

Habitat Assessment Prioritization for Alaska Stocks

Report of the Alaska Regional Habitat Assessment Prioritization Coordination Team

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Report of the Alaska Regional Habitat Assessment Prioritization Coordination Team

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ABSTRACT

The significance of habitat to sustainable management of the Nation's fisheries was acknowledged by the U.S. Congress in 1996. The Magnuson-Stevens Fishery Conservation and Management Act was amended by the Sustainable Fisheries Act of 1996 to include provisions for defining Essential Fish Habitat (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity", applicable to all federally managed species and all of their life-history stages. The sheer magnitude of the EFH mandate and the general absence of dedicated funding prompted the agency to produce the Habitat Assessment Improvement Plan (HAIP) for marine fisheries. The HAIP had multiple objectives including the improvement and prioritization of habitat-science research activities related to stock assessments and EFH definitions. One of the key recommendations in the HAIP is that NMFS should develop criteria to prioritize stocks and geographic locations that would benefit from habitat assessments, meaning the process and products associated with consolidating, analyzing, and reporting the best available information on habitat characteristics relative to the population dynamics of fishery species and other living marine resources. This prompted formation of the national Habitat Assessment Prioritization Working Group (HAPWG) in 2011. The HAPWG developed national guidance for objectively scoring managed species/stocks on a standard set of rubrics. The prioritization process involved a sequential set of filters and scorable criteria intended to identify high, medium, and low priority stocks for future habitat assessments, both in terms of value to EFH designations and to address habitat-related uncertainty in stock assessments.

A coordination team representing the Alaska Fisheries Science Center, the Alaska Regional Office, and the NMFS Office of Science and Technology adapted the generic prioritization process to the specific circumstances in the Alaska Region, assembled data and references to support online scoring, and arranged for the lead stock assessment authors to score their stock(s) from among the assembled list of managed stocks. As a result, a total of 69 stocks or stock complexes were individually evaluated by the stock-assessment authors including six crab stocks and one rockfish complex that are managed by the State of Alaska and three non-target species that were added at the request of the NPFMC Groundfish Plan Team. Fourteen stocks each in the stock assessment and EFH themes were identified as high priorities for habitat assessments, based on predetermined scoring thresholds for the Alaska Region. Overall, 17 different stocks were given high-priority status in one or the other theme and 11 stocks were prioritized in both themes. Upon completion, an internal review was conducted to assess the process and develop recommendations for future habitat-prioritization exercises.

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Introduction

The spatial distributions of fish reflect variability in the surrounding environment, and those areas normally occupied by a species constitute its habitat. These places where a species lives are often characterized by their physical, biological, and geological properties. The significance of habitat to sustainable management of the Nation's fisheries was acknowledged by the U.S. Congress in 1996. The Magnuson-Stevens Fishery Conservation and Management Act was amended by the Sustainable Fisheries Act of 1996 (P. L. 104-297) to include provisions for defining Essential Fish Habitat (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity". This mandate was intended to protect designated areas from harm by fishing and other human activities and applies to all federally managed species, each of their life history stages, and to certain major prey species as well. For each of these cases, the National Marine Fisheries Service (NMFS) is required to describe EFH in environmental terms and produce maps of its spatial extent based on the best available scientific information.

The sheer magnitude of the EFH mandate and the general absence of dedicated funding prompted the agency to produce the Habitat Assessment Improvement Plan (HAIP) for marine fisheries (NMFS 2010). The HAIP had multiple objectives including the improvement and prioritization of habitat-science research activities related to stock assessments, EFH definitions, coastal and marine spatial planning, and ecosystem-based fishery management. Its scope was limited to stocks and stock complexes with formal Fishery Management Plans administered by regional fishery management councils, with particular focus on those comprising the Fish Stock Sustainability Index (FSSI) which represent 85% of the total domestic catch (FSSI, n = 199 stocks).

The HAIP defines habitat science as the study of relationships between species and their environment and states that the relative importance of different habitats can be inferred from habitatspecific rates of growth, mortality, and production. When these habitat-specific vital rates are not available, it is commonly assumed that animal densities reflect different levels of habitat utilization, and the degree to which a habitat is utilized is indicative of habitat quality (McConnaughey and Smith 2000). A habitat assessment is the process and products associated with consolidating, analyzing, and reporting the best available information on habitat characteristics relative to the population dynamics of fishery species and other living marine resources. Indicators of the value and condition (or status) of habitat can be developed through a habitat assessment by understanding the relationships between habitat characteristics, the productivity of fishery species, and the type and magnitude of various impacts.

One of the key recommendations in the HAIP is that NMFS should develop criteria to prioritize stocks and geographic locations that would benefit from habitat assessments. Although not part of the EFH mandate, it is nevertheless considered a strategic approach to the agency's sizable habitat-science task and prompted formation of the national Habitat Assessment Prioritization Working Group (HAPWG)

in 2011. The HAPWG was specifically tasked to 1) determine the approach, terms, and specific criteria that are most appropriate for prioritizing habitat assessments; and 2) make recommendations about how to best apply prioritization criteria to develop lists of regional habitat priorities (NMFS 2011). To this end, guidance for objectively scoring managed species/stocks on a standard set of rubrics was developed for the six NMFS regions. The prioritization process involved a sequential set of filters and scorable criteria intended to identify high, medium, and low priority stocks for future habitat assessments, both in terms of value to EFH designations and to address habitat-related uncertainty in stock assessments (Fig. 1). To date, the regional Habitat Assessment Prioritization (HAP) process has been completed in three regions. The Southwest Region (i.e., California) was the first to work through the regional prioritization process and test the practical implementation of the criteria and guidelines outlined by the HAPWG (NMFS 2012). The Northwest Region completed the regional prioritization process for Washington, Oregon, and Idaho in 2013-14 (NMFS 2014). That final report describes application of the HAPWG prioritization criteria to both the Northwest and Southwest stocks, compares and contrasts different scoring approaches, and presents results across all West Coast stocks. The Northeast Region evaluated 39 fishery species representing 49 stocks managed under 14 separate fishery management plans that are administered by two different fishery management councils (NMFS 2015). That final report also identified and prioritized significant data gaps for the stocks considered and discussed possible bias against pelagic stocks in the guidance. More recently, the Pacific Islands Region, with jurisdiction over approximately 1.5 million square nautical miles of habitat, completed the habitat HAP-scoring process for 68 important species and families, and a final report is being developed. The Southeast Region has not yet prioritized its stocks. The present document reports on the HAP process for the Alaska Region.

Habitat Assessment Prioritization – Alaska

In overview, a coordination team representing the Alaska Fisheries Science Center, the Alaska Regional Office, and the NMFS Office of Science and Technology was formed in 2014 to structure and support the Habitat Assessment Prioritization process for the Alaska Region. Based on consultations and the experiences in other regions, the team adapted the generic prioritization process (Fig. 1) to the specific circumstances in the Alaska Region, assembled data and references to support scoring, and arranged for the lead stock assessment authors to score their stock(s) from among the assembled list of managed stocks. Notable departures from the approaches used in the other regions included scoring by stock assessment authors (Table 1) rather than a small panel of experts, common access to reference information to support consistent scoring, and the online collection and tabulation of results.

Supporting Information

To facilitate consistent scoring, the Alaska coordination team provided basic stock information and data sourced (2/4/2016) from the <u>NMFS Species Information System database</u> and the <u>NMFS</u>

<u>Annual Commercial Landings Statistics database</u> for each stock or stock complex (Appendix A), including the following:

- 1. Fishery management plan.
- 2. Scientific name.
- 3. FSSI membership (2015, n = 199).
- 4. Stock notes.
- 5. Lead stock-assessment author and affiliation.
- 6. Year of last assessment (full, partial, benchmark) or not assessed.
- 7. SAIP assessment level.
- 8. Biomass (metric tons in 2015, except as noted).
- 9. B_{MSY.}
- 10. B/B_{MSY.}
- 11. Catch (F; metric tons in 2014, except as noted) and basis; catch limit (Flim) and basis; and F/Flim.
- 12. Stock status (overfishing, overfished, approaching overfished, rebuilding).
- 13. Commercial retained weight (year; sold whole weight for non-groundfish stocks; salmon and scallop values are statewide).
- 14. Commercial value (average per pound and total ex-vessel value for 2012-2014, based on the <u>NMFS Annual Commercial Landings Statistics database</u>).
- 15. Current (2010) EFH levels for eggs, larvae, early juveniles, late juveniles, adults.

Other information sources were also suggested to address specific scorable criteria, including the following:

- 1. Recreational catch at the state level (<u>Pacific States Marine Fisheries Commission Recreational</u> Fisheries Information Network "RecFin" database).
- 2. Trophic level (<u>FishBase</u>, cautionary use).
- 3. <u>Productivity and Susceptibility Analysis</u> (PSA) scores. These have been calculated for 90 of the Alaska stocks and stock complexes (Ormseth and Spencer 2011).

Additional supporting references were in some cases identified and used by stock authors during scoring, including current <u>Stock Assessment and Fishery Evaluation (SAFE) reports</u> and the <u>Fishery</u> <u>Management Plan</u> appendices.

Species List

The Alaska region encompasses nearly 3 million square miles spanning five different <u>large</u> <u>marine ecosystems</u>, namely the Eastern Bering Sea, Gulf of Alaska, Aleutian Islands, Chukchi Sea, and Beaufort Sea. A great variety of fisheries produced more than 2.7 billion kg valued at more than \$1.7 billion, representing 61% of national landings and 33% of the total national value (2015; <u>NMFS</u> <u>Commercial Fishery Statistics</u>).

A total of 181 individual species are represented by the 65 stocks or stock complexes that are actively managed with six federal Fishery Management Plans (FMPs) administered by the North Pacific Fishery Management Council (NPFMC) plus an additional 20 that are designated as Ecosystem Components (non-FMU), not listed within the FMP, or are species managed within the complexes. Stocks not actively managed under Federal FMPs, including state-managed species (e.g., crab, salmon), certain forage species, protected resources, and non-target stocks managed as "Ecosystem Considerations" or "Data Management", are ordinarily beyond the scope of the NMFS HAP process. However, scientists on the NPFMC Groundfish Plan Teams raised concern about exclusion of certain species that are not actively managed, particularly those that are listed in the FMPs as ecosystem components and are included as stand-alone chapters in the annual SAFE report. The consensus was that grenadiers (Macrouridae) and certain forage fish species should automatically pass through the first filter criterion (Fig. 1) and be added to the list of Alaska stocks being prioritized. Note that this inclusion is consistent with an ecosystem approach to management. Six crab stocks and one rockfish complex that are managed by the State of Alaska with federal oversight were also scored. Two walleye pollock stocks (Aleutian Islands, Bogoslof) were merged with the Bering Sea stock for scoring; forage fishes in the Bering Sea/Aleutian Islands and Gulf of Alaska were considered as a single group; and 13 stock-complex members were not individually scored. As a result, a total of 69 stocks or stock complexes were individually evaluated by the stock-assessment authors (Table 1).

General Scoring Guidance

General guidance for prioritization scoring was developed by the coordination team and a guidance document was provided to stock authors before scoring commenced. Specifically:

- 1. <u>Compiling Scores</u>: An online scoring template was used by stock authors to provide scores and accompanying information. One form was filled out for each stock.
- 2. <u>Stock Complexes</u>: Many Alaska species are managed as part of stock complexes. Although these management complexes may represent a variety of life history characteristics, many also contain a large number of species with limited data available. Therefore, to improve data quality and reduce the workload burden on respondents, not every species within each complex should be considered individually. It was, however, left to the discretion of the stock authors how best to score stock complexes considered as a group overall, or selecting one or more representative ("indicator") species contained within. Complexes were identified in a dropdown list of stock names. If scoring was for a particular representative/indicator stock(s) instead, the complex name was used and the species being used was noted on the scoring form.
- 3. <u>Comparing Stocks</u>: Some criteria assign points to the top quartile of stocks. When assigning scores under these types of scoring rubrics, scorers were instructed to make comparisons against other stocks *within* the stock's FMP. For instance, a groundfish stock in the Gulf of Alaska should be compared against other groundfishes in the Gulf of Alaska, but not against Bering Sea stocks, crab, or salmon.

- 4. <u>Life History Stages</u>: Each life history stage was considered and the maximum score was assigned to that stock.
- 5. <u>Top Scores</u>: The top level of some criteria set a high bar and may not be achieved for many stocks. This was both expected and acceptable.
- 6. <u>Documenting Scoring Rationale</u>: A brief explanation of the rationale should accompany each individual score, including the life history stage considered. For example, "Stock is not listed in the Research Priorities document" or "EFH description is unavailable for the juvenile life history stage." Notes about any additional resources used to support scoring were also requested. This information is important to document priorities, data gaps, and research needs.
- 7. <u>Limited Supporting Data</u>: Wherever possible, online data to support scoring was consolidated and provided. In cases of inadequate information, scores could be inferred from similar stocks, similar habitats, and/or professional opinion or judgment. If no information was available and could not be inferred through similar stocks, habitats, or expert opinion, a moderate value (i.e., 2) should be assigned to ensure that the lack of information does not significantly impact the stock's overall score either positively or negatively.
- 8. <u>Weighting</u>: Weighting of individual criteria during calculation of the final score is discouraged in the Habitat Assessment Prioritization guidance (NMFS 2011) and was not applied for the Alaska prioritization.

Scoring Guidance and Results

Another section in the Alaska guidance document summarized the scoring rubrics identified in the national guidance document (NMFS 2011), along with specific instructions on how to apply them to Alaska stocks in consideration of regional circumstances and data availability.

FILTER CRITERION: FMP stock listed in the FSSI or is a regional Fishery Management Council research priority

<u>Scoring Rubric</u>: Due to the large number of FMP stocks and the information requirements of the prioritization process, it is necessary to filter out lower priority stocks. To pass this filter for further consideration, a stock must be included in the management unit of a federal FMP. The stock must also be included as one of the 199 stocks on the Fish Stock Sustainability Index (FSSI) list or be listed as a regional Fishery Management Council research priority.

<u>Alaska Application</u>: All stocks that are not included in the management unit of a federal FMP have already been removed from the list of stocks for initial consideration. Stock listings match those used for stock status, but may differ from the listing used for describing EFH. The exception to this is salmon, which are listed at the species level. FSSI-listed stocks can be found in the supporting data. To

determine if a stock is a research priority, refer to the most recent NPFMC Research Priorities document (NPFMC 2014) or <u>online database</u>. If a stock is mentioned in the document, it should pass through the filter. Stocks may be listed as general research priorities and still pass – they do not need to be listed as a habitat-specific research priority. Stocks not included in the FSSI or listed in the research priorities document should be removed from further consideration and do not need to be addressed in any further criteria/questions, with the special exception of grenadiers (Macrouridae) and forage fish.

Excluded Stocks: 1) Golden king crab – Pribilof Islands, 2) Red king crab – Western Aleutian Islands, 3) Arctic cod - Arctic Management Area, 4) Saffron cod - Arctic Management Area, 5) Snow crab - Arctic Management Area, 6) Bering Sea / Aleutian Islands Other Rockfish Complex, 7) Bering Sea / Aleutian Islands Sculpin Complex, 8) Shortraker rockfish - Bering Sea / Aleutian Islands, 9) Atka mackerel - Gulf of Alaska, 10) Gulf of Alaska Sculpin Complex, 11) Shortraker rockfish - Gulf of Alaska.

FILTER CRITERION: Habitat assessment likely to benefit stock assessment

<u>Scoring Rubric</u>: This criterion is intended to select only those stocks whose stock assessments would likely benefit from a habitat assessment. To pass this filter for further consideration, a stock must be likely to be assessed in the next 5 years. Additionally, the stock's assessment must be likely to benefit from a habitat assessment through one of the following conditions. The habitat assessment would likely 1) improve model design (e.g., define spatial structure or provide an additional population dynamics process); 2) improve stock-assessment-model inputs (e.g., improve survey design or reduce sampling variability); or 3) create new opportunities to develop modeling or survey techniques that incorporate the relationship between habitat and population processes or data variability.

<u>Alaska Application</u>: This filter should be applied on the basis of expert opinion as described immediately above; erring on the side of inclusion (a related scorable criterion offers additional opportunity to differentiate stocks on this basis). Stocks that do not pass this filter are removed from further consideration for the Habitat for Stock Assessment application; scores for the "Benefits of a habitat assessment to a stock assessment" scorable criterion do not need to be provided, but all other remaining criteria should be scored.

Excluded Stocks: 1) Red king crab – Norton Sound, 2) Bering Sea / Aleutian Islands Octopus Complex (giant octopus), 3) Bering Sea / Aleutian Islands Shark Complex, 4) Bering Sea / Aleutian Islands Squid Complex, 5) Flathead sole - Gulf of Alaska, 6) Gulf of Alaska Octopus Complex (giant octopus), 7) Gulf of Alaska Shark Complex, 8) Gulf of Alaska Squid Complex, 9) Gulf of Alaska Thornyhead Rockfish Complex (shortspine thornyhead), 10) Gulf of Alaska Grenadiers (giant grenadier), 11) Bering Sea / Aleutian Islands Grenadiers (giant grenadier).

FILTER CRITERION: Habitat assessment likely to inform essential fish habitat science

<u>Scoring Rubric</u>: To pass this filter for further consideration, an EFH review must be expected to be completed in the next 5 years for a stock, species, and/or species complex. In addition, the habitat assessment for this stock must be likely to describe EFH, refine EFH, or improve the understanding of adverse effects of fishing or non-fishing activities on EFH.

<u>Alaska Application</u>: All stocks pass this filter – all EFH is reviewed every 5 years.

SCORABLE CRITERION: Benefits of a habitat assessment to a stock assessment

<u>Scoring Rubric</u>: Assign the score corresponding to the highest applicable category below.

Score	Rubric		
	A habitat assessment for this stock is likely to result in an SAIP Level 5 stock		
5	assessment, an HAIP Tier 3 habitat assessment, or improve performance within an		
	existing SAIP Level 5 or HAIP Tier 3 assessment.		
4	A habitat assessment for this stock is likely to improve survey efficiency or efficacy,		
	reduce sampling variability, or improve the analysis of fishery catch per unit of		
	effort (CPUE) data that are likely to be used in a stock assessment.		
	A habitat assessment would provide new opportunities to develop stock		
1	assessment modeling or survey techniques that incorporate the relationships		
	between habitat and population processes or data variability.		

<u>Alaska Application</u>: Scores should be assigned on the basis of expert opinion, evaluating the feasibility and likelihood of applying habitat assessment results to the stock assessment process for each stock considered. SAIP Level 5 stock assessments are defined in the Stock Assessment Improvement Plan (SAIP; NMFS 2001) as assessments that use complex and sophisticated methods, incorporating ecosystem considerations in addition to spatial and seasonal analyses into the assessment model. Ecosystem considerations include one or more of the following: 1) time-varying parameters, including environmental variables; 2) multispecies effects; or 3) living components of the ecosystem. HAIP Tier 3 habitat assessments are defined in the Habitat Assessment Improvement Plan (NMFS 2010) as those habitat assessments that incorporate habitat-specific vital rates (e.g., growth, reproduction, survival, and production) of FMP/FSSI stocks by life stage. This is equivalent to EFH Levels 3 and 4 data. Information on the current SAIP assessment level is provided in the supporting data table; no HAIP Tier 3 habitat assessments are currently available for Alaska marine stocks.

<u>Top Scoring Stocks</u>: 1) Snow crab - Bering Sea, 2) Greenland halibut - Bering Sea / Aleutian Islands, 3) Pacific ocean perch - Gulf of Alaska.

SCORABLE CRITERION: Habitat assessment likely to advance EFH information

<u>Scoring Rubric</u>: EFH regulations define four progressive levels of information for describing EFH. This criterion evaluates the extent to which a habitat assessment for a stock will result in an increase in the EFH level of knowledge for any life stage of the stock, or increase understanding of the effects of fishing or non-fishing activities on EFH. For this purpose, all improvements between EFH levels of knowledge are equal, such that moving from level 1 to 2 is the same as moving from level 3 to 4 (or level 1 to 4).

Score	Rubric		
	A habitat assessment would likely provide an initial description of EFH or an		
5	increase in understanding of adverse effects of fishing or non-fishing activities on		
	EFH.		
4	A habitat assessment would likely provide an increase in information sufficient to		
	increase between EFH levels of knowledge.		
1	A habitat assessment would likely provide an increase in information within the		
	existing EFH level of knowledge.		

<u>Alaska Application</u>: EFH levels of knowledge are defined as follows: Level 1 = presence/absence data are available to describe the distribution of a species (or life history stage) in relation to potential habitats, for some or all portions of the geographic range of the species; Level 2 = quantitative data (i.e., density or relative abundance) are available for the habitats occupied by a species or life history stage; Level 3 = data are available on habitat-related growth, reproduction, and/or survival by life history stage; Level 4 = data are available that directly relate the production rates of a species or life history stage to habitat type, quantity, quality, and location. Current EFH levels of knowledge for Alaska stocks are provided in the supporting data to aid scoring based on professional judgment.

<u>Top Scoring Stocks</u>: 1) Red king crab – Bristol Bay, 2) Bering Sea / Aleutian Islands Skate Complex, 3) Pacific cod - Aleutian Islands, 4) Pacific cod - Bering Sea, 5) Gulf of Alaska Other Rockfish Complex, 6) Weathervane scallop – Alaska.

SCORABLE CRITERION: Fishery status

<u>Scoring Rubric</u>: This criterion prioritizes stocks that are at risk of population decline due to overexploitation or other factors. Scores are determined using current official stock status determinations and by comparing current levels of abundance and fishing mortality to reference levels.

Score	Rubric		
5	Stock is overfished, approaching an overfished condition, experiencing overfishing,		
	or is in a rebuilding or recovery plan.		
3	Stock is below 80% of B _{MSY} .		
2	Stock is fully exploited (i.e., $F_{MSY} \ge F_c \ge 0.75^* F_{MSY}$, or ABC \ge Total Catch $\ge 0.75^* ABC$ if		
	Fmsy is not available).		
1	Stock status is unknown, but credible information exists to suggest that the stock is		
	at risk or vulnerable to overexploitation.		
0	Stock is not overfished, not approaching an overfished condition, not experiencing		
	overfishing, or otherwise showing any evidence of overexploitation. Or, if stock		
	status is unknown, no available evidence suggests that the stock is currently		
	vulnerable to overexploitation.		

<u>Alaska Application</u>: Information on current stock status (overfished, approaching overfished, overfishing, rebuilding/recovery) is provided for Alaska stocks in the supporting data, along with current biomass and catch levels relative to reference levels from the most recent stock assessments (as reported to the Species Information System database). This information should be used to score stocks for the 2-3-5 point categories. Stocks not qualifying for the 2-3-5 point categories should be scored either 0 or 1 point on the basis of expert opinion.

Top Scoring Stocks: (1) Blue king crab - Pribilof Islands.

SCORABLE CRITERION: Regional Fishery Management Council research priority

Scoring Rubric: This criterion is intended to identify stocks considered important to the regional FMC. Stocks may be listed as general research priorities; habitat-specific research priorities are not required here. All stocks represented as FMC priorities but not identified as having specific, pressing issues or ongoing needs that must be addressed (i.e., do not qualify for 5 or 3 points) should be assigned 1 point.

Score	Rubric
	Research is identified for a stock by the regional FMC to address a pressing issue
5	and satisfy the federal requirements of the Magnuson-Stevens Fishery
	Conservation and Management Act.
2	Research is identified for a stock by the regional FMC to address ongoing needs
5	to maintain existing fishery management.
1	Research is identified for a stock by the regional FMC; however, it is not of
	immediate concern or necessary to manage a federal fishery.

