

THOMAS M. DECARLO

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PROFESSIONAL POSITIONS

POSTDOCTORAL RESEARCH FELLOW *February 2019 – present*
RED SEA RESEARCH CENTER, KING ABDULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

POSTDOCTORAL RESEARCH ASSOCIATE *2017 – 2019*
UNIVERSITY OF WESTERN AUSTRALIA, SCHOOL OF EARTH SCIENCES AND OCEANS INSTITUTE
ARC CENTRE OF EXCELLENCE FOR CORAL REEF STUDIES

EDUCATION

MASSACHUSETTS INSTITUTE OF TECHNOLOGY /
WOODS HOLE OCEANOGRAPHIC INSTITUTION *February 2017*
PHD, JOINT PROGRAM IN OCEANOGRAPHY

UNIVERSITY OF SAN DIEGO BA in Marine Science *May 2012*

AWARDS AND FELLOWSHIPS

LIZARD ISLAND RESEARCH STATION POSTDOCTORAL FELLOWSHIP *2017-2018*

- \$11,000 research award

NSF GRADUATE RESEARCH FELLOWSHIP *June 2013-2016*

WOODS HOLE OCEANOGRAPHIC INSTITUTION

- Coastal Ocean Institute \$2,000 research award *November 2015*
- Coastal Ocean Institute \$1,500 research award *November 2013*
- Ocean Ventures Fund \$5,000 research award *May 2013*

PEER-REVIEWED PUBLICATIONS

DeCarlo T.M. & H.B. Harrison (2019). An enigmatic decoupling between heat stress and coral bleaching on the Great Barrier Reef. *PeerJ* 7, e7473.

DeCarlo T.M., Harrison H.B., Gajdzik L., Alaguada D., Rodolfo-Metalpa R., D'Olivo J., Liu G., Patalwala D., & M.T. McCulloch (2019). Acclimatization of massive reef-building corals to consecutive heatwaves. *Proceedings of the Royal Society B* 286, 20190235.

- DeCarlo T.M.**, Comeau S., Cornwall C.E., Gajdzik L., Guagliardo P., Sadekov P., Thillainath E.C., Trotter J., & M.T. McCulloch (2019). Application of *in vivo* and high-resolution *ex vivo* Raman spectroscopy to investigate marine bio-calcification. *Global Change Biology* 25, 1877-1888.
- DeCarlo T.M.**, Ross C., & M.T. McCulloch (2019). Diurnal cycles of coral calcifying fluid aragonite saturation state. *Marine Biology* 166, 28.
- D'Olivo J.P., Ellwood G., **DeCarlo T.M.**, & M.T. McCulloch (2019). Deconvolving the long-term impacts of ocean acidification and warming on coral biomineralisation. *Earth and Planetary Science Letters* 526, 115785.
- Comeau S., Cornwall C.E., Pupier C.A., **DeCarlo T.M.**, Alessi C., Trehern R., & M.T. McCulloch (2019). Flow-driven micro-scale pH variability affects the physiology of corals and coralline algae under ocean acidification. *Scientific Reports* 9, 12829.
- Ross C., **DeCarlo T.M.**, & M.T. McCulloch (2019). Calibration of Sr/Ca, Li/Mg, and Sr-U Paleothermometry in Branching and Foliose Corals. *Paleoceanography and Paleoclimatology* 34, 1271-1291.
- Reid E., **DeCarlo T.M.**, Cohen A.L., Wong G.T.F., Lentz S., Safaie A., Hall A., & K.A. Davis (2019) Internal waves influence the thermal and nutrient environment on a shallow coral reef. *Limnology and Oceanography* 64, 1949-1965.
- Comeau S., Cornwall C.E., **DeCarlo T.M.**, Doo S.S., Carpenter R.C., & M.T. McCulloch (2019). Resistance to ocean acidification in coral reef taxa is not gained by acclimatization. *Nature Climate Change* 9, 477-483.
- Mollica N.R., Cohen A.L., Alpert A.E., Barkley H.C., Brainard R.E., Carilli J.E., **DeCarlo T.M.**, Drenkard E.J., Lohmann P., Mangubhai S., Pietro K.R., Rivera H.E., Rotjan R.D., Scott-Buechler C., Solow A.R., & C.W. Young (2019). Skeletal records of bleaching reveal different thermal thresholds of Pacific coral reef assemblages. *Coral Reefs* 38, 743-757.
- D'Olivo J.P., Georgiou L., Falter J., **DeCarlo T.M.**, Irigoien X., Voolstra C.R., Roder C., Trotter J., & M.T. McCulloch (2019). Long-term impacts of the 1997-1998 bleaching event on the growth and resilience of massive *Porites* corals from the central Red Sea. *Geochemistry, Geophysics, Geosystems* 20, 2019GC008312.
- DeCarlo T.M.** (2018). Characterizing coral skeleton mineralogy with Raman spectroscopy. *Nature Communications* 9, 5325.
- DeCarlo T.M.**, Comeau S., Cornwall C.E., & M.T. McCulloch (2018). Coral resistance to ocean acidification linked to increased calcium at the site of calcification. *Proceedings of the Royal Society B* 285, 20180564.

