



Serial No. N6509

NAFO SCR Doc. 15/061

NAFO/ICES WG PANDALUS ASSESSMENT GROUP-SEPTEMBER 2015

Results of Russian investigations of the northern shrimp in the Barents Sea in 2004-2015

by

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Abstract

In 2004-2014 Russian researches of the northern shrimp in the Barents Sea were conducted within the joint Russian-Norwegian ecosystem survey. During the survey in 2014 287 trawls were made. Northern shrimp was found in the catches of 217 trawls. Catches of shrimp varied from several grams to 63.5 kg per 15 minutes of trawling. The total index of the stock was 13 % less than the long-term annual average and 21 % lower compared to 2014; the stock index comprised 303 thousand tons.

Introduction

Since 2004 the studies of the northern shrimp stock were carried out within the Russian-Norwegian ecosystem survey from August to September. The survey area covers the Barents Sea area and adjacent area of the Spitsbergen. During the survey 3-5 vessels conducted 300-700 trawls by the trawl Campelin-1800 used for the shrimp fishery. The present document contains results of the survey 2014 compared to the results of preceding surveys.

Material and methods

The stock index of the northern shrimp was calculated applying the Kriging method (Cressie, N. A. C., 1990) wherefore catch data were recalculated into the reference area equal to 1 degree of latitude and 1 degree of longitude in view of the meridional narrowing. Individuals with weight of 1 kg selected accidentally were subjected to a biological analysis, which included the following operations: length measuring and determination of a sex and stages of gonads' maturity (Aschan et al., 1993).

Carapace lengths (CL) for length frequency information were measured from the posterior margin of the eyestalk to the posterior mid dorsal edge of the carapace. Sex of the northern shrimp was determined by the shape of the endopodite of the first pair of pleopods,

distribution of sternal spines on the first segment of abdomen and by the presence of roe (Rasmussen, 1953; McCrary, 1971).

Results

In 2014 the stock assessment was conducted by three Norwegian and one Russian research vessels. During the survey 2014 287 trawls were made (fig.1). The northern shrimp was found in catches of 217 trawls. Shrimp catches varied from several grams to 63.5 kg per 15 minutes of trawling (fig.1). The largest catches of the northern shrimp were found in the eastern and northern parts of the Barents Sea (Central Bank, Novaya Zemlya Bank, Franz-Victoria Trough) and to the north of the Spitsbergen Archipelago. In the south-eastern part of the Barents Sea and the Spitsbergen Bank no northern shrimp was observed.

The total index of the northern shrimp in 2014 decreased in comparison to the previous year and comprised 303 thousand tons that is 21 % less than in 2013 and on 13 % less than average level (table 1). Thus survey conducted in 2014 showed the increasing of the recruitment index of the northern shrimp (abundance of shrimp at size 13–16 mm CL) to the average level over 8 years of the observation period (fig.2). The main reason of the low level of the index in 2014 is difficult situation with ice cover in August-September 2014.

Table 1.

The number of station, total biomass and recruitment (abundance of shrimp at size 13–16 mm CL) index of northern shrimp in 2004-2013 according to the data of joint Russian-Norwegian ecosystem surveys in the Barents Sea.

Year	Number of stations	Total biomass index	Recruitment index
2004	669	215	
2005	756	363	
2006	676	400	29
2007	753	286	13
2008	471	262	14
2009	378	327	18
2010	318	455	23
2011	401	378	18
2012	443	424	14
2013	486	386	16
2014	287	303	25
Average	512	345	19

Biological analysis of the northern shrimp stock was conducted in 2014 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 8-25 mm and females with carapace length of 12-30 mm (fig.3). Sex ratio of the northern shrimp was various in different trawling sites, but on the whole in the surveyed area males were predominant in catches, around 72 % from the total abundance of shrimps. The portion of the spawning females were 5 %, those post-

spawning - around 23 % from the total abundance of shrimps in the catch. Thus in the largest part of the surveyed area 130-360 individuals occurred in 1 kg of the catch. The higher portion of large individuals was found in the southern part of the Central Trough where one kg of the catch accounted for less than 130 individuals. The highest portion of small individuals was found in the western area of the Novaya Zemlya Bank where one kg of the catch numbered over 360 individuals of the northern shrimp.

In the eastern Barents Sea maximum of the average biomass is in the range from 0 to 1 °C, level of the biomass falls with increasing of the temperature. Data for negative temperature has very big mean error (fig. 4).

In the shallow parts of the sea catches of the shrimp were very low. But starting on the depths 175-200 m we see increasing of the average biomass until peak on the depth 250 m. Thereafter level of the biomass decreasing but it is still higher than level of the biomass in shallow places (fig. 5).

