

## JIMAR ANNUAL REPORT FOR FY 1999

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GRADUATE ASSISTANTS: Jill Muraoka (MS Candidate), and Minling Pan (Ph.D. Candidate)

PARTICIPATING RESEARCHERS: Fang Ji and Omar El-Gayar

PROJECT PROPOSAL TITLE: **A Multilevel and Multiobjective Programming Model of Hawaii Commercial Multifishery**

FUNDING AGENCY: NOAA

### **1. Purpose of Project:**

To develop and test a multilevel and multiobjective programming model of the Hawaii commercial multifishery. The multilevel aspect of the model is an attempt to incorporate and analyze objectives of both the policy makers and fishermen. In addition, the use of a multiobjective model is essential, as the complexity of fishery management requires the implementation of more than one general objective.

### **2. Progress during FY 1999:**

#### *A. Determine Management Goals of the Hawaii Multifishery.*

This task is completed. See FY 1998 Progress Report.

#### *B. Modify and Extend the NMFS Linear Programming Model*

This task is completed. See FY 1998 Progress Report.

#### *C. Operationalize the Developed Model on a Microcomputer.*

The model has been computer-coded using the software program GAMS for solution. Appropriate databases of inputs have been developed using MS FoxPro to facilitate the evaluation of different scenarios, and to facilitate future updating, as more and improved data become available. Interfaces (computer routines) have also been developed using MS Excel to extract relevant model results for clarity of presentation. The entire modeling system has been integrated as a Fishery Management Decision Support System (FMDSS). A User's Manual has also been prepared. The system has been distributed to potential users in NMFS and WPRFMC.

#### *D. Scenarios Development and Evaluation.*

The model has been used to evaluate the economic impact of closing area within 75 nm from the shore for the longliners to reduce conflict between the longliners and the recreational fishers. It was estimated that such an action would have incurred an economic efficiency loss of \$0.44 to \$0.70 million. Or, in other words, the cost of avoiding conflict between the longliners and the small boats amounted to about \$0.44 to \$0.70 million. The model was also used to estimate the tradeoffs between the commercial and recreational fisheries. At the current level of recreational participation, the economic rent loss per recreational trip was estimated to be about \$12.14.

A technical report documenting the current model formulation and the detailed results has been forwarded to the JIMAR Office to be published as a JIMAR Research Report. A draft paper is being prepared at this time for journal submission and for presentation at the International Water and Resource Economics Consortium Meeting, June 29 – July 2, 1999, Kamuela, Hawaii.

### **3. Plans for the next three months:**

#### *A. Determine Management Goals of the Hawaii Multifishery.*

- Completed

#### *B. Modify and Extend the NMFS Linear Programming Model*

- Completed.

#### *C. Operationalize the Developed Model on a Microcomputer.*

- Completed. Finalize Model Documentation and User's Manual. Assist NMFS and WPRFMC users to resolve possible problems in using FMDSS.

#### *D. Scenarios Development and Evaluation.*

- Completed. Prepare journal submission and prepare paper presentation at the Economics of Marine Resources Session, International Water and Resource Economics Consortium Meeting.

### **4. List of Papers Published in Refereed Journals:**

- Leung, P.S., J. Muraoka, S.T. Nakamoto, and S. Pooley. "Evaluating Fisheries Management Options in Hawaii Using Analytic Hierarchy Process (AHP)," *Fisheries Research* 36(1998) 171-183.

### **5. Other Papers, Technical Reports, etc.**

- P.S. Leung, M. Pan, F. Ji, S.T. Nakamoto, and S.G. Pooley. "A Bilevel and Bicriterion Programming Model of Hawaii's Multifishery," Proceedings of the Workshop on Ocean-Scale Management of Pelagic Fisheries: Economic and Regulatory Issues, East-West Center, Honolulu, Hawaii, November 12-13, 1997.
- M. Pan, P.S. Leung, F. Ji, S.T. Nakamoto, and S.G. Pooley A Multilevel and Multiobjective Programming Model for the Hawaii Fishery: Model Documentation and Application Results, forthcoming JIMAR Report.
- O. El-Gayar and F. Ji. Fisheries Management Decision Support System (FMDSS), User's Manual, forthcoming JIMAR Report.
- A Decision-Support Model for Hawaii Fishery Management – A Multilevel and Multiobjective Programming Approach, paper under preparation for journal submission.

**6. Names of Students Graduating with MS or Ph.D. Degrees during FY 1999; Titles of their Thesis and Dissertation.**

- Minling Pan. A Multilevel and Multiobjective Programming Model for Hawaii Fisheries Management. Ph.D. Dissertation, University of Hawaii at Manoa, December 1998, 239pp.