

**Master of Science Program in Tropical Conservation Biology and Environmental Science  
College of Arts and Sciences  
University of Hawai`i at Hilo**

A SELF-STUDY IN SUPPORT OF CHANGE FROM PROVISIONAL TO  
ESTABLISHED STATUS

**1. IS THE PROGRAM ORGANIZED TO MEET ITS OBJECTIVES?**

**Program Description:**

The Master of Science program in Tropical Conservation Biology and Environmental Science (TCBES) program is administered by the College of Arts and Sciences at the University of Hawai`i at Hilo. It is a 30-36 semester hour program. The program currently is the only one in the University of Hawai`i system that trains students in the interdisciplinary fields of conservation biology and environmental science at the master's degree level. The program admitted its first cohort of students in the Fall semester of 2004 and produced its first nine graduates in May of 2007 with an additional 14 graduates in 2008. As of July 2010 forty-four students have graduated from TCBES.

TCBES unites 34 faculty at UH Hilo with 51 affiliated faculty from federal and state agencies and other universities. Participating UH Hilo faculty reside in the Anthropology, Biology, Chemistry, Geography, Geology, and Marine Science Departments of the College of Arts and Sciences, and in the College of Agriculture, Forestry and Natural Resource Management. As a multidisciplinary, multi-college program, TCBES encourages and facilitates sustained collaboration across the research areas of ecological and evolutionary genetics, ecosystems analyses and responses to environmental change, cyberinfrastructure for environmental research, and geospatial analyses. Faculty and students engage in projects in environments that range from marine and coastal habitats to tropical rainforests, mesic and dry forests and shrublands, and rivers. At the core of the TCBES Program are the dynamic research collaborations between faculty, students and federal and state agencies on Hawai`i Island.

The primary purpose of the MS in TCBES is to provide graduate training in conservation biology and environmental science to people with baccalaureate degrees and others currently working in the field. The program utilizes the extraordinary biological, physical and cultural complexity on the Island of Hawai`i as a focus of investigation and study. The program prepares students for technical positions and for entry into Ph.D. programs in related fields.

**Program Objectives:**

- Foster knowledge of current trends and issues in conservation biology and environmental sciences including basic and applied research and natural resource problems.
- Provide participants with experiences in conceptual and technical research in ecology, evolutionary genetics, geographic analysis, environmental monitoring and assessment in marine and terrestrial environments.
- Promote research and scholarly activities that will enable participants to enter the scientific research community.

## **Participants of the program:**

- Perform scientific research in the interdisciplinary field of conservation biology and environmental science.
- Develop skills in natural resource and protected area management.
- Use advanced technological equipment, perform quantitative analysis and interpret complex data.
- Present scientific results in oral and written publications.
- Interpret and critique professional scientific literature.

## **Prospects for Graduates:**

Graduates of the program will be able to seek employment with numerous Federal and State agencies such as USDA Forest Service, USDA Agricultural Research Services, USGS Biological Resource Division, US Fish & Wildlife Service, US National Park Service, Hawai'i Department of Land and Natural Resources, Nature Conservancy, National Oceanographic and Atmospheric Agency and as teachers and researchers with schools and universities. Employment prospects for professionals in the conservation biology and environmental sciences field are currently good in Hawai'i and in many other areas of the United States. Employment opportunities in this field are expected to grow at a faster than average rate over the coming years. A partial list of the employment of the TCBES graduates is in section 5.

Graduates of the program will also be able to seek further education primarily by enrolling in Ph.D. programs. The Masters of Science in TCBES prepares the students for the rigors of graduate school and gives them the preparatory background to be successful in a related Ph.D. program.

## **Admission Requirements:**

To be eligible for admission to the Master of Science in Tropical Conservation Biology and Environmental Science, students must meet the following minimum requirements:

1. have earned a baccalaureate degree from an accredited institution or from a nationally recognized foreign institution.
2. in her/his personal statement, list advisor(s) from the TCBES faculty who agrees to sponsor the application and to serve as primary advisor upon acceptance to the program.
3. have a minimum combined verbal and quantitative score of 1000 on the General Graduate Record Exam (GRE).
4. have a grade point average of 3.0 (4.0 = A scale) or the equivalent in the last four semesters of approximately 60 semester credits of undergraduate and/or in all post-baccalaureate work.
5. submit three letters of recommendation from references who have observed or supervised the applicant's performance and are able to comment on the quality of the applicant's academic achievement, ability to pursue graduate study, and general character.
6. earn a score of 550 TOEFL (paper based), 213 (computer-based) or 79 (internet based) (for students who have not attended an English language university, or for whom English is not the primary language).

\*Recommended course work prior to admission: 2 years chemistry; 1 year calculus; 1 course in geographic information or remote sensing, 1 course in statistics; 2 courses in life sciences; 2 additional courses in physical sciences.

Meeting the minimum requirements does not guarantee admission. Eligible applications are reviewed by the TCBES Graduate Admissions Committee which uses multiple criteria for the assessment of applicants. Admission is selective.

### **Application Procedure:**

The priority application deadline for Fall admission is February 1. Applications received in the UH Hilo Graduate Office of Admissions after the deadline are considered on a space available basis. Students who submit applications after the February 1 deadline may be ineligible for certain types of financial aid.

Complete applications that meet the minimum admission requirements are forwarded to the TCBES's Graduate Admissions Committee, which reviews each application. Admission decisions are made by this committee and forwarded to the UH Hilo Graduate Office of Admissions.

The UH Hilo Graduate Office of Admissions receives applications and supporting documents and maintains the applications through final notification. In general, for applications received by the priority deadline, the Graduate Office of Admissions notifies each applicant of acceptance or rejection by March 1. Applicants must submit all of the following items:

1. UH Hilo Graduate application form.
2. Application fee.
3. Official transcripts from all colleges or universities attended (must be received directly from the institution or in a sealed envelope if submitted with your application).
4. Personal statement (see the program website).
5. Resume.
6. Three professional recommendation letters, which may use the special recommendation forms (not required, however) included with the application materials. The recommendations should be sent directly to the UH Hilo Graduate Office of Admissions by the referees.
7. GRE general test scores (sent to UH Hilo directly by the testing service).

In addition, international applicants must submit the following items:

- International Graduate Student Supplementary Information Form (<http://www.uhh.hawaii.edu/forms/index.php>).
- TOEFL scores (if English is not the applicant's native language).
- Official college transcripts in the original language accompanied by official translations into English.
- Official evaluation of the bachelor's degree transcript if awarded at a non-US institution.

## **Transfer of Credits:**

Requests for transfer of credits must be made during the first semester in which the student is enrolled in the program. Students need to obtain program approval for all credit transfers. Only credit hours with a grade of B or better from accredited universities are transferable. Transfer credit hours must have been completed within five years prior to admission.

## **Course Substitutions:**

Up to six credits of 400-level courses can be used to substitute 600-level courses, with the approval of the program chair.

## **Program Curriculum:**

Total Credits Required:

- Plan A = 30 credits
- Plan B = 36 credits

Core Courses (8) credits required for all M.S. TCBES students:  
(CBES is the four letter alpha for TCBES courses):

- CBES 600 (3) Conservation Biology and Environmental Science
- CBES 601 (3) TCBES Field and Laboratory Methods
- CBES 602 (1) Research Seminar in TCBES
- CBES 603 (1) Natural Resource Management Seminar

Elective Courses\*:

Plan A: 16 elective credits of 600-level CBES courses.

Plan B: 25 elective credits of 600-level CBES courses.

\*A maximum of 6 credits of 400-level courses may count toward these elective credits.

