



Biology of Fishes Syllabus

SIO 188 - Fall 2024

Lecture: Tuesday & Thursday 10:00-11:30 AM

Lab: Tuesday & Thursday 2:00-5:00 PM

Vaughan Hall 147

There is, Darwin said, "a grandeur in this view of life," in which "endless forms most beautiful and most wonderful have been, and are being, evolved."

Contact Information

Instructor name	Dr. Dahiana Arcila (pronounce 'Diana' 'aa-r-s-EE-l-uh')
Email	dkarcila@ucsd.edu
Office Hours:	Available upon request. Schedule 72 hours in advance.
Teaching Assistant	Fernando Melendez V.
Email	fmelendezvazquez@ucsd.edu
Office Hours	Available upon request. Schedule 72 hours in advance.
Credits	5

Course Prerequisites

BILD 3 or consent of instructor

Welcome to Biology of Fishes!

This course will focus on the evolution, diversity, ecology, and biology of fishes. With over 36,000 species, fishes are an incredibly diverse group, constituting more than half of all vertebrate species. While it is impossible to cover everything known about fishes in one quarter, this course will survey their phylogenetic diversity, emphasizing major families, key traits, and adaptations. Topics will include anatomy, identification of marine fishes (especially species and families found in deep-sea and shallow environments along the Pacific coast), life history, physiology, and biogeography. Both model and non-model fish groups will be used to illustrate these concepts. Additionally, the course will feature a brief history of ichthyology as a science.

Course Objectives

The three main goals of this class are:

- Have a perspective of the fish diversity
- Comprehend the phylogenetic relationships among major fish groups and understand the basis for their classification
- Identify major aspects of fish anatomy and describe their evolutionary origins and physiological function

Course Learning Outcomes

Upon successful completion of the course, students should be able to:

- Recognize and identify major fish groups
- Understand present-day patterns in the distribution and habitat utilization of fishes on earth as well as the major historical processes shaping these patterns
- Describe key adaptations in the evolutionary history of fishes
- Follow standard protocols for curation and examination of fish material, including collection, preservation, sorting, and identification

Course Materials and Tools

Textbooks (optional)

- **The Diversity of Fishes: Biology, Evolution, and Ecology:** (Helfman et al. 2nd edition: ISBN-10: 1405124946).
- **Fishes: A Guide to Their Diversity (1st ed.):** (Hastings, P.A., Walker, H. J., & Galland, G.R. 2014: University of California Press.)
- **Fishes of the world:** (Nelson, J. S. 2006: John Wiley & Sons, Hoboken)

Websites

- **[Dictionary of Ichthyology \(Links to an external site.\)](#)**
Brian W. Coad and Don. E. McAllister: The Dictionary of Ichthyology is a helpful online glossary of terms spanning the breadth of the field.
- **[FishBase \(Links to an external site.\)](#)**
FishBase is probably the most complete online clearinghouse of data on fish species, including scientific names, life history information, and photographs. Be a little careful in using it, as there's no guarantee that a curator has verified that all the photos are correctly identified in any given taxon. That said, its accuracy is pretty good overall.
- **[Catalog of Fishes \(Links to an external site.\)](#)**
The definitive source for scientific names of fishes, including information on who described them, when, and in which journals

Text/Readings/Other Material

- Betancur-R., R., E. O. Wiley, G. Arratia, A. Acero, N. Bailly, M. Miya, G. Lecointre & G. Ortí. 2017. **Phylogenetic classification of bony fishes**. BMC Evolutionary Biology 17(162): DOI: 10.1186/s12862-017-0958-3
- Wainwright, P.C., and S.J. Longo. 2017. **Functional Innovations and the Conquest of the Oceans by Acanthomorph Fishes**. Current Biology. 27, 11: R550-R557.
- Arcila D. & G. Ortí. 2022 **Phylogenetic Systematics of Fishes**. In Midway S., C. Hasler, & P. Chakrabarty, editors. Methods for Fish Biology, Second edition. American Fisheries Society, Bethesda, Maryland, USA.

