Lab Manual: The Quantitative Marine Ecology Lab

Last updated: 24-May-2022

General expectations, guidelines, and information for all lab members

Table of Contents

Welcome to the Quantitative Marine Ecology Lab!

Welcome to the Quantitative Marine Ecology Lab (QMEL) at UNH. You are joining a team of scientists dedicated to changing the world by tackling the most pressing problems in our oceans. We use a variety of quantitative approaches, coupled with big data and experiments, to investigate the natural world, with a focus on marine systems. The purpose of this document is to help ensure a more seamless transition into the lab. The document is a living document and is by no means exhaustive. The goal is simply to try and get members of the lab on the same page and to help you be successful. You are encouraged to make additions and edits to this document in order to help future lab members. In addition, to this lab manual, there is

also a **lab wiki**. The lab wiki is to provide more nitty gritty details on how the lab operates and how to be successful (e.g., how to get signed off to operate UNH boats, where to find funding, etc.). The wiki is in the same repository as this onboarding document.

As a new member of the lab, you will be expected to read through this manual. This lab manual is only a starting point for how the lab operates. Ultimately, the lab is made of people. We as a lab determine the environment in which we all work.

Wherever possible, this document includes links to other resources and documents on campus. This is to reduce overlap in effort and to keep everything up to date. Here are two of the most important:

- UNH Graduate School: https://unh.app.box.com/s/za4ndpjqa9x0dzxi7yljnr8eqq4njbj2
- DBS Grad Student Handbook: https://colsa.unh.edu/biological-sciences/key-documents

 If you're a PI or a trainee in a different lab and want to write your own lab manual, feel free to take inspiration from this one (and cite us!)

Guiding principles

There are several guiding principles that form the basis of my outlook as a scientist which also inform my approach to leading a lab. Throughout this lab manual, I will come back to these themes.

1. Work-life balance
2. Vulnerability and openness
3. Transparency
4. Tracking progress
5. Antiracist principles
6. Embrace failure - failing often is the key to success
7. Celebrate and support one another
8. Produce high quality science
9. Communicate early and often
10. Backwards design
11. Produce science that can be used (stakeholder engagement, popular press)

General expectations

Big picture

Science can be hard, frustrating, and even sometimes painful (like when my appendix ruptured in the field!). However, the process of science can also be filled with joy, discovery, and collaboration. As a lab, it is key that we work together to create an environment that is conducive to productive, honest, and healthy science. We do not buy into myths that one has to work 80 hours a week or that you have to be cutthroat to succeed. With that in mind, there are a few big picture thoughts that are important for this lab (many of which are very different from other labs you may have been a part of):

- You should be working on problems that excite you. This doesn't mean every step of the process will be exciting, but following your curiosity is a tried-and-true path to creating interesting and impactful science.
- We have to be very careful and honest about the science we produce. I am not a famous PI at some fancy school. When we produce groundbreaking or novel work, people will not take our word for it (and nor should they!). We have to be sure of the work we produce and own up to mistakes when they happen.

- Some of science is done on an individual business, but it is also highly collaborative. This is especially true in QMEL. When someone in the lab succeeds, we all succeed. Be kind and help one another.
- If you are struggling professionally or personally, it is important to seek help. This can be from Easton, your fellow lab mates, friends, family, or professionals. Easton sees a therapist frequently as a check on his mental health.
- A research lab is similar to a small business. As the lab PI, I am the entrepreneur and CEO. One of my main responsibilities is to provide overall direction and to bring in work (via grants). However, because we are a small group, there should be a relatively flat hierarchy in the lab. This research lab will only be successful if we work together.
- Research funding and publications are two commonly used metrics of success in science. This is problematic in many ways, but it is how things are. This doesn't mean that we can't work on other things (e.g., science outreach), but funding and publications still have to happen.
- Each semester, we will reflect as a group and in one-on-one discussions on upcoming goals of the lab. This is meant as a way to track our progress towards goals and reduce ambiguity. We are not aiming to accomplish 100% of our goals. Ideally, we will only accomplish 70-80% of our goals each semester to ensure our goals are achievable, but lofty. We also keep the idea of backwards design in our planning process on order to help us achieve our long-term goals.
- A critical part of being a lab member is attending events in the department, on campus, and beyond the university. Events can include casual coffee breaks, job candidate talks, scientific lectures, and social hours. All of these events provide an important opportunity for both your own career and to build a culture of community.

