Sitka Tribe of Alaska
Tribal Government for Sitka, Alaska

October 10, 2019

Glen Haight
Executive Director II
Boards of Fish and Game
PO Box 115528
Juneau, AK 99811-5526

RE: Supplemental Information on the Sitka Tribe of Alaska's ACR Proposal (ACR 4) to the Board of Fisheries

Dear Mr. Haight,

The attached comments are submitted by the Sitka Tribe of Alaska in support of the ACR the tribe submitted earlier (ACR 4). If you have any questions regarding these comments I can be reached at (907)747-7469 or emailed at jeff.feldpausch@sitkatribe-nsn.gov.

Sincerely,

Jeff Feldpausch
Resource Protection Director

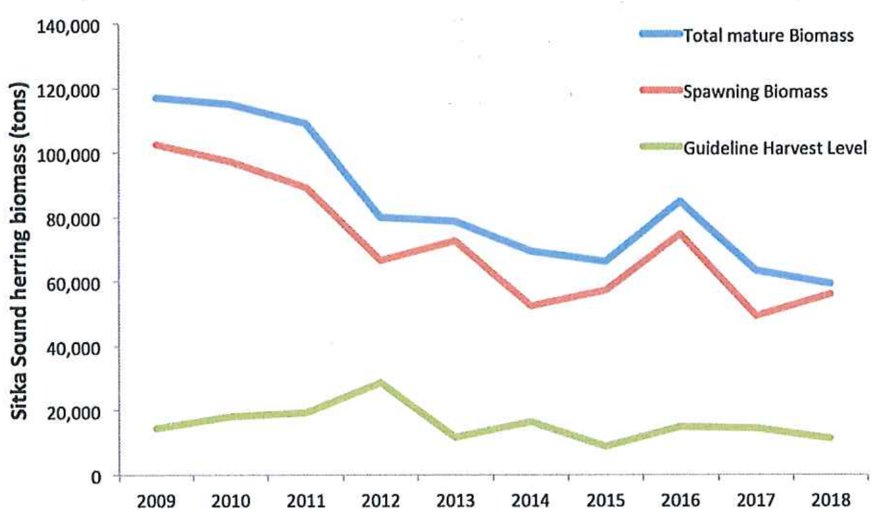
Information in Support of the Sitka Tribe of Alaska's (STA) Agenda Change Request Regarding Conservation Concerns for Sitka Sound Herring

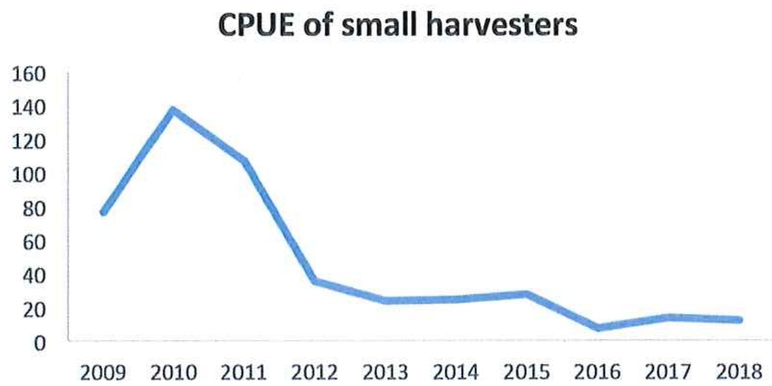
The information below demonstrates a significant conservation concern for Sitka Sound herring, the need to re-do the 20 year-old analysis of population dynamics necessary for managing the fishery and avoiding a shifting baseline, and the need to implement a more precautionary approach that considers the requirements of Chinook salmon and subsistence users and unprecedented and unpredictable ocean conditions. The use of best available science, as requested by our ACR, is paramount to sustainable fisheries management in Alaska.

