Experimental animal behaviour studies

A Data Management Plan created using DMPonline

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Project abstract:

How animal communication systems evolve is a fundamental question in ecology and evolution and crucial for our understanding of adaptation and speciation. We will make use of the process of urbanization to address how communication signals adapt to changes in the sensory environment. We will focus on the impact of noise and light pollution on acoustic communication of Neotropical frogs and address the following questions: 1) How do senders, such as a male frog, adjust their signals to altered sensory environments? We will assess plasticity and heritability of signal divergence found between urban and forest populations of the tungara frog. 2) How do signals evolve in response to direct (via sender) and indirect (via receivers) selection pressures? We will expose forest sites to noise and light pollution, parse out importance of multiple selection pressures and carry out experimental evolution using artificial phenotypes. 3) What are the evolutionary consequences of signal divergence? We will assess inter-and-intra sexual responses to signal divergence between urban and forest populations. 4) Can we predict how species adapt their signals to the sensory environment? We will use a trait-based comparative approach to study signal divergence among closely related species with known urban populations. Our state-of-the-art automated sender-receiver system allows for experimental evolution using long-lived species and opens new ways to study selection pressures operating on animal behaviour under real field conditions. Our expected results will provide crucial insight into the early stages of signal divergence that may ultimately lead to reproductive isolation and speciation.

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Summary

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1. **Field activity data**

Data is obtained during sensory pollution experiments carried out in the field. One set of experiment involves placing artificial puddles in the rainforest, expose puddles to urban and forest sensory conditions and monitor frog behavior. Behavioral data on male calling activity will be scored from videos. Another set of experiments involves broadcasting frog sounds and monitoring approach signal receivers, such as males and females as well as predators and parasites. Data on the number of approaching receivers will be scored from video. Analyzed data will consist of a datasheet with behavioral scores and experimental and site-specific descriptors. Expected sample size will be 80 observations from the puddle experiment and 640 playback nights.

1. **Lab behavioral data**

Data is obtained during sensory pollution experiments with frogs collected from urban and forest populations. One set of experiments involves exposing calling males to rival sounds in the presence/absence of noise and light pollution. Calling behavior will be scored from sound recordings, behavioral data from videos and physiological data from hormone sampling. Another set of experiments involves female mate choice experiments, during which females will be given a choice to choose between two speakers broadcasting sounds of different males. Choice data will be scored from videos. Analyzed data will consist of a datasheet with behavioral scores and experimental descriptors. Expected sample size will be 320 recorded male frogs and 160 females during the mate choice trials.

1. **Population genomic data**

Data is obtained from sampling tissue of 200 individuals from 10 urban and 10 forest sites. Data will be sequenced and analyzed using standardized protocols.

FAIR data and resources

We will make all experimental and genomic data available and findable through publications in peer-reviewed journals. In the rare case that a dataset cannot be used for a scientific publication we will register and store the data on its own, ensuring the data is findable through rich metadata.

Analyzed datasets will be uploaded upon submission of publications to either the Dryad repository or to GenBank. The datasets will be assigned unique and persistent identifiers (DOI for data in Dryad, accession number for genomic data) accompanied by rich metadata describing the sampling conditions, experimental treatments and behavioral/physiological outcomes.

For the data on field activity and behavioral lab data we adhere to the DCMI metadata terms. For genomic metadata we will rely on guidelines outlined on GenBAnk. Analyzed data will contain a reference number to the raw data (video/sound recording file numbers/ tissue sampling number). Raw data will be stored at our digital depository at the VU, which is accessible upon request. Left-over tissue/DNA samples will be stored in freezers at the VU until at least 5 years after the end of the project.

Behavioral, physiological and field data will be stored in the Dryad depository and retrievable by their DOI. Statistical code used to analyze and interpret the data will accompany each dataset in a separate tab. Genomic data will be stored on GenBank

We will use vocabularies for our (meta)data that follow the FAIR principles

We will extensively describe our data, in particular data collected from the field. We will add spatial, temporal and climatic data that accompanies our behavioral field observations. These data are not part of our central research questions, but can be valuable for future field studies.
All data will be released with a clear and accessible data usage license

Raw data files (video and sound recordings) and tissue samples will be stored at the VU until at least 5 years after the end of the project. Raw files are regularly backed up using the institute’s cloud storage facilities (SciStore), which costs the project ~100 euros per year. Analyzed data will be stored in public depositories, securing long-term data re-use.