In January-August 2015 Russian, Norwegian, Greenland and Faroese vessels fished shrimp in the Russian part of the Barents Sea. This year shrimp was fished mostly as in the last two year on the northern Central trough and on the slopes of the Novaya Zemlya Bank and Novaya Zemlya trough. Also there were series of trawling around Goose Bank, In the Central Trough catches of shrimp varied from several kilos to 0.99 tons per hour and average catch was 0.39 ± 0.21 t. Around Novaya Zemlya Bank catches varied from 0.01 to 0.92 tons and average catch was 0.39 ± 0.19 t. On the Goose bank shrimp catches varied from 0.01 to 1.85 tons per trawling and average catch was 0.27 ± 0.02 t per hour.

Conclusions

1. The total index of the stock was 11% less than the long-term annual average and 21% lower compared to 2013; the stock index comprised 303 thousand tons.
2. Thus survey conducted in 2014 showed the increasing of the recruitment index of the northern shrimp.
3. Frequency distribution of shrimp in the surveyed areas corresponded to the traditional one with high concentrations in the eastern areas of the Central Bank and Novaya Zemlya Bank. On the whole, the state of the northern shrimp stock in 2014 was evaluated as satisfactory.
4. The main reason of the low level of the index in 2014 is difficult situation with ice cover in August-September 2014.
5. The highest biomass observed on the depth 250-300 m and temperature 0-1 °C.
6. In 2015 Russian, Norwegian, Greenland and Faroese vessels fished shrimp in the Russian part of the Barents Sea. This year shrimp was fished mostly as in the last two year on the northern Central trough and on the slopes of the Novaya Zemlya Bank and Novaya Zemlya trough

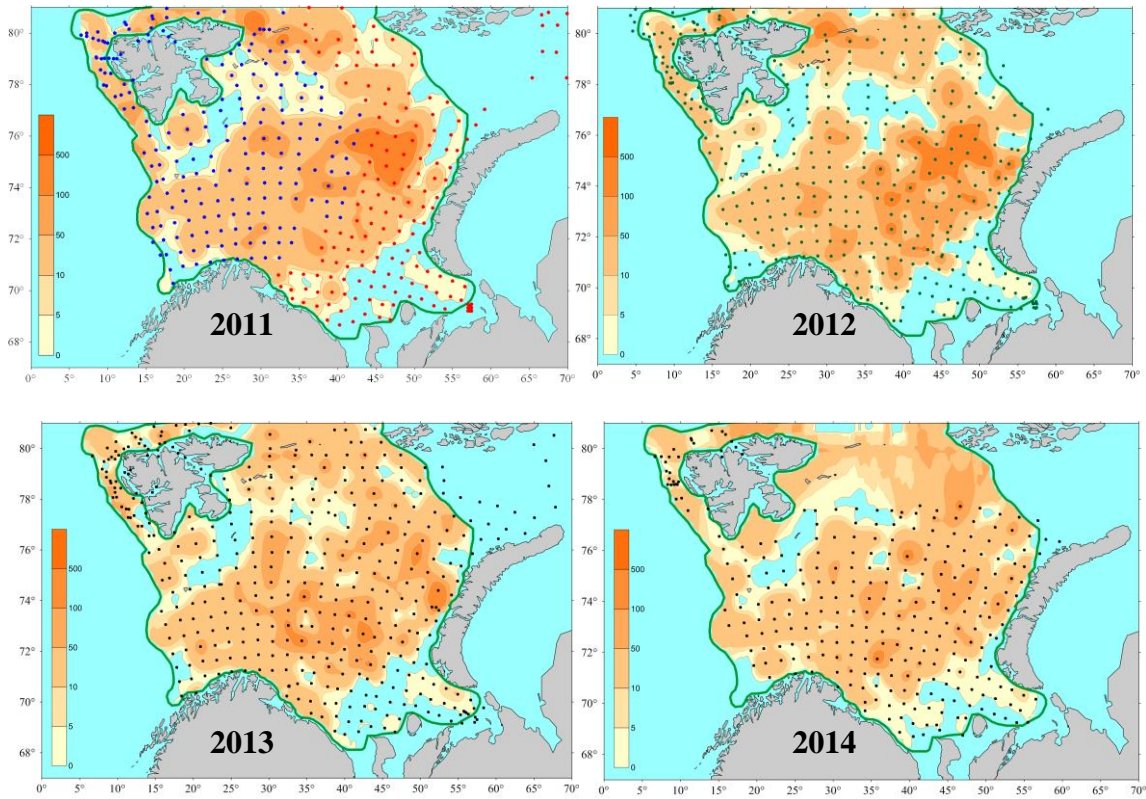


Fig.1. Distribution of *Pandalus borealis* in 2011-2014 according to the data of joint RussianNorwegian ecosystem surveys in the Barents Sea (kg/ hour of trawling)

