



## MEMORANDUM

**To:** Donna E. Shalala, President

**From:** Tomas A. Salerno  
Chair, Faculty Senate

A handwritten signature in black ink, appearing to read 'Tomas A. Salerno'.

**Date:** February 27, 2015

**Subject:** Faculty Senate Legislation #2014-27(B) – *Rename* the Master of Science (M.S.), and Master of Professional Science (M.P.S.) in Marine Affairs and Policy to Marine Ecosystems and Society, and  
*Establish* the Doctor of Philosophy (Ph.D.) Marine Ecosystems and Society (MES), Rosenstiel School of Marine and Atmospheric Science

\*\*\*\*\*

The Faculty Senate, at its February 25, 2015 meeting, voted by majority with 1 abstention to approve the restructure of the graduate programs at the Rosenstiel School of Marine and Atmospheric Science as amended. Each department's proposal is written as separate legislation for administrative purposes and includes the proviso that the School will give a report to the Senate in two years after the programs' implementation.

As noted in the proposal, these programs serve the needs of the students and faculty of the department by providing a challenging and flexible curriculum that encompasses the breath of research areas in the social and ecological sciences related to the marine environment. This name change will align the graduate program names with the department name of Marine Ecosystems and Society.

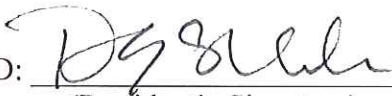
This legislation is now forwarded to you for your action.

TAS/rh

Enclosure

cc: Thomas LeBlanc, Executive Vice President and Provost  
Roni Avissar, Dean, Rosenstiel School of Marine and Atmospheric Science  
Amy Clement, Associate Dean, Rosenstiel School of Marine and Atmospheric Science  
Sharanya Majumdar, Program Director, Rosenstiel School of Marine and Atmospheric Science  
Kenny Broad, Chair, Department of Marine Ecosystems and Society, Rosenstiel School of Marine and Atmospheric Science

**CAPSULE:** Faculty Senate Legislation #2014-27(B) – *Rename* the Master of Science (M.S.), and Master of Professional Science (M.P.S.) in Marine Affairs and Policy to Marine Ecosystems and Society, and *Establish* the Doctor of Philosophy (Ph.D.) Marine Ecosystems and Society (MES), Rosenstiel School of Marine and Atmospheric Science

APPROVED:  DATE: 03/06/2015  
(President's Signature)

OFFICE OR INDIVIDUAL TO IMPLEMENT: Dean Avissar

EFFECTIVE DATE OF LEGISLATION: IMMEDIATELY  
(if other than June 1 next following)

NOT APPROVED AND REFERRED TO: \_\_\_\_\_

REMARKS (IF NOT APPROVED): \_\_\_\_\_

UNIVERSITY OF MIAMI

**ROSENSTIEL****SCHOOL of MARINE &  
ATMOSPHERIC SCIENCE**

Rosenstiel School of Marine and Atmospheric Science

University of Miami

4600 Rickenbacker Causeway

Miami, FL 33149, USA



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Rosenstiel School of Marine and Atmospheric Science  
University of Miami  
4600 Rickenbacker Causeway  
Miami, FL 33149, USA



## MEMORANDUM

**TO:** Professor Brian Blake (Dean, University of Miami Graduate School)  
**FROM:** Sharan Majumdar (Assoc. Professor and Chair, Academic Committee, Rosenstiel School)  
Amy Clement (Professor and Associate Dean of Graduate Studies, Rosenstiel School)  
**DATE:** November 10, 2014  
**SUBJECT:** **Graduate Program Restructuring at the Rosenstiel School**

The Rosenstiel School of Marine and Atmospheric Science has entered an exciting phase of its evolution, with externally funded new buildings and research facilities, a major investment by UM in renovating infrastructure, new business models for faculty and graduate students aligned with national models, and plans to hire the next generation of faculty. On June 1, 2014, the Rosenstiel School was restructured from 6 divisions into 5 new departments, following approval by the Faculty Senate on March 26, 2014. The main reason for this restructure has been to develop the School into academic units that can be administered more autonomously.

The establishment of the new departments has provided an opportunity to rethink and revitalize our graduate programs into new or improved programs. Currently, there exist 6 programs with the names of the 6 former divisions. We are proposing a new structure in which 5 graduate programs are aligned with the 5 new departments, and one existing program will continue as an inter-departmental program. The package presented here describes how we will transition to this new structure, which includes the development of 3 new Ph.D. programs, 3 program name changes, 1 new certificate program, and the phasing out of 2 existing programs. A schematic showing the old divisions/programs, new departments, and new proposed structure is on the next page. We wish for this package to be considered holistically, since the various actions of developing, renaming and phasing out programs are interdependent.

The contents of the package together with results from faculty votes are as follows:

### School-wide Memos

- S1. This cover letter, explaining the programmatic restructure from a School-wide perspective.
- S2. Dean of the Rosenstiel School.
- S3. Vice Chair of the Rosenstiel School Council.
- S4. Associate Dean of Master of Professional Science (MPS), on the transfer of MPS degree programs.

### Departments

- D1. Department of Ocean Sciences (OCE)**
  - New M.S. and Ph.D. program proposal in Ocean Sciences. **Supported 19-1 (1 abstain)**
- D2. Department of Atmospheric Sciences (ATM)**
  - New M.S. and Ph.D. program proposal in Atmospheric Sciences. **Supported 11-0.**
- D3. Department of Marine Ecosystems and Society (MES)**
  - New Ph.D. program proposal in Marine Ecosystems and Society. **Supported 10-0.**
  - M.S. program name change from Marine Affairs and Policy (MAF) to Marine Ecosystems and Society (MES). **Supported 10-0.**
- D4. Department of Marine Biology and Ecology (MBE)**
  - M.S. and Ph.D. program name change from Marine Biology and Fisheries (MBF) to Marine Biology and Ecology (MBE). **Supported 14-0.**

**D5. Department of Marine Geosciences (MGS)**

- Proposal for new Certificate Program in Applied Carbonate Geology. **Supported 8-0.**
- M.S. and Ph.D. program name change from Marine Geology and Geophysics (MGG) to Marine Geosciences (MGS). **Supported 8-0.**

Existing Programs

**E1. Applied Marine Physics (AMP)**

- Memo stating faculty intention to admit new graduate students solely into the new programs in 2016. **Supported 6-0.**

**E2. Marine and Atmospheric Chemistry (MAC)**

- Memo stating faculty intention to admit new graduate students solely into the new programs in 2016. **Supported 7-0.**

**E3. Meteorology and Physical Oceanography (MPO)**

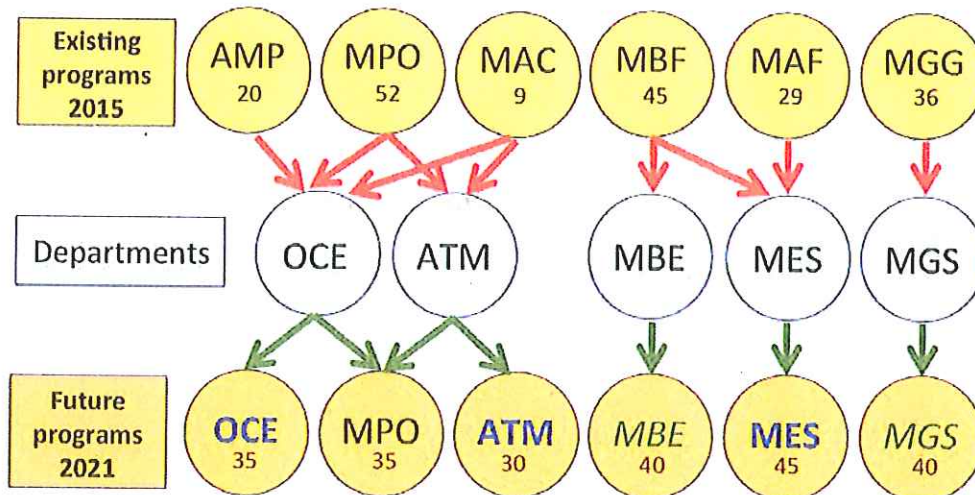
- Memo stating support for new programs and long-term continuation of MPO. **Supported 14-6.**

**E4. Abess Center for Ecosystem Science and Policy**

- Memo stating support from the Director of the Abess Center.

Each new program aligned with the new departments will offer M.S. and Ph.D. degrees with the degree title matching the program name. The three departments that are proposing new graduate programs: OCE, ATM, and MES, are proposed to begin in Fall 2015. The MBE and MGS departments, and the MES Master's Program, are proposing a name change to their existing programs. We propose that students in the existing programs will be allowed to transfer into the new programs beginning in Fall 2015. Current MPS tracks will be transferred into new departments, but will otherwise remain unchanged.

*This diagram illustrates the 6 existing graduate programs (M.S. and Ph.D. combined, except MAF which is M.S. only) and student populations in each program (yellow circles). The red arrows illustrate how the existing graduate programs are mapped onto the 5 departments (green circles). The orange circles list the 6 proposed graduate programs with conservatively projected student populations in 2021, five years after the enrollment of new students in the new programs. These numbers are based on polls of faculty on their projected student intake, and average graduation rates. The green arrows illustrate the alignment between the new departments and the future programs. The programs listed in blue are new programs, while the two programs listed in green are renamed programs. The MPO program will continue as is and will be maintained as an interdepartmental program served by faculty from OCE and ATM.*



## School-wide Rationale

An overview of the rationale for the establishment of the new programs is summarized here, with explanations in further depth provided in each of the individual program proposals.

In the UM Strategic Plan (2008), the need was stated for UM to advance up the National Research Council (NRC) rankings, and in turn reach the highest echelon of national research universities: the private institutions of the Association of American Universities (AAU). This intention included aiming for a top-10 ranking for the Rosenstiel School with nationally prominent graduate programs that are distinguished by their breadth and depth, and quality of the student body that matches that on the campuses of private AAU institutions. In the 2010 NRC Rankings, the 5<sup>th</sup> & 95<sup>th</sup> percentile rankings for the Rosenstiel School out of 50 comparable schools and departments were 11 & 40 respectively in criteria deemed important for scholars, and 10 & 42 respectively in research rankings. These numbers suggest that the Rosenstiel School is on average in the middle, with most opinions ranging from the highest 20% to the lowest 20%. Our goal is to elevate the Rosenstiel School's graduate education into the top tier.

The improvement of our graduate programs relies on our ability to recruit top-class students. Currently, the number and quality of applicants especially in the physical and chemical sciences are sub-optimal, even with highly competitive stipends and 5-year research assistantships. The faculty have expressed a need to offer broader opportunities to prospective graduate students, and the proposed programs are designed to meet this need. In developing our new proposed programs, the core curricular structures have been revisited (something that has not been done in existing programs for decades), and the result is more curricular options offering greater flexibility for students, and adding more prominence in attractive areas including interdisciplinary studies. We expect that the programs will be more visible to high-caliber students in the oceanic and atmospheric sciences via the identity of the departments. This increased visibility will also serve to enhance the pool of high quality students in the retained program (MPO).

The 6 programs that used to reside within the old divisions have been in existence for several decades (yellow circles in diagram). As is indicated by the red arrows in the diagram, these programs are presently not well aligned with the 5 new departments (green circles). The new graduate program structure aligns cleanly with the 5 departments (green arrows). The MPO program will continue as an inter-departmental program that attracts students with interests in the physical processes of both the atmospheric and oceanic media, a core strength at UM that will continue to contribute to the overall growth in the graduate student population. All the main 6 programs (5 departments and MPO) will be of comparable size to each other, with a conservative projection of at least 30 graduate students in each program in the long-term (2021). The new programmatic structure will align with our parallel undergraduate and MPS programs, which are also expected to align with the departments moving forward. The proposed structure will also enable opportunities for joint programs or concentrations across both the Rosenstiel School and UM (such as the recently revived Ocean Engineering program).

The reorganization into new departments has left some important disciplines without a distinctive 'home'. Chief among these are fisheries, marine physics, marine chemistry, and atmospheric chemistry. The new M.S. and Ph.D. program in Marine Ecosystems and Society is designed to accommodate fisheries. Faculty in the other three disciplines have had difficulty recruiting into the existing small programs, and have formally stated their interest in recruiting new students solely into the new OCE and ATM programs. One top priority is to expand our programmatic structure in the well-funded physical and chemical sciences from one large program (MPO) and two small programs (AMP, MAC) into three thriving complementary programs that accommodate the diverse range of research expertise across the faculty in the OCE and ATM departments. This reorganization ensures that all graduate programs have critical mass – a robust cohort class is important for attracting students and for a collaborative learning environment.

The equilibrium faculty size of the Rosenstiel School in the Provost's business model is 68. Working within this number, there is a robust plan to recruit up to 16 new faculty in the School by 2020. The announcements for hiring 5 new faculty members (1 in each department) have recently been advertised. The presence of exciting new and diverse *research-enhancing* graduate programs with high visibility is expected to be more attractive to top faculty applicants than the existing uneven structure, together with the incentive for future and current faculty to make a substantial contribution to their development. Furthermore, the School contains a large core of internationally recognized, well-published and funded mid-career faculty who maintain large research programs and advise many graduate students, who also contribute substantially to the educational mission of UM. The 'positive feedback' through the recruitment of high-quality students remains an important factor in the retention of top faculty. Many faculty have expressed the need for the new programs to enhance their student recruitment.

We anticipate that the new programs will overall be more *reputation-enhancing* than is possible with the current structure, with an excellent student body, placements among top academic and research institutions, faculty highly committed to advancing course offerings and mentoring students one-on-one, and providing financial and research support to students. The ultimate goal is to develop a culture of academic excellence and long-term stability in all 6 M.S. and Ph.D. programs.

### **Budget and Student Numbers**

A standard business model exists for all students in 5-year Ph.D. programs who are not on Fellowships. Each student's annual stipend, tuition and health insurance are supported for 3 years on the advisor's extramurally funded research grant. In the remaining 2 years, the student is fully supported by the School. The M.S. students have their stipend and tuition supported by the advisor. Additionally, several M.S. students are self-funded. This School-wide model will continue for students entering the proposed new programs.

This business model for graduate students is in line with the principles in the UM Strategic Plan, which suggests a strategy for building nationally prominent Ph.D. programs within resource constraints. These principles include competitive stipends, leveraging external funds wherever possible, and graduate students playing important roles in undergraduate education. The annual stipend will be approximately \$30,000 per year in Fall 2016, higher than most comparable programs nationwide (which are generally \$20,000-\$28,000). External grants come from federal agencies such as the National Science Foundation, NASA, NOAA, Department of Energy, Department of Defense, National Institute of Health etc. While the student intake is in part dependent on the available funding in the field and the faculty members' success in winning grants, this funding has generally been steady both nationally and at the School in recent years, and it is expected to remain steady over the next decade. Another method of leveraging funds is to be more aggressive in pursuing external fellowships, through initiatives such as those developed by the UM Graduate School and guidance from advisors. A new model for self-funded M.S. students across the School has recently been introduced.

There currently are 191 M.S. and Ph.D. students in the 6 programs. For the new faculty, it is anticipated that the start-up package for each new hire would include two new graduate students. Based on the new hires, steady national funding levels, and modestly improved recruitment of students within the new programs, a conservative projection is for 220 M.S. and Ph.D. students by 2021. The majority of students (80-90%) in OCE, ATM, MGS and MBE will be Ph.D. students. In MES, at least 15 Ph.D. students are anticipated around 2021, with most of the remainder being self-funded M.S. students as exists now. Hence, the projected 220 students may be divided into 50 M.S. students and 170 Ph.D. students in 2021.

## Impact on Existing Programs

The faculty in the **AMP** and **MAC** programs have voted that they do not intend to recruit into these programs after the new **OCE** and **ATM** programs have been formally established. **AMP** and **MAC** will continue as long as students remain in the programs, with few students expected to remain by 2021.

The existing programs in **MAF**, **MBF** and **MGG** are being renamed to align with the **MES**, **MBE** and **MGS** departments. The fisheries component of **MBF** will become part of the new **MES** program.

The only existing program that will continue is **MPO**, which houses about 50 students advised by faculty belonging to the former **MPO** division. This program will remain as is, governed by a Program Director and an Academic Committee across the **ATM** and **OCE** departments. The programmatic structure of **MPO** will remain as is, including the same required courses and suite of elective courses taught by faculty in the **ATM** and **OCE** departments. The new programs are designed so as not to increase the graduate or undergraduate teaching loads of faculty involved in any of the programs, including **MPO**. Students enrolled in the **MPO** program will share several courses and seminars with students enrolled in the **ATM** and **OCE** programs, and therefore there will be broader student camaraderie and a cohort that extends beyond each individual program. There will be no impact on the existing program budget, which is largely handled by the School, and there will be no impact on facilities or space.

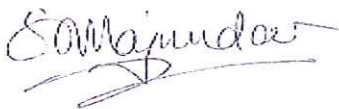
The main impact on **MPO** will be a reduction in the number of students pursuing a degree in **MPO**. The current number of about 50 is expected to decrease slowly to an equilibrium of about 35 over the next 7 years, as students begin to enroll in the new programs. Several faculty in **ATM** and **OCE** have expressed their desire to continue to recruit students in **MPO**. Therefore, it is expected that **MPO** will have a stable future. The program will admit students in the same way as the other programs.

Given the natural connections between the atmosphere and ocean, there will be some common ground across **ATM**, **OCE** and **MPO**. At the same time, each program will also possess a distinct identity and be complementary to each other. **ATM** will focus on the dynamics, physics, and chemistry of the atmosphere, with extensions to other relevant areas (e.g. atmospheric science policy). **OCE** will include studies of the dynamics, physics, chemistry and biology in the ocean, with interdisciplinary connections. **MPO** will continue to admit students interested in weather, climate, ocean circulation and physical processes, and air-sea interactions. The establishment of the new programs will also be necessary in order to extend beyond the scope and reach of **MPO** that could not be achieved by simply reorganizing **MPO**. Therefore, we are confident that the three complementary programs will all thrive, and synergies between each of them will be exploited through coordination and inclusivity across the programs.

