Interpreting Coral-Bacterial Relationships from Early Life Stages of Corals

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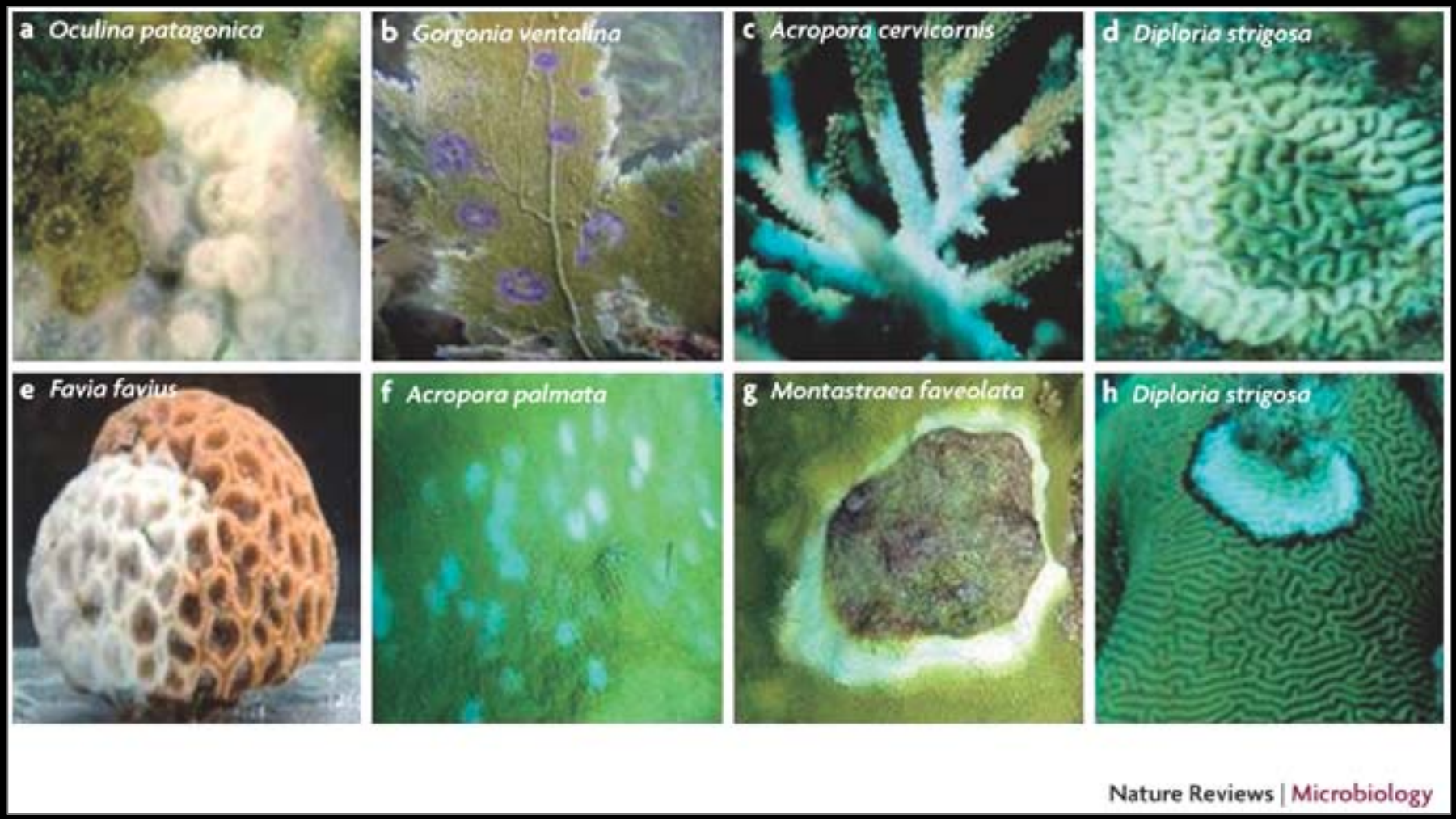
OCEAN GENOME LEGACY

MOTE MARINE LABORATORY

The Field of Coral Microbiology



(Rosenberg *et al*. 2007)

Bacterial Community *Diversity* in Corals (what we know…)

- Abundant, diverse bacterial communities in coral mucus layer, tissue, and skeleton
- Metabolically significant component of the holobiont
- *Some are* species-specific associations
- Evidence for beneficial roles of bacteria
  - Transform atmospheric N_2 for the host coral
  - Defend corals against pathogens

