# Chapter 20: Assessment of the Shark stock complex in the Bering Sea and Aleutian Islands

(Executive Summary)

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## Introduction

The shark complex (Pacific sleeper shark, spiny dogfish, salmon shark and other/unidentified sharks) in the Bering Sea and Aleutian Island (BSAI) is now being assessed on a biennial stock assessment schedule. BSAI sharks are a Tier 6 complex, with OFL based on maximum historical catch between the years 1997 – 2007 (ABC is 75% of OFL). For this off-year summary we have updated the time series of catch to reflect any changes that might have occurred in the Catch Accounting System (for the years 2003 – 2011). Changes in the Catch Accounting System did not result in new estimates of maximum historical catch and thus did not change the proposed ABC/OFL. We have also included Appendix 20A which contains the non-commercial and halibut fishery catch estimates for total catch accounting. Although documented, these data are not currently used to determine the ABC and OFL for sharks, but are presented to be consistent with the revised SAFE guidelines. For further information regarding the assessment, please refer to last year's full stock assessment, which is available online (Tribuzio et al. 2010, http://www.afsc.noaa.gov/REFM/docs/2010/BSAIshark.pdf). A full stock assessment document with updated survey and catch estimates will be presented in next year's SAFE report.

## ABC, OFL, and Catch

The final 2010 catch was 53 t, and the estimate of the 2011 catch is 148 t (as of October 11, 2011). We recommend the same ABC and OFL as in last year's assessment: ABC = 1,020 t and OFL = 1,360 t.

ABC and OFL Calculations and Tier 6 recommendations for the shark complex for 2011-2012.

| **Shark Complex** | As estimated or *specified last* year for: | | As estimated or *recommended this* year for: | |
|---|---|---|---|---|
| **Quantity** | 2011 | 2012 | 2012 | 2013 |
| Tier | 6 | 6 | 6 | 6 |
| OFL (t) | 1,360 | 1,360 | 1,360 | 1,360 |
| maxABC (t) | 1,020 | 1,020 | 1,020 | 1,020 |
| ABC (t) | 1,020 | 1,020 | 1,020 | 1,020 |
| | As determined *last* year for: | | As determined *this* year for: | |
| **Status** | 2009 | 2010 | 2010 | 2011 |
| Overfishing | No | n/a | No | n/a |

**References:**

Tribuzio, C. A., K. Echave, C. Rodgveller, J. Heifetz, and K. J. Goldman. 2010. Assessment of the sharks in the Bering Sea and Aleutian Islands. North Pacific Fishery Management Council, 605 W 4th Ave, Suite 306 Anchorage, AK 99501. pp. 1451-1500.

## Responses to Council, SSC, and Plan Team Comments

From the December 2010 SSC minutes:

*A priority need for improvement in the shark assessment is the development of improved estimates of shark catches. This is a difficult task, owing to the probable large amount of dogfish bycatch in un-observed fisheries. The SSC appreciates the formation of a working group to develop methods to estimate shark bycatch in the unobserved halibut IFQ fleet and looks forward to inclusion of this important information into catch estimates in next year's assessment.*
**Appendix 20A contains both non-commercial catch (i.e. research, state fisheries) and estimates of catch from the halibut fishery for all shark species in the BSAI. Catch of spiny dogfish in either the groundfish or halibut fishery is small in the BSAI and not an issue for this assessment.**

*As with the GOA shark assessment, the SSC also encourages approaches to attempt to estimate shark removals in other unobserved fisheries that may have substantial shark catches.*
**We are working with ADF&G to develop methods similar to the HFICE methods for estimating shark bycatch in state groundfish fisheries (such as Pacific cod). The other potential source of shark bycatch is in salmon fisheries, but no observer data exists and there is not a survey to use as proxy data. We have been discussing options with ADF&G biologists.**

*Research priorities for BSAI shark research should also include priorities identified by the SSC for sharks in the GOA.*
**An extensive list of research priorities is detailed in the GOA SAFE document as requested. Below is an abbreviated list detailing research priorities only relevant to the BSAI.**

## Research Priorities

Data limitations are severe for shark species in the BSAI, and effective management of sharks is extremely difficult with the current limited information. Gaps include inadequate catch estimation, unreliable biomass estimates, lack of size frequency collections, and a lack of life history information including age composition and maturity, especially for Pacific sleeper sharks. Regardless of future management decisions regarding the shark complex management category, it is essential to continue to improve shark fishery and survey sampling with the collection of biological data from sharks. Future shark research priorities will focus on the following areas:

1. Define the stock structure and migration patterns (i.e. tagging studies, genetics)
    a. Actions: Developing study plan for long term tagging of sleeper sharks to determine long-term movement patterns (i.e. greater than 1 year)
2. Determine or clarify existing estimates of life history parameters for use in models
    a. Actions: Examining methods for estimation of *M* for Pacific sleeper sharks and investigating potential methods to age Pacific sleeper shark

