

EXPERTISE

My research program combines omics techniques with biogeochemistry and microbial ecology to uncover the underlying mechanisms that influence ecosystem function. Using a combination of shotgun metagenomic sequencing, analytical chemistry, and microbiology I have shown how coral reef-associated microbes change in response to local and global stressors. My working group is currently developing a novel metabolomic pipeline to link the chemical composition of fixed carbon compounds exuded by benthic primary producers with the metabolic genes encoded by marine microbial communities that facilitate transformations of this pool of dissolved organic matter through remineralization. By identifying which members of the microbial community can utilize what carbon substrates, we can better understand the principles governing microbial metabolism, which ultimately drives ecosystem bioenergetics.

PROFESSIONAL HIGHLIGHTS

- Google Scholar Citations *h*-index of 23, over 5000 citations
- 35 peer reviewed research articles, including high impact journals *Nature*, *PNAS*, *Nature Communications*, *Nature Microbiology*, *Proceedings of the Royal Society-B*, *ISMEJ*, and *L&O Letters*
- Awarded \$1.8M in federal funding from the National Science Foundation and the Department of Energy
- Led or co-authored 25 articles in the field of genomics, many of which established novel methods for sample preparation and sequence analyses
- Published the first shotgun sequence metagenomic library of a coral holobiont
- Established US collaborations for research and funding at SDSU, UCSB, UCSD, SIO, University of Hawaii, the University of Chicago, and with NOAA Fisheries
- Established international collaborations at NIOZ (The Netherlands), Bangor University (Liverpool, UK), CARMABI Research Station (Curacao), and Gump Research Station (Moorea)
- Undergraduate teaching in Microbiology, Cell and Molecular Biology, Marine Viruses, Coral Reef Ecology, and Metagenomics
- Extensive mentorship experience: 34 students (>50% women and >30% underrepresented groups) comprising PhD (8), Masters (12), and Undergrads (14) both from the US and international students from Mexico, Ecuador, Brazil, Sri Lanka, Malaysia, Indonesia, China, Vietnam, India, and the Netherlands.

EDUCATION

San Diego State University	Biology	BS, 2003
UCSD & SDSU Joint Doctoral Program	Cell & Molecular Biology	PhD, 2013
San Diego State University	Marine Microbial Ecology	Postdoc, 2014

PROFESSIONAL APPOINTMENTS

Assistant Research Professor – San Diego State University, Department of Biology, 2014 – present

OTHER PROFESSIONAL ACTIVITIES

Faculty Lecturer – San Diego State University, Department of Biology, 2011- 2018

Courses: Biol 350 - General Microbiology

Teaching Assistant – San Diego State University, Department of Biology, 2009 – 2011

Courses: Advanced Cell and Molecular Biol. Lab, Introduction to Cell and Molecular Biol. Lab

Lab Manager – San Diego State University, Department of Biology, 2002 – 2008

Research Assistant - San Diego State University, Department of Biology, 2001 – 2002

FUNDING

NSF IOS-1848671 9/2018 –8/2021

Convergence: RAISE: Engineering Coral Reef Recovery

PIs: A. J. Wagoner Johnson, L. Wegley Kelly, B. W. Fouke, G. Juarez, K. L. Marhaver

Award to Kelly: \$234,229

DOE ARPA-E 8/2019 – 7/2021

KRuMBS: Kyphosid Ruminant Microbial Biodigestor of Seaweeds

PIs: Neil Sims, L. Wegley Kelly, C. Nelson, P. Dorrestein, L. Laurens, B. Simmons

Award to Kelly: \$331,620

NSF OCE – 1538567 12/2015 – 11/2019

Collaborative Research: Dissolved organic matter feedbacks in coral reef resilience: The genomic & geochemical basis for microbial modulation of algal phase shifts.

