Program Review Report

Department of Biological Sciences

College of Arts and Sciences

January, 2008

Table of Contents **Page**

Appendices

I. Executive Summary

The Department of Biological Sciences continues to be one of the strongest departments at FIU, and is now one of the largest. We currently have 42 active faculty members in our department. Our combined external funding for the last five years (2002 – 2007) was $38,450,203. Our enrollment of undergraduate majors (declared plus intended) has increased from Fall 2002 to Fall 2007 from 1408 to 1717, which includes students in our new undergraduate program in Marine Biology. Our graduate program reflects a new emphasis on Ph.D. students (vs. masters), and since 2002 the relative number of Ph.D. students in our graduate program has increased from 44% to 73%. Enrollment in our graduate program was 106 in Fall 2007. We have produced 69 masters and 31 doctoral degrees during the past five years.

Our goal is to become a premier biology department in the State University System of Florida, and to be recognized at the national and international levels. We are actively moving towards this goal. FIU's Department of Biological Sciences was one of six departments in FIU's College of Arts & Sciences (CAS) that ranked highest (calculated Z-score) in an Academic Analytics' survey of academic productivity commissioned by the CAS and carried out in Academic Year (AY) 2006/2007.

This Self Study was prepared by the Department Chair, Laurie Richardson and the Associate Chair, Gene Rosenberg, with input from the Graduate Program Director, Mo Donnelly, the Undergraduate Program Director, John Makemson, and various faculty members queried for specific information. Additionally, material from our most recent annual faculty Department Retreat held in December 2007, which focused on departmental strategic planning, was incorporated into this document.

II. Response to the Recommendations from Previous Reviews

Priority recommendations from the last Program Review (2001) and actions taken in response to the Review. Note: More detailed responses are presented in the response to the Executive Program Review Committee recommendations which follow.

A. **Recommendation:** Develop a strategic plan that includes an implementation timeframe that addresses the aggressive research, enrollment and faculty recruitment objectives the department has identified. Special attention must be given to the development of a plan for graduate enrollment growth and doctoral degree production.

   Response: The Department began having faculty retreats in Spring of 2006 to address these objectives. Each retreat (three to date) had a focus, with the first addressing the overall status of the department, the second, faculty and the evaluation process, and the third (December 2007), strategic planning. The Strategic Plan is included in this document as Section XI (Major Findings and Recommendations). Graduate enrollment and doctoral degree production have both increased and are addressed in this Self Study.

B. **Recommendation:** Identify and plan for enhanced multidisciplinary research initiatives in areas such as biomedical, environmental, Southeast Environmental Research Center (SERC) and bioinformatics.

Response: We are actively building upon and increasing such collaborations at the individual and departmental levels. We are increasing our number of joint appointments with other departments, colleges, and organizations outside of FIU, such as Fairchild Tropical Botanic Garden. We have formed a departmental hiring task force to develop hiring plans that integrate enhanced multidisciplinary research by new hires into our existing programs and efforts.

C. **Recommendation:** Address the concerns about graduate workloads, externally funded research assistantships, and undergraduate advisement.

Response: Graduate teaching workloads have been reduced as recommended (see below). Our graduate students continue to receive substantial numbers of EPA STAR and GRO Fellowships and support through the NIH MBRS RISE Program. We now have a dedicated Biology Career Advisor in addition to our Undergraduate Program Director.

D. **Recommendation:** Expand federal support for shared research equipment, NIH funding, and dissertation improvement fellowships through NSF.

Response: Our overall NIH funding has increased both in terms of shared research equipment and PI support. Funding within the MBRS program at FIU (and directed by Charles Bigger of our department) included $500,000 in NIH funding for shared equipment, which allowed us to purchase a confocal laser microscope, a DNA sequencer, HPLCs, equipment to support molecular work, and three years of service contracts. PI funding from NIH has more than doubled since the last Program Review and currently, of 17 full SCORE projects at FIU, seven are held by PIs in the Biology Department. One of our faculty members has an NIH RO1 grant, and our faculty are now actively applying to this program. Since the last review two of our graduate students have received NSF dissertation improvement fellowships.

Executive Program Review Committee recommendations from the last Program Review and actions taken in response since the last review

A. **Recommendation:** Conduct a study to determine whether the teaching assignments for 0.5 FTE GTAs are competitive with national peers, and if not develop a plan to bring these assignments in line with peers.

Response: After conducting a study, teaching assignments have been revised to conform with national peers and now TAs teach no more than two laboratory sections of one individual course. The course load has been reduced from a previous load of three lab sections, which was the basis for concern and the specific recommendation.

B. **Recommendation:** Respond to the consultant's concerns regarding the advisement of majors.

Response: Since the last Review we hired a Biology Career Advisor (Professor Emeritus Leon Cuervo) at 0.5 FTE to specifically address undergraduate advisement. While this position is targeted for career advising, Dr. Cuervo also assists our Undergraduate Director (John Makemson) and his Senior Secretary (Ana Diaz) in the Biology Undergraduate Office with advising. Additionally, Ana Diaz received training to provide routine advising to our undergraduates (administration, registration, class permission numbers, requirements, etc.). At Biscayne Bay Campus (BBC) we have, since the last review, established a Marine Biology Advising Center. This is normally staffed by a graduate student as his/her assignment (instead of teaching two laboratory sections.) Additionally, one of our BBC faculty (Instructor Maureen Walter) provides advising of non-Marine Biology undergraduates. All tenured/tenure-earning Biology faculty continue to be required to hold a minimum of three office hours per week for walk-in undergraduate advising.

C. **Recommendation:** Respond to the consultant's concerns regarding efforts and attitudes required to keep together a department with disciplinary diversity (i.e., the three major divisions of the department) and spatial discontinuity (i.e., integration of the growing BBC Marine Biology program with other established programs at the University Park (UP) Campus).

Response: To address this issue, we initiated one day Biology Department retreats. The first retreat (held at the Montgomery Botanical Center, whose Director is a member of our graduate faculty) was a general retreat about the status of the department, and addressed a broad number of issues. At this retreat we decided to target specific issues for future retreats. As such, the second retreat (held at the Kampong, whose Director is FIU Biology Professor David Lee) was focused on evaluation of faculty (procedures and assessment of excellence), and the third (also at the Kampong) was a strategic planning session facilitated by the Director of FIU's Center for Labor Research and Studies (Dr. Dawn Addy). This retreat, held in December 2007, also addressed the divisions of the department and spatial discontinuity. Results of this retreat are incorporated throughout this Self Study and are detailed in sections VI through IX as well as XI (the Strategic Plan). We have a commitment (thanks to our new Dean Ken Furton) to install state-of-the art teleconferencing equipment between BBC and UP to link our Marine Biology and UP Biology colleagues during faculty meetings and seminars. (Recently we began using speaker phones during meetings so our BBC colleagues can call in.)

