



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
Northeast Fisheries Science Center  
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## CRUISE RESULTS

NOAA FRV GLORIA MICHELLE  
Gulf of Maine Northern Shrimp Survey  
Cruise No. GM 07-05 Parts I-IV  
22 July – 16 August, 2007

## INTRODUCTION

This report summarizes results of the 2007 survey cruise for northern shrimp, *Pandalus borealis*, in the western Gulf of Maine. This was the 24<sup>th</sup> 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 – 16 August, 2007 aboard the 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 one member of the Atlantic States Marine Fisheries Commission and other 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). Stations were allocated to strata roughly in proportion to the area of the strata and 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 comprised of four parts; Part I was during 22-27 July; Part II, 30 July – 3 August; Part III, 6-10 August; Part IV, 13-16 August 2007. The vessel departed Woods Hole, MA and made planned intermediate port calls in Portland, ME and Gloucester, MA, before returning to Woods Hole, MA. Locations of stations sampled during each part are given in Figure 2.

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; in depths between 86-100 fathoms, 250 fathoms of wire was used; and in depths greater than 100 fathoms, the scope was 2.5:1. Reference/hull surface temperatures and meteorological observations were recorded at each station. The Vemco minilogger for Windows Base stations was used to record the bottom temperatures during the survey. Northstar Technical Inc. Netmind Trawl Monitor System was utilized to monitor trawl gear performance on most tows during the survey.

Headrope height, wingspread and doorspread of the trawl were transmitted and logged electronically.

At most stations, a 2 kilogram (kg) sample of Pandalid shrimp was collected for determination of 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 lobster 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 length information for shrimp and all other measured species were recorded directly into the Fisheries Scientific Computer System (FSCS).

## RESULTS

A total of 79 stations were occupied. Northern shrimp were collected at 66 stations (Table 1). There were 24 non-random fixed stations. Strata 1, tow 3 had the highest total number of northern shrimp while the lowest number was taken in Strata 4, tow 2.

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 (200770)).

## 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 station and northern shrimp collected on the 2007 northern shrimp survey in the western Gulf of Maine aboard the FRV GLORIA MICHELLE, 22 July – 16 August, 2007.

STRATUM-TOW	STATION	LATITUDE	LONGITUDE	DEPTH (m)	BOTTOM TEMP (C)	TOTAL NO. ≤ 22 (mm)	TOTAL NO. > 22 (mm)	WEIGHT (kg)	TOTAL NUMBER
6-4	2	42 49	69 06	173	5.9	333	851	9.55	1184
6-2	3	42 55	69 03	190	5.9	556	755	10.76	1311
8-8	4	42 58	68 50	181	6.1	543	1476	17.61	2019
8-5	5	42 51	68 38	183	6.1	0	24	0.20	24
10-2	6	43 06	68 13	205	6.7	230	517	5.71	747
10-4	7	43 16	68 18	177	6.9	580	981	12.59	1561
10-1	8	43 34	68 14	179	7.1	100	831	7.72	931
10-3	9	43 40	68 04	176	7.0	13	180	2.01	193
10-5	10	43 34	68 28	173	6.9	640	4144	46.45	4784
8-2	11	43 32	68 34	135	6.5	6036	3644	60.11	9680
8-3	12	43 24	68 42	108	6.5	65	45	0.67	110
8-9	13	43 32	68 46	155	6.4	5506	5457	76.72	10963
8-6	14	43 25	68 55	123	5.9	379	1038	11.50	1417
8-4	16	43 06	68 44	170	6.2	698	1003	12.71	1701
8-1	17	43 12	68 55	159	6.0	3219	8049	86.21	11268
6-8	18	43 13	69 04	146	5.4	1844	2953	35.69	4797
6-13	19	43 09	69 08	183	5.4	2238	5530	62.01	7768
6-11	20	43 09	69 09	188	5.4	1319	3058	37.94	4377
6-6	21	43 12	69 11	193	5.8	1080	3149	35.75	4229
6-14	22	43 20	69 21	178	5.3	2783	4050	52.14	6833
3-8	23	43 27	69 35	156	5.5	17405	7528	142.81	24933
6-7	24	43 33	69 20	143	5.2	8110	7222	107.72	15332
6-1	25	43 33	69 07	143	5.2	4234	4585	62.94	8819
6-3	27	43 29	69 02	139	5.2	522	3078	31.67	3600
6-9	28	43 27	69 11	162	5.3	9404	3242	78.29	12646
6-10	29	43 20	69 01	164	5.2	5472	3840	63.31	9312
3-4	30	43 14	69 31	149	5.2	2414	2407	34.79	4821
3-12	32	43 02	69 42	135	5.4	414	5263	52.86	5677
3-10	33	43 06	69 45	148	5.8	11710	6132	129.85	17842
3-5	34	43 06	69 48	166	5.6	2010	5918	75.21	7928
5-4	35	43 03	69 54	201	6.4	231	1316	14.92	1547
1-3	37	42 58	70 11	164	4.5	22008	15336	233.87	37344
1-7	38	42 58	70 16	159	4.7	10637	11626	158.60	22263
1-1	39	42 45	70 31	94	4.6	3361	40	7.30	3401
1-8	40	42 53	70 27	109	4.4	4436	887	27.08	5323
1-4	41	43 03	70 22	104	5.2	450	0	1.37	450
1-5	42	43 08	70 18	113	4.6	4949	840	22.90	5789
1-6	43	43 19	70 10	113	5.0	4230	906	20.72	5136
1-2	44	43 18	70 01	172	5.6	16612	10541	173.45	27153
3-2	45	43 19	69 54	152	5.9	5826	6893	98.47	12719
3-6	46	43 19	69 46	172	5.9	5885	5594	85.23	11479
3-1	47	43 25	69 49	137	5.3	6265	3815	66.88	10080
3-11	48	43 19	69 59	163	--	13517	9173	147.16	22690

