

2016 Review of Essential Fish Habitat

Council Decisions for October 2016

- Do FMPs need to be updated to redefine EFH?
 - Stock author assessments
- Which maps should be used to redefine EFH?
 - Stock author assessments
 - Plan Team recommendations

Date	Action
October 2016	1. Determine whether EFH should be updated 2. Choose seasonal maps or aggregated map
December 2016	1. Review report describing effects of non-fishing activities on EFH 2. Review and approve proposed methods to evaluate effects of fishing on EFH 3. Determine whether to update EFH research priorities 4. Determine whether to update HAPC priorities
April 2017	1. Initial review of omnibus EFH amendment a. EFH text descriptions b. EFH maps c. Fishing effects evaluation* d. Non-fishing effects e. EFH research priorities f. HAPC priorities

*If analysis shows effects of fishing on EFH are more than minimal and not temporary, then conservation measures must be developed and approved.

2016 Review of Essential Fish Habitat

- EFH Review required every 5 years
 - NS2 – based on the best scientific information available
 - NS6 – take into account and allow for variations among, and contingencies in fisheries, fishery resources, and catches
- For 2015/16 review focus placed on
 - EFH description and identification
 - Fishing activities that may affect EFH
 - Non-fishing activities

EFH Species Descriptions

600.815 (a)(1)(ii)(B). FMPs must demonstrate that the **best scientific information available was used in the description and identification of EFH**, consistent with National Standard 2.

600.815 (a)(1)(iii)(B). Councils should **strive to describe habitat based on the highest level of detail (i.e., Level 4)**. If there is no information on a given species or life stage, and habitat usage cannot be inferred from other means, such as information on a similar species or another life stage, EFH should not be designated.

EFH Levels within EFH Regulation (50 CFR Part 600)

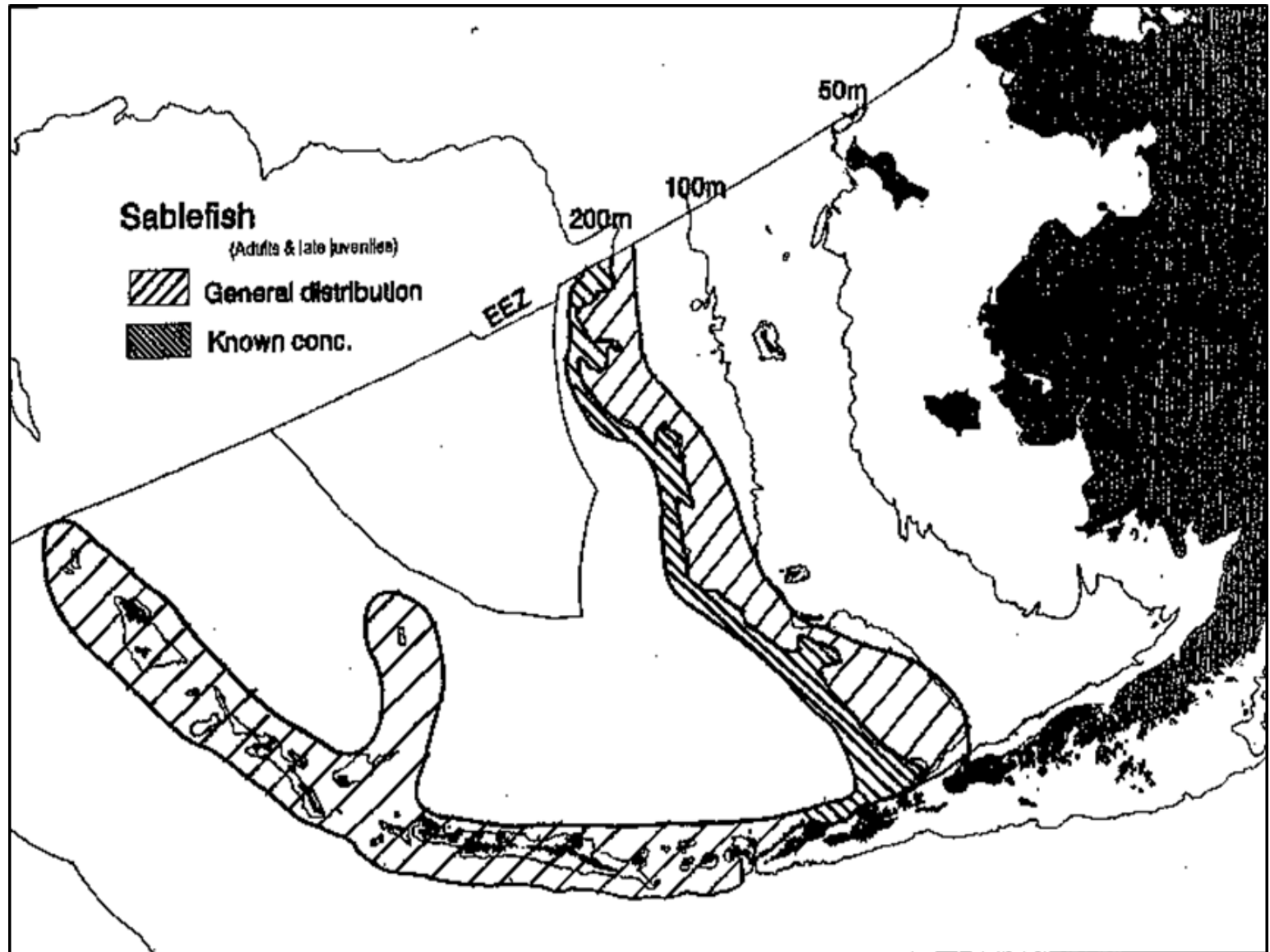
Level 1 - *Distribution data are available* for some or all portions of the geographic range of the species.

Level 2 - *Habitat-related densities* of the species are available

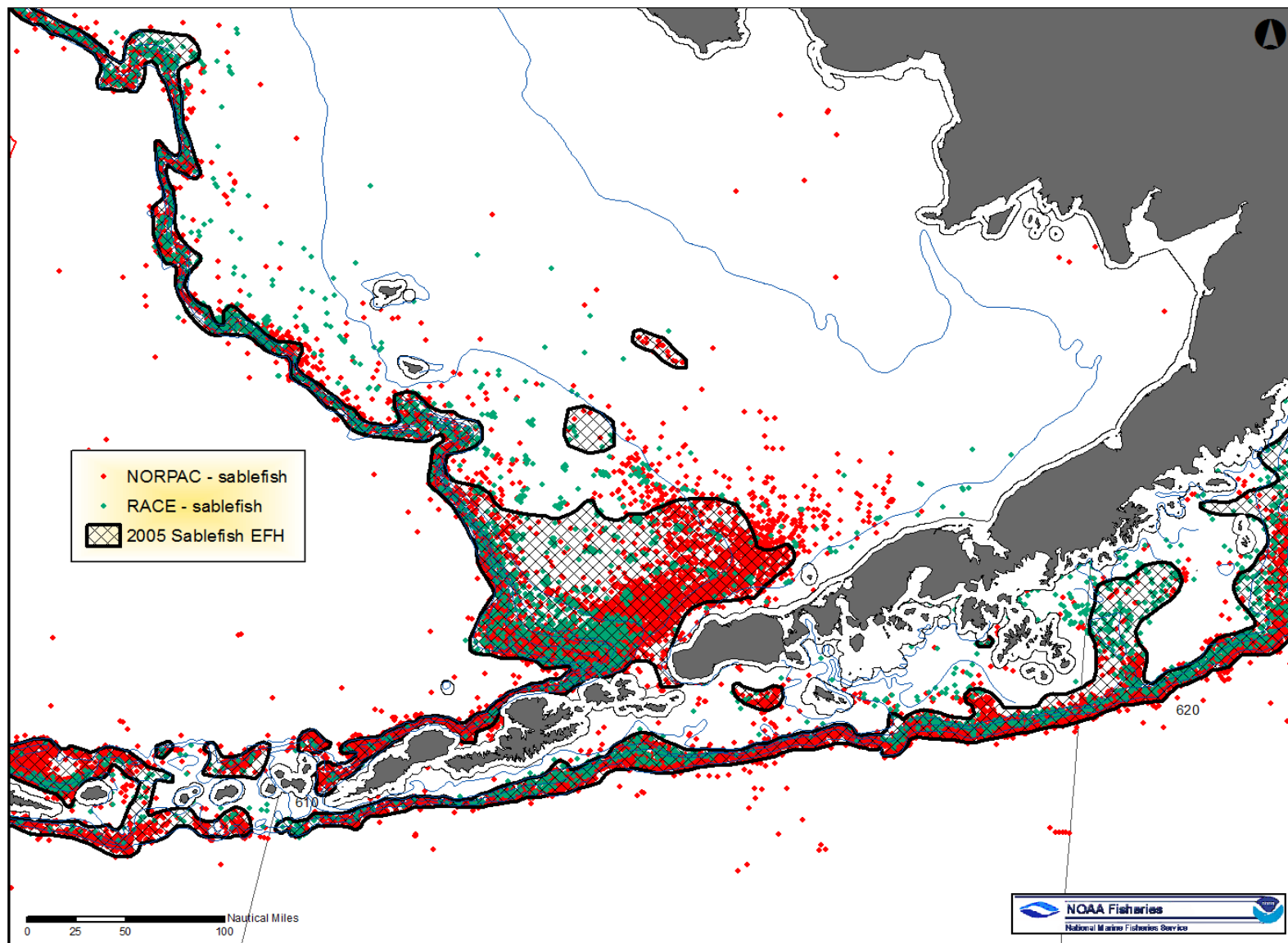
Level 3 - *Growth, reproduction, or survival rates* within habitats are available.