D. **Recommendation:** Become more aggressive in obtaining external support for major pieces of shared research equipment and receive NSF MRI funding for equipment in the $500,000 to $1,000,000 range.

Response: Since the last Program Review, as noted above, Dr. Charles Bigger received a $500,000 equipment grant from NIH with which we purchased major pieces of equipment, including a confocal laser microscope (specifically noted as an equipment priority by Dr. Gene Block, External Reviewer for our last Program Review). This has been set up as a charge-back facility and is widely available to FIU scientists. This grant also supported equipping a new DNA Core Facility in Biology. Additionally we have a new DNA Profiling Facility with major

equipment acquired by Chemistry's International Forensic Research Institute (IFRI), a joint venture between Chemistry and Biology. The Profiling Facility Director, Dr. Dee Mills, holds a joint line (0.5/0.5) between Biology and Chemistry and is a member of our Graduate Faculty. There were no NSF MRI proposals submitted.

E. **Recommendation:** Present data on current external funding per square foot of laboratory space and present a plan to increase that funding measure.

Response: Our current total lab space is 48,604 square feet based on data provided by FIU's Office of Sponsored Research Administration (OSRA). Our most recent available annual data for external funding in the department is for fiscal year 2006/2007 and was $7,210,127. Therefore our external funding per square foot of laboratory space is equal to $148. The funding and space issue at FIU is currently being addressed by OSRA to support a new Research Space Allocation policy. We are continually submitting research proposals and are encouraging all faculty to target programs that allow the maximum overhead (currently 40% at FIU). The potential to bring in external grants is also an important factor in our hiring strategy. We are also encouraging our current faculty to increase their external funding by providing for research intensive faculty assignments with reduced teaching.

F. **Recommendation:** Increase the number of doctoral students and the proportion of doctoral students supported through externally funded research assistantships.

Response: Since the last review we have increased the number of doctoral students in our program from 49 in Fall of 2002 to 76 in Fall of 2007, representing a proportional increase from 44% to 73% of all graduate students (see Table on page 5). This was accomplished by shifting the acceptance ratio of doctoral vs. master's students (although we still believe the master's program is important). We have increased the proportion of graduate students supported by externally funded research assistantships to the point that we are having a difficult time finding enough Teaching Assistants (TAs) to teach our laboratory sections. As a result, we have had to hire many adjunct lab instructors.

G. **Recommendation:** Work with the central administration to remove impediments to the processing of external awards so awards rightly belonging in the department are not housed elsewhere for convenience purposes. Similarly, departmental graduate students should be working as Graduate Research Assistants rather than as hourly employees.

Response: The Department has been given an accountant (Melissa Dubose) to work with the PIs. This has been a tremendous help, especially with the implementation of PantherSoft. The CAS has expanded the Research Office under a new Associate Dean for Research and Facilities to better support PIs, and will provide a financial manager (to be shared between Biology and Chemistry) for additional support. One problem with "housing" of grants continues to be the NIH MBRS program (housed in OSRA) in which the PI, the Department, and the College do not receive any Indirect Cost (IDC) return for

major funding despite resources provided (i.e. office and lab space, infrastructure, etc.). As an example, between 2004-2007 the Direct Cost for eight Biology faculty supported by this program was $3,961,406 (including Dr. Bigger with $203,247 for Program Administration) with 40% overhead for allowable costs (salary, supplies, etc.). In contrast, other FIU programs in which grants were received by Biology faculty PIs (for example SERC) split the IDC return, and this is to be the policy with the College of Medicine (COM) as well. Biology graduate research assistants are no longer paid as hourly employees. Within the last five years graduate student stipends have been increased and health insurance is now provided.

H. **Recommendation:** Work with the Dean's Office and the Office of the Vice President for Advancement to increase significantly the number of Biology alumni and other interested parties contributing to the University.

Response: At our second departmental retreat we discussed this in detail, and have since formed a new departmental committee, the "Development/Outreach Committee". This is a standing committee with five faculty members. One committee charge is "to discover sources of funding to support department-level activities, and initiate efforts to secure such funding". We also requested that FIU's School of Journalism and Mass Communication provide suggestions to increase our visibility and fund-raising. As a result, a team of students spent one semester on this, and made recommendations such as revising the department newsletter as a vehicle for fundraising with a donation card enclosed. Additionally, we were working towards a "Biology brick" program (similar to UM) in which individuals could purchase a name's brick and had planned to write alumni about this. However, the program did not find favor at higher levels at FIU and was not implemented.

I. **Recommendation:** Continue interdisciplinary collaborations such as those with SERC while expanding collaborations with other programs such as Biomedical Engineering, health professions, physiological psychology, and Computer Sciences, with the latter in the area of Bioinformatics.

Response: We are continuing to build upon such collaborations at the individual and departmental levels and are expanding our collaborations with other programs. The Departments of Biology, Mathematics, and Computer Sciences have begun discussions to create an interdepartmental Bioinformatics program. One of our faculty members now has a joint appointment with the College of Medicine, and we are interviewing for two new hires with joint appointments in SERC and Fairchild Tropical Botanical Garden. We are developing a new Biochemistry Ph.D. program which has been approved by FIU and is a joint venture between Biology and Chemistry. We are attempting to hire (offer letter is in processing) a new hire in Neurophysiology who works in the specific, recommended area of physiological psychology.

III. Program Description

The Department offers two Bachelor of Science degree programs, Biology and Marine Biology, as well as both master's and doctoral degree programs in Biology. The undergraduate curriculum includes programs of study that prepare graduates for employment in education, industry, and all levels of government. The baccalaureate degree also satisfies the requirements for admission to colleges of medicine, dentistry, optometry, pharmacy and veterinary medicine as well as to graduate programs in any of the life sciences. The graduate program offers specialized studies in a wide range of disciplines that fall within the areas of expertise of our graduate faculty.

