Plain sculpin − *Myoxocephalus jaok*

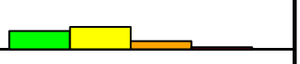
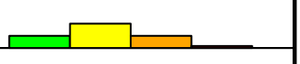
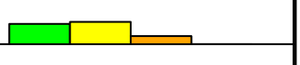
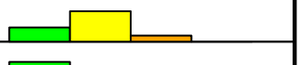
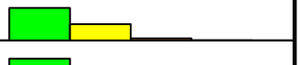
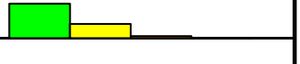
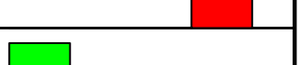
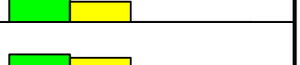
Overall Vulnerability Rank = Low

Biological Sensitivity = Low

Climate Exposure = Low

Sensitivity Data Quality = 17% of scores ≥ 2

Exposure Data Quality = 56% of scores ≥ 2

	Myoxocephalus jaok	Expert Scores	Data Quality	Expert Scores Plots (Portion by Category)
Sensitivity attributes	Habitat Specificity	1.8	1.6	
	Prey Specificity	1.5	1.6	
	Adult Mobility	2.6	1.0	
	Dispersal of Early Life Stages	1.9	1.4	
	Early Life History Survival and Settlement Requirements	2.1	1.4	
	Complexity in Reproductive Strategy	2.3	1.2	
	Spawning Cycle	2.4	1.4	
	Sensitivity to Temperature	1.8	2.2	
	Sensitivity to Ocean Acidification	2.4	2.4	
	Population Growth Rate	1.8	1.2	
	Stock Size/Status	1.4	1.0	
	Other Stressors	1.4	1.2	
	Sensitivity Score	Low		
Exposure factors	Sea Surface Temperature	2.1	2.2	
	Sea Surface Temperature (variance)	1.4	2.2	
	Bottom Temperature	2.3	3.0	
	Bottom Temperature (variance)	1.8	3.0	
	Salinity	1.5	2.0	
	Salinity (variance)	2.3	2.0	
	Ocean Acidification	4.0	3.0	
	Ocean Acidification (variance)	1.3	3.0	
	Phytoplankton Biomass	2.1	1.2	
	Phytoplankton Biomass (variance)	2.0	1.2	
	Plankton Bloom Timing	1.4	1.0	
	Plankton Bloom Timing (variance)	2.0	1.0	
	Large Zooplankton Biomass	1.8	1.2	
	Large Zooplanton Biomass (variance)	1.5	1.2	
	Mixed Layer Depth	1.3	1.0	
	Mixed Layer Depth (variance)	1.6	1.0	
	Currents	1.3	2.0	
	Currents (variance)	1.5	2.0	
	Air Temperature	NA	NA	
	Air Temperature (variance)	NA	NA	
	Precipitation	NA	NA	
	Precipitation (variance)	NA	NA	
	Sea Surface Height	NA	NA	
	Sea Surface Height (variance)	NA	NA	
	Exposure Score	Low		
	Overall Vulnerability Rank	Low		

Low
Moderate
High
Very High

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Plain sculpin (*Myoxocephalus jaok*)

Overall Climate Vulnerability Rank: **Low**. (97% certainty from bootstrap analysis).

Climate Exposure: **Low**. With the exception of ocean acidification (4.0), all exposure factors had scores less than 2.5.

Biological Sensitivity: **Low**. Adult mobility (2.6) was ranked as "moderate" sensitivity, and all other sensitivity attributes were ranked as "low" sensitivity.

Potential for distribution change: **High** (74% certainty from bootstrap analysis). Dispersal of early life stages and habitat specificity indicated high potential for distribution change.

Directional Effect in the Eastern Bering Sea: Projected climate change in the eastern Bering Sea is expected to have a negative effect on plain sculpin, with 68% certainty in expert scores.

Data Quality: 17% of the sensitivity attributes, and 56% of the exposure factors, had average data quality scores of 2 or greater (indicating at least "moderate" data quality).

Climate Effects on Abundance and Distribution:

Sculpin larvae are dependent on copepods, whose shells are made of chitin and calcium. Ocean acidification would threaten survival of copepod populations. Copepod juveniles emerge in the spring to coincide with spring blooms of plankton (Conover and Huntley 1991). If copepod emergence timing changes, then food could be unavailable for juvenile sculpin. In the eastern Bering Sea the main predator of large sculpins (sculpins from the genera *Myoxocephalus, Hemitripterus* and *Hemilepidotus*) is Pacific cod. Increases in the abundance of cod could result in an increase in predation on sculpins.

Life History Synopsis:

Plain sculpin *Myoxocephalus jaok* range from the Bering Sea to the Gulf of Alaska, but are not common in the Aleutian Islands. Adults are found from intertidal areas to depths of about 100 m, but are most common in shallow waters (<50 m). Larvae are distributed pelagically and in the neuston across broad areas of the eastern Bering Sea shelf and slope, but predominantly on the inner and middle shelf, where they have been found all year-round. Larvae exhibit diel vertical migration (near surface at night and at depth during the day). Plain sculpin spawn in winter; the female lays demersal eggs amongst rocks, where they are guarded by males (Panchenko 2001). Egg incubation duration is unknown.

Larvae forage primarily on copepods, and it is unknown whether diet can be expanded to other prey items. Adults feed on bottom invertebrates (crabs, molluscs, barnacles) and small fish (Spies et al. 2014).

Plain Sculpin are managed in the eastern Bering Sea as a single stock within a stock complex that includes all sculpin species (Spies et al. 2014). Natural mortality of plain sculpin is estimated to be 0.28 based on an empirical relationship between natural mortality and longevity (Hoenig 1983; Ormseth and TenBrink 2009), but there is little other information on life history in this species.

Literature Cited:

Conover R.J., Huntley M. 1991. Copepods in ice-covered seas—distribution, adaptations to seasonally limited food, metabolism, growth patterns and life cycle strategies in polar seas. Journal of Marine Systems (2): 1-41.

Hoenig, J.M. 1983. Empirical use of longevity data to estimate mortality rates. Fishery Bulletin 82(1): 898-903.

Ormseth, O.A. and TenBrink, T.T. 2009. 18d. Bering Sea/Aleutian Islands sculpins.

Panchenko, V. 2001. Reproduction peculiarities of plain sculpin *Myoxocephalus jaok* in Peter the Great Bay, Sea of Japan. Journal of Marine Biology. 27(2): 111-112.

Spies, I., Nichol, D., Ormseth, O., and TenBrink, T. 2014. Assessment of the sculpin stock complex in the Bering Sea and Aleutian Islands. http://www.afsc.noaa.gov/REFM/Stocks/assessments.htm