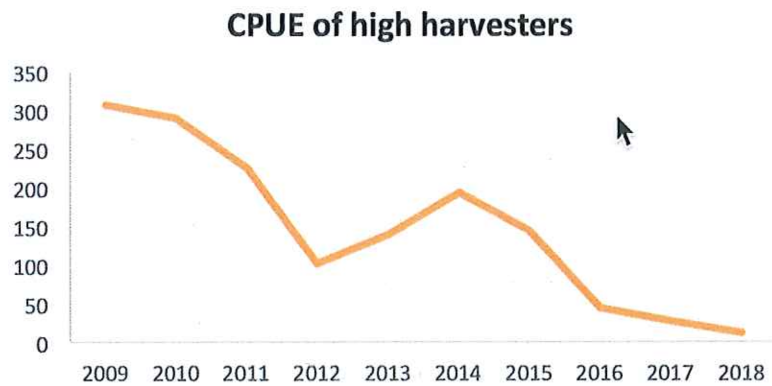
Our supplement highlights the new re-analysis of herring by Canadian scientists that led to the adoption of a much more conservative harvest management approach. The previous approach in British Columbia was similar to that in Sitka Sound. The approach in British Columbia is much more conservative than the previous approach that was found to be too aggressive.

Although ADFG agrees with STA that new analyses of Sitka Sound herring are needed, they claim that this is not an urgent need. However, studies in British Columbia and elsewhere show that herring populations can decline rapidly (within a few years), indicating that management should not be complacent (Essington et al. 2015, Kronlund et al. 2018).

Herring Biomass is Declining in Sitka Sound





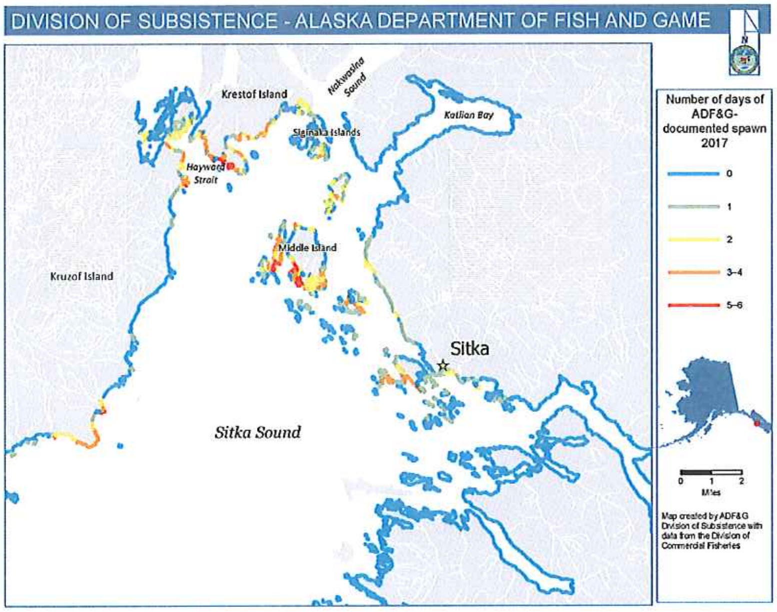


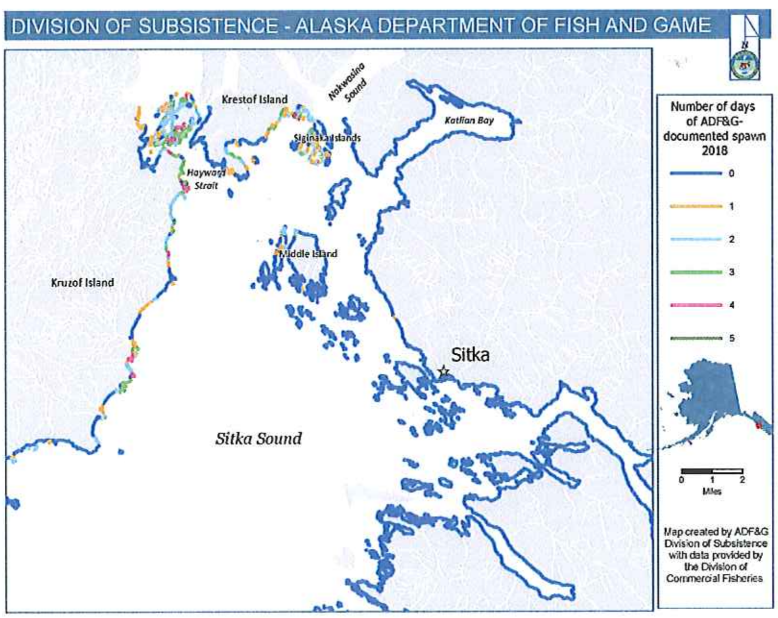
Total biomass and spawning biomass of herring in Sitka Sound has declined steadily since 2009 and is now only 48% of what it was in 2009. Subsistence catch per unit effort (CPUE; lbs. per set) has also declined, reflecting the declining herring biomass since 2009, yet the guideline harvest level (GHL) for the commercial fishery has remained nearly constant at or near the maximum (20%) in 10 of 11 recent years. In contrast, the lower amount necessary for subsistence (ANS) has not been met in 11 of the past 15 years (2005-2019).

