

Re-Introducing...

S t o c k

P r o f i l e

E c o s y s t e m

C o n s i d e r a t i o n s &

S o c i o e c o n o m i c s

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Alaska Fisheries Science Center

NMFS Office of Science & Technology

What?

A standardized process/product framework for considerations beyond formal stock assessment


Why?

To operationalize the integration of ecosystem & socioeconomic factors within stock assessment

How?

Use data collected from national initiatives for baselines that can be compared across stocks & regions

Background

- Initial 2014 document to improve SAFE section
 - National Initiatives for AFSC 2015 - 2016
 - New framework (SPECs) proposed at 2016 PT
- 
- SPECs manuscript draft September 2017

September 2016 Plan Team Draft

Species Profiles and Ecosystem Considerations

Stock Profiles and Ecosystem Considerations (SPECs) in Alaska groundfish fishery management plans

S. Kjelvik, Shetwell, Dana M. Hanselman, Stepheni Tzolis, and Veron Ojeda,
September 2016

Executive Summary

A number of national initiatives such as stock/habitat assessment prioritization and fish stock climate vulnerability have highlighted and enhanced the MSA mandate to sustain marine fish and associated habitats by moving toward an ecosystem approach to fisheries management (EAFM). At the same time, the integration of ecosystem information directly into the stock assessment process is receiving substantial attention for effective marine conservation and management. As EAFM becomes part of operations, it is imperative that a clear avenue exist for providing ecological context for a stock assessment and allows for including relevant ecosystem data directly into the assessment model.

For the North Pacific region, the Ecosystem Considerations chapter of the Alaska groundfish stock assessment and fishery evaluation (SAFE) report is a leading example of EAFM. The compendium provides an ecosystem synthesis of Alaska's four large marine ecosystems and is updated annually by incorporating new information from a variety of ecosystem surveys and research projects. However, data in this report is difficult to incorporate within the ecosystem considerations sections of the individual stock or stock complex SAFE chapters. We propose a new framework for incorporating ecosystem information into the individual SAFE chapters termed the Species Profiles and Ecosystem Considerations (SPECs). This approach utilizes pre-existing data collected through national initiatives to generate an ecosystem baseline of information for the stock or stock complex. A baseline SPEC would include a stock-specific ecosystem status rating, a stock life history conceptual model, a stock profile, and a stock report card of relevant indicators. Ecosystem terms of reference (eco-TOR) would also be included to guide priorities for future research.

We provide an example baseline SPEC created for Alaska sablefish as a case study of the framework. Options for improving the baseline using information from current ecosystem surveys and research are explored in the discussion. Since a baseline SPEC can be created from data already collected through national initiatives, the work associated with creating the SPEC is minimized and this framework can be applied to numerous stock assessments in multiple regions. Ultimately, the synthesis of the national initiatives through the SPEC framework will provide the necessary building blocks to move toward the next generation of integrated ecosystem stock assessments.

Introduction

Under the mandate of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), National Standard 1 and 2 guidelines contain specific language that requires the consideration of ecosystem processes with regard to specifying optimum yield and informing the regional Councils through the stock assessment and fishery evaluation (SAFE) report (16 U.S.C. 1851 (1,2)). Because of this, ecosystem-based science is at the forefront for effective marine conservation and resource management (Levin et al., 2009). In general, this approach consists of two main components: 1) a comprehensive ecosystem assessment and 2) an assessment of a changing environment on a stock in the fishery (Hollowed et al., 2014). Since 1995, the North Pacific Fishery Management Council (NPFMC) Groundfish Plan Teams along with scientists from the Alaska Fisheries Science Center (AFSC) have implemented an ecosystem approach to fisheries management (EAFM) through the Ecosystem

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Alaska Stock Assessment Profile Part 1



Thank
You
Authors!

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

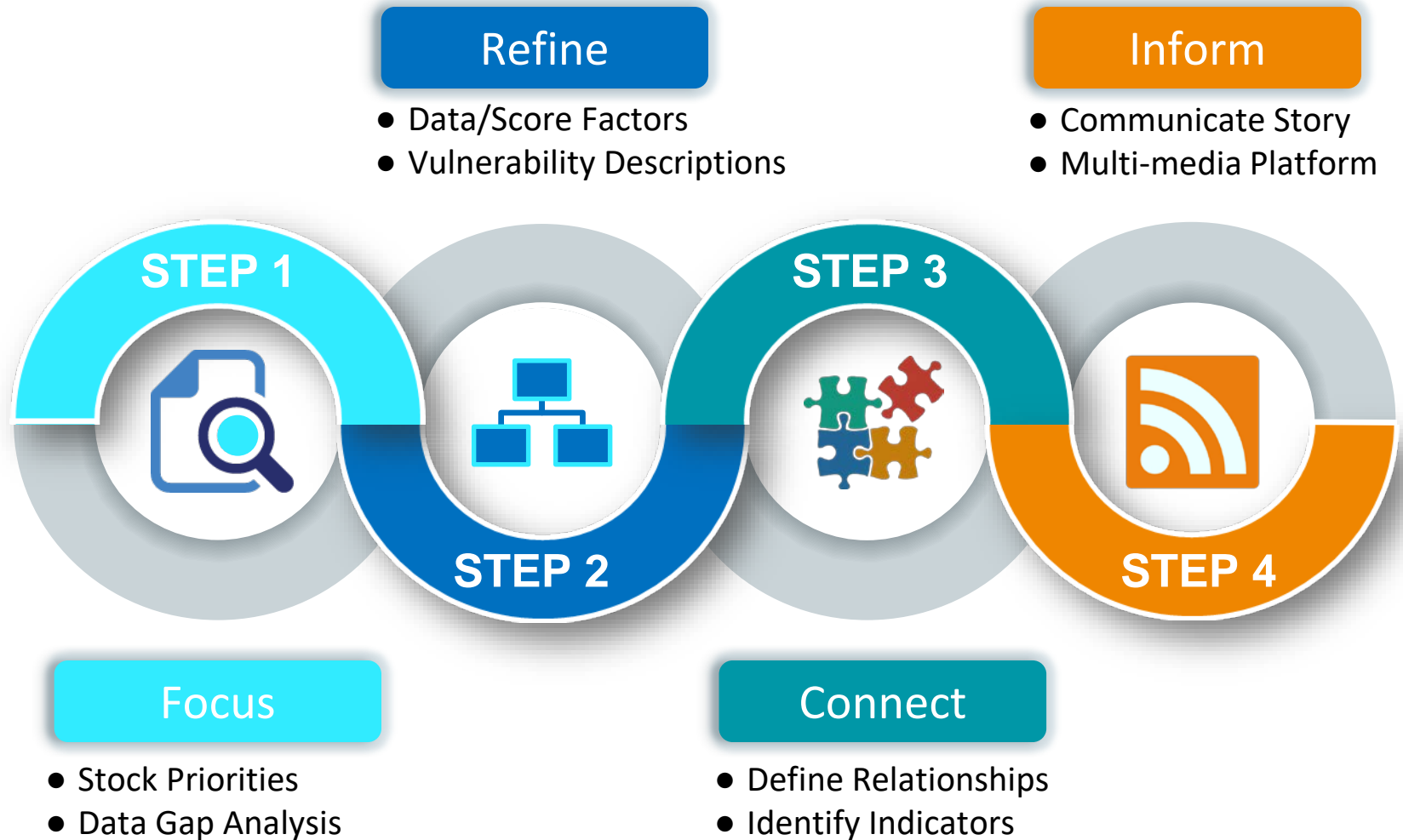
Please provide information on references and the data quality of answers where requested and applicable using the following scoring metrics:

1. National data calls for AFSC stocks 2015-2016
2. Used online form to collect all data in standard format for stock/habitat prioritization, vulnerability assessments, (PSA, CVA), and stock assessment classification
3. Responses became ecological synthesis of a stock

Qualitative

- Select representative set of factors
 - Factors retained should be relevant to region
 - Similar or unknown factors should not be used
- Scale factors by fishery management plan
 - NA = no provided value or unknown
 - Data factors scaled to maximum value of stocks
 - Scored factors scaled to maximum score
- Use factors in four step process
 - First round produces baseline, subsequent rounds produce enhanced SPECS

SPECS Baseline Process



Stock-Specific

1. Data Gap Analysis
2. Factor Profile & Conceptual Model
3. Indicators Report Card
4. Document, Web



Example: Alaska Sablefish

Comparison: 4 GOA-IERP species

Stock Assessment Classification

	Attribute	Level
Assessment Application	Model Category	<ul style="list-style-type: none"> • Data-Limited • Index-Based • Aggregate Biomass Dynamics • Virtual Population Analysis • Statistical Catch-at-Length • Statistical Catch-at-Age
	Age	<ul style="list-style-type: none"> • Years since assessment conducted
Input Data	Catch	<ol style="list-style-type: none"> 0. None 1. Major gaps preclude use 2. Major gaps in some sector(s) 3. Minor gaps across sectors 4. Minor gaps in some sector(s) 5. Near complete knowledge
	Size/Age Composition	<ol style="list-style-type: none"> 0. None 1. Major gaps preclude use 2. Support data-limited only 3. Gaps, but supports age-structured assessment 4. Support fishery composition 5. Very complete
	Abundance	<ol style="list-style-type: none"> 0. None 1. Uncertain or expert opinion 2. Standardized fishery-dependent 3. Limited fishery-independent 4. Comprehensive fishery-independent 5. Absolute abundance
	Life History	<ol style="list-style-type: none"> 0. None 1. Proxy-based 2. Empirical and proxy-based 3. Mostly empirical estimates 4. Track changes over time 5. Comprehensive over time and space
	Ecosystem Linkage	<ol style="list-style-type: none"> 0. None 1. Informative or used to process input data 2. Random variation, not mechanistic 3. Direct linkage(s) 4. Linkage(s) informed by process studies 5. Fully coupled

