

**IMPROVING ESTIMATES OF STRIPED BASS DISCARDS IN THE CENTRAL SOUTHERN
MANAGEMENT AREA (CSMA) THROUGH A RECREATIONAL ACCESS SITE SURVEY AND AN
EXPANDED OBSERVER PROGRAM**

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**1. IMPROVING ESTIMATES OF STRIPED BASS DISCARDS IN THE CENTRAL
SOUTHERN MANAGEMENT AREA (CSMA) THROUGH A RECREATIONAL ACCESS
SITE SURVEY**

North Carolina Division of Marine Fisheries
Final Report
CRFL Grant 2011-F-001

Job 1

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ABSTRACT

The goal of this study was to improve estimates of striped bass discards in the Central Southern Management Area (CSMA) through a recreational access site survey, or creel survey, to provide fisheries managers quality information to formulate management decisions to optimize stock recovery of striped bass within the CSMA. The study objectives included obtaining striped bass catch rates (harvest and discard), overall species composition, size distribution, fishing location, fishing method, fishing effort, and socioeconomic data. Information on discarded fish has become an essential need as management actions necessitate that anglers discard certain sizes and amounts of finfish. Information on the quantity and size of discarded fish is a critical need. A non-uniform probability based access site creel survey as described in Pollock et al. (1994) was conducted each week during the reporting period for the Neuse, Tar/Pamlico, Trent, and Pungo rivers of the CSMA. From July 1, 2011 through June 30, 2012, North Carolina Division of Marine Fisheries (NCDMF) project staff conducted 825 recreational access site survey assignments resulting in 4,396 intercepts, including 2,444 with fishing activity (56%). A noticeable reduction in intercepts occurred during the first few weeks in September 2011 following the North Carolina landfall of Hurricane Irene on August 28, 2011. After June 30, 2012, this study was funded under the Coastal Recreational Fishing License Coastal Angling Program (CAP) as part of the North Carolina Division of Marine Fisheries (NCDMF) Five Year Plan for Obligated Funds from the Marine Resources Fund.

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INTRODUCTION

The dynamic nature of North Carolina's recreational fisheries and the scope of this job require many strategies to determine the impact recreational fishers have on the coastal resources of the state. The objective of this recreational access site survey, or creel survey, was to obtain striped bass catch rates (harvest and discard), overall species composition, size distribution, fishing location, fishing method, fishing effort, and socioeconomic data to provide fisheries managers quality information to formulate management decisions to optimize stock recovery of striped bass within the Central Southern Management Area (CSMA). Information on discarded fish has become an essential need as management actions necessitate that anglers discard certain sizes and amounts of finfish. Information on the quantity and size of discarded fish is a critical need.

METHODS

A non-uniform probability based access site creel survey as described in Pollock (1994) was conducted each week during the reporting period for the Neuse, Tar/Pamlico, Trent, and Pungo rivers of the CSMA. The CSMA, a management unit within the Estuarine Striped Bass Fishery Management Plan, consists of all internal, coastal, joint, and contiguous inland waters south of a line beginning at a point 35°48.369' N – 75°43.7232' W on Roanoke Marshes Point, running southeasterly to a point 35°44.171' N – 75°31.052' W on Eagle Nest Bay, to the South Carolina boarder (Figure 1.1).

Sixty-eight fishing sites were identified and divided among six geographical regions. The Upper Tar River (TP1) consisted of nine sites from Battle Park in Rocky Mount to a Canoe Access site Near Tarboro. Ten sites were identified in Lower Tar/Upper Pamlico rivers beginning with the Town Commons at Greenville downstream to Durham' Creek near Aurora (TP2). Pungo River sites were focused around the middle reach of the river and included three sites near Belhaven and extended to a fourth site at Leechville (TP3).

The Trent River, a major tributary to the Neuse system, is included in this survey. Seventeen access points from Anderson Point Park in East Raleigh to an access site at the HWY 111 Bridge between Goldsboro and Seven Springs were categorized as the Upper Neuse River (NR1). An additional division at Core Creek separated Middle (NR2) and Lower Neuse River (NR3) areas. The Trent River, a major tributary to the Neuse system, is included in this survey (NR3).

Probabilities for survey assignments were based on seasonal fishing pressures observed at the access sites during past surveys in addition to anecdotal information such as intermittent counts as surveyors pass sites during the course of their working day. Probabilities were adjusted during the survey period according to angler counts to provide more accurate estimates. Anglers were interviewed by North Carolina Division of Marine Fisheries (NCDMF) creel clerks at the selected access point to obtain information regarding party size, effort, total number of fish harvested and/or released, primary fishing method, and location. Harvested fish were identified, enumerated, measured (nearest mm centerline length), and weighed to the nearest 0.1 kg, while information on discarded fish was obtained from the angler(s) to acquire the number and status of discarded individuals. Information regarding the status of the discarded fish was also obtained to delineate between regulatory discards from those of catch and release activities. Scale collections were taken from available fish to determine age. Creel clerks also obtained socioeconomic information from the angler(s), including age, state and county of

residence, sex, ethnic background, marital status, number of individuals within household, trip information, and expenditures.

All survey data collected was stored in Microsoft Access and SAS datasets on the NCDMF Washington Regional Office server. In addition, NCDMF worked with the North Carolina Wildlife Resource Commission (NCWRC) to launch a program that would allow NCDMF to utilize NCWRC's Portal Access to Wildlife System (PAWS) website. This will provide a single point of access to all CSMA creel survey applications including site register maintenance, sampling schedules, data entry and storage, and report generation. PAWS will be available to all NCWRC and NCDMF staff (including any contractors and temporary employees) via the Internet regardless of their physical location.

RESULTS

During the reporting period from July 1, 2011 through June 30, 2012, NCDMF project staff conducted 825 recreational access site survey assignments resulting in 4,396 intercepts, including 2,444 with fishing activity (56%). Summaries of assignments worked and angler intercepts obtained by month and river system are shown in Table 1.1 and Table 1.2. A noticeable reduction in intercepts occurred during the first few weeks in September 2011 following the North Carolina landfall of Hurricane Irene on August 28, 2011.

Twenty species or species groupings (including "fishing for anything") were indicated as primary fishing targets by anglers intercepted during this reporting period. Although target species for fishing trips varied across rivers and areas within each river, striped bass was the most often targeted species (26.6%). Trips without a specific target species followed, while spotted seatrout, American shad, largemouth bass, and hickory shad rounded out the top five targeted species (Table 1.3). Striped bass was clearly the dominant target species in the Lower Tar/Upper Pamlico rivers and lower Neuse River while spotted seatrout was most dominant in the Pungo River. Shad were most often targeted in the upper reaches of the Tar and Neuse rivers as well as the middle reach of the Neuse River.

Angler reported (discards) and sampler observed (harvest) catches included 34 species, with the most abundant including striped bass (19.4%), sunfishes (18.4%), spotted seatrout (17.9%), hickory shad (9.5%) and largemouth bass (7.6%). Sunfishes, flounders, and catfishes were grouped by genus (Table 1.4). A total of 226 striped bass were measured and averaged 20.7 inches total length and 3.8 pounds (Table 1.5).

An estimated 116,135 angler trips occurred in the CSMA throughout the report period; 18,541 of these trips targeted striped bass (Table 1.6). Total striped bass fishing effort was estimated to be 73,242 angling hours. The total estimated striped bass catch was 37,807 fish, including 4,331 harvested fish and 33,476 discarded fish. The estimated weight of the harvest was 16,361 pounds. Discards included an estimated 205 over-creel fish, 5,992 legal sized, 24,081 sub-legal sized fish and 3,198 fish within the prohibited slot (Table 1.6 and 1.7). The Lower Tar/Upper Pamlico and Lower Neuse rivers contributed 82% of the total striped bass harvested by weight and number and 91% of all discarded striped bass (Table 1.7).

Demographic information collected from CSMA anglers indicated the average age of anglers was 46 years. Anglers were mostly males, and accounted for over 95% of all interviews. Over 90% of anglers were Caucasian, with African Americans, Native Americans, Asian/Pacific Islanders, and Hispanics accounting for the remainder of observations (Table 1.8). Most anglers were married (69%).

Anglers residing from 51 counties traveled to the CSMA during the reporting period. However, six counties account for over half of the total angling effort with Pitt (19%), Beaufort (14%), and Craven (13%) accounting for 46% of the angling effort within the CSMA and Wake, Edgecombe, and Johnson accounting for an additional 16% (Table 1.9). Anglers traveled an average of 27 miles (Table 1.10). These numbers were slightly higher on weekends. Total mean expenditures provided a trip cost of \$25.91. This included an average \$7.16 spent on food, \$0.73 spent on ice, \$2.43 spent on bait, and \$15.59 spent on boat fuel and oil (Table 1.10).

CONSIDERATIONS

Recreational saltwater fisheries in North Carolina have an estimated economic value of \$1.6 billion and must be considered in the development of any FMP. The collection of recreational fisheries statistics is a primary function of the NCDMF. North Carolina has long participated in the Marine Recreational Fisheries Statistics Survey (MRFSS) to obtain estimates of recreational fishing effort and catch and has been integrally involved in implementing its replacement, the Marine Recreational Information Program (MRIP). The MRIP is a national survey program that gathers recreational fisheries information sufficient for use in management at regional levels (Northeast, Mid-Atlantic, South Atlantic, etc.). The MRIP is not intended to provide state-level estimates of catch and participation and provides little to no information on fisheries such as flounder gigging, recreational shellfishing and crabbing, or upper estuarine fisheries for anadromous species (striped bass, American shad, hickory shad). The Coastal Angler Program (CAP) provides comprehensive recreational fisheries data for the FMP process for all managed species.

Species such as American shad, hickory shad, and striped bass caught in the upper estuarine waters are not covered through the MRIP or the coastal angling survey. In the past, surveys were conducted for anadromous species using funds from separate non-secure, short-term grants from ASMFC and Wallop-Breaux. The successful funding of anadromous work within North Carolina by these grant agencies is not predictable and jeopardizes the ability to maintain a long-term data series. The importance of having a long-term, uncompromised time series for these species is crucial for fisheries management.

DEVIATIONS

The reporting period for this study is from July 1, 2011 through June 30, 2012. After June 30, 2012, this study was funded under the Coastal Recreational Fishing License Coastal Angling Program (CAP) as part of the NCDMF Five Year Plan for Obligated Funds from the Marine Resources Fund.

LITERATURE CITED

Pollock, K.H., C.M. Jones, and T.L. Brown. 1994. Angler surveys and their application to fisheries management. American Fisheries Society Special Publication 25. Bethesda, MD.

Table 1.1 Number of Central Southern Management Area recreational access site survey assignments conducted for the period, July 1, 2011 through June 30, 2012.

River/Area	2011						2012						Total
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Upper Neuse	-	-	-	-	-	-	-	9	18	17	12	-	56
Middle Neuse	-	-	-	-	-	-	17	16	19	17	12	-	81
Lower Neuse	16	14	15	20	15	17	19	14	19	17	17	18	201
Upper Tar	-	-	-	-	-	-	17	16	19	17	12	-	81
Lower Tar/Upper Pamlico	19	14	16	18	17	17	16	16	17	18	17	17	202
Pungo	18	16	17	18	16	18	17	17	16	16	18	17	204
Total	53	44	48	56	48	52	86	88	108	102	88	52	825

Table 1.2 Number of Central Southern Management Area recreational access site survey assignment angler intercepts obtained during the period, July 1, 2011 through June 30, 2012.

River/Area	2011						2012						Total
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Upper Neuse	-	-	-	-	-	-	-	22	124	86	47	-	279
Middle Neuse	-	-	-	-	-	-	13	53	114	61	17	-	258
Lower Neuse	18	31	20	63	86	78	89	75	91	88	44	75	758
Upper Tar	-	-	-	-	-	-	4	42	103	55	7	-	211
Lower Tar/ Upper Pamlico	24	37	2	26	78	49	80	55	87	90	38	30	596
Pungo	47	31	24	52	37	31	17	11	14	19	20	39	342
Total	89	99	46	141	201	158	203	258	533	399	173	144	2,444

Table 1.3 Primary target species (shown as percentages) by river/area indicated during Central Southern Management Area recreational access site survey assignment angler interviews conduct during the period July 1, 2011 through June 30, 2012.

Common Name	Upper Neuse	Middle Neuse	Lower Neuse	Upper Tar	Lower Tar		Total
					/Upper Pamlico	Pungo	
Striped bass	2.2	0.8	30.2	18.8	54.1	18.7	26.6
Anything	23.7	5.1	14.9	8.6	9.8	11.0	12.6
Spotted seatrout	-	-	19.8	0.0	4.3	50.7	12.2
Shad (misc)	29.6	-	1.9	60.4	1.2	-	10.4
Largemouth bass	4.4	4.3	12.3	1.0	15.6	0.5	8.8
Hickory shad	3.3	52.7	1.6	1.5	1.2	-	7.8
Sunfishes	10.0	13.7	9.3	1.0	5.5	1.0	7.4
Catfishes	25.2	19.9	3.5	0.5	1.8	-	7.3
Black crappie	0.4	2.3	2.2	1.0	3.5	-	2.0
White perch	-	-	0.6	-	1.4	9.1	1.4
American shad	0.4	-	2.0	7.1	-	-	1.3
Flounders	-	-	1.1	-	1.0	7.7	1.3
Red drum	-	-	0.6	-	0.4	-	0.3
Bowfin	-	1.2	-	-	-	-	0.1
Gizzard shad	0.7	-	-	-	-	-	0.1
Atlantic croaker	-	-	-	-	-	0.5	<0.1
Black drum	-	-	-	-	-	0.5	<0.1
Stingrays	-	-	-	-	-	0.5	<0.1
Striped mullet	-	-	-	-	0.2	-	<0.1
Yellow perch	-	-	-	-	0.2	-	<0.1

Table 1.4 Reported and observed catches by species and disposition from Central Southern Management Area recreational access site survey assignment angler intercepts conducted July 1, 2011 through June 30, 2012.

Common name	Scientific name	Kept (n)	Discards (n)				Total	Total catch (n)	Percent (%)
			Legal size	Under size	Over bag	In slot			
Striped bass	<i>Morone saxatilis</i>	308	391	1,617	25	219	2,252	2,341	19.4
Sunfishes	Centrarchidae	728	1,452	15	22	0	1,489	2,217	18.4
Spotted seatrout	<i>Cynoscion nebulosus</i>	210	74	1,847	29	0	1,950	2,160	17.9
Hickory shad	<i>Alosa mediocris</i>	270	857	0	20	0	877	1,147	9.5
Largemouth bass	<i>Micropterus salmoides</i>	16	368	498	35	0	901	917	7.6
Flounders	<i>Paralichthys spp.</i>	107	7	574	11	0	592	699	5.8
White perch	<i>Morone americana</i>	398	213	3	0	0	216	614	5.1
Catfishes	Ictaluridae	90	328	0	0	0	328	418	3.5
American shad	<i>Alosa sapidissima</i>	62	247	0	0	0	247	309	2.6
Black crappie	<i>Pomoxis nigromaculatus</i>	68	162	34	0	0	196	264	2.2
Pinfish	<i>Lagodon rhomboides</i>	4	142	0	0	0	142	146	1.2
Red drum	<i>Sciaenops ocellatus</i>	6	3	103	2	0	108	114	0.9
Striped mullet	<i>Mugil cephalus</i>	50	51	0	0	0	51	101	0.8
Threadfin shad	<i>Dorosoma petenense</i>	45	35	0	0	0	35	80	0.7
Atlantic croaker	<i>Micropogonias undulatus</i>	10	67	0	0	0	67	77	0.6
Spot	<i>Leiostomus xanthurus</i>	20	52	0	0	0	52	72	0.6
Bowfin	<i>Amia calva</i>	2	69	0	0	0	69	71	0.6
Black drum	<i>Pogonias cromis</i>	40	23	0	0	0	23	63	0.5
Gizzard shad	<i>Dorosoma cepedianum</i>	28	19	0	0	0	19	47	0.4
Shad sp.	<i>Alosa spp.</i>	11	34	2	0	0	36	47	0.4
Longnose gar	<i>Lepisosteus osseus</i>	0	43	0	0	0	43	43	0.4
Mullet sp.	<i>Mugil spp.</i>	0	34	0	0	0	34	34	0.3
Spanish mackerel	<i>Scomberomorus maculatus</i>	23	0	4	0	0	4	27	0.2
Chain Pickerel	<i>Esox niger</i>	1	15	0	0	0	15	16	0.1
Hybrid striped bass	<i>M. saxatilis x chrysops</i>	10	0	1	0	0	1	11	<0.1

Common name	Scientific name	Kept (n)	Discards (n)					Total catch (n)	Percent (%)
			Legal size	Under size	Over bag	In slot	Total		
Yellow perch	<i>Perca flavescens</i>	6	2	0	0	0	2	8	<0.1
Bluefish	<i>Pomatomus saltatrix</i>	2	5	0	0	0	5	7	<0.1
American eel	<i>Anguilla rostrata</i>	0	6	0	0	0	6	6	<0.1
Clearnose skate	<i>Raja eglanteria</i>	2	4	0	0	0	4	6	<0.1
Golden shiner	<i>Notemigonus crysoleucas</i>	1	1	0	0	0	1	2	<0.1
Sheepshead	<i>Archosargus probatocephalus</i>	1	1	0	0	0	1	2	<0.1
Common carp	<i>Cyprinus carpio</i>	1	0	0	0	0	0	1	<0.1
Stingrays	Dasyatidae	0	1	0	0	0	1	1	<0.1
Tarpon	<i>Megalops atlanticus</i>	0	1	0	0	0	1	1	<0.1
Total		2,520	4,707	4,698	144	219	9,768	12,069	100

Table 1.5 Measures of central tendency for lengths and weights of striped bass observed in the Central Southern Management Area recreational access site survey during the period July 1, 2011 through June 30, 2012.

