$$Percent\ Harvest\ Rate = 2 + 8\left[\frac{Forecast\ Spawning\ Population\ Size}{20,000}\right]$$

Sitka HCR

$$Percent\ Harvest\ Rate = 8 + 2\left[\frac{Forecast\ Spawning\ Population\ Size}{Threshold\ Level}\right]$$

SEAK HCR

$$Percent\ Harvest\ Rate = \cancel{2} + \cancel{8}\left[\frac{Forecast\ Spawning\ Population\ Size}{20,000}\right]$$

8 **2**

Proposal 156

Sitka AC Meeting
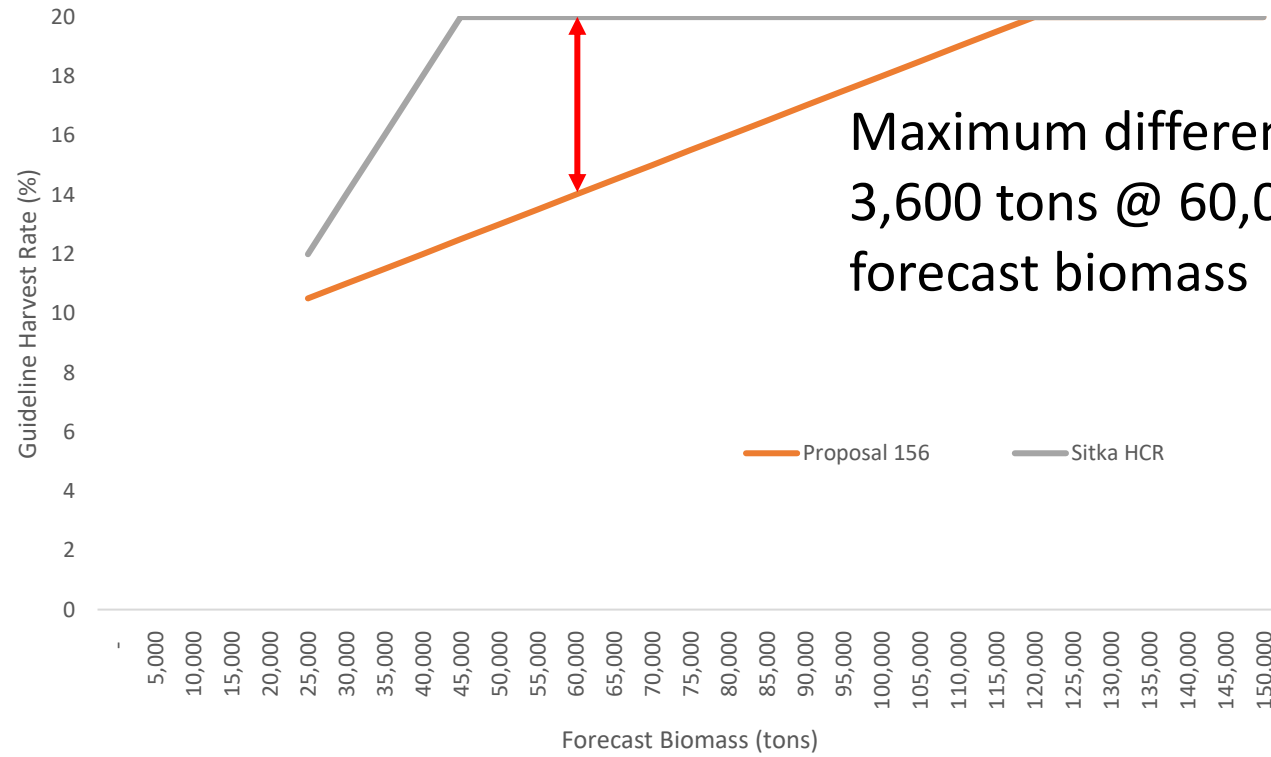11/4/2021
Sitka Tribe of Alaska
Proposal 156

- Slope of Sitka Sound HCR is four times greater than SEAK slope
- Proposal 156 just seeks to switch the 2 and 8 back to the SEAK format
- **The Sitka AC unanimously supported a slightly more conservative prior to 2018 BoF meeting**
- Note: Sitka Sound HCR no longer tied to threshold

$$\textbf{8} \quad \textbf{2}$$

$$Percent\ Harvest\ Rate = 2 + 8\left[\frac{Forecast\ Spawning\ Population\ Size}{20,000}\right]$$

