



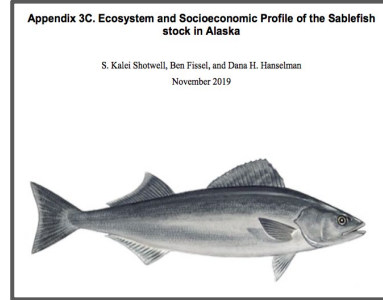
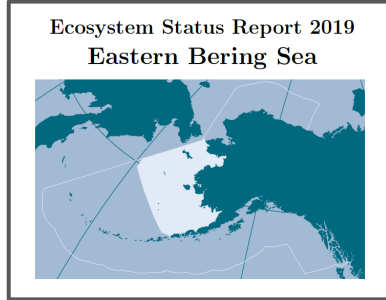
Bering Sea Fishery Ecosystem Plan

*Update on Strategic Ecosystem Evaluation (SEE or
“Ecosystem Health Report Card”) development*

BS FEP Team, April 4, 2022



Distinguishing ESR, ESP, SEE



ESR

ESP

Strategic Ecosystem Evaluation

	ESR	ESP	Strategic Ecosystem Evaluation
Purpose	Tactical - harvest specs	Tactical - harvest specs	Strategic
When issued	Oct-Dec	Oct-Dec	April every 3 yrs
Scope	Aggregated - Indicators that pertain to many stocks at once	Species/Stock-specific - we believe these have an impact on this specific stock	Aggregated - Synthesizing across ecosystem area /activities
Spatial	Large Marine Ecosystem (EBS, GOA, AI)	Large Marine Ecosystem/ FMP (EBS, GOA, AI)	LME -- Basin-scale
Temporal scope	Annual	Mixed	Bi or Triennial / longer term



Fisheries effects on the ecosystem??

- Cumulative, multi-species effects (synthesis needed)
- Informs management strategy, not tactical management decisions
- Diversity of audiences
- Monitors success of EBFM management actions (progress towards goals and objectives)
- *Without* overwhelming



Example of differences

- For “Total groundfish biomass”:
 - An ESR indicator might use BTS (survey) data – a current-year uptick may be a shift of distribution, catchability as well as long-term abundance, that informs interpretations of stock assessments and risk tables in the current year.
 - A SEE indicator might use a running average or other smoothing method, or (since information doesn’t need to be “up to the minute”) use stock assessment results as the best available science on biomass.
- Oceanography indicators:
 - ESR: “Are we in a heat wave now/recent past?” versus SEE: “Have we seen more/are we at greater risk now for heat waves?”



Ongoing indicator review

- There have been several “global” level indicator reviews and reports to develop suites of indicators (e.g. Ocean Health Index, Indiseas, Fulton et al.)
- Focus of these studies was generally broad comparison across worldwide ecosystems, so focused on lowest-common-denominator data (catch, basic surveys).
- The Bering Sea is one of the most monitored fished LMEs worldwide, can use more informative (but less available worldwide) indicator data.
- Additional criteria:
 - Scale: Summer EBS is most-monitored (compared to NBS, other subregions and seasons) – care to have representation across seasons and subregions.
 - Simulation: What can be climate-tested using model projections and e.g. models available through the ACLIM project?



So where is our report starting point?

- Focus of FEP is strategic
 - Strategic versus Tactical advice led to development of this new product to deliver longer-term strategic advice rather than the near-term tactical advice contained in the ESRs.
 - Purpose in FEP: to allow fishery management to more explicitly take into account and be responsive to changes in the ecosystem
- Six ecosystem goals are overarching; FEP associates them with one or more strategic Ecosystem Objectives
- May 3 2021 workshop recommendation: Organize report by six goals, and objectives under those goals. Subteams at workshop brainstormed initial data sources/resources.



