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Juvenile Yellowtail Snapper, *Ocyurus chrysurus*, collected from short-term fisheries-independent surveys in Florida Bay and the Florida Keys from 1994 – 2003

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Introduction

Seagrass beds (primarily *Thalassia testudinum*) and mangroves (primarily *Rhizophora mangle*) have been shown to be important nursery habitats for juvenile Yellowtail Snapper throughout the Caribbean (e.g. Puerto Rico, Saba, Curacao, Bonaire, British Virgin Islands), and their proximity can subsequently influence adult population densities on local reefs (Rooker et al. 1991; Nagelkerken et al. 2000a; Nagelkerken et al. 2000b; Nagelkerken et al. 2002; Pollux et al. 2007; Huijbers et al. 2013). However, despite the use of a variety of gears by surveys (e.g. trawls, seines, pushnets), observations of juvenile Yellowtail Snapper have been limited in the seagrass habitats of southeast Florida, Florida Bay, and the Florida Keys. Lindeman et al. (1998) reported (but not enumerated) observations of newly settled (<25 mm SL) Yellowtail Snapper on either seagrass or hardbottom habitats in Biscayne Bay and Springer et al. (1962) found 3 juveniles (37 – 62 mm SL) on a grassy shore on the Atlantic Ocean side of Lower Matecumbe Key. Bartels and Ferguson (2006) found 5 individuals (<45 mm SL) in nearshore seagrass beds on the Atlantic Ocean side of the middle Florida Keys and Acosta et al. (2007) reported 66 individuals from seagrass beds throughout the Florida Keys. In a recent study using z-traps in the Dry Tortugas, 289 Yellowtail Snapper (≤150 mm SL) were collected over relatively deep seagrass beds (1.7-10.1m), as compared to 396 over reef habitats (Flaherty-Walia et al. 2017). Similarly, juvenile Yellowtail Snapper have been frequently reported by visual census on reef habitats in southeast Florida (Kilfoyle et al. 2015), the Florida Keys (Smith et al. 2011), and the Dry Tortugas (Ault et al. 2013). Here, we report additional unpublished observations of Yellowtail Snapper documented from fishery-independent surveys in Florida Bay and the Florida Keys between 1994 and 2003.

Study areas

Florida Bay is a shallow lagoonal system covering approximately 220,000 ha (543,620 acres) and consists of complex networks of subtidal basins separated by shallow carbonate mud banks and mangrove islands (Handley et al. 2007; Flaherty et al. 2013). Freshwater inputs come primarily into the northeastern portion of the Bay from Taylor Slough, Taylor River, coastal creeks, and as overflow from the South Florida Water Management District's C-111 Canal (Hittle et al. 2001). Western Florida Bay receives fresh waters from the Shark River Slough, the primary freshwater flowway of the Everglades, after mixing with the near shore waters of the Gulf of Mexico. In spite of these freshwater inputs and the annual variation in rainfall, evaporation rates in Florida Bay typically exceed the rate of freshwater input and create hypersaline conditions (Lee et al. 2006, Price et al. 2007). These hypersaline conditions are

exacerbated by significant historic alteration to the Everglades, canal regulated water releases, poor water circulation between interconnected carbonate mudbanks, and low levels of precipitation during the dry season (typically November through May). This is particularly common in the north-central portions of Florida Bay (Hittle et al. 2001; Handley et al. 2007). Between 1984 and 1994, seagrass meadows declined heavily in Florida Bay, mostly attributed to chronic light reduction caused by microalgal blooms and resuspended sediments and die-off attributed to physiological stressors (Hall et al. 1999; Handley et al. 2007). During this time, it was found that grass root densities of turtle grass (*Thalassia testudinum*), shoal grass (*Halodule wrightii*) and manatee grass (*Syringodium filiforme*) at sampling stations had declined by 22%, 92%, and 93%, respectively. The Fisheries-Independent Monitoring (FIM) program thus began to sample Florida Bay in 1994 in response to these major environmental perturbations which included seagrass and sponge die-offs and extensive algal blooms.

The Florida Keys are a string of limestone islands surrounded by mangrove islands and seagrass meadows that extend for 120 km from Key Biscayne southwest to the Dry Tortugas (Acosta et al. 2007). Seagrass beds, which have been recognized as important nursery habitats, provide an abundance of food, complex shelter from predation, and are effective at intercepting planktonic fish larvae (Nagelkerken et al. 2000a; Pollux et al. 2007). Juvenile fish will inhabit seagrass beds before shifting with size or age to nearby reefs or offshore habitats (Nagelkerken et al. 2000a; Acosta et al. 2007; Huijbers et al. 2013). In 1999, the FIM program began monitoring the seagrass meadows within the Florida Keys National Marine Sanctuary (FKNMS) to determine the extent to which reef-associated species utilized these habitats (see Acosta et al. 2007).

