Analysis of Hogfish data from Coastal Fisheries Logbook Program (CFLP)
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Commercial discard calculation

Commercial vertical line discards were calculated for the west Florida shelf (statistical zones 4-7), the Florida Keys-east Florida (zones 1-3, 2482-3081), and Georgia-North Carolina (zones 3175-3677). Discards were reported from dive and vertical line (handline and electric/hydraulic reel) trips, but no discards were reported from dive trips in the Georgia-North Carolina region or from vertical line trips in west Florida. Reports of commercial hogfish discards from all other gears included either too few reported discards for reliable discard calculation or discards were reported for only two of the 11 years of the time series. The numbers of trips reporting discards of hogfish over the period 2002-2013 were:

Gear	GA-NC	Keys-EFL	WFL
Dive	0	25	25
Vertical line	11	35	0

Total trips (discards of any species) reported to the discard logbook program over the period 2002-2013 were:

Gear	GA-NC	Keys-EFL	WFL
Dive	100	1,549	476
Vertical line	6,864	34,3680	6,123

The available data sets for calculating hogfish discarded from the commercial fishery included fisher reported discard rate and effort data. Few hogfish (N=7 fish) were reported from the Gulf of Mexico reef fish observer data and those data were not included in any analysis. No long term reef fish observer data are available from the US South Atlantic. Discard rate was calculated from self-reported discard logbook data available for the years 2002-2013. Total effort was summed from coastal logbook data. The discard and coastal logbook data were trip based; therefore, reported trips with multiple subregions fished were removed because effort could not be apportioned among subregions within single trips. In addition, a small percentage of records were removed due to missing effort data or because they contained logical inconsistencies (e.g., number of lines fished not reported as a whole number) and records with effort data that had values beyond the 99.9 percentile of the data set were removed as presumptive data entry errors. Finally, only those coastal logbook records (used to determine total effort) from statistical zones where hogfish landings or discards had been reported were retained.

Although hogfish were rarely discarded, total discards were calculated for each subregion/gear combination with reports of hogfish discards. The data were insufficient for further stratification. The mean discard rate over all years, 2002-2013, was calculated for each subregion/gear stratum. Those rates were multiplied by year and stratum specific total effort reported to the coastal logbook program to calculate yearly stratum specific total discards.

Calculated discards of hogfish from the commercial vertical line and dive fisheries are provided in Tables 1-4. Sample sizes (number of trips reporting to the discard logbook program), total effort reported to the coastal logbook program, the yearly discard rate, and discard rate coefficients of variation are also provided. Calculated discards were highest for the Keys-East Florida dive fishery, but the number of calculated discards never exceeded 300 fish per year in any subregion/gear stratum. The uncertainty associated with the discard rates is very high, likely due to very low sample size. The number of calculated yearly discards is possibly so low, and the uncertainty in those yearly totals so large, that these result will have little affect on the outcome of any assessment model run.

Table 1. Calculated hogfish discards from the commercial vertical line fishery in the Georgia-North Carolina subregion. Discards are in number of fish.

year	logbook total hook hours	discard rate	calculated discards	trips reporting discard logbooks (sum of 2002-2013)	CV discard rate
1993	804,549	0.000015	12		26.09
1994	990,172	0.000015	15		26.09
1995	913,497	0.000015	14		26.09
1996	939,566	0.000015	14		26.09
1997	950,789	0.000015	14		26.09
1998	773,426	0.000015	12		26.09
1999	615,204	0.000015	9		26.09
2000	673,203	0.000015	10		26.09
2001	769,180	0.000015	12		26.09
2002	715,627	0.000015	11	6,864	26.09
2003	580,093	0.000015	9	6,864	26.09
2004	510,178	0.000015	8	6,864	26.09
2005	511,891	0.000015	8	6,864	26.09
2006	602,664	0.000015	9	6,864	26.09
2007	602,524	0.000015	9	6,864	26.09
2008	629,916	0.000015	10	6,864	26.09
2009	610,209	0.000015	9	6,864	26.09
2010	522,728	0.000015	8	6,864	26.09
2011	432,488	0.000015	7	6,864	26.09
2012	393,254	0.000015	6	6,864	26.09
2013	362,946	0.000015	5	6,864	26.09

Table 2. Calculated hogfish discards from the commercial dive fishery in the Keys-East Florida subregion. Discards are in number of fish.

year	logbook total diver hours	discard rate	calculated discards	trips reporting discard logbooks (sum of 2002-2013)	CV discard rate
1993	14,645	0.012352	181		11.2
1994	18,745	0.012352	232		11.2
1995	18,813	0.012352	232		11.2
1996	20,767	0.012352	257		11.2
1997	23,422	0.012352	289		11.2
1998	22,537	0.012352	278		11.2
1999	18,986	0.012352	235		11.2
2000	20,418	0.012352	252		11.2
2001	19,315	0.012352	239		11.2
2002	19,213	0.012352	237	1,549	11.2
2003	14,943	0.012352	185	1,549	11.2
2004	15,035	0.012352	186	1,549	11.2
2005	13,934	0.012352	172	1,549	11.2
2006	13,203	0.012352	163	1,549	11.2
2007	17,138	0.012352	212	1,549	11.2
2008	14,021	0.012352	173	1,549	11.2
2009	10,766	0.012352	133	1,549	11.2
2010	11,590	0.012352	143	1,549	11.2
2011	13,434	0.012352	166	1,549	11.2
2012	16,244	0.012352	201	1,549	11.2
2013	11,641	0.012352	144	1,549	11.2

