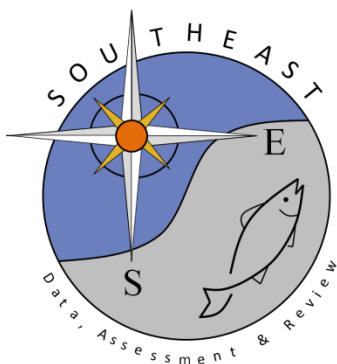


Historic catch rates of Red Snapper by Headboats through historic photograph analysis

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Historic catch rates of Red Snapper by Headboats through historic photograph analysis.

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Historical Fisheries Working Group Contribution

I. Introduction

Photographs have been taken routinely by a professional photographer at the Stone family's headboat business following each fishing trip. These photographs celebrate prized fish caught by that day's customers, but more importantly represent historic evidence of catch rates of common recreational species in the Daytona Beach area during that time, including catch rates for Red Snapper. These photographs span 1951 through the mid 1970's and therefore precede fisheries dependent monitoring estimates. This data gap of what catch per unit effort (CPUE) rates were in the early 1950's through the 1970's requires that assumptions be made for stock assessments. A common method is to extend the earliest known CPUE back in time, assuming that CPUE trends have remained constant. Using these photographs, CPUE is calculated to identify trends in fishing pressure on Red Snapper in the 1950's through the mid 1970's.

II. Methods

A total of 377 photographs were received spanning a twenty year period between 1951 and 1974. From each picture, total number of fish, total number of anglers, date, vessel, captain, and species composition was recorded. All fish were recorded down to species level if possible, and Red Snapper was of particular interest. During this time frame, a total of eight vessels were active and were included in the analysis, including *Mako*, *Candie Kidd*, *Ginger*, *Miss Juanita*, *Snow White II*, *Marianne*, *Broadbill* and *Flamingo*.

Of the 377 photographs used, only those which included at least one Red Snapper were used in the analysis. Photographs with bundles of fish of unknown species and numbers were also removed, as were photographs that had poor clarity. Some photographs included wheelbarrows of unidentifiable fish. Those that contained wheelbarrows were included in the analysis knowing

that it was very unlikely that Red Snapper would be held in them, and therefore would not impact the CPUE estimates (pers. communication). Photographs of the vessel *The Critter*, however, always included wheelbarrows, and this vessel was known to include Red Snapper in its wheelbarrows. Therefore, all photographs of the vessel *The Critter* were excluded from the analysis.

CPUE of Red Snapper, calculated as total number of Red Snapper divided by total number of anglers, was averaged yearly with a 95% confidence interval to investigate potential variability in CPUE trends. Average number of anglers, number of Red Snapper caught per trip, and resulting CPUE was then calculated across a five year period to compare the early and late years of each decade. For a broad overview of CPUE trends, decadal CPUE was estimated. Total number of photographs of each vessel per year is also given, which provides detail to which vessels make up the CPUE averages calculated.

III. Results

CPUE ranged between 0 and 10.25 in the 1950's, 0 and 9.5 in the 1960's and 0 and 5.91 in the 1970's (Table 1). Figure 1 illustrates CPUE variability seen in Table 1 using 95% confidence intervals. Table 2 shows that Red Snapper CPUE in the early 1950's was lower, 1.44 fish per angler, relative to the late 1950's, and was lowest in the 1970's at 1.06. Red Snapper CPUE remained above 2 during the late 1950's up until the 1970's. Mean decadal CPUE for the 1950's, 1960's and 1970's (Table 3) were 1.85, 2.44, and 1.06, respectively. With the exception of the CPUE seen from the vessel *Ginger*, which had particularly high catch rates, moderate CPUE rates were seen for Red Snapper in the 1950's and increased in the 1960's by nearly 32%. CPUE then decreased in the 1970's back to only 54% that seen in the 1960's.

Table 1. Red Snapper summary statistics, including number of observations, average CPUE per year, standard deviation, and a minimum and maximum.

Year	N Obs	Average CPUE			
		Mean	Std Dev	Minimum	Maximum
1951	4	0.683	0.294	0.375	1.000
1952	5	0.682	0.441	0.333	1.300
1953	2	0.921	1.020	0.200	1.643
1954	18	1.877	1.263	0.111	4.333
1955	2	5.375	6.894	0.500	10.250
1956	3	0.478	0.345	0.250	0.875
1957	3	1.950	2.353	0.583	4.667
1958	1	0.800	.	0.800	0.800
1959	38	2.118	1.474	0.286	6.250
1960	35	2.628	1.979	0.125	9.500
1961	6	2.915	1.641	1.294	5.714
1962	21	3.011	1.421	1.103	6.222
1963	3	4.291	3.217	1.000	7.429
1964	3	2.091	0.867	1.273	3.000
1965	4	2.271	1.137	1.357	3.929
1966	1	0.389	.	0.389	0.389
1967	9	2.917	1.181	1.238	4.667
1968	63	2.289	2.080	0.050	8.417
1969	15	1.247	1.632	0.053	6.500
1970	16	0.414	0.339	0.032	1.235
1971	16	1.270	1.438	0.115	5.909
1973	20	1.413	1.053	0.125	3.583

