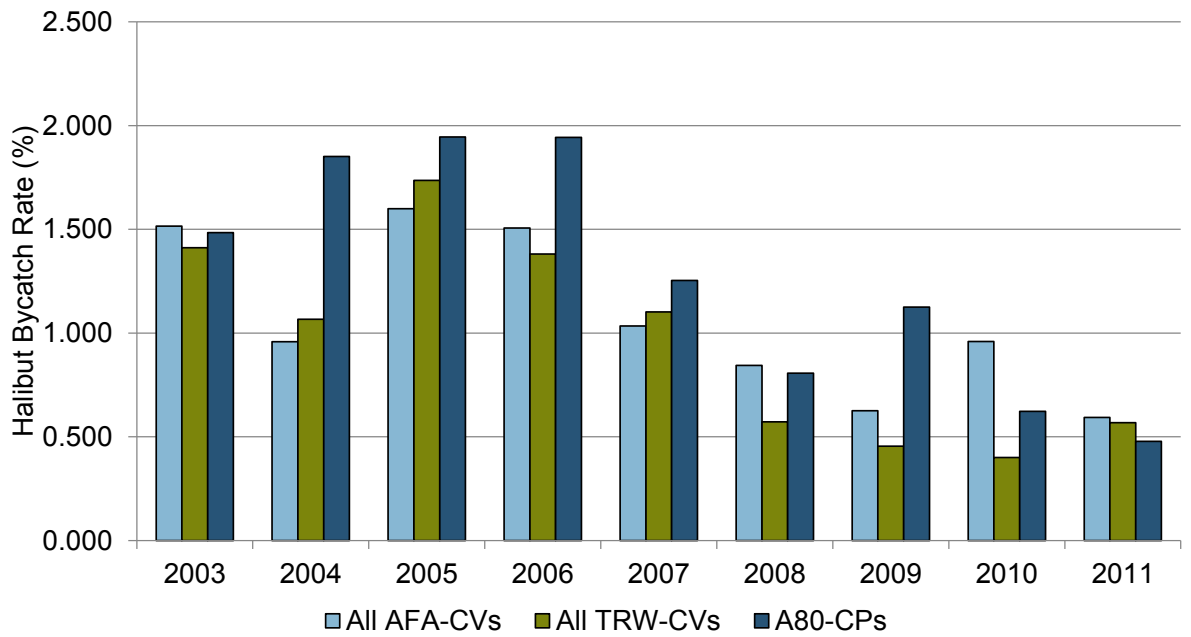
<b>Sector</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
<b>Groundfish Caught in Target Fishery (MT)</b>									
All AFA-CVs	40,055	39,504	33,861	35,463	35,689	29,483	24,105	23,618	30,388
All TRW-CVs	12,169	5,948	3,145	3,686	6,064	7,353	6,556	7,225	10,395
A80-CPs	38,903	62,674	40,229	42,859	49,059	5,705	6,733	5,643	3,498
LGL-CPs	135,938	137,259	142,980	119,816	98,559	116,556	122,788	108,330	143,473
All LGL-CVs	480	647	1,110	655	852	991	693	360	475
POT-CPs	1,596	3,282	3,392	3,207	2,780	4,606	4,817	5,163	3,370
All POT-CVs	21,090	14,522	14,403	17,296	15,777	16,691	10,965	17,235	25,536
<b>Halibut Mortality (MT)</b>									
All AFA-CVs	607.2	378.5	541.7	534.3	369.2	249.0	150.9	226.5	180.3
All TRW-CVs	171.8	63.4	54.6	50.9	66.8	42.1	29.8	28.9	59.1
A80-CPs	577.2	1,160.1	782.3	832.8	615.2	46.0	75.8	35.1	16.7
LGL-CPs	495.5	489.5	589.7	434.6	531.4	721.8	712.4	619.1	527.9
All LGL-CVs	2.5	4.6	5.9	2.9	6.3	11.9	3.0	1.7	1.3
POT-CPs	0.2	0.4	0.6	0.6	0.0	1.0	0.2	0.7	1.4
All POT-CVs	2.0	2.3	2.2	3.8	0.7	4.4	0.2	1.7	3.8
<b>Halibut Bycatch Rate (%)</b>									
All AFA-CVs	1.516	0.958	1.600	1.507	1.034	0.844	0.626	0.959	0.593
All TRW-CVs	1.412	1.066	1.735	1.381	1.102	0.572	0.455	0.400	0.568
A80-CPs	1.484	1.851	1.945	1.943	1.254	0.807	1.126	0.623	0.478
LGL-CPs	0.365	0.357	0.412	0.363	0.539	0.619	0.580	0.571	0.368
All LGL-CVs	0.517	0.712	0.529	0.436	0.735	1.197	0.437	0.479	0.272
POT-CPs	0.010	0.011	0.017	0.019	0.001	0.022	0.003	0.013	0.040
All POT-CVs	0.010	0.016	0.015	0.022	0.005	0.026	0.001	0.010	0.015
<b>Wholesale Value in Target Fishery (\$ millions)</b>									
All AFA-CVs	45.64	44.66	38.03	40.11	40.46	33.61	28.06	27.32	35.27
All TRW-CVs	13.43	6.57	3.46	4.05	6.72	8.85	7.77	8.79	12.33
A80-CPs	52.44	81.42	55.23	57.32	63.55	7.83	9.31	7.86	4.49
LGL-CPs	193.17	195.09	203.01	171.08	141.11	165.84	174.80	154.45	202.83
All LGL-CVs	0.54	0.72	1.24	0.73	1.01	1.09	0.79	0.40	0.52
POT-CPs	2.26	4.73	4.83	4.54	4.00	6.46	6.77	7.25	4.79
All POT-CVs	23.38	16.14	16.00	19.21	17.57	18.71	12.05	19.13	28.38
<b>Value per Mortality-Ton (\$ thousands/MT)</b>									
All AFA-CVs	75.2	118.0	70.2	75.1	109.6	135.0	186.0	120.6	195.6
All TRW-CVs	78.2	103.6	63.3	79.5	100.6	210.3	260.5	304.1	208.7
A80-CPs	90.8	70.2	70.6	68.8	103.3	170.1	122.9	223.6	268.6
LGL-CPs	389.8	398.6	344.3	393.6	265.5	229.8	245.4	249.5	384.2
All LGL-CVs	216.4	157.1	210.9	255.1	161.8	92.2	260.7	229.9	404.2
POT-CPs	14,130.6	12,709.3	8,441.0	7,311.6	114,184.4	6,268.8	43,239.6	11,057.0	3,517.6
All POT-CVs	11,458.7	7,017.6	7,203.9	5,113.6	23,899.7	4,250.4	74,833.8	10,992.9	7,552.2

Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

- Groundfish Caught in the Pacific Cod Target Fishery:** As seen in Table 14, the three largest sectors in the Pacific cod target fisheries are the LGL-CPs, All AFA-CVs, and the POT-CVs. Prior to 2008 the A80-CPs have larger groundfish harvests in Pacific cod target fisheries than AFA CVs, but with the reallocation of Pacific cod under Amendment 85, their harvests have been significantly reduced. A80-CPs are currently harvesting less than All TRW-CVs, (non-AFA) and POT-CPs. Since 2008, A80-CPs have average just 5,395 mt of groundfish in the Pacific cod target fishery, down from 46,745 mt on average from 2003–2007. None of the other sectors included in the table have experienced similar declines, although groundfish harvests in Pacific cod target fisheries by AFA-CPs have also declined significantly since 2007. Of the remaining included sectors, three—All TRW CVs (non-AFA), POT-CPs, and All POT-CVs—have seen increases since 2007, with increases ranging from 6–57 percent. The LGL CPs have experienced a 3 percent decline since 2007, while All AFA-CVs and All LGL-CVs have experienced declines of 27 and 16 percent respectively.
- Halibut Mortality (MT):** Overall halibut mortality in Pacific cod target fisheries (see the second section of Table 14) has clearly declined since 2003, due primarily to reductions in harvests by trawlers. Halibut mortality by LGL-CPs increased significantly in 2008 to the highest levels in the period and remained high in 2009 before dropping down again in 2010; it is conceivable that the formation of a voluntary cooperative among LGL-CPs in August 2010 may have helped reduce the sector’s halibut mortality. The very large drop in mortality for A80-CPs after 2009 is due primarily to the reduced levels of activity in Pacific cod target fisheries, but may also be a result of the individual accountability inherent in catch share and cooperative systems. Halibut mortality by year, in combination with normalized groundfish wholesale value per ton of halibut can be seen in Figure 8 (for trawl vessels), Figure 10 (for longline vessels), and Figure 12 (for pot vessels).
- Halibut Bycatch Rate (%):** Beginning in 2007, halibut bycatch rates by included trawl vessels in Pacific cod target fisheries have declined significantly. A80-CPs experienced an increase in 2009, but dropped again the following year. Similarly All AFA-CVs experienced a one-year increase in 2010, but dropped again in 2011. Bycatch rates of the LGL-CPs from 2007–2010 were higher than from 2003–2006, but were lower again in 2011. In 2008, bycatch rates of LGL-CPs in the Pacific cod target fishery (1.19 percent) were the highest of any sector. Bycatch rates of both groups’ pot vessels remain very low—generally at least an order of magnitude lower than any of the other sectors. The very low bycatch rates of pot vessels in the Pacific cod target fishery is the primary reason pot gear is exempt from halibut PSC limits. Figure 7 shows annual bycatch rates for the three included trawl sectors; Figure 9 shows annual bycatch rates for longline CPs and CVs; Figure 11 shows annual bycatch rates for pot CPs and CVs.
- Wholesale Value in Pacific Cod Target Fisheries (\$ millions):** The wholesale values generated in the Pacific cod target fisheries as shown in the table are normalized by using the seasonal average value of products produced per ton of groundfish in the target fishery by the sector (or groups of sectors) over the 2003–2011 period. In this way, the influence on differences due to inflation, changes in product prices, product mixes, and currency exchanges are minimized. In general, normalized wholesale value will track groundfish landings by sector.
- Value per MT of Halibut Mortality (\$ millions/Halibut mt):** This field shows the normalized wholesale value generated in the Pacific cod fishery per ton of halibut mortality. The normalized groundfish wholesale value per ton of halibut, in combination with halibut mortality, can be seen in Figure 8 (for trawl vessels), Figure 10 (for longline vessels), and Figure 12 (for pot vessels). There is also a separate figure (Figure 13) that compares normalized groundfish wholesale value per ton of halibut across all sectors. Because of their extremely low bycatch rate, wholesale values per ton of halibut mortality for pot vessels are extremely high, usually in excess of \$10 million, but