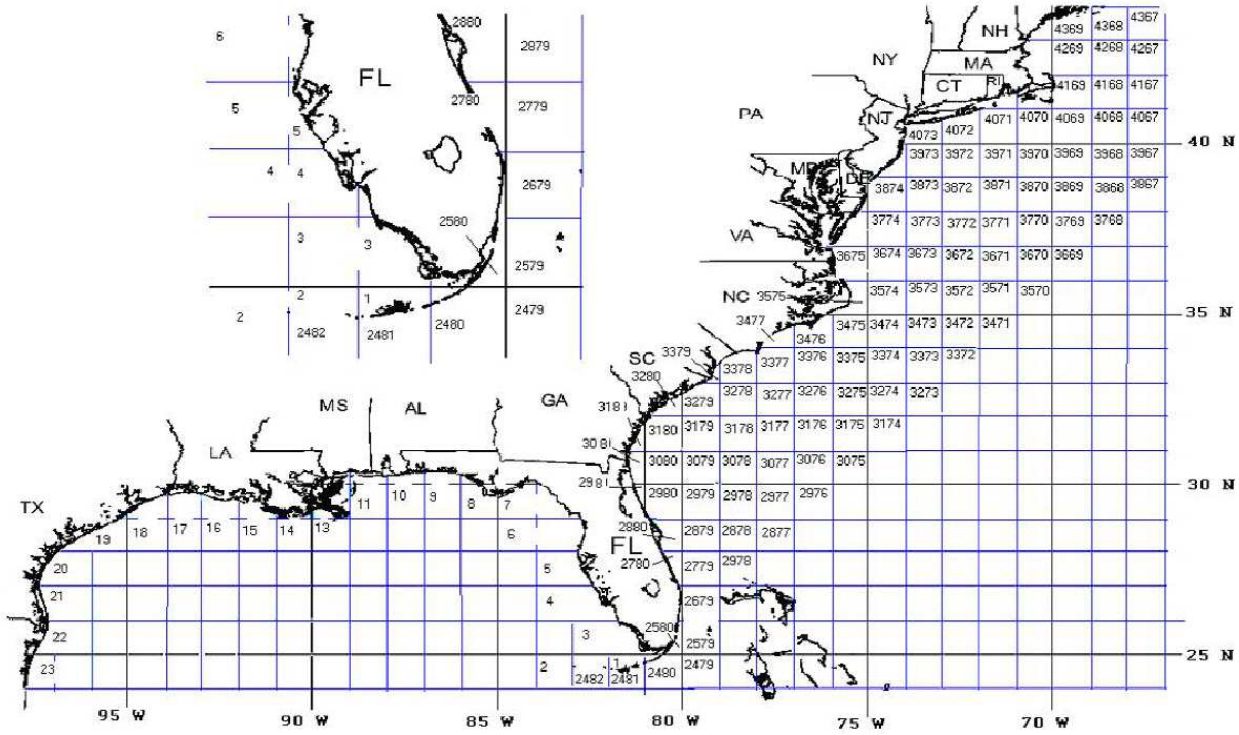
Table 3. Calculated hogfish discards from the commercial vertical line fishery in the Keys-East Florida subregion. Discards are in number of fish.

year	logbook total hook hours	discard rate	calculated discards	trips reporting discard logbooks (sum of 2002-2013)	CV discard rate
1993	829,278	0.000186	154		63.58
1994	1,374,574	0.000186	255		63.58
1995	1,061,572	0.000186	197		63.58
1996	1,059,025	0.000186	197		63.58
1997	1,214,997	0.000186	226		63.58
1998	890,344	0.000186	165		63.58
1999	1,074,799	0.000186	200		63.58
2000	961,537	0.000186	179		63.58
2001	709,684	0.000186	132		63.58
2002	766,605	0.000186	142	34,368	63.58
2003	600,870	0.000186	112	34,368	63.58
2004	540,685	0.000186	100	34,368	63.58
2005	458,333	0.000186	85	34,368	63.58
2006	482,592	0.000186	90	34,368	63.58
2007	498,404	0.000186	93	34,368	63.58
2008	488,857	0.000186	91	34,368	63.58
2009	589,187	0.000186	109	34,368	63.58
2010	475,706	0.000186	88	34,368	63.58
2011	522,994	0.000186	97	34,368	63.58
2012	491,291	0.000186	91	34,368	63.58
2013	398,213	0.000186	74	34,368	63.58

Table 4. Calculated hogfish discards from the commercial dive fishery in the West Florida subregion. Discards are in number of fish.

year	logbook total diver hours	discard rate	calculated discards	trips reporting discard logbooks (sum of 2002-2013)	CV discard rate
1993	2,741	0.014767	40		5.1
1994	4,225	0.014767	62		5.1
1995	2,668	0.014767	39		5.1
1996	4,158	0.014767	61		5.1
1997	4,658	0.014767	69		5.1
1998	3,183	0.014767	47		5.1
1999	3,072	0.014767	45		5.1
2000	4,334	0.014767	64		5.1
2001	3,999	0.014767	59		5.1
2002	4,522	0.014767	67	476	5.1
2003	5,926	0.014767	88	476	5.1
2004	5,410	0.014767	80	476	5.1
2005	5,881	0.014767	87	476	5.1
2006	5,895	0.014767	87	476	5.1
2007	5,576	0.014767	82	476	5.1
2008	6,801	0.014767	100	476	5.1
2009	6,968	0.014767	103	476	5.1
2010	9,552	0.014767	141	476	5.1
2011	8,652	0.014767	128	476	5.1
2012	8,187	0.014767	121	476	5.1
2013	5,356	0.014767	79	476	5.1

Figure 1. Statistical areas as defined in the coastal logbook and discard logbook programs.



