University of Puerto Rico
Mayagüez Campus

DEPARTMENT OF MARINE SCIENCES

ANNUAL REPORT 2024 – 2025

Dr. Ernesto F. Weil Machado

July 7, 2025

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Contents

Mission of the Department of Marine Sciences

The mission of the Department of Marine Sciences (DMS) is to promote a greater understanding of the marine environment within the core areas of biological oceanography, physical oceanography, chemical oceanography, and geological oceanography. The specific goals of the department are to increase knowledge in the marine sciences, to train graduate students in the marine sciences, and to serve the community. Original research by both faculty and students is the central focus of the department's program, emphasizes the complementary and mutualistic relationship among these goals.

The Department currently offers two postgraduate programs in Marine Sciences: Master and Doctorate. A new Professional Masters in Marine Science program is being developed and will be available for the Spring semester of 2025. This program does not require the development and completion of a research project or thesis as does Plan I. Plan II requires curses and a project (internship, seminar, or short project, and Plan III only require coursework and a final exam with a graduate committee.

Students successfully completing Plan I (Thesis) will be conferred the Master of Science degree (M.Sc.), whereas those completing Plan II (Project) or Plan III (Coursework) will be conferred a Professional Master in Marine Science degree (P.Mc). In addition, those students enrolled in Plan I (Thesis), will be able to specialize in one of the following areas: Biological, Chemical, Geophysical and Physical Oceanography. The Doctorate program leads to the degree of Doctor of Philosophy (Ph.D.) in Marine Sciences and students enrolled in this program will also be able to specialize in one of the four oceanography areas listed above.

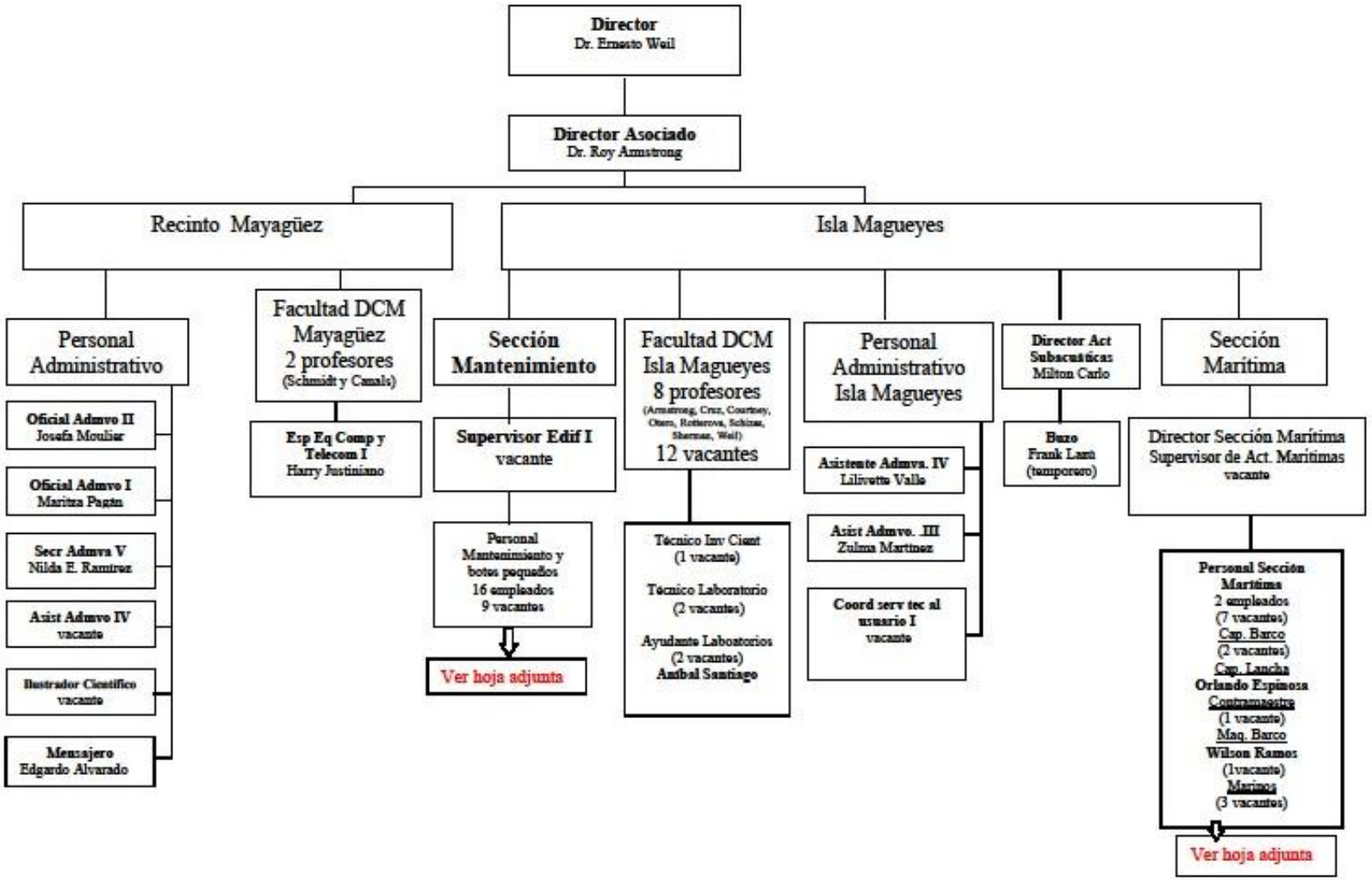
These programs encompass both the full breadth of these disciplines and the specialization needed to develop specific technical and analytical skills within a larger scientific context. The program seeks to produce graduates with a strong background in marine sciences able to critically analyze problems and offer solutions through the application of scientific knowledge and research. Students are prepared for careers in teaching, research, and industry, as well as resource and environmental management.

The vision

- To increase knowledge of the marine environment by means of scientific research and transmitting this knowledge to the larger academic and stakeholder community.
- To contribute to social and economic development of Puerto Rico through the conservation and sustainable uses of the marine environment and its resources.
- To provide leadership and serve as a model department for graduate education on the Mayagüez Campus.

Departamento de Ciencias Marinas
Universidad de Puerto Rico, Recinto Universitario de Mayagüez

Organigrama General



II. Report on Initiatives, Activities, and Achievements in Accordance with the Strategic Plan and International Activity

A. Executive Summary

The Department of Marine Sciences (DMS) has provided graduate education in marine sciences for over 55 years. It was officially founded on August 19, 1968, after the first master's program in Marine Sciences at the Mayagüez Campus was approved by the Puerto Rico Higher Education Council. The doctorate (Ph.D.) program in Marine Sciences was approved four years later, in 1972. These were the first graduate programs at the Mayagüez campus. By design, the DCM is the only department in the UPR system that concentrates 100% on graduate studies and research training.

The mission and goals of the Department of Marine Sciences (DMS) follow those of the School of Arts and Sciences, and the university in general. They emphasize excellence in graduate education and training, the advance of scientific knowledge through high quality research in Marine Sciences, and the betterment of the people and economics of Puerto Rico, the USA and the Caribbean. The DMS thrives in promoting a better understanding of the marine environment within the areas of biological, physical, chemical and geological oceanography; training graduate students in marine science; serving the community and the interest of the UPR system and the government.

