



U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
Southwest Fisheries Center Honolulu Laboratory  
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CRUISE REPORT

VESSEL: *Townsend Cromwell*, cruise TC-91-01 (TC-159)

CRUISE PERIOD: Leg I: 4 January-2 February 1991  
Leg II: 5-20 February 1991

AREA OF OPERATION: Leg I: Submerged banks in the area of Necker Island and French Frigate Shoals (FFS) as well as seamounts to the north of the Hawaiian archipelago (Fig. 1).  
Leg II: Waters within 240 nmi of the Hawaiian Archipelago (Fig. 2).

TYPE OF OPERATION: Leg I: Personnel from the Southwest Fisheries Science Center (SWFSC) Honolulu Laboratory (HL) conducted longline fishing operations to collect biological samples to further ongoing studies of the population biology of swordfish, *Xiphias gladius*. Environmental data were collected with expendable bathythermograph (XBT) and conductivity-temperature depth (CTD) casts, the acoustic Doppler profiler (ADCP), and surface thermo-salinograph.  
Leg II: Personnel from the SWFSC, HL conducted fishing operations to collect biological samples for ongoing life history studies on major species associated with North Pacific pelagic driftnet fisheries (in particular the neon flying squid, *Ommastrephes bartramii*, and the Pacific pomfret, *Brama japonica*. Sampling included plankton tows with a 4 m<sup>2</sup> ring and Manta neuston nets, and Cobb trawls for micronekton. Environmental data were collected with XBT and CTD casts.



## ITINERARY:

- 4 January Departed Snug Harbor, Honolulu, at 1500 and headed for "middle bank" (lat. 22°40'N, long. 161°W) between Kauai and Nihoa.
- 5 January Arrived middle bank, completed a conductivity-temperature-depth (CTD) cast, and deployed trial set of longline gear.
- 6 January Hauled trial set of longline gear and departed for the Necker Island-FFS area.
- 8 January Arrived in the operational area. Set the longline gear and made a CTD cast in the evening.
- 9 January Hauled the gear and departed for Snug Harbor because of malfunctioning longline spooler.
- 11 January Arrived Snug Harbor to effect repairs.
- 12 January Departed Snug Harbor for operational area.
- 13 January Arrived in the Necker Island-FFS area and restarted scientific operations (setting the longline gear and making a CTD cast in the evening; hauling the longline gear the next morning).
- 31 January Departed Musicians Seamounts for Snug Harbor.
- 2 February Arrived Snug Harbor. End of Leg I.
- 5 February Departed Snug Harbor at 1315 for first scheduled station in the vicinity of 22°N lat., 167°W long. On board were Keith A. Bigelow, Jubal T. Jones, and Michael P. Seki.
- 7 February Arrived at lat. 22°N, long. 167°W and commenced fishing and oceanographic operations. Plankton tows with a 4m<sup>2</sup> ring net and a Manta neuston net, Cobb trawls for micronekton, XBT and CTD casts, and squid jigging stations were conducted.
- 8 February-  
19 February Conducted fishing and oceanographic operations at each sampling site (Fig. 2).
- 20 February Arrived Snug Harbor, Honolulu. Disembarked Bigelow, Jones, and Seki. End of Leg II and cruise.

MISSION  
AND  
RESULTS:

- A. Collect biological samples from longline-caught swordfish, *Xiphias gladius*, and other selected species.

Otoliths, dorsal and anal fin spines, cephalic and caudal vertebrae, pectoral fin girdles and cross sections of bills, gonads, parasites, heat exchanger tissue, and other mtDNA-rich tissue were collected from swordfish and other selected species by laboratory staff and collaborating investigators.

- B. Collect standard size measurements from all fishes landed and morphometric measurements from longline-caught swordfish.

Standard fork length measurements, as well as a few other determinations, were recorded for all fishes caught. Morphometric measurements were recorded for swordfish: posterior edge of the eye orbit-fork length, lower jaw-fork length, tip of the bill-fork length, several truss measurements, and body depth and half-girth at two different sites.

- C. Collect environmental data in association with the swordfish longline fishing operations.