During the period from 2002 to 2007 the number of our undergraduate majors (declared plus intended) has increased from 1408 to 1717. This includes an increase in our Marine Biology undergraduates (the program started in 2001) from 0 to 124. Our graduate program enrollment (total) decreased slightly from 116 to 106. However, due to our increasing emphasis on Ph.D. admission and production the relative number of Ph.D. students (vs. masters) has increased (44% to 73%). The length of the Ph.D. program is on average twice as long as the Master's program, so this increase is substantial. From Fall 2002 through Fall 2007 we have awarded 722 Bachelor of Science degrees (including Marine Biology), 69 masters degrees, and 31 doctoral degrees. Our award of the doctoral degree has increased from an annual average of 3.8 from 1995 to 1999 to an annual average of 6.2 from Fall 2002 to Fall 2007.

The following table summarizes the number of Biology majors (undergraduate and graduate) and degrees awarded for the past five years:

Majors	**Fall 02**	**Fall 03**	**Fall 04**	**Fall 05**	**Fall 06**	**Fall 07**
Undergraduate	1,408	1,386	1,435	1,579	1,656	1,717
Masters	62	76	64	46	33	28
Doctoral	49	51	68	68	73	76
Total	1,519	1,513	1,567	1,693	1,762	1,821
Degrees	**02-03**	**03-04**	**04-05**	**05-06**	**06-07**	**Fall 07**
Bachelor	139	110	138	138	149	48
Masters	8	13	19	11	15	3
Doctoral	5	5	7	5	6	3
Total	152	128	156	154	170	54

The current numbers of declared minors in Biology and in Marine Biology are 41 and 1, respectively. The Marine Biology minor was added in AY2006-07. PantherSoft does not have a query to determine the number of declared minors in past semesters; however, it does allow one to view the number of Minors who graduated in past semesters. These data are presented as follows:

	02-03	**03-04**	**04-05**	**05-06**	**06-07**	**Fall 07**
Biology Minors Graduated	9	19	12	19	20	4
Marine Biology Minors Graduated	NA*	NA*	NA*	NA*	1	0

*na – Not applicable; the program did not exist.

University Core Curriculum (UCC) courses delivered

The UCC requires two courses in basic sciences, one in Life Sciences and one in Physical Sciences. Each course must include both lecture and lab, which also satisfies an FIU requirement. These courses are listed as follows:

Biology courses that fulfill the University Core Curriculum:

BOT 1010 + Lab	Introductory Botany
BSC 1010/1011 + Labs	General Biology I + 2
BSC 2023 + Lab	Human Biology (face-to-face and online)
MCB 2000 + Lab	Introductory Microbiology
OCB 2003 + Lab	Introductory Marine Biology
PCB 2061 + Lab	Introductory Genetics
PCB 2099 + Lab	Foundations of Human Physiology (face-to-face and online)

In addition to University Core courses, the Department of Biological Science offers a number of courses that fulfill requirements (or are specifically required) for majors other than Biology. These are as follows:

Required Courses and Programs Requiring Them

Biology Courses/Labs	Programs Requiring Them
BCH 3033 General Biochemistry	Biomedical Engineering
BSC 1010 General Biology 1 only	Biomedical Engineering, Dietetics and Nutrition
BSC 1011 General Biology 2 only	Earth Sciences
BSC 1010 + 1011 + Labs	Environmental Studies, Pre-Physical Therapy, Biology Education*, Statistics*, Nursing*
BSC 2023 Human Biology	Psychology, Social Work*, Health Sciences*
MCB 2000 Introductory Microbiology	Dietetics and Nutrition, Nursing, Health Sciences*
PCB 2099 Found. of Human Physiology	Nursing, Social Work*
PCB 3043 Ecology + Lab	Biology Education, Environmental Studies*
PCB 3063 Genetics + Lab	Biology Education

PCB 3702 Intermediate Human Physiology (+ Lab)	Biology Education*, Dietetics and Nutrition* + Lab, Occupational Therapy*
PCB 3703 Human Physiology 1 + Lab	Biology Education*
PCB 3704 Human Physiology 2 + Lab	Biology Education*
PCB 4023 Cell Biology + Lab	Biology Education
PCB 4674 Evolution	Biology Education
ZOO 3731 Human Anatomy + Demonstration	Health Sciences*, Nursing, Occupational Therapy, Pre Physical Therapy

* Other courses may substitute for this requirement in these departments.

Student/Faculty Ratios. Student/Faculty Ratios (reported in the following table) were calculated from data in our annual Departmental Progress Reports. Within this table, Student FTEs consist of annual full-time equivalent students, including lower division, upper division, and graduate enrollment in Biology courses. The Number of Faculty consists of the total number of tenured/tenure-earning professors, lecturers or instructors, and visiting faculty in the department for that academic year, without taking into account the percentage of their appointments in Biology. It is apparent that this ratio has increased in recent years.

	Student FTE	Number of faculty	Student:faculty ratio
AY2001-02	687	41	16.8
AY2002-03	749	40	18.7
AY2003-04	820	45	18.2
AY2004-05	846	45	18.8
AY2005-06	922	45	20.5
AY2006-07	978	48	20.4

The Self Study guidelines request that we provide the "Percentage of graduates who go on to graduate or professional school". We only have information from exit surveys, which were first conducted in AY2006-2007. Most students do not respond to the survey. Of those that do respond only an extremely low percentage are able to provide this information. The number of students who graduated in AY2006-07 was 149. Of these, 40 students answered the query about acceptance to graduate or professional schools. Five had been accepted. Forty-four students responded to the query about post-graduation employment in the field of biology, and three students were employed in the field. We do not find this to be a meaningful assessment, since most students begins searching for jobs after they graduate.

IV. Major Changes in Program

Discipline or field – We have both a new Marine Biology undergraduate major and a new Marine Biology undergraduate minor, which are included above in section III. We also have received Faculty Senate approval (with pending State approval) for a new

Ph.D. in Biochemistry that is a joint program between the departments of Biology and Chemistry. We have a new Biomedical and Premedical Honors Track within the undergraduate program. We also have a new undergraduate program, Quantifying Biology in the Classroom (QBIC) which is detailed below in section VI. We work closely with the new International Forensics Research Institute, which is headed by Chemistry, and are actively developing our multidisciplinary Marine Sciences Program which includes faculty in Biology, Chemistry, and perhaps Earth Sciences in the future.

