



10 October 2012

CRUISE RESULTS

NOAA FRV *Gloria Michelle*
Gulf of Maine Northern Shrimp Survey
GM 12-03, Parts I-IV
22 July – 18 August 2012

INTRODUCTION

This report summarizes results of the 2012 survey cruise for northern shrimp, *Pandalus borealis*, in the western Gulf of Maine. This was the 29th 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 22 July – 18 August 2012 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 state agencies of Maine and Massachusetts (see Appendix I).

A stratified random sampling design was used to select stations sampled during the survey (Figure 1). The number of stations allocated to each stratum was roughly proportional to the area of that 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 conducted in four parts: Part I was during 22 – 27 July; Part II, 30 July – August 3; Part III, 6 - 10 August; Part IV, 13 - 18 August 2012. 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 Gloucester, MA before returning to Woods Hole, MA.

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. Reference/hull surface temperatures and meteorological observations were recorded at each station. A Vemco Minilogger was used to record the bottom temperatures during the survey. Northstar Technical Inc. Netmind Trawl Monitor System was used to monitor trawl gear performance on most survey tows. Doorspread and bottom contact of the trawl were transmitted and logged electronically. A Seabird SBE 19 CTD was attached to the headrope of the net on each tow to collect temperature, depth, and conductivity data. This was the first time deploying a SBE 19 during a shrimp survey and its use was considered experimental.

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 was 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 volume. Total and individual weights and lengths information for shrimp and all other measured species were recorded directly into the Fisheries Scientific Computer System (FSCS), version 2.0.

RESULTS

A total of 80 stations were occupied. Northern shrimp were collected at 71 stations (Table 1). There were 20 non-random fixed stations. Stratum 10, tow 2 had the highest total number of northern shrimp while the lowest number was taken in Stratum 9, tow 1.

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 201270).

REFERENCES

- Azarovitz, T. R. 1981. A brief historical review of the Woods Hole Laboratory trawl survey time series. *Can. Spec. Publ. Fish. Aquat. Sci.*, 58: 62-67.
- Grosslein, M. D. 1969. Groundfish survey methods. NMFS, Woods Hole, Lab. Ref. Doc. 69-2, 34p.
- 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.

Table 1. Summary of stations and northern shrimp collected on the 2012 National Marine Fisheries Service, Northeast Fisheries Science Center northern shrimp survey in the western Gulf of Maine aboard FRV *Gloria Michelle*, 22 July – 18 August 2012.

STRATUM-TOW	STATION	LATITUDE	LONGITUDE	DEPTH (m)	BOTTOM TEMP (C)	TOTAL No. <= 22mm	TOTAL No. > 22mm	TOTAL NUMBER	TOTAL WEIGHT (kg)
5-1	4	42 59	69 48	191	8.1	2	50	52	0.558
1-6	7	43 03	70 12	167	6.6	1608	3241	4849	42.26
1-4	8	42 56	70 23	120	6.0	2400	1056	3456	20.057
1-9	9	42 52	70 27	116	6.0	2182	3129	5311	43.057
1-3	10	42 47	70 22	81	6.1	12	0	12	0.038
1-1	11	42 55	70 20	139	6.1	2150	2914	5064	40.206
1-8	12	42 58	70 15	158	6.4	1625	3825	5450	47.606
1-2	13	42 59	70 25	104	6.4	736	8	744	1.591
1-5	14	43 11	70 12	109	6.6	267	33	300	1.345
1-7	15	43 15	70 15	100	6.9	30	0	30	0.068
3-12	17	43 20	69 57	156	7.3	3778	5194	8972	68.716
3-9	18	43 14	69 53	170	7.8	183	888	1071	10.193
3-1	20	43 10	69 44	137	7.0	1193	1924	3117	26.387
3-11	21	43 06	69 46	157	7.8	281	776	1057	9.754
3-4	22	43 04	69 46	155	7.8	374	1343	1717	15.864
3-5	23	43 14	69 30	144	7.0	944	1319	2263	19.941
6-16	25	43 19	69 21	170	6.9	357	1189	1546	14.59
3-10	26	43 28	69 31	159	6.9	386	1036	1422	13.189
3-8	27	43 34	69 44	104	7.5	366	761	1127	8.92
6-13	28	43 34	69 07	130	6.7	1024	982	2006	13.979
6-9	29	43 34	69 02	132	6.9	959	944	1903	14.473
6-10	30	43 29	69 03	145	6.7	790	550	1340	9.185
6-11	31	43 30	69 12	145	6.7	983	1004	1987	15.203
6-5	32	43 19	69 05	148	6.9	453	560	1013	8.193
6-8	33	43 20	69 12	148	6.9	342	743	1085	9.235
8-5	34	43 47	68 41	101	9.1	35	45	80	0.512
8-7	36	43 48	68 37	109	9.1	221	154	375	2.38
10-2	37	43 46	68 29	146	8.5	5200	6000	11200	99.676
8-3	39	43 45	68 31	146	8.5	1053	1742	2795	25.581
8-10	40	43 32	68 46	141	8.5	291	387	678	5.551
10-6	41	43 34	68 29	172	8.1	75	338	413	4.118
10-4	42	43 26	68 14	173	8.8	212	539	751	6.264
10-1	43	43 22	68 29	180	8.2	412	540	952	7.849
6-3	44	43 28	69 27	146	6.9	625	985	1610	12.96
2-3	45	42 31	70 26	95	7.3	19	1	20	0.077
2-4	46	42 23	70 29	84	7.0	668	258	926	5.095
2-2	47	42 19	70 24	93	7.0	373	165	538	4.341
4-1	49	42 32	70 00	141	7.2	44	24	68	0.424
10-5	50	43 14	68 19	181	8.7	237	288	525	4.58
10-3	51	43 03	68 24	198	8.4	243	406	649	6.291