River/Area	Total length* (inches)				Weight (pounds)			
	Number	Minimum	Maximum	Average	Number	Minimum	Maximum	Average
Upper Neuse	4	19.11	27.33	23.2	4	2.65	9.04	5.65
Middle Neuse	3	18.79	24.47	21.03	3	2.87	5.51	3.86
Lower Neuse	90	17.62	28.01	20.43	89	2.09	9.92	3.66
Upper Tar	14	18.1	21.37	20.24	14	2.87	5.07	3.76
Lower Tar/Upper Pamlico	86	17.62	27.29	20.46	86	2.43	9.7	3.91
Pungo	29	18.83	27.24	21.73	29	2.43	7.05	3.6
Total	226	17.62	28.01	20.66	225	2.09	9.92	3.79

* Lengths are obtained as center-line lengths (CLL, mm), total lengths were obtained using the conversion $TL = \exp(0.12138 + 0.98645 \times \log(CLL, mm))$.

Table 1.6 Estimates of overall angling effort and striped bass effort, harvest, and discards for the CSMA for period July 1, 2011 through June 30, 2012.

Month	All effort		Striped bass effort		Striped bass harvest		Striped bass discards (n)				
	Trips	Hours	Trips	Hours	Number	Pound	Over creel	Under size	Legal size	In slot	Total
Jul	3,022	15,043	177	683	0	0	0	542	550	103	1,195
Aug	3,432	13,874	100	356	0	0	0	336	312	57	705
Sep	951	3,915	226	554	0	0	0	20	1,025	0	1,045
Oct	2,071	7,113	905	3,696	182	366	0	1,288	168	24	1,480
Nov	5,547	21,895	3,330	13,356	761	2,543	9	6,720	278	178	7,185
Dec	4,011	17,855	1,929	8,295	843	3,325	0	3,038	268	434	3,740
Jan	6,441	23,230	3,619	14,116	1,116	4,458	7	3,034	404	720	4,165
Feb	12,982	34,835	2,348	7,465	490	1,953	189	2,794	670	298	3,951
Mar	21,275	53,606	2,377	8,876	385	1,523	0	999	556	483	2,038
Apr	16,856	52,232	2,570	12,532	463	1,824	0	1,598	112	849	2,559
May	32,262	25,943	764	2,488	37	148	0	2,730	1,241	52	4,023
Jun	7,285	31,501	196	825	54	221	0	982	408	0	1,390
Total	116,135	301,042	18,541	73,242	4,331	16,361	205	24,081	5,992	3,198	33,476
PSE	20.3	6.7	11.4	12.3	17.1	17.1	92.4	13.8	25.4	22	11.2

Table 1.7 Estimates of overall angling effort and striped bass effort, harvest, and discards for the Central Southern Management Area recreational access site survey by river/area for period July 1, 2011 through June 30, 2012.

River/Area	All effort		Striped bass effort		Striped bass harvest		Striped bass discards (n)				
	Trips	Hours	Trips	Hours	Number	Pound	Over creel	Under size	Legal size	In slot	Total
Upper Neuse	11,880	22,534	539	2,371	130	520	0	0	32	96	128
Middle Neuse	10,309	27,062	137	498	51	206	0	17	51	0	68
Lower Neuse	35,652	118,380	6,700	27,503	1,683	6,325	196	11,091	1,546	584	13,417
Upper Tar	7,330	21,825	1,719	6,758	208	783	0	129	43	834	1,006
Lower Tar/ Upper Pamlico	45,270	84,628	8,816	33,219	1,848	7,072	9	11,235	4,233	1,576	17,053
Pungo	5,695	26,613	630	2,892	410	1,455	0	1,609	87	108	1,804
Total	116,136	301,042	18,541	73,241	4,330	16,361	205	24,081	5,992	3,198	33,476
PSE	20.3	6.7	11.4	12.3	17.1	17.1	92.4	13.8	25.4	22	11.2

Table 1.8 Demographics of anglers by river/area interviewed within the Central Southern Management Area recreational access site survey during the period, July 1, 2011 through June 30, 2012.

Demographic	Level	Upper Neuse	Middle Neuse	Lower Neuse	Upper Tar	Lower Tar/ Upper Pamlico	Pungo	CSMA
Age	Average	37	40	47	46	47	51	46
Gender	Male	91.4%	94.4%	95.6%	99.0%	98.1%	94.0%	95.7%
	Female	7.4%	5.2%	4.4%	-	0.8%	5.7%	3.7%
	Unspecified	1.2%	0.4%	-	1.0%	1.2%	0.3%	0.6%
Race	Hispanic/Latino	8.7%	3.2%	0.3%	1.5%	-	1.2%	1.7%
	Caucasian	71.5%	88.1%	94.3%	88.8%	96.4%	89.2%	90.2%
	African-American	18.6%	8.3%	4.8%	8.7%	3.3%	9.3%	7.5%
	Asian-Pacific Islander	1.2%	-	0.5%	0.5%	0.2%	0.0%	0.4%
	Native American	0.0%	0.4%	0.0%	0.0%	0.2%	0.0%	0.1%
	Unspecified	0.0%	0.0%	0.0%	0.5%	0.0%	0.3%	0.1%
	Marital Status	Currently married	48.8%	52.4%	72.5%	67.0%	76.4%	79.7%	69.0%
	Divorced	7.9%	7.9%	10.9%	8.7%	7.7%	7.6%	8.7%
	Widowed	0.8%	1.6%	2.0%	1.5%	1.0%	3.3%	1.7%
	Separated	0.8%	2.4%	0.3%	1.5%	1.3%	0.6%	1.0%
	Never-married	40.5%	35.3%	14.2%	19.9%	13.6%	8.8%	19.2%
	Unspecified	1.2%	0.4%	0.2%	1.5%	0.0%	0.0%	0.4%

Table 1.9 Observed North Carolina striped bass angler residency by county and river fished, July 1, 2011 through June 30, 2012 (Upper Neuse =NR1, Middle Neuse=NR2, Lower Neuse=NR3, Upper Tar=TP1, Lower Tar/Pamlico=TP2, Pungo=TP3).

County	NR1	NR2	NR3	TP1	TP2	TP3	All	County	NR1	NR2	NR3	TP1	TP2	TP3	All
Alamance	0.4	-	-	-	-	-	0.1	Harnett	1.7	0.4	-	-	0.6	0.3	0.4
Beaufort	-	0.8	0.2	-	25.5	50.6	14.0	Hyde	-	-	-	-	-	0.3	0.1
Bertie	-	-	-	-	0.2	0.6	0.1	Johnston	29.3	2.0	1.3	0.5	1.3	1.2	4.4
Bladen	-	-	0.3	-	-	-	0.1	Jones	-	0.8	4.9	-	0.2	0.6	1.6
Brunswick	-	-	0.2	-	-	-	0.1	Lee	-	-	-	-	0.2	0.3	0.1
Cabarrus	-	-	0.5	-	-	-	0.1	Lenoir	0.8	27.3	8.7	-	1.5	-	6.1
Caldwell	-	-	-	-	-	0.3	0.1	Martin	-	-	-	-	3.3	3.9	1.4
Carteret	-	1.6	3.1	-	0.4	-	1.2	Mecklenburg	-	-	0.2	-	-	-	0.1
Catawba	-	-	-	-	-	0.3	0.1	Nash	-	0.4	0.2	27.9	1.0	3.9	3.6
Chatham	-	1.6	-	-	-	-	0.2	New Hanover	-	-	0.5	-	-	-	0.1
Chowan	-	-	-	-	0.2	0.9	0.2	Northampton	-	-	-	-	0.2	-	0.1
Columbus	-	-	0.2	-	-	-	0.1	Onslow	-	0.8	11.3	-	-	-	3.3
Craven	-	9.2	42.1	-	0.8	0.6	13.3	Orange	-	-	-	0.5	-	-	0.1
Cumberland	-	1.6	0.3	-	0.2	-	0.3	Pamlico	-	-	10.0	-	-	-	2.9
Currituck	-	-	0.2	-	-	-	0.1	Pender	-	-	0.8	-	-	-	0.2
Dare	-	-	-	0.5	0.2	0.3	0.1	Perquimans	-	-	-	-	-	0.3	0.1
Davidson	-	0.4	-	0.5	-	-	0.1	Pitt	-	18.5	4.2	17.7	49.1	15.4	19.2
Duplin	0.4	2.8	1.6	-	0.2	-	0.9	Robeson	0.4	-	-	-	-	-	0.1
Durham	-	-	0.2	-	0.2	-	0.1	Sampson	1.2	-	-	-	-	-	0.1
Edgecombe	-	-	0.3	43.1	5.2	7.5	6.6	Surry	-	-	-	-	-	0.6	0.1
Forsyth	-	-	-	-	-	0.3	0.1	Union	-	-	0.2	-	0.2	-	0.1
Franklin	1.2	-	0.2	-	-	0.6	0.3	Wake	27.3	0.4	1.3	5.4	1.0	3.0	4.7
Greene	-	18.5	1.8	1.0	4.2	1.5	4.0	Warren	-	-	-	0.5	-	-	0.1
Guilford	-	0.4	-	-	0.2	-	0.1	Washington	-	-	-	-	0.2	1.2	0.2
Halifax	-	-	-	0.5	-	-	0.1	Wayne	36.8	12.1	4.9	-	1.0	1.8	7.4
								Wilson	0.4	0.4	0.7	2.0	2.9	3.6	1.7

Table 1.10 Angler costs by river/area within the Central Southern Management Area recreational access site survey during the period, July 1, 2011 through June 30, 2012.

Item	Upper Neuse	Middle Neuse	Lower Neuse	Upper Tar	Lower Tar/ Upper Pamlico	Pungo	CSMA
Trip bait	\$1.94	\$3.57	\$2.56	\$0.71	\$2.05	\$4.31	\$2.43
Trip food	\$3.55	\$5.03	\$9.81	\$0.00	\$8.15	\$13.10	\$7.16
Trip fuel*	\$5.93	\$12.78	\$16.91	\$3.70	\$14.31	\$23.92	\$15.59
Trip ice	\$0.21	\$0.75	\$0.91	\$0.07	\$0.80	\$1.69	\$0.73
Trip miles	11.47	19.67	29.07	14.39	24.50	52.40	27.04

* Private boat fishing mode

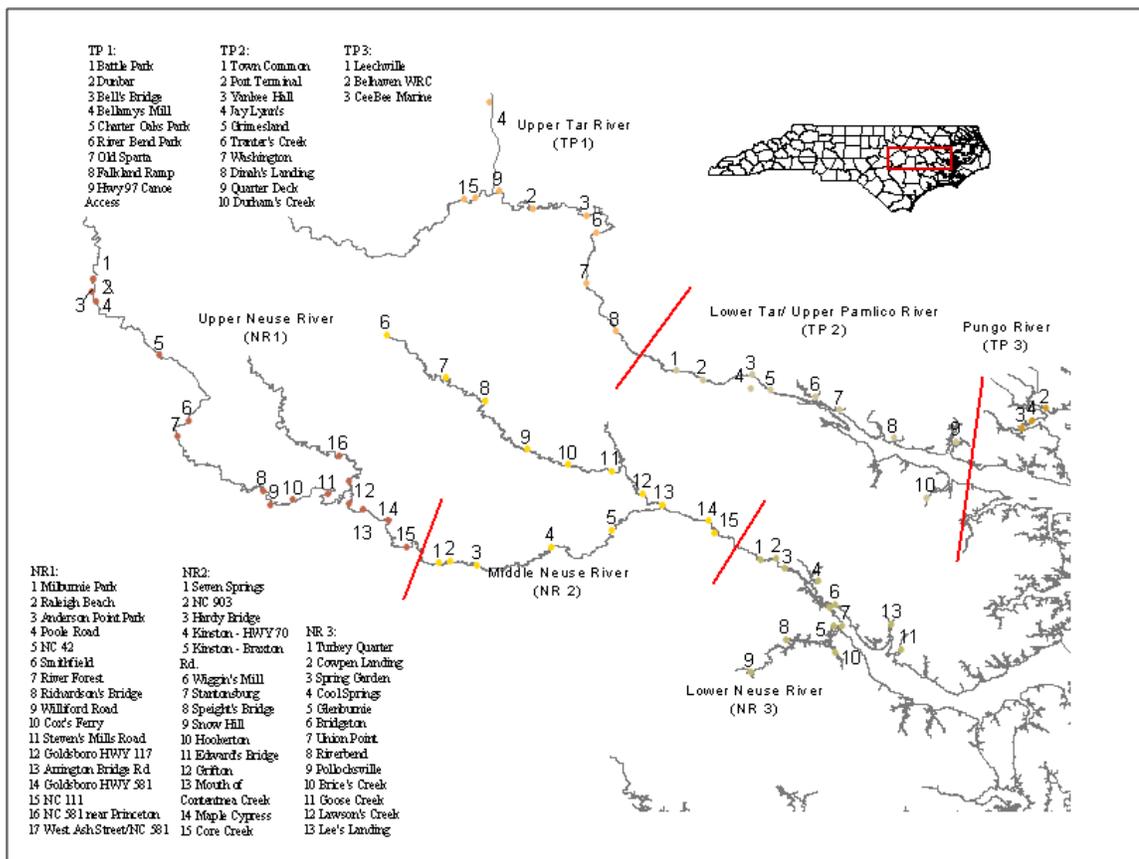


Figure 1.1 Areas sampled within the Central Southern Management Area recreational access site survey, July 1, 2011 through June 30, 2012.

**2. IMPROVING ESTIMATES OF STRIPED BASS DISCARDS IN THE CENTRAL
SOUTHERN MANAGEMENT AREA (CSMA) THROUGH AN EXPANDED OBSERVER
PROGRAM**

North Carolina Division of Marine Fisheries
Final Report
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Job 2

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ABSTRACT

The primary objectives of the study were to expand observer coverage for the commercial gill net fishery in the Neuse and Pamlico rivers, collect effort, catch, and bycatch data for striped bass, other recreationally important species, and protected species and to characterize striped bass discards in the estuarine large mesh gill net fishery. From January 2011 through June 2013, 183 observer trips were completed in the Bay, Neuse and Pamlico rivers. Atlantic menhaden and striped mullet were the most commonly observed species. Other recreationally important species observed included American shad, hickory shad, Atlantic croaker, black drum, bluefish, red drum, sheepshead, southern flounder, southern kingfish, spot, spotted seatrout, summer flounder, and weakfish. A total of 137 striped bass were observed, the majority of which were captured during the open season, were of legal size, and alive. Annual estimates of striped bass discards in the large (≥ 5 -inch stretch mesh) and small mesh (< 5 -inch stretch mesh) gill net fisheries combined ranged from 149 to 1,127 individuals (assuming 100% discard mortality). Because of difficulty securing observer trips and to address another research need, Program 462 (Estuarine Gill Net Selectivity) was reinitiated to evaluate the tie-down and distance from shore measures adopted in the 2004 Estuarine Striped Bass FMP and implemented in 2008. A total of 345 striped bass were captured in 207 gill net sets made in the Neuse and Pamlico rivers from December 2011 through May 2013. There was no significant difference between the number of striped bass captured during open and closed seasons in this survey. With only 35 total striped bass discards observed, the overall number of striped bass discards in the Neuse and Pamlico rivers seems to be relatively low with a high number of live releases. Due to the persistence of striped bass in nearshore waters and the comparatively low number of discarded striped bass observed in commercial gill nets, it appears as though the distance from shore and tie-down requirements enacted in 2008 have been successful in reducing the number of striped bass discards in the commercial gill net fishery in the Pamlico and Neuse rivers. Overall, this study indicates approximately an 82% reduction in striped bass discards from previous levels estimated in Amendment 1 to the Estuarine Striped Bass FMP. This study indicates discard mortality from the commercial estuarine gill net fishery makes up a smaller portion of the total mortality experienced by striped bass in these systems than previously thought.

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INTRODUCTION

The 2004 Estuarine Striped Bass Fishery Management Plan (FMP) was approved by the North Carolina Marine Fisheries Commission (NCMFC) in May 2004 and by the North Carolina Wildlife Resource Commission (NCWRC) in July 2004. The FMP specified a number of management actions but also allowed for additional data collection in the Central Southern Management Area (CSMA) prior to determining measures to deal with reducing mortality in the recreational fishery (reduced season and creel limit) and discards in the commercial gill net fishery (specifically gill nets >5 in. stretch mesh; NCDMF 2004). In May 2008 (Proclamation M-9-2008), the North Carolina Division of Marine Fisheries (NCDMF) implemented measures to reduce the level of commercial discards by the following actions:

“Require the use of a 3 foot tie down in large mesh (>5 in. stretch mesh) gill nets in the Pamlico, Pungo, and Neuse rivers, maintain a minimum distance from shore of 50 yards for these nets, except RCGL large mesh nets may be set within 50 yards of shore if attended at all times. Restrictions would be in place after the commercial 25,000 pound harvest is met (spring) through 31 December of each year.”

The commercial discard estimate, compiled prior to implementing the above gill net restrictions, accounted for ~67% of total striped bass (*Morone saxatilis*) removals. To determine the effectiveness of the chosen management strategy it is necessary to evaluate the actual outcomes in the commercial fishery. The level of discard reduction is best obtained by comparing actual commercial gill net catch rates pre and post July 2008. The NCDMF onboard observer program is the best method to acquire this data.

In May 2010, NCDMF implemented statewide measures (see Proclamation M-8-2010 in Appendix A) to reduce the number of sea turtle interactions in the gill net fishery for gill nets ≥ 4 in. stretch mesh. These new regulations are likely to impact harvest and discard numbers due to limited soak times, a reduction to four fishing days, and the low profile of allowed nets. This project will track the effects of these regulations on catch, bycatch, and discards in the CSMA gill net fishery.

