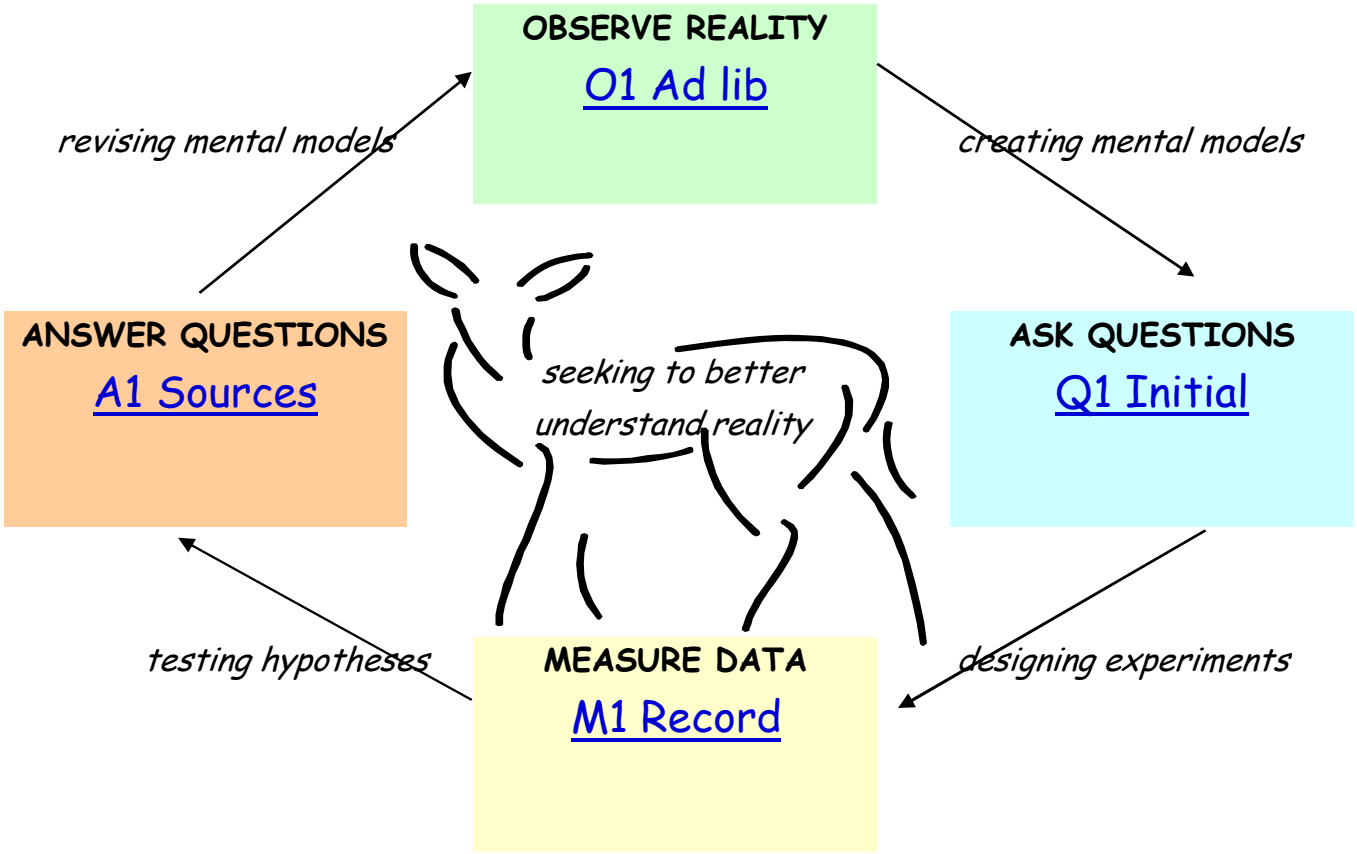
SCIENCE IN ACTION!