Plans to collect environmental data along a grid pattern in the area of operations were abandoned because the swordfish fishery had not developed in any well-defined area prior to our departure. Latitudinally oriented transects of XBT and CTD casts (to 1,000 m) were made at selected sites where a number of swordfish longline sets had been conducted. Also, CTD casts to 500 m were made after completion of the longline sets. Surface temperature and salinity data were recorded on the ship's VAX computer continuously throughout the cruise. Data from the acoustic Doppler current profiler were also recorded throughout the cruise, but the device occasionally stopped recording data for an unknown reason.

- D. Determine the depth of the longline gear and the depth at which swordfish take the baited hooks.

Time-depth recorders were attached to all but one setting of the swordfish longline gear. Hook timers were used on all sets and nearly all hooks throughout the cruise, except for the first trial set at middle bank.

- E. Collect fish catch and effort data for the swordfish longline fishing operations.

Catch logs were completed for each set of the longline gear.

- F. Tag, mark, and release viable swordfish and selected other pelagic species.

During the cruise, 10 swordfish and 2 striped marlin were injected with oxytetracycline, tagged and released. Also, 4 swordfish; 1 striped marlin, *Tetrapturus audax*; 6 bigeye tuna, *Thunnus obesus*; 5 yellowfin tuna, *Thunnus albacares*, and 1 mahimahi, *Coryphaena hippurus*, were tagged and released, using tags provided by James Squires from the Southwest Fisheries Science Center in La Jolla.

- G. Strip spawn swordfish and shortbill spearfish, *Tetrapturus angustirostris*, to determine when the first otolith growth increment is laid down, as opportunity arises.

The swordfish captured were not sexually mature. Only one shortbill spearfish was captured, and it was dead.

- H. Collect paralarval squid and juvenile pomfret by using plankton nets and micronekton trawls.

A total of 55 4m<sup>2</sup> plankton ring tows, 10 Manta neuston tows, and 22 Cobb trawls were conducted to capture the early life stages of the target species. Forty-seven of the 4m<sup>2</sup> ring tows were conducted in an oblique fashion, targeting a maximum depth of 100 m. The remaining 8 tows were made at the surface, each 30-40 minutes in duration. Cobb trawls targeted waters 0-100 m and were conducted in a stepped oblique fashion. All samples were fixed in a 10% formalin solution, transferred into and preserved in 50% isopropanol, and returned to the HL for sorting and analysis.

- I. Collect environmental data corresponding to the area of squid and pomfret fishing operations.

Nine CTD and 42 XBT casts were conducted during Leg II of the cruise. CTD casts were made to 1,000 m in depth; water samples were collected at the surface and at 1,000 m. XBT casts were made at 0000, 0600, 1200, and 1800 G.m.t. each day of the cruise leg. Since operations at each sampling site were conducted over a 12-h period, two XBT casts were normally made in the general sampling vicinity.

SCIENTIFIC  
PERSONNEL:

Leg I: (4 January - 2 February 1991)

Robert A. Skillman, Chief Scientist, National Marine Fisheries Service (NMFS), Southwest Fisheries Science Center (SWFSC), Honolulu Laboratory (HL).  
Randolph K.C. Chang, Fishery Biologist, NMFS, SWFSC, HL.  
Patrick Frost, Cooperating Scientist, University of

California, Long Beach.  
John Finnerty, Cooperating Scientist, University of Chicago.  
Soo Young Kim, Cooperating Scientist, University of Chicago.  
Linda A. Koch, Biological Technician, NMFS, SWFSC, HL.  
James H. Uchiyama, Fishery Biologist, NMFS, SWFSC, HL.

Leg II: (5-20 February 1991)

Michael P. Seki, Chief Scientist, NMFS, SWFSC, HL.  
Keith A. Bigelow, Fishery Biologist, NMFS, SWFSC, HL.  
Jubal T. Jones, Cooperating Scientist, University of Hawaii.