The ADFG response to our ACR claims that this decline is not a conservation concern because the biomass is still twice the harvest threshold value (25,000 tons). However, as discussed below, this harvest threshold stems from a 20 year-old analysis. Our ACR states that a new analysis and approach to setting the harvest threshold is needed to avoid a shifting baseline and to incorporate new information on the needs of other species, such as Chinook salmon, and the needs of subsistence users.

In other areas of Southeast Alaska, spawning biomass has also declined since 2008, although these trends are confounded by inconsistent annual surveys (Figure 19 in Hebert 2019).

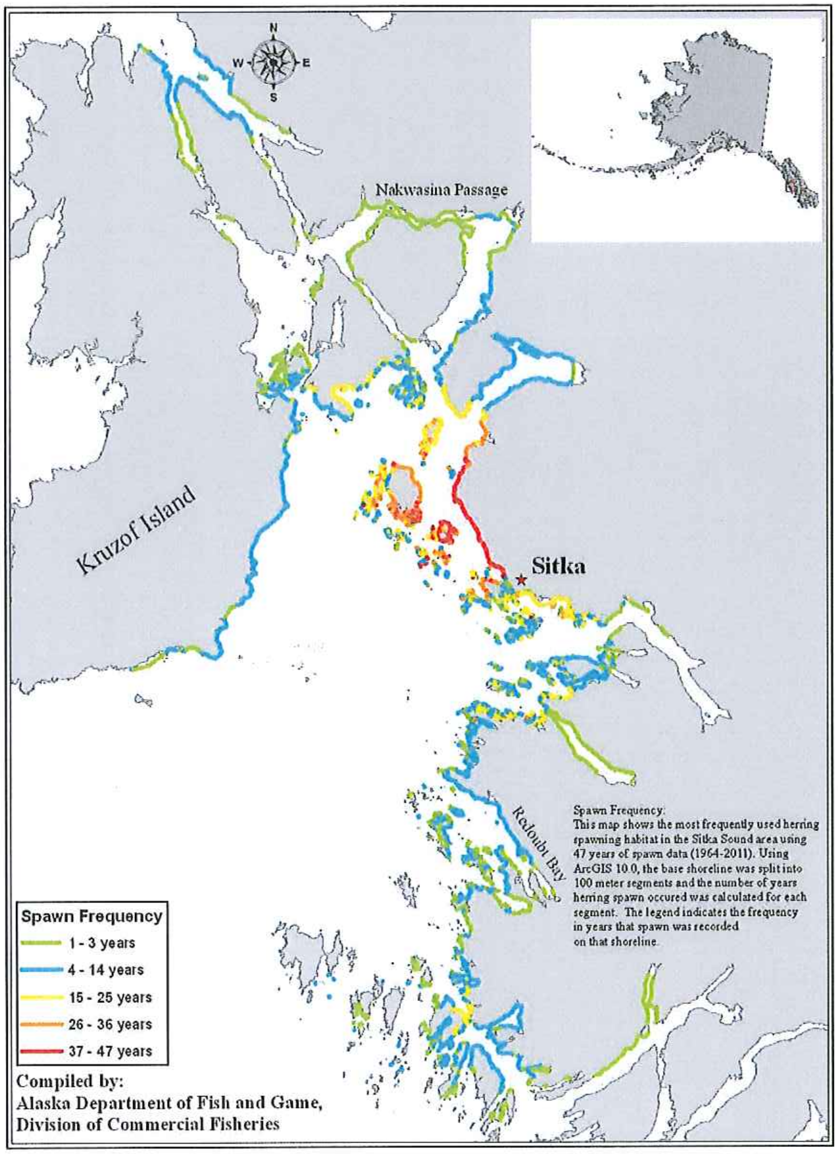
Quality of Herring Spawn has Declined in Sitka Sound Leading to Decreased Subsistence Harvests





Areas receiving multiple days of spawn are less common in recent years compared with past years indicating significant change in the spawning behavior of herring. In 2017 and 2018, for example, very little of the shoreline in Sitka Sound had more than two days of spawn (Sill and Cunningham 2019, Sill and Lemons 2019 (draft)). Furthermore, the density of spawn (spawn biomass per mile) declined 34% from 2005-2009 to 2015-2018. Reduced areas with multiple days of spawn has led to lower quality of spawn available to subsistence users. Traditional knowledge holders suggest that at least three days of spawn on branches is preferred (Thornton et al 2010). This also raises a conservation concern.

