

JIMAR ANNUAL REPORT FOR FY 2006

Plans for the Next Fiscal Year

Equatorial Oceanography

JASMINE, The Joint Air-Sea Monsoon Interaction Experiment: Upper Ocean Survey

P.I.: Peter Hacker, Roger Lukas, and Eric Firing

Plans for the Next Year

With the small remaining resources, we plan to complete our use of the JASMINE and recent NOAA observations for the planning and implementation of the moored array for the Indian Ocean via participation in the CLIVAR Indian Ocean Panel.

Penetration of Anthropogenic CO₂ in the Oceans Based on Analysis of Recent WOCE/JGOFS/OACES Carbon Data Using the Remineralization Ratios Obtained by the New Three-End-Member Mixing Model

P.I.: Yuan-Hui Li

Plans for the Next Year

To verify the partial nitrification hypothesis in the Pacific Ocean. Also to study the causes of alkalinity variation in the surface and deep oceans.

University of Hawaii Sea Level Center

P.I.: Mark Merrifield

Plans for the Next Year

The UHSLC will complete station upgrades and new installations in the Indian Ocean in support of the regional tsunami warning system, with supplemental funding provided by the IOC, ADPC, and USAID. Our next focus will be South Korea, where we intend to help install stations at Pusan, Inchon, and Taehusan-Do in collaboration with NORI. We will install new real-time stations at Fortaleza, Brazil, Puerto Deseado, Argentina, and Acapulco, Mexico. We have contacted Roshydromet and offered to assist with GLOSS station upgrades in Russia. Forthcoming publications include a study of extreme event climatologies, an assessment of sea level rise based on the tide gauge network, and an assessment of GPS estimates of land motion at stations operated by UHSLC in coordination with the Pacific GPS Facility.

Tsunami Research

Archiving and Analysis of High-Resolution Sea Level Data from the Hawaiian Islands

P.I.: Douglas Luther

Plans for the Next Year

Collection, processing and dissemination (through ARSHSL) of rapidly sampled Hawaiian sea level will continue. Funding is being sought by Mark Merrifield, Director of the UHSLC, from State agencies to significantly upgrade the PTWC gauges. Depending on the amount of effort needed to maintain the archive, enhancements to the archive will continue, including (i) updating the archive's technical report; (ii) updating files of concatenated, quality-

controlled, hourly-averaged sea level data for low-frequency studies; and, (iii) improving and automating the procedures for editing the 1-second data from 8 PTWC gauges.

Inverse Algorithm for Tsunami Forecast

P.I.: Thomas Schroeder

Plans for the Next Year

(1) Develop computer models of tsunami generation from seafloor deformation. The current approach assumes the initial tsunami waveform to be identical to the seafloor deformation and ignore the dynamics of tsunami generation.

(2) Extend the inverse algorithm to describe rupture propagation. The present inverse approach assumes instant rupture of the entire fault and is not amenable to events like the 2004 Sumatra-Andaman earthquake, in which the rupture propagated along the 1,200-km faultline over a 10-min duration.

The proposal research will better model the physics of tsunami generation and improve the accuracy of the forecasts.

University of Hawaii Sea Level Center—Tsunami Research

P.I.: Mark Merrifield

Plans for the Next Year

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Climate Research

Compilation, Digitization, and Use of Hawaii State Rainfall Records

P.I.: Pao-Shin Chu

Plans for the Next Year

We will continue to update rainfall station information for Maui and Hawaii counties.

Development of Real-Time Percipitable Water Capability Using the Global Positioning System

P.I.: Steven Businger

Plans for the Next Year

The SkyNet network of GPS receivers will be maintained, with those sites not yet reporting data hourly upgraded to provide hourly or half-hourly data files where possible. Equipment and processing software will be upgraded as necessary. LIHU will be connected to the internet and incorporated into SkyNet.

Plans are underway to explore the retrieval of IPWV from shipboard GPS units. The University of Hawaii operates a research vessel with geodetic GPS units installed for navigation. By adapting and tuning the processing software used for high precision kinematic GPS position solutions it should be possible to get IPWV with sufficient accuracy for weather modeling. Once demonstrated, we plan to deploy this technique on the transportation barges on regular inter-island routes. We envision being able to expand the program onto barges traveling to and from the mainland and also onto open ocean buoys, thus generating IPWV estimates for data-sparse regions.

Effects of the Andes on Eastern Pacific Climate

P.I.: Shang-Ping Xie and Yuqing Wang

Plans for the Next Year

ROAM will continue to be used to study mechanisms shaping the spatio-temporal variations in eastern Pacific climate. In particular, we will study effects of land orography, and the interaction of low clouds and the ocean.

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

P.I.: Julian McCreary, Jr., Peter Hacker, James Potemra

Plans for the Next Year

As our project has grown, we have reorganized our activities for the future. During the coming year, the project will continue baseline activities addressing the three (new) major goals of the APDRC: operate and continue development of the web-based, integrated Data Server System; provide a global data base and data management for climate data and products; and develop and serve new climate related products for research and applications users.

Activities within the third goal include continuation of: PRIDE activities to develop integrated data products; needed research for climate product development; value-added activities that produce enhanced data products; GODAE Product Server activities for a broad range of research and applications users with focus on satellite and model-derived products; implementation of high-resolution models for downscaling operational models in the Pacific Islands regions with initial focus on the Hawaii region; pilot observations in support of high-resolution, ocean data assimilation models; and data rescue and historic data quality control activities.

Impacts of Warm Pool and Extratropical Processes on ENSO

P.I.: Bin Wang

Plans for the Next Year

We will finish the work on the impacts of ENSO on midlatitude intraseasonal and interannual variability and expect a manuscript will be complete in 2006.

Investigating the Transport and Transformation Mechanisms of Atmospheric Mercury in the Remote Central North Pacific Marine Free Troposphere

P.I.: Thomas Schroeder [Darryl Kuniyuki]

Plans for the Next Year

The next year will introduce an addition of a rain collection device located at the Hakalau forest reserve. It will be used to study trace metals and mercury deposition.

