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Preliminary Results from Russian Surveys and Fishery of White Hake,
Urophycis tenuis, in Divisions 3NO in 2000-2004

by

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Abstract

The white hake fishery in NAFO Regulatory Area has been regulated since 2005. In 2002-2003, Russian fishery of the white hake was directed. Besides, it is a traditional object of by-catch at 500 m depth in fishing of skate in Div. 3N and of redfish in Div. 3O. In the catches, alongside with the white hake, 25 species were found. Fish length varied from 21 to 101 cm. Under the length of less than 50 cm the weight of males was greater than that one of females, with length increment the weight of females increased more rapidly. The length of white hake under 50% maturation and without dividing by sex was 54 cm. The portion of mature fish in the commercial catches of Russia gradually increased and reached 66% in 2004.

Introduction

The reduction in stocks of many traditional objects of fishing which was the greatest in the 1990s led to the fishery development of alternative species. Since 2005 fishery regulation for white hake in NAFO Regulatory Area (Div. 3NO) was initiated that generated the growth of scientific and fishery interest in this species. Many biological aspects of this species have not been studied well yet. Until recently, in the Russian fishery, the white hake, as a rule, was a by-catch in the directed fishery of redfish in Div.3O and of skate in Div. 3N. The most of the total catch was usually taken in Div. 3O. The directed fishery was carried out by Russian vessels in 2002-2003. The greatest catches were registered in June-August.

This paper presents the data on fishery statistics of Russia as well as on some characteristics of white hake biology and distribution in NAFO Div. 3NO that were collected by Russian observers aboard fishing vessels in 2000-2004.

Material and Methods

The data on white hake biology were mainly collected in the directed fishery in 2002-2003. Also, the data were obtained from the catches of commercial vessels engaged in harvesting redfish, skate and Greenland halibut where the white hake occurred in by-catches.

In 2000, investigations of white hake were conducted in May-June, in 2001, - in June-July and September-October. In 2002, the data were collected the whole year round except for November, in 2003 – in March and June-August, in 2004, - from April to June.

Collection and primary processing of biological data were executed in accordance with methods used in PINRO and NAFO. The total length of fish was measured without dividing by sex in 2000, and with it in the following years. When creating the length distribution data were ranged by three classes. Maturity stages were determined using the

6-point scale. The length under which 50% of individuals reached sexual maturity (L_{50}), was calculated by fit of the logistic curve using the ratio between the portion of mature fish (P) and length (L):

$$P = 1 / (1 + e^{-r(L-L_{50})}),$$

where r is a constant.

The catches in which the white hake occurred were stratified by 100 m ranges. The portion of each species in catch was calculated in percents by weight.

Results and Discussion

The white hake *Urophycis tenuis* (Mitchill, 1815) is a demersal inhabitant of the upper continental shelf and occurs at 50-1 000 m depth (mainly 150-350 m depth) (Scott and Scott, 1988; Kulka and Mowbray, 1998). In NAFO Regulatory Area, the main aggregations are found in the southern Grand Bank and, especially, in its south-western slope.

In the early 1990s, the total catch of the white hake reached 2.5×10^3 tons. In the following years, the catch decreased and in the period till 2002 it did not exceed $0.3-0.7 \times 10^3$ tons. The most significant rise of the white hake catch was recorded in 2002-2003 when it increased in, approximately, 10 times and reached 7×10^3 tons. Fishery regulation of white hake from NAFO Regulatory Area began in 2005.

Fishing vessels of Russia were engaged in the directed fishery of white hake in 2002-2003 when the catch was estimated at $0.8-1.1 \times 10^3$ tons. In those years, the main contribution to the total catch was made by EU-Portugal and EU-Spain (Table 1).

Besides being the target of directed fishery, the white hake is an object of traditional by-catch at the depth of, primarily, to 500 m in the fishery of skates in Div. 3N and redfish in Div. 3O. According to the reports of observers, another 25 species were found in catches together with the white hake (Table 2). The species predominated in catches (to 76%) at the depth of 100-200 m. Exceeding allowable by-catch by not more than 9% was registered for such moratorium species as American plaice and cod within some depth ranges.

