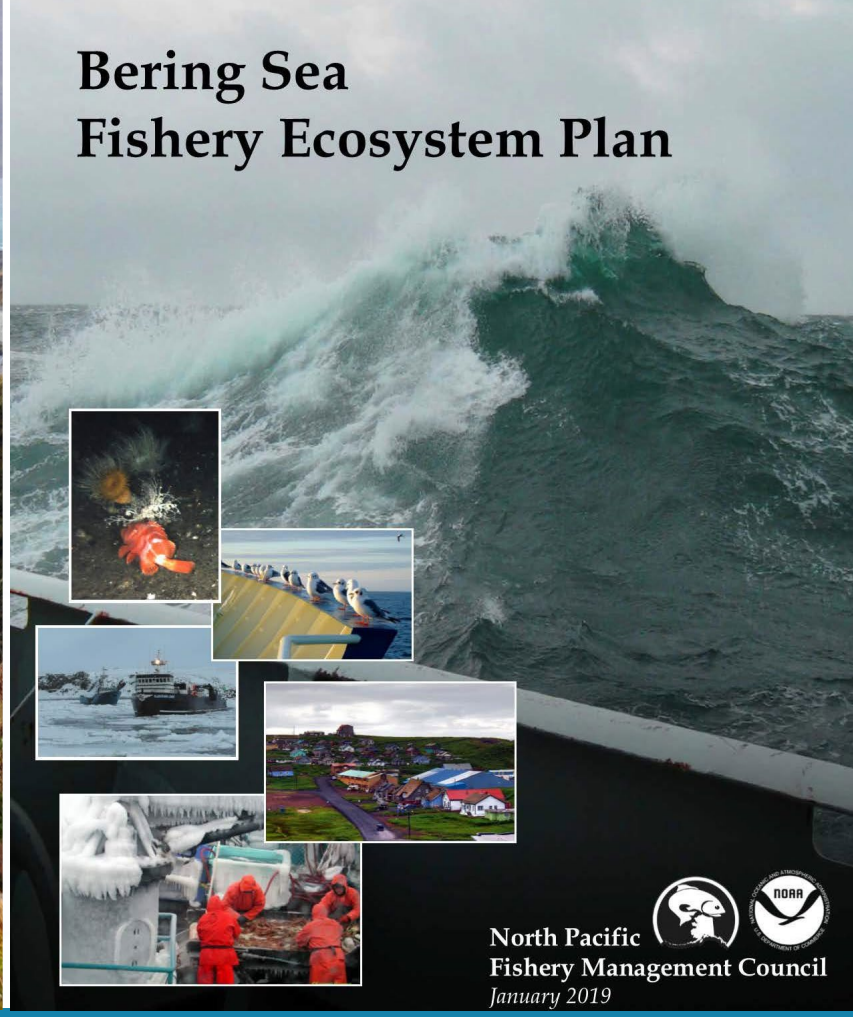


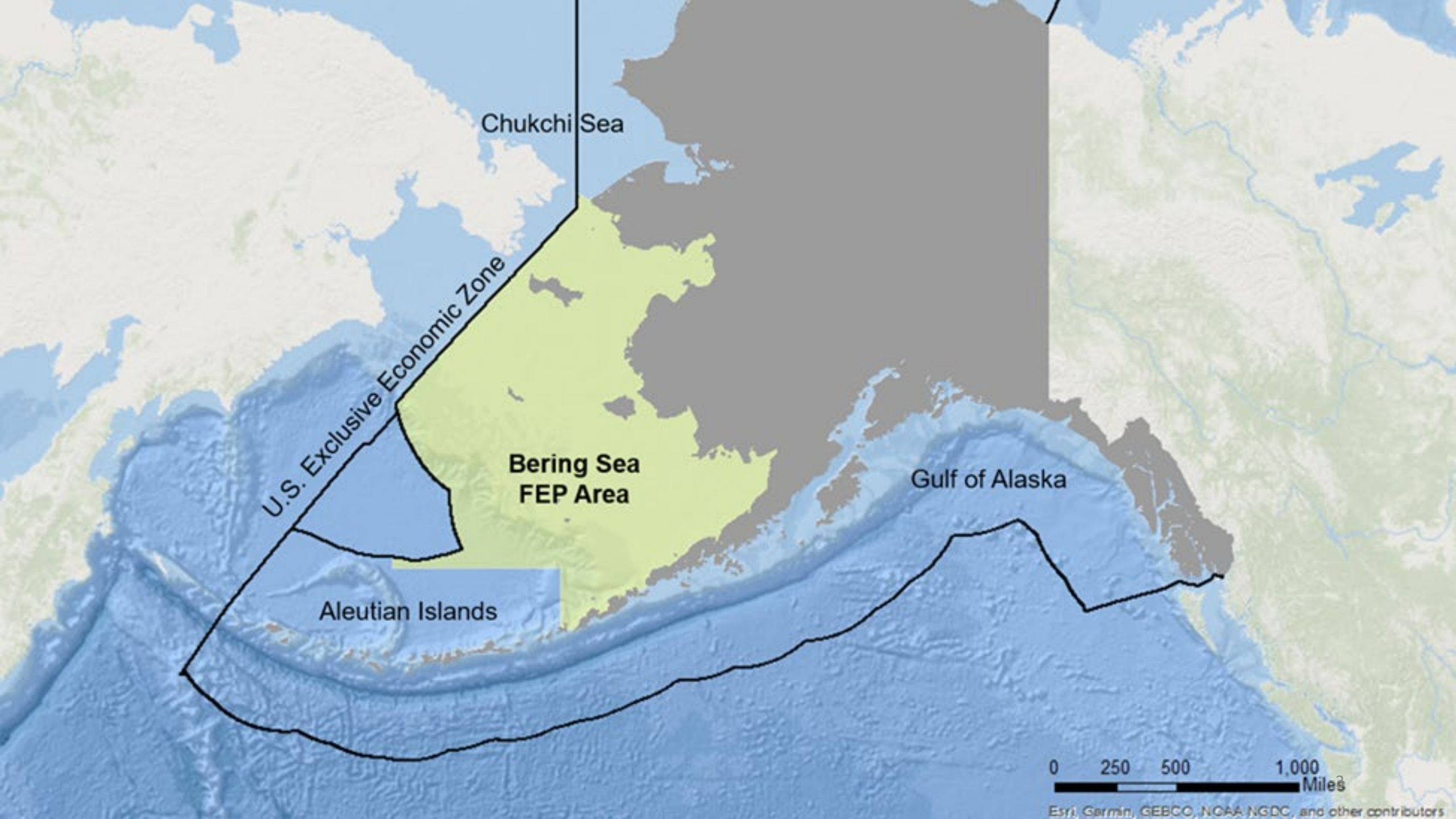
Bering Sea Fishery Ecosystem Plan

Kerim Aydin and Diana Evans

PICES Annual Meeting, October 2019

Why did the Council develop a FEP for the Bering Sea?

- Serve as a **communication tool** for ecosystem science and Council policy
- Create a **transparent public process** for the Council to identify ecosystem values and management responses
- Provide a **framework for strategic planning** that would guide and prioritize research, modeling, and survey needs
- **Identify connected Bering Sea ecosystem components**, and their importance for specific management questions
- Assess Council management with respect to ecosystem-based fishery management best practices, and **identify areas of success and gaps** indicating areas for improvement on a regular basis
- Provide a **framework for considering policy options** and associated opportunities, **risks, and tradeoffs** affecting FMP species and the broader Bering Sea ecosystem
- **Build resiliency of Council management strategies**, and options for responding to **changing circumstances**


Chukchi Sea
U.S. Exclusive Economic Zone
Bering Sea
FEP Area
Gulf of Alaska
Aleutian Islands
0 250 500 1,000
Miles
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

INFORM but don’t OVERWHELM

“One ongoing challenge is developing and addressing research questions from a Traditional Knowledge lens rather than solely from a western researcher's perspective.”

Raymond-Yakoubian, J., & Daniel, R. (2018). Marine Policy, *97:*101–108.

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Role of the Bering Sea FEP team

Provide strategic support for the Council's goals and objectives for ecosystem-based fishery management (EBFM), as described in the BS FEP

