19. Assessment of the sculpin complex in the Bering Sea and Aleutian Islands

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Executive Summary

Summary of Changes in Assessment Inputs

Beginning in 2011, BSAI sculpins will be assessed biannually, with full assessments in even years. Therefore, there have been no changes to the input data, and no changes in the assessment methodology for the current executive summary. In 2010, trawl survey sculpin biomass estimates from the Eastern Bering Sea shelf survey comprised 85.7% of the total BSAI sculpin biomass. The 2010 Eastern Bering Sea slope survey and the Aleutian Islands survey comprised 10.3 and 4.0% respectively, of the total BSAI sculpin biomass. There were no Aleutian Islands or Eastern Bering Sea slope surveys in 2011. Catch data has been updated for 2010 and 2011.

Summary of Results

	last year		**this year**	
Quantity/Status	2011	2012	**2012**	2013
sculpin complex average mortality rate*	0.28	0.28	**0.28**	0.28
Specified/recommended Tier	5	5	**5**	5
Biomass (t)	208,181	208,181	**208,181**	**208,181**
F_{OFL} (*F=complex mortality rate*)	0.28	0.28	**0.28**	0.28
max F_{ABC} (maximum allowable = 0.75 *x* F_{OFL})	0.21	0.21	**0.21**	0.21
Specified/recommended F_{ABC}	0.21	0.21	**0.21**	0.21
Specified/recommended OFL (t)	58,291	58,291	**58,291**	58,291
Specified/recommended ABC (t)	43,718	43,718	**43,718**	43,718
Is the stock being subjected to overfishing?	NA		**NA**	
(for Tier 5 stocks, data are not available to determine whether the stock is in an overfished condition)				

* *The sculpin complex mortality rate is a biomass-weighted average of the instantaneous natural mortality rates for the six most abundant sculpins in the BSAI. The complex mortality rate may change as new survey data become available.*

Response to SSC Comments

In response to page 33 of the Dec. 2010 SSC minutes, the zero values in Table 6a of the 2010 BSAI sculpin assessment represent missing values. This will be clarified in future assessments.

Introduction

The Bering Sea/Aleutian Islands (BSAI) sculpin complex is assessed based on information from the genera *Myoxocephalus*, *Hemitripterus*, and *Hemilepidotus* that observers from the North Pacific Groundfish Observer Program identify to genus in commercial catches. Sculpins are relatively small,

benthic-dwelling, teleost fish and are distributed throughout the Bering Sea/Aleutian Island region and occupy all benthic habitats and depths. This group is especially speciose; during cooperative U.S.-Japan trawl surveys, 41 species of sculpins were identified in the Eastern Bering Sea (EBS) and 22 species in the Aleutian Islands (AI) region. Sculpin diversity remains high in recent surveys of both the Aleutians and Eastern Bering Sea, and the specific composition of sculpins differs among the two areas.

Historically, sculpins have been managed as part of the BSAI Other Species complex (sculpins, skates, sharks, and octopus). Specifications for this group were set by summing the individual ABCs and OFLs for each species group to create an aggregate OFL, ABC, and TAC. However in 2010, the North Pacific Fishery Management Council passed Amendment 97 to the BSAI Fishery Management Plan, which separated the Other Species complex into its constituent species groups. Thus, BSAI sculpins are now managed as an independent complex with its own harvest specifications. Sculpins are currently taken only as bycatch in fisheries directed at target species in the BSAI, and it is likely that future catch of sculpins will continue to be dependent on the distribution and limitations placed on target fisheries, rather than on any harvest level established for this category. Sculpins, in general, are not retained by fisheries in the BSAI region, although fishery observer data indicate that the retention rate increased from 1% in 2003 to 13% in 2009.

