MNS 352/382 MARINE COMMUNITY ECOLOGY

Today

Overview course structure

Housekeeping

Short intro to R

Background on my research

Primer to community ecology

COURSE STRUCTURE

Course Details

Time: Mondays, 10.30am – 12.00pm (Lecture), Thursdays, 1.00pm – 4.00pm (Lab)

Location: UTMSI Admin Wing Video Classroom (S06 201C) and on Zoom

Instructor: Dr. Simon J. Brandl (he/him/his), simon.brandl@austin.utexas.edu

Office location: Marine Science Institute, Main Research Building, 3.05

Office hours: by appointment, in-person or Zoom

Undergraduate and Graduate Students

53545 – SbtS students

53604 – graduate students

Lectures, coding, and labs

Lectures: 80-90 minutes, slides on Canvas approximately 30 minutes prior to lecture.

Labs: Coding labs with class exercises, fieldwork, and lab processing.

Learning outcomes: all students

1) Gain a thorough understanding of ecological theory.

2) Acquire/improve computational skills to explore, analyze, and visualize data in R.

3) Express scientific knowledge in writing via research papers, syntheses, and short essays.

4) Present your work and follow/contribute to discussions on marine community ecology.

5) Survey, sample, process, and analyze marine and estuarine communities in the field.

6) Learn how to assess your own progress and growth in a non-traditional grading format.

Learning outcomes: grad students

1) Gain advanced skills in R that allow you to troubleshoot coding issues and help your peers navigate the pitfalls of data wrangling, analyses, and visualization in R.

2) Develop leadership skills in research, including the capacity to steer discussions, tackle problems, find solutions, and delegate tasks.

3) Synthesize research outcomes into a brief, compelling narrative, pitched to a journal using a cover letter, abstract, and figures.

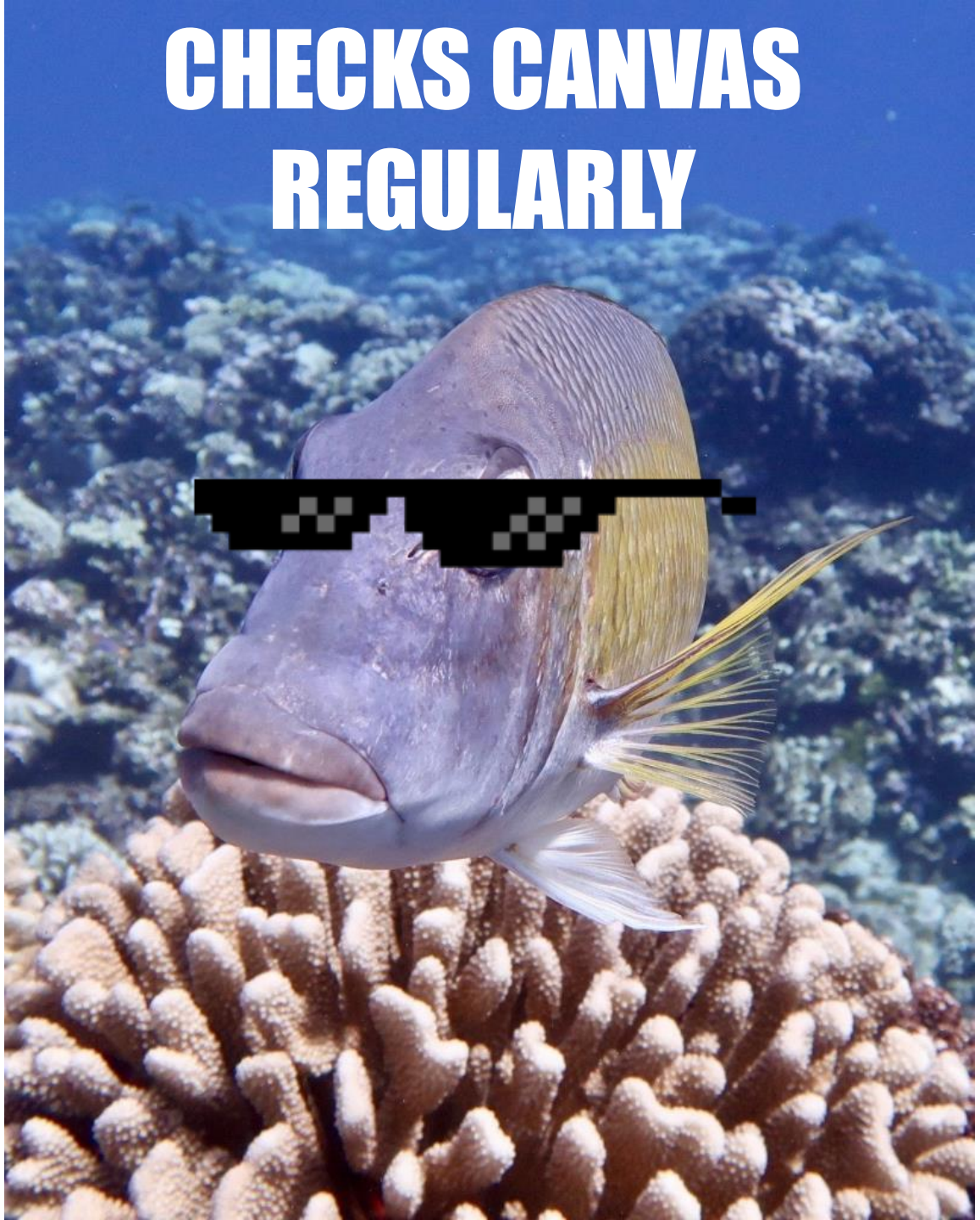
Christina Marconi, TA

Dr. Chris Hemingson, Co-instructor

Resources and policies

UT Canvas

- syllabus
- announcements
- lectures
- assignments
- homework
- files and materials



Companion page

- coding demos
- coding exercises
- coding solutions

👷

Other resources on syllabus

Policies

- Late work and unexcused absences are generally not accepted, but I am flexible in the case of religious observance, illness, or emergencies.

- Accessibility statement: If you have disability, I can work with you to ensure you have equal opportunity to participate. File an Accommodation Letter Request through the Services for Students with Disabilities (SSD) and talk with me ASAP.

- Academic dishonesty, such as plagiarism, is subject to disciplinary penalties.

- Title IX reporting: I am a responsible employee and must report any Title IX related incidents. Further info on reporting can be found in syllabus.

- AI: Suit yourself.

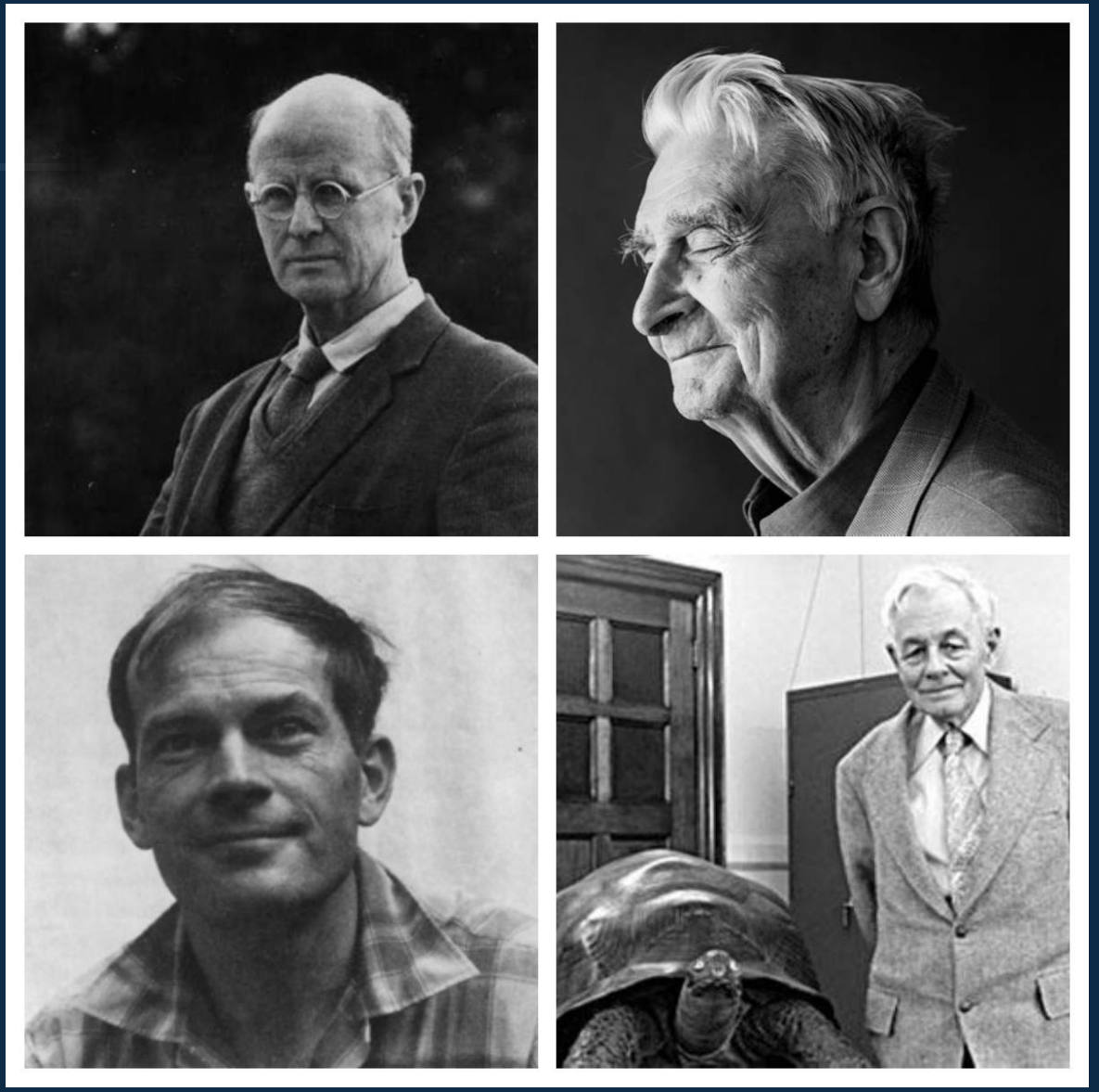
Policies

1) Safe and inclusive learning environment

2) Respect other's contributions and provide constructive criticism without judgement

