



# Responses of Benthic Coral Reef Organisms to the Zoning Action Plan

Steven Miller<sup>1</sup>, Mark Chiappone<sup>1</sup>, Dione Swanson<sup>2</sup> and Leanne Rutten<sup>1</sup>

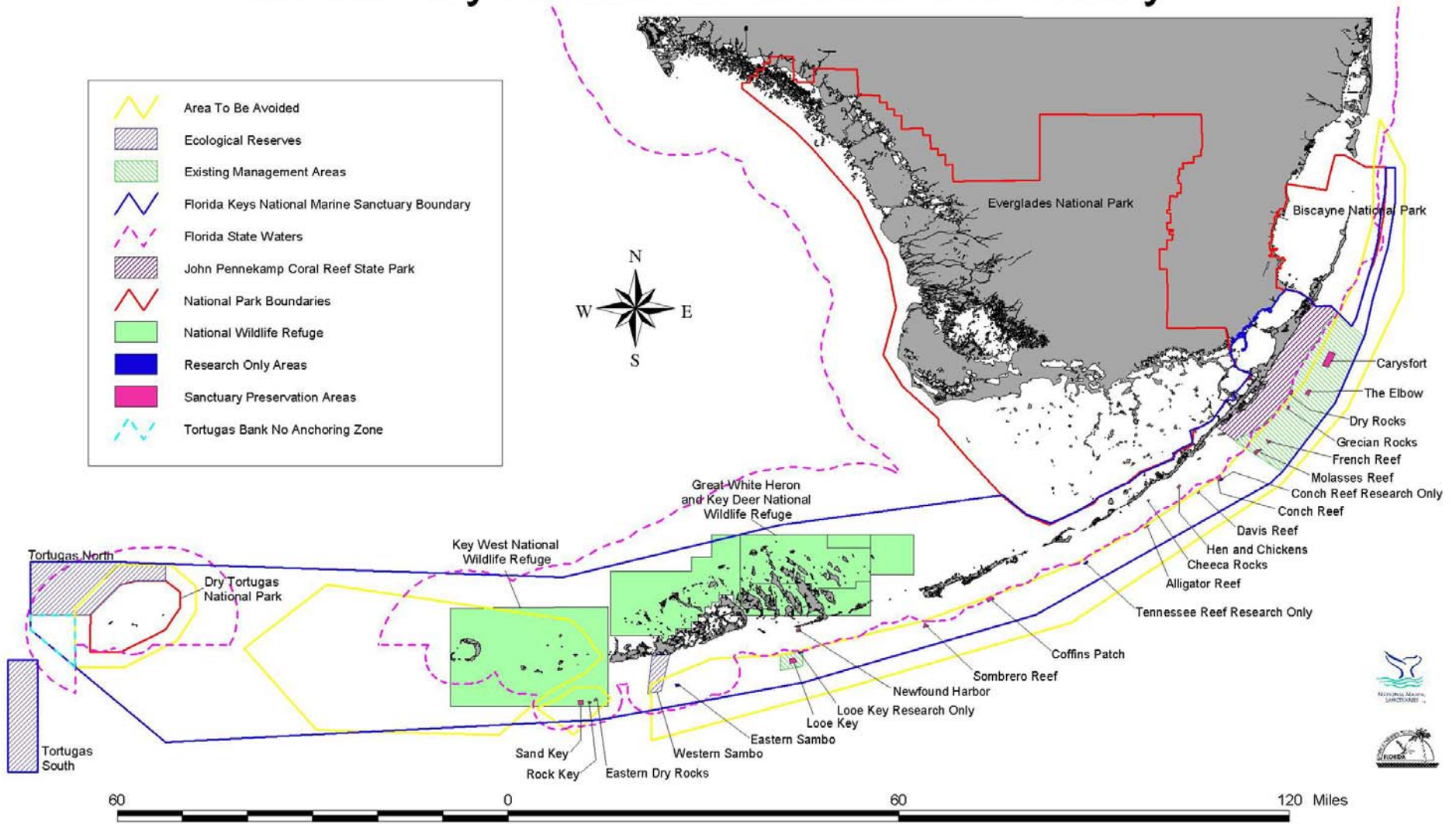
<sup>1</sup>*Center for Marine Science, University of North Carolina-Wilmington*

<sup>2</sup>*Division of Marine Biology and Fisheries, RSMAS-University of Miami*



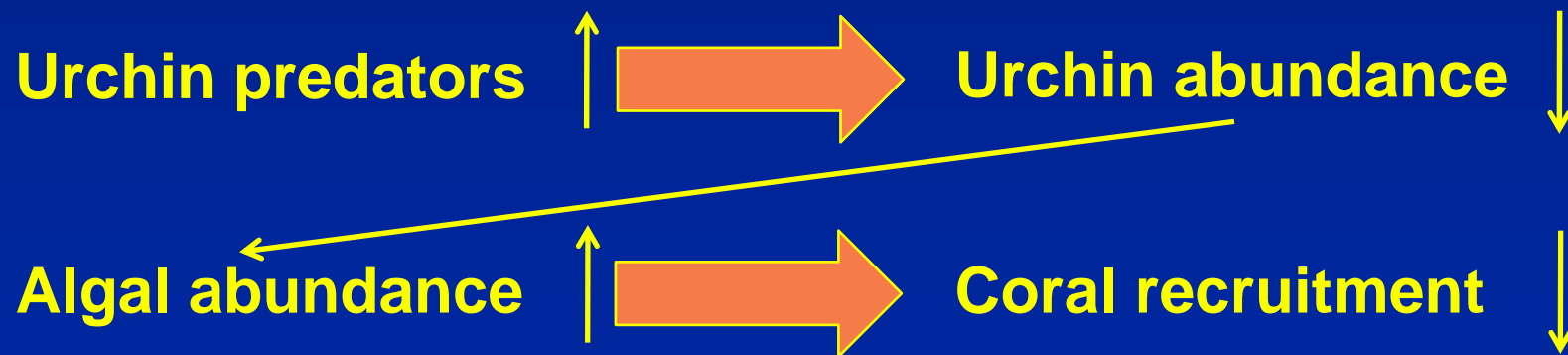


# Florida Keys National Marine Sanctuary

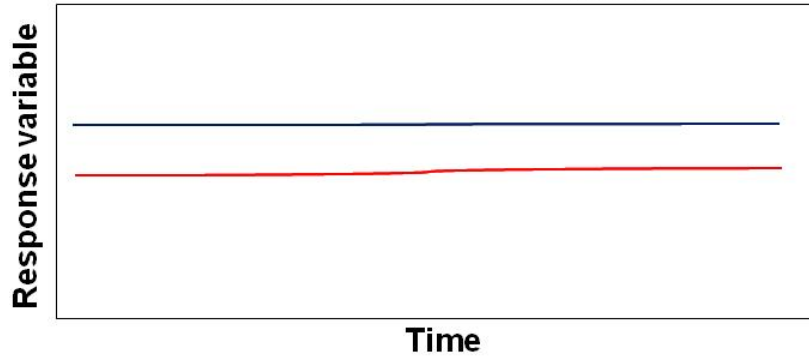


# Possible Benthic Responses

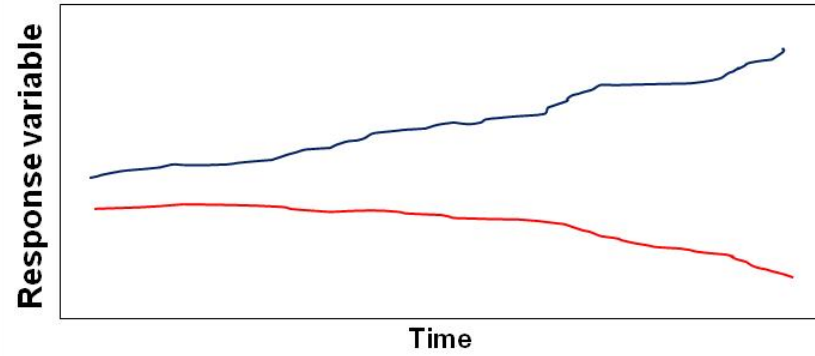
- Organisms that are removed will likely respond in terms of abundance and/or size
- Organisms not directly removed may respond due to changes in predation or competition
- Example:



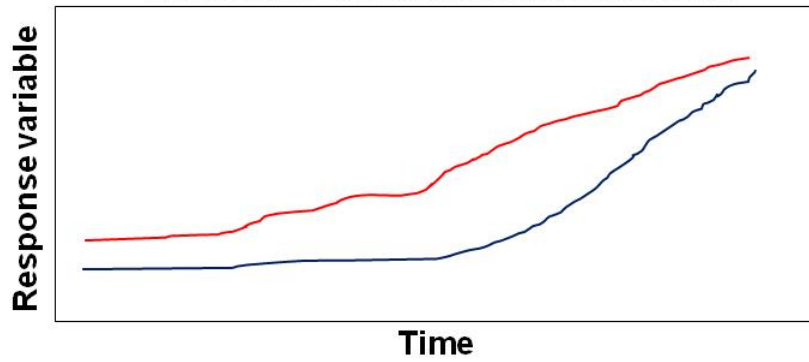
**Stasis in Zones and Reference Areas**



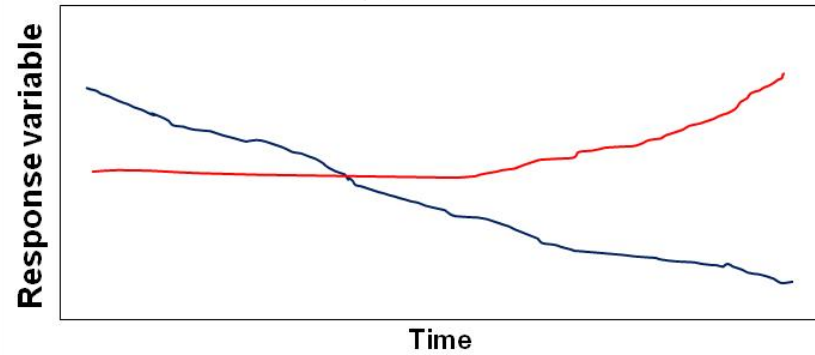
**Zones Increase, Reference Areas Decline**



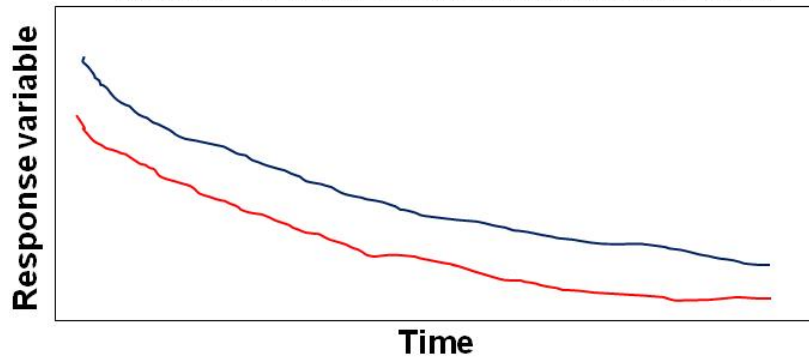
**Increase in Zones and Reference Areas**



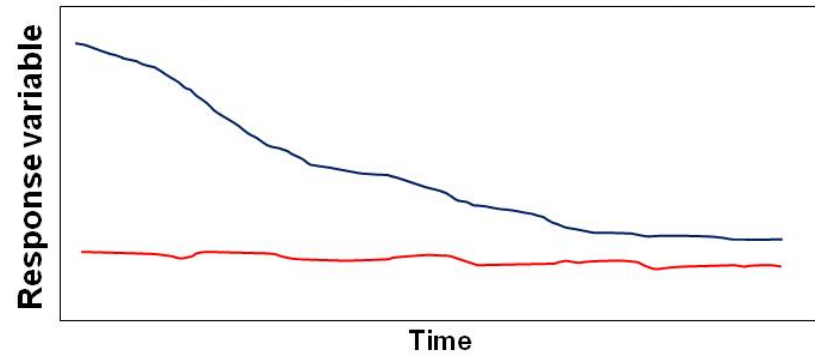
**Zones Decrease, Reference Areas Increase**

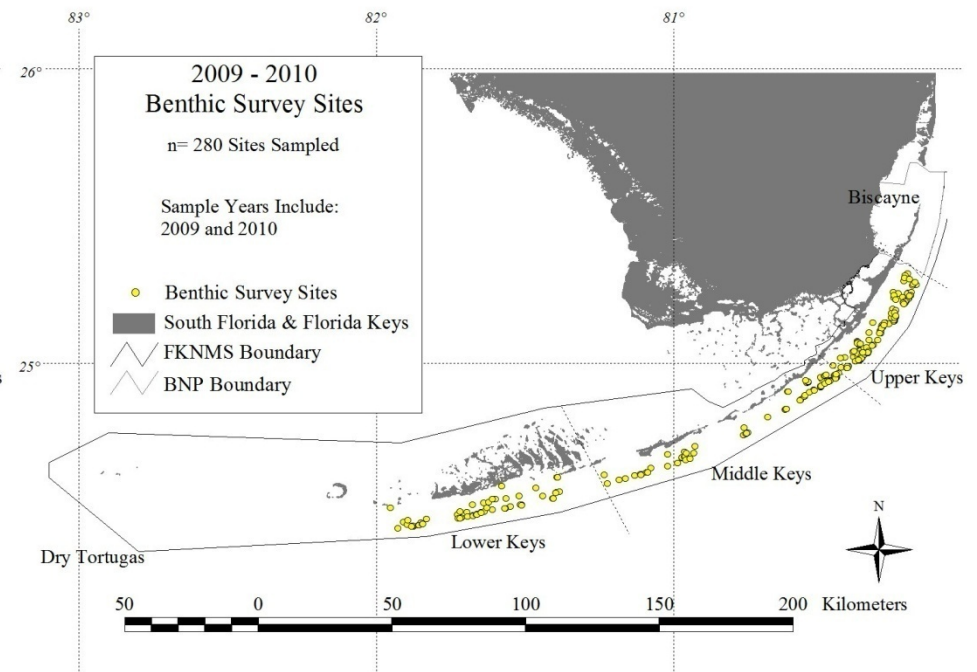
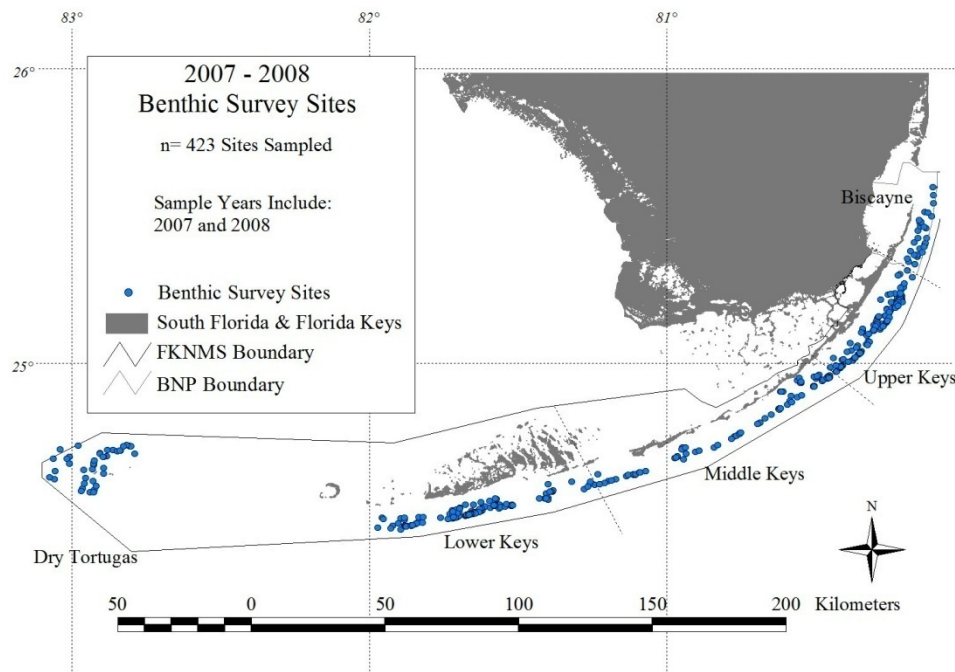
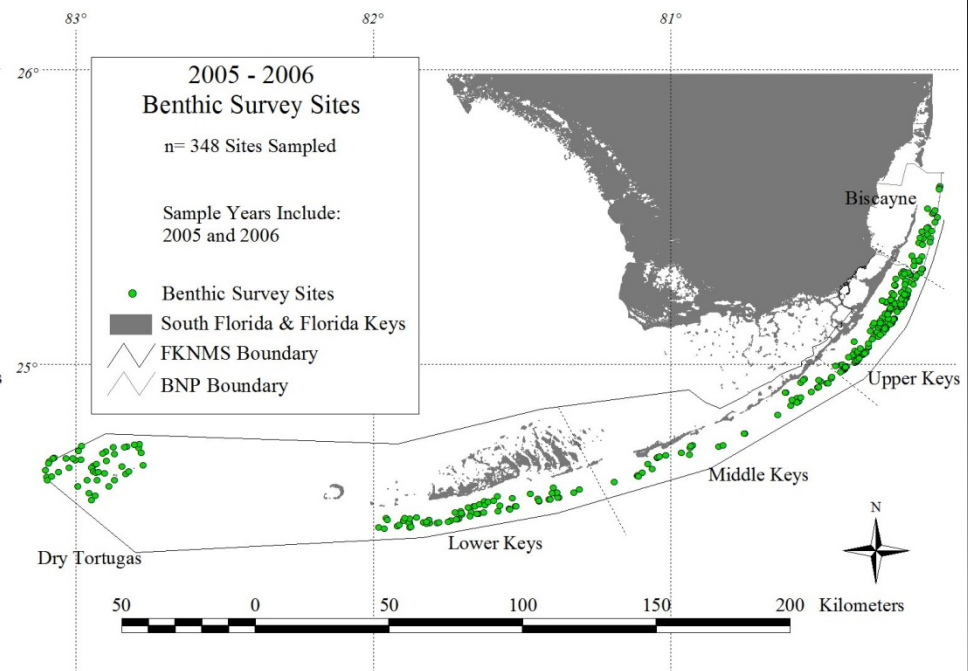
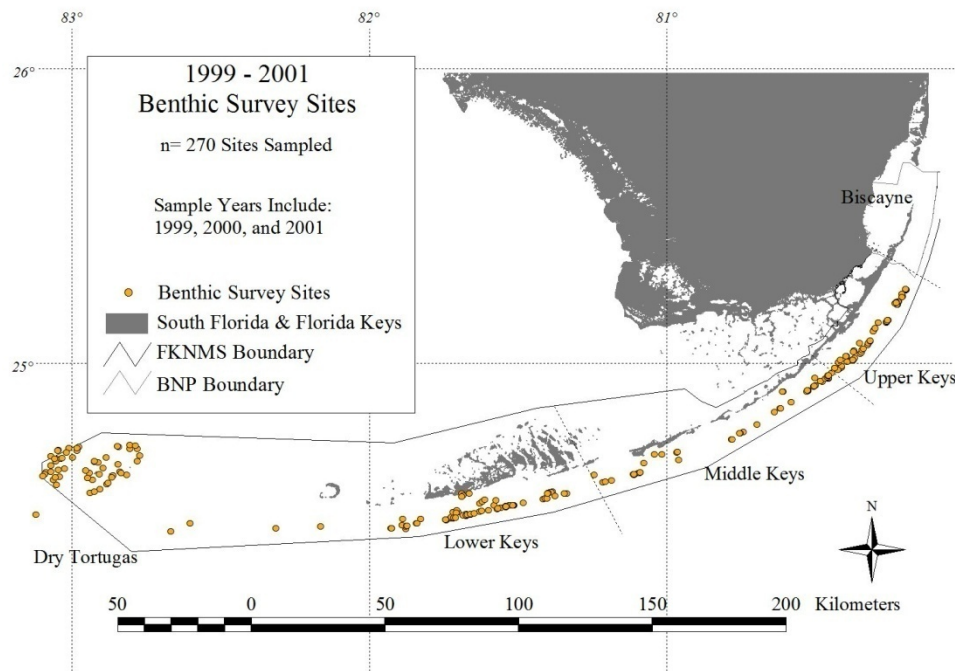