The programs and budgets are self-contained, being handled internally within the Rosenstiel School. Therefore, no other programs at **UM** will be impacted. The new programs will complement those within the **Abess Center** of Ecosystem Science and Policy, as stated in a separate memo by their Director.

We thank you and the Graduate Council for your consideration.

Sincerely,



Sharanya J. Majumdar



Amy C. Clement





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and Assessment

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MEMORANDUM

**DATE:** January 27, 2015

**TO:** Dr. Sharan Majumdar  
Associate Professor and Chair, Academic Committee  
Rosenstiel School of Marine and Atmospheric Science

**FROM:** David E. Wiles, Executive Director  
Assessment and Accreditation *[Signature]*

**SUBJECT:** Graduate Program Restructuring/New Programs and Program Changes

On December 16, 2014, the Rosenstiel School of Marine and Atmospheric Science submitted a proposal notifying our office of its intent to restructure its graduate departments; create five new graduate degree programs and one certificate program; rename eight other existing degree programs; the planned phase-out of four existing degree programs, although students presently enrolled these programs will be allowed to complete their studies under the existing curriculum or to transfer to the corresponding new degree program. The changes are scheduled to take effect beginning in the fall of 2015 and are summarized in the chart below.

Credential	Level	Program * =courtesy master's awarded to doctoral student ** =inactive program	Changes in 2015-16
		<b>Rosenstiel School of Marine and Atmospheric Science</b>	
Certificate		Applied Carbonate Geology -- Graduate Credit	new
M.S.	M	Applied Marine Physics	phase out
Ph.D.	D	Applied Marine Physics	phase out
M.S.	M	Atmospheric Sciences	new
Ph.D.	D	Atmospheric Sciences	new
B.A.M.A.	B	Marine Affairs	
M.P.S.	M	Marine Affairs and Policy rename "Marine Ecosystems and Society"	rename
M.S.	M	Marine Affairs and Policy rename "Marine Ecosystems and Society"	rename
M.S.	M	Marine and Atmospheric Chemistry	phase out
Ph.D.	D	Marine and Atmospheric Chemistry	phase out
M.P.S.	M	Marine Biology and Fisheries rename "Marine Biology and Ecology"	rename
M.S.	M	Marine Biology and Fisheries rename "Marine Biology and Ecology"	rename
Ph.D.	D	Marine Biology and Fisheries rename "Marine Biology and Ecology"	rename
Ph.D.	D	Marine Ecosystems and Society	new
M.S.	M	Marine Geology and Geophysics rename "Marine Geosciences"	rename
Ph.D.	D	Marine Geology and Geophysics rename "Marine Geosciences"	rename
B.S.M.A.S.	B	Marine Science (all tracks)	
B.S.M.A.S.	B	Meteorology (all tracks)	
M.P.S.	M	Meteorology and Physical Oceanography rename "Atmospheric Science(-s)?"	rename
M.S.	M	Meteorology and Physical Oceanography	
Ph.D.	D	Meteorology and Physical Oceanography	
M.S.	M	Ocean Sciences	new
Ph.D.	D	Ocean Sciences	new

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January 27, 2015  
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The proposal also mentions the recruitment of 16 new faculty members, including the immediate hiring of five new faculty members, and an expanded curriculum. Although our office will need to submit the changes and new program additions as a notification to the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC), please provide written clarification on the following matters:

- Specify the minimum number of **post-baccalaureate** credit hours for each new graduate degree program (should be at least 30 credits for a master's degree and 60 for the Ph.D.).
- For each of the five new faculty currently sought, please indicate whether the hire will be (1) teaching new courses, (2) minimum qualifications for the appointment or provide the C.V. (if already hired), and (3) whether the hire will be an addition to the faculty or will fill a vacancy.
- The exact new name for the existing M.P.S. in Meteorology and Physical Oceanography.
- For the five new courses that will be offered as part of the Certificate in Applied Carbonate Geology, whether these courses will be a subset of the curriculum for an existing graduate degree program at RSMAS—if so, which program(s)?
- Student Learning Outcomes (SLOs) should be stated in terms of the knowledge, skills, values, or behaviors students will develop; should be worded in active voice (e.g., “Students will demonstrate...” or “Graduates will be able to...”); and include at least **two** measures.
- Where standardized examinations are used for admission, minimum scores should be reported on the current exam scale (e.g., 0-120 for the TOEFL iBT).
- Finally, it would be helpful if all pages of the proposal were numbered.

Please allow six months for review by the SACSCOC once the notifications are submitted by our office. Feel free to contact us should you have any further questions (305) 284-9431.

cc: Faculty Senate  
Dr. M. Brian Blake, Vice Provost and Graduate School Dean  
Dr. Roni Avissar, Dean, RSMAS  
Dr. Amy Clement, Professor and Associate Dean of Graduate Studies, RSMAS

MEMORANDUM

DATE: February 4, 2015

TO: Tomas Salerno  
Chair, Faculty Senate

FROM: M. Brian Blake *M. Brian Blake*  
Dean, The Graduate School

SUBJECT: Revised Memo - Restructuring of the Graduate Programs in RSMAS

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The Rosenstiel School of Marine and Atmospheric Sciences submitted a proposal to restructure the graduate programs in RSMAS. The proposal was discussed at the meeting of the Graduate Council on Tuesday, January 20, 2015, and was approved by those present. The second reading was waived.

Several discussions from the meeting are notable:

1. The Graduate Council received concerns from member(s) of the Graduate Faculty that the program would cause undue competition and that the new divisions would weaken the overall program. The proposers provided a rationale to explain the material differences between ATM/OCE/MPO vs. OCE/MPO. The Graduate Council discussed the concerns and the rationale in detail. The Graduate Council found favorable the ability for the programs to evolve separately with the changing faculty. The Council also appreciated that there might be some overlap in the programs but found it acceptable. The Graduate Council did not perceive a sense of competition between the two programs considering material differences and the nature of graduate programs in general.
2. The Graduate Council requested that the proposers prepare a 1-page document with a projected synopsis of graduate programs that will retire in addition to a date when the Graduate Council should revisit the status of those retirements.
3. The proposers favorably distinguished between MES and the ABESS program in response to a question from the Council.

cc: Roni Avissar, Dean, RSMAS  
Amy Clement, Associate Dean of Graduate Studies, RSMAS  
Sharan Majumdar, Graduate Academic Committee Chair, RSMAS  
Office of Planning, Institutional Research and Assessment

UNIVERSITY OF MIAMI  
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## MEMORANDUM

TO: Professor Brian Blake, Dean, UM Graduate School  
FROM: Roni Avissar, Dean *Roni Avissar*  
DATE: November 10, 2014  
SUBJECT: Graduate Program Restructuring at RSMAS

The Rosenstiel School of Marine and Atmospheric Science (RSMAS) has recently reorganized into five departments: (1) Ocean Sciences (OCE); (2) Atmospheric Sciences (ATM); (3) Marine Biology and Ecology (MBE); (4) Marine Geosciences (MGS); and (5) Marine Ecosystems and Society (MES). Previously, RSMAS was organized into six divisions: (1) Meteorology and Physical Oceanography (MPO); (2) Marine and Atmospheric Chemistry (MAC); (3) Applied Marine Physics (AMP); (4) Marine Biology and Fisheries (MBF); (5) Marine Geology and Geophysics (MGG); and (6) Marine Affairs (MAF). This evolution of RSMAS was required due to the combination of multiple factors, including the needs to reduce the size of the faculty that was unable to sustain itself financially because of the disproportion between its size and its teaching portfolio, and also because of its lack of competitiveness in some of its programs that were clearly not visible to many potentially interested students. Indeed, priorities and interest of potential students have changed over the past few decades, but RSMAS maintained its organization and academic offerings during that same period.

Following this reorganization and the multiple discussions that took place before, during and after its implementation, the overwhelming majority of faculty members at RSMAS (see all attached memos summarizing all anonymous votes) believe that now is the right time (and unique opportunity) to reconsider our graduate program portfolio. The attached proposal, and especially the memo of Professor Sharan Majumdar (Chair of our Graduate Academic Committee) and Professor Amy Clement (Associate Dean for Graduate Programs) provides an excellent summary of the issues that we are trying to resolve by proposing to restructure our graduate programs. This includes a net gain in the number of graduate students that we could easily absorb with our existing research funds available for fellowships, but we are unable to recruit within the inadequate current programs. Very conservatively, we anticipate a growth of about 20% in our student population and not less importantly, we anticipate in at least some of the programs a considerable increase in the quality of the students applying to our programs. This would be achieved without increasing the total number of our graduate programs at no additional cost to the School. Thus, the income realized by the additional students would in fact increase the net revenues of the School and, as a result, of the University.

There is no point for me to repeat here the arguments provided in the memo of Professors Majumdar and Clement. Rather, **the purpose of this memo is to emphasize my unambiguous and enthusiastic support for this proposal, which was put together by the faculty in their new departments led by the Graduate Academic Committee.** It was reviewed carefully and approved by the School Council (see attached memo of the School Council Vice Chair, Professor

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Roni Avissar, Ph.D.  
Professor and Dean

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Rana Fine) and was unanimously approved by the School Leadership (which at RSMAS consists of the five department chairs, the five associate deans, and the VC of the School Council).

But I would like also to emphasize the importance of considering this proposal in its entirety, rather than each program separately. This is because any of the programs is interconnected directly or indirectly to the five others and modifying only part of them would necessarily leave out some of our faculty members. Indeed, two of our current programs that the faculty has decided to abandon (AMP and MAC) would have no home for their graduate students if ATM and/or OCE were not approved, and faculty members formerly in the MBF Division who joined the former MAF Division to create the new MES Department would not have a home for their students. The Graduate Academic Committee together with the faculty in the newly created departments choreographed very carefully the entire proposal and it is key to the success of this initiative to move forward as a single proposal for restructuring.

In this proposal we are requesting to restructure the existing six graduate programs that were associated with the six former divisions into six programs, five of them aligned with the five new departments and one of them, MPO, the largest of the existing programs becoming a cross-departmental program that will serve students interested in both the ocean and the atmosphere, and their interactions. The support for the alignment between new departments and their own graduate program is overwhelmingly positive. Indeed, from all five departments, only one single vote rejects the proposal to create a new OCE graduate program (see summary of confidential votes provided in the document). The only minor disagreement to this entire proposal is regarding the future of the MPO program jointly with the ATM and OCE programs. Yet even in that case, it is essential to appreciate that 70% of the faculty are in favor of moving forward with the three programs (see faculty vote of MPO, ATM and OCE).

Last but not least, with expected retirements that will occur at RSMAS during the next 5-7 years, we anticipate a recruitment of 16 new faculty members to maintain the total number of tenured and tenure-track faculty at 68 (we are in the process of recruiting a first wave of five faculty). The restructuring proposed here will facilitate the integration of these new faculty members in their department. Indeed, the alignment of programs with departments is quite typical in academia and the confusion of six programs aligned with previously existing divisions would not be helpful in recruiting top faculty members. We anticipate this new faculty recruitment to significantly impact in a very positive way the newly created programs.

I hope that the Graduate School will appreciate the tremendous effort put together by the Graduate Academic Committee, the School Council, the School Leadership and the entire RSMAS faculty to develop this very exciting proposal, which is very considerate for the interest of all faculty at the School while enhancing the benefits for the School and the University. It is extremely well thought, it will contribute to the quality and the population of graduate students at UM, and I strongly urge you to support RSMAS' effort to improve and to contribute to the Graduate School.



February 4, 2015

To: Dr. Amy Clement, Associate Dean Graduate Studies

From: Rana Fine, Professor and Vice Chair RSMAS School Council

A handwritten signature in black ink, appearing to read "Rana Fine".

This is written in enthusiastic support of the graduate program restructuring package submitted to the Graduate School for the Rosenstiel School. On 3 February the School Council met and **unanimously approved** the entire package with a vote of 5-0. The wording of the resolution was:

"I approve the entire package, including all of the individual proposals to establish new programs, together with the renaming of other programs."

At RSMAS, there is widespread support for the restructuring, which basically involves name changes for two of the existing programs and three new programs. The proposed new programs for Marine Ecosystems and Society, Ocean Sciences and Atmospheric Sciences have strong support within their departments for starting them as evidenced by the near unanimous votes of approval they received. Also, there is unanimous support for a new Certificate Program in Applied Carbonate Geology. There is strong support for continuing the existing academic program in Meteorology and Physical Oceanography. It is the full intension of the School to continue other existing graduate programs at least until the last student graduates, and many of the faculty involved have indicated a preference for recruiting into new programs instead of existing programs.

Cc: Dean Avissar, Dr. Sharan Majumdar, Ms. Cassandra Wiggins

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**ATMOSPHERIC SCIENCE**



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## Memorandum

To: M. Brian Blake, Dean of the Graduate School  
Cc: Roni Avissar, Dean of RSMAS  
  
From: Brian J. Soden, Associate Dean for Professional Studies

Date: November 9, 2014

Re: Proposed transferring of the M.P.S. degree programs

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The purpose of this memorandum is to indicate our intentions to transfer the degree programs with the RSMAS Master of Professional Science (M.P.S.) from their legacy divisional names to align with the current departmental structure at RSMAS.

There are currently 3 M.P.S. degree programs with a total of 14 tracks in the following divisions: Marine Biology and Fisheries (MBF), Marine Affairs (MAF), Meteorology and Physical Oceanography (MPO). We wish to transfer these programs to coincide with their respective departments where the majority of faculty and courses reside. The attached tables outline the proposed renaming for each of the current tracks.

Faculty in each of the departments where the M.P.S. degrees will reside have been asked to vote on the transfer of the programs. The vote in MBE was 13-1 in favor of the transfer; the vote in MES was 8-0 in favor of the transfer; and the vote in ATM was 7-0 in favor of the transfer.

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## Memorandum

**To:** M. Brian Blake, Dean of the Graduate School  
**Cc:** Amy Clement, Associate Dean of Graduate Studies, RSMAS  
Roni Avissar, Dean of RSMAS

**From:** M. J. Olascoaga and William Drennan (Applied Marine Physics Academic Committee)

**Date:** November 6, 2014

**Re:** Applied Marine Physics Graduate Program

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The Applied Marine Physics (AMP) Graduate Program was housed in the academic division of the same name. On June 1, 2014, as part of the restructuring at RSMAS, the AMP division ceased to exist and all graduate faculty but one became members of the Ocean Sciences department (OCE).

In a vote conducted anonymously by the RSMAS School Council, 6 faculty in the AMP program voted upon and unanimously approved 6-0 the following statement:

"As a faculty member in the AMP program, I support the establishment of the new OCE and ATM graduate programs. My future students will not be recruited into the AMP program. The AMP program will continue to function for existing students until they graduate and/or transfer to the new programs."

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M. Josefina Olascoaga

---

William M. Drennan



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## Memorandum

**To:** M. Brian Blake, Dean of the Graduate School  
**Cc:** Amy Clement, Associate Dean of Graduate Studies, RSMAS  
Roni Avissar, Dean of RSMAS

**From:** Jingfeng Wu, Associate Professor, Department of Ocean Sciences  
and Program Director, Marine and Atmospheric Chemistry

**Date:** November 6, 2014

**Re:** Marine and Atmospheric Chemistry Graduate Program

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The Marine and Atmospheric Chemistry (MAC) Graduate Program was housed in the academic division of the same name. On June 1, 2014, as part of the restructuring at RSMAS, the MAC division ceased to exist and all graduate faculty became members of the new Ocean Sciences (OCE) and Atmospheric Sciences (ATM) departments.

In a vote conducted anonymously by the RSMAS School Council, the faculty in the MAC program voted upon and unanimously approved 7-0 the following statement:

"As a faculty member in the MAC program, I support the establishment of the new OCE and ATM graduate programs. My future students will not be recruited into the MAC program. The MAC program will continue to function for existing students until they graduate and/or transfer to the new programs."

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## Memorandum

**To:** M. Brian Blake, Dean of the Graduate School  
**Cc:** Amy Clement, Associate Dean of Graduate Studies, RSMAS  
Roni Avissar, Dean of RSMAS

**From:** Sharanya J. Majumdar, Associate Professor, Department of Atmospheric Sciences  
and Program Director, Meteorology and Physical Oceanography

A handwritten signature in black ink, appearing to read 'S. Majumdar'.

**Date:** November 6, 2014

**Re:** Meteorology and Physical Oceanography Graduate Program

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The Meteorology and Physical Oceanography (MPO) Graduate Program was housed in the academic division of the same name. On June 1, 2014, as part of the restructuring at RSMAS, the MPO division ceased to exist and all graduate faculty became members of the new Ocean Sciences (OCE) and Atmospheric Sciences (ATM) departments.

Through a meeting of faculty in the MPO program and additional e-mail discussions, the future of MPO in the new programmatic structure was discussed. In a vote conducted anonymously by the RSMAS School Council, the MPO program faculty were polled on the following statement:

"As a faculty member in the MPO program, I support the establishment of the new OCE and ATM programs that are being developed within their respective departments, together with the long-term continuation of the MPO program."

14 faculty supported this statement. 6 faculty did not support this statement.

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## Memorandum

**TO:** M. Brian Blake, Dean of the Graduate School

**CC:** Roni Avissar, Dean of RSMAS  
Amy Clement, Associate Dean of Graduate Studies, RSMAS

**FROM:** Kenny Broad, Director, Abess Center for Ecosystem Science and Policy

**DATE:** November 7, 2014

**RE:** **Support for Marine Ecosystems and Policy M.S. and Ph.D. program**

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The proposed Marine Ecosystems and Society (MES) M.S. and Ph.D. Program will complement the current Abess Center program along several dimensions:

(a) it will provide options for Abess Center's advanced undergrad and PhD students for additional courses at the 500 and 600 levels that address human-environment interaction related to use of scientific information to inform policy decisions;

(b) it will likely increase the size of current Abess Center core courses which tend to only have 3-5 PhD students (the courses are required for incoming PhD students only, but would be open to MES PhD students);

(c) The MES program will allow Abess students who want to go into further depth (no pun intended) in linking their research to marine science themes additional opportunities and will allow MES PhD students access to courses in terrestrial and decision science courses that are not part of the MES formal curriculum.

