

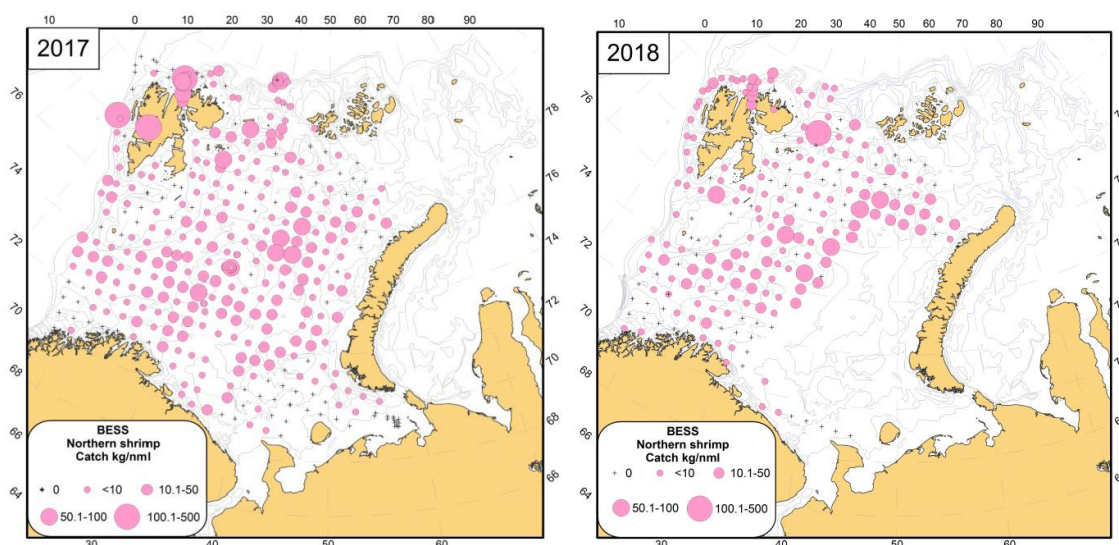
**10 COMMERCIAL SHELLFISH****10.1 Northern shrimp (*Pandalus borealis*)**

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Figures by: D.V. Zakharov and T. Hauge Thangstad

During the survey in 2018 217 trawls were made. Northern shrimp was found in the catches of 160 trawls. The biomass of shrimp varied from several grams to 128.9 kg/nml with an average catch of  $10.2 \pm 1.4^1$  kg nml (Table 10.1.1, in Appendix).

In 2017 the densest concentrations of the shrimp were registered in central part of the Barents Sea, around Spitsbergen and in the Franz Victoria Trough, in 2018 survey has not cover all area distribution of shrimp, but as 2017 bulk concentration has been found in the same areas (Figure 10.1.1). In 2017, the calculated index of the biomass (method of squares) of the Northern shrimp was 314.2 thousand tons, in 2018 calculation impossible.

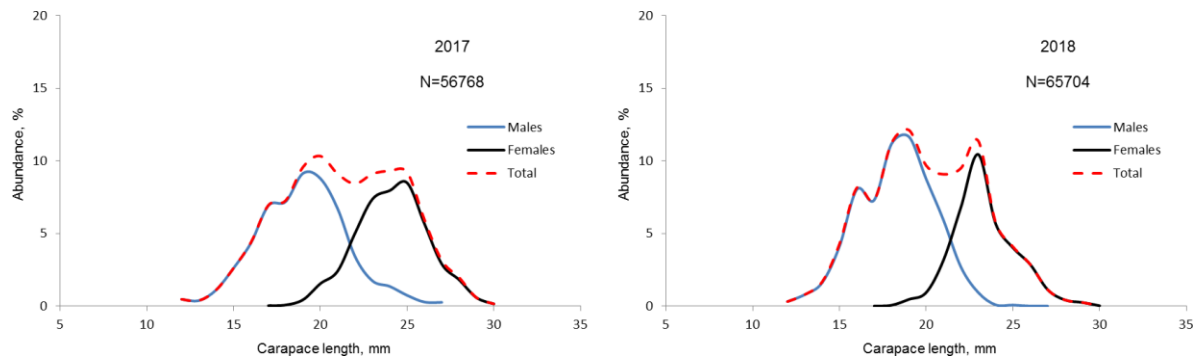


**Figure 10.1.1.** Distribution of the Northern shrimp (*Pandalus borealis*) in the Barents Sea, August-October 2017-2018

Biological analysis of the northern shrimp was conducted in 2017 by Russian scientists in the eastern part of the survey area. Likewise, in the previous year the bulk of population of the Barents Sea shrimp was made up of individuals of smaller age groups – males with carapace length of 12-27 mm and females with carapace length of 17-30 mm (Figure 10.1.2). In 2018 biological analysis of the northern shrimp was conducted in north-eastern Barents Sea bulk of population there was made up of individuals of smaller age groups – males with carapace length of 11-25 mm and females with carapace length of 17-30 mm.

