Abundance and Distribution of Juvenile Yellowtail Snapper in Nearshore Seagrass Habitat in the Middle Florida Keys

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Abundance and Distribution of Juvenile Yellowtail Snapper in Nearshore Seagrass Habitat in the Middle Florida Keys

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Introduction:

Seagrass beds provide nursery habitat for many important snapper species in the Florida Keys, including yellowtail snapper. Understanding the recruitment of juvenile yellowtail snapper to seagrass beds could help with the management of these economically important snapper in the Keys. Therefore, the Florida Fish and Wildlife Research Institute's Finfish Research Program at the South Florida Regional Lab, in the Florida Keys has been conducting monthly seine surveys in the middle keys since 2006. These seine surveys aim to describe the distribution and abundance, species composition, size structure, and habitat usage of juvenile fishes in the middle Florida Keys. This seine dataset was used to look at the recruitment of yellowtail snapper and their habitat preferences.

Methods:

Sampling was conducted on the Atlantic side of the middle Keys in shallow (<1.3m deep) seagrass beds. Sites were selected by a habitat-based, stratified-random-sampling procedure based upon the "Benthic Habitats of the Florida Keys" Geographical Information System (GIS) (FDEP and NOAA, 1998). The middle Keys were divided into one-longitudinal- by one-latitudinal-minute [~1 nautical nm^2] sampling macrogrids (Fig 1). All grids touching land containing bottom habitat mapped as seagrass were included in the sampling universe. Each of these resultant grids was further subdivided into 100 microgrids (~0.01 nm^2) (Fig 1). Monthly sites were randomly selected from these microgrids.

One seine haul was conducted at each site during daylight hours using a 21.3m center-bag drag offshore seine net, constructed of knotless 3.2mm #35 Delta nylon-mesh and a 183cm x 183cm x 183cm bag. The net coverage area was approximately 140 m^2/haul. The net was set in open water away from the shoreline, oriented perpendicular or parallel to the tide, in water that was at least 0.3m deep. The seine was pulled by hand using PVC poles attached to the ends of the net. A 15.5m line was attached between the tops of the two end poles and kept taught in order to maintain a standardized distance between the end poles. Two small PVC tether poles with 9.1m of line attached were anchored in the substrate on both sides of the net adjacent to the starting point. In order to standardize the distance of the tow, the free end of these tether lines was attached to the seine end poles, and the net was pulled forward 9.1m until the tether lines became taught. At this point the tether lines were dropped and the seine ends were brought together encircling and trapping the fish. The ends of the net were then pulled together 90^{o} around a pivot pole in order to move the fish down into the bag. The bag was slowly inverted and the fish were removed from the net and placed in a five gallon bucket for processing.

All snappers collected were counted, measured to the nearest mm, and identified to the lowest possible taxon in the field, typically to species. Juvenile yellowtail snapper were defined as fish that were < 100mm standard length (SL) and settlement-stage snapper were fish less than < 40mm SL. All other fish collected were counted, measured, and identified to the lowest possible taxon as well.

Hydrographic data, atmospheric and sea conditions, and observations relative to bottom type including water depth, substrate type, submerged aquatic vegetation (SAV) types, and percent bottom cover of SAV were recorded at each site. Water temperature (ºC), salinity (‰), specific conductivity (µS/cm), dissolved oxygen (mg/L), and pH were measured using a YSI water-quality instrument. The primary vegetation at each site was considered the most abundant SAV (>50%). If multiple SAV species were present at a site, and no one species accounted for > 50% of seagrass bed composition, then the primary vegetation was considered to be "mixed".

Results and discussion:

From 2006 through 2017, 1512 seine surveys were conducted in the middle Keys (Fig 2). Of these 1512 surveys, yellowtail snapper were present in 215 (14%) of the surveys (Fig 3). A total of 617 yellowtail snapper were caught and approximately 40% were settlement stage, less than 40mm (Fig 4). Only one fish was greater than 100mm. Average monthly catch per unit of effort (CPUE) began increasing in the summer and was highest in September (Fig 5) coinciding with peak yellowtail snapper spawning during the summer. Average CPUE by year was greatest in 2012 and relatively stable until 2017 when CPUE dropped (Fig 6). Due to Hurricane Irma, sites were not surveyed during September 2017, when CPUE and recruitment is typically highest.

