

U. S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center

Cruise Report

Date Submitted:

Platform:

Cruise Number:

Project Title:

Cruise Dates: -

Submitted by:
Field Party Chief

Date:

Approved by:
Lab Director

Date:

Approved by:
Dr. Bonnie Ponwith
Director, SEFSC

Date:

CRUISE REPORT

Southeast Fishery-Independent Survey (SEFIS)

NOAA Ship *Pisces* Cruise PC-15-03

10 – 18 July 2015

21 July – 03 August 2015

03 – 08 August 2015 (Transit to Pascagoula)

Total Number of Days At-Sea - 23

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
Beaufort Laboratory
101 Pivers Island Rd.
Beaufort, NC 28516

320 camera-trap deployments
56 CTD casts

INTRODUCTION

The NOAA Ship *Pisces* departed from Morehead City, NC, on 10 July 2015 at 1030 for a Southeast Fishery-Independent Survey (SEFIS) research cruise in continental shelf and shelf-break waters off the southeastern US. Departure of the cruise was delayed five days due to vessel repairs. SEFIS was created by the National Marine Fisheries Service in 2010 and operates out of the Beaufort Laboratory. This survey was created to conduct applied fishery-independent sampling and related research focusing on the assessment of spatial variability in distribution and abundance of red snapper and other reef species within the snapper-grouper complex, via data collected from fish traps, video cameras, and acoustics. During this survey, chevron trap catches and associated underwater video recordings were collected from hardbottom habitats found in Raleigh, Onslow, and Long bays, North and South Carolina. A total of 320 stations were sampled with camera-trap arrays over 23 sea days between 18 and 110 m depths.

OBJECTIVES

1. Fishery-independent sampling of randomly selected stations in North Carolina. Baited chevron traps, with two mounted high-definition video cameras, were utilized for (a) hardbottom reef fish community assessments, (b) collection of reef fish for biological samples (i.e., otoliths and gonads), and (c) comparative gear sampling (cameras versus traps).
2. Use video cameras on chevron traps to address trap selectivity issues, locate and describe hardbottom habitats, and provide an additional index of abundance for stock assessments.
3. Map bottom habitats using multibeam sonar to improve survey design and to expand knowledge of hardbottom habitats in the southeast US.
4. Use a CTD instrument package to collect environmental data (temperature, salinity, dissolved oxygen, turbidity) at camera-trap sampling locations, and XBTs to sample water temperature during multibeam mapping operations.

METHODS

Camera-Trap Sampling

Camera-trap gear consisted of two high definition video cameras mounted to a chevron fish trap. Chevron traps were composed of plastic-coated wire mesh. GoPro cameras (model HD Hero[®] H4) were attached above the mouth and nose of the trap (Figure 1). Traps were baited with Atlantic menhaden, *Brevoortia tyrannus*, and video cameras were set to record before deployment. Camera-traps were deployed at least 200 m apart on suspected or known hardbottom habitats, and soak time was targeted for approximately 90 min. Camera-traps were most often deployed in sets of six. A CTD cast (see environmental data collection) was conducted while traps were soaking. Fish catches were processed after trap retrieval. All fish were enumerated, weighed, and measured to the nearest millimeter. Individuals of many species (mostly species found in the snapper-grouper complex) were further processed for additional lengths and biological samples (otoliths, gonads, and DNA). Video files were downloaded and backed up on digital media storage devices. Biological samples and video files were brought to the Beaufort Laboratory for further processing and analysis.

Environmental Data Collection

Environmental data were collected with Seabird “Conductivity, Temperature, and Depth” instrument package (CTD; model SBE 9) and Scientific Computer System (SCS) software. CTD casts were conducted near the middle of the camera-trap soak period; instruments were lowered to within 2 m of the bottom. Numerous water profile measurements were taken, including temperature (°C), salinity, dissolved oxygen (mg/L), average sound velocity (m/s), fluorescence (mg/m³), and beam transmission (%). CTD data were archived for further processing at the Beaufort Laboratory. SCS software 4.0 was used to collect specific information for each fishing and CTD event, including soak time/cast duration as well as start and end latitude, longitude, and depth (m). We had planned to deploy expendable bathythermographs (XBTs) during the mapping shift to collect water column temperature data while the ship was underway, but (1) the XBT system was not working and (2) very little mapping occurred because of the malfunctioning ME-70 mapping unit.

