

CRUISE RESULTS

Gulf of Maine Northern Shrimp Survey
July 21 - August 4, 2000

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Introduction

This report summarizes results of the 2000 survey cruise for northern shrimp, *Pandalus borealis*, in the western Gulf of Maine. This was the seventeenth survey cruise 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 21-August 4 aboard the FRV *GLORIA MICHELLE*, a 65-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 and other personnel from the NEFSC and state agencies of Maine and Massachusetts (see Appendix I). Data entry and analyses were performed at the NEFSC.

A stratified random sampling design was used (Figure 1). Stations were allocated to strata roughly in proportion to the area of the strata and additional non-random stations were also occupied. Fieldwork was conducted during daylight hours to account for diel changes in northern shrimp availability. The survey was comprised of four parts. During Part I, several shrimp trawls were instrumented and performance measurements were obtained. The standard survey was conducted during Parts II, III, and IV. 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 85-100 fathoms, 250 fathoms of wire was used; and in depths greater than 100 fathoms the scope was 2.5:1. Bucket surface temperatures and meteorological observations were recorded at each station. Bucket temperature readings were used as surface temperature readings. The minilogger was successfully used to record the bottom temperatures during the survey.

During Part I of the survey, a comparison of net geometries between two shrimp trawls was made. In addition, these data were compared to the historical shrimp trawl measurements obtained in the 80's to determine if the net has continued to perform consistently over time.

In all instances where feasible, a 2 kilogram (kg) sample of pandalid shrimp was collected for determination of species composition, and for northern shrimp, length frequency measurements (mid-dorsal carapace length, rounded down to the nearest 0.5 millimeter) and sex and female spawning stage determinations (Rasmussen 1953; McCrary 1971.) In cases in which less than 2 kg of shrimp were caught, 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 (shell height, cm) and cephalopods were measured (mantle length, cm). All species weights were recorded to the nearest 0.1 kg. The remainder of the catch (miscellaneous invertebrates, trash, etc.) was recorded by weight. Total weight and sample length frequencies for each species were recorded on standard NEFSC Bottom Trawl Survey forms, which were retained for processing and computer entry.

Results

A total of 55 stations was occupied. Northern shrimp were taken at 53 stations (Table 1). There were 16 non-random fixed stations. On Station 25, Stratum-tow 3-9, the tow was repeated as Station 26, Stratum-tow 3-12 due to a hang-up. Strata 1, tows 3, 6, and 7 had the highest total number of shrimp for the survey while Stratum 3, tows 4 and 6 and Stratum 6, tow 1 had the lowest collection of shrimp (Table 1).

All survey data for northern shrimp, and data for other Pandalid species (total weight and number) have been key-entered, audited, and archived in computer data files, together with data for finfish and selected invertebrates (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 2070).

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 2000 northern shrimp survey in the western Gulf of Maine aboard the R/V GLORIA MICHELLE July 21-August 4, 2000.

Stratum tow	Station	Latitude	Longitude	Depth (m)	Bottom Temp (C)	Weight (kg)	Total No	Total No. > 22 mm
01-01	34	43 21	70 05	154	6.1	16.4	3,304	860
01-02	39	42 56	70 28	101	6.1	23.3	5,430	984
01-03	37	43 02	70 17	151	5.5	83.3	12,72	4,993
01-04	36	43 09	70 11	148	6.8	39.4	6,678	2,318
01-05	41	42 48	70 23	84	6.1	1.0	255	104
*01-06	38	42 60	70 14	170	5.5	75.1	14,58	2,886
*01-07	40	42 53	70 28	108	5.6	96.8	17,10	5,944
*02-01	44	42 33	70 26	106	6.7	23.2	4,164	1,353
*02-02	45	42 24	70 30	88	6.1	11.6	1,613	468
03-01	31	43 31	69 52	115	6.7	1.4	256	120
03-02	05	42 51	69 32	165	6.5	20.7	2,927	1,386
03-03	04	42 53	69 37	155	6.3	20.5	2,561	1,371
03-04	27	43 07	69 33	115	6.2	0.1	40	0
03-05	30	43 30	69 43	122	6.4	13.7	1,514	849
03-06	35	43 11	69 59	106	6.8	0.0	11	0
03-07	32	43 21	69 54	155	6.4	32.7	4,657	2,182
03-08	29	43 22	69 46	159	6.2	16.2	4,045	534
03-09	25	43 13	69 37	121	6.2	0.0	0	0
*03-10	28	43 06	69 47	157	6.2	11.8	1,487	755
*03-11	33	43 20	69 58	157	6.2	43.6	10,78	1,389
03-12	26	43 14	69 38	135	6.2	36.9	8,699	1,404
04-01	54	42 01	69 50	97	6.5	0.0	0	0
04-02	42	42 31	69 59	157	6.3	2.6	483	147
*04-03	53	42 07	69 53	144	6.4	0.7	183	20
*04-04	43	42 37	69 58	176	6.2	1.8	480	47
05-01	46	42 21	70 01	170	6.2	1.3	302	44
05-02	01	42 49	69 50	254	99.9	3.2	451	204
05-03	47	42 19	69 50	227	6.7	2.4	442	84
*05-04	03	42 53	69 44	201	6.8	10.6	2,013	384
*05-05	02	42 47	69 38	208	7.0	11.9	1,782	630
06-01	06	42 47	69 24	130	6.5	0.1	29	5
06-02	22	43 29	69 10	159	6.1	18.9	3,064	1,226
06-03	09	43 01	69 13	201	6.2	17.6	2,408	929
06-04	10	42 57	69 03	183	6.5	12.8	1,635	754
06-05	08	42 52	69 09	179	6.4	12.1	1,403	728
06-06	07	42 53	69 14	159	6.2	51.4	5,818	3,547