Seine sites were conducted on four types of substrate, with the majority of sites having either mud or sand substrate (Table 1). The majority of yellowtail snapper (57%) were caught at habitats with mud substrate (Table 1). Seine samples were conducted at seagrass beds with six primary vegetation types (Table 2). Most sites (75%) were dominated by *Thallassia testudinum* and most yellowtail snapper (95%) were caught at *Thallassia* dominated sites (Table 2, Fig 7).

Table 1. The type of substrate at each of the seine sampling sites, the number of sites sampled at each type of habitat, and the number of yellowtail snapper caught.

Substrate	Sites Sampled	Number
Detritus	2	0
Shell	7	0
Mud	611	352
Sand	892	265

Table 2. The primary vegetation at the sampling sites, the number of sites sampled at each type of habitat, and the number of yellowtail snapper caught.

Primary Vegetation	Sites	Number
Acetabularia spp.	2	0
Calcareous Algae Spp.	7	0
Filamentous Green Algae Spp.	1	0
Halodule wrightii	239	11
Laurencia Spp.	1	0
Mixed Vegetation	95	19
No Vegetation	5	0
Penicillus capitatus	1	0
Sargassum spp.	3	1
Syringodium filiforme	18	1
Thalassia testudinum	1140	585

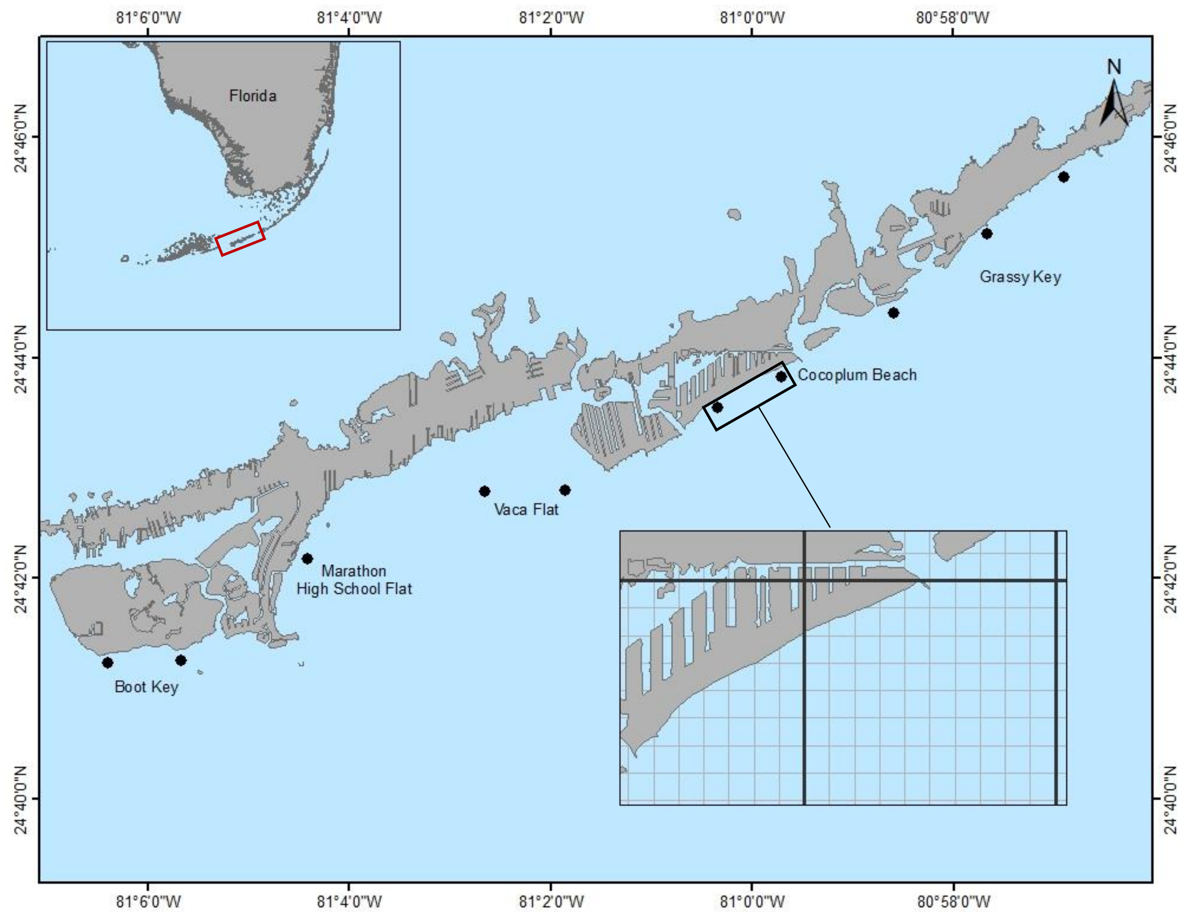

Figure 1: A map of the sampling area in the middle Florida Keys showing the location of the macrogrids (thick lines) and the micrograms (thin lines).

