BIOLOGY 355 – Marine Invertebrates of Southern New England Summer 2026

Instructors: Dr. Niels Hobbs (nvshobbs@uri.edu)
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Class / Laboratory Room: CBLS 310-320, Kingston Campus, URI

Hours: *Much more variable than course description suggests*.
Minimum lab open hours (with more possible, as needed):
Tuesday and Thursday - 2-8pm
Monday, Wednesday, and Friday - Noon-6pm
Lecture / meeting on Tuesdays, ~5-7pm (depending on fieldtrips)
Semi-optional ~daily trips usually tide-dependent, TBA (see provisional dates below)

COURSE DESCRIPTION
This course is structured around intensive lab and field work, with one (~2 hrs.) lecture and class meeting a week. Most of your course grade will be based on collecting and accurately identifying a broad sample of local marine invertebrates, and presenting these in a final photo catalog that is put together by each of you *individually* and cataloged in a powerpoint slide collection. In addition, part of your grade will be based on a taxonomic report on an assigned species, a small field study, and a final practical exam.

The course schedule is dictated largely by the schedule of low tides. We'll go in the field to different intertidal and dock sites around Rhode Island (and occasionally farther) nearly every day (at least for the first few weeks), and the laboratory will be open each weekday for several set hours, with more depending on demand. These daily field trips will be tide-dependent, but weather-independent, so students should be prepared for foul weather. Students can also expect to put in some long (but highly rewarding and fun) hours into this class. The weekly lecture on Tuesday evening with focus on putting all the critters we collect in the context of general invertebrate/animal diversity and ecology.

This is an intensive class, but it'll also be a lot of fun. We get muddy, sweaty, slimy, tired, and sometimes a little stung - but it will be worth it!

PREREQUISITES
BIO 260/360, or BIO 262, or NRS 223, or permission of instructor

COURSE LEARNING OBJECTIVES
By the end of this course, students will be able to:

1. **Independently identify, verify, and classify** at least 100 marine invertebrate species from southern New England to the lowest feasible taxonomic level using morphological characters, dichotomous keys, primary taxonomic literature, and *current* nomenclature standards, and explicitly justify identifications.
2. **Explain and evaluate the diagnostic characteristics** of the major marine invertebrate phyla and compare their ecological roles across key coastal habitats (e.g., rocky intertidal, mudflats, floating docks, marinas), and demonstrate mastery of identification of common marine species from memory.
3. **Apply and adapt field sampling techniques** (e.g., quadrats, sieves, plankton nets, scraping, hand collection) appropriate to specific habitats, tidal regimes, and target taxa, including critical consideration of sampling bias, effort, replication, and ethical constraints inherent to intensive coastal fieldwork.
4. **Synthesize species-level, environmental, and abundance data** to interpret patterns of habitat association, distribution, and community composition in southern New England coastal systems.
5. **Analyze environmental data** (salinity, temperature, habitat type, abundance) and integrate it into species records to assess habitat associations and species distributions.
6. **Critically assess the ecological impact of non-native species** integrating field observations with current scientific literature to evaluate invasion dynamics, management challenges, and conservation trade-offs.
7. **Produce professional-quality scientific products** that meet disciplinary standards, including a rigorously documented photographic species catalog, a research-style species report with annotated sources, and a formal oral presentation.

8. **Demonstrate professional-level field and laboratory practice**, including leadership, collaboration, ethical specimen handling, equipment stewardship, and adherence to safety standards expected of practicing marine biologists.
9. **Synthesize and reflect** on the diversity of marine invertebrates to appreciate their evolutionary adaptations and phylogenies, ecological interactions, and broader significance to marine biodiversity.

WHAT'S EXPECTED OF YOU

Though the hours are mostly flexible, you should expect to spend a minimum of 15 hours in the lab and on trips each week in order to get the most from this course (remember, the course catalog lists this as 8 scheduled hours plus an additional 8hrs TBA, so we expect this minimum amount). You should also anticipate at least a few hours a week outside of lab dedicated to bookkeeping and cleaning up of your notes and photo collections; this time will be even more pressing the last week as you work to wrap up your full species collection in the final taxonomically organized assembly.