STRATUM-TOW	STATION	LATITUDE	LONGITUDE	DEPTH (m)	BOTTOM TEMP (C)	TOTAL NO. <= 22 (mm)	TOTAL NO. > 22 (mm)	WEIGHT (kg)	TOTAL NUMBER
5-6	52	42 47	69 38	221	6.2	147	784	8.81	931
5-1	53	42 48	69 38	193	6.2	92	1242	12.85	1334
5-2	54	42 52	69 43	196	6.4	345	1921	22.37	2266
5-7	55	42 44	69 30	204	6.2	187	772	9.17	959
2-3	59	42 22	70 29	86	4.9	4340	4789	64.52	9129
7-9	62	41 57	69 16	205	6.1	63	423	5.00	486
7-1	63	42 05	69 23	209	6.2	133	569	6.54	702
4-5	64	42 36	69 54	181	5.8	1214	922	14.96	2136
5-3	65	42 34	69 41	240	6.7	21	348	3.88	369
7-5	66	42 28	69 19	227	6.6	28	364	3.69	392
7-6	67	42 37	69 15	208	6.4	393	660	9.61	1053
7-2	68	42 40	69 15	183	6.1	155	496	5.82	651
7-3	69	42 39	69 05	179	6.1	60	307	3.11	367
7-7	70	42 26	69 03	218	6.5	68	534	6.09	602
9-1	71	42 21	68 56	212	6.5	29	443	4.93	472
9-3	72	42 31	68 45	197	6.7	102	340	4.47	442
9-2	73	42 38	68 39	196	6.7	24	304	2.98	328
11-1	74	42 33	68 28	213	6.8	20	152	1.64	172
11-2	75	42 07	68 25	184	6.3	82	302	3.54	384
9-4	76	42 13	68 39	196	5.9	324	375	4.83	699
12-1	77	42 09	68 49	179	5.6	296	538	6.66	834
4-2	78	42 06	69 51	143	5.6	0	2	0.02	2
5-5	79	42 07	69 45	205	6.5	31	91	1.13	122

Table 2. Miscellaneous scientific collections made on the 2007 northern shrimp survey in the western Gulf of Maine aboard the FRV GLORIA MICHELLE, 22 July – 16 August, 2007.

Investigator & Affiliation	Samples Saved	Approximate Number
Anne Richards, NMFS, NEFSC, Woods Hole, MA	Goosefish vertebrae	7 indiv.
Steven Searcy, UMASS, Dartmouth, MA	Alewife	20 indiv.
Age Samples, NMFS, NEFSC, Woods Hole, MA	White hake otoliths	144 indiv.

