



JIMAR Plans for FY 2017

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Ecosystem Forecasting

ADMB Open Source Project

P.I.: John R. Sibert

Plans for the next fiscal year include continued development of the software to meet standards of modern C++ compilers over all major operating systems. This will include enhancing the documentation and improving software testing, particularly for extant models. Development for the multi-cpu support into ADMB has been delayed because it made the code base too complex and harder to maintain. Another approach using C++11 standard threading support is being investigated for the upcoming fiscal year. An updated major release date has not been set. Instead another minor release (ADMB 11.6) will be made available in 2016. Further collaboration and developments with the TMB project as well as other similar projects will be pursued which include more training courses and a coordinated developers workshop.

Ecosystem Monitoring

A Biogeographic Assessment of Reef Fishes, Fisheries, and Benthic Assemblages in Hawaii

PI: Alan Friedlander

In FY 2017 the project will finalize its publication on the biogeography of reef fisheries in Hawaii and conduct outreach for the launch of the report as part of NOAA activities related to the publication.

Bio-Sampling

P.I.: Mark A. Merrifield [JIMAR Project Lead: Brett Taylor]

The focus for next year is on delivering high-quality research output detailing and quantifying the life history strategies of commercially harvested coral reef fishes and deepwater snappers from the Pacific region. Completion of several draft manuscripts is anticipated, focusing primarily on species from American Samoa, CNMI and Guam. Biosampling staff will continue to work with territorial partners to facilitate efficient data collection and processing, and this will entail additional training opportunities held in the territories. JIMAR staff will also be co-organizing a research workshop held at the Western Australia Department of Fisheries where the latest techniques in otolith processing and biochronological analysis will be discussed. This workshop will also focus on deriving collaborative scientific output directly from the Samoan Archipelago Research Cruise from FY 2016.

Ecosystem Modeling

P.I.: Mark A. Merrifield [JIMAR Project Lead: Melanie Abecassis]

Emphasis for the next fiscal year is to use data from the Hawaii Longline Observers Program and longline logbook data, as well as satellite remote sensing data and an ecosystem model, to investigate the potential linkages between temperature, chlorophyll concentration, zooplankton biomass and the catch of species of commercial interest, especially during the last three years which have been defined by a marked warming of the central North Pacific and an El Niño event.

Ecosystems Observations Research Program

P.I.: Mark A. Merrifield [JIMAR Project Lead: Kyle Koyanagi]

Enhanced Environmental Data Management to Support Fisheries Research. Led by Jesse Abdul, the project plans to accomplish the following.

- Develop procedures and data tools to facilitate the documentation and dissemination of scientific data to satisfy NOAA's Public Access to Research Results (PARR) requirements.
- Conduct an assessment on PIFSC research divisions' data streams, data management workflows, infrastructure, and internal capacity to identify common needs and ability to accomplish the development of the necessary data solutions and assist with PARR tasks.
- Facilitate the development and/or dissemination of centralized data tools to satisfy common data needs across the Center and help with overall data management improvement planning and execution.
- Assist in the development and dissemination of data management policies, procedures, and best practices for PIFSC that describe methods for accomplishing common data management and development activities within the data life cycle.
- Facilitate communication and collaboration between PIFSC divisions with common data issues/needs and where needed, provide support on collaborative efforts.
- Continue to assist in the development of data tools, policies, and procedures for the SPTT data set and the migration of historical SPTT data from SWFSC to PIFSC.
- Facilitate the development of methods and tools to increase the accessibility of scientific data within the Science Center.
- Increase internal GIS, database development, data management, and application development skills and capacity within each division in PIFSC.
- Through the activities above, continue to facilitate integration of data sets collected by different PIFSC divisions to increase usability of the data sets and to facilitate ecosystem approaches by researchers and resource managers.

Aquaculture Systems Management. For the coming year, JIMAR staff, led by Aaron Moriwake will continue to provide system management support for the SWS facility which includes coordinating activities, maintaining and repairing equipment, training staff on system operations, and providing support for incoming animals.

Coordinated Main Hawaiian Islands Bottomfish Population Assessments. For FY 2017, the project (led by William Misa) will begin with a full scale bottomfish sampling effort in the Main Hawaiian Islands on the NOAA Ship Oscar Sette with the MOUSS as the primary sampling gear. The results from the deployment should verify whether or not the MOUSS technology is successful for bottomfish surveys. Bottomfish abundance and length data products from the cruise will be provided to the PIFSC Stock Assessment Program (SAP) upon completing video analysis of MOUSS deployments. With a fully operational MOUSS, other technological assets such as the AUV, ROV, low light cameras, action cameras, and acoustic profilers will continue to be developed with the goal of operationalizing these gears for future bottomfish sampling missions. Technical reports for FY 2016 MOUSS-BotCam comparisons and MOUSS optimal frame rate analysis will be completed in FY 2017 while new image analysis methodologies (MeanCount) will also be evaluated. In addition, the project will continue to collaborate and support PIFSC with advanced technology and survey needs.

Pacific Islands Region Fisheries Science Outreach and Education. Led by Amy Vandehey, planning is nearly complete for the 2016 Science Camp, which will be held July 18-22, 2016. Hawaii U.S. Senator Mazie Hirono, who is interested in promoting educational opportunities, will visit on the first day of camp to give a special welcome and see the camp underway. The format, theme and target audience is substantially similar to last year. However, this year the camp will be for five days, including a field trip to the Waikiki Aquarium that will offer several specialist stations and a behind-the-scenes tour. The project will host 40 students from all over the island of Oahu, and feature several science modules.

Main Hawaiian Islands Bottomfish Benthic Habitat Mapping. Led by John Smith, a final technical report will be delivered in July 2016, and a publishable manuscript will be developed in collaboration with NMFS/PIFSC and other partners. Posting the data products to the HMRG and PacIOOS websites should be accomplished by the end of August 2016.

Analysis of Deepwater Surveys in the U.S. Line Islands. The remaining tasks for this project (led by Virginia Moriwake) include completing the ROV annotation, finishing review and error checking of the data, and assembling the final data set along with metadata. The work is expected to be completed in the summer of 2016.

GIS Mapping Tools for the Marianas Trench Marine National Monument Waters. Over the next year, the project team (led by Bryan Dieter) will continue working to expand the functionality of mapping tools and increase amount of datasets being delivered by the web mapping application. In addition, capacity building efforts are being carried out to train individual data owners at PIFSC to manage and develop the data distribution services for their data, which is an important step to ensure the longevity of the project. The project team is also working with a JavaScript programmer from the Papahānaumokuākea Marine National Monument to develop a new interface for the mapping application with customized features and capabilities. A prototype version of the new application will be completed by mid-FY 2017.