- CBES 610 (3) Environmental Chemical Analysis
- CBES 615 (3) Global Environmental Change
- CBES 620 (3) Research Techniques in Molecular Conservation Biology
- CBES 630 (3) Near shore Monitoring and Analysis
- CBES 633 (3) Biodiversity
- CBES 635 (3) Physical Environment of Ecosystems
- CBES 640 (3) Advanced Remote Sensing and Digital Image Processing
- CBES 645 (3) Applying Social Science to Marine and Coastal Resource Management
- CBES 650 (3) Oceanographic Monitoring and Analysis
- CBES 655 (3) Ecological Physiology
- CBES 665 (3) Environmental Toxicology
- CBES 660 (3) Molecular Ecology
- CBES 670 (3) Advanced Techniques in Geographic Information Systems
- CBES 675 (3) Conservation Genetics

- CBES 677 (3) Quantitative Ecology
- CBES 680 (3) Advanced Statistical Analysis and Research Design
- CBES 685 (3) Behavioral Ecology and Evolutionary Analysis

Other Courses:

- CBES 690 (3) Internship (Plan B: 3 credits required)
- CBES 694 (1-3) Special Topics in Tropical Conservation Biology and Environmental Sciences
- CBES 699 (1-3) Directed Research
- CBES 700 (1-6) Thesis Research (Plan A: 6 credits required)

## **2. IS THE PROGRAM MEETING ITS LEARNING OBJECTIVES FOR STUDENTS?**

Among the objectives of the TCBES program is to provide an intellectually enriching experience, as well as to prepare students for careers in Conservation Biology. In Spring 2009, all former and current participants in the TCBES program were sent a survey, and 43 of 71 participated, for a 61% response rate. The results of the survey speak to the perceived strengths and weaknesses of the TCBES program.

Answer Options	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
1. The Program fosters knowledge of current trends and issues in conservation biology and environmental sciences	23%	51%	9%	16%	0%	0%
2. The Program fosters knowledge of basic research	23%	58%	12%	7%	0%	0%
3. The Program fosters knowledge of applied research	21%	35%	33%	7%	5%	0%
4. The Program provides skills in natural resource and protected area management	9%	23%	23%	26%	16%	2%
5. The Program promotes research and activities that will enable participants to enter the scientific research community	16%	51%	19%	12%	2%	0%
6. The Program provides experience in performing scientific research in conservation biology and environmental science	21%	49%	12%	14%	5%	0%
7. The Program provides experience in using advanced technological equipment, performing quantitative analysis and interpreting complex data	7%	37%	30%	14%	12%	0%
8. The Program provides opportunities for presenting scientific results in oral and written publications	19%	40%	26%	14%	2%	0%
9. The Program provides experience in interpreting and critiquing scientific literature	33%	40%	19%	9%	0%	0%
10. The Program provides appropriate training for moving on to PhD studies	12%	33%	28%	12%	14%	2%
11. The Program provides appropriate training for obtaining employment in the field	9%	37%	30%	14%	9%	0%
12. I am satisfied with the graduate student support facilities on campus	0%	23%	21%	23%	28%	5%
13. I am satisfied with the support I receive from my thesis committee	21%	35%	14%	5%	14%	12%
14. I am satisfied with the support I receive from my thesis advisor	42%	21%	14%	12%	9%	2%

These results indicate that most of the respondents strongly agreed or agreed that the main objectives of the program were met: questions 1, 2, 3, 5, and 6 (56% to 84%) and that they were satisfied with opportunities for presenting research, interpreting scientific literature, and support from their committee and advisor (59% to 77% responses strongly agreed or agreed). Based on these results, it is concluded that the program is meeting its learning objectives for students.

While the program faculty and university can be satisfied with the positive ratings from most of the graduates, the uncertain and lower ratings on particular issues also need to be addressed. As an example, the program is now addressing the need to provide more skills in natural resource management (question 4) with a seminar each spring term in Natural Resources Management, and there is a new course on Science and Policy being offered for the first time in Spring 2009. In addition, question 7 addressed experience using advanced technical equipment and performing analyses. There are a number of technical and quantitative elective courses and three core research and education facilities that offer advanced technical equipment in analytical chemistry, genetics and geospatial analysis. The program will integrate these facilities more tightly with course offerings. The program now offers an advanced statistics course (Fall 2009) that should also address this issue. The slightly lower agreement by the respondents for the program providing training for moving on to Ph.D. degrees (question 10) and in obtaining employment (question 11) does not agree with the realized career achievement of the graduate students. Most of the TCBES graduate students obtained employment or pursued Ph.D. degrees after finishing the TCBES masters program. Please see section 5 below (Evidence of Program Quality) where the success of the graduate students is listed. The lowest rated question concerned the graduate student support facilities provided. The TCBES program has not been provided with sufficient space on campus for graduate students to study as is typical of successful graduate programs. It is clear that this space issue must be addressed in the future.

As the program moves forward it is clear that special attention needs to be made in providing the program with specific allocation of resources to compensate faculty in departments to teach in the TCBES program so that specific courses can be taught that are important for the graduate students. In addition, TCBES graduate student space needs to be provided on campus that will allow the graduate students to study and collaborate with each other and with their faculty advisors in a more meaningful way.

Another way to determine if the program is meeting its learning objectives for students is through an assessment of the students work. Assessment of students in the TCBES program occurs in a number of stages. First, the students take two CBES “core” course as a cohort during their first semester. These courses are designed to ensure that all students possess a background of skills and knowledge essential to the program. The students work closely during this semester with three TCBES faculty, who are able to provide very detailed feedback to the students on their progress. Students then receive a grade for both courses, and if they receive less than a “B” they must take the course again. Students are also evaluated in subsequent semesters (primarily through grades) by TCBES faculty as they continue to take elective courses to fulfill the requirements of the program. The most relevant assessment of the quality of a student’s research is done by the 3 member thesis committee. This committee is responsible for reviewing, editing, and finally signing off on the Masters Thesis. As outlined under Question 5 below, 27 Masters Theses have been judged to be of high quality and accepted by the Thesis Committee. Finally, the publication of manuscripts in peer reviewed journals is another excellent gauge of the quality of student work. To date, at least 14 manuscripts authored by current or former TCBES students have either been accepted by peer reviewed journals for publication or are in review.

### **3. ARE PROGRAM RESOURCES ADEQUATE?**

The TCBES program was initiated in conjunction with the National Science Foundation Experimental Program to Stimulate Competitive Research (NSF EPSCoR) Research Infrastructure Improvement (RII) grant programs that were awarded to the University of Hawai'i from 2003-2009. These NSF EPSCoR RII grants provided UH Hilo with three education and research facilities: Hilo Analytical Chemistry Facility, Hilo Core Genetics Facility, and Spatial Data Analysis Laboratory. The equipment and personnel endowed the TCBES Masters program with a forceful beginning and they are essential to its long-term success. In addition, nine faculty members were hired in association with the NSF EPSCoR RII grants. These faculty members are currently tenure-track faculty in Biology, Geography, Marine Science, and the College of Agriculture, Forestry and Natural Resource Management. These EPSCoR-hired faculty members joined the other faculty in the TCBES program and now there are 34 UH Hilo faculty and 51 certified faculty in the program. The certified faculty are researchers from outside UH Hilo who are reviewed and accepted by the UH Hilo graduate council to serve in the TCBES program. These certified faculty members provide breadth and depth to the TCBES program for both course offerings and basic and applied research. Additional information about the areas of expertise of these faculty members are presented under #5, Evidence of Program Quality.