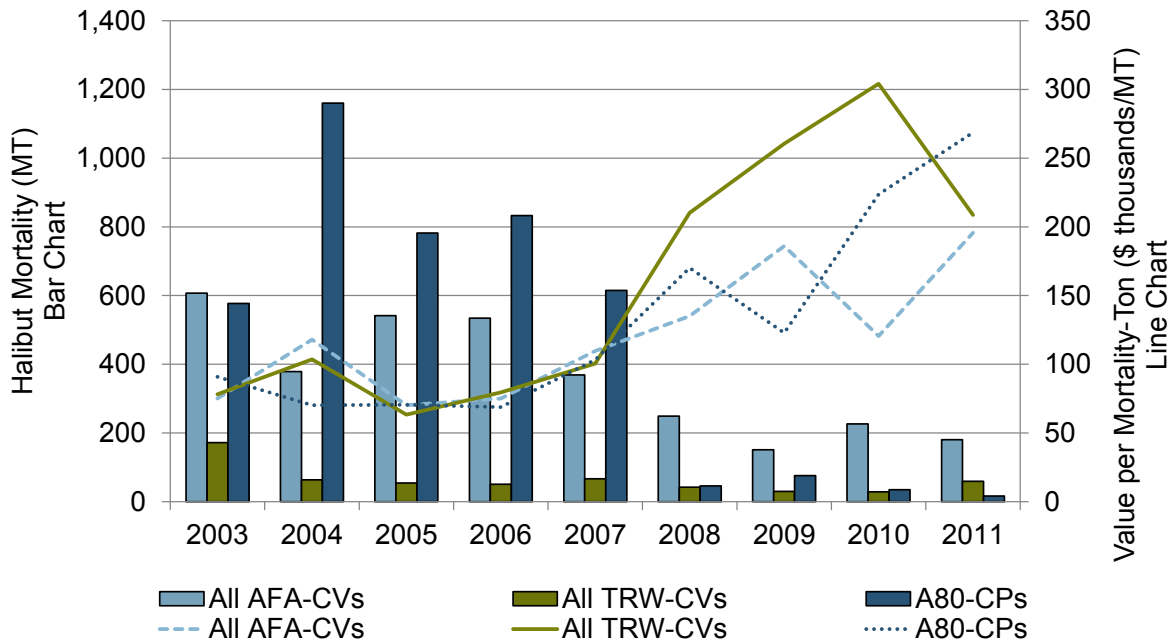
occasionally much higher. Values for trawl vessels were generally ranged between \$60,000 and \$100,000 per ton of halibut mortality prior to 2007, but have increased significantly since then.

**Figure 7. Halibut Bycatch Rates in Pacific Cod Trawl Fisheries by Sector, 2003-2011**



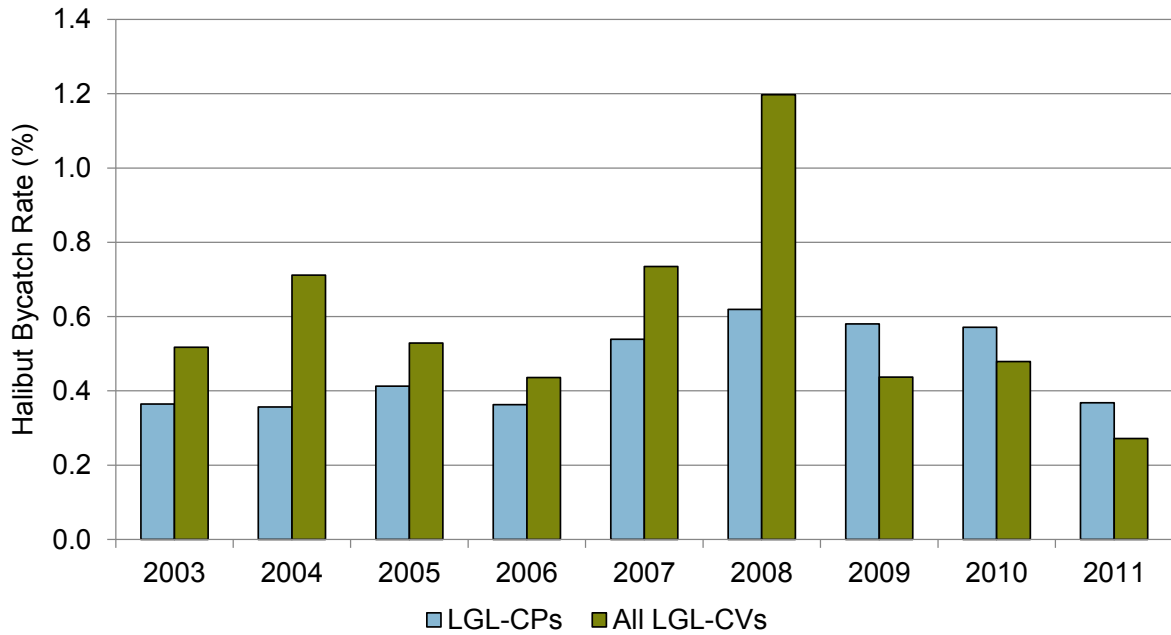
Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

**Figure 8. Annual Halibut Mortality and Groundfish Wholesale Value per MT Halibut in Pacific Cod Trawl Fisheries, 2003-2011**



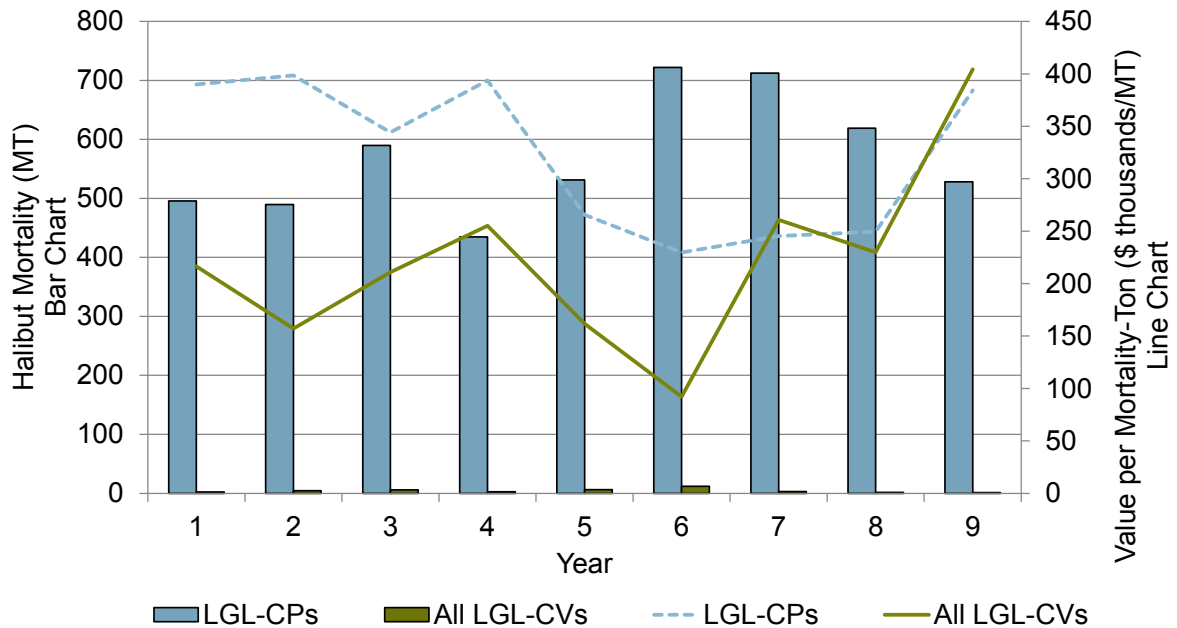
Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

**Figure 9. Halibut Bycatch Rates in Pacific Cod Longline Fisheries by Sector, 2003-2011**



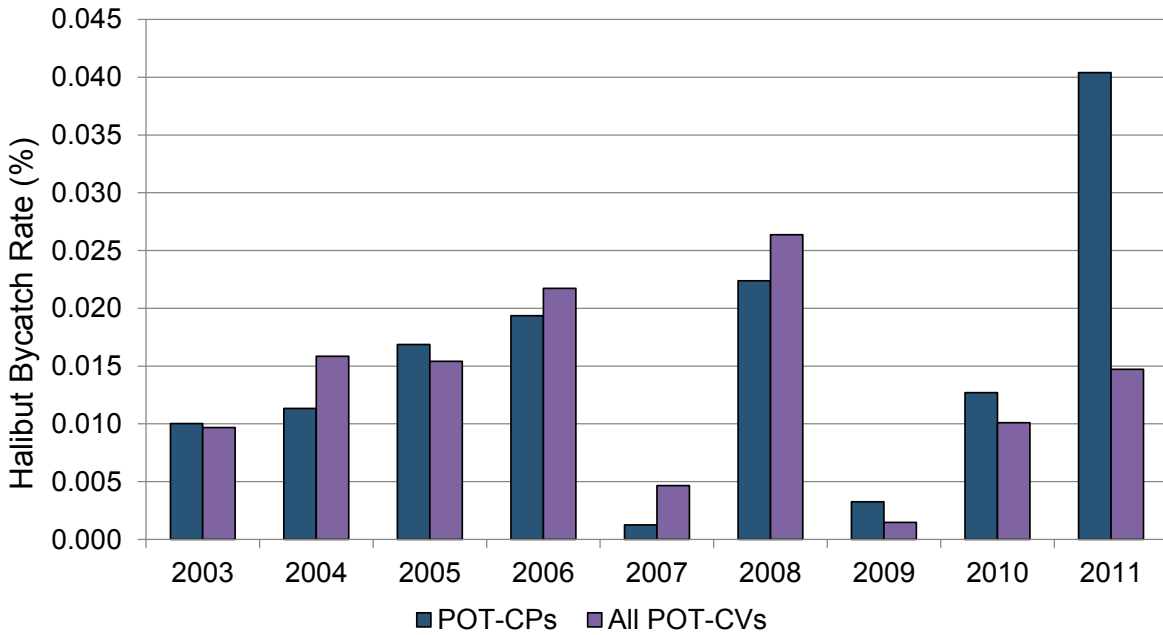
Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

