Fishery Dynamics of the South Florida Marine Ecosystem

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Florida Keys Coral Reef Ecosystem Services

Supports highly diverse plant & animal communities
- Algae, sponges, seagrass
- Corals & octocorals
- Fishes
- Macroinvertebrates

Supports lucrative fishing & tourism industries
- Food fisheries
- Sportfishing
- Marine life/aquaria fisheries
- Recreational snorkeling & scuba diving
**Key management concern**
- Sustainability of multispecies reef fisheries

**“Sustainability”**
Ability of exploited stock to maintain sufficient reproductive capacity to produce yields at suitable levels into the indefinite future.

**Major Threats to Sustainability of Reef Fishes**
- Overfishing
- Habitat Degradation – Pollution, Bleaching, Sedimentation
- Climate Changes
“Fishing Capital of the World”
**Key Concepts:**

- Managing risks via IEA & CMSP
- Fish as biophysical integrators
- Ontogenetic uses of “habitat”
- Seasonality and connectivity
- Challenges to sustainability
Regional Ecosystem Connections

Southwest Florida Shelf

Everglades

Florida Bay
The Managed Florida Keys-Dry Tortugas Coral Reef Ecosystem
A Cooperative Multi-agency Reef Fish Monitoring Protocol for the Florida Keys Coral Reef Ecosystem

Natural Resource Report NPS/SFCN/NRR—2009/150
Fish as biophysical integrators!
Life-history Ontogenic Uses of “Habitat”

Larvae hatch from eggs and drift in currents for 30-80 days.

Fertilized eggs drift in currents.

Post-larvae settle in mangrove litter and roots.

Juveniles hide in mangrove microhabitats.

Older juveniles migrate to coral reefs.

Adults live in reefs for 40+ years.

Adults migrate and spawn into water column.
Bicolor Damselfish

Stegastes partitus
Species Richness

Groupers

Parrotfish
Florida Keys Coral Reef Fish Sampling Design Efficiency 1979-2009

Neyman Optimal Sampling Allocation
Contribution of age/size data

Declining frequency of older, larger fish in catch is a reflection of mortality...
OFL~ C_t F_{MSY}/F

Slide courtesy of Jerry Ault
Management Benchmarks for the Multispecies Reef Fish Community

Exploited Coral Reef Fishes

(Best Publication Award & NOAA Certificate of Achievement 2002)
Florida Keys Fishery Ecosystem

Reef Fish
Snappers, groupers, grunts, triggerfish, porgies, wrasses, barracuda, tilefish and jacks

Baitfish
Mullet, Menhaden, Scads, Anchovies, Herrings, Butterfish, Atlantic Bumper, Sardines

Groundfish
Atlantic croaker, spot, drums, flatfish, sheepsheads

Crustaceans
Pink, white & brown shrimp, Stone & blue crabs, lobsters

Pelagics
wahoo, dolphinfish, little tunny, yellowfin tuna, sailfish, marlin, swordfish, mako, silky and whitetip sharks, mammals, turtles

Coastal Pelagics
Tarpon, cobia, bluefish, cero, King mackerel, Spanish mackerel, hammerhead, bull and tiger sharks, mammals, turtles
Cold Fronts
mid-Oct through April

Hurricanes &
Tropical Storms
May through mid-Oct
Annual Baitfish Runs
“Silver King”
The Most Perfect and Ancient of Sport Fishes
January 1 2009
Orange is Optimal!

26°C or 79°F

T116
Florida Keys Bonefish Census

8th Fall Census Saturday October 23rd
Florida Keys Bonefish Population Census 2003-2010

\[ \bar{P} = 339,595 \]
Florida Keys National Marine Sanctuary

Black Grouper – Exploited Phase: Protected and Fished

Mean Density

1999-2000: 1.19% Occupancy
2004: 12.82% Occupancy
2006: 8.40% Occupancy
2008: 7.11% Occupancy
Unexpected Consequences
Fish Habitat Loss

St. Lucie Inlet, Martin Co.

1962

Today
Goliaths in the Mist
Summary

• New strategies for monitoring, modeling & risk assessment.

• Enhanced understanding of impacts from fishery extraction, ecosystem alterations, and natural oceanographic variability.

• Sustain “ecosystem services” from reef populations and communities.