1.a- Graduation, Recruitment and Retention Statistics

Fourteen (14) new applications (11 for Ms.C and three for Ph.D. program) were received for the academic year 2024-25. The DMS accepted two doctoral students and only 11 of Masters applications, for a total student body of 41 master's and 16 doctoral students (N= 57) in the program during the 2024-25 academic year. Four good applications were rejected because the faculty members were saturated supervising the already enrolled graduate students, and they could not accept to advice any other students. This is the first time in 55 years that this has happened, and is a clear sign of the critical situation of the graduate academic program in Marine Sciences. The Department accepted 18 new students and one readmission for the 2025-26 academic year three of whom still do not have an assigned departmental advisor. A new professor is starting in July 1, 2025, which could take on these students under her advice There is an URGENT need to hire new professors to ensure the quality and survival of the program. **(Appendix I)**.[1]

During the 2024-2025 academic year the Department of Marine Sciences awarded ten (10) Master of Science Degrees (Plan I), one (1) Professional Masters in Marine Sciences (Plan II), and two (2) Doctorate (Ph.D.), for a total 13 graduates in Marine Sciences, one more graduate from 2024. Only two Ph. D students finished degree in this period.

This represents 17 % of the total number of graduate students (Masters and Ph. Ds) that graduated from the School of Arts and Sciences, and 30 % of those in the Sciences programs.

Even with the low number of professors and reduced number of courses, the DMS graduated 33% of the total PhD graduates (2 out of 6) and 15% (11 out of 71) of the Masters of the School of Arts and Sciences for the Academic year 2024-25.

[1] Information was compiled by Nilda E. Ramírez, Secretary V

All graduating students completed all the requirements to receive their diplomas, including the DMS-exit assessment forms, included in the **Student Learning Assessment Outcome manual.**

The retention rate was 100% for this academic year.

1.b- Faculty hiring and awards

The Chancellor authorized a Job Announcement (24-28) to fill position RUMR000074 left vacant by Dr. Richard S. Appeldoorn. Immediately after this, the DMS posted the announcement for the open position of Assistant Professor. The Personnel Committee selected three outstanding candidates from a pool of applicants and completed the interview and selection process by April 30, 2024. The selected candidate; Noelle Lucey, PhD, was informed and officially offered the Assistant Professor position starting on July 1, 2025.

Another announcement (25-19) for an Assistant Professor in Physical Oceanography was published in May, 2025 with a closing date of July 15, 2025. The Personnel Committee will review the applicants' documents and call for interviews as soon as the new semester starts in August. The new professor should start in January 2026.

Unfortunately, due to the Governments' new policies on research grants, the DMS lost a new professor that was included as part of an ONR-Enterprise grant to the DMS. The first three years of faculty salary was going to be paid by the project, and the University had committed to provide an official tenure track position as DMS faculty after the project was completed.

The 2024 Edition of Ranking of Top Scientists in the field of Ecology and Evolution ranked Dr. E. Weil at 1083 in the US and 2992 in the World. https://research.com/scientists-rankings/ecology-and-evolution.

Dr. J. Rotterova; STEM Excellence Award 2025, granted by Vice President for Research, University of Puerto Rico for recognition of contribution to advancement of science and education in the areas of Science, Technology, Engineering, Arts, and Mathematics (STEAM), PR, USA, April 2025.

1.c- Student support

The financial aid to our graduate students improved significantly due to external funding linked to new research projects awarded to DMS faculty, collaborative projects between the DMS, local government agencies (DNRA), NGOs (ISER), private donations and other institutions. A total of $ 276,237.42 was provided for graduate student support which helped over 75% of the DMS students during the academic year 2024-25.

Seventy-two (72) research assistantships were funded with external funds provided by research grants awarded to DMS faculty members, donations and other sources (appendix 1). The total amount of funding was $300,000 A NASA-OCEANOS funded project to Dr. R. Armstrong provided $14,265.00 for four undergraduate students working in different projects in Magueyes. Fifteen teaching assistantships were funded by the Department of Biology-UPRM, two research assistantships were funded by EcoEléctrica through a collaborative agreement (MOU), two were funded by the DMS through our collaborative agreement with CARICOOS ($18,000) and one by the DNRA-CRCD related to the NSF-RAPID-funded Microbiome Project ($ 20,000). The total amount of funding for these 19 assistantships was $96,676.

Eight (8) graduate students received hourly wages (jornal) to assist in different tasks, including research projects and maintenance of the invertebrate collection. One (1) student worked in the DMS to help in administrative issues (**Appendix 2**), Total $22,524.00

The Maxwell-Hanrahan foundation from San Francisco donated $15,000 to the DMS to be exclusively used to support field work of the research projects of the Graduate Students of the department. Six students (two Ph.D. and four Ms.C submitted proposals to be evaluated for funding. All six received all the amounts requested for different aspects of their field work and minor equipment needed. The Foundation was very pleased with the results and decided to increase the donation to 25,000 for the second year (2025-2026). Funds have already been transferred to the donation account of the DMS.

ISER-Caribe hired 14 students and the annual cost in salaries was $219,039.

1.d- New programs and courses

The DMS Curriculum Committee has been helping and following the certification process of the new program “Professional Masters in Marine Sciences” with Plan II and Plan III. After the approval of the Program by the Senate in UPRM, the process is in the final steps of the approval by the Administration in Rio Piedras. These plans were designed to provide a shorter and more general education in marine sciences, adaptable to more flexible professional demands, to attract students with other work interests (other than research and university teaching) and who want to graduate in a shorter period of time. Ven though the Program has been advertised little, there is high interest by advanced undergraduates and some of our graduate students that are not interested in developing research projects (Thesis).

Dra. Johana Rotterová, our new Assistant professor, reactivated and updated the course syllabus and program for the courses Marine Microbiology and Marine Parasitology to be a curricular sequence, Marine Microbiology I (CMOB8635) and Marine Microbiology II (CMOB8636). She is also developing a new course in Marine Symbiosis **(CMOB-6010)**, an extremely important topic for any marine biologist.

1.e- On going projects, proposals and collaborations

There are 11 funded projects that are still active under the direction of five Faculty members as Principal Investigators ($3,383.565) and seven that ended in 2022 but are still under a no-cost extension allowance. One collaborative project between the DMS and ISER-CARIBE (Institute for Socio Ecological Research), an NGO with a budget of $ 11,189,000 started in August 2023 and is making good progress after overcoming problems and adjustments through the initial stages. It has funding (NOAA) until 2027. The project is making good progress, it has developed

The largest on-land coral nursery in Puerto Rico and the eastern Caribbean to support coral reef restoration programs, training and educational outreach around the island, was developed with NOAA funding under this collaborative effort during the past two years. The innovative holistic approach involves assisted evolution by using resistant to (thermal anomalies and diseases) and genetically variable coral colonies of foundational, massive coral species together with other keystone species that control algal growth at the

transplantation localities. Latest additions to the project included the larval rear facility, improving the sea urchin and crab growing tank area, adjusting the new salt water immersed pumps, filtration capabilities and issues with water pressure and distribution.

The project has successfully out-planted thousands of healthy fragments of several foundational coral species to several impacted reefs together with sea urchins and herbivorous crabs. The project provides training and financial support for many of our graduate students and some undergraduates from Biology as well as many volunteers. Drs. Weil, Cruz-Motta and Courtney from DMS are CoPIs in this large, five-year long project financed by NOAA. The project has invested close to $500,000 in updating the existing infrastructure at the Magueyes Marine.

