CRUISE RESULTS Gulf of Maine Northern Shrimp Survey

NOAA FRV Gloria Michelle

Cruise No. GM 23-03 (Parts I-III)

NOAA National Marine Fisheries Service Northeast Fisheries Science Center

Submitted to: NOAA, NEFSC

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NOAA FRV *Gloria Michelle*
Gulf of Maine Northern Shrimp Survey
GM 23-03 Parts I-III
07 July - 25 July 2023

INTRODUCTION

This report summarizes results of the 2023 survey cruise for northern shrimp, *Pandalus borealis*, in the western Gulf of Maine. This was the 40th survey conducted by the Northeast Fisheries Science Center (NEFSC) in cooperation with the Northern Shrimp Technical Committee of the Atlantic States Marine Fisheries Commission (ASMFC). The survey is designed to provide data required for annual stock assessments and related tasks.

METHODS

The survey cruise was conducted from 07 July to 25 July 2023 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 and the ASMFC.

The 2023 Northern Shrimp Survey was completed over the course of three survey legs. A stratified random sampling design was used to select stations sampled (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: Leg 1 during 7 – 12 July; Leg 2 during 14 – 18 July; Leg 3 during 19 – 25 July 2023.

The vessel departed Woods Hole, MA and made intermediate port calls in New Castle, NH before ending the survey in Woods Hole, MA.

At each station, a 15 minute tow was made at a vessel speed of two knots. Gear consisted of Bison size 7+ trawl doors and 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.

Reference/hull surface temperatures and meteorological observations were recorded at each station. A NOTUS Trawl Monitoring System was deployed to monitor trawl gear performance on all survey tows. Door spread, vertical opening, wing spread, 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 to collect temperature, depth, and conductivity data.

A 2 kilogram (kg) subsample of Pandalid shrimp was collected at stations where the catch was greater than 2 kg to determine species composition. Length frequency measurements were collected for northern shrimp, *P. borealis* (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

During legs 1 – 3 of the shrimp survey, a total of 62 representative stations and 1 non-representative stations were completed. Northern shrimp were collected at 25 stations (Table 1). There were 20 representative fixed stations and 0 non-representative fixed station. Stratum 6, tow 12 had the highest total catch weight of northern shrimp (1.584 kg).

All shrimp, finfish, and select invertebrate data have been audited and archived in computer data files (total weights, numbers, 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 202370).

REFERENCES

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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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Table 1. Summary of stations where northern shrimp were collected during the 2023 NOAA Northeast Fisheries Science Center Gulf of Maine Northern Shrimp Survey aboard FRV Gloria Michelle, July 07 - July 25, 2023. (* indicates a Non-Representative tow)

Stratum-Tow	Station	Latitude	Longitude	Depth (m)	Bottom Temp (C)	Number ≤ 22 mm	Number > 22 mm	Total Number	Total weight (kg)
6-17	4*					0	0	0	0.000
6-3	5	42.759	-69.479	180	8.06	0	0	0	0.000
6-2	6	42.785	-69.296	71	6.89	0	0	0	0.000
6-8	7	42.995	-69.223	214	7.18	0	2	0	0.024
6-1	8	43.048	-69.346	196	7.19	0	1	0	0.014
6-15	9	43.146	-69.153	187	7.56	0	0	0	0.000
8-4	10	42.826	-68.798	210	8.58	0	0	0	0.000
8-7	11	42.846	-68.802	210	8.60	0	0	0	0.000
8-9	13	42.987	-68.830	181	8.46	0	0	0	0.000
8-6	14	43.036	-68.874	179	8.36	0	0	0	0.000
6-13	15	43.161	-69.127	187	7.44	0	0	0	0.000
8-8	16	43.281	-68.906	154	7.37	0	2	0	0.026
8-3	17	43.176	-68.910	175	8.00	0	2	0	0.024
10-4	18	43.257	-68.464	188	9.04	0	3	0	0.044
10-6	19	43.252	-68.329	185	9.22	0	0	0	0.000
10-2	20	43.563	-68.177	180	9.06	0	0	0	0.000
10-1	21	43.650	-68.040	190	9.03	0	0	0	0.000
10-5	22	43.573	-68.487	182	8.72	0	0	0	0.000
8-5	23	43.795	-68.619	120	8.08	0	29	0	0.429
8-10	24	43.534	-68.782	145	7.94	0	4	0	0.062
6-9	25	43.403	-69.036	155	7.09	1	3	4	0.054
6-5	26	43.544	-69.167	137	6.62	0	25	0	0.314