Input Data Only

5 attributes of input data

0 to 5 options

No data to complete

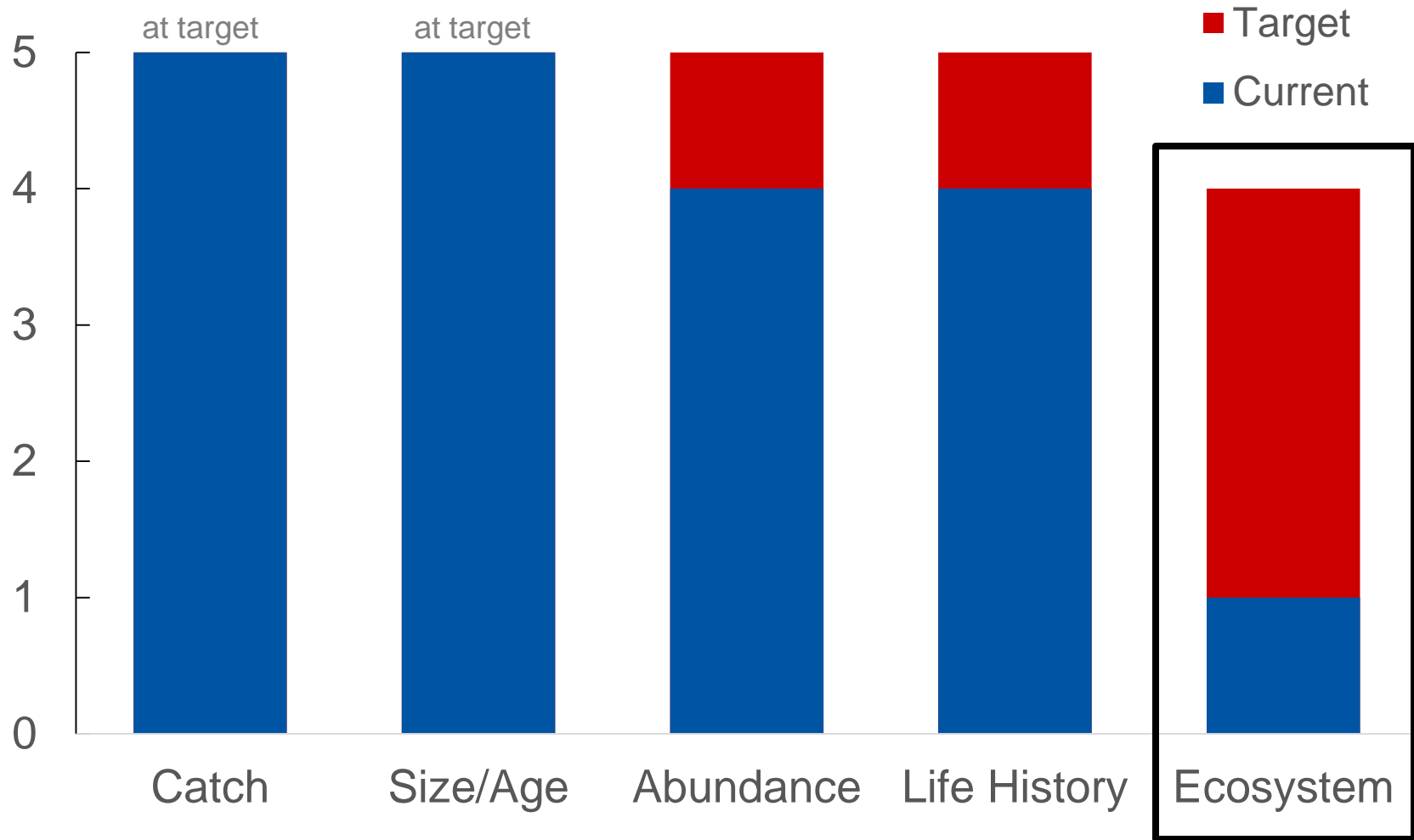
Gap Analysis

Current from authors

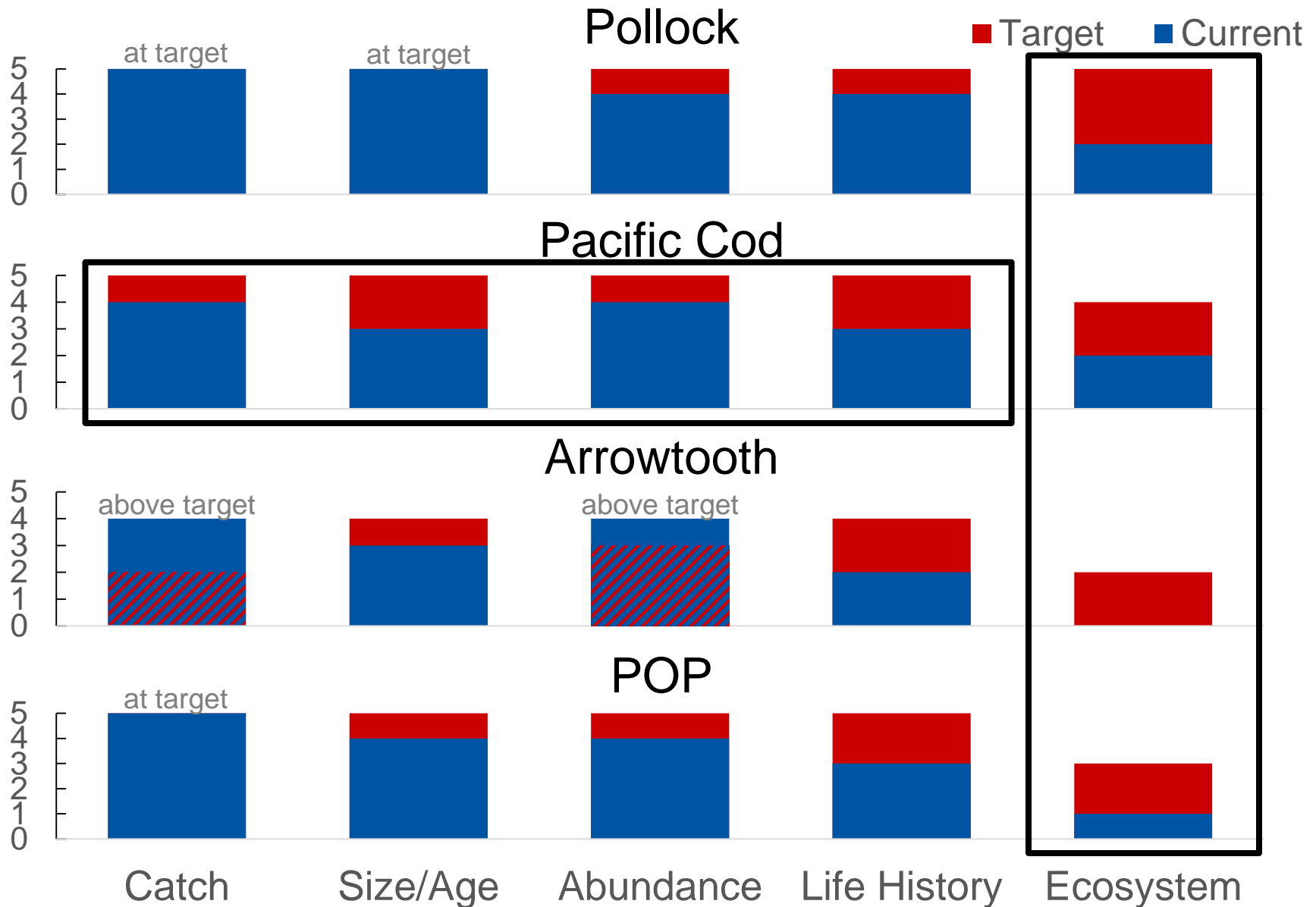
Target from SAIP

Target – Current = Gap

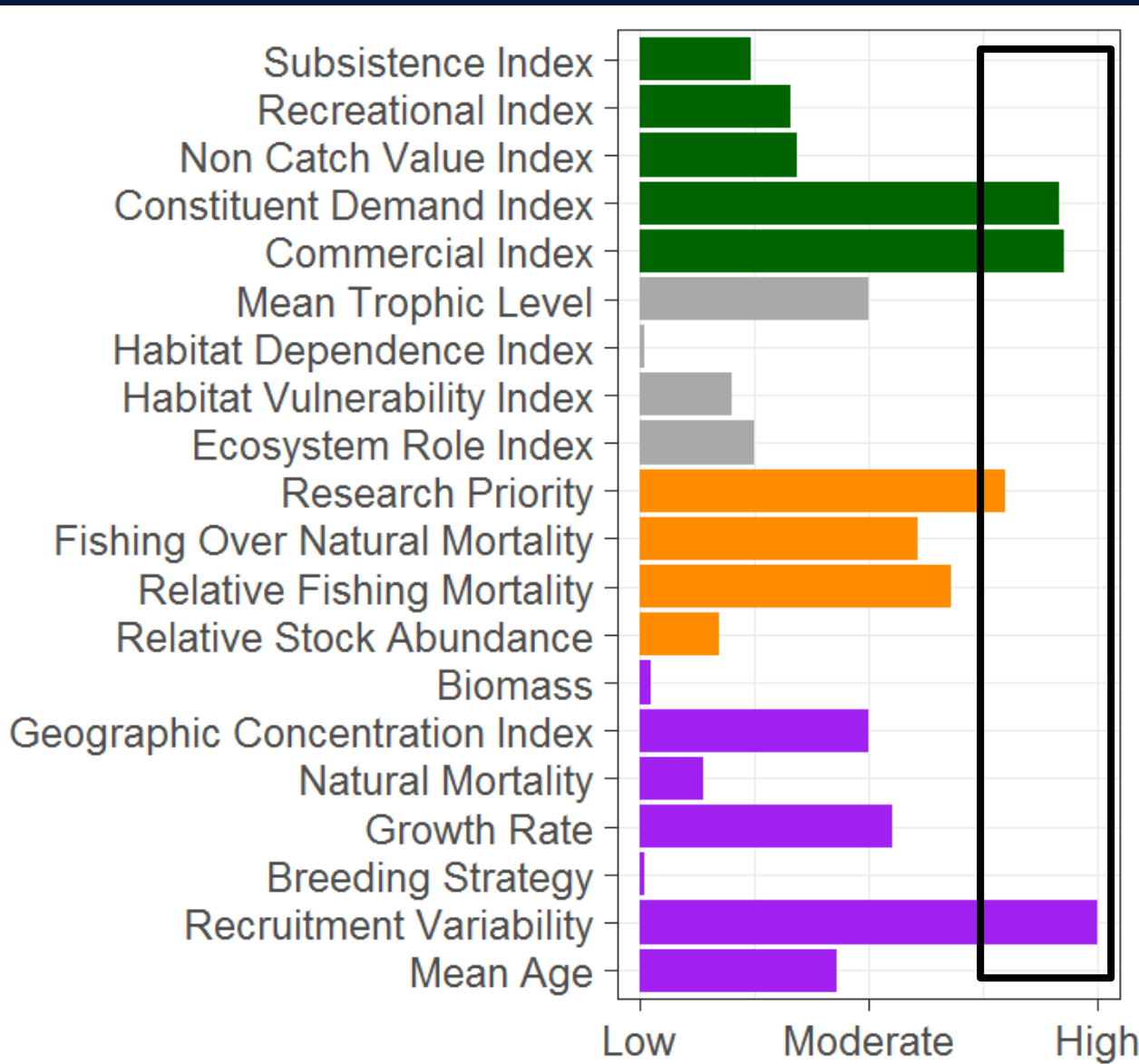
Data Gap Analysis – Sablefish



Data Gap Analysis – GOA-IERP



Stock Profile – Sablefish



Factors

Low to High

FMP Relative

Blank = Gap

Categories

- Economic
- Ecosystem
- Management
- Stock

Stock Profile – GOA-IERP

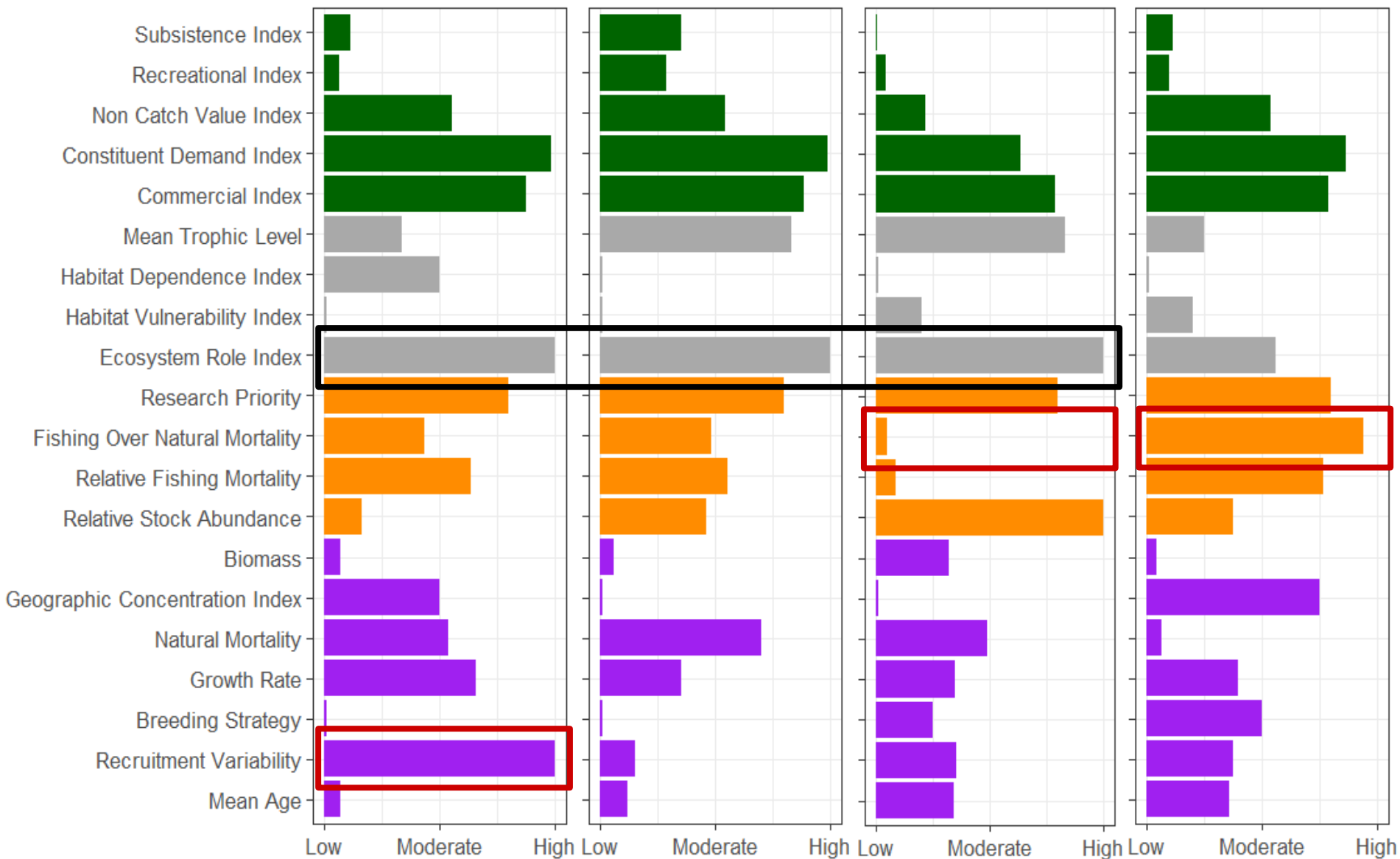


Pollock