<u>Alaska Application</u>: Refer to the most recent NPFMC Research Priorities document (NPFMC 2014) to score this criterion. Stocks listed as critical or high research priorities by the NPFMC should be considered "pressing issues" and scored 5 points. Stocks listed as medium research priorities should be considered "ongoing needs" and scored 3 points. All other stocks listed in the most recent priorities document, including those classified as low priorities, should be considered "not of immediate concern" and scored 1 point.

<u>Top Scoring Stocks</u>: 1) Golden king crab – Aleutian Islands, 2) Snow crab - Bering Sea, 3) Atka mackerel - Bering Sea / Aleutian Islands, 4) Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex, 5) Bering Sea / Aleutian Islands Octopus Complex (giant octopus), 6) Bering Sea / Aleutian Islands Squid Complex, 7) Northern rockfish - Bering Sea / Aleutian Islands, 8) Pacific cod -Aleutian Islands, 9) Pacific cod - Bering Sea, 10) Pacific ocean perch - Bering Sea / Aleutian Islands, 11) Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska, 12) Gulf of Alaska Octopus Complex (giant octopus), 13) Gulf of Alaska Other Rockfish Complex, 14) Gulf of Alaska Squid Complex, 15) Gulf of Alaska Grenadiers (giant grenadier), 16) Bering Sea / Aleutian Islands Grenadiers (giant grenadier).

SCORABLE CRITERION: Habitat disturbance, vulnerability, and rarity

<u>Scoring Rubric</u>: This criterion measures a suite of related characteristics that together describe the susceptibility of a fish stock to the impacts of habitat loss or alteration. While few habitats are truly pristine, this criterion is intended to refer to meaningful disruptions to the ecological function of a habitat. Each stock should be assigned a point in every category for which it meets the standards, with a maximum score of 5 points. If information to support an individual category is not available, cannot be inferred through similar stocks or habitats, or cannot be determined through professional judgment, no points should be awarded for that category. All habitat aspects (e.g., benthic characterization, water column and oceanographic conditions, and connectivity) should be considered. Category 1 refers to direct habitat disturbances (e.g., fishing, dredging, mining, point-source pollution, and habitat removal), while Category 2 evaluates indirect impacts caused by humans but mediated by a series of other physical, chemical, or biological processes (e.g., freshwater diversions, nutrient enrichment, climate change, and non-point source pollution). For Category 3, consider disturbance based on location (e.g., close to population centers, close to fishing ports, or heavily used fishing grounds). Categories 4 and 5 refer to the vulnerability and rarity (respectively) of a stock's habitat, not of the stock itself. Habitats that are slow to recover should be considered in the context of recovery time and disturbance frequency. Rarity may be defined either spatially or ecologically (e.g., living habitats), and can include habitat types that have experienced substantial loss.

Additive Points	Rubric	Category	
	A large portion of the habitat of a fish stock		
+1	is disturbed due to fishing activities or	1	
	other direct anthropogenic events.		
	A large portion of the habitat of a fish stock		
+1	is disturbed as a result of natural disasters	2	
	and indirect anthropogenic impacts.		
+1	The habitat of a fish stock is vulnerable to		
	disturbance based on a location that is	2	
	accessible or heavily used, resulting in	5	
	impacts to habitat.		
+1	The habitat of a fish stock is vulnerable or	Λ	
+1	slow to recover from disturbance.	4	
+1	The habitat of a fish stock is demonstrably	F	
	rare.	5	

<u>Alaska Application</u>: Scores should be assigned primarily on the basis of expert opinion. New stock-specific results from a long-term effects index model may be available to inform scoring. When assigning scores for Categories 1-3, carefully consider impacts due to use (1/2) versus location (3) – an individual stock may receive points in one, two, or all three categories. Category 2 includes impacts due to climate change, but the relative magnitude of impacts due to climate should be considered (e.g., all stocks impacted to a certain extent by climate change, but some disproportionately). For Category 5, the NPFMC defines rarity as habitats uncommon or less frequent, and occurs to some extent or in discrete areas within only one or two of the Alaska regions identified by the NPFMC (Gulf of Alaska, Bering Sea, Aleutian Islands, and Arctic).

Top scoring stocks: None (maximum score was 2 points).

SCORABLE CRITERION: Habitat dependence

<u>Scoring Rubric</u>: This criterion prioritizes habitat science for stocks that are highly habitatdependent.

Score	Rubric			
5	There is quantitative evidence that vital rates and productivity of a stock are dependent on habitat.			
3	There is a measurable difference, attributable to habitat quality and/or quantity, in a stock's density, population size, and/or an individual's condition factor.			
1	While uncertainty exists due to poor or conflicting data, there is a reasonable expectation for a measurable difference, attributable to habitat quality and/or quantity, in a stock's density, population size, and/or an individual's condition factor.			

<u>Alaska Application</u>: Points should be assigned on the basis of professional judgment, utilizing external resources as available. Note that the 5-point category is roughly equivalent to EFH level 4 information, which is not available for most stocks.

<u>Top Scoring Stocks</u>: 1) Snow crab - Bering Sea, 2) Arrowtooth flounder - Bering Sea / Aleutian Islands, 3) Arrowtooth flounder - Gulf of Alaska, 4) Pacific cod - Gulf of Alaska, 5) Walleye pollock -Western / Central Gulf of Alaska.

SCORABLE CRITERION: Ecological importance

<u>Scoring Rubric</u>: This criterion places higher priority on stocks with relatively high ecological importance. A maximum of 5 points is possible. Each life history stage should be considered, and the score from the maximum-scoring life history stage for a category should be assigned to that category.

Additive Points	Rubric	Category
	The stock is an important predator. Based	
	on current data from the region, the stock	
+1	consumes a high number of species (top	1
	quartile) compared to other predators at	
	that life stage.	

Additive Points	ditive Points Rubric			
	The stock is important prey. Based on			
	current data from the region, the stock			
+1	occurs in diets of a high number of species	2		
	(top quartile) compared to other prey at			
	that life stage.			
	The stock has a high biomass. The stock			
+1	currently has a high (top quartile) biomass			
	in the best available metric, within the	3		
	region of interest, and at a particular life			
	stage.			
	The stock is a habitat-altering species. It is			
+1	known to create, modify, or maintain	4		
	habitat functions.			
+1	Evidence exists that in the region of			
	interest the stock was historically	E		
	abundant, or an important	J		
	predator/prey/ecosystem engineer.			

<u>Alaska Application</u>: When making comparisons amongst stocks for Categories 1-3, compare individual stocks only against all other stocks within a given FMP (e.g., Groundfish of the Gulf of Alaska). Categories 1 and 2 should be scored on the basis of expert opinion, while current biomass data will be provided in the supporting data to aid in scoring Category 3. For Category 4, the definition for habitataltering species comes from Jones et al. (1994). The authors describe ecological engineers as organisms that modify, maintain, or create habitats by directly or indirectly affecting the availability of resources to other species by causing physical state changes in biotic or abiotic materials. This can include species that change the environment via their own physical structures (their living or dead tissues; e.g., corals, mussels, tube-building polychaete worms), as well as those that change the environment by transforming living or non-living materials from one physical state to another via mechanical or other means (e.g., sediment excavators such as certain skate species or salmon). The direct provision of resources to other species in the form of living or dead tissues is not considered ecological engineering. Category 5 should include, in addition to considerations of historical abundance, significant range shifts related to climate change affecting regional abundance.

<u>Top Scoring Stocks</u>: None (maximum score was 3).

SCORABLE CRITERION: Economic, social, and management value

<u>Scoring Rubric</u>: This criterion measures the importance of a stock in economic, social, and management terms. Assign a point in each applicable category; a maximum of 5 points is possible. Points for management importance (Categories 3 and 4) should be awarded if the stock meets one of the following conditions: 1) it functions as a "choke stock" with bycatch limits that can cause premature closure of another fishery; 2) its fishery is responsible for protective spatial-management measures that substantially limit fishing effort or methods in the region; or 3) it is directly responsible for a significant take of protected species. Category 5 includes considerations for social importance such as traditional use, historical ties to fishing communities, or indigenous rights.

Additive Points	Rubric	Category
	The economic impacts of the commercial	
+1	industry for this stock are in the top	1
	quartile (25%) of FMP stocks in the region.	
	The economic impacts of recreational	
+1	fishing for this stock are in the top quartile	2
	(25%) of FMP stocks in the region.	
+1	The commercial fishery for the stock has	р
+1	high resource-management importance.	5
ــــــــــــــــــــــــــــــــــــــ	The recreational fishery for the stock has	Л
+1	high resource-management importance.	4
	The stock has high social value such as	
+1	cultural importance or strong localized	5
	effects on community viability, or is	J
	necessary for subsistence.	

<u>Alaska Application</u>: Information on recent commercial ex-vessel landings, as a proxy for commercial economic impacts, was provided in the supporting data to aid scoring of Category 1. Categories 2-5 should be assigned points based on professional judgment, relying on external resources as available.

<u>Top Scoring Stocks</u>: None (maximum score was 3).

Assessment Prioritization Bins

Final ranked stocks were separated into high, medium, and low priority bins (Table 2). Cutoffs for priority bins are not defined in the national Habitat Assessment Prioritization guidance. In the Alaska Region, ranked stocks in the top quartile are considered to be high priority, those in the second quartile

are medium priority, and those in the bottom half of ranked stocks are low priority. The cut-points for priority bins in Alaska are compared with the schemes for the Northwest, Southwest, and Northeast regions listed in Table 3. Stocks that did not pass through the initial filters were not considered during this ranking process.

Discussion and Recommendations

The habitat assessments that are likely to benefit stock assessments and inform essential fish habitat science have been prioritized for federally (co-)managed Alaska fishery stocks and species complexes (Table 2). The prioritization process followed national guidelines (NMFS 2011) that were adapted to the particular circumstances and management needs for the Alaska Region.

Stock assessment authors at the AFSC and ADF&G processed a total of 69 stocks (Table 1), including three non-target species that were added at the request of the Groundfish Plan Team and seven stocks co-managed with the State of Alaska. After applying the filters, 58 were scored and ranked under the EFH theme (Appendix B) and 48 were scored and ranked under the stock assessment theme (Appendix C). For the EFH theme, 11 stocks were excluded by the FSSI/FMC filter and 10 additional stocks were filtered from the stock assessment theme as unlikely to benefit from a habitat assessment.

Fourteen stocks in each theme were identified as high priorities for habitat assessments (Table 2), based on the predetermined scoring thresholds for the Alaska Region (Table 3). Overall, 17 different stocks were given high-priority status in one or the other theme and 11 stocks were prioritized in both themes. The high degree of overlap isn't surprising considering each theme shares six of the seven scorable criteria and every stock scored in the stock assessment theme was also scored for the EFH theme, though not the other way around (Figs. 2, 3).

A review of the completed exercises in the Southwest, Northwest, and Northeast regions identified critical elements of the process, and suggested several innovative measures that resulted in a rigorous, consistent, and efficient ranking of the Alaska stocks. In particular, scoring by the designated lead assessment scientist for each stock ensured a very high level of professional judgment (Table 1). The scoring exercise was timed to coincide with the 5-year EFH review to provide additional focus for the scientists outside the regular stock assessment process. Clear regional guidance in the form of written instructions, common supporting data that were available online, and ready access to the coordination team during scoring ensured comparable scoring across the stocks that was overall consistent with the national guidelines and the expected outcomes (Table 2). The capability for online scoring using a common template was both efficient and fully accountable. The rationales for the assigned scores were recorded and are available for review (Appendices B and C), and provide a basis for identifying significant data gaps and research needs related to habitat science and scientific fishery management.

An internal review was conducted to assess the process and develop recommendations for future habitat-prioritization exercises. In particular, comments and suggestions were requested about the scoring rubrics determined by the national committee, adaptation of the national guidelines for Alaska stocks, and the final list of prioritized stocks (Table 2). There was general agreement that the rubrics for prioritizing stocks for habitat assessments were effective. However, it was pointed out that the criteria with additive points did not seem to be particularly useful for prioritizing stocks; overall, only 14% (Habitat Disturbance, Vulnerability, and Rarity), 20% (Ecological Importance), and 21% (Economic, Social, and Management Value) of the 290 scores for each criterion (5 categories each for 58 stocks) were non-zero values. In particular, the rubric for the Habitat Disturbance, Vulnerability, and Rarity scoring criterion was considered to be unclear and separation of stocks was poor, with final scores of 0 and 1 out of a possible 5 for 53 of the 58 stocks. Another review questioned whether category 5 (i.e., evidence exists that in the region of interest the stock was historically abundant, or an important predator/prey/ecosystem engineer) in the Ecological Importance scoring criterion was useful or appropriate. The review also indicated the customized Alaska Application sections in the scoring guidance were helpful, appropriate, and reflected the national guidance. The cut point scheme used to define high-, medium-, and low-priority stocks (Table 3) was acceptable. There was general agreement with the final prioritization of stocks (Table 2) and reviewers overall deferred to the expertise and judgment of the stock-assessment authors, although some of the results were considered surprising. For example, it was questioned how the same species (Pacific ocean perch) can be the highest ranked overall stock in the Bering Sea / Aleutian Islands and just a "middle-of-the-road" stock in the Gulf of Alaska (Table 2). This and a few other inconsistencies raised the suggestion that a panel of experts may have done a better job characterizing the best *relative* levels of these stocks and their habitat preferences. Finally, the needs to identify, prioritize, and protect pelagic habitats for critical prey species (such as euphausiids and the forage fishes capelin/eulachon) were highlighted. Forages fishes were included in the current exercise at the request of the NPFMC Groundfish Plan Team, but were ranked low or medium (Table 2) despite being very important elements of the pelagic-habitat realm. It was suggested that stocks such as these (and perhaps corals) may be underrepresented by the current perspectives on marine habitat and they should be routinely included in future prioritizations.

Looking forward, there is an opportunity to leverage the results of this exercise into an emerging framework for an ecosystem approach to fisheries management in the Alaska Region (Shotwell et al. 2016). This framework, "Stock Profiles and Ecosystem Considerations" (SPECs), would assemble and synthesize the large amounts of information collected by various national initiatives within NMFS⁴ to develop baseline monitoring of all federally managed stocks and incorporate ecosystem information into individual stock assessments in a consistent manner. For each managed stock, the SPEC framework is composed of four elements: a stock ecosystem status rating, a conceptual life history model, a stock

⁴ In addition to Habitat Assessment Prioritization, the national initiatives include Stock Assessment Prioritization, Productivity and Susceptibility Analysis, Fish Stock Climate Vulnerability Analysis, and Stock Assessment Classification.

profile, and a stock report card. Taken together, they would establish the role of a stock in the ecosystem, identify relevant indicators, and indicate priorities for future research.

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Figure 1. -- Schematic of the steps to be followed by each Regional Habitat Assessment Prioritization Working Group (NMFS 2011). The Common Filter Criterion identifies the stocks to be ranked. The Theme-specific Filter Criteria and the associated Scorable Criteria separate the ranking process with respect to EFH and stock-assessment benefits, whereas the Common Scorable Criteria are applicable to each category.









Figure 3. -- Contributions of the scoring criteria used to identify the 14 high-priority stocks in the stock assessment theme.

Table 1. -- Participants in the Alaska Regional Habitat Assessment Prioritization activity. Abbreviations in the affiliation column are for the following divisions in the Alaska Regional Office: Habitat Conservation (HC); in the NMFS Office of Science and Technology: Assessment and Monitoring (AM); the Alaska Fisheries Science Center: Auke Bay Laboratories (ABL), Office of Management and Information (OMI), Resource Assessment and Conservation Engineering (RACE), Resource Ecology and Fishery Management (REFM); the North Pacific Fishery Management Council (NPFMC); and the Alaska Department of Fish and Game, Division of Commercial Fisheries (ADFG).

Name	Affiliation	Role
Armstrong, Jim	NPFMC	Weathervane scallop - Alaska
Barbeaux, Steve		Pacific cod - Gulf of Alaska
	NEFIVI	Greenland halibut - Bering Sea / Aleutian Islands
Blackhart, Kristan	AM	National and Alaska HAP coordination teams
Conners Liz		Bering Sea / Aleutian Islands Octopus Complex
		Gulf of Alaska Octopus Complex
		Golden king crab – Pribilof Islands
Daly, Ben	ADFG	Red king crab – Western Aleutian Islands
		ADFG coordination
Dorn Martin	REEM	Walleye pollock - Western / Central Gulf of Alaska
		Walleye pollock - Eastern Gulf of Alaska
Eagleton, Matt	HC	National and Alaska HAP coordination teams; Regional EFH Coordinator
Febaua Katu		Shortraker rockfish - Gulf of Alaska
Lenave, Katy	ADL	Gulf of Alaska Thornyhead Rockfish Complex
Hamazaki, Hamachan	ADFG	Red king crab - Norton Sound
Hanselman, Dana	ABL	Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska
Heifetz, Jon	ABL	National HAP coordination team
Hulson Data	ABL	Northern rockfish - Western / Central Gulf of Alaska
Huison, Pete		Pacific ocean perch - Gulf of Alaska
Ianelli, Jim	REFM	Walleye pollock - Eastern Bering Sea / Aleutian Islands / Bogoslof
	ABL	Chinook salmon
		Chum salmon
Joyce, John		Coho salmon
		Pink salmon
		Sockeye salmon
		Atka mackerel - Bering Sea / Aleutian Islands
		Atka mackerel - Gulf of Alaska
Lowe, Sandra	REFM	Arctic cod - Arctic Management Area
		Saffron cod - Arctic Management Area
		Snow crab - Arctic Management Area
Lunsford, Chris	ABL	Dusky rockfish - Gulf of Alaska
McConnaughey, Bob	RACE	National and Alaska HAP coordination teams

Name	Affiliation	Role
McGilliard, Carey		Flathead sole - Gulf of Alaska
		Gulf of Alaska Deepwater Flatfish Complex
	REFIVI	Rex sole - Gulf of Alaska
		Bering Sea / Aleutian Islands Flathead Sole Complex
Olson, Andrew	ADFG	Gulf of Alaska Demersal Shelf Rockfish Complex
		Bering Sea / Aleutian Islands Skate Complex
		Big skate - Gulf of Alaska
		Longnose skate - Gulf of Alaska
Ormseth, Olav	REFM	Gulf of Alaska Skate Complex
		Bering Sea / Aleutian Islands Squid Complex
		Gulf of Alaska Squid Complex
		Forage fishes – BSAI / GOA
Pedrueller Cara		Bering Sea / Aleutian Islands Grenadiers
Rodgveller, Cara	ABL	Gulf of Alaska Grenadiers
Shotwell, Kalei	ABL	Gulf of Alaska Blackspotted and Rougheye Rockfish Complex
Siddeek, Shareef	ADFG	Golden king crab – Aleutian Islands
		Pacific ocean perch - Bering Sea / Aleutian Islands
Spencer, Paul	REFM	Northern rockfish - Bering Sea / Aleutian Islands
		Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex
		Arrowtooth flounder - Bering Sea / Aleutian Islands
		Arrowtooth flounder - Gulf of Alaska
Spice Ingrid	DEEM	Bering Sea / Aleutian Islands Other Rockfish Complex
spies, iligitu	REFIVI	Bering Sea / Aleutian Islands Sculpin Complex
		Shortraker rockfish - Bering Sea / Aleutian Islands
		Gulf of Alaska Sculpin Complex
Stockhauson William	REFM	Blue king crab - Pribilof Islands
Stockhausen, william		Southern Tanner crab - Bering Sea
Thompson Grant	REFM	Pacific cod - Aleutian Islands
mompson, Granc		Pacific cod - Bering Sea
	ABL	Bering Sea / Aleutian Islands Shark Complex
Tribuzio, Cindy		Gulf of Alaska Shark Complex
		Gulf of Alaska Other Rockfish Complex
Turnock Jack	DEEN	Snow crab – Bering Sea
Turnock, Jack	REFIVI	Red king crab – Pribilof Islands
		Yellowfin sole - Bering Sea / Aleutian Islands
		Bering Sea / Aleutian Islands Rock Sole Complex
Wilderbuer, Tom	REFM	Alaska plaice - Bering Sea / Aleutian Islands
		Kamchatka flounder - Bering Sea / Aleutian Islands
		Bering Sea / Aleutian Islands Other Flatfish Complex
		Gulf of Alaska Shallow Water Flatfish Complex
Zheng, Jie	Jie ADFG	Red king crab - Bristol Bay
		Blue king crab – Saint Matthew Island

Table 2. -- Species list and final prioritization scores for the Alaska habitat assessments. Missing total scores indicate the stock did not pass through the filter criterion and thus was not prioritized.

