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On argentine stock locality in the Northwest Atlantic (ICNAF Div. 4V, 4W and 4X).

by

L. I. Shevchuk
AtlantNIRO
Kaliningrad, USSR

Abstract

This paper gives the results of the investigations on argentine, *Argentina silus Ascanius*, stock localizations off the North American coast (ICNAF Div. 4X, 4W and 4V). Real differences observed between the characters make it possible to give the argentine localization in Div. 4X (southern slope of Browns Bank) and Div. 4W (eastern slope of Sambro Bank), as well as to suggest the existence of a local group in Div. 4V (southern slope of Banquereau Bank).

Introduction

Biology of argentine off the North American coast was discussed in papers by Borodulina (1964), Emery and McCracken (1966, and Chrzan and Zukowski (1966). The existence of local argentine populations in Div. 4X and 4W is only stated in the paper by Borodulina (1964), whose data confirmed the localization *A. silus* by different linear and weight body growth rate and different weight of otoliths. However, Borodulina does not present a degree of accuracy for differences between the characters under consideration. Thus, the present paper is aimed at further investigation on argentine localization in Div. 4X, 4W and 4V (Fig. 1).

Material and Methods

Morphometric characters of fresh fish were studied by generally accepted methods (Pravdin, 1966) in the laboratory. A total of 390 specimens from Div. 4X and 4W were investigated. Morphometric material on argentine from Div. 4V is lacking. Studies on argentine stock locality by otoliths are based upon the method of Trout (1961). A total of 850 otoliths of argentine from Div. 4X, 4W and 4V were investigated. Otoliths measurements were made along the centers of their long and cross axes by binocular microscope MBS-1 (8 × 1 magnification). Otoliths were weighed by the torsion balance to the nearest 1 mg. Linear and weight fish growth rates were calculated from 570 specimens of fish studied.

The processing of the material collected was carried out by the variation-statistical methods. The value of M differentia (Pravdin, 1966) was used when specifying mean error of difference between mean values of two series. Besides this value, a degree of accuracy was estimated by Fisher criterion (Plokhinsky, 1970).

Investigation on Stock Locality by the Morphometric Method

It is known that the changes in most morphometric characters of fish are related both with the increase in age and the increment in individual length. Therefore, before analysing the meristic and plastic characters of argentine from Div. 4X and 4W, we had to ascertain that there were no size-age differences between two samples under investigations (M diff. <3) (Table 1).

The investigation on the meristic characters showed that the mean vertebrae number of argentine from Div. 4W was greater than that of the fish from Div. 4X (Table 2). Since M diff. >3. Among the measurements true differences were observed in snout length and anteanal distance of males (Table 3).

Table 1. Samples of argentine mean length from Div. 4X and 4W.

Sex	Divisions 4X	Divisions 4W	M differentia between the divisions
Females	32.82	32.22	1.9
Males	31.00	30.55	0.1

Table 2. Relative indices of meristic characters for argentine from Div. 4W and 4X.

Characters	Sex	Divisions 4W M_1	4W m_1	4W n_1	4X M_2	4X m_2	4X n_2	M diff. between the divisions
Ray number in dorsal fin	♂	11.74	0.095	42	11.57	0.112	56	1.2
	♀	11.76	0.062	49	11.61	0.104	56	1.3
Ray number in pectoral fin	♂	17.22	0.098	45	17.22	0.074	51	0.1
	♀	17.14	0.109	37	17.30	0.064	50	1.4
Ray number in vertral fin	♂	12.29	0.056	200	12.16	0.055	63	1.8
	♀	12.31	0.060	116	12.22	0.087	73	0.9
Ray number in anal fin	♂	14.29	0.107	45	14.25	0.096	92	0.2
	♀	14.41	0.104	37	14.55	0.072	86	1.1
Gill-rakers number	♂	19.13	0.076	198	19.40	0.181	52	1.3
	♀	19.23	0.090	117	19.11	0.131	58	0.7
Vertebrae number	♂	66.51	0.128	43	65.71	0.063	86	5.8
	♀	66.26	0.121	38	65.72	0.061	85	4.2

Table 3. Relative indices of measurements for argentine from Div. 4W and 4X.

