

Dr. Samantha J. de Putron

Associate Scientist/ Assistant Director of Education for University Programs/Senior Lecturer

Bermuda Institute of Ocean Sciences (BIOS)

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EDUCATION

University of Wales, Swansea

Ph.D. (2003) in coral reef biology and ecology

M.Phil. (1999) in temperate rocky shore ecology

B.Sc. Honors (1996) Marine Biology; Grade: First Class; Academic award (highest grade in year)

Ph.D. thesis title: “The reproductive ecology of two corals and one gorgonian from sub-tropical Bermuda”

M.Phil. thesis title: “Studies on the Lower Shore Invertebrate Fauna of West Wales after the Sea Empress oil Spill”

PROFESSIONAL HISTORY

Bermuda Institute of Ocean Sciences (2002 – present)

Current position: Associate Scientist/Assistant Director of Education for University Programs/ Senior Lecturer

Promotion history:

2017: Assistant Director of Education for University Programs (current)

2009: Associate Scientist (current)

Visiting Lecturer, **Princeton University** (until July 2015)

2005: Assistant Scientist (until April 2009)

Senior Lecturer (current)

2003: Instructor in Residence (teaching post-doctoral; until April 2005)

Adjunct Assistant Professor, **Duke University** (until June 2007)

2002: Research Assistant (until April 2005)

University of Wales, Swansea (1996 – 2002)

1998–2002: Graduate Intern, University of Wales, Swansea

1996–1997: Research Assistant; joint position with Countryside Council for Wales

Countryside Council for Wales (1996-1997)

1996 – 1997: Research Assistant

PROFESSIONAL EXPERIENCE

Current Research, BIOS (2009 – present)

Ecology, biology and resilience of coral reefs to rapid environmental change

Ecophysiology of corals with a focus on reproductive processes

Role of temperature, heterotrophy, light, and the microbiome on coral physiology and resilience

Mechanisms of coral calcification and effects of global climate change

Assistant Director of Education for University Programs, BIOS (2017 – present)
 Internship faculty coordinator (NSF REU and summer international internships)
 University program development, course development and scheduling, curriculum content
 Administration, grant proposals and reports, financial planning and budget management

Senior Lecturer, BIOS (2005 – present)
 Semester coordination of scheduling, budgets, and communication between instructors
 Management and training of teaching assistants
 Course instructor: delivering lectures and workshops, field and lab work, grading, course
 development, professional development workshops for students and staff

Princeton University Visiting Lecturer (2009 – 2015)
 Course instructor and content development for BIOS-Princeton field course
 Visiting lecturer to Princeton University teaching undergraduate biology; student recruitment

Assistant Scientist, BIOS (2005 – 2009)
 Marine Environmental Program: designing and implementation of Bermuda's long-term benthic
 monitoring plan including video surveys, coral condition monitoring and recruitment dynamics
 BEACON: Bermuda Ocean Acidification and Coral Reef Investigation

Postdoctoral teaching position, BIOS (2003 – 2005)
 Course instructor in all semesters, delivering lectures, field and lab work, grading
 New course development and implementation; education department general administration

Duke University Adjunct Assistant Professor (2003 – 2007)
 Course instructor and content development for BIOS-Duke field courses

Research Assistant, BIOS (2002 – 2005)
 Benthic Ecology Research Program: surveys, coral condition monitoring, recruitment dynamics
 Course: First International Coral Reef Ecotoxicology and health workshop (3 wk, 2003)

Doctoral Research, Swansea University (1998 – 2003, Advisors: J. Ryland and S.R. Smith)
 The reproductive ecology of two corals and one gorgonian from sub-tropical Bermuda
 Research Assistant: NSF research on coral recruitment dynamics, Florida Keys, 1999 and 2000 (2
 wk/yr). PI: S.R. Smith
 Course: The Molecular Ecology and Physiology of Marine Symbioses, 2001 (H. Trapido-Rosenthal)
 Workshop: Coral Tissue Slide Reading, George Washington University, 2001 (Dr. E. Peters)

Masters Research, Swansea University of Wales (1996 – 1999, Advisor: J. Ryland) and
Research Assistant, Countryside Council for Wales, Swansea (1996 – 1997)
 Studies on the Lower Shore Macroinvertebrate Fauna of West Wales after the Sea Empress oil Spill
 Rocky shore temperate ecology research, reproductive ecology, field sampling, identification

