CRUISE RESULTS

NOAA FRV *Gloria Michelle*
Door Calibration and Gulf of Maine Northern Shrimp Survey
GM 17-04, Parts I-IV
9 July – 4 August 2017

Submitted to: NOAA, NEFSC

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INTRODUCTION

This report summarizes results of the 2017 survey cruise for northern shrimp, *Pandalus borealis*, in the western Gulf of Maine. This was the 34th survey conducted by the Northeast Fisheries Science Center (NEFSC) in cooperation with the Northern Shrimp Technical Committee of the Atlantic States Marine Fisheries Commission. The survey is designed to provide data required for annual stock assessments and related tasks.

METHODS

The survey cruise was conducted from 9 July – 4 August 2017 aboard FRV *Gloria Michelle*, a 72-foot, 96 gross registered ton (GRT) stern trawler powered by a 365 horsepower Caterpillar diesel engine. Fieldwork was overseen by NEFSC staff. Participants included personnel from the NEFSC, the state agencies of Maine and Massachusetts, and the ASMFC.

Part I of the cruise (July 9-13) was dedicated to performing comparison tows between the standard 350 KG Portuguese doors and the new Bison size 7+ doors. Station locations during Part I were selected based on historical survey tows and were therefore non-random (Figure 2). Each plotted station was sampled once with each door type to obtain catch comparison data. All operational protocols were the same as for the regular survey, as outlined below. Catch results from comparison tows will be reported once all calibration cruises have been completed (likely during summer of 2018).

A stratified random sampling design was used to select stations sampled during the 2017 Northern shrimp survey (Parts II – IV; Figure 1). The number of stations allocated to each stratum was based on the importance of the stratum to the assessment and on the total area of the stratum. Additional non-random stations were also occupied. Field work was conducted during daylight hours in recognition of diel changes in northern shrimp availability. The survey was scheduled to be completed in three parts: Part II during 17 – 21 July; Part III, 24 - 28 July; Part IV, 31 July - 5 August 2017.

Locations of stations sampled during each part are given in Figure 2. The vessel departed Woods Hole, MA and made planned intermediate port calls in Portland, ME and New Castle, NH before returning to Woods Hole, MA. The 2017 survey lost 2 days of sampling due to weather.

At each station, a 15 minute tow was made at a vessel speed of two knots. Gear consisted of a four-seam modified commercial shrimp trawl fished at a scope of 3:1 in depths up to and including 85 fathoms; 250 fathoms of wire in depths between 86 and 100 fathoms; and a scope of 2.5:1 in depths greater than 100 fathoms. It should be noted that Bison size 7+ trawl doors were used for the entire 2017 shrimp survey. This is the first year that the survey has not utilized the standard 350KG Portuguese Polyvalent Doors. The Bison doors will permanently replace the Portuguese doors for all future surveys (calibration studies excluded). Additionally, the R/V Gloria Michelle installed new Pullmaster split winches to replace the historically used Marco winches during the winter of 2016/2017, prior to the 2017 survey.

Reference/hull surface temperatures and meteorological observations were recorded at each station. A NOTUS Trawl Monitoring System was used to monitor trawl gear performance on all survey tows. Doorspread, wingspread, vertical opening, and bottom contact of the trawl were transmitted and logged electronically. A Seabird long-endurance CTD was attached to the headrope of the net for each survey tow (not including calibration tows during part I) to collect temperature, depth, and conductivity data.

A 2 kilogram (kg) sample of Pandalid shrimp was collected at most stations to determine species composition. Length frequency measurements were collected for northern shrimp (mid- dorsal carapace length, rounded down to the nearest tenth of a millimeter) in addition to sex and female spawning condition (Rasmussen 1953; McCrary 1971). When less than 2 kg of shrimp were caught at a station, the entire catch was processed as described above.