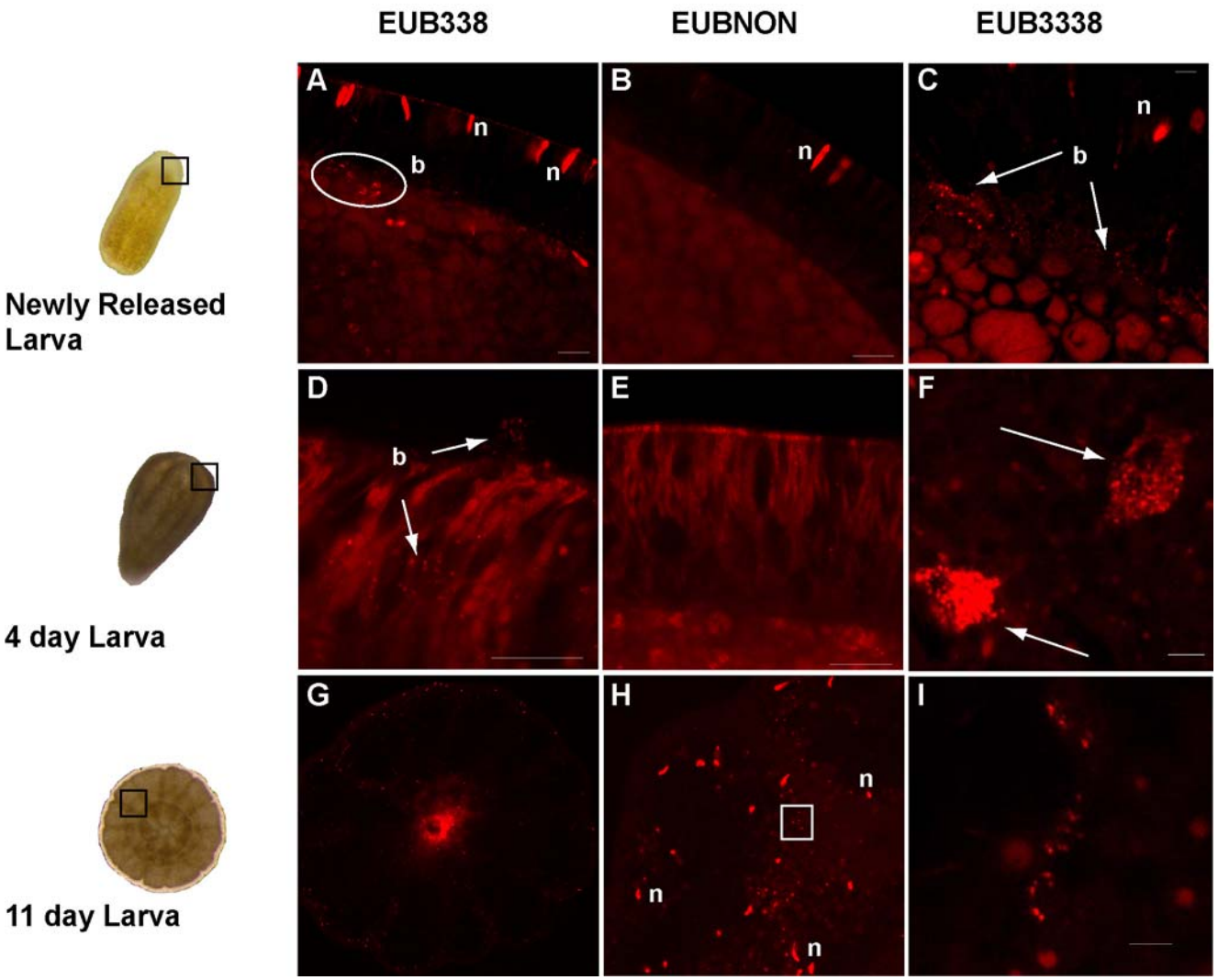
Bacterial Community *Dynamics* in Corals (what we don't know…)

- Where do the bacteria come from?
- What is a "normal" bacterial community associated with healthy corals?
- Are bacterial communities on corals stable?
- How do bacteria contribute to the health of corals?

How do we survey bacterial communities on corals to learn which bacteria are meaningful?