Profiling CTD Float Array Implementation and Ocean Climate Research

P.I.: Thomas Schroeder [Gregory Johnson]

Plans for the Next Year

In FY 2007, collaboration with PMEL and other Argo partners will continue, with testing, deployment, and performance monitoring for more floats. Delayed-mode salinity quality control activities for Argo will cease. However, ocean climate studies will continue using Argo data, including analysis of global ocean heat, and possibly freshwater, content variations.

Roles of Ocean-Atmosphere-Land Interaction in Shaping Tropical Atlantic Variability

P.I.: Shang-Ping Xie

Plans for the Next Year

Affording higher resolutions than global models, regional models can better resolve narrow features such as the ITCZ and the equatorial cold tongue. We have developed a regional ocean-atmosphere model (ROAM) for the eastern tropical Pacific, which successfully captured salient features of the regional climate including the northward displaced ITCZ, the equatorial cold tongue and the stratus cloud deck south of the equator. We have implemented the atmospheric component in the tropical Atlantic, which simulates the semi-annual cycle in the equatorial zonal wind. We will further test the model and implement the ROAM in the Atlantic in preparation for long decadal hindcasts in the next year. This ROAM for the tropical Atlantic has the potential of being a powerful tool to study the sources and reduce the large biases of global models in the region.

Transition from Experimental Climate Prediction to Operational Climate Forecasting and Information Services for the U.S. Affiliated Pacific Islands (USAPI)

P.I.: Thomas Schroeder

Plans for the Next Year

The CCA model results are useful in their current form. However, more attentions are given during 2005-06 to linkages these products to ENSO-related impacts, such as patterns of historical flooding and drought at various station locations. This would provide a means to generate a value-added ENSO forecast, for example by identifying specific areas where flooding may be anticipated. This work is in progress and likely to be continued in the years to come. Another important aspect of the present CCA model is that it is solely based on the El-Nino Southern Oscillation (ENSO) climate cycle and the sea-surface temperatures (SSTs) in the tropical Pacific Ocean. Observation revealed that there are some stations displaying not good correlation with the ENSO index. Therefore, more attentions were given to examine the extent to which other climate indices (e.g., the East Pacific index) may be useful as a predictor of elevated sea levels. This work is also in progress and likely to be continued in the years to come.

Warm Pool Dynamics in the Interaction Between Asian Summer Monsoon and ENSO

P.I.: H. Annamalai

Plans for the Next Year

We will further analyze the IPCC model integrations to understand the reasons for the decadal modulation in the ENSO-monsoon relationship.

Tropical Meteorology

National Weather Service International Pacific Training Desk

P.I.: Thomas Schroeder

Plans for the Next Year

The Desk Trainer (Robert Larson) will be visiting the weather offices in the Cook Islands, Fiji and Vanuatu in August 2006. In September interns from the Solomon Islands and Kiribati will visit. Additional interns are under continuous recruitment.

Fisheries Oceanography

A General Model for Protected Species

P.I.: John Sibert [Mark Maunder]

Plans for the Next Year

The applications of the general framework to the Tern Island population of black footed albatross and the yellow-eyed penguin will be completed, the results presented at the EURING conference and a manuscript submitted for publication. An ADMB course will be taught in Seattle and MM will attend the NMFS stock assessment methods workshop in Seattle to evaluate the use of Stock Synthesis II for protected species. MM will attend the PFRP PI meeting in Hawaii. We will carry out further investigation into appropriate methods to include information in models of protected species and to estimate uncertainty. MM will continue his collaboration with Tore Schweder at the Centre for Ecological and Evolutionary Synthesis, University of Oslo and Jaume Forcada at the British Antarctic Survey.

Addition of Multi-Species Capability, Sex Structure and Other Enhancements to the Length-Based, Age Structured Modeling Software MULTIFAN-CL

P.I.: John Sibert [John Hampton and Pierre Kleiber]

Plans for the Next Year

This PFRP project has now been completed, although work on several of the enhancements will continue through a companion project.

Aggregation Behavior of Small FAD-Associated Yellowfin Tuna and Size-Dependent Vertical Stratification

P.I.: Kim Holland

Plans for the Next Year

Release additional small tuna carrying acoustic tags and analyze data currently in hand.

An Analysis of Archaeological and Historical Data on Fisheries for Pelagic Species in Guam and the Northern Mariana Islands

P.I.: John Sibert [Judith Amesbury, Rosalind Hunter-Anderson]

Plans for the Next Year

We plan to interview three fishermen on Guam. We are in the processing of obtaining three radiocarbon dates from the Ylig Project. We are currently writing the main body of our report. We plan to use the three reports from our consultants, Foss Leach and Wakako Higuchi, as appendices to our report.

An Assessment of Small Boat Yellowfin and Bigeye Tuna Operations and Regulatory Scenarios in the Main Hawaiian Islands

P.I.: John Sibert [Edward Glazier]

Plans for the Next Year

Per the project objectives and schedule, plans for the upcoming months involve the convening of a series of small focus groups of fishery participants in order to document reported experiences and perspectives regarding: (a) patterns of change in PFAD and other fishing operations in the region, (b) the nature of recent operational and marketing/distribution challenges, and (c) the perceived effects of preferred and other potential future management and regulatory strategies for the MHI small boat handline and troll fleets. Additional interviews are planned with key informants to further understanding of: (a) observed changes in currents and biological communities associated with the PFADs; (b) interactions with other fishing fleets, including other portions of the small boat fleet; and (c) macro- and micro-social and economic factors that may historically have constrained and/or enabled small boat fishing operations in the MHI. Finally, we intend to incorporate archival review, interview, and observational findings from the ika-shibi project with the same elements derived during the current project to generate comprehensive description and analysis of the nature and estimated extent of BET/yellowfin fishing pressure associated with small boat fishing operations in the MHI. The draft and final reports will focus especially on longitudinal description of social and economic aspects of the fisheries and potential regulatory scenarios and their implications for the fleets.

Climate Change and Ecosystem Variability in the North Pacific Ocean and the Dynamics of Marine Resource Populations

P.I.: Thomas Schroeder [Franklin Schwing]

Plans for the Next Year

The research emphasis for this project in FY07 will continue to focus on the following areas: 1) the characterization of ocean “hot spots” and their utilization by marine pelagic fish and mammals, 2) understanding the impact of large-scale climate variability on mesoscale ocean structure and its consequences to marine populations, 3) developing satellite-based data products that define physical and biological attributes of ocean habitat, and 4) developing indicators of climate and environmental variability that can be incorporated into ecosystem models and resource management strategies.

