June 18, 1997 F/SWC2:CHB:FLF
CR9610-3.CHB

CRUISE REPORT

VESSEL: *Townsend Cromwell*, Cruise TC-96-10 (TC-213)

CRUISE PERIOD: September 5-29, 1996

AREA OF OPERATION: Within a radius of 1,000 miles north of the Island of Oahu, Hawaii (Fig. 1)

TYPE OF OPERATION: Longline fishing operations were conducted using monofilament longline gear in conjunction with hook timers and time-depth recorders (TDRs) to study the habitat utilization, hooked longevity, and vulnerability to fishing gear of broadbill swordfish (*Xiphias gladius*). Physical oceanography was monitored with expendable bathythermographs (XBT's), conductivity-temperature depth (CTD) casts, thermosalinograph (TSG) and acoustic Doppler current profile (ADCP) transects.

ITINERARY:

5 September	- Embarked scientists. Departed Snug Harbor and proceeded towards the first fishing station about 580 nmi northwest of Oahu.
6 September	- At 110 nmi northwest of Oahu, tested and adjusted setting rates of the longline shooter and retrieval speeds of the longline reel. Checked the frequency and strength of radio buoys and calibrated the TDR's. Deployed a CTD cast and proceeded to the first fishing station.
7 September	- Set 450 hooks at 2354 and deployed a CTD cast.
8 September	- Retrieved the longline at 0855. Proceeded north to the next fishing station.

10 September - Deployed 3 XBT's throughout the day before setting 450 hooks at set 2 (Fig. 1) at 2000. Deployed a CTD cast after the set.

11 September - Retrieved longline at 0330 and at 0800. Proceeded to next fishing station and set longline at 2000 followed by a CTD cast. The set was hauled at 2330 and 0330.

12-23 September - For longline sets 4-13 (Fig. 1), continued the general pattern of early evening sets, followed by a CTD or XBT cast. Retrievals were scheduled before and after sunrise.

23-24 September - Set 321 hooks at 1930 followed by a CTD cast. Retrieved the longline at 0030 and proceeded to Snug Harbor.

29 September - Arrived at Snug Harbor about 0930. End of cruise. Proceeded to off-load gear, specimens, and records.

MISSIONS AND RESULTS:

A. To measure factors affecting the capture condition (alive, moribund, dead) and viability for release of swordfish (and other species) caught on longline gear, and the efficiency of fishing gear as related to the thermocline. The experimental design will compare fish caught during day and night periods, the length of time the fish remained on the hook, the effectiveness of circle hooks to increase viability, and the effect of lower temperatures to improve captured condition.

A total of 5,632 hooks were set over 13 longline fishing stations (Fig. 1). All hooks were set in the evening.

CTD and XBT casts and TDRs confirm that most hooks were all set at depths within the steepest part of the thermocline, from 20-60 m. Most swordfish were caught on the shallower hooks at the top of the thermocline.

A total of 15 broadbill were caught of which 2 were tagged and released, 2 were released without tags and 9 dead or moribund fish were sampled. On one of the tagged fish released, the line was wrapped around its bill and it was not hooked. Another large and exceptionally strong fish was tethered, but had probably freed itself since the fish was gone when the tether was retrieved. These two swordfish would have been excellent candidates for archival tag placements.

The effect of night versus day retrievals, circle versus J hooks and soak time have yet to be quantitatively analyzed,

but the preponderance of dead and moribund swordfish, and the internal wounding observed even in vigorous, viable looking swordfish does not bode well for experiments that require tagging many fish.

B. To test the hypothesis that swordfish catchability is increased in the vicinity of surface thermal fronts.

The best catch rates for swordfish (3-4 fish/set) were encountered at the northernmost extent of the cruise in the general area of the subarctic frontal zone. However, the data are too few to be conclusive. Proximity to the frontal zone seemed beneficial to rates but we were not able to set in close proximity to any intense frontal structures.

C. To develop and test procedures to better retrieve and handle live swordfish for future tracking and archival tagging experiments.