Spawning Distribution of Herring has Shifted Away from Traditional Spawning Areas

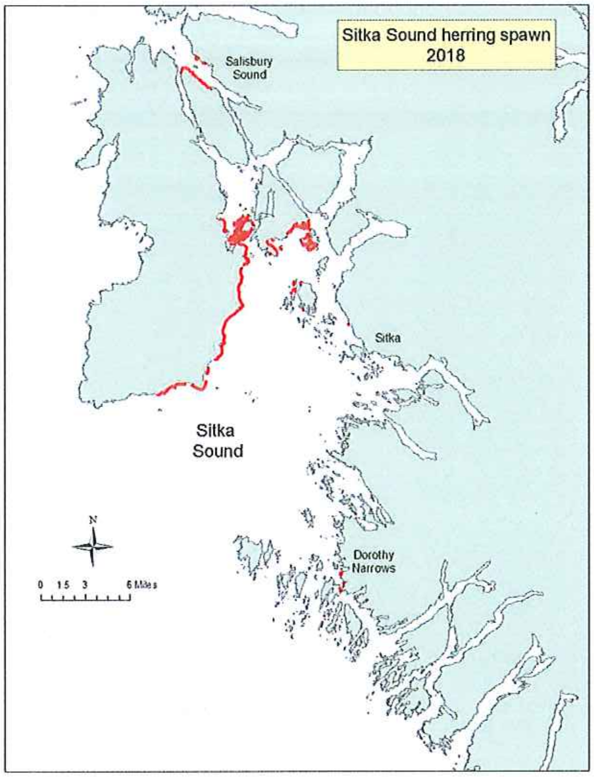


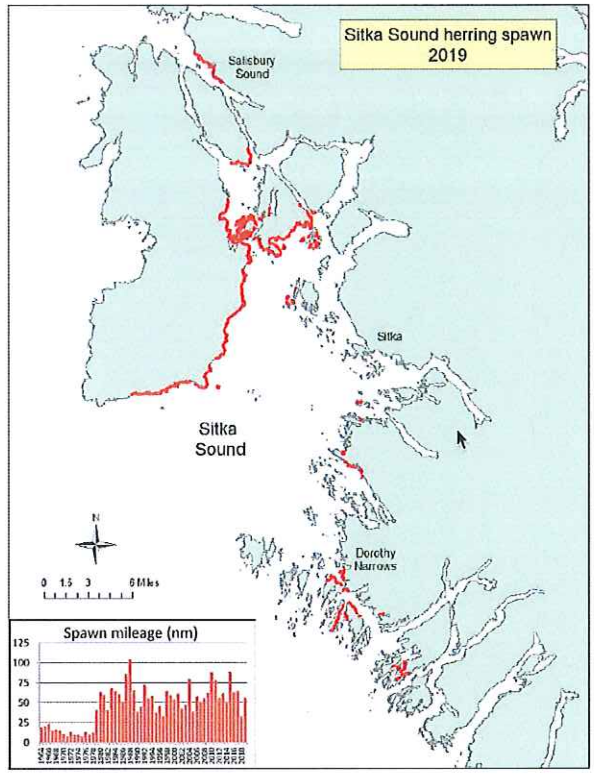
Historical spawn distribution data (1964-2011) show that herring frequently spawned in shoreline areas close to Sitka (chart above, ADFG 2019). However, in 2018 and 2019, almost no herring spawned in the core area where they have spawned in nearly every year since 1964 (see charts below). While ADF&G's age-structured analysis model assumes that an egg deposited anywhere in Sitka Sound is equivalent, this is not the case for subsistence harvesters who largely depend on spawn in the traditional area.