In preparation of striped bass and other FMPs (e.g., red drum, southern flounder, spotted sea trout, striped mullet, river herring, and kingfish) the lack of comprehensive bycatch data is noted and identified as an important research need. If all sources of removal are not accounted for, the recommended management strategies for each stock are jeopardized. The NCDMF has a gear development and observer program to address this need. This program has been funded by multiple entities since 2004 including state appropriations and license receipts, the U.S. Fish and Wildlife Service, and the Atlantic Coastal Cooperative Statistics Program (ACCSP). Funding for this program has been received on an annual basis since 2004, but data collections are often not comprehensive temporally or spatially throughout the state. Maintaining consistent and adequate observer coverage in the CSMA river systems is essential to determine current levels of striped bass discards for these systems.

OBJECTIVES

- 1) Expand existing observer coverage into the Pamlico and Neuse river systems
- 2) Collect effort, catch, and bycatch data for striped bass from the estuarine gill net fishery
- 3) Characterize discards of striped bass from the estuarine gill net fishery

- 4) Collect effort, catch, and bycatch data for other recreationally important species (e.g., red drum, southern flounder, spotted seatrout, American shad, striped mullet)
- 5) Collect effort, catch, and bycatch data for protected species (e.g., Atlantic sturgeon and sea turtles)

METHODS

Observer Trips (Program 466)

Beginning in July 2011, two temporary observers were hired and trained as specified under NCDMF gill net observer data collection protocols. National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries – Beaufort Lab) staff provided training on sea turtle identification, handling, and tagging protocols. Field data collections began on September 9, 2011 in the Neuse River and September 27, 2011 in the Pamlico River. Observers were provided a contact list of all licensed gill net fishermen using gill nets >5 in. stretch mesh by area from NCDMF Trip Ticket and license data. Observers were responsible for contacting and establishing weekly trips with fishermen under direction of a district supervisor. Observer sampling effort was weighted by river and month, based on trip ticket data from 2005-2009, to ensure observer coverage was proportionally applied to fishing effort. Observer trips and coverage were updated with 2010 effort data to effectively reflect any changes in effort caused by Proclamation M-8-2010. Each week, observers were debriefed and all coded data were turned into NCDMF for entry into the biological database.

Data collected on each trip included: enumerating, measuring, weighing, and recording disposition (kept, unmarketable discard, regulatory discard) of all target and bycatch species; and recording date, time, location (GPS coordinates), and gear characteristics (e.g., effort (yards * soak hours), net height, hanging ratio, twine size, mesh size) of all sets and retrievals. Protected species were measured, tagged, and released and/or brought in for post-mortem examination. When possible, individual lengths were taken for target species.

The total number of commercial gill net trips in the CSMA for the time period covered in this grant was obtained from the Trip Ticket Program (TTP). Each time fish are sold to a licensed seafood dealer in North Carolina, a trip ticket must be completed. Information provided on each ticket includes: the weight in pounds for each species sold, the gear type used (i.e., trawl, gill net, pound net, etc.), and the primary area fished. Total yards of gill net fished and mesh size are not recorded on trip tickets. While the total number of gill net fishing trips was easily obtainable, assumptions were required to determine the mesh size used on each trip. The method selected for assigning mesh size to a trip mirrored those used for the analysis of red drum gill net discards (NCDMF 2008) and methods used in the 2004 striped bass FMP. North Carolina has many commercially valuable species that are targeted by gill nets throughout the year with no single size gill net (i.e., mesh size) being ideal for all species. This results in the use of specific mesh size gill nets depending on the target species. While multiple species are most often landed for a single trip, a target species most often represents the majority of the catch. Identification of target species can be used to characterize specific estuarine gill net fisheries. Using observer and trip ticket data, the species of highest abundance in landings was considered the target species and used to define the trip as large mesh (≥ 5 inch) or small mesh (< 5 inch). Target species used to distinguish large mesh gill nets were American shad, catfish, black drum, carp, gizzard shad, hickory shad, longnose gar, red drum, sheepshead, flounder and striped bass. Target species used to distinguish small mesh gill nets were Atlantic croaker,

Atlantic menhaden, bluefish, pinfish, river herring, southern kingfish, spot, spotted seatrout, weakfish, and white perch.

Net yardage was calculated using observer data and trip ticket data. The total number of gill net yards observed was divided by the number of observer trips to calculate an average yardage per trip in a season. The average yardage observed was then multiplied by the total number of gill net trips in a season to estimate the total yardage of net fished. Because all analysis was conducted in the CSMA, regional differences in the amount of gill net fished per trip is unlikely to bias estimates. In addition, calculating yardage estimates seasonally should account for differences in gill net yardage fished throughout the year.

Data was grouped and mortality estimates were calculated by season based on two different time frames. The first time frame was seasonal and included; winter (December, January, and February), spring (March, April, and May), summer (June, July, and August), and fall (September, October, and November). The other time frame was based on whether the striped bass commercial fishery was open (months of March and April) or closed.

Using observer data, the total number of striped bass that were discarded, both live and dead, were summed by time frame. Catch-per-unit-effort of dead discards was calculated by dividing the number of dead discards by the number of observed trips or amount of observed net yardage in a time frame (winter, spring, summer, fall; open, closed). Number of dead discards was expanded by multiplying CPUE by the total number of gill net trips or total yardage fished. These calculations were done for number of fish and pounds of fish. The same procedures were used to calculate numbers and poundage of live releases.

Annual estimates of gill net discard mortality were calculated by summing the total number of live and dead expanded discard estimates from large and small mesh gill nets. It is known that some percentage of striped bass released alive from gill nets will suffer delayed mortality; however, adequate data were not available to estimate a rate so annual discard mortality was calculated assuming both 100% and 50% discard mortality.

Striped Bass Distance from Shore (Program 462)

For a number of reasons, observing the number of trips originally proposed (see Deviations section) was difficult. Because of the shortage of observer trips, NCDMF Program 462 (P462) was reactivated in December 2011 and continued through May 2013. When unable to obtain observer trips, observers funded through this grant assisted existing NCDMF staff with field work and data processing for P462.

Program 462 sampling was conducted in the Upper and Middle Pamlico and Upper and Upper-Middle Neuse River based on striped bass seasonal distribution reflected in Program 915 sampling and to encompass areas where both the tie-down and distance from shore requirements had been in place since 2008. Each area was further divided into a one-minute by one-minute grid system and the first sampling location was randomly chosen from the grids. A gang of nets was set in the grid selected, and one gang was set in each grid on either side, for a total of three gangs. If a suitable area of shoreline was not available in a grid, an adjacent grid, or the opposite shoreline, was used. Each sampling area was sampled once a month, with one area sampled per week on average. The order in which the areas were sampled in a given month was randomly chosen.

Four sink gill nets 50-yards in length consisting of 5 ½ inch stretch mesh (twine size #177, 0.47mm) were deployed parallel to the shore line. Nets were constructed with a hanging ratio of 2:1 with the required 36-inch tie downs located 10 yards apart. The first net was set 20 yards from shore, the second 30 yards, the third 40 yards, and the fourth 50 yards from shore. Nets were set in a staggered pattern, with no overlap. A “control net” consisting of a single 50-yard float net (covering the entire water column) of 5 ½ inch stretch mesh (twine size #104, 0.33mm) was set perpendicular to the shoreline 100 yards upstream of the parallel nets. This net was set with one end at the shoreline and marked with colored braiding at 10-yard intervals. The four parallel nets and one perpendicular net were considered one gang, and three gangs were set in each field trip. Gear was typically deployed within an hour of sunset and fished the following morning to keep all soak times within 14 hours.

The total number of target species, including damaged individuals, was counted by parallel net and by 10-yard net segments in the “control” net. Lengths of undamaged specimens (nearest millimeter FL or TL) and condition (alive and dead) were recorded. An aggregate weight was recorded to the nearest 0.1 kg. Target species (striped bass, flounders, drums, Atlantic croaker, spot, weakfish, and speckled trout) were sorted to species, counted, measured to the nearest mm (FL or TL), weighed as a species group, and condition of the fish was recorded. All other species were discarded. Environmental conditions, temperature (°C), salinity (ppt), dissolved oxygen (ppm), wind direction, and velocity were recorded upon retrieval of the nets on each sampling trip. Water depth was recorded in the center of each parallel net and in each 10-yard segment of the “control” net when the nets were set.

Number of striped bass in each segment of net were enumerated and mean was calculated. A t-test was used to compare differences in the mean number of striped bass caught between open and closed seasons to examine temporal differences in the distribution of striped bass.

Although not directly funded by this grant, the work done was consistent with the overall purpose of the grant which is to allow NCDMF to evaluate the reduction in commercial striped bass discards due to the management measures enacted in May 2008.

RESULTS

Observer Trips (Program 466)

A total of 183 commercial gill net trips were observed from January 2011 through June 2013 (Figure 2.1). In 2011, striped mullet (*Mugil cephalus*) was the most abundant species observed and had the highest harvest number (Table 2.1), while in 2012 and 2013 Atlantic menhaden (*Brevoortia tyrannus*) was the most abundant species observed and had the highest harvest number (Tables 2.2 and 2.3).

Recreationally important species observed included: American shad (*Alosa sapidissima*), hickory shad (*Alosa mediocris*), Atlantic croaker (*Micropogonias undulatus*), black drum (*Pogonias cromis*), bluefish (*Pomatomus saltatrix*), red drum (*Sciaenops ocellatus*), sheepshead (*Archosargus probatocephalus*), southern flounder (*Paralichthys lethostigma*), southern kingfish (*Menticirrhus americanus*), spot (*Leiostomus xanthurus*), spotted seatrout (*Cynoscion nebulosus*), striped bass, striped mullet, summer flounder (*Paralichthys dentatus*), and weakfish (*Cynoscion regalis*) (Tables 2.1-2.3). Of the recreationally important species striped mullet had the highest harvest number in 2011 (Table 2.1) and American shad had the highest harvest number in 2012 and 2013 (Tables 2.2-2.3).

Atlantic menhaden had the highest number of unmarketable discards in every year. In 2011 (Table 2.1) and 2013 (Table 2.3) southern flounder had the highest number of regulatory discards while in 2012 red drum had the highest number of regulatory discards (Table 2.2). A single Atlantic sturgeon in 2011, and two in 2012 were the only protected species observed.

A total of 137 striped bass were observed in commercial gill nets from 2011 to 2013 in the Neuse (N=57), Pamlico (N=57) and Bay (N=23) rivers (Figure 2.3). The number of striped bass harvested was highest in 2013 (N=58) and lowest in 2011 (N=2). The highest number of striped bass regulatory discards was observed in 2012 (N=21) and the lowest number was observed in 2013 (N=3; Tables 2.2-2.3). One striped bass, captured in 2012, was an unmarketable discard (Table 2.2). No striped bass were observed in 88% of Neuse River and 55% of Pamlico River observer trips (Table 2.4).

The striped bass commercial harvest season was open from March 1 to March 25 in 2011, March 1 to March 30 in 2012, and March 1 to April 15 in 2013 (Table 2.5). Disposition of striped bass (alive or dead) that were harvested was not consistently recorded. All of the 46 striped bass that had no recorded disposition were observed when the striped bass commercial harvest season was open (March or April), all were of legal size, and all but one was harvested (one was an unmarketable discard; all 23 striped bass observed in Bay River had no recorded disposition). In the Neuse, Bay, and Pamlico rivers the majority of striped bass were observed in March (N=47) and April (N=59; Figure 2.4), and were of legal size (N=57; Tables 2.6 and 2.7).

The length frequency distribution of observed striped bass regulatory discards ranged from 9 to 24 inches total length with bimodal peaks at 14 and 22 inches. The length frequency distribution of harvested striped bass ranged in size from 18 to 27 inches with a modal peak at 24 inches (Figure 2.5).

In the Neuse River, seven of 39 legal size alive striped bass were observed out of season. Of the seven legal size dead striped bass one was observed out of season. The single sublegal alive striped bass was observed in season. No dead sublegal striped bass were observed (Table 2.6).

In the Pamlico River, two of 17 legal size alive striped bass were observed out of season. Two of the five legal size dead striped bass were observed out of season. Of the 14 sublegal alive striped bass, 13 were observed out of season, and the six dead sublegal striped bass were observed out of season (Table 2.7).

Program 466 provides the only available data to estimate striped bass discards from the commercial large and small mesh gill net fisheries. Data were analyzed from 2011 to 2013. Prior years were not analyzed as they did not encompass expanded observer coverage funded through this grant. The percent coverage for large mesh observer trips varied, ranging from 0.3% coverage in the summer of 2011 to 10.2% coverage in the winter of 2012. In total, 2.4% of large mesh gill net trips in the Neuse and Pamlico rivers were observed from 2011 to 2013 (Table 2.8). The percent coverage for small mesh observer trips varied, ranging from zero coverage in the summer of 2011 to 25% coverage in the spring of 2011. In total, 3.3% of small mesh gill net trips in the Neuse and Pamlico rivers were observed from 2011 to 2013 (Table 2.9).

Only 35 striped bass discards (live and dead) were observed in the small and large mesh gill net fisheries in the Neuse and Pamlico rivers during the study period. When expanded by season (winter, summer, fall, spring) estimates of dead discards from the large mesh gill net fishery ranged from zero to 115 individuals in the fall of 2011. Expanded estimates of live releases from the large mesh gill net fishery ranged from zero to 389 individuals in the fall of 2012 (Table 2.8). Expanded estimates of dead discards from the small mesh gill net fishery ranged from zero to 235 individuals in the fall of 2011. Expanded estimates of live releases from the small mesh gill net fishery ranged from zero to 549 individuals in the fall of 2012 (Table 2.9). Annual estimates of striped bass discard mortality from the large and small mesh gill net fisheries combined varied and were relatively low ranging from 149 to 1,127 fish assuming 100% discard mortality. Assuming 50% discard mortality estimates ranged from 99 to 604 fish (Table 2.10).

The percentage of large mesh gill net observer coverage varied between open and closed seasons. A higher percentage of large mesh gill net trips were observed during the closed season in every year (Table 2.11). The percentage of small mesh gill net observer coverage was consistently higher in the open season compared to the closed season (Table 2.12).

Expanded estimates of dead discards from the large mesh gill net fishery ranged from zero to 128 individuals when the season was closed in 2011. Expanded estimates of live releases from the large mesh gill net fishery ranged from zero to 189 individuals when the season was closed in 2012 (Table 2.11). Expanded estimates of dead discards from the small mesh gill net fishery ranged from zero to 90 individuals when the season was closed in 2011. Expanded estimates of live releases from the small mesh gill net fishery ranged from zero to 1,134 individuals when the season was closed in 2012 (Table 2.12). Annual estimates of striped bass discard mortality from the large and small mesh gill net fisheries combined was variable ranging from 130 to 1,463 fish assuming 100% discard mortality. Assuming 50% discard mortality estimates ranged from 73 to 802 fish (Table 2.13).

In addition to discard estimates based on number of trips, number of discards was estimated based on net length. Because net yardage is not recorded in trip ticket data, total yardage was estimated using mean length of gill nets observed and the total number of reported gill net trips. Based on gill net yardage, seasonally (winter, summer, fall, spring) expanded estimates of dead discards from the large mesh gill net fishery ranged from zero to 115 individuals in the fall of 2011. Expanded estimates of live releases from the large mesh gill net fishery ranged from zero to 389 individuals in the fall of 2012 (Table 2.14). Expanded estimates of dead discards from the small mesh gill net fishery ranged from zero to 235 individuals in the fall of 2011. Expanded estimates of live releases from the small mesh gill net fishery ranged from zero to 549 individuals in the fall of 2012 (Table 2.15). Annual estimates of striped bass discard mortality from the large and small mesh gill net fisheries combined varied and were relatively low ranging from 149 to 1,127 fish assuming 100% discard mortality. Assuming 50% discard mortality estimates ranged from 99 to 604 fish (Table 2.16).

Based on gill net yardage, seasonally (open/closed) expanded estimates of dead discards from the large mesh gill net fishery ranged from zero to 128 individuals when the season was closed in 2011. Expanded estimates of live releases from the large mesh gill net fishery ranged from zero to 480 individuals when the season was closed in 2012 (Table 2.17). Expanded estimates of dead discards from the small mesh gill net fishery ranged from zero to 90 individuals when the season was closed in 2011. Expanded estimates of live releases from the small mesh gill net fishery ranged from zero to 1,134 individuals when the season was closed in 2012 (Table 2.18). Annual estimates of striped bass discard mortality from the large and small mesh gill net

fisheries combined was variable ranging from 142 to 1,754 fish assuming 100% discard mortality. Assuming 50% discard mortality estimates ranged from 80 to 947 fish (Table 2.19).

Note: one observer trip in June 2013, on which no striped bass were observed, was excluded from the discard analysis because it was the only trip that occurred in the summer 2013 time frame covered by this grant (summer=June, July, August and last grant month was June 2013).

Striped Bass Distance from Shore (Program 462)

From December 2011 through May 2013, 54 gill net sets (3 per month) were made in the middle Pamlico, upper Pamlico, upper/middle Neuse, and upper Neuse rivers. Deviations occurred in June 2012 when no sets were made in the middle Pamlico, and September 2012 when no sets were completed in the upper middle Neuse, or upper Neuse (Table 2.20). During this time 138 striped bass were captured at Neuse River sites (69 from the upper/middle Neuse, 69 from the upper Neuse; Table 2.15) and 207 striped bass were captured at Pamlico River sites (71 from middle Pamlico and 136 from upper Pamlico; Table 2.21).

No striped bass were captured in January, March, May, and September 2012 or February and May 2013 in the upper Neuse River. In the upper/middle Neuse River no striped bass were captured in April, June and September 2012 or January and February 2013 (Table 2.21; Figure 2.6). In the Neuse River, the most striped bass (N=14) were captured in November 2012 from the upper/middle Neuse (Table 2.15; Figure 2.6).

No striped bass were captured in January, February, May, June, July, and August 2012 or January and March 2013 in the middle Pamlico River. In the upper Pamlico River no striped bass were captured in February and March 2013. In the Pamlico River, the most striped bass (N=27) were captured in January 2012 from the upper Pamlico River (Table 2.21; Figure 2.6).

