



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

NOAA FRV GLORIA MICHELLE
Gulf of Maine Northern Shrimp Survey
(Parts I-IV)
17 July – 29 August, 2005

INTRODUCTION

This report summarizes results of the 2005 survey cruise for northern shrimp, *Pandalus borealis*, in the western Gulf of Maine. This was the 22nd 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 between 17 July – 29 August 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 Technical Committee members, 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 to account for diel changes in northern shrimp availability. The survey was comprised of four parts; Part I was during 17-22 July; Part II, 24-29 July; Part III, 31 July-5 August; Part IV, 25-29 August 2005. The vessel departed Woods Hole, MA and headed to Boothbay Harbor, ME; Boothbay Harbor, ME to Portland, ME; Portland, ME to Gloucester, MA; and Gloucester, MA returning to Woods Hole, MA. Locations of stations sampled during each part are given in Figure 2. A mechanical problem postponed the completion of the cruise until 29 August.

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 for most tows during the survey. Headrope height, wingspread and doorspread of the trawl were transmitted and logged electronically.

When feasible, 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 (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 68 stations were occupied. Northern shrimp were taken at 66 stations (Table 1). There were 8 non-random fixed stations. Strata 1, tow 6 had the highest total number of northern shrimp while the lowest number were taken in Strata 4, tows 1 and 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 (200570)).

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 2005 northern shrimp survey in the western Gulf of Maine aboard the FRV GLORIA MICHELLE, 17 July – 29 August, 2005.

Stratum-Tow	Station	Latitude	Longitude	Depth (m)*	Bottom Temp (C)*	Weight (kg)	Total No.	Total No. >= 22mm	Total No. <22 mm
01-01	51	42 59	70 25	101	4.7	17.37	5810	513	5297
01-02	49	43 01	70 14	151	5.4	134.74	21371	6319	15052
01-03	52	42 55	70 20	142	5.0	85.41	16283	3525	12758
01-04	54	42 48	70 27	113	4.8	64.17	14823	2667	12156
01-05	38	43 14	70 07	143	5.6	99.29	16349	5264	11085
01-06	48	43 01	70 08	150	5.3	195.67	32604	8550	24054
01-07	39	43 13	70 01	130	5.4	68.93	16248	1620	14628
01-08	37	43 14	70 07	139	5.6	0	0	0	0
01-09	50	42 58	70 15	149	5.1	137.68	20178	6130	14048
01-10	53	42 53	70 28	104	4.8	51.61	11438	2494	8944
03-01	20	43 32	69 36	152		151.12	24288	9223	15065
03-02	29	43 14	69 32	136	6.0	94.02	19800	4361	15439
03-03	33	43 33	69 47	111	5.2	16.29	4633	924	3709
03-04	32	43 22	69 45	148	5.8	144.89	27446	5934	21512
03-05	42	42 57	69 37	151	6.1	56.48	10130	1625	8505
03-06	34	43 31	69 54	106	5.1	10.41	4600	220	4380
03-07	40	43 10	69 44	132	5.6	64.03	17114	1085	16029
03-08	19	43 34	69 37	146		73.45	9427	5172	4255
03-09	36	43 24	69 51	148	5.9	71.59	12528	3851	8677
03-10	43	42 54	69 42	163	6.2	75.50	8524	4110	4414
03-11	31	43 23	69 35	165	6.0	114.43	28188	4814	23374
03-12	41	43 07	69 46	151	6.1	63.78	9652	2934	6718
03-13	35	43 20	69 57	141	5.6	114.55	23136	4594	18542
04-01	47	42 53	70 04	105	5.3	0.04	12	0	12
04-02	55	42 41	70 04	97	5.2	0.02	8	3	5
05-01	45	42 52	69 46	221	7.3	29.90	4459	853	3606
05-02	57	42 01	69 32	215	6.7	3.85	644	165	479
05-03	46	42 56	69 53	224	7.1	6.55	1124	174	950
05-04	56	42 19	69 40	244	7.3	3.76	542	156	386
05-05	44	42 48	69 39	207	7.3	21.36	3002	645	2357
06-01	27	42 58	69 14	196	6.3	47.66	7203	2853	4350
06-02	26	43 08	69 18	190	6.5	80.25	11880	4140	7740
06-03	24	43 06	69 10	167		102.98	17547	4286	13261
06-04	17	43 23	69 20	168		47.82	7284	2273	5011
06-05	16	43 28	69 09	159		3.97	619	211	408
06-06	30	43 21	69 28	171	6.4	65.74	9654	3301	6353
06-07	21	43 29	69 30	162		101.30	19622	5296	14326
06-08	28	43 03	69 28	155	5.9	37.57	7110	1465	5645
06-09	23	43 19	69 05	162		60.94	10878	2710	8168
06-10	18	43 39	69 27	136		41.36	13930	1848	12082
06-11	22	43 24	69 22	171		75.62	12219	3040	9179
06-12	25	43 20	69 19	161	6.4	112.95	22473	3943	18530
07-01	61	42 25	69 22	251	7.5	0.42	68	19	49
07-02	59	42 12	69 28	211	6.9	30.72	4007	1503	2504

