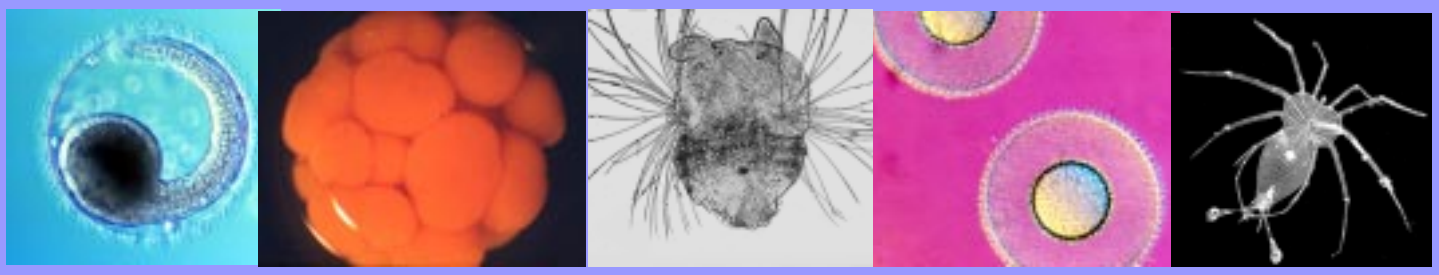
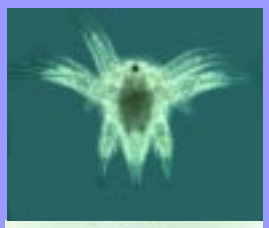
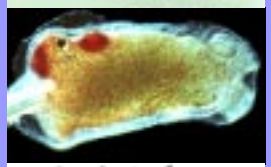


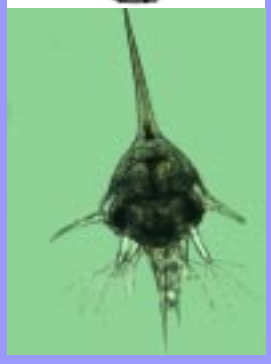
Comparative Embryology and Larval Biology

Spring 2005 Syllabus

This course, which is available to both undergraduates and graduate students, is a survey of embryonic development, larval forms and larval ecology across all of the marine invertebrate phyla. Students explore the rich and colorful diversity of marine larvae by culturing dozens of representative species in the laboratory. Lab and field experiments introduce methods for studying ecological aspects of early life-history biology, including fertilization success, gametogenic synchrony, life-history evolution, and the dispersal, nutrition, behavior, orientation, and settlement of larvae.







Week 1 (April Fools Day) (tide: 11:30, -0.2)

Field: Offshore boat trip (dredging and plankton , R/V Pluteus)

Field: Rocky shore (Lighthouse point, Sunset Bay) for echinoderms

Lab: Adventures in babysitting: culture methods for invertebrate embryos. Photomicrography and videomicrography of larvae.

Week 2 (April 8) (tide: 6:46 a.m., -0.06)

Lecture: Advanced Birds and Bees: what your parents didn't tell you about the facts of life (and introduction to the course).

Lab: Spawning and cleavage of echinoderms.

Lecture: Fertilization and radial cleavage. Echinoderm larval forms.

Week 3 (April 15) (tide: 12:06, 0.7)

Lecture: Gametogenic timing and the ecology of fertilization.

Field: Field experiments on broadcast spawning (North Spit)

Lab: Fertilization kinetics; data analysis from field experiment.

Week 4 (April 22) (tide: 11:06, -0.89)

Lecture: Teddy bears, helmets and fuzzy footballs: development in the lower metazoa (sponges, cnidarians, ctenophores, platyhelminths and nemertines).

Field: Collection of polyclads, nemertines , trematodes, molluscs (Brown's Cove).

Lab: Egg plaques of flatworms and larvae of parasitic trematodes.

Week 5 (April 29) (tide: 5:49, 0.86)

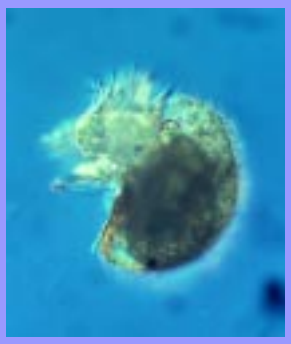
Lecture: Twist and shout: Spiralian development (sipunculans, polychaetes and molluscs).

Lecture: Egg ecology and encapsulation.

Lab: Spawning, brooding and cleavage in polychaetes and molluscs.

Field: Collection of oweniids, arenicoids, serpulids (docks & nearby mudflats).

Week 6 (May 6) (tide: 5:48, -0.31)



Lecture: Larval feeding and nutrition.

Lecture: An introduction to life-history theory.

Lab: More on molluscs, and experiments on particle collection.

Week 7 (May 13) (tide: 10:36, 0.00)

Lecture: Lophophorate development (bryozoans, phoronids, brachiopods).

Lab: bryozoan larval release and settlement; spawning of phoronids

Lecture: Larval settlement and metamorphosis.

Field: Mucking for phoronids (mudflats)

Week 8 (May 20)

Lecture: Development of Arthropods

Lecture: The ins and outs of up and down: Larval locomotion, orientation, migration and dispersal

Field and Lab: experiments on vertical migration and phototaxis.

