

PHANOR H. MONTOYA MAYA, Ph.D.

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PROFESSIONAL AND RESEARCH INTERESTS

Coral reef restoration

I study science-based solutions that lead to sustainable coral reefs, focusing on coral gardening as a Marine Protected Area management tool.

Conservation strategies and tools

Following a multidisciplinary approach and through networking, communication and research I pursue leading solutions to preserve marine ecosystem services.

Capacity building

For people dependent on natural resources, to develop educational opportunities that empowers them to independently improve their livelihood security.

EDUCATION

Ph.D. Biology, University of KwaZulu-Natal, 2009 – 2014.

Thesis title: “Ecological genetic connectivity between and within southeast African marginal coral reefs”.

Brief Synopsis of Research: South-east African MPAs are managed under the untested assumption that South Africa’s marginal reefs were connected with reefs to the north by the southward dispersal of gametes and larvae mediated by regional oceanographic conditions. My research assessed the large- and small-scale genetic connectivity of two scleractinian species on protected reefs along the south-east African coast in an attempt to test this assumption. The results indicated that South African populations are, at ecological time scales, independent of gene flow from northern coral populations. The findings also suggest that the scope of management needed for the protection of the reefs in the region should not be broad in outlook; each reef should be managed as a single unit, part of the whole rather than representative of the whole. My PhD work is being used by the Oceanographic Research Institute of South Africa to propose a new management plan for South Africa’s coral MPAs.

During my Ph.D. I also worked as postgraduate demonstrator, regularly supervising practicals and sporadically giving lectures on Genetics for undergraduate students.

M.Sc. Ichthyology, Rhodes University, 2006 – 2009.

Thesis title: “Dynamics of ichthyoplankton and zooplankton from selected south and west coast estuaries of South Africa”.

B.Sc. Marine Biology, Universidad de Bogotá Jorge Tadeo Lozano, 1996 – 2002.

Thesis title: “Evaluación de la macro-fauna epi-bentónica asociada a praderas de *Thalassia testudinum* (Banks ex König) en el Caribe Colombiano”.

EMPLOYMENT

January 2016 – present. Research Associate. Nature Seychelles, Mahe, Seychelles

I provide support to Nature Seychelles' research and work on reef restoration and other marine conservation related issues.

October 2014 – December 2015. Technical & Scientific Officer for UNDP-GEF/USAID Reef Rescuers Project. Nature Seychelles, Mahe, Seychelles

I assisted in the design of the 2nd phase of the Reef Rescuers Project and raised US\$250K from USAID, which allowed us to assess the effectiveness of coral transplantation as a tool to enhance coral reef resilience and resistance to bleaching – Proof of Concept.

I developed and lectured the 2015 Reef Rescuers Training Program, the first professional development program in large-scale coral reef restoration using the coral gardening concept.

November 2014 – April 2015. Co-Investigator: Implementing the first stage of an Indian Ocean Global Warming Observatory based in Seychelles. USAID/NASA/SERVIR Program and Nature Seychelles, Seychelles.

I assisted the principal investigator in developing the first stage of an in situ global warming observatory within the onset of the 2014-2015 El Niño. The observatory matched real ocean temperatures at a depth relevant to coral reefs with ecosystem health and contrasted results with satellite sea surface temperature (SST) data.

I collected information using underwater surveys to assess the status of coral reef fishes and benthic communities in relation to changes in underwater sea temperature.

June 2009 - December 2013. Principal Investigator: Ecological genetic connectivity between and within southeast African marginal coral reefs. WIOMSA and Oceanographic Research Institute – ORI (South Africa). Durban, South Africa.

I designed and implemented research on the ecological genetic connectivity between and within southeast African marginal coral reefs; this research study resulted in the preparation of four scientific manuscripts (three already published and one under review), one technical report and four local and international presentations.

I increased the scope of the project after securing US\$50,000 from WIOMSA (grant no. MASMA/CC/2010/06) and established collaborations with researchers and suppliers.

I oversaw project expenses (US\$100,000 over three years), in conjunction with the finance department and set up the ORI Genetics Lab.

July 2006 – April 2009. Education Officer. East Coast Fish Watch Project, South African Institute of Aquatic Biodiversity (SAIAB). Grahamstown, South Africa.

I introduced recreational divers into fish-watching as a citizen science activity by conducting fish-watch dives with volunteer divers.

I assisted Dr Phil Heemstra in assessing fish diversity along the east coast of Africa by creating a "Most Wanted Fish" page to motivate divers to take photographs of poorly documented fish from the Western Indian Ocean.

