



# Coral Population Dynamics and Implications for Management

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NOAA

# Acknowledgments

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



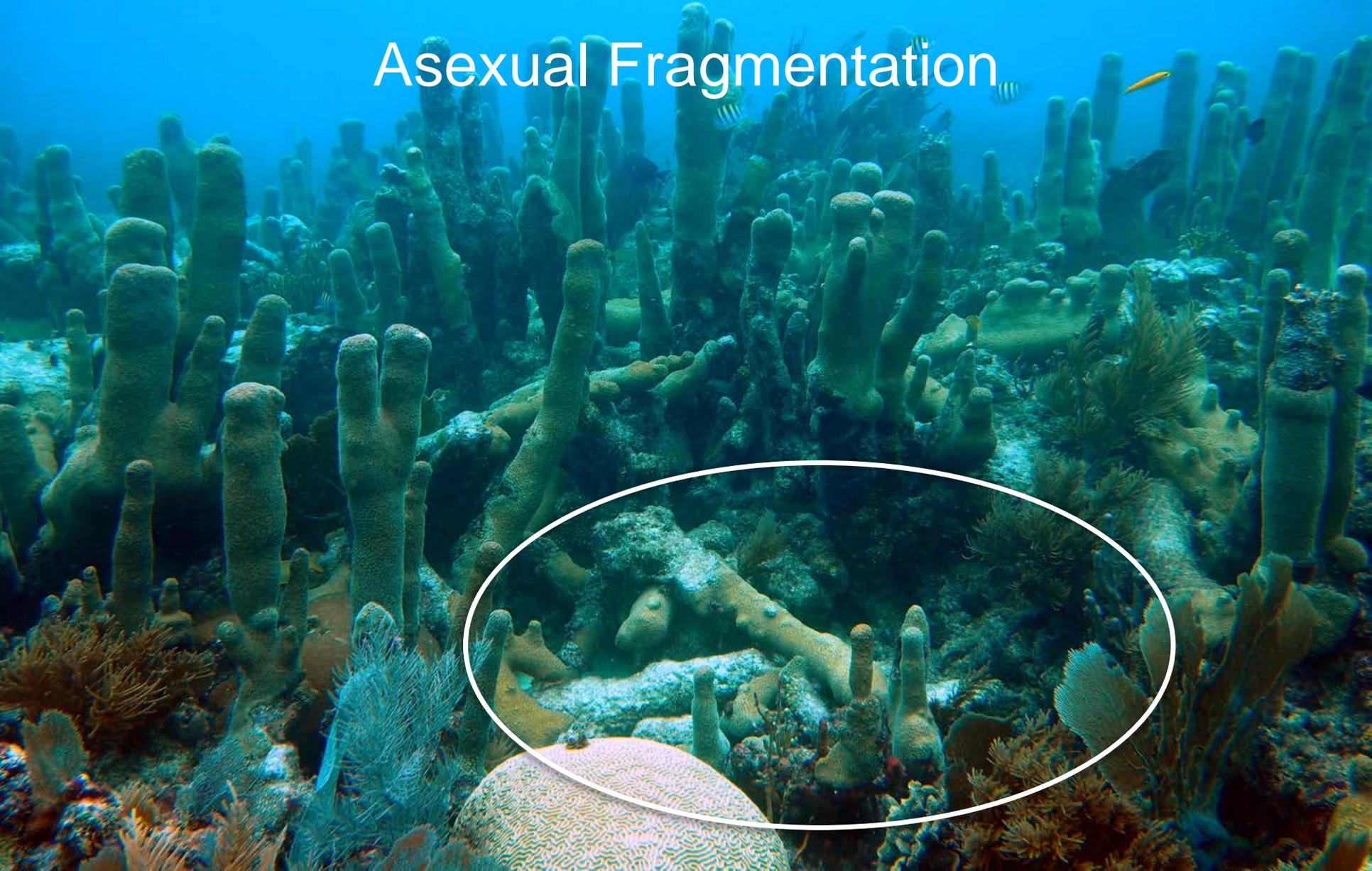
# Overview

- Coral reproduction – Asexual vs. Sexual
- Management recommendations
- Importance of Diversity
- Increasing Sex
- Identifying Pillar coral and Elkhorn coral populations



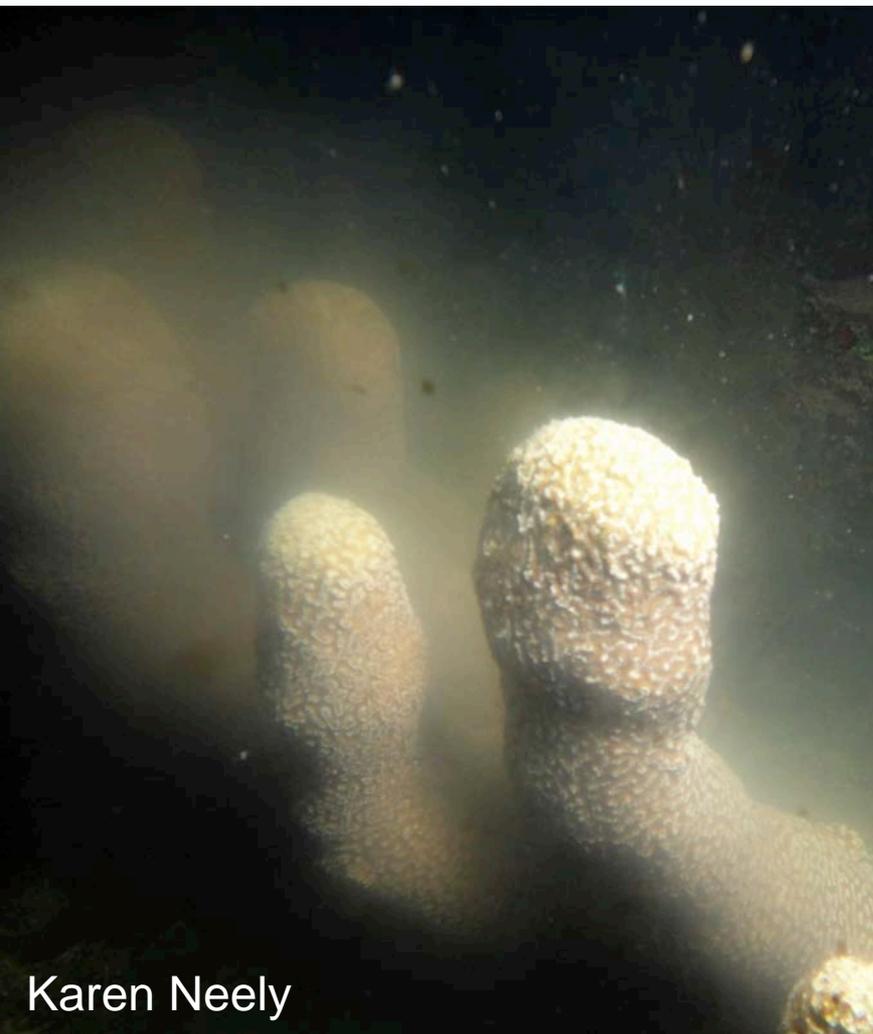
# Corals reproduce in two ways:

## Asexual Fragmentation



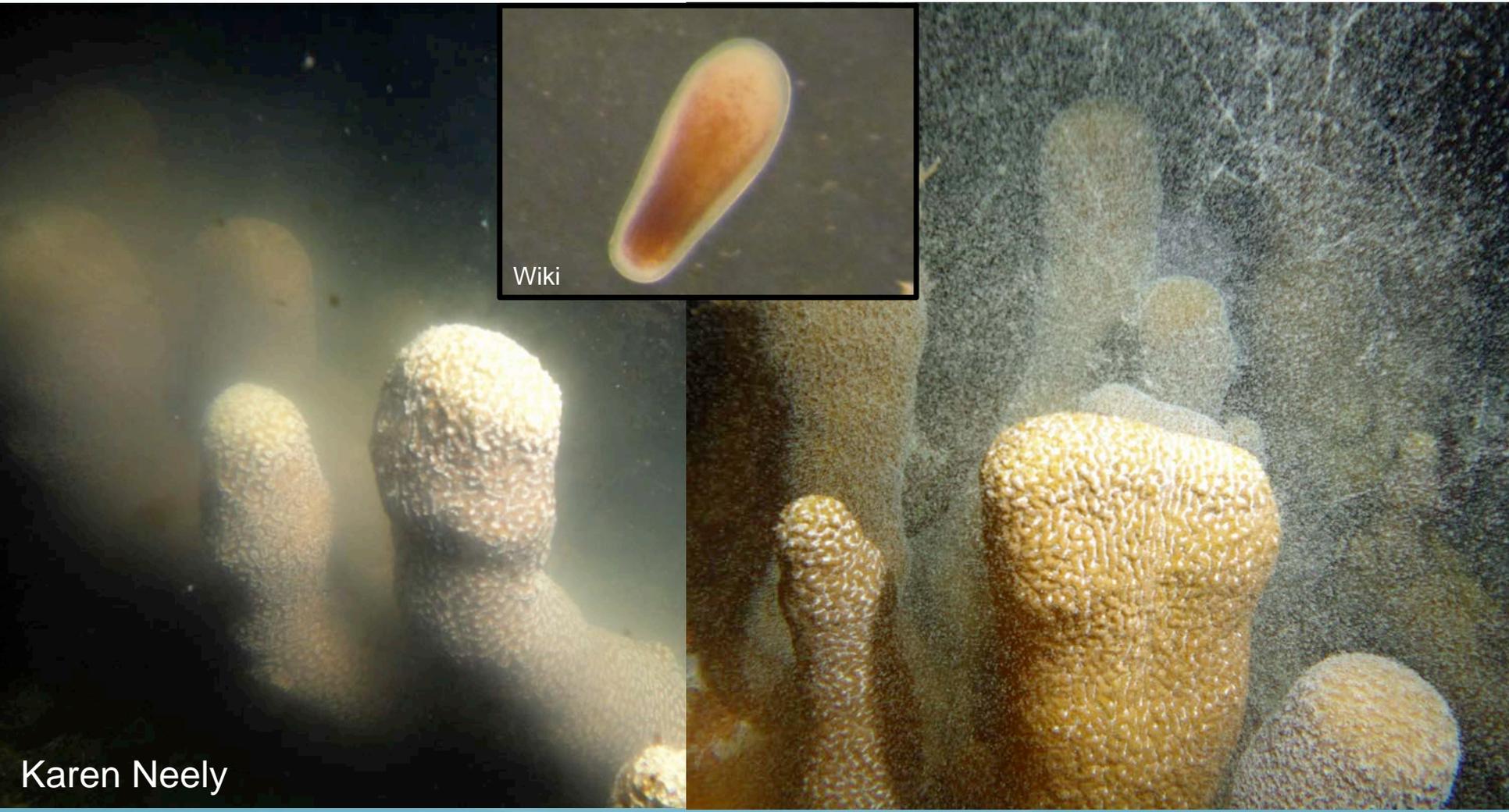
# Corals reproduce in two ways:

Sexual production of larvae



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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

