Stock-specific Ecosystem Considerations (SEC)

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Why Stock-specific Eco?

- National Standards 1 & 2
  - States stocks are influenced by interactions with other stocks and ecosystem
  - Ecological conditions should be considered to the extent possible for specifying optimum yield
- Avenues for including ecosystem information
  - Ecosystem Considerations Chapter is well developed but at regional scale (e.g. BS, AI, GOA)
  - Stock-specific Ecosystem Considerations (SEC) exists within each chapter but need revamping

Current Initiatives

- Four major requests to stock authors:
  - 1.) Climate Vulnerability
  - 2.) Habitat Prioritization
  - 3.) Stock Prioritization
  - 4.) 5-year EFH Update

  #sadface

- Author Responsibilities – December 2015
  - Generate stock profiles, update EFH
  - Score stock for vulnerability & prioritization

SEC Organization

- SEC Document and Working Group (WG)
    - Presented to Plan Team and Council 2014
    - WG consists of stock/ecosystem assessment authors and members from Plan Team
- Initiated coordinated effort on data calls
    - Created Google form for species profiles
    - Includes stock status, life history, productivity,...
    - Ends with ecosystem status section
    - Form serves as baseline SEC for a given stock

Alaska Stock Assessment Profiles

Form provides background information that will be used to characterize a stock or stock complex for tasks such as climate vulnerability, stock/habitat prioritization, stock/habitat improvement and developing stock-specific ecosystem considerations (SEC) sections of the annual stock assessment and fishery evaluation (SAFE) reports.

Please provide information on references and the data quality of answers where requested and applicable using the following scoring metrics:

0 = No Data. No information to base an attribute score on. Very little is known about the stock or related stocks and there is no basis for forming an expert opinion (please use judiciously).

1 = Expert Judgment. The attribute score reflects the expert judgment of the reviewer and is based on their general knowledge of the stock, or other related stocks, and their relative role in the ecosystem.

2 = Limited Data. The score is based on data which has a higher degree of uncertainty. The data used to score the attribute may be based on related or similar stocks or species, come from outside the study area, or the reliability of the source may be limited.