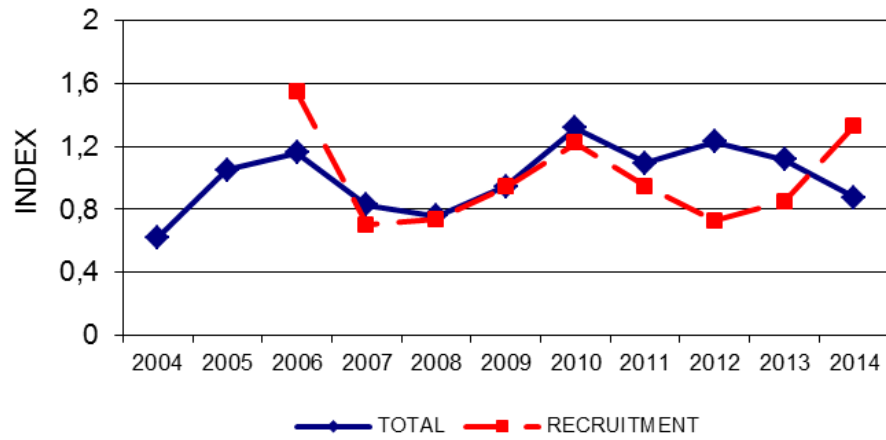


Fig.2. Total biomass and recruitment index of northern shrimp in 2004-2014 according to the data of joint Russian-Norwegian ecosystem surveys in the Barents Sea.

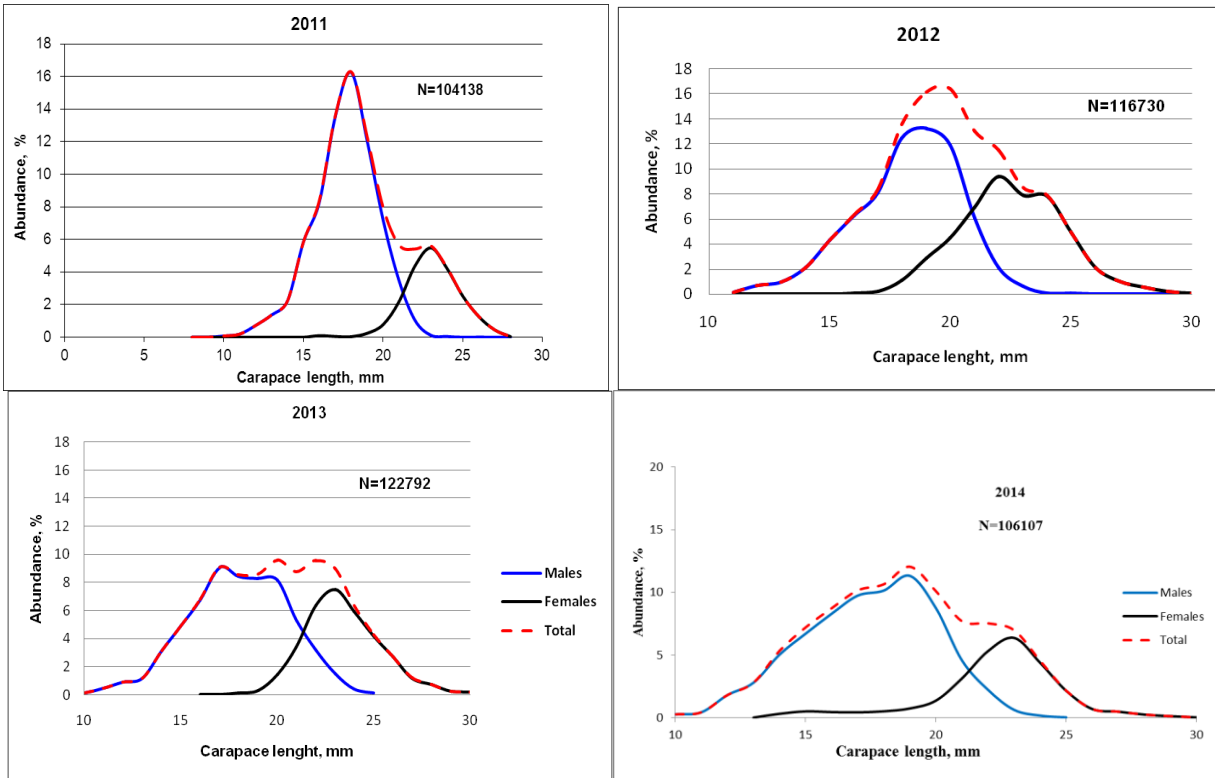


Fig.3. Length composition of catches of northern shrimp in the eastern part of the Barents Sea resulted from Russian-Norwegian surveys in 2011-2014