Nature's Partners: predators, prey & you

Module 1. Scouting 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 EACH MODULE IN THIS INQUIRY CYCLE

Module 1. Scouting for deer

1.1 Distinguish between observation, inference, and questions that arise from freestyle (ad libitum) notes about deer communication

1.2 Use video technology to record the body language of deer for further detailed analysis.

1.3 Practice critical thinking in distinguishing between reliable (scientific) and unreliable sources of information about deer

MAP FAQ SOURCES

Name:	Kimberly Cornell
Date(s):	12/1/09
Duration (min):	60 minutes

O1 Ad Lib (freestyle) Observations

STEP 1 Find a place to watch deer and video the behavior (see M1), or choose video clip(s) you find on the web (e.g. "Red Deer Roaring") or provided by your instructor (clip 1). Write the source information in the box provided and refer to it by code in the column on the left (VIDEO). Empty your mind of preconceptions and try to absorb the environment as if you were inside the skin of the deer. Note what you observe about the place, habitat, clues about the season, other animals, etc. Write your general observations in the top box.

STEP 2 Replay the video clip, and choose one communication display to analyze in more detail in terms of sender/receiver. Write your observations about the behavior of the deer in the box marked "sender". Observe how other members of the same species respond ("ignore" is also a response), and write your notes in the box marked "receiver".

STEP 3 Choose another video of the same display behavior (may be another scene or individual in the same clip). Repeat STEP 2 to fill in the next sender/receiver boxes. Note any similarities and differences between the behaviors, compared to your first observations. .

STEP 4 Read the analysis categories in the box at the bottom of this page . In the far right column, write the code(s) that apply to what you wrote in the center column.

SPECIFIC INFORMATION ABOUT THE SOURCE VIDEO(S), AND MY CODE FOR IT:

agonline website: Clip 1 & Clip 3

http://agonline.tamu.edu/wfsc422/materials/part3_mating/wethogram/videos/v_index.htm

VIDEO CODE	AD LIBITUM NOTES ON WHAT I OBSERVED	ANALYSIS CODE
Clip 1 http://agonline.tamu.edu/wfsc422/materials/part3_mating/wethogram/videos/v_index.htm	general notes about location, species, behavior & context: Context: The elk are observed in a mountain scrub habitat with short, shrub-like vegetation in dimly lit and cloudy skies. Species/behavior: One male elk is seen bugling and walking amidst seven or more female elk. No female elk were seen walking toward the male; instead, they walked away or continued eating. This recording may have taken place in the early morning or evening due to the low lighting. The female elk appeared to not pay attention to the male elk.	OBS OBS INF

http://agonline.tamu.edu/wfsc422/materials/part3_mating/wethogram/videos/v_index.htm	Clip 1	sender: The male elk held his head up while walking around with an upright posture and emitted bugling sounds. The bugles appeared to have a long, ascending squealing sequence followed by short grunting or barking sequences.	OBS INF
http://agonline.tamu.edu/wfsc422/materials/part3_mating/wethogram/videos/v_index.htm	Clip 1	receiver: Some of the female elk's ears perked up toward the male. Most females were observed walking away from the male. Then the females' ears stopped pointing toward the male. It appears that the females walked away from the male as if avoiding or ignoring him.	OBS INF
http://agonline.tamu.edu/wfsc422/materials/part3_mating/wethogram/videos/v_index.htm	Clip 3	sender: Similarities with Clip 1: A male elk is seen with his head held up while bugling near a herd of female elk. Differences: The male elk is facing away from the females while bugling in Clip 3, whereas it appears the male in Clip 1 faces several directions including towards the females. The male elk in Clip 3 then turns toward the females and walks behind them to herd them. When a female gets too far away from the herd, he runs her back in to keep her close. A descending squeal is heard at the end of the clip, and I'm wondering whether this is from the focal male after herding his females, or is there another male in the vicinity?	OBS INF Q
http://agonline.tamu.edu/wfsc422/materials/part3_mating/wethogram/videos/v_index.htm	Clip 3	receiver: Similarities with Clip 1: The female elk walk away from the focal male when he is bugling as if ignoring him. Differences: The male is seen herding the females, and when he runs near the females, the female elk turn and run away from him but toward the female herd. I wonder if the females are running away from the male because they are not receptive to mate yet or if they are afraid of him poking them with his antlers.	OBS INF Q

