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Divisions 3LNO Northern pink shrimp (*Pandalus borealis*) – Interim Monitoring Update

By

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Abstract

This document updates some of the indices for northern pink shrimp (*Pandalus borealis*) harvested within NAFO Divisions 3LNO. A full assessment for this resource was completed, within Scientific Council during November 2002, and management advice was provided for the years 2003 and 2004. The catch table and biomass estimates are updated within this report. A catch of 6,977 tons was taken in 2002 against a TAC of 6 000 tons. The autumn biomass index was 215 008 tons while the preliminary spring biomass index was 189 476 tons. There has been no significant change in the status of 3LNO *P. borealis* since the November assessment.

Fishery and Management

TAC regulation

During November 2002, Scientific Council (SC) noted that there had been a significant increase in biomass and recruitment in Div. 3LNO shrimp since 1999. Applying a 15% exploitation rate to the lower 95% confidence interval of biomass estimates, averaged over the autumn 2000-2001 and spring 2001-2002 surveys, resulted in a catch of approximately 13 000 tons. Accordingly, Scientific Council recommended that the TAC for shrimp in Div. 3LNO in 2003 and 2004 should not exceed 13 000 tons. At that time, SC reiterated its recommendation that the fishery be restricted to Div. 3L and that the use of a sorting grate with a maximum bar spacing of 22 mm be mandatory for all vessels in the fishery (NAFO, 2002). SC agreed to review the 2004 advice in September 2003.

Catch trends

Catches increased dramatically since 1999, with the beginning of a regulated fishery. Since then, sixteen contracting nations have exercised their privileges to fish shrimp in Div. 3L (Table 1). Over the period 2000-2002, catches were 4 920, 10 566 and 6 977 tons, respectively. As per NAFO agreements, Canadian vessels took most of the catch during each year. Canadian catches increased from 4 250 tons in 2000 to 5 414 tons in 2002. Fishing vessels from contracting nations took 619, 5 437 and 1 563 tons of shrimp each respective year. Most of the catch from the NRA, in 2001 and 2002, was taken by Estonian and Faroese vessels. Table 1 provides a break down of catches by nation and year. Figure 1 illustrates catches and TAC since 1992.

Canadian Multi-species Bottom Trawl Research Survey Trends

Spring and autumn multi-species surveys, using a Campelen 1800 shrimp trawl, have been conducted onboard the Canadian Coast Guard vessels Wilfred Templeman, Teleost and Alfred Needler since 1995. Details of the survey design and fishing protocols are outlined in (Brodie, 1996; McCallum and Walsh, 1996). Shrimp were frozen and returned to the Northwest Atlantic Fisheries Centre where species identifications were made, and number and weight per set were calculated. Stratified abundance and biomass indices were estimated via areal expansion using programs based upon Cochran (1997) and written in SAS (D.C. Orr, unpublished).

Samples from spring 2003 had been processed prior to this report; however, the data were not available for this interim report. Spring 2003 estimates presented in this report made use of sample weights from unprocessed sets. In order to estimate the 2003 spring trawlable biomass index, the 1999-2002 spring trawlable biomass indices were estimated from unprocessed sample data. The proportion of *P. borealis* within the unprocessed indices was then determined. This proportion was applied to the combined Div. 3LNO trawlable biomass index from unprocessed samples as indicated below:

Total shrimp biomass index from unprocessed samples = 215 293 tons
Proportion of *P. borealis* within 1999-2002 spring biomass indices = .88008
Preliminary biomass estimate for spring 2003 = .88008 * 215 293 tons = 189 475 tons

Analyses from the autumn 2002 survey indicated that the Div. 3LNO trawlable biomass index was stable at 215 000 tons, while abundance increased to 50 billion animals (Table 2, Fig. 2). The 95% confidence intervals around these indices overlap the 95% confidence intervals for the respective indices since spring 2000; therefore, there has been no significant change in autumn biomass or abundance indices since spring 2000.

Preliminary estimates from the spring 2003 survey indicated that the Div. 3LNO trawlable biomass index was 189 476 tons. This is the highest trawlable biomass index in the 5-year time series (Table 3, Fig. 3). The 95% confidence interval around the preliminary spring biomass index is within the range of spring and autumn confidence intervals since 2000. Thus the spring and autumn biomass indices are similar and have not changed significantly since spring 2000.

The NRA accounted for between 12 and 32% of the total Div. 3LNO biomass as determined from each survey since 1995. More than 90% of the biomass was found within Div. 3L, mostly within depths from 185 to 550 m. Div. 3N accounted for less than 10% of the total Div. 3LNO biomass while Div. 3O accounted for less than 1% of the Div. 3LNO biomass. Figure 4 demonstrates that there has been no change in distribution of autumn Canadian multi-species survey catches since 1999.