These spawning distributions are unprecedented in Traditional Ecological Knowledge and represent a major shift in Sitka Sound herring. These changes have upset the traditional harvest of herring eggs, which has occurred since time immemorial. Subsistence harvests have plummeted since the Board of Fisheries last examined Sitka Sound herring. The 2018 draft subsistence harvest estimate is only 25,862 lbs., by far the lowest total on record (Sill and Lemons 2019). The 2018 harvest is less than 25% of the median subsistence harvest from 2002-2017 (111,398 lbs.). The next lowest subsistence harvest estimate is 65,691 lbs. from 2017 (Sill and Cunningham 2019). Data from 2019 are not yet available, but are unlikely to exceed 2017's poor harvest.

ADFG claims that the cause for this unusual spawning distribution in 2018 and 2019 is unknown, but this claim ignores traditional ecological knowledge and learned migration behavior discussed in the scientific literature (see MacCall et al. 2018). We discuss this topic below. The dramatic changes in spawning distribution, spawning frequency, and reproductive potential (age distribution of herring) demand a more precautionary approach to harvest management because these factors could lead to lower spawning success and reduced future production of herring.

ADFG claims that a somewhat high biomass of age 3 herring in 2019 (no biomass values provided) is evidence of no conservation concern for herring. However, this view ignores the fact that these young herring did not spawn in traditional spawning areas (see chart above and below) and that future production may therefore be reduced. Furthermore, the ADFG claim of no conservation concern ignores statements by leading scientists that the ocean is undergoing unprecedented changes and is highly unpredictable (see below).


Sitka Sound herring spawn
2018
Salisbury
Sound
Sitka
Sitka
Sound
Dorothy
Narrows
N
0 1.5 3 6 Miles


Sitka Sound herring spawn
2019
Salisbury
Sound
Sitka
Sitka
Sound
Dorothy
Narrows
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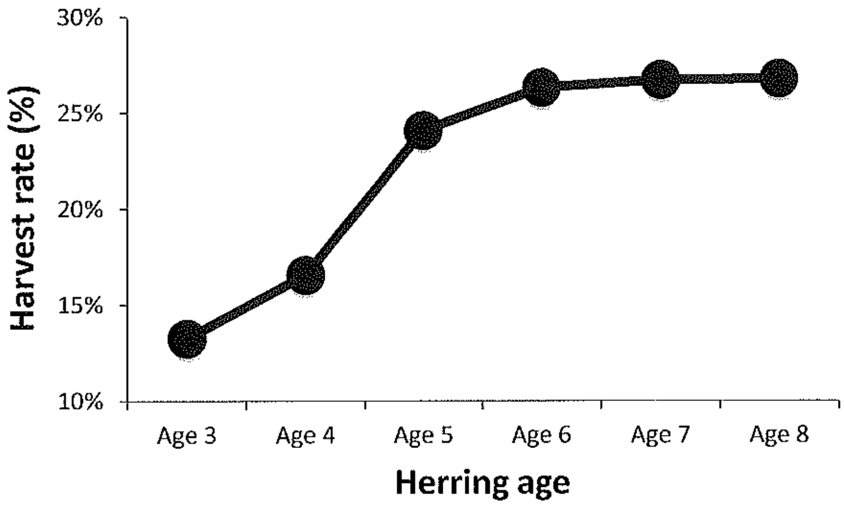
0 1.5 3 6 Miles
Spawn mileage (nm)
125
100
75
50
25
0

Harvest Rates on Older Herring Exceed the 20% Maximum Rate



The market demand for large, fecund herring and the test fishery process have led the commercial sac roe fishery to selectively target larger, older herring. This is well documented by news accounts and by ADFG. The graph above, based on ADFG data provided to STA, quantifies the degree of selectivity for large herring during 2014 and 2017. Harvest rates on age 5, age 6, age 7, and age 8 herring in Sitka Sound were 24% to 27% which is much greater than the harvest rates on the younger herring (13-17%). Harvest rates on these older herring, which contribute disproportionately more to future production compared with smaller herring (Barneche et al. 2018), exceeded the 20% maximum allowable harvest rate on Sitka Sound herring.

Current regulation does not consider harvest rates by age of herring as long as the overall rate is 20% or less. This regulation needs to be changed because it would allow, for example, a ~40% harvest rate on older herring that are most needed for future production as long as the overall harvest rate did not exceed 20%.

