FORMAT 8

Submit originals and one copy and electronic copy to Governance/Faculty Senate Office

PROPOSED FOR: CORE NATURAL SCIENCE DESIGNATOR

SUBMITTED BY:

CONTACT HOURS PER WEEK: 3 | LECTURE | 3 | LAB | OTHER

/week | specify type

BIOL A 102

4 credits

Offered Spring

What is sex and why is it important? This course explores the biological bas

reproduction and sexual behavior among anim

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ther organisms

to make sure that the quality of UAF educatio not lowered a

ALONG WITH THIS FORM PLEASE SUBMIT THE FOLLOWING

[redacted]

A. A syllabus is attached.

B. Titles of all laboratory exercises are included in the syllabus.

C. Titles of textbooks are included in syllabus.

D. Three laboratory exercises are attached.

E. This course intends to explore the biology of sex and sexual behavior through the lens of evolution.

[redacted]

Evolutionary theory will be explored in depth throughout the course, including both natural and sexual selection. See the syllabus for a complete description of learning outcomes.

COURSE SYLLABUS
Biology of Sex
BIOL 102
4 credits

Meeting times: Tuesday/Thursday (time TBA)

Lab meeting times and place: TBA

Meeting place: TBA

Prerequisites: High school algebra; Placement in ENG F111X. This course is intended for non-biology majors.

Instructor: Dr. Laura Carsten Conner
907-474-6950
ldconner@alaska.edu
Bunnell 307B

Office hours: Tues 12-2 or by appt.

Lab instructors: TBA

Course description

[redacted]

lens of evolution. We will also explore the mechanistic basis of this diversity, as well as what it means to "do science."

Student Learning outcomes

Upon completion of the course, students will be able to do the following:

- Compare and contrast science with other ways of knowing
- Create hypotheses and devise experiments to test hypotheses
- Distinguish between proximate and ultimate explanations for behaviors
- Describe the features of diverse mating systems, such as polygyny and polyandry
- Compare and contrast mitosis with meiosis
- Describe the principles of natural selection, including sexual selection
- Explain why monogamy is rare in nature
- Compare and contrast asexual and sexual reproduction

Apply evolutionary principles to explain sexual behaviors, including human behaviors

Course exams will use a combination of multiple choice, short answer, and essay questions. In order to do well, you will need to understand the principles underlying major concepts, rather than simply memorizing facts. Exams must be taken at the scheduled time except in the case of university sanctioned events (such as participation in UAF athletic events) or emergencies. In the case of sanctioned events, you must contact me at least 1 week prior to the exam to notify me of your absence, and the exam must be taken prior to the absence. In the case of emergencies, you must notify me as soon as possible via email or phone about the absence. Make-up exams in the case of emergencies must be taken within 48 hours of the emergency if possible. Expect to provide documentation of the emergency.

the other lab. If you miss a lab experience, you will receive a zero for the lab assignment for

Grading

Assignment	Points
Case Studies (complete 4)	100
Exam 1	100
Exam 2	100
Exam 3	100
Final Exam	100
Participation	50
Lab	250
TOTAL	**800**

Grades will be calculated as a percentage of the 800 points possible in the course.

90-100% = A
80-89% = B
70-79% = C
60-69% = D
Below 60 = F

Attendance Policy

I expect you to attend class and participate. Science education research has demonstrated that students who take an active role in their learning learn more and retain that knowledge longer.

Lecture schedule

Date	Topic	Readings
16-Jan	Introduction:	Judson preface
21-Jan	What is sex? Approaches, sexual reproduction	Reading 1 in packet
23-Jan	The Nature of Science	Reading 2 in packet
28-Jan	Darwinian Theory and levels of analysis	Alcock Ch. 1
30-Jan	Advantages of sex	CASE STUDY 1
4-Feb	Nature vs. Nurture?	Alcock Ch 3.
6-Feb	EXAM 1	
11-Feb	What does it mean to be male or female?	Judson Ch. 1 & 2
13-Feb	Gender and behavior: what is "normal"?	Judson Ch. 9

TBA FINAL EXAM

Lab Schedule

Week of:	**Topic**
Jan 27-31	Observation and ethograms: crickets
Feb 3-7	IACUC and the ethical treatment of animals
Feb 10-14	Designing testable hypotheses: isopods
Feb 17-21	Gender, sex determination, and society
Feb 24-28	Operational Sex Ratio: walnut flies
Mar 3-7	Territoriality: crayfish
Mar 10-14	Courtship display: crickets
Mar 17-21	**Spring Break- no lab**
Mar 24-28	Student project formulation
Mar 31-Apr l 4	Student Project data collection
Apr l 7-11	Student Project data collection
Apr l 14-18	Analysis and interpretation

Today, we will examine territory defense by male Crayfish. Territories have one common theme: they are defended areas which provide a valuable resource such as nesting sites, food, or shelter to the territorial resident. Possession of a territory enables that resident (the territory owner) to survive and reproduce better than an intruder, or non-territory owner. We will use scientific methods to explore how territoriality functions in the Crayfish.

