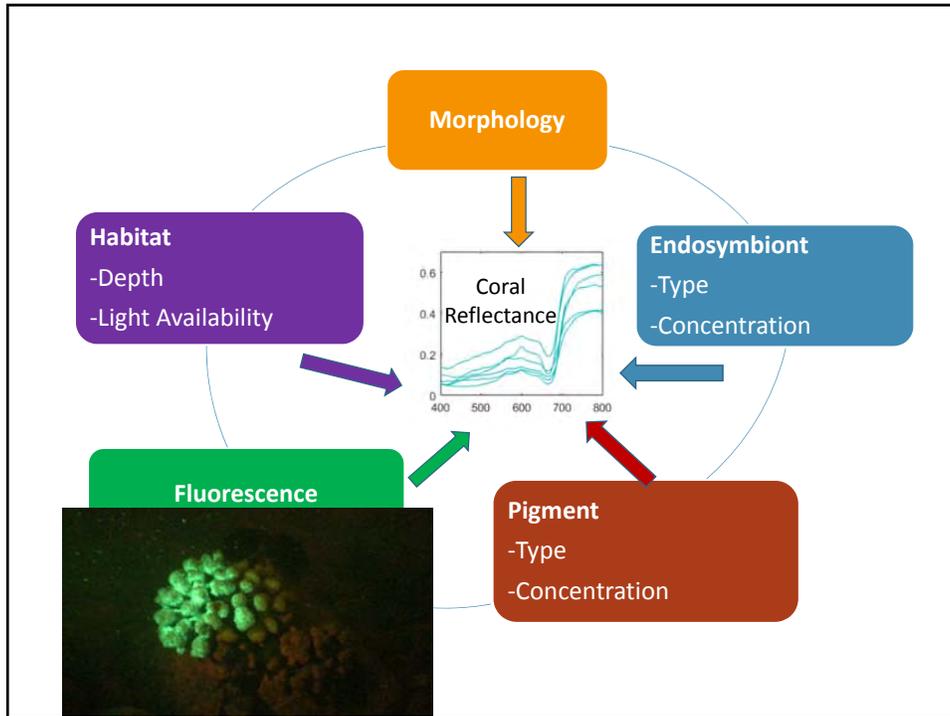


## Acknowledgements

- John Hedley, Environmental Computer Science LTD
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- Brandon Russel, University of Connecticut/Harbor Branch