PIs: C. Nelson, L. Wegley Kelly, C. Carlson

Award to Kelly: \$394,005

NSF: OCE-Biological Oceanography 5/21/17 – 11/30/18

ROA Supplement to 1538567

PI: L. Wegley Kelly

Total Award Amount: \$55,918

NSF OCE-0927415 11/2009 – 10/2013

Collaborative Research: Emerging Topics in Biogeochemical Cycling (ETBC): The coupling between DOM, algae and microbes on coral reef platforms

Role: Key Personnel (developed and wrote proposal, facilitated field and lab research, wrote manuscripts and reports)

PIs: F. Rohwer, C. Carlson, J. Smith, J. Leichter

Award to Kelly & Rohwer: \$753,508

PATENTS

F Rohwer, **L Wegley**. High-throughput methods for quantifying cells in environmental and laboratory samples. Patent 8,563,251, 2013.

PUBLICATIONS

>5000 Citations

h-index 23

i10-index 26

Roach et al. 2020 PNAS.

Wegley Kelly, L.*, C. E. Nelson*, A. F. Haas*, D. S. Naliboff, S. Calhoun, C. A. Carlson, R. A. Edwards, M. D. Fox, M. Hatay, M. D. Johnson, E. L. A. Kelly, YW Lim, S. Macherla, Z. A. Quinlan, G. G. Z. Silva, M. J.A. Vermeij, B. Zgliczynski S. A. Sandin, J. E. Smith, and F. Rohwer (2019). Diel population and functional synchrony of microbial communities on coral reefs. **Nature Communications** 10 (1): e1691.

James, A. K., **L. Wegley Kelly**, C. E. Nelson, E. G. Wilbanks, C. A. Carlson (2019). Elevated pCO₂ Alters Marine Heterotrophic Bacterial Community Composition and Metabolic Potential in Response to a Pulse of Phytoplankton Organic Matter. **Environmental Microbiology** 21(2):541-556.

Wegley Kelly, L., A. F. Haas, and C. E. Nelson (2018). Ecosystems microbiology of coral reefs: Linking genomic, metabolomic and biogeochemical dynamics from animal symbioses to reefscape processes. **mSystems** 3 (2) e00162-17.

Quinlan, Z. A., Remple, K. , Fox, M. D., Silbiger, N. J., Oliver, T. A., Putnam, H. M., **Wegley Kelly, L.** , Carlson, C. A., Donahue, M. J. and Nelson, C. E. (2018), Fluorescent organic exudates of corals and algae in tropical reefs are compositionally distinct and increase with nutrient enrichment. **Limnol. Oceanogr.**, 3: 331-340. doi:10.1002/lol2.10074

Nakajima, R., A. F. Haas, C. B. Silveira, E. L.A. Kelly, J. E. Smith, S. A. Sandin, **L. Wegley Kelly**, F. Rohwer, N. Nakatomi, H. Kurihara (2018). Release of dissolved and particulate organic matter by the soft coral Lobophytum and subsequent microbial degradation. **J. Expt Mar Biol & Ecol** 504: 53-60.

Petras, D., I. Koester, R. Da Silva, B. M. Stephens, A. F. Haas, C. E. Nelson, **L. Wegley Kelly, L.** I. Aluwihare, P. C. Dorrestein (2017). High-resolution liquid chromatography tandem mass spectrometry enables large scale molecular characterization of dissolved organic matter. **Frontiers in Marine Science** 4: 405.

Roach, Ty N.F., ML Abieri, EE George, B Knowles, DS Naliboff, CA Smurthwaite, **L Wegley Kelly**, AF Haas, and F Rohwer (2017). Microbial bioenergetics of coral-algal interactions. **PeerJ** 5:e3423.

Knowles, B., B. Bailey, L. Boling, M. Breitbart, A. Cobián-Güemes, J. del Campo, R. Edwards, B. Felts, J. Grasis, A. F. Haas, P. Katira, **L. W. Kelly**, A. Luque, J. Nulton, L. Paul, G. Peters, N. Robinett, S. Sandin, A. Segall, C. Silveira, M. Youle & F. Rohwer (2017) Variability and host density independence in inductions-based estimates of environmental lysogeny. **Nature Microbiology** 2: e17064.