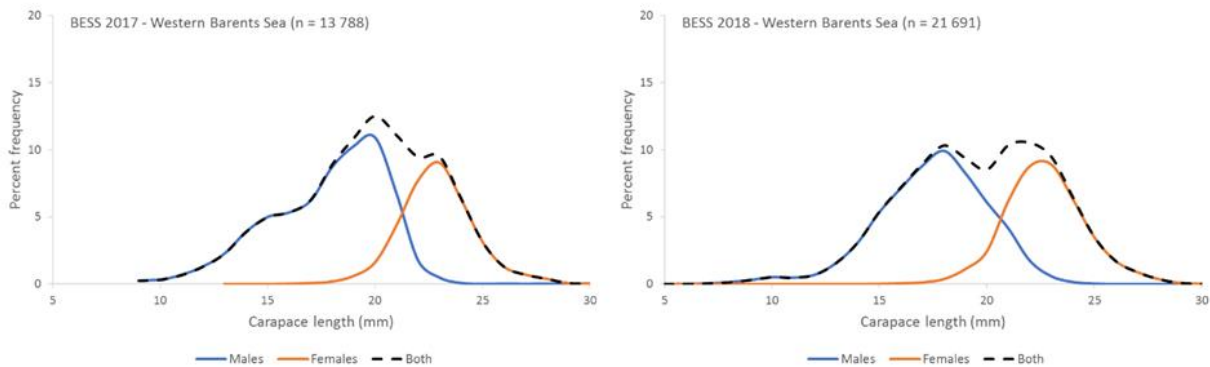
<sup>1</sup> In the section 10 the average values are reported with standard error

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**Figure 10.1.2.** Size and sex structure of catches of the Northern shrimp (*Pandalus borealis*) in the eastern Barents Sea 2017 (left) and in the north-eastern Barents Sea 2018 (right)

Similarly, in the western survey area the smaller male shrimps (carapace lengths 10-23 mm, compared to females 18-28 mm) were most frequent, making up 59% and 64% of the catches in 2018 and 2017, respectively (Figure 10.1.3).



**Figure 10.1.3.** Size and sex structure of catches of northern shrimp (*Pandalus borealis*) in the western Barents Sea, August-October 2017 and 2018