Conclusions

Available data do not indicate a major change in the status of NAFO Div. 3LNO northern pink shrimp since it was last assessed in November 2002.

References

Brodie, W. 1996. A description of the 1995 fall groundfish survey in Division 2J3KLMNO. NAFO SCR. Doc., No. 27, Serial No. N2700, 7 p.

Cochran, W. G. 1997. Sampling Techniques. Third Edition. John Wiley & Sons. Toronto, 428 p.

McCallum, B.R. and S.J. Walsh. 1996. Groundfish survey trawls used at the Northwest Atlantic Fisheries Centre, 1971 – present. NAFO SCR Doc., No. 50, Serial No. N2726, 18 p.

NAFO, 1999. Scientific Council Reports, p 207-215.

NAFO 2002. Scientific Council Reports, p. 237-238.

Table 1. Nominal catches (tons) by country of northern pink shrimp (*Pandalus borealis*) caught in NAFO Div. 3L.

Country	2000	2001	2002	2003
Canada – Nfld.	3,843[1]	4,708[2]	4847[2]	
Canada – Mar.	458[1]	421[2]	567[2]	
Cuba			70[3]	
Estonia	64[1]	2,264[7]	450 [4] 154[7]	
Faroe Islands	42[2]	2,052[7]	620[4]	
France (SPM)	67[1]		36[3]	
Greenland	34[2]			
Iceland	97[2]	55[6]	55[6]	
Latvia	64[1]	53[3]	59[3]	
Lithuania	67[1]	51[3]	67[3]	
Norway	77[1]	78[5]	70[5]	
Poland	40[1]			
Portugal		61[4]		
Russia	67[1]	67[3]	67[3]	
Spain		699[4]		
Ukraine		57[1]		
USA			69[3]	
GRAND TOTAL	4,920	10,566	6,977 ?? 6,681	
TAC (tons)	6,000	6,000	6,000	13,000

Sources:

1 NAFO Statlant 21A
2 Canadian Quota Report, or other preliminary sources
3 NAFO monthly records of provisional catches
4 Canadian surveillance reports
5 Observer datasets
6 Icelandic logbook dataset.
7 Estonian logbook dataset

Table 2 Northern shrimp stock size estimates in NAFO divisions 3LNO from autumn research trawl surveys - offshore, 1995 - 2002. (standard 15 min. tows)

	Biomass (tons)			Abundance (numbers x 10^{-6})			Survey
Year	Lower C.I.	Estimate	Upper C.I.	Lower C.I.	Estimate	Upper C.I.	Sets
1995	3,639	5,921	8,202	659	2,054	3,449	337
1996	10,230	20,088	29,948	1,985	5,866	9,748	304
1997	25,530	46,202	66,875	6,280	10,523	14,766	318
1998	40,011	59,914	79,816	10,787	15,326	19,866	347
1999	36,202	53,144	70,086	9,588	13,060	16,533	313
2000	93,132	118,180	143,227	25,840	32,066	38,292	337
2001	77,563	223,995	370,427	20,177	54,077	87,978	362
2002	126,180	215,008	303,837	30,469	50,256	70,043	365

Table 3 Northern shrimp stock size estimates in NAFO divisions 3LNO from spring research trawl surveys - offshore, 1999 - 2003. (standard 15 min. tows; bold numbers refer to estimates derived from unprocessed samples).

	Biomass (tons)			Abundance (numbers x 10^{-6})			Survey
Year	Lower C.I.	Estimate	Upper C.I.	Lower C.I.	Estimate	Upper C.I.	Sets
1999	12,564	55,317	98,069	3,178	12,702	22,227	313
2000	-15,869	121,815	259,498	-54,743	25,012	104,768	298
2001	62,359	102,566	142,773	13,417	24,845	36,272	300
2002	121,067	159,491	197,916	28,311	37,512	46,714	300
2003	**109,154**	**189,476**	**269,798**				300

Table 4 NAFO divisions 3LNO *Pandalus borealis* biomass estimates for entire divisions. (Shrimp were collected during the autumn Canadian multi-species surveys using a Campelen 1800 shrimp trawl. (standard 15 min. tows; bold numbers from spring 2003 indicate that estimates were made from unprocessed sample data).

