Nearshore Hard-Bottom, a Critical Habitat for Juvenile Fish in the Florida Keys

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INTRODUCTION

During 2008, Florida commercial fishermen landed 22,282 tons of fish, with 1,902 tons in Monroe County (Marine Fisheries Information System, 2008 Annual Landing Summary, FWC). Proper fishery management and estimation of future potential harvest can only be accomplished with knowledge of the entire recruitment dynamics of the fish and their life history information such as growth, reproduction, and size at maturity. Two variables commonly used to determine maturity are L_{min}, the smallest length at which maturity is observed, and L_{50}, the length at first maturity, defined as the length at which 50% of fish are sexually mature.

Nearshore hard-bottom habitat (NSHB) covers about 67,000 ha or almost 30% of the entire nearshore habitat in the Florida Keys Marine Ecosystem. With its sponges, corals, octocorals and solution holes, the NSHB provides different degrees of structural complexity favorable to fish. But is the NSHB a suitable juvenile habitat for fish?

METHODS

WHAT?

All fish species that dwell in shallow nearshore hard-bottom habitats throughout the Florida Keys with a focus on the following seven species:

- red grouper (*Epinephelus morio*)
- gag grouper (*Mycteroperca microlepis*)
- white grunt (*Haemulon plumierii*)
- pinfish (*Lagodon rhomboids*)
- gray snapper (*Lutjanus griseus*)
- lane snapper (*L. synagris*)
- yellowtail snapper (*Ocyurus chrysurus*)

WHEN?

- Quarterly from fall 2003 to summer 2004
- Bi-annually from fall 2005 to spring 2007

HOW?

A team of two divers counting and assessing fish sizes using:

- Four 25-by-2-meter linear transects from permanent center stake marking sites
- Two 10-minute roving diver surveys

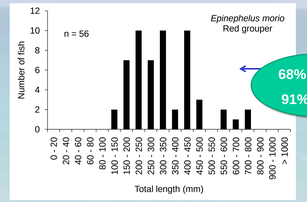
WHERE?

WHY?

This study sought to detail the **abundance** and **size-structure** of the ecological and economically prominent fish species of the nearshore hard-bottom of the Florida Keys to assess its importance as a **juvenile habitat** for future **ecosystem and fishery management strategies**.

THE NEARSHORE HARD-BOTTOM: A JUVENILE FISH HABITAT

A few examples



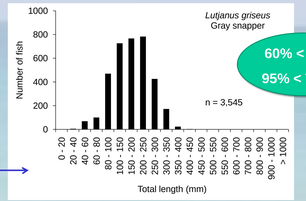
68% < TL_{min}
91% < TL_{50}

L_{min}: the smallest length at which maturity is observed

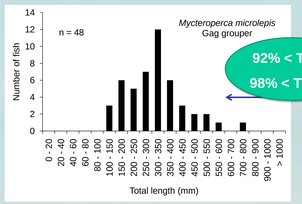
L_{50}: the length at first maturity, defined as the length at which 50% of fish are sexually mature.

Table 1. Minimum total length at which maturity was observed (L_{min}), and total length at which 50% of the fish were sexually mature (L_{50})

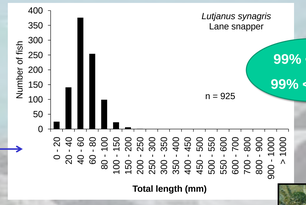
	TL_{min} (mm)		TL_{50} (mm)	
	Female	Male	Female	Male
Epinephelus morio	406	427	529	--
Mycteroperca microlepis	508	790	641	980
Haemulon plumierii	105	99	138	186
Lagodon rhomboides	122	149	174	175
Lutjanus griseus	247	230	445	317
Lutjanus synagris	161	151	201	160
Ocyurus chrysurus	242	140	252	283



