Standardized catch rates of red snapper (*Lutjanus campechanus*) from headboat at-sea-observer data

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SEDAR41-DW14

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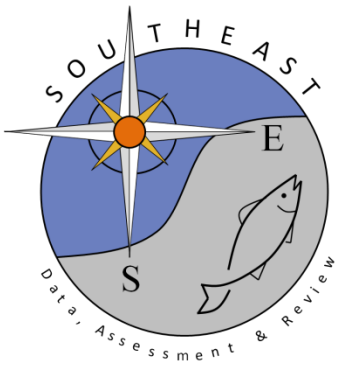
***Addendum added to reflect changes made during Data Workshop.**
Final index is found in the addendum.



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Standardized catch rates of red snapper (*Lutjanus campechanus*)
from headboat at-sea-observer data

Sustainable Fisheries Branch, National Marine Fisheries Service,
Southeast Fisheries Science Center, 101 Pivers Island Rd, Beaufort, NC 28516

***Addendum at end of document reflecting changes made at Data Workshop**

Abstract
Standardized catch rates were generated from the Southeast headboat at-sea-observer program for 2005-2014. The analysis included areas from central North Carolina through south Florida. The index is meant to describe population trends of fish in the size/age range of fish discarded by headboat vessels. Data filtering and subsetting steps were applied to the data to model trips that were likely to have directed red snapper effort.

Background and Data Description

The data used for this index were all trips in the headboat at-sea observer database which discarded red snapper from 2005-2013. The at-sea-observer program occurred from 2004-2009 in North and South Carolina, but did not occur in Florida and Georgia in 2004. In addition, after 2007 the Florida Keys were no longer included in the at-sea observer program.
Trip-level information included state, county, Florida region, year, month, day, dock to dock hours (total trip hours), the number of hours fished (to the nearest half hour), the total number of anglers on the boat, the number of anglers observed on a trip, the number of red snapper discarded, minimum depth of the fishing trip, and maximum depth of the fishing trip. Depth information was not collected for South Carolina, North Carolina, and Georgia; therefore, it was not used in this analysis. Refer to working paper SEDAR41-DW33 for more details regarding this program.

Methods
Data treatment
Data from 2004 were dropped from the analysis because Georgia and Florida were not sampled. Observer trips by year and area relative to all headboat trips as well as total red snapper observed are presented in Table 1.

Data were subsetted to include trips with the presence of at least one of the following associated species identified in Shertzer and Williams (2008) (bank seabass, black seabass, gag, gray triggerfish, greater amberjack, knobbed porgy, red porgy, red snapper, scamp, tomtate, vermillion snapper, white grunt, whitebone porgy).

A 20” TL minimum size regulation has been in place since 1992. In SEDAR 24, headboat at-sea observer data was used to index discards below 20” TL minimum. A 2010 closure has created a scenario where all fish observed are discarded (mini-seasons in 2012 & 2013 were removed). During this closure period, discards greater than 20” were removed.

Response and explanatory variables

CPUE – Discards per unit effort (DPUE) is defined as units of fish/ angler interviewed and was calculated as the number red snapper discarded divided by the number of anglers interviewed. CPUE relative to each explanatory variable is provided in Figure 1-6.

YEAR – A summary of the total number of trips with red snapper effort per year is provided in Table 1.

AREA –Area was defined as North Carolina, South Carolina and Georgia, north Florida (nFL), south Florida, (excluding the keys, flreg=3)

SEASON – The seasons were defined as winter (January, February, March), spring (April, May, June), summer (July, August, September) and fall (October, November, December).

PARTY – Four categories for the number of anglers on a vessel were considered in the standardization process.

HRSF– Four categories for the number of hours fished were considered in the standardization process.

Objective for SEDAR 41 Data Workshop

- Approve or modify proposed factors and factor definitions
- Discuss cpue definition (anglers vs angler-hours)
- Discuss filtering using associated species (bank seabass, black seabass, gag, gray triggerfish, greater amberjack, knobbed porgy, red porgy, red snapper, scamp, tomtate, vermillion snapper, white grunt, whitebone porgy)
- Disscuss management regulations and their potential influence on index
- Run GLM based on DW decisions regarding data and factors
- Estimate uncertainty
- Update working paper and provide text, figures, and research recommendations for the SEDAR 41 DW report

LITERATURE CITED

Shertzer. K. W. and E. H. Williams. 2008. Fish assemblages and indicator species: reef fishes off the southeastern United States. Fisheries Bulletin. 106:257-269.

Table 1. Trips by area and year and discarded red snapper in the south Atlantic headboat at-sea-observer data relative to the proportion of all headboat trips by state and year. (n.HB.obs= total observer trips, n.HB=total headboat trips, %cov= percent of all headboat trips observed, num.d= number of red snapper discards less than 20 " TL.)

*ADDENDUM(n.HB is incorrect, disregard percent coverage, correct table is in the Addendum below)

	NC				SC/GA				nFL				sFL				All			
year	n.HB.obs	n.HB	%cov	num.d	n.HB.obs	n.HB	%cov	num.d	n.HB.obs	n.HB	%cov	num.d	n.HB.obs	n.HB	%cov	num.d	n.HB.obs	n.HB	%cov	num.d
2005	97	2080	5%	0	64	4502	1.4%	10	42	6379	0.7%	512	76	6266	1.2%	50	279	19227	1.5%	572
2006	88	2109	4%	0	52	5316	1.0%	12	35	6696	0.5%	721	53	5449	1.0%	0	228	19570	1.2%	733
2007	91	1795	5%	14	60	6395	0.9%	10	48	7166	0.7%	1592	49	5789	0.8%	34	248	21145	1.2%	1650
2008	78	2140	4%	25	42	5200	0.8%	39	50	8031	0.6%	1619	57	12940	0.4%	28	227	28311	0.8%	1711
2009	69	1747	4%	3	43	6237	0.7%	32	52	9487	0.5%	414	61	16965	0.4%	8	225	34436	0.7%	457
2010	83	2179	4%	22	29	6515	0.4%	16	46	8782	0.5%	171	54	17614	0.3%	13	212	35090	0.6%	222
2011	79	1808	4%	13	25	6218	0.4%	9	46	6667	0.7%	199	47	15256	0.3%	0	197	29949	0.7%	221
2012	70	1924	4%	43	44	5379	0.8%	53	48	6440	0.7%	315	48	19843	0.2%	3	210	33586	0.6%	414
2013	53	1941	3%	145	52	5078	1.0%	45	46	6259	0.7%	224	66	20253	0.3%	1	217	33531	0.6%	415
total	708	17723	4%	265	411	50840	0.8%	226	413	65907	0.6%	5767	511	120375	0.4%	137	2043	254845	0.8%	6395

