JIMAR Plans for FY 2019

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JIMAR Plans for FY 2019

Ecosystem Forecasting

Open Source ADMB Project

P.I.: John R. Sibert

For the next fiscal year, the project plans to distribute another release of ADMB in December 2018. The release will include bug fixes, added function documentation, software testing and improvements to ADMB runtime. The software was originally developed to be used on a single CPU and supporting multiple CPUs has proven difficult, so a key focus of the software upgrade will be to utilize multiple system CPUs for faster runtimes. The project will continue investigating ideas to thread the computations in the software. Another key area for development is utilizing the current ISO/IEC C++ 17 standard into the ADMB. The software was developed before the older ISO/IEC C++11 standard. By using the current C++ 17 standard, ADMB can then use the built-in threading support, templates and other built-in functions to improve source code maintainability and runtime. There are tentative plans for a Developers' Workshop in 2018 at the University of Massachusetts Dartmouth, USA. The workshop objectives will be similar to previous workshops where developers will discuss new ideas and work in small groups to resolve software issues.

Ecosystem Monitoring

Data Validation at the Hawaii MAPCO2 Buoy Network in Support of a Test-Bed for Technology Development: Phase II

P.I.: Douglas S. Luther, Eric Heinen De Carlo

Project plans for the next year are to continue efforts carried out to date and train new students in field and laboratory operations associated with operation and maintenance of the MAP-CO_2 buoys. Students will also receive training in field sampling and laboratory analyses of inorganic carbon parameters in seawater. A new graduate student recently joined the group and is responsible for all DIC and TA analyses in the research group. Another technician has been with the project for slightly over one year and is now responsible for field operations.

Ecosystem Structure and Function

P.I.: Douglas S. Luther [JIMAR Project Lead: Melanie Abecassis]

The project will continue support of a UH graduate assistant to expand the lancetfish stomach content analysis effort and describe the spatial and temporal patterns of micronekton in the central North Pacific.

JIMAR staff will complete the climate vulnerability analyses for a selected range of fish and invertebrate species and examine longline logbook and observers data to investigate the extent to which oceanographic changes such as the recent El Niño and anthropogenic climate change have impacted the subtropical ecosystem. JIMAR will also examine how changes to the physical environment impact different trophic levels and the degree to which top-down pressures (e.g., fishing) may act to amplify or dampen changes in productivity at the base of the food web.

Ecosystems Observations and Research Program: Pacific Islands Fisheries and Ecosystems Support Project

P.I.: Douglas S. Luther [JIMAR Project Lead: Kyle Koyanagi]

Analysis and Evaluation of Fishery Independent Data and Collection Methods for Insular Fish Stocks in the Pacific Islands Region. The Analysis and Evaluation Team will continue to support video analysis and annotations for insular bottomfish survey missions and development of the artificial LED light study to enhance

MOUSS surveys for the PIFSC SAP. The team will also continue to test and evaluate the use of off-the-shelf 360° cameras for fisheries surveys and produce a technical report on its findings.

Advanced Survey and Sampling Technology Development. In the next year the Survey and Sampling Technology Development Team (SSTP) will operate two 360° cameras in tandem with the MOUSS stereo camera systems to test and assess the capability and applicability of this technology for fisheries surveys. The SSTP will also continue with development of an artificial LED light system for MOUSS stereo camera systems to expand the depth range beyond 250 meters.

Operations and Logistics Services to Support Pacific Islands Fisheries Science Center Research Missions and Projects. The SOD Field Operations Team will continue to provide high quality effective logistical, operational, and small boat, laboratory, and dive research support services and lead the standard in safety for the PIFSC research activities.

Geospatial Products. The project will recruit a new JIMAR GIS Data and Web Specialist to continue to develop and provide innovative geospatial products for general research efforts.

Marine National Monuments of the Pacific. The project will recruit a new JIMAR GIS Data and Web Specialist to continue to develop and provide innovative geospatial products for general research efforts.

Ecosystems Observations and Research Program: Research Support Project

P.I.: Douglas S. Luther [JIMAR Project Lead: Jeffrey Hare]

Enhanced Environmental Data Management to Support Fisheries and Ecosystem Research. Led by Jesse Abdul, the project will provide support and guidance to PIFSC divisions' data staff on database development, data management, appropriate application development, and lead functional data group meetings on data-related topics. The project plans to identify collaboration opportunities between divisions on data projects, contribute to the planning process and provide guidance for the integration of data holdings across divisions to increase the usability of the data. JIMAR will collaborate with ESD to integrate the water sampling database with the centralized CTD database and gather information about ESD's data holdings and internal capacity for data management activities. The project will also continue to develop standards, best practices, procedures, and data tools to satisfy core organizational data needs and for PIFSC management decision-making.

Coordinated Main Hawaiian Islands Bottomfish Population Assessments. Led by Jeff Hare, the project will opportunistically support JIMAR staff participation in a variety of field programs to assess bottomfish population dynamics in the Hawaiian Islands and in the Pacific Island areas. This includes cruise participation and technology development support for underwater assessments.