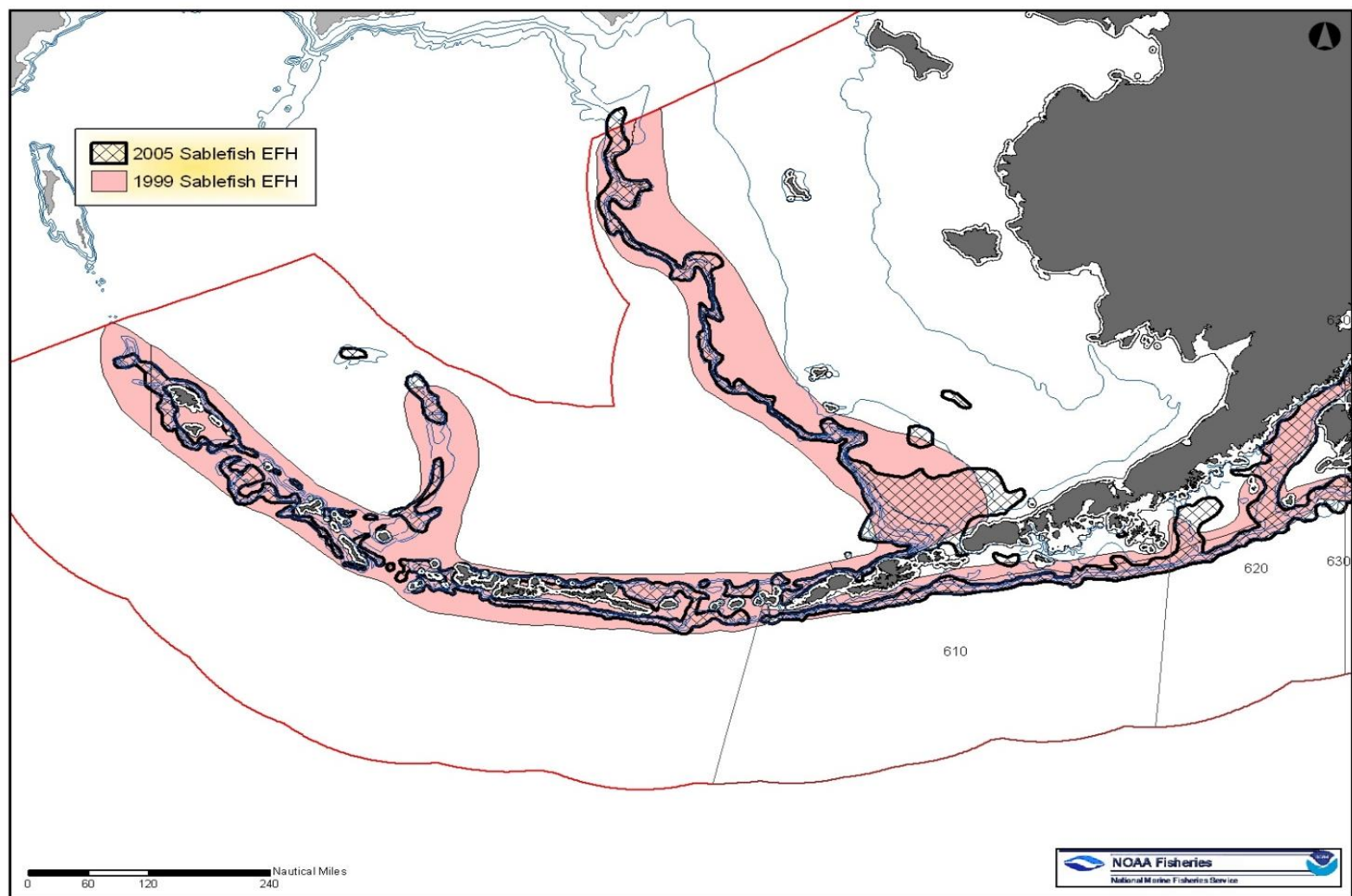
Level 4 - *Production rates* by habitat are available.

Sablefish EFH, 1999



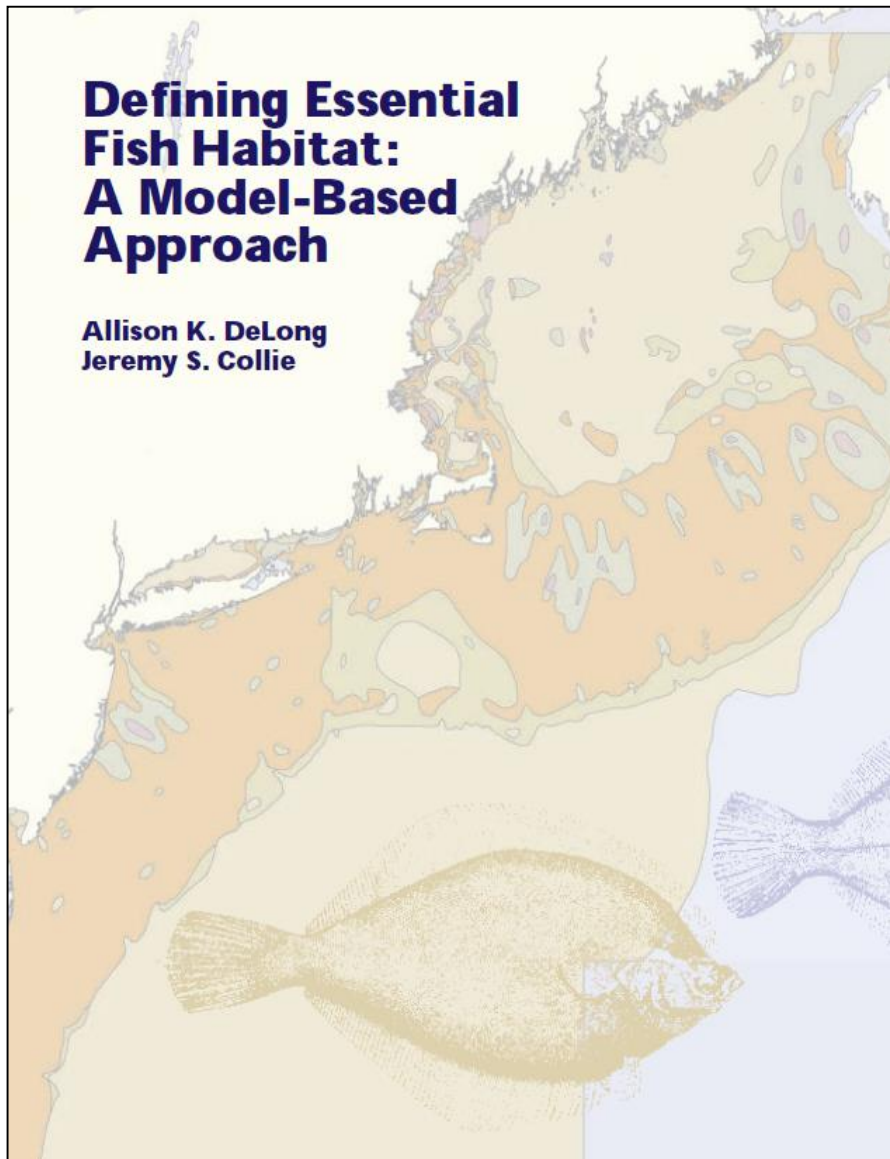
Sablefish EFH, 2005/2010





Defining Essential Fish Habitat: A Model-Based Approach

Allison K. DeLong
Jeremy S. Collie



NOAA Technical Memorandum NMFS-AFSC-236

A Refined Description of Essential Fish Habitat for Pacific Salmon Within the U.S. Exclusive Economic Zone in Alaska

by
K. Echave, M. Eagleton, E. Farley, and J. Orsi

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Alaska Fisheries Science Center