Fisheries Monitoring and Support

P.I.: Mark A. Merrifield [JIMAR Project Lead: Walter Machado]

The project will continue to monitor Hawaii's pelagic longline fishery at the same high level to allow quarterly and annual reports to be done within the allotted time. JIMAR staff will complete daily bigeye and striped marlin catch updates to the fast track system to allow for timely and accurate forecasting and fishery closures to comply with annual WCPFC and IATTC requirements. Additionally, as local and international management continues to include tracking of more species of concern, the project is exploring options for inclusion of these species. Staff involved with the at-sea electronic tablet reporting initiative will continue to validate and test the reporting application for certification purposes. Should certification efforts prove successful the staff will also incur permanent additional duties such as distribution of tablets, equipment maintenance, updating of tablet software, and training of captains in their use. These additional responsibilities may necessitate additional staff so that the additional data stream and dockside duties can be properly administered.

The logbook archival scanning project will be turning its attention to the American Samoa Longline logbooks once the Hawaii logbooks are completed. JIMAR continues to foster positive and cooperative relationships among PIFSC, fishing industry, and other interested parties through its daily onsite monitoring activities.

Investigation of Ecological Constraints for Bumphead Parrotfish

P.I.: Mark A. Merrifield [JIMAR Project Lead: Meagan Sundberg]

As previously reported, due to logistical complexity, there are no plans to travel to Wake Island to conduct additional surveys. The project activity is currently suspended, pending a re-evaluation of priorities and potential future directions for investigations in U.S. Monument waters.

Kona Integrated Ecosystem Assessment

P.I.: Mark A. Merrifield [JIMAR Project Lead: Melanie Abecassis]

For the next project year JIMAR researchers will compare the key components and processes identified in the CEMs to a set of pre-defined indicators, and evaluate the indicators against established criteria. CEMs for all key ecosystem states (e.g. water column and pelagic fishes) will be developed to look closely at individual ecosystem states and examine the relationships that exist between social and ecological components.

Ecosystem modeling work will run scenarios based on potential management options currently being weighed by the community of Puako, Hawaii Island. This will help inform and guide the community's recommendations to the State for local coral reef resource management plans.

A cruise will be conducted in September 2016 to study slicks and the mesopelagic boundary layer of the coast of West Hawaii.

Main Hawaiian Islands Deep 7 Bottomfish Fast Track Project

P.I.: Mark A. Merrifield [JIMAR Project Lead: Kimberlee Harding]

A 2011 stock assessment determined the ACL for the 2016-2017 at 314,000 pounds with a 41% risk of overfishing; and for 2017-2018 at 302,000 pounds with a 38% risk of overfishing. JIMAR staff will continue

real-time monitoring to enter fisheries data within two days of receiving fishing reports. They will also continue to run daily error checks and give fishery managers weekly summary updates. Error analysis reports containing discrepancies between fisher and dealer reports are created monthly and the report records were rectified by contacting fishers and dealers for corrections. JIMAR staff generally follows up with dealers within three days to correct any discrepancies or blank data and up to one month with fishers for trip reports submitted online or through mail. The Hawaii State DAR Fishing Report System (FRS) database and its applications are being converted from the obsolete Visual FoxPro (VFP) to MySQL database. This will be an ongoing process for several years. During the project year, JIMAR staff will attend training on database functions and management of MySQL database systems.

Ocean Remote Sensing

P.I.: Mark A. Merrifield [JIMAR Project Lead: Melanie Abecassis]

JIMAR staff will complete the data processing architecture redesign and website redesign based on user feedback. New servers will be procured and set up to increase the data capacity at OWCP to support the growing data streams and provide up to date operating systems and libraries to accommodate newer data formats and data platforms. All existing data, data processing tools and scripts will be transferred and adapted to the new servers. JIMAR staff will work with a contractor to develop a new data viewer to replace the outdated Live Access Server. This will allow less tech-savvy users to visualize different data layers for various regions, generate time-series when clicking on a point in the map, and download data and images. Finally, JIMAR staff will work with partners to develop climate indicators from remote-sensing data to assist with research projects and management efforts.

Pacific Islands Territorial Science Initiative

P.I.: Mark A. Merrifield [JIMAR Project Lead: Toby Matthews]

Project staff Matthews and Jasper will work with staff at the American Samoa Department of Marine and Wildlife Resources (DMWR) and Commonwealth of the Northern Mariana Islands (CNMI) Division of Fish and Wildlife (DFW) to document local creel survey methodologies, similar to the documentation produced for the Guam Division of Aquatic and Wildlife Resources (DAWR). Matthews will organize at least two workshops in American Samoa to focus on species identification and to expand the data collected during the DMWR creel survey program. Matthews will also compose summaries of recent creel data along with statistical recommendations for each territory. Jasper will produce a species identification key for Guam to complement the creel survey documentation. Finally, Matthews and Jasper will continue their regular tasks of analyzing creel data, suggesting survey improvements, conducting creel surveys, and performing quality control on collected data.

Pacific Tuna Fishery Data Management

P.I.: Mark A. Merrifield [JIMAR Project Lead: Jesse Abdul]

During the next project year, JIMAR staff will: 1) update the SPTT data model as necessary to implement additional data streams; 2) work to maintain existing applications to manage SPTT data and develop new applications to address additional data streams; 3) manually enter and import electronic data provided by U.S. purse seine fishery in a timely manner; 4) assess the needs and feasibility of integrating alternative data sources, such as observer data collected at-sea and Vessel Monitoring System (VMS) data into the database; and 5) work with SWFSC to facilitate the migration of the historical SPTT data to the PIFSC SPTT database.