- DeCarlo T.M.**, Farfan G., & H. Ren (2018). The origin and role of organic matrix in coral calcification: insights from comparing coral skeleton and abiogenic aragonite. *Frontiers in Marine Science* 5, 170.
- DeCarlo T.M.**, Holcomb M., & M.T. McCulloch (2018). Reviews and syntheses: Revisiting the boron systematics of aragonite and their application to coral calcification. *Biogeosciences* 15, 2819-2834.
- Farfan G.A., Cordes E.E., Waller R.G., **DeCarlo T.M.**, & C.M. Hansel (2018). Mineralogy of deep-sea coral aragonites as a function of aragonite saturation state. *Frontiers in Marine Science* 5, 473.
- Ross C.L., **DeCarlo T.M.**, & M.T. McCulloch (2018). Environmental and physiochemical controls on coral calcification along a latitudinal temperature gradient in Western Australia. *Global Change Biology* 25, 431-447.
- Barkley H.C., Cohen A.L., Mollica N.R., Brainard R.E., Rivera H.E., **DeCarlo T.M.**, Lohmann G.P., Drenkard E.J., Alpert A.E., Young C.W., Vargas-Angel B., Lino K.C., Oliver T.A., Pietro K.R., & V.H. Luu (2018). Repeat bleaching of a central Pacific coral reef over the past six decades (1960-2016). *Communications Biology* 1, 177.
- Cornwall C.E., Comeau S., **DeCarlo T.M.**, Moore B., D'Alexis Q., & M.T. McCulloch (2018). Resistance of corals and coralline algae to ocean acidification: physiological control of calcification under natural pH variability. *Proceedings of the Royal Society B* 285, 20181168.
- Comeau S., Cornwall C.E., **DeCarlo T.M.**, Krieger E., & M.T. McCulloch (2018). Similar controls on calcification under ocean acidification across unrelated reef taxa. *Global Change Biology* 24, 4857-4868.
- Ross C.L., Schoepf V., **DeCarlo T.M.**, & M.T. McCulloch (2018). Mechanisms and seasonal drivers of calcification in the temperate coral *Turbinaria reniformis* at its latitudinal limits. *Proceedings of the Royal Society B* 285, 20180215.
- DeCarlo T.M.**, D'Olivo J.P., Foster T., Holcomb M., Becker T., & M.T. McCulloch (2017). Coral calcifying fluid aragonite saturation states derived from Raman spectroscopy. *Biogeosciences* 14, 5253-5269.
- DeCarlo T.M.** & A.L. Cohen (2017). Dissepiments, density bands and signatures of thermal stress in *Porites* skeletons. *Coral Reefs* 36, 749-761.
- DeCarlo T.M.**, Cohen A.L., Wong G.T.F., Davis K.A., Lohmann P., & K. Soong (2017). Mass coral mortality under local amplification of 2°C ocean warming. *Scientific Reports* 7, 44586.
- DeCarlo T.M.**, Cohen A.L., Wong G.T.F., Shiah F.K., Lentz S.J., Davis K.A., Shamberger K.E.F., & P. Lohmann (2017). Community production modulates coral reef pH and the

sensitivity of ecosystem calcification to ocean acidification. *Journal of Geophysical Research – Oceans* 122, 745-761. *Selected for AGU “Editor’s Highlights” section