Comparing Sea Turtle Distributions and Fisheries Interactions in the Atlantic and Pacific

P.I.: John Sibert [Selina Heppell, Molly Lutcavage]

Plans for the Next Year

PASTA II will convene in San Diego August 22-25, 2006. Day one will be a meeting of the original PASTA attendees, to present findings and discuss synthesis. Day 2 will include additional invitees from sea turtle and oceanographic fields to critically evaluate and contribute to our assessment. Day 3 will focus on synthesis and development of products. Prior to the PASTA II meeting, we will complete a series of GIS maps of nesting beaches, foraging grounds, oceanographic zones and fisheries distribution over time, statistical analysis of population trends in time and space to determine the scale of population-level impacts and detect spatial correlations. Life history models that incorporate age structure (time lags) and changes in vital rates for each species and are then compared with nesting beach trends and size distribution data, and movement models that utilize nesting distributions (to map possible dispersal routes), remotely sensed data, current maps and satellite tracking information to determine likely overlaps for turtles and various fisheries. Anticipated products include a series of GIS maps that show the distribution of turtles, nesting beach status, oceanographic features, and fisheries in each ocean basin, concentrating on Northern Hemisphere waters, a list of alternative hypotheses for population differences, along with their predicted effects on age/size structure, population growth, and/or population distribution, a list of critical research needs (data gaps), and prototypes of new, integrated assessment models. We anticipate 1 overview paper of our approach and findings for publication in a peer-reviewed journal, plus 2-4 papers authored by PASTA attendees that contribute to the effort.

Describing the Vertical Habitat of Bigeye and Albacore Tunas and Post Release Survival for Marlins in the Central Pacific Longline Fisheries with Pop-up Archival Transmitting Tags

P.I.: John Sibert [Jeffrey Polovina, Michael Seki]

Plans for the Next Year

Project concludes at the end of FY06. However some analyses and manuscript preparation will continue into FY07.

Economic Fieldwork on Pelagic Fisheries in Hawaii

P.I.: John Sibert [Minling Pan]

Plans for the Next Year

Task A. (1) Examine the cost-earnings status of the Hawaii longline fleet based on the 2005 operation; (2) Explore the cost structure and identify the impact of the fuel price changes in the Hawaii longline vessels. (3) Write report and paper to document data collection and analytical results.

Task B. (1) Analyze the important elements related to fishing technology in determining effective fishing efforts; (2) Investigate enhancement of the established technology and vessel or gear attributes to fishing operations and productivity; (3) Identify the factors that affect technology adoption in the Hawaii longline fishery, (4) Write report and paper to document data collection and analytical results.

Economic Value of Pacific Blue Marlin in the Hawaii Recreational Fishery

P.I.: John Sibert [Stewart Allen]

Plans for the Next Year

Now that the blue marlin questions have been developed and incorporated into the mail survey, data collection will proceed for the next eight months. This will involve little effort on the part of the project because all mailings and data entry, coding, and verification will take place as part of the broader socioeconomic add-on survey effort as coordinated by Gentner and his contractors. Analysis can begin after the data set is complete, expected to occur in March 2007. We then expect to produce one report on recreational values of blue marlin (and the other pelagic species) based on the results of the mail survey, and one report, targeted at managers, comparing recreational with commercial economic values. Both of these reports are expected to be completed during FY 2007.

Evaluation of Data Quality for Catches of Several Pelagic Management Unit Species by Hawaii-based Longline Vessels and Exploratory Analyses of Historical Catch Records from Japanese Longline Vessels

P.I.: John Sibert [William Walsh, Keith Bigelow]

Plans for the Next Year

The intentions for FY 2007 are to complete the manuscript related to the five billfishes (blue marlin, striped marlin, shortbill spearfish, black marlin, sailfish) for the 10-year period March 1994-February 2004 planned for submission to *Fisheries Research* and to revise (as necessary) and publish the paper submitted to the *Bulletin of Marine Science*.

Fishery Dynamics in the Samoan Archipelago

P.I.: John Sibert [Keith Bigelow, Adam Langley, John Hampton]

Plans for the Next Year

Plans for the remaining fiscal year of the project will concentrate on fishery dynamics in the Samoan archipelago. Aspects of the albacore availability and local depletion effects will be analyzed with various statistical models. Within the newly established observer program in A. Samoa, time-depth recorders will be deployed on longlines to monitor gear depth. Results from the project will be presented at various forums, including a forum on south Pacific albacore fisheries sponsored in September 2006 by the Western Pacific Regional Fisheries Management Council and the PFRP PI meeting in November 2006.

Fisheries Oceanography: Methods to Reduce Sea Turtle-Longline Interactions

P.I.: Thomas Schroeder [John Wang, Yonat Swimmer]

Plans for the Next Year

During this next fiscal year, we aim to continue our efforts to identify a mitigation method that will effectively reduce sea turtle bycatch in commercial fisheries. Now that we have successfully identified a collaborator with whom we can quickly test turtle reactions in captivity and in a fishery, we will plan to return with new ideas to test. We also plan to conduct experiments on board the NOAA R/V Oscar Sette and on board foreign fishing vessels, including tests of shaded light sticks, LED lights that emit wavelengths of light at 395 nm, blinking LED lights, and an acetate shark silhouette, as well as different bait types. We will also work to ensure that we are in compliance with all NEPA requirements.

Fisheries Oceanography: Protected Species Investigation: Marine Turtle Research Program

P.I.: Thomas Schroeder [Stacy Kubis, George Balazs]

JIMAR staff in the MTRP consists of two professional level researchers (one FT Marine Turtle Research Biologist—Stacy Kubis and one 50% time Marine Turtle Specialist—Denise Parker) and two biological technicians with a third technician position to be filled. For FY2007, MTRP JIMAR staff plans to accomplish the following goals.