**Figure 10. Annual Halibut Mortality and Groundfish Wholesale Value per MT Halibut in Pacific Cod Longline Fisheries, 2003-2011**



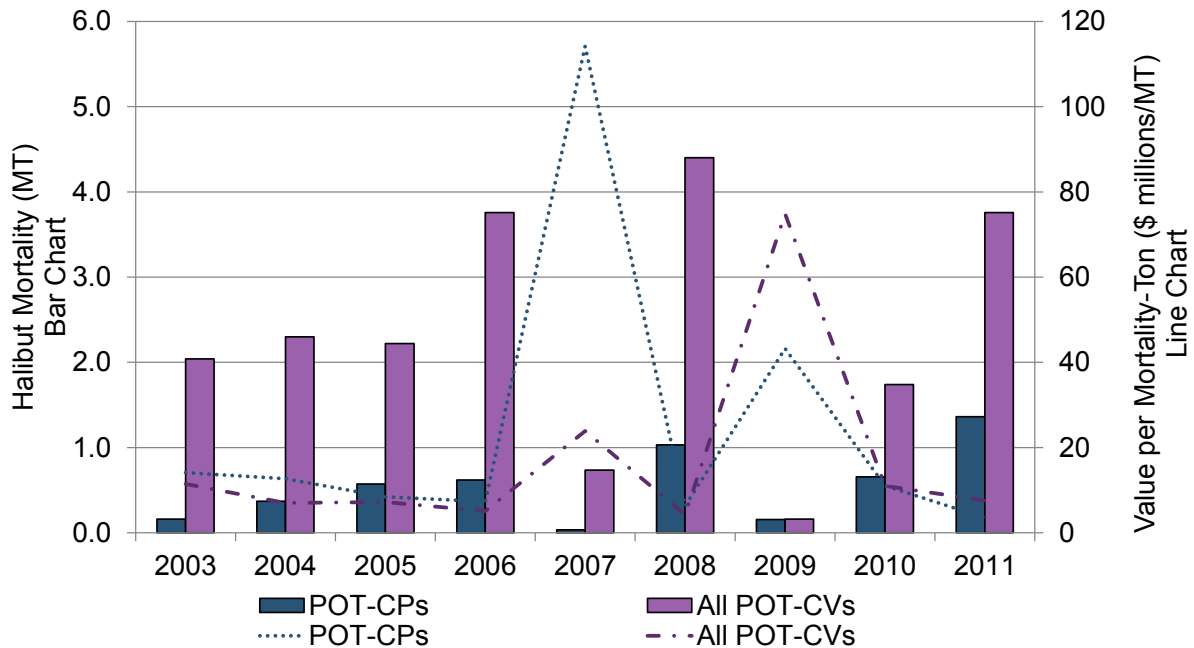
Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

**Figure 11. Halibut Bycatch Rates in Pacific Cod Pot Fisheries by Sector, 2003-2011**



Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

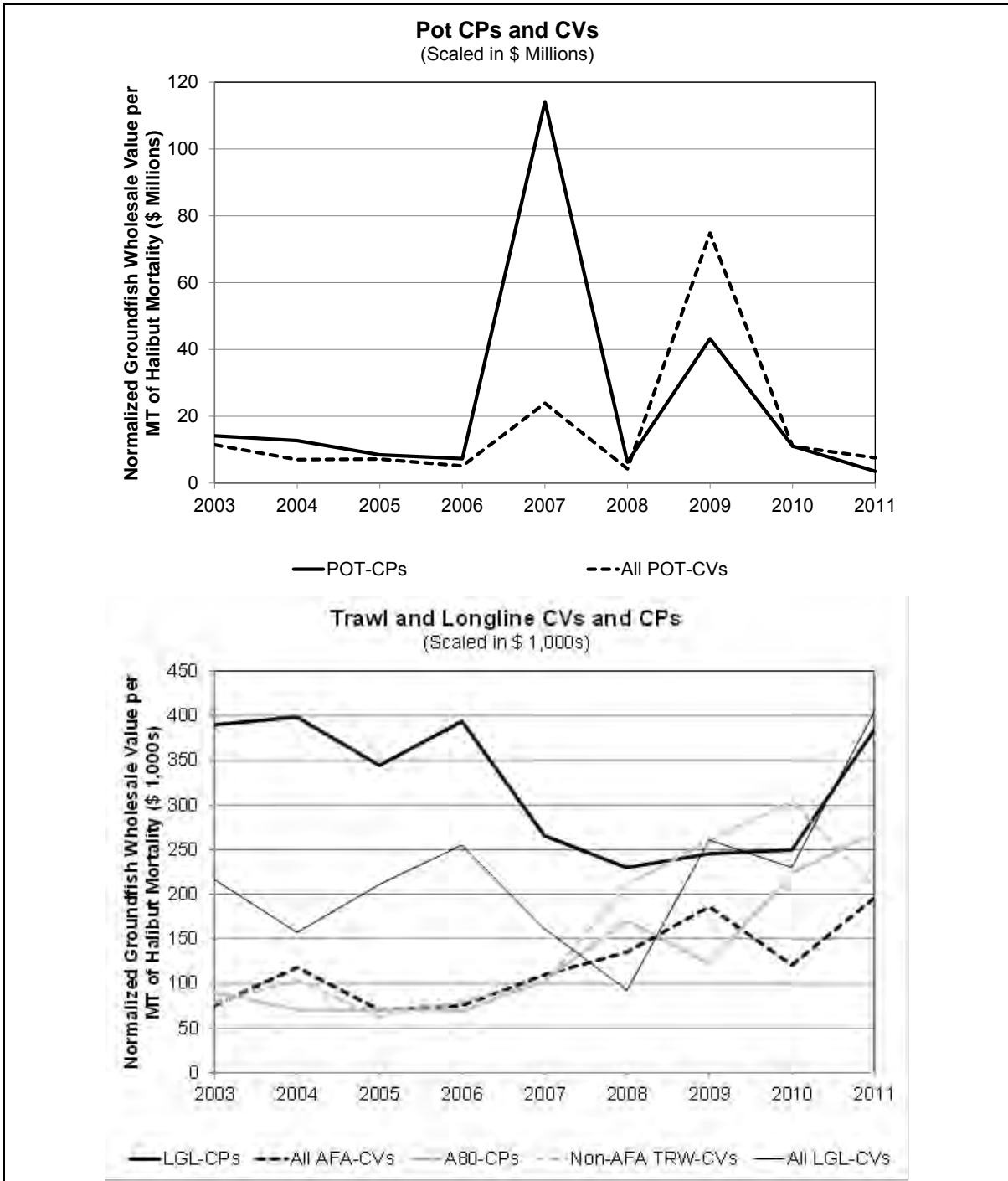
**Figure 12. Annual Halibut Mortality and Groundfish Wholesale Value per MT Halibut in Pacific Cod Pot Fisheries, 2003-2011**



Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.



Figure 13. Normalized Groundfish Wholesale Value per Ton of Halibut Mortality by Sector



Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

### 4.3 Yellowfin Sole

Two sectors, A80-CPs and AFA-CPs, have had significant levels of participation in the yellowfin sole target fisheries from 2003–2011. The numbers of vessels with yellowfin sole targets by sector and year are shown in Table 15. The number of AFA-CPs participating the yellowfin sole has increased since 2008 and implementation of Amendment 80. The number of A80-CPs with target landings has remained very stable throughout the period. There have been very limited levels of participation by trawl CVs. Data on these sectors cannot be released due to confidentiality restrictions.