Season	Year	Division	Entire Division Biomass estimate (Kg x 1000)	Entire Division Percent by division
Autumn	1995	3L	5,357	90.48
Autumn	1996	3L	18,566	92.42
Autumn	1997	3L	45,758	99.04
Autumn	1998	3L	56,485	94.28
Autumn	1999	3L	52,863	99.47
Autumn	2000	3L	117,902	99.77
Autumn	2001	3L	223,149	99.62
Autumn	2002	3L	210,451	97.88
Autumn	1995	3N	533	9.00
Autumn	1996	3N	1,514	7.54
Autumn	1997	3N	427	0.92
Autumn	1998	3N	3,360	5.61
Autumn	1999	3N	272	0.51
Autumn	2000	3N	270	0.23
Autumn	2001	3N	836	0.37
Autumn	2002	3N	4,444	2.07
Autumn	1995	3O	31	0.52
Autumn	1996	3O	9	0.04
Autumn	1997	3O	17	0.04
Autumn	1998	3O	69	0.12
Autumn	1999	3O	9	0.02
Autumn	2000	3O	8	0.01
Autumn	2001	3O	10	0.00
Autumn	2002	3O	113	0.05
	all divisions			
Autumn	1995		5,921	
Autumn	1996		20,089	
Autumn	1997		46,202	
Autumn	1998		59,914	
Autumn	1999		53,144	
Autumn	2000		118,180	
Autumn	2001		223,995	
Autumn	2002		215,008	

Season	Year	Division	Entire Division Biomass estimate (Kg x 1000)	Entire Division Percent by division
Spring	1999	3L	53,934	97.50
Spring	2000	3L	119,521	98.12
Spring	2001	3L	102,493	99.93
Spring	2002	3L	155,061	97.22
Spring	2003	3L	**185,945**	98.14
Spring	1999	3N	1,349	2.44
Spring	2000	3N	2,248	1.85
Spring	2001	3N	53	0.05
Spring	2002	3N	4,395	2.76
Spring	2003	3N	**3,471**	1.83
Spring	1999	3O	34	0.06
Spring	2000	3O	46	0.04
Spring	2001	3O	20	0.02
Spring	2002	3O	35	0.02
Spring	2003	3O	**59**	0.03
		all divisions		
Spring	1999		55,317	
Spring	2000		121,815	
Spring	2001		102,566	
Spring	2002		159,491	
Spring	2003		**189,475**	

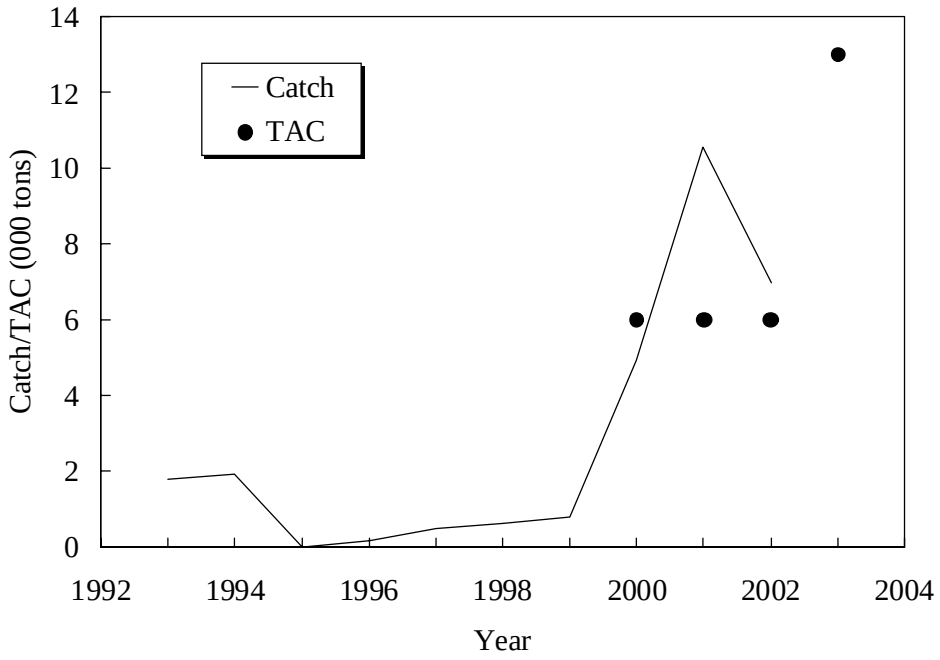

Fig. 1. Trends in NAFO Div. 3LNO northern pink shrimp (*Pandalus* borealis) catch and TAC over the period 1993-2002.