ASSIGNMENTS and GRADES

1. Full Species Collection – **70%**
   – a photographic collection of all the animals you've collected and personally identified during the course (up to 100 spp.) in .ppt or .pdf (see more details below) – DUE Saturday July 25.
2. Final practical exam of species taxonomy and ecology – **15%**
   – a lab practical exam testing your ability to identify and name twenty common local marine species – Scheduled for Tuesday July 21.
3. Species Presentation on taxonomy and ecology of one species (oral & paper) – **15%**
   – a ten-minute oral presentation detailing the phylogeny, morphology, ecology, and conservation status of a single local species of marine invertebrate, and an accompanying single page annotated bibliography of sources used (full rubric provided) – Presentation in class on Tuesday July 14.

Class participation and proficiency with sampling and lab techniques *may* also affect your final grade (generally, in a positive way). We won't be punitive, but very good lab / community involvement can help those of you on the cusp of a better grade to get bumped up.

FIELD TRIPS

In past years, students carpooled to sampling sites, but this year we'll mostly be using departmental vans. As noted, there usually will be daily field trips at times determined by the tides, including an optional longer awesome day trip to collect specimens on Cape Cod (likely Thursday July 16th, more details on this in class!). As students get more familiar with the sites, the techniques, and what species are found where, students can probably start doing some semi-independent collecting, but even these must be done with at least one other person from the class - we can't have students going out on their own to collect at some of these sites for obvious safety reasons. Tide times can be found online here:
http://usharbors.com/monthly-tides/Rhode%20Island/Narragansett%20Pier

EQUIPMENT

Boots, bucket, CD/SD, Camera, rain gear, hat, sunscreen… It is recommended that you purchase your own thigh-high rubber boots for use in the field. Water shoes or an old pair of sneakers can also be used if you don't mind getting wet (and sometimes cold), but sandals or open shoes are absolutely not allowed due to the risks posed by broken shells and glass. You should also get a good large bucket (with a lid) to transport your collections.

You need to also provide your own blank CD, SD card, or thumb-drive (recommended) to record your final photo collection for handing in at the end of the class. Additionally, a nice digital camera and a good field notebook are also highly recommended. While it won't suffice to simply take photos of most critters solely in the field (for one, you'll find it very hard to ID later on from a photo), it can be very handy to have one good shot in the wild before the specimen gets beaten up (or eaten) in transit back to the lab.

Finally, you should obviously use sunscreen (at least SPF 40 or 50) and wearing a good protective hat and long-sleeved shirt are advisable. Btw, we'll probably get class t-shirts, if enough folks are interested in that.

TEXTS (none required, but it would be good to have one of your own):
1. Howard Weiss. 1996. *Marine Animals of Southern New England and New York*.
Connecticut EPA. ISBN # 0-942081-06-4
Great, easy to use format, though a bit out of date and in a not very portable size. This is a relatively user-friendly and thorough guide. www.ctdeepstore.com - Search for it under DEP publications - $19.95
2. Leland Pollock. 1995. *A Practical Guide to the Marine Animals of Northeastern North America.*
Rutgers. ISBN # 0-8135-2399-0
Superb ID manual that's more thorough than Weiss. Rutgers sells it for $40, but you can generally get it for less than half that at Abebooks.com or Amazon.
Additional taxonomic journal articles – since most of these ID books don't go into full detail of all the species that could be found in our area, we'll provide several additional sources for identifying some of the important taxa that are relatively neglected in these books.

Note: Due to the ever-changing field of Taxonomy, particularly given the advances made by molecular techniques, the names for some species have changed (sometimes more than once), so we'll try to provide updated errata for the latest names. If you own a copy of one of the ID books, I strongly recommend you make these changes. See WoRMS (www.marinespecies.org) for more current names.

TIPS TO COLLECTING AND IDENTIFYING CRITTERS
For the first part of the class, you'll learn how to use much of the basic field and lab equipment, but a few pointers up front are good. There is no one way to collect all the organisms you'll need for your collection – almost every species has their own unique niche that makes collecting them as much an art form as it is science. Some species require digging deep and quick into mud and then sifting them through a screen, others are easy to pull off rocks, while some need to be pried off carefully with a scraper, and others need to be shaken from seaweed or caught in a plankton net. By the end, you'll all be quite proficient at these techniques.