In June-July, the main catches of white hake were taken at the depths to 300 m. Since the fish were mainly distributed on the south-west slope of the Grand Bank, the largest catches – to 5 tons per a hauling hour – were registered in Div. 3O (Fig. 1).

Length composition of the white hake included fish as long as 21-101 cm (Fig. 2). In 2000-2004, the commercial catches, as a rule, consisted of fish 45-57 cm in length. In those years, the average length gradually increased from 46 cm in 2000 to 54-57 cm in 2004.

According to the data by Kulka and Mowbray (1998), in the catches of research vessels the white hake 12-120 cm in length occurred. Larger mature individuals concentrated at the large depths while immature fish were distributed in the shallow and closer to coast.

In the catches sex ratio was, approximately, the same. In 2000-2004, the white hake males first matured having the length of 38 cm. A complete maturation was under the length of about 65 cm, the mean length with 50% maturation equaled to 49 cm. Sexual maturation of females, as compared to males, was somewhat slower and started with the length of 40 cm. All the fish more than 70 cm in length were mature, 50% maturation was recorded when the length was 58 cm (Fig. 3). In general, L_{50} was equal to 54 cm for both sexes of the white hake that agreed well with the calculations having been made by Canadian scientists before (Kulka *et al.*, 2004).

The development of fishery in Div. 3NO was characterized by a gradual increase in the white hake length from 46 cm in 2000 to 56 cm in 2004. Accordingly, in those years, the portion of mature fish grew from 18 to 66% (Fig.4).

To the length of 50 cm when the white hake reached, approximately, 935 g, male weight by length was larger as compared with that one of females. With further increase in length the rate of weight growth of females was greater and with 80 cm length the differences by weight reached, on the average, 1.5 kg (Fig.5).

References

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TABLE 1. Catch of white hake in Div. 3NO (tons) in 2000-2004.

Country	2000	2001	2002	2003	2004	Total
Canada	414	511	1014	417	0	2356
EU-Portugal	0	0	1674	4090	0	5764
EU-Spain	150	122	2677	1645	0	4594
Estonia	3	0	0	6	0	9
Russia	108	22	1074	803	82	2089
Total	675	655	6439	6961	82	14812

TABLE 2. Composition of catch with white hake by 100m depth range (100%) Div. 3NO in 2000-2004.

