WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

WPRFMC Five-year Research Priorities under the MSRA 2025-2029

June 2024 (Revised August 2025)

The reauthorized Magnuson-Stevens Fishery Conservation and Management Act (MSRA), created new responsibilities and authorities for domestic regional fishery management councils and their advisory bodies. Following is the relevant MSRA text regarding the development and implementation of five-year regional research priorities by Councils.

MSRA Text on Five-Year Research Priorities

Section 302 (h) Each Council shall develop, in conjunction with the scientific and statistical committee, multi-year research priorities for fisheries, fishery interactions, habitats, and other areas of research that are necessary for management purposes that shall –

(A) establish priorities for 5-year periods;
(B) be updated as necessary; and
(C) be submitted to the Secretary and the regional science centers of the National Marine Fisheries Service for their consideration in developing research priorities and budgets for the region of the Council.

Council's Program Priorities

The 2025-2028 Council Program Plan is centered on the following themes: 1) Adaptability to Environmental Change, 2) Strengthening U.S. Pacific Fishery Competitiveness Domestically and Internationally, 3) Emerging Technologies in U.S. Pacific Fisheries (including electronic monitoring), 4) Improving Conditions for U.S. Pacific Island Fishing Communities, and 5) Capacity-Building and Fishery Development. The Council Program Plan, for each of its five fishery ecosystem plans (FEPs) will need research conducted over the Program Plan Period to achieve management objectives outlined under each FEP and theme. These specific management objectives range from improving what we know about Council-managed fisheries to reducing protected species interactions in Council-managed fisheries. MSRA Research Priorities for the next five years should address Program Plan themes and associated management objectives.

Process

The Council's five year research priority document serves as a comprehensive list of overarching research priorities to address management considerations. In February 2024, the Council hosted a workshop with PIFSC staff to determine status of prior 2020-2024 MSRA Research Priorities and select new potential candidate priorities. Those are incorporated into the document for first review by Council advisory bodies at their March 2024 meetings and the Archipelagic and

Pelagic Plan Teams in May 2024. A final report went to Council advisory groups and the Council for adoption at its June 2024 (199th Council Meeting) meeting cycle. MSRA Research Priorities originating from this document were submitted to NMFS for review following the Council's June 2024 199th Council Meeting. On an annual basis, staffs from PIFSC and PIRO are to meet with Council staff to rank priorities for the following year. The progress of MSRA research priorities will be monitored through the PIFSC Director's report to the SSC and the Council. A matrix with status for each research priority included will serve as the tool to monitor which priorities are being addressed and their progress.

Pelagic Fisheries (PF) Research Priorities

The Pelagic Fisheries Program is governed by the Pelagic Fisheries Ecosystem Plan and activities associated with international fisheries management objectives. Research priorities revolve around domestic longline and the small trolling vessel pelagic fisheries.. These priorities also feed into the information needed for international stock assessments of tuna, bill fish and tuna-like species.

PF1 Improving the understanding of fishery performance for Western Pacific fisheries.

This includes territorial pelagic fisheries, non-longline fisheries, longline fisheries, and incidental species.

Information Gap 1: Small scale pelagic fisheries in Hawaii and the US Territories target tunas and catch other pelagic management unit species (MUS) like mahimahi, wahoo, and monchong. Some of these species in the territories may have nascent population dynamics with very little exploitation. There is a lack of clear understanding on what is driving fishery performance in these fisheries. Other species may have ample ideal habitat in Territorial waters. Projects are needed to determine the feasibility of directed fisheries for these species. Additionally, biological and life history characteristics from seemingly unexploited pelagic species in Territorial waters should be compared with those of their conspecific populations in the Hawaiian Islands.

Associated Research Priorities

PF1.1 Improve the estimation of non-commercial catches in state and territorial non-longline fisheries

PF1.2 Conduct feasibility studies on the development of targeted fisheries for PMUS species in state and territorial fisheries

PF1.3 Conduct biosampling of PMUS species in the territories aside from BMUS, in cooperation with regional science providers and international sampling initiatives

Information Gap 2: Over half of the landings of the Hawaii longline fishery are comprised of bigeye tuna, followed by swordfish, opah, and yellowfin. However, monchong, mahimahi, and spearfish also comprise approximately 20% of landings. Through international cooperation, stock assessments are conducted for the major tuna, billfish (e.g., swordfish, blue marlin, striped marlin), and shark stocks**.** Lack of fishery indicators for incidental species and pelagics in territories. There is a lack of clear understanding on what is driving fishery performance. Stock assessments and stock indicators are lacking for other important species retained and marketed by the Hawaii longline fishery such as opah, monchong, and shortbill spearfish. The stock assessments for the non-target pelagic species need to be included and prioritized in the WPSAR Schedule. Species such as mahimahi, wahoo, and monchong are commonly caught in small scale pelagic fisheries in the US Territories.