The following resources are requested to sustain the high quality of the TCBES program:

#### **1) Director and Secretary Positions.**

The first two NSF EPSCoR RII grants supported the Director position but these grants ended in May 2009. The current NSF EPSCoR RII grant does not support the Director position or secretary position. The TCBES program involves 34 UH Hilo faculty, more than 50 certified faculty and between 42-65 graduate students each year in the program. The faculty and students require administrative support for this complex and dynamic program. *The University has recently established a permanent Director for the TCBES program and a part-time Executive Assistant position has recently been filled to assist the TCBES program.*

#### **2) Graduate Teaching Assistant positions for TCBES program.**

The Graduate Teaching Assistants could support undergraduate education in the departments associated with the TCBES program while providing academic training for graduate students. The departments associated with the TCBES program teach laboratory courses and large lecture classes that could employ graduate teaching assistants to assist departments in teaching undergraduate students.

Currently, the graduate students are primarily supported by extramural grants. The current EPSCoR grant supports 5 or 6 graduate students as research assistants to individual faculty. The current NSF CREST grant supports 9 graduate students per year to work with individual faculty. The previous NSF GK-12 grant supported 9-10 graduate students in K-12 activities. There are additional grants awarded to individual faculty that support some additional graduate students in the program. While these grants are important for both faculty and graduate students they do not provide the reliable base support that a quality graduate program in the sciences requires.

*The University will implement its first teaching assistantships in Fall 2011, with two TAs assigned to teach undergraduate laboratory courses in Biology. Additional teaching assistantships will be phased in as the University's budget permits.*

**3) Faculty compensation for mentoring TCBES graduate students and additional credit for teaching TCBES graduate courses.**

The Faculty members who mentor graduate students in the TCBES program need to be compensated for the time spent advising graduate students in research. Faculty members spend extensive time training graduate students who are engaged in their thesis research over the 2.5 to 3 years that each student is in the program. To date all but one student who graduated from the program completed a thesis research project and registered for 6 credits of Thesis Research (CBES 700) with their faculty advisor. In addition, high quality graduate courses require the faculty to be current in the topic area and devote additional time preparing for these courses. The TCBES program has been challenged each year to recruit faculty to teach in the program and this is due, in part, to the additional work required to teach graduate courses. *The Graduate Council has recently drafted a faculty workload compensation plan for faculty that are thesis advisors in graduate programs and who teach graduate-level courses. A proposal will be submitted to the University Administration that will be considered for implemented by Fall 2011.*

**4) Instructional support in the TCBES program and associated Departments.**

The TCBES program is continually challenged to offer a diversity of courses necessary for this interdisciplinary program. One reason for this difficulty is that the primary responsibility of faculty has traditionally been to the instruction in the undergraduate departments. *The TCBES program will be provided \$6000 per course offered to compensate Departments that provide faculty to teach in the TCBES program or pay certified faculty to teach the TCBES courses. This will begin in Fall 2011 and should result in a more consistent curriculum offered each year.*

**5) Space for TCBES for graduate students to conduct their studies.**

The TCBES program is challenged by shortage of research and teaching space. This acute difficulty should be relieved to some degree with the planned remodeling of the Wentworth building to be completed in 2012. The building will then provide TCBES graduate students with space for studying on campus, and it will provide new research and teaching space for the Biology and Marine Science Departments. In addition, there is limited research space on campus that has been provided to TCBES faculty who currently have research grants. *The TCBES program will be provided 895 ft<sup>2</sup> of space in the Wentworth building for graduate students. In addition, the Biology Department and Marine Science Department will be provided with research laboratories in the Wentworth building that should increase the space that graduate students have to conduct their thesis research. This space will be available in Fall 2012*

**6) Operating budget for the TCBES program.**

The TCBES program is currently supported by approximately \$10,000 in annual general funds and one part-time student assistant position from the College of Arts and Sciences. This funding is used primarily to support the TCBES courses. Currently there are no university funds available for graduate students to conduct research. *The University will provide the TCBES program with \$20,000 per year to support the TCBES courses and provide limited funds to support graduate student thesis activities.*

#### **4. IS THE PROGRAM EFFICIENT?**

Data were obtained from UH Hilo's Office of Institutional Research for the purpose of completing the assessment of productivity and cost/benefit considerations. Presented in Attachment 1 are the results of this analysis, which shows that the program is operating efficiently. For example, in all four years of this analysis the program has generated more revenue than expenditure costs. The Net Cost (Revenue) shows that the program has generated funds over the years and the most recent year generating more than \$47,000.

Another indicator of program efficiency is the program's graduation rate. In the first two years of the program 30 applicants were admitted to the program in Fall 2004 and Fall 2005. Twenty-five of these students have graduated by July of 2010. One student will be graduating in Fall 2010; the long duration of their graduate program is due primarily to their employment in science-related positions outside the university that has prolonged the completion of their thesis research. Two students from these two cohorts have left the program. Thus 87% of the students from the first two years of the program will have graduated by 2010. In Fall of 2006, 16 applicants were admitted into the program with one student subsequently leaving the program. Thirteen of these students graduated from May 2009 to July 2010 and two more should be graduating in December 2010. In Fall of 2007, 14 applicants were admitted into the program: two graduated in Fall 2009 and four graduated in May or July 2010 with twelve currently on track to graduate in Fall 2010 or 2011. Fifteen students entered the program in Fall 2008, 19 in Fall 2009 and in the most recent cohort 22 students entered in Fall 2010. These students are on track to finish in 2.5 to 3 years as is typical in this program. Figure 1 summarizes the current status of the TCBES graduate students.

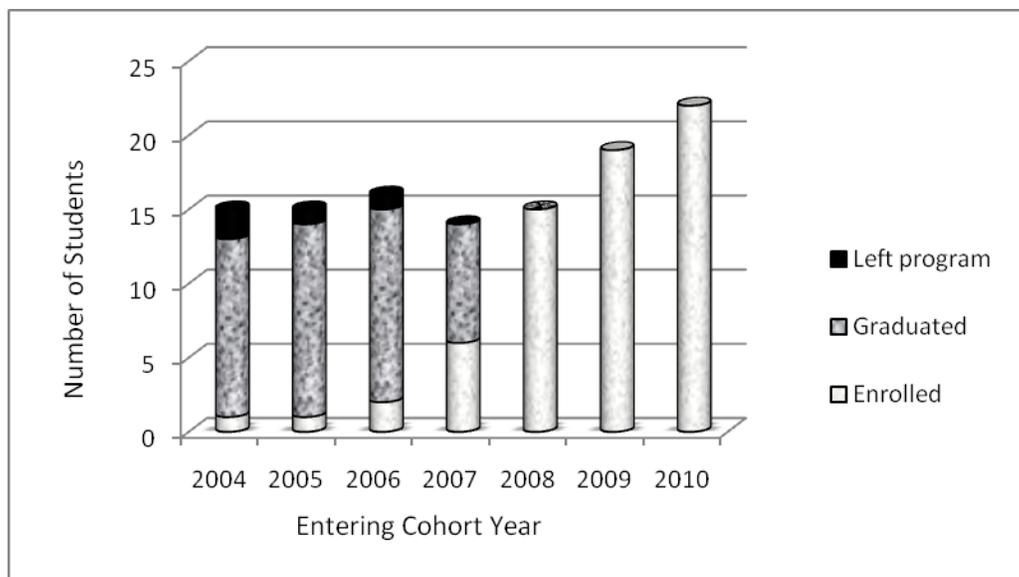


Figure 1. The current status of the TCBES graduate students.

