10:15

3aAB8. Echolocation parameters of toothed whales measured at sea. Jens C. Koblitz (BioAcoust. Network, Eichenallee 32 a, Neuss 41469, Germany, Jens.Koblitz@web.de), Peter Stilz (BioAcoust. Network, Hechingen, Germany), Lisa Steiner (Whale Watch Azores, Horta, Portugal), and Marianne H. Rassmussen (The Univ. of Iceland's Res. Ctr. in Húsavík, Husavik, Iceland)

Historically, data on toothed whale echolocation parameters and abilities were collected from captive animals. Acoustic parameters under investigation were inter-click-interval, spectral content, source level, directionality, emission direction, including correlation and variation of those parameters. Technological advances over the past decade have allowed collecting data on those parameters from animals at sea using acoustic recording tags or hydrophone arrays. Using a vertical, linear array of 16 hydrophones, echolocation clicks from harbor porpoises, white-beaked dolphins, common dolphins, and bottlenose dolphins were recorded around Iceland and the Azores. The animal's position at click production was computed for each click based on the time of arrival differences. Intensity and spectral differences at the array allowed measuring source levels, beam width, and spectral variation at different angles relative to on-axis. Advancing knowledge on the use and variation of echolocation signals of toothed whales in their natural habitat will allow widespread and effective use of acoustic monitoring.

10:30

3aAB9. Echolocation detection of fishing hooks and implications for the Hawaiian longline fishery. Aude F. Pacini, Paul E. Nachtigall, Adam B. Smith, Rock Owens, and Stephanie Vlachos (School of Ocean and Earth Sci. and Technol., Hawaii Inst. of Marine Biology, 46-007 Lilipuna Rd., Kaneohe, HI 96744, aude@hawaii.edu)

Interactions between marine mammals and fisheries have a biological and economic impact that is often detrimental to both fishermen and species of concern. False killer whale bycatch in the Hawaii longline fishery has exceeded the potential biological removal (PBR) triggering the designation of a take reduction team under the Marine Mammal Protection Act (MMPA). As an attempt to understand the importance of acoustic cues in depredation events, this study presents preliminary data looking at the echolocation ability of a false killer whale (Pseudorca crassidens) to detect a longline fishing hook at various distances. Using a go/no-go paradigm, the whale was trained to report the presence of the hook at distances varying in 50 cm increments. A total of 28 sessions of 25 trials each were collected and echolocation signals were recorded using a nine element acoustic array. Number of clicks, acoustic parameters, decision time and performance were recorded. The subject successfully reported the presence of the hook up to 6 m. This work presents evidence that false killer whales can easily detect fishing gear which could influence how they interact with longline fishery.

10:45

3aAB10. The characteristics of dolphin clicks compared across recording depths and instruments. Marc Lammers (Hawaii Inst. of Marine Biology, 46-007 Lilipuna Rd., Kaneohe, HI 96744, lammers@hawaii.edu), Julie N. Oswald (Bio-Waves, Inc., Encinitas, CA), Anke Kuegler (Marine Biology Graduate Program, Univ. of Hawaii, Honolulu, HI), and Eva M. Nosal (Abakai Int., LLC, Waianae, HI)

The identification of delphinid species on the basis of the characteristics of their acoustic signals is an important aspect of many passive acoustic monitoring efforts. The development of species classifiers relies on the assumption that species-specific signal characteristics will be consistent across different recording scenarios, including depth and instrumentation. However, this assumption has largely remained untested. Here, we report on an effort to examine whether and how the properties of echolocation clicks obtained from different delphinid species vary as a function of recording depth and the instrument employed. Field recordings of seven species of dolphins were obtained off Kona, Hawaii, and San Diego, CA, using a 250 m vessel-based vertical array composed of five microMARS recorders, two SoundTrap recorders, and four C75 broadband dipping hydrophones (Cetacean Research Technology). The clicks obtained were characterized on the basis of their spectral properties and duration for each recording depth and also compared among different instruments deployed at the same depth. Both depth and recording instrumentation influenced the click characteristics observed. However, the click properties of some species varied to a greater degree than others. These results suggest that developing species-specific classifiers based on dolphin clicks should be approached with caution and carefully validated.

