Essential Fish Habitat (EFH)

5-year Review for 2010

Summary Report

PRELIMINARY

November 2009

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1 Introduction

The Magnuson-Stevens Fishery Conservation and Management Act includes provisions concerning the identification and conservation of Essential Fish Habitat (EFH). The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The National Marine Fisheries Service (NMFS) and regional Fishery Management Councils (Councils) must describe and identify EFH in fishery management plans (FMPs), minimize to the extent practicable the adverse effects of fishing on EFH, and identify other actions to encourage the conservation and enhancement of EFH. Federal agencies that authorize, fund, or undertake actions that may adversely affect EFH must consult with NMFS, and NMFS must provide conservation recommendations to federal and state agencies regarding actions that would adversely affect EFH. Councils also have the authority to comment on federal or state agency actions that would adversely affect the habitat, including EFH, of managed species.

Each FMP contains the following EFH components:

1. EFH Descriptions and Identification
2. Fishing activities that may adversely affect EFH
3. Non-Magnuson-Stevens Act fishing activities that may adversely affect EFH
4. Non-Fishing activities that may adversely affect EFH
5. Cumulative impacts analysis
6. EFH Conservation and Enhancement Recommendations
7. Prey species list and any locations
8. HAPC identification
9. Research and Information needs
10. Review EFH every 5 years

As clarification for component 10, the EFH Final Rule requires 'a review and revision of EFH components' be completed every 5 years, and EFH provisions be revised or amended, as warranted, based on available information. The EFH Final Rule continues that the review should also evaluate:

- published scientific literature
- unpublished scientific reports
- information solicited from interested parties
- previously unavailable or inaccessible data.

The report documents the 5-year EFH review for the Council. Based on this report, the Council will decide whether revisions to or re-evaluations of EFH, and EFH mitigation measures, are called for. If so, the Council will accordingly initiate FMP amendments, to revise EFH components or management measures within the FMPs.

1.1 Background

The Council last amended five of its FMPs (Bering Sea/Aleutian Islands [BSAI] Groundfish FMP, Gulf of Alaska [GOA] Groundfish FMP, BSAI Crab FMP, Scallop FMP, and Salmon FMP) in 2005, to address the EFH requirements (Table 1). The Council and NMFS developed an environmental impact statement evaluating alternatives and environmental consequences for three actions: (1) describing and identifying EFH for fisheries managed by the Council; (2) adopting an approach for the Council to identify Habitat Areas of Particular Concern within EFH; and (3) minimizing to the extent practicable the adverse effects of Council-managed fishing on EFH. The Council used an extensive public process to develop the alternatives for the EIS, including numerous public meetings of the Council and its EFH

Committee. The analysis indicated that there are long-term effects of fishing on benthic habitat features off Alaska, and acknowledged that considerable scientific uncertainty remains regarding the consequences of such habitat changes for the sustained productivity of managed species. Nevertheless, based on the best available scientific information, the EIS concluded that the effects on EFH are minimal because the analysis found no indication that continued fishing activities at the current rate and intensity would alter the capacity of EFH to support healthy populations of managed species over the long term. The analysis concluded that no Council-managed fishing activities have more than minimal and temporary adverse effects on EFH, which is the regulatory standard requiring action to minimize adverse effects under the Magnuson-Stevens Act. Importantly, the Council initiated a variety of practicable management actions and precautionary measures to conserve and protect EFH.

The actions the Council and NMFS took in association with this EIS resulted in FMP amendments to modify the existing EFH and HAPC designations and to implement additional measures to reduce the effects of fishing on EFH. The amendments are Amendment 78 to the FMP for the Groundfish Fishery of the BSAI Area, Amendment 73 to the FMP for Groundfish of the GOA, Amendment 16 to the FMP for BSAI King and Tanner Crabs, Amendment 9 to the FMP for the Scallop Fishery off Alaska, and Amendment 7 to the FMP for the Salmon Fisheries in the Exclusive Economic Zone (EEZ) off the Coast of Alaska. Specific regulations and associated conservation areas are located at http://www.fakr.noaa.gov/habitat/efh.htm.

The Council now also has a sixth FMP, as a new FMP for Fish Resources of the Arctic was approved by the Secretary of Commerce in August 2009 (Table 1). A thorough assessment of EFH was included in the Arctic FMP. Consequently, this FMP will not be addressed in this 5-year review report.

Table 1 List of Council Fishery Management Plans, and status of EFH review

Fishery Management Plan	EFH Last Updated	Current Review Status or Comments
Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI Groundfish)	2005	NPFMC review in 2009-10 (including Plan Team)
Groundfish of the Gulf of Alaska (GOA Groundfish)	2005	NPFMC review in 2009-10 (including Plan Team)
Bering Sea/ Aleutian Islands King and Tanner Crabs (BSAI Crab)	2005	NPFMC review in 2010 (including Plan Team)
Scallop Fishery off Alaska (Scallop)	2005	NPFMC review in 2010 (including Plan Team)
Salmon Fisheries in the EEZ off the Coast of Alaska (Salmon)	2005	NPFMC review in 2010 No salmon plan team, so review will be provided by NMFS salmon experts.
Fish Resources of the Arctic (Arctic)	FMP implemented in August 2009	NPFMC review completed in 2009 with adoption of FMP

2 Approach

The result of the 2010 5-year EFH review is documented in this summary report for the Council. The review included evaluating new information on EFH, identifying whether any revisions to EFH are needed or suggested, and assessing information gaps and research needs. The review fulfills the FMP requirement to complete a 5-year review of EFH. This summary report will be presented to the SSC, AP, and Council. If the Council chooses to update its FMP(s) to revise EFH text or management measures, FMP amendments will be prepared, along with the appropriate analytical documents.

This is the first time the 5-year review is being conducted, and the approach to the review and any subsequent revisions is being developed for this report. It is anticipated that this review will establish a process applicable for future 5-year reviews.

The following steps have been used to complete and document the EFH review:

1. Evaluate new information, available since the last EFH review, and review the text in the Council's 5 FMPs (BSAI groundfish, GOA groundfish, BSAI King and Tanner crab, Scallop, Salmon) relating to the 10 EFH components. Note areas where changes to the EFH components may be warranted.
    a. Stock assessment authors are the lead reviewers for EFH text relating to the species or species complex which they assess.
    b. Other components will be reviewed by NMFS Habitat Division staff, or other qualified NMFS, Council, or other staff.
2. Consult with the Plan Teams with respect to the stock assessment authors' review of EFH text, and other EFH review components, if appropriate[1]. Plan Teams are invited to provide recommendations to the SSC and the Council as to whether the individual species reviews are accurate and complete, and whether the available new information warrants revisions to EFH text in the FMPs, or to Council management measures to protect and conserve EFH.
3. Prepare EFH 5-year review summary report for Council. Include recommendations of whether changes to the FMPs are warranted. Report should be made available in advance to the public. Contents of Council summary report will include:
    a. Review of 10 EFH components, documenting how the review was conducted, what new information is available relating to each component, and whether it agrees or disagrees with the information that is currently in the FMP.
    b. Possible changes to the 10 EFH components in the five FMPs under review.
4. If the Council decides to initiate FMP amendments, prepare amendments and any associated analysis to update EFH components in FMPs. Note, any change to the FMP text (which includes all 10 EFH components) must be implemented through an FMP amendment. The degree of analysis require to implement the change will vary based on whether the proposed amendment is a substantive change (e.g., a change in the EFH description), or a technical one (e.g., minor changes to the life history information).

For the most part, the review will be conducted by agency staff using new information available in the five years since the completion of the EFH EIS, the last time such an evaluation was conducted. Staff will use information from published or unpublished scientific literature or scientific data, as directed in the EFH Final Rule, assuming the information meets acceptable standards of scientific review. Staff have

[1] Note, as there is no Salmon Plan Team, the review will rely on the expertise of NMFS staff to review and provide recommendations on changes to the Salmon FMP.

also noted, as part of their review, unpublished studies that are currently underway or whose results are under review, which may provide further insight on EFH in the future. The summary report that is presented to the Council will also be distributed in advance to the public, and the public and any interested parties are invited to provide input on or information pertaining to the EFH review before the Council decides whether revisions to EFH are warranted.

2.1 Specific approach to each component

A description of the review for each of the ten EFH components listed in the FMPs is included in Table 2.

Table 2 Review plan for each of the ten EFH components

EFH FMP Component	Plan for review
1. EFH Descriptions and Identification	Identify and evaluate new scientific literature, and information from other relevant sources, to see whether species-specific EFH description and identification, as written in the FMPs, is correct. Edit the FMP text if appropriate. Stock assessment authors will be the lead reviewers on this component.
2. Fishing activities that may adversely affect EFH	An update of the fishing effects model is not planned as part of the 5-year review. Instead, the review will evaluate the various inputs to the model to see how they compare with the model inputs from 2004 (a. distribution of the fisheries, b. species recovery rates, c. gear changes in the fisheries that may affect habitat). This should demonstrate whether the impacts analysis from the 2005 EIS is likely to still be valid, or whether it warrants revision. Note, the model also uses species' EFH descriptions as an input, so if major changes to the EFH descriptions are implemented by the Council, this component may need to be reevaluated.
3. Non-Magnuson-Stevens Act fishing activities that may adversely affect EFH	Review whether there have been changes in current halibut and State water fisheries, compared to EFH analysis. Identify sources of new information that may shed light on analysis of the impact of these fishing activities.
4. Non-Fishing activities that may adversely affect EFH	Review whether there have been changes to non-fishing activities affecting habitat since the EFH analysis. Identify sources of new information that may shed light on analysis of the impact of non-fishing activities.
5. Cumulative impacts analysis	Review cumulative impacts discussion in FMPs, and evaluate against new information.
6. EFH Conservation and Enhancement Recommendations	Review EFH recommendations for fishing and non-fishing activities, and evaluate against new information to see whether updates are warranted.
7. Prey species list and any locations	Based on review of new information in Component 1, review prey species information, and determine whether updates are warranted.
8. HAPC identification	Review will summarize Council's current progress in establishing HAPC priorities. As appropriate, based on species-specific review of EFH, stock assessment authors or Plan Teams may suggest candidate HAPC areas that could be considered by the Council in the next HAPC priority cycle.
9. Research and Information needs.	Based on review of new information in Component 1, review research and information needs, and determine whether updates to EFH research needs identified in the FMPs are warranted.
10. Review EFH every 5 years.	Summary report represents EFH 5-year review.

2.2 Revision of EFH text and management measures, if warranted

The Council's role with respect to the EFH 5-year review is to receive a report on the review, and decide whether any of the new information from the last 5 years, highlighted in the review, warrants change to management (i.e., amendments to the FMPs). The Council will be considering all ten EFH components for each FMP, including individual species EFH descriptions, EFH conservation and enhancement recommendations for fishing and non-fishing effects on EFH, and identification of HAPCs. Any change to the FMP text, no matter how minor, requires an FMP amendment.

Based on the summary report, the Council may decide to initiate FMP amendments to revise one or more EFH components within any of the five FMPs under review. The level of analysis (environmental assessment, environmental impact statement, categorical exclusion) that is required to support that amendment will vary depending on the impacts of the change. The 2005 EFH EIS provided a comprehensive discussion of EFH in the five Council FMPs. It can be difficult to assess the impacts of changes to available habitat, whether due to fishing pressure, non-fishing anthropogenic activities, or the effects of changing climate or physical conditions, because the linkages between habitat preferences and abundance of managed species is largely unknown. The analysis of any new amendments initiated by the Council would be likely to rely heavily on the 2005 EFH EIS, where these unknowns were discussed and characterized. This could either be accomplished through environmental assessments tiering off the EFH EIS, or by issuing a supplement to the EFH EIS, addressing the new amendments.

Of the types of recommended changes that may emerge from the EFH 5-year review, there are some potential amendments that may be of higher priority to the Council than others. For example, while much of the EFH material in the FMPs is descriptive in nature, there are nonetheless certain sections that may have the potential to affect how EFH for a species is impacted by fishing and non-fishing activities. Examples of some of these recommended changes that may be of higher priority are listed below.

EFH text and map descriptions

The EFH text description, by life history stage, represents the legal EFH description for each of the managed species. In the Council FMPs, that text description is also portrayed graphically on a map. It is on the basis of these descriptions that evaluations are made by the agency about whether an activity is likely to impact EFH. The lead stock assessment authors have all been asked to evaluate their species' EFH descriptions, based on new information, and decide whether changes are warranted. In turn, the Plan Teams have also provided recommendations to the SSC and the Council with respect to these descriptions. If the Council decides that such changes warrant revision to the FMP, amendments will be initiated to implement these changes. Recommended changes could include:

- Change to the EFH text description of map of EFH for each species, or change to the available level of habitat information for species' life history stages
- Changes to the management of species within a complex, which may result in a new EFH description

Adverse effects on EFH from fishing or non-fishing activities

The EFH EIS reviewed the effects of fishing at the then-existing rate and intensity, and concluded that fishing would not affect the capacity of EFH to support the life history processes of any species. In other words, the effects of fishing on EFH were concluded to be no more than minimal. Since the analysis in the EFH EIS, the Council has taken management actions that may have changed the distribution or intensity of fishing, including a suite of mitigation measures adopted by the Council to provide additional protection to EFH. The 5-year review has evaluated changes to fishing distribution since the EFH EIS

analysis, and stock assessment authors have reviewed changes in fishing activities and whether any such changes are likely to impact the conclusions of the EFH EIS for their species. If a change to the conclusions of the evaluation of fishing effects is indicated, this may be a higher priority action item for the Council.

Potential adverse impacts from non-fishing activities on EFH were also evaluated in the EFH EIS, and EFH Conservation Recommendations were described that span a diverse range of anthropogenic activities that may have adverse effects on EFH. Example activities include: oil and gas exploration and development; vessel casualties that result in physical damage to living habitats or spill of toxic substances (i.e., oil spill); introduction of exotic species; depositional fill; marine dredging; mineral extraction; and waste water discharges. These conservation recommendations are included in the FMPs, and they have been reviewed by the staff of the NMFS Habitat Conservation Division. These recommendations are used by NMFS staff when consulting on effects to EFH by other agencies, and updating the FMPs to reflect the most recent recommendations may be a higher priority amendment for the Council to consider.

In summary, some of the recommended changes that might be indicate a higher priority response from the Council could be the following:

- Recent changes in fishing activities that may affect the EFH EIS conclusion that no adverse effects of fishing on EFH are more than minimal and not temporary
- New recommendations to avoid, minimize, or compensate for adverse effects on EFH caused by activities other than fishing

2.3 Timeline for review and possible subsequent amendments

The following provides an overview of the timeline for completing the review in 2009 and 2010.

2009	**Overall tasks for 2009:** • Assess information gaps and new information • Stock expert review • Plan Team feedback	
February 19	Scallop Plan Team meeting	Brief PT on plans for EFH 5-year review, get input on new habitat information on scallops
March-October		Prepare review of other 9 EFH components, including fishing and non-fishing effects on habitat, and cumulative impacts review
March 30-April 1	Council meeting	Review methodology for EFH 5-year review with Council's SSC
April-June		Prepare template for stock assessment author review. Template should include (a) current FMP EFH text, (b) worksheet identifying any new or inconsistent habitat information (since the 2005 EFH EIS) and questions to solicit input on 10 EFH components
July-October		Distribute template and worksheets to groundfish stock assessment authors, authors review and edit FMP text and worksheets
September 16	Joint Crab and Groundfish Plan Teams meeting	Discussion of EFH review requirements and PT approach for November and March. Discussion of HAPC process criteria.
September-February 2010		Distribute template and worksheets to crab and scallop stock assessment authors, authors review and edit FMP text and worksheets
October-December		Prepare Preliminary Summary Report for Groundfish Plan Team and Council.
November 16-20	Groundfish Plan Team meetings	PTs to (a) review any proposed changes to FMP EFH text, based on stock assessment author review, and (b) provide input on review of other EFH components (including HAPC and EFH conservation recommendations). PTs will recommend whether Council should consider changes to EFH descriptions and identification, or other amendments to EFH FMP text and management.
December 7-15	Council meeting	Preliminary Summary Report for Council Review. Will not include crab, scallop, and salmon reviews. Solicit public input on habitat information. Update Council on progress with EFH review, provide indication as to whether FMP amendments are likely to be required (based on PT recommendations and other comments/review)

2010	**Overall tasks for 2010:** • SSC, AP, and Council review • Final Council decision • Implement any changes through FMP amendment *Note: all changes to the FMP text, however minor, must be implemented through an FMP amendment.*	
March 4-5	Scallop Plan Team meeting	PTs to (a) review any proposed changes to FMP EFH text, based on stock assessment author review, and (b) provide input on review of other EFH components (including HAPC and EFH conservation recommendations). PTs will recommend whether Council should consider changes to EFH descriptions and identification, or other amendments to EFH FMP text and management.
March 29-April 2	Crab Plan Team meeting	PTs to (a) review any proposed changes to FMP EFH text, based on stock assessment author review, and (b) provide input on review of other EFH components (including HAPC and EFH conservation recommendations). PTs will recommend whether Council should consider changes to EFH descriptions and identification, or other amendments to EFH FMP text and management.
April 6-14	Council meeting	Summary Report for Council Review. Will include crab and scallop reviews. Council to decide whether changes to EFH are required, and initiate FMP amendments accordingly (based on PT recommendations and other comments/review). Council will also decide whether to initiate a HAPC process by setting HAPC priorities and calling for proposals.
April – December		*If necessary, prepare amendments required to change FMP EFH text for any of Council's 5 FMPs. Determine level of analysis required to support FMP amendments.*
September	*Joint Groundfish Plan Team meeting, Crab PT meeting*	*Opportunity for PTs to review proposed FMP amendments, if necessary/ appropriate*
October	*Council meeting*	*Initial review of FMP amendments to change EFH FMP text*
December	*Council meeting*	*Final action on FMP amendments to change EFH FMP text*

3 Roadmap to ten EFH components

Although the ten EFH components are all addressed in each of the Council's FMPs, some components vary by FMP, and some are general across all the FMPs. Consequently, the format of the summary report is geared to minimize duplication, and groups related components together where appropriate. The following sections provide a roadmap to where, in the summary report, the review of each component may be found.