June 2012

Approach– EFH Definitions in Alaska

- Uses species distribution modeling tuned to available data
- Divisions by season (Fall, Winter, Spring)
- Divisions by life history stage
(egg, larvae, pelagic juvenile
settled juvenile, adult)
- Funded by Alaska Regional Office

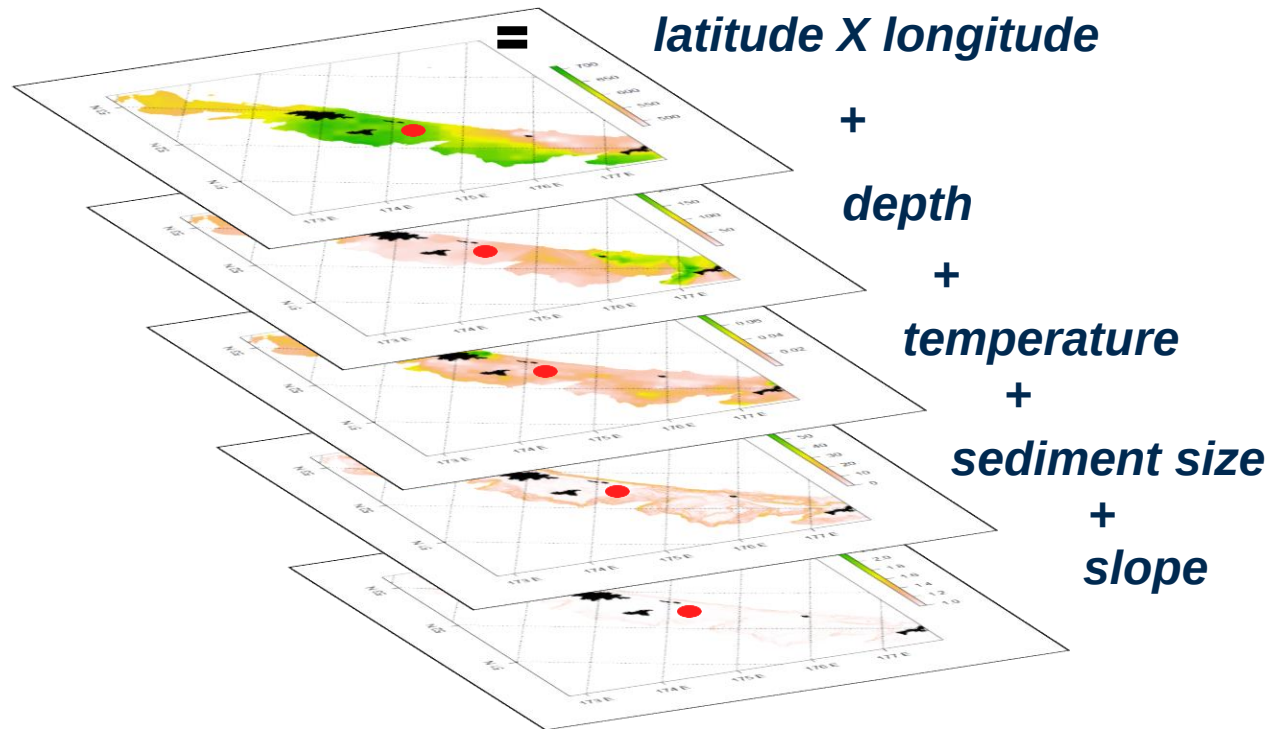


Dependent data



- Bottom trawl surveys (1982-2014)
 - CPUE (GAM, hurdle GAM, Maxent)
 - Adults
 - Settled juveniles
 - Summer only
- EcoFOCI data (1994-2015)
 - Presence only (MaxEnt)
 - Eggs
 - Larvae
 - Pelagic juveniles
 - All seasons
- Catch in areas database (2005-2013)
 - Presence only (MaxEnt)
 - Fall, winter, spring
 - Adults only

Method Part I. Term Selection & Model Fitting (GAM)



Method Part II. Generalized Additive Modeling

$$y = s(\text{latitude}, \text{longitude}) + s(\text{depth}) + s(\text{temperature}) + s(\text{slope}) + s(\text{tide}) \\ + s(\text{current}) + s(\text{ocean_color}) + s(\text{grain_size}) + \varepsilon$$



Details:

Dismo package for MaxEnt

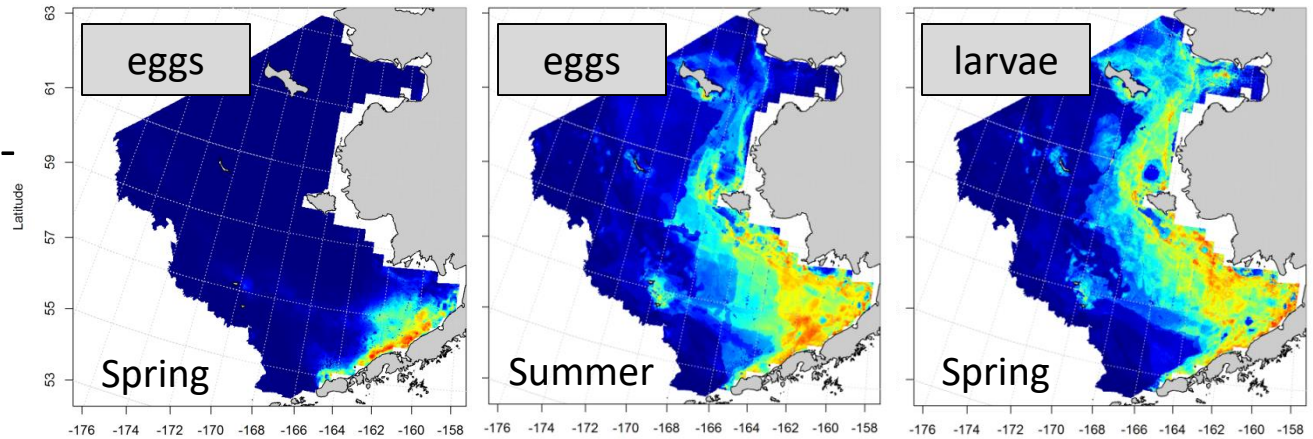
MGCV package for GAM

Presence-absence = Binomial distribution

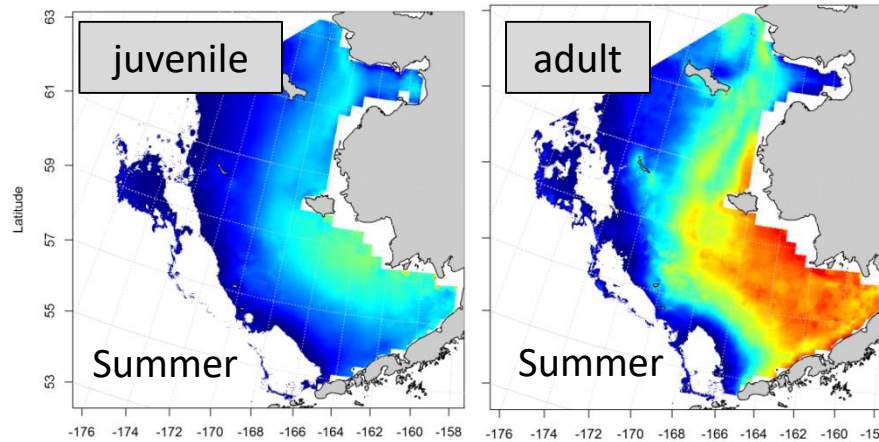
CPUE = 4th root transformation

k = 30 for bivariate term, 4 for univariate terms

ichthyoplankton survey -
MaxEnt - presence only
(probability)