In the upper/middle Neuse River the fewest striped bass (N=3) were captured in the section of control net 41 to 50 yards from shore. The most (N=13) were caught in the net set 20 yards from shore (Figure 2.7). Of the striped bass captured in the upper/middle Neuse 35 of 69 were alive and legal size, 33 were legal size and dead, and one was alive and sublegal. The most legal size alive striped bass (N=6) were captured in the section of control net 11 to 20 yards from shore and the fewest (N=2) were captured in the net set 40 yards from shore and the section of control net 0 to 10 yards from shore. The most legal size dead striped bass (N=7) were captured in the net set 20 yards from shore and the fewest (N=0) were captured in the section of control net 41 to 50 yards from shore. The greatest number of legal size alive striped bass (N=13) were captured in November, and the highest number of legal size dead striped bass (N=6) were captured in October. The single sublegal alive striped bass was captured in February in the net set 20 yards from shore. No dead sublegal striped bass were captured (Table 2.22).

In the upper Neuse River, the fewest striped bass (N=4) were captured in the section of control net 11 to 20 yards from shore. The most (N=11) were caught in the net set 50 yards from shore (Figure 2.7). In the upper Neuse River 35 striped bass were legal size and alive, and 34 were legal size and dead. The most legal size alive striped bass (N=9) were captured in the net set 20 yards from shore and the fewest (N=1) were captured in the section of control net 31 to 40 yards from shore. The most legal size dead striped bass (N=7) were captured in the section of control net 41 to 50 yards from shore and the fewest (N=0) were from the section of control net 11 to 20 yards from shore. The greatest number of legal size alive (N=6) and dead (N=8) striped bass were captured in April. No sublegal striped bass were captured (Table 2.23).

In the middle Pamlico River, the fewest striped bass (N=3) were captured in the section of control net 0 to 10 yards from shore. The most (N=10) were captured in the nets set 20, and 30 yards from shore and the section of control net 21 to 30 yards from shore (Figure 2.7). Of the striped bass caught in the middle Pamlico River, 28 were legal size and alive, and 43 were legal size and dead. In the middle Pamlico River, the most legal size alive striped bass (N=5) were captured in the net set 40 yards from shore and the sections of control net 21 to 30 and 41 to 50 yards from shore. The fewest (N=0) were captured in the net set 30 yards from shore. The most legal size dead striped bass (N=10) were captured in the net set 30 yards from shore and the fewest (N=2) were captured in the sections of control net 0 to 10 and 41 to 50 yards from shore. The greatest number of legal size alive striped bass (N=10) were captured in April, and the most that were dead (N=14) were captured in March. No sublegal striped bass were captured (Table 2.24).

In the upper Pamlico River, the fewest striped bass (N=9) were captured in the net set 20 yards from shore. The most (N=22) were caught in the section of control net 31 to 40 yards from shore (Figure 2.7). In the upper Pamlico River 69 striped bass were legal size and alive, 61 were legal size and dead, and 5 were sublegal and alive. The most legal size alive striped bass (N=11) were captured in the section of control net 41 to 50 yards from shore, and the fewest (N=6) were captured in the nets set 20, and 30 yards from shore and the section of control net 0 to 10 yards from shore. The most legal size dead striped bass (N=13) were captured in the section of control net 31 to 40 yards from shore, and the fewest (N=1) were captured in the net set 20 yards from shore. The most sublegal alive striped bass (N=2) were captured in the net set 20 yards from shore and the section of control net 31 to 40 yards from shore. The fewest (N=0) were captured in nets set 30, and 40 yards from shore and the sections of control net 0 to 10, 11 to 20, 21 to 30, and 41 to 50 yards from shore. The greatest number of legal size alive striped bass (N=21) were captured in January, and the most that were dead (N=11) were captured in December. The most sublegal alive striped bass (N=3) were caught in April with single fish caught in May and July. No dead sublegal striped bass were captured (Table 2.25).

There was no significant difference in the number of striped bass captured between open and closed seasons in P462 ($t_{205} = -0.15$, $P = 0.88$; Figure 2.8). There were no noticeable differences in the number of striped bass collected between open and closed seasons by distance from shore. The largest difference was in the parallel net set 20 yards from shore where mean collection number was higher in the open season (Figure 2.9).

Length frequency of striped bass captured in parallel nets ranged from 12 to 38 inches total length with a peak at 22 inches. Length frequency of striped bass captured in control nets ranged from 10 to 26 inches with a peak at 22 inches. Distance from shore, in both parallel and control nets, did not influence size of striped bass captured (Figure 2.10).

In the Pamlico River, length frequency of striped bass in control nets ranged from 10 to 25 inches total length with a peak at 22 inches. Length frequency of striped bass in parallel nets ranged from 13 to 27 inches with a peak at 22 inches, though a high number of 21-inch striped bass were also captured (Figure 2.11). In the Neuse River, length frequency of striped bass in control nets ranged from 19 to 26 inches with a peak at 23 inches, though high numbers of 21 and 22-inch striped bass were also captured. Length frequency of striped bass in parallel nets ranged from 14 to 38 inches with a peak at 22 inches (Figure 2.11).

CONCLUSIONS

Observer coverage was expanded in the Pamlico and Neuse river watersheds from 2011 to 2013 to collect data on effort, catch, and bycatch in the large and small mesh gill net fisheries (Tables 2.26; 2.27). Despite lower than expected observer coverage, observations of striped bass discards are still valuable for discerning trends in the fishery and estimating striped bass discards. Because of the low level of observed discards, expanded estimates were variable but generally low. Low numbers of striped bass observations may indicate an overall low population size, effectiveness of gill net regulations enacted in 2008, seasonal availability, or some combination of each. While estimating the population size of striped bass in the CSMA is beyond the scope of this study, few observations of striped bass out of season compared to in season would seem to indicate vulnerability of striped bass to commercial gill nets in the CSMA is variable, likely due to seasonal availability and effectiveness of regulations enacted in the gill net fishery to reduce interactions with striped bass.

Data collected from P462 indicates striped bass were persistent within the Pamlico and Neuse river systems, within 50 yards of shore, regardless of season. Persistent availability of striped bass within 50 yards of shore, and low numbers of out of season observations on commercial gill net trips indicates that instituting the 50-yard buffer and tie-down measures for large mesh gill nets was likely effective in reducing gill net interactions with striped bass. In addition, length frequency information provided by observer data indicates large mesh gill net catch (harvest and discards) is comprised of predominantly legal sized fish regardless of season.

In Amendment 1 to the Estuarine Striped Bass FMP (NCDMF 2013), dead discards were estimated from limited commercial gill net observer data and NCDMF independent gill net survey data. From 2004 to 2009, dead discard estimates from observer data averaged 4,818 pounds annually (Table 2.28). For the years 2011 and 2012, full calendar years covered in this study, the annual average dead discard estimate was 1,213 pounds (809 striped bass), assuming 100% discard mortality of live releases. This represents approximately a 75% decrease in the estimated average annual discards of striped bass in the commercial gill net fishery in the Pamlico, Pungo, Bay, and Neuse river areas from estimates in Amendment 1. It should be noted the average yardage of gill net fished per trip has also decreased approximately 69% for large mesh and 43% for small mesh gill nets from 2004-2009 to 2011-2012. There has also been a decrease of approximately 41% for large mesh and 56% for small mesh gill net trips from 2004-2009 to 2011-2012 (see Deviations section for more details).

The discard estimates from this study are likely overestimates and would be improved by conducting a post-release mortality study for striped bass caught and released from commercial gill nets. Additionally, it is impossible to definitively determine if the results of this study show an actual decrease in the level of commercial discards (due to gill net regulations, decreased effort, etc.), are the result of improved data used calculate discard levels, or some combination of the two.

The results from this study address concerns in a recent North Carolina Wildlife Resources Commission (NCWRC) report indicating that “cryptic mortality”, primarily from dead discards in the commercial gill net fishery, is a significant source of mortality for striped bass in the Neuse River (Rachels and Ricks 2015). While dead discards in the commercial gill net fishery will continue to be monitored through the NCDMF Observer Program, they do not appear to be as significant as previously thought and other potential sources of mortality identified by Rachels and Ricks (2015), such as unreported landings (both recreational and commercial) and mortality from ghost fishing gear, should be explored. A potential source of unreported harvest is from

Recreational Commercial Gear License (RCGL) holders. From 2002-2008, RCGL harvest in the CSMA averaged 2,620 lbs./yr. (621 striped bass/yr.), this averages to 0.47 lbs./RCGL (average 5,651 licenses per year). For 2011-2012, license numbers averaged 4,933/yr., using the same harvest rate as 2002-2008 (and assuming a relationship between RCGL numbers and striped bass harvest), this would approximate a RCGL harvest of 2,319 lbs./yr. (550 striped bass/yr.). This represents approximately 6% of the average total recreational and commercial landings for 2011-2012. Additionally, high rates of total mortality in stocked fish should also be explored. Based on tag return data Callihan et al. (2014) estimated total mortality of striped bass stocked in the Tar/Pamlico and Neuse river systems to be higher than for striped bass stocked in the Albemarle Sound

Figure 2.12 is a recreation of Figures 11.6.6 and 11.6.7 in Amendment 1 (pages 353-354) and depicts the sources of all fisheries removals (harvest and dead discards in numbers of fish) from the commercial and recreational fisheries for CSMA striped bass. The figures in Amendment 1 show the source of removals in the CSMA by sector but used different calculation methods to estimate commercial discards. Figure 11.6.6 used data from the NCDMF fishery-independent gill net survey as a proxy to estimate commercial discards, where Figure 11.6.7 used the limited data available at the time from the NCDMF Observer Program to estimate commercial discards. Using data collected from this study for 2011-2012, which includes expanded recreational and commercial fishery observations, the recreational fishery accounted for 53% and the commercial fishery accounted for 47% of all documented striped bass removals (by number) in the CSMA. The estimates from this study indicate the estimates in Figure 11.6.6 in Amendment 1 likely over-estimated commercial discards by using fishery-independent data. Further the commercial discard estimates from this study are in line with the estimates in Figure 11.6.7 which used the limited observer data available at the time.

The results of the current study suggest discards from commercial gill net fisheries in the CSMA are likely not a major contributor to total mortality at this time. Recently, two separate studies (Rachels and Ricks 2015; Bradley 2016) have examined population responses of striped bass in the Neuse River to different management scenarios using the higher commercial gill net discard estimates from Figure 11.6.6 in Amendment 1. Since the results of this study have produced considerably lower discard estimates it is reasonable to hypothesize the high total mortality estimates by Rachels and Ricks (2015) and Bradley (2016) may be influenced more by low population abundance, underestimated or unreported harvest, underestimate of natural mortality, underestimated or undocumented source(s) of recreational or commercial discards, or some combination of each rather than commercial gill net discards. These data, as well as data from more recent observer trips and creel surveys, may be used to update the mortality estimates and management advice from these studies and to help better inform future management of striped bass in these systems.

DEVIATIONS

The project initially proposed 208 large mesh gill net observer trips in the CSMA and 6% observer coverage based on the average number of large mesh gill net trips in the CSMA from 2005-2009 (Table 20). There was a delay in sampling until observers were hired and trained. The Neuse River observer's first trip was on September 9, 2011 and the Pamlico River observer's first trip was on September 27, 2011. Due to staff turnover, the observer position on the Pamlico River was vacant from November 23, 2011-January 30, 2012 and then again from June 8, 2012-July 31, 2012. The Neuse River position was vacant from May 29, 2012-July 31, 2012. Due to staff turnover, difficulty obtaining trips, and to avoid duplication of effort, the task

of obtaining observer trips under this grant was turned over to the NCDMF Observer Program in August 2012 through June 2013 for the completion of the observer field work for the grant. A total of 130 large mesh, and 53 small mesh observer trips were made on commercial gill net boats on the Neuse (N=144), Pamlico (N=31), and Bay (N=8) rivers from 2011-2013 (Table 2.26; Figure 2.1).

For a number of reasons, it was extremely difficult to observe the number of trips originally proposed. On August 27, 2011, Hurricane Irene passed through eastern North Carolina. The local fishing industry was hard hit as most fishermen had extensive damage to their boats, gear, and homes. As a result, many fishermen were unable to fish after the Hurricane until repairs were completed.

During the project period observations of small mesh gill net trips were also able to be made. These observations were not part of the original proposal. Observing these trips helped to make the striped discard estimates more complete and provide a more comprehensive estimate of discards in the commercial gill net fishery.

Also occurring since the approval of this grant was a Settlement Agreement with the Karen Beasley Sea Turtle Rescue and Rehabilitation Center requiring statewide observer coverage and restrictions on the commercial gill net fishery that went into effect in May 2010 (grant proposal submitted in July 2010). Restrictions for certain areas of the state included: overnight soak times (12 hours), four-day fishing weeks, 100 yard shots of large mesh gill net with a space of 25 yards between shots, and a 2,000-yard total limit for large mesh gill nets. However, these restrictions were lifted for the Neuse and Pamlico rivers in September 2011 (Proclamation M-27-2011). In 2011, the first full year after the Sea Turtle Settlement Agreement restrictions went into effect, commercial gill net trips in the Pamlico and Neuse river systems dropped 41% compared to 2009 (last full year before restrictions were in place).

In February 2012, the National Marine Fisheries Service issued a ruling officially listing Atlantic Sturgeon as an endangered species effective April 6, 2012. This listing, along with the regulations from the Sea Turtle Settlement Agreement, caused some fishermen to become disenfranchised with NCDMF and cooperation with observer requests decreased. As a result, in April 2012 the NCDMF began enforcing Marine Fisheries Rule 15A NCAC 03I.0113 to include collection of biological data by observers onboard commercial fishing vessels. This essentially meant any refusal to take an observer was in violation of existing rules and subject to penalties. However, even after this action observer trips were still difficult to obtain as many fishermen simply were not active, opting to wait for the fall flounder fishery to begin. In 2013, the NCDMF received the Sea Turtle ITP for the statewide large and small mesh gill net fisheries.

A condition of the Sea Turtle Settlement Agreement was to have a statewide Incidental Take Permit (ITP) from the National Marine Fisheries Service for the large and small mesh gill net fisheries for all species of sea turtles which, incorporated all of the restrictions in the agreement. In September 2013, the NCDMF received the Sea Turtle ITP for the large and small mesh gill net fisheries. The Sea Turtle ITP required 7-10% observer coverage in the large mesh gill net fishery and 1-2% in the small mesh gill net fishery.

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Table 2.1 Total catch and harvest status counts for all species observed in commercial gill nets in the Neuse, Pamlico, and Bay rivers, 2011.

Common name	Scientific name	Total catch	Harvested	Unmarketable	Regulatory discards
Striped mullet	<i>Mugil cephalus</i>	7,172	7,170	2	.
Atlantic menhaden	<i>Brevoortia tyrannus</i>	2,313	166	2,147	.
Southern flounder	<i>Paralichthys lethostigma</i>	642	533	4	105
American shad	<i>Alosa sapidissima</i>	418	418	.	.
Blue crab	<i>Callinectes sapidus</i>	382	25	357	.
Spot	<i>Leiostomus xanthurus</i>	90	86	4	.
Black drum	<i>Pogonias cromis</i>	85	75	10	.
Bluefish	<i>Pomatomus saltatrix</i>	82	73	9	.
Red drum	<i>Sciaenops ocellatus</i>	66	46	5	15
Jellyfish	Cnidaria	62	.	62	.
Cownose ray	<i>Rhinoptera bonasus</i>	33	.	33	.
Atlantic croaker	<i>Micropogonias undulatus</i>	28	26	2	.
Gizzard shad	<i>Dorosoma cepedianum</i>	27	.	27	.
Spotted seatrout	<i>Cynoscion nebulosus</i>	25	20	2	3
Hickory shad	<i>Alosa mediocris</i>	22	20	2	.
White catfish	<i>Ameiurus catus</i>	15	14	1	.
Pinfish	<i>Lagodon rhomboides</i>	14	.	14	.
Striped bass	<i>Morone saxatilis</i>	12	2	.	10
Sheepshead	<i>Archosargus probatocephalus</i>	12	10	2	.
Southern kingfish	<i>Menticirrhus americanus</i>	12	2	10	.
Atlantic stingray	<i>Dasyatis sabina</i>	11	.	11	.
Clearnose skate	<i>Raja eglanteria</i>	10	.	10	.
Channel catfish	<i>Ictalurus punctatus</i>	8	8	.	.
Longnose gar	<i>Lepisosteus osseus</i>	6	.	6	.
Summer flounder	<i>Paralichthys dentatus</i>	5	2	.	3
Weakfish	<i>Cynoscion regalis</i>	3	2	.	1
Double-crested cormorant	<i>Phalacrocorax auritus</i>	3	.	.	3
Southern stingray	<i>Dasyatis americana</i>	2	.	2	.
Smooth butterfly ray	<i>Gymnura micrura</i>	2	.	2	.
Horseshoe crab	<i>Limulus polyphemus</i>	1	.	1	.

Common name	Scientific name	Total catch	Harvested	Unmarketable	Regulatory discards
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>	1	.	.	1
Ladyfish	<i>Elops saurus</i>	1	.	1	.
Oyster toadfish	<i>Opsanus tau</i>	1	.	1	.
Atlantic needlefish	<i>Strongylura marina</i>	1	.	1	.
White perch	<i>Morone americana</i>	1	1	.	.
Atlantic tripletail	<i>Lobotes surinamensis</i>	1	1	.	.
Pigfish	<i>Orthopristis chrysoptera</i>	1	.	1	.
Silver perch	<i>Bairdiella chrysoura</i>	1	1	.	.
Mulletts	<i>Mugil spp.</i>	1	1	.	.
Lesser scaup duck	<i>Aythya affinis</i>	1	.	.	1
Total		11,573	8,702	2,729	142

Table 2.2 Total catch and harvest status counts for all species observed in commercial gill nets in the Neuse, Pamlico, and Bay rivers, 2012.