For other species of invertebrates and finfish, standard NEFSC bottom trawl survey techniques (Azarovitz 1981, Grosslein 1969) were used to process the catch. Bony fish were measured to the nearest centimeter (cm) to the end of the central caudal ray; American lobsters were measured in millimeters (mm) from eye socket to end of carapace; and carapace width (cm) was recorded for crabs. Bivalves were measured by shell height (cm) and cephalopods were measured by mantle length (cm). All species weights were recorded to the nearest 0.001 kg. The remainder of the catch (miscellaneous invertebrates, trash, etc.) was recorded by weight. Total and individual weights and lengths for shrimp and all other measured species were recorded directly into the Fisheries Scientific Computer System (FSCS), version 2.0.

RESULTS

A total of 56 representative stations were completed. Northern shrimp were collected at 47 stations (Table 1). There were 8 non-random fixed stations. Stratum 8, tow 2 had the highest total weight of northern shrimp (21.898 kg) while the lowest weights were taken at Stratum 6, tow 1 and Stratum 7, tow 1 (.012 kg).

All shrimp, finfish, and select invertebrate data have been audited and archived in computer data files (total weight, number, and length frequencies). Scientific sample collections are summarized in Table 2. This information is available on request (refer to NEFSC Survey Master Data files Cruise Code 201770).

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McCrary, J. A. 1971. Sternal spines as a characteristic for differentiating between females of some Pandalidae. J. Fish. Res. Board Can., 28: 98-100.

Rasmussen, B. 1953. On the geographical variation in growth and sexual development of the deep sea prawn (Pandalus borealis kr.). Norway Fish. Mar. Invest. Rep., 10 (3); 1-160.

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NEFSC Ecosystems Survey Branch Shrimp Cruise Reports

Table 1. Summary of stations and northern shrimp collected on the 2017 NOAA Fisheries Service, Northeast Fisheries Science Center northern shrimp survey in the western Gulf of Maine aboard FRV *Gloria Michelle*, 17 July – 4 August 2017.

STRATUM-TOW	STATION	LATITUDE	LONGITUDE	DEPTH (m)	BOTTOM TEMP (C)	TOTAL No. <= 22mm	TOTAL No. > 22mm	TOTAL NUMBER	TOTAL WEIGHT (kg)
8-2	19	43 39	68 39	141	7.47	1237	1171	2408	21.898
10-5	21	43 48	68 20	143	7.41	0	1	1	0.02
10-1	22	43 52	68 10	181	8.12	1	0	1	0.013
8-1	25	43 21	68 37	157	7.7	79	57	136	1.299
6-4	26	43 29	69 03	151	5.56	305	294	599	4.901
6-3	27	43 32	69 10	144	5.48	209	198	407	3.38
6-7	28	43 31	69 27	145	5.83	53	191	244	2.718
3-3	29	43 40	69 31	131	5.54	340	196	536	4.806
3-8	30	43 32	69 35	156	5.52	16	153	169	2.108
3-4	31	43 24	69 37	159	6.22	55	118	173	1.722
3-2	32	43 18	69 49	176	6.68	71	80	151	1.418
3-10	33	43 11	69 46	159	6.49	33	63	96	0.979
3-11	34	43 06	69 46	166	6.38	60	108	168	1.608
3-1	35	43 23	69 45	146	6.17	333	352	685	6.164
3-9	36	43 30	69 47	130	5.54	521	359	880	7.884
1-7	37	43 00	70 18	143	5.17	96	172	268	2.558
1-4	38	42 56	70 14	179	5.15	406	608	1014	10.096
3-6	39	42 59	69 35	166	5.77	41	65	106	0.826
6-2	41	42 52	69 28	169	6.31	6	7	13	0.116
3-5	42	42 48	69 32	185	7.13	19	16	35	0.293
3-7	43	42 53	69 34	179	6.89	13	19	32	0.263
5-7	44	42 53	69 44	209	7.46	13	17	30	0.292
5-1	45	42 59	69 49	197	7.54	11	41	52	0.573
1-5	46	43 18	70 06	137	5.51	468	191	659	4.525
1-2	47	43 14	70 09	137	5.43	78	70	148	1.145
1-6	48	43 10	70 06	160	5.66	654	1437	2091	21.739
1-1	49	43 03	70 12	167	5.24	201	377	578	5.618
1-3	50	42 58	70 20	137	5.12	183	256	439	3.966
1-8	51	42 57	70 15	174	5.14	306	487	793	7.135
6-8	52	43 22	69 27	174	NA	64	147	211	2.15
6-9	53	43 22	69 24	177	6.4	54	154	208	1.988
6-10	54	43 10	69 17	202	6.22	19	27	46	0.416

