NOAA – National Marine Fisheries Service

WEEK ONE
August 24 – 31

2008 LUTH CRUISE

*Studying **L**eatherback **U**se of **T**emperate **H**abitat Along the Central California Coast*

CHIEF SCIENTIST:
Scott Benson

CRUISE LEADER:
Scott Benson

SCIENTISTS (A-Z):
Kristen Cieciel
Heidi Dewar
Tomo Eguchi
Karin Forney
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Jim Harvey
Daniel Palacios
Owyn Snodgrass
Kate Swails
Russ Vetter

VISITORS:
Aaron Guptill

TEACHER AT SEA
Alice Eilers

SURVEY COORDINATOR:
Annette Henry

David Starr Jordan

Cruise Overview

Scientists from **NOAA's Southwest Fisheries Science Center** (SWFSC) launched and completed Week 1 of the 2008 Leatherback Use of Temperate Habitat (LUTH) Cruise. Led by Chief Scientist Scott Benson (Marine Turtle Ecology and Assessment Program), this month-long effort will characterize the oceanographic conditions that create and define leatherback foraging habitat within the offshore areas of central California, a known foraging hotspot for leatherbacks originating from nesting beaches in the Western Pacific Ocean (Indonesia and Solomon Islands). In situ oceanographic sampling from the research vessel NOAA Ship *David Starr Jordan* coincides with aerial surveys of the study area aboard a NOAA Twin Otter Aircraft (*N-57*). Data collected from these platforms will be paired with remotely-sensed ocean satellite data and turtle-borne satellite telemetry. By determining the oceanographic processes linked with leatherback movements, this project will provide information that is vital for mitigation of leatherback-fishery interactions.

Weekly Science Summary

Scott Benson (Chief Scientist)

Welcome to the 2008 LUTH Cruise! Our first week has been eventful. We departed one day late, on Sunday August 24, to allow for some repairs to our ship, *David Starr Jordan.* The first day was spent calibrating the multi-frequency hydroacoustic system in San Diego Bay. This system will help us document and locate fish, krill, and jellyfish while underway. After dropping off the hydroacoustics team at the end of the day, we departed San Diego around 8:00pm. During the next two days as we sailed north to the study area, we finalized equipment setup on board, conducted a test sampling station, held drills and safety training, and coordinated logistics with our land-based aerial survey team in Monterey Bay.

Once in the study area, we conducted two successful oceanographic stations and net tows, and then it was time to head to Monterey to pick up the swordfish tagging team: Heidi Dewar, Russ Vetter, Owyn Snodgrass, and longline fisherman Aaron Guptill. It appears that we may have also inadvertently picked up some instrument gremlins, which subsequently infested our flow-through fluorometer and conductivity-temperature-depth recording (CTD) system (See Oceanography Report below). But we've adapted our sampling plan to collect more frequent surface chlorophyll samples and expendable bathythermographs (XBTs) until we can repair or replace the malfunctioning units. Daniel Palacios, Tomo Eguchi, Karin Forney, and Dave Griffith have been editing and processing the oceanographic data as we go, so we can adapt our sampling strategy to meet our objectives.

WEEKLY SCIENCE SUMMARY - *CONTINUED*

"Between net tows, humpback whales and California sea lions kept us entertained, while Common Murre fathers and their chicks called to each other all around us.."

SCOTT BENSON

As we headed offshore for blue water and swordfish fishing operations, we encountered short-beaked common dolphins (*Delphinus delphis*), fin whales (*Balaenoptera physalus*), a few ocean sunfish (*Mola mola*), and some scattered moon jellies (*Aurelia* spp.). With clear skies, the aerial team surveyed some of the same areas -- seeing many of the same species and oceanic features we had documented.