Common name	Scientific name	Total catch	Harvested	Unmarketable	Regulatory discards
Atlantic menhaden	<i>Brevoortia tyrannus</i>	18,090	9,147	8,943	.
American shad	<i>Alosa sapidissima</i>	952	941	11	.
Jellyfish	Cnidaria	795	.	795	.
Blue crab	<i>Callinectes sapidus</i>	464	24	440	.
Southern flounder	<i>Paralichthys lethostigma</i>	389	255	9	125
Red drum	<i>Sciaenops ocellatus</i>	190	3	.	187
White perch	<i>Morone americana</i>	140	138	2	.
Hickory shad	<i>Alosa mediocris</i>	138	87	41	10
Cownose ray	<i>Rhinoptera bonasus</i>	92	.	92	.
Striped bass	<i>Morone saxatilis</i>	64	42	1	21
Longnose gar	<i>Lepisosteus osseus</i>	60	.	60	.
Striped mullet	<i>Mugil cephalus</i>	53	51	2	.
Smooth butterfly ray	<i>Gymnura micrura</i>	44	.	44	.
Double-crested cormorant	<i>Phalacrocorax auritus</i>	44	.	.	44
Gizzard shad	<i>Dorosoma cepedianum</i>	28	3	25	.
Common loon	<i>Gavia immer</i>	26	.	.	26
Black drum	<i>Pogonias cromis</i>	19	19	.	.
Spotted seatrout	<i>Cynoscion nebulosus</i>	18	15	.	3
Southern stingray	<i>Dasyatis americana</i>	17	.	17	.
White catfish	<i>Ameiurus catus</i>	13	13	.	.
Atlantic stingray	<i>Dasyatis sabina</i>	12	.	12	.
Butterfish	<i>Peprilus triacanthus</i>	12	12	.	.
Lesser scaup duck	<i>Aythya affinis</i>	12	.	.	12
Horseshoe crab	<i>Limulus polyphemus</i>	9	.	9	.
Atlantic croaker	<i>Micropogonias undulatus</i>	9	5	4	.
Common carp	<i>Cyprinus carpio</i>	8	.	8	.
Spot	<i>Leiostomus xanthurus</i>	8	6	2	.
Bluefish	<i>Pomatomus saltatrix</i>	7	5	2	.
Clearnose skate	<i>Raja eglanteria</i>	6	.	6	.
Sheepshead	<i>Archosargus probatocephalus</i>	5	4	1	.

Common name	Scientific name	Total catch	Harvested	Unmarketable	Regulatory discards
Bowfin	<i>Amia calva</i>	4	.	4	.
Yellow perch	<i>Perca flavescens</i>	3	.	3	.
Jelly bomb	<i>Stomolophus meleagris</i>	2	.	2	.
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>	2	.	.	2
River herrings	<i>Alosa spp.</i>	2	.	.	2
Inshore lizardfish	<i>Synodus foetens</i>	2	.	2	.
Surf scoter	<i>Melanitta perspicillata</i>	2	.	.	2
Brown shrimp	<i>Farfantepenaeus aztecus</i>	1	.	1	.
Spiny dogfish	<i>Squalus acanthias</i>	1	.	.	1
Bullnose ray	<i>Myliobatis freminvillei</i>	1	.	1	.
Ladyfish	<i>Elops saurus</i>	1	1	.	.
Ictalurus catfishes	<i>Ictalurus spp.</i>	1	1	.	.
Searobins	<i>Triglidae</i>	1	.	1	.
Largemouth bass	<i>Micropterus salmoides</i>	1	.	1	.
Pinfish	<i>Lagodon rhomboides</i>	1	.	1	.
Weakfish	<i>Cynoscion regalis</i>	1	.	1	.
Silver perch	<i>Bairdiella chrysoura</i>	1	.	1	.
Southern kingfish	<i>Menticirrhus americanus</i>	1	.	1	.
Atlantic spadefish	<i>Chaetodipterus faber</i>	1	1	.	.
Astroscopus stargazers	<i>Astroscopus spp.</i>	1	.	1	.
Common snapping turtle	<i>Chelydra serpentina</i>	1	.	1	.
Common slider	<i>Trachemys scripta</i>	1	.	.	1
Ruddy duck	<i>Oxyura jamaicensis</i>	1	.	.	1
Great black-backed gull	<i>Larus marinus</i>	1	.	.	1
Total		21,758	10,773	10,547	438

Table 2.3 Total catch and harvest status counts for all species observed in commercial gill nets in the Neuse, Pamlico, and Bay rivers, 2013.

Common name	Scientific name	Total catch	Harvested	Unmarketable	Regulatory discards
Atlantic menhaden	<i>Brevoortia tyrannus</i>	5,403	4,258	1,145	.
American shad	<i>Alosa sapidissima</i>	304	294	3	7
Jellyfish	<i>Cnidaria</i>	272	.	272	.
Hickory shad	<i>Alosa mediocris</i>	157	148	9	.
Southern flounder	<i>Paralichthys lethostigma</i>	113	82	.	31
Double-crested cormorant	<i>Phalacrocorax auritus</i>	76	.	.	76
Striped bass	<i>Morone saxatilis</i>	61	58	.	3
Longnose gar	<i>Lepisosteus osseus</i>	60	.	60	.
Gizzard shad	<i>Dorosoma cepedianum</i>	31	.	31	.
Common loon	<i>Gavia immer</i>	28	.	.	28
Red breasted merganser	<i>Mergus serrator</i>	28	.	.	28
Blue crab	<i>Callinectes sapidus</i>	26	.	26	.
Red drum	<i>Sciaenops ocellatus</i>	23	7	.	16
Bowfin	<i>Amia calva</i>	11	.	11	.
Southern stingray	<i>Dasyatis americana</i>	10	.	10	.
Common carp	<i>Cyprinus carpio</i>	8	2	6	.
Cownose ray	<i>Rhinoptera bonasus</i>	7	.	7	.
Spotted seatrout	<i>Cynoscion nebulosus</i>	7	7	.	.
Black drum	<i>Pogonias cromis</i>	5	5	.	.
Bluefish	<i>Pomatomus saltatrix</i>	4	4	.	.
Pied billed grebe	<i>Podilymbus podiceps</i>	3	.	.	3
Lesser scaup duck	<i>Aythya affinis</i>	3	.	.	3
Ruddy duck	<i>Oxyura jamaicensis</i>	3	.	.	3
Horseshoe crab	<i>Limulus polyphemus</i>	2	.	2	.
Atlantic stingray	<i>Dasyatis sabina</i>	2	.	2	.
Weakfish	<i>Cynoscion regalis</i>	2	.	.	2
Surf scoter	<i>Melanitta perspicillata</i>	2	.	.	2
Miscellaneous	<i>Miscellaneous</i>	1	.	.	1
Jelly bomb	<i>Stomolophus meleagris</i>	1	.	1	.
Sea lamprey	<i>Petromyzon marinus</i>	1	.	1	.

Common name	Scientific name	Total catch	Harvested	Unmarketable	Regulatory discards
White catfish	<i>Ameiurus catus</i>	1	.	1	.
White perch	<i>Morone americana</i>	1	1	.	.
Yellowbelly turtle	<i>Chrysemys scripta</i>	1	.	.	1
Brown pelican	<i>Pelecanus occidentalis</i>	1	.	.	1
Total		6,658	4,866	1,587	205

Table 2.4 Percentage of observer trips in the Neuse and Pamlico rivers that observed zero striped bass, 2011-2013. Bay River trips are included with Neuse River trips.

Location	N	Percent zero catches
Neuse River	152	88
Pamlico River	31	55

Table 2.5 Date opened, date closed, harvest limit, and size restrictions of the striped bass commercial harvest season in the Central Southern Management Area, 2011-2013.

Year	Date opened	Date closed	Limit (#/day)	Size (inches)
2011	1-Mar	25-Mar	10/day	≥18
2012	1-Mar	30-Mar	10/day	≥18
2013	1-Mar	15-Apr	10/day	≥18

Table 2.6 Number and status of striped bass observed in commercial gill nets in the Neuse River by month from 2011-2013. (A) = Alive, (D) = Dead. Legal \geq 457 mm, Sublegal < 457 mm. UNK = No status recorded. Bay River fish were included with Neuse River.

Year	Month	Legal (A)	Sublegal (A)	Legal (D)	Sublegal (D)	UNK	Total
2011	JAN	.	.	.	.	.	0
	FEB	1	.	.	.	.	1
	*MAR	1	.	1	.	.	2
	APR	.	.	.	.	.	0
	MAY	.	.	.	.	.	0
	JUN	.	.	.	.	.	0
	JUL	.	.	.	.	.	0
	AUG	.	.	.	.	.	0
	SEP	.	.	.	.	.	0
	OCT	.	.	1	.	.	1
	NOV	.	.	.	.	.	0
	DEC	.	.	.	.	.	0
	Total		2	0	2	0	0	4
2012	JAN	.	.	.	.	.	0
	FEB	.	.	.	.	.	0
	*MAR	6	.	1	.	23	30
	APR	.	.	.	.	.	0
	MAY	.	.	.	.	.	0
	JUN	.	.	.	.	.	0
	JUL	.	.	.	.	.	0
	AUG	.	.	.	.	.	0
	SEP	.	.	.	.	.	0
	OCT	.	.	.	.	.	0
	NOV	6	.	.	.	.	6
	DEC	.	.	.	.	.	0
	Total		12	0	1	0	23	36
2013	JAN	.	.	.	.	.	0
	FEB	.	.	.	.	.	0
	*MAR	.	.	2	.	.	2
	**APR	25	1	2	.	10	38
	MAY	.	.	.	.	.	0
	Total		25	1	4	0	10	40
Total in season		32	1	6	0	33	72
Total out of season		7	0	1	0	0	8
Grand total		39	1	7	0	33	80

*Striped bass harvest season open.

**Closed April 15, 2013

Table 2.7 Number and status of striped bass observed in commercial gill nets in the Pamlico River by month from 2011-2013. (A) = Alive, (D) = Dead. Legal \geq 457 mm, Sublegal < 457 mm. UNK = No status recorded.

Year	Month	Legal (A)	Sublegal (A)	Legal (D)	Sublegal (D)	UNK	Total
2011	JAN	.	.	.	.	.	0
	FEB	.	.	.	.	.	0
	*MAR	.	.	.	.	.	0
	APR	.	.	.	.	.	0
	MAY	.	.	.	.	.	0
	JUN	.	.	.	.	.	0
	JUL	.	.	.	.	.	0
	AUG	.	.	.	.	.	0
	SEP	.	.	.	.	.	0
	OCT	.	.	2	.	.	2
	NOV	.	1	.	5	.	6
	DEC	.	.	.	.	.	0
	Total		0	1	2	5	0	8
2012	JAN	.	.	.	.	.	0
	FEB	2	.	.	.	.	2
	*MAR	.	.	.	.	13	13
	APR	.	.	.	.	.	0
	MAY	.	.	.	.	.	0
	JUN	.	.	.	.	.	0
	JUL	.	.	.	.	.	0
	AUG	.	.	.	.	.	0
	SEP	.	.	.	.	.	0
	OCT	.	.	.	.	.	0
	NOV	.	11	.	1	.	12
	DEC	.	1	.	.	.	1
	Total		2	12	0	1	13	28
2013	JAN	.	.	.	.	.	0
	FEB	.	.	.	.	.	0
	*MAR	.	.	.	.	.	0
	**APR	17	1	3	.	.	21
	MAY	.	.	.	.	.	0
	Total		17	1	3	0	0	21
Total in season		17	1	3	0	13	34
Total out of season		2	13	2	6	0	23
Grand total		19	14	5	6	13	57

*Striped bass harvest season open.

**Closed April 15, 2013

Table 2.8 Seasonal estimated striped bass discards (dead and live) by number and weight for anchored gill nets \geq 5 inch stretch mesh in the Pamlico and Neuse rivers. Winter = December, January, February. Spring = March, April, May. Summer = June, July, August. Fall = September, October, November.

Year	Season	# Trips	Obs.	% Coverage	dead discards						live releases						Total #
					# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.	# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.	
2011	Winter	130	12	9.2%	0	0	0	0	0	0	1	2.50	0.08	0.21	11	27.08	11
	Spring	783	6	0.8%	0	0	0	0	0	0	0	0	0	0	0	0	0
	Summer	588	2	0.3%	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fall	653	17	2.6%	3	6.78	0.18	0.40	115	260.43	0	0	0	0	0	0	0	115
2012	Winter	244	25	10.2%	0	0	0	0	0	0	2	4.40	0.08	0.18	20	42.94	20
	Spring	669	17	2.5%	1	.	0.06	.	39	.	0	0	0	0	0	0	39
	Summer	571	13	2.3%	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fall	778	8	1.0%	0	0	0	0	0	0	4	10.80	0.50	1.35	389	1050.30	389
2013	Winter	117	10	8.5%	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spring	941	19	2.0%	1	1.90	0.05	0.10	50	94.10	2	2.20	0.11	0.12	99	108.96	149
Total		5,474	129	2.4%	5	8.68			204	354.53	9	19.9			518	1,229.29	723

*Unmarketable discard, no weight/length recorded

Table 2.9 Seasonal estimated striped bass discards (dead and live) by number and weight for anchored gill nets < 5 inch stretch mesh in the Pamlico and Neuse rivers. Winter = December, January, February. Spring = March, April, May. Summer = June, July, August. Fall = September, October, November.

Year	Season	# Trips	Obs.	% Coverage	Dead discards						Live releases						Total #	
					# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.	# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.		
2011	Spring	44	11	25.0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Summer	149	0	0.0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fall	141	3	2.1%	5	4.60	1.67	1.53	235	216.20	1	1.00	0.33	0.33	47	47.00	282	
	Winter	93	13	14.0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	Spring	118	8	6.8%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Summer	174	1	0.6%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fall	169	4	2.4%	1	0.40	0.25	0.10	42	16.90	13	15.95	3.25	3.99	549	673.89	592	
	Winter	262	3	1.1%	0	0	0	0	0	0	1	0.20	0.33	0.07	87	17.47	87	
2013	Spring	364	4	1.1%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Winter	96	6	6.3%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1,610	53	3.3%	6	5			277	233.10	15	17.15			684	738.354	961	

Table 2.10 Annual estimates of striped bass by discards from large and small mesh anchored gill nets combined based on season.

Year	# Trips	Observed	% Coverage	Large mesh # dead	Small mesh # dead	Large mesh # released	Small mesh # released	Combined*	Combined**
2011	2,581	64	2.5%	115	235	11	47	408	379
2012	2,985	79	2.6%	39	42	409	637	1,127	604
2013 [†]	1,518	39	2.6%	50	0	99	0	149	99

*Assumes 100% release mortality

**Assumes 50% release mortality

[†]January-May only

Table 2.11 Seasonal estimated striped bass discards (dead and live) by number and weight for large mesh anchored gill nets in the Pamlico and Neuse rivers. See Table 2.6 for dates of open and closed seasons.

Year	Season	# Trips	Obs.	% Coverage	Dead discards						Live releases						Total #	
					# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.	# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.		
2011	Open	658	2	0.3%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Closed	1,496	35	2.3%	3	6.78	0.09	0.19	128	289.80	1	2.5	0.03	0.07	43	106.86	171	171
2012	Open	589	10	1.7%	1	*	0.1	*	59	*	0	0	0	0	0	0	59	59
	Closed	1,673	53	3.2%	0	0	0	0	0	0	6	15.2	0.11	0.29	189	479.80	189	189
2013 [†]	Open	789	14	1.8%	0	0	0	0	0	0	2	2.2	0.14	0.16	113	123.99	113	113
	Closed	269	16	5.9%	1	1.90	0.06	0.12	17	31.94	0	0	0	0	0	0	17	17
Total		5,474	130	2.4%					204	321.74					345	710.65	549	549

*Unmarketable discard, no weight/length recorded

[†]January-May only

Table 2.12 Seasonal estimated striped bass discards (dead and live) by number and weight for small mesh anchored gill nets in the Pamlico and Neuse rivers. See Table 2.6 for dates of open and closed seasons.

Year	Season	# Trips	Obs.	% Coverage	Dead discards						Live releases						Total #	
					# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.	# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.		
2011	Open	67	7	10.4%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Closed	360	20	5.6%	5	4.60	0.25	0.23	90	82.80	1	1	0.05	0.05	18	18.00	108	
2012	Open	75	8	10.7%	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Closed	648	8	1.2%	1	0.40	0.13	0.05	81	32.40	14	15.95	1.75	1.99	1134	1291.95	1215	
2013 [†]	Open	145	4	2.8%	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Closed	315	6	1.9%	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total		1610	53	3.3%					171	115.20					1152	1309.95	1323	

[†]January-May only

Table 2.13 Annual estimates of striped bass discards from large and small mesh anchored gill nets combined based on open and closed seasons.

Year	# Trips	Observed	% Coverage	Large mesh # dead	Small mesh # dead	Large mesh # released	Small mesh # released	Combined*	Combined**
2011	2,581	64	2.5%	128	90	43	18	279	249
2012	2,985	79	2.6%	59	81	189	1,134	1,463	802
2013 [†]	1,518	40	2.6%	17	0	113	0	130	73

*Assumes 100% release mortality

**Assumes 50% release mortality

[†]January-May only

Table 2.14 Seasonal estimated striped bass discards (dead and live) by number and weight for yards of large mesh anchored gill nets in the Pamlico and Neuse rivers.