STRATUM-TOW	STATION	LATITUDE	LONGITUDE	DEPTH (m)	BOTTOM TEMP (C)	TOTAL No. <= 22mm	TOTAL No. > 22mm	TOTAL NUMBER	TOTAL WEIGHT (kg)
6-15	55	43 09	69 08	190	6.21	22	32	54	0.495
6-14	56	43 07	69 00	166	6.16	4	5	9	0.085
8-8	57	43 09	68 56	177	6.7	7	9	16	0.156
8-7	58	43 06	68 42	183	7.07	28	33	61	0.544
8-6	59	42 55	68 41	195	7.96	5	0	5	0.038
8-5	60	42 52	68 43	206	8.42	1	2	3	0.037
8-9	61	42 58	68 50	183	7.23	26	11	37	0.31
8-3	62	42 53	68 50	174	7.48	7	7	14	0.147
6-1	63	42 46	69 02	179	6.48	0	1	1	0.012
7-2	66	42 38	69 16	204	7.82	1	0	1	0.015
5-5	67	42 47	69 37	214	7.72	4	19	23	0.244
7-1	68	42 28	69 18	226	7.81	1	0	1	0.012
7-3	70	42 16	69 14	221	7.62	3	5	8	0.097
7-5	71	42 12	69 27	218	7.54	0	2	2	0.028
5-4	75	42 12	69 50	213	7.61	1	4	5	0.067

Table 2. Miscellaneous scientific collections made on the 2017 NOAA Fisheries Service, Northeast Fisheries Science Center northern shrimp survey in the western Gulf of Maine aboard FRV *Gloria Michelle*, 17 July – 4 August 2017.

Investigator & Affiliation	Samples Saved	Approximate Number
Age Samples, NMFS, NEFSC, Woods Hole, MA	White Hake	171 otoliths
Anne Richards, NMFS, NEFSC, Woods Hole, MA	Goosefish	4 Whole Fish
Peter Chase, NMFS, NEFSC, Woods Hole, MA	Misc Inverts for ID	6 individuals
Rich Langton, NMFS, NEFSC, Orono, ME	Sea Pens	27 bags
John Galbraith, NMFS, NEFSC, Woods Hole, MA	Misc fish for ID	10 individuals

Figure 1. Northern shrimp survey strata and observed distribution of catch per tow (kg) of northern shrimp collected during the 2017 NOAA Fisheries Service, Northeast Fisheries Science Center northern shrimp survey in the western Gulf of Maine aboard FRV *Gloria Michelle*, 17 July – 4 August 2017.