Scientific Advice and Coordination for NOAA Office of Exploration and Research's 2015-2016 "CAPSTONE" Operations in the Pacific

P.I.: Christopher Kelley

At the present time, there remains one ROV cruise and one mapping cruise left to complete for the 2016 EX operations. These last two cruises will be completed by September 12, 2016. The PI will be one of the on-board

scientists for the ROV cruise that will take place between July 27 and August 19. The PI has also been asked to prepare materials and a presentation for the 2016 World Conservation Congress in September in Honolulu and during that month, will also present data and findings from the cruises at the Sixth International Symposium on Deep Sea Corals in Boston. At the writing of this report, the PI is actively working with OER staff on the 2017 EX operations in the South Pacific, Johnston Atoll, and the Musicians seamounts, which will complete the three-year CAPSTONE project. He will likely be asked to be an on-board scientist again for one of the scheduled ROV cruises and will be operating the UH ECC for the others. Finally, the PI will again take custody of all of the samples obtained during the 2016 cruises and will ship them to their repositories as he did during this last report period. Therefore, the PI will be heavily engaged in all aspects of his responsibilities including expedition planning, execution, and post-expedition deliverables.

Ship-Based GPS Sensing of Precipitable Water

P.I.: Steven Businger

For the next year the project will complete the processing of the GPS data using the new processing package and complete the analysis and interpretation of the combined data sets.

Sustaining Healthy Coastal Ecosystems

P.I.: Mark A. Merrifield [JIMAR Project Leads: Annette DesRochers, Adel Heenan, Troy Kanemura James Morioka, Tom Oliver, Bernardo Vargas-Angel, and Supin Wongbusarakum]

Coral Reef Fish Research. For data collection the research team plans to work on the following: 1) continue surveys in Kahekili Herbivore Fisheries Management Area; 2) contribute to the Hawaiian Islands Pacific Reef Assessment and Monitoring Program (Main and Northwest Hawaiian Islands) survey mission; 3) contribute to the Marianas Archipelago Pacific Reef Assessment and Monitoring Program survey mission; and 4) conduct a reef fish survey project, monitoring fish assemblages in the Main Hawaiian Islands.

For data analysis and handling the team will work on the following: 1) provide technical and analytical support to the Hawaii Division of Aquatic Resources, the American Samoa Department of Marine and Wildlife Resources, and other stakeholder groups (e.g. non-governmental organizations and academic partners); 2) collaborate with the Kona Integrated Ecosystem program on coral reef fish assemblage indicator development; 3) provide analytical support to assess vulnerability and adaptive capacity to address climate-change impacts in fishing communities and fisheries resources in Micronesia and the U.S. affiliated Pacific islands; 4) collaborate with human dimensions researchers and managers on integrated monitoring and on bringing human and environmental data together; and 5) continue researching survey methods and designs, different technologies (such as re-breathers) and other mechanisms to further optimize sampling.

The Coral Reef Fish Research team will work on producing the following products: 1) complete a report on improving assessments of Hawaii priority reef fish species and apex predators using remote video-survey imagery; 2) a report/publication for Hawaii Division of Aquatic Resources on the status of targeted resource fishes in Hawaii; 3) the annual reef fish monitoring data report and associated monitoring briefs for 2016 survey missions; 4) a workshop report, outlining the main conclusions from a workshop in American Samoa regarding the integration of national and local monitoring data; 5) a community socio-environmental vulnerability assessment for American Samoa; 6) submit two manuscripts on roving predator distributions, comparisons between video graphic approaches, and mesophotic reef fish populations; and 7) contribute to the Pacific Remote Island Area Monument monitoring report.

Benthic Research. Major milestones for FY 2017 include: 1) continuation of RAMP activities with one major cruise MHI and NWHI, scheduled for the summer of 2016; 2) completion of analysis of stratified random benthic imagery for the Hawaiian Archipelago (HARAMP) 2016; 3) complete technical summary reports for the 2015 benthic baseline surveys conducted on West Maui and American Samoa; 4) continue to investigate and evaluate coral demographic patterns across the U.S. Pacific; 5) continue analysis of reef resilience potential for coral reefs in American Samoa; 6) continue to investigate and evaluate coral bleaching and health condition patterns across the U.S. Pacific, in particular the effects of the 2015 bleaching event in the MHI; and 7) continue optimization of stratified random approach to monitoring of coral communities and continue belt-transect proficiency training for CREP staff and partner divers.

Ocean and Climate Change Research. The OCC Team will continue the NCRMP work across both HARAMP16, and MARAMP17, and will continue to add new data to the monitoring analyses. The Team will continue work on the climate vulnerability analysis for FY 2017 and will extend carbonate sampling to estimate rates of reef-scale calcification/dissolution by developing salinity budgets for the focal NCRMP islands.

Marine Debris Response and Operations. For FY 2017 the project team plans to accomplish the following: 1) develop a 5-year strategic plan that pools resources over consecutive years to allow for more substantive and impactful removal efforts; 2) develop new partnerships and collaborations with other NOAA line offices, federal/state agencies, and NGO's to generate additional funding sources; 3) develop protocols that will improve measuring the impacts of derelict fishing gear on shallow coral reef ecosystems; 4) continue to develop research driven projects to further understand the characteristics, impacts and accumulation of marine debris in the NWHI; 5) continue to opportunistically aid in marine debris related emergency responses; 6) continue to support Japan Tsunami Marine Debris Assessment and Response Framework, Subject Matter Expert Group; 7) continue to opportunistically conduct marine debris survey and removal operations in the MHI; and 8) disseminate information about marine debris issues to management agencies and the public.

International Capacity Building. For FY 2017 the project team will work on the following milestones: 1) conduct a social data analysis and data management training with the core Micronesia SEM team; 2) collaborate with DAR CBFSFA program to provide socioeconomic monitoring training for officials and representatives who work in Ha'ena (Kaua'i Island) and other potential CBSFA sites and start their baseline data collection; 3) develop recommendations for a socioeconomic data management plan in Micronesia to eventually establish a database for the Micronesia region; 4) serve as the socioeconomic monitoring team lead for MC and participate in a MC Measures meeting; 5) guide and provide technical assistance to develop a MC regional socioeconomic monitoring plan; 6) in collaboration with the University of Hawaii's Department of Urban and Regional Planning, the project will lead data analysis and publications for the socioeconomic assessment and integrated monitoring of Manell-Geus, and a study on core socioeconomic indicators across Micronesia Challenge countries; 7) through the new S-K grant for the project, "Assessing and building adaptive capacity to address climate change impacts on fishing communities and fisheries resources in Micronesia," the project will collaborate with the UH SSRI, The Nature Conservancy-Micronesia Program and local partners in Micronesia to assess and analyze the social adaptive capacity of fishing communities at target sites in Guam, Pohnpei, Chuuk, and Yap; 8) collaborate with the PIFSC Socioeconomic Program to identify social indicators for climate vulnerability and social adaptive capacity; 9) as a member of the SNAPP working groups on evidence-based conservation and bio-cultural indicators for resilience in the Pacific islands, contribute to advance group activities and publications; and 10) lead a conservation campus on socioeconomic monitoring and co-session on equity in conservation at the IUCN WCC.