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

Pacific Islands Region Fisheries Science Outreach and Education. Led by Amanda Dillon, this project will provide outreach and education activities that reflect PIFSC and JIMAR partnership at community events, career fairs, and school programs on a quarterly basis. The 2018 PYSO program is currently in progress with four new students working with JIMAR and PIFSC federal staff on research projects. JIMAR will also continue to develop and post online outreach products focused on current research and Science Center priorities, such as Feature Stories, Science Blogs, and Story Maps coordinated with social media updates. In addition, the project plans to increase outreach collaborations and exchanges with scientists based at the University of Hawaii.

Main Hawaiian Islands Commercial Fisheries Fast Track Data Project

P.I.: Douglas S. Luther [JIMAR Project Lead: Kimberlee Harding]

The 2018 PIFSC stock assessment determined the ACL for the federal fishing years 2018-2019, 2019-2020, and 2020-2021 at 492,000 pounds with a 40% risk of overfishing. The new federal fishing year for 2018-2019 will begin on September 1, 2018 and JIMAR staff will continue real-time monitoring and entering fisheries data within two days of receiving fishing reports. They will also run daily error checks and provide fishery managers with weekly summary updates. Error analysis reports that highlight discrepancies between fisher and dealer

reports are created monthly and the discrepancies are rectified by contacting fishers and dealers for corrections. JIMAR staff will follow up with dealers within three days to correct any discrepancies and/or blank data, and within one week with fishers for trip reports submitted online or through mail.

JIMAR staff will attend training on database functions and management of the new HDAR MySQL database. Staff will continue to support HDAR staff and Western Pacific Fisheries Information Network (WPacFIN) to develop the new ODRS expected to launch in June 2019.

Ocean Remote Sensing

P.I.: Douglas S. Luther [JIMAR Project Lead: Melanie Abecassis]

In the coming year, legacy code will be rewritten in Python and a code versioning and validation system will be implemented. TurtleWatch will be updated to include information on leatherback turtles. Two satellite courses will be organized and offered to NOAA Pacific Islands agencies and University of Hawaii researchers.

On-site Support for OA Mooring Test-beds: Evaluating and Expanding New Carbon Technologies to Subsurface Habitats

P.I.: Douglas S. Luther, Eric Heinen De Carlo

For the next reporting year the project plans to continue efforts carried out to date, support further PMEL driven field testing of sensor technology and participate in data analysis. However, OAP office funding for this activity will be routed through PacIOOS therefore no further activities on this project are anticipated through JIMAR.

Pacific Fisheries Monitoring Program

P.I.: Douglas S. Luther [JIMAR Project Lead: Walter Machado]

The project will continue to monitor Hawaii's pelagic longline fishery at the same high level that allows completion of quarterly and annual reports within the allotted time. JIMAR staff will complete daily bigeye and striped marlin catch updates for entry into the fast track system. This system allows for timely and accurate forecasting and fishery closures in compliance with annual WCPFC and IATTC requirements. Additionally, as local and international management continue evolving 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 JIMAR will be involved in distributing tablets, equipment maintenance, updating tablet software, and training captains in their use.

By distributing at least 30 tablets to fishing captains the Electronic Reporting team (ER) anticipates that this expansion of the electronic logbooks will cover about 20% of the longline fleet. By inputting ER data directly into the fast-track system, the program will provide real time data thus reducing the necessity of key punching in the fish species with annual catch quotas.

The JIMAR Electronic Monitoring (EM) project will continue to test camera systems on longline vessels and compare species composition data collected between cameras and simultaneous at-sea human observers. To date, only about 10% of the recorded video hauls have been reviewed. With such a large amount of video remaining to be reviewed JIMAR may add staff to view and manage this new data stream and perform dockside duties.

The logbook archival scanning project will continue its work on the American Samoa longline logbooks and scanning the Hawaii logbooks as they are submitted. The JIMAR team will continue to foster positive and cooperative relationships among PIFSC, the fishing industry, and other interested parties through its daily onsite monitoring activities.

Pacific Islands Territorial Science Initiative (PITSI)

P.I.: Douglas S. Luther [JIMAR Project Lead: Toby Matthews]

The Territorial Fisheries Data Specialist will continue responding to data and analytical requests from territorial staff. The Territorial Fisheries Associate on Guam will continue participating in the DAWR creel survey, performing quality control of creel data, and providing on-site database support. Improvements will be suggested for the Guam creel survey based on completed pilot study results. Completed drafts of creel survey manuals for the American Samoa and CNMI creel programs will be produced. Finally, R expansion algorithms and suggested improvements will be made for the boat- and shore-based creel surveys in each of the three territories.

