

Distribution and Biological Characteristics of Herring
with a Smaller Vertebral Count in the South-Eastern
Barents Sea in the Autumn-Winter Period, 1968-1971

by

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Summary

The work aims at a generalization of data on the distribution and on some biological characteristics of herring with a smaller vertebral count, which were caught in the south-eastern Barents Sea in autumn-winter 1968-1971.

In that period the greatest concentrations of herring with a smaller vertebral count were formed in the Kolguyev area and on the southern slope of Goose Bank (more than 100 specimens per one hour's trawling).

The average vertebral count was 53.84 ± 0.02 .

Specimens at the age of 1 to 12 years were found in the catches, their length ranging from 6 to 30 cm.

The analysis of the size age relation and the stages of gonad maturity of herring showed that in the autumn-winter period the specimens of the younger age groups distribute in the extreme south-eastern areas of the Barents Sea, while older herring are mainly wintering in the area of the southern slope of Goose Bank.

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Herring with a smaller vertebral count (*Clupea harengus pallasii* n. Suworowi Rabinerson) inhabit the south-eastern Barents Sea. From previous years' experience it is known that they form the densest concentrations at Kolguyev Island and in the Choshskaya Bay, where the fisheries is most effective, especially during their spawning period, i.e. in June-July (Yessipov, 1938; Marty, 1941, 1952; Yudanov, 1969).

In the feeding period, while migrating to the north and north-west, they reach the western slope of Goose Bank and from there into the north central area (Marty, 1952). The northern border of their distribution is observed along the $73^{\circ}40'N$, the western along the Kola meridian (Shutova-Korzh, 1961).

In the present paper materials which were collected by research and scouting vessels in the south-eastern Barents Sea in autumn-winter 1968-1971 are analysed.

In this period herring catches were taken mainly in the Kolguyev area and on the southern slope of Goose Bank (Figure 1): more than 100 specimens per one hour's trawling were taken there. In other areas (Kanin Bank, Kanin-Kolguyev Shallows, the Pechora area) herring of this sub-species occurred in the catches in rather small numbers: from several specimens to some tens of specimens.

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In the period of observations the northern border of the herring distribution was registered along 72°45'N (the northern part of the Novaya Zemlya Shallows), and the western one along the meridian 42°37'E. To the west of Kanin Bank herring with a smaller vertebral count did not occur in the catches.

In the coastal and shallow waters of the south-eastern Barents Sea herring were caught at depths of 45-75 m, whereas offshore they were caught at depths of 140-260 m.

The bottom temperature, at which herring were registered, fluctuated from +1.5 to -1.3, the densest concentrations being formed at a temperature around 1° (Figure 1).

The number of vertebrae in herring (the main meristic feature) varied from 50 to 56 ($M = 53.84 \pm 0.02$), whereas in some areas the average vertebral count varied from 53.35 to 54.07 (Tables 1, 2).

In catches taken by research and scouting vessels herring with a smaller vertebral count occurred at the age of 12 years. The age composition of herring for some areas is given in Table 3.

Specimens of younger age groups were mainly registered nearest to the spawning grounds (Choshskaya Bay). Thus, in the Kolguyev area 3 to 5 year old herring made up 80%. In the concentrations on the Kanin-Kolguyev Shallows 2 year olds were predominating (80%). To the north of these areas, on the southern slope of Goose Bank, specimens pertaining to older age groups were predominant (Table 3).

The observed separation of herring in accordance with age groups gives reason to believe that the main wintering areas of the older age groups are in the area of the southern slope of Goose Bank; immature specimens mainly stay close to the spawning grounds.

The size composition of herring in the catches taken in the autumn-winter period 1968-1971 varied greatly both by areas and by years. Herring from 6 to 30 cm long occurred in the catches taken in the entire south-eastern Barents Sea (Figure 2). In the Kolguyev area young herring 6-10 cm long predominated in the catches in 1970, whereas the greater specimens, 11-18 cm long, predominated in the catches in 1968-1969 (Figure 2a).

