Adaptation and resilience in response to global environmental change

The Baskett Lab
Department of Environmental Science & Policy
CMSI Symposium, 3/19/15
Over-arching theme

**Basic science:**
How does heterogeneity affect population and community dynamics?

The response of marine populations and communities to global environmental change

**Applied science:**
How do responses to environmental change affect management decision-making?
Over-arching theme

What role does genetic adaptation/rapid evolution play?

The response of marine populations and communities to global environmental change

How do communities respond as complex adaptive systems?

Primary methodology: dynamical models
Population level: role of genetic adaptation

• Drivers of coral reef adaptation to ocean acidification (collaborator: Josh Madin, Macquarie University)

• Mitigating unintended fitness consequences of hatcheries and aquaculture

UCD collaborators: Mike Springborn (ESP), Allison Dedrick (GGE), Amanda Faig (ARE); non-UCD collaborators: Robin Waples, NWFSC; Stephanie Carlson, UCB; Will Satterthwaite & Steve Lindley, SWFSC

Jaime Ashander (PBGG): Interaction between phenotypic plasticity and genetic evolution in response to environmental change
Community level: response as complex adaptive system

- Effect of coral response diversity on ecological resilience
  (collaborators: Kevin Gross, NCSU; Nick Fabina, recent PBGG grad)

Lewis Barnett (GGE): Effect of spatial management on ecological resilience

Robert Dunn (GGE/SDSU): Effect of multi-trophic harvest on kelp vs. urchin abundance in temperate reefs

Vadim Karatayev (GGE): Effect of spatial heterogeneity on resilience
Student summary

Lewis Barnett (GGE): Do marine reserves buffer responses to environmental variability and change given:
- Interactive effects of fishing and climate?
- Species interactions with alternative stable states?

Jaime Ashander (PBGG): Interaction between phenotypic plasticity, genetic evolution, and demography in noisy and changing environments
- Inferring relative roles of each from time series
- Optimizing dam operations based on population models

Allison Dedrick (GGE): Multiple interacting impacts
- How do ocean acidification, temperature change, and fishing interact in their effect on population dynamics?
- How do hatcheries, fishing, oceanic variability, and climate change interact in their effect on salmon populations?

Robert Dunn (GGE/SDSU): Trophic interactions and community dynamics in near-shore reefs
- Effects of multi-trophic level harvest in kelp forests
- Integration of field work and modeling

Vadim Karatayev (GGE): Effect of spatial structure and heterogeneity on resilience in benthic marine communities
- Synthesize data & models
- Also: management implications of trait plasticity in aquatic invasives