JIMAR ANNUAL REPORT FOR FY 2008

P.I./SPONSOR NAME: Réka Domokos, Kim Holland, Jeffrey Polovina, and John Sibert

NOAA OFFICE (Of the primary technical contract): PIFSC

PROJECT PROPOSAL TITLE: Synchronous assessment of bigeye tuna (*Thunnus obesus*) and micronekton biomass, distribution, and movement patterns at Cross Seamount, and the effects of the seamount environment

FUNDING AGENCY: NOAA

NOAA GOAL (Check those that apply):

- ✠ To protect, restore, and manage the use of coastal and ocean resources through ecosystem-based management
- ☐ To understand climate variability and change to enhance society's ability to plan and respond
- ☐ To serve society's needs for weather and water information
- ☐ To support the nation's commerce with information for safe, efficient, and environmentally sound transportation

PURPOSE OF THE PROJECT (One paragraph): Globally, seamounts play an important role in shaping the distribution of pelagic species, such as tunas and sharks. Cross seamount in the Hawaiian archipelago --- a seamount with a 5 nmi diameter 400 m deep plateau, rising from a 5000 m seafloor and lying in the path of the North Equatorial Current and internal tides generated at the Main Hawaiian Islands chain --- is known to aggregate economically important fish such as juvenile and subadult bigeye tuna, a population which is heavily targeted by the local fishery. Reported moderate exploitation rates have recently raised concerns that the local fishery removes too many juveniles that could otherwise recruit to adult grounds and help maintain Pacific stocks. Since adult bigeye tuna are an important target species of both local and international fisheries, reducing adult populations of bigeye could have wide ranging negative effects. These concerns call for closely monitoring the biomass of bigeye tuna aggregated at Cross seamount. Since conventional fisheries dependent stock assessment methods are known to be inaccurate and biased, the current research undertakes the development of a fisheries independent method of bigeye tuna biomass estimation using active acoustics. Further, since populations of bigeye tuna depend on the biological and physical environment, the distribution, composition, and movement patterns of bigeye tuna forage, micronekton, as well as the effects of the unique environment at Cross seamount on both bigeye and micronekton, are investigated.

PROGRESS DURING FY 2008 (One-two paragraphs, including a comparison of the actual accomplishments to the objectives established for the period, and the reasons for the slippage if established objectives were not met):

During FY08, a second shipboard survey was conducted to Cross Seamount. The survey design was optimized based on information obtained on movement patterns and distribution of bigeye tuna during the FY07 cruise. Data collected during the cruise consisted of acoustic data to study both bigeye and its forage, micronekton, and environmental variables such as current profiles, temperature, salinity, dissolved oxygen, and chloropigments. Acoustic data were groundtruthed by fishing efforts and midwater trawl samples for tuna and micronekton, respectively.

Preliminary results from the FY08 shipboard survey show increased bigeye tuna and micronekton biomass at the seamount, consistent with previous observations. Further, the seamount has an effect on the vertical distribution of micronekton over the plateau and at its flanks. Over the plateau, several layers of micronekton occupy depths of 200-400 m (Figure 1), a layer which is devoid of organisms away from the plateau. The deep scattering layer is thicker and vertically extended at the flanks. Micronekton is observed to be actively swimming against the currents during their diel vertical migration periods (Figure 1) and their composition is different at the seamount than away from it. These facts indicate that the Seamount is likely to be occupied by resident species of micronekton. While the effects of the Seamount on micronekton extend to slopes which are at 800-900 m depth or further, bigeye tuna are tightly associated with the plateau or slopes not deeper than about 600 m. Bigeye tuna appear at dawn at the upcurrent, southwest edge of the plateau to feed on specific micronekton layers which are migrating downward from the shallow scattering layer (Figure 2). At this time, bigeye are tightly concentrated in a small area, highly mobile, and form very loose aggregations. During the early morning hours, bigeye spread and occupy the southwest end of the plateau, still feeding. By late morning, they are spread over the plateau area south of the summit. During the afternoon and early evening, bigeye occupy the entire area of the plateau and tend to form thicker aggregations. At around sunset, bigeye start dispersing and seemingly leave the plateau, to appear next dawn again at the upcurrent edge. As opposed to bigeye tuna, large, thick aggregations of fish, likely to be monchong, appear after sunset and occupy the entire area of the plateau, not farther than 50 m from the seafloor. At sunrise they descend along the flanks, predominantly on the upcurrent side of the plateau, and occupy depths of the deep scattering layer, at around 500-750 m.