December 2003 – December 2005. Executive Director. Fundación Bucea Colombia, Bogotá, Colombia

I promoted the support of national and international coral reef conservation strategies by pioneering the first dive volunteering organization in Colombia.

I designed, organized, conducted and fundraised for Reef Checks, beach and underwater clean-ups, mooring buoy installations and coral spawning expeditions.

I hired, trained, supervised and motivated a small team of administrative and volunteer staff members.

I developed collaborations between artisanal fishermen, scientists and recreational divers to launch conservation strategies for the National Natural Tayrona Park, Colombia.

ADDITIONAL PROFESSIONAL EXPERIENCE

2016 - present. **Onboard Expert/Expedition Staff**, Noble Caledonia, UK.

2014. **Coral Specialist**, Pristine Seas Expedition to Southern Mozambique, National Geographic Society, USA.

2013. **Scientific Diver**. Reef Rescuers Project, Nature Seychelles, Republic of Seychelles.

2012 - 2013. **Safety Diver/Shark Guide**, Blue Wilderness Expeditions, South Africa.

2007 – 2009. **House Warden**, Botha House, Rhodes University, South Africa.

2006 - 2007. **Research Assistant**, Doctor Phil Heemstra, South African Institute for Aquatic Biodiversity, South Africa.

2003. **Research Diver**, Coralina/Ocean Conservancy 2003 Northern Cays Expedition, Archipelago de San Andrés, Providencia y Santa Catalina, Colombia.

2002 – Present. **SCUBA Diving Instructor**, NAUI, SSI and PADI.

2001 - 2002. **Research Assistant**, Marine and Coastal Research Institute "José Benito Vives de Andreis" - INVEMAR, Colombia

1996. **Volunteer Park Ranger**, Gorgona Island and Utria National Natural Parks. Colombia.

SKILLS

General skills in research project management and data analysis. Specific expertise and interests in:

Computing Skills

- Applications: Microsoft Office Suite, GIMP, InkScape, Image J, QUANTUM GIS.
- Programming Languages: PHP, MySQL, and HTML.
- Operating Systems: Linux, Windows, iOS.

- Statistical and population genetics software: R Environment, Statistica, PRIMER 6, Geneious PRO, Structure, Arlequin, BAPS v6, among others.
- Web and App development software: WordPress, Joomla, HTML5.

Teaching Skills

- Student's residence administrator where I served as a counsellor, supervisor and role model to undergraduate students.
- I have developed extended educational programmes and developed training materials for undergraduate students and recent graduates in scientific diving, and coral reef conservation and restoration.
- I have 14-years' experience teaching SCUBA diving, invertebrate biology, and coral reef research topics.

Laboratory and Field Work Skills

- Inventory, sampling, monitoring and survey of benthic and pelagic fauna.
- Collection and analysis of benthic and fish data from video- and photo-sampling.
- Molecular biology techniques.
- Boat driving license (Colombia and South Africa).
- Standards of Training, Certification and Watchkeeping (STCW) 2010 certificate.
- Commercial Diver Class IV (South Africa).
- SCUBA Diving Instructor NAUI, SSI and PADI.

Other skills/Short Courses

- What's Your Big Idea. The University of North Carolina at Chapel Hill via Coursera.org.
- Quantitative PCR for Coral Biologists Workshop. Mote Tropical Research Laboratory. USA.
- Benthic Marine Invertebrate Workshop. Department of Biodiversity and Conservation Biology, University of the Western Cape, South Africa.
- Statistics for Biologists Course. INVEMAR, Colombia.
- Marine Invertebrate Biology Course. Discovery Bay Marine Laboratory, Jamaica.
- Emergency First Response Instructor.
- Enriched Air Nitrox Instructor.

RESEARCH OUTPUTS

Peer-review manuscripts

MONTOYA-MAYA P, SMIT KP, BURT AJ, FRIAS-TORRES S. (in press). Large-scale coral reef restoration could assist natural recovery in the Seychelles, Indian Ocean. *Nature Conservation*.

MONTOYA-MAYA P, SCHLEYER MH, MACDONALD AHH. 2016. Limited ecologically relevant genetic connectivity in the south-east African coral populations calls for reef-level management. *Marine Biology* 163:1–16.1.

FRIAS-TORRES S, GOEHLICH H, REVERET C, **MONTOYA-MAYA P**. 2015. Reef fishes recruited at midwater coral nurseries consume biofouling and reduce cleaning

time in Seychelles, Indian Ocean. *African Journal of Marine Science* 2338:1–6. doi: 10.2989/1814232X.2015.1078259

MONTOYA-MAYA P, MACDONALD AHH, SCHLEYER MH. 2014. Estimation of size at first maturity in two South African coral species. *African Journal of Marine Science* 36(4):513-516.