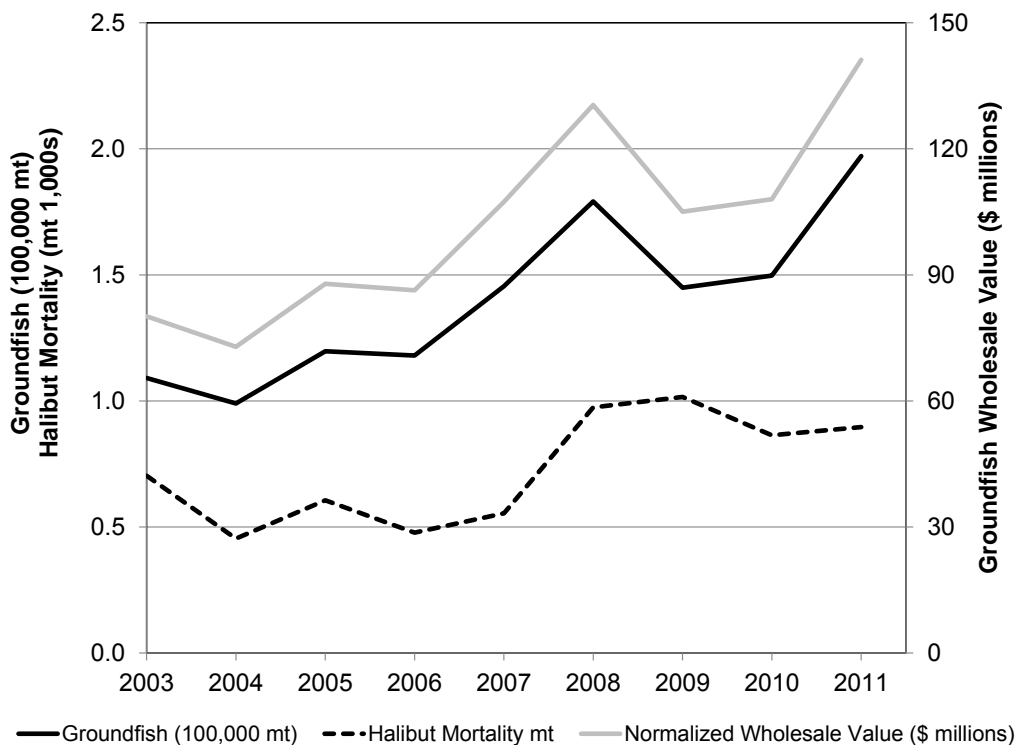
**Table 15. Number of Unique Harvester Vessels in Yellowfin Sole Target Fisheries by Sector, 2003–2011**

Sector	2003	2004	2005	2006	2007	2008	2009	2010	2011
A80-CP	21	22	21	22	22	22	20	19	20
AFA-CP	3	4	5	6	8	12	8	9	9
AFA-CV	-	1	-	3	1	-	-	-	-
TRW-CV	-	-	-	1	2	3	-	-	-
TRW-MCV	1	1	1	1	1	1	1	-	2

Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

Figure 14 provides an overview of the yellowfin sole fishery in terms of total groundfish, wholesale value (normalized), and halibut mortality. The data in the figure do not include trawl CVs. In general, landings and normalized wholesale values in the yellowfin sole fishery have been increasing throughout the study period. The only year with significant declines in harvest came in 2009. In that year however, halibut mortality in the fishery actually increased, but has leveled off since then.

**Figure 14. Groundfish Harvest, Halibut Bycatch and Normalized Wholesale Value of Groundfish in Yellowfin Sole Target Fisheries of Included Sectors, 2003 - 2011**



Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

Table 16 summarizes groundfish harvests, normalized wholesale values, and halibut bycatch in yellowfin sole fisheries for A80-CPs and AFA-CPs. In addition, Figure 15 depicts halibut bycatch rates by sector, and Figure 16 combines annual halibut mortality and normalized groundfish wholesale value per MT of halibut mortality.

- Groundfish Caught in the Yellowfin Sole Fisheries:** As seen in Table 16, harvests of groundfish in yellowfin sole fisheries of both trawl CP sectors have increased over the study period. The increase for AFA-CPs has been much more significant if measured using 2003 as a base—in 2011 harvests by AFA-CP in the yellowfin sole fishery were more than nine times the harvest in 2003. For A80-CPs the magnitude of the increase has been greater—up over 50,000 mt. The increased harvests can be attributed at least in part to both sector’s ability to manage their use of halibut afforded to them under Amendment 80.
- Halibut Mortality (MT):** Halibut mortality in yellowfin sole fisheries by included sectors has varied significantly from year to year (see the second section of Table 16). Halibut mortality by year in yellowfin sole fisheries, in combination with normalized groundfish wholesale value per ton of halibut can be seen in Figure 16.

For A80-CPs, mortality levels declined by 250 mt in 2004, but then increased by 150 mt in 2005, before dropping back down by over 200 mt in 2006. With implementation of Amendment 80 in 2008, halibut mortality had its largest increase in the study period, with a year-over-year increase of over 70 percent. The large increase in 2008 corresponds to a large increase in groundfish harvests. Halibut mortality for A80-CPs jumped again in 2009, but declined in both 2010 and 2011.

Halibut mortality for AFA-CPs has had similar levels of variability, with significant increases corresponding to higher harvests in 2005 and 2006, followed by large swings since then.

**Table 16. Halibut and Target Mortality and Value in Yellowfin Sole Targeted Fisheries, 2003-2011**

Sector	2003	2004	2005	2006	2007	2008	2009	2010	2011
<b>Groundfish Caught in Target Fishery (MT)</b>									
A80-CP	104,062	94,132	109,873	99,074	118,286	156,220	131,226	125,613	159,515
AFA-CP	4,989	4,842	9,788	18,946	27,212	22,883	13,694	24,099	37,579
<b>Halibut Mortality (MT)</b>									
A80-CP	701.0	451.4	590.2	384.9	495.8	858.4	920.7	836.9	793.3
AFA-CP	2.0	2.8	15.5	92.5	58.2	116.0	94.7	26.8	102.7
<b>Halibut Mortality Rate (%)</b>									
A80-CP	0.67	0.48	0.54	0.39	0.42	0.55	0.70	0.67	0.50
AFA-CP	0.04	0.06	0.16	0.49	0.21	0.51	0.69	0.11	0.27
<b>Wholesale Value in Target Fishery (\$ millions)</b>									
A80-CP	76.8	69.5	80.9	73.7	89.2	114.1	95.8	90.4	115.7
AFA-CP	3.3	3.4	7.0	12.6	18.2	16.3	9.2	17.5	25.5
<b>Value per Mortality-Ton (\$ millions/MT)</b>									
A80-CP	0.11	0.15	0.14	0.19	0.18	0.13	0.10	0.11	0.15
AFA-CP	1.62	1.21	0.45	0.14	0.31	0.14	0.10	0.66	0.25

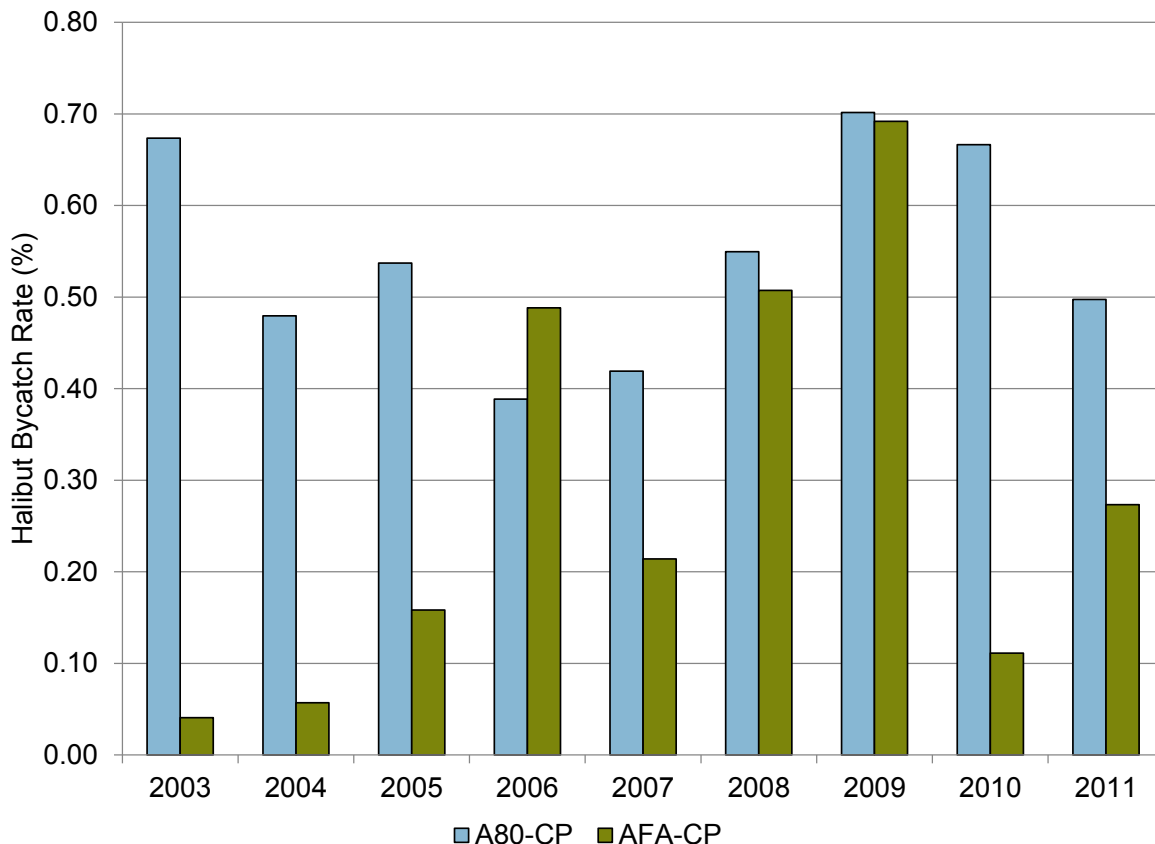
Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

- Halibut Bycatch Rate (%):** The third section of Table 16 shows annual bycatch rates for the two included sectors. Figure 15 also presents bycatch rates. Halibut bycatch rates for A80-CPs in the yellowfin sole fishery (measured as ton of halibut mortality divided by tons of groundfish

harvested) have been relatively stable during the study period, ranging from a low of 0.39 percent in 2006 to a high of 0.7 percent in 2009. Bycatch rates by AFA-CPs have had relatively greater variability, ranging from very low amounts of 0.04 percent and 0.06 percent in 2003 and 2004 to a high of 0.69 percent in 2009.