Undergraduate research, Swansea University (1995 – 1996, Advisor: J. Lancaster and S.R. Smith)
 Coral larval dynamics: larval availability versus settlement to the reef. Scholarship awarded (Bank
 of Bermuda) to perform field research in Bermuda

Scientific cruises
 2004 (2 wk): Research scientist, NSF cruise, Bahamas, for extensive underwater coral surveying
 aboard the R/V Walton Smith, RSMAS, University of Miami, Florida. PI: Dr H. Lasker
 1999, 2000 (2 weeks/yr): Research scientist, NSF funded, Florida Keys, to study recruitment
 dynamics. PI: Dr Struan Roberstson Smith (formerly BIOS, now Bermuda Aquarium Museum and
 Zoo, Bermuda)

GRANTS and AWARDS (2000 - present)

2022 – 2025	\$1,243,895	Heising-Simons Foundation International, Ltd. Collaborative Research: Enhancing coral resilience against climate warming. PIs: S de Putron, Y Sawall (BIOS PIs) in collaboration with H Putnam (URI) and G Goodbody-Gringley (CCMI).
2021 – 2023	\$343,390	NSF DBI. Infrastructure Capacity for Biological Research: Major Improvements of the Outdoor Mesocosm Facility at the Bermuda Institute of Ocean Sciences. Y. Sawall (PI), S. de Putron
2021 – 2024	\$486,002	NSF Research Experience for Undergraduates (REU) Site: “Collaborative Marine Research Experience at the Bermuda Institute of Ocean Sciences.” A. Peters (PI), S. de Putron.
2018 – 2021	\$440,433	NSF Research Experience for Undergraduates (REU) Site. “Fall Semester Student Research in Oceanography and Marine Science at BIOS.” A. Peters (PI), S. de Putron
2017 – 2021	\$737,635	Heising-Simons Foundation International, Ltd. “How Resilient are Coral Reefs to Global Climate Change?” S. de Putron and G. Goodbody-Gringley (BIOS PIs) in collaboration with H. Putnam (URI PI)
2015 – 2018	\$82,401	NSF BIO-OCE. “Collaborative Research: Identifying the Role of Basin-scale Climate Variability in the Decline of Atlantic Corals.” S. de Putron (PI, BIOS). In collaboration with A Cohen (PI, WHOI) and D. Sigman (PI Princeton University)
2010 – 2013	\$78,888	NSF BIO-OCE Ocean Acidification- Category 1. “Collaborative Research: An Investigation of the Role of Nutrition in the Coral Calcification Response to Ocean Acidification.” S. de Putron (PI, BIOS). In collaboration with A. Cohen (PI, WHOI), D. McCorkle, A. Tarrant (co-PIs)
2009 – 2013	\$851,025	NSF BIO-OCE. “BEACON: BERMUDA ocean Acidification and CORal reef iNvestigation.” Andreas Andersson (PI), N. R. Bates, S. de Putron.
2009	\$10,000	Vita Foundation. ‘Ocean acidification and coral research.’ S. de Putron
2006 – 2009	\$307,671	NSF Research Experience for Undergraduates (REU) Site. “Research Experience in Open Ocean and Subtropical Marine Environments of Bermuda.” G. Plumley (PI), S. de Putron
2007 – 2008	\$61,570	Vulcan Inc. “Diversity of deep-sea corals and associated microbial communities on the Bermuda seamount.” R. Jones (PI), J. Loram, A. Venn, S. de Putron, S. McKenna and T. Knap.
2007 – 2008	\$10,000	BIOS Internal Faculty Award. “Global Climate Change: coral larval development and recruitment as a sensitive biological indicator.” S.de Putron (PI)
2002	\$1,950	Roger T Stone Fellowship for graduate studies, BBSR
2001	\$2,000	Grant-in-Aid, BBSR

PUBLICATIONS (* denotes student)