Pacific Tuna Fishery Data Management

P.I.: Douglas S. Luther [JIMAR Project Lead: Jesse Abdul]

During the next project year, JIMAR staff will: 1) continue developing and implementing data QC criteria for data collected under the South Pacific Tuna Treaty (SPTT); 2) improve existing data tools and procedures to streamline and perform automation; 3) complete the migration of all historical SPTT data from SWFSC to PIFSC thus allowing PIFSC to manage all U.S. data collected over the lifetime of the treaty; 4) continue ongoing data management activities to ensure quality, accuracy, and completeness of data; 5) continue to generate standard data reports to fulfill management and treaty requirements; 6) develop new database schemas, data tools, and procedures for managing additional SPTT data streams and facilitate development and implementation of automated data loading processes for ER SPTT data; 7) continue working with a collaborator to improve the usability of the tracking application; and 8) work with PIFSC ITS to provide authorized PIRO users access to specific SPTT applications.

Research Support for Ocean Exploration and Research: The Acoustic Dimensions of Ocean Exploration

P.I.: Darren T. Lerner

Plans for the next fiscal year are to: 1) develop a strategic plan and report on acoustic exploration of the water column for NOAA Office of Ocean Exploration and Research (OER); 2) continue supporting efforts for a national ocean exploration program using the acoustic dimension; and 3) develop best practices for "baseline characterization", which includes an understanding of "soundscapes", or background acoustic signals present in the deep ocean.

Sustaining Healthy Coastal Ecosystems

P.I.: Douglas S. Luther [JIMAR Project Lead: Brittany Huntington]

The overarching goals of the Sustaining Healthy Coastal Ecosystems (SHCE) Project are to: 1) improve understanding of coral reef ecosystems through interdisciplinary assessment, long-term monitoring, and applied research across the Pacific; 2) evaluate and reduce adverse impacts to coral reef ecosystems with particular emphasis on land based sources of pollution, fishing activities, and climate impacts; 3) enhance ecosystem approaches to fisheries management and conservation; and 4) expand, strengthen and establish science-based management strategies for effective coral restoration and intervention in the U.S. Pacific and globally.

To meet these goals, focus for the next year will include: 1) collection, processing, and dissemination of mapping, biological, and oceanographic datasets; 2) leveraging existing ESD monitoring and other available data to provide analyses that support activities of resource management agencies, educational institutions, and key stakeholders; and 3) serve as a resource on best practices, methods development, and analyses regarding coral reef ecosystem research and management decision-making.

During the next project year, the SHCE Project will focus staff time and efforts analyzing NCRMP data and producing a suite of reports, information products, and services to support ecosystem-based management and conservation of coral reefs across the Pacific Islands Region. Many of these information products, services, and

analyses are in response to specific requests received during on-going collaborative discussions with local and jurisdictional partners in Hawaii, American Samoa, Guam, the CNMI, and NOAA and other federal partners. Some deliverables extend into FY 2020 and will require additional funds for completion.

Territorial Biosampling

PI: Douglas S. Luther [JIMAR Project Lead: Brett Taylor]

Plans for next year focus on delivering research output describing life-history strategies of commercially-harvested coral reef fish species and deepwater snappers from the U.S. Pacific Islands region. It's anticipated that a draft manuscript documenting age, growth, and maturation of two goatfish species from Saipan, CNMI will be completed. A PIFSC LHP research cruise to American Samoa is scheduled for 2019 and JIMAR staff will participate in research efforts during that cruise. Territorial Biosampling staff will continue to work with territorial partners to facilitate efficient data collection and processing.

West Hawaii Integrated Ecosystem Assessment

P.I.: Douglas S. Luther [JIMAR Project Lead: Melanie Abecassis]

For the next project year, the JIMAR West Hawaii IEA project will continue to conduct novel and interdisciplinary research that elucidate key socioeconomic factors, oceanographic processes, and ecological interactions that drive nearshore and pelagic marine food-web dynamics.

In particular, JIMAR research efforts will provide baseline information for the State of Hawaii's Marine 30x30 Initiative. A primary goal of the Initiative is to identify a statewide network of priority management areas constituting at least 30% of nearshore waters by 2030. During 2019, the Initiative will begin developing a Marine Management Implementation Plan, where management recommendations will be made using a combination of scientific information and community input. The West Hawaii IEA will be extensively involved with the Initiative by leveraging resources and conducting collaborative research to develop current information to support the plan's development. For example, the 2016 West Hawaii IEA Ecosystem Status Report collated a suite of ecosystem indicators useful for tracking trends and status of the region's social-ecological system but was released before the full impact of the 2015 coral bleaching event was quantified. During 2019, the JIMAR West Hawaii IEA project will work with management collaborators to provide updates to the Ecosystem Status Report.

The West Hawaii IEA will also work with partners such as the Hawaii Monitoring and Research Collaboration (HiMARC) to combine long-term monitoring and survey data (historical data 2000–present) with site- and depth-specific information to assess historical trends in coral and benthic fish communities. In addition, recent ecological information (2016–present) was collected along West Hawaii by the Scripps Institution of Oceanography (SIO) and the Carnegie Airborne Observatory (CAO) using advanced photogrammetry and high-fidelity imaging spectroscopy technologies. These technologies provide an opportunity to quantify spatiotemporal changes in coral reef communities at a level of detail and geographic scope not previously attainable using traditional benthic survey methods. The datasets provide complementary important information: detailed, site-specific information such as coral growth and mortality, recruitment, and three-dimensional structure; and a synoptic coast-wide assessment of benthic community composition, and include locations along West Hawaii where no previous coral reef information existed.

