



NOAA
FISHERIES

Using Ecosystem Indicators to Inform Fisheries Management

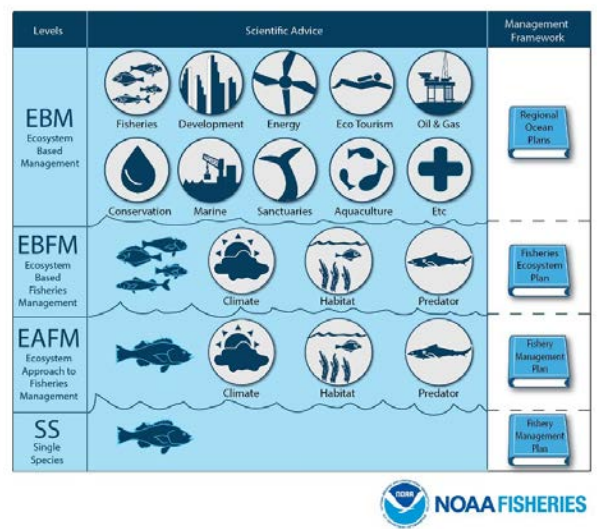
Stephani Zador
Elizabeth Siddon
Ellen Yasumiishi
Kerim Aydin

NOAA Fisheries Mission

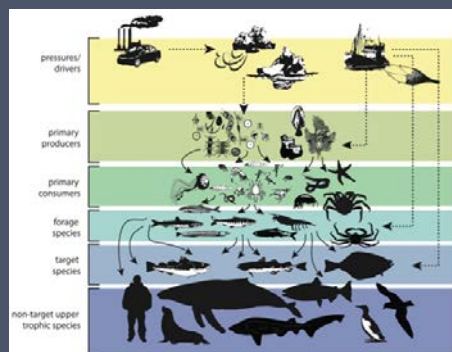
Providing vital services for the nation: **productive and sustainable fisheries**, safe sources of seafood, the recovery and conservation of protected resources, and healthy ecosystems—all backed by sound science and an **ecosystem-based approach to management**



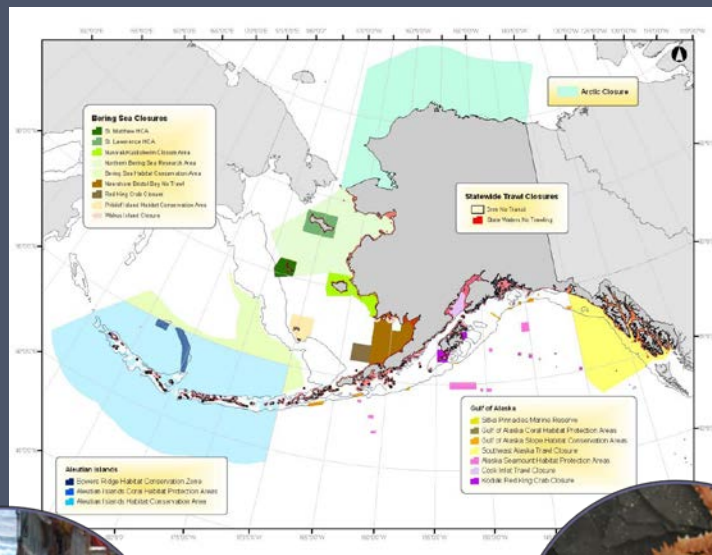
The AFSC provides science to inform how the North Pacific Fisheries Management Council *balances competing interests*



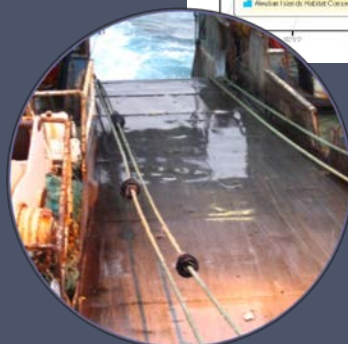
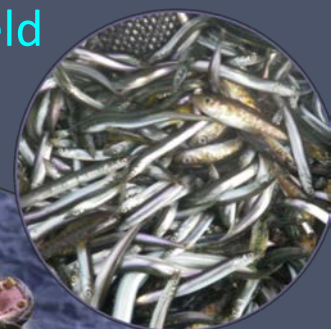
There are a variety of ways we practice EBFM/EAFM in Alaska



Ecosystem models



Optimum Yield (OY) caps



Gear modifications



Fishery Closures

Ecosystem Status (Considerations) Reports

- Indicator-based assessments
- EBS, GOA (AI and Arctic)
- Targeted for managers
- Linked with stock assessments

