

REQUIREMENTS AND POLICIES GOVERNING GRADUATE PROGRAM IN MARINE BIOLOGY AND BIOLOGICAL OCEANOGRAPHY

Applies to students entering in Fall 2016

The Graduate Program in Marine Biology and Biological Oceanography & its Administration

Introduction

Graduate students in the Graduate Program in Marine Biology and Biological Oceanography (referred to subsequently as "GPMBBO" or the "Program") may pursue a Ph.D. degree within the Marine Environmental Biology section of the Department of Biological Sciences at USC (referred to subsequently as "MEB").

At the University of Southern California, graduate education is the responsibility of the Department, but the University's Graduate School establishes minimum requirements concerning grade point average, number and distribution of units, residency, time limits, etc. that are common to all advanced degrees offered within the College of Letters, Arts and Sciences at the University. Specific courses, examinations, skills, and research requirements are established by the student's program of study, in this case the Graduate Program in Marine Environmental Biology. Collectively, both sets of regulations constitute the student's "degree requirements," all of which must be met by the student.

Graduate School regulations are listed in the current *University of Southern California Catalogue* in several locations. One part of these are located in the section on "Academic Policies and Information" near the beginning of the *USC Catalogue* and the rest are found near the middle of the *USC Catalogue* under "The Graduate School." Those regulations, which most commonly affect GPMBBO students, are included in this document, but the information in the University of Southern California Catalogue should be considered definitive.

GPMBBO regulations are listed in this document; the major requirements of degrees in the GPMBBO are also listed in the *USC Catalogue* under "Department of Biological Sciences."

Program Administration--The Graduate School

The Graduate School maintains the University's official Permanent Graduate Student File and is ultimately responsible for admission of our graduate students and the awarding of their degrees. As noted above the Graduate School establishes requirements concerning grade point average, number and distribution of units, residency, and time limits that are common to advanced degree programs in all units under their jurisdiction, including the Department of Biological Sciences.

Official forms are used to track a student's progress by The Graduate School and completion and submittal of these usually is to be at a specified point in the student's tenure. Timetables for the completion of degree requirements are available at The Graduate School. The schedule for the Ph.D. student's final and penultimate semesters is especially detailed and needs to be adhered to closely.

All Graduate School forms prepared by or on behalf of the student must be approved by the Director of the Program (Dr. Andrew Gracey) or by the Chair of the Department (Dr. Douglas Capone) before their submittal to the Graduate School. All Graduate School forms are available online at http://www.usc.edu/schools/GraduateSchool/current_guidelines_forms.html or from the Graduate Programs Manager, Linda Bazilian. *Please turn in all forms to Linda Bazilian who will submit them to the proper office on your behalf.*

Graduate Student Representatives

In late spring, GPMBBO students select two graduate students to serve as Graduate Student Representative and Alternate Graduate Student Representative for the coming academic year. To be eligible for the posts, both students must have passed their Qualifying Examination. The Alternate will represent the graduate students in the Graduate Student Representative's absence or by the latter's appointment. The Graduate Student Representative has one vote in meetings of the MEB Faculty representing the opinions of the graduate students.

The Graduate Student Representative has no voting power in either the continuation of fellow graduate students or in the Qualifying Examination. At the option of the student examined, the Graduate Student Representative may also be present during the oral part of the Qualifying Examination.

In late spring, the students will also elect a Graduate Student Mentor whose job will be to help facilitate incoming MBBO students with the transition of moving to Los Angeles and the USC campus (issues involving transportation, housing, dining and entertainment). The mentor may also provide written material and serve as a conduit to faculty, staff or graduate students who may be of assistance. At no time will the mentor comment on MBBO program requirements or policies, including class requirements, screening exam or qualifying exam. Only the MEB staff, Biological Sciences faculty or the MBBO program director is authorized to address questions regarding MEB program requirements or policies. The mentor should contact incoming students sometime early in the summer, before they make permanent living arrangements.

Graduate Programs Manager of GPMBBO

The Graduate Programs Manager of GPMBBO is the staff member responsible for processing and maintaining graduate student files; serving as liaison between the students, GPMBBO Faculty, and the Graduate School; and making available application materials, Graduate School Forms, and other relevant documents. A permanent Department file on each student is maintained in the GPMBBO Office.

Student Advisement and Guidance

The First Year Advisor; Initial Advisement and Evaluation by Student's Advisor

Most students have a first-year advisor who is identified in the acceptance letter. This initial advisor may be replaced by another faculty member with whom the student has closer research affiliations at the request of the student and with the approval of the GPMBBO Program Director and the new advisor. That request can be made by the student to the GPMBBO program office or of the GPMBBO Program Director. If an incoming student has not chosen an advisor or been appointed one, this should be a priority during the first semester.

The Program provides an initial orientation for all incoming students. During registration week of a graduate student's first semester, the student's initial advisor meets with the student to review his/her previous course work and experiences and to discuss career objectives. A primary purpose of this initial interview is to identify major deficiencies in a student's preparation and to suggest means of remedying any such deficiencies.

Screening Committee

The purpose of the Screening Exam is *to identify individual strengths and weaknesses of each student, in an effort to determine what steps might be taken to address those weaknesses*. It is designed to be an examination that will help the students improve their individual professional development, and the recommendations of the Screening Committee will be specific for each student. Those steps might include specific courses, performing teaching assistant duties for pertinent courses, directed readings. In some cases, the decision of the committee may be the dismissal of the student from the program. The

Screening Exam is an oral examination. Information discussed during the exam should not be conveyed to other students, in order not to undermine the overall purpose of the exam.