DeCarlo T.M. (2017). Deriving coral skeletal density from computed tomography (CT): effects of scan and reconstruction settings. *Matters Select*.

Gajdzik L., & **T.M. DeCarlo** (2017). The perfect calm: reoccurring mass die-offs on a remote coral atoll. *Matters*.

Alpert A.E., Cohen A.L., Oppo D.W., **DeCarlo T.M.**, Gaetani G.A., Hernandez-Delgado E.A., Winter A., & M.E. Gonneea (2017). Twentieth century warming of the tropical Atlantic captured by Sr-U paleothermometry. *Paleoceanography* 32, 146-160.

Lentz S.J., Davis K.A., Churchill J.H., & **T.M. DeCarlo** (2017) Coral reef drag coefficients – water depth dependence. *Journal of Physical Oceanography* 47, 1061-1075.

Ren H., Chen Y-C., Wang X.T., Wong G.T.F., Cohen A.L., **DeCarlo T.M.**, Weigand M.A., Mii H-S., & D.M. Sigman (2017). 21st Century Rise in Anthropogenic Nitrogen Deposition on a Remote Coral Reef. *Science* 356, 749-752.

Gonneea M.E., Cohen A.L., **DeCarlo T.M.**, & M.A. Charette (2017). Relationship between water and aragonite barium concentrations in aquaria reared juvenile corals. *Geochimica et Cosmochimica Acta* 209, 123-134.

Silbiger N.J. & **T.M. DeCarlo** (2017). Comment on “Bioerosion: the other ocean acidification problem”: on field studies and mechanisms. *ICES Journal of Marine Science* 74, 2489-2493.

Pan X., Wong G.T.F., **DeCarlo T.M.**, Tai J-H., & A.L. Cohen (2017). Validation of the remotely sensed nighttime sea surface temperature in the shallow waters at the Dongsha Atoll. *Terrestrial, Atmospheric and Oceanic Sciences* 28, 517-524.

DeCarlo T.M., Gaetani G.A., Cohen A.L., Foster G.L., Alpert A.E., & J. Stewart (2016). Coral Sr-U Thermometry. *Paleoceanography* 31, 626-638.

Holcomb M., **DeCarlo T.M.**, & M. McCulloch (2016). Factors affecting B/Ca ratios in synthetic aragonite. *Chemical Geology* 437, 67-76.

Alpert A.E., Cohen A.L., Oppo W.D., **DeCarlo T.M.**, Gove J.M., & C.W. Young (2016). Comparison of equatorial Pacific sea surface temperature variability and trends with Sr/Ca records from multiple corals. *Paleoceanography* 31, 252-265.

DeCarlo T.M., Gaetani G.A., Holcomb M. & A.L. Cohen (2015). Experimental determination of factors controlling U/Ca of aragonite precipitated from seawater: implications for interpreting coral skeleton. *Geochimica et Cosmochimica Acta* 162, 151-165.

DeCarlo T.M., Cohen A.L., Barkley H.C., Cobban Q., Young C., Shamberger K.E., Brainard R.E., & Y. Golbuu. (2015). Coral macrobioerosion is accelerated by ocean acidification and nutrients. *Geology* 43, 7-10.

DeCarlo T.M., Karnauskas K.B., Davis K.A., & G.T.F. Wong. (2015). Climate modulates internal wave activity in the Northern South China Sea. *Geophysical Research Letters* 42, 831-838.