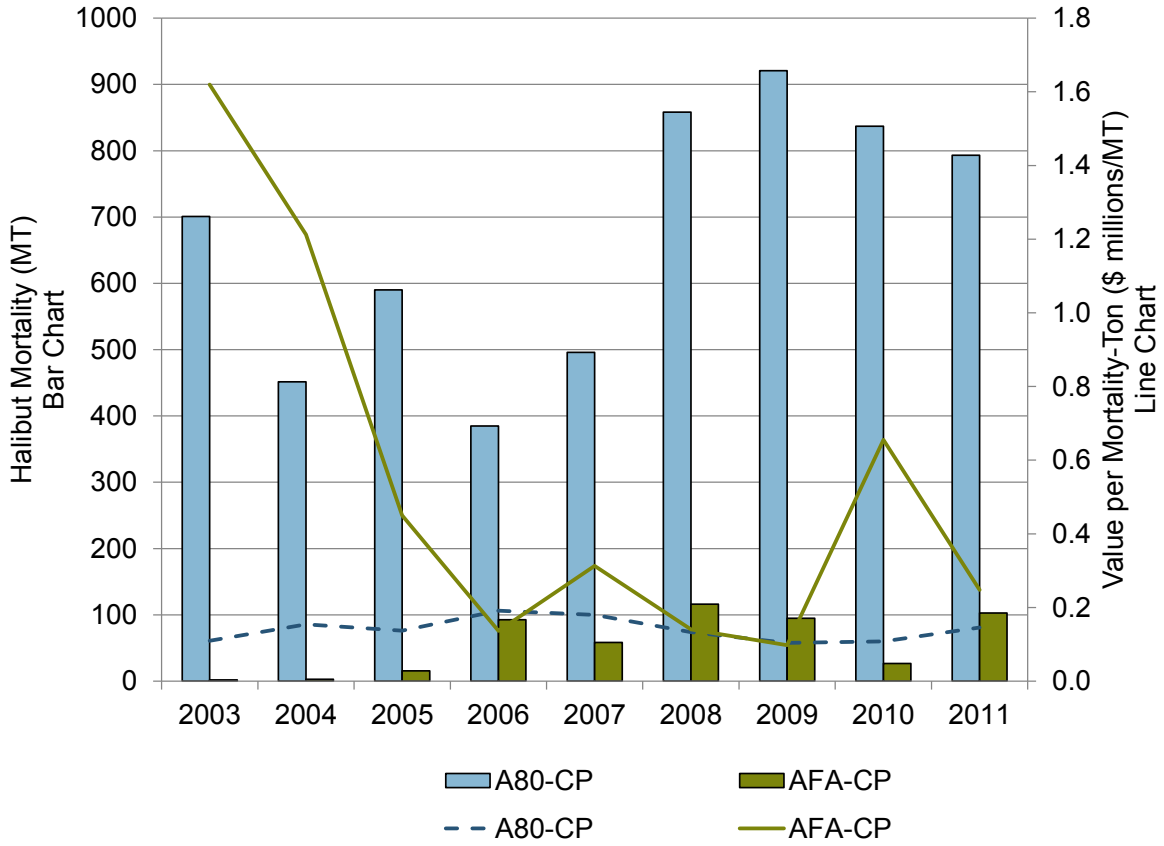
- Wholesale Value in Yellowfin Sole Fisheries (\$ millions):** The wholesale values generated in yellowfin sole fisheries as shown in the table are normalized by using the average value of products produced per ton of groundfish in the target fishery by sector over 2003–2011. Because a normalized value per ton is used, wholesale value follows the same pattern as landings. The normalized value per ton of groundfish in the A-season for A80-CPs was \$808.04/mt and \$712.71/mt in the B-Season. For AFA-CPs, normalized values were \$728.21/mt and \$632.33/mt for the A and B seasons respectively.
- Value per MT of Halibut Mortality (\$ millions/Halibut mt):** This field shows the normalized wholesale value generated in the yellowfin sole fisheries per ton of halibut mortality. The normalized groundfish wholesale value per ton of halibut, in combination with halibut mortality, can also be seen in Figure 16. Over the study period, the weighted average wholesale value per ton of halibut for A80-CPs has been very stable at about \$134,000/mt. For AFA-CPs, there have been wild variations, with normalized groundfish wholesale values ranging from \$1.6 million/mt of halibut in 2003 to as low as \$100,000/mt of halibut in 2009. For comparison, the normalized wholesale value of halibut in the directed halibut fisheries in the BSAI is estimated at \$11,515/mt.

**Figure 15. Halibut Bycatch Rates in Yellowfin Sole Targeted Fisheries by Sector, 2003-2011**



Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

Figure 16. Annual Halibut Mortality and Groundfish Wholesale Value per MT Halibut in Yellowfin Sole Target Fisheries, 2003-2011



Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

## 4.4 Halibut Bycatch in Target Fisheries of Amendment 80 CPs

This section provides a summary of groundfish harvests, wholesale value, and halibut mortality in the target fisheries of the A80-CPs. These vessels are the most diversified of all sectors in terms of the different number of target fisheries in which they have significant levels of participation. No other sector has had consistent and significant levels of participation in more than two target fisheries over the study period. Levels of participation in terms of unique numbers of A80-CPs by target fishery are shown in Table 17. Almost all of the A80-CPs participate in Yellowfin Sole and Rock Sole fisheries, while participation in rockfish, Atka mackerel, and Arrowtooth fisheries is more limited. Very few vessels have participated in target fisheries for other flatfish/Alaska plaice, Greenland turbot, or sablefish.<sup>7</sup> Because of low participation levels in sablefish and Greenland turbot fisheries, fishery-specific tables and figures in the rest of this section will not include information for sablefish or turbot.

**Table 17. Counts of Unique A80-CPs Participating in Target Fisheries, 2003–2011**

Fishery	2003	2004	2005	2006	2007	2008	2009	2010	2011
Pollock	<b>2</b>	<b>2</b>	6	3	3	17	19	15	15
Sablefish	-	3	<b>1</b>	-	<b>1</b>	3	<b>1</b>	-	-
Greenland Turbot	5	6	<b>2</b>	-	<b>1</b>	<b>2</b>	4	3	3
Other Flatfish & Plaice	6	11	11	6	7	5	5	4	7
Arrowtooth & Kamchatka	10	12	15	13	13	16	15	12	17
Rock Sole	21	22	22	22	21	21	21	19	18
Rockfish	11	10	6	8	8	11	11	14	16
Atka Mackerel	14	19	19	21	17	9	12	7	9
Flathead Sole	13	20	17	15	18	15	15	15	12
Pacific Cod	18	19	18	18	22	12	15	14	14
Yellowfin Sole	21	22	21	22	22	22	20	19	20
<b>All Targets</b>	<b>22</b>	<b>23</b>	<b>22</b>	<b>22</b>	<b>22</b>	<b>22</b>	<b>21</b>	<b>20</b>	<b>20</b>

Note: Shaded cells with bolded text indicate that landings and value data are confidential.

Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

Figure 17 summarizes levels of groundfish harvests, normalized wholesale values, and halibut mortality over all BSAI target fisheries from 2003–2011.<sup>8</sup> Total groundfish harvests have been trending up over the study period, with a low in 2007 at around 280,000 mt increasing by 2010 to just over 350,000 mt. Normalized wholesale values of groundfish in all BSAI targets have increased from \$250 and \$300 million. While total harvests have increased, total halibut mortality by A80-CPs in BSAI target fisheries has declined. The highest levels were seen in 2004 (2,864 mt) and the lowest in 2011 (1,875 mt). The big drop in halibut mortality corresponds to implementation of Amendment 80, which allowed the formation of cooperatives, and Amendment 85, which significantly reduced the apportionment of Pacific cod available to the sector.

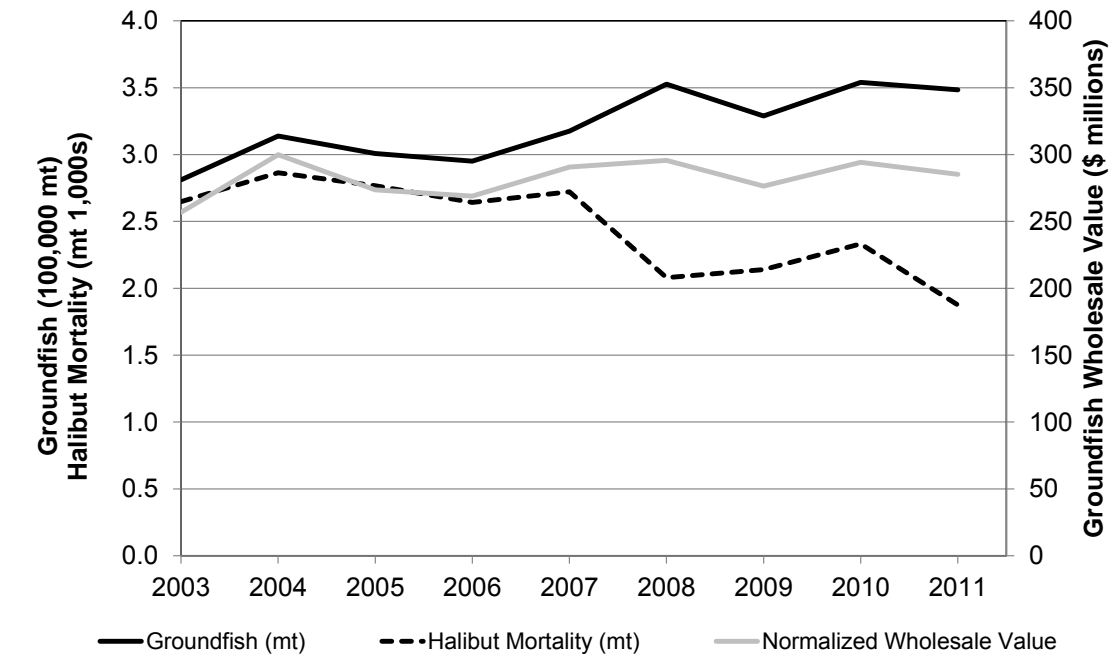
Figure 18 summarizes halibut bycatch rates (calculated as total groundfish mt ÷ total halibut mortality), and the normalized wholesale value of groundfish per mt of halibut mortality. The figure clearly shows the inverse relationship of these two measures. When bycatch rates go down, normalized groundfish value per mt of halibut mortality increases. Since 2003, halibut bycatch rates of A80-CPs in all of their target fisheries have declined from 0.94 percent to 0.54 percent—a 42 percent

<sup>7</sup> In this section, target fisheries for other flatfish and Alaska Plaice have been combined, as have target fisheries for arrowtooth and Kamchatka flounder.