JIMAR will also continue processing, analyzing, and summarizing the extensive amounts of biological samples and physical data collected during previous expeditions. These results will be synthesized into reports, peer-reviewed journal articles and outreach material, and will highlight novel findings and key insights on food-web dynamics necessary to support ecosystem-based management in the region.

Western Pacific Fisheries Information Network (WPacFIN)

P.I.: Douglas S. Luther [JIMAR Project Lead: Toby Matthews]

The project will continue converting VFP database applications to MySQL and C# for WPacFIN Central and all partner agencies. The United Fishing Agency (UFA) dealer import, Hawaii Fisher Reporting System (FRS),

and Council Fisheries Ecosystem Plan Team module applications will be completed in C#. The third phase of the WPacFIN website will also be completed, providing users access to summary tables, figures, and common data reports. Finally, annual and semi-annual reports will be completed, including PIFSC reports to RFMOs and FUS. The FSWP will be converted to a web-based report with downloadable annual and monthly tables for each of the four insular areas.

Ecosystem-Based Management

Socioeconomics of Western Pacific Fisheries

P.I.: Douglas S. Luther [JIMAR Project Lead: HingLing Chan]

Project plans for the coming year are to continue providing support to the ongoing economic data collection programs for the American Samoa, Guam, and CNMI small-boat fisheries and database management (mainly data entry) for the cost data collected from the Hawaii and American Samoa longline fisheries. JIMAR will regularly update the data summary on the website and seek publications in various outlets.

Ten additional new sub-project elements are also planned for FY 2019: 1) provide assistance to the National Community Social Vulnerability Indicators work plan; 2) conduct socioeconomic monitoring for resilient communities in the Pacific; 3) conduct a cost-earnings study of the Hawaii longline fleet; 4) model longline fisheries trip costs in Hawaii and American Samoa; 5) implement a pilot project on the science of compliance to improve understanding of sensitive/non-compliant fishery activities; 6) evaluate interactions between oceanic whitetip sharks and West Hawaii's small-scale fisheries in a human dimension context; 7) examine allocative foundation for catch share management of the Hawaii longline industry; 8) provide assistance to model the impact of climate change on the economic viability of fishing for tuna and billfish; 9) perform West Hawaii IEA and Habitat Focus Area socioeconomics assessment; and 10) integrate social, economic, and cultural components into a submodule for the Main Hawaiian Islands Atlantis Ecosystem Model.

Stock Assessment Research Program

P.I.: Douglas S. Luther [JIMAR Project Lead: Marc Nadon]

JIMAR researchers within the PIFSC Stock Assessment Program will be involved in investigations of insular and pelagic fishes in the next reporting year. The pelagic fish group will focus on the stock assessment of striped marlin, including analyses of spatially explicit length-frequency distributions using spatio-temporal statistics to generate a standardized abundance index and running an integrated assessment using stock synthesis software. The coastal fish group will finalize and present the Guam reef fish assessments, the Hawaii Kona crab assessment, and assist with the territorial bottomfish assessments. Work will begin on the uku (gray snapper) assessment in Hawaii. Scientific papers to support this work will also be finalized, including one on generating Kona crab life history priors and another on calibrating highly diverse survey datasets collected with different observation methods. Finally, work will continue on the new surplus-production model tool created at PIFSC (JABBA). Data will also be prepared for the next stock assessment of striped marlin and uku.

Protection & Restoration of Resources

Cetacean Research Program

P.I.: Douglas S. Luther [JIMAR Project Lead: Marie Hill]

In January–February 2019, the CRP will conduct a smaller scale version of HICEAS during 60 days aboard the NOAA *R/V Oscar Elton Sette*. The CRP will conduct visual and acoustic surveys for cetaceans throughout the entire Hawaiian Archipelago with a focus on baleen whales. 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 the HARP systems.

Deep Sea Coral Submersible Dives

P.I.: Douglas S. Luther [JIMAR Project Lead: Jeffrey Hare]

The project was established to support the dive activity only and recently completed its last successful dive. Analysis of the datasets is ongoing under other support mechanisms.

Effects of Nitrogen Sources and Plankton Food-Web Dynamics on Habitat Quality for the Larvae of Atlantic Bluefin Tuna in the Gulf of Mexico

P.I.: Karen E. Selph

The PI will analyze all collected flow cytometry samples and share the results with the entire group. The project also has a data workshop planned for February 2019. In addition, results from this project will be shared at a related workshop in Spain with the project's international collaborators. Manuscript preparation will commence.

