

JIMAR, PFRP ANNUAL PROGRESS REPORT FY 2004

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Project Proposal Title: Modeling Longline Effort Dynamics and Protected Species Interaction

Funding Agency: NOAA

1. Purpose of the project and indicative results.

The general aim of the proposed study is to refine and extend the existing fleet dynamic model, and the specific objectives and tasks are as follows:

- (1) Extend the longline trip level time-series data set to 2002.
- (2) Re-estimate the technical and economic interrelationships among different species landed; and the entry/stay/exit behavior.
- (3) Estimate the catch-effort relationships for each species and for each fleet.
- (4) Analyze the factors, rate, and degree of protected species interaction (e.g., turtles, and seabirds) with longline fishing activities.
- (5) The information generated above will be incorporated into the existing fleet dynamic model in maximizing fishery welfare and fishing effort considering broader implications on protected species and stock conditions.

2. Progress during FY 2004. Provide a thorough discussion of accomplishments and problems.

The following summarizes the major activities:

- (1) The longline trip level time-series dataset has been extended to 2002.
- (2) A modified surplus production model was used to model the catch-effort relationships of the multi-species harvested in three different trip types, i.e., tuna, swordfish and mixed trips. The model was estimated using a two-step seemingly unrelated regression (SUR) to take into account the differential catchability of the three trip types. The results appear reasonable and are being evaluated at this time. A draft paper documenting the estimated model and results is under preparation.
- (3) Analysis of sea turtle interaction with the longline fishery using Poisson and negative binomial regression models has been completed. The study explored the factors and degree of sea turtle interactions with the longline fishery in an analytical framework of rare events using the count data models for the period 1994-2003. Fishing season, turtle population, and technologies used in catching fish significantly explained the sea turtle interactions with the longline fishery. Previous history of interactions had positive impact on sea turtles interaction, but was not significant. Similarly, spatial factor failed to explain turtle interaction in the swordfish directed trips. Without a dramatic development of a technology to avert sea turtles in longline fishing there is about 4.99% and 23.41% chance that at least one sea turtle/trip will be encountered in

a tuna and swordfish targeted fishing trips, respectively. Few of the feasible factors that attributed significantly on turtle interactions can be regulated. A paper documenting the estimated models and results has been submitted to *Ecological Economics* for possible publication.

- (4) Modification and improvement of the existing fleet effort dynamic model in maximizing fishery welfare by incorporating protected species as well as the newly estimated catch-effort relationships is currently underway.
- (5) Two papers are forthcoming, and another paper is under review. Two journal papers from the previous project have also been published in 2003 (see publication list below).

3. Plans for the next fiscal year.

The next twelve months will be spent on

- (1) Finalize the estimated catch-effort relationships.
- (2) Continue to work on the modifications, improvements, and testing of the fleet effort dynamics model by considering protected species interaction with the longline fishery and the newly estimated catch-effort relationships.
- (3) Prepare papers from (1) and (2) above for conference presentations and journal publications.

4. List of papers published in refereed journals during FY 2004.

- 1) Pradhan, N.C. and P.S. Leung. 2004. "Modeling entry, stay, and exit decisions of the longline fishers in Hawaii," *Marine Policy*, 28:311-324.
- 2) Pradhan, N.C. and P.S. Leung. "Modeling trip choice behavior of the longline fishers in Hawaii," *Fisheries Research (Forthcoming)*.
- 3) Pradhan, N.C. and P.S. Leung. "A Poisson and negative binomial regression model of sea turtle interactions in Hawaii's longline fishery," *Ecological Economics (Under review)*.
- 4) Pradhan, N.C., K.R. Sharma and P.S. Leung. 2003. "Analyzing Technological and Economic Interrelationships in Hawaii's Longline Fishery," *Marine Resource Economics*, 18:167-193.
- 5) Sharma, K.R., N.C. Pradhan, and P.S. Leung. 2003. "Technological and Economic Interrelationships in Hawaii's Troll and Handline Fisheries," *North American Journal of Fisheries Management*, 23:869-882

5. Other papers, technical reports, meeting presentations, etc.

- 1) Preliminary analysis of the sea turtle interaction with the longline fishery was presented in the 2003 December PFRP meeting.
- 2) The paper on “Modeling entry, stay, and exit decisions of the longline fishers in Hawaii” will be presented at the International Fishery Economics and Trade conference to be held in Tokyo, Japan on July 21-30, 2004.
- 3) The paper on “A Poisson and negative binomial regression model of sea turtle interactions in Hawaii’s longline fishery,” will be presented in the American Fisheries Society’s meeting to be held in Madison, Wisconsin on August 21-26 2004.

**6. Names of students graduating with MS or Ph.D. degrees during FY 2004.
Include title of thesis or dissertation.**

Naresh C. Pradhan. “*Three Essays on the Economics of Hawaii’s Longline Fishery: Modeling Fishers’ Behavior.*” *Ph.D. Dissertation.* Department of Economics, University of Hawaii at Manoa, August 2003.