Metrics: RG score: 21.4; h-index: 14; i10-index: 17

- Lima LFO*, Alker AT*, Papudeshi B, Morris MM, Edwards RA, **de Putron SJ**, Dinsdale EA (2021) Coral and Seawater metagenomes reveal key microbial functions to coral health and ecosystem functioning shaped at reef scale. Nature Microbiology.
- Wong KH*, Goodbody-Gringley G, **de Putron SJ**, Becker DM*, Chequer A, Putnam HM (2021) Brooded coral offspring physiology depends on the combined effects of parental press and pulse thermal history. Global Change Biology, 1–17. <https://doi.org/10.1111/gcb.15629>
- Lima LFO*, Weissman M, Reed M, Papudeshi B, Alker AT*, Morris MM, Edwards RA, **de Putron SJ**, Vaidya NK, Dinsdale EA (2020) Modeling of the coral microbiome: the influence of temperature and microbial network. mBio11:e02691-19, DOI 10.1128/mBio.02691-19.
- Drenkard E*, Cohen A, McCorkle D, Repeta D, **de Putron SJ**, Starczak V* (2018) Juveniles of the Atlantic coral, *Favia fragum* do not invest energy to maintain calcification under ocean acidification. Journal of Experimental Marine Biology and Ecology, 507:61-69
- Goodbody-Gringley G, Wong KH*, Becker DM*, Glennon K*, **de Putron SJ** (2018) Reproductive ecology and early life history traits of the brooding coral, *Porites astreoides*, from shallow to mesophotic zones. Coral Reefs, DOI 10.1007/s00338-018-1673-2
- Courtney TA*, Lebrato M, Bates NR, Collins A, **de Putron SJ**, Garley R, Johnson R, Molinero J-C, Noyes T, Sabine CL, Andersson AJ (2017). Environmental controls on modern scleractinian coral and reef-scale calcification. Science Advances, 3: e1701356
- de Putron SJ**, Lawson JM*, White KQL*, Costa MT*, Geronimus MVB*, MacCarthy A* (2017) Variation in larval properties of the Atlantic brooding coral *Porites astreoides* between different reef sites in Bermuda. Coral Reefs, DOI 10.1007/s00338-016-1527-8
- Courtney TA*, Andersson AJ, Bates NR, Collins A, Cyronak T, **de Putron SJ**, Eyre BD, Garley R, Hochberg EJ, Johnson R, Musielewicz S, Noyes TJ, Sabine CL, Sutton AJ, Toncin J, Tribollet A (2016) Comparing chemistry and census-based estimates of net ecosystem calcification on a rim reef in Bermuda. Frontiers in Marine Science, DOI: 10.3389/fmars.2016.00181
- Goodbody-Gringley G. and **de Putron SJ** (2016) Brooding corals: planulation patterns, larval behavior, and recruitment dynamics in the face of environmental change. In ‘*The Cnidaria, past, present and future. The world of Medusa and her sisters.*’ S. Goffredo and Z. Dubinsky eds. Springer publisher.
- Baird, K, **de Putron SJ**, Cohen A (2015). Building a skeleton in a changing ocean. Exercise for the Network of Conservation Educators and Practitioners, American Museum of Natural History. Available at: <http://ncep.amnh.org>.
- Andersson AJ, Yeakel KL*, Bates NR, **de Putron SJ** (2013). Partial offsets in ocean acidification from changing coral reef biogeochemistry. Nature Climate Change. DOI: 10.1038/NCLIMATE2050
- Drenkard EJ*, Cohen AL, McCorkle DL, **de Putron SJ**, Starczak V, Zicht A* (2013). Calcification by juvenile corals under heterotrophy and elevated CO₂. Coral Reefs. DOI 10.1007/s00338-013-1021-5.
- Smith SR, **de Putron SJ**, Murdoch TJT, Pitt JM, Nagelkerken I (2013) “Biology and Ecology of Corals and Fishes on the Bermuda Platform.” pp. 135-151 in C.R.C. Sheppard (ed.), *Coral Reefs of the United Kingdom Overseas Territories*, Coral Reefs of the World 4, Springer Science+Business Media Dordrecht.