**Decline in Both Zones and Reference Areas**



**Zones Become Similar to Reference Areas**



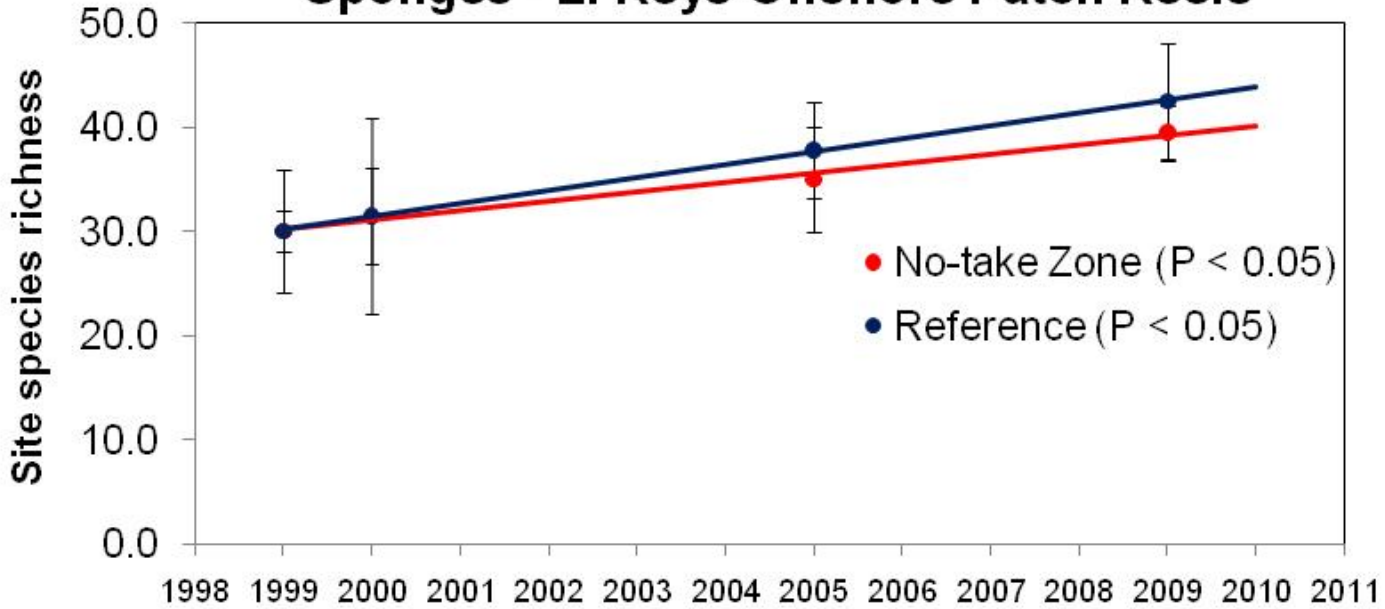


# Benthic Coral Reef Organisms

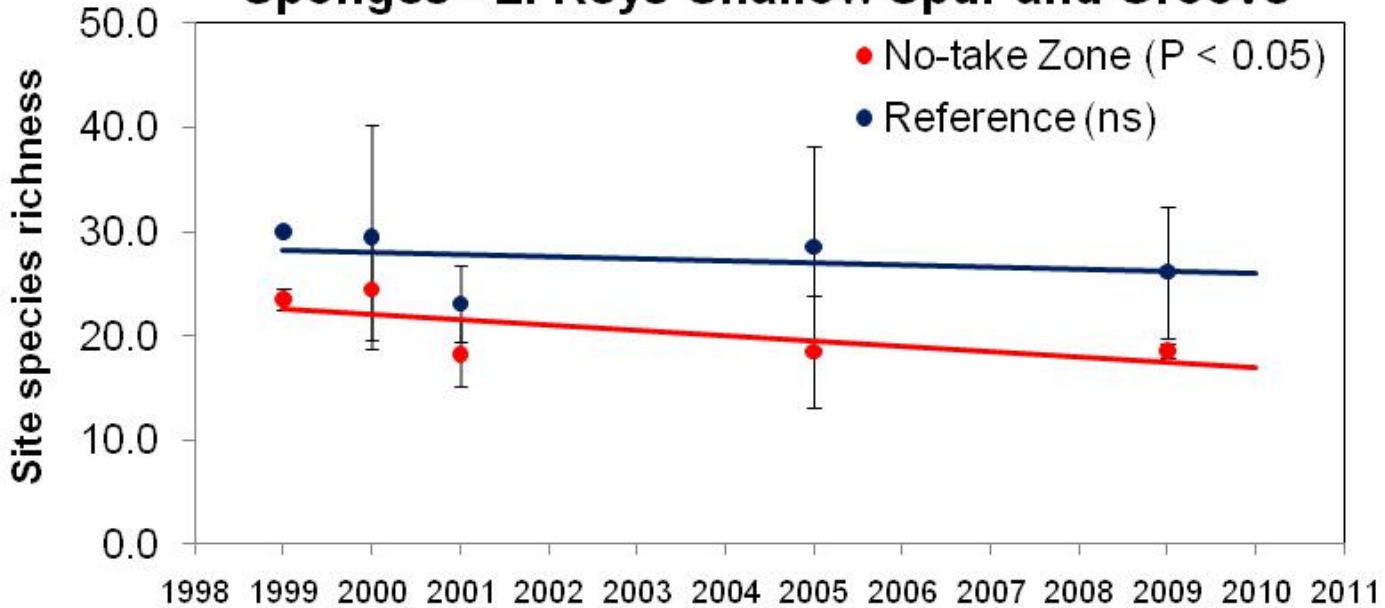




### Sponges - L. Keys Offshore Patch Reefs



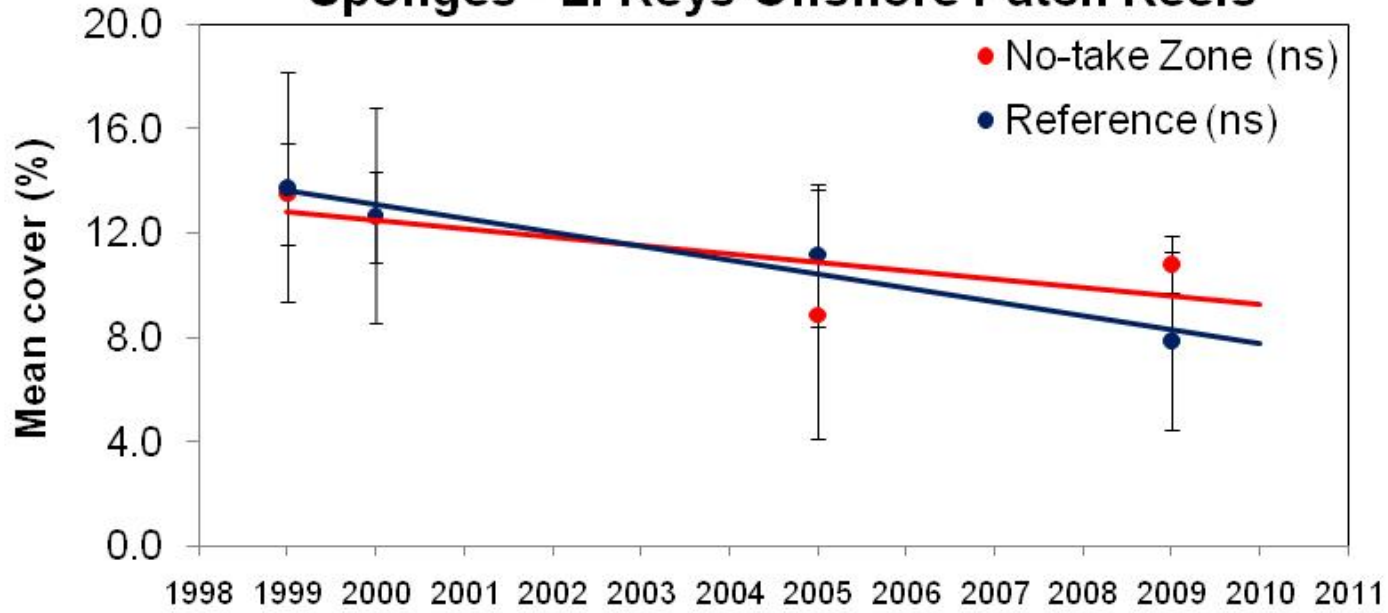
### Sponges - L. Keys Shallow Spur and Groove