It should also be noted that the Abess Center does not have a master's degree program.

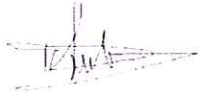
In summary, the MES program would complement the existing Abess Center mission

February 19 2015

To: General Welfare Committee

From: David J. Die Program Director, MAF (on behalf of MES Department Chair who is absent)

Subject: Impact of proposed graduate programs in OCE on existing graduate programs



### **Summary:**

M.S. and Ph.D. programs in Marine Ecosystems and Society are proposed, with the program governed by an academic committee of Graduate Faculty within the department Marine Ecosystems and Society. This program will serve the needs of the students and faculty of that department by providing a challenging and flexible curriculum that encompasses the breath of research areas in the social and ecological sciences related to the marine environment. MES faculty voted unanimously and enthusiastically to support the establishment of this program.

### **Impact on Existing programs:**

Currently, RSMAS offers a PhD program for students interested in fisheries science through the Marine Biology and Fisheries program but it does not offer such possibility to students interested in other aspects of marine resource management research. Such students are limited to an MSc degree within the existing Marine Affairs Program.

The existing MSc program in MAF, however, has traditionally attracted large number of students, many of whom have expressed in the past their interest in pursuing a PhD. A reason behind this demand for a PhD is the increasing number of opportunities for careers in government institutions and NGOs that work in the interface between social and ecological sciences applied to the ocean. Increasingly, graduates are seeking to differentiate themselves in the market by having an interdisciplinary PhD.

The existing Marine Biology and Fisheries program has serviced well students interested in an MSc and PhD in fisheries science as proven by the number of PhD graduates and their professional success. The program, however, has always been constrained by the requirements of a traditional marine biology program. Today's more fishery students are seeking an academic experience that includes social sciences than those that seek other areas of marine biology. The creation of the MES department and the proposal for a new academic program on MES will greatly enhance the opportunities for enhancing the academic experience of such students to match the new needs of the current fisheries professional market place. Faculty in the Marine Biology and Ecology Department, with

interests in fisheries and marine ecology, will also be involved and support the new MES program.

The University of Miami also has a PhD program in Ecosystem Science as part of the Abess Center. Such program, however, has a larger emphasis on land-based ecosystem science and on research in support of ecosystem services derived from land ecosystems. The new MES program will not compete with the Abess center program<sup>1</sup> because of its emphasis on marine resources, moreover, the new program is likely to enhance academic programs at the University of Miami that offer graduate level education in support of natural resource management.

In summary, the proposed MES program will greatly increase opportunities for recruiting graduate students to interdisciplinary research teams in the interface between fisheries, ecology, oceanography, policy, anthropology and economics at both the MSc and PhD level. The program is likely to support in the order of 30 to 40 students and have 15 faculty actively engaged in it. All of the faculty currently in MES or that are planned to be recruited into the department will have one thing in common: an emphasis of translating scientific products into practical management of ocean and coastal natural resources. Such emphasis, highlighted in the department's strategic plan, should ensure the success of the new proposed MES program.

<sup>1</sup> See memo from Abess Center Director

## MEMORANDUM

**TO:** Professor Thomas Salerno (Chair, Faculty Senate)  
**FROM:** Sharan Majumdar (Assoc. Professor and Chair, Academic Committee, Rosenstiel School)  
Amy Clement (Professor and Associate Dean of Graduate Studies, Rosenstiel School)  
Roni Avissar (Dean, Rosenstiel School)  
**DATE:** January 21, 2015  
**SUBJECT:** **Responses to questions and comments from Senate Chair, Vice Chairs and General Welfare Committee Re: Graduate Program Restructuring at the Rosenstiel School**

Since the package on the restructuring of the graduate programs at the Rosenstiel School was submitted to the UM Graduate School on November 10, 2014, the following meetings have taken place:

- Graduate Council: First Reading held on November 18, 2014.
- Graduate Council: Second Reading held on January 20, 2015. (Program Restructuring Approved)
- Meeting with Senate Chair and Vice Chairs held on December 8, 2014.
- General Welfare Committee (Discussion only) held on January 14, 2015.

Except for the Second Reading of the Graduate Council, Professors Majumdar, Clement and Avissar were present at each meeting. This memorandum serves as a written response to the questions and comments raised at the latter two meetings. We thank the Senate Chair, Vice Chairs, and General Welfare Committee for their questions, and for the opportunity to respond both in person and here in writing.

### **Q1: Describe the process so far in the development of the programs.**

In June 2014, shortly after the Rosenstiel School was reformed into new Departments, Brian Blake (Dean, Graduate School) met with Associate Dean Clement and the Rosenstiel School Graduate Academic Committee (GAC). Dean Blake recommended that the introduction of new programs, closing of some programs, and any changes to existing programs be considered holistically, and submitted as one coherent package at one time as opposed to a series of individual proposals. The timeline of early November 2014 was suggested for the submission to the Graduate School. The GAC, comprising Directors of the existing and proposed new programs, was charged with leading the development of a coordinated package.

Between June and November 2014, each of the Departments met several times to discuss the graduate programs, in formal meetings called by their Chairs. Other informal meetings and in-person and e-mail discussions were initiated by the relevant Program Directors. For the Departments proposing new programs, several drafts of their new program proposals were shared with the Department faculty for comments and suggested revisions. In parallel, the faculty in the individual AMP, MAC and MPO programs also had meetings and were engaged in e-mail discussions across their respective mailing lists. The proposed restructure across the School was presented and discussed at a School-wide faculty meeting on October 10, 2014. Following this, two meetings were held with the Rosenstiel School Council, in which the voting process was formalized. Further meetings were held with the Rosenstiel Leadership Group (comprising the Dean, all Chairs and Associate Deans, and the Vice Chair of the School Council).

The Provost attended one of these Leadership Group meetings and was briefed on the proposed restructure.

All votes were conducted anonymously via e-mail. The Departmental votes were administered by their respective Chairs. The Program votes were administered by the Vice Chair of the School Council, in which only those faculty belonging to the program were eligible to vote. The language in the program votes was determined by the School Council, in consultation with the Program Academic Committees and faculty.

The 5-page cover memo, presented at the front of the full package, was distributed among all Rosenstiel School faculty for comments and revisions. Following the input from faculty and the collection of memos from the Dean, School Council, and all Chairs and Program Directors, the full package was finalized and submitted to the Graduate School on November 10, 2014.

**Q2: Describe the process so far with the Graduate School.**

The first reading with the Graduate Council was held on November 18, 2014. A presentation of the full package was given, and questions by the Graduate School Dean and Graduate Council were responded to at the meeting. The personnel leading the development of each of the three proposed new M.S. and Ph.D. programs (ATM, MES, OCE) were present to respond to questions.

The second reading with the Graduate Council will be held on January 20, 2015. Graduate School Dean Brian Blake notified us that the program restructuring was all approved, and that a formal memorandum and minor comments would be forthcoming.

The process with PIRA has also been initiated, as per the guidelines on new programs from the Senate.

**Q3: Describe the governance process for the new programs.**

The new programs will be governed following the UM Faculty Manual and the Bylaws of the Rosenstiel School. In each of the five Departments, the respective program will be led by a Program Director who is appointed by the Department Chair, in consultation with the Department faculty. In an inter-departmental program such as MPO, the Director is appointed by the Associate Dean of Graduate Studies, in consultation with the relevant Department Chairs and the program's faculty. Each program will have its own Academic Committee. All academic matters relevant to most or all of the School will be handled through the Graduate Academic Committee, which will comprise the Directors in each program, as well as the Associate Deans of Graduate Studies.

In situations where there is common ground across two or more programs, there will also be careful coordination between the Program Directors and Academic Committees of the respective programs and the relevant Department Chairs when needed. As is done presently in programs that currently share common ground, the programs will collaborate on preparing materials to attract prospective graduate students, and to present at other universities and at conferences. Student applications to different programs will continue to be shared between programs, consistent with the current practice. The coordination of courses, seminars, awards etc. will be conducted by the Program Directors, seminar chairs etc. as is relevant, in consultation with the relevant Department Chairs.

**Q4: What is the financial model and impact on the University?**

There will be no need for additional financial support from the University.

There will be no proposed changes to the current financial model. The activities of graduate students are supported by graduate tuition income. The following standard models exist for most Ph.D. and M.S. students (there is a little variability for students with Fellowships):

- Ph.D. Students
  - Years 1-3: Annual stipend, tuition, health insurance, conference travel etc. supported on extramurally funded research grant
  - Years 4-5: Student supported by School
- M.S. Students
  - Supported by extramural grants or self-supported

The projected number of M.S. and Ph.D. students is conservatively projected to increase by about 15% by 2021. Therefore, the financial impact on the School is expected to be positive, through increased tuition revenue.

**Q5: What is the impact on undergraduate teaching?**

There will be no net change to the undergraduate teaching or advising load.

At the Rosenstiel School, there is a need to increase the efficiency of some courses (e.g. those with small class sizes). The proposed programmatic restructure offers the opportunity to restructure both the graduate and undergraduate courses. There are under-utilized faculty resources at the Rosenstiel School to teach, especially in Ocean Sciences who have a large faculty body and no undergraduate program yet.

A few revised or new graduate courses will be made available to suitably qualified senior-level undergraduate students, thereby enhancing the undergraduate program.

The introduction of the new graduate programs will not necessitate a proliferation of new courses, unless there are available faculty resources for teaching. Several courses (such as Geophysical Fluid Dynamics and Climate Dynamics) will be shared by students belonging to the ATM, OCE and MPO programs, thereby enhancing the cohort across the different programs. The faculty teaching resources committed to the existing programs at both graduate and undergraduate level will not be reduced.

**Q6: For the two programs that are proposed to be phased out (AMP and MAC), what is the plan for the programs and the current students enrolled in these programs?**

The AMP and MAC programs will continue, for as long as students are enrolled in the programs. Each program will remain on the books until after the last student has graduated.

There will be no impact on the current students who elect to remain in the AMP and MAC programs. The relevant core courses will still be taught, and there will be no substantial changes to key elective courses.

All students will be given the opportunity to transfer into the new programs.

**Q7: There are currently 3 programs in the physical and chemical sciences (AMP, MAC, MPO), and the proposal is for MPO to continue and for two new programs (ATM, OCE) to be established. What do the new programs bring to the table in addition to what is already offered in MPO?**

The inter-departmental MPO program reflects an existing strength at the Rosenstiel School, in which students are educated in the physical processes of both the atmosphere and ocean. There is student demand in this area, and interest from many MPO program faculty in preserving the program with no changes. The new ATM and OCE programs provide the opportunity to expand beyond this scope. For



example, many students are interested in studying either the atmospheric medium or the ocean medium, each of which can be inter-disciplinary in its own right (e.g. chemistry and physics and biology intertwined). Some students prefer a specific focus in only one discipline (e.g. atmospheric dynamics). The expansion of opportunities provided by these new programs is expected to attract a broader range of talented students, together with top faculty applicants. The new programs are also expected to raise the visibility worldwide, through distinctive identities aligned with the departments that students can easily find.

The new ATM and OCE programs will also be aligned with the relevant Master of Professional Science tracks housed in the respective departments, and respectively with the ATM undergraduate program and a future OCE undergraduate program that is under development.

**Q8: How is inter-disciplinary education handled within the new programmatic structure?**

The MPO program offers an inter-disciplinary education in the physical sciences, across both the atmosphere and ocean. The OCE program will be inter-disciplinary in its own right, with students interested in the physics, chemistry, biology and geosciences of the ocean being able to take a diverse range of courses and organize dissertation committees that span these disciplines. Similarly, students in ATM interested in inter-disciplinary studies of the atmosphere would be able to engage in the physics, chemistry and dynamics of the atmosphere, and opportunities will be provided for them to also engage in atmospheric science policy and other potential disciplines such as communication and sustainability.

Additionally, some scientific areas are inter-disciplinary across several programs. One example is climate. While the student would obtain a M.S. or Ph.D. degree in a 'home' program, meeting the requirements of that program, they would simultaneously engage in a new 'concentration' in climate. This concentration would involve a climate seminar series, an annual Colloquium with invited experts from outside Miami, and recommended courses that expand beyond the student's home program, thereby building a cohort of climate-oriented students in several different core disciplines. For example, a student in the MPO program can take courses on the effects of climate change on coral reefs (MBE) and climate policy (MES), and others if they are interested. Hence, while the programs are proposed to be more cleanly aligned with the departments in the new structure than is presently the case, opportunities for inter-disciplinary studies will be emphasized more formally than is presently being done.

**Q9: The vote by MPO program was 14-6 in favor; what was the thinking behind the votes against?**

The language in the MPO vote, as recommended by the Rosenstiel School Council, was the following: "As a faculty member in the MPO program, I support the establishment of the new OCE and ATM programs that are being developed within their respective departments, together with the long-term continuation of the MPO program." An interpretation of the six "No" votes could represent a lack of support for the new OCE and ATM programs, or a lack of support for the long-term continuation of the MPO program. Since the voting process was anonymous, the precise interpretation is unknown. There have been numerous faculty meetings (within departments, programs, and RSMAS-wide) in which concerns have been discussed. In particular, the question of overlap between MPO and the two other new programs (ATM and OCE) has been extensively discussed. Moving forward, this concern will be addressed by continuing with our practices of coordination (through the Graduate Studies Office and through the Graduate Academic Committee) among programs that currently overlap (see response to Q3).

Overall, 70% of the faculty in the MPO program were in favor of both the establishment of the new programs and the long-term continuation of the MPO program.

**Q10: How will we evaluate the success of the new programs?**

The success of the new programs will be evaluated both in the short-term and long-term, comparing against previous years in our programs, and also against comparable national programs.

The number of applicants, and the quality of applicants (via GPA, GRE and undergraduate program strengths) will be evaluated against previous years. For example, the combination of ATM, MPO and OCE applicants from 2016 will be evaluated against AMP, MPO and MAC applicants up to and including 2015. The ratio of students given offers by the programs to students enrolling in the programs will also be assessed. The quality of the students enrolled in the new programs will be monitored each year.

The assessment measures related to the learning outcomes in the annual SACS assessments provide another metric for evaluation, for students at different stages in the program. These measures include: success in the comprehensive and qualifying exams, quality of student seminar presentations, and the quality of the defense. Additionally, the quality and quantity of papers published in the peer-reviewed literature are an important metric, and any prestigious awards won at conferences will also be counted. Finally, the number of students receiving national scholarships and UM fellowships will be documented.

In the long-term, the career paths of M.S. and Ph.D. graduates will be monitored and compared with the career paths of students who have graduated in the past 5 years, whom we have been in contact with. In particular, the ability of our graduates to attain high-profile positions such as a faculty member at a top university, a researcher being a principal investigator of their own funded projects, or an influential figure in science policy will be recorded.

**Q11: There is a typo on the third line from the bottom on Page 4 of the cover memo in regard to the number of Ph.D. students expected to be enrolled in MES by 2021. How many students are expected?**

From discussions with the MES faculty, a conservative total of about 15 Ph.D. students enrolled in MES by 2021 are expected. The MES program will remain largely comprised of M.S. students, whose body is presently enrolled in the Marine Affairs and Policy M.S. program (about 30).

[End Memorandum]

## Voting Process and Results

## The Voting Process and Results

### School Council Votes

On the advice of the Chair and Vice Chairs of the Senate, a vote on all the different actions was conducted by the Rosenstiel School Council, on behalf of the School. The School Council discussed and voted on the following statement at a School Council meeting on February 3<sup>rd</sup>, 2015: "I approve the entire package, including all of the individual proposals to establish new programs, together with the renaming of other programs." This statement was **supported 5-0** by the voting School Council members.

### Departmental Votes

Voting on the 5 departmental programs was conducted in October 2014, led by the respective department Chair. In the MES, MBE and MGS departments, the votes were conducted and counted at their respective faculty meetings. In the OCE and ATM departments, the votes were conducted via e-mail, in a process organized by their respective Chair. Each faculty member casted their vote anonymously via e-mail to the Secretary. For each of the 5 departments, their Chair reported the results in a Memorandum, contained within this package.

#### **D1. Department of Ocean Sciences (OCE)**

- New M.S. and Ph.D. program proposal in Ocean Sciences. **Supported 19-1 (1 abstain)**

#### **D2. Department of Atmospheric Sciences (ATM)**

- New M.S. and Ph.D. program proposal in Atmospheric Sciences. **Supported 11-0.**

#### **D3. Department of Marine Ecosystems and Society (MES)**

- New Ph.D. program proposal in Marine Ecosystems and Society. **Supported 10-0.**
- M.S. program name change from Marine Affairs and Policy (MAF) to Marine Ecosystems and Society (MES). **Supported 10-0.**

#### **D4. Department of Marine Biology and Ecology (MBE)**

- M.S. and Ph.D. program name change from Marine Biology and Fisheries (MBF) to Marine Biology and Ecology (MBE). **Supported 14-0.**

#### **D5. Department of Marine Geosciences (MGS)**

- Proposal for new Certificate Program in Applied Carbonate Geology. **Supported 8-0.**
- M.S. and Ph.D. program name change from Marine Geology and Geophysics (MGG) to Marine Geosciences (MGS). **Supported 8-0.**

### Existing Program Votes

All votes pertaining to the 3 existing programs in the physical and chemical sciences (AMP, MAC, MPO) were conducted by the Rosenstiel School Council between October 30 – November 3 2014. The process and the language of the votes were formalized by the School Council together with the faculty in the respective programs. The proposals for the new OCE and ATM programs were distributed to all faculty in these programs prior to the initiation of the voting, which was held at the same time as the departmental voting. All votes were made anonymously via e-mail to an account handled solely by the Library staff. The Vice Chair of the Rosenstiel School Council reported the results to the Faculty. The results from each program are reported in Memoranda from the respective Program Directors, which are included in this package.

