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On Discrimination of the Silver Hake Stocks of the Nova Scotia Shelf (Div. 4W) and Southwestern Slope of the Grand Bank (Div. 30)

by

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Abstract

During the conduction of the directed fishing for the redfish in Div. 30 the silver hake is sometimes taken as a by-catch.

Relative isolation of the Grand Bank (Cabot Strait) from the Nova Scotia shelf is not a good enough reason for discrimination there of an independent stock unit of this species. In the present paper an attempt is made to specify this question by means of comparison of some morphometric and biological characteristics of the hake from Divs. 4W and 30.

Materials and Methods

In April 1981, one sample (100 specimens) of the silver hake was taken on a commercial ship which conducted a directed fishing for the redfish in Div. 30. In the AtlantNIRO, morphometric and biological analyses were made involving measurements of the length and weight, vertebrae count and number of rays in the first dorsal fin, sex, gonad maturity stage and age determinations and stomach filling of each individual.

For comparison the similar data (excluding morphometry) on the hake from Div. 4W for May 1981 were used. These data were collected by the AtlantNIRO observers on the commercial ships. Unfortunately, the recent data on the morphometry of

the hake from Div. 4W go back to 1965, when 247 specimens were examined. For lack of new data we had to use those available.

Taking into account a considerable amount of samples for comparison of vertebrae counts and number of rays in the first dorsal fin (247 and 100 observations in Divs. 4W and 30 respectively), a ratio of difference $\bar{X}_1 - \bar{X}_2 = D$ to its statistical error was taken as a criterion of reliability of differences between the mean $\bar{X}_1$ and $\bar{X}_2$.

The age was determined using the methods adopted by the Working Group of ICNAF (Hunt, 1979).

Results

The data presented in Table 1 give a certain idea on an extent of reliability of differences between morphometric characteristics for the silver hake from Divs. 4W and 30.

For $P = 0.99$ $t_{st}=2.58$. Since for the **second characteristic** $t_\phi > t_{st}$, a difference between the vertebrae **counts is reliable.**

The results of comparison of biological **characteristics** are shown in Tables 2-5. Although in the given case **the material** was collected approximately at the same time, a difference between the number of observations did not allow for drawing any definite conclusions from the analysis made. That's why we had to confine ourselves to comments of general nature. Length and age compositions of the hake appeared to be rather close (Tables 2 and 3) in both areas. A greater proportion of large individuals can be noted in Div. 30. The mean length of the fish of the same age (3-5 years old males and 4-7 years old females) is also almost the same (Table 4), which cannot be said about the mean mass of the same age groups (Table 5), where the hake of Div. 4W prevails.

In both areas the gonads of the hake were mainly at the stage of ripening. The hake was intensively feeding in Div. 30. The stomach filling was 1.88 according to the scale of 5 degrees.

Discussion and Conclusion

As reported by Bigelow and Schroeder (1953), the silver hake ranges along the eastern coast of the North Atlantic to the north as far as the Newfoundland banks. According to Leim and Scott (1966) the northern limit of occurrence of this species is the southern and eastern parts of the Gulf of Saint Lawrence and the southern Grand Bank, which includes Div. 30 (Fig. 1).

From the available results it can be suggested that a very small local hake stock inhabits this zone; the abundance of this stock reduces almost to zero in the years with the unfavourable hydrological conditions (bor ders of the area), and increases to its maximum (for the given area) during the periods of the rise in temperature. It seems that just this process was observed in the Northwest Atlantic in the recent years (Sigaev, 1979).

The available material is so scanty that we cannot express a more definite opinion on the state of the hake in Div. 30. A large-scale sampling of the materials on morphometry and biology of the hake on the Nova Scotia shelf and in the southern and south-western parts of the Grand Bank is required. A final conclusion can be made only on completion of the analysis of the new data.

References

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Table 1 Statistical characteristic of differences between two morphometric characteristics for silver hake from Divs. 4W and 30

Characteristics	4W				30				t_ϕ
	n	$\bar{X}$	$\pm m_{\bar{x}}$	σ	n	$\bar{X}$	$\pm m_{\bar{x}}$	σ	
No. of rays in first dorsal fin	247	12.31	±0.05	0.82	100	12.45	±0.02	0.20	1.69
Vertebrae count	247	54.47	±0.04	0.61	100	53.49	±0.02	0.17	15.81

Table 2 Length composition (%%) of the hake from Divs 4W and 30 in spring 1981

Div.	Length, cm															
	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
4W	0.1	0.4	0.7	1.2	3.0	6.5	13.5	18.0	16.9	13.9	9.1	6.6	3.9	2.5	1.4	1.1
30	-	-	-	1.0	7.0	9.0	8.0	15.0	10.0	18.0	7.0	3.0	5.0	2.0	9.0	1.0

Div.	39	40	41	42	43	44	45	46	47	48	49	50	51	52	%%	n	$\bar{X}$
4W	0.4	0.3	0.2	0.1	+	0.1	+	-	+	+	+	+	-	0.1	100	5998	31.2
30	-	1.0	-	-	-	2.0	-	1.0	-	-	1.0	-	-	-	100	100	32.1

Table 3 Age composition (%%) of the silver hake from Divs. 4W and 30 in spring 1981