Acoustic Data Collection

We planned to use the *Pisces* ME-70 multibeam sonar unit 12 hours each night to create hydrographic maps for improving our understanding of the distribution of hardbottom in the Southeast. Mapping information in the region is critically important for (1) expanding fishery-independent sampling of reef fish, (2) improving our understanding of marine protected areas, (3) quantifying the relationship between the trap catch or video counts of reef fish and their habitat, (4) trying to scale up relative abundance information to true abundance of reef fish, which would benefit stock assessment greatly. Unfortunately, there are a number of significant problems with the *Pisces* ME-70 sonar unit.

1. The unit was primarily intended to collect data on fish in the water column, not bathymetric information about the bottom. SEFSC biologists have gone to great lengths (at a major cost to the government) the last 6 years to attempt to extract bathymetric information from the unit, with some success.
2. Hardware and software problems have limited the amount of time mapping data could be collected. For instance, various SEFSC cruises had to be temporarily stopped in 2013 and 2015 in order to pick up parts mailed to nearby ports, since spare parts were not on board.
3. Even after significant input from professional hydrographers (e.g., Glen Rice, Matthew Wilson), the unit has periodically regressed into a state of poor data collection. Documentation of system changes has been a significant challenge.
4. After a major system upgrade before the 2015 field season, the ME-70 was not able to collect any suitable mapping data on any cruises during 2015.
5. There has been limited historical real time mission tech support for the ME-70 from OMAO or Simrad staff. Thus, biologists and interested survey techs have had to figure out the highly complex system almost entirely on their own.

Given the problems encountered in 2015, SEFIS cruises were only able to collect limited ME-70 data, and the quality of mapping data was very poor (described below).

SURVEY RESULTS

Camera-Trap Sampling

Three hundred and twenty stations were sampled with camera-trap gear (Table 1). From these traps, fish from 35 taxa were collected and worked up for length frequency data. Various reef fish species were further processed for otolith, gonad, and DNA tissues. Two traps were lost during the SEFIS cruise (one got stuck on the bottom, one was cut off by the pot hauler); the trap stuck on the bottom was retrieved via SCUBA later in the cruise.

Environmental Data Collection

Fifty six CTD casts (Table 1) were conducted during the cruise. CTD data will be processed with Seabird SBE Data Processing software (version 7.2), and archived in a database at the NMFS-Beaufort Laboratory for future analysis.

Multibeam Acoustics Data Collection

The ME-70 mapping unit did not work during leg 1, and was able to turn on and collect data on a limited basis during leg 2. During leg 2, mapping was done during four nights (ranging from 1 – 10 hours) at four different areas in Onslow Bay, North Carolina. However, data quality was low and maps may not be usable.

Table 1. Summary of station coordinates, depth (m), date, and time for each fishing event (camera-trap, Gear=324; hook and line, Gear=014) and CTD cast (Gear=298) conducted on the PC-15-03 survey. Times were recorded in Coordinated Universal Time (UTC).

