

**JIMAR, PFRP ANNUAL PROGRESS REPORT
FY 2002**

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Project Proposal Title: Pelagic Fisheries Research Program: Program Management

Funding Agency: NOAA

1. Purpose of the project and indicative results.

Manage the activities of the PFRP, solicit and implement new research proposals, and promote science based management of fisheries for highly migratory fisheries in the western Pacific Ocean.

2. Progress during FY 2002. Provide a thorough discussion of accomplishments and problems.

The PFRP initiated a major request for proposals in December 2001 and was rewarded with forty letters of intent to submit proposals. The total cost of the proposed work was over \$4,000,000, more than four times the funds available. These letters of intent were winnowed down by the PFRP Steering Committee to 18 full proposals with a total cost of over \$2,000,000. A suite of 15 projects was selected for funding on the basis of peer review. The total cost of these projects exceeds the funds available in the current budget. Therefore, eleven projects will be funded from the current FY2002 appropriation. The remaining four will be deferred until some of the currently active projects have been completed and will be funded from the anticipated FY2003 appropriation.

The RFP called for research projects in areas of ecosystem-based fishery management, integrated statistical models of protected species population dynamics, management of Southern Albacore fisheries, dynamics of tuna aggregation, and social sciences. A list of successful projects is appended to this report. The RFP process was assisted by two workshops: Protected Species Modeling Workshop and the 2001 PFRP Principal Investigators Meeting which focused on ecosystem-based fishery management. These workshops assembled some of the leading researchers in these fields and helped to identify feasible research projects and productive collaborations.

The productivity of PFRP research projects remains high. Approximately fifteen of the thirty-four presentations at the 2002 Lake Arrowhead Tuna Conference were based on PFRP funded projects. This unusually high proportion was due to both an increase in PFRP productivity and lower than average attendance at the Tuna Conference.

The PFRP remains active in international tuna research and management. The PFRP Program Manager was an active member of the United States Delegation to the Second Preparatory Conference for the Commission for the Conservation and Management of Highly Migratory Fish Stocks in Western and Central Pacific in Madang, 21 February – 1 March, 2002. The PFRP will co-host the fifteenth meeting of the Standing Committee on

Tuna and Billfish in Honolulu July 18 – 27. Scientists from The SCTB are regarded as the most definitive source for information on fisheries for highly migratory species in the Pacific Ocean. Participants from most Pacific Island countries, Australia, Indonesia, Philippines, Viet Nam, Taiwan, China, Korea, and possibly Japan are expected. In the context of the SCTB Methods Working Group, the PFRP has been coordinating evaluation of stock assessment methods through the use of fishery simulations.

The graduate research assistantship program got off to a bad start in 2001. No economics students were identified and the oceanography student withdrew from the University midway through the first semester. For 2002, a new oceanography student has been accepted to work under UH Geology and Geophysics professor Dr. Brian Popp, in stable isotope and pelagic food webs. In addition, a geography student has been accepted to work with UH Geography professor Matthew McGranaghan on visualization of geographic information for oceanography and fisheries.

One of the major problems encountered during the last reporting period was the excessive time lag between approval of projects and the advent of funding at the University. Requests for funding action on a large number of PFRP projects were made to NOAA in September and October 2001. Funds were not awarded to the University until May 2002.

3. Plans for the next fiscal year.

1. Establish a degree program in fisheries at the University of Hawaii. PFRP Management funds will be used to hire a faculty member to update and implement the long-standing proposal for a graduate degree in tropical fisheries and aquaculture.
2. Streamline funding procedures to decrease the time lag in implementation of PFRP projects.
3. Convene a meeting of PFRP PIs with the theme of improving mechanisms for applying electronic tags to large pelagic fish.
4. Facilitate international collaboration in research on pelagic fisheries.

New Projects 2002 — 2003

Ecosystem-based fishery management

1. Comparisons of Catch Rates for Target and Incidentally Taken Fishes in Widely Separated Areas of the Pacific Ocean; PIs: W. Walsh and S. Pooley.
2. Describing the Spatial Dynamics (Vertical and Horizontal) for Large Pelagics in the Central Pacific Ecosystem with Pop-up Satellite Archival Tags; PIs: J. Polovina and M. Seki. *From FY 2003 appropriation.*
3. Evaluating Biochemical and Physiological Predictors of Long Term Survival in Released Pacific Blue Marlin tagged with Pop-up Satellite Archival Transmitters (PSATs); PIs: M. Musyl, C. D. Moyes, and R. W. Brill.

Consideration of the effects of fishing on non-target species is one of the canons of ecosystem-based fishery management. These three projects will add substantially to our ability to assess fishery impacts fish species incidentally caught in longline fisheries.

4. Trophic Structure and Tuna Movement in the Cold Tongue-Warm Pool Pelagic Ecosystem of the Equatorial Pacific; PIs: V. Allain, B. Fry, R. Olsen, F. Galvan Magaña, and B. Popp.