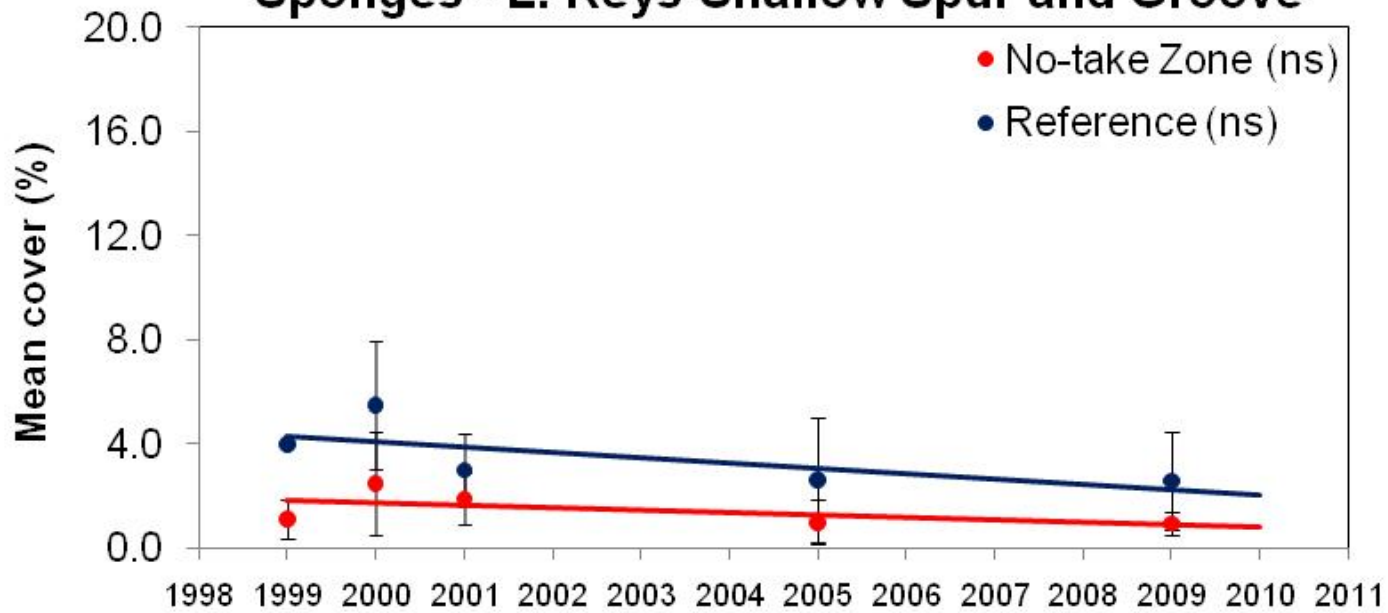




### Sponges - L. Keys Offshore Patch Reefs

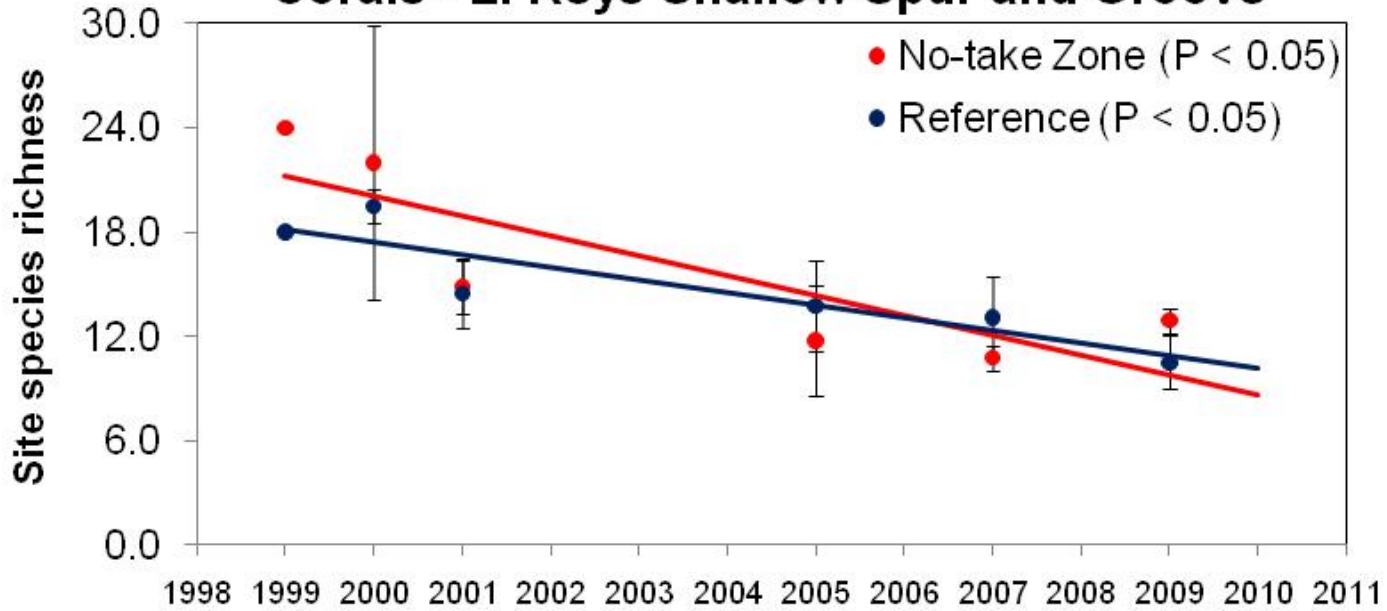


### Sponges - L. Keys Shallow Spur and Groove

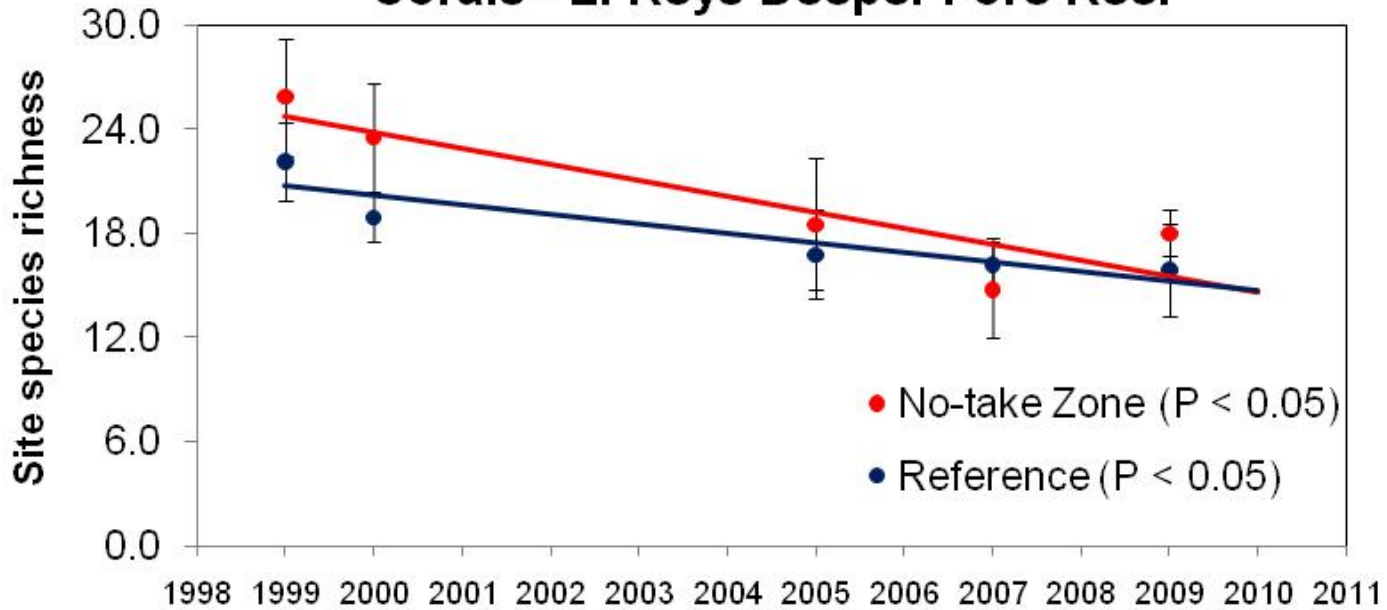




### Corals - L. Keys Shallow Spur and Groove

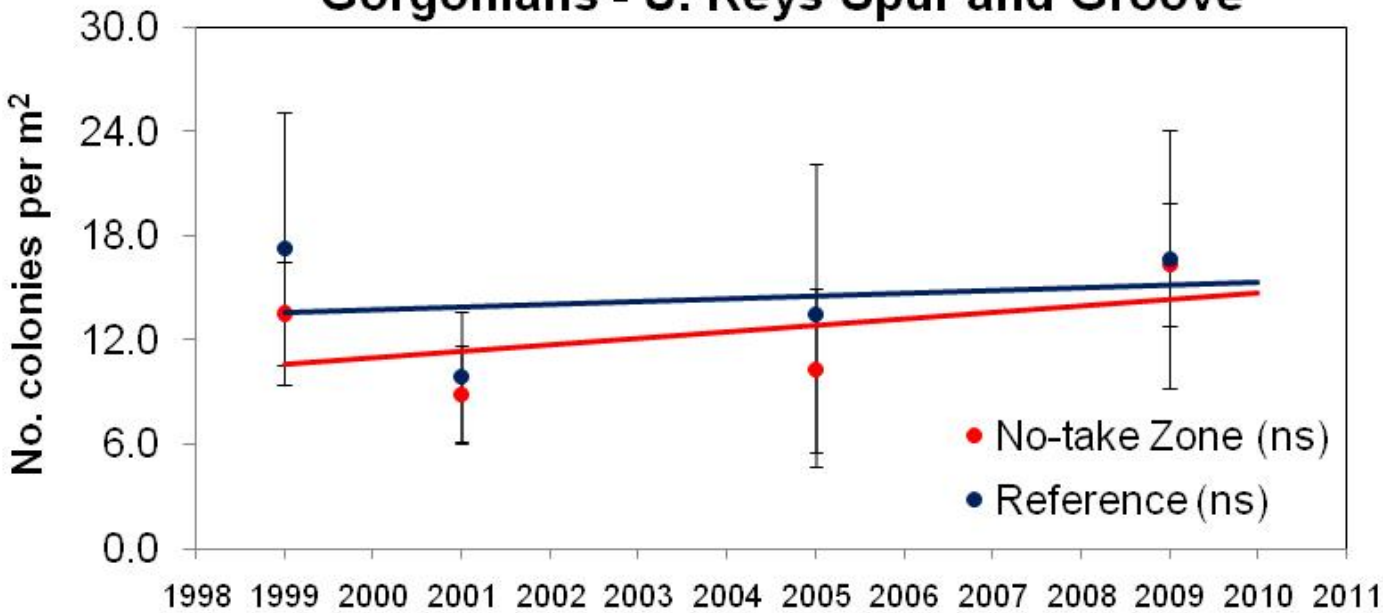