Furthermore, traditional ecological knowledge (TEK) in Sitka Sound, British Columbia, and other regions states that older herring are needed to guide younger herring back to spawning areas where survival is likely to be greatest (MacCall et al. 2018). Evidence for this TEK stems from 2018 and 2019: few older herring returned to Sitka Sound in 2018 and 2019 and the spawn distribution was highly unusual (see graphs above). Modeling studies demonstrate that herring with the "go with the older fish" (GWOF) behavior are disproportionately affected by commercial fishing (MacCall et al. 2018). MacCall et al. conclude that *"The GWOF hypothesis provides a simple and transparent mechanism for learned migration behaviour or "entrainment." In addition to GWOF providing an extension to the body of published scientific literature on learned migration behaviour, it also is based on an independent body of traditional knowledge* *that often remains unrecognized or under-used in modern quantitative population modelling."* It is noteworthy that the authors of the "go with the older fish" publication include an ADFG herring scientist and two representatives from the Alaska fishing industry. Nevertheless, current management in Sitka Sound does not consider GWOF behavior, rather older herring are targeted and have harvest rates that sometimes exceed the 20% maximum overall rate.

The harvest control rule should consider the selectivity of larger/older herring by the fishery and the importance of these larger/older fish to future production when setting the guideline harvest level. In other words, the harvest rate on these older fish should not exceed 20% (or the maximum allowed guideline rate under current harvest rules), and should be much less if the spawning distribution of herring depends on older herring, as indicated by the young herring age and unusual spawning patterns in 2018 and 2019.

Avoid a Shifting Baseline in Sitka Herring

A shifting baseline in a fish population occurs when managers forget about the great abundance and/or large size of fish during an early period when the population was poorly monitored and recognize the recent depleted population as the norm. Failure by managers to recognize the earlier high production of fish populations can constrain growth of the population, leading to fewer fish available to fishermen and the ecosystem.

The estimate of the pristine biomass, or averaged unfished biomass, for Sitka Sound herring is from 1998. This analysis relied upon data from the 1970s and 1980s when the population was depressed and less productive, and therefore underestimates the true equilibrium biomass and underestimates the minimum harvest threshold. Furthermore, the methodology used to estimate herring abundance changed after 1977 (Carlile et al. 1996). More than 20 years have now passed since that initial analysis and new data should be used to update unfished equilibrium biomass. It should be noted that the new Canadian procedures estimate the unfished equilibrium biomass each year and includes estimates of uncertainty. The ADFG estimate of unfished equilibrium biomass is 20 years old and has no estimate of precision. The Canadian approach addresses the possibility of shifting baselines every year.

ADFG notes that herring biomass is twice the current harvest threshold (25,000 tons) and claims that Sitka Sound herring has no conservation concern. However, guideline harvest rates are almost always near the maximum (20%) and harvests of older herring sometimes exceed 20%. For this reason, the increased harvest threshold from 20,000 tons to 25,000 tons in 2010 had no benefit to species and subsistence users that depend on herring. The ADFG conclusion ignores the potential for a shifting baseline whereby existing management actions constrain further growth of the herring population. Interestingly, later in its response to our ACR, ADFG recognizes the need to re-estimate unfished biomass, which is needed to evaluate the status and management of Sitka Sound herring. In our opinion, ADFG should have re-estimated unfished biomass before jumping to the conclusion that there is no conservation concern.

A new analysis of average unfished biomass (or equilibrium biomass) is needed to prevent Sitka herring from falling into the trap of a shifting baseline. This analysis should exclude data from the 1970s when the population suffered from overfishing and less reliable survey methodology (Carlile et al. 1996). The analysis should also consider population data from the 1930s when the herring fishery was beginning and biomass was great.

British Columbia Adjusts Herring Harvest Control Rule to be More Conservative

Until recently, harvest management of herring in British Columbia was similar to that in Sitka Sound: 20% maximum harvest rate when the stock was greater than 25% of the estimated unfished (pristine) biomass. However, Canadian government scientists recently recognized that past harvest management assumptions were less conservative than expected, and recommended more conservative harvest control rules in support of sustainable fisheries (Kronlund et al. 2018).