Advisors and members of the Screening Committee, a standing MEB faculty committee, meet with incoming students, as soon as possible, to evaluate the student's background and make recommendations for developing a solid base in marine biology. The Screening Committee administers the Screening Examination near the end of the student's second semester of graduate work at USC, and before the student has taken more than 24 units. The Screening Committee, together with the advisor, is responsible for the student's advisement and guidance until the five-member Ph.D. Guidance Committee is established. Following evaluation of perceived strengths and weaknesses, and in recognition of the research subdiscipline identified by the student, the Committee will provide specific recommendations on reading, coursework, teaching assistantships or other forms of training that the student might need in order to fill deficiencies in his/her background. Each student's performance will be reported in writing on the GPMBBO's *Report of the Screening Committee*.

Requirements for the Ph.D. Degree

Time Schedule

All course requirements for the Ph.D. degree are normally completed within three calendar years from the date on which the student took his/her first course at USC and must be completed within eight calendar years from that time.

General Requirements

A total of 60 units must be completed for the Ph.D. Degree.

Course Requirements--Core courses

Five core courses are currently required: BISC 582 (Advanced Biological Oceanography), BISC 583 (Evolution and Adaptation of Marine Organisms), BISC 584 (MEB Faculty Lecture Series), BISC 585 (Scientific Writing and Reviewing), and BISC 586 (Biological Oceanographic Instrumentation). BISC 582, 583 and 586 should be taken during the student's first year at University of Southern California (582 and 586 in the Fall semester, 583 in the Spring semester); BISC 585 is open to second year students only (Spring semester). Students are also required to take 4 units of BISC 529 (MEB Seminar) and four advanced graduate seminars (8 units total). Finally, students are required to take an approved course in statistics (e.g. PM 510L).

Students must receive a grade of B or better in each core class and maintain a cumulative Grade Point Average of 3.0 or above in all coursework in order to fulfill the requirements of the MBBO Program.

Official Guidance Committees

A five-person Ph.D. Guidance Committee should be established soon after the screening exam, but no later than the fourth semester of enrollment for a student seeking a Ph.D. degree. After the student passes the Qualifying Examination, the Ph.D. Guidance Committee is dissolved and a new Dissertation Committee is formed.

The Student and His/Her Responsibilities

The student is ultimately responsible for his/her graduate career and must be familiar with Graduate School and GPMBBO requirements and responsible for their timely completion.

If a student's needs are not being met, he/she should seek redress, using the following chain of command: advisor, advisory committee (screening, guidance, dissertation), Director of the Program,

Department Chair, and Graduate School. The Director of the GPMBBO Program is always available to provide guidance on how to deal with particular situations.

In addition to all other rules, the University has established codes of conduct to which all students must adhere. One aspect of graduate training -- service as a teaching assistant -- places them in a position of power over undergraduate students. The position implies added responsibilities and liabilities, especially in respect to such matters as fairness, equal treatment, sexual harassment, etc. Information on University policies concerning conduct is available in *SCampus*. Further information or sources of information may be obtained from the Department office.

Formal Graduate Seminars

Students must complete a minimum of four (4) 2-unit graduate seminars. Because a critical feature of such seminars is exposure to current literature, all four required seminars must be completed during the student's tenure at USC. With the written permission of the student's committee, a formal course completed at another institution may be counted as one of the four required seminars (the course must have been completed during the student's tenure at USC).

Research Tool Requirement

Proficiency in statistics is a necessary skill for all scientists. Satisfactory skill level may be demonstrated by

- a) completion (grade of B or better) of a course approved by majority vote of the MEB faculty. Several courses with the University are available.
- b) acceptance of course work previously completed either at USC or elsewhere. The acceptability of a previously completed course will be made by an examiner selected by the GPMBBO Program faculty.

A rigorous grad level course in Biostatistics is available at the Medical School in the Department of Preventive Medicine, PM 510L. Permission is needed from the PM Department. A free shuttle bus runs routinely between the University Park and Med School Campuses. Other statistics courses are listed in the appendix.

Research Units

BISC 790 Research units are normally taken whenever the student is conducting his/her doctoral research. Dissertation research will normally take the equivalent of about 2.5-3 years of full time work, but the number of research units taken usually does not reflect this. Typically advanced graduate students will take 6 units of 790 and possibly a 2-unit seminar each semester. Graduate Programs Manager, Linda Bazilian can provide guidance on balancing course and research units.

Grade Point Average Requirements

Students must maintain a grade point average of at least 3.0 in all courses taken at USC, in conformity with regulations of the university; work graded C- or below is not acceptable for either subject or unit credit. In addition to the overall GPA requirement of the university, the MBBO Program requires that students must achieve at least a B in each core course in order to satisfactorily complete that material. If a student receives a B- or less, the course must be retaken even if the Graduate School grants credit for the course. Students must receive at least a B for the retaken course(s).

If a student's cumulative grade point average falls below 3.0 at any time, the student will be placed on departmental academic probation. The cumulative average must be raised to 3.0 by the completion of the next two semesters of registration at USC in courses approved by the student's guidance committee. Note: this may require that the student take additional formal and/or seminar courses since directed

research and dissertation units are on a Pass/No Pass basis and are not computed into the GPA. If the student does not improve his/her overall GPA to 3.0 within this period, the student will be dismissed from the program. A student who has been removed from probation but subsequently fails to meet the scholarship requirement is subject to termination (will be terminated) from the program.

Marine Program Noon Seminar Series

Students must regularly attend the Marine Environmental Biology Noon Seminar series throughout their tenure at USC (traditionally held on Tuesdays). In addition to attending other seminars, each student presents a 20-minute seminar on his/her current research once each academic year, beginning in their second year. Attending faculty will provide short written evaluations of the seminar to help students improve their public speaking skills. (See "Forms" section).