Course Components

Lectures (Dahiana)

The class will meet twice per week for one hour and thirty minutes. During the first class of the quarter, I will present the general structure of the course and materials on ichthyology. You will be responsible for any material presented or discussed in class. There is no required textbook, but I suggest three optional books: one covering global fish diversity. I will provide outlines summarizing major fish groups; however, you should take detailed notes during class to complete these outlines with in-class information. If you miss a class, a written medical excuse or another legitimate reason will be required upon your return if you wish to make up a missed assignment or test (see make-up policy below). Any requests for re-grades must be submitted within one week.

Laboratories (Dahiana with TA Fernando)

The laboratory component will involve hands-on activities where you will engage in the morphological identification of various fish species. This will include examining physical characteristics such as body shape, fin structure, scale patterns, and other distinguishing features to accurately identify different species. Additionally, you will study the major evolutionary groups of fish, exploring their anatomical adaptations, evolutionary history, and ecological roles. The lab sessions will provide practical experience and a deeper understanding of the diversity and evolution of fishes, reinforcing concepts discussed in lectures. *Some labs will use fish specimens. Because fish anatomy and physiology involve the study of tissues and organ systems, there is no adequate substitute for the use of animals in these labs. These animals are always treated humanely. All procedures for labs that require the use of vertebrate animals have been reviewed by UCSD's Animal Care and Use Committee (IACUC), which includes members from outside the UCSD community. Any neglectful or deliberate mistreatment of animals (either alive or dead) will result in severe disciplinary action.*

Discussion Boards

Each week, you are encouraged to post a question about the topic or topics that will be addressed in the lecture and lab component. If you have questions regarding general course logistics or the

course material, please post them to one of the discussion boards we've set up on Canvas. This will allow us to respond where the whole class can benefit from the answer. Personal concerns, extension requests, etc., can, of course, come through email.

Course Grade Criteria

Attendance is required and will be noted for all classes. You are expected to arrive on time, complete all assignments, ask questions (if you have them), and focus during each class and lab session. This means that cell phones should be silenced and except for emergencies, you should not be texting, emailing, surfing the web, etc., during class. Grades will be posted on Canvas. If you have any questions regarding a grade, please reach out after class or via email.

Quizzes (10%)

Quizzes, will start on October 4th. Each Friday afternoon (5 PM), we'll activate a quiz in Canvas that will cover the material from the lecture we saw that week. You will have until the following Monday at the end of the day (midnight) to finish the quiz, which will consist of questions in multiple-choice, multiple answers, true or false, and fill-in-the-blank formats. Since you will take them outside the class, the quizzes are open-book, but you will have only 25 minutes to complete each once you begin. The timer will activate when you start your quiz in Canvas, and it will automatically end at the end of the allowed 25-minute window. Each quiz accounts for only a small portion of your final grade, and its purpose is to familiarize you with the material and help prevent you from falling behind. I understand that technical difficulties arise, that you might need to be away for an entire weekend, etc. Therefore, your lowest quiz score will be dropped, with no questions asked.

Exams (30%)

There will be two exams: one midterm-practical exam and one final exam, each consisting of a combination of multiple-choice, fill-in-the-blanks, and short-answer essay questions. The midterm exam will be held during the regular class time on October 24th, and the final exam will take place during the designated finals period on December 10th. These exams will cover the material presented in lectures, labs, and assigned readings. The midterm-practical exam will focus on hands-on identification, analysis of fish specimens, and diagnostic traits, while the final exam will assess your comprehensive understanding of the course content.

Lab component (30%)

For your lab work, you should always bring either a drawing notebook or a folder with blank (unlined) good-quality pages, 8 ½ by 11 inches, to record the information discussed in the lab (see example [here](#)). This information may be included in the mid-term and final exams and will be helpful when compiling the Lab Reports. The notebook or folder will be collected and graded twice (midterm and end of quarter), contributing 15% to your lab grade. All drawings must be done with a pencil (soft = HB or softer). Printouts of practicals will be provided, but not lecture notes.

Final project and presentation (30%)

Ichthyology is a dynamic field with frequent new discoveries. For the final project, you will write a two-page paper summarizing, contextualizing, and explaining a recent (2021 or later) scientific publication in ichthyology (10%). Add your topic(s) and the corresponding paper to this [Google spreadsheet](#) for approval by October 17th. Submit a brief 200-character summary of your selected final project by October 31st (5%). All final projects must be summarized as indicated and submitted electronically by December 5th. Choose an engaging topic, as a significant part of your grade will depend on how well you convey its importance. Projects will be conducted individually and presented at the end of the course on December 5th and 10th. Each presentation should last 12 minutes, followed by 3 minutes for questions, and include an introduction, results, discussion, and conclusions (10%).