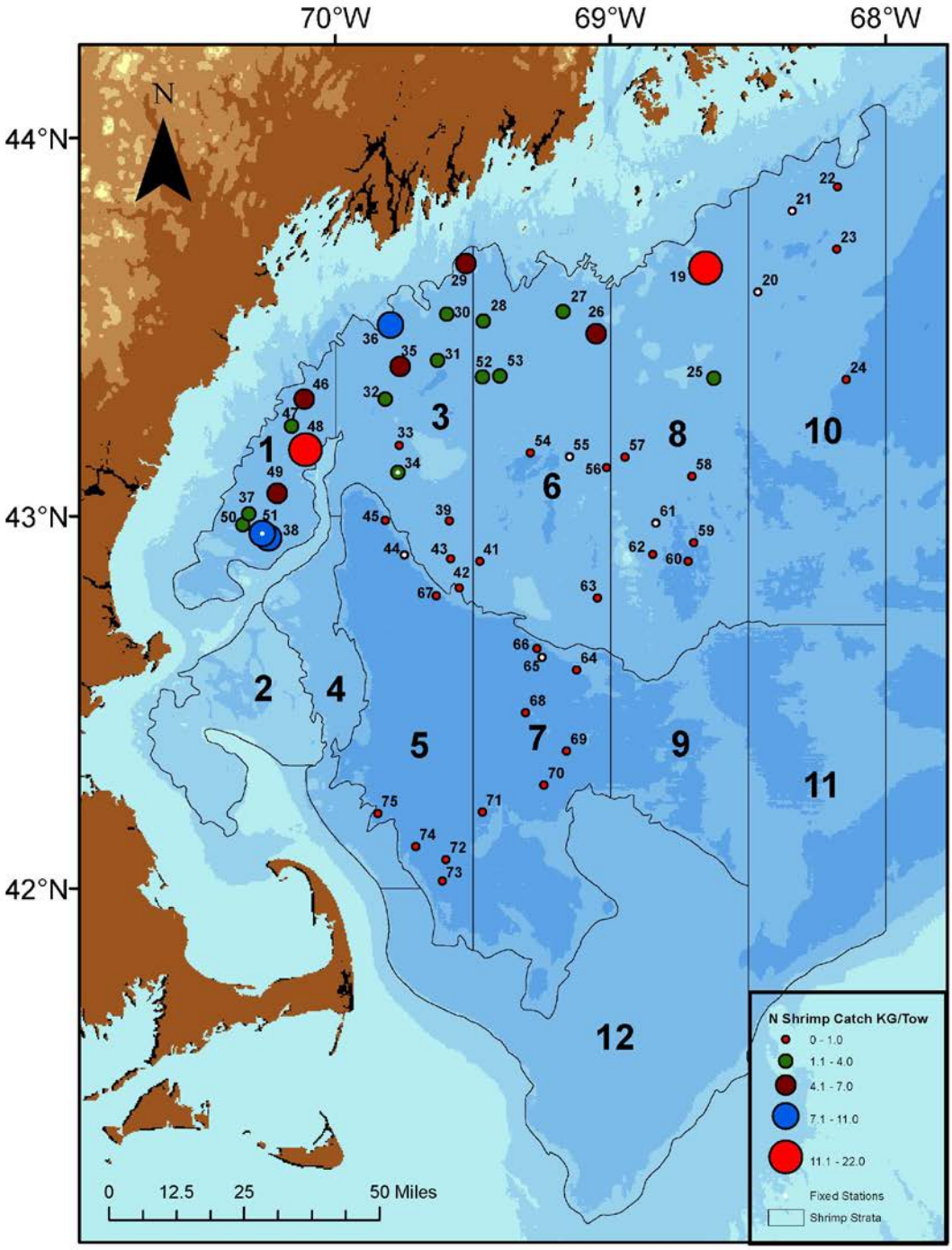
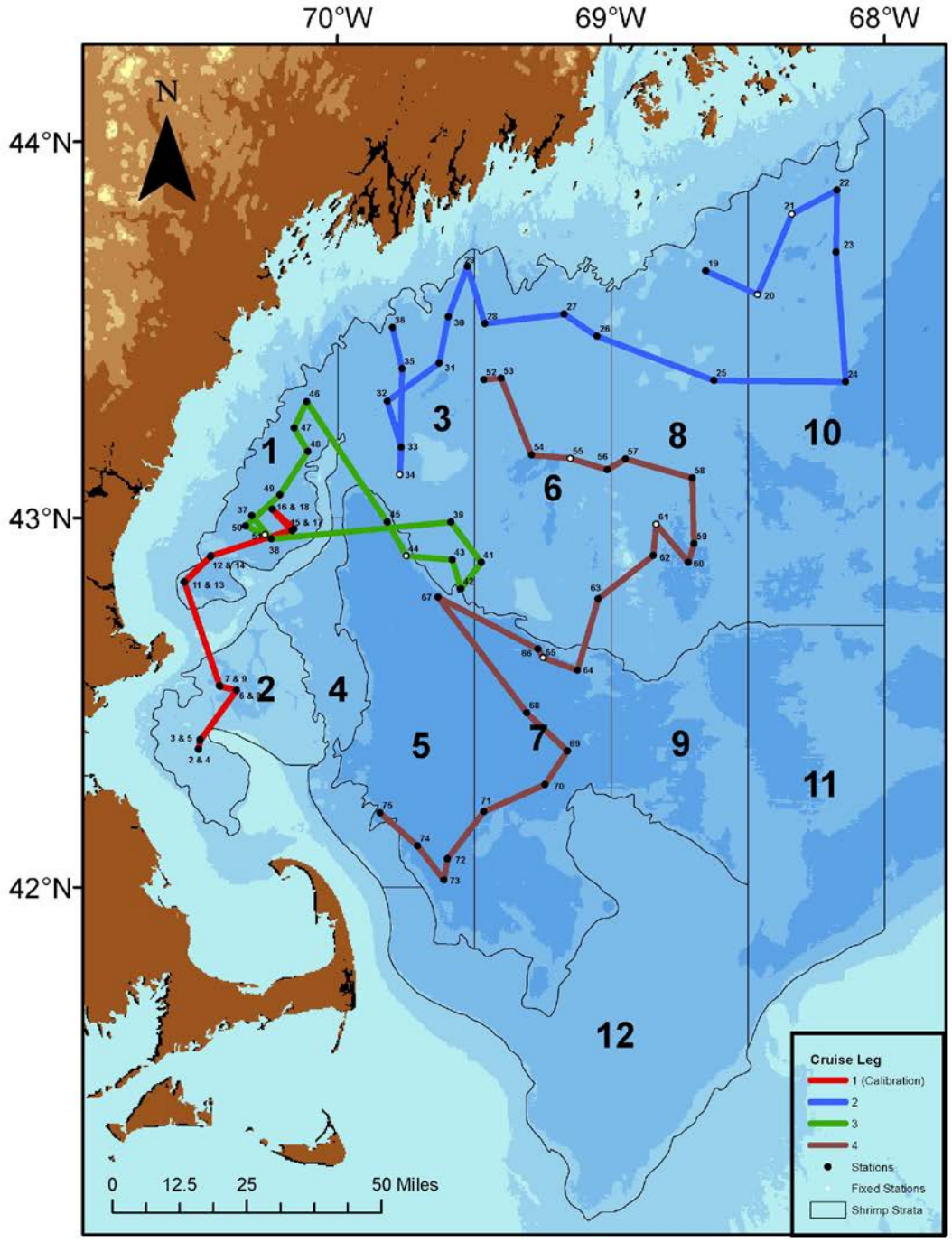