PLANS FOR THE NEXT FISCAL YEAR (One paragraph):

Analysis of data obtained during the FY07 and FY08 cruises will be continued during FY09, and the results prepared for publication in a peer review journal. The remaining funds for the project will be spent on the salary of a Research Associate, Eric Cruz, hired to help with data crunching and some analyses, and on some of his supplies, such as a computer.

LIST OF PAPERS PUBLISHED IN REFERRED JOURNALS DURING FY 2008, in the following format: (Author or authors with last name and initials, publication year: Article title. *Journal name,* volume, page range.) For example: Charney, J.G., and A. Eliassen, 1964: On the growth of the hurricane depression. *J. Atmos. Sci.*, 21, 68-75.

None

OTHER PAPERS, TECHNICAL REPORTS, ETC.:

Domokos, R., 2008: Bigeye tuna and its forage base at Cross Seamount. Presented at WPRFMC's 98th Meeting of the Scientific and Statistical Committee.

GRADUATES (Names of students graduating with MS or PhD degrees during FY 2008; Titles of their Thesis or Dissertation): None

AWARDS (List awards given to JIMAR employees or to the project itself during the period): None

PUBLICATION COUNT (Total count of publications for the reporting period and categorized by NOAA lead author and Institute (or subgrantee) lead author and whether it was peer-reviewed or non peer-reviewed (not including presentations):

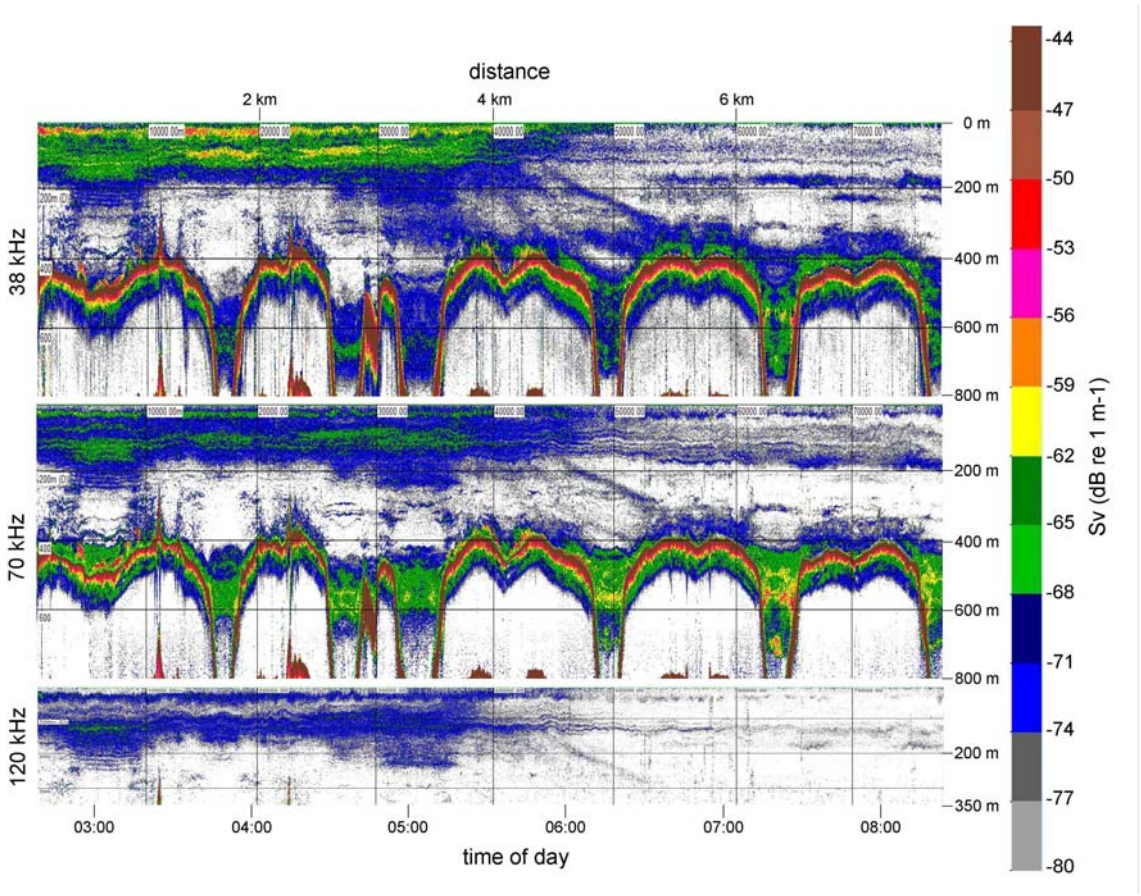
	JI Lead Author	NOAA Lead Author	Other Lead Author
Peer Reviewed			
Non-Peer Reviewed			