FEP facilitates co-production of knowledge

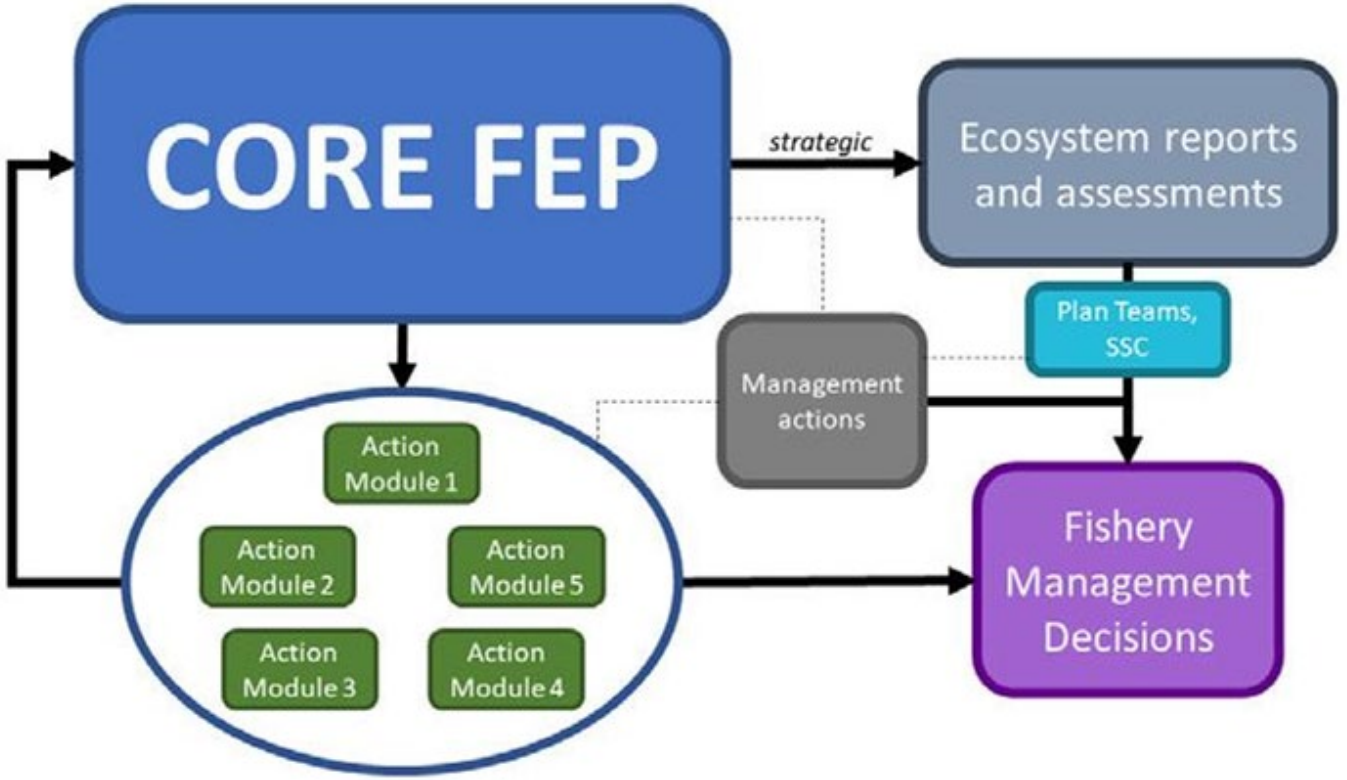
Core FEP aims to define LK and TK clearly in order to facilitate co-production of knowledge while protecting intellectual property as per the UN Declaration on the Rights of Indigenous Peoples (Articles 11.2, 31).

Local Knowledge	Traditional Knowledge
• Close environmental observations • Place-based • Empirical • Pragmatic • Often inter-generational	• A living body of knowledge • Acquired through long-term sociocultural, spiritual, and environmental engagement • Defines human – animal reciprocal relationships • Defines human – human kinship and reciprocity • Embodies rules about right conduct that intertwine the pragmatic and spiritual • Transmitted inter-generationally through oral history and ritual • Rooted in time and place, while having wide applicability • Rooted in tradition, while adaptable and dynamic

Structure of the Bering Sea Fishery Ecosystem Plan

- Strategic planning document
- Action informing but not action forcing

  Management action continues to occur through the FMPs



Ecosystem Goals

FEP also identifies ecosystem objectives under each of these ecosystem goals

- Maintain, rebuild, and restore fish stocks at levels sufficient to protect, maintain, and restore food web structure and function;
- Protect, restore, and maintain the ecological processes, trophic levels, diversity, and overall productive capacity of the system;
- Conserve habitats for fish and other wildlife;
- Provide for subsistence, commercial, recreational, and non-consumptive uses of the marine environment;
- Avoid irreversible or long-term adverse effects on fishery resources and the marine environment;
- Provide a legacy of healthy ecosystems for future generations.

