| Top | ID | Title | Description | Theme | Focus | Research Status | Groundfish Plan Team Priority | Crab Plan Team Priority | Scallop Plan Team Priority | SSC Priority |
|---|---|---|---|---|---|---|---|---|---|---|
| Crab | 147 | **Life history research on data poor or non-recovering crab stocks** | Why certain stocks have declined and failed to recover as anticipated is a pressing issue (e.g., Pribilof Island blue king crab, Adak red king crab). Research into all life history components, including predation by groundfish on juvenile crab in nearshore areas, is needed to identify population bottlenecks, an aspect that is critically needed to develop and implement rebuilding plans. | Stock assessment inputs | Age and growth, Maturity, Natural mortality, Reproduction | Partially underway | | Urgent | | Important |
| Crab | 148 | **Spatial distribution, habitat requirements, and movement of crabs relative to life history events and fishing** | There is a need to characterize the spatial distribution and movement of crab stocks. For example, information is needed to understand the distribution of male/female snow crab at time of mating, a better understanding of spatial stock dynamics and population connectivity for Tanner Crab east and west of 166, and to understand the distribution and movement of golden king crab in the Aleutian Islands in areas historically fished and not fished. There is a need to characterize the spatial distribution of male snow crab at time of mating relative to reproductive output of females in the middle domain of the EBS shelf. Additionally there is a need to investigate spatial stock dynamics and population connectivity for Tanner Crab (2 stocks). | Stock assessment inputs | Stock identification/distribution/genetics | Partially underway | | Urgent | | Urgent |
| GF | 163 | **Conduct routine fish, crab, and oceanographic surveys in the Arctic Ocean** | Dynamic ecosystem and environmental changes in the Arctic Ocean are occurring. Assessment of the current baseline conditions and trophic interactions is important. This effort should not supplant the regular surveys in the BSAI and GOA, which are of critical importance to science and management. | Ecosystem surveys | Initiation of survey | Partially underway | Urgent | Important | | Important |
| GF | 171 | **Acquire basic life history information (e.g., natural mortality, growth, size at maturity) for data-poor stocks** | Basic life history information is needed for data-poor stocks including all blue king crab stocks, three red king crab stocks, Pribilof Islands golden king crab, scallops, sharks, skates, sculpins, octopus, grenadiers, and squid. Specifically, information is needed on natural mortality, growth rates, size at maturity, predation, and other basic indicators of stock production/productivity, which is especially critical for stocks in rebuilding. | Stock assessment inputs | Age and growth, Maturity, Natural mortality, Reproduction | Partially underway | Important | Urgent | Important | Urgent |
| GF | 174 | **Develop spatially explicit stock assessment models** | Develop spatially explicit stock assessment models. High priority species for spatially explicit models include: walleye pollock, snow and Tanner crab, Pacific cod, sablefish, yellowfin sole, rock sole, arrowtooth flounder, Pacific ocean perch, black spotted rockfish, rougheye rockfish, and Atka mackerel. | Stock assessment methods | Spatial models | Partially underway | Important | Important | | Urgent |
| GF | 176 | **Refine methods to incorporate uncertainty into harvest strategies** | Refine P* and decision theoretic methods to incorporate uncertainty into harvest strategies for groundfish for ACL estimation. Continue existing management strategy evaluations at the stock level. | Stock assessment methods | MSE | Underway | Important | Urgent | | Urgent |