Associated Research Priorities

PF1.4 Analyze fishery performance of non-target pelagic management unit species (PMUS), including effects due to climate change. Priority species are mahimahi, ono, monchong complex, opah complex, and shortbill spearfish.

PF1.5 Develop status, productivity, or risk indicators for PMUS that currently lack stock assessments or have historically lacked complete landings information. Investigate available size-based indicators, if possible;

PF1.6 Work with regional fishery management organization science providers to collect and develop CPUE time series and other necessary information to conduct stock assessments on non-target PMUS currently lacking stock status evaluation in the following priority: mahimahi, ono, opah complex, monchong complex, and shortbill spearfish

PF2 Understanding the effects of spatial closures and large-scale marine protected areas on fisheries, island communities, and population dynamics on target and non-target species

Two of the world's largest marine protected areas (MPAs) are located within the US Exclusive Economic Zone (EEZ) of the Pacific Islands Region and approximately 50% of the US waters in the region are closed to commercial fishing. Large-scale MPAs have displaced fishing effort of Hawaii longline and US purse seine vessels into international waters, which are also fished by tuna fleets of several nations. There is an emerging United Nations (UN) Law of the Sea Convention on Protecting Marine Biodiversity in areas Beyond National Jurisdiction, which may establish MPAs in international waters. Recent Executive Orders also call for evaluation of Marine National Monuments.

Information Gap: There is a lack of information on the effects of large-scale MPAs on US fishing fleets in the US Pacific Islands Region.

Associated Research Priority

PF2.1 Synthesis of existing studies available to examine the impacts of closures with respect to displaced fishing effort on target and non-target species, economic performance, and competition with international fisheries

PF2.2 Evaluate strategies of static and dynamic area-based management tools utilizing large centralized management areas versus a network of smaller management areas and gauge effectiveness through balancing management objectives (i.e., maximize target catch, minimize non-target catch, economic optimization, etc.).

PF2.3 Evaluate near-real time area-based non-regulatory management strategies that are adaptive in nature and can be utilized by vessels at sea to minimize interactions with protected species while optimizing target catch and whether such a strategy could be climate-informed

PF2.4 Examining social,economic,and biological impacts due to existing or proposed fishery closures, including opportunity loss to U.S. fisheries due to closed areas and potential for U.S. fishing communities in the even of opening some closed areas to fishing.

PF3: Improving knowledge on stock structure, distributions, and life history of pelagic management unit species and their responses to environmental factors

Information Gap: Connectivity between tropical tunas (bigeye tuna, yellowfin tuna, and skipjack tuna) found in the equatorial band (10^0 N – 10^0 S) and higher latitudes is not well

known, and understanding bigeye stock structure and movement continues to be priority for stock assessment and management. Demographics of billfish and tuna species caught around Hawaii and United States (US) Territories are not well understood. Additionally, there are many data gaps in the early life history ecology of these target pelagic species pertaining to connectivity, survivorship, and trophic ecology that require immediate scientific attention

Associated Research Priorities

PF3.1 Discerning impacts of climate change on distributions and connectivity of PMUS through synthesizing existing studies and through what other needs

PF3.2 Identifying environmental variables that have a direct effect on PMUS life history

PF3.3 Mixing of target and incidental species between U.S. fisheries and sub-populations and/or larger populations

PF3.4 Estimate proportional impacts of U.S. fisheries on internationally managed tuna stocks, including bigeye tuna and South Pacific albacore, and their impacts relative to competing foreign fisheries

PF3.5 Provision of knowledge stock structure of key fisheries that are under international conservation and management measures (CMMs) and how CMMs are affected by this information. Focus should be on fisheries that target tropical tunas and South Pacific albacore.

PF3.6 Influence of ocean circulation on fishery performance of Hawaii longline fleet on bigeye and other PMUS

PF4 Advancing ecosystem-based fisheries management

Ecosystem-based fisheries management (EBFM) is a holistic way of managing fisheries and marine resources by taking into account the entire ecosystem of the species being managed. The goal of ecosystem-based management is to maintain ecosystems in a healthy, productive, and adaptive condition so they can provide the services humans want and need. EBFM is comprised of accounting for multiple processes affecting the environment.

The Annual SAFE Report now contains the annual summaries of environmental parameters that are readily available in the NOAA website. This will be included in the online version of the Annual SAFE reports – how do we utilize this information more effectively for adaptive fisheries.

Information Gap: As fisheries target certain species, there is a need to understand dynamics between multiple species, their interdependency and means to predict species shifts. With that comes with a need to assess the relative importance of epi-pelagic and meso-pelagic prey organisms on trophic structure, including those species used as bait in Pacific fisheries. We also need to include the role of fishing communities as well as the role of local governments of state, territories, and commonwealth enhancing and protecting their fisheries. Further, determining appropriate metrics of ecosystem health need to be explored.

