



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

Gulf of Maine Northern Shrimp Survey

July 26 - August 8, 2004

Introduction

This report summarizes results of the 2004 survey cruise for northern shrimp, *Pandalus borealis*, in the western Gulf of Maine. This was the 21st 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 July 26-August 8 aboard the R/V 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). For the first time, data was recorded directly into the Fisheries Scientific Computer System (FSCS) at sea. These data will be audited, edited, and archived into the NEFSC survey database.

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 three parts; Part I was during 26-30 July; Part II, 31 July-4 August; Part III, 5-8 August 2004. The vessel departed Woods Hole, MA and headed to Boothbay Harbor, ME; Boothbay Harbor, ME to Gloucester, MA, and Gloucester, MA 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 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 0.5 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 weight. Total weights for all species were recorded on paper trawl logs but all length information for both fish and shrimp were recorded directly into the Fisheries Scientific Computer System (FSCS).

Results

A total of 54 stations were occupied. Northern shrimp were taken at 48 stations (Table 1). There were 7 non-random fixed stations. Strata 1, tows 4 and 8 had the highest total number of northern shrimp while the lowest number were taken in Strata 12, tows 1 and 4.

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 (200470)).

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 2004 northern shrimp survey in the western Gulf of Maine aboard the R/V GLORIA MICHELLE, July 26-August 8, 2004.

Stratum tow	Station	Latitude	Longitude	Depth (m)	Bottom Temp (C)	Weight (kg)	Total No.	Total No. >= 22 mm	Total No. < 22 mm
01-01	42	42 53	70 18	147	3.4	84.5	12,095	6,987	5,108
01-02	36	43 01	70 09	163	3.2	1.9	241	164	77
01-03	37	43 13	70 11	112	3.9	7.1	3,186	63	3,123
01-04	40	42 49	70 33	110	3.8	161.0	35,458	9,873	25,585
01-05	38	43 04	70 11	168	3.3	2.0	252	176	76
01-06	35	42 59	70 13	166	3.2	85.0	10,635	7,147	3,488
01-07	39	42 58	70 15	167	3.2	1.9	271	161	110
01-08	41	42 54	70 28	108	4.1	142.6	26,417	8,804	17,613
03-01	24	43 01	69 36	164	4.5	2.1	544	87	457
03-02	25	43 31	69 47	122	4.9	37.0	6,756	2,432	4,324
03-03	23	43 00	69 32	163	4.6	9.0	1,395	670	725
03-04	30	43 06	69 54	176	4.6	33.7	5,746	2,378	3,368
03-05	28	43 20	69 52	176	4.6	51.1	9,016	3,640	5,376
03-06	32	42 53	69 41	175	5.0	34.4	3,802	3,073	729
03-07	26	43 29	69 54	123	4.5	0	0	0	0
03-08	29	43 13	69 48	174	5.0	30.6	3,577	2,565	1,012
03-09	17	43 30	69 31	151	4.1	54.5	8,187	4,747	3,440
03-10	31	43 06	69 46	158	4.7	47.4	6,720	3,480	3,240
03-11	27	43 29	69 54	128	4.7	0	0	0	0
04-01	43	42 51	70 08	105	3.4	0	0	0	0
05-01	34	42 59	69 57	221	5.2	7.3	981	671	310
05-02	44	42 22	69 54	215	3.4	1.6	208	118	90
05-03	33	42 59	69 51	0	5.2	12.3	1,195	1,030	165
05-04	1	42 47	69 39	231	5.1	11.1	1,016	984	32
06-01	14	43 14	69 10	172	4.3	37.0	4,773	4,260	13
06-02	21	43 10	69 20	202	4.4	19.8	2,211	1,918	293
06-03	20	43 09	69 20	203	4.4	0	0	0	0
06-04	18	43 15	69 22	176	4.0	47.8	6,150	5,126	1,024
06-05	3	42 46	69 19	69	4.4	0	0	0	0
06-06	16	43 37	69 19	127	4.8	21.8	3,143	1,842	1,301
06-07	22	43 04	69 11	171	4.3	46.6	4,575	4,175	400
06-08	19	43 10	69 27	136	4.0	19.1	2,357	1,699	658
06-09	2	42 46	69 30	178	5.0	22.5	2,584	2,272	312
06-10	15	43 29	69 17	171	4.0	57.4	7,915	5,306	2,609
07-01	52	41 56	69 18	205	4.7	3.6	548	240	308
07-02	4	42 42	69 22	0	5.0	11.3	1,209	998	211
07-03	45	42 13	69 29	227	4.7	2.3	196	176	20
07-04	46	42 21	69 18	232	5.0	1.6	165	139	26
07-05	5	42 39	69 16	208	4.9	6.9	924	563	361
07-06	47	42 26	69 03	198	5.5	3.1	501	248	253
08-01	10	43 09	68 37	183	5.8	13.2	1,398	1,270	128
08-02	7	42 59	68 50	183	5.4	17.4	2,102	1,862	240
08-03	13	43 17	68 55	153	4.2	19.4	2,897	1,494	1,403
08-04	6	42 43	68 44	200	5.8	6.6	725	620	105
08-05	8	42 58	68 42	0	5.8	0	0	0	0