CODE	CATEGORY	DEFINITION	EXAMPLE
OBS	Observation	what I actually saw, heard, smelled, or otherwise sensed about the animal and its environment	in the forest, lone male raises nose in line with back, opens mouth and bugles
INF	Inference	what I (or others) think about what I observed; my underlying mental model	I think this is a young male because his antlers are small, and his call is relatively high pitched
Q	Question	what I'm curious to learn more about, to better understand what I observed; my hypothesis about cause/effect	I wonder if the presence of other males makes a difference in how often he calls
O	Other:	define:	

MAP FAQ SOURCES

Name:	Kimberly Cornell
Date(s):	12/2/09
Duration (min):	25 minutes

Q1 Brainstorming Initial Questions

STEP 1 Review your notes in O1. Think about what you do and do not know about this behavior. OPTION: Discuss your thoughts with others.

STEP 2 Brainstorm and write down as many questions as come to mind.

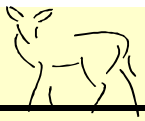
STEP 3 Read the categories at the bottom; in the far right column, write the code(s) that apply to what you wrote in the center column.

#	WHAT I AM CURIOUS ABOUT LEARNING	CODE
1	Does the male elk bugle in order to attract females or does he bugle in order to deter other males from approaching his herd?	FP
2	What anatomical features allow the male elk to emit various vocalizations?	HOW?
3	Does the male anatomy conducive to vocalizations change as the male grows older, and does this effect the pitch of the bugle?	HOW?
4	Are female elk more inclined to mate with males that bugled more often or less often?	WHY?
5	Why do the female elk walk away from the male when he is bugling?	WHY?

CODE	CATEGORY	DEFINITION	EXAMPLE
FP	Folk Psychology	Questions about beliefs, emotions, desires of the animal	Does he want to impress the females to stay with him?
HOW?	Proximate	Questions about the cause and development of behavior	How does the bull make that sound? Do young bulls sound the same as older bulls?
WHY?	Ultimate	Questions about the function and evolution of behavior	Why don't white-tailed deer bugle like elk? Are the females more likely to mate with a male that has a lower pitch bugle?

O	Other:	define:

MAP FAQ SOURCES



Name: Kimberly Cornell
Date(s): 10/18/09
Duration (min): 120 minutes

M1 Record Data (video/tape)

STEP 1 Find a place where you can watch deer and use a video cam to record behavior of a focal individual. This means keep the camera focused on one individual and follow it with the camera wherever it goes, for 3 minutes. OPTION: work with a partner who can write while you are using the video; check off behaviors you see on an ethogram list provided by the instructor.

STEP 2 Before starting, record information about your video by answering Q1- Q5.

STEP 3 Fill out the video log below. Use a new line for each clip.

Q1	What species will you watch (scientific & common name)?	Cervus elaphus - Red Deer
Q2	Where will you do observations (eg. Location, blind, vehicle)?	Location: Fossil Rim Wildlife Center Moving blind: Vehicle with side windows cut out
Q3	When (date and time)?	10/18/09 1400-1600
Q4	How (camera & partner)?	Cameras: Digital (JVC) & Tape (Sony) Partner: Danielle Minick
Q5	What label will be used to identify these clips in the video archive that you will later analyze?	video clip #1: FR09 Red Deer Tape 4 15:01? video clip #2: FR09 Red Deer SD 3:14pm

VIDEO LOG

#	START	GROUPS OF ANIMALS	NOTES ON BEHAVIORS AND CONTEXT
1	Sony 15:01	Female Red Deer	Behaviors: grazing bout, moving, inactive-standing Context: Savannah-like pastures, forested areas and hillsides, one male and several females in the near vicinity, people in vehicles present about 50ft away
2	JVC 3:14	Focal Male Red Deer with broken right antler 3-4 Female Red Deer visible, lying about 3+ body lengths away	Behaviors: cleaning/grooming, yawn, inactive-lying, licking, ear flick, tongue flick Context: Savannah-like pastures, forested areas and hillsides, warm weather, mild breeze, 7-10 males and about 30 females in the pasture, people in vehicles present about 50ft away

MAP FAQ SOURCES

Name: Kimberly Cornell
Date(s): 12/5/09
Duration (min): 20 minutes

A1 Finding Scientific Sources

STEP 1 To answer your questions in Q1, use Google Scholar to search sources available to the general public; write the keyword you used for the search, and the reference of the source you found (e.g. web address, title, author, organization, publisher, date)

STEP 2 Search scientific sources using a library database (i.e. Web of Science); write the keyword and the complete reference (author, date, title, journal, volume, pages)

STEP 3 Categorize your sources in terms of reliability. Read the categories at the bottom; in the far right column, write the code(s) that apply.

