INVERTEBRATE ECOLOGY

The misuse of medicinal leeches

INVERTEBRATE ECOLOGY BIO50-444-01 - SYLLABUS
Active Lecture – MWF – 9 – 9:50 AM; Laboratory – W – 1:30 - 4:30 PM
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SEMESTER THEME:
This semester of Invertebrate Ecology will focus on student-driven inquiry and discovery of the critical importance of invertebrates, their unknown diversity and their unique adaptations to thrive in different environments. Students will work to make connections between general textbook material, primary literature and newfound discoveries about invertebrates while building their skills in critical thinking, reasoning, writing and oral communication.

MOLECULAR-SPONSORERED KECK MODULE: As part of the goals of infusing interdisciplinary molecular biology into the curriculum, this course will include a research-oriented module – Course Undergraduate Research Experience.

What's a Species Really? A case study using apple snails to teach students about modern (i.e. genetic) species definitions

Modern definitions of species extend beyond the biological species concept and unique morphological characteristics to include a genetic component. The rise of DNA barcoding has revolutionized how ecologists measure species diversity. Invertebrates comprise 98% of known biodiversity but estimates of species diversity remain problematic due to cryptic biodiversity. The genus *Pomacea* contains dozens of species and provides a good model for developing an instructional module on species identification. This module will use samples from an on-going research project in Uruguay to confirm species identification and measure intraspecific (i.e. population) diversity.

10+ REASONS WHY INVERTEBRATES: Perhaps before taking this course, but definitely after, every students should easily be able to brainstorm ten specific reasons why a biology major should study invertebrates.

- Examples: to regulate food production (i.e. role of pollination), for decorating (i.e. butterflies, dragonflies on house décor), to understand the learning process (i.e. cephalopods), etc…

CAPSTONE CONTRIBUTION: This course is an advanced integrative course in **Organismal and Population Level Biology** that partially fulfills the capstone requirement in Biology. In this course, you will integrate together and build upon material and skills you have learned in the required prerequisites of (First-year Biology, Biology Methods Course, Statistics).

COURSE STRUCTURE: To fully engage in active learning and experiment with a 'semi-flipped' classroom structure, we will diversity the days of the week with a mix of lecture and active learning. Typically on Mondays, Burks will deliver an overview lecture on the phyla of the week and students will have opportunities to share connections. On Wednesdays, students will work in groups to create review sheets or quizzes and prepare for discussion of primary literature or "big topics" in invertebrate biology. Fridays will provide time for students to engage with each other through dissection of current research papers or investigations into the big picture aspects connected to invertebrates.

SYLLABUS PHILOSOPHY: I think of a syllabus as an "owner manual" for a course just like you would have an owner's manual for any car that you drive. As such, this syllabus contains extensive information about the course and the expectations and should be used as a first resource when questions arise. Additional material will be posted on Moodle. Think of Moodle as parallel to "traffic" or "exit" signs that point to important information.

BIOLOGY DEPARTMENT STUDENT LEARNING OUTCOMES: Throughout their degree:

- Students **will understand and apply knowledge and concepts about the functioning of living systems**;
- Students will **accurately and thoughtfully identify, evaluate and critique research and research literature** on biological phenomena;
- Students will clearly, accurately and in appropriate styles, **communicate about biological phenomena and research orally, in writing and graphically;**
- Students will accurately, appropriately and safely perform physical techniques of biological investigation; and
- Students will accurately and appropriately apply quantitative reasoning and methods to biological problems.

INVERTEBRATE ECOLOGY COURSE STUDENT LEARNING OUTCOMES: By the end of the course, students will be able to:

- Describe the major invertebrate taxonomic groups and what makes them unique;
- Take responsibility for their own learning and progress in class;
- Articulate the need and reasons for combating vertebrate bias;
- Understand how molecular ecology contributes to the process of species identification;
- Comfortably synthesize a substantial amount of content into a digestible format;
- Determine the relevant information for study;

- Quickly find appropriate sources and employ a methodology to critiquing content;
- Think creatively about how to communicate science in different forums;

PARTICIPATION: Regular class participation is the default circumstance for students in upper level Biology courses. Class participation involves discussing primary literature, posing questions about class materials, working effectively in groups and maintaining a positive attitude.