Collecting *P. astreoides* Larvae for Microbiology

Porites astreoides Inherit Bacteria via their Larvae



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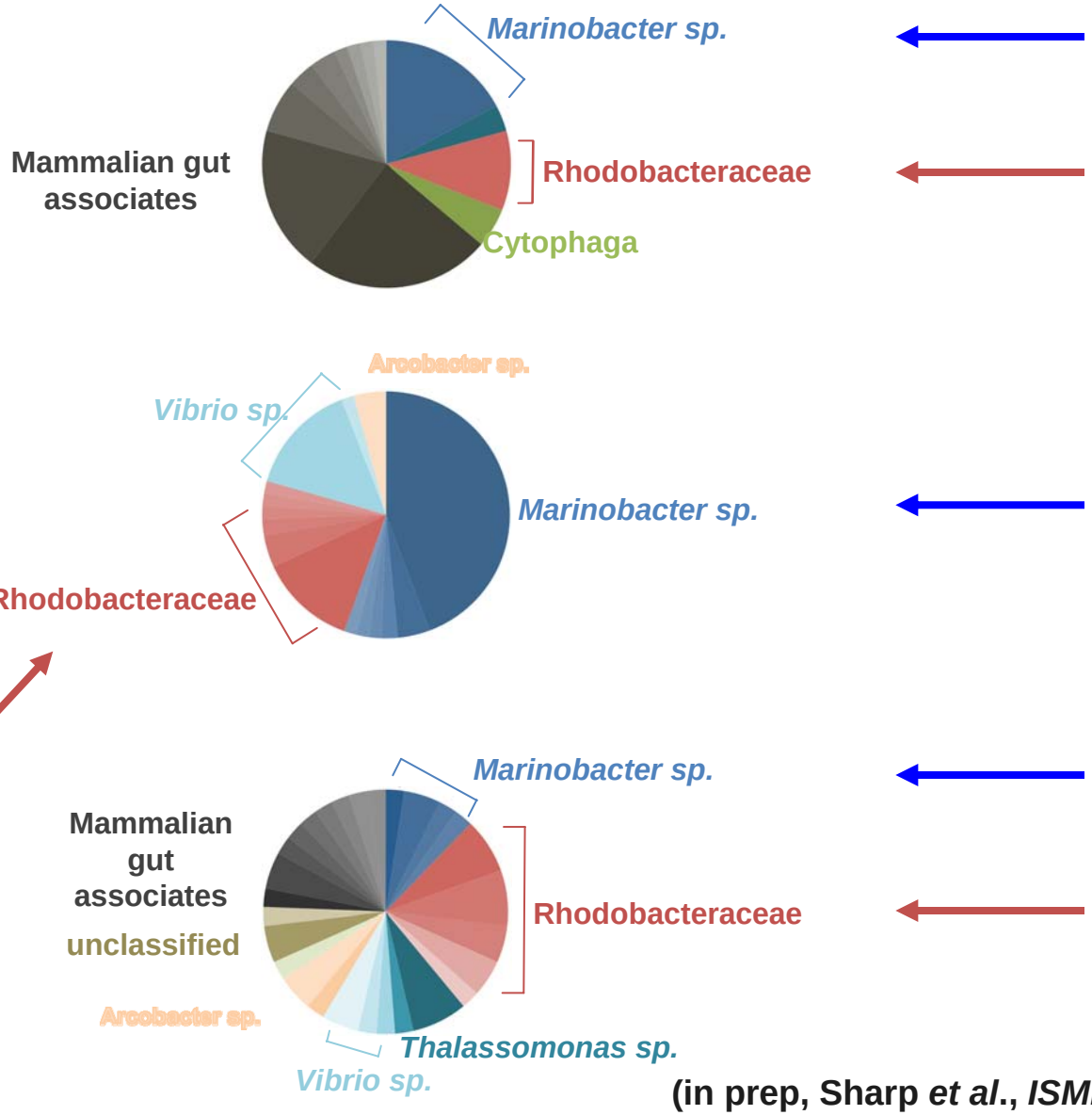
(in prep, Sharp *et al*., *ISME-J)*