Progress by Objective

Ecosystem Goal 1: Maintain, rebuild, and restore fish stocks at levels sufficient to protect, maintain, and restore food web structure and function

Ecosystem Goal 2: Protect, restore, and maintain the ecological processes, trophic levels, diversity, and overall productive capacity of the system

- Objectives measurable by "more familiar" fisheries and ecological data.
 - Much of the raw data already gathered/reported by stock assessments, ESRs, and ESPs.
 - Desired indicators conducive to time series format (similar to ESRs).
 - May have different formats/analysis for "tactical" (SAs, ESRs, ESPs) versus "strategic" (SEE).
 - Many indicators already gathered/data assembled by team.
 - Categorizing of data sources including time and space scales began at March meeting.
 - Data shortlist by ~May 2022 to produce draft report by Sept 2022.



Progress by Objective

Ecosystem Goal 1: Maintain, rebuild, and restore fish stocks at levels sufficient to protect, maintain, and restore food web structure and function

Ecosystem Goal 2: Protect, restore, and maintain the ecological processes, trophic levels, diversity, and overall productive capacity of the system

Indicator	FEP Eco	Indicator type	Indicator topic	Indicator category (AK)	Reporting	ACLIM model?	Management int	Ref	What is it?
1 Foodweb complexity: number of trophic levels, connectivity, path length, niche width	5	ecosystem function	network analysis	Foodweb	possible	yes	1. Priority	Degnbol, P. and A. Jarre (2004). "Review of indicators in fisheries management - "	
2 Oceanography (production index - plankton) <i>as in PPR otherwise physical</i>	5	ecosystem function	trophic	Oceanography	Already tracked	possible	1. Priority	"Fulton et al. 2004. "Ecological Indicators for the Impacts of Fishing on Non-Targi	
3 Condition index (of proxy species) <i>Fulton'4?</i>	5, 15	population/structure	size/age/maturity	Survey biomass	Already tracked	no	1. Priority	?	
4 CPUE (species, community, species at risk etc) - Goal 1	1, 3	population/community	catch/effort	Catch	Already tracked	no	1. Priority	"Shin et al. 2010. "Using indicators for evaluating, comparing, and communicati	
5 Diversity size-spectra slope and intercept	5	community structure	size/age/maturity	Survey biomass	Already tracked	no	1. Priority	Shin, Y. J., et al. (2005). "Using size-based indicators to evaluate the ecosystem ef	
6 Physical oceanography (e.g. temperature, DIN, oxygen, chlorophyll a, ENSO)	5	physical - in 5?	Physical	Physical	Already tracked	no	1. Priority	?	
7 Species composition - plankton assemblage	5	community structure	abundance	Survey biomass	Already tracked	no	1. Priority	Fulton et al. 2004. "Ecological Indicators for the Impacts of Fishing on Non-Target	
8 Fat content of selected species - as proxy for food availability and quality of food	5, 15	ecosystem function	trophic	Survey biomass	Already tracked	no	1. Priority (using	Degnbol, P. and A. Jarre (2004). "Review of indicators in fisheries management - "	
9 Ecological network analysis indices (production, consumption, respiration, flow to	5	ecosystem structure	trophic	Network	possible	yes	2. Desired	?	