The first Inland Pilot Marine Integrated Multitrophic Aquaculture System in Puerto Rico developed and installed in Magueyes has come to an end. Funding was cancelled and Dr. Ernesto Otero, the PI, retired in June 30st. of this year.

The DMS is also collaborated for a few years with Dr. Loretta Robertson and her team who developed a pilot project for culturing commercially valuable algae in La Parguera. Funding for this project also dried-up and the project was terminated at the end of 2024.

The EPA-DNRA funded project on water Quality and coral reefs systems ended in June of this year.

Fourteen (14) research proposals to Federal agencies (NSF, ONR, NASA and NOAA), were submitted by DMS faculty (Pi and Co-PI) during this academic year for a total of **$ 27,370,953** in research funding. Of these, six (**43 %)** were funded for a total of **$ 4,800,387** in external funding (**Appendix 3**).

1.f- Productivity: Meetings, workshops Presentations and seminars

Peer-reviewed publication by Faculty members and DMS students was high again this year. A total of thirty-four (34) peer-reviewed manuscripts were submitted to recognized peer reviewed journals and one technical report was produced. Overall, 15 manuscripts were published, five are in print or accepted, and the rest are in the review process as of this date. Five were submitted by professors and thirteen by students as senior authors. Students appear as senior or secondary authors in 57% of this year's publications (**Appendix 4**).

Twenty-six presentations were given in 11 meetings and workshops (Appendix 4) by DMS Faculty members and Students of the Department.

Several seminars (hybrid format) and a workshop were provided by faculty, students and visitors. The DMS students carried out ten (10) (appendix 3) departmental seminars. Two seminars were offered by visiting researchers; Dr. Fabio Bulleri, Universitat di Pissa – Italia, "*Experimental Design in Marine Ecology*", November 21, 2023 and Dr. Jen McWhorter, NOAA, "*Biogeochemical Argo Research Applications*", February 1, 2024**.**[2]

[2] Information compiled by Maritza Pagán, Administrative Officer

1.g- Education, Visitors and outreach

The department has increased its outreach and community service activities thanks to the help of AECIMA and several professors and administrative personnel assistance. One major task was the involvement of the DMS in the development of a marine science “program” for the new Montessori School Alejandro Tapia Rivera in the community of La Parguera. The DMS continues to provide information, materials, talks and logistical support for several visits of the students to our lab facilities. DMS collaborated with a series of workshops on coastal marine ecosystems and environmental and scientific photo-journalism during June of 2024.

As part of the DMS outreach and educational programs, our facilities in Magueyes are open to organized visits so elementary and high school students, private citizens, managers, agency personnel, etc. can have a direct and personal experience of what a working marine lab. looks like, and what sort of different projects are being carried out in these facilities.

During the academic year 2024-2025 Isla Magueyes Lab. Received a total of 1,396 visitors.

Twenty-six (26) groups (240 people) were from Universities and Agencies of the United States and a few International, 24 groups (506 people) came from schools or community groups, 8 groups (59 people) from US Agencies and 27 groups (667 people) from local universities and government agencies.

The small boats served 1,225 people, for a total of 173 outings for research purposes, 50 outings for educational purposes, 35 outings for class purposes and 80 outings as part of thesis work. The DMS boats were used for a total of 1106.75 hours. The larger and medium-sized vessels made 2 sorties, for research purposes.

The dormitories received 31 people for research and educational purposes. (**Appendix 5**).[3]

AECIMA and Yanelle Silva, the student representative, collaborated with the 2024 Summer Camp organized by the School of Arts and Sciences. After this, the Association President and Secretary resigned and it took one year to reorganize it. Now with new Administration of motivated new students, AECIMA participated actively in the 2025 School of Arts and Sciences Summer Camp for undergraduates.

1.h- Infrastructure and new equipment

The DMS continues to have serious problems with infrastructure damaged by hurricanes Maria and Fiona, by the series of earthquakes in 2020 and general lack of mayor maintenance issues like the painting of the buildings, replacement of old zinc roofs, deep cleaning of the Invertebrate Museum (flooded during Maria and water still leaks down from the roofless second floor destroyed by the hurricane).

This is a list of important issues

1. Demolition and removal of the second floor of the Chemical Oceanographic building MG811 destroyed by Maria.
2. Sealing and impermeabilization of the roof of the building after removing the structure.
3. Repairs to all Windows damaged by hurricane Fiona in building MG836.

[3] Information was compiled by Lilivette Valle, Administrative Assistant

4. Cleaning and maintenance of all air conditioning units at Isla Magueyes. These units have gone without maintenance for over three years and some of them are breaking down. A new 5-ton unit is needed for the Chemistry lab (MG831-100), three smaller units (two 12k btu and one 1 18 k btu) are needed for the CCRI office space area, three 12k btu are needed for the shop area and two 36k btu units for the Schizas lab and the Invertebrate Museum area.
5. Pressure wash and painting of all buildings in Magueyes. These structures have not been painted in over 13 years and they look bad.
6. Buy F350 truck or equivalent with a tomb to take out the trash from Isla Magueyes – send a quote to the Dean of Arts and Sciences.
7. Clean, Paint and renew furniture for most student offices and the student lounge.

Accomplish work – infrastructure

1. Impermeabilization of the roof and vertical roof-walls of the main building MG831
2. Installation of the following AC units: 7-ton AC unit in the Student Office space MG812, the Maritime office, CCRI conference room and Dr. Armstrong's lab.

The Department purchased two new working vehicles to facilitate maintenance, moving materials and equipment around and construction work at Magueyes. A four-wheel drive Kawasaki Mule utility vehicle with all terrain tires ($18,500) and a medium-size multi-use KIOTO tractor ($39.200). Both vehicles are already helping the DMS physical plant workers to perform their maintenance tasks.

The Faculty of Arts and Sciences provided $20,473.16 for updating equipment for non-teaching staff. Through this, several pieces of equipment were acquired with the purpose of improving technological resources. The "Center of Technology Information (CTI)" provided funds ($31,176) to improve the teaching laboratories and classroom to be able to provide local and distance teaching and conferences.

The dissemination of academic achievements was reduced to informing the faculty and students of the list of masters and doctorate graduates for the year. The DMS web page is being updated and reorganized to serve not only as a much better information platform of the DMS, its academic program, the faculty members, research projects, productivity, student body and activities (AECIMA), but also to have sections of interactive new information, events, students' status, publications, and up-to-date dissemination of important news related to the marine environment etc.

1.I- DMS Revenues and financial balance

The total revenue to the DMS for the use of lab/office space, wet table area space, classrooms and conference rooms by NGO's, Sea Grant, CARICOOS, EcoEléctrica and visitors was $ 211,554, and increase from the $158,300 collected in 2023-24.

The use of the smaller boats generated $ 32,141.28.

Diving support and tank use generated $4,536.00, and the dormitories a total of $3,251.50.