MONTOYA-MAYA P., A.H.H. MACDONALD, M.H. SCHLEYER. 2014. Cross-amplification and characterization of microsatellite loci in *Acropora austera* from the south-western Indian Ocean. *Genetics and Molecular Research* 13(1): 1244 – 1250.

KENKEL CD, AGLYAMOVA G, ALAMARU A, BHAGOOI R, CAPPER R, **MONTOYA-MAYA P**, et al. 2011 Development of gene expression markers of acute heat-light stress in reef-building corals of the genus *Porites*. *PLoS ONE* 6(10): e26914. doi:10.1371/journal.pone.0026914.

SÁNCHEZ JA, HERRERA S, NAVAS-CAMACHO R, RODRÍGUEZ-RAMÍREZ A, HERRON P, PIZARRO V, ACOSTA AR, CASTILLO PA, **MONTOYA P**, OROZCO C. 2010. White plague-like coral disease in remote reefs of the Western Caribbean. *Revista de Biología Tropical* May 58(1):145-154.

MONTOYA-MAYA P, STRYDOM N. 2009. A description of larval fish composition, abundance and distribution in nine south and west coast estuaries of South Africa. *African Zoology* 44(1): 75-92

MONTOYA-MAYA P, STRYDOM N. 2009. Zooplankton composition, abundance and distribution in selected south and west coast estuaries in South Africa. *African Journal of Aquatic Science* 34 (2): 147-157.

SÁNCHEZ JA, PIZARRO V, ACOSTA AR, CASTILLO PA, HERRON P, MARTÍNEZ JC, **MONTOYA P**, OROZCO C. 2005. Evaluating coral reef benthic communities from remote Caribbean atolls (Quitasueño, Serrana, and Roncador Banks, Colombia): multivariate approaches to recommend Marine Protected Areas for the Sea Flower Biosphere Reserve (Archipelago of San Andrés and Providencia). *Atoll Research Bulletin* 531:1-66.

Popular articles

MONTOYA-MAYA, P. 2009. Next Diving Experience: Coral spawning. <http://www.wetlens.co.za> 11 December, 2009.

MONTOYA-MAYA P. 2006. Praderas Marinas. En: Agenda del Mar 2006. Imprelibros S.A., Cali, Colombia.

MONTOYA-MAYA P., P. HEEMSTRA, E. HEEMSTRA. 2006. The East Coast Fish-Watch Project: a South African Collaboration of Scientists and Amateur Ichthyologists. *QUEST* 3(1): 26-27.

Chapters in Books

FRIAS-TORRES, **MONTOYA-MAYA PH**, SHAH NJ. 2015. Coral Reef Restoration Toolkit: A Field-Oriented Guide Developed in the Seychelles Islands. Nature Seychelles, Mahe, Republic of Seychelles.

BARRIOS LM, GOMEZ-LOPEZ DI, **MONTOYA P.** 2003. Estructura de la comunidad biológica asociada a las praderas en Colombia. In: Las praderas de pastos marinos en

Colombia: Estructura y distribución de un ecosistema estratégico. Díaz, J.M., L. M. Barrios y D. I. Gómez-López (Eds.). 2003. INVEMAR, Serie Publicaciones Especiales No. 10, Santa Marta, 160 p.

DIAZ JA, GOMEZ-LOPEZ DI, BARRIOS LM, **MONTOYA P**. 2003. Composición y distribución de las praderas de pastos marinos en Colombia. In: Las praderas de pastos marinos en Colombia: Estructura y distribución de un ecosistema estratégico. Díaz JM, Barrios LM y Gómez-López DI (Eds.). 2003. INVEMAR, Serie Publicaciones Especiales No. 10, Santa Marta, 160 p.

Presentations/Webinars

FRIAS-TORRES S, **MONTOYA-MAYA PH**, REVERET C, SHAH NJ. 2016. Large-scale coral reef restoration in Seychelles adapted to climate change. 13th International Coral Reef Symposium. 19 - 24 Junio 2016. Honolulu, Hawaii. Oral.

MONTOYA-MAYA PH, REVERET C, FRIAS-TORRES S, HENRI K, SHAH NJ. 2016. Coral gardening as a MPA management tool: a success story in the Republic of Seychelles. 13th International Coral Reef Symposium. 19 - 24 Junio 2016. Honolulu, Hawaii. Oral.