3.1 EFH Descriptions and Identification

The review of EFH descriptions and identification for each managed species is described in this report by FMP, in Sections 4 through 8. For each individual species, the following information is contained within the FMP, and was reviewed for this report:

- *EFH description* – in text by life history stage, and illustrated on a map, along with an indication of the level of EFH information that is known for each life history stage of the species
- *General habitat information* – life history and general distribution; habitat, biological, and predator-prey associations; trophic information; upper size limit of juvenile fish
- *Fishery information* – description of directed fishery, evaluation of fishing effects (by any fishery) on species habitat (summarized from the 2005 EFH EIS, which is incorporated by reference)
- *References* – references in the literature to learn more about species life history and habitat, persons to contact for further information

3.2 Fishing activities that may adversely affect EFH

The fishery effects model was used to evaluate fishing activities that may adversely affect EFH in the 2005 EFH EIS. In Section 9, the report identifies how the various inputs to the model used in the 2005 analysis were compared against information now available. The model inputs include the distribution and intensity of fishing activities, and habitat recovery rates. This should demonstrate whether the impacts analysis from the 2005 EIS is likely to still be valid, or whether it warrants revision.

Additionally, each of the sections reviewing individual species EFH (Sections 4 through 8) includes consideration of whether the changes in fishing activity are likely to result in a change to the conclusions from the 2005 EFH EIS.

3.3 Non-Magnuson-Stevens Act fishing activities that may adversely affect EFH

The effects of non-Magnuson-Stevens Act fishing activities are covered within the discussion of fishing effects on habitat, and the review of the effects of fishing gear types on habitat species. The types of gear used by the non-Magnuson-Stevens Act fisheries in Alaska are discussed in detail in the 2005 EFH EIS, as well as their distribution.

3.4 Non-Fishing activities that may adversely affect EFH

An extensive evaluation of the various non-fishing activities that may adversely affect EFH in Alaska is included in each of the FMPs, along with EFH conservation recommendations to avoid, minimize, or compensate for adverse effects on EFH caused by activities other than fishing. Section 10 reports on the

review of these FMP sections, and identifies whether any changes to the recommendations are merited based on new information.

3.5 Cumulative impacts analysis

The cumulative effects of fishing and non-fishing activities on EFH was considered in the 2005 EFH EIS was considered, but available information was not sufficient to assess how the cumulative effects of fishing and non-fishing activities influence the function of EFH on an ecosystem or watershed scale. No new information is available since the analysis in the EFH EIS to allow the magnitude of the combined effect of all of these activities to be quantified, so the level of concern remains unknown at this point.

3.6 EFH conservation and enhancement recommendations

Habitat conservation and enhancement recommendations address fishing and non-fishing threats to EFH and HAPCs. As part of the evaluation of EFH in 2005, the Council adopted a number of mitigation measures in the fisheries to provide additional protection to EFH. These measures were implemented in 2005, and include the designation of EFH habitat conservation areas and HAPC habitat conservation zones in the Gulf of Alaska and the Aleutian Islands. Additionally, in 2008, habitat conservation areas were implemented in the Bering Sea, and in October 2009 the Council adopted a gear modification for the Bering Sea non-pelagic trawl flatfish fishery in order to reduce adverse impact to bottom habitat. These fishing recommendations for EFH conservation have been implemented by the Council, and are described in Section 9.2. Additionally, stock assessment authors were provided the opportunity to offer EFH conservation recommendations for the Council's consideration, relevant to their species. These are found in the same section. Non-fishing EFH conservation recommendations are reviewed in Section 10.

3.7 Prey species list and any locations

The prey species of each managed species in the FMPs are reviewed in the individual species sections for each FMP, in Sections 4 through 8, and any recommended changes are highlighted in those sections.

3.8 HAPC identification

A description of the Council's HAPC identification process since the last evaluation of EFH in 2005 is described in Section 11. Additionally, stock assessment authors were provided the opportunity to offer HAPC recommendations for the Council's consideration, relevant to their species. These are also included in the same section.

3.9 Research and information needs

Section 12 describes the review of research and information needs for EFH, as well as providing research recommendations for many of the individual FMP species.

3.10 Review EFH every 5 years

The final EFH component is to review EFH every 5 years. This summary report documents the occurrence of this review.

4 EFH descriptions for BSAI Groundfish species

4.1 What are the BSAI groundfish species?

Table 3 lists the species and species complexes for which EFH is currently identified in the BSAI Groundfish FMP, and compares them to the species or species complexes that are assessed in the 2009 SAFE report. In a few cases, there are discrepancies. Shortraker and rougheye rockfish were managed as a complex in 2005, but are now managed separately (in fact, rougheye rockfish is managed as a complex with blackspotted rockfish). The habitat description currently in the FMP for rock sole is actually for southern rock sole, when in fact it is northern rock sole that is assessed in the SAFE report. Addressing these discrepancies is an area of recommended change resulting from this 5-year review.

Table 3 Species or species complexes for which EFH is currently identified in the FMP, compared to species or species complexes that are assessed in the 2009 SAFE report

	Species or complexes for which EFH was identified in BSAI Groundfish FMP in 2005	Species or complexes which are assessed in the 2009 SAFE report
Pollock	pollock	pollock (EBS, AI, Bogoslof)
Pacific cod	pacific cod	pacific cod
Sablefish	sablefish	sablefish
Flatfish	yellowfin sole	yellowfin sole
	greenland turbot	greenland turbot
	arrowtooth flounder	arrowtooth flounder
	rock sole	Northern rock sole
	flathead sole	flathead sole
	alaska plaice	alaska plaice
	rex sole dover sole	other flatfish
Rockfish	Pacific ocean perch	Pacific ocean perch
	northern rockfish	northern rockfish
	shortraker/ rougheye rockfish	shortraker rockfish blackspotted/ rougheye rockfish
	yelloweye rockfish dusky rockfish thornyhead rockfish	other rockfish
Atka mackerel	atka mackerel	atka mackerel
Squid	squid	squid
Other species	octopus	octopus
	sharks	sharks
	sculpins	sculpins
	skates	skates
Forage fish	forage fish complex	
Unspecified species		grenadiers

4.2 Summary of EFH review for individual species changes

The stock assessment author was asked to review the current FMP text relating to EFH for each species or species complex. For each species, the author filled in a worksheet with some general questions about new habitat information available since the 2005 EFH EIS, and recommendations on potential HAPC or EFH conservation recommendations. The author also marked up the existing FMP text with recommended changes or updates. The authors' review for each species is included in Appendix 1, which

is available online at www.alaskafisheries.noaa.gov/npfmc. There are several components in the FMP that relate to EFH for each species:

- EFH description by life history stage, in text and in maps, including an indicator for how much habitat information is known about each life history stage
  - This is the legal description of EFH, based on which EFH consultations for fishing and non-fishing effects on EFH are held as directed by the Magnuson-Stevens Act
- General information about the life history and distribution of the species/complex, the fishery, relevant trophic information, and habitat and biological associations
- A literature section that cites references of where habitat information on the species/complex can be found, and a section listing contact people for more information on the species
- Conclusions from the evaluation of fishing effects on EFH for the species, summarized from the 2005 EFH EIS

Table 4 provides an overall summary of the EFH reviews by species. "Yes" indicates that the author has suggested a substantive change to the text in the identified section. Where the "yes" is combined with shading, this is to indicate that the recommended change has the potential to be a higher priority for the Council. Changes are identified as higher priority if the proposed change has the potential to affect management of the species (for example, there is a change to the EFH description for one or more life history stages, or new information indicates that the evaluation of fishing effects on the species' EFH may merit consideration – see additional discussion in Section 2.2). Low priority changes are those that are relatively minor, and are not likely to affect management of the species at this time (for example, they update general information about the species).

The BSAI Groundfish Plan Team has also reviewed the stock assessment author's recommended changes, and provided recommendations for the SSC and the Council during their November 2009 Plan Team meeting. These recommendations will be available at the December Council meeting, and will be incorporated into this report before it is finalized.

Following the summary table, the major changes recommended to the EFH text for each species are detailed in bulleted form.

Table 4 EFH review of BSAI Groundfish species, with recommended changes to the existing EFH FMP text

KEY: yes = author has recommended an update to the existing FMP text, based on new information
e/c = author has recommended editorial changes or clarifications to the existing FMP text
"–" = no changes to the existing text have been recommended
shading = indicates that these recommended changes may be higher priority, as they may affect management of species

Species	Recommended changes to the FMP text											Worksheet recommendations	
	EFH description			General information							2005 evaluation of fishing effects on EFH		
	text	map	available level of information	tables of associations	life history, gen. distribution	trophic information	biological/ habitat associations	literature	contact person	description of fishery		HAPC[2]	EFH conservation and enhancement
pollock	e/c	–	–	yes	yes	–	–	yes	–	yes	–	–	–
pacific cod	e/c	–	–	–	yes	–	–	yes	yes	yes	–	–	–
sablefish	yes	–	–	yes	yes	yes	–	yes	–	yes	–	yes	yes
yellowfin sole	–	–	–	–	–	–	–	yes	–	–	e/c	–	–
greenland turbot	–	–	–	–	e/c	–	–	yes	–	–	–	–	–
arrowtooth flounder	–	–	–	–	yes	–	–	yes	–	–	e/c	–	–
northern rock sole[3]	e/c	–	–	–	yes	–	–	yes	–	–	e/c	–	–
flathead sole	–	yes	–	yes	yes	–	yes	yes	–	–	e/c	–	–
alaska plaice	–	–	–	–	–	–	–	yes	–	–	e/c	–	–
rex sole	–	–	–	yes	yes	–	yes	yes	–	–	(not in FMP)	–	–
dover sole	Author recommends deleting this EFH description from the BSAI FMP.												
Pacific ocean perch	–	–	–	yes	yes	–	yes	yes	–	yes	–	–	–
northern rockfish	yes	–	yes	yes	yes	e/c	–	yes	–	yes	–	–	–
shortraker rockfish[4]	yes	yes	yes	yes	yes	yes	yes	yes	–	yes	yes	–	–
blackspotted/ rougheye rockfish	yes	yes	yes	yes	yes	yes	yes	yes	–	yes	yes	–	–
yelloweye rockfish	Author recommends deleting this EFH description from the BSAI FMP.												
dusky rockfish	–	–	–	–	e/c	e/c	–	–	e/c	e/c	–	–	–
thornyhead rockfish	–	–	–	–	e/c	e/c		–	–	yes	–	–	–

[2] HAPC and EFH conservation recommendations are described in detail for individual species in Sections 11.3 and 9.2.2.
[3] EFH is currently described for rock sole, not northern rock sole, as assessed in the SAFE report and recommended by this review
[4] EFH is currently described for shortraker/ rougheye rockfish, not shortraker rockfish and blackspotted/ rougheye rockfish, as assessed in the SAFE report, and recommended by this review

Species	Recommended changes to the FMP text											Worksheet recommendations	
	EFH description			General information							2005 evaluation of fishing effects on EFH		
	text	map	available level of information	tables of associations	life history, gen. distribution	trophic information	biological/ habitat associations	literature	contact person	description of fishery		HAPC[2]	EFH conservation and enhancement
atka mackerel	yes	–	yes	yes	yes	yes	yes	yes	–	yes	e/c	–	–
squid	–	–	–	–	–	–	–	–	yes	–	–	–	–
octopus	–	(not in FMP)	–	–	yes	yes	yes	yes	yes	yes	e/c	–	–
sharks	–	(not in FMP)	–	yes	yes	yes	yes	–	–	yes	–	–	–
sculpins	–	–	–	–	yes	–	–	yes	yes	yes	–	–	–
skates	yes	–	yes	yes	–	–	–	yes	yes	–	yes	yes	–
forage fish complex	–	(not in FMP)	–	–	–	–	–	yes	yes	–	–	–	–

Pollock

- clarifications but no substantive changes to EFH description
- update to age at 50% maturity, and general life history
- updated with recent fishery info
- new literature references added
- ongoing research: BSIERP should provide more information for future EFH reviews

Pacific cod

- editorial clarifications to the text in various places
- updates to natural mortality, maturity, and maximum age information
- update to description of the fishery
- updated literature section
- relevant ongoing studies identified: one EFH project and three NPRB projects, studying productivity, habitat utilization, and recruitment dynamics of Pacific cod; climate change and the match-mismatch hypothesis in terms of Pacific cod larval survival; spatio-temporal spawning patterns of Pacific cod; and spawning and migration through a mark-recapture experiment.

Sablefish

- information added to the EFH description for early juveniles, but no changes to the finding of no EFH description determined
- additions to the BSAI general information sections to make consistent with the more comprehensive GOA sections
- minor updates to the timing of the spawning season
- updates to reflect recent fishery information
- updated literature section
- ongoing studies identified: Tagging juvenile sablefish in southeast Alaska with time/depth recording tags to track movements from shallow inshore waters to deeper areas on the slope. Revisited lightly trawled shelf habitat in SE AK to estimate recovery rates of benthic habitat organisms. Mounted substrate nearby corals and sponges to examine recolonization of benthic

organisms in SE AK. Examining the distribution of juvenile sablefish in AFSC trawl surveys (1977-present).

Yellowfin sole

- literature section updated
- fishing effects: change in trawling noted in recent period (increase in nearshore where spawning occurs and early juveniles reside, decrease in mid-shelf), although conclusion is same

Greenland turbot

- editorial clarifications to the text
- literature section updated

Arrowtooth flounder

- update to fecundity information
- literature section updated
- fishing effects: change in trawling noted in recent period (increase in nearshore where early juveniles reside, decrease in mid-shelf), although conclusion is same

Northern rock sole

- update to life history section (*and EFH description also?*) to indicate northern rock sole (northern is over 95% of BS population)
- literature section updated
- fishing effects: change in trawling noted in recent period (increase in nearshore where early juveniles reside, decrease in mid-shelf), although conclusion is same

Flathead sole

- author suggests map of distribution of larvae should be updated with the latest information from the EcoFOCI Ichthyoplankton Information System (IIS)
- updates to age at 50% maturity, spawning behavior, size at metamorphosis
- literature section updated
- fishing effects: updated with SAFE reference, recent stock abundance trajectory

Alaska plaice

- literature section updated
- fishing effects: updated SAFE reference

Rex sole

- updated age and length at 50% maturity, larval timing
- literature section updated

Dover sole

- author recommends deleting; yelloweye rockfish is not a key species in the BSAI, no directed targeting

Pacific ocean perch

- associations table: updated depth association, spawning season
- updates to natural mortality, maximum age
- recent fishery information added
- updated to note associations of juvenile POP with habitat structures

- literature section updated
- ongoing studies identified: EFH projects on juvenile POP habitat utilization, juvenile rockfish habitat utilization, juvenile slope rockfish habitat utilization, habitat specific production of POP in the AI, rockfish abundance and diurnal habitat associations in isolated rocky habitat in the EBS
- note included on fishing effects: that the POP fishery in the AI is spread out more throughout the year. It is not clear how this affects that spatial footprint of the fishery, or how it would affect the impact of fishing upon the habitat

Northern rockfish

- new information for late juvenile associations
- associations table: updated depth associations, spawning season
- updates to natural mortality, maximum age, upper size limit of juveniles
- recent fishery information added
- updated to note associations of juvenile POP with habitat structures
- literature section updated
- ongoing studies identified: EFH projects on juvenile rockfish habitat utilization, juvenile slope rockfish habitat utilization

Shortraker rockfish

- new EFH descriptions as shortraker split out from rougheye; new maps needed, information level on larval life history stage downgraded
- associations table: revised depth and substrate associations, spawning season
- new life history information, trophic information, and habitat / biological associations sections rewritten
- recent fishery information added
- literature section updated
- ongoing studies: several studies on rockfish, but none focused on shortraker
- fishing effects: the POP fishery in the AI is spread out more throughout the year, and this affects the manner in which shortraker are harvested as bycatch. It is not clear how this affects that spatial footprint of the fishery, or how it would affect the impact of fishing upon the habitat.