- 1) Major emphasis will continue to be placed on the research of the pelagic ecology and movements of sea turtles to develop management strategies to reduce fisheries bycatch. In addition to continued research with colleagues in Japan, a new collaborative project is in progress with an aquarium in New Caledonia. Loggerhead hatchlings from nesting beaches in New Caledonia will be raised to a suitable size at the aquarium then satellite tagged and released to study their pelagic habitats. Attachment of satellite transmitters, tracking, data management, and mapping expertise will be provided by NMFS and JIMAR as a joint effort with the aquarium.
- 2) Continuing research will be conducted on fibropapillomatosis disease with emphasis on specimens obtained from the Hawaii sea turtle stranding and salvage research program.
- 3) Captive care and rehabilitation will also continue as an important part of the stranding and salvaging research program. JIMAR biological technicians are responsible for the care of captive rehabilitated animals, and are instrumental in the administration and conduction of the stranding and salvage research program.
- 4) Studies of marine turtles and their foraging grounds will be conducted in collaboration with faculty and students from the University of Hawaii, Hilo. These studies will investigate the diversity and abundance of forage items in coastal waters in relation to diet samples obtained from live sea turtles (via stomach flushing) and dead stranded turtles.
- 5) The JIMAR Marine Turtle Research Biologist is substantially involved in all aspects of fieldwork related to capturing and tagging sea turtles. These data will be organized and summarized to help determine at which sites future research activities should be focused and whether new sites are necessary.

Fisheries Oceanography: Swordfish Research

P.I.: Thomas Schroeder [Karen Sender]

Plans for the Next Year

Work in FY2007 will continue on three projects in support of swordfish, pelagic fisheries, and the NOAA Fisheries Service's efforts toward building the FIS. Tasks in support of these efforts will include the following.

1. Longline Observer Data System (LODS)

Project Objective: Continue the maintenance and enhancement of LODS.

2007 Project Tasks

- a. Modify LODS to allow input and management of American Samoa Observer data
- b. Develop user creation and management tools for Pacific Islands Regional Office and PIFSC data managers
- c. Complete the roll-over from the existing Trip Cost system to the new system

2. FIS InPort v. 2 Development

Project Objective: To provide FIS with a centralized repository for managing and accessing information about fisheries data—metadata—in order to comply with the objectives of the Sustainable Fisheries Act and to fulfill NOAA objectives for transparency of the collection, management, and dissemination of data and information. The FY2007 goals for the InPort system are as follows.

- Facilitate the inventory of fisheries dependent data holdings across all NOAA Fisheries Service regions
- Migrate InPort v 1.1 to Fisheries Office of Science and Technology
- Design, build, test, and deploy InPort v. 1.2

2007 Project Tasks

- a. Develop additional tutorials and training resources
- b. Continue to provide production support of InPort v. 1x
- c. Support migration of InPort v. 1.1 to Headquarters
- d. Build, test, and deploy additional metadata detail modules
- e. Build, test, and deploy Advanced web search
- f. Build, test, and deploy XML interfaces for getting metadata in and out of InPort

3. FIS Data Management Tools

Project Objective: To provide FIS with packaged and documented tools and components that can be used to facilitate the design and management of quality fisheries data and information. In FY2007, goals for this project include publication of Data Trawler, a data downloading tool.

2007 Project Tasks

- a. Complete development and documentation of Data Trawler

Human Dimensions Analysis of Hawaii's Ika-Shibi Fishery

P.I.: John Sibert [Edward Glazier]

Plans for the Next Year

We will continue to monitor changes in participation and production across the ika-shibi fleet. Additional review of HDAR and various economic data and a series of interviews with will be undertaken to assess prospective relationships between macro-economic and social trends and rates and manner of participation in ika-shibi, palu-ahi, and other MHI small boat fisheries over the course of time.

Incidental Catch of Non-Target Fish Species and Sea Turtles: Comparing Hawaii's Pelagic Longline Fishery Against Others

P.I.: John Sibert [John Kaneko, Paul Bartram]

Plans for the Next Year

We will make the fact finding trip to Taiwan to conduct interviews with fishing industry representatives and fishing vessel captains when schedules can be coordinated with our bilingual Taiwanese tuna industry specialist and local contacts for interviews with ULT fishing boat captains and fleet representatives.

Incorporating Oceanographic Data in Stock Assessments of Blue Sharks and Other Species Incidentally Caught in the Hawai'i-based Longline Fishery

P.I.: John Sibert [Pierre Kleiber, Hideki Nakano]

Plans for the Next Year

Work on planned major enhancements to MFLC will continue in the FY 2007, supported by the remainder of funds allocated to this project.

Instrumented Buoys as Autonomous Observatories of Pelagic Ecosystems

P.I.: Kim Holland

Plans for the Next Year

The fully assembled echosounding prototype buoy will be tank tested and then shipped to Hawaii for initial field testing. Experiments will continue with the bioacoustic probe and first experiments will be conducted with the stomach acidity transmitter.

Integrated Modeling for Hawaiian Albatross Populations

P.I.: John Sibert [Dan Goodman, Jean-Dominique Lebreton]

Plans for the Next Year

The finalization of the various approaches above will be the main objective of the year to come. Communication with the other teams collaborating in the project, to compare various approaches to integrated modeling will be the other major theme.

Integrative Modeling in Support of the Pelagic Fisheries Research Program: Spatially Disaggregated Population Dynamics Models for Pelagic Fisheries

P.I.: John Sibert

Plans for the Next Year

This project continues to maintain and develop the two software packages “kftrack” and “kfSST,” which are used by many scientists to improve their tracks. Collaborations with numerous excellent scientists are ongoing, which benefit this project by providing inside information about real data challenges, and benefit them by improving their geolocation tools.