Proposal 156

$$Percent\ Harvest\ Rate = 2 + 8\left[\frac{Forecast\ Spawning\ Population\ Size}{20,000}\right]$$

Sitka HCR

$$Percent\ Harvest\ Rate = 8 + 2\left[\frac{Forecast\ Spawning\ Population\ Size}{Threshold\ Level}\right]$$

SEAK HCR

Maximum difference in GHL is 3,600 tons @ 60,000 tons forecast biomass

- Based on HCR in regs; does not include years ADFG reduced GHL (e.g. 2013, 2021)

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4

- Slope of Sitka Sound HCR is four times greater than SEAK slope
- The Sitka AC unanimously supported a slightly more conservative prior to 2018 BoF meeting
- Sitka Sound HCR no longer tied to threshold
- **Implications of threshold and AUB**
- Issues with biomass as only indicator of population health

$$Percent\ Harvest\ Rate = 2 + 8\left[\frac{Forecast\ Spawning\ Population\ Size}{20,000}\right]$$ Sitka HCR

$$Percent\ Harvest\ Rate = 8 + 2\left[\frac{Forecast\ Spawning\ Population\ Size}{Threshold\ Level}\right]$$ SEAK HCR

$$Percent\ Harvest\ Rate = 2 + 8\left[\frac{Forecast\ Spawning\ Population\ Size}{20,000}\right]$$ Proposal 156

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Proposal 156

- Sac roe fishery harvests older fish at approximately twice the rate as younger fish (based on ADFG data)
- In years with lots of younger fish, this can lead to high exploitation rates on older fish
- Proposal 157 limits the harvest rate on old fish to 20%
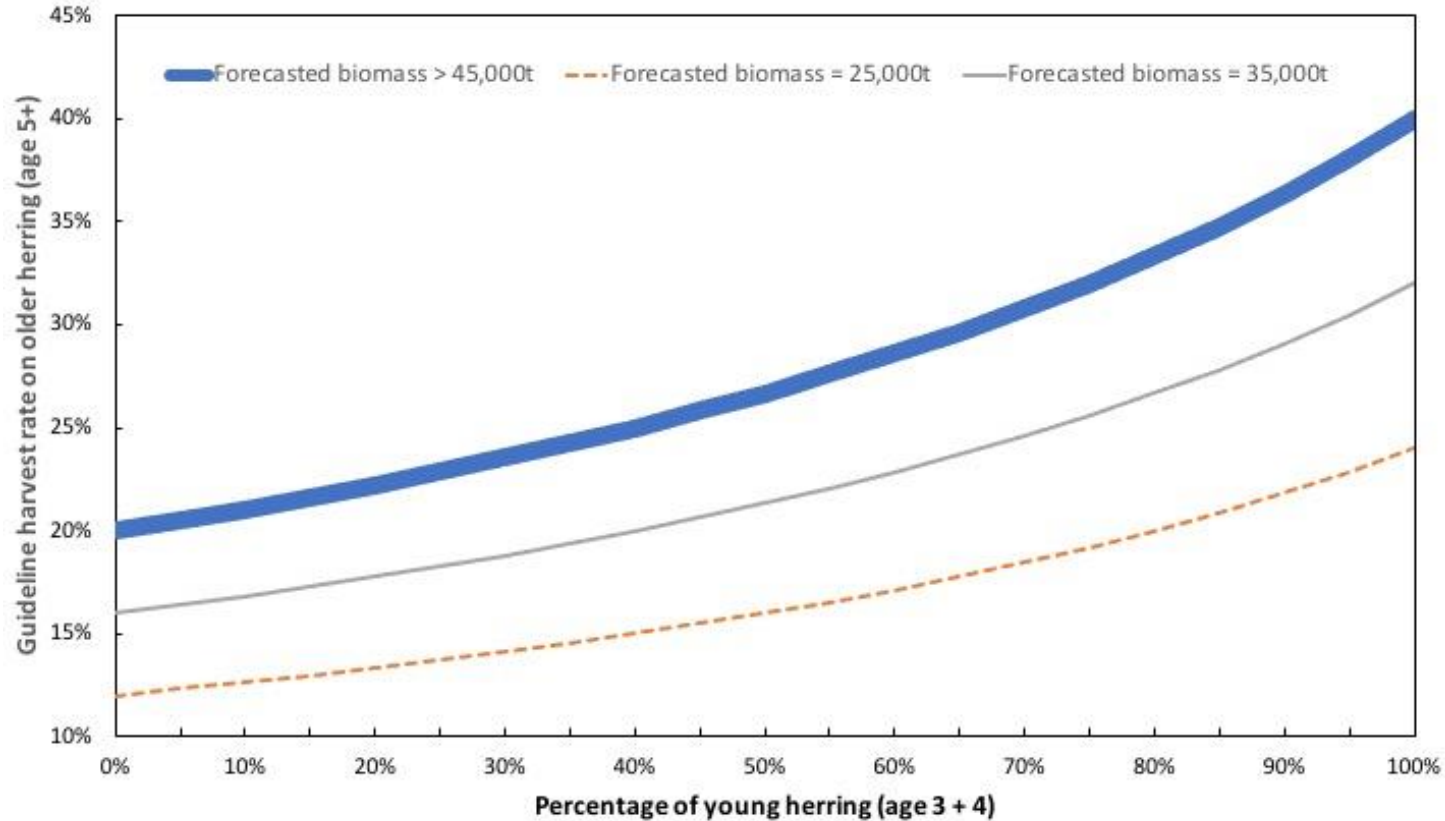
5 AAC 27.160. Quotas and guideline harvest levels for Southeastern Alaska Area

