Aquatic Ecology Independent Research Syllabus

Biology 50-971 - 04: Independent Research, Biology Dept., Southwestern University

Faculty Mentor: Dr. Romi Burks (burksr@southwestern.edu),
Office 141-FJSH (512-863-1280), home (512-869-8069/cell)

Course description: Students will gain insight into the scientific process by designing, executing and analyzing a research project in aquatic ecology.

Student Learning Outcomes: By the end of the experience,

1. Students will demonstrate scientific competence/understanding when discussing the distinction between exotic and invasive species and the ways in which biological invasions occur;
2. Students will be competent at caring for exotic snails using proper precautions;
3. Students will increase their skills in searching for appropriate primary literature papers, reading these papers and integrating their content into draft manuscripts;
4. Students will execute pilot experiments and data analysis under the supervision of Dr. Burks and then design follow-up experiments more independently;
5. Students will better learn what it means to be a scientist in today's society by discussing topics of ethics, responsibility, communication and outreach.

The Context:

Apple snails include large aquatic invertebrates that have recently established exotic populations outside their native range (i.e. South America). These snails pose a threat to native vegetation as well as native biodiversity. Release through the aquarium trade currently ranks as the leading hypothesis for their introduction. There are two exotic species of 'channeled' (deep groove in shell) applesnails that occur in the U.S as well as a native applesnail and one that is okay for the aquarium tanks.

Minimal Reading List: By the end of the semester (if not before), all Burks Lab students should have a solid familiarity with the following resources:

- General apple snail: Hayes et al. 2008, 2009a, 2012
- Fecundity: Barnes et al. 2008, Burks et al. 2010, Kyle et al. 2011, Kyle et al. 2013 & Burks et al. 2014 (in press)
- Distribution: Byers et al. 2013
- **For overall general information on Ampullariidae, consider Hayes et al. 2015 as a resource**

The Players:

- **OUR MAIN STUDY ORGANISM in TEXAS:** *Pomacea maculata* - this species has established populations across the southeastern United States. Populations have established in Florida and threaten the native apple snail.
- *Pomacea diffusa (*formerly *P. bridgesii*) – this apple snail is called a "spiketop" apple snail and is a true grazer and appropriate to the aquarium trade. It eats algae and does not grow to very large sizes.
- *Pomacea canaliculata* (most well known – but possibly confused with several species) – this apple snail is a "global" invader with current US populations in FL, CA and AZ. The species in Texas were first thought to be this one before genetic confirmation of a different species.

- *Pomacea paludosa* – Florida apple snails that serves as a food source for endangered kite
- *Pomacea megastoma* – formerly *Pomella.* Species native to South America and not yet found in exotic habitats.
- *Felipponea* & *Asolene* – apple snails that permanently dwell underwater and belong to a different group than *P. canaliculata*.

General course requirements (done as 1 or 2 semester project):

1. Participation in lab meetings including reading scientific papers and articles.
2. Independent research project under the guidance of Dr. Burks
3. **In the beginning:** Research proposal outlining:
    a. Experimental question and hypotheses
    b. Proposed experimental design and methods
    c. Anticipated results
    d. Significance of research
4. Understanding of statistical analyses (under guidance of Dr. Burks)
5. Execution of pilot or developed experiment
6. **As you get results:** Research paper submitted to "Editor" Dr. Burks
7. Oral or poster presentation of research*

*Option to go to a regional or national scientific meeting if earned and interested.

Expectations for each student will differ based on experience and available time.

Using the proposal template (see end of syllabus), each student must develop their own specific plan for each semester of research and turn this in with a Purple Independent Research Form to the Registrar.

Honor Code Expectation: All research conducted and published during this independent study is governed by the Southwestern Honor Code. Plagiarism, data falsification, etc… are not tolerated.

Contact Time:

The independent research will take place during the fall semester of the 2010 year. Each research student will schedule a time to meet with Dr. Burks weekly.