Associated Research Priorities

PF4.1 Investigate response or sensitivity of population dynamics and distribution to ocean variability and projecting environmental futures

PF4.2 Connecting ichthyoplankton surveys to fishery production, and identifying readily available environmental proxies that may reflect these mechanistic processes

PF4.3 Developing species distribution models to predict the distribution of key tuna and non-target species as a result of changing conditions (similar to EcoCast on West Coast)

PF4.4 Improvement of the PIFSC bigeye tuna recruitment index and possible development of such an index for American Samoa for albacore, North Pacific swordfish, or other PMUS.

PF4.5 Determine the influence of mesoscale oceanographic features on island fisheries

PF4.6 Develop and/or evaluate integrated management across archipelagic and pelagic scales

PF4.7 Continue ongoing diet analyses to track the composition of prey communities, including any changes to these communities over time

PF4.8 Improved regional modeling on Hawaiian Islands - an effort to develop regionally downscaled circulation models (including basic biogeochemical and plankton fields) will offer 3-dimensional estimates of ocean conditions at about 4-6-km spatial resolution (through FY27). There is a need to prioritize oceanographic metrics or indices relevant to fisheries to translate that output into products useful for climate-informed management decisions

PF5 Mitigation of depredation and development of deterrents to reduce incidental interactions in U.S. Pacific Island fisheries

Previous work supported by the Council identified species responsible for shark depredation events in the Marianas and similar studies and tracking projects have been conducted in Hawaii. Marianas fishermen regularly complain of high shark depredation events during troll fishing trips. Data collected from the Guam creel survey program in 2017 indicated that 40% of pelagic fishing trips surveyed reported shark interactions that included either stealing bait or depredation of the catch. However, depredation is not limited to sharks and non-longline fisheries. Longline fisheries also suffer unknown, but significant economic losses from false killer whales, protected shark species, and species such as cookie-cutter sharks that degrade market quality of tuna landed. The need to address depredation has shifted to developing mitigation strategies.

Information Gap: Using limited information on the dynamics of shark interactions with U.S. Pacific Island fisheries (including longline and non-longline fisheries), there is a need to develop mitigation technologies and strategies to reduce interactions.

Associated Research Priorities

PF5.1 Estimates of total fishery-wide occurrence and economic loss in longline fisheries due to shark depredation including events associated with cookie cutter shark mutilation of catch.

PF5.2 Evaluation of measures intended for protected species mitigation in longline fisheries that may affect depredation from other species (i.e., wire leader prohibition, gear characteristics)

PF5.3 Cost and opportunity loss estimation from depredation events in longline fisheries

PF5.4 Gear and operational characteristics or modifications to reduce the impact of shark species involved in depredation events (noting validated species from existing studies)

PF5.5 Cross-Marianas tagging network to monitor shark species responsible for depredation and estimate population and residency

Island Fisheries (IF) Research Priorities

The Island Fisheries Program is governed by the four Fisheries Ecosystem Plans for American Samoa, Marianas, Hawaii and the Pacific Remote Island Areas. Research priorities revolve around the bottomfish, coral reef, crustacean, and precious coral fisheries in these areas. The main focus of the stock theme of the research priorities is improving fishery dependent data collection to support ACL based management as well as monitoring the ecosystem component species. The research priorities for the ecosystem theme are to assess and understand the ecosystems found in federal waters and implementation of Ecosystem Based Fisheries Management.

IF1 Robust insular fisheries data collection for annual catch limit management of management unit species (MUS) and ecosystem component species (ECS) in support of state and territorial management

The Western Pacific region (WPR) currently does not have a robust fishery data collection system that would meet the requirements of managing their insular fisheries under an annual catch limit (ACL) for all management unit species (MUS) in its associated fishery ecosystem plan (FEP). The existing data collection implemented by the State and Territories is mostly funded through WSFR and IFA grants and is partially funded by the National Marine Fisheries Service (NMFS). Two main information gaps are identified below (1.1 and 1.2)

IF1.1 – Information Gap: There is a need to establish and modify current data collection programs geared towards collecting fishery information designed to support ACL management. Information affecting catchability or performance throughout time also need to be identified because they may impact analyses and decisions affecting ACLs.

Associated Research Priorities

IF1.1.1 Promote and begin development of electronic reporting and monitoring for fisheries harvesting management unit species (MUS). In areas with mandatory licensing and reporting, application of an electronic reporting system is feasible and needs to be explored. This can be done at either the fisherman and/or at the dealer level. There is a need to continue development of electronic reporting and monitoring for fisheries harvesting management unit species (MUS) at either the fisherman and/or at the dealer level.

