

**JIMAR, PFRP ANNUAL PROGRESS REPORT
FY 2002**

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Project Proposal Title:

Trophic Ecology of Structure Associated Tuna In Hawaiian Waters

Funding Agency: NOAA/JIMAR

1. Purpose of the project and indicative results.

To understand the influence of structure, both manmade and natural, on the biology of yellowfin and bigeye tuna and to elucidate the way in which these species utilize the forage base which, at first glance, appears to be the same for both species

2. Progress during FY 2002. Provide a thorough discussion of accomplishments and problems.

During the 2001-2002 fiscal year, samples were collected from 406 bigeye tuna and 206 yellowfin tuna. Our database now contains 812 total samples. Port sampling accounted for 436 of these and 376 were collected at sea. Port samples were taken from fourteen different commercial vessels, seven from the longline fleet and seven from the handline fleet. Sixty percent (N=483) were associated with the Cross Seamount and 32% (N=261) were associated with offshore weather buoys, all caught by the commercial handline fleet. The remaining eight percent were unassociated fish caught by the commercial longline fleet (N=56) or fish captured by our research group (N=12). Landings by the commercial handline fishery in Hawai'i are dominated by bigeye tuna. This is reflected in our samples, as 71% are bigeye. Ninety-five percent of all samples have been analyzed in the laboratory.

The vertical distributions of yellowfin and bigeye tuna are known to differ. Bigeye generally select deeper, colder waters (150 to 350 meters) while yellowfin are concentrated near the thermocline and the mixed surface layer (less than 100 meters). This pattern is known to break down near FADs and the two species overlap considerably. In fact, both species are caught in near-surface aggregations at the offshore weather buoys and the Cross Seamount. Our data suggests that the separation in vertical distribution is maintained during feeding. Yellowfin tuna feed primarily on prey common in the mixed layer while bigeye tuna feed on deep scattering-layer prey.

The forage base of both species is extremely diverse. In this study, 34 families of fishes and at least 14 invertebrate taxa have been identified as prey of yellowfin tuna while 53 families of fishes and at least 25 invertebrate taxa have been identified as prey of bigeye tuna. Despite this diversity, relatively few taxa are numerically important in the diet. Overlap indices suggest that both species feed on different prey when associated with the seamount than when associated with the weather buoys. They also suggest that bigeye and yellowfin tuna feed on different prey taxa regardless of association. Our data also suggest that both species are euryphagous predators with intermediate feeding strategies (between generalized and specialized) when associated with the Cross Seamount, the most dominant prey being oplophorid shrimp for bigeye tuna and sergestid

shrimp for yellowfin tuna. Feeding strategies are much more specialized when associated with the offshore weather buoys with bigeye feeding predominantly on cephalopods and yellowfin on crab megalopae. This apparent specialization may simply be a function of low overall prey availability.

Our data suggest that associating with the Cross Seamount may impart a significant trophic advantage to bigeye tuna but may offer little or no advantage to yellowfin tuna, which may explain why residence time of bigeye tuna on the Cross Seamount is thought to be much longer than yellowfin. In addition, these results indicate that association with the offshore weather buoys offers no trophic advantage to either tuna species and may actually be metabolically costly to bigeye tuna. More samples are being collected to thoroughly evaluate this possibility. If true, this would suggest that detailed evaluations of the ecological impact of man-made structures in tropical waters might be warranted.

3. Plans for the next fiscal year.

To continue collection of stomach samples from both species from well-defined collection sites. Emphasis will be placed on obtaining samples from longline vessels and in collecting samples from mixed schools of yellowfin and bigeye tuna. These samples will serve as “controls” for the samples collected from various structure associated schools (i.e., schools associated with seamounts and FADS.)

4. List of papers published in refereed journals during FY 2002.

None

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

**6. Names of students graduating with MS or Ph.D. degrees during FY 2002.
Include title of thesis or dissertation.**

None

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

N/A