1-credit hour: 1 hour every other week with Dr. Burks
2-credit hours: minimum of 1 hoursper wk with Dr. Burks
3-credit hours: 3 hours per wk with Dr. Burks; 3 hours supervised in lab editing, writing, working on figures, doing statistics) with Dr. Burks in office

Independent research requires the same amount of time, if not more, than a typical course. Time requirements may vary, depending on the type and course of research.

1-hour: 4-5 hours of work a week
2-hours: 9-10 hours of work a week
3-hours: 11-15 hours of work a week

Monthly official evaluations by e-mail with delivery aimed at the first Friday of every month: February 6th, March 6th and April 3rd. These evaluations will break-down the grading categories and give the students insight into their status in the course of independent research. Each "grade" will be divided into two parts: Effort & Quality.

Top 10 General Considerations:

1. During the week, all direct emails (or ones where a response is requested) sent by Dr. Burks get returned within 24 hours, even that means with just an acknowledgement.

2. All emails to colleagues or requests to others get cc'd to Dr. Burks.

3. Particularly on molecular side but also for statistics, emails should be sent when you update/back-up files on Dropbox.

4. Sunday/Monday (plan to do)- Friday (got done) updates with hours of activity described (LOG).

5. If you say what you are going to do something by X time, then you need to do it by that time or explain why it did not get done. Do not promise what you cannot deliver.

6. Leave everything better than you found it. Always look for ways to help organize, clean-up or help someone out.

7. ALWAYS be on the lookout for new research on apple snails (or generally aquatic, invasive mollusks or snail biodiversity). When you find it, send a link or copy of paper to the lab.

8. Keep a record of all of your primary literature papers. I recommend organizing them into a Zotero database.

9. Keep in mind that conducting undergraduate research is a privilege that you continue to earn.

10. As part of the lab, think of every action that you take as reflective on the integrity of the science and professional nature of a research lab and the reputation of Dr. Burks.

Evaluation Areas: All credit experience will earn a grade. Each area will be equally weighted.

1. Lab Participation: Full credit is earned when students participate actively in lab meetings, inspire discussion and attain reasonable progress with their research. Lab members may also be expected to take turns with basic lab duties as part of their research experience. Excessive absence in the lab and missed deadlines will quickly lower a student's grade in this area.

2. Execution of research: Execution of an experiment does not represent the only way in which research moves forward. Execution of research includes working on all the details that lead up to an experiment. In some cases, that may take a semester. Two credit hour projects minimally require pilot experiments and written methods. Research will be done under the mentoring and advice of Dr. Burks. However, students are responsible for thinking about issues involved in experimentation as well as interpreting results. Other individuals should not have to take responsibility for maintaining your project.

3. Writing: To pass the research course, students must submit good quality (i.e. carefully constructed) proposals, manuscript reviews and research reports or manuscripts by expected deadlines. Writing efforts include literature searches as well as annotated bibliographies. Successful writing also includes responding to constructive criticism or reviewing primary literature papers. For some students, writing efforts can be focused on small grant projects (i.e. Sigma Xi, Texas Academy of Science).

4. Presentation and Communication: Dr. Burks will find opportunities for students to present ideas, plans or results. Each student should be expected to talk about their recent work during lab meetings. In terms of communication, students must send in weekly updates of their progress.

Although official evaluations will occur monthly, please ask Dr. Burks about your performance at any time during the semester.

General Lab Policies

1. Each student will undergo laboratory training in accordance with standards set by the USDA permit for exotic snails (see attachments).

2. Each research student should maintain a lab notebook in which they keep track of the number of hours worked as well as experimental observations and data.

3. Students have access to the computers and printer in the lab. Back up your work routinely on your flash drive.

   a. Passwords for computers (nearest 141 office vs. nearest sink)
      i. Username: BurksLab1 Password: apple
      ii. Username: BurksLab2 Password: snail
   b. Keep your files in a folder with your name on it.
   c. **All files should be backed up on DropBox Friday.** Failure to back up your drive will diminish your effort grade in lab participation. Please alert Dr. Burks to any problems.