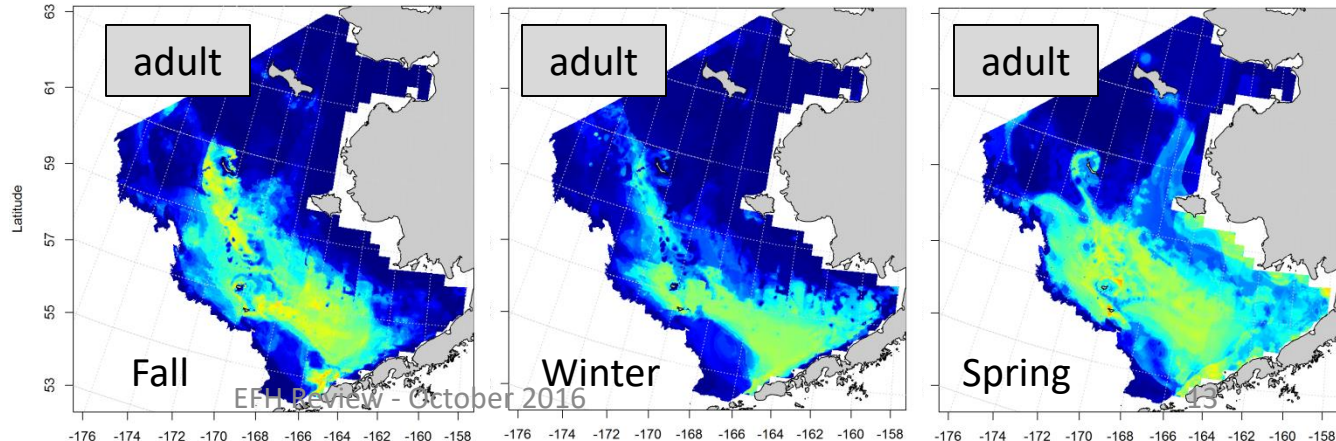
bottom trawl survey -
GAM - abundance



yellowfin
sole



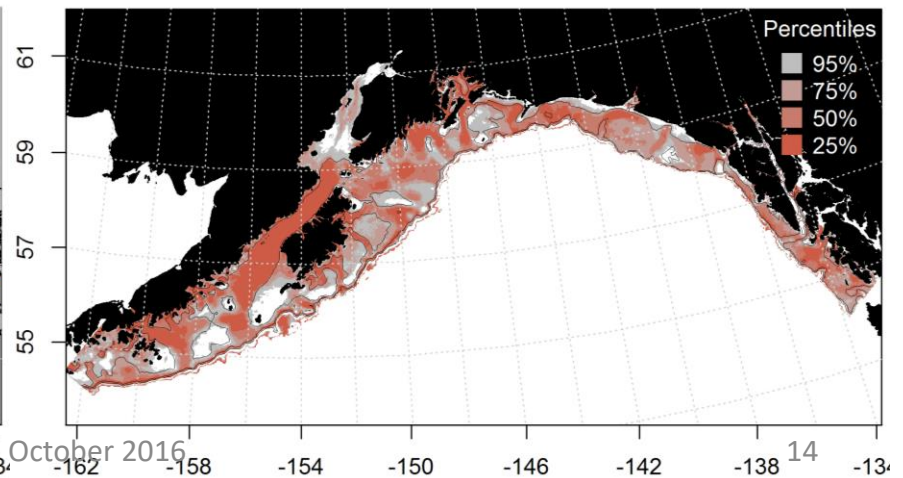
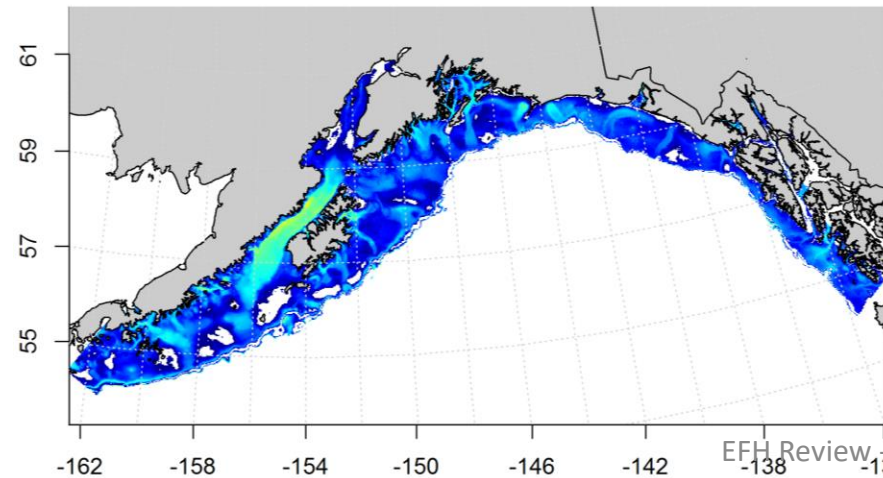
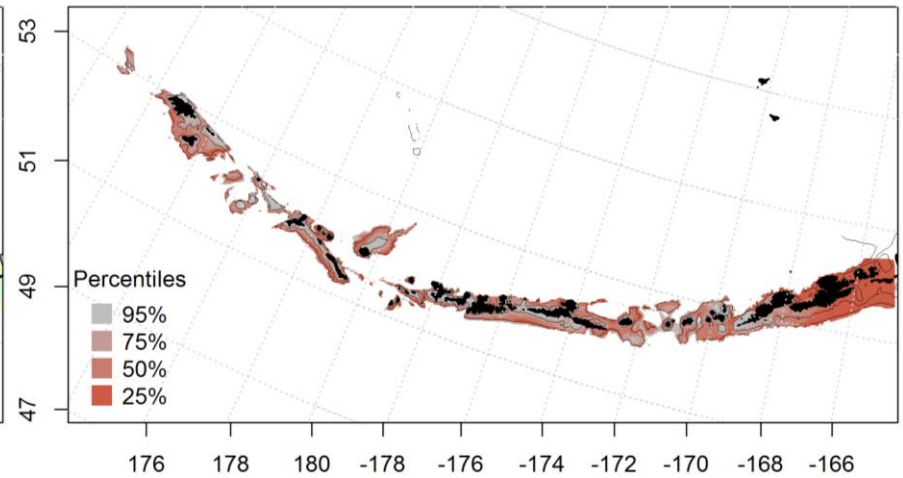
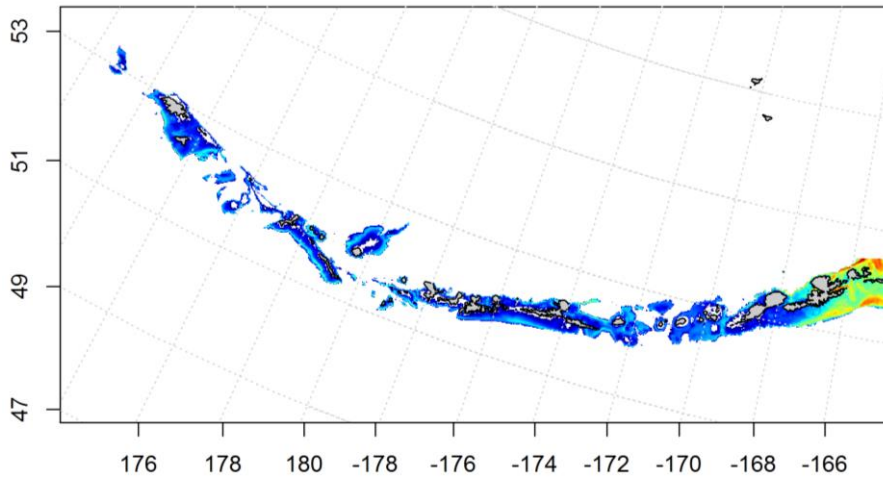
observer catch -
MaxEnt - presence
only (probability)