Stock	Scientific name (Indicator species)	Stock assessment		EFH		
		Total score	Category (H/M/L)	Total score	Category (H/M/L)	
Blue king crab - Pribilof Islands	Paralithodes platypus	18	Н	18	Η	
Blue king crab - Saint Matthew Island	Paralithodes platypus	16	Н	16	Н	
Golden king crab - Aleutian Islands	Lithodes aequispinus	14	Н	14	Н	
Golden king crab - Pribilof Islands	Lithodes aequispinus	No score – not FSSI stock				
Red king crab - Bristol Bay	Paralithodes camtschaticus	18	Н	22	Н	
Red king crab - Norton Sound	Paralithodes camtschaticus	8	L	8	L	
Red king crab - Pribilof Islands	Paralithodes camtschaticus	3	L	3	L	
Red king crab - Western Aleutian Islands	Paralithodes camtschaticus	No score – not FSSI stock				
Snow crab - Bering Sea	Chionoecetes opilio	17	Н	13	Н	
Southern Tanner crab - Bering Sea	Chionoecetes bairdi	11	М	11	М	
Arctic cod - Arctic Management Area	Boreogadus saida	No score – not FSSI stock				
Saffron cod - Arctic Management Area	Eleginus gracilis	No score – not FSSI stock				
Snow crab - Arctic Management Area	Chionoecetes opilio	No score – not FSSI stock				
Alaska plaice - Bering Sea / Aleutian Islands	Pleuronectes quadrituberculatus	8	L	11	М	
Arrowtooth flounder - Bering Sea / Aleutian Islands	Reinhardtius stomias			9	L	
Atka mackerel - Bering Sea / Aleutian Islands	Pleurogrammus monopterygius	13	М	16	H	
Bering Sea / Aleutian Islands Blackspotted and Rougheye		14	н	11	М	
Rockfish Complex		14		11		
Bering Sea / Aleutian Islands Flathead Sole Complex		3	L	6	L	
Bering Sea / Aleutian Islands Octopus Complex (giant octopus)	(Enteroctopus dofleini)			9	L	
Bering Sea / Aleutian Islands Other Flatfish Complex		9	L	9	L	
Bering Sea / Aleutian Islands Other Rockfish Complex		No score – not FSSI stock				
Bering Sea / Aleutian Islands Rock Sole Complex (northern rock sole)	(Lepidopsetta polyxystra)	8	L	11	М	
	Colontific nome	Stock ass	essment	EFH		
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Stock	(Indicator species)	Total score	Category (H/M/L)	Total score	Category (H/M/L)	
Bering Sea / Aleutian Islands Sculpin Complex			No score – r	not FSSI stock		
Bering Sea / Aleutian Islands Shark Complex				8	L	
Bering Sea / Aleutian Islands Skate Complex		10	М	14	Н	
Bering Sea / Aleutian Islands Squid Complex				8	L	
Greenland halibut - Bering Sea / Aleutian Islands	Reinhardtius hippoglossoides	9	L	5	L	
Kamchatka flounder - Bering Sea / Aleutian Islands	Reinhardtius evermanni	8	L	11	М	
Northern rockfish - Bering Sea / Aleutian Islands	Sebastes polyspinis	14	Н	11	М	
Pacific cod - Aleutian Islands	Gadus microcephalus	13	М	17	Н	
Pacific cod - Bering Sea	Gadus microcephalus	16	Н	20	Н	
Pacific ocean perch - Bering Sea / Aleutian Islands	Sebastes alutus	19	Н	16	Н	
Shortraker rockfish - Bering Sea / Aleutian Islands	Sebastes borealis		No score – I	not FSSI stock		
Walleye pollock – eastern Bering Sea	Gadus chalcogramma	11	М	11	М	
Yellowfin sole - Bering Sea / Aleutian Islands	Limanda aspera	8	L	8	L	
Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska	Anoplopoma fimbria	16	н	16	н	
Arrowtooth flounder - Gulf of Alaska	Reinhardtius stomias			9	L	
Atka mackerel - Gulf of Alaska	Pleurogrammus monopterygius		No score – r	not FSSI stock		
Big skate - Gulf of Alaska	Raja binoculata	7	L	10	М	
Dusky rockfish - Gulf of Alaska	Sebastes variabilis	9	L	9	L	
Flathead sole - Gulf of Alaska	Hippoglossoides elassodon			6	L	
Gulf of Alaska Blackspotted and Rougheye Rockfish Complex		7	L	7	L	
Gulf of Alaska Deepwater Flatfish Complex (Dover sole)	(Microstomus pacificus)	3	L	6	L	
Gulf of Alaska Demersal Shelf Rockfish Complex (yelloweye rockfish)	(Sebastes ruberrimus)	15	Н	12	М	
Gulf of Alaska Octopus Complex (giant octopus)	(Enteroctopus dofleini)			9	L	
Gulf of Alaska Other Rockfish Complex		14	Н	15	Н	

	Scientific name	Stock ass	essment	EFH		
Stock	(Indicator species)	Total score	Category (H/M/L)	Total score	Category (H/M/L)	
Gulf of Alaska Sculpin Complex			No score – r	not FSSI stock		
Gulf of Alaska Shallow Water Flatfish Complex (northern rock sole)	(Lepidopsetta polyxystra)	8	L	11	М	
Gulf of Alaska Shark Complex				8	L	
Gulf of Alaska Skate Complex (not big and longnose skates)		5	L	8	L	
Gulf of Alaska Squid Complex				8	L	
Gulf of Alaska Thornyhead Rockfish Complex (shortspine thornyhead)	(Sebastolobus alascanus)			7	L	
Longnose skate - Gulf of Alaska	Raja rhina	5	L	8	L	
Northern rockfish - Western / Central Gulf of Alaska	Sebastes polyspinis	9	L	9	L	
Pacific cod - Gulf of Alaska	Gadus macrocephalus	16	Н	16	Н	
Pacific ocean perch - Gulf of Alaska	Sebastes alutus	10	М	9	L	
Rex sole - Gulf of Alaska	Glyptocephalus zachirus	3	L	6	L	
Shortraker rockfish - Gulf of Alaska	Sebastes borealis		No score – r	not FSSI stock		
Walleye pollock - Eastern Gulf of Alaska	Gadus chalcogramma	7	L	4	L	
Walleye pollock - Western / Central Gulf of Alaska	Gadus chalcogramma	18	Н	15	Н	
Chinook salmon	Oncorhynchus tshawytscha	12	М	12	М	
Chum salmon	Oncorhynchus keta	9	L	9	L	
Coho salmon	Oncorhynchus kisutch	10	М	10	М	
Pink salmon	Oncorhynchus gorbuscha	10	М	10	М	
Sockeye salmon	Oncorhynchus nerka	10	М	10	М	
Weathervane scallop – Alaska	Patinopecten caurinus	5	L	9	L	
Forage fishes – BSAI / GOA		9	L	12	М	
Bering Sea / Aleutian Islands Grenadiers	Macrouridae	8	L	9	L	
Gulf of Alaska Grenadiers	Macrouridae	8	L	9	L	

Table 3. -- (a) A comparison of the regional definitions of numeric bins used to rank stocks for future habitat assessments and (b) the resulting quartiles (e.g., Q1 for the 1st) and the corresponding number of high-, medium-, and low-priority Alaska stocks (n) for the Stock Assessment (SA) and EFH themes.

(a)

NMFS region	High	Medium	Low
Alaska	Top 25% (76-100%)	51-75%	Lowest 50% (0-50%)
Northwest	Top 20% (81-100%)	21-50%	Lowest 50% (0-50%)
Southwest	Top ⅓ (67-100%)	Mid ⅓ (34-66%)	Lowest ⅓ (0-33%)
Northeast	Top ⅓ (67-100%)	Mid ⅓ (34-66%)	Lowest ⅓ (0-33%)

(b)

		Stoc	k assessn	nent						EFH			
Low p	riority	Medium	priority	High p	riority	Total n	Low pr	Low priority Medium priorit			High	Total n	
Q2	n	Q3	n	Q4	n	Total n	Q2	n	Q3	n	Q4	n	Total n
9	24	13	10	19	14	48	9	29	12	15	22	14	58

Appendix A – Supporting Data for Habitat Assessment Prioritization (Alaska)

Appendix Table A1. -- Supporting data table for the Alaska habitat assessment prioritization – stock information.

Stock name	Scientific name (Indicator species)	FMP	FSSI	Stock notes
Blue king crab - Prihilof Islands	Paralithodes nlatvnus	Bering Sea/Aleutian Islands King and Tanner	v	
	r di diffiodes platypus	Crabs		
Blue king crab - Saint Matthew Island	Paralithodes platypus	Bering Sea/Aleutian Islands King and Tanner	v	1
	r uruntnodes platypus	Crabs		-
Golden king crah - Aleutian Islands	Lithodes aequispinus	Bering Sea/Aleutian Islands King and Tanner	v	
	Enhoues acquispinas	Crabs		
Golden king crah - Prihilof Islands	Lithodes agavisninus	Bering Sea/Aleutian Islands King and Tanner	N	2
		Crabs	IN	2
Red king crab Prictal Pay	Baralithodas camtschaticus	Bering Sea/Aleutian Islands King and Tanner	v	
Neu king crab - bitstor bay	Furuntinoues cumisciluticus	Crabs		
Red king srab Norton Sound	Daralithadas samtschatique	Bering Sea/Aleutian Islands King and Tanner	V	
Keu king crab - Norton Sound		Crabs	T	
Red king crob Dribilof Islands	Daralithadas samtschatique	Bering Sea/Aleutian Islands King and Tanner	V	
		Crabs	T	
Red king crab. Western Aleutian Islands	Baralithodas camtschaticus	Bering Sea/Aleutian Islands King and Tanner	N	
Neu King crab - Western Aleutian Islanus	Furuntinoues cumisciluticus	Crabs	IN	
Show crab - Bering Sea	Chiangecetes anilia	Bering Sea/Aleutian Islands King and Tanner	v	
	chionoecetes opino	Crabs		
Southern Tanner crah - Bering Sea	Chionoecetes hairdi	Bering Sea/Aleutian Islands King and Tanner	v	
Southern raimer crab - bering sea	chionoecetes bundi	Crabs		
Arctic cod - Arctic Management Area	Boreogadus saida	Fish Resources of the Arctic Management Area	Ν	3
Saffron cod - Arctic Management Area	Eleginus gracilis	Fish Resources of the Arctic Management Area	Ν	3
Snow crab - Arctic Management Area	Chionoecetes opilio	Fish Resources of the Arctic Management Area	Ν	3
Alaska plaice - Boring Soa / Aloutian Islands	Reuropactas augdritubarculatus	Groundfish of the Bering Sea and Aleutian	v	
Alaska platte - Berling Sea / Aleutian Islanus	Fieuronectes quauntaberculatas	Islands Management Area	1	
Arrowtooth flounder - Bering Sea / Algutian Islands	Reinhardtius stomias	Groundfish of the Bering Sea and Aleutian	v	
Anowtooth hounder - bening Sea / Aleutian Isidhus		Islands Management Area	I I	
Atka mackaral Baring Soa / Alautian Islands	Blourogrammus mononto-seine	Groundfish of the Bering Sea and Aleutian	v	
Alka malkerel - Bernig Sed / Aleulian Isianus	rieurogrammus monopteryglus	Islands Management Area	ř	

Stock name	Scientific name (Indicator species)	FMP	FSSI	Stock notes
Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex		Groundfish of the Bering Sea and Aleutian Islands Management Area	Y	4
Bering Sea / Aleutian Islands Flathead Sole Complex		Groundfish of the Bering Sea and Aleutian Islands Management Area	Y	5
Flathead sole - Bering Sea / Aleutian Islands	Hippoglossoides elassodon	Groundfish of the Bering Sea and Aleutian Islands Management Area	Complex member	6
Bering Sea / Aleutian Islands and Gulf of Alaska Forage Species		Groundfish of the Bering Sea and Aleutian Islands Management Area	Ecosystem component	7
Bering Sea / Aleutian Islands Grenadiers	Macrouridae	Groundfish of the Bering Sea and Aleutian Islands Management Area	Non-FMP	8
Bering Sea / Aleutian Islands Octopus Complex		Groundfish of the Bering Sea and Aleutian Islands Management Area	Ν	9
Giant octopus - Bering Sea / Aleutian Islands	Enteroctopus dofleini	Groundfish of the Bering Sea and Aleutian Islands Management Area	Complex member	10
Bering Sea / Aleutian Islands Other Flatfish Complex		Groundfish of the Bering Sea and Aleutian Islands Management Area	Ν	11
Bering Sea / Aleutian Islands Other Rockfish Complex		Groundfish of the Bering Sea and Aleutian Islands Management Area	Ν	12
Bering Sea / Aleutian Islands Rock Sole Complex		Groundfish of the Bering Sea and Aleutian Islands Management Area	Y	13
Northern rock sole - Bering Sea / Aleutian Islands	Lepidopsetta polyxystra	Groundfish of the Bering Sea and Aleutian Islands Management Area	Complex member	14
Bering Sea / Aleutian Islands Sculpin Complex		Groundfish of the Bering Sea and Aleutian Islands Management Area	Ν	15
Bering Sea / Aleutian Islands Shark Complex		Groundfish of the Bering Sea and Aleutian Islands Management Area	Ν	16
Bering Sea / Aleutian Islands Skate Complex		Groundfish of the Bering Sea and Aleutian Islands Management Area	Y	17
Alaska skate - Bering Sea / Aleutian Islands	Bathyraja parmifera	Groundfish of the Bering Sea and Aleutian Islands Management Area	Complex member	18
Bering Sea / Aleutian Islands Other Skates Complex		Groundfish of the Bering Sea and Aleutian Islands Management Area	Complex member	19
Bering Sea / Aleutian Islands Squid Complex		Groundfish of the Bering Sea and Aleutian Islands Management Area	Ν	20

Appendix Table A1. -- Continued.

Stock name	Scientific name (Indicator species)	FMP	FSSI	Stock notes
Greenland halibut - Bering Sea / Aleutian Islands	Reinhardtius hippoglossoides	Groundfish of the Bering Sea and Aleutian Islands Management Area	Y	
Kamchatka flounder - Bering Sea / Aleutian Islands	Reinhardtius evermanni	Groundfish of the Bering Sea and Aleutian Islands Management Area	N	
Northern rockfish - Bering Sea / Aleutian Islands	Sebastes polyspinis	Groundfish of the Bering Sea and Aleutian Islands Management Area	Y	
Pacific cod - Aleutian Islands	Gadus macrocephalus	Groundfish of the Bering Sea and Aleutian Islands Management Area	N	21
Pacific cod - Bering Sea	Gadus macrocephalus	Groundfish of the Bering Sea and Aleutian Islands Management Area	Y	
Pacific ocean perch - Bering Sea / Aleutian Islands	Sebastes alutus	Groundfish of the Bering Sea and Aleutian Islands Management Area	Y	
Shortraker rockfish - Bering Sea / Aleutian Islands	Sebastes borealis	Groundfish of the Bering Sea and Aleutian Islands Management Area	N	
Walleye pollock - Aleutian Islands	Theragra chalcogramma	Groundfish of the Bering Sea and Aleutian Islands Management Area	Y	
Walleye pollock – Bogoslof	Theragra chalcogramma	Groundfish of the Bering Sea and Aleutian Islands Management Area	Ν	1
Walleye pollock - Eastern Bering Sea	Theragra chalcogramma	Groundfish of the Bering Sea and Aleutian Islands Management Area	Y	
Yellowfin sole - Bering Sea / Aleutian Islands	Limanda aspera	Groundfish of the Bering Sea and Aleutian Islands Management Area	Y	
Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska	Anoplopoma fimbria	Groundfish of the Bering Sea and Aleutian Islands Management Area / Groundfish of the Gulf of Alaska	Y	
Arrowtooth flounder - Gulf of Alaska	Reinhardtius stomias	Groundfish of the Gulf of Alaska	Y	
Atka mackerel - Gulf of Alaska	Pleurogrammus monopterygius	Groundfish of the Gulf of Alaska	N	
Big skate - Gulf of Alaska	Raja binoculata	Groundfish of the Gulf of Alaska	N	22
Dusky rockfish - Gulf of Alaska	Sebastes variabilis	Groundfish of the Gulf of Alaska	Y	
Flathead sole - Gulf of Alaska	Hippoglossoides elassodon	Groundfish of the Gulf of Alaska	Y	
Gulf of Alaska Blackspotted and Rougheye Rockfish Complex		Groundfish of the Gulf of Alaska	Y	23
Gulf of Alaska Deepwater Flatfish Complex	(Microstomus pacificus)	Groundfish of the Gulf of Alaska	Y	24

Stock name	Scientific name (Indicator species)	FMP	FSSI	Stock notes
Dover sole - Gulf of Alaska	Microstomus pacificus	Groundfish of the Gulf of Alaska	Complex member	25
Gulf of Alaska Other Deepwater Flatfish Complex		Groundfish of the Gulf of Alaska	Complex member	26
Gulf of Alaska Demersal Shelf Rockfish Complex	(Sebastes ruberrimus)	Groundfish of the Gulf of Alaska	Y	27
Yelloweye rockfish - Gulf of Alaska	Sebastes ruberrimus	Groundfish of the Gulf of Alaska	Complex member	28
BSAI / GOA Forage fishes		Groundfish of the Gulf of Alaska	Ecosystem component	29
Gulf of Alaska Grenadiers	Macrouridae	Groundfish of the Gulf of Alaska	Non-FMP	30
Gulf of Alaska Octopus Complex	(Enteroctopus dofleini)	Groundfish of the Gulf of Alaska	Ν	31
Giant octopus - Gulf of Alaska	Enteroctopus dofleini	Groundfish of the Gulf of Alaska	Complex member	32
Gulf of Alaska Other Rockfish Complex		Groundfish of the Gulf of Alaska	N	33
Gulf of Alaska Sculpin Complex		Groundfish of the Gulf of Alaska	Ν	34
Gulf of Alaska Shallow Water Flatfish Complex	(Lepidopsetta polyxystra)	Groundfish of the Gulf of Alaska	Y	35
Northern rock sole - Gulf of Alaska	Lepidopsetta polyxystra	Groundfish of the Gulf of Alaska	Complex member	36
Rock sole - Gulf of Alaska	Lepidopsetta bilineata	Groundfish of the Gulf of Alaska	Complex member	36
Gulf of Alaska Other Shallow Water Flatfish Complex		Groundfish of the Gulf of Alaska	Complex member	37
Gulf of Alaska Shark Complex		Groundfish of the Gulf of Alaska	N	38
Gulf of Alaska Skate Complex		Groundfish of the Gulf of Alaska	N	39
Gulf of Alaska Squid Complex		Groundfish of the Gulf of Alaska	Ν	40
Gulf of Alaska Thornyhead Rockfish Complex	(Sebastolobus alascanus)	Groundfish of the Gulf of Alaska	Y	41
Shortspine thornyhead - Gulf of Alaska	Sebastolobus alascanus	Groundfish of the Gulf of Alaska	Complex member	42
Longnose skate - Gulf of Alaska	Raja rhina	Groundfish of the Gulf of Alaska	N	43
Northern rockfish - Western / Central Gulf of Alaska	Sebastes polyspinis	Groundfish of the Gulf of Alaska	Y	44
Pacific cod - Gulf of Alaska	Gadus macrocephalus	Groundfish of the Gulf of Alaska	Y	45

Appendix Table A1. -- Continued.

Stock name	Scientific name (Indicator species)	FMP	FSSI	Stock notes
Pacific ocean perch - Gulf of Alaska	Sebastes alutus	Groundfish of the Gulf of Alaska	Y	
Rex sole - Gulf of Alaska	Glyptocephalus zachirus	Groundfish of the Gulf of Alaska	Y	
Shortraker rockfish - Gulf of Alaska	Sebastes borealis	Groundfish of the Gulf of Alaska	N	
Walleye pollock - Eastern Gulf of Alaska	Theragra chalcogramma	Groundfish of the Gulf of Alaska	N	
Walleye pollock - Western / Central Gulf of Alaska	Theragra chalcogramma	Groundfish of the Gulf of Alaska	Y	
Chinook salmon	Oncorhynchus tshawytscha	Salmon Fisheries in the EEZ off the Coast of Alaska	NA	46
Chum salmon	Oncorhynchus keta	Salmon Fisheries in the EEZ off the Coast of Alaska	NA	47
Coho salmon	Oncorhynchus kisutch	Salmon Fisheries in the EEZ off the Coast of Alaska	NA	47
Pink salmon	Oncorhynchus gorbuscha	Salmon Fisheries in the EEZ off the Coast of Alaska	NA	47
Sockeye salmon	Oncorhynchus nerka	Salmon Fisheries in the EEZ off the Coast of Alaska	NA	47
Weathervane scallop – Alaska	Patinopecten caurinus	Scallop Fishery off Alaska	N	48

Stock Notes

- 1. Fishery in the EEZ is closed
- 2. Catch/fishing mortality levels are confidential
- 3. No commercial fishing for this stock
- 4. No indicator; contains blackspotted rockfish and rougheye rockfish; assessed at the complex level; biomass and biomass reference points are for AI portion of stock only
- 5. Indicator is flathead sole; also contains Bering flounder (minor component)
- 6. Indicator for the BSAI flathead sole complex
- 7. Contains Osmeridae, Ammodytidae, Trichodontidae, Stichaeidae, Pholidae, Myctophidae, Bathylagidae, Gonostomatidae, and Euphausiacea
- 8. Giant grenadier makes up a majority of catch and serves as indicator for other species; stock is assessed, but info is not available from SIS database

- 9. Indicator is giant octopus; also contains flapjack octopus, pelagic octopus, smoothskin octopus, spoonarm octopus, *Benthoctopus oregonensis*, and *Graneledone boreopacifica*
- 10. Indicator for the BSAI octopus complex
- 11. No indicator; contains Arctic flounder, butter sole, curlfin sole, deepsea sole, Dover sole, English sole, longhead dab, Pacific sanddab, petrale sole, rex sole, roughscale sole, Sakhalin sole, sand sole, slender sole, and starry flounder
- 12. No indicator; contains dusky rockfish, harlequin rockfish, redbanded rockfish, redstripe rockfish, sharpchin rockfish, yelloweye rockfish, and shortspine thornyhead
- 13. Indicator is northern rock sole (assessed individually) also contains southern rock sole (separate species)
- 14. Indicator for the BSAI Rock Sole Complex; assessed individually
- 15. No indicator; contains antlered sculpin, Arctic staghorn sculpin, armorhead sculpin, bigmouth sculpin, blackfin sculpin, blacknose sculpin, blob sculpin, bride sculpin, broadfin sculpin, butterfly sculpin, crested sculpin, darkfin sculpin, eyeshade sculpin, flabby sculpin, fourhorn sculpin, great sculpin, grunt sculpin, highbrow sculpin, hookhorn sculpin, Leister sculpin, longfin sculpin, northern sculpin, Pacific staghorn sculpin, plain sculpin, purplegray sculpin, ribbed sculpin, roughskin sculpin, roughspine sculpin, sailfin sculpin, scaled sculpin, scalybreasted sculpin, scissortail sculpin, slim sculpin, smoothcheek sculpin, spatulate sculpin, spectacled sculpin, spinyhead sculpin, sponge sculpin, tadpole sculpin, thorny sculpin, threaded sculpin, uncinate sculpin, warty sculpin, wide-eye sculpin, banded Irish lord, longfin Irish lord, and yellow Irish lord
- 16. No indicator; contains Pacific sleeper shark, salmon shark, and spiny dogfish
- 17. Indicator is Alaska skate (with separate assessment for remainder); also contains Aleutian skate, big skate, butterfly skate, commander skate, deepsea skate, mud skate, Okhotsk skate, roughshoulder skate, roughtail skate, sandpaper skate, whiteblotched skate, and whitebrow skate
- 18. Indicator for the BSAI Skate Complex; assessed separately
- 19. Remainder of species contained in the BSAI Skate Complex, exclusive of Alaska skate; assessed at the complex level separately from indicator assessment
- 20. No indicator; contains berry armhook squid, Boreopacific armhook squid, clawed armhook squid, fiery armhook squid, flowervase jewel squid, Madokai armhook squid, magister armhook squid, Makko armhook squid, minimal armhook squid, North Pacific bobtail squid, robust clubhook squid, *Belonella borealis*, *Chiroteuthis calyx*, *Cranchia scabra*, *Eogonatus tinro*, *Galiteuthis phyllura*, and *Gonatus kamtschaticus*
- 21. Catch includes the state fishery
- 22. Assessed with other GOA skates, but has separate harvest specs
- 23. No indicator; contains blackspotted rockfish and rougheye rockfish; assessed at the complex level

- 24. Indicator is Dover sole (with separate assessment for remainder); also contains deepsea sole and Greenland halibut
- 25. Indicator for GOA Deepwater Flatfish Complex; assessed individually; biomass estimates are for Dover sole only, while fishing mortality applies to entire deepwater assemblage
- 26. Remainder of species contained in the GOA Deepwater Flatfish Complex, exclusive of Dover sole; assessed at the complex level separately from indicator assessment
- 27. Indicator is yelloweye rockfish; also contains canary rockfish, China rockfish, copper rockfish, quillback rockfish, rosethorn rockfish, and tiger rockfish
- 28. Indicator for GOA Demersal Shelf Rockfish Complex; assessed individually; fishing mortality estimates apply to entire assemblage
- 29. Contains Osmeridae, Ammodytidae, Trichodontidae, Stichaeidae, Pholidae, Myctophidae, Bathylagidae, Gonostomatidae, and Euphausiacea
- 30. Giant grenadier makes up a majority of catch and serves as indicator for other species; stock is assessed, but info is not available from SIS database
- 31. Indicator is giant octopus; also contains East Pacific red octopus, flapjack octopus, North Pacific bigeye octopus, pelagic octopus, smoothskin octopus, and vampire squid
- 32. Indicator for GOA Octopus Complex; assessed individually
- 33. No indicator; contains blackgill rockfish, bocaccio, chilipepper, darkblotched rockfish, greenstriped rockfish, harlequin rockfish, northern rockfish, pygmy rockfish, redbanded rockfish, redstripe rockfish, sharpchin rockfish, silvergray rockfish, splitnose rockfish, stripetail rockfish, vermilion rockfish, widow rockfish, yellowmouth rockfish, and yellowtail rockfish
- 34. No indicator; contains antlered sculpin, armorhead sculpin, bigmouth sculpin, blackfin sculpin, blob sculpin, brightbelly sculpin, buffalo sculpin, crested sculpin, darkfin sculpin, dusky sculpin, eyeshade sculpin, fourhorn sculpin, frog sculpin, frogmouth sculpin, great sculpin, grunt sculpin, longfin sculpin, northern sculpin, Pacific staghorn sculpin, plain sculpin, ribbed sculpin, roughskin sculpin, roughspine sculpin, sailfin sculpin, scissortail sculpin, silverspotted sculpin, slim sculpin, smoothcheek sculpin, smoothhead sculpin, spatulate sculpin, spectacled sculpin, spinyhead sculpin, sponge sculpin, spotfin sculpin, tadpole sculpin, thorny sculpin, threaded sculpin, threadfin sculpin, warty sculpin, wide-eye sculpin, brown Irish lord, red Irish lord, yellow Irish lord, and *Artediellus* spp.
- 35. Indicators are rock sole and northern rock sole (with separate assessment for remainder); also contains Alaska plaice, butter sole, C-O sole, curlfin sole, English sole, Pacific sanddab, petrale sole, sand sole, slender sole, speckled sanddab, starry flounder, and yellowfin sole
- 36. Indicator for GOA Shallow Water Flatfish Complex; assessed individually; fishing mortality represents entire assemblage
- 37. Remainder of the GOA Shallow Water Flatfish Complex, exclusive of northern rock sole and rock sole; assessed at the complex level; fishing mortality represents the entire shallow water complex
- 38. No indicator; contains Pacific sleeper shark, salmon shark, and spiny dogfish; biomass represents spiny dogfish only