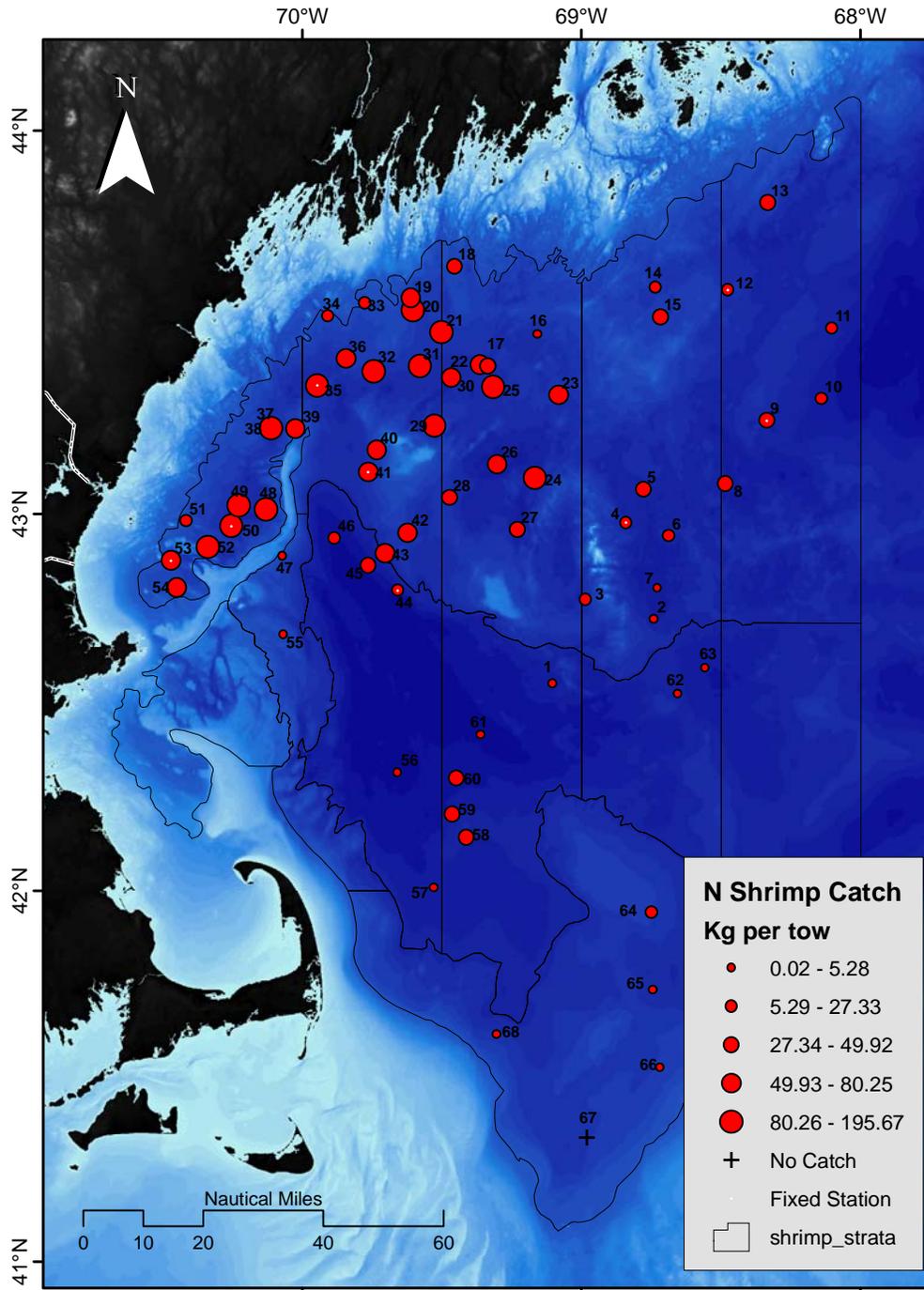
Stratum-Tow	Station	Latitude	Longitude	Depth (m)*	Bottom Temp (C)*	Weight (kg)	Total No.	Total No. >= 22mm	Total No. <22 mm
07-04	60	42 18	69 27	226	7.1	37.32	4892	1978	2914
07-05	1	42 33	69 06	208		4.27	627	279	348
08-01	3	42 46	68 59	174		22.21	4009	863	3146
08-02	14	43 36	68 44	154		26.27	5507	1035	4472
08-03	2	42 43	68 44	192		1.52	242	107	135
08-04	5	43 04	68 47	192		36.36	6275	1250	5025
08-05	15	43 31	68 43	141		32.57	7948	1207	6741
08-06	4	42 59	68 50	177		15.79	2239	1058	1181
08-07	6	42 57	68 41	194		27.32	3904	1672	2232
08-08	7	42 48	68 44	213		5.06	785	299	486
09-01	63	42 36	68 34	210	7.8	2.22	327	105	222
09-02	62	42 32	68 39	192	7.7	5.23	1015	181	834
10-01	8	43 05	68 29	194		29.07	5410	1319	4091
10-02	12	43 35	68 29	167		27.33	7778	480	7298
10-03	11	43 29	68 06	196		17.30	2787	793	1994
10-04	13	43 49	68 20	136		49.92	10503	1809	8694
10-05	10	43 18	68 08	207		14.77	2101	940	1161
10-06	9	43 15	68 20	179		39.79	6864	2005	4859
12-01	66	41 32	68 43	140	5.5	0.17	62	8	54
12-02	64	41 57	68 45	143	5.5	18.93	6172	680	5492
12-03	67	41 20	68 59	143	5.2	0	0	0	0
12-04	68	41 37	69 18	157	5.6	0.08	17	3	14
12-05	65	41 44	68 45	169	6.3	2.20	869	14	855