Fishing Impacts on Non-target Species

P.I.: Douglas S. Luther [JIMAR Project Lead: Melanie Hutchinson]

During the next project year, JIMAR will complete the post release survival study on sharks discarded in the longline fisheries and finalize reports to submit to the relevant agencies and user groups. JIMAR Fisheries Bycatch Researcher Dr. Melanie Hutchinson integrated the results generated in this study for traditional stock assessments and plans to finalize a report on this method. Gear trials are planned to test the effects of different gear types on survival and a gear dissolution study will be conducted to assess how fast trailing gear will rust away from an animal. The project has also expanded the scope of the ongoing community tagging study to include tagging of other species such as silky sharks. A large identification tagging program will be developed similar to what other NMFS science centers have done. The data from this program will assist in outreach endeavors and generate information on baseline interaction and population demographics for several species. The outreach component of the program will be to create shark identification materials for community members and assemble information packets for broad scale dissemination along with tagging materials.

Hawaiian Monk Seal Northwestern Hawaiian Islands Research Seasonal Support

P.I.: Douglas S. Luther [JIMAR Project Lead: Lizabeth Kashinsky]

Over the coming year, 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 NWHI. JIMAR staff will perform field studies, tag and mark animals for identification, collect specimens for genetic studies, conduct boating operations, collect non-invasive samples for foraging studies, and 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 French Frigate Shoals (FFS), and reuniting mother-pup pairs. Special enhancement projects may include continuation of shark monitoring and removal, vaccinating seals against morbillivirus, and translocation of pups between breeding sites. Advanced technologies (remote cameras, rovers, unmanned aircraft systems, etc.) may also be utilized to monitor the population. Field personnel may also perform vocalization studies and assist other programs and agencies that may include establishing and maintaining marine debris plots, conducting insect, plant, and Laysan duck surveys, and collecting sea turtle nesting data.

Hawaiian Monk Seal Research Program

P.I.: Douglas S. Luther [JIMAR Project Lead: Lizabeth Kashinsky]

Over the next reporting year, 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 National

Marine Fisheries Service (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 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. Vaccination of wild seals against morbillivirus will continue. Ongoing survival enhancement activities may include collection of dangerous debris off beaches, disentanglement of seals, translocation of weaned pups within the FFS, and reuniting mother-pup pairs. Special enhancement projects may include continuation of shark monitoring and removal, collection of undersized seals for rehabilitation, and translocation of pups between breeding sites. The program will continue to advance its behavioral research and may design studies to test techniques to modify monk seal behavior and develop tools and protocols for application in future management activities.

Marine Turtle Recovery in the Pacific Islands Region

P.I.: Douglas S. Luther [JIMAR Project Lead: Camryn Allen]

For FY 2019 the JIMAR Marine Ecological Researcher will continue studies on the ecology of hawksbill sea turtles in the Main Hawaiian Islands (MHI). The JIMAR field researchers at FFS will continue to monitor the nesting abundance of green sea turtles and return in the fall of 2018. JIMAR staff will participate in field captures of marine turtles on Oahu, and periodically on the neighbor islands, and will continue utilization of the newly developed sea turtle endocrinology laboratory for research projects investigating sex, sex ratio, capture stress, and age of sexual maturity. JIMAR will conduct studies on age and growth of green and hawksbill sea turtles within the MHI as well as high seas populations through collaboration with the Pacific Islands Regional Office (PIRO) observer program.

Pacific Islands Deep Sea Coral and Sponge Initiative

P.I.: Douglas S. Luther [JIMAR Project Lead: Jeffrey Hare]

For the next report period, JIMAR expects to complete the final version of the online Benthic Deepwater Animal Identification Guide, complete annotation of the video from NOAA *R/V Okeanos Explorer* (EX) dives in the Pacific and submit the additional 50,000 HURL records to DSCRTP. The team will also finish the creation of dive characterization reports for 2017 activity and reports for each region surveyed by EX in the Pacific from 2015 to 2017.

Papahānaumokuākea Marine National Monument Monitoring and Research

P.I.: Douglas S. Luther [JIMAR Project Lead: Brian Hauk]

For the next fiscal year the project will work on the following.

- JIMAR project staff will coordinate advanced survey trainings for student intern divers who will be participating in RAMP fish surveys.
- Staff will participate in the NWHI RAMP/BioGeo cruise in August–September 2018 to monitor/characterize shallow and mesophotic coral reef ecosystems and quantify their benthic habitats in association with fish assemblages. By the end of the next reporting year JIMAR project staff will coordinate logistics and planning for the FY 2019 cruise as well.
- For monitoring of shallow reefs, JIMAR staff will serve as Principal Investigator and take the lead on RAMP fish and benthic surveys including the 3D photogrammetry project. JIMAR will also perform follow-up surveys at the Lisianski mass bleaching site.
- For characterization of mesophotic reefs, JIMAR staff will perform fish surveys and start incorporating the 3D photogrammetry technique into the surveys. Prior to the cruise, JIMAR will participate in a training to learn the procedure for collecting photo images and also establish a protocol specifically designed for working at depths greater than those of conventional SCUBA diving.

- JIMAR staff will continue processing 3D models and start analyzing data and preparing manuscripts.
- Project staff will continue to participate in activities to protect the marine ecosystems of the NWHI, including hull inspections, efforts to remove marine debris and documentation of non-native fouling organisms on marine debris.