Student demand Both student FTE and our number of majors have shown continual increases as seen in the tables in the previous section. Since the end of the last Review FTE's have increased from 687 to 978 (42% increase) and majors from 1408 to 1717 (22% increase).

Occupational demand We have observed increased student interest in the biomedical and biotechnology fields in line with the growth and job opportunities apparent in these areas. Our student body continues to be overwhelmingly interested in the biomedical area (cell and molecular biology) and with FIU's new College of Medicine we have an opportunity to enhance our faculty expertise and course offerings in this area. Given the Everglades Restoration Project, the activities of the South Florida Water Management District, and the proximity of two National Parks and the Florida Keys National Marine Sanctuary, our students continue to find jobs in these environmental sectors, including environmental consulting companies. With the increasing demand for "green" urban planning we foresee a demand for students trained in environmental biology.

Societal need The societal need for professionals trained in Biology has shown no signs of abating. Trained biologists will continue to be at the forefront of advances in medicine, will fulfill a demand for teachers at all levels, and will support growing demands for expertise in environmental remediation. The new awareness of global and climate change will also augment the demand for career biologists.

V. Student Learning Outcomes

Copies of the Academic Learning Compacts for Biology and Marine Biology, which include the direct measures of student learning objectives for each baccalaureate degree offered, are attached as Appendices 2 and 3. The Compacts are prominently posted on the Biology Department website.

Academic Year 2006-07 was the first year for which undergraduate Student Learning Outcomes were systematically assessed using the Academic Learning Compacts for the B.S. in Biology and the B.S. in Marine Biology. Assessment of Student Learning Outcomes was carried out in BSC 4931 Senior Seminar, the capstone course for the B.S. in Biology and the B.S. in Marine Biology. In AY 2006-07, there was no way to prevent students who were not seniors from enrolling in this course, so the sample population consisted of a mixture of seniors, juniors, and even sophomores. Beginning in Fall 2007, electronic enforcement ensured that only seniors could enroll in the capstone course, so some results from Fall 2007 are included for comparison. Assessment of Student Learning Outcomes is now ongoing and will be conducted on an annual basis

Content/discipline knowledge was assessed using the online Major Field Test in Biology produced by the Educational Testing Service (Princeton, NJ). From August 2005 to December 2006, this test was taken by 7,523 *seniors* in 173 colleges and universities across the United States. This is the population with which our FIU undergraduates are being compared (as percentile = % at or below).

In AY 2006-07, 172 FIU Biology students were tested, with 69% self-identifying as seniors, 16% as juniors, and 13% not identifying their class year. In AY 2006-07, the total test scores for this mixed student population placed our students at the 30th percentile (30th percentile in Cell Biology; 35th percentile in Molecular Biology and Genetics; 30th percentile in Organismal Biology; 25th percentile in Population Biology, Evolution & Ecology). In Fall 2007, when the FIU sample population (n = 49) consisted of seniors only, the total test scores improved dramatically, placing our students at the 60th percentile. The disciplinary area subscores for Fall 2007 also showed great improvement.

In addition, FIU's Marine Biology majors are required to take a supplementary examination in Marine Biology and Oceanography. For Fall of 2007 our mean score was 70% (n = 3).

Critical Thinking and Oral and Written Communication skills were assessed using standard scoring rubrics. In AY 2006-07, the oral and written work of 146 students was assessed using rubrics in which 4 = excellent, 3 = good, 2 = fair, and 1 = poor. For application of the scientific method to solve biological problems, the mean rubric scores were 3.3 oral (75% level 3 or above) and 3.2 written (81% ≥ level 3). For use of appropriate analysis strategies, the scores were 3.4 oral (84% ≥ level 3) and 3.3 written (80% ≥ level 3). For ability to gather and evaluate information critically (including library and online), the scores were 3.3 oral (76% ≥ level 3), 3.4 written (82% ≥ level 3). For analysis/ synthesis to draw scientifically valid conclusions, the scores were 3.3 oral (79% ≥ level 3) and 3.2 written (80% ≥ level 3). For use of biological terms and concepts, the scores were 3.3 oral (81% ≥ level 3) and 3.3 written (79% ≥ level 3). For oral communication using presentation technologies, the score was 3.5 (88% ≥ level 3).

Under the terms of our new Departmental By-laws that went into effect in Fall 2007, the Department of Biological Sciences now has two faculty committees that are concerned with undergraduate education. A new 5-member Biology Education Committee has been established to monitor and help improve the quality of educational activities within the department, from undergraduate to graduate levels, including the evaluation of teaching effectiveness. Their evaluations embody institutional and department goals in instruction and learning of analytical skills, including the Academic Learning Compacts. The committee will use student evaluations and course instruments, such as syllabi and exams, peer evaluations (classroom visits), and the annual assessments of Student Learning Outcomes reported above. The 7-member Biology Undergraduate Committee is responsible for operational aspects of the B.S. programs in Biology and Marine Biology. It is charged with improving the quality of the educational experience for our undergraduate students. Both of these committees act to improve program quality by formulating motions to be voted on by the Department.

Given that the Academic Learning Compacts at FIU first went into effect in Fall 2006 and that we only recently completed our first annual assessment of Student

Learning Outcomes covering AY2006-07 and established a Biology Education Committee, there has not yet been sufficient time to use the results for program improvement. A report of the first year's assessment is in the hands of the Biology Education Committee which will consider the results and formulate recommendations for faculty action during the Spring semester 2008. Our initial concern about the results from the ETS Major Field Test in Biology for AY2006-07 have been somewhat tempered by the improved results for Fall 2007 when only seniors were tested. The Department recognizes the importance of closing the assessment loop by using the results to effect improvements in the curriculum, instruction, and student learning.

Introduction to Sections VI - IX. Strengths, Weaknesses, Opportunities, and Threats (SWOT)

In December 2007 the Biology Department held a Faculty Retreat on Strategic Planning. Dr. Dawn Addy of FIU's Labor Center (an expert in meeting facilitation and strategic planning) was invited to lead the retreat. In preparation, Dr. Addy conducted a survey to produce a current SWOT analysis derived from the last Biology Department Program Review (2001), the comments of our external reviewer, and FIU's recommendations to the Department based on the Review. Benchmarks for the 2007 analysis were determined based on the 2001 report. The (anonymous) survey was returned by 26 of our 42 active full/part-time faculty. Thirty of our 42 faculty attended the retreat. The overall goal of the retreat was to develop a Strategic Plan for the Department (which is included here in section XI). We present here the results of the December 2007 SWOT analysis with identified benchmarks. Assessment of change and current analysis directly follows each section of the analysis.