Methods

Survey Designs

The FIM program used a fixed station sampling approach at 31 stations within the Everglades National Park boundaries of Florida Bay from 1994 – 1997 (Table 1). Three samples were collected per site per month from August 1994 through December 1995, after which one sample was collected per site per month. One station was dropped from the sampling regimen in January 1997 so that 30 stations were sampled for the period January 1997 through October 1997. The FIM program intended to discontinue the fixed station sampling design in Florida Bay in favor of a stratified-random sampling design used in other river and estuarine systems, and in 1997, SRS monitoring began in Florida Bay alongside fixed station monitoring. A total of 27 sets were conducted each month within five ecological zones (Table 2) subdivided similarly to subregions proposed by Zieman and Fourqurean (1985). However, the 1997 sampling year was prematurely cut short after October when the Everglades National Park collecting permit was not renewed, thereby suspending all sampling efforts within Florida Bay.

The FIM program later resumed SRS efforts across seagrass habitats in the Florida Keys National Marine Sanctuary (FKNMS) from Key Largo to Key West between 1999 and 2003. For logistical purposes, the Florida Keys were divided into 3 zones (Upper, Middle, and Lower) and

two strata (Atlantic Ocean side and Gulf of Mexico side of U.S. Highway 1). Each zone was further subdivided into 1-nm[1] x 1-nm grids that were randomly selected for sampling. Grids were stratified by habitat and depth, thereby identifying the gear types that could be used in those areas. A single sample was collected at each randomly selected site (see Acosta et al. 2007 for further details). In most cases, the number of monthly samples collected in each zone with each gear was proportional to the number of grids in the zone that could be sampled with a particular gear (FWRI 2018, p. 20). Sampling was monthly from February 1999 to January 2001. Evaluation of the 24-month trawl data led to a program modification from a monthly survey to a seasonal survey. Sampling was thus conducted only in the fall months (September and October) of 2001, 2002, and 2003 (Table 3) when overall abundances, as well as abundances of the majority of selected species, are at annual maximums.

Sampling Gears

Yellowtail Snapper were collected by seines and trawls, and all sampling was conducted during daytime hours (one hour after sunrise to one hour before sunset). A 21.3-m center bag seine was used throughout Florida Bay to target young-of-the-year (YOY) and juvenile fishes in shallow water (≤ 1.5-m). The 21.3-m center bag seine is constructed of 3.2-mm #35 knotless nylon Delta mesh and covers approximately 140-m^2/haul (Table 4). A 6.1-m otter trawl (Table 4) was used to sample sites in both Florida Bay and the Florida Keys to target YOY, juvenile, and adult fish in deeper water (1.0 – 7.6-m) during daylight hours (one hour after sunrise to one hour before sunset). Trawl tows were standardized to three minutes and covered approximately 100-m^2/tow (Table 4).

Sample Workup

The sample work-up technique was similar for all samples, regardless of gear type or sampling regime. Environmental data consisting of water chemistry and habitat characteristics were recorded for each sample (e.g. depth, bottom type, bottom vegetation, bottom vegetation cover, bycatch composition, shoreline cover, shore type, secchi depth, current direction, wind direction, wind speed, dissolved oxygen, water temperature, pH, and salinity). Water chemistry was measured using a YSI multiparameter sonde.

Samples in both Florida Bay and the Florida Keys were taken over habitats primarily with mud or sand substrate and bottom vegetation comprised of seagrass beds or algae. For either bottom type or bottom vegetation recordings, the most abundant bottom composition or vegetation was considered primary and the next abundant (if any) considered secondary. Seagrass percent cover (0 – 100%) was estimated visually at each site and prominent seagrasses included turtle grass (*Thalassia testudinum),* shoal grass *(Halodule wrightii),* and manatee grass *(Syringodium filiforme)*. If an observation at a sample sites was attempted but was unable to be determined (e.g. reduced visibility), it was labelled 'unknown'. If an observation was neglected to be taken, it was marked with a "."

[1] nm: nautical mile

All fish and selected invertebrate species captured were identified to the lowest practical taxonomic level, counted, and a random sample of at least 10 individuals per species were measured (standard length for teleosts, precaudal length for sharks, disc width for rays, carapace width for crabs, and post-orbital head length for shrimp; FWRI 2018, p. 21). Standard lengths were measured to the nearest mm.

Results and Discussion

At fixed stations in Florida Bay, 2,636 total samples were taken by the two gears (seines = 1,367; trawls = 1,269; Table 1; Figure 1). The majority of sites (n = 1,703 [seines = 1,187; trawls = 516]) had seagrasses as the primary bottom vegetation and turtle grass beds were identified as the most frequent (n = 1,416 [seines = 697; trawls = 449]; Table 6). Mixed species algae were the most frequently observed primary algal vegetation (n = 325 [seines = 137; trawls = 188]; Table 6). Sand was the most common substrate sampled (n = 1,167 [seines = 832; trawls = 335]) followed closely by mud (n = 1,057 [seines = 516; trawls = 541]; Table 7). Water temperatures ranged from 12.5 – 35.0°C (mean = 26.8°C; median = 27.5°C) and salinities ranged from 0.5 – 46.7 ppt (mean = 29.0 ppt; median = 30.7 ppt).