Week 9: (May 27) (tide: 9:54, -1.8)

Lecture: Tadpoles are just little squirts: Development and larval biology of ascidians.

Lab: Ascidian embyology and metamorphosis .

Field: Collection of ascidians

Lecture: Asexual reproduction.

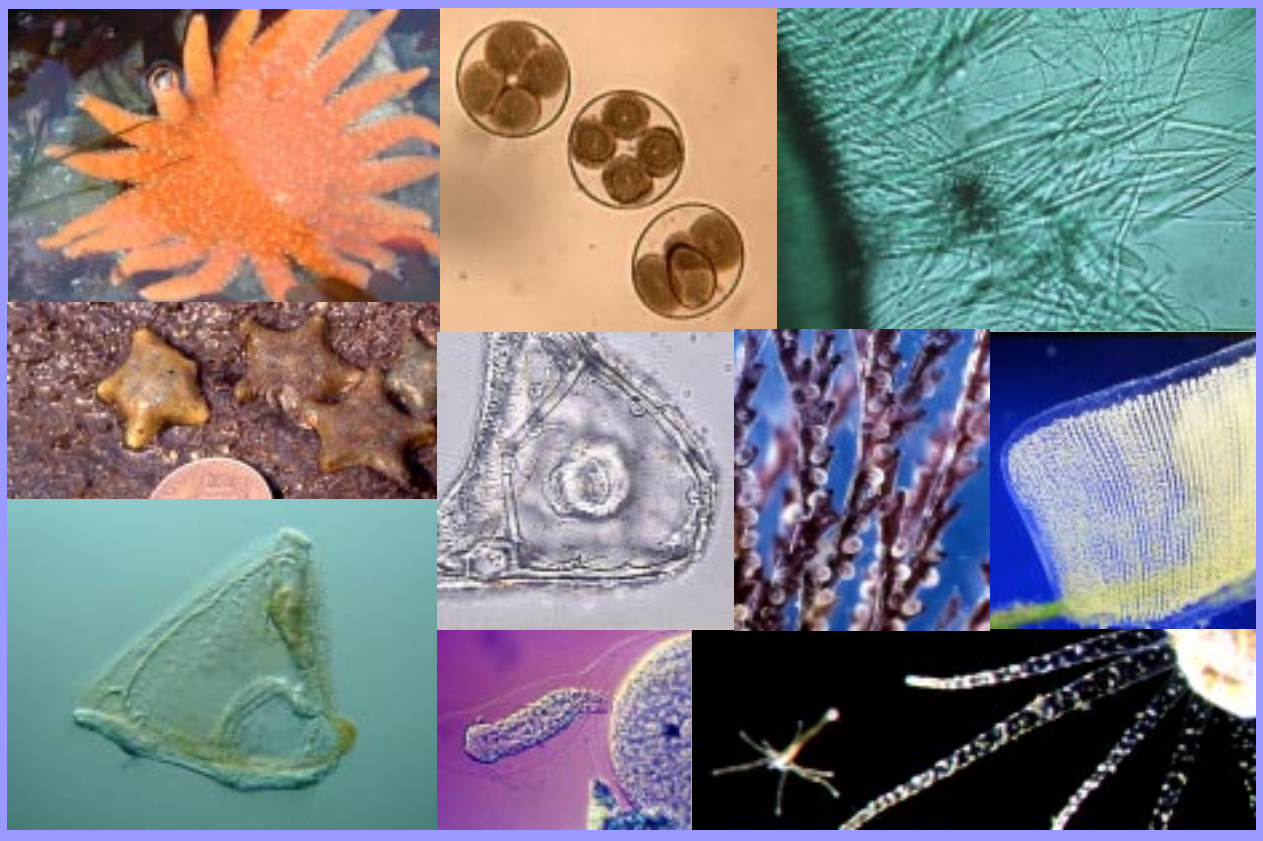
Week 10 (June 3) (tide: 4:45, -0.16)

Lecture: Larval forms in some lesser phyla.

Lecture: Babies deep and cold: Larval development in extreme environments.

Dicussion of group projects

Note: The above schedule is tentative, as embryological lab work depends in part on the reproductive timing of animals that we do not control. Thus, the order of topics may be modified to accommodate spawning and other opportunistic events.



Grading

Notebook. All students will be expected to maintain a high-quality notebook that covers all lab and field activities. The notebook should contain:

1. A brief account of every field trip, including observations of any reproductive activity observed and a list of animals collected by the class.

2. Drawings of embryos and larvae observed in the laboratory.

3. Developmental timetables for all animals cultured.

4. Tables containing raw data from all projects in which you were personally involved.

The notebook should not contain lecture notes, handouts or reading lists.

Embryology paper. Each student will write a short descriptive paper on the embryology of a species that interests her or him. This should include drawings or photographs, a developmental timetable, and a brief literature review and should be in the form of a scientific paper (Introduction, Materials and Methods, Results, Discussion, Literature cited).

Oral discussion on group projects. We will undertake several group projects on ecological themes, with the intent of introducing basic methods of larval ecology. At the end of the course, all students are expected to participate in an oral presentation/ discussion of one of these projects.

Additional requirements for graduate students. As graduate students are required to do additional work for 500-level credit, they will be asked to help with the location and collection of animals and the logistics of field trips.

The grade will be computed as follows:

Notebook: 50% of grade

Embryology Paper: 30% of grade

Oral discussion: 20% of grade