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|---|---|---|---|---|---|---|---|---|---|---|
| GF | 177 | **Conduct prospective and retrospective analyses of changes in the spatial and temporal distribution of fishing effort in response to management and environmental changes** | Conduct prospective and retrospective analyses of changes in the spatial and temporal distribution of fishing effort, in response to management actions (e.g., time/area closures, marine reserves, PSC and other bycatch restrictions, co-ops, IFQs, multi-target crab fisheries) and environmental changes. | Fishery management | Impacts of measures | Partially underway | Important | Important | | Strategic |
| GF | 189 | **Develop stock-specific ecosystem indicators and incorporate into stock assessments** | Develop stock-specific ecosystem indicators and incorporate into stock assessments. (in progress) | Ecosystem processes | Ecosystem indicators | Partially underway | Urgent | Urgent | | Urgent |
| GF | 191 | **Assess whether changes in pH and temperature would affect managed species, upper level predators, and lower trophic levels.** | Assess whether changes in pH and temperature would affect managed species, upper level predators, and lower trophic levels. Laboratory studies are needed to assess the synergistic effects of ocean acidification and changes in temperature on productivity of marine species. | Ecosystem processes | Climate change | Partially underway | Important | Important | | Strategic |
| Crab | 225 | **Develop projection models to evaluate management strategies under varying climate, ecological, and economic conditions and evaluate impacts to managed resources and coastal communities.** | There is a need to develop projection models that evaluate the robustness and resilience of different management strategies under varying climate, ecological, and economic conditions. Projection models should forecast seasonal and climate related shifts in the spatial distribution and abundance of commercial fish and shellfish, and impacts to communities. | Stock assessment methods | MSE | Partially underway | Important | Urgent | | Strategic |
| GF | 366 | **Continue to investigate time variation and the shape of fishery and survey selectivity models** | There is considerable controversy about (1) whether selectivity should be dome-shaped or asymptotic, and (2) whether selectivity should be time-varying by default. Using a dome-shaped curve can create a large increase in biomass which may not be real. Treating selectivity as time-varying increases the number of model parameters greatly, which may lead to confounding among parameters. Better scientific guidance through research studies is needed to address these two problems. | Stock assessment methods | Model parameterization | Partially underway | Important | Urgent | | Urgent |
| Crab | 592 | **Maturity estimates for Bering Sea and Aleutian Island crab stocks** | Application of Tier 3 control rules for crab requires reliable estimates of maturity to determine mature biomass. Maturity estimates of BSAI crab stocks are, in many cases, based on old studies using outdated methods. New studies to estimate both male and female maturity curves are needed for several stocks, with Aleutian Islands golden king crab considered a priority. | Stock assessment inputs | Age and growth, Maturity, Natural mortality, Reproduction | No action | | Urgent | | Urgent |

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| GF | 613 | **Maintain and update coupled biophysical projections for the North Pacific** | Coupled model projection systems are needed to support the NPFMC's strategic initiatives related to the Bering Sea Regional Action Plan, the Bering Sea Fisheries Ecosystem Plan and the Alaska Climate Integrated Modeling activity. Research is needed on methods to dynamically downscale physics and bio-geo-chemical information derived from global models and earth systems models to regional ocean models (ROMs) as well as methods for coupling nutrient-phytoplankton-zooplankton (NPZ) into ROMS. Likewise continued research on methods for coupling biological models (including the response of fishers) to projected environmental change will be an ongoing strategic activity. Projected environmental conditions from the ROMS/NPZ model is the foundation for management strategy evaluations needed to provide climate informed harvest strategies for the future. Support for continued update and refinement of the ROM/NPZ coupled models will be an ongoing strategic research need for the NPFMC. | Ecosystem processes | Climate change | Partially underway | Strategic | Important | | Strategic |
| GF | 651 | **Thermally marked otolith project to support PSC salmon stock composition in the Gulf of Alaska** | Thermally marked otolith project to support PSC salmon stock composition in the Gulf of Alaska | Bycatch species | Stock identification/distribution/genetics | Partially underway | Pending | | | Pending |
| GF | 711 | **Identify best practices for catch estimation for large bycatch species** | Evaluate whether alternative methods of weight estimation for large species of bycatch such as sharks can be made rather than direct measurements, including the alternative of managing by numbers. | Observer program | Development/improvement of survey methods | Partially underway | Urgent | | | Pending |
| Scallop | 533 | **Explore optimal sampling strategies and geospatial approaches for time series of survey data** | The Stock Assessment Improvement Plan seeks to ensure that NMFS conducts its surveys in the most effective and effecient manner possible. Statistical analysis of the optimal number of survey stations needed to accurately assess the status and trends of groundfish and crab stocks is required to achieve this goal. An extension of this activitiy would be to explore alternative abundance estimation methods. For example exploring Thorson's geostatistical model as an alternative to the designed-based estimates for abundance indices used in stock assessments is a potentially useful analysis. Extensions would include an assessment of whether there are certain life history characteristics or levels of aggregation when geospatial models are used. | Fishery Resource surveys | Development/improvement of survey methods | Underway | Important | Urgent | | Urgent |
| Scallop | 571 | **Age validation for scallop shells** | The combination of O18 (oxygen isotope) analysis and a benthic temperature model can be used to validate that the bands in cross sections of scallop shells are annuli and can be used to determine scallop age. This method is less time consuming that other methods that require recapture of scallops. | Stock assessment inputs | Age and growth, Maturity, Natural mortality, Reproduction | Partially underway | | | Important | Important |

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