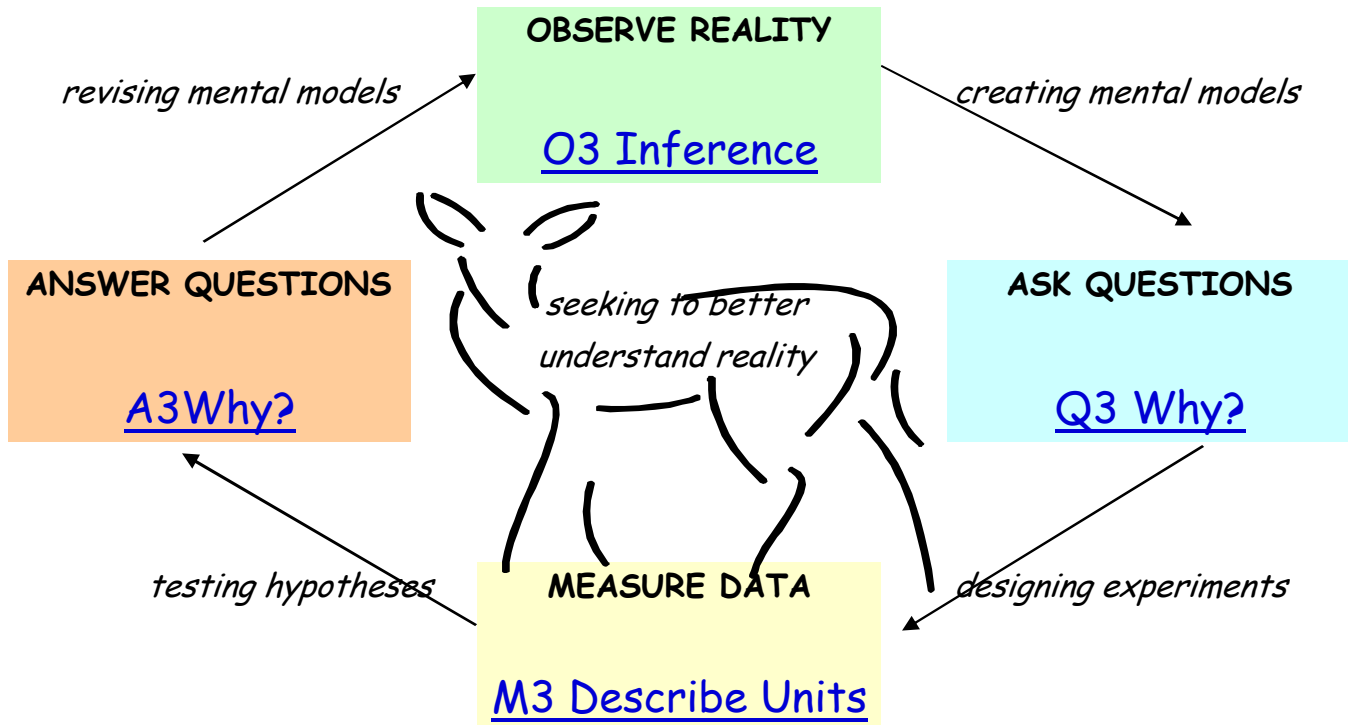


SCIENCE IN ACTION!

Nature's Partners: predators, prey & you

Module 3. Function: Deer Behavior



GENERAL LEARNING GOAL: Experience the nature of scientific inquiry (observation, measurements, asking and answering questions), as an alternative to folk psychology. Explain how each of these steps in the inquiry cycle relates to the others and helps us understand the science behind the myths of animal behavior. Explain how all inquiry involves these four steps; however, each person may choose to enter the cycle at a different place.

SPECIFIC OBJECTIVES FOR THIS MODULE IN THE INQUIRY CYCLE

- 3.1 Distinguish between function and evolution perspectives used to identify testable ultimate hypotheses about body language of deer.
- 3.2 Rank behavior units in terms of variability (fixed vs. flexible; instinct vs. learned)
- 3.3 Integrate information from observations and sources to present the evidence available to test ultimate hypotheses about deer behavior.

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 Duration (min): _____

O3 Subjective Inference- ULTIMATE

- STEP 1 Practice thinking intuitively like a scientist, by noting the consequences of behaviors and what this might mean for survival and reproduction of various genotypes. Refer to the table at the bottom of this page to clarify how the ultimate perspective differs from proximate.
- STEP 2 Review the same video clips that you used in O2. Write notes on what you observe and think about the consequences of the behavior in the short term and long term.
- STEP 3 Reread your notes and add codes in parentheses at the end of each sentence, referring to the categories in the table at the end of this page.

