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PROJECT PROPOSAL TITLE: Investigation of Pacific Broadbill Swordfish Migration Patterns and Habitat Characteristics Using Electronic Archival Tag Technology (RCUH project 2073, 2127)

FUNDING AGENCY: NOAA, NMFS, JIMAR, PFRP

1. Purpose of the Project:

To understand harvest impacts and interactions among fisheries across the Pacific, information is needed on swordfish and bigeye tuna migration patterns and on how environmental factors influence distribution and catchability. Recent advances in electronic data storage technology have made it possible to construct devices that record the vertical and horizontal movements of fishes over months or years. These "archival tags" are carried by the fish and record ambient light levels, swimming depth, temperature, and estimates of geographical position based on day length (latitude) and local noon (longitude). When the fish is recaptured, a detailed record of both the migrations and vertical movements is recovered from the tag. For species such as the marlins and swordfish, in which recapture rates are very low, the high cost of archival tags is a major deterrent to their use. Recognising this, new pop-up, satellite-transmitting archival tags (PSTATs) are being developed that will come off the fish, float, and upload archived geolocation data.

2. Progress during FY 1999:

Under a subcontract to the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia, software development for the PSTAT continued in FY 1999. With significant input from this research project regarding design, software, and attachment to fish, the first geolocation archiving PSTATs are just becoming available. Other pop-up satellite transmitting tags that do not archive geolocation data have been produced elsewhere but do not meet the objective of this project to document fish migration pathways between release and pop-up locations. With its own funding, CSIRO contracted the production of geolocation archiving PSTAT prototypes in 1998. Beta test models from one vendor were received in mid 1999. Several of these test models have been deployed on southern bluefin tuna in Australia and three are now available for testing in Hawaii.

In the interim, this project has proceeded with conventional archival tag deployments on tuna. One of the 24 bigeye tuna implanted with Northwest Marine Technologies (NMT) archival tags by this project last April was recovered after three months at large. The fish maintained daytime depths in excess of that required to use the light sensor for navigation. However, geolocation information was obtained via a novel analysis of crepuscular dive behavior and vertical temperature structure. A popular article on the recovery was published and a scientific paper on the data analysis is in preparation. The

results were presented at the Pacific Bigeye Tuna Research Coordination Workshop in November 1998 and at the Tuna Conference in May 1999. The results indicated that the fish remained in the vicinity of Hawaii. Most of these fish had tags implanted in the dorsal musculature, an original method developed by Dr. Brill has the advantage that the portion the fish containing the tag is not likely to be inadvertently discarded when the fish is gutted. This year another joint research cruise with NMFS aboard the NOAA vessel Townsend Cromwell in January 1999 deployed 26 more archival tags on bigeye tuna. Most of these tags were designed for the more common method of implantation in the visceral cavity. A sensor stalk from one of these tags was recently returned by a fisherman after 6 months at large. Unfortunately the fisherman released the fish with its implanted tag back into the sea because it was alive in good condition, and too small to be worth much at the market. This incident revealed a need for the project to increase publicity among non-english speaking fishermen regarding large cash rewards given for the return of implanted archival tags.

3. Plans for FY 2000:

Delayed continuing funds were awarded in FY 1999 and will be used to fund a biologist to conduct tag deployments and to purchase PSTATs. We will be deploying the 30 remaining conventional archival tags of the 80 purchased by the project on bigeye tuna in FY 2000. In the next few weeks we will also deploy three beta test prototype PSTATs on shark and tuna. Fully operational PSTATs will be ready for deployment at the end of calendar 1999.

4. List of Papers Published in Refereed Journals during FY 1999:

None.

5. Other Papers, Technical Reports:

Boggs, C., M. Musyl & R. Brill. 1998. Results from Archival Tagged Bigeye Tuna. *Hawaii Fishing News*, September 24(8): 5.

6. Students graduating:

None.