A similar size distribution of herring is also characteristic for the areas situated to the west and north-west of Kolguyev Island (Figure 2b).

On the southern slope of Goose Bank, where older age groups predominated in catches, the size composition of herring was more homogeneous (Figure 2c). Specimens 22-25 cm long predominated in the catches.

The analysis of gonad maturity stages showed that in the winter-autumn period mainly immature herring were found in the south-eastern Barents Sea (specimens with gonad maturity in the juvenile stage amounted to 68% (Table 4)).

Maturing herring (III, III-IV and IV stages of gonad maturity) wintered mainly on the southern slope of Goose Bank. Thus, judging from the age-size relation and the maturity stages of gonads, specimens of younger age groups of herring with a smaller vertebral count distribute in the autumn-winter period in the extreme south-eastern areas of the Barents Sea (the Pechora and Kolguyev areas, Kanin-Kolguyev Shallows, Kanin Bank), while older herring are mainly wintering in the area of the southern slope of Goose Bank.

References

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Table 1. The numbers of vertebraes in herring of the south-eastern Barents Sea, 1968-1971 (in %).

Number of vertebraes							N	M \pm m
50	51	52	53	54	55	56		
1	7	27	174	224	145	8	586	53.84 \pm 0.02
0.2	1.2	4.6	29.6	38.3	24.8	1.3	100.0	

Table 2. Average vertebral count in herring taken in different areas of the south-eastern Barents Sea, 1968-1971.

Area	Average vertebral count M \pm m	Average length (cm)	N
Pechora	54.07 \pm 0.08	12.82	13
Kolguyev	53.97 \pm 0.02	13.18	158
Kanin Bank	53.66 \pm 0.08	11.17	137
Kanin-Kolguyev Shallows	53.85 \pm 0.03	13.18	158
Southern slope of Goose Bank	53.35 \pm 0.09	17.51	101

Table 3. Age composition of herring with a smaller vertebral count by areas in the south-eastern Barents Sea in 1968-1971 (in %).

Age	Area, month and year			
	Southern slope of Goose Bank		Kanin-Kolguev Shallows	Kolguev
	December 1968	February 1971	November 1969	October 1969
1			$\frac{20.00}{12.05}$	
2			$\frac{80.00}{12.13}$	$\frac{22.6}{15.31}$
3				$\frac{2.4}{17.55}$
4		$\frac{95.6}{17.87}$		$\frac{10.7}{19.38}$
5	$\frac{17.7}{23.71}$	$\frac{4.4}{19.00}$		$\frac{45.3}{19.00}$
6	$\frac{11.7}{24.55}$			$\frac{10.7}{21.17}$
7	$\frac{41.2}{25.33}$			$\frac{3.5}{21.72}$
8	$\frac{11.7}{24.05}$			$\frac{4.8}{23.00}$
9	$\frac{5.9}{24.05}$			
10	-			
11	$\frac{5.9}{26.05}$			
12	$\frac{5.9}{30.05}$			
Number of specimens	17	23	15	84

Note: In the denominator the average length of specimens of a given age group is given in cm.

Table 4. Herring gonad indices by areas in the south-eastern Barents Sea in the autumn-winter period 1968-1971 (in %).