# Management recommendations

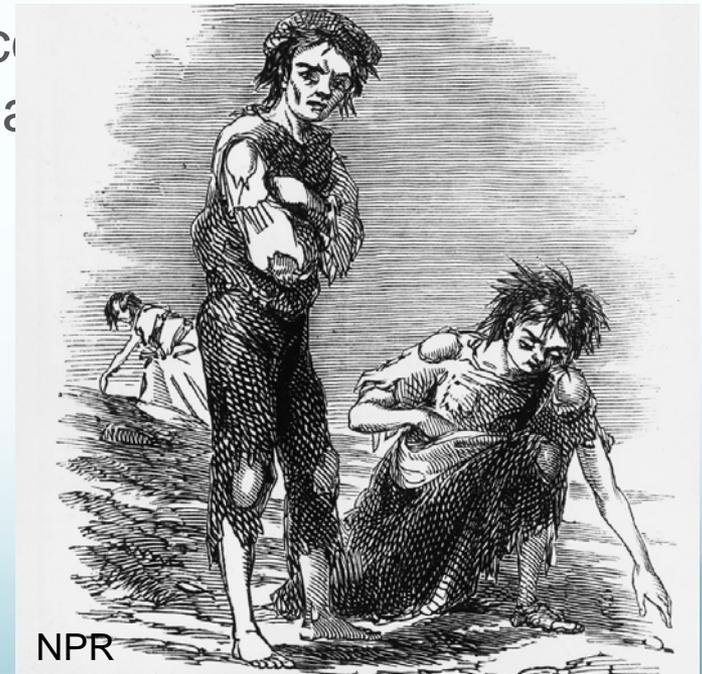
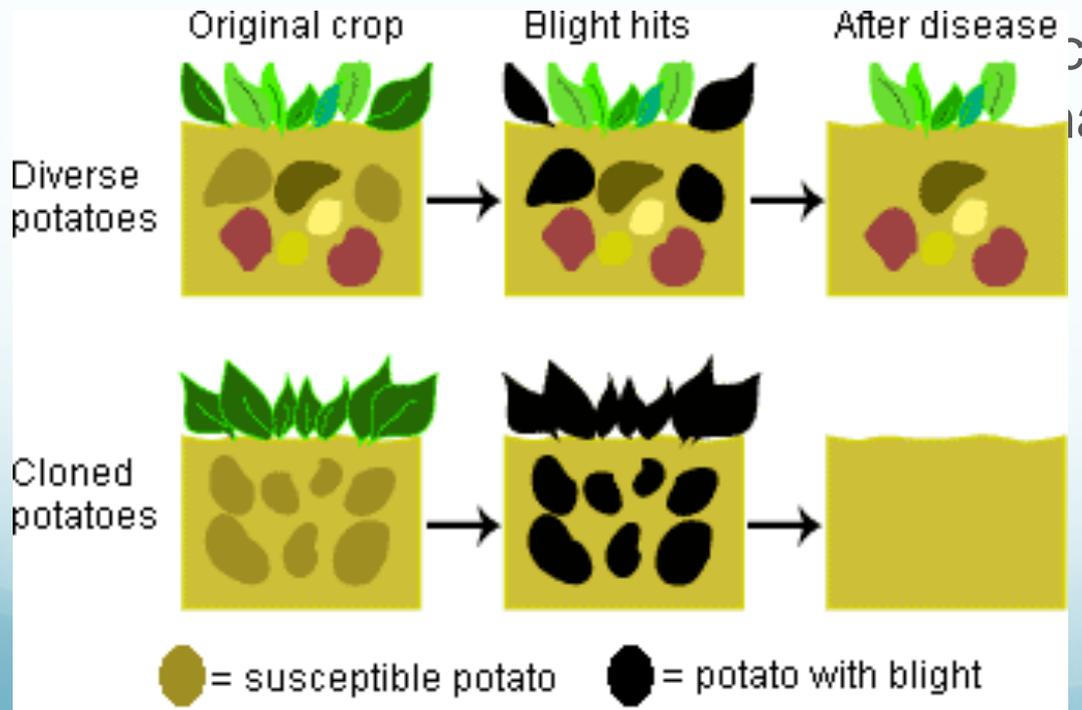
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# 1) More diversity = more chances for success

- 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

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# 1) More diversity = more chances for success

- 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



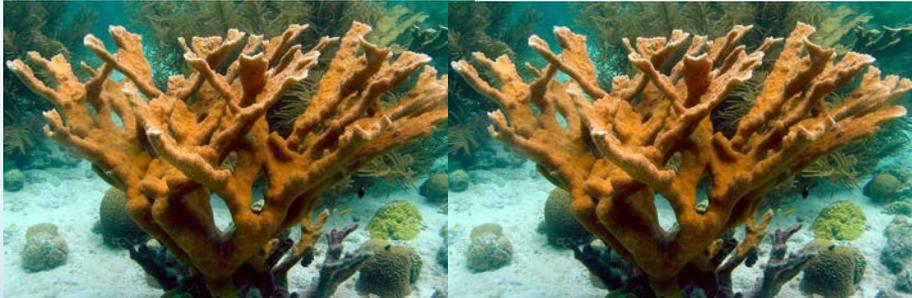
VS.



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[Not so straightforward in corals]



VS.