Observations of juvenile Yellowtail Snapper in Florida Bay were very low with only 55 individuals found in the southern and western-most areas closest to the Keys and the Gulf of Mexico border (Table 5; Figure 2). This spatial trend reinforces previous research that documented juveniles of economically valuable species in the southern and western basins of Florida Bay, rather than in northeastern Florida Bay (e.g. Chester and Thayer 1990; Ley et al. 1999; Powell et al. 2002; Powell 2003; Powell et al. 2004; Flaherty et al. 2013). Although Yellowtail Snapper were observed throughout the year with slightly higher numbers of individuals in the fall and early winter months, there were insufficient numbers to derive trends in relative abundance. Numbers of individuals were highest in 1994 (n = 18) and 1995 (n = 23), and juveniles were collected with both gears (25 fish in the 21.3-m seine and 30 fish in the 6.1-m otter trawl). Yellowtail Snapper were most commonly found over sand substrate (n = 34; Table 7) where either turtle grass (n = 24 fish) or manatee grass (n = 13) were the primary bottom vegetation (Table 6). Fish were found inhabiting waters with temperatures ranging from 15.8 – 32.7°C (mean = 27.2°C; median = 28.2°C) and salinities from 27.7 – 37.8 ppt (mean = 33.7 ppt; median = 34.3 ppt).

During SRS monitoring of Florida Bay in 1997, 130 seines and 140 trawls were completed (Table 2; Figure 1). Turtle grass was the dominant vegetation at most sample sites (n = 139 [seines = 99; trawls = 40]; Table 6). Water temperatures ranged from 22 – 35.9°C (mean = 27.3°C; median = 26.9°C) and salinities ranged from 0.9 – 42.0 ppt (mean = 30.8 ppt; median = 33.2 ppt). Two Yellowtail Snapper were collected over unknown bottom habitats in January (temperature = 20.6 – 24.5°C; salinity = 32.5 ppt) and 1 fish was collected over a mud-dominant bottom with mixed algae vegetation in April (temperature = 24.8°C; salinity = 37.8 ppt; Table 6; Table 7).

In the Florida Keys, a total of 1,095 trawls were pulled between 1999 – 2003 on the Atlantic Ocean and Gulf side of the Keys (Table 3; Figure 1). Sampling occurred more frequently

on the Gulf side of the U.S. Highway 1 where seagrass beds are denser with greater seagrass species diversity. When identifiable, turtle grass was the most common dominant bottom vegetation at sample sites (n = 258) followed by manatee grass (n = 90; Table 6). Sand (n = 321) and mud (n = 222) were identified as the two most frequent bottom substrates (Table 7). Most of the sample sites, however, could not have their bottom vegetation (n = 659) or bottom substrate (n = 530) identified (Table 6; Table 7). The increase in the "unidentified" bottom habitat description is largely attributed to being restricted solely to visual identification when trawling. Water temperatures in the Florida Keys ranged from 13.9 – 33.3°C (mean = 26.6°C; median = 27.4°C) and salinities ranged from 22.7 – 39.1 ppt (mean = 35.7 ppt; median = 36.1 ppt).

There were 142 Yellowtail Snapper collected in the Florida Keys (Table 5; Figure 2). Of these, 42 fish were found over seagrass beds dominated by turtle grass, 9 fish were found over seagrass beds dominated by manatee grass, 4 fish were found over mixed seagrasses, and 5 fish were found over algal habitats (Table 6). Fish were most commonly found over sand (n = 41) and mud (n = 28) substrates (Table 7). Yellowtail Snapper were found in waters between 14.7 and 31.7°C (mean = 26.8°C; median = 27.4°C) and with salinities ranging between 28.2 ppt and 38 ppt (mean = 35.3 ppt; median = 35.4 ppt). Gear limitations may contribute to the observed lower numbers of Yellowtail Snapper. Acosta et al. (2007) noted that while the majority of seagrass beds within this region of the Florida Keys are found in waters >1 m depth, juvenile Yellowtail Snapper may also inhabit the shallow-water (<1 m) seagrass beds and are therefore unavailable to the 6.1-m otter trawl.

Size Structure

At fixed stations in Florida Bay, the 25 juveniles collected in the center bag seine ranged in size from 16 – 61 mm standard length (SL) with a median size of 25 mm SL (Figs. 3 & 4). The 30 fish collected in the Florida Bay trawls ranged in size from 23 – 174 mm SL with a larger median size of 63 mm SL (Figs. 3 & 4). The 3 fish collected in trawls by SRS monitoring in Florida Bay were 54, 64, and 86 mm SL. In trawl samples from the Florida Keys, juveniles ranged in size from 24 – 188 mm SL with a median size of 74 mm SL (Figs. 3 & 4). Size ranges of Yellowtail Snapper collected in these surveys were similar to settlement and juvenile sizes measured in seagrass habitats in other south Florida and Caribbean studies. Bartels and Ferguson (2006) found individuals in the 16 – 30 mm SL range in nearshore seagrass habitats in the middle Florida Keys. In the Dry Tortugas, Yellowtail Snapper as small as 33 mm SL were collected in seagrass habitats (Flaherty-Walia et al. 2017). Outside of Florida, in the British Virgin Islands, Watson et al. (2002) found Yellowtail Snapper settlement sizes between 15 – 25 mm SL "hanging in the water column amidst blades of seagrass" and Pollux et al. (2007) found individuals in the 15 – 25 mm SL range in the seagrass habitats of Curacao. In Bonaire, seagrass beds were observed as the primary habitat for Yellowtail Snapper and exclusively used by fish <100 mm total length (TL; Nagelkerken et al. 2000a).