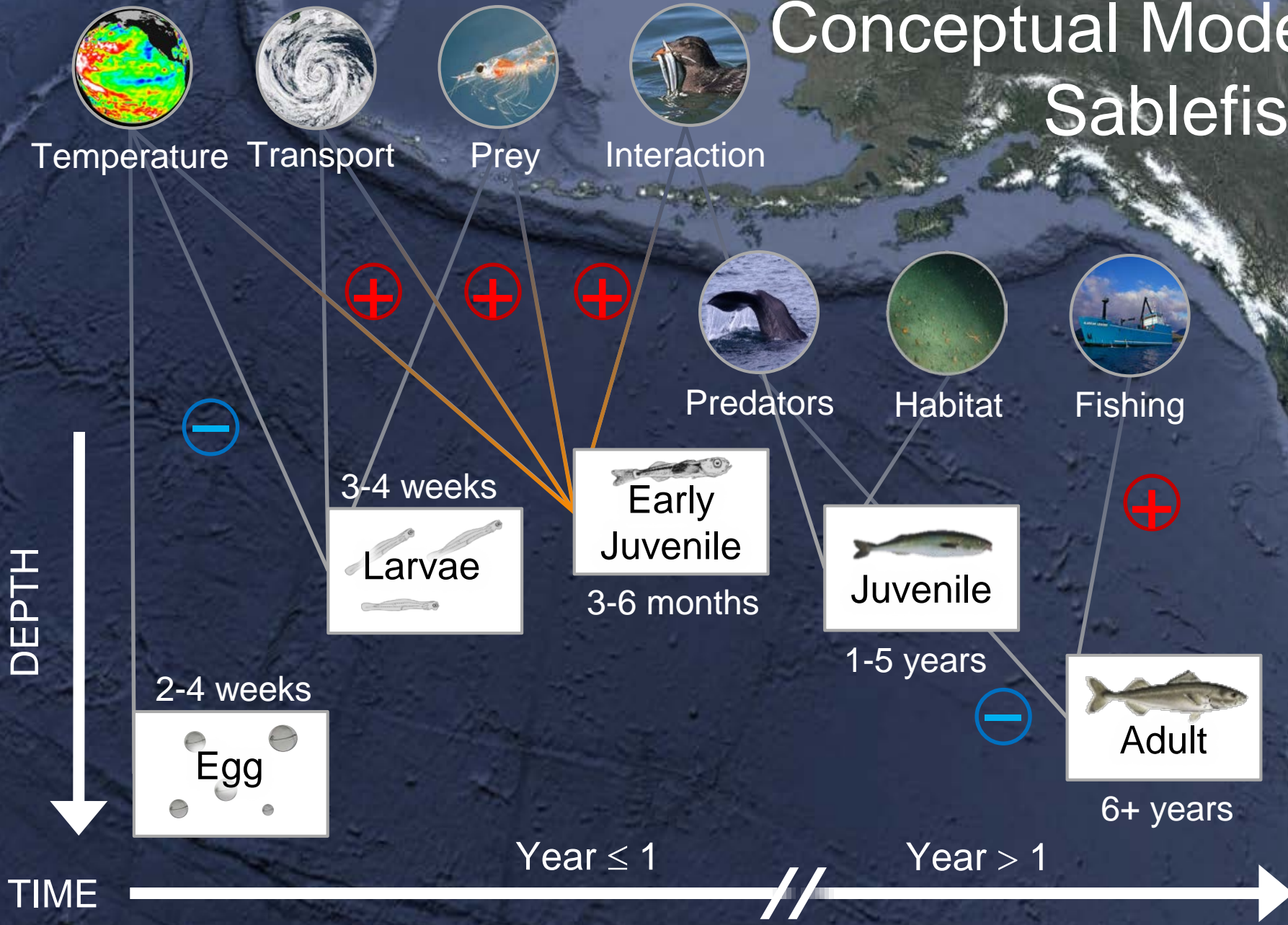
Pacific Cod

Arrowtooth

POP



Conceptual Model Sablefish

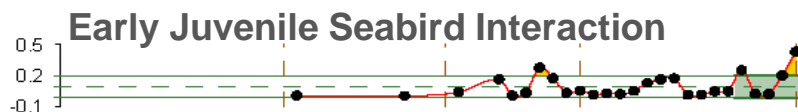
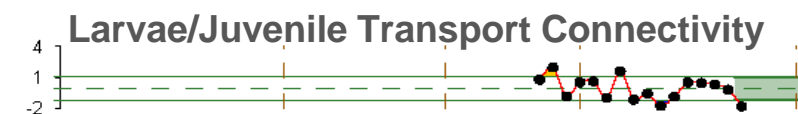
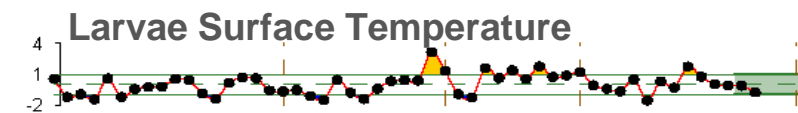
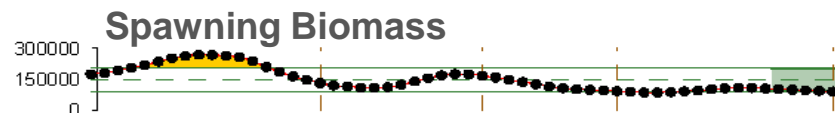
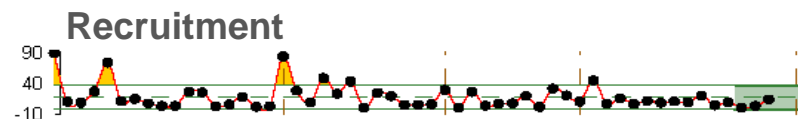


Report Card – Sablefish

1. Show relevant time series from stock assessment
2. Use profile and conceptual model to identify mechanisms
3. Locate proxy indicators where possible from ESR
4. Update with process study indicators when available