Ecosystem Considerations 2017 Status of the Gulf of Alaska Marine Ecosystem



Edited by:
Stephani Zador¹ and Ellen Yasumishi²
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Reviewed by:
The Gulf of Alaska Groundfish Plan Team

Ecosystem Considerations 2016 Status of the Aleutian Islands Marine Ecosystem



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Reviewed by:
The Plan Team for the Aleutian Islands, the
Bering Sea, Aleutian Islands, and Gulf of Alaska

November 14, 2016
2016 Pacific Fishery Management Council
425 W. 4th Avenue, Suite 500
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Ecosystem Considerations 2017 Status of the Eastern Bering Sea Marine Ecosystem



Edited by:
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With contributions from:

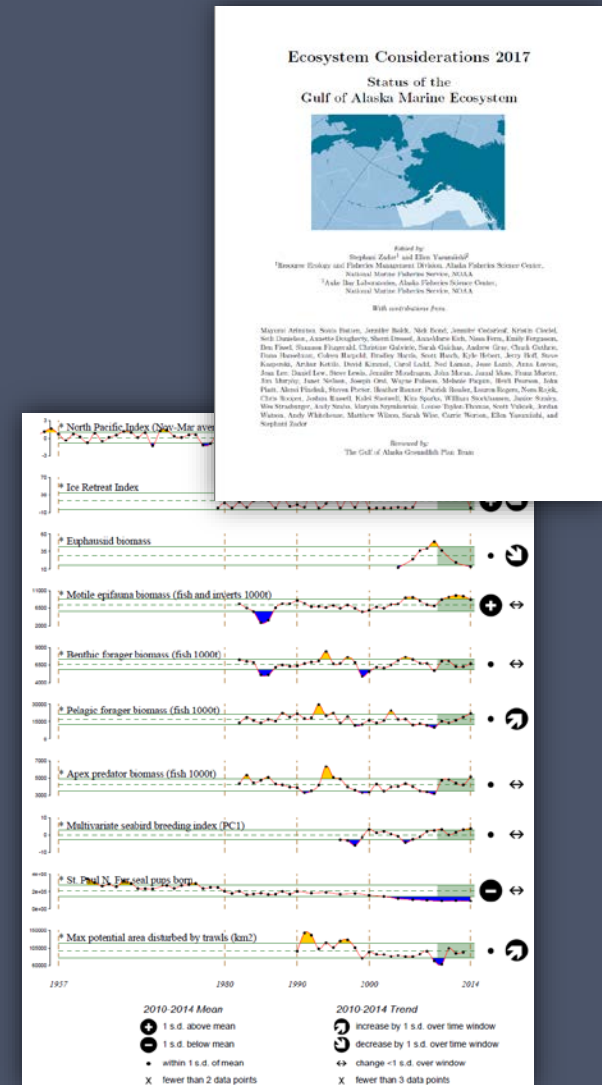
Alex Andrews, Kerin Aydin, John Branstetter, Jennifer Dahl, Nick Bond, Lyle Britt, Hillary Burgess, Kristin Ceciel, Anne Marie Eich, Lee Emswiler, Ed Farley, Benjamin Fiesel, Shannon Fitzgerald, Robert Fox, Sarah Gaidhas, Jennifer Goss, Colleen Harpold, Sam Hesse, Jerry Hoff, Kristin Holman, Katherine Howard, Jim Iwanski, Taylor Jarvis, Timothy Jones, Rob Kake, Steve Kuiperski, David Kimmel, Kristin Kube, Lin Lachlan, Carol Ladd, Christine Long, Geoff Long, Robert Louch, Anna Lavie, Jean Lee, David R. Lee, Michael Litwin, Jennifer Mondragon, Franz Myster, Jim Murphy, John V. Olson, Jan Overland, Julia Parich, Bill Ryan, Heather Renner, Jan Richter, Mary Rose, Chris Rooper, David Saks, Elizabeth Siddons, Kim Sparks, Paula Stahner, Kate Stafford, Jonny Stirling, Marysia Seymowski, Grant Thompson, Rod Towell, Martin Wang, Andy Whitehouse, Tim Willerford, Michael Williams, Sarah E. Wise, Ellen Yasumishi, and Stephani Zador

ESR Goals and Objectives

- Synthesis of ecosystem(s) status
- Provides context for EAFM/EBFM
 - Data external to stock assessment
- Spurs discussion, which can influence the quota-setting process