Migration to reef habitats has largely been inferred using habitat specific length frequency data (Nagelkerken et al. 2007) and can vary by region. Yellowtail Snapper on coral

reefs in Curacao measured greater than 150 mm TL and greater than 100 mm TL in Bonaire (Nagelkerken et al. 2000a; Nagelkerken et al. 2000b; Huijbers et al. 2013). Watson et al. (2002) observed that “fish < 75 mm were always seen over seagrass habitats and never on coral reefs” and young (>75 mm TL) Yellowtail Snapper were only observed over rocky hard bottom adjacent to seagrass habitats. However, juvenile Yellowtail Snapper have been observed on reef habitats by the Reef Fish Visual Census (RVC) in Southeast Florida, the Florida Keys, and the Dry Tortugas (Smith et al. 2011; Ault et al. 2013; and Kilfoyle et al. 2015) with individuals estimated to be in the 20 - 39 mm FL size class in all three regions. Likewise, Flaherty-Walia et al. (2017) reported fish as small as 47 mm SL on reef habitats in the Dry Tortugas. Seagrass or seagrass areas with adjacent mangrove habitats may serve as primary habitats for juvenile Yellowtail Snapper in parts of the Caribbean. Whereas, in the Florida Keys and along the Florida Reef Tract, juvenile and settlement-size individuals may act more opportunistic in their habitat selection in conjunction with using seagrass areas.

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Tables

Table 1. Number of samples taken per month using the 21.3-m center bag seine (seine) and the 6.1-m otter trawl (trawl) at fixed stations in Florida Bay from 1994-1997.

		Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Total
1994	Seine	24	24	27	27	30	36	42	48	48	48	48	48	450
	Trawl	12	12	21	21	30	36	42	45	45	45	45	45	399
1995	Seine	48	48	48	48	48	48	48	48	48	48	48	48	579
	Trawl	45	45	45	45	45	45	45	45	45	45	45	45	540
1996	Seine	16	16	16	16	16	16	16	16	16	16	16	16	192
	Trawl	15	15	15	15	15	15	15	15	15	15	15	15	180
1997	Seine	15	14	15	15	15	15	15	15	15	15	-	-	149
	Trawl	15	15	15	15	15	15	15	15	15	15	-	-	150
	Total	**190**	**189**	**202**	**202**	**214**	**226**	**238**	**247**	**247**	**247**	**217**	**217**	**2,636**

Table 2. Number of samples taken per month and per zone using the 21.3-m center bag seine (seine) and the 6.1-m otter trawl (trawl) during SRS monitoring of Florida Bay in 1997.

		Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Total
1997	Seine	13	13	13	13	13	13	13	13	13	13	-	-	130
	Trawl	14	14	14	14	14	14	14	14	14	14	-	-	140
	Total	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**27**	**-**	**-**	**270**

		Zone A	Zone B	Zone C	Zone D	Zone E	Total
1997	Seine	39	20	21	20	30	130
	Trawl	40	30	30	20	20	140
	Total	**79**	**50**	**51**	**40**	**50**	**270**

Table 3. Number of samples taken per month, zone, and stratum using the 6.1-m otter trawl during SRS monitoring of the Florida Keys from 1999 – 2003.

	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Total
1999	-	30	30	29	30	30	30	30	30	30	30	30	329
2000	45	40	40	40	40	41	40	40	40	40	40	40	486
2001	40	-	-	-	-	-	-	-	34	46	-	-	120
2002	-	-	-	-	-	-	-	-	39	41	-	-	80
2003	-	-	-	-	-	-	-	-	42	38	-	-	80
Total	**85**	**70**	**70**	**69**	**70**	**71**	**70**	**70**	**185**	**195**	**70**	**70**	**1,095**

	Zone U	Zone M	Zone L	Total
1999	119	210	0	329
2000	110	196	180	486
2001	27	48	45	120
2002	18	32	30	80
2003	18	32	30	80
Total	**292**	**518**	**285**	**1,095**

	Stratum O	Stratum G	Total
1999	112	217	329
2000	170	316	486
2001	42	78	120
2002	29	51	80
2003	28	52	80
Total	**381**	**714**	**1,095**

Table 4. Description of sampling gears used in fishery-independent monitoring surveys of Florida Bay and the Florida Keys from 1994 – 2003.

Gear	Deployment	Mesh Size (mm)	Area Sampled	Description of use
21.3-m Seine (center bag)	Bay	3.2	140 m^2	used in near-shore areas ≤ 1.5 m
6.1-m Otter Trawl	Straight Tow	38.1 3.2-mm liner	100 m^2	used in areas from 1.8-m to 7.6-m deep
	Arc Tow	38.1 3.2-mm liner	100 m^2	used in areas from 1.0-m to 1.7-m deep

Table 5. Number of Yellowtail Snapper (*Ocyurus chrysurus*) collected per month using the 21.3-m center bag seine (seine) and the 6.1-m otter trawl (trawl) during fixed station and SRS monitoring of Florida Bay and the Florida Keys from 1994 – 2003.