The use of a photocopier at Isla Magueyes produced $0.00. Total revenue for the fiscal year 2024-25 for the DMS was $251,446.91. (**Appendix 6**)[4]

[4] Information was compiled by Zulma Martínez, Administrative Assistant

The maintenance section was spent $135,964.12 on the purchase of fuel, engine oil, maintenance of laboratory equipment, purchase of consoles and units of 7.5 tons and 36k of air conditioner, installation and maintenance of several air consoles, purchase of parts for the maintenance of official vehicles, purchase of scheduled and laboratory materials among other things for the routine maintenance of Isla Magueyes.[5]

[5] Information was submitted by Josefa Moulier, Administrative Officer

III. Objectives

Objective 1- To institutionalize a culture of strategic planning and assessment

We are currently updating the DCM Strategic Plan for the next five years. The plan includes eight objectives, each one described in terms of the strategies to develop and the metrics to evaluate the success of achieving the goals.

Objective one and two are of critical importance because they include strategies to increase the quality, number, diversity and expertise of professors in the department, strengthen links with other academic units, provide teaching experience through Graduate teaching assistantships and support research assistantships by increasing external funding supplies and equipment, develop efficient administrative/reporting/evaluation protocols appropriate for a graduate/research program.

The most pressing issue for the DMS is the low number of faculty members **(Fig. 2)** This significantly affects the overall quality of the Graduate Program, the recruitment of students and total number of students in the program, the retention rates, the number of externally funded projects and funding to support students and the overall productivity of the DMS. In 2023 for example, the Graduate Committee had to reject four of the 16 applications to the program because professors were already saturated with students under their advice and they did not want more. For the next Academic year, the DMS accepted 18 new students, three of which had not committed faculty to be their advisor. The Department has a new professor starting in August and is advertising for another position for January 2026. These students could then have an advisor for their second semester.

The metrics to evaluate this objective include: number, composition and area of expertise of the DMS faculty, number of formal and new agreements with other departments (UPRM) and/or institutions, number of new TAs and RAs available to the DMS students, number of research theses supported with external funds, number and funding of external grants, and number of new courses created and offered.

There are several examples fitting the metrics established to evaluate the compliance of the DMS with the goals established in the UPRM and the DMS strategic plans. The number of new student applications to the program, the number of graduates per year, number of peer-reviewed manuscripts published and the number of externally funded projects are the most important metrics to assess the performance and success of the Graduate Program in Marine Sciences at UPRM. For example, the number of new student applications to the DMS Graduate program has been steadily increasing in the last few years (Figure 1). Total number of students accepted into the program was higher during 2023-2025 compared to previous years, eighteen (18) applications were received for the Fall semester of 2025.

The valuation committee of DMS is developing an assessment protocol and metrics to evaluate the status (i.e. full or partial completion) of the different objectives in our strategic plan. However, we consider that the various important metrics mentioned above are good indicators and valuable components of this process, and we use them as a measurement of improvement (or not) and success of the program.

Dra. Johana Rotterová, our new Assistant Professor updated the course syllabus and program for both courses, Marine Microbiology and Marine Parasitology and organized them to be a curricular sequence, Marine Microbiology I (CMOB8635) and Marine Microbiology II (CMOB8636). She is also developing a new course in Marine Symbiosis (CMOB-6010), an extremely important topic for any marine biologist. The first two are already in the program for students to register.

Dr. Noelle Lucey, the new faculty, will start in July 1st. and will teach one course during the Fall semester (8 contact hours) and will update the courses in aquaculture and Marine Physiology for the Spring semester.

The DMS metrics to assess yearly success in the academic and research activities include number of graduating students, number of proposals submitted and approved, total amount of new external funding, status of ongoing projects, financial aid to our students, peer-reviewed publications, new professors in the DMS, outreach activities, and number of researchers visiting and using our facilities. Other metrics are also used to assess the productivity of our administrative staff and the status and improvements of the infrastructure and logistical support of the Magueyes Marine Laboratory, and the overall revenues produced by the use of the facilities, boats, dive tanks, etc. A summary of these metrics was presented in the Executive Summary.

Most of the resources needed to fulfill the objectives come from the DMS regular budget, the rotative accounts, and the external funds from research grants.

Objective 2. Lead higher education throughout Puerto Rico while guaranteeing the best education for our students.

The educational goals of the DMS are clearly stated in the mission and vision statements, the Student Outcome Learning Assessment (2016) and the DMS Strategic Plan (2026-2022), and in the Student Manual (2021).

The Department of Marine Sciences (DMS) is the only one offering a bi-lingual, comprehensive, high quality graduate program in marine sciences in Puerto Rico and the Caribbean. Graduates from this program are highly competitive professionals and most of them have found jobs in local government and federal agencies, higher education/research institutions, NGOs and the private sector. Therefore, the UPRM-DMS is the leader institution providing graduate training in Marine Sciences to Puerto Rican and Caribbean students.

The DMS is well known across the marine science academic and research circles because of the high- quality of our program represented by the quality of our graduates, and the innovative and highly productive research activities represented by close to a thousand peer-reviewed manuscripts.

The department is completing a curricular review, and is waiting on the approval of the new **"Professional Masters in Marine Sciences"** program, it continues to update and improve the academic and training coursework (field work, experimental designs). The new program, "Professional Masters in Marine Sciences" with two plans (Plan II and Plan III) is in the last stage for approval. The two new plans were designed to provide a more general education in

marine sciences adaptable to more flexible professional demands to attract students with more extensive preparations. the DCM benefits from a greater demand an application to the Department (30% increase in applications the first semester offered), a reduction in graduation time and, an increase in the graduation and retention rates, and an increase in collaborations between departments and with the private industry in general. The program was offered one semester and attracted several new students to the Department, furthermore, several of the current students enrolled in the master's program (Plan I) switched or want to switch to this new program. The DMS hopes that the program will be certified and will be available for the second semester of the 2024-25 academic year.

A curricular revision of the graduate program of the Department of Marine Sciences was approved by the Academic Senate on June 19, 2020 [Certification 20-52 (SA-RUM)]. The DMS faculty has been revising and updating the list of courses offered for our graduate program due to the attrition of faculty members. Several courses were eliminated (old, or have no professor), and others were inactivated for lack of professors to teach them. This is a major problem the graduate program is facing and it will not improve until the Administration allows the DMS to hire new professors. The current professors (8) teach a total of 33 courses (not including special topics or theses) between the two semesters of each academic year.

Some of these courses are not offered every semester because of the curricular sequence, or due to lack of professors. The very important areas such as marine botany, marine physiology, ichthyology, aquaculture, and fisheries biology do not have active courses due to a lack of professors.

Dra. Rotterová, our new Assistant professor updated the course syllabus and program for the course Marine Microbiology and Marine Parasitology to be a curricular sequence, Marine Microbiology I (CMOB8635) and Marine Microbiology II (CMOB8636). She is also developing a new course in Marine Symbiosis (CMOB-6010), an extremely important topic for any marine biologist. The first two are already in the program for students to register.

Dr. Noelle Lucey, the new faculty member will be revising and updating at least four courses that she will be teaching and also, creating new courses for the academic curriculum of the Department.

There is a limit to how many new courses can be developed by the DMS faculty because of the potential schedule overlaps and/or restrictions, and the associated field/lab work. The faculty continues to develop courses at the 5000 and 6000 level to attract upper-level undergraduate students and motivate them to apply to our graduate program. These courses also add diversity and opportunity for our active students to complement their academic programs given the low number of courses currently available due to lack of professors.