<sup>8</sup> All harvests, values, and bycatch information in this section includes data from CDQ fisheries.

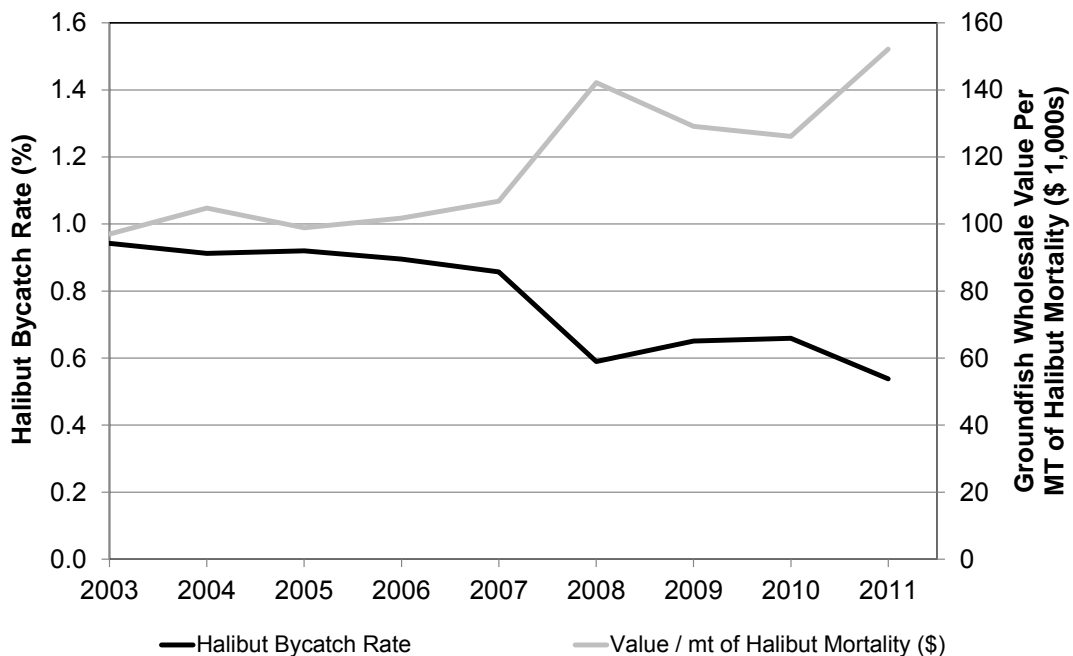
drop over the study period. Similarly, total groundfish value per mt of halibut mortality in all BSAI target fisheries has increased from \$97,000 in 2003 to \$152,000 in 2011.

**Figure 17. Groundfish Harvest, Halibut Bycatch and Normalized Wholesale Value of Groundfish in All A80-CP Target Fisheries, 2003 - 2011**



Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

**Figure 18. Halibut Bycatch Rates and Groundfish Value per MT of Halibut Mortality for A80-CPs across All Target Fisheries, 2003–2011**



Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.



The summary information provided in Figure 17 and Figure 18 is re-configured in Figure 19 and Figure 20 for each of the eight largest target fisheries of the A-80-CP sector.<sup>9</sup> The data going into each of the figures can be found in Table 18. Discussions of the trends in each of the target fisheries are provided below with fishery-specific figures and the table following.

- **Yellowfin Sole:** Groundfish landings in the yellowfin sole fishery for A80-CPs have trended up over the study period, with similar increases in normalized groundfish wholesale value. Levels of halibut mortality have generally tracked with changes in harvest—exceptions were seen in 2009 when halibut mortality increased while harvests decreased, and in 2011 when harvests increased and halibut mortality decreased. Bycatch rates in the yellowfin sole fishery (see Figure 20) have been relatively flat, ranging from 0.4 percent to 0.7 percent. Normalized wholesale values per mt of halibut mortality have ranged from \$104,000/mt to \$191,000/mt.
- **Rock Sole:** Harvests of and normalized wholesale value of groundfish in A80-CP rock sole target fisheries bounced up and down between 2003–2007, with harvests ranging between at 37,000 mt and 50,000 mt and wholesale value ranging between \$37 million and \$50 million. Both increased significantly in 2008, with harvests ranging between 50,000 mt and 70,000 mt. Interestingly, halibut mortality in the rock sole fishery prior to 2008 tended to move in the opposite direction of harvest—halibut mortality went up when harvests in rock sole targets went down. Since 2008, the inverse relationship between catch and halibut mortality no longer appears to apply. Bycatch rates in the rock sole fishery (see Figure 20) have had considerable variation—from over 2.5 percent in 2003 to 0.7 percent in 2011. During those same years, normalized wholesale values per mt of halibut mortality have ranged from \$39,000/mt to \$149,000/mt.
- **Atka Mackerel:** Harvests, normalized wholesale value and halibut mortality in the A80-CP target fishery for Atka mackerel have all been relatively stable through most of the study period before harvests and value dropped in 2011. With the exception of spikes in 2007 and 2011, halibut mortality in the Atka Mackerel fishery has been relatively flat ranging between 55 mt and 92 mt in most years. In 2007, halibut mortality jumped to 198 mt and in 2011 it increased to 111 mt. Bycatch rates in the Atka mackerel fishery (see Figure 20) have been relatively flat (approximately 0.1 percent except for spikes in 2007 and 2011). Normalized wholesale values per mt of halibut mortality have been greater than \$600,000/mt every year except when bycatch has spiked—in 2007 values per mt of halibut mortality fell to \$278,000/mt.
- **Pacific Cod:** As indicated in the discussion of Pacific cod earlier A80-CP participation in the Pacific cod target fishery fell off dramatically in 2008 following the re-apportionment under Amendment 85. From 2008–2011, groundfish harvests in the Pacific cod target fishery have ranged between 3,498 mt and 5,643 mt, while normalized wholesale values of groundfish have ranged from \$4.5 million to \$9.3 million. Halibut mortality levels have generally tracked levels of harvest. Bycatch rates in the Pacific cod target fishery (see Figure 20) fell significantly with declines in harvest in 2008 to levels less than 1 percent. Normalized wholesale values per mt of halibut mortality have increased as a result to over \$250,000/mt.
- **Pollock:** As indicated in the discussion of the pollock target fisheries earlier, A80-CP participation in pollock target fisheries has increased significantly since 2008. In 2007 groundfish harvests in the pollock target fishery were 411 mt; by 2009 harvests increased an order of magnitude to 4,602 mt. Halibut mortality has tracked closely with groundfish harvests increasing from 0.4 mt in 2007 to 41.5 mt in 2008 and 58.8 mt in 2010. Bycatch rates in the pollock fishery since 2008 have ranged from 0.9 percent to 1.3 percent. These rates are much higher than rates seen in midwater

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<sup>9</sup> For ease of comparison, and in the interest of saving space, the figures have been reduced in size.

fisheries for pollock. Normalized wholesale values per mt of halibut mortality since 2008 have ranged \$44,000/mt to \$60,000/mt.

- **Flathead Sole:** Between 2003 and 2010, levels of groundfish harvest in the flathead sole fishery have bounced up and down between 18,883 mt (2003) to 27,993 mt (2008). After an increase in 2010, harvests in the flathead sole target fishery dropped significantly in 2011 to their lowest level in the study period—7,687 mt. Industry sources indicate that operators may be deciding that participation in the Flathead sole fishery is too costly with constraining species—pacific cod and halibut. Between 2003 and 2010 halibut mortality ranged between from 175 mt and 311 mt. In 2011 halibut mortality was 68.7 mt. Bycatch rates in the flathead sole fishery (see Figure 20) have varied widely from year to year, but since 2008 the absolute levels and variations have declined, ranging from 0.8 percent to 1.0 percent. Prior to 2008, normalized wholesale values per mt of halibut mortality in the flathead sole fishery ranged between \$60,000/mt and \$100,000/mt. Since 2008, values per mt of halibut have been greater than \$100,000/mt every year.
- **Arrowtooth and Kamchatka Flounder:** Prior to 2008, A80-CP participation in the arrowtooth flounder target fishery was constrained by TACs and apportionments of halibut PSC. Groundfish harvests in the arrowtooth flounder target fishery ranged between 1,841 mt (2007) and 5,693 mt (2005). In those early years, halibut mortality was relatively high peaking at 200 mt in 2005. In 2008, under Amendment 80, groundfish harvests by A80-CPs in the arrowtooth flounder target fishery jumped 16,079 mt and by 2010 had climbed to 31,426 mt. In 2010, halibut mortality was 190.4 mt—10 mt less than in 2005. The weighted average of normalized groundfish revenue per ton in the arrowtooth flounder target fishery was \$747/mt. Bycatch rates in the arrowtooth flounder target fishery were as high as 3.5 percent (2005), but since 2008 have dropped to below 1 percent. Since 2008, normalized wholesale values per mt of halibut mortality have varied around \$100,000/mt.
- **Rockfish:** The rockfish target fishery includes the target fisheries for Pacific Ocean Perch (POP) as well as all other rockfish target fisheries.<sup>10</sup> Groundfish harvested in rockfish target fisheries declined between 2003–2005, increased from 2006–2008, dropped in 2009, and increased again in 2010 and 2011. The jump in 2011 was a 9,000 mt increase. At approximately \$1,000/mt, the normalized wholesale value of groundfish in rockfish target fisheries tracks closely with harvests. Halibut mortality generally tracks with groundfish harvests, although in 2007 halibut mortality dropped while groundfish harvests had a sizeable increase. Bycatch rates in the rockfish fisheries have bounced up and down ranging from 0.5 percent in 2004 to 0.1 percent in 2007. Normalized wholesale values per mt of halibut mortality have also varied widely—from \$200,000/mt in 2004 to nearly \$860,000/mt in 2007.