Collection	Gear	Date	Time (UTC)	Latitude	Longitude	Depth (m)
153537	324	7/10/2015	18:55	34.35868073	-76.37726593	23
153538	324	7/10/2015	19:01	34.35147095	-76.37840271	23
153539	324	7/10/2015	19:05	34.34736633	-76.38063812	23
153540	324	7/10/2015	19:09	34.34199524	-76.38005829	24
153541	324	7/10/2015	19:13	34.33820724	-76.37984467	22
153542	324	7/10/2015	19:17	34.33303452	-76.37899017	28
153543	298	7/10/2015	22:21	34.35606766	-76.37420654	26
153544	324	7/11/2015	11:41	34.47597885	-75.8785553	84
153545	324	7/11/2015	11:46	34.47415924	-75.88402557	80
153546	324	7/11/2015	11:52	34.47063065	-75.88267517	86
153547	324	7/11/2015	12:00	34.4679718	-75.8868866	83
153548	324	7/11/2015	12:07	34.46362686	-75.89601898	78
153549	324	7/11/2015	12:14	34.45901871	-75.90386963	79
153550	298	7/11/2015	12:27	34.45627594	-75.90024567	84
153551	324	7/11/2015	14:58	34.48416519	-75.8734436	82
153552	324	7/11/2015	15:04	34.48384094	-75.88048553	73
153553	324	7/11/2015	15:09	34.48826599	-75.88316345	72
153554	324	7/11/2015	15:22	34.47689056	-75.89704132	72
153555	324	7/11/2015	15:26	34.47378922	-75.89857483	72
153556	324	7/11/2015	15:37	34.4602623	-75.91636658	71
153557	298	7/11/2015	17:55	34.46100235	-75.91529846	70
153558	324	7/11/2015	19:59	34.60886383	-75.79967499	60
153559	324	7/11/2015	20:17	34.58342361	-75.78381348	67
153560	324	7/11/2015	20:32	34.57959366	-75.80945587	62
153561	324	7/11/2015	20:42	34.58024216	-75.82353973	61
153562	324	7/11/2015	20:47	34.5765686	-75.82756805	63
153563	324	7/11/2015	20:56	34.572052	-75.83966064	60
153564	324	7/12/2015	10:58	34.87196732	-75.50741577	57
153565	324	7/12/2015	11:05	34.86867523	-75.51692963	57
153566	324	7/12/2015	11:07	34.86821747	-75.51998901	58
153567	324	7/12/2015	11:12	34.8657341	-75.52571869	56
153568	324	7/12/2015	11:15	34.86483383	-75.52963257	57

153569	324	7/12/2015	11:18	34.86161423	-75.53203583	58
153570	298	7/12/2015	11:30	34.85898972	-75.53216553	61
153571	324	7/12/2015	14:42	34.92658615	-75.51210022	53
153572	324	7/12/2015	14:49	34.92225647	-75.50375366	54
153573	324	7/12/2015	14:57	34.91737747	-75.50816345	53
153574	324	7/12/2015	15:00	34.91469193	-75.50997925	54
153575	324	7/12/2015	15:05	34.90915298	-75.51391602	56
153576	324	7/12/2015	15:09	34.90625	-75.51683044	54
153577	298	7/12/2015	15:25	34.91041565	-75.52786255	52
153578	324	7/12/2015	19:03	34.99698639	-75.46629333	50
153579	324	7/12/2015	19:07	35.00111389	-75.46368408	50
153580	324	7/12/2015	19:10	35.00455856	-75.46237946	49
153581	324	7/12/2015	19:13	35.00804901	-75.4606781	50
153582	324	7/12/2015	19:18	35.01250076	-75.46376801	49
153583	324	7/12/2015	19:21	35.01520538	-75.46305847	48
153584	298	7/12/2015	19:32	35.01914978	-75.4553299	49
153585	324	7/13/2015	10:58	34.60770416	-76.19432068	37
153586	324	7/13/2015	11:03	34.6023407	-76.19992065	36
153587	324	7/13/2015	11:11	34.59178543	-76.20404053	36
153588	324	7/13/2015	11:18	34.5813942	-76.21151733	36
153589	324	7/13/2015	11:22	34.57893372	-76.21619415	36
153590	324	7/13/2015	11:25	34.57694244	-76.22012329	36
153591	298	7/13/2015	11:35	34.57714462	-76.22838593	36
153592	324	7/13/2015	13:53	34.56713486	-76.2048645	37
153593	324	7/13/2015	14:00	34.56687927	-76.21435547	37
153594	324	7/13/2015	14:07	34.56201935	-76.22299957	36
153595	324	7/13/2015	14:10	34.561409	-76.22865295	36
153596	324	7/13/2015	14:18	34.55433655	-76.23448181	36
153597	324	7/13/2015	14:25	34.54645538	-76.2375946	36
153598	298	7/13/2015	14:38	34.5449028	-76.22866821	36
153599	324	7/13/2015	19:51	34.54654312	-76.20477295	39
153600	324	7/13/2015	19:56	34.54295731	-76.20874786	39
153601	324	7/13/2015	19:59	34.53952789	-76.20994568	39
153602	324	7/13/2015	20:03	34.53702164	-76.21437836	39
153603	324	7/13/2015	20:07	34.53273773	-76.2155304	38
153604	324	7/13/2015	20:14	34.5236969	-76.21434784	39
153605	298	7/13/2015	20:23	34.52044678	-76.21060181	39
153606	324	7/14/2015	10:57	34.31853867	-76.87743378	27
153607	324	7/14/2015	11:01	34.31784439	-76.88357544	27
153608	324	7/14/2015	11:04	34.31621933	-76.88741302	27
153609	324	7/14/2015	11:08	34.31332397	-76.88355255	27
153610	324	7/14/2015	11:12	34.30957031	-76.88441467	26
153611	324	7/14/2015	11:16	34.30716324	-76.88902283	27
153612	298	7/14/2015	11:32	34.30143356	-76.88663483	28
153613	324	7/14/2015	14:25	34.28152847	-76.82331085	29
153614	324	7/14/2015	14:32	34.27397156	-76.82347107	29
153615	324	7/14/2015	14:38	34.26905441	-76.82776642	29
153616	324	7/14/2015	14:39	34.26719284	-76.82826233	30
153617	324	7/14/2015	14:42	34.26477051	-76.82888031	30