Based on new analyses and the need to be more conservative, Canadian scientists recommended that herring fisheries not begin until the biomass was well above 30% of the unfished equilibrium biomass (limit reference point)[1] rather than triggering the fishery at 25% of the unfished equilibrium biomass, as in the recent past and in Sitka Sound. They state that a herring population that is only 30% of the unfished equilibrium is undesirable, so they manage the fishery to avoid this level rather than using it to trigger a commercial fishery. In other words, a 20% harvest rate should not occur until biomass is well above 30% of the unfished equilibrium spawning biomass.

Canadian scientists also considered a "upper stock reference point (USR)" which *"marks the boundary between the healthy and cautious zones. When a fish stock level falls below this point, the removal rate at which the fish are harvested must be progressively reduced in order to avoid serious harm to the stock."* In 2019, a key candidate upper stock reference point was identified at 60% of the unfished equilibrium spawning biomass, which is twice the limit reference point (30% of B_0) (DFO 2019).

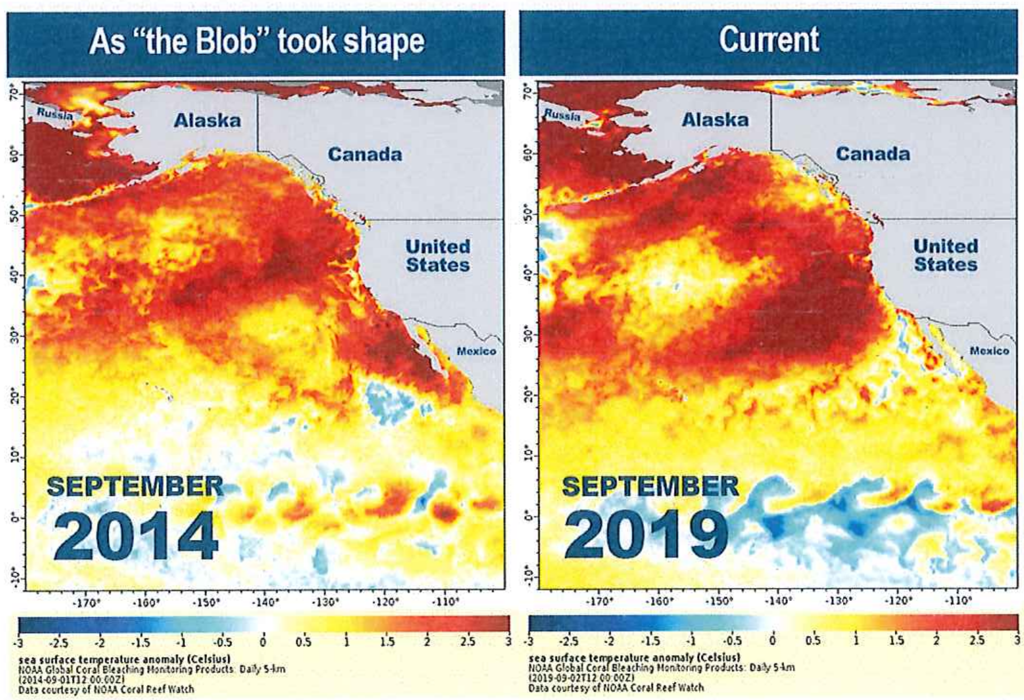
The LRP and the USR help to define the point at which the maximum 20% (or 10%) harvest rate may occur while ensuring that the fishery does not cause the spawning biomass to approach

[1] Canadian scientists recommended a limit reference point (LRP) of 30% of the unfished equilibrium spawning biomass. An LRP is defined as a biomass that should be avoided such that managers would not allow harvests when biomass was close to the LRP.

30% of the unfished equilibrium spawning biomass. Canadian scientists are also evaluating a maximum harvest rate of 10% rather than 20%.

ADFG recognizes the need to estimate unfished equilibrium spawning biomass so that a sustainable harvest control rule can be developed, but this has yet to happen. STA would like to be involved with this process. It is important that values that underestimate herring biomass, such as those based on a different methodology in the 1970s, be excluded because they would lead to low unfished biomass estimates. Furthermore, as discussed below, STA believes that the harvest control rule for the commercial fishery should incorporate the needs of subsistence users who depend on high spawning biomass to harvest sufficient roe on branches (see CPUE graph above) and species such as Chinook salmon that depend on herring for nutrition, growth, and survival.