Blackspotted/rougheye rockfish

- new EFH descriptions as shortraker split out from rougheye; new maps needed, information level on larval life history stage downgraded
- associations table: revised depth and substrate associations, spawning season
- new life history information, trophic information, and habitat / biological associations sections rewritten
- recent fishery information added
- literature section updated
- ongoing studies: several studies on rockfish, but none focused on blackspotted/rougheye
- fishing effects: the POP fishery in the AI is spread out more throughout the year, and this affects the manner in which blackspotted/rougheye are harvested as bycatch. It is not clear how this affects that spatial footprint of the fishery, or how it would affect the impact of fishing upon the habitat. If hard coral provides important habitat, damage to these corals may have negative impact on blackspotted/rougheye.

Yelloweye rockfish

- author recommends deleting; yelloweye rockfish is not a key species in the BSAI, there is no commercial targeting on this species, and the BSAI is not the center of its distribution

Dusky rockfish

- clarification to indicate was once called light dusky rockfish
- editorial clarifications to the text in various places

Thornyhead rockfish

- editorial clarifications to the text in various places
- recent fishery information added

Atka mackerel

- new information available on the distribution of eggs in the GOA (limited, not general, distribution data)
- updates to habitat, biological, and prey associations for various life history stages (depths, substrate, location in water column, community and temperature associations, reproductive traits)
- update to age at 50% maturity, prey information
- recent fishery information added
- literature references added
- minor change to evaluation of fishing effects text to indicate that stock no longer at peak spawning biomass, although biomass is still relatively high

Squid

- contact person updated

Octopus

- updates to predator prey associations
- new life history information, trophic information, and habitat / biological associations sections rewritten
- recent fishery information added
- literature section updated
- ongoing studies identified: doctoral research with E. dofleini growth and development; NPRB project on field studies to document reproductive seasons of E dofleini in Alaska and to develop octopus pot gear and tagging methods; ongoing observer program special project to collect individual weights and sex of octopus; for 2009, will also be testing vitality key for possible discard mortality; proposals for octopus discard mortality studies

Sharks

- updates to depth range, age at 50% maturity, maximum age, spawning season, and predator and prey species (in tables and sections)
- recent fishery information added
- ongoing studies identified: habitat use of spiny dogfish from satellite data

Sculpins

- deleted red irish lord and butterfly as part of complex, added warty sculpins – life history updated
- recent fishery information added
- literature section and contact person updated

Skates

- new information available on location of skate nurseries, affects level of information available on skate egg life history stage
- update to depth association for eggs in table
- recent fishery information added
- updates to literature section, contact person
- evaluation of the effects of fishing has not been done on skate nursery sites; fishing gear that touches the bottom has the potential to impact, but areas are small
- ongoing studies identified: NPRB project on habitat mapping and production estimate of skate nursery sites in the eastern Bering Sea; AFSC tagging of Alaska skates in the EBS to better understand their movement

Forage fish

- some progress on forage fish distribution and habitat, but not sufficient yet to formally describe EFH for forage fishes. One exception is that nearshore areas throughout the BSAI are almost certainly EFH for some forage species, but insufficient data as yet to support that.
- literature section and contact person updated
- ongoing studies identified: AFSC nearshore survey in northern Bristol Bay (capelin and rainbow smelt), but too limited in scope to provide comprehensive EFH information; UAF researchers in Dillingham also working on nearshore projects; BSIERP contains some forage components

5 EFH descriptions for GOA Groundfish species

5.1 What are the GOA groundfish species?

Table 5 lists the species and species complexes for which EFH is currently identified in the GOA Groundfish FMP, and compares them to the species or species complexes that are assessed in the 2009 SAFE report. In a few cases, there are discrepancies. Shortraker and rougheye rockfish were managed as a complex in 2005, but are now managed separately (in fact, rougheye rockfish is managed as a complex with blackspotted rockfish). The habitat description currently in the FMP for rock sole is actually for southern rock sole, and in fact both northern and southern rock sole are the major species in the shallow water flatfish complex that is assessed in the SAFE report. Addressing these discrepancies is an area of recommended change resulting from this 5-year review.

Table 5 Species or species complexes for which EFH is currently identified in the FMP, compared to species or species complexes that are assessed in the 2009 SAFE report

	Species or complexes for which EFH was identified in GOA Groundfish FMP in 2005	Species or complexes which are assessed in 2009 SAFE report
Pollock	pollock	pollock
Pacific cod	pacific cod	pacific cod
Sablefish	sablefish	sablefish
Flatfish	yellowfin sole rock sole Alaska plaice	shallow water flatfish
	dover sole greenland turbot	deep water flatfish
	rex sole	rex sole
	arrowtooth flounder	arrowtooth flounder
	flathead sole	flathead sole
Rockfish	Pacific ocean perch	Pacific ocean perch
	northern rockfish	northern rockfish
	shortraker/ rougheye rockfish	shortraker/ other slope rockfish blackspotted and rougheye rockfish
	dusky rockfish	pelagic shelf rockfish
	yelloweye rockfish	demersal shelf rockfish
	thornyhead rockfish	thornyhead rockfish
Atka mackerel	atka mackerel	atka mackerel
Skates	skates	skates
Other species	squid	squid
	octopus	octopus
	sharks	sharks
	sculpins	sculpins
Forage fish	forage fish complex	
Unspecified species		grenadiers

5.2 Summary of EFH review for individual species changes

The stock assessment author was asked to review the current FMP text relating to EFH for each species or species complex. For each species, the author filled in a worksheet with some general questions about new habitat information available since the 2005 EFH EIS, and recommendations on potential HAPC or EFH conservation recommendations. The author also marked up the existing FMP text with

recommended changes or updates. The authors' review for each species is included in Appendix 1, which is available online at www.alaskafisheries.noaa.gov/npfmc. There are several components in the FMP that relate to EFH for each species:

- EFH description by life history stage, in text and in maps, including an indicator for how much habitat information is known about each life history stage
  - This is the legal description of EFH, based on which EFH consultations for fishing and non-fishing effects on EFH are held as directed by the Magnuson-Stevens Act
- General information about the life history and distribution of the species/complex, the fishery, relevant trophic information, and habitat and biological associations
- A literature section that cites references of where habitat information on the species/complex can be found, and a section listing contact people for more information on the species
- Conclusions from the evaluation of fishing effects on EFH for the species, summarized from the 2005 EFH EIS

Table 6 provides an overall summary of the EFH reviews by species. "Yes" indicates that the author has suggested a substantive change to the text in the identified section. Where the "yes" is combined with shading, this is to indicate that the recommended change has the potential to be a higher priority for the Council. Changes are identified as higher priority if the proposed change has the potential to affect management of the species (for example, there is a change to the EFH description for one or more life history stages, or new information indicates that the evaluation of fishing effects on the species' EFH may merit consideration – see additional discussion in Section 2.2). Low priority changes are those that are relatively minor, and are not likely to affect management of the species at this time (for example, they update general information about the species).

The GOA Groundfish Plan Team has also reviewed the stock assessment author's recommended changes, and provided recommendations for the SSC and the Council during their November 2009 Plan Team meeting. These recommendations will be available at the December Council meeting, and will be incorporated into this report before it is finalized.

Following the summary table, the major changes recommended to the EFH text for each species are detailed in bulleted form.

Table 6 EFH review of GOA Groundfish species, with recommended changes to the existing EFH FMP text

KEY: yes = author has recommended an update to the existing FMP text, based on new information
e/c = author has recommended editorial changes or clarifications to the existing FMP text
"–" = no changes to the existing text have been recommended
shading = indicates that these recommended changes may be higher priority, as they may affect management of species

Species	Recommended changes to the FMP text											Worksheet recommendations	
	EFH description			General information							2005 evaluation of fishing effects on EFH		
	text	map	available level of information	tables of associations	life history, gen. distribution	trophic information	biological/ habitat associations	literature	contact person	description of fishery		HAPC	EFH conservation and enhancement
pollock	e/c	–	–	no	e/c	–	–	yes	–	yes	–	–	–
pacific cod	–	–	–	–	yes	–	–	yes	–	yes	–	–	–
sablefish	yes	–	–	yes	e/c	yes	–	yes	yes	yes	e/c	yes	yes
yellowfin sole	Author recommends deleting this EFH description from the GOA Groundfish FMP.												
Northern rock sole[5]													
Southern rock sole													
Alaska plaice	Author recommends deleting this EFH description from the GOA Groundfish FMP.												
dover sole	–	yes	–	yes	yes	yes	yes	yes	–	–	–	–	–
Greenland turbot	Author recommends deleting this EFH description from the GOA Groundfish FMP.												
rex sole	–	yes	–	yes	yes	yes	yes	yes	–	–	–	–	–
arrowtooth flounder	–	–	–	–	yes	–	–	yes	(not in FMP)	–	e/c	–	–
flathead sole	–	yes	–	yes	yes	yes	yes	yes	–	yes	–	–	–
Pacific ocean perch	–	–	–	yes	yes	–	yes	yes	–	yes	–	–	–
northern rockfish	yes	–	yes	yes	yes	yes	yes	yes	e/c	yes	e/c	–	–
shortraker rockfish[6]	yes	–	yes	yes	yes	yes	yes	yes	–	yes	yes	–	–
blackspotted/ rougheye rockfish	yes	yes	yes	yes	yes	yes	yes	yes	–	yes	e/c	–	–
dusky rockfish	–	–	–	e/c	e/c	–	–	yes	–	yes	–	–	–
yelloweye rockfish	yes	yes	yes	yes	yes	–	yes	yes	–	e/c	(not in FMP)	–	–
thornyhead rockfish	yes	–	yes	yes	yes	yes	yes	yes	–	yes	–	–	–

[5] EFH is currently described for rock sole, not northern rock sole, as assessed in the SAFE report and recommended by this review.
[6] EFH is currently described for shortraker/ rougheye rockfish, not shortraker rockfish and blackspotted/ rougheye rockfish, as assessed in the SAFE report, and recommended by this review

Species	Recommended changes to the FMP text											Worksheet recommendations	
	EFH description			General information									
	text	map	available level of information	tables of associations	life history, gen. distribution	trophic information	biological/ habitat associations	literature	contact person	description of fishery	2005 evaluation of fishing effects on EFH	HAPC	EFH conservation and enhancement
atka mackerel	yes	–	yes	yes	yes	yes	yes	yes	–	yes	e/c	–	–
skates	–	–	–	–	yes	–	e/c	yes	yes	yes	–	–	–
octopus	–	(not in FMP)	–	yes	yes	yes	yes	yes	yes	yes	e/c	–	–
sharks	–	(not in FMP)	–	yes	yes	yes	yes	yes	–	yes	–	–	–
sculpins	–	–	–	–	–	–	–	yes	yes	yes	–	–	–
squid	–	–	–	–	–	–	–	–	yes	–	–	–	–
forage fish complex	–	(not in FMP)	–	–	–	–	–	yes	yes	yes	–	–	–

Pollock

- clarifications but no substantive changes to EFH description
- update to age at 50% maturity, and general life history
- updated with recent fishery info
- new literature references added

Pacific cod

- editorial clarifications to the text in various places
- updates to natural mortality, maturity, and maximum age information
- update to description of the fishery
- updated literature section
- relevant ongoing studies identified: one EFH project and three NPRB projects, studying productivity, habitat utilization, and recruitment dynamics of Pacific cod; climate change and the match-mismatch hypothesis in terms of Pacific cod larval survival; spatio-temporal spawning patterns of Pacific cod; and spawning and migration through a mark-recapture experiment.

Sablefish

- information added to the EFH description for early juveniles, but no changes to the finding of no EFH description determined
- additions to the BSAI general information sections to make consistent with the more comprehensive GOA sections
- minor updates to the timing of the spawning season
- updates to reflect recent fishery information
- updated literature section
- ongoing studies identified: Tagging juvenile sablefish in southeast Alaska with time/depth recording tags to track movements from shallow inshore waters to deeper areas on the slope. Revisited lightly trawled shelf habitat in SE AK to estimate recovery rates of benthic habitat organisms. Mounted substrate nearby corals and sponges to examine recolonization of benthic organisms in SE AK. Examining the distribution of juvenile sablefish in AFSC trawl surveys (1977-present).

Yellowfin sole

- author recommends deleting; yellowfin sole is not a key species in the BSAI, no directed targeting on this species in the GOA, and the GOA is not the center of its distribution

Rock sole (northern and southern)

- Review pending. EFH description currently written for rock sole generically; revision will separate habitat description to distinguish northern and southern rock sole

Alaska plaice

- author recommends deleting; Alaska plaice is not a key species in the GOA, it is not a direct target, main center of distribution is the Bering Sea

Dover sole

- author suggests map of distribution of larvae should be updated with the latest information from the EcoFOCI Ichthyoplankton Information System (IIS)
- updates to biological and predator-prey associations for dover sole life history stages (female age at 50% and 100% maturity, spawning season, predators, prey) in tables and sections
- literature references updated

Greenland turbot

- author recommends deleting; Greenland turbot is not a key species in the GOA, it is not a direct target, main center of distribution is the Bering Sea

Rex sole

- author suggests map of distribution of larvae should be updated with the latest information from the EcoFOCI Ichthyoplankton Information System (IIS)
- updates to prey association table and revised trophic information section
- update to life history and general distribution information (spawning season, larval duration, female maturity, natural mortality rate
- literature references updated

Arrowtooth flounder

- updates to natural mortality
- literature references updated (also in fishing effects section)

Flathead sole

- author suggests map of distribution of larvae should be updated with the latest information from the EcoFOCI Ichthyoplankton Information System (IIS)
- updates to habitat, biological, and predator-prey associations for flathead sole life history stages (substrate, female age at 50% maturity, spawning season, predators, prey) in tables and sections
- description of fishery updated
- literature references updated
- acknowledgment that more information on early juvenile distribution exists in the GOA than in the BSAI, but insufficient to change level of information for this life stage from "insufficient" to "sufficient"

Pacific ocean perch

- updates to depth, substrate, age at female 100% maturity, predator and prey species in tables and sections

- recent fishery information added
- literature references added
- fishing effects: no change required; the Central GOA Rockfish Pilot program has the potential effect of spreading effort in time and space and the increase in pelagic trawling will likely decrease effects of fishing
- ongoing studies identified: EFH habitat studies being conducted at Little Port Walter Field station on POP juveniles; several submarine dive studies that will be published in the future related to Pacific ocean perch habitat and catchability

Northern rockfish

- clarifications to EFH descriptions, and refinement of depths for adult life history stage
- updates to spawning season, predator in tables
- update to life history information, including size at 50% maturity, maximum age; tropic information; and larval and juvenile associations
- recent fishery information added
- literature references added
- fishing effects: no change required, although the spatial distribution of the fishery has changed since the original analysis. When the original EFH EIS for GOA northern rockfish was prepared, fishery catches were described as being particularly concentrated in one relatively small area, the "Snakehead" south of Kodiak Island. More recent catch data show this area no longer produces large catches and that localized depletion likely occurred here as a result of the heavy fishing effort in the 1990s. Fishing is now more dispersed over other fishing grounds, which is probably beneficial to the habitat of these fish. In addition, the Central GOA Rockfish Pilot Program, which includes northern rockfish, has the potential effect of spreading effort in space and time and also will likely decrease the effects of fishing.

Shortraker rockfish

- new EFH descriptions as shortraker split out from rougheye; new maps needed, information level on larval life history stage downgraded as, in comparison with rougheye, much less is known about juvenile shortrakers
- associations table: rewritten for depth, water column, substrate associations, spawning season
- new life history information, trophic information, and habitat / biological associations sections rewritten
- recent fishery information added
- literature references added
- fishing effects: the Rockfish Pilot Program appears to have spread fishery effort in space and time, and this will likely decrease the effects of fishing on the bottom. Section edited to excise rougheye.

Rougheye/blackspotted rockfish

- new EFH descriptions as shortraker removed and two distinct species of rougheye identified; maps for larvae ok, but new adult map needed; information level on larval life history stage downgraded as, in comparison with rougheye, much less is known about juvenile shortrakers
- associations table: rewritten for depth, water column, substrate associations, age at 50% maturity, spawning season, predator and prey
- new life history information, trophic information, and habitat / biological associations sections rewritten
- recent fishery information added
- literature references added

- ongoing studies: larval rougheye rockfish identification; 2009 NMFS trawl survey collected data on both rougheye and blackspotted rockfish to evaluate new identification techniques and potential population distribution differences
- fishing effects: the Rockfish Pilot Program has the potential effect of spreading fishery effort in space and time, and the increase in pelagic trawling will likely decrease the effects of fishing. Section edited to excise shortraker and add blackspotted.

Dusky rockfish

- update to life history information, including size at 50% maturity, maximum age; tropic information; and larval and juvenile associations
- editorial clarifications in table to remove 'light' before dusky; implementation date of dark rockfish removal corrected
- recent fishery information added
- literature references added
- fishing effects: the Rockfish Pilot Program has the potential effect of spreading fishery effort in space and time, and the increase in pelagic trawling will likely decrease the effects of fishing.