- Smith SR, Sarkis S, Murdoch TJT, Weil E, Croquer A, Bates NR, Johnson RJ, **de Putron SJ**, Andersson AJ (2013) “Threats to Coral Reefs of Bermuda.” pp. 173-188 in C.R.C. Sheppard (ed.), *Coral Reefs of the United Kingdom Overseas Territories*, Coral Reefs of the World 4, Springer Science+Business Media Dordrecht.
- de Putron SJ**, McCorkle D, Cohen AL, Dillon A*. (2011) The impact of seawater saturation state and bicarbonate ion concentration on calcification by new recruits of two Atlantic corals. *Coral Reefs* 30(2): 321-328
- de Putron SJ** and Smith SR. (2011). Planula release and reproductive seasonality of the scleractinian coral *Porites astreoides* in Bermuda, a high-latitude reef. *Bulletin of Marine Science* 87(1): 75-90
- de Putron SJ** and Ryland JS. (2009) Effect of seawater temperature on reproductive seasonality and fecundity of *Pseudoplexaura porosa* (Cnidaria:Octocorallia): latitudinal variation in Caribbean gorgonian reproduction. *Invertebrate Biology*, 128(3): 213-222
- Cohen AL, McCorkle DC, **de Putron SJ**, Gaetani, GA, Rose, KA. (2009) Morphological and compositional changes in the skeletons of new coral recruits reared in acidified seawater: Insights into the biomineralization response to ocean acidification. *Geochemistry Geophysics Geosystems*, 10, Q07005, doi:10.1029/2009GC002411
- Goodbody- Gringley G* and **de Putron SJ**. (2009) Planulation patterns of the brooding coral *Favia fragum* (Esper) in Bermuda. *Coral Reefs* 28: 959-963
- Ryland JS, **de Putron SJ**, Scheltema RS, Chimonides PJ, Zheden DG. (2000). Sempers (Zoanthid) larvae: pelagic life, parentage and other problems. *Hydrobiologia* 440:191-198.
- de Putron SJ** and Ryland JS. (1998) Effects of the ‘Sea Empress’ oil spillage on reproduction and recruitment of *Alcyonidium* (Bryozoa) populations on *Fucus serratus*. *The Sea Empress Oil Spill: Proceedings of the International Conference*. Cardiff, Wales pp 457-466.
- Ryland JS and **de Putron SJ**. (1997). An appraisal of the effects of the 'Sea Empress' oil spillage on sensitive sessile marine communities. School of Biological Sciences, University of Wales, Swansea. 97 pp. *The Sea Empress Environmental Evaluation Committee report to the Countryside Council for Wales*.

PRESENTATIONS with published abstracts (2000-present)

Oral:

- Benthic Ecology Meeting, St Johns, Newfoundland, Canada, April 2019
- European Coral Reef Symposium, Oxford, UK, December 2017
- European Coral Reef Symposium, Wageningen, The Netherlands, December 2010
- 11th International Coral Reef Symposium, Florida, USA, July 2008
- 10th International Coral Reef Symposium, Okinawa, Japan, June 2004
- European Coral Reef Symposium, Cambridge, UK, September 2002

Posters:

- 14th International Coral Reef Symposium, virtual, July 2021
- AGU Fall Meeting, December 2020
- ASLO Ocean Sciences Meeting, San Diego, California, February 2020
- European Coral Reef Symposium, Oxford, UK, December 2017
- 13th International Coral Reef Symposium, Hawaii, July 2016
- Society of Integrative and Comparative Biology, San Francisco, CA, USA, January 2013
- ASLO Aquatic Sciences Meeting, New Orleans LA, USA, February 2013

12th International Coral Reef Symposium, Cairns, Australia, July 2012
ASLO Ocean Sciences Meeting, Salt Lake City Utah, February 2012
IPCC WG II/WG I Workshop on impacts of ocean acidification, Okinawa, Japan 2011
OCB Ocean acidification PI meeting, Woods Hole, MA, USA, March 2011
ASLO Aquatic Sciences Meeting, San Juan, Puerto Rico, February 2011
ASLO Ocean Sciences Meeting, Portland, OR, USA 2010
11th International Coral Reef Symposium, Fort Lauderdale, FL, July 2008
10th International Coral Reef Symposium, Okinawa, Japan, June 2004
European Coral Reef Symposium, Cambridge, UK, September 2002
9th International Coral Reef Symposium, Bali, Indonesia, October 2000

INVITED TALKS (Highlighted selection only; > 30 since 2001)