### 10.2 Red king crab (*Paralithodes camtschaticus*)

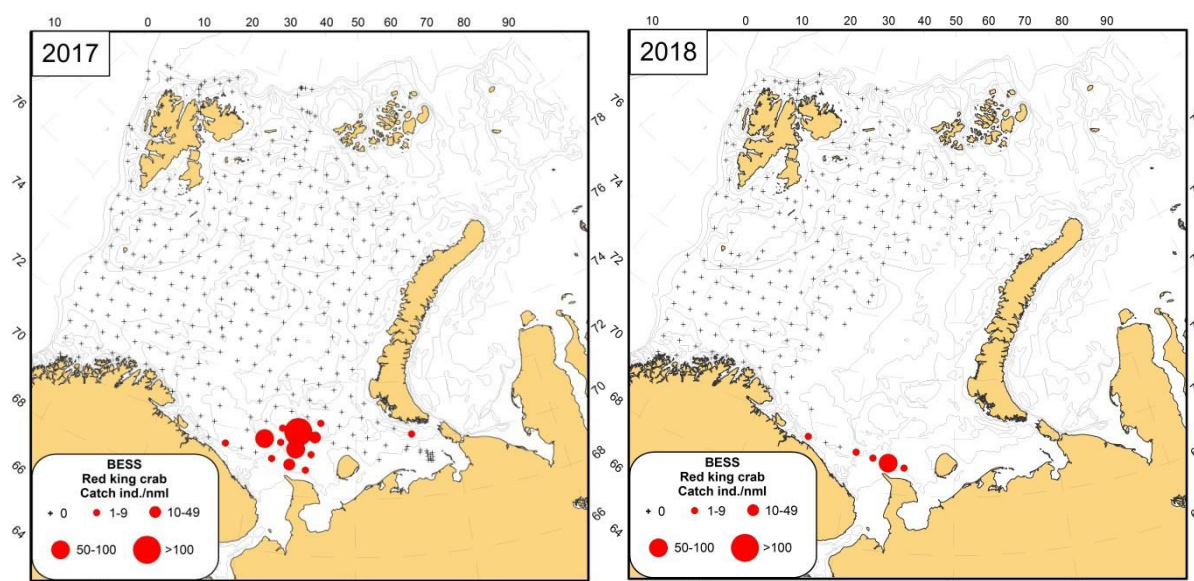
Text by *N. Strelkova*

Figures by *D.V. Zakharov*

The presented data cannot be estimated as representative (valid) due to lack of coverage of south part of the Barents Sea within REZ where the most part of the adult red king crab population are concentrated.

During survey the red king crab was recorded in 5 of 217 trawl catches (Table 10.2.1, Appendix).

According to the data of 2017 the most dense concentration of the crab was not covered by BESS 2018 (Fig. 10.2.1). As in the previous year, the crab was not registered in the Norwegian open sea waters.



**Figure 10.2.1** Distribution of the red king crab (*Paralithodes camtschaticus*) in the Barents Sea, August-October 2017 and 2018

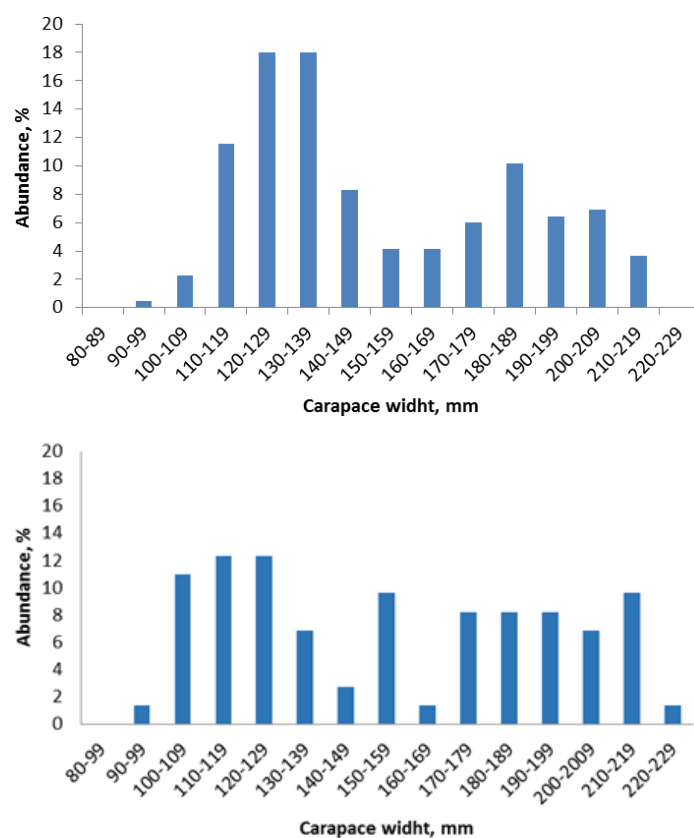
The biomass of red king crab catches in 2018 varied from 14.1 to 112.5 kg/haul (16.5-135.1 kg/nml) compared with 0.8 to 324.3 kg/haul (0.3-397.9 kg/nml) in 2017. The average biomass was  $34.9 \pm 19.4$  kg/haul ( $41.9 \pm 23.3$  kg/nml) compared with  $52.8 \pm 25.4$  kg/haul ( $64.6 \pm 31.3$  kg/nml) in 2017.

The abundance of crab ranged from 4 to 50 ind./haul (5.0-60.1 ind./nml) given an average crab abundance of  $14.6 \pm 8.9$  ind./haul ( $17.5 \pm 10.7$  ind./nml) compared with 1-109 ind./haul (0.1-133.7 ind./nml) and  $23.0 \pm 10.0$  ind./haul ( $28.3 \pm 12.4$  ind./nml) in 2017.

Given above data are not good suitable for comparison due to difference of crab area coverage. But comparing of 7 stations in the southernmost transect (35-45° N), carried out in the similar positions both in 2017 and 2018 (see Fig. 10.2.1), shows increasing of all quantitative parameters in 2018 comparing 2017 but without statistical confidence (Table 10.2.2, Appendix).

