Introduction to the Workshop on the Factors Influencing Albatross Interactions in the Hawaii Longline Fishery: Towards Identifying Drivers and Quantifying Impacts

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Purpose of the workshop

The Hawaii longline fishery has been required to use seabird mitigation measures under the Pacific Pelagic Fishery Management Plan (current Fishery Ecosystem Plan, or FEP) since 2001. Since the implementation of seabird mitigation measures, the fishery has seen an increasing trend in Laysan and Black-footed Albatross interactions. A recent analysis conducted by Gilman and colleagues (2016) using data from October 2004 to May 2014, indicated that albatross interaction rates significantly increased during years of higher annual mean multivariate El Niño index (MEI), suggesting that oceanographic changes may have contributed to the increasing trend in albatross catch rates. This analysis also showed a significant increasing trend in the number of albatrosses attending fishing vessels, which may have contributed to the increasing catch rates. Moreover, the higher interaction rates observed during the recent (2015–2016) El Niño event further underscore the potential links between ocean conditions and albatross longline interactions.

In response to the recent trend in albatross interactions, the Western Pacific Regional Fishery Management Council (Council), at its 166th Meeting in June 2016, recommended research on the at-sea foraging behavior of albatrosses to improve understanding of their interaction rates in the Hawaii longline fishery. Recognizing that the increase in albatross captures may be driven by fishery factors, the Council also directed its Plan Team and Protected Species Advisory Committee to continue monitoring interactions through the FEP Stock Assessment and Fishery Evaluation (SAFE) report to detect future changes in albatross interactions that may be attributed to fishing operations.

Additionally, the Council and NMFS are in the process of developing a data integration chapter for the SAFE report that would assess policy-relevant fishery ecosystem relationships. The relationship between albatross interaction trends, fishing operation characteristics, and oceanographic factors has been identified as a high importance focus for the Pelagic FEP SAFE report data integration chapter.

This workshop will explore the potential drivers and implications of the higher interaction rates observed in 2015–2016 in the context of longer-term oceanographic variability, shifts in fishery effort and distribution, changes in albatross at-sea distribution, and albatross demography and population trends. The workshop will focus on addressing four key objectives:

1. Review recent increased albatross interactions in the Hawaii longline fishery;
2. Explore possible factors responsible for this increase:
3. Evaluate albatross population impacts; and
4. Provide input for future data collection, analysis, and models.

The Workshop's approach is summarized in a conceptual diagram (Figure 6).

