ECOLOGY AND EVOLUTIONARY BIOLOGY

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The Department of Ecology and Evolutionary Biology (E&EB) offers broad education in the biological sciences, covering subject matter that ranges from molecules, cells, and organs through organisms to communities and ecosystems, and the evolutionary processes that shape them. The department offers a B.S. and a B.A. degree. The B.S. program is designed for students planning to pursue graduate study in ecology and evolutionary biology, other biological disciplines, environmental science, or to attend medical, dental, or veterinary school. The B.A. program is intended for students who are interested in ecology, evolution, and organismal diversity as part of a liberal education but do not intend to pursue graduate work in the discipline, or for students who are interested in a second major. The two programs share the same prerequisites, introductory courses, and core requirements but differ in their electives and senior requirements.

COURSES FOR NONMAJORS

Several E&EB courses have no college-level prerequisites and are suitable for nonmajors. These include all 100-level offerings as well as 200-level courses that deal with particular organism groups such as plants, fish, mammals, birds, and insects or other invertebrates.

CONCENTRATIONS

Students majoring in E&EB select one of two concentrations. The concentration in *Biodiversity and the Environment* (formerly Track 1) emphasizes courses appropriate for careers in ecology, evolutionary biology, and environmental science. The concentration in *Organismal Biology* (formerly Track 2) is appropriate for premedical, predental, and preveterinary students, and for students interested in research in physiology, functional morphology, and anatomy. The E&EB major offers opportunities for independent research in both laboratory and field.

PREREQUISITES

The prerequisites for the major are intended to provide core scientific literacy; they include courses in biology, chemistry, physics, and mathematics. Finishing these introductory courses early allows for a more flexible program in later years, but it is not necessary to complete them before declaring the major.

The introductory biology sequence BIOL 101, 102, 103, and 104 is required. Also required are a two-term lecture sequence in general chemistry, CHEM 161, 165 or CHEM 163, 167, with associated laboratories, CHEM 134L and 136L; one term of mathematics (MATH 115 or 116 or 120) or one term of statistics & data science (S&DS 100 or 230).

Students should take four additional courses, for a total of four credits, from among the following options: MATH 115 or 116, MATH 118 or 120, MATH 222 or 225, MATH 230

or MATH 231, MATH 235, 241, 242, 244, 246, 247, MATH 250, 255, S&DS 100-106, 220, 230, 238, 240, CPSC 100, 112, 123, 201, CHEM 174 or 220, CHEM 175 or 221, CHEM 222L, 223L, PHYS 170 or 180, PHYS 171 or 181, EPS 110, 212, 220, 222, 232, 240, and 255. No more than two of these four additional courses may originate in the same department.

An online program, ONEXYS for Physics, will be offered in the summer by the Mathematics and Physics departments and by the Poorvu Center for Teaching and Learning, to review math skills needed in preparation for introductory physics courses.

Acceleration credit awarded in chemistry, mathematics, and physics, or completion of advanced courses in those departments, may be accepted in place of the corresponding introductory courses for the E&EB major. Students who have mathematics preparation equivalent to MATH 115 or higher are encouraged to take a statistics course (usually S&DS 101–106) and/or additional mathematics or statistics courses such as MATH 120, 121, MATH 222 or 225 or 226, and S&DS 220 or 230. Students are strongly urged to take general chemistry in the first or second year. Students who place out of general chemistry can take organic chemistry during their first year.

PLACEMENT PROCEDURES

Students can place out of the introductory biology sequence (BIOL 101, 102, 103, 104) by means of the biology placement examination administered jointly by the biological science departments, E&EB, MB&B, and MCDB, at the beginning of the first year.

Potential E&EB majors are expected to take the mathematics placement test. Those who place above the level of MATH 112 may proceed to introductory courses for the E&EB major; those who place into MATH 112 must take that course first.

For information about placement examinations, refer to the *Calendar for the Opening Days of College* and the Yale College Dean's Office website. The Chemistry department arranges placement in chemistry courses.

REQUIREMENTS OF THE MAJOR

B.S. degree program Beyond the prerequisites, the B.S. degree requires three lecture courses and one laboratory, for three and one-half course credits; two electives for two course credits, one of which must be a lecture or a seminar; and the senior requirement. The required courses in the *Biodiversity and the Environment* concentration are E&EB 220, 225, and a lecture course on organismal diversity usually chosen from E&EB 246–272 or E&EB 280, along with its associated laboratory, or E&EB 326 and 327L. Other lecture courses on organismal diversity, with laboratory, are permitted with approval of the DUS, including MCDB 290 and 291L. Required courses in the *Organismal Biology* concentration include E&EB 290; E&EB 295 or BENG 350; MCDB 300 or MB&B 300; and E&EB 291L. Most E&EB, MCDB, or MB&B courses numbered 200 or above qualify as electives, as do most research courses and laboratories in a biological sciences department or in the Yale School of Medicine. Courses from other science departments as well as Mathematics, Statistics and Data Science, and Computer Science may qualify with permission of the DUS. Residential College Seminars may not be counted toward the requirements of the major.