10 Increasing return time from perturbations	5	ecosystem function	threshold	Fishing effects	possible	yes	2. Desired	"Fulton et al. 2004. "Ecological Indicators for the Impacts of Fishing on Non-Targi	
11 Species composition - fish assemblage	5	community structure	diversity	Survey biomass	possible	yes	2. Desired	Fulton et al. 2004. "Ecological Indicators for the Impacts of Fishing on Non-Target	
12 Network indices	15, 5	ecosystem structure	network analysis	Network	possible	possible	2. Desired	Fulton, E. A., et al. (2005). "Which ecological indicators can robustly detect effect	
13 Gao resilience index	5	community structure	vulnerability/resilience	Fishing effects	possible	?	2. Desired	?	
14 1/(landings / biomass)	5	community condition	abundance	Survey biomass/catch	possible	yes	3. Of interest	Shin et al. 2010. "Using indicators for evaluating, compa indicates global fishing g	
15 biomass ratio of demersal/pelagic finfish	5	ecosystem structure	abundance	Survey biomass	possible	yes	3. Of interest	Fulton et al. 2004. "Ecological Indicators for the Impacts indicates trophic structu	
16 biomass ratio of infauna:epifauna (InF:EpF)	5	ecosystem structure	abundance	Survey biomass	possible	yes	3. Of interest	Fulton, E. A., et al. (2005). "Which ecological indicators can robustly detect effect	
17 biomass ratio of piscivorous:zooplanktivorous fish (PvB:ZvB)	5	ecosystem structure	trophic	Survey biomass	possible	yes	3. Of interest	"Shin et al. 2010. "Using indicators for evaluating, comparing, and communicati	
18 Species composition (e.g. ratio of species, MDS and other ordination/clustering analysis)	5	community structure	diversity	Survey biomass	possible	yes	3. Of interest	Fulton et al. 2004. "Ecological Indicators for the Impacts of Fishing on Non-Target	
19 biomass relative to unexploited level - by community and group	5	community condition	abundance	Survey biomass	possible	possible	3. Of interest	Fulton, E. A., et al. (2005). "Which ecological indicators can robustly detect effect	
20 Community relatedness-similarity indices	5	community structure	diversity	Survey biomass	possible	?	3. Of interest	Fulton et al. 2004. "Ecological Indicators for the Impacts of Fishing on Non-Target	
21 1 / Coefficient of variation (e.g. of catch orof survey index)	5	community structure	abundance	Catch	possible	yes	4. Low priority	Shin et al. 2010. "Using indicators for evaluating, compa provides a measure of t	
22 biomass ratio of endangered:non-endangered	5	community condition	vulnerability/resilience	Foodweb	possible	yes	4. Low priority	Degnbol, P. and A. Jarre (2004). "Review of indicators in fraction of endangered :	
23 Capacity, overhead, and relative ascendancy	5	ecosystem function	network analysis	Catch	possible	yes	4. Low priority	Fulton, E. A., et al. (2005). "Which ecological indicators can robustly detect effect	
24 Cumulative biomass vs. trophic level curve inflection point	5	community structure	trophic	Survey biomass	possible	yes	4. Low priority	Link et al., 2015. Emergent Properties Delineate Marine Ecosystem Perturbation	