Rapid Increases in Reproductive Information for Exploited Reef Fish and Enhanced Research Capacity through Training to Support Ecosystem-Based Fisheries Management in Guam

P.I.: Erik C. Franklin

During the next fiscal year, project researchers will remotely collaborate with Jungle Histology Guam participants to complete data analysis of the reef fish species examined during the workshop and prepare a manuscript of these results for publication in an academic journal. There has been considerable interest in future offerings of the training so the project is exploring funding mechanisms to offer another course in Guam and other Pacific locations.

Equatorial Oceanography

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

P.I.: Douglas S. Luther [William S. Kessler]

During the next fiscal year, the project's primary goals are to: 1) finalize and publish results on the ENSO related variations of mass and temperature advection fluxes through the Solomon Sea based on 10 years of glider data; and 2) expand the ready to use glider dataset of corrected velocities, temperature and salinity sections across the Solomon Sea.

Optimizing Routine Ocean Current Measurements by the NOAA Fleet

P.I.: Eric Firing

During the next fiscal year, monitoring and troubleshooting support will continue. The project plans to update the software on the research vessels *Nancy Foster*, *Henry Bigelow*, *Hi'ialakai*, and *Oscar Elton Sette*. They anticipate making the data 'pipeline' (ship to NOAA archive) operational. Project staff plan to participate in the annual winter NOAA survey technician training session and will also reach out to NOAA personnel involved in data processing (typically not the survey technicians) to see whether a dedicated NOAA data processing workshop can be arranged.

University of Hawaii Sea Level Center

P.I.: Philip Thompson

Development of the UHSLC data acquisition and archiving software will continue to be a priority focus during FY 2019. Researchers will continue to update the website content and focus on developing content with real-world uses for stakeholders and researchers. In particular, they are developing a sea level rise dashboard that uses UHSLC data in combination with climate model output to show projections of changes in inundation frequency and duration during the 21st century. UHSLC technicians nominally visit stations at approximately two-year intervals for normal maintenance and plan to visit 14 UHSLC core project stations during FY 2019. UHSLC research in the coming year will consist of a variety of ongoing and new projects. The project will continue to investigate the dynamical origin of hemispheric asymmetry in sea level change, origin of record setting mean sea level anomalies around the State of Hawai'i during 2017, frequency of future flooding due to sea level rise, and skill and usefulness of seasonal sea level forecasts around the United States.

University of Hawaii Sea Level Center cGPS

P.I.: Philip Thompson, James Foster

For the next project year, a new GNSS site will be installed at an existing UHSLC tide gauge installation in the Pacific region. Maintenance visits are planned to the GNSS sites in the Cape Verde Islands, Mexico, and Maldives. Data from existing sites will be received, archived locally, and transmitted to the international data archives for global public access.

Climate Research and Impacts

Analysis of Vulnerability of Military Installations in the Pacific Basin to Coastal Flooding

P.I.: Mark A. Merrifield

The project will conduct Regional Frequency Analysis (RFA) with the following: 1) use the Generalized Pareto Distribution (GPD) to utilize more data over shorter record lengths; 2) solve for 'virtual' stations centered at mid-points of 1-degree grids along the U.S. coastlines; and 3) explore using predicted tide quantities. Researchers will also identify and explore customized climate indices via their co-variability with characteristics of variables that combine to make up the TWL extreme distribution. This approach will assist with developing a prognosis of extreme event probabilities. The project will also continue work on the vulnerability assessment at the Naval Amphibious Base (NAB), identify physical effects on these assets and determine sensitivities and thresholds (operational/cost impacts and corresponding depth, frequency, duration relationships) associated with the impact metrics. They will then create scenarios that will inform resilience (vulnerability or risk).

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

P.I.: Kelvin Richards

This was a one-year grant project but a proposal has been submitted to continue the APDRC data services for an additional year.

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

P.I: Douglas S. Luther [Russell Schnell, Darryl Kuniyuki, Winston Luke]

For the next project year attention will be focused on preserving and optimizing data quality. Due to budgetary constraints, little additional testing or method development will be done at MLO. Instead, additional instrumentation for measuring Hg0 and total mercury will be deployed at several locations around the Big Island, in collaboration with the U.S. Environmental Protection Agency (Region 9), U.S. National Park Service, U.S. Geological Survey, and Hawaii Department of Health.

Pacific ENSO Applications Climate (PEAC) Center

P.I.: James Potemra

As part of PEAC's ongoing transition to the National Weather Service (NWS), the project will continue to develop a suite of NWS operational products for its long wire system AWIPS. They will also continue to do the regular 'regional climate monitoring and reporting' task, develop operational rainfall and sea level forecasts, and conduct outreach, training and capacity building activities during 2018–19. In summary, the project will continue its regular workloads during 2018–19 including the following: 1) conduct rainfall, sea level, and tropical cyclone forecasts on seasonal-to-interannual time-scale; 2) interpret regional climate data and formulate assessments

accessible to user groups; 3) prepare and disseminate warnings for peak ENSO conditions; 4) respond and provide feedback to user inquiries and concerns; 5) review and analyze the end-to-end product stream and foster research to product transitions as they develop; and 6) conduct regular quarterly ENSO briefings at the NOAA IRC building in Ford Island.