- 39. No indicator; contains Alaska, Aleutian, deepsea, roughshoulder, roughtail, sandpaper, and whiteblotched skates; big skate and longnose skate are listed separately
- 40. No indicator; contains berry armhook squid, Boreopacific armhook squid, clawed armhook squid, fiery armhook squid, flowervase jewel squid, Madokai armhook squid, magister armhook squid, Makko armhook squid, minimal armhook squid, octopus squid, opalescent inshore squid, robust clubhook squid, *Chiroteuthis calyx, Cranchia scabra, Eogonatus tinro, Galiteuthis phyllura*, and *Gonatus kamtschaticus*
- 41. Indicator is shortspine thornyhead; also contains longspine thornyhead
- 42. Indicator for GOA Thornyhead Rockfish Complex; assessed individually
- 43. Assessed with other GOA skates, but has separate harvest specs
- 44. Northern rockfish in Eastern GOA are managed under the Other Rockfish Complex
- 45. Substantial state fishery
- 46. Score at the species level throughout AK; assessment is for the Eastern North Pacific Far North Migrating portion of stock
- 47. Score at the species level throughout AK; status is based on assessment of four indicator stocks of coho salmon that represent the Alaska Coho Salmon Assemblage (includes coho, chum, pink, and sockeye under federal management)
- 48. Weathervane only other scallop species are managed as Ecosystem Components

Stock name	Last	Туре	SAIP level	Biomass	B Year	B Unit	B _{MSY}	B/B _{MSY}	F	F Year	F unit	F basis	F limit	F limit basis	F/F limit
Blue king crab - Pribilof Islands	2014	Full update	1	225	2014		4002	0.056	0.6	2013		total catch	1.2	F directed=0; F limit=average catch 1999/00- 2005/06	0.500
Blue king crab - Saint Matthew Island	2016	Full update	4	2110	2016	mt	3680	0.573	50.0	2016	mt	total male catch	280	M*gamma	0.179
Golden king crab - Aleutian Islands	2016	Full update	1		2015				3080	2015	mt	total catch	5690	Avg total catch 1985/86- 1995/96	0.541
Golden king crab - Pribilof Islands	2016	Full update	1		2015					2015		total catch	91	Avg total catch 1993-1998	
Red king crab - Bristol Bay	2015	Full update	4	27254	2014	mt	26100	1.044	5429	2014	mt	catch mortality	7070	catch at F35% adjusted for B <b35%< td=""><td>0.768</td></b35%<>	0.768
Red king crab - Norton Sound	2016	Full update	4	2660	2015	mt	2060	1.291	240	2015	mt	total male catch	320	M*gamma	0.750
Red king crab - Pribilof Islands	2014	Full update	1	4679	2013		5164	0.906	2.25	2013		total catch	903	M*gamma	0.002
Red king crab - Western Aleutian Islands	2016	Full update	1		2015					2015	mt	Total catch	56	Avg total catch 1984/85- 2007/08	0.019
Snow crab - Bering Sea	2015	Full update	4	137300	2014	mt	146357	0.938	27840	2014	mt	catch mortality	78100	catch at F35%	0.356
Southern Tanner crab - Bering Sea	2015	Full update	4	71567	2014	mt	26791	2.671	6431	2014	mt	catch mortality	31480	catch at F35%	0.204
Arctic cod - Arctic Management Area	Not assessed						1								
Saffron cod - Arctic Management Area	Not assessed						-								
Snow crab - Arctic Management Area	Not assessed														
Alaska plaice - Bering Sea / Aleutian Islands	2015	Partial update	4	215300	2015	mt	115087	1.871	19449	2014	mt	catch	66800	catch at F35%	0.291
Arrowtooth flounder - Bering Sea / Aleutian Islands	2015	Partial update	5	533731	2015	mt	194266	2.747	19109	2014	mt	catch	125642	catch at F35%	0.152
Atka mackerel - Bering Sea / Aleutian Islands	2015	Full update	4	177285	2015	mt	118697	1.494	30947	2014	mt	catch	74492	catch at F35%	0.415

Appendix Table A2. -- Supporting data table for the Alaska habitat assessment prioritization – stock assessment information.

Stock name	Last	Туре	SAIP level	Biomass	B Year	B Unit	B _{MSY}	B/B _{MSY}	F	F Year	F unit	F basis	F limit	F limit basis	F/F limit
Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex	2015	Partial update	4	7954	2015	mt	9977	0.797	173	2014	mt	catch	505	Mixed	0.343
Bering Sea / Aleutian Islands Flathead Sole Complex	Indicator assessment														
Flathead sole - Bering Sea / Aleutian Islands	2015	Partial update	5	240427	2015	mt	111722	2.152	15788	2014	mt	catch	79633	catch at F35%	0.198
Bering Sea / Aleutian Islands Forage Species	data not available														
Bering Sea / Aleutian Islands Grenadiers	data not available														
Bering Sea / Aleutian Islands Octopus Complex	Indicator assessment														
Giant octopus - Bering Sea / Aleutian Islands	2015	Partial update	1		2015	mt			422	2014	mt	catch	3450		0.122
Bering Sea / Aleutian Islands Other Flatfish Complex	2015	Full update	3	112104	2015	mt			4391	2014	mt	catch	16700	catch at F=M	0.263
Bering Sea / Aleutian Islands Other Rockfish Complex	2015	Partial update	3	49630	2015	mt			944	2014	mt	catch	1550	catch at F=M	0.609
Bering Sea / Aleutian Islands Rock Sole Complex	Indicator assessment														
Northern rock sole - Bering Sea / Aleutian Islands	2015	Full update	4	611242	2015	mt	257000	2.378	51946	2014	mt	catch	228700	catch at arithmetic mean F _{MSY}	0.227
Bering Sea / Aleutian Islands Sculpin Complex	2015	Partial update	3	180570	2015	mt			4860	2014	mt	catch	56424	catch at F=M	0.086
Bering Sea / Aleutian Islands Shark Complex	2015	Partial update	1		2015	mt			137	2014	mt	catch	1363		0.101
Bering Sea / Aleutian Islands Skate Complex	Indicator assessment														

Stock name	Last	Туре	SAIP level	Biomass	B Year	B Unit	B _{MSY}	B/B _{MSY}	F	F Year	F unit	F basis	F limit	F limit basis	F/F limit
Alaska skate - Bering Sea / Aleutian Islands	2015	Partial update	4	115378	2015	mt	65423	1.764	27511	2014	mt	catch	41849	catch at F35%	0.657
Bering Sea / Aleutian Islands Other Skates Complex	2015	Partial update	3	103682	2015	mt			27511	2014	mt	catch	41849	catch at F=M	0.657
Bering Sea / Aleutian Islands Squid Complex	2015	Full update	1		2015	mt			1678	2014	mt	catch	2624		0.639
Greenland halibut - Bering Sea / Aleutian Islands	2015	Benchmark	4	23041	2015	mt	44255	0.521	1656	2014	mt	catch	2647	catch at F35% adjusted for B <b40%< td=""><td>0.626</td></b40%<>	0.626
Kamchatka flounder - Bering Sea / Aleutian Islands	2015	Partial update	4	61700	2015	mt	46400	1.330	6459	2014	mt	catch	8270	catch at F35%	0.781
Northern rockfish - Bering Sea / Aleutian Islands	2015	Partial update	4	95565	2015	mt	50547	1.891	2342	2014	mt	catch	12077	catch at F35%	0.194
Pacific cod - Aleutian Islands	2015	Full update	3	68880	2015	mt			10595	2014	mt	catch	20100	catch at F=M	0.527
Pacific cod - Bering Sea	2015	Full update	4	401573	2015	mt	282000	1.424	238729	2014	mt	catch	299000	catch at F35%	0.798
Pacific ocean perch - Bering Sea / Aleutian Islands	2015	Partial update	4	234222	2015	mt	148053	1.582	32383	2014	mt	catch	39585	catch at F35%	0.818
Shortraker rockfish - Bering Sea / Aleutian Islands	2015	Partial update	3	23009	2015	mt			197	2014	mt	catch	493	catch at F=M	0.400
Walleye pollock - Aleutian Islands	2015	Full update	4	70209	2015	mt	72437	0.969	2375	2014	mt	catch	42811	catch at F35% adjusted for B <b40%< td=""><td>0.055</td></b40%<>	0.055
Walleye pollock - Bogoslof	2015	Benchmark	3	106000	2015	mt			428	2014	mt	catch	13413	catch at F=M	0.032
Walleye pollock - Eastern Bering Sea	2015	Full update	4	3471720	2015	mt	1984200	1.750	1298590	2014	mt	catch	2795000	catch at arithmetic mean F _{MSY}	0.465
Yellowfin sole - Bering Sea / Aleutian Islands	2015	Full update	5	697207	2015	mt	435000	1.603	156778	2014	mt	catch	259700	catch at arithmetic mean F _{MSY}	0.604
Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska	2015	Full update	4	89957	2015	mt	89956	1.000	11562	2014	mt	catch	16225	catch at F35% adjusted for B <b40%< td=""><td>0.713</td></b40%<>	0.713
Arrowtooth flounder - Gulf of Alaska	2015	Benchmark	4	1133010	2015	mt	347295	3.262	36294	2014	mt	catch	229248	catch at F35%	0.158

Appendix Table A2. -- Continued.

Stock name	Last	Туре	SAIP level	Biomass	B Year	B Unit	B _{MSY}	B/B _{MSY}	F	F Year	F unit	F basis	F limit	F limit basis	F/F limit
Atka mackerel - Gulf of Alaska	2015	Full update	1		2015	mt			1042	2014	mt	catch	6200		0.168
Big skate - Gulf of Alaska	Complex- level assessment														
Dusky rockfish - Gulf of Alaska	2015	Benchmark	4	27678	2015	mt	17244	1.605	3032	2014	mt	catch	6708	catch at F35%	0.452
Flathead sole - Gulf of Alaska	2015	Full update	4	82007	2015	mt	32258	2.542	2556	2014	mt	catch	50664	catch at F35%	0.050
Gulf of Alaska Blackspotted and Rougheye Rockfish Complex	2015	Benchmark	4	14133	2015	mt	7198	1.963	738	2014	mt	catch	1497	catch at F35%	0.493
Gulf of Alaska Deepwater Flatfish Complex	Indicator assessment								465	2011	mt	catch	7823	mixed	0.059
Dover sole - Gulf of Alaska	2015	Benchmark	4	48918	2015	mt	19855	2.464	354	2014	mt	catch	16159	catch at F35%	0.022
Gulf of Alaska Other Deepwater Flatfish Complex	2015	Full update	1		2015	mt			354	2014	mt	catch	16159		0.022
Gulf of Alaska Demersal Shelf Rockfish Complex	Indicator assessment														
Yelloweye rockfish - Gulf of Alaska	2016	Executive Summary	3	10347	2016	mt				2015	mt	catch	346	catch at F35	0.280
Gulf of Alaska Forage Species	data not available														
Gulf of Alaska	data not							97							
Gulf of Alaska	Indicator														
Octopus Complex Giant octopus - Gulf of Alaska	assessment 2015	Full update	1	12270	2015	mt			1298	2014	mt	catch	2009		0.646
Gulf of Alaska Other Rockfish Complex	2015	Full update	3	104826	2015	mt			987	2014	mt	catch	5347	Mixed	0.185
Gulf of Alaska Sculpin Complex	2015	Benchmark	3	34943	2015	mt			1187	2014	mt	catch	7448	catch at F=M	0.159
Gulf of Alaska Shallow Water Flatfish Complex	Indicator assessment								8484	2009	mt	catch	74364	mixed	0.114
Northern rock sole - Gulf of Alaska	2015	Benchmark	4	39468	2015	mt	18100	2.181	1720	2014	mt	catch	50007	catch at F35%	0.034
Rock sole - Gulf of Alaska	2015	Benchmark	4	83979	2015	mt	32700	2.568	1720	2014	mt	catch	50007	catch at F35%	0.034

Appendix Table A2. -- Continued.

Stock name	Last	Туре	SAIP level	Biomass	B Year	B Unit	B _{MSY}	B/B _{MSY}	F	F Year	F unit	F basis	F limit	F limit basis	F/F limit
Gulf of Alaska Other Shallow Water Flatfish Complex	2015	Benchmark	3	89099	2015	mt			4750	2014	mt	catch	50007	catch at F=M	0.095
Gulf of Alaska Shark Complex	2015	Full update	1	56181	2015	mt			1553	2014	mt	catch	7986		0.194
Gulf of Alaska Skate Complex	2015	Full update	3	119174	2015	mt			5765	2014	mt	catch	11503	catch at F=M	0.501
Gulf of Alaska Squid Complex	2015	Full update	1		2015	mt			172	2014	mt	catch	1530		0.112
Gulf of Alaska Thornyhead Rockfish Complex	Indicator assessment														
Shortspine thornyhead - Gulf of Alaska	2015	Full update	3	87155	2015	mt			1131	2014	mt	catch	2454	catch at F=M	0.461
Longnose skate - Gulf of Alaska	Complex- level assessment														
Northern rockfish - Western / Central Gulf of Alaska	2015	Benchmark	4	35426	2015	mt	24485	1.447	4274	2014	mt	catch	6349	catch at F35%	0.673
Pacific cod - Gulf of Alaska	2015	Benchmark	4	202714	2015	mt	113800	1.781	84854	2014	mt	catch	107300	catch at F35%	0.791
Pacific ocean perch - Gulf of Alaska	2015	Benchmark	4	154984	2015	mt	99865	1.552	17617	2014	mt	catch	22319	catch at F35%	0.789
Rex sole - Gulf of Alaska	2015	Benchmark	4	41418	2015	mt	19896	2.082	3577	2014	mt	catch	12207	catch at F=M	0.293
Shortraker rockfish - Gulf of Alaska	2015	Full update	3	57175	2015	mt			685	2014	mt	catch	1764	catch at F=M	0.388
Walleye pollock - Eastern Gulf of Alaska	2015	Full update	3	44087	2015	mt			3	2014	mt	catch	16833	catch at F=M	0.000
Walleye pollock - Western / Central Gulf of Alaska	2015	Full update	4	251012	2015	mt	262344	0.957	142633	2014	mt	catch	211998	catch at F35%	0.673
Chinook salmon	2015	Full update	4	2504254	2014	Spawners (wild)	1299545	1.927	1385460	2014	number of fish	catch	1503710	Quota overage allowance	0.921
Chum salmon	2015 - indicator	Full update	4		2014	Spawners (wild)				2014	Annual exploitation rate	Annual exploitation rate		Escapement goal	
Coho salmon	2015 - indicator	Full update	4		2014	Spawners (wild)				2014	Annual exploitation rate	Annual exploitation rate		Escapement goal	
Pink salmon	2015 - indicator	Full update	4		2014	Spawners (wild)				2014	Annual exploitation rate	Annual exploitation rate		Escapement goal	

Stock name	Last	Туре	SAIP level	Biomass	B Year	B Unit	B _{MSY}	B/B _{MSY}	F	F Year	F unit	F basis	F limit	F limit basis	F/F limit
Sockeye salmon	2015 - indicator	Full update	4		2014	Spawners (wild)				2014	Annual exploitation rate	Annual exploitation rate		Escapement goal	
Weathervane scallop - Alaska	2015	Full update	1			Pounds of shucked meats			399134	2014	Pounds of shucked meats	catch	1284000	MSY	0.311

Appendix Table A3. -- Supporting data table for the Alaska habitat assessment prioritization – fishery status information. Blank cells indicate data are not available from the source.

Stock name	Overfishing	Overfished	Approaching overfished	Rebuilding?	Commercial retained	Comm catch year	Comm catch unit	Avg \$/lb	Commercial ex-vessel value \$
Blue king crab - Pribilof Islands	No	Yes	NA	Year 2 of plan		2013	mt	5.35	
Blue king crab - Saint Matthew Island	No	No	No	N/A		2012	mt	\$ 5.35	
Golden king crab - Aleutian Islands	No	Unknown	Unknown	N/A		2011	mt	\$ 5.35	
Golden king crab - Pribilof Islands	No	Unknown	Unknown	N/A		2011	mt	\$ 5.35	
Red king crab - Bristol Bay	No	No	No	N/A		2011	mt	\$ 5.35	
Red king crab - Norton Sound	No	No	No	N/A		2011	mt	\$ 5.35	
Red king crab - Pribilof Islands	No	No	No	N/A		2012	mt	\$ 5.35	
Red king crab - Western Aleutian Islands	No	Unknown	Unknown	N/A		2012	mt	\$ 5.35	
Snow crab - Bering Sea	No	No	No	N/A		2013	mt	2.02	
Southern Tanner crab - Bering Sea	No	No	No	N/A		2013	mt	2.35	
Arctic cod - Arctic Management Area	No	Unknown	Unknown	N/A	0	2014	mt	0.43	
Saffron cod - Arctic Management Area	No	Unknown	Unknown	N/A	0	2014	mt	0.43	
Snow crab - Arctic Management Area	No	Unknown	Unknown	N/A	0	2014	mt	2.02	
Alaska plaice - Bering Sea / Aleutian Islands	No	No	No	N/A	15747	2014	mt	0.14	4,860,261.16
Arrowtooth flounder - Bering Sea / Aleutian Islands	No	No	No	N/A	16765	2014	mt	0.11	4,065,649.97
Atka mackerel - Bering Sea / Aleutian Islands	No	No	No	N/A	30561	2014	mt	0.26	17,517,601.87
Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex	No	No	No	N/A	174	2014	mt	0.28	107,409.09
Bering Sea / Aleutian Islands Flathead Sole Complex	No	No	No	N/A	15128	2014	mt	0.20	6,670,298.27
Flathead sole - Bering Sea / Aleutian Islands									
Bering Sea / Aleutian Islands Forage Species								0.19	
Bering Sea / Aleutian Islands Grenadiers								0.43	
Bering Sea / Aleutian Islands Octopus Complex	No	Unknown	Unknown	N/A	86	2014	mt	0.47	89,110.74
Giant octopus - Bering Sea / Aleutian Islands									
Bering Sea / Aleutian Islands Other Flatfish Complex	No	Unknown	Unknown	N/A	939	2014	mt	0.15	310,520.73
Bering Sea / Aleutian Islands Other Rockfish Complex	No	Unknown	Unknown	N/A	716	2014	mt	0.28	441,982.22
Bering Sea / Aleutian Islands Rock Sole Complex	No	No	No	N/A	50005	2014	mt	0.19	20,945,984.39
Northern rock sole - Bering Sea / Aleutian Islands									
Bering Sea / Aleutian Islands Sculpin Complex	No	Unknown	Unknown	N/A	120	2014	mt	0.02	
Bering Sea / Aleutian Islands Shark Complex	No	Unknown	Unknown	N/A	4	2014	mt	0.43	5 291 09
Bering Sea / Aleutian Islands Skate Complex	No	No	No	N/A	8375	2014	mt	0.27	4,985,196.98

Appendix Table A3. -- Continued.

Stock name	Overfishing	Overfished	Approaching	Rebuilding?	Commercial	Comm catch	Comm catch	Avg	Commercial
			overtished		retained	year	unit	\$/10	ex-vessel value >
Alaska skate - Bering Sea / Aleutian Islands									
Bering Sea / Aleutian Islands Other Skates Complex									
Bering Sea / Aleutian Islands Squid Complex	No	Unknown	Unknown	N/A	682	2014	mt	0.06	90,213.05
Greenland halibut - Bering Sea / Aleutian Islands	No	No	No	N/A	1397	2014	mt	0.48	1,478,329.99
Kamchatka flounder - Bering Sea / Aleutian Islands	No	No	No	N/A	5919	2014	mt	0.14	1,826,880.41
Northern rockfish - Bering Sea / Aleutian Islands	No	No	No	N/A	2189	2014	mt	0.28	1,351,255.69
Pacific cod - Aleutian Islands	Unknown	Unknown	Unknown	N/A	10401	2014	mt	0.23	5,273,958.10
Pacific cod - Bering Sea	No	No	No	N/A	235005	2014	mt	0.23	119,162,246.31
Pacific ocean perch - Bering Sea / Aleutian Islands	No	No	No	N/A	31386	2014	mt	0.23	15,914,666.76
Shortraker rockfish - Bering Sea / Aleutian Islands	No	Unknown	Unknown	N/A	107	2014	mt	0.28	66,050.42
Walleye pollock - Aleutian Islands	No	No	No	N/A	2237	2014	mt	0.13	641,125.54
Walleye pollock - Bogoslof	No	Unknown	Unknown	N/A	373	2014	mt	0.13	106,902.02
Walleye pollock - Eastern Bering Sea	No	No	No	N/A	1283063	2014	mt	0.13	367,726,625.64
Yellowfin sole - Bering Sea / Aleutian Islands	No	No	No	N/A	152163	2014	mt	0.16	53,673,854.89
Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of	No	No	No	N/A	116/18	2014	mt	3 20	84 485 271 27
Alaska	110	No	No	N/A	11040	2014	inc	5.25	04,403,271.27
Arrowtooth flounder - Gulf of Alaska	No	No	No	N/A	32832	2014	mt	0.11	7,962,029.22
Atka mackerel - Gulf of Alaska	No	Unknown	Unknown	N/A	965	2014	mt	0.26	553,139.16
Big skate - Gulf of Alaska	No	Unknown	Unknown	N/A	437	2014	mt	0.27	260,123.11
Dusky rockfish - Gulf of Alaska	No	No	No	N/A	2966	2014	mt	0.28	1,830,892.82
Flathead sole - Gulf of Alaska	No	No	No	N/A	2401	2014	mt	0.20	1,058,658.52
Gulf of Alaska Blackspotted and Rougheye Rockfish Complex	No	No	No	N/A	627	2014	mt	0.28	387,043.09
Gulf of Alaska Deepwater Flatfish Complex	No	No	No	N/A	237	2014	mt	0.10	52,249.49
Dover sole - Gulf of Alaska									
Gulf of Alaska Other Deepwater Flatfish Complex									
Gulf of Alaska Demersal Shelf Rockfish Complex	No	Unknown	Unknown	N/A	138	2014	mt	0.29	88,228.89
Yelloweye rockfish - Gulf of Alaska	No	No	No	N/A					
Gulf of Alaska Forage Species								0.19	
Gulf of Alaska Grenadiers								0.43	
Gulf of Alaska Octopus Complex	No	Unknown	Unknown	N/A	530	2014	mt	0.47	549,170.84
Giant octopus - Gulf of Alaska									
Gulf of Alaska Other Rockfish Complex	No	Unknown	Unknown	N/A	603	2014	mt	0.17	225,995.60
Gulf of Alaska Sculpin Complex	No	Unknown	Unknown	N/A	39	2014	mt	0.02	
Gulf of Alaska Shallow Water Flatfish Complex	No	No	No	N/A	4308	2014	mt	0.19	1,804,525.56
Northern rock sole - Gulf of Alaska									.,
Rock sole - Gulf of Alaska									

Appendix Table A3. -- Continued.