Once you've collected them, you'll need to take some care that they don't get injured or die before you have a chance to identify them. The best thing to do is to not get too greedy when collecting – only collect a modest amount that won't fill up your bucket and will manageable to identify in a day or two. If you collect too much, it'll all probably be a big stinky mess by the time you get part way through it. When you have your collection in the lab, be sure to keep an airstone in the collection container at all times. This will go a long way toward making sure that all the critters you've abducted have a chance at survival through the whole process and may even make it back to the wild intact.

As you identify these organisms, be sure to pay attention to the details. Perhaps start by taking two animals that look similar, say two crabs or two worms, and look for differences in some of the finer details. Usually this means looking under one of the dissecting scopes. Are there different numbers of spines, or plates, or are their claws shaped differently, or their segments arranged differently? Soon you'll develop a good eye for the important characteristics. The instructors are here to help you with those – don't be afraid of asking for suggestions. There are also more than a few critters that really really really don't want to be identified – they'll fight you all the way – they swim around really fast, or they'll try to run away, or hide in their shells. These will take some finesse and different techniques to get them to cooperate, but with patience you can get them.

As you use the keys in the books, be sure that all the clues add up. There are a LOT of species out there, some are super common and will be easy to find quickly, some are quite rare, and it may be very difficult (even impossible) to hunt down a particular species. You can get most of the 100 species by collecting common and easy critters, but some of them unavoidably will be more difficult.

THE PHOTO-COLLECTION
In days of yore, a proper taxonomist was one who pillaged the natural world – catching, shooting, stuffing, pickling, pinning, and labeling any critters unfortunate enough to cross *his* path… well, it's not too different same now, but we do things different in Bio 355. We skip nasty chemicals (formaldehyde, particularly) to fix and preserve specimens that never quite look, well, alive ever again. Instead, we collect, identify, and photograph – and then, hopefully – return alive the animals we collect. In order to get a proper appreciation for the

remarkable diversity of life out there in the waters around southern New England, you will need to collect and correctly identify a good cross-section of marine and estuarine animal species. Ideally, you'll identify all of them down to the species level, but there will be some that simply defy full identification. You can still get credit for that specimen even if you give a higher taxonomic name for it, but you'll only be able to count one for that category, unless you can adequately justify a difference, i.e. you'll only get credit for one "Copepod."

When you're taking photos of your specimens, be sure that you start with one really clear overall shot of the entire animal, and then take a few more (or whatever number you need) of the specific detail characteristics that distinguish it as the species you claim it to be. At the end of the class, when all of these are being graded, you will *only* receive credit for a species if you've taken nice, clear (focused!) shots of the important features – i.e. it may be fairly obvious to me that you've got a green crab, as you claim, but unless I see clear details of the correct number of spines on the carapace, you won't get credit. This is important, because it assures me that you understand the important features and you're not just guessing. It's recommended that you identify and photograph a small number of "cushion" species – above your 100 species – in order to assure you get the maximum number of points, even if you get a few wrong.

Additionally, the more species you identify, the more you'll get out of Bio 355 beyond a good grade. In acquiring 100+ species, you'll have no choice but to collect a really solid cross-section of marine invertebrate diversity. You'll see animals that even the best Hollywood CGI lab couldn't possibly dream up. Some of them, you might not even have previously thought could possibly be animals. That's what this class is all about.

For each species you identify, you'll need to record the following:
- Species identification – *Genus* and *species*, and family (confirm updated names via marinespecies.org)
- Specific location collected (and date) and type of habitat (rocky shore, floating dock, etc)
- Salinity and temperature of water
- Abundance you observed (abundant, common, uncommon, rare)
- Native or introduced?
- key characteristics you used to identify this species, with minimal jargon
- source used to identify, including page number
- Finally, *importantly*, your species collection must be arranged taxonomically, with species such as snails grouped with other snails, and with molluscs as a whole, etc.