IF1.1.2 Develop novel data collection systems to replace antiquated data collection systems using image recognition technology – the regional data collection system relied on surveys and logbooks account for fisheries landings for decades. Emerging technologies can be applied to fishery data collection in order to increase accuracy, timeliness and efficiency of data collection. Image recognition software is currently being tested for fishery data collection. This offers a potential solution for the inadequacies in the current data collection systems being used for federal fishery management. This would include the following projects:

- Collect fish images from existing data collection programs and through collaboration with fishing coops and auction. Photos taken from the coop and auction will include a length reference (tape measure or checker board with

known dimensions) in the field of view. Create a database of images of different fish species (prioritizing MUS) with known length information.
- Development of an image-recognition software that would utilize the pictures from the image library to identify the species and estimate length.
- Develop the hardware and process for automating the fishery data collection and apply this at the appropriate reporting level (boat, fisherman, or dealer) adapting to the situation at each area of Council jurisdiction.

IF1.1.3 Research on data biases (e.g. shark depredation, noncommercial catch, under reporting, etc.) that impacts stock assessments, status, and other data products

IF1.2 – Information Gap: The Ecosystem Component species (ECS) will be monitored using existing fishery data collection systems that rely largely on creel intercept surveys and market reporting in the territories. These programs, however, need to be significantly improved to increase both spatial and temporal survey coverage. Associated environmental monitoring is also required to determine how the stock and fishery respond to variability in environmental conditions. There is insufficient information on participation, catch, and effort for many fishery species throughout the Pacific Island territories that can be used to produce stock assessments as well as determine and monitor ACLs.

Associated Research Priorities

IF1.2.1 Develop and define objectives for target ECS reference points and/or a threshold level that would transfer an ECS back to MUS when;

IF1.2.2 Improve the existing fishery data collection systems to support monitoring of ECS, the majority of which are coral reef-associated species. If possible, apply the data collection improvements previously described for MUS to ECS;

IF1.2.3 Improve the collection and monitoring of environmental parameters (via satellite-derived imaging or in-situ logs) to generate data products that can in turn be used to monitor the impact of variability in the environmental parameters on fishery performance.

IF2 Improve information, particularly life history information and fishery-independent information, to support and improve stock assessments of island fisheries MUS and ECS

The Territorial bottomfish complexes MUS and other ECS need better life history information and other information to inform stock assessments. This is noting the shift in new stock assessment approaches for some MUS using length-based information and spawning potential ratio (SPR).The use of fishery independent data and surveys is underscored in this priority and can help determine MSY. Research should focus on developing better assessments for MUS, especially those with limited baseline information.

IF2.1 – Information Gap: Life history information from local sources is lacking for several MUS species, which is critical for use in stock assessments where length composition information is a principal data source. The Territorial bottomfish complexes lack thorough fishery independent surveys and baseline information on indices of abundance.

Associated Research Priorities

IF2.1.1 Implement the next generation of stock assessments for island fisheries MUS considering supporting the life history research that can be geared towards developing recruitment and growth indices as response variables to environmental change;

IF2.1.2 Perform resource assessments including growth and recruitment, estimates of unreported catch, etc. to determine life history, population dynamics and connectivity information on MUS.

IF3 Improving the adaptability of the annual catch limit (ACL) specification process to promote climate-ready fisheries

There is a need to improve the existing assessments for Main Hawaii Island (MHI) deep 7 bottomfish, Territory bottomfish complexes, and Hawaii Kona crab by incorporating environmental variables (though this has been done to some extent already for the deep 7 complex). With this there is a need to make the ACL specification process more adaptive. The score-based P* and Social, Economic, Ecological, and Management (SEEM) analyses need significant improvements to become more objective and consistent.

IF3.1 – Information Gap: In order to apply ecosystem-based fisheries management to the remaining stocks in the FEP, policies should be put in place to determine the maximum and minimum harvest allowed depending on stock and oceanic productivity levels, including climate change. The P* and SEEM processes quantify the scientific and management uncertainties for the Acceptable Biological Catch (ABC) and ACL specification process. This specification must be in line with the harvest control rules and harvest control policy. There is a need to adapt these processes to account for environmental change that can help fisheries optimize catch and ensure adaptability.

Associated Research Priorities

IF3.1.1 Explore modifications to the P* process in order to be more adaptive to account for near-term directional shifts in productivity, including the use of proportional harvest threshold tables. This may include developing a comprehensive and standardized P* process and best practices–there are potential issues with the P* process utilizing values from previous years' assessments instead of re-calculating them at the start of a new process each year. This may eventually lead to the continual increase of P* to the point that it would represent a "perfect" value, despite it being impossible to have a truly flawless assessment.

IF3.1.2 Develop a comprehensive and standardized SEEM process – the Council is currently revising the SEEM process to be more wide-ranging and robust.

IF4 Improve Essential Fish Habitat and Habitat Areas of Particular Concern Designations

The MSRA requires the Council to designate essential fish habitat (EFH) and habitat areas of particular concern (HAPC) for all species included in the FEPs. These designations are defined

for the four life stages of each species (i.e., egg, larval, post-larval, and adult), and are required to be reviewed and revised, if needed, every five years. Once designated, all activities undertaken by a federal agency must consult with NMFS to minimize impacts to areas designated as EFH and HAPC. In 2022, EFH model-based distributions for uku based on fishery independent data sources were deemed best scientific information available through the WPSAR process. The Council requests further model-based approaches in predicting distribution of MUS based on multiple habitat-related variables. There exists a notable overlap here with priorities categorized under the Ecosystem theme.

