2022 Aleutian Islands Ecosystem Status Report:

IN BRIEF

Current Conditions

- Sea surface temperatures were the second highest (after 2014) since 1900 during the warm months, May - October.
- Winds during winter 2021-22 favored northward flow through Unimak Pass.
- Seabird reproductive success was at or above average, indicating wide availability of zooplankton and fish prey.
- The biomass of groundfish pelagic foragers in the bottom trawl survey increased compared to the last survey in 2018, while the biomass of apex predators decreased, indicating that conditions may be more favorable for plankton-eating groundfish species.
- Steller sea lions counts show a west to east gradient, with continued declines in the western Aleutians and stable or potentially increasing numbers towards the eastern Aleutians.
- Paralytic shellfish toxins samples were 3.4 times the legal limit, which is noticeably lower than past couple years.

Multi-year Patterns

Overall, there seem to be three major drivers of the multi-year patterns observed across the Aleutian Islands:

1) Persistent warm conditions since 2013-14. Water column temperatures have been above-average from top to bottom. Phytoplankton have often remained in lower abundances over the same time period. These warm conditions suggest that there has been lower productivity across the ecosystem, along with increased bioenergetic needs for fish, faster growth rates for zooplankton and larvae, and shorter incubation periods for eggs.

2) Increased abundance of Eastern Kamchatka pink salmon in odd-numbered years. Their abundance during even-numbered years has also increased, although numbers remain much lower compared to the odd-numbered years. Several other ecosystem indicators show a biennial pattern. For example, satellite chl-a is lower in even years, the number of age 3+ Pacific Ocean perch in the stock assessment is lower in even years, and tufted puffin chick hatching dates are earlier in odd years.

3) Rockfish have replaced Atka mackerel and pollock as the most abundant pelagic foragers. Stock assessment estimates show that rockfish, which include Pacific Ocean perch and northern rockfish, are the dominant groundfish pelagic foragers. This represents a change from the the early 1990s, when Atka mackerel and pollock were dominant. Longer-lived species such as rockfish help to increase the stability of the food web because their numbers do not vary with environmental conditions as much as shorter-lived species do. However, the overall increase in rockfish biomass may be increasing competition for zooplankton prey in the ecosystem. For example, the below-average condition observed in rockfish and pollock suggest that they are not experiencing optimal foraging conditions. It is unclear whether this change in pelagic foragers has impacted trends in other parts of the ecosystem, such as the declines of harbor seals and Steller sea lions.

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Regional Highlights

Western Aleutians

Sustained high sea surface temperatures, particularly during winter and summer, resulted in an extended **moderate marine heat wave** which at times reached strong and severe levels in May and July-Aug 2022. The heat wave subsided briefly during September and October and is now back to a moderate level.

Apex predator abundance increased 3% overall during the 2022 bottom trawl survey compared to the last survey during 2018. The persistent decline in fish condition observed in the region may be indicative of a variety of factors, such as poor prey quality and/or the low availability of prey.

In general, **fish-eating seabirds** such as tufted and horned puffins, thick-billed murres, and glaucous winged gulls had successful reproduction during 2022, as has been observed since 2019. This year, hatching dates of fish-eating seabirds were earlier or average, suggesting that adults found sufficient prey during spring during the early stages of the nesting period. The reproductive success of **zooplankton-eating seabirds**, such as auklets, serves as indicators of **zooplankton abundance**. The high reproductive success of zooplankton-eating seabirds since 2019 suggests that zooplankton have been plentiful over this time. In contrast, **Steller sea lion** numbers have continued to decline and show no signs of recovery.

Central Aleutians

Similar to the Western Aleutians, the central Aleutians have been under a **moderate marine heat wave** throughout most of the year, at times reaching strong or severe levels. Overall, the region experienced a particularly warm winter and summer during 2022. This year again, the average bottom temperature was slightly higher than in the other regions. **Eddy** kinetic energy during 2022 was generally above its long-term average except for a brief period during early winter, indicating that there was potentially above-average flux of nutrients and heat across the passes from the Pacific Ocean to the Bering Sea. Phytoplankton biomass was generally below average.