#### **E1. Applied Marine Physics (AMP)**

- "As a faculty member in the AMP program, I support the establishment of the new OCE and ATM graduate programs. My future students will not be recruited into the AMP program. The AMP program will continue to function for existing students until they graduate and/or transfer to the new programs."

**Supported 6-0.**

#### **E2. Marine and Atmospheric Chemistry (MAC)**

- "As a faculty member in the MAC program, I support the establishment of the new OCE and ATM graduate programs. My future students will not be recruited into the MAC program. The MAC program will continue to function for existing students until they graduate and/or transfer to the new programs."

**Supported 7-0.**

#### **E3. Meteorology and Physical Oceanography (MPO)**

"As a faculty member in the MPO program, I support the establishment of the new OCE and ATM programs that are being developed within their respective departments, together with the long-term continuation of the MPO program."

**Supported 14-6.**

**NOTE: Each faculty member with voting rights in the OCE and ATM departments was eligible to vote only once for their department, and only once for the existing program that they presently belong to. No faculty member voted in more than one department. No faculty member voted in more than one existing program.**

# Department of Marine Ecosystems and Society

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## Memorandum

**TO:** M. Brian Blake, Dean of the Graduate School

**CC:** Roni Avissar, Dean of RSMAS  
Amy Clement, Associate Dean of Graduate Studies, RSMAS

**FROM:** Kenny Broad, Chair, Marine Ecosystems and Society

**DATE:** October 21, 2014

**RE:** Department Name Change

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Ten (10) Marine Ecosystems and Society Faculty Members met on October 16, 2014 in the Dean's Conference Room at RSMAS and voted to change the M.S. program name from "Marine Affairs and Policy" to "Marine Ecosystems and Society". The vote was unanimous.

Eligible Voting Faculty was comprised of:

Jerald Ault  
Andrew Bakun  
Daniel Benetti  
Kenny Broad  
David Die  
Nelson Ehrhardt  
Neil Hammerschlag  
David Letson  
Sarah Meltzoff  
Gary Thomas

Absent:

Maria Estevanez  
Daniel Suman

UNIVERSITY OF MIAMI  
**ROSENSTIEL**  
**SCHOOL of MARINE &**  
**ATMOSPHERIC SCIENCE**



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## Memorandum

**TO:** M. Brian Blake, Dean of the Graduate School

**CC:** Roni Avissar, Dean of RSMAS  
Amy Clement, Associate Dean of Graduate Studies, RSMAS

**FROM:** Kenny Broad, Director, Abess Center for Ecosystem Science and Policy

**DATE:** November 7, 2014

**RE:** **Support for Marine Ecosystems and Policy M.S. and Ph.D. program**

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The proposed Marine Ecosystems and Society (MES) M.S. and Ph.D. Program will complement the current Abess Center program along several dimensions:

(a) it will provide options for Abess Center's advanced undergrad and PhD students for additional courses at the 500 and 600 levels that address human-environment interaction related to use of scientific information to inform policy decisions;

(b) it will likely increase the size of current Abess Center core courses which tend to only have 3-5 PhD students (the courses are required for incoming PhD students only, but would be open to MES PhD students;

(c) The MES program will allow Abess students who want to go into further depth (no pun intended) in linking their research to marine science themes additional opportunities and will allow MES PhD students access to courses in terrestrial and decision science courses that are not part of the MES formal curriculum.

It should also be noted that the Abess Center does not have a master's degree program.

In summary, the MES program would complement the existing Abess Center mission



## Department of Marine Ecosystems and Society

### Proposal to Offer the Degrees

#### Doctor of Philosophy and Master of Science

##### **1. RATIONALE** – *Summary of intellectual and academic need for each proposed degree*

Marine ecosystems spread over coastal zones, continental shelves and vast open ocean regions providing many ecosystem services to society. Human activities are inherent part of these ecosystems, especially in coastal zones where society has a particular strong footprint in the environment through activities such as coastal development, fishing, urbanization, port infrastructure and mineral extraction. Fishing, transport of goods and oil extraction, also present in the coastal zone, extend their impact to the continental shelf and open ocean. In addition, trans-boundary issues such as pollutant transport and climate change impact these areas. Resources in marine ecosystems are, for the most part, considered to be publically owned. The development of policy for the management of these resources is strongly influenced by the science that supports decisions made by the different government levels that have responsibility for different areas of the ecosystem. This type of science is inherently interdisciplinary and includes aspects of fishery science, ecology, oceanography, environmental economics, management science and anthropology. The MES program seeks to provide students with the tools and knowledge to be effective providers of this science.

Given these societal changes in managing marine ecosystem resources the Rosenstiel School of Marine and Atmospheric Science (RSMAS), a new Department of Marine Ecosystems and Society (MES) was established in June 2014 as part of the restructuring of RSMAS into departments. A new MES graduate program is important for several reasons:

- Management of marine ecosystems infers that there is some understanding of the responses of populations and communities to human activities and other uses of the oceans. The responses to management options, as well as interpretations of observed natural fluctuations, must be investigated in part by the use of ecosystem models, by incorporation of ecosystem considerations within marine ecosystem management, and the understanding of how other ocean features influence ecosystem properties. For example fisheries can modify the structure and function of marine food webs as fisheries directed at lower trophic levels have had indirect and at times substantial impacts on upper trophic level species. At the same time, sustainable utilization of marine resources requires long-term commitment to rational and equitable use that may only be achieved if advances in understanding of

private and public policy approaches to natural resource management are integrated with ecological knowledge.

- The distinct identity of the proposed MES program is essential to make UM more competitive in attracting students of the caliber that will be able to tackle in their research the challenging ecosystem level questions that are increasingly being asked by marine resource managers. With this new identity, the traditional RSMAS strengths in the areas of ecological science and social science will be able to be integrated to provide students an academic experience more in tune to the needs of the future market for marine resource scientists. In addition to recruiting better students, the high profile of the MSE program is likely to be attractive to future hires applying for new faculty positions, instructorships and research fellowships in the department, as these people will see that the department is aligning the academic program with future societal needs for effective scientists.
- The establishment of an MES graduate program will provide a clean programmatic mechanism for aligning directly and coordinating with the successful Marine Affairs undergraduate program, and the Master of Professional Science tracks relevant to MES. Additionally, collaborations across UM that are currently linking the research of many of the faculty of MES, such as those related to the Institute of Theoretical Mathematical Ecology and The Abess Center will be strengthened and broadened to include integrated aspects of marine sustainability, economics, policy, and ecology.
- RSMAS has a diverse and rich marine scientific environment to draw the necessary expertise demanded by the MES program. New proposed hires for MES will complete the needs of the Program and will strengthen the human resources that will be available to accomplish its mission. The University of Miami is located at the doorway to the Americas and Caribbean with easy access to any area of the world. This geographical location facilitates the access of students of MES to the marine ecosystems that are relevant to their research and at the same time interact with scientists from the whole hemisphere.
- RSMAS is located in Virginia Key next to the two NOAA research laboratories at AOML and SEFSC. These laboratories house scientists that fund, collaborate and get involved in RSMAS research and academic programs. The new MES program will enhance the collaboration between these institutions by developing a program that integrates all the sciences that are required for the implementation of Ecosystem-based fishery management, the major objective of the NOAA strategic plan for fisheries.

An M.S. and Ph.D. program under one umbrella is proposed, with the program governed by an academic committee of Graduate Faculty within the MES department.

*a. Exact degree title*

- Master of Science in Marine Ecosystems and Society
- Doctor of Philosophy in Marine Ecosystems and Society

*b. Purpose and goals of the degree*

The broad purpose of the degree is to advance students' knowledge and understanding of the science within an interdisciplinary program related to marine ecosystems, primarily through class instruction, professional experiences and thesis and dissertation research. Through a carefully designed portfolio of graduate-level courses, students are expected to formalize their knowledge of the fundamentals within their own set of sub-disciplines (e.g. fisheries, aquaculture, conservation ecology, marine economics, marine policy and marine anthropology). Students will be trained to conduct leading-edge research in their chosen area but also develop the skills necessary to communicate such research to resource managers and the public. This process involves designing research ideas, testing these ideas, and communicating the results through the peer-reviewed literature, and to the appropriate channels of communication with resource management clients. Additionally, all Ph.D. students will be trained in education and communication, by serving as Teaching Assistants in the undergraduate MSC program or the MES graduate program.

The ultimate goal is for our graduates to develop into leaders in the marine ecosystem sciences and thereby contribute to better informing the public and policy makers on how to manage marine ecosystems on the basis of the best available science.

*c. Level of Demand for the Program*

*i. Job market outlook*

The job market for M.S. and Ph.D. graduates in marine ecosystem science is diverse and challenging in some areas, however there are few programs that have the breadth and strong interdisciplinary nature of the proposed MES program. We therefore hope that MES graduates will be able to successfully follow these career paths:

- **Research:** Graduates in MES science often pursue a research career, either at a university or a government research lab, or in the private sector. Government agencies include NOAA, EPA, State fishery agencies and State and local environmental agencies,

International Institution such as FAO-UN, IUCN and regional fishery commissions or conservation commissions.

- **Education:** Many Universities both in the US and abroad have academic programs on one or more of the science disciplines that are part of the MES program however our program will be unique in that it encompasses a broad set of ecological sciences and social sciences in support of management of marine ecosystems. Our graduates, because of the combined academic and research experience will be highly competitive for jobs in many types of institutions of higher learning.
- **Management and Policy development.** Our graduates will be trained so that they can compete for careers in government and NGOs that require the interdisciplinary background required to support development of marine resource policy or to support day to day management of marine resources. Many graduates of the MAF and MBF programs have found work among the leading environmental NGOs such as Environmental Defense and The Nature Conservancy.
- **Outreach and Communication:** There is a growing need to communicate scientific research in support of fishery management, aquaculture development, conservation of protected resources, and the understanding of how critical marine ecosystem services are to our society. Our graduates will be accomplished science communicators and have a broad understanding of the value of marine ecosystem science to society.
- **Industry:** MES graduates will be able to work for aquaculture firms, fishery industry associations or big fishery firms and marine environmental consulting firms. As an example a graduate of our MBF program works now with MRAG of the Americas, a large environmental consulting firm.

Appendix E provides details on current appointments of past graduates from the fisheries/aquaculture M.S. and PhD programs indicating the diversity of employment opportunities that these graduates have had.

*ii. Similar programs at other universities*

This new program is unique among academic programs in Universities so strict comparisons are impossible to be made, if required we could provide information on programs in fishery science and marine policy.

*d. Relationship of proposed program to other UM Graduate programs*

The proposed program will be complementary to several programs at the University of Miami:

- **Marine Affairs and Policy –**

Students in the MAF M.S. program will be able to transfer into the MES M.S. program if they choose to do so. The M.S. in Marine Affairs will stop recruiting students when the new MES M.S. program starts and the M.S. program in Marine Affairs will be replaced by the new M.S. in MES program. While the two program co-exist the programs will share much of the same courses and students engaged in either program will participate in coordinate student activities such as seminars and workshop designed to provide both type of students the best academic experience possible. The MAF program will progressively sunset as the new program starts.

- **Marine Biology and Ecology –**

The old MBF M.S. and PhD program will be renamed the MBE program. The MBE program will continue to offer many courses that are important for MES graduate students as electives. Students in the MES program will also benefit from the mentorship of MBE faculty, some of which will be officially part of the MES program as it is expected that they will hold secondary appointments in MES.

- **OCE and ATM –** Students in the MES program will benefit from the classes offered within other RSMAS graduate program such as MPO and the new OCE and ATM programs. This connection will be especially students pursuing one of the RSMAS concentrations on climate.

- **ABESS Center –** The new proposed MES program which will have a strong marine focus and complement and benefit from the ABESS center PhD program that will retain its stronger land ecosystem focus. Abess Center core PhD courses that address the theoretical and methodological aspects of interdisciplinary research will be part of the list of courses that can be considered to meet the requirements related to MES electives (see table 1).

- **RSMAS Master of Professional Science (MPS):** <http://mps.rsmas.miami.edu/>

The growing MPS program is for students seeking a 1-year degree and simultaneous experience (via an internship) within the profession of their choice. These students are self-funded. The program contains several tracks in MES related Sciences, presently including (a) Aquaculture (b) Coastal Sustainability, (c) Coastal Zone Management, and (d) Fisheries Management and Conservation e) Marine Conservation and f) Underwater Archaeology. These existing MPS tracks will provide a pool of students that will register in classes taught by the faculty of the MES program. These tracks, currently associated

with the MBF and MAF program will be renamed as MES tracks within the MPS program.

- **Transfer into M.S. and Ph.D. Program:** Outstanding MPS students who are interested in pursuing research are encouraged to seek admission into the M.S. and Ph.D. programs.

The MES program, like all other new programs proposed by RSMAS, are distinct from the existing programs in that the existing programs are discipline oriented. The new MES program builds on the existing capabilities present at RSMAS to provide students with a cohesive education in the ecological, and societal aspects of the marine ecosystem. In contrast to the existing MBF and MAF program, the MES will integrate aspects of biology, oceanography and social sciences into a single program that aims at training scientist to provide research outputs that can be used to inform management of marine ecosystems. Given the talent of the faculty in MES and their interest in recruiting graduate students for their active research programs, it is expected that the MES program will quickly grow and slowly replace the fisheries track of the MBF program and the MAF graduate program.

Through coordination by the RSMAS Graduate Academic Committee and the respective Program Directors and committees of the respective programs, the programs will be reviewed, revised and marketed in order for each of them to reach their potential.

*e. Relationship of proposed program to undergraduate and professional programs*

The establishment of a new MES graduate program will provide a necessary direct alignment with some aspects of the existing undergraduate Marine & Atmospheric Science Program led by RSMAS. The coordination of activities listed below will be facilitated via unified overarching governance of and communication between the separate programs.

- **Undergraduate Marine Science Program (code: MSC):**  
[http://www.miami.edu/index.php/academicbulletin/undergraduate\\_academic\\_programs/marine\\_atmospheric\\_science\\_program/marine\\_science/](http://www.miami.edu/index.php/academicbulletin/undergraduate_academic_programs/marine_atmospheric_science_program/marine_science/)

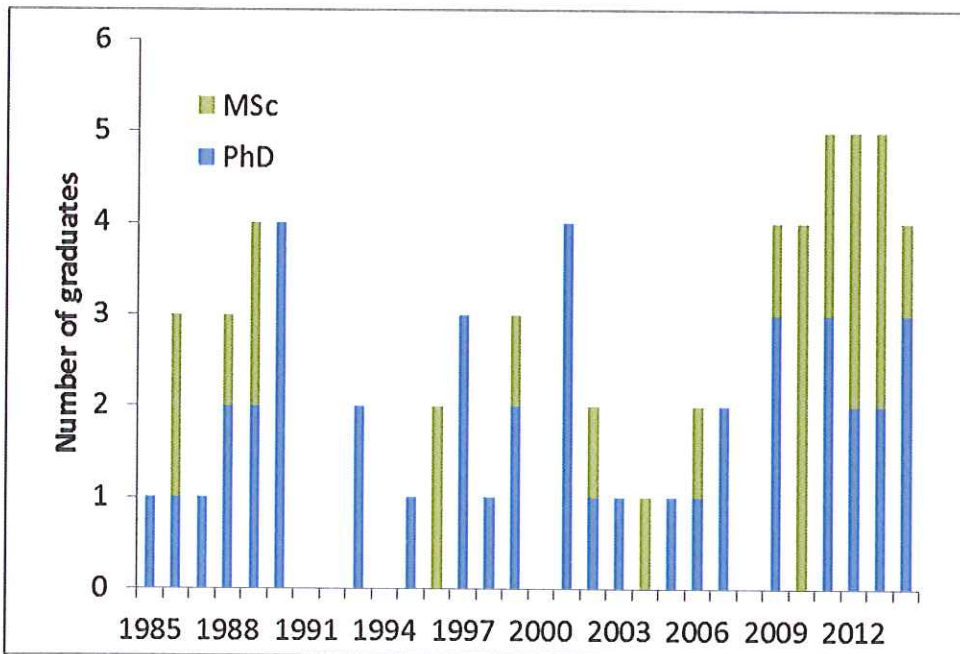
The MES graduate program will be connected to three of the RSMAS undergraduate programs: BSc in MSC/Biology, BA in Marine Affairs and the five-year BA/MPS in Marine Affairs.

- **Courses:** Some graduate level MES courses can be taken as electives by senior-level MSC undergraduates.
- **Teaching Assistants:** The educational training program at RSMAS enables graduate students to serve as teaching assistants for undergraduate MSC courses on Coral Gables campus.

- **Research:** Undergraduate students participate in the research programs of the MES faculty. Graduate students interact with undergraduates through these research projects, giving graduate students an opportunity to develop skills in informal mentoring and training.