Ecospacial Information Research. For FY 2017 the project team plans to work on the following: 1) expand the pilot project to identify habitat layers which are the best predictors of reef fish distribution to the main Hawaiian Islands, where bathymetry data coverage is complete with regard to fish survey locations; 2) continue the project to support PIRO on the critical habitat designation for the ESA-listed Pacific coral species and developing maps of hard/soft substrates and coral cover for the eight additional inhabited islands in the PIR; 3) produce a final report documenting the process to develop an updated benthic habitat map and geomorphologic data layers for the West Hawaii Habitat Blueprint focus area; 4) provide eight weeks of geospatial support to DAR, with the objective of building DAR's GIS capacity by expanding on the training DAR received in May 2016; 5) complete quality control of the spatial data from the towed-diver surveys from the 2014 and 2015 RAMP missions, and conduct a comparative analysis of human annotations and automated annotations for the Automated Image Analysis project to support management of ESA-listed corals; 6) complete activities and products for work in Timor-Leste, including the spatial data framework and the final report; 7) continue supporting the projects to develop web maps for the Pacific Marine National Monuments and the Pacific Remote Islands Marine National Monument Monitoring Report; 8) develop benthic habitat maps for the Protected Species Toolbox; and 9) develop a 5-year master plan for shallow-water (< 30m depths) mapping around the Pacific Islands.

Data Management. For the upcoming year, the Data Management Team will continue to support data collection on reef assessment and monitoring program cruises (Hawaiian and Mariana archipelagos) and any of the program's shore-based missions as well as prioritize the documentation and archival of data collections in order to achieve Public Access to Research Results (PARR) compliance and satisfy the requirements of the Big Earth Data Initiative project to support data management efforts for the Pacific Remote Islands Marine National Monument Monitoring Report. The team is also planning to sophisticate the program's data entry applications to improve data quality and efficiency, moving from Microsoft Access to Oracle Application Express.

Western Pacific Fisheries Information Network (WPacFIN)

P.I.: Mark A. Merrifield [JIMAR Project Lead: Karen Brousseau]

The project will continue converting VFP database applications to MySQL and C# for WPacFIN Central and all partner agencies, and continue supporting development of the WPacFIN website. Project staff will complete the VFP metadata dictionary for Hawai'i, meet the next PARR milestone for WPacFIN metadata (March 1, 2017), and meet FUS, FSWP, and RFMO reporting deadlines for FY 2016-2017. The project will continue to work with DAR's online fishing reports, which are changing; all online fishing reports will now be trip-based instead of monthly. Project staff will create a C# application to make HIC's data compatible with DAR's MySQL database formats and perform data summaries. These data can then be shared more easily with PIFSC.

Ecosystem-Based Management

Economics of Fisheries Initiative

P.I.: Mark A. Merrifield [JIMAR Project Lead: Hing Ling Chan]

For FY 2017 the project will continue providing support on the ongoing economic data collection programs for the Guam and CNMI small-boat fisheries and the database management (mainly data entry) for the cost data collected from the Hawaii and American Samoa longline fisheries. JIMAR will keep the data summary updated on the website and seek publication in different channels. For the cost-earnings study for Hawaii small-boat fishery, the technical report will be completed for editorial review in the second half of 2016. For the Hawaii longline fleet dynamic model project, the project will complete a dis-aggregated model by target species and ocean region and evaluate specific policies in Hawaii. For the cost-earnings study of the Hawaii bottomfish fishery a summary report will follow in FY 2017. For the cost-earnings study for American Samoa longline fishery field work is planned for 2017. For the vessel-level profit assessment for Hawaii small boat commercial fisheries, data analysis and a technical report are expected to be completed in the coming year.

Human Dimensions of Fishing and Marine Ecosystems in the Western Pacific

P.I.: Mark A. Merrifield [JIMAR Project Lead: Hing Ling Chan]

The plan for FY 2017 is to finish up the CNMI fishing community profile update. An additional trip will be conducted in the second half of 2016 to finish Saipan fieldwork and also to conduct interviews and observations on the southern CNMI islands of Tinian and Rota. Findings from the profile update will be posted on PIFSC's blog and results will be compiled into a NOAA technical report. For right based management alternatives for the Hawaii longline fishery, a second manuscript outlining alternatives management mechanisms is planned. A new project element will update Hawaii community social vulnerability indices (CSV) with 2011-2015 American Community Survey data, fisheries data and other data as identified when they become available. The Hawaii CSV databases will be updated at Census County Division (CCD) geographic scales and a community vulnerability report will be produced using the updated time series at the CCD-scale on changes in community vulnerability over time, where feasible. The project is in the process of recruiting another Social Research Project Manager to work on this new project element.

International Ecosystem Approach to Fisheries Management Project

P.I.: Mark A. Merrifield [JIMAR Project Lead: Supin Wongbusarakum]

Philippines. FY 2017 project milestones by the team for this region include the following.

- Continue to build capacity among Philippines partners, using revised E-EAFM materials tailored to the Philippines and providing technical assistance to develop and implement an EAFM Plan at a priority BFAR demonstration area/site and mainstream EAFM in fisheries management efforts in the country.

- Organize and conduct peer-to-peer exchange visits and meetings with the Philippines Bureau of Fisheries and Aquatic Resources (BFAR) and DENR-BMB to foster understanding about NOAA and JIMAR approaches to science-based management of fisheries and coastal and marine resources.
- Continue to provide technical assistance and guidance to support DENR-BMB biodiversity awareness raising, education and outreach using ARMS. Develop associated educational materials.
- Develop improved multi-model aggregate regional projections of ocean change for ocean surface thermal and primary productivity.
- Develop improved information on the locations and abundance of key Philippines fisheries based on VIIRS and dimethylsulfoniopropionate (DMSP) satellite imagery of night-light fishing, including spatial patterns and seasonal cycles of fishing effort relative to BFAR management actions. A workshop will be conducted to deliver products and discuss monitoring of climate and ocean change on biodiversity and fisheries with the National Fisheries Research and Development Institute of BFAR.
- Two peer-reviewed journal articles will be developed. The first will be on projected changes in ocean features in and around the Philippines, and the second will describe predicting essential fish habitats for small pelagic fishes using nighttime satellite images.
- Develop a prototype visualization website to disseminate results from various analyses of Philippine national stock assessment data, climate projections, and environmental conditions.