Area	Month	Gonad indices								
		Juv.	I-II	II	II-III	III	III-IV	IV	IV-V	
Pechora	Nov.	$\frac{64.0}{12.18}$	$\frac{22.4}{12.50}$	$\frac{13.6}{13.05}$						36
Kolguyev	Oct.-Nov.	$\frac{53.1}{8.31}$	$\frac{14.1}{13.07}$	$\frac{3.0}{15.94}$	$\frac{4.7}{17.84}$	$\frac{11.7}{19.65}$	$\frac{7.7}{19.74}$	$\frac{5.7}{20.28}$		299
Kanin-Kolguyev Shallows	Nov.-Dec.	$\frac{68.3}{9.10}$	$\frac{31.1}{12.05}$	$\frac{0.6}{14.0}$						164
Kanin Bank	Nov.	$\frac{67.1}{8.06}$	$\frac{14.8}{14.02}$	$\frac{10.1}{14.21}$	$\frac{1.6}{14.17}$	$\frac{2.6}{15.26}$	$\frac{0.9}{15.33}$	$\frac{1.6}{15.97}$	$\frac{1.3}{16.55}$	309
Southern slope of Goose Bank	Dec.			$\frac{5.2}{25.0}$		$\frac{36.9}{24.77}$	$\frac{36.9}{25.63}$	$\frac{21.0}{24.05}$		19
Southern slope of Goose Bank	Febr.		$\frac{27.0}{16.86}$		$\frac{2.0}{18.0}$	$\frac{9.0}{17.38}$	$\frac{4.0}{15.30}$	$\frac{56.0}{17.80}$	$\frac{2.0}{18.0}$	100

Note: In the denominator the average length of herring is given in cm.

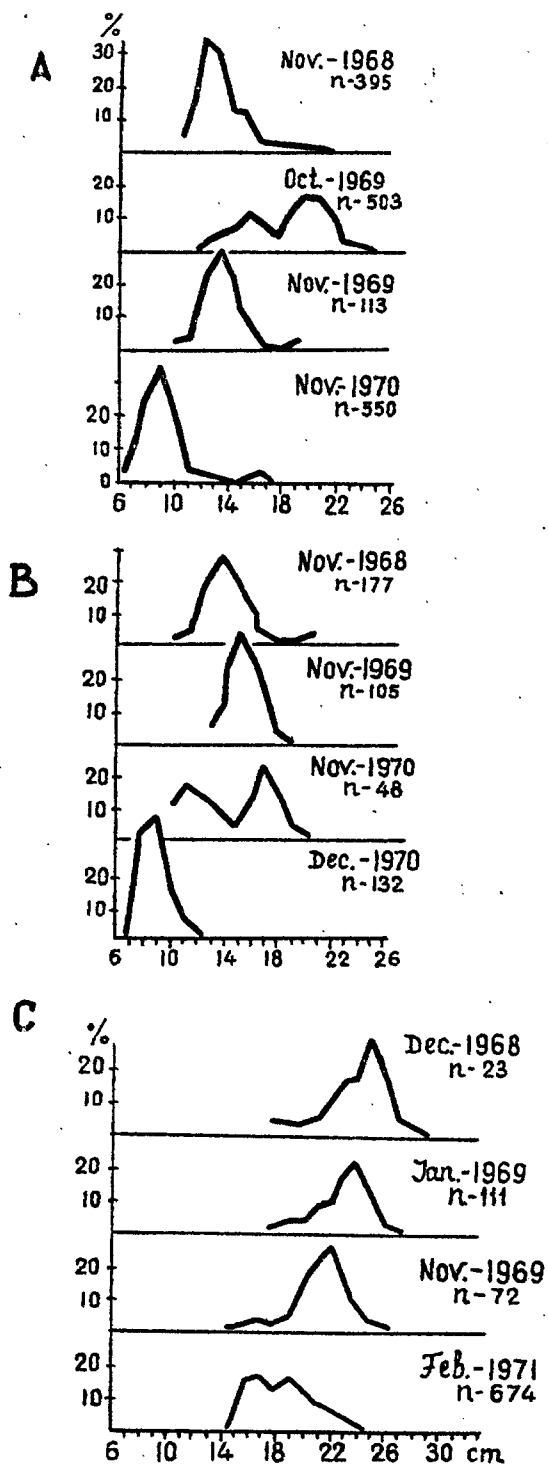


Figure 1. Distribution of herring with a smaller vertebral count in the south-eastern Barents Sea, presented schematically, and demersal isotherms in November-December.

A - in 1968

B - in 1969

C - in 1970-1971.