VI. Strengths that support the achievement of program goals

The 2001 report identified the following **Strengths** (not ranked) which we used as benchmarks for our 2007 SWOT analysis:

1. a well developed sense of collegiality
2. a diverse faculty with diverse interests
3. a sense of identity as part of cohesive disciplinary groups
4. a particularly strong Ecology and Organismic discipline group
5. a well-established Program with Fairchild Tropical Garden
6. a strong graduate program with nationally competitive students
7. substantial graduate and undergraduate enrollments
8. a positive sense of the future development of the department
9. strong support by the administration
10. solid record of publishing in peer-reviewed journals and external grant support in environmental biology and biomedical areas
11. opportunity for research in unique or unusual areas including the Everglades and tropical marine ecosystems

The 2007 survey indicated that the Department remains strong in the above areas numbered 2, 4, 5, 6, 7, 10 and 11. In areas 1, 3, 8, and 9 the strengths declined due to a sense of pessimism following faculty losses and a sense that collegiality had

eroded. Disciplinary groups were no longer viewed as cohesive and were perceived as having fractured the department. The strengthening of groups has become problematic due to loss of faculty and failure to replace them. There was a sense of discouragement due to a perception of lack of support from the higher administration. However, we also recognized as a strength the willingness of faculty to work toward renewed unity, and since the retreat we note a definite renewed sense of optimism and collegiality. We are enthusiastic about our new dean (who attended part of our retreat).

We believe that our best strength is our faculty who do an outstanding job of teaching undergraduates and supervising graduate students and thus achieve our program goals in teaching and research. Our scholarly productivity (publications) has notably increased despite the fact that we have lost so many faculty. A summary of our departmental publications for the past five years is as follows:

Publication category	AY02-03	AY03-04	AY04-05	AY05-06	AY06-07
Authored books	1	1	1	0	1
Edited books	4	1	0	2	1
Book chapters	20	8	4	16	3
Refereed articles	49	84	98	119	124
Total	**74**	**94**	**103**	**137**	**129**

We have further expanded our strengths in terms of new programs, new Core Facilities, and continued growth of specific programs within the department such as Marine Biology. Some examples are as follows:

LTER Renewal

It is a major achievement that our Florida Coastal Everglades-Long Term Ecological Research (FCE-LTER) grant was renewed by NSF. AY 2006-07 was the first year of the six-year renewal. This is a prominent, multi-million dollar award with an annual budget of $820,000. The PI, Evelyn Gaiser, is a Biology Professor and is a joint appointment with SERC. This multi-disciplinary program has three CoPIs, Mike Heithaus (Biology/Marine Science) and faculty members from Chemistry/SERC and Earth Sciences, as well as 60 senior scientists (six in Biology) and 44 students from 27 institutions.

QBIC

QBIC is the acronym for **Quantifying Biology in the Classroom.** Currently, and pending extramural funding, it is a pilot program within the Department of Biological Sciences that was spearheaded by Dr. Ophelia Weeks and funded by the Provost. It was developed over a 2-year period (beginning in 2004) by 12 faculty members in Biological Sciences, Mathematics, Statistics, Chemistry, Physics, Computer Science and Biomedical Engineering in response to a report titled: "*BIO 2010-Transforming Undergraduate Education for Future Research Biologists".* This report was generated from a major study on undergraduate biology education conducted by the *National Research Council* of the *National Academies*. The primary recommendation of the report (available on the National Academies website - **http://www.nap.edu/openbook.php?isbn=0309085357)** is that biology education should use an interdisciplinary approach that incorporates a strong basis in mathematics

and physical sciences. The FIU QBIC program exposes QBIC scholars, as cohorts of 24 undergraduate students, to a more rigorous curriculum in biology that is both inter-disciplinary and quantitative and is implemented in small groups of students. Our first cohort began the QBIC program in Fall 2007.

DNA Core Laboratory

In 2003 we opened Biology's DNA Core facility, under the direction and supervision of Biology Professor Tim Collins. The Core is an FIU recharge facility, and is fully equipped for DNA sequencing, fragment analysis, and data analysis for FIU faculty and students. It contains state-of-the-art DNA sequencing equipment and fragment analysis software/computer support. The facility is staffed by a laboratory manager who carries out the day-to-day functions and analysis. Further details may be found at http://www.fiu.edu/~dnacore/. The facilitiy includes an on-site freezer-stocking program with Promega. Over 75 students and more than 20 faculty from four different units within FIU, as well as Fairchild Tropical Botanical Garden, use the DNA Core. Virtually all of the papers and proposals based on molecular data that have come from Biology Department are based on data from the Core. The Core also provides, when requested, free service for grant development, particularly for new faculty and graduate students.

Marine Biology and the Marine Sciences Program

Within the Biology Department we offer two new undergraduate degrees (a Major and Minor) in Marine Biology, as discussed previously (Section lll). In addition to this focus on undergraduate education in marine biology, we have a new Marine Science Building at FIU's Biscayne Bay Campus (BBC). Office and research lab space are available for 10 marine science faculty who are envisioned to span departments. At the present time two Biology and one Chemistry faculty are housed at the new building, and we are in the midst of a search to hire at least one new marine biologist in the present year. The program has been housed in Biology, and one of our faculty (Biology Professor Mike Heithaus) was recently appointed as Marine Sciences Director. The program has its own budget for development, and is actively expanding in terms of a flow through seawater system, new docks and boats, etc. It is noteworthy that both of our Marine Biology faculty at BBC (Drs. Mike Heithaus and Craig Layman) have just been recommended for NSF CAREER awards, stellar achievements. This program has enormous potential and priority support from the Biology department faculty.

Center for Ethnobiology and Natural Products (CENaP)

This new program is directed by Biology Professor Brad Bennett. Since its inception (four years ago) CENaP has received more than $2,000,000 in external funding, most notably from the NIH program "Training in Alternative Tropical Botanical Medicines." These funds have been used to support research and to support ca. 10 graduate students, 3 post-docs, and 2 undergraduates. This promisting program has experienced loss of a key faculty member, and we are targeting this as a potential focus for "cluster hiring" with the College of Arts and Sciences. CENaP's primary objective is to investigate the use of natural products in both traditional and modern health systems, with a focus on plants that are employed in medicines. CENAP researchers employ a multidisciplinary approach to: (1) identify sources of natural products, (2) investigate their cultural importance, (3) isolate and identify active constituents of natural products, and (4) determine the pharmacological activity of these constituents. This field-to-pharmacy approach distinguishes CENaP from other natural products research groups. CENaP's

goals closely parallel FIU's strategic themes in health, the environment, and internationalism. CENaP research has been published in several journals and has been publicized in the local and national press (including the Wall Street Journal).