№	Common name	Scientific name	2000					2001			2002					2003					2004									
			3N		3O			3O			3N		3O			3N			3O		3N	3O								
			0-100	0-100	101-200	201-300	401-500	201-300	301-400	401-500	101-200	201-300	101-200	201-300	301-400	401-500	0-100	101-200	201-300	301-400	401-500	101-200	201-300	301-400	401-500	0-100	101-200	201-300	301-400	401-500
1	White hake	<i>U. tenuis</i>	+	25.1	42.1	57.4	1.0	2.4	1.0	1.1	0.6	1.7	36.9	42.0	4.3	1.7	+	56.8	38.0	6.2	7.8	58.6	2.7	0.9	1.2	+	76.3	52.5	35.9	38.3
2	Witch flounder	<i>G. cynoglossus</i>	2.7	1.0	1.6	1.0	3.2						4.5	2.2	1.1	0.7		3.3	1.2	2.2	2.9	2.8					2.2	3.0	4.2	3.6
3	American plaice	<i>H. platessoides</i>	4.0	9.3	2.1	1.4	3.1				8.0		7.4	3.6	1.0	4.4	4.7	7.0	1.6	3.5	3.6	0.8		1.0	4.0	4.7	4.1	4.2	3.6	
4	Yellowtail flounder	<i>L. ferruginea</i>	6.9		1.6	7.8	6.4				3.2	0.6					3.2	1.3	1.7							2.6				
5	Thorny skate	<i>A. radiata</i>	83.7	34.0	27.7		0.8	1.8	0.7	0.7	81.6	91.1	54.0	10.9	0.7	92.0	8.6	9.6	8.3	10.1	2.8				89.7	9.5	22.2	18.0	8.2	
6	Beaked redfish	<i>S. mentella</i>		30.3	24.4	32.3	83.3	86.3	94.6	93.8			1.0	32.4	51.3	52.0		3.5	4.5	9.5	3.4	2.7	7.8	13.1	15.5		2.4	14.1	32.2	30.4
7	Atlantic cod	<i>G. morhua</i>	2.4				2.1				1.7		2.9	3.0	2.3	0.8		3.7	7.0	1.8	3.3	3.5	1.1			3.0	3.1	4.1	3.9	3.2
8	Haddock	<i>M. aeglefinus</i>						1.6	0.5	0.7			0.9	1.1	1.0															
9	Silver hake	<i>M. bilinearis</i>																												
10	American angler	<i>L. americanus</i>						1.7	0.7	0.8																				
11	Atlantic wolffish	<i>A. lupus</i>							0.6	0.7							1.6	1.4	1.0	1.6	1.0									
12	Spotted wolffish	<i>A. minor</i>						1.6																						
13	Northern wolffish	<i>A. denticulatus</i>						1.1						0.5						0.5			1.0		1.0					1.0
14	Wolffishes	<i>Anarhichas</i> sp.																											0.9	0.9
15	Atlantic halibut	<i>H. hippoglossus</i>						1.0				4.7	7.2		1.0					1.0										1.0
16	Pollock	<i>P. virens</i>																1.0									1.4			
17	Rough grenadier	<i>M. berglax</i>																	1.4	0.8	3.7									
18	Arctic skate	<i>A. hyperborea</i>																11.0				20.1								
19	Acadian redfish	<i>S. fasciatus</i>											0.8	34.5	43.0		2.6	4.2	37.7		2.4	85.9	71.2	69.9						9.2
20	Greenland halibut	<i>R. hippoglossoides</i>				1.0											0.8	21.3	29.3	62.8			1.0							
21	Atlantic redfishes	<i>Sebastes</i> sp.															1.0				1.2	1.0	12.8	11.6						1.9
22	Golden redfish	<i>S. marinus</i>																2.4												
23	Eelpouts	<i>Lycodes</i> sp.																												
24	Black dogfish	<i>C. fabricii</i>						1.1	1.0	1.0																				
25	Argentine	<i>A. silus</i>																	0.6						1.0					
26	Spinytail skate	<i>B. spinicauda</i>						1.6	0.6	0.7																				
Number of sets			4	3	14	10	4	19	29	44	8	1	48	92	241	876	5	33	2	2	5	100	176	245	227	34	4	1	5	16

Note: +* - value less than 0.5 %.