Figure 1. Discards/angler box plots by year and area.

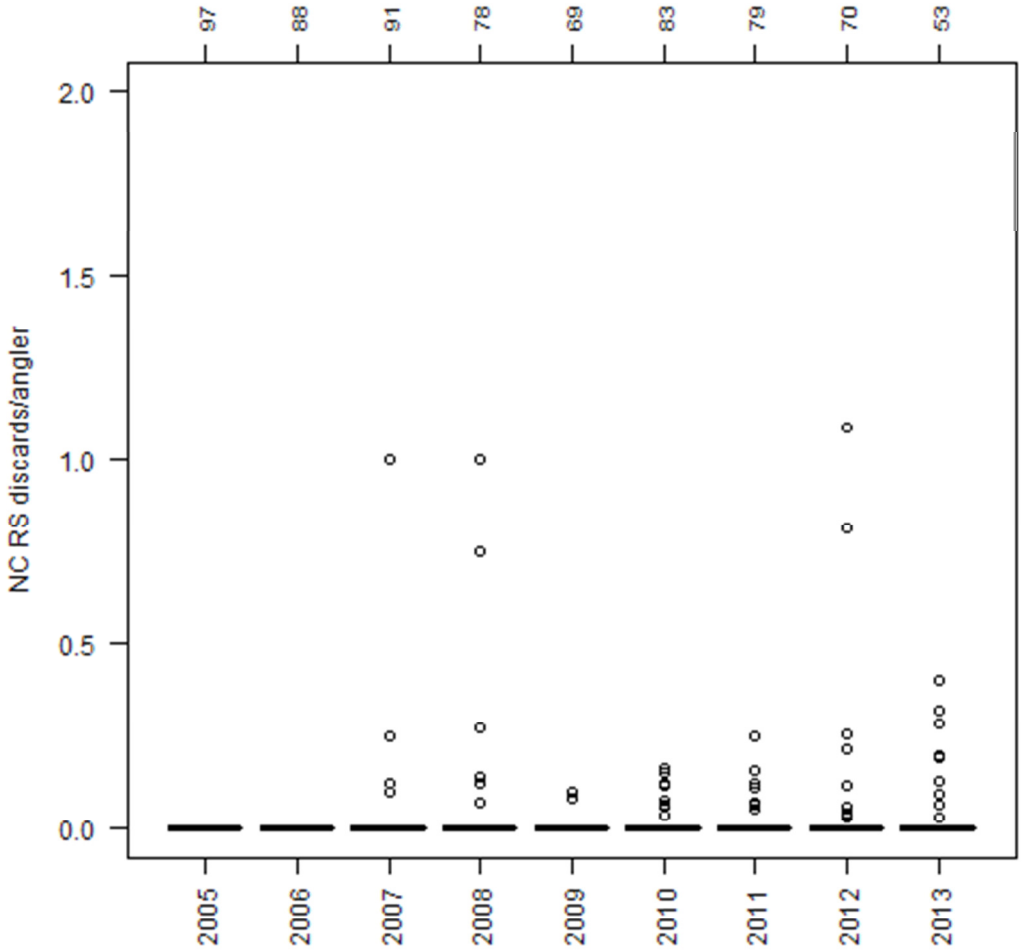


Figure 1. (continued)