Yelloweye rockfish

- EFH description for early juveniles added, and information level updated
- update to larval map recommended to indicate presence of larval rockfish in 640 and 650
- updates to depth, substrate, structure, community associations; age at 50% maturity, maximum age, egg development, prey in tables and sections
- editorial clarifications to fishery text
- literature references added
- ongoing studies identified: ADFG research for collecting density information for the DSR stock assessment; also NMFS studies on rockfish larvae

Thornyhead rockfish

- EFH description for early juveniles added, and information level updated
- update to substrate, age at 50% maturity, fertilization, spawning season, predator and prey in tables and sections
- recent fishery information added
- literature references added

Atka mackerel

- new information available on the distribution of eggs in the GOA (limited, not general, distribution data)
- updates to habitat, biological, and prey associations for various life history stages (depths, substrate, location in water column, community and temperature associations, reproductive traits)
- update to age at 50% maturity, prey information
- recent fishery information added
- literature references added
- minor change to evaluation of fishing effects text to indicate that stock no longer at peak spawning biomass, although biomass is still relatively high

Skates

- added depth distribution information for skate species in life history section
- recent fishery information added
- updated SAFE reference

Octopus

- updates to predator prey associations
- new life history information, trophic information, and habitat / biological associations sections rewritten
- recent fishery information added
- literature section updated
- ongoing studies identified: doctoral research with E. dofleini growth and development; NPRB project on field studies to document reproductive seasons of E dofleini in Alaska and to develop octopus pot gear and tagging methods; ongoing observer program special project to collect individual weights and sex of octopus; for 2009, will also be testing vitality key for possible discard mortality; proposals for octopus discard mortality studies

Sharks

- updates to depth range, age at 50% maturity, maximum age, spawning season, and predator and prey species (in tables and sections)
- recent fishery information added
- ongoing studies identified: habitat use of spiny dogfish from satellite data

Sculpins

- recent fishery information added
- literature section and contact person updated

Squid

- contact person updated

Forage fish

- some progress on forage fish distribution and habitat (more than in the BSAI), but not sufficient yet to formally describe EFH for forage fishes. Nearshore areas in general are likely to be EFH for some forage species for at least part of the year.
- Recent fishery information for eulachon added
- literature section and contact person updated
- ongoing studies identified: there is a lot of interest in GOA forage fishes. The NPRB is currently creating a GOA integrated ecosystem research project, and forage species will be a primary focus of this work. The project is slated to run from 2010-2014 and will probably yield some useful results for the next 5-year review

6 EFH descriptions for BSAI king and Tanner crab species

6.1 What are the BSAI crab species?

The managed species identified in the BSAI Crab FMP are the following:

- red king crab
- blue king crab
- golden king crab
- scarlet king crab
- Tanner crab
- Snow crab
- Grooved tanner crab
- Triangle tanner crab

6.2 Summary of EFH review for individual species changes

The stock assessment authors were asked to review the current FMP text relating to EFH for each species or species complex. For each species, the author was asked to fill in a worksheet with some general questions about new habitat information available since the 2005 EFH EIS, and recommendations on potential HAPC or EFH conservation recommendations. The author was also asked to mark up the existing FMP text with recommended changes or updates. There are several components in the FMP that relate to EFH for each species:

- EFH description by life history stage, in text and in maps, including an indicator for how much habitat information is known about each life history stage
  - This is the legal description of EFH, based on which EFH consultations for fishing and non-fishing effects on EFH are held as directed by the Magnuson-Stevens Act
- General information about the life history and distribution of the species/complex, the fishery, relevant trophic information, and habitat and biological associations
- A literature section that cites references of where habitat information on the species/complex can be found, and a section listing contact people for more information on the species
- Conclusions from the evaluation of fishing effects on EFH for the species, summarized from the 2005 EFH EIS

The species reviews for the BSAI Crab FMP will be completed in February 2010, and will be discussed at the BSAI Crab Plan Team in late March 2010. They will be included in the final version of this report for the April 2010 Council meeting.

7 EFH descriptions for Scallop FMP species

7.1 What are the Scallop FMP species?

There is only one managed species identified in the Scallop FMP: weathervane scallops.

7.2 Summary of EFH review for individual species changes

The stock assessment author was asked to review the current FMP text relating to EFH for each species or species complex. For each species, the author was asked to fill in a worksheet with some general questions about new habitat information available since the 2005 EFH EIS, and recommendations on potential HAPC or EFH conservation recommendations. The author was also asked to mark up the existing FMP text with recommended changes or updates. There are several components in the FMP that relate to EFH for each species:

- EFH description by life history stage, in text and in maps, including an indicator for how much habitat information is known about each life history stage
  - This is the legal description of EFH, based on which EFH consultations for fishing and non-fishing effects on EFH are held as directed by the Magnuson-Stevens Act
- General information about the life history and distribution of the species/complex, the fishery, relevant trophic information, and habitat and biological associations
- A literature section that cites references of where habitat information on the species/complex can be found, and a section listing contact people for more information on the species
- Conclusions from the evaluation of fishing effects on EFH for the species, summarized from the 2005 EFH EIS

The species review for the Scallop FMP will be completed by February 2010, and will be discussed at the Scallop Plan Team in early March 2010. It will be included in the final version of this report for the April 2010 Council meeting.

8 EFH descriptions for Salmon FMP species

8.1 What are the Salmon FMP species?

The managed species identified in the Salmon FMP are the following:

- Chinook salmon
- Chum salmon
- Coho salmon
- Pink salmon
- Sockeye salmon

8.2 Summary of EFH review for individual species changes

Because management of salmon is deferred to the State of Alaska, and there is no Council Salmon Plan Team, NMFS salmon experts were asked to provide the EFH review for salmon. They were asked to review the current FMP text relating to EFH for each species or species complex. For each species, staff were asked to fill in a worksheet with some general questions about new habitat information available since the 2005 EFH EIS, and recommendations on potential HAPC or EFH conservation recommendations. They were also asked to mark up the existing FMP text with recommended changes or updates. There are several components in the FMP that relate to EFH for each species:

- EFH description by life history stage, in text and in maps, including an indicator for how much habitat information is known about each life history stage
  - This is the legal description of EFH, based on which EFH consultations for fishing and non-fishing effects on EFH are held as directed by the Magnuson-Stevens Act
- General information about the life history and distribution of the species/complex, the fishery, relevant trophic information, and habitat and biological associations
- A literature section that cites references of where habitat information on the species/complex can be found, and a section listing contact people for more information on the species
- Conclusions from the evaluation of fishing effects on EFH for the species, summarized from the 2005 EFH EIS

The species reviews for the Salmon FMP will be included in the final version of this report for the April 2010 Council meeting.

9 Fishing effects on EFH

9.1 Compilation of new information affecting input parameters to the analysis of fishing effects on EFH

In the previous analysis of the effects of fishing on EFH, application of a model provided spatial distributions of an index of effects on several classes of habitat features. These distributions were provided to experts on each managed species to support their assessment of whether such effects were likely to impact life–history processes in a way that indicated an adverse change to EFH. The specific index (Fujioka 2006), the Long-term effect index (LEI), estimated the eventual proportional reduction of habitat features from a theoretical unaffected habitat state, should the recent pattern of fishing intensities be continued indefinitely. Inputs to this model included: the distribution of fishing intensity for each gear type, spatial habitat classifications, classification of habitat features, habitat- and feature-specific recovery rates, and gear- and habitat-specific sensitivity (proportional reduction by one gear exposure) of habitat features.

The purpose of this document is to review research that has occurred since the prior analysis to see how knowledge of any of these elements of the analysis have changed and whether those changes might substantially affect our perception of the effects of fishing on EFH for Alaska managed species.

9.1.1 Fishing Intensity

The spatial structure of LEI values was principally due to the distribution of fishing effort, as it was the only factor that varied on a scale smaller than broad habitat categories. The original analysis calculated fishing intensity distributions from observer data for the most recent 5 year period available (1998-2002). Non-pelagic trawling was the gear type with the highest LEI values evaluated in the EFH EIS. Consequently, for this review, staff has concentrated on non-pelagic trawling intensity. Fishing intensity distributions for the periods 2003-2007 and 1993-1997 are being calculated. A preliminary comparison in the Bering Sea of the EFH EIS period to the most recent period was made available to stock assessment authors for completing their review. Comparisons for the Bering Sea, Aleutian Islands, and the Gulf of Alaska will be included in the next draft of this summary report, currently scheduled for March 2010.

It should be noted that some of the changes to fishing distribution result from Council management actions. Since the EFH EIS analysis, the Council has closed a number of areas to protect habitat. These actions are described in Section 9.2.1. Additionally, the rockfish pilot program in the Central Gulf of Alaska has also changed the distribution of effort in the rockfish fisheries, which prior to the implementation of the program were almost exclusively conducted with non-pelagic trawl gear.

9.1.2 Habitat categorization

The original analysis categorized Bering Sea habitat types primarily by sediment types, sand, mixed sand and mud, and mud. Additional categories were added for the slope below 200 m depth and the northern shelf. An analysis of invertebrate catches from the eastern Bering Sea crab/groundfish survey from 1982 to 2002 (Yeung and McConnaughey 2006) found spatial classifications based on the invertebrate data that matched fairly closely with the broad classifications used in the prior EFH analysis. While considerable interannual variation was detected, mainly due to responses of the more mobile invertebrates, this underlying pattern was persistent.

Lacking comprehensive sediment distribution data, the ability to classify habitats in the Aleutian Islands and Gulf of Alaska was highly constrained. Some additional information has been generated in both areas

since then. In the Gulf of Alaska, Michael Martin and Mark Zimmerman have been analyzing the ability of the GOA bottom trawl survey to trawl at randomly selected sites and the catch of invertebrates in an auxiliary net, designed to sample benthic epifauna. This is leading toward a spatial description of the locations of rough/hard bottom and abundance of living structure organisms. In the Aleutians, a multibeam sonar survey, with submarine and ROV dives for ground-truthing, along 17 strips across the Aleutian Islands (Heifetz et al. 2007) has provided new information on the proportions of different substrate types in that central Aleutians. As the sampled strips are far from contiguous, they fall short the coverage needed for comprehensive classification.

Woodby et al. (ms) also analyzed coral distributions to better predict their areas of concentration. They found relationships to depth, slope and roughness of the terrain, but were unable to assess other factors considered likely to affect corals, such as current flows.

9.1.3 Modeling Methods

A number of recent studies have addressed the modeling and analysis of the effects of fishing on seafloor habitats. First, Fujioka (2006) published the model used in the prior EFH analysis. That paper also addressed a number of alternative applications for the model, including ways to refine closures to limit reduced habitat benefits due to redistribution of fishing effort. Hiddink et al. (2006) developed a model that included effects of fishing on the size composition of living habitat features, as well as their abundance. McConnaughey et al. (2005) demonstrated size differences for Bering Sea invertrbrates between adjacent untrawled and heavily-trawled areas. However, requirements for both size composition and size selectivity of habitat features would make the Hiddink et al (2006) model difficult to implement for Alaska fisheries. Hiddink et al. (2007) described an application of this model to the North Sea.

The Northeast Region has started their 5-year EFH review. Their analysis approach was described in a draft released in March 2009. This analysis method considers parallel factors to those considered in the Alaska EFH analysis. Key differences include that: 1) all quantitative values are reduced to scores (usually 0-2 or 0-3) before being combined into overall scores, and 2) that assessing the habitat requirements of managed species are part of the same process. This later factor contrasts to the Alaska analysis, which was divided into the two stages of distribution of effects on habitat features in a numerical model and expert assessment of the consequences of those effects on the managed species.

9.1.4 Sensitivity

While a range of sensitivity studies provided rate estimates for the EFH analysis, there was certainly need for more information that was directly relevant to the gears and environments of Alaska waters. Some work has been completed to fill that need.

The 2001-2002 TRAWLEX project was a two-year effort (2001-2002) to evaluate the impact of bottom trawling on soft-bottom benthic habitats and to describe the recovery process (R. McConnaughey, pers. comm.). The experiment used a Before-After Control-Impact (BACI) experimental design with six pairs of experimental and control trawl corridors each 100 m wide and 21 km long, located in the Crab and Halibut Protection Zone 1 (management area 512 in Bristol Bay). The study area has strong tidal currents, a generally level and compacted mud-sand seafloor with depths ranging from 40 to 80 m. Potential impacts were studied by fishing a two-seam Aleutian combination otter trawl with a 14" diameter footrope in a previously untrawled area of Bristol Bay, making four complete passes over each experimental corridor in alternating directions. Epifauna were randomly sampled at preselected stations before and after commercial trawling with a NMFS 83/112 bottom trawl that was modified to improve capture and retention of small macroinvertebrates.

Overall, taxon biomasses (kg/ha) in the experimental corridors were not significantly different than the corresponding biomasses in the control corridors in 21 of the 24 taxa examined (alpha = 0.10). The situation was unchanged one year later, ruling out the possibility of delayed mortality. Of particular interest for the EFH analysis was that the dominant structure-forming invertebrate in the area, *Boltenia*, had one of the statistically significant reductions (-27%). The high-profile shape of this ascidian makes it particularly vulnerable to trawl damage or removal and it should have been well sampled by the sampling trawl. Assuming removal of equal proportions of remaining animals with each trawl pass, this result yields a removal per exposure of 7.5%, in the lower part of the range of sensitivity rates used in the prior analysis for living structure features on soft substrates (1 – 21%, with a central estimate of 15%). It is also notable that the effect was not detectable after one year, supporting the relatively fast recovery times used in the model for those organisms.

Another relevant study was completed on cobble substrates with similar gear on Newfoundland's Grand Banks (Henry et al. 2006). They trawled an experimental corridor 12 times annually for three years. Results were summarized: "No cumulative effects from the pulsed trawling were detected, and colonial species assemblages on control and impacted lines were similar at the end of the experiment." While some of the tests for trawling effects were statistically weak, the authors concluded that it was certain that any effects were small relative to natural inter-annual change. In comparing this outcome to results from Alaska (e.g., Freese et al. 1999) the authors' comment that: "Unlike sessile epifaunal assemblages dominated by erect, rigid megabenthic sponges and corals, the colonial epifauna in the study area was dominated by flexible *Dendrobeania* spp. (Bryozoa), a small epizoic sponge, *Scypha ciliata*, and several hydroids, which may generally be less vulnerable to immediate removal than more rigid species." is particularly relevant. While their site had not been subject to trawling for 10 years, that may not have been long enough to recover to some of the later successional stages that may be present in some of the Alaska sites with cobble substrates. Increases in abundance of some sessile epifauna at control sites provided additional evidence of continuing recovery.

A study by AFSC Conservation Engineering to test trawl modifications to reduce effects on living-structure animals collected rates of damage for sea whips, basket stars and sponges after exposure to each component of a typical Alaska bottom trawl (C. Rose, pers. comm.). While these have not been converted into average damage rates across the trawl's swath, that could be done. Another problem with interpreting these data is converting damage rates to reductions in structure. While the Malecha and Stone (2009 – see below) study provides one-year outcomes for damaged (fractured or dislodged) sea whips, no such relationship is available for the other species.

An extensive, long-term study of the effects of fishing on emergent, habitat-forming invertebrates of Australia's Great Barrier Reef (Pitcher 2008) provided a wide range of effect and recovery estimates for animals from similar taxonomic groups to those found in hard-bottom habitats off of Alaska. While sensitivity rates to trawling were not directly applicable to Alaska fisheries as the impact gear was a shrimp trawl, the overall negligible effects observed were notable.

Henry et al.(2003) found that *Gersemia*, a soft coral found on the unconsolidated sediment area covering much of the Bering Sea shelf, were not extremely sensitive to simulated trawling exposures. Colonies crushed every two weeks over two months did not behave differently than control colonies. *Gersemia* responded by immediate retraction, which limited damage.

Several reviews and meta-analyses of the effects of fishing on living habitat features have been published since the EFH analysis Pitcher et al 2009, Lokkeborg 2005, Kaiser et al 2006. While analysis method and conclusion details and emphases varied between these studies, their conclusion on sensitivity broadly support the rates used in the EFH analysis and the variation of those rates relative to gears, taxa and

habitats. This is not altogether surprising as the study lists analyzed are almost identical and nearly all of those studies were considered in the EFH analysis.

9.1.5 Recovery

Recovery rates were among the hardest parameters to find values for from the literature, particularly for the living structure animals that the EFH analysis identified as the most vulnerable habitat feature. Some progress has been made, and two research projects have been started to fill more of this gap.

Malecha and Stone (2009) studied the recovery and delayed mortality of seawhips after simulated trawling exposure. They found that essentially all seawhips that were either dislodged or had fractured axial rods lost all tissue within a year, while tissue damage to lightly abraded animals mostly healed over the same period. Surprisingly, half of the dislodged seawhips were able to right themselves quickly, however nearly all became dislodged again (Though authors cite a possibility that attachment of anchors to mark individuals may have influenced this result). Interaction with predation by nudibranchs was involved in much of the tissue loss observed, as dislodgement or fracture made parts of the seawhips accessible to these predators that would not otherwise have been. Recovery due to healing was only effective for animals that remained erect. The study did not address recovery by reproduction, likely a much slower process.

