

October 23, 1995

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CR9504-2.CHB

CRUISE REPORT

VESSEL: *Townsend Cromwell*, Cruise TC-95-04 (TC-200) and concurrent charter of fishing vessel *Hana Like*

CRUISE PERIOD: 6-21 August 1995 (*Townsend Cromwell*) and 6-20 August (*Hana Like*)

AREA OF OPERATION: Off the Kona Coast of the Island of Hawaii (Fig. 1)

TYPE OF OPERATION: Longline, handline, and troll fishing operations were conducted to acquire live, vigorous yellowfin tuna (*Thunnus albacares*) for subsequent tracking by sonic telemetry. Longline fishing operations were conducted by the *Townsend Cromwell*. Troll and handline fishing operations were conducted by the *Hana Like*. Tracking operations were conducted primarily by the *Hana Like* and occasionally by the *Townsend Cromwell*. The *Townsend Cromwell* conducted oceanographic sampling in a grid around the area of tracking using conductivity-temperature-depth (CTD) and Niskin bottle casts, expendable bathythermograph (XBT) casts, acoustic Doppler current profiles (ACDP) and thermosalinograph (TSG) recordings. The *Townsend Cromwell* also conducted occasional Isaacs-Kidd (IK) surface trawls and night-light stations to collect larval and juvenile billfish, and several times attempted to locate transmitter signals from fish that eluded the tracking vessel by deploying tracking hydrophones at fish aggregating devices (FADs).

ITINERARY:

- 6 August Embarked 12 scientists in Kailua-Kona, Hawaii (9 aboard the *Townsend Cromwell* and 3 aboard the *Hana Like* and commenced acoustical testing off Kailua-Kona at 1600. Departed Kailua Kona for the fishing grounds around 2300.
- 7 August Commenced fishing, tracking, and oceanographic sampling. The *Townsend Cromwell* always fished offshore (ca. 5-15 mi) while the *Hana Like* mostly fished closer to shore (ca. 1-5 mi). The *Townsend Cromwell* conducted a night (swordfish-style) set before dawn and hauled back after dawn. The *Hana Like* attached a transmitters to two yellowfin tunas caught by handline fishing. The signal was lost immediately from the first fish, and after 2 h the second fish (YF9501) shed its transmitter. The *Townsend Cromwell* started an oceanographic sampling grid around the *Hana Like's* track.
- 8 August Continued CTD sampling around the area likely to enclose a fish trackline. A fourth scientist was added to the tracking crew on the *Hana Like*, which caught and tracked a ca. 200-lb yellowfin tuna (YF9502) for 14 h and lost the signal near sunset.
- 9 August Continued CTD sampling till daylight. Then the *Townsend Cromwell* made a tuna style longline set and tethered several marlin, completing these operations by sunset. In the morning the *Hana Like* caught and initiated a track on a ca. 140-lb yellowfin tuna caught by handline. In the evening the *Townsend Cromwell* continued CTD sampling.
- 10-12 August Continued CTD sampling except for swordfish-style longline set on the night of August 10. The *Hana Like* continued tracking the same fish. At 1600 on August 12 both vessels began joint tracking of the same fish. At 2100 the *Hana Like* quit tracking.
- 13 August The *Townsend Cromwell* continued tracking the same fish for 5 more h until ca. 0100 when the signal was lost, making a total track of 88 h on this fish (YF9503). In the morning the *Townsend Cromwell* searched for transmitter signals and then CTD sampling was resumed. That night the *Townsend*

Cromwell made a swordfish-style longline set, and the *Hana Like* caught and began tracking a ca. 170-lb yellowfin tuna.

- 14 August The fish (YF9504) was lost after 11 h. After completing longline haulback the *Townsend Cromwell* tried to reacquire signals by chumming at a FAD visited by the tracked fish.
- 15 August A tuna-style longline set was made during the day. In the afternoon the *Hana Like* caught and began tracking a ca. 150-lb yellowfin tuna. The *Townsend Cromwell* resumed CTD sampling around the area of the track.
- 16-17 August The *Hana Like* tracked the fish (YF9505) for 46 h. The *Townsend Cromwell* conducted CTD operations and listened for lost transmitter signals, and then joined the *Hana Like* in attempting a joint track on the same fish for 5 h. The transmitter was shed at .ca 1420 August 17. Both vessels then fished for live bait and returned to fishing operations.
- 18 August The *Townsend Cromwell* conducted a tuna style longline set, and again attempted to capture live bait. The *Hana Like* fished all day but caught only blue marlin, one of which was tagged with a radio satellite transmitter.
- 19 August The *Hana Like* caught and tracked a .ca 140-lb yellowfin tuna and the *Townsend Cromwell* resumed CTD operations. In the afternoon the *Townsend Cromwell* attempted to assume the role of tracking vessel with poor results and so resumed CTD operations while the *Hana Like* continued to track.
- 20 August The *Townsend Cromwell* completed CTD operations at 0500, dropped off two scientists (Brill and Koenig) in Kailua-Kona, and departed for Snug Harbor. The *Hana Like* broke off tracking the fish (YF9506) after 35 hours and departed for port at 1200. Disembarked four scientists (Boggs, Block, Marsinek, and Freund) at Keahou Bay. End of charter.
- 21 August Disembarked remaining six scientists at Snug Harbor, Honolulu. End of cruise.