Stock name	Overfishing	Overfished	Approaching overfished	Rebuilding?	Commercial retained	Comm catch year	Comm catch unit	Avg \$/lb	Commercial ex-vessel value \$
Gulf of Alaska Other Shallow Water Flatfish Complex							unit		
Gulf of Alaska Shark Complex	No	Unknown	Unknown	N/A	14	2014	mt	0.43	13,271.81
Gulf of Alaska Skate Complex	No	Unknown	Unknown	N/A	104	2014	mt	0.27	61,905.73
Gulf of Alaska Squid Complex	No	Unknown	Unknown	N/A	133	2014	mt	0.06	17,592.87
Gulf of Alaska Thornyhead Rockfish Complex	No	Unknown	Unknown	N/A	966	2014	mt	0.28	596,305.62
Shortspine thornyhead - Gulf of Alaska									
Longnose skate - Gulf of Alaska	No	Unknown	Unknown	N/A	915	2014	mt	0.27	544,651.37
Northern rockfish - Western / Central Gulf of Alaska	No	No	No	N/A	4113	2014	mt	0.28	2,538,928.58
Pacific cod - Gulf of Alaska	No	No	No	N/A	79613	2014	mt	0.23	40,368,774.77
Pacific ocean perch - Gulf of Alaska	No	No	No	N/A	15988	2014	mt	0.23	8,106,916.85
Rex sole - Gulf of Alaska	No	No	No	N/A	3531	2014	mt	0.30	2,335,353.97
Shortraker rockfish - Gulf of Alaska	No	Unknown	Unknown	N/A	504	2014	mt	0.28	311,115.97
Walleye pollock - Eastern Gulf of Alaska	No	Unknown	Unknown	N/A		2014	mt	0.13	
Walleye pollock - Western / Central Gulf of Alaska	No	No	No	N/A	141160	2014	mt	0.13	40,456,540.70
Chinook salmon	No	No	No	N/A				3.63	
Chum salmon	No	No	No	N/A				0.60	
Coho salmon	No	No	No	N/A				1.13	
Pink salmon	No	No	No	N/A				0.37	
Sockeye salmon	No	No	No	N/A				1.32	
Weathervane scallop - Alaska	No	Unknown	Unknown	N/A		2013	mt	7.96	

Appendix A4 Supporting data table for the Alaska habitat asses	sment prioritization – EFH status information An '×' indicates that no
information is available to assign an EFH level.	

			EFH level		
Stock name	Eggs	Larvae	Early juveniles	Late juveniles	Adults
Blue king crab - Pribilof Islands	inferred	x	x	1	1
Blue king crab - Saint Matthew Island	inferred	x	x	1	1
Golden king crab - Aleutian Islands	inferred	х	x	1	1
Golden king crab - Pribilof Islands	inferred	x	x	1	1
Red king crab - Bristol Bay	inferred	x	x	1	1
Red king crab - Norton Sound	inferred	х	x	1	1
Red king crab - Pribilof Islands	inferred	х	x	1	1
Red king crab - Western Aleutian Islands	inferred	x	x	1	1
Snow crab - Bering Sea	inferred	x	x	1	1
Southern Tanner crab - Bering Sea	inferred	x	x	1	1
Arctic cod - Arctic Management Area	х	x	x	1	1
Saffron cod - Arctic Management Area	х	x	x	1	1
Snow crab - Arctic Management Area	1	x	x	1	1
Alaska plaice - Bering Sea / Aleutian Islands	1	x	x	1	1
Arrowtooth flounder - Bering Sea / Aleutian Islands	x	x	x	1	1
Atka mackerel - Bering Sea / Aleutian Islands	1	1	х	х	1
Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex	x	x	x	x	1
Bering Sea / Aleutian Islands Flathead Sole Complex	1	1	x	1	1
Flathead sole - Bering Sea / Aleutian Islands	1	1	x	1	1
Bering Sea / Aleutian Islands Forage Species	х	х	x	x	х
Bering Sea / Aleutian Islands Grenadiers	х	х	x	x	х
Bering Sea / Aleutian Islands Octopus Complex	x	x	x	x	x
Giant octopus - Bering Sea / Aleutian Islands	х	x	x	x	x

Appendix Table A4. -- Continued.

	EFH level									
Stock name	Eggs	Larvae	Early juveniles	Late juveniles	Adults					
Bering Sea / Aleutian Islands Other Flatfish Complex	x	x	x	1	1					
Bering Sea / Aleutian Islands Other Rockfish Complex	х	1	x	х	1					
Bering Sea / Aleutian Islands Rock Sole Complex	х	1	x	1	1					
Northern rock sole - Bering Sea / Aleutian Islands	х	1	х	1	1					
Bering Sea / Aleutian Islands Sculpin Complex	х	х	x	1	1					
Bering Sea / Aleutian Islands Shark Complex	х	х	x	x	x					
Bering Sea / Aleutian Islands Skate Complex	1	х	x	x	1					
Alaska skate - Bering Sea / Aleutian Islands	1	х	x	x	1					
Bering Sea / Aleutian Islands Other Skates Complex	1	x	х	x	1					
Bering Sea / Aleutian Islands Squid Complex	х	х	×	1	1					
Greenland halibut - Bering Sea / Aleutian Islands	1	1	x	1	1					
Kamchatka flounder - Bering Sea / Aleutian Islands	x	x	x	1	1					
Northern rockfish - Bering Sea / Aleutian Islands	х	1	x	1	1					
Pacific cod - Aleutian Islands	х	1	x	1	1					
Pacific cod - Bering Sea	х	1	×	1	1					
Pacific ocean perch - Bering Sea / Aleutian Islands	х	1	x	1	1					
Shortraker rockfish - Bering Sea / Aleutian Islands	x	x	x	x	1					
Walleye pollock - Aleutian Islands	1	1	x	1	1					
Walleye pollock - Bogoslof	1	1	x	1	1					
Walleye pollock - Eastern Bering Sea	1	1	x	1	1					
Yellowfin sole - Bering Sea / Aleutian Islands	х	х	x	1	1					
Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska	х	1	х	1	1					
Arrowtooth flounder - Gulf of Alaska	x	1	x	1	1					
Atka mackerel - Gulf of Alaska	1	1	x	x	1					

Appendix Table A4. -- Continued.

			EFH level		
Stock name	Eggs	Larvae	Early juveniles	Late juveniles	Adults
Big skate - Gulf of Alaska	x	x	x	x	1
Dusky rockfish - Gulf of Alaska	х	1	x	x	1
Flathead sole - Gulf of Alaska	1	1	x	1	1
Gulf of Alaska Blackspotted and Rougheye Rockfish Complex	x	x	x	x	1
Gulf of Alaska Deepwater Flatfish Complex	1	1	x	1	1
Dover sole - Gulf of Alaska	1	1	x	1	1
Gulf of Alaska Other Deepwater Flatfish Complex	1	1	x	1	1
Gulf of Alaska Demersal Shelf Rockfish Complex	х	1	1	1	1
Yelloweye rockfish - Gulf of Alaska	х	1	1	1	1
Gulf of Alaska Forage Species	х	х	x	x	х
Gulf of Alaska Grenadiers	х	х	x	x	х
Gulf of Alaska Octopus Complex	х	х	x	x	х
Giant octopus - Gulf of Alaska	х	х	x	x	х
Gulf of Alaska Other Rockfish Complex	х	х	x	x	х
Gulf of Alaska Sculpin Complex	х	x	x	1	1
Gulf of Alaska Shallow Water Flatfish Complex	х	1	x	1	1
Northern rock sole - Gulf of Alaska	х	1	x	1	1
Rock sole - Gulf of Alaska	х	1	x	1	1
Gulf of Alaska Other Shallow Water Flatfish Complex	x	1	x	1	1
Gulf of Alaska Shark Complex	x	х	x	x	х
Gulf of Alaska Skate Complex	x	х	x	x	1
Gulf of Alaska Squid Complex	х	х	x	1	1
Gulf of Alaska Thornyhead Rockfish Complex	х	1	1	1	1
Shortspine thornyhead - Gulf of Alaska	х	1	1	1	1
Longnose skate - Gulf of Alaska	х	х	x	x	1

Appendix Table A4. -- Continued.

			EFH level		
Stock name	Eggs	Larvae	Early juveniles	Late juveniles	Adults
Northern rockfish - Western / Central Gulf of Alaska	x	x	х	x	1
Pacific cod - Gulf of Alaska	1	1	x	1	1
Pacific ocean perch - Gulf of Alaska	x	1	x	1	1
Rex sole - Gulf of Alaska	1	1	x	1	1
Shortraker rockfish - Gulf of Alaska	x	x	x	x	1
Walleye pollock - Eastern Gulf of Alaska	1	1	x	1	1
Walleye pollock - Western / Central Gulf of Alaska	1	1	х	1	1
Chinook salmon	1	1	1	1	1
Chum salmon	1	1	1	1	1
Coho salmon	1	1	1	1	1
Pink salmon	1	1	1	1	1
Sockeye salmon	1	1	1	1	1
Weathervane scallop - Alaska	x	x	х	1	1

Appendix B Raw Habitat Assessment Prioritization Scores (Alaska) EFH Theme Appendix Table B1. -- Raw scores and rationale statements for filter criteria used to prioritize habitat assessments in Alaska for the EFH theme.

-	Filter criteria								
Ineme		Both			EFH				
Stock	FSSI stock or FMC priority Likely to inform EFH								
TOTAL POSSIBLE SCORE	1	Life history stage	Rationale	1	Rationale				
Blue king crab - Pribilof Islands	1	A	1	1	13				
Blue king crab - Saint Matthew Island	1		1	1	13				
Golden king crab - Aleutian Islands	1	LJ, A	1, 14	1	13				
Golden king crab - Pribilof Islands	0		2						
Red king crab - Bristol Bay	1		1	1	13				
Red king crab - Norton Sound	1	А	1	1	13				
Red king crab - Pribilof Islands	1		1	1	13				
Red king crab - Western Aleutian Islands	0		2						
Snow crab - Bering Sea	1		1	1	13				
Southern Tanner crab - Bering Sea	1	А	1	1	13				
Arctic cod - Arctic Management Area	0								
Saffron cod - Arctic Management Area	0								
Snow crab - Arctic Management Area	0								
Alaska plaice - Bering Sea / Aleutian Islands	1	LJ, A		1	13				
Arrowtooth flounder - Bering Sea / Aleutian Islands	1	EJ, LJ, A		1	13				
Atka mackerel - Bering Sea / Aleutian Islands	1			1	13				
Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex	1	L, LJ, A	3	1	13				
Bering Sea / Aleutian Islands Flathead Sole Complex	1	E, L, LJ, A		1	13				
Bering Sea / Aleutian Islands Octopus Complex (giant octopus)	1	E, L, EJ, LJ, A	4	1	13				
Bering Sea / Aleutian Islands Other Flatfish Complex	1	А		1	13				
Bering Sea / Aleutian Islands Other Rockfish Complex	0								
Bering Sea / Aleutian Islands Rock Sole Complex (northern rock sole)	1	LJ, A		1	13				
Bering Sea / Aleutian Islands Sculpin Complex	0								
Bering Sea / Aleutian Islands Shark Complex	1	EJ, LJ, A	5	1	13				
Bering Sea / Aleutian Islands Skate Complex	1			1	13				
Bering Sea / Aleutian Islands Squid Complex	1		6	1	13				
Greenland halibut - Bering Sea / Aleutian Islands	1	A	1	1	13				

	Filter criteria												
Theme		Both	EFH										
Stock	FSSI	Likely to in	form EFH science										
TOTAL POSSIBLE SCORE	1	Life history stage	Rationale	1	Rationale								
Kamchatka flounder - Bering Sea / Aleutian Islands	1	LJ, A		1	13								
Northern rockfish - Bering Sea / Aleutian Islands	1	L, LJ, A	3	1	13								
Pacific cod - Aleutian Islands	1	E, L, EJ, LJ, A	1	1	13								
Pacific cod - Bering Sea	1	E, L, EJ, LJ, A	7	1	13								
Pacific ocean perch - Bering Sea / Aleutian Islands	1	L, LJ, A	3	1	13								
Shortraker rockfish - Bering Sea / Aleutian Islands	0												
BSAI Walleye pollock (includes Eastern Bering Sea, Aleutian Islands, and Bogoslof stocks)	1	E, L, EJ, LJ, A		1	13								
Yellowfin sole - Bering Sea / Aleutian Islands	1	LJ, A		1	13								
Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska	1	LJ, A		1	13								
Arrowtooth flounder - Gulf of Alaska	1	EJ, LJ		1	13								
Atka mackerel - Gulf of Alaska	0												
Big skate - Gulf of Alaska	1			1	13								
Dusky rockfish - Gulf of Alaska	1	A		1	13								
Flathead sole - Gulf of Alaska	1			1	13								
Gulf of Alaska Blackspotted and Rougheye Rockfish Complex	1	A	7	1	13								
Gulf of Alaska Deepwater Flatfish Complex (Dover sole)	1			1	13								
Gulf of Alaska Demersal Shelf Rockfish Complex (yelloweye rockfish)	1	L, EJ, LJ, A	8	1	13								
Gulf of Alaska Octopus Complex (giant octopus)	1	E, L, EJ, LJ, A	4	1	13								
Gulf of Alaska Other Rockfish Complex	1	LJ, A	9	1	13								
Gulf of Alaska Sculpin Complex	0												
Gulf of Alaska Shallow Water Flatfish Complex (northern rock sole)	1	LJ, A		1	13								
Gulf of Alaska Shark Complex	1	EJ, LJ, A	10	1	13								
Gulf of Alaska Skate Complex (Other Skates exclusive of big and longnose)	1			1	13								
Gulf of Alaska Squid Complex	1		6	1	13								
Gulf of Alaska Thornyhead Rockfish Complex (shortspine thornyhead)	1	L, EJ, LJ, A		1	13								
Longnose skate - Gulf of Alaska	1			1	13								
Northern rockfish - Western / Central Gulf of Alaska	1			1	13								
Pacific cod - Gulf of Alaska	1	E, L, LJ, A		1	13								
Pacific ocean perch - Gulf of Alaska	1		1	1	13								
Rex sole - Gulf of Alaska	1	E, L, LJ, A	1	1	13								
Shortraker rockfish - Gulf of Alaska	0												

Thomas	Filter criteria												
Ineme		EFH											
Stock	FSSI st	Likely to inform EFH science											
TOTAL POSSIBLE SCORE	1	1	Rationale										
Walleye pollock - Eastern Gulf of Alaska	1	E, L, EJ, LJ, A	7	1	13								
Walleye pollock - Western / Central Gulf of Alaska	1	E, L, EJ, LJ, A	1	1	13								
Chinook salmon	1	E, L, EJ, LJ, A		1	13								
Chum salmon	1	А	11	1	13								
Coho salmon	1	E, L, EJ, LJ, A		1	13								
Pink salmon	1	E, L, EJ, LJ, A		1	13								
Sockeye salmon	1	E, L, EJ, LJ, A		1	13								
Weathervane scallop – Alaska	1	E, L, EJ, LJ, A	1, 7	1	13								
Forage Fishes	1		7	1	13								
Gulf of Alaska Grenadiers (giant grenadiers)	1	E, L, EJ, LJ, A	12	1	13								
Bering Sea / Aleutian Islands Grenadiers (giant grenadiers)	1	1	13										

Rationales

- 1. FSSI stock
- 2. Not FSSI
- 3. Life stages described in 2016 EFH update
- 4. Complex has variable life history, habitats, and levels of knowledge
- 5. Data poor assessments, lacking life history for some species
- 6. Lacking basic life history information for some species in complex
- 7. NPFMC research priority
- 8. Yelloweye rockfish are a long-lived, slow maturing and reproducing commercially important species across the GOA
- 9. Improve surveys in untrawlable habitat
- 10. Data poor stock complex, with declining indices
- 11. Bycatch reduction
- 12. NPFMC research priority lacking basic life history information
- 13. All stocks pass
- 14. Additional References provided

Appendix Table B2. -- Raw scores and rationale statements for scorable criteria used to prioritize habitat assessments in Alaska for the EFH theme.

Theme		EFH Both				Both				Both							
Stock		ikalu ta adua	nco EEU info	info Eichony status EMC priority		iority	Habitat disturbance, vulnerability, and rarity										
Stock	-	ikely to auva			FISHERY	status				1	2	3	4	5	Total	Rationale	
TOTAL POSSIBLE SCORE	5	LH Stage	Rationale	5	LH Stage	Rationale	5	LH Stage	Rationale	1	1	1	1	1	5		
Blue king crab - Pribilof Islands	4	EJ, LJ, A	14	5	А	42	3	EJ, LJ, A	77					1	1	109	
Blue king crab - Saint Matthew Island	4	EJ, LJ, A		3	LJ, A	43	3	EJ, LJ, A	78		1		1		2	110	
Golden king crab - Aleutian Islands	4	LJ, A	15	1	А	44	5	LJ, A	79			1			1	111	
Golden king crab - Pribilof Islands																	
Red king crab - Bristol Bay	5	EJ, LJ, A	16	2	LJ, A	45	3	E, L, EJ, LJ, A	80	1	1	1	1		4	112	
Red king crab - Norton Sound	1	А		0	А		3	А				1			1	113	
Red king crab - Pribilof Islands	1	Ε, Α		0	А		1	А							0		
Red king crab - Western Aleutian Islands																	
Snow crab - Bering Sea	1			0	А		5								0		
Southern Tanner crab - Bering Sea	4	LJ, A	17	0	LJ, A	46	3	LJ, A	81						0		
Arctic cod - Arctic Management Area																	
Saffron cod - Arctic Management Area																	
Snow crab - Arctic Management Area																	
Alaska plaice - Bering Sea / Aleutian Islands	4	LJ, A	18	0	LJ, A		3	LJ, A	82			1			1	114	
Arrowtooth flounder - Bering Sea / Aleutian Islands	1	EJ, LJ, A	19	0	EJ, LJ, A	47	1	EJ, LJ, A	47	1					1	115	
Atka mackerel - Bering Sea / Aleutian Islands	4	Ε, Α	20	2	А	48	5	А	83			1			1	116	
Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex	1	LJ, A	21	0	LJ, A	49	5	LJ, A	83			1			1	117	
Bering Sea / Aleutian Islands Flathead Sole Complex	4	E, L, LJ, A	22	0	LJ, A	50	0	LJ, A	84						0		
Bering Sea / Aleutian Islands Octopus Complex (giant octopus)	1	Е, Ц, А	23	0	EJ, LJ, A	51	5	E, L, EJ, LJ, A	85						0	118	
Bering Sea / Aleutian Islands Other Flatfish Complex	1	А	18	1	А	52	3	А	82			1			1	114	
Bering Sea / Aleutian Islands Other Rockfish Complex																	
Bering Sea / Aleutian Islands Rock Sole Complex (northern rock sole)	4	Ц, А	18	0	LJ, A	53	3	LJ, A	82			1			1	114	
Bering Sea / Aleutian Islands Sculpin Complex																	
Bering Sea / Aleutian Islands Shark Complex	1	EJ, LJ, A	24	1	EJ, LJ, A	54	3	EJ, LJ, A	86						0		

Theme		EFH Both			Both				Both							
Stock		ikolu to adva	nco EEH info	Eichory status			FMC priority			Habitat disturbance, vulnerability, and rarity						
Stock	-	ikely to auva			FISHELY	status		Fivic pi	lonty	1	2	3	4	5	Total	Rationale
TOTAL POSSIBLE SCORE	5	LH Stage	Rationale	5	LH Stage	Rationale	5	LH Stage	Rationale	1	1	1	1	1	5	
Bering Sea / Aleutian Islands Skate Complex	5	Е, ЕЈ, Ц, А	25	0		55	3	E	87	1				1	2	119
Bering Sea / Aleutian Islands Squid Complex	1		26	0		56	5		88						0	
Greenland halibut - Bering Sea / Aleutian Islands	1	L, EJ, LJ, A	27	3	А	57	0	E, L, EJ, LJ, A	89						0	
Kamchatka flounder - Bering Sea / Aleutian Islands	4	Ц, А	18	0	LJ, A		3	LJ, A	82			1			1	
Northern rockfish - Bering Sea / Aleutian Islands	1	LJ, A	21	0	LJ, A	49	5	LJ, A	83			1			1	117
Pacific cod - Aleutian Islands	5	E, L, EJ, LJ, A	28	2	LJ, A	58	5	E, L, EJ, LJ, A	90	1					1	120
Pacific cod - Bering Sea	5	Е, L, EJ, Ц, А	28	0	LJ, A	59	5	E, L, EJ, LJ, A	90	1		1			2	121
Pacific ocean perch - Bering Sea / Aleutian Islands	1	LJ, A	21	2	LJ, A	60	5	LJ, A	83			1			1	117
Shortraker rockfish - Bering Sea / Aleutian Islands																
BSAI Walleye pollock (includes Eastern Bering Sea, Aleutian Islands, and Bogoslof stocks)	1	EJ, LJ	29	0	LJ, A	61	3	LJ, A							0	
Yellowfin sole - Bering Sea / Aleutian Islands	1	LJ, A	18	0	LJ, A		3	LJ, A	91			1			1	114
Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska	4	EJ	30	2	LJ, A	60	5	LJ, A	92	1					1	122
Arrowtooth flounder - Gulf of Alaska	1	EJ, LJ, A		0	EJ, LJ, A	47	1	EJ, LJ, A	47			1			1	123
Atka mackerel - Gulf of Alaska																
Big skate - Gulf of Alaska	4	E, EJ, LJ, A	31	1		62	1		93	1					1	124
Dusky rockfish - Gulf of Alaska	4	А		0	А		3	А							0	
Flathead sole - Gulf of Alaska	4	E, L, LJ, A		0	LJ, A	63	0		94						0	
Gulf of Alaska Blackspotted and Rougheye Rockfish Complex	4	LJ, A	32	0	LJ, A	64	1	LJ, A	95						0	
Gulf of Alaska Deepwater Flatfish Complex (Dover sole)	4	EJ, LJ, A	33	0	LJ, A	65	0		96						0	
Gulf of Alaska Demersal Shelf Rockfish Complex (yelloweye rockfish)	1	L, EJ, LJ, A		0	L, EJ, LJ, A		3	L, EJ, LJ, A				1			1	125
Gulf of Alaska Octopus Complex (giant octopus)	1	E, LJ, A	23	0	EJ, LJ, A	51	5	E, L, EJ, LJ, A	85						0	118
Gulf of Alaska Other Rockfish Complex	5	EJ, LJ, A	34	1	LJ, A	66	5	LJ, A	97	1					1	126
Theme		EF	н		Bot	h		Bot	h						Both	
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Stock	L	ikelv to adva	nce FFH info		Fisherv	status		FMC pr	iority	I	labi	tat	distu	ırba	nce, vulne	rability, and rarity
	-		Dationala	-	111 Channe	Detionala	-		Detionals	1	2	3	4	5	Total	Rationale
Gulf of Alaska Sculpin Complex	5	LH Stage	Rationale	5	LH Stage	Rationale	5	LH Stage	Rationale	1	1	1	1	1	5	
Gulf of Alaska Shallow Water Flatfish							_									
Complex (northern rock sole)	4	LJ, A	18	0	A	67	3	LJ, A	82			1			1	114
Gulf of Alaska Shark Complex	1	EJ, LJ, A	35	1	EJ, LJ, A	68	3	EJ, LJ, A	98						0	
Gulf of Alaska Skate Complex (Other Skates	4			0			1			1					1	
exclusive of big and longnose)				-			_								_	
Gulf of Alaska Squid Complex	1		26	0		56	5		88						0	
Gulf of Alaska Thornyhead Rockfish	1	L, EJ, LJ,			А	69	3	А	99			1			1	127
Complex (snortspine thornynead)		A	26	0		70	1		100	1					1	124
Longnose skate - Gulf of Alaska	4		36	0		70	1		100	1					1	124
of Alaska	4	А	39	0	А		1	А	101			1			1	128
Pacific cod - Gulf of Alaska	4	LJ, A	38	0	LJ, A	71	1	А				4			0	
Pacific ocean perch - Gulf of Alaska	4	L, EJ, LJ, A	39	0	А	72	1	L, EJ, LJ, A	102			1			1	129
Rex sole - Gulf of Alaska	4	E, L, LJ, A		0	LJ, A	73	0		103						0	
Shortraker rockfish - Gulf of Alaska																
Walleye pollock - Eastern Gulf of Alaska	1	E, L, EJ, LJ, A		0	LJ, A	74	1	LJ, A	104						0	
Walleye pollock - Western / Central Gulf of Alaska	1	L, EJ, LJ, A	37	2	LJ, A	64	3	E, L, EJ, LJ, A							0	
Chinook salmon	1	E, L, EJ, LJ, A		0	E, L, EJ, LJ, A		3	LJ, A	105			1			1	130
Chum salmon	1	E, L, EJ, LJ, A		0	E, L, EJ, LJ, A		1	А				1			1	130
Coho salmon	1	Е, L, EJ, Ц, А		0	E, L, EJ, LJ, A		1	E, L, EJ, LJ, A				1			1	130
Pink salmon	1	Е, L, EJ, Ц, А		0	E, L, EJ, LJ, A		1	E, L, EJ, LJ, A				1			1	130
Sockeye salmon	1	Е, L, EJ, IJ, A		0	E, L, EJ, LJ, A		1	E, L, EJ, LJ, A				1			1	130
Weathervane scallop - Alaska	5	E, L, EJ	40	0	LJ, A	75	3	LJ, A	106						0	
Forage Fishes	4		41	0			3		107	1		1	l		2	131
Gulf of Alaska Grenadiers	1			0	А	76	5	E, L, EJ, LJ, A	108						0	132
Bering Sea / Aleutian Islands Grenadiers	1			0	А	76	5	E, L, EJ, LJ, A	108						0	132