Important note: what's particularly expected of you is that you identify these animals yourself. The instructors are here to help guide you along in the process, and we might even provide hints. We also encourage some cooperative work in terms of collecting and maintaining critters, but the only way you will properly benefit from this class is if you are the one doing the actual final ID. Just copying someone else's ID and taking the same photos not only cancels any knowledge you can derive from this class, but it's also plagiarism. If you don't know what that means, please see the university's policy on plagiarism and cheating. It ain't pretty.

By the way, the record is 161 correctly identified species – can you beat that?

CARE OF EQUIPMENT
Salt water and much of our equipment don't mix well. This means that we need to regularly wash field gear (boots, nets, etc) after field use. You should also clean the glassware and any airstones you're using for critters. It MOSTLY means that we need to be super-extra careful with the Microscopes, Cameras, and Computers! You know what happens if you drop your cell phone in the water… Well, it's a lot worse if you drop it in salt water. Some of the microscope and camera set-ups we'll be using in the lab are more expensive than a year's tuition. They definitely cost more than what I make teaching this class, if you get my drift. So, PLEASE BE CAREFUL – quickly wipe up any spills, just plain don't spill near the expensive stuff, and wipe off the stages of the microscopes after you've used them.

Additionally, almost as valuable as the lab equipment are the books that we use. Some of them are cheap and easy to replace, others are very rare and essentially impossible to replace (and some of those are from my personal collection!). Please use great care with these! Please be sure that your hands are not wet and that you

take some care with the spines of these tomes. You're encouraged to buy and use your own gear (boots and books, particularly), and it's just as important that you care for your field equipment investment.

CARE OF ANIMALS

As stated before, we really strive to not totally decimate the natural world – it may not seem it, but 10-15 people out on a collecting trip can do some damage. Plus, instead of preserving everything in alcohol or formalin, we will be doing our best to work with these organisms as they really look – alive. As much as possible, this means we need to keep the animals submerged in water, with a working air stone keeping the water moving. Do not overcrowd your collections, only collect what you can identify in a day or two, and try to return the critters within a couple days. Some of the species we'll collect are not native to local waters, and we may have *other plans* for them (see below). The woods across Flagg Road could always stand to have some high-quality fertilizer. Otherwise, utmost care and respect for these organisms is expected – after all, this is a Biology class, not a Necrology class.

The biggest exception to this guiding principle is when we deal with non-native species – which we will do a lot. For some of the more nasty of these (AKA "invasive species"), we will NOT return them to the water for them to do more harm.

CARE OF YOURSELF

The field can be a little dangerous; there are plenty of slippery rocks and sharp barnacle shells – use common sense and be careful. Though there are a lot of really great species to collect sub-tidal, we cannot allow scuba-diving or snorkeling as part of this class. Also, very few of the animals we will encounter can possibly hurt you, but if you are stung or cut by something, let us know right away.

The greatest danger probably comes from the elements, particularly the sun. Protective clothing and sunscreen are necessary. Also, it's a very good idea to have a bottle of water to keep yourself well-hydrated. If you have allergies or the like, please be sure to have your medication handy – and absolutely let us know of any relevant medical conditions.

Remember, too, the class motto: ***HABEO CANCERES***.

CLASS GUIDELINES

Viral Illness Precautions Statement

The University is committed to delivering its educational mission while protecting the health and safety of our community. Students who are experiencing symptoms of viral illness should NOT go to class/work. The Centers for Disease Control and Prevention (CDC) recommends that all people who are experiencing viral illness should stay home and away from others until symptoms improve and they are fever free (without medications) for 24 hours. They should take added precautions for the next 5 days.

Academic Honesty

Students are expected to be honest in all academic work. A student's name on any written work, quiz or exam shall be regarded as assurance that the work is the result of the student's own independent thought and study. Work should be stated in the student's own words, and properly attributed to its source. Students have an obligation to know how to quote, paraphrase, summarize, cite and reference the work of others with integrity. Instructors shall have the responsibility of informing students about their expectations regarding the preparation of all assignments with academic integrity…[and] shall have the explicit duty to take action in known cases of cheating or plagiarism.

