

# RAEL HORWITZ, PhD

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## EDUCATION

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2010-16 Doctor of Philosophy in Biology: Bar-Ilan University (BIU) and the Interuniversity Institute for Marine Sciences (IUI), Israel

Advisor: Prof Maoz Fine

Thesis: Anthozoan response to high  $p\text{CO}_2$  in marine environments

2006-08 Master of Science in Biotechnology: University of Cape Town (UCT), South Africa

Advisor: Prof Vernon Coyne

Thesis: Characterization of an intracellular bacterium infecting the digestive gland of the South African abalone, *Haliotis midae*

2002-05 Bachelor of Science in Marine Sciences and Ocean Environment (Magna cum Laude): Ruppin Academic Center, Israel

Dual Majors in Biology and Broad Field Science

## POSITIONS HELD

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2017-present Lab Manager: Institute of Evolution and Department of Evolutionary & Environmental Biology, Faculty of Natural Sciences, University of Haifa, Israel

2016-17 Postdoctoral Researcher: Centre de Recherche Insulaire et Observatoire de l'Environnement (CRIOBE) and Laboratoire d'Excellence (CORAIL), French Polynesia

## PEER-REVIEWED PUBLICATIONS

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9. **Horwitz R**, Jackson M, Mills SC (2017) The embryonic life history of the tropical sea hare *Stylocheilus striatus* (Gastropoda: Opisthobranchia) under ambient and elevated ocean temperatures. *PeerJ* 5, e2956 [1 citation]
8. **Horwitz R**, Hoogenboom MO, Fine M (2017) Spatial competition dynamics between reef corals under ocean acidification. *Nature Scientific Reports* 7, 40288
7. Mullen AD, Treibitz T, Roberts PLD, Kelly ELA, **Horwitz R**, Smith JE, Jaffe JS (2016) Underwater microscopy for *in situ* studies of benthic ecosystems. *Nature Communications* 7, 12093 doi: 10.1038/ncomms12093 [3 citations]
6. Oren A, Abu-Ghosh S, Argov T, Kara-Ivanov E, Shitrit D, Volpert A, **Horwitz R** (2015) Expression and functioning of retinal-based proton pumps in a saltern crystallizer brine. *Extremophiles* 20, 69-77 [2 citations]
5. **Horwitz R**, Mouton A, Coyne VE (2015) Characterization of an intracellular bacterium infecting the digestive gland of the South African abalone *Haliotis midae*. *Aquaculture* 451, 24-32 [1 citation]
4. **Horwitz R**, Borell EM, Yam R, Shemesh A, Fine M (2015) Natural high  $p\text{CO}_2$  increases autotrophy in *Anemonia viridis* (Anthozoa) as revealed from stable isotope (C, N) analysis. *Nature Scientific Reports* 5, 8779; doi:10.1038/srep08779 [5 citations]

3. **Horwitz R**, Borell EM, Fine M, Shaked Y (2014) Trace element profiles of the sea anemone *Anemonia viridis* living nearby a natural CO<sub>2</sub> vent. *PeerJ* 2, e538; doi:10.7717/peerj.538 [5 citations]
2. **Horwitz R**, Fine M (2014) High CO<sub>2</sub> detrimentally affects tissue regeneration of Red Sea corals. *Coral Reefs* 33, 819-829 [9 citations]
1. Borell EM, Steinke M, **Horwitz R**, Fine M (2014) Increasing pCO<sub>2</sub> correlates with low concentrations of intracellular dimethylsulfoniopropionate in the sea anemone *Anemonia viridis*. *Ecology and Evolution* 4, 441-449 [6 citations]

## DATA PRODUCTS

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2. **Horwitz R**, Borell EM, Yam R, Shemesh A, Fine M, Yang Y (2015) Natural high pCO<sub>2</sub> increases autotrophy in *Anemonia viridis* (Anthozoa) as revealed from stable isotope (C, N) analysis. PANGAEA Data Repository doi:10.1594/PANGAEA.846688
1. **Horwitz R**, Borell EM, Fine M, Shaked Y, Yang Y (2014) Trace Element profiles of the sea anemone *Anemonia viridis* living nearby a natural CO<sub>2</sub> vent. PANGAEA Data Repository doi:10.1594/PANGAEA.838925

## SCIENTIFIC TECHNIQUES & GENERAL SKILLS

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*Molecular and Cell Biology*: DNA, RNA and protein isolations, restriction enzyme digests and mapping, sub-cloning, southern hybridization, radioactive labeling of DNA probes (qualified radioactive worker), *in situ* hybridization, PCR and primer design, sequence editing, bioinformatic analysis, bacterial and yeast cell culture (aseptic technique), algal measurements (quantification and chlorophyll), histological imaging analyses, stable isotope measurements

