Contribution of Mangrove Nursery Habitats to Replenishment of Adult Reef Fish Populations in Southern Florida

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Life History Transitions

Mangrove Forest  Coastal Bay  Reef  Pelagic zone

- Seagrass
- Rubble
- Sand/mud flat

- Patch reef
- Barrier reef
- Reef edge

- open ocean
- Gulfstream

Juveniles  Adults  Spawning

Settlement  Larvae

[Images of fish and human hand with fish eggs]
Mangroves: critical nursery habitat for reef fishes?

- Juveniles are abundant
- High food
- Low predation/Shelter

- Limited evidence (*Nagelkerken, 2007*)
  - focused on one habitat
  - juvenile or adult habitat
  - juvenile/adults not distinguished
  - survey methods differed
Objectives

- Synthesize mangrove/reef fish survey data
- Nature and extent of habitat connectivity
- Index-of-Recruitment
  - annual variability
  - environmental influences
- Predictive models
Complementary Data Sets

Mangrove Visual Survey (J. Serafy)
- 1999 - 2007 (981 transects)
- 99 taxa

Reef Visual Census (J. Bohnsack)
- 1999 - 2007 (931 surveys)
- 365 taxa

Mangrove/Reef = 68 taxa
- Abundance, Length
- Habitat, Environment
Mangrove Habitat
Multivariate Analysis

- Spatial
  - habitat
  - lat/lon
- Temporal
  - year
  - wet/dry season
- Environmental
  - salinity
  - temperature
  - depth
  - DO
  - freshwater discharge
Developmental Stage

![Bar charts showing frequency of different stages (Juvenile, Subadult, Adult) for various species.](image)
Ontogenetic Habitat Shifts?

*Haemulon sciurus*
Ontogenetic Habitat Shifts?
*Lutjanus griseus*
Index of Recruitment

- Assigned to year class (0-4): VBGE
- Leeward Key, Mainland, or Both
- Index = annual mean - global mean
- Mangrove: Age-0 and Age-1
- Reef: Age-1 to Age-4

Search indices:
- greatest significant correlation
- meaningful scale of annual variation
Index: Abundance

Gray Snapper

$r^2 = 0.69; \ p < 0.002$
Index: $\sqrt{\text{Abundance}}$

Gray Snapper

$r^2 = 0.57; p < 0.027$
Conclusions

- Direct evidence of mangrove to reef connectivity
- Suggest mangroves drive replenishment of reef fish
- Management implications:
  - forecast reef fish abundances
  - account for recruitment variability in stock assessment
Current Work

- Improve predictive models by accounting for additional sources of variation

- Ecosystem-wide trends in recruitment?
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