- **RSMAS graduate programs**

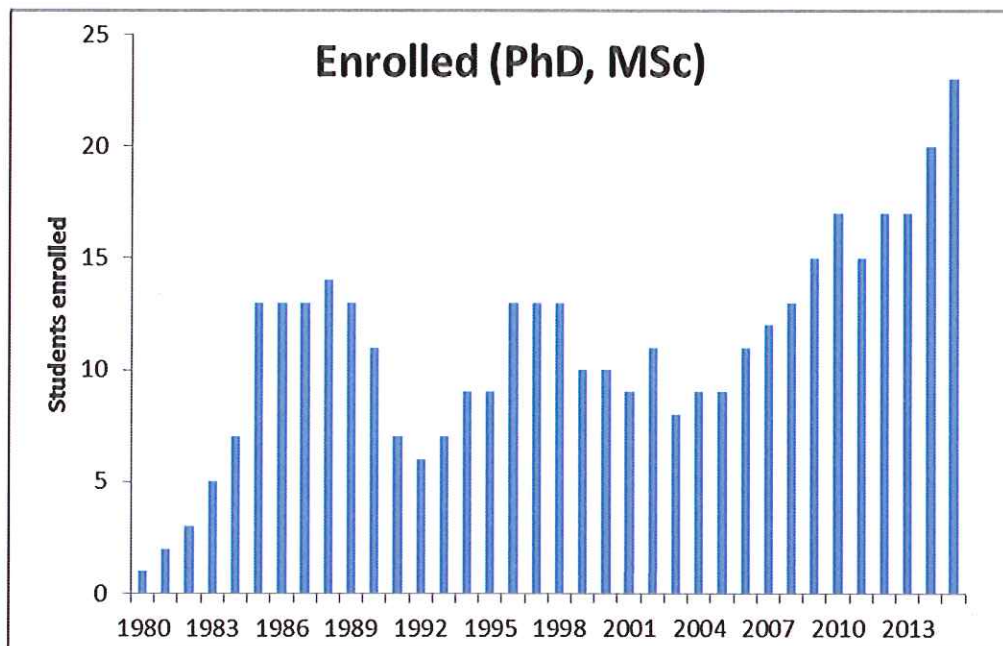
The fisheries and aquaculture faculty have been graduating students conducting fisheries and aquaculture research as part of the academic programs of the Marine Biology and Fisheries Division and the Marine Affairs and Policy division since 1983. In this period students have obtained 25 M.S. and 43 PhD degrees. This represents an average of about one M.S. every year and three PhDs every two years, however the total number of graduating students has oscillated between 1 and 5 in any particular year (Figure 1).



*Figure 1: Number of students graduating each year from the fisheries and aquaculture programs at RSMAS.*

The number of PhD graduating has varied, however, there has been more variation in the number of graduating M.S. because of the changes in the academic programs. The MBF Division reduced the support towards M.S. program in the 1990s, however, started awarding them as joint degrees with MAF thereafter. MAF graduated many M.A. since 2000 but these numbers have recently declined as the MPS program in RSMAS was developed. There are currently 17 PhDs and 6 M.S.

enrolled in the fisheries/aquaculture programs. This is greater than the average of the last ten years which has been 18 students (Figure 2). Since 2000 the program has been supported by a core group of faculty that has grown from three to five. This group has mentored the majority of the graduating students (Figure 3). Details of graduates are provided in Appendix 1.



*Figure 2: Numbers of graduate students enrolled each year in the fisheries and aquaculture programs at RSMAS. Data were interpolated when yearly data were not available by using the average duration of each degree (6 years PhD, 3 years M.S. and 2 years M.A.).*



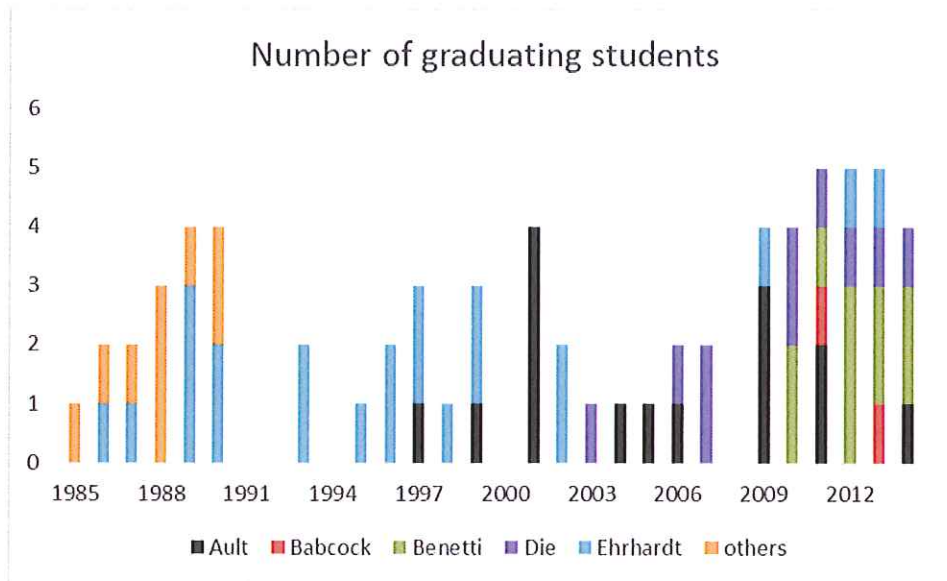


Figure 3: Numbers of M.S. and PhD students graduated by each fishery and aquaculture faculty in the program.

Note that these statistics do not represent all graduate students in the MAF program because they only include students conducting fisheries and aquaculture research. Such students were the majority of M.S. MAF graduates, however, because the current MAF M.S. program required another of the Science Division at RSMAS to support the M.S. and it was the Division of MBF and in particular the Fisheries faculty within MBF which provided most of the co-advising for M.S. MAF students.

**2. RESOURCES** – List and evaluate all of the physical resources available and what will be needed in addition to implement the proposed program.

- a. Library. Survey of library print and electronic resources, collections, documents, major sets, data, and tools in all formats
  - i. Special or unique resources the UM libraries currently have
  - ii. Additional library resources needed and their estimated cost
  - iii. Estimate of incremental library needs per year
  - iv. Demonstrate that library resources are adequate not only for instruction, but for the research of faculty recruited as part of the program

The proposed program will not require any additions to the library at RSMAS. The Library holds more than 125,000 volumes and has 537 current journals through subscription, gift, or exchange. Over sixty percent of the journals are in electronic format. In addition to journals and

books, library holdings also include reports from private, state, federal, and international agencies and organizations. Other library holdings include several thousand maps and nautical charts, atlases, expedition reports, and rare books. The online catalog, IBISWEB, provides access to the resources of the University of Miami Libraries as well as the holdings of the RSMAS Library; through university-wide resource sharing, RSMAS Library patrons are able to access hundreds of databases and thousands of electronic journals and books.

#### Laboratory Facilities, Equipment and Space

##### *v. Existing laboratory facilities and equipment*

- **Computing Facilities**

All graduate students have access to a nationally leading Center for Computational Science (CCS) at UM. Many students in the atmospheric sciences use this high-performance supercomputing facility. CCS maintains one of the largest centralized academic cyber-infrastructures in the country with numerous assets. The High Performance Computing team has been in operation for the past five years. Over that time, the core has grown from zero cyber-infrastructure to a high-performance computing environment that currently supports more than 1,200 users, 220 TFlops of computational power, and more than 3 Petabytes of disk storage. The center's latest system acquisition, an IBM IDataPlex system, has been ranked at number 389 on the November 2012 Top 500 Supercomputer Sites list and has over 6000 x86 computational cores.

- **Marine Life Sciences Center**

One of the MES faculty, Dr. Benetti has a new aquaculture laboratory in the new Marine Life Sciences center fully equipped with state of the art facilities to hold live animals and conduct experiments.

- **Marine Ecosystem Observations**

RSMAS scientists are involved in many aspects related to most marine ecosystem observations such as those related to climate, weather, oceanography, ecology and fisheries. Through their collaboration with the NOAA labs in Virginia Key MES scientists have access to many of the federal databases on marine ecosystems, especially those related to the Caribbean, Gulf of Mexico and Southeastern US.

The Center for Southeastern Tropical Advanced Remote Sensing (CSTARS) is a high-capability receiving and near-real-time analysis facility for low earth orbiting (LEO) satellite data. CSTARS permits a rapid use of civilian synthetic aperture radar (SAR), electro-optical (EO), and other remote sensing satellite data for a variety of users (including government agencies) and applications. CSTARS utilizes rapid data access to enable fast response for time-critical

operations and asset allocations. It enhances the nation's homeland defense and environmental security by enabling advanced ship detection and classification capabilities, rapid assessment of damage from storms and other natural disasters, and the detection and locating of sources of pollutants and targets in specific areas of interest. CSTARS can provide timely information on environmental conditions during severe storms such as hurricanes, extensive flooding of rivers and coastal regions, and other natural hazards. As leading center for environmental remote sensing in the southeastern U.S., CSTARS is capable of receiving, processing, and providing large volumes of satellite data, in particular SAR images covering more than 2,500 km on the ground in single-beam mode or combinations of multiple scenes with different beam modes, within 30 minutes of capture. CSTARS can receive data from satellites about 2.5° above the horizon. While images of this direct visibility domain can be downlinked as they are acquired, images of other regions around the world can be obtained by using a "store and forward" concept. The variety of data available through CSTARS and of the related research projects give RSMAS graduate students a great opportunity to get involved in the latest developments in the field of ocean and ice remote sensing and to get in touch with research partners and users from all over the world.

- **New Technologies**

Three current MES faculty currently have research programs that use sophisticated satellite tagging technology to track movement and behavior of ocean fish. The program also has an expert in the use of acoustic technology for the study of fish ecology and population dynamics.

- b. Other Resources.

- i. *Other physical resources, such as office equipment and student support services, that are necessary to the proposal*
    - ii. *Estimated cost of the addition of such resources*

The regular physical resources granted to the MES department, including classrooms, office equipment, and support services, are mostly sufficient for the graduate program.

- **"Virtual Classroom" across campuses**

The fisheries faculty have for the last 10 years been involved in delivering graduate courses through a virtual campus with funding from NOAA through the Living Marine Resources Cooperative Science Center. This courses have reached students from another two partner Universities in the Center, The University of Maryland Eastern Shores and Delaware State University. The MES program will be integrated in the LMRCSC virtual campus therefore benefiting from the experience of those faculty that have been involved in it in the past. If

opportunities arise to develop further Virtual classroom classes for the MES program the MES faculty will be in a position to capture such opportunities with relatively small adjustments.

### **3. CURRICULUM**

*a. Major division or divisions of the discipline in which the proposed graduate work will be offered*

The MES program will not have divisions. The core science themes that will be offered presently include Marine Fisheries, Marine aquaculture, Marine Conservation and Marine Affairs. Future focus areas may include Marine Ecosystem Modeling, in collaboration with the MBE program and Fishery Socio-economics in collaboration with the department of economics.

Additionally, there will be 'concentrations' in disciplines that span across multiple departments, and which are recognizable as core strengths at UM. The two concentrations pertinent to MES are in climate and society and hazards and tropical resource management.

*b. Evaluation of adequacy of our present undergraduate and graduate curricular structure for the proposed program*

The present undergraduate curriculum is designed at a different level to that required for M.S. and Ph.D. students, though seniors will be able to take 500-level electives together with our graduate students. Via evidence from the past decade of UM B.S. graduates in M.S./Biology and B.A. and M.A. in Marine Affairs who have entered graduate school, our MSC undergraduate program does provide students with a especially strong preparation for entrance into graduate school. Outstanding seniors in the UM undergraduate program will be encouraged to apply to the MES graduate program.

Overall, all of the core material for the new MES program is already being routinely taught. The bulk of the proposed graduate curriculum will initially be drawn from the existing interdisciplinary M.P.S., M.S. and Ph.D. programs in MAF and MBF. However, there are several gaps in the graduate curriculum that will be gradually filled by some realignment of current teaching responsibilities and by the recruitment of new faculty. The proposed MES program will aim to address these gaps in the curricular structure, via revisions to and revitalization of existing courses and the introduction of new courses.

*c. List of anticipated additions, deletions and changes in current curricular structure resulting from the new program (involved faculty listed for each item)*

## Overview

The establishment of the new MES program will provide an opportunity to integrate the curriculum of two pre-existing programs MAF and the fisheries component of MBF. There has been considerable synergy between these two programs in the past, with many students taken courses in both while registered in one or the other. Up until now, however, the programs have functioned largely independently in their admission requirements, degree expectations, course offerings and even student support. The new program will build on the different strengths of the two existing programs to deliver an integrated academic experience for students interested in the interface of ecology, fisheries and social sciences. Recognizing the breadth of possible research interests and disciplinary background of MES students the program will be designed to provide strong focus on one aspect of marine ecosystem and society through core requirements whilst providing an opportunity to learn about other aspects through electives.

## Required Courses

The curriculum is designed to have roughly the same number of required course credits as elective course credits so as to provide the student flexibility to tailor his/her graduate interdisciplinary program . The following describe course requirements to fulfill the minimum of 24 course credits for the M.S. and 30 course credits for the PhD.

- a) Core courses specific to the scientific discipline chosen by the students among those supported in the MES program (9 credits for M.S. and 12 cr for PhD).
- b) MES elective courses outside the chosen scientific discipline, but within the MES catalog (3 cr for M.S. 6 for PhD)
- c) RSMAS common courses RSM574 (1 cr) will be required for PhDs and RSM600 (0 cr) for both M.S. and PhDs.
- d) General elective courses will be a minimum of 12 cr for the M.S. and 12 the PhD.

Table 1: Current catalog of MES courses

<b>X Core courses (select 3 for M.S. and 4 for PhD)</b> <b>XX MES electives (select 1 for M.S and 2 for PhD)</b> <b>* RSMAS requirement for M.S. or PhD</b>			
MES Course	Credits	Fisheries , Aquaculture and Conservation	Marine Affairs
MBF508 Biometrics in Marine Science	3	X	
MBF545 Marine Population Assessment Surveys & Analysis	3	X	
MBF546 Marine Population Biology Process & Modeling	3	X	
MBF577 Marine Ecosystems: Management & conservation	3	X	
MBF604 Biological Oceanography	3	X	
MBF613 Marine Population Dynamics	3	XX	
MBF614 Population Modeling and Management	3	XX	
MBF615 Advanced Biometrics	3	XX	
MAF501 Political Ecology of Resource Management	3		X
MAF502 Economics of Natural Resources	3		X
MAF504 Fieldwork in Coastal Management	3		X
MAF505 Fieldwork in Coastal Cultures	3		X
MAF506 Fieldwork in Political Ecology	3		X
MAF510 Environ. Policy & the Environ. Impact Statement	3		X
MAF512 Aquaculture Management I	3	X	
MAF513 Aquaculture Management II	3	X	
MAF516 Ocean Policy and Development	3		X
MAF517 Legal Environ. & Business Planning in Aquaculture	3	XX	
MAF518 Coastal Zone Management	3		X
MAF520 Environmental Law	3		X
MAF525 Fisheries Socioeconomics and Management	3	XX	
MAF526 Management of Underwater Cultural Resource	3		X
MAF530 Port Operations	3		X
MAF560 Intro to Marine GIS	3		X
MAF561 Intro to Spatial Analysis	3	XX	XX
MAF570 Conservation & Management of Marine Mammals	3	X	
MAF571 Marine Conservation Biology	3	X	
MAF578 Gold and Glory: Ethics of Exploration	3		X

MAF579 Citizen & Participatory Science	3		X
MAF576 Sustainable Energy Science	3		X
MAF577 Island Food Security and the Global Economy	3		X
MAF578 A History of Seafaring	3		X
MAF579 Marine Conservation Outreach	3		X
MAF580 Management of Marine Res. In the Bahamas	3		X
MAF581 Sustainable Design and Human Ecology	3		X
MAF582 Exploration Technology and Media	3		X
MAF583 Biology, Ecology and Management of Mangroves	3		X
MAF610 International Ocean Law and Governance	3		X
MAF620 Coastal Law	3		XX
RSM574 Communicating Science to any Audience	1	*	*
RSM600 Research Ethics	0	*	*
ECS501 Interdisciplinary Environmental Theory	3		XX
ECS503 Interdisciplinary Environmental Methods	3		XX
ECS507 Interdisciplinary Environmental Decision Analysis	3		XX
ECS572 Special Topics in Environmental Science & Policy	3		XX
ECS605 Interdisciplinary Environmental Law & Policy	3		XX

### Electives

In the past students in the MAF and MBF fisheries programs have taken electives in many other departments of the University and other programs in RSMAS and we anticipate that such practice will expand as the new program is designed to be truly interdisciplinary. Several substantive changes are proposed to provide graduate students with the fundamentals in specialty areas of the faculty; to exploit newly available resources; and to create a unique curriculum that will make UM stand out to prospective applicants and current students.

### Summary of additions, deletions, and changes:

The following changes are proposed for the first year of the MES graduate program (Academic Year 2016-17), with more to follow in subsequent years:

**Additions:** New 600 level courses will gradually be developed to satisfy the need of the PhD curricula for all scientific themes within MES. Such additions will be fulfilled mostly by the new faculty that are planned to be hired into MES. As of now, the Fisheries, Aquaculture, Marine Conservation science themes have enough 600 level courses to fulfill requirements of a PhD.

**Deletions:** None planned

**Changes:** None planned

## Concentrations

Two new cross-program 'concentrations' are anticipated in two core strength disciplines at UM-RSMAS. In addition to increasing the visibility of these unique strengths, the purpose of the concentrations is to enable interdisciplinary education in relevant courses across the departments, and to provide students with a broader and more fulfilling experience outside the classroom in their area of interest.

These concentrations will be coordinated through a committee involving a faculty member from MES and faculty members in other programs across RSMAS and at UM, so that students will have available to them a portfolio of graduate-level courses that educate not only from the atmospheric perspective, but also, for example, the ocean, earth science, policy, and economics. The required courses for MES students in these concentrations will be the same as those required for all other students in MBE and OCE. Additional courses within and outside MES are recommended (though not required) in the concentration, and will be coordinated by the student, their major advisor, and the committee. A basic website will be maintained for each concentration, listing courses and events, and showcasing relevant activities to the external world.