Similar healing results were found for laboratory experiments that simulated crushing of *Gersimia rubiformes* by a trawl (Hennry et al. 2003). Like sea whips, this soft coral is a species that is commonly found on the unconsolidated sediments of the Bering Sea shelf, where trawl intensities can be much higher than in the hard bottom habitats of most corals. Healing of damaged tissues started in weeks, with new tissue covering the wounded surface by the first month. While disturbed colonies released daughter colonies, the released polyps did not survive, so may have represented a premature release of propagules that could inhibit normal reproductive rates and hence recovery.

Scientists from the Auke Bay Laboratory aboard the chartered ADFG research vessel R/V Medeia conducted submersible operations during the period August 5 through August 14, 2009 (Pat Malecha, pers. comm.). The submersible Delta was deployed in the eastern Gulf of Alaska offshore of Salisbury Sound. Video transects were conducted on the seafloor of the continental slope to document moderate- to long-term damage and recovery of sponges and sea whips 13 years after the pass of a single trawl. Persistent evidence of trawling was observed including trawl furrows on the seafloor and damaged and displaced sponges. Video analysis is scheduled to occur this winter. This study follows up on previous work that documented immediate effects (Freese et al. 1999) and one year post-trawling effects (Freese 2003).

Scientists from the Auke Bay Laboratory aboard the chartered US Fish and Wildlife research vessel R/V Curlew conducted scuba operations during a period from August 17 through August 22, 2009 (Pat Malecha, pers. comm.). The Curlew transported scientific personnel and served as a tender vessel in Middle Arm, Kelp Bay, Southeast Alaska. This project is planned for a minimum duration of two years and will document damage, recovery, and recruitment of the gorgonian coral *Calcigorgia spiculifera*. In 2009, scuba divers installed settlement substrates designed to capture new coral recruits and subjected a selection of coral colonies to simulated trawl disturbances. Video observations of the trawled colonies were recorded pre- and post-treatment. Divers will return in the spring and late summer of 2010 to evaluate recruitment and survival and recovery of the damaged coral colonies.

An extensive, long-term study of the effects of fishing on emergent, habitat-forming invertebrates of Australia's Great Barrier Reef (Pitcher 2008) provided a wide range of effect and recovery estimates for animals from similar taxonomic groups to those found in hard-bottom habitats off of Alaska. Recovery

rates varied from rapid for some soft corals and ascidians, moderate for a range of sponges, gorgonians and hard corals, to slow for some other sponges and gorgonians. While the applicability of specific rates to the very different environmental and ecological conditions from Alaska waters may be limited, the relative recovery rates of different taxa may be relevant.

9.1.6 Corals

The effects of fishing analysis noted that the LEI results required separate consideration for particularly long-lived and slow growing living structure, exemplified by corals in hard bottom areas. Even relatively low fishing intensities still eventually reduced corals to very low levels in exposed areas. This resulted in this class of living structure being treated separately for those with faster recovery rates. Research on coral distribution and fishing impacts have moved forward, with studies by Stone (2006), expanded in Heifitz et al. (in press). These found coral ubiquitous through transects across the central Aleutians and damage to these correlated to bottom trawling effort. Damage was also noted in depths with little trawling effort, where longline and pot fisheries were the only fishing effort contacting the seafloor. Damage from those gears was harder to identify and attribute due to the less continuous pattern of their effects.

These studies confirm that bottom trawling damages corals and that such damage continues in the areas left open by the Council's action to protect EFH in the Aleutians. Their observations on effects of pot and longline gear on corals are some of the only such information available. While such effects were clearly less identifiable and intensive than damage due to trawling, the slow recovery rates of coral leave them an area needing further assessment.

9.2 EFH conservation recommendations for fishing threats to EFH and HAPC

The 2005 EFH EIS concluded that fisheries do have long term effects on habitat, but these impacts were determined to be minimal and not detrimental to fish populations or their habitats. The analysis found no indication that continued fishing activities at the current rate and intensity would alter the capacity of EFH to support healthy populations of managed species over the long term. Nevertheless, the Council acknowledged that considerable scientific uncertainty remains regarding the consequences of habitat alteration for the sustained productivity of managed species. Consequently, the Council has adopted a number of management measures designed to reduce adverse impacts to habitat, both in conjunction with the 2005 EFH EIS, and more recently. These actions are described in Section 9.2.1. Section 9.2.2 identifies suggestions for EFH conservation recommendations that resulted from the EFH individual species reviews.

9.2.1 EFH conservation actions taken in conjunction with and since the 2005 EFH EIS

Gulf of Alaska and Aleutian Islands habitat conservation measures – implemented in 2006

<u>EFH mitigation actions</u>

In February 2005, the Council adopted several new closure areas to conserve EFH. To minimize the effects of fishing on EFH, and more specifically to address concerns about the impacts of bottom trawling on benthic habitat (particularly on coral communities) in the Aleutian Islands, the Council took action to prohibit all bottom trawling in the Aleutians, except in small discrete "open" areas. Over 95% of the management area is closed to bottom trawling (277,100 nm^2). Additionally, six Habitat Conservation Zones with especially high density coral and sponge habitat were closed to all bottom-contact fishing gear (longlines, pots, trawls). These "coral garden" areas, which total 110 nm^2, are essentially marine reserves.

To improve monitoring and enforcement of the Aleutian Island closures, a vessel monitoring system is required for all fishing vessels in the Aleutian management area.

In the Gulf of Alaska, bottom trawling for all groundfish species is also prohibited in 10 designated areas along the continental shelf. The GOA Slope Habitat Conservation Areas, which are thought to contain high relief bottom and coral communities, total 2,086 nm^2.

Habitat areas of particular concern

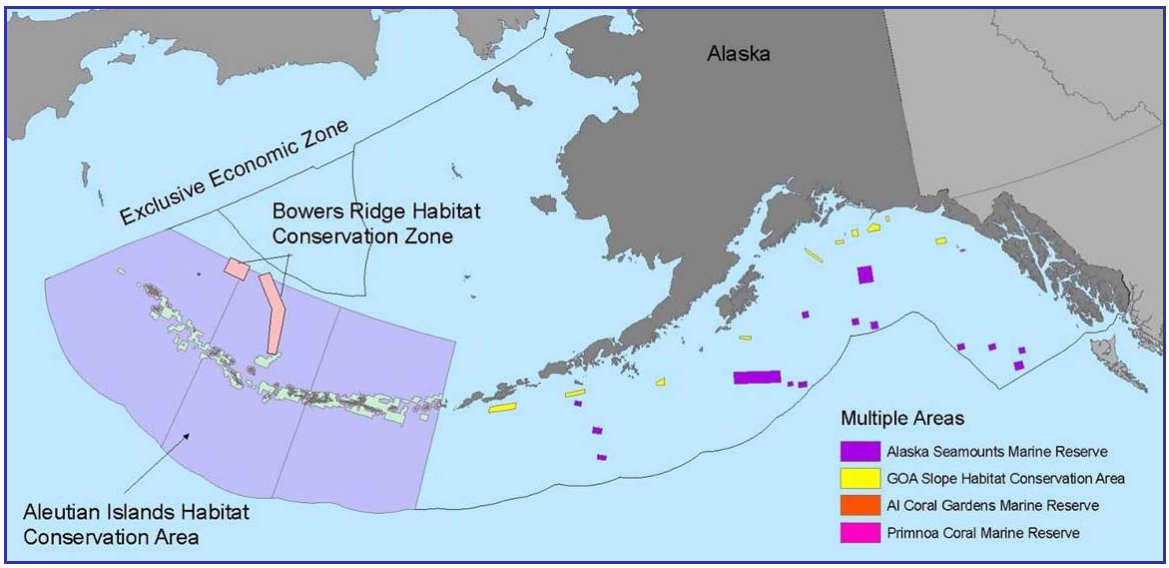
Also in February 2005, the Council adopted several new HAPCs. Twenty sites in the Gulf of Alaska and Aleutian Islands, consisting of seamounts and high density coral areas, were identified as HAPCs. To protect these sites and eliminate environmental impacts due to fishing, the Council prohibited fishing in these areas by gear types that contact the bottom. These sites and measures became effective in June 2006.

The Alaska Seamount Habitat Protection Area encompasses all 16 seamounts in Federal waters off Alaska, named on NOAA charts (Bowers, Brown, Chirkikof, Marchand, Dall, Denson, Derickson, Dickins, Giacomini, Kodiak, Odessey, Patton, Quinn, Sirius, Unimak, and Welker). Bottom-contact fishing is prohibited in all of these HAPCs, an area which totals 5,329 nm^2.

In Southeast Alaska, three sites with large aggregations ("thickets") of long-lived Primnoa coral are also identified as HAPCs. These sites, in the vicinity of Cape Ommaney and Fairweather grounds, total 67 nm^2. The Gulf of Alaska Coral Habitat Protection Area designates five zones within these sites where submersible observations have been made, totaling 13.5 nm^2. All bottom-contact gear (longlines, trawls, pots, dinglebar gear, etc.) is prohibited in this area.

In the Aleutian Islands region, the relatively unexplored Bowers Ridge was also identified as a HAPC. As a precautionary measure, the Council acted to prohibit mobile fishing gear that contacts the bottom within this 5,286 nm^2 area.

Figure 1 Habitat protections in the Gulf of Alaska and the Aleutian Islands

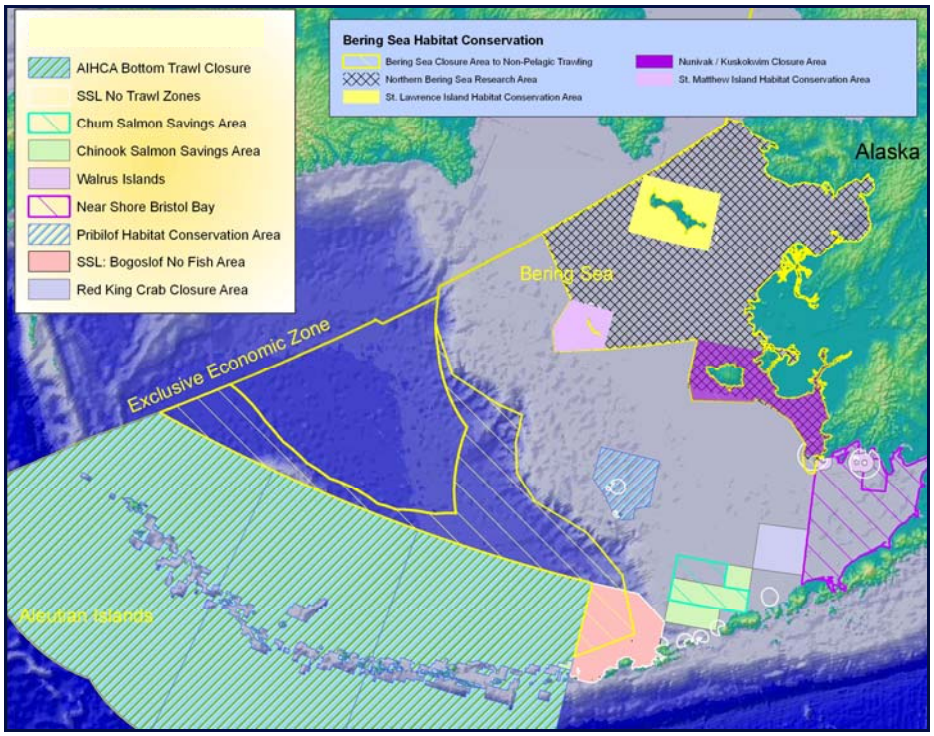


Bering Sea habitat conservation measures – implemented in 2008

In June 2007, the Council adopted precautionary measures to conserve benthic fish habitat in the Bering Sea by "freezing the footprint" of bottom trawling by limiting trawl effort only to those areas more recently trawled. Implemented in 2008, the new measures prohibit bottom trawling in a deep slope and basin area (47,000 nm^2) and the Northern Bering Sea Research Area that includes the shelf waters to the north of St. Matthew Island (85,000 nm^2).

The entire Northern Bering Sea Research Area will be closed to bottom trawling while a research plan is developed. The research plan may include an adaptive management design, which could allow bottom trawling in designated areas to evaluate effects, or research using other experimental fishing approaches. Specific areas within the Northern Bering Sea Research Area, however, will always remain closed to bottom trawling. The MPAs were established to conserve blue king crab habitat and other EFH where subsistence harvesting and small-scale local fisheries take place, and include the nearshore areas of Nunivak Island and Kuskokwim Bay, and around St. Lawrence and St. Matthew Islands. The research plan may also identify additional protection measures for blue king and snow crab, marine mammals, ESA-listed species, and subsistence needs for western Alaska communities in nearshore areas.

Figure 2 Bering Sea Habitat Conservation Closures



Bering Sea gear modification – Adopted by Council in 2009

in October 2009 the Council adopted a gear modification for the Bering Sea non-pelagic trawl flatfish fishery in order to reduce adverse impact to bottom habitat.

9.2.2 EFH conservation recommendations suggested by assessment authors

Table 7 provides a list of recommendations for EFH conservation suggested from the individual species reviews.

Table 7 Recommendations for EFH conservation from the individual species reviews

Council FMP	Species	Recommendation
BSAI and GOA Groundfish	Sablefish	Given the intense fishing in areas of sensitive habitat features as indicated in Figure B.2-3a,b (of the EFH EIS), more research should be done to evaluate the recovery rates of these features and their role in the survival and growth of the early juvenile life stage of sablefish and other species that inhabit those areas.

10 Non-fishing effects on EFH

10.1 Background

Non-fishing activities that may adversely affect EFH are diverse[7]. Example activities include harbor construction, navigation channel dredging, fill for near shore development and infrastructure, oil and gas exploration and production facilities, shoreline stabilization, exotic species introduction, and fish processing waste water. The NOAA Fisheries Alaska Region Habitat Conservation Division staff (HCD) reviewed Appendix G of the 2005 EFH FEIS. Appendix G describes non-fishing activities and offers EFH Conservation Recommendations by activity type. Example EFH Conservation Recommendations for fill placed in marine waters include:

- Fill be utilized in upland areas first;
- Fill be considered for beneficial use to enhance marine habitats previously disturbed, such as artificial reef creation;
- Any in-water deposition area avoid spawning areas, areas that concentrate prey, or areas of sensitive marine aquatic vegetation (used by fish as refugia);
- Fill not disrupt juvenile or adult fish migration

10.2 Review Approach and Summary of Findings

Non-fishing activities review included minor editorial and technical changes to EFH FEIS (2005) Appendix G; update literature and information sources; and provide opportunity for subject experts to update or suggest new EFH Conservation Recommendations (Non-Fishing Activities Summary Table). HCD subject experts completed two worksheets and recommended changes to non-fishing activities in each of the FMPs.

Worksheet A asked subject experts to update and document new information for non-fishing impacts available since EFH was last identified. The intent of the worksheet is to capture the most recent information available. Worksheet A includes:

1. New subject matter information
2. New literature sources
3. Any unpublished data, reports or other related subject matter documents

Worksheet B asked subject expert s to determination whether existing FMP text is still accurate and review existing EFH Conservation Recommendations. Subject experts were also asked to offer new EFH Conservation Recommendations, if needed.

Worksheet B topics include:

1. Research and information needs
2. Most recent and best available information

[7] Non-fishing activities (or developmental activities) information is compiled by NOAA, other Federal agencies, academia, and environmental consulting firms. The amount of this type of information as compared to information used to address fishing affects on fish habitat is extensive. Appendix G addresses those activities most likely to reduce the quantity and/or quality of EFH. It is not meant to provide a conclusive review and analysis of the impacts of all potentially detrimental activities; rather it highlights notable threats and provides information to determine if further examination of a proposed activity is necessary. Subject-specific EFH Conservation Recommendations are advisory and serve as proactive conservation measures that would help minimize and avoid adverse effects of these fishing activities on EFH. Site-specific EFH Conservation Recommendations will be prepared per activity and as necessary during EFH Consultation [see: CFR 50 Part 600 Subpart K].

3. An affects discussion
4. Cumulative impacts
5. Changes to existing EFH Conservation Recommendations
6. New EFH Conservation Recommendations[8]

10.3 New EFH Conservation Recommendations

For each of the non-fishing activities identified in Table 8, staff reviewed the evaluation in the FMP of the activity's potential to result in adverse impacts on EFH, and the recommended conservation measures to avoid, minimize, or compensate for adverse effects on EFH. The complete review is available in Appendix 6, which is available online at www.alaskafisheries.noaa.gov/npfmc. Table 8 identifies new EFH conservation recommendations that resulted from the review. The Council may wish to consider initiating FMP amendments to add these conservation recommendations to each of the FMPs.