Oxford University: “Coral Biology, Ecology, Resilience”, October 2021
John Hopkins University: “Coral Biology, Ecology”, “Coral Science Issues”, Jan 2019, 2020, 2022
Oxford University: “Coral Biology, Ecology, Resilience”, September 2020
Greenrock, Bermuda: “Coral Science Issues”, Hamilton, Bermuda, March 2018
Living Reefs Foundation, Bermuda: “Coral gardening and conservation”, June 2016
Newcastle University: “Coral Biology, Ecology, Resilience”, September 2014
University of Roehampton, London: “Bermuda corals and Ocean Acidification”, March 2012
Bermuda Government: Overview of Coral Reef Research at BIOS”, June 2010
Natural History Museum, London: “Coral reefs of Bermuda and Ocean Acidification”, April 2010
Princeton University: “Coral Reefs”, December 2006, 2007, 2008
Princeton University: “Coral Reef Research and Education at BIOS”, October 2006
Bermuda Aquarium, Natural History Course: “Coral reefs of Bermuda”, annual October 2002- 2006
BSAC diving club, Bermuda: “The coral reefs of Bermuda”, November 2005
Swansea University of Wales: “Coral Reproductive Ecology in Bermuda”, March 2001

TEACHING AND SERVICE

Student advising:

Graduate thesis advisees (**5**):

Kevin Womg, Ph.D. candidate University of Rhode Island; 2016 – ongoing (field advisor)
Lais Lima, Ph.D. candidate San Diego State University; 2016 – ongoing (field advisor)
Victoria Luu, Ph.D. candidate Princeton University; 2015 – ongoing
Gretchen Goodbody-Gringley, Ph.D. Harvard University; 2004 - 2009 (field advisor)
Helen Brylewska, Masters (M.Phil.) University of Wales, Swansea; 2005 - 2007

Senior undergraduate thesis advisees (**12**): 2003-2019

Research Experience for Undergraduates - NSF REU-BIOS Fall program (**14**): 2006-2019, 2022

Other BIOS intern programs (**15**): 2007-2020, 2022

Bermuda intern summer program -High School and undergraduate (**10**):2006-2018, 2022

Courses taught at BIOS:

Princeton undergraduate summer course (4 weeks); **Marine Biology**: 2006-2015

BIOS summer course (3 weeks): **Coral Reef Ecology**; 2002-2012, 2016, 2017, 2019

BIOS Fall semester (University of Rhode Island and Roger Williams study abroad program:

Coral Reef Ecology (10 weeks); 2004-2011; 2014, 2015

Marine Biology and Oceanographic Research (4 weeks); 2003-2010; 2014, 2016-2019, 2021

Marine Invertebrate Zoology (10 weeks); 2003; 2021, 2022

Duke-BIOS Program:

Coral Reef Ecology (spring, 7.5 weeks); 2005-2006

Marine Ecology (spring, 7.5 weeks); 2003-2004, 2007

Marine Invertebrate Zoology (winter, 7.5 weeks); 2004

Short synopses of courses developed and taught:

Marine Biology (Princeton): Ecology, physiology, taxonomy, and behavior of a wide variety of organisms in a series of habitats, including open ocean, seagrass beds, coastal zone, rocky shore, marine ponds, mangroves, mud flats, and coral reefs. Marine ecological principles are taught using these diverse habitats combining hands-on field surveys and laboratory experiments.

Coral Reef Ecology: Biology and ecology of corals and their response to environmental changes and global climate scenarios. Topics cover the biological, physical, biogeochemical and evolutionary processes that determine reef growth, function and resilience, ranging from the organism to whole reef. Underwater studies (snorkel/SCUBA) teach reef monitoring techniques and lab work explores coral eco-physiology.

Marine Invertebrate Zoology: Comparative diversity of animal forms, their adaptations to different ecosystems, and their responses to environmental changes and anthropogenic impacts. Topics cover the development, anatomy, biology and evolutionary relationships of invertebrates. Environmental characteristics of local tropical habitats are explored and discussed in relation to the resident invertebrate populations.

Marine Ecology: The distribution, abundance, and diversity of marine organisms. Topics cover primary production, abiotic factors, habitat ecology, marine functional processes and life history strategies. The integrated field trips and laboratory work provide experience in commonly used marine ecological field sampling techniques whilst exploring eco-physiology.

Marine Biology and Oceanographic Research: A full research internship experience where a project is chosen, researched and a proposal is submitted. The project is executed and communicated through oral presentations and a final research paper. Professional development is provided through lectures and workshops.

ADDITIONAL QUALIFICATIONS

SCUBA diving PADI Assistant Instructor, Nitrox certification

Science Diver certification (AAUS); Emergency First Response and DAN O2 provider

Small boat handling, BIOS boat captain

British and Bermuda (BOTC) passports