WEEKLY: Students will have the opportunity to earn 5 points based on their participation effort (prompt attendance, active engagement in class, completion of prep for primary literature or big topic discussion). As an upper-level course and one part of the integrative capstone experience in the Department of Biology (see below), the workload expectation includes three hours of "out of class work/time" for every hour in class.

Integrated into the weekly coursework (see next section), participation counts 8%. Each week, you will provide a quick self-evaluation (out of 5 pts) on Moodle as to your efforts on the course elements. When self-evaluating, students should consider the following components of participation as worth equal amounts (only whole #s; round down).

- Performed to the best of ability (quality, time, organized, planned, follow-up)
- Executed portion of group work appropriately (not too little, not too much)
- Worked well with others
- Presented material clearly
- Took accountability for own learning/inquiry-based initiative

If self-evaluation falls below a 4, please identify what you need to do in the next iteration to improve.

PARTICIPATION INFLUENCE ON COURSE GRADE:

- **Outstanding** - Particularly noteworthy class participation will grant you a 1% benefit of the doubt at final grade time. In other words an 89% B+ would end up as a 90% A-.
- **Acceptable** - Regular class participation assures course standing (no change)
- **Below Average** - Less than frequent class participation/poor attendance lowers your grade by 1/2 letter (i.e. B+ = B)
- **Unacceptable** - Number of unexcused absences (more than 3 class periods) or extreme lack of participation will result in course failure. I will notify you of your status every three weeks. If I have any serious concerns, I will bring them to your attention immediately. If you are otherwise curious, please inquire at any time

GRADING SCALE:

975 and > = A+	925 - 974 = A	895 – 924 = A-
875 – 894 = B+	825 - 874 = B	795 – 824 = B-
775 – 794 = C+	725 - 774 = C	695 – 724 = C-
675 – 694 = D+	625 - 674 = D	600 – 624 = D- below 600 = F

Please monitor your grade (Moodle) and bring forth any discrepancies to Dr. Burks immediately.

Group	1st Quiz Creation	2nd Quiz Creation	3rd Quiz Creation	Primary Lit Discussion	Big Topic Discussion	Review Sheet
A	3 (2/3) Jellies	5 (2/17) Mollusks	10 (4/7) Insects	2 (2/10) Platyhelminthes	4 (3/31) Agriculture	Sponges Nematodes Crustaceans
B	1 (1/20) Protists	8 (3/24) Arthropods	12 (4/14) Starfish	3 (2/24) Annelids	3 (3/10) Medicine	Spiders Echinoderms Crustaceans
C	4 (2/10) Platyhelminthes	7 (3/10) Nematoda	9 (3/31) Crustaceans	1 (1/27) Sponges	2 (2/17) Biodiversity	Annelids Jellies Insects
D	2 (1/27) Sponges	6 (2/24) Annelids	11 (4/17) Spiders	4 (4/7) Insects	1 (2/3) Origins	Flatworms Starfish Mollusks

COURSE COMPONENTS (ask about details as needed)

ACTIVE LECTURE (75%):

- Group Discussion – Primary Lit and Big Topics **100 POINTS**
  - 50 points each x 2
  - 5 of points for self-evaluated individual contributions
  - Group members receive the same out of remaining 45 points

- 8 of 12 quizzes = (based Brusca et al.) **140 POINTS**
  - Individual grades
  - Take 8 Quizzes (20 points each) and have the Top 7 count

- 3 of 12 Quiz Making & 3 of 12 Review sheets **120 POINTS**
  - Group grades made up largely of a completion grade
    - Excellent - 20, Very Good-15, Good-10

- Primary Literature Abstracts (Non-discussion weeks) **60 POINTS**
  - 20 points each; Individual or paired
  - Context, Question, Methods, Analysis and Take Home Message

- Midterm and Final Examinations (75 points each) **150 POINTS**
- Value Project **100 POINTS**
- Weekly Self-evaluation participation **80 POINTS**

LAB (25%)

- Molecular lab worksheets **100 POINTS**
  - Scavenger hunt, phylogeny, methodology, analysis
- Poster Presentation **100 POINTS**
- Oral Research Presentations **50 POINTS**

DETAILS FOR QUIZ AND REVIEW PAGE GROUPS:

After listening to the highlights of the particular phyla from a lecture by Dr. Burks, **Quiz Groups** will work to identify the key content and creating an appropriate assessment for student acquisition of basic material. **Review Groups will work independently to summarize the key information.** Written at the graduate level and driven more through an evolutionary lens, Brusca et al. (2016) represents the most comprehensive and up to date text on invertebrates but provides a challenge to read. The topics within this course cover an intense amount of material and could easily occupy several lifetimes of study. No one person could be an expert in all of the areas. **Learning to recognize important concepts, trends, terms, and processes constitutes a key skill for students.**

These assignments (quiz and review sheet creation) have 3 student learning outcomes:

1. Students learn to determine the relevant material amidst growing information.
2. Students learn to construct questions that test knowledge across Bloom's learning taxonomy of learning domains.
3. Students will increase their appreciation of material organization and the need to provide materials in a timely manner.

QUIZ GROUP EVAL: Preparation & presentation of material earns 20 points as a group grade:

1. Ability to follow directions, make deadlines, attention to detail 5 points
2. Comprehensive coverage as described above (content) 10 points
3. Quiz Key with justification for coverage 5 points

Specifics:

- Quiz clarity and structure (2- 3 pages limit) – easy to read, no typos, clear format.
- Choice of questions for quiz (i.e. is material adequately covered but not too detailed?). **Questions should not be obscure, but at the same time questions need to evaluate how well students read the chapter and paid attention to the lecture/discussion.**
- Rationale for question choice (i.e. justification for what captured interest)
- Completeness of answer key – ease with which quizzes can be graded
- The quiz must be finalized by Thursday am.

REVIEW GROUP EVAL: Preparation & presentation of material earns 20 points as a group grade:

1. Ability to follow directions, make deadlines, attention to detail 5 points
2. Comprehensive coverage as described above (content) 15 points

Specifics:

As part of this group, students will prepare 1 page (single spaced) document with the key information from the lecture – this should be made finalized by Thursday am.

Evaluation scale:

(5) = Excellent; no considerable improvement needed
(4) = Very good; quality effort; minor tweaks needed
(3) = Adequate for getting the information across but could use improvement
(2) = Insufficient coverage, poor communication,
(1) = Incomplete, late, poor and ineffective in coverage and delivery

Quiz Design: To address this, groups of students will design an appropriate quiz (20 points) that includes the following:

1. **Vocabulary** – 5-10 key words that the group finds critical to understanding (5 points).
2. **Organization and Structural Uniqueness** –Question(s) designed to give students an opportunity to describe what is distinctive about the phyla and how they are organized (Could be MC, T/F, Match, SA, Drawing, etc…5 points).
4. **Function** (Feeding, Locomotion, Reproduction, etc…) – A single Short Answer Question about that is reasonable to answer given cursory reading of the chapter (5 points).
5. **Big Picture –** students should write a question that relates to the broader themes in invertebrate biology (i.e. phylogenetic relationships, biodiversity, ecosystem function).

Some more important details:

- **Generally, final quizzes and keys created by the group are due to Dr. Burks by 8 a.m. on Thursday after the Monday lecture and Wednesday work time.**
- They will then be reviewed and posted as PDF files on the same day by 5 pm.
- Send quizzes as e-mail attachments of a Microsoft Word file.
- During class, Dr. Burks will consult with groups to help create examples of quality questions for each quiz.

Individual Chapter Quizzes 7 x 20 pts = 140 pts (14%)

Invertebrate Biology involves a near weekly quiz component to encourage students to keep up-to-date and to engage in the material. The structure purposely provides study questions and helps prepare students early for exams. See above for details about the quiz structure.

5 important details for quiz takers:

1. Students should bring **completed quizzes (paper) to class** the day of the lecture.
2. The Honor Code Applies to taking of quizzes
    a. Especially to quiz-writing students not to share the questions
    b. No materials should be used when taking quizzes.
3. Quizzes should be available by 5 p.m. the night before class.
4. Write legibly – spelling does count.
5. Students should not take a quiz that they worked to create.

Note – if this process does not work out, then Dr. Burks reserves the right to write all the quizzes and have them make up for the missing points.

