JIMAR – PFRP ANNUAL REPORT FOR FY 2005

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Project Proposal Title:

Integrated modeling for Hawaiian Albatross Populations

Funding Agency: NOAA

NOAA Goal (Check those that apply):

- x☐ To protect, restore, and manage the use of coastal and ocean resources through ecosystem-base management
- ☐ To understand climate variability and change to enhance society's ability to plan and respond
- ☐ To serve society's needs for weather and water information
- ☐ To support the nation's commerce with information for safe, efficient, and environmentally sound transportation

1. Purpose of the Project

The purpose of the project is to analyze available information concerning Black-footed (*Phoebastria nigripes*) and Laysan (*Phoebastria immutabilis*) albatross (BFAL and LAAL for the sake of brevity in what follows). These analyses aim at assessing the status of their populations in relation with the potential impact of longline fisheries. While BFAL population size is about one tenth of LAAL's, the ratio of by-catch by longline fishing is higher. This suggests a high impact of longline fishing on BFAL, with potential biologically significant consequences. Due to the uncertainty on population size (roughly 300 000 individuals), and the level of by-catch in the 90s (between 5 000 to 12 000 individuals), up to now the impact of by-catch on population dynamics and sustainability in BFAL remains unknown, although such a

level is considered on general grounds as high enough to be detrimental. Furthermore, little is known about the demography and biology of both BFAL and LAAL, for example for what concerns age and rate of recruitment, adult and juvenile survival, rate of pair reformation after widowhood.
The project is divided in three main steps:

- Estimation of demographic parameters by capture-recapture analysis of existing data and analysis of census data
- Integration of these pieces of information in a matrix model, integrating as much biological specificities as possible, such as intermittent breeding, widowhood and time to repair…
- Last, development of integrated models, using in particular the Kalman filter and Bayesian approaches, to combine likelihoods for the various pieces of information available.

2. Progress during FY 2005 (One-two paragraphs, including a comparison of the actual accomplishments to the objectives established for the period, and the reasons for slippage if established objectives were not met):

a- Compilation of data

A large part of the year was used to finalize the compilation of information required for the analysis. This included updating capture-recapture data of BFAL and LAAL, getting data on fishing effort and on recoveries of ringed animals caught by Hawaiian fleet. We also met people from the Pacific Fish and Wildlife Service involved in albatrosses project, in order to obtain more details on study design and sampling methods.

b- Analyses of capture recapture

We started the analysis of capture-recapture data for adults BFA using models with heterogeneity in capture probability developed in our laboratory. Without the use of these models, the survival estimates are underestimated. As a first approach, we performed the analysis using a model where survival was constant over time. We confirmed the existence of heterogeneity in recapture probability (survival estimated at 0.903 in a classical model versus 0.92 when taking into account heterogeneity). All analyses were performed using software U-CARE and M-SURGE.

c- Estimation of by-catch

A major source of uncertainty comes from the estimation of by-catch rate. Up to now, estimation of by-catch was direct, relying on counting the number of animals caught on boats with observers, extrapolating to American fleet and to other fleet. An important source of variance in the estimation of by-catch comes from the extrapolation to a large scale. We plan to estimate the by-catch rate using another method relying on the combination of capture-recapture and recoveries data. This

estimate will be used for validating the former estimation method for obtaining more accurate estimates. It thus could be used in the future as a useful and powerful tool for the management of by-catch rate. In practice, we built a multi-state capture-recapture model that includes recoveries of caught birds by boats with NOAA observers.

d- Integrated modeling

We collaborated with Mark Maunder and Simon Hoyle of the IATTC, involved in a PFRP project of "general Bayesian integrated population dynamics model for protected species". We established a common capture-recapture model and matrix model that we plan to use as a common framework for integrated modeling.

3. Plans for the next fiscal year (one paragraph):

We will finalize all the analyses, which include:

- Complete the estimation of demographic parameters by adding analysis of juveniles, and establishing more complex capture-recapture models accounting for heterogeneity (time and age dependent…).
- Estimate by-catch rates with recapture-recoveries models and compare with the figures obtained with the former method based on direct count.
- Finalize the integrated modeling, using census information and compare the results we obtain using the Kalman Filter method with those obtained by Mark Maunder and Simon Hoyle using Bayesian method.
- Evaluate the impact of by-catch on the demography of the specie.
- Compare our analysis and results with the case of southern hemisphere albatrosses submitted to the same pressure of longline fishing.
- Run the same analysis for LAAL and compare the results

4. List of papers published in refereed journals during FY 2005.

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

Presentation at the PFRP Principal Investigators Workshop, Honolulu, December 2004 :
"Towards integrated modeling of Black Footed Albatross population"

6. **Graduates (Names of students graduating with MS or PhD degrees during FY 2005. Provide titles of their thesis or dissertation):**

7. **Awards (List awards given to JIMAR employees or to the project itself during the period):**

8. **Publication Count (Total count of publications for the reporting period and previous periods categorized by NOAA lead author and Institute (or subgrantee) lead author and whether it was peer-reviewed or non peer-reviewed (not including presentations):**

	JL Lead Author			NOAA Lead Author			Other Lead Author		
	FY03	FY04	FY05	FY03	FY04	FY05	FY03	FY04	FY05
Peer-reviewed									
Non-peer reviewed									

9. **Students and Post-docs (Number of students and post-docs that were associated with NOAA funded research. Please indicate if they received any NOAA funding. For institutes that award subcontracts, please include information from your subgrantees):**

2 PhD students (Sophie Véran and Viviane Hénaux). One received some NOAA funding.

10. **Personnel:**

(i) Number of employees by job title and terminal degree that received more than 50% support from NOAA, including visiting scientists (this information is not required from subgrantees): 0

(ii) Number **of employees/students that received 100% of their funding from an OAR laboratory and/or are located within that laboratory.** 0

(iii) **Number of employees/students that were hired by NOAA during the past year:**
0

11. **Images and Captions (JIMAR will be including images in the annual report. Please send two of your best high-resolution, color images (photo, graphic, schematic) as a JPEG of TIFF with a caption for each image. Hardcopies of images can be dropped off at the JIMAR office if no electronic versions are available.**

- **Caption 1:**

- **Caption 2:**