# Management recommendations

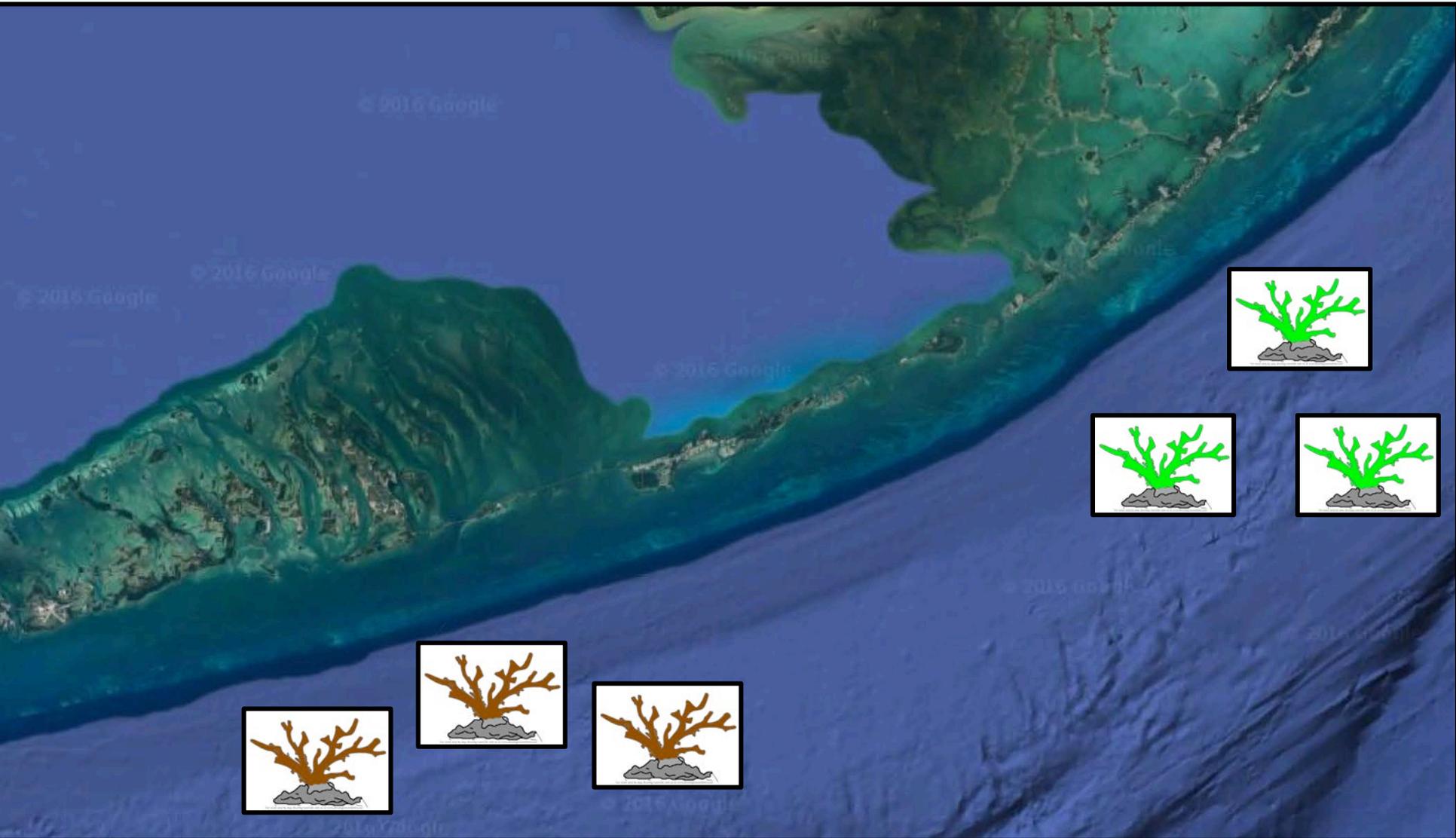
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## 2) Both species are highly clonal

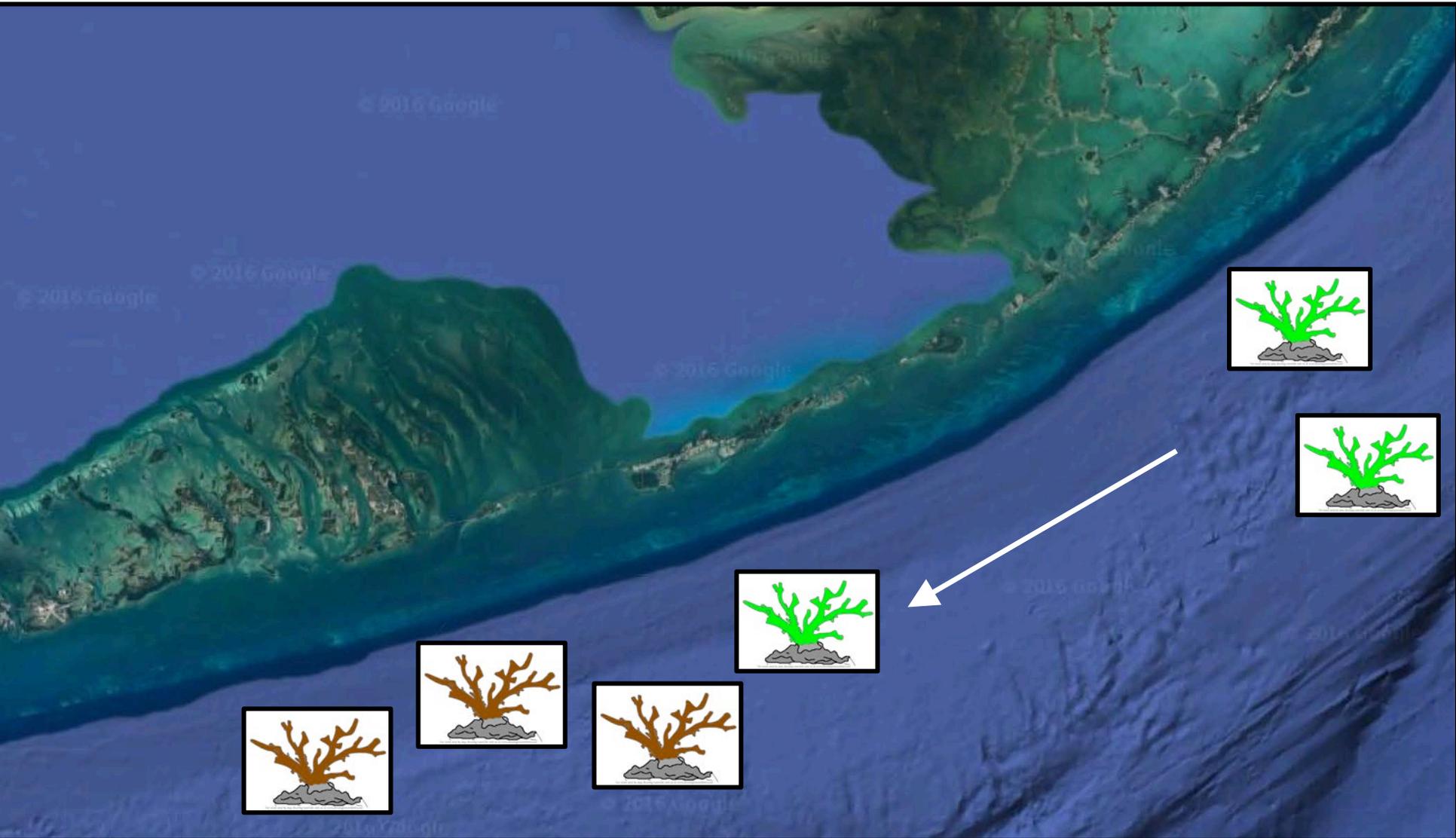
- Many reefs dominated by a single clone
- Asexual fragmentation is the primary mode of reproduction
- Juvenile corals are rare to nonexistent