Table 1. Summary of station and northern shrimp collected on the 2004 northern shrimp survey in the western Gulf of Maine aboard the R/V GLORIA MICHELLE, July 26-August 8, 2004.

Stratum tow	Station	Latitude	Longitude	Depth (m)	Bottom Temp (C)	Weight (kg)	Total No.	Total No. >= 22 mm	Total No. < 22 mm
08-06	9	43 00	68 34	193	5.8	29.8	3,425	3,171	254
09-01	48	42 26	68 54	222	5.2	6.4	847	475	372
09-02	49	42 24	68 37	191	5.6	6.5	1,383	350	1,033
10-01	11	43 19	68 11	201	5.8	4.2	393	378	15
10-02	12	43 28	68 21	187	5.6	6.0	553	541	12
12-01	50	42 03	68 51	137	4.6	0.2	72	5	67
12-02	54	41 49	69 30	183	4.6	1.4	445	22	423
12-03	51	41 44	68 53	164	4.6	3.0	940	111	829
12-04	53	41 42	69 24	171	4.6	0.1	42	1	41

Table 2. Miscellaneous scientific collections made on the 2004 northern shrimp survey in the western Gulf of Maine aboard the R/V GLORIA MICHELLE, July 26-August 8, 2004.

Investigator & Affiliation	Samples Saved	Approximate Number
Aquarium, NMFS, NEFSC, Woods Hole, MA	Shrimp	81 bags
Jay Burnett, NMFS, NEFSC, Woods Hole, MA	Goosefish vertebrae	20 indiv.
Katherine Sosebee, NMFS, NEFSC, Woods Hole, MA	White hake otoliths	185 indiv.

Figure 1. Northern shrimp survey strata and observed distribution of catch per tow (kg) of northern shrimp collected during the 2004 survey in the western Gulf of Maine aboard the R/V GLORIA MICHELLE, July 26- August 8, 2004.