BISC 794 Doctoral Dissertation

After a student successfully completes the Qualifying Examination (see below) and is therefore a formal candidate for the Ph.D., he/she must register for BISC 794 Doctoral Dissertation each semester except summer. The student would sequentially register for BISC 794a, 794b, 794c, 794d in the first four semesters after completing the Qualifying Examination, and then BISC 794z each subsequent semester as needed. Students must have at least 4 units of 794 credit, but can receive no more than 8; hence BISC 794a-794d are valued at 2 units and BISC 794z at 0 units. Graduate Programs Manager, Linda Bazilian can provide guidance on balancing course and research units.

Other Course and Unit Requirements

Additional formal course requirements may be established by the Section and/or by the student's guidance committee and/or on advice of the committee, which evaluates the student's preparation in the Screening Examination.

A course in scientific ethics is strongly recommended, although not a course requirement for the program.

The minimum number of units required for the Ph.D. by the Graduate School is 60. Units must include 4, but no more than 8, units of BISC 794 credit and may be completed with other formal classes or BISC 790 work.

The student must be registered at USC during the semester that the dissertation is submitted.

Teaching Assistantship Requirement

Graduate students pursuing the Ph.D. in the GPMBBO must serve as a teaching assistant for at least two semesters; ideally, the student should serve in at least two different courses.

Student Progress Committee

Student progress will be evaluated annually by a standing committee of MEB faculty (the Student Progress Committee). Each student and his/her advisor will complete an annual evaluation form (Annual Student Progress Report Form by student, Faculty Evaluation Form by advisor; see forms attached at end). The information contained in these reports will be used to judge the progress of each student toward degree, including course preparation and grades achieved, research training, manuscript preparation, seminars presented, and the level and type of student support. Each student (and his/her advisor) will receive a report of his/her progress following a formal committee meeting and review.

Screening Examination

The Graduate School requires a Screening Examination. The exam is oral, about one hour in length, and should be taken before the student has completed 24 units of graduate work at USC. The Screening Committee (a standing committee within the MEB section) administers the exam. *The purpose of the Exam is to evaluate the student's academic preparation, determine competence to continue graduate study, and (in collaboration with the student's advisor) identify deficiencies to be remedied prior to the Qualifying Examination (e.g. specific courses, reading or training).* Prior to the Screening Exam, the student submits a 1-2 page to the Committee document outlining his/her academic background, activities during the previous year and present (and projected) research interests. The Exam begins with a *short* (5-10 minute) presentation by the student of their academic background and research interests.

The topics covered in the Screening Examination include:

- a summary by the student of their research while at USC
- biotic diversity, classification, and life histories
- organismal evolution and phylogeny; molecular evolution
- structure and physiology of cells and organisms
- biochemistry
- Mendelian, population, and molecular genetics
- biological, chemical, and physical oceanography
- statistics, experimental design, modeling and theoretical biology
- ecology and environmental sciences.

Each student's performance will be reported in writing to the student. A copy is placed in the student's file.

Guidance Committee

Composition of the Guidance Committee

Upon completion of the Screening Examination, the student's program of study is placed under the direction of the student's advisor and a five-member Guidance Committee. The Guidance Committee must be established at least one semester before the student takes his/her Qualifying Examination. Members of the Guidance Committee and its Chair are proposed to the Graduate School via the **Appointment of Committee** form by the student, with the advice and consent of the student's advisor. Therefore, the student should request appointment of the committee as soon as possible after the screening exam but certainly before the end of his/her third or fourth semester of enrollment in the Ph.D. program.

The composition of the guidance committee must meet the following guidelines:

- a) One member of the committee must be a tenured or tenure-track professor from a Ph.D. granting department at USC other than Biological Sciences. This "outside member" serves as the representative of the Vice Provost for Graduate Programs. For information see: http://www.usc.edu/schools/GraduateSchool/documents/StuServices/Role_of_Outside_Member.pdf
- b) Normally, the other four members of the committee are tenure-track faculty of the Marine Environmental Biology Section of the Department of Biological Sciences, but one of the members may be from another Section in Biological Sciences, and at least one must be tenured. The chair of the committee must be from the Marine Environmental Biology section. Co-Chairs are normally not permitted unless required by the Vice Dean of the

College, Office of Graduate Programs (see next paragraph). The student's advisor cannot be a member of the Guidance Committee but may attend and observe the Qualifying Examination and the subsequent executive session, in which the student's performance is evaluated.

In exceptional cases of academic merit, a person not meeting the above guidelines may be approved by the Graduate School to serve on a Guidance Committee. To request such an exception, the student must submit to the Graduate School a current Curriculum Vitae of the proposed member and a letter from the chair of the committee citing the particular expertise of the person and the relevance of the requested appointment along with the **Appointment of Committee** form. A specially approved member may not serve as the outside member (see below) or as sole chair of the committee, but may serve as a co-chair with a regular faculty member of the Marine Environmental Biology section. A guidance committee may include no more than one specially approved member unless the size of the committee is enlarged past five.

Request for changes in the composition of the Guidance Committee must be made in writing by the student to the Program. If approved, the committee is officially changed using the Graduate School's **Request for Change of Committee** form.

If the chair of the Guidance Committee will be absent from campus for any extended period of time (e.g., on leave) (s)he must appoint a temporary chair. The permanent chair will continue as a member of the Committee during his/her absence and will be in communication with the Guidance Committee. If the permanent chair must be absent at the time of the Qualifying Examination or the defense of the dissertation, a petition for formal appointment of a temporary chair must be submitted to the Graduate School.