3) I will honor your request to change your name or pronouns from those listed on the official course roster

4) A word on historical community ecology…

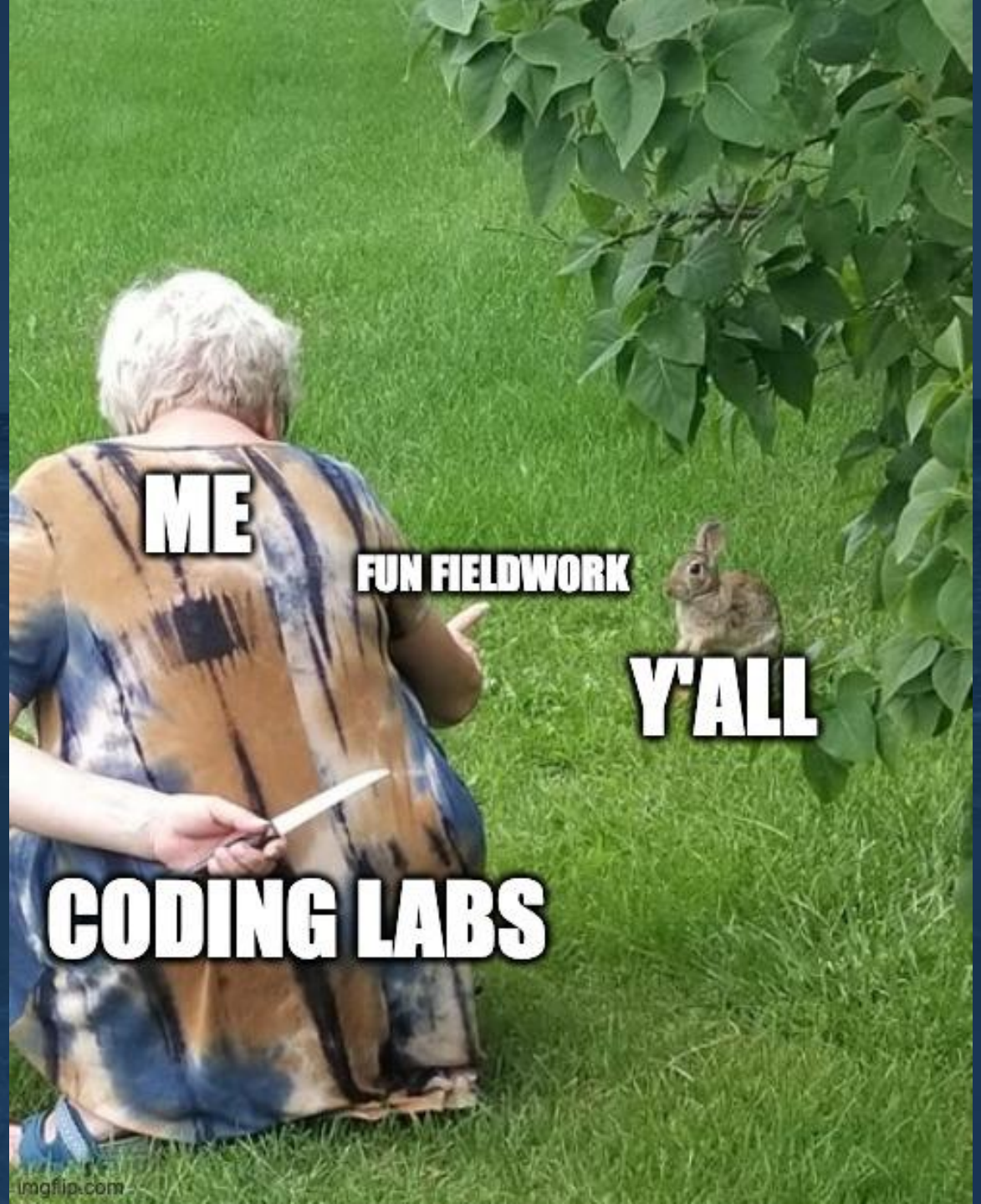


Overview

Four Modules

Module I	Introduction to community ecology • Community ecology is a dumpster fire
Module II	A general theory of ecological communities • Four processes: drift, selection, dispersal, speciation
Module III	Empirical evidence in marine systems • How these processes shape real-world communities
Module IV	Marine communities in the 21st century • Current research: global change, new methods, and management


Labs

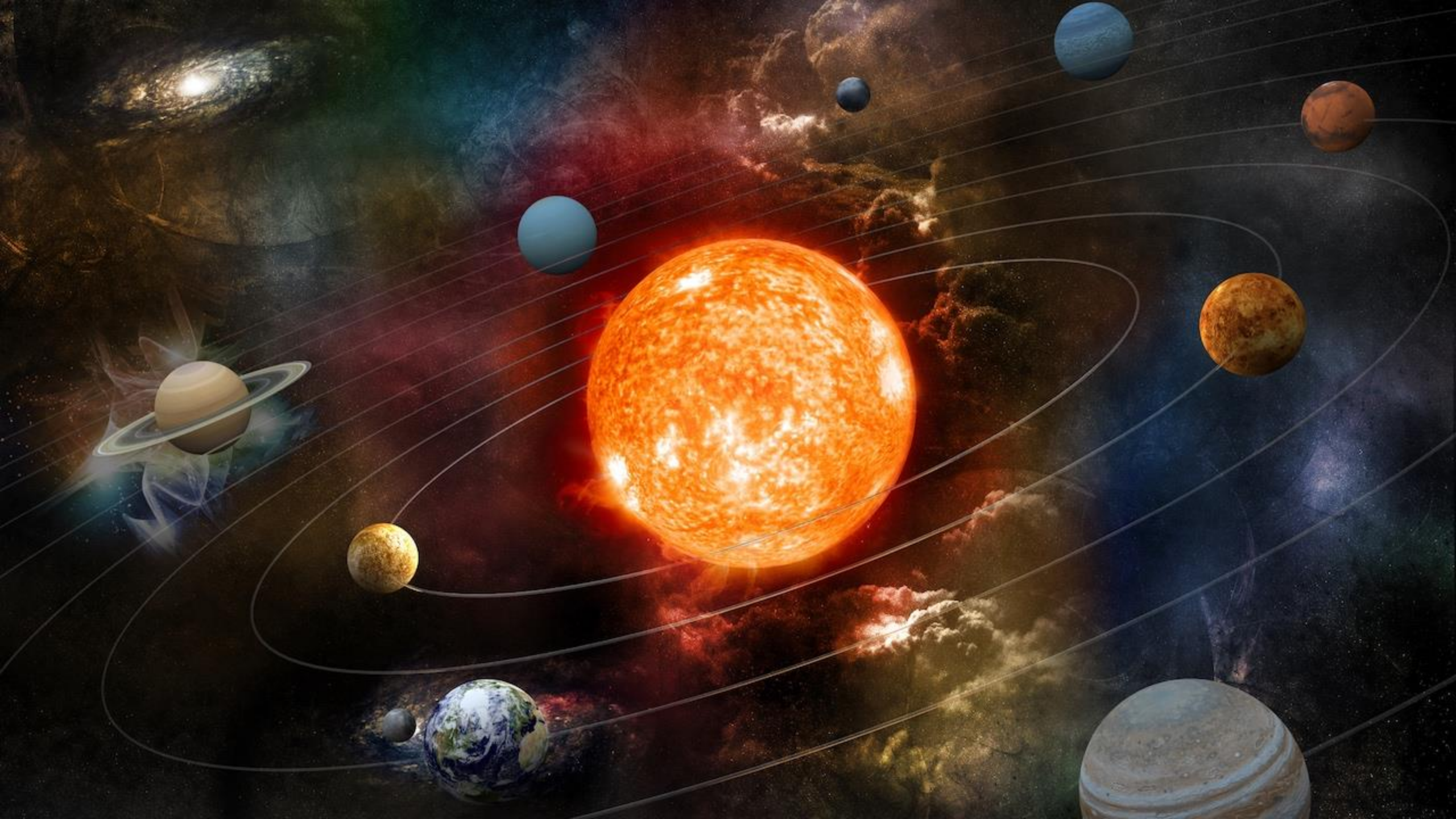

ME
FUN FIELDWORK
Y'ALL
CODING LABS
imgflip.com

Fieldwork I

Fieldwork II


Grades


Let me take a moment to move over to
a different board so I can show you
how I will grade you in this course
There's NOTHING HERE!
imgflip.com



Ungrading

A system based on trust between students and the instructor to achieve learning based on intrinsic motivation and a growth mindset.