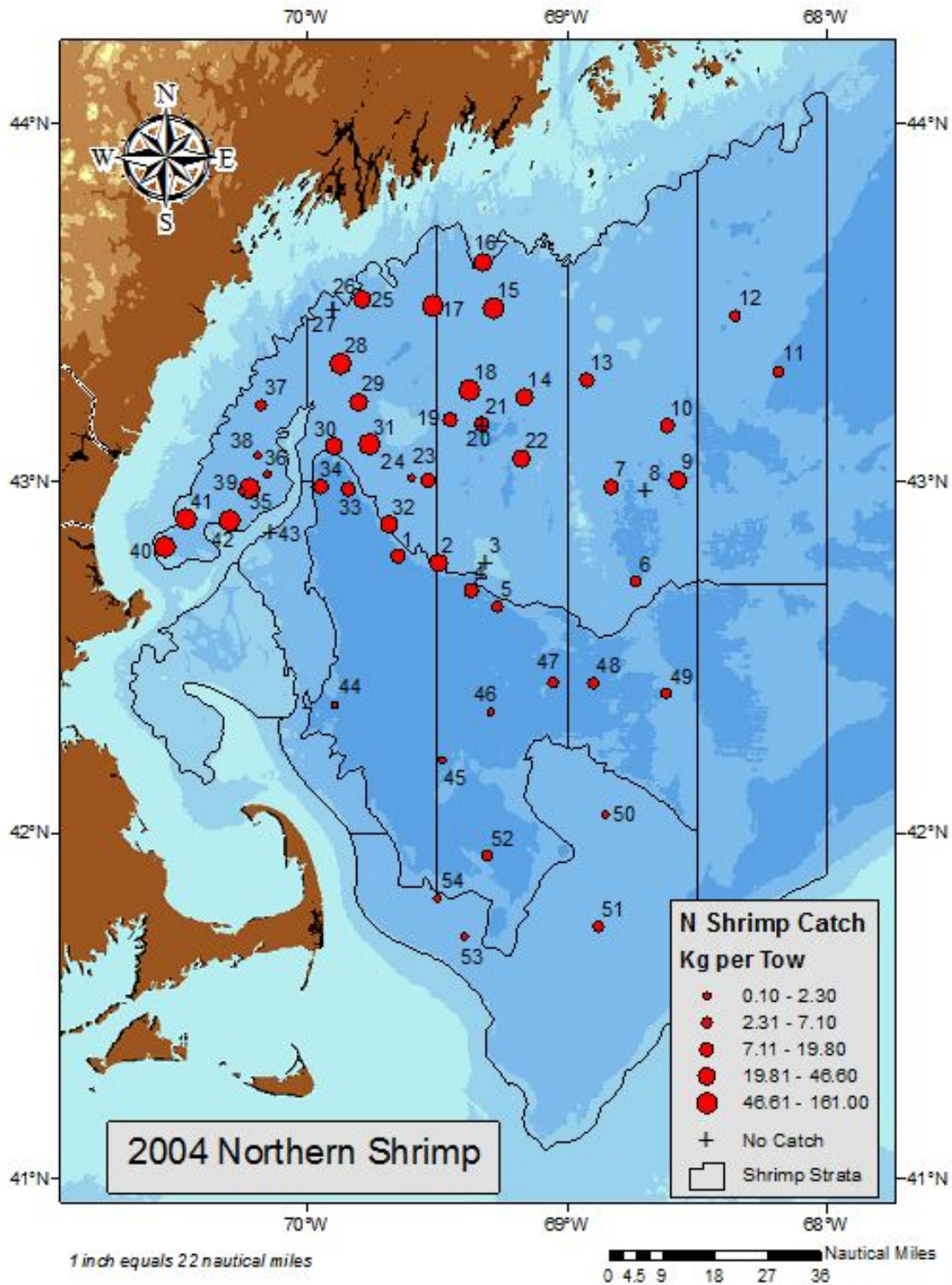
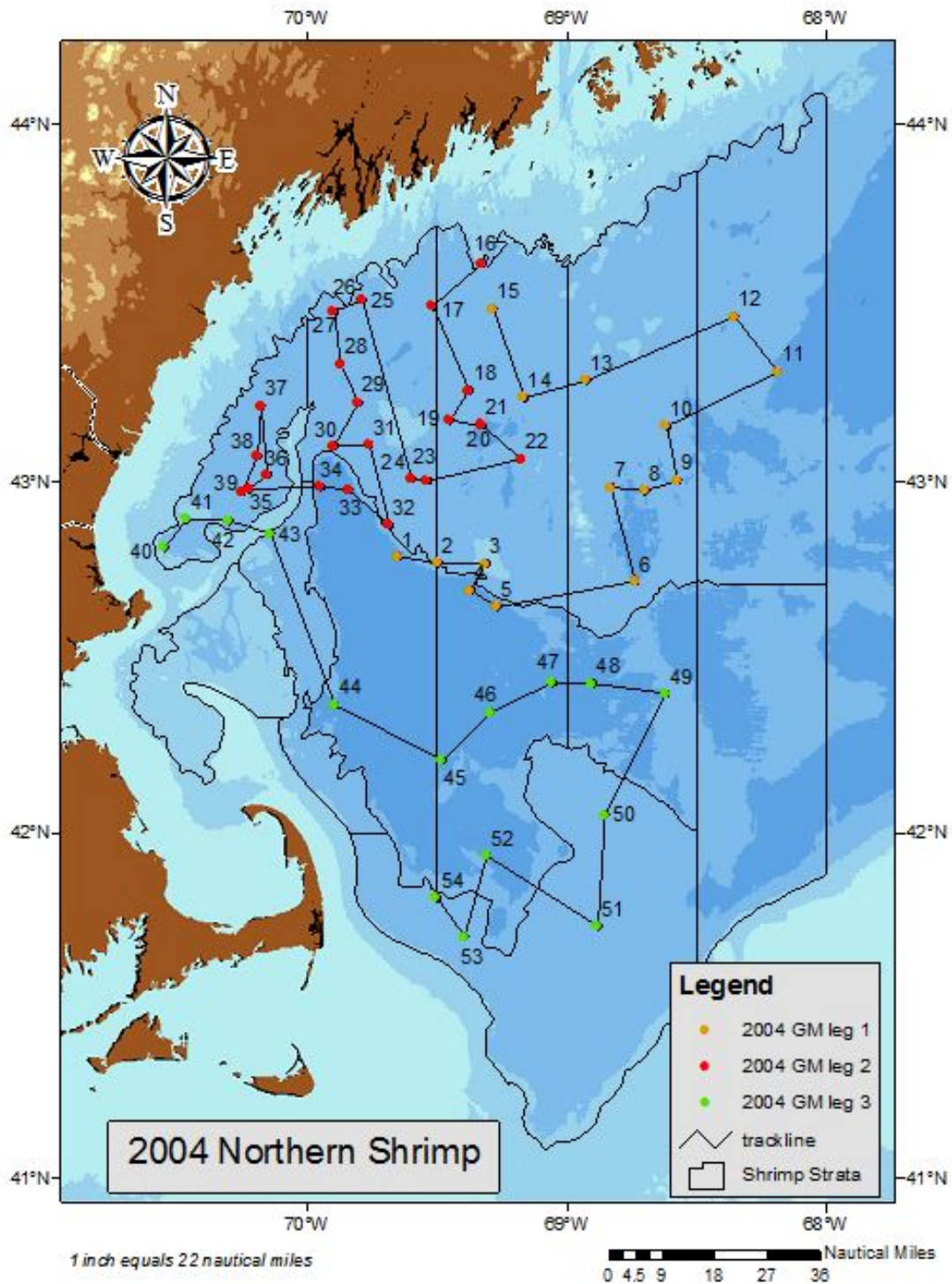


Figure 2. Trawl hauls made from the RV GLORIA MICHELLE, during the National Marine Fisheries Service, Northeast Fisheries Science Center summer northern shrimp survey (04-06), July 26 - August 8, 2004.



Appendix I. Participants on the 2004 northern shrimp survey cruise in the western Gulf of Maine, aboard the R/V GLORIA MICHELLE, July 26-August 8, 2004.

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¹ 7/26 -30, Part I

² 7/31 -8/4, Part II

³ 8/5 - 8/8, Part III