Responsibilities of the Guidance Committee

The Guidance Committee is responsible, in consultation with the student's advisor, for preparing the student for the Qualifying Examination. The Guidance Committee is responsible for the evaluation of the student's performance on the Qualifying Examination. Specific responsibilities include:

- a. Meeting with the student and the student's advisor to evaluate progress towards meeting the recommendations of the Screening Committee and preparedness to take the Qualifying Examination.
- b. Monitoring the student's compliance with deadlines leading to the Qualifying Examination.
- c. Approval of the 1-2 page Research Abstract and full, 15-page Research Proposition.
- d. Administration and evaluation of the written and oral parts of the Qualifying Examination.

Qualifying Examination

Prerequisites for the Qualifying Examination

During the semester the exam is taken, the student must be enrolled in a departmental graduate course or GRSC 800. Permission to enroll in GRSC 800 is needed from the Graduate School. Students may register for GRSC-800 up to three times without having to petition. However, students are strongly encouraged to complete the qualifying examination during the first semester of GRSC 800. The GPMBBO requires that students have completed:

- a) All required core courses, each with a minimum grade of B.
- b) At least two graduate seminars.
- c) The statistics research tool requirement.
- e) Removal of inadequacies noted in the screening examination.
- f) Completion of the **Request to Take Ph.D. Qualifying Examination** form.

Depending on how the above requirements were met, the student may have to take additional course work to satisfy the Graduate School requirements that students have completed at least 24 units of course work applicable to the degree while in residence and with a minimum cumulative GPA of 3.0.

Timing of the Qualifying Examination

The Qualifying Examination **is normally taken during the student's fifth semester in the Ph.D. Program** and must be taken before completion of his/her sixth semester.

Components of the Qualifying Examination

The Qualifying Examination consists of a written and an oral part. The student's Guidance Committee conducts and evaluates both parts. Prior to the Qualifying Exam, the student must compose his/her research proposition. At least two weeks before the date of the oral examination, the student must submit one copy of the Research Proposition to each member of the Guidance Committee and one copy to the Marine Program's Student Affairs Administrator for the student's permanent file.

The Research Proposition (The Fifteen Pager) and its Preliminary Approval

At least two months before the anticipated date of the written examination, the student should meet with his/her Guidance Committee and provide them with a 1- or 2-page Research Abstract of the anticipated research program to be presented in the Research Proposition. The purpose of this meeting is to ascertain whether the anticipated research constitutes a defensible dissertation topic so that the student does not develop a detailed plan for a research program that has serious flaws and probably cannot be successfully defended in the oral examination. It is also to evaluate the student's academic preparedness for the Qualifying Exam. If the committee has reservations, modifications that are mutually satisfactory to the student and the committee can be worked out during this meeting or the student can be asked to submit a revised or new abstract.

Upon approval of the Proposition Abstract by the Guidance Committee, the student will develop it into a formal Written Proposition. This is to be in the form of a grant proposal and should include a short historical introduction, a statement of the problem and its significance, one or more hypotheses (if appropriate), the research design, anticipated results, methods to be used in interpretation of the results, and pertinent references. The treatment should be concise and should not exceed 15 single-spaced pages, including tables and figures but not references. The Written Proposition must have 1-inch margins all around, use an approved typeface (Arial, Courier New, or Palatino Linotype at a font size of 10 points or larger [Macintosh users also may use Helvetica and Palatino typefaces], Times New Roman at a font size of 11 points or larger, or Computer Modern family of fonts at a font size of 11 points or larger), black font color, and no more than 3 lines of text per inch.

The Written Examination

The written examination will consist of two sets of questions each day continuing over consecutive days until all sets of questions are complete. This examination can be taken on a laptop computer supplied by the MEB department administrator (i.e., the student cannot use their own computer). Each Guidance Committee member (with the possible exception of the "outside member" whose participation is optional here) submits three questions; the student must answer two of this set, spending about equal time on each and having a maximum of two hours per set. The order in which the sets of questions are taken is at the student's option.

Questions will be comprehensive in scope with respect to the student's chosen area of specialization and will be designed to test the student's conceptual, analytical and integrative ability and preparation.

Each member of the Examination Committee will grade his/her question on a scale of 1.0-5.0 using

0.5 unit steps if necessary (1.0 as poor and 5.0 as exceptional). The examination result will be calculated by averaging all the grades. Scores are tallied by the Chair of the Guidance Committee at the time of the oral exam, just prior to conducting the oral examination. A mean score of 3.3 or above for all questions is passing; below 3.0 is failing. Cases where the mean is between 3.0 and 3.3 or where two or more questions are graded below 3.0 are evaluated by the Guidance Committee followed by a vote, using a secret ballot. More than one negative vote of the Guidance Committee will result in failure of the student to pass the written examination.

The written part of the Qualifying Examination must be taken before (normally 2 weeks before) the oral examination described below. *The results of the written examination and the oral examination are given only at the completion of the oral examination.*

The Oral Examination

The oral examination will be in the area of the student's intended research and will be based on a research project selected and developed by the student into a Research Proposition.

The oral examination is usually taken two weeks after and must be taken within one month of the written examination.

The oral examination will be conducted and evaluated by the student's full 5-member Guidance Committee. Typically, the Committee meets briefly without the student to review the student's course work, other preparation and progress; to review the student's performance on the screening examination (copies of the student's transcript and Screening examination report should be obtained for each committee member from the Graduate Student Administrator by the Chair); and to agree on the exact format and order of questioning during the oral examination. Subsequently, the student typically presents the highlights of the research proposition [*15 minutes or less*]. Then members of the committee ask two or more rounds of questions. The questions are largely focused on the student's ability to conceive, conduct, evaluate of independent research and to communicate the results of such work. However, the oral examination is not limited to the context of the Written Proposition; as specific examples, questions are often asked a) from the written examination and b) concerning the removal of deficiencies identified during the Screening Examination.

