JIMAR, PFRP ANNUAL PROGRESS REPORT FY 2002

P.I. Name: Sam Pooley

Project Proposal Title:

Regulatory Impact Analysis Framework for Hawaii Pelagic Fishery Management

Funding Agency: Pelagic Fisheries Research Program/NOAA

Project Purpose and Indicative Results: The objective of this project was to revise the multi-level, multi-objective programming model for the Hawaii fishery created by the Leung project (PFRP #2066/2113) by making it more tractable for regulatory analysis. This would involve revising the basic model structure to allow more flexible time-area specification as well as updating the underlying data. The update focuses on the Hawaii longline fishery.

Project Activities and Progress During FY 2002: The intended research associates for this project subsequently made other commitments since project funding would lapse in July 2002. Nonetheless the first research assistant, Dr. Xiulin Gu, thoroughly documented the model's GAMs programs and identified a number of issues concerning the inter-relationship of parameters in the model and the data demands for seeding the GAMS program. Mr. Keiichi Nemot, graduate research assistant, was picked up in the Spring of 2002 and has accomplished most of the initial tasks in the project objectives. This includes modifying the GAMS program to be simpler and more visible so that it can be easily adjusted to a different schema of area, season, target and species. He is also developing a dta processor that could flexibly generate the parameters for 5 to 8 rectangular areas that are more realistic for fisheries management. The latter use existing up-to-date monthly 1-degree summary data provided from the NMFS longline logbook program.

Planned Project Activities for FY 2003: See attached "Proposal to Continue Research" and budget sheet

Papers Published in Journals During FY 2002: None

Other Papers, Reports, and Presentations During FY 2002:

Gu, Xiulin. 2001. Assessment of fishing capacity in domestic fisheries: Hawaii based longline fleet. (informal project report).

Gu, Xiulin. 2001. Sensitivity analysis, non-inferiority set estimation, and a multiobjective programming model. (informal project report).

Graduating Students with M.S. or Ph.D. Degrees During FY 2002: None.

Budget: See attached budget sheet

Proposal to Continue Research Regulatory Impact Analysis Framework for Hawaii Pelagic Fishery Management PFRP Project 657863 PI: Sam Pooley

Background:

This project began with an earlier era PFRP research project¹ that developed the Multilevel Multi-Objective Programming Model (MMPM) of Hawaii's pelagic fisheries. We developed a subsequent proposal (Pan and Pooley, April 26, 2000) to continue that research in order to make the original model more flexible and to update its data. However the project was not funded until August 2001 which led to an interruption in the project and loss of some project funds due to the expiration of the previous JIMAR cooperative agreement. Over the past year a graduate research assistant, Mr. Keiichi Nemoto, has been working on the project supplemented with NMFS funds in an attempt to meet some of its original goals. This proposal requests funding to continue that work.

The project is one of a group of economic studies under PFRP directed toward developing formal economic models of Hawaii fisheries. Even though their approaches to modeling differ, the common purpose of these studies is toward understanding the economic consequences of alternative regulatory policies to assist decision-making. The MMPM considers the variations of economic elements within the fisheries such as motivation and vessel size, covering nine fleet categories and ten fishing strategies (targets), reflecting the various components and behaviors noted in this complex fishery. The MMPM incorporates objectives of both policy-makers and fishermen, in this case maximization of net revenue for commercial fishing and fishery participation for recreational fishing. As such the model is designed to accommodate two types of optima. The optimal fishing effort of the MMPM was determined based on not only trip returns but also expected annual returns to owner and crew of each individual fleet.

Objective of the Research

The objective of this project was to update a practical and comprehensive model to evaluate existing and potential regulatory impacts of the management regimes for reducing by-catch and protected species interactions in longline fishery. The project expands upon previous modeling efforts funded by Pelagic Fisheries Research Program (PFRP) by modifying the allocation model (MMPM) developed by Leung *et al.* (1999) to include more flexibly-defined fishing areas.

¹ PFRP Project 2066 (2113) – A Multilevel and Multiobjective Programming Model of Hawaii Commercial Fisheries, PIs: PingSun Leung and Stuart Nakamoto, completed in 1999.

Description of Work

The following are the original descriptions of work from the 2000 project proposal with some commentary on what needs to be done next.