- 15. Habitat-specific catchability would likely increase EFH level from 1 to 2
- 16. Habitat assessment would shed light to the effect of area shrinkage for fishing after rationalization and pot and groundfish trawling effect on the resource's habitat
- 17. A habitat assessment help understanding the impact of trawling on red king crab, especially in the Southern Bristol Bay
- 18. Habitat-specific catchability would likely increase EFH level from 1 to 3
- 19. Provide an annual estimate of density by habitat type with improved surveys
- 20. Habitat for adults is located throughout the management unit
- 21. Enhance our understanding of the distribution in time and space
- 22. Increase amount of quantitative density data by habitat type available
- 23. Improve our understanding of habitat-population dynamics links
- 24. Improved catchability and habitat use info for denning and egg incubations
- 25. Level 1 EFH complex, with highly migratory species
- 26. EFH knowledge for BSAI skates is currently low
- 27. Squids are pelagic, so EFH very difficult to define
- 28. Life history and distribution of stock in the Bering Sea is pretty well known
- 29. Improve understanding of adverse effects of fishing/non-fishing activities
- 30. Advances would likely contribute to existing EFH Level
- 31. Information about why early juveniles settle in the few known locations
- 32. Possibly allow moving from Level 1 to Level 2
- 33. Improve current Level from 1 to 2 using GAM model approach
- 34. More info on ontogenetic movements is needed
- 35. EFH has not been described for Other Rockfish
- 36. Currently, no real EFH defined; any assessment would be an improvement
- 37. Likely increase EFH to Level 2
- 38. Potentially increase the EFH beyond Level 1
- 39. More information on habitat should increase from Level 2 to 3
- 40. Likely increase EFH beyond Level 1
- 41. No description for these life stages at this time

- 42. Data supporting EFH for forage fishes are extremely sparse
- 43. Stock is overfished
- 44. The fishery is closed due to low abundance
- 45. The golden king crab sub stock in the western Aleutian Islands management area appears to be in decline with a possibility of over fishing. Additional Supporting Resources: Siddeek, M.S.M., J. Zheng, and D. Pengilly. 2016. Aleutian Islands Golden King Crab (*Lithodes aequispinus*) Model-Based Stock Assessment in Fall 2016. Draft report submitted for the September 2016 Crab Plan Team Meeting. North Pacific Fishery Management Council, Anchorage, Alaska.
- 46. This stock has been fully exploited for a long time (>50 years). The current mature biomass is about 92% of B_{MSY}.
- 47. Stock appears to be above B_{MSY}
- 48. Stock is above B_{MSY} and lightly fished
- 49. TAC = ABC, and catches are just below TAC
- 50. Lightly exploited over the BSAI area
- 51. No evidence of overexploitation; catches always below the TAC
- 52. Catch << M; catch rates highly variable, but show no declining trends
- 53. Overfished status unknown, but starry flounder down 50% in 2015 shelf survey
- 54. The status of the stock and its productivity is known
- 55. Multiple survey indices show declining trends for two species in complex
- 56. Using Alaska skate as indicator, $B >> B_{MSY}$ and catch << ABC
- 57. Unknown but overfishing is unlikely
- 58. Stock has been hovering around B20% for the last few years
- 59. F/F limit = 0.798
- 60. F/F limit = 0.527
- 61. Fully exploited, with a large percentage of ABC harvested
- 62. Catch is well below that expected at 0.75^*F_{MSY}
- 63. ABC exceeded several times recently, but new rules limit skate catch
- 64. ABC harvest specifications and catches for 2015
- 65. See stock assessment results
- 66. No evidence of overexploitation; catch is typically a very small % of the TAC
- 67. Survey biomass estimates are highly uncertain
- 68. Exploitation is light and no evidence of heavy exploitation

- 69. Survey indices suggest declines in GOA stocks over the last 15 years
- 70. Tier 5 species; stock is not overfished
- 71. Unknown overfished status but catch < ABC so no overfishing is occurring
- 72. Stock is not overfished or approaching an overfished condition
- 73. See most current assessment (Hulson et al. 2015)
- 74. No evidence of overexploitation
- 75. Tier 5 stock; no directed pollock fishing in the eastern GOA due to trawl ban
- 76. Data poor stock, but currently classified as not overfished/no overfishing
- 77. Overfishing undefined, but low fishing pressure and high abundance for stock
- 78. Role of habitat in population dynamics; info on spatial distribution and movement
- 79. High research priorities on life history information, annual trawl survey and handling mortality estimates
- 80. Since fishery independent data are lacking for the Aleutian Islands golden king crab stock, collecting alternative stock abundance indices (e.g., industry designed pot surveys) are identified as urgent in the Research Priority list. Additional Supporting Resources: See the data gap and research priorities section in the following report: Siddeek, M.S.M., J. Zheng, and D. Pengilly. 2016. Aleutian Islands golden king crab (*Lithodes aequispinus*) Model-Based Stock Assessment in Fall 2016. Draft report submitted for the September 2016 Crab Plan Team Meeting. North Pacific Fishery Management Council, Anchorage, Alaska.
- 81. Many high research priorities are listed for this stock by NPFMC, including trawling impacts, handling mortality estimates, stock boundary, stock survey, and reproductive index.
- 82. Studies on factors (e.g., habitat, depth) that affect catchability
- 83. Several research priorities; important but not crucial to management
- 84. Improving surveys in untrawlable grounds is an urgent research priority
- 85. No priorities that specifically mention the Flathead Sole Complex
- 86. Improving basic life history information for data-poor stocks is an urgent priority
- 87. Limited life history data; research priority level raised by declining survey indices
- 88. NPFMC supports continued research into skate nursery areas (HAPC)
- 89. Urgent priority to acquire basic life history information for data-poor stocks
- 90. No priorities that specifically mention Greenland halibut
- 91. Several high and medium research priorities listed for BSAI cod
- 92. Research recommendations are important but not crucial to management
- 93. Spatially explicit assessments and MSEs identified as critical research priorities

- 94. Research priority is to identify GOA nursery areas
- 95. No priorities that specifically mention GOA flathead sole
- 96. Research priority for generating spatially explicit models in the future
- 97. No priorities that specifically mention Dover sole/Deepwater Flatfish
- 98. Research into trawlable/untrawlable habitats to improve assessments is underway
- 99. Data poor assessment research priority to examine life history for prominent species
- 100. Continuing life history research is necessary, most importantly ageing
- 101. Research priority is to identify nursery areas
- 102. Highly variable adult maturity has been identified as an area of concern
- 103. Additional data needs, but none are identified as an urgent concern
- 104. No priorities that specifically mention rex sole
- 105. Project is probably not necessary to effectively manage the stock
- 106. Bycatch reduction
- 107. Improvements would potentially elevate stock above data-poor status
- 108. Generating data to monitor forage fish populations is a priority
- 109. Acquiring basic life history information for data-poor stocks is an urgent need
- 110. Early juvenile habitat is in inshore, rocky shell hash and is not abundant
- 111. 2) Due to island-style habitat, climate change can have big impacts on this stock. 4) Due to a long time from spawning to maturity, the recovery time is long for this stock.
- 112. The golden king crab stock distribution in the eastern Aleutian Islands is closer to the Dutch harbor than that in the western Aleutian Islands. Fishing impact from other fisheries (e.g., groundfish pot and trawl fisheries may have impact on this stock).
- 113. 1) Trawling in the southern Bristol Bay impacts the spawning ground. 2) The regime shift in 1976-77 may have greatly impacted the stock productivity. Global warming impacts crab distributions that may affect larvae settlement and ocean acidity has impacts on juvenile crab growth and survival. 3) Heavy bottom trawl fisheries occurred within Bristol Bay. 4) Red king crab is a relatively long live species and it takes about 7-8 years from spawning to mature. A depressed stock would take a long time to recovery.
- 114. 3) Port dredging and gold mining nearshore may impact crab mating and larvae development around those areas.
- 115. No evidence that flatfish avoid disturbed areas
- 116. Adult habitat is subject to trawling, but spawning likely occurs much deeper
- 117. Egg nesting grounds and adult habitats are vulnerable to disturbance
- 118. Rockfish catches to be come from distinct, heavily used fishing grounds

- 119. Habitats not well defined and likely not very rare
- 120. Habitat is heavily trawled; skate nurseries are rare and highly localized
- 121. Large portion of habitat is disturbed by fishing, particularly bottom trawling
- 122. Habitat is heavily trawled; important spawning ground near Dutch Harbor
- 123. Entire GOA deep slope is longlined, but the total footprint is low
- 124. Unlikely to encounter habitat limitations
- 125. Extensive fishing activities, including trawling, throughout range
- 126. DSR have a finite adult range so continued fishing in a given area would cause impacts to the habitat and population
- 127. Much of the habitat of these species is likely impacted by trawl gear or fixed gear
- 128. Adults live in habitat that is fished by trawl gear and longline gear
- 129. Highly associated with untrawlable habitat
- 130. A large proportion of the population is vulnerable to fishing activities
- 131. All stages
- 132. Habitats experience commercial fishing pressure and vulnerable to degradation
- 133. Adults reside along entire slope, where impacts are unlikely due to depth

Appendix Table B3. -- Raw scores and rationale statements for scorable criteria used to prioritize habitat assessments in Alaska for the EFH theme.

Theme		Bot	h					E	Both							Both		
Stock		Liebitet der	andanaa			E	colo	gica	l importa	nce	E	cond	omic	, soc	cial,	and manag	ement value	Total score
Stock		парітат цер	Dendence	1	2	3	4	5	Total	Pationalo	1	2	3	4	5	Total	Pationalo	
TOTAL POSSIBLE SCORE	5	LH Stage	Rationale	1	1	1	1	1	5	Kationale	1	1	1	1	1	5	Rationale	35
Blue king crab - Pribilof Islands	3	EJ	134					1	1	166					1	1	196	18
Blue king crab - Saint Matthew Island	3	EJ, LJ, A						1	1	167						0		16
Golden king crab - Aleutian Islands	1	LJ, A	135			1			1	168	1					1	197	14
Golden king crab - Pribilof Islands																		
Red king crab - Bristol Bay	5	L, EJ, LJ, A	136					1	1	169	1		1			2	198	22
Red king crab - Norton Sound	1	A						1	1	170					1	1	199	8
Red king crab - Pribilof Islands	1	Е, L, EJ, Ц, А							0							0		3
Red king crab - Western Aleutian Islands																		
Snow crab - Bering Sea	5	E, L, A	137						0		1		1			2	200	13
Southern Tanner crab - Bering Sea	1								2	171	1					1	201	11
Arctic cod - Arctic Management Area					1		1											
Saffron cod - Arctic Management Area																		
Snow crab - Arctic Management Area																		
Alaska plaice - Bering Sea / Aleutian Islands	1	LJ, A	138			1			1	172			1			1		11
Arrowtooth flounder - Bering Sea / Aleutian Islands	5	EJ, LJ, A	139	1					1	173						0	202	9
Atka mackerel - Bering Sea / Aleutian Islands	1	Ε, Α	140		1	1			2	174			1			1	203	16
Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex	3	LJ, A	141						0						1	1	204	11
Bering Sea / Aleutian Islands Flathead Sole Complex	1	LJ, A	142						0				1			1	205	6
Bering Sea / Aleutian Islands Octopus Complex (giant octopus)	1	E	143	1	1				2	175						0		9
Bering Sea / Aleutian Islands Other Flatfish Complex	1	А				1			1	176			1			1		9
Bering Sea / Aleutian Islands Other Rockfish Complex																		
Bering Sea / Aleutian Islands Rock Sole Complex (northern rock sole)	1	LJ, A	138			1			1		1					1	206	11
Bering Sea / Aleutian Islands Sculpin Complex																		

Appendix Table B3. -- Continued.

Theme		Bot	h					B	Both							В	Both		-
Stock		Habitat dar	ondonco			E	colo	gica	l importa	nce	E	con	omie	c, so	cial,	al, ar	nd manag	ement value	Total score
Stock		Habitat uep	enuence	1	2	3	4	5	Total	Pationalo	1	2	3	4	5	5	Total	Pationalo	
TOTAL POSSIBLE SCORE	5	LH Stage	Rationale	1	1	1	1	1	5	Kationale	1	1	1	1	1	1	5	Kationale	35
Bering Sea / Aleutian Islands Shark Complex	1			1				1	2	177							0		8
Bering Sea / Aleutian Islands Skate Complex	3	E	144	1					1	178							0		14
Bering Sea / Aleutian Islands Squid Complex	1		145		1				1	179							0		8
Greenland halibut - Bering Sea / Aleutian Islands	1	L, EJ, LJ, A	146						0	180							0	207	5
Kamchatka flounder - Bering Sea / Aleutian Islands	1	LJ, A	147	1					1	181			1				1		11
Northern rockfish - Bering Sea / Aleutian Islands	3	LJ, A	141						0						1	1	1	204	11
Pacific cod - Aleutian Islands	3	L, EJ, LJ, A	148						0				1				1	208	17
Pacific cod - Bering Sea	3	LJ, A	148	1		1			2	182	1		1		1	1	3	209	20
Pacific ocean perch - Bering Sea / Aleutian Islands	3	LJ, A	141			1			2	183	1				1	1	2	210	16
Shortraker rockfish - Bering Sea / Aleutian Islands							1												
BSAI Walleye pollock (includes Eastern Bering Sea, Aleutian Islands, and Bogoslof stocks)	1	L, EJ	149	1	1	1			3	184	1		1		1	1	3	211	11
Yellowfin sole - Bering Sea / Aleutian Islands	1	LJ, A	138			1			1		1						1	206	8
Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska	1	LJ, A	150					1	1	185	1				1	1	2	212	16
Arrowtooth flounder - Gulf of Alaska	5	L	151	1					1	186							0	202	9
Atka mackerel - Gulf of Alaska																			
Big skate - Gulf of Alaska	1		152	1					1	187			1				1	213	10
Dusky rockfish - Gulf of Alaska	1	EJ, LJ, A							0				1				1	214	9
Flathead sole - Gulf of Alaska	1	E, L, LJ, A	153						0				1				1	205	6
Gulf of Alaska Blackspotted and Rougheye Rockfish Complex	1	LJ, A	154						0				1				1	215	7
Gulf of Alaska Deepwater Flatfish Complex (Dover sole)	1	E, L, LJ, A	155						0	180			1				1	205	6
Gulf of Alaska Demersal Shelf Rockfish Complex (yelloweye rockfish)	3	EJ, LJ, A	156					1	1	188			1	1	1	1	3	216	12
Gulf of Alaska Octopus Complex (giant octopus)	1	E	143	1	1				2	175							0		9
Gulf of Alaska Other Rockfish Complex	3	LJ, A	157						0								0		15
Gulf of Alaska Sculpin Complex																			

Appendix Table B3. -- Continued.

Theme		Bot	h					E	Both							Both		
Shadu		Linking day				E	colo	gica	l importa	nce	Ε	con	omie	c, so	cial,	and manag	gement value	Total score
STOCK		Habitat dep	bendence	1	2	3	4	5	Total	Dationala	1	2	3	4	5	Total	Dationala	
TOTAL POSSIBLE SCORE	5	LH Stage	Rationale	1	1	1	1	1	5	Rationale	1	1	1	1	1	5	Rationale	35
Gulf of Alaska Shallow Water Flatfish Complex (northern rock sole)	1	LJ, A	138			1			1	172			1			1		11
Gulf of Alaska Shark Complex	1			1				1	2	177						0		8
Gulf of Alaska Skate Complex (Other Skates exclusive of big and longnose)	1		158	1					1	189						0		8
Gulf of Alaska Squid Complex	1		145		1				1	179						0		8
Gulf of Alaska Thornyhead Rockfish Complex (shortspine thornyhead)	1	EJ, LJ, A							0				1			1	217	7
Longnose skate - Gulf of Alaska	1	E	159	1					1	189						0		8
Northern rockfish - Western / Central Gulf of Alaska	1	А						1	1	190			1			1	218	9
Pacific cod - Gulf of Alaska	5	L, EJ, LJ, A		1	1	1			3	191	1		1		1	3	219	16
Pacific ocean perch - Gulf of Alaska	1	Α	160					1	1	192	1					1	220	9
Rex sole - Gulf of Alaska	1	E, L, LJ, A	161						0				1			1	205	6
Shortraker rockfish - Gulf of Alaska																		
Walleye pollock - Eastern Gulf of Alaska	1	E, L, EJ, LJ, A			1				1							0		4
Walleye pollock - Western / Central Gulf of Alaska	5	EJ, LJ	162		1	1			2	193	1		1			2		15
Chinook salmon	3	E, L, EJ, LJ, A						1	1		1	1			1	3		12
Chum salmon	3	E, L, EJ, LJ, A						1	1			4		1		2		9
Coho salmon	3	E, L, EJ, LJ, A						1	1			Ţ	1	1	1	3		10
Pink salmon	3	E, L, EJ, LJ, A						1	1				1	1	1	3		10
Sockeye salmon	3	E, L, EJ, LJ, A						1	1				1	1	1	3		10
Weathervane scallop - Alaska	1	LJ, A	163						0							0		9
Forage Fishes	1	А	164		1				1	194			1			1	221	12
Gulf of Alaska Grenadiers	1	А	165			1		1	2	195			1	1	1	0	222	9
Bering Sea / Aleutian Islands Grenadiers	1	Α	165		1	1	1	1	2	195	1	1	1	1	1	0	222	9

- 134. Rely on specific habitat (rough bottom with shell hash) as nursery areas
- 135. There is a paucity of information on golden king crab life history characteristics due in part to the deep depth distribution (~200–1000 m) and the asynchronous nature of life history events. Information is lacking that vital rates and productivity are dependent on habitat. Additional Supporting Resources: Pengilly D., 2016. Aleutian Islands golden king crab 2016 Tier 5 assessment. *In* Stock assessment and fishery evaluation report to the North Pacific Fishery Management for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands Regions. North Pacific Fishery Management Council, 605 W. 4th Avenue, Anchorage AK 99510.
- 136. The regime shift in 1976-77, the productivity has been much lower than before. The low productivity could be due to changes in larvae food availability and composition and unfavorable larval settlement locations, or habitat destruction by bottom trawl fisheries in Bristol Bay.
- 137. Environmental effects on egg production, larval survival, and adult habitat use
- 138. Considered habitat generalists
- 139. Habitat generalist little concern that habitat would be a limiting factor
- 140. Strong habitat associations established for egg and adults
- 141. The 2016 EFH update relates population density to habitat characteristics
- 142. Catchability is related to temperature, but we don't know effect on vital rates
- 143. Nursery habitats could be affected by physical disturbance/water quality
- 144. Skate nursery sites are small, rare, and highly localized
- 145. Likely affected by oceanographic features, but difficult to assess habitat associations
- 146. Recruitment seems to be dependent on the extent of the cold pool
- 147. Probably not restricted to a single habitat type
- 148. Measurable differences in population density across habitat types
- 149. Oceanography affects prey availability, condition, and over-wintering survival
- 150. Limited amount of deep slope habitat
- 151. Larvae are the most sensitive to habitat of all ATF life stages
- 152. Big skates likely have some sort of specific nursery areas
- 153. Little data exist on this for flathead sole
- 154. A portion of the population exists on untrawlable rocky habitat
- 155. Possible that temperature or some other effect would influence vital rates
- 156. Yelloweye and the DSR complex are highly dependent on rocky habitat

- 157. Rockfish species are generally strongly associated with specific habitat types
- 158. Skates likely depend on specific nursery sites
- 159. It's likely that longnose skates depend on specific nursery habitats
- 160. Additional data are needed on habitat dependence for this species
- 161. Not a lot of information on habitat dependence for rex sole
- 162. Differential growth rates of pollock larvae and juveniles in different habitats in GOA
- 163. Associated habitats are neither rare nor limiting for species
- 164. Some species have very particular needs regarding spawning habitat
- 165. Distribution is homogenous on slope; little information about specific habitats
- 166. Stock supported a commercial fishery in the 1970s/early 1980s, now overfished
- 167. (5) Historically high abundance was mostly south of the island. Now crabs occur north of the island as well. The current abundance is much lower than 20 years ago.
- 168. (3) The golden king crab adult stocks have been providing consistent catches for the last 30 plus years. The western stock however, shows a decline in recent years. The adult sizes are not reported to be a major prey items to the co-occurring species. The bycatch in the groundfish fisheries is also low.
- 169. (5) Historically, the stock mostly concentrated in the southern and middle Bristol Bay. Now it is mostly in the middle and northern Bristol Bay.
- 170. (5) Norton Sound red king crabs are generally scavengers on sandy bottom. Other than improving nutrient cycling, their role on other species is unknown.
- 171. High biomass, although much higher in 1970s reduced ecosystem role
- 172. High biomass and light exploitation
- 173. Very abundant and consume other key species, including pollock and cod
- 174. High biomass; important prey to halibut, Pacific cod, and arrowtooth flounder
- 175. Known predators on a variety of species; present in diets of benthic predators
- 176. High biomass
- 177. Significant apex predators with broad impact; historically much more abundant
- 178. Top predators abundant and ubiquitous, omnivorous, and have few predators
- 179. Squids of all age/sizes are important prey for everything from fish to whales
- 180. Low abundance
- 181. Important predators at late juvenile and adult stages

- 182. Top-quartile predator; high biomass
- 183. High abundance; historically abundant
- 184. Dominant biomass; overall consumption is high; top fish prey item in system
- 185. Stock used to be much more abundant, and is important predator
- 186. Abundant and important predator of pollock, cod, other groundfish
- 187. Adult big skates are top predators and omnivorous
- 188. Based on DSR catch history, these rockfish were in a much higher abundance than they are now.
- 189. Adult skates are top predators and omnivorous
- 190. Historical biomass was potentially much larger than current levels
- 191. Important predators; important role as prey; large biomass
- 192. Historical biomass of this species is estimated to be significantly larger than current levels
- 193. Info from stock assessment
- 194. Extremely important prey items for everything from fish to whales
- 195. Most abundant species on the slope, but ecosystem role is not well understood
- 196. A revitalized fishery could have localized but important economic benefits
- 197. (1) Aleutian Islands golden king crab is a commercially important species managed under FMP. It has been providing consistent catches under Tier 5 management strategy of FMP
- 198. (1) The stock supports one of most important crab fisheries in Alaska. (2) Few crabs have been taken by recreational fishing. (4) Few crabs have been taken by recreational fishing
- 199. (5) Norton Sound Red King crab fishery is super exclusive (highly localized) in both commercial and subsistence, involving many local community members. Their commercial value is small compared to other stocks, but is big for region that is economically depressed.
- 200. Highly valuable fishery
- 201. Increasingly important commercial species
- 202. Not commercially valuable
- 203. Highly regulated fishery spatial management for Stellar sea lion measures
- 204. Rockfish stocks in general considered to have cultural significance
- 205. Halibut fisheries limit potential targeting of this species
- 206. High ex-vessel value
- 207. Deep water species, minor fishery
- 208. Significant take of "protected species" (halibut, crab) in commercial fishery

- 209. Top 25% commercial landings; fishery allocation issues; high cultural importance
- 210. High ex-vessel value; cultural significance
- 211. Largest AK fishery; CDQs important to economy of coastal communities
- 212. \$85 million ex-vessel; IFQ fishery supports many small communities and fishers
- 213. Bycatch species, also targeted in a "topping off" behavior by other fisheries
- 214. Major economic fishery in the region each individual species is important
- 215. Bycatch stock and functions as a "choke stock" that can close other fisheries
- 216. Yelloweye and DSR species are an important part of the commercial, recreational, and subsistence fishing communities.
- 217. Bycatch limits for shortspine could close other fisheries if met
- 218. 196 Fishery important to the industry in the GOA
- 219. Economically and socially important; communities are highly dependent on stock
- 220. Premiere rockfish species targeted in GOA with an ex-vessel value > \$8 million (2014)
- 221. Bycatch can hinder commercial fishing activity
- 222. Low fishing pressure and value; managed as an Ecosystem Component

Appendix C Raw Habitat Assessment Prioritization Scores (Alaska) Stock Assessment Theme Appendix Table C1. -- Raw scores and rationale statements for filter criteria used to prioritize habitat assessments in Alaska for the stock assessment theme.