Indices of abundance

Relative indices of abundance were constructed using dive and vertical line commercial fisher reported data (through the coastal logbook program) from the years 1993-2012. Although commercial logbook reporting began in 1990, the period 1990-1992 had very low sample size, only 20 percent of Florida vessels were required to report prior to 1993, and was limited to trips reported from the Gulf of Mexico because South Atlantic reporting did not begin until 1992. Reports of hogfish landings from vessels using other gears were too few for use in index construction. Relative abundance indices were constructed using vertical line data reported from Georgia to North Carolina (Georgia-North Carolina subregion) and the Florida Keys to the Florida-Georgia border (Keys-East Florida subregion). Data reported from the commercial dive fishery were used to construct indices for the Keys-East Florida subregion and along the West Florida Shelf (West Florida subregion). Too few positive trips were reported from the West Florida and Georgia-North Carolina dive fisheries for indices to be constructed.

The available coastal logbook data set for constructing hogfish indices of abundance included commercial fisher reported landings and effort data. Those data were trip based; therefore reported trips with multiple subregions or gears fished were removed because effort and landings could not be apportioned among subregions or gears within single trips. In addition, a small percentage of records were removed due to missing effort data or because they contained logical inconsistencies (e.g., number of lines fished not reported as a whole number). Records with effort data that had values beyond the 99.9 percentile of the data set were removed as presumptive data entry errors. Logbook reports received later than 45 days following the completion of a fishing trip were also excluded from the analyses because accuracy of effort data in such late reports is in question. Such filtering retains 70-75 percent of all logbook records.

Hogfish trips were identified using a data subsetting technique (modified from Stephens and MacCall, 2004) intended to restrict the data set to trips with fishing effort in presumptive hogfish habitat. Such an approach was necessary because fishing location was not reported at a spatial scale adequate to identify targeting based upon the habitat where the fishing occurred. This method was successful for identifying targeted trips in the Georgia-North Carolina vertical line, the Keys-East Florida dive, and the West Florida dive fisheries.

The Stephens and MacCall method performed poorly when attempted using Keys-East Florida vertical line data. An alternative species association approach (modified from Rios, 2013) was then used to identify trips targeting hogfish. Species assumed to occur within hogfish habitat were identified by: 1. ranking each species in descending order of their frequency of occurrence on trips with reported hogfish landings; 2. examining the change in percent occurrence between the ranked species; and 3. identifying the largest change in percent frequency between species. A large change in percent frequency, relative to the differences between the other species, was assumed to differentiate that group of species most highly associated with hogfish from species with much low frequency of association. For example, in the table below yellowtail snapper were reported as landed on 59% of trips that also landed hogfish, mangrove snapper on 50.8% of trips (a percent change of 8.2%), mutton snapper on 45.1% (5.6% lower than mangrove snapper), etc. The percentage of trips with hogfish and white grunt landings, however, was much lower (12.6% lower) than trips with hogfish and black grouper landings. That relatively large change in percent co-occurrence was used to differentiate species most highly associated with hogfish from those less frequently co-occurring species. Trips with landings of the most frequently co-occurring species were assumed to be targeting hogfish habitat.

Number of co-occurring trips	Percent hogfish trips with co-occurrence	Percent change	Species
3,194	100.0		hogfish
1,884	59.0	41.0	yellowtail snapper
1,622	50.8	8.2	mangrove snapper
1,442	45.1	5.6	mutton snapper
1,153	36.1	9.0	red grouper
1,051	32.9	3.2	black grouper
649	20.3	12.6	white grunt
465	14.6	5.8	jolthead porgy
348	10.9	3.7	blue runner
337	10.6	0.3	lane snapper

Species associated with hogfish habitat were defined for the Keys-East Florida vertical line fishery as: yellowtail snapper, mangrove snapper, mutton snapper, red grouper, and black grouper. Once the hogfish associated species were identified, trips targeting presumptive hogfish habitat were identified as:

1. all trips with hogfish landings
2. trips without hogfish landings when at least three associated species were landed and total landings of hogfish associated species were greater than the total landings of all other species on that trip

For trips that did not land hogfish, a minimum of three associated species with landings exceeding those of all other species was required to avoid including trips that were exclusively targeting one of the associated species. For example, a trip with red grouper as the majority of the landings and no landings of other hogfish associated species was assumed to be a red grouper targeted trip, not a trip targeting hogfish habitat.