3 = Adequate Data. The score is based on data which have been observed, modeled or empirically measured for the stock in question and comes a from reputable source.
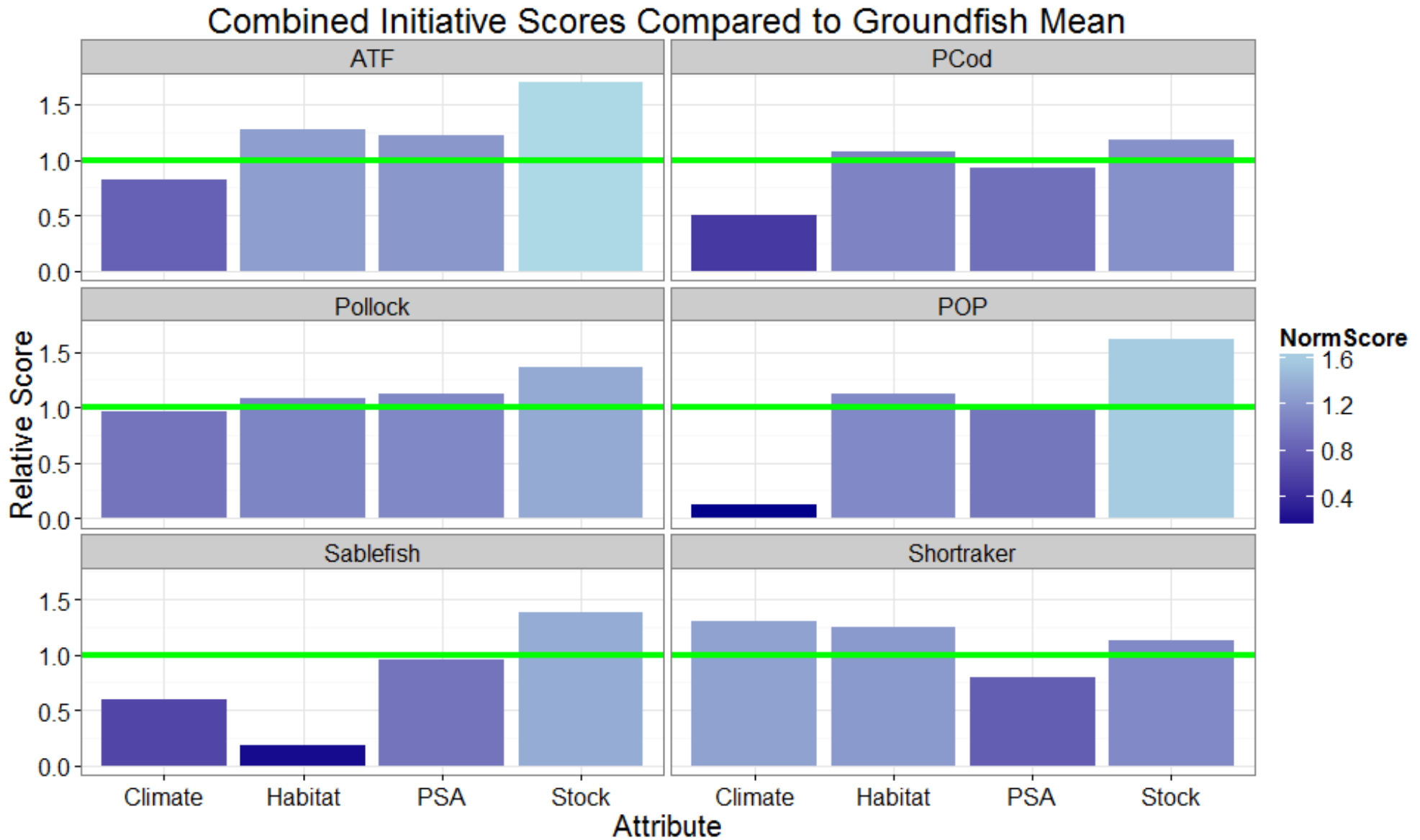
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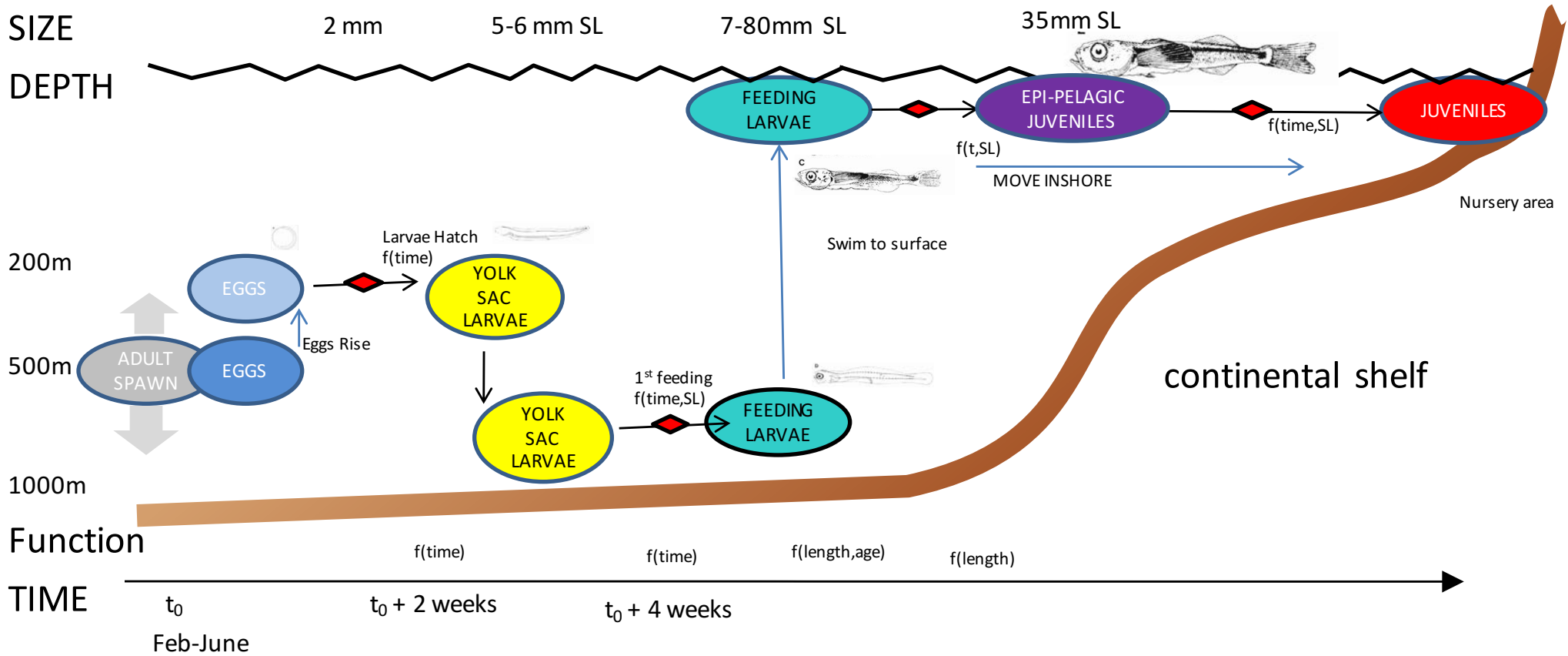Please enter your name for future reference