1) Learning contract: my side

B- if all deliverables are submitted, rest is up to you!

2) Learning contract: your side

Set your own goals and expectations for each learning objective

3) Self-evaluation

Two times to reflect on your learning, growth, and achievement of goals

Learning outcomes: all students

1) Gain a thorough understanding of ecological theory.

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4) Present your work and follow/contribute to discussions on marine community ecology.

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Grading contract

Skill/learning objective	Goal	Actions	Mid-semester	Final
1) **Gain a thorough understanding of ecological theory**	Exceed expectations – I have a good foundation in ecology, but since I want to pursue a graduate degree in ecology, I really want to go above and beyond	1 - Complete all readings outside of class 2 - Stay engaged and take notes during class 3 - Read at least 2 extra papers per week 4 - Spend 1 hour per week reviewing class materials 5 - Revise written assignment to incorporate feedback 6 - Ask at least one question during grad student symposium	1 - On track 2 - On track 3 - fell short of goal but read 5 extra papers throughout semester, aiming to improve 4 - started revising assignment 1 but ran out of time, likely won't have time to revise assignment 2 5 - On track 6 - asked 2 questions that sparked discussion during the symposium, aiming to ask 5 questions during class for the rest of the semester	1 - Completed 2 - Mostly completed, but notes got lighter towards the end 3 - did not read as much, only 3 extra papers 4 - actually did find the time to revise assignment 1, did well on it with limited corrections 5 - spent 1 hour consistently 6 - asked more than five questions **Summary: Exceeded expectations but less than I was hoping (92%)**

Actions for reflections

In class	Outside class	Assignments & Homework
• Attend class • Be timely • Complete readings • Write notes • Prepare and ask questions • Display engagement • Contribute to discussions • Listen actively • Be respectful • …	• Review notes • Solicit & provide feedback • Seek dialogue • Don't give up & help others • Practice • Attend office hours • Review concepts/topics you didn't follow • Watch recordings • …	• Read more • Write more • Code more • Revise & resubmit • Seek feedback • Track your hours • Metacognition: learn to assess your own progress • …

Talk to me

Office 3.05 (main research building, 3rd floor)

Office hour Zoom link


WHEN YOUR 40 HOUR WORK WEEK
HAS 50 HOURS OF MEETINGS
imgflip.com


Assignments

Undergraduate + Graduate

- 10 x Homework
- 1 Contract and 2 x Self evaluation
- Project 1
- Project 2
- Project 3

Graduate Only

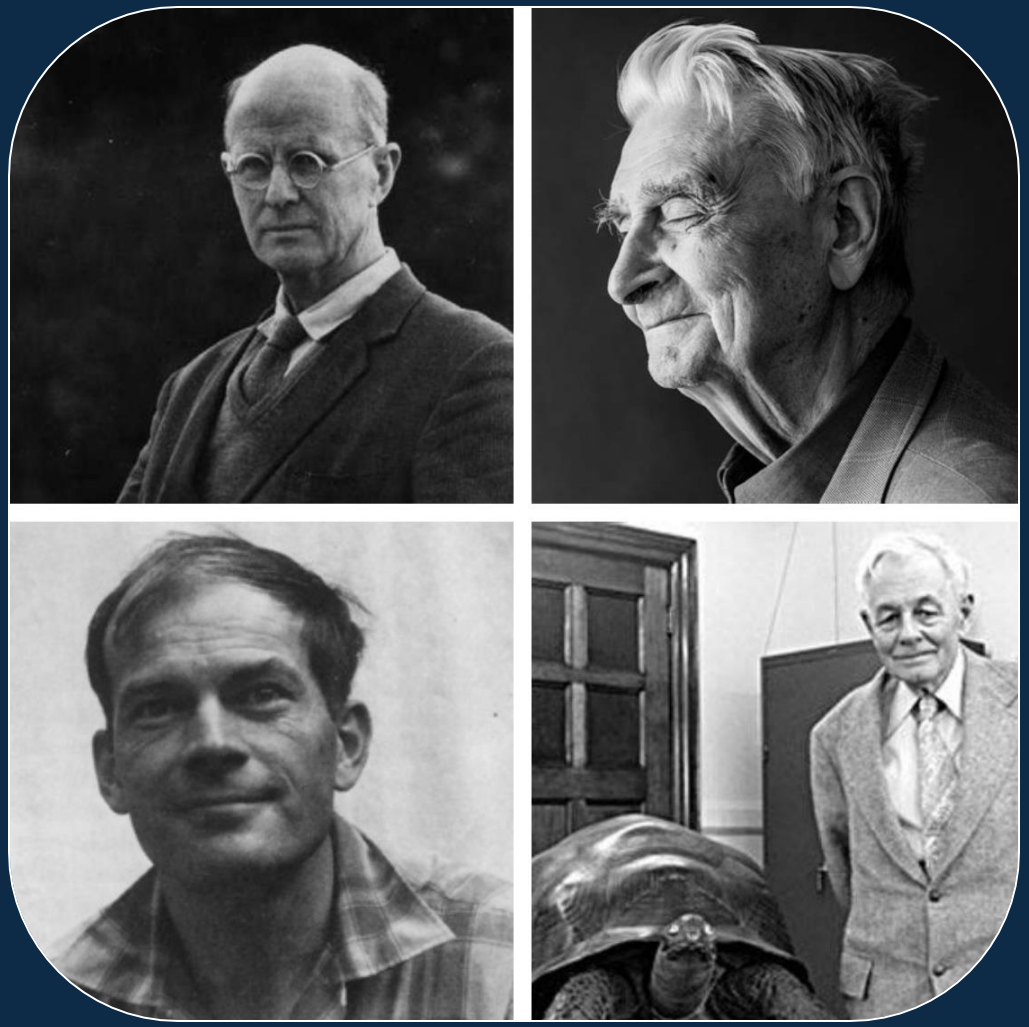
- Project 1 Presentation
- Paper pitch

Homework

- 10 homework assignments, 1-2 hours each
- Details on each homework assignment provided in class
- Needs to be fully completed and submitted by 9am on the due date

Project 1: paper critique

- Critical evaluation of a seminal theory or hypothesis in community ecology
- Group activity to collect/evaluate literature, but paper is written individually!
- Group assignments on Canvas
- Paper: 3 pages, template on Canvas
  - Introduce theory
  - Evidence for and against theory
  - Concluding support or rebuttal



Due: TBA

Project 2: research paper

Group-based project:

- Clean, process, and visualize historical data
- Collect new data using visual surveys
- Process, analyze and visualize data
- Research paper
  - 5 pages (including figures), template on Canvas
  - Abstract, Introduction, Methods, Results, Discussion

Due: TBA

Project 3: research presentation

- Group-based data collection on coastal fish communities
- Laboratory processing of fishes to obtain traits
- Data analysis and visualization
  - Submit R code
  - Produce figures
- Research presentation
  - 12 minute presentations on findings as a group

Due: TBA

Graduate Only: critique presentation

- Presentation on your written paper critique (Project 1)
  - 10 minutes max
- Create a compelling narrative and engaging presentation that clearly conveys the theory and your assessment thereof
- develop a dialogue with the rest of the class to test their understanding of your presentation
  - 5 minutes max

Due: TBA

Graduate Only: paper pitch

- ‘Pre-submission inquiry’ for the paper resulting from data collection and analysis
- Consists of a cover letter, title and abstract, and figures for submission to one of the *Ecological Society of America* journals
- maximum of six pages, arranged in the following order:
  - 1) cover letter (one page)
  - 2) title & abstract
  - 3) figures & captions (4 display items)

Due: TBA

SHORT INTRO TO R

Learning objectives

- Execute basic commands in R
- Load and use packages
- Manipulate and analyze data
- Plot data and their uncertainty
- Run basic simulations
- Run multivariate ordinations (and maybe more)

R Coding by Module

Module I

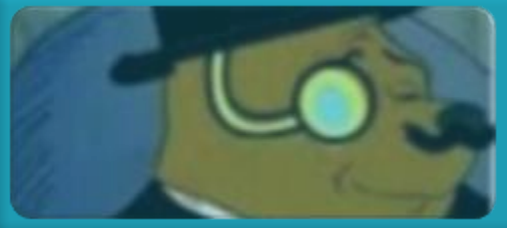
- Introduction, tidy data processing and visualization

Module II

- Simulations of ecological processes

Module III

- Multivariate analysis and trait-based analyses



Module IV

- Analyzing and visualizing your own data

Why R?

- Free!
- Most commonly used platform in ecology & evolution
- Large, helpful, active user community
- Open-source, community-built
  - Computational platform for special building blocks (packages) made by the community
- Forces basic understanding of statistics unlike drop-down menu statistics platforms
- Helps you gain programming skills

R Studio®

R is Challenging

Download R!

