Coral Population Dynamics and Implications for Management

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Sanctuary Advisory Council Meeting
August 16, 2016
Acknowledgments

- Baums Lab ([http://baumslab.org/](http://baumslab.org/))
- SECORE, Ken Nedimyer and CRF, Margaret Miller, Diego Lirman, FKNMS, Cindy Lewis, Karen Neely, Kate Lunz
Overview

- Coral reproduction – Asexual vs. Sexual
- Management recommendations
- Importance of Diversity
- Increasing Sex
- Identifying Pillar coral and Elkhorn coral populations
Corals reproduce in two ways:

Asexual Fragmentation
Corals reproduce in two ways:

Sexual production of larvae
Corals reproduce in two ways:

Sexual production of larvae
Management recommendations

1) Diversity (within-species) should be preserved

2) The number of distinct individuals should be increased at each reef – increase the opportunity for sex

3) Colonies should not be moved over large geographic distances right now
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1) More diversity = more chances for success

- The more diverse individuals on a reef, the more larvae can be made

- Differential tolerance to disease and other stressors
  - More individuals increase the chances that a few will be strong enough to survive climate change and disease
  - Ex. Irish lumper potato

Miller et al. 2016, evolution.berkeley.edu
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- We have developed molecular markers that allow us to distinguish between individuals and identify clones
  - Pillar Coral (*Dendrogyra cylindrus*) – Microsatellite markers
  - Elkhorn Coral (*Acropora palmata*) – Single Nucleotide Polymorphisms
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[Not so straightforward in corals]
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2) Both species are highly clonal

- Many reefs dominated by a single clone
- Asexual fragmentation is the primary mode of reproduction
- Juvenile corals are rare to nonexistent
2) Increase reef diversity
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- Before fragments are transplanted between reefs:
  - How well can the corals survive being transplanted farther away?
  - Check compatibility between individual corals – can they successfully produce larvae?
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What is a population?

A *population* is a group of interbreeding individuals of the same species that is isolated from other groups.
3) Old: Two Elkhorn Coral populations
Outbreeding Depression

Blue beetles on blue leaf

Red beetles on red leaf
Outbreeding Depression
Outbreeding Depression

Red beetle on blue leaf: mismatch of color
Outbreeding Depression

Purple offspring: also mismatch of color
3) Avoid Transferring Coral Fragments Between Populations

- Differences in habitat are not always obvious (to us)
- Could transport unseen pathogens

Vattakaven et al. 2006

Vibrio tasmaniensis
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There is hope!

- Elkhorn coral population still diverse
- Situation more critical for pillar corals, but there is still some diversity
- Asexual fragmentation – CRF
- Sexual reproduction – SECORE (www.secore.org)
Questions?