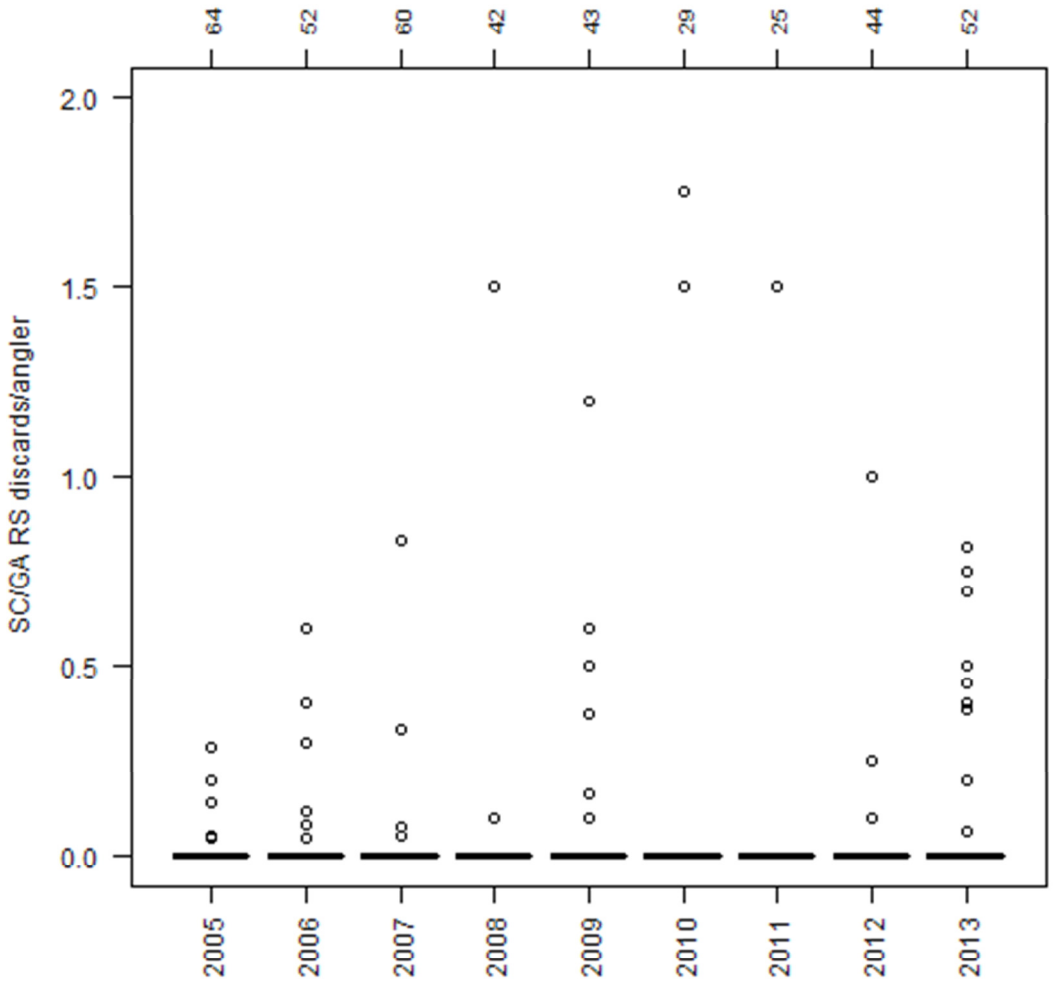


Figure 1. (continued)

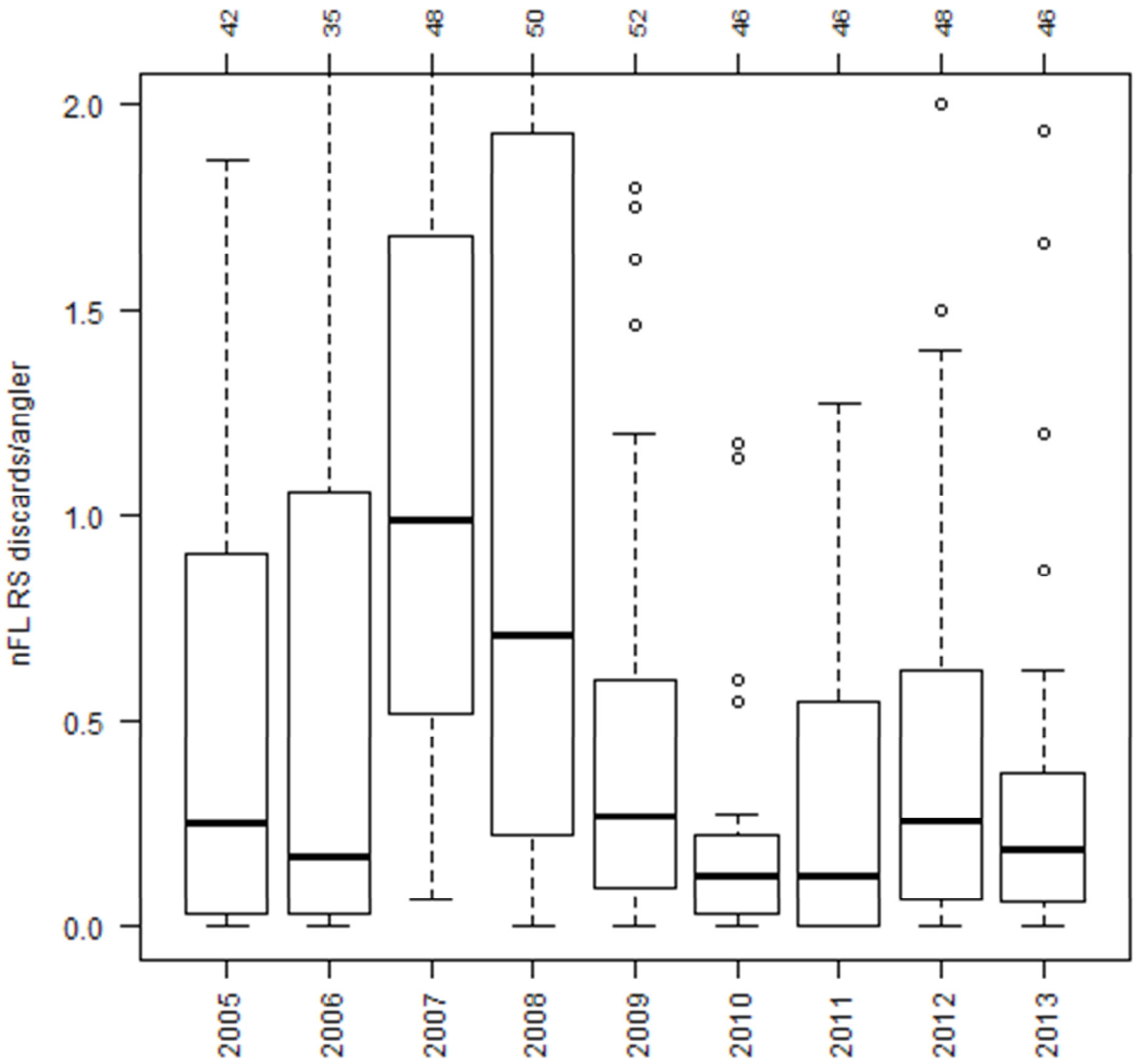


Figure 1. (continued)