Year	Season	Exp. yards	Yds. obs.	% Coverage	Dead discards						Live releases						Total #
					# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.	# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.	
2011	Winter	70,265	6,486	9.2%	0	0	0	0	0	0	1	2.50	<0.01	<0.01	11	27.08	11
	Spring	398,025	3,050	0.8%	0	0	0	0	0	0	0	0	0	0	0	0	0
	Summer	382,200	1,300	0.3%	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fall	764,394	19,900	2.6%	3	6.78	<0.01	<0.01	115	260.43	0	0	0	0	0	0	0	115
2012	Winter	281,088	28,800	10.2%	0	0	0	0	0	0	2	4.40	<0.01	<0.01	20	42.94	20
	Spring	676,871	17,200	2.5%	1*	.	<0.01	.	39	.	0	0	0	0	0	0	39
	Summer	458,996	10,450	2.3%	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fall	641,850	6,600	1.0%	0	0	0	0	0	0	4	10.80	<0.01	<0.01	389	1050.30	389
2013	Winter	72,891	6,230	8.5%	0	0	0	0	0	0	0	0	0	0	0	0	0
	Spring	689,258	13,917	2.0%	1	1.90	<0.01	<0.01	50	94.1	2	2.20	<0.01	<0.01	99	108.96	149
Total		4,435,838	113,933	2.6%	5	8.68			204	355	9	19.9			518	1,229.29	723

*Unmarketable discard, no weight/length recorded

**No trips observed so yardage not expanded

Table 2.15 Seasonal estimated striped bass discards (dead and live) by number and weight for yards of small mesh anchored gill nets in the Pamlico and Neuse rivers.

Year	Season	Exp. yards	Yds. obs.	% Coverage	Dead discards						Live releases						Total #	
					# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.	# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.		
2011	Spring	19,400	4,850	25.0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Summer	0*	0*	0.0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fall	105,750	2,250	2.1%	5	4.60	<0.01	<0.01	235	216.2	1	1.00	<0.01	<0.01	47	47	282	
	Winter	33,265	4,650	14.0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	Spring	85,550	5,800	6.8%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Summer	330,600	1,900	0.6%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fall	188,013	4,450	2.4%	1	0.40	<0.01	<0.01	42	16.9	13	15.95	<0.01	<0.01	549	673.89	592	
	Winter	248,900	2,850	1.1%	0	0	0	0	0	0	1	0.20	<0.01	<0.01	87	17.47	87	
2013	Spring	348,530	3,830	1.1%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Winter	84,480	5,280	6.3%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		1,418,278	35,860	2.5%	6	5			277	233.10	15	17.15			684	738	961	

*No trips observed, yardage not expanded

Table 2.16 Annual estimates of striped bass discards from large and small mesh anchored gill nets combined based on gill net yardage and seasons.

Year	Yards	Yds. obs	% Coverage	Large mesh # dead	Small mesh # dead	Large mesh # released	Small mesh # released	Combined*	Combined**
2011	1,773,300	42,486	2.4%	115	235	11	47	408	379
2012	2,911,867	78,050	2.7%	39	42	409	637	1,127	604
2013 [†]	1,195,159	29,257	2.4%	50	0	99	0	149	99

*Assumes 100% release mortality

**Assumes 50% release mortality

[†]January-May only

Table 2.17 Seasonal (open/closed) estimated striped bass discards (dead and live) by number and weight for yards of large mesh anchored gill nets in the Pamlico and Neuse rivers. See Table 2.6 for dates of open and closed seasons.

Year	Season	Exp. yards	Yds. obs.	% Coverage	Dead discards						Live releases						Total #	
					# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.	# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.		
2011	Open	312,550.00	950	0.3%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Closed	1,273,138.74	29,786	2.3%	3	6.78	<0.01	<0.01	128	289.80	1	2.5	<0.01	<0.01	107	106.86	235	
2012	Open	606,670.00	10,300	1.7%	1*	0	<0.01	0	59	0	0	0	0	0	0	0	59	
	Closed	1,665,108.49	52,750	3.2%	0	0	0	0	0	0	6	15.2	<0.01	<0.01	480	479.80	480	
2013 [†]	Open	512,230.07	9,089	1.8%	0	0	0	0	0	0	2	2.2	<0.01	<0.01	124	123.99	124	
	Closed	248,484.27	13,856	5.6%	1	1.90	<0.01	<0.01	18	34.07	0	0	0	0	0	0	169	
Total		6,212,153.25	114,133	1.8%	5	8.68			205	324	9	19.9			711	710.65	916	

*Unmarketable discard, no weight/length recorded

[†]January-May only

Table 2.18 Seasonal (open/closed) estimated striped bass discards (dead and live) by number and weight for yards of small mesh anchored gill nets in the Pamlico and Neuse rivers. See Table 6 for dates of open and closed seasons.

Year	Season	Exp. yards	Yds. obs.	% Coverage	Dead discards						Live releases						Total #	
					# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.	# Caught	Caught (lb.)	CPUE #	CPUE (lb.)	Exp. #	Exp. wt.		
2011	Open	31,107.14	3,250	10.4%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Closed	153,000.00	8,500	5.6%	5	4.60	<0.01	<0.01	90	82.8	1	1	<0.01	<0.01	18	18	108	
2012	Open	54,375.00	5,800	10.7%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Closed	745,200.00	9,200	1.2%	1	0.40	<0.01	<0.01	81	32.4	14	15.95	<0.01	<0.01	1,134	1,291.95	1,215	
2013 [†]	Open	125,062.50	3,450	2.8%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Closed	150,255.00	2,862	1.9%	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		2,042,999.64	35,860	2.6%	6	5			171	115	15	16.95			1,152	1,309.95	1,323	

†January-May only

Table 2.19 Annual estimates of striped bass discards from large and small mesh anchored gill nets combined based on gill net yardage and seasons (open/closed).

Year	Exp. yards	Yards observed	% Coverage	Large mesh # dead	Small mesh # dead	Large mesh # released	Small mesh # released	Combined*	Combined**
2011	1,769,796	42,486	2.4%	128	90	107	18	343	281
2012	3,071,353	78,050	2.5%	59	81	480	1,134	1,754	947
2013 [†]	1,036,032	29,257	2.8%	18	0	124	0	142	80

*Assumes 100% release mortality

**Assumes 50% release mortality

†January-May only

Table 2.20 Number of gill net sets made in Program 462 from December 2011 to May 2013 in the middle Pamlico, upper Pamlico, upper/middle Neuse, and upper Neuse rivers.

Year	Month	Middle Pamlico	Upper Pamlico	Upper/Middle Neuse	Upper Neuse	
2011	DEC	3	3	3	3	
	JAN	3	3	3	3	
	FEB	3	3	3	3	
	MAR	3	3	3	3	
	APR	3	3	3	3	
2012	MAY	3	3	3	3	
	JUN	0	3	3	3	
	JUL	3	3	3	3	
	AUG	3	3	3	3	
	SEP	3	3	0	0	
	OCT	3	3	3	3	
	NOV	3	3	3	3	
	DEC	3	3	3	3	
	2013	JAN	3	3	3	3
		FEB	3	3	3	3
		MAR	3	3	3	3
		APR	3	3	3	3
MAY		3	3	3	3	
Total		51	54	51	51	

Table 2.21 Number of striped bass captured in gill nets from Program 462 at sites in the Pamlico and Neuse rivers from December 2011 to May 2013.

Year	Month	Middle Pamlico	Upper Pamlico	Upper/Middle Neuse	Upper Neuse	Total	
2011	DEC	13	25	3	19	60	
	JAN	0	27	4	0	31	
	FEB	0	4	9	4	17	
	MAR	22	8	3	0	33	
	APR	16	4	0	3	23	
2012	MAY	0	10	6	0	16	
	JUN		4	0	2	6	
	JUL	0	4	1	3	8	
	AUG	0	12	4	1	17	
	SEP	3	1			4	
	OCT	2	3	8	7	20	
	NOV	3	17	14	9	43	
	DEC	5	5	8	6	24	
	JAN	0	1	0	2	3	
	FEB	3	0	0	0	3	
	2013	MAR	0	0	1	2	3
		APR	1	9	7	11	28
MAY		3	2	1	0	6	
Total		71	136	69	69	345	

Table 2.22 Number and status of striped bass captured in Program 462 gill net sets in the upper/middle Neuse River by month from December 2011 to May 2013. (A) = Alive, (D) = Dead. Legal \geq 457 mm, Sublegal < 457 mm.

Status	Month	Parallel nets				Control net					Total
		20	30	40	50	0-10	11-20	21-30	31-40	41-50	
Legal (A)	JAN	.	.	.	.	.	1	.	.	.	1
	FEB	.	1	.	.	.	1	.	1	.	3
	MAR	.	1	.	.	.	.	1	1	.	3
	APR	.	.	.	1	.	1	1	.	.	3
	MAY	.	1	1	.	.	.	.	.	.	2
	JUN	.	.	.	.	.	.	.	.	.	0
	JUL	.	.	.	.	.	.	.	.	.	0
	AUG	.	.	.	.	.	.	.	.	.	0
	SEP	.	.	.	.	.	.	.	.	.	0
	OCT	.	.	.	1	.	.	.	.	1	2
	NOV	1	.	1	1	1	1	3	3	2	13
	DEC	4	.	.	1	1	2	.	.	.	8
	Total	5	3	2	4	2	6	5	5	3	35
Legal (D)	JAN	.	1	1	.	1	.	.	.	.	3
	FEB	3	.	.	.	1	1	.	.	.	5
	MAR	.	.	.	.	.	.	.	1	.	1
	APR	.	.	.	2	.	.	1	1	.	4
	MAY	2	1	1	.	1	.	.	.	.	5
	JUN	.	.	.	.	.	.	.	.	.	0
	JUL	.	.	1	.	.	.	.	.	.	1
	AUG	1	2	.	.	1	.	.	.	.	4
	SEP	.	.	.	.	.	.	.	.	.	0
	OCT	.	.	.	1	1	.	2	2	.	6
	NOV	.	.	.	.	.	.	.	1	.	1
	DEC	1	.	1	.	.	.	.	1	.	3
	Total	7	4	4	3	5	1	3	6	0	33
Sublegal (A)	FEB	1	.	.	.	.	.	.	.	.	1
	Total	1	0	0	0	0	0	0	0	0	1
Grand total		13	7	6	7	7	7	8	11	3	69

Table 2.23 Number and status of striped bass captured in Program 462 gill net sets in the upper Neuse River by month from December 2011 to May 2013. (A) = Alive, (D) = Dead. Legal \geq 457 mm, Sublegal < 457 mm.

Status	Month	Parallel nets				Control net					Total
		20	30	40	50	0-10	11-20	21-30	31-40	41-50	
Legal (A)	JAN	.	.	.	.	1	.	.	.	.	1
	FEB	1	.	1	.	.	.	.	.	1	3
	MAR	.	.	.	.	1	.	.	.	.	1
	APR	1	1	1	2	.	.	1	.	.	6
	MAY	.	.	.	.	.	.	.	.	.	0
	JUN	.	.	.	.	.	.	.	.	.	0
	JUL	.	.	.	.	.	.	.	.	.	0
	AUG	.	.	.	.	.	.	.	.	.	0
	SEP	.	.	.	.	.	.	.	.	.	0
	OCT	.	1	.	.	.	.	.	.	.	1
	NOV	.	.	.	1	.	1	1	.	1	4
	DEC	7	1	.	2	3	3	2	1	.	19
	Total		9	3	2	5	5	4	4	1	2	35
Legal (D)	JAN	.	.	.	.	1	.	.	.	.	1
	FEB	.	.	1	.	.	.	.	.	.	1
	MAR	.	.	.	.	1	.	.	.	.	1
	APR	.	.	3	.	.	.	2	1	2	8
	MAY	.	.	.	.	.	.	.	.	.	0
	JUN	.	1	.	1	.	.	.	.	.	2
	JUL	.	1	.	.	.	.	.	2	.	3
	AUG	.	.	.	.	.	.	.	.	1	1
	SEP	.	.	.	.	.	.	.	.	.	0
	OCT	.	1	.	5	.	.	.	.	.	6
	NOV	.	.	1	.	.	.	.	.	4	5
	DEC	1	1	1	.	.	.	.	3	.	6
	Total		1	4	6	6	2	0	2	6	7	34
Grand total		10	7	8	11	7	4	6	7	9	69

Table 2.24 Number and status of striped bass captured in Program 462 gill net sets in the middle Pamlico River by month from December 2011 to May 2013. (A) = Alive, (D) = Dead. Legal \geq 457 mm, Sublegal < 457 mm.

Status	Month	Parallel nets				Control net					Total
		20	30	40	50	0-10	20	30	40	50	
Legal (A)	JAN	.	.	.	.	.	.	.	.	.	0
	FEB	.	.	.	.	.	.	1	.	1	2
	MAR	3	.	.	2	.	1	1	.	1	8
	APR	.	.	3	.	1	2	.	1	3	10
	MAY	.	.	.	.	.	.	.	.	.	0
	JUN	.	.	.	.	.	.	.	.	.	0
	JUL	.	.	.	.	.	.	.	.	.	0
	AUG	.	.	.	.	.	.	.	.	.	0
	SEP	.	.	.	.	.	.	.	.	.	0
	OCT	.	.	.	.	.	.	.	1	.	1
	NOV	.	.	1	.	.	.	.	1	.	2
	DEC	.	.	1	1	.	.	3	.	.	5
	Total		3	0	5	3	1	3	5	3	5	28
Legal (D)	JAN	.	.	.	.	.	.	.	.	.	0
	FEB	.	.	.	.	.	.	1	.	.	1
	MAR	3	6	1	1	.	1	1	1	.	14
	APR	.	.	2	1	1	1	1	1	.	7
	MAY	1	.	.	1	.	.	1	.	.	3
	JUN	.	.	.	.	.	.	.	.	.	0
	JUL	.	.	.	.	.	.	.	.	.	0
	AUG	.	.	.	.	.	.	.	.	.	0
	SEP	2	.	.	.	1	.	.	.	.	3
	OCT	.	.	.	.	.	.	1	.	.	1
	NOV	.	.	1	.	.	.	.	.	.	1
	DEC	1	4	.	1	.	3	.	2	2	13
	Total		7	10	4	4	2	5	5	4	2	43
Grand total		10	10	9	7	3	8	10	7	7	71

Table 2.25 Number and status of striped bass captured in Program 462 gill net sets in the upper Pamlico River by month from December 2011 to May 2013. (A) = Alive, (D) = Dead. Legal \geq 457 mm, Sublegal < 457 mm.

Status	Month	Parallel nets				Control net					Total
		20	30	40	50	0-10	11-20	21-30	31-40	41-50	
Legal (A)	JAN	3	2	2	.	3	4	4	1	2	21
	FEB	.	.	.	.	.	.	.	1	1	2
	MAR	.	.	.	1	2	1	.	1	1	6
	APR	3	.	.	1	.	.	1	2	1	8
	MAY	.	.	.	.	.	.	1	.	.	1
	JUN	.	.	.	.	.	.	.	.	.	0
	JUL	.	.	1	.	.	.	.	.	.	1
	AUG	.	.	.	.	.	1	.	.	1	2
	SEP	.	.	.	.	.	.	.	.	.	0
	OCT	.	.	.	1	.	.	.	.	.	1
	NOV	.	2	3	.	.	.	.	1	2	8
	DEC	.	2	4	5	1	1	2	1	3	19
	Total		6	6	10	8	6	7	8	7	11	69
Legal (D)	JAN	.	2	1	1	.	1	1	1	.	7
	FEB	.	.	.	.	.	.	1	1	.	2
	MAR	.	.	.	.	1	.	1	.	.	2
	APR	1	.	.	1	.	.	.	.	.	2
	MAY	.	2	.	2	1	1	2	1	1	10
	JUN	.	2	.	2	.	.	.	.	.	4
	JUL	.	.	.	.	.	2	.	.	.	2
	AUG	.	2	1	2	.	.	.	4	.	9
	SEP	.	.	.	.	.	.	1	.	.	1
	OCT	.	.	1	1	.	.	.	.	.	2
	NOV	.	.	3	2	.	.	.	4	.	9
	DEC	.	2	1	1	2	1	.	2	2	11
	Total		1	10	7	12	4	5	6	13	3	61
Sublegal (A)	APR	2	.	.	.	.	.	.	1	.	3
	MAY	.	.	.	1	.	.	.	.	.	1
	JUL	.	.	.	.	.	.	.	1	.	1
	Total	2	0	0	1	0	0	0	2	0	5
Grand total		9	16	17	21	10	12	14	22	14	135

*No data recorded for one August fish

Table 2.26 Proposed and actual number of observed gill net trips and percent coverage by month for large and small mesh gill net trips. Proposed estimates obtained using average number of large mesh gill net trips from 2005 to 2009 in the CSMA.

	Month												Total
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Proposed													
Avg. large mesh trips 2005-2009	90	206	578	404	352	292	282	332	349	406	186	68	3,545
Proposed trips/observer	4	10	12	11	10	9	9	9	10	11	5	4	104
Total trips/month	8	20	24	22	20	18	18	18	20	22	10	8	208
% Coverage/month	9	10	4	5	6	6	6	5	6	5	5	12	6
% Coverage/month w/20% trip reduction	11	12	5	7	7	8	8	7	7	7	7	15	7
Actual													
Avg. large mesh trips 2011-2013	22	142	546	164	88	183	235	365	489	326	77	0	2,637
Observed large mesh trips/month	13	34	18	17	7	6	4	6	12	8	5	0	130
% Coverage/month large mesh	59	24	3	10	8	3	2	2	2	2	6	0	5
Avg. small mesh trips 2011-2013*	25	47	77	69	83	65	70	94	73	79	74	24	780
Observed small mesh trips/month	6	10	17	3	3	0	0	1	0	0	7	6	53
% Coverage/month small mesh	24	21	22	4	4	0	0	1	0	0	9	25	7

*Observing small mesh trips was not part of the original proposal.

Table 2.27 Distribution of observer trips in the Neuse, Pamlico and Bay rivers by month, 2011-2013.