Plan for Applications Research: Longer-term ENSO Impacts Scenario. Recent observations revealed that the number of ENSO events has increased considerably, and based on the latest IPCC-Assessment Report 5 (AR5)-Coupled Model Intercomparison Project Phase (CMIP5)-model-based projection, the increasing trend will continue in the future. Several recent studies suggested that super El Niño events could double in the future, and projected that an extreme El Niño event could occur roughly every 10 years instead of every 20. The increasing number of ENSO will severely affect the water-scarce islands in RMI and FSM. The project intends to initiate a CMIP5-based ENSO applications research in 2018–19 to provide island-specific impacts on longer time-scales.

Profiling CTD Float Array Implementation and Ocean Climate Research

P.I.: Douglas S. Luther [Gregory C. Johnson]

For the next project year, JIMAR collaboration with PMEL and other Argo partners will continue with testing, deployment, and performance monitoring for more conventional and Deep Argo floats. Ocean climate studies will continue using Argo data including analysis of global ocean heat content and sea surface salinity variations with more work on delayed-mode quality control for the PMEL Argo floats. Work will continue towards building a regional deep Argo Array in the South Atlantic. A new JIMAR Float Research Associate will also be hired.

Transferal of Pacific ENSO Applications Climate (PEAC) Center Products and Services to Weather Forecast Office (WFO) Honolulu

P.I.: James Potemra

Due to personnel changes and funding delays, the project tasks will be concentrated in the latter half of the fiscal year. In addition, the PI submitted a follow-on proposal to extend this work an additional year.

Tsunamis and Other Long-Period Ocean Waves

Archive of Rapidly-Sampled Hawaiian Sea Level

P.I.: Douglas S. Luther

The ongoing application of the rapidly-sampled sea level records in PacIOOS to diagnose the causes of harbor sea level variations, as well as coastal inundation events, demonstrates that the collection, processing, archiving and dissemination (through ARSHSL) of rapidly-sampled Hawaiian sea level are important activities that will therefore be continued. As funding permits, the project will move forward with the re-establishment of the full ARSHSL archiving activities. Along with JIMAR funding, PacIOOS resources will be used to accomplish the resumption of real-time data acquisition from PTWC's gauges for archiving in ARSHSL. However, the low priority and light funding of ARSHSL means this will be a multi-year activity.

Tsunami Research and Modeling

P.I.: Douglas S. Luther

Due to delays in personnel recruitment, project tasks have been delayed to later in the project year. The project will begin work once the position has been filled.

The University of Hawaii Sea Level Center—Tsunami Research

P.I.: Philip Thompson

During FY 2019, the project plans to meet project objectives by servicing five Pacific Tsunami gauges and five Caribbean Tsunami gauges.

Plans for FY 2019—Associated Awards

Cetacean Research Program- Monitoring in the Mariana Islands Range Complex
Cooperative Agreement No. NA17NMF4320293)

P.I.: Douglas S. Luther [JIMAR Project Lead: Marie Hill]

For the next reporting period the CRP will return to the Marianas in 2019 to conduct surveys specifically targeted at humpback whales in the winter.

Marine Turtle Nearshore Assessment in the Mariana Islands
Cooperative Agreement No. NA17NMF4320294)

P.I.: Douglas S. Luther [JIMAR Project Lead: Camryn Allen]

Many of the JIMAR objectives for the next reporting period involve data collection for population status, trends, and abundance. JIMAR project staff will conduct population assessment by: 1) conducting in-water surveys, including capture mark recapture; 2) deploying animal-borne instruments following permitted procedures; 3) collecting samples to improve genetic understanding and population status of marine turtles across the Pacific Islands Region (PIR); 4) designing and completing spatial abundance analysis from surveys; 5) generating figures, tables, and manuscripts detailing the spatio-temporal patterns; 6) conducting and contributing to studies on the foraging ecology, movements, migration, and habitat use of marine turtles; and 7) maintaining sample databases, including organization, storage, and delivery of samples to MTBAP partners.