Theme					Filter criteria	
		Both			Stock asses	ssment
Stock		FSSI stock or FM	IC priority		Likely to benefit sto	ock assessment
TOTAL POSSIBLE SCORE	1	Life history stage	Rationale	1	Life history stage	Rationale
Blue king crab - Pribilof Islands	1	А	1	1	EJ, LJ, A	13
Blue king crab - Saint Matthew Island	1		1	1	EJ, LJ, A	14
Golden king crab - Aleutian Islands	1	LJ, A	1	1	LJ, A	15
Golden king crab - Pribilof Islands	0		2			
Red king crab - Bristol Bay	1		1	1	LJ, A	
Red king crab - Norton Sound	1	А	1	0	А	16
Red king crab - Pribilof Islands	1			1		
Red king crab - Western Aleutian Islands	0		2			
Snow crab - Bering Sea	1			1		
Southern Tanner crab - Bering Sea	1	А	1	1	EJ, LJ, A	17
Arctic cod - Arctic Management Area	0					
Saffron cod - Arctic Management Area	0					
Snow crab - Arctic Management Area	0					
Alaska plaice - Bering Sea / Aleutian Islands	1	LJ, A		1	LJ, A	
Arrowtooth flounder - Bering Sea / Aleutian Islands	1	EJ, LJ, A		1	EJ, LJ, A	18
Atka mackerel - Bering Sea / Aleutian Islands	1			1		
Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex	1	L, LJ, A	3	1	LI, A	19
Bering Sea / Aleutian Islands Flathead Sole Complex	1	E, L, LJ, A		1	LJ, A	20
Bering Sea / Aleutian Islands Octopus Complex (giant octopus)	1	E, L, EJ, LJ, A	4	0		
Bering Sea / Aleutian Islands Other Flatfish Complex	1	А		1	А	
Bering Sea / Aleutian Islands Other Rockfish Complex	0					
Bering Sea / Aleutian Islands Rock Sole Complex (northern rock sole)	1	LJ, A		1	LJ, A	
Bering Sea / Aleutian Islands Sculpin Complex	0					
Bering Sea / Aleutian Islands Shark Complex	1	EJ, LJ, A	5	0		21
Bering Sea / Aleutian Islands Skate Complex	1			1		
Bering Sea / Aleutian Islands Squid Complex	1		6	0		
Greenland halibut - Bering Sea / Aleutian Islands	1	Α	1	1	E, L, EJ, LJ, A	22

Theme					Filter criteria	
meme		Both			Stock asse	essment
Stock		FSSI stock or FM	C priority		Likely to benefit st	ock assessment
TOTAL POSSIBLE SCORE	1	Life history stage	Rationale	1	Life history stage	Rationale
Kamchatka flounder - Bering Sea / Aleutian Islands	1	LJ, A		1	LJ, A	
Northern rockfish - Bering Sea / Aleutian Islands	1	L, LJ, A	3	1	LJ, A	19
Pacific cod - Aleutian Islands	1	E, L, EJ, LJ, A	1	1	LJ, A	23
Pacific cod - Bering Sea	1	E, L, EJ, LJ, A	7	1	LJ, A	23
Pacific ocean perch - Bering Sea / Aleutian Islands	1	L, LJ, A	3	1	LJ, A	19
Shortraker rockfish - Bering Sea / Aleutian Islands	0					
BSAI Walleye pollock (includes Eastern Bering Sea, Aleutian Islands, and Bogoslof stocks)	1	E, L, EJ, LJ, A		1	L, EJ	24
Yellowfin sole - Bering Sea / Aleutian Islands	1	LJ, A		1	LJ, A	
Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska	1	LJ, A		1	EJ, LJ, A	25
Arrowtooth flounder - Gulf of Alaska	1	EJ, LJ		1	EJ, LJ, A	18
Atka mackerel - Gulf of Alaska	0					
Big skate - Gulf of Alaska	1			1		
Dusky rockfish - Gulf of Alaska	1	А		1	А	26
Flathead sole - Gulf of Alaska	1			0		27
Gulf of Alaska Blackspotted and Rougheye Rockfish Complex	1	А	7	1	LJ, A	28
Gulf of Alaska Deepwater Flatfish Complex (Dover sole)	1			1	LJ, A	29
Gulf of Alaska Demersal Shelf Rockfish Complex (yelloweye rockfish)	1	L, EJ, LJ, A	8	1	L, EJ, LJ, A	30
Gulf of Alaska Octopus Complex (giant octopus)	1	E, L, EJ, LJ, A	4	0		
Gulf of Alaska Other Rockfish Complex	1	LJ, A	9	1	L, EJ, LJ, A	31
Gulf of Alaska Sculpin Complex	0					
Gulf of Alaska Shallow Water Flatfish Complex (northern rock sole)	1	LJ, A		1	LJ, A	
Gulf of Alaska Shark Complex	1	EJ, LJ, A	10	0		21, 32
Gulf of Alaska Skate Complex (Other Skates exclusive of big and longnose)	1			1		
Gulf of Alaska Squid Complex	1		6	0		
Gulf of Alaska Thornyhead Rockfish Complex (shortspine thornyhead)	1	L, EJ, LJ, A		0	EJ, LJ, A	
Longnose skate - Gulf of Alaska	1			1		
Northern rockfish - Western / Central Gulf of Alaska	1			1		
Pacific cod - Gulf of Alaska	1	E, L, LJ, A		1	LJ, A	33

Theme					Filter criteria	
		Both			Stock asse	ssment
Stock		FSSI stock or FM	C priority		Likely to benefit st	ock assessment
TOTAL POSSIBLE SCORE	1	Life history stage	Rationale	1	Life history stage	Rationale
Pacific ocean perch - Gulf of Alaska	1			1		
Rex sole - Gulf of Alaska	1	E, L, LJ, A		1	LJ, A	34
Shortraker rockfish - Gulf of Alaska	0					
Walleye pollock - Eastern Gulf of Alaska	1	E, L, EJ, LJ, A	7	1	LJ, A	35
Walleye pollock - Western / Central Gulf of Alaska	1	E, L, EJ, LJ, A	1	1	LJ, A	36
Chinook salmon	1	E, L, EJ, LJ, A		1	E, L, EJ, LJ, A	
Chum salmon	1	А	11	1	E, L, EJ, LJ, A	
Coho salmon	1	E, L, EJ, LJ, A		1	E, L, EJ, LJ, A	
Pink salmon	1	E, L, EJ, LJ, A		1	E, L, EJ, LJ, A	
Sockeye salmon	1	E, L, EJ, LJ, A		1	E, L, EJ, LJ, A	
Weathervane scallop - Alaska	1	E, L, EJ, LJ, A	1, 7	1	EJ, LJ, A	
Forage Fishes	1		7	1		37
Gulf of Alaska Grenadiers	1	E, L, EJ, LJ, A	12	0		
Bering Sea / Aleutian Islands Grenadiers	1	E, L, EJ, LJ, A	12	0		

- 1. FSSI stock
- 2. Not FSSI
- 3. Life stages described in 2016 EFH update
- 4. Complex has variable life history, habitats, and levels of knowledge
- 5. Data poor assessments, lacking life history for some species
- 6. Lacking basic life history information for some species in complex
- 7. NPFMC research priority
- 8. Yelloweye rockfish are a long-lived, slow maturing and reproducing commercially important species across the GOA.
- 9. Improve surveys in untrawlable habitat

- 10. Data poor stock complex, with declining indices
- 11. Bycatch reduction
- 12. NPFMC research priority lacking basic life history information
- 13. Improve abundance estimates based on habitat-specific catchability
- 14. St. Matthew Island blue king crab distribution depends greatly on habitat. Habitat information can be used for survey design and estimating survey selectivity
- 15. Groundfish trawl activities are noted in recent years in the eastern Aleutian Islands golden king crab fishing areas. This could affect the pre-adults (juveniles) and adults in this habitat. Industry brought up this issue at the September 2016 crab plan team meeting. Trawl effect study would help the adult stock assessment studies. Additional Supporting References: Crab Plan Team minutes for September 2016 meeting, NPFMC, crab plan team web site.
- 16. Norton Sound bottom structure is simple.
- 17. Improve understanding of spatial distribution and changes
- 18. Provide info on spawning behavior/ location and egg/larval survival
- 19. Improved survey biomass estimates and survey catchability
- 20. Temperature affects distribution and population dynamics
- 21. Not strongly associated with specific habitats
- 22. Inform model design; analyze environmental effects
- 23. Improve survey estimates (selectivity and catchability)
- 24. Improve understanding of biology at multiple life history stages
- 25. Improve surveys or analysis of CPUE data; help explain recruitment
- 26. Improve biomass estimation and trawlable/untrawlable understanding
- 27. No known habitat-related movement, mortality, or growth is occurring
- 28. Inform trawl survey estimates on untrawlable grounds
- 29. Understanding habitat occupation by life history stage

- 30. Rocky habitat is a strong indicator for identifying DSR assemblages that is used in stock assessment.
- 31. Address survey biomass issues
- 32. Data suggest large migrations
- 33. Improve survey estimates or create opportunities for ecosystem indices
- 34. Anecdotal evidence of variable growth rates
- 35. Develop spatial model, potentially include eastern GOA portion
- 36. Improve knowledge of spawning habitat use and survey catchability
- 37. Improve understanding of distributions

Appendix Table C2. -- Raw scores and rationale statements for scorable criteria used to prioritize habitat assessments in Alaska for the stock assessment theme.

Theme		Stock ass	sessment		Both			Bot	h						Both	
Stack		Benefits	to stock		Field and atta	.		EN4C and	a star	н	abit	at di	stur	band	ce, vulnerab	lity, and rarity
Stock		assess	sment		Fishery sta	itus		FIVIC pr	lority	1	2	3	4	5	Total	Patianala
TOTAL POSSIBLE SCORE	5	LH Stage	Rationale	5	LH Stage	Rationale	5	LH Stage	Rationale	1	1	1	1	1	5	Rationale
Blue king crab - Pribilof Islands	4	LJ, A	35	5	А	65	3	EJ, LJ, A	100					1	1	132
Blue king crab - Saint Matthew Island	4	EJ, LJ, A	36	3	LJ, A	66	3	EJ, LJ, A	101		1		1		2	133
Golden king crab - Aleutian Islands	4	LJ, A	37	1	А	67	5	LJ, A	102			1			1	134
Golden king crab - Pribilof Islands														1		
Red king crab - Bristol Bay	1	EJ, LJ, A	38	2	LJ, A	68	3	E, L, EJ, LJ, A	103	1	1	1	1		4	135
Red king crab - Norton Sound	1	А		0	А		3	А				1			1	136
Red king crab - Pribilof Islands	1	Α		0	А		1	Α							0	
Red king crab - Western Aleutian Islands																
Snow crab - Bering Sea	5	E, L, LJ, A		0	А		5							1	0	
Southern Tanner crab - Bering Sea	4	LJ, A	39	0	LJ, A	69	3	LJ, A	104					1	0	
Arctic cod - Arctic Management Area																
Saffron cod - Arctic Management Area																
Snow crab - Arctic Management Area														1		
Alaska plaice - Bering Sea / Aleutian Islands	1	LJ, A	40	0	LJ, A		3	LJ, A	105			1		1	1	137
Arrowtooth flounder - Bering Sea / Aleutian Islands	1	EJ, LJ, A	41	0	EJ, LJ, A	70	1	EJ, LJ, A	70	1					1	138
Atka mackerel - Bering Sea / Aleutian Islands	1	А	42	2	A	71	5	А	106			1			1	139
Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex	4	LJ, A	43	0	LJ, A	72	5	LJ, A	106			1			1	140
Bering Sea / Aleutian Islands Flathead Sole Complex	1	LJ, A	44	0	LJ, A	73	0	LJ, A	107						0	
Bering Sea / Aleutian Islands Octopus Complex (giant octopus)				0	EJ, LJ, A	74	5	E, L, EJ, LJ, A	108						0	141
Bering Sea / Aleutian Islands Other Flatfish Complex	1	А	40	1	А	75	3	А	105			1			1	137
Bering Sea / Aleutian Islands Other Rockfish Complex																
Bering Sea / Aleutian Islands Rock Sole Complex (northern rock sole)	1	LJ, A	40	0	LJ, A	76	3	LJ, A	105			1			1	137
Bering Sea / Aleutian Islands Sculpin Complex																

Theme		Stock ass	essment		Both			Bot	h						Both	
Stack		Benefits	to stock			h		EN/C mail	a vite	н	abita	at di	stur	band	ce, vulnerabi	lity, and rarity
SLOCK		assess	ment		Fishery sta	lus		FINIC PR	ionity	1	2	3	4	5	Total	Pationalo
TOTAL POSSIBLE SCORE	5	LH Stage	Rationale	5	LH Stage	Rationale	5	LH Stage	Rationale	1	1	1	1	1	5	Nationale
Bering Sea / Aleutian Islands Shark Complex				1	EJ, LJ, A	77	3	EJ, LJ, A	109						0	
Bering Sea / Aleutian Islands Skate Complex	1	EJ, LJ, A	45	0		78	3	E	110	1				1	2	142
Bering Sea / Aleutian Islands Squid Complex				0		79	5		111						0	
Greenland halibut - Bering Sea / Aleutian Islands	5	EJ, LJ, A	46	3	А	80	0	E, L, EJ, LJ, A	112						0	
Kamchatka flounder - Bering Sea / Aleutian Islands	1	LJ, A	40	0	LJ, A		3	LJ, A	105			1			1	
Northern rockfish - Bering Sea / Aleutian Islands	4	LJ, A	43	0	LJ, A	72	5	LJ, A	106			1			1	140
Pacific cod - Aleutian Islands	1	LJ, A	47	2	LJ, A	81	5	E, L, EJ, LJ, A	113	1					1	143
Pacific cod - Bering Sea	1	LJ, A	47	0	LJ, A	82	5	E, L, EJ, LJ, A	113	1		1			2	144
Pacific ocean perch - Bering Sea / Aleutian Islands	4	LJ, A	43	2	LJ, A	83	5	LJ, A	106			1			1	140
Shortraker rockfish - Bering Sea / Aleutian Islands																
BSAI Walleye pollock (includes Eastern Bering Sea, Aleutian Islands, and Bogoslof stocks)	1	L, EJ, LJ	48	0	Ц, А	84	3	LJ, A							0	
Yellowfin sole - Bering Sea / Aleutian Islands	1	LJ, A	40	0	LJ, A		3	LJ, A	114			1			1	137
Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska	4	EJ, LJ, A	49	2	LJ, A	83	5	LJ, A	115	1					1	145
Arrowtooth flounder - Gulf of Alaska	1	EJ, LJ, A	50	0	EJ, LJ, A	70	1	EJ, LJ, A	70			1			1	146
Atka mackerel - Gulf of Alaska																
Big skate - Gulf of Alaska	1		51	1		85	1		116	1					1	147
Dusky rockfish - Gulf of Alaska	4	А		0	A		3	А							0	
Flathead sole - Gulf of Alaska				0	LJ, A	86	0		117						0	
Gulf of Alaska Blackspotted and Rougheye Rockfish Complex	4	LJ, A	52	0	LJ, A	87	1	LJ, A	118						0	
Gulf of Alaska Deepwater Flatfish Complex (Dover sole)	1	LJ, A	53	0	LJ, A	88	0		119						0	
Gulf of Alaska Demersal Shelf Rockfish Complex (yelloweye rockfish)	4	L, EJ, LJ, A	54	0	L, EJ, LJ, A		3	L, EJ, LJ, A				1			1	148
Gulf of Alaska Octopus Complex (giant octopus)				0	EJ, LJ, A	74	5	E, L, EJ, LJ, A	108						0	141
Gulf of Alaska Other Rockfish Complex	4	EJ, LJ, A	55	1	LJ, A	89	5	LJ, A	120	1					1	149

Theme		Stock ass	essment		Both			Bot	h						Both	
Stack		Benefits	to stock					FMC we	a vite i	H	abit	at di	istur	ban	ce, vulnerabi	lity, and rarity
SLOCK		assess	ment		Fishery sta	lus		FIVIC Pri	only	1	2	3	4	5	Total	Dationala
TOTAL POSSIBLE SCORE	5	LH Stage	Rationale	5	LH Stage	Rationale	5	LH Stage	Rationale	1	1	1	1	1	5	Rationale
Gulf of Alaska Sculpin Complex																
Gulf of Alaska Shallow Water Flatfish	1		40	0	^	90	3		105			1			1	137
Complex (northern rock sole)	1	ы, л	40	0	~	50	5	ы, л	105			1			-	157
Gulf of Alaska Shark Complex				1	EJ, LJ, A	91	3	EJ, LJ, A	121						0	
Gulf of Alaska Skate Complex (Other Skates	1			0			1			1					1	
exclusive of big and longnose)	1			0			1			1					-	
Gulf of Alaska Squid Complex				0		79	5		111						0	
Gulf of Alaska Thornyhead Rockfish				٥	^	92	2	٨	122			1			1	150
Complex (shortspine thornyhead)				0	~	52	5	C	122			T			-	150
Longnose skate - Gulf of Alaska	1			0		93	1		123	1					1	147
Northern rockfish - Western / Central Gulf	л	۸	56	0	^		1	٨	124				1		1	151
of Alaska	4	A	50	0	A		1	A	124				T		1	151
Pacific cod - Gulf of Alaska	4	LJ, A	57	0	LJ, A	94	1	А							0	
	F	L, EJ, LJ,	F.9	0	•	05	1		125			1			1	150
Pacific ocean perch - Guif of Alaska	Э	А	56	0	A	95	T	L, EJ, LJ, A	125			T			1	152
Rex sole - Gulf of Alaska	1	LJ, A	59	0	LJ, A	96	0		126						0	
Shortraker rockfish - Gulf of Alaska																
Walleye pollock - Eastern Gulf of Alaska	4	LJ, A		0	LJ, A	97	1	LJ, A	127						0	
Walleve pollock - Western / Central Gulf of				-				E, L, EJ,								
Alaska	4	LJ, A	60	2	LJ, A	87	3	LJ, A							0	
		E. L. EJ.			E. L. EJ. LJ.			,								
Chinook salmon	1	_, _,, Δ		0	Δ			LJ, A	128			1			1	153
Chum salmon	1	L, L, LJ,		0	L, L, LJ, LJ,	2		А				1			1	153
		LJ, A			A	3										
Coho salmon	1	E, L, EJ,		0	E, L, EJ, LJ,			E, L, EJ,				1			1	153
		LJ, A			A	1		LJ, A								
Pink salmon	1	E, L, EJ,		0	E, L, EJ, LJ,			E, L, EJ,				1			1	153
		LJ, A		-	A	1		LJ, A				_			_	
Cockeye colmon	1	E, L, EJ,		0	E, L, EJ, LJ,			E, L, EJ,				1			1	152
Sockeye saimon	1	LJ, A		0	A	1		LJ, A				T			1	155
Weathervane scallop - Alaska	1	LJ, A	61	0	LJ, A	98	3	LJ, A	129						0	
Forage Fishes	1			0		1	3		130	1		1			2	154
								E, L, EJ,						1		
Gulf of Alaska Grenadiers				0	A	99	5	LJ. A	131						0	155
		1		1			\vdash	F. I. FI			-			-		
Bering Sea / Aleutian Islands Grenadiers				0	A	99	5	LJ, A	131						0	155

- 38. Potentially reduce very high survey CVs
- 39. A habitat assessment will improve survey efficiency and reduce sampling variability
- 40. Aleutian Islands golden king stock assessment is based on fishery dependent data. Fishery independent pot survey data are limited in comprehensive information to use in the length-based assessment model. CPUE data is one of the main components of the model, which is used in a standardized form. The standardization of observer CPUE is done by GLM considering a suite of predictor variables. Habitat assessment can help to enhance the predictor variable options to better predict CPUE. Additional Supporting Resources: Siddeek, M.S.M., Jie Zheng, and Doug Pengilly 2016. Standardizing CPUE from the Aleutian Islands golden king crab observer data. Pages 97-116 *In* T.J. Quinn II, J.L. Armstrong, M.R. Baker, J. Heifetz, and D. Witherell (eds.), Assessing and Managing Data-Limited Fish Stocks. Alaska Sea Grant College Program AK-SG-16-01d, University of Alaska Fairbanks.
- 41. Mostly for crab availability to trawl survey, especially nearshore area. Better understanding the crab habitat in near shore area may help to estimate trawl survey availability. Also, habitat information may be used to develop the relationship between trawl survey selectivity and habitat
- 42. Improve habitat-specific estimates of catchability
- 43. Improve understanding of habitat fidelity and fish movement
- 44. Improve understanding of earlier life stages
- 45. Re-evaluate survey data, inform new survey designs or enhance the model
- 46. Improve estimates of densities in untrawlable/trawlable habitats
- 47. Temperature affects distribution and population dynamics
- 48. Understanding skate nursery areas is higher priority
- 49. Understand effects of temperature on recruitment variability
- 50. Improve survey estimates (selectivity and catchability)
- 51. Improve understanding of temperature on juvenile survival and vital rates
- 52. Estimate time-varying parameters and/or explain residual patterns
- 53. Improve understanding of earlier life stages