IF4.1 – Information Gap: Basic distribution maps for MUS are mostly absent and EFH is defined through broad descriptions.. There exists limited information for level 2 EFH (i.e., abundance per habitat level) for MHI deep 7 bottomfish, territory bottomfish, and non-deep 7 bottomfish. There is a need to develop predictive models for species occurrence in a given area. Understanding and quantifying non-fishing impacts to habitat is needed to improve the designation and delineation of EFH and HAPC as defined in the Council's FEPs. There is also a need to understand and quantify non-fishing impacts to habitat to improve designation of EFH and HAPC.

Associated Research Priorities

IF4.1.1 Develop distribution and habitat maps for the remaining MUS and develop a predictive model to support EFH descriptions for bottomfish;

IF4.1.2 Develop a predictive model to inform level 2 EFH descriptions for the remaining MUS. The development of a predictive mapping capability that can provide EFH information previously unavailable would be ideal for completing such analyses on the species level due to scarcity of direct species observations in inaccessible areas.

IF4.1.3 Conduct studies for the different habitats known to be EFH, and develop thresholds at the level an EFH is no longer essential to the MUS – categorize different areas and develop EFH maps of areas possessing different threshold levels.

IF5 Implementing ecosystem-based fisheries management to develop adaptive island fisheries

Fishery management decisions have required ecosystem considerations since the 1990s. A majority of the island fisheries are in a data-limited situation, causing the development of single species assessments to inform management to be challenging. In order to implement ecosystem-based fisheries management (EBFM) in the island fisheries, the Council needs a comprehensive understanding of island fisheries ecosystem dynamics in the Western Pacific. Only by understanding the linkages between different ecosystems under federal jurisdiction and the dynamics of the stocks that inhabit those ecosystems will the Council be able to implement EBFM. There is interest in developing a fishery decision-making tool that would take into account the status of a representative stock (from an available stock assessment) and ecosystem information (including social and economic information), not dissimilar approaches utilized by a MSE.

IF5.1 – Information Gap: Ecosystem based fisheries management is such a broad clause. Operationalizing EBFM would be difficult unless there is a complete understanding of the linkages between the federal and state resources and the dynamics of the environment affecting both areas.

Associated Research Priorities

IF5.1.1 Developing the overarching objectives for ecosystem-based fisheries management;

IF5.1.2 Investigate the connectivity of MUS and ECS ecosystems in the region (e.g. deep and shallow) through movements, larval recruitment, etc.;

IF5.1.3 Develop ocean and coastal circulation models to understand island ecosystems;

IF5.1.4 Support the development of fishery management decision making tools that incorporate ecosystem processes and environmental changes (e.g. investigate the utility of e-DNA to analyze species distribution, apply Integrated Environmental Assessments, perform trophic analyses and diet studies to understand species-specific dynamics);

IF6 Assessment of deepwater and pelagic ecosystems MUS and exploration.

The Pacific islands are characterized by having deep-sloping ecosystems. Federal waters typically lack the shallow continental shelf areas, but are instead comprised of mesophotic reefs, pinnacles, offshore banks, and deep precious coral beds. These resources are poorly mapped, and assessments on the status of the resource are limited.

IF6.1 – Information Gap: The region lacks a comprehensive map that describes the distribution of the different MUS present. The Council also lacks baseline information on the state and extent of these habitats utilized by MUS throughout their life history.

Associated Research Priorities

IF6.1.1 Develop maps of mesophotic and deepwater bank habitats to generate a comprehensive list of federal banks and mesophotic reefs.

IF6.1.2 Conduct a comprehensive resource survey on the deep reef habitat, utilize technology-based optics including autonomous underwater vehicles (AUVs), and conduct mesophotic diving for shallower habitats;

IF6.1.3 Generate high-resolution bathymetry of deep-water fisheries coupled with fishery-independent projects.

Protected Species Research Priorities

The Protected Species section deals with scientific research needed to reduce bycatch impacts on protected species and to ensure FEP compliance with statutory requirements such as the Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA). Incorporating climate and ecosystem indicators into fishery management, evaluating effectiveness of and developing protected species interaction and bycatch mitigation measures, and addressing the needs of small-boat fisheries and communities are major priorities being addressed in this section.

PS1 Incorporate Climate and Ecosystem Indicators into Fishery Management to Inform Development of Dynamic/Adaptive Management Opportunities

The Council will be advancing the development of climate resilient fisheries through the IRA funding projects. The associated protected species management priorities for developing climate resilient fisheries are to 1) advance understanding of ecosystem drivers that impact protected species and bycatch rates, and 2) incorporate climate effects and population trends in predicting and managing protected species interactions in US Pacific pelagic fisheries.