Consistent Bacteria throughout *P. astreoides* Early Development

Newly Released Larva

4 day Larva

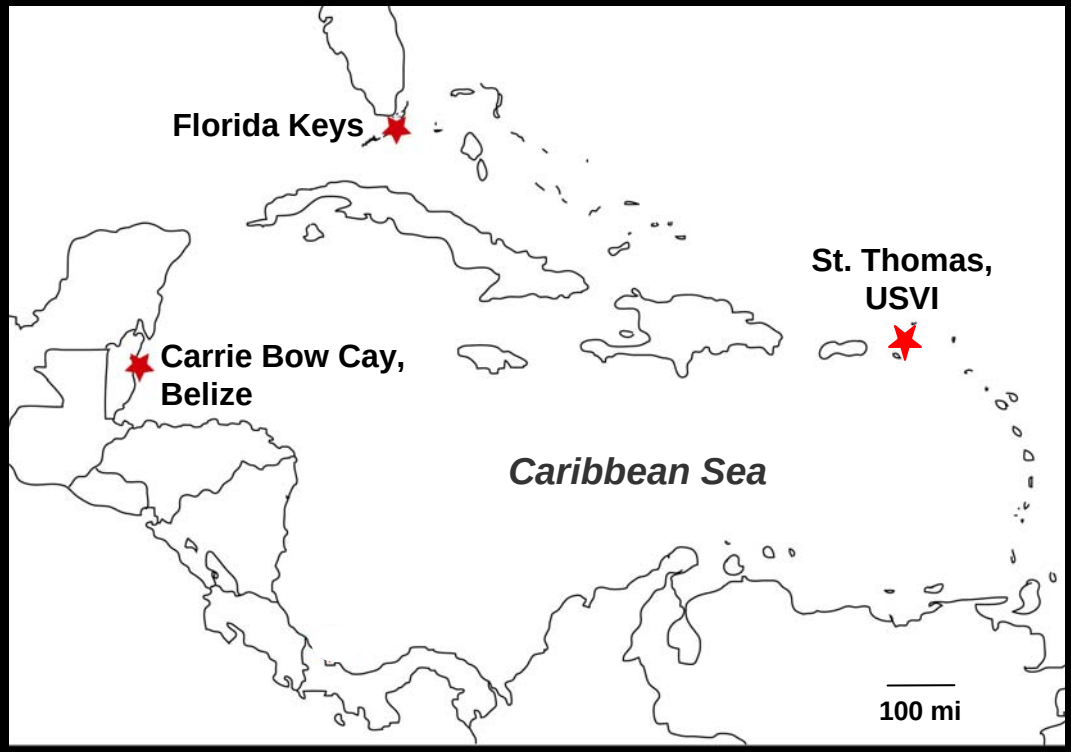
11 day Larva



(in prep, Sharp *et al*., *ISME-J)*

Surveying the Bacterial Communities in *P. astreoides* Larval Collections

- **Geography:**
  - Florida Keys
  - Belize
  - St. Thomas, USVI
- **Time:**
  - FLK 2006-2009
  - St. Thomas 2008
  - Belize 2008
- **Development:**
  - Newly released larvae → 11d post-release