Timor Leste. FY 2017 project milestones for this region include finalizing figures and content for the final report for Timor-Leste and submit for editorial review. This will be published as a NOAA Special Publication, professionally print, and delivered to in-country partners at the Ministry of Agriculture and Fisheries.

Indonesia. The project will continue with work planning for activities in FY 2017 and FY 2018.

Regional Development Mission of Asia—RDMA. The project will continue with work planning for activities in FY 2017 and FY 2018.

Pacific Islands Region Observer Program Initiative

P.I.: Mark A. Merrifield [JIMAR Project Lead: Jeffrey Hare]

This project is near completion, and project specific endeavors for the coming year are limited to outreach and educational efforts in collaboration with the JIMAR Pacific Islands Regional Outreach and Education Program in the Pacific Islands Regional Office (PIRO).

Pacific Islands Region Outreach and Education Program

P.I.: Mark A. Merrifield [JIMAR Project Lead: Amy Vandehey]

Next year will be the final one for this JIMAR project. The Outreach and Education Program will continue to serve as a resource for PIRO and PIFSC providing services that help inform stakeholders about NMFS science, service, and stewardship. The program will continue to include an outreach and education coordinator, print layout/web specialist, and multimedia/social media specialist until the start of calendar year 2017. Outreach events and communications materials will continue to be a focus for the program with staff participating in annual events and seeking new opportunities. Program staff will continue support of outreach displays and materials production, website, social media, and multimedia projects. Specific plans include a complete website redesign (2017-2018), PIRO intranet redesign, PIRO and PIFSC joint Facebook account, and new outreach displays, brochures and reports for outreach events that PIR normally attends.

Pacific Islands Region Sustainable Fisheries Initiative

P.I.: Mark A. Merrifield [JIMAR Project Lead: Jeffrey Hare]

The research component of the project has ended, and outreach and educational activities are planned in the coming year.

Stock Assessment Research Program

P.I.: Mark A. Merrifield [JIMAR Project Lead: Marc Nadon]

JIMAR researchers within the PIFSC Stock Assessment Program will be involved in investigations of insular and pelagic fishes in FY 2017. Work related to the former will include publishing a paper testing the application of data-poor methods to estimate life history parameters for stock assessments and a paper on the calibration of high-diversity reef fish datasets. A Western Pacific Stock Assessment Review (WPSAR) will occur in August 2016 on application of the length-based assessment approach to generate overfishing limits for Hawaii reef fishes. Work will continue on the assessment of coral reef fishes in the Guam area following the completion of the Hawaii reef fish review and accompanying technical memo. Fisheries-independent diver surveys for reef fishes are also planned in the Mariana Archipelago next winter. The pelagic fish group will focus on developing prior information for the low-fecundity stock recruitment relationships for pelagic sharks, which will be incorporated in future stock assessments and work on North Pacific blue shark stock assessment. Finally, Eric Fletcher, the Program's computer programming analyst, will work on creating a graphical user interface for the NOAA Fisheries software toolbox. Mr. Fletcher will also prepare data for the next stock assessment of bottomfish in the main Hawaiian Islands.

Western Pacific Fisheries Economic Integration

P.I.: Mark A. Merrifield [JIMAR Project Lead: HingLing Chan]

The plan for FY 2017 is to hire a new JIMAR Fisheries Economic Specialist in fall of 2016 to complete the projects listed in the Western Pacific Fisheries Economic Integration proposal.

Protection and Restoration of Resources

Cetacean Research Program

P.I.: Mark A. Merrifield [JIMAR Project Lead: Marie Hill]

The CRP will return to the Marianas in February-March 2017 to continue the humpback whale project and again in May-June to continue the ongoing small-boat cetacean surveys. During July-December 2017 the CRP will conduct the Hawaiian Islands Cetacean Ecosystem Assessment Surveys (HICEAS) in collaboration with the Southwest Fisheries Science Center (SWFSC). Using two NOAA research vessels the project will conduct line transect surveys of the entire Hawaii EEZ in order to determine the distribution and abundance of cetacean species encountered. Additional plans for the next fiscal year include continued deployment of acoustic recorders on longline gear to assess the potential cues to false killer whales and continued maintenance and data collection of HARPs.

Fishing Impacts on Non-target Species

P.I.: Mark A. Merrifield [JIMAR Project Lead: Melanie Hutchinson]

In the upcoming year, the project plans to continue tag deployments on sharks discarded in the tuna longline fisheries in Hawaii and American Samoa. JIMAR project staff will also continue the tagging efforts on pelagic shark species encountered in Kona waters off Hawaii Island. These studies will provide information on post release survival rates of sharks discarded in commercial fisheries, will help identify habitat use requirements and improve stock assessment parameters.

Hawaiian Monk Seal Northwestern Hawaiian Islands Research Seasonal Support

P.I.: Mark A. Merrifield [JIMAR Project Lead: Lizabeth Kashinsky]

In fiscal year 2017, the JIMAR HMSRP staff will continue to collaborate with NMFS scientists to collect monk seal survey and life history data and conduct enhancement activities primarily in the Northwestern Hawaiian

Islands (NWHI). JIMAR staff will: 1) perform daily field operations and participate in field studies; 2) tag and mark animals for identification; 3) collect specimens for genetic studies; 4) conduct boating operations; 5) collect non-invasive samples for foraging studies; and 6) monitor for health and disease opportunistically through necropsies and non-invasive sampling techniques. Non-invasive specimens will also be collected for ongoing foraging studies. Ongoing survival enhancement activities may include collection of dangerous debris off beaches, disentanglement of seals, translocation of weaned pups within FFS, and reuniting mother-pup pairs. Special enhancement projects may include continuation of shark monitoring and removal, vaccination studies, and translocation of pups between breeding sites. Advanced technologies (remote cameras, rovers, Unmanned Aircraft Systems, etc.) may also be utilized to monitor the population.