STRATUM-TOW	STATION	LATITUDE	LONGITUDE	DEPTH (m)	BOTTOM TEMP (C)	TOTAL No. <= 22mm	TOTAL No. > 22mm	TOTAL NUMBER	TOTAL WEIGHT (kg)
8-1	52	43 06	68 40	179	8.5	25	198	223	2.404
8-8	53	43 12	68 47	166	8.7	325	551	876	8.35
8-4	54	43 09	68 47	169	8.7	75	358	433	4.557
8-2	55	43 04	68 43	179	8.5	5	51	56	0.623
8-9	56	42 58	68 50	175	8.8	26	124	150	1.564
6-12	57	42 54	69 04	179	8.2	5	27	32	0.338
6-4	58	43 03	69 12	185	7.5	93	387	480	5.063
6-15	60	43 08	69 09	183	8.2	444	1608	2052	20.889
6-2	62	43 04	69 29	151	6.9	98	242	340	2.945
6-7	63	42 58	69 25	176	7.2	156	660	816	7.855
6-14	65	42 54	69 17	155	7.0	22	149	171	1.718
6-6	66	42 47	69 27	159	7.9	6	93	99	1.078
6-1	67	42 46	69 12	148	7.2	6	9	15	0.123
7-7	69	42 38	69 16	206	8.4	12	9	21	0.151
4-4	73	42 38	69 58	181	7.9	310	536	846	7.137
5-3	74	42 49	69 56	207	8.4	12	122	134	1.464
5-7	75	42 53	69 45	208	8.2	28	320	348	3.668
3-2	76	42 54	69 35	163	8.1	20	109	129	1.213
3-6	77	42 49	69 35	173	8.1	13	103	116	1.194
5-8	78	42 48	69 39	210	8.2	1	22	23	0.283
5-5	79	42 44	69 33	216	8.2	3	53	56	0.618
5-6	81	42 24	69 51	226	8.3	12	64	76	0.778
7-8	83	42 26	69 03	217	8.4	1	14	15	0.063
9-4	84	42 31	68 47	200	8.3	3	15	18	0.216
8-6	85	42 45	68 44	198	8.5	3	63	66	0.757
9-1	86	42 25	68 42	196	8.4	1	3	4	0.056
9-2	89	42 22	68 53	205	8.3	2	13	15	0.175
9-3	90	42 20	68 56	212	8.3	2	18	20	0.25
7-1	91	42 18	69 02	209	8.3	2	28	30	0.352
7-4	92	42 06	69 11	185	8.0	1	16	17	0.219
5-2	96	42 03	69 44	193	7.9	6	15	21	0.192

Table 2. Miscellaneous scientific collections made on the 2011 National Marine Fisheries Service, Northeast Fisheries Science Center northern shrimp survey in the western Gulf of Maine aboard FRV *Gloria Michelle*, 22 July – 18 August 2012.

Investigator & Affiliation	Samples Saved	Approximate Number
Age Samples, NMFS, NEFSC, Woods Hole, MA	Goosefish	12 vertebrae
	White Hake	307 otoliths

Figure 1. Northern shrimp survey strata and observed distribution of catch per tow (kg) of northern shrimp collected during the 2012 National Marine Fisheries Service, Northeast Fisheries Science Center northern shrimp survey in the western Gulf of Maine aboard FRV *Gloria Michelle*, 22 July – 18 August 2012.