Keyword	SOURCES I FOUND	Reliability Category
Red Deer Behavior	Clutton-Brock TH,Guinness FE, Albon SD. Red deer: behavior and ecology of two sexes. The University of Chicago Press. 1982.	5
Red Deer Bugle	Feighny JA, Williamson KE, Clarke JA. North American elk bugle vocalizations: Male and female bugle call structure and context. Journal of Mammalogy. Vol. 87. Pp. 1072-1077. 2006.	5
Red Deer Mate Choice	McComb KE. Female choice for high roaring rates in red deer, Cervus elaphus. Animal Behaviour. Vol. 41. Pp. 79-88. 1991.	5

CODE	CATEGORY	DESCRIPTION	EXAMPLE
1 *	unreliable	Tabloids designed to sell many copies to a mass audience interested in sensational stories	People magazine, National Enquirer
2 **	less than average	Popular magazines, books and videos marketing to a large market of the informed public	Whitecap Books, Penguin Books, Reader's Digest,
3 ***	intermediate	Science magazine articles written by journalists who specialize in interpretation of scientific information	Discovery, National Geographic, Smithsonian
4 ****	more than average	Invited books, textbooks and articles written by scientists but not peer reviewed	Scientific American, American Scientist, Voyageur Press
5 *****	most reliable	Peer reviewed scientific journal published by a society of professionals; peer-reviewed book	Animal Behaviour, Behaviour, Science, University of Chicago Press, Oxford Press

EVALUATION/FEEDBACK (optional to earn participation points)

1. What worked?

2. What did not work?

3. Suggestions?

SCIENCE IN ACTION!

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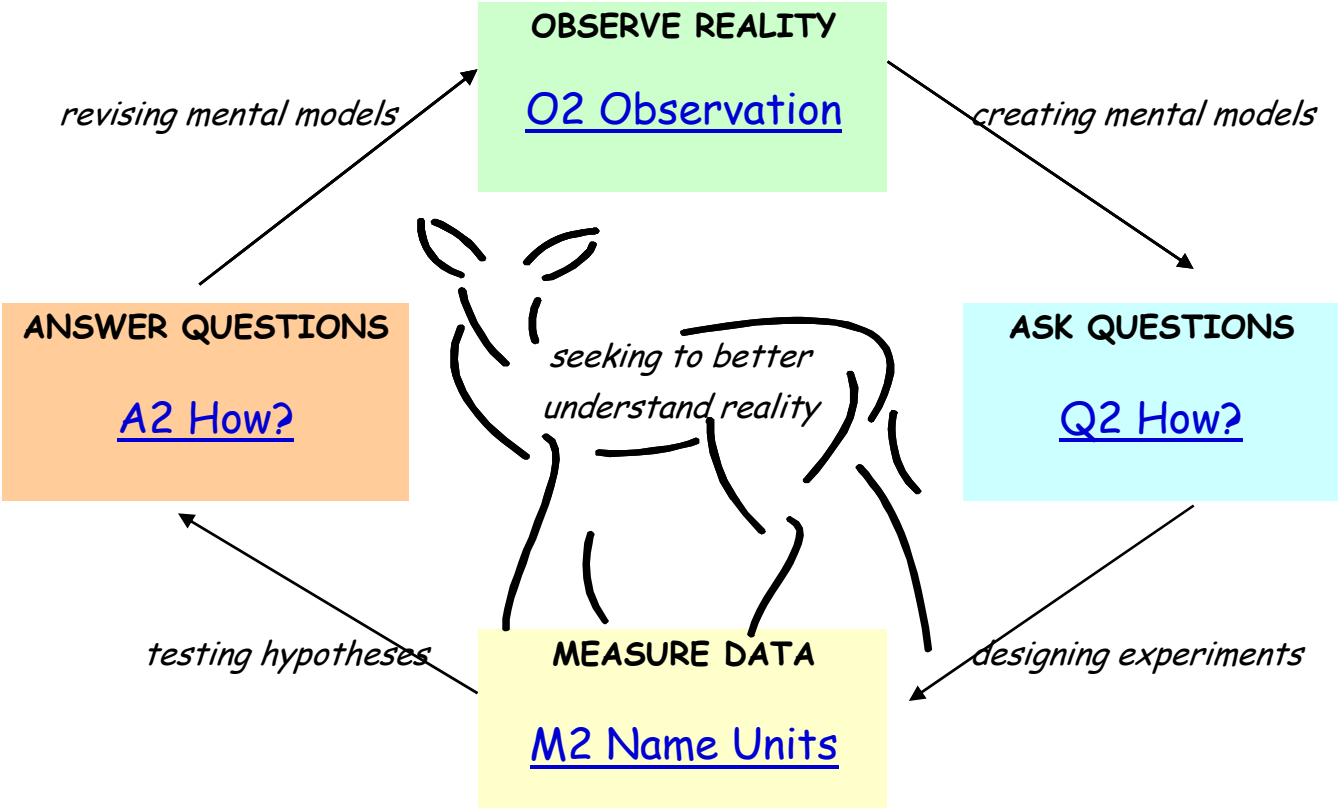
Module 2: Structure: Deer Behavior



