Sea Education Association
# Plastics and Biodiversity in the Sargasso Sea (C326)

## Directed Oceanographic Research (4 credits, 90+ contact hours)

**SEA 3025 - (ENV)**

**Contact Info:**

**Dr. Sarah Kingston:** skingston@sea.edu

**Aiden Houlihan, Teaching Assistant:** aidenhoulihan@gmail.com

**Course Catalog Description:**
Design and conduct original oceanographic research. Collect data and analyze samples. Compile results in peer-reviewed manuscript format and share during an oral presentation session. Emphasis on development of research skills and written/oral communication abilities.

**Prerequisites:**
Admission to SEA Semester. One introductory science course and one 200-level science lab or consent of instructor.

**Program Director**
Sarah Kingston — skingston@sea.edu office hours by appointment

**Teaching Assistant**
Aiden Houlihan — aidenhoulihan@gmail.com

**Course Philosophy and Approach:**
This course is part of the suite of required courses in the *Plastics and Biodiversity in the Sargasso Sea* (*PBS)* program. Collectively, the *PBS* courses provide the context, tools, and opportunity for students to make authentic contributions to the international effort to protect the ocean ecosystem. This course is dedicated to practical biodiversity and molecular data collection, data analysis, and dissemination of original scientific research results.

Research project proposals will have been developed prior to the start of the sea component and this DOR course (see syllabus for *Advanced Topics in Biological Oceanography: Biodiversity*). At sea, students work collectively during laboratory watch to sample for all projects. Students acquire practical skills in sample design, standard operating procedures for safe deployment/retrieval of modern oceanographic sampling equipment, accurate recording of metadata associated with each sampling station, advanced laboratory sample analysis using morphological and molecular methods, and robust data analysis. Direct operation of the onboard instruments helps students to appreciate the limitations of various sensing technologies and to critically evaluate the data they collect. During the cruise, students gradually assume greater responsibility for deployment and data management.

At the end of the sail component, each research team completes data analysis and production of their original scientific manuscript and oral presentation. The manuscript will be written per the guidelines of a high-impact scientific journal. Students present their research findings in the professional setting of a capstone Symposium.

**Learning Outcomes:**
Students will be able to. . .

1. Demonstrate safe deployment/retrieval and describe underlying operating principles and inherent limitations of standard oceanographic sampling equipment: hydrographic winch, Conductivity Temperature and Depth (CTD) profiler, *in situ* fluorometer to measure chlorophyll-*a* concentration, hull-mounted Acoustic Doppler Current Profiler (ADCP) to measure currents, full ocean depth profiler for acoustic seafloor mapping, surface and subsurface nets for zooplankton sampling.
2. Demonstrate knowledge and skill in molecular biology methods, including DNA extraction, amplification, quantification, and analysis.
3. Demonstrate accurate data recording and participate/contribute as an essential member of a working research laboratory.
4. Critically analyze and interpret authentic oceanographic and genomic data.
5. Generate clear and accurate visual representations of oceanographic and molecular data.
6. Compose a professional-quality manuscript and deliver a professional scientific presentation.
7. Convey research results to scientific as well as lay audiences.

**Evaluation:**

| | |
|---|---|
| On-Watch Performance Evaluation | 20% |
| Manuscript Draft(s) | 15% |
| Final Manuscript | 25% |
| Symposium Oral Presentation | 25% |
| Peer/Self Evaluation of Team Contribution | 15% |

**Assignments:**
On-Watch Performance Evaluation: Much of the practical learning will occur at all hours of day and night as students and crew carry out scientific operations during laboratory watch. The watch-standing Marine Technicians are best able to evaluate overall progress, including performance in and knowledge of lab routines as well as the attitude and effort each student brings to watch.

Manuscript Section Drafts/Revisions: Revisions to the Methods described in your research proposal will be necessary once the sampling plan is implemented at sea. Research teams will also submit draft versions of Results and Discussion sections for review.

Final Manuscript: Research teams will produce a written manuscript following guidelines for a high-impact scientific journal. There is an expectation of professional quality work. The final manuscripts will be archived at SEA.

Symposium Oral Presentation: Research teams will present their research during the capstone Symposium.

Peer/Self Evaluation of Team Contribution: Candid self and peer evaluations of research project contributions will be completed. Emphasis will be placed on identifying individual strengths and weaknesses in the context of collaborative work.

**Submitting Assignments**:
All assignments should be neatly edited and formatted and include your name and a heading. While on shore, all assignments are to be submitted *electronically only*, by the specified deadline, using Google Classroom.

Assignments must be submitted via Google Classroom as Microsoft Word, PowerPoint or Excel documents (or compatible non-MS correlates), as appropriate based on the assignment, that can be opened and edited on a Mac or PC *without* use of a special program (i.e. special software or a web-based program like Google Docs/Drive). All assignments must be submitted with the following file name format: [YourLastNameHere_Nameofassignment_date]. For example, if I were submitting my proposal draft in collaboration with Aiden, I would name it KingstonHoulihan_proposaldraft_2026Mar05.