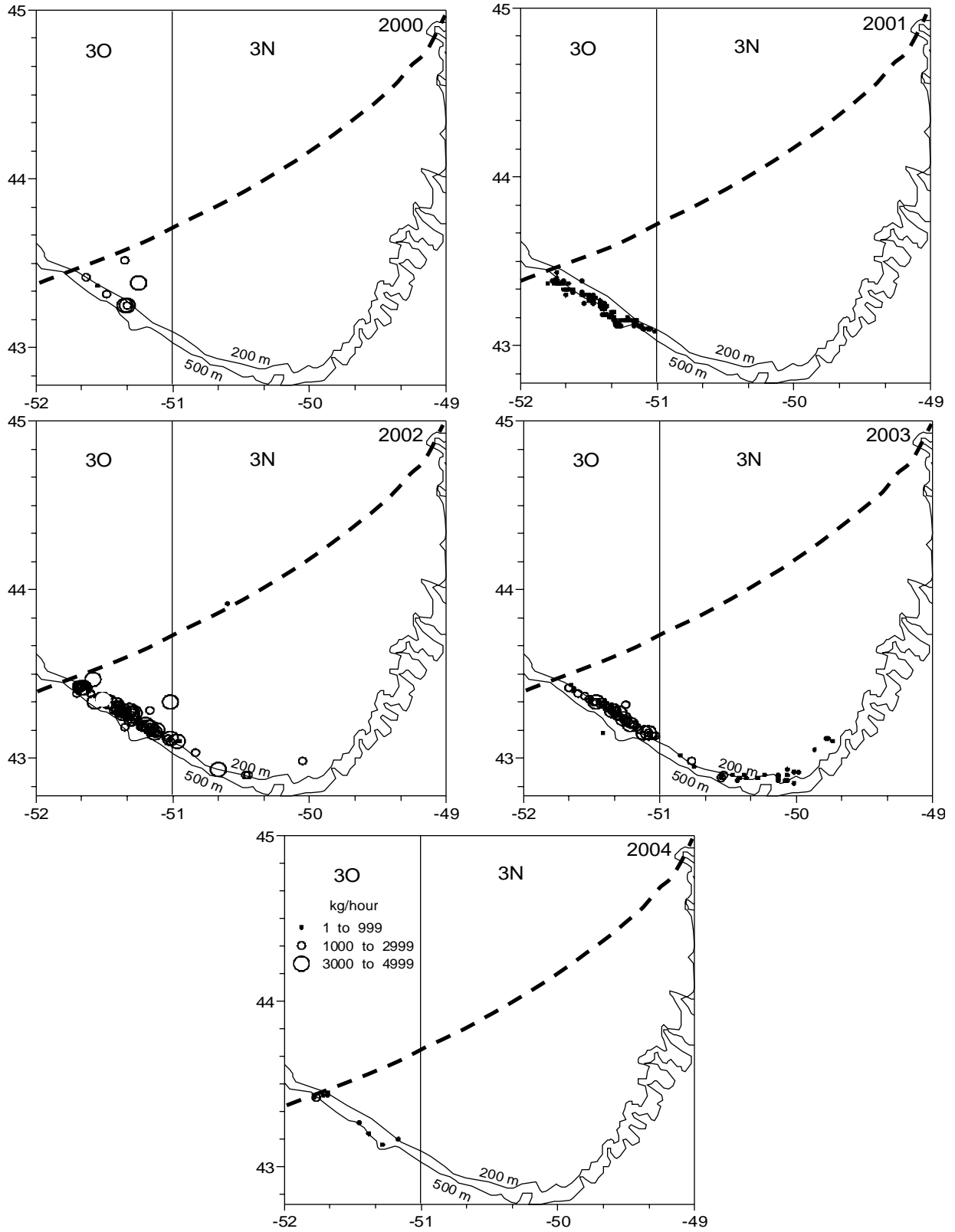


Fig.1. Distribution of white hake catches in 2000-2004.