Alaska Stock Assessment Profiles

Productivity

To determine the relative productivity of the stock using information on age, length and growth

<><><><><><><><> Lookup Resources <><><><><><><><>

AFSC Bottom Trawl
Survey:http://www.afsc.noaa.gov/RACE/groundfish/survey_data/default.htm
AFSC Longline Survey: http://www.afsc.noaa.gov/maps/longline/Map.php
Age & Growth Otolith Database: http://www.afsc.noaa.gov/REFM/Age/Stats/stats.htm

Natural Mortality

Indicate the best available estimate for natural mortality rate (M)

Natural Mortality Data Quality

Please select data quality of the natural mortality information above using the 0 to 3 data quality scale described at the beginning of the form.

- ○ 0 = No Data
- ○ 1 = Expert Judgement
- ○ 2 = Limited Data
- ○ 3 = Adequate Data

Alaska Stock Assessment Profiles

Ecosystem Status

To determine the relative position of a stock/complex within the ecosystem based on trophic level and influence. Quantification of spatial and temporal trends of assessment inputs is also included to assist in development of ecosystem report cards that capture the primary indicators of system change that may influence the stock/complex.

<><><><><><><> Lookup Resources <><><><><><><>
Ecosystem Assessment: http://access.afsc.noaa.gov/reem/ecoweb/index.php

Ecosystem Indicators: http://access.afsc.noaa.gov/reem/ecoweb/DataSelect.php

Stock-Specific Ecosystem Considerations (SEC) Framework:
http://www.afsc.noaa.gov/refm/stocks/plan_team/2014/Sept/Stock-Specific_Ecosystem_Considerations_Sept-2014.pdf

Ecosystem Importance
Specify if role of stock/complex in ecosystem, choose all that apply

Baseline SEC

- Use profile form for initiatives & SEC
  - Improvement scores (prioritization, vulnerability)
  - Life history conceptual model, reference table
  - Models/maps for EFH baseline, diet, food web
- Construct mechanistic model per stock
  - Combines scores with the profile elements to generate a baseline mechanistic model
  - Proxy indicators are identified to populate a species-specific report card

Improvement Scores

Combined Initiative Scores Compared to Groundfish Mean

Sablefish Conceptual Model


= Modeled 'Stage'

= Indicates 'switch' to next 'Stage'

SIZE

DEPTH

2 mm   5-6 mm SL   7-80mm SL   35mm SL

FEEDING LARVAE

EPI-PELAGIC JUVENILES

f(time,SL)

JUVENILES

f(t,SL)

MOVE INSHORE

Nursery area

Swim to surface

Larvae Hatch f(time)

200m

YOLK SAC LARVAE

EGGS

Eggs Rise

500m

ADULT SPAWN

EGGS

1st feeding f(time,SL)

YOLK SAC LARVAE

FEEDING LARVAE

continental shelf

1000m

Function

f(time)   f(time)   f(length,age)   f(length)