Background

A) Territory Defense

Animals must compete for critical resources such as food or mates, but the form of this competition can differ from one kind of animal to another. The

Crayfish Territorial Behavior Lab Instructions

- Set up two watchglasses containing water and sand. One

	• Put the Invader in the Resident's tank and observe the crayfish for 5 minutes. After the observation period, [redacted]

[redacted]

	• Construct 2 alternative hypotheses based on the territoriality behaviors you observed. Record your hypothesis and procedures you will use here: • Test your hypothesis, observing for 20 minutes to get a large sample of behaviors. Record behaviors here:

- Make a change in the animal's social environment or habitat. Make a hypothesis for how the behavior might

Questions:

1) What are the characteristics of territory defence, and do the crayfish exhibit these characteristics (that is, are they really territorial)?

2) How do crayfish attempt to defend their territories?

3) Do they use evidence of exclusive occupation or that intruders avoid territory

5) Is fighting always the ultimate resolution to conflicts over territory or scarce

encounters be settled without fighting?

Operational Sex Ratio, Walnut flies

BIOL 102

Summary

Mating behavior is one of the most frequently studied areas of animal behavior. This is not only because of the fascinating variety of behaviors associated with mating, but because it is so closely tied to fitness and thus natural selection. In this lab, we will focus on male-male competition patterns as they relate to operational sex ratio. We will experimentally test hypotheses you generate from the background information provided.

Background

A) Mating Behavior

All else being equal, the more abundant gender competes against each other

C) Mate Guarding and Sex Ratio

Sperm competition is the physical competition between the sperm of two separate males to fertilize the eggs of a female. A male's fitness is usually measured as a function of the number of females inseminated; however, in many animal species, fertile females mate with many male partners. Males in many species have evolved mechanisms to give their own sperm a special advantage after deposition in the female reproductive regions. Some males, instead of or in addition to their own

mechanisms of sperm competition, will guard their female partners to prevent

further copulation after sperm deposition. Mate-guarding exists in a variety of

forms including prolonged copulations, mating plugs, and mate grasping.

Assuming the male controls copulation duration, the relative benefits of long

OSR WORKSHEET

1. Hypothesis:

2. Predictions:

3. Experimental steps needed to test this hypothesis:

4. Data collected (ethogram or other. Use additional pages if needed):

5. Graph of data

6. Explain how your results support or do not support your hypothesis:

7. Do your results suggest any new hypotheses?

8. Design an experiment to test these hypotheses. Write out the steps

Activity 1: 1 in 4000

Based on video content

15 minutes

Setup

One in approximately 4000 babies is born with intersexuality. In this condition, gender cannot be determined by visual examination of the genitals. The video for this unit explores the biology of

Potential Answers

A few causes your group may have thought of are:

1. abnormalities of entire chromosomes
    a. missing chromosomes

        XO (Turner's syndrome, result is female development with some mental and physical differences)

    b. extra sex chromosomes

        i. more than two X (XXY, XXX, etc): viable, although more than two X chromosomes causes some physical differences and any Y causes masculine development

        ii. more than one Y(XYY etc): viable as long as there is an X; results in male development

15 minutes

Setup

Biology has a variety of ways to create different genders. In pairs, take a few minutes to brainstorm

A few different mechanisms that your group may have thought of are:

1. chromosomal determination

Activity 3: What About Meiosis?