Hawaiian Monk Seal Research Program

P.I.: Mark A. Merrifield [JIMAR Project Lead: Lizabeth Kashinsky]

In fiscal year 2017, the JIMAR HMSRP will continue to collect survey and life history data on monk seals and conduct enhancement activities primarily in the MHI. JIMAR staff will collaborate with NMFS scientists to conduct HMS field studies, analyze data and perform daily maintenance, operations, and training for field camps. JIMAR staff will coordinate and respond to stranded monk seals, conduct boating operations, train and lead field personnel, and continue to update and maintain existing databases. Foraging and dietary studies will be carried out in the MHI, and health and disease monitoring will occur opportunistically through necropsies and non-invasive sampling techniques in conjunction with foraging studies. Ongoing survival enhancement activities may include collection of dangerous debris off beaches, disentanglement of seals, translocation of weaned pups within French Frigate Shoals, and reuniting mother-pup pairs. Special enhancement projects may include continuation of shark monitoring and removal, and translocation of pups between breeding sites. The program will continue to advance its behavioral research and will design studies to test techniques to modify monk seal behavior and develop tools and protocols for application in future management activities.

Pacific Islands Deep Sea Coral and Sponge Initiative

P.I.: Mark A. Merrifield [JIMAR Project Lead: Jeffrey Hare]

For the next fiscal year, the JIMAR project team in PIFSC will focus on the bathymetric mapping component of the project. Researchers will work on the following.

Hi'ialakai Support for Multibeam Mapping. Existing bathymetry data will be delivered to the NOAA Ship *Hi'ialakai* to guide new data collection in the PMNM in advance of Leg 3 of the HARAMP mission, and in advance of Leg 2 of the Mariana Archipelago Reef Assessment and Monitoring Program (MARAMP) mission. The project team may also send a team member to support the ship's Survey Tech with multibeam mapping on HARAMP or MARAMP. The Project Team will also continue to support the *Hi'ialakai* in developing and executing a long-term plan for multibeam mapping, that at a minimum ensures the goals of this project continue to be met.

Multibeam Data Processing and Management. A survey and calibration is expected about half way through the next project year. Therefore, processing of the data for American Samoa and the PRIMNM will commence thereafter, with new map products to be produced for all locations within these regions. The data will be documented, delivered to the data manager for the Deep Sea Coral project, and archived at the NOAA data center. A one-page synthesis will also be developed summarizing the project outcomes for the mission. This revised work plan also applies to the data collected during the PMNM and HARAMP cruises in 2016. Simultaneously, the existing data for these regions will undergo a complete data management overhaul.

Multibeam Data Processing Training. The resident multibeam data processing experts will develop a curriculum to train the entire project team to process multibeam data since processing the data for the three missions will be compressed into the second half of FY 2016.

For the next fiscal year the UH project team will continue efforts on identifying animals in previously acquired video as well as conducting the following research.

Survey deep coral sites. Under a separate project (JIMAR Deep Sea Coral Submersible Dives), JIMAR is supporting two dives of submersible vehicles operated by the University of Hawaii to survey deep coral sites

and to recover and re-deploy instrumentation established at these locations. Two days of PISCES submersible operations during the period August-September 2016 from the deck of the University of Hawaii's R/V Ka'imikai O Kanaloa (KOK) will be conducted offshore of the island of Oahu at the Makapuu coral bed, off Barbers Point in Oahu, or off the southeastern coast of the island of Lanai. Data from the deployments will be handled by the JIMAR Pacific Islands Deep Sea Corals and Sponge Initiative project and other PIFSC programs. Expected outcomes are the retrieval of environmental instruments and data loggers placed in the study locations. The data from the retrieved instrumentation will be collated and analyzed to determine if various environmental factors influence either distribution or growth of deep sea corals. The results from the data analysis will be released as either peer-reviewed publications or internal NOAA reports. All data from the instruments will be archived and available for public access through the NOAA deep sea coral and sponge database.

Specimen extraction and processing. For the next year, the UH project team will complete the various extractions in progress as mentioned above by this coming fall. The NOAA Ship *Okeanos Explorer* will return to Honolulu in September 2016, at which time the 2016 ROV video and specimens can be obtained from the ship. Specimen processing and shipping out to repositories will take place in early October. Next, the UH team will update the deep water guide with new images of animals recorded in the NWHI, the Marianas, and around Wake. The team will then begin the annotation process for the 2016 ROV dives.

Protected Resources Environmental Compliance Initiative (PRECI)

P.I.: Mark A. Merrifield [JIMAR Project Lead: Karen Frutchey]

The research component of the project has ended and the only anticipated activity over the next reporting period will be in coordination with the JIMAR Pacific Islands Region Outreach and Education Program in NOAA/PIRO. JIMAR staff work closely with the PIFSC Protected Species Division (PSD) and the PIRO Protected Resources Division (PRD) on outreach aimed to promote awareness and conservation of the Hawaiian monk seal and marine turtles, including leading the development of printed materials that reach thousands of members of the public at educational events throughout Hawaii.

JIMAR staff will continue working with PIRO PRD on a public outreach response to Hawaiian monk seals in Oahu harbors and will meet with various harbor masters on developing messaging and signage appropriate to the harbor user target audience. JIMAR will also continue to create awareness with the Honolulu hotel visitor community regarding responsible wildlife viewing of sea turtles.

Sea Turtle Bycatch and Mitigation Research

P.I.: Mark A. Merrifield [JIMAR Project Lead: Melanie Hutchinson]

The project is in its final phases and the next year will focus on bycatch reduction testing in the field, including multiple taxonomic groups such as elasmobranchs, marine mammals, sea birds, and sea turtle species. In addition, post release mortality studies will be initiated to better understand the consequences of interacting with various fisheries such as longline, gillnet, pound net, and purse seine fisheries. Such studies will utilize various satellite telemetry technologies as well as basic physiological assessments.

Turtle Research Program (TRP)

P.I.: Mark A. Merrifield [JIMAR Project Lead: Devon Francke]

Major emphasis will continue to be placed on studying the pelagic ecology and movements of sea turtles to develop management strategies to reduce fisheries bycatch. Continued research with colleagues in Japan, China, and New Caledonia are slated for FY 2017. Tracking, data management, and mapping expertise will continue to be provided by National Marine Fisheries Service (NMFS) and JIMAR as a joint effort with international colleagues.

Captive care and rehabilitation will also continue as an important part of the stranding and salvaging research program. JIMAR MTBAP Stranding Associates are responsible for the care of captive and rehabilitated animals and are instrumental in the administration and conduction of the stranding and salvage research program.

Necropsy of dead turtles, biological sample collection, and management of biological samples are major

responsibilities of JIMAR MTBAP stranding associates and will continue to be an important part of their routine tasks.