On completion of the examination, the Guidance Committee meets in executive session (without the student) to evaluate the student's performance on the oral examination. Each member has one vote, pass or fail. More than one negative vote will result in failure of the student to pass the examination.

At the end of the executive session, the student is notified of the results on the two portions of the Qualifying Examination. Although one could pass both oral and written exams, only one of these exams, or neither exam, the student passes the Qualifying Examination (as a whole) only if his/her performances on both the written and oral portions are satisfactory. If the student passes both the oral and written examinations, he/she is indicated to have passed the Qualifying Examination on the Graduate School form **Report on Ph.D. Qualifying Examination**.

If the student fails the written examination or the oral examination or both, the committee must indicate that the student failed the Qualifying Examination on the Graduate School form **Report on Ph.D. Qualifying Examination**. The committee must make recommendations concerning the student's continuation in the graduate program. The committee usually grants the student a second chance to pass the failed portions (either part satisfactorily completed in the first examination does not have to be retaken), but may recommend that the student not repeat the exam or even deny a second chance (the latter action could be appealed to the Graduate School). The second attempt is a final one and can be taken no sooner than six months or later than twelve months after the initial failure.

Admission to Candidacy

After the student passes the Qualifying Examination, the Guidance Committee recommends to the

Graduate School that the student be admitted to candidacy for the Ph.D. Degree. Following admission to candidacy the student must register for BISC 794 Dissertation every semester, except summers, until the degree is awarded.

After the Qualifying Examination has been passed, the Guidance Committee will be dissolved and a Dissertation Committee requested via an Appointment of Committee form. The Dissertation Committee will comprise the student's advisor, serving as Chair, an outside member as required by the Graduate School, and two members of the GPMBBO faculty. Service on the Guidance Committee does not preclude or necessitate service on the Dissertation Committee. The GPMBBO does not allow the reduction of the Guidance Committee to a three-member Dissertation Committee as permitted by the USC Catalogue, except under special circumstances. If these circumstances are met, at least 2 members must be from the GPMBBO faculty.

Research

A student must undertake original investigation of a selected problem in marine biology or biological oceanography. This is normally based on the Written Proposition as presented in the Qualifying Examination, subject to acceptance by the student's committee. Subsequent changes of research direction or content must have advance approval by the student's advisor and Dissertation Committee.

Research Prior to Admission to Candidacy

Students in the GPMBBO are encouraged to conduct research at their earliest opportunity. Credit may be obtained for this research by registering for BISC 790. Ideally, this early research will develop into an appropriate dissertation topic. Certainly, the student will find it difficult to develop and defend a Research Proposition without significant exposure to research in general and the specific problem in particular. Such preliminary research should be based on a detailed plan prepared by the student and approved by his/her advisor.

Research Subsequent to Admission to Candidacy and its Relationship to the Written Proposition

As noted above, dissertation research is normally based on the Written Proposition as presented in the Qualifying Examination, subject to its acceptance by the student's committee. Difficulties frequently force revision of the planned study. The student's Dissertation Committee must approve in advance any such changes of research direction or content. *It is the student's responsibility to keep their Dissertation Committee members appraised of progress and/or changes. At least annual meetings between the student and the Dissertation Committee will be held, preferably shortly after the student's annual presentation in the weekly seminar series.*

Publication Prior to Submittal of the Dissertation

Prompt publication of research results is very strongly encouraged in the GPMBBO. Students should organize their research efforts into blocks that a) can be completed in sequence, and b) represent topics for separate future papers so that submittal of one or more papers can be completed during their graduate tenure. Advisors often require students to submit one or more papers before completing their dissertation.

Authorship of such papers is significant. If the student is the sole author or if the student is the first author with the advisor as the only additional author, it implies that the student did most if not all of the research and hence the entire contents of the paper may be acceptable for incorporation into the dissertation. If the advisor contributed significantly to the research or if other individuals (other graduate students, faculty, post docs, research technicians, etc.) are co-authors, only that part of the paper which represents the student's work may be incorporated into the student's dissertation.

A published work may be incorporated into the body of the dissertation but may not be appended in the form of a reprint according to Graduate School regulations. The student is advised to seek the

approval of the dissertation committee before submittal of a manuscript that is to be included in the dissertation since that committee must ultimately approve all contents of the dissertation. The fact that material has been submitted (accepted, published) does not mean that it will be allowed to be incorporated without revision by the committee.

Preparation and Defense of the Dissertation

A dissertation represents a significant contribution to science that is based on an original research program completed by the student. Determination of the adequacy of the research program is the sole responsibility of the student's Dissertation Committee. Approval of the dissertation itself is primarily the responsibility of the student's Dissertation Committee, but the completed dissertation must also be examined by the Thesis Editor of the Graduate School to determine if it meets the grammatical standards and other requirements described in *Guidelines for the Format and Presentation of Theses and Dissertations* published by the University of Southern California and available online at http://www.usc.edu/schools/GraduateSchool/current_thesis_dissert_05.html. Additional regulations and information on the organization and preparation of the dissertation are provided in *Directions for Preparation of Dissertations and Research Reports as Required by the Graduate Program in Biology/University of Southern California*. Students should obtain a copy of both sets of regulations before they initiate their writing.

GPMBBO students defend an advanced draft of the dissertation rather than a "final" copy typed on dissertation paper. The advanced draft should be complete, including all text, figures, tables, references, etc. and the draft must be in a suitable form for final typing. Before assembly of a complete draft is initiated, the student should confer with his/her full committee to determine whether adequate research has been completed.

