JIMAR – PFRP ANNUAL REPORT FOR FY 2006

P.I./Sponsor Name: Michael P. Seki and Jeffrey J. Polovina

Project Proposal Title: Oceanographic Characterization of the American Samoa Longline Fishing Grounds for Albacore, *Thunnus alalunga*

Funding Agency: NOAA

NOAA Goal (Check those that apply):

- ☒ To protect, restore, and manage the use of coastal and ocean resources through ecosystem-base 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

1. Purpose of the Project (one paragraph)

The American Samoa domestic longline fishery has undergone extraordinary growth, particularly in the fleet composition of large vessels (>20 m in length) that have fueled a fivefold increase in fishing effort and landings from 1999 to 2001. The most intense period of the expansion occurred during 2001, when the total number of hooks set increased tenfold from 860 thousand during 2000 to 8.6 million in 2002. The target species of the longline fleet is albacore tuna, *Thunnus alalunga,* which dominates the catch. Oceanographically there has been little study regarding the pelagic habitat in the American Samoa region. The current research undertakes the task of characterizing the pelagic habitat and fishing grounds occupied by the American Samoa longline fishery through the use of satellite oceanographic remote sensing and *in situ* shipboard surveys. Coupled with the oceanographic assessment will be fishery information to develop a functional understanding of the spatial and temporal occupation and movement tendencies of large South Pacific albacore and the role of the environment on longline gear performance and catch. These data include albacore depth distribution and gear performance obtained from commercial longlines instrumented with time-depth-temperature recorders (TDRs) and the set level catch information from the American Samoa fishery logbook program.

2. Progress during FY 2006 (One-two paragraphs, including a comparison of the actual accomplishments to the objectives established for the period, and the reasons for slippage if established objectives were not met):

Results of the first part of the two year project to characterize the American Samoa albacore habitat and fishing grounds are being prepared for publication in a peer review journal, to be submitted in FY 2006. The paper will basically describe the findings of the March 2004 oceanographic survey. As the second part of the project, a second oceanographic survey of the American Samoa longline fishing grounds was conducted during February 15 through March 02 aboard the NOAA ship *Oscar Elton Sette*. Since results from the first part of this project indicate that the eastward flowing, seasonal South Equatorial Counter Current (SECC) has a significant effect on the American Samoa longline fishery performance for albacore tuna, survey activities were designed to investigate the importance of the SECC for the longline fishery, focusing on the high shear boundary regions between the SECC and the westward flowing South Equatorial Current (SEC). During the cruise, dual frequency (38 and 120 kHz) bioacoustic and ADCP (75 kHz) transects were conduced at four study sites to investigate their effects on the distribution and abundance of albacore and their forage, micronekton, in these regions frequented by the longline fleet. In addition to bioacoustic backscatter and in situ currents information, temperature, salinity, dissolved oxygen, and chloropigments were determined via CTD casts and trawl samples collected at depths of high sonic scattering layers. Concurrent with the survey operations, pop-up archival transmitting satellite tags were attached to seven albacore tuna to collect information on habitat characteristics such as preferred temperature and depth ranges of individual fish.

Preliminary results of the surveys seem to indicate that anticyclonic eddies are formed from waters carried by the SECC. The strongest sonic scattering layers, indicating dense aggregations of micronekton, are found between 500 and 900 m deep during the daytime, usually composed of two prominent layers at 500-650 m and 750-900 m, and in the upper 200 m during nighttimes (Fig. 1). However, both layers persist at all times with another persistent, although thinner, layer at around 200-300 m. Dawn and dusk echograms show that a significant portion of the organisms migrate between the surface and the 750-900 m deep layer (Fig 2a), indicating the possible importance of water characteristics down to 900 m depth. Large aggregations of nekton are prominent throughout the days but rarely observed at nights. Almost exclusively, all nekton aggregations are found between 200 and 300 m below the surface, apparently feeding on the organisms composing the scattering layers at those depths (Fig. 2b). High micronekton biomass seems to be related to SECC water masses but unrelated to high nekton biomass. The effects of water properties on nekton distribution and biomass are not evident from the preliminary results, although the bioacoustics data have not been analyzed in detail. Analysis of the in situ data (ADCP currents, Cobb trawl samples, bioacoustics, and pop-up tag temperature and depth), with the combination of satellite altimetry and log books catch from the longline fleet, has begun and will continue during the rest of FY 2006.

3. Plans for the next fiscal year (one paragraph):

Analysis of data obtained during the second year of the project (FY 2006) will continue during FY 2007, and the results prepared for publication in a peer preview journal.