## **5. EVIDENCE OF PROGRAM QUALITY**

### **Program's Students:**

Evidence of program quality is shown through several indices, and one of these indices is the quality of the program's students. Below is a list of the students' scholarly accomplishments in the form of (1) completed master's theses, (2) graduate student publications, presentations and awards. In addition, the TCBES faculty and certified TCBES faculty are listed with their advanced degrees, affiliations, and research expertise.

### **Completed Master's Theses:**

1. Ciguatoxin in Hawaiian archipelago fishes: Toxicity identified by N2a bioassay by *White, Darla J.*, M.S., University of Hawai'i at Hilo, 2010, 87 pages.
2. One year at Honu'apo Bay: A social and biological monitoring project in SE Hawai'i (Ka'u) by *Lamson, Megan R. McWhite*, M.S., University of Hawai'i at Hilo, 2010, 151 pages.
3. Population divergence in an endemic Hawaiian Drosophila: Phylogeographic patterns and local adaptation. by *Eldon, Jon*, M.S., University of Hawai'i at Hilo, 2010, 105 pages.
4. Relationship of zooplankton emergence, manta ray abundance and SCUBA diver usage Kona Hawaii by *Osada, Kara*, M.S., University of Hawai'i at Hilo, 2010, 140 pages.
5. The effects of invasive riparian trees on hihiwai ( Neritina granosa), a freshwater Hawaiian gastropod by *Brooks, Samuel E.*, M.S., University of Hawai'i at Hilo, 2010, 55 pages.
6. The effect of salinity and temperature on survival of the orange-black Hawaiian damselfly, Megalagrion xanthomelas by *Tango, Lori K. K.*, M.S., University of Hawai'i at Hilo, 2010, 47 pages.
7. The evolution of invasiveness: Testing the EICA hypothesis with three weeds of Hawaiian forests by *Benitez Antar, David Martin*, M.S., University of Hawai'i at Hilo, 2010, 45 pages.
8. The foraging ecology of the green sea turtle (Chelonia mydas) on the east coast of Hawai'i island by *Wills, Kate'Lyn Elaine*, M.S., University of Hawai'i at Hilo, 2010, 130 pages.
9. The population structures of three Hawaiian marine gastropod species by *Chaney, Nancy L.*, M.S., University of Hawai'i at Hilo, 2010, 63 pages.
10. The roles of elevation, distance, and phenotype on the neutral genetic structure of Metrosideros polymorpha on east Hawai'i Island by *DeBoer, Nicholas*, M.S., University of Hawai'i at Hilo, 2010, 79 pages.
11. Analysis of the foraging ecology of hawksbill turtles (Eretmochelys imbricata) on Hawai'i Island: An investigation utilizing satellite tracking and stable isotopes by *Graham, Shannon C.*, M.S., University of Hawai'i at Hilo, 2009, 31 pages.
12. Breeding phenology of Hawaiian petrels (Pterodroma sandwichensis) and Newell's shearwaters (Puffinus auricularis newelli) on Kaua'i, Hawai'i, using ornithological radar, auditory, and visual surveys by *Deringer, Cary V.*, M.S., University of Hawai'i at Hilo, 2009, 78 pages.

13. Free-living Symbiodinium: Genetic diversity and availability for acquisition by asymbiotic coral larvae by *Adams, Lisa M.*, M.S., University of Hawai'i at Hilo, 2009, 99 pages.
14. Gene flow and connectivity of the crown-of-thorns sea star, *Acanthaster planci*, in the central Pacific by *Timmers, Molly A.*, M.S., University of Hawai'i at Hilo, 2009, 77 pages.
15. Quantification of plumage coloration of a Hawaiian honeycreeper (*Hemignathus virens virens*) along gradients of biogeography: Does variation exist between sub-populations on the island of Hawai'i? by *Gaudioso, Jacqueline M.*, M.S., University of Hawai'i at Hilo, 2009, 81 pages.
16. Transfer and effects of maternal anti-Plasmodium antibodies in Hawai'i 'amakihi (*Hemignathus virens*) and common canary (*Serinus canaria*) by *Hsu, Bobby*, M.S., University of Hawai'i at Hilo, 2009, 36 pages.
17. Application of the nonpoint source pollution and erosion comparison tool (N-SPECT) model for resource management in the Waiulaula watershed, island of Hawai'i by *Gaut, Katie*, M.S., University of Hawai'i at Hilo, 2009, 113 pages.
18. Effects of hydrological forcing on the structure of a tropical estuarine food web by *Atwood, Trisha B.*, M.S., University of Hawai'i at Hilo, 2009, 45 pages.
19. Integrating literature, industry participant knowledge, and fishery data to formulate management recommendations for a targeted marine aquarium species, *Centropyge potteri* (Pomacanthidae), in the Hawaiian Islands by *Chapin, Brandon Cody*, M.S., University of Hawai'i at Hilo, 2009, 124 pages.
20. Does the invasive tree, *Falcataria moluccana* facilitate high population density of the invasive Puerto Rican frog, *Eleutherodactylus coqui*? by *McGuire, Raymond*, M.S., University of Hawai'i at Hilo, 2008, 50 pages.
21. Habitat use by Hawai'i 'Amakihi (*Hemignathus virens*) in low-elevation suburban habitat on the Island of Hawai'i: Neighborhood and local-scale perspectives by *Sugishita, Junichi*, M.S., University of Hawai'i at Hilo, 2008, 55 pages.
22. An invasive producer (albizia) and predator (coqui frogs) alter decomposition processes in a Hawaiian tropical forest by *Norman, Michelle Noelani*, M.S., University of Hawai'i at Hilo, 2008, 45 pages.
23. Surface water metabolism in a tropical estuary, Hilo Bay, Hawai'i, USA, during storm and non-storm conditions by *Mead, Lucas H.*, M.S., University of Hawai'i at Hilo, 2008, 47 pages.
24. Monitoring coqui frog (*Eleutherodactylus coqui*) populations using sound pressure levels by *Warrington, Miyako*, M.S., University of Hawai'i at Hilo, 2008, 55 pages;
25. Recreational use and impact assessment for Richardson's Ocean Park, Hilo, Hawaii by *Kearns, Colby M.*, M.S., University of Hawai'i at Hilo, 2008, 54 pages.