Excused Absences

Absences due to serious illness or traumatic loss, religious observances, military service, or participation in a university sanctioned event are considered excused absences. Students are responsible for work missed during an excused absence but will not be penalized by grading or assignment/exam make-up policies. Students should notify faculty in advance of absences due to religious observance or university-sanction events, and as soon as possible for other absences See University Manual sections 8.51.11-8.51.16 for details.

Mental Health and Wellness

We understand that college comes with challenges and stress associated with your courses, job/family responsibilities and personal life. URI offers students a range of services to support your mental health and wellbeing, including the URI Counseling Center, TELUS Health Student Support App, the Wellness Resource Center, and Well-being Coaching.

Anti-Bias Syllabus Statement

We respect the rights and dignity of each individual and group. We reject prejudice and intolerance, and we work to understand differences. We believe that equity and inclusion are critical components for campus community members to thrive. If you are a target or a witness of a bias incident, you are encouraged to submit a report to the URI Bias Resource Team at www.uri.edu/brt. There you will also find people and resources to help.

Disability, Access, and Inclusion Services for Students Statement

Your access in this course is important. Please send me your Disability, Access, and Inclusion (DAI) accommodation letter early in the semester so that we have adequate time to discuss and arrange your approved academic accommodations. If you have not yet established services through DAI, please contact them to engage in a confidential conversation about the process for requesting reasonable accommodations in the classroom. DAI can be reached by calling: 401-874-2098, visiting: web.uri.edu/disability, or emailing: dai@uri.edu.

Anti-Discrimination Resources

Several offices provide support to help faculty comply with the University's commitment to maintain an educational and working environment free from discrimination, and to uphold our collective obligation as a community to foster an inclusive, people-centered culture.

Office of Equal Opportunity (OEO).

The Office of Equal Opportunity (OEO) leads institutional civil rights compliance efforts and supports the belief that all individuals have a right to enjoy equal opportunity in employment and equal access to all university programs, services, and activities, without regard to their protected status. OEO's primary focus areas include: anti-discrimination, affirmative action, equal opportunity, Americans with Disabilities Act (ADA) and Rehabilitation Act Compliance, education & training, and language access. OEO is available to address inquiries from faculty, staff, students, and service recipients and to work with departments to promote compliance with the university's Policy on Nondiscrimination, Policy on Language Access, the University's Language Access Plan, and applicable civil rights laws and regulations.

Title IX.

Any student, faculty, or staff member with questions or concerns about the Policy on Sexual Misconduct or who believes that they have been the victim of sex discrimination, sexual harassment, or sexual violence, as defined under Title IX, is encouraged to contact the University's Title IX Coordinator. Matters involving employees that do not meet the burden of proof under Title IX are forwarded to the Office of Equal Opportunity and the Office of Human Resources. The Title IX Office, in collaboration with the Dean of Students, provides support for and ensures enforcement of the University's Policy on Sexual Misconduct. The Title IX Coordinator also provides support to pregnant and parenting students, in collaboration with the Dean of Students, and to pregnant and parenting employees, in collaboration with the Office of Human Resources. Faculty with questions or concerns about potential sex-based discrimination or sex-based harassment violations, or departments seeking training, should contact the Title IX Coordinator at tixc@etal.uri.edu. More information is available at: Know your Title IX – Sexual Violence Prevention and Response.

Providing equal access for students with disabilities

Every qualified student with a disability has the right to equal access to educational programs, services, activities, and facilities. Documentation-supported accommodations are communicated to faculty through a letter from Disability, Access and Inclusion (DAI), delivered by the student. Faculty are required by law to provide these accommodations and are encouraged to review the information on the DAI website.

The Academic Testing Center is available to support testing accommodation needs. Students seeking accommodations in their roles as internal payroll employees should contact the Office of Human Resources. This includes Graduate Assistants and Graduate Research Assistants. Students seeking accommodations in their roles as Federal Work-Study recipients should contact the Office of Human Resources and their placement supervisor.

Testing accommodations are administered by the Academic Testing Center and must be coordinated by the faculty. Visit ADA Compliance – Office of Equal Opportunity for a list of ADA Liaisons at the University.