MISSIONS AND RESULTS:

- A. Capture live vigorous broadbill swordfish and large (>150 lb) yellowfin tuna for tracking. On the *Townsend Cromwell* conduct longline sets with short soak times, using more controlled recovery speeds to carefully lift the gear during recovery to avoid dragging fish through the water. Collect fish catch, effort, depth, and time of capture data for the longline fishing operation using hook timers and time-depth recorders. On the *Hana Like* use handline or troll fishing methods to capture fish for tracking.
1. No live swordfish were caught. The fishing vessel *Hana Like* experienced excellent fishing success for yellowfin tuna due in large part to the skill of the *Hana Like's* captain and crew. They captured 8 vigorous, healthy fish ranging in size from 140 lb to 200 lb at an average rate of 1 fish per 17 h of fishing effort (including search time, and time spent to capture live bait). Of these fish, transmitters were attached to 7 and tracks were conducted on 6. The *Hana Like* fished using a wide variety of methods including daytime trolling, daytime drift-float handline, daytime handline in porpoise schools (make'-dog), daytime handline from the vessel with chum (palu ahi), and nighttime handline (ika shibi). The latter method, using live opelu for bait, was most successful. In contrast the *Townsend Cromwell* was unable to capture any fish suitable for tracking in six longline operations totaling approximately 80 h. (Note that neither fishing nor tracking were primary objectives for the *Townsend Cromwell*.) Hook timer and TDR capture depth data on the longline catch have not been analyzed.
- B. Track swordfish or yellowfin tuna for an extended period of time (>3 days) to determine vertical and horizontal movements that will be analyzed in relation to environmental factors measured concurrently aboard the *Townsend Cromwell*.
1. Yellowfin tuna proved very difficult to track by either the *Townsend Cromwell* or the better-suited tracking vessel *Hana Like* due to: (1) the frequency of 5-7 kn sprints by the fish and the scientists' inexperience with such tracking, and (2) the poor design of some tag anchors, their attachment to the transmitters, or the transmitters' nonstreamlined shape. In two documented cases transmitters were shed. Although both vessels provided better platforms for tracking than

anticipated, the high activity level of the tuna defeated our attempts to acquire several tracks of >3 days duration. Nevertheless, 3 tracks \geq 35 h were achieved including one 88-h track, and the dominantly nearshore behavior of the tracked fish was unexpected and fascinating. The *Hana Like* succeeded in routine tracking at speeds up to 6 knots (occasionally, 7 kn!), and sonic transmitter signals were audible up to 0.8 nmi away and sometimes farther. The *Hana Like* had greater range for picking up the transmitters and was more maneuverable than the *Townsend Cromwell*.

- C. Collect environmental data on the habitat of tracked fish by conducting oceanographic stations along and across the course of the charter vessel during tracking.
1. A very good description of the physical habitat of the tracked fish was acquired through oceanographic sampling by the *Townsend Cromwell*. The ADCP, and TSG functioned properly throughout the cruise. A total of 86 CTD casts were completed in a grid from the 700-m isobath along the coast to 15 mi offshore, and from the Keahole Pt. to Kauna Pt. The grid was repeated several times to document temporal variation. All tracking was conducted within this area. Spatial and temporal variation in currents as indicated by ADCP was much more substantial than spatial or temporal variation in the thermocline or oxycline. Horizontal movements of the tracked fish seemed to be unrelated to oceanographic conditions. Fish behavior seemed to be associated with FADs, the coastline, drifting objects, and porpoises. Some fish seemed to develop an association with the tracking vessel and followed the vessel.
- D. Collect biological samples (tissues appropriate for mtDNA analysis, stock heterogeneity studies, growth rate estimation, diet studies, and sex determination).
1. The longline catch included only one small dead swordfish which was brought back whole for various analyses. One gemplid (*Promethichthys prometheus*) was also collected whole. No other species caught on longline gear were sampled except for stomachs checked for juvenile billfish (none found). Seven IK trawls were made, capturing two blue marlin (*Makaira mazara*) larvae, one unidentifiable istiophorid larvae, and one other (unidentifiable) billfish larvae. Six night-light stations were conducted, but no billfish were captured.

- E. Take and record biological measurements and determinations (fork length, various morphometric measures, tissue weights, somatic weight, fin ray counts, sex, etc.)
1. Size data (and sex of mature fish) were recorded for 1 swordfish, 1 blue marlin, 3 albacore (*Thunnus alalunga*), 1 mahimahi (*Coryphaena hippurus*) and 2 lancetfish (*Alepisaurus ferox*) from the longline catch.
- F. Tether viable swordfish or yellowfin tuna for recovery and tracking by the charter vessel. Tag, mark, and release viable billfish and tuna not needed for tracking.
1. Two blue marlin were tethered for possible satellite tagging. They were both alive when retrieved and were tagged with conventional tags. Two other blue marlin and one albacore caught by the *Townsend Cromwell* were tagged and released, and two blue marlin caught by the *Hana Like* were tagged and released, one with a satellite transmitting tag. One oilfish (*Ruvettus pretiosus*) and ten sharks caught on the longline were released. One pelagic stingray (*Dasyatis violacea*) caught on the longline, and one bigeyed jack (*Caranx sexfasciatus*) caught on rod and reel by the *Townsend Cromwell's* crew were brought back alive for the Waikiki Aquarium.

**SCIENTIFIC
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Attachment

Figure 1. Location of CTD stations (top panel) and longline sets (bottom panel) conducted off the Kona Coast of Hawaii during TC 95-04.