The size structure of the red king crab population in 2018 has a weakly expressed bimodal pattern and is quite similar to that of 2017 (Fig. 10.2.2).

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**Figure 10.2.2** Size structure of the red king crab population in the Barents Sea in August-October 2017 (upper) and 2018 (lower).

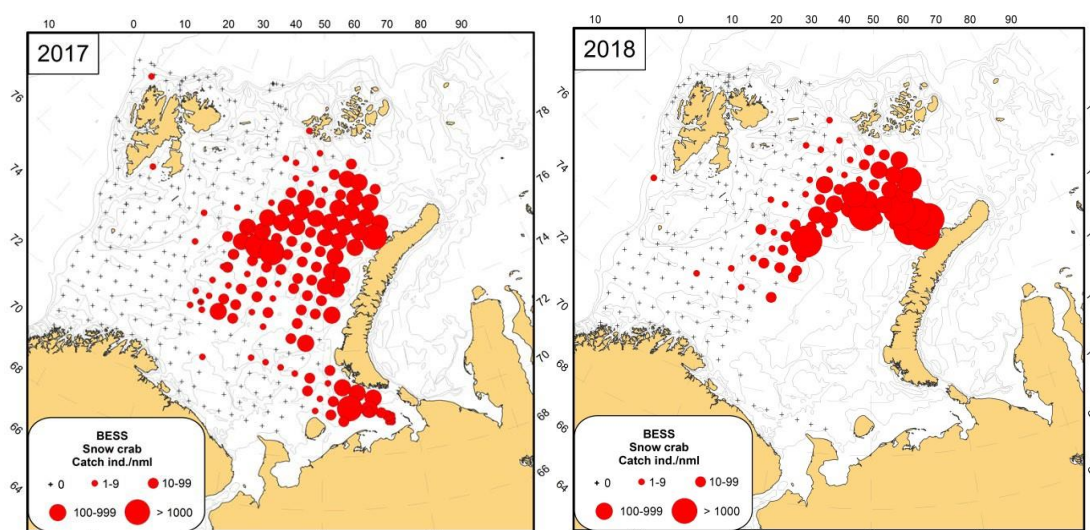
10.3 Snow crab (*Chionoecetes opilio*)

Text by *N. Strelkova and Ann Merete Hjelset*

Figures by *D.V. Zakharov*

Presented data cannot be estimated as representative (valid) due to lack of coverage of the eastern Barents where the most part of the snow crab population is concentrated. In 2017 the snow crab was recorded in 61 out of 217 trawl catches (Table 10.3.1, Appendix).

In 2017 the snow crab was for the first time recorded in the water of Spitsbergen. In 2018 one young male with carapace wide 34 mm and weight 12 g was caught to south-west of South Cap of Spitsbergen in the depth 350 m (Fig. 10.3.1). In general, in 2018, the border recordings of the snow crabs were made further to the southwest boreal part of the Barents Sea shelf compared to previous years.



**Figure 10.3.1.** Distribution of the snow crab in the Barents Sea, August-October 2017 and 2018

Due to lack of coverage the comparison of data for 2017 and 2018 is possible only for part of the crab area.

In the part of the Barents Sea (northern of 76°N) the biomass of snow crab in 2018 varied from 5 g to 268.0 kg/haul with an average of  $16.7 \pm 6.4$  kg/haul compared with 0.001-101.6 kg/haul and  $13.5 \pm 2.9$  kg/haul in 2017.

The abundance in 2018 ranged from 1 to 4496 ind./haul with an average of  $393.6 \pm 129.7$  ind./haul compared with 1-1000 ind./haul and  $149.2 \pm 31.7$  ind./haul in 2017.