Small picture

- If you're sick, stay home and take care of yourself. Because you need it, and also because others don't need to get sick.
- You aren't expected to come into lab on weekends and holidays, and you aren't expected to stay late at night (Easton rarely works during these times). You are expected to get your work done (whatever time of day you like to do it).
- Show up and be on time for meetings.
- Keep the lab spaces clean and tidy

Expectations of the Principal Investigator

Including the expectations above and throughout this document, I promise to:

- Support you (scientifically, emotionally, financially)
- Give you feedback on a timely basis, including feedback on project ideas, conference posters, talks, manuscripts, figures, grants
- Be available in person and via online on a regular basis, including regular meetings to discuss your research (and anything else you'd like to discuss)
- Give my perspective on where the lab is going, where the field is going, and tips about surviving and thriving in academia
- Support your career development by introducing you to other researchers in the field, promoting your work at talks, writing recommendation letters for you, and letting you attend conferences as often as finances permit
- Help you prepare for the next step of your career, whether it's a post-doc, a faculty job, or a job outside of academia
- Care for your emotional and physical well-being, and prioritize that above all else

Communication

One of the most important aspects to being successful in this lab, UNH, and elsewhere is clear, early, and frequent communication. Early communication can save everyone a lot of headaches later on. We have several platforms for communication.

Weekly lab meetings

Each week, we will meet as an entire lab. At the beginning of each semester, we will decide on lab meeting objectives and goals. This can include topics like professional development, practice talks, reading and discussing papers, general check ins (including our mental health), or collaborative lab projects.

Weekly one-on-one meetings

I (Easton) will meet weekly with each member of the lab unless a different agreement has been reached. I expect these meetings to be led by the advisee, not me. These weekly meetings are a way for you to keep me updated on your progress and to get input. I expect agendas going into each meeting and notes written afterwards in order to make our time together effective. This is your primary time to get my input on a regular basis.

Unscheduled communication

I am typically on campus from 9am-6pm Mon through Friday. However, my time is split between being working in my office, attending meetings, or teaching classes. When I am in my office, I may or not be available to chat. I often have "deep work" sessions where I am trying to concentrate and focus on thinking hard thoughts. During these times, or if I am on a call, my door will be closed. When my door is open, you are welcome to stop in for a quick chat. Anything longer than a few minutes may require setting up a formal time to chat.

Click-up

Will be introduced in January 2022.

Lab Slack team

The lab group uses Slack https://qmel.slack.com/ as one of our main communication tools. It is a useful way to celebrate our achievements together virtually, share interesting articles or papers, coordinate collaborations, and organize meetings. This helps remove some email clutter.

Email

In progress

Texting and phone calls

I use texting and phone calls sparingly. They are best for quick one one-off messages (e.g., "For our meeting, let's meet at the coffee shop instead") or in case you really need something urgently (e.g., "I'm locked out of the building"). Conversations that require a lot of back and forth are often handled best in a quick in-person meeting.

Science workflow

Each scientist, lab, and field has their own set up favorite tools and technologies that allow them to actually do science. This ranges from what software to write papers to statistical software to field equipment. Below is a brief description of how the scientific workflow currently operates in the QMEL. A shared set of tools and approaches helps us ultimately make more progress as a group.

Programming (R, R markdown, and Github)

Our lab is a leader in open and reproducible science. This means that every member of the lab will use tools such as R, R markdown, and Github. These tools allow us to reproducible workflows and make our work more accessible to others. Where possible, each paper should be written in R markdown (and/or LaTex) and tracked using version control in Github. Sometimes this workflow is not possible given outside collaborators that may not be comfortable with these tools. Google docs can work as a substitute in these cases.

File storage and sharing

The lab uses a combination of Sharepoint and Google Drive. We use Sharepoint for large file storage and backing up data. We use Google drive for collaborating on documents, especially with external co-authors. For manuscripts written by only members of QMEL, the preference for document preparation is a combination of R markdown and Github.

Working on papers

The style of the lab is to share outlines and drafts of manuscripts early and often. This allows Easton or others to make comments early on in the process which might save a lot of headaches later. When you have a version, you would like Easton to read, simply let him know that you would like feedback and try to specify by when and for what you specifically want feedback with (e.g., structuring the introduction, figure design, etc.). Every grant and paper needs to be read by one other lab member and Easton before submission.

Reference manager

You are free to use whatever reference manager you prefer, but most people in the lab use Zotero. It is free, integrates with R markdown and Google docs, and allows collaborations among many people.

Social media

The lab has a Twitter (https://twitter.com/quantmarineeco) that is maintained by the lab PI.