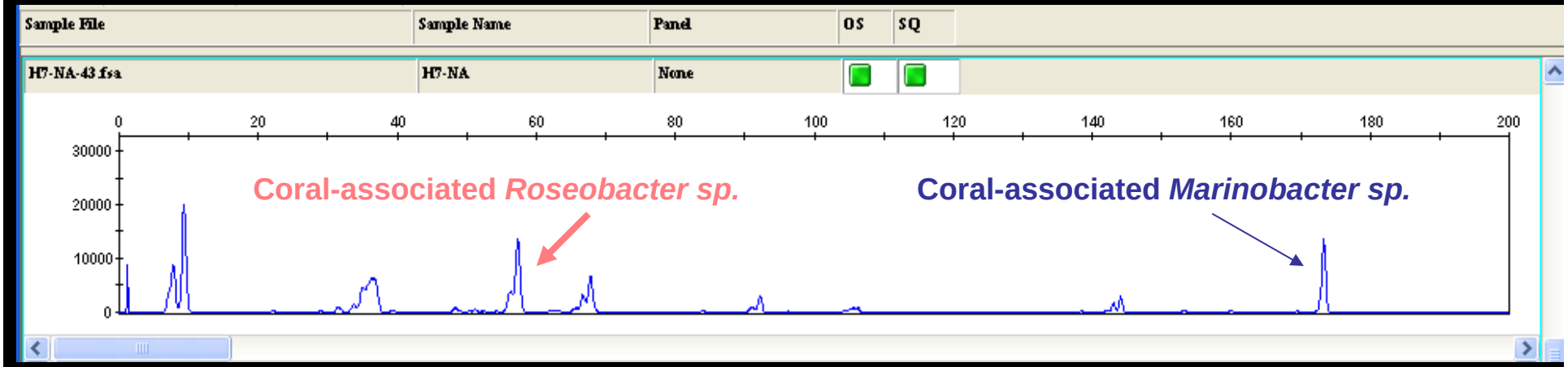


(in prep, Sharp *et al.*, *ISME-J)*

Surveying the Bacterial Communities in *P. astreoides* Larval Collections

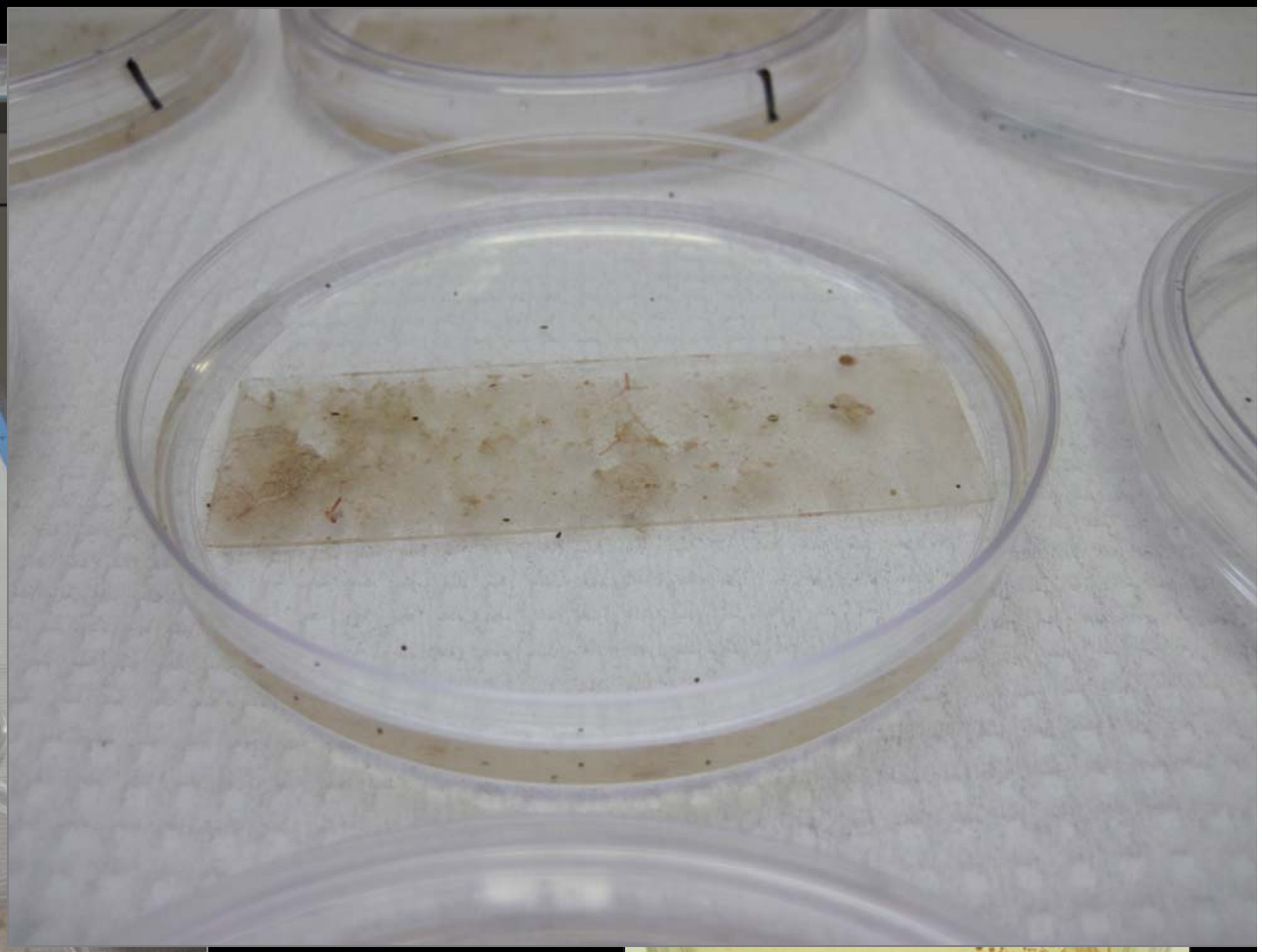
- No significant differences in community structure across all surveyed larvae

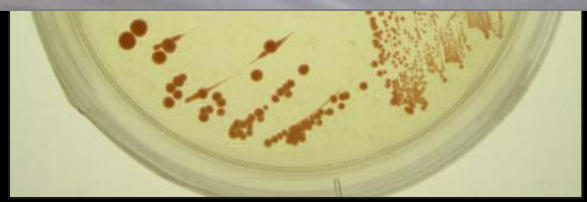
- Two bacterial groups consistently present in 100% of all samples



(in prep, Sharp *et al.*, *ISME-J*)

