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Northern Shrimp (*Pandalus borealis*, Krøyer) from EU-Spain Bottom Trawl
Survey 2024 in NAFO Div. 3LNO

by

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Abstract

The Spanish Institute of Oceanography carried out in 2024 two bottom trawl surveys in the NAFO Regulatory Area in Division 3NO and 3L during the months of June, July and August respectively. The results on Northern shrimp (*Pandalus borealis*) are presented and compared with those from previous surveys from the same series. As recent years in 2024 the shrimp catch (32.347 kg.) and estimated biomass (139.84 t.) in Divisions 3NO remain between the lowest of the series. The Northern shrimp catches in 3L Division have declined from 2009, the shrimp catch (746 kg.) and biomass estimated in 2024 (4636 t.) also remain among the lowest values in the historical series.

Introduction

Northern shrimp (*Pandalus borealis* Krøyer, 1883) is a prodrandric, circumpolar species, discontinuously distributed in the North Atlantic and of considerable commercial importance. The greatest abundance is being in the Northwest Atlantic at latitudes above 46°N. The stock of this species in Div. 3LNO, NAFO is distributed along the entire edge of the Grand Bank, mainly in Div. 3L, at depths generally ranging from 185 to 550 metres, although historically at least 92.7% of the 3LNO shrimp biomass had been found within Division 3L. The proportion of biomass in 3LNO within the NAFO Regulatory Area (NRA), over the period 1996 – 2014, accounted for between 4 and 32.6% (Orr and Sullivan, 2014).

Since 1995, Canadian multi-species stratified random surveys have been used to estimate northern shrimp biomass and abundance indices within NAFO Div. 3LNO. In this series of surveys, Div. 3N accounts for between 0.2 and 8.1% of the total 3LNO biomass. Between 0 and 100% of the 3N biomass was located outside the 200 Nmi limit. The biomass in Division 3O accounts for less than 1% of the biomass in Div. 3LNO and only a negligible amount of the biomass in Div. 3O is beyond the 200 miles limit (Orr and Sullivan, 2014).

The fishery began in 1993 and came under TAC control in 2000. The TAC was then reduced annually until no directed fishing was implemented for 2015. The Oceanographic Spanish Institute (IEO) is conducting research cruises since 1995 in the NAFO Regulatory Area in Div. 3NO beyond Canada's EEZ. A stratified, random, bottom trawl, multi-species research sampling program was carried out to obtain abundance and biomass indices as well as other biological data for the most important commercial species present in the area. In the surveys conducted between 1995 and 2000, the catches of northern shrimp were insignificant. This could be explained by the low efficiency of the fishing gear "pedreira", with this species (Paz et al., 1995), used in those years.



Since 2001, the survey was carried out on board R/V “*Vizconde de Eza*” using a Campelen 1800 net (Walsh *et al.*, 2001). Despite the improvements incorporated with the new vessel and the use of a Campelen 1800 net, which is highly efficient for this species (Vazquez, 2002), total catches in 2001 were poor, i.e., 29 kg. In the following years a significant increase of the catches of northern shrimp was noted in 3NO Division where catches were higher than 300 kg. Since 2007 the catches have declined to levels next to the lowest in the historical series.

Also, since 2003 a new research survey was conducted in Division 3L as an extension of the survey carried out in 3NO (Román *et al.*, 2008). The estimated biomass in 3L Division always was very superior to that estimated in 3NO. Since 2009, the catches have declined to low levels staying in the last years between the lowest in the historical series.

This work presents data on the geographical distribution in the NAFO Regulatory Area (Div. 3LNO), on biomass, length frequencies and age structure of catches of northern shrimp on EU-Spanish bottom trawl surveys 2024.

Materials and Methods

In 2024 the EU-Spanish bottom trawl surveys were carried out in 3NO (from 13th June to 1st July) and 3L (from 8st to 27st August) following set guidelines previously established for the series of Spanish research surveys (Walsh *et al.*, 2001). These surveys took place in Div. 3NO and 3L, with a total of 113 and 94 valid hauls respectively ranging depths between 45 and 1482 m approximately. All strata were surveyed.

Shrimp samples of approximately 1.5 kg were taken to determine length frequencies. Males and females were separated with reference to the endopod of the first pleopod (Rasmussen, 1953). Following this criterion, individuals that were in the middle of a sex change were considered as females. The females were differentiated into mature and immature, following the sternal spines criteria (McCray, 1971). Ovigerous females were considered as an independent group not included within the mature females.

Individuals were measured onboard by noting the distance from the base of the eye to the posterior mid dorsal point of the carapace -CL- (Shumway *et al.*, 1985). Such measurements were made to the lower half millimetre using electronic callipers.

Furthermore, in 2024 survey some samples were frozen onboard to determine the length-weight relationship in the laboratory.