*Physiology*: Measurements of basic metabolism and health status of aquatic organisms, calcification (radioisotope technique, alkalinity anomaly technique, buoyant weight), photosynthesis [fiber optical O<sub>2</sub> sensor probes; Pulse Amplitude Modulated (PAM) fluorometer; Maxi and Microscopy hardware; Fast Rate Repetition (FRR) fluorometer, Single and Multiple turnover protocols], *Symbiodinium* (i.e., zooxanthellae) density and chlorophyll content

*Spectrophotometry*: photosynthetic pigments, Bradford protein assay, PAH quantification

*Biochemistry*: Protein handling (western blotting, ELISA assay, immunoprecipitation), measurement of lipid peroxidation and proteins carbonylation

*Cell culture*: Maintenance and transfection of cell lines (mammal cells, zooxanthellae)

*Reproduction*: Sexual gamete collection, rearing and husbandry in broadcast and brooding scleractinian coral species, larval biology and recruitment of corals

*Microscopy*: Confocal microscopy, light/phase microscopy, fluorescence microscopy

*Wet Lab and Field Work*: Extensive field surveying and sampling of marine plants, fish and invertebrates, long-term animal culture (crustaceans, corals, sea anemones, micro- and macro-algae, sea urchins), manipulative wet-laboratory experiments with pH and temperature treatments in seawater flow-through systems, seawater chemistry analysis, carbonate chemistry analysis, nutrient analysis

*Aquaculture*: Well experienced in culture systems commonly practised in fish and shellfish industries (extensive, modified extensive, semi-intensive and intensive), including recirculating aquaculture systems (RAS), thorough knowledge of the diurnal variations of water chemical parameters (dissolved oxygen, pH, alkalinity, etc.) and their effects on physiology and health of aquatic organisms, wide experience in stocking/acclimatisation/maintenance techniques of nurseries and grow-out systems

*Statistical analysis*: Statistical analyses with SPSS and R software

IT: Microsoft Office (Word, Excel, Power Point, Photoshop), Google apps, Endnote, *in silico* DNA sequence analysis with desktop (Lasergene) and dedicated website software

Languages: English (mother tongue), Hebrew (fluent and scientific), French (scholar)

SCUBA diving/seamanship: Certified advanced NITROX and Technical/Scientific diver (IANTD) (including rescue-diver training and surface-supplied diving) with comprehensive knowledge of SCUBA diving theory and its application to safe diving practices, certified skipper's license for international boat voyages

## SELECTED PRESENTATIONS & INVITED TALKS

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10. **Horwitz R**, Mills SC. Developmental and transgenerational acclimation of the tropical sea hare *Stylocheilus striatus* (Gastropoda: Opisthobranchia) to ocean warming and acidification. Centre de Recherche Insulaire et Observatoire de l'Environnement (CRIOBE) and Laboratoire d'Excellence (CORAIL), Mo'orea, French Polynesia, 2016.
9. **Horwitz R**, Hoogenboom MO, Fine M. Ocean acidification may alter coral competitive interactions. Interuniversity Institute for Marine Sciences (IUI), Eilat, Israel, 2015.
8. **Horwitz R**, Fine M. High CO<sub>2</sub> detrimentally affects tissue regeneration of Red Sea corals. Ocean Sciences Meeting, Honolulu, USA, 2014.
7. **Horwitz R**, Fine M. High CO<sub>2</sub> detrimentally affects tissue regeneration of Red Sea corals. International Conference on Coelenterate Biology, Eilat, Israel, 2013.
6. **Horwitz R**, Borell EMB, Meron D, Fine M. Response of sea anemone to long-term changes in carbonate chemistry nearby CO<sub>2</sub> volcanic vents. Annual Science Meeting of the EU-funded Mediterranean Sea Acidification in a Changing Climate (MedSeA) project, Hellenic Centre for Marine Research, Heraklion, Greece, 2013.
5. **Horwitz R**, Borell EMB, Fine M. Anthozoan response to high pCO<sub>2</sub> marine environments. Interuniversity Institute for Marine Sciences (IUI), Eilat, Israel, 2013.
4. **Horwitz R**, Borell EMB, Fine M. Anthozoan response to high pCO<sub>2</sub> marine environments. ASSEMBLE Marine conference, Olhao, Portugal, 2012.
3. **Horwitz R**, Coyne V. Characterization of an intracellular bacterium infecting the digestive gland of the South African abalone, *Haliotis midae*. South African Marine Sciences Symposium (SAMSS), Cape Town, South Africa, 2008.
2. **Horwitz R**, Coyne VE. Characterization of an intracellular bacterium infecting the digestive gland of the South African abalone, *Haliotis midae*. Marine and Coastal Management (MCM) Frontier Programme Conference, Cape Town, South Africa, 2007.
1. **Horwitz R**, Coyne VE. Characterization of an intracellular bacterium infecting the digestive gland of the South African abalone, *Haliotis midae*. Marine and Coastal Management (MCM) Frontier Programme Conference, Cape Town, South Africa, 2006.