5. Keep placeholder for research needs

Special thanks for indicators to:

M. Arimitsu, B. Fissel, D. Hanselman, S. Hatch, J. Joyce, S. Vulstek, E. Yasumiishi, and S. Zador



1977 1989 1999 2015

Multiple Avenues

1. Stock Assessment Reports

- Baseline SPECS included as “consideration” section
- Use R Markdown for standardization and customization
- Research gaps are highlighted and stock-specific

2. Centralized Web Species Pages

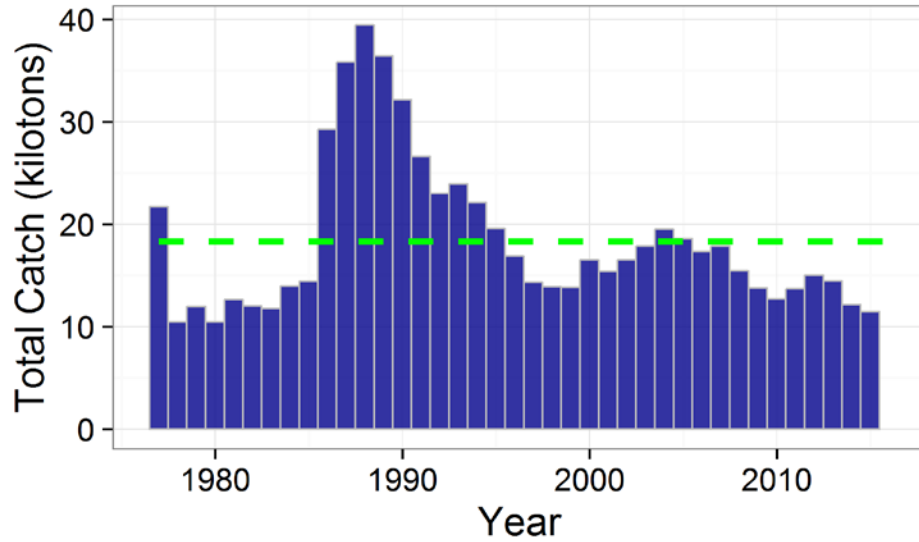
- Data from SPECS can interface with new web format
- R Markdown allows for output in many formats