B.A. degree program Beyond the prerequisites, the B.A. degree requires the same courses as the B.S. degree, except for the two electives for a total of three and one-half course credits (not counting the senior requirement).

Limit on research courses While independent research courses may be taken multiple times for credit, there are restrictions on the number of such courses that can be included in a student's curriculum. See Academic Regulations, section C, Course Credits and Course Loads. Interested sophomores and juniors can take E&EB 469 and E&EB 474. For information on how to become involved in research, see the E&EB Guide to Research and Undergraduate Research Opportunities. For information on fellowships and summer experiences, see the E&EB Guide to Fellowships and Summer Experiences.

Limit on courses taken in the professional schools Undergraduates may apply up to 4 courses taken in the professional schools for credit towards graduation. See Academic Regulations, section L, Special Academic Arrangements for more information.

Graduate courses of interest to undergraduates Graduate courses in the biological and biomedical sciences that may be of interest to undergraduates are listed in the Graduate School online bulletin, and many are posted on the Biological and Biomedical Sciences website. There is no limit on the number of courses students may take in the Graduate School of Arts and Sciences. Additional information is available from the DUS and the director of graduate studies. Undergraduates with an appropriate background may enroll with the permission of the director of graduate studies and the instructor.

Credit/D/Fail No course, including prerequisites, taken Credit/D/Fail may be counted toward the E&EB major.

SENIOR REQUIREMENT

B.S. degree program Students in the B.S. degree program fulfill the senior requirement by completing two terms of original research in E&EB 475 and 476, or in E&EB 495 and 496. Students interested in conducting research before their senior year may do so by taking E&EB 469 or E&EB 474, but they do not count toward the senior requirement.

B.A. degree program Students in the B.A. degree program fulfill the senior requirement either by completing one term of independent study in E&EB 470 or by writing a senior essay. The senior essay may be related to the subject matter of a course, but the senior essay is a separate departmental requirement in addition to any work done in a course and does not count toward the grade in any course. Students intending to write a senior essay must obtain an approval form from the office of the DUS and have it signed by the senior essay adviser before the end of the course selection period. Senior essays must be submitted to the DUS by the last day of classes.

ADVISING

First-year students considering a major in Ecology and Evolutionary Biology are invited to consult with the DUS. After the first year, students should choose an adviser from the department faculty who has interests comparable to their own and/or is a fellow of their residential college. For additional information, visit the E&EB website. Students in E&EB should consult one of the advisers assigned to their class (see below). The course schedules of all E&EB majors (including sophomores intending to major in

E&EB) must be reviewed by a faculty member in E&EB; the signature of the DUS is not required, but is valid for any student. Students whose regular adviser is on leave can consult the DUS to arrange for an alternate.

PEER MENTORS

Peer mentors provide a helpful student perspective to navigating the major and the department. Students are encouraged to contact them.

YEEBUG is an undergraduate group of Yale's Ecology and Evolutionary Biology majors. The student members organize social events and panels, lead field trips, and represent the group at bazaars and academic fairs.

STUDY ABROAD

Participation in study abroad field programs is encouraged. The Organization for Tropical Studies (OTS) and the School for Field Studies (SFS) provide specific opportunities for study of tropical and conservation biology. Credit for such programs may apply toward the major; interested students should consult the DUS prior to going abroad.

SUMMARY OF MAJOR REQUIREMENTS

Prerequisites 13 courses for 11 credits, as specified

Number of courses *B.S.*—5½ course credits beyond prereqs (not incl senior req); *B.A.*—3½ course credits beyond prereqs (not incl senior req)

Specific courses required For both the *B.A.* and the *B.S.* degrees in *Biodiversity and the Environment*—E&EB 220, 225; in *Organismal Biology*—E&EB 290; E&EB 295 or BENG 350; MCDB 300 or MB&B 300; and E&EB 291L

Distribution of courses For both the *B.A.* and the *B.S.* degrees in *Biodiversity and the Environment*—1 lecture course from E&EB 246–272 or E&EB 280 with associated lab, or E&EB 326 and 327L; Additionally for the *B.S.*—2 electives as specified

Substitutions permitted MCDB lecture/lab courses on organismal diversity for E&EB lecture/lab

Senior requirement *B.S.*—two terms of E&EB 475 and 476, or E&EB 495 and 496; *B.A.*—E&EB 470 or senior essay