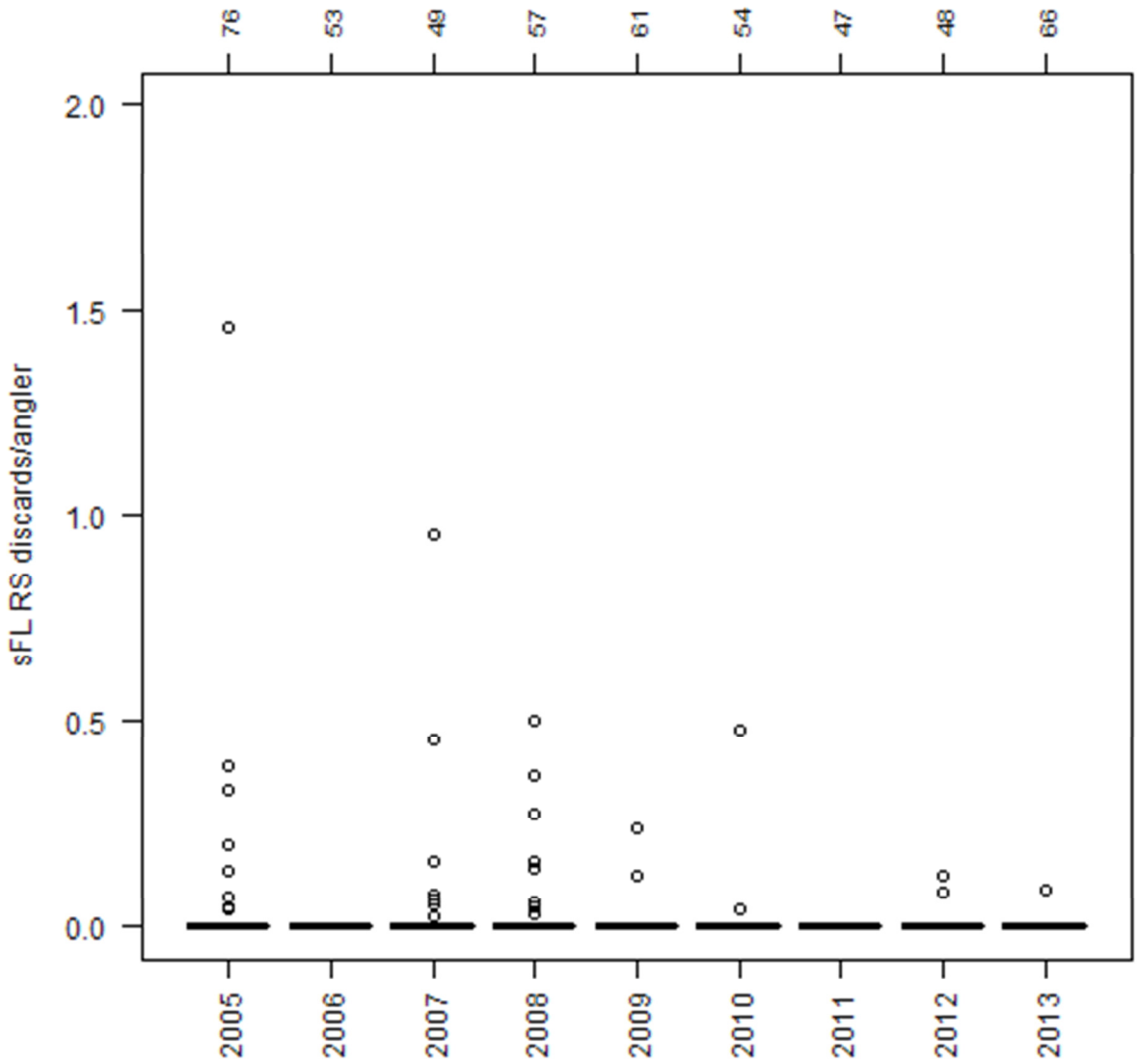


Figure 2. Discards/angler by year and area.