The Comparative Immunology Institute (CII)

The CII institute, directed by Biology Profess Sylvia Smith, continues to be strong and is internationally recognized. It is supported by program development funds from NIH/NIGMS (the Comparative Immunology and Biomedical Research Initiatives). The immunogenetics laboratory of the CII functions as a core FIU research facility, and provides FIU faculty from many Departments, Colleges, Schools and Centers access to instrument/equipment usage, hands-on individualized research training to students, and research facilities for visiting scientists. Research training workshops offered by the CII include *Marine Comparative Immunology, Protein Immunochemistry,* and *Cell-free Protein Synthesis*. The facility has been used by visiting scientists from Japan, Mexico, Korea, Canada, England and Scotland and has led to collaborations with FIU faculty that have resulted in successful grant applications (DOD, NIAID, Burroughs Wellcome Fund. The CI institute hosts the annual Biomedical and Immunology Symposium with nationally/internationally renowned plenary speakers.

VII. Weaknesses that impede the achievement of program goals

Identified **Weaknesses** (not ranked) from the 2001 report were:

1. inadequate infrastructure support
2. lack (and loss) of faculty in key research groups
3. discontinuation of QIP funding for Tropical Biology
4. the condition of the OE building and need of renovations to some of its key facilities
5. a need to strengthen Cell and Molecular Sciences
6. a small number of postdoctoral fellows

In this area, all identified weaknesses remain as problems. In particular, faculty loss (number 2) is ongoing and is discussed in detail below. For number 1 (infrastructure), the implementation and training required for PantherSoft were widely perceived as serious infrastructure impediments. However it is now functional and (particularly for the Student Administration component) we recognize that this software has significantly improved our teaching and advising activities. Management of grants by the financial side of PantherSoft continues to be time-consuming and problematic. To improve departmental infrastructure support, within the past five years we have hired)at University Park campus) an Associate Chair for our department, a dedicated Grants Manager, and a Building Manager for the Health and Life Sciences building. At BBC we have hired a Director (see above), a dedicated secretary, and a Building Manager for the Marine Science Building. These are all great strides forward. For number 3, we now believe that we can and should obtain our own funds and not rely on QIP (FIU's Quality Improvement Program). Renovation of OE is occurring, but is slow and incremental. For number 5 we believe our partnership with the College of Medicine will strengthen this area. For number 6 have increased the number of postdocs, and we believe this is now a strength.

We believe that loss of faculty is our most severe problem; however, we do recognize that FIU's administration is becoming increasingly supportive of our faculty dilemma and we hope to hire at least five new tenure-track faculty this year. The situation in our department is dire. As of the beginning of Fall 2007 we had 52 faculty members listed in our department. Of these, four are on leaves of absence and will not be returning to FIU, two did not receive tenure, two have moved 100% to the COM, one has moved 85% to OSRA, one is moving 75% to COM, one has moved 75% to the Kampong, one is Vice President for Academic Affairs (100% assignment), one has retired, and one has voluntarily left FIU. This is a loss of 10 faculty in less than one year. There have been three additional losses since the last Review - our 13 lost faculty included 5 tenure track Professors, 5 tenured Professors, and 3 Lecturers. One more lecturer will be moving to COM Fall 2009. In the short term we have had to hire numerous adjuncts. For example, in Fall 2007 we paid $76,000 for adjuncts. This exceeded the previous Fall and Spring (2006) together, which totaled $68,500.

In addition to the above losses of faculty, six of our faculty are on 50% joint lines with other departments (SERC, FTBG, IFRI, Earth Sciences, or research) and eight faculty have substantial administrative duties (the Chair and Associate Chair, Biology Career Advisor, Marine Science Director, ABR Administrator, QBIC Director, and Graduate and Undergraduate Directors).

With our (100%) loss of 10 faculty (Doug Wartzok, Vice President for Academic Affairs, is active as a mentor in our Graduate Program) we now have 42 active faculty with full or part-time FTE in Biology). Of these 30 are tenured/tenure-earning, but only 16 of these function as 100% Biology faculty (i.e. do not have joint lines or administrative assignments). We have seven non-tenure track permanent faculty who are lecturers or instructors. These include four full time permanent lines, two half lines, and one 25% line. We also have three visiting lines.

On the bright side, we are currently advertising for new tenure track hires in Wetlands Ecosystem Ecology (joint with SERC), Marine Biology, Virology, and Plant Population Genetics (joint with Fairchild Tropical Botanic Garden). We are also attempting an opportunistic hire in Neurophysiology, and an offer letter is being written.

VIII. Opportunities to explore in the achievement of program goals

Identified **Opportunities** (not ranked) from the 2001 report were:

1. further development of the environmental theme
2. further development of the health theme
3. increases in extramural funding
4. increased support in infrastructure to enhance productivity
5. hiring of instructors to teach large courses for non-science majors
6. more collaborations and joint programs
7. sharing of major equipment and resources with other departments
8. further development of Marine Sciences

All of the opportunities that were benchmarked in the past continue as opportunities and some have increased in importance. For example, given the prominence of environmental issues regionally, nationally and globally, this opportunity

provides strong potential for funding growth in this area and development of even stronger programs. The same holds true for the health theme with the opening of the College of Medicine. We view this as a tremendous opportunity for our department, and are focusing on how we can interface with this new program both in our hiring strategy and our departmental strategic plan. We currently have one faculty member, Kalai Mathee, who has been appointed as a joint line with the COM (25% Biology, 75% COM). We provided input to the Dean of Arts and Sciences for his recent development of a policy for joint appointments between Biology and the COM in terms of tenure, space, grants, etc. We plan to approach the COM with proposals for specific joint hires within the next year.