Barkley H.C., Cohen A.L., Golbuu Y., Starczak V.R., **DeCarlo T.M.**, & K.E.F. Shamberger (2015). Changes in coral reef communities across a natural gradient in seawater pH. *Science Advances* 1, e1500328

Holcomb M., **DeCarlo T.M.**, Schoepf V., Dissard D., Tanaka K., & M. McCulloch. (2015). Cleaning and pre-treatment procedures for biogenic and synthetic calcium carbonate powders for determination of elemental and boron isotopic compositions. *Chemical Geology* 398, 11-21.

PRODUCTS

coralCT: software tool to analyze computerized tomography (CT) scans of coral skeletal cores for calcification and bioerosion rates. <https://zenodo.org/record/57855> doi:10.5281/zenodo.57855

TEACHING AND MENTORING

Graduate student supervision

- Claire Ross (PhD) – University of Western Australia
- Diego Alaguarda (masters) – Aix Marseille Universite

Courses and lectures

“Climate data and analysis”
Taught at KAUST

Spring semester 2019

Guest lecturer in “Global change and the marine environment”
University of Western Australia

May 2018

MIT award for best Teaching Assistant: “Numerical
Modeling and Data Analysis for Geochemistry”

Fall Semester 2014

CONFERENCES AND PRESENTATIONS

(TALK) CORAL REEF FUTURES SYMPOSIUM, BRISBANE (AUSTRALIA), 2018
DeCarlo T.M., Alaguarda D., Harrison H., Rodolfo-Metalpa R., Gajdzik L., D’Olivo J.P., Liu G., & M.T. McCulloch. Successive bleaching events increase thermal tolerance in *Porites* corals.

(TALK) ASIA PACIFIC CORAL REEF SYMPOSIUM, CEBU (PHILIPPINES), 2018
DeCarlo T.M., Alaguarda D., Harrison H., Rodolfo-Metalpa R., Gajdzik L., D'Olivo J.P., Liu G., & M.T. McCulloch. Coral thermal stress histories over the past two centuries from the northern Great Barrier Reef and Coral Sea.

(TALK) GOLDSCHMIDT, PARIS (FRANCE), 2017
DeCarlo T.M., D'Olivo J.P., Foster T., Holcomb M., Comeau S., Cornwall C., & M.T. McCulloch. Coral calcifying fluid aragonite saturation states derived from Raman spectroscopy.

(POSTER) AMERICAN GEOPHYSICAL UNION FALL MEETING, SAN FRANCISCO (U.S.A.), 2016
DeCarlo T.M., Gaetani G.A., Cohen A.L., Foster G.L., Alpert A.E., & J. Stewart (2016). Coral Sr-U Thermometry.

(TALK) CLIMATE ANALYSIS WORKSHOP, WOODS HOLE OCEANOGRAPHIC INSTITUTION, 2016
DeCarlo T.M., Karnauskas K.B., Davis K.A., & G.T.F. Wong. (2016). Climate modulates internal wave activity in the Northern South China Sea.

(TALK) 13TH INTERNATIONAL CORAL REEF SYMPOSIUM, HONOLULU (U.S.A.), 2016
DeCarlo T.M., Cohen A.L., Wong G.T.F., Shiah F.K., Lentz S.J., Shamberger K.E.F., and Davis K.A. Interaction Between Community Metabolism and Reef Water pH on a Coral Atoll in the South China Sea.

(TALK) UNIVERSITY OF CALIFORNIA, IRVINE, OCEAN BIOGEOCHEMISTRY SEMINAR, 2015
DeCarlo T.M., Cohen A.L., Davis K.A., Lentz S., & K.E.F. Shamberger. Rapid calcification on a coral atoll nourished by internal waves.

(TALK) ACADEMIA SINICA, TAIWAN, OCEAN ACIDIFICATION WORKSHOP, 2015
DeCarlo T.M., Cohen A.L., Davis K.A., Lentz S., & K.E.F. Shamberger. Production and calcification rates on Dongsha Atoll: physical and ecological drivers.