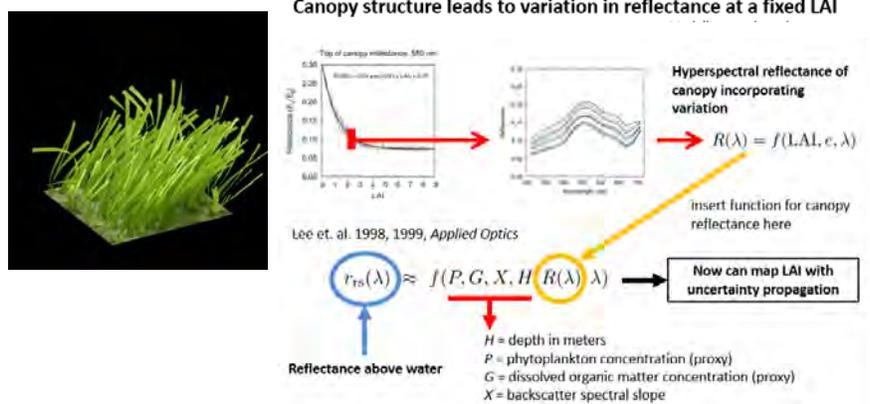
Funding:  
NASA  
Biodiversity





## How does this variability influence the uncertainties in remote sensing of corals?

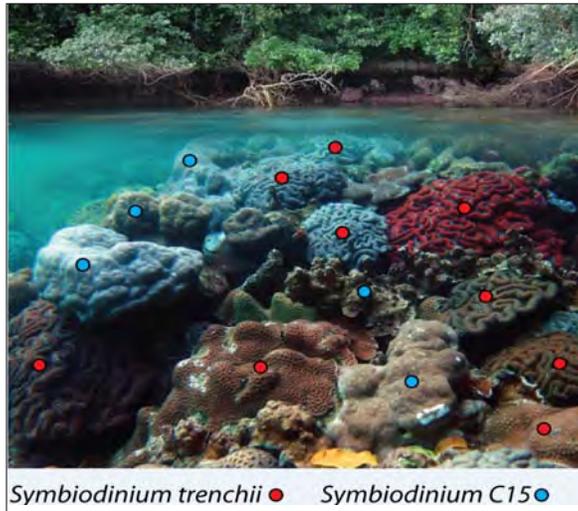
- 3D radiative transfer modeling



Hedley et al. 2017, *Frontiers in Marine Sciences*  
Hedley et al. 2015, *Remote Sensing Environment*

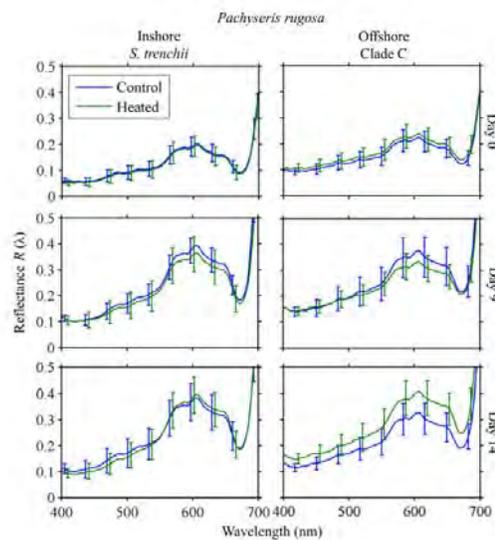
Collaborator  
John Hedley  Environmental Computer Science Ltd.

## Opportunistic Symbiotic Dinoflagellates



LaJeunesse et al. 2009. Proc. R. Soc. B Biol. Sci. **2009**,276, 4139–4148.

## No specific reflectance signature to differentiate type of symbiont



Russell et al 2016. Remote Sensing of the Environment



In situ optics too imprecise due to current surges and surface waves



# Specimen collections

State of Hawaii  
Department of Land & Natural Resources  
Division of Aquatic Resources  
1151 Punchbowl Street, Room 330  
Honolulu, Hawaii 96813

**SPECIAL ACTIVITY PERMIT**  
(SAP) 2018-02  
Issued: 02/09/17  
Expires: 2/1/2018

COMMON NAME	SPECIES	LIMITS see Special Conditions	LOCATION see Special Conditions
Finger coral	<i>Porites compressa</i>	≤ 20 coral fragments (each 10 cm <sup>2</sup> ) See Special Conditions, C. Activities	Hawaii Island (Locations provided in appendix)
Lobe coral	<i>Porites lobata</i>	≤ 20 coral fragments (each 10 cm <sup>2</sup> ) See Special Conditions	Hawaii Island

SAP 2018-02 BIRD DIVERSITY-COLO-SPECTRUM-BIG ISLAND

COMMON NAME	SPECIES	LIMITS see Special Conditions	LOCATION see Special Conditions
Open Lobe coral	<i>Porites evermanni</i>	≤ 20 coral fragments (each 10 cm <sup>2</sup> ) See Special Conditions, C. Activities	Hawaii Island
Flow coral	<i>Montipora capitata</i>	≤ 20 coral fragments (each 10 cm <sup>2</sup> ) See Special Conditions, C. Activities	Hawaii Island





Our "Lab"

1) Hyperspectral Imagery  
2) Morphology  
3) Fluorescence  
4) Sample for DNA and pigment analyses

The collage consists of three photographs. The top right photo shows a man with a beard and long hair, wearing a dark long-sleeved shirt and shorts, kneeling on a wooden pier or boat deck. He is holding a large, dark, irregularly shaped coral sample over a white bucket filled with water. The bottom left photo shows the same man in a dark lab coat, working in a laboratory setting. He is using a pipette to transfer liquid from a small vial into a white bucket. The scene is illuminated with a strong blue light. The bottom right photo is a list of four research activities.



