

BOB SAM

PART 1

SITKA TRIBE

RC 27

THIS REPORT IS IN 6 PARTS

The Sitka Tribe of Alaska submits this report in support of its earlier comments requesting that the BOF accept the ACR and take a broad, comprehensive look at the regulation and management practices of the Sitka Sound herring subsistence and commercial fishery. Among other issues, the Board's review should include regulation of the timing of the commercial fishery to ensure that the amount of herring necessary to meet subsistence needs reaches the closed areas.



NATURAL RESOURCES CONSULTANTS, INC.

4039 21ST AVENUE WEST, SUITE 404
SEATTLE, WASHINGTON 98199, U.S.A.
TELEPHONE: (206) 285-3480
FAX: (206) 283-8263
EMAIL: GRuggerone@nrccorp.com

Evaluation of the Sitka Sound Commercial and Subsistence Herring Fishery

Prepared for:

Sitka Tribe of Alaska

Prepared by:

Gregory T. Ruggerone, Ph.D.

James Selleck

August 31, 2018

Table of Contents

Summary	3
Introduction	6
Sitka Tribe Observations and Concerns.....	7
Status of Southeast Alaska, Sitka Sound, and British Columbia Herring	10
Population Structure	11
Sitka Sound Herring Status.....	11
British Columbia Herring Status	12
Sitka Sound Subsistence Herring Fishery	13
Sitka Sound Commercial Herring Fishery	16
Herring Management in Sitka Sound	16
Implementation of the Harvest Rule in Sitka Sound	17
Herring Management in British Columbia.....	19
"Go with Older Fish" and Size Selective Harvests	20
Serial Depletion Hypothesis	22
Herring Contribution to the Marine Ecosystem.....	23
Recommendations	24
Acknowledgments.....	26
References	27

Summary

Total biomass and spawning biomass of herring in Sitka Sound and other areas of Southeast Alaska has declined since 2009 and the linear miles of herring spawn in Sitka Sound during 2018 was the lowest on record since 1979. The commercial fishery has harvested sac row herring every year since 1978, and the harvest is typically close to the harvest guideline level. In contrast, subsistence harvests of roe on substrate (mostly hemlock branches) have not met subsistence needs in 10 of the past 14 years. This discrepancy stems in part from the declining biomass and roe density of Sitka Sound herring, the reduced ability of subsistence users to harvest herring roe outside of the contemporary harvest area when spawning locations change, and the ability of the commercial fleet to move throughout Sitka Sound and harvest herring where ever they aggregate and spawn. This report describes and evaluates a number of issues regarding the status, behavior, and management of herring in Sitka Sound. The primary recommendations stemming from this evaluation are:

- Re-evaluate the commercial harvest threshold for Sitka Sound herring using all available data, including approximations from the early fisheries when total biomass appeared to be very high and the more recent total biomass values that extend well beyond the values used by Carlile (1998). Also, consider the recent finding by DFO (2017) in British Columbia (BC) to increase the threshold from 25% to 30% of the unfished biomass, as a means to further protect herring populations at low abundances while also supporting predators that depend on herring for food. This analysis should avoid the problem of a shifting baseline that might reflect climate shifts and fishery harvests, as discussed by DFO (2017). In other words, a threshold based on an unfished biomass estimated from biomass data in the 1970s and 1980s would lead to a low threshold and allow harvests to begin at a low population size compared with an analysis that included other time periods when biomass was high. The analysis to establish a harvest threshold should also consider the "Go with Older Fish" (GWOFF) or learned migration strategy, given TEK observations in Southeast Alaska and BC, scientific findings by the ICES scientists, and the implications for harvest management as described by McCall et al. (2018). Additional investigation into learned migration of herring is needed.
- Consider a harvest threshold based on a minimum spawning biomass rather than minimum total biomass. For example, in BC a harvest is not allowed until the estimated spawning biomass reaches a minimum level after projecting a 20% harvest rate on the herring run. As noted above, the BC harvest threshold has been recently increased from 25% to 30% of the estimated unfished biomass, as a means to protect the herring population from overfishing at low populations levels. Current management in BC is more protective of herring at lower herring abundances than in Southeast Alaska, but fisheries in BC reach the 20% maximum harvest rate quicker after the minimum threshold is reached.
- Manage the Sitka Sound commercial herring fishery using the same harvest rate schedule as in other herring fisheries in Southeast Alaska. In Sitka Sound, a much more aggressive harvest rate is used once the harvest threshold has been reached. In Sitka Sound, the initial