Project staff will conduct longline observer training sessions as requested by PIRO. Training sessions include a 30-minute classroom training session on marine turtle biology and hands-on training in measurements, tagging, and biological sample collection. At least two training sessions are planned for FY 2017.

JIMAR MTBAP employees will participate in field capture of marine turtles on Oahu and on the outer islands as needed. Participation in this research includes hand-capturing turtles, performing health assessments, measuring, tagging, collecting biological samples, and releasing the turtles back into the wild.

Project employees will participate in the planning, preparation, and data analysis/reporting of annual nesting beach field work on East Island, FFS. One to two temporary-hire JIMAR MTBAP employees will also perform the nesting survey during the summer of 2017.

JIMAR MTBAP employees will participate in and assist with the planning of future meetings of the China/USA Working Group of the NOAA Living Marine Resources panel initiative. JIMAR staff will guide Chinese collaborators in field work and necropsy techniques so they can gain practical hands-on experience.

A postdoctoral scholar will organize existing databases from aerial and in-water tow board surveys obtained through ongoing partnerships with PIFSC programs and territorial agencies. JIMAR MTBAP staff will develop quantitative spatial analyses for estimation of turtle population density and will seek cofactors to understand any spatiotemporal patterns. Results of these analyses can then be incorporated into management decision process and actions in compliance with statutory processes under the U.S. Endangered Species Act.

Equatorial Oceanography

Characterization and Dynamics of Mesoscale and Submesoscale Oceanic Variability in the Solomon Sea Simulated by a Nested ROMS Model

P.I.: Mark A. Merrifield [William S. Kessler]

During the next fiscal year the project's primary goals are: 1) to finalize and publish results on the intraseasonal variability in the Solomon Sea and its effect on glider transport estimates; and 2) to coordinate with UCLA partners on the topic of submesoscale dynamics in the low-latitude southwest Pacific Ocean, focusing on the dynamics of surface temperature and salinity, their vertical fluxes and involvement in the different types of submesoscale processes (topographic vs. mixed layer). One lesson learned from glider/model comparisons is that surface salinity variability in the Solomon Sea is important and requires high-frequency freshwater forcing to be more realistically represented in a model simulation.

Optimizing Routine Ocean Current Measurements by the NOAA Fleet

P.I.: Eric Firing

In the coming year the project plans to complete the installation of UHDAS on the remainder of NOAA ships with ADCPs, update project software on some of the older installations, continue software development and maintenance, troubleshooting and other support for all installations as well as conducting training activities. The new installations will be on the *Bigelow*, the *Hassler*, the *Thomas Jefferson*, the *Lasker*, the *Dyson*, and the *Oregon II*.

The University of Hawaii Sea Level Center

P.I.: Mark A. Merrifield

The UHSLC data acquisition and archiving software packages will continue to be a priority focus during FY 2017. The website will continue to be improved, and with the new website in working order, the project will focus on developing content with real-world uses for stakeholders and researchers. Upcoming plans are to develop a number of applications, including: 1) a tool for comparing tide gauge data with satellite altimetry and ocean reanalyses; 2) sea level and wave inundation forecasts for the Pacific region; and 3) interactive data access

tools involving mapping of the tide gauge stations with linked station pages that allow for data and metadata viewing. UHSLC technicians nominally visit stations at 1.5-2 year intervals for normal maintenance. The project plans to visit 14 UHSLC core project stations during FY 2017. UHSLC research in the coming year will consist of a variety of ongoing and new projects. Researchers will continue to investigate the dynamical origin of hemispheric asymmetry in sea level change with a focus on extending the analysis completed in the Equatorial and North Indian Ocean to the South Indian Ocean. Work will also continue on creating seasonal inundation forecasts for Pacific Islands using the relationships between climate variability, sea level, wave generation, and inundation. Finally, work will begin on a new project to understand climatological and instrumental contributions to acceleration in the global mean sea level rise from altimetry.

University of Hawaii Sea Level Center (Ship-Based Tsunami Detection and Characterization)

P.I.: Mark A. Merrifield, James Foster, Todd Ericksen

For the next year the project will continue maintenance of the network and testing of system performance. Upcoming plans are to: 1) determine the optimal filtering strategy to minimize noise and maximize resolution of tsunami parameters and establish approach for robust estimation of the errors associated with each parameter; 2) characterize the performance of the ship-based detection network; and 3) define strategy for scaling to a full operational network that would achieve a designated performance level.

Climate Research and Impacts

Enhancement of Data and Research Activities for Climate Studies at the International Pacific Research Center (IPRC)

P.I.: Kelvin Richards

The APDRC has received continued support from NESDIS, albeit at reduced levels, to maintain the data servers. This will involve half support for two APDRC personnel. The data server systems will be maintained and any new data identified by researchers will be added. Using leveraged funds from external grants, new data products will be added. Finally, leveraged efforts funded by PICSC will allow for new web-based tools to be added to the APDRC site.

Mechanisms of Atmospheric Mercury Transport and Transformation in the Remote Pacific Marine Free Troposphere Measured in Hawai'i

P.I: Mark A. Merrifield [Russell Schnell, Darryl Kuniyuki, Winston Luke]

For the next fiscal year a calibration system for RGM species will be deployed and tested, allowing a quantitative assessment of potential measurement biases at the site. Design improvements to existing equipment will also be evaluated.

Pacific ENSO Applications Center

P.I.: Mark A. Merrifield

The project will continue to develop and improve its sea level, rainfall, and ENSO information products for the USAPI region. As a new initiative, researchers intend to explore longer-term sea level projections using CMIP5 multi-model ensembles used in the IPCC Fifth Assessment Report (AR5). The aim is to statistically downscale the results of CMIP5 ensembles to target the USAPI region. At this stage, the objective is to look for limited aspects of sea level rise and discuss their immediate implications for the vulnerable USAPI region. This projection has immediate implications as there is a demand for the interpretation of IPCC projections in a regional context.

The probability of La Nina in 2016-17 is gradually increasing. As the demand for ENSO information has significantly increased, project researchers are therefore preparing to update La Niña information regularly, including its physical and social impacts in the greater Pacific region.

The project plans to continue research into the variability and predictability of drought events in the USAPIs, with special focus on drought events similar to the 2013 drought in the northern Republic of the Marshall Islands. Once a basis for the prediction of this type of event is established, the goal is to develop new forecasting methodology capable of improving forecasting skill during this type of event. If this goal is achieved, then this new forecasting methodology will be incorporated into the PEAC Center forecasting suite.