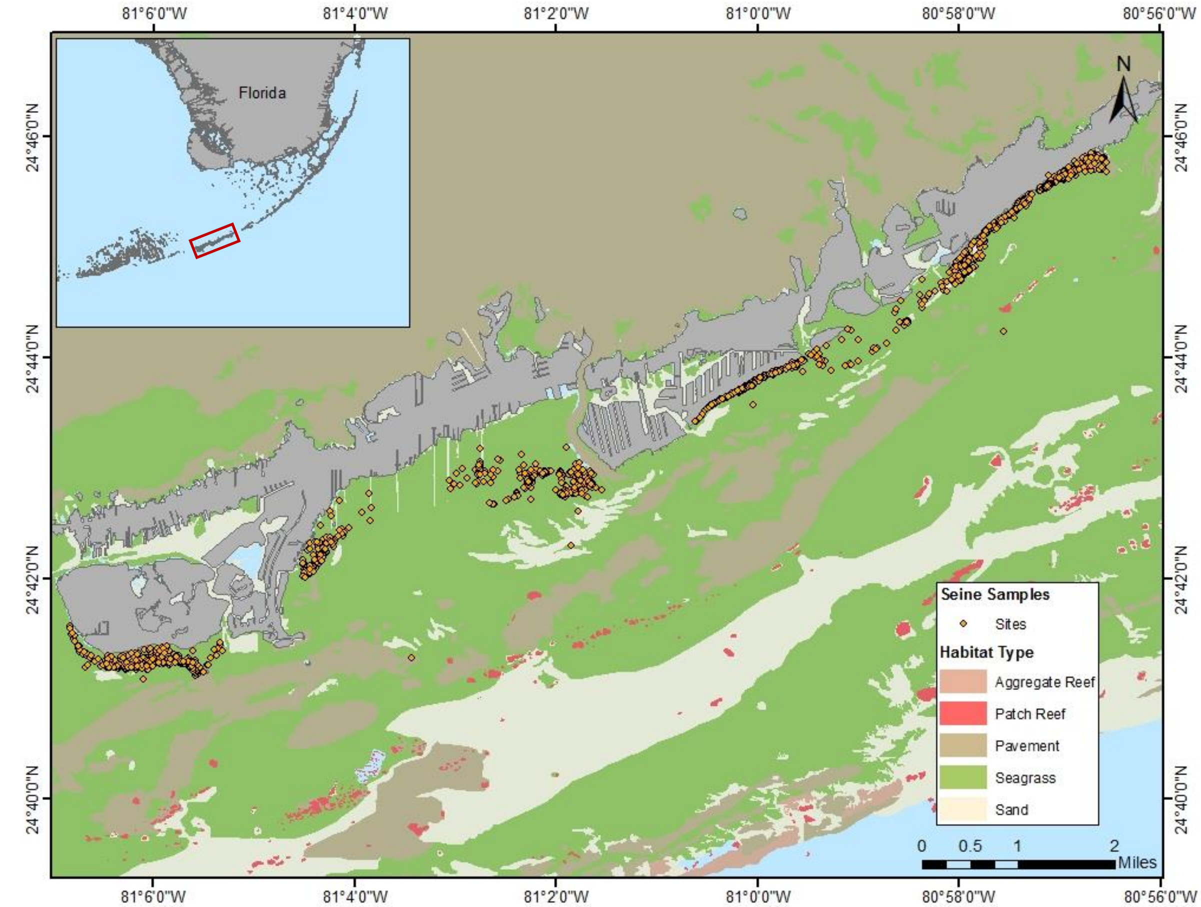

Figure 2. A map of all seining sites and benthic habitat (FWRI 2015) from 2006 through 2017.