Fieldwork: research cruise (5%)

All students are required to participate in a day-long research cruise aboard the R/V Gordon Sproul. We have organized two cruises: one on Saturday, October 19, and another on Sunday, October 20. Both cruises will depart at 7:00 AM, with students required to be onboard at the Nimitz Marine Facility by 6:00 AM, and will return around 11:00. Further details, including required paperwork and assigned cruise days, will be provided.

Bonus points (up to 10%)

You can earn up to a maximum of 10% bonus by participating in the following activities. Each activity can only be used once for bonus points.

Guest lecture summaries (2%): Attend optional guest lectures related to ichthyology and present a brief 5-minute summary of the key points and your reflections to the class.

Lab demonstrations (2%): Volunteer to lead a lab demonstration or help set up lab activities.

Create study aids (2%): Develop study guides, flashcards, or other educational materials for your classmates and share them on the class discussion board.

Special projects (up to 5%): Propose and complete a small special project related to ichthyology, such as creating a fish identification guide or conducting a small research project.

Halloween costume (up to 1%): Dress up as a fish species for Halloween and briefly present to the class why you selected that species. Your presentation should include interesting facts about the species, its habitat, and any unique adaptations it has.

Note. To participate in any of these activities, ensure you: add the activity and tentative date to the schedule in the [bonus points spreadsheet](#), provide at least a two-week notice for presentations or lab demonstrations. We will review and approve your activity within one week, or suggest a reschedule if necessary.

Tentative Grading Scale

A = 90-100% (S) B = 80-89% (S) C = 70-79% (S) D = 60-69% (U) F = 59%-below (U)

Course activities and grades listed for each activity

Activity	Weight
Quizzes (seven quizzes, note that your lowest quiz score will be dropped)	10%
Exams (two exams)	30%
Lab component	30%
Final project and presentation	30%
Total	100%
Optional: bonus points	Up to 10%

Course and Lab Policy & Safety

Eating and drinking are NOT allowed in laboratories (you may exit the lab briefly to consume food or beverages). No open-toed shoes are allowed in lab. During labs involving dissections, you must wear long pants. Long hair should be tied back. During a lab period, one warning will be issued to correct the issue. Failure to comply with the lab instructor’s safety instructions will result in removal from lab and will count as an unexcused absence. You are not allowed to take photos in the lab unless given explicit permission by your instructor.

Behave responsibly: Any behavior that is inappropriate for a college laboratory setting will result in expulsion from class/lab that week at the discretion of the instructors. You are expected to participate actively in the activities. If you are disruptive or disrespectful to your classmates or instructors, you will receive a verbal warning and then you will be asked to leave, which will result in a grade penalty as if you have missed class/lab. Cell phones and other electronic devices must be silenced and stored out of view to both the student and instructor during class. If you need to leave your cell phone engaged, please discuss this with the instructor prior to class. Any use of your phone must be done outside the lab in the hallway.

You are expected to complete the preparation materials before each class/lab when applicable. Arrive to class/lab on time. Lab sessions will generally involve groups working together to record data, with each student then recording notes. Each student will receive the materials necessary to perform each week’s exercises. These materials must be returned clean and intact at the end of the lab. Breakage will be charged to the person(s) responsible if they can be identified; otherwise, the entire class will share its cost. **Each student is responsible for**

cleaning up any materials used and the tabletop at the end of each lab, such that the workstation appears as it did before lab began.

Unexcused Absences. Missing a class/lab period will result in a 0 for that activity.

Late Arrivals. Attendance will be taken at the listed start time of class/lab. If you are more than 15 minutes late, you will be counted as an unexcused absence and the grade penalty will be assessed as above.

Excused absences. Absences for official university-sponsored events, religious holidays, professional development, legally required obligations, illness, death, or emergencies will be excused with the appropriate documentation. If you must miss a class or lab, you need to contact your instructor as soon as possible prior to the class/lab to arrange for make-up work. Any assignment or report due on the date of your planned absence should be turned in PRIOR to your absence. Avoid scheduling medical appointments on your class/lab day.