Haas, Andreas F, MFM Fairoz, **LW Kelly**, CE Nelson, EA Dinsdale, RA Edwards, S Giles, M Hatay, N Hisakawa, B Knowles, YW Lim, H Maughan, O Pantos, T Roach, SE Sanchez, CB Silveira, SA Sandin, JE Smith, and F Rohwer (2016). Global microbialization of coral reefs. **Nature Microbiology** 1: e16042.

Quistad, Steven D., Yan Wei Lim, Genivaldo Gueiros Z. Silva, Craig E. Nelson, Andreas F. Haas, **Linda Wegley Kelly**, Robert A. Edwards, Forest L. Rohwer (2016). Using viromes to predict novel immune proteins in non-model organisms. **Proceedings of the Royal Society B** 283(1837): 20161200.

Knowles, B., C. B. Silveira, B. A. Bailey, K. Barott, V. A. Cantu, A. G. Cobián-Güemes, F. H. Coutinho, E. A. Dinsdale, B. Felts, K. A. Furby, E. E. George, K. T. Green, G. B. Gregoracci, A. F. Haas, J. M. Haggerty, E. R. Hester, N. Hisakawa, **L. W. Kelly**, Y. W. Lim, M. Little, A. Luque, T. McDole-Somera, K. McNair, L. S. de Oliveira, S. D. Quistad, N. L. Robinett, E. Sala, P. Salamon, S. E. Sanchez, S. Sandin, G. G. Z. Silva, J. E. Smith, C. Sullivan, C. Thompson, M. J. A. Vermeij, M. Youle, C. Young, B.

- Zgliczynski, R. Brainard, R. A. Edwards, J. Nulton, F. Thompson and F. Rohwer (2016). Lytic to temperate switching of viral communities. **Nature** 531: 466–470.
- Wegley Kelly, L**, GJ Williams, KL Barott, CA Carlson, EA Dinsdale, RA Edwards, AF Haas, M Haynes, YW Lim, T McDole, CE Nelson, E Sala, SA Sandin, JE Smith, MJA. Vermeij, M Youle, and F Rohwer (2014). Local genomic adaptation of coral reef-associated microbiomes to gradients of natural variability and anthropogenic stressors. **Proceedings of the National Academy of Sciences, USA**. 111 (28): 10227-10232.
- Haas AF, Knowles B, Lim YW, McDole Somera T, **Kelly LW**, Hatay M, Rohwer F (2014). Unraveling the unseen players in the ocean - a field guide to water chemistry and marine microbiology. **J Vis Exp**. 93:e52131.
- Lim YW, Cuevas DA, Silva GGZ, Aguinaldo K, Dinsdale E, Haas AF, Hatay, M, Sanchez SE, **Kelly LW**, Dutilh BE, Harkins TT, Lee CC, Tom W, Sandin SA, Smith JE, Zgliczynski B, Vermeij MJA, Rohwer F, Edwards RA (2014). Sequencing at sea: Challenges and experiences in Ion Torrent PGM sequencing during the 2013 Southern Line Islands Research Expedition. **PeerJ** 2:e433.