*non-random tow

Table 1. (continued). Summary of station and northern shrimp data collected on the 2000 northern shrimp survey in the western Gulf of Maine aboard the FRV *GLORIAMICHELLE* July 21-August 4, 2000.

Stratum tow	Station	Latitude	Longitude	Depth (m)	Bottom Temp (C)	Weight (kg)	Total No	Total No. >_22 mm
06-07	23	43 24	69 21	170	6.1	48.8	10,209	1,999
06-08	11	43 07	69 20	208	6.7	8.11	1,317	382
*06-09	24	43 20	69 22	176	6.1	34.7	4,623	2,419
06-10	21	43 39	69 27	135	6.2	5.6	869	288
*06-11	12	43 09	69 09	183	6.2	56.4	8,909	3,129
07-01	49	42 33	69 20	230	7.3	4.6	692	242
*07-02	50	42 38	69 15	207	7.0	4.2	626	260
07-03	51	42 29	69 08	234	7.8	2.5	379	178
07-04	48	42 20	69 27	223	6.8	3.5	490	192
*07-05	52	42 26	69 04	220	7.5	1.2	161	109
07-06	55	41 54	69 28	199	6.5	1.1	146	73
08-01	14	42 58	68 41	179	7.5	7.5	930	500
08-02	20	43 36	68 43	146	7.3	1.1	127	70
08-03	16	43 15	68 33	192	7.0	11.6	1,329	848
08-04	17	43 30	68 42	146	7.4	19.2	2,447	1,187
08-05	15	43 12	68 45	172	7.3	12.1	1,535	792
*08-06	13	42 60	68 51	176	7.4	21.1	2,413	1,440
*08-07	18	43 32	68 49	139	7.3	3.1	325	195
10-01	19	43 35	68 29	163	7.3	15.9	1,703	1,077

Table 2. Miscellaneous scientific collections made on the 2000 northern shrimp survey in the western Gulf of Maine aboard the *FRV GLORIA MICHELLE*, July 21-August 4, 2000.

Investigator& Affiliation	Samples	Approximate Number Saved
George Bolz, NMFS, NEFSC Woods Hole, MA	Goosefish vertebrae	58 individuals
Jason Link, NMFS, NEFSC Woods Hole, MA	Goosefish stomach contents	58 individuals
Katherine Sosebee, NMFS, Woods Hole, MA	White hake otoliths	126 samples

Figure 1. Northern shrimp survey strata and observed distribution of catch per tow (kg) of northern shrimp collected during the 2000 survey in the western Gulf of Maine on the FRV Gloria Michelle July 21 - August 4, 2000.