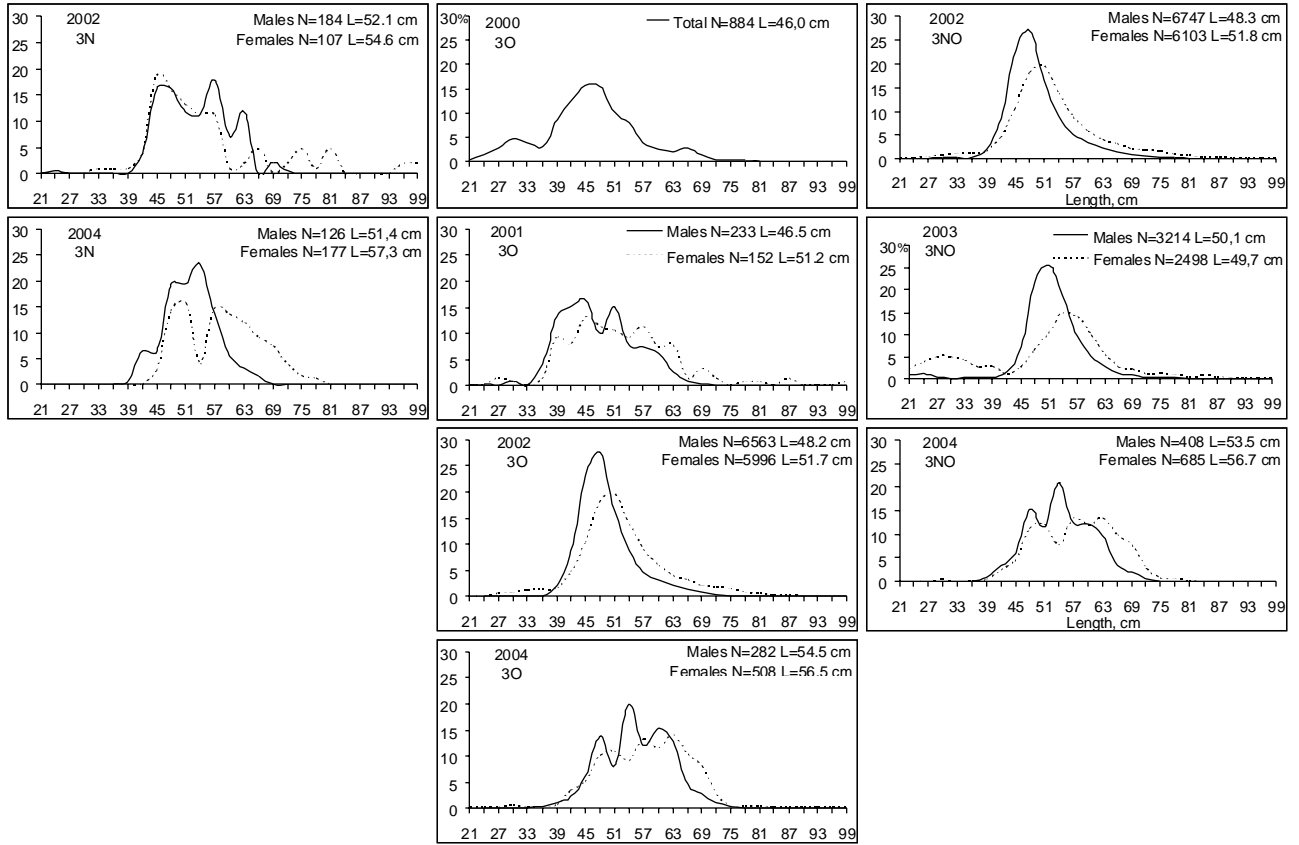


Fig.2 White hake catch composition in Div. 3NO in 2000-2004.