Results and Discussion

The Table 1 shows the catches, biomass and standard errors estimated by swept area method of northern shrimp from the EU-Spanish multi-species surveys, carried out by IEO Vigo from 1995-2024 (except 2020) in the NAFO Div. 3NO and from 2003-2024 in Division 3L. In the summer of 2005, 2020, 2021 and 2022 the research survey could not be carried out in Division 3L. From the year 2002 an abrupt increase with respect to earlier years occurred in 3NO Division, both in terms of catch and biomass (Diaz *et al.*, 2002). These initial data were considered with caution due to the fact that, until 2001, the “Pedreira” gear used as a sampler (Paz *et al.*, 1995) was not efficient for catching shrimp. However, although in 2001, the gear “type Pedreira” was changed for a new type “Campelen 1800” (Walsh *et al.*, 2001) with high efficiency for catching this species (Vazquez, 2002), the catches and biomass estimated stayed at low levels.

From 2002 to 2006, the increase of shrimp catches in 3NO was confirmed, in terms of the period 1995-2001. After that, in the last years the catches and estimated biomasses of shrimp have decreased markedly and they are now at levels of the beginning of the series. The estimated biomass in 2024 was around 140 t. (Figure 1).

Unlike 3NO, the estimated biomass in 3L Division showed a general upward trend from 63 647 t. in 2003 to 149 265 t. in 2008. This trend changed in 2009 with the strong decline of the biomass estimated (74 091 t, about 50% with respect to 2008) and since then the biomass decreased up to the historical minimum recorded

in 2019 (7 063 t.). In 2024 the biomass remains unchanged compared to 2023 (4 636 t.) and it still remains between the values lowest in the survey series (Figure 1).

The distribution of northern shrimp catches in the EU-Spanish trawl surveys 2024 is shown in Figure 2. As in previous years the catches in 3NO Division were residuals.

The Tables 2 and 3 show the shrimp biomass by depth strata from 1995 to 2024 surveys in 3NO Divisions and from 2003 to 2024 in 3L Division. Although it is considered that the shrimp in Div. 3LNO is distributed along the entire edge of the Grand Bank, at depths generally ranging from 51 to 300 fathoms (93-550 m.), the depth of the bulk of biomass in 3L Division was generally in depths lower than 200 ft (92% of the biomass in 2024). From 2013 to 2015 this general pattern changed and the percentage of the estimated biomass in depths lower than 200 ft decreased up to 44%, 77% and 85% of the biomass in 2013, 2014 and 2015 respectively. In 3NO the percentage of the estimated biomass in depths lower than 200 ft. varied along the years, showing a deeper distribution in 2004, 2005 and 2011 (26%, 34% and 21% respectively).

The length distribution by sex estimated in 3NO and 3L Divisions are presented in the tables 4, 5 and Figure 3. In 3NO, the main modes were around 18 mm. for males and 22.5 mm. for females; and 18 mm. for males and 21.5 mm. for females in 3L Division. In 2024 the sex ratio was different in both Divisions, showing a higher percentage of the females (81% in 3NO and 66% in 3L).

The Table 6 shows the length-weight relationship estimated in 2024 surveys by sex and maturity stage as well the parameters of the relationship, number of specimens sampled and determination coefficient R². 376 individuals were selected in 3NO Divisions, dried and weighed with a precision of 0.01g to calculate the length-weight relationship in each Division.

The MIX modal size analysis programme was used with the length distribution by sex estimated in 3L Divisions (Table 7). From the cited analysis the males presented three modes at 14.5, 18.2 and 20.6 mm. corresponding with ages 2, 3 and 4 respectively. The females showed several modes at 16.1, 18.7, 20.9, 22.6, 24.5 and 26.1 mm from ages 2 to 7 years old.

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Table 1. Northern shrimp biomass estimated by swept area (t), standard error and catches (kg) from EU-Spanish bottom trawl surveys in NAFO Div. 3NO, 1995-2024 and 3L 2003-2024.

3NO				3L			
Year	Biomass		Catch (kg)	Year	Biomass		Catch (kg)
	tons	Std.err.			tons	Std. err	
1995 ¹	14	13	5	2003 ²	63647	20105	5836
1996 ¹	18	17	2	2004 ²	94270	40332	5093
1997 ¹	1	1	0	2005		Not surveyed	
1998 ¹	23	17	5	2006 ²	125850	12690	17805
1999 ¹	81	36	13	2007 ²	113402	13445	18098
2000 ¹	26	9	6	2008 ²	149265	48490	23720
2001 ²	178	72	29	2009 ²	74091	37999	12173
2002 ²	2043	814	408	2010 ²	37803	9836	6103
2003 ²	1618	716	325	2011 ²	24346	4449	4092
2004 ²	2654	1693	550	2012 ²	10784	3724	1838
2005 ²	1627	590	368	2013 ²	17438	5363	3101
2006 ²	1274	352	278	2014 ²	10846	2764	1860
2007 ²	401	285	71	2015 ²	8435	1930	1450
2008 ²	144	98	24	2016 ²	20125	7903	3418
2009 ²	140	111	33	2017 ²	12893	2804	2149
2010 ²	114	35	21	2018 ²	7807	1726	1352
2011 ²	37	24	9	2019 ²	7063	1706	1164
2012 ²	4	3	1	2020 ²		Not surveyed	
2013 ²	38	15	9	2021 ²		Not surveyed	
2014 ²	3	1	1	2022 ²		Not surveyed	
2015 ²	2	1	1	2023 ²	4399	1696	739
2016 ²	2	2	0	2024 ²	4636	1686	746
2017 ²	3	1	1				
2018 ²	2	0	1				
2019 ²	5	1	1				
2020 ²		Not surveyed					
2021 ²	3	1	1				
2022 ²	168	132	44				
2023 ²	19	14	5				
2024 ²	140	127	32				