## 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?

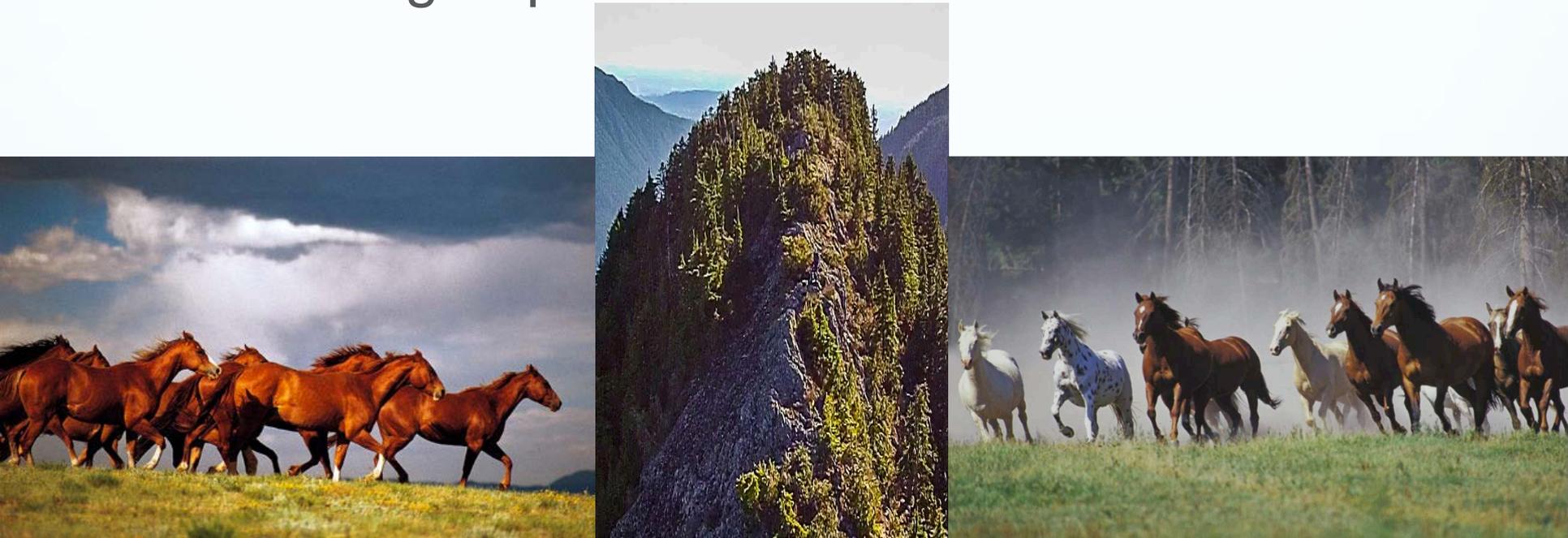


# Management recommendations

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# What is a population?

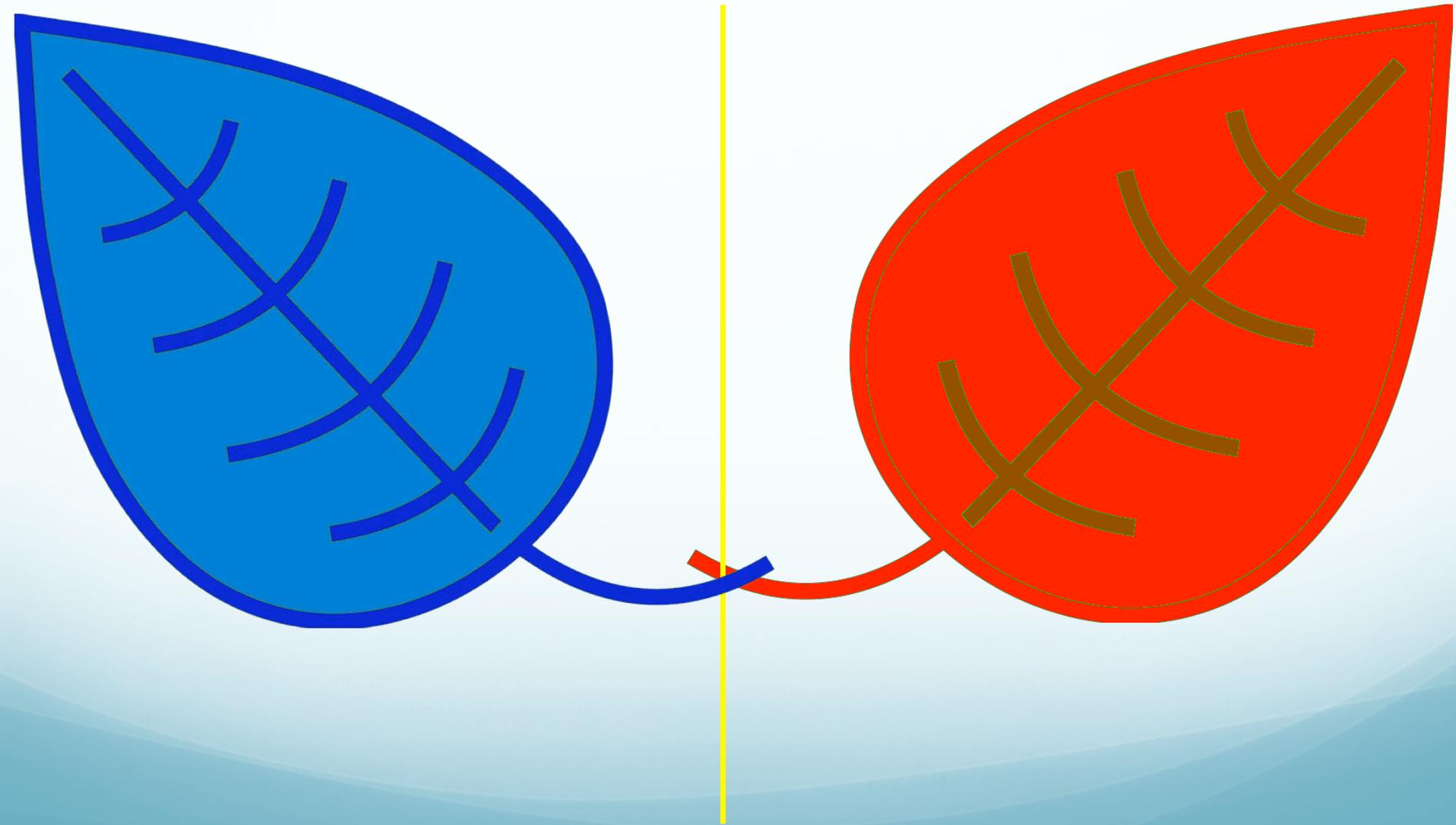
A **population** is a group of interbreeding individuals of the same species that is isolated from other groups