Catch rates of trips assumed to be targeting hogfish were defined for vertical line gear as weight of hogfish landed per hook hour fished; catch rates for diving were defined as weight of hogfish landed per diver hour. Six factors were considered as possible influences on hogfish catch rates. In order to develop well balanced sample designs it was necessary to define categories within the factors examined:

Georgia-North Carolina, vertical line

Factor	Levels	Value
Year	20	1993-2012
Area	3	Statistical areas 3175-3280, 3372-3379, 3474-3677 (Fig. 1)
Days at sea	3	1-3, 4-6, 7+
Quarter	4	Jan-Mar, Apr-Jun, Jul-Sep, Oct-Dec
Crew	2	1-2, 3+ crew members
Trip effort[1]	4	0.1-150, >150-284, >284-480, >480

Keys-East Florida, dive

Factor	Levels	Value
Year	20	1993-2012
Area	3	Statistical areas 1-3, 2481-2482, 2480+2479+2579-3081 (Fig. 1)
Days at sea		Not tested, 93.6% of trips were single day trips
Quarter	3	Oct-Mar, Apr-Jun, Jul-Sep
Crew	2	1, 2+ crew members
Trip effort[1]	4	0.1-6, >6-12, >12

Keys-East Florida, vertical line

Factor	Levels	Value
Year	20	1993-2012
Area	3	Statistical areas 1-3, 2481-2482, 2480+2479+2579-3081 (Fig. 1)
Days at sea	2	1, 2+
Quarter	4	Jan-Mar, Apr-Jun, Jul-Sep, Oct-Dec
Crew	2	1, 2+ crew members
Trip effort[1]	4	0.1-14, >14-24, >24-72, >72

West Florida, dive

Factor	Levels	Value
Year	20	1993-2012
Area	2	Statistical areas 4-5, 6-7 (Fig. 1)
Days at sea	2	1, 2+
Quarter	4	Jan-Mar, Apr-Jun, Jul-Sep, Oct-Dec
Crew	2	1-2, 3+ crew members
Trip effort[1]	3	0.1-10, >10-24, >24

[1] Trip effort was examined in the vertical line binomial GLM only.

The categorized data were used in delta lognormal models (Lo et al. 1992) to construct standardized indices of abundance. This method combines separate general linear model (GLM) analyses of the proportion of successful trips (trips that landed hogfish) and the catch rates on successful trips to construct a single standardized CPUE index. Parameterization of each model was accomplished using a GLM analysis (GENMOD; Version 8.02 of the SAS System for Windows © 2000. SAS Institute Inc., Cary, NC, USA).

For each GLM analysis of proportion positive trips, a type-3 model was fit, a binomial error distribution was assumed, and the logit link was selected. The response variable was proportion successful trips. During the analysis of catch rates on successful trips, a type-3 model assuming lognormal error distribution was examined. The linking function selected was "normal", and the response variable was log(CPUE) where log(CPUE)=ln(pounds of hogfish/trip effort - hook hours fished or diver hours). All 2-way interactions among significant main effects were examined. Higher order interaction terms were not examined.

A forward stepwise regression procedure was used to determine the set of fixed factors and interaction terms that explained a significant portion of the observed variability. Each potential factor was added to the null model sequentially and the resulting reduction in deviance per degree of freedom was examined. The factor that caused the greatest reduction in deviance per degree of freedom was added to the base model if the factor was significant based upon a Chi-Square test ($p<0.05$), and the reduction in deviance per degree of freedom was $\geq 1\%$. This model then became the base model, and the process was repeated, adding factors and interactions individually until no factor or interaction met the criteria for incorporation into the final model.

Once a set of fixed factors was identified, the influence of the YEAR*FACTOR interactions were examined. YEAR*FACTOR interaction terms were included in the model as random effects. Selection of the final mixed model was based on the Akaike's Information Criterion (AIC), Schwarz's Bayesian Criterion (BIC), and a chi-square test of the difference between the –2 log likelihood statistics between successive model formulations (Littell et al. 1996).

The final delta-lognormal models were fit using a SAS macro, GLIMMIX (Russ Wolfinger, SAS Institute). To facilitate visual comparison, a relative index and relative nominal CPUE series were calculated by dividing each value in the series by the mean cpue of the series.

The final models for the binomial on proportion positive trips and the lognormal on CPUE of successful trips for the Georgia-North Carolina vertical line index of abundance were:

PPT = DAYS at SEA + YEAR + AREA

LN(CPUE) = CREW + QUARTER + YEAR + AREA + DAYS at SEA + YEAR*QUARTER + YEAR*CREW

The final models for the binomial on proportion positive trips and the lognormal on CPUE of successful trips for the Keys-East Florida dive index of abundance were:

PPT = YEAR* + AREA

LN(CPUE) = YEAR + AREA + YEAR*AREA

*Year did not reduce the deviance per degree of freedom above the threshold amount for inclusion in the model ($\geq 1\%$); however, it was included so that yearly mean cpue could be calculated.

The final models for the binomial on proportion positive trips and the lognormal on CPUE of successful trips for the Keys-East Florida vertical line index of abundance were:

PPT = YEAR + TRIP EFFORT

LN(CPUE) = YEAR + DAYS at SEA + QUARTER + CREW + YEAR*QUARTER + YEAR* DAYS at SEA

The final models for the binomial on proportion positive trips and the lognormal on CPUE of successful trips for the West Florida dive index of abundance were:

PPT* = TRIP EFFORT + AREA + YEAR + TRIP EFFORT*AREA

LN(CPUE) = YEAR + QUARTER + YEAR*QUARTER

*The GLM failed to converge when the interaction Year*Trip Effort was included in the model; therefore, that term was excluded.

