

acoustics while active acoustics monitored the distribution and vertical and horizontal movement of the prey organisms in the water column. In one instance a diving sperm whale was also detected by the active acoustics allowing TS measurements and estimation of diving speed and angle. Additional data such as ocean current and proximity of vessels, in addition to vessel noise measurements, further allowed us to examine potential links between oceanographic conditions and noise on sperm whale behavior and foraging and the presence of prey and whales. The results demonstrate the additional information obtained by combining data from active and passive acoustic sensors. The first part of the LoVe cross-disciplinary ocean observatory was established in 2013, and the extension is planned for 2017/2018 covering the Norwegian shelf to approximately 2500 m depth. This will further expand the observatories capabilities for underwater acoustic monitoring and targeted scientific studies.

5aAbB8. Mining noise affects Rufous-Collared Sparrow (*Zonotrichia capensis*) vocalizations. Yasmin Viana (Laboratório de Bioacústica, Museu de Ciências Naturais, Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, MG, Brazil), Robert J. Young (School of Environment and Life Sci., Univ. of Salford Manchester, Salford, United Kingdom), Renata S. Sousa-Lima (Physiol. and Behavior, UFRN, Lab. of BioAcoust., Centro de Biociencias, Campus Universitario, Caixa Postal 1511, Natal, Rio Grande do Norte 59078-970, Brazil, sousalima.renata@gmail.com), and Marina H. Duarte (Laboratório de Bioacústica, Museu de Ciências Naturais, Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, Brazil)

Mining activity generates noise through explosions, traffic, machinery, alert signals, etc. Noise affects the behavior of many species that depends on acoustic communication. Our objective was to verify if the noise produced by truck traffic affects rufous-collared sparrow vocalizations. Data were collected in an Atlantic forest fragment located close to a mine at the Peti Environmental Station, in Southeast Brazil. Two digital field recorders (SM2—Wildlife Acoustics) were installed 150m from each other and 25 m from a mining road. The SM2 were set to record at 44.1kHz, from 05:00 to 09:00 am during seven days in October 2012. Using Raven pro 1.4, maximum and minimum frequencies, number of notes and duration of the *Z. capensis* songs were extracted from the recordings one minute before, one after and during the passage of trucks. Trucks noise spectral measurements were also extracted. The species decreased the duration ($H=17.8$, $gl=2$, $p<0.05$), the bandwidth ($H=36.28$, $gl=2$, $p<0.05$) and the maximum frequency ($H=24.45$, $gl=2$, $p<0.05$) and increased the minimum frequency of the calls ($H=25.34$, $gl=2$, $p<0.05$) during exposure to truck noise. These results indicate that noise can affect the vocal behavior of the species and reveal the need to address the acoustic impact of mining on animal species.

5aAbB9. Non-linear analysis as a hierarchal classification scheme for vocalizing marine biologics. Cameron A. Matthews (Panama City Div., Naval Surface Warfare Ctr., 110 vernon ave, Panama City, FL 32407, cameron.matthews@navy.mil), Anthony Matthews (EPS Corp, Panama City, FL), and Anthony Ceparano (Gumbo Limbo Res. Facility, Boca Raton, FL)

Many ocean animals use acoustic communications. Breeding, territorial aggression, and hunting actions often include some form, often complex, and can provide actionable intelligence on the vocalizing animals' intent. As a means of considering the linear features of the time series and the corresponding spectral and cyclic frequency content as it pertains to different classes of animals, a hierarchy termed periodic linear, periodic non-linear, and aperiodic non-linear structural vocalization is considered. To demonstrate the application of such a hierarchy, known vocalizations from the red hind grouper (*Epinephelus guttatus*), the four lined grunter (*Pelates quadrilineatus*), the spiny lobster (*Panulirus argus*) are considered and analyzed for grouping according to the hierarchy based on their time, spectral, and cyclic signal content. Finally, a vocalization collected from the invasive Lionfish (*Pterois volitans*), understood at the time of publication to be the first such recorded instance, is exercised against the hierarchy to show membership identification.