Long-Term Deployment of Satellite Tags on Swordfish Using the California Harpoon Fleet

P.I.: John Sibert [Heidi Dewar, Jeffrey Polovina]

Plans for the Next Year

In 2006 we plan to deploy 14 tags using the California harpoon fleet; the two tags remaining from 2005 and the 12 tags allotted for deployment in 2006. The goal is to deploy half of these tags from June through August and the remaining half in October- November. This year 12 tags will be rigged with the second dart type and 2 with the original dart type. For the tags that release and transmit data, analysis will focus on both identifying general oceanographic regions as well as characterizing behaviors and habitats. In addition to the PAT tag deployments a number of complimentary efforts will be initiated. 1) Twelve fish will be double tagged with both a PAT tag and an archival tag, which can be downloaded if the fish is recaptured. Using the archival tags provides the potential for

multi-year records. 2) Both tissue samples and otoliths will be collected for isotopic analysis and microconstituent analysis. Tissue samples will include those taken during the tagging event. These analyses provide a complimentary method for identifying stock structure as well as insight into trophic ecology. Samples collected off California will be compared to those collected by collaborators in other locations including Australia, Hawaii and Japan.

Fisheries Oceanography: Marine Mammal Research Program

P.I.: Thomas Schroeder [George Antonelis]

Plans for the Next Year

In FY2007, the monk seal studies will include continued population monitoring and assessment, characterization of foraging ecology, and evaluation of health and disease. Specific goals are as follows.

- The MHI assessment effort will develop and integrate into the database the GPS coordinates for all haulout sites within the MHI.
- The monk seal foraging ecology project will complete identification of all prey samples, which have been collected.
- The monk seal health and disease group will continue to train field personnel and process samples, and will develop a database to integrate sample inventory, laboratory and other test results, and biological information on monk seals.

The cetacean research component has the following specific goals for FY2007.

- Establishment of a collaborative community-based Hawaiian spinner dolphin photo-identification catalogue
- Draft publication on cetacean species and distribution in American Samoa
- Continue analysis of High Frequency Acoustic Recording Package (HARP) data from Cross Seamount and Palmyra Atoll
- Development of a predictive spatial model of preferred resting habitat for spinner dolphins
- Conduct surveys for cetaceans in the NWHI in collaboration with monk seal foraging research cruise.

Marine Resource Dynamics and Assessment Program (MARDAP): Cooperative Research

P.I.: Thomas Schroeder [Michael Musyl and Christofer Boggs]

Plans for the Next Year

Complete baseline research papers (below) on horizontal and vertical movements of sharks, tunas, and billfish and performance of PSATs. This information will be used to develop the IBMs.

Marine Resource Dynamics and Assessment Program (MARDAP): Economics of Fisheries Initiative

P.I.: Thomas Schroeder [Minling Pan]

Plans for the Next Year

The Economics of Fisheries initiative has experienced a reduction in funding from NOAA Fisheries Service. As a result, the CO-treated tuna study has been discontinued in favor of pursuing more relevant and timely objectives in FY2007 (July 1, 2006 to June 30, 2007), as follows.

1) Support the ongoing economic data collection program to assess changes in key economic indicators in Hawaii longline and NWHI bottomfish fisheries, including summarizing and publishing the summary data from the second

year of the program in an appropriate format.

2) Conduct cost-earning analysis on the Hawaii longline fleet based on the economic data collected in FY2006, present summary data and findings to the fisheries management plan team and the council, prepare metadata for the data collected in the study, and document the data and findings.

3) As the American Samoa longline fishery observer program matures, work with PIRO or explore other possible options to establish a continuous economic data collection program for that fishery in order to assess changes in key economic indicators in the fishery.

Marine Resource Dynamics and Assessment Program (MARDAP): Lobster Research Program

P.I.: Thomas Schroeder [Gerard DiNardo]

Plans for the Next Year

In FY2007, we plan to (1) continue the spiny and slipper lobster tagging experiments in the NWHI (a charter vessel is scheduled to conduct tagging operations at Maro Reef, Laysan Island, and North Hampton Seamount from July 17-August 16, 2006); (2) conduct the NWHI lobster resource survey in June 2007; (3) if feasible, expand the spatial scope of the NWHI lobster resource survey and tagging experiments; (4) plan and participate in the two Joint meetings of the ISC Marlin and Swordfish Working Groups (the first is scheduled for November 2006 in Shimizu, Japan and the second for March/April 2007 in Taiwan); (5) advance stock assessment methodologies for pelagic species in the North Pacific ocean and insular species in the Pacific Islands Region.

Marine Resource Dynamics and Assessment Program (MARDAP): Research Support

P.I.: Thomas Schroeder [Susan Kamei]

Plans for the Next Year

Web Services—The Webmaster will execute the Web Development Plan and direct the PIFSC Web Team. She will maintain web pages and provide direct technical support for delivery of data products and other dynamic web content. She will continue to review and revise web practices to ensure conformance with NOAA and other guidelines. She will establish an online Web Content Management System.

Scientific Editing—The Scientific Editor will continue to provide comprehensive professional editing services to program staff. She will help establish an online (web-based) system for PIFSC manuscript submission and processing. She will provide editorial support for PIFSC Web content as a member of the Web Team.

Maintenance Support—The maintenance assistant will continue to provide principal investigators and staff with facilities support, including basic carpentry, plumbing, and general upkeep of facilities. Facilities-related projects planned for the project period include exterior painting of the facility, re-carpeting of offices and conference rooms, the upkeep of new vehicles added to PIFSC's inventory, and other ongoing improvements to the facility and grounds.

Administrative Support—The Administrative Associate will continue to provide a wide range of administrative services, including travel coordination and administration, budget reconciliation and planning, procurement, and general correspondence and office administration. Additional duties will include meeting coordination, rapporteuring, and project management. Due to increasing administrative demands on the project, a second administrative associate position has been added to the project for FY06. The incumbent of the second position will

focus on travel administration, payroll, and small purchase administration.

Fisheries Specialist—Work plans for FY06 are a continuation of current activities, including daily rounds to local docks to collect log books, followed by a detailed review of logbooks for compliance with reporting protocols. The specialist may also collect specimens (small swordfish, etc.) and tags from fishing boats as needed. The specialist will continue to serve as a liaison in collecting and distributing information relevant to the industry.

Marine Resource Dynamics Assessment Program (MARDAP): Sociocultural Profile of Pacific Islands Region Fishing Ports

P.I.: Thomas Schroeder [Stewart Allen]

Plans for the Next Year

The primary task will be completing final versions of the four papers and publishing them as NOAA technical memorandums. The need for additional publications and applications of the data will be explored. One of the above papers incorporates description of shoreside businesses and the fish distribution system, but additional fieldwork will be conducted to further explore these initial findings and a separate report developed on the distribution chain (with a focus on sociocultural aspects).