List of Acronyms

ACL	Annual Catch Limit
ADMB	Automatic Differentiation Model Builder
APDRC	Asia-Pacific Data Research Center
ARSHSL	Archive of Rapidly-Sampled Hawaiian Sea Level
ASRAMP	American Samoa Reef Assessment and Monitoring Program
AWIPS	Advanced Weather Interactive Processing System
CAO	Carnegie Airborne Observatory
CAPSTONE	Campaign to Address Pacific Monument Science, Technology, and Ocean Needs
CCR	Closed-Circuit Rebreather
CMIP5	Coupled Model Intercomparison Project Phase Report 5
CNMI	Commonwealth of the Northern Mariana Islands
CPU	Central Processing Unit
CRP	Cetacean Research Program
CSVI	Community Social Vulnerability Indices
CTD	Conductivity-Temperature-and Depth
DA-BFAR	Philippines Department of Agriculture, Bureau of Fisheries and Aquatic Resources
DAWR	Division of Aquatic and Wildlife Resources (Guam)
DIC	Dissolved inorganic carbon
DIDSON	Dual-frequency identification sonar
DMIP	Data Management Improvement Plan
DSCRTP	Deep Sea Coral Research and Technology Program
EAFM	Ecosystem Approach to Fisheries Management
EM	Electronic Monitoring
ENSO	El Niño Southern Oscillation
ER	Electronic Recording
ERDDAP	Environmental Research Division Data Access Platform
ESA	Endangered Species Act
ESD	Ecosystem Sciences Division
EX	NOAA *R/V Okeanos Explorer*
FAD	Fish Aggregating Device
FFS	French Frigate Shoals
FOT	Final Turn Out Receipt
FRS	Fishing Report System
FSM	Federated States of Micronesia
FSWP	Fishery Statistics of the Western Pacific
FUS	Fisheries of the United States
FY	Fiscal Year
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPD	Generalized Pareto Distribution

GTS	Global Telecommunications System
GUI	Graphic User Interface
HA	*R/V Hi'ialakai*
HARP	High-frequency Acoustic Recording Packages
HDAR	Hawaii Department of Aquatic Resources
HICEAS	Hawaiian Islands Cetacean Ecosystem Assessment Survey
HiMARC	Hawaii Monitoring and Research Collaboration
HMS	Hawaiian Monk Seal
HMSRP	Hawaiian Monk Seal Research Program
IATTC	Inter-American Tropical Tuna Commission
IDEA	Integrated Data and Environmental Activities
IEA	Integrated Ecosystem Assessment
IEAFM	International Ecosystem Approach to Fisheries Management
iFIMS	Integrated Fisheries Information Management System
IPCC	Intergovernmental Panel on Climate Change
IRC	Inouye Regional Center
ISO/IEC	International Organization for Standardization/International Electrotechnical Commission
IT	Information Technology
JABBA	Just Another Bayesian Biomass Assessment
JIMAR	Joint Institute for Marine and Atmospheric Research
LBJ	Lyndon Baines Johnson
LED	Light Emitting Diode
LHP	Life History Program
$MAPCO_2$	Moored Autonomous pCO2 System
MARAMP	Marianas Archipelago Reef Assessment and Monitoring Program
MCBH	Marine Corps Base Hawaii
MHI	Main Hawaiian Islands
MLO	Mauna Loa Observatory
MOUSS	Modular Underwater Stereoscopic System
NAB	Naval Amphibious Base
NBG	Naval Base Guam
NCEI	National Centers for Environmental Information
NCRMP	National Coral Reef Monitoring Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWHI	Northwestern Hawaiian Islands
NWS	National Weather Service
OA	Ocean Acidification
OAP	Ocean Acidification Program (NOAA)
ODRS	Online Commercial Marine Dealer Reporting System
OER	Ocean Exploration and Research

PacIOOS	Pacific Islands Ocean Observing System
PaCIS	Pacific Climate Information System
PARR	Public Access to Research Results
PEAC	Pacific ENSO Application Climate (Center)
PI	Principal Investigator
PIFSC	Pacific Islands Fisheries Science Center
PIRO	Pacific Islands Regional Office
PMEL	Pacific Marine Environmental Laboratory
PMNM	Papahānaumokuākea Marine National Monument
PRIMNM	Pacific Remote Islands Marine National Monument
PTWC	Pacific Tsunami Warning Center
PYSO	PIFSC Young Scientist Opportunity
QA	Quality Assurance
QC	Quality Control
RAMP	Reef Assessment and Monitoring Program
RCC	Regional Climate Center
RFA	Regional Frequency Analysis
RFMO	Regional Fishery Management Organization
RGM	Reactive Gaseous Mercury
RMI	Republic of the Marshall Islands
ROMS	Regional Ocean Modeling System
ROV	Remotely Operated underwater Vehicle
RPL	Regional Purse-Seine Logsheet
SAP	Stock Assessment Program
SCUBA	Self-Contained Underwater Breathing Apparatus
SHCE	Sustaining Healthy Coastal Ecosystems
SIO	Scripps Institution of Oceanography
SOD	Science Operations Division
SOP	Standard Operating Procedures
SPTT	South Pacific Tuna Treaty
SSTP	Survey and Sampling Technologies Program
SWFSC	Southwest Fisheries Science Center
SWS	SeaWater System
TA	Total alkalinity
TG	Tide Gauge
THREDDS	Thematic Real-time Environmental Distributed Data Services
TWL	Total water level
U.S.	United States
UCLA	University of California Los Angeles
UFA	United Fishing Agency
UH	University of Hawaii

UHSLC	University of Hawaii Sea Level Center
UL	Unloading and Transshipment Logsheet
USAPI	United States Affiliated Pacific Islands
VFP	Visual FoxPro
VMS	Vessel Monitoring System
WCPFC	Western and Central Pacific Fisheries Commission
WPacFIN	Western Pacific Fisheries Information Network