¹ Pedreira codend 35 mm. mesh size.

² Campelen codend 44 mm. mesh size. (inner codend 20mm)

Table 2. Northern shrimp biomass (kg.) by strata from Spanish bottom trawl survey 1995-2024 in NAFO Div. 3NO.

Stratum	Area miles ²	Depth range ft.	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
375	271	0-30	0	0		0	0	0	3453	0	25	0	0	1989	0	0
376	1334	0-30	0	0		0	0	0	1270	0	0	0	341	4203	0	0
353	269	31-50	0	0		0	0	0	79	0	48	0	0	0	126	0
360	2783	31-50	0	0		0	0	0	26423	1457	3470	24	0	0	445	0
374	214	31-50	0	0		0	0	0	178	0	0	0	0	0	62	0
354	246	51-100	0	0		0	0	0	87612	0	292	6917	0	0	14	0
359	421	51-100	0	0		0	1389	0	6348	847	1309	43	41	22	98	42
377	100	51-100	0	0		0	208	44	0	2020	751	1471	3742	3704	83	60
382	343	51-100	0	0		0	213	206		112695	302	297	825	944	191	4131
355	74	101-150		0		0	0	0	15170	147	7635	6146	6183	9179	262	204
358	225	101-150	0	0		0	30129	0	717	3261	3900	10289	32548	258	2357	2902
378	139	101-150	0	0		8968	10998	1196	17004	680353	11429	772	3985	10066	1357	481
381	144	101-150		0		63	11205	122		84984	20648	225280	1486	75176	303300	114294
356	47	151-200		0		0	0	0	137	0	1337	12937	8046	2683	213	635
357	164	151-200	0	18097		0	0	0	606	16414	425145	163606	38796	114178	9307	1249
379	106	151-200	0	0	720	0	135	0	12511	70342	254080	7709	329867	116970	12146	2238
380	96	151-200		0		1024	9346	10240		1000960	698502	258603	120866	607392	6488	11379
721	65	201-300		0		0	0	0	2889	3282	1112	852	256	3054	0	257
723	155	201-300		0		0	16872	0	0	12667	92831	44044	3333	53799	14615	90
725	105	201-300	14315	0		0	0	0	271	527	91803	1814540	748369	206794	47133	578
727	96	201-300		0		13213	0	11429		28660	2119	98477	326841	62635	1248	3172
722	84	301-400		0		0	37	734	2890	60	156	0	36	0	0	0
724	124	301-400	0	0		0	0	0	0	55	628	58	165	53	213	0
726	72	301-400	0	0		0	0	0	0	7	54	2048	0	406	170	0
728	78	301-400		0		0	0	1671		7280	0	0	86	135	0	0
752	131	401-500		0		0	0	0		86	0	49	222	58	309	0
756	101	401-500		0		0	0	0	0	0	46	42	869	84	27	84
760	154	401-500		0		0	0	0	0	0	283	49	0	0	590	0
764	100	401-500		0		0	0	0	42	0	0	0	0	0	0	0
753	138	501-600		0		0	0	0		0	0	0	0	166	0	0
757	102	501-600		0		0	0	0		204	0	0	27	0	67	0
761	171	501-600		0		0	0	0	0	0	0	0	0	0	99	0
765	124	501-600		0		0	0	0	0	37	0	0	0	0	0	0
754	180	601-700				0	0	0		0	0	0	0	0	0	207
758	99	601-700				0	0	94		16302	0	19	88	0	0	0
762	212	601-700				0	0	0	0	85	0	0	0	0	0	0
766	144	601-700				0	0	0		19	58	0	0	0	0	0
755	385	701-800				0	0	89		0	174	0	68	0	0	1839
759	127	701-800				0	0	0		17	0	48	0	0	0	0
763	261	701-800				0	0	0		0	0	0	0	0	0	0
767	158	701-800				0	0	0		0	0	0	0	0	0	0
Biomasa (ton.)			14	18	1	23	81	26	178	2043	1618	2654	1627	1274	401	144
Std. Error (tons)			13	17	1	17	36	9	72	814	716	1693	590	352	285	98
Biomass % < 200 fth			0	100	100	43	79	46	97	97	88	26	34	74	84	96

Table 2 (cont.). Northern shrimp biomass (kg.) by strata from Spanish bottom trawl survey 1995-2024 in NAFO Div. 3NO.