## AWARDS

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| 2015    | Berko Award for excellence in marine science research (€1,250)  |
| 2014    | Bar-Ilan University outstanding PhD candidate Travel Award (€250)                                     |
| 2013    | Hebrew University Research Travel Award (€250)  |
| 2010-14 | Bar-Ilan Presidential Scholarship for excellent PhD candidates, Bar-Ilan University, Israel (€48,000) |

- 2006-08 NRF MSc Prestigious Scholarship, University of Cape Town, South Africa (€12,000)
- 2006-08 KW Johnston UCT Research Scholarship, University of Cape Town, South Africa (€6,000)
- 2006-08 The Harry Crossley Foundation Postgraduate Bursary, University of Cape Town, South Africa (€7,500)
- 2002-05 Merit Scholarship for academic excellence, Ruppin Academic Center, Israel (€900)

## GRANTS AND FELLOWSHIPS

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- 2016-17 Postdoctoral Research Fellowship grant (LabEx, EPHE) (€28,000, Co-author and lead researcher on grant to SC Mills), “Developmental and transgenerational acclimation of the tropical sea hare *Stylocheilus striatus* to ocean warming and acidification”
- 2014 ASSEMBLE research grant to ECIM (Las Cruces, Chile), EU-funded FP7 research infrastructure initiative (€5,000, PI)
- 2012 ASSEMBLE research grant to SZN (Naples and Ischia, Italy), EU-funded FP7 research infrastructure initiative (€5,000, PI)

## RESEARCH EXPEDITIONS

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- 2014 Research expedition to Huinay Scientific Field Station (Patagonia, Chile), PI  
“Understanding climate change effects of elevated temperature and irradiance on the cold-water coral, *Desmophyllum dianthus*, and the role of its endolithic algae”
- 2014 ASSEMBLE-funded research expedition to ECIM (Las Cruces, Chile), PI  
“Understanding climate change effects of elevated temperature and irradiance in central Chile on two species of sea anemone and the role of their photosynthetic symbionts”
- 2012 Research expedition to the Eastern Mediterranean Sea (Israel), EU-funded Mediterranean Sea Acidification in a Changing Climate (MedSeA) project, Research Staff  
“Mediterranean vermetid reefs at extinction risk”
- 2012 ASSEMBLE-funded research expedition to SZN (Naples and Ischia, Italy), PI  
“Response of sea anemone to long-term changes in carbonate chemistry nearby CO<sub>2</sub> volcanic vents at Ischia Island, Mediterranean Sea”

## PROFESSIONAL EXPERIENCE

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- 2014 Organising Committee: Faculty Seminar, Interuniversity Institute for Marine Sciences (IUI), Israel
- 2013 Organising Committee: International workshop on the “Impacts of Ocean Acidification and Climate Change on Corals and Coral Reefs”, Israel

## TEACHING EXPERIENCE

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- 2010-16 Graduate Teaching Assistant, Interuniversity Institute for Marine Sciences (IUI), Israel  
Courses taught: Nutrient Biogeochemistry and Uptake, Marine Microbiology (5x), Coral Biology (5x), Introduction to the Ecosystem of the Gulf of Eilat
- 2010-16 Graduate Teaching Assistant, Bar-Ilan University, Israel  
Courses taught: Ecological Aspects of the Gulf of Eilat (4x), Advanced Laboratory Techniques in Marine Ecology (5x)
- 2008-10 Graduate Teaching Assistant, Ruppin Academic Center's Maritime Institute, Israel

Courses taught: From Cell to Organism (2x), Introduction to Microbiology (2x)

2006-08 Graduate Teaching Assistant, University of Cape Town, South Africa

Courses taught: Cell Biology (3x), Introduction to Microbiology (3x), Microbial Biotechnology (2x)

## **REFERENCES**

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Available upon request