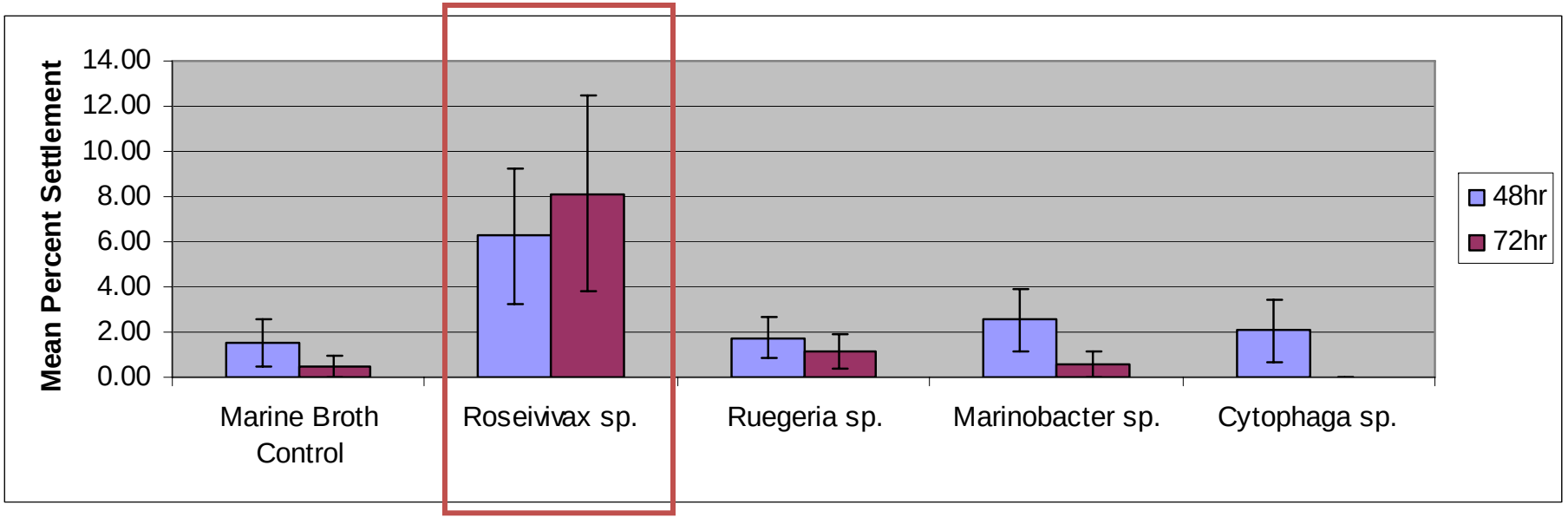
Exploring Potential Functions of Bacteria: Role in Larval Settlement?





Exploring Potential Functions of Coral-Associated Bacteria:
Cultured relative in the *Roseobacter* group increases larval settlement