Characters	Sex	Divisions 4W M_1	4W $\pm m_1$	4W $\pm \delta_1$	4X M_2	4X $\pm m_2$	4X $\pm \delta_2$	M diff. between the divisions
Body length by Smith	♂	30.55	0.237	2.57	31.00	0.214	2.08	0.13
	♀	32.82	0.239	2.26	32.22	0.187	1.75	1.9
Anteanal distance	♂	74.78	0.210	2.17	75.56	0.175	1.48	3.1
	♀	75.00	0.247	2.15	75.06	0.246	2.41	0.2
Head length	♂	25.18	0.160	1.73	25.41	0.107	0.99	1.2
	♀	25.05	0.125	1.22	25.27	0.138	1.24	1.2
Ventral fin length	♂	11.78	0.144	1.15	12.03	0.105	1.02	1.5
	♀	11.84	0.119	0.96	11.56	0.114	1.06	1.8
Snout length	♂	29.21	0.108	0.75	30.14	0.222	1.85	3.8
	♀	29.44	0.535	3.21	29.69	0.227	2.07	0.4
Upper jaw length	♂	24.78	0.436	2.93	24.37	0.149	1.32	0.9
	♀	24.97	0.279	1.68	24.76	0.192	1.72	0.6
Lower jaw length	♂	33.96	0.147	1.31	33.96	0.147	1.31	1.8
	♀	32.42	0.472	2.83	33.15	0.204	1.86	1.4

Otolith Reading

Otolith reading included a comparison of otolith length ratio to its breadth (l/d), an investigation on its length (l) and its weight (P) in argentine of the same body size originating from different areas. Before making the comparisons, we ascertained that there was no difference between the left otolith and the right one, as well as between the otoliths in males and females. Though a certain difference in otoliths between males and females does exist, it is not statistically true.

The value of otolith length ratio to its breadth in argentine from Div. 4X is lower than that in fish from Div. 4W and 4V (Fig. 2). The analysis on reliable difference of ratio (l/d) mean values (Table 1) by all the size groups for Div. 4X and 4W have shown:

i) There are no differences in fish up to 31 cm in size.

ii) There are differences in fish of 31 cm and more in size.

In Div. 4X and 4V true differences were observed in the value of ratio l/d. In Div. 4W and 4V the difference in the value of ratio l/d obtained is not valid.

Mean value of otolith weights by *A. silus* size groups from the different areas is given in Fig. 3. The otoliths in fish from Div. 4X are heavier than those in fish from Div. 4V, and have an equal weight with those in fish from Div. 4W. Reliable differences between otolith weight mean values in *A. silus* from divisions under investigation are shown in Table 5.

The investigations on argentine otolith length have shown that the mean values of otolith length in fish from Div. 4X, 4W, 4V were closely connected (Fig. 4).

Argentine Linear and Weight Growth Rate

The study on argentine linear and weight growth rate has shown that these values were higher for Div. 4X and 4V than for Div. 4W (Figs. 5, 6, 7, 8). The differences in argentine linear and weight growth rate were not observed between Div. 4X and 4V. Validity of length mean values for argentine of the same age was not verified because of material deficiency. As to the weight growth rate, the difference in fish weight mean values is rather valid (Table 6).

Table 4. Determination of reliable difference of mean values for the ratio l/d to argentine body length.

Fish length (cm)	Between Divisions					
	4X and 4W		4W and 4V		4V and 4X	
	F_{st}	F_{diff}	F_{st}	F_{diff}	F_{st}	F_{diff}
31	4.1-7.5-13.2	21.2	4.8-9.7-19.7	2.8	4.2-7.8-13.9	3.2
32	4.2-7.7-13.6	15.1	4.5-8.7-16.6	0.0	4.1-7.4-13.0	10.3
33	4.6-8.9-17.1	9.2	5.1-10.6-22.9	0.0	4.5-8.7-16.6	8.1
34	4.5-8.4-15.7	77.8	5.6-12.3-29.2	0.1	4.5-8.5-16.1	33.2
35	4.4-8.2-15.1	21.9		-		-

F_{st} = standard values of Fisher's criterion found by special tables for three probability thresholds of exact forecast (0.95-0.99-0.999).

F_{diff} = criterion on difference validity according to Fisher.