The student's advisor is the individual responsible for determining whether or not a draft is sufficiently refined for distribution to the full Dissertation Committee. Portions or all of earlier drafts may be submitted to some or all of the committee members for suggestions and evaluation at any time. The thesis draft to be defended must be given to the Dissertation Committee at least one month prior to the thesis defense date.

Presentation and oral defenses of the dissertation are achieved in a formal seminar open to all members of the academic community and in a closed meeting of the student and the Dissertation Committee.

Since the final copy of the dissertation must be uploaded to the Graduate School and Library at least three weeks prior to the end of the term in which the degree is to be granted and since the student must allow adequate time after the defense for corrections and final typing, the defense should be scheduled at least six weeks before the end of the term in which the student plans to graduate. Please consult with the Graduate Program Coordinator in order to ensure that all requirements and deadlines are met.

Before undertaking the Dissertation Defense, the student must have completed (or be in progress of completing) all other degree requirements.

The Chair of the Dissertation Committee is required to notify the Student Affairs Administrator of the GPMBBO of the date, time, and place of the defense of the dissertation, so that a notice of the Dissertation Seminar and Defense may be distributed to all faculty and graduate students of the Department at least **two weeks** in advance. The date selected for this defense cannot be on an official University holiday (e.g., Labor Day, President's Day, etc.).

The open oral defense of the dissertation is achieved in a formal 50-minute "research" seminar such as would be given by a visiting scholar. The presentation is open to the public and the student should be prepared to answer all questions from members of the audience, including those on the Dissertation Committee. The period of questioning is not to be limited in time.

The dissertation is also subject to a detailed defense made before the full Dissertation Committee in a meeting that is usually held shortly after the conclusions of the seminar. At this meeting, which is typically two-three hours in length, the Dissertation Committee must critically evaluate the dissertation and determine whether or not it is to be accepted. To be acceptable, the dissertation must represent a major, original contribution to science.

Only members of the Dissertation Committee may vote whether to pass or fail the student (accept or reject the dissertation and its open defense in the seminar). A vote to pass the student must be unanimous and such a vote does not preclude that the committee may require modifications of the dissertation. Reasons for failure of the defense should be clearly identified by the committee and may include a) a flawed research plan, b) nonconclusive or inadequate research results, c) major deficiencies in the dissertation, etc. A student who fails the defense the first time is normally given a second opportunity, but any decision on re-examination is at the discretion of the Dissertation Committee.

If the defense is satisfactory and no major revisions of the dissertation are required, all members of the Dissertation Committee sign the **Approval to Submit Defended and Final Copy of Doctoral Work form**, which is submitted to the Graduate School. If significant revisions of the manuscript are required, the **Approval** form is not signed until such revisions are completed. The Chair of the Dissertation Committee may be assigned full responsibility for determining that the required revisions have been made, but some or all other members of the committee may request that they also be involved in the final approval. The signed **Approval** form signifies approval of the dissertation and defense by the committee.

If the Approval form is signed and dated by the drop/add deadline for FALL or SPRING, no further registration is required.

Once the student has successfully defended the dissertation, a dissertation profile should be created on the Graduate School web site <http://grad.usc.edu/WebThesis/> as well as completion of the document checklist process. When approved, the manuscript can be uploaded in PDF format for review by the editing staff. The student also needs to prepare and upload an abstract of the dissertation

The **SIGNATURE PAGE** is bound with the dissertation to verify that the dissertation has been approved by the Committee and accepted by the Graduate School. Signatures required on this form are those of the Committee and the Graduate School.

In addition to the original copy required by the Graduate School, one hardbound copy of the dissertation must be presented to the Department of Biological Sciences and another to the chair of the student's (Guidance and) Dissertation Committee.

The student must pay a Publication and Processing Fee in the University's Cashier's office and submit a receipt of payment to the Graduate School upon submitting the dissertation.

The **SURVEY OF EARNED DOCTORATES** must be completed and returned to the Graduate School for approval.

The **Verification of Completion of the Requirements for the Doctoral Degree** form must be signed by the Chair of the Department of Biological Sciences. The signed **Verification** form signifies completion of all departmental degree requirements and all University degree requirements. Most important of all, it indicates that the degree has been cleared for conferral. The completed **Verification** form is submitted by the Graduate Programs Manager to the Graduate School for approval. Once the Graduate School has received and approved the form, you have officially graduated!

COURSES AVAILABLE IN MARINE ENVIRONMENTAL BIOLOGY

- BISC 582 Biological Oceanography, offered each Fall.
- BISC 583 Evolution and Adaptation of Marine Organisms, offered each Spring.
- BISC 584 Faculty Lecture Series, offered each Spring (MEB Faculty)
(2 units)
- BISC 585 Scientific Writing and Reviewing, offered each Spring
(2 units)
- BISC 586 Biological Oceanographic Instrumentation
- BISC 529 Marine Environmental Biology Seminar
(1 unit; 4 units required, maximum)

Advanced Graduate Seminars, offered on a rotating basis; check current Schedule of Classes
(2 units each; 8 units required)

- 530 Plankton Biology (Caron & K. Heidelberg, Schnetzer)
531 Physiology of Marine Organisms (Gracey, Manahan)
532 Molecular and Microbial Ecology (Fuhrman)
533 Remote Sensing and Modeling (Kiefer)
534 Population Genetics of Marine Organisms (Edmands & Hedgecock)
536 Marine Biogeochemistry & Microbial Ecology (Capone & Ziebis)
538 Metals and Biology in Oceanic Regimes
599 Ocean Optics (Jones)
599 Communicating Ocean Science (Jacobsen, Michaels, Sullivan)

'Quick Check List' of Student/Advisor Responsibilities

First Month (Late Summer/Early Fall; ASAP, before classes get going)

Each student meets with the "Screening Committee" (same composition as the Admissions Committee for that year, plus the student's advisor). This committee will be the same one that administers the Screening Exam at the end of Year 1. The Screening Committee evaluates each student's background and advises on courses to be taken in the first 1/2 years to develop each student's background in marine science (and specific area of interest).