The two concentrations are

- **Climate**
  - Selection of courses across multiple departments
  - Monthly climate seminar series
  - Annual Colloquium (at least one day) on climate
  - Invited speaker program
  - Draws a parallel with the undergraduate minor in climate
- **Tropical Ecosystems**
  - Selection of courses across multiple departments
  - Monthly tropical ecosystems seminar series
  - Annual Colloquium (at least one day) on tropical ecosystems
  - Invited speaker program

It is foreseen that the MES program will have some students interested in both of these concentrations and that the program will have courses that are relevant to both of these concentrations. Examples would be students that are interested in the effects of climate change on the dynamics and sustainability of marine resources, or in the development of management and policies for coastal zone management that are appropriate for countries within the tropics.



*Detailed description of the proposed program*

Unless otherwise stated, the following description is presented for the 5-year Ph.D. program, in which about 80% of the students are expected to be enrolled. For the M.S. program, the UM and RSMAS graduate handbook regulations will be followed, with a requirement of 24 course credits and a M.S. thesis that will typically be completed within two years.

*Program Requirements (consistent with a graduate bulletin masthead)*

**M.S. Degree (same as Ph.D. degree unless otherwise stated)**

- Credit Requirements
  - At least 24 MES graduate-level course credits.
- Course Requirements
  - TBD
- Thesis Committee
  - As per the UM Graduate Handbook.
- Comprehensive Examination
  - At the end of May in their first year, after completing at least 18 course credits, the student will take a written comprehensive examination. The student will be required to answer 4 of 6 questions in the written exam.
- Thesis Proposal
- Thesis
  - A thesis is required, and a public oral defense of the thesis must take place.

**Ph.D. Degree**

- Credit Requirements
  - At least 30 MES graduate-level course credits.
  - No less than half of the total credits must be in coursework open only to graduate students (600-level or above).
- Course Requirements
  - TBD
  - As per the UM Graduate Handbook.
- Comprehensive Examination
  - At the end of May in their first year, after completing at least 18 course credits, the student will take a written and oral comprehensive examination. The student will be required to answer 4 of 6 questions in the written exam, and will be prepared to answer questions from any of the courses taken in the oral exam.
- Qualifying Examination

- A qualifying examination is required of all students admitted to the doctoral program. It is normally administered after the approval of the P.H.D proposal. The student's committee will prepare and administer the qualifying examinations and will choose whether an oral, written or both exams are required.
- Dissertation Proposal
  - The proposal should demonstrate the capability of the student to produce and present scientific research that is of the quality that is suitable for a peer-reviewed journal article. Emphasis is placed on the goals of the proposed research, the hypotheses to be tested and methods used for testing, and ideally some idea of anticipated results.
- Admission to Candidacy
  - Upon completion of the following requirements, the student is admitted to candidacy:
    - Have an approved committee on file in Graduate Studies
    - Passed the Comprehensive Examination
    - Passed the Qualifying Examination
    - Passed the Dissertation Proposal
    - Have a 3.0 average in all credits earned
    - Remove all "I" or deficiencies
  - All doctoral students must be admitted to candidacy at least one semester prior to the one they intend to graduate.
- Dissertation
  - A dissertation is required of all doctoral students. A public oral defense of the dissertation is required.

*Anticipated program mission and learning outcomes*

**Anticipated program mission and learning outcomes**

Mission: "To advance students' knowledge and understanding of the marine. The goal is for our graduates to develop into leaders in the sciences related to management of marine ecosystem resources, and thereby contribute to better informing the public and policy makers on how to prepare support sustainable management."

*Student Learning Outcome 1:* Students gain a broad knowledge of marine ecosystem science and an awareness of how scientific research in their topical areas bears on current human and societal issues.

*Student Learning Outcome 2:* Students learn how to critically evaluate scientific literature, study the previous knowledge on a topic, formulate testable hypotheses, and skillfully use available data and tools to advance the knowledge in a topical area.

*Student Learning Outcome 3:* Students learn oral and written communication skills, and are able to effectively communicate and defend their scientific findings to a peer audience

*Course descriptions for each new course (Syllabus for each course in Appendix A)*

- *Thesis Research, Additional Coursework, Dissertation*
  - d. *Teaching*

*What kinds of teaching will prevail in the program (i.e. clinical, classroom, independent research, seminars, online etc.), and in what proportion?*

Most of the formal coursework will be conducted in the classroom, through a combination of lecture notes and visual tools. Many courses include small research projects.

While the student seminar series (described in part h below) is not formally part of a course, it represents a vital part of the teaching mission.

- e. *Expected distribution of graduate students among advisors*

An average of 4 graduate students per advisor on the tenure track is expected, with a generally uniform distribution.

- f. *Colloquia series, special seminars, or conferences that will be held*

A weekly MES departmental seminar series will be held each semester. Some seminars will be held jointly with other programs (e.g. MBE or OCE), depending on the topic. Seminars will comprise external speakers, faculty and research staff from UM, and every graduate student in their second year or above will give either a 15-minute seminar or a 1-hour (pre-Ph.D. defense) seminar.

MES graduate students will also be invited to participate in other colloquia and workshops hosted by MES faculty, wherever appropriate.

- g. *Learning Outcomes Assessment Plan ( see Appendix B)*

#### 4. FACULTY

- a. *Complete C.V. for each member of the department who will participate in each program. (See Appendix C)*

<b>Faculty Member</b>	<b>Field</b>	<b>Department</b>	<b>Rank</b>
Juan Agar	Fishery Economics	MES	Adj. Assoc. Prof.
Jerry Ault	Fishery Dynamics	MES	Prof.
Elizabeth Babcock	Ecosystem Dynamics	MBE	Assoc. Prof.
Andy Bakun	Biological Oceanography	MES	Prof.
Daniel Benetti	Aquaculture	MES	Prof.
Kenny Broad	Exploration Science	MES	Prof.
Nelson Ehrhardt	Fishery Science	MES	Prof.
Maria Estevanez	Geographical Information Systems	MES	Lecturer
David Die	Fishery Management	MES	Res. Assoc. Prof.
Grubman	Law and Policy	MES	Lecturer
Neil Hammerschlag	Marine Ecology	MES	Res. Assist. Prof.
David Letson	Resource Economics	MES	Prof.
Sarah Meltozf	Anthropology	MES	Prof.
Jill Richardson	Marine Mammal Science	MBE	Assist. Prof.
Manoj Shivlani	Marine Policy	MES	Lecturer
Daniel Suman	Law and Coastal Management	MES	Prof.
Gary Thomas	Marine Fishery Acoustics	MES	Prof.

- b. *Estimate the need for additional faculty, including in each instance*
- i. *Specialization desired*
  - ii. *Degree of experience desired*
  - iii. *Salary anticipated*

As proposed in the RSMAS strategic plan that is currently under development, MES will seek to hire 5 new faculty in the next 5 year cycle to fulfill its academic obligations in the MSC undergraduate and the MES graduate program.

- c. *Interaction of proposed program with other graduate programs, e.g. thesis and dissertation committees.*

Current students have a significant participation of MBE and OCE faculty in their thesis and dissertation committees. It is anticipated that such participation will continue.

## 5. STUDENTS

*a. Estimated number of students in the program and the pool from which they will be selected*

Currently there are about 20 students enrolled in the MBF fisheries PhD and MAF M.S. programs. We predict that the number of students enrolled in the MES PhD and M.S. will be ultimately be around 25. Enrollment of students in the MES classes over the period of 2010-2014 can be seen in Appendix A.

*b. Requirements for admission to and expected retention of students in the proposed program*

The following criteria will be used in the admission process:

- Strong GPA, especially in advanced quantitative courses from well-regarded programs
- Some research experience
- Strong reference letters
- Quantitative GRE score above the 70<sup>th</sup> percentile of all GRE takers
- Strong interview with faculty (in person or online)

Most students, when admitted, are expected to be capable of pursuing the M.S. or Ph.D. degree. The Comprehensive Exam (end of Year 1) and Ph.D. Qualifying Exam (typically Year 3) will serve to judge the progress of the student and ultimately whether they are qualified to pursue the M.S. and Ph.D. The expected retention rate is over 90%, though some students may graduate with a M.S. instead of a Ph.D respectively.

*Anticipated need for and specific use of teaching assistants and research assistants in the program. Include the number and estimated stipends for each assistant (indicate stipend level and whether 9-month or 12-month).*

All Ph.D. students will be admitted on a graduate research assistantship. The estimated stipend for 2016 is approximately \$30,000 per year (12 months), and is governed by the standard rate at RSMAS. All students, except when on Fellowships, will receive this stipend. The number of incoming students per year will be driven by the number of research grants obtained by faculty with full stipend and tuition, in addition to high-caliber students who are self-funded through Fellowships. The estimated average number of available stipends per year is about 6.

Although no graduate students at RSMAS are enrolled specifically as Teaching Assistants (TA), all Ph.D. students are expected to be a TA for two courses while pursuing their degree. This is as part of their 'Educational Training', which is an integral part of the Ph.D. program at RSMAS.

The student performs their TA duties in their second and/or third years. The TAs are required to take a 1-credit training workshop, and will be enrolled in a 3-credit Educational Training course in each semester that they serve as a TA. Students in the ATM Ph.D. program would mostly serve as TAs for courses in the undergraduate ATM program, as well as other suitable undergraduate courses administered by RSMAS. The allocation of TAs is determined largely by the size of the class, and therefore most undergraduate classes are offered priority over graduate classes. However, on occasion, a senior-level graduate student may TA for one of the introductory graduate courses that has a particularly large enrollment. M.S. students are not expected to act as TAs.

## **6. ADMINISTRATION**

### *a. Estimated administrative increments imposed by addition of this program*

#### *i. Need for administrative help*

The Graduate Studies Office will provide administration support for the program on: recruitment, admissions, student academic tracking, student pay/tuition/health insurance, TA-ships, student research awards, course and classroom coordination, interactions with the UM graduate school. Additional administrative help is expected to be handled by the departmental Administrative Assistant.

#### *ii. Need for additional office equipment and supplies*

Office equipment and supplies will be in the departmental budget. These are not expected to exceed the corresponding budget for the existing programs.

#### *iii. Need for additional travel, publication, costs and other funds*

The budget for student recruitment is currently handled by the School. If recruitment duties are instead delegated to the department, then an additional budget would be necessary for recruitment. The budget would need to cover additional staff time to conduct a variety of activities: these include communication with program directors and prospective students in undergraduate programs, preparing materials, frequently updating the web site, attending career fairs and conferences, and giving presentations at universities when opportunities present themselves. An additional budget would be needed to invite the top prospective students to Miami for the annual Open House and interviews.

The School also offers a Graduate Career Development that students can apply to. The funds provide partial support for Doctoral and Masters related independent research, and also activities that will enhance the career prospects for graduate students. This may include

activities related to development of professional skills in scientific research (e.g. oral or written communication, management, budgets, negotiation, mentoring... etc), and serve the individual student as well as the RSMAS community.

*b. Arrangements for administration and for academic direction of the program as it pertains to*

*i. The day-to-day administration of the program.*

The day-to-day administration and oversight of academic direction will be provided by the program director, who will be appointed by the department chair. The director and chair will nominate a program academic committee. Among the duties of the director are the following:

- Chair the program academic committee
- Communicate to students in the program (e.g., career development opportunities)
- Hold an annual town hall meeting with the students in the program
- Maintain office hours or availability by appointment with students
- Organize nominees for school-wide awards, and any awards within the program
- Coordinate courses to be offered in each semester
- Coordinate annual Comprehensive Exams
- Coordinate faculty teaching responsibilities with relevant department chairs (though only the chairs have authority)
- Coordinate TA assignments with relevant department chairs and program directors; and recommend them to the associate dean for graduate education
- Coordinate recruitment activities for the program
- Coordinate the nomination of UM fellowships and other fellowships for students
- Collect annual progress reports and coordinate the annual student review
- Review the student evaluations of courses in the program;
- Coordinate the admissions for the program
- Sign the form for admission of new students into the program prior to final approval by the delegated associate dean
- Attend and vote in School Graduate Academic Committee (GAC) meetings
- Delegate a member of the program academic committee to attend GAC meetings if the director is absent
- Report on items from GAC and items relevant to the program in department faculty meetings
- Prepare annual Program Assessment Reports for SACS.

*ii. The academic policy-making mechanisms used to implement the program, including criteria for membership in the faculty of the program.*

The program director and academic committee are responsible for proposing policies in the program. The general academic policies will follow the UM graduate handbook, followed by the RSMAS graduate handbook. Any policies that are not covered in these handbooks will be prepared by the program academic committee, and will be voted upon by the faculty.

**7. BUDGET (three-year)**

*Provide a three-year projected budget commencing with the year the program gets under way. Each year's budget should include all anticipated income (use current year tuition credit costs and projected overhead) and all anticipated incremental costs, e.g. new faculty with fringe, library additions, teaching assistantships, laboratory equipment, staff, travel funds, etc.*

The new program will operate under the same business model of students funding and it will not require additional support from UM. Since the financial package for a Ph.D. student is for 5 years, with significant differences between years 1-3 and years 4-5, the full five-year projected budget is provided here.

The budget in the table is for one Ph.D. student starting in FY 2017. Note that some students from MBF on this business model at different stages of their tenure may transfer into MES beginning in Fall 2016. Some will be supported by their advisor's grants at that time, whereas others will be supported by RSMAS.

Ph.D. PROGRAM COST	FY 2017	FY 2018	FY 2019	FY 2018	FY 2019
<b>Ph.D. Student Stipends</b>					
University Coverage				\$30000	\$30000
Coverage from Grants	\$30000	\$30000	\$30000		
<i>Total Ph.D. Student Stipends</i>	<i>\$30000</i>	<i>\$30000</i>	<i>\$30000</i>	<i>\$30000</i>	<i>\$30000</i>
<b>Tuition</b>					
University Coverage				\$20000	\$20000
Coverage from grants	\$20000	\$20000	\$20000		
<i>Total Tuition</i>	<i>\$20000</i>	<i>\$20000</i>	<i>\$20000</i>	<i>\$20000</i>	<i>\$20000</i>
<b>Student Health Insurance</b>					
University Coverage				\$ 2500	\$ 2500
Coverage from grants	\$ 2500	\$ 2500	\$ 2500		
<i>Total Health Insurance</i>	<i>\$ 2500</i>	<i>\$ 2500</i>	<i>\$ 2500</i>	<i>\$ 2500</i>	<i>\$ 2500</i>
<b>Administrative Expenses</b>					



Student Travel Funds from Grants	\$ 2000	\$ 2000	\$ 2000	\$ 2000	\$ 2000
Supplies and Computers from Grants	\$ 3000				
Research operating from grants		\$3000	\$3000	\$3000	\$1000
Recruiting, Speakers, etc. from Department					
Additional Course Costs					
<i>Total Administrative Expenses</i>	<i>\$ 5000</i>	<i>\$ 2000</i>	<i>\$ 5000</i>	<i>\$ 5000</i>	<i>\$ 5000</i>
Program Cost from Grants					
Program Cost from School or Department					
<b>Total Program Cost</b>					

There is an increased number of students in MES who wish to pursue a M.S. degree and then enter the profession. M.S. students at the Rosenstiel School are on two different types of business model.

The traditional and most common business model for M.S. students is to be funded by research grants, with their budget being identical to that of years 1-3 in the table for Ph.D. students, for as long as they are in the program. Only a relatively small number of students are expected to be accepted in this model, given that there are strong research and financial incentives for faculty to recruit Ph.D. students.

To accommodate the increasing application pool of students who are seeking a M.S., a new business model introduced at the Rosenstiel School in 2014 allows self-funded M.S. students to pay tuition and enroll in the program, subject to acceptance by a faculty advisor.

- 8. COMPARISONS** – *Compare the proposed program at the University of Miami with five high-quality, established programs at comparable universities. In the comparisons, include only the sections and subsections from items #1 through #7 above that are appropriate.*

This new program is unique among academic programs in Universities so strict comparisons are impossible to be made, if required we could provide information on programs in fishery science and marine policy.

**9. Online and distant degree and certificate programs only**

N/A

**10. Transfer of coursework to graduate degree programs**

- a. Indicate if the courses taken in the certificate program can be substituted for courses in a graduate degree program.*

A course taken in the certificate program (MPS) cannot be substituted for required courses in the MES graduate program. All students in the MES graduate program will be required to complete a minimum of 24 (M.S.) or 30 (Ph.D.) graduate MES course credits. It is worth noting that students in the MPS program will take several of the MES graduate courses.

- b. Indicate if the courses can be transferred to a graduate degree program after the certificate is completed.*

If a student in the MPS program is accepted into the M.S. or Ph.D. program in MES, then they will be able to transfer the credits from the MES graduate courses that they had already taken during their tenure as a MPS student.

**APPENDIX A: Syllabus for each course**

Table 1: Enrollment and instructors teaching courses in the proposed MES program. Enrollment corresponds to total number of students for the period 2010-2014. \* Courses only taught in alternate years, # courses taught through virtual campus. Enrolled students are only UM students and do not include students from other Universities taught through the virtual campus.