Table 5. Determination of validity of mean values difference for otolith weight relative to fish body length for argentines.

Fish length (cm)	Between Divisions					
	4X and 4W		4W and 4V		4V and 4X	
	F_{st}	F_{diff}	F_{st}	F_{diff}	F_{st}	F_{diff}
29	4.3-7.9-14.4	0.5		-		-
30	4.1-7.3-12.8	2.6	4.1-7.4-13.1	6.3	4.1-7.4-13.0	12.2
31	4.1-7.3-12.9	0.0	4.1-7.4-13.1	4.6	4.1-7.4-13.0	13.3
32	4.1-7.3-12.9	0.9	4.1-7.4-13.0	28.4	4.1-7.3-12.9	15.9
33	4.1-7.4-13.1	0.1	4.1-7.4-13.0	26.9	4.1-7.4-13.0	53.6
34	4.2-7.6-13.5	0.9	4.3-7.8-14.0	10.3	4.8-9.7-19.7	6.2

Table 6. Statistical validity of differences in body weight of argentine of the same age by divisions.

Age	Sex	4X				4W				4V				M differentia		
		M_1	$\pm\delta_1$	$\pm m_1$	n_1	M_2	$\pm\delta_2$	$\pm m_2$	n_2	M_3	$\pm\delta_3$	$\pm m_3$	n_3	4X4W	4X4V	4V4W
5	♂	171.3	19.0	5.49	12	163.7	14.8	2.11	49	-	-	-	-	-	-	-
	♀	124.0	19.6	4.62	18	147.0	23.5	3.32	50	-	-	-	-	-	-	-
6	♂	209.5	30.4	6.21	24	185.5	31.4	5.23	36	-	-	-	-	-	-	-
	♀	183.1	22.6	5.65	16	161.1	27.4	4.84	32	-	-	-	-	-	-	-
7	♂	273.5	54.6	9.98	30	215.7	41.2	8.78	22	268.5	30.0	5.22	33	4.3	0.4	5.2
	♀	233.4	36.0	4.33	69	189.5	48.2	15.25	10	-	-	-	-	3.0	-	-
8	♂	301.3	40.8	4.91	69	217.5	24.0	6.20	15	299.9	34.6	7.95	19	10.6	0.1	8.2
	♀	263.9	72.4	9.19	62	-	-	-	-	-	-	-	-	-	-	-

Summary

1. As a result of the investigations carried out, there were specific differences in the following characters of argentine between Div. 4X and 4W: vertebrae number, snout length, anteanal distance, otolith length ratio to its breadth, otolith weight, linear and weight growth rate. Based on these differences, we ascertain existence of local groups in Div. 4X and 4W.

2. True differences in otolith weight (both in males and females) and in weight growth rate (in males) exist between argentine from Div. 4W and fish from Div. 4V. Further investigations on argentine from Div. 4V are required to confirm a suggestion on their stock localization.

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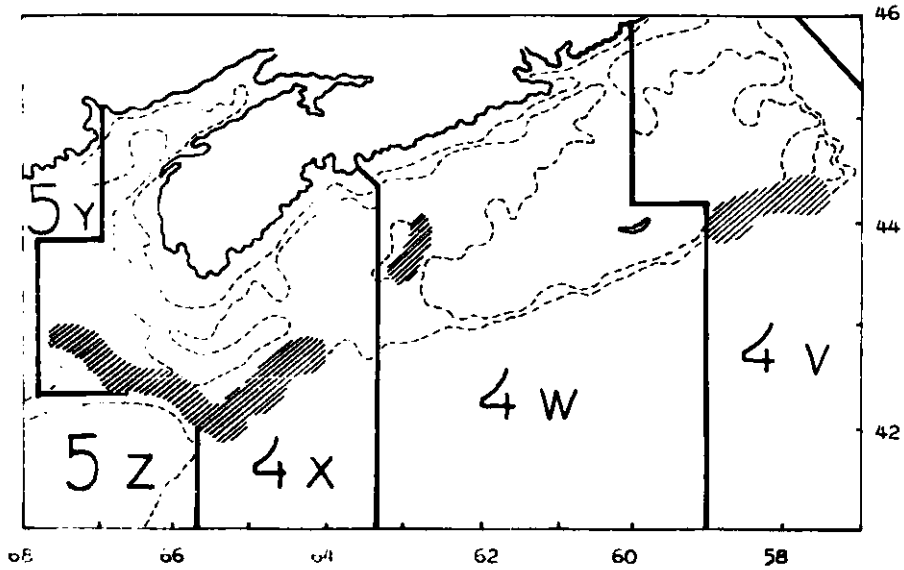

Fig. 1. Plot of argentine local groups distribution in the Northwest Atlantic.