TIME

t_0

t_0 + 2 weeks

t_0 + 4 weeks

Feb-June

Life Table – Sablefish

	Stage	Distribution	Phenology	Movement	Age/Length	Growth	Energetics
Adult	Recruit	Shelf edge, slope, gullies (>200 m), Alaska population GOA to Bering[18]	First recruit to survey and fishery age 2[18]	Annual movement high, 10-88%, time-varying (< late '90s, >09)[18]	Max: 73 yrs, 134♀/138♂ cm Average: 12 yr[18]	L_inf: 80♀/68♂ cm K:0.22♀, 0.29♂ T_0: -1.95♀, -2.27♂ time-varying (>)[18,28]	Low conversion efficiency, low metabolic rate[21]
	Spawning	Shelf break[1], deep pelagic	Winter-spring, peak March[1,26] 25 wks, high production[17]	-	1st mature: 5.5 yr 50%: 6.6 yr/65cm ♀, 5 yr/57 cm ♂[17,18]	Females larger than males (5.5 max average ♀, 3.2 ♂)[28]	Oviparous, high fecundity[1,17] Skip-spawning[18]
Offshore to Nearshore Pelagic	Egg	Slope (>200-400 m), sink to deeper depths, negatively buoyant[1]	Late winter to early spring, limited duration, 10 wks[17]	-	Egg size: 1.8-2.2 mm, uniquely large egg size[17,RACE]	-	Max survival to hatch, 34-35ppt, 4-6.6°C (lab)[22]
	Larvae	Slope (>200-600 m) (hatching to yolk-sac), surface over shelf and slope, 160 km offshore (yolk-sac to YOY)[1,2,7,17]	Late spring and summer[7,16], peak end May[17], 12 wks[17], extended epipelagic[19]	Immediately swim to surface after hatch[1,19], ascend as yolk-sac larvae[7,16]	10-80 mm SL[1,7,16]	1.2 mm/day[10], develop as obligate neuston[7,16]	Growth threshold 22°C (lab)[9]
	YOY	Shelf[1], neuston and near surface (upper 10-20 cm of water column), central/east GOA[1,10,17]	No marked transition time to this stage[1,19]	Pelagic juveniles move nearshore[25]	60-230 mm FL (120 mm avg from otolith) captured from top 3 m of water column[10]	Ontogenetic rapid, growth[23], 1.2 mm/day[10]	Upper thermal limit near upper limit survival[9], absence lipid regulation[23]
Nearshore	YOY/Juvenile	Nearshore (6-214 m)[3,4], 0-90 m[6], inlet, bay, fjord, strait[3,6], rare unless > yr class	Late summer-fall[4]	Diel pelagic feeding excursions[30]	300-400 mm after second summer, age 2+ yrs[25]		
	Pre-Recruit	Nearshore, shelf (10-207 m)[3,4,6,8], (6-90 m)[6,], inlet, bay, fjord, strait[3,6,8]		Offshore movement begins after 2nd summer[25]	<600 mm FL[5], age 2+ yrs[10]		

Life Table – Sablefish (cont)

	Stage	Habitat	Diet	Associations	Predators	Physics	Mechanism
Adult	Recruit	Benthic, 1 m from bottom[18]	Opportunistic, euphausiids, pol/cod, capelin, herring, squid, jelly[12,18,REEM]	Slope groundfish[18]	Sperm whales, orca, fisheries[18]		
Adult	Spawning	Deep water pelagic	-	Slope groundfish[18]	Sperm whales, orca, fisheries[18]		North Pacific Polar Front, winter before spawning[20]
Offshore to Nearshore Pelagic	Egg	Deep water pelagic	Yolk is homogenous[RACE]			Prior to spring bloom[17]	
Offshore to Nearshore Pelagic	Larvae	Epipelagic, extreme neustonic	(<12.5 mm SL) copepod nauplii, (12.6-20.5 mm SL) nauplii, small copepods, (>20.6 mm SL) sm & lg copepods	Co-occur with larval cottids, hexagrammids, wrymouths, and also non-obligate neustonic[1,8,9]		Currents that transport onto shelf[1]	Survival of first-feeding larvae linked to copepod abundance[11]
Offshore to Nearshore Pelagic	YOY	Epipelagic, extreme neustonic	Euphausiids, pelagic tunicates, other crustaceans, larval fish[1,10]	Active inshore migration likely[1]	Coho and chinook salmon[31], seabirds[GOA+]	Troughs, valleys used for transport, currents to enhance transport nearshore nurseries[1,10,19]	
Nearshore	YOY/ Juvenile	Mixed, mud, soft[3], proximity to rock[6]	Herring, smelts, salmon remains, jellies[30]	Macroalgae, sponge, anemone, sea whip, b.star[3], eelgrass[15], shelf groundfish[12]	Salmon, halibut[12,31], seabirds[GOA+]		
Nearshore	Pre-Recruit	Mixed, mud, soft[3], proximity to rock[6]	Euphausiids, shrimp, pollock, other fish, other crustaceans, cephalopods, jellies, salmon[12,13,14]	Sponge, sea whip, sea pen, coral, b. star, anemone[3], shelf groundfish[12]			