PERSONNEL:

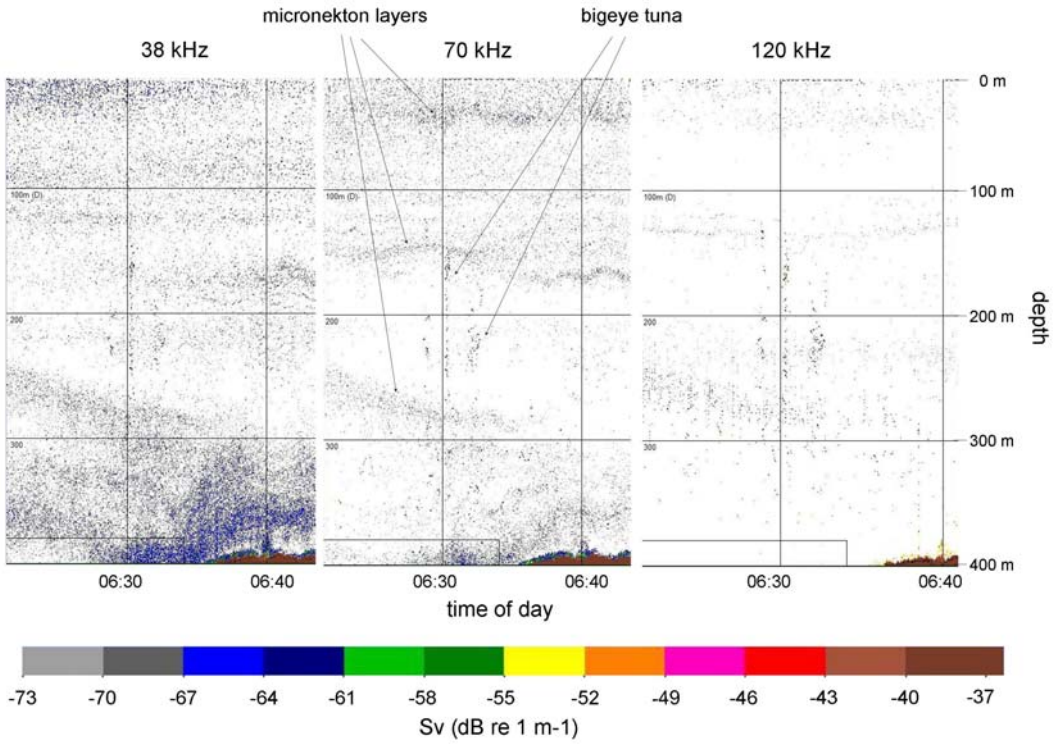
For projects that awarded subcontracts in the fiscal year, please provide the number of supported postdocs and students from each subgrantee.

1 Postdoc: Mathieu Doray

IMAGES AND CAPTIONS (We will also be including images for the annual report. Please send two of your best high-resolution, color images (photo, graphic, schematic) as a **JPEG or TIFF (300 dpi)** with a caption for each image. If you do not have an electronic version of the image, a hardcopy version may be dropped off at the JIMAR office located in the Marine Sciences Building, Room 312):



- Caption 1: Echograms showing the micronekton scattering layer over the plateau and flanks of Cross Seamount, including a nighttime to daytime transition period. Note the differences in backscatter properties of micronekton at the 38 kHz (top), 70 kHz (middle) and 120 kHz (bottom) frequencies, the micronektonic layers between 200 and 400 m depths, and the presence of large aggregations of fish over the plateau floor during night and at the flanks during day. Micronekton is shown to descend to the deep scattering layer along both downcurrent (at ~06:00-06:30) and upcurrent (at ~07:00-07:03) flanks. Bigeye tuna is seen after 06:00, most noticeable on the 120 kHz echogram.



- Caption 2: Loose aggregations of bigeye tuna foraging on descending micronekton layers after dawn at the upcurrent flank of the Seamount. Note that as opposed to micronekton, tuna backscatter is similar at all three frequencies.