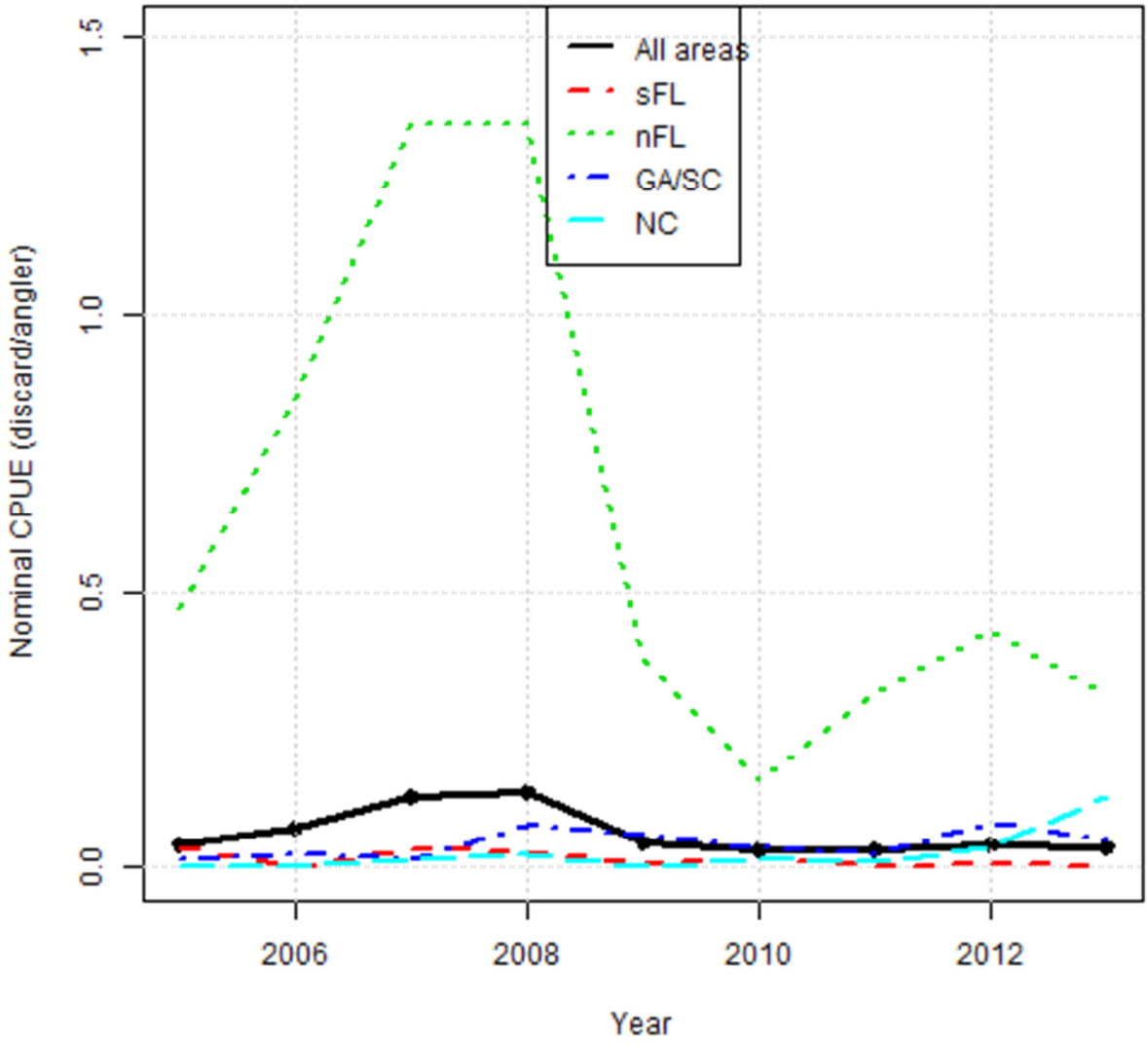


Figure 3. Discards/angler by year and season.

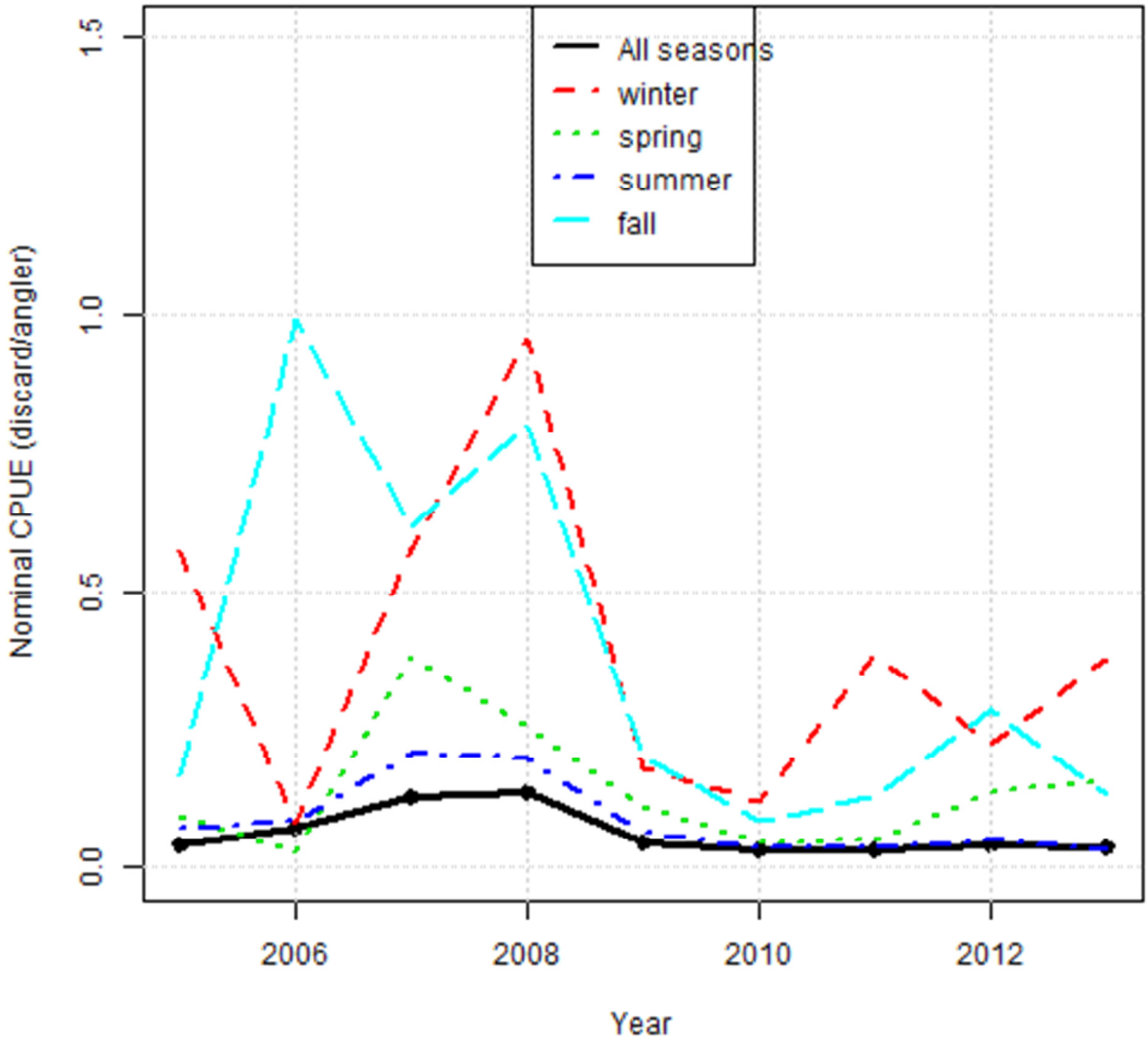


Figure 4. Discards/angler by year and party size.