Based on video and online text content

45–20 minutes, depending on the experience of the participants

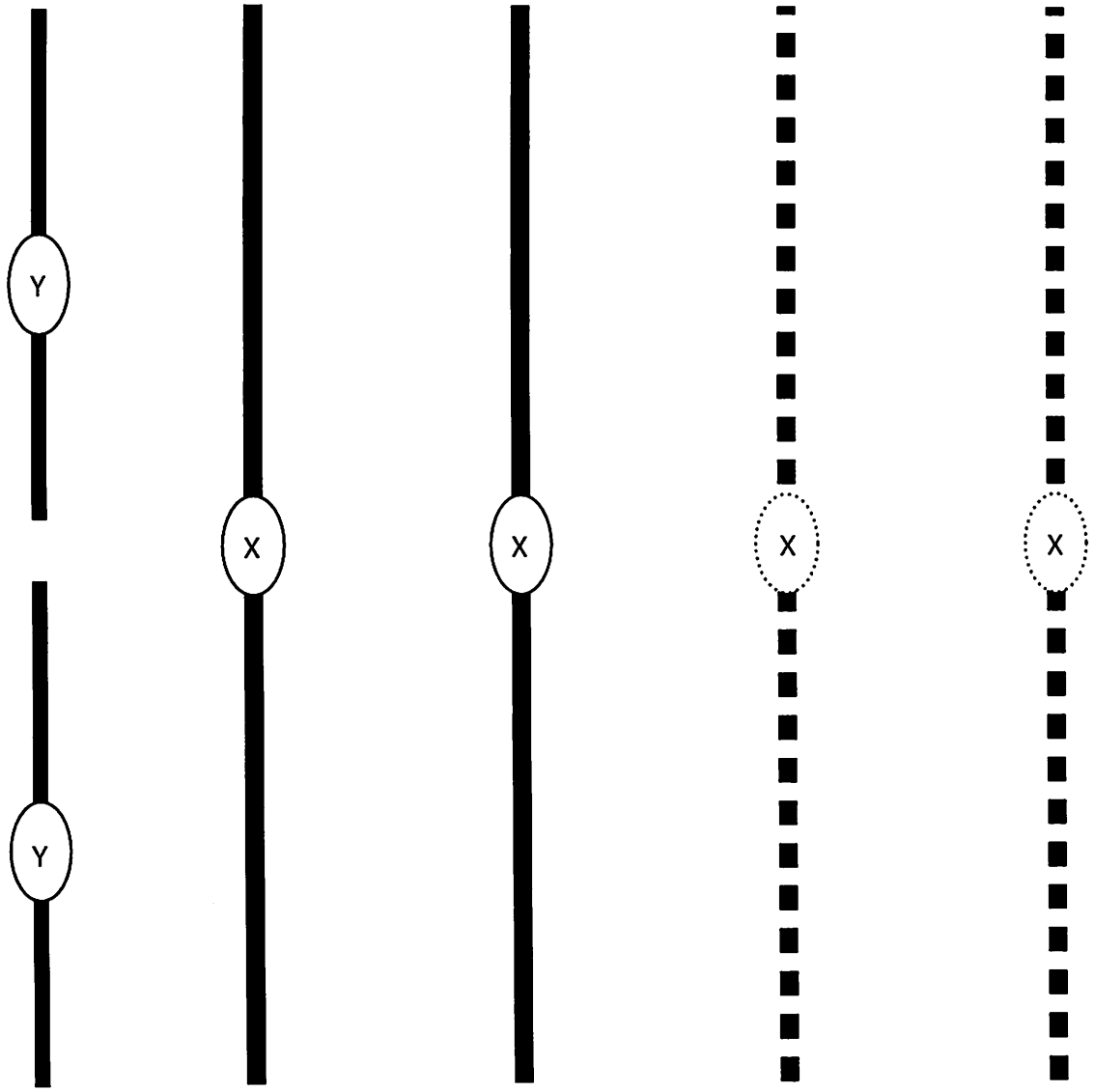
[redacted]

Setup

The sex chromosomes represent a special situation in meiosis. In meiosis I, autosomes pair with their homologs, cross-over, and segregate. The pairing and crossing-over is an essential step; meiosis cannot proceed without it. However, in an XY male, the X and the Y do not have a homologous chromosome with which to pair. So what do they do?

[redacted]

Paper Chromosomes



Instructions and Situations

For answers, see Tips and Suggested Answers.

Instructions:

Make sure your chromosomes have been cut so that each chromosome is separate. To make

Some males have two X chromosomes, but with part of the Y chromosome translocated onto one of the X's. The translocation mutation may occur during meiosis in the father of the 46, XX male. The father would be normal XY, but would produce a sperm that, when combined with an egg, produced the 46, XX male genotype.

Start with the normal XY chromosome combination, as they would be in meiosis I. Show how the translocation would occur by ripping off a little bit of one Y chromatid, transferring it to one X chromatid, and then securing it with tape. Then show how the rest of meiosis would proceed. What gametes are produced in the end? What part of Y has to be translocated in order to direct male development? Because translocations often occur through errors in crossing-over—and you have shown in Situation 5 how X and Y cross-over in meiosis—where do you think the critical part of Y is located?