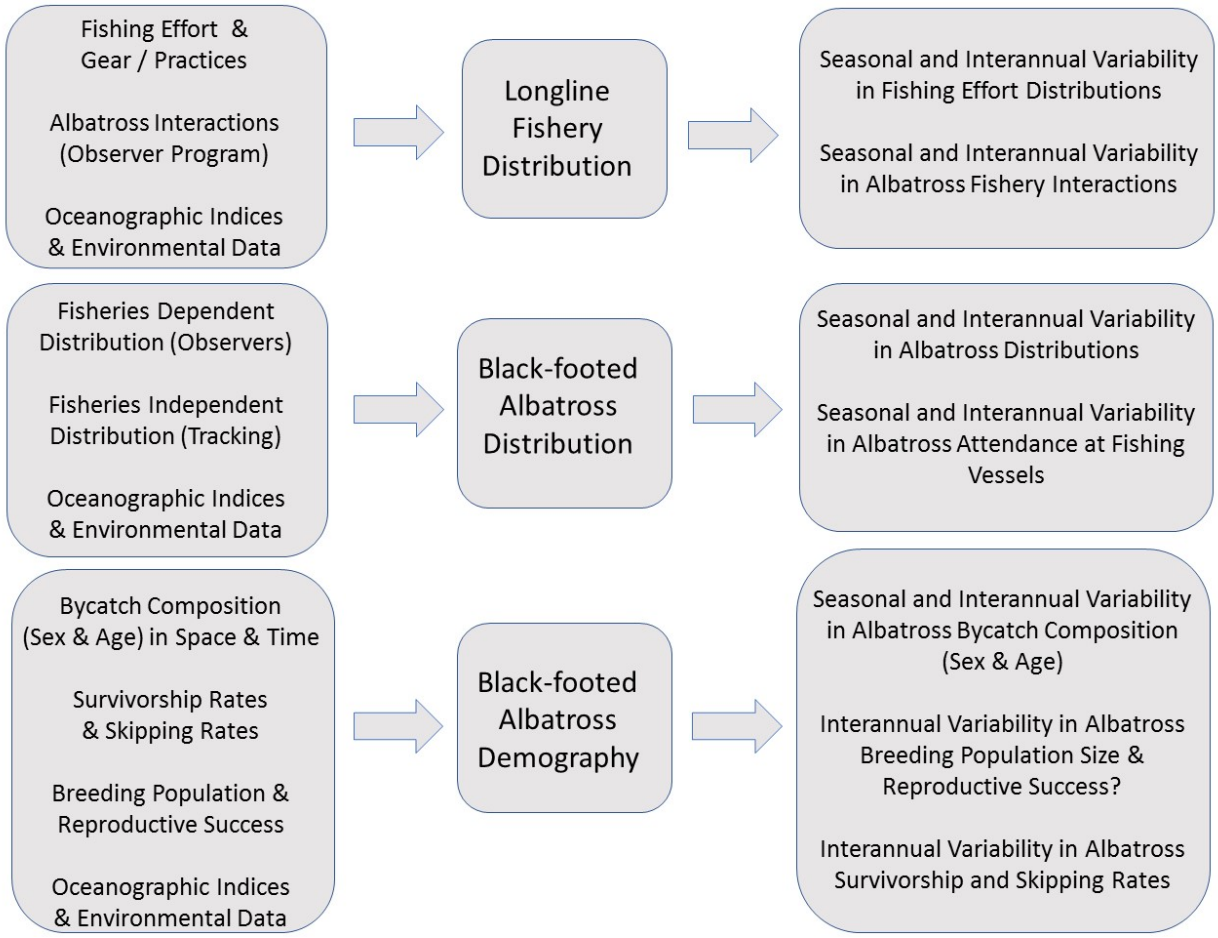

Figure 6. Conceptual diagram for the workshop.

While the ultimate discussions and conclusions from these exploratory analyses will be defined adaptively, based on the results presented at the workshop, we anticipate the discussions on the following topics, integrated into three overarching themes (Figure 7):

- Review recent conditions during 2015–2016 in the context of a longer-term reference period (2004–2016), concerning: (i) the oceanographic setting; (ii) longline fishing effort, distribution, and other operational characteristics; (iii) albatross at-sea distribution; (iv) albatross breeding population size and success; and (v) albatross bycatch composition by age/sex.

- Investigate the influence of the following factors on albatross interactions: (i) oceanographic variability; (ii) longline fishing effort, distribution, and other operational characteristics; and (iii) albatross at-sea distribution.
- Explore how albatross demographic parameters (adult survivorship and breeding probability, reproductive success) vary from year to year in relation to covariates designed to capture the dynamics of the marine environment and the fishery, including: (i) changes in the oceanography of the central North Pacific; (ii) shifts in longline effort and distribution; and (iii) changes in albatross at-sea distribution.
- Evaluate the population-level impacts of these interactions by modeling how albatross populations respond to changes in demographic parameters, bycatch rates, and the composition of the bycatch composition by age/sex.
- Provide input towards the creation of integrated models and assessments capable of merging the available population data (number of breeders, breeding success, capture-recapture data) with fishery-dependent information (effort and interaction rates, bycatch composition by age/sex).