Age, years	4W			30		
	♂	♀	♂ ♀	♂	♀	♂ ♀
1	+	-	+	-	-	-
2	13.3	2.1	8.5	6.8	-	3.4
3	61.8	38.5	51.9	61.5	17.8	39.3
4	23.2	36.3	28.8	22.7	57.8	40.4
5	1.3	17.8	8.2	4.5	11.1	7.9
6	0.3	4.0	1.9	4.5	2.2	3.4
7	0.1	0.8	0.5	-	6.7	3.4
8	-	0.2	0.1	-	4.4	2.2
9	-	0.2	0.1	-	-	-
10	-	0.1	+	-	-	-
%%	100.0	100.0	100.0	100.0	100.0	100.0
Mean age	3.1	3.9	3.5	3.4	4.4	3.8

Table 4 Mean length (cm) and age of the silver hake* from Divs. 4W and 30 in spring 1981

Age	4W			30		
	♂	♀	♂ ♀	♂	♀	♂ ♀
1	22.0	-	22.0	-	-	-
2	27.6	27.1	27.6	26.9	-	26.9
3	29.1	30.9	30.2	28.8	29.4	28.9
4	31.5	32.7	32.1	31.8	32.4	32.2
5	36.0	35.9	35.9	36.2	36.3	36.3
6	39.9	36.5	36.8	36.1	36.8	36.3
7	44.0	41.6	42.0	-	42.6	42.6
8	-	47.2	47.2	-	42.1	42.1
9	-	52.4	52.4	-	-	-
10	-	54.0	54.0	-	-	-

* The amount of observations in Div. 30 is given in table 5. The mean length of the hake from Div. 4W was estimated from the data obtained as a result of conversion of the age to length composition.

Table 5 Mean weight (g) and age of the silver hake from Divs. 4W and 30 in spring 1981 (weight as numerator, No. of observations as denominator)

Age	4W			30		
	♂	♀	♂ ♀	♂	♀	♂ ♀
1	-	-	28	-	-	-
2	98/20	104/5	100/25	136/3	-	136/3
3	211/16	188/4	207/20	176/27	196/8	181/35
4	257/11	273/5	262/16	236/10	267/26	258/36
5	570/1	407/15	417/16	390/2	382/5	384/7
6	-	453/3	453/3	375/2	400/1	383/3
7	-	651/4	651/4	-	636/3	636/3
8	-	980/1	980/1	-	550/2	550/2
9	-	1400/1	1400/1	-	-	-

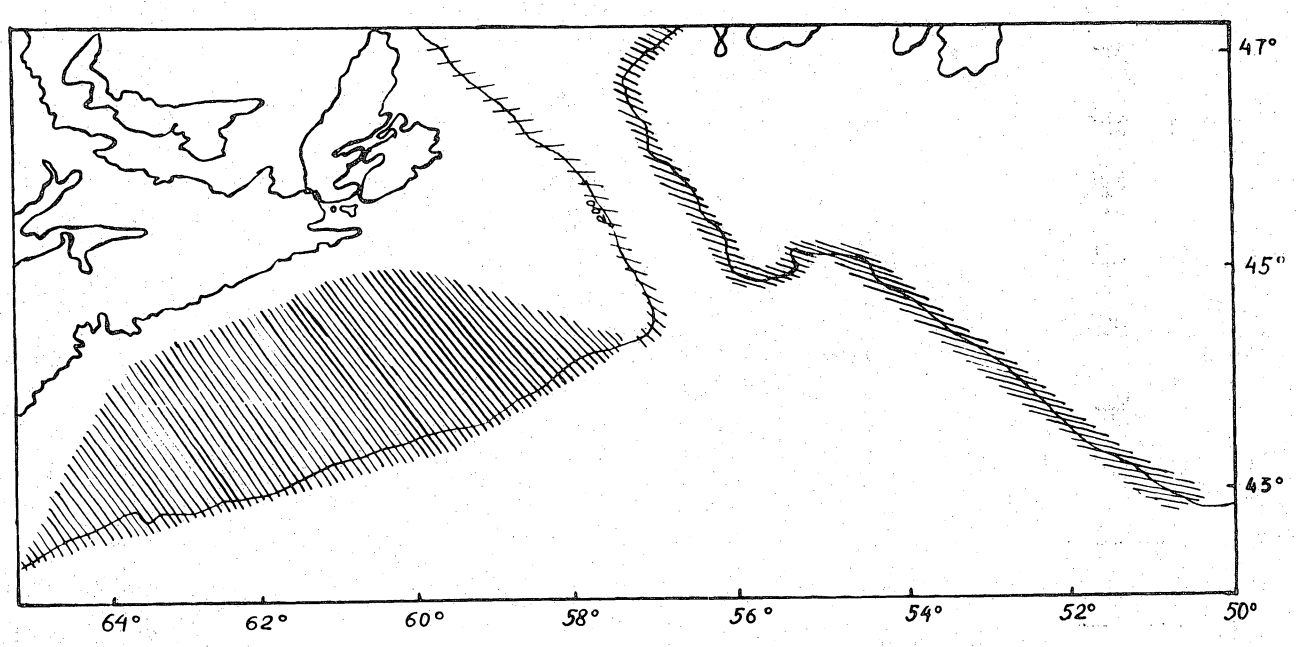

Fig. 1. Silver hake distribution off Nova Scotia and South Slope of the Grand Bank.