Table 8 New EFH Conservation Recommendations for Non-fishing Activities

Activity	New EFH Conservation Recommendations
Non-point Source Pollution	• Identify subsurface waterflows to ensure prevention of leakage into river/stream systems (hyproheic connections). • Research chemicals used in the area of application to prevent reactions resulting in toxic contaminants to fish or their prey. • Ensure that levels of pesticide entering waters do not surpass FDA requirements for human consumption.
Silverculture / Timber Harvest	Review pending
Pesticide Application	Review pending
Urban / Suburban Development	• Install oil/water separators in areas adjacent to marine or anadromous waters. • Where feasible, remove impervious surfaces such as abandoned parking lots and buildings from hyporheic, riparian and shoreline areas; re-establish water regime, wetlands, and native vegetation.
Road Building and Maintenance	• After creating disturbance to the riparian area, re-vegetate with native vegetation to avoid colonization by non-native plant species. • Avoid storage or disposal of snow directly into waters. Snow laden with salt and ice melt chemical should not be placed in anadromous fish streams. Snow-melt disposal areas should be silt-fenced and include a collection basin. • Use Stream simulation techniques to design watered crossing structures (bridges or culverts); maintain flow, slope, and natural alignment.
Mining	• To the extent practicable, avoid mineral mining in waters, water sources and water sheds, riparian areas, hyproheic zones, and floodplains containing EFH. • Incorporate stochastic water models and include predictions to illustrate uncertainty.

[8] New EFH Conservation Recommendations supplement existing EFH Conservation Recommendations for each non-fishing activities, as appropriate.

Activity	New EFH Conservation Recommendations
Organic and Inorganic Debris	• Locate and identify type and source of debris. Determine rough timeline of foreign debris. Information should directly determine the avenue for any removal remedies and address outreach, as necessary. Provide resources and technical guidance to develop focused studies, restoration, and monitoring of the site. • Develop and implement a monitoring protocol to ensure that installed fish passage systems are working.
Dam Operation	• Develop and implement monitoring protocols for fish passage.
Commercial and Domestic Water Use	Review pending
Dredge/Fill/Material Disposal	• In areas near anadromous streams, fill should be sloped to maintain shallow water, photic zone productivity; allow for unrestricted juvenile and adult salmon migration; and provide refugia for juvenile fish. • In marine areas of kelp and other aquatic vegetation, fill (including artificial structure fill reefs) be designed to maximize kelp colonization and provide areas for juvenile fish acclimation to marine conditions and shelter juvenile fish from higher currents and exposure to predators. • Fill materials should be tested and be within the neutral range of 7.5 to 8.4 pH. This pH range, in marine waters, will maximize colonization of marine organisms. Excessively acidic fill material (pH>8.4) should not be used.
Vessel Operations / Transportation / Navigation	• To facilitate movement of fish around breakwaters, breach gaps and construct shallow shelves to serve as “fish benches”, as appropriate. Often benches are expanded shelf features used in common toe-slope stabilization transitions within the breakwater design. Benches need to provide for unrestricted fish movement throughout all stages of local tidal condition (i.e. -3’ MLLW).
Introduction of Exotic Species	• Undertake a thorough scientific review and risk assessment before any non-native species are introduced. • Identify effects of non-native species on existing native species in such areas as habitat alteration, pathology, and associated species composition.
Pile Installation and Removal	No new recommendations.
Pile Driving	No new recommendations.
Pile Removal	No new recommendations.
Overwater Structures	No new recommendations.
Flood Control / Shoreline Protection	No new recommendations.
Log Transfer Facilities / In-water Log Storage	No new recommendations.
Utility Line / Cables / Pipeline Installation	No new recommendations.
Commercial Utilization of Habitat	No new recommendations.
Point Source Discharge	• Coordinate regulations/programs at Federal (EPA) and state (ADNR, ADEC) to ensure consistency.
Fish Processing Waste – Shoreside and Vessel Operation	• Incorporate most-recent technologies to minimize the impacts of nutrient overloading.

Activity	New EFH Conservation Recommendations
Water Intake Structures / Discharge Plumes	No new recommendations.
Oil and Gas Exploration / Development / Production	Review pending
Habitat Restoration and Enhancement	No new recommendations.
Marine Mining	• Incorporate water quality and quantity modeling and predictions that illustrate uncertainty, such as those found in stochastic models.
Persistent Organic Pollutants	Review pending

10.4 Conclusions

A review by NMFS HCD staff provided new information and new EFH Conservation Recommendations for consideration. Updates to this section provide the Council, Federal agencies, the public, and NMFS staff a starting point as to those actions that may adversely affect EFH (other than fishing) and ways to avoid, minimize, or mitigate for any effects.

10.5 Future Considerations

Non-fishing activities that may affect EFH span a multitude of subjects. Future application to assess these types of actions could include a GIS spatial planning component linked to fish and fish habitat information, research, and management.

11 HAPC recommendations

Habitat areas of particular concern (HAPCs) are areas within essential fish habitat (EFH) that may require additional protection from adverse effects. Essential fish habitat is designated for the managed species identified in the Council's five Fishery Management Plans (BSAI and GOA groundfish, BSAI crab, Scallop, and Salmon). The EFH guidelines provide that HAPCs may be identified as specific types or areas of habitat within EFH, based on one or more of the following four considerations:

1. The importance of the ecological function provided by the habitat.
2. The extent to which the habitat is sensitive to human-induced environmental degradation.
3. Whether, and to what extent, development activities are, or will be, stressing the habitat type.
4. The rarity of the habitat type.

The Council will consider HAPCs that meet at least two of the four HAPC considerations above, and rarity will be a mandatory criterion of all HAPC proposals.

The Council will periodically set priority habitat types, and call for HAPC nominations through a proposal process that will focus on specific sites consistent with those priorities. HAPC proposals will be considered by the Council on a three-year cycle, or on a schedule decided by the Council. The sites proposed under this process will then be reviewed by the Plan Teams for ecological merit, and also reviewed by staff for socioeconomic, management, and enforcement impacts. Based on this combined review, the Council may choose to advance various HAPC proposals for further analysis. The Council may designate specific management measures, if needed, to apply to each HAPC location.

11.1 HAPC nomination processes

In 2005, the Council formally revised its approach to the designation of HAPCs by adopting a site-based approach. To date, there has been one HAPC nomination process, initiated in October 2003, which resulted in the implementation of several HAPC designations in the Gulf of Alaska and the Aleutian Islands in 2006. For the initial 2003-2004 HAPC process, the Council identified two specific priority areas for HAPC proposals:

1. Seamounts in the exclusive economic zone (EEZ), named on National Oceanic and Atmospheric Administration (NOAA) charts, that provide important habitat for managed species.
2. Largely undisturbed, high-relief, long-lived hard coral beds, with particular emphasis on those located in the Aleutian Islands, which provide habitat for life stages of rockfish or other important managed species.

Additionally, nominations were to be based on best available scientific information and include the following features:

1. Sites must have likely or documented presence of Fishery Management Plan (FMP) rockfish species.
2. Sites must be largely undisturbed and occur outside core fishing areas.

The Council received 23 HAPC proposals from six different organizations. The proposals were reviewed by the Plan Teams, and by staff to consider management, enforcement, and socioeconomic issues. Ultimately, the Council identified a range of alternatives, staff completed an analysis, and the Council established several new HAPCs. Management measures for these HAPCs were implemented in August 2006.

11.2 Current Council action on HAPC priorities

During the 2003-4 HAPC proposal cycle, six proposals were received that did not meet the Council's designated priorities. These identified two sites in the Bering Sea with dense aggregations of soft corals; three deepwater canyons, two in the Bering Sea and one in Prince William Sound; 54 pinnacles in the Gulf of Alaska; 82 pinnacles in the Aleutian Islands; and the Eight Fathom Pinnacle in the Gulf of Alaska. The Council minutes from April 2004 note that these proposals were removed from the current analysis, but were placed on hold for further consideration under the next HAPC cycle. The proposals would be considered "alive", and need not be re-submitted, although it was expected that the submitters would participate in updating and revising their proposals.

In 2006-2007, the Council considered to initiate the HAPC Proposal Process during discussion releated to Bering Sea Habitat Conservation. There were two parts to this discussion. First, the Council reviewed the previous HAPC cycle and decided that a review of the HAPC Considerations is needed to address Plan Team and other concerns. Some concerns included: how the Council assembles proposed HAPC nominations; the need to ensure uniformity; better criteria definitions, such as the use of rarity. Secondly, the Council sought input on whether or not to set a HAPC priority for Bering Sea skate nurseries and/or Bering Sea canyons. A summary of available research on these subjects was prepared and presented. Following public input and Plan Team review, the Council determined that it would be premature to initiate a call for proposals as there are outstanding issues within the process (better considerations and judgement criteria are needed) and there are no identified conservation concerns at that time.

In June 2009, the Council considered whether to set priorities for identifying HAPCs and resolicit for HAPC proposals. The Council opted to postpone this decision pending the completion of the five-year essential fish habitat (EFH) review that is scheduled to come before the Council in December 2009 and April 2010. The Council chose to synchronize the timing of the two actions so that the results from the five-year review can be considered in setting HAPC priorities, and the HAPC proposal cycle that might result. During this review time, an SSC working group will review the HAPC considerations with input from the AFSC and the NMFS Alaska Regional EFH Coordinator.

11.3 Recommendations on HAPCs from the 5-year review

Table 9 provides a list of recommendations on HAPC priorities that came out of the EFH 5-year review, for the Council's consideration in the next HAPC proposal cycle.

Table 9 Recommendations on HAPC priorities from the individual species reviews

Council FMP	Species	Recommendation
BSAI and GOA Groundfish	Sablefish	Areas of extensive and intensive bottom trawling should be of concern. Small unobtrusive research closures would be a responsible step for NMFS in determining whether EFH is adversely affected.
BSAI Groundfish	Skates	The Council may want to consider closing known skate nurseries to fishing activity. I know the Council has discussed this in the past; I'm not sure where things stand at the moment.

12 Research and information needs

Section 12.1 identifies the EFH research plan that was outlined in the 2005 EFH EIS. Section 12.2 provides habitat research priorities for the NMFS and the NPFMC, as well as listing NPRB proposals that have addressed habitat issues in the time period since the EFH EIS analysis. Section 12.3 identifies the research priorities that were identified in each of the individual species reviews.

12.1 EFH research priorities from 2005, currently in FMPs

The EIS for Essential Fish Habitat Identification and Conservation (NMFS 2005) identified the following research approach for EFH regarding minimizing fishing impacts.

Objectives

Reduce impacts. (1) Limit bottom trawling in the AI to areas historically fished and prevent expansion into new areas. (2) Limit bottom contact gear in specified coral garden habitat areas. (3) Restrict higher impact trawl fisheries from a portion of the GOA slope. (4) Increase monitoring for enforcement. (5) Establish a scientific research program.

Benthic habitat recovery. Allow recovery of habitat in a large area with relatively low historic effort.

Research Questions

Reduce impacts. Does the closure effectively restrict higher-impact trawl fisheries from a portion of the GOA slope? Is there increased use of alternative gears in the GOA closed areas? Does total bottom trawl effort in adjacent open areas increase as a result of effort displaced from closed areas? Do bottom trawls affect these benthic habitats more than the alternative gear types? What are the research priorities? Are fragile habitats in the AI affected by any fisheries that are not covered by the new EFH closures? Are sponge and coral essential components of the habitat supporting FMP species?

Benthic habitat recovery. Did the habitat within closed areas recover or remain unfished because of these closures? Do recovered habitats support more abundant and healthier FMP species? If FMP species are more abundant in the EFH protection areas, is there any benefit in yield for areas that are still fished without EFH protection?

Research Activities

Reduce impacts. Fishing effort data from observers and remote sensing would be used to study changes in bottom trawl and other fishing gear activity in the closed (and open) areas. First, the recent gear-specific fishing pattern must be characterized to establish a baseline for comparison with observed changes in effort after closures occur. An effective analysis of change requires comprehensive effort data with high spatial resolution, including accurate information about the tow path or setting location, as well as complete gear specifications. Effects of displaced fishing effort would have to be considered. The relative effects of bottom trawl and alternative gear/footrope designs and, thus, the efficacy of the measure should be investigated experimentally in a relatively undisturbed area that is representative of the closed areas. The basis of comparison would be changes in the structure and function of benthic communities and populations, as well as important physical features of the seabed, after comparable harvests of target species are taken with each gear type. Ultimately, there should be detectable increases in FMP species that are directly attributable to the reduced impacts on sponge and coral habitat.

Benthic habitat recovery. Monitor the structure and function of benthic communities and populations in the newly closed areas, as well as important physical features of the seabed, for changes that may indicate recovery of benthic habitat. Whether these changes constitute recovery from fishing or just natural

variability/shifts requires comparison with an area that is undisturbed by fishing and otherwise comparable. A reference site would have to remain undisturbed by fishing during the entire course of the recovery experiment. Such a reference site may or may not exist, and the essential elements of comparability for identifying this area are presently unknown. Without proper reference sites, it may still be possible to deduce recovery dynamics based on changes observed in comparable newly closed areas with different histories of fishing disturbance.

Research Time Frame

Changes in fishing effort and gear types should be readily detectable. Biological recovery monitoring may require an extended period if undisturbed habitats of this type typically include large or long-lived organisms and/or high species diversity. Recovery of smaller, shorter-lived components should be apparent much sooner.

12.2 Agency research priorities

12.2.1 NOAA Fisheries EFH Research

EFH Research Planning is coordinated through the AFSC, the AFSC Habitat and Ecological Processes Research (HEPR) Core Team, the NPFMC, and the Alaska Region, HCD. The plan includes an annual EFH Research Proposal process and divided into: themes; priorities; allocations and funding; and example.

Alaska Fisheries Science Center Mission Statement

> *The mission of the Alaska Fisheries Science Center is to plan, develop, and manage scientific research programs which generate the best scientific data available for understanding, managing, and conserving the region's living marine resources and the environmental quality essential for their existence.*

EFH Research Proposal Process Overview

NMFS Alaska Region has an annual EFH Research Proposal Process. The process begins with discussion between the AFSC and Regional Office to establish any research needs and priorities. Proposals are then requested for scientific research on Essential Fish Habitat in Alaska. Funding is dependent on yearly allocations and summarized as:

Year	Funded (in thousands)
2006	$478K
2007	436K
2008	547K
2009	520K
2010	450K (anticipated)

Proposals must involve habitat for species managed under an FMP and meet the following EFH research priorities:

- Coastal areas facing development, including ShoreZone mapping
- Characterize habitat utilization and productivity
- Sensitivity, impact and recovery of disturbed benthic habitat
- Validate and improve habitat impacts model
- Seafloor mapping

Proposals should include:

- Provide explicit objectives or hypotheses;
- Provide maps of study area(s);
- Fully explain acronyms;
- Provide thorough study purpose and background;
- Specifically address why the proposal is a habitat proposal (rather than, for example, a stock assessment proposal);
- Describe previous funding history of the proposal (e.g., funding year and amount);
- Specify how the revision responds to last year's Team comments if the proposal is a resubmission.

Proposals will be rated based on relevance to the EFH research priorities, scientific merit, probability of success and quality of presentation; equal weight will be given to each factor. Proposals are reviewed by the AFSC Habitat Ecological Processes Research (HEPR) Core Team and Alaska Regional Office, Habitat Conservation Division. The HEPR Core Team will recommend proposals. Lastly, the HEPR Program Leader and Assistant Regional Administrator for Habitat Conservation will prepare a consolidated recommendation, based on the scientific rating and overall priority for fisheries management, for the final decision by the AFSC Science Director and NMFS Regional Administrator.

Recently, recovery rate studies have received apriority status. However, recovery rate proposals are often expensive due to logistics (equipment such as submersibles) or methodology (laboratory methods to analyze field specimens).

EFH Research Plan

Plan is organized into four sections:

- Research themes
- Research priorities
- Allocation of resources
- Example research projects

Research Themes

Habitat characterization - Characterize, census, and map habitat features including offshore habitats susceptible to disturbance from fishing gear (e.g., corals) and coastal habitats susceptible to disturbance from non-fishing activities.

Habitat utilization - Evaluate habitat use for managed species to assess the strength of associations with different habitat features.

Habitat productivity - Investigate the relative productivity of different habitats for managed fish species, including disturbed and undisturbed habitats; studies describe whether certain habitat types provide greater support for important life history functions (e.g., growth, reproduction, and feeding).

Recovery rates - Measure habitat impact rates, sensitivity of habitat features to disturbance and recovery rates following disturbance, which could be used to indicate the persistence of effects from fishing gear or coastal development and population-level consequences for managed species.

Reduce impacts – Conduct research that could lead to significant reductions in habitat disturbance resulting from fishing and other human activities.

Research Priorities

The marine ecosystem off Alaska is large and complex. An overarching priority is research on habitats most affected by human activities, including habitats with frequent human activity as well as habitats sensitive to disturbance where human activity is infrequent. Priority habitats include offshore habitats susceptible to disturbance from fishing gear and coastal habitats susceptible to disturbance from non-fishing activities.

Coastal areas facing development - Characterization of coastal habitats susceptible to disturbance from non-fishing activities is a priority. These non-fishing activities include oil and gas development, logging, mining, urbanization, and contaminants. The research approach includes coastal habitat mapping (ShoreZone) as well as field surveys of a representative subset of the mapped habitats to measure fish and shellfish utilization. Priority coastal habitats for study are those utilized by managed fish and shellfish species and facing development pressure.