			Florida Bay											
			Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Total
Fixed Station Sampling	1994	Seine	0	0	0	0	0	0	1	2	0	2	1	2	8
		Trawl	0	0	0	0	0	1	0	0	3	1	2	3	10
	1995	Seine	1	0	0	11	0	0	2	1	0	0	0	0	15
		Trawl	0	1	0	1	0	0	2	1	0	1	1	1	8
	1996	Seine	0	0	0	0	0	0	0	0	0	1	0	0	1
		Trawl	4	0	0	0	0	0	1	0	1	1	0	1	8
	1997	Seine	0	0	0	0	0	0	1	0	0	0	-	-	1
		Trawl	1	0	0	0	0	1	1	0	0	1	-	-	4
		Total	**6**	**1**	**0**	**12**	**0**	**2**	**8**	**4**	**4**	**7**	**4**	**7**	**55**
Stratified Random Sampling (SRS)	1997	Seine	0	0	0	0	0	0	0	0	0	0	-	-	0
		Trawl	2	0	0	1	0	0	0	0	0	0	-	-	3
		Total	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**-**	**-**	**3**

Table 5 continued. Number of Yellowtail Snapper (*Ocyurus chrysurus*) collected per month using the 6.1-m otter trawl (trawl) during fixed station and SRS monitoring of Florida Bay and the Florida Keys from 1994 – 2003.

			Florida Keys												
			Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Total
	1999	Trawl	-	1	1	1	0	0	1	1	6	7	6	1	25
Stratified	2000	Trawl	4	4	0	0	1	1	1	0	1	12	8	5	37
Random	2001	Trawl	6	-	-	-	-	-	-	-	13	31	-	-	50
Sampling	2002	Trawl	-	-	-	-	-	-	-	-	8	9	-	-	17
(SRS)	2003	Trawl	-	-	-	-	-	-	-	-	6	7	-	-	13
		Total	**10**	**5**	**1**	**1**	**1**	**1**	**2**	**1**	**34**	**66**	**14**	**6**	**142**
Grand Total			**18**	**6**	**1**	**14**	**1**	**3**	**10**	**5**	**38**	**73**	**18**	**13**	**200**

Table 6. Number of samples (hauls) and the number of Yellowtail Snapper collected over primary bottom vegetation types in Florida Bay (1994 – 1997) and the Florida Keys (1999 – 2003) using the 21.3-m center bag seine (S) and the 6.1-m otter trawl (T).

	Florida Bay: Fixed Stations (1994 – 1997)				Florida Bay: SRS Monitoring (1997)				Florida Keys: SRS Monitoring (1999 – 2003)	
	Number of Hauls		Number of Yellowtail Snapper		Number of Hauls		Number of Yellowtail Snapper		Number of Hauls	Number of Yellowtail Snapper
Bottom Vegetation	S	T	S	T	S	T	S	T	T	T
Algae: Mixed	137	188	0	2	7	7	0	1	36	5
Algae: Unidentified	1	0	0	-	-	-	-	-	1	0
Filamentous green algae	3	0	0	-	-	-	-	-	-	-
Red algae *(Acanthophora spp.)*	9	2	0	0	1	0	0	-	-	-
Grasses: Mixed	71	23	2	1	4	2	0	0	31	4
Grasses: Unidentified	1	0	0	-	-	-	-	-	-	-
Manatee grass *(Syringodium spp.)*	76	23	12	1	3	1	0	0	90	9
Shoal grass *(Halodule spp.)*	59	21	1	0	7	1	0	0	-	-
Turtle grass *(Thalassia spp.)*	967	449	10	14	99	40	0	0	258	42
Widgeongrass *(Ruppia spp.)*	13	0	0	-	1	0	0	-	-	-
None	1	3	0	3	-	-	-	-	-	-
Unknown	27	544	0	9	4	88	0	2	659	80
No bottom vegetation recorded (null)	2	16	0	0	4	1	0	0	20	2
Total	**1,367**	**1,269**	**25**	**30**	**130**	**140**	**0**	**3**	**1,095**	**142**

Table 7. Number of samples (hauls) and the number of Yellowtail Snapper collected over primary bottom substrates in Florida Bay (1994 – 1997) and the Florida Keys (1999 – 2003) using the 21.3-m center bag seine (S) and the 6.1-m otter trawl (T).

	Florida Bay: Fixed Stations (1994 – 1997)				Florida Bay: SRS Monitoring (1997)				Florida Keys: SRS Monitoring (1999 – 2003)	
	Number of Hauls		Number of Yellowtail Snapper		Number of Hauls		Number of Yellowtail Snapper		Number of Hauls	Number of Yellowtail Snapper
Bottom Substrate	S	T	S	T	S	T	S	T	T	T
Detritus	3	0	0	-	-	-	-	-	-	-
Mud	516	541	2	7	63	52	0	1	222	28
Rocks	1	0	0	-	0	1	-	0	-	-
Sand	832	335	21	13	63	22	0	0	321	41
Shell	0	4	-	0	-	-	-	-	-	-
Sponge	0	10	-	1	-	-	-	-	1	0
Tunicates	3	0	2	-	3	0	0	-	-	-
Unknown	12	370	0	8	0	65	-	2	530	70
No bottom type recorded (null)	0	9	-	1	1	0	0	-	21	3
Total	**1,367**	**1,269**	**25**	**30**	**130**	**140**	**0**	**3**	**1,095**	**142**