(g) The guideline harvest level for the herring sac roe fishery in Sections 13-A and 13-B **shall consider the preseason age structure as a means to prevent exceeding the 20% maximum harvest rate when targeting older herring. The guideline harvest level** shall be established by the department and will be a harvest rate percentage that is [not less than] **between 12 and 20 percent on "old" herring and** not more than ~~20~~ **10** percent **on "young" herring,** and within that range shall be determined by the following **formulas** [formula]:

$$GHL_{old\ fish} = (\%\ Old\ fish) * (Spawning\ Biomass) * ((2 + 8\ (Spawning\ Biomass\ /20{,}000))/100)$$

$$GHL_{young\ fish} = (Selectivity\ Correction\ Factor) * (\%\ Young\ fish) * (Spawning\ Biomass\ ) * ((2 + 8\ (Spawning\ Biomass\ /20{,}000))/100)$$

$$Total\ GHL = GHL_{old\ fish} + GHL_{young\ fish}$$

[Harvest Rate Percentage = 2 + 8 (Spawning Biomass (in tons)/20,000).]

"Old fish" is defined as herring that are age-5 and older; "young fish" is defined as age-3 and age-4 herring. Based on current selectivity patterns, the selectivity correction factor shall be set at 0.5. The selectivity correction factor should be allowed to change in accordance with future selectivity patterns. The harvest rate cap on "young" fish should also be allowed to change with future selectivity patterns. The fishery will not be conducted if spawning biomass is less than 25,000 tons.

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Example Calculation

We provide an example to compare the current regulation to the proposed change. In 2016, the pre-season "spawning" biomass forecast was 74,707 tons, the GHL was 14,941 tons, and the GHR was 20%. ASA model estimated age composition data provided by ADF&G to STA indicated the return biomass in 2016 was 30% "old" fish (age 5+) and 70% "young" fish. If the full GHL (14,941 tons) was harvested and older fish were selectively harvested at twice the rate of young fish, as shown by ADF&G data, then the harvest rate on old herring would be 31%.

The GHL formula proposed by STA is calculated as follows:

$GHL_{old fish}$ = (0.30) * (74,707 tons) * (0.20) = 4,482 tons

$GHL_{young fish}$ = (0.5) * (0.70) * (74,707 tons) * (0.20) = 5,229 tons

Total GHL = 4,482 tons + 5,229 tons = 9,711 tons

In this example, the proposed Guideline Harvest Rate was constrained to 20% because the forecasted biomass exceeded 45,000 tons. The revised GHL is 9,711 tons, which is necessary to limit the harvest rate on old herring to 20% given the estimated 2X selectivity for older herring.