3. Two-page Executive Summary – SAIP

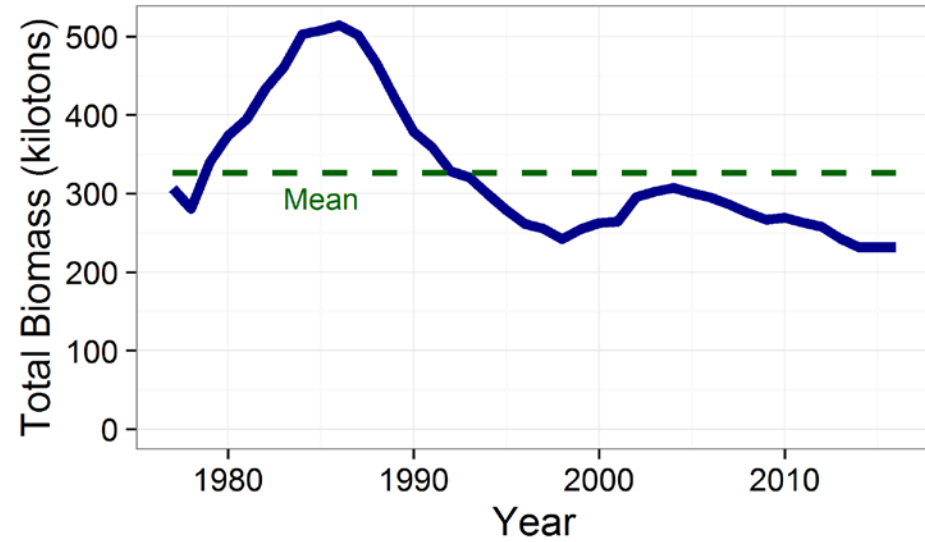
- Outreach document for science and stakeholders