Figures

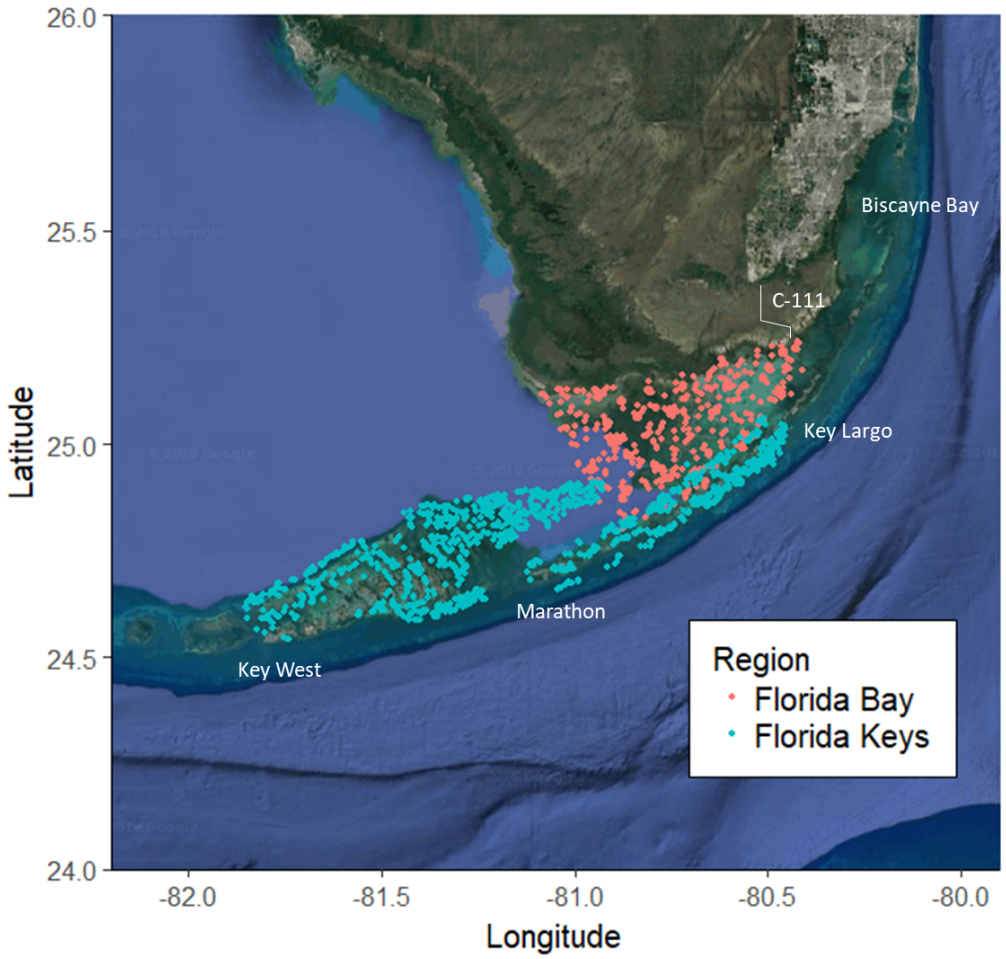

Figure 1. Sample locations by color in Florida Bay (1994 -1997) and the Florida Keys (1999 – 2003) by the Florida Fish and Wildlife Conservation Commission's Fisheries Independent Monitoring program.