Figure 2. Trawl hauls made during the 2017 NOAA Fisheries Service, Northeast Fisheries Science Center northern shrimp survey and trawl door calibration in the Gulf of Maine aboard FRV *Gloria Michelle*, 9 July – 4 August 2017.



Appendix I. Participants on the 2017 National Marine Fisheries Service, Northeast Fisheries Science Center northern shrimp survey and trawl door calibration cruise in the western Gulf of Maine aboard FRV *Gloria Michelle*, 9 July to 4 August 2017.

National Marine Fisheries Service, NEFSC, Woods Hole, MA

Peter Chase, Chief Scientist[1, 2]
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Jakub Kircun, Chief Scientist[3]
Paul Kostovick[1]
Richard Raynes[1]
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Mike Kersula[1,2,3]

Atlantic States Marine Fisheries Commission

Lisa Havel[3]

NH Department of Fish and Game, Durham, NH

Robert Eckert[1]
Kara Villone[2]

Volunteers

Ashley Charleson[3]
Vanessa Blair-Gantz[4]
Charles Woodbury[2]

Gloria Michelle Crew

LTJG Andrew Reynaga[1,2,3,4]
ENS Chris Gallagher[1,2,3,4]
George Morton[1,2,3,4]
Emma Ethier[1]
Cristina Bascunan[2]
Tyler Alrich[3]
LTJG Blair Delean[4]

[1] 9 – 13 July
[2] 17 – 21 July
[3] 24 - 28 July
[4] 31 July – 4 August