- 54. No direct effect on stock assessment model
- 55. Estimate extent of untrawlable habitat to reduce survey uncertainty
- 56. Inform age-specific rates, availability; extent of untrawlable habitats
- 57. Much of the Eastern GOA rockfish habitat needs to me mapped and with additional mapping would improve survey efficiency and stock assessment
- 58. Improve survey estimates of biomass
- 59. Improve estimates from fishery-independent sources
- 60. Improve survey estimates or create opportunities for ecosystem indices
- 61. Data-rich assessment potential for improving to ecosystem-linked
- 62. Inform links between habitat and population dynamics
- 63. Improve estimates of catchability using oceanographic-defined habitat
- 64. Age-structured model not yet implemented for stock
- 65. Stock is overfished
- 66. The fishery is closed due to low abundance.
- 67. The golden king crab sub-stock in the western Aleutian Islands management area appears to be in decline with a possibility of over fishing. Additional Supporting Resources: Siddeek, M.S.M., J. Zheng, and D. Pengilly. 2016. Aleutian Islands golden king crab (*Lithodes aequispinus*) Model-Based Stock Assessment in Fall 2016. Draft report submitted for the September 2016 Crab Plan Team Meeting. North Pacific Fishery Management Council, 605 West 4th, Suite 306 Anchorage, Alaska 99501-2252
- 68. This stock has been fully exploited for a long time (>50 years). The current mature biomass is about 92% of B_{MSY}.
- 69. Stock appears to be above B_{MSY}
- 70. Stock is above B_{MSY} and lightly fished
- 71. TAC = ABC, and catches are just below TAC
- 72. Lightly exploited over the BSAI area
- 73. No evidence of overexploitation; catches always below the TAC

- 74. Catch << M; catch rates highly variable, but show no declining trends
- 75. Overfished status unknown, but starry flounder down 50% in 2015 shelf survey
- 76. The status of the stock and its productivity is known
- 77. Multiple survey indices show declining trends for two species in complex
- 78. Using Alaska skate as indicator, B >> B_{MSY} and catch << ABC
- 79. Unknown but overfishing is unlikely
- 80. Stock has been hovering around B20% for the last few years
- 81. F/F_{limit} = 0.798
- 82. F/F_{limit} = 0.527
- 83. Fully exploited, with a large percentage of ABC harvested
- 84. Catch is well below that expected at $0.75*F_{MSY}$
- 85. ABC exceeded several times recently, but new rules limit skate catch
- 86. ABC harvest specifications and catches for 2015
- 87. See stock assessment results
- 88. No evidence of overexploitation; catch is typically a very small % of the TAC
- 89. Survey biomass estimates are highly uncertain
- 90. Exploitation is light and no evidence of heavy exploitation
- 91. Survey indices suggest declines in GOA stocks over the last 15 years
- 92. Tier 5 species; stock is not overfished
- 93. Unknown overfished status but catch < ABC so no overfishing is occurring
- 94. Stock is not overfished or approaching an overfished condition
- 95. See most current assessment (Hulson et al. 2015)
- 96. No evidence of overexploitation

- 97. Tier 5 stock; no directed pollock fishing in the eastern GOA due to trawl ban
- 98. Data poor stock, but currently classified as not overfished/no overfishing
- 99. Overfishing undefined, but low fishing pressure and high abundance for stock
- 100. Role of habitat in population dynamics; info on spatial distribution and movement
- 101. High research priorities on life history information, annual trawl survey and handling mortality estimates
- 102. Since fishery independent data are lacking for the Aleutian Islands golden king crab stock, collecting alternative stock abundance indices (e.g., industry designed pot surveys) are identified as urgent in the Research Priority list. Additional Supporting Resources: See the data gap and research priorities section in the following report: Siddeek, M.S.M., J. Zheng, and D. Pengilly. 2016. Aleutian Islands golden king crab (*Lithodes aequispinus*) Model-Based Stock Assessment in Fall 2016. Draft report submitted for the September 2016 Crab Plan Team Meeting. North Pacific Fishery Management Council, 605 West 4th, Suite 306, Anchorage, Alaska 99501-2252.
- 103. Many high research priorities are listed for this stock by NPFMC, including trawling impacts, handling mortality estimates, stock boundary, stock survey, and reproductive index.
- 104. Studies on factors (e.g., habitat, depth) that affect catchability
- 105. Several research priorities; important but not crucial to management
- 106. Improving surveys in untrawlable grounds is an urgent research priority
- 107. No priorities that specifically mention the Flathead Sole Complex
- 108. Improving basic life history information for data-poor stocks is an urgent priority
- 109. Limited life history data; research priority level raised by declining survey indices
- 110. NPFMC supports continued research into skate nursery areas (HAPC)
- 111. Urgent priority to acquire basic life history information for data-poor stocks
- 112. No priorities that specifically mention Greenland halibut
- 113. Several high and medium research priorities listed for BSAI cod
- 114. Research recommendations are important but not crucial to management
- 115. Spatially explicit assessments and MSEs identified as critical research priorities

- 116. Research priority is to identify GOA nursery areas
- 117. No priorities that specifically mention GOA flathead sole
- 118. Research priority for generating spatially explicit models in the future
- 119. No priorities that specifically mention Dover sole/Deepwater Flatfish
- 120. Research into trawlable/untrawlable habitats to improve assessments is underway
- 121. Data poor assessment research priority to examine life history for prominent species
- 122. Continuing life history research is necessary, most importantly ageing
- 123. Research priority is to identify nursery areas
- 124. Highly variable adult maturity has been identified as an area of concern
- 125. Additional data needs, but none are identified as an urgent concern
- 126. No priorities that specifically mention rex sole
- 127. Project is probably not necessary to effectively manage the stock
- 128. Bycatch reduction
- 129. Improvements would potentially elevate stock above data-poor status
- 130. Generating data to monitor forage fish populations is a priority
- 131. Acquiring basic life history information for data-poor stocks is an urgent need
- 132. Early juvenile habitat is in inshore, rocky shell hash and is not abundant.
- 133. (2) Due to island-style habitat, climate change can have big impacts on this stock. (4) Due to a long time from spawning to maturity, the recovery time is long for this stock.
- 134. The golden king crab stock distribution in the eastern Aleutian Islands is closer to the Dutch Harbor than that in the western Aleutian Islands. Fishing impact from other fisheries (e.g., groundfish pot and trawl fisheries may have impact on this stock).
- 135. (1) Trawling in the southern Bristol Bay impacts the spawning ground. (2) The regime shift in 1976-77 may have greatly impacted the stock productivity. Global warming impacts crab distributions that may affect larvae settlement and ocean acidity has impacts on juvenile crab

growth and survival. (3) Heavy bottom trawl fisheries occurred within Bristol Bay. (4) Red king crab is a relatively long live species and it takes about 7-8 years from spawning to mature. A depressed stock would take a long time to recovery.

- 136. (3) Port dredging and gold mining nearshore may impact crab mating and larvae development around those areas.
- 137. No evidence that flatfish avoid disturbed areas
- 138. Adult habitat is subject to trawling, but spawning likely occurs much deeper
- 139. Egg nesting grounds and adult habitats are vulnerable to disturbance
- 140. Rockfish catches to be come from distinct, heavily used fishing grounds
- 141. Habitats not well defined and likely not very rare
- 142. Habitat is heavily trawled; skate nurseries are rare and highly localized
- 143. Large portion of habitat is disturbed by fishing, particularly bottom trawling
- 144. Habitat is heavily trawled; important spawning ground near Dutch Harbor
- 145. Entire GOA deep slope is longlined, but the total footprint is low
- 146. Unlikely to encounter habitat limitations
- 147. Extensive fishing activities, including trawling, throughout range
- 148. DSR have a finite adult range so continued fishing in a given area would cause impacts to the habitat and population
- 149. Much of the habitat of these species is likely impacted by trawl gear or fixed gear
- 150. Adults live in habitat that is fished by trawl gear and longline gear
- 151. Highly associated with untrawlable habitat
- 152. A large proportion of the population is vulnerable to fishing activities
- 153. All stages
- 154. Habitats experience commercial fishing pressure and vulnerable to degradation
- 155. Adults reside along entire slope, where impacts are unlikely due to depth

Appendix Table C3. -- Raw scores and rationale statements for scorable criteria used to prioritize habitat assessments in Alaska for the stock assessment theme.

Theme		Bot	h					E	Both							Both		
Stack			andanaa			E	colo	gica	l importa	nce	E	cond	omic	, so	cial,	and manag	ement value	Total score
SLOCK		парітат дер	bendence	1	2	3	4	5	Total	Rationale	1	2	3	4	5	Total	Rationale	
TOTAL POSSIBLE SCORE	5	LH stage	Rationale	1	1	1	1	1	5		1	1	1	1	1	5		35
Blue king crab - Pribilof Islands	3	EJ	156					1	1	188					1	1	218	18
Blue king crab - Saint Matthew Island	3	EJ, LJ, A						1	1	189						0		16
Golden king crab - Aleutian Islands	1	LJ, A	157			1			1	190	1					1	219	14
Golden king crab - Pribilof Islands																		
Red king crab - Bristol Bay	5	L, EJ, LJ, A	158					1	1	191	1		1			2	220	18
Red king crab - Norton Sound	1	А						1	1	192					1	1	221	8
Red king crab - Pribilof Islands	1	E, L, EJ, LJ, A							0							0		3
Red king crab - Western Aleutian Islands																		
Snow crab - Bering Sea	5	E, L, A	159						0		1		1			2	222	17
Southern Tanner crab - Bering Sea	1					1			2	193	1					1	223	11
Arctic cod - Arctic Management Area							1											
Saffron cod - Arctic Management Area																		
Snow crab - Arctic Management Area																		
Alaska plaice - Bering Sea / Aleutian Islands	1	LJ, A	160			1			1	194			1			1		8
Arrowtooth flounder - Bering Sea / Aleutian Islands	5	EJ, LJ, A	161	1					1	195						0	224	
Atka mackerel - Bering Sea / Aleutian Islands	1	Ε, Α	162		1	1			2	196			1			1	225	13
Bering Sea / Aleutian Islands Blackspotted and Rougheye Rockfish Complex	3	LJ, A	163						0						1	1	226	14
Bering Sea / Aleutian Islands Flathead Sole Complex	1	LJ, A	164						0				1			1	227	3
Bering Sea / Aleutian Islands Octopus Complex (giant octopus)	1	E	165	1	1				2	197						0		
Bering Sea / Aleutian Islands Other Flatfish Complex	1	А				1			1	198			1			1		9
Bering Sea / Aleutian Islands Other Rockfish Complex																		
Bering Sea / Aleutian Islands Rock Sole Complex (northern rock sole)	1	LJ, A	160			1			1		1					1	228	8
Bering Sea / Aleutian Islands Sculpin Complex																		
Bering Sea / Aleutian Islands Shark Complex	1			1				1	2	199						0		

Theme		Bot	h	Both												Both		
Stack		Habitat dar	andanca			E	colo	gica	l importa	nce	E	cond	omic	, so	cial,	and manag	gement value	Total score
SLOCK		парітат пер	enuence	1	2	3	4	5	Total	Rationale	1	2	3	4	5	Total	Rationale	
TOTAL POSSIBLE SCORE	5	LH stage	Rationale	1	1	1	1	1	5		1	1	1	1	1	5		35
Bering Sea / Aleutian Islands Skate Complex	3	E	166	1					1	200						0		10
Bering Sea / Aleutian Islands Squid Complex	1		167		1				1	201						0		
Greenland halibut - Bering Sea / Aleutian Islands	1	L, EJ, LJ, A	168						0	202						0	229	9
Kamchatka flounder - Bering Sea / Aleutian Islands	1	LJ, A	169	1					1	203			1			1		8
Northern rockfish - Bering Sea / Aleutian Islands	3	LJ, A	163						0						1	1	226	14
Pacific cod - Aleutian Islands	3	L, EJ, LJ, A	170						0				1			1	230	13
Pacific cod - Bering Sea	3	LJ, A	170	1		1			2	204	1		1		1	3	231	16
Pacific ocean perch - Bering Sea / Aleutian Islands	3	LJ, A	163			1			2	205	1				1	2	232	19
Shortraker rockfish - Bering Sea / Aleutian Islands							1											
BSAI Walleye pollock (includes Eastern Bering Sea, Aleutian Islands, and Bogoslof stocks)	1	L, EJ	171	1	1	1			3	206	1		1		1	3	233	11
Yellowfin sole - Bering Sea / Aleutian Islands	1	LJ, A	160			1			1		1					1	228	8
Sablefish - Eastern Bering Sea / Aleutian Islands / Gulf of Alaska	1	LJ, A	172					1	1	207	1				1	2	234	16
Arrowtooth flounder - Gulf of Alaska	5	L	173	1					1	208						0	224	
Atka mackerel - Gulf of Alaska																		
Big skate - Gulf of Alaska	1		174	1					1	209			1			1	235	7
Dusky rockfish - Gulf of Alaska	1	EJ, LJ, A							0				1			1	236	9
Flathead sole - Gulf of Alaska	1	E, L, LJ, A	175						0				1			1	227	
Gulf of Alaska Blackspotted and Rougheye Rockfish Complex	1	LJ, A	176						0				1			1	237	7
Gulf of Alaska Deepwater Flatfish Complex (Dover sole)	1	E, L, LJ, A	177						0	202			1			1	227	3
Gulf of Alaska Demersal Shelf Rockfish Complex (yelloweye rockfish)	3	EJ, LJ, A	178					1	1	210			1	1	1	3	238	15
Gulf of Alaska Octopus Complex (giant octopus)	1	E	165	1	1				2	197						0		
Gulf of Alaska Other Rockfish Complex	3	LJ, A	179						0							0		14
Gulf of Alaska Sculpin Complex																		
Gulf of Alaska Shallow Water Flatfish Complex (northern rock sole)	1	LJ, A	160			1			1	194			1			1		8

Theme	Both				Both								Total score					
Stock		Habitat dependence			Ecological importance							con						
					2	3	4	5	Total	Rationale	1	2	3	4	5	Total	Rationale	
TOTAL POSSIBLE SCORE	5	LH stage	Rationale	1	1	1	1	1	5		1	1	1	1	1	5		35
Gulf of Alaska Shark Complex	1			1				1	2	199						0		
Gulf of Alaska Skate Complex (Other Skates	1		180	1					1	211						0		5
exclusive of big and longnose)	-		100	-					-							ů		5
Gulf of Alaska Squid Complex	1		167		1				1	201						0		
Gulf of Alaska Thornyhead Rockfish Complex (shortspine thornyhead)	1	EJ, LJ, A							0				1			1	239	
Longnose skate - Gulf of Alaska	1	E	181	1					1	211						0		5
Northern rockfish - Western / Central Gulf of Alaska	1	А						1	1	212			1			1	240	9
Pacific cod - Gulf of Alaska	5	L, EJ, LJ, A		1	1	1			3	213	1		1		1	3	241	16
Pacific ocean perch - Gulf of Alaska	1	А	182					1	1	214	1					1	242	10
Rex sole - Gulf of Alaska	1	E, L, LJ, A	183						0				1			1	227	3
Shortraker rockfish - Gulf of Alaska																		
Walleye pollock - Eastern Gulf of Alaska		E, L, EJ,			4											0		
	T	LJ, A			T				T							0		/
Walleye pollock - Western / Central Gulf of Alaska	5	EJ, LJ	184		1	1			2	215	1		1			2		18
Chinook salmon	3	E, L, EJ,						1	1		1	1			1	2		10
		LJ, A						Т	1		1	1			1	5		12
Chum salmon	3	E, L, EJ,						1	1							2		٩
		LJ, A						Ţ	1			1		1		2		5
Coho salmon	3	E, L, EJ,						1	1			T	1	1	1	2		10
		LJ, A						1	1				Т	1	1	5		10
Pink salmon	3	E, L, EJ,						1	1				1	1	1	2		10
		Ц, А						T	1				Т	T	T	5		10
Sockeye salmon	3	E, L, EJ,						1	1				1	1	1	2		10
		LJ, A						T	1				T	T	T	3		10
Weathervane scallop - Alaska	1	LJ, A	185	l	l			1	0							0		5
Forage Fishes	1	А	186		1				1	216			1			1	243	9
Gulf of Alaska Grenadiers	1	А	187			1	1	1	2	217					1	0	244	8
Bering Sea / Aleutian Islands Grenadiers	1	A	187			1	1	1	2	217						0	244	8
							1	<u>i</u>	•									u

- 156. Rely on specific habitat (rough bottom with shell hash) as nursery areas
- 157. There is a paucity of information on golden king crab life history characteristics due in part to the deep depth distribution (~200–1000 m) and the asynchronous nature of life history events. Information is lacking that vital rates and productivity are dependent on habitat. Additional Supporting Resources: Pengilly D., 2016. Aleutian Islands golden king crab 2016 Tier 5 assessment. *In* Stock assessment and fishery evaluation report to the North Pacific Fishery Management for the king and Tanner crab fisheries of the Bering Sea and Aleutian Islands Regions. North Pacific Fishery Management Council, 605 W. 4th Avenue, Anchorage AK 99510.
- 158. Since the regime shift in 1976-77, the productivity has been much lower than before. The low productivity could be due to changes in larvae food availability and composition and unfavorable larval settlement locations, or habitat destruction by bottom trawl fisheries in Bristol Bay.
- 159. Environmental effects on egg production, larval survival, and adult habitat use
- 160. Considered habitat generalists
- 161. Habitat generalist little concern that habitat would be a limiting factor
- 162. Strong habitat associations established for egg and adults
- 163. The 2016 EFH update relates population density to habitat characteristics
- 164. Catchability is related to temperature, but we don't know effect on vital rates
- 165. Nursery habitats could be affected by physical disturbance/water quality
- 166. Skate nursery sites are small, rare, and highly localized
- 167. Likely affected by oceanographic features, but difficult to assess habitat associations
- 168. Recruitment seems to be dependent on the extent of the cold pool
- 169. Probably not restricted to a single habitat type
- 170. Measurable differences in population density across habitat types
- 171. Oceanography affects prey availability, condition, and over-wintering survival
- 172. Limited amount of deep slope habitat

- 173. Larvae are the most sensitive to habitat of all ATF life stages
- 174. Big skates likely have some sort of specific nursery areas
- 175. Little data exist on this for flathead sole
- 176. A portion of the population exists on untrawlable rocky habitat
- 177. Possible that temperature or some other effect would influence vital rates
- 178. Yelloweye and the DSR complex are highly dependent on rocky habitat
- 179. Rockfish species are generally strongly associated with specific habitat types
- 180. Skates likely depend on specific nursery sites
- 181. It's likely that longnose skates depend on specific nursery habitats
- 182. Additional data is needed on habitat dependence for this species
- 183. Not a lot of information on habitat dependence for rex sole
- 184. Differential growth rates of pollock larvae and juveniles in different habitats in GOA
- 185. Associated habitats are neither rare nor limiting for species
- 186. Some species have very particular needs regarding spawning habitat
- 187. Distribution is homogenous on slope; little information about specific habitats
- 188. Stock supported a commercial fishery in the 1970s/early 1980s, now overfished
- 189. (5) Historically high abundance was mostly south of the island. Now crabs occur north of the island as well. The current abundance is much lower than 20 years ago
- 190. (3) The golden king crab adult stocks have been providing consistent catches for the last 30 plus years. The western stock however, shows a decline in recent years. The adult sizes are not reported to be a major prey items to the co-occurring species. The bycatch in the groundfish fisheries is also low
- 191. (5) Historically, the stock mostly concentrated in the southern and middle Bristol Bay. Now it is mostly in the middle and northern Bristol Bay

- 192. (5) Norton Sound red king crabs are generally scavengers on sandy bottom. Other than improving nutrient cycling, their roles on other species are unknown
- 193. High biomass, although much higher in 1970s reduced ecosystem role
- 194. High biomass and light exploitation
- 195. Very abundant and consume other key species, including pollock and cod
- 196. High biomass; important prey to halibut, Pacific cod, and arrowtooth flounder
- 197. Known predators on a variety of species; present in diets of benthic predators
- 198. High biomass
- 199. Significant apex predators with broad impact; historically much more abundant
- 200. Top predators abundant and ubiquitous, omnivorous, and have few predators
- 201. Squids of all age/sizes are important prey for everything from fish to whales
- 202. Low abundance
- 203. Important predators at late juvenile and adult stages
- 204. Top-quartile predator; high biomass
- 205. High abundance; historically abundant
- 206. Dominant biomass; overall consumption is high; top fish prey item in system
- 207. Stock used to be much more abundant, and is important predator
- 208. Abundant and important predator of pollock, cod, other groundfish
- 209. Adult big skates are top predators and omnivorous
- 210. Based on DSR catch history, these rockfish were in a much higher abundance than they are now.
- 211. Adult skates are top predators and omnivorous
- 212. Historical biomass was potentially much larger than current levels
- 213. Important predators; important role as prey; large biomass
- 214. Historical biomass of this species is estimated to be significantly larger than current levels
- 215. Info from stock assessment
- 216. Extremely important prey items for everything from fish to whales
- 217. Most abundant species on the slope, but ecosystem role is not well understood
- 218. A revitalized fishery could have localized but important economic benefits
- 219. (1) Aleutian Islands golden king crab is a commercially important species managed under FMP. It has been providing consistent catches under Tier 5 management strategy of FMP
- 220. (1) The stock supports one of most important crab fisheries in Alaska. (2) Few crabs have been taken by recreational fishing. (4) Few crabs have been taken by recreational fishing.
- 221. (5) Norton Sound Red King crab fishery is super exclusive (highly localized) in both commercial and subsistence, involving many local community members. Their commercial value is small compared to other stocks, but is big for region that is economically depressed.
- 222. Highly valuable fishery
- 223. Increasingly important commercial species
- 224. Not commercially valuable
- 225. Highly regulated fishery spatial management for Steller sea lion measures
- 226. Rockfish stocks in general considered to have cultural significance
- 227. Halibut fisheries limit potential targeting of this species
- 228. High ex-vessel value
- 229. Deep water species, minor fishery
- 230. Significant take of "protected species" (halibut, crab) in commercial fishery
- 231. Top 25% commercial landings; fishery allocation issues; high cultural importance
- 232. High ex-vessel value; cultural significance
- 233. Largest AK fishery; CDQs important to economy of coastal communities

- 234. \$85 million ex-vessel; IFQ fishery supports many small communities and fishers
- 235. Bycatch species, also targeted in a "topping off" behavior by other fisheries
- 236. Major economic fishery in the region each individual species is important
- 237. Bycatch stock and functions as a "choke stock" that can close other fisheries
- 238. Yelloweye and DSR species are an important part of the commercial, recreational, and subsistence fishing communities.
- 239. Bycatch limits for shortspine could close other fisheries if met
- 240. Fishery important to the industry in the GOA
- 241. Economically and socially important; communities are highly dependent on stock
- 242. Premiere rockfish species targeted in GOA with an ex-vessel value > \$8 million (2014)
- 243. Bycatch can hinder commercial fishing activity
- 244. Low fishing pressure and value; managed as an Ecosystem Component

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