



Welcome to lab!



FISH 460, Applied Marine Animal Physiology

Fisheries Teaching and Resource Center
(FTR) Room 125

Lab Section AA: Monday 1330–1620

Lab Section AB: Tuesdays 1330–1620

- **Introductions**
- **Lab Safety Orientation & Ground Rules**
- **Introduce Crab Lab! Ecophysiology Projects**
- **Cover Lab Schedule, Structure & Grading**
- **Get to Know Your Crabs**
- **A Brief on Lab Tools**
- **What Makes a Good Literature Review?**
- **Hello... GitHub**

Sarah Tanja - Lab TA



Sarah Tanja

Master's Student, Jacqueline
Padilla-Gamino Lab
School of Aquatic and Fishery Sciences
stanja@uw.edu
Office hours: TUE 11:00-12:00 FSH 264B

Career:

University of Portland, OR
BS, Biology

NOAA Corps

- ENS. Navigation Officer on *R/V Reuben Lasker*, SWFSC, San Diego, CA
- LT. Oceanography and Mooring Operations, PMEL, Seattle, WA

UW SAFS Grad Student

Research interests:

- Ecophysiology / ecotoxicology
- Microbiome host interactions
- Embryonic development
- Symbiosis

LAB SAFETY ORIENTATION

- ❑ Emergency evacuation route and meeting area
- ❑ Location of fire extinguishers
- ❑ Location of closest fire alarm pull station
- ❑ Location and proper use of safety showers
- ❑ Location and proper use of eyewash stations
- ❑ Location of first aid kit
- ❑ Location and use of spill kits
- ❑ Location of hazardous materials
- ❑ Location and proper use of fume hoods
- ❑ **NO FOOD OR DRINK ALLOWED IN THE LAB!**

GROUND RULES & PERSONAL CONSIDERATIONS

- ❑ NO FOOD OR DRINK ALLOWED IN THE LAB!
 - ❑ Keep it in the hallway
- ❑ LAB is 2hrs & 50 minutes long
 - ❑ Take breaks... drink water...
 - ❑ We expect you to stay until the end
 - ❑ Motivated by exit tickets
- ❑ LAB is collaborative ... meaning
 - ❑ Teamwork is a cornerstone of science
 - ❑ Be kind to each other
 - ❑ Show up for each other

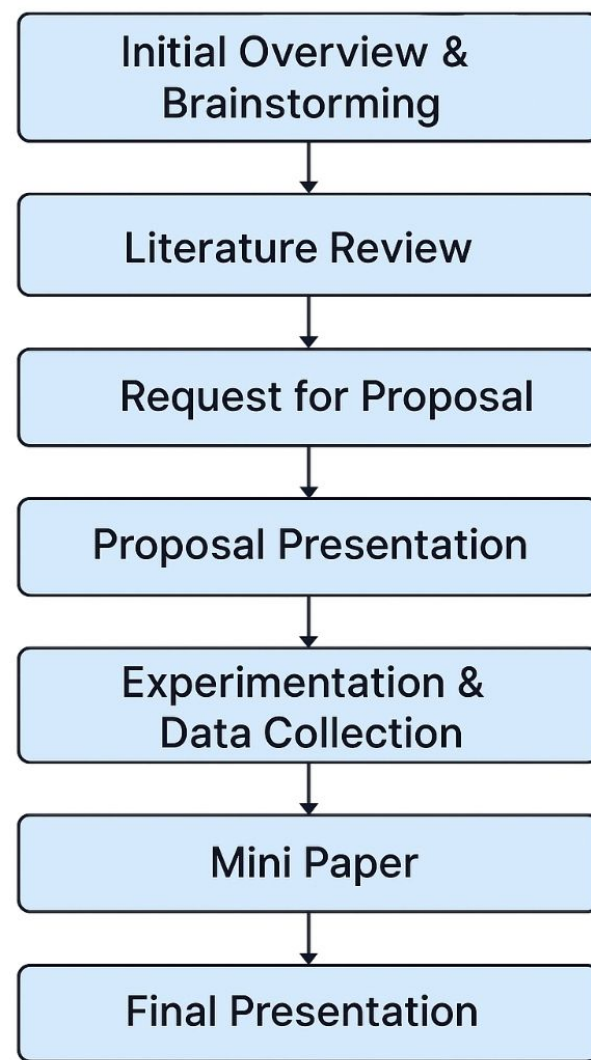
What's different about this lab?