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Stratum-Tow	Station	Latitude	Longitude	Depth (m)	Bottom Temp (C)	Number ≤ 22 mm	Number > 22 mm	Total Number	Total weight (kg)
6-12	27	43.512	-69.404	149	6.81	2	124	126	1.584
6-7	28	43.421	-69.323	166	6.97	0	0	0	0.000
6-4	29	43.375	-69.298	167	6.96	0	1	0	0.016
1-7	30	43.067	-70.165	169	6.27	0	1	0	0.014
1-1	31	43.028	-70.312	145	6.04	0	15	0	0.247
1-6	32	43.170	-70.126	163	6.63	0	1	0	0.016
1-3	33	43.219	-70.019	130	6.27	0	1	0	0.016
3-6	34	43.350	-69.958	161	7.25	1	2	3	0.038
3-5	35	43.450	-69.903	147	6.92	0	11	0	0.158
3-12	36	43.376	-69.962	159	7.16	9	3	12	0.135
3-10	37	43.502	-69.935	118	6.81	0	4	0	0.056
3-1	38	43.489	-69.642	110	6.72	0	0	0	0.000
3-2	39	43.540	-69.536	147	6.71	0	2	0	0.032
6-16	40	43.331	-69.357	175	7.12	0	0	0	0.000
3-9	41	43.236	-69.592	148	7.10	0	0	0	0.000
3-8	42	43.227	-69.852	174	7.82	0	3	0	0.048
3-11	43	43.128	-69.770	163	7.83	0	0	0	0.000
5-7	44	42.793	-69.647	220	8.33	0	0	0	0.000
3-4	45	42.891	-69.613	164	7.87	0	0	0	0.000
5-8	46	42.891	-69.746	208	8.27	0	0	0	0.000
2-3	47	42.384	-70.495	89	6.29	0	1	0	0.020
2-4	48	42.528	-70.431	99	6.50	0	0	0	0.000

Table 1. Summary of stations where northern shrimp were collected during the 2023 NOAA Northeast Fisheries Science Center Gulf of Maine Northern Shrimp Survey aboard FRV Gloria Michelle, July 07 - July 25, 2023. (* indicates a Non-Representative tow)

Stratum-Tow	Station	Latitude	Longitude	Depth (m)	Bottom Temp (C)	Number ≤ 22 mm	Number > 22 mm	Total Number	Total weight (kg)
1-4	49	42.831	-70.425	128	5.90	0	0	0	0.058
1-8	50	42.897	-70.472	111	5.95	0	0	0	0.768
5-6	51	42.950	-69.804	209	8.34	0	0	0	0.000
5-2	52	42.760	-69.954	197	8.25	0	0	0	0.000
4-3	53	42.629	-69.975	187	7.73	0	0	0	0.000
1-9	54	42.978	-70.268	160	6.13	0	11	0	0.188
5-3	55	42.450	-69.898	190	7.76	0	0	0	0.000
5-5	56	42.301	-69.925	199	7.86	0	0	0	0.000
4-4	57	42.080	-69.873	117	6.58	0	0	0	0.000
7-5	58	42.183	-69.369	199	7.90	0	0	0	0.000
7-4	59	42.025	-69.319	209	7.95	0	0	0	0.000
7-1	60	41.986	-69.246	212	7.98	0	0	0	0.000
7-6	61	41.957	-69.179	213	7.87	0	0	0	0.000
9-4	62	42.225	-68.681	204	7.49	0	0	0	0.000
9-2	63	42.241	-68.642	195	7.55	0	0	0	0.000
9-1	64	42.295	-68.519	179	7.62	0	0	0	0.000
9-3	65	42.530	-68.763	198	8.93	0	0	0	0.000
7-8	66	42.478	-69.021	223	8.88	0	0	0	0.000
7-7	67	42.622	-69.248	215	8.46	0	0	0	0.000

Table 2. Miscellaneous scientific collections made during the 2023 NOAA Northeast Fisheries Science Center Gulf of Maine Northern Shrimp Survey aboard FRV Gloria Michelle, July 07 - July 25, 2023.