Answers

Situation 1:

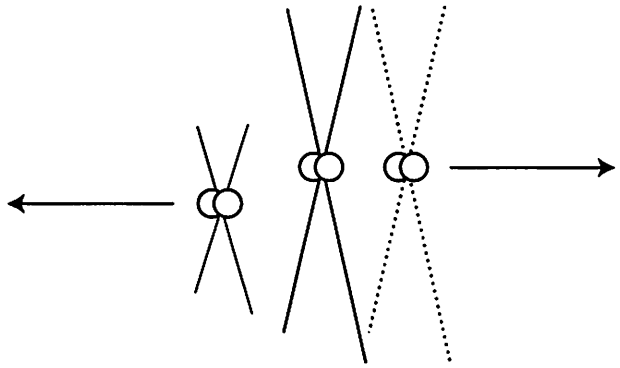
The chance of gamete with Y is 1/2. The chance of a dotted chromosome is 1/2. 1/2 x 1/2 = 1/4.

meiosis I

duplicated X and duplicated Y pair and then segregate, just like the homologous autosomes, even though they are not true homologs

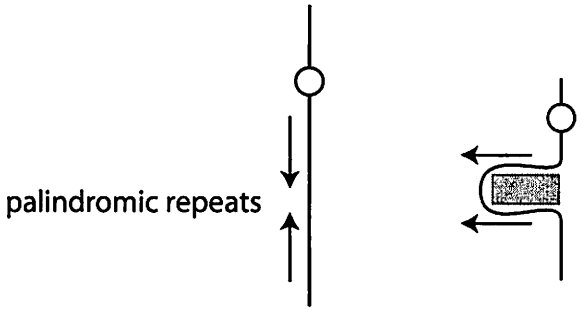
X chromosomes

Situation 4:
XX and Y all pair, so meiosis I looks like this:



During segregation, the two duplicated X's could go into one cell, with the duplicated Y segregating into the other. Alternately, an X and a Y could segregate together into one cell, with

If the Y chromosome uses its palindromic repeat sequences to undergo recombinational repair, the sequences have to align along their homologous (or similar) regions. A conformation like this would have to occur. As above, regions where crossing over can occur are shown in gray.



Situation 6:
In meiosis I, after the translocation, the chromosomes would look like this:

Activity 4: What Are Our Roles?

30 minutes

Setup

One of the ramifications of gender assignment is how parents, teachers, counselors, and school administrators will treat intersex children. In 2001, the television show *Friends* offended the

former high-school colleague who made up a rumor that Jennifer Aniston character was intersex.

Situations and Discussion Topics

1. How might a health care professional approach parents who will give birth to, or have given birth to, an intersex baby? How might the parents react, what might their options be, and how would they make their decision?

   For this situation, it might help to read the position of the Intersex Society of North America as of 2003 (http://www.isna.org):

   - Intersexuality is basically a problem of stigma and trauma, not gender.
   - Parents' distress must not be treated by surgery on the child.
   - Professional mental health care is essential.
   - Honest, complete disclosure is good medicine.
   - All children should be assigned as boy or girl, without early surgery.

2. How might a teacher introduce a child of ambiguous gender in a classroom at several grade

Activity 6: Y?

Based on video content

15 minutes

Setup

The sequence of the Y chromosome has been determined, and this smallest human chromosome contains more genes than we had previously expected. Take a few moments to consider the implications of this discovery by discussing the provided questions.

Materials

- Optional: Paper Chromosomes (master copy provided in Activity 3)
- One copy of the Discussion Questions per person (master copy provided)
- Tips and Suggested Answers

Discussion Questions

See Tips and Suggested Answers for more information and answers.

1. At one point, the Y chromosome was thought to have a dozen genes or fewer. Now we

Additional Information and Answers

1. One caveat to the genetic "differences between the sexes" is that the differences between male and female humans is in discrete genes. The differences between humans and chimps is

2. X and Y share enough homology at the ends that they can pair in meiosis in an XY male, and undergo limited crossing-over at these terminal regions. However, the bulk of the Y chromosome cannot undergo crossing-over, and is destined to accumulate mutations. The article notes that the Y chromosome has large, repeated regions, and suggests that these regions represent extra material that is available for repairing mutations.

3. In mammals, gene dosage of X chromosome genes is regulated by X inactivation

Activity 7: You Be the Judge

Based on video content

15 minutes

Setup

The video for this unit included a bit of the history of gender testing in the Olympics, and covered some of the issues in human gender determination. Now that you've had a chance to apply and reflect on this information, discuss the following questions in pairs or in a group.

Materials

- One copy of the Discussion Questions per person (master copy provided)

Discussion Questions

1 According to *The Journal of the American Medical Association*, at the 1992 Winter Olympics in Albertville, France, 8 of 3387 (1 per 423) women were found to have the Y-linked gene *SRY*. Seven of the eight had complete or partial androgen insensitivity syndrome, and the eighth probably had a defect in an enzyme in a testosterone biosynthesis pathway.

In your opinion, which, if any, of these people should be allowed to compete in women's events?

2. Do you think it would be fair for a true male who could "pass" as a female—and perhaps had

Notes