153618	324	7/14/2015	14:45	34.26161957	-76.8269043	30
153619	298	7/14/2015	14:57	34.25756454	-76.81864166	31
153620	324	7/14/2015	16:48	34.27015305	-76.81372833	29
153621	324	7/14/2015	16:52	34.26560211	-76.81580353	29
153622	324	7/14/2015	16:56	34.26129913	-76.81777954	29
153623	324	7/14/2015	17:03	34.2566185	-76.80780029	29
153624	324	7/14/2015	17:07	34.25246048	-76.8056488	28
153625	324	7/14/2015	17:10	34.24903107	-76.80347443	30
153626	298	7/14/2015	17:18	34.24657059	-76.79586792	30
153627	324	7/15/2015	16:42	33.81650162	-77.64038086	26
153628	324	7/15/2015	16:48	33.81280518	-77.646492	22
153629	324	7/15/2015	16:54	33.81120682	-77.63729858	23
153630	324	7/15/2015	16:58	33.80965805	-77.6415329	24
153631	324	7/15/2015	17:03	33.8071785	-77.63837433	23
153632	324	7/15/2015	17:11	33.79743576	-77.63394165	23
153633	298	7/15/2015	17:20	33.79471207	-77.62743378	23
153634	324	7/15/2015	19:57	33.72797012	-77.63783264	23
153635	324	7/15/2015	20:01	33.72515488	-77.63385773	24
153636	324	7/15/2015	20:05	33.72268295	-77.62994385	28
153637	324	7/15/2015	20:07	33.71957779	-77.62998962	24
153638	324	7/15/2015	20:11	33.71845627	-77.62612152	24
153639	324	7/15/2015	20:16	33.71371078	-77.62579346	24
153640	298	7/15/2015	20:25	33.7082634	-77.62475586	27
153641	324	7/16/2015	10:56	33.86505508	-77.28933716	32
153642	324	7/16/2015	11:01	33.85940933	-77.28845978	32
153643	324	7/16/2015	11:02	33.85743332	-77.28798676	33
153644	324	7/16/2015	11:05	33.85412598	-77.28752899	33
153645	324	7/16/2015	11:09	33.84987259	-77.28465271	35
153646	324	7/16/2015	11:13	33.84588242	-77.28266144	35
153647	298	7/16/2015	11:23	33.84315872	-77.28605652	35
153648	324	7/16/2015	13:46	33.8564415	-77.26721954	34
153649	324	7/16/2015	13:49	33.85194397	-77.26604462	33
153650	324	7/16/2015	13:52	33.84915543	-77.26548767	36
153651	324	7/16/2015	13:54	33.84650803	-77.26400757	36
153652	324	7/16/2015	13:59	33.84178543	-77.26194	35
153653	324	7/16/2015	14:05	33.83627319	-77.26525116	33
153654	298	7/16/2015	14:16	33.83454514	-77.27306366	33
153655	324	7/16/2015	16:45	33.80915451	-77.27342987	35
153656	324	7/16/2015	16:47	33.81148911	-77.27298737	32
153657	324	7/16/2015	16:51	33.81602097	-77.27137756	31
153658	324	7/16/2015	16:56	33.82161713	-77.26834106	30
153659	324	7/16/2015	16:59	33.825634	-77.26808167	31
153660	324	7/16/2015	17:03	33.83063889	-77.26624298	31
153661	298	7/16/2015	17:12	33.83552933	-77.26520538	34
153662	324	7/16/2015	19:28	33.87873459	-77.23548889	30
153663	324	7/16/2015	19:31	33.88361359	-77.23600006	30
153664	324	7/16/2015	19:36	33.88913345	-77.23851013	33
153665	298	7/16/2015	19:45	33.89357758	-77.23630524	31
153666	324	7/17/2015	10:57	33.43709564	-77.02755737	81

