

**APPLICATION OF A NEW DIVER-OPERATED 4-CHANNEL ACOUSTIC/VIDEO DEVICE TO RECORD AND LOCALIZE HIGH FREQUENCY DOLPHIN SOUNDS.**

**Schotten, Michiel (1)**, Lammers, Marc O. (2), Herzing, Denise L. (3), Sexton, Ken D. (4) and Au, Whitlow W.L. (5)

(1) [mike\\_schotten@hotmail.com](mailto:mike_schotten@hotmail.com) Department of Marine Biology, Groningen University, Kercklaan 30, 9751 NK Haren (Gn), The Netherlands (2) Marine Mammal Research Program, P.O. Box 1106, Kailua HI 96734 (3) Wild Dolphin Project, P.O. Box 8436, Jupiter FL 33468 (4) The Sexton Company LLC, 860 E Street NE, Salem, OR 97301 (5) Marine Mammal Research Program, P.O. Box 1106, Kailua HI 96734, USA

From decades of research on captive dolphins much is known about their sound production, reception and discrimination capabilities, but the study of wild dolphin echolocation and communication is only since recently becoming more accessible with the advancement of new technologies. Traditionally, recording dolphins in the wild has been difficult because of: (1) The broadband nature of dolphin signals, with some signals extending over 200 kHz in frequency; (2) The directional properties of dolphin signals, with only signals recorded from the center of the beam being undistorted; (3) The difficulty of identifying which and how many individual dolphins produced the recorded signals; and (4) Being confined to recording equipment on a boat, which complicates the recording of significant behaviors. To resolve each of these difficulties, an underwater portable battery-operated digital recording device was developed that is capable of capturing acoustic signals beyond 220 kHz on 4 channels, as well as dolphin behaviors on simultaneous video. By localizing the sounds using a 4-hydrophone method, recorded sounds can be attributed to individual dolphins on the video. The new system consists of a custom-made underwater housing, containing two batteries, a digital camcorder, tv-screen, and an acoustic recording unit with custom-made signal conditioning board, 4-channel data acquisition card, PC/104-plus single board computer and power supply, and a notebook hard disk. Attached to the housing is a 4-hydrophone star array. Post-recording, acoustic signals recorded within 15 m are accurately localized in 3-D and attributed to individual dolphins on the video. Thus, acoustic signal features can be correlated with different echolocation behaviors and communicative signal exchanges among dolphins can be assessed. Recordings were made of a population of wild Atlantic spotted dolphins (*Stenella frontalis*) and bottlenose dolphins (*Tursiops truncatus*) in The Bahamas. Some of the *Stenella* echolocation clicks had significant energy past 220 kHz.

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**THE CODA REPERTOIRES OF INDIVIDUAL SPERM WHALES IN A SOCIAL UNIT**

**Schulz, Tyler, M. (1)**, Whitehead, Hal (1), & Rendell, Luke (2)

(1) [tmschulz@dal.ca](mailto:tmschulz@dal.ca) Department of Biology, Dalhousie University, Halifax, Nova Scotia, Canada, B3H 4J1; (2) Centre for Social Learning and Cognitive Evolution / Sea Mammal Research Unit, School of Biology, University of St. Andrews, Fife, United Kingdom, KY16 8LB

Due to the difficulties of studying the vocalizations of individual marine mammals in the field, almost nothing is known about the coda repertoires of individual sperm whales, thereby severely limiting our understanding of sperm whale communication. To examine the vocal repertoires of individual sperm whales within a well-studied social unit (consisting of 5 adult females, one juvenile male, and one calf), we took advantage of a fortuitous feature of sperm whale clicks, the inter-pulse interval (IPI), and used the similarity between the IPIs of usual clicks made by whales when fluking alone and the IPIs of coda clicks recorded during social sessions to assign codas to individual whales. Although the calf in the unit did not fluke, codas with IPIs less than 2 msec recorded while the calf was present were assumed to have been made by the calf. Comparing both continuous and categorical measures of the similarities of codas within and between whales and recordings, we found that only the calf and its mother had coda