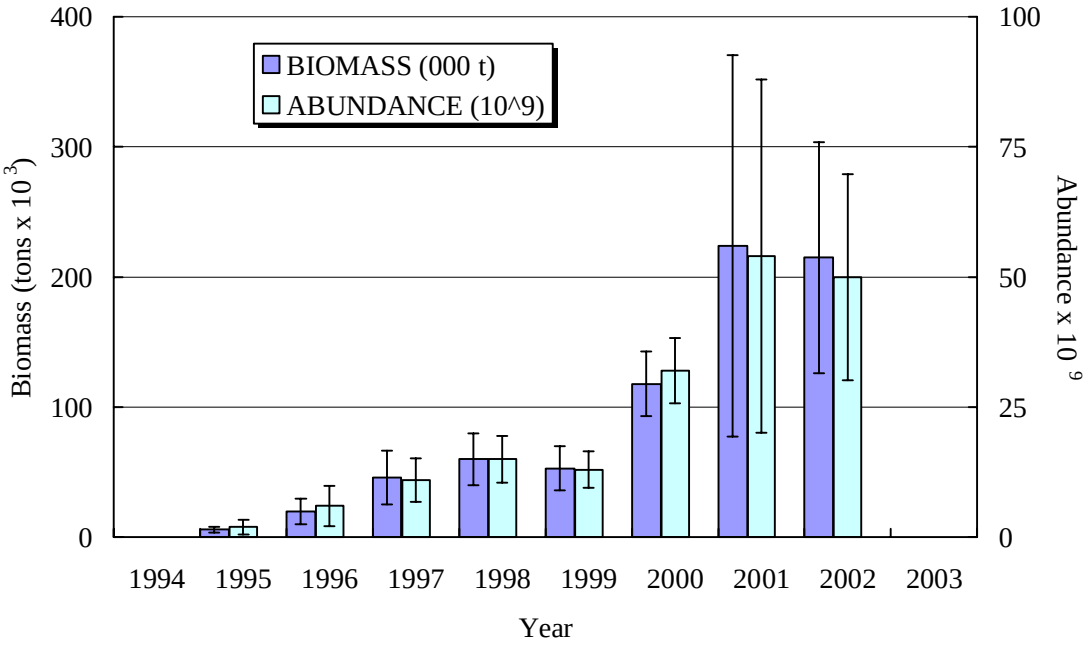

Fig. 2. Autumn northern pink shrimp (*Pandalus borealis*) abundance and biomass estimates within NAFO Div. 3LNO. Data were from Canadian multi-species bottom trawl surveys using a Campelen 1800 trawl. (standard 15 min. tows).

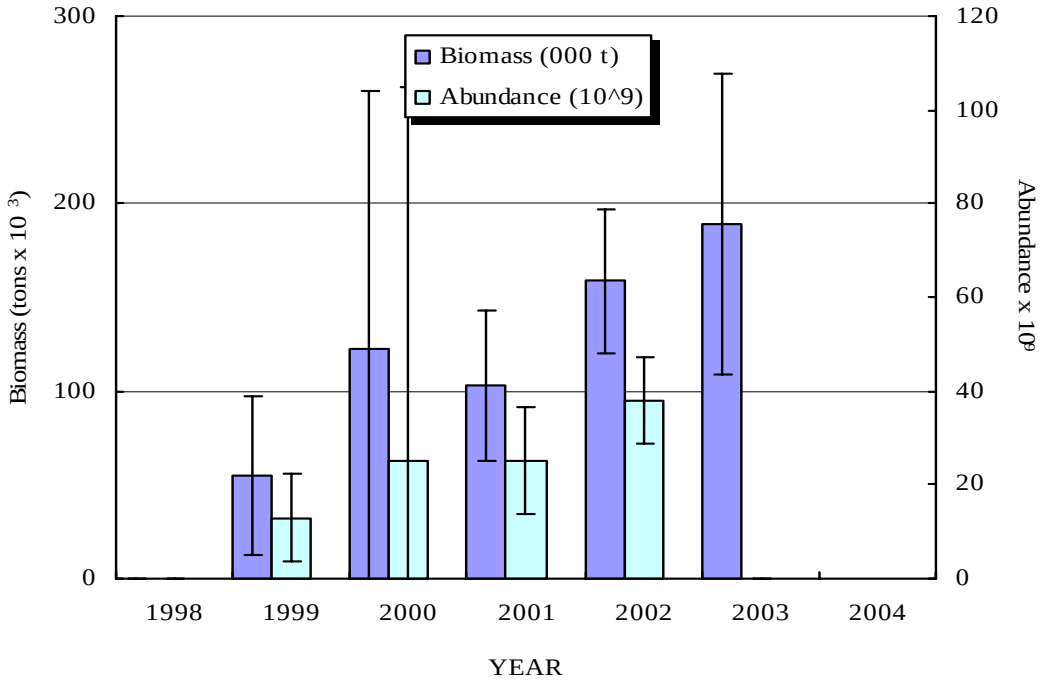

Fig. 3. Spring northern pink shrimp (*Pandalus borealis*) abundance and biomass estimates within NAFO Div. 3LNO. Data were from Canadian multi-species bottom trawl surveys using a Campelen 1800 trawl. (standard 15 min. tows; spring 2003 estimate from unprocessed sample data).