Marine Turtle Conservation and Management Initiative

P.I.: Thomas A. Schroeder [Charles Karnella]

Plans for the Next Year

Solomon Islands Sea Turtle-Fisheries Interaction Outreach Education Project

NOAA Fisheries will continue to monitor the situation with the government and fisheries in the Solomon Islands and look into opportunities to implement the project through the next fiscal year. There may be an opportunity for NOAA fisheries to investigate the situation in Honiara in September 2006 while conducting a site visit for another marine turtle project in the region.

New Caledonia Sea Turtle-Fisheries Interaction Outreach Education Project

It is expected the project will commence on January 15, 2007 and end on June 30, 2007. A final report will be submitted no later than July 31, 2007.

Mixed-Resolution Models for Investigating Individual to Population Spatial Dynamics of Large Pelagics

P.I.: John Sibert [Patrick Lehodey]

Plans for the Next Year

The project is almost completed. There are no additional funds required other than those already planned in FY2006 and not yet used (e.g., publication).

Tasks of the following months will be essentially devoted to publication in peer reviewed scientific journals. In addition to the papers describing changes in the model SEAPODYM and the results from the tagging data analysis, there is room for potentially three other articles.

- one describing the version Seapodym_APE and an application to skipjack
- one describing the mixed grid technique and the changes due to different resolution, i.e., effect of integrating

meso-scale in simulations (depending however of high resolution input data availability)

- one providing simulation results for 3 tuna species (skipjack, yellowfin and bigeye) over the last 50 years and discriminating between fishing and environmental/climate effects). This will require multiple simulations to obtain the best possible set of parameters.

The PI of the project will attend the PFRP PI meeting in November 2006 to present the conclusion of the project.

Modeling Longline Effort Dynamics and Protected Species Interaction

P.I.: PingSun Leung [Naresh Pradhan, Sam Pooley]

Plans for the Next Year

Complete the two journal articles submitted and prepare summary of overall project findings by December 31, 2006.

Modeling the Eco-Physiology of Pelagic Fishes and Sharks with Archival and Pop-up Satellite Archival Tags (PSATs)

P.I.: John Sibert [Michael Musyl, Christina Larsen, Hans Malte, Richard Brill]

Plans for the Next Year

Complete baseline research papers (below) on horizontal and vertical movements of sharks, tunas, and billfish and performance of PSATs. This information will be used to develop the IBMs. Tentative PSAT papers currently coordinated by Musyl and slated to be drafted in 2006.

- 1) Post-release survivability and movements of blue shark (*Prionace glauca*) from longline fishing gear in the Central Pacific Ocean as Identified by Pop-up Satellite Archival Tags (PSATs) by Musyl, Brill, Laurs, Foley, Bigelow, and McNaughton
- 2) Long Term Survivability of Pacific Blue Marlin (*Makaira mazara*) released from sportsfishing boats in Hawaii Determined from Pop-up Satellite Archival Tags (PSATs) by Musyl, Moyes, Brill, West, Bright, and McNaughton
- 3) Movements and migration corridors of Pacific Blue Marlin (*Makaira mazara*) in relation to oceanographic conditions Determined from Pop-up Satellite Archival Tags (PSATs) by Bigelow, Musyl, Brill, Laurs, Foley, and McNaughton
- 4) Temporal and Spatial Movement Patterns in Relation to Oceanographic Conditions for Epipelagic Sharks As Revealed by Pop-up Satellite Archival Tags (PSATs) in the Central Pacific Ocean: I. Oceanic White-tip shark (*Carcharhinus longimanus*) by Laurs, Foley, Nielsen, Bigelow, Musyl, Brill, and McNaughton
- 5) Temporal and Spatial Movement Patterns in Relation to Oceanographic Conditions for Epipelagic Sharks As Revealed by Pop-up Satellite Archival Tags (PSATs) in the Central Pacific Ocean: II. Silky shark (*Carcharhinus falciformes*) by Laurs, Foley, Nielsen, Bigelow, Musyl, Brill, and McNaughton
- 6) Behaviors and habitats of swordfish satellite tagged in the Atlantic and Pacific Oceans by Heidi Dewar, Eric Prince, Mike Musyl, Richard Brill, Jiangang, Joe Seraphy, Derk Snodgrass, Michael Laurs, Lianne McNaughton—draft complete

- 7) PSAT Performance and Meta Data Analysis Project by Musyl, Richard Brill, Michael Domeier, Molly Lutcavage, Lianne McNaughton, Yonat Swimmer, and Steve Wilson

Oceanographic Characterization of the American Samoa Longline Fishing Grounds for Albacore, *Thunnus alalunga*

P.I.: John Sibert [Michael Seki, Jeffrey Polovina]

Plans for the Next Year

Analysis of data obtained during the second year of the project (FY 2006) will continue during FY 2007, and the results prepared for publication in a peer review journal.

Pelagic Fisheries Research Program: Program Management

P.I.: John Sibert

Plans for the Next Year

- Education and training

The PFRP will continue to promote graduate education at UH and will work closely with SOEST administration and PIFSC staff to create a graduate degree curriculum.

- Facilitate international collaboration in research on pelagic fisheries.

The Scientific Committee and Specialist Working Groups of the WCPFC have supplanted the SCTB. PFRP staff and researchers will be participating in these groups. The PFRP Program Manager will participate fully in the CLIOTOP Steering Committee.

Protected Resources Environmental Compliance Initiative

P.I.: Thomas Schroeder [Chris Yates]

Plans for the Next Year

Plans for the next fiscal year under the PRECI project include hiring a Sea Turtle Biologist to support the recovery and conservation of sea turtles in the Pacific Region. JIMAR staff will continue to be key participants in evaluating human impacts on protected resources, working on conservation projects throughout the region, and developing and implementing outreach and education programs regarding marine mammals and sea turtles.