Year	Month	Pamlico River	Neuse River	Bay River	Total
2011	JAN	.	6	.	6
	FEB	.	16	.	16
	MAR	.	10	.	10
	APR	.	3	.	3
	MAY	.	4	.	4
	JUN	.	.	.	0
	JUL	.	.	.	0
	AUG	1	1	.	2
	SEP	4	3	.	7
	OCT	5	2	.	7
	NOV	4	2	.	6
	DEC	.	3	.	3
	Total				64
2012	JAN	.	7	.	7
	FEB	1	17	.	18
	MAR	3	12	3	18
	APR	.	3	1	4
	MAY	.	3	.	3
	JUN	1	3	1	5
	JUL	.	3	1	4
	AUG	1	3	1	5
	SEP	1	3	1	5
	OCT	.	1	.	1
	NOV	3	3	.	6
	DEC	2	1	.	3
	Total				79
2013	JAN	.	6	.	6
	FEB	.	10	.	10
	MAR	.	7	.	7
	APR	5	8	.	13
	MAY	.	3	.	3
	JUN	.	1	.	1
	Total				40

Table 2.28 Striped bass dead discard estimates for the Pamlico and Neuse River areas from fishery dependent (observer) gill net data, 2004-2009 (Amendment 1) and 2011-2013 (current study).

Source	Year	Mesh size	Trip Ticket data			NCDMF observer data
			Total trips	Average yards per trip	Landings	Dead discards (lbs.)
						Dependent
Amendment 1	2004		5,055	1,985	21,726	2,453
		Large	4,142	2,884	19,823	2,296
		Small	913	1,086	1,904	157
	2005		5,124	1,984	16,313	4,394
		Large	4,036	2,752	13,134	4,394
		Small	1,088	1,216	3,180	0
	2006		5,269	2,221	12,340	6,151
		Large	3,835	3,081	9,256	5,582
		Small	1,434	1,360	3,083	569
	2007		5,440	2,111	15,749	11,943*
		Large	3,852	3,084	13,415	710*
		Small	1,588	1,137	2,334	11,233*
	2008		4,262	2,177	8,362	3,323
		Large	2,819	3,176	6,044	3,323
		Small	1,443	1,178	2,319	0
2009		5,036	2,081	23,060	645	
	Large	3,711	2,918	22,108	0	
	Small	1,325	1,243	953	645	
Current study	2011		2,581	664	27,843	551
		Large	2,154	831	26,889	288
		Small	427	435	954	263
	2012		2,985	988	22,628	1,875
		Large	2,262	1,001	22,529	1,167
		Small	723	938	99	708
	2013**		1,518	750	27,878	203
		Large	1,058	791	27,218	203
		Small	460	631	660	0

*Estimates derived from NCDMF independent gill net survey

**January-May only



Figure 2.1 Location of commercial gill net observer trips, 2011-2013. Note: observations for 2013 are for January-June only.

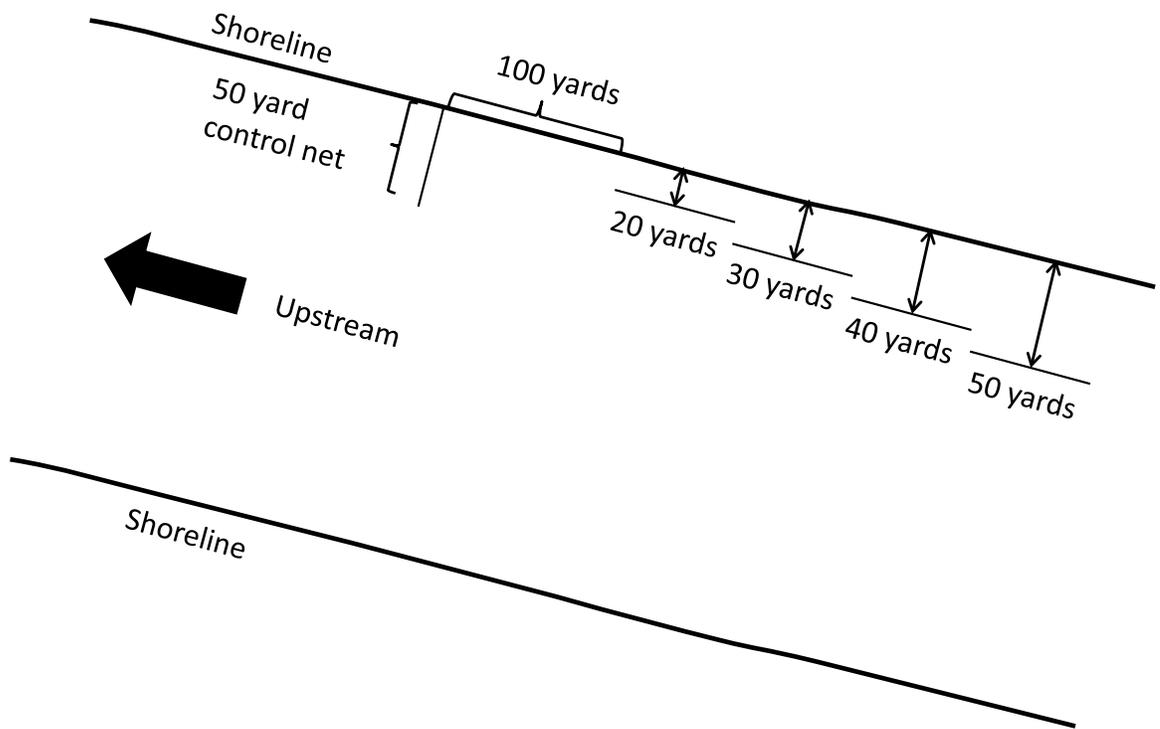


Figure 2.2 Orientation of gill nets during sampling for Program 462.

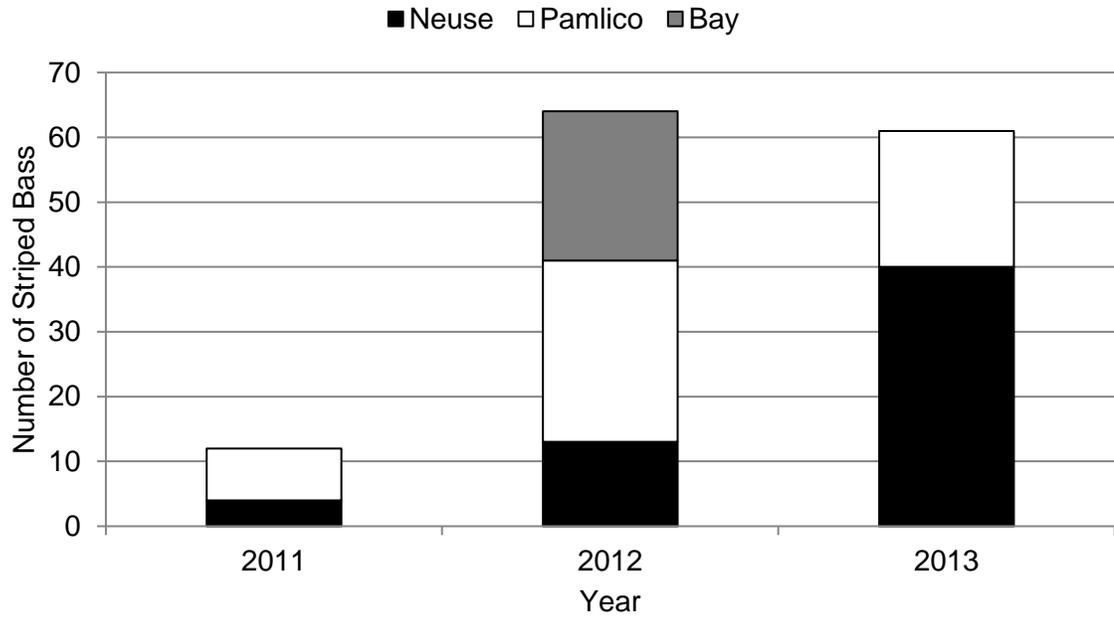


Figure 2.3 Number of striped bass observed in the Neuse, Pamlico and Bay rivers from 2011 to 2013. Note: numbers for 2013 are for January-May only.

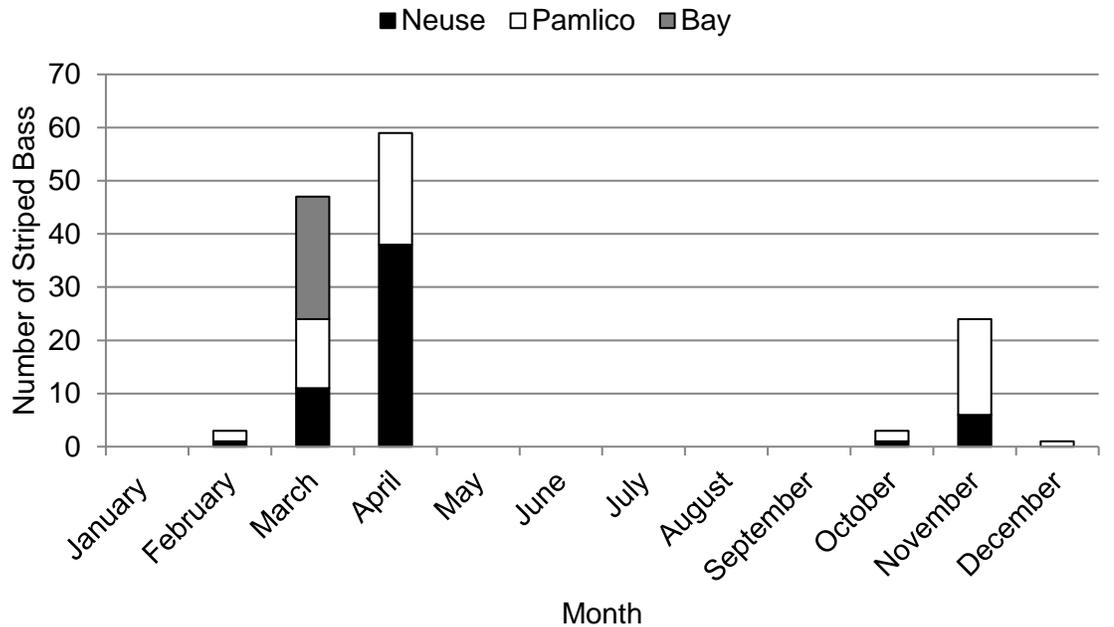


Figure 2.4 Number of striped bass observed in the Neuse, Pamlico and Bay rivers by month from 2011 to 2013. Note: numbers for 2013 are for January-May only.

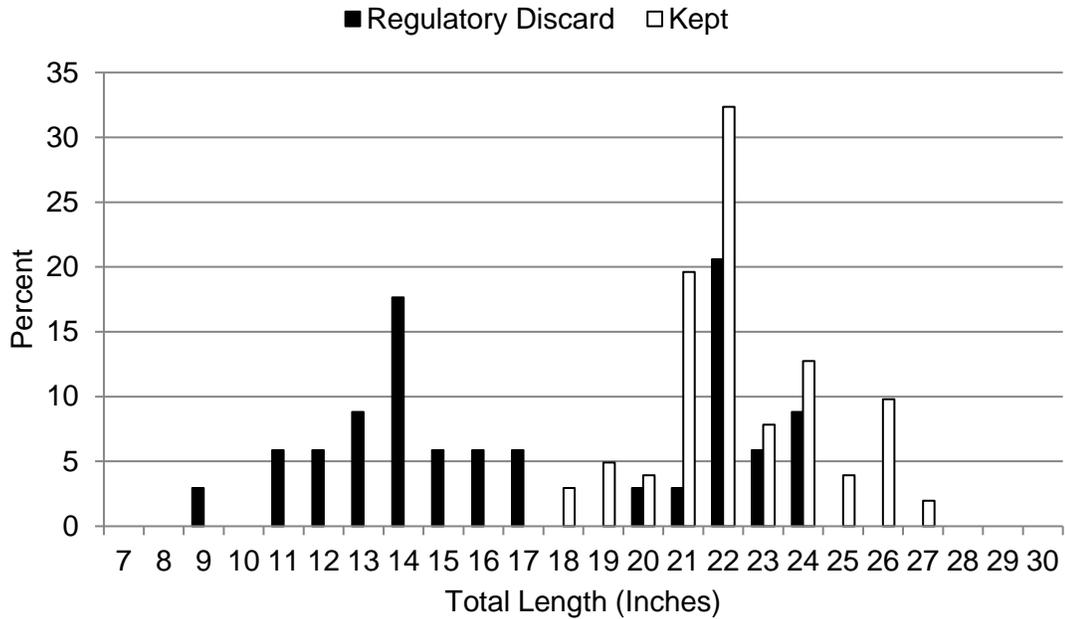


Figure 2.5 Length frequency of striped bass observed in Program 466 by fate (i.e. regulatory discard, kept).

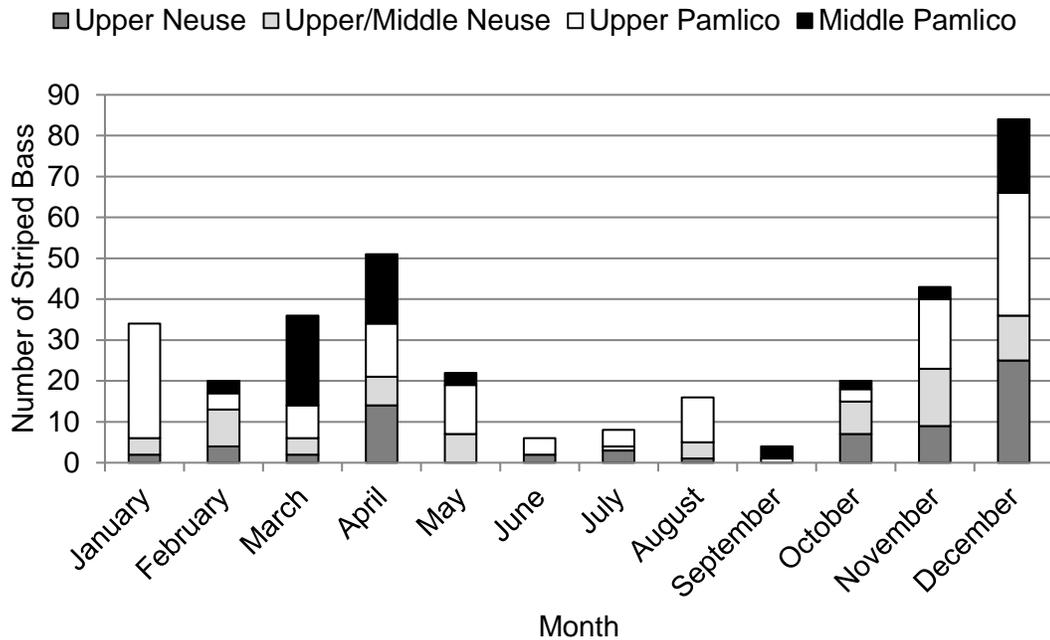


Figure 2.6 Number of striped bass captured in Program 462 gill net sets in the upper/middle Neuse, upper Neuse, middle Pamlico, and upper Pamlico rivers by month.

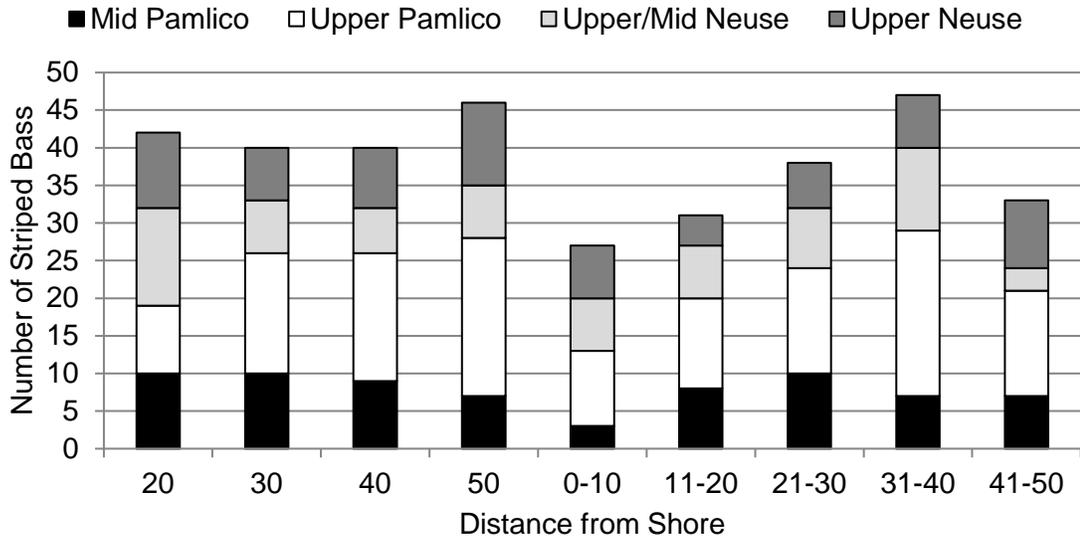


Figure 2.7 Number of striped bass captured in Program 462 gill net sets in the upper/middle Neuse, upper Neuse, middle Pamlico, and upper Pamlico rivers from December 2011 to May 2013. Nets were set 20, 30, 40, and 50 yards from shore. A control net was set perpendicular to shore and separated into 10 yard segments.