By the End of Year 1 (Summer)

Student completes the Screening Exam, which tests the student's general scientific knowledge, and identifies weaknesses that need to be addressed. The student will receive written comments from the committee on the "Screening Examination Results" form.

Beginning of Year 2 (Fall)

Student and advisor compose and request appointment of a Ph.D. Guidance Committee, which meets with the student near the beginning of the second year. Prior to the meeting, the student submits a (at least) 1-2 page document outlining his/her proposed research. Following a brief presentation by the student, the committee provides feedback, which includes a second review of the student's coursework and training, and any appropriate recommendations for further course work or directed study.

Year 3

The student must complete the Qualifying Examination (as described in "Requirements and Policies" document) by the end of Year 3. At least one month prior to the exam, the student completes the "Request to Take Ph.D. Qualifying Examination" form (available online). At least two months prior to the exam, the student must submit a thesis proposal (the fifteen-pager) to the Guidance Committee and obtain permission to proceed to the exam. The Chair of the Guidance Committee should obtain the student's file for the Qualifying Examination. A "Report on Ph.D. Qualifying Examination" form will be in the file for all committee members to sign.

Years 3-5

Following successful completion of the Qualifying Examination, the Ph.D. Guidance Committee is dissolved and a new Dissertation Committee is requested. The student meets *at least* annually with the committee. A short memo describing the students' progress (signed by all committee members) is submitted to the Section office following each annual meeting.

Additional Annual Requirements:

Yearly Seminar: Each student must present a 20-minute seminar once each academic year beginning in their second year.

Yearly Progress Reports: On or by May 15th, each student will complete and submit to the Section office a brief progress report (signed by each member of their Guidance or Dissertation Committee) detailing their activities during the previous 12 months (courses taken, research undertaken, seminars given at USC and elsewhere, participation in cruises, etc.). Forms for these reports will be emailed to students as a reminder.

**Annual Student Progress Report
(June 1, XXXX – May 31, XXXX)**

Date: _____

Student: _____

Advisor: _____

Year(s) in Program: _____

Financial Support (Type & No. of months this year): _____

Present Committee Members: _____

(Screening, Guidance or Dissertation Committee?): _____

Date of Last Full Committee Meeting: _____

Anticipated (or Completion) Dates for:

Screening Exam: _____
Formation of Ph.D. Guidance Committee: _____
Qualifying Exam: _____
First Meeting of Dissertation Committee: _____
Completion of Research: _____
Dissertation Defense: _____

Please attach a summary of your progress during the past year (June-May):

What have you been doing during the last year; guidelines below, but feel free to add items; *bulleted accomplishments are fine*. Note any difficulties you are having.

- BRIEF summary of research progress, problems, future plans.
- Courses completed or audited.
- TA duties.
- Participation in lab and field research.
- Meetings/workshops attended.
- Seminars given (USC and elsewhere) include titles, locations, etc.
- Citations for manuscripts submitted, in press or published.

Faculty Evaluation Form
(June 1, XXXX – May 31, XXXX)

Date: _____

Student: _____

Advisor: _____

Overall evaluation:

- _____ **Making excellent progress**
- _____ **Making good progress**
- _____ **Making minimal-to-fair progress**
- _____ **Making little or no progress**

Specific evaluation of student's progress:

Things to consider:

- Is he/she on track for graduation in a reasonable amount of time?
- Any noteworthy accomplishments?
- Progress on coursework and/or research satisfactory?
- Preparation for quals satisfactory?

Problems or issues that need to be addressed or noted:

- Academic (coursework/grade) problems?
- Time management issues?
- Writing or research problems?

Feel free to add any pertinent information.

Report of the Graduate Screening Committee

Committee members: _____

Student: _____

Faculty Advisor: _____

Attached are the results of the screening evaluation. A copy of this evaluation will be placed in the student's permanent file.

Explanation of the evaluation:

The committee seeks to evaluate the general undergraduate-level background of each student in a broad range of topics in biology. While our coverage is necessarily cursory and superficial, we believe that the format is sufficient to reveal the student's preparation. We rate the student in each of the subject areas as:

Good. Better than average grasp of the topic. This level of understanding is expected of all students in topics near their chosen field of specialty. With continued normal study in and outside of the classroom, the student is on the right track for their professional career.

Adequate. Minimal acceptable grasp of the topic. This level is expected of all students in those topics that are outside of their area of concentration. For topics near one's specialty, this rating may be considered below that preferred at this stage in the student's studies. With extra attention to these areas, the student should be developing to broaden their knowledge in this topic.

Inadequate. Below the minimal grasp of a subject area. Students **MUST** strive to exceed this level in all areas covered. This rating represents a deficiency, and the student should recognize that a greater than normal effort must be devoted to studying and gaining a grasp of terms and concepts in this field.

We emphasize that the screening exam is advisory. Doing well does not guarantee the student an easy time on future exams, nor does doing poorly guarantee an especially hard time for you. Indeed, it is the goal of this process to offer guidance that will enrich your career development in science, not just to pass any upcoming test.

Screening Evaluation Report Sheet

Student: _____

Date: _____

TOPICS

COMMENTS

1. Evolutionary Biology

- a. Phylogeny and classification
- b. Plant and animal diversity
- c. Functional morphology
- d. Life history strategies

2. Genetics

- a. Mendelian
- b. Molecular
- c. Population

3. Biochemistry

- a. Structural
- b. Functional
- c. Metabolism (incl. respir. & photosyn.)

