

Behavioral observations and ethograms

Imagine that you are a starting PhD student, and you need to generate a dissertation topic on animal behavior. You are stressed because you need to come up with a novel project. It might be good to hit the library to find inspiration, but many behavioral ecologists find inspiration by going outside and watching the animals that they are interested in studying. Research projects are born by observing the subtle and not-so-subtle behavior of wild animals, and asking questions about those behaviors.

Observation skills are one of the key components to experimental design and field studies. This assignment is designed to improve your observation skills and to help you start brainstorming research questions.

Part 1:

Create an ethogram (in your field notebook)

Ethology is the study of animal behavior, and ethologists measure and study the biological roots and meanings of animal actions. Basic questions about animal behavior begin from observations and detailed notes of what you see - and are one of the main ways we generate questions. Observations also help us become familiar with animals and determine what aspects of their behavior we can and cannot measure. Ultimately, this leads to the formulation of testable hypotheses and experiments.

The ability to measure something requires that it be relatively discrete and identifiable, and those measures must have units. For example, body size is a discrete variable that can be measured in units of length or mass. Behaviors are not so straight-forward, and yet must be defined and given meaningful units if they are to be studied quantitatively. Therefore, the first step in studying the behaviors of animals is the construction of an ethogram. An ethogram is a catalogue of all the behaviors exhibited by a particular species or group of animals. You will build an ethogram for an animal species.

You will make observations of behavior for 30 minutes, with the goal of 10 minutes spent on each of three individuals. However, depending on species or situation, it is okay if you have 30-combined minutes of observation.





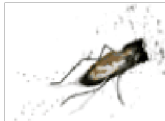
To create an ethogram: Create a list of specific behaviors (see examples below). Give each behavior a name, and a clear description in terms of the animal's actions. Make sure the description does not imply a function. For instance, do not say 'mating call', but you can say 'high pitched call. After describing it, you will include a category for "potential function".

<u>Behavior</u>	<u>Definition</u>	<u>Potential function</u>
<u>States</u>		
resting	Not moving, eyes open, body low to ground	
alert	Not moving, eyes open, body erect and raised off of the ground	
<u>Events</u>		
grooming	Licking or biting own body, usually occurs in resting posture	removal of dirt or parasites
grunt	short duration vocalization with mouth closed, often made with head down	communication, perhaps warning to other individuals in the group
howl	long duration vocalization made with mouth open and head raised in air	social communication, perhaps long-distance territorial advertisement

TABLE 1.—Descriptions of behaviors exhibited by *Aneides vagrans* in 90 staged encounters, each of 30-min duration. Descriptions and presumed functions are partly based on Cupp (1980), Jaeger (1984), Ovaska (1987), and Staub (1993).

Behavior	Description	Presumed function	No. Encounters (%)
<u>Non-contact</u>			
Resting posture	Head and anterior part of trunk raised above substrate	resting, observing	90 (100%)
All-trunk-flat	Head, trunk, and tail pressed against substrate	resting	36 (40%)
Nose-tapping	Touching substrate or fecal pellets with nasolabial grooves	investigation	51 (56.7%)
Alert posture	Trunk off substrate, head slightly raised	investigation	47 (52.2%)
Snout-raised	Head elevated >45°	investigation, threat display	14 (15.6%)
Vent-rubbing	Vent and/or tail rubbed against substrate 3–10 times	scent marking	15 (16.7%)
Approach	Walk toward other salamander	investigation, threat or attack	44 (48.9%)
Threat posture	Trunk raised off substrate, all legs straight, back and tail arched (= defensive posture: Staub, 1993)	threat display	1 (1.1%)
Chasing	Moving directly and rapidly toward a retreating salamander	attack	7 (7.8%)
Chin-rubbing	Chin rubbed along the substrate	scent marking	30 (33.3%)
<u>Physical contact</u>			
Nasal-contact	One salamander touches the other salamander with its snout; includes nose taps and snout rest (Staub, 1993)	threat, investigation	35 (38.9%)
Snout-pressing	Head moved rapidly in a lateral motion across the head or back of the other salamander	threat, attack	13 (14.4%)
Biting	Jaws open and grasping other salamander	attack	2 (2.2%)
Holding-down	With the head, pressing down on the back of the other salamander; the jaws are closed and biting is not involved; possible variation of bite-hold described by Staub (1993)	attack	20 (22.2%)
Pushing	Pushing the other salamander with snout; may be related to snout to snout (Staub, 1993) and/or head wrestle (Wiltenmuth, 1996)	threat	19 (21.1%)
Circle-pushing	Salamanders pushing against each other and rotating slowly in a circular motion	threat display	2 (2.2%)
Walking-over	Walking over other salamander; may include courtship tail-straddling walk	threat-investigation	19 (21.1%)

Table. Common behaviors of the Great Dunes Tiger Beetle

Behavior	Definition		Potential function
Searching	Body elevated and animal moving regularly. Antennae moving frequently in contact with soil.		Associated with locating mates or prey. Form of sensory exploration.
Basking	Slow movements with abdomen held close to sand.		Absorb warmth from sand to increase body temperature.
Stilting	Animal usually moving with legs extended maximally to keep abdomen away from ground.		Cooling or avoidance of overheating.
Shading	Animals not moving and usually stilting that position themselves within the shade of another object (e.g., plant).		Cooling or avoidance of overheating.
Burrowing			Cooling or avoidance of overheating.

Animals excavate a hole in the sand and move inside where they become motionless.

Part 2: Create a time budget (in your field notebook)

1. Once you complete your ethogram, the next step is to use your understanding of the species to record the occurrences and duration of animal behaviors in the field (in your field notebook's catalogue). Your objective is to collect **QUANTITATIVE** data to construct a behavioral time budget. Your data sheet should make it possible for you to quantify the duration, or the occurrence (i.e., counts) of a behavioral event, and you should provide context for that observation (examples, but this depends on the species: animal sex, age, place, habitat, time of day, were other individuals present, etc...). An ethogram is seldom static, so your data sheet should accommodate observing and measuring new behaviors you had not previously described.
2. For this step, you should again collect a of 30 combined minutes of observation of a minimum of 3 individuals. For each observation of a behavior quantify the duration, and/or frequency on your data sheet. Here is an example of what your second set of observations might look like.

<u>Animal</u>	<u>Behavior</u>	<u>Time</u>	<u>Duration</u>	<u>Frequency</u>	<u>Location</u>
1	resting	0800h	4 min	na	On ground in patch of thick hemlocks
1	grooming	0803h	1 min	na	"
1	alert	0804h	1 min	na	Still in hemlocks, appeared to be in response to loud crash sound in distance
1	howl	0805h	15 seconds	2 sec	Still in hemlocks in freeze posture.

3. **Create the Behavioral Time Budget:** Once you complete your observations, construct a graphical budget of the amount of time your focal species spent dedicated to different behaviors and write a brief descriptive paragraph to accompany the graph. Note, this is one budget for all animals combined, not one per animal. Therefore, your measurements will often be represented by an average (mean) duration or occurrence of each behavior.

Part 3: Brainstorm! (submit as doc in Google Drive)

- a. Based on your observations, list 2-5 questions within the field of behavior/ecology/evolution for which caught your interest.
- b. For two of your potential research questions, do a brief literature search to address:
 - 1a. Has the question been answered before? (the answer may be 'yes' or 'no'.). What search terms did you use and in what database?
If the answer was 'yes', provide details on what was studied and what was found. What were approaches used to answer these types of questions?
 - If the answer was 'no', address the following: Has a similar question been answered in different taxa? (the likely is almost certainly 'yes'.) Provide details on what was studied and what was found. What were approaches used to answer these types of questions?

note: Make sure to cite your sources. Also, keep in mind that the goal of developing of an ethogram above was to allow you to creatively ask questions. Here is your chance to see if there is already an answer to your questions (which is exciting!), or whether there is a gap in knowledge on which you can base your next research project.