153667	324	7/17/2015	11:04	33.4330368	-77.0361557	86
153668	324	7/17/2015	11:09	33.43040848	-77.04411316	76
153669	324	7/17/2015	11:13	33.42818069	-77.04890442	79
153670	324	7/17/2015	11:16	33.42607117	-77.05262756	83
153671	324	7/17/2015	11:18	33.42459106	-77.05636597	82
153672	298	7/17/2015	11:28	33.42599106	-77.06227112	65
153673	324	7/17/2015	14:31	33.46685791	-76.9936676	74
153674	324	7/17/2015	14:33	33.46816635	-76.99023438	74
153675	324	7/17/2015	14:36	33.47024918	-76.98757935	74
153676	324	7/17/2015	14:39	33.47142029	-76.98390961	74
153677	324	7/17/2015	14:43	33.47338486	-76.97860718	76
153678	324	7/17/2015	14:46	33.47603226	-76.97438812	78
153679	298	7/17/2015	14:57	33.47865677	-76.96678925	81
153680	324	7/17/2015	17:48	33.46977615	-76.96902466	96
153681	324	7/17/2015	17:51	33.47169876	-76.96496582	96
153682	324	7/17/2015	17:54	33.4740715	-76.96125793	96
153683	298	7/17/2015	18:03	33.47720718	-76.95960236	83
153684	324	7/22/2015	10:58	34.54330063	-76.40105438	21
153685	324	7/22/2015	11:01	34.54063416	-76.40182495	21
153686	324	7/22/2015	11:03	34.5386467	-76.40146637	20
153687	324	7/22/2015	11:06	34.53723145	-76.40364075	19
153688	324	7/22/2015	11:11	34.53405762	-76.40315247	19
153689	324	7/22/2015	11:15	34.52952576	-76.40455627	19
153690	298	7/22/2015	11:24	34.52542496	-76.40299225	19
153691	324	7/22/2015	14:32	34.5145874	-76.35041809	24
153692	324	7/22/2015	14:39	34.52252579	-76.34894562	24
153693	324	7/22/2015	14:44	34.52619171	-76.35370636	24
153694	324	7/22/2015	14:53	34.53383255	-76.346138	24
153695	324	7/22/2015	15:00	34.54383087	-76.34270477	27
153696	324	7/22/2015	15:04	34.54880142	-76.34146881	27
153697	298	7/22/2015	15:12	34.55140686	-76.33869934	27
153698	324	7/22/2015	20:01	34.38780594	-76.59262848	22
153699	324	7/22/2015	20:05	34.38752747	-76.58669281	23
153700	324	7/22/2015	20:09	34.38814163	-76.5802536	23
153701	324	7/22/2015	20:12	34.388134	-76.57555389	20
153702	324	7/22/2015	20:18	34.38925171	-76.5670929	21
153703	324	7/22/2015	20:20	34.38941574	-76.56330872	22
153704	298	7/22/2015	20:27	34.38615036	-76.55856323	20
153705	324	7/23/2015	10:59	34.13197708	-76.54751587	37
153706	324	7/23/2015	11:02	34.12786484	-76.54928589	37
153707	324	7/23/2015	11:07	34.12222672	-76.55136871	37
153708	324	7/23/2015	11:11	34.11920929	-76.55420685	37
153709	324	7/23/2015	11:14	34.12107849	-76.55718231	38
153710	324	7/23/2015	11:17	34.1254158	-76.55859375	37
153711	298	7/23/2015	11:25	34.12990952	-76.55984497	38
153712	324	7/23/2015	15:20	34.23978043	-76.3945694	34
153713	324	7/23/2015	15:26	34.23393631	-76.39696503	32
153714	324	7/23/2015	15:28	34.23239517	-76.40013885	32
153715	324	7/23/2015	15:30	34.23391342	-76.40274048	32