4. Each research student should work in the lab for at least 1 scheduled hour during which Dr. Burks is available. Consult with Dr. Burks

5. Each research student should be prepared to discuss his or her progress at each usually-weekly lab meeting.

6. Research students will have their own budgets (usually around $500). Items less than $25 can be bought without direct permission from Dr. Burks. If over $25, please submit a request on the appropriate order form. Turn in all receipts to Dr. Burks.

7. Follow proper safety protocols in the lab and report any accidents to Dr. Burks immediately. Be especially careful of wet floors.

8. Help keep the lab clean and organized. If you need a permanent working space, discuss the request with Dr. Burks.

9. Label all samples and data sheets properly with your initials and date and type of sample.

10. The Honor Code applies to all the work that is done in the lab.

Standard Operating Procedures

Principal Investigator/Permit Holder: Dr. Romi L. Burks
Associate Professor of Biology, Southwestern University
Maintenance of *Pomacea insularum* under laboratory conditions

SOPs Drafted: 1/11/10
Anticipated effective date (when snails arrive): 1/11/15

1. For all experimental and culturing purposes, snails will remain within the Aquatic Ecology lab, Rooms 144-145 in Fondren Jones Science Hall at Southwestern University.
2. *P. maculata* cultures will all be properly labeled.

3. All tanks will be positioned to prevent escape.
4. Snails will be fed only lettuce, unless otherwise instructed.
5. A daily feeding log and care will accompany each tank containing snails.
6. Bi-weekly inventories of snails will take place, including adults, juveniles and the approximate number of hatchlings.
7. Adult and large juvenile snails from different populations will be housed in differed tanks.
8. All water that comes in contact with eggs or hatchlings will be bleached prior to disposal.
9. Dead snails must be frozen at -20F for 72 hours prior to autoclaving.
10. All egg clutches produced will be immediately taken from culture tanks and placed in the "hatchery" or preserved in NaOH for enumeration.
11. All students will undergo Animal Care Training.

Any questions or concerns should be reported immediately and directly to Dr. Burks, cell phone 512-869-8098; office phone 512-863-1280; email burksr@southwestern.edu

Guidelines for Research Proposal (1-2 pgs): A clear research proposal (1-2 pages) provides details about a project and ultimately develops into a manuscript.

The research proposal should include the following:

1. **Title** – this should be creative, interesting and accurate
2. **Context –** little background as to why important/why ask
3. **Identify main question** being asked
    - **How does snail size affect consumption?**
4. Null hypothesis (What are your statistics testing?)
    - NULL: Small and large snails will have the same per capita rate of consumption.
5. **Alternate hypotheses** and **expectations** (What do you think will happen?)
    - ALTERNATIVE: Larger snails will consume more per capita.
6. **Experimental design** (Factors, Treatments and Replicates)
7. **Materials** required for experiment :
    - People
    - Organisms
    - Time
    - Containers, etc…
8. **Parameters** that you will measure (# organisms, behavior, etc…)
9. **Statistics** that you will employ to analyze your experiment
10. **Timeline** (actual dates required, including for data analysis and presentation)
11. **Statement of significance** – How does this fit in with what we know?
12. **Primary literature references** supporting methodology

8/8/2010

Lab Guide for Apple Snail Lab of Dr. Burks

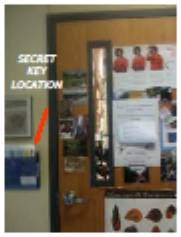
Created 30 June 2010

Contact Information

- Dr. Romi Burks: Cell 512-869-8098
- SU Police Department: x1944
- UR Allyson Plantz: 512-508-1811
- UR Tracy Day: 903-920-2912
- Biology Technician Christy Schaller: x1544 or 512-635-9688
- Administrative Assistant Maria Trevino: x1360

SNAILS DO NOT LEAVE THE LAB

Lab Authorization



- Restricted Access
- DOORS MUST REMAIN LOCKED
- Visitors must be accompanied by trained lab person
- Visitors Must Sign Log