R
https://www.r-project.org/

R Studio
https://www.rstudio.com/

Swirl
https://swirlstats.com/


https://simonjbrandl.github.io/marinecommunityecology/

MY RESEARCH

Background

- B.Sc. | Biology | University of Innsbruck, Austria
- PhD | Marine Biology | James Cook University, Australia
- Postdoc | Marine Global Earth Observatory | Smithsonian Institution, USA
- Postdoc | Simon Fraser University | Vancouver, Canada
- Postdoc | École Pratique des Hautes Études | Perpignan, France
- Assistant Professor | Marine Science | UT-Austin Marine Science Institute, USA

MARINE BIODIVERSITY

ECOSYSTEM FUNCTION

GLOBAL CHANGE

www.fishandfunctions.com


TEXAS

PRIMER TO COMMUNITY ECOLOGY

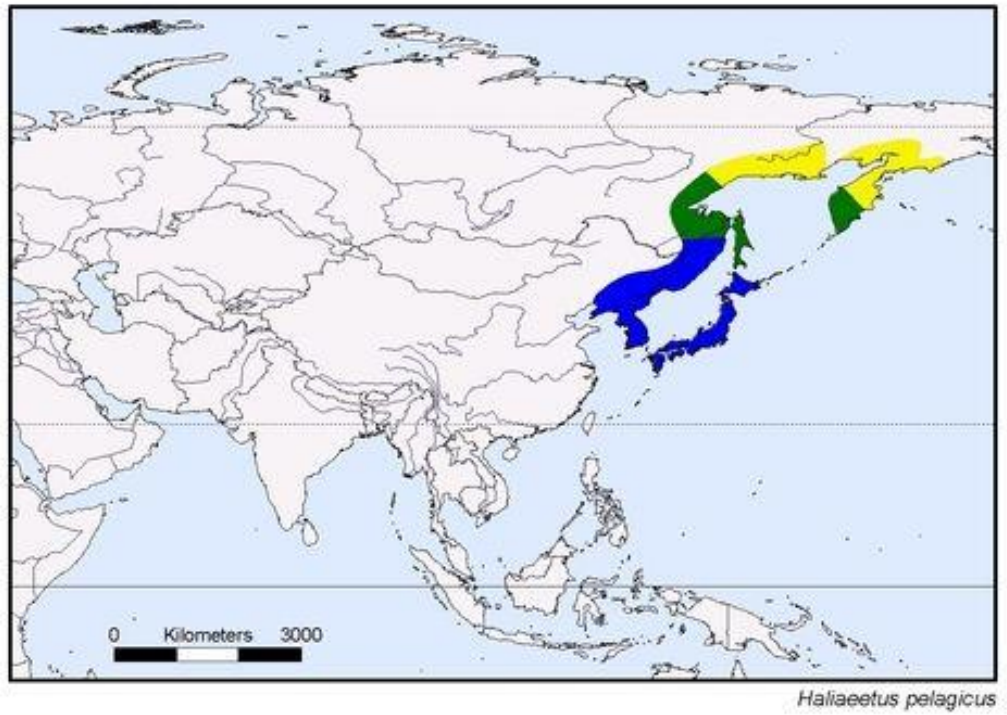
Maine, January 2022

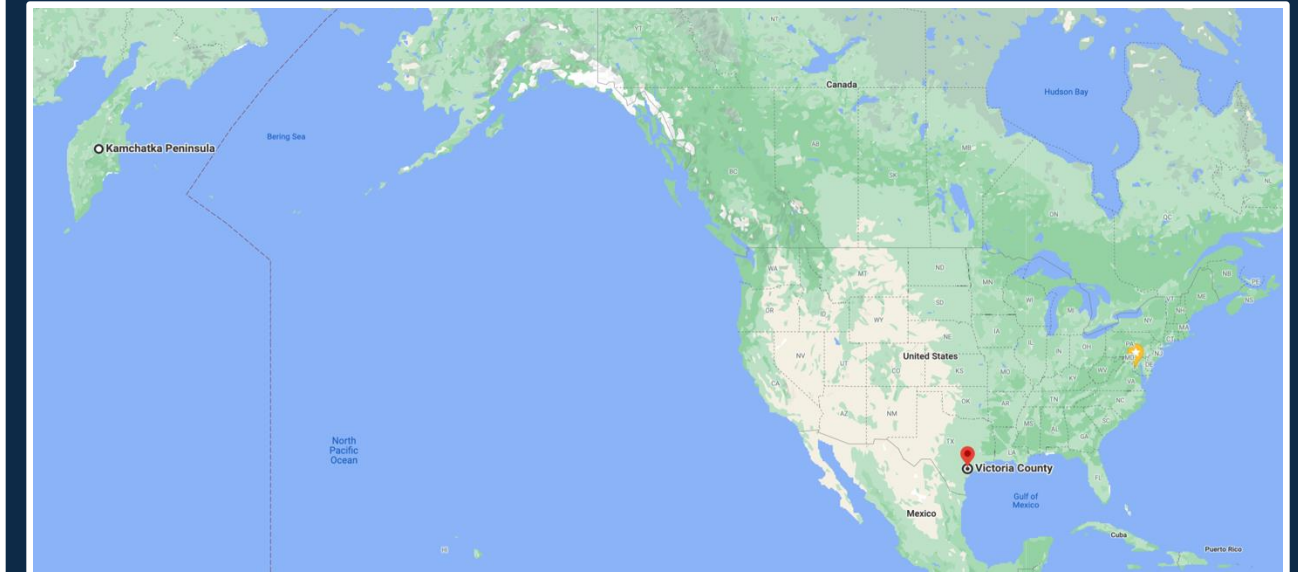
The New York Times

TRILOBITES

This Eagle Is Very, Very Lost

Bird-watchers have been tracking a Steller's sea eagle. They're usually found in Asia, but this one turned up in Eastern Canada and may have flown as far as South Texas.





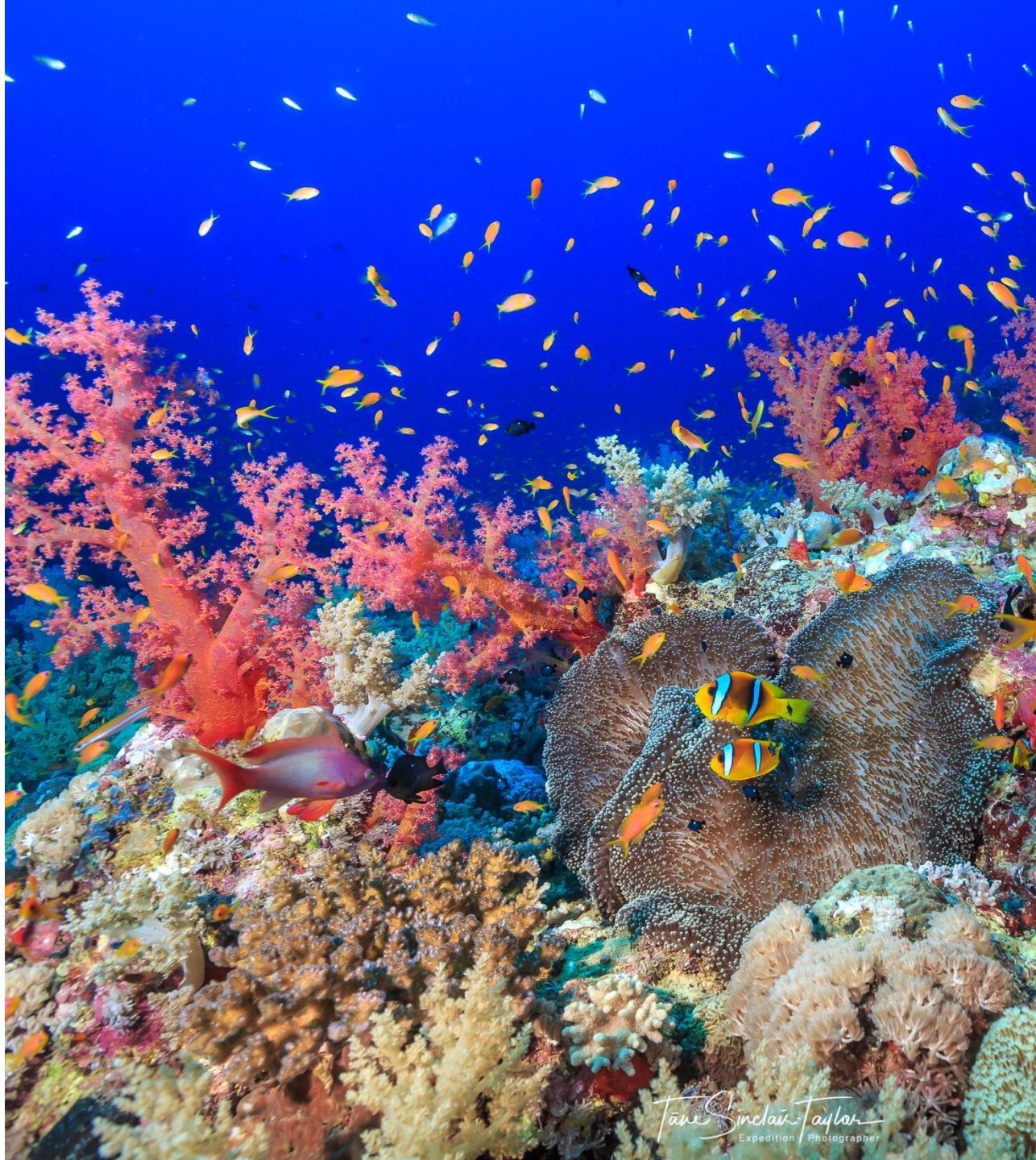
What determines where species occur?