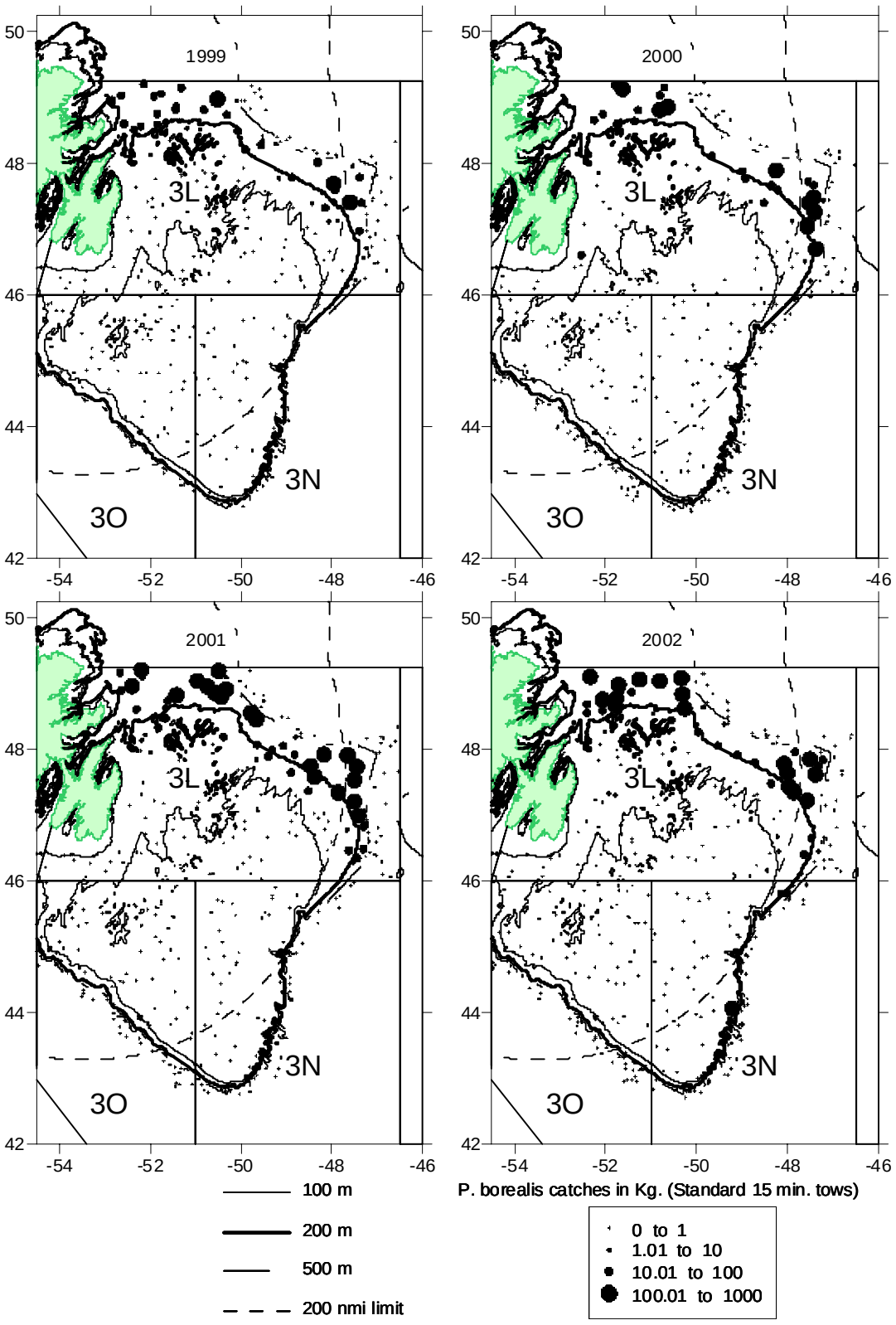

Fig. 4 Distribution of NAFO Div. 3LNO northern pink shrimp (*Pandalus borealis*) catches (kg/tow) from as determined from autumn Canadian stratified random surveys conducted over the period 1999-2002 using a Campelen 1800 shrimp trawl.