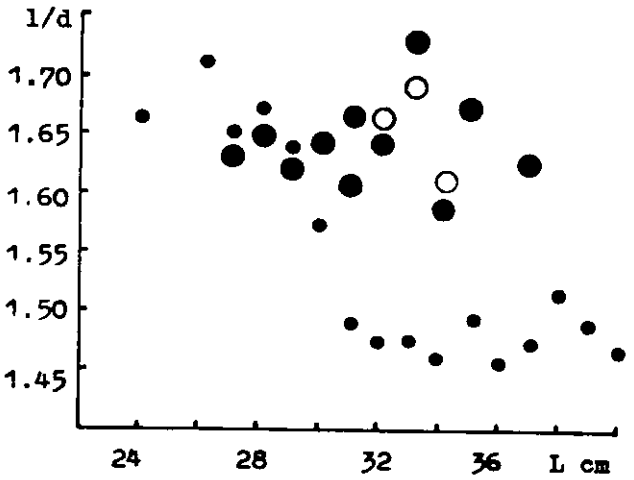

Fig. 2. A dependence between the value of otolith length ratio to its breadth (l/d) and argentine body length (l) by divisions.

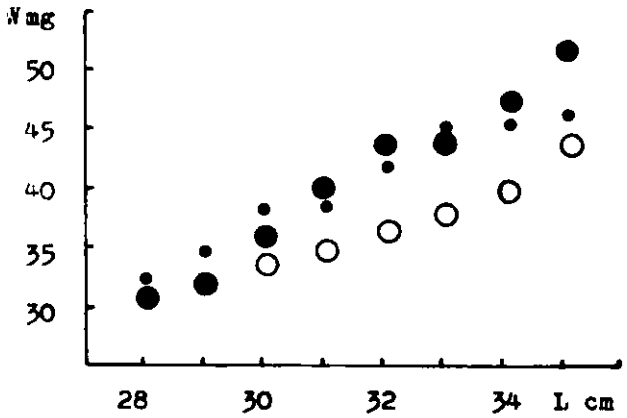

Fig. 3. A dependence of argentine otolith weight (P) on argentine body length by divisions.

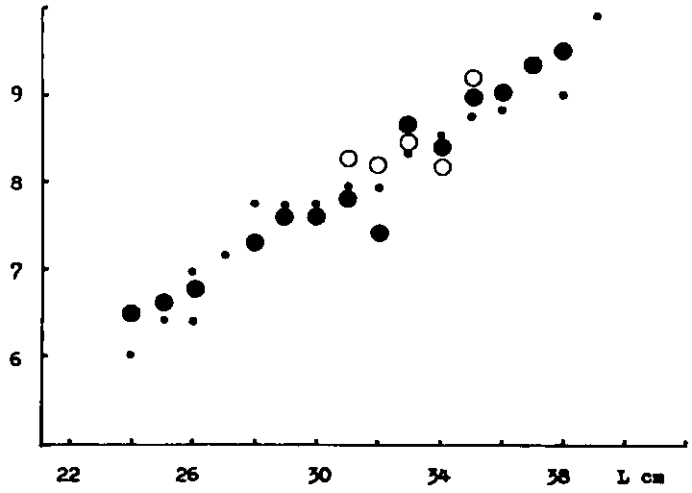

Fig. 4. A dependence of otoliths length (l) on argentine body length by divisions.