PS1.1 – Management Priority: Advance understanding of ecosystem drivers that impact protected species and bycatch rates

Associated Information Needs/Gaps: Advancing the understanding of ecosystem drivers that impact protected species interaction and bycatch rates is an integral step to understanding climate effects on predicting and managing protected species interactions in fisheries. Progress has been made in recent years to improve understanding of environmental factors driving interaction patterns with the development of PIFSC's Protected Species Ensemble Random Forest (PSERF) model and other species distribution models. Further development of these models to refine the understanding of factors that impact interaction rates will improve the accuracy of future predictions.

Associated Research Priorities:

PS1.1.1 Improve understanding of relationships between species distribution and interaction distribution (including fishery distribution), interchangeability of those for management purposes, and consequences of each distributions on predictions under climate scenarios

PS1.2 – Management Priority: Incorporate climate effects and population trends in predicting and managing protected species interactions in US Pacific pelagic fisheries

Associated Information Needs/Gaps: Incorporating climate effects and population trends in predicting protected species interactions will help improve the information base necessary to manage fisheries into the future.

Associated Research Priorities:

PS1.2.1 Adapt false killer whale species distribution models to incorporate climate effects, which may include revising covariates with a climate focus (currently based on remotely sensed data), using alternative remotely sensed data suitable for assessing climate effects, and incorporating ecosystem models or other in-situ data

PS1.2.2 Improve approaches for incorporating sea turtle abundance trends into population viability analyses

PS2 Monitor and evaluate effectiveness of protected species interaction and bycatch mitigation measures

Monitoring protected species interactions, evaluating impacts of fisheries interactions on protected species populations, and monitoring and evaluating the effectiveness of protected species interaction and bycatch mitigation measures are integral to managing fisheries under the MSA National Standards and the Council's FEPs, and to ensure these fisheries are managed consistent with other applicable laws such as ESA and MMPA. Data collection and research are needed to address the Council's associated management priorities for 1) advancing protected species population and risk assessments to support evaluation of impacts for FEP-managed fisheries; and 2) developing more robust abundance estimates and risk assessments for managing FKW interactions in the DSLL fishery.

PS2.1 – Management Priority: Advance protected species population and risk assessments to support evaluation of impacts for FEP-managed fisheries

Associated Information Needs/Gaps: The Council needs robust population and risk assessments to inform management of protected species interactions in fisheries managed under the Council's FEP. These assessments are used to develop MSA and associated NEPA analyses, as well as ESA and MMPA analyses and activities (e.g., ESA Section 7 consultations and associated Biological Opinions; MMPA Take Reduction Plans) that affect the FEP-managed fisheries. The primary species that are of high management priority include leatherback and loggerhead turtles, false killer whales (see also PS 2.2 below), oceanic whitetip shark, giant manta ray, and black-footed and Laysan albatrosses that interact with the Hawaii and American Samoa longline fisheries.

Associated Research Priorities:

PS2.1.1 Improve length estimates for leatherback turtles caught in the Hawaii and American Samoa longline fisheries through observer and/or electronic monitoring data and developing approach for measuring leatherback turtles in-water from vessel-side to address information gap of length and sex ratio data needed for improving population assessments (associated activity - identify observer data fields important for population assessments)

PS2.1.2 Continue international collaboration for collecting and compiling leatherback and loggerhead turtle nesting data

PS2.1.3 Establish baseline abundance estimates for sea turtles utilizing innovative approaches such as close-kin mark recapture (CKMR; starting with Hawaii green turtles)

PS2.1.4 Determine feasibility of CKMR for protected species (through an expert meeting to help prioritize and assess funding)

PS2.1.5 Ongoing data collection to improve evaluation of impacts on ESA-listed species (including data limited species such as giant manta ray)

PS2.1.6 Continue refinement of analytical tools for abundance trends and population impacts

PS2.1.7 Complete tagging mechanism development and deploy satellite tags on post-interaction leatherback turtles in the longline fishery to estimate species-specific post-hooking mortality rates

PS2.2 – Management Priority: Develop more robust abundance estimates and risk assessments for managing false killer whale interactions in the Hawaii deep-set longline fishery

Associated Information Needs/Gap: Development of robust abundance estimates and risk assessments for managing false killer whale interactions in the Hawaii deep-set longline fishery continues to be a high priority for the Council. Priority information needs include estimation of species-specific post-release mortality rates, and resolving data limitations surrounding high seas false killer whale abundance and stock structure.

Associated Research Priorities:

PS2.2.1 Improve pelagic false killer whale assessments on the high seas, including delineation of stock range based on robust biological data, robust abundance estimates, bycatch estimates and foreign fisheries impacts

PS2.2.2 More frequent surveys to determine trends, increase genetic sampling - Incorporating passive acoustic data (increase precision in any individual surveys, which could help in deducing trend)

PS2.2.3 Develop alternative strategies for collecting biopsy samples. Biopsy sample collection by federal observers have been limited due to the conflict with the False Killer Whale Take Reduction Plan goal of straightening hook.