You will be completing a **quarter-long group research project** focused on **crab ecophysiology** with a variety of laboratory tools made available to you.



Progression through Lab

Your journey through lab will mirror the **entire process of designing and implementing a funded research project** in crab ecophysiology



... And ... buckle up ...you're going to learn research project management skills with R and GitHub



Grading

-
- 30% of your FISH 460 grade is Lab Assignments
- There are no automatic drops for Lab Assignments
- There are 2 Lab Assignment 'due dates':
 - In lab - due by 1620 day of lab!
 - (aka done in lab!)
 - In prep - due by 1330 the day of the *next* lab
 - (aka done before the start of the next lab!)
- Each week we will have a Lab Assignment
- Each week we will have 'exit tickets' worth 3 points!

Week	Monday	Tuesday	Lab session	Assignment(s) due	Points	Submission	By
Week 1	Mar30	Mar31	Lab overview + make GitHub accounts	GitHub account name added to FISH460 Org.	3	In Lab	Individual
Week 2	Apr6	Apr7	Establish research teams + make GitHub repos connect to R	Annotated bibliography upload to GitHub	10	In Prep	Individual
Week 3	Apr13	Apr14	Refine hypothesis & experiment + upload LOI	Letter of intent upload to GitHub	3	In Lab	Group
Week 4	Apr20	Apr21	Proposal pitch & gather experiment supplies	Proposal pitch presentation	20	In Prep	Group
Week 5	Apr27	Apr28	Collect Data I + record methods	Lab records & datasheets upload to Github	3	In Lab	Group
Week 6	May4	May5	Collect Data II + figure generation in R	Lab records & datasheets upload to GitHub	3	In Lab	Group
Week 7	May11	May12	Collect Data III + figures & statistical testing in R	Draft figure upload to GitHub	3	In Lab	Individual
Week 8	May18	May19	Present initial results	Initial results presentation upload to GitHub	10	In Prep	Group
Week 9	May25	May26	No Lab - Memorial Day Holiday	Mini paper due Tues all sections upload to GitHub	55	In Prep	Individual
Week 10	Jun1	Jun2	Final presentations	Final research presentation upload to GitHub	20	In Prep	Group

Get to Know Your Crabs

- **Hairy shore crab**
 - (*Hemigrapsus oregonensis*)
- Ubiquitous native species collected here in the Puget Sound



Please be
nice to me*





Setae: Small, usually flexible, bristle-like or hairlike projection articulating with or extending through cuticle (exoskeleton)

Geographical Range: Resurrection Bay, Alaska to Bahia de Todos Santos, Baja California.

Depth Range: Intertidal

Habitat: Open mud flats, algal mats and eelgrass beds, in bays and estuaries and on open beaches where there is plenty of fine sediment.

Physiology:

- Digs burrows and is **capable of withstanding hypoxic conditions**.
- This species is **a better osmoregulator** than the other local shore crabs [*H. nudus*](#) .

Foraging: Feeds mainly at night, mostly on diatoms and green algae, but will eat meat if it has opportunity. Predators include shorebirds.



I'm an oxygen regulator and can keep my metabolic rate steady despite low oxygen!



I'm euryhaline and can switch from actively osmoregulating and osmoconforming to tolerate large swings in salinity !

Typical

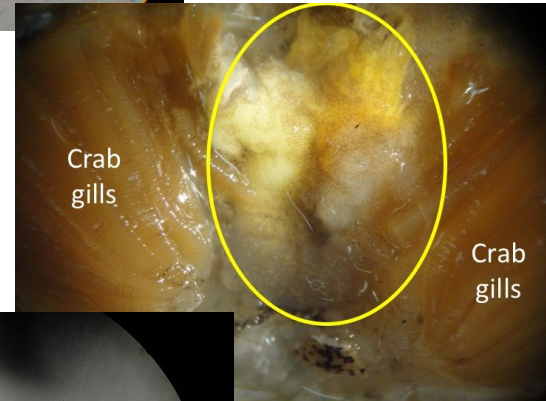


Feminized Males



Portunium conformis

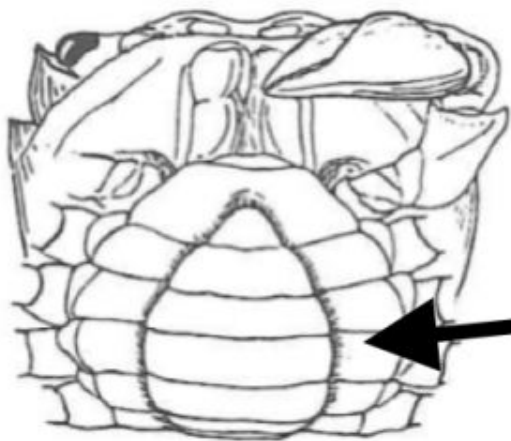
Is a parasitic



Isopod!

Photos by
Dr.
Chelsea
Wood

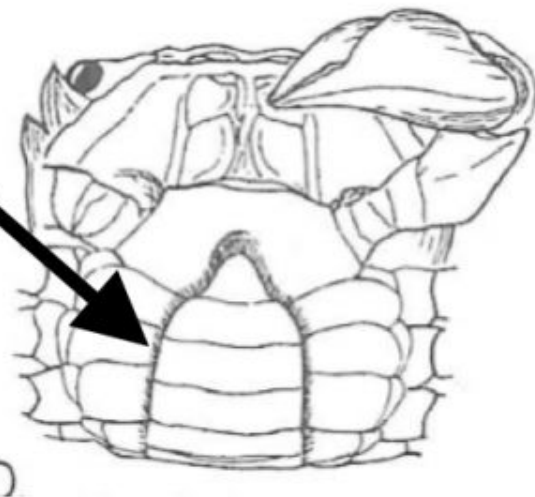
Juvenile female



Abdomen has
straight sides

Abdomen has
rounded sides

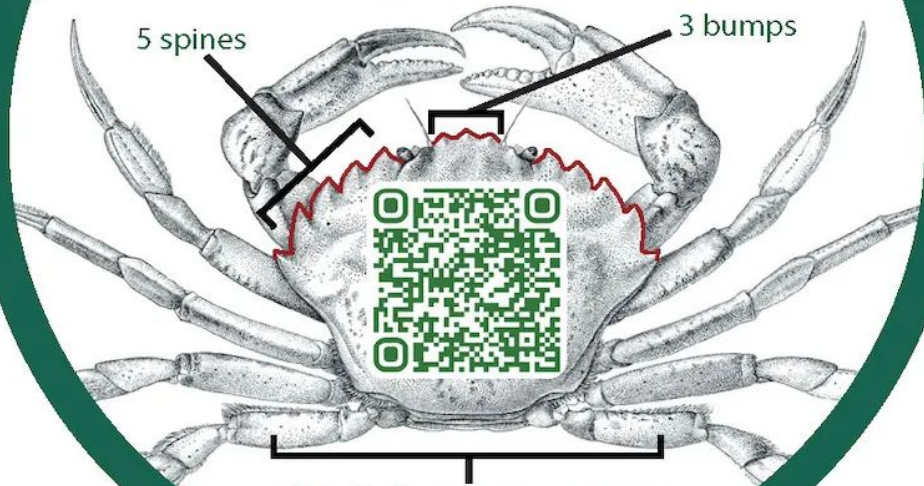
Feminized male



European green crab (*Carcinus maenas*)



REPORT INVASIVE EUROPEAN GREEN CRAB



Adult shells can measure up to
4 inches across in width.

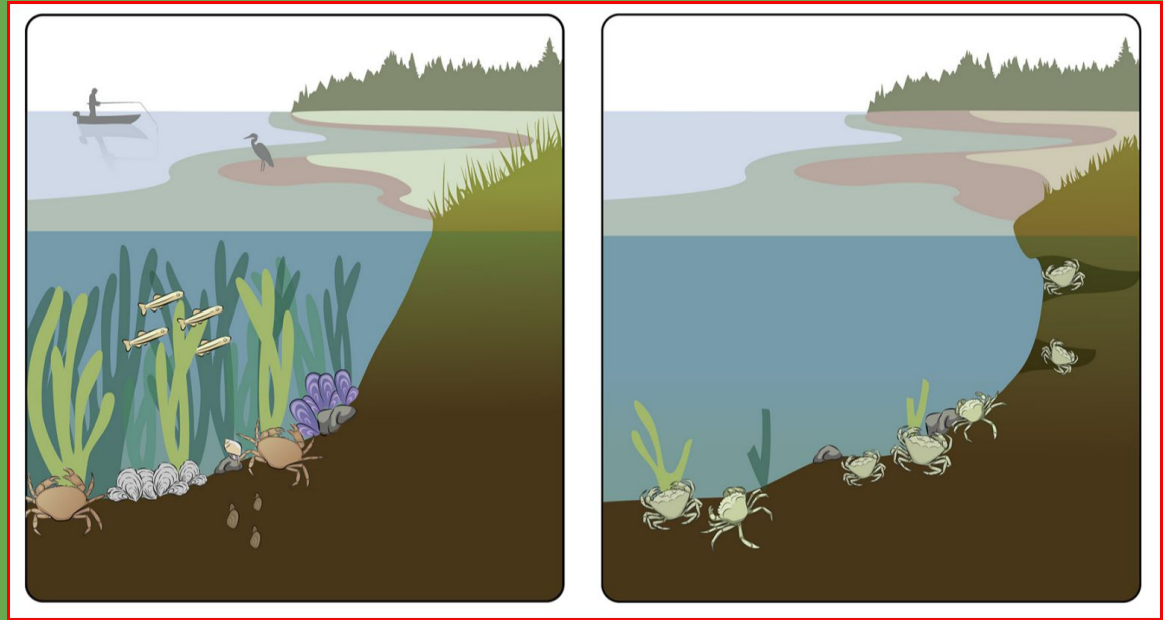


OPB



European green crab (*Carcinus maenas*)

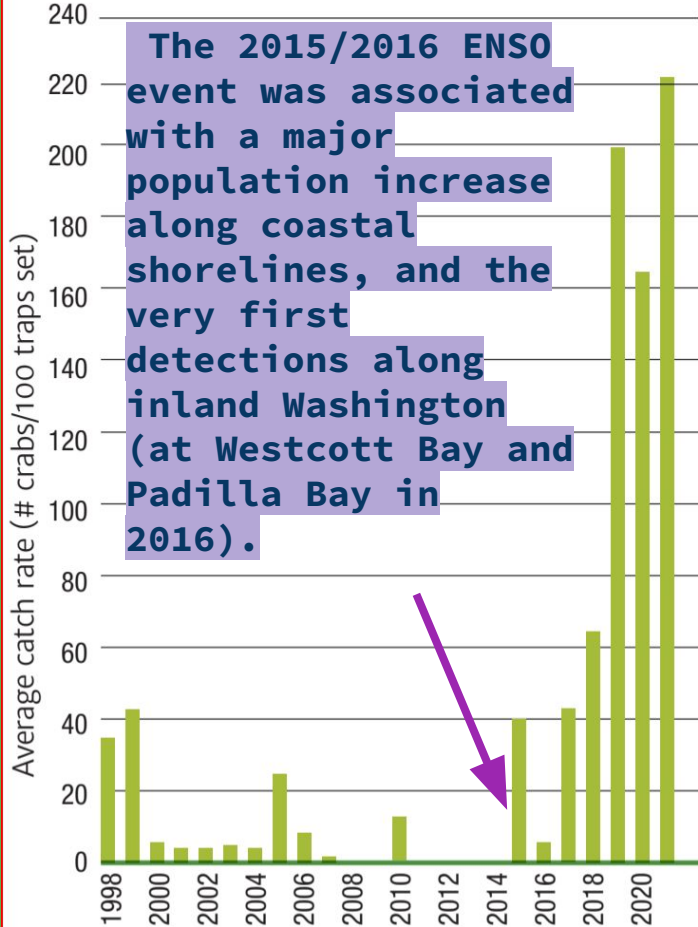
- Burrowing destabilizes banks
- Found in pocket estuaries
- Eat Dungeness
- Eat Shellfish
- Dig up eelgrass
 - Reduces habitat for..
 - Salmon
 - Birds



Illustrations by Kate Hourihan

Willapa Bay Green Crab sampling (1998-2021) at Stackpole site.

Data courtesy of Sylvia Behrens Yamada/PSMFC.



Dates of first confirmed detection of European green crabs across the Pacific Northwest.



Photo credits: Above left, Sean McDonald; above right, Greg Jensen.

Sacculina carcini parasitic barnacles infect European green crabs only in their native range

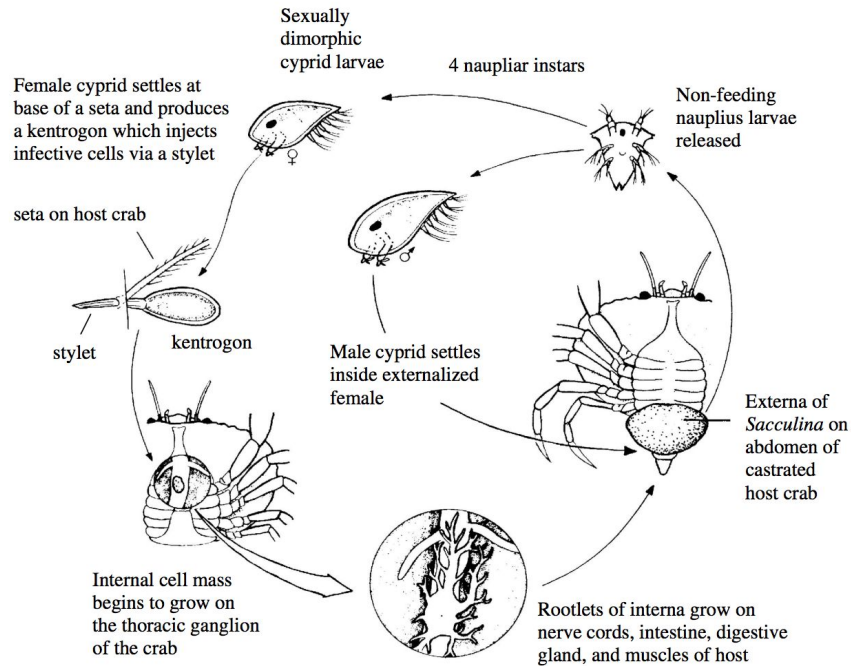


Figure 1. Life cycle of *Sacculina carcini* modified from Hickman et al. (1988).

What applied research questions might you be able to address with *shore crabs*?

— — —

What applied research questions might you be able to address with *shore crabs*?

1. Invasive species comparative physiology

- a. Will greater resilience to environmental stress allow invasive species to outcompete native species?
- b. How might invasives avoid mortality in more hostile environments?

2. Stress Physiology

- a. What lessons can we learn about stress physiology in shore crabs that may apply to other marine invertebrates of interest?

3. Crab fisheries

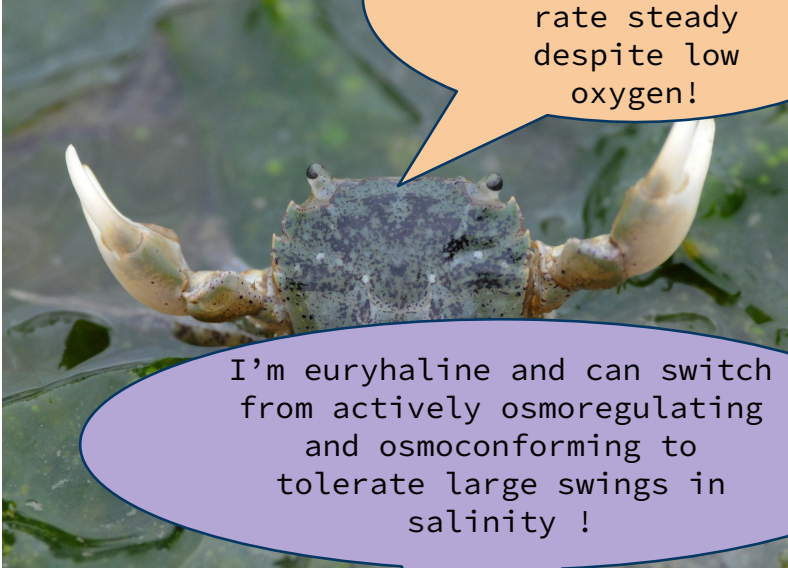
- a. How might crab fisheries be impacted by climate change?

Which environmental stressors could you examine?


— — —

What physiological parameters could you measure to test environmental response or stress?

— — —



I'm an oxygen regulator and can keep my metabolic rate steady despite low oxygen!



I'm euryhaline and can switch from actively osmoregulating and osmoconforming to tolerate large swings in salinity !

What can we control?

- Treatment tanks and husbandry supplies
- Laboratory environmental manipulation
 - Temperature
 - Desiccation
 - Salinity
 - Predator stimuli
 - Dissolved Oxygen*
 - *maybe!
 -

REALITY CHECK... Pilot Studies and Feasibility Assessments

Amelia Earhart mystery: How pilot could have been eaten alive by thousands of tiny crabs



Bad example of a crab ecophysiology pilot study

- **We only have 3 weeks of experimentation!**
- Projects will hover somewhere between a pilot study, feasibility assessment, and experimental hypothesis testing
- The goal is to discover insights we can apply to real world systems!

Week 2 Lab Assignment - 🔥 Lit 🔥 Review

- An annotated bibliography is a collection of papers
- Each with a short summary (bullet points are fine!)
- And a reflection on how it guides your research direction
- Ground your research using peer-reviewed literature articles
- Frame the applied nature of your work in current events
- How does your research fit into previous studies?
- What are the applications of your research?

🔥 Lit 🔥 Search Resources

- [Google Scholar](#)
- [UW Libraries](#)
- [Web of Science](#)
 - [Preprints](#)
 - [Dissertations and Theses](#)
- [PubMed](#)
- [Elicit](#)
 - AI lit review tool



Yes you can 🙄

🔥 Lit 🔥 Review - Bring a paper copy to Week 2 Lab!



**SPEED
DATING**



Some things to keep in mind as you think about project ideas....

Next week (Lab 2) we will
get into experimental
design, measurements, &
controls

K eep
I t
S imple
S tupid

And now... project management



Andy Nutzhorn - Lab Manager



Andy Nutzhorn

Instructional Laboratory Manager
School of Aquatic and Fishery Sciences
adn9@uw.edu

Career:

Western Washington University
BSc, Marine Ecology

US Navy

- Damage Controlman 2nd Class,
USS Harry S. Truman

Seattle Aquarium

- Citizen Science Instructor

Washington Dept. of Fish &
Wildlife

- European Green Crab
Technician