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<sup>10</sup> Other than POP, most rockfish species are closed to directed fishing by NFMS-AKR, because of low TAC levels—most of the activity in rockfish target fisheries as used here is actually in target fisheries for POP.

Figure 19. Groundfish Harvest, Halibut Bycatch and Normalized Wholesale Value of Groundfish in Specific A80-CP Target Fisheries, 2003 - 2011

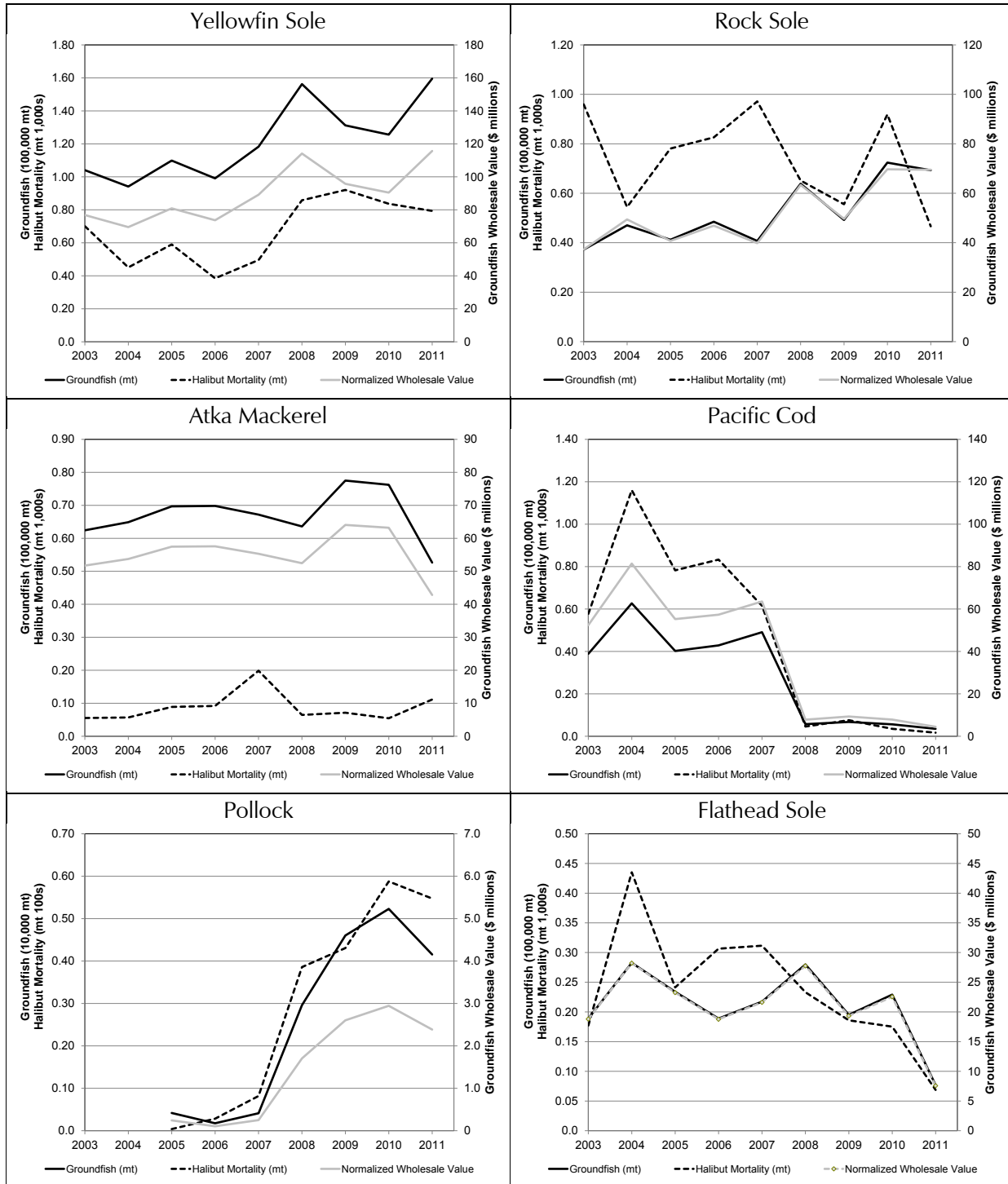
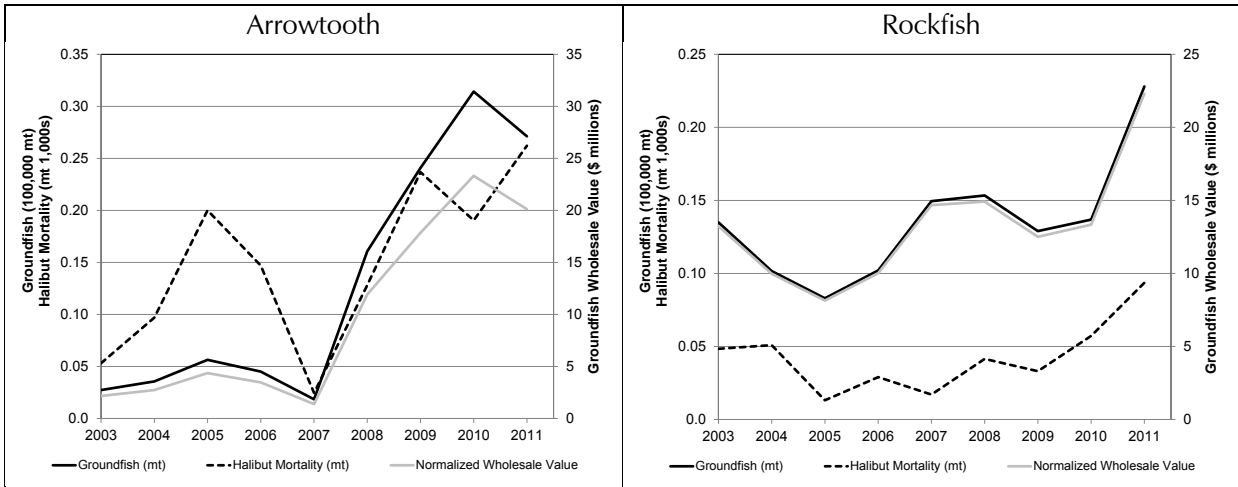


Figure 19. Groundfish Harvest, Halibut Bycatch and Normalized Wholesale Value (continued)



Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

Figure 20. Halibut Bycatch Rates and Groundfish Value per MT of Halibut Mortality for A80-CPs for Specific Target Fisheries, 2003–2011