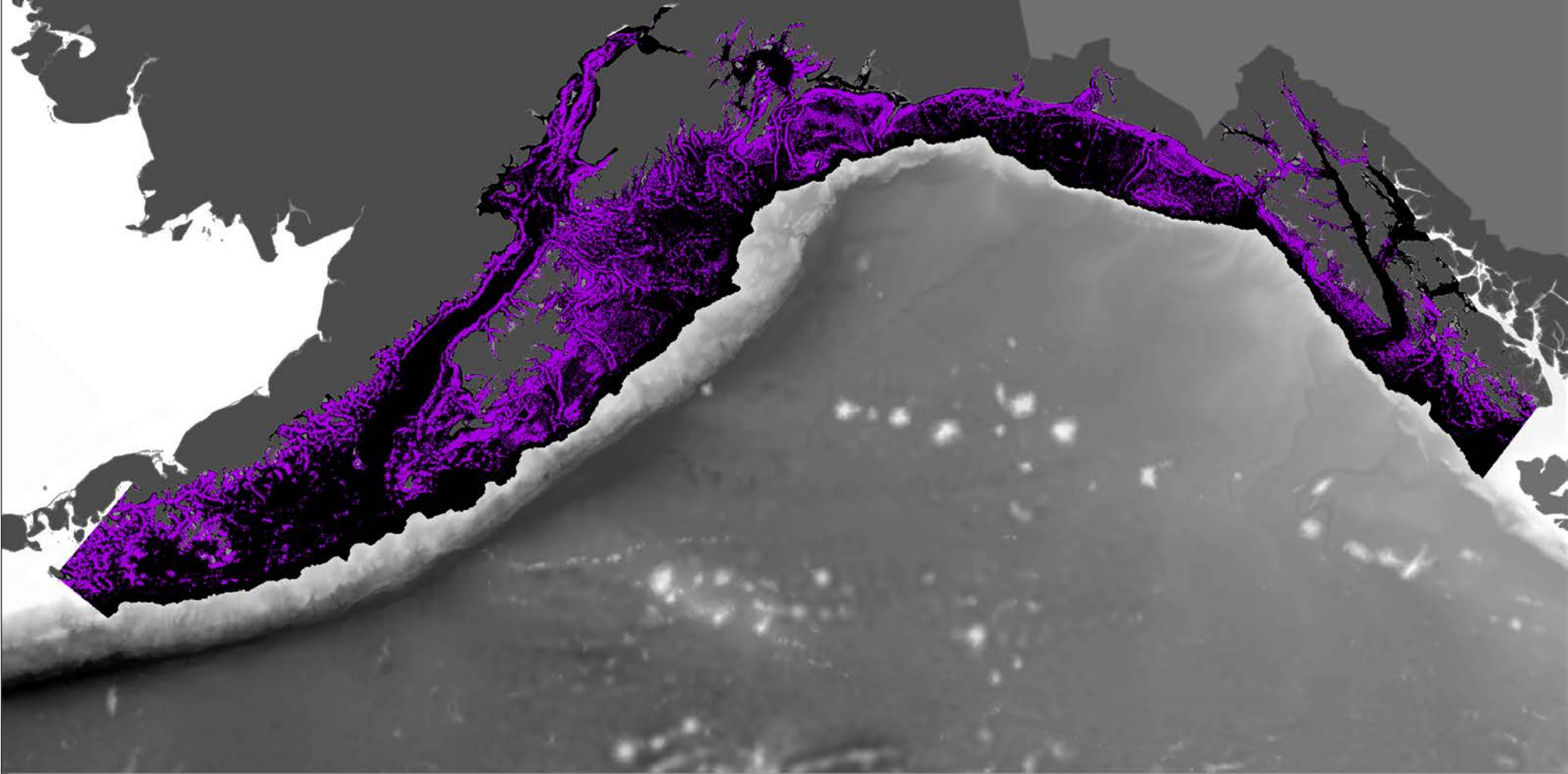# Sablefish
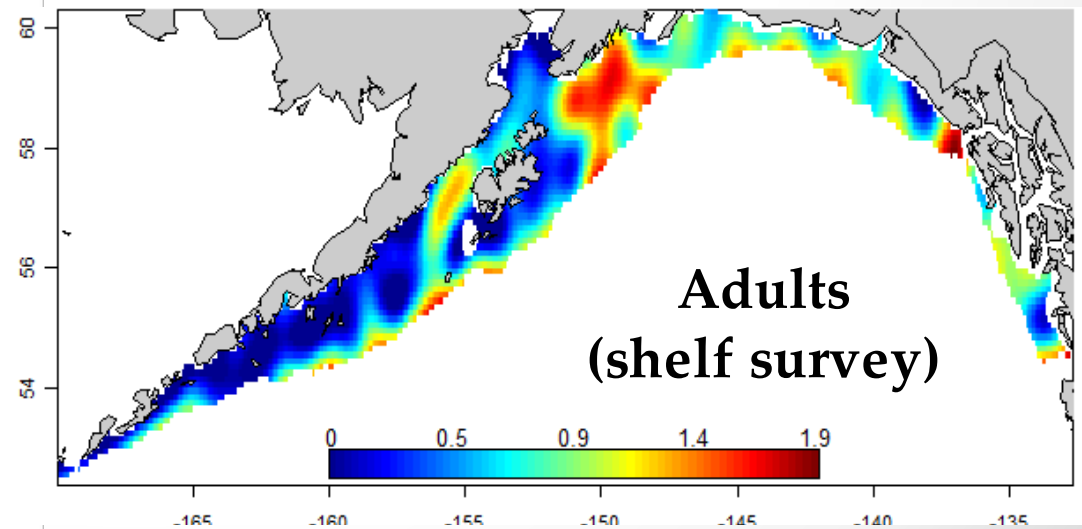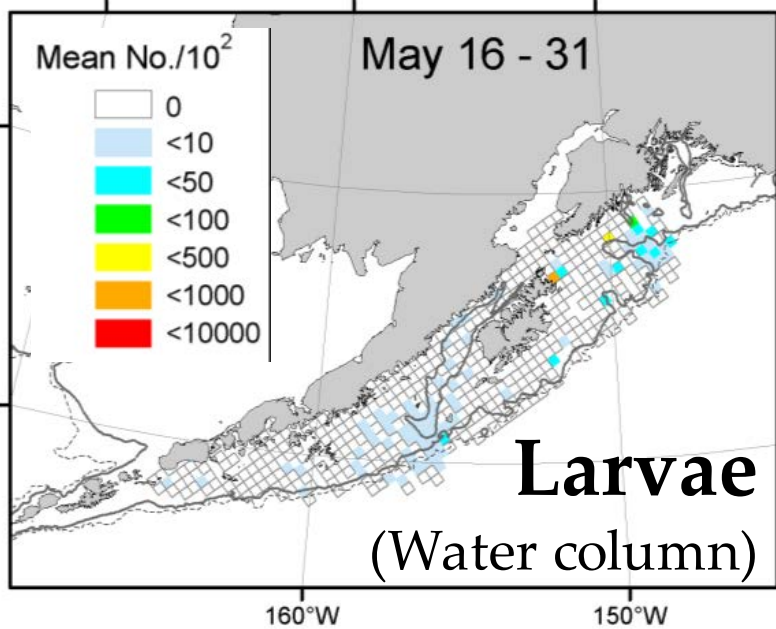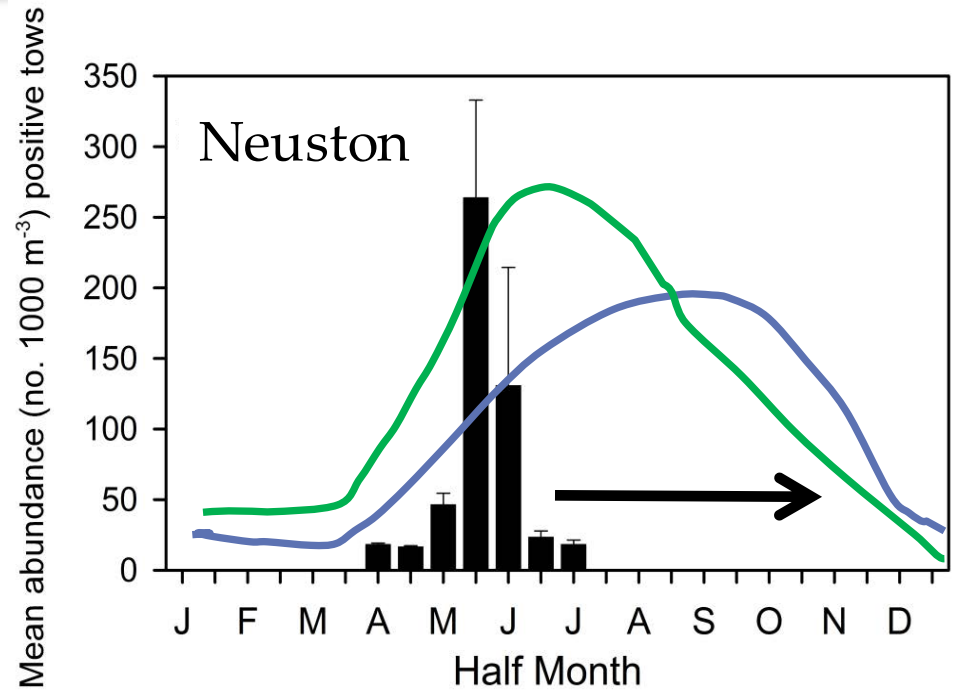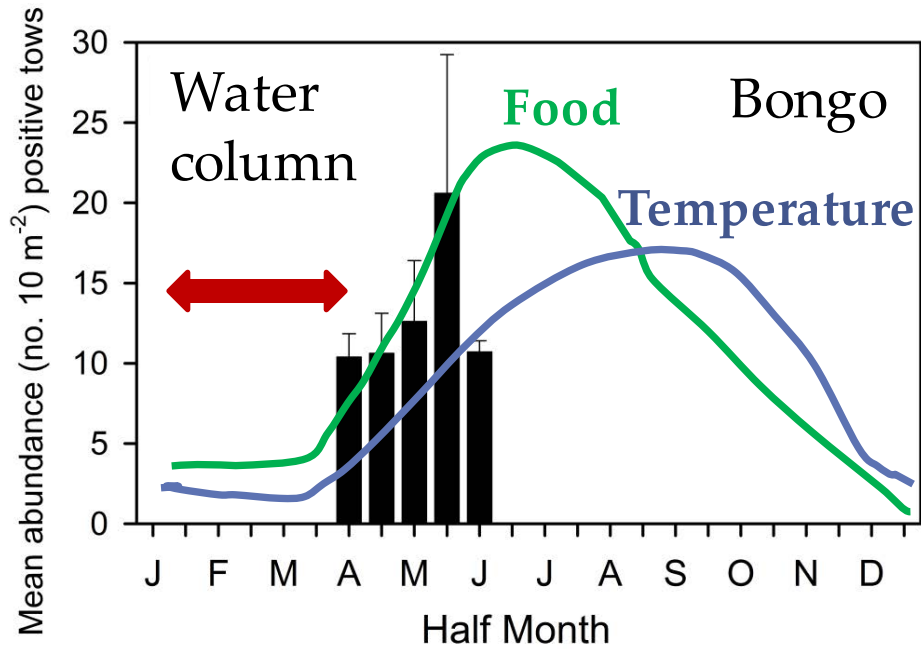