Biological oceanography is the area with the most demand receiving the bulk of the new applications. Other specialization areas within the program such as physical, geological and chemical oceanography are receiving very few, or none, new students, which pose a problem for professors in these areas if they are not advising a high number of students. Lack of professors in these areas also produces another problem, the low number of specialization courses for the few students in these three areas. Adding to our academic and training program, the DMS is at the front line of researching and finding answers and viable solutions to the current problems affecting marine ecosystems in Puerto Rico and the Caribbean. These

new challenges move the faculty to seek training in the use of new technologies that can be used to answer the questions and proposed solutions. As a graduate program, most of the learning and training takes place in the field, in the lab, or seeking remote, satellite environmental information to answer particular questions and hypotheses. Our labs have state-of-the-art equipment to conduct research in physical, chemical, geological and biological oceanography.

Professors complement and advance their professional background through research, publication of their results in peer reviewed journals, attend workshops and scientific meetings where they present results and interact with colleagues bringing new ideas and/or technologies back to the DMS.

During the last years the DMS faculty and students have been involved with important projects, including water quality assessment, coral reef diseases and coral community declines, fisheries dynamics, *Sargassum* impact on coastal communities, economically important algae cultures, and holistic approaches to coral reef restoration. A generous financing from NOAA has allowed the development of the first and more extensive on-land culture of corals, sea urchins, crabs and fish for coral reef restoration in collaboration with the Institute for Socio-Ecological Research (ISER), other NGO's, and local and Federal Government agencies.

Information on all CIMA projects, results and goals has been shared with local schools, dive enthusiasts, visitors and communities throughout the DMS outreach and community training activities and the AECIMA (Asociación de Estudiantes de Ciencias Marinas) organization. The information is also shared with local government and Federal agencies so they can engage on developing protection and managing plans for Puerto Rico's coastal marine communities. Hundreds of visitors come to the facilities of the Magueyes lab where the on-land coral, urchin, mangrove, crab and fish cultures are being developed to learn about the process and the potential outcomes.

The number of applications and registered students has varied across semesters and years, with the higher number of applications usually for the Fall semester. The trend over time (Fig. 1) shows the temporal variability in total number of accepted students into the program. This variability responds to different factors such as the total number of professors in the DMS (that can take and advise graduate students), the financial situation of Puerto Rico and the University, and the lack of stability of the university with student and employee strikes that tend to scare away current and potential students. The maximum number of registered students was in 2004 when the DMS had a full complement of 24 professors **(Fig.2)** covering all sorts of research and academic areas in marine sciences. The lowest number was in 2012 with 46 students, a 50% reduction. It has been varying between 50 and 65 since 2015, even though the number of professors has dropped to a critical number of 8 (a 65% decline) by 2023-24, and I back to ten at the moment (Fig. 2).

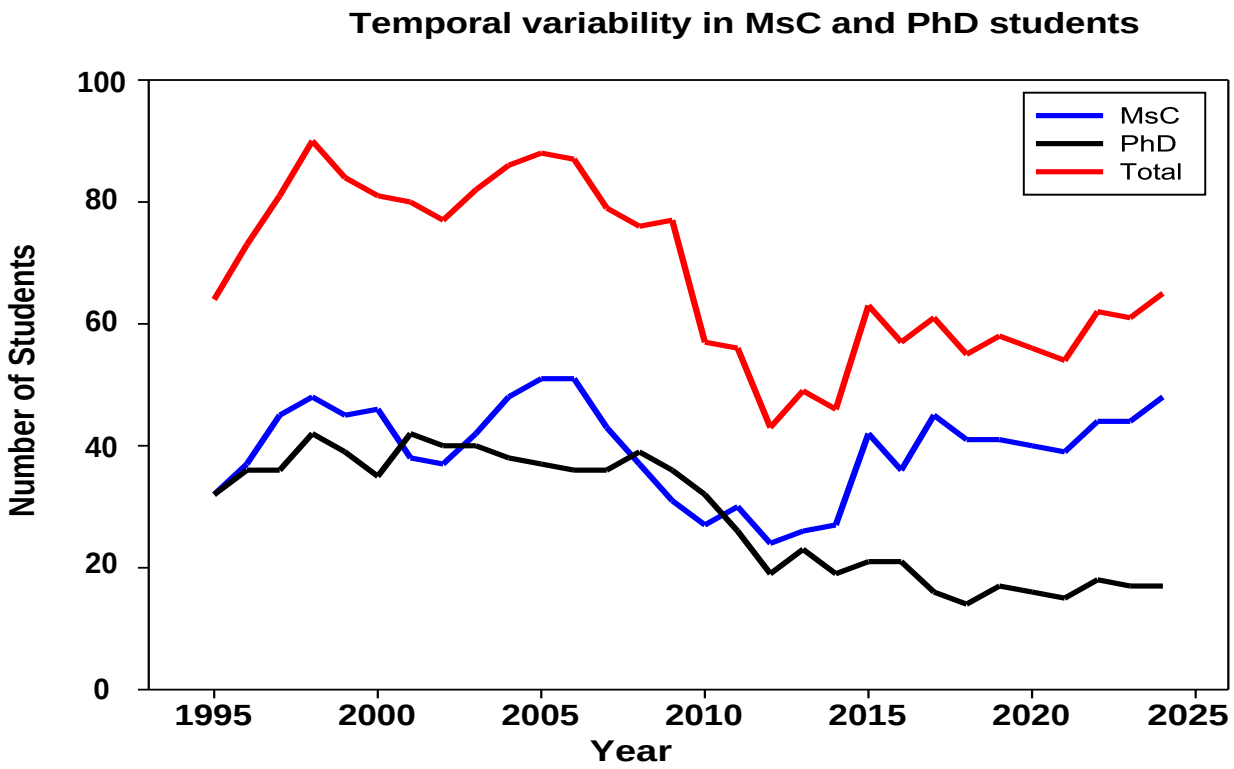


Figure 1. Temporal variability in the number of active graduate students in the DMS over time.