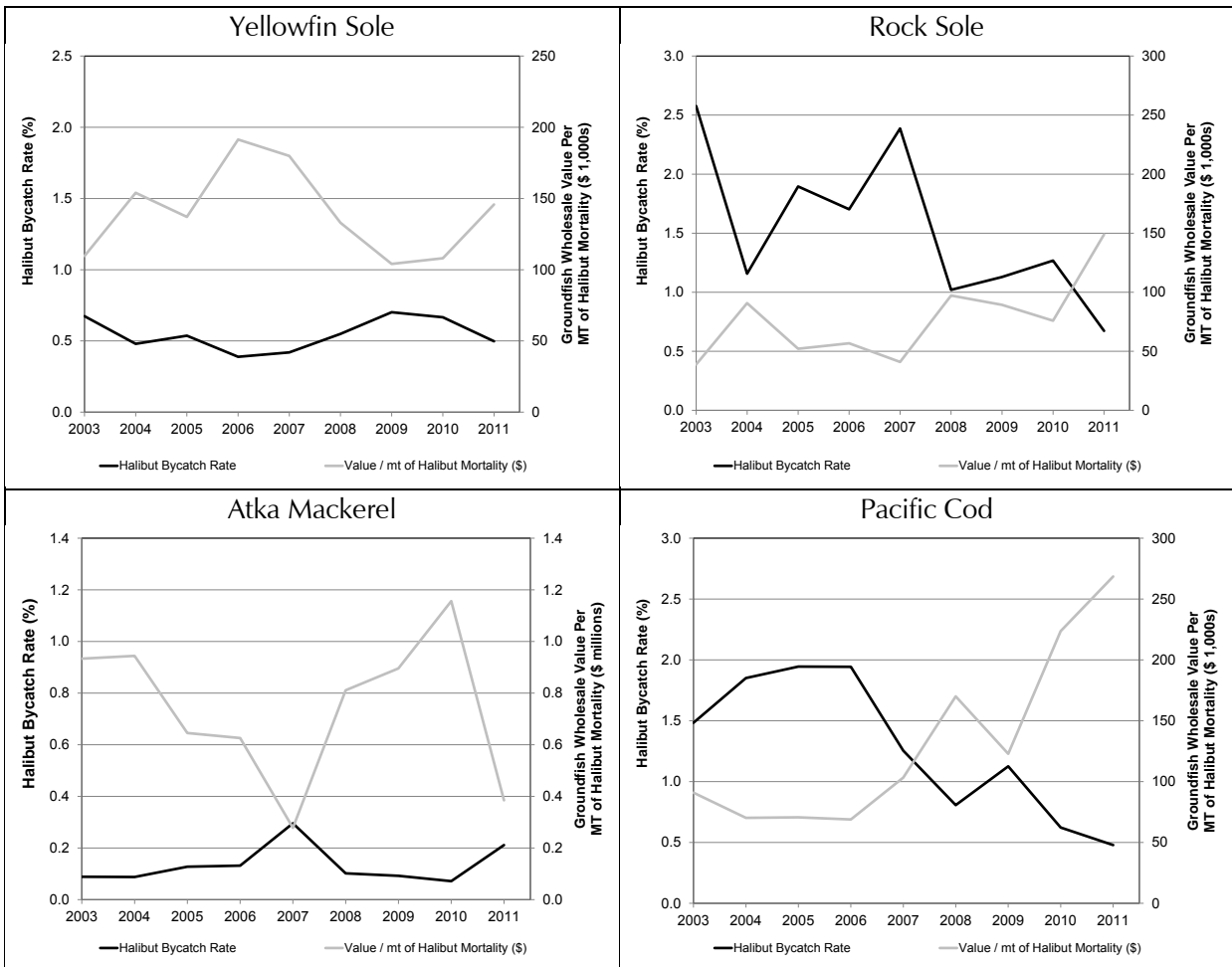
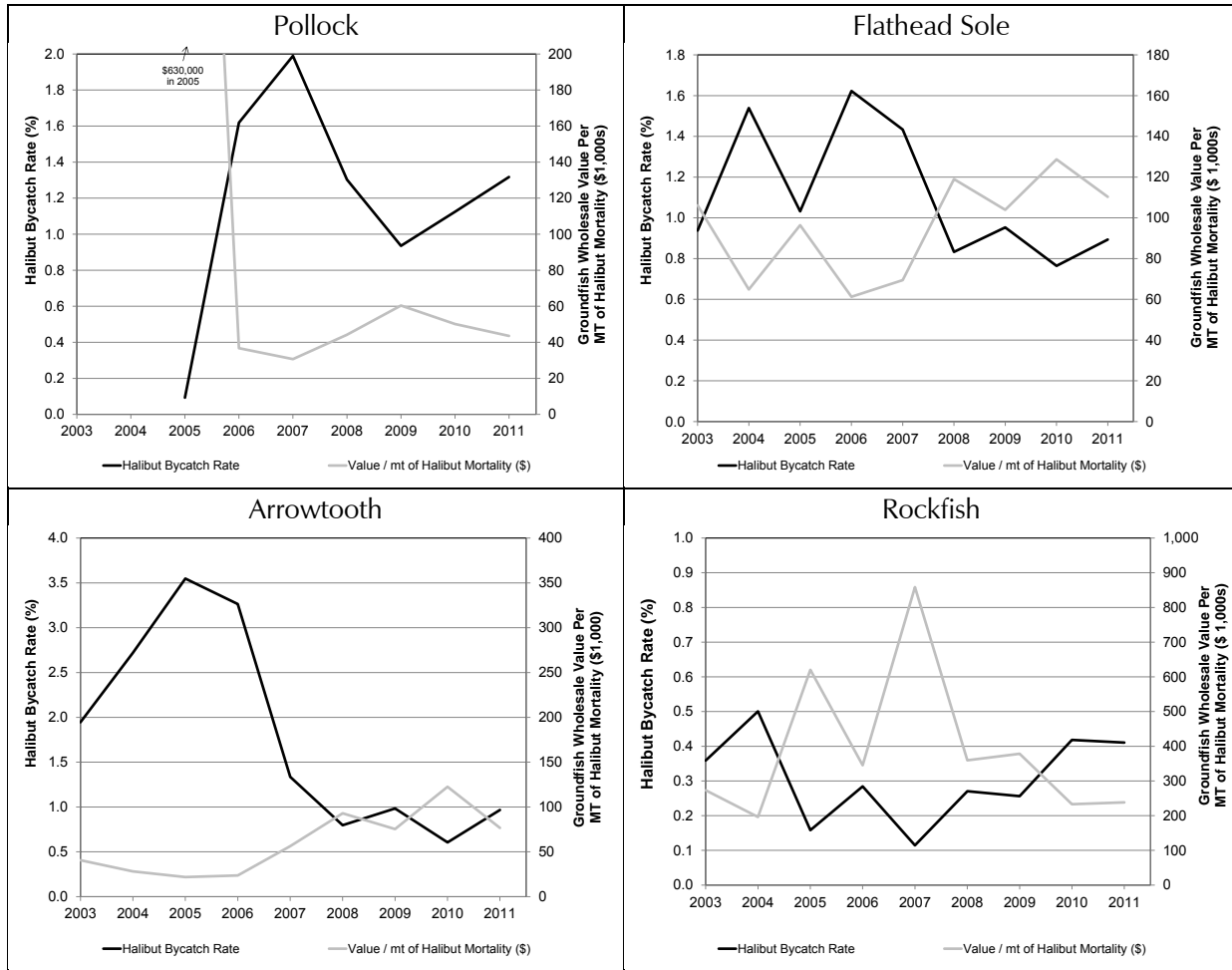


Figure 20. Halibut Bycatch Rates and Groundfish Value per MT of Halibut Mortality for A80-CPs for Specific Target Fisheries, 2003–2011 (continued)



Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.

**Table 18. Halibut and Target Mortality and Value in the A80 Fishery, 2003-2011**

Target	2003	2004	2005	2006	2007	2008	2009	2010	2011
Groundfish Caught in Target Fishery (MT)									
Other Flatfish & Place	1,692	2,640	1,963	874	3,099	300	482	538	1,687
Arrowtooth & Kamchatka	2,732	3,566	5,639	4,505	1,841	16,079	24,075	31,426	27,119
Pollock	ND	ND	419	175	411	2,959	4,602	5,228	4,155
All Rockfish	13,497	10,167	8,298	10,207	14,950	15,342	12,897	13,686	22,804
Atka Mackerel	62,438	64,872	69,673	69,814	67,186	63,595	77,505	76,213	52,628
Rock Sole	37,240	47,023	41,191	48,511	40,697	63,845	49,209	72,407	69,284
Flathead Sole	18,883	28,269	23,384	18,885	21,732	27,993	19,510	22,922	7,687
Pacific Cod	38,903	62,674	40,229	42,859	49,059	5,705	6,733	5,643	3,498
Yellowfin Sole	104,062	94,132	109,873	99,074	118,286	156,220	131,226	125,613	159,515
Halibut Mortality (MT)									
Other Flatfish & Place	41.6	56.6	67.5	15.3	75.2	13.0	11.6	3.1	5.5
Arrowtooth & Kamchatka	53.2	97.0	200.1	147.0	24.6	128.2	236.7	190.4	262.1
Pollock	ND	ND	0.4	2.8	8.2	38.6	43.1	58.8	54.7
All Rockfish	48.4	50.9	13.1	29.0	17.1	41.5	33.1	57.3	93.6
Atka Mackerel	55.4	56.9	89.0	92.0	198.7	64.7	71.5	54.7	111.3
Rock Sole	959.3	544.2	780.7	826.1	971.3	651.4	555.9	918.3	466.5
Flathead Sole	177.1	435.1	241.3	306.5	311.5	233.1	185.9	175.2	68.7
Pacific Cod	577.2	1,160.1	782.3	832.8	615.2	46.0	75.8	35.1	16.7
Yellowfin Sole	701.0	451.4	590.2	384.9	495.8	858.4	920.7	836.9	793.3
Halibut Bycatch Rate (%)									
Other Flatfish & Place	2.5	2.1	3.4	1.8	2.4	4.3	2.4	0.6	0.3
Arrowtooth & Kamchatka	1.9	2.7	3.5	3.3	1.3	0.8	1.0	0.6	1.0
Pollock	ND	ND	0.1	1.6	2.0	1.3	0.9	1.1	1.3
All Rockfish	0.4	0.5	0.2	0.3	0.1	0.3	0.3	0.4	0.4
Atka Mackerel	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.2
Rock Sole	2.6	1.2	1.9	1.7	2.4	1.0	1.1	1.3	0.7
Flathead Sole	0.9	1.5	1.0	1.6	1.4	0.8	1.0	0.8	0.9
Pacific Cod	1.5	1.9	1.9	1.9	1.3	0.8	1.1	0.6	0.5
Yellowfin Sole	0.7	0.5	0.5	0.4	0.4	0.5	0.7	0.7	0.5
Wholesale Value in Target Fishery (\$ millions)									
Other Flatfish & Place	2.5	4.0	3.0	1.0	4.6	0.3	0.7	0.3	0.4
Arrowtooth & Kamchatka	2.2	2.7	4.4	3.5	1.4	11.9	17.9	23.3	20.1
Pollock	ND	ND	0.2	0.1	0.3	1.7	2.6	2.9	2.4
All Rockfish	13.2	10.0	8.1	10.0	14.7	14.9	12.5	13.3	22.3
Atka Mackerel	51.7	53.7	57.5	57.6	55.3	52.5	64.1	63.2	42.8
Rock Sole	37.3	49.4	40.7	46.9	39.8	63.4	49.7	69.7	69.5
Flathead Sole	18.8	28.2	23.3	18.8	21.6	27.7	19.3	22.6	7.6
Pacific Cod	52.4	81.4	55.2	57.3	63.6	7.8	9.3	7.9	4.5
Yellowfin Sole	76.8	69.5	80.9	73.7	89.2	114.1	95.8	90.4	115.7
Value per Mortality-Ton (\$ thousands/MT)									
Other Flatfish & Place	61.13	70.74	44.12	63.55	61.64	23.80	61.33	99.11	65.79
Arrowtooth & Kamchatka	40.66	28.19	21.83	23.62	56.34	93.04	75.41	122.54	76.73
Pollock	ND	ND	630.95	36.75	30.65	44.18	60.43	50.13	43.57
All Rockfish	273.19	196.06	620.27	345.32	858.43	359.48	378.36	233.01	238.26
Atka Mackerel	933.58	944.05	645.55	625.88	278.37	810.90	895.66	1,156.45	384.70
Rock Sole	38.89	90.80	52.18	56.76	40.98	97.28	89.34	75.90	148.96
Flathead Sole	106.16	64.83	96.40	61.25	69.40	119.03	103.96	128.70	110.29
Pacific Cod	90.84	70.18	70.60	68.83	103.31	170.05	122.86	223.62	268.57
Yellowfin Sole	109.62	154.03	137.10	191.42	179.84	132.97	104.04	108.06	145.84

Note: Cell showing ND cannot be disclosed because of confidentiality.

Source: Developed by Northern Economics based on CAS and COAR data from AKFIN.