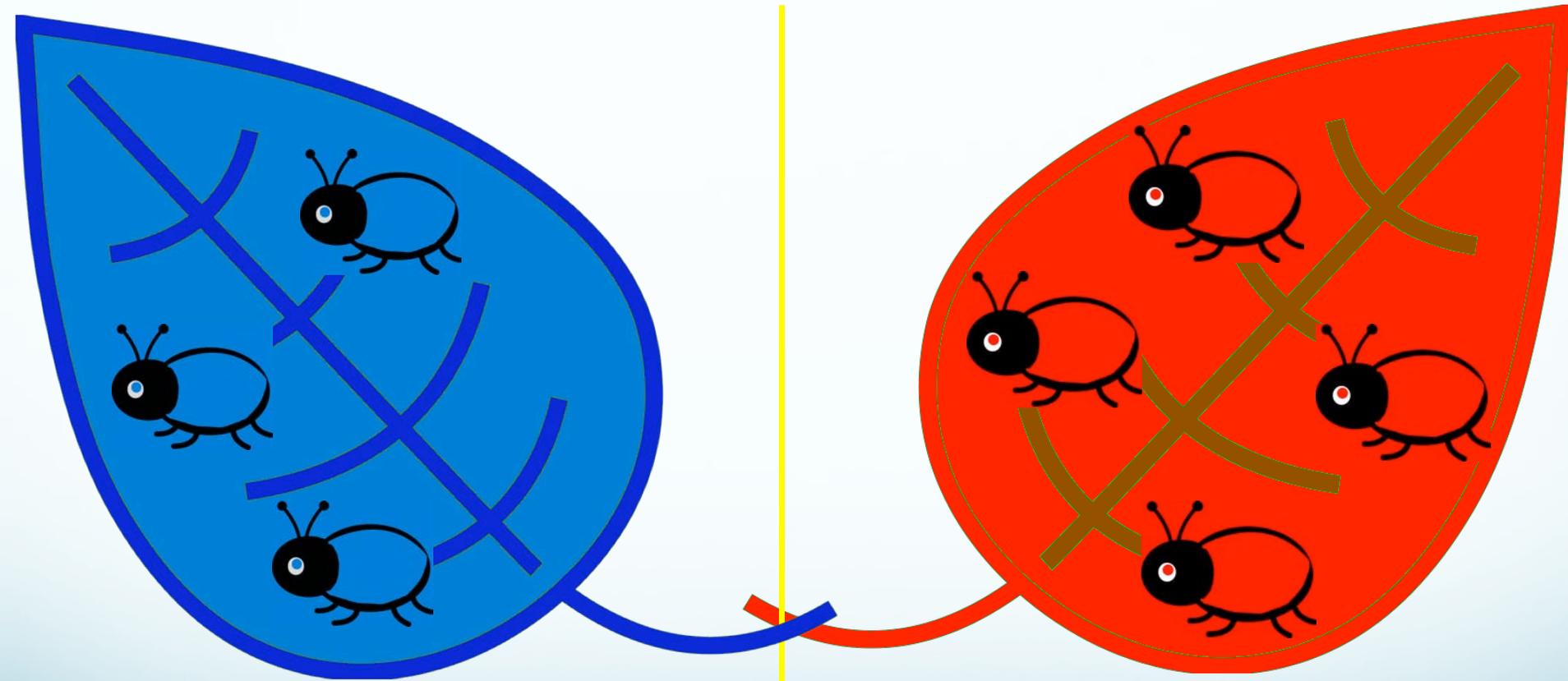
### 3) Old: Two Elkhorn Coral populations