Submitted by: Robert A. Skillman  
Robert A. Skillman  
Chief Scientist, Leg I

Michael P. Seki  
Michael P. Seki  
Chief Scientist, Leg II

Approved by: George W. Boehlert  
George W. Boehlert  
Director, Honolulu Laboratory

Attachments

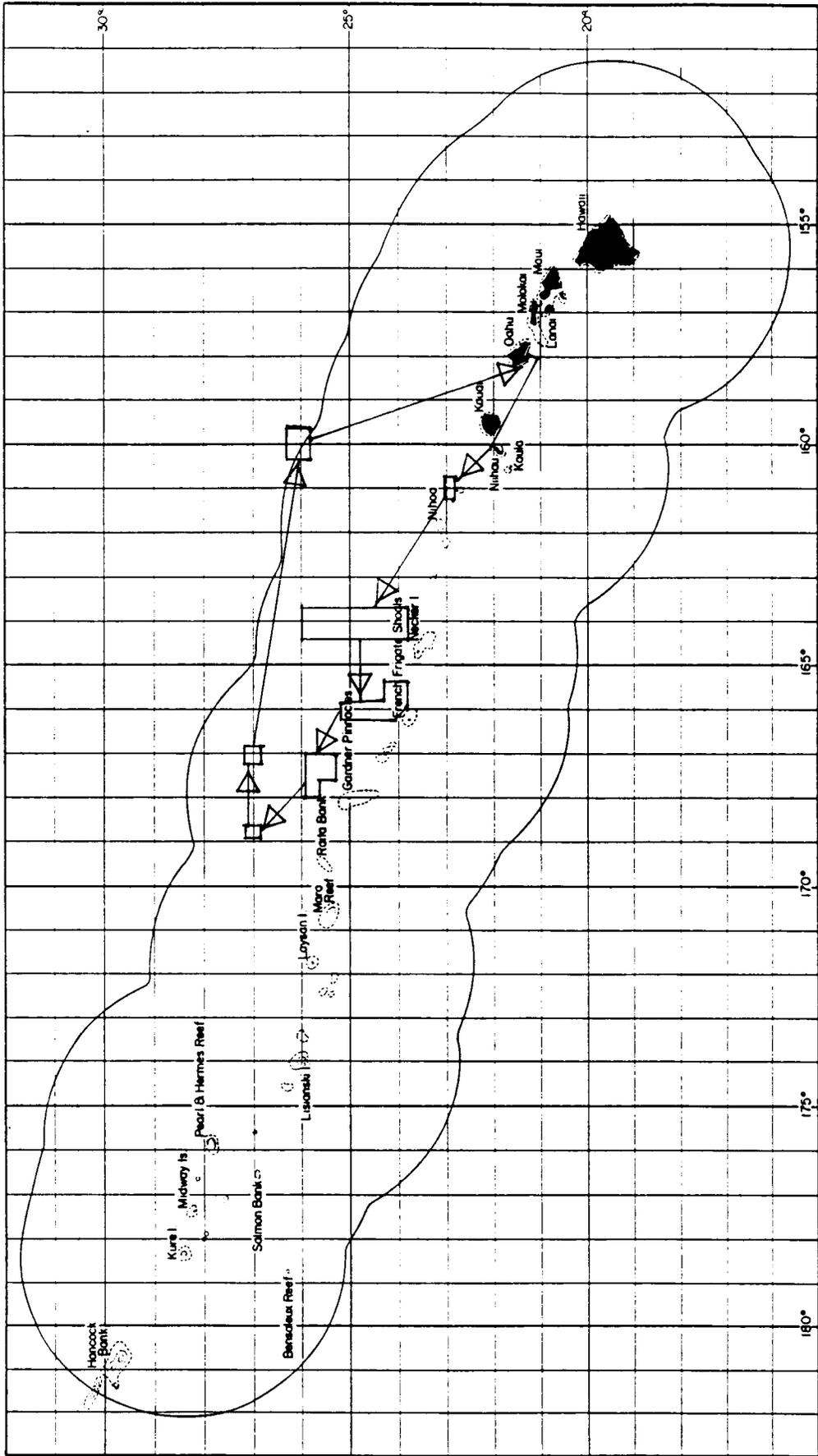


Figure 1.--Track and longline sampling areas occupied on Leg I of the Townsend Cromwell cruise 91-01 (TC-159), 4 January-2 February 1991.