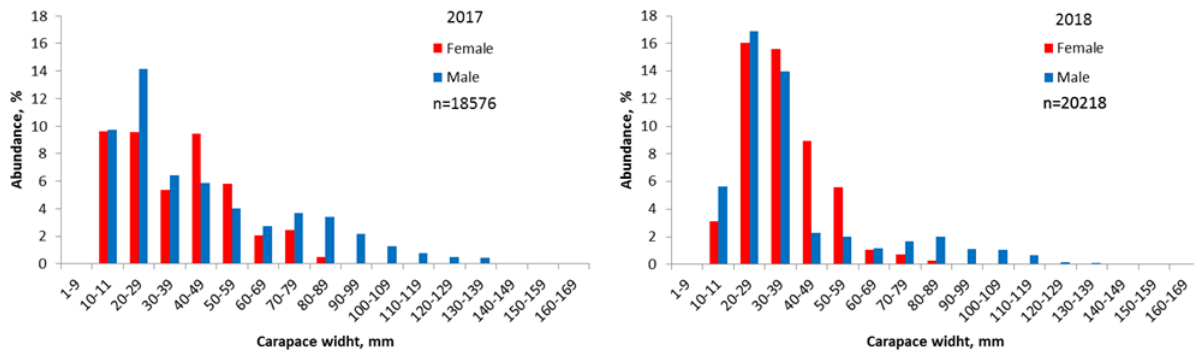
Comparison of the data obtained in the north part of the Barents Sea, covered by stations both in 2017 and 2018, shows statistically nonsignificant increasing of all quantitative parameters of abundance and biomass in 2018 comparing 2017. (Table 10.3.2, Appendix).

Compared with previous year, the mean abundance of snow crab, standardized to nautical mile, has increased in 2.7 times while biomass in 1.2 times only. It can be results of preferential



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increasing of juvenile part of population that is agreeing with size structure of the crab catches in 2018 (Fig. 10.3.2).



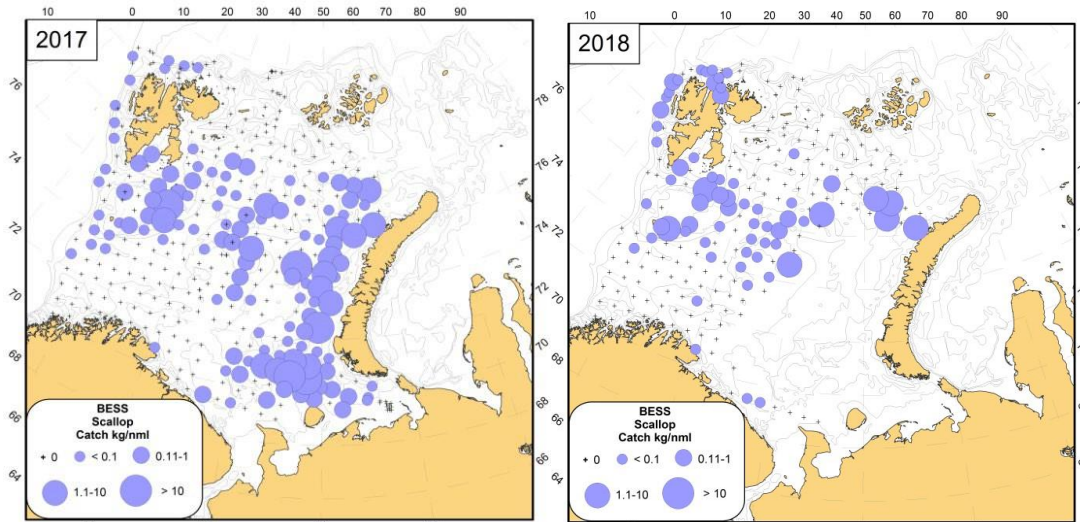
**Figure 10.3.2** Size structure of the snow crab population in the Barents Sea in 2017 and in the north part of the sea in 2018

10.4 Iceland scallop (*Chlamys islandica*)

Text by I.E. Manushin and L.L. Jørgensen

Figures by D.V. Zakharov

In 2018 the Iceland scallop was recorded in 65 of 217 trawl catches. The survey showed a wide distribution of scallops in the Barents Sea. The deepest record in 2018 was at 441 m, but the most abundant catches were recorded in the shallow banks and elevations of the bottom: Spitsbergen Bank, Central Bank, Great Bank, Novaya Zemlya Bank (Figure 10.4.1).



**Figure 10.4.1** Distribution of Iceland scallop (*Chlamys islandica*) in the Barents Sea, August- October 2017-2018

The biomass of scallops in 2018 varied from 1.5 g to 5.6 kg/haul (0.001-6.9 kg/nml). The average biomass is  $442 \pm 76$  g/haul ( $537 \pm 91$  g/nml) (table 10.4). The abundance ranged from 1 to 189 ind./haul (1-225 ind./nml). The average abundance of scallops is  $26 \pm 4$  ind./haul ( $31 \pm 4$  ind./nml)(Table 10.4, Appendix).