The proposed change in GHL is much less when the percentage of young herring is relatively low. For example, in 2014, the forecasted biomass was 81,663 tons leading to a GHL of 16,333 tons based on current regulations. In 2014, 24% of the herring were young and 76% were old, leading to a revised GHL of 14,386 tons based on the proposal to limit the harvest rate on old herring to 20%.
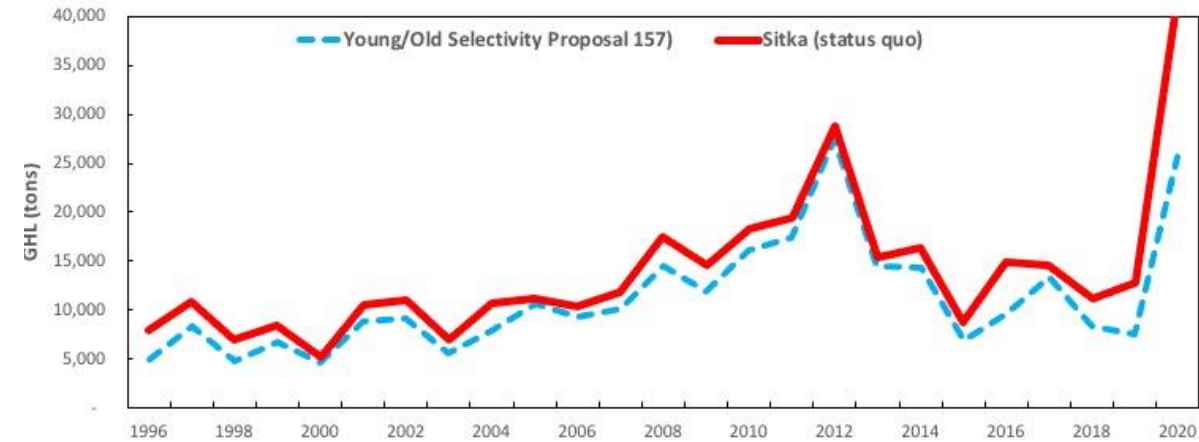
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PROPOSAL 158
### 5 AAC 27.160. Quotas and guideline harvest levels for Southeastern Alaska Area.
Incorporate forecasted age structure into Sitka Sound commercial sac roe herring fishery spawning biomass threshold, as follows:

Managers must ensure there are sufficient old and large fish in the population to lead younger fish to appropriate spawning grounds and increase the potential for successful recruitment to the population.

5 AAC 27.160. Quotas and guideline harvest levels for Southeastern Alaska Area
(g) The guideline harvest level for the herring sac roe fishery in Sections 13-A and 13-B shall be established by the department and will be a harvest rate percentage that is not less than 12 percent, not more than 20 percent and within that range shall be determined by the following formula: Harvest Rate Percentage = 2 + 8 (Spawning Biomass (in tons) / 20,000). The fishery will not be conducted if spawning biomass of is less than 25,000 tons **or the proportion of fish age 5 and older is less than or equal to 0.20, as determined by the pre-season bait fishery or test fishing completed by February 28th in District 13-B.**