While on board the ship, any assignments will be submitted electronically to a designated folder via the ship's computer network.

For team/group assignments, one person in the group should upload the assignment.

***IMPORTANT!*** Late assignment submissions will not be accepted. Internet issues are not an excuse for late submission unless the SEA IT staff informs us that the entire SEA network is down. We maintain very high standards in this course because a key objective of PBS is to teach you professional skills that will help you succeed in the professional practice of marine science and conservation.

**Expectations and Requirements:**

- Punctual attendance is required at every class meeting/lab watch.
- Active participation in research discussions is expected.
- The policy on academic accuracy, quoted below, will be strictly followed in this class.

> The papers that you submit in this course are expected to be ***your original work.*** You must take care to distinguish your own ideas and knowledge from wording or substantive information that you derive from one of your sources. The term "sources" includes not only published primary and secondary material, but also information and opinions gained directly from other people and text from any site on the Internet.
>
> ***The responsibility for learning the proper forms of citation lies with you.*** Quotations must be placed properly within quotation marks and must be cited fully. In addition, all paraphrased material must be acknowledged completely. Whenever ideas or facts are derived from your reading and research, the sources must be indicated. (Harvard *Handbook for Students,* 305)

**Accessibility and Accommodations:**
All accommodation requests will be confidential; students with documented disabilities who require learning accommodations should contact your professor, Sarah Kingston (skingston@sea.edu) or the Academic Dean, Erin Bryant (ebryant@sea.edu), with as much preparatory time as possible in order to facilitate execution of learning accommodations.

**Class Schedule:**
The watch schedule is posted throughout the ship. At-sea and Shore II assignment due dates will be posted on the ship's calendar.

**DOR Reading List:**

Literature search for final manuscript

Field protocols

## DOR Calendar (VERY MUCH A DRAFT: this is a fluid schedule that absolutely will change due to weather and other factors):

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| Apr 05 | 06 | 07 | 08 | 09 | 10 | 11 |
| Student Arrival ~ 1800 (brief ship intro, expectations) | Orientation I (fire, galley, med) Round 1 of rotations | Orientation II (rotation stations, wire demo) (or depart this day and go to anchor?) | AM Orientation III, aloft Clear out, 1500 Departure PM NT | 1430 Class: OCE PM NT | 1430 Class: NS PM NT | FIELD DAY PM MNT |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| No Class PM NT | 1430 class - NS PM MNT | 1430 class – OCE PM NT | 1430 Class: NS PM MNT | 1430 Class: OCE PM NT | 1430 Class: Watch Rotation Drill PM NT | FIELD DAY PM MNT |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| start Phase II No Class PM NT | 1430 Class: Line Chase PM NT | 1430 Class: OCE PM NT | 1430 Class: NS PM NT | 1430 Class: OCE Project Check-in PM MNT | Drill PM NT | FIELD DAY PM NT |
| 26 | 27 | 28 | 29 | 30 | May 01 | 02 |
| No Class PM NT | BDA arrival/ clear-in | BDA | BDA | BDA-clear out/ departure | 1430 Class: Watch Rotation Drill PM NT | FIELD DAY PM NT |
| 03 | 04 | 05 | 06 | 07 | 08 | 09 |
| Start JWO No Class PM NT ONT#01 | 1430 Class: OCE Project check-in PM MNT | 1430 Class: NS PM NT ONT#02 | 1430 Class: OCE PM MNT ONT#03 | 1430 Class: NS PM NT | 1430 Class: Drills PM NT ONT#04 | FIELD DAY PM NT |
| May 10 | 11 | 12 | 13 | 14 | 15 | |
| No Class PM NT | 1430 Class: NS PM MNT | 1430 Class: OCE Finish Project Data Collection PM NT | 1430 Class: NS | At anchor MV Swizzle | Arrive WH | |

DOR/ Science watches: 6-hour shifts once every 36 hours (21 watches)

## Shore II calendar (VERY MUCH ALSO A DRAFT; this calendar *will* change based on project and fluidity of course needs):

| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|---|---|---|---|---|---|---|
| May 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | | | | | CC departure and return to campus | Day off |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| day off | AM session - Data Analysis and Interp; PM session - research groups | AM session - OSPP revisions ; PM session - group work and writing, sci comm pres | AM session PM session - group work and writing; OCE manuscript drafts due 23:59 | WHOI guests / field trip | AM outing; drafts returned PM | independent revisions |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| final OCE manuscripts due 23:59 | work sessions AM and PM sessions; Symposium presentations due 23:59 | Practice Symposium 0900 - 1600 with lunch and other breaks | Symposium 0900 - 1530; closing activity | departure day | | |
| AM sessions 0900 - 1200 | | PM sessions 1330 - 1700 | | | | |