- Haas, A.F., C.E. Nelson, F. Rohwer, **L. Wegley Kelly**, C. A. Carlson, J. J. Leichter, and J.E. Smith. (2013). Influence of coral and alga exudates on microbially mediated reef metabolism. **PeerJ** 1: e108.
- Nelson, C.E., S.J. Goldberg, **L.W. Kelly**, A.F. Haas, J.E. Smith, F. Rohwer, and C.A. Carlson (2013). Coral and macroalgal exudates vary in neutral sugar composition and differentially enrich reef bacterioplankton lineages. **The ISME Journal** 7: 962–979.
- Wegley Kelly, L**, K. L. Barott, E. Dinsdale, A. M. Friedlander, B. Nasrat, D. Obura, E. Sala, S. Sandin, J. E. Smith, M. J. A. Vermeij, G. J. Williams, D. Willner, and F. Rohwer (2012). Black reefs: Iron induced phase-shift on coral reefs. **The ISME Journal** 6: 638–649.
- ***Highlighted in:
- Black Reefs: When the ship hits the reef | Enric Sala
National Geographic: Voices | 1 Sept 2011
<http://voices.nationalgeographic.com/2011/09/01/black-reefs-when-the-ship-hits-the-reef/>
- Microbial ecology: Reefs wrecked by shipwrecks | Nature Research Highlights
Nature 477, 253. doi:10.1038/477253b | 15 Sept 2011 <http://www.nature.com/nature/journal/v477/n7364/full/477253b.html>
- Excessive iron leads to dying “Black Reefs,” why iron control is essential to home aquaria | Brian Blank
Reef Builders | 15 Sept 2011
<http://reefbuilders.com/2011/09/15/iron-black-reefs/>
- Shipwreck Microbiology | Merry Youle
Small Things Considered | 3 Oct 2011 <http://schaechter.asmblog.org/schaechter/2011/10/shipwreck-microbiology.html>
- Haas AF, Nelson CE, **Kelly LW**, Carlson CA, Rohwer F, et al. (2011) Effects of Coral Reef Benthic Primary Producers on dissolved organic carbon and microbial activity. **PLoS One** 6 (11): e27973.
- Beltran Rodriguez-Mueller, L. Li, **L. W. Kelly**, M. Furlan, F. Angly, et al. (2010) Viral and microbial community dynamics in four aquatic environments. **The ISME Journal** 4: 739-751.
- Angly, FE, D Willner, A Prieto-Davó, RA Edwards, R Schmieder, R Vega-Thurber, DA Antonopoulos, K Barott, M T Cottrell, C Desnues, EA Dinsdale, M Furlan, M Haynes, MR Henn, Y Hu, DL Kirchman, T McDole, JD McPherson, F Meyer, RM Miller, E Mundt, RK Naviaux, B Rodriguez-Mueller, R Stevens, **L Wegley**, L Zhang, B Zhu, and F Rohwer (2009). The GAAS metagenomic tool and its estimations of viral and microbial average genome size in four major biomes. **PLoS computational biology** 5 (12): e1000593.

