**Garcia-Sais et al. 2017**

**Mortality, Recovery, and community shifts of scleractinian corals in Puerto Rico one decade after the 2005 regional bleaching event**

**Summary: Used the same dataset I am, marginally related**

Background:

* Large bleaching event in 2005
* The increase of anthropogenic stressors, such as coastal development, eutrophication and sedimentation, and loss of key reef herbivores have been associated with the lack of coral recovery at many Caribbean coral reefs (Carilli et al., 2009; Wilkinson, 2010; Roff & Mumby, 2012).

Methods:

* Used satellite data to get the water quality info
* ANOVA to compare percent cover between depths & years at each reef
* PERMANOVA (Anderson, 2001) used to examine changes in coral assemblages, only used corals that contributed to more than 10% of cover

Results:

* Negative correlation between % cover loss and light attenuation coefficient
* Positive correlation between coral cover recovery and light attenuation coefficient
* O. annularis was severely impacted by the bleaching event, and because it was a large portion of the community composition, it therefore caused the total % cover to decline (see fig 5)
* Coastal reefs recovered faster than offshore/shelf edge sites
* Depth affected coral recovery: shallower ones recovered more quickly
* Observed shifts in coral community composition as O. annularis died out & porites & agaricia became more common

Discussion

* Localized impacts upon coral reefs associated with anthropogenic activities have been reported (Hughes et al., 2003; Fabricius, 2005; Warne, Webb & Larsen, 2005), but the main driver of change on the Puerto Rican coral reef community has been linked to the 2005 regional coral bleaching event (García-Sais et al., 2008; Bruckner & Hill, 2009).
* Bleaching event caused by elevated sea surface temps that lasted a long time
* Light may have played a determinant role as a precursor of coral bleaching & mortality
* Orbicella annularis (complex) is the main reef builder in PR. It suffered major declines after the bleaching event

Reflections:

* Used the same dataset as I am, marginally related

**Author/Year: Bruno et al. 2019**

**Title:** Climate Change, Coral Loss, and the Curious Case of the Parrotfish Paradigm: Why Don’t Marine Protected Areas Improve Reef Resilience?

**Summary/Keywords:**

Background:

* Localized threats: turbidity, sedimentation, eutrophication & other pollution, fishing & the loss of fishes
* Broader threats: diseases, earthquakes/tsunamis, Ocean warming, acidification, deoxygenation, storm intensity
* Controlling local stressors is thought to improve resistance to and recovery from warming, storms, disease, bleaching
* Appealing because it suggests that one management action can have a huge trickle down effect
* Managed-resilience hypothesis – supported by most scientists, the belief that conserving herbivores will help protect corals
* The hypothesized interaction chain leading from management to coral community resilience comprises five direct links (Figure 3): the effects of (1) management on fishing; (2) fishing on the abundance and size of parrotfishes and other herbivores; (3) parrotfishes (and other herbivores) on algae (primarily macroalgae); (4) algae on coral recruitment, growth, and survival; and (5) coral recruitment on rates of postdisturbance recovery of adult coral populations.

Methods:

Results:

* Virtually no evidence that the M-R hypothesis is valid
* Nearly all coral loss was due to loss of Orbicella
* Higher recruits in MPAs but lower survival rates (outcompeted by weedy corals)
* Higher numbers of herbivores did not translate to higher grazing rates (Mumby et al. 2006)
* One study (mumby & Harborne 2010) found a positive relationship but it was a very slow recovery rate & low coral cover compared to nearby healthy reefs
* Acroporates & Orbicella have dominated reefs in the past, but now are being replaced by “weedy” corals which have lower capacity for accretion

Discussion

* Protection against local stressors (pollution, fishing) doesn’t mitigate against climate change

Reflections:

Mumby & Harborne (2010)

(Harris et al. 2014)

Graham et al. 2006

Graham et al. 2011

Carassou et al. 2013

Selig & Bruno 2010

Selig et al. 2012

Bruno et al. 2019

* When coral cover declines, so does habitat complexity (Alvarez-Filip et al. 2009, 2011) and the diversity of reef inhabitants, including fishes and invertebrates (Idjadi&Edmunds 2006, Jones et al. 2004, Pratchett et al. 2008).
* Important that there are grazing fish to remove algae which competes with the coral
* Parrotfish abundance specifically helps protect reef systems
* Hypothesis that MPAs protect parrotfish, and therefore protect coral
* Managed – resilience theory: good figures
* No study found that local protection improved local coral cover resilience
  + Coral recovery was consistent in and out of MPAs
  + Coral response decline was worse in MPAs than outside
* Only one out of the 18 studies supported the hypothesis
* Shift in coral species to slower growing corals that do not fill functional niches
* One reason that the theory does not work could be that MPAs do not protect the herbivores
* \*\*\* do the MPAs protect the parrot fish?
* \*\*\* do the parrot fish impact the macroalgae cover?
* Fish protection may be so good, that they’re restoring the top predators and therefore decreasing the herbivores (trophic cascade)
* Size of the fish impacts how much they eat
* Non –fish species can be herbivores (urchins)
* Resilience vs recovery
* By decreasing local disturbance, it could actually be making the reef less acclimated and therefore more susceptible to global/larger scale disturbance
* Fishing can directly harm corals through destructive fishing practices
* There is clear evidence of widespread and striking declines in fish biomass on coral reefs, including general declines in parrotfish biomass (Paddack et al. 2009, Valdivia et al. 2017, Williams set al. 2011).
* No evidence that declines in parrotfish have adverse effects on corals
* On how coral mortality affects the composition and diversity of fishes via habitat loss ( Jones et al. 2004, Pratchett et al. 2008, Wilson et al. 2006). Jackson et al. (2014) asked the inverse question and found that spatial variation in parrotfish biomass across the Caribbean was unrelated to coral loss (Figure 8).
* \*\*\*\* are there relationships between algal and coral cover?
* Fishing intensity strongly related to fishing ports/proximity of people (Nadon et al. 2012, Stallings 2009).
* By protecting the herbivores, you also protect their predators, and actually may reduce the number of herbivores
* Parrotfishes both help and harm corals through bioerosion and reducing algal cover

Beltran 2020

* Discusses each of the MPAs in detail
* Lists of commercially important fish species
* Need better connectivity between MPAs to form networks… not currently happening in the Caribbean

McClanahan & Muthiga 2020

* Restriction of parrotfish capture led to recovery of the top species
* Parrotfish pop controlled by ecology of reef rather than fishing pressure