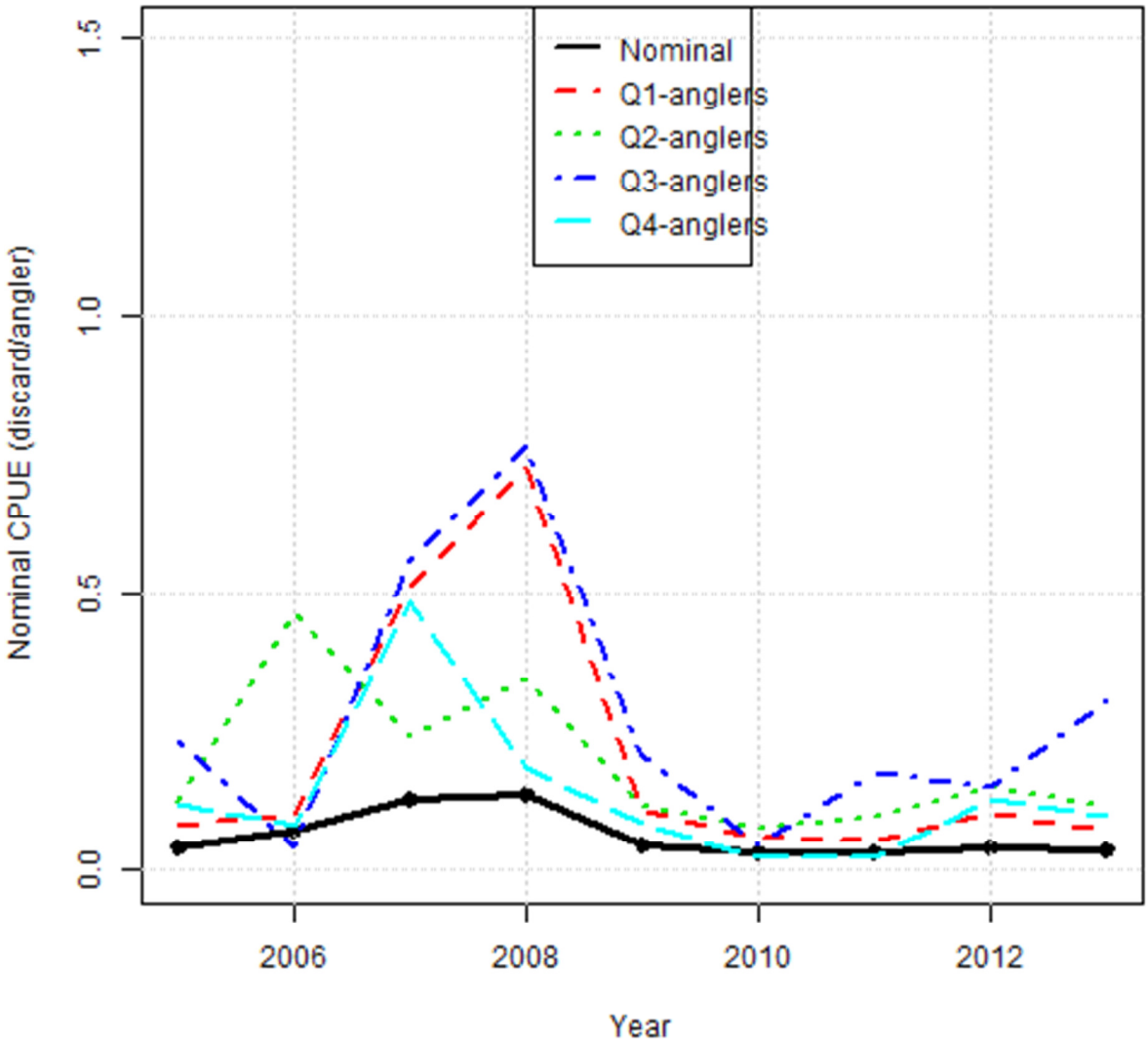
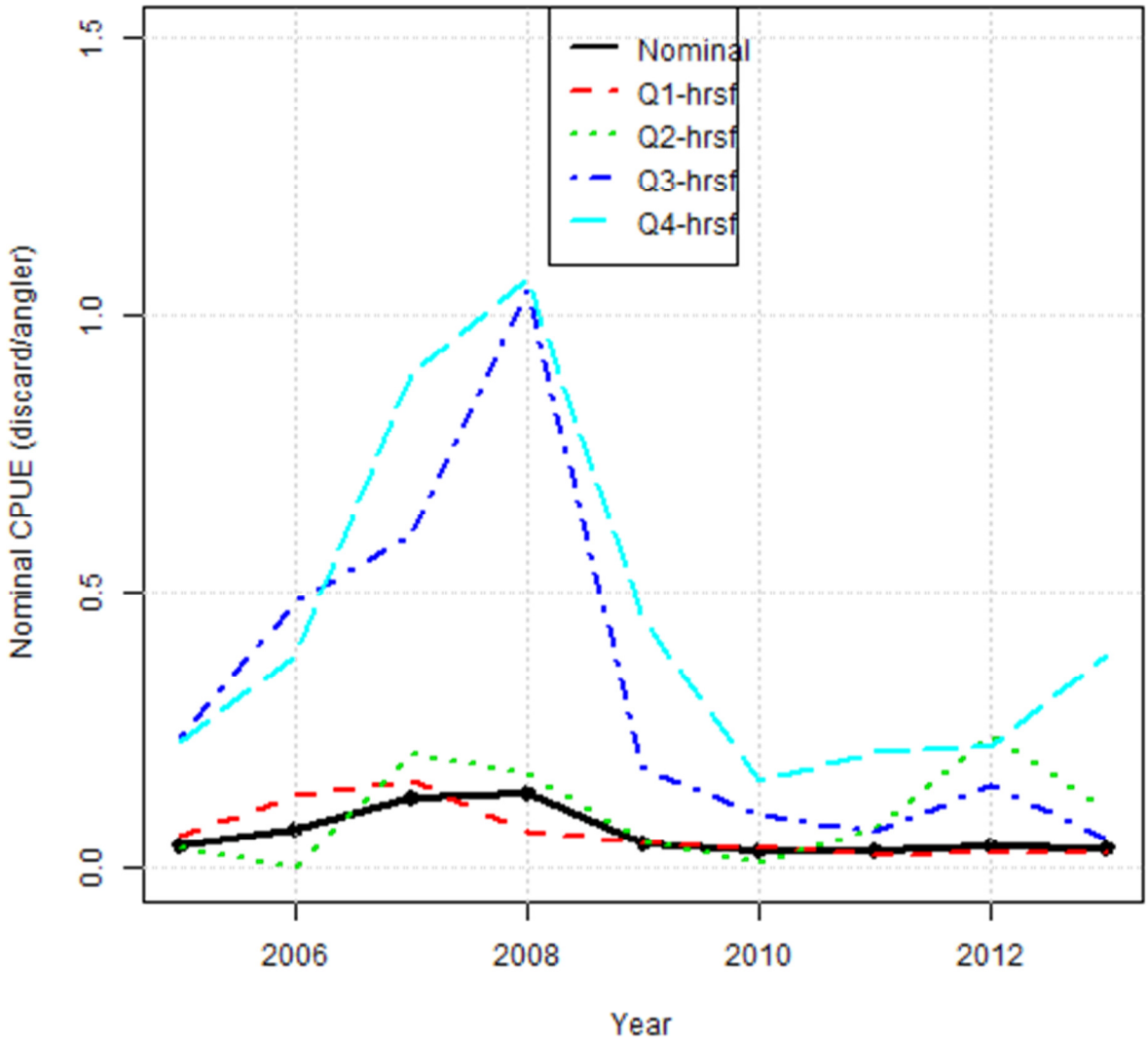


