

Ecosystem Information in the Harvest Specifications Process

Ecosystem-based fisheries management for long-term sustainability

Ecosystem conditions can have a substantial impact on the productivity of stocks managed by the North Pacific Fishery Management Council. Marine heat waves drove the recent collapse of eastern Bering Sea snow crab, and the dramatic decrease in abundance of Gulf of Alaska Pacific cod. The Council follows an ecosystem-based fisheries management approach to ensure the long-term sustainability of Alaska’s fisheries.

The annual harvest specifications process provides an “on-ramp” to consider information about the status of marine ecosystems, including the impacts of environmental variability. It provides a structured, iterative way for the Council, SSC, and Plan Teams to review ecosystem information, identify potential sources of uncertainty and risk, and consider the appropriate level of precaution in recommending harvest levels.

NMFS AFSC scientists develop several products to support the Council’s harvest specifications process. This information is provided in annual Stock Assessment and Fishery Evaluation (SAFE) reports, and presented to the Council, Scientific and Statistical Committee (SSC), and Plan Teams.

Ecosystem Status Reports: Summarize large amounts of ecosystem-level information by region

Ecosystem Status Reports (ESRs) are provided for the Eastern Bering Sea, Aleutian Islands, and Gulf of Alaska, and inform the harvest specifications process for all Fishery Management Plans. ESRs include assessments based on ecosystem indicators that reflect the current status and trends of ecosystem components including physical oceanography, biology, and human dimensions. A concise “in brief” version of each ESR summarizes current conditions, noteworthy topics, and how information is used for management.

2024 Eastern Bering Sea
Ecosystem Status Report:

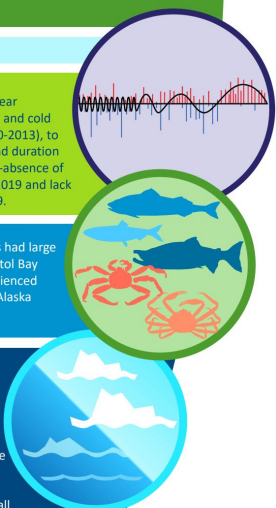
IN BRIEF

Current Conditions

The eastern Bering Sea (EBS) transitioned from year-to-year variability (1982–2000), to multi-year stanzas of warm (above-average temperatures) and cold (below-average temperatures) conditions (2000–2013), to a warm period unprecedented in magnitude and duration (2014–2021). This warm period included a near-absence of sea ice in the winters of 2017/2018 and 2018/2019 and lack of a cold pool in the summers of 2018 and 2019.

During the extended warm period, some stocks had large recruitment events, like Togiak herring and Bristol Bay sockeye salmon. Conversely, some stocks experienced declines, like snow crab and multiple Western Alaska salmon runs.

Since 2021, the EBS has returned to average thermal conditions based on metrics such as sea ice extent, sea surface temperatures, and bottom temperatures. This has resulted in different ecosystem responses in the southeastern and northern Bering Sea. Over the southeastern shelf, zooplankton quality has remained low. For pelagic foragers like pollock, this has led to reduced fish size. However, overall biomass increased 74% in the bottom trawl survey as the 2018 year class continues to grow. Over the northern shelf, zooplankton quality has improved, yet juvenile salmon condition declined and overall biomass trends of forage fish were mixed in 2024.



ESRs provide information on ecosystem status and trends as context for the SSC’s recommendations for the Overfishing Limit (OFL) and Acceptable Biological Catch (ABC) recommendations, and for the Council’s Total Allowable Catch (TAC) recommendations for groundfish. The information in ESRs is also integrated through inclusion in stock-specific risk tables, in specific stock assessments as ecosystem considerations, and through presentations to the Groundfish Plan Teams, SSC, AP, and Council. Presentations are made by report authors to the SSC, AP, and Council during their annual October and December meetings. Final ESRs are submitted to the Council in December.

Example of an excerpt from NMFS AFSC “In Brief” summary of key ecosystem information, including current ecosystem conditions.

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Ecosystem and Socioeconomic Profiles: Provide a pathway for ecosystem-linked stock assessments

ESPs are a newer product, used for some groundfish and crab stocks, that provide a framework for compiling and evaluating stock-specific ecosystem and socioeconomic indicators. They also communicate linkages and potential drivers of stock dynamics within the stock assessment process, laying the groundwork for incorporating ecosystem information directly into future stock assessments. Like ESRs, ESPs also provide context for the SSC's ABC and OFL recommendations, and for the Council's TAC recommendations.

Risk tables: Identify risk factors to support a precautionary approach

Risk tables are a stock-specific tool that provides a standardized way for scientists to document concerns that are not explicitly addressed by stock assessment models. The "risk" is the risk of setting ABC at a level that could exceed the true (but unknown) OFL. This information helps the SSC to determine whether to reduce the ABC from the maximum permissible ABC to account for uncertainty that is not already accounted for in a stock assessment or in the tier systems used for groundfish and crabs. Risk tables are currently used for groundfish stocks and are under development for crab stocks.

Risk tables document concerns across 4 categories: assessment model, population dynamics, the ecosystem, and fishery performance, and indicate the severity of these concerns (normal, increased, or extreme). Through the "ecosystem" category, risk tables can incorporate the information compiled in ESRs and ESPs, providing a way to directly consider ecosystem dynamics in management decisions.

Examples of environmental concerns could include adverse trends in environmental/ecosystem indicators, ecosystem model results, decreases in ecosystem productivity, decreases in prey abundance or availability, increases or decreases in predator abundance or productivity.

Looking ahead

NMFS scientists are continuing to build their understanding of how environmental variability impacts stock productivity. In the future, more environmental information may be directly incorporated into stock assessments. The Council is also considering adaptations to the Harvest Control Rules applied to groundfish stocks, to support greater resilience amid changing fishery and ecosystem conditions.

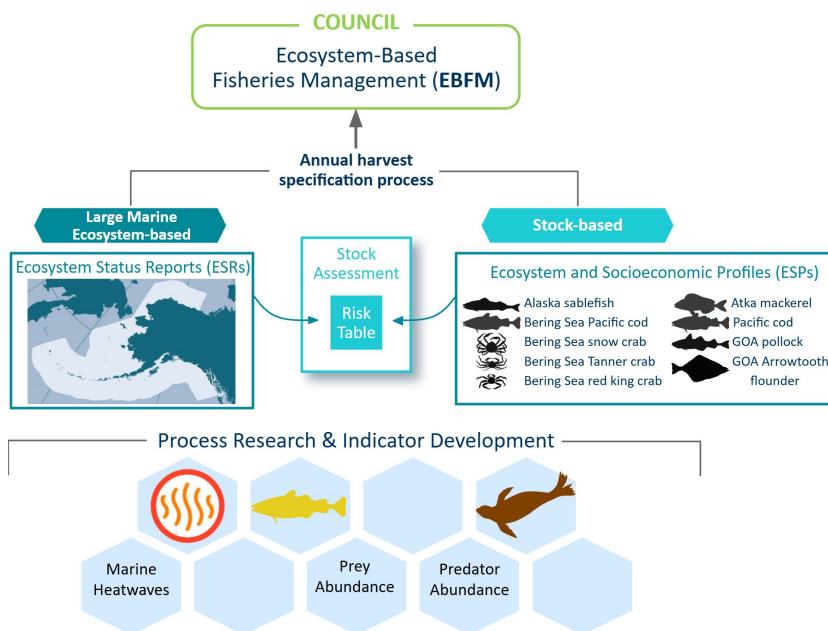


Diagram: NMFS AFSC