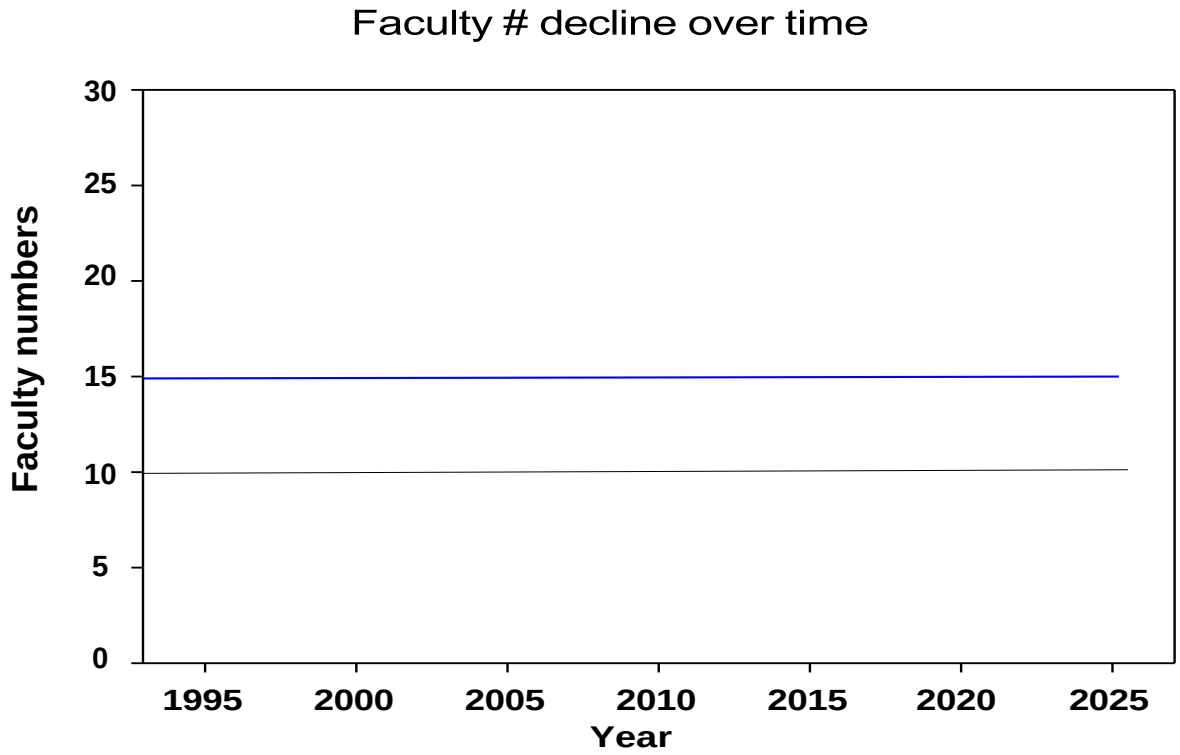


Figure 2. Temporal decline in the total number of active professors in the DMS between 2001 and 2024.

The graph shows a decline of 63% in the number of faculty (from 24 to 9 in 2021). The red line indicates a critical number of professors under which the quality and diversity of the graduate program is suffering.

The Graduate program in Marine Sciences continues to be in high demand. The DMS received eighteen applications for the Fall semester of the 2025-26 academic year. Unfortunately, the DMS had to reject some good applications for 2024-25 because there are not enough faculty members to mentor all the students. On average, each faculty should be advising 6+ students each, however, this is not the case because most of our students are in the Biological Oceanography specialty, so professors in this area average 8-10 graduate students, a high overload.

The other concerning trend is the decline in the number of Ph.D. students until 2017, when we had the lowest number (12). It has remained low since then, averaging 12-16 with no current trend to increase **(Fig. 1).** The DMS graduated two doctoral students during the last year and two were accepted into the Program. No doctoral applications were received for the 2025-26 academic year. Part of the problem is that all professors with external funding have those already compromised, and the UPRM does not provide assistantships and/or financial support to the DMS4.1- Curricular reviews

The most important initiative is to strengthen teaching and the quality of the graduate program is hiring new professors to fill the gaps in important topics in the four different areas of the DMS graduate program in marine sciences.

The DMS hired Dr. Noelle Lucey as a new Professor in Marine Physiology and Aquaculture, two important areas in the Strategic Plan of the DMS. The DMS got another Assistant professor position in Physical Oceanography. The call for applications was opened and has a deadline of July 15th. So far three applications have been received up to July 5th. The review process will start in August and we expect to fill the position by January 2026.

The DMS personnel committee continues to review the CVs of several candidates to be appointed as Adjunct professors. Adjunct professors can teach and advise graduate students, write proposals and develop research projects with DMS faculty. It could increase and complement our academic offerings for new students. However, the most important initiative to strengthen teaching and the quality of the graduate program is hiring new professors to fill the gaps in important topics in the four different areas of the DMS graduate program in marine sciences.

Professor Aurelio Mercado Irizarry was honored with a Doctor Honoris Causa by the University in a ceremony at the Mayagüez Campus (RUM). Dr. Mercado Irizarry had a Masters and worked at the department for 30 years until his retirement. He was a pioneer in Physical Oceanography issues in Puerto Rico, working on the threats of Tsunamis in the region, contributed significantly to the Curricular Sequence of Atmospheric Sciences and Meteorology of the Mayaguez Campus. His prolific scientific carrier has served as the basis for the development of public policy with a view to reducing the vulnerability of coastal communities and residents of flood-prone areas during extreme events such as hurricanes, torrential rains, and tsunamis within a climate change scenario.

Dr. Travis Courtney was awarded a **2024 Sloan Research Fellowship**. He was among 126 early- career scholars that represent the most promising scientific researchers working today according to the Sloan selection committee., "Their achievements and potential place them among the next generation of scientific leaders in the US and Canada".

A leading academic platform for **Ranking of Top Scientists in the field of Ecology and Evolution researchers** (Research.com), in its 2024 Edition ranked Dr. E. Weil at 1083 in the US and 2992 in the World. https://research.com/scientists-rankings/ecology-and-evolution, an improving ranking since the 2023 edition. The ranking is based on D-index (Discipline H-index) metric, which only includes papers and citation values for an examined discipline. The ranking includes only leading scientists with D-index of at least 30 for academic publications made in the area of Ecology and Evolution.

Objective 3. Increase and diversify the Institutions sources of revenue.

Faculty members are constantly encouraged to write and submit as many proposals as they can to bring funds to the DMS to support our students and infrastructure. They are also looking for new sources of funding, including private foundations, private companies, and joining as Co-PIs with local NGOs to increase potential sources of research and academic funding, and funds for our graduate students.

The financial aid to our graduate students improved significantly due to external funding linked to new research projects awarded to DMS faculty, collaborative projects between the DMS, local government agencies (DNRA), NGOs (ISER), private donations and other institutions. A total of $ 276,237.42 was provided for graduate student support which helped over 75% of the DMS students during the academic year 2024-25.

Seventy-two (72) research assistantships were funded with external funds provided by research grants awarded to DMS faculty members, donations and other sources (appendix 1). The total amount of funding was close to $300,000 including the student assistantships funded by the Department of Biology. A NASA-OCEANOS funded project to Dr. R. Armstrong provided $14,265.00 to four undergraduate students working in different projects in Magueyes. Fifteen teaching assistantships were funded by the Department of Biology-UPRM, two research assistantships were funded by EcoElectrica through a collaborative agreement (MOU), two were funded by the DMS through our collaborative agreement with CARICOOS ($18,000) and one by the DNRA-CRCD related to the NSF-RAPID-funded Microbiome Project ($ 20,000). The total amount of funding for these 19 assistantships was $96,676.

Eight (8) graduate students received hourly wages (journal) to assist in different tasks, including research projects and maintenance of the invertebrate collection. One (1) student worked in the DMS to help in administrative issues (**Appendix 1**), Total $22,524.00

The Maxwell-Hanrahan foundation from San Francisco donated $15,000 to the DMS to be exclusively used to support field work of the research projects of the Graduate Students of the department. Six students (two Ph.D. and four Ms.C submitted proposals to be evaluated for funding. All six received all the amounts requested for different aspects of their field work and minor equipment needed. The Foundation was very pleased with the results and decided to

increase the donation to $ 25,000 for the second year (2025-2026). Funds have already been transferred to the donation account of the DMS.

ISER-Caribe hired 14 DMS graduate students with an annual investing in salaries of $219,039.

The MOU's between UPRM and CARICOOS, Ecoelectrica, SeaGrant and ISER-CARIBE were renewed for another year (2026). These collaborations include the rental of space on Magueyes island which represents a substantial source of income for the DMS. A New MOUs with ISER and DNRA are in progress for the Coral reefs restoration projects. A new MOU with the Puerto Rico Council on Research and the Department of Energy and development for the installation of a photovoltaic system to cover yet electrical needs of the main building (MG831) in Magueyes was developed and is in the legal department for review.