153716	324	7/23/2015	15:36	34.23088074	-76.405159	34
153717	298	7/23/2015	15:44	34.22973251	-76.40850067	34
153718	324	7/24/2015	11:00	33.26577759	-77.56066895	41
153719	324	7/24/2015	11:03	33.26451492	-77.56409454	41
153720	324	7/24/2015	11:16	33.25987244	-77.59059143	39
153721	324	7/24/2015	11:21	33.25370026	-77.59423065	40
153722	324	7/24/2015	11:26	33.24879837	-77.59803009	41
153723	298	7/24/2015	11:39	33.24375916	-77.59574127	43
153724	324	7/24/2015	15:21	33.23386002	-77.29840088	63
153725	324	7/24/2015	15:24	33.23015594	-77.30026245	62
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153731	324	7/24/2015	20:02	33.31222153	-77.26112366	57
153732	324	7/24/2015	20:10	33.31490707	-77.25434875	58
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153739	324	7/25/2015	14:06	34.16413116	-77.28816223	26
153740	324	7/25/2015	14:11	34.16677856	-77.29315186	25
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153754	324	7/25/2015	20:52	34.05935669	-77.20240784	30
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153760	324	7/26/2015	11:04	34.28245163	-76.58346558	29
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153763	324	7/26/2015	11:23	34.30179977	-76.5814743	27
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153797	324	7/28/2015	10:55	33.97558212	-76.66311646	41
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153805	324	7/28/2015	14:36	33.93798447	-76.51667023	42
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153807	324	7/28/2015	14:44	33.93946075	-76.50869751	42
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153816	324	7/28/2015	17:59	33.87443542	-76.47612	77
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153820	324	7/28/2015	21:07	33.79806519	-76.57875061	96
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153829	324	7/29/2015	11:10	33.79904175	-76.69274139	44
153830	324	7/29/2015	11:13	33.80101395	-76.68965912	44
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153860	324	7/31/2015	11:37	34.32175064	-77.18153381	25
153861	324	7/31/2015	11:44	34.32852936	-77.18788147	24
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153864	324	7/31/2015	11:56	34.33934784	-77.19898987	23
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153866	298	7/31/2015	12:14	34.33777618	-77.20596313	23
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153876	324	7/31/2015	20:09	34.58745575	-76.94602966	18
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153882	324	8/1/2015	14:38	34.00597382	-77.37397766	32
153883	324	8/1/2015	14:43	34.00928879	-77.37847137	27
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153897	298	8/1/2015	20:23	33.96538925	-77.27294159	29
153898	324	8/2/2015	10:59	33.7872963	-76.83893585	41
153899	324	8/2/2015	11:05	33.77973557	-76.83649445	43
153900	324	8/2/2015	11:11	33.77967834	-76.84347534	44
153901	324	8/2/2015	11:16	33.77558899	-76.84710693	42
153902	298	8/2/2015	11:25	33.77181625	-76.85126495	44
153903	324	8/2/2015	14:01	33.69497681	-76.83976746	44
153904	324	8/2/2015	14:07	33.6940918	-76.8487854	44
153905	324	8/2/2015	14:16	33.69010162	-76.84187317	44
153906	324	8/2/2015	14:28	33.6831131	-76.85582733	45
153907	298	8/2/2015	14:36	33.68258667	-76.86009216	44
153908	324	8/2/2015	17:18	33.7030983	-77.02984619	39
153909	324	8/2/2015	17:27	33.69071579	-77.03586578	38
153910	324	8/2/2015	17:31	33.68558502	-77.03849792	38
153911	324	8/2/2015	17:36	33.68071365	-77.04155731	38