## Summaries for Plan Team

| Species | Year | OFL | ABC | TAC | Catch |
|---|---|---|---|---|---|
| Shark Complex | 2010 | 9,432[1] | 7,075[1] | 4,500[1] | 53[2] |
| | 2011 | 1,360 | 1,020 | 50 | 148[2,3] |
| | 2012 | 1,360 | 1,020 | | |
| | 2013 | 1,360 | 1,020 | | |

[1]Sharks were still part of the Other Species Complex in 2010, these catch specifications are for the Other Species Complex
[2]Catch was for sharks only
[3]As of October 11, 2011

**Appendix 20A.—Supplemental catch data**

In order to comply with the Annual Catch Limit (ACL) requirements, two new datasets have been generated to help estimate total catch and removals from NMFS stocks in Alaska. The first dataset, non-commercial removals, estimates total removals that do not occur during directed groundfish fishing activities. This includes removals incurred during research, subsistence, personal use, recreational, and exempted fishing permit activities, but does not include removals taken in fisheries other than those managed under the groundfish FMP. These estimates represent additional sources of removals to the existing Catch Accounting System (CAS) estimates. For sharks, these research removals can be compared to the research removals reported in previous assessments (Tribuzio et al. 2010) (Table 20A.1). Removals from subsistence and personal use have not been previously documented in the shark assessments. The shark non-commercial removals are small relative to the fishery catch. In 2010, NMFS surveys accounted for < 0.5 t of catch. The IPHC longline survey reports the greatest research shark catch, about 8 t. Total non-commercial removals are less than 10 t, much less than 1% of the 2011 recommended ABC of 1,020 t and represents a relatively low risk to the shark stock.

The second dataset, Halibut Fishery Incidental Catch Estimation (HFICE), is an estimate of the incidental catch of groundfish in the halibut IFQ fishery in Alaska, which is currently unobserved. To estimate removals in the halibut fishery, methods were developed by the HFICE working group and approved by the Gulf of Alaska and Bering Sea/Aleutian Islands Plan Teams and the Scientific and Statistical Committee of the North Pacific Fishery Management Council. A detailed description of the methods is available in Tribuzio et al. (2011).

These estimates are for total catch of groundfish species in the halibut IFQ fishery and do not distinguish between “retained” or “discarded” catch. These estimates should be considered a separate time series from the current CAS estimates of total catch. Because of potential overlaps HFICE removals should not be added to the CAS produced catch estimates. The overlap will apply when groundfish are retained or discarded during an IFQ halibut trip. IFQ halibut landings that also include landed groundfish are recorded as retained in eLandings and a discard amount for all groundfish is estimated for such landings in CAS. Discard amounts for groundfish are not currently estimated for IFQ halibut landings that do not also include landed groundfish. For example, catch information for a trip that includes both landed IFQ halibut and sablefish would contain the total amount of sablefish landed (reported in eLandings) and an estimate of discard based on at-sea observer information. Further, because a groundfish species was landed during the trip, catch accounting would also estimate discard for all groundfish species based on available observer information and following methods described in Cahalan et al. (2010). The HFICE method estimates all groundfish caught during a halibut IFQ trip and thus is an estimate of groundfish caught whether landed or discarded. This prevents simply adding the CAS total with the HFICE estimate because it would be analogous to counting both retained and discarded groundfish species twice. Further, there are situations where the HFICE estimate includes groundfish caught in State waters and this would need to be considered with respect to ACLs (e.g. Chatham Strait sablefish fisheries). Therefore, the HFICE estimates should be considered preliminary estimates for what is caught in the IFQ halibut fishery. Improved estimates of groundfish catch in the halibut fishery may become available following restructuring of the Observer Program in 2013.

The HFICE estimates of shark catch by the BSAI halibut fishery are substantial relative to catch in the groundfish fisheries (on average 67% of groundfish fishery shark catch) and in 2010 represented approximately 9% of the 2010 shark ABC (Table 20A.2). It is unknown what level of shark catch reported here is already accounted for as IFQ harvest in the CAS system because the HFICE estimates do not separate retained and discarded catch. It is likely that small amounts of retention of sharks occur, but it is a rare occurrence. The sharks in the BSAI are extremely data limited and they are managed based on

historical maximum catch (i.e. the ABC/OFL are not based on biological information). Therefore, it is unknown if there if a significant biological impact from this level of removals.

**References:**

Cahalan J., J. Mondragon., and J. Gasper. 2010. Catch Sampling and Estimation in the Federal Groundfish Fisheries off Alaska. NOAA Technical Memorandum NMFS-AFSC-205. 42 p.

