

A DISCUSSION OF THE FINDINGS OF THE NATURAL SETTING

AT SITE 31CR314

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Weather and Water Conditions

During the 1997 October field project at site 31CR314 various environmental measurements and data were gathered and recorded in the initial attempt to gain specific knowledge of the basic physical environment that surrounds the wreck. One or two times a day weather and water conditions were observed and recorded on an oceanographic log sheet using specific weather terminology and oceanographic methods.

Prior to the field project David Monaghan of the Marine Division of Cape Fear Community College was contacted. He generously agreed to loan the North Carolina Underwater Archaeology Branch (UAB) the necessary oceanographic equipment, which included a Secchi disc, a wind anemometer, a Forel scale, a barometer, a bottom grab, and the weather log form for recording the data. A current meter was offered, but there was not suitable storage space in R/V *Snapdragon* due to the size of the meter, the support stand, and the cable. David provided additional testing equipment when he participated in the field project aboard *Snapdragon* on October 20. This included a refractometer, a PH meter, a dissolved oxygen (DO) meter, and various water sampling bottles.

Snapdragon, while stationed on site, was the platform for all oceanographic testing. The time and position were taken from the Northstar 951X GPS chart navigator. While the position, which was recorded in latitude and longitude was the same each day, the time of data collection varied from day to day due to scheduling of other activities on board. The present weather, visibility, and sea state (swell direction, swell height, and wave height) were observed by the technician. The present weather conditions, which were generally good for the month, ranged from clear to partly cloudy to cloudy, and the visibility ranged from over ten

miles to 2 miles. Not once was rain recorded at the time of sampling.

Swells are generally the seas with the longer wave length, longer duration, smoother appearance, and are generated from a distant weather system. The swell directions that were observed, recorded as one of the eight points of the compass rose, were mostly from the northeast (NE) and north (N). East (E) and Southeast (SE) swells were noted on some days, and one day a southwest (SW) swell rolled in. The swell height was recorded in feet ranging from one foot to three feet except two to four foot swells on Friday, October 24, and three-foot swells on Tuesday, October 28. Waves are the seas that are produced by local winds, are closer together, and quite possibly come from a different direction than the swells. During the project month, the wave heights were recorded and were generally shorter than the swells.

Wind measurements were taken with the wind anemometer, which indicated wind velocity and direction. The wind speed was recorded in knots and the direction in degrees. When the measurements were taken, *Snapdragon* was always moored stationary on the wreck site. The anemometer was held by the technician, usually on the fore deck, pointing north. As indicated on the weather log, the wind speed generally was ten knots or less, and only on four days was it measured over ten knots but never over twenty knots.

Air temperature and relative humidity information was gathered with a sling psychrometer. The wick on the wet bulb was moistened with fresh, distilled water, and with an easy wrist motion, the technician would "sling" the device for about ninety seconds, then the wet bulb and the dry bulb (air temperature) measurements were read and recorded. The relative humidity was calculated from these readings. The air temperature for the most part decreased during the period with the range being a high temperature of 82 degrees Fahrenheit (F) and a low temperature of 57 degrees F, and the average temperature was 71 degrees F. The relative humidity ranged from 95% to 42% with an average of 74%.

Several sea water properties and characteristics were measured and recorded. The seawater temperature was read from the Apelco fishfinder made by Raytheon electronics, which was installed in *Snapdragon* with a transom-mount

transducer. The highest water temperature reading of 76.8 degrees F was recorded on October 9, and the lowest water temperature of 65.3 degrees F was recorded on October 30. Basically, the seawater temperature decreased during the month, with some slight variation, and the average sea water temperature was 72.8 degrees F.

The water visibility was determined by using a Secchi disc. The vertical surface measurement was made by lowering the Secchi disc from the deck of the *Snapdragon* into the water. The vertical visibility varied from as little as 1.5 meters (M) to as much as 5 M with an average of 2.9 M. When a diver was available to make the measurement, the Secchi disc was taken to the sea floor, and a horizontal visibility was determined for the underwater visibility. The measurements that were recorded ranged from less than 1 M to 3.66 M. Visibility measurements were not determined using the Secchi disc on the morning of October 6 when water clarity was excellent. Reportedly, the wreckage could be seen from the surface, and divers reported the underwater visibility to be 20 feet (6M). Sea water color was determined by comparing the water to a Forel scale which has eleven vials of different graduated colored solutions. Each glass vial has a numerical designation. The observed results were usually a 6 or 7 with four readings of 8 and one 5.

Seawater chemical determinations were taken from surface and bottom water samples. During the project these analyses were not systematically made. The first sample for salinity, dissolved oxygen, and PH (acidity) surface measurements was taken on October 20. Analyses resulted in readings of 35ppt salinity, 6.2 dissolved oxygen (DO), and 7.2 PH (acidity). [Link to Monaghan report] Other samples were collected in the water sample bottles, refrigerated, and analyzed after the field project. A technician at the Marine Technology Division of Cape Fear Community College made the water analyses. Due to this lengthy postponement, the DO determinations were inconclusive because DO continues to be used by organic compounds and microscopic organisms, but the PH and salinity recordings were valid. The bottles were marked with a number for the date and for surface or bottom. The PH range was from 6.5 to 7.7, and the salinity range was from 32ppt to 35ppt.

Overall, weather conditions during the entire October field project for 1997 allowed fieldwork on the site for the

duration. The prevailing fall wind directions are generally on shore northerly breezes causing the site to be in the lee of Shackleford Banks and Cape Lookout protecting it from the huge swells of the northeasters. With a few exceptions, the winds were from the north and the seas were relatively calm, facilitating boating, mooring, and diving operations. Divers were able to swim, see, and effectively carry out underwater operations with the diminished surge and less turbidity. The fact that the site is situated near Beaufort Inlet also greatly influences the sea conditions. Tidal changes affect the sea state, underwater visibility, and current speed. Underwater visibility is generally better during flood tide, especially at high water, before the ebb begins. In the situation when the north wind occurs simultaneously with the falling tide, more water is being pushed out from the rivers, sounds, and back waters which results in greater current velocity and turbidity, and the diving becomes difficult. In spite of the difficulties, early fall still seems to be the best time for field research. Southerly winds which blow from the open ocean prevail in the summer. Due to the uninterrupted fetch, when the wind velocity increases the wind produces a large swell and rough sea conditions making research in this area very difficult.