### Corals - L. Keys Deeper Fore Reef

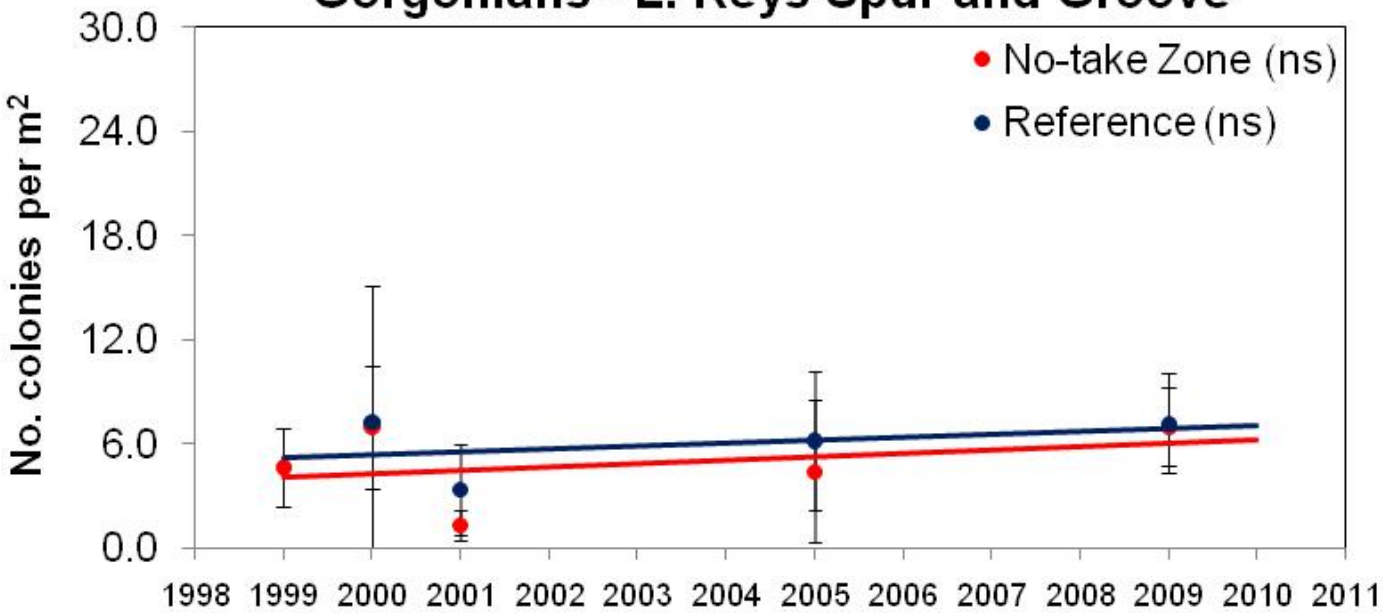




### Gorgonians - U. Keys Spur and Groove

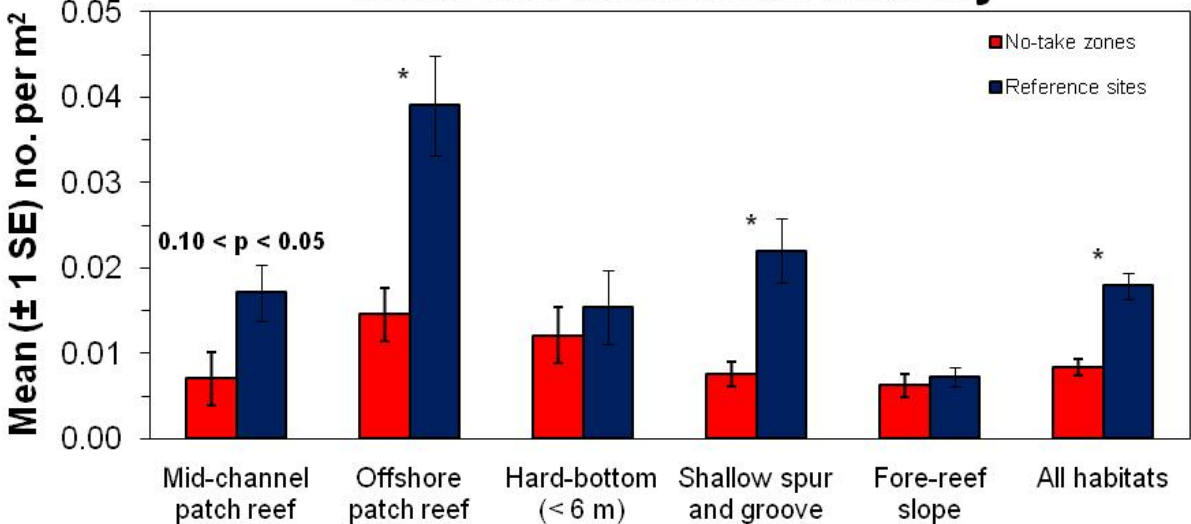


### Gorgonians - L. Keys Spur and Groove

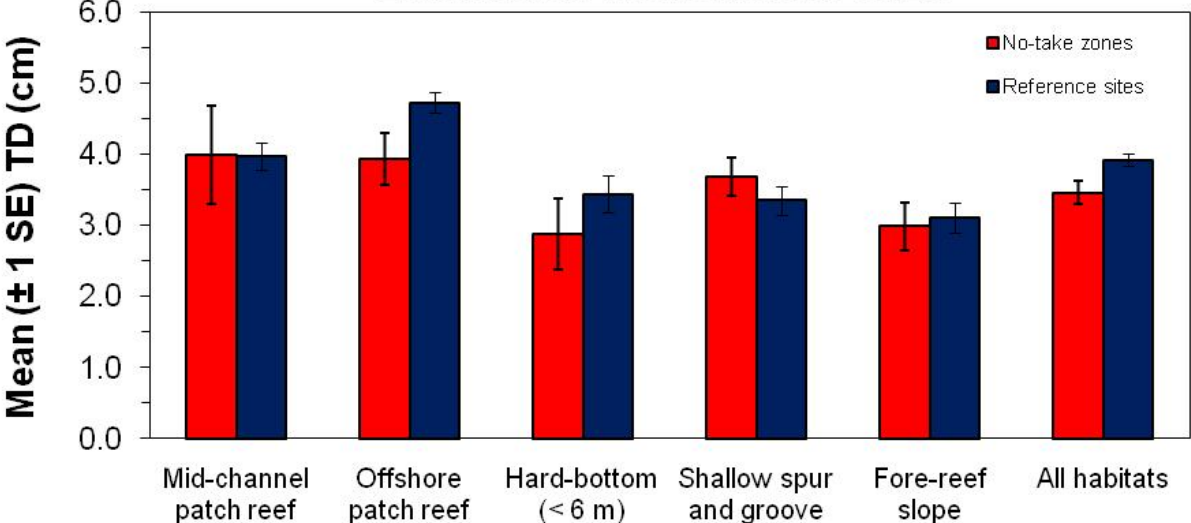




### *Diadema antillarum* density

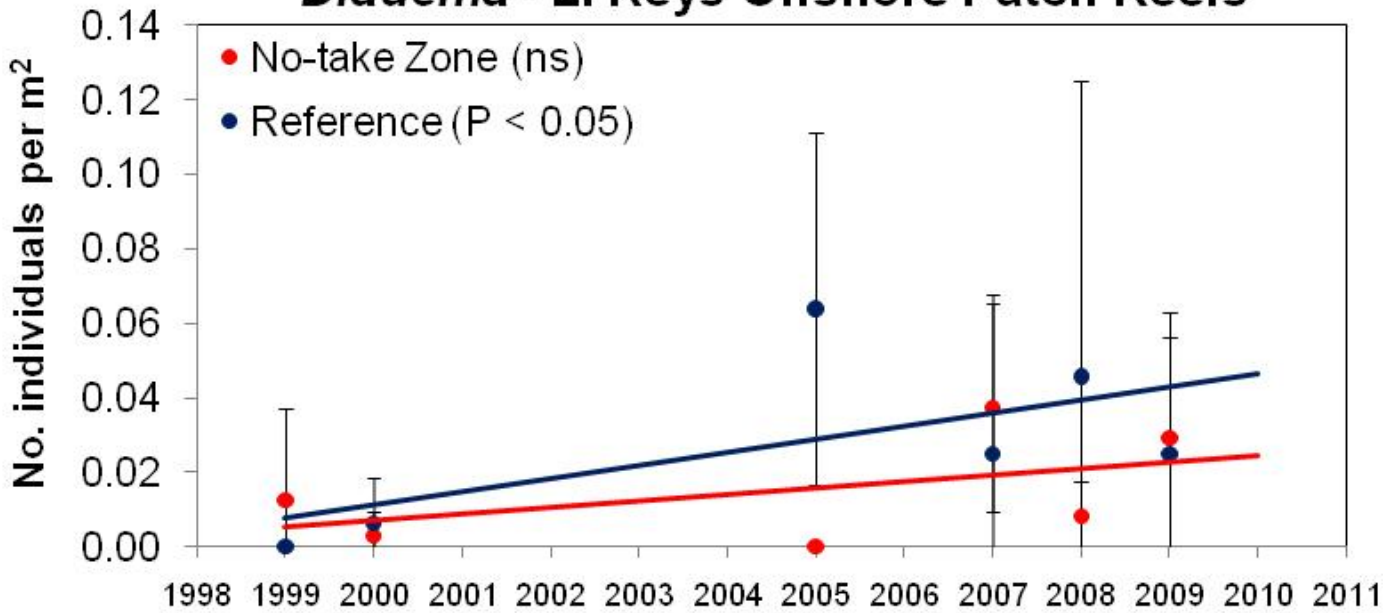