Tribuzio, CA, K Echave, C Rodgveller, J Heifetz, KJ Goldman. 2010. Assessment of the sharks in the Bering Sea and Aleutian Islands. North Pacific Fishery Management Council, 605 W 4th Ave, Suite 306 Anchorage, AK 99501. pp. 1451-1500.

Tribuzio, CA, S Gaichas, J Gasper, H Gilroy, T Kong, O Ormseth, J Cahalan, J DiCosimo, M Furuness, H Shen, K Green. 2011. Methods for the estimation of non-target species catch in the unobserved halibut IFQ fleet. August Plan Team document. Presented to the Joint Plan Teams of the North Pacific Fishery Management Council.

Table 20A.1. Research survey catch of sharks between 1977 and 2011 in the Bering Sea/Aleutian Islands (BSAI). The AFSC LL and IPHC LL survey catches are provided in numbers prior to 2010. The total catch numbers from the IPHC survey are estimated based on the subsample of observed hooks, the 2010 estimated catch (t) is directly from the survey. Beginning in 2010 all research and other non-commercial catch is provided by the AKRO.

| Year | **Source** | **AFSC Trawl Surveys (t)** | **AFSC LL Survey (#s)** | **AFSC LL Survey (t)** | **IPHC LL Survey (#s)** | **IPHC LL Survey (t)** | **ADF&G (includes sport and research)** |
|---|---|---|---|---|---|---|---|
| 1977 | | 0 | | | | | |
| 1978 | | | | | | | |
| 1979 | | 0.03 | 4 | NA | | | |
| 1980 | | 0 | 4 | NA | | | |
| 1981 | | 0.07 | 5 | NA | | | |
| 1982 | | 0.16 | 15 | NA | | | |
| 1983 | | 0.01 | 33 | NA | | | |
| 1984 | | | 40 | NA | | | |
| 1985 | | 0.59 | 53 | NA | | | |
| 1986 | | | 52 | NA | | | |
| 1987 | | 0.01 | 61 | NA | | | |
| 1988 | | 1.06 | 30 | NA | | | |
| 1989 | | 0.07 | 27 | NA | | | |
| 1990 | Assessment of the sharks in the Bering Sea and Aleutian Islands (Tribuzio et al. 2010) | 0 | 4 | NA | | | |
| 1991 | | 0.56 | 18 | NA | | | |
| 1992 | | 0.09 | 55 | NA | | | |
| 1993 | | | 75 | NA | | | |
| 1994 | | 0.17 | 111 | NA | | | |
| 1995 | | 0.04 | 0 | NA | | | |
| 1996 | | 0.1 | 3 | NA | | | |
| 1997 | | 0.11 | 59 | NA | | | |
| 1998 | | 0.09 | 1 | NA | 207 | NA | |
| 1999 | | 0.08 | 20 | NA | 152 | NA | |
| 2000 | | 8.5 | 2 | NA | 723 | NA | |
| 2001 | | | 12 | NA | 164 | NA | |
| 2002 | | 5.74 | 1 | NA | 169 | NA | |
| 2003 | | 0.03 | 22 | NA | 368 | NA | |
| 2004 | | 0.76 | 3 | NA | 251 | NA | |
| 2005 | | 0 | 6 | NA | 237 | NA | |
| 2006 | | 0 | 3 | NA | 241 | NA | |
| 2007 | | 0 | 34 | NA | 170 | NA | |
| 2008 | | 0.47 | 8 | NA | 208 | NA | |
| 2009 | | 2.02 | 2 | NA | 234 | NA | |
| 2010 | AKRO | 0.43 | 0 | 0 | NA | 8.4 | trace |

Table 20A.2. Estimates of shark catch (t) by EBSAI NMFS Regulatory Area from the Halibut Fishery Incidental Catch Estimation (HFICE) working group.

| Area | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| AI | 258 | 68 | 49 | 5 | 1 | 1 | 1 | 5 | 0 | 11 |
| BS | 481 | 137 | 1,069 | 196 | 135 | 36 | 64 | 48 | 104 | 78 |
| Total | 739 | 205 | 1,119 | 201 | 136 | 36 | 64 | 52 | 104 | 89 |

Table 20A.3. Estimates of shark catch (t) by species in the BSAI from the Halibut Fishery Incidental Catch Estimation (HFICE) working group.

| Shark Species | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| Misc | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Pacific Sleeper | 738 | 205 | 1,119 | 200 | 135 | 36 | 64 | 49 | 104 | 87 |
| Spiny Dogfish | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 | 3 |
| Total | 739 | 205 | 1,119 | 201 | 136 | 36 | 64 | 52 | 104 | 89 |