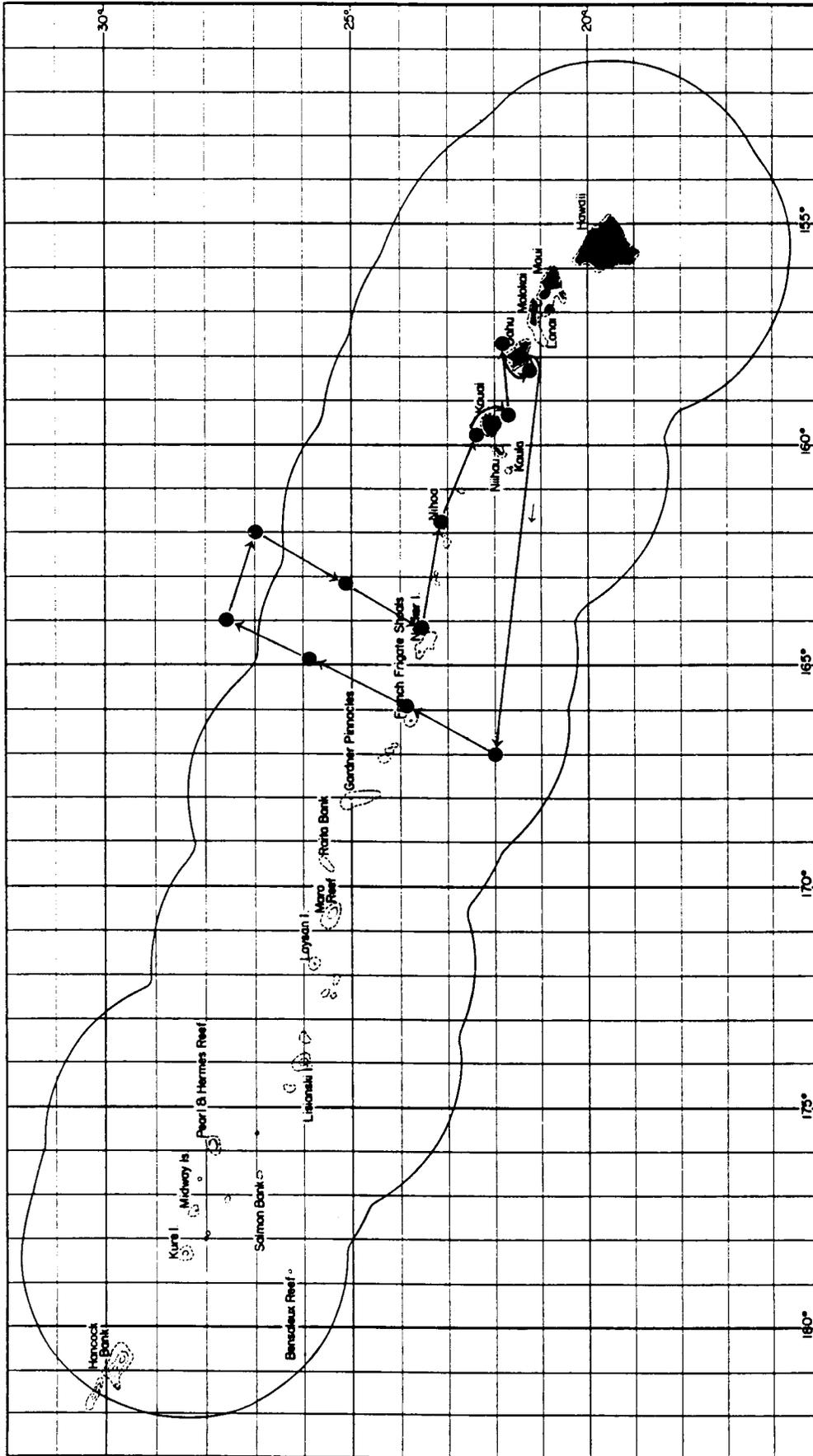


Figure 2. ---Track and sampling sites of Leg II of the Townsend Cromwell cruise 91-01, 5-20 February 1991.