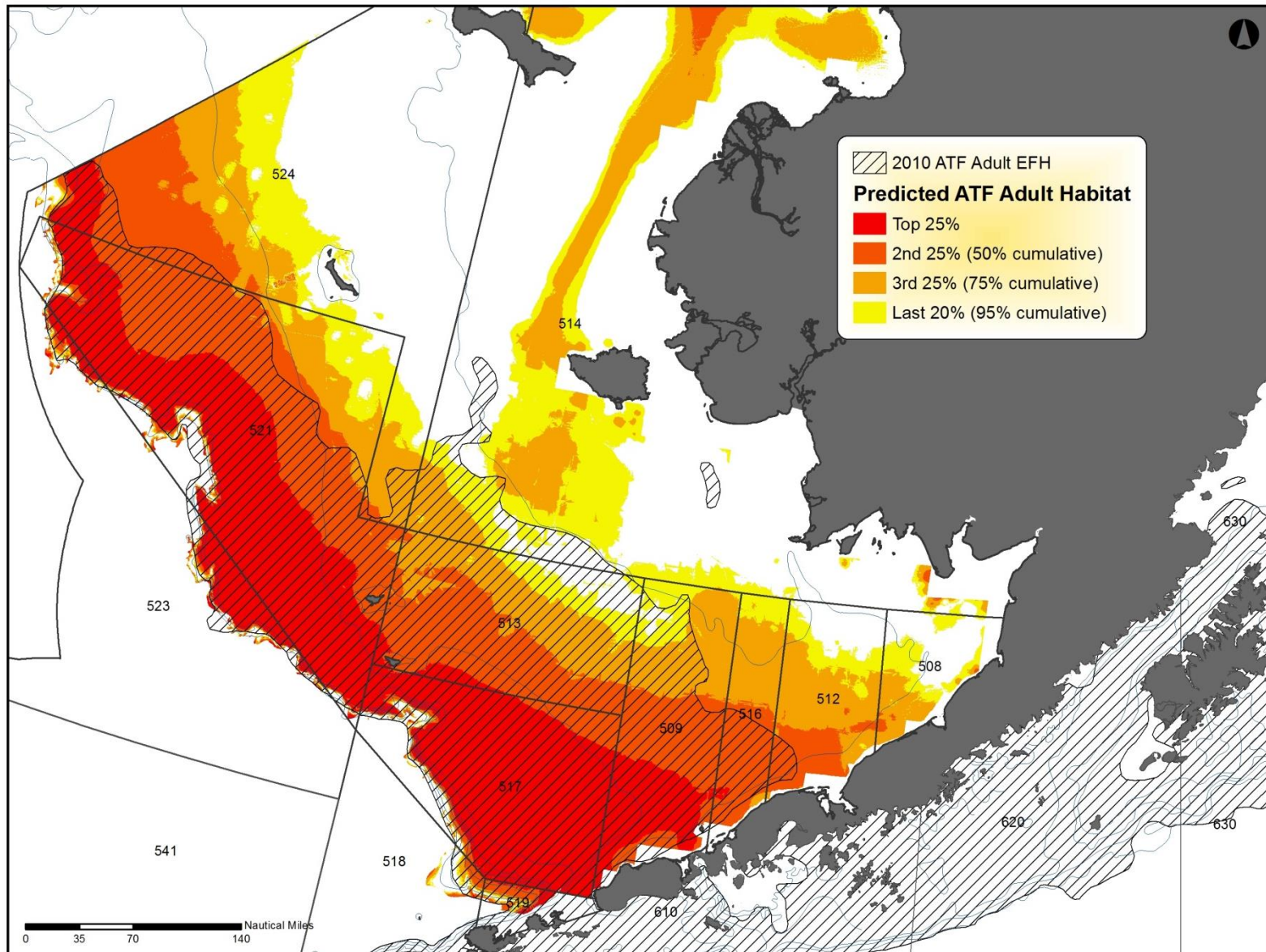
AI and GOA too!

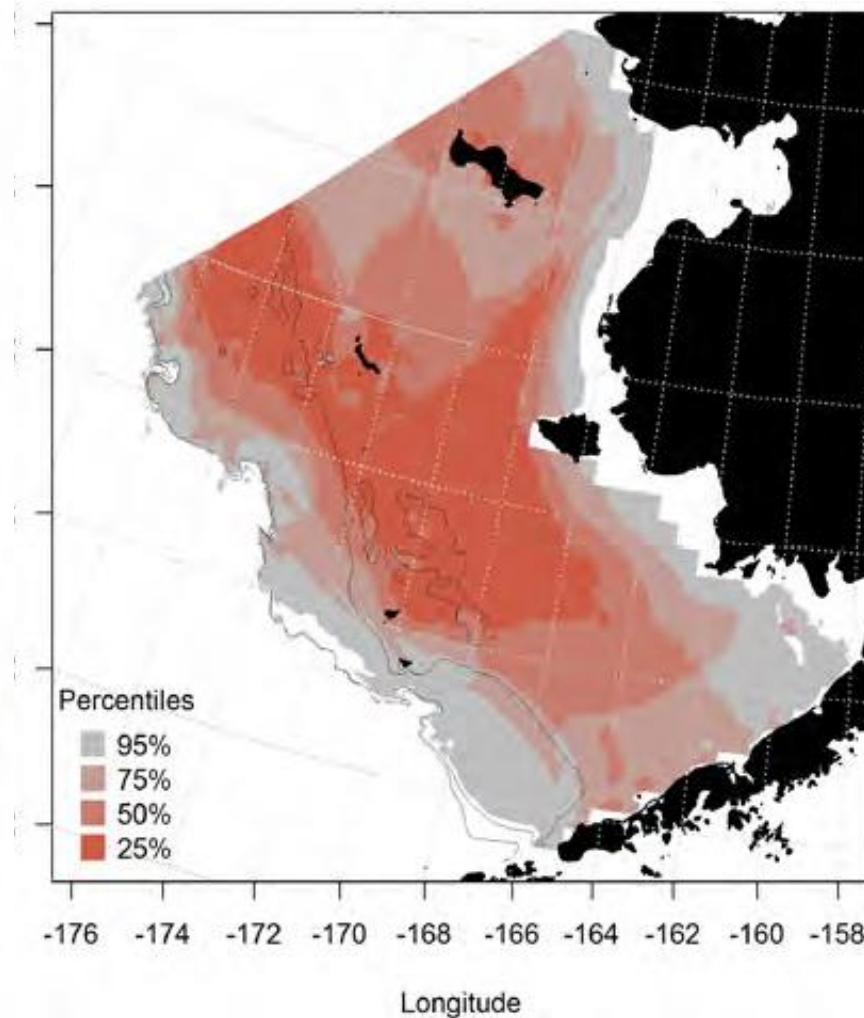
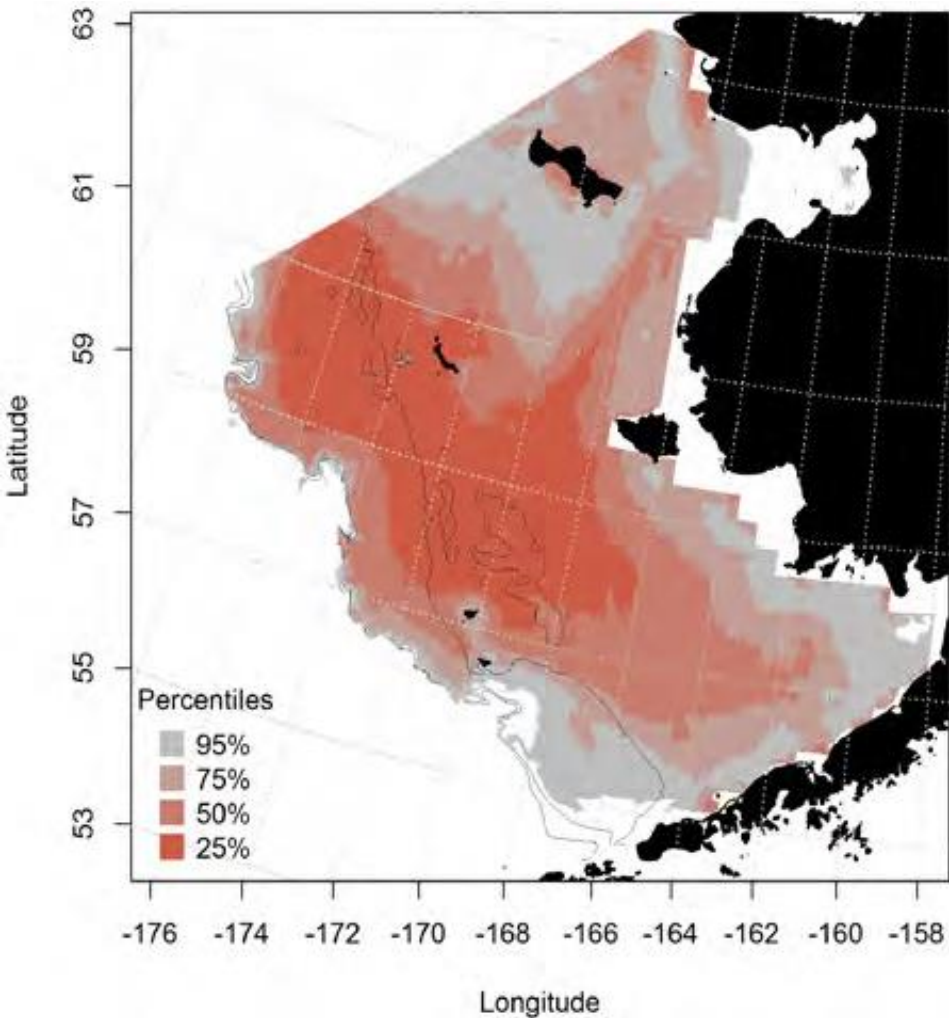