Recent studies on the reproductive biology of the five most abundant sculpin species in the Eastern Bering Sea Shelf area have given us new information on sculpin life history in Alaska. Prior to those studies much of the reproductive biology information came from studies in the western North Pacific. Most, if not all sculpins lay adhesive eggs in nests, and many exhibit parental care for eggs (Eschmeyer et al. 1983). Markevich (2000) observed the sea raven, *Hemitripterus villosus*, releasing eggs into crevices of boulders and stones in shallow waters in Peter the Great Bay, Sea of Japan. This type of reproductive strategy suggests that sculpin populations may be more sensitive to changes in benthic habitats than other groundfish species such as walleye pollock, which are broadcast spawners with pelagic eggs. In the western Pacific, great sculpins (*Myoxocephalus polyacanthocephalus*) are reported to have relatively late ages at maturity (5-8 years, Tokranov, 1985) despite being relatively short-lived (13-15 years). This suggests a limited reproductive portion of the lifespan relative to other groundfish species. Fecundity for the great sculpin in East Kamchatka waters ranged from 48,000 to 415,000 eggs (Tokranov 1985). Within each sculpin species, observed spatial differences in fecundity, egg size, and other life history characteristics suggest local population structure (Tokranov 1985).

The BSAI sculpin complex is assessed using Tier 5 criteria, where OFL = natural mortality * average survey biomass and ABC $\leq 0.75 * M *$ average survey biomass. Sculpin natural mortality is estimated using a biomass-weighted average of the instantaneous natural mortality rates for the six most abundant sculpins in the BSAI: bigmouth (*Hemitripterus bolini*), great (*Myoxocephalus polyacanthocephalus*), plain (*Myoxocephalus jaok*), threaded (*Gymnocanthus pistilliger*), warty (*Myoxocephalus verrucosus*), and yellow Irish lord (*Hemilepidotus jordani*). The BSAI biomass estimates are calculated as the sum of the average of the last three surveys in each area. **The exploitable BSAI biomass as presented in the 2010 assessment for the sculpin complex is 208,181 t (shelf = 178,475 t, slope = 21,438 t, AI = 8,268 t).**

The Council set the 2011 BSAI OFL, ABC, and TAC for sculpins at 58,300 t, 43,700 t, and 5,200 t, respectively (http://www.fakr.noaa.gov/sustainablefisheries/specs11_12/bsaitable1.pdf). Last year's full assessment is available on the internet (Ormseth and TenBrink 2010, http://www.afsc.noaa.gov/REFM/docs/2010/BSAIsculpin.pdf).

New information and projection

New catch information includes updated 2010 and 2011 catches by area as of September 17, 2011. Prior to 2011, the Regional Office Catch Accounting System (CAS) did not report sculpin catch separately

from the other species complex, so the 2010 catch was reported from the AKFIN database and the 2011 catch is from the Regional Office website (http://www.fakr.noaa.gov/2011/car110_bsai_with_cdq.pdf). Catch in 2010 was 5,631 t and 4,513 t in 2011.

There is no new information incorporated into the projection. For the 2012 and 2013 fisheries, we recommend ABCs of 43,718 t. These ABCs are equivalent to last year's ABCs for 2011 (and 2012) set by the Council. The corresponding reference values for BSAI sculpins are summarized below. Because sculpins are managed in Tier 5, some of the values are not applicable (NA).

Summaries for the Plan Team

Species	Year	Biomass	OFL	ABC	TAC	Catch
Sculpin complex	2011	208,181	58,291	43,718	5,200	4513[1]
	2012	208,181	58,291	43,718		
	2013	208,181	58,291	43,718		

[1]/ Current as of September 17, 2011 http://www.fakr.noaa.gov/2011/car110_bsai_with_cdq.pdf.

Data gaps and research priorities

Sculpin life history has been studied more extensively in the western Bering Sea and associated waters. Although we have recently acquired substantially more age and growth life history data for five species in the EBS, data gaps continue to persist for other species in the Eastern Bering Sea and Aleutian Island regions. Age validation studies could be conducted to validate the newly acquired age data from the five species in the EBS. Genetic analysis of species found in different regions would help determine if complex population structure exists within species inhabiting the BSAI. Studies of habitat use and catchability studies of smaller sculpin species would be useful to understand why only the larger species make up most of the sculpin complex biomass. These data are necessary to improve management strategies and stock assessments for this non-target species group.

Literature Cited

Eschmeyer, W.N., E.S. Herald, and H. Hammann, 1983. A field guide to Pacific coast fishes of North America. Houghton Mifflin Co., Boston: 336 pp.

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