Why are larger individuals of a particular species eaten more frequently than smaller ones?

Background

In the 1960's ecologists such as Drs. MacArthur, Emlen, and Pianka developed models to predict animals' decisions about what to eat, where to find it, when to look for it, etc., based on the reward (energy) they gain and the effort (time and energy) they expend foraging. Animals' decisions are constrained by other needs (e.g. predation risk, time to find mates), their sensory systems (what they can see, smell, etc.), and other parameters. Economists, neurobiologists, psychologists, sociologists and other natural and social scientists have also contributed to or benefited from this area of research and tested, expanded, modified, and even replaced its models, which have been applicable from insects to humans.

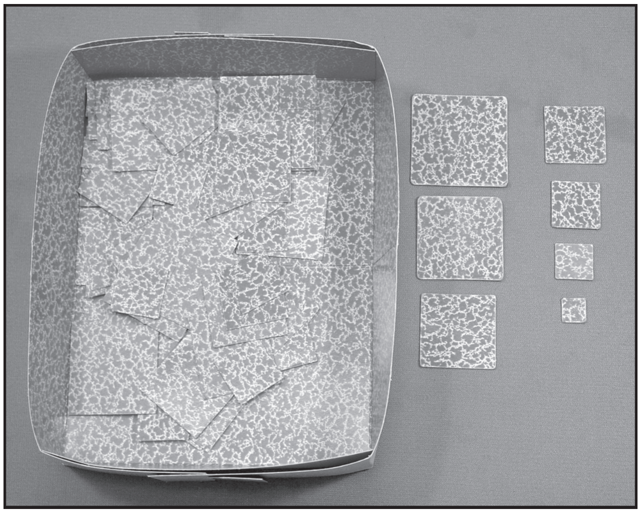

Figure I1.1 | *Tetra cryptoforma* in its natural habitat. Surrounding the "live" individuals in the container are seven museum specimens representing the seven commonly found sizes. For reference, the largest individual pictured is 51 mm on a side.

One area of foraging theory involves predicting when an animal's diet will include an item. Small prey may be plentiful or easier to handle (capture and eat), but they offer less energy than large prey, which may be rare or hard to handle. Research shows that animals make very sophisticated decisions based on simple cues. The best models (hypotheses) explicitly and quantitatively predicted correctly that animals would ignore certain prey even when available. Studies also showed that choices made by individuals could have an impact on populations or communities. Such is our case here.

A scientist has observed that when a primate predator is given the chance to choose prey from a population of Tetra cryptoforma, the predator tends to eat the largest ones and hypothesizes that "Larger" Tetra cryptoforma are eaten more often than smaller ones because they are the easier to see." Tetra cryptoforma are dorso-ventrally compressed, sessile animals with a highly-irregular, dappled epidermis similar to their environment. They live in clumps forming piles in shallow crevices with steep slopes. Rather than use live prey, the scientist decides to test this hypothesis using physical models of the organisms and their environment because the hypothesis deals with the physical characteristics of the prey, not their energetic value or edibility. Thus, humans could serve as model primate predator.

Since this is your first week in lab, you are asked to design and conduct a good experiment to test this hypothesis, rather than one you developed. But good scientists (and successful students) always have alternative hypotheses ready for comparison – ones that will lead to different predictions when they conduct their experiments. Your mentor suggests that before you formulate alternatives and design your experiment, you complete the pre-lab exercises.

Before coming to lab, you should be:

- **Familiar with the organization of the lab manual**
- **Aware of how to conduct lab and write a report**
- **Familiar with the experimental conditions for this lab**
- **Able to discuss some mechanisms that organisms use for camouflage and how they work**
- **Able to explain how the probability of capturing a particular type of prey is related to its relative abundance**

A. Pre-lab activities

The following extra credit activities will help you learn what you **need to know before lab.**

1. Carefully read the sections "How to successfully conduct a lab" and "How to write a lab report" in this lab manual. Then complete the *How to be Successful in Lab* online pre-lab.
2. Observe the photograph of *Tetra cryptoforma* in its natural habitat (Figure I1.1) and be prepared to discuss your ideas on how it is predated and why certain sizes are eaten more frequently. There are "live" ones in the LRC.Then complete the *observations of test specie*s online pre-lab.
3. Complete the *Disruptive Coloration* online pre-lab.
4. Complete the experiment provided in the *Sampling and Requency Distribution* online pre-lab. In it are jars containing two types of weebles. If you reach in and grab ten of them, how many of each color would you expect to have? Why? Test your prediction. How many did you actually get? If you replaced the beads and repeated the procedure again, what would you expect? What happened? Why? What would the results of 100 repetitions be?

B. Terms/concepts of potential interest for use in your lab report

Disruptive coloration	Foraging theory	Visual acuity
Encounter rate	Size distribution	Alternate hypotheses
Crypsis	Search image	Double-blind experiment

C. Special equipment and materials

Tetra cryptoforma squares and box

D. Special instructions

None

E. **For the most up-to-date information, check the investigation's web site at *biol1114.okstate.edu/study_guides/labs/lab1.htm***

Investigations

Planning Form

Name____ Group # (includes your section)_____

Collaborators (write NONE if none)___________________

Pre-labs - To help you learn the knowledge and skills you need to be prepared for lab (and to earn up to 1 pt each extra credit), before you answer the preparation checklist question, do the following:

For ALL Pre-labs: Complete the Pre-lab activities described in the lab manual, complete the online portion.

1. Describe the **observations** in the background material that led to the **question** under investigation. (1 pt)

2. What **hypothesis** (causal explanation) are you proposing to explain the observations and answer the question? (4 pts)

3. Outline of your **experiment**: (2 pts; ½ pt each)

   A. How will you treat your **experimental group(s)**?

   B. What will serve as your **control group(s)**?

   C. How will you **collect** your data (equipment, interval, method and duration of sampling)?

   D. List your **dependent** and **independent** variables and sketch (an) appropriate **graph(s)** using them.

4. What are your **prediction(s)**? (1 pt; ½ pt each)

   A. IF my hypothesis is SUPPORTED, then I predict that the results of my experiment will be that....

   B. IF my hypothesis is UNSUPPORTED, then I predict that the results of my experiment will be that....

5. **References** (textbook, library articles, URL):

6. **Preparation Checklist**—To indicate you are prepared for lab, answer these questions: (2 pts total)

   A. What do you have to do to be successful in the laboratory of this course? (pre-lab 1)

   B. Under which “natural” conditions do *Tetra cryptoforma* live and how does predation occur? (pre-lab 2)

   C. How do the characteristics of *Tetra cryptoforma* contribute to its ability to avoid predation? (pre-lab 3)

   D. How can sample size and frequency distributions affect the apparent capture rate of *Tetra cryptoforma*? (pre-lab 4)

Lab Instructor Only:
Planning Form Score (out of 10) _______ Pre-lab Extra Credit +_______