### *Diadema antillarum* size

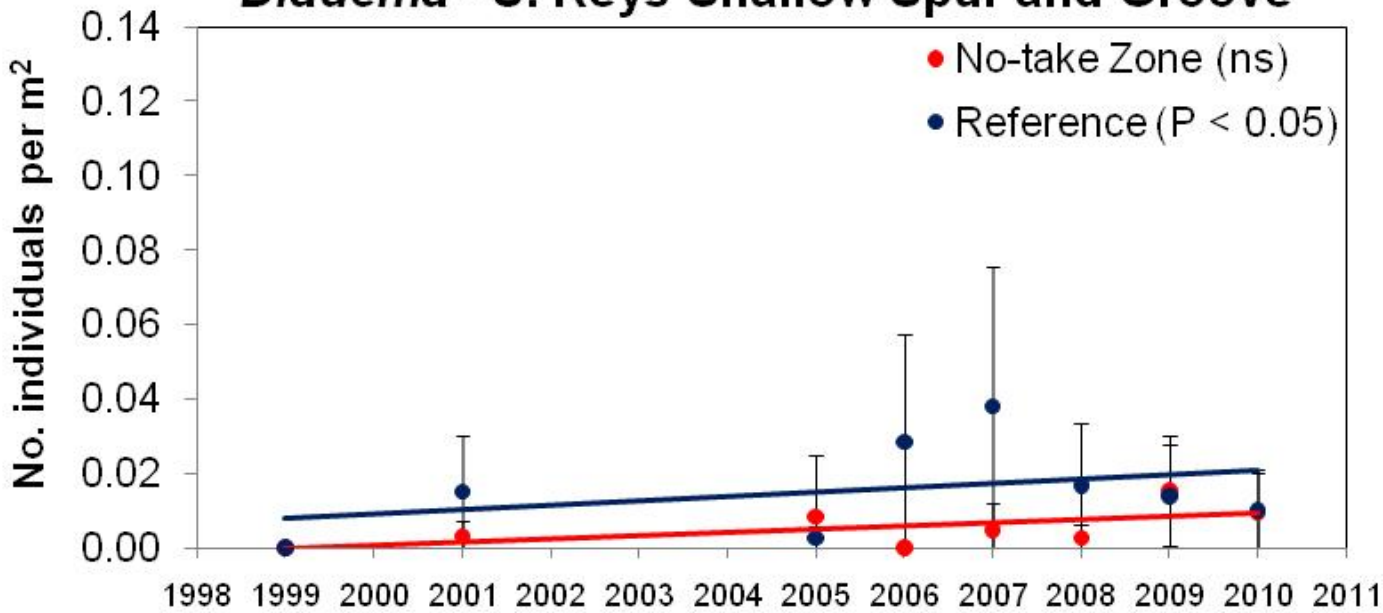




### *Diadema* - L. Keys Offshore Patch Reefs

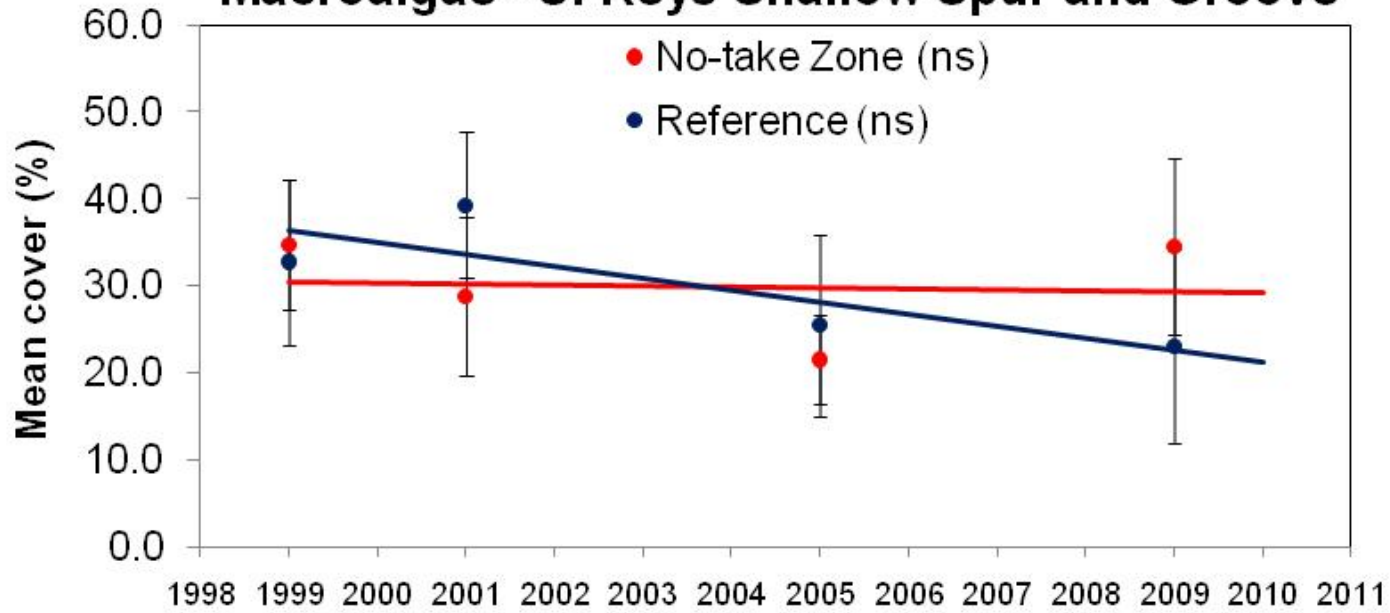


### *Diadema* - U. Keys Shallow Spur and Groove

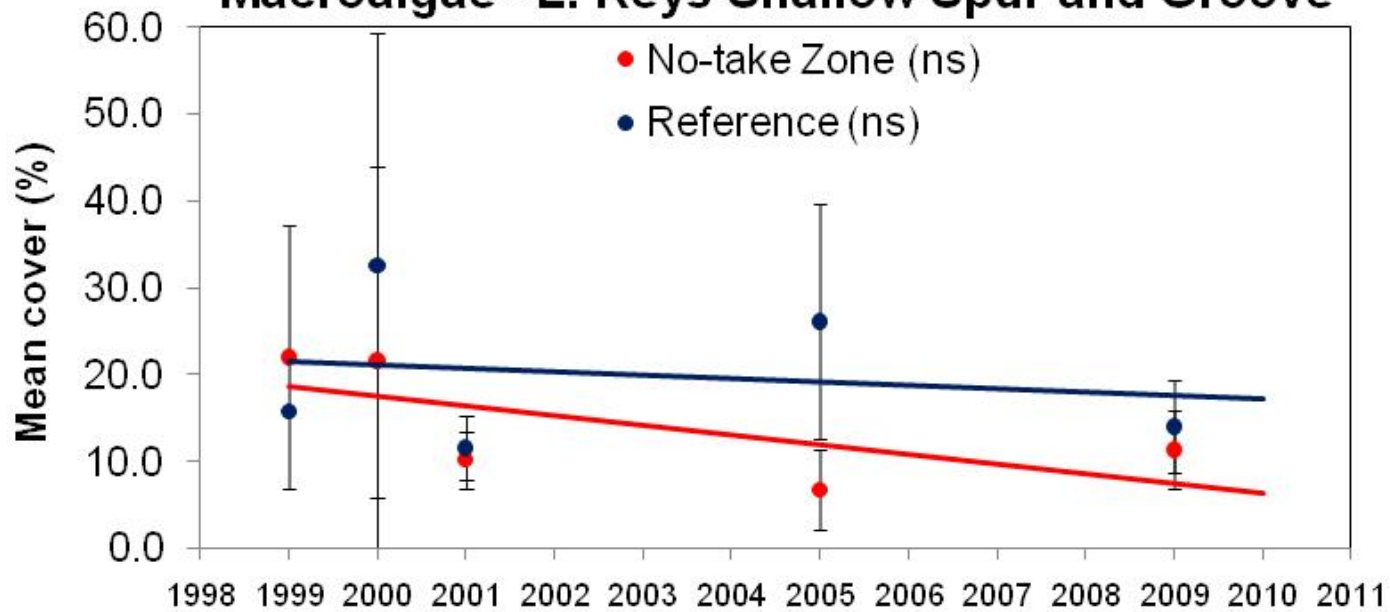


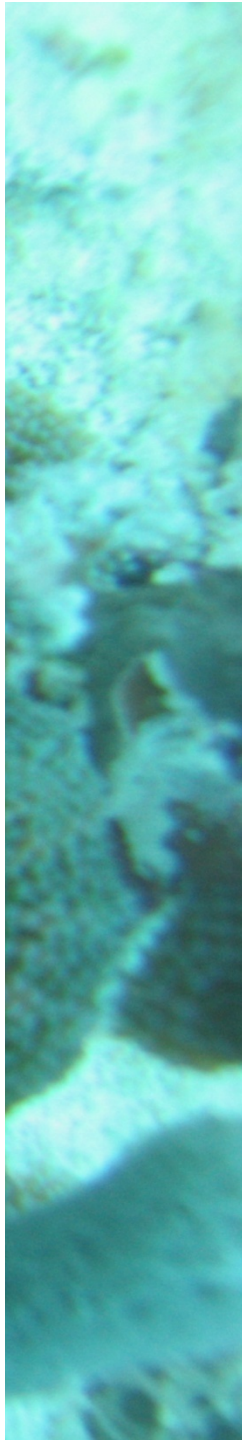