walleye pollock



New EFH Descriptions



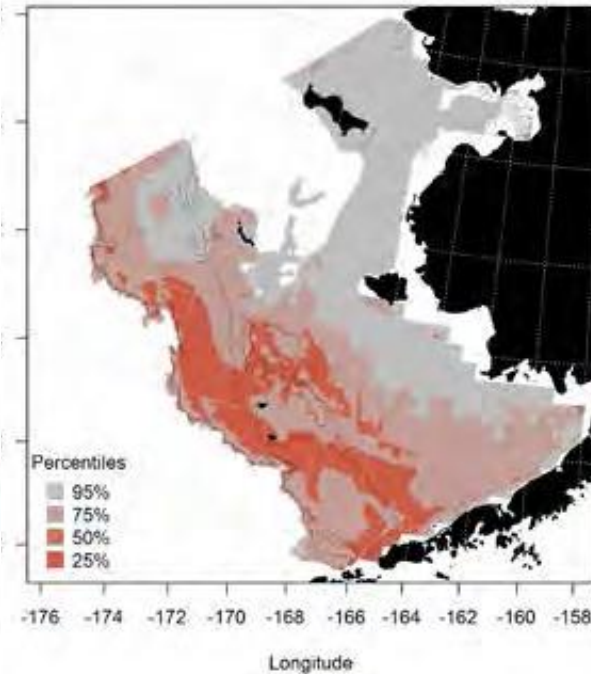
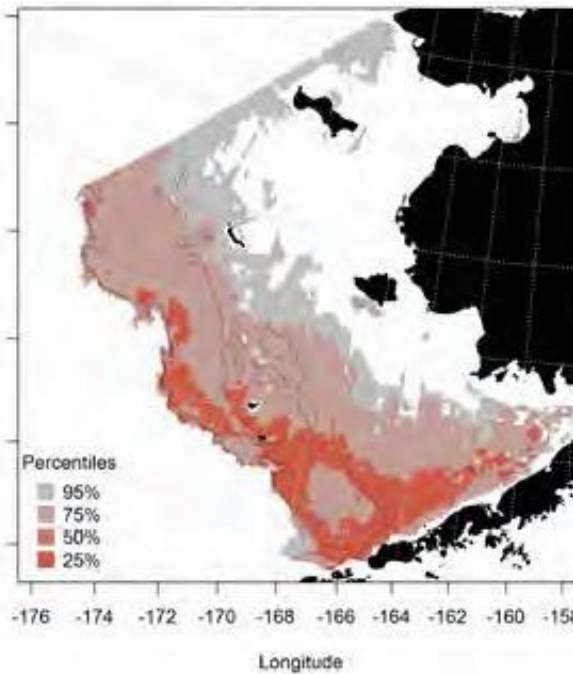
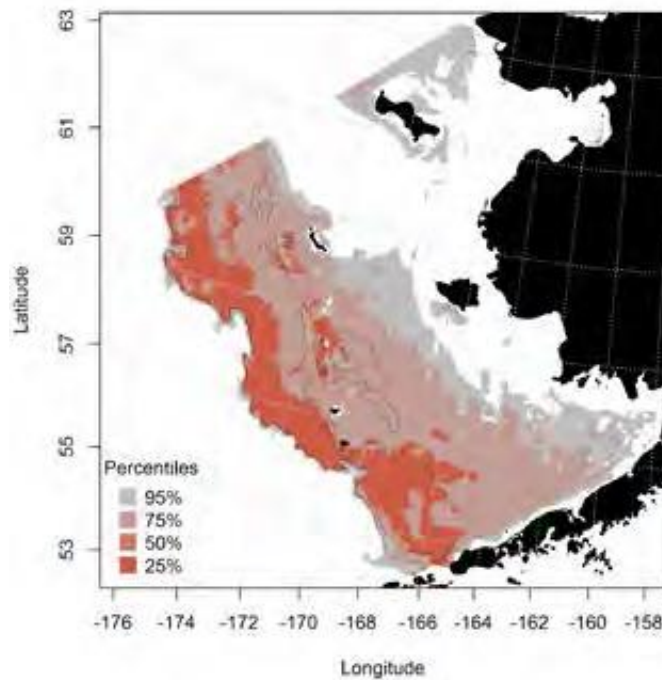


Predicted summer Essential Fish Habitat for pollock late juveniles (left) and adult (right) from summertime bottom trawl surveys (GAMs)

Fall

Winter

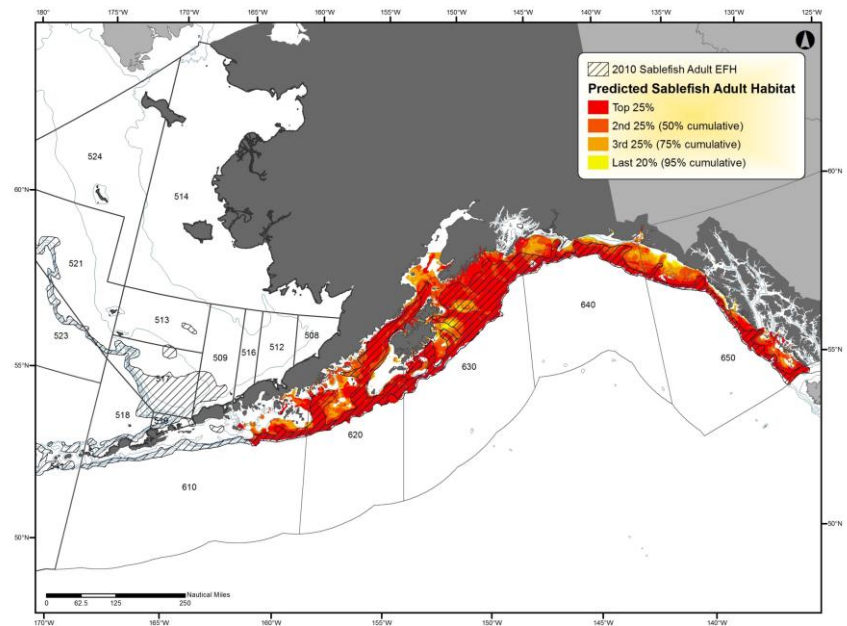
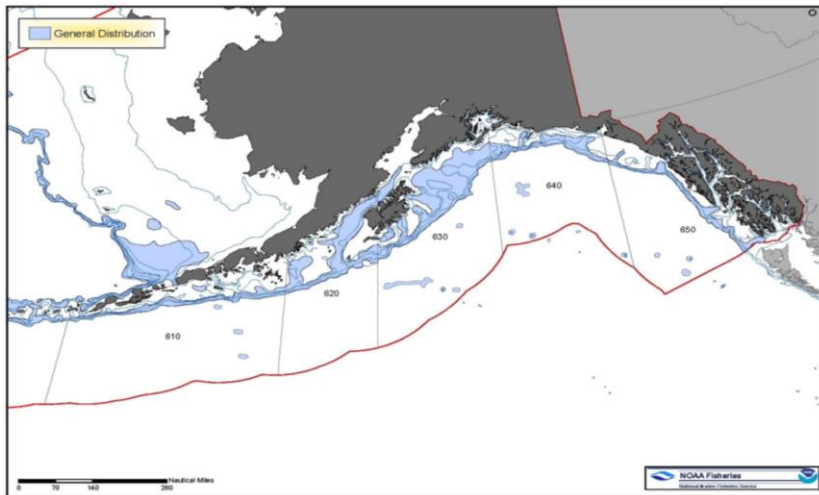
Spring



Predicted Essential Fish Habitat for pollock during the fall, winter, and spring from commercial fishery catches (MaxEnt)

Stock assessment author review

- Authors reviewed existing text and maps
- Suggested updates to text, where appropriate
- Selected existing maps or new, model-based maps