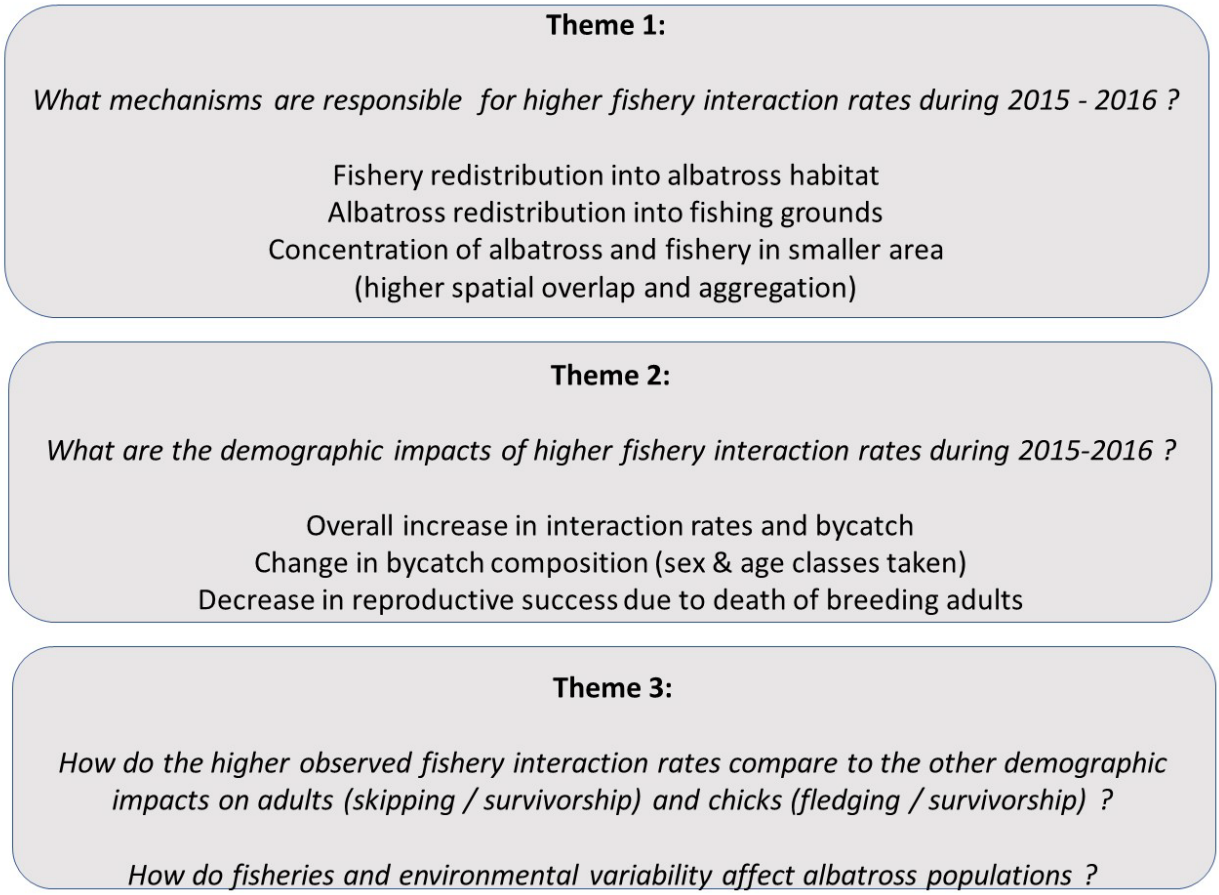

Figure 7. Conceptual diagram of the workshop's focal areas for discussion.

1998 Black-footed Albatross Population Biology Workshop Findings

The Council hosted the Workshop on the Population Biology of the Black-footed Albatross in Relation to Mortality Caused by Longline Fishing in October 1998 (Cousins and Cooper 2000). The workshop brought together seabird and fisheries biologists and population modelers to characterize the population biology of the Black-footed Albatross and to evaluate the species' resilience to the effects of mortality due to longline fisheries interactions.

Key findings from the 1998 Population Biology Workshop relevant to the discussions of the current workshop are summarized below. Additionally, the full workshop report is available at the Council web-site[6]

Banding Data

- Banding data from longline-caught birds suggested that younger and less experienced birds are more vulnerable to bycatch. The great majority (77%) of albatross captured at sea was taken during the six-month period (March–August) spanning from the chick-rearing period to the post-breeding dispersal.
    - Analysis of 255 known-age at-sea Black-footed Albatross banding records showed that 114 (44.7%) were young-of-the-year, 40 were 2-year-olds (5.7%), 25 were 3-year-olds (9.8%), and 52 were over five years (20.4%).
    - Band returns were not distributed uniformly throughout the year: monthly proportions ranged from a low in November (1.8%) to a high in July (20.3%). Overall, band returns varied by quarter, (18.0%, 33.7%, 38.5%, and 9.8%), with most band returns from summer (July–September) and spring (April–June).

Population Modeling

- Population modeling experiments were developed at the workshop to compare the effects of different removal rates of adults and juveniles.
- Due to the lack of population parameters, the models assumed equal sex ratio (1:1), equal survival rate for males and females, and constant juvenile survival rate to the age of first breeding.
    - The modal age of first breeding is seven years.
    - Some of the population parameters used in the modeling experiments (e.g., adult survival rate of 0.923 with a range of 0.810–0.994) were based on data collected in the 1960s, prior to the development of the modern Hawaii longline fleet.
- Modeling conclusions:
    - If the total number of birds killed in the longline fishery each year is of the order of one percent of the total population, then the growth rate of the population (lambda) will be reduced by slightly more than one percent.

[6] http://www.wpcouncil.org

- A total population of 300,000 birds could withstand, at the very most, a loss of 10,000 birds per year to all mortality sources including combined natural and anthropogenic sources.
- When removal rates are 10 times higher for juveniles than for adults, the population declines more slowly than if removal rates are equal.

Workshop Recommendations

1. Complete, develop, and manage a relational database for banding records.
2. Encourage further analyses of the existing data sets and conduct further modeling at a population dynamic modeling laboratory.
3. Design and implement a population-monitoring program at breeding sites to address the effects of longlining mortality.
4. Obtain information and make best estimates of fishing effort and mortality of birds from the Pacific halibut and non-U.S. longline fisheries in the Northern Pacific Ocean.
5. Design, implement, and develop a longline fishery-monitoring scheme to test mitigation measures and to gather mortality data.
6. Undertake comparative studies with Laysan and Japanese Black-footed Albatross.
7. Hold a follow-up meeting to discuss progress with the above recommendations at the Second International Albatross Conference in Honolulu, Hawaii, 8–12 May 2000.

Literature Cited

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Cover: A Black-footed Albatross taking off from the sea surface in waters north of Hawaii. Photo courtesy of David Hyrenbach.