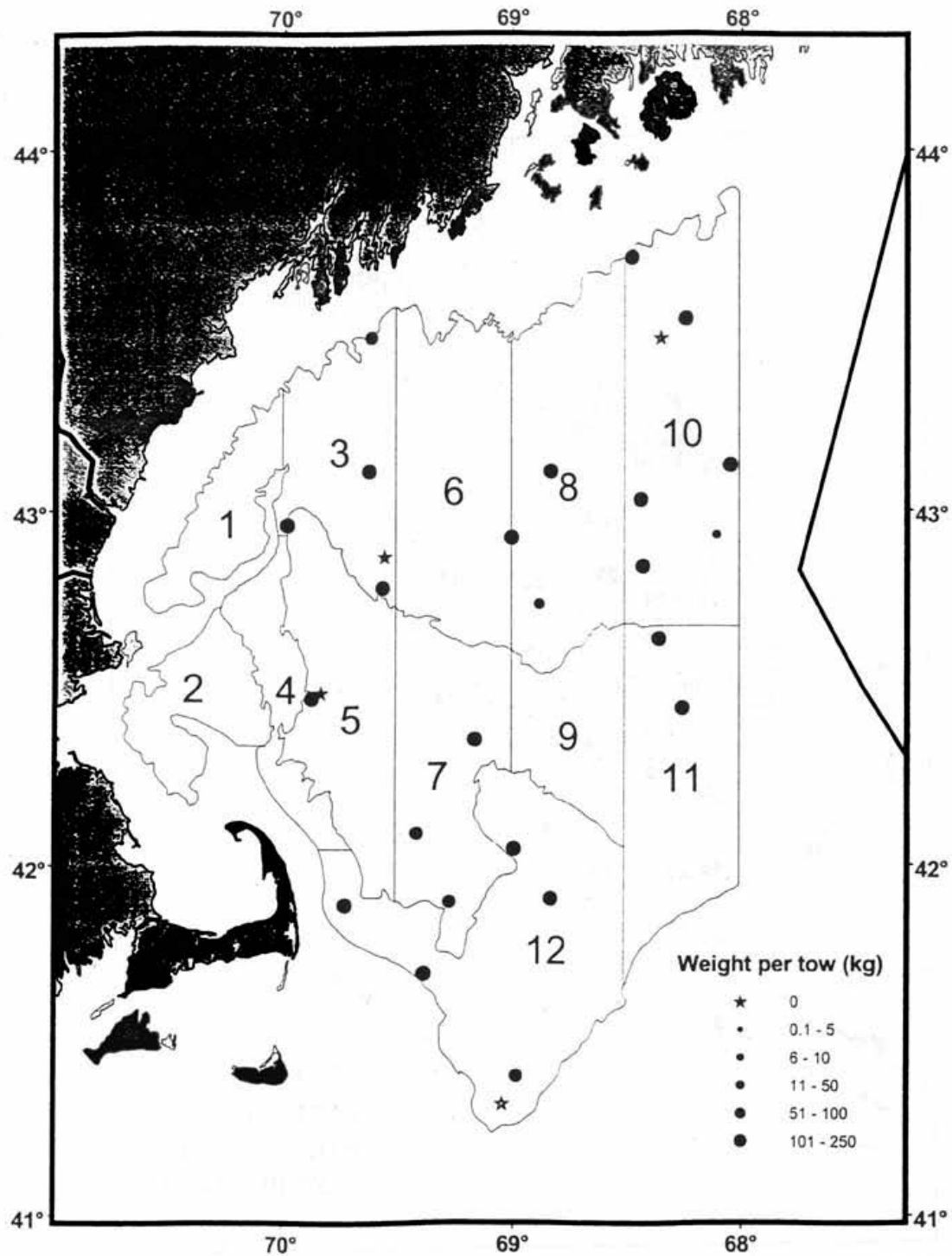
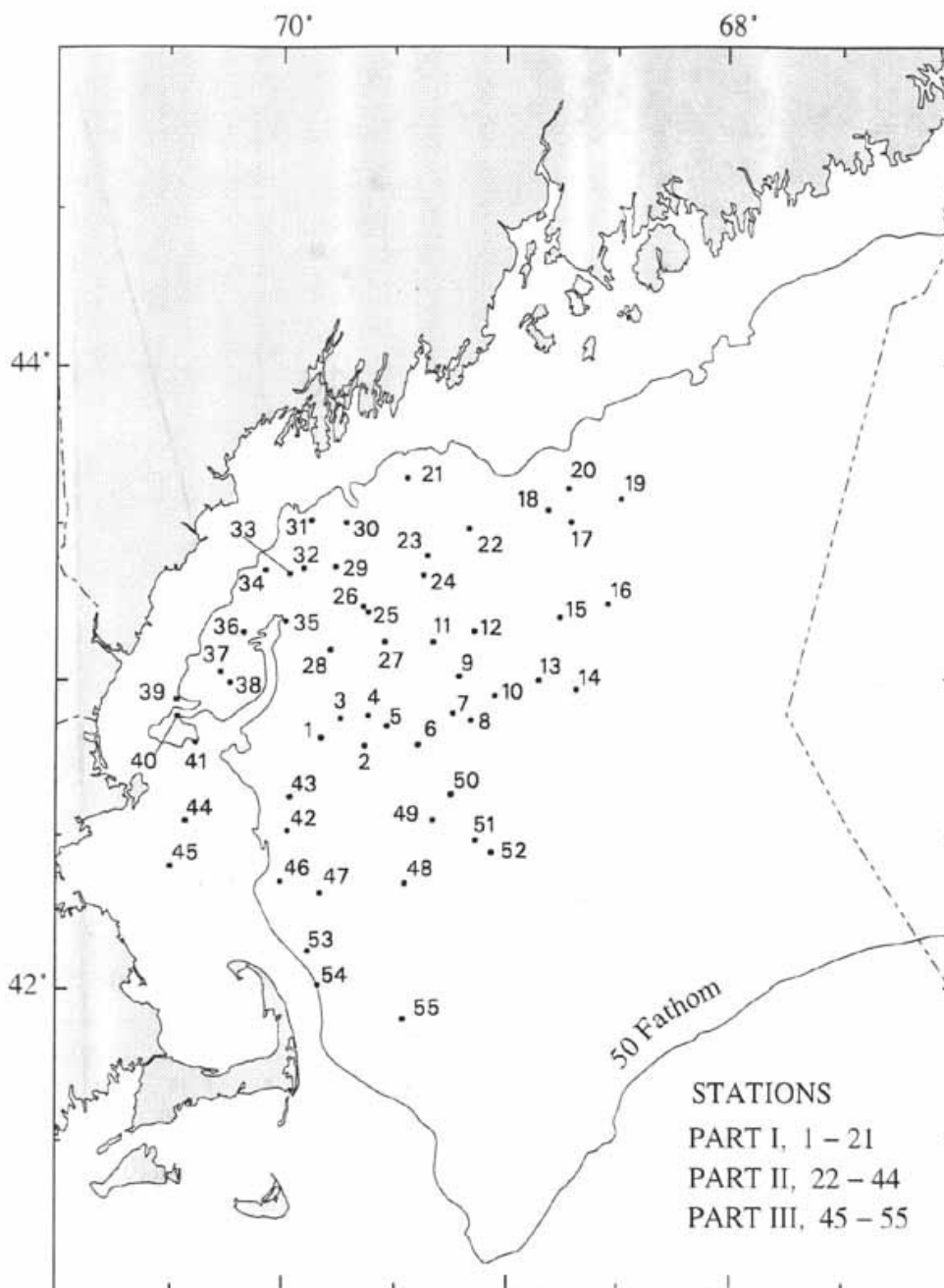