Extant order Sirenia – two genera, four species

Common name	Genus	Scientific name	Status	Distribution	Picture
West Indian manatee	*Trichechus* (manatees)	*T. manatus* Linnaeus, 1758	VU IUCN		
African manatee	*Trichechus* (manatees)	*T. senegalensis* Link, 1795	VU IUCN		
Amazonian manatee	*Trichechus* (manatees)	*T. inunguis* Natterer, 1883	VU IUCN		
Dugong	*Dugong*	*D. dugon* Müller, 1776	VU IUCN		


Tane Sinclair-Taylor
Expedition Photographer


Tane Sinclair-Taylor
Expedition Photographer


Tane Sinclair-Taylor
Expedition Photographer

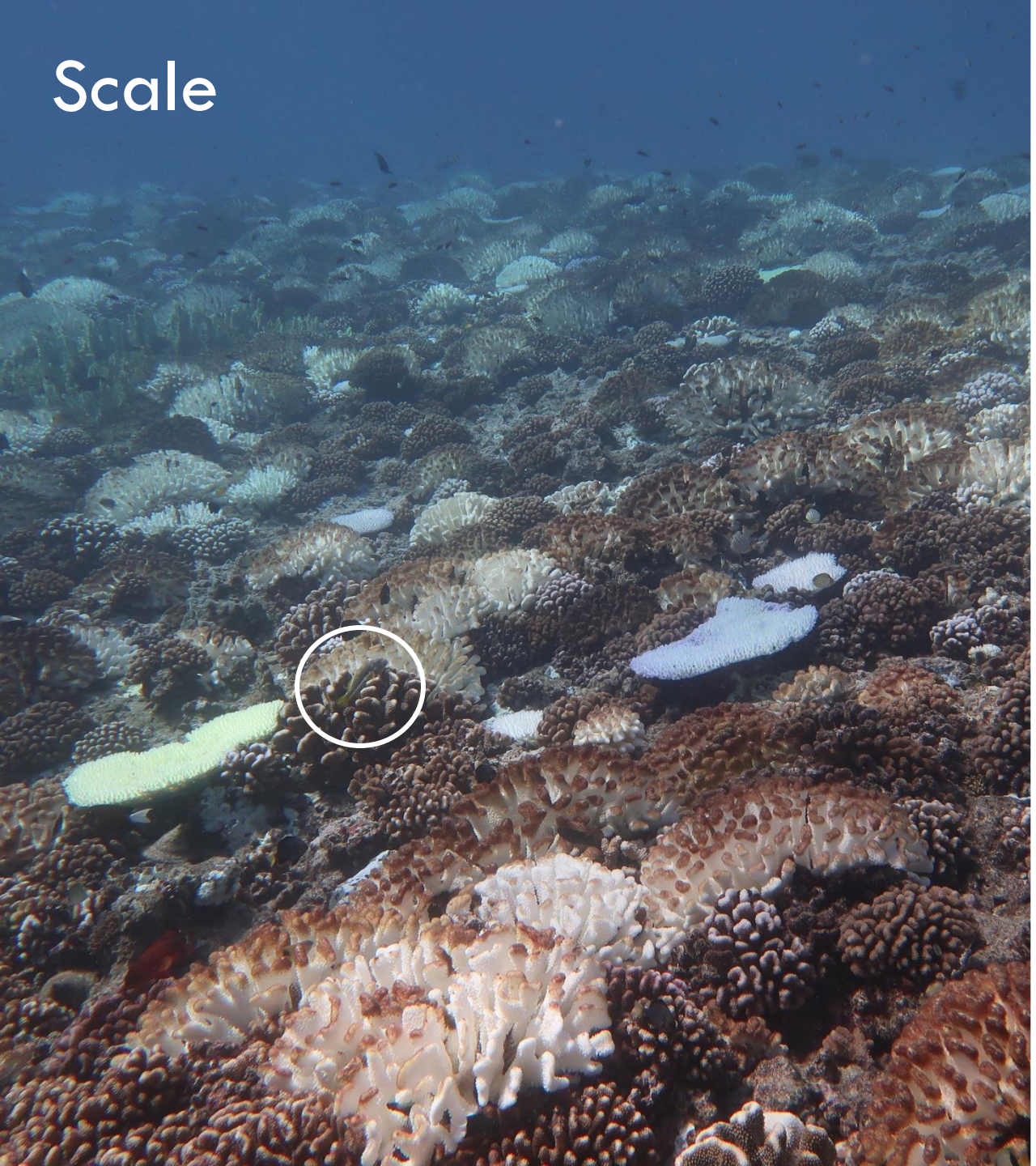
Biological Scales

Community ecology

Cells	Organisms	Populations	Communities	Ecosystems	Biomes	Earth

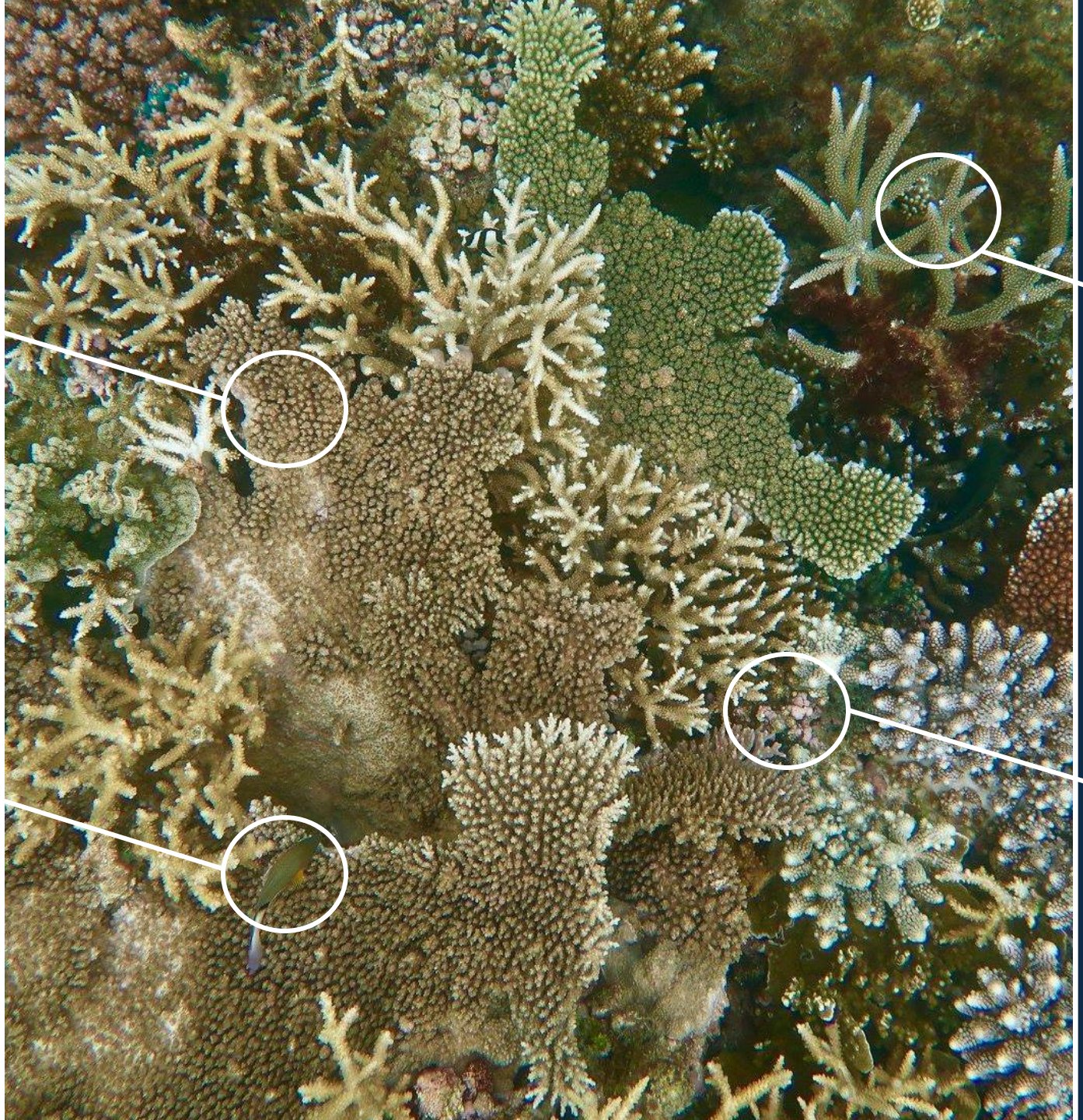
Spatial Scales

Scale



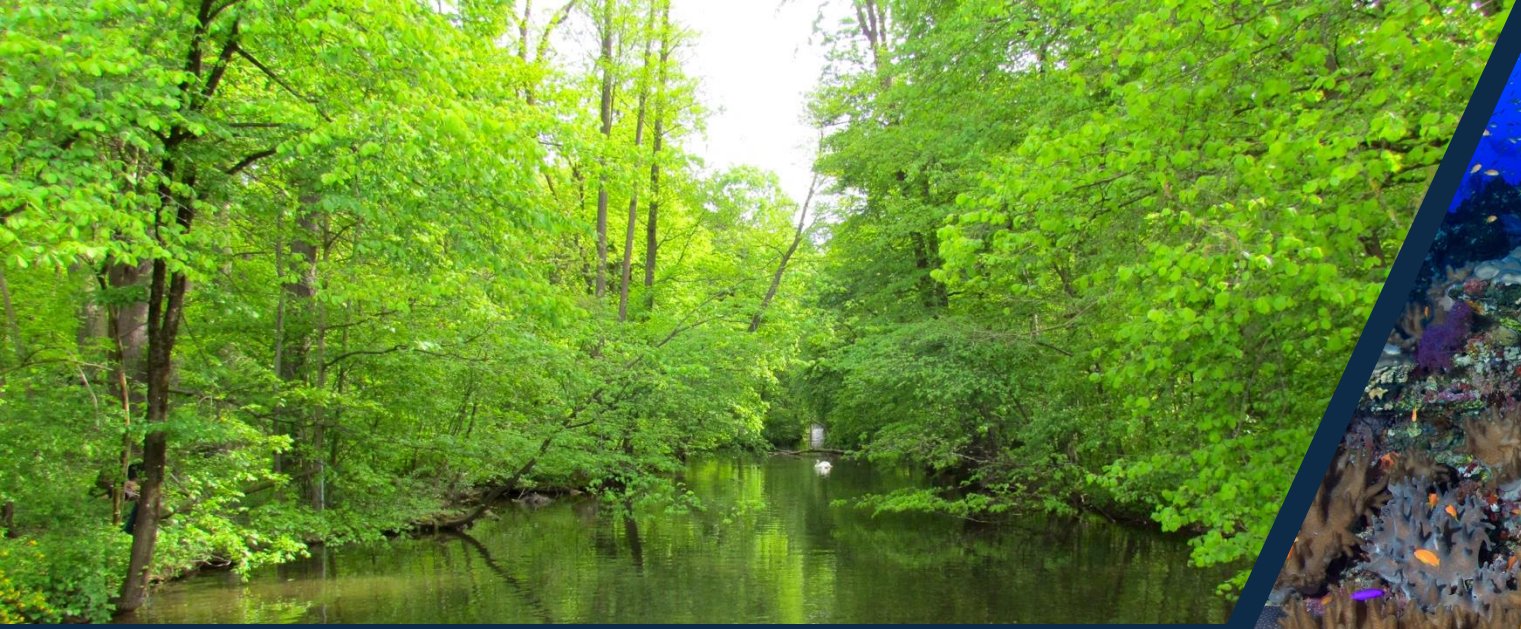
temperature:
megameters

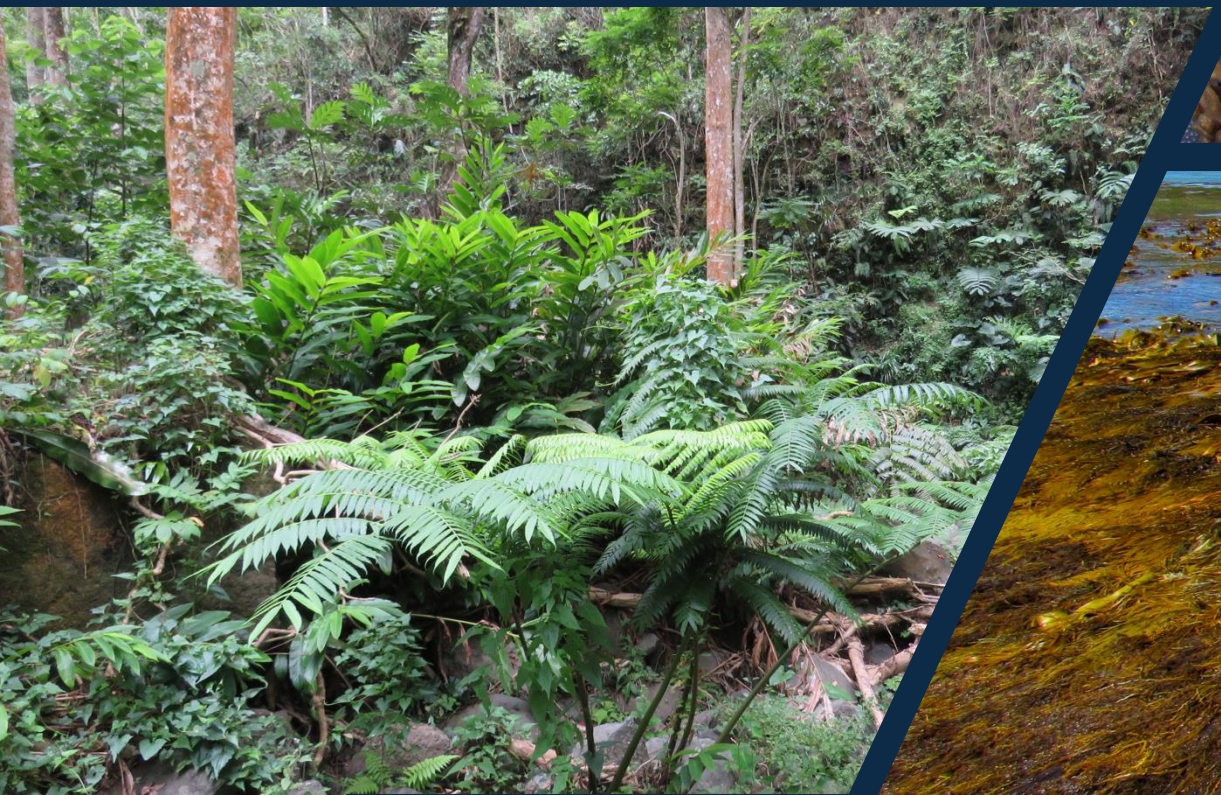
larvae:
kilometers



zooxanthellae:
micrometers

other corals:
centimeters



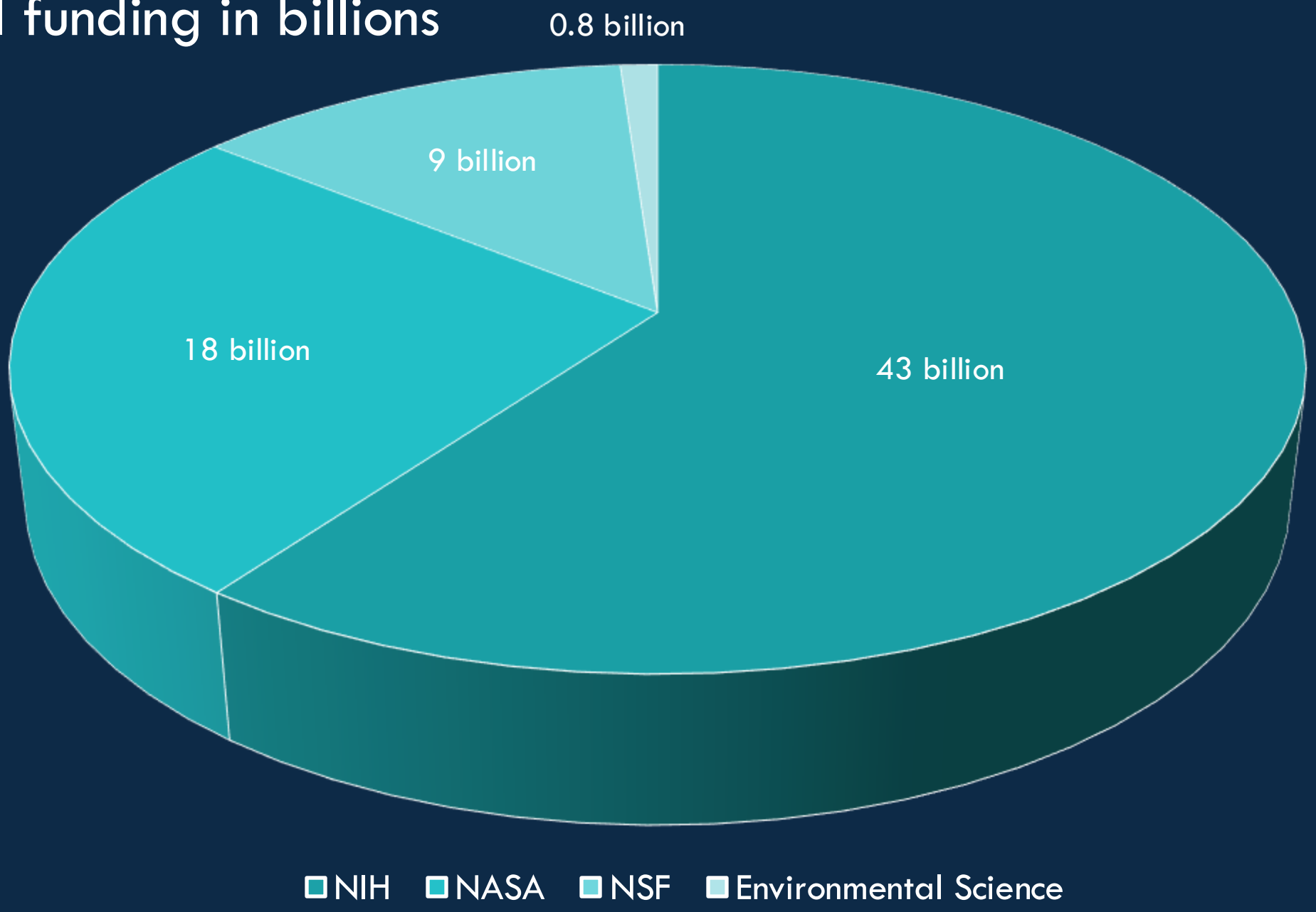



MAKO

Our planet's heartbeat goes through ecological communities


NOT THAT KIND
OF DOCTOR

Federal funding in billions




YOU DON'T BELONG HERE