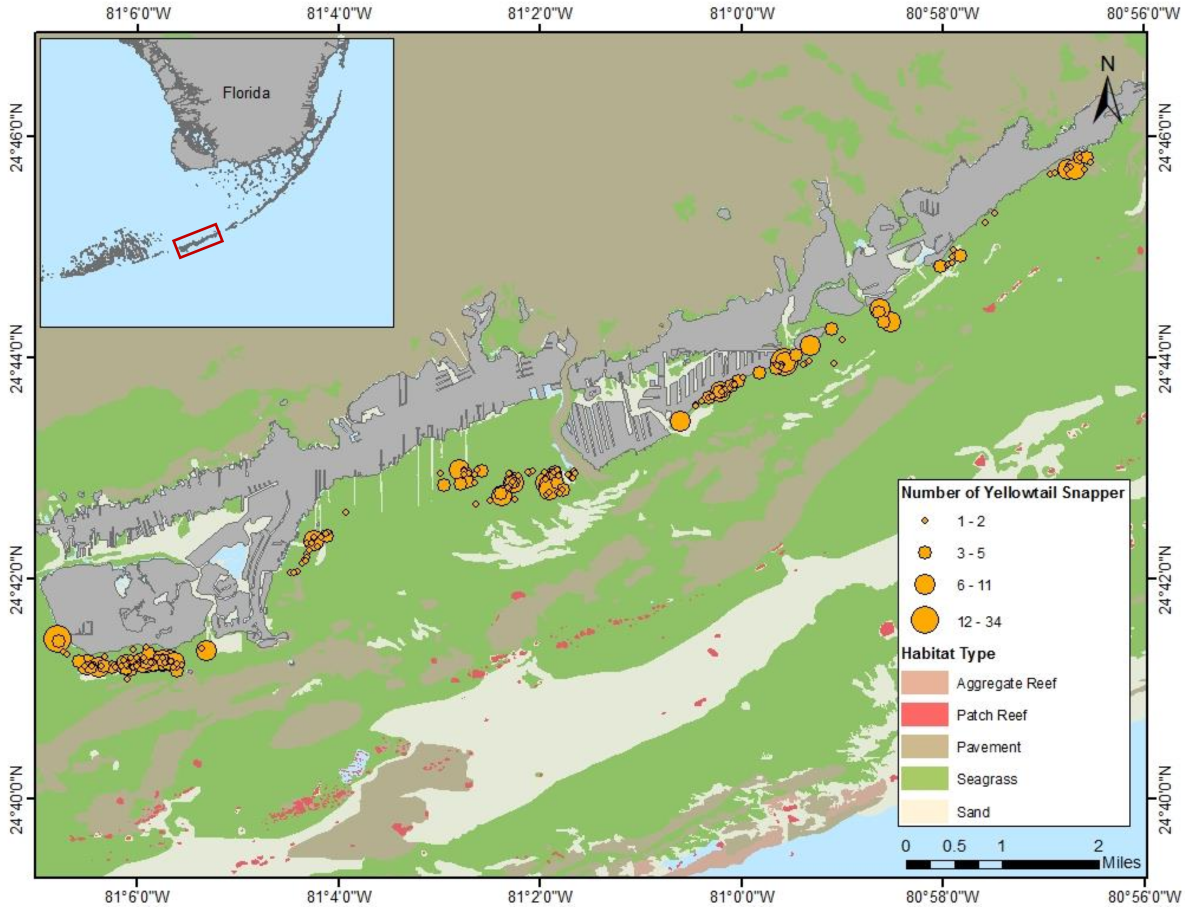

Figure 3. A map of seining sites and benthic habitat (FWRI, 2015) where yellowtail snapper were caught, showing the number caught at each site.