4. Physiology

- a. Cellular
- b. Systems
- c. Organismic

5. Ecology

- a. Organismic
- b. Population, species
- c. Systems, cycles

6. Quantitative skills and reasoning

- a. Units
- b. Equations

Course of Action:

If you received a rating of **Good** in your specialty and **Adequate** in other areas, continued attention and normal growth in these topics through classroom, library, and laboratory work will probably be proper preparation.

Adequate in your specialty suggests that you should seek specific opportunities to increase your familiarity in and grasp of these areas. Especially good options include participating/auditing/TAing an undergraduate course covering this area, as suggested by the committee, and focusing on graduate seminars and readings.

Inadequate suggests specific remedial action. Specific attention should be paid by the student and the advisor to address these potential problem areas. At a minimum we expect you to understand at the level of the freshman biology text now in use. You will want to read the appropriate chapters of that text. TAing a general class on the deficient topic will provide an opportunity to attend lectures and read the textbook, more than needed for general TAing duties. In many cases, formally taking an undergraduate class (if available) may be the appropriate action. Few students are well prepared across the board, and 8 units of undergraduate classes at the 400-level are fully acceptable for graduate credit.

In all cases, regardless of your evaluation, use this time to think a bit about how you approach the various academic opportunities you are encountering. In our experience, successful graduate students all make a transition from an “undergraduate mentality” to a graduate “professional mentality”. Part of this transition involves taking responsibility for your own development and maturation as a scientist. Seek to build a unified conceptual framework.

Suggested Remediation:

Timeline to completion:

Other comments:

APPENDIX 1. MEB Relevant Courses

BISC Courses offered on the UPC (other than MEB graduate courses listed above)

403 Advanced Molecular Biology (4 units)
419 Environmental Microbiology (4 units)
435 Advanced Biochemistry (4 units)
450 Principles of Immunology (4 units)
460 Seminar in Marine and Environmental Biology (2 units)
469L Marine Biology (4 units)
483 Geobiology and Astrobiology (4 units)
502ab Molecular Genetics and Biochemistry (4, 4 units)
510 Integrative and Evolutionary Biology (4 units)
549 Seminar in Integrative and Evolutionary Biology (2 units)

Related Advanced Courses in Other Departments that can be used to meet course requirements

GEOL 412 Oceans, Climate and Environment (4 units)
GEOL 460L Geochemistry and Hydrogeology (4 units)
GEOL 500 Paleocology (3 units)
GEOL 501 Paleobiology (3 units)
GEOL 512 Introduction to Physical and Chemical Oceanography (3 units)
GEOL 514 Marine Geology (3 units)
GEOL 555 Paleo-oceanography (3 units)
GEOL 560 Marine Geochemistry (3 units)
GEOL 564 Isotope Geochemistry (3 units)
GEOL 567 Stable Isotope Geochemistry (3 units)
GEOL 577 Micropaleontology (3 units)

GEOG 587 GPS/GIS Field Techniques (Catalina Island Summer Source) (4 units)

PPD 694 Coastal Policy and Planning (4 units)

ENG 443 Environmental Chemistry (3 units)
ENG 463L Water Chemistry and Analysis (3 units)
ENG 503 Microbiology in Environmental Engineering (3 units)
ENG 513L Instrumental Analysis (3 units)
CTSE 507 Issues, History & Rationale of Science Education (McComas)
CTSE 509 Advanced Science Teaching Methods (McComas)

Statistics Courses

BISC 305 Introduction to Statistics for Biologists (Waterman, Chen - Fall 07)

PSYC 501 Statistics in Psychological Research (4, Fa) Principles of descriptive and inferential statistics for psychological research; introduction to analysis of variance and regression. Computer methods.
Prerequisite: PSYC 274. (Wilcox)

PSYC 502 Analysis of Variance and Experimental Design (4, Sp) Experimental designs and their analyses of variance beyond straightforward factorial, nested, or repeated measures designs. *Prerequisite:* PSYC 501.

PSYC 503L Regression and the General Linear Model (4, Fa) Multiple regression as a tool in experimental and non-experimental data; analysis of variance and covariance as regression on coded variables. Computer applications Laboratory exercises. *Prerequisite:* PSYC 501.

PM 340L Health Behavior Statistical Methods (4, FaSp) Intermediate statistics for health behavior studies; topics include descriptive statistics, hypothesis testing, correlation and regression, and use of computer software in data analysis.

PM 510L Principles of Biostatistics (4) Concepts of biostatistics; appropriate uses and common misuses of health statistics; practice in the application of statistical procedures; introduction to statistical software including EXCEL, SPSS, nQuery. Laboratory.

PM 511abL Data Analysis (4-4, a: Fa, b: Sp) *a:* Major parametric and nonparametric statistical tools used in biomedical research, computer packages including SAS. Includes laboratory. Lecture, 3 hours; laboratory, 1 hour. *Prerequisite:* PM 510L. *b:* Exploratory data analysis, detection of outliers, robust methods, fitting data with linear and nonlinear regression models, computer packages including BMDP. Includes laboratory. Lecture, 3 hours; laboratory, 1 hour. *Prerequisite:* PM 511aL.

Catalina Semester Courses:

431L Environmental Microbiology (4, F)
455L Molecular Approaches to Microbial Diversity (4, F)
474L Ecosystem Function and Earth Systems (4, F)

447L Natural History and Island Ecology (4, Sp)
456L Conservation Biology (4, Sp)
437L Comparative Physiology of Marine Animals (4, Sp)

490 Independent Research (4, F, Sp)
590 Independent Research (4, F, Sp)