4. List of papers published in refereed journals during FY 2006.

None

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

Domokos, R., J. J. Polovina, and M. P. Seki (2005). Oceanographic Influences on Albacore Catch Rates in the American Samoa Longline Fishery. Presented at PFRP annual winter PI meeting, Nov. 14-15, 2005, Honolulu, HI.

Domokos, R., J. J. Polovina, and M. P. Seki (2006). Oceanographic Influences on Albacore and its Forage in the American Samoa Longline Fishing Grounds. Presented at the 57th International Tuna Conference, May 22-25, 2006, Lake Arrowhead, CA.

6. Graduates (Names of students graduating with MS or PhD degrees during FY 2006. Provide titles of their thesis or dissertation):

None

7. Awards (List awards given to JIMAR employees or to the project itself during the period):

None

8. Publication Count (Total count of publications for the reporting period and previous periods categorized by NOAA lead author and Institute (or subgrantee) lead author and whether it was peer-reviewed or non peer-reviewed (not including presentations):

	JL Lead Author			NOAA Lead Author			Other Lead Author		
	FY04	FY05	FY06	FY04	FY05	FY06	FY04	FY05	FY06
Peer-reviewed				1	1	0			
Non-peer reviewed				0	0	0			

9. Students and Post-docs (Number of students and post-docs that were associated with NOAA funded research. Please indicate if they received any NOAA funding. For institutes that award subcontracts, please include information from your subgrantees):

None

10. Personnel:
    (i) Number of employees by job title and terminal degree that received more than 50% support from NOAA, including visiting scientists (this information is not required from subgrantees):

    (ii) Number of employees/students that received 100% of their funding from an OAR laboratory and/or are located within that laboratory:

    None

    (iii) Number of employees/students that were hired by NOAA during the past year:

    None

11. Images and Captions. (JIMAR will be including images in the annual report. Please send two of your best high-resolution, color images (photo, graphic, schematic) as a JPEG of TIFF with a caption for each image. Hardcopies of images can be dropped off at the JIMAR office if no electronic versions are available.

    ● Caption 1: 38 kHz echograms showing the typical daytime deep (double) and nighttime shallow scattering layers, with the addition of the persistent thin layer at 200-300 m.

    ● Caption 2: 38 kHz echograms showing dawn vertical migration patterns of organisms (upper panel) and nekton apparently feeding on micronekton in the 200-300 m thin scattering layer (lower panel).