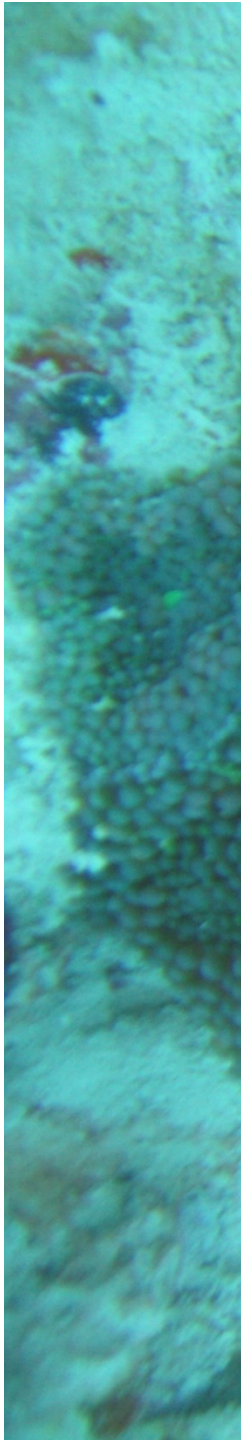


### Macroalgae - U. Keys Shallow Spur and Groove

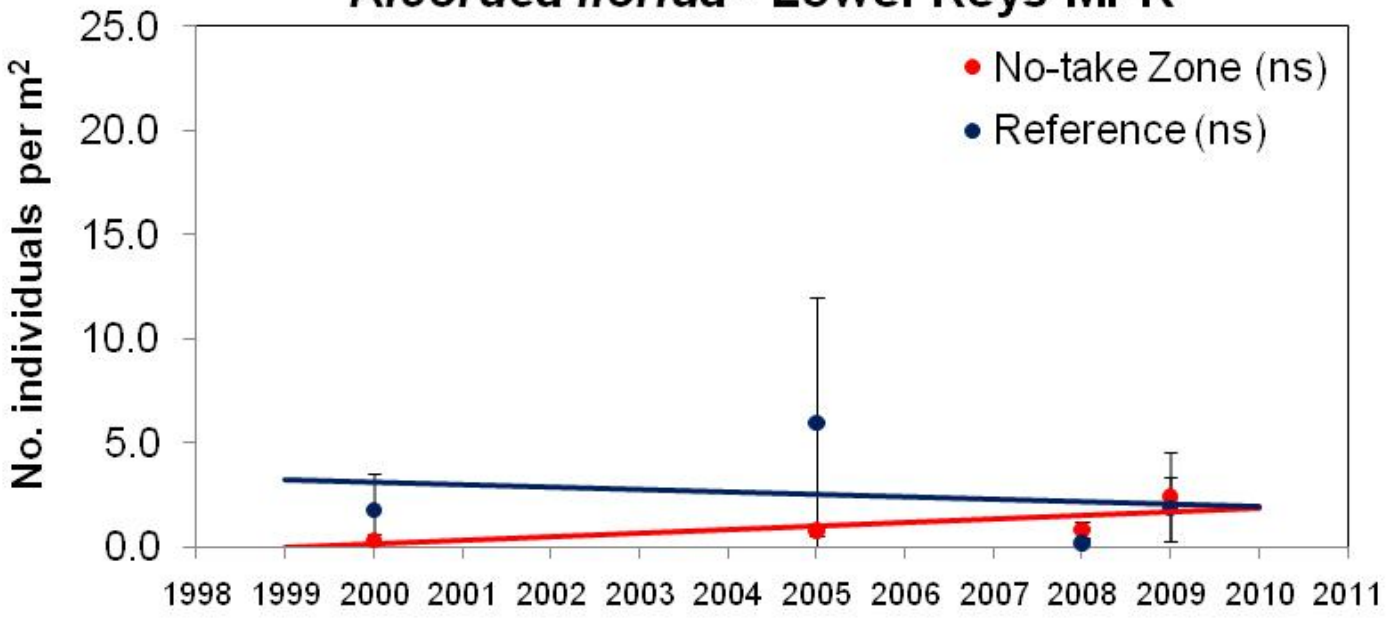


### Macroalgae - L. Keys Shallow Spur and Groove

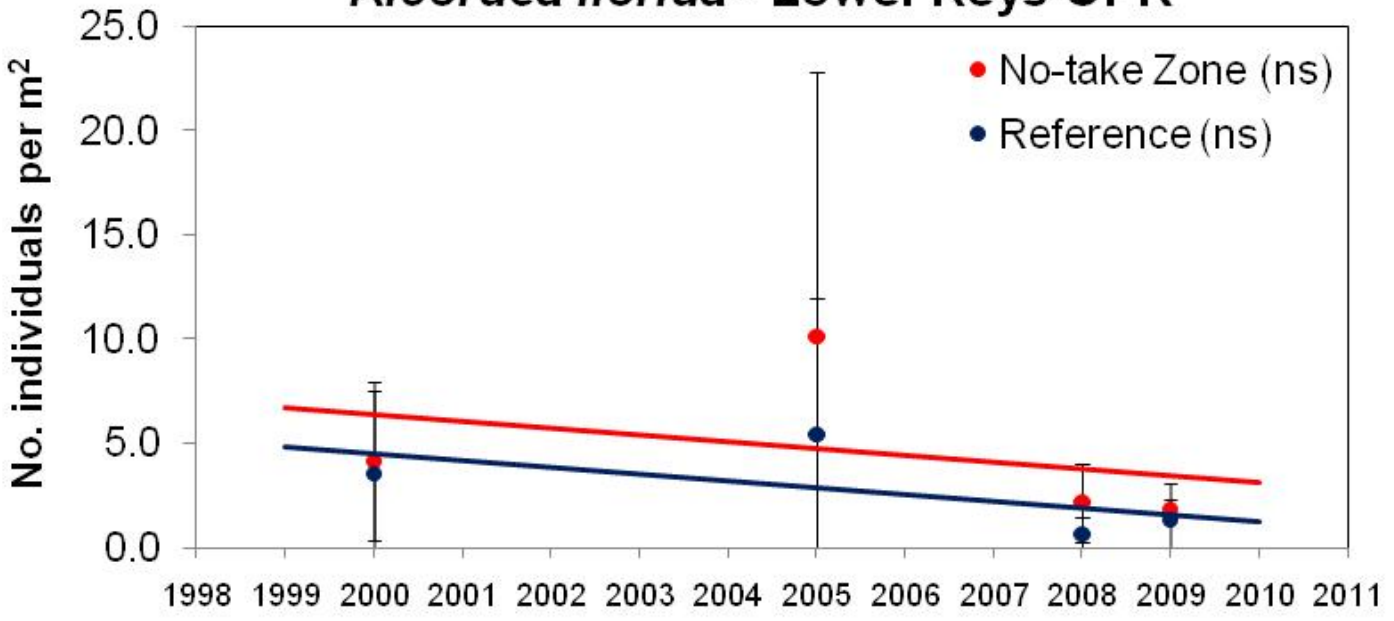




### *Ricordea florida* - Lower Keys MPR



### *Ricordea florida* - Lower Keys OPR



# Parting Thoughts

- It's a mixed bag and it may take some time for trophic effects to play out
- The no-take zones are the controls
- Is fishing pressure the major driver of change for the benthos in this system?
- Non-compliance is an ongoing challenge
- Some interesting experiments: Urchin predation, Damselfishes, *Coralliophila*