1. Modify Leung *et al.* (1999)'s multilevel and multiobjective programming model (MMPM) by re-defining areas to a flexible classification system. The proposed study will incorporate a "hypothesis fishing area" – a regulatory area whose range and shape can be adjusted based on the need of regulation, into MMPM (Figure 1). A hypothesis area is necessary since the fixed classification system of the existing model limits its application in dealing with various policy options concerning fishing area. Under a flexible classification system, the parameters of the regulatory area will be the same as the given area if the regulatory area happens to be one of the fix area defined in the model; And the parameters of the regulatory area can be directly generated from the weighted average of the parameters from all the areas that the regulatory area covers or re-estimated as a new area if it is a combination of different areas. – **This task is essentially completed.** –



Figure 1. An Example of the Flexible Area Classification

- Modify the structure of MMPM by re-defining the shape and range of a basic area given some stocks are migratory and the variations in production technology and convenient design of the data engine. The exiting MMPM utilizes five concentrated areas radiating from Honolulu may not be adequate to represent the variations of the stock and production technology for Hawaii fisheries. However, most of regulatory areas (except for coastal areas) are defined as straight-line boundaries. In addition, catch data from NMFS logbook and HDAR catch reports can be easily summarized to 1° or 5° degree square. To meet the needs of policy analysis and be convenient for inquiring data, the MMPM needs a new area classification. It could be most convenient to define areas that can be aggregative of 1° square. This task is essentially completed. –
- 3. Develop a data engine to support a flexible area, season, target, and species classification system for the model and sensitivity analysis. This task is essentially completed. -
- 4. Update model parameters based on the new structure of the model using the most recent (1999 or 2000) HDAR, longline logbook, and new cost-earnings survey data (if available); includes trade-offs by type of longline vessels. **This task has not been started.** –
- 5. Estimate the regulatory impacts of new and potential area closures, and other relevant policy options; This task has not been started. –
- 6. Estimate the change in the trade-off value between small boats and longline fishery with area regulation; This task has not been started. –

In addition we would implement one substantive improvement to the model, i.e., trying a different CPUE profile in the variable catch rate component of the catch function. A further extension would be to introduce a dynamic element to the model through the vessel entry-exit condition and incorporating an upward-sloping labor supply function (for the crew). These activities would be secondary to completing tasks #4 and #5.

Time Frame:

This was to be a two-year project. This first year was to be devoted to a preliminary modification and test of the model structure to incorporate flexible area classification, and to develop an associated data engine. The second year was to be spent on preparing up-to-date time-series data for subsequent testing, and estimating regulatory impacts, and preparing the final report and professional papers.

The proposed second year will incorporate some of the first year tasks as well as those proposed for the second year. If the project is funded on time and the current research assistant remains available, then these tasks should be completed within 12 months. If not, then a new research assistant will be required and this will extend the project to 18 months.

Budget: (See attached budget sheet).

Linkages to Other Components of PFRP:

This study extends the comprehensive programming model developed by Leung, et al. (PFRP project # 2066) and uses the cost-earnings developed by the first HIFIVE project (PFRP project #2046) and the catch and effort data summaries and follow-on longline cost-earnings data developed by the follow-on HIFIVE project (PFRP project # 653530). Cost data developed by Travis (PFRP project #2166) and more recent HIFIVE project (PFRP Project #653530) will also be used in the longline component of this study. This study may also utilize the empirical catchability coefficient component of Chakravorty (PFRP project #2118) in modifying the Variable Catch Rate component of the Leung, et al. model.

References:

Chakravorty, U., and K. Nemoto. 2000. Modeling the Effects of Area Closure and Tax Policies: A Spatial Model of the Hawaii Longline Fishery. SOEST 00-02, JIMAR Contribution 99-329, Pelagic Fisheries Research Program, University of Hawaii at Manoa, Honolulu.

Pan, M., P.S. Leung, F. Ji, S.T. Nakamoto, and S.G. Pooley. 1999. A Multilevel and Multiobjective Programming Model for the Hawaii Fishery: Model Documentation and Application Results. SOEST 99-04, JIMAR Contribution 99-324, Pelagic Fisheries Research Program, University of Hawaii at Manoa, Honolulu.