Figure 5. Discards/angler by year and hours fished.



ADDENDUM

Standardized catch rates of red snapper (*Lutjanus campechanus*)
from headboat at-sea-observer data

Sustainable Fisheries Branch, National Marine Fisheries Service,
Southeast Fisheries Science Center, 101 Pivers Island Rd, Beaufort, NC 28516

*NOTE: 2014 headboat at-sea observer data was included in the following analysis

Abstract
Standardized catch rates were generated from the Southeast headboat at-sea-observer program for 2005-2014. The analysis included areas from central North Carolina through north Florida (north of Cape Canaveral). The index is meant to describe population trends of fish in the size/age range of fish discarded by headboat vessels.

SEDAR 41 Index Working Group Review

Data workshop findings

The SEDAR 41 index working group (IWG) reviewed the methods used to develop an index of abundance for red snapper from headboat at-sea observer data. The following topics were discussed at the data workshop and include the final decisions.

Start & end year

For a fisheries dependent index like the headboat at-sea observer index, identifying changes in angler behavior are important when developing an index. SEDAR 41 IWG participants along with fisherman present at the meeting discussed the red snapper closure in 2010 and its potential impact on the red snapper headboat at-sea observer index in 2010-2014. Avoidance of juvenile red snapper (less than 20 inches) was discussed and assumed to be similar before and after the closure.

The following data represents the dGLM results for the red snapper headboat at sea observer indices (2005-2014) with south Florida removed.

Table 1. Trips by area and year and discarded red snapper in the south Atlantic headboat at-sea-observer data by state and year.

	N.discards			N.trips			total	
Year	FL	GASC	NC	FL	GASC	NC	discards	trips
2005	512	5	0	43	64	97	517	204
2006	721	10	0	38	52	88	731	178
2007	1592	10	14	49	60	91	1616	200
2008	1619	39	24	52	42	78	1682	172
2009	414	32	3	52	43	69	449	164
2010	171	4	14	48	29	83	189	160
2011	181	4	7	47	25	79	192	151
2012	301	21	41	51	44	70	363	165
2013	209	17	118	49	52	53	344	154
2014	409	9	12	56	49	63	430	168
Grand Tot	6129	151	234	485	460	771	6514	1716

Table 2. The relative nominal CPUE, number of trips, standardized index, and CV for the red snapper headboat at-sea observer data in the south Atlantic from **2005-2014**.

Year	N	Nominal CPUE	Relative nominal	Standardized CPUE	CV
2005	204	0.098	0.502	0.328	0.340
2006	178	0.176	0.907	0.400	0.395
2007	200	0.367	1.889	2.490	0.185
2008	172	0.503	2.587	1.993	0.285
2009	164	0.167	0.858	0.946	0.261
2010	160	0.061	0.314	0.444	0.289
2011	151	0.109	0.559	0.458	0.335
2012	165	0.166	0.853	1.165	0.250
2013	154	0.132	0.682	0.951	0.270
2014	168	0.165	0.850	0.824	0.284

Figure 1. Residuals by factor from **2005-2014**.