Characterize habitat utilization and productivity – This priority focuses on understanding the relationship between habitat type, patterns of use by species, and differences between habitats in productivity of managed species. Our approach is to support integrated research projects that combine measurements of habitat characteristics, habitat utilization, and habitat productivity in one study, and also combine laboratory experiments, controlled field manipulations, and field observations. Our approach also includes conducting studies that would support refining the description and identification of EFH in Fishery Management Plans based on relevant information. Focal species are studied for multiple years to accumulate enough information for understanding. At least one rockfish species will be studied, presuming that rockfish are dependent on benthic structure that is sensitive to human activity.

Sensitivity, impact and recovery of disturbed benthic habitat– Habitat-forming biota such as corals and sponges often are sensitive to human activity and may take many years to recover from disturbance. Some managed fish and shellfish species use this habitat for protection and camouflage. Estimates of fishing intensity, sensitivity, and recovery rates are applied in habitat impacts models to understand the effects of fishing. Likewise, estimates of habitat impacts, sensitivity, and recovery rates are necessary to understand the effects of non-fishing activities. Recovery rates are defined as the rate of change of impacted habitat back to un-impacted habitat following disturbance. Sensitivity is defined as the susceptibility of habitat to degradation – for fishing, it is the proportion of habitat in the path of the fishing gear that is impacted by one pass of the gear. Little specific information is available on recovery rates and sensitivity.

To estimate sensitivity and recovery rates our priority is to measure damage, survival, growth, and recovery of habitat features before and after (both immediately and up to several years following) disturbance. Attention to species that are short to moderately long-lived and faster-growing is warranted because they have the potential to recover within one or two decades and specific estimates of recovery rate are needed for habitat impacts modeling. For very slow-growing species, their slow growth implies recovery will take several decades or more and more detailed information is not as high a priority for habitat impacts modeling.

Dominant habitat-forming species in Gulf of Alaska hard-bottom habitat include *Primnoa* sp., black corals, hexactinellid sponges (2 species), and demosponges (1 species), in Gulf of Alaska and Bering Sea (canyon) soft-bottom habitat, the pennatulacean *Halipteris willemoesi*, in Bering Sea pebble/sand, the tunicate *Boltenia* sp. and the soft-coral *Gersemia* sp., and in the Aleutians, *Primnoa* sp., *Paragorgia* sp., bamboo corals, and the gorgonians *Fanellia* sp., *Plumarella* sp., and *Thourella* sp. and several species of hexactinnelid sponges and demosponges. Candidate

species for study because they are shorter-lived or faster-growing include demosponges, *Boltenia* sp., *Gersemia* sp., bamboo corals, *Fanellia* sp., *Plumarella* sp., and *Thourella* sp.

In addition, coastal areas often are affected by non-fishing impacts. Recovery and monitoring studies of impacted coastal areas, such as log transfer facility (LTF) sites and marine ports, are needed to determine if these sites have returned to their pre-utilization state following facility closure or development.

Validate and improve habitat impacts model – A Center for Independent Experts (CIE) panel reviewed the habitat impacts model used to estimate effects of fishing. The panel found that the model was well conceived and useful in providing estimates of the possible effect of fishing on benthic habitat, but that the parameter estimates were not well resolved and had a high degree of uncertainty and there was no attempt to validate the model. Subsequently, model validation was attempted with survey data, but because of time limitations, a comprehensive model validation analysis was not completed. Model validation remains a priority because the habitat impacts model has played a key role in evaluating the effects of fishing and deciding on measures to conserve and protect habitat areas from fishing gear impacts, i.e. closure areas.

Seafloor mapping – Information characterizing fish habitat and utilization in Alaska is limited to coarse depth and habitat information (e.g. nautical charts) and utilization information from AFSC surveys for the adult stage of commercially important species. Missing are fine-scale depth and habitat information, as well as juvenile stage information, especially nearshore. Seafloor mapping is costly and time-consuming. Our approach is to support low cost mapping efforts with existing sampling platforms (e.g. trawl survey vessels, NOAA vessels) to reduce costs.

Allocation of Resources

This section on allocation of resources includes a subsection on FY 2007 – 2011 EFH funding, as well as subsections on other EFH-related activities not funded by EFH, such as habitat impacts modeling and analyses to meet management needs. The intent is to provide a complete picture of how resources will be allocated, both dollars and people, on habitat research by the Alaska Fisheries Science Center during FY 2007 - 2011.

FY 2007 - 2011 EFH funding –Funding is limited, so we focus EFH funding on three research priorities:

- Coastal areas facing development, including ShoreZone mapping
- Characterize habitat utilization and productivity
- Recovery rates of disturbed benthic habitat

Habitat Modeling Team - A major criticism of the Center for Independent Experts (CIE) Panel that reviewed the draft Essential Fish Habitat Environmental Impacts Statement was that the habitat impacts model was not validated. In addition, the Panel recommended exploration of alternative models that incorporate spatially explicit parameters other than abundance (e.g. growth). Our approach is to support formation of a habitat modeling team to meet the need to validate and improve the habitat impacts model. An economics component also may be added to the habitat impacts model to broaden the model's utility. Likely members of this cross-Divisional team include a habitat modeler, an economist, a habitat biologist, and a stock assessment biologist. Additional expertise is available from the Alaska Region, Habitat Conservation Division. The AFSC currently allocates significant modeling resources to stock assessment and ecosystems modeling because of their importance for informing management. Initiation of a habitat modeling team seems appropriate given the similar importance of habitat research and

management. Further, improvement of the habitat impacts model will prepare the tools necessary to evaluate future habitat-related management proposals. Adding an economics component to the model will provide additional outputs useful for proposal evaluation. The following analyses are needed to meet the outcome: Validate and improve the habitat impacts model.

Outcome and Projects for 2007 - 2011	FTE needs by fiscal year				
Outcome. Validate and improve habitat impacts model.	*2007*	*2008*	*2009*	*2010*	*2011*
Project. Validate the habitat impacts model by comparing habitat impacts model output to empirical data.	1	1	0	0	0
Project. Incorporate spatially-explicit productivity data into habitat impacts model.	0	1	1	1	0
Project. Incorporate economic data into habitat impacts model.	0	0	1	1	1
Project. Determine likely efficacy of research closures to validate estimates of fishing effects.	1	0	0	0	0

Seafloor mapping – Currently the AFSC and collaborators expend significant effort developing acoustic systems for characterizing soft-bottom substrates. Another approach has been deployment of single-beam echo sounders on existing platforms (trawl survey vessels), but the limited effort has been unsuccessful so far. One challenge has been the lack of a commonly agreed acoustic system for habitat mapping, mostly because of the difficulty of balancing coverage and resolution. Three workgroups are expected to recommend methods for remote mapping with sound in 2006. These groups are the NOAA Fisheries Advanced Technology Working Group (habitat mapping workshop), an ICES working group, and an NPRB-funded group.

Dedicated seafloor mapping is costly and time consuming. Given the high cost of seafloor mapping, using scarce EFH funds for seafloor mapping would leave little for other EFH research priorities. Thus, we do not plan to allocate EFH funds for seafloor mapping.

Our approach is to support industry-government collaboration for seafloor mapping of selected, small areas and for development of alternative methods of habitat identification. For example, three Gulf of Alaska slope areas (Figure 1) were nominated for protection by fishing industry groups where their expert anecdotal information supported the HAPC (Habitat Areas of Particular Concern) considerations and Council priorities for high-relief coral and rockfish habitat information. In these areas, research information is needed to supplement local knowledge that suggests abundance of high-relief corals. In addition, industry has proposed testing fishermen's knowledge to type habitats, as a means of reducing costs of habitat mapping. Two potential collaborators are the Marine Conservation Alliance Foundation and the Alaska Fisheries Development Foundation.

Management-based analyses – Analyses to meet habitat management needs, such as the Bering Sea Fishing Impacts Analysis, are a continuing need. These analyses typically are completed by Council, Alaska Region, and AFSC staff. The following analyses are needed to meet the outcome: Complete management-based analyses.

Outcome and Projects for 2007 - 2011	FTE needs by fiscal year				
Outcome. Complete management-based analyses.	*2007*	*2008*	*2009*	*2010*	*2011*
Project. Refine EFH definition for marine salmon.	1	0	0	0	0
Project. Refine EFH definition for forage species.	0	0	1	0	0
Project. Identify candidate HAPCs.	1	0	0	0	0
Project. Bering Sea Fishing Impacts Analysis.	1	0	0	0	0
Project. Calculate historical fishing effort.	0	1	0	0	0
Project. Offshore pinnacle inventory.	0	1	0	0	0

Nearshore mitigation of impacted coastal areas –Alaska-specific studies or monitoring are needed to evaluate the effectiveness of nearshore mitigation projects such as artificial reefs. Our approach is to solicit funding for these projects through the NOAA Restoration Center or other avenues.

Gear modification research – Research on gear modification has the potential to reduce habitat impact rates on habitat-forming biota. Reduce gear impacts research has been supported by EFH funding in previous years, as well as cooperative research funding and industry-government collaboration. Given limited EFH funds and the identified EFH research priorities, AFSC management plans to replace EFH funding of gear modification research with cooperative research funding.

Examples of Possible EFH Research Projects

1. Mapping and Fish Utilization of Coastal Habitats Facing Shoreline Development and Climate Change
2. Habitat influences on growth and recruitment of northern rock sole
3. Recovery of deep water sponges from bottom trawling

12.2.2 North Pacific Fishery Management Council

The following is an excerpt from the Council's research priorities, adopted in October 2010, as they relate to habitat research. The full research priority list is available on the Council website, at http://www.fakr.noaa.gov/npfmc/Research_priorities09.pdf.

Five-Year Research Priorities: 2010-2014

Immediate Concerns

III. Habitats

A. Evaluate habitats of particular concern:

1. Assess whether Bering Sea canyons are habitats of particular concern, by assessing the distribution and prevalence of coral and sponge habitat, and comparing marine communities within and above the canyon areas, including mid-level and apex predators (such as, short-tailed albatrosses) to neighboring shelf/slope ecosystems.
2. Assess the extent, distribution, and abundance of important skate nursery areas in the EBS, to evaluate the need for designation of new HAPCs.

B. Baseline Habitat Assessment

1. Dynamic ecosystem and environmental changes in the northern Bering Sea and Arctic are occurring on a pace not observed in recorded time . Given the potential for fishery expansion into the northern Bering Sea, as well as considerations associated with the new FMP for the Arctic, assessment of the current baseline conditions is imperative. This effort, while of great scientific importance, should not supplant the regular surveys in the BSAI and GOA, which are of critical importance to science and management.

Ongoing Needs

III. Habitat

A. Habitat Mapping

1. Improved habitat maps (especially, benthic habitats) are required to identify essential fish habitat and distributions of various substrates and habitat types, including habitat-forming biota, infauna, and epifauna.
2. Begin to develop a GIS relational database for habitat, including development of a historical time series of the spatial intensity of interactions between commercial fisheries and habitat, which will be needed to evaluate impacts of changes in EFH on the growth, reproduction, and distribution of fish and shellfish.
3. Assess the extent of the distribution of Primnoa corals in the GOA.

B. Function of Habitat

1. Evaluate relationships between, and functional importance of, habitat-forming living substrates to commercially important species, including juveniles.
2. Develop a time series of the impact of fishing on GOA, AI, and EBS habitats that could be used to assess: a) the impact of changes in management on the rate of habitat disturbance, and b) the impact of habitat disturbance on the growth, distribution, and reproductive success of managed species.
3. Evaluate effects of fishing closures on benthic habitats and fish production. There are many closures that have been in effect for various periods of time, for which evaluations have not been conducted. A recent example includes slope HAPCs designated in the western Gulf of Alaska.

12.2.3 North Pacific Research Board (NPRB) Funded Research Projects

The NPRB is a major funding source for marine science research. Yearly, peer-reviewed research projects are funded to further investigate data gaps. Many of these projects are 'forward-thinking' and are the cutting-edge for science in northern climates. In many instances, these projects would not have been possible without NPRB involvement. The following table (as below) lists NPRB studies by year and name that have furthered knowledge of EFH or EFH related management (list is not comprehensive of all yearly NPRB projects). Visit http://www.nprb.org/ for more detailed information.

North Pacific Research Board Studies relating to EFH

NPRB 2004	401	Forage fish
	402	Ocean circ model
	404	Ocean info GIS
	406	SEAK bio & oceano
	410	? BS biology
	415	Skates
	416	Juv rockfish
	417	Atka mack.
	418	Sharks -dogfish
	419	Groundfish multi-spp
	420	POP young of the year

NPRB 2005	502	Ecological Indicators
	503	Salmon programs
	505	EBS pollock
	506	Pollock tagging
	507	Prib BKC
	508	EBS Snow crab
	509	RKC
	510	Skates
	511	Sharks – dogfish
	512	POP - phase 2
	522	Atka mack bio
	523	Pollok recruitment
	524	Capelin and pollock productivity
	525	Groundfish modeling
	529	Habitat Closure Valuation
	530	Ecosystem
	536	Plankton survey North Pacific and southern BS

NPRB 2006	601	Plankton in North Pacific and southern BS
	602	Changes in BS
	603	GOA long term observations
	604	Norton Sound benthic fauna
	605	Early life stage modeling p cod
	607	Lower trophic changes to climate change
	610	Pollock larvae adaptation to climate changes
	612	NP Meso-Marine Ecosystem
	614	Coastal ecosystem health and change
	615	Marine Mapping workshop
	616	Chiswell ridge
	618	P cod spatial patterns
	619	EBS Greenland halibut (turbots)
	620	P cod movements
	621	Skates
	622	Groundfish prey
	623	Tanner crab
	624	Larval snow crab
	625	BSAI RKC
	627	Squid life histories
	628	BS large ecosystems for sculpins
	629	Adult female POP
	630	AI forage fish distributions
	640	Baseline commercial fishing communities ???
	642	Forage fish distributions and habitat use
	645	Rockfish local and subsistence harvests

NPRB 2007	701	Eco-system changes on BS shelf
	704	AK Marine Info system ???
	709	Flatfish EBS
	710	Trawl impact on flatfish nurseries
	711	BSAI crab effects from trawling
	713	Predicting snow crab growth
	714	RKC and Snow crab biological reference points
	715	Skate life history info
	716	Squid assessments
	719	BS Oceanographic info
	725	Fisheries Rationalization and crew dynamics ???
	726	benthic habitat characterization
	728	Herring spawning areas
	729	Copper rockfish in PWS
	730	Pollock biomass to manage fisheries and SSL
	731	Comm fleet temp data collection to reduce bycatch
	734	GOA hydrology model ??

NPRB 2008	803	Plankton recorder (similar to 536)
	805	Meso-zooplankton populations GOA and BS
	806	Euphausia in GOA
	808	Skate habitat mapping EBS
	809	Rockfish survey patchiness
	810	Rockfish assessment in untrawlable areas using adv. technologies
	811	RKC enumeration
	812	Snow crab behavior and structure preferences
	813	Uncertainty in snow crab recruitment using management
	814	EBS Tanner crab recruitment
	815	P cod movements using mark-recapture
	817	P cod genetic; investigating ecological barriers
	823	Copper River salmon biology
	825	BB RKC management

12.3 EFH research priorities identified by species

Table 10 identifies research priorities that were highlighted in the individual species reviews.

Table 10 Research priorities identified in the individual species reviews

Council FMP	Species	Recommendation
BSAI Groundfish	pollock	none
	Pacific cod	The early life history stages of Pacific cod are poorly understood, as noted in several recent articles. Most of the recent work has focused on the Gulf of Alaska stock of Pacific cod.
	sablefish	Little is known about the early juvenile stage distribution, habitat requirements, and interaction with other components of the ecosystem. They have been known to reside in habitat subject to potentially adverse fishing effects as indicated by high LEI values for living structure (table B.3-3 of Final EFH EIS). Research is needed on the effect of fishing on the habitat in this area, the role of habitat features on prey, predator, and competitor species in the area, and the role of these species on the growth and survival of sablefish.
	yellowfin sole	Distribution of eggs, larvae and early juvenile stages is mostly unknown (undocumented).
	greenland turbot	Distribution of early juvenile stages is mostly unknown (undocumented).
	arrowtooth flounder	Distribution of larvae and early juvenile stages is mostly unknown (undocumented).
	northern rock sole	Distribution of eggs, larvae and early juvenile stages is mostly unknown (undocumented)
	flathead sole	Little to no information exists regarding early juvenile distribution and EFH requirements.
	alaska plaice	Distribution of larvae and early juvenile stages is mostly unknown (undocumented).
	rex sole	Distribution of early juvenile stages is mostly unknown (undocumented).
	dover sole	Review pending
	Pacific ocean perch	Little information currently exists on the habitat use of various life stages of POP. The studies above are addressing this issue, but field studies are often limited to small geographical areas relative to the POP distribution in Alaska. This field work should be continued and expanded in order to better understand how stock productivity is related to habitat. Also, efforts should be made to estimate population abundance in “trawlable” and “untrawlable” habitats, and their relative trends over time. A concern with our trawl surveys is that we implicitly assume the trawlable habitats (where we have data) are equivalent to the untrawlable habitats.

