SOUTHWEST FISHERIES SCIENCE CENTER RESEARCH REPORT

The Southwest Fisheries Science Center (SWFSC) has been conducting a number of highly migratory species (HMS) research projects in collaboration with various domestic and international partners.

Research: In a continued effort with the American Fishermen's Research Foundation, the SWFSC conducted a cruise off Oregon in early August to deploy archival tags in juvenile albacore. Since 2001, 552 tags have been deployed in albacore off the U.S. West Coast. To date, 21 archival tags have been recovered with the latest recovery occurring aboard a longline vessel operating out of American Samoa. Overall, the fish recovered have demonstrated a very wide range of behaviors with some staying near the North American continent for a full year following tagging while others migrated out to the central North Pacific and then back to the U.S. West Coast the following season. One fish migrated across the Pacific and was recaptured off Japan. Vertical habitat utilization also varied depending upon the season and water column characteristics. The data are being analyzed and will contribute valuable information on albacore stock structure and habitat preferences.

This summer, the SWFSC conducted a juvenile mako and blue shark abundance survey in the Southern California Bight. The survey has been conducted nearly every year since 1994 and now represents a 14 year time series of fishery-independent data for these two managed sharks. Survey catch totaled 45 shortfin makos, 276 blue sharks, 2 common threshers, 5 pelagic rays, 1 bat ray and 1 spiny dogfish. The preliminary data indicate that the nominal survey catch rate was 0.184 per 100 hook-hours for shortfin mako and 1.090 per 100 hook-hours for blue sharks. The nominal CPUE for blue sharks was somewhat higher than in 2007; however, there is a declining trend in nominal CPUE for both species over the time series of the survey. The survey also provided an opportunity to tag and release sharks for ongoing studies of their age and growth and migratory patterns.

As part of the survey efforts, and in collaboration with the Tagging of Pacific Pelagics Program, SWFSC scientists have been deploying satellite tags on shortfin mako, common thresher and blue sharks to learn more about their stock structure and habitat use. This summer an additional 9 mako sharks and 4 blue sharks were tagged. In total, 77 makos, 66 blue sharks and 32 threshers have been tagged since 1999. The data are beginning to show the extent of the range of these species in the eastern North Pacific. While some individual blue and mako sharks range offshore as far as the Hawaiian Islands, the majority remain within the California Current ecosystem throughout the year. From the limited thresher shark data, it appears that they are less migratory and prefer to stay closer to shore than the mako and blue sharks. The distributions of each of these species suggest that in order to effectively manage the U.S. west coast populations, bilateral cooperation with Mexico will be necessary.

In May 2008 the SWFSC, SWR and Pfleger Institute of Environmental Research continued a study to determine the survivability of thresher sharks caught and released alive by recreational fishermen. This spring two thresher sharks, hooked by the tail by anglers, were fitted with satellite tags and released. One fish did not survive capture and release. Combined with data from last year, preliminary results indicate that mortality often occurs soon after release and is more likely to occur when larger fish are caught that require longer fight times to bring the fish to the boat. Further tagging is planned for the fall in order to increase the sample size and to explore modifications to the gear to reduce tail hooking.

In May 2008, the SWFSC and SWR co-sponsored a workshop on leatherback bycatch in the swordfish fisheries. Fishermen, managers, policy makers and scientists working on swordfish, leatherbacks, jellyfish and regional oceanography attended. The two day meeting focused on swordfish research, management, stock status and fisheries, and on leatherback research and fishery interactions. The group

identified an number of research initiatives to help understand more about 1) the economics of swordfish fisheries in the eastern North Pacific, 2) potential gear modifications based on behavior of swordfish and leatherback turtles, and 3) collecting additional data to better understand the habitat overlap between the two species north of Point Conception. A summary workshop report is being prepared. Already the workshop has stimulated a new SWFSC collaboration among the protected resources and highly migratory species research groups. Swordfish and leatherback turtles will both be surveyed in an historical area of overlap and swordfish will be concurrently tagged with electronic tags to study their vertical and horizontal behavior.

Stock Assessment: SWFSC scientists participated in a number of HMS stock assessments during 2007. One set of assessments involved review of work done by the Inter-American Tropical Tuna Commission (IATTC) staff on Eastern Pacific yellowfin, bigeye, and skipjack tunas. The assessments were found to be of high quality and used fishery data through 2007. Results indicated that the Eastern Pacific yellowfin tuna and bigeye tuna stocks are being heavily exploited, but that there appears to be no conservation concern for skipjack tuna. For yellowfin tuna, recent fishing mortality rates are about equal to those required to produce MSY. Yield levels could be increased if the fishing effort were diverted to the fisheries that catch larger yellowfin, or could be diminished if fishing effort were diverted to catching smaller fish. For bigeye tuna, the most recent estimates indicate that the bigeye stock in the eastern Pacific may be overexploited with spawning biomass below the level corresponding to MSY and that overfishing is taking place ($F > F_{MSY}$).

Another set of assessments involved collaborations with International Scientific Committee (ISC) member scientists in conducting stock assessments for North Pacific albacore, striped marlin and Pacific bluefin tuna. A new stock assessment of Pacific bluefin tuna was completed in 2008 using data from as recent as 2005. The assessment was conducted in a fully integrated assessment framework which replaced the VPA model used in previous assessments. Results indicated a population that is currently experiencing fishing mortality greater than most target reference points (including F_{MAX}), and that fishing mortality on juveniles was increasing. However, no apparent trend in recruitment over the model time period (1952-2005) was noted and current fishing mortality is not above commonly used reference points that may serve as indicators of recruitment overfishing (F_{MED} and $F_{SSB\text{-}MIN}$). In light of the new assessment, the ISC reiterated that it is important that current F not be increased above current levels.

The evaluation of the North Pacific albacore stock was a qualitative assessment of new data to examine trends since the last (2006) stock assessment. Data updates and limited analysis indicated a slightly more optimistic view of the spawning biomass level than the 2006 assessment. The ISC plans to complete a new full stock assessment in 2010 and work has already begun to transition the 2010 stock assessment from a VPA into a fully integrated assessment model. Due to the limited amount of additional data since 2006, the ISC reiterated its recommendation from 2007 of not increasing F from current level and that reductions in F may be necessary depending on which reference points are selected for management purposes.

Investigations of the spatial distribution of striped marlin and initial data preparations for an upcoming 2009 assessment of swordfish stock status were completed in 2008. No new stock assessments of billfish were completed in 2008, thus the conservation advice on billfish given by the ISC in 2007 remains: that until appropriate measures are taken considering various factors associated with this species and its fishery, fishing mortality should not be increased.