

## **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).

**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.

#### **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 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 climate 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 to climate change. 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 climate change that can help fisheries optimize catch and ensure resiliency

#### **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 climate-ready and resilient 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.