Council FMP	Species	Recommendation
	northern rockfish	Little information currently exists on the habitat use of various life stages of rockfish. The studies above are addressing this issue, but field studies are often limited to small geographical areas. This field work should be continued and expanded in order to better understand how stock productivity is related to habitat. Also, efforts should be made to estimate population abundance in "trawlable" and "untrawlable" habitats, and their relative trends over time. A concern with our trawl surveys is that we implicitly assume the trawlable habitats (where we have data) are equivalent to the untrawlable habitats.
	shortraker rockfish	Little information currently exists on the habitat use of various life stages of shortraker rockfish in the BSAI. Information on the distribution and habitat use of the various life-history stages would improve our knowledge of stock productivity and population dynamics. Also, efforts should be made to estimate population abundance in "trawlable" and "untrawlable" habitats, and their relative trends over time. A concern with our trawl surveys is that we implicitly assume the trawlable habitats (where we have data) are equivalent to the untrawlable habitats.
	blackspotted/ rougheye rockfish	Little information currently exists on the habitat use of various life stages of either blackspotted or rougheye rockfish in the BSAI. A study examining fine-scale habitat partitioning would help address the question of how speciation could occur and be maintained with organisms that appear to occupy similar large-scale habitats. Also, efforts should be made to estimate population abundance in "trawlable" and "untrawlable" habitats, and their relative trends over time. A concern with our trawl surveys is that we implicitly assume the trawlable habitats (where we have data) are equivalent to the untrawlable habitats.
	yelloweye rockfish	Review pending
	dusky rockfish	It is assumed that the bycatch of dusky in targeted fisheries in the Bering Sea is minimal and does not adversely impact the population or their habitat.
	thornyhead rockfish	It is assumed that the bycatch of shortspine thornyheads in targeted fisheries in the Bering Sea is minimal and does not adversely impact the population or their habitat.
	atka mackerel	o Studies to determine whether there have been any changes in life history parameters over time (e.g. maturity-at-age, fecundity, weight- and length-at-age) o Studies to determine the impacts of environmental indicators such as temperature regime on Atka mackerel o Information on Atka mackerel habitat preferences is needed to improve our understanding of Essential Fish Habitat (EFH), and improve our assessment of the impacts to habitat due to fishing o Better habitat mapping of the Gulf of Alaska would provide information for survey stratification and the extent of trawlable and untrawlable habitat. o Regional and seasonal food habits data for Gulf of Alaska Atka mackerel
	squid	Squid in the BSAI are very poorly understood, so any information on distribution or habitat would be helpful. Perhaps the most important question is how the distribution of squids (and the habitat needs that drive it) overlap with seabird and marine mammal predators. This would be really useful for looking at the potential impact of squid removals on other parts of the ecosystem.

Council FMP	Species	Recommendation
	octopus	1) Life history: Because octopuses are semelparous, a better understanding of reproductive seasons and habits is needed to determine the best strategies for protecting reproductive output. Reproductive seasons and spawning habitat of E dofleini need to be identified for Alaskan waters. Life histories of other species need more information. 2) Seasonal movement: E. dofleini in Japan and off the US west coast reportedly undergo seasonal movements, but the timing and extent of migrations in Alaska is unknown. While many octopus move into shallower coastal waters for egg-laying, it is probable that at least some octopus reproduction occurs within federal waters. 3) State/Federal: The distribution of octopus biomass and extent of movement between federal and state waters is unknown and could become important if a directed state fishery develops. Tagging studies to determine seasonal and reproductive movements of octopus in Alaska would add greatly to our ability to appropriately manage commercial harvest. 4) Biomass Estimation: Fishery-independent methods for assessing biomass of the harvested size group of octopus are feasible, but would be species-specific and could not be carried out as part of existing multi-species surveys. Pot surveys are effective both for collecting biological and distribution data and as an index of abundance; mark-recapture methods have been used with octopus both to document seasonal movements and to estimate biomass and mortality rates. These methods would require either extensive industry cooperation or funding for directed field research. Factors determining year-to year patterns in octopus abundance are poorly understood. Octopus abundance is probably controlled primarily by survival at the larval stage; substantial year-to-year variations in abundance due to climate and oceanographic factors are expected. The high variability in trawl survey estimates of octopus biomass make it difficult to depend on these estimates for time-series trends; trends in CPUE from observed cod fisheries may be more useful. 5) Natural Mortality: Estimates of natural mortality rates for octopus would require species and region-specific field studies. Any stock assessment calculations would need to be based on natural mortality rates for adult octopus prior to spawning. Development of octopus-specific survey gear or tagging would be needed to perform such studies. 6) Growth: Field and laboratory studies to determine growth rates, age at maturity, and fecundity.
	sharks	Estimates of bycatch from unobserved fisheries, including halibut IFQ and salmon. Identification of nursery areas and juvenile habitat use. Investigation of fishing effects on the species, such as fecundity and survival.
	sculpins	there is a need for research on sculpin habitat utilization throughout their life history. This basic information is not known. It is also not known whether bottom trawling negatively impacts the habitat of adult sculpins. It would be first priority to find out what types of habitat are utilized by sculpins throughout their life history and then determine whether fishing activities negatively impact those habitats.
	skates	1) Location and habitat features of skate nurseries. While some of these have been identified, further research is needed to fully characterize these areas. 2) Age-related movement and distribution of skates, particularly the Alaska skate.
	forage fish complex	Basic information on distribution, seasonal movements, and habitat associations
GOA Groundfish	pollock	Additional research is needed on impacts of trawling using midwater nets.
	pacific cod	The early life history stages of Pacific cod are poorly understood, as noted in several recent articles. Most of the recent work has focused on the Gulf of Alaska stock of Pacific cod.

Council FMP	Species	Recommendation
	sablefish	Little is known about the early juvenile stage distribution, habitat requirements, and interaction with other components of the ecosystem. They have been known to reside in habitat subject to potentially adverse fishing effects as indicated by high LEI values for living structure (table B.3-3 of Final EFH EIS). Research is needed on the effect of fishing on the habitat in this area, the role of habitat features on prey, predator, and competitor species in the area, and the role of these species on the growth and survival of sablefish.
	yellowfin sole	Review pending
	Northern rock sole	Review pending
	Southern rock sole	Review pending
	Alaska plaice	Review pending
	dover sole	The level of information for the early juvenile life stage is inadequate to change the current level from "Unknown" to "Level 1".
	Greenland turbot	Review pending
	rex sole	The level of information for the early juvenile life stage is inadequate to change the current level from "Unknown" to "Level 1".
	arrowtooth flounder	It would be desirable to know if arrowtooth flounders are broadcast or batch spawners. It would also be informative to know there role, if any, in the pelagic zone.
	flathead sole	While more information exists regarding early juvenile distribution and EFH requirements in the GOA than in the BSAI, it does not seem complete enough to change the level of information for this life stage from "Unknown" to "Level 1".
	Pacific ocean perch	There is little information on larval, post-larval, or early juvenile stages slope rockfish. Habitat requirements for these stages are mostly unknown. Habitat requirements for later stage juvenile and adult fish are anecdotal or conjectural. Research needs to be done on the bottom habitat of the major fishing grounds, on what HAPC biota are found on these grounds, and on what impact bottom trawling has on these biota. Additionally, Pacific ocean perch are undersampled by the current survey design. The stock assessment would benefit from additional survey effort on the continental slope. Further research on trawl catchability and trawlable/untrawlable grounds would be very useful.
	northern rockfish	Except for adults, there is almost no information on life history or habitat of northern rockfish in the GOA. At this time, identification of northern rockfish larvae and post-larvae is not possible, even using genetic methods. Additional genetic studies are needed to determine genetic markers that will positively identify northern rockfish to species. Few small juvenile northern rockfish have been caught in either the fishery or by surveys; studies are needed to locate and sample these young fish before their habitat requirements can be determined. Manned submersible studies on the outer shelf and upper slope have observed small red rockfish associated with corals and sponges. New studies need to be done to identify these fish to species and determine if they include northern rockfish. Although much more is known about adult fish, even their habitat requirements remain largely conjectural or based on circumstantial evidence. Research needs to be done on the bottom habitat of the major fishing grounds, on what HAPC biota are found on these grounds, and on what impact bottom trawling has on these biota.

Council FMP	Species	Recommendation
	shortraker rockfish[9]	There is very little information on larval, post-larval, or juvenile shortraker rockfish, especially juveniles, which are rarely caught in any sampling gear. Studies are needed to locate and sample these young fish before their habitat requirements can be determined. Although more is known about adult fish, the specifics of their habitat requirements need further research. For example, does a relationship exist between adult shortraker rockfish and Primnoa coral, and if so, how important is this relationship? Research needs to be done on the bottom habitat of the major fishing grounds, on what HAPC biota are found on these grounds, and on what impact bottom trawling has on these biota.
	blackspotted/ rougheye rockfish	There is little information on larval, post-larval, or early juvenile stages of rougheye and blackspotted rockfish. Habitat requirements for these stages are mostly unknown. Habitat requirements for later stage juvenile and adult fish are anecdotal or conjectural. Research needs to be done on the bottom habitat of the major fishing grounds, on what HAPC biota are found on these grounds, and on what impact bottom trawling has on these biota. Additionally, the current NMFS trawl survey design should extend into deeper waters (>300 m) to cover the range of primary habitat for rougheye and blackspotted rockfish. Further research on trawl and longline catchability, trawlable/untrawlable grounds, and natural mortality would be very useful.
	dusky rockfish	There is little information on larval, post-larval, or early juvenile stages slope rockfish. Habitat requirements for these stages are mostly unknown. Habitat requirements for later stage juvenile and adult fish are anecdotal or conjectural. Research needs to be done on the bottom habitat of the major fishing grounds, on what HAPC biota are found on these grounds, and on what impact bottom trawling has on these biota. Additionally, dusky rockfish are undersampled by the current survey design. The stock assessment would benefit from additional survey effort on the continental slope. Further research on trawl catchability and trawlable/untrawlable grounds would be very useful.
	yelloweye rockfish	adult and juvenile fish associations with living habitats and also more can be done to identify larvae and their locations, do DSR larvae ever use eel grass beds like some other rockfish species do?
	thornyhead rockfish	age and growth studies
	atka mackerel	o Studies to determine whether there have been any changes in life history parameters over time (e.g. maturity-at-age, fecundity, weight- and length-at-age) o Studies to determine the impacts of environmental indicators such as temperature regime on Atka mackerel o Information on Atka mackerel habitat preferences is needed to improve our understanding of Essential Fish Habitat (EFH), and improve our assessment of the impacts to habitat due to fishing o Better habitat mapping of the Gulf of Alaska would provide information for survey stratification and the extent of trawlable and untrawlable habitat. o Regional and seasonal food habits data for Gulf of Alaska Atka mackerel
	skates	Habitat needs for GOA skates have not been studied. In particular, it would be valuable to know whether there are nursery sites (where egg cases are deposited) similar to those that have been found in the BSAI. Also, we know nothing about movement of skates throughout the GOA.

[9] EFH is currently described for shortraker/ rougheye rockfish, not shortraker rockfish and blackspotted/ rougheye rockfish, as assessed in the SAFE report, and recommended by this review

Council FMP	Species	Recommendation
	octopus	1) Life history: Because octopuses are semelparous, a better understanding of reproductive seasons and habits is needed to determine the best strategies for protecting reproductive output. Reproductive seasons and spawning habitat of E dofleini need to be identified for Alaskan waters. Life histories of other species need more information. 2) Seasonal movement: E. dofleini in Japan and off the US west coast reportedly undergo seasonal movements, but the timing and extent of migrations in Alaska is unknown. While many octopus move into shallower coastal waters for egg-laying, it is probable that at least some octopus reproduction occurs within federal waters. 3) State/Federal: The distribution of octopus biomass and extent of movement between federal and state waters is unknown and could become important if a directed state fishery develops. Tagging studies to determine seasonal and reproductive movements of octopus in Alaska would add greatly to our ability to appropriately manage commercial harvest. 4) Biomass Estimation: Fishery-independent methods for assessing biomass of the harvested size group of octopus are feasible, but would be species-specific and could not be carried out as part of existing multi-species surveys. Pot surveys are effective both for collecting biological and distribution data and as an index of abundance; mark-recapture methods have been used with octopus both to document seasonal movements and to estimate biomass and mortality rates. These methods would require either extensive industry cooperation or funding for directed field research. Factors determining year-to year patterns in octopus abundance are poorly understood. Octopus abundance is probably controlled primarily by survival at the larval stage; substantial year-to-year variations in abundance due to climate and oceanographic factors are expected. The high variability in trawl survey estimates of octopus biomass make it difficult to depend on these estimates for time-series trends; trends in CPUE from observed cod fisheries may be more useful. 5) Natural Mortality: Estimates of natural mortality rates for octopus would require species and region-specific field studies. Any stock assessment calculations would need to be based on natural mortality rates for adult octopus prior to spawning. Development of octopus-specific survey gear or tagging would be needed to perform such studies. 6) Growth: Field and laboratory studies to determine growth rates, age at maturity, and fecundity.
	sharks	Estimates of bycatch from unobserved fisheries, including halibut IFQ and salmon; Identification of nursery areas and juvenile habitat use; Investigation of fishing effects on the species, such as fecundity and survival.
	sculpins	sculpin habitat utilization throughout their life history. This basic information is not known. It is also not known whether bottom trawling negatively impacts the habitat of adult sculpins. It would be first priority to find out what types of habitat are utilized by sculpins throughout their life history and then determine whether fishing activities negatively impact those habitats.
	squid	Squid in the GOA are very poorly understood, so any information on distribution or habitat would be helpful. Perhaps the most important question is how the distribution of squids (and the habitat needs that drive it) overlap with seabird and marine mammal predators. This would be really useful for looking at the potential impact of squid removals on other parts of the ecosystem.
	forage fish complex	There are lots of little bits of information on GOA forage fishes; what is needed is a comprehensive understanding of distribution, habitat, and movement gulfwide. Hopefully the GOA IERP will yield some of this

13 Conclusions

The 5-year EFH review is currently underway, at the writing of this preliminary draft. Once the document is finalized, the Council's primary decision point will be to determine whether, based on the new information available in the last five years, revisions to the EFH text in the Council's 5 FMPs are warranted. This preliminary draft does not contain species-specific review information for the BSAI Crab, Scallop, or Salmon FMPs, nor does it contain the full review of the effects of fishing on EFH. The reviews for groundfish species are largely complete, as is the review of non-fishing effects.

The Council also decided, in June 2009, to delay the consideration of whether to initiate a new HAPC proposal cycle until the completion of the EFH 5-year review. Consequently, another decision point for the Council once the review is finalized will be to decide whether to set HAPC priorities, thus initiating a call for proposal for specific sites to define as HAPCs. Section 11 provides some guidance to the Council on HAPC priorities that have been suggested since the last HAPC proposal cycle, both within the Council process and as part of the EFH review.

In order to provide some guidance for the Council with respect to whether to initiate FMP amendments for revising EFH, the recommendations contained within the review are summarized in Table 11.

Table 11 Summary of recommended changes to the FMPs resulting from the EFH 5-year review

EFH component	Council FMP	Recommended change	Priority?
EFH descriptions of individual species	BSAI Groundfish	Some degree of change is recommended to the FMP text for all 24 species or complexes whose habitat is described in the BSAI FMP	The BSAI Plan Team will likely have recommendations about whether these amendments constitute low or higher priorities. However, based on the author reviews, it is possible that revisions for nine species may qualify as higher priority amendments, that have the potential to affect management of the species.
	GOA Groundfish	Some degree of change is recommended to the FMP text for all 24 species or complexes whose habitat is described in the GOA FMP	As above, the GOA Plan Team will likely have recommendations about whether these amendments constitute low or higher priorities. However, based on the author reviews, it is possible that revisions for nine species may qualify as higher priority amendments, that have the potential to affect management of the species.
Fishing activities that may adversely affect EFH	All Council FMPs	Review is pending for comparing the fishing distribution from the period analyzed in the EFH EIS to the most recent period. Preliminary information for the Bering Sea was made available for the stock assessment authors.	Unknown pending completion of review.
Non-fishing activities that may adversely affect EFH	All Council FMPs	Review is completed for 22 of 27 activities evaluated. New EFH conservation recommendations proposed for 12 of 22 activities.	Recommendations are used by NMFS to consult with other agencies about activities affecting EFH.

EFH component	Council FMP	Recommended change	Priority?
HAPC identification	Potentially all Council FMPs	Review has provided suggestions for HAPC priorities	Council has indicated that consideration of whether to set HAPC priorities will occur in conjunction with EFH 5-year review.
Research and information needs	Potentially all FMPs	FMPs include a general plan for EFH research questions. Review has identified specific research needs for individual species.	Council may wish to consider revising general EFH research strategy. Additionally, Council may wish to incorporate specific research needs for species within its annual research priorities.

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Preparation of document

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Review of groundfish species EFH

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BSAI and GOA Groundfish Plan Teams

Review of non-fishing effects

Coordinated by Jeanne Hanson; Erika Ammann, Doug Limpinsel, Katherine Miller, Hartmann Moore, Lance, Shaw (others?)

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