The total revenue to the DMS for the use of lab/office space, wet table area space, classrooms and conference rooms was **$ 211,554**, and increase from the **$158,300** collected in 2023-24. The funds are deposited in the DMS physical plant maintenance for use in the renovations, purchase of materials and small equipment for maintenance of infrastructure, buildings, labs, and offices. The dormitories produced a total of **$3,251**. These funds are used to maintain the dorms and associated facilities.

The use of the small boats by professors, visitors and students generated **$ 32,141.28**. These funds are deposited in the Boat account of the DMS and are used for maintenance and repair of boats, outboard engines, trailers and boat docks and boat ramps.

The large research Vessels, Gaviota and Sultana have been out of commission for over a year due to mechanical and structural problems. Several efforts by DMS staff to get the Sultana on dry-dock for repairs and bottom painting have not been successful. The major issue is that they do not have the UPRM-provider paperwork, or they just do not want to work with the UPRM. The Marine Operations committee suggested that the DMS should decommission these vessels. We are now in contact with the UPRM property office to start the process. No replacement boats have been suggested so far.

Diving support and tank rentals generated **$4,536.00**, Funds are used to purchase replacement parts and maintenance of the compressors and tanks.

Total revenue for the fiscal year 2024-25 for the DMS was **$251,446.91**. (**Appendix 6**)[1]

Overall, **$135,964.12 was expended** on the purchase of fuel, engine oil, maintenance of laboratory equipment, building of boat consoles, purchase of some AC units (7.5 tons and 36k), materials and parts for the maintenance of official vehicles, purchase of minor maintenance equipment, and laboratory materials among other things for the routine maintenance of Isla Magueyes.

[1] Information was compiled by Zulma Martínez, Administrative Assistant

Objective 4. To implement efficient and expedient competitive creative endeavors

Administrative staff has been working to simplify the flow of information and run administrative tasks more efficiently across employees, faculty, and students. A Spreadsheet summarizing information related to the different steps of the purchase process has been created, for example. It includes all information needed to follow the process form the company quote to the date the merchandise or service is received; company and quote date, number and date of requisition, number and date of purchase order, cheque, and date the merchandize or service was received. This table is in OneDrive for easy access to everyone.

The administrative staff have attended the workshops for training on the new Adobe-signs platform and the KRONOS system of attendance.

The administrative staff continues to keep important internal statistics up to date. These include employees' attendance, illness leave, vacations, accumulated balances, extra hours, other leave, etc. Balances are then prepared every month. This information together with the individual requests are used to prepare the projection of excesses, vacation planning without affecting work, and the vacation dates for all employees.

Objective 5. To strengthen research and competitive endeavors.

Fourteen (14) research proposals to Federal agencies (NSF, ONR, NASA and NOAA), were submitted by DMS faculty (Pi and Co-PI) during this academic year for a total of **$ 27,370,953** in research funding. Of these, six (**43 %)** were funded for a total of **$ 4,800,387** in external funding (**Appendix 3**).

All these projects include funding to support our graduate students, purchasing innovative equipment, support the DMS facilities and logistical support. Students mostly benefit from the opportunity to participate in innovative research projects that often lead to their thesis project, writing of peer reviewed manuscripts, participating in local and international scientific meetings and their graduation.

There are 11 funded projects that are still active under the direction of five Faculty members as Principal Investigators ($3,383.565) and seven that ended in 2022 but are still under a no-cost extension allowance. One collaborative project between the DMS and ISER-CARIBE (Institute for Socio Ecological Research), an NGO with a budget of $ 11,189,000 started in August 2023 and is making good progress after overcoming problems and adjustments through the initial stages. It has funding (NOAA) until 2027.

As a result of this funding, ISER-CARIBE and the DMS have developed the largest on-land coral nursery in Puerto Rico and the eastern Caribbean to support coral reef restoration programs, training and educational outreach around the island. The innovative holistic approach involves **assisted evolution** by using resistant (to thermal anomalies and diseases) and genetically variable coral colonies of foundational, massive coral species together with other keystone species that control algal growth at the transplantation localities. Latest additions to the project included the larval rear facility, improving the sea urchin and crab growing tank area, adjusting the new salt water immersed in pumps, filtration capabilities and issues with water pressure and distribution.

The project has successfully out-planted thousands of healthy fragments of several foundational coral species to several impacted reefs together with thousands of sea urchins and herbivorous crabs. The project provides training and financial support for many of our graduate students and some undergraduates from Biology as well as many volunteers. Drs. Weil, Cruz-Motta and Courtney from DMS are CoPIs in this large, five-year long project financed by NOAA. The project has invested close to $500,000 in updating the existing infrastructure at the Magueyes Marine Lab.

One important result is the first Inland Pilot Marine Integrated Multitrophic Aquaculture System in Puerto Rico developed and installed in Magueyes has come to an end. Funding was cancelled and Dr. Ernesto Otero, the PI, retired in June 30st. of this year.

The DMS is also collaborated for a few years with Dr. Loretta Robertson and her team who developed a pilot project for culturing commercially valuable algae in La Parguera. Funding for this project also dried-up and the project was terminated at the end of 2024.

The EPA-DNRA funded project on water Quality and coral reefs systems ended in June of this year. It was lead by Dr. Travis Curtney, JJ Cruz Motta and E. Weil.

Peer-reviewed publication by Faculty members and DMS students was high again this year. A total of thirty-four (34) peer-reviewed manuscripts were submitted to recognized peer reviewed journals and one technical report was produced. Overall, 15 manuscripts were published, five are in print or accepted, and the rest are in the review process as of this date. Five were submitted by professors and thirteen by students as senior authors. Students appear as senior or secondary authors in 57% of this year's publications (**Appendix 4**). Twenty-six presentations were given in 11 meetings and workshops **(Appendix 4**) by DMS Faculty members and Students of the Department.

Several seminars (hybrid format) and a workshop were provided by faculty, students and visitors. The DMS students carried out ten (10) (appendix 3) departmental seminars. Two seminars were offered by visiting researchers; Dr. Fabio Bulleri, Universitat di Pissa – Italia, "*Experimental Design in Marine Ecology*", November 21, 2024 and Dr. Jen McWhorter, NOAA, "*Biogeochemical Argo Research Applications*", February 1, 2024.[2]

Objective 6. To Impact the Puerto Rican Society

Applies to the four faculties, Rectorate, Student affairs, Deans Office and Academic Affairs Dean Office.

The department has increased its outreach and community service activities thanks to the help and assistance of professors and administrative personnel, and the initiatives of AECIMA, the student organization and our local collaborators. One major accomplishment was the involvement of the DMS in the development of a high school marine science "program" for the new Montessori School Alejandro Tapia Rivera in the community of La Parguera. The DMS,

[2] Information compiled by Maritza Pagán, Administrative Officer

the school principal, the San Juan headquarters and Mr. Efrain Figueroa and the Sea Grant program and CARICOOS are collaborating with this project.

The DMS has provided information, materials, talks and logistical support for several visits of the students to our lab facilities, especially during the summer camps. This is an important collaboration because we are training and motivating the future graduate students of the department, and the community leaders to protect our marine natural resources. Recently, DMS collaborated with a series of workshops on coastal marine ecosystems and environmental and scientific photo-journalism for the school during June of 2024 lead by Mr. E. Figueroa.