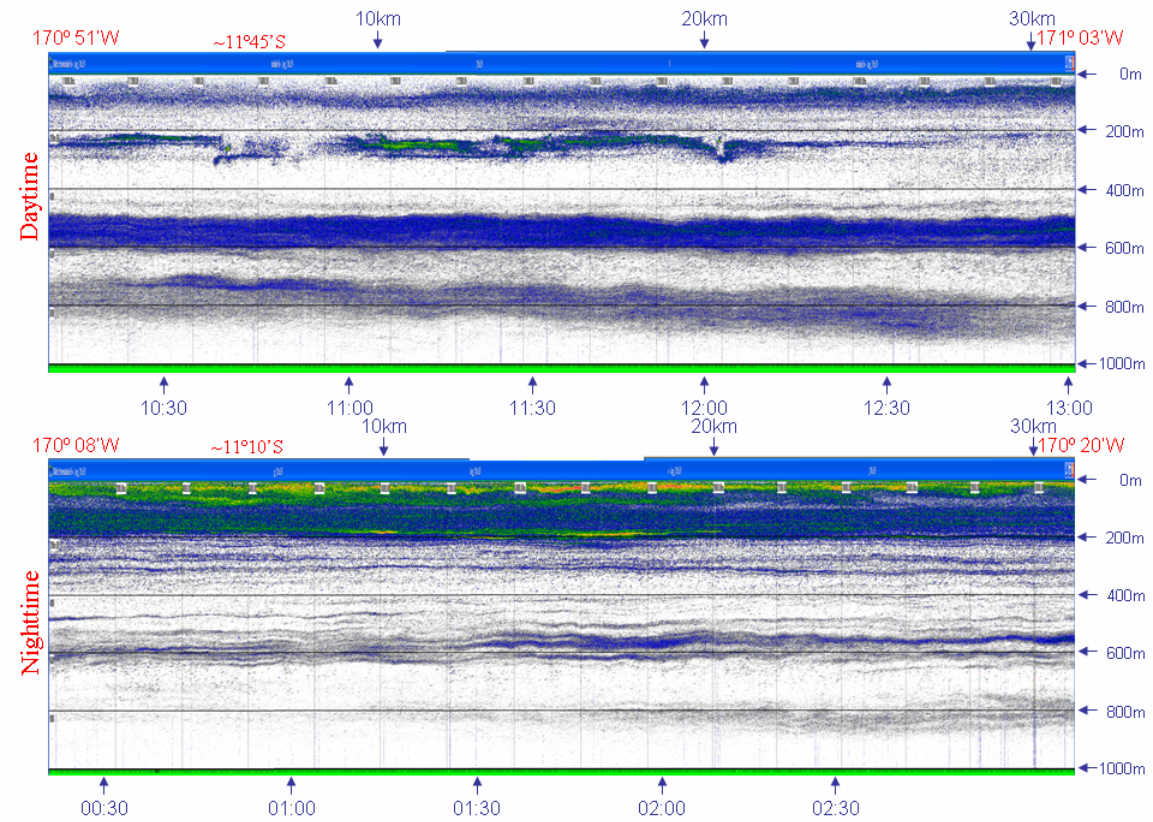

Figure 1. 38 kHz echograms showing the typical daytime deep (double) and nighttime shallow scattering layers, with the addition of the persistent thin layer at 200-300 m.

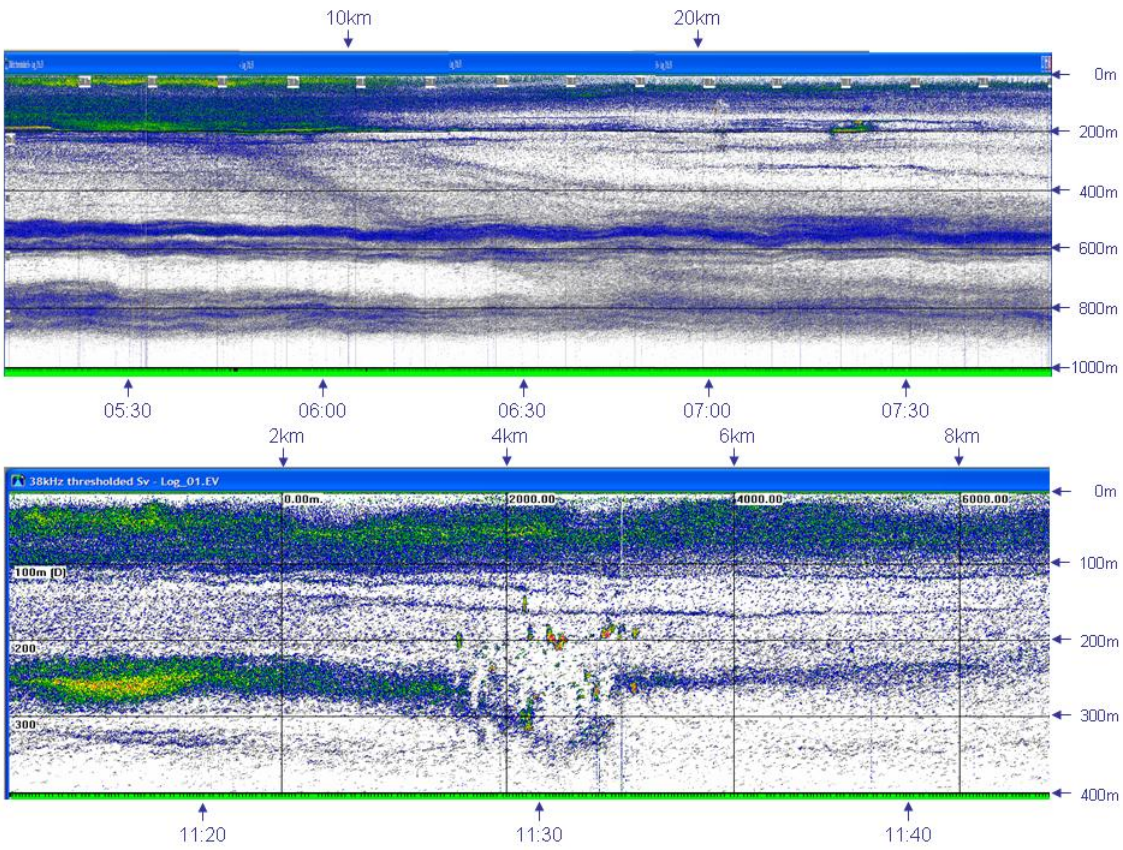

Figure 2. 38 kHz echograms showing dawn vertical migration patterns of organisms (upper panel) and nekton apparently feeding on micronekton in the 200-300 m thin scattering layer (lower panel).