(TALK) AMERICAN GEOPHYSICAL UNION FALL MEETING, SAN FRANCISCO (U.S.A.), 2014
DeCarlo T.M., Gaetani G.A., Holcomb M. & A.L. Cohen. Experimental determination of factors controlling U/Ca of aragonite precipitated from seawater: implications for interpreting corals.

(TALK) INDONESIA ASSOCIATION OF OCEANOLOGISTS, BALIKPAPAN (INDONESIA), 2014
DeCarlo T.M., Cohen A.L., Barkley H.C., Cobban, Q., Young C., Shamberger K.E., Brainard R.E., Golbuu Y. (2014) Coral Reef Bioerosion Rates.

(TALK) NANYANG TECHNOLOGICAL UNIVERSITY DEPARTMENT SEMINAR, SINGAPORE, 2014
DeCarlo T.M., Cohen A.L., Barkley H.C., Cobban, Q., Young C., Shamberger K.E., Brainard R.E., Golbuu Y. (2014) Coral bioerosion is accelerated by ocean acidification and nutrients.

(TALK) ACADEMIA SINICA, TAIWAN, PI MEETING ON SOUTH CHINA SEA RESEARCH, 2014
DeCarlo T.M., and A.L. Cohen (2014) Calcification rates on Dongsha Atoll, South China Sea.

(POSTER) OCEAN SCIENCES MEETING, HONOLULU (U.S.A.), 2014
DeCarlo T.M., Cohen A.L., Barkley H.C., Cobban, Q., Young C., Shamberger K.E., Brainard R.E., Golbuu Y. (2014) Coral reef bioerosion is accelerated by ocean acidification and nutrients.

(POSTER) GRADUATE CLIMATE CONFERENCE WOODS HOLE, MASSACHUSETTS, 2013
DeCarlo T.M., Gaetani G.A., Cohen A.L., Holcomb M. (2013) Climate signals recorded in coral skeletons: from proxy development to paleoclimate interpretation.

(TALK) WOODS HOLE OCEANOGRAPHIC INSTITUTION PALEO LUNCH, 2013
DeCarlo T.M., Gaetani G.A., Cohen A.L., Holcomb M. (2013) Reconstructing ocean temperature with multiple element ratios in coral skeletons.

(POSTER) INTERNATIONAL CONFERENCE ON PALEOCEANOGRAPHY, BARCELONA (SPAIN), 2013
DeCarlo T.M., Gaetani G.A., Cohen A.L., Holcomb M. (2013) Coral skeleton U/Ca as a proxy for the carbonate chemistry of the calcifying fluid.

(TALK) AMERICAN GEOPHYSICAL UNION FALL MEETING, SAN FRANCISCO (U.S.A.), 2011
DeCarlo T.M., Gaetani G.A., Cohen A.L., Zinke J., Grove C. (2011) Rayleigh-Based Multi-Element (RBME) Coral Paleothermometry: New Developments and Applications.

FIELDWORK

RED SEA, SAUDI ARABIA – coral coring	<i>February-April 2019</i>
CORAL SEA, AUSTRALIA – coral coring	<i>December 2017</i>
GREAT BARRIER REEF, AUSTRALIA (lead) – coral coring	<i>October 2017</i>
CORAL BAY, AUSTRALIA – <i>In situ</i> coral staining	<i>May 2017</i>
JARVIS ISLAND (co-lead) – ecological surveys, coral coring	<i>November 2015</i>
DONGSHA ATOLL, TAIWAN (lead) – coral coring for calcification histories, <i>in situ</i> reef metabolism rates, reef heat budgets	<i>Summers 2013-2015</i>
PALAU – coral culturing experiments, coral coring, <i>in situ</i> reef community metabolism studies	<i>April 2013</i> <i>January 2015</i>
CARIBBEAN (US VIRGIN ISLANDS, MARTINIQUE, BARBADOS, CURACAO) (co-lead) – coral coring for calcification histories	<i>December 2013</i>
US VIRGIN ISLANDS – coral community surveys	<i>August 2013</i>
BERMUDA – coral culturing experiments, coral coring	<i>2012, 2013</i>