Stock Assessment Results - Sablefish

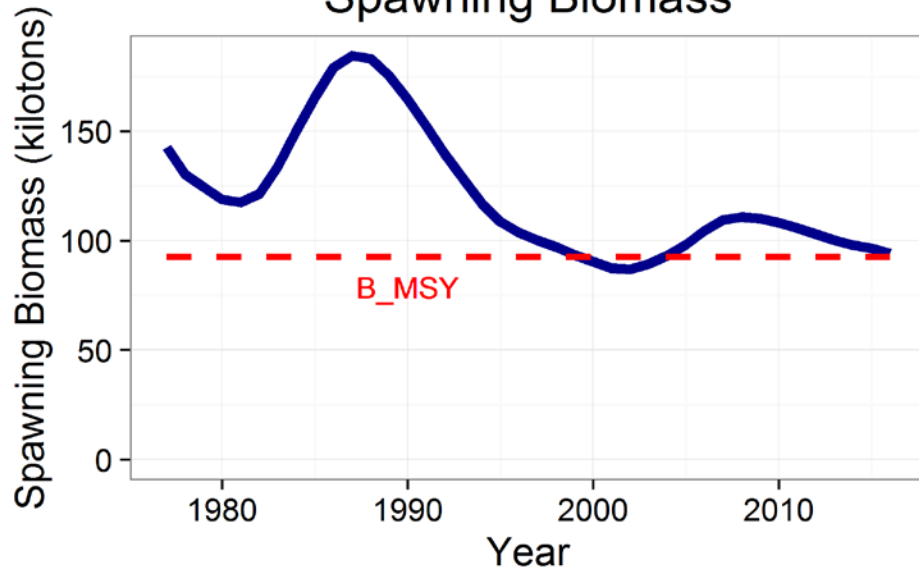
Total Catch



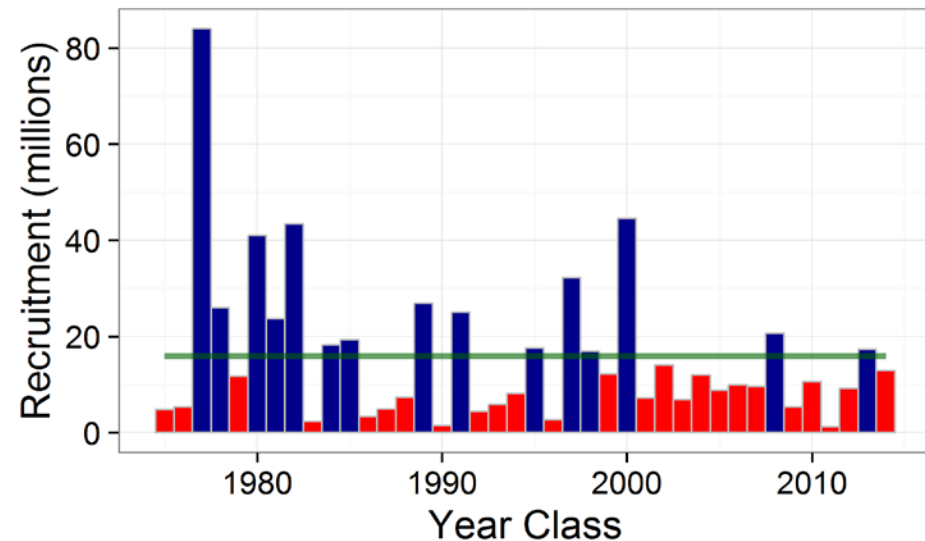
Total Biomass



Spawning Biomass



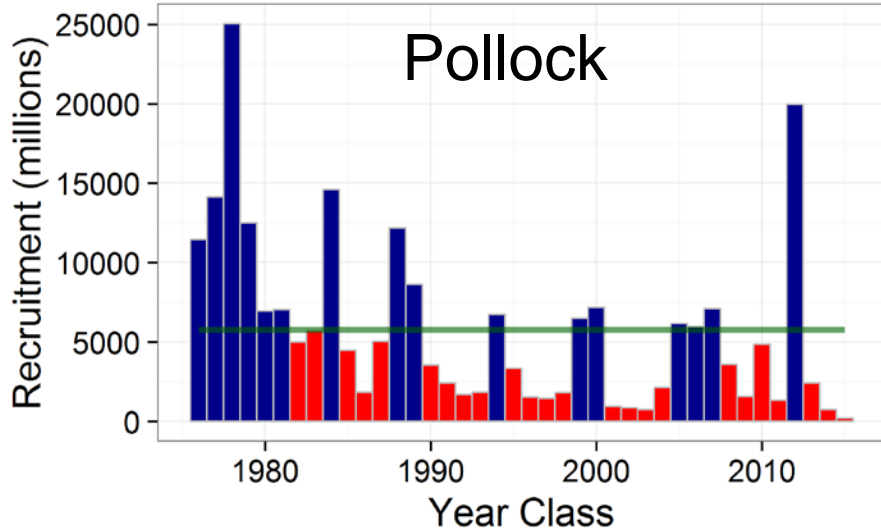
Age 2 Recruitment



Recruitment – GOA-IERP

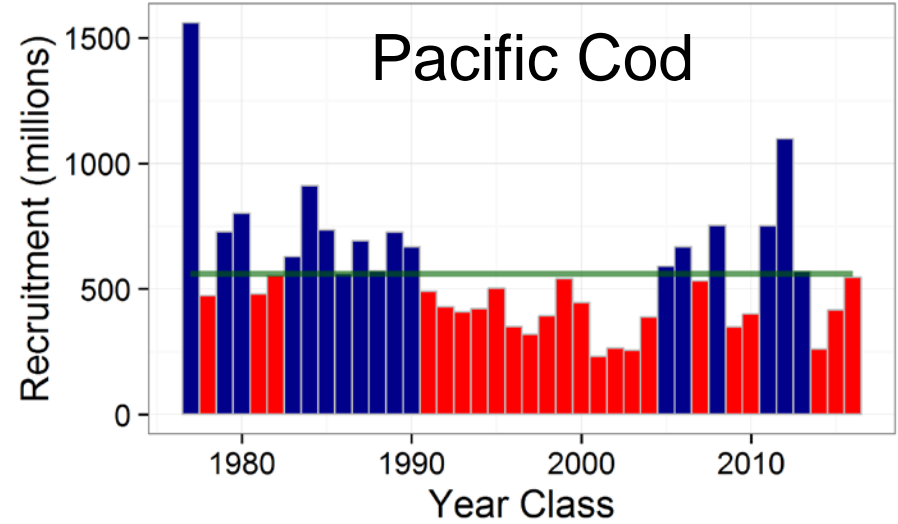
Age 1 Recruitment

Pollock



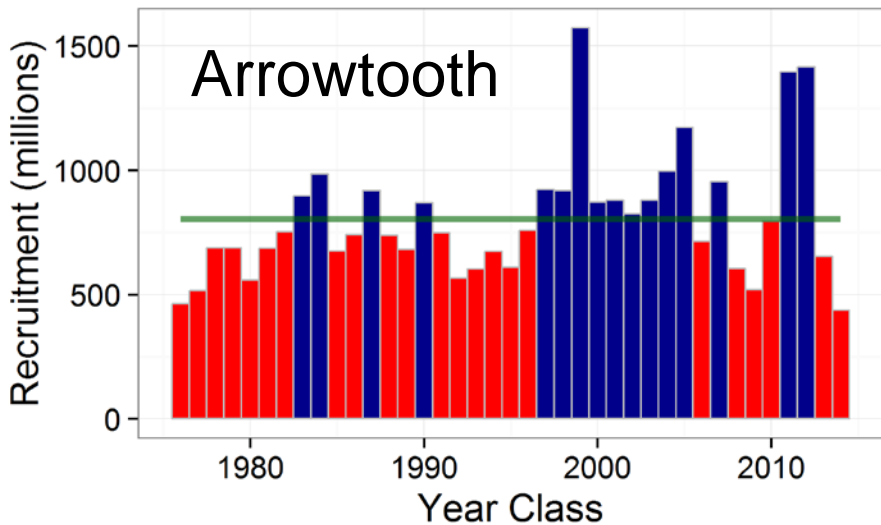
Age 0 Recruitment

Pacific Cod



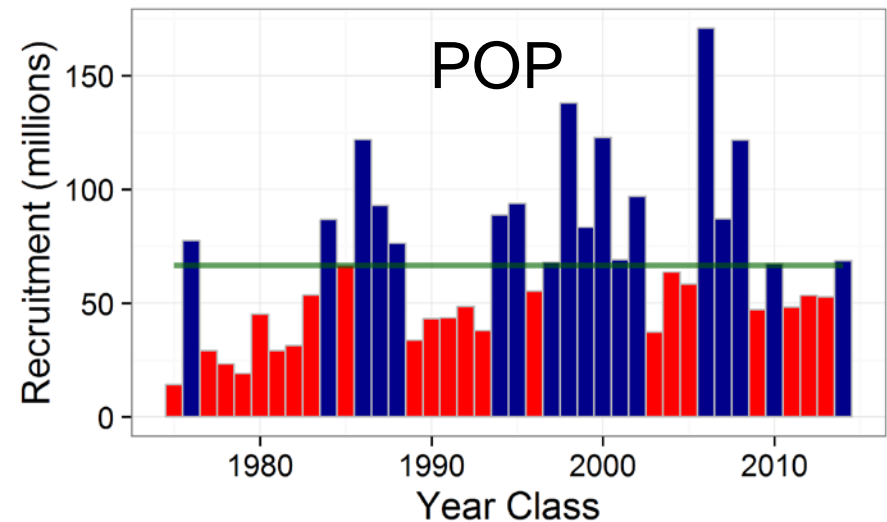
Age 1 Recruitment

Arrowtooth



Age 2 Recruitment

POP



Species Page – New NMFS Web



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- [Protecting Marine Life](#)
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Sablefish

- [Overview](#)
- [Recreational Fishing](#)
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- [Subsistence Fishing](#)
- [Conservation & Management](#)
- [Science](#)
- [Resources](#)

Science

Research operations and projects are designed to support sablefish stock assessment by responding to priority data needs and improving ecological understanding. The population assessment and supporting surveys are critical for maintaining the high standard of conservation and management of this species. New ecosystem approaches are currently being tested for this species through innovation and collaboration.

Stock Assessment

The Alaska Fisheries Science Center models the entire federally managed Alaska sablefish fishery as one population, integrating data from the Bering Sea, Aleutian Islands, and the Gulf of Alaska. The model incorporates data from a variety of sources that include catch, relative abundance, age/length compositions, and biological data. The model is updated annually in conjunction with the longline survey and recently completed a benchmark assessment in 2016.