A brief history of the reports

- Produced **annually** since 1995
- Evolving** documents
 - 1995: a compendium of general information on EBS, AI and GOA ecosystems and a general discussion of ecosystem-based management.
 - 2016: **Separate reports** for each Large Marine Ecosystem
- Adaptive** documents
 - Revised annually in response to review and new information available
 - New indicators every year**



Report Outline

Increasing level of detail

- Report Cards (1-3 p)
 - Eastern Bering Sea
 - Western and Eastern GOA
 - (Western, Central and Eastern AI)
 - (Arctic)
- Executive Summary (~5p)
- Response to SSC Comments (~10 p)
- Ecosystem Assessments (Includes Hot Topics) (~20 p)
- Ecosystem Status and Management Indicators (70-160 p)

Indicator Categories

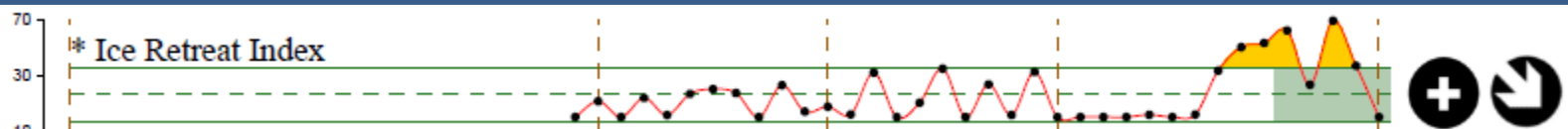
Ecosystem Status

- Physical
- Phytoplankton
- Zooplankton
- Forage fish
- Herring
- Salmon
- Groundfish
- Groundfish Recruitment Predictions
- Benthic Communities and Non-Targets
- Seabirds
- Marine Mammals
- Ecosystem or Community Indicators

Fishing and Human Dimensions

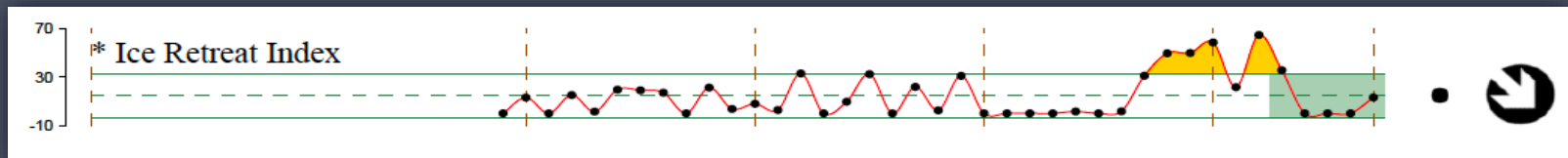
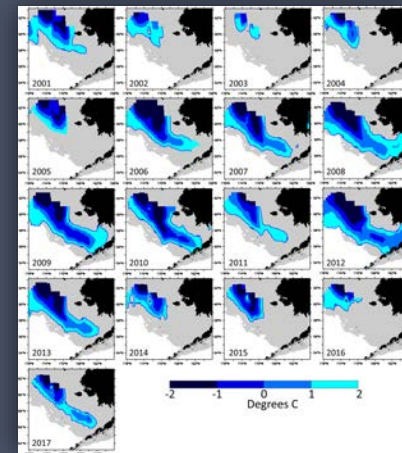
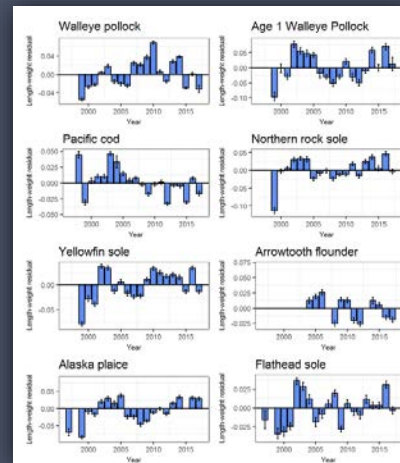
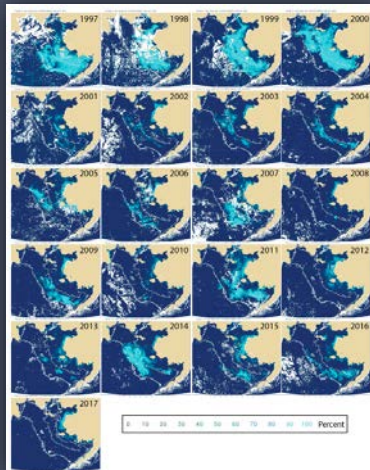
- Discards and Non-Target
- Habitat
- Sustainability
- Seafood Production
- Profits
- Recreation
- Employment
- Socio-cultural