The major industrial fisheries for tunas in the Pacific occur in two distinct oceanographic regimes: the shallow mixed layer “cold-tongue” ecosystem in the Eastern Pacific Ocean west of Central America; and the deep mixed layer “warm-pool” ecosystem in the Western Pacific Ocean near Papua New Guinea. Researchers from Hawaii, New Caledonia, Mexico and California will analyze the basis of tuna productivity in these two ecosystems and will provide information to compare to related PFRP-sponsored research on the North Pacific production systems. The research involves analysis of the food of target and non-target species using traditional diet analysis and modern high-tech stable isotope analysis. The results will help to distinguish between fluctuations in abundance due to changes in forage base and fluctuations in abundance caused by fishing.

5. Application of a Continuous Advection-Diffusion Equation to Spatial Mixed Resolution Dynamics Population Models; PI: P. Lehodey. *From FY 2003 appropriation.*

Will integrate information from studies of individual movement into ocean-basin scale models of tuna populations based on models of forage distribution and increases the spatial resolution of these models in areas of special interest such as Hawaii. This model will also serve as a means of interpreting the results of other PFRP studies of ecosystem structure.

6. Patterns and Causes of Declines in World Billfish Catch Rates; PIs: R. Myers and P. Ward.

The usual indices of stock abundance for marlins, for example catch per unit of effort (CPUE), derived from the analysis of longline catch and effort data generally show

extreme declines early in the available time series. Often, these declines are too extreme to attribute to global stock-wide decrease in abundance. The research proposed here is long overdue and will contribute to an understanding of this phenomenon on a world-wide basis and an improvement of marlin stock assessments.

Integrated statistical models of protected species population dynamics

1. Integrated Statistical Model for Hawaiian Albatross Populations; PIs: D. Goodman and J-D Lebreton.
2. A General Bayesian Integrated Population Dynamics Model for Protected Species; PI: M. Maunder. *From 2003 appropriation.*

Sustainability of commercial fisheries increasingly depends on recovery of species protected under the Endangered Species Act. Population dynamics models currently applied to many protected species do not make complete use of the available data and do not incorporate uncertainty in a very sophisticated fashion. These two research programs will apply two different modeling approaches to develop state-of-the-art population models of for Hawaiian albatross and other populations of endangered species. The complementary approach of the two modeling groups will enable some economies in preparing the raw for analysis. The inevitable differences in model results between the two approaches will promote closer analysis of model assumptions and will ultimately increase the credibility of both models.

3. Development of a Hierarchical Model to Estimate Sea Turtle Rookery Contributions to Mixed Stocks in Foraging Habitats; PIs: B. Bolker, K. Bjorndal and A. Bolten.

The nucleotide sequence in fragments of DNA extracted from tissue samples is often used to determine the stock structure of populations and to ascribe an individual to a specific sub-population. The current statistical methods applied to such problems can sometimes be ambiguous. This project seeks to develop a new statistical approach to the problem mixed stock resolution of genetic data. The methods will be developed using populations of Atlantic turtles and will be applied to Pacific species in second year.

4. Direct Tests of the Efficacy of Bait and Gear Modifications for Reducing Interactions of Sea Turtles in Costa Rica; PIs: Y. Swimmer, R. Brill, C. Boggs, M. McCracken, and R. Arauz.

This project will directly test longline gear modifications for their efficacy in reducing interactions with sea turtles in an environment where the interaction rate is much higher than that in the Hawaii longline fleet.

Management of Southern Albacore fisheries

5. Ecological Characterization of American Samoa's Small-Scale Alia Albacore Longline Fishery (Sentinal Monitoring of the American Samoa Small-Scale Longline Fishery); PIs: J. Kaneko, P. Bartram, and T. Beeching.
6. Oceanographic Characterization of the American Samoa Longline Fishing Grounds for Albacore, *Thunnus alalunga*; PIs: M. Seki and J. Polovina.

Longline fisheries targeting southern albacore tuna have grown explosively in American Samoa (and in Samoa as well) since 1995. Currently fisheries based in Pago Pago and Apia collectively comprise approximately 20% of the southern albacore catch and have become important economic resources in both areas. These two projects will collect badly need information on incidental catch and bycatch in the American Samoa fishery, assess the feasibility of tagging longline caught albacore, and provide the oceanographic background for interpreting fluctuations in catches.

Dynamics of tuna aggregation

7. Instrumented Buoys as Autonomous Observations of Pelagic Ecosystems; PIs: K. Holland and L. Dagorn. *From 2003 appropriation.*

Approximately 70% of the world tuna catch is caught by purse seine around floating objects, man-made fish aggregation devices (FADs) or logs. The fish caught in this manner are often juvenile and almost exclusively so for bigeye tuna. Unfortunately, the impact of this removal on tuna population dynamics is completely unknown. This project will test feasibility of using “smart” FADs to analyze the aggregative behavior of tunas around floating objects and for relating behavior in aggregations to population abundance and extends the work on the relationship between feeding and aggregation currently in place in Hawaii. The “smart” FADs will be instrumented with acoustic detection equipment, devices to monitor the movement of fish equipped with electronic tags, and equipment to remotely interrogate the on-board systems.

Social sciences

8. A Sociological Baseline of Hawai'i's Longline Fishery; PIs: S. Pooley and S. Allen.

This project will supply long-overdue data that can be use for social impact analysis of regulations on the Hawaii longline fleet.

9. Modeling Longline Effort Dynamics and Protected Species Interaction; PIs: P. Leung, N. Pradhan, and S. Pooley.

This project updates previous work on optimal fleet composition in light of recent changes in fishery and will improve the usability of the economic model.