Relative nominal CPUE, number of trips, proportion positive trips, and relative abundance indices are provided in Tables 1-4 for each of the hogfish analyses. The delta-lognormal abundance indices constructed for each time series, along with 95% confidence intervals, are shown in Figures 2-5.

Literature cited

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Table 1. Georgia-North Carolina relative nominal CPUE, number of trips, proportion positive trips, and standardized abundance index for hogfish constructed using commercial vertical line data.

YEAR	Normalized Nominal CPUE	Trips	Proportion Successful Trips	Standardized Index	Lower 95% CI (Index)	Upper 95% CI (Index)	CV (Index)
1993	1.486155	223	0.49	1.190205	0.631607	2.242831	0.324925
1994	1.635949	299	0.56	1.027163	0.576419	1.830376	0.294992
1995	2.209342	416	0.62	1.644174	0.96602	2.798395	0.270674
1996	0.820538	329	0.57	0.892088	0.508908	1.563782	0.286267
1997	1.043654	457	0.59	1.031188	0.599005	1.775192	0.276685
1998	1.147964	381	0.62	1.392885	0.809106	2.397867	0.276688
1999	2.317745	438	0.63	2.28076	1.341128	3.878728	0.270247
2000	1.117148	441	0.50	1.243957	0.71334	2.169273	0.283509
2001	0.880549	416	0.56	1.137274	0.657583	1.966888	0.279128
2002	0.99199	330	0.54	1.281619	0.722899	2.272167	0.292274
2003	0.835063	305	0.60	1.058467	0.601077	1.863908	0.288684
2004	0.498092	311	0.45	0.5653	0.304365	1.04994	0.317132
2005	0.908913	294	0.49	0.930506	0.510103	1.697384	0.307475
2006	0.717478	405	0.46	0.819446	0.453258	1.481478	0.302693
2007	0.501594	465	0.40	0.580379	0.32078	1.050063	0.303097
2008	0.69167	413	0.42	0.739369	0.407254	1.342324	0.304933
2009	0.65362	257	0.28	0.337883	0.16271	0.701649	0.377906
2010	0.499241	177	0.40	0.482724	0.231482	1.006656	0.380233
2011	0.577357	162	0.45	0.707657	0.350724	1.427841	0.362071
2012	0.465939	86	0.44	0.656957	0.286283	1.507572	0.433889

Table 2. Florida Keys-East Florida relative nominal CPUE, number of trips, proportion positive trips, and standardized abundance index for hogfish constructed using commercial dive data.

YEAR	Normalized Nominal CPUE	Trips	Proportion Successful Trips	Standardized Index	Lower 95% CI (Index)	Upper 95% CI (Index)	CV (Index)
1993	1.594737	157	0.66	1.560919	0.971791	2.507193	0.24031
1994	1.26666	168	0.73	1.226235	0.769147	1.95496	0.236418
1995	1.162006	163	0.71	1.158058	0.721935	1.857642	0.239618
1996	0.794218	111	0.69	0.88849	0.510703	1.545742	0.282259
1997	0.753368	290	0.62	0.70887	0.440144	1.141663	0.241708
1998	0.98257	299	0.62	1.317246	0.831073	2.087827	0.233378
1999	1.480692	180	0.61	1.045294	0.630351	1.733383	0.256986
2000	1.37545	265	0.72	0.986722	0.623208	1.562272	0.23282
2001	0.790657	335	0.64	0.736817	0.468892	1.157834	0.2289
2002	0.802677	361	0.64	0.750792	0.478699	1.177541	0.227907
2003	0.85767	208	0.59	0.790917	0.480218	1.302635	0.253409
2004	0.948855	248	0.75	0.949359	0.60545	1.488615	0.227782
2005	0.86668	218	0.67	0.903994	0.56692	1.441484	0.236514
2006	0.662891	137	0.62	0.847061	0.506722	1.415986	0.261202
2007	0.745793	186	0.72	0.943644	0.579799	1.535813	0.247189
2008	1.217199	139	0.74	1.176429	0.720461	1.920972	0.248905
2009	1.082128	101	0.71	1.135319	0.666141	1.934949	0.271391
2010	1.274439	74	0.65	1.252325	0.714506	2.194967	0.286197
2011	0.782432	123	0.56	0.94109	0.557714	1.588001	0.266136
2012	0.558877	185	0.52	0.680422	0.413934	1.118475	0.25239

Table 3. Florida Keys-East Florida relative nominal CPUE, number of trips, proportion positive trips, and standardized abundance index for hogfish constructed using commercial vertical line data.