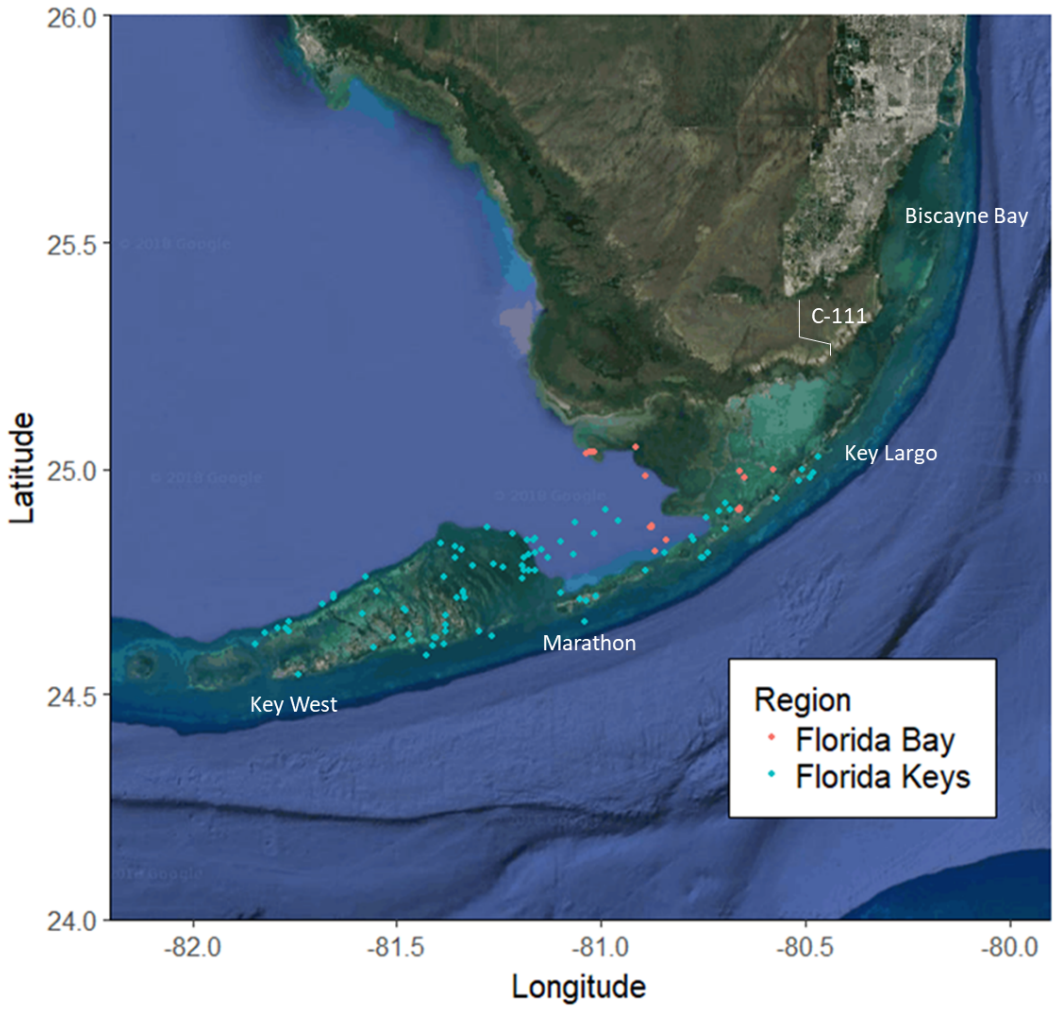

Figure 2. Locations with positive collections of juvenile or young-of-the-year Yellowtail Snapper (*Ocyurus chrysurus*) in Florida Bay (1994 – 1997) and the Florida Keys (1999 – 2003) as collected by the Florida Fish and Wildlife Conservation Commission's Fisheries Independent Monitoring program.