Figure 2. Trawl hauls made from the FRV Gloria Michelle, during National Marine Fisheries Service, Northeast Fisheries Science Center summer northern shrimp survey (00-12), July 24, August 6, 2000 of northern shrimp collected during the 2000 survey in the western Gulf of Maine on the R/V Gloria Michelle July 21 - August 4, 2000.



Appendix I. Participants in the 2000 Northern Shrimp Survey cruise to the western Gulf of Maine, July 21 - August 4, 2000.

National Marine Fisheries Service, NEFSC, Woods Hole, MA

Victor Nordahl Chief Scientist, Part I - July 21-23
 Victor Nordahl Chief Scientist, Part II - July 24-28
 Nancy McHugh Chief Scientist, Part III - July 29-August 1
 Victor Nordahl Chief Scientist, Part IV - August 2-4
 Christina Bascunan, II
 Stephen Clark, I, II
 Paul Kostovick, III
 Henry Milliken, I
 John Nelson, I, II, III, IV

National Marine Fisheries Service, NEFSC, Highlands, NJ

Fred Falwell, Lead Fisherman, I, II, III, IV

NOAA Corps, Highlands, NJ

LT Scott Sirois, Commanding Officer, I, II, III, IV
 LTJG James Cronin, Executive Officer, I, II, III, IV

ME Department of Marine Resources, West Boothbay Harbor, ME

Kohl Kanwit, II
 Marcy Lucas, IV
 Kerry Lyons, IV
 Daniel Schick, I, III
 Wayne Weeks, III

Atlantic States Marine Fisheries Commission, West Boothbay, ME

Amy Schick, III

MA Division of Marine Fisheries, Pocasset, MA

Jeremy King, II

MA Division of Marine Fisheries, Gloucester, MA

Michael Armstrong, IV
 William Hoffman, IV
 Jeffrey Plouff, II

MA Division of Marine Fisheries, Boston, MA

David McCarron, IV

New England Fishery Management Council, Kennebunk, ME

John Williamson, III