IX. Threats to overcome in the achievement of program goals

Identified **Threats** (not ranked) from the 2001 report were:

1. we need more space to accommodate growth in our undergraduate and graduate programs but space is now a premium at FIU
2. existing space must remain in the department (not allocated to other units) but we have experienced recent loss
3. more instructional labs required to support our undergraduate courses
4. increased infrastructure (support staff and resources for common use labs and equipment) is required to support our undergraduate courses
5. decrease in Federal Grant opportunities (overall budget declines)

All previously identified threats remain the same and some have increased. Our most serious concern is that some of our faculty, in spite of stellar research productivity and excellent graduate student mentoring and production, were recently specifically targeted to lose current lab space. We managed to prevent this from happening by working closely with our Dean, the Faculty Senate, and OSRA. While these individual faculty members are no longer targeted, we remain very concerned with the upcoming implementation of a Research Space Allocation based very heavily on external funding and % overhead yield. We strongly believe that some of our most successful faculty members, with internationally prominent research programs, do not require major funding levels (hundreds of thousands of dollars per year). A requirement to write grants that bring in this level of funding would not be an efficient use of their time. We would prefer a system in which the funding of all of our faculty members is pooled and used as the basis for research space allocated to the department as a whole since some of our faculty bring in more money than they need to "justify" their space. Additionally, we would prefer if the Space Allocation model included more recognition of graduate student training and faculty scholarship.

X. Budget

Our budget has steadily decreased due to the State Wide SUS budget cuts. However, we continue to bring in research grants. Grant income for the Biology Department over the past five years was as follows:

Fiscal Year	Amount
2002-03	$ 7,210,127

2003-04	$ 7,430,143
2004-05	$ 8,723,555
2005-06	$ 8,422,219
2006-07	$ 7,210,127
Total	**$38,450,203**

We continue to submit (and are awarded) a substantial number of external grants. Our overall trajectory over the past five years has been positive, and this trend is expected to increase in the next five years with our new initiative in the area of biomedicine. Additionally, we are emphasizing the importance of attaining substantial external funding to our interviewees for our current four approved tenure-track hires.

Proposed increments in total budget requirements for the next five years are difficult to envision based on the current severe cuts in educational funding at the state level. At the very least, we propose to continue hiring tenure track faculty to replace our lost faculty and to conform to the College of Arts & Sciences new hiring plans. We cannot predict expected revenues and return on investment given the current uncertain (State of Florida) budget environment.

XI. Major Findings and Recommendations For this section we present the Strategic Plan developed at our December 2007 department retreat.

Strategic Plan for the Department of Biological Sciences:

A. Overall Goal: Develop a Strong Biology Faculty

Objective 1: Develop a hiring plan for the future.

a. Strategy: *Develop four and eight year hiring plans*.

This specific task was requested by Dean Furton and includes proposals for cluster hiring. At the retreat a Task Force for Hiring consisting of eight Biology faculty members was formed and has been working on the hiring plans. The task force (Chaired by Jennifer Richards) will report regularly to the Department starting in Spring of 2008.

Priorities identified from group discussion were:

- design flexibility within the hiring plan to enable Biology to take advantage of hires of opportunity
- revisit hiring priorities every year
- conform with the Delaware model
- make the Department attractive to improve faculty retention

b. Strategy: Identify program areas and needs for faculty hires.

Suggestions at the retreat included Marine Biology, Biomedicine, and interdisciplinary hires that will serve multiple purposes. We also recognize the need to maintain strengths in currently strong areas. This strategy will be examined by our Task Force for Hiring under the same timeline.

Priorities:

- clarify how each new hire will strengthen the department as a whole and not

diminish other areas of the department
- reduce our reliance on adjuncts
- identify teaching deficiencies and integrate needs within the context of hiring
- offer a broader range of specialty courses (ichthyology, entomology, ornithology, etc.), many of which are listed in our catalogue but no longer offered due to loss of faculty
- continue strengthening of the undergraduate curriculum
- review and improve departmental advising

Objective 2. Improve Faculty Collegiality

a. Strategy: Acknowledge and reward faculty for their efforts and accomplishments.

Priorities:
- use monthly faculty meetings for acknowledgment
- host an annual event in conjunction with the Biology Symposium in which faculty and graduate student accomplishments are recognized
- emphasize positive accomplishments in annual evaluations of faculty and merit raises (i.e. reward faculty through all possible university channels)
- develop perks and benefits in the department such as release time for proposal writing

b. Strategy: Increase collegial (social) interaction

Priorities:
- host welcoming parties for new faculty
- have wine/cheese receptions for faculty following monthly departmental faculty meetings
- encourage open and transparent discussions about major department issues that include the entire faculty

c. Strategy: Target collegiality in new faculty hires

Objective 3. Examine Faculty Workload

a. Strategy: Address infrastructure shortages to reduce time spent by faculty on bureaucratic and technical issues.

Priorities:
- recommend streamlining of PantherSoft for requistions
- improve accounting support for grant management in the department
- hire more support technicians for research (common use facilities)
- adjust teaching loads to conform to research intensive universities

b. Strategy: Increase participation in faculty development workshops available at or through FIU.

Priorities:
- improve grant writing skills
- improve classroom teaching
- increase professional development

B. Overall goal: Develop Resources

Objective 1: Ensure efficient use of space

a. Strategy: Develop a space plan that allows us to meet our academic goals, including growth and maintenance of shared core facilities that ensure faculty development, research expansion, graduate and undergraduate research, academic training, and teaching.

Priorities:

- develop space plans that conform with four and eight year hiring plans in addition to providing space for current faculty
- develop proactive policies in response to space problems as they arise
- identify recharge facilities in the Department
- identify additional funding sources for seed projects for faculty and graduate students
- update and be proactive about Department resources including service and maintenance contracts

Objective 2: Examine Existing Budget and Increase Funding

a. Strategy: Pursue opportunities for federal funding for departmental research facilities.

b. Strategy: Pursue institutional (FIU) sources of money.

Priorities:

- communicate funding needs and interests to administrators
- increase Biology proposals within limited submission programs at FIU
- negotiate agreements with external organizations that bring us research space as well as faculty hires (e.g. Fairchild Tropical Botanic Garden)

c. Strategy: Improve the level of support and guidance from OSRA and FIU

Priorities:

- work more closely with financial managers assigned to Biology within OSRA
- pursue Biology representation on the University Research Committee

C. Overall goal: Evaluate Current Structure of the Department

Objective 1: Interface with College of Medicine

a. Strategy: Strengthen our own biomedical prowess.