[Stock Assessment Reports](#)

Longline Survey

The primary survey used for assessing Alaska sablefish is the Alaska Fisheries Science Center longline survey, which annually surveys major groundfish species in the Bering Sea, Aleutian Islands, and Gulf of Alaska. Relative abundance indices, age/length data, biological collections, and whale observations are provided for annual stock assessments. An extensive tag program provides data for spatially explicit modeling and species distributions. Auxiliary ecosystem data such as temperature profiles and seabird interactions are also collected.

[Survey Reports](#)

MORE INFORMATION

- [Longline Survey Data](#)
- [Longline Survey Video](#)
- [Sablefish Almanac](#)
- [Sablefish Summary](#)

RECENT NEWS

INTERACTION
Turns out whales are good for sablefish



MOVEMENT
In search of the illusive nearshore sablefish



SURVEY
Living on the edge and catching baby sablefish



[More News](#)

Research Activities



DATA COLLECTION
Synthesizing coast-wide data for regional comparisons

[Alaska, West Coast](#)



INTERACTION
Accounting for whale depredation in survey and fishery

[Alaska](#)



RECRUITMENT
Understanding ecosystem drivers of early life survival

[Alaska, West Coast](#)



MOVEMENT
Exploring behavior, foraging, and spawning activity from tag data

[Alaska](#)

Focus on Science tab

Stock Assessment
Surveys

Research Activities
Recent News

SPECS

Guide page organization
Highlight data gaps
Show research needs

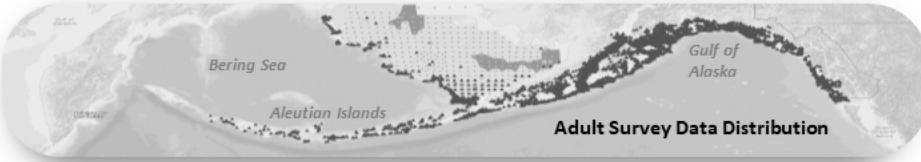
SIGN UP FOR NEWS

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Executive Summary - SAIP



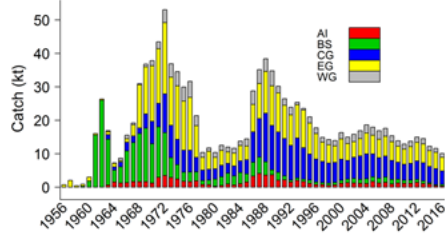
Sablefish (*Anoplopoma fimbria*)



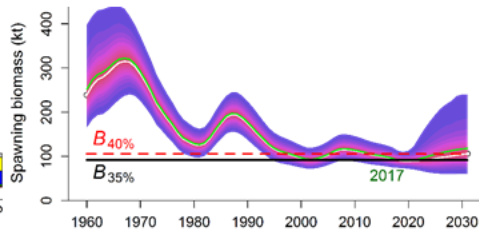
Stock Assessment & Status

- Bering Sea/Aleutian Islands and Gulf of Alaska stock with custom statistical catch-at-age model
- Benchmark assessment in 2016 included CIE recommendations to 1) account for whale depredation on the survey and fishery, and 2) propagate more structural uncertainty of management quantities.

Catch by Management Area



Biomass with Reference Points



Year	ABC	OFL	Total Biomass	B/ B_MSY	F/ F_MSY	Recruits (mill #s)	Total Catch	Ex-Value (mill \$)
2012	17,240	20,400	257,952	1.126	0.675	10.55	15,046	127.4
2013	16,230	19,180	242,524	1.095	0.655	1.24	14,468	90.8
2014	13,722	16,225	231,726	1.072	0.576	9.24	12,156	95.5
2015	13,657	16,128	231,493	1.055	0.574	17.25	11,463	93.7
2016	11,795	13,397	231,796	1.029	0.533	12.88	9,993	

This stock is not subjected to overfishing, currently overfished, nor approaching an overfished condition.

Research Priorities

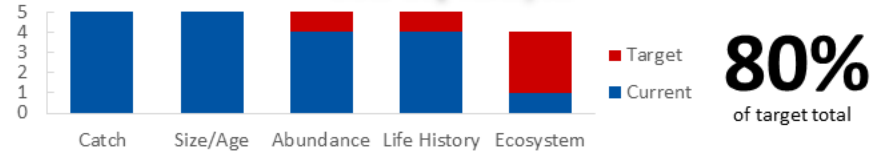
- Evaluate apportionment strategies for the ABC, use spatially explicit research model
- Explore integration of ecosystem data to understand highly variable recruitment
- Refine fishery abundance index, identify covariates that affect catch rates



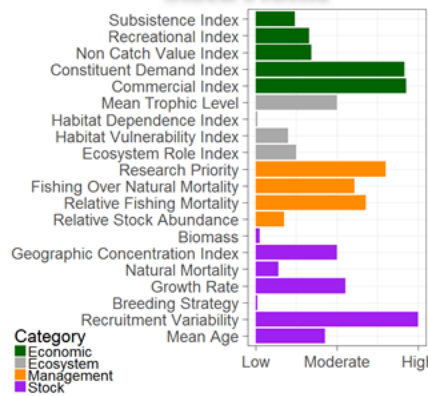
Sablefish (*Anoplopoma fimbria*)

- Priority data gaps are to identify primary ecosystem and socioeconomic drivers considering very high recruitment variability and high economic value.

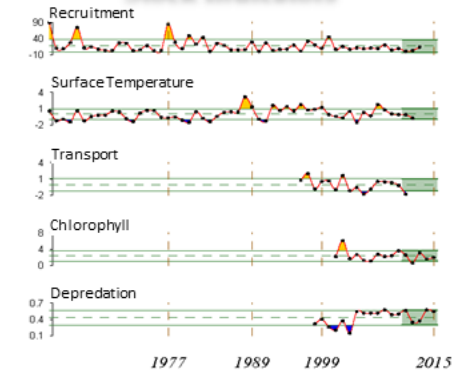
Data Gap Analysis



Stock Profile



Stock Indicators



Now what?

- **Baseline / Enhanced SPECS**
 - Create baseline for all AFSC groundfish
 - Provide manuscript and R Markdown for reference
 - 5 GOA-IERP stocks for enhanced SPECS in 2018
- **Integrate into SAFE (discussion for PT)**
 - Supplement or replacement for current ecosystem considerations section (main body or appendix?)
 - 2 pager as front cover or final summary (good idea?)
- **Fit into Plan Team process (how?)**