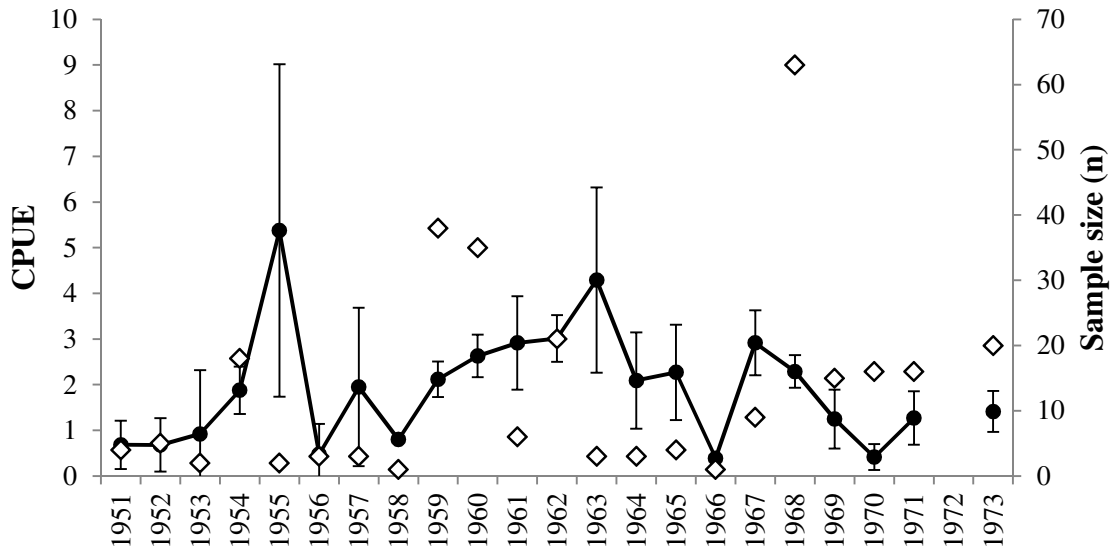


Figure 1. Mean catch per unit effort with 95% confidence intervals. Sample size (numbers of photographs read per year) are illustrated as hollow, diamond-shaped data points.

Table 2. Red Snapper summary statistics per five year period. Average CPUE, anglers and total number of American Red Snapper is provided.

Lustrum	N Obs	Variable	Mean	Std Dev	Minimum	Maximum
1950-1954	29	CPUE	1.440	1.170	0.111	4.333
		Anglers	7.172	2.726	1.000	14.000
		t_ars	9.345	7.242	1.000	29.000
1955-1959	47	CPUE	2.113	1.925	0.250	10.250
		Anglers	10.574	3.746	3.000	18.000
		t_ars	20.085	15.280	2.000	57.000
1960-1964	68	CPUE	2.821	1.810	0.125	9.500
		Anglers	12.426	4.208	4.000	29.000
		t_ars	31.088	14.736	1.000	70.000
1965-1969	92	CPUE	2.159	1.940	0.050	8.417
		Anglers	17.413	6.535	1.000	36.000
		t_ars	32.098	24.610	1.000	106.000
1970-1975	52	CPUE	1.061	1.118	0.032	5.909
		Anglers	17.423	6.569	4.000	31.000
		t_ars	17.712	18.494	1.000	75.000

Table 3. Red Snapper summary statistics by decade. Average CPUE, anglers and total number of American Red Snapper is provided.

Decade	N Obs	Variable	Mean	Std Dev	Minimum	Maximum
1950s	76	CPUE	1.856	1.700	0.111	10.250
		Anglers	9.276	3.762	1.000	18.000
		t_ars	15.987	13.797	1.000	57.000
1960s	160	CPUE	2.440	1.908	0.050	9.500
		Anglers	15.294	6.166	1.000	36.000
		t_ars	31.669	20.938	1.000	106.000
1970s	52	CPUE	1.061	1.118	0.032	5.909
		Anglers	17.423	6.569	4.000	31.000
		t_ars	17.712	18.494	1.000	75.000

Table 4. Number of trips per year made by each vessel that caught Red Snapper.