Progress by Objective

Ecosystem Goal 3: Conserve habitats for fish and other wildlife

Ecosystem Goal 4: Provide for subsistence, commercial, recreational, and non-consumptive uses of the marine environment

- Requires more data discussion/availability.
- Requires more consultation with data providers not at the Plan Team table.
- More spatial considerations outside time series format.
- Using Goal 1-2 work as an example, reach out to providers/determine candidate indicators and needed expertise by Sept 2022 (data gathering and reporting to proceed after that).



Progress by Objective

Ecosystem Goal 3: Conserve habitats for fish and other wildlife

Ecosystem Goal 4: Provide for subsistence, commercial, recreational, and non-consumptive uses of the marine environment

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
Objective	Indicator	Indicator Title	Longer description	Primary Contact	Timing	Ongoing produc	Permission to u	Access	Geo_Regi	Geo_Loc	Time_Sea	Time_Ann	Time_3-5	Time_10-1	Variability_Me	Variability_Ext	Use_Subst	Use_Comm	Use_Recre	Use_Non-Consumpt
	11 Employment	Total #	Commercial fishing captains, crews, processing jobs.						X	X	X	X	X	X			X			
	11, 14 Employment	Sporty #	Sport fishing guides, lodge employment, etc.						X	X	X	X	X	X				X		
	9 Unemployment	BS/AI (Fisheries)							X		X	X	X	X						X
	9 Unemployment	Case Study Communities								X	X	X	X	X						X
	9 Unemployment	Fleet Index - Crew (Crab or Amend-80)							X		X	X	X	X			X			
	9 Unemployment	Entry Index - 'Greying of Fleet issues'							X		X	X	X	X			X	X		
	9 Human population								X	X	X	X	X	X						X
	9 Traffic	Vessel Traffic							X	X	X	X	X	X						X
	14 Traffic	Tourism	TDX Seabird Tourism? Cruise ship traffic in Nome?							X		X	X	X		X				X
	9 Fisheries	Declared Fisheries Disasters?							X		X	X	X	X	X	X	X	X	X	
	10 Fisheries	trends in species-specific harvests/processed							X	X	X	X	X	X	X	X	X	X	X	
	9 Fisheries	Total # Fisheries							X	X	X	X	X	X			X	X	X	
	10 Fisheries	# vessel linked to communities							X	X	X	X	X	X		X	X	X		
	10 Fisheries	Underutilization of TAC	(% of TAC NOT captured); summary by species fisheries by volume or dollars						X	X	X	X	X	X		X		X	X	
	9 Fisheries	Gear Use							X	X	X	X	X	X			X	X	X	
	10 Fisheries	consolidation	change in # of unique QS holders						X	X	X	X	X	X			X	X		
	10 Fisheries	consolidation	#LLP holders						X	X	X	X	X	X			X	X		
	12 Fisheries	Subsistence SHARC cards							X	X	X	X	X	X		X	X			
	12 Fisheries	Subsistence salmon	Salmon harvest assessments in the Y-K delta. Available from WDFW. Shift effort from Chinook to other						X	X	X	X	X	X		X	X			
	12 Fisheries	Annual Subsistence Salmon Report	"Fish Camp" participation, well-being, and identity						X	X	X	X	X	X		X	X			
	12 food security	case study data	USDA food security surveys, ADF&G DoS surveys. Use case study.						X	X	X	X	X	X						
	12 food security	Tribal groups, associations, and consort	St. Paul Island Murre egg harvests?						X		X	X	X	X		X				
	12 food security	Annual Migratory Bird Subsistence Repx	NFWS by Div. Sub.								X	X	X	X						
	12 food security	Tribal groups, associations, and consort	Marine Mammal Harvest Data							X	X	X	X	X			X			
	12 food security	Tribal groups, associations, and consort	Non-marine resources (berries)							X	X	X	X	X			X			
	12, 14 Cultural values	Tribal groups, associations, and consort	Elder inputs and transfer of knowledge?						X	X	X	X	X	X			X	X	X	X
	12, 14 Community well-bein	Tribal groups, associations, and consortium	data collected across region						X	X	X	X	X	X			X	X	X	X
	12, 14 Subsistence way of l	Participation at the individual and house	Participation data is available from DOS surveys for each species and species category.						X	X	X	X	X	X		X				
	12, 14 Community well-bein	Local School Enrollment							X	X	X	X	X	X		X				X

Work In Progress

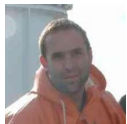


Progress by Objective

Ecosystem Goal 5: Avoid irreversible or long-term adverse effects on fishery resources and the marine environment

Ecosystem Goal 6: Provide a legacy of healthy ecosystems for future generations

- Active collaboration with CCTF.
- May affect interpretation of Goal 1-4 indicators as well as suggesting goal-specific indicators.
- Similar timeline to Goal 3-4 report sections.



Goal 1-2 working plan

- Steps by May 2022
 - List potential indicators for each goal (expansive shortlist)
 - Get current or recent data/check data availability
 - Summarize individual indicators and reason for inclusion

- Steps after May 2022 check-in
 - Review shortlist - anything missing (including Council body/stakeholder)
 - Graphical/statistical synthesis (time range, etc.)
 - Final indicator recommendations from Plan teams for broader review ~Sept 2022
 - Final report *draft goals 1-2 section* ~Sept 2022