153912	298	8/2/2015	17:43	33.67655182	-77.04206085	39
154818	014	7/16/2015	21:46	33.88475037	-77.23612976	30
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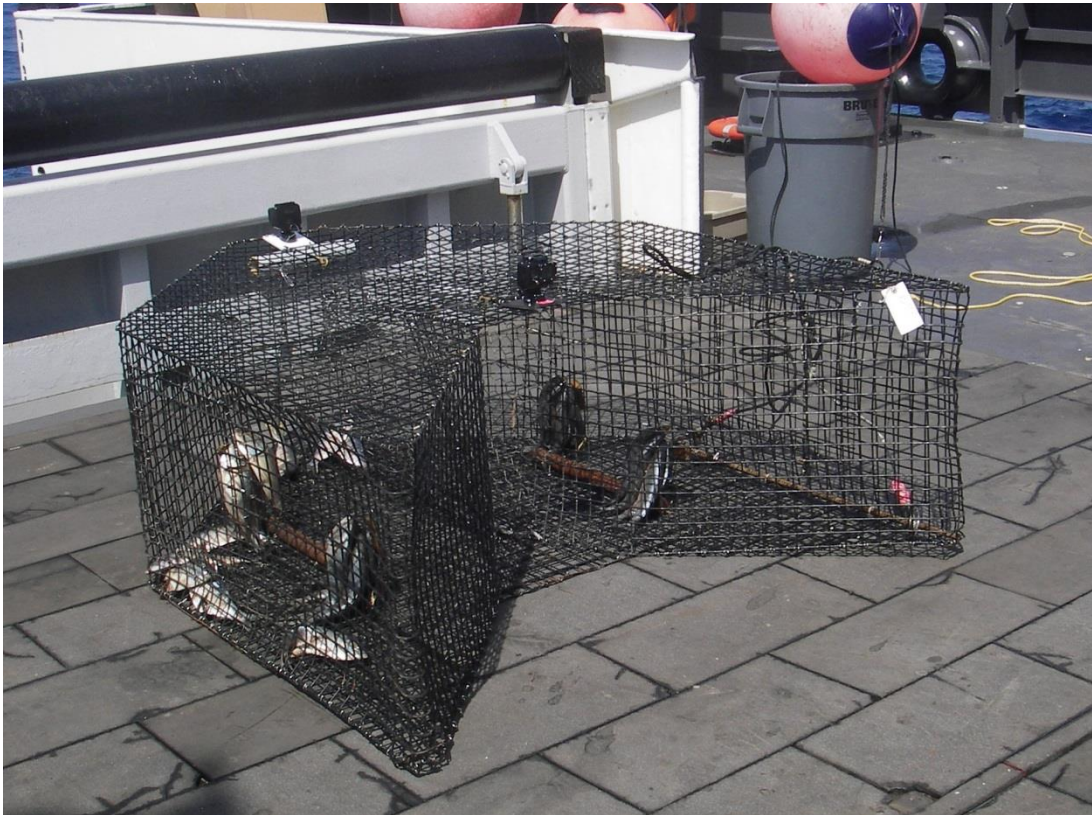


Figure 1. Chevron trap with video cameras used to sample reef fish on the PC-15-03 survey.