Stratum	Area miles ²	Depth range ft.	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2021	2022	2023	2024
375	271	0-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
376	1334	0-30	0	0	34	0	0	0	0	0	0	0	0	0	0	0	0
353	269	31-50	16	0	0	0	0	0	0	0	0	0	7	0	0	48	0
360	2783	31-50	110	1317	129	0	50	0	0	70	95	158	27	0	0	207	0
374	214	31-50	0	0	0	0	0	0	0	0	82	0	0	0	0	0	0
354	246	51-100	0	55	86	0	292	0	0	0	14	0	0	6	0	0	0
359	421	51-100	0	543	47	0	30	28	0	0	0	7	0	40	0	0	0
377	100	51-100	40	0	0	0	0	0	0	0	48	0	0	0	0	0	0
382	343	51-100	0	0	0	0	0	0	0	37	0	0	16	0	46	0	0
355	74	101-150	0	961	0	148	89	11	37	0	0	0	0	94	0	0	0
358	225	101-150	0	17220	196	0	27	0	0	0	0	0	0	143	6	103	0
378	139	101-150	73	192	0	0	0	0	0	105	0	0	0	188	55	0	232
381	144	101-150	466	25403	87	111	41	78	347	1889	1379	70	107	93	150	0	0
356	47	151-200	39	409	33	0	0	0	41	0	0	6	6	20	7	0	0
357	164	151-200	959	14877	29	0	0	144	0	21	0	0	0	27	81	0	0
379	106	151-200	5079	15709	19	28	897	175	47	51	22	14	0	137	30	0	0
380	96	151-200	125767	26518	7269	3483	26188	1086	663	37	1288	1783	3811	1695	133422	18420	132804
721	65	201-300	318	6	6339	11	315	569	596	0	0	20	10	13	352	0	0
723	155	201-300	0	916	335	0	98	132	0	0	0	78	0	69	0	0	105
725	105	201-300	239	7745	0	0	216	231	69	106	30	266	0	655	324	44	0
727	96	201-300	179	632	22656	83	9350	512	158	38	25	0	1090	132	31640	0	2002
722	84	301-400	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0
724	124	301-400	0	0	32	0	0	0	0	0	0	0	0	0	5	0	0
726	72	301-400	5351	146	0	0	0	0	0	10	0	10	0	0	0	18	0
728	78	301-400	41	146	0	0	40	0	0	0	0	0	19	12	532	0	0
752	131	401-500	143	136	0	0	79	0	0	0	0	0	0	0	572	0	0
756	101	401-500	391	0	0	0	0	0	0	0	0	0	0	13	0	0	0
760	154	401-500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
764	100	401-500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
753	138	501-600	0	0	0	0	0	0	0	0	36	0	0	12	463	0	4511
757	102	501-600	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0
761	171	501-600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
765	124	501-600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
754	180	601-700	0	96	0	0	0	0	0	0	0	0	0	0	152	0	0
758	99	601-700	0	0	0	0	0	0	0	0	0	0	0	0	0	72	0
762	212	601-700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
766	144	601-700	0	32	0	0	0	0	0	0	0	0	0	0	0	0	0
755	385	701-800	0	0	0	0	0	0	0	0	0	0	0	0	68	0	0
759	127	701-800	0	965	0	0	0	0	0	0	0	0	0	0	0	0	185
763	261	701-800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
767	158	701-800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biomasa (ton.)			139	114	37	4	38	3	2	2	3	2	5	3	168	19	140
Std. Error (tons)			111	35	24	3	15	1	1	2	1	0	1	1	132	14	127
Biomass % < 200 fth			95	91	21	98	73	51	58	93	97	84	78	73	80	100	98

Table 3. Northern shrimp biomass (kg.) by strata from Spanish bottom trawl survey 2003-2024 in NAFO Div. 3L.