Swordfish fishing took place during the next three nights, aided by fisherman Aaron's expert knowledge and our oceanographic data from ship and space. We successfully found suitable habitat quickly and caught four swordfish during two of the sets. Unfortunately, we were not able to tag any of these fish, but biological data from two of them will aid our understanding about the structure of this population, so not all was lost. Meanwhile, a leatherback that received a transmitter from us last September slowly but steadily moved east through our study area and back to the coastal location where she was encountered nearly a year ago. On Saturday 29 August, the seas became outrageous and were too rough for us to continue operations. We decided to return to the shelter of Monterey Bay to conduct net tows and oceanographic sampling in areas where we have seen leatherbacks and jellyfish in the past. This will provide comparative data for nearshore and offshore habitats. The tows in Monterey Bay yielded some impressive specimens of the leatherback's favorite prey - the sea nettle, *Chrysaora fuscescens*. We also caught moon jellies (*Aurelia labiata*), an egg-yolk jelly (*Phacellophora camtschatica*), and some ctenophores. Between net tows, humpback whales (*Megaptera novaeangliae*) and California sea lions (*Zalophus californianus*) kept us entertained, while Common Murre (*Uria aalge*) fathers and their chicks called to each other all around us. We also observed two seabird species side-by-side that are not normally close neighbors: Brown Pelicans (*Pelicanus occidentalis*; a coastal species) and Black-footed Albatross (*Phoebastria nigripes*; an offshore species that breeds in the northwestern Hawaiian Islands). Their proximity is a direct reflection of the deep Monterey Canyon adjacent to shallow Bay waters.

As we head into our second week, we hope for better weather and some success in getting our oceanographic instruments working 100% again. Before closing for the week, I'd like to thank all of the LUTH Team on land who helped get us off to a good start.

"On Saturday 29 August, the seas became outrageous... We decided to return to the shelter of Monterey Bay to conduct net tows and oceanographic sampling…"

Leatherback turtles are specialist consumers, feeding exclusively on gelatinous prey. Notice the specialized mouth 'hook' to help with jelly consumption (left), and the esophageal papillae for keeping jellies down once ingested (right).

Readying to deploy a CTD cast during LUTH 2008

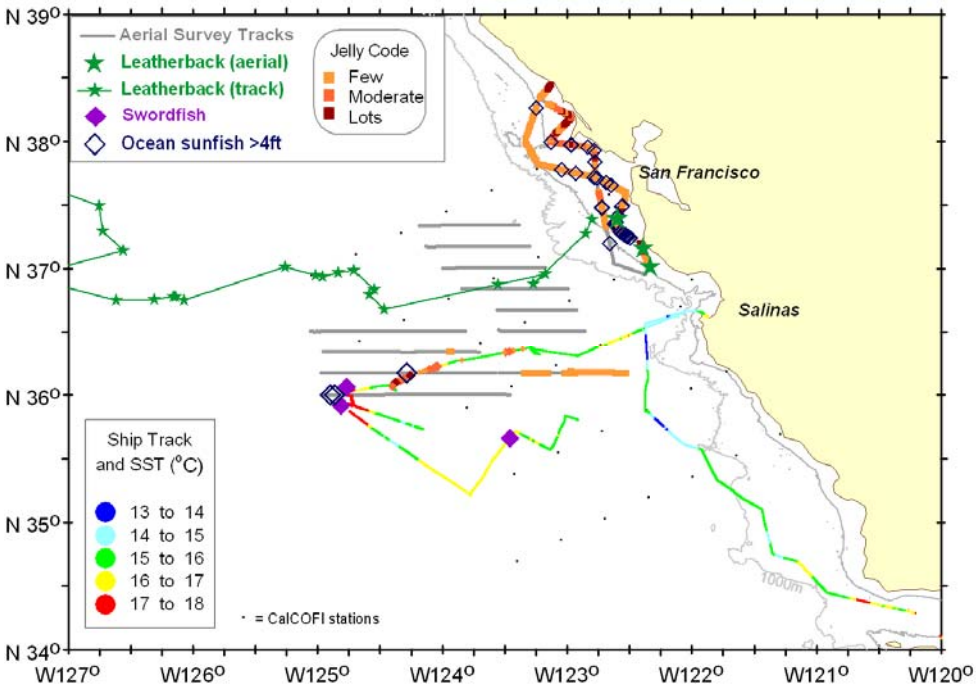

FIG 1. Summary of survey effort and key observations during the first week of LUTH 2008. Large ocean sunfish, leatherback turtles, and jellyfish co-occurred in nearshore areas. Swordfish, ocean sunfish, and jellyfish were encountered in warmer offshore waters by aerial and shipboard observation teams. The satellite-tagged leatherback has crossed the offshore study area and is near other leatherbacks off the San Mateo County Coast.