11:00

3aAB11. From dolphin sonar to commercial scientific acoustic systems. Lars N. Andersen (Underwater Sci., Simrad, Kongsberg Maritime AS, P.O. Box 111, Horten 3191, Norway, lars.nonboe.andersen@simrad.com)

Dolphins have remarkable sonar systems for underwater navigation, object detection, object inspection, and general understanding of the environment. It is easy to be inspired by these advanced biosonar systems when designing new advanced commercial sonar systems. Similarly, it is also easy to be inspired when discussing bioacoustics with Whitlow Au. His work on dolphin sonar systems has been and still is of significant inspiration for many working with both biological and manmade sonar systems. Personal examples on how Whitlow Au has inspired development of commercial scientific echo sounders will be given. Characteristics of dolphin sonar and commercial scientific acoustic systems will be discussed.

11:15

3aAB12. The echolocation beam of bottlenose dolphins (*Tursiops truncatus*): High-resolution measurements of horizontal beam patterns and nearfield/farfield transitions. Jason Mulsow (National Marine Mammal Foundation, 2240 Shelter Island Dr., Ste. 200, San Diego, CA 92106, jason.mulsow@nmmf.org), James J. Finneran (U.S. Navy Marine Mammal Program, San Diego, CA), Brian K. Branstetter, Patrick W. Moore, Cameron Martin, and Dorian S. Houser (National Marine Mammal Foundation, San Diego, CA)

The work of Whitlow Au and colleagues has demonstrated that dolphin biosonar forms a highly directional, forward-facing beam. In our recent studies, we have expanded upon previous work by making biosonar beam measurements using high-resolution hydrophone arrays with up to 48 hydrophones. Bottlenose dolphins were trained to echolocate on both physical targets and phantom echo generators, with clicks simultaneously recorded on all hydrophones at a sampling rate of 2 MHz. Target ranges (and simulated target ranges for phantom echoes) were varied in order to examine the resulting effects on the spatial characteristics of the acoustic field. The directivity index of the echolocation beam increased with increasing click level and center frequency, and recordings from extreme off-axis azimuths displayed a two-pulse pattern best explained by internal reflections off of the premaxillary bones. High-density hydrophone arrays placed near echolocating dolphins' heads demonstrated that a transition from the geometric nearfield to the farfield occurs at approximately 0.3 to 0.4 m from the melon. The results were remarkably similar to the earlier findings of Au and colleagues, and provide further information on the spatial characteristics of the acoustic field associated with dolphin biosonar. [Funding from ONR]

3a WED. AM

11:30

3aAB13. Transmission beam characteristics of a spinner dolphin (*Stenella longirostris*). Adam B. Smith, Aude F. Pacini (Marine Mammal Res. Program, Hawaii Inst. of Marine Biology, 1933 Iwi Way, Honolulu, HI 96816, adambsmi@hawaii.edu), Paul E. Nachtigall (Marine Mammal Res. Program, Hawaii Inst. of Marine Biology, Kailua, HI), Leo Suarez (Philippines Marine Mammal Stranding Network, Subic Bay, Philippines), Lem Aragonez (Inst. of Environ. Sci. and Meteorol., Univ. of the Philippines, Subic Bay, Philippines), Carlo Magno (Ocean Adventure, Subic Bay, Philippines), Gail Laule (Philippines Marine Mammal Stranding Network, Subic Bay, Philippines), and Laura N. Kloepper (Biology, St. Mary's College, South Bend, IN)

Transmission beam characteristics have been described in a small number of odontocete species, providing insight into the biological and ecological factors that have influenced the design of the outgoing echolocation beam. The current study measured the on-axis spectral characteristics and transmission beam pattern of echolocation clicks from a small oceanic delphinid, the spinner dolphin (*Stenella longirostis*). A formerly stranded individual was rehabilitated in captivity and trained to station underwater in