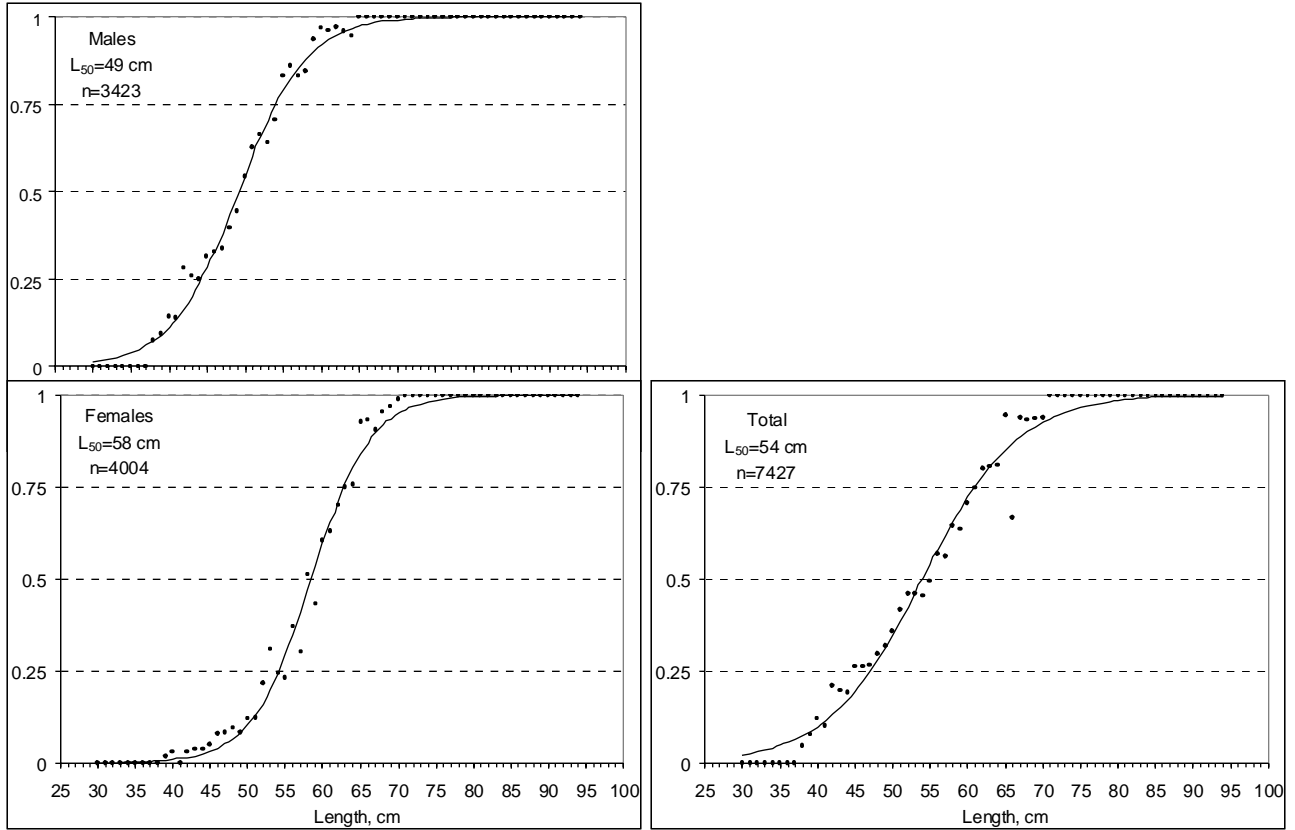


Fig.3. Maturity ogives of white hake in Div. 30 in 2000-2004.