Aft deck aboard NOAA Ship David Starr Jordan *LUTH 2008*

Oceanographic Data Collection

Kristen Cieciel, Tomo Eguchi, Karin Forney, Dave Griffith, and Daniel Palacios

LUTH's primary objective is to characterize leatherback turtle habitat in the California Current System between 35°N and 38°N and out to 125°W off central California. For Leg 1, the sampling protocol consists of collecting continuous underway measurements of surface conditions with the ship's flow-through system and occupying selected CTD stations from the CalCOFI program for water-column measurements down to 525m. Fluorescence and dissolved oxygen sensors are also mounted on the CTD instrument. In addition, XBTs are dropped down to 700m and surface water samples are collected for chlorophyll determination at regular intervals while underway. Because of the project's complimentary objectives of finding and tracking turtles and swordfish, stations are not occupied in a systematic manner. Instead, sampling is done adaptively, using near-real-time data to determine the best locations to target, given the dynamic nature of the system. A shore-based team from SWFSC's Environmental Research Division (ERD) regularly sends satellite data through the ship's e-mail system and assists with interpretation and decision-making (Dave Gray, the ship's ET, has been particularly helpful in ensuring reception of these data).

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"In spite of inclement weather and persistent instrument failures, during the first week we have made good progress in covering different portions of the study area. "

Tomo Eguchi in action on the Jordan

A forest of laptops on the Jordan

OCEANOGRAPHIC DATA COLLECTION - *CONTINUED*

In spite of inclement weather and persistent instrument failures, during the first week we have made good progress in covering different portions of the study area. The satellite sea surface temperature and ocean color imagery provided by ERD for this week depict the classic summertime conditions in the California Current in exquisite detail and complexity: cold filaments streaming from three coastal upwelling centers at Point Arena, Point Año Nuevo and Point Sur; warmer waters in the main body of the California Current further offshore; and a pool of warm water (> 18ºC) in the offshore region (Fig. 2). The underway thermosalinograph data show these features along our track (Fig. 3), with cold, salty water during the initial inshore northward transit from San Diego to Monterey (where we picked up the fishing crew), and progressively warmer, less salty water during the transit to the offshore 'warm pool' (Fig. 3), where swordfishing operations were conducted. Along our track, we have dropped 51 XBTs, performed six successful CTD casts, and collected 31 surface chlorophyll samples.

In collaboration with Alaska Fisheries Science Center – Auke Bay Lab we are also collecting continuous underway measurements of the water's inherent optical properties using a Spectral Absorption-Beam Attenuation (AC-S) system. These data will give us an indication of the phytoplankton communities found in the water masses we have covered from an optical perspective. Given the failure of the flow-through fluorometer, the AC-S will be particularly valuable in filling this gap. Another innovation has been the use of a nitrate sensor mounted on the CTD to obtain vertical nutrient profiles. This instrument has been in testing mode during the first week, but it is now fully operational and we are eagerly awaiting calmer seas to continue our water-column sampling.

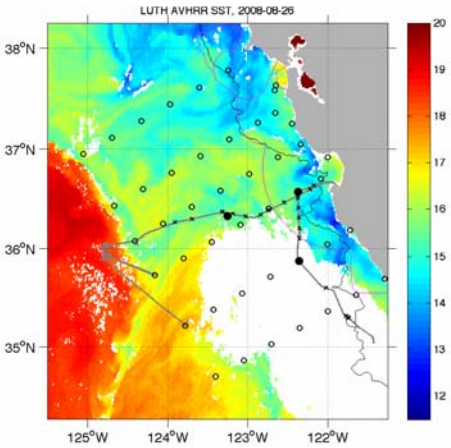

FIG 2. Oceanography sampling stations overlaid on sea surface temperature within the study area. SST data courtesy of NOAA CoastWatch.

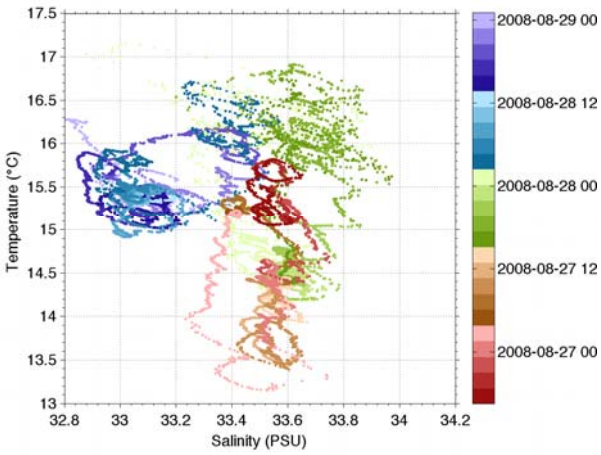

FIG 3. Temperature-salinity diagram from the continuous thermosalinograph, by date during week 1 of LUTH.