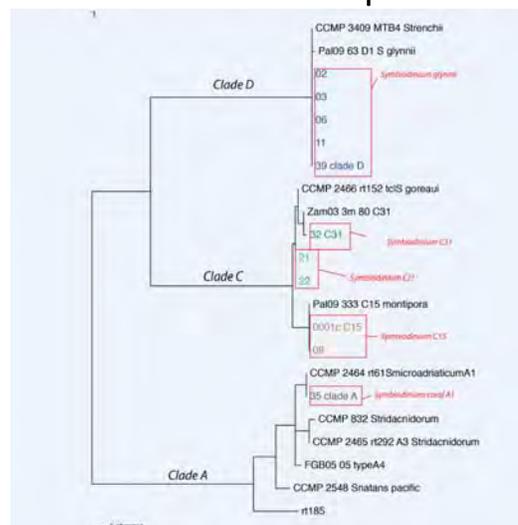
Coral 008 – *Porites evermanni*

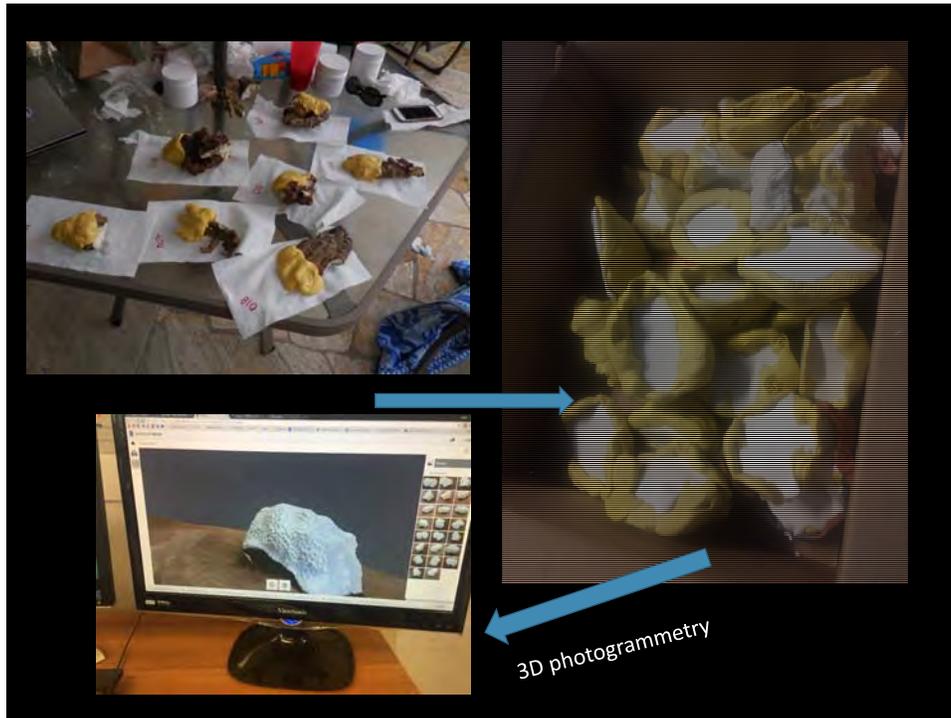


## Coral 008 – Imagery with spoon



## Symbiont identification and concentrations completed





## Next set of slides

3D structure of corals input into 3D radiative transfer model

Results are being prepared for publication and show that shading reduces the benthic reflectance according to sun angle.

A correction factor is developed.

THANK YOU FOR YOUR TIME!  
Stay tuned as the results progress