26. The effects of skin and body hydration on the susceptibility of the frog, *Eleutherodactylus coqui*, to citric acid as a control agent by *Doratt, Rogelio Ernesto*, M.S., University of Hawai'i at Hilo, 2008, 53 pages.
27. Variation of sediment trace elements and stream nitrate isotope ratios with land use in the Waiulaula and Hilo Bay watersheds, Hawai'i Island, Hawai'i by *Tait, James R.*, M.S., University of Hawai'i at Hilo, 2008, 70 pages.
28. A biological and social examination of opelu (*Decapterus* spp.) fisheries in West Hawaii, Hawaii Island by *McNaughton, Blake D.*, M.S., University of Hawai'i at Hilo, 2008, 55 pages.
29. Development of a passive diffusive sampling device for time-integrated assessment of atrazine in Hawaiian streams by *Vaduvescu, Simona*, M.S., University of Hawai'i at Hilo, 2008, 58 pages.
30. Estimating genetic diversity of Palila (*Loxioides bailleui*) and familial relationships of helper males by *Patch-Highfill, Leayne D.*, M.S., University of Hawai'i at Hilo, 2008, 99 pages.
31. Host specificity and biology of *Syphraea uberabensis* (Coleoptera: Chrysomelidae) for the potential biological control of *Tibouchina herbacea* (Melastomataceae) in Hawaii by *Souder, Steven Kazunori*, M.S., University of Hawai'i at Hilo, 2008, 52 pages.
32. Molecular assessment of sub-lethal stress in the Hawaiian coral, *Pocillopora meandrina*, exposed to elevated inorganic nutrient concentrations and an acute temperature increase by *Pagarigan, Lauren K.*, M.S., University of Hawai'i at Hilo, 2008, 97 pages.
33. Variation in the trap gene of *Plasmodium relictum*: Prevalence of single nucleotide polymorphisms in infected amakihi (*Hemignathus virens*) on the east side of Hawaii Island by *Farias, Margaret E.M.*, M.S., University of Hawai'i at Hilo, 2008, 89 pages.
34. Sibling sea urchin species of the genus *Echinothrix* in Hawai'i: Unification of morphological characters and genetic clades by *Jessop, Holly*, M.S., University of Hawai'i at Hilo, 2008, 80 pages.
35. Effects of light availability on the germination, growth and survival of alien grasses and native trees and shrubs by *McDaniel, Sierra*, M.S., University of Hawai'i at Hilo, 2007, 50 pages.
36. Distribution and inorganic speciation of arsenic in Waiakea Mill Pond and Wailoa River Estuary, Hawai'i Island by *Glendon-Baclig, Cybil Eddie-Ann K.*, M.S., University of Hawai'i at Hilo, 2007, 113 pages.
37. Population genetics of an anchialine shrimp, *Metabetaeus lohena*, in the Hawaiian islands by *Russ, Atlantis Dawn*, M.S., University of Hawai'i at Hilo, 2007, 80 pages.

38. Field control of the invasive little fire ant, *Wasmannia auropunctata* (Roger) (Hymenoptera: Formicidae) in tropical fruit orchards by Souza, Evann, M.S., University of Hawai'i at Hilo, 2007, 67 pages.
39. Comparison of dissolved organic carbon bioavailability from native and invasive vegetation along the Wailuku River, Hawai'i by Tubal, Randee L., M.S., University of Hawai'i at Hilo, 2007, 34 pages.
40. Examining the comparative foraging proficiency of captive-bred and wild palila (*Loxioides bailleui*); an endangered Hawaiian honeycreeper by Frayne, Roland D., M.S., University of Hawai'i at Hilo, 2007, 68 pages.
41. Investigation of inbreeding and inbreeding depression in Nene (*Branta sandvicensis*) using microsatellite DNA fingerprinting and pedigree information by Veillet, Anne C., M.S., University of Hawai'i at Hilo, 2007, 120 pages.
42. Predicting the potential distribution of an invasive plant using stratified sampling and habitat modeling by Purell, Melora K., M.S., University of Hawai'i at Hilo, 2006, 40 pages.
43. The role of parasites in the invasional success of the Puerto Rican tree frog (*Eleutherodactylus coqui*) in Hawai'i by Marr, Shenandoah R., M.S., University of Hawai'i at Hilo, 2006, 39 pages.

**There are an additional 65 students currently enrolled in the program and their Master's Theses are in progress.**

### **TCBES Graduate Student Publications, Presentations and Awards**

(Graduate student's names are in bold and their advisor's name is underlined)

1. **Adams, L.M.**, Cumbo, V.R., Takabayashi, M. 2009. Exposure to sediment enhances primary acquisition of *Symbiodinium* by asymbiotic coral larvae. *Marine Ecology Progress Series* 377: 149-156.
2. Benevides, F. L. Jr., W. J. Mautz, and **M. Warrington**. A piece-wise linear model of the sound pressure level of male *Eleutherodactylus coqui* overnight chorus. *Herpetological Review*. In press.
3. Dohm, M. R., W. J. Mautz, **R.E. Doratt**, and J.R. Stevens. Ozone Exposure Affects Feeding and Locomotor Behavior of Adult *Bufo marinus*. *Environ.Toxicol. and Chemistry*. 27:1209-1216.
4. **Frayne, R.**, 2006. Foraging Proficiency of an endangered Hawaiian Honeycreeper: Palila (*L.bailleui*). Best Student Poster Award. Hawaii Conservation Conference-Sustainability: Mauka to Makai (July 26-28, 2006; Honolulu, HI), (advisor: D.K. Price)
5. Funk, J.L. and **S. McDaniel**. 2009. Altering light availability to restore invaded forest: the predictive role of plant traits. *Restoration Ecology*, in press. (advisor: R. Ostertag)
6. **Gaudioso, J.M.**, LaPointe, D.A., and P.J. Hart. Knemidokoptic Mange in Hawai'i 'Amakihi on the Island of Hawai'i. *Journal of Wildlife Diseases*, 45(2): In press.
7. **Gaudioso, J.M.**, Leonard, D.L. Jr., LaPointe, D.A., Randall, J. A., and L.J. Hadway. 2008. Scaly-leg mange found in Hawai'i 'Amakihi on the Big Island: A New Threat to Hawaiian Honeycreepers? *Elepaio*, 68 (9): 71-72. (advisor: P.J. Hart)
8. **Marr, S.R.**, W.J. Mautz, and A.H. Hara. 2008. Parasite loss and introduced species: a comparison of

- the parasites of the Puerto Rican tree frog, *Eleutherodactylus coqui*, its native and introduced ranges. *Biological Invasions*. 10:1289-1298.
9. **McDaniel, S.** and **R. Ostertag**. 2009. Strategic light manipulation to suppress alien grasses in Hawaii during secondary succession. *Applied Vegetation Science*. In review.
  10. **Mead, L.H.** and **T.N. Wiegner**. Surface water metabolism in a tropical estuary, Hilo Bay, Hawaii, USA, during storm and non-storm conditions. *Coasts and Estuaries*. In review.
  11. **Pagarigan, L.K.**, **Takabayashi, M.** (in press). Reference gene selection for qRT-PCR analysis of the Hawaiian coral *Pocillopora meandrina* subjected to elevated levels of temperature and nutrient. *Proceedings of the 11th International Coral Reef Symposium*.
  12. **Russ, A.**, **S R Santos**, and **C Muir**. Population structure of an anchialine shrimp, *Metabetaeus lohena* (Crustacea: Alpheidae), in the Hawaiian Islands. *J. Tropical Biology*. In Review.
  13. **Vaduvescu, S.** and **JP Michaud**, 2008. "Development of a Passive Diffusive Sampling Device for Assessment of Atrazine in Time-Variant Streams of Hawaii." Poster presentation at AAAS, Pacific Division, 89th Annual Meeting, Waimea, HI, 15 - 20 June 2008, Awarded second place in Chemistry and Biochemistry Section.
  14. **Veillet, A.**, **R. Shrestha**, and **D.K. Price**. 2008. Polymorphic microsatellites in nene, the endangered Hawaiian goose (*Branta sandvicensis*). *Molecular Ecology Resources* 8: 1158–1160
  15. **Wiegner, T.N.**, **R.L. Tubal**, and **R. A. MacKenzie**. Bioavailability and export of dissolved organic matter from a tropical river during base- and stormflow conditions. *Limnology and Oceanography*. In review.
  16. **Tait, J.**, **S. Lundblad, S.**, and **W. Cutler**. 2008. Optimizing XRF for Field Mapping of Soil Arsenic, The Environmental Institute Triad Investigations: New Approaches and Innovative Strategies, Amherst, Massachusetts. (advisor: **J Michaud**)
  17. **Takabayashi, M.**, **Gregg, T.M.**, **Farah, E.**, **Burns, J.**, **Teves, K.**, **Cody, N.H.** (in press) The prevalence of skeletal growth anomaly and other afflictions in scleractinian corals at Wai‘apae, Hawai‘i. *Proceedings of the 11th International Coral Reef Symposium*.