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

2.1 Distinguish between cause and development perspectives used to identify testable proximate hypotheses about body language of deer.

2.2 Identify behavior units described as states and events in an ethogram for the species

2.3 Integrate information from observations and sources to present the evidence available to test proximate hypotheses about deer behavior.

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FAQ SOURCES

Name:	Kimberly Cornell
Date(s):	12/5/09
Duration (min):	39 minutes

O2 Objective Observations- PROXIMATE

STEP 1 Practice thinking analytically like a scientist, by separating objective observations from subjective inference. Use the box at the bottom of this page to clarify proximate inference.

STEP 2 Watch your clip #1 from M1 and record your observations in the first white box. Repeat for #2.

STEP 3 Code what you wrote by inserting at the end of each sentence a code from the green box.

VIDEO	Observations (What did the animal do? Sense? Show?)	
Sony FR09 Red Deer Tape 4 15:01?	The female red deer is grazing.	RESP
	She appears thin and in need of nourishment as she feeds.	INT
	She sensed other animals watching her or heard something of interest to her.	STIM
	She lifts her head and looks back with ears alert.	RESP
	Her body is covered with mud as if she has been wallowing to cool down.	INT
	She is in a savannah-like pasture with about 7-10 males and 30 females, while people in vehicles are also present.	CONT
JVC FR09 Red Deer SD 3:14pm	The focal male red deer is inactively lying down.	RESP
	He yawns and keeps his eyes partially closed.	RESP
	He appears tired.	INT
	He is resting in a pasture with 3-4 females about 3+ body lengths away, males in the vicinity, and people about 50ft away.	CONT
	Another male bugles in the distance.	STIM
	Focal male raises his ears forward, opens his eyes, and turns his head toward the sound.	RESP
	He cleans/licks himself.	RESP

CODE	CATEGORY	DEFINITION	EXAMPLE
STIM	External stimulus	what the animal appeared to hear, smell, or otherwise sense about its environment	a "cow call" came from a man in camouflage, lying about 30 m uphill
RESP	Response	the animal's actions, including posture, movements, sounds, change in color or hair, etc.	male repeatedly raises the nose & makes a prolonged noise of high pitched, followed by low pitched grunts
INT	Internal state	indicators of hormonal, nutritional, age or other body condition; evidence of motivational state e.g. time since last meal	male has thick neck, rough neck hair; body is covered with mud as if it has been wallowing to cool down; large antlers;
CONT	External context	Other animals, plants, objects etc. around the animal	male is on the edge of a group of 12 females, in a grassy clearing in the evergreen forest
REW	Reward	external consequences that might shape the behavior by reward or punishment	after the bull shoves an intruding male, it leaves the group of cows
O	Other:	define:	

MAP FAQ SOURCES

Name:	Kimberly Cornell
Date(s):	12/5/09
Duration (min):	22 minutes

Q2 Asking HOW? Questions- Hypotheses

STEP 1 Reread your observations in O2. Brainstorm about what questions come to mind about the CAUSE and DEVELOPMENT of behavior in individuals.