Lab website

An updated lab website (https://quantmarineecolab.github.io/) is important for public engagement and sharing our work with others. As a member of the lab, you are expected to contribute to the lab website from time to time. This includes a biography of yourself, project updates (usually in the form of blog posts), and posting papers. Details of how to contribute to the website are on the website's Github page (https://github.com/quantmarineecolab).

Authorship

For better or worse, publications are a key currency in science. They are one of the main ways we track scientific progress and individual production. Authorship on papers can be one of the most fraught topics and is therefore often ignored until the last minute. This is a bad strategy and only leads to resentment among co-authors. Therefore, authorship (in terms of composition and order) should be determined at the onset of the project. The specifics might change throughout the project, but it is key to have a starting point to work with from the start. The term "significant scientific contributions" is often used for defining who should be included as an author. In this lab, we use the definition from the International Committee of Medical Journal Editors (http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html): The ICMJE recommends that authorship be based on the following 4 criteria:

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
- Drafting the work or revising it critically for important intellectual content; AND
- Final approval of the version to be published; AND
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. In addition, "the corresponding author is the one individual who takes primary responsibility for communication with the journal during the manuscript submission, peer review, and publication process".

Thus, simply providing some data or providing minor comments on a manuscript do not warrant authorship, but they should still be acknowledged. Just because I am your advisor, does not mean I warrant authorship on your publications. There will likely be publications that you are involved with that I have only a small part in. That being said, the most common order (but by no means the only) for authorship in the lab is Grad Student Lead, Other Contributors, with the PI as the last author. It is common for the grad student lead and the PI to both be corresponding authors.

Authorship resources

- http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html
- https://www.sciencemag.org/careers/2010/04/conventions-scientific-authorship
- https://www.sciencemag.org/careers/2021/05/how-navigate-authorship-scientific-manuscripts

Funding

Like publications, funding is an important metric in science. Applying for and receiving funding allows us to do interesting science, but it also will help you in your career. As a lab member, you are expected to apply for grants to support research and travel as well as fellowships that may advance your career. This helps both you and the lab as a whole. Although you'll lead these applications, you can also expect meaningful contributions from Easton throughout the process. This means enough lead time is critical. In addition, you

may occasionally be asked to add comments or contribute a figure to a grant proposal that Easton is working on. In addition, you are always welcome to read grants that Easton has worked on or submitted.

As a lab, we have compiled a database of funding opportunities that are the most relevant to members of this lab (see shared Google Drive). However, there are lots of other good databases of funding opportunities as well:

- https://grad.ucla.edu/funding/#/search
- daljkds

Being a successful postdoc

Postdocs (or postdoctoral fellows or postdoctoral trainees) are a strange position within academia. It is an awkward couple of years when you have lots of expertise, yet you are not in a permanent position. Unlike graduate school, you are expected to be more independent, although this depends on the lab and PI. The time as a postdoc can also feel lonely as you are not a graduate student and also not faculty. It is key to make connections with other postdocs or scientists on campus. During your time as a postdoc in the QEML, you will have several responsibilities:

1) Working on projects/papers related to your postdoc position
2) Finishing up old work
3) Developing independent work
4) Mentoring students
5) Applying for funding and jobs

One of the most stressful parts of a postdoc position is the short-term and finite nature of the role. You only have a couple of years to find funding, find another postdoc position, or find a more permanent job. This means you should be applying for opportunities throughout your time as a postdoc.

My goal as an advisor with postdocs is to help them do good science and get the job they want.

Being a successful graduate student

Graduate school is designed to help make you a more independent scientist. In the QMEL, graduate students are expected to co-develop their projects with the lab PI as opposed to being handed a specific project. This freedom can be GREAT, but it can also make you feel adrift at times. That is okay and it is expected. Especially early in graduate school, you should be spending a significant portion of your time reading, taking classes, attending talks, and meeting others. The goal is to think broadly and come up with interesting questions.

The goal of graduate school is not to get a degree. The goal is to learn how to think critically, learn skills, and to get the job you want after graduation. My goal as an advisor is to help you accomplish these things. Early and often communication is key to a strong advisor-advisee relationship. I have to know when you need help in order for me to be a good advisor.

During your time as a grad student in the QEML, you will have several responsibilities:

1) Taking care of yourself
2) Taking classes
3) Attending conferences and giving presentations
4) Working on projects/papers related to your thesis
5) Working on projects/papers not related to your thesis
6) Serving as a teaching assistant or teaching courses
7) Mentoring students
8) Applying for funding and fellowships

9) Applying for jobs
10) Science communication and outreach
11) Staying up to date on the latest science

There is clearly a lot to being a graduate student. It can sometimes be difficult to know where to spend your time, which is your most precious resource. I use the term backwards design (which I've stolen from research on pedagogy) to overcome this problem. The key is to think about where you want to be after graduate school. Do you want to be a professor? Then it will be important to publish, get funding, and teach courses in graduate school. Do you want to work on science policy? Then it will be important to publish, work with local officials, and apply for opportunities related to policy. Meetings with Easton and others in the lab or on campus will help clarify some of these choices.