Groundfish survey biomass estimates for apex predators decreased in 2022 compared to 2018, except for large sculpins. In contrast, the biomass estimate of groundfish pelagic foragers increased, driven by **Atka mackerel** and to some degree by **northern rockfish**. There are no seabird surveys in this area. **Steller sea lion counts** in the central Aleutians had mixed trajectories, with counts declining in the west and stable or potentially increasing towards east.

Statewide, school enrollment bottomed out in 2020-21 and did not recover in the ecoregion this year. School enrollment decreased from 15 to 13 students in Adak, which is approaching the 10 student minimum for schools to qualify for state funding. Amid rising operating costs and flat funding in general, small schools like those at Adak and Atka are at increasing risk of closure.

Eastern Aleutians

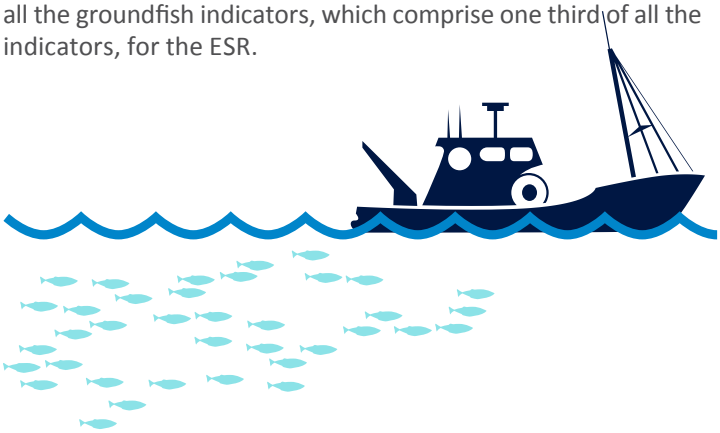
As in 2021, sea surface temperatures in the eastern Aleutians during 2022 were not as high during winter as in the western and central Aleutians. The **marine heat wave** periods were also of lower intensity and shorter, primarily restricted to summer. Survey estimates of **pelagic forager groundfish** increased, whereas **apex predator groundfish** decreased, compared to the last survey in 2018. Fish-eating seabirds, such as murres, puffins and gulls, had above-average reproductive success. Storm-petrels, which feed on a mix of invertebrates and zooplankton, had average to above-average reproductive success. The overall **seabird reproductive success** suggests that there was enough fish and invertebrate prey to support seabird chick-rearing, which may indicate that there were favorable foraging conditions for some species of groundfish. Steller sea lions were surveyed in 2022, but counts are still being analyzed and currently unavailable.

This year appears to have lower risk of **paralytic shellfish poisoning**. Sampled blue mussels had toxins 3.4 times above the regulatory level, but these values were noticeably lower than those observed in 2021 and 2020. Public awareness efforts in the area have been successful in minimizing impacts on human health. Overall school enrollment declined in 2020-21 and did not recover in 2021-22. The decrease in the **eastern Aleutians school enrollment** was driven by a large decline at Unalaska Elementary. All other schools in this region had increased enrollments.

