Biology 475 Parasitology Spring 2009



Course Information

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Course Website

http://www4.nau.edu/isopod Current Teaching -> BIO 475

All course information and updates will be posted there. Lecture pdfs will be available there also, usually the day before lecture.

A Survey of the Biology of Animal Parasites

In this class we will consider:

The parasitic animal phyla using selected taxa to illustrate concepts in:

parasite/host evolution, systematics, physiology, morphology, life history, ecology and behavior.

Biology as a Scientific Discipline

1. A conceptual means for learning about living things

- a. You will see that this framework is not much different from common sense.
- b. Foundation built on an understanding of the process of natural selection.

Natural Selection



The current hypothesis for explaining biological diversity



Crystalized by Charles Darwin and Alfred R. Wallace in 1858.

My Goals for this Course

1. To provide you with:

- a. Increased understanding and appreciation of animal life on this planet
- b. Factual and conceptual tools to become professional biological scientists:
 - 1. botanists, zoologists, geneticists, psychologists
 - 2. physicians, dentists, veterinarians, etc.

Understanding These Principles



May seem somewhat removed from what you may expect for yourself after watching "ER" or reading "All Creatures Great and Small."

However, in a medical/scientific career you *must* be:

- a. Skilled observers of detail.
- b. Accurate record keepers (including diagrams).
- c. Critical thinkers/diagnosticians.
- d. Managers of large mental databases.
- e. Able to *apply* your knowledge in practical situations.

You *must* develop these skills in this class to do well.

In this course and on exams I will expect you to be:

- a. Skilled observers of detail.
- b. Accurate record keepers (including diagrams).
- c. Critical thinkers/diagnosticians.
- d. Managers of large mental databases.
- e. Able to *apply* your knowledge in practical situations.

Syllabus

- 1. Be sure to read it over
- Additional copies are available on the class website (http://www4.nau.edu/isopod/)
- 3. Note: Freshmen, undeclared majors are *not eligible* for this class.

Textbooks and Reading

- Textbooks are in the bookstore; Laboratory manuals are at the NAU Bookstore. *They are Required*.
- 2. PDF copies of Chapter 1 from Manual is available on the class website.
- 3. Additional readings for the course are also posted here.
- 4. Questions?

Laboratory

- 1. Laboratory will meet once per week in BS 146 (Tuesday 1-4, 4-7).
- 2. Most labs will involve examination of slides or preserved material.
- 3. We will also have as much live material as we can.
- 4. Labs are designed to give you a feel for parasite diversity.

Laboratory, continued

- 1. Anything presented in laboratory is fair game for practical exams.
- 2. Information presented in lecture and laboratory will overlap considerably.
- The best strategy is to learn as much as you can – "Know Everything!"
- 4. Consider this an opportunity to learn how your brain retains information.

About Me

- B.S. University of Michigan 1976.
- M.S. University of New Mexico 1979.
- Ph.D., University of California, Berkeley 1987.
- Postdoctoral Associate, University of California, Riverside, 1987-88.
- Postdoctoral Associate, University of Chicago 1988-90.

Parasitology: What is it?

- 1. "Parasitology" can legitimately include the study of most of the animals on the planet.
- 2. Unless you delimit yourself a bit, you can try to explain so much that you explain nothing.

3. This is one of the problems with courses or philosophies that are too sweeping.

Definition of Parasitology

- 1. The study of animal associations a.k.a, "symbiosis"
 - a. Means "living together"
- b. what types of animal associations exist?
- c. Understanding these will help us delimit what we are talking about.

Animal Associations



- 1. First consider the null: Independence [0,0]
- a. This means, one species has *absolutely no influence* on another species.
- Does this truly exist?

Independence

b. The hypothesis can be tested by species removal.

1. We are in the process of doing just that right now.

2. It appears that there can be catastrophic effects.



Extinctions Since 1970

At least *one of every eight* plant species in the world, is under threat of extinction. Three of every ten plant species in the United States is under threat of extinction. 34,000 plant species endangered world wide. Among the plants most at risk: 14 percent of rose species 32 percent of lilies 32 percent of irises 14 percent of cherry species 29 percent of palms.

Independence

- 3. In general, unlikely to exist in any biological system, at least totally.
- 4. However, this is also fairly uninteresting from the point of view of understanding animal relationships.
- c. With independence, no relationship exists.
 - d. Clearly, we need to examine *Interaction!*



Interactions

- 2. Two general categories of interaction:
 - b. Heterospecific (interspecific) organisms of different species.



Interspecific Interactions

a. Amensalism [-,0]

 One species is inhibited, the other is unaffected
Example: sheep and cattle







Interspecific Interactions

Phoresy

- 1. Involves transport of individuals
- 2. Can be facultative or obligate
- a. by chance or if symbiont needs association to survive











Interspecific Interactions

Competition [-,-]

 both species are negatively affected by interaction
a. example: barnacles and mussels
b. can be interspecific or intraspecific



Intraspecific Interactions



Interspecific Interactions

Mutualism [+,+]

1. Both species are positively affected by interaction.

a. Lots of examples





Insects and Pollinators







Interspecific Interactions Predation [+.-]

1. one species benefits, with immediate mortality of other

2. lots of examples here too



Spiders and Insects

















Parasitoids





Things to keep in mind in Parasitology

 Parasitology is a scientific discipline.
a. this means that we will strive for certain goals in our explanations.

Science: 4 Questions

- 1. What evidence exists?
- 2. What is the simplest explanation?
 - 3. Is the proposed explanation testable?
 - 4. Is there a source of bias?