

**JIMAR, PFRP ANNUAL PROGRESS REPORT
FY 2001**

P.I. Name: Kim Holland

Project Proposal Title: Trophic Ecology and Structured-Associated Aggregation Behavior in Bigeye and Yellowfin Tuna in Hawaiian Waters

Funding Agency: NOAA/NMFS/JIMAR/PFRP

1. Purpose of the project and indicative results.

Aggregation behavior (schooling associated with specific locations) is a defining characteristic of tuna biology and is also a critical component of the way in which the majority of the world's tuna are harvested. Whether these aggregations are associated with natural phenomena such as dolphins, whale sharks, logs or seamounts, or with man-made structures such as FADs or off-shore weather buoys, there is little understanding of the underlying biological significance of these behaviors. It is probable that, at least in the natural settings, trophic (feeding) biology is driving the aggregation behavior. In order to advance our understanding of aggregation behavior in general and aggregations important to Hawaii fisheries in particular, we have just commenced an investigation of the feeding behavior of tunas harvested from various types of aggregations found in Hawaiian waters. We are conducting a quantitative study of what and when bigeye and yellowfin tuna eat in different aggregation settings. This is being accomplished by rigorous analysis of the gut contents of specimens collected from the various aggregation sites. As a 'control' for fish harvested from specific aggregation sites, feeding behavior of long-line caught fish is also being described.

The output of this project should be a quantitative appraisal of the types of prey taken by yellowfin and bigeye tuna when they occur at different aggregation sites and, equally important, an estimate of *when* feeding is occurring.

2. Progress during FY 2001. Provide a thorough discussion of accomplishments and problems.

Funding circumstances dictated that this project only really got up to speed in the beginning of 2001. Consequently, the project is in its very early stages. One difficulty encountered (and now overcome) was to assess the insurance coverage requirements of the University of Hawaii and the Research Corporation of the University of Hawaii (RCUH) for technicians placed aboard fishing vessels to collect stomach samples. This situation has been successfully researched and resolved. A Post-Doctoral Fellow has been employed to take the lead in collecting and analyzing stomach contents. Additional student helpers will soon be employed to assist in this task.

Two types of collecting activities are being conducted: port sampling and field sampling. Port sampling is conducted after the vessels return to port from fishing. This activity will indicate the overall types of prey taken by the two species when they occur in different aggregation settings. Field sampling is designed to elucidate the temporal aspects of

feeding. That is, when is feeding occurring at the different sites and are both species of tuna feeding at the same time of day? This technique involves removing the stomach contents from fish as soon as they are caught and brought aboard the boat. Digestive processes are stopped by immediately immersing the gut contents in formalin and the type food and degree of digestion are subsequently analyzed ashore. Because the time of capture and the degree of digestion are both known, the timing of feeding events can be calculated. To date, one successful field trip has been made to the Cross seamount. This trip will guide future field efforts.

3. Plans for the next fiscal year.

The gut sampling regime will be continued and expanded. In addition, stable isotope analyses will be conducted on various tissue types (Blood, muscle, bone) to attempt to discern inter-specific differences in trophic status. Experiments will be conducted to measure the sound fields occurring around anchored near-shore FADs – sound has been suggested as one of the cues in which tuna may use to locate FADs but no empirical data have been previously collected.

4. List of papers published in refereed journals during FY 2001.

None.

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

Holland, K.N and R.D. Grubbs. (2001). The trophic ecology of tuna aggregations: rationale, experimental design and early results. 52nd Annual Tuna Conference, Lake Arrowhead, California. May 2001.

6. Names of students graduating with MS or Ph.D. degrees during FY 2001.

Include title of thesis or dissertation.

None.

7. For multi-year projects, provide budget for the next year on a separate page.