Three types of objectives

Process objectives	Council actions to improve EBFM in the Bering Sea
Research objectives	Ideas of how to fulfill the process objectives; link directly to Action Modules
Ecosystem objectives	Bridge between ecosystem goals and ecosystem indicators for monitoring

Mapping ecosystem indicators to ecosystem objectives

Table 2.1 in FEP

Ecosystem Objective	Indicators to track
1. Maintain target biomass levels for target species, consistent with optimum yield, using available tools.	Fish Stock Sustainability Index (FSSI); Groundfish distribution and abundance; Groundfish recruitment predictions (P. cod and pollock); Commercial crab biomass indices; Stability of Groundfish Biomass
2. Maintain healthy populations and function of non-target and forage species.	Jellyfish; Forage fish and juvenile salmon distribution and abundance; Groundfish condition metric; Miscellaneous species; Non-target species catch
3. Adjust fishing-related mortality from the system to be commensurate with total productivity and continue to limit optimum yield to 2 million metric tons for the BSAI groundfish fisheries.	Aggregated CPUE
4. Maintain key predator/prey relationships.	RZA zooplankton indicator
5. Conserve structure and function of ecosystem components.	CEATTLE? Species richness and diversity
6. Minimize adverse impacts to essential fish habitat, to the extent practicable.	Winter spawning flatfish recruitment and wind forcing; Area Disturbed by Trawl Gear
7. Minimize and/or avoid impacts to ecologically-sensitive habitat, including habitat areas of particular concern (HAPCs).	Structural epifauna (EBS shelf)
8. Minimize and/or avoid impacts to seabirds, marine mammals, and protected species.	Coccolithophores; Seabird monitoring; Northern fur seal pup production; Seabird bycatch
9. Support benefits in the Bering Sea fishery and fishery-related industries.	Trends in unemployment; Human population; School enrollment
10. Provide opportunities for new entrants in Federal fisheries.	
11. Promote economic and community stability to all commercial harvesting and processing sectors.	Landings; Value and unit value
12. Promote sustainable opportunities and community resilience for subsistence users and Alaska Native communities.	Halibut and salmon subsistence trends
13. Provide for directed fisheries including subsistence fisheries by minimizing bycatch mortality.	Juvenile Chinook index; Groundfish Discards
14. Preserve the ability for stakeholders to derive non-consumptive and cultural value from the Bering Sea ecosystem.	Recreational fishing participation
15. Establish appropriate thresholds to minimize risk of crossing ecosystem tipping points caused by fishery or other human activity.	Mean lifespan, Length of fish community
16. Encourage responsible parties to minimize adverse impacts to fish and other wildlife associated with changes in shipping activity, tourism, energy, and other types of development.	
17. Ensure that fishery management is sufficiently adaptive to account for the effects of climate change or other ecosystem changes, including loss of sea ice and ocean acidification.	North Pacific Climate Overview; Climate indices; Eastern Bering Sea climate; Spatial distribution of groundfish stocks

Five Action Modules approved in the FEP

first two initiated by the Council in December 2018

Climate change

Local, Traditional Knowledge / Subsistence

EBFM gap analysis

Interdisciplinary conceptual models

Research

Action Module Workplan:

Evaluate effects of climate change and develop management considerations

GOAL

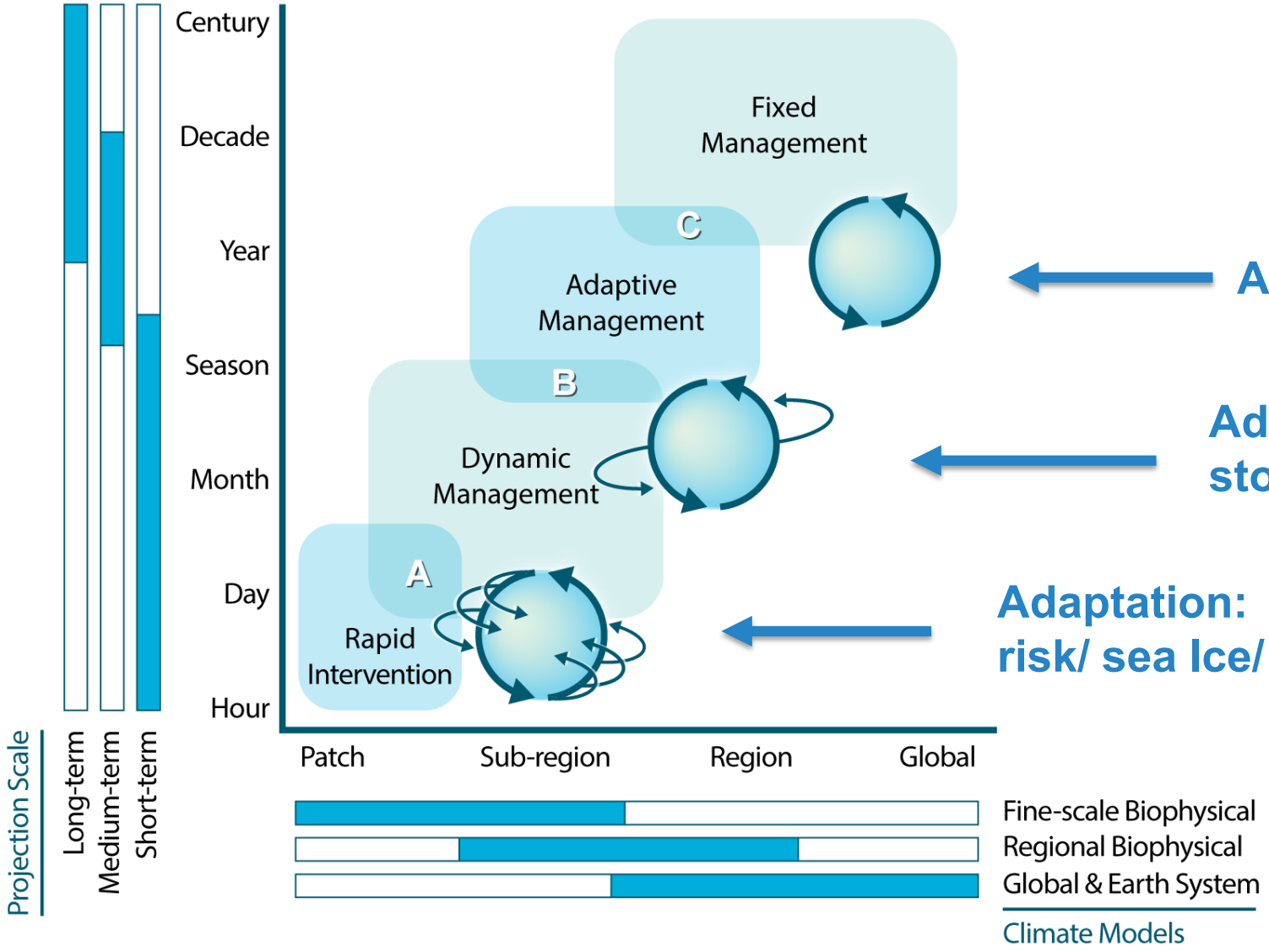
To support equitable climate change adaptation pathways and long-term resilience for the coupled social-ecological system of the Eastern Bering Sea.

METHOD

This Action Module will:

- **synthesize** current climate change knowledge;
- **identify** potential management measures; and,
- **evaluate** risks, timescale, and probability of success.

Consider nested scales of management & adaptation



Adaptation: increased flexibility

Adaptation: climate-enhanced stock assessments

Adaptation: nowcast/ forecast maps of risk/ sea Ice/ spp distributions

Holsman, K. K., Hazen, E. L., Haynie, A., Gourguet, S., Hollowed, A., Bograd, S. J., … Aydin, K. (2019). Towards climate resiliency in fisheries management. ICES Journal of Marine Science. https://doi.org/10.1093/icesjms/fsz031

METHOD

This Action Module will:

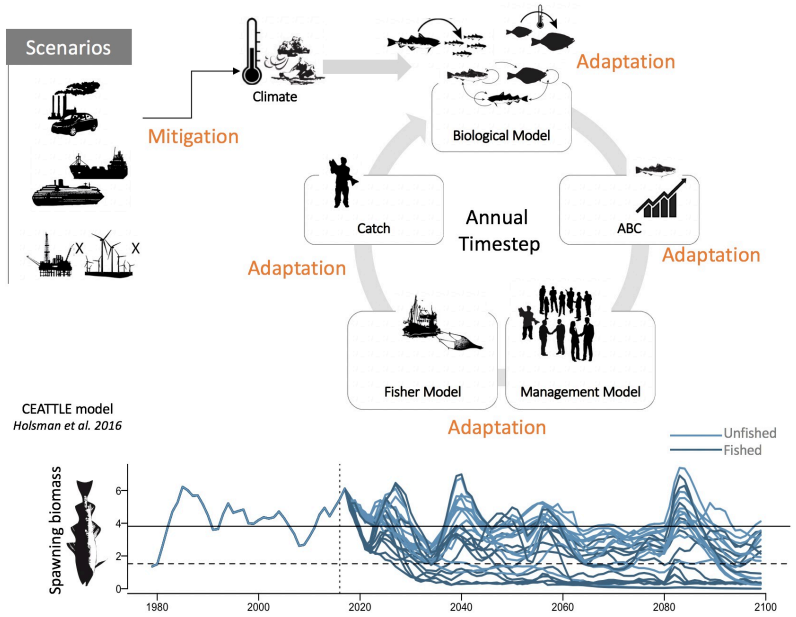
- **synthesize** current climate change knowledge;
- **identify** potential management measures; and,
- **evaluate** risks, timescale, and probability of success.

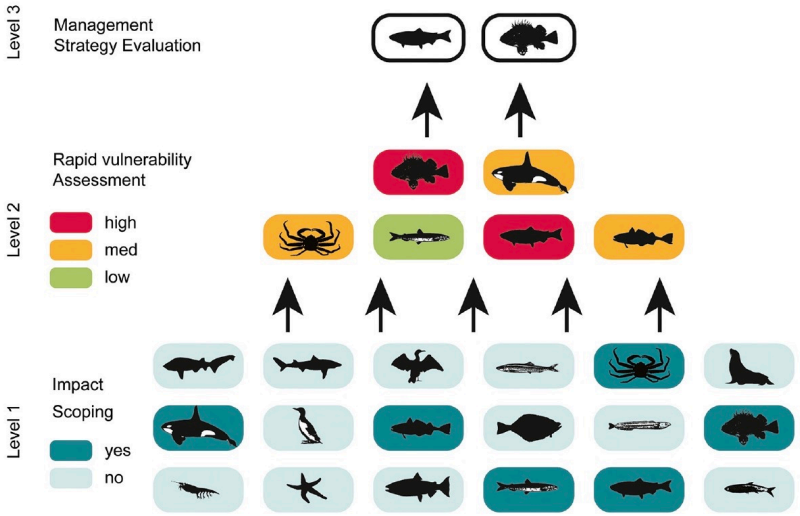
”Assessment of key risks necessitates consideration of large and deep uncertainties about the human trajectory.”
- Mach et al. 2016