harvest rate is 12% rather than 10% as in all other regions, and the maximum 20% harvest rate is reached at 1.8 times rather than 6 times the threshold level. The biological basis for the higher harvest rate of the Sitka Sound fishery is not apparent. Furthermore, the decline in biomass of herring in Sitka Sound is coincident with the more aggressive harvest rate schedule.

- Consider the importance of abundant herring for supporting numerous commercially and socially important species, including Chinook and coho salmon, Pacific cod, and other species that have recently declined. ADF&G biologists recognized the ecosystem benefits of herring, but they simply assume that the current management approach sufficiently protects this benefit. To this extent, DFO (2017) should be consulted since this team of scientists identified the need to raise the threshold to 30% of the unfished biomass. DFO (2017) identified the need to further quantify the needs of marine species for abundant herring; their revised threshold did not consider ecosystem benefits but it did recognize the need to do so.
- Expand the current closed commercial fishing area that is intended to reduce interactions with subsistence fishers, whom have a priority in Alaska. Recent commercial fisheries often harvest herring immediately adjacent to the closed area boundary and these harvests and activities likely reduces the availability of herring roe to subsistence fishers. The extent of the closed fishing area will become more important if the Sitka Sound herring population continues its downward decline, which began about 10 years ago. Other herring stocks in Southeast Alaska and BC have been declining over time and many populations no longer support fisheries, indicating the need for a more precautionary approach to herring management. In Sitka Sound, subsistence needs are not typically met.
- Monitor spawn density, which is a key factor affecting subsistence users. Evaluate discrepancies between Age Structured Assessment (ASA) biomass estimates and those based on field surveys. The primary discrepancy appears to occur when field surveys estimate a large herring biomass. Biomass estimates (forecast and observed) should include confidence intervals that reflect the degree of uncertainty in the values. The pre-season forecasted age composition should be compared with the observed age composition as a means to track year class strength over time.
- Quantify the degree of size and age selectivity by the commercial seine fishery in Sitka Sound in response to their targeting of larger, older herring. Consider this information in management analyses and decisions while considering the implications of the "Go with Older Fish" on herring management, as described by McCall et al. (2018).
- Estimate the degree of premature (false) spawning associated with the herring test fishery and commercial fishery, and the degree to which commercial fishing activities cause herring to spawn in less favorable habitat.

- Anticipate low herring runs that might result from climate change and poor ocean conditions. In most years, ADF&G has managed the commercial fishery to be close to the pre-season guideline harvest level. In 2018, herring body size was too small for the market, and the fishery was stopped early. Managers should examine herring abundance in season to ensure biomass is sufficient to allow a commercial harvest. A cautionary approach is especially important during a period of declining abundance, such as shown by herring throughout Southeast Alaska in recent years.
- Incorporate factors, such as oceanographic events (climate change, the "Blob"), or other approaches (i.e., time series), into forecasting methods and models in an attempt to anticipate a downward trend in herring biomass as shown in recent years. This would help reduce the likelihood of commercial harvests exceeding the harvest guideline level. Guideline harvest levels should consider the forecasted age composition of herring and the degree to which the commercial fishery harvests larger and older herring. The commercial fishing industry desires old, large herring that have greater roe content, but these fish are also more important to the sustainability of the herring population.

Introduction

The Sitka Tribe of Alaska (STA) has relied upon herring roe in Sitka Sound for subsistence throughout their long history in this region. Today, the Tribe includes more than 4,000 members, but the use of herring roe for subsistence extends beyond tribal members. People from throughout Southeast Alaska come to Sitka to harvest herring roe for subsistence. Additionally, Tribal members share herring roe with people throughout Alaska, as is customary with subsistence food (Sill and Cunningham 2017).

