matic monitoring of dolphin abundance and migration activity is in progress. The system should consist of radio-acoustical buoys placed in the sea to record signals and to transmit them to a coastal station and an automatic signal analyzer in conjunction with an expert-system capable of determining whether the respective signals belong to a school registered earlier, or a new one.

11:40

3aAB7. Matched-field processing of baleen whale vocalizations using calibrated environmental models. Aaron M. Thode, Gerald L. D'Spain, and William A. Kuperman (Marine Physical Lab., Scripps Inst. of Oceanogr., Univ. of California at San Diego, La Jolla, CA 92093-0205)

During the 1997 Marine Mammal Vocalization (MMV) experiment conducted by the Scripps Marine Physical Laboratory last September, J15 source tows were conducted in a highly range-dependent environment northwest of San Nicolas Island in the Southern California Bight region. The tows consisted of eight radial tracks ranging from 1 to 6 nautical miles from the research platform FLIP, along all cardinal directions. Among the signals broadcast were low-frequency combs (18–110 Hz), middle-frequency combs (50–200 Hz), FM downsweeps (900 to 50 Hz over 9 s), and an Eastern Pacific type A blue whale recorded during the 1996 MMV experiment. Multiple CTD casts were also taken, and a bathymetric database was obtained from the National Oceanographic Service. All these data are used to calibrate matched-field processing environmental models, which are subsequently applied to find the location in 3D space of a series of blue whale vocalizations. [Work sponsored by ONR.]

12:00

3aAB8. Feasibility of monitoring bowhead whales with a vertical line array. Kevin D. Heaney and Peter N. Mikhalevsky (Sci. Applications Intl. Corp., 10260 Campus Pt. Dr., San Diego, CA 92121)

As part of the ACOUS trans-Arctic acoustic propagation experiment, a vertical line array will be deployed off Pt. Barrow, Alaska in the summer of 1998. The array will be cabled to shore and will be capable of real-time recording of acoustic frequencies from 20 to 500 Hz. This array will provide scientists the opportunity to record bowhead whale songs in real time from hydrophones spanning the water column. Currently, the bowhead whale census is taken during the spring migration from the edge of ice leads. The feasibility of doing a Fall census, when the sea is relatively free of ice, will be presented. Recordings of bowhead whale songs, and simulations of localization using the vertical array will be presented. Using varying bathymetry and sono-buoys, to add to the horizontal resolution of the array, 3D localization of vocalizing whales should be possible.

12:20

3aAB9. Observations of the movements of humpback whales about an operating seismic survey vessel near Exmouth, Western Australia. Robert D. McCauley (Ctr. for Marine Sci. Technol., Curtin Univ. Technol., P.O. Box U 1987, Perth 6854, Western Australia), Micheline-Nicole Jenner, Curt Jenner (Ctr. for Whale Res., Broome 6725, Western Australia), and Douglas H. Cato (Defence Sci. Technol. Organisation, Prymont, NSW 2009, Australia)

As part of a project investigating the interaction of air-gun noise and marine animals, monitoring of migrating humpback whales traversing the track of a seismic vessel was conducted in October 1996. Four separate pods traveling SW in 100–120 m of water were followed as they approached a seismic vessel traveling on an east/west heading and operating a 2678 cui air-gun array every 8 s. The response of pods was to change course at 3–6 km from the vessel so as to pass in front of or behind it. In one instance a single animal was observed moving slowly at 4.2 km NNW of the vessel, then to suddenly accelerate to 10–12 kn on a SW course across the vessel's bow at a closest range of 1.5 km. It then swam S at 5–10 kn until it was 4 km from the vessel. During the period of rapid swimming the animal stayed close to the surface with the tail flukes often breaking the water, maintaining a 40-s blow interval. The animal then swam steadily SW, eventually stopping and commencing singing on encountering a pod of two animals at 15 km from the still operating seismic vessel. [Work supported by the Energy Research and Development Corporation, Australian Petroleum Production and Exploration Association, and WMC Petroleum.]

WEDNESDAY MORNING, 24 JUNE 1998 GRAND BALLROOM A (S), 8:30 TO 10:30 A.M.

Session 3aAO

Acoustical Oceanography and Underwater Acoustics: Acoustic Determination of Ocean Parameters

Jeffrey A. Nystuen, Chair
Applied Physics Laboratory, University of Washington, 1013 NE 40th Street, Seattle, Washington 98105

Contributed Papers

8:30

3aAO1. Applications of two frequency insonification techniques to oceanic bubble sizing. Andy D. Phelps, Matt D. Simpson, and Timothy G. Leighton (Inst. of Sound and Vib. Res., Univ. of Southampton, Southampton SO17 1BJ, UK, ap@isvr.soton.ac.uk)

This work presents the results from using a combination frequency acoustic technique to measure the near-surface bubble population in both the open sea and surf zone. The benefits of using a combination frequency technique are that the collected data are more accurate and less prone to ambiguities than linear backscatter measurements. The technique monitors the appearance of sum-and-difference signals generated by the nonlinear interaction of two sound fields: one high-frequency signal scattering geometrically from the bubble surface and the other used to excite the bubble into resonant pulsation. The work details the calibration of the apparatus necessary to relate the measured heights of the sum-and-difference terms to actual numbers of bubbles, and describes the experimental procedure for the collection of the oceanic data. The collected data are verified using simultaneous measurements of the dispersive sound speed and attenuation, which can be compared with estimates calculated from the measured bubble population. The results from a number of trials are presented, with both time-averaged and time-variant measures of the local population demonstrated. [Work supported by the Natural Environment Research Council.]