# Outbreeding Depression



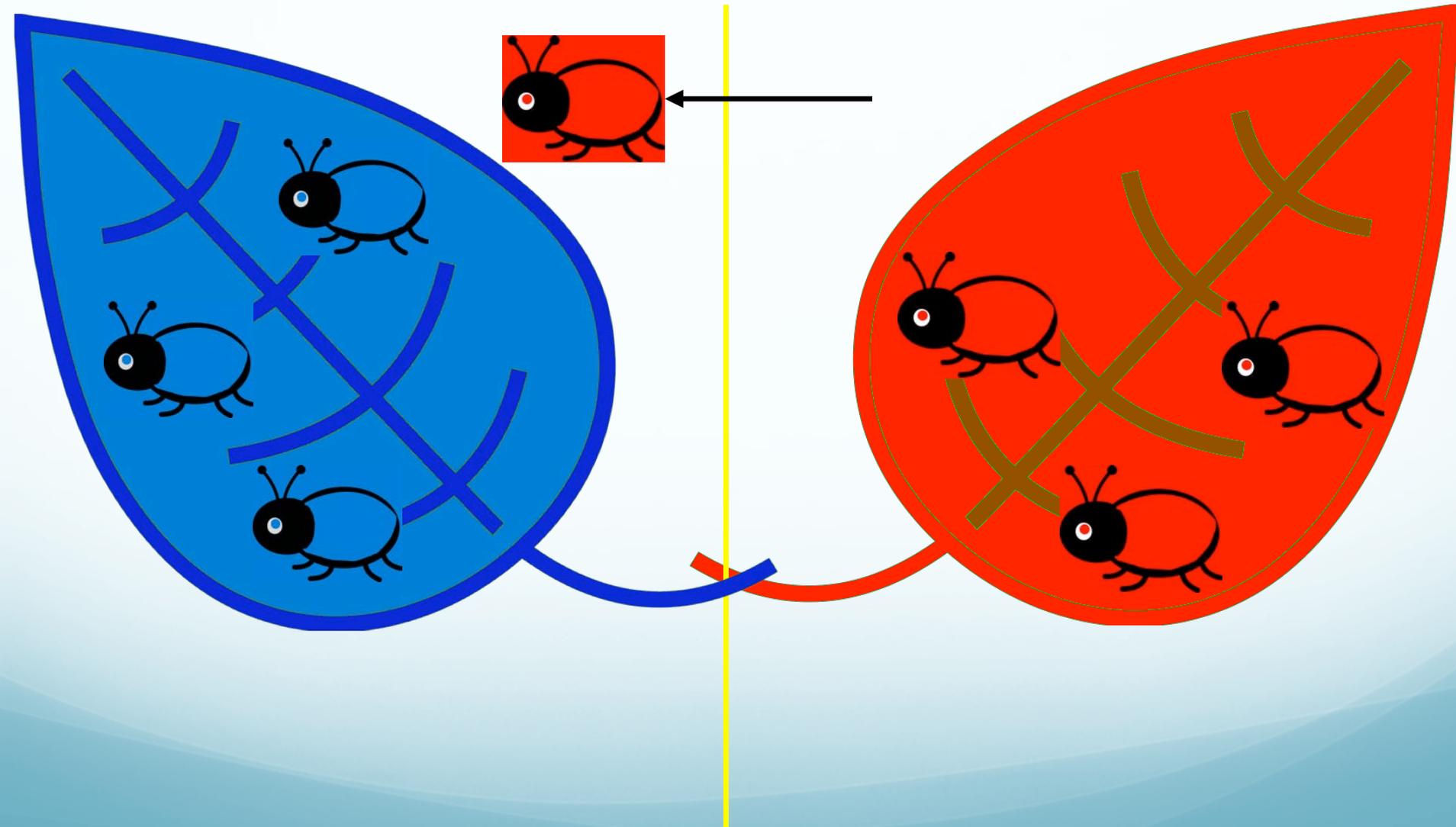
# Outbreeding Depression



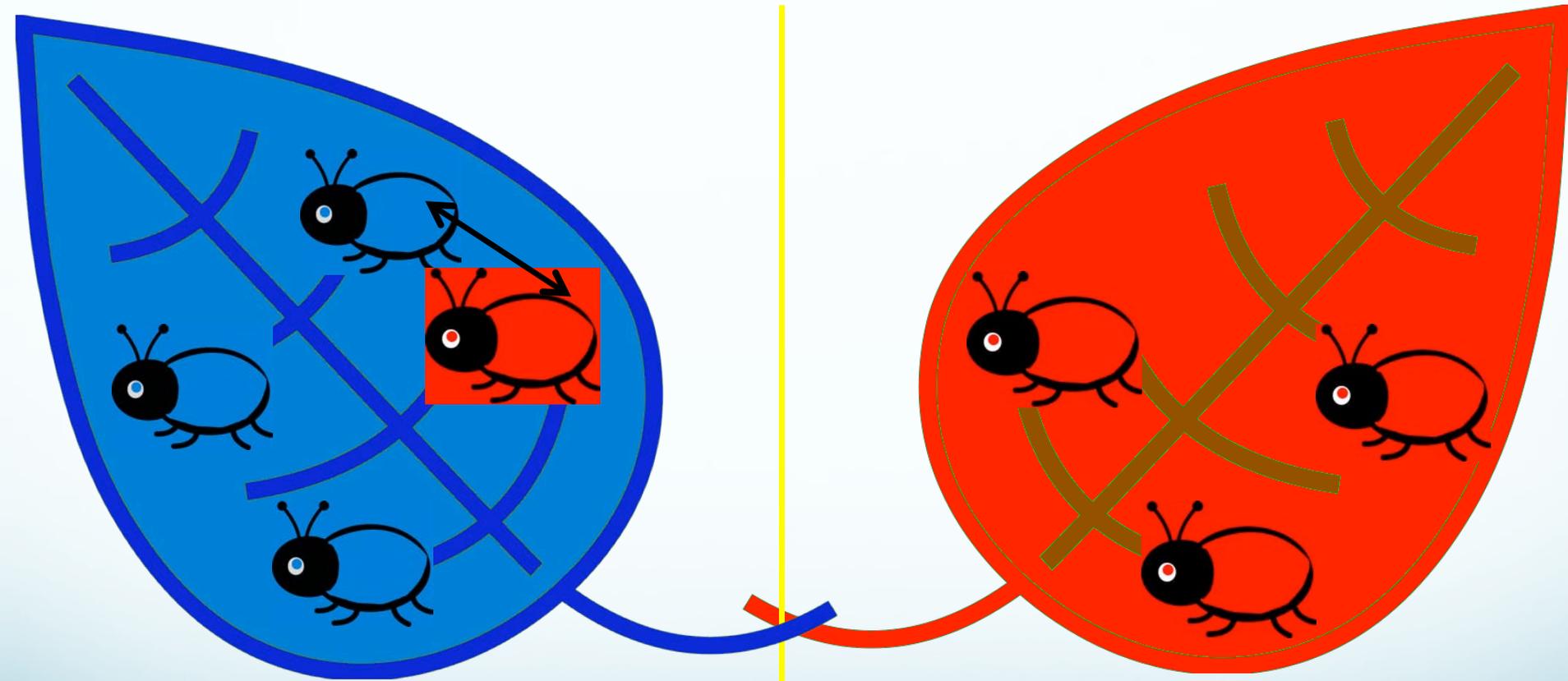
Blue beetles on blue leaf

Red beetles on red leaf

# Outbreeding Depression

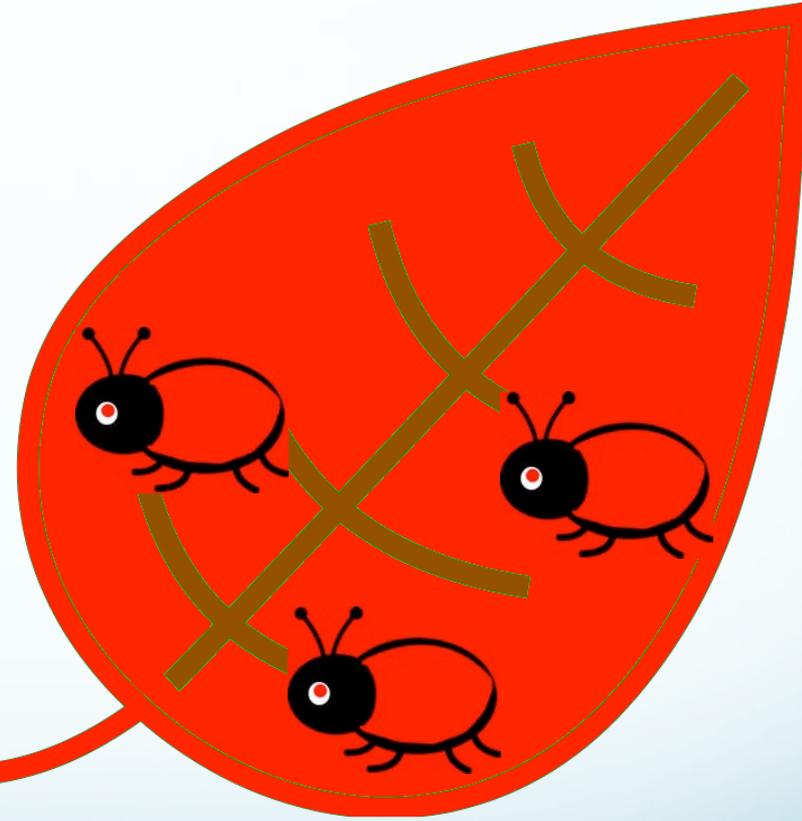
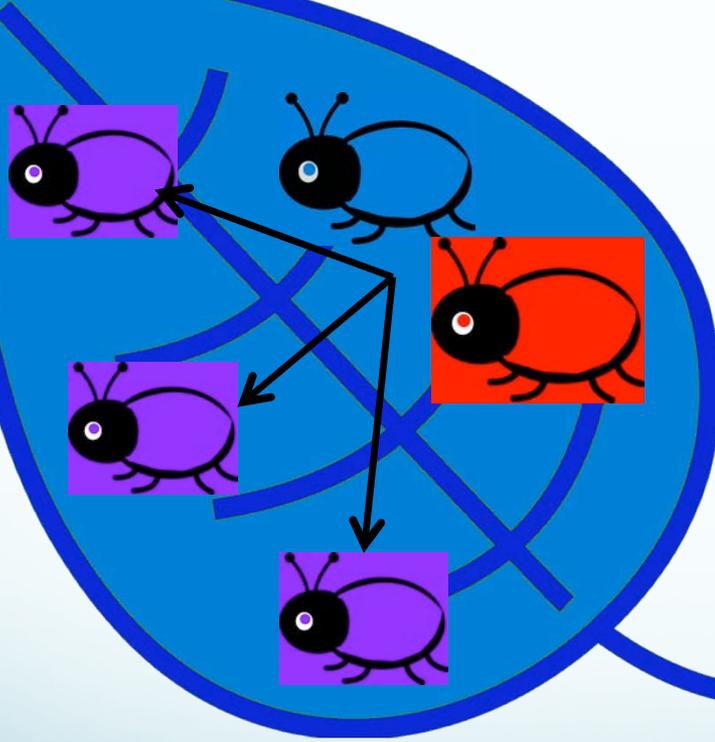