Retrievals associated with slower ship speeds proved very successful during the day but suffered somewhat during the night because of poor visibility. The establishment of an archival tagging procedure is hampered by a lack of success in capturing viable swordfish. Tethering, to hold live fish in readiness for tracking was attempted with 2 swordfish. One result is described above (A). The other fish appeared viable but was dead upon retrieval and was found to be gut hooked.

D. To tag and mark swordfish with tetracycline for movement studies and to measure the rate of deposits on otoliths, and to tag and release other viable fish for movement studies. Also, to compare the application and retention of different tag designs.

Tetracycline marking was cancelled due to the poor retrieval rate of injected fish so far. Sixteen fish, 2 bigeye tuna, 3 striped marlin, 2 broadbill swordfish, 1 shortnose spearfish and 8 albacore tuna were successfully tagged with National Marine Fisheries Service (NMFS), Southwest Fisheries Service Center (SWFSC) tags and released.

E. Collect biological samples (tissues appropriate for mtDNA analysis, stock heterogeneity studies, growth rate estimation, diet studies, and sex and fecundity determinations).

Muscle samples from 9 broadbill swordfish were collected for DNA determination by Seinan Chow of the Research Institute of Far Seas Fisheries, Shizuoka, Japan.

Gonads, stomach contents, otoliths and anal fins from 9 broadbill swordfish and fins from 22 blue sharks were

collected for Fish Biology and Ecology Investigation personnel.

F. Collect and record biological measurements and determinations (fork length, various morphometric measures, tissue weight, somatic weight, fin ray counts, sex, etc.).

The fork length, weight and sex were collected from 5 albacore tuna (*Thunnus alalunga*), 2 bigeye tuna (*Thunnus obesus*), 3 longnose lancet fish (*Alepisaurus ferox*), 4 escolar (*Lepidocybium flavobrunneum*), 13 snake mackerel (*Gempylus serpens*), 22 blue shark (Prionace glauca), 9 broadbill swordfish, 31 mahimahi (coryphaena hippurus), and 1 striped marlin (Tetrapturus audax).

In addition, extensive morphometric data were collected from 22 blue sharks (*Prionace glauca*) on the Pelagic Shark Biological Form and from 9 broadbill swordfish and 1 striped marlin for the swordfish head and morphometrics log for the Life History Program.

G. Participation in the "Teacher-at-Sea" program and with cooperative scientists.

The two teachers and the Chilean marine biologist participated in all phases of the cruise. Much of the information gained is unique to a research longline cruise. This included the setting and hauling of the instrumented longline gear (i.e., with TDR's and hook timers), collecting and recording catch data, and monitoring CTD operations. The ship's E-mail capabilities were used to inform classes on the daily operations of the cruise and to answer questions that the communication produced. The teachers used their hands-on experiences and exposure to the operation of a research vessel to develop lesson plans and returned with specimens and samples of data collected from the cruise and samples of fishing gear for their classrooms. The Chilean marine biologist will also be reporting on shipboard and fishing operations.

SCIENTIFIC PERSONNEL:

Christofer H. Boggs, Chief Scientist, National Marine Fisheries Service (NMFS), Southwest Fisheries Service Center (SWFSC), Honolulu Laboratory (HL)
Randolph K.C. Chang, Fishery Biologist, NMFS, SWFSC, HL
Daniel Curran, Fishery Biologist, Joint Institute for Marine and Atmospheric Research (JIMAR), University of Hawaii (UH)
J. Miguel Donoso, Marine Biologist, Instituto, de Fomento Pesquero (ITOP), Chile
Thomas K. Kazama, Fishery Biologist, NMFS, SWFSC, HL
Marilyn A. Parkes, Teacher-at-Sea, NMFS, Pacific Marine Center (PMC)

Paul S. Shiota, Fishery Biologist, NMFS, SWFSC, HL
JoAnne B. Sims, Teacher-at-Sea, NMFS, PMC
Happy A. Williams, Fishery Biologist, NMFS, SWFSC, HL

Submitted by: */s/Christofer H. Boggs*
_____
Christofer H. Boggs
Chief Scientist

Approved by: */s/R. Michael Laurs*
_____
R. Michael Laurs
Director, Honolulu, Laboratory

Attachments