Figure 1. Northern shrimp survey strata and observed distribution of catch per tow (kg) of northern shrimp collected during the 2007 survey in the western Gulf of Maine aboard the FRV GLORIA MICHELLE, 22 July – 16 August, 2007. Stations 15, 31, 50, 56, and 61 were bad tows due to gear problems and not shown in this figure.

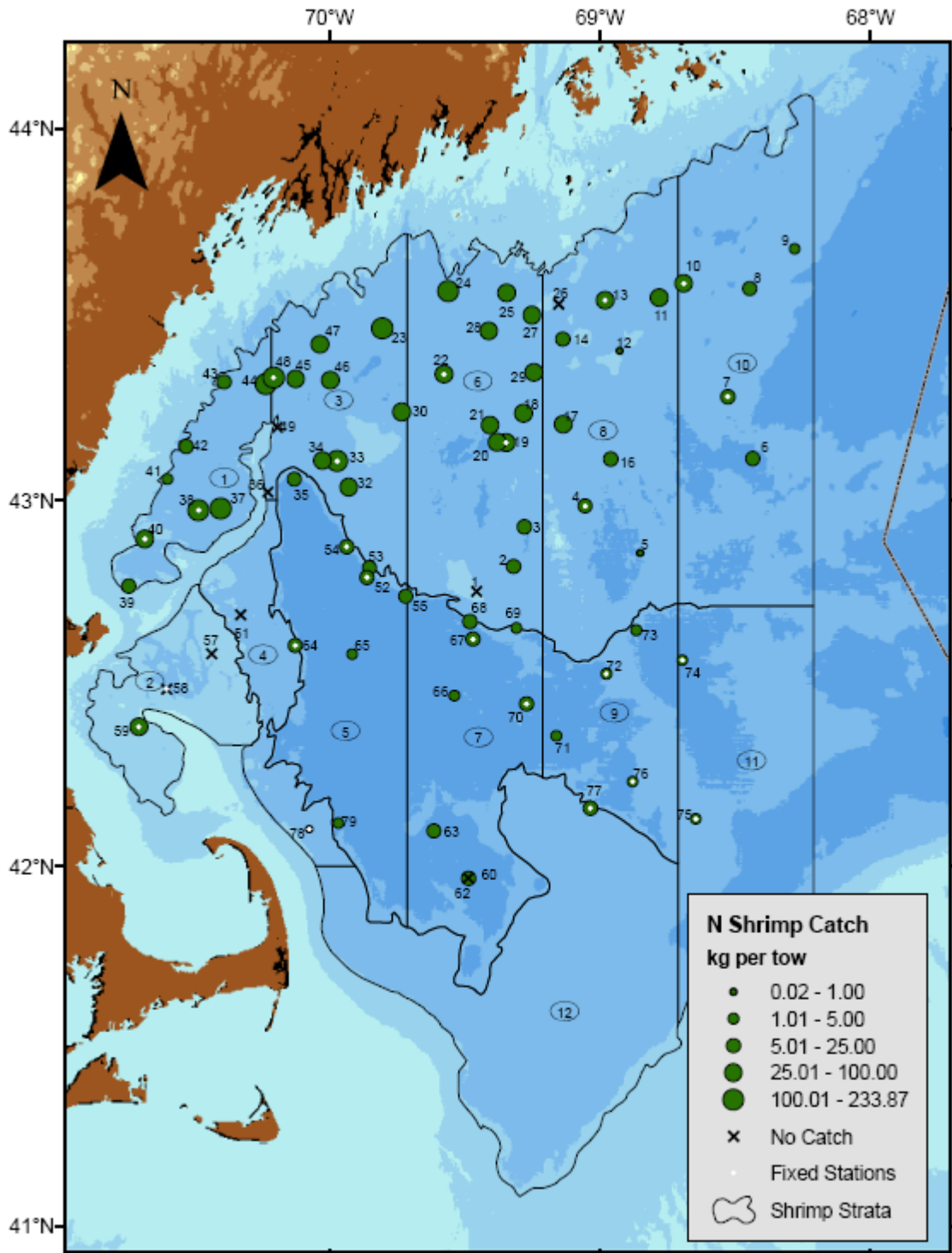
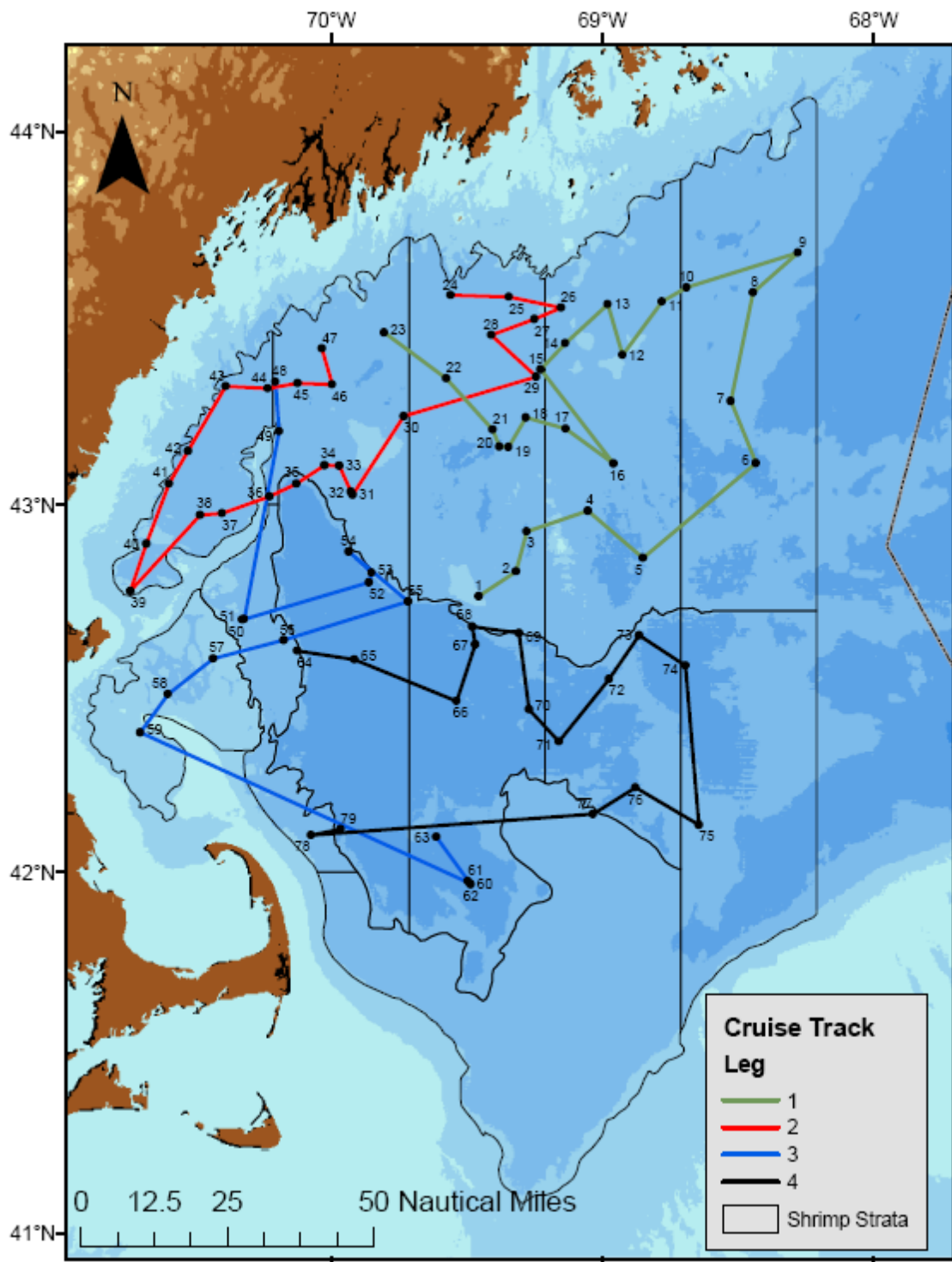


Figure 2. Trawl hauls made from the FRV GLORIA MICHELLE, during the National Marine Fisheries Service, Northeast Fisheries Science Center summer northern shrimp survey (07-70), 22 July – 16 August, 2007.



**Appendix I.** Participants on the 2007 northern shrimp survey cruise in the western Gulf of Maine, aboard the FRV GLORIA MICHELLE, 22 July – 16 August, 2007.

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<sup>1</sup> 22 – 27 July, Part I

<sup>2</sup> 30 July – 3 August, Part II

<sup>3</sup> 6 – 10 August, Part III

<sup>4</sup> 13 – 16 August, Part IV