Types:
Observations
Model-based
Multivariate

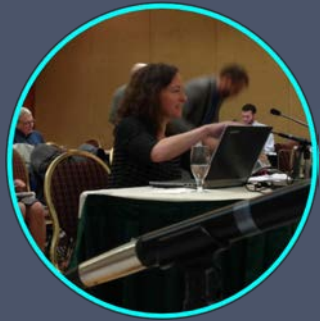


The ideal indicator...

- Fills gaps in, or improves, the current suite of indicators
- Characterized at annual scales
- Long-term time series and/or likely to be measured for many years
- Available for current year or year before (at most)
- Known (or surmised) implications for fisheries management



Ecosystem context for quota deliberations



Updates on the status
of our large marine
ecosystems

NOAA Ecosystem
considerations

NOAA Stock
assessments

August &
September



Regional
Plan Teams

September
& November



Scientific
and Statistical
Committee

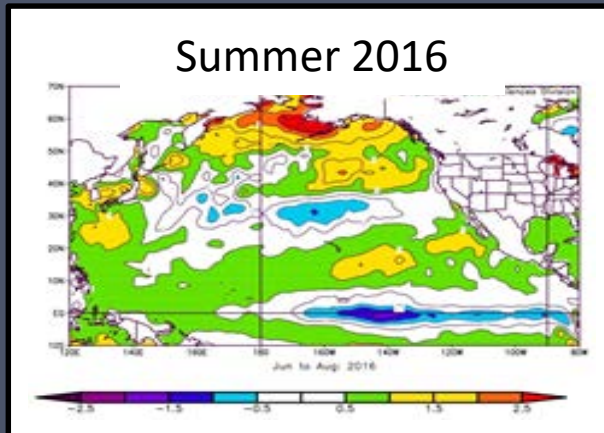
December



Council

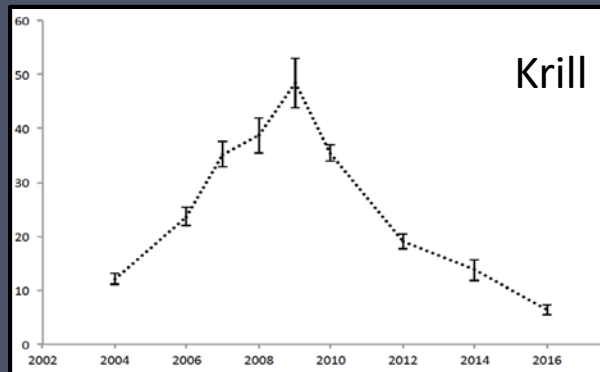
Fishery
quotas set

2016 Eastern Bering Sea Pollock example



2016 Pollock Stock assessment

“Additional precaution may be warranted since warm conditions are thought to negatively affect the survival of larval and juvenile pollock.”



Scientific & Statistical Committee

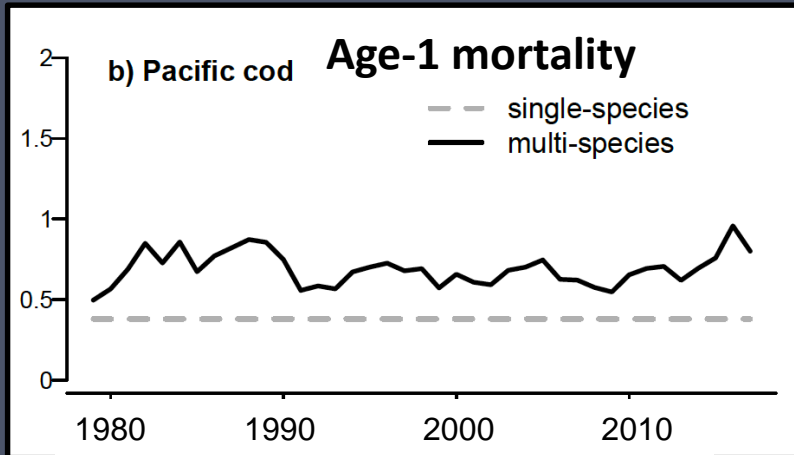
“Our current understanding of pollock early life dynamics suggests that recent survival from age-0 to age-1 may be low due to low availability of suitable prey.”