PS2.2.4 Incorporate cetacean samples into ongoing eDNA sampling work to develop utility of eDNA for refining false killer whale stock structure

PS2.2.5 Establish international collaboration for collecting false killer whale demographic data

PS2.2.6 Develop tagging or other innovative approach for improve species-specific post-release mortality estimate for false killer whales that interact with the Hawaii longline fishery

PS3 Develop and implement protected species interaction and bycatch mitigation measures

Measures to mitigate protected species interactions and bycatch of other species of concern are critical components of the ecosystem-based management approach implemented by the Council through its Fishery Ecosystem Plans (FEPs). The MSA also requires federal fishery management

plans to be consistent with laws such as ESA and MMPA and directs under NS 9 that conservation and management measures minimize bycatch to the extent practicable. Research and development is needed to address the Council's management priorities for 1) developing and implementing revised seabird mitigation measures for the Hawaii shallow-set longline fishery; 2) reducing impacts on false killer whales;

PS3.1 – Management Priority: Develop and implement revised seabird mitigation measures for the Hawaii shallow-set longline fishery

Associated Information Needs/Gap: The Council is in the process of developing alternative seabird mitigation measures for the Hawaii shallow-set longline fishery, with focus on tori line to replace blue-dyed bait and provide flexibility with night setting. Following the 2024 pilot study, additional research may be necessary to further develop practical and effective seabird mitigation measures for the fishery.

Associated Research Priorities:

PS3.1.1 Conduct additional SSLL seabird mitigation measure trials as necessary to refine development of alternative measures to blue-dyed bait that may also provide flexibility with night setting

PS3.2 – Management Priority: Reduce impacts on false killer whales

Associated Information Needs/Gap: False killer whale depredation on longline catch and bait lead to incidental interactions (hookings or entanglements). Development of a practical, safe and effective mechanism for deterring depredation, as well as approaches for reducing trailing gear continue to be priorities for the Council.

Associated Research Priorities:

PS3.2.1 Develop approaches for reducing trailing gear on false killer whales that interact in the longline fishery, including fighting line device and improved line cutter

PS3.2.2 Develop false killer whale depredation deterrents

PS3.3 – Management Priority: Develop and improve tools to help longline vessels avoid protected species interactions and bycatch, and reduce post-release mortality

Associated Information Needs/Gap: As new potential tools or approaches for reducing interactions and reducing associated impacts develop, research and development will be needed to assess the applicability of those tools or approaches to the region's fisheries, and to conduct trials to evaluate the practicality, safety and effectiveness. New tools for reducing post-release mortality may help streamline protected species handling requirements and best practices.

Associated Research Priorities:

PS3.3.1 Develop and evaluate tools for interaction avoidance and other non-gear mitigation approaches utilizing information on interaction patterns and drivers

PS3.3.2 Develop and evaluate protected species safe handling measures and tools to reduce post-release mortality and (see also PS3.2.1)

PS4 Address the Needs of Small-boat Fisheries and Underserved Communities of the Western Pacific Region

Small-boat fisheries operating under the Council's FEPs are socially and culturally important in their respective island areas. While these fisheries have limited interactions with protected species, monitoring potential changes to interactions and depredation events will help identify any management needs in the future. The Council also continues to support the exploration of green sea turtle cultural use pathways as a priority for the communities of the Western Pacific region.

PS4.1 – Management Priority: Monitor bycatch, protected species interactions and depredation in the Hawaii small-boat fisheries (priority on false killer whales & oceanic whitetip shark)

Associated Research Priorities:

PS4.1.1 Develop and test new gear, methods and tools to mitigate depredation, minimize protected species interactions and reduce post-release mortality (also see PF6)

PS4.1.2 Improve understanding of protected species interactions with aquaculture facilities and operations, and develop tools to reduce impacts as needs arise

PS4.2 – Management Priority: Continue to explore Green sea turtle cultural use pathways

Associated Research Priorities:

PS4.2.1 Green turtle population assessments for Hawaii/territories

PS4.3 – Management Priority: Improve early coordination for ESA actions (e.g., critical habitat, listing, recovery planning)

Associated Research Priorities:

PS4.3.1 Improve data collection on habitat use and habitat requirements for protected species to inform current and potential future critical habitat designations

Human Communities (HC) Research Priorities

The Human Communities section addresses the socio-cultural and economic needs (the human dimensions) inherent in regional fisheries management. The MSA requires that the Council consider the importance of fishery resources to fishing communities, as well as to use social and economic data to support the specification of Optimum Yield. In addition, the MSA finds that the Pacific Insular Areas have unique social and historical characteristics. Finally, the WPRFMC's process to specify annual catch limits requires assessing relevant social and economic factors and their importance to the fishery.