* Due to a server malfunction, stations 1-24 are missing minilog data. Depth for these stations is indicated using the ship's depth sensor at the time when the net was set. No bottom temperature was recovered from these stations.

Table 2. Miscellaneous scientific collections made on the 2005 northern shrimp survey in the western Gulf of Maine aboard the FRV GLORIA MICHELLE, 17 July – 29 August, 2005.

Investigator & Affiliation	Samples Saved	Approximate Number
Aquarium, NMFS, NEFSC, Woods Hole, MA	Shrimp	29 bags
John Galbraith, NMFS, NEFSC, Woods Hole, MA	Various species	14 indiv.
Jay Burnett, NMFS, NEFSC, Woods Hole, MA	Goosefish vertebrae	33 indiv.
	Cod otoliths	1 indiv.
Katherine Sosebee, NMFS, NEFSC, Woods Hole, MA	White hake otoliths	263 indiv.

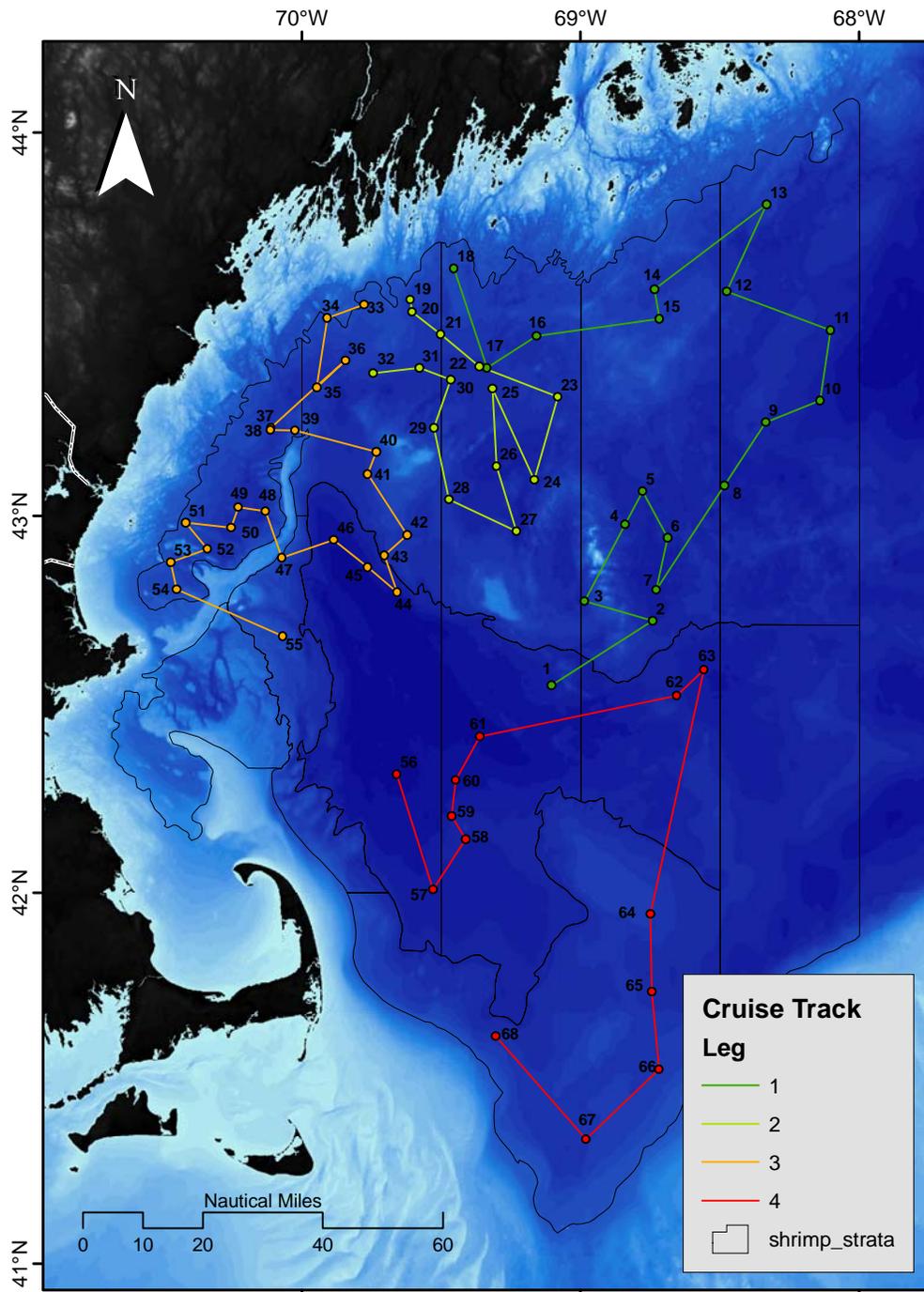
Figure 1. Northern shrimp survey strata and observed distribution of catch per tow (kg) of northern shrimp collected during the 2005 survey in the western Gulf of Maine aboard the FRV GLORIA MICHELLE, 17 July – 29 August, 2005.



1 inch equals 22.7 nautical miles

2005 Northern Shrimp Survey

Figure 2. Trawl hauls made from the FRV GLORIA MICHELLE, during the National Marine Fisheries Service, Northeast Fisheries Science Center summer northern shrimp survey (05-70), 17 July – 29 August, 2005.



1 inch equals 22.7 nautical miles

2005 Northern Shrimp Survey

Appendix I. Participants on the 2005 northern shrimp survey cruise in the western Gulf of Maine, aboard the FRV GLORIA MICHELLE, 17 July – 29 August, 2005.

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Tracy Pugh²

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Lessie White¹
Charles Woodbury⁴

ME Department of Health and Human Services, Augusta, ME

Deckhands

Anthime Brunette^{1,2,4}
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NOAA Corps, Seattle, WA
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Boothbay Harbor, ME

¹ 17 – 30 July, Part I

² 24 – 29 July, Part II

³ 31 July – 5 August, Part III

⁴ 25 – 29 August, Part IV