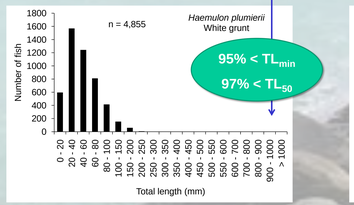
60% < TL_{min}
95% < TL_{50} *1



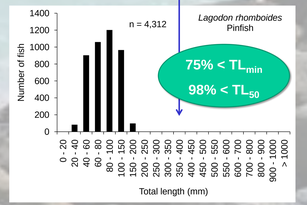
92% < TL_{min}
98% < TL_{50} *1



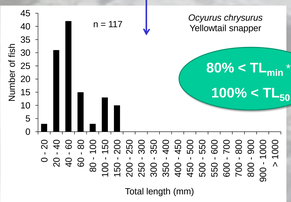
99% < TL_{min}
99% < TL_{50} *2



95% < TL_{min}
97% < TL_{50}



75% < TL_{min}
98% < TL_{50}



80% < TL_{min} *2
100% < TL_{50}

*1 if females; *2 if males

SIZE-DISTRIBUTION OF ALL FISH

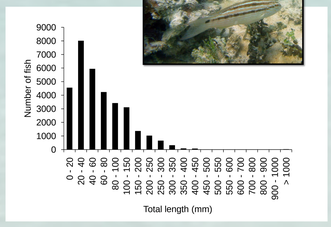
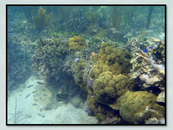
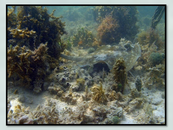


Figure 1. Size-distribution of all the fish surveyed from fall 2003 to spring 2007 in the nearshore hard-bottom of the Florida Keys.

- 32,864 fish among 186 taxa.
- 89% of the fish surveyed were smaller than 150 mm TL, and almost 80% were smaller than 100 mm TL (Figure 1).
- About **¾ of the fish surveyed had not reached 25% of their potential maximum size**; and almost 90% were smaller than 35% of their maximum size (Figure 2).





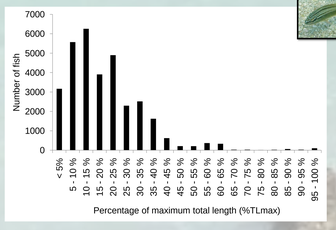


Figure 2. Relative size-distribution of all the fish surveyed from fall 2003 to spring 2007 in the nearshore hard-bottom of the Florida Keys.

NSHB IN THE ONTOGENIC DEVELOPMENT OF FISH

- A habitat with **high food abundance** and **shelter** against predation with its corals, octocorals and solution holes in limestone
- Our sites areas (> 3,100 m^2) were larger than the home range of most juvenile fish indicating potential **residency**
- **Three-phase ontogenic recruitment process:** the **NSHB** is a **necessary link** between newly settled juveniles in seagrass and recently mature adults on the reef

NSHB & FISHERY-ECOSYSTEM MANAGEMENT

- Most **MPAs** are on the reef on spawning grounds and thus they focus on the adults by favorably affecting fish density through increases in reproductive output and spill-over
- However, we should not focus on one aspect of a species' life history or one habitat but move towards **global ecosystem management**
- Sound, **proactive fishery-ecosystem management** should **integrate the NSHB** in their plans

CONCLUSION

Nearshore hard-bottom is essential juvenile fish habitat and should be incorporated into Florida Keys Marine Ecosystem conservation and management plans.

ACKNOWLEDGEMENT

Support was provided for this project by the Florida Fish and Wildlife Conservation Commission, Florida's Wildlife Legacy Initiative, and the U.S. Fish and Wildlife Service's State Wildlife Grants (grant number: F2196-05-F). We would also like to thank Dr. Mark Butler IV and his students from Old Dominion University, Dr. William Herrnkind and his students from Florida State University, and the Florida Keys National Marine Sanctuary for assisting in the data collection.