**Appendix: Ch 10****Shellfish**Ch. 10.1 Northern shrimp**Table 10.1.1.** *The total catch of shrimp during ecosystem surveys of 2005-2018*

Year	Total number of station	Number of station with shrimp	Average abundance, ind./nml	Average biomass, kg/nml
2005	224	169	856.3±12.1	12.1±4.3
2006	637	480	3460.8±21.4	15.0±0.9
2007	551	426	2875.5±19.7	13.2±0.9
2008	431	329	1846.6±17.7	9.2±0.7
2009	378	310	1673.0±17.4	7.9±0.9
2010	319	238	2625.5±15.3	12.0±1.2
2011	391	304	2165.2±17.2	10.4±0.9
2012	443	325	2351.2±18.0	12.0±1.0
2013	487	388	1838.2±19.1.0	9.5±0.6
2014	165	101	1676.0±10.1.0	8.4±1.0
2015	334	247	1371.0±15.6	7.1±0.6
2016	317	187	1457.9±13.1.0	7.0±0.6
2017	339	281	2021.4±16.3	13.8±1.9
2018	217	160	1759.0±11.9	10.2±1.4
<b>Total</b>	<b>5233</b>	<b>3947</b>	<b>1998.4±177.4</b>	<b>10.5±0.6</b>

Ch. 10.2 Red king crab**Table 10.2.1.** *The total catches of the red king crab during BESS 2005-2018.*

Year	Total number of station	Number of station with red king crab	Total numbers, ind.	Total biomass, kg
2005	649	8	106	309
2006	550	66	1243	3350
2007	608	30	1521	3869
2008	452	10	127	93
2009	387	7	15	25
2010	331	6	12	25
2011	401	4	40	22
2012	455	8	126	308
2013	493	3	272	437
2014	304	11	168	403
2015	335	14	255	517
2016	317	11	202	552
2017	376	13	299	687
2018	217	5	73	175

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**Tables 10.2.2** Comparing of abundance and biomass parameters of red king crab catches in southernmost transect (35-45° N) in 2017 and 2018 and Student's t-test of statistical significance of differences.

Parameters	2017	2018	t statistic	Critical value for t statistic ( $\alpha=0.05$ )	p
Number of stations	7	7			
Number of station with crabs	4	5			
Abundance: min-max, ind./nml	1.18-18.13	4.98-60.06			
Average abundance, ind./nml	3.8±2.5	12.5±8.0	1.04	2.179	0.32
Biomass: min-max, kg/nml	0.91-38.51	16.49-135.10			
Average biomass, kg./nml	10.08±5.56	29.91±17.85	1.11	2.179	0.29

### Ch. 10.3 Snow crab

**Table 10.3.1** The total catch of snow crab during ecosystem surveys of 2005-2018

Year	Total number of station	Number of station with snow crab	Total numbers, ind.	Total biomass, kg
2005	649	10	14	2.5
2006	550	28	68	11
2007	608	55	133	18
2008	452	76	668	69
2009	387	61	276	36
2010	331	56	437	22
2011	401	78	6219	154
2012	455	116	37072	1169
2013	493	131	20357	1205
2014	304	78	12871	658
2015	335	89	4245	378
2016	317	84	2156	137
2017	376	159	25878	1422
2018	217	61	19494	846

**Tables 10.3.2** Comparing of abundance and biomass parameters of the snow crab catches in north part of the Barents Sea (northern 76° N) in 2017 and 2018 and Student's t-test of statistical significance of differences.

Parameters	2017	2018	t statistic	Critical value for t statistic ( $\alpha=0.05$ )	p
Number of stations	135	118			
Number of station with crabs	46	44			
Abundance: min-max, ind./nml	1.2-1204.8	0.9-5273.9			
Average abundance, ind./nml	178.9±37.6	478.9±155.3	1.89	1.99	0.062
Biomass: min-max, kg/nml	1.34-122.43	0.007-314.33			
Average biomass, kg./nml	16.33±3.56	20.27±7.62	0.47	1.99	0.64



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## Ch. 10.4 Iceland scallop

**Table 10.4.1** *Annual parameters of scallop population in the Barents Sea*

Year	Stations	Abundance, ind./nml	Biomass, g/nml
2011	101 (26)	35±5	1294±235
2012	146 (33)	62±7	1580±195
2013	131 (27)	115±17	8378±1359
2014*	50 (36)	29±4	812±121
2015	103 (31)	13±1	264±32
2016*	76 (24)	18±2	268±38
2017	125 (33)	82±11	1486±198
2018*	65 (30)	31±4	537±91

\*Full survey area not covered