Disability, Access, and Inclusion Drop-In Hours

Questions about student DAI accommodations? DAI staff are available each weekday from 2-4pm in their webex room, or call 874-2098. DAI leadership also provides special Faculty WebEx Drop-in Hours, for the first month of the Fall and Spring semesters on Mondays from 11AM-1PM and Wednesdays from 8-10AM. Please also reach out to us at dai@uri.edu if you would like to discuss a Workshop for your department or colleagues, we can work with you to tailor this to your individual needs and interests.

And, finally, but no less important…

The University of Rhode Island Land Acknowledgment

The University of Rhode Island occupies the traditional stomping ground of the Narragansett Nation and the Niantic People. We honor and respect the enduring and continuing relationship between the Indigenous people and this land by teaching and learning more about their history and present-day communities, and by becoming stewards of the land we, too, inhabit.

Note, given that we spend so much of our time out exploring the remarkable marine biodiversity in our own backyard, it's important to recognize the deep history of human use and interconnectedness with this biodiversity, which goes back thousands of years.

***<u>DRAFT 2026 SCHEDULE* - the *dates* and tide times below are correct, but specific trip times and events are from 2025 and currently TBD!!</u>**
(all field trips meet and leave from lab, unless otherwise noted – remember, each trip is optional, but you should plan on doing ~two trips a week if possible)**:**

Tues June 23 (low 9:13am; 0.6') - class at 4pm - *intro and orientation session, intro to marine invertebrate biodiversity, intro to basic field techniques and equipment use and care, use of identification keys and online resources.*
Wednesday June 24 (low 9:54am; 0.6') - field trip at 10am - Galilee Mudflats
Thursday June 25 (low 10:36am; 0.6') - field trip at 10:30am - Galilee Mudflats
Friday June 26 (low 11:19am; 0.5') – TBD – may do a quick morning trip then lab time.

Monday June 29 (low 1:31pm; 0.4') – TBD
Tuesday June 30 (low 2:17pm; 0.3') – 2pm - Sprague Bridge (or possibly Allen Harbor)
Class at 5pm – sponge identification; bioinvasions and management, biodiversity assessment, literature use and tips for deeper research on species and taxonomy/phylogenetics.
Wednesday July 1 (low 3:01pm; 0.3') – 2pm – TBD
Thursday July 2 (low 3:42pm; 0.4') – TBD
Friday July 3 (low 4:22pm; 0.4') – Lab

Monday July 6 (low 6:05am; 0.2' / 6:35pm 0.6') - 2pm - Allen Harbor Marina
Tuesday July 7 (low 6:50am; 0.2' / 7:44pm 0.7') - 4pm - Allen Harbor Marina
Class at 6pm – identifying the more difficult species: amphipods and annelids, a deeper dive on phylogenies and molecular techniques
Wednesday July 8 (low 7:44am; 0.4') - 2pm - Point Judith Marina
Midterm checks begin (we will assess the state of your species collection and provide feedback – this is not for points, but just to improve your final product!
Thursday July 9 (low 8:45am; 0.2') - 4pm - Point Judith Marina
Friday July 10 (low 9:48am; 0.1') - Lab

Monday July 13 (low 12:50pm; -0.2') – TBD
Tuesday July 14 (low 1:49pm; -0.3') – TBD Class at 5pm, *Species report oral presentations!*
Wednesday July 15 (low 2:49pm; -0.2') – TBD, prepping for Cape Cod trip
Thursday July 16 (CC: low 7:17am; -1.5') – 5 AM departure!!! – *SANDWICH CAPE COD* (back to lab by ~noon)
Friday July 17 (low - 4:37pm; 0.0') – Lab

Monday July 20 (low 6;26am 0.3'/ 7:26pm; 0.8') - TBD
Tuesday July 21 (low 7:09am; 0.5') - TBD - class / lab practical exam at 6pm
Wednesday July 22 (low 8:00am 0.7') - TBD
Thursday July 23 (low 8:58am; 0.7') - TBD
Friday July 24 **Last day of class** – lab time only.

Final presentations due by Saturday July 25 at 5pm