## Core Program Faculty:

In addition to student achievement in these various forms, evidence of program quality is also shown by examining the number of faculty at UH Hilo and certified faculty from partner agencies and universities who participate in the TCBES program. Below are descriptions of the TCBES faculty members, their educational background and research and specialties.

<b>Name</b>	<b>Educational Background</b>	<b>Research Focus</b>
Donald Price - Professor of Biology, Director TCBES Graduate Program	Ph.D. University of Illinois, Ecology, Ethology and Evolutionary Biology, 1991	Evolutionary and conservation genetics, behavioral ecology and genetics, insects and birds
Jason Adolf - Assistant Professor of Marine Science	Ph.D. University of Maryland College Park, 2002	Coastal phytoplankton ecology, real-time continuous monitoring
Norman Arancon Assistant Professor of Horticulture	Ph.D., The Ohio State University	Crop and environmental science
Jonathan Awaya - Assistant Professor, Biology	Ph.D. University of Hawai`i at Manoa, Molecular Biosciences and Bioengineering, 2005	Molecular microbiology, Bioremediation, Iron-trafficking pathways, Secondary metabolites
James Beets - Professor of Marine Science	Ph.D. University of Georgia, Zoology, 1990	Marine ecology, fish/fisheries ecology, ecological monitoring
Kathryn Besio - Associate Professor of Geography	Ph.D. University of Hawai`i at Manoa, Geography, 2001	Cultural geography, tourism, nature-society relations
Daniel Brown - Professor of Anthropology and Coordinator of Research	Ph.D. Cornell University, Anthropology, 1978	Human environmental physiology, stress, health risk, Pacific population emphasis
Leng Chee Chang - Assistant Professor of Pharmacy	Ph.D. University of Illinois at Chicago, Natural Products Chemistry, 1998	Isolation and elucidation of structures from marine & microbial natural products, anticancer agents
Donna Delparte - Assistant Professor, Geography	Ph.D. University of Calgary, 2008	Geographic Information Science, terrain and flow modeling, 3D visualization
Marta deMaintenon - Professor and Chair of Marine Science	Ph.D. UC Berkeley, Integrative Biology, 1996	Gastropod anatomy and systematics, evolution of novel characteristics
Maria Haws - Director of Pearl Research and Training Program	Ph.D. Texas A&M University, Wildlife and Fisheries Sciences, 1993	Aquaculture, marine invertebrates, coastal zone management, natural resources policy
Patrick Hart - Associate Professor of Biology	Ph.D. University of Hawai`i at Manoa, Zoology & EECB, 2000	Ecology and conservation-Hawaiian forests/forest birds
Kevin Hopkins - Professor of Aquaculture Director of the Pacific Aquaculture & Coastal Resources Center	Ph.D. Auburn University, Fisheries & Allied Aquacultures, 1979	Aquaculture and fisheries development including their environmental impacts
Susan Jarvi - Associate Professor of Pharmacy	Ph.D. Northern Illinois University, Biological Sciences, 1989	Host-parasite co-evolution, avian disease systems
James Juvik – Professor and Chair of Geography	Ph.D. University of Hawai`i at Manoa, Geography, 1977	Climatology, fog forest ecosystems, biogeography

Sonia Juvik - Professor of Geography	Ph.D. Australia National University, Geography, 1981	Land use planning, environmental conflict, natural resources management
Ernest Kho - Associate Professor of Chemistry	Ph.D. University of California-Santa Cruz, Organic Chemistry, 1978	Natural Products Chemistry of marine organisms
Yiqing Li - Assistant Professor of Forest Ecology	Ph.D. University of Puerto Rico, Biology, 1999	Carbon sequestration of tropical forests, forest soil ecology, and forest ecosystem restoration
Steven Lundblad - Assistant Professor of Geology	Ph.D. University of North Carolina	
Bruce Mathews - Professor of Soil Science & Agronomy	Ph.D. University of Florida, Agronomy and Soils, 1992	Environmental agronomy, nutrient cycling, water quality, grassland management
William Mautz - Professor and Chair of Biology	Ph.D. Cornell University, Ecology and Evolutionary Biology, 1979	Environmental toxicology, physiological ecology of reptiles and amphibians
Fiona McCormack - Assistant Professor, Anthropology	Ph.D. University of Auckland, 2006	Fisheries (indigenous; traditional management tools; regulations; property rights)
Karla McDerimid - Professor of Marine Science	Ph.D. University of Hawai`i at Manoa, Botanical Sciences, 1988	Seaweed/seagrass taxonomy, ecology, biogeography & nutritional composition
J.P. Michaud - Associate Professor and Chair of Chemistry	Ph.D. University of Arizona, Toxicology and Pharmacology, 1994	Toxicology, environmental chemistry, epidemiology of volcanic fog & endocrine disruptors
Jene Michaud - Associate Professor of Geology	Ph.D. University of Arizona, Hydrology, 1991	Surface water, modeling, floods, geomorphology
Peter Mill, Professor of Anthropology	Ph.D. at U.C. Berkeley in 1996	Archaeology, historic archaeology, lithics
Cedric Muir - Associate Professor of Biology	Ph.D. Simon Fraser University, Molecular Biology and Biochemistry, 1998	Ecological genetics/conservation genetics of endemic Hawaiian fauna
Rebecca Ostertag - Associate Professor of Biology	Ph.D. University of Florida, Botany, 1998	Community structure and nutrient dynamics of tropical forests
Adam Pack - Associate Professor of Psychology and Biology	Ph.D. University of Hawai`i at Manoa, Psychology	Dolphin sensory perception, cognition, and communication; Humpback whale social behavior
Brian Perry - Assistant Professor, Biology	Ph.D. Harvard University, Organismic and Evolutionary Biology, 2006	Fungal evolution, systematics and taxonomy, phylogeography, conservation biology
Jonathan Price - Assistant Professor of Geography	Ph.D. University of California at Davis, Geography, 2002	Biogeography and landscape/vegetation ecology
Michael Shintaku - Associate Professor of Plant Pathology	Ph.D. Cornell University, Plant Pathology, 1991	Plant virology
Elizabeth Stacy - Associate Professor of Biology	Ph.D. Boston University, Ecology, Behavior and Evolution, 2001	Plant population biology and evolutionary genetics
Misaki Takabayashi - Associate Professor of	Ph.D. The University of Queensland, Centre for Marine	Coral reef ecology, coral molecular biology, marine microbial molecular

Marine Science	Studies, 2000	biology
Jason Turner - Associate Professor of Marine Science	Ph.D. Texas A&M University, Wildlife and Fisheries, 2004	Marine ecology, trophic dynamics of food webs, biochemical tracers
Tracy Wiegner - Associate Professor of Marine Science	Ph.D. Rutgers University, Oceanography, 2002	Carbon, nitrogen, and phosphorus cycling in freshwater and marine environments

For more information about each of these faculty members please see the TCBES website and the faculty members' personal websites that are linked <http://tcbes.uhh.hawaii.edu/>

**TCBES Faculty Involvement:** The primary roles of the faculty in the TCBES program is mentoring graduate students in thesis research and teaching graduate-level courses in the TCBES program. Faculty also serve as members on Graduate Student Thesis committees and serve on TCBES Executive and Admissions committees.