Regime Shifts and Recruitment in Western and Central Pacific Ocean Tuna Fisheries

P.I.: John Sibert [David Kirby]

Plans for the Next Year

Component (i)—This work has so far considered ecosystem properties within fixed geographical boundaries. Software is also under development to define dynamic boundaries based on multiple criteria; the variability of these ecological provinces can then be explored. Further spatial investigation is therefore planned and other analytical methods will be tested.

Component (ii)—During the time between annual stock assessments (after August 2006) work will be carried out to incorporate the results of Component (i) in the recruitment estimation procedures of the stock assessment software MULTIFAN-CL.

Component (iii)—The detailed dataset acquired during the ECOTAP diet study of yellowfin, albacore and bigeye conducted in French Polynesia in the early 1990's has been obtained for use in the project. A student has been assigned to examine recent samples of tuna stomachs from French Polynesia, to compile and analyze the whole 2001-2005 dataset and to compare it to the 1990s ECOTAP dataset.

Satellite Remote Sensing Research Program

P.I.: Thomas Schroeder [Jeffrey Polovina]

Plans for the Next Year

Analyses of electronic tagging data will be the focus of our 2007 work, leading to manuscripts for publication on movements and habitats of pelagic fishes. In addition, research results will be presented at scientific meetings.

Satellite Remote Sensing Research Related to the West Coast Integrated Ocean Observing System

P.I.: Thomas Schroeder [Franklin Schwing]

Plans for the Next Year

In addition to maintaining the existing data services, this project has two key priorities for the coming year.

- (1) Per the request of scientists at NMFS/AFSC, an Alaskan version of the West Coast Satellite data browser will be developed, with features specific to the region, such as map projections more suitable for high latitudes, and serving sea ice data. AOOS has expressed interest in the capabilities that will be provided by this Alaskan browser.
- (2) The time series for many parameters are already being served by IOOS DMAC-recommended methods by the OceanWatch Live Access Server at the ERD. We propose to develop "live", continually updating climatologies, which are required by resource managers to place satellite data within the context of long-term regional ocean dynamics.

Sociological Baseline of Hawaii Longline Industry

P.I.: John Sibert [Stewart Allen]

Plans for the Next Year

The primary task will be completing final versions of the four papers and publishing them as NOAA technical memorandums. The need for additional publications and applications of the data will be explored. One of the above papers incorporates description of shoreside businesses and the fish distribution system, but additional fieldwork will be conducted to further explore these initial findings and a separate report developed on the distribution chain (with a focus on sociocultural aspects).

Spatial Modeling of the Tradeoff between Sea Turtle Take Reduction and Economic Returns to the Hawaii Longline Fishery

P.I.: John Sibert [Minling Pan, Shichao Li]

Plans for the Next Year

- Run the refined sea turtle take General Additive Models with 12-year period (1994 to 2005) data while replacing three trip types (tuna, swordfish and mixed) with two set types in order to investigate the spatial and

seasonal tradeoff between turtle take reduction and economic returns (in terms of net returns) before and after the new regulation;

- Select optimal closure scenarios from sorted simulations by “efficient frontier”;
- Evaluate economic impacts of potential regulatory options for the sea turtle take cap using the refined sea turtle take General Additive Models developed by the current project; and
- Document the metadata for public access, data sharing with other PFRP projects, and the model modification; write JIMAR research report and peer-reviewed paper(s), and evaluate the possible application of the model to other protected species.

Survivorship, Migrations, and Diving Patterns of Sea Turtles Released from Commercial Longline Fishing Gear, Determined with Pop-Up Satellite Archival Transmitters

P.I.: John Sibert [Yonat Swimmer, Mike Musyl, Lianne McNaughton, Richard Brill]

Plans for the Next Year

We are currently working to analyze the data we’ve collected from all tags deployed on turtles since the beginning of this research project. To date, we have deployed 15 tags on primarily olive ridley turtles (plus one green turtle) caught and released on fishing gear off Costa Rica, 29 on loggerhead turtles and 1 olive ridley turtle in the North Pacific with the assistance of Hawaii and California-based NOAA fisheries observers, and 9 on loggerheads in the Southwest Atlantic Ocean attached by observers from Brazil. We will work cooperatively with Dr. Milani Chaloupka to establish survivorship models to meet our grant’s objectives. Additionally, with regards to future tagging efforts in Brazil and in the Hawaii fishery, we will work to improve tag retention and the amount of data obtained from each PSAT. Additionally, turtles’ most probable tracks are currently being determined via the Kalman-filter modeling approach. We continue to work with Anders Nielsen to refine these estimates based on incorporation of sea surface temperature data. Regarding the biochemical aspect of this proposed work; we plan to work with Dr. Amanda Southwood from University of North Carolina at Wilmington to analyze blood parameters from blood collected from incidentally caught loggerhead turtles in Brazil.

Sustainable Fisheries Initiative

P.I.: Thomas Schroeder [Alvin Katekaru, John Kelly, Charles Karnella]

Plans for the Next Year

Observer Program

The Observer Program will continue with its activities as described above but will participate in more outreach activities and produce more materials for outreach to the fishing industry and community as well as educational establishments. The program will increase its coverage rate to 20% in American Samoa and will increase its activities with the SPC/FFA.

Sustainable Fisheries and International Fisheries Program

SFD will continue to engage in outreach/education protected resources mitigation activities and conservation and management actions, authorized under the Magnuson-Stevens Act, for the U.S. domestic fisheries in the Pacific island areas. The IFP will continue its fisheries-marine turtle interaction outreach education activities in Papua New Guinea.

Trophic Ecology and Structure-Associated Aggregation Behavior in Tuna

P.I.: Kim Holland

Plans for the Next Year

Existing data will continue to be analyzed and published and tagging and gut content experiments are planned for the next (2006/07) pFAD fishing season.

Trophic Structure and Tuna Movement in the Cold Tongue-Warm Pool Pelagic Ecosystem of the Equatorial Pacific

P.I.: John Sibert [Valerie Allain, Robert Olson, Felipe Galván-Magaña, Brian Popp]

Plans for the Next Year

This 3-year project was scheduled to finish at the end of 2005. However, the labor-intensive sample collection and the time-consuming lab work have not given us sufficient time to fully exploit our extensive and unique dataset. In December 2005 the project received a time extension to October 31, 2006 and will be receiving additional PFRP funding during calendar year 2006. For now, sampling efforts have been terminated. The project extension will be dedicated to processing the remaining samples in the laboratory, data analysis, modeling, and publication of the results.