The Department has been contacted many times in the last year to give local and international TV and journalist interviews about the current problems facing the coastal marine communities of Puerto Rico. This is part of our outreach activities and the one that reaches the most people.

The DMS has strengthened the collaboration with the Department of Natural Resources. During the last year we have had meetings and discussion about the critical situation of the La Parguera Natural Reserve (LPNR) due to the combination of stressful conditions linked to climate change (high temperatures, storms, diseases and bleaching) and the direct impact of human activities through the uncontrolled tourism activities. The LPNR has become a tourist nightmare due to the lack of law reinforcement and the ignorance of the users. The DNRA and the DMS are now working closely to increase the environmental education levels of the users, establish usage regulations to ameliorate the human impact (Noise control, speed limits in manatee areas, night lighting, carrying capacity in some highly visited localities, etc.) while we finish the Management plan for the reserve.

The DMS has a couple of projects dealing with the influx of the floating seaweed Sargassum, which has increased significantly every year since 2016. The idea is to use the results of these studies to forecast the

Objective 7. To strengthen school spirit, pride and identity.

All improvements to the infrastructure and facilities at the Magueyes lab. Facilitates the logistics supporting the students of the DMS. The new water system will help other aquaculture projects on Magueyes such as the fish and mangrove, and algae cultures and thesis projects that need running sea water. The fish and mangrove cultures are for academic and outreach purposes and several workshops were organized for people interested in culturing fish for commercial goals.

The Maxwell-Hanrahan foundation from San Francisco has donated $ 35,000 to the DMS over the last year. These funds are to be exclusively used to support field work of the research projects of the Graduate Students of the department. Six students (two Ph.D. and four Ms.C submitted proposals to be evaluated for funding in 2024 and seven in 2025. All received the funding requested for different aspects of their field work and minor equipment needs.

The department has increased its outreach and community service activities thanks to the help of AECIMA and several professors and administrative personnel assistance. One major task was the involvement of the DMS in the development of a marine science “program” for the

new Montessori School Alejandro Tapia Rivera in the community of La Parguera. The DMS continues to provide information, materials, talks and logistical support for several visits of the students to our lab facilities. DMS collaborated with a series of workshops on coastal marine ecosystems and environmental and scientific photo-journalism during 2024.

As part of the DMS outreach and educational programs, our facilities in Magueyes are open to organized visits so elementary and high school students, private citizens, managers, agency personnel, etc. can have a direct and personal experience of what a working marine lab. looks like, and what sort of different projects are being carried out in these facilities.

During the academic year 2024-2025 Isla Magueyes Lab. Received a total of 1,396 visitors. Twenty- six (26) groups (240 people) were from Universities and Agencies of the United States and a few International, 24 groups (506 people) came from schools or community groups, 8 groups (59 people) from US Agencies and 27 groups (667 people) from local universities and government agencies.

The DMS fleet of small and medium sized boats serve a wide range of users, starting with our faculty and students who use the boats for their classes and training, and their externally funded, or non- funded, thesis and other research projects, and for the outreach program, providing an opportunity to some groups to visit some of the nearby shallow marine communities. The boats are also available to visiting researchers and students from universities abroad and from other educational and government agencies from PR.

The small boats served 1,225 people, for a total of 173 outings for research purposes, 50 outings for educational purposes, 35 outings for class purposes and 80 outings as part of thesis work. The DMS boats were used for a total of 1106.75 hours. The larger and medium-sized vessels made 2 sorties, for research purposes.

The dormitories received 31 people for research and educational purposes. (**Appendix 5**).[3]

AECIMA and Yanelle Silva, the student representative, collaborated with the 2024 Summer Camp organized by the School of Arts and Sciences. After this, the Association President and Secretary resigned, and it took one year to reorganize it. Now with new administration of motivated new students, AECIMA participated actively in the 2025 School of Arts and Sciences Summer Camp for undergraduates.

The dormitories received 31 people for research and educational purposes. They are in the process of renovation again. The DMS needs to overhaul the dormitories and lab. Space up the hill to offer more facilities to our visitors in the near future. Use of dormitories is increasing slowly to the levels of the pre- pandemic times when the DMS had many visiting groups of students and researchers.

These funds are deposited in the rotative accounts and are mainly used for the maintenance of the boats and the diving facilities, including the air/nitrox compressor.

[3] Information was compiled by Lilivette Valle, Administrative Assistant

Funds from the “time purchase” (compra de tiempo) account ($14,000) were used to increase the start- up award ($8,000) provided by the Chancellors office to Dr. Johana Rotterova, the new Assistant Professor that started in January of 2024 Some funds from this account were used for student support (hourly wages) during the past year. Some extra funds might be used to purchase some basic equipment that the new professor would need to start her research as soon as possible.

The department was able hire three new guards this year, completing the needed number to cover the three daily turns 365 days a year. A new janitor was also hired which will help to keep facilities clean and well maintained. The DMS still needs other workers such as a refrigeration technician, small boat fiberglass repair, work on the general maintenance of facilities, small construction projects, maintenance of the boats and docks. A Magueyes supervisor is also essential.

The administrative personnel performed extremely well during 2024-25 given the amount of work the DMS puts on them. They attended most of the training workshops related to the improvement of the different academic (registration) administrative (sign-request, use of programs, etc.) processes that were provided by the administration during 2024-The DMS is compiling information to develop courses that will help our graduate students to write research proposals and scientific publications. The revision student’s manual and the DMS web page are being updated with recent important information on the Professional Masters in Marine Sciences program, new courses, changes in the official protocols and curriculum sequences, deadlines etc. that will provide better and easier information to our current and potential students.

The DMS has one student organization, AECIMA, which has been doing excellent work with community services and training, tours of our facilities, talks, organizing the DMS annual Scientific Symposium, workshops, and organizing open houses in the department, music nights and beach cleaning activities. Also, AECIMA participates in the promoting activities of the DMS in other institutions around Puerto Rico.

The Department has been contacted many times in the last year to give local and international TV and journalist interviews about the current problems facing the coastal marine communities of Puerto Rico. This is part of our outreach activities and the one that actually reaches the most people.

The DMS does not receive any recurrent donations from Alumni. However, The Rita Walsh MD Scholarship was established in 2012 to aid graduate students from the department of marine sciences and the school of medicine in Ponce. The agreement was signed by the then President of the University Dr. Miguel Munoz and Mrs. Carmen Walsh Rivera. The funds come from the dividends of Mrs. Walsh investments and the only information we could get from the Central administration is two deposits into the endowment for $ 452,838.79, which we assume are from two years. **We have not** been able to find out what the deposits for the other ten years are and how much is the total endowment for assistantships in the scholarship fund.

IV.International activity

During the academic year 2023-25 The DMS had few international students. Only seven (7) or 12 % of the students were from foreign countries, mostly from central and south America. Two masters (one male one female) and one Ph. D (female) students were from Colombia, two male Ph. D students were from Mexico, one female Ph. D student was from Ecuador and one male and one female from Costa Rica.

Three of the faculty members are originally from foreign countries, two from Venezuela and one from Greece. Our new faculty member is from Czechoslovakia.

Most of the faculty have collaborations with researchers from other institutions, some from foreign countries, and have published joint manuscripts with them. Last year publication list (appendix 3) at least 22 of the 41 (53%) manuscripts published and in revision in peer-reviewed journal av at least one international coauthor. The DMS has no courses in collaboration with international colleagues.