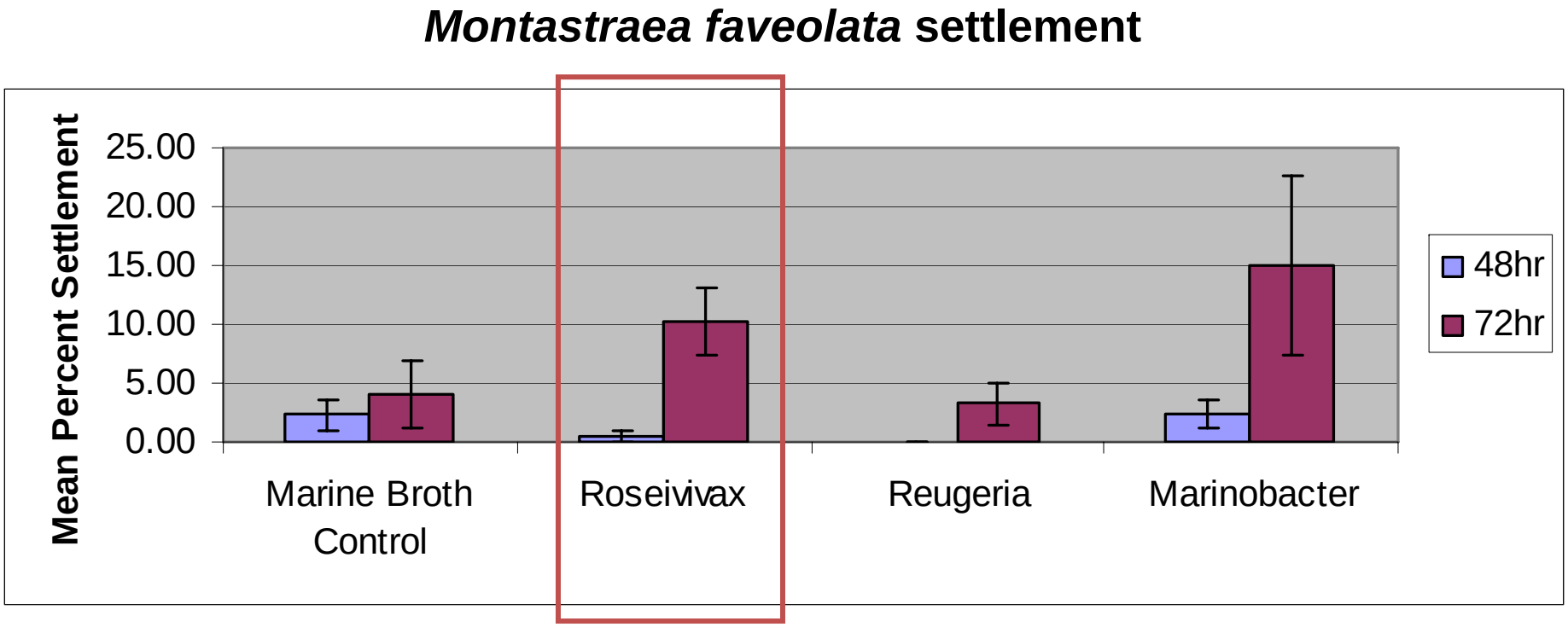
***Porites astreoides* settlement**



n = 10
20 larvae/replicate

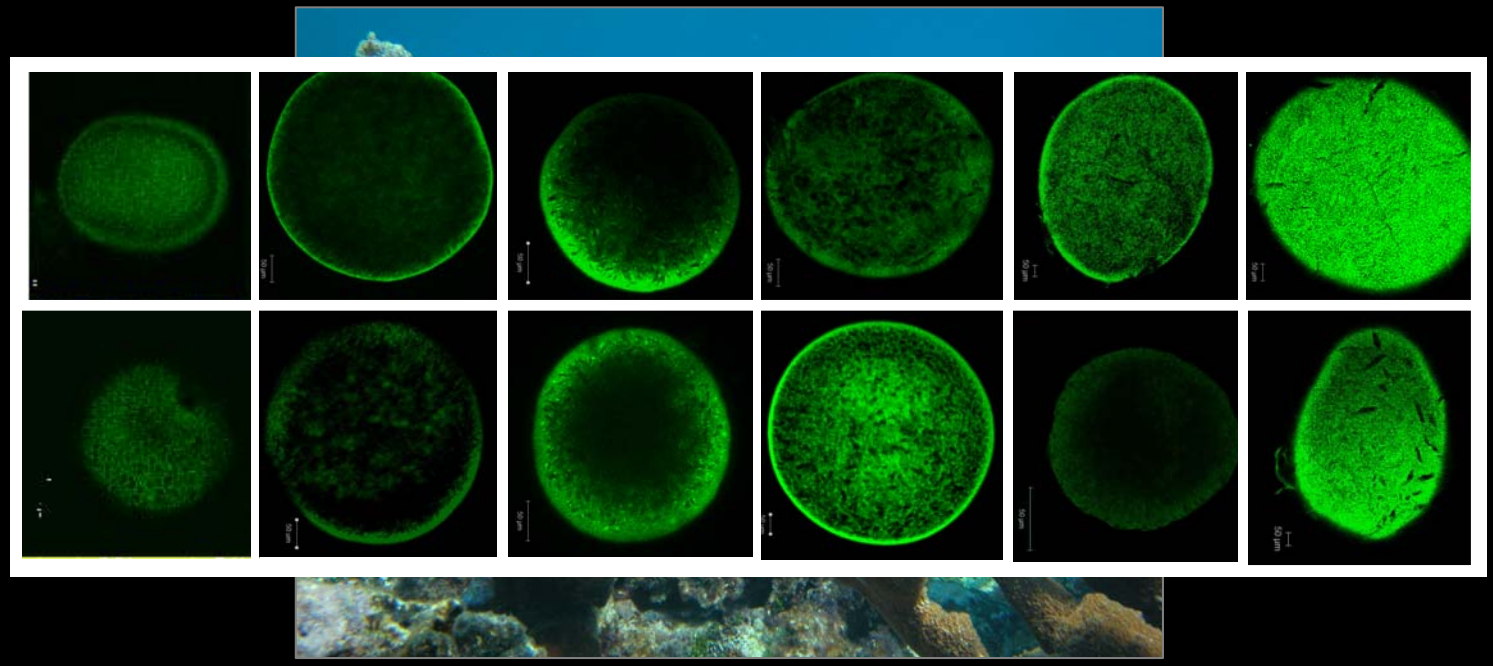
Exploring Functions of Coral-Associated Bacteria:

Cultured relatives in the *Roseobacter* group increases larval settlement



n = 10
20 larvae per replicate

Mass Spawning Corals in the Florida Keys Do Not Inherit Bacteria via Gametes



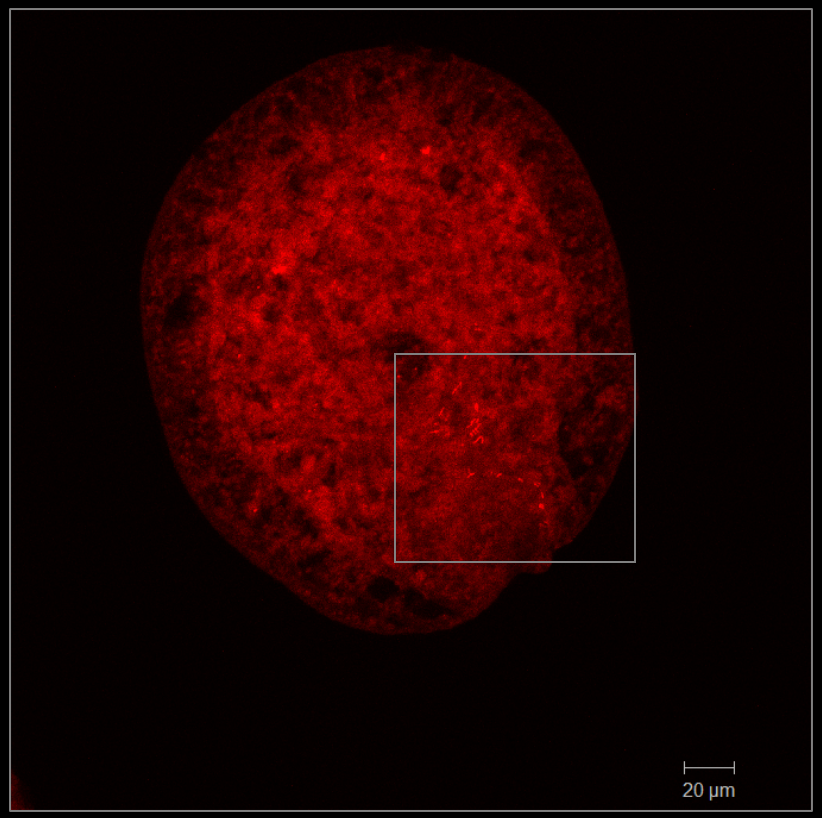
- **3 Sampling years:** 2005, 2006, 2007
- **4 Locations:** FL Keys, Belize, Panama, Guam
- **6 species:** *Montastraea faveolatata, M. annularis, M. franksi, Acropora palmata, A. cervicornis, A. humilis, Diploria strigosa*

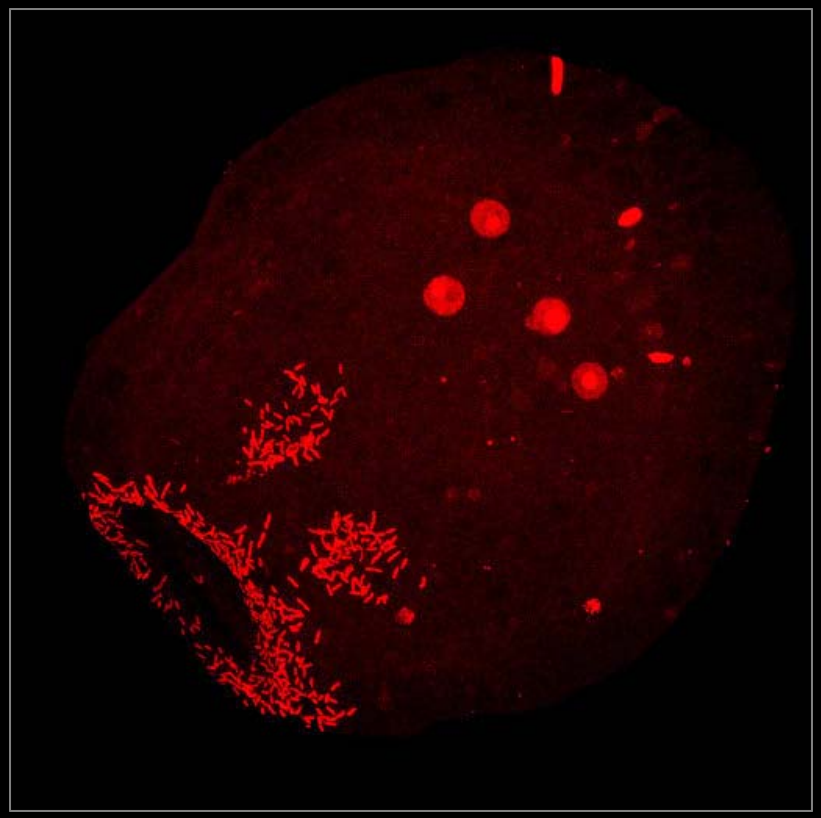
(Sharp *et al*., *PLoSOne*)

Bacterial interactions with larvae of Hawaiian coral *Fungia scutaria*

collaboration with V. Weis, Oregon State University

Bacteria infect larvae regardless of zooxanthellae presence





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collaboration with V. Weis, Oregon State University

Environmental Changes = Bacterial Community Composition Changes

- Bacteria interact with corals at earliest stages, but in different ways…
- Do bacterial communities associated with juvenile corals change during environmental disturbance?
- Will changes in seawater bacterial communities affect coral fitness?

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