VIDEO	CONSEQUENCES OF THE BEHAVIOR FOR THE GENE POOL

CODE	CATEGORY	DEFINITION	EXAMPLE
FP	Folk Psychology	my explanation in terms of human-like beliefs, emotions, desires; including "for the benefit of the species", or "to spread his genes"	the bull wants to attract females and is angry at other bulls he believes will intrude on his harem
HOW?	Proximate	my hypothesis about the stimulus that elicits this response, the internal state of the animal and how much this varies among individuals as they mature	young males are more likely to approach females and avoid bigger males, when testosterone is high during the fall breeding season
WHY?	Ultimate	my hypothesis about the function in terms of survival and reproduction of distinct genotypes in a population; ancestral roots of the behavior based on comparing species that have diverged (or converged) over evolutionary time	those males with lower pitched calls are more likely to attract females at a distance in forests than males with higher pitched calls; the lower pitched roar of red deer diverged from elk during the glacial ages in more densely forested habitat



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Date(s): _____

Duration (min): _____

Q3 Asking WHY? Questions- Hypotheses

STEP 1 Reread your observations in O3. Brainstorm about what questions come to mind about the FUNCTION and EVOLUTION of behavior in populations of species.

STEP 2 Practice rewriting your questions based on the logic that a scientist uses to develop hypotheses about why a behavior evolved.

STEP 3 Read the categories at the bottom; in the far right column, write all code(s) that apply to what you wrote in the center column.

#	HYPOTHESES ABOUT WHY BEHAVIOR EVOLVED	CODE
1		
2		
3		
4		
5		

CODE	CATEGORY	DEFINITION	EXAMPLE
UE	Evolution	Questions about the evolutionary history of species (or populations); why ancestral roots of a behavior changed over time as species diverged (or converged)	Why do species that live in dense forests have lower pitched vocalizations than those that live in open grasslands?
UF	Function	Questions about which genotypes make more copies in the gene pool of a population	Do males with low pitched calls sire more offspring than males with high pitch calls?
O	Other:	define:	



Name: _____

Date(s): _____

Duration (min): _____

M3 Describe Behavior Units

- STEP 1** To answer your questions in Q3, choose 4 behaviors from M2 & A2 (2 activity states and 2 action events); enter the names in the appropriate box in the second column.
- STEP 2** Describe the behavior in objective terms; strive to make a "word picture" that all observers on staff or a research team would recognize.
- STEP 3** Read the categories at the bottom; in the far right column, rate the degree to each action is flexible (highly variable/learned/abnormal) or fixed (heritable instinct/individual stereotypy)

Category	NAME	OBJECTIVE DESCRIPTION (postures, movements, sounds, color changes, hair/feather changes)	VARIATION (5 is most variable)
State1			
State 2			
Event 1			
Event 2			

CODE	CATEGORY	ACTIVITY STATE	ACTION EVENT
1 *	Fixed instinct	The sequence of action is the same every time and in every individual; duration may vary, e.g. prairie chicken courtship display	form and duration of the action is the same in all individuals and each time it is repeated, e.g. Firefly flash
2 **	Stereotypy	The sequence of actions is repeated, but only in abnormal individuals, as in a psychological or developmental disorder, e.g. pacing, cribbing	the unique action is repeated the same each time, but it is only in certain individuals, not a heritable trait of the species, e.g. head toss "tic"
3 ***	Modal	Intermediate between fixed and flexible, e.g. foraging	intermediate between fixed and flexible, e.g. sniffing
4 ****	Abnormal	Unusual and highly variable activity observed only in unique individuals, e.g. eating rocks	Unique movement shown only by one individual, with variations e.g. "floating limb"
5 *****	Flexible learning	A lot of variation in the form, duration, sequence, and diversity of actions across both individuals and times, e.g. tool using in chimps	Highly variable form and orientation of the behavior; change in frequency related to rewards, e.g. bottle-opening in great tits



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A3 Answering WHY Questions

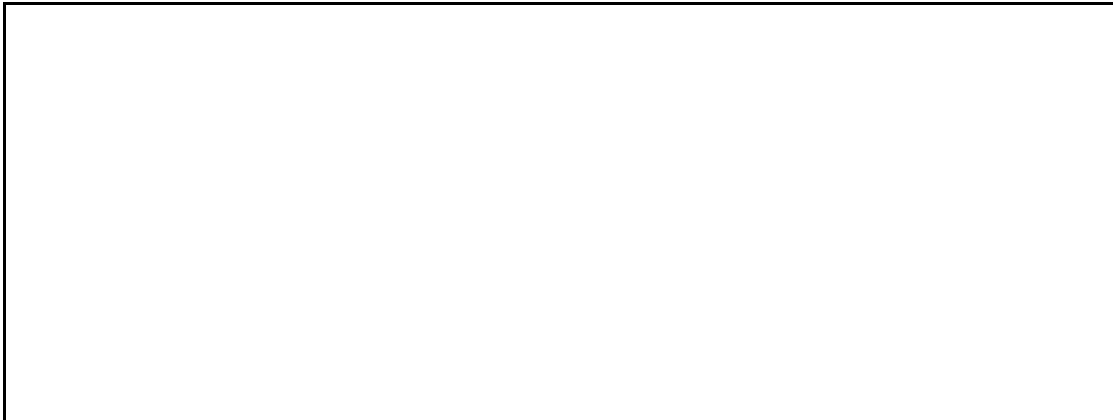
- STEP 1 Search the sources you found in A1 to explore answers to the WHY questions you wrote in Q3. Think about how the categories in M3 would influence your answers. OPTION: find additional sources to answer your questions
- STEP 2 Focus on one behavior you named in M3. Find a similar behavior in your sources and compare similarities and differences between what you observed and what you read about it from your sources. Write the behavior in one cell of the left column. Repeat.
- STEP 3 Write an hypothesis that would answer the question "Why does this behavior happen" from the perspective of FUNCTION. (Note your sources in parentheses)
- STEP 4 Repeat Step 3 for this question "Why did this behavior change over the history of the species?" from the perspective of EVOLUTION.

Behavior	FUNCTION? (Source)	EVOLUTION? (Source)

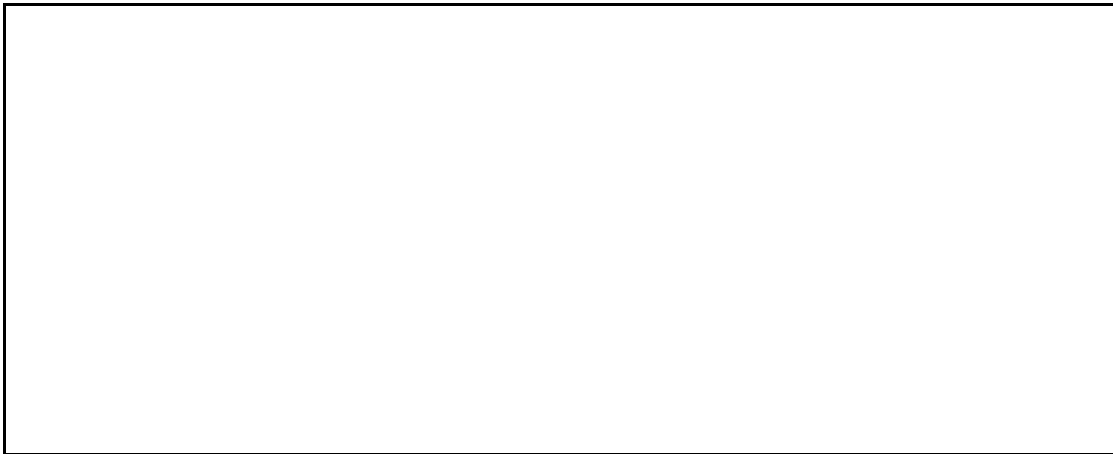
CODE	CATEGORY	DEFINITION	EXAMPLE
UE	Evolution	Answers about the evolutionary history of species (or populations); why ancestral roots of a behavior changed over time as species diverged (or converged)	elk diverged from smaller bodied ancestors with changes in forest/grassland habitat during the ice ages; the larger body was associated with more resonant mating calls that carried a longer distance and male-defense of a group of cows (video w/wide-angle)
UF	Function	Answers about which genotypes make more copies in the gene pool of a population; differential fitness of the genotypes related to survival and reproduction	those genotypes that bugled were more likely to attract females and intimidate males than those that did not (snapshot w/wide-angle)
FP	Folk Psychology	Answers in terms of human-like beliefs, emotions, desires; including "for the benefit of the species", or "to spread his genes"	Bulls bugle because they want to spread their genes throughout the population. Contests among bulls are for the good of the species so only the best will breed

EVALUATION/FEEDBACK (optional to earn participation points)

1. What worked?



2. What did not work?



3. Suggestions?