Stratum	Area		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
	miles ²	Depth range ft.											
385	118	51-100	420	175		2485867	2416545	8265541	140724	12046	975	4998	31
390	815	51-100	1014	3780		2577958	5404325	317330	37466118	145874	2020	49686	414
389	509	101-150	14397492	41654297		53639329	49120205	74404070	25997291	21705956	979731	630153	149429
391	282	101-150	1116135	1299793		3712072	12397477	24948041	28071	120096	11940	99221	3115
387	256	151-200	17618619	21721973		29967360	11782827	14287154	6473372	7874303	15006844	6644446	5206921
388	357	151-200	25169595	24779540		32585066	26954928	21602795	2348269	5096163	8113071	2136050	1979045
392	145	151-200	2821419	1866379		193967	1199955	3675300	1564098	1608469	24550	118649	329956
729	186	201-300	20371	1465049		88481	172095	16126	11533	95976	149	2618	11348
731	216	201-300	2449416	1467221		177357	666240	1501056	54100	1083034	2647	799077	2191919
733	234	201-300		4077		390052	3281339	240647	6718	51397	194095	285343	7544711
730	170	301-400	0	876		1485	76	32	20	581	92	0	36
732	231	301-400	34907	5643		14535	4723	1905	226	4266	1349	596	3229
734	153	301-400		408		10554	136	2144	70	129	4910	1553	15628
741	100	401-500	0	56		1379	22	486	0	0	662	189	402
745	348	401-500	17642	0		1699	186	1950	0	2716	1911	250	1613
748	159	401-500	292	696		366	499	66	0	49	108	0	21
742	64	501-600	0	0		462	0	0	0	1718	57	11202	9
746	392	501-600	0	0		134	0	74	70	225	381	0	395
749	126	501-600	0	23		99	0	0	0	0	11	0	0
743	51	601-700		0		1020	0	23	0	0	2	20	0
747	724	601-700		0		147	0	41	201	51	32	0	116
750	556	601-700		0		58	0	132	295	0	308	0	37
744	66	701-800		0		185	0	0	0	0	0	0	0
751	229	701-800				0	0	0	0	0	0	0	21
Biomasa (ton.)			63647	94270		125850	113402	149265	74091	37803	24346	10784	17438
Std. Error (tons)			20105	40332		12690	13445	48490	37999	9836	4449	3724	5363
Biomass % < 200 fth			96	97		99	96	99	100	97	99	90	44

Table 3 (cont.). Northern shrimp biomass (kg.) by strata from Spanish bottom trawl survey 2003-2024 in NAFO Div. 3L.

Stratum	Area		Depth range							
	miles ²	ft.	2014	2015	2016	2017	2018	2019	2023	2024
385	118	51-100	68	0	0	315	37	0	51	134
390	815	51-100	2340	492	94	238	12	145	1232	5717
389	509	101-150	318135	148994	176622	879985	213006	131246	117877	702761
391	282	101-150	16223	9267	8073	1677	16544	13523	23173	23475
387	256	151-200	3955026	4608862	10305953	5244142	4391914	1731129	1991054	494457
388	357	151-200	3858773	1811165	8512571	5268078	2095031	2194903	1905566	2832795
392	145	151-200	155247	553694	174468	695049	273519	1052760	203843	202613
729	186	201-300	2331	18320	5156	30569	491	37211	237	2915
731	216	201-300	1644180	875000	288113	101120	525416	1319325	589	304786
733	234	201-300	833091	400587	653016	671788	290774	582639	154931	65880
730	170	301-400	907	0	0	294	10	15	15	8
732	231	301-400	34455	1088	453	62	100	31	217	334
734	153	301-400	16075	2625	421	0	41	0	13	41
741	100	401-500	1893	3429	82	0	0	0	0	0
745	348	401-500	5068	591	55	0	12	0	83	0
748	159	401-500	83	0	0	0	21	0	0	92
742	64	501-600	0	473	31	0	0	0	0	0
746	392	501-600	1068	0	45	0	0	0	91	0
749	126	501-600	140	28	0	0	0	0	0	0
743	51	601-700	18	0	0	0	0	0	0	0
747	724	601-700	753	21	51	0	6	19	32	166
750	556	601-700	178	95	0	0	0	41	98	199
744	66	701-800	9	18	0	0	0	0	0	0
751	229	701-800	21	0	0	0	0	0	61	0
Biomasa (ton.)			10846	8435	20125	12893	7807	7063	4399	4636
Std. Error (tons)			2764	1930	7903	12893	1706	1164	1696	746
Biomass % < 200 fth			77	85	95	94	90	73	96	92

Table 4. Northern shrimp size distribution ('000) by sex from Spanish bottom trawl survey 2024 in NAFO Div. 3NO.

CL (mm)	Males	Females	Total
8			
8.5			
9			
9.5			
10			
10.5			
11			
11.5			
12	74		74
12.5	0		
13	74		74
13.5	74		74
14	13		13
14.5	0		
15	80		80
15.5	13		13
16	154	6	160
16.5	119		119
17	461		461
17.5	593	6	599
18	781	166	947
18.5	381	240	620
19	302	327	628
19.5	221	555	776
20		682	682
20.5	147	1029	1177
21		770	770
21.5		1279	1279
22		1245	1245
22.5		1680	1680
23		1633	1633
23.5		1602	1602
24		1130	1130
24.5		757	757
25		683	683
25.5		442	442
26		308	308
26.5		449	449
27		74	74
27.5		80	80
28			
29			
29.5			
30			
30.5			
Total	3487	15216	18703
	19%	81%	

Table 5. Northern shrimp size distribution ('000) by sex from Spanish bottom trawl survey 2024 in NAFO Div. 3L.