YEAR	Normalized Nominal CPUE	Trips	Proportion Successful Trips	Standardized Index	Lower 95% CI (Index)	Upper 95% CI (Index)	CV (Index)
1993	0.091298	920	0.07	0.110994	0.038504	0.319954	0.568693
1994	0.161449	1,274	0.12	0.213612	0.085979	0.530711	0.47963
1995	0.088526	1,148	0.11	0.170792	0.067781	0.430353	0.487879
1996	0.270018	960	0.12	0.255322	0.098468	0.662038	0.504751
1997	0.376168	1,461	0.12	0.392624	0.164141	0.939155	0.457639
1998	0.170144	1,273	0.09	0.267377	0.104572	0.683647	0.496473
1999	0.313252	938	0.12	0.406607	0.158167	1.045286	0.499667
2000	1.934233	876	0.18	0.735478	0.303678	1.781255	0.464812
2001	0.505327	1,068	0.21	0.580217	0.25002	1.346501	0.440284
2002	1.80712	1,229	0.26	1.091293	0.490497	2.427989	0.416377
2003	1.507182	1,217	0.27	1.791459	0.801224	4.005527	0.419165
2004	1.130284	1,117	0.29	1.910038	0.854437	4.269766	0.419047
2005	1.028916	795	0.20	1.117849	0.457362	2.732163	0.470105
2006	1.2085	620	0.19	0.965509	0.381403	2.444155	0.490601
2007	1.678005	521	0.26	1.761694	0.71454	4.343446	0.475164
2008	1.113527	523	0.28	1.438804	0.588832	3.5157	0.469954
2009	1.532853	431	0.24	1.557038	0.597759	4.055761	0.507452
2010	1.098409	380	0.22	1.418319	0.514259	3.911708	0.541699
2011	1.86187	370	0.25	1.73189	0.656939	4.565787	0.514599
2012	2.122919	348	0.31	2.083085	0.819631	5.294139	0.492923

Table 4. West Florida relative nominal CPUE, number of trips, proportion positive trips, and standardized abundance index for hogfish constructed using commercial dive data.

YEAR	Normalized Nominal CPUE	Trips	Proportion Successful Trips	Standardized Index	Lower 95% CI (Index)	Upper 95% CI (Index)	CV (Index)
1993	0.849785	36	0.83	0.899901	0.528642	1.53189	0.270761
1994	0.770275	37	0.86	0.751151	0.460246	1.225929	0.248643
1995	0.837771	45	0.69	0.924176	0.543752	1.570755	0.269937
1996	0.48942	59	0.73	0.495002	0.309219	0.792408	0.23855
1997	0.661998	72	0.79	0.743264	0.491431	1.124147	0.209097
1998	0.745361	54	0.76	0.776958	0.488708	1.235223	0.23496
1999	0.561981	71	0.69	0.596117	0.380786	0.933217	0.226943
2000	1.088469	91	0.86	1.154608	0.789864	1.687785	0.191551
2001	1.513014	92	0.82	1.816105	1.229838	2.681849	0.196772
2002	1.475302	105	0.77	1.527801	1.03018	2.265793	0.198976
2003	1.163346	106	0.86	1.352185	0.926131	1.97424	0.190937
2004	0.828897	103	0.71	0.767096	0.506117	1.162648	0.210189
2005	0.779057	91	0.71	0.897373	0.580098	1.388177	0.220758
2006	0.436801	102	0.69	0.450141	0.294187	0.68877	0.215101
2007	0.653089	93	0.71	0.662014	0.429648	1.020051	0.21871
2008	0.929525	133	0.83	0.932584	0.649092	1.33989	0.182689
2009	2.246808	133	0.78	1.76563	1.211555	2.573097	0.189983
2010	0.929683	144	0.82	0.988246	0.688772	1.417928	0.181991
2011	1.478304	127	0.83	1.20725	0.838878	1.737383	0.183535
2012	1.561117	150	0.83	1.292397	0.910887	1.833695	0.176264

Figure 1. Statistical areas as defined in the coastal logbook and discard logbook programs.