Bering Sea author assessment

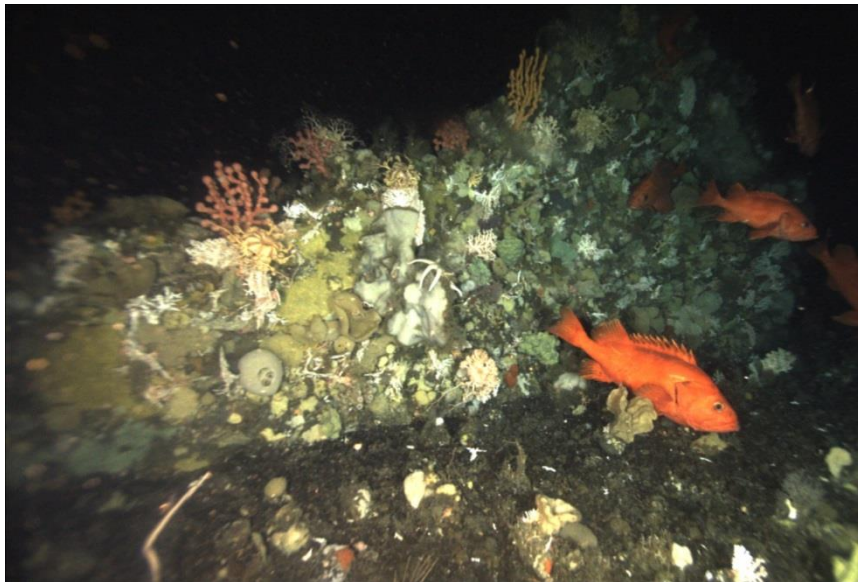
Species	Text Revisions	Replace maps
Pollock	✓	✓
Pacific Cod	✓	✓
Sablefish	✓	✓
Yellowfin sole	✓	✓
Greenland turbot	✓	✓
Arrowtooth flounder	✓	✓
Kamchatka flounder	✓	✓
Northern rock sole	✓	✓
Alaska plaice	✓	✓
Rex sole	✓	✓
Dover sole	✓	✓
Flathead sole	✓	✓
Rockfish	✓	✓
Pacific Ocean perch	✓	✓
Northern rockfish	✓	✓
Shortraker rockfish	✓	✓
Blackspotted & rougheye rockfish	✓	✓
Dusky rockfish	✓	✓
Thornyhead rockfish	✓	✓
Atka mackerel	✓	✓
Squid	✓	✓
Skates	✓	✓

GOA author assessment

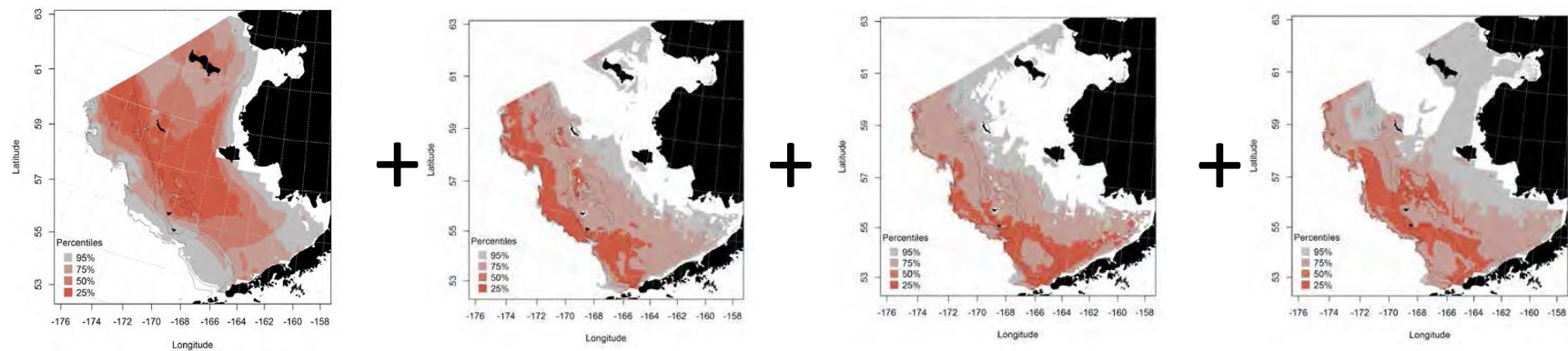
Species	Text Revisions	Replace maps
Pollock	✓	✓
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Sablefish	✓	✓
Yellowfin sole	✓	✓
Northern rock sole	✓	✓
Southern rock sole	✓	✓
Alaska plaice	✓	✓
Rex sole	✓	✓
Dover sole	✓	✓
Flathead sole	✓	✓
Arrowtooth flounder	✓	✓
Pacific Ocean perch	✓	✓
Northern rockfish	✓	✓
Shortraker rockfish	✓	✓
Blackspotted & Rougheye rockfish	✓	✓
Dusky rockfish	✓	✓
Yelloweye rockfish	✓	✓
Thornyhead rockfish	✓	✓
Atka mackerel	✓	✓
Squid	✓	✓
Skates	✓	✓
Sculpin		✓

Stock assessment author review

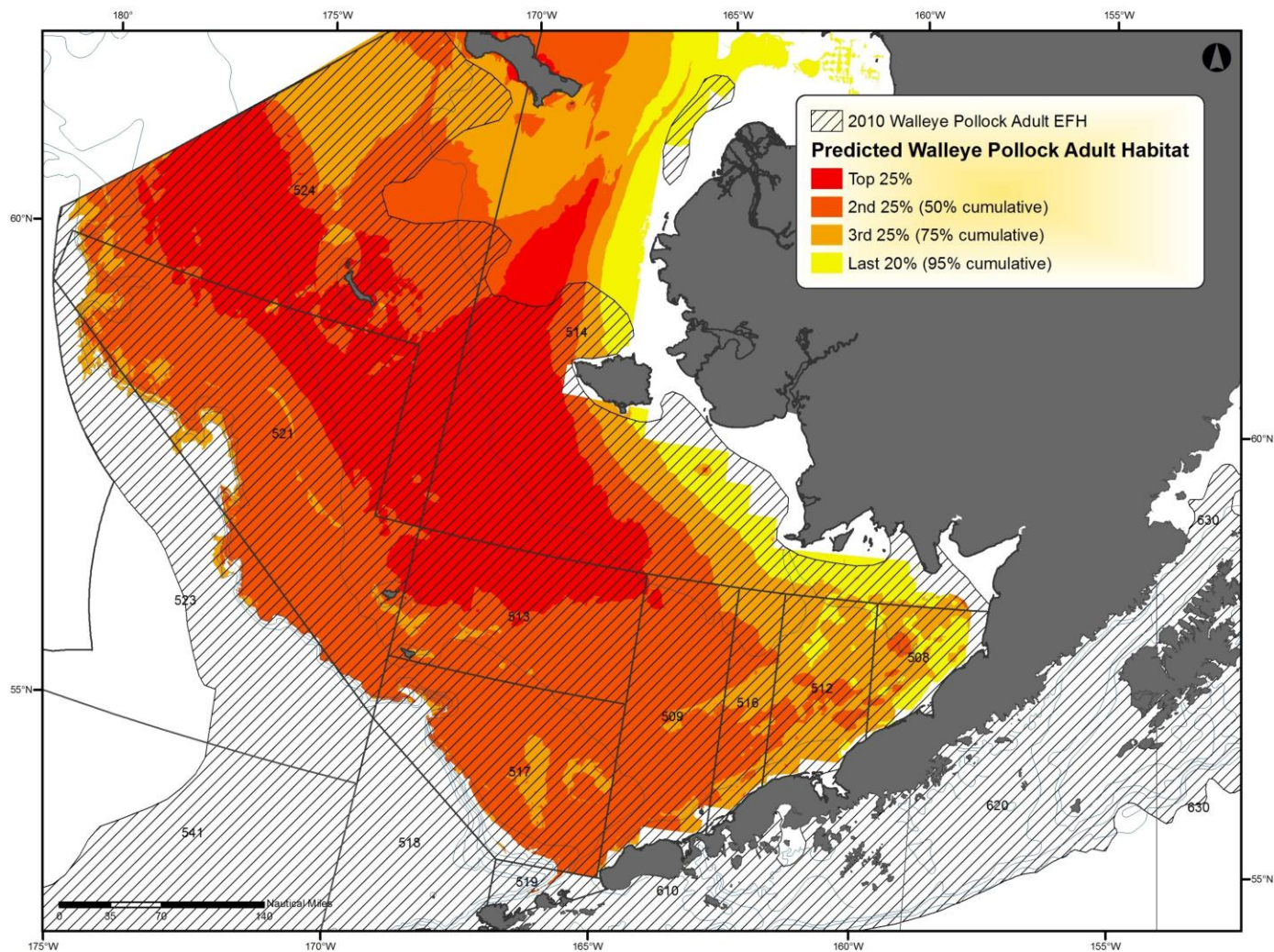
- Updates to EFH recommended for all FMPs
EXCEPT scallop FMP
- Updated maps recommended for all FMPs
EXCEPT scallop and Arctic FMP