- Thurber, RLV, D. Willner-Hall, B. Rodriguez-Mueller, C. Desnues, RA Edwards, F. Angly, E. Dinsdale, **L. W. Kelly**, F. Rohwer (2009). Metagenomic analysis of stressed coral holobionts. **Environmental Microbiology** 11 (8): 2148-2163.
- Thurber, RLV, M Haynes, M Breitbart, **L Wegley**, and F Rohwer (2009). Laboratory procedures to generate viral metagenomes. **Nature protocols** 4 (4): 470-483.
- Dinsdale, EA, RA Edwards, D Hall, F Angly, M Breitbart, JM Brulc, M Furlan, C Desnues, M Haynes, L Li, L McDaniel, M Moran, KE Nelson, C Nilsson, R Olson, J Paul, B Rodriguez-Brito, Y Ruan, BK Swan, R Stevens, DL Valentine, RV Thurber, **L Wegley**, BA White, F Rohwer (2009). Functional metagenomic profiling of nine biomes. **Nature** 452: 629-632.
- Dinsdale, EA, O Pantos, S Smriga, RA Edwards, F Angly, **L Wegley**, M Hatay, et al. (2008). Microbial ecology of four coral atolls in the Northern Line Islands. **PLoS One** 3 (2): e1584.
- Thurber, RLV, K.L. Barott, D Willner, H. Liu, B. Rodriguez-Mueller, C. Desnues, R.A. Edwards, M. Haynes, F.E. Angly, **L. Wegley**, F. Rohwer (2008) Metagenomic analysis indicates that stressors induce production of herpes-like viruses in the coral *Porites compressa*. **Proceedings of the National Academy of Sciences, USA**. 105 (47): 18413–18418.
- Desnues, C., B. Rodriguez-Brito, S. Rayhawk, S. Kelley, T. Tran, M. Haynes, H. Liu, M. Furlan, **L. Wegley**, B. Chau, Y. Ruan, D. Hall, F. E. Angly, R. A. Edwards, L. Li, R.L.V. Thurber, R. P. Reid, J. Siefert, V. Souza, D. L. Valentine, B. K. Swan, M. Breitbart, and F. Rohwer (2008). Biodiversity and biogeography of phages in modern stromatolites and thrombolites. **Nature** 452 (7185): 340-343.
- Wegley, L.**, R. Edwards, B. Rodriguez-Brito, H. Liu, F. Rohwer (2007). Metagenomic analysis of the microbial community associated with the coral *Porites astreoides*. **Environmental Microbiology** 9 (11): 2707-2719.
- Beman, J. M., K. J. Roberts, **L. Wegley**, F. Rohwer, CA Francis (2007). Distribution and diversity of archaeal ammonia monooxygenase genes associated with corals. **Applied & Environmental Microbiology** 73 (17): 5642-5647.
- Wegley, L.**, P. Mosier-Boss, S. Lieberman, J. Andrews, A. Graff-Baker, F. Rohwer (2006). Rapid estimation of microbial numbers in water using bulk fluorescence. **Environmental Microbiology** 8 (10): 1775-1782.
- Edwards, R. A., B. Rodriguez-Brito, **L. Wegley**, M. Haynes, M. Breitbart, D. M. Peterson, M. O. Saar, S. Alexander, E. C. Alexander Jr., F. Rohwer (2006). Using pyrosequencing to shed light on deep mine microbial ecology under extreme hydrogeologic conditions. **BMC Genomics** 7: 57.
- Casas, V., D. I. Kline, **L. Wegley**, Y. N. Yu, M. Breitbart, F. Rohwer (2004). Widespread association of a Rickettsiales-like bacterium with reef-building corals. **Environmental Microbiology** 6 (11): 1137-1148.
- Sano, E., S. Carlson, **L. Wegley**, F. Rohwer (2004). Movement of viruses between biomes. **Applied & Environmental Microbiology** 70 (10): 5842-5846.
- Wegley, L.**, Y. Yu, M. Breitbart, V. Casas, D. Kline, F. Rohwer (2004). Coral-associated Archaea. **Marine Ecology Progress Series** 273: 89-96.
- Breitbart, M., **L. Wegley**, S. Leeds, T. Schoenfeld, F. Rohwer (2004). Phage community dynamics in hot springs. **Applied & Environmental Microbiology** 70: 1633-1640.
- Mosier-Boss P. A., S. H. Lieberman, J. M. Andrews, **L. Wegley**, M. Breitbart, F. Rohwer (2003). Use of fluorescently labeled phage in the detection and identification of bacterial species. **Applied Spectroscopy** 57 (9): 1138-1144.