Investigator and Affiliation	Scientific Name	Common Name	Approximate Number
Age & Growth, NMFS, NEFSC, Woods Hole, MA	*Clupea harengus*	Atlantic Herring	121 heads
Age & Growth, NMFS, NEFSC, Woods Hole, MA	*Urophycis tenuis*	White Hake	171 otoliths

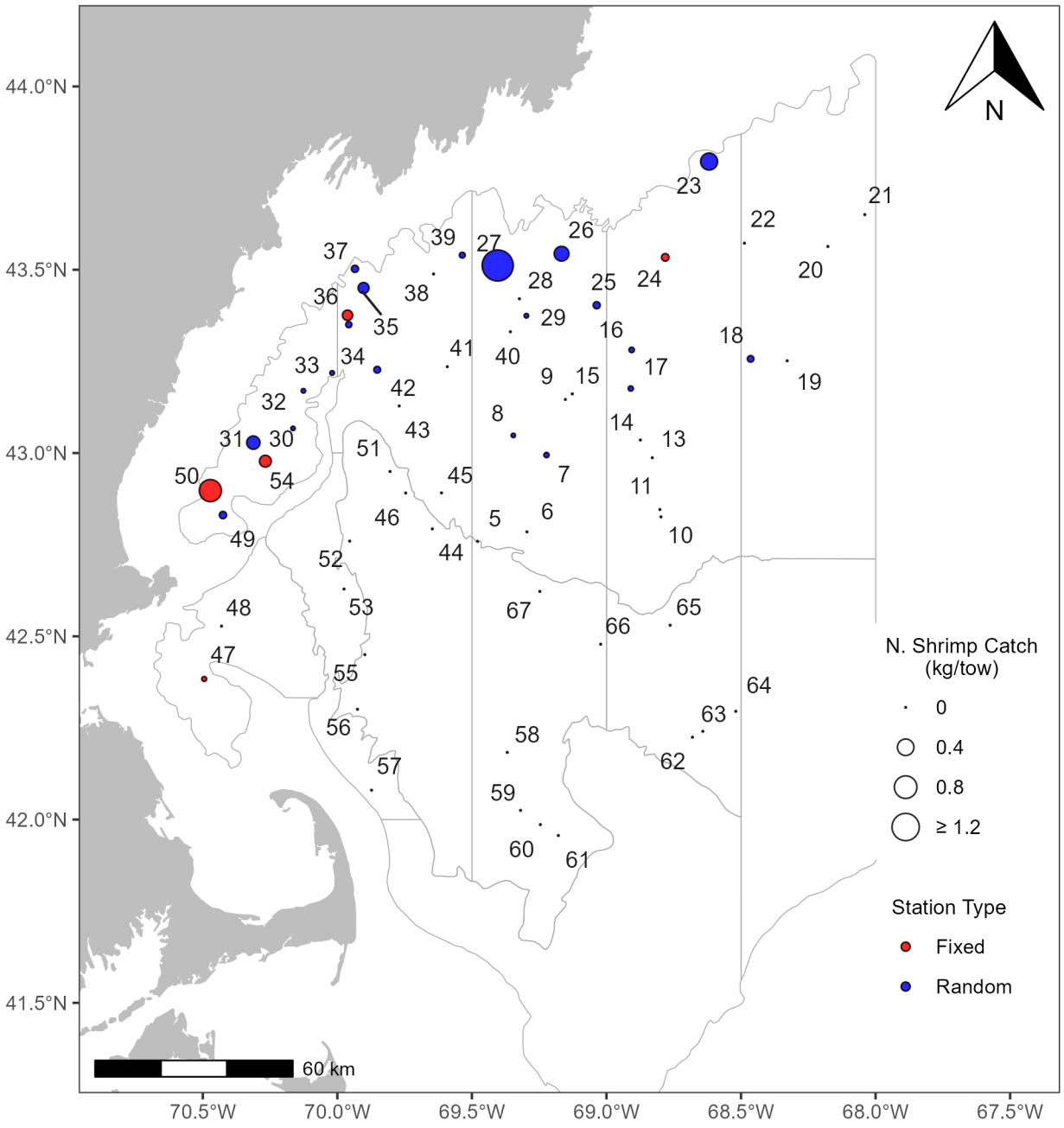

Figure 1: *Northern shrimp survey strata and observed distribution of catch (kg) per tow of northern shrimp collected during the 2023 NOAA Northeast Fisheries Science Center Gulf of Maine Northern Shrimp Survey aboard FRV Gloria Michelle, July 07 - July 25, 2023.*

Appendix I. Participants on the 2023 NOAA Northeast Fisheries Science Center Gulf of Maine Northern Shrimp Survey aboard FRV Gloria Michelle, 07 July - 25 July 2023.

National Marine Fisheries Service, NEFSC, Woods Hole, MA

Mike Bergman, Chief Scientist [1,2]
Pete Chase, Chief Scientist [3]
Nancy McHugh [1]
Dom St Amand [1]
Joe Dunphy [1,2]
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Megan Barry [2,3]
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LT Alex Creed [1,2,3]
LTJG Trevor Grams [1,2,3]
Carolina Breakell [1,2]
Elizabeth Alonzo [1,3]
Jason Lucarelli [2,3]

[1] 7 – 12 July

[2] 14-18 July

[3] 20-25 July