		Vessel by Year																						
		Year																					Total	
Vessel		1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971		1973
Mako	Frequency	4	5	1	18	0	1	2	1	0	1	0	4	0	1	0	0	5	2	0	0	0	0	45
	Row Pct	8.89	11.11	2.22	40.00	0.00	2.22	4.44	2.22	0.00	2.22	0.00	8.89	0.00	2.22	0.00	0.00	11.11	4.44	0.00	0.00	0.00	0.00	0.00
	Col Pct	100.00	100.00	50.00	100.00	0.00	33.33	66.67	100.00	0.00	2.86	0.00	19.05	0.00	33.33	0.00	0.00	55.56	3.17	0.00	0.00	0.00	0.00	0.00
Candie Kidd	Frequency	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Row Pct	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Col Pct	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ginger	Frequency	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	Row Pct	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Col Pct	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miss Juanita	Frequency	0	0	0	0	0	2	1	0	1	1	5	16	3	1	4	0	0	0	0	0	0	0	34
	Row Pct	0.00	0.00	0.00	0.00	0.00	5.88	2.94	0.00	2.94	2.94	14.71	47.06	8.82	2.94	11.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Col Pct	0.00	0.00	0.00	0.00	0.00	66.67	33.33	0.00	2.63	2.86	83.33	76.19	100.00	33.33	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Snow White II	Frequency	0	0	0	0	0	0	0	0	37	33	0	0	0	0	0	0	0	0	0	0	0	0	70
	Row Pct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.86	47.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Col Pct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.37	94.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Marianne	Frequency	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	1	0	0	0	0	5
	Row Pct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	20.00	0.00	20.00	0.00	20.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00
	Col Pct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.67	4.76	0.00	33.33	0.00	100.00	0.00	1.59	0.00	0.00	0.00	0.00	0.00
Broadbill	Frequency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	47	5	0	5	15	76
	Row Pct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.26	61.84	6.58	0.00	6.58	19.74	0.00
	Col Pct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44.44	74.60	33.33	0.00	31.25	75.00	0.00
Flamingo	Frequency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	10	16	11	5	55
	Row Pct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.64	18.18	29.09	20.00	9.09	0.00
	Col Pct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.63	66.67	100.00	68.75	25.00	0.00
Total	Frequency	4	5	2	18	2	3	3	1	38	35	6	21	3	3	4	1	9	63	15	16	16	20	288

Timeline of Vessel Activity

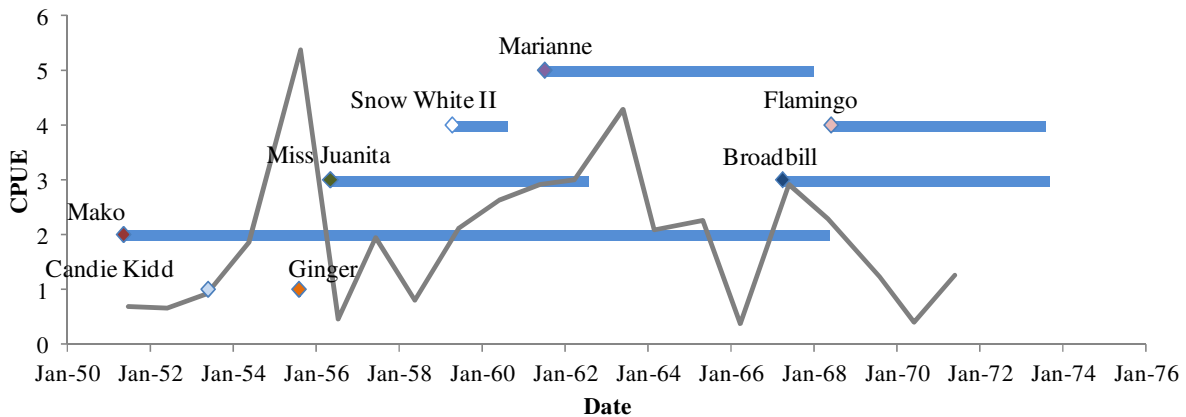


Figure 2. A timeline showing the timeframe each vessel was active. This timeline is overlaid by a weighted CPUE trend.

IV. Conclusions

Results of this study represent preliminary findings of CPUE variability between 1950 and 1974. The preliminary findings suggest that the assumption that CPUE trends were constant between 1950 and 1974 may be inaccurate, with an apparent peak in the 1960's.

Future work is needed to analyze hundreds more of photographs, including those which did not contain Red Snapper. Using photographs from all trip types, a ratio of trips that caught Red Snapper compared to those that didn't will be useful in determining seasonal effort. Further, software can be used to assess lengths to investigate potential decreases of fish size through time as well. Results from this preliminary analysis will be used to develop a proposal to the southeast Region Cooperative Research Program (CRP) between fishermen of Daytona Beach, the Fish and Wildlife Research Institute and National Marine Fisheries Service so that a more complete analysis of all available photographs may be conducted.