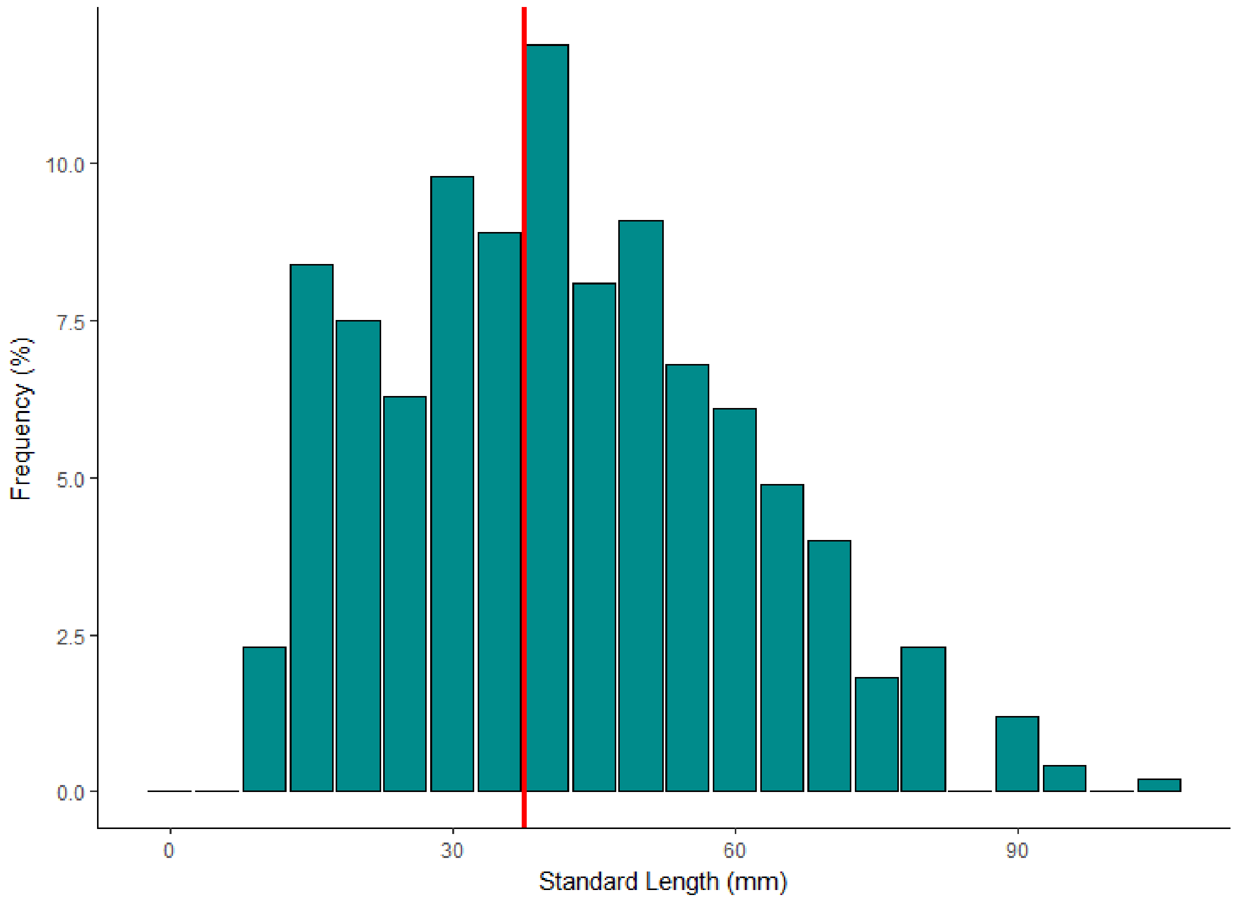

Figure 4. The length frequency of juvenile yellowtail snapper caught seining. The red line represents settlement stage individuals, less than 40 mm.