In order to be successful as a scientist, it is critical that you stay up to date on the latest research. This can be a formidable challenge but it can be facilitated by using RSS feeds or emails with journal table of contents. Setting up Google Scholar alerts can also be helpful for specific key words. You can also consider following scientists or scientific organizations on Twitter.

Good resources:

- https://www.nature.com/articles/d41586-021-01233-2?utm_source=Nature+Briefing&utm_campaign=07eb2bdc6b-briefing-dy-20210510&utm_medium=email&utm_term=0_c9dfd39373-07eb2bdc6b-43934377

Being a successful undergraduate researcher

Undergraduates play a critical role in QMEL. The lab has several ongoing research projects led by either Professor White or another senior member of the lab (including graduate students and postdocs). Undergraduates interested in working in the lab should have a genuine interest in the research questions and be interested in developing quantitative (e.g., math, statistics, computer programming) skills.

Research Phases: There are three phases at which undergraduates can be involved in research within QMEL. The different phases represent different levels of research experience, independence, and responsibility. Most students start as research assistants. Not all students move through all three levels of involvement.

- Research Apprentice: The first stage of involvement for an undergraduate is as a research apprentice. At this stage, an undergraduate joins a research team in the lab. The goal is to get caught up on the current progress of the team. This includes reading scientific papers, learning necessary tools (e.g., R programming), and meeting regularly with team members. This phase continues until Professor White and the research team agree the student is ready to become a more active and contributing member to the lab. This phase typically last one semester or year.
- Research Assistant: Following their apprenticeship, students are expected to contribute in more significant ways to the research team. This can involve collecting and analyzing data, manuscript writing, conducting experiments, and so forth. The goal during this phase is to present work at a scientific conference or submit a manuscript to a peer-reviewed scientific journal.
- Research Associate: The final phase of involvement in the lab is for students who have presented their work at a conference or been involved in the submission of a manuscript (see above). This phase involves more leadership and independence. Students at this level define team goals, help mentor new team members, and meet regularly with Professor White. This phase in the lab is very similar to being a graduate student in the lab.

During your time as a undergraduate researcher in the QEML, you will have several responsibilities:

- Send me weekly email updates on Fridays by 5pm describing briefly what you've been working on, what you plan to do the following week, and any questions or troubles you had. Important things to include: projects you've worked on, broken equipment, storage/equipment conflicts, if your data looks weird.

- Attend lab meetings. The entire lab assembles approximately once a week to discuss our research. Generally, the person leading the lab meeting will distribute reading materials in advance. You should read these materials and come prepared to participate actively in the discussion.
- Maintain a lab notebook and stay organized. There is a lot of overlap in projects, and it is essential that you keep track of your work. This includes updating the data spreadsheets and lab notebooks immediately. Someone else should be able to step into your role at any moment and be able to get up to speed quickly.
- Read background literature. A key part to your development as a scientist
- Communicate, communicate, communicate. Many of the issues that arise in research are simply because of a lack of communication. It is critical that you communicate early and often on issues or concerns that you may be experiences.
- Be independent. I am periodically away, and I expect you to get things done well without me. Ask questions when I am around, but don't be afraid to try to do the detective work on your own if I am not. We have a helpful, experienced lab, so know that folks other than me may be excellent resources.

Inspiration for this lab manual

I drew on a lot of different resources, including other lab manuals and websites, for the initial QMEL lab manual. Here is a brief list of some of those resources:

- https://github.com/alylab/labmanual
- https://www.nature.com/articles/d41586-018-06167-w
- https://github.com/memobc/memolab-manual
- https://www.sciencemag.org/careers/2019/08/three-keys-launching-your-own-lab
- https://www.sciencemag.org/careers/2019/04/want-become-better-mentor-ask-anonymous-feedback
- Mehr S. Lab handbooks tweet thread: Twitter. https://twitter.com/samuelmehr/status/1139733291899080705. Accessed 8 Jul 2020
- Masters KS, Kreeger PK. Ten simple rules for developing a mentor-mentee expectations document. PLoS Comput Biol. 2017;13(9):e1005709. https://doi.org/10.1371/journal.pcbi.1005709.
- https://store.aamc.org/downloadable/download/sample/sample_id/99/