Name	# Graduate Student Advisees 2004-10
Jason Adolf	2
Jonathan Awaya	2
James Beets	5
Kathryn Besio	New '08
Daniel Brown	0
Leng Chee	0
Donna Delparte	2
Maria Haws	2
Steven Lundblad	New '08
Marta deMaintenon	3
Patrick Hart	10
Kevin Hopkins	5
Susan Jarvi	3
James Juvik	2
Sonia Juvik	1
Ernest Kho	0
Yiqing Li	1
Bruce Mathews	1
William Mautz	6
Fiona McCormack	New '08
Karla McDermid	4
J.P. Michaud	3
Jene Michaud	2
Cedric Muir	3
Rebecca Ostertag	7
Adam Pack	1
Michael Parsons*	2
Brian Perry	New '09
Donald Price	10
Jonathan Price	2
Craig Severance*	3
Michael Shintaku	2
Elizabeth Stacy	8
Michael Steinberg*	1
Misaki Takabayashi	4
Jason Turner	7
Tracy Wiegner	5

\* - faculty no longer at UH Hilo

Name	Courses Taught
James Beets	600 <sup>3</sup> , 601 <sup>3</sup> , 602 <sup>2</sup> , 605, 694
Susan Cordell <sup>+</sup>	694
Donna Delparte	670
Ken Gerow <sup>+</sup>	680
Christian Giardina <sup>+</sup>	694
Patrick Hart	600, 601, 602, 677 <sup>3</sup> , 694
David Helweg <sup>+</sup>	694
William Mautz	605, 655 <sup>3</sup>
J.P. Michaud	610
Jene Michaud	635 <sup>2</sup>
Cedric Muir	600, 601, 694
Lisa Muehlstein <sup>+</sup>	694
Rebecca Ostertag	600 <sup>4</sup> , 601 <sup>4</sup> , 602 <sup>4</sup>
Donald Price	603, 605, 675, 685
Jonathan Price	645, 694
Michael Shintaku	620 <sup>2</sup>
Elizabeth Stacy	600 <sup>5</sup> , 601 <sup>5</sup> , 602 <sup>4</sup> , 633 <sup>2</sup>
Misaki Takabayashi	600, 601, 602, 620 <sup>2</sup> , 694
Jason Turner	600, 694 <sup>2</sup>
Tracy Wiegner	600, 601
Sun Park*	640 <sup>2</sup> , 670 <sup>2</sup>
Rosemary Sherriff*	670 <sup>2</sup> , 694
Robert Smith <sup>+</sup>	603, 694
Michael Steinberg*	645

Superscript number indicates number of times the course has been offered. The courses 600, 601, 602, 605, 620 are team-taught by 2 or 3 faculty members.

<sup>+</sup> TCBES Certified Faculty

\* - faculty no longer at UH Hilo

**Certified Faculty:**

In addition to the UH Hilo faculty there are currently 51 certified faculty in TCBES. These faculty serve on graduate committees, occasionally teach graduate courses, seminars or workshops, and can co-chair graduate committees with a UHH faculty member.

<b>Name</b>	<b>Affiliation of Record</b>
Carter Atkinson, Ph.D.	USGS Pacific Island Ecosystems Research
George Balazas, M.S.	Zoologist and leader, Marine Turtle Research Program
Paul Banko, Ph.D.	USGS Pacific Island Ecosystems Research Center
Lawrence Basch, Ph.D.	Marine Ecology and Science Advisor, National Park Service
Francis Benevides Jr., Ph.D.	Manager/Engineer/Technician, Federal Aviation Administration
Brian Bowen, Ph.D.	Research Professor, HIMB UH-Manoa
Frank Chapman, Ph.D.	Associate Professor, University of Florida
Susan Cordell, Ph.D.	Research Ecologist, USDA Forest Service
Julie Denslow, Ph.D.	Research Ecologist, USDA Forest Service
Chris Farmer, Ph.D.	USGS Pacific Island Ecosystems Research
Linda Shea Flanders	Executive Director, Cape Kumukahi
Peter Follett, Ph.D.	Research Entomologist, USDA
David Foote, Ph.D.	Ecologist, USGS, Pacific Island Ecosystems Research Center
Ruth Gates, Ph.D.	Associate Research Professor, HIMB UH-Manoa
Grant Gerrish, Ph.D.	UH Hilo Biology Department
Christian Giardina, Ph.D.	Research Ecologist, USDA Forest Service
William Gilmartin, M.S.	Director of Research, Hawai'i Wildlife Fund
Arnold Hara, Ph.D.	UH Manoa CTAR - Beaumont Center
David Helweg, Ph.D.	Deputy Center Director, USGS Pacific Island Ecosystems Research Center
Darcy Hu, Ph.D.	US National Park Service, Ecologist and Science Advisor
Flint Hughes, Ph.D.	USDA Forest Service, Research Ecologist
David Itano, M.S.	Research Associate, UH Manoa
James Jacobi, Ph.D.	USGS- Biological Resources Division
Jack Jeffery	Senior Wildlife Biologist, US Fish and Wildlife Service
Tracy Johnson, Ph.D.	Research Entomologist, USDA Forest Service
Boone Kaufman, Ph.D.	Director and Research Ecologist, USDA Forest Service
Les Kaufman, Ph.D.	Professor of Biology, Marine Program & Center for Ecology and Conservation Biology, Boston University
Lisa Keith, Ph.D.	Research Plant Pathologist Biology, USDA
Stacy Kubis, M.S.	Marine Turtle Research Biologist, NOAA - JIMAR
Dennis Lapointe, Ph.D.	Ecologist, USGS Pacific Island Ecosystems Research Center
Harilaos Lessios, Ph.D.	Staff Biologist, Smithsonian Tropical Research Institute
Rhonda Loh, Ph.D.	National Park Service
Fred Mackenzie, Ph.D.	Professor Emeritus, Department of Oceanography, UH Manoa
Richard MacKenzie, Ph.D.	Research Ecologist, USDA Forest Service
Lisa Muehlstein, Ph.D.	UH Hilo Biology and Marine Science Department

Kate Nishijima, M.S.	Plant Pathologist, USDA
Robert Nishimoto, Ph.D.	Division of Aquatic Resources, DLNR
Thane Pratt, Ph.D.	Project Leader, USGS Pacific Island Ecosystems Research Center
William Pitt, Ph.D.	USDA, National Wildlife Research Center
Richard Pyle, Ph.D.	Associate Zoologist, Database Coordinator, Bishop Museum
Michelle Reynolds, Ph.D.	USGS- Biological Resources Division
Mike Robinson, M.S.	Property Management Agent, Hawaiian Homelands
David Schofield, M.S.	Marine Mammal Response Network Coordinator, NOAA
Craig Severance, Ph.D.	Retired UHH Faculty in Anthropology and TCBES
David Shively, Ph.D.	Assistant Professor of Geography, University of Montana
Robert Smith, M.S.	Fish and Wildlife Service, Retired
Michael Steinberg, Ph.D.	Geographer
Robert Toonen, Ph.D.	Associate Research Professor, HIMB UH-Manoa
William Walsh, Ph.D.	Division of Aquatic Resources, Hawai'i DLNR
Debbie Weeks, Ph.D.	Chemist
Sharon Ziegler-Chong, M.S.	Associate Director, PACRC; Coordinator, Hawai'i Cooperative Studies Unit

## **6. ARE PROGRAM OUTCOMES COMPATIBLE WITH THE OBJECTIVES?**

An important way to assess whether the program outcomes are compatible with the objectives is to examine the marketability of the graduates of the program. As can be seen below, the TCBES graduates are employed with federal, state agencies and academic institutes or have continued their graduate studies into PhD programs. Of the listed below, 3 students are now employed in federal agencies, 4 in state agencies, 13 at academic institutions, 2 at private companies, and 6 are enrolled in PhD programs elsewhere. This suggests that the graduates of the program are readily able to find positions and further education that match well with their training and suggests that the program outcomes are compatible with its objectives.