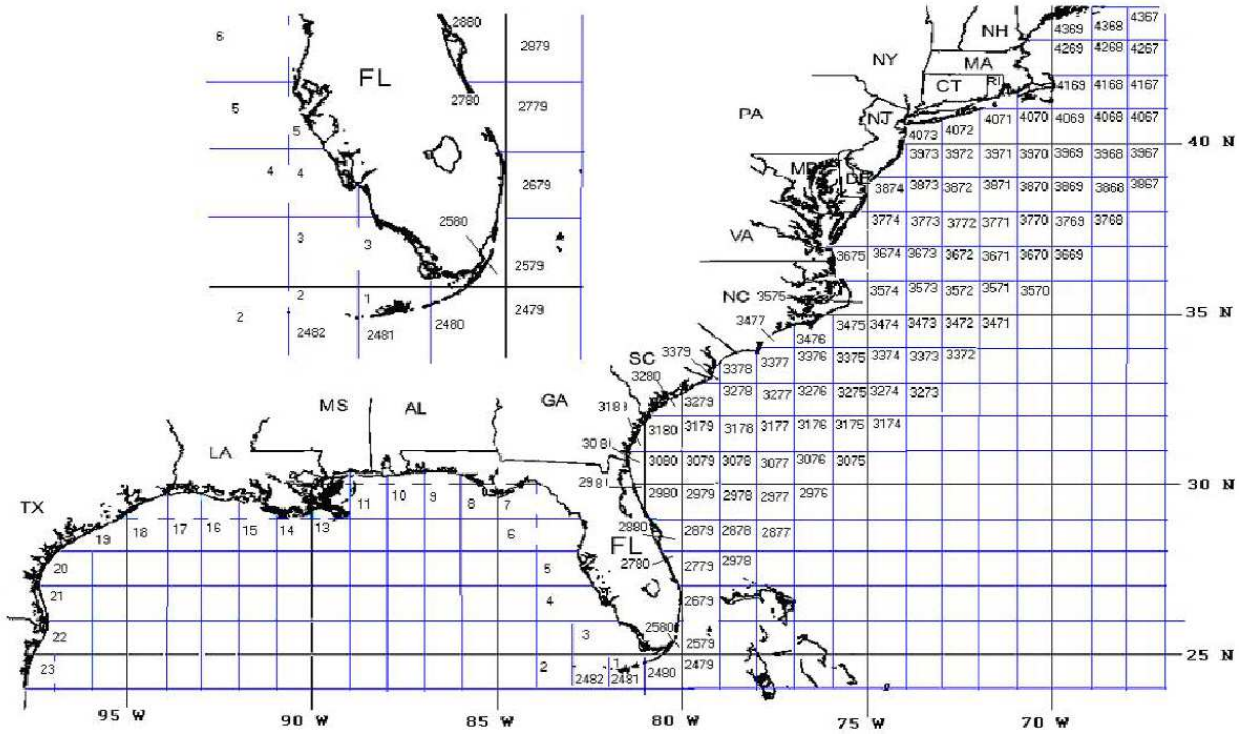

Figure 2. Georgia-North Carolina hogfish nominal CPUE (solid circles), standardized CPUE (open diamonds) and upper and lower 95% confidence limits of the standardized CPUE estimates (dashed lines) for commercial vessels fishing vertical line gear.

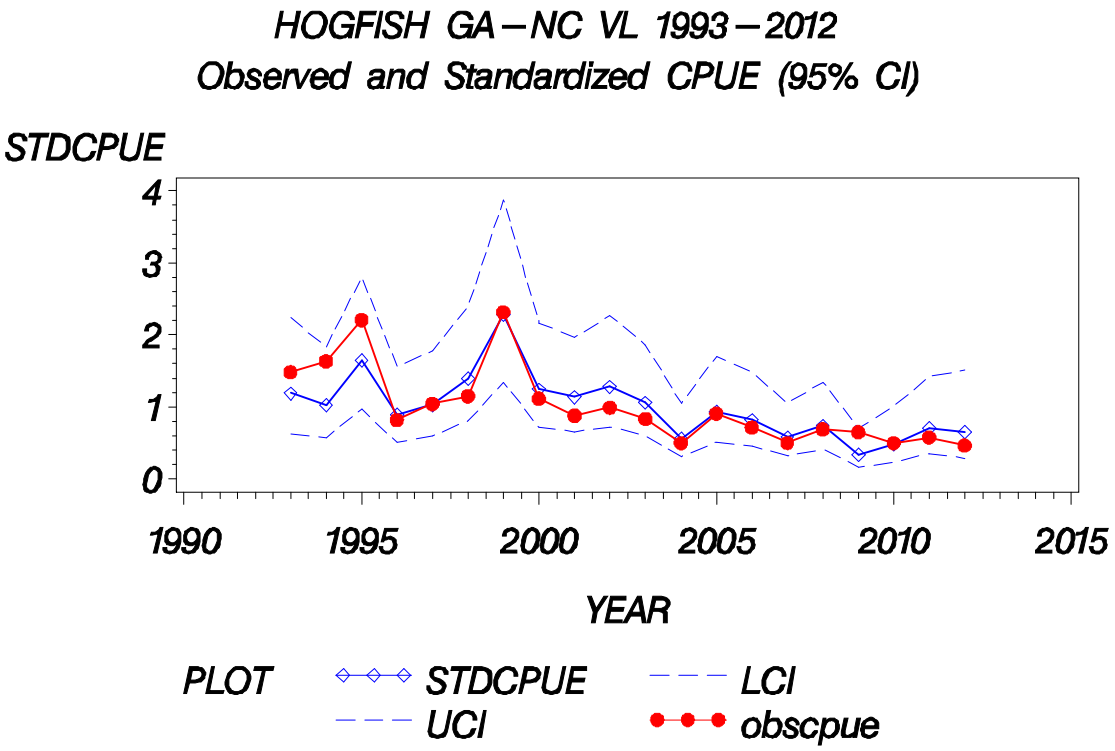

Figure 3. Florida Keys-East Florida hogfish nominal CPUE (solid circles), standardized CPUE (open diamonds) and upper and lower 95% confidence limits of the standardized CPUE estimates (dashed lines) for commercial dive vessels.