Council

Quota was reduced under a more conservative Tier 3 approach; consideration of ecosystem indicators impacted management decisions.

2017 Eastern Bering Sea Pacific cod example



BSAI Groundfish Plan Team

“The Team spent a significant amount of time discussing **ecosystem considerations**.”

- **Negative indicators:** (i) low recruitment, (ii) high age-1 mortality, (iii) low weight-at-age, (iv) warming ocean temperatures, (v) bird die offs, and (vi) low crab abundance.
- **Positive indicators:** (i) high abundance in NBS, (ii) relatively high Fulton’s condition, and (iii) cooler temperatures predicted in future years.
- “...the Team felt that the ABC should be **reduced from the maximum** ABC in 2018.”

Scientific & Statistical Committee

“Ecosystem and population information provided a **mixed signal**.”

- Recommended setting the 2018 ABC at the maximum permissible level because there is “**not unequivocal information justifying a further reduction**.”

U.S. Fish & Wildlife Service
Seabird Die Off: Point Hope to Bristol Bay, June to September 2017

Next steps for indicators

- Formalization of indicator review
- Coordination with SA authors
 - GOA cod example – Steve Barbeaux
- Ecosystem and Socio-Economic Profiles (ESPs)

Ecosystem Status Report
information

Stock Assessment
information

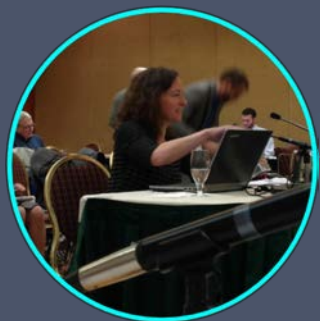
	Not okay	Okay
Not Okay	2006 EBS pollock 2017 GOA cod	2016 EBS Pollock
Okay	“No red flags were indicated.”	EBS Yellowfin sole

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Updates on the status
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NOAA Ecosystem
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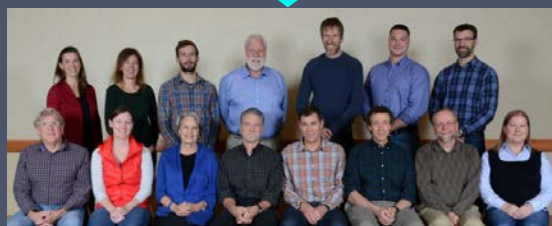
NOAA Stock
assessments

