Tracking Fins

Introduction: Animal behaviors are a response to stimuli in their environment. These responses are usually influenced by three basic needs for survival: food, safety, comfort. Behavioral scientists have developed protocol for taking inventory of animal behavior, and the collective results are referred to as an ethogram. Ethograms generally fit into two broad categories – those that describe behaviors based on the behavior itself (movements, color change, position) and those that describe behaviors in terms of their consequences (food, mating, predation).

Below is an overview of a study on ethograms. Type of sampling is up to you and your class based on scope of study, age of students, and time. Many of the examples have been tailored to our stream exhibit. Feel free to use these concepts in other exhibits, simply account for the change from fresh to saltwater or habitat, Tennessee streams to the Amazon river.

Overview of Study (Martin, Bateson 2007) – when deciding on systematic rules for recording behavior, 2 levels of decision must be made: sampling rules – specify which subjects to watch and when. This covers the distinction between *ad libitum sampling** (no systematic constraints are placed on what is recorded or when, simply note down whatever is visible and seems relevant at the time), *focal sampling, scan sampling* and *behavior sampling.*

*Observations will be biased towards those behavior patterns and individuals which happen to be the most conspicuous. Useful during preliminary observations

Recording rules – specifies how the behavior is recorded. This covers the distinction between continuous sampling and time sampling. (Lehner 1992)

Initial question: What behavior is of interest? A determination of the behaviors that occur under specified conditions may be desired. For example, it is the end of spring, and we are transitioning into summer. These fish live in an exhibit that replicates Tennessee Mountain streams. At 10am/12pm/3pm what is their behavior?

Second: Is it important who performs the behavior? For example, there are male and female tangerine darters in the stream exhibit. Do you wish to record the behavior of a sexually mature male, or a YOY with indiscernible sex characteristics?

Third: What is the temporal aspect of the study? Are you interested in the natural variation in environmental factors that influence behavior, or do you wish to record behaviors in response to manipulated stimuli (i.e. the aquarists just fed the exhibit).

Sampling always consists of using either *Focal Animal Sampling* – behavior is recorded for only 1 animal during and sample period, or *All Animals Sampling* – recording of behavior from all animals observable, paired with another method. For example, Focal Animal and All Occurrences.

Focal Animal Sampling should be used when the primary interest is in the individual, there are too many behaviors, or/and they are occurring rapidly making it difficult to accurately record several individuals.

All occurrences sampling means the observer will take a complete record of every occurrence of one or more predetermined behaviors for every individual in the sample. This can be referred to as continuous sampling and is generally used to measure both frequency and durations – most accurate data is the observer restricts themselves to a certain number of behaviors and animals recorded per sample.

One-Zero sampling is used to record whether the behavior occurred or did not. One-Zero is a poor measure of frequency and duration, however it does allow for a large number of behaviors and animals to be measured and can be useful if only the presence or absence of a behavior is useful to the observer.

The selection of a sampling method is determined by time constraints, availability of facilities, subjects, treatments, observers, and equipment. **The rule to follow is select the sampling method that will provide data sufficient to answer your research question!**

Lay out your ethogram study as follows (work as individuals, pairs, or teams of three) There are also recommendations within this plan:

- Methods
  - Subject Name
    - Scientific and common name
    - Description of subject: physical and life history traits. Before observing the chosen fish in the Ridges to Rivers gallery, determine the physical and life history traits that will be helpful in identifying the fish relative to others. *Watch videos of fish behavior!*

o   Describe Sampling Rules –

VARIABLE	DESCRIPTION & EXAMPLES
WHAT	Type of Behavior (feeding, mating, agonistic)
WHO	Individuals (sex, age, social rank, genotype)
WHEN	Temporal
WHERE	Spatial
ENVIRONMENTAL **ABIOTIC** **BIOTIC**	 Temperature, humidity, flow, photoperiod Animals, vegetation, observers

o   Describe Recording Rules

Method	Description
Focal Animal	Restricts data recording during a sample period to one animal, pair, or group
All Animals	Data is gathered on all observable animals
	One of the Above is paired with one of the methods below
Ad-libitum	Opportunistic sampling with no constraints
	Continuous recording
All Occurrences	Record all occurrences of selected behavior
Sequence	Sampling is restricted to all occurrences of selected intra- or interindividual sequences of behavior
Sociometric Matrix	Record results of interactions between individuals
	Timed sampling
One-Zero	Record the presence (one) or absence (zero) of selected behaviors during sequential sample intervals
Instantaneous or scan	Record behavior of an individual (instantaneous sample) or a group of individuals (scan sample) at sequential, predetermined points of time

- State hypothesis being explored and any predictions that arise from hypothesis
  - All hypotheses should be based on a well-developed model or theory. In addition, students should be able to recognize that it is not always possible to control variables and that other methods can be used in such cases - for example, looking for correlations.
- Timeline/plan for data collection (can include time already spent if study in progress)
- Example of data collection sheet – try to focus on non-divisible behaviors, for example horizontal movement can be broken down into 3 categories: no movement, shift right, shift left)
  - Fin utilization
  - Movement in space
  - Swimming patterns – up, down, frequency
  - Charging movement – movement toward another
  - Mouth movement – changes in size of open mouth, open/close, frequency, presence of stimuli
  - Opercular cover (gills) – movement, frequency
  - Tail movement – speed, frequency, direction, repetition
  - Coloration – intensity, location, frequency
- Thoughts, ideas, comments about the methods you are planning to use and your confidence in those methods
- Encourage students to record their fish, this will make it easier if they have a fast-moving fish, attention is diverted, and in classroom analysis. What have you already learned about the fish(es) after 5-10 minutes conducting an ethogram – reflection time and recording any notes while still in the gallery.
- Data summary plan – based on observations and discussions, identify at least 2 behaviors that can be easily recognized and quantified and create your own data sheet
- Data analysis plan – look at your data and see what patterns emerge, how do your observations compare with others in the classroom? Were results similar or were there obvious differences amongst the various fishes? How would you demonstrate this graphically or statistically.
- Summary
  - Any other comments – can include your reflections on this process and lessons learned, issues or concerns

References

1. Martin P, Bateson P. Recording methods. In: *Measuring Behaviour: An Introductory Guide*. Cambridge University Press; 2007:48-61.
2. PHILIP N. LEHNER, Sampling Methods in Behavior Research, Poultry Science, Volume 71, Issue 4, 1992, Pages 643-649, ISSN 0032-5791, https://doi.org/10.3382/ps.0710643.