ABSTRACT FOR PRIMARY LITERATURE:

To encourage effective reading of primary literature, *each student should bring an abstract of the paper.*

- 1st STEP: Cover up the abstract and title of the paper. Only read the main sections.
- 2nd STEP: Write an abstract for the paper as if you were the author. In other words, you are to write what you think should be in the abstract from the paper. Actual statistics are not necessary; include significant results but stick to trends. Consider the five components to a quality abstract (context, question, methods, results and implications).
- 3rd STEP: At the end of the abstract, suggest a title for the paper with a justification.

• 4th STEP: After you have written your abstract, read the actual one and make a few key notes on 1) what you included in the abstract versus the actual authors; 2) main strength and weakness of each abstract; and 3) the writing style of each abstract.
• 5th STEP: Include a correct complete citation at the end of the assignment.

Abstract Exercise Evaluation:

Style/Grammar/Proofread/Citation	5 points
Choice of Information Included in Abstract/Title	5 points
Compare/Contrast Content	5 points
Strengths/Weaknesses	5 points

DETAILS FOR VALUE PROJECTS 100 POINTS

This project will be open-ended for you to explore the depth of appreciation "we" should have for invertebrates. Southwestern's signature program, Paideia, focuses on three I's: Interdisciplinary, Intentional and Integrative. These three I's describe an ideal creative project.

Task: Create an intentional "work" that integrates material you learned in invertebrate biology and educates the public audience by showcasing interdisciplinary links.

Student Learning Objectives: With the projects, students will be able to:

1. Educate an "audience" about an invertebrate and counter vertebrate bias;
2. Increase their ability to identify interdisciplinary connections to invertebrate ecology;
3. Tap their critical thinking skills to evaluate and form a rationale for how a particular project bolsters/boosts interest in biodiversity of invertebrates;
4. Effectively critique the quality and success of peer projects.
5. Foster creativity by creating some type of visual presentation (poster, game, theoretical 'ap', webpage, EOL work, art piece, etc…) that can be shared with the greater community;
6. Improve writing skills for a public audience.

Evaluation:

1. Proposal Idea	10 points
2. Draft Abstract	20 points
3. Final Abstract	10 points
4. Class Presentation	20 points
5. Final Project	30 points
6. SLO Reflection	10 points

10 POINT EXTRA CREDIT OPTION – PARTICIPATION IN CWS

DETAILS FOR PRIMARY LITERATURE DISCUSSION:

After providing an introduction to the topic/context of the paper, member of the PLN group will then guide the class through the primary literature paper. Remember that **one should rely on your peers** to have questions worthy of discussion but presenters should have their own list prepared to foster discussion. Your participation evaluation depends not only on your ability to

review the paper but also to engage others. As we work through the paper in class, you will want to guide a discussion of the paper that includes the following points:

1) Context – question and purpose – why care?
2) Experimental Design & Statistics
    -Taxa included
3) Relevant Figures – Discuss the data and critique on particular figure
4) 3 Strengths and weaknesses of paper?
5) What is the Take Home Message? Compare to other studies….think about next Step?

The paper must be experimental in nature. Groups must have an approved paper at least one week prior to presentations. All members of the class will read the paper and those not presenting will write an abstract (due the day of the discussion).

PNL GROUP EVAL: Preparation & presentation of material earns 45 points as a group grade:

1. Search, selection and justification of paper choice	5 points
2. 1 page review sheet (given at the end of class)	5 points
3. Comprehensive coverage as described above (content)	10 points
4. Ability to guide discussion and engage peers	20 points
5. Equal contribution of team members	5 points

DETAILS FOR BIG TOPIC DISCUSSIONS:

Invertebrates make up the bulk of the diversity on the planet and intersect with all aspects of our lives. We will take four opportunities to engage in discussion on "big topics" such as origins, agriculture, biodiversity and medicine.

Each group will identify a case study that associates the big topic and overall invertebrates. Ideally the focus will be on the group that we are studying during the week but the overall reach can be more extensive.

Example of a Big Topic: Coral Bleaching
Key connections: Climate change, symbioses, diversity
Important Question: Can it be reversed? Or can coral habitats be restored?
Examples of resources: Primary literature information plus NYT article
http://www.nytimes.com/2016/11/29/world/australia/great-barrier-reef-coral-bleaching.html?_r=0

BIG TOPIC GROUP EVAL: Preparation & presentation of material earns 45 points as group grade:

1. Justification, selection of reading and annotated bibliography	10 points
2. Identification of important question	5 points
3. Engaging presentation of case study	10 points
4. Equal group ability to guide discussion and engage peers	20 points

The topic and reading must be approved by Dr. Burks. Groups must have a reading approved at least one week prior to presentations. All members of the class will read the section.