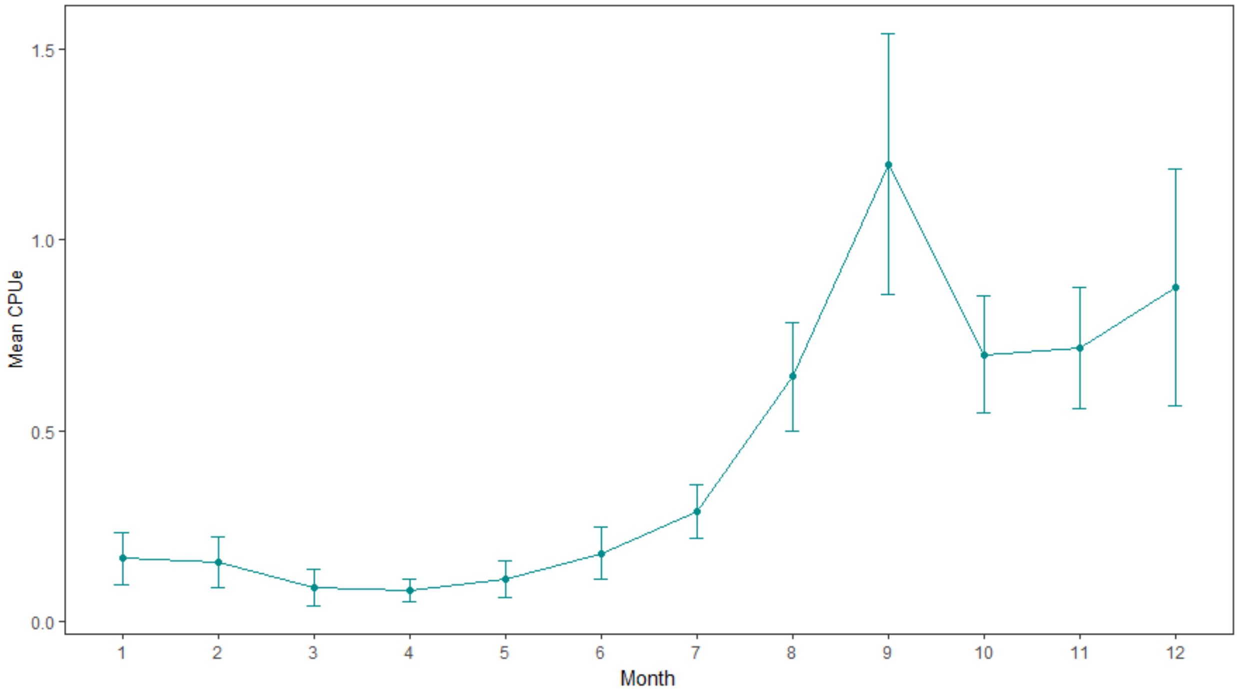

Figure 5. The average monthly CPUE for yellowtail snapper. Error bars represent the standard error.

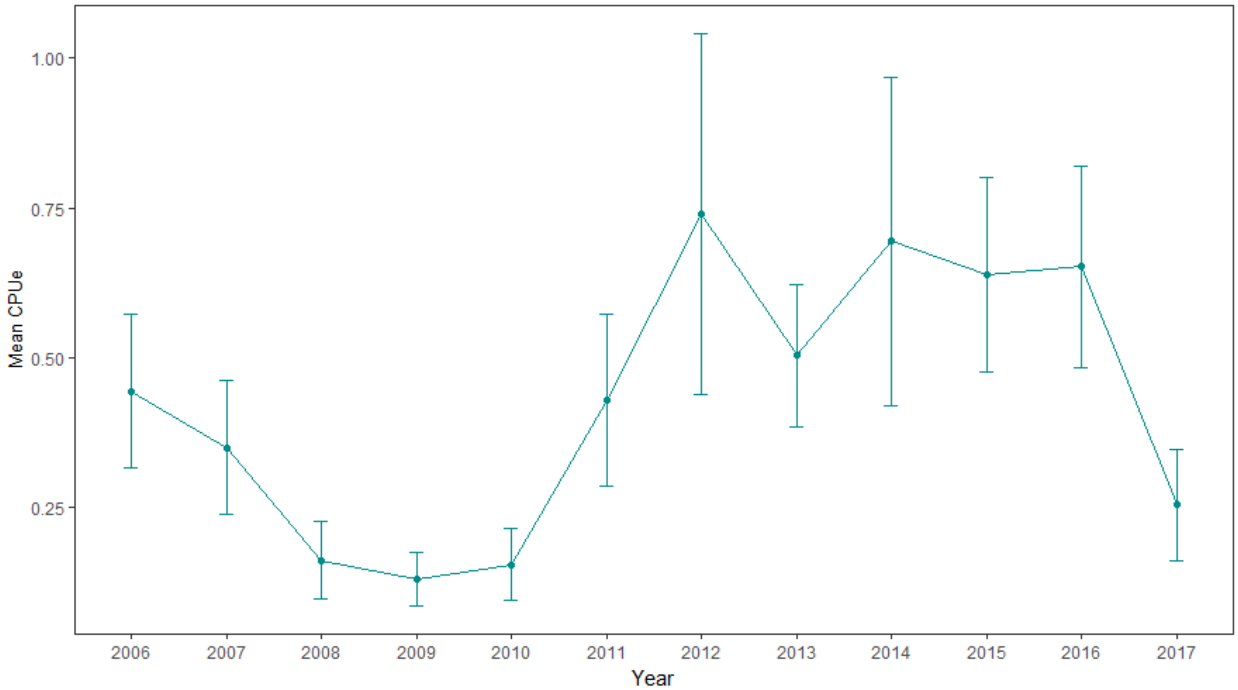

Figure 6. The average CPUE by year. Error bars represent the standard error.