Priorities:

- develop new courses such as Medical Ecology to be offered in the Biology Department
- pursue joint hires with the COM
- strengthen biomedically oriented areas in the Biology Department that complement the COM
- pursue more NIH funding

b. Strategy: Increase our interaction and communication with the COM.

Priorities:

- send email announcements for all biomedical themed Biology seminars, symposia, etc. to the COM faculty e-mailing list

- host a yearly mixer between COM and Biology in conjunction with the Biomedical and Comparative Immunology Symposium

Objective 2: Departmental Discipline Groups

a. Strategy: Review current discipline groups

Priorities:

- dissolve current (divisive) groups and function as one, integrated department

D. Overall goal: Improve our Students' Educational Experience

Objective 1: Enhance the quality of our undergraduate program.

a. Strategy: Improve our schedule of course offerings and advising.

Priorities:

- provide course schedules that allow Biology students to take courses in a reasonable timeframe and order
- set up a yearly advising schedule for Biology students

b. Strategy: Provide two tracks for the Biology major. Track 1 will consist of students who declare Biology as a major upon admission to FIU as freshmen. Track 2 will consist of transfer students, students from Miami-Dade College, and students who switch majors at FIU.

Priorities:

- revise undergraduate advising for Track 1 to focus on career goals
- implement a pre-university summer academic "Boot Camp" for Track 1 students
- obtain NSF Research Experiences for Undergraduates (REU) funding to support "Boot Camp"

Objective 2: Increase the quality of our graduate program

a. Strategy: Review and improve graduate program structure.

Priorities:

- offer core graduate courses on a regular basis so students can plan
- offer courses to supplement our required Introduction to Biological Research, such as Critical Thinking and Analysis, and Scientific Writing
- keep the same admission standards in Spring as in Fall

Appendix 1

List of abbreviations

ABR	Access to Biomedical Research program (FIU)
ALC	Academic Learning Compact
AY	Academic Year
BBC	Biscayne Bay Campus (FIU)
BCI	Biomedical and Comparative Immunology Symposium (FIU)
CAS	College of Arts & Sciences (FIU)
CENAP	Center for Ethnobiology and Natural Products (FIU)
CII	Comparative Immunology Institute (FIU)
COM	College of Medicine (FIU)
EPA	U.S. Environmental Protection Agency
FTBG	Fairchild Tropical Botanic Garden
FTE	Full-Time Equivalent
FY	Fiscal Year
GTA	Graduate Teaching Assistant
GRO	Greater Research Opportunities program (EPA)
HLS	Health and Life Sciences Building 1 or 2 (FIU)
HPLC	High Performance Liquid Chromatography
IDC	Indirect Cost return on sponsored research
IFRI	International Forensics Research Institute (FIU)
MBRS	Minority Biomedical Research Support program (FIU)
MDC	Miami-Dade College
MSB	Marine Science Building (FIU)
NIGMS	National Institute of General Medical Sciences (NIH)
NIH	National Institutes of Health
NSF	National Science Foundation
OE	Owa Ehan Building (FIU)
OSRA	Office of Sponsored Research Administration (FIU)
PantherSoft	FIU financial and student administration software packages
QBIC	Quantifying Biology In the Classroom program (FIU)
QIP	Quality Improvement Program (FIU)
RA	Research Assistant
REU	Research Experiences for Undergraduates (NSF)
RISE	Research Initiative for Scientific Enhancement (NIH)
SCORE	Support of Competitive Research program (NIH)
SERC	Southeast Environmental Research Center (FIU)
STAR	Science to Achieve Results program (EPA)
SWOT	Strength, Weakness, Opportunity, Threat
TA	Teaching Assistant
UCC	University Core Curriculum (FIU)

Florida International University

Academic Learning Compact

Name of the Undergraduate Degree Program

Biology

Mission Statement

The aim of the Biology degree program is to provide a strong foundation in structural and developmental biology, physiology, organismal diversity, and ecology, within an evolutionary framework. This field of study will prepare students for further graduate and professional studies, as well as for employment in areas that require university-level training in the life sciences.

Student Learning Outcomes

FIU Biology graduates should be able to achieve the following:

Content/Discipline Knowledge

1. Describe how structural complexity in living organisms is built up by combining simpler subunits into complex, adaptive combinations.
2. Explain how cells and organisms use integrated regulatory processes to maintain homeostasis.
3. Explain the principles of genetics that determine how species exist as populations that share a gene pool and how species evolve.
4. Explain the principles that govern the interaction of organisms and their environments.

Critical Thinking

1. Apply the scientific method in laboratory and field settings to solve problems in the biological sciences.
2. Select and use appropriate analysis strategies including, when applicable, statistical analyses.
3. Demonstrate the ability to gather and evaluate information critically, including the use of library and online research resources.
4. Analyze and synthesize information to draw scientifically valid conclusions.

Oral and Written Communication

1. Use biological terms and concepts accurately and effectively in written form.
2. Communicate biological information in oral form employing appropriate presentation technologies.

Florida International University

Academic Learning Compact

Name of the Undergraduate Degree Program

Marine Biology

Mission Statement

The aim of the Marine Biology degree program is to provide a strong foundation in structural and developmental biology, physiology, organismal diversity, and ecology, within an evolutionary framework. Emphasis will be placed on marine organisms and ecosystems, taking advantage of ready access to the diverse marine environments of Florida and the Caribbean. This field of study will prepare students for further graduate and professional studies, as well as for employment in areas that require university-level training in marine biology and oceanography.

Student Learning Outcomes

FIU Marine Biology graduates should be able to achieve the following:

Content/Discipline Knowledge

1. Describe how structural complexity in marine organisms is built up by combining simpler subunits into complex, adaptive combinations.
2. Explain how cells and organisms use integrated regulatory processes to maintain homeostasis.
3. Explain the principles of genetics that determine how species exist as populations that share a gene pool and how species evolve.
4. Explain the principles that govern the interaction of marine organisms and their environments.

Critical Thinking

1. Apply the scientific method in laboratory and field settings to solve problems in marine biology and oceanography.
2. Select and use appropriate analysis strategies including, when applicable, statistical analyses.
3. Demonstrate the ability to gather and evaluate information critically, including the use of library and online research resources.
4. Analyze and synthesize information to draw scientifically valid conclusions.

Oral and Written Communication
1. Use marine biological terms and concepts accurately and effectively in written form. 2. Communicate marine biological information in oral form employing appropriate presentation technologies.