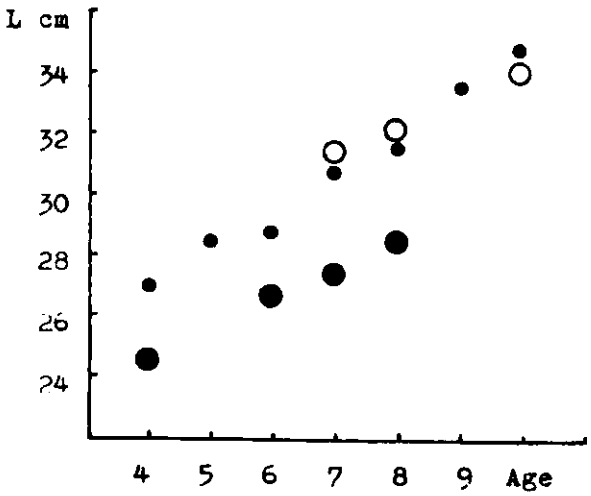

Fig. 5. Linear growth of argentine males by divisions.

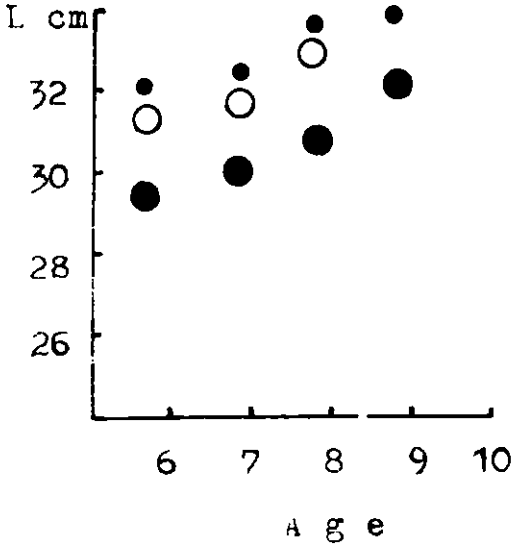

Fig. 6. Linear growth of argentine females by divisions.

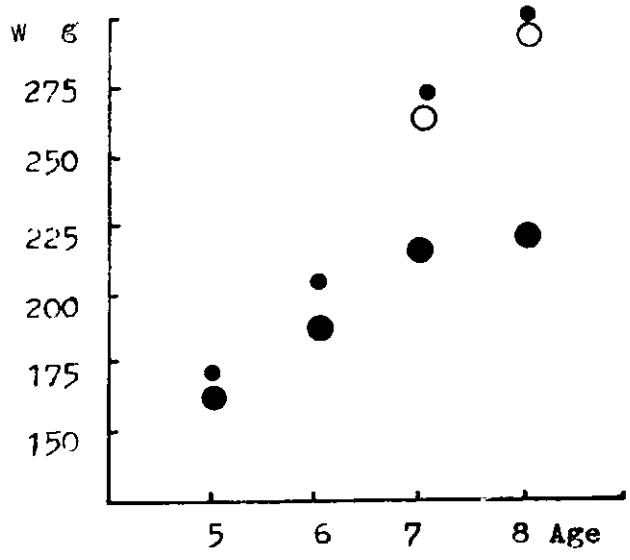

Fig. 7. Weight increment of argentine males by divisions.

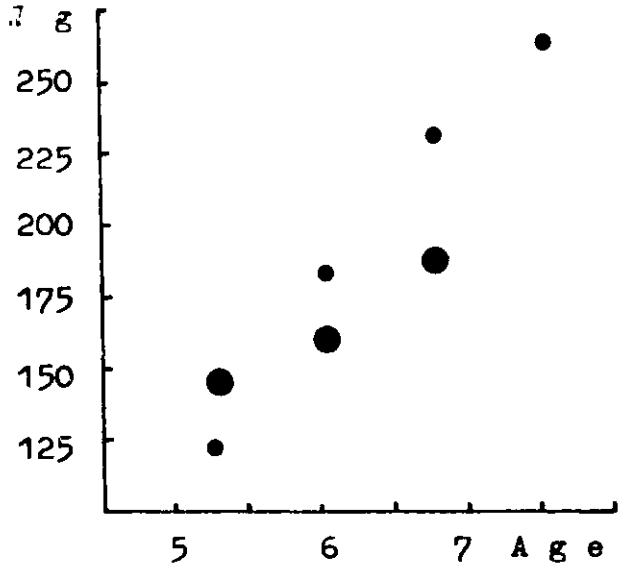

Fig. 8. Weight increment of argentine females by divisions.