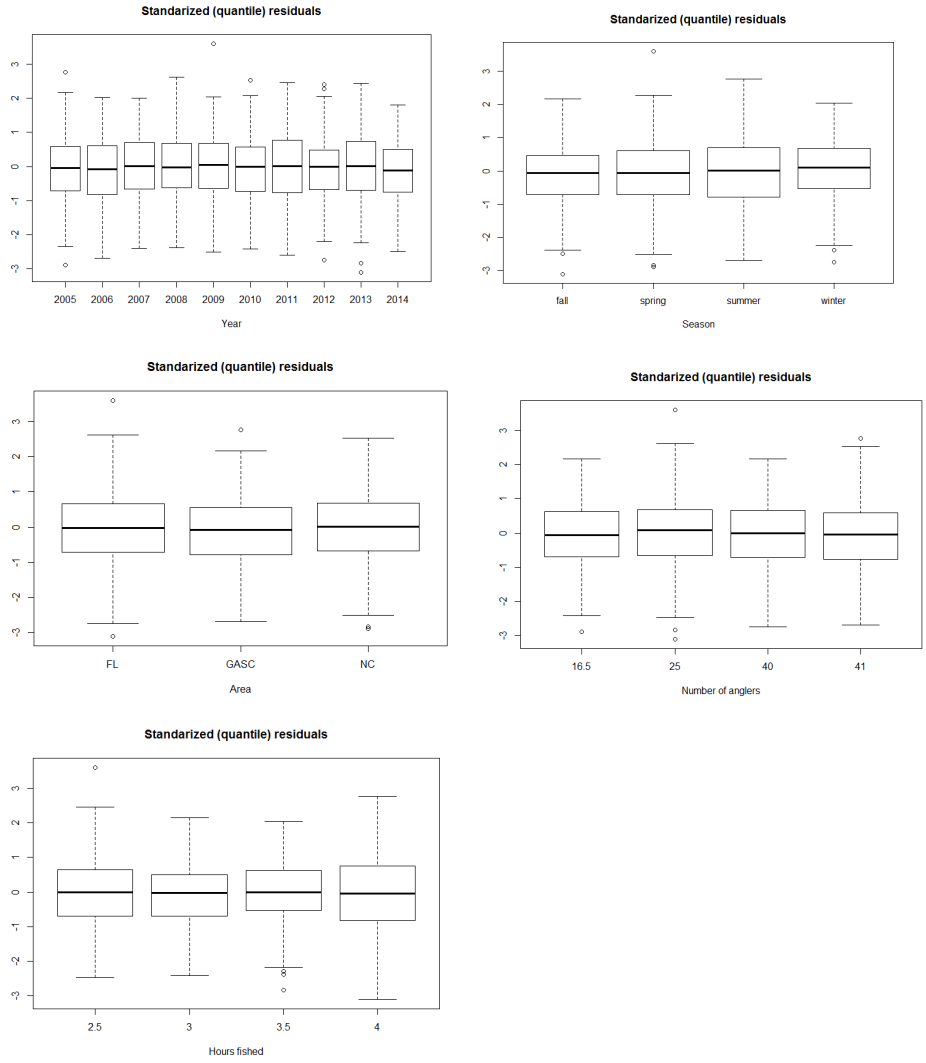
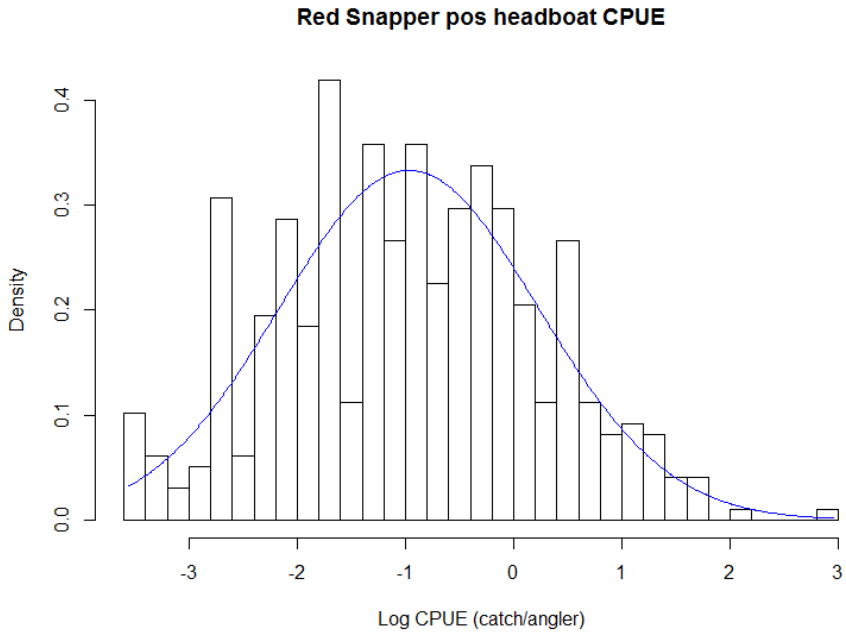


Figure 2. The lognormal distribution and qq plot of catch for the south Atlantic headboat at sea observer during **2005-2014**.



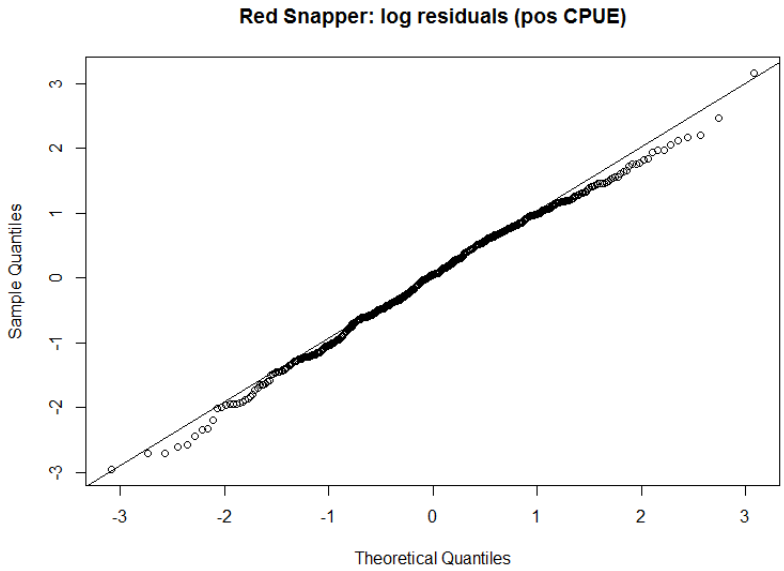


Figure 3. The standardized and nominal CPUE index with error bars at (+/-) 2 standard deviations (nominal by area below) computed for red snapper in the south Atlantic using the headboat at-sea observer data during **2005-2014**.