

tract along the oral and nasal pathways. We used this data to model resonances patterns produced by these VT including the oral pathway, the nasal pathway, or both. We found that the combined oral/nasal VT produced a formant pattern that more closely matches that observed in fallow deer groans and enables a better estimation of VT length from formant patterns. This clear indication that the nasal cavity and oral cavity are both simultaneously involved in the vocal production of a nonhuman mammal suggest that the potential for partial nasalization of putative oral loud calls should be carefully considered.

1:30

**5pABb3. Restoring dueting behavior in a mated pair of buffy cheeked gibbons after exposure to construction noise at a zoo through playbacks of their own sounds.** Jeanette A. Thomas, Brett Friel, and Sarah Yegge (Biological Sci., Western Illinois Univ.-Quad Cities, WIUQC, 3300 River Dr., Moline, IL 61265, jeanettethomaswiu@gmail.com)

There is concern about anthropogenic noise effecting zoo animals. Gibbons are known for duets exhibited by a mated pair. During a 6-month period in 2009, Niabi Zoo conducted construction (sewer/water lines, and paving) within 100 m of the buffy cheeked gibbon exhibit. Prior to construction, a male/female pair (plus their 4-year old son) performed loud, elaborate duets each day. Friel collected behavior data using focal animal and instantaneous scan-sampling for 10 days; 5 times per day prior to construction and for 20 days during construction. SEL measurements were taken during both periods. In general, the immature gibbon vocalized little; the female vocalized most. Gibbons vocalized less during construction noise. After construction, the subadult male became ill and was euthanized; thereafter the pair ceased vocalizing. Two years later, Yegge played back sounds to encourage dueting: 1) their own duet, 2) the duet of wild gibbons, 3) rock music, and 4) a silent control. Their behavior was collected for 3, 15-min playback sessions per day for 30 days. The pair's own playback elicited a duet even during the first session. The female vocalized significantly more than the male, especially during the wild gibbon duet. Currently, the pair continues dueting on their own.

1:45

**5pABb4. Baby's first words: Vocal behavior and ontogeny of Northern right whales in the southeast critical habitat.** Edmund R. Gerstein (Psych., Florida Atlantic Univ., 777 Glades Rd., Boca Raton, FL 33486, gerstein2@aol.com), Vasilis Tyrgonis (Univ. of the Aegean, Lesvos, Greece), and James Moir (Marine Resource Council of Florida, Palm Bay, FL)

North Atlantic right whales are one of the most endangered of the great whales. A remnant population of ~500 inhabits the eastern seaboard of North America. A small fraction (2%) travels south to their critical calving habitat along the Florida and Georgia coast. By late November and through the winter, right whales give birth and nurse their calves in these shallow waters before departing in early spring to their northern habitats. In the southeast critical habitat mother-calf pairs remain generally isolated from other whales, presenting a unique platform to study vocal development and learning in large whales. Using small boats, GPS-instrumented, free-drifting autonomous acoustic buoys were deployed in close proximity to 44 photo-identified mother-calf pairs over 7 calving seasons. Surface video and synchronized underwater recordings documented their social and vocal behavior. With the exception of some low-energy gunshot sounds, mothers, and their calves, remained predominantly silent during the first 4 weeks. This might be due to calf maturation, and or a strategy to avoid harassment by other whales or potential predators. Over 100 calls have been analyzed from 15 different calves. Some of these calves were resampled at different stages at <1 week up to 12 weeks of age. Evidence of age-related variance and changes in call structure, complexity, power, rates, as well as vocal mimicry and learning are presented. [Funding: HBOI Florida PFW License Plate Fund, The Harry Richter Foundation and IBM, NOAA Permit #14233.]