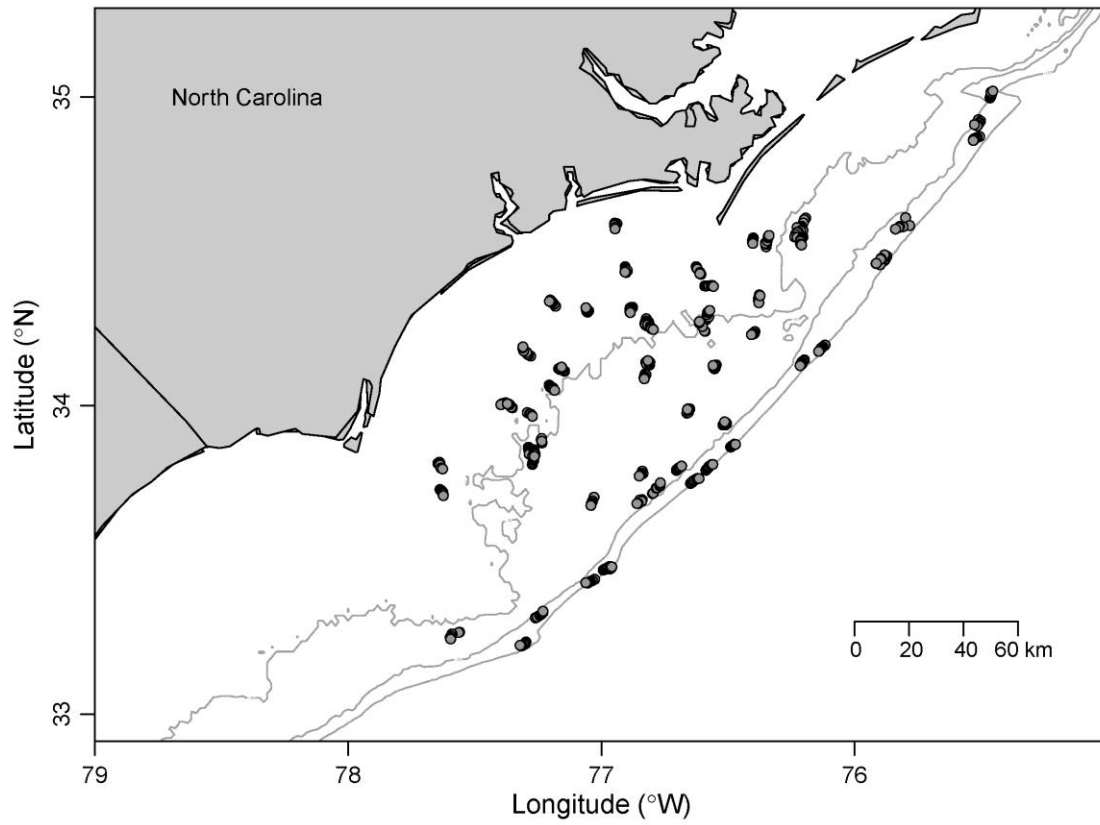


Figure 2. Locations sampled with traps and video cameras during the PC-15-03 cruise in Raleigh, Onslow, and Long bays, North Carolina. Gray bathymetry lines are 30, 50, and 100-m deep.

CRUISE PARTICIPANTS

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Jennifer Schull / Scientist / NMFS-Miami, FL
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Cruise Report Prepared by: Nate Bacheler and Christina Schobernd

Note: The use of trade, product, industry, or firm names, products, software, or models, whether commercially available or not, is for informative purposes only and does not constitute an endorsement by the U.S. Government or the National Oceanic and Atmospheric Administration.