HC1 Socioeconomic characterization of regional fisheries, markets, and fishing communities (Characterization)

HC1.1 - Information Gap: Understanding and incorporating economic and social science on commercial and non-commercial fishing dimensions into fishery management

Associated Research Priorities:

- **1.1.1.** Monitor and track changes of the costs of fishing, fisher effort (who and where) and/or participation
- **1.1.2.** **Characterizing non-commercial vessels, participants, motivations, catch and effort**
- **1.1.3.** **Improving estimations of the relative proportionality of commercial and noncommercial catch and effort**
- **1.1.4.** Understand product flow, price determination, demand structure , consumer preferences, and non-market channels of fish distribution relationships with formal markets (fish flow for both commercial and non-commercial)
- **1.1.5.** Characterize and analyze labor supply focusing on fishing and processing labor, its source, composition, alternative employment opportunities, and related issues;
- **1.1.6.** Characterize and analyze seafood imports and effects on domestic seafood markets, including issues of mislabeling, product quality, seafood safety, and unfair trade practices.
- **1.1.7.** Monitor community engagement, reliance, and dependence on fishery resources
- **1.1.8.** Explore the feasibility of establishing a regional long-term socioeconomic monitoring program beyond monetary fishing costs/earnings (e.g., demographic, social, and cultural characteristics of fishers and beneficiaries of fishing)
- **1.1.9.** Perform comparative analyses of data from different qualitative and quantitative sampling designs such as focus groups, fishing panels, general household surveys, and targeted fishing community surveys to inform fishery characterizations

HC1.2 - Information Gap: Understanding the distribution of fishery management benefits and burdens in the current management systems

Associated Research Priorities:

- **1.2.1.** Examine levels of representation or engagement in research and/or management processes.
- **1.2.2.** Examine fishing practices and values that are bolstered or threatened by research and/or management practices.

HC2 Integrating socioeconomic, ecological, and biophysical research efforts to inform ecosystem-based fisheries management

HC2.1 - Information Gap: Understanding and incorporating EBFM in the Western Pacific region.

Associated Research Priorities:

- **2.1.1.** Support studies to expand understanding of ecosystem service valuation (non-market values; non-economic considerations), human well-being (seafood safety, security), and other intangible benefits
- **2.1.2.** Evaluate integrated social, ecological, biophysical, and bioeconomic research efforts to inform EBFM
- **2.1.3.** Develop and utilize approaches or models that integrate socioeconomic and ecological considerations with trends in fishery performance
- **2.1.4.** Collaborate with local and Indigenous knowledge holders to improve EBFM characterization, including appropriate datasets and trends over time

HC2.2 - Information Gap: Understanding and evaluating how management actions influence or are adopted by fishing communities

Associated Research Priorities:

- **2.2.1.** Research the influences on behavior within regional fishery regulations and best practices with applications to commercial and non-commercial catch reporting and behavior (commercial marine licenses [CMLs], fish sales, closed areas, bag and size limits, etc.) and protected species interactions (turtles, monk seals, cetaceans, ESA-listed species, etc.)
- **2.2.2.** Design and evaluate strategic communication processes (e.g., conservation marketing, etc.) to improve resource conditions
- **2.2.3.** Evaluate effects of management actions, alternatives and governance on fisher behavior, markets, and communities
- **2.2.4.** Evaluate factors that affect participation in existing and new data collection programs
- **2.2.5.** Evaluate community understanding of importance of data reporting (commercial and non-commercial).

HC2.3 - Information Gap: Understanding impacts of environmental change and other large-scale phenomena resulting in an uncertain future for fisheries and fishing communities for adaptive management.

Associated Research Priorities:

- **2.3.1.** Develop robust indicators to examine community resilience, risk perception, and adaptive management
- **2.3.2.** Generate attributes of island communities, including local knowledge and traditional practices, that may help them be resilient when exposed to change
- **2.3.3.** Determine the cultural importance of and community reliance on species vulnerable to effects of environmental change

2.3.4. Understand resilience/adaptations to real-time and potential large-scale disruptions to fishery production, supply chains, markets, and fishing communities.

HC3 Understanding the cultural dimensions and values of island and Indigenous fishing (Cultural values)

HC3.1 - Information Gap: Recognizing the centrality of fisheries to island cultures and the important role of all fishing practices to fishing communities.

Associated Research Priorities:

3.1.1. Examine interactions between culture and contemporary fisheries to understand dimensions of fishing potentially impacted by management

3.1.2. Assess the human dimensions of US Pacific Marine managed areas (such as area closures or marine protected areas) regarding procedural and distributive justice, transferred economic, social and ecological effects and safety

3.1.3. Describe dimensions of fishing and fishing cultures at appropriate scales (e.g., village, island, fishery, community -- including communities of practice, etc.)

3.1.4. Identify community priorities (e.g., places, practices, species) at appropriate scales (e.g., village, island, fishery, community -- including communities of practice, etc.)

3.1.5. Perform focused research on attributes of culture (examples such as: materials, fishing practice, identity, motivation, governance, distribution, etc.) to ensure appropriate consideration in management actions