STEP 2 Practice rewording your questions about mechanisms in terms of testable hypotheses.

STEP 3 Code your questions in the right hand column, using the categories in the box at the bottom of this worksheet

#	HYPOTHESES ABOUT MECHANISMS OF BEHAVIOR	CODE
1	As male red deer mature with age, the pitch of their vocalizations decreases as the frequency of their vocalizations increases.	PD
2	Females are more likely to approach a male after he roars.	PC
3	Male calves that are raised solely with female red deer and are not exposed to adult male vocalizations will not roar like adult male red deer.	PD
4	A male roars in response to a female moving too far away from the harem.	PC
5	When levels of ghrelin, a hunger hormone, are high in the deer's body, the deer will graze.	PC

CODE	CATEGORY	DEFINITION	EXAMPLE
PC	Cause	Questions about stimulus, response internal state and external rewards	Is a bull more likely to approach a cow if she answers his call?
PD	Development	Questions about how much a behavior is "fixed instinct" or "flexible learning", and how this changes as individuals mature with age	If elk calves were raised in Europe with red deer, would they roar like red deer?
O	Other:	define:	

MAP FAQ SOURCES

Name:	Kimberly Cornell
Date(s):	11/18/09
Duration (min):	155 minutes

M2 Name Behavior Units (Events & States)

STEP 1 Choose a video clip from M1/O2 and write the source information here:

YouTube video clip: FR 09 Red Deer 10/18 2:59

STEP 2 Use reliable sources from A1 to make a list of behaviors for this species (i.e. an ethogram). OPTION: Use the ethogram provided by your instructor

STEP 3 Watch the clip. Write down the first behavior you see, using a name from the ethogram. Record the duration. Using the codes described in the box at the bottom of this page (or the ethogram), code this action as a state or event. Repeat.

Start	duration (mm:ss)	NAME OF BEHAVIOR	CODE
Time 0	00:34	Inactive - Standing	AS
0:34	00:05	Roaring/Bugling	AS
1:10	00:01	Lick	AE
1:11	00:02	Move/Head turn	AE
1:27	00:07	Roaring/Bugling	AS
1:54	00:01	Lick	AE
2:08	00:24	Sniffing/Licking	AS
2:34	00:05	Tongue Hang	AS
2:40	00:01	Lick	AE
2:41	00:21	Inactive - Standing	AS

> or = 5sec = AS

CODE	CATEGORY	DEFINITION	EXAMPLE
AS	Activity State	A broad category of behavior that includes many specific actions associated with one motivational state (mood or goal); duration of minutes (e.g. an ongoing behavior you would time with a stopwatch)	resting, locomotion, foraging, interacting, maintenance (long duration, timed with a stopwatch in minutes & seconds)
AE	Action Event	Specific action patterns that are short in duration; subunits of an activity state; duration of seconds (e.g. a short action that you would count with a clicker, too brief to time)	step, turn, bite, lunge, call (short duration, counted with tally marks)

MAP FAQ SOURCES

Name:	Kimberly Cornell
Date(s):	11/12/2009
Duration (min):	50 minutes

A2 Answering HOW Questions

STEP 1 Search the sources you found in A1 to explore answers to the HOW questions on Q2. OPTION: use the link to background information provided by your instructor.

STEP 2 Focus on one behavior from M2 that you coded as an "action event". Read about it in your sources. Write the name of the behavior in the left column. Answer the Cause and Development questions for this behavior, refering to box at the bottom of this page and O2. Cite the source(s) in parentheses.

STEP 3 Repeat Step 2 for a behavior that you coded in M2 as an "activity state". Note that an activity state relates to an activated physiological system, so be specific about internal state.

STEP 4 Reread what you wrote. Decide what aspects are folk psychology, and edit the words fto state your idea in more scientific terms.