5aAbB10. Acoustic environment of North Atlantic right whales in the Southeastern United States. Susan Parks (Dept. of Biology, Syracuse Univ., Syracuse, NY), Andrew J. Read, and Douglas P. Nowacek (Nicholas School of the Environment and Duke Univ. Marine Lab., Pratt School of Eng., Duke Univ., Beaufort, NC, doug.nowacek@duke.edu)

North Atlantic right whales are an endangered species of baleen whale that migrates along the east coast of the United States, with winter calving grounds located in the coastal waters off Florida and Georgia. This study investigated the acoustic environment experienced by individual right whales swimming through this habitat through the use of suction cup attached acoustic recording tags. Nineteen tag attachments were made between 2014 and 2016. These tags documented a range of sounds from the right whale acoustic environment, including calls produced by the tagged whale, sounds produced by conspecifics, as well as sounds from other biological (fish and dolphin) and anthropogenic sources. The call rates of individual whales were relatively low, with calls typically produced in short duration bouts. Sounds from other biological sources, particularly fish and dolphin, and anthropogenic sources, particularly vessels, were common. This project presents an initial step toward characterizing the acoustic environment experienced by individual whales to allow future comparisons to stationary acoustic recordings in the same habitat.

5aAbB11. Redefining species boundaries for acoustically and morphologically distinct species of swamp breeding frilled tree frogs (*Kurixalus appendiculatus*) in the Southwestern Philippines. Taylor Broadhead (Forestry and Natural Resources, Purdue Univ., 203 S. Martin Jischke Dr., B066, West Lafayette, IN 47907, taylorbroadhead@gmail.com), Jesse Grismer, and Rafe Brown (Ecology and Evolutionary Biology, Univ. of Kansas, Lawrence, KS)

Combining analysis of male advertisement calls, multivariate analysis of continuous morphological variation, biogeographic information, and a multilocus phylogenetic estimate of relationships, we reconsider species boundaries within Philippine populations of the frilled tree frogs *Kurixalus appendiculatus*. Within the archipelago, the species spans several recognized biogeographic boundaries, with highly divergent genetic lineages isolated within formally recognized, geologically defined, faunal subregions. Given this distribution, at least four possible taxonomic arrangements are possible, varying from one to four possible evolutionary species. Simultaneous consideration of fixed external phenotypic character differences, continuously varying morphometric data, evolutionary relationships, biogeography, and statistically significant differences in mating calls converges on a solution of two Philippine species. We advocate for more widespread, regular, and deliberate sampling of acoustic data to diminish challenges for future studies, where we anticipate the validation of other likely taxonomic arrangements by differences in advertisement calls.

5aAbB12. Brazilian Cerrado nocturnal summer soundscape. Luane S. Ferreira (Physiol., Universidade Federal do Rio Grande do Norte, Avenida Senador Salgado Filho 3000 - Campus Universitário, Natal, Rio Grande do Norte 59078-970, Brazil, fsluane@gmail.com), Eliziane G. Oliveira (Ecology, Universidade Federal do Rio Grande do Norte, Natal, Rio Grande do Norte, Brazil), Luciana H. Rocha (Physiol., Universidade Federal do Rio Grande do Norte, Natal, Rio Grande do Norte, Brazil), Flávio H. Rodrigues (General Biology, Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil), and Renata S. Sousa-Lima (Physiol., Universidade Federal do Rio Grande do Norte, Natal, Rio Grande do Norte, Brazil)

The Brazilian *Cerrado* is one of the world's biodiversity hotspots. Our objective was to characterize its nocturnal soundscape. 12 autonomous recorders (SongMeter2+, Wildlife Acoustics) were deployed in Canastra National Park (MG/Brazil) and recorded five consecutive nights during the rainy season. Using Arbimon II soundscape builder we identified four frequency bands with higher activity levels. The lower band (0.3-1.3 kHz) is acoustically occupied throughout the night. The second band (2.8-3.2 kHz) is highly active around sunset and almost disappears after 10 PM. The third band (3.8-6.6 kHz) splits into two near 9 PM, with the upper limit disappearing after 3 AM. The highest frequency band (9-16 kHz) is the broadest and occupied in all recordings, being comprised by unidentified background noise. Insects (mainly crickets and cicadas) are present in the three superior