Make-up work for sudden absences due to accidents, severe illnesses, etc. will be dealt with on a case-by-case basis with proper documentation, but you will not be penalized for these kinds of absences. You will be asked to present a doctor's note or other documents to verify such absences. Doctor's notes for illness must be submitted to your instructor within three days of your lab. For major medical absences (hospitalization, surgery, etc.), documentation must be submitted to your instructor within one week of your return to class. You should do everything possible to not schedule interviews during your lab period. If this is necessary, you must discuss it with your instructor as soon as possible so we can make alternate arrangements

Academic Integrity: Plagiarism is strictly prohibited; two students should *never* hand in identical written assignments unless that is explicitly allowed in the assignment instructions. Plagiarism will result in a 0 on the assignment and a report made to the academic integrity office with failing the course being the likely outcome.

Accessibility Accommodations. UCSD will reasonably accommodate otherwise qualified individuals with a disability unless such accommodation would pose an undue hardship or would result in a fundamental alteration in the nature of the service, program, or activity or in undue financial or administrative burdens. The Office for Students with Disabilities (OSD) provides support services to students with disabilities and is committed to the goal of achieving equal educational opportunity and full participation for students with disabilities. Any student in this course who has a disability that may prevent them from fully demonstrating his or her abilities should contact Dr. Arcila personally as soon as possible so we can arrange the accommodations necessary to ensure full participation and facilitate your educational opportunities. To request accommodation through OSD please use the following link: <https://osd.ucsd.edu/students/registering.html>.

Resources for Support and Learning

There are a variety of resources available to students at UC San Diego, which are designed to address needs and enhance the student experience. In this section, the course is connected to the broader university community by services and programs for students. If there are resources specific to the course, school, department and/or topic, be sure to include those here.

<h3>Learning and Academic Support</h3>	
<p><u>Ask a Librarian: Library Support</u> <i>Chat or make an appointment with a librarian to focus on your research needs</i></p> <p><u>Course Reserves, Connecting from Off-Campus and Research Support</u> <i>Find supplemental course materials</i></p> <p><u>First Gen Student Success Coaching Program</u> <i>Peer mentor program that provides students with information, resources, and support in meeting their goals</i></p> <p><u>Office of Academic Support & Instructional Services (OASIS)</u> <i>Intellectual and personal development support</i></p>	<p><u>Writing Hub Services in the Teaching + Learning Commons</u> <i>One-on-one online writing tutoring and workshops on key writing topics</i></p> <p><u>Supplemental Instruction</u> <i>Peer-assisted study sessions through the Academic Achievement Hub to improve success in historically challenging courses</i></p> <p><u>Tutoring – Content</u> <i>Drop-in and online tutoring through the Academic Achievement Hub</i></p> <p><u>Tutoring – Learning Strategies</u> <i>Address learning challenges with a metacognitive approach</i></p>
<h3>Support for Well-being and Inclusion</h3>	
<p><u>Basic Needs at UCSD</u> <i>Any student who has difficulty accessing sufficient food to eat every day, or who lacks a safe and stable place to live is encouraged to contact: foodpantry@ucsd.edu basicneeds@ucsd.edu (858) 246-2632</i></p> <p><u>Counseling and Psychological Services</u> <i>Confidential counseling and consultations for psychiatric service and mental health programming</i></p>	<p><u>Community and Resource Centers Office of Equity, Diversity, and Inclusion</u> <i>As part of the Office of Equity, Diversity, and Inclusion the campus community centers provide programs and resources for students and contribute toward the evolution of a socially just campus (858).822-.3542 diversity@ucsd.edu</i></p> <p><u>Get Involved</u></p>

Triton Concern Line

Report students of concern: (858) 246-1111

Office for Students with Disabilities (OSD)

Supports students with disabilities and accessibility across campus

Student organizations, clubs, service opportunities, and many other ways to connect with others on campus

Undocumented Student Services

Programs and services are designed to help students overcome obstacles that arise from their immigration status and support them through personal and academic excellence

Course Schedule Fall 2024

Changes in class information will be sent out periodically. It is the student's responsibility to check email daily. You are responsible for all information that is posted on Canvas or by email. Make sure that you are getting all appropriate alerts from Canvas postings and/or are checking Canvas

The lecture and lab schedule, including detailed information about key dates, will be posted in this [Google spreadsheet](#). Please refer to the spreadsheet regularly for updates and important deadlines.