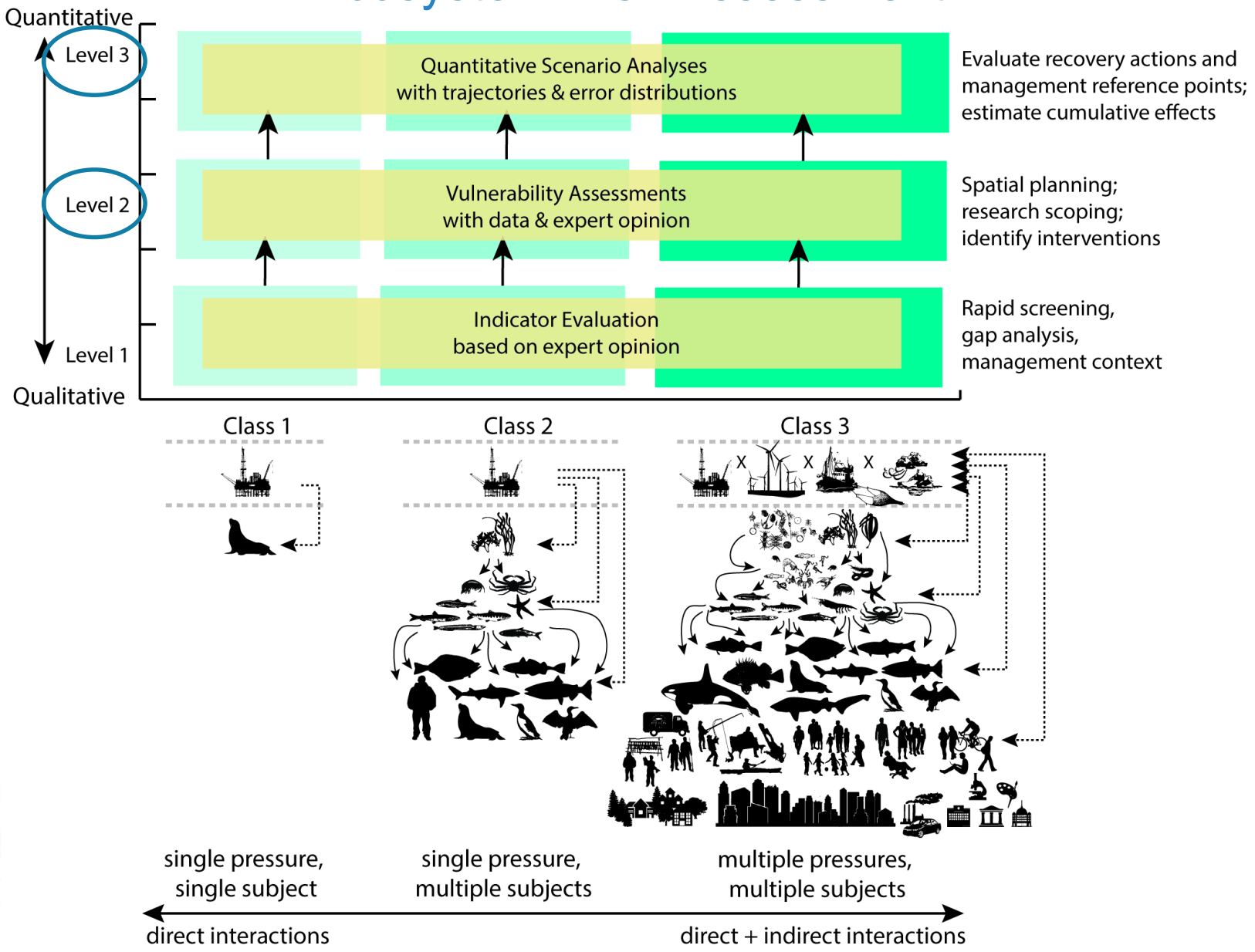
Mach, K. J., Mastrandrea, M. D., Bilir, T. E., & Field, C. B. (2016). Understanding and responding to danger from climate change: the role of key risks in the IPCC AR5. *Climatic Change*. https://doi.org/10.1007/s10584-016-1645-x

Mark Hoisman

Ecosystem Risk Assessment







Holsman et. al 2017. An ecosystem-based approach to marine risk assessment. Ecosystem Health and Sustainability 3(1):e01256. 10.1002/ehs2.1256

RESULTS

Results will help the Council track climate change impacts on the Bering Sea ecosystem and **ensure** that **fisheries management in the region is flexible** enough **to adapt to** rapid **shifts in species** distributions or abundance **under future conditions.**

MEMBERSHIP

The Taskforce will be composed of a diverse group of individuals with interdisciplinary expertise. Members will include AFSC researchers, Traditional Knowledge holders, and representatives of indigenous organizations and NGOs.

Action Module Workplan:

Develop protocols for Local Knowledge, Traditional Knowledge, and Subsistence

GOAL

To develop protocols for using local knowledge (LK), traditional knowledge (TK) in management and understanding impacts of Council decisions on subsistence resources, users, and practices.

3 PARTS

Part 1: Processes for incorporating LK

Part 2: Processes for incorporating TK

Part 3: Processes for assessing impacts of Council actions on subsistence

MEMBERSHIP

Stakeholders have recommended the Taskforce be composed of a diverse group of individuals geographically representative of the entire BS FEP area, including local residents and people from multiple age groups.

OUTREACH AND COMMUNICATIONS

Council staff have developed story maps of FEP components, located on the BS FEP website

https://www.npfmc.org/bsfep/

Thanks!

https://www.npfmc.org/bsfep/

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IPCC IK and LK Discussion Paper:

- Understanding the role of indigenous knowledge in impact detection and evaluation
- Showing how IK/LK helps to define baselines of past changes both in climate and ecological terms, for example, from Indigenous place names in places where historical records are lacking
- Identifying Key thresholds in each region that should not be crossed if the worst impacts are to be avoided both in spatial and socio-economic terms
- Defining of “safe havens” for both species, ecosystems and the most vulnerable human societies – ILK groups, Elders, women
- Including IK/LK in the development of climate-resilient pathways, e.g., as a source of information about adaptation, to inform adaptation policy and practice, and through the direct engagement of indigenous populations in adaptation