Ocean Conditions Remain Uncertain, So Precautionary Management is Needed

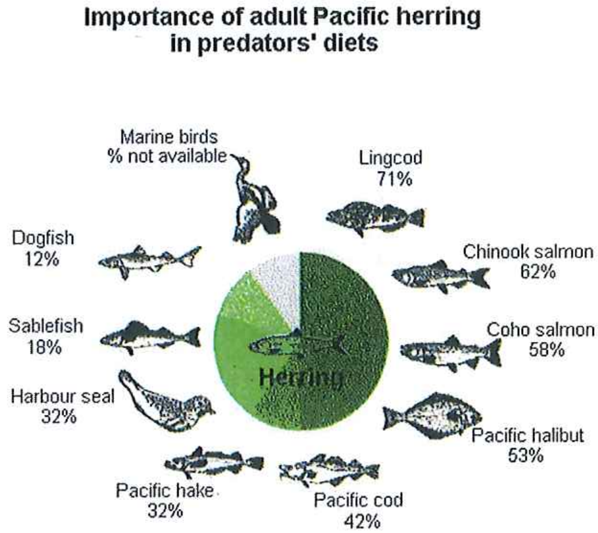


Marine heatwaves, including the 2014/2015/2016 "Blob" in the northeastern North Pacific Ocean, have had profound impact on the marine ecosystem and they have become more frequent (Smale et al. 2019). A team of scientists recently concluded that marine heat waves *"are rapidly emerging as forceful agents of disturbance with the capacity to restructure entire ecosystems and disrupt the provision of ecological goods and services in coming decades."*

Furthermore, as reported by NOAA Fisheries in September 2019, a new heatwave has emerged in the northeastern North Pacific and it resembles the early stages of the recent "Blob." This previous marine heat wave peaked through 2014 and 2015 with temperatures close to seven degrees Fahrenheit above average. *"We learned with 'the Blob' and similar events worldwide that what used to be unexpected is becoming more common,"* said Cisco Werner, NOAA Fisheries Director of Scientific Programs and Chief Science Advisor. The current heatwave has led to unusually high mortality of seabirds, seals, and whales.

The "Blob" and associated ocean conditions have undoubtedly affected Sitka Sound herring, and its effects are probably similar to those documented for Pacific sand lance in which the nutritional status of sand lance declined significantly (von Biela et al. 2019). Management of the Sitka Sound herring fishery must consider these unprecedented changes by embracing a more precautionary approach. A precautionary approach is especially important for herring because they are a vital forage fish that provide food for so many species.

The Marine Ecosystem Depends on Herring as a Key Forage Fish



Source: Fisheries and Oceans Canada, Nanaimo, B.C.

The State of Alaska recognizes the importance of forage fishes to the marine ecosystem, including commercially important species, and the State has a policy to protect forage fishes (5 AAC 39.212. Forage Fish Management Plan). This policy protects forage fishes, in part, by not allowing commercial harvests. However, in spite of overwhelming scientific evidence that herring is a key forage fish, the State policy fails to recognize herring as a forage fish.

The Alaska decision to not recognize herring as a forage fish is contrary to all scientific literature. The importance of herring to other species, such as Chinook and coho salmon, Pacific cod, sea birds and marine mammals should be recognized and managed so that these ecosystem needs are delivered. The figure above shows the contribution of herring to many focal species in British Columbia. In Southeast Alaska, diet studies also show that herring are the dominant prey of both Chinook and coho salmon (Reid 1961, Wing 1985).

The Board of Fisheries is well aware of the declining abundances and size of Chinook salmon throughout Alaska. A key question that the Board of Fisheries should ask itself is the extent to which declining herring abundances have contributed to the decline of Chinook salmon in Alaska.

Fishery scientists recognize the value of forage fishes to the ecosystem and they recommend that forage fishes be managed more conservatively so that they can continue to provide vital ecosystem services. Recently, a Forage Fish Task Force, consisting of 13 preeminent marine and fisheries scientists from around the world, provided practical, science based advice for the management of forage fishes. For well-managed fisheries, the Task Force recommended that fishing mortality should be 50% of the conventional rate and that at least 40% of equilibrium biomass remain in the ocean (Pikitch et al. 2012). In contrast, the BOF and ADFG only require that 25% of the average unfished biomass remain in the ocean, i.e., ~15% less than that suggested by the Forage Fish Task Force.

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