ESPs

Stock-specific
indicators



Regional
Plan Teams



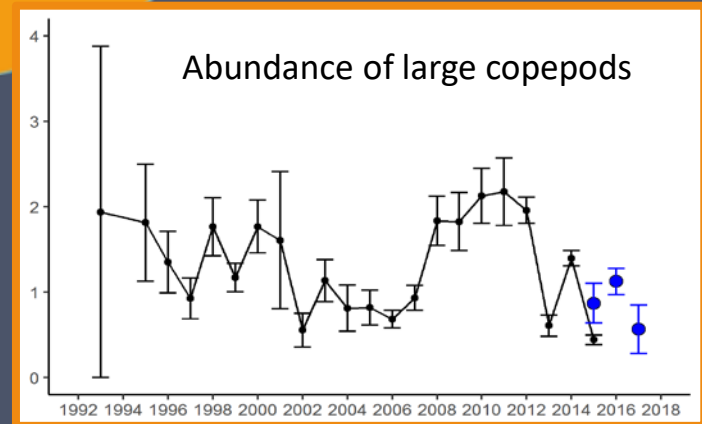
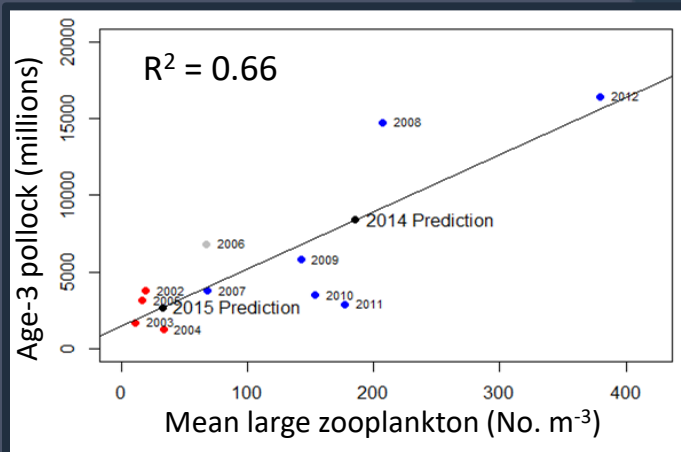
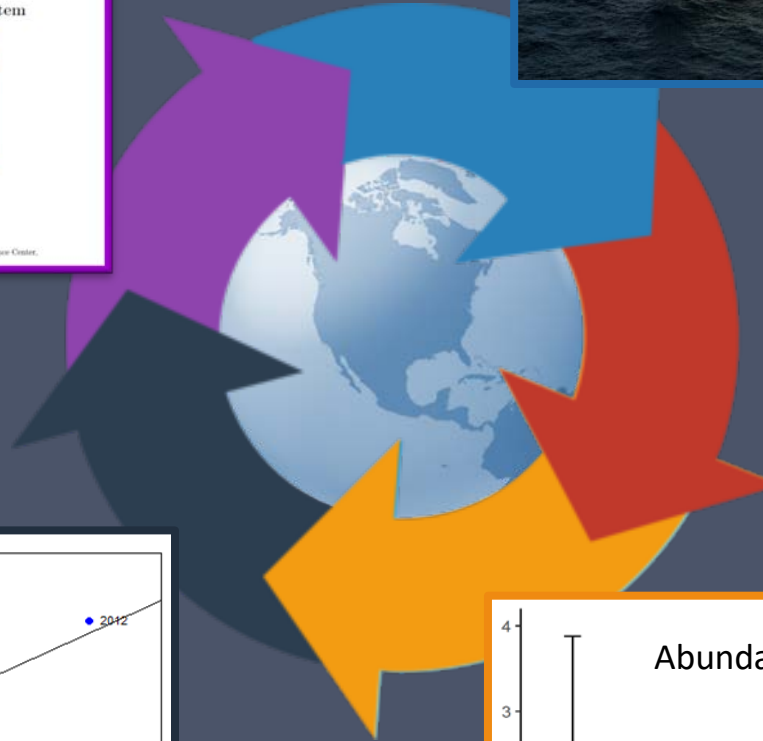
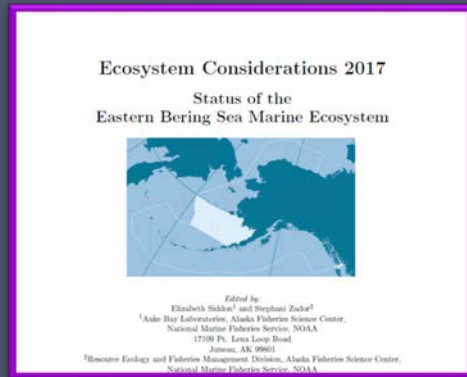
Scientific
and Statistical
Committee



Council

Fishery
quotas set

Science to Management





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Alaska Marine Ecosystem Status Reports

Home

Home Data Assessments Report Cards Hot Topics Links

Ecosystem Status Reports are produced annually to compile and summarize information about the status of the Alaska marine ecosystems for the [North Pacific Fishery Management Council](#), the scientific community and the public. As of 2016, there are separate reports for the the Eastern Bering Sea (updated 2017), Aleutian Islands (updated 2016), the Gulf of Alaska (updated 2017), and Arctic (forthcoming) ecosystems. These reports include ecosystem report cards, ecosystem assessments, and ecosystem and ecosystem-based management indicators that together provide context for ecosystem-based fisheries management in Alaska.

Eastern Bering Sea

- [Executive Summary](#)
- [Assessment](#)
- [Report Card](#)
- Hot Topic
 - [Thinking Outside the Survey Box](#)
 - [Local Environmental Observer Network](#)
 - [Dead and Dying Seabirds](#)
- [Full Report \(.pdf\)](#)

Aleutian Islands (2016)

- [Executive Summary](#)
- [Assessment](#)
- [Report Card](#)
- Hot Topic
 - [Aleutian Life Forum](#)
- [Full Report \(.pdf\)](#)

Gulf of Alaska

- [Executive Summary](#)
- [Assessment](#)
- [Report Card](#)
- Hot Topics
 - [Pyrosomes in Research Surveys](#)
 - [Local Environmental Observer Network](#)
- [Full Report \(.pdf\)](#)

Arctic (2015)

- [Assessment](#)
- Hot Topic
 - [Polar Bears](#)
- [Full Report \(.pdf\)](#)

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<https://access.afsc.noaa.gov/reem/ecoweb/Index.php>