CL (mm)	Males	Females	Total
6			
6.5			
7	9		9
7.5	68		68
8	117		117
8.5	282		282
9	60		60
9.5	536		536
10	43		43
10.5	495		495
11	451		451
11.5	181		181
12	270		270
12.5	1940		1940
13	2137	8	2145
13.5	4992	18	5010
14	8225	31	8256
14.5	11400	512	11912
15	8881	36	8917
15.5	10308	565	10873
16	7550	533	8083
16.5	11780	3180	14960
17	14709	2752	17460
17.5	35019	10976	45995
18	37090	12020	49110
18.5	25452	17554	43006
19	31123	23171	54294
19.5	13053	26754	39807
20	6399	35295	41694
20.5	5627	45320	50946
21	5342	45536	50878
21.5	5656	52591	58248
22	739	31132	31872
22.5	528	33981	34509
23	415	33290	33705
23.5		24176	24176
24	193	17864	18057
24.5		23884	23884
25		16649	16649
25.5		10655	10655
26		9014	9014
26.5		10357	10357
27		4243	4243
27.5		1555	1555
28		1179	1179
28.5		719	719
29		261	261
29.5		189	189
30		8	8
30.5			
Total	251070	496008	747078
	34%	66%	

Table 6. Northern shrimp length-weight relationship by sex, maturity stage and all combined from Spanish bottom trawl survey 2024 in NAFO Div. 3NO and 3L.

	a	b	R ²	N
Division 3NO				
Males	0.0016	2.692	0.8641	82
Inmature females	0.0017	2.6842	0.8918	218
Mature females	0.0028	2.5382	0.8629	76
Ovigerous females	-	-	-	-
All combined	0.0012	2.7954	0.9584	376

Table 7. Results of the modal analysis (MIX) by sex and maturity stage Spanish bottom trawl survey 3L 2024.

<i>3L</i>				
<i>Males</i>			<i>Females</i>	
<i>Age</i>	<i>Prop.</i>	<i>St. Dev.</i>	<i>Prop.</i>	<i>St. Dev.</i>
1				
2	0.2017	0.0008	0.005608	
3	0.6673	0.0014	0.134371	
4	0.1310	0.0013	0.398591	
5			0.237027	0.0001
6			0.147095	0.0001
7			0.077308	
<i>Age</i>	<i>Mean CL</i>	<i>St. Dev.</i>	<i>Mean CL</i>	<i>St. Dev.</i>
1				
2	14.48	0.0036	16.09	
3	18.19	0.0033	18.68	
4	20.62	0.0112	20.94	
5			22.68	
6			24.49	
7			26.09	
<i>Age</i>	<i>Sigma</i>	<i>St. Dev.</i>	<i>Sigma</i>	<i>St. Dev.</i>
1				
2	0.65149	Fixed C.V.	0.7239	Fixed C.V.
3	0.81847	Fixed C.V.	0.8404	Fixed C.V.
4	0.92784	Fixed C.V.	0.9425	Fixed C.V.
5			1.0206	Fixed C.V.
6			1.1021	Fixed C.V.
7			1.1742	Fixed C.V.