Report Card – Sablefish
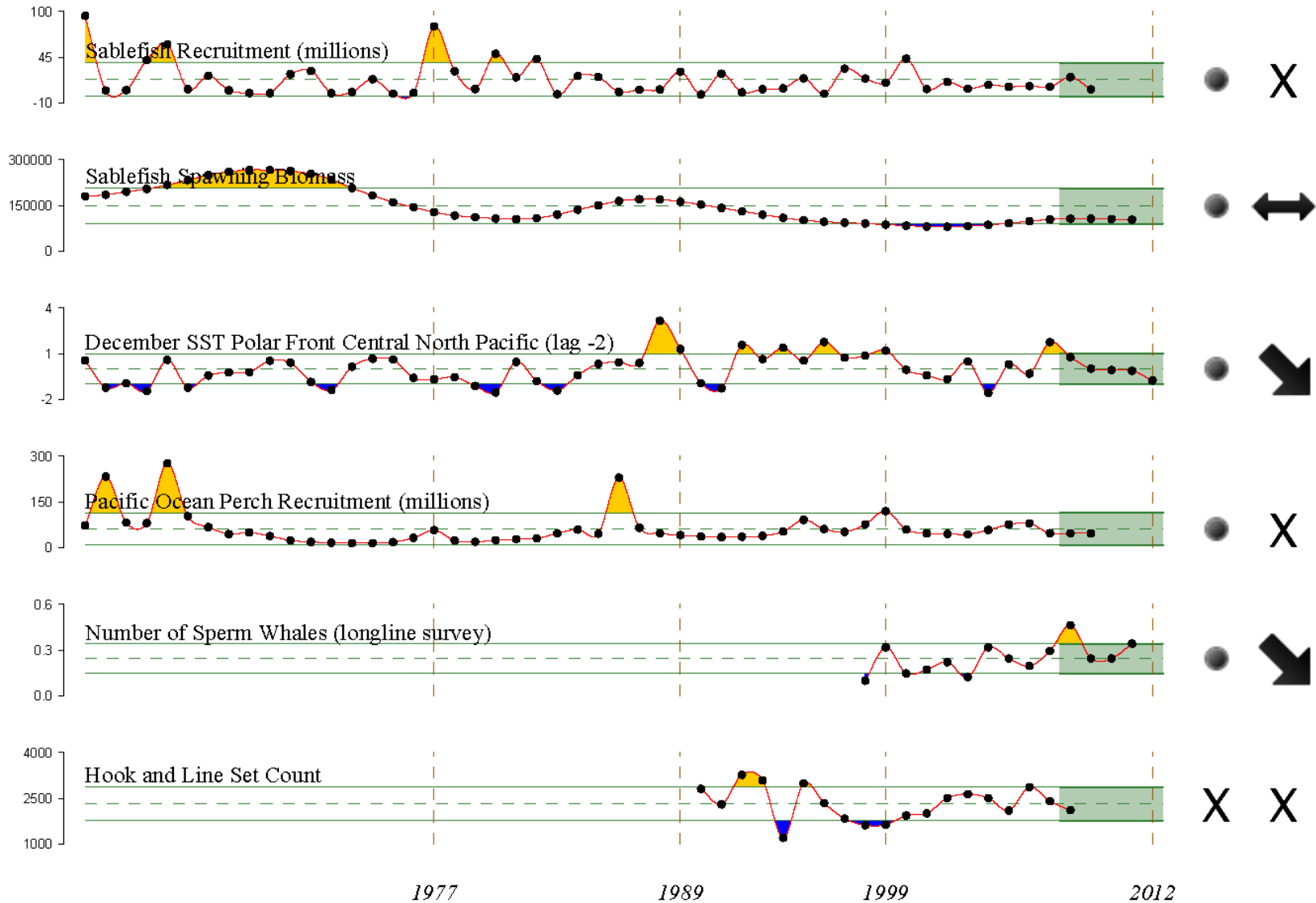
To Infinity and Beyond!

- Ecosystem Indicators Repository
  - Online and accessible indicators that are updated
  - Time series available by LME with descriptive text that details use, relevance, caveats, recent trends
- Generate baseline SEC for stocks
  - Coordinate with stock assessment authors to complete species profiles through google form
  - Gather scores when initiatives are completed
  - Begin automating process of SEC creation
  - Develop Ecosystem TOR to complement Stock TOR