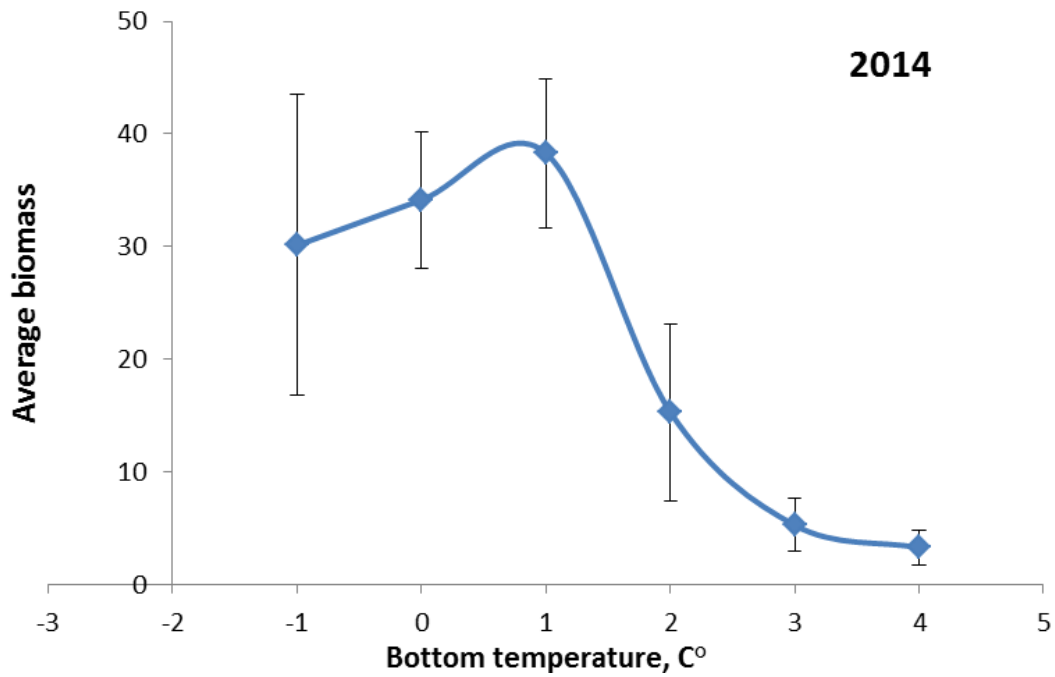


Fig. 4. Average biomass (kg/hour of trawling) and bottom temperature (C°) in the eastern Barents Sea

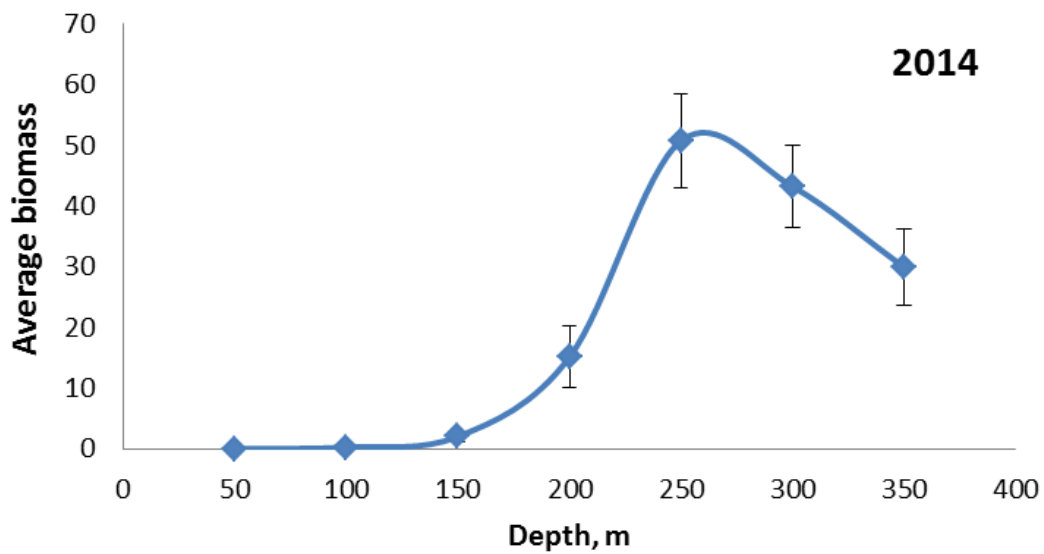


Fig. 5. Average biomass (kg/hour of trawling) and depth (m) in the eastern Barents Sea