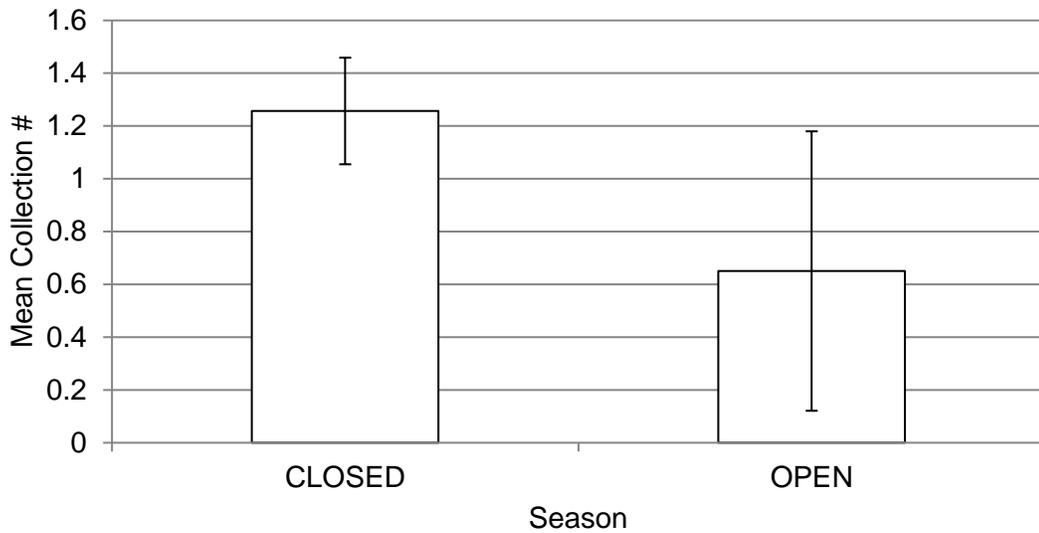


Figure 2.8 Mean (\pm S.E.) number by open and closed seasons of striped bass captured in Program 462 gill nets.

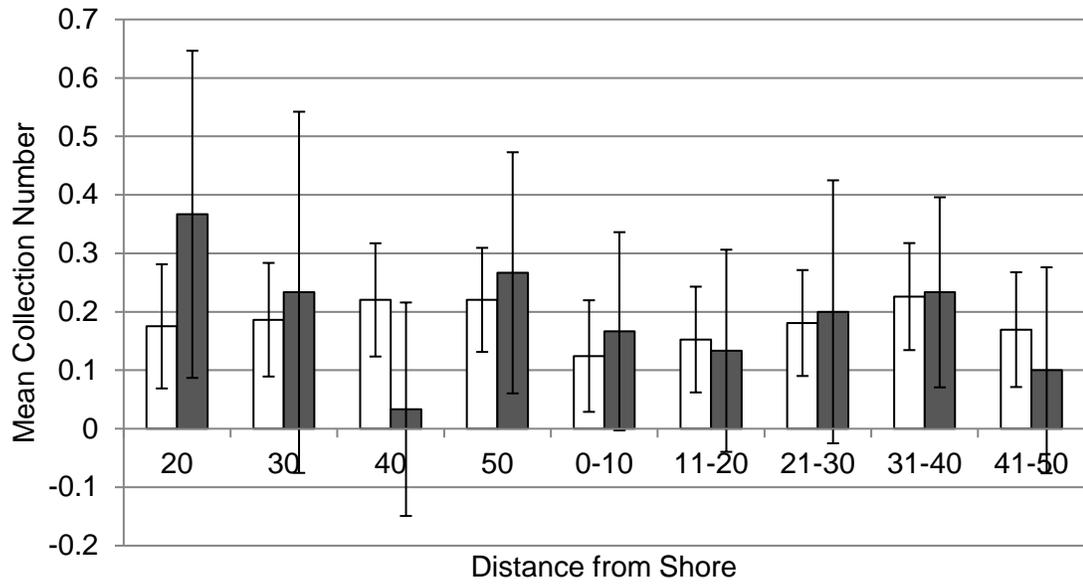


Figure 2.9 Mean (\pm S.E.) number by open (gray bars) and closed (white bars) seasons of striped bass captured in Program 462 gill nets.

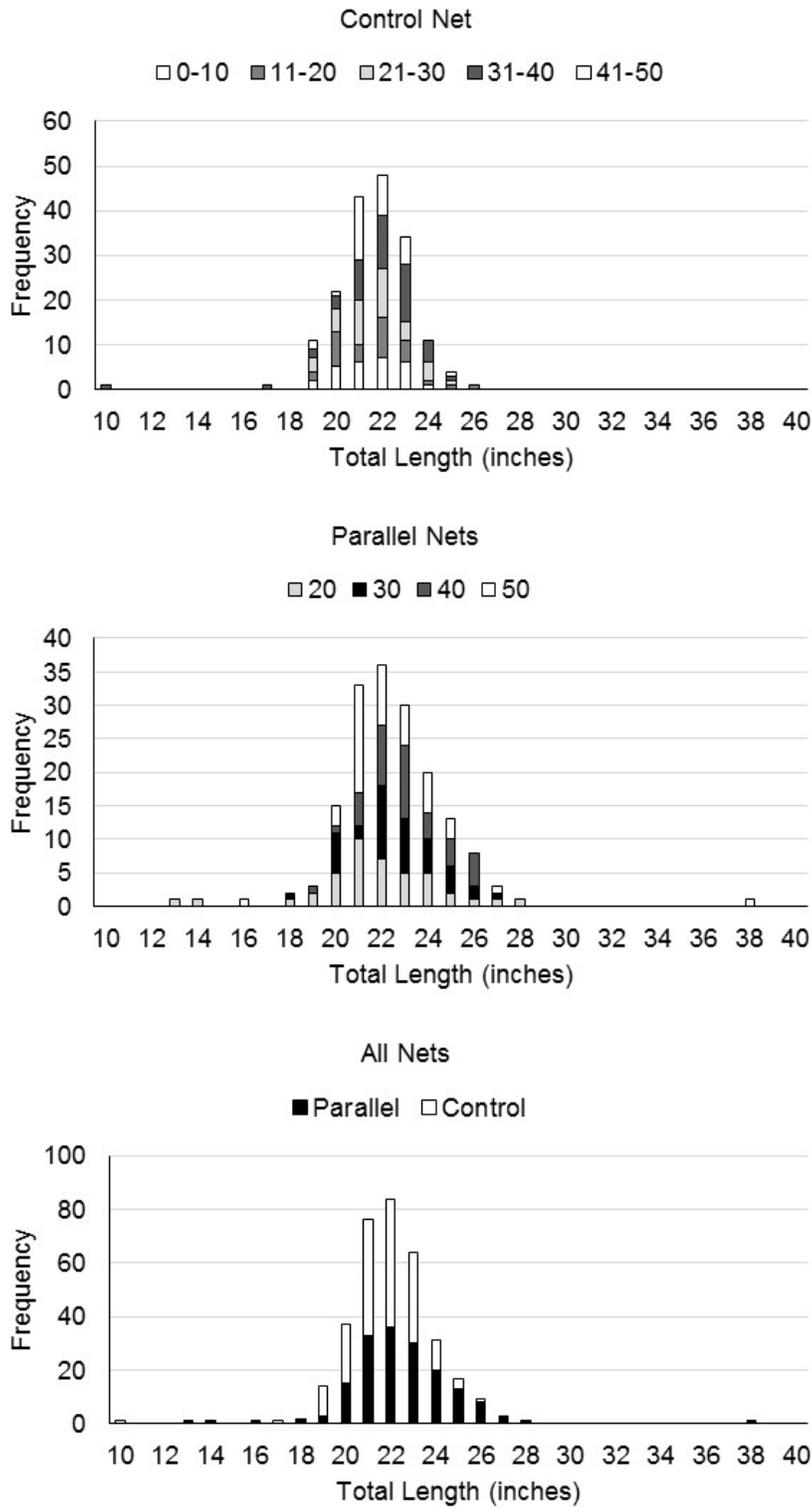


Figure 2.10 Length frequency of striped bass caught in Program 462 gill nets by distance from shore (yards) and net type.

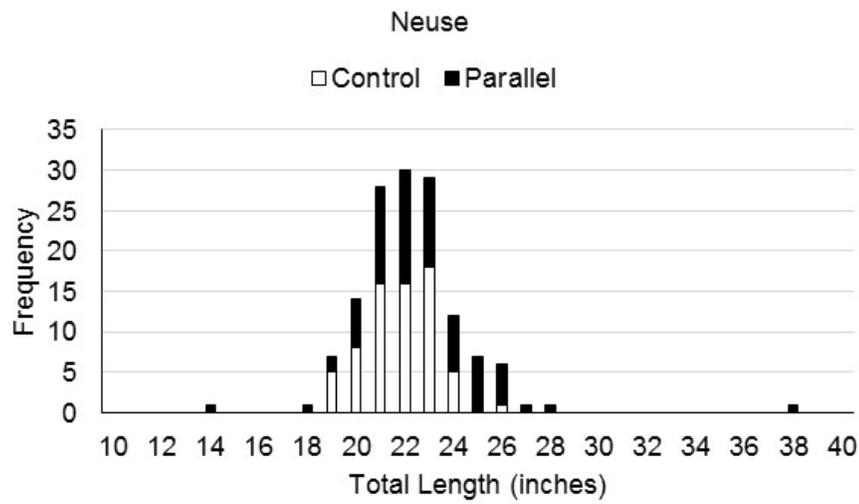
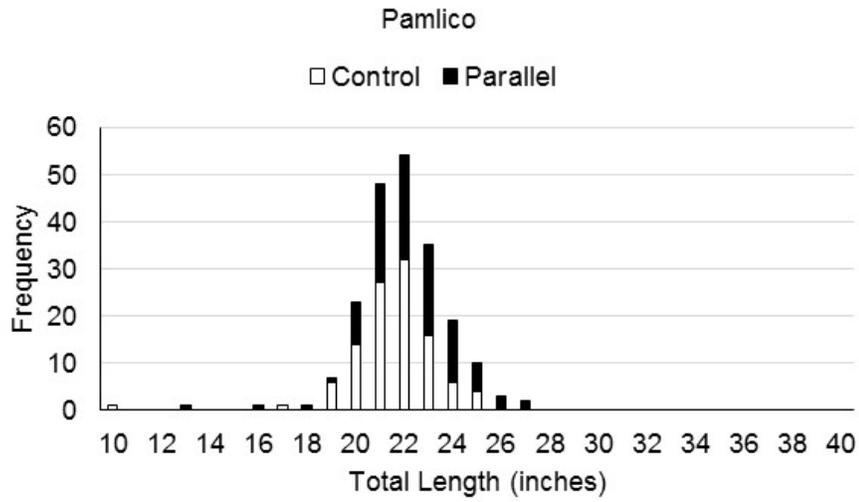


Figure 2.11 Length frequency of striped bass caught in Program 462 gill nets by river and net type.

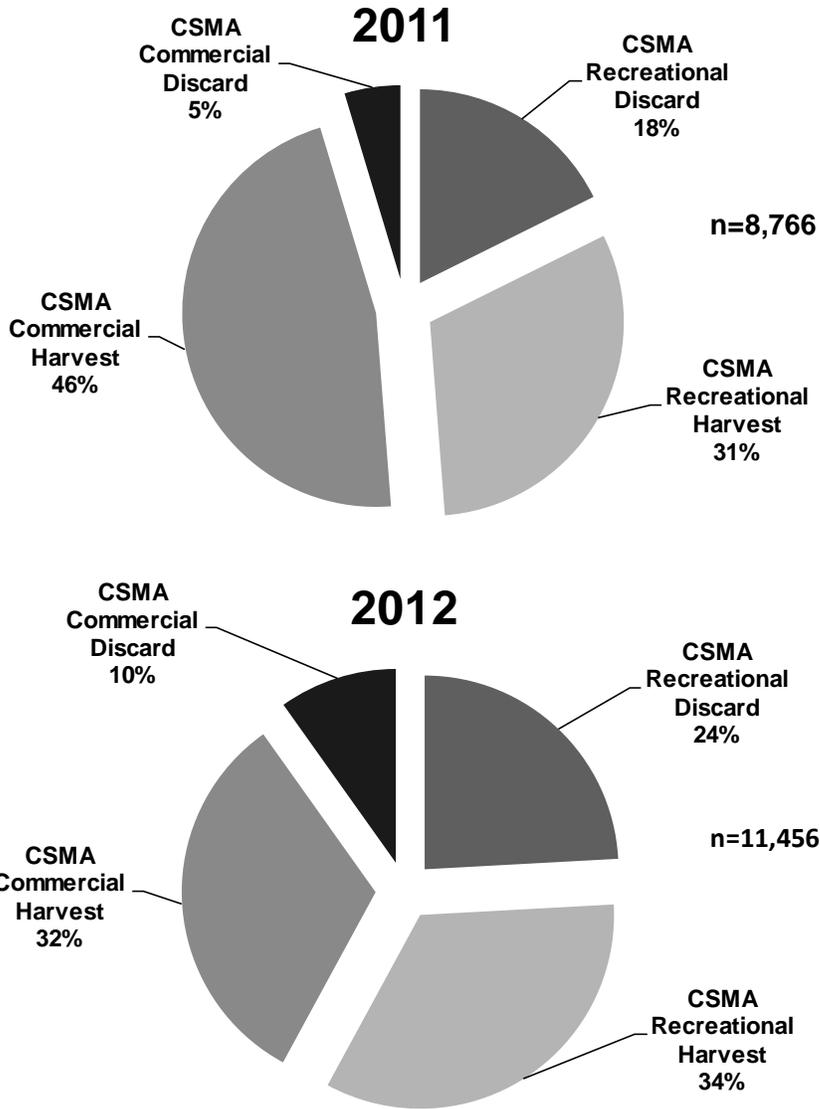


Figure 2.12 Harvest and discard mortality contributions (by number) in the CSMA for the commercial and recreational sectors, 2011-2012. Commercial discard estimates taken from fishery dependent observer coverage. Recreational harvest and discard estimates provided by the NCDMF Coastal Angling Program. A 6.4% post-release mortality rate was applied to recreational discards. Commercial discard mortality was assumed to be 100%. Values in this figure do not include RCGL harvest.

APPENDIX A

M-8-2010

PROCLAMATION

RE: LARGE MESH GILL NETS: INTERNAL COASTAL WATERS

Dr. Louis B. Daniel III, Director, Division of Marine Fisheries, hereby announces that effective at 6:00 P.M., Saturday, May 15, 2010, the following provisions shall apply to the use of large mesh gill nets:

I. SUSPENSION OF PORTION OF MARINE FISHERIES RULE 15A NCAC 03J .0103

The following portion of Marine Fisheries Rules for Coastal Waters 15A NCAC 03J .0103 is suspended:

Section (i) (1), which reads:

(i) For gill nets with a mesh length five inches or greater, it is unlawful:

(1) To use more than 3,000 yards of gill net per vessel in internal waters regardless of the number of individuals involved.

II. AREAS AND EXEMPTIONS

A. This proclamation applies to all internal coastal waters except for Albemarle and Currituck sounds and their tributaries described as follows:

1. In Albemarle Sound, the restrictions do not apply west of a line beginning at a point 35° 57.5590'N - 75° 56.8200' W; running northerly to a point 36° 09.9280'N - 75° 54.6950'W.

2. In Currituck Sound, the restrictions do not apply north of the Highway 158 Wright Memorial Bridge beginning at a point on the western shore at 36° 04.8280'N - 75° 47.4050'W; running easterly along the south side of the bridge to a point on the east shore at 36° 05.5770'N - 75° 44.5850'W.

B. Run-around or strike nets and drop nets that are used to surround a school of fish and then are immediately retrieved are exempted from the restrictions in this proclamation.

C. The Pamlico Sound Gill Net Restricted Area (PSGNRA) will operate under Incidental Take Permit (ITP) No. 1528 and is exempt from the restrictions in this proclamation during the September through December 2010 period. Restrictions in this proclamation apply to the PSGNRA outside of that time period.

III. GILL NET RESTRICTIONS

It is unlawful to use large mesh gill nets (defined as 4 inches to 6½ inches stretched mesh, inclusive) unless they comply with the following provisions:

- A. It is unlawful to set and retrieve large mesh gill nets except during the following times:
1. No sooner than one hour before sunset on Monday and no later than one hour after sunrise on Tuesday.
 2. No sooner than one hour before sunset on Tuesday and no later than one hour after sunrise on Wednesday.
 3. No sooner than one hour before sunset on Wednesday and no later than one hour after sunrise on Thursday.
 4. No sooner than one hour before sunset on Thursday and no later than one hour after sunrise on Friday.

B. It is unlawful to use large mesh gill nets of more than 15 meshes in height and without a lead core or leaded bottomline. It is unlawful to use cork, floats, or other buoys except those required for identification except that south of the Highway 58 bridge, beginning at a point on the north shore at 34° 40.7848'N - 77° 04.0273'W; running southerly to a point on the south shore at 34° 39.8620'N - 77° 03.7438'W, floats are allowed.

C. It is unlawful to use more than 2,000 yards of large mesh gill net per vessel north of the Highway 58 bridge (coordinates above) and it is unlawful to use more than 1,000 yards of large mesh gill net per vessel south of the Highway 58 bridge.

D. It is unlawful to set more than 100 yards of large mesh gill net in a continuous line.

E. It is unlawful to use large mesh gill nets without leaving a space of at least 25 yards between separate lengths of net.

IV. GENERAL INFORMATION

A. This proclamation is issued under the authority of N.C.G. S. 113-134; 113-170.4; 113-170.5; 113-182; 113-221.1; 143B-289.52 and N.C. Fisheries Rules 15A NCAC 03H .0103 and 03J .0101 and .0103.

B. It is unlawful to violate the provisions of any proclamation issued by the Fisheries Director under his delegated authority pursuant to N.C. Fisheries Rule 15A NCAC 03H .0103.

C. The intent of this proclamation is to implement gill net restrictions while the Division applies for a statewide incidental take permit from NMFS under Section 10 of the Endangered Species Act.

D. The restrictions in this proclamation apply to gill nets used by Recreational Commercial Gear License holders as well as Standard and Retired Commercial Fishing Licenses holders.

E. The small mesh gill net attendance requirements in N.C. Marine Fisheries Rule 15A NCAC 03J .0103 (h), size restrictions in 03J .0103(a)(2), the navigational passage requirements in 03J .0101, as well as all other existing gill net rules and proclamations remain in effect.

This proclamation supersedes Proclamation M-19-2009, dated August 26, 2009.

May 13, 2010
1:45 P.M.
M-8-2010