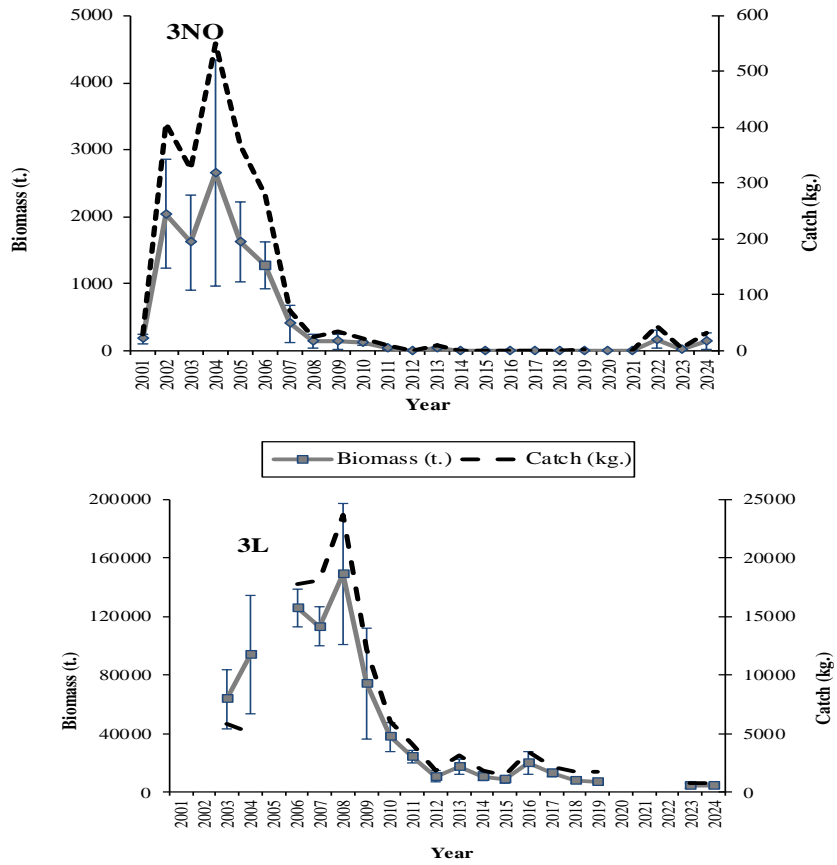


Figure 1. Northern shrimp biomass (tons) and catch (kg) from Spanish research surveys in NAFO Div. 3NO 2001-2024 and 3L 2003-2024.

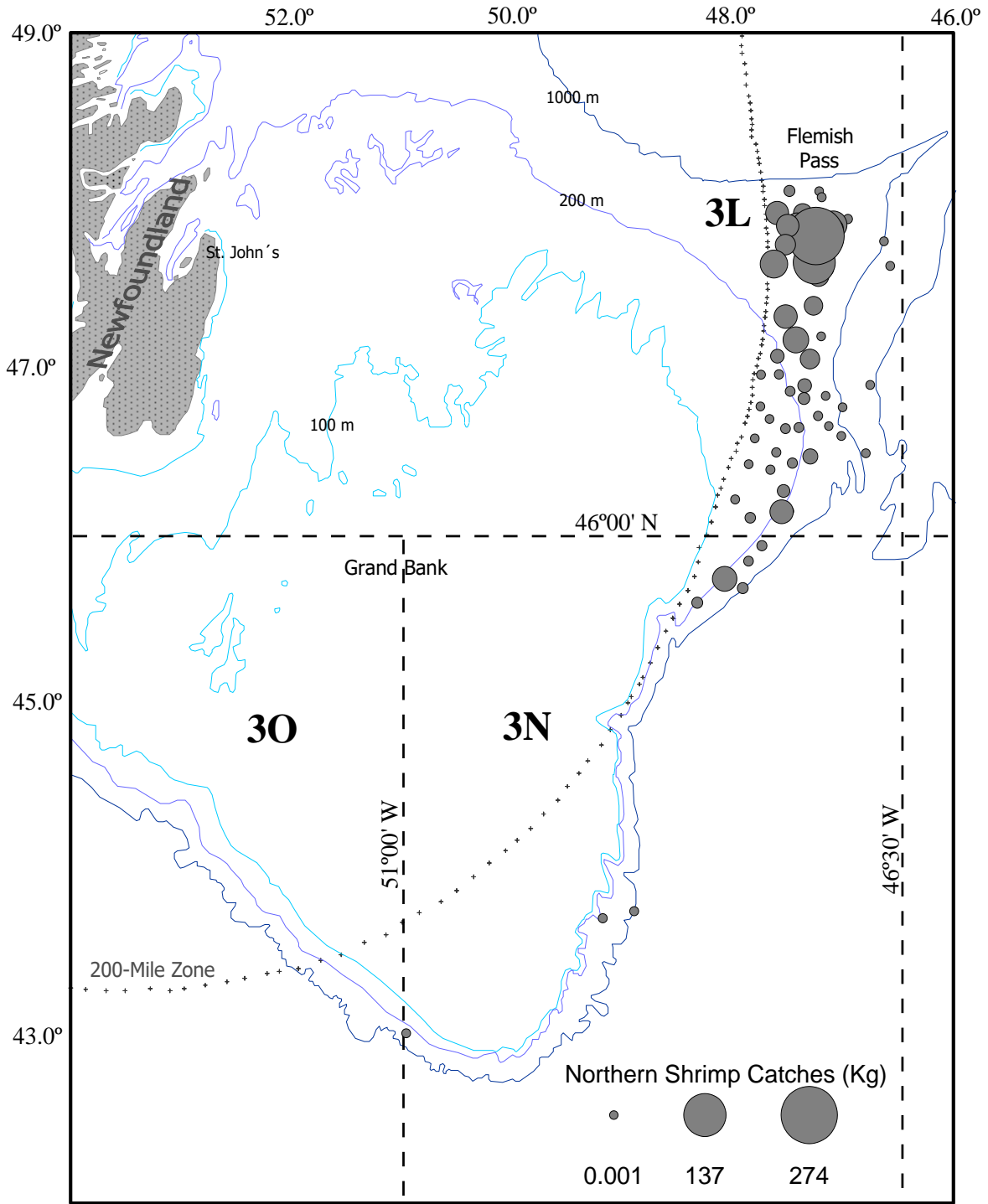


Figure 2. Geographic distribution of Northern shrimp catches from Spanish bottom trawls surveys 2024.