Profiling CTD Float Array Implementation and Ocean Climate Research

P.I.: Mark A. Merrifield, [Gregory C. Johnson]

In FY 2017, collaboration with PMEL and other Argo partners will continue, with testing, deployment, and performance monitoring for more floats. Ocean climate studies will continue using Argo data, including analysis of global ocean heat content and sea surface salinity variations, and further work on delayed-mode quality control for the PMEL Argo floats.

Tsunamis and Other Long-Period Ocean Waves

Archive of Rapidly-Sampled Hawaiian Sea Level

P.I.: Douglas S. Luther

Considering the ongoing application of the rapidly-sampled sea level records in PacIOOS efforts to diagnose the causes of harbor sea level variations, as well as coastal inundation events, the collection, processing, archiving and dissemination (through ARSHSL) of rapidly-sampled Hawaiian sea level continues to be important activities. After a slow start, the project is now moving forward toward full re-establishment of the ARSHSL archiving activities. Along with JIMAR funding, PacIOOS resources will be used to finish the development of the codes necessary to resume real-time data acquisition from PTWC's gauges for archiving in ARSHSL. The project anticipates that normal, daily archiving of the Hawaiian sea level data from the PTWC gauges will resume this year. Archiving of the sea level data from the six NOS gauges has already resumed under the new acquisition code. Secondary activities, such as the creation of concatenated hourly datasets, will continue depending on the availability of resources.

The University of Hawaii Sea Level Center—Tsunami Research

P.I.: Mark A. Merrifield

During FY 2017, the project intends to conduct five station visits each in the Caribbean and Pacific, with site selection dependent on station performance. All data from the Pacific and Caribbean tsunami stations are available in real-time via the Global Telecommunications System (GTS). Quality assessment and data processing will be performed by UHSLC staff.

List of Acronyms

ACL	Annual Catch Limit
ADCP	Acoustic Doppler Current Profiler
ADMB	Automatic Differentiation Model Builder
APDRC	Asia-Pacific Data Research Center
ARMS	Autonomous Reef Monitoring Structure
ARSHSL	Archive of Rapidly-Sampled Hawaiian Sea Level
AUV	Autonomous Underwater Vehicle
BFAR	Philippines Bureau of Fisheries and Aquatic Resources
CAPSTONE	Campaign to Address Pacific Monument Science, Technology, and Ocean Needs
CBSFA	Community Based Subsistence Fishing Areas in Hawaii
CCD	Census County Division
CEMs	Conceptual Ecosystem Models
CMIP5	Coupled Model Intercomparison Project Phase 5
CNMI	Commonwealth of the Northern Mariana Islands
CREP	Coral Reef Ecosystem Program
CRP	Cetacean Research Program
CSVI	Community Social Vulnerability Indices
DAR	Division of Aquatic Resources (Hawaii)
DAWR	Division of Aquatic and Wildlife Resources (Guam)
DENR-BMB	Philippines Department of Environment and Natural Resources, Biodiversity Management Bureau
DFW	Division of Fish and Wildlife (CNMI)
DMSP	Dimethylsulfoniopropionate
DMWR	American Samoa Department of Marine and Wildlife Resources
ECC	Exploration Command Center
E-EAFM	Essentials Ecosystems Approach to Fisheries Management
EEZ	Exclusive Economic Zone
ENSO	El Niño Southern Oscillation
ESA	Endangered Species Act
EX	Okeanos Explorer
FFS	French Frigate Shoals
FRS	Fishing Report System
FSWP	Fishery Statistics of the Western Pacific
FUS	Fisheries of the United States
GIS	Geographic Information System
GTS	Global Telecommunications System
HARAMP	Hawaiian Archipelago Reef Assessment and Monitoring Program
HARPs	High-frequency Acoustic Recording Packages
HIC	Hawaii Information Consortium
HICEAS	Hawaiian Islands Cetacean Ecosystem Assessment Surveys

HMRG	Hawaii Mapping Research Group
HMS	Hawaiian Monk Seal
HMSRP	Hawaiian Monk Seal Research Program
IATTC	Inter-American Tropical Tuna Commission
IPCC	Intergovernmental Panel on Climate Change
IPRC	International Pacific Research Center
IUCN WCC	International Union for Conservation of Nature and Natural Resources World Conservation Conference
KOK	Ka'imikiai O Kanaloa
MARAMP	Marianas Archipelago Reef Assessment and Monitoring Program
MC	Micronesian Challenge
MHI	Main Hawaiian Islands
MOUSS	Modular Underwater Stereoscopic System
MTBAP	Marine Turtle Biology and Assessment Program
NCRMP	National Coral Reef Monitoring Program
NESDIS	National Environmental Satellite, Data, and Information Service
NGOs	Non-Governmental Organizations
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NWHI	Northwestern Hawaiian Islands
OER	Office of Ocean Exploration and Research
OWCP	Ocean Watch-Central Pacific
PARR	Public Access to Research Results
PI	Principal Investigator
PICSC	Pacific Islands Climate Science Center
PIFSC	Pacific Islands Fisheries Science Center
PIR	Pacific Islands Region
PIRO	Pacific Islands Regional Office
PMEL	Pacific Marine Environmental Laboratory
PMNM	Papahānaumokuākea Marine National Monument
PRD	Protected Resources Division
PRIMNM	Pacific Remote Islands Marine National Monument
PSD	Protected Species Division
PTWC	Pacific Tsunami Warning Center
RAMP	Reef Assessment and Monitoring Program
RDMA	Regional Development Mission of Asia
RFMO	Regional Fishery Management Organization
RGM	Reactive Gaseous Mercury
ROV	Remotely Operated underwater Vehicle
SAP	Stock Assessment Program
SEM	Socioeconomic Monitoring

SNAPP	Science for Nature and People Program
SPTT	South Pacific Tuna Treaty
SSRI	Social Science Research Institute
SWFSC	Southwest Fisheries Science Center
SWS	SeaWater System
TMB	Template Model Builder
UCLA	University of California Los Angeles
UH	University of Hawaii
UHDAS	University of Hawaii Data Acquisition System
UHSLC	University of Hawaii Sea Level Center
USAPI	United States Affiliated Pacific Islands
VFP	Visual FoxPro
VIIRS	Visible Infrared Imaging Radiometer Suite
VMS	Vessel Monitoring System
WCPFC	Western and Central Pacific Fisheries Commission
WPSAR	Western Pacific Stock Assessment Review