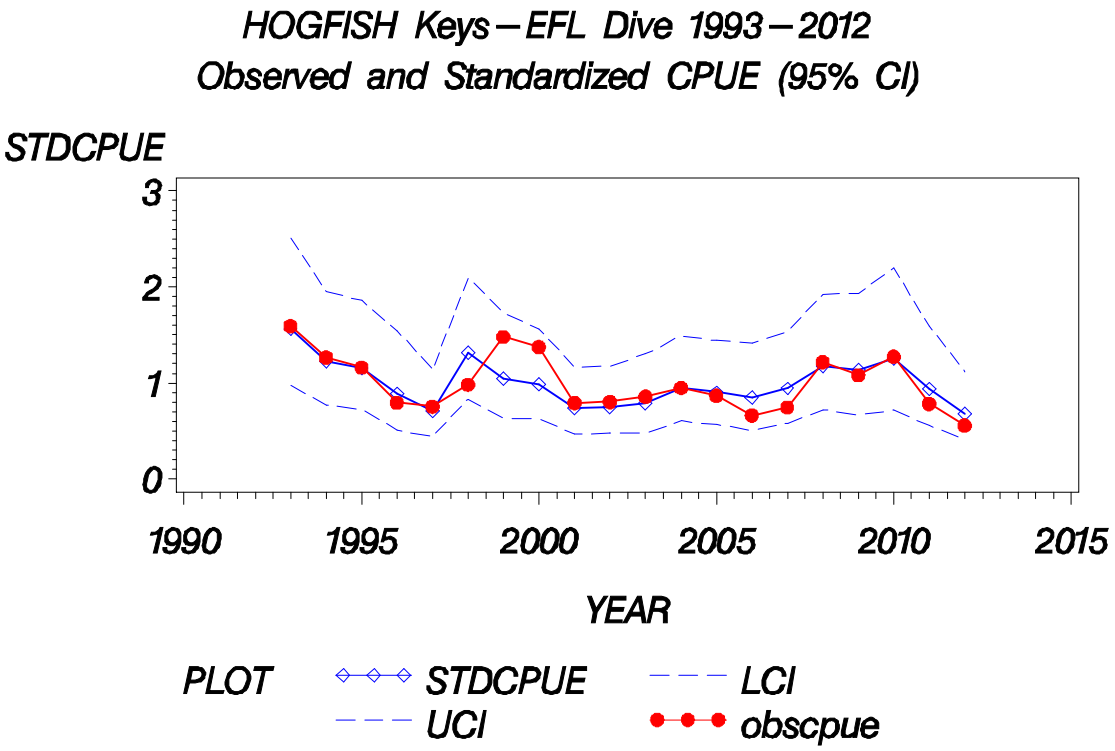

Figure 4. Florida Keys-East Florida hogfish nominal CPUE (solid circles), standardized CPUE (open diamonds) and upper and lower 95% confidence limits of the standardized CPUE estimates (dashed lines) for commercial vessels fishing vertical line gear.

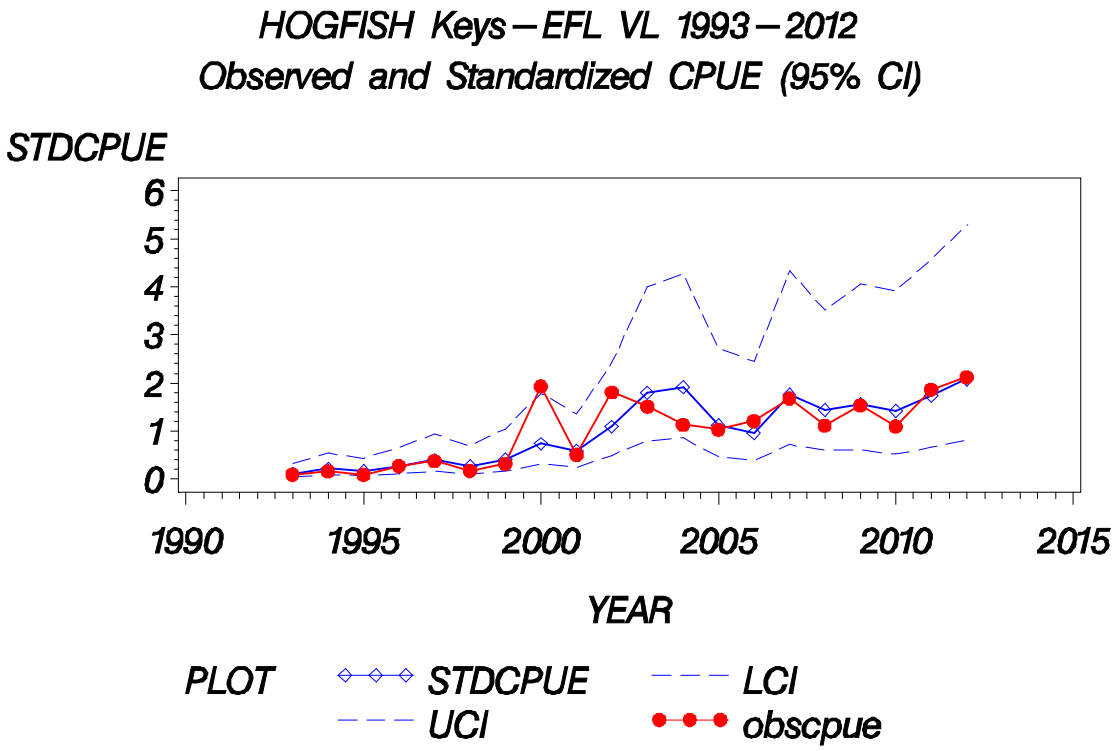

Figure 5. West Florida hogfish nominal CPUE (solid circles), standardized CPUE (open diamonds) and upper and lower 95% confidence limits of the standardized CPUE estimates (dashed lines) for commercial dive vessels.