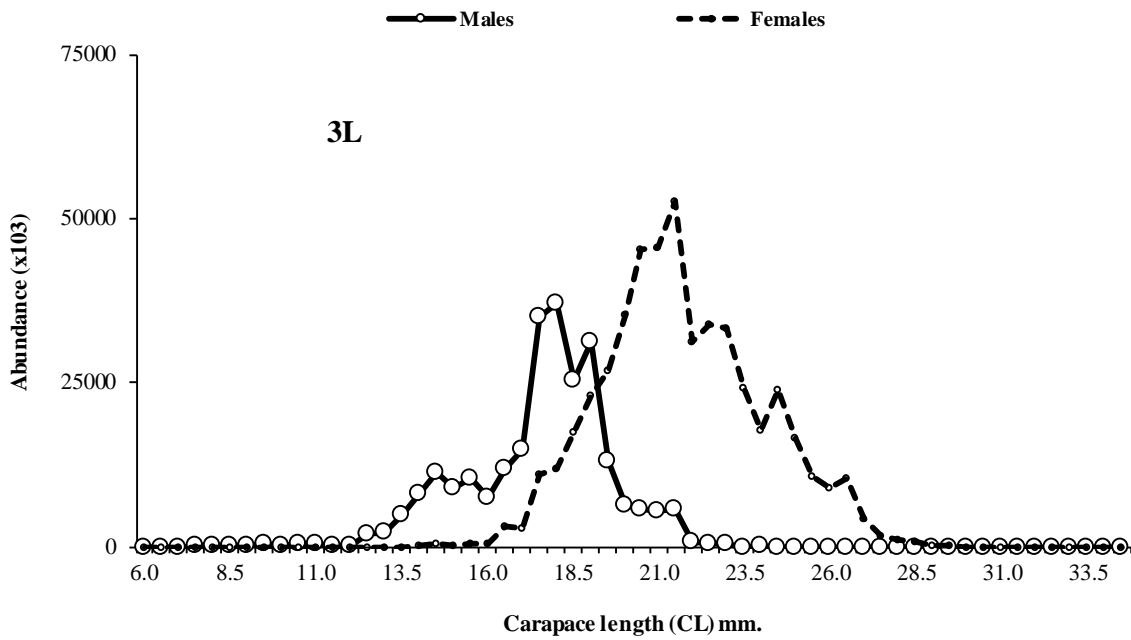
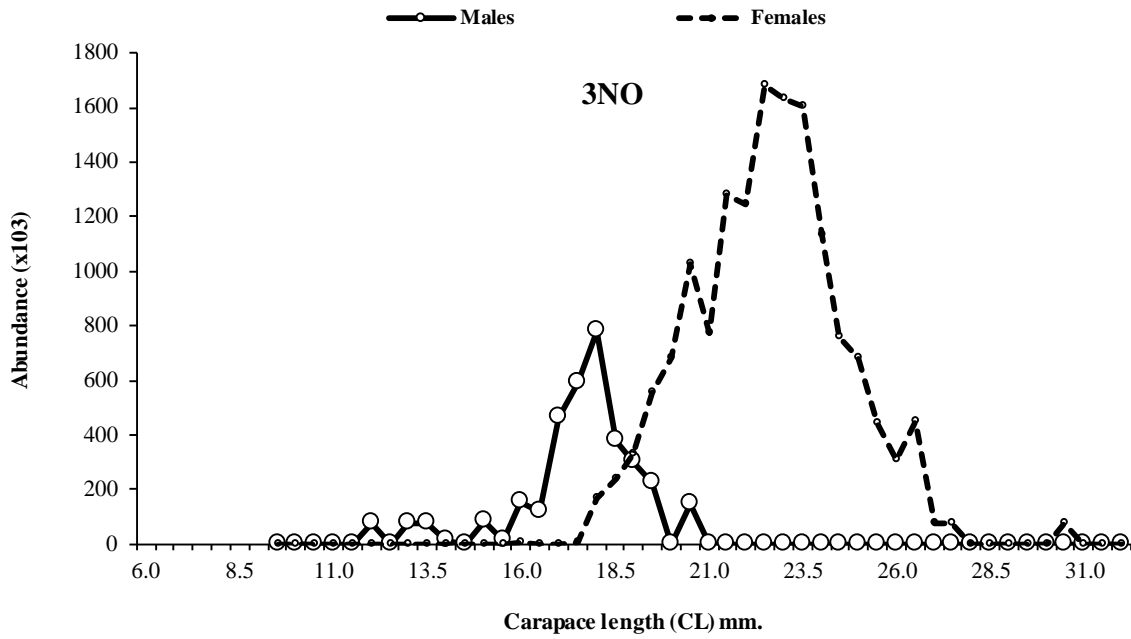


Figure 3. Northern shrimp size distribution, by sex from Spanish bottom trawl survey (2024) in Divs. 3NO and 3L.