PRESENTATIONS

- San Diego State University. San Diego, CA. 2020. Invited Speaker
Scripps Institution of Oceanography. La Jolla, CA. 2019. Invited Speaker
Florida International University. Miami, FL. 2019. Invited Speaker

San Diego Coral Club. San Diego, CA. 2019. Invited Speaker
Reef Futures. Key Largo, FL. 2018. Invited Speaker
Schmidt Ocean Institute Data Analytics Workshop. San Diego, CA. 2018. Invited Speaker
STEAM Night Language Academy. San Diego, CA. 2018. Presenter
Ocean Science Meeting, ASLO. Portland, OR. 2018. Speaker
Nature Conferences: Environmental microbial biofilms and human microbiomes. 2017. Nanyang Technological University, Singapore. Invited Speaker
Marine biodiversity, conservation, & global change. 2017. UCSD-SIO. Invited Lecturer
Ocean Discovery Inst. STEM speaker 5th grade fieldtrip. 2016. Invited Speaker
Introduction to Phage Biology Seminar. San Diego. 2016. Invited Speaker
International Coral Reef Symposium. Honolulu. 2016. Speaker
UCI Microbiology Group Seminar. Irvine, CA. 2016. Invited Speaker
Marine Virus Lecture for SIO-290 Course. UCSD-SIO, San Diego. 2016. Invited Speaker
Metagenomics Workshop. San Diego. 2015. Invited Speaker
Ocean Discovery Inst. STEM speaker 3rd grade LJ Tide Pools. 2015. Invited Speaker.
PIRE Class-Moral Reef Microbiology Seminar. San Diego. 2015. Invited Speaker
UCSB Departmental Seminar, Santa Barbara. 2015. Invited Speaker.
American Society of Limnology and Oceanography. Granada, Spain. 2015. Speaker.
Ocean Discovery Inst. STEM speaker 5th grade Adam Elementary. 2014. Invited Speaker
SDSU Biology Departmental Seminar, San Diego. 2014. Speaker.
CIFAR: Integrated Microbial Biodiversity Program. Whistler, BC. 2013. Speaker
SDSU Biology Department Graduate Student Seminar, San Diego. 2013. Speaker
American Society of Limnology and Oceanography. Salt Lake City, UT. 2012. Speaker
SDSU Biology Department Graduate Student Seminar, San Diego. 2010, 2011, and 2012. Speaker.
American Society for Microbiology, San Diego. 2010. Poster.
SDSU Biology Department Graduate Student Seminar, San Diego. 2009. Speaker.
SDSU Microbiology Journal Club. San Diego. 2008. Speaker
San Diego Microbiology Group Annual Meeting. San Diego. 2008. Poster.
Metagenomics meeting at CalIT2. San Diego, CA. 2007. Poster.
San Diego Microbiology Group Annual Meeting. San Diego. 2007. Poster.
American Society of Limnology and Oceanography. Santa Fe, NM. 2007. Poster.
San Diego Microbiology Group Annual Meeting. San Diego. 2006. Poster.
ASLO Ocean Sciences Meeting. Honolulu, HI. 2006. Participant.
San Diego Microbiology Group Annual Meeting. San Diego. 2005. Poster.
International Society of Microbial Ecology. Cancun, Mexico. 2004. Poster.
California State University Student Research Competition. Stanislaus, CA. 2003. Speaker.
American Society of Limnology and Oceanography. Salt Lake City, UT. 2003. Poster.

SCIENTIFIC OUTREACH and SYNERGISTIC ACTIVITIES

Media: Guest scientist on Oral Microbiota segment aired on KUSI News; Production of a Seek-out-Science public awareness project about “Coral Reef Systems” aired on KPBS.
San Diego Coral Club: Coordinator (2007-2008), participant and presenter (2007 – present).
K-12 outreach: Ocean Discovery Institute, Language Academy STEM workshop (2014-2016), Rancho Santa Fe Elementary, Logan Heights Elementary
ODI Discoverers Field Day - Community Science – (2014-present)

CERTIFICATIONS

Scientific diver certified

Fieldwork expeditions: Research cruise to the Northern Line Islands; Gump Research station on Moorea; Smithsonian Tropical Research Institute in Bocas del Toro, Panama; Hawaii Institute of Marine Biology, HI; CARMABI, Curacao

Software and programming languages: Linux, Python, R, SPSS

REVIEWERSHIPS and ASSOCIATIONS

Ad hoc Reviewer for: Applied and Environmental Microbiology, Aquatic Microbial Ecology, Austrian Science Fund (FWF), BMC Microbiology, Coral Reefs, Environmental Microbiology, French National Research Agency, Frontiers in Marine Science, Frontiers in Microbiology, Integrative and Comparative Biology, ISME Journal, Limnology & Oceanography, Marine Biology, Microbial Ecology, National Science Foundation, PeerJ, PLoS One, PNAS, Nature Communications.

Member of: American Society for Limnology & Oceanography (ASLO), American Society for Microbiology (ASM), International Society for Reef Studies (ISRS), San Diego Microbiology Group (SDMG), San Diego Coral Club.