Surgeonfishes
Family Acanthuridae

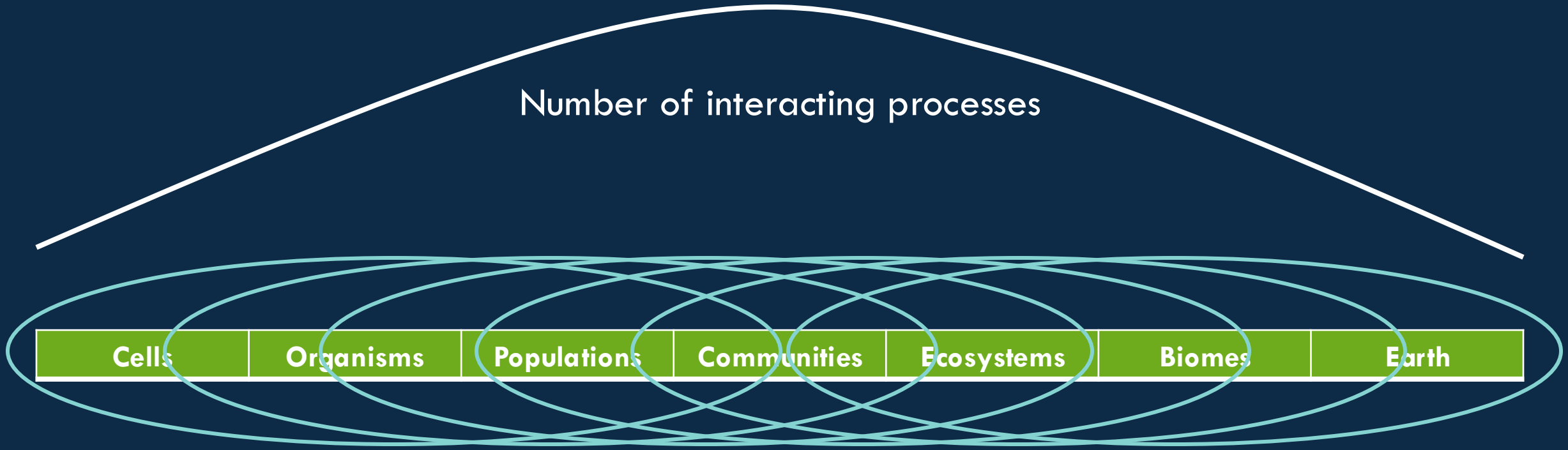
85 species globally

85 species, 7 species on any given reef

$$85\,!\,/\,[7\,!\,*\,(85-7)\,!] = 4{,}935{,}847{,}320$$

Tebbett et al. 2022

Drivers of community assembly: a mid-domain effect?



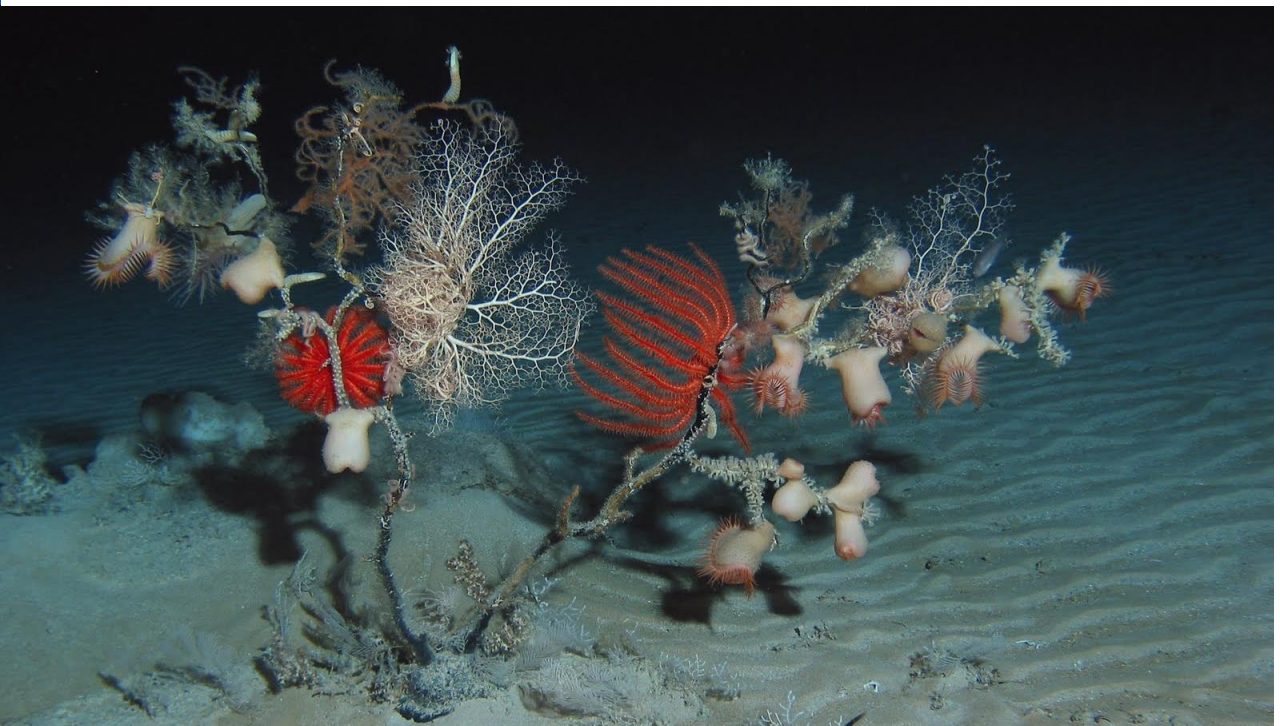
SHOCK! Parrot learned to say "depends on the context" and defended his Ph.D. in **Community Ecology**

Current state of knowledge?

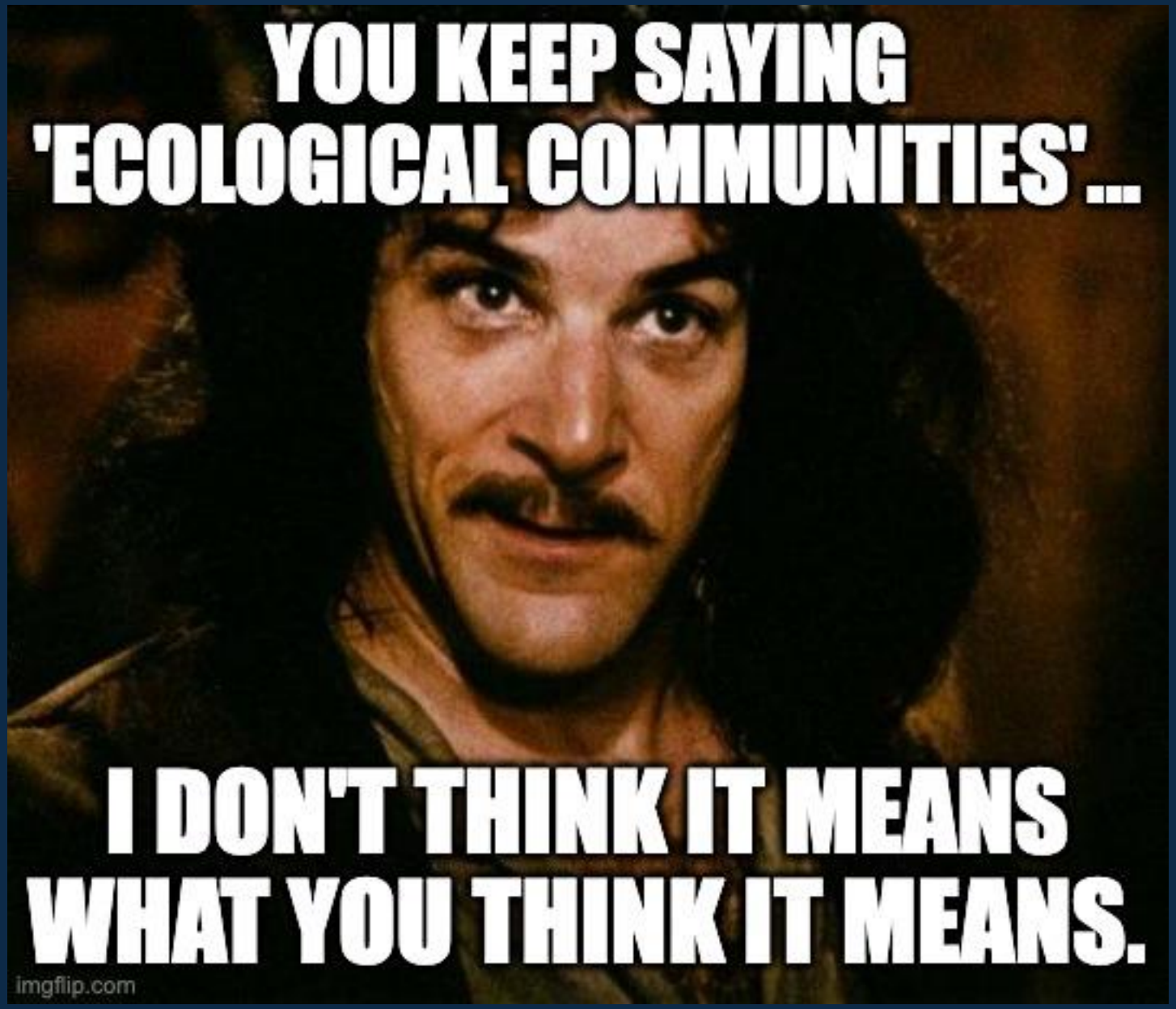
- identification
- spatial scale
- temporal scale
- convenience