In the western and central Pacific, thanks to the additional PFRP funding for the project extension, two lab assistants will examine the remaining stomach samples. Diets of the main predators from this region will be analyzed and compared to the results from the eastern Pacific. The diet information will also be incorporated into an Ecopath model for the western and central Pacific. Stomach contents analysis of the diverse suite of predators collected in the eastern Pacific will continue. The diet information will form the basis for the graduate students' dissertation and thesis, will be synthesized into peer-reviewed publications, and eventually incorporated into a new Ecopath model for the eastern Pacific.

Compound-specific nitrogen isotope analyses of amino acids will be used to investigate a) the processes producing anomalous ^{15}N enrichment in bulk yellowfin tuna collected from Micronesia and French Polynesia, b) the effects of tissue catabolism during fasting on bulk $\delta^{15}\text{N}$ values of Oahu FAD-associated juvenile yellowfin tuna, c) the constancy and the mechanisms underlying the 7‰ per trophic level difference between the $\delta^{15}\text{N}$ of glutamic acid ("trophic transfer" amino acids) and the essential amino acids ("source" amino acids) using the distinct positive shift in the $\delta^{15}\text{N}$ of Oahu FAD-associated yellowfin tuna documented by Graham *et al.* (2006), and d) potential effects of commercial fishing on the trophic ecology of pelagic fishes in the eastern Pacific inferred from changes in trophic level based on the $\delta^{15}\text{N}$ of individual amino acids in archived fish tissues.

Further analysis of the trophic ecology of several key predator components of the pelagic ecosystem in the ETP will be investigated using comparisons with the geographical distribution of bulk $\delta^{15}\text{N}$ values of mesozooplankton and mesopelagic myctophid fishes, as proxies for the base of the food web. Plans include developing a model (*e.g.* GLM) to predict and map large-scale spatial patterns. Independent variables will include spatial and environmental factors.

Several papers for the different regions and comparative papers on diet and isotopes for the entire equatorial Pacific will be submitted for publication. Final results of the project will be presented during the Hawaii PFRP-PI meeting in November 2006.

Western Pacific Fisheries Information Network Project

P.I.: Thomas Schroeder [Michael Quach]

Plans for the Next Year

In FY2006, WPacFIN JIMAR will continue to work with and support the WPacFIN Program. WPacFIN JIMAR has several specific goals for the next fiscal year.

- 1) Improve Guam's commercial data collection program and Guam's creel survey data entry and data processing.
- 2) Develop an application and database to store fishery independent (ecosystem monitoring) data for American Samoa. These data are very important for establishing the fishery baseline. (However, the successful development of this application and database depends on the success of the data collection program, which is funded and administered by the local fishery office in American Samoa's Department of Marine and Wildlife Resources.)
- 3) Create computerized automation applications to output the Coral Reef Ecosystem Plan Team (CREPT) Fishery Management Plan annual report in Word documents for Guam, CNMI, American Samoa, and Hawaii. A WPFMC contractor developed a report for Guam, and it is currently under review by CREPT members. Once it is approved, staff will be working with the contractor to develop reporting specifications and implement computerized automation applications for all islands. This is a substantial undertaking requiring considerable input and feedback from several external sources and will likely take longer than one year to complete for all areas.
- 4) Continue developing an improved data reconciliation and integration system for the Fisherman and Dealer data systems maintained by HDAR to create a "best-available" commercial landings data set. Additional effort will be added to contact fishermen and fish dealers to improve the data and create a higher success rate in data integration.
- 5) Continue to design, program, and implement the American Samoa Tutuila-based, shoreline-based creel survey system for American Samoa's Department of Marine and Wildlife Resources.
- 6) Expand the Tutuila-based creel systems to incorporate Manua data collection.
- 7) Continue to update the WPacFIN Program website with current data and text.
- 8) Produce data summaries for the FUS and compile the next volume of FSWP for Guam, CNMI, American Samoa, and Hawaii.
- 9) Complete the design, programming, and implementation of a vessel classification system for American Samoa's Department of Marine and Wildlife Resources.
- 10) Provide information technology support to Hawaii and American Samoa fishery offices.

Coastal Research

Coral Reef Management Initiative

P.I.: Thomas Schroeder [Alan Everson, John Naughton]

Plans for the Next Year

Plans are to continue to work with the various Federal, State and local agencies to enhance the management of coral reef ecosystems throughout the Pacific. GIS database will continue to expand, participation in the Coral Reef Mitigation work will continue. Staff will continue with oversight of the LAS fishery management process and assist with project implementation in Hawaii, Guam, CNMI and American Samoa. Coral reef outreach/education efforts will also continue in all of the jurisdictions.

National Environmental Policy Act (NEPA) Initiative

P.I.: Thomas Schroeder [Charles Karnella]

Plans for the Next Year

Solomon Islands Sea Turtle-Fisheries Interaction Outreach Education Project

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It is expected the project will commence on January 15, 2007 and end on June 30, 2007. A final report will be submitted no later than July 31, 2007.

Sustaining Healthy Coastal Ecosystems

P.I.: Thomas Schroeder [Russell Brainard]

Plans for the Next Year

Continued coral reef assessment and monitoring efforts are scheduled for FY2007 on board the NOAA Ships *Oscar Elton Sette* and *Hiialakai*. There will be CRED research cruises to the MHI, NWHI, Guam, CNMI, and Wake Atoll. Benthic habitat mapping and characterization efforts will be conducted off the R/V *AHI* and the NOAA Ship *Hiialakai*, and are scheduled for all locations. Replacement and deployment of various oceanographic and meteorological monitoring platforms are also scheduled for all locations next fiscal year.

Marine debris plans for FY2007 include continuation of removal efforts in the NWHI on the NOAA Ship *Oscar Elton Sette* as well as continued collaboration with potential U.S. Coast Guard deployments in the NWHI. There are also plans for continuation of the ongoing MHI marine debris cleanup that was based on helicopter surveys conducted in early 2006.