

**JIMAR/PFRP Annual Report
FY 2005**

P.I Name: Kim Holland, Laurent Dagorn, David Itano

Project Title: Instrumented Buoys as Autonomous Observatories of Pelagic Ecosystems

Funding Agency: NOAA

Purpose of Project. This report covers work accomplished in these two interrelated projects that are designed to explore the dynamics of aggregations of tuna when they associate with various man-made structures and to elucidate the underlying biology that results in these types of aggregation/association phenomena.

Progress during 2005. Significant advances were made in all facets of the program.

- Captive tuna facilities at Coconut Island have continued to produce important data concerning target strengths of both yellowfin tuna and mackerel scad. In the most recent round of experiments using a Simrad EK 60 unit (November 2004), the orientation of the individually insonicated animals was confirmed by using an underwater camera focused on the target area. This allowed exact quantification of the angle of the incidence of the sonar beam on the target animal. These data are currently being analyzed. The acquisition of sonic data for mackerel scad is an important addition because this species is often found in large numbers around coastal FADs. Passive acoustic signatures were also acquired for yellowfin tuna and mackerel scad and these data are also being analyzed. Captive tuna are currently being raised to achieve sizes suitable for testing new types of electronic tags as part of the “ecology tags” component of this program (see below).
- Development of new types of electronic tags (“ecology tags”). Progress was made in investigation of three types of tag. A “bioacoustic probe” acquired on loan from Dr. William Burgess (Greenfield Technologies, Santa Barbara, CA) was successfully deployed through intraperitoneal implantation in a black tip reef shark. The subsequent retrieval of the tag revealed successful recording of many different types of pertinent acoustic signatures including those associated with feeding, the vocalizations of puffer fishes near the shark and the sound of motorized vessels operating in the vicinity of the shark lagoon. These data indicate that this approach holds promise for further development and arrangements have been made with Dr. Burgess to continue this testing. Stomach motility tags have been successfully tested with captive blacktip reef sharks with deployment periods ranging from a few days to two weeks. The resultant data show remarkably little stomach motility but there is evidence of diel changes in activity. The probe has been slightly redesigned and testing will continue. Progress is also being achieved in developing a stomach pH transmitter although there have been problems with the power supply for these units. They are currently under repair by the German manufacturer.

- Isotope/trophic status experiments. Experiments with captive yellowfin fed controlled diets of known isotopic composition were completed during this reporting period and the data are currently being analyzed and two papers are being prepared for publication. These data have been presented at several different symposia.
- Design of a “Smart FAD”. All appropriate administrative tasks have been completed to formalize the interaction between University of Hawaii and Dr. Jules Jaffe (SIO) concerning the design and deployment of a prototype “Smart FAD” equipped with a 360-degree scanning sonar. The prototype has been designed and is currently under construction under Dr. Jaffe’s supervision in La Jolla. Testing will occur in Spring/Summer 2005

Plans for Next Fiscal Year.

- Deploy and test “Smart FAD” prototype in collaboration with SIO
- Continued laboratory testing of various “ecology tags” (tuna and sharks)
- Deployment and testing of a Simrad prototype instrumented FAD
- Analysis and publication of stable isotope data