State and Federal laws provide a priority for subsistence use over all other uses of fish and wildlife in Alaska (www.adfg.alaska.gov/index.cfm?adfg=subsistenceregulations.main; www.doi.gov/subsistence/library/history). In this regard, Tribal members have frequently expressed concern over declining quantity and quality of herring roe in their subsistence harvests, and they have repeatedly raised concerns about the effects of the commercial sac roe fishery on Sitka Sound herring. Subsistence harvesters often do not meet their subsistence needs. In response to these concerns, STA requested that we produce a report on the status and management of Sitka Sound herring that evaluates their concerns.

The objectives of this report are:

1. Document the Tribe's observations and concerns about Sitka Sound herring and their management.
2. Describe the status of herring in Southeast Alaska, Sitka Sound, and British Columbia (BC).
3. Describe and evaluate the herring subsistence fishery in Sitka Sound, including the location of the subsistence fishery relative to the commercial fishery and the ability of households to meet their needs.
4. Describe and evaluate the commercial herring fishery in Sitka Sound, including harvest thresholds, harvest rates, guideline harvest levels, accuracy of preseason forecasts, and the extent to which climate change and ecosystem effects are considered in management.
5. Describe management implications of the "Go With Older Fish" concept in which younger herring follow older herring back to the spawning grounds, and evidence for the "serial depletion hypothesis".
6. Describe the contribution of herring to the marine ecosystem.
7. Provide recommendations for enhancing sustainability of herring in Sitka Sound.

Sitka Tribe Observations and Concerns

Observations and concerns about Sitka Sound herring were discussed with Tribal members and Natural Resource staff on July 19, 2018. Individuals included Harvey Kitka (Council member and chair of Natural Resources committee), Mike Miller (Council member and chair of Marine Mammal Commission), Jeff Feldpausch (Director of Resource Protection Department), Kyle Rosendale (Fisheries Biologist), Lisa Gassman (General Manager), and Kathy Mathews (Paralegal). The following comments reflect the primary issues that were presented by the Tribe.

- A number of changes have occurred in the marine environment in recent years, leading to concern about the declining status of Sitka Sound herring. Smelt and sandlance are now gone. There are shifts in the abundances of whales, sea lions, salmon, etc. Humpback whales are much more abundant and they consume many herring during the spawning period. These and other observations provide warning signs that the environment is changing, and so management of the herring fishery should be more conservative to protect the long-term sustainability of this important species.
- Subsistence needs for herring eggs have not been met during past 5-10 years. Quality of eggs on beaches is lower, e.g., lower egg densities, perhaps since the late 1990s. As in the past, Sitka Sound herring support subsistence users from throughout Southeast Alaska, not just people within the Sitka Sound area.
- Tribal members have harvested herring and their eggs near the town of Sitka and throughout Sitka Sound for 1,000s of years. Now, very few herring spawn where most subsistence users can readily access them. A boat is now needed to travel farther to find spawning herring, but small boats can not always safely reach the distant spawning areas. Few herring now spawn along beaches where subsistence users can gain access from the Sitka road system.
- There is concern that survey methods overestimate herring biomass and the amount of spawn. ADF&G documents linear miles of herring spawn. Sometimes Tribal members go to locations identified as having spawn but the density of eggs is very low or absent. Herring spawn is more patchy now and this could lead to overestimation of herring eggs and biomass.
- The commercial sac roe fishery searches for and selects larger more fecund herring, and this selection and removal of older relatively large herring may lead to lower egg production per amount of spawning herring. The purse seine gear is not selective but fishermen seek relatively large and mature herring to meet market demands. To capture larger herring, the purse seine is set around a school of herring, then the fish are sampled for size and egg content. If fish size and egg content is sufficiently large, the fish are harvested. If not, the fish are released and another school of herring is targeted with the purse seine. Depending on the year, many sets (unspecified number) can be made before large herring are available

to the seine. Furthermore, the limited capacity of the industry to process herring each day means that the fishery lasts longer now and more activity disrupts spawning herring.