Swordfish
Xiphias gladius

Swordfish Studies

Heidi Dewar

One of the goals of the LUTH cruise is to simultaneously characterize the habitat of swordfish and leatherbacks off Central California. To examine swordfish habitat we have conducted three longline sets with the help of a professional fisherman, Aaron Guptill. We have learned a lot from Aaron, including that we should not give up our day jobs. Using the longline both provides some sense of where the swordfish are and also the opportunity to deploy electronic tags if the fish are alive and healthy. In the first set we caught only blue sharks although we apparently fed a lot of squid. In the second and third sets we caught blue and mako sharks and four swordfish in a nice intrusion of warm, blue water to the west. Unfortunately we were not able to tag any of the swordfish. Three of these fish were dead; two were foul hooked and one had just recently died. The final fish escaped when the leader was cut on the propeller. We were able to bring two of the dead fish on deck and took a number of valuable biological samples ranging from DNA to heater tissue to otoliths to parasites. One interesting observation was that all of the external parasites were embedded in the most recent cookie cutter shark scars. Ironically, in our run to escape the pending 15 ft seas we saw a swordfish basking on the surface, just out of reach, waving good bye. The hunt continues.

Substantial data on morphology and parasites were collected from each swordfish, and numerous tissue samples were collected.

Swordfish tissue sample with visible endoparasite

AERIAL TEAM COORDINATOR:
ERIN LACASELLA

NOAA TWIN OTTER PILOTS:
NICOLE CABANA
JASON MANSOUR

OBSERVERS:
KELLY NEWTON
DAN PROSPERI
SUZANNE RODEN
JEFFREY SEMINOFF
LISA WERTZ

Aerial Team in front of the NOAA '57' Twin Otter

AERIAL SURVEYS

ERIN LACASELLA

After several days of fog and wind, we were finally able to get in the air on Thursday Aug 28 for our first flight of the season. NOAA Twin Otter pilots LT Nicole Cabana and LT Jason Mansour, and observers Erin LaCasella, Jeffrey Seminoff, Dan Prosperi of the SWFSC marine turtle programs, Kelly Newton from UC Santa Cruz and Lisa Wertz of Moss Landing Marine Labs embarked on a 6.5 hour flight of offshore transect lines (including a *David Starr Jordan* fly-by). Flying approximately 250 miles offshore we completed four transect lines with sightings of common dolphin and fin whales. We were able to fly another 3.5 hours the same afternoon doing near-shore transect lines up the coast. We had sightings of four leatherback turtles, humpback whales, harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), many ocean sunfish, and tons of jellyfish (See Fig. 1 on Page 3). On Friday Aug 29, Suzanne Roden of the SWFSC marine turtle program joined us for 4.5 hours of flying offshore lines outside of Pescadero and Monterey Bay before the fog shut us down. The wind has kept us out of the air a few days but we hope to be in the air again early this week, guiding *David Starr Jordan* as the science team attempts to put suction cup time-depth recorders on leatherbacks.

A WORD FROM OUR TEACHER AT SEA

ALICE EILERS

My first week as a NOAA Teacher at Sea has been an enlightening and enriching experience. It has transferred my role as an educator to that of a student with numerous opportunities. My primary objective during week one was to familiarize myself with the science research efforts and assist the scientists in anyway possible. My first scientific task was as a visual observer. This required me to familiarize myself with the identification of various marine animal species: mammals, jellyfish, seabirds etc. Once identified, the species name was logged in a computer program along with the animal's location and other pertinent information such as sea state and weather conditions.

Aside from my role as a student, I am also recording a video journal of my experience at sea for use in a Teacher at Sea kiosk at the Ocean Exhibit in the Smithsonian Natural History Museum. The main objective of this task is to document the technology used to identify, biotic, and abiotic factors surrounding the habitat of the leatherback sea turtle.

However, not everything went as planned. It was interesting to see how well the chief scientist, officers and crew handled the logistics of rearranging daily objectives due to situations beyond human control such as weather, mechanical problems and equipment malfunctions. An important lesson I've learned from this is that careers as an educator or a scientific researcher are surprisingly similar with regards to being flexible, multitasking and having the fortitude to get the job done.