MONTOYA-MAYA PH. 2016. Reef Rescuers: Coral Gardening as an MPA Management Tool - Webinar. (The Reef Resilience Network, 2016). at <http://www.reefresilience.org/reef-rescuers-coral-gardening-as-an-mpa-management-tool/>

CNN Inside Africa - Reef rescuers race against time. June 9 2015. http://edition.cnn.com/videos/intl_tv-shows/2015/06/29/seychelles-biodiversity-inside-africa-b-spc.cnn

MONTOYA-MAYA PH, BURT AJ, REVERET C, ROWE K, FRIAS-TORRES S. Coral transplantation effects on fish and benthic community structure at a naturally damaged coral reef. 9th WIOMSA Scientific Symposium. 26 – 31 October 2015. Port Edward, South Africa. Oral.

SHAH NJ, **MONTOYA-MAYA PH**, FRIAS-TORRES S. 2015. Reef Restoration in the WIO: a success story in the Republic of Seychelles. 9th WIOMSA Scientific Symposium, 26 – 31 October 2015. Port Edward, South Africa. Oral.

MONTOYA-MAYA P, SCHLEYER MH, MACDONALD AHH. 2013. Small-scale vs large-scale ecological genetic connectivity on south-east African marginal reefs. 8th WIOMSA Symposium. 28 October - 2 November 2013. Maputo, Mozambique. Oral.

MONTOYA-MAYA P, SCHLEYER MH, MACDONALD AHH. 2013. Size at first maturity estimates in two species of corals from a high-latitude reef in South Africa. 8th WIOMSA Symposium. Maputo, Mozambique. 28 October - 2 November 2013. Poster.

MONTOYA-MAYA P, SCHLEYER MH, MACDONALD AHH. 2012. The ecological genetic connectivity of South African Marginal reefs. Symposium of Contemporary Conservation Practice. 22 – 26 October 2012. Pietermaritzburg, South Africa. Oral.

MONTOYA-MAYA P, SCHLEYER MH, MACDONALD AHH. 2011. Ecologically relevant genetic connectivity in the broadcast-spawning coral, *Acropora austera*, on south-east African coral reefs. 7th WIOMSA Symposium. 24 – 29 October 2011. Mombasa, Kenya. Oral.

MONTOYA-MAYA P, STRYDOM N. 2008. Ichthyoplankton from south and west coast estuaries of South Africa. 13th Southern African Marine Science Symposium. 29 June – 3 July 2008. Cape Town, South Africa. Poster.

MONTOYA, P. 2005. La industria del buceo y los arrecifes de coral: quien afecta a quien. Décima Reunión Nacional de Instructores de Buceo. Febrero, 2005. Cali, Colombia. Oral.

MONTOYA P, BARRIOS LM, DÍAZ JM. 2003. Evaluación de macro fauna asociada a praderas de pastos marinos en el Caribe colombiano. Memorias XII seminario nacional de ciencias del mar. Santa Marta – Colombia, 2003. p 130. Oral.

MONTOYA P, DOMÍNGUEZ E, ROA L, TABORDA A, GRIJALBA M. 2001. Nudibranchios y otros moluscos opisthobranchios de la Bahía Gaira, y zonas aledañas a Santa Marta (Colombia). In: Latin-American Congress of Marine Sciences (Congreso Latinoamericano de Ciencias del Mar COLACMAR; 9: 2001: San Andrés Isla). Resúmenes del IX Congreso Latinoamericano de sobre ciencias del Mar COLACMAR. San Andrés Isla - Colombia, 2001. p.189. Poster.

AWARDS, FELLOWSHIPS, AND GRANTS

- USAID Travel Grant to ICRS (US\$ 2800). 2016.
- USAID Extension Grant to Reef Rescuers Project v2 (US\$ 250 000). 2014.
- WIOMSA Travel Grant to 7th WIOMSA Symposium. Mombasa, Kenya (US\$ 385). 2011.
- WIOMSA MARG III “qPCR for Coral Biologists” Workshop (US\$ 2500). 2010.
- WIOMSA MASMA Programme Grant (US\$ 50000). 2010.
- ORI – NRF PhD Bursary (US\$ 24000). 2009.

PROFESSIONAL MEMBERSHIPS

- Red Colombiana de Restauración Ecológica, 2016 – Present.
- Professional Association of Diving Instructors, 2016 – Present.
- Society for Conservation Biology, 2014 – Present.
- International Society for Coral Reef Studies, 2014 – Present.

REFERENCES UPON REQUEST