ADDITIONAL COURSE INFORMATION:

FACEBOOK POLICY

Most students seem to have a Facebook account. If you don't have one, that is perfectly fine. All official class information goes through Moodle.

1. I will not set up a Facebook site for the course. If someone wants to take the initiative to make a group, I am in favor of group studying and brainstorming.
2. I avoid setting up my own groups because if I send any student an invite, I think that they have to be "my friend" in terms of not wanting to say no to a professor.
3. Friend policy: I'm happy to be "A Friend" to a current SU student, but I am a faculty member at Southwestern University first. If something worries me, I will follow up. I believe in better safe than sorry. At the same time, I neither have the time nor I am in the habit of not in checking up on students. However, I cannot help but read updates when posted.
4. My Profile page is all-inclusive for my family and friends. I do not put anything there that I am not willing to publicly share (this is good advice). So, feel free to request to be my friend, I will certainly accept but I do not want to compel people.

DOGS

I tend to enjoy the faculty privilege of bringing my dogs, Twinkie and Cupcake, to class. If they bother you, please let me know. They are hypoallergenic and shouldn't cause any allergic issues. They on occasion bark but usually are not disruptive. Over the last couple of months, Cupcake unfortunately has developed Congestive Heart Failure. This causes her to cough and need to take a number of medications. One of the side effects of the medications is an excessive thrist and the consequence that goes along with it. If she indicates the need to go outside during class, I will request a short break.

OPEN COMMUNICATION

Students should discuss questions and areas of concern with me, especially in this new version of the course that depends on quality group dynamics.

EMAIL

I frequently e-mail (most often through Moodle) to recap important points from class or to clarify questions. Please check your e-mail daily.

ATTENDANCE

Students are expected to prepare for and attend each class meeting. More importantly than just attendance, lack of preparation for class will diminish your capacity to fully engage in the intellectual pursuits of class.

TIMELINESS Arrive to class ON TIME

Anything less is disrespectful to me and your peers.

DROP DATES

- **2/13 without record entry or 3/26 for W.**

LATE PAPERS

•Most of the work will be done in a group and will not work if late. However, if you forget to bring an assignment (quizzes or literature critiques) or load it on Moodle, you have 30 minutes after class in which to obtain it – otherwise the assignment is late. Late assignments earn a 20% penalty per day. The best advice is to turn in your work on time.

HONOR CODE – FYI: I take this very seriously

• Academic Dishonesty: All course work is to be done independently. We are all very fortunate to have the Honor System here at Southwestern. In general, professors establish ground rules for acceptable collaboration or rules for exams and students follow those rules. You must write out and sign the honor pledge on all individual work to be graded. For electronic work, you should type the pledge and create an electronic signature.

The wording is as follows: ***"I have acted with honesty and integrity in producing this work and am unaware of anyone who has not."***

If you are unclear on the concept of plagiarism or cannot sign the honor code in good faith, please see Me. When in doubt, paraphrase and cite using Name and Year methods (Burks 2003). Any perceived impropriety will be discussed with the student and then the appropriate action pursued.

ACCOMMODATIONS

Southwestern University will make reasonable accommodations for persons with documents disabilities. Students should provide documentation and schedule an appointment with the Academic Services Coordinator (located in the Office of Academic Success in Prothro).

PAIR OR GROUP WORK

All students are expected to contribute equally to projects done in pairs or groups.

FOOD/DRINK

I do not mind if we "snack" in class as long as it is not disruptive. Please avoid feeding the dogs without letting me know. Avoid grapes, chocolate, raisins, etc…

CELL PHONES/LAPTOPS/PDAs, etc...

Unless you want me to answer it when it rings, please turn your cell phone off (this does not mean vibrate). Exception: If you have a family or personal emergency that requires it on, then fine. If it rings, please leave the room as quickly and quietly as possible. For Laptops/PDAs/IPads, etc...if you wish to use electronic devices to take notes and follow along with the slides, then no problem. If discovered randomly searching or emailing during class, students will be asked to leave.

FROM EVERY VOICE – TUESDAY – APRIL 4TH – UNIVERSITY WIDE EVENT