<b>Employment and Educational positions of TCBES graduates</b>	
<b>TCBES Graduate</b>	<b>Current Position</b>
Lisa Adams	NOAA John A. Knauss Marine Policy Fellow, Washington D.C.
Trisha Atwood	PhD Candidate, University of British Columbia
Rogelio Doratt	Academic Professional Technician, University of Hawai'i at Hilo, Biology Department.
Cybil Glendon-Baclig	Instructor, Ka Haka 'Ula o Ke'elikolani-College of Hawaiian Language, UH Hilo
Margaret Farias	Research Technician, UH Hilo College of Pharmacy
Shannon Graham	PhD Candidate, University of Tennessee
Holly Jessop	PhD candidate, Zoology, UH Manoa
Colby Kearns	Outreach Coordinator, Education Department UH Hilo, and Project Coordinator, PRISM GK-12 Program UH Hilo
Brian Kettl	Environmental Analyst. U. S. Navy
Shenandoah R. Marr	Research Technician, College of Tropical Agriculture and Human Resources. University of Hawai'i at Manoa.
Sierra McDaniel	Botanist, Volcanoes National Park
Raymond McGuire	Coordinator, Coqui Control Program. Division of Forestry and Wildlife. DLNR, State of Hawai'i.
Blake McNaughton	Science Literacy Resource Teacher for Kamehameha School's Literacy Instruction and Support Division
Lucas Mead	Laboratory Manager, EPSCoR Analytical Laboratory. UH Hilo
Michelle Norman	Science Literacy Resource Teacher for Kamehameha School's Literacy Instruction and Support Division
Kara Osada	Marine Tech Diver, State of Hawaii, Division of Aquatic Resources
Lauren Pagarigan	Science Literacy Resource Teacher for Kamehameha School's Literacy Instruction and Support Division
Leayne Patch-Highfill	Science Literacy Resource Teacher for Kamehameha School's Literacy Instruction and Support Division

Melora Purell	Coordinator, Kohala Watershed Partnership
Atlantis D. Russ	Ph.D. candidate, University of Arizona
Steven Souder	Ph.D. candidate, UC Berkeley
Evann Souza	Research Technician Cyanotec, Kailua-Kona, Hawai`i
James Tait	Environmental Consultant, San Francisco
Randee Tubal	Instructor of Biology, UH Hilo
Simona Vaduvescu	Instructor of Biology and Chemistry, UH Hilo
Anne Veillet	Laboratory Manager EPSCoR Core Genetics, UH Hilo
Miyako Warrington	PhD candidate, Macquarie University, Sydney, Australia
Darla White	Maui Island Coordinator at Eyes of the Reef Hawai`i DLNR, Division of Aquatic Resources
<b>Summary</b>	<b>22 Graduates employed in Science, Science Education or Education 6 Graduates currently Ph.D. candidates at another institution</b>

## **7. ARE PROGRAM OBJECTIVES STILL APPROPRIATE FUNCTIONS OF THE COLLEGE AND UNIVERSITY?**

The TCBES graduate program remains consistent with UH System strategic goals and objectives with the primary mission of UH Hilo as outlined in the 2002-2010 Strategic Plan.

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**UH Hilo Goal I. Maintain a well-rounded mix of liberal arts and professional programs, while distinguishing ourselves by taking full advantage of the extraordinary natural environment and cultural diversity afforded by our island setting.**

**Objective 1.** *Emphasize studies of the environment of Hawai`i, the Pacific, and East Asia and make full use of the Island of Hawai`i, from the tops of the mountains to the bottom of the ocean, for hands-on learning and as a research laboratory.*

The TCBES program has already been successful at greatly expanding the breadth of environmental studies taking place on the Hawai`i Island. Until recently, most environmental scientific research and monitoring had been performed by faculty and students from off-island universities. The TCBES graduate courses and graduate student research take advantage of the world class natural laboratory that surrounds UH-Hilo. Interactions and collaborations with federal, state and non-profit agencies have successfully augmented the program through access to additional research opportunities, facilities and expertise. The TCBES faculty and students in has developed successful collaboration and training opportunities with institutions from other Pacific island and East Asian nations. These collaborations have developed, in part, because of the geographic proximity and similar climates and ecosystems to other sites in the Pacific and East Asia. For example, two TCBES students have obtained NSF East Asia Pacific Summer Institutes fellowships.

**Objective 3.** *Offer selected graduate programs in areas with sustainable student and job market demand and where UH Hilo has strong expertise.*

The solutions to the conservation challenges that Hawai`i currently faces require a broad knowledge not only of biology, but of the physical and social sciences. A continuing goal of the TCBES program is to address these challenges by providing recent baccalaureate graduates with graduate training that will prepare them for careers as conservation and environmental scientists and managers. The program has encouraged students to include people on their graduate committees from agencies external to UH Hilo, many of which are part of Hawai`i State government. These students receive mentoring and education from these agencies on the needs of the island and state. We also recruit Master`s candidates who were working for Hawai`i County, Hawai`i State and local branches of federal management agencies. For example, students have worked for the US National Park Service, the US Forest Service and the USDA while attending the TCBES program. A large percentage of the recent TCBES graduates are employed as professional scientists with federal, state and not-government agencies and in the private sector. Finally, the TCBES program also provides students with an excellent foundation for doctoral studies in a variety of theoretical and applied disciplines.

The TCBES has proven to be highly popular as a graduate school option for both Hawai`i Island residents and out-of-state students. Each year, the program accepts only a fraction of the qualified students that apply. In addition, the program makes it possible for residents of Hawai`i Island to pursue a Master of Science degree in this field without having to move to O`ahu or the continental USA. This removes a formidable barrier to graduate training for many, especially nontraditional students with families and job responsibilities on the Island of Hawai`i.

**Objective 4.** *Excel at using research and other scholarly endeavors to provide learning opportunities for students, enabling them to use the knowledge gained in the classroom and apply the methods and tools of the disciplines.*

The TCBES program supports UH Hilo's primary mission of providing an excellent undergraduate liberal arts education. It enriches existing UH Hilo undergraduate programs with supplementary courses and activities. Honors students and advanced undergraduates participate in a variety of activities with the graduate program. TCBES makes it possible for undergraduates in the environmental sciences to work with graduate students to gain valuable field and lab experience. The TCBES program thus enriches the undergraduate academic experience. These opportunities for undergraduates are critical to their success in obtaining jobs or continuing with graduate education, and were rare prior to the formation of the TCBES program. In addition, outcomes of the TCBES research projects have also been communicated at public events such as TCBES Symposium, Earth Day, Ocean Day Hawai`i and the annual Hawai`i Conservation Conference. As a result we have had members of the public such as science teachers and high school students become aware of and come to assist in various TCBES research projects.

**Objective 5.** *Support knowledge creation and transfer in both theoretical and applied research, with special emphasis on studies that advance knowledge of the island, the state, the Pacific, and East Asia.*

There are at least 40 different theoretical and applied research projects focusing on critical environmental issues in Hawai`i that are being conducted by TCBES graduate students each year. These projects often augment the research programs of UH Hilo faculty as well as state and federal researchers. TCBES students have presented papers at numerous scientific meetings in Hawai`i, on the mainland USA, and internationally, and they have made many successful contributions to peer-reviewed scientific journals (see above).