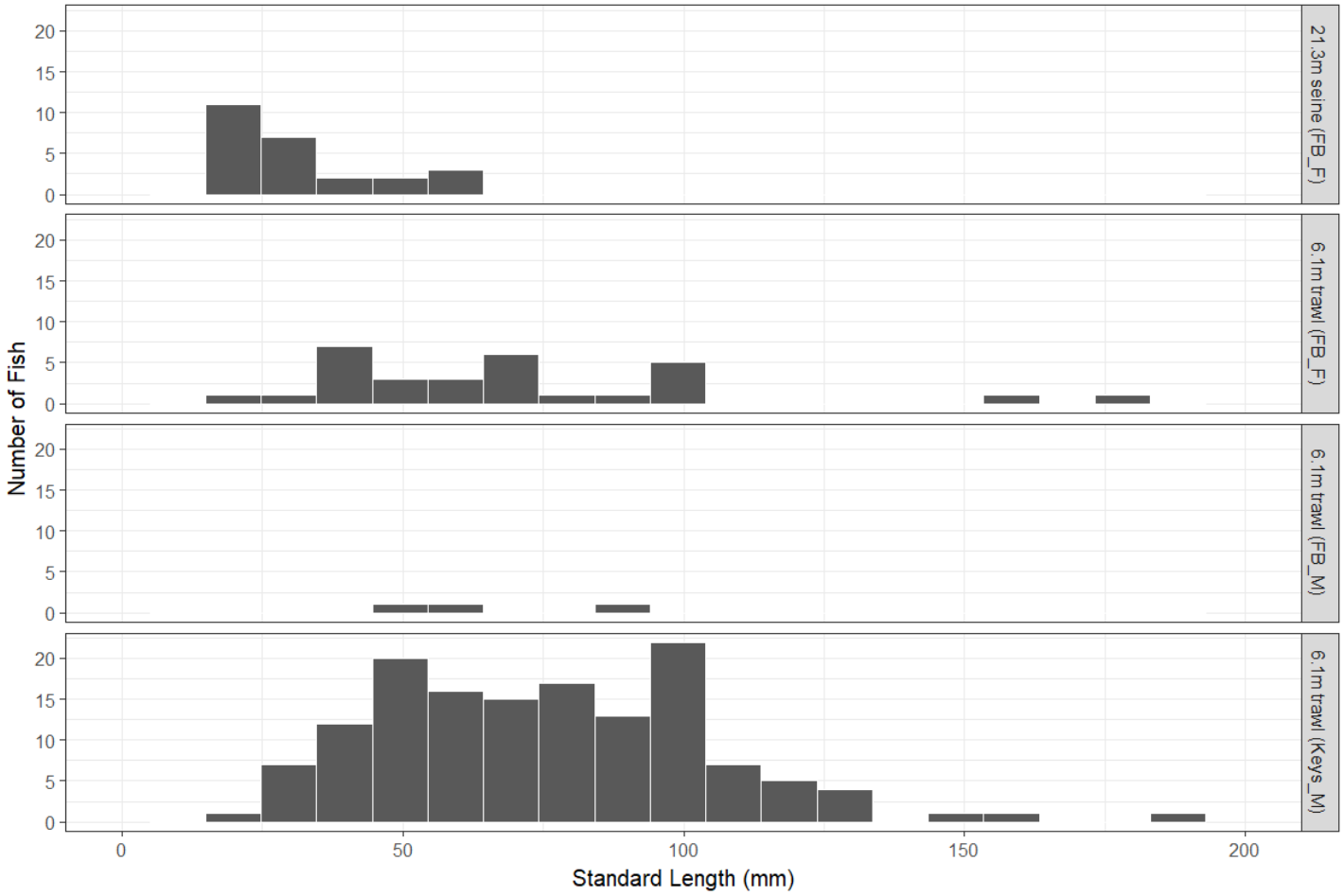

Figure 3. Length frequency histograms of Yellowtail Snapper (*Ocyurus chrysurus*) collected by gear in Florida Bay (FB) and the Florida Keys (Keys). Fixed station sampling (F) occurred only in Florida Bay (1994 – 1997) and SRS monitoring (M) occurred in Florida Bay (1997) and in the Florida Keys (1999 – 2003).

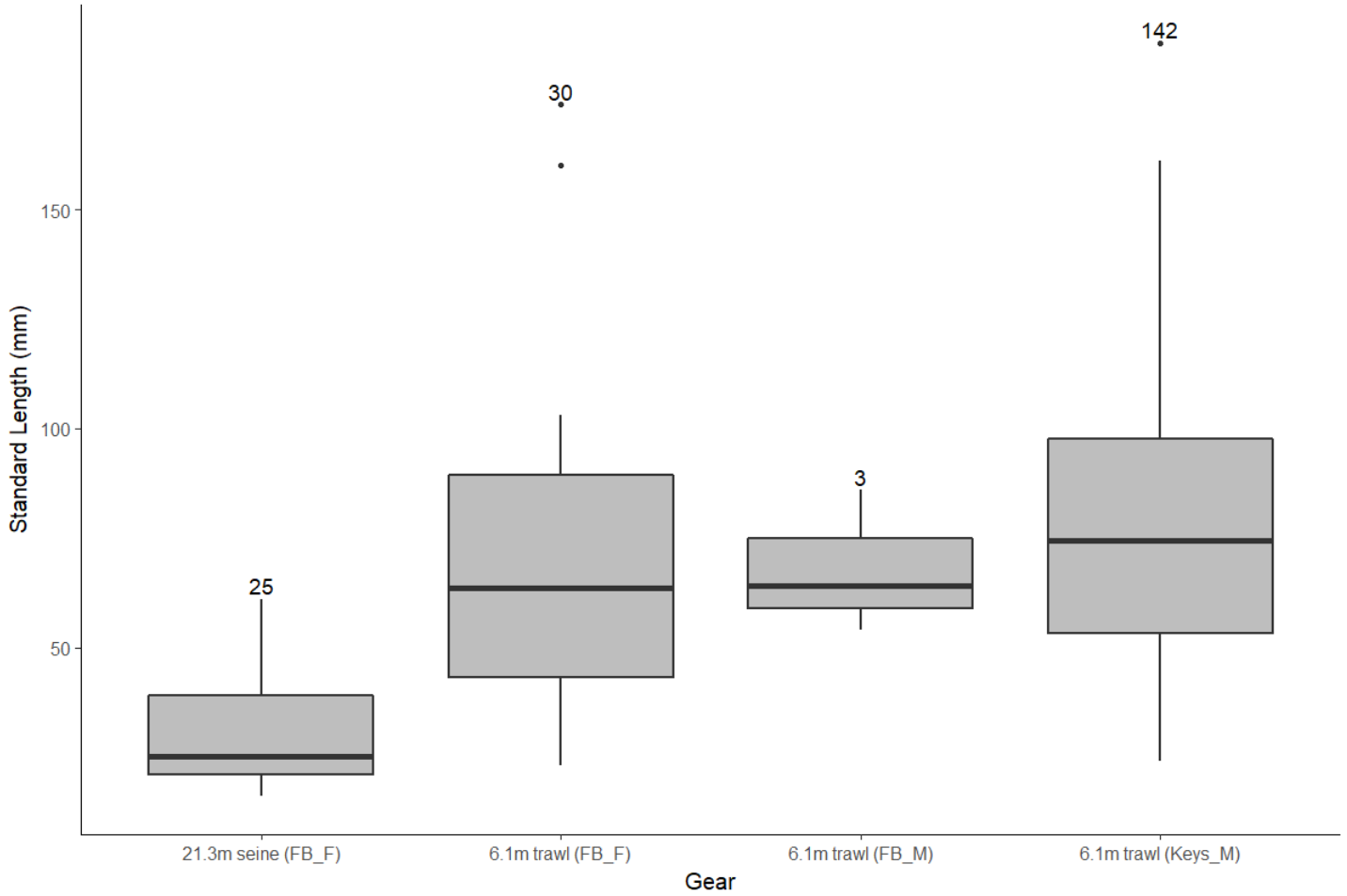

Figure 4. Length frequency boxplots of Yellowtail Snapper (*Ocyurus chrysurus*) collected by gear in Florida Bay (FB) and the Florida Keys (Keys). Fixed station sampling (F) occurred only in Florida Bay (1994 – 1997) and SRS monitoring (M) occurred in Florida Bay (1997) and in the Florida Keys (1999 – 2003). Numbers above boxplots indicate total number of Yellowtail Snapper collected by that particular gear and monitoring survey.