Instructor	Course	Enrollment	
Meltzof	MAF501 POL ECOL RES MGT	41	
Letson	MAF502 ECO OF NAT RESOURCES	57	
Suman	MAF504 FLDWRK CSTL MNGMT	45	
Meltzof	MAF505 FLDWRK COASTL CULTRS	25	
Meltzof	MAF506 AD FLDWK CST CULTR	19	
Suman	MAF510 ENV PLN ENV IMPCT	59	
Benetti	MAF512 AQUACULTURE MGT	95	
Benetti	MAF513 AQUACULTURE MGT II	54	
Gifford	MAF514 PREHIS ARCH EXCVTN	22	
Gifford	MAF515 TECH MAR ARCHLGY SUR	9	
Shivlani	MAF516 OCN POL & DEV & ANLY	106	
Benetti	MAF517 AQUACULTURE & THE LAW	46	
Suman	MAF518 COASTAL ZONE MGMNT	92	
Benetti	MAF519 AQUACULTRE MGT III	31	
Suman	MAF520 ENVIRONMENTAL LAW	98	
Agar	MAF525 FIS SOCIOECO & MGT	71	
Gifford	MAF526 MAR CULT RES MGT	18	
Stribling	MAF530 PORT OPER & POLICY	30	
Estevanez	MAF560 INTRO TO MAR GIS	217	
Estevanez	MAF561 INTRO MAR GIS-LAB	89	
Estevanez	MAF562 SPATIAL ANALYSIS	50	
Richardson	MAF570 CONSV MGT MAR MAM	180	
Hammerschlag	MAF571 MARINE CONSERVATION-BIO	24	
Ehrhardt	MBF508 BIOMTRCS IN MAR SC	78	
Thomas	MBF521 FLD TEC & INST TME	52	
Ehrhardt	MBF545 FISH SAMP AND ANAL	16	
Ehrhardt	MBF546 FISHER POPLTN BIOL	20	
Bakun	MBF565 FISH ECO OCEANOGRA	20	
Die	MBF577 MANAGEMENT OF MARINE ECOSYSTMS	34	
Thomas	MBF590 ACOUSTIC MEASUREMENT	13	
Bakun	MBF610 PHY ENVRN MAR ORGN	38	
Die	MBF613 MAR POPULATN DYNM	19	#
Ault	MBF614 POPULATN MODEL MGT	14	*
Ault	MBF615 AD BIOMTRCS MAR SC	20	*

Babcock	MBF616 BAYESIAN STATISTICS	21	*#
Shivlani	MAF610 INTL OCN LAW GOV	31	.
Grubman	MAF620 COAST LAW & POLICY	63	

Syllaby are provided in separate documents and can be accessed online.

## APPENDIX B: Learning Outcomes Assessment Plan

### Learning Outcomes Assessment Plan

**Student Learning Outcome 1:** *Students gain a broad knowledge of marine ecosystem science and an awareness of how scientific research in their topical areas bears on current human and societal issues.*

- **Assessment Measure 1:** All students take a Comprehensive Exam at the end of their first year of study to assess their basic knowledge and ability to convey learned concepts clearly. The Director of the graduate program administers the exam with participation from all teaching faculty. A rubric will be used to quantitatively evaluate student performance on the oral and written components of the exam. The final score and grade of High Pass, Pass and Fail are then computed as a weighted average of an adjusted GPA (20%) and the oral and written Comprehensive Exam scores (40% each). The effectiveness of the Comprehensive Exams and the way they are administered are reviewed each year by the Academic Committee and in Faculty Meetings.
- **Assessment Measure 2:** Ph.D. students subsequently take a Qualifying Exam to enter Ph.D. candidacy to thoroughly assess their breadth of knowledge and scientific competency in their area of specialization. The exam is tailored to the research problem the student is addressing, and is administered by the Dissertation Committee Chairperson with participation from all members of the Dissertation Committee. Each member of the Committee submits one question and takes the lead in assessing the written answer, though all members of the Committee see all answers and all participate in the oral component of the exam. The exam result is Pass or Fail. Guidelines and a rubric for assessment of student performance on the exam are distributed to all students.

**Student Learning Outcome 2:** *Students learn how to critically evaluate scientific literature, study the previous knowledge on a topic, formulate testable hypotheses, and skillfully use available data and tools to advance the knowledge in a topical area.*

- **Assessment Measure 1:** Each year, advisors make an evaluation of the progress of each student in their research and the areas where students are excelling or need to improve. The students also report on the planned timing and completion of academic benchmarks (comprehensive exam, student committee establishment, qualifying exam, dissertation proposal, presentations at conferences, submission of papers to the peer-reviewed literature, etc). All faculty meet for half a day to discuss every student in the program (excluding first year students), whether they have met their milestones and are on track,

and to offer ideas on how to handle problems in a timely way. The Program Director notifies each student individually of their progress and specific recommendations from the faculty.

- **Assessment Measure 2:** Ph.D. students produce a dissertation proposal that outlines their planned research, including background, hypotheses, analysis methods, and anticipated results. Each proposal is formally reviewed by an appointed Dissertation Committee of at least 4 members, three of whom must be members of the Graduate Faculty. The criteria for assessment of the proposal include (i) Sufficient knowledge of the broad scientific problem including a literature review; (ii) promising preliminary results, ready to be submitted to the peer-reviewed literature; (iii) well-posed scientific hypotheses; (iv) adequate description of proposed methods to test the hypotheses; and (v) a realistic timeline and summary of the work plan. The committee uses these criteria to review the proposal, and the outcome is then either to accept the proposal, or to suggest, or require, revisions to any number of the above criteria prior to the student's admission to Ph.D. candidacy.

**Student Learning Outcome 3:** *Students learn oral and written communication skills, and are able to effectively communicate and defend their scientific findings to a peer audience.*

- **Assessment Measure 1:** Students deliver a seminar annually on their research, which must be intelligible to non-specialists and explain the broad motivation of the research. An extended abstract of the presentation is also required. These requirements, and the format of the presentation, follow those used for conferences, such as those held by the American Meteorological Society. Written guidelines are provided to the students on the preparation of abstracts and on qualities of a good presentation.
- **Assessment Measure 2:** Students conduct a formal defense of their doctoral dissertation in front of the school-wide faculty and students. A rubric is used for assessing the dissertation and defense.

**APPENDIX C: Complete CV of each faculty member who will participate in the program**

Graduate teaching experience and grants received of the person concerned should be included in each CV.

## **APPENDIX D** Description of current academic program for the fishery science curricular group

### **I. General Overview**

The Fishery Science Curricular Group of the Department of Marine Ecosystems and Policy, established within the Division of Marine Biology and Fisheries at RSMAS in 1983, contains the quantitative marine fishery science track specializing in marine population dynamics, fisheries oceanography, stock assessment, applied statistics, mathematical and computer model-building, ecosystem modeling and fishery management.

Fishery science is essentially a mathematical subject attempting to assess biological processes (as modified by technological and economic factors) by mathematical reasoning. On these grounds, fishery science is frequently identified as a branch of mathematical ecology. As such, fishery science is concerned with the study of the fish biology and biological responses exploitation of those fish populations that sustain fisheries. Thus, fishery science deals with the interactive dynamics of exploited fish populations and of fishery operations. For the purpose of conservation and management, fishery biologists examine recruited (juvenile and small adult) fishes in considerable detail regarding their behavior, growth, mortality, reproduction, year class strength, etc., in response to the physical environment and to fishery exploitation. However, the mechanisms by which the annual year classes are generated are rooted in the dynamics of larvae and pre-recruit juveniles, coupled with the physical-oceanographic environment, which may be identified with the work carried out by fisheries (biological) oceanographers and marine ecologists; and, in the level of parent stock abundance, identified with the work of fishery scientists. Fishery science integrates multiple disciplines among which fisheries oceanography plays an important role.

Until 1982, fisheries research at RSMAS centered on broadly viewed ichthyological studies, benthic research, and descriptive studies of fisheries. Though highly relevant, past research departed significantly from contemporaneous objectives and tasks specifically identified as fishery research in support of fishery management. Since then two significant advances have been accomplished at RSMAS in the field of fisheries. First, a formal quantitative fishery curriculum was developed in Fall 1983 which was tailored to the needs of tropical fisheries biology and management. Over the past thirty-one years, seventy-eight (78; see attached list of graduates) degree seeking students have completed the fishery science curriculum. From those students, twelve received a M.S.. Degree and fifteen received the Ph.D. Degree. Over 130 graduate students from MBF, other divisions at RSMAS, and from the University of Miami's Main Campus have taken one or more of the courses offered by the Curricular Group. In the early 1990's, a more comprehensive fishery research program was established encompassing two main avenues of fishery research:



1. Basic and applied research on fish and macroinvertebrate population dynamics (including recruitment studies and the coupling of biological-physical factors), stock assessment and fishery management.
2. Development of new theory and methodologies for deepening the understanding of the dynamics of complex multispecies populations and communities with emphasis on sub-tropical and tropical multicohort stocks of fishes and macroinvertebrates.

RSMAS fishery initiatives have generated over \$25 million dollars for quantitative research since 1983. Principal research funding sources are grants of Federal origin, e.g.: NOAA National Marine Fisheries Service, NOAA Sea Grant, U.S. State Department MAB/MACE Directorate, Florida Keys National Marine Sanctuary, National Park Service, NOAA Coastal Ocean Program, U.S. Army Corps of Engineers, and the National Undersea Research Center; but, these fiscal resources are routinely complimented by substantial research support from the State of Florida Fish & Wildlife Conservation Commission, U.S. Agency for International Development, and other private corporate and private institutions and foundations (i.e., Florida Power & Light Corporation, Ocean Reef Club, Bonefish & Tarpon Trust, Robserton Foundation, Storer Foundatoo, Center for Marine Conservation, etc.).

## II. Potential of the Subject

Fishery research with emphasis on tropical marine fishery ecosystems has received increased attention as a consequence of the establishment of exclusive economic zones worldwide in the mid-1970's. Exclusive economic zones incorporated vast fishery resources to the national economies of countries situated adjacent to tropical seas and mandated that a great deal of attention be given to the determination of the appropriate levels of resource utilization in marine fishery environments. The concern provided the impetus for solicitation of expert management advice for resource conservation. Fishery resources in the subtropics and tropics are relatively more difficult to manage than those in more temperate regions. This is because management difficulties in tropical areas are exacerbated by the remote and heterogeneous character of the attendant artisanal and semi-industrial fishing fleets which have restricted operational ranges and highly selective fishing gears. Management difficulties are further compounded by the comparatively more complicated population dynamic processes which are exhibited by tropical fish species. Tropical fisheries are extensively utilized and management advice may improve yields. However, the stocks need to be assessed before sound management alternatives are formulated.

Efforts to assess the effects of exploitation on fishery resources are usually marred by the considerable uncertainties associated with growth, recruitment and mortality estimates derived from a dearth of fishery statistical, biological, and oceanographic information. To resolve this dilemma new methods have had to be, or are being developed for, or adapted to, tropical fisheries.

Based on the consideration that tropical fishery resources are the least understood and the most complex to study, very few State and Federal institutions have had the capabilities to generate the required level of scientific knowledge to successfully manage these resources. Universities have played a major role in generating new knowledge from basic and applied fishery research for Federal and Local Governments. RSMAS has very unique scientific capabilities in fishery science which will continue to be expanded with adequate planning and careful investment. National and International projection of fishery research carried out by UM scientists puts RSMAS in the forerunner position to expand research activities on the world's tropical fisheries.

## II. The Academic Program

The following Fishery Science & Aquaculture Curricular requirements were developed for an academic concentration in quantitative marine stock assessment, fish population dynamics, and fishery management science leading to either the Master of Science or Doctor of Philosophy degrees in the Department of Marine Ecosystems and Policy:

<b>Master of Science</b>		<b>Doctor of Philosophy</b>		
	Oceanography Core Courses	5 Cr	Approved M.S. Degree Coursework	24 Cr
RSM 602	Fishery Science Seminar	1 Cr	MBF 615 Advanced Biometrics	3 Cr
MBF 510	Fisheries of the World & Lab	4 Cr	MAF 625 Bioeconomic Modeling	3 Cr
MBF 508	Introductory Biometrics	3 Cr	MBF 6xx Advances in Fishery Management Science	3 Cr
MBF 613	Fish Population Dynamics	3 Cr	<u>Ph.D Electives</u>	<u>15 Cr</u>
MBF 614	Population Modeling & Mgmt	3 Cr		
	<u>M.S. Electives</u>	<u>5 Cr</u>		
<b>Total M.S. Course Credits</b>		<b>24 Cr</b>	<b>Total Ph.D. Course Credits</b>	<b>48 Cr</b>
MBF 710	Master's Thesis Research	6 Cr	MBF 730 Doctoral Dissertation	12 Cr
<b><u>Total M.S. Research Credits</u></b>		<b><u>6 Cr</u></b>	<b><u>Total Ph.D. Research Credits</u></b>	<b><u>12 Cr</u></b>
<b>Total Credits for M.S. Degree</b>		<b>30 Cr</b>	<b>Total Credits for Ph.D. Degree</b>	<b>60 Cr</b>

Course descriptions are found in the RSMAS Bulletin and the University of Miami Graduate Studies Catalogue. See attached spreadsheet for details of Fisheries Science Curricular Group course requirements.

## IV. Faculty Resources

The core Faculty in the quantitative fishery science curriculum of marine population dynamics, statistics, fisheries oceanography, population and ecosystem modeling, stock assessment and fishery management are Drs. Ault, Babcock, Bakun, Benetti, Die, Ehrhardt, and Thomas. Other Faculty involved in various aspects, including human dimensions, of Fisheries Science include Drs. Broad, Grosell, Letson, Luo, Serafy and Smith. There are also excellent interactions between the Fisheries Faculty and the Departments of Meteorology and Physical

Oceanography, Department of Ocean Sciences, the Institute for Theoretical and Mathematical Ecology, Department of Management Sciences and Operations Research in the School of Business, and the Abess Center. Adjunct Faculty in quantitative fisheries play important roles as advisors on student committees, as well as in both research discussions and presentation of scientific seminars. Most Adjunct Faculty in Fisheries are from NOAA Fisheries, either the National Marine Fisheries Service, Southeast Fisheries Science Center located across the Rickenbacker Causeway on Virginia Key, the Pacific Islands Fisheries Science Center, Honolulu; or, the Florida Fish & Wildlife Conservation Commission's Florida Marine Research Institute located in St. Petersburg, Florida.

**APPENDIX E: Past graduates students from the MBF and MAF programs that focused on fisheries/aquaculture.**

*List is ordered by FACULTY advisor*

**Dr. Jerald S. Ault (MES)**

- (1) **Chairman.** Marc O. Nadon. (2014) *Improving stock assessment capabilities for the coral reef fishes of Hawaii and the Pacific region.* **Research Fishery Biologist, NOAA Pacific Islands Fisheries Science Center, Honolulu, HI.**
- (2) **Chairman.** Michael F. Larkin. Ph.D. (2011). *Assessment of South Florida's Bonefish Stock.* **Research Fishery Biologist, Sustainable Fisheries Division, Southeast Regional Office, NOAA Fisheries Service. St. Petersburg, FL.**
- (3) **Chairman.** Dione W. Swanson, Ph.D. (2011). *Spatial dynamics of coral populations in the Florida Keys.* **Research Fishery Biologist, Coral Reef Ecosystem Division, NOAA Pacific Islands Fisheries Science Center, Honolulu, HI.**
- (4) **Chairman.** Ashley McCrea-Strub, Ph.D. (2009). *Evaluation of dynamic interactions between predators, prey and fisheries in ecosystem models.* **Post-doctoral fellow with Professor Daniel Pauly in Ecosystem Modeling at the Fisheries Centre, University of British Columbia.**
- (5) **Chairman.** Nicholas A. Farmer, Ph.D. (2009). *Reef Fish Movements and Marine Reserve Designs.* **Research Fishery Biologist, Sustainable Fisheries Division, Southeast Regional Office, NOAA Fisheries Service. St. Petersburg, FL.**
- (6) **Chairman.** Helena Molina-Urena, Ph.D. (2009). *Towards An Ecosystem Approach for Non-Target Reef Fishes: Habitat Uses and Population Dynamics of South Florida Parrotfishes (Perciformes: Scaridae).* **Associate Professor of Fisheries, Universidad de Costa Rica, San Jose, CR.**
- (7) **Co-Chairman.** Michael C. Feeley, Ph.D. (2006). *Bioenergetics of juvenile billfish and cobia.* **Co-Chair with Professor Daniel Benetti. Research Fishery Biologist. National Park Service, Palmetto, FL.**
- (8) **Chairman.** Robert J. Robbins, Ph.D. (2005). *Impacts of salinity fluctuations on the productivity of coastal mangrove fish populations.* **Research Fishery Biologist, South Florida Water Management District, W. Palm Beach, FL.**

- (9) **Chairman.** Erik C. Franklin, M.S. (2004). *Habitat-based assessment protocol for the Florida marine aquaria fishery with applications to gray angelfish.* **Assistant Professor of Fisheries, University of Hawaii, Honolulu, HI.**
- (10) **Chairman.** Guillermo A. Diaz, Ph.D. (2001), *Population dynamics and assessment of pink shrimp (*Farfantepenaeus duorarum*) in a subtropical nursery grounds.* Winner of Koczy Fellowship in Marine Sciences (2000-2001) and Dean's Prize (1995). **Research Fishery Biologist, Assessment & Monitoring Division, Office of Science and Technology, NOAA Fisheries Service, Washington, DC.**
- (11) **Co-Chairman.** Robert Humston, Ph.D. (2001). *Development of movement models to assess the spatial dynamics of marine fish populations.* Koczy Fellowship in Marine Sciences (1999-2000) and UM Graduate Fellowship (1996-1998). Co-Chair with Professor Don Olson. **Associate Professor, Department of Biology, Washington and Lee University, Lexington, VA.**
- (12) **Chairman.** M. Refik Orhun, Ph.D. (2001). *Empirical and quantitative analysis of marine fish larvae dynamics.* **Research Fishery Biologist, Sustainable Fisheries Division, Southeast Fisheries Center, NOAA Fisheries Service, Miami, FL.**
- (13) **Chairman.** Geoffrey A. Meester, Ph.D. (2000). *A mathematical programming and simulation-based approach to determining critical factors in the design of effective marine reserve plans for coral reef fishes.* Smith Prize for best Ph.D. Dissertation (2000) at RSMAS and University of Miami Graduate Fellow (1996-1998). **Vice President of Sales and Operations, Capital One Financial Corporation, McLean, VA.**
- (14) **Co-Chairman.** Geoffrey A. Meester, M.S. (1999). *Designing marine reserves for fishery management.* Department of Management Science, University of Miami. Co-Chair with Professor Anuj Mehrotra. **Vice President of Sales and Operations, Capital One Financial Corporation, McLean, VA.**
- (15) **Co-Chairman.** Steven G. Smith, Ph.D. (1997). *Models of crustacean growth dynamics.* University of Maryland College Park. Co-Chair with Estelle Russek-Cohen (Univ. MD Statistics Department). **Associate Research Scientist, University of Miami RSMAS.**
- (16) **Chairman.** Kenyon C. Lindeman, Ph.D. (1997). *Development of grunts and snappers of southeast Florida: cross-shelf distributions and effects of beach management alternatives.* **Professor of Fisheries, Graduate School of Oceanography, Florida Institute of Technology, Melbourne, FL.**