- Tribal members and staff state that test fishing and more frequent commercial fishing periods disrupt herring preparing to spawn, leading to premature or false spawning events. Fishery activities interrupt herring that are preparing to spawn and cause herring to spawn in nearby habitats that less favorable rather than in preferred spawning areas. Herring productivity is reduced by the fishing activity. Now there are fewer spawning events and the herring spawning period is much shorter than in the past.
- Prior to the beginning of the sac roe fishery, herring spawned throughout Sitka Sound. The spawning distribution of herring changed after the sac roe fishery began because this type of fishery disrupts spawning herring.
- Guideline harvest levels (GHL) for the commercial fishery are based on the forecasted age composition and biomass of herring, but the fishery selectively harvests larger herring. This important disconnect is not considered when setting the GHL. Larger herring produce larger and more numerous eggs than small herring. Age composition has changed over time. Herring are younger now and the Age Structured Assessment (ASA) model used now to establish harvest rates may not be adequate. The level of uncertainty in biomass estimates, including biomass by age group, is not reported.
- Tribal members believe that large herring are especially important for the sustainability of the herring population. They suggest that larger herring lead the spawning migration, especially previously unspawned herring, back to spawning areas that have supported good survival in the past. Older herring tend to spawn before younger herring; young herring follow the older herring from the feeding grounds to the spawning grounds. Spawn timing is often bimodal, suggesting genetics may be different between the spawning groups. Selective removal of larger herring may be a factor causing the spawning distribution of herring to shift over time. The shifting distribution of herring affects subsistence users, who have limited ability to follow the shifting distribution of spawners. Additionally, a change in the distribution of spawning herring could lead to lower productivity of the herring progeny if currents and habitats adjacent to the new spawning area are less favorable.
- Tribal members and staff are concerned that herring surveys overestimate herring biomass, supporting higher harvests by the commercial fleet at a time when subsistence users are unable to meet their needs.
- The miles of herring spawn in 2018 was the lowest amount on record. The Tribe believes the "baseline" is shifting in that fewer herring are spawning now than in the past. Herring are less broadly distributed now and they have fewer spawning events.
- Tribal members are concerned that dive surveys exclude observations of zero eggs and this exclusion overestimates egg biomass and density.

- Sitka Sound herring are harvested at a higher rate than all other herring in Southeast Alaska, yet there is no biological support for this higher rate. For example, a preseason forecast of 25,000 tons in Sitka Sound is currently needed before the commercial fishery can be opened. At 25,000 tons (harvest threshold), the specified harvest rate is a maximum of 12%. The allowed harvest rate increases toward the overall maximum rate of 20% when the forecasted biomass reaches 45,000 tons or 1.8x the minimum harvest threshold. In contrast, all other herring fisheries in Southeast Alaska have a 10% harvest rate limit at the minimum harvest threshold, and the maximum harvest rate of 20% is not reached until herring biomass is 6x the minimum harvest threshold. The aggressive harvest rate disrupts spawning herring and causes them to spawn in less favorable habitats. The Tribe believes the higher harvest rate in Sitka Sound compared with all other herring fisheries contributes to their inability to meet subsistence needs.
- The minimum biomass threshold for Sitka Sound herring was increased from 20,000 tons to 25,000 tons in 2009 (implemented in 2010). While this increase provided some protection for the herring population at low biomass, the initial harvest rate was increased from 10% to 12%.
- Only 2 of 12 stocks monitored by the State are at their harvest threshold, indicating declining harvests throughout much of Southeast Alaska. Lynn Canal and Kah Shakes were two other premier herring fisheries in Southeast Alaska and both have crashed and show no sign of recovery to high abundance. The decline of these stocks creates concern about the declining abundance of Sitka Sound herring.
- Ultimately, the Tribe wants a well managed herring fishery that will sustain the abundance and quality of herring so that subsistence users can meet their needs as they have done for many years in the past prior to the commercial fishery.
- The Tribe believes that a conservatively managed commercial fishery will promote further building of the herring population, which is also beneficial to the long-term sustainability of the subsistence and commercial fisheries.

In addition to these observations and comments, the STA provided a list of additional comments, which are shown in the appendix at the end of this report. Our report addresses some of these concerns and the aforementioned concerns, but some issues lack sufficient data to be addressed in detail, so recommendations were made to collect data and evaluate the issue.