Noteworthy

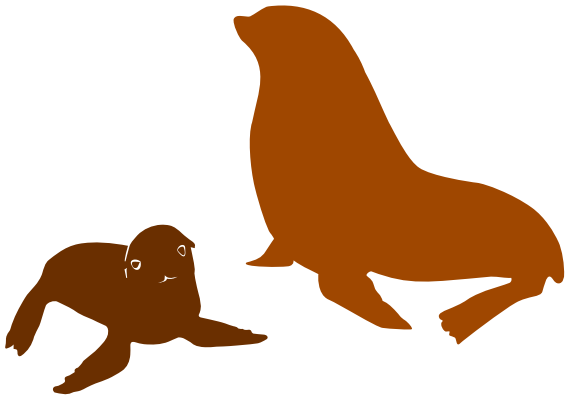
Groundfish surveys

The Alaska Fisheries Science Center completed the Aleutian Islands standard bottom trawl survey this year. The survey is conducted biennially during even years but had not been conducted since 2018 due to COVID-19. There were still several hurdles in dealing with COVID-specific travel and isolation to successfully complete the survey. This is the only fish survey that covers the Aleutian Islands, sampling 420 bottom trawl stations along 1700 km from Unimak Pass to Stalemate Bank. The survey provides all the groundfish indicators, which comprise one third of all the indicators, for the ESR.



Steller sea lion surveys

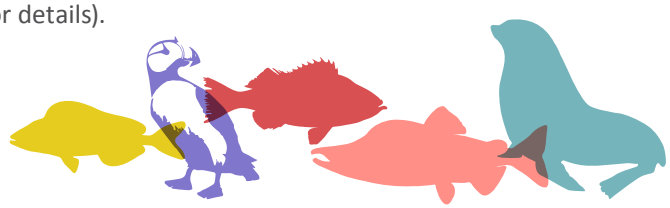
The Steller sea lion is the only regular marine mammal survey in the Aleutians. It is usually a biennial survey, but it had not been conducted since 2018 due to COVID-19 challenges. The survey counts pups (approx. 1 month old) and non-pups on terrestrial rookery and haulout sites from late June through mid-July, which is after approximately 95% of all pups are born. The survey provides one of 4 marine mammal indicators for the ESR.

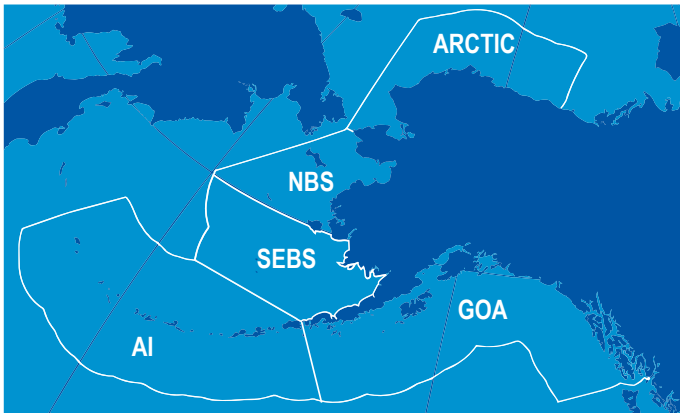


Management uses

Ecosystem information was formally considered in sixteen full assessments for the Bering Sea/Aleutian Islands region and one statewide stock (sablefish) in 2022. Two of these assessments, as opposed to four assessments last year, classified ecosystem dynamics at risk level 2 (out of 4 levels) noting substantially increased concerns: Aleutian Islands Pacific cod, and Atka mackerel. The ecosystem concerns for AI Pacific cod continue to be considered level 2 because they imply consistent unfavorable conditions for the stock, such as below-average weight, a decreasing biomass trend, lower prey quality, and increasing temperatures. Similarly for Atka mackerel, despite the increase in biomass, the ecosystem concerns are sustained unfavorable conditions such as potential competition from Pacific ocean perch, below-average weight and increased temperatures. For the other stocks, precautionary measures already incorporated into setting catch levels were considered sufficient to address uncertainty about potential ecosystem impacts on stocks.

For EBS pollock the author recommended Tier 3 ABC as a reduction from Tier 1 due to assessment concerns (see EBS in Brief for details).





Links to full reports from Large Marine Ecosystems are available here: https://www.fisheries.noaa.gov/alaska/ecosystems/ecosystem-status-reports-gulf-alaska-bering-sea-and-aleutian-islands

Reference: Ortiz, I. and Zador, S., 2022. Ecosystem Status Report 2022: Aleutian Islands, Stock Assessment and Fishery Evaluation Report. North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, AK 99501.

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