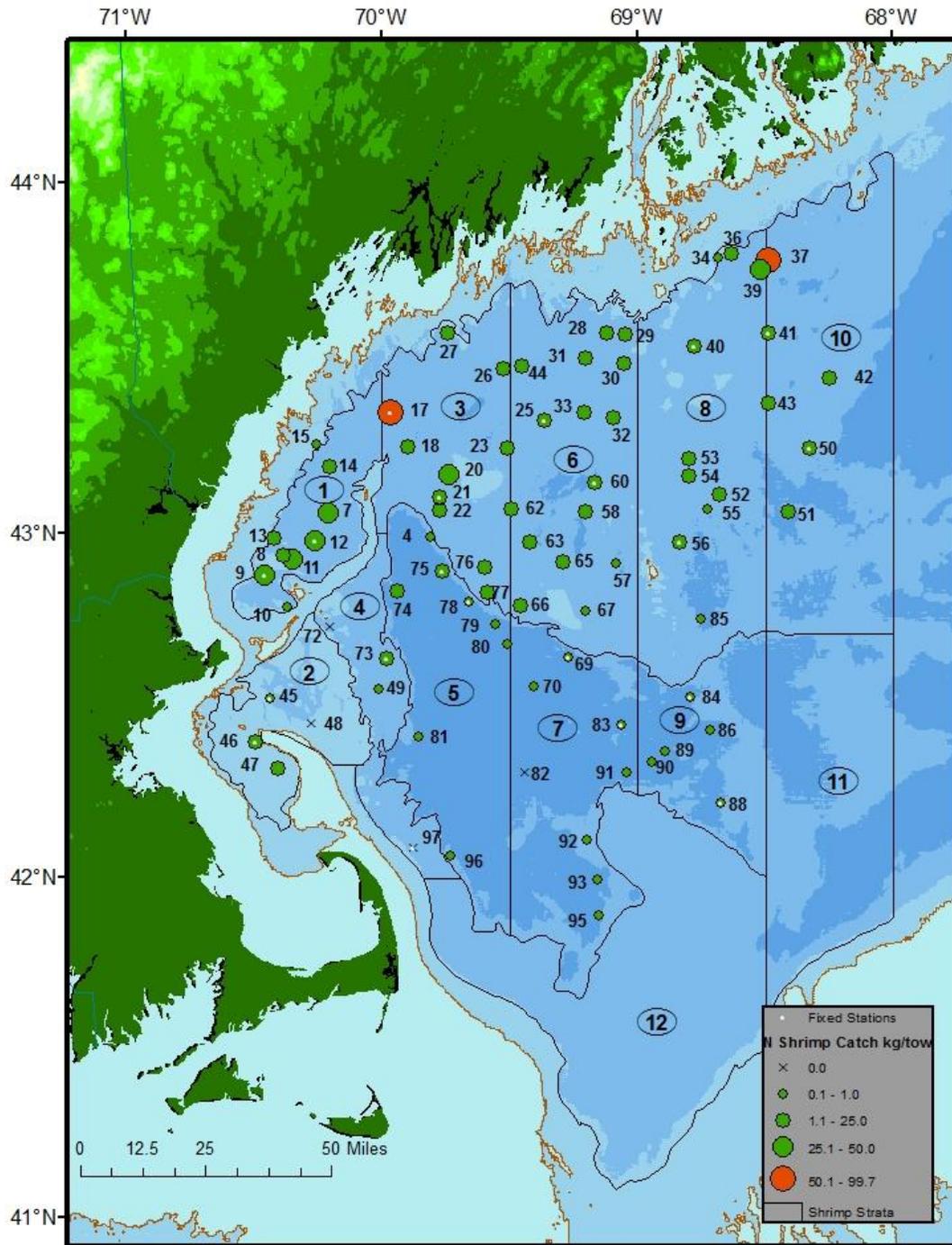
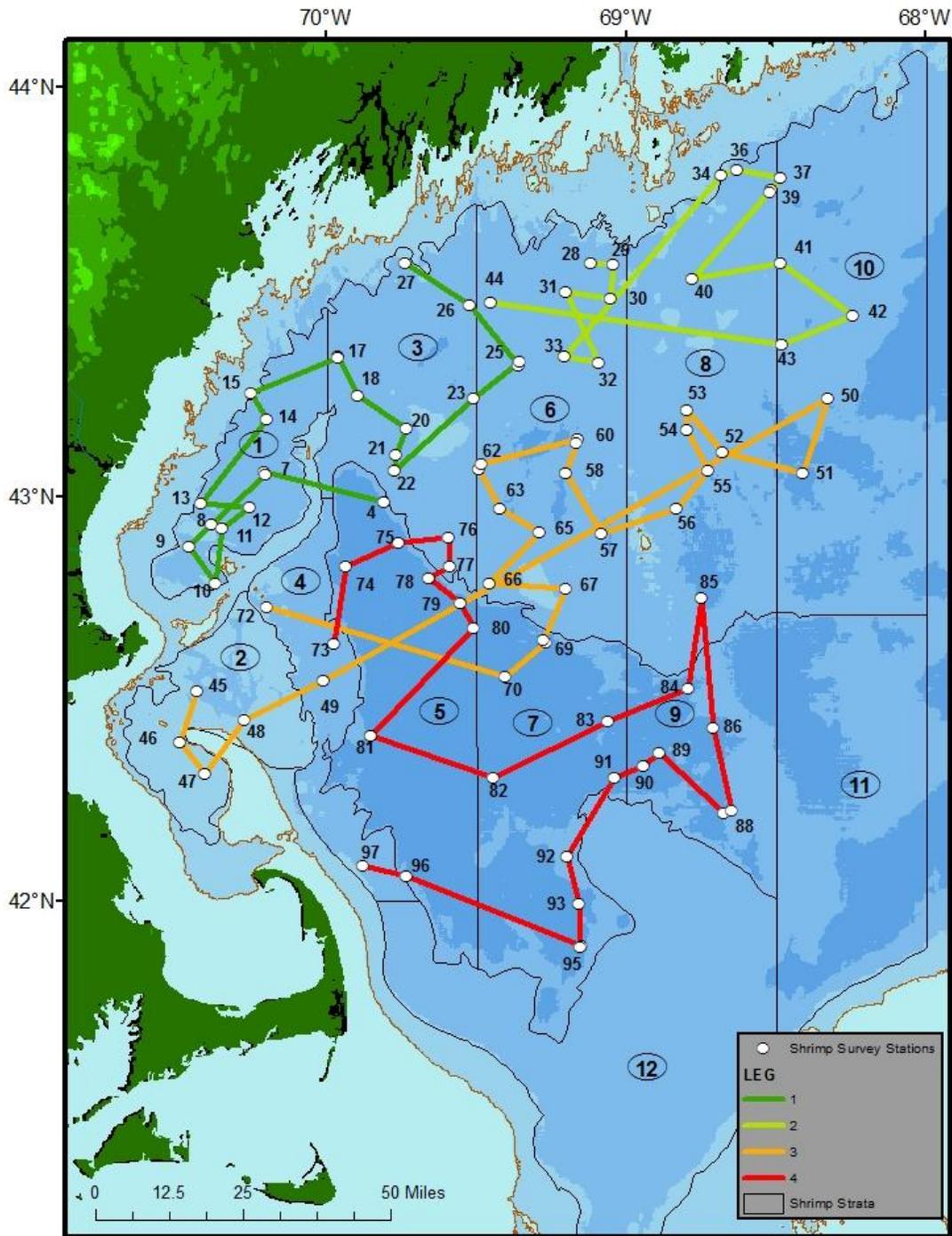


Figure 2. Trawl hauls made during the 2012 National Marine Fisheries Service, Northeast Fisheries Science Center northern shrimp survey in the Gulf of Maine aboard FRV *Gloria Michelle*, 22 July – 18 August 2012.



Appendix I. Participants on the 2012 National Marine Fisheries Service, Northeast Fisheries Science Center northern shrimp survey cruise in the western Gulf of Maine aboard FRV *Gloria Michelle*, 22 July to 18 August 2012.

National Marine Fisheries Service, NEFSC, Woods Hole, MA

Peter Chase, Chief Scientist ^{1,2}	Grace Thorton ⁴
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Volunteers

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Gloria Michelle Crew

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ENS Shannon Hefferan^{1,2,3,4}
George Morton^{1,2,3,4}
LT Carl Rhodes^{1,2}
Jeffrey LaMarche³
LT Sarah Duncan⁴

¹ 22 – 27 July

² 30 July – 3 August

³ 6 – 10 August

⁴ 13 – 18 August