Comprehensive, annual map

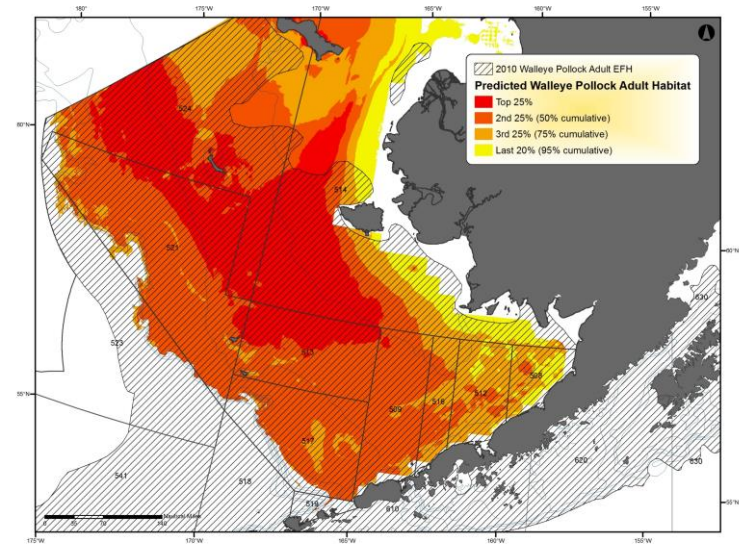


Comprehensive, annual map



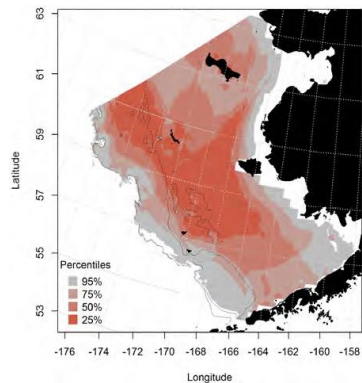
Comprehensive, annual map

- Authors reviewed comprehensive maps in May 2016
- Asked to respond if problematic
 - No response = approval
- Received very few responses, all minor

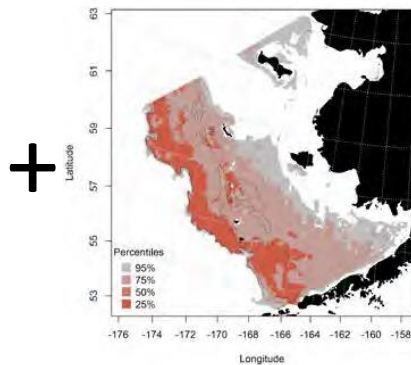


- Models and maps reviewed again by Plan Teams in September 2016 during review of Fishing Effects methods
- All Plan Teams expressed concerns about combining maps

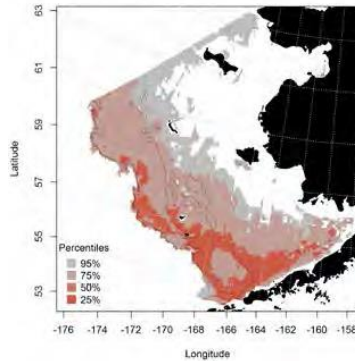
Abundance



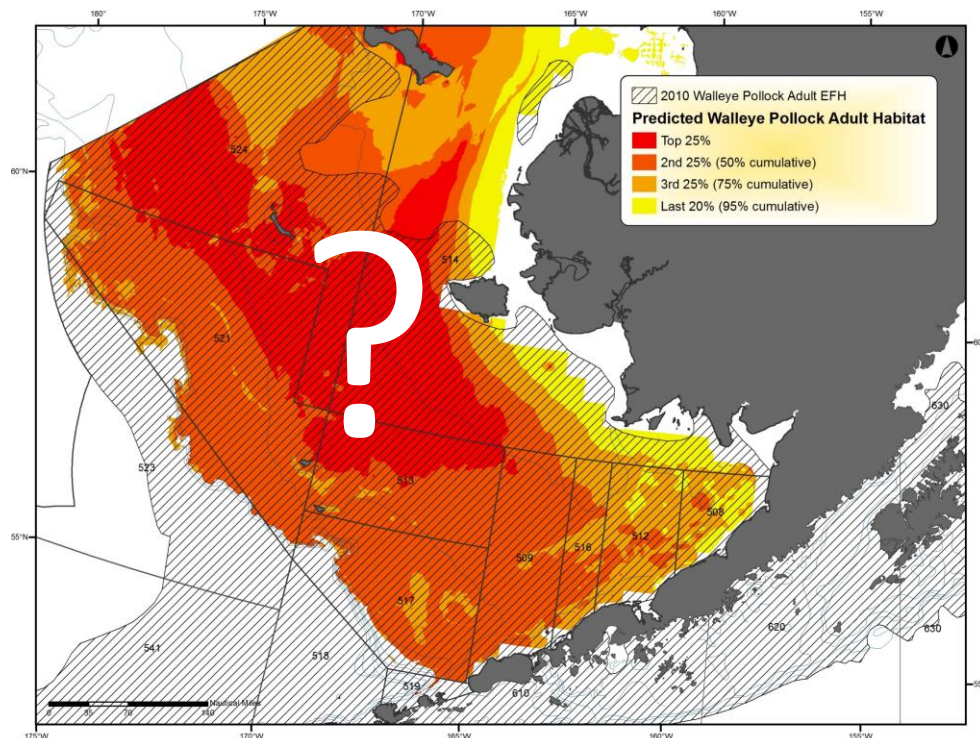
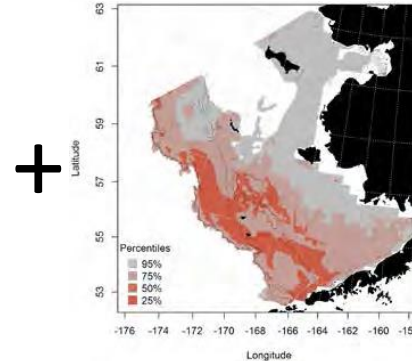
Probability



Probability



Probability



EFH Review - October 2016

Plan Team Recommendations

- All Plan Teams recommended against using the single, comprehensive map as prepared
- All Plan Teams recommended using original seasonal maps
 - *Important seasonal differences in king crab*
- *IF* a single map is desired, plan teams recommended converting summer model to MaxEnt and combining similar outputs
 - *Converting from presence/absence data in GAMs to presence only data in MaxEnt*

Council decisions

- Do FMPs need to be updated to redefine EFH?

Stock assessment author review

- Updates to EFH text recommended for all FMPs
EXCEPT scallop FMP
- Updated maps recommended for all FMPs
EXCEPT scallop and Arctic FMP



Council decisions

- Which maps should be used to define EFH?

Plan Team Recommendations

- Against using the single, comprehensive maps
- Recommended using original seasonal maps

OR

- Convert summer GAM to MaxEnt and combining similar outputs

What happens next?

- *IF* changes to EFH are not warranted – nothing
 - Existing text and map descriptions of EFH remain
- *IF* changes to EFH are warranted
 - FMP appendices amended to include new text descriptions and maps
 - Analyze effects of fishing on new EFH descriptions
 - Proposed methods to be presented to the Council in December
- *Regardless* of whether Council updates EFH
 - Decide whether to initiate HAPC proposal process
 - Decide whether to update EFH research Priorities
- *Omnibus package presented in April 2017*

Date	Action
October 2016	1. Determine whether EFH should be updated 2. Choose seasonal maps or aggregated map
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April 2017	1. Initial review of omnibus EFH amendment a. EFH text descriptions b. EFH maps c. Fishing effects evaluation d. Non-fishing effects* e. EFH research priorities f. HAPC priorities

*If analysis shows effects of fishing on EFH are more than minimal and not temporary, then conservation measures must be developed and approved.