# Outbreeding Depression



Red beetle on blue leaf:  
mismatch of color

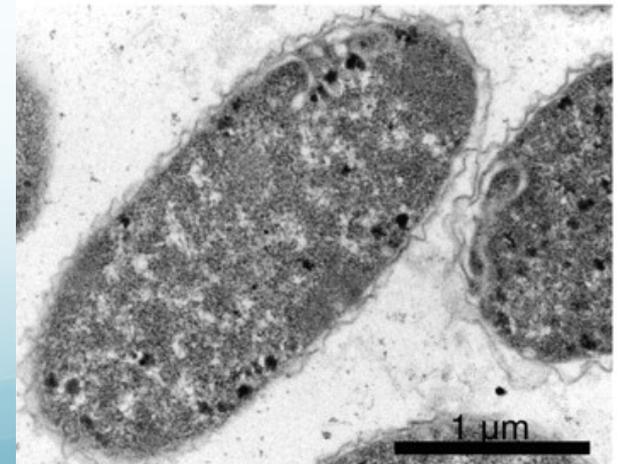
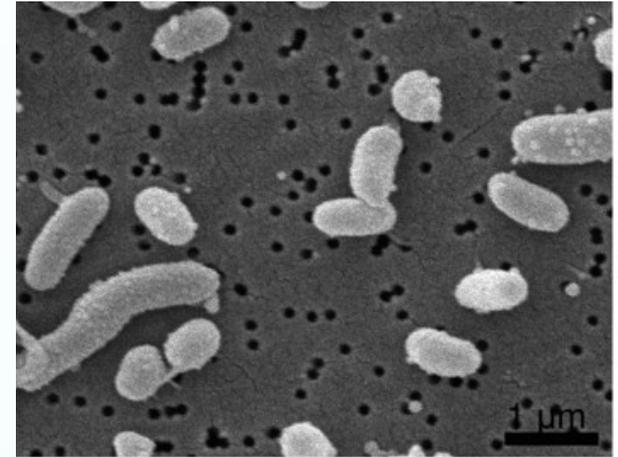
# Outbreeding Depression



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



*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.secure.org](http://www.secure.org))



Questions?