**Dissertations in Progress:**

- (17) **Chairman.** Ph.D., Nathan Vaughan. *Nonequilibrium length-based assessment models.*
- (18) **Chairman.** Ph.D., Molly Adams. *An ecosystem based assessment and economic optimization of the Florida reef fishery.*
- (19) **Chairman.** Ph.D., Christine L. Harvey. *Biological and physical mechanisms forcing meso-scale migrations and spatial abundance distributions of Atlantic Tarpon (Megalops atlanticus)*
- (20) **Chairman.** Ph.D., Craig Raffenberg

**Dr. Nelson Ehrhardt (MES)**

- (1) **Chairman.** Claire B. Limouzy, M.S. (1986) *Efficiency of yolk utilization of snook, Centropomus undecimalis, larvae in relation to incubation temperature.* **Associate Professor, RSMAS Faculty**
- (2) **Chairman.** Tracy W. Baynes. M.S. (1986). *The effect of current on the sessile benthic community structure of an artificial reef.* **Scripps Institution of Oceanography, University of California, San Diego and Arizona State.**
- (3) **Chairman.** Martha de Maintenon, M.S. (1989) *The comparative morphology of the cranial cartilages in the Teuthoid Suborder Myopsida (Cephalopoda: Teuthoidea).* **Faculty, Department of Marine Sciences, University of Hawaii.**
- (4) **Chairman.** David J. Die, Ph.D. (1989) *Analysis of a size-age stratified population under a multigear fishery operation: The European hake fishery off Northwest Africa".* **Research Associate Professor, RSMAS Faculty**
- (5) **Chairman.** Ricardo V. Restrepo, Ph.D. (1989) *Population dynamics and yield-recruit assessment of Southwest Florida stone crabs, Menippe mercenaria.* **Former NOAA and Scientific Secretary ICCAT. Scientist with ONG.**
- (6) **Chairman.** Sherry C. Manikchand, Ph.D. (1990) *Spawning energetics of the whitemouth croaker, Micropogonias furnieri, (Desmarest, 1823), and implications for exploitation in Trinidad, West Indies.* **Faculty, University of the West Indies and private consultant.**

- (7) **Chairman.** Mark I. Farber, Ph.D. (1990) *Evaluating statistical bias using catch-rate indices from the U.S. recreational billfish fishery for estimating abundance by the use of a simulation model.* **Retired NOAA/NMFS**
- (8) **Chairman.** Christopher M. Legault, M.S. (1991) *On the bootstrap techniques used to assess uncertainty in fisheries biology.* **Fishery Research Biologist, NOAA Fisheries Northeast Fisheries Science Center.**
- (9) **Co-Chairman.** Clarence E. Porch III, Ph.D. (1993) *A numerical study of larval retention in the Southeastern Straits of Florida.* **Director, Sustainable Fisheries Division, NOAA Fisheries Southeast Fisheries Science Center.**
- (10) **Chairman.** Charles Pike III, Ph.D. (1993) *A population dynamic study of the South Florida spiny lobster, Panulirus argus, fishery using simulation modelling.* **Unknown.**
- (11) **Chairman.** Chi Lu Sun, Ph.D. (1995) *Stock assessment and fishery management of the South Atlantic albacore.* **Professor of Fisheries, National University of Taipei, Taiwan.**
- (12) **Chairman.** Josué Martínez-Garmendia, M.S. (1996) *A simulation study of the effect of size selective exploitation on fish growth estimates and a related management bench mark.* **Unknown.**
- (13) **Chairman.** Robert, J. Robbins, M.S. (1996) *Age and growth of the Atlantic swordfish, Xiphias gladius.* **Research Fishery Biologist, South Florida Water Management District, West Palm Beach, FL.**
- (14) **Chairman.** Freddy Arocha, Ph.D. (1997) *The reproductive dynamics of swordfish Xiphias gladius L. and management implications in the Northwestern Atlantic.* **Faculty, University of Oriente, Venezuela.**
- (15) **Chairman.** Christopher, M. Legault, Ph.D. (1997) *Management of a multigear fishery exploiting a highly migratory stock: Spanish mackerel, Scomberomorus maculatus, en the eastern Gulf of Mexico.* **Fishery Research Biologist, NOAA Fisheries Northeast Fisheries Science Center.**
- (16) **Chairman.** Mauricio Ortiz, Ph.D. (1998) *Shrimp bycatch in the US Gulf of Mexico: review and evaluation of bycatch effects on exploited populations.* **Former NOAA Fisheries. Statistic Division ICCAT, Madrid, Spain.**
- (17) **Chairman.** Ivan D. Lima, Ph.D. (1999) *A three-dimensional coupled physical-biological model of the marine pelagic ecosystem.* **NOAA Climate Research Center and Universidad Rio Grande do Sul, Brazil.**

- (18) **Chairman.** Craig A. Brown, Ph.D. (1999) *Application of simulation modeling and bootstrapping methodology to problems of uncertainty in catch estimates of recreationally fished stocks.* **Fishery Research Biologist, NOAA Fisheries**
- (19) **Co-Chairman.** Christopher D. Jones, Ph.D. (2002) *Performance, uncertainties, and management implications of dart tags on red snapper (*Lutjanus campechanus*) and red drum (*Sciaenops ocellatus*).* **NOAA Fisheries, Director, US Antarctic Fisheries Research Program**
- (20) **Chairman.** Vallierre K.W. Deleveaux, M.S. (2002) *The definition of an optimum minimum size for the spiny lobster fishery in the Bahamas.* **Fisheries Officer, Ministry of the Bahamas Government.**
- (21) **Chairman.** Mark D. Fitchett, M.S. (2009) *Seasonal dynamics of the sailfish, *Istiophorus platypterus*, off the Guatemalan Pacific coast.* **Ph.D. candidate, University of Miami RSMAS.**
- (22) **Chairman,** Vallierre K.W. Deleveaux, Ph.D. (2012) *Ecosystem approach to assess recruitment dynamics and fishery management of the red snapper in the Gulf of Mexico.* **Executive Director of Marine Science, Bahamas Agriculture and Marine Science Institute.**
- (23) **Co-Chairman (with Dr. Daniel Benetti).** Dwight Ebanks, Ph.D. (2013) *The influence of increased CO<sub>2</sub> on early developmental stages of cobia, *Rachycentron canadum*.* **Unknown.**
- (24) **Chairman.** Mark D. Fitchett, Ph.D. (expected defense Nov 2014) *Assessing growth, mortality, and availability of sailfish: a data poor species in the eastern Pacific targeted by commercial and recreational fisheries.*

**Dissertations in Progress:**

- (25) **Chairman.** Ph.D., Bruce Pohlot. *Habitat use and behavior of billfish in the eastern Pacific Ocean.*
- (26) **Chairman.** Ph.D., Julie Brown. *On the relative value of recreational fishery catch rates to determine spatial-temporal abundance of of billfish species in the eastern Pacific.*
- (37) **Co-Chairman (with Dr. Daniel Benetti).** Ph.D., Zack Daugherty

Dr. David D. Die (MES)



- (1) **Chairman.** Elizabeth Councill, Ph.D. (2014) *Simulating the age and spatial structure of exploited fish stocks using discrete and continuous dynamical systems models.* **Post-doctoral research Associate, University of Washington, School of Fisheries.**
- (2) **Co-Chairman (with Daniel Suman).** Katherine Shaw, M.S. (2013) *Effects of inundation on hatch success of loggerhead sea turtle (Caretta caretta) nests.* **Private science tutor, Miami.**
- (3) **Chairman.** Steven Saul, Ph.D. (2012) *An individual-based model to evaluate the effect of fisher behavior on reef fish catch per unit effort.* **Post-doctoral Research Associate, Nova Southeastern University.**
- (4) **Chairman.** Veronique Koch, M.S. (2011) *The spatial ecology of black groupers (Mycteroperca bonaci) in the upper Florida Keys.* **Science documentary filmmaker, WPBT2 South Florida Public Media.**
- (5) **Chairman,** Katrina Phillips, M.S. (2010) *Beyond the beach: population trends and foraging site selection of a Florida loggerhead nesting assemblage.* **Ph.D. student, University of Central Florida.**
- (6) **Co-Chairman (with Daniel Benetti).** Francesca Forrestal, M.S. (2010) *Effects of capture-based aquaculture of bluefin tuna (Thunnus thynnus thynnus) on a Western Mediterranean ecosystem.* **Ph.D. candidate, University of Miami RSMAS.**
- (7) **Chairman.** Ayeisha Brinson, Ph.D, (2007) *Incorporating recreational and artisanal fishing fleets in Atlantic billfish management.* **Economist, NOAA, National Marine Fisheries Service.**
- (8) **Chairman.** Kristine Kleisner, Ph.D. (2007) *A spatio-temporal analysis of dolphinfish, Coryphaena hippurus, abundance in the Western Atlantic: implications for stock assessment of a data-limited pelagic resource.* **Research Associate, NOAA, National Marine Fisheries Service, Seattle, WA.**
- (9) **Co-Chairman (with Joseph Serafy)** Xaymara Serrano, M.S. (2006) *Ecophysiology of the gray snapper Lutjanus griseus: salinity effects on distribution, abundance and behavior.* **Postdoctoral Research Associate, University of Miami.**
- (10) **Co-Chairman (with Robert Cowen).** Monica Valle, Ph.D. (2003) *Aspects of the population dynamics, stock assessment and fishery management strategies of the queen conch, Stombus gigas, in the Caribbean.* **Senior Fishery Biologist, MRAG of the Americas.**

**Dissertations and Thesis in Progress:**

- (11) **Chairman.** Ph.D., Dominique Lazarre. *Examining the lionfish invasion: How growth and recruitment relates to connectivity and controls.*
- (12) **Chairman.** Ph.D., Francesca Forrester. *Implications of small teleost bycatch in the eastern Atlantic tropical tuna fish aggregating device (FAD) fishery.*
- (13) **Chairman.** Ph.D., Michelle Sculley. *Estimating movements of tropical tunas, Katsuwonus pelamis, Thunnus albacores and T. obesus, from tagging data in the Atlantic Ocean.*
- (14) **Chairman.** Ph.D., Daniel Hoenig. *Estimation of relative abundance indices under changes of catchability.*
- (15) **Chairman.** M.S., Chiara Pacini. *Age and growth of juvenile snowy grouper*
- (16) **Chairman.** M.S., Elizabeth Starnes. *Changes in spatial patterns of fishing effort in the Southwestern Florida shelf reef fisheries.*

**Dr. Daniel Benetti (MES)**

1. **Co-Chair (with Dr. Martin Grosell)**, John Stieglitz, PhD (2014). *Effects of the Deepwater Horizon oil spill on pelagic fish species of the Gulf of Mexico.*
2. **Chair**, Andrew Blumenthal, MS (2014). Using garlic (*Allium sativum*) as a masking agent to improve palatability of praziquantel-medicated feeds for juvenile yellowtail kingfish (*Seriola lalandi*)
3. **Co-Chair (with Dr. Nelson Ehrhardt)**, Dwight Ebanks, PhD (2013). *The Influence of Increased CO2 on Early Developmental Stages of Cobia, *Rachycentron canadum*.*
4. **Chair**, Sasa Miralao, MS (2013). *Metabolic Rates of Embryo and Growth of Cobia (*Rachycentron canadum*) and Mahi (*Coryphaena hippurus*) Larvae Through Early Juvenile Stages.*
5. **Chair**, Matthew Taynor, MS (2013). *Evaluation of Gross Protein/Energy Ratios for Adult Florida Pompano, *Trachinotus carolinus*, Fed Practical Diets, in Relation to Growth, Feed Utilization, and Nitrogen Retention.*
6. **Chair**, Zachary Daugherty, MS (2013). *Effects of algae paste substitutes on the larval rearing performance and microbial communities in the culture of yellowtail kingfish (*Ceriola lalandi*) and cobia (*Rachycentron canadum*.*

7. **Chair**, Robert C. Jones, MS (2012). *Changing Bio-economic Conditions, Vessel Responses, and Financial Outcomes in the Federal Gulf of Mexico Shrimp Fishery; a 2006 through 2009. Comparison of Annual Vessel-Level Data.*
8. **Chair**, Drew A. Davis, MS (2012) *Apparent Digestible Protein, Energy, Phosphorus, and Amino Acid Availability of a Novel Strain of Soybean Meal for Juvenile Cobia, *Rachycentron canadum*.*
9. **Chair**, Monique A. Giguere, MS (2011). *The Economics of Partial Artemia Replacement Using Two Commercially Available Feeds in the Diets of *Litopenaeus vannamei* from Z3/M1 – PL10.*
10. **Chair**, Bruno Sardenberg, MS (2011). *A Fifteen-Year Plan for Cobia (*Rachycentron canadum*) Aquaculture Development in Brazil.*
11. **Co-Chair (with Dr. David Die)**, Francesca C. Forrestal, MS (2010). *Effects of Capture-Based Aquaculture of Bluefin Tuna (*Thunnus thynnus*) on a Western Mediterranean ecosystem.*
12. **Chair**, John Stieglitz, MS (2010). *Optimizing Transport of Live Juvenile Cobia (*Rachycentron canadum*): Effects of Salinity and Shipping Biomass.*
13. **Chair**, Aaron W. Welch, MS (2010). *Developing Hatchery and Growout Techniques for Bigeye Scad (*Selar crumenophthalmus*) Aquaculture.*
14. **Co-Chairman (with Dr. Jerry Ault)**. Michael C. Feeley, Ph.D. (2006). *Bioenergetics of juvenile billfish and cobia.*

**Dissertations in Progress:**

15. **Co-Chair (with Dr. Nelson Ehrhardt)**, Zack Daugherty, PhD. Entered program in 2014; *Research on analysis of aquaculture performance metrics of early developmental stages of pelagic marine fish larvae.*
16. **Co-Chair (with Dr. Kenny Broad)**, Aaron Welch, PhD (expected graduation Spring 2015). Tentative title: *Environmental assessment standards and status of regulatory process of offshore aquaculture in the US.*
17. **Co-Chair (with Dr. Larry Brand)**, Juan Sierra de la Rosa, PhD (expected graduation Summer of 2016). *Using probiotics to manipulate gut microbiome of tuna and cobia larvae, juveniles and adults.*

**Dr. Gary Thomas (MES)**

1. **Chair**. Justin Lerner MSc. 2009. *Population dynamics of Atlantic Swordfish off Florida.*

**Dr. Elizabeth Babcock (MBE)**

- (1) **Chair.** William Harford, Ph.D. (2013) *Integrated monitoring and stock assessment of spatially heterogeneous reef fisheries.* **Postdoctoral Research Associate, NOAA Fisheries Southeast Fisheries Science Center.**
- (2) **Chair.** Mandy Karnauskas, Ph.D. (2011) *From physics to fishers: a multidisciplinary approach to evaluating indicators of fishery benefits of marine reserves.* **Research Fishery Biologist, NOAA Fisheries, Southeast Fisheries Science Center.**
- (3) **Chair.** Lorena de la Garza, M.P.S. (2014). *Distribution and Abundance of Black Sea Bass (*Centropristis striata*) along the Florida Gulf Coast.*
- (4) **Chair.** Mary Trainor, M.P.S. (2013) *Improving fisheries management through governance and incentives for habitat conservation.* **Working for an NGO.**

#### **Dissertations in Progress:**

- (5) **Chair.** Holly Perryman, Ph.D. *An Atlantis model to inform ecosystem-based management for the Gulf of Mexico.*
- (6) **Chair.** Ph.D., Matthew Nuttall, *The influence of environmental and ecological processes on the dynamics of Gulf menhaden (*Brevoortia patronus*) within the Gulf of Mexico.*
- (7) **Chair.** Ph.D., Halie O'Farrell, Ph.D.

#### **PAST FACULTY**

##### **Dr. William W. Fox, Jr. (MBF)**

- (1) **Chairman.** Scott P. Banerott, Ph.D. (1985). *The dynamics of exploited groupers (Serranidae): an investigation of the protogynous hermaphroditic reproductive strategy.*
- (2) **Chairman.** Jerald S. Ault, Ph.D. (1988). *Nonlinear numerical simulation models for assessing tropical fisheries with continuously breeding multichort populations.*
- (3) **Chairman.** Clarence Porch, M.S. (1989) *Assessment of bag limits in recreational fisheries.*
- (4) **Chairman.** Edward Gaw, M.S. (1989). *Selected Size Group Dynamics Of Swordfish (*Xiphias Gladius*) Off The Florida East Coast.*

Dr. Edwin Iverson (MBF)

- (1) **Chairman.** Darryl Jory, Ph.D. (1988)
- (2) **Chairman.** Daniel D. Benetti, M.S.. (1990)

Dr. Frank Williams (MBF)

- (1) **Chairman.** Behzad Mahmoudi, Ph.D. (1986) *Vermillion snapper stock assessment in the US South Atlantic.*
- (2) **Chairman.** Guillermo Podesta. Ph.D. (1990) Remote sensing of Argentinian hake.
- (3) **Chairman.** Mitchell A, Roffer, Ph.D. (1987) *Influence of the environment on the distribution and relative apparent abundance of juvenile Atlantic bluetin tuna along the United States east coast. Roffer Ocean Fishing Forecasting Service (ROFFS).*