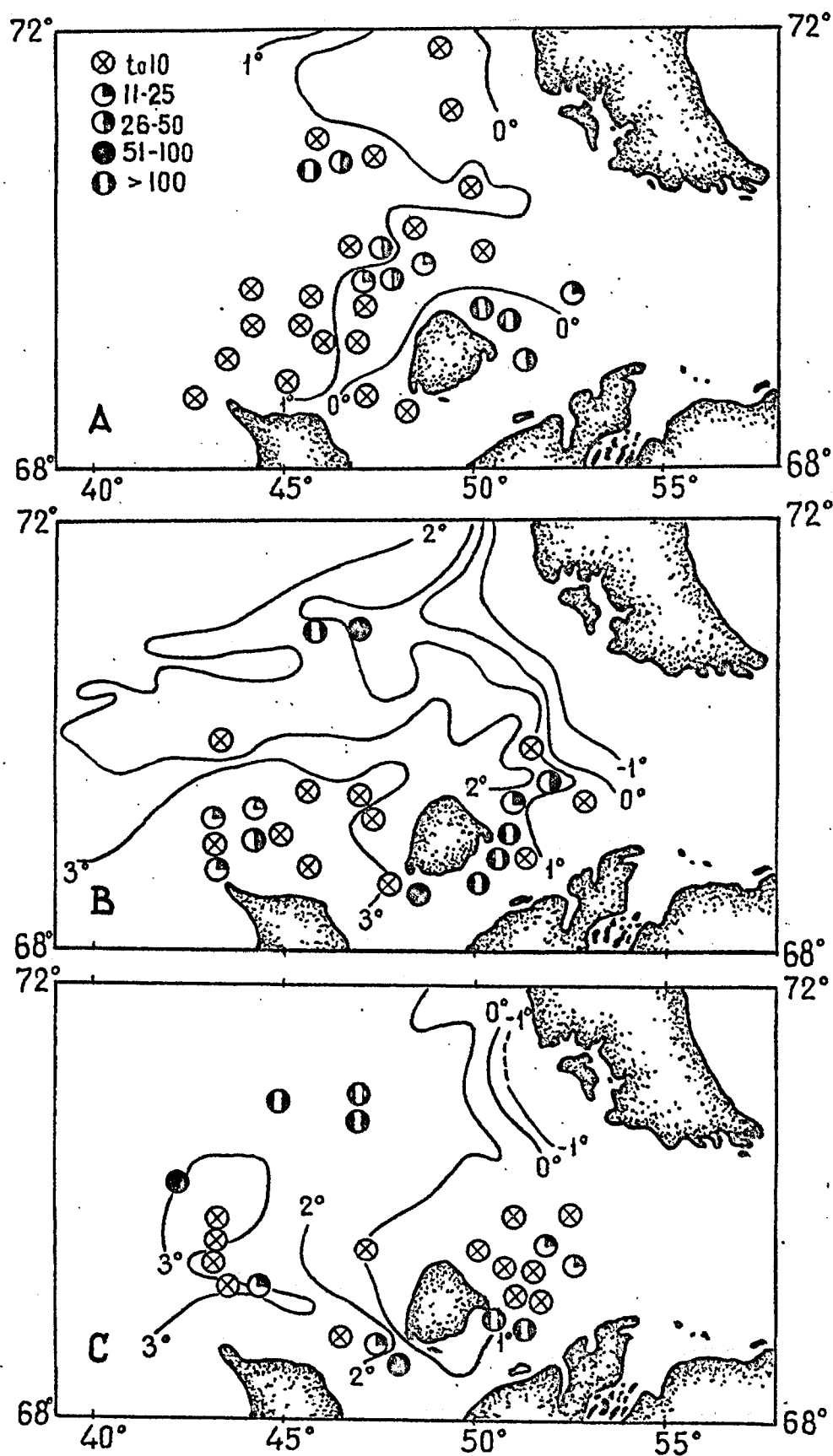


Figure 2. Size composition of herring with a smaller vertebral count in the south-eastern Barents Sea in autumn-winter 1968-1971.

- A - Kolguyev area
- B - areas to the west and north-west of Kolguyev Island
- C - southern slope of Goose Bank.