2:00

**5pABb5. Dwarf sperm whale (*Kogia sima*) echolocation clicks from Guam (Western North Pacific Ocean).** Karlina Merckens (CRP, NOAA/PIFSC (Lynker Tech.), 1845 Wasp Blvd., Bldg. 176, Honolulu, HI 96818, karlina.merckens@noaa.gov), Yvonne Barkley, Marie Hill (CRP, NOAA/PIFSC (JIMAR), Honolulu, HI), and Erin Oleson (CRP, NOAA/PIFSC, Honolulu, HI)

The cryptic species of the genus *Kogia*, including the dwarf sperm whale (*Kogia sima*) and the pygmy sperm whale (*Kogia breviceps*), are very difficult to observe in any but the most calm sea conditions. However, recordings of signals from wild and captive animals reveal that they echolocate at high frequencies (peak frequencies > 100 kHz) which makes passive acoustic monitoring (PAM) a possibility. We present details from a recent encounter with *K. sima* in the wild near the island of Guam (Western North Pacific Ocean). Three individuals were observed during a small-boat, visual survey in May 2016, and recordings were collected using a Compact Acoustic Recording Buoy (CARB). These clicks, with mean peak frequency of 126 kHz (+/- 4.3 kHz), mean click duration of 72 us (+/- 21 us), and -3 dB bandwidth 5.5 kHz (+/- 1.6 kHz), had similar properties to recordings of wild *K. sima* from the Bahamas (Atlantic Ocean), and also appear similar to published recordings from *K. breviceps* (Madsen *et al.* 2005). Available data and analyses to date do not allow for absolute determination between the two *Kogia* species at this time, but recordings such as these bring us closer to definitive species classification.

2:15

**5pABb6. Inter and intra specific variation in echolocation signals among cetacean species in Hawaii, the northwest Atlantic and the temperate specific.** Tina M. Yack, Kerry Dunleavy, Julie N. Oswald (Bio-Waves, Inc., 364 2nd St., Ste. #3, Encinitas, CA 92024, tina.yack@bio-waves.net), and Danielle Cholewiak (NOAA Northeast Fisheries Sci. Ctr., Woods Hole, MA)

Odontocete species use echolocation signals (clicks) to forage and navigate. The aim of this study is to explore inter- and intra-specific variation in clicks among odontocete species in the Northwest Atlantic, Temperate Pacific, and Hawaii. Clicks were examined for seven species of delphinids in the western North Atlantic; common dolphin, Risso's dolphin, pilot whale, rough-toothed dolphin, striped dolphin, Atlantic spotted dolphin, and bottlenose dolphin. Newly developed PAMGuard tools were used to automatically measure a suite of click parameters. Five parameters were compared between species; duration, center frequency, peak frequency, sweep rate, and number of zero crossings. Significant differences in duration, center and peak frequency were evident between species within regions (Dunn's test with Bonferroni adjustment  $p < 0.05$ ). Geographic variation in click parameters between the three study regions was compared for five species; bottlenose dolphin, common dolphin, striped dolphin, pilot whale, and Cuvier's beaked whale. Significant differences in several parameters were found for all species between the regions (Dunn's test with Bonferroni adjustment  $p < 0.05$ ). These results suggest that there are species specific differences in clicks among delphinids and that geographic variation exists for multiple species. The ecological significance of these findings will be discussed along with implications for classifier development.

2:30–2:45 Break

2:45

**5pABb7. Determining killer whale (*Orcinus orca*) call variability from passive acoustic monitoring in the Chukchi and Bering Sea, Alaska.** Brijonnay C. Madrigal (Vertebrate Ecology Lab., Moss Landing Marine Lab., 8272 Moss Landing Rd., Moss Landing, CA 95039, bmadrigal@mlml.calstate.edu), Catherine L. Berchok, Jessica L. Crance (Marine Mammal Lab., Alaska Fisheries Sci. Center/NMFS/NOAA, Seattle, WA), and Alison K. Stimpert (Vertebrate Ecology Lab., Moss Landing Marine Lab, Moss Landing, CA)

Killer whales (*Orcinus orca*) are a highly vocal species that produce three types of vocalizations; pulsed calls, whistles, and clicks. Unlike the Northern and Southern Resident populations of western Canada and the Pacific Northwest, little is known regarding the acoustic behavior of resident