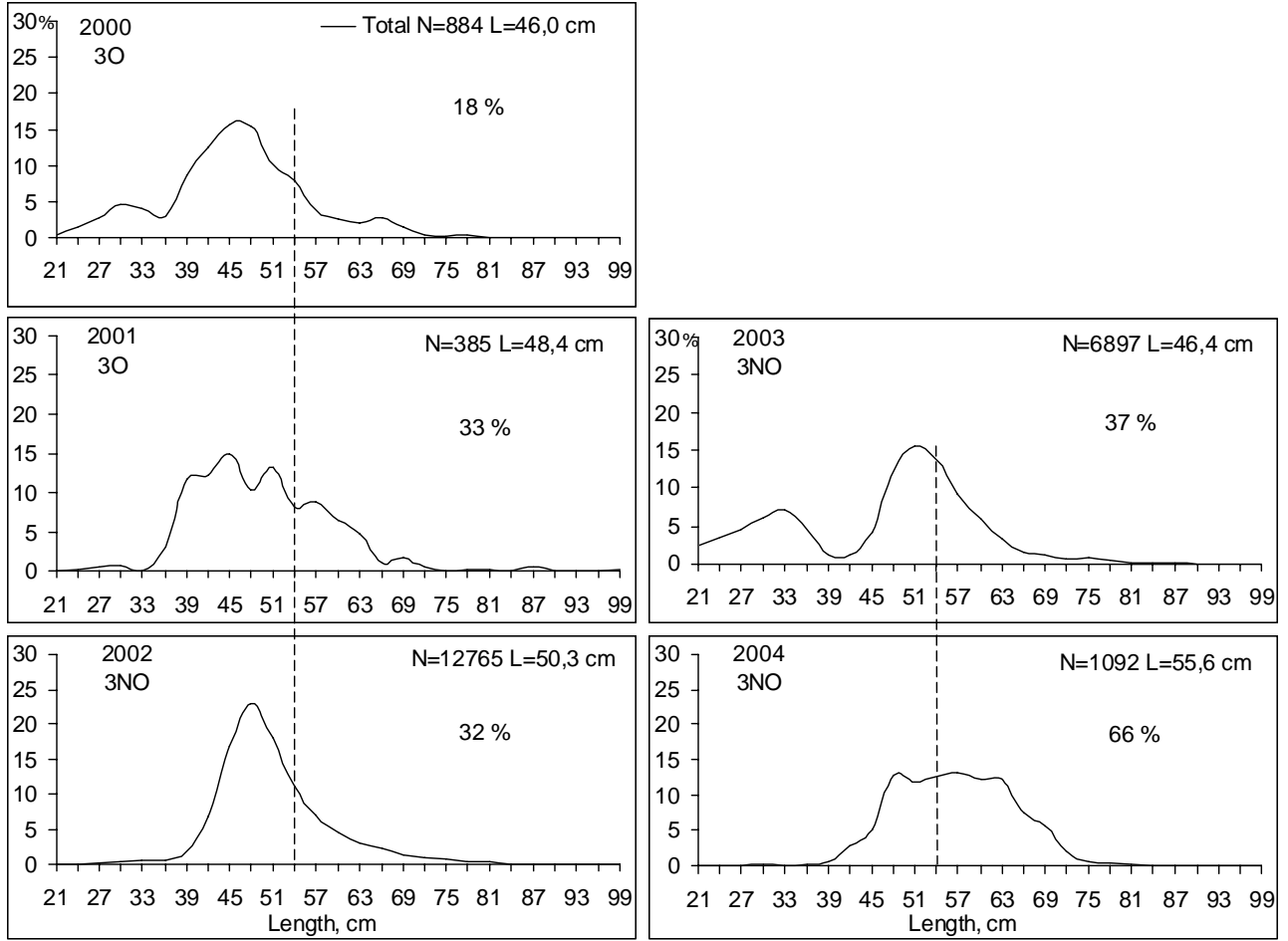


Fig.4. Ratio of mature and immature fish by length in the catches of white hake from Div.3NO in 2000-2004.

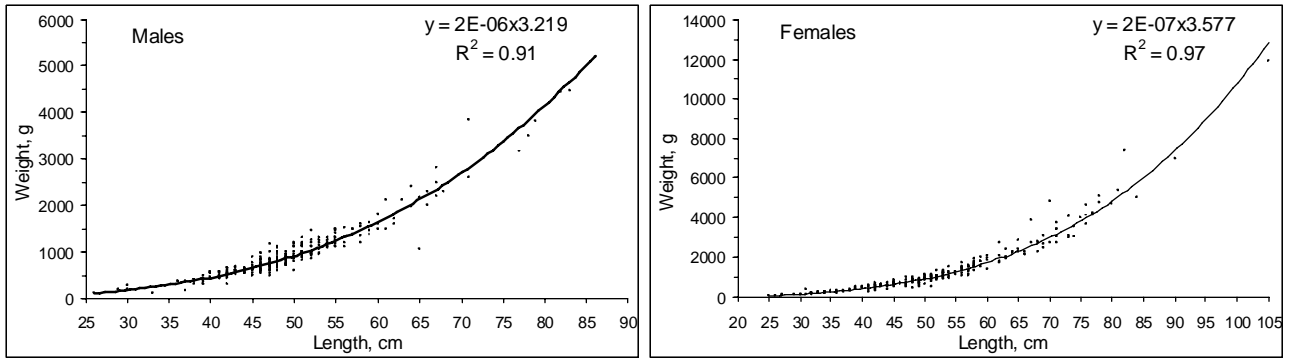


Fig.5. Length-weight ratio of white hake in Div. 3O in 2000-2004.