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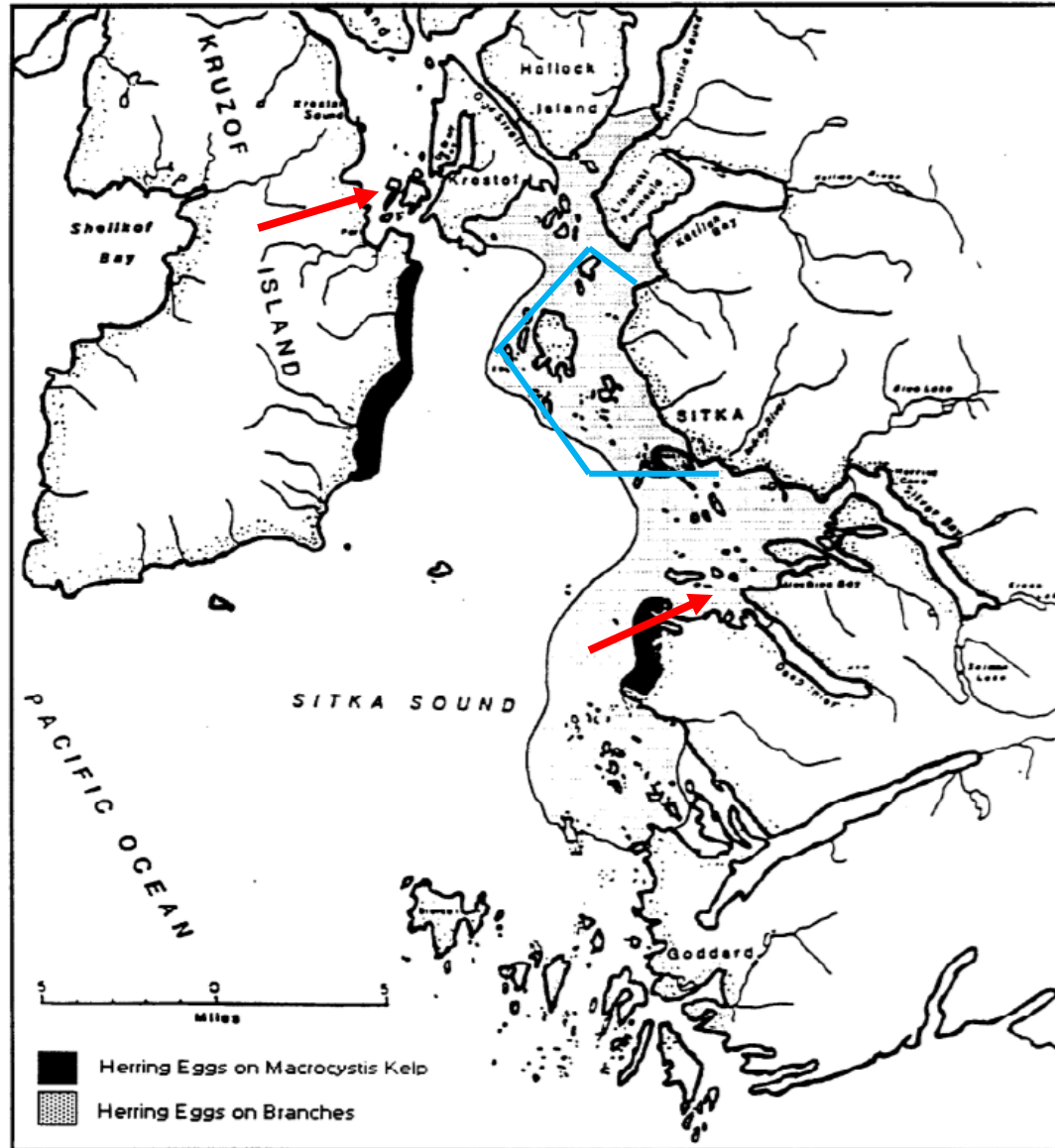
- Closed waters in Sitka Sound (from Dupuis et al. 2021)
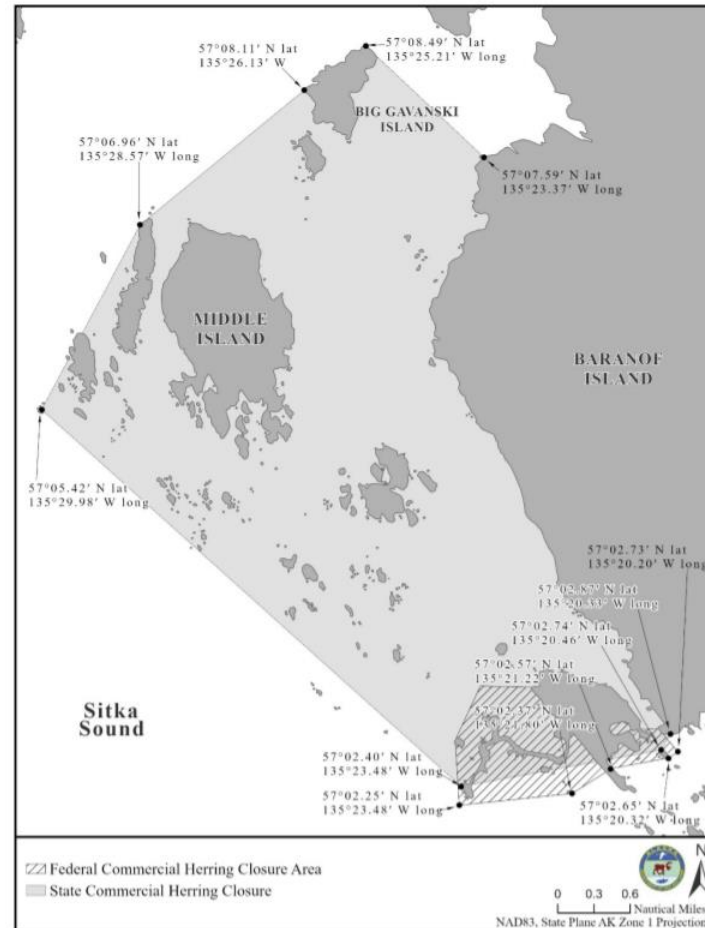
- Sitka Sound herring sac roe fishery area
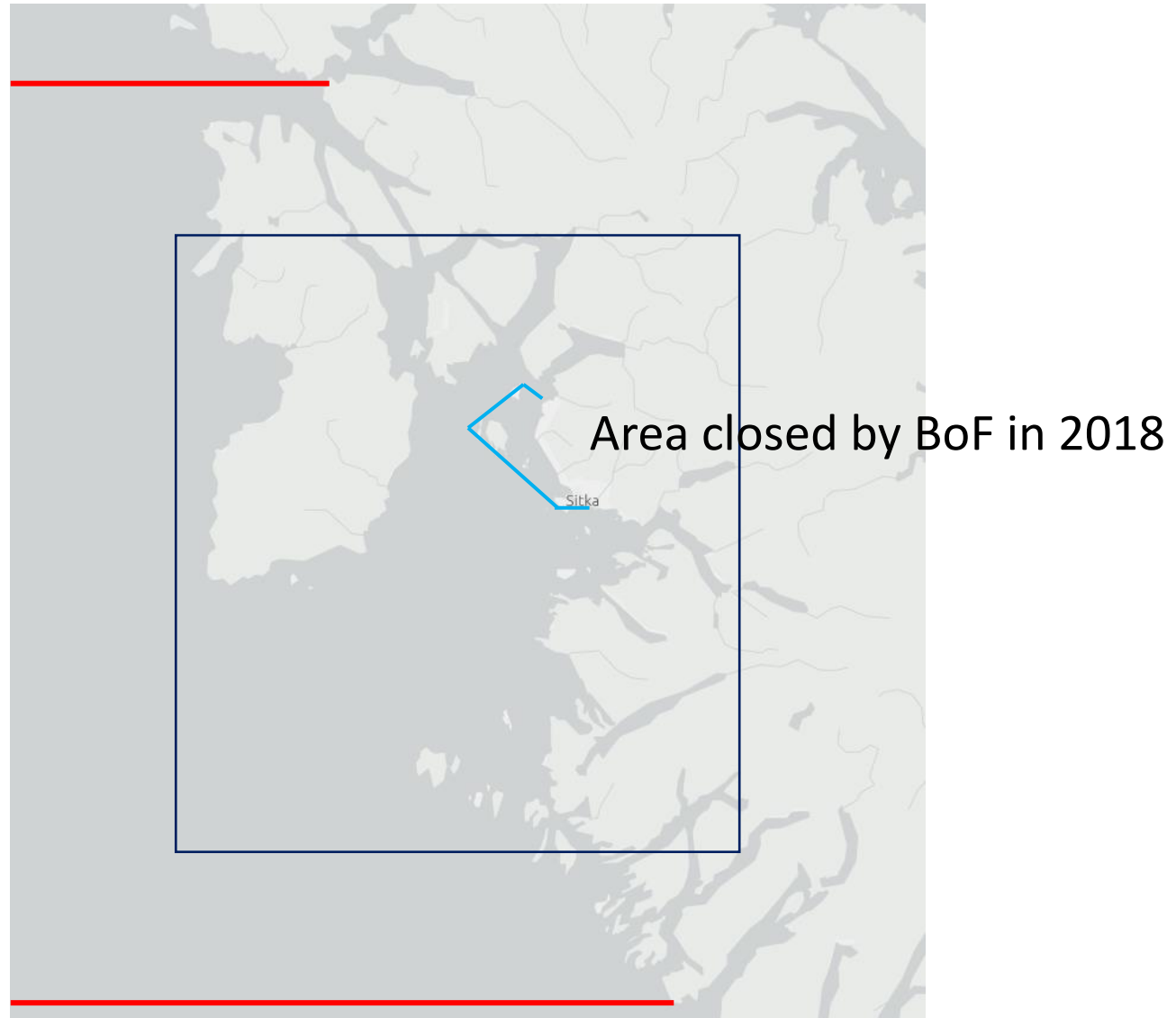
Area closed by BoF in 2018

- Subsistence herring egg harvest areas (from Schroeder and Kookesh 1990)

- Traditional harvesting practices emphasized quiet to avoid disturbing spawning herring (Thornton et al. 2010; Thornton and Moss 2021)
- Herring show avoidance reactions to boats and sonar (Pitcher et al. 1996; Wilson and Dill 2002)
- Holding herring in nets for ten mins can cause >50% mortality and significant increases in stress (Tenningen et al. 2012)

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- Photos of dead herring on seafloor from unknown sac roe opening in 2008
- Photo of undated sac roe opener just south of bridge