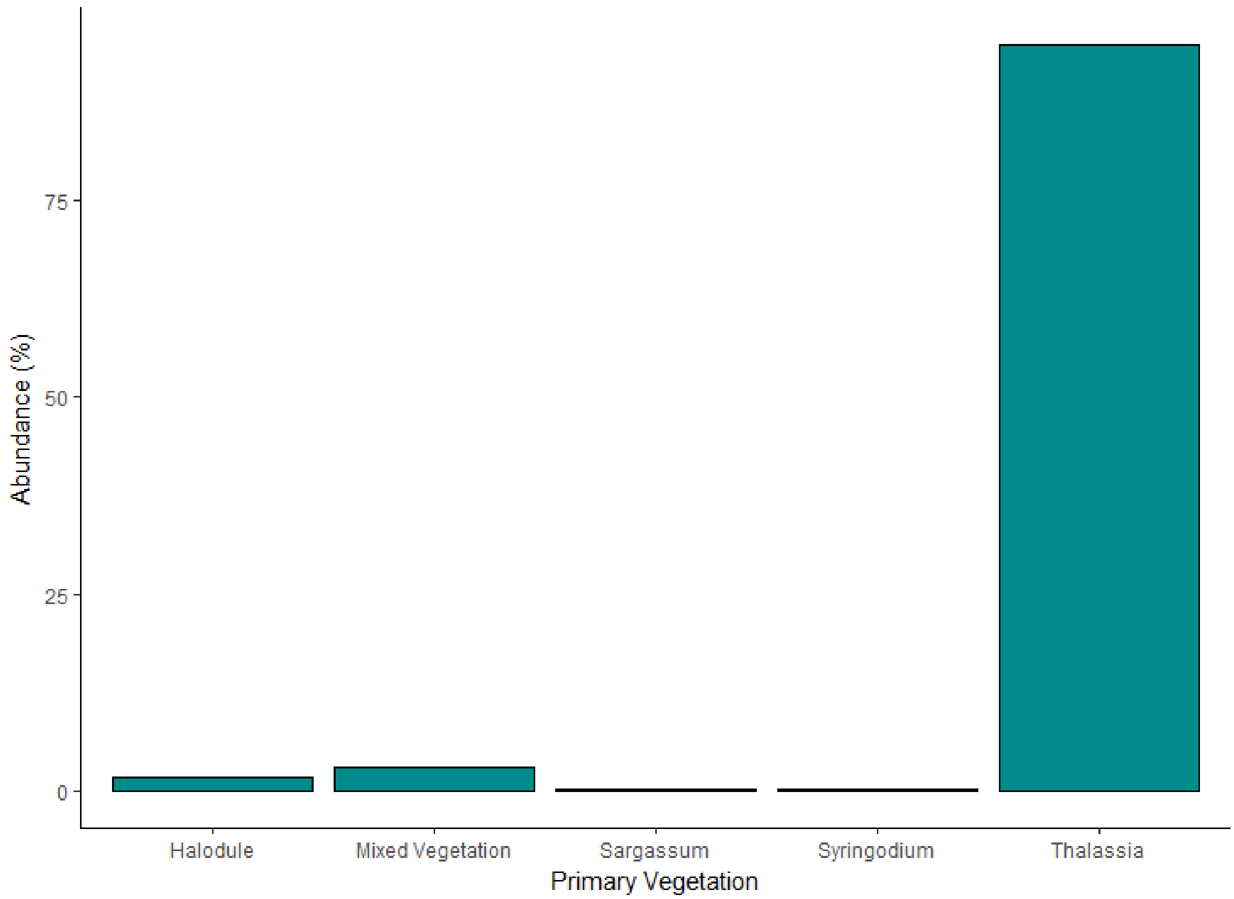

Figure 7. The percent of yellowtail snapper caught by type of primary vegetation where yellowtail snapper were present.

References:

FDEP and NOAA (Florida Department of Environmental Protection and National Oceanic and Atmospheric Administration) 1998. Benthic Habitats of the Florida Keys. Florida Marine research Institute. Technical report. TR-4.

Florida Fish and Wildlife Research Institute (FWRI). 2015. Unified Florida Coral Reef Tract Map v2.0. GIS Metadata. Online linkage:http://ocean.floridamarine.org/IntegratedReefMap/UnifiedReefTract.htm.