Lab Basics: Handling Snails

- Gloves
  - Recommended but not required
  - Always an option
  - Avoid running finger along shell
- Snails do not bite
- Do not eat raw snails
- Do not leave snails where they could crawl away and fall off a surface

Anatomy 101

8/8/2010

Lab Basics

- Any water that touches snails should be bleached before going down the drain
- BLUE BUCKETS = no bleach
- YELLOW BUCKETS = bleach
- Bleach can be found under sink

Lab Basics: Disposing of Snails

- If only shells and/or Operculum
  - BLEACH for a minimum of 2 hours
- If snail with body mass, place in small plastic bag and tie knot.
- Add information to LOG
- Put in freezer

Lab Basics: Water

- Use water from white tap for snails
- Be careful to remember that you have water running
- Keep tanks filled at recommended "lines"
- Mop or towel up any water on the floor

If water gets out of control

- Call for HELP
- Use vacuum – hose goes on the front
- Or mop

Snail Tanks

- Adult snails from Water Brook
- Keep screens on with secure clamps
- Do not overtighten clamps
- Keep water level up by filling reservoir tank

Snail Tanks

- Snails from Florida
- Keep screens on with secure clamps
- **Do not overtighten clamps**
- Keep water level up
- Be careful of pumps and filters

8/8/2010

Basic Methods for Apple Snail Lab of Dr. Burks

Created 1 July 2010

What to do with a Clutch

- CAREFULLY obtain a razorblade from the small drawer labeled "Razorblades"
- Remove clutch from the side of the tank
- Place into small plastic container (found on shelf to the right of computer #2)
- Take to incubator in Christy Scheller's office (FJS 203)
- Contact Maria Trevino for key (FJS 215)

How to Measure Clutches

- Use a Digital Micrometer
- Make sure that it is set on "mm"
- Zero it when the tips are together
- Slowly move apart the tips until the edges touch what you want to measure

Hatching Efficiency

- Methods
  - Measure Clutch before setting up
  - Incubated at 28 - 30°C in incubator
  - Place clutch above water
  - Check DAILY
  - HE= Total Number of Hatchlings / Total Number of Eggs (Eggs+Hatchlings)

How to Measure a Snail

- When measuring a snail one must find the Greater width (GW), Lesser width (LW), Height (HT) and Mass
- The Greater width is the horizontal distance across the operculum
- The Lesser width is the vertical distance across the operculum
- The height is the distance from the operculum to the top of the whorl
- Mass is the weight of the snail measured in grams

Greater Width

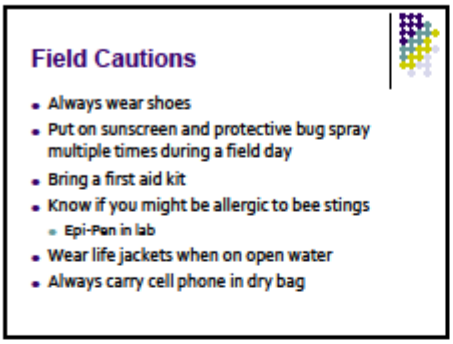
Height

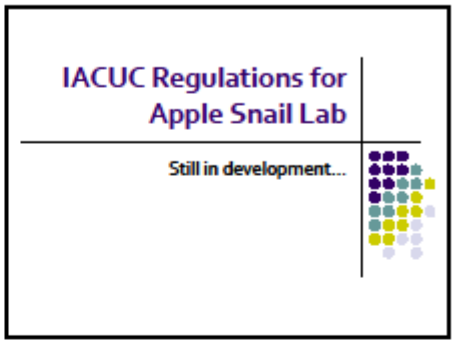
Lesser Width

Rules for Data Entry

- Use informative file names
  - ExperimentDataInfo
- Always put data on your Lab Flash Drive
- Always BACK UP data in your folder on Lab Computer
- Always send Dr. Burks data files as attachments

8/8/2010


Field Cautions
Always wear shoes
Put on sunscreen and protective bug spray multiple times during a field day
Bring a first aid kit
Know if you might be allergic to bee stings
Epi-Pen in lab
Wear life jackets when on open water
Always carry cell phone in dry bag


IACUC Regulations for Apple Snail Lab
Still in development…

SOUTHWESTERN UNIVERSITY, Georgetown, Texas, Department of Biology
Liability Waiver

AGREEMENT AND RELEASE FORM FOR FIELD COURSES

I, the undersigned, a participant in a **THE LAB OF DR. ROMI BURKS OF SOUTHWESTERN UNIVERSITY** do waive and release all claims against Southwestern University and its agents, any tour organizer or arranger employed or utilized by Southwestern University, for any injury, loss, damage, accident, delay or expense resulting from the use of any vehicle, any strikes, war, weather, sickness, quarantine, government restriction of regulations arising from any act or omission of any steamship, airline, railroad, bus company, taxi service, hotel, restaurant, school, university, or any other firm, agency, company or individual.

I also release Southwestern University and its agents and agree to indemnify them with regard to any financial obligations or liabilities that I may personally incur or any damage or injury to the person or property or others that I may cause while participating in field work in the aforementioned course. I understand that Southwestern University is not responsible for any injury or loss whatsoever suffered by me during periods of independent travel (which I understand are unsupervised) or during any absence from the program or other Southwestern supervised activities.

I hereby grant Southwestern University and its agents full authority to take whatever actions they may consider to be warranted under the circumstances regarding my health and safety, and I fully release them from any liability for such decisions or actions as may be taken in connection therewith. I authorize Southwestern University and its agents, at their discretion, to place me, at my own (or my parents') expense, in a hospital within the United States for medical services and treatment, or if no hospital is readily available, to place me in the hands of a local medical doctor for treatment.

I will comply with the Southwestern University rules, standards and instructions for student behavior. I hereby waive and release all claims against Southwestern University and its agents arising at a time when I am not under the direct supervision of Southwestern University or its agents or arising out of my failure to remain under such supervision or to comply with such rules, standards and instructions; and I agree to indemnify Southwestern University and its agents against any consequences thereof. I agree that Southwestern University shall have the right to enforce appropriate standards of conduct and that it may at any time terminate my participation in the Southwestern University program for failure to maintain these standards or for any actions or conduct which Southwestern University considers to be incompatible with the interest, harmony, comfort and welfare of other students and/or persons employed by Southwestern University. If my participation is terminated, I consent to being sent home at my own expense.

I will also accept in good faith the instructions and suggestions of Southwestern University or its agents in all matters relating to the program or the personal conduct of program participants. I understand that from time to time Southwestern University's publicity material may include statements by its students and/or their photographs, and I consent to such use of my comments and photographic likeness. I understand that Southwestern University reserves the right to make cancellations, substitutions or changes in cases of emergency or changed conditions or in the interest of each group.

All references in this Agreement and release to "Southwestern University" and "its agents" shall include Southwestern University and all of its officers, directors, faculty and staff members, counselors, group leaders, employees, agents and affiliated companies. All references herein to the "parents" of the participant shall include the legal guardian or other adult responsible for the participant.

I have read the terms and conditions set forth in this form Southwestern University program indicated above, and understand that they constitute a part of my agreement with Southwestern University.

Contract

I _____(print name) have read the above syllabus and understand the expectations and requirements of Independent Research.

1. Agree to abide by lab safety guidelines, restrictions as required by USDA permit and animal training protocols as specified by IACUC

Signature: _____

2. Signed liability form for lab and travel related to lab work

Signature: _____

3. Agree to conduct oneself as a professional scientist

Signature: _____

4. Agree to keep all lines of communication open with Dr. Burks and maintain a dialogue regarding outcomes of authorship.

Signature: _____

5. Contribute positively to building up the spirit of the lab environment

Signature: _____

Date: _____

Availability: I will be in the lab on _____ from _____ to _____ which coincides with the availability of Dr. Burks.