What does that mean for marine community ecology?

- Largest, most interconnected biome on Earth
- Inaccessible habitats
- Lack of knowledge about basic processes
- Sparse theoretical concepts to provide general guidance
- Empirical evidence is from different ecosystems

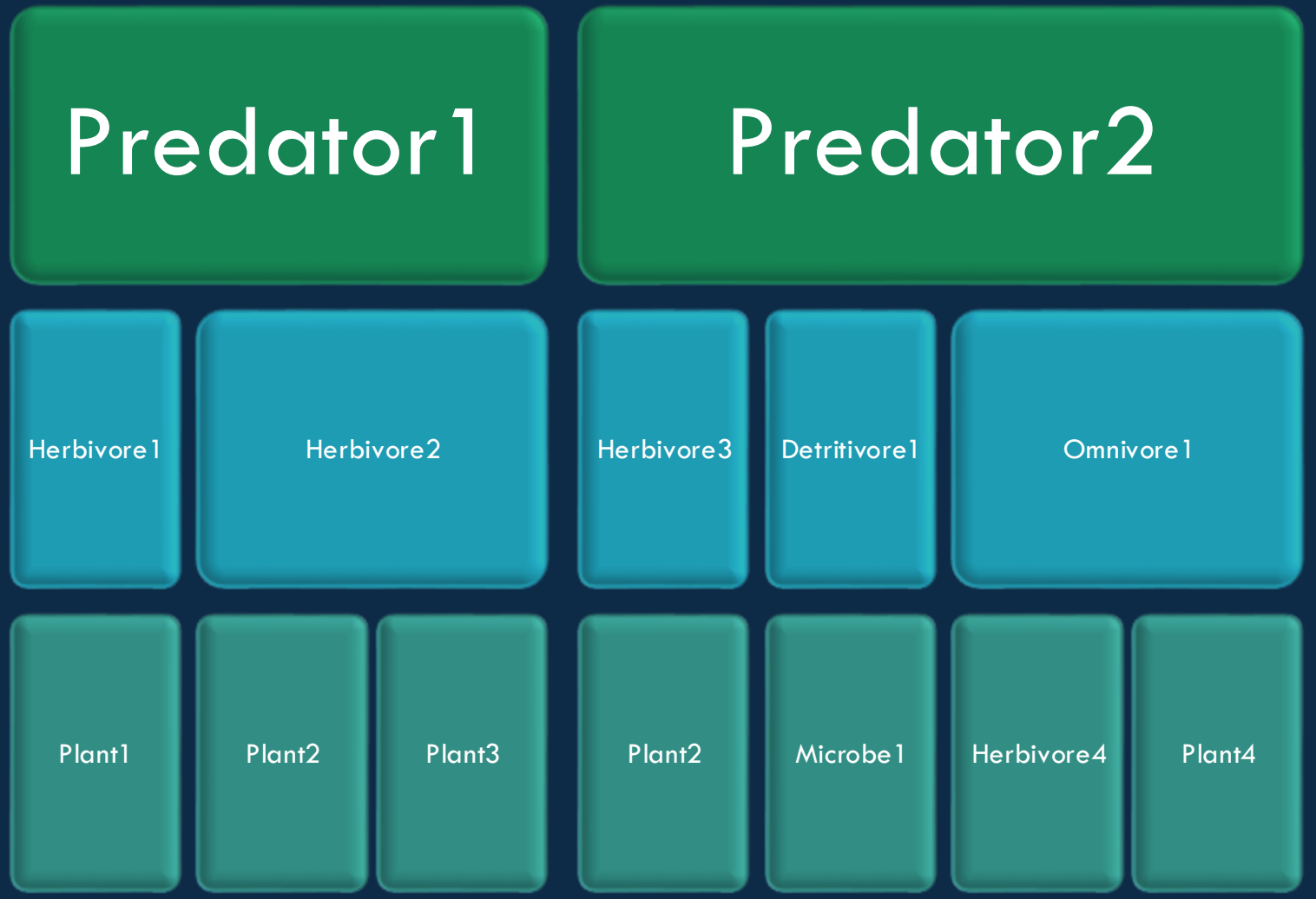


ECOLOGICAL COMMUNITIES


YOU KEEP SAYING
'ECOLOGICAL COMMUNITIES'...
I DON'T THINK IT MEANS
WHAT YOU THINK IT MEANS.
imgflip.com

What is a community?

"the complete set of organisms belonging to all species (from viruses to microbes, plants, and animals) living in a particular place at a particular time"



Vellend 2016

4,935,847,320

What is a community?

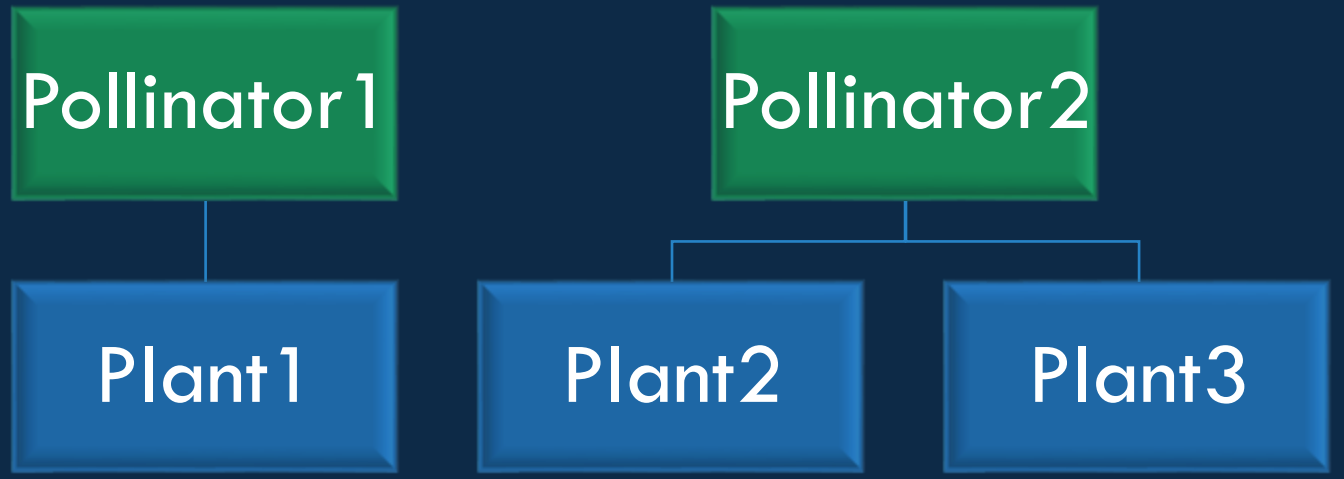
a) Predator-prey interactions (including food webs)

b) Mutualisms

What is a community?

a) Predator-prey interactions (incl. food webs)

b) Mutualisms




Ned DeLoach BlennyWatcher.com

What is a community?

A set of species with similar ecology (Chesson 2000) or evolutionary history:

- “assemblage” (Fauth et al. 1996)
- “guild” (Root 1967)
- “horizontal community” (Loreau 2010)

What is a community?

Ecological communities

- Fish1
  - Fish2
  - Fish3
  - Fish4

Coral — Sponge — Bryozoa — Algae


SCUBAPRO

Homework 1

Due: Monday, 27 January, 9.00 am

Draw an ecological community of choice.
Write 3-4 sentences about what makes it an ecological community.
Any medium or approach is fine, from stick figures to scientific illustrations.

Submit to Canvas.

Homework 2
Due: Thursday, 16 January

R Overview Tutorial found here:
https://simonjbrandl.github.io/marinecommunityecology/0-overview.html

R Introduction Tutorial found here:
https://simonjbrandl.github.io/marinecommunityecology/1-introduction.html

NEXT CLASS

Thursday, 1pm (Lab)