Behavior	CAUSE? (Source)	DEVELOPMENT? (Source)
EVENT Roar	Context: Mature males roar in the presence of females and after chasing another male (Feighny et al, 2006). There is no apparent external stimulus, and the roar seems to be spontaneous.	The length and shape of the larynx is highly heritable with some variation among individuals. Red deer can lower their larynx while roaring to lengthen their vocal tract (Feighny et al, 2006). Young males learn not to roar in the presence of older males, and mature males roar spontaneously.
STATE Rutting	The photoperiod is the stimulus that influences the testosterone cycles in the fall. Testosterone levels increase when females are present in response to the stimulus of female urine, and the males respond by sniffing it and lifting their lip. The photoperiod seasonality and testosterone cycle is associated with antler and muscle growth, the timing of the coat change, and other behaviors as well (Clutton-Brock et. al, 1982).	Testosterone levels increase in the fall season as the male reaches maturity (Clutton-Brock et al, 1982). The high testosterone levels result in the rutting behavior. Young males do not sniff female urine, while mature males do.

CODE	CATEGORY	DEFINITION	EXAMPLE
PC	Cause	Answers about stimulus, response internal state and external rewards	Mature males in rut respond to the stimulus of female urine by sniffing it and lifting the lip (analagous to a snapshot w/telephoto lens)
PD	Development	Answers about how much a behavior is "fixed instinct" or "flexible learning", and how this changes as individuals mature with age	Young males ignore female urine, but as they reach puberty, they are much more likely to sniff the urine and follow the female (analogy of a video w/telephoto lens)
FP	Folk Psychology	Answers in terms of human-like beliefs, emotions, desires; including "for the benefit of the species", or "to spread his genes"	stags spar because they are testy during the rutting season and their tempers flare easily; bulls want to know if there is a cow in the area when they hear a call, and approach to see if she wants to mate

EVALUATION/FEEDBACK (optional to earn participation points)

1. What worked?

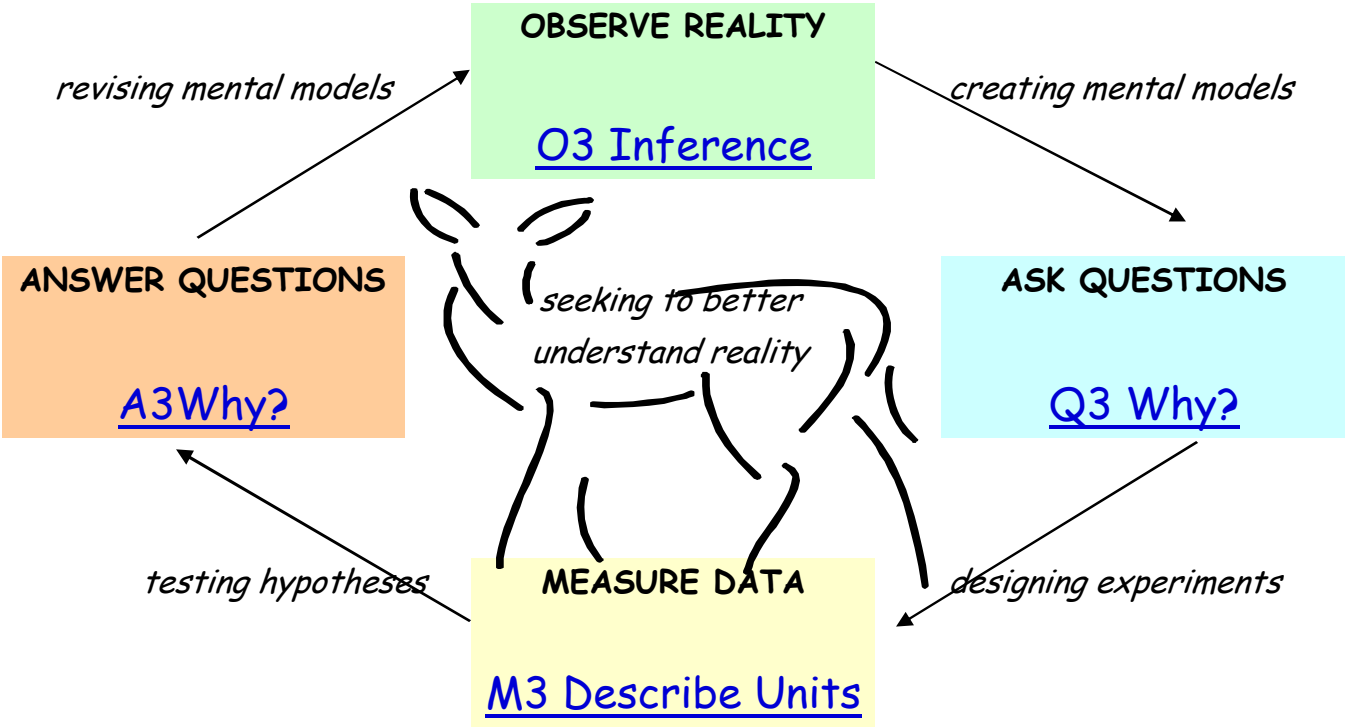
2. What did not work?

3. Suggestions?

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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MAP FAQ SOURCES

Name:	Kimberly Cornell
Date(s):	12/8/2009
Duration (min):	29 minutes

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 ultiimate 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
Sony FR09 Red Deer Tape 4 15:01?	The female red deer maintains her nutrition by feeding regularly. (WHY?) The female assesses her surroundings by lifting her head and looking around. (WHY?) She cools her body temperature down by wallowing in the mud. (WHY?)
JVC FR09 Red Deer SD 3:14pm	The male red deer becomes more rested by inactively lying down. (WHY?) He is more vulnerable to prey when lying down. (WHY?) He assesses his surroundings by lifting his ears forward, opening his eyes, and turning his head. (WHY?) He maintains good hygiene by cleaning himself. (WHY?)

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

MAP FAQ SOURCES

Name:	Kimberly Cornell
Date(s):	12/8/2009
Duration (min):	40 minutes

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	Those male red deer that bugle most often are more likely to attract a female.	UF
2	Those that adapt to their environment by cooling themselves in the mud are less likely to become overheated.	UF
3	A male red deer that pushes an intruding male deer away from his harem of females will increase his chance to pass on his genes to future generations.	UF
4	Males with high pitch calls sire fewer offspring than those with low pitch calls.	UF
5	Those deer that maintain their hygiene by cleaning themselves are less prone to infections.	UF

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:	

MAP FAQ SOURCES

Name: Kimberly Cornell
Date(s): 12/8/2009
Duration (min): 25 minutes

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	Rutting	"Enter harem, bark, flehman, roar, chivy, lick rump, mount, dismount, harem hold, displace, chase, fight, herd/drive, lick nose, pant, abduct, parallel walk, ejaculate, thrash" (Illustrated Ethogram of the genus Cervus, http://wfsc.tamu.edu/jpackard/scienceinaction/preymod2.html)	1
State 2	Sniffing/ Licking	Using the nose and mouth inhale odors Touching the tongue to an object multiple times in order to taste or clean the object Head and neck change posture and move in direction of scent or object	3
Event 1	Roar	Lifting the head and neck and using the internal anatomy of the head and neck region to emit a loud sound	3
Event 2	Ear Flick	Quick, jerky, spontaneous movement of the ear	1

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

MAP FAQ SOURCES

Name:	Kimberly Cornell
Date(s):	12/8/2009
Duration (min):	45 minutes

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)
Bugle	"During the breeding season, male elk emit bugle calls that have been proposed to function in attracting potential mates, bringing herd members closer together, and aiding in the assessment of lighting ability and dominance of other males" (Feighny et al, 2006). Those genotypes that initiated roaring bouts and roared more often were more likely to attract mates (McComb, 1991)	Large-bodied elk evolved from smaller ancestors as their environment changed over time (Clutton-Brock et al., 1982). Mating calls that carry over a longer distance were needed in open grassland habitats.
Approaching	Males that approach females increase their chance to mate to make more copies of their genes. The male is more likely to copulate with the female. Males displace rivals that get too close to the harem by walking steadily toward them (Clutton-